COMMONWEALTH OF MASSACHUSETTS
HUMAN RESOURCES DIVISION

MASSACHUSETTS FIRE DEPARTMENTS
PHYSICAL ABILITY TEST
PREPARATION GUIDE

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INTRODUCTION

This Preparation Guide has been distributed to help you prepare for the Commonwealth of Massachusetts Firefighter's Physical Ability Test. The Physical Ability Test consists of a series of events simulating firefighting activities. This Guide contains a physical conditioning program intended to assist you in preparing for the Physical Ability Test. It is divided into six major sections as follows:

Section I: Summary of Physical Ability Test

This section provides a description of the Physical Ability Test in which candidates will participate as part of the testing process.

Section II: Preparing to Begin a Fitness Program

This section begins with a discussion of health factors that may affect your ability to perform the fitness program and the Physical Ability Test, continues with a discussion of principles of training and concludes with a fitness test for assessing your current level of fitness.

Section III: Fitness Program

This section presents a fitness program designed for a sixteen week training period. The program includes Warm-up Exercises, Calisthenics, Weight Training, Aerobic Training and Cool-down Exercises.

Section IV: Weekly Log Pages

Log pages are provided so that you can track your progress.

Section V: Application of the Exercise Training Program to Firefighter Tasks and the Physical Ability Test

This section provides a table explaining the link between the exercises in the program and the specific events that make up the Physical Ability Test.

Section VI: References

This section lists the references used to develop the physical conditioning program. You can review these reference sources if you would like further information about physical fitness.

SECTION I: SUMMARY OF PHYSICAL ABILITY TEST

A. General Description

The Physical Ability Test (PAT) is designed to assess a candidate's capacity to perform the tasks ordinarily performed by a firefighter while on the job. This is accomplished by requiring the candidate to perform a series of events that both simulate firefighting activities and depend on the physical abilities required to perform the firefighter’s job. These abilities include

cardiovascular fitness, muscle strength, muscular endurance and flexibility. The exercise training program presented in this guide provides candidates with the information they need to improve their level of physical fitness by conditioning the individual muscles and muscle groups involved in the tasks performed by a firefighter, and required to perform the PAT events.

B. Commonwealth of Massachusetts Firefighter Physical Ability Test

You are advised of the following:

- Wear clothing appropriate for physically demanding work. Wear long pants, such as warm-up suit or sweatpants.

- You may wear gloves and/or kneepads, however, these items WILL NOT be provided for you. You must bring your own gloves and kneepads if you want to wear them.

- Wear sneakers or rubber soled shoes.

- Participants may not use any extraneous piece of equipment (e.g., harnesses, straps) that they may bring with them to help in an event. They may use only the material and equipment provided for the test event. However, personal safety appliances (e.g., knee brace, ankle brace) will be allowed, but they will not be provided.

Because the Physical Ability Test is physically demanding, it is suggested that you refrain from eating at least two hours before the examination. However, you are urged to drink plenty of fluids beginning the day before the test and continuing up until the time you are tested. Avoid drinking caffeinated beverages. You are also advised to stretch and warm-up before participating in the test.

The Firefighter Physical Ability Test consists of 7 events that require you to perform simulations of activities that are part of the firefighter's job. As indicated earlier, these events require cardiovascular fitness, muscle strength, muscular endurance and flexibility. Each event will be timed. During all events, you will wear a weighted vest which approximates the weight of the clothing, equipment and breathing apparatus that a firefighter normally wears during these types of activities. The events are described, in the sequence completed, below.

1) Stair Climb: This event simulates continuous stair climbing, an activity that firefighters may perform when getting to a fire at an incident scene. For this event, you will be required to step on a rotating stair case (also known as a stepmill) at a pre-determined stepping pace for a specific period of time. You will get a 5 minute rest period after this event. The required time to remain on the stepmill is 200 seconds.

2) Ladder Event: This event simulates various activities related to using ladders. You will be required to remove a ladder from a rack, carry it some distance, raise a weight of approximately 45 lbs. attached to a rope that simulates the raising of an extension ladder, lower that weight and return the ladder to the rack from which it was taken. The event ends when the ladder is back in the rack. The time limit is 35.56 seconds.

3) Hose Advance: This event simulates the actions necessary to manipulate a fully charged fire hose. You will be required to pull 50 feet of hose through a U-shaped course with several turns. There will be a ceiling on the U-shaped course to prevent you from standing upright. The time limit is 20.00 seconds.

4) Forcible Entry: This event simulates breaking down a door to gain entry to a burning structure or an incident scene. For this event you will be required to strike a rubber pad mounted on a moveable post. You will use a 12 lb. sledge hammer to move the post a set distance. The post and structure are weighted to simulate the force you would need to exert on a door in order to gain entrance. The time limit is 13.91 seconds.

5) Search: This event simulates the actions necessary to enter and search a smoke-filled structure. You will be required to crawl through a dark wooden tunnel with obstructions and turns. The tunnel is approximately 65 feet long. The tunnel is 4 feet high and 4 feet wide. At one location in the tunnel there is an obstacle on the floor and at one location there is an obstacle from the ceiling. In addition, at two locations, the tunnel is reduced from 4 to 3 feet in width. The time limit is 39.00 seconds.

6) Rescue Through a Doorway: This event simulates the actions necessary to drag an unconscious victim out through a doorway to get the victim to safety. You will be required to drag a 125 pound dummy approximately 50 feet, along a zigzag course to a designated area at the end of the course. In this event, there is a low ceiling over the course to prevent you from standing upright. The time limit is 36.00 seconds.

7) Ceiling Hook (Pike Pole): This event simulates the use of a pike pole or ceiling hook. A pike pole or ceiling hook is a firefighting tool used to tear down ceilings or open walls while looking for hidden fires. This event will require you to take a pike pole, tipped with an industrial hammer head, and thrust it upward at a metal plate in an 8 foot ceiling. The metal plate weighs approximately 60 lbs. and must be lifted six inches in order for the strike to count. You will then step over to the next part of the event, where a pike pole handle is suspended from a ceiling height. The pole is attached to a counter balance that weighs approximately 80 lbs. You must pull the pole down six inches in order for the pull to count. You will be required to perform one push and five pulls in a sequence. The event will require you to perform four one-minute periods of work, in which you will try to do as many push-pull sequences as possible. Each work period will be followed by a 30 second rest period. You must complete 25 full repetitions.

SECTION II: PREPARING TO BEGIN A FITNESS PROGRAM

A. Medical and General Health Factors

Health Screening for Physical Activity[1]

To optimize your safety during both the Physical Ability Testing (PAT) and exercise training in preparation for the PAT, some initial screening for important medical and health factors is necessary. The purposes for this type of pre-participation screening include:

- identifying those individuals who have medical conditions serious enough that exercise would either present an immediate risk or aggravate the medical problem,
- identifying those individuals who have signs and symptoms which suggest a problem or risk factors for diseases who should receive further medical evaluation before undergoing exercise training or a PAT, and
- identifying those individuals who may have special exercise requirements, or who should take special precautions prior to exercising. For example, taking a diuretic (water pill) for moderate hypertension means that you should take care to drink extra fluid before, during, and after exercise.

It is not necessary for everyone to get a thorough physical examination from a physician prior to starting an exercise program. Such a requirement is not scientifically necessary, cost-effective, or time-efficient. However, if going to your physician would make you feel better about beginning an exercise program, by all means do so.

[1] Portions of the following are adapted from the American College of Sports Medicine, Guidelines for Exercise Testing and Prescription, draft of 5th ed. (W.L. Kenney, ed.), Waverly Press, Philadelphia, 1995, with the permission of the editor.

The Physical Activity Readiness Questionnaire (PAR-Q) is recommended as a minimal standard for screening prior to beginning an exercise program or, if some activity is already underway, to exercising more vigorously. The PAR-Q is designed to identify the small number of adults for whom physical activity might be inappropriate and those who should have medical clearance prior to exercise and testing.

Physical Activity Readiness Questionnaire (PAR-Q)[2]

1.	Has a doctor ever said you have a heart condition and recommended only medically supervised physical activity?	YES	NO
2.	Do you have chest pain brought on by physical activity?	YES	NO
3.	Have you developed chest pain within the last month?	YES	NO
4.	Do you tend to lose consciousness or fall over as a result of dizziness?	YES	NO
5.	Do you have a bone or joint problem that could be aggravated by the proposed physical activity?	YES	NO
6.	Has a doctor ever recommended medication for your blood pressure or a heart condition?	YES	NO
7.	Are you aware, through your own experience or a doctor's advice, of any other physical reason why you should avoid exercising without medical supervision?	YES	NO

If you answered YES to any of these 7 questions, vigorous exercise and exercise testing should be postponed until medical clearance is obtained.

[2] From: S. Thomas, J. Reading, and R.J. Shephard. Revision of the Physical Activity Readiness Questionnaire (PAR-Q). Canadian Journal of Sport Science 17:338-345, 1992.

Question number 7 of the PAR-Q is an open-ended question which covers medical and physical problems which make further medical screening necessary. Many individuals may question whether certain conditions are important enough or severe enough to warrant seeing their doctor. The table below provides additional information, including an indication of signs and symptoms suggestive of underlying diseases, risk factors for heart disease which, in combination, suggest the need for medical screening, and a list of conditions which may increase the risk of complications during exercise.

1. Major Signs or Symptoms which Suggest Heart, Lung, or Metabolic Disease:

- Pain, discomfort, or numbness in the chest, arm, jaw, neck, or back
- Unaccustomed shortness of breath or shortness of breath with mild exertion
- Difficult or painful breathing
- Ankle swelling
- Palpitations or racing heart rate
- Leg pain
- Known heart murmur

If you have any of these symptoms, vigorous exercise or exercise testing should be postponed until medical clearance is obtained.

2. Major Heart Disease Risk Factors:

- Systolic blood pressure $\geq$ 160 or diastolic blood pressure $\geq$ 90 mmHg (measured on at least 2 separate occasions)
- Serum cholesterol $\geq$ 240 mg/dl
- Cigarette smoking
- Family history of heart disease or stroke in parents or siblings prior to age 55

If you have <u>two or more</u> of these risk factors, vigorous exercise or exercise testing should be postponed until medical clearance is obtained.

3. Diabetics who:

- take insulin
- have had diabetes for more than 15 years
- who do not take insulin but are over 35 years of age

should get medical clearance prior to beginning an exercise program.

