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**CANDIDATE PREPARATION GUIDE FOR**

**JEA**

**ENTRY-LEVEL SUBSTATION TECHNICIAN EXAMINATION**

**PHYSICAL ABILITY TEST**

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**State College, PA**

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# INTRODUCTION

This Candidate Preparation Guide has been distributed to help you prepare for the JEA Substation Technician's Physical Ability Test. A separate preparation guide will be provided for all other test components. Please be sure to review that guide because it contains important information about the rest of the examination process.

The Physical Ability Test consists of a series of events simulating Substation Technician 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**

This section provides log pages so that you can track your progress during the fitness program.

## **Section V: Application of the Fitness Program to Substation Technician 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.

# 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 Substation Technician while on the job. This is accomplished by requiring the candidate to perform a series of events that both simulate Substation Technician activities and depend on the physical abilities required to perform the Substation Technician's job. These abilities include cardiovascular fitness, muscle strength, muscular endurance, and flexibility. The physical conditioning 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 Substation Technician and required to perform the PAT events.

## B. JEA Substation Technician Physical Ability Test

During the PAT, you will be performing tasks that are performed by individuals working in the job you are seeking. These tasks will be performed at a JEA facility and will be physically demanding. In order to comply with normal safety and work attire requirements, you will be given specific instructions from JEA regarding what to wear to the PAT test and what will be provided at the testing facility. You must comply with those requirements in order to be permitted to complete the PAT. Failure to comply could result in your disqualification from further consideration for the position you seeking.

Since the PAT 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 Substation Technician PAT consists of six (6) events that require you to perform simulations of activities that are part of the Substation Technician'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 safety equipment. The events are described below. They will most likely be performed in the order listed although participants will be divided into groups and each group will start on a different event.

**Please note that the specific weights, distances, etc. may vary slightly from what is described below.**

## Substation Technician Physical Ability Test Event Listing

- 1) **500 mcm Cable Cut Event – Ratcheting Cutter Version:** The objective of this exercise is to demonstrate the ability to safely cut a piece of 500 mcm cable utilizing JEA provided manual cable cutters. This is a timed event.
- 2) **Lattice Rack Climb Event:** The objective of this exercise is to demonstrate the ability to climb a lattice structure to a height of 21'. This is a timed event. Please note that this event is intended to give you a realistic preview of climbing and maneuvering at a distance above ground level to assess your comfort with heights.
- 3) **Surge Arrestor Lift and Carry Event:** The objective of this exercise is to demonstrate the ability to properly lift and carry an object weighing 50 pounds between ground level and the height of the back of a truck. This is a timed event.
- 4) **Confined Space Entry Event – Breaker Version:** The objective of this exercise is to demonstrate the ability to enter a confined space, demonstrate finger dexterity and grip strength to remove and reinstall a bolt and nut, and exit the breaker safely. This is a timed event.
- 5) **Ladder Carry Event:** The objectives of this exercise are to demonstrate the ability to safely remove a 20' ladder from the ladder rack on a van, carry it, and set up the ladder as instructed; climb the pre-set ladder, safely tie off with a safety belt and lean back for 10 seconds; then undo the safety belt and climb down; and finally take down the 20' ladder, carry it back to the van, and replace it in the ladder rack as instructed. All tasks handling the ladder must include maintaining positive control of the ladder. This is a timed event.
- 6) **Bucket Truck Event with Insulator Task:** The objectives of this exercise are to demonstrate the ability to 1) climb onto the bucket truck and into the bucket following proper safety protocols, 2) ride in the bucket to different heights and through various maneuvers, 3) perform work out of the bucket at a 40' height using channel lock pliers to install and remove an insulator on a crossarm, and 4) climb out of the bucket and off of the bucket truck following the same safety protocols. The majority of this event is untimed. The exception is the short period when you will install and remove the insulator at 40' off of the ground. In addition to watching your performance with the tools and equipment, you will be observed throughout the event to gauge your comfort with heights.

## SECTION II: PREPARING TO BEGIN A FITNESS PROGRAM

### A. Medical and General Health Factors

#### Health Screening for Physical Activity

To optimize your safety during both the PAT and fitness program in preparation for the PAT, some initial screening for important medical and health factors is necessary. The objectives of this type of pre-participation screening include:

- Identifying those individuals who have medical conditions that would either be aggravated by exercise, or those who should talk to an exercise professional before the initiation of a fitness program, and
- Identifying those individuals who have signs and symptoms that suggest a problem, or risk factors for diseases, that should receive further medical evaluation before undergoing a fitness program or a PAT.

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.

The Physical Activity Readiness Questionnaire (PAR-Q+) is recommended as a minimal standard for screening prior to beginning a fitness program or, if some activity is already underway, prior 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+ 2019)

The health benefits of regular physical activity are clear; more people should engage in physical activity every day of the week. This questionnaire will tell you whether it is necessary for you to seek further advice from your doctor/medical professional before becoming more physically active.

- |  |     |    |
|--|-----|----|
| 1. Has a doctor ever said you have a heart condition OR high blood pressure?   | YES | NO |
| 2. Do you feel pain in your chest at rest, during your daily activities, OR when you do physical activity?   | YES | NO |
| 3. Do you lose balance because of dizziness OR have you lost consciousness in the last 12 months? <i>(Please answer NO if your dizziness was associated with over-breathing including during vigorous exercise.)</i>   | YES | NO |
| 4. Have you ever been diagnosed with another chronic medical condition (other than heart disease or high blood pressure)?  | YES | NO |
| 5. Are you taking prescription medication(