4. It is also recommended that men over the age of 40 and women over the age of 50 have a physical exam prior to beginning a vigorous exercise program. "Vigorous" means that the amount of exercise represents a challenge and will result in fatigue within 20 minutes. Healthy persons of any age should be able to begin a low intensity exercise program without physician clearance provided that they adhere to the above conditions.

No set of guidelines can cover every conceivable situation. In general, if you know that you have a problem or disease, see your physician first. Some other conditions which indicate a

need for medical screening include alcoholism, drug use or abuse, problems with dehydration or an inability to tolerate heat, and acute infections (including severe colds and flu symptoms). Pregnant women, or women who think they may be pregnant, should consult a physician prior to beginning an exercise program if they have not been physically active prior to the pregnancy.

Smoking

Inhaled smoke has been linked to lung cancer, lung disorders, and coronary heart disease. Smoking also affects a person's ability to perform aerobic tasks. The same mechanisms that eventually lead to lung disorders limit the ability of the lungs to take in air and distribute oxygen to the blood. This ability is particularly crucial when performing tasks that involve large muscle groups continually contracting for several minutes or longer. A candidate who smokes may be specifically affected in his or her ability to climb stairs or walk or run for any length of time, especially while carrying equipment. A smoker may not be able to do as well on an event that involves this type of activity as a non-smoker of similar size, ability and training. Therefore, in order to maximize their potential to do well on the Physical Ability Test, applicants who smoke are urged to quit smoking as soon as possible. Civil Service applicants for the entry-level firefighter examination are reminded that, by law, you must be a non-smoker to work as a firefighter in one of the 107 municipalities covered by civil service.

Weight Control

Carrying excess weight in the form of fat will reduce an applicant's performance potential on the Physical Ability Test. Excess weight increases the work that the muscles, heart, and lungs have to do when performing tasks. For example, when an overweight person walks up stairs, the leg muscles have to lift more weight. The heart also has to pump more blood to those working muscles, putting additional stress on the heart. When muscles have to work harder, against the stress of carrying excess weight, injuries can result ranging from pulled leg muscles to a heart attack.

In an effort to promote safety and optimal health, it is recommended that overweight applicants try to lose weight before participating in the Physical Ability Test. To best accomplish this, overweight applicants should begin a weight reduction program that contains both a nutrition and an exercise component. Weight loss can best be achieved by: (a) decreasing the amount of food you normally eat through the reduction of portion sizes, (b) changing a few "bad habits" such as the amount of high fat food selections you may be making, and (c) increasing the amount of exercise you are presently getting.

1. Through reduction of food intake. A successful weight loss program always includes an eating plan designed to provide the right amount of vitamins, minerals, and calories to avoid hunger pangs and any possible nutrient deficiencies. Nutritionists suggest the following method to assess your current calorie intake and to cut back calories appropriately. To determine your current caloric intake: **multiply your present weight by the number 15.**

The answer is the average number of calories you are eating daily to maintain your current body weight. The number 15 is used because it takes approximately 15 calories to maintain one pound of body weight.
Now that you know the average number of calories you're eating, to lose weight, you need to reduce this amount by between 500-1000 calories per day. To demonstrate the effect of reducing your calorie intake, look at the following examples:

3500 calories = 1 pound of body weight
500 calories x 7 days a week = 3500 calories (1 pound)
1000 calories x 7 days a week = 7000 calories (2 pounds)

By cutting back 500 calories per day, you will be able to lose approximately 1 pound of body weight per week. Cutting back 1000 calories per day allows you to lose approximately 2 pounds of body weight per week. Losing any more than 2-3 pounds of body weight in one week could be detrimental to your health and also increases the chances of gaining the weight back more quickly. So go slowly and steadily.

Some people will lose less than a pound one week and 2 pounds the next. There often is no clear way to gauge weight loss, but be confident that if you're cutting back on calories, you will definitely see a difference over the long haul.

2. Through exercise. An exercise program is also a key component of losing weight and keeping it off. For example, if you don't want to cut your calories by 1000 per day but still want to lose 2 pounds of weight per week, you can cut calories by 500 and increase exercise by 500 calories. The results will be the same... a 2 pound weight loss. Here are some examples of ways to burn roughly 500 calories through energy expenditure:

Ways to Burn 500 Calories

- walk 5 miles (takes 100 minutes)
- jog 5 miles (takes about 55 minutes)
- climb stairs for 80 minutes
- cycle or row for 60 minutes

3. Through appropriate food selection. Now that you realize some of your weight loss options, the next step is to select the appropriate foods. Our first aim is to identify the foods you're currently eating that are too high in fat. Some examples might include:

- peanut butter
- ice cream
- butter or margarine on toast, vegetables, popcorn, potatoes, etc.
- large amounts of meats and their skins
- fried foods such as french fries, fried chicken, fried eggs, etc.
- cheese, sour cream, cream cheese, mayonnaise, salad dressings
- high fat desserts such as cookies, pies, cakes, pastries and donuts
- fatty meats such as ribs
- oils

Although fat is an essential nutrient, most Americans are simply eating too much of it. You should get only about 20-30 percent of your total daily calories from fat. But rather than try to calculate what that number should be, your goal should be to cut back on fat as much as possible.

Your next step is to assess how many fruits and vegetables you're eating. The recommended number of fruits is 2-4 pieces per day (or 2-4 cups of canned fruit in it's own juice). Vegetables

can be eaten cooked or raw to total 2-4 cups per day. In many cases, vegetables can be eaten in any quantity due to their very low calorie content. Finally, assess how many foods you eat from the grain, cereal, and bread category. It is recommended that the majority of food you eat in a day come from these foods, 6-11 servings per day. Examples include:

- rice
- pasta/noodles
- potatoes, corn, peas, dried beans such as navy, pinto, garbanzo and black beans
- all types of bread, bagels, muffins
- all types of cereal
- cornmeal
- stuffing
- sweet potatoes, squash, yams

These foods are referred to as complex carbohydrates. They are responsible for providing you with the most available form of energy, glucose. Consequently, your diet needs to be plentiful in them, yet you can still lose weight due to their typical high fiber content.
Protein rich foods should be kept to a minimum, to the surprise of many people. In fact, only 12-15% of your total daily calories need to come from protein rich foods such as meat, eggs, milk, yogurt, and other dairy products. Look for lean meats; remove skin from chicken and fish; trim all fat off meat; and select skim milk, no fat yogurt, and lower fat cheese such as mozzarella.

An example of a high carbohydrate, low fat eating plan that can be adapted to your desired caloric intake follows.

The following is an example of a high carbohydrate, low fat Eating Plan:

Breakfast
1-2 cups of cereal (a high fiber one is best, but any will do) 1 cup of skim milk 1 piece of fruit (any kind) 1-2 slices of toast or a bagel or English muffin with jam or jelly (no fat)
Snack
1 piece of fruit (any kind)
Lunch
1 sandwich made with: 2 slices whole wheat bread, 3 - 4 ounces of turkey, chicken or fish mustard and no mayo tomatoes, lettuce, pickles a bag of raw vegetables including carrots, celery, broccoli, cauliflower 1 piece of fruit (any kind) 1 cup of low fat or no-fat yogurt 1 small bag of pretzels a non-caloric beverage of choice, or water
Snack
pretzels (small bag), fruit, vegetables, or yogurt
Dinner
5-6 ounces of meat of your choice a potato or 2 cups of rice or 2 cups of pasta or 2 slices of bread any amount of vegetables without butter or margarine on them 1 piece of fruit 8 ounces of skim milk or 8 ounces of non-fat yogurt
Additional calories may be obtained from other low fat sources.

Meal Planning

Always eat three regular size meals as shown in the example Eating Plan, or six small meals every day. The purpose behind this advice is twofold. First, you spread your calories out throughout the day allowing adequate blood sugar for energy. Second, by eating periodically, you are never "starving." By withholding calories as in skipping a meal, you allow your blood sugar to drop so low that your body will crave high fat, high sugar calories causing you to eat candy bars and other immediate sweets to satisfy the craving. You actually can prevent this by eating regularly.

Select foods that contain carbohydrate, protein, and fat for each meal. Since carbohydrates empty from the stomach the quickest, providing excellent and immediate energy, they should be the largest part of any meal. Protein is the next nutrient to leave the stomach and fat the last. Both of these nutrients help keep you feeling full for a longer period of time since they stay in the stomach longer.

There are many misconceptions and fallacies about diets and exercise. The truth about some of the most common misconceptions is discussed below:

1. **FALSE:** *Exercise will increase your appetite.*

   Exercise does not increase appetite. In fact, it can actually act as an appetite suppressant. In other words, it may decrease your appetite. Exercise also serves to stimulate metabolic rate, or the rate you burn calories, for a while after exercise is over.

2. **FALSE:** *A lot of extra weight is "water-weight," and you can lose weight by sweating or drinking less fluid.*

   Exercising in rubber suits, in saunas, or steam rooms will only increase your loss of body water and dehydrate you, giving you a "false sense" of weight loss. Dehydration is not an effective way to lose weight. Since the body is made up of 70% water, it makes sense to drink plenty of fluids each day to maintain proper fluid balance. We lose body fluids without really knowing it through our skin as well as through sweating. Weighing yourself after exercise and seeing a decrease in body weight is not an appropriate way to assess true weight loss. You need to drink fluids to replace lost water. In fact, you should drink a little more water than what quenches your thirst to fully prevent dehydration.

3. **FALSE:** *Fad diets and gimmicky exercise programs are effective.*

   You cannot lose body fat unless you decrease total calories (not just fat calories).

4. **FALSE:** *Dieting is a short-term way to lose weight.*

   The concept of "diet" typically implies some form of eating plan that you'll follow for a short period of time. Consider the fact that the body has a set number of fat cells that NEVER die until the day that you do. Consequently, losing weight by changing eating habits must be continued to maintain lost weight. By "going off the diet" you will inevitably gain the lost weight back. So concentrate on changing a few bad habits slowly and permanently and include exercise.

5. **FALSE:** *Quick-reducing diets are effective.*

   Diets that promise rapid weight loss are typically short-term programs. When you lose more than 2-3 pounds per week, you are not only losing fat, but also muscle mass and water. As soon as the low calorie diet, quick weight loss scheme wears you down, you'll revert back to your more pleasant way of eating and gain all the lost weight back, and typically, more.

6. **FALSE:** *You can spot-reduce in specific areas of your body.*

   You cannot "spot-reduce." In other words, by cutting back on your calories, you cannot specify where the changes in body reduction will occur. But, by exercising specific body parts, you can effectively strengthen certain muscle groups to give you a leaner, stronger look, but fat does not selectively disappear from those areas.

Three factors play key roles in determining weight loss in any given individual. The first is heredity. If you were born to overweight parents, you have a predisposition to being overweight. As a result, your ability to lose weight easily may be somewhat impaired due to your genetics. Secondly, environment plays a big role. What kinds of foods do you keep in the house, where do you socialize and does socialization usually mean food? Third, what is your activity level? Are you typically a more sedentary person? Try watching less television and work on more projects in the evening. Do you snack while sitting around? Try more movement in general. Think about where you can fit in exercise.

In conclusion, successful, long-term weight loss involves many factors. Cutting back calories is critical to weight loss but it won't make you more fit or promote long-term weight management. That's where exercise fits. The combination is the right approach. Set some realistic (1-2 lbs. per week) goals for weight loss through a change in eating habits and increased exercise. Keep food records to assess accurately what you are eating. Write down everything you eat for about a week and assess where you think some changes could reasonably be made. Keep an activity log. Strive for adding a few extra minutes of activity periodically until you reach 30-40 minutes of exercise a day.

B. Principles of Training

Terms

Some of the terms used in this training program are explained below, as are some of the principles upon which this training program is based. (Sharkey, 1979)

Physical Fitness

Physical fitness is defined as “the ability to carry out daily tasks with vigor and alertness, without undue fatigue and with ample energy to enjoy leisure-time pursuits and to meet “unforeseen emergencies” (President’s Council on Physical Fitness and Sports). An adequate level of physical fitness is required to perform many jobs, to provide energy for recreational activities, and to help avoid some diseases (such as heart disease and osteoporosis). Physical fitness consists of the following components: cardiovascular fitness, muscle strength, muscular endurance, and flexibility. In order to perform optimally at work and in our other daily activities it is necessary to develop and maintain adequate levels of fitness in each of these components. The training program is designed to develop all components of fitness because of their role in the PAT events and in maintaining good overall health.

Cardiovascular fitness (aerobic endurance, stamina) is a measure of heart and lung function. It is the ability to maintain whole body activity for a length of time without fatiguing or running out of breath. An adequate level of cardiovascular fitness is also associated with decreased mortality from many diseases.

Muscle strength (also referred to in this Preparation Guide simply as "strength") is a measure of the greatest amount of force a muscle can apply; that is, the most weight a muscle group can move one time. In addition to its importance in many job-related tasks, improving muscular strength also helps prevent injuries to the muscles and makes bones and tendons stronger.

Muscular endurance is a measure of a muscle's ability to maintain a submaximal force or repeatedly apply a submaximal force without a rest; that is, the number of times you can lift a certain amount of weight. Adequate levels of muscular endurance allow your muscles to perform a task for a longer period of time before the muscles get tired. Poor endurance of the back and abdominal muscles has been implicated as the cause of much of the low back pain suffered by American adults.

Flexibility is a measure of the range of motion at a joint. Adequate levels of flexibility are necessary in order to make daily movements with ease and to help prevent injuries to muscles and joints. In addition, there is evidence to suggest that inadequate flexibility of the back and legs is related to low back pain.

Adaptation

The stress of repeated exercise produces changes in the body that are called training effects. Your body undergoes some changes in structure and function that allow it to respond better to the demands of physical work and exercise. The body adapts to the extra demands imposed by training by undergoing the following changes:

- Heart function and circulation are improved.
- Blood pressure and cholesterol levels are improved.
- Muscle strength and muscular endurance are improved.
- Muscle mass increases and the portion of weight made up of fat decreases.

Training consists of exercising specific muscles or muscle groups and stressing different systems of the body. It involves having the muscle or muscles apply and maintain a force for a short time and/or repeatedly. Calisthenics, weight training, stretching, and aerobic activity are all important training methods that will result in adaptations that will enable the body to perform more effectively. The rate of improvement or adaptation is related to the following:

- Frequency of activity (the number of times per week).
- Intensity of activity (how hard you train).
- Duration of training (the length of each training session).
- Your initial fitness level.

Overload

For improvement in fitness level to take place via adaptation, a part of the body must be subjected to more than it is accustomed to. For example, in order for muscular strength to improve, the muscles must apply a greater force than they normally would apply during regular daily activities. This increase in intensity of force, or overload, elicits an adaptation. Increasing the duration of an activity would also be an overload. As the body adapts to an increased load, more load must be added to continue adaptation.

Specificity

The body adapts very specifically to the type of training it receives. The type of training must be related to the desired results or to the purpose of the training. Aerobic activity will cause very different body adaptations than will weight training. Thus, heavy weight training is of little value for cardiovascular endurance, and a lot of running is not particularly useful for developing upper body strength. In addition, adaptations are specific to the muscle groups that are trained. Thus, stretching the shoulder muscles in order to improve shoulder flexibility will not improve flexibility at any other joint, nor will it improve strength of the shoulder muscles. Performance of an activity improves when the training is applied to the same muscle groups as are used in the activity in the same way they are used in that activity.

One especially important use of training specificity for firefighters is stair climbing. In particular, climbing down stairs involves an action which stretches (rather than contracts) the leg muscles. This may cause muscle tissue damage which leads to muscle soreness - probably more so than any other activity! Training which specifically involves stair climbing (up and down, repetitively) will decrease potential for muscle soreness and related problems.

One exception to this specificity principle is cardiovascular endurance. The heart-lung system involved in cardiovascular endurance is vital in all activities that require large muscle groups to be active for any length of time. The specific activity used to train the cardiovascular system is, therefore, not critical, unless one is competing in high level athletic events.

Use and Disuse

The body needs activity and does not "wear out." Lack of activity results in weak muscles, including the heart, poor circulation, shortness of breath, increased body fat, and weakening of bones and connective tissue. Regular activity results in good muscle tone, a strong heart, good circulation, endurance, and strong bones and connective tissue (ligaments, tendons, etc.).

Individual Response

Individuals respond differently to the same training program. The differences in response may be the result of any of the following factors: heredity, physical maturity, state of nutrition, habits of rest and sleep, level of fitness, personal habits such as smoking and alcohol intake, level of motivation, the environment, and the influence of physical disability, disease, or injury.

Warm-up

Warm-up is a gradual increase in intensity of physical activity and should always precede strenuous activity. A 5-10 minute warm up period allows the individual to:

- Mentally prepare for exercise,
- Increase body temperature slowly,
- Stretch the muscles and joints, and
- Increase heart rate and breathing gradually.

Warm-up consists of low intensity aerobic activity such as walking or slow jogging followed by calisthenics and light stretching.

Stretching

Muscles groups should be stretched in order to improve flexibility at a joint. Stretching exercises should be performed slowly and gently, without any bouncing, bobbing, jerking or lunging. Stretching exercises can be performed as part of the warm-up, following 5 minutes of low intensity aerobic activity or as part of the cool-down phase.

Calisthenics

Calisthenics are exercises that can be performed without equipment, although hand or ankle weights may be used. These types of exercises can be used to develop strength, muscular endurance, and flexibility. Calisthenics usually involve the repetitive lifting and lowering of a body segment as in push-ups, curl-ups, and arm circles.

Weight Training

Weight training consists of exercises that involve moving a weight that is external to the body. Such exercises are used to develop strength, muscular endurance, and (sometimes) flexibility. Particular care must be taken if free weights (e.g., barbells) are used in training. They may cause injury if they fall on a person or if undue strain occurs in trying to control the weight (for example, to keep it from falling). This can happen as a result of the hands slipping, if a person attempts to lift a weight that is too heavy for him/her to support, or if poor technique is used. For these reasons, weight machines may be safer for novices to use in weight training. If you use free weights for weight training, be sure always to work with a partner who can assist you.

Aerobic Training

Aerobic training improves cardiovascular fitness. The training of the cardiovascular system is accomplished by continuous rhythmical motion over time, using large muscle groups. Jogging, bicycling, stair climbing, rowing, walking, swimming, hiking, cross country skiing, skating, and aerobic dancing are good activities for aerobic training.

Cool-Down

The cool-down phase is as critical as the warm-up and should last 5-10 minutes. This phase of activity is important for the following reasons:

- It allows heart rate to decrease gradually.
- Continued activity maintains adequate circulation, prevents pooling of blood, and hastens recovery.
- It provides a time for thorough stretching and relaxation activity.

Cooling down consists of slowing down your activity, walking, light calisthenics, and stretching exercises.

Unusual Reactions

If, during or immediately after exercise, you have any of the following reactions, stop exercising immediately and consult a physician as soon as possible:

- Labored or difficult breathing (not the deep breathing normally associated with exercise)
- Loss of coordination
- Dizziness
- Tightness in the chest
- Sharp pain in any muscle or joint
- Numbness

C. Assessing Your Current Level of Fitness

This section contains instructions for a simple fitness test that you can use to assess your current level of fitness. Take the test now, before you begin a fitness program, to determine your current level of fitness. Also, take the test at several intervals in your training period before the Physical Ability Test to measure your progress.

The events described in the fitness test are related to the four areas of fitness. A sit and reach test measures flexibility. Curl-ups, push-ups, a flexed arm hang, dips and a jump and reach test measure muscular strength and endurance. A 1.5-mile run measures cardiovascular fitness.

Keep a record of your results each time you complete the test. Do not be concerned about how your results compare to national standards. Use your results to monitor your progress, to provide motivation, to establish goals, and to determine the effectiveness of your training program.

Here is a list of the equipment and facilities you will need to conduct the fitness test.

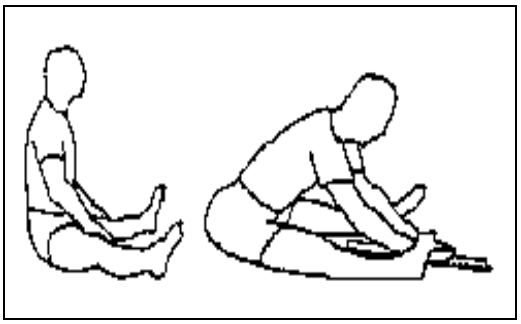
- Yard stick and some masking tape
- Stop watch
- High bar to hang from (about 3/4 inch in diameter)
- Newspaper
- 12 inch high step
- 1.5 mile measured distance (a high school track or measured running path)
- Scale to measure body weight
- Score sheet (included at the end of this section)

Fitness Test Descriptions and Instructions

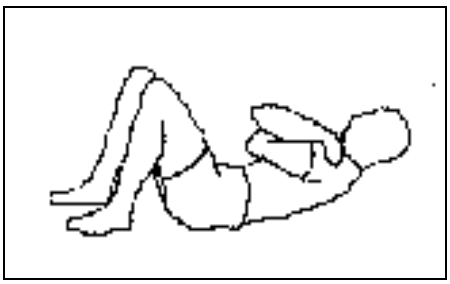
Before beginning the fitness test, do five to ten minutes of warm-up. See the warm-up exercises section of the guide.

1. Sit and Reach

Tape a yard stick to the floor at the fifteen inch mark. Sit on the floor with the yardstick between your legs and the zero mark on the yardstick toward you. Keep your legs straight and place your heels even with the fifteen inch mark on the yard stick. Place your hands in front of you, one over the other. Slowly stretch forward, sliding your hands along the yardstick as far as possible. Do not bounce or lunge. Lean forward and stretch slowly as far as you can. Record the farthest distance you can reach in three tries to the nearest inch.



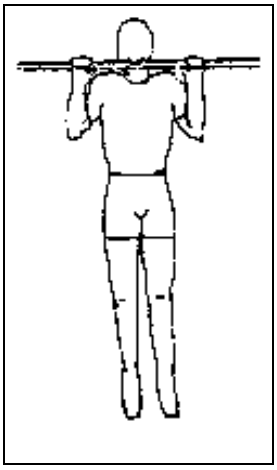
2. Curl-ups



Lie face up on the floor with legs bent and lower back flat against floor. Using abdominal muscles, pull head and shoulders off of floor while looking up. Hands and arms may be crossed over chest, supporting head, on floor or sliding up legs. Record the number of curl-ups completed. You need not go all the way up, merely lift the shoulders and upper back off the floor.

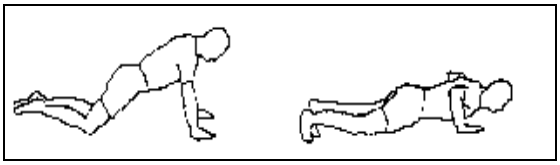
3. Flexed-Arm Hang

Assume a flexed-arm position, palms facing away from your body, with your chin above the bar. Hold as long as possible. Record the amount of time you can remain with your chin above the bar.

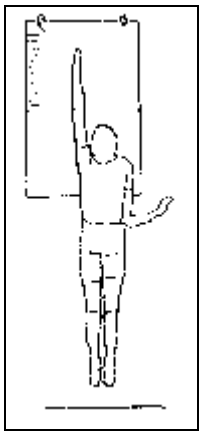


4. Push-ups

Assume a prone position with hands on the floor, just outside the shoulders. Legs may be straight with weight on toes, or bent, with weight on knees if your initial strength level is low (if you can't do three or four toe push-ups). Push up, keeping the back straight. Return until the chest almost touches the floor. Repeat as many times as possible. Record the number of push-ups completed.



5. Jump and Reach



Tape a piece of newspaper to the wall above your head. Using the yard stick, make marks on the newspaper at one inch intervals. Dip the fingers of your dominant hand into some water. With your dominant side toward the paper, jump as high as you can, reaching up with your dominant hand. At the top of your jump, touch the paper with your wet fingers. Repeat. Record the height of the highest jump out of two tries.

6. 1.5 Mile Run

Determine the starting and end point for a 1.5 mile distance. Run and/or walk as fast as you can to cover this distance. Record the time it takes to complete the 1.5 mile distance.

FITNESS TEST SCORE SHEET

1. Date of first test: _____ Weight: _____
2. Date of second test: _____ Weight: _____
3. Date of third test: _____ Weight: _____

	Test 1	Test 2	Test 3
FLEXIBILITY			
Sit and Reach	Distance:	Distance:	Distance:
MUSCULAR - STRENGTH AND ENDURANCE			
Curl-ups	No.	No.	No.
Flexed-arm hang	Time:	Time:	Time:
Push-ups	No.	No.	No.
Jump and Reach	Height:	Height:	Height:
CARDIOVASCULAR			
1.5 Mile Run	Time:	Time:	Time:

SECTION III: FITNESS PROGRAM

A. General Directions for Fitness Program

The fitness program is divided into the following sections:

- Warm-up
- Strength and Muscular Endurance Exercises (Calisthenics and Weight Training)
- Aerobic Training Exercises
- Cool-Down

The strength and muscular endurance exercises do not have to be done on the same day or during the same exercise session as the aerobics program. In other words, they may be done on separate days or at different times on the same day. However, every exercise session should be preceded by a warm-up period and followed by a cool-down period. For example, if the strength and muscular endurance exercises are done on the same day but at a different time than the aerobics program, warm-up and cool-down exercises should be performed before and after each of the two exercise sessions.

The warm-up exercises are designed not only to get a person physically and mentally ready for the muscular and/or aerobics exercise sessions, but also to help develop flexibility in various joints. The strength and muscular endurance exercises can be done in one of two ways, depending on the availability of equipment. Some degree of strength and muscular endurance can be developed by doing calisthenics which require little or no equipment but is more typically accomplished by training with weights. Training with weights can be done either by using free weights, such as barbells, or by using weight machines, for example, "Universal" or "Nautilus" systems. Once a program has begun using a particular method for strength and muscular endurance exercises, it should be continued for the duration of the training period for comparative purposes.

Since there are no equipment requirements for the aerobics training, the same program can and should be followed by everyone regardless of the particular program (i.e., calisthenics vs. weight training) chosen to develop strength and muscular endurance. A weekly log sheet is provided so that applicants can keep track of their progress in developing strength, muscular endurance, and cardiovascular fitness. Two types of log sheets are provided, one for calisthenics and aerobics (for those individuals who use calisthenics to train for strength and muscular endurance), and one for weight training and aerobics (for those individuals who use weights to train for strength and muscular endurance). Of course, applicants should use the log sheet that is designed for the particular exercise program they've chosen to follow. Copies of the log sheet will have to be made for each week of the training program.

Training for the Physical Ability Test

The stretching exercises have been selected to help develop flexibility in the major joints of the body. Although flexibility will be of particular importance to events on the Physical Ability Test that involve performing an activity within a confined space or under conditions that confine one's movement, it will play a role in all the test events.

Appropriate preparation for the Physical Ability Test also will require the development of strength and endurance in the muscle groups that will be used when performing the test events. Muscle strength will be particularly important to those events that require a single application of force such as is involved in dragging a victim over a distance. Both muscle strength and muscular endurance will be important to those activities that involve maintaining a force or the repeated application of a force over a period of time such as is involved in dragging a hose and carrying equipment over a distance. Like flexibility, muscular endurance also will be important to performance on the test as a whole since there will be repeated instances, across events, in which force will need to be applied. Once again, an exercise program that consists of calisthenics or weight training can be used to develop in these areas.

Finally, it will be necessary for applicants to develop cardiovascular fitness to perform those events that involve continuous activity over an extended period of time, such as the stepmill, as well as to endure through the entire series of test events. As previously mentioned, the aerobic demands of stair climbing, simulated by the stepmill, are very specific. Training for the Physical Ability Test should include this particular aerobic activity on a regular basis.

The sections which follow describe the exercises that you can perform to develop the four categories of fitness identified previously. The Warm-up Exercises section describes the warm-up exercises which are useful for the development of flexibility and an essential component of any exercise regimen. The Calisthenics and Weight Training sections describe the calisthenics and weight training exercises that can be used toward the development of muscle strength and muscular endurance. The Aerobic Training Program section provides an aerobic training program aimed at enhancing cardiovascular fitness. Finally, the Cool-down section provides cool-down exercises which will aid in recovery from exercise, help develop flexibility and are an important component of any exercise program.

B. Warm-up Exercises

The warm-up period should last 5-10 minutes. The whole set should be performed before each exercise session. If the strength and muscular endurance exercises are performed on different days or at different times of the day than the aerobic exercises, the warm-up should be performed before each separate exercise session.

Each stretch should be performed in a slow, gentle manner. Move to the point that a stretch, not pain, is felt in the muscle. Hold that position for 10-20 seconds. Repeat each exercise three to five times.

Several traditional stretches are listed below. These stretching exercises should be avoided because they may lead to injury. More effective stretching exercises are listed and explained in this section of the Preparation Guide.

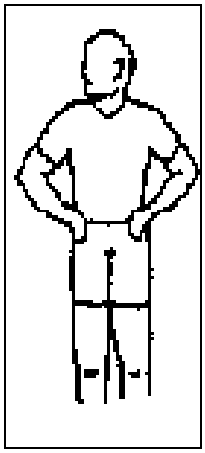
DO NOT DO THESE EXERCISES

- Standing Toe Touch with Knees Locked
- Hurdler Stretch
- The Plow or Backover
- Full Neck Circles
- Back Hyperextension or Cobra
- Back Bends

Exercise Descriptions

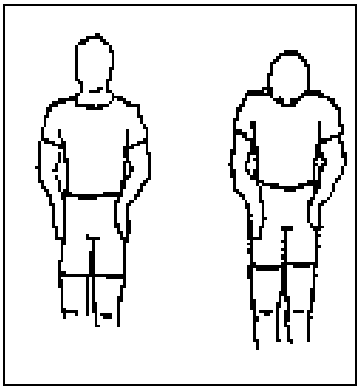
The following stretches are effective for improving flexibility in each muscle group. Begin your warm-up period by performing light aerobic activity, such as marching or jogging in place and arm circles.

1. Side-to-Side Look



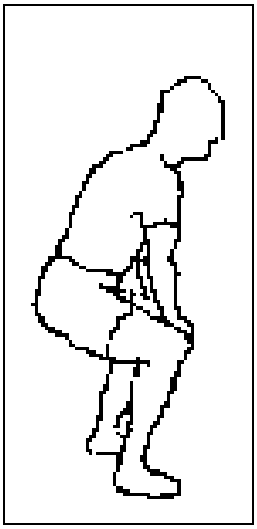
Stretches the neck muscles.
Slowly turn head and look to right. Then slowly turn head back to center and look to left.

2. Forward and Down Look



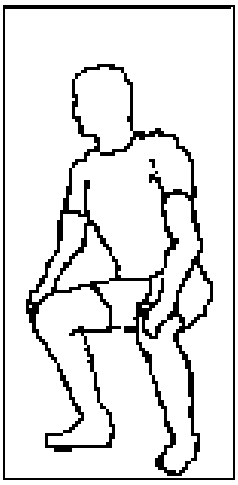
Stretches the neck muscles.
Slowly look downward. Don't put chin on chest.

3. Standing Cat Stretch



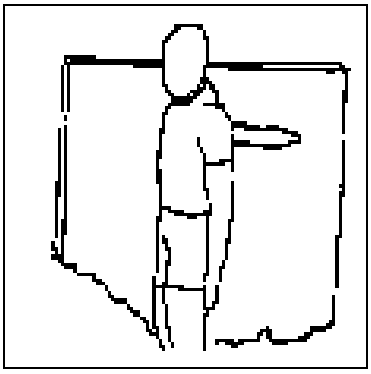
Stretches the upper and lower back
Stand with feet slightly wider than shoulder-width apart. Keep knees bent. Hinge forward at hips and place hands just above knees. Do not bend at the waist. Begin with back straight and flat, arch back up pulling in with abdominals and curl chin towards chest. Return to flat back position. Do not arch back down past the flat back position.

4. Shoulder Turn



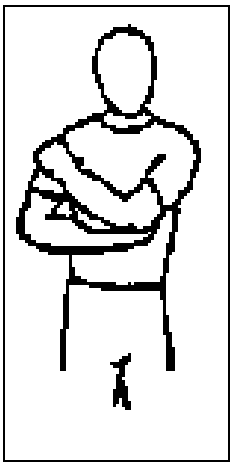
Stretches the lower back.
Stand with feet slightly wider than shoulder-width apart. Keep knees bent. Hinge forward at hips and place hands just above knees. Do not bend at the waist. With back straight and flat, gently press left shoulder downward and bring right shoulder upward with a smooth twisting motion. Repeat on other side.

5. Chest Stretch



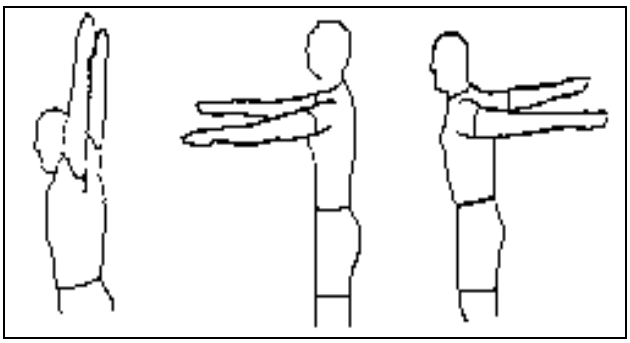
Stretches the chest muscles
Stand next to wall approximately 8-12 inches away. Extend arm back placing palm of hand on wall below shoulder level. Thumb faces the ceiling. Slowly rotate body away from wall. Repeat on other side.

6. Shoulder Stretch



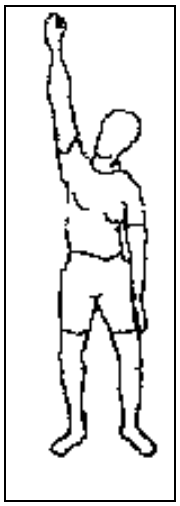
Stretches the shoulders and upper back muscles.
Stand up straight with feet shoulder-width apart and knees slightly bent. Reach left hand across body to right shoulder. Use right hand to hold arm. Place right hand on back of left arm just above the elbow. Gently press the left arm with the right hand. Do not rotate torso. Repeat on other side.

7. Arm Circles

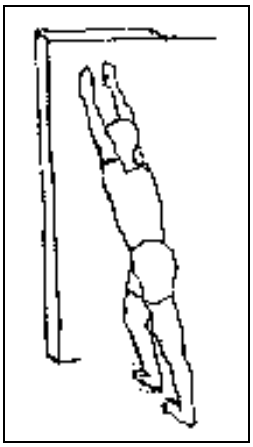


Stretches the chest and shoulder muscles.
Standing with feet shoulder-width apart and knees slightly bent, perform slow, full-arm circles backward 5 to 10 times, then forward the same number of times. The thumb-side of the hand should always lead and the arms should brush past the ears and the sides of the trunk.

8. Side Stretch or Reach



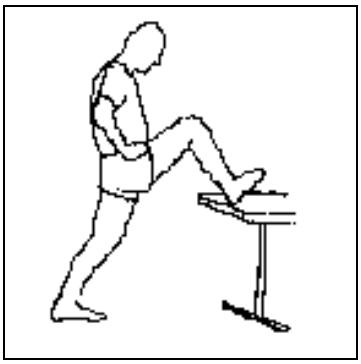
Stretches the muscles on the sides of the trunk.
Standing with feet shoulder-width apart and knees slightly bent, place the left hand on the right outer thigh and extend the right arm overhead with the thumb pointing backward. Reach straight up with the right hand as you slide the left hand down your thigh towards your knee until you feel a stretch up your side. Do not allow the right foot to raise from the floor. Reposition the arms and do the same on the other side.



9. Wall Lean

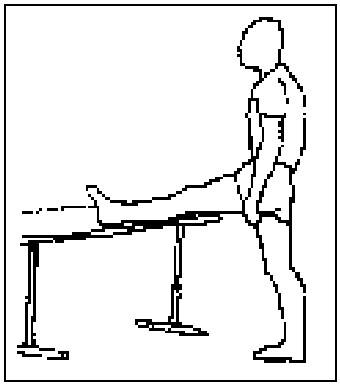
Stretches the muscles in the back of the lower legs.
Stand about arm's distance away from a wall and feet slightly apart. Put both hands on the wall. Keeping the heel on the floor, toe slightly turned in and the leg straight, slide one foot back until a stretch is felt in the calf. Repeat on the other side.

10. Stride Stretch



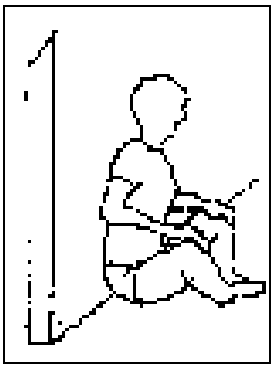
Stretches the muscles in the front of the thigh.
Stand facing sturdy bench approximately 2-3 feet high. Keeping hips and shoulders straight forward, place one foot flat on top of bench. Maintain erect posture while pushing hips forward until you feel the stretch in the front of the hip. Do not allow the front knee to go beyond the mid-foot. Repeat on the other side.

11. Hamstring Stretch



Stretches the muscles in the back of the thigh
Stand facing sturdy bench approximately 2-3 feet high. Keeping hips and shoulders straight forward, place one heel on top of bench. Maintain a flat back while hinging slightly forward at the hips until you feel the stretch. Do not bend at the waist.

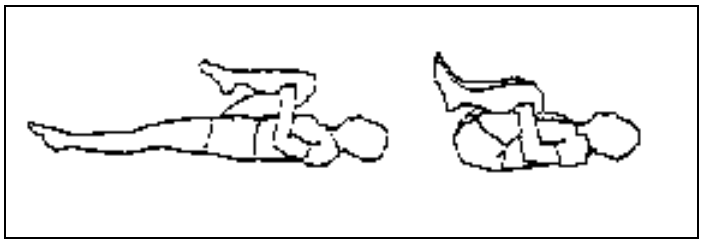
12. Groin Stretch



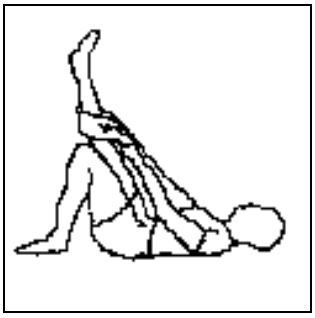
Stretches the muscles of the inner thighs and hips.
Sit with your back flat against the wall. Bring the soles of your feet together and allow your knees to drop to the floor. Gently press the knees toward floor with hands.

13. Knee to Chest

Stretches the muscles in the lower back and the back of the thighs.
Lie on the floor on your back. Pull one knee toward chest with hands clasped behind your bent knee. Repeat with other leg. Finally, pull both knees toward chest.



14. Supine Leg Stretch



Stretches the muscles of the back of the thigh.
Lie on the floor on your back with one leg bent and foot flat on the floor and the other leg extended in the air. Wrap a towel behind the extended knee. Slowly pull the leg back toward your head. Repeat on the other side.

CAUTION: When it comes to stretching, you should feel the stretching sensation in the muscle, NOT the joints. If you feel pain in the joints, check to be sure you are using the correct position to do the exercise, reposition yourself as necessary, and try again. If you still feel pain in the joints, avoid that exercise.

C. Calisthenics

Calisthenics are exercises that use body weight as the load or resistance. The following exercises were selected in order to increase the strength and muscular endurance in the muscle groups that will be utilized in the Physical Ability Test. The exercise routine should be performed 3 to 4 times per week. To begin with, each exercise should be performed as many times as possible at a continuous, steady pace, and that number repeated for each exercise during the first week. Thereafter, the number of repetitions for each exercise should be increased by at least the number indicated for each exercise below. Remember to keep a performance log.

The following exercises are to be avoided because they create too much stress in certain joints. More effective calisthenic exercises are listed and explained in this section of the Preparation Guide.

DO NOT DO THESE EXERCISES

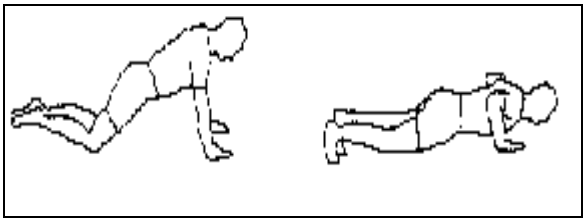
- Deep knee bends
- Double leg lifts (raising both legs while lying on the back)
- Straight leg sit-ups (sit-ups with straight legs)
- Toe-touches from a standing position (bending at waist and touching toes while keeping legs straight)

Exercise Descriptions

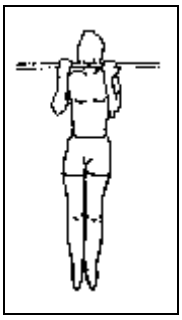
These exercises are listed in the suggested order of performance. Be sure to complete a warm-up period before doing these exercises.

1. Push-ups

For the chest, shoulder region and back of the upper arms.
With hands outside the shoulders, push up while keeping the back straight. Push ups can be performed with legs straight and your weight resting on toes, or with legs bent and weight resting on your knees. Return until the chest almost touches the floor. Aim at increasing by at least 1 push-up per week.



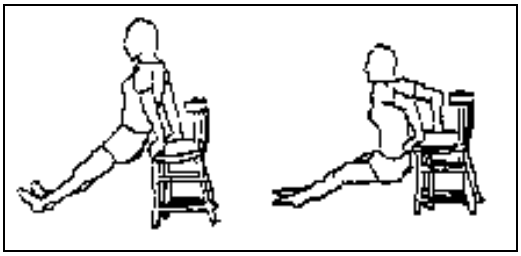
2. Chin-ups



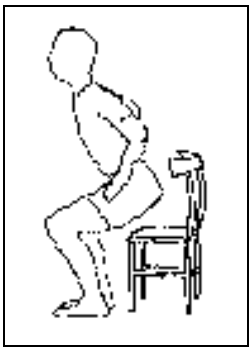
For the shoulder region and arm flexion.
With an underhand grasp, pull up until the chin is over the bar. Let down as slowly as possible. Increase by at least 1 per week.

3. Dips

For the muscles in the arms, shoulders and chest.
Grasp the sides of a chair and let your feet slide forward while supporting your weight on your arms. Lower your body by bending the elbows to about 60 degrees and then push up to the starting position. Keep body close to the chair. Increase by at least 1 per week.



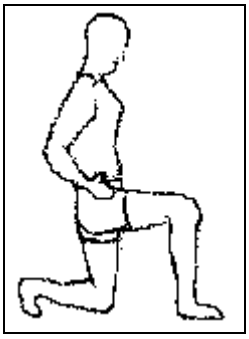
4. Chair Squats



For the leg muscles.
Stand about 6 inches in front of a chair, facing away from the chair. With feet slightly wider than shoulder-width, move hips back as you squat until the thighs are almost parallel to the ground, without sitting down on the chair. The kneecaps should be aligned towards the second toe and the knees should not travel beyond the mid-foot. Hold for 1-2 seconds. Return to the standing position. Increase the number of squats by at least 1 per week, up to a maximum of 25. As an advanced exercise, the exercise can be done with a weight secured to the back, for example, a backpack.

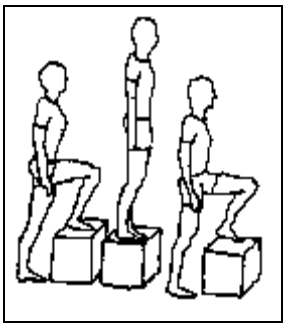
5. Lunges and Forward Traveling Lunges

For the leg muscles.
Stand with feet hip-width apart in a stride position and hands on hips. Lower the body directly between the feet by bending the knees to approximately 90-degree angles. Press back up to starting position. Perform the same number of lunges on the other side. Increase the number of lunges by at least 2 per week, up to a maximum of 25.



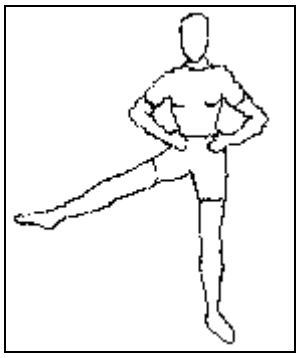
Variation: Step forward with right foot and lower the body weight to a lunge position. Knees bent to approximately 90-degree angles. Push through the hips and thighs in order to bring the left foot forward to meet the right foot. Continue to lunge, walking forward, alternating feet.

6. Bench Steps



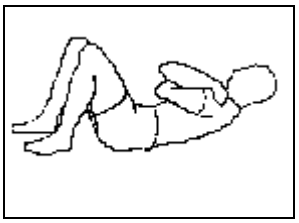
For the leg muscles.
Step up onto a bench that is 8-12" high, bringing up both feet and then down again, one at a time, for 30 seconds (up-up-down-down). Switch the lead foot and repeat for 30 seconds. Increase the time for each lead foot by 10 seconds per week, up to a maximum of 60 seconds of stepping up and down with each lead foot.

7. Standing Side Leg Lifts



For the hip and outer thigh muscles.
Stand with feet shoulder-width apart and hands on hips. Transfer body weight completely to the left leg. Lift a straight right leg directly to the side. Lower right leg just short of resting foot on the floor then lift again. Maintain erect posture. Perform the same number of lifts on the other side. Increase the number of lifts by at least 2 per week, up to a maximum of 25 per side.

8. Curl-ups



For the abdominal region.
Lie face up on the floor with legs bent and heels approximately 8 - 12 inches from buttocks. Using abdominal muscles, tilt hips towards ribcage as you raise head and shoulders off of floor pressing lower back towards floor. Eyes stay focused over knees. Hands and arms may be supporting head, crossed over chest, sliding up legs or resting on floor. Increase by at least 2 per week.

9. Opposite Arm and Leg Lifts

For the muscles of back, buttocks and the back of the legs. Lie face down on the floor with forehead resting on a towel. Arms are stretched overhead with hands shoulder-width apart. Raise the left arm and the right leg approximately 4-8 inches from the floor. Lower to starting position. Repeat on other side. Increase by at least 1 per week, up to a maximum of 15 raises per side.

D. Weight Training

Weight training is one method by which an overload can be applied to a muscle or muscle group in order to improve muscular endurance and strength. The program provided here will exercise all the major muscle groups that will be used in the Physical Ability Test. A 16-week training progression is given on the next page. The table prescribes the following:

Load: refers to the number of pounds of resistance lifted or moved.

Repetitions: refers to the number of consecutive times the exercise is done without interruption or rest, "reps."

Set: One set equals the number of repetitions performed for one exercise. If the prescription is for 3 sets, then 3 groups of "reps" are to be done in the exercise session. It would also be described as one round of all the different exercises, should the "reps" for an exercise not be done consecutively.

The weight training exercises that are prescribed for this program can be performed through the combined use of free weights and weight machines, or through the use of only a weight machine. Two exercises (i.e., curl-ups and bench steps from the calisthenics program) that have body weight as the load instead of external weights are included in this training program to ensure that all relevant muscle groups are exercised. The recommended beginning or initial load (IL) is given at the end of each exercise description. If you cannot move the recommended load or cannot complete the 4 reps to start your program, reduce the recommended load by increments of 5 lbs. until you are able to complete 4 consecutive movements. Record the load.

If, on the other hand, the recommended initial load does not appear to stress you for the beginning 4 reps, then add increments of 5 lbs. until you feel that the load represents an overload for that muscle group. Another way of determining the initial load is to use the maximum load you can move <u>once</u> in a specific exercise. Use 80% of that maximum load as the initial load for that exercise. If you use the latter method to determine your initial load, it is extremely important that you have another person there to assist you. In fact, it is a good idea to have another person assist you in the determination of your initial load, or on the first day of training, regardless of the way you determine the initial load for each exercise.

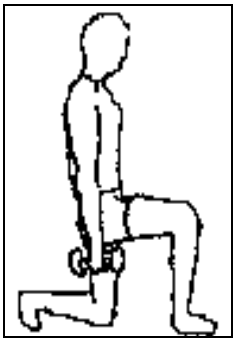
The weight training exercises are presented in the order in which it is suggested they be performed. This program should be performed 3 times per week. Keep a log of the loads and number of repetitions, as appropriate. The suggested load increments are provided in the table on the next page.

WEIGHT TRAINING PROGRESSION			
Week	**Load**	**Reps.**	**Sets**
1	Initial Load (IL)	4	3
2	IL	5	3
3	IL	6	3
4	IL	7	3
5	IL	8	3
6	IL + 5lb	4	3
7	IL + 5lb	5	3
8	IL + 5lb	6	3
9	IL + 5lb	7	3
10	IL + 5lb	8	3
11	IL + 10lb	4	3
12	IL + 10lb	5	3
13	IL + 10lb	6	3
14	IL + 10lb	7	3
15	IL + 10lb	8	3
16	IL + 10lb	9	3

Exercise Descriptions

These exercises are listed in the suggested order of performance. Be sure to complete a warm-up period prior to weight training.

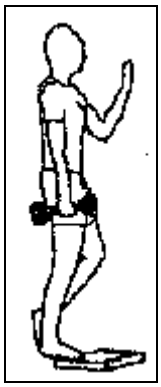
1. Lunges and Traveling Lunges



For the leg muscles.
Stand with feet hip-width apart in a stride position. Hold dumbbells next to body or rest bar on your shoulders behind your neck with palms forward hands spread far apart on the bar. Lower the body directly between the feet by bending the knees to approximately 90-degree angles. Press back up to the starting position. Perform the same number of lunges on the other side. Suggested initial load: 1/4 of body weight.

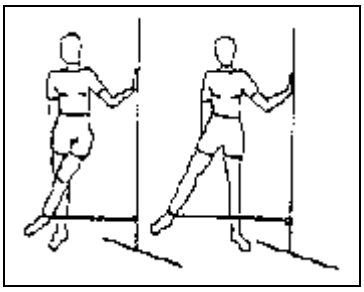
Variation: Hold dumbbells next to body or rest bar on your shoulders behind your neck with palms forward hands spread far apart on the bar. Step forward with the right foot and lower the body weight to a lunge position. Bend knees to approximately 90-degree angles. Push through the hips and thighs in order to bring the left foot forward to meet the right foot. Continue lunge, walking forward, alternating feet.

2. Toe Raises



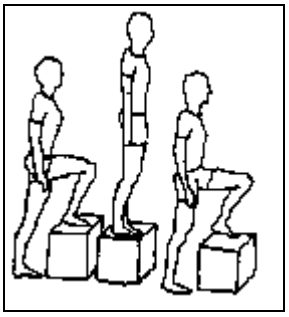
For the muscles of the back of the lower leg.
Stand on a platform at least 4 inches high on right leg and hold a dumbbell in right hand. Balance yourself with the left hand. Keeping the right knee straight, raise upward on the ball of the right foot as high as possible then slowly lower the heel towards the floor. Do not stretch down as far as possible. Repeat on other side. Suggested initial load: 1/8 of body weight.

3. Side Leg Raises



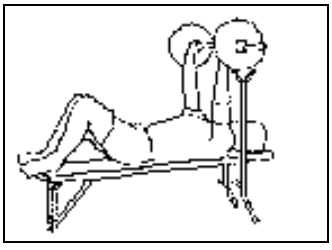
For the hip and thigh muscles.
Standing with your side to the pulley at a pulley station and holding it with one hand, hook the ankle of the outside leg to the pulley. With the knee slightly bent, move your leg to the side, as far as possible, and then return to the starting position. After completing a set, hook the ankle of the inside leg to the pulley. With the knee straight, move your leg in front of the other as far to the side as possible and complete a set. Turn around and repeat the exercises with the opposite legs. Suggested initial load: 1/4 of body weight.

4. Bench Steps



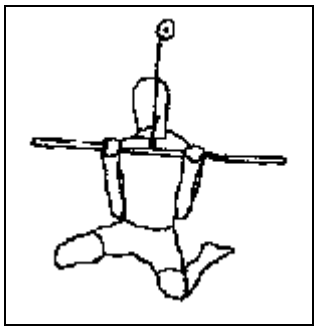
For the leg muscles.
Step up onto a bench 8-12" high, bringing up both feet and then down again, one at a time, for 30 seconds ("up-up-down-down"). Increase the time for each lead foot by 10 seconds per week, up to a maximum of 60 seconds of stepping up and down with each lead foot.

5. Bench Press



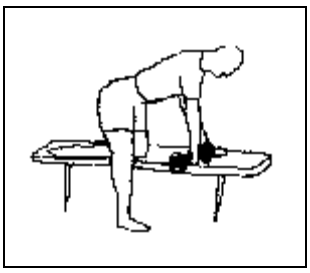
For the muscles in the shoulder, chest and arms.
Lie on your back on a bench with your feet on the bench. Hold the bar above the chest with an overhand grip, hands slightly wider than shoulder width, and elbows straight. Lower the bar to approximately 1 inch above the chest and then return it to the starting position. Suggested initial load: 1/3 of body weight.

6. Lateral Pull-downs



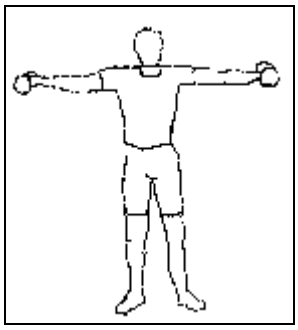
For the muscles of the upper and mid-back.
Grip the bar with palms forward hands slightly wider than shoulder-width apart. Start from a sitting position or kneeling position on the floor with arms stretched overhead. Lean torso back slightly. Pull the bar towards the chest. It is not necessary to touch the chest. Return to the starting position. Suggested initial load: 1/3 of body weight.

7. Bent Over Row



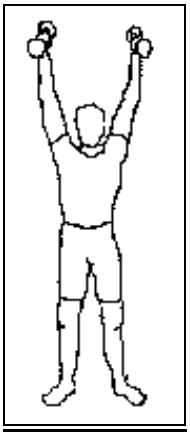
For the muscles of the upper and mid-back.
Stand next to bench with right hand and right knee on top of bench. Maintain flat back position. Grasp dumbbell in left hand. Pull left elbow towards ceiling brushing left forearm by ribcage. Slowly return to starting position. Repeat on the other side. Suggested initial load: 1/3 of body weight.

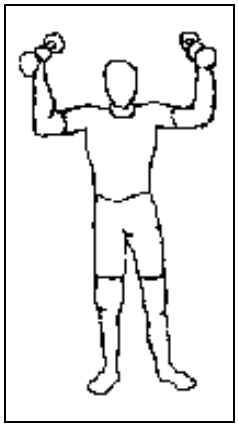
8. Lateral Raise



For shoulders.
Stand erect with feet shoulder width apart and knees slightly bent. Hold dumbbells slightly forward of thighs. Maintain a slight bend in the elbow as you raise the arms to shoulder level. Hands should remain in peripheral vision. Slowly return to starting position. Suggested initial load: 1/20 of body weight.

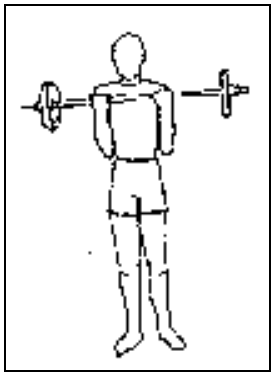
9. Overhead Press





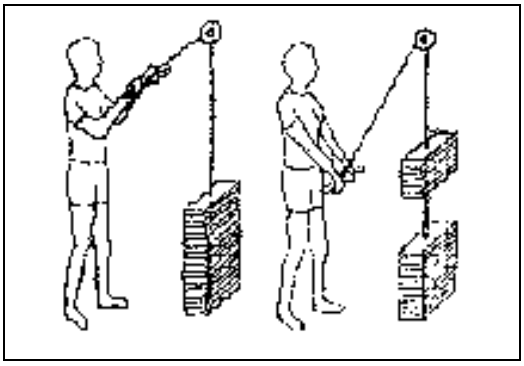
For the muscles of the shoulders.
Sit or stand erect with feet shoulder-width apart. Hold dumbbells with palms facing ears, hands positioned directly over the elbows. Push the dumbbells straight up to an overhead position until the arms are straight and then lower it in a controlled manner to the starting position. Do not arch your back. Suggested initial load: 1/4 of body weight.

10. Arm Curls



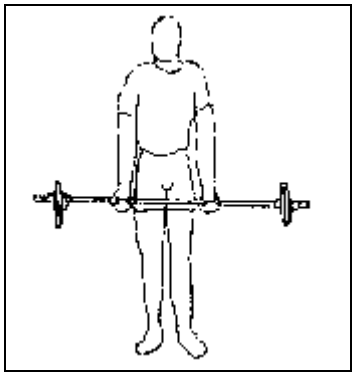
For the muscles that bend the elbow.
Standing with the elbows straight and in front of the thighs, hold the bar with an underhand grip, hands shoulder-width apart. Keeping the elbows close to your sides, bend your elbows and raise the bar to your chest, then slowly lower the bar to the starting position. Do not lean backward while raising the bar or forward when lowering it. Suggested initial load: 1/4 of body weight.

11. Triceps Push-down



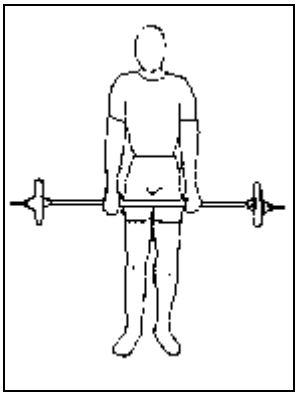
For the muscles that extend the elbow.
Attach bar to the top pulley at pulley station. Stand with feet shoulder-width apart one foot forward of the other and knees slightly bent. Grasp bar with palms forward and shoulder-width apart. Pull bar down so that the elbows are next to but not touching ribcage. Straighten your elbows pressing the bar down towards thighs and then return to the starting position. Suggested initial load: 1/3 of body weight.

12. Wrist Curls



For the muscles that bend the wrist.
Standing with the elbows straight and in front of the thighs, hold the bar with an underhand grip, hands shoulder-width apart. Keeping the elbows close to your sides, curl your wrists to move the bar up, then slowly lower the bar to the starting position. Suggested initial load: 1/4 of body weight.

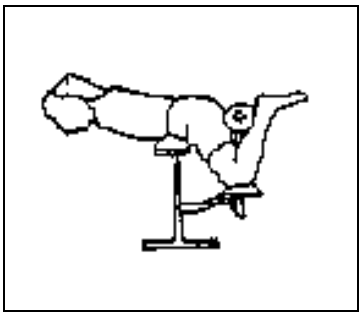
13. Reverse Wrist Curls



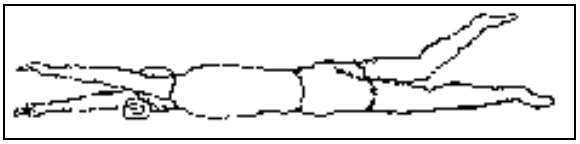
For the muscles that extend the wrist.
Standing with the elbows straight and in front of the thighs, hold the bar with an overhand grip, hands shoulder-width apart. Keeping the elbows close to your sides, extend your wrists to lift the bar up, then slowly lower the bar to the starting position. Suggested initial load: 1/4 of body weight.

14. Trunk Lifts

For the muscles in the back, buttocks and back of the legs. Lie on your abdomen, with the trunk unsupported over the edge of the trunk lift station support, and bent. With the hands locked behind your head, slowly lift your trunk and head so that your back is parallel to the ground and then return to the starting position. Suggested initial load: 5 lifts. Increase the number of lifts by at least 1 per week, up to a maximum of 15.



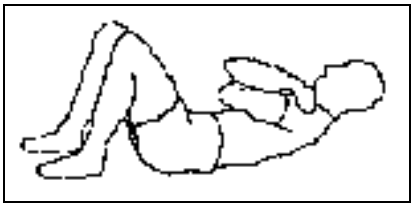
15. Opposite Arm and Leg Lifts



For the muscles of back, buttocks and the back of the legs. Lie face down on the floor with forehead resting on a towel. Arms are stretched overhead with hands shoulder-width apart. Raise the left arm and the right leg approximately 4-8 inches from the floor. Lower to starting position. Repeat on other side. Increase by at least 1 per week, up to a maximum of 15 raises per side.

16. Curl-ups

For the abdominal region.
Lie face up on the floor with legs bent and heels approximately 8 - 12 inches from buttocks. Using abdominal muscles, tilt hips towards ribcage as you raise head and shoulders off of floor pressing lower back towards floor. Eyes stay focused over knees. Hands and arms may be supporting head, crossed over chest, sliding up legs or resting on floor. Increase by at least 2 per week.



E. Aerobic Training Program

The aerobic training program is designed to develop cardiovascular endurance as well as muscular endurance in the legs. These are needed for the Physical Ability Test. The running and the stair climbing programs should be done 3 times per week, or as indicated.

Exercise Descriptions

1. Running Program

Significant improvements in aerobic conditioning should be evident after 10-12 weeks of training. The following program is designed with a progression that extends up to 16 weeks. If you continue to train for longer periods, you should continue to progressively increase the distance while maintaining the intensity at 7-8 minutes per mile. Start the program by walking, then walk and run, or run, as necessary to meet the changing time goals.

Week	Distance (miles)	Time Goal (minutes:seconds)	Times per Week
1	2.0	32:30	3
2	2.0	30:30	3
3	2.0	27:00	3
4	2.0	26:00	3
5	2.0	25:00	3
6	2.0	24:30	3
7	2.0	24:00	3
8	2.0	22:00	3
9	2.0	21:00	3
10	2.0	19:00	3
11	2.0	18:00	4
12	2.0	17:00	4
13	2.5	22:00	3
14	2.5	21:30	4
15	3.0	27:00	3
16	3.0	26:30	4

2. Stair Climb

Keeping a moderate but steady pace, climb up stairs to the second floor from where you start (for example, from the first to the third floor) and then descend the stairs to the level from which you started. As you begin your training do not try to run at full speed; gradually increase your speed climbing up the stairs. You should climb quickly but safely, remaining in control at all times. Do not skip steps, either on your trips up or down. On your trips down the stairs, you should walk briskly back down the stairs to the level from which you started. There is no need to descend the stairs at a pace faster than a brisk walk. Repeat as many times as you can without resting, and count each round trip you can complete while keeping the same steady pace. For the first week of exercises, complete as many round trips as were done on the first day and record the amount of time you kept moving on the stairs. Increase the number of round trips by 1 per week, up to a maximum duration of 10 minutes of climbing up and down the stairs. Thereafter, try to increase the number of round trips you make during the 10 minutes.

F. Cool-Down

The cool-down session should be performed for 5 to 10 minutes at the end of each exercise period. The purpose of this phase of the program is to gradually decrease the heart rate, to continue adequate blood circulation, and to decrease the chance that dizziness, nausea or other problems may follow the exercise session.

After the aerobic training session, begin to jog, then walk rapidly for a total of about 5 minutes. Continue with moderate walking. Afterward, do the following stretching exercises. These are a part of the warm-up set and their descriptions can be found in the Warm-up Exercise section of this guide.

- Hamstring Stretch
- Supine Leg Stretch
- Stride Stretch
- Wall Lean
- Shoulder Stretch
- Arm Circles

If your work-out session consisted of only the strength and muscular endurance exercises, walk at a moderate pace for a few minutes and then perform the above exercises from the warm-up set.

SECTION IV. WEEKLY LOG PAGES

A: Weekly Log: Calisthenics and Aerobics

Date of First Day of Week: _____ Weight: _____

Training Week Number: _____

Number of Repetitions (#) or Time (T)					
Exercise		Session 1 Date:	Session 2 Date:	Session 3 Date:	Session 4 Date:
Push-ups	(#)				
Chin-ups	(#)				
Dips	(#)				
Chair Squats (max=25)	(#)				
Lunges and Forward Traveling Lunges (max=25 per side)	(#)				
Bench Steps (max =60 sec)	(T)				
Standing Side Leg Lifts (max=25 per side)	(#)				
Curl-ups	(#)				
Opposite Arm and Leg Lift (max=15 per side)	(#)				
Running Program	(#)				
	(#)				
	(T)				
Stair Climb	(#)				
(max=10 min)	(T)				

B. Weekly Log: Weight Training and Aerobics

Date of First Day of Week: _____ Weight: _____

Training Week Number _____ RM: _____ Sets: 3 per Session

Load (L), Repetitions (#) or Time (T)					
Exercise		Session 1 Date:	Session 2 Date:	Session 3 Date:	
Lunges and Traveling Lunges	(L)				
Toe Raises	(L)				
Side Leg Raises	(L)				
Bench Steps (max=60 sec)	(L)				
Bench Press	(L)				
Lateral Pull-Downs	(L)				
Bent Over Row	(L)				
Lateral Raise	(L)				
Overhead Press	(L)				
Arm Curls	(L)				
Triceps Push-down	(L)				
Wrist Curls	(L)				
Reverse Wrist Curls	(L)				
Trunk Lifts (max=15)	(#)				
Opposite Arm and Leg Lift (max=15 per side)	(#)				
Curl-ups	(#)				
Running Program	(#)				
	(T)				
Stair Climb	(#)				
(max=10 min)	(T)				

SECTION V: APPLICATION OF THE EXERCISE TRAINING PROGRAM TO FIREFIGHTER TASKS AND THE PHYSICAL ABILITY TEST

The Physical Ability Test (PAT) is designed to assess your capacity to perform the tasks ordinarily performed by a firefighter during his/her job. The exercise training program described in these Guidelines provides you with the information necessary to improve your level of physical fitness in preparation for taking the PAT. All of the exercises described in the training program are selected to improve muscle strength, muscle power, flexibility, cardiovascular endurance and muscular endurance. The training program will condition the muscles and muscle groups involved in the tasks performed by a firefighter and the events that make up the PAT. The following table provides information to explain the link between the exercises in the program and specific events that make up the PAT.

PAT Event	Firefighter Task	Exercise
Stair Climb Event	Continuous stair climbing to get to the fire floor or reach a victim	**Warm-up:** Standing Cat Stretch, Shoulder Turn, Wall Lean, Stride Stretch, Hamstring Stretch, Groin Stretch, Knee to Chest **Calisthenics:** Chair Squats, Lunges and Forward Traveling Lunges, Bench Steps, Standing Side Leg Lifts, Opposite Arm and Leg Lifts **Weight Training:** Lunges and Traveling Lunges, Side Leg Raises, Trunk Lifts, Opposite Arm and Leg Lifts **Aerobic Training:** Running Program, Stair Climb
Ladder Event	Raising/Carrying a ladder	**Warm-up:** Side-to-Side Look, Forward and Down Look, Standing Cat Stretch, Shoulder Turn, Chest Stretch, Shoulder Stretch, Arm Circles, Side Stretch or Reach **Calisthenics:** Push-ups, Dips, Chair Squats **Weight Training:** Lunges and Traveling Lunges, Bench Press, Lateral Pull-downs, Bent Over Row, Overhead Press, Arm Curls, Triceps Push-downs, Trunk Lifts

PAT Event	Firefighter Task	Exercise
Hose Advance	Moving and handling a hose at the scene of a fire	**Warm-up:** Standing Cat Stretch, Shoulder Turn, Chest Stretch, Shoulder Stretch, Arm Circles, Side Stretch or Reach, Wall Lean, Stride Stretch, Knee to Chest **Calisthenics:** Push-ups, Chin-ups, Dips, Chair Squats, Lunges and Forward Traveling Lunges, Bench Steps, Standing Side Leg Lifts, Opposite Arm and Leg Lifts **Weight Training:** Lunges and Traveling Lunges, Toe Raises, Side Leg Raises, Bench Press, Lateral Pull-downs, Bent Over Row, Overhead Press, Arm Curls, Triceps Push-downs, Trunk Lifts, Opposite Arm and Leg Lifts
Forcible Entry	Breaking through a door to gain entry to a burning structure	**Warm-up:** Shoulder Turn, Chest Stretch, Shoulder Stretch, Arm Circles **Calisthenics:** Push-ups, Chin-ups, Dips, Curl-ups **Weight Training:** Bench Press, Lateral Pull-downs, Bent Over Row, Overhead Press, Arm Curls, Triceps Push-down, Curl-ups
Search Event	Finding a victim in a dark enclosed structure	**Warm-up:** Side-to-Side Look, Forward and Down Look, Standing Cat Stretch, Shoulder Stretch, Stride Stretch, Hamstring Stretch, Knee to Chest **Calisthenics:** Push-ups, Chair Squats, Lunges and Forward Traveling Lunges, Bench Steps **Weight Training:** Lunges and Traveling Lunges, Trunk Lifts

PAT Event	Firefighter Task	Exercise
Rescue Event	Dragging an unconscious victim from a burning building or other emergency situation	**Warm-up:** Side-to-Side Look, Forward and Down Look, Standing Cat Stretch, Shoulder Turn, Chest Stretch, Shoulder Stretch, Arm Circles, Side Stretch or Reach, Wall Lean, Stride Stretch, Hamstring Stretch, Knee to Chest **Calisthenics:** Chin-ups, Dips, Chair Squats, Lunges and Forward Traveling Lunges, Bench Steps, Standing Side Leg Lifts, Curl-ups, Opposite Arm and Leg Lifts **Weight Training:** Lunges and Traveling Lunges, Toe Raises, Side Leg Raises, Bench Press, Lateral Pull-downs, Bent Over Row, Overhead Press, Arm Curls, Triceps Push-down, Trunk Lifts, Opposite Arm and Leg Lifts, Curl-ups **Aerobics:** Running Program, Stair Climb
Ceiling Hook	Use a ceiling hook to tear down a ceiling after a fire	**Warm-up:** Side-to-Side Look, Forward and Down Look, Standing Cat Stretch, Shoulder Turn, Shoulder Stretch, Wall Lean, Stride Stretch, Knee to Chest **Calisthenics:** Push-ups, Chin-ups, Dips, Chair Squats, Lunges and Forward Traveling Lunges, Bench Steps, Opposite Arm and Leg Lifts **Weight Training:** Lunges and Traveling Lunges, Bench Press, Lateral Pull-downs, Bent Over Row, Overhead Press, Arm Curls, Triceps Push-down, Trunk Lifts, Opposite Arm and Leg Lifts **Aerobics:** Running Program, Stair Climb

SECTION VI: REFERENCES

The following sources were used as references in the developing this fitness program.

1. American College of Sports Medicine. Fitness Book. Champaign, IL: Leisure Press, 1992.

2. American College of Sports Medicine. Guidelines for Exercise Testing and Prescription. Fourth Edition. Philadelphia: Lea & Febiger, 1991.

3. Cooper, K. H. The Aerobics Way. New York: M. Evans Co., 1977.

4. Heyward, Vivian H. Designs for Fitness. Minneapolis: Burgess Publishing Co., 1984.

5. Howley, Edward T. & Franks, Don B. Health/Fitness Instructor's Handbook. Champaign, IL: Human Kinetics Publishers, 1986.

6. Reid, J. Gavin & Thompson, John M. Exercise Prescription for Fitness. Englewood Cliffs, NJ: Prentice Hall, Inc., 1985.
7. Sharkey, Brian J. Physiology of Fitness. Champaign, IL: Human Kinetics Publishers, 1979.

CONCLUSION

This Preparation Guide represents an attempt to familiarize you with all aspects of the Physical Ability Test for firefighters, including the exercises, logistics and evaluation procedures; as well as to provide some suggestions for preparation. The suggestions provided here are not exhaustive. We encourage you to engage in whatever additional preparation strategies you believe will enhance your chances of performing effectively on the test and on the job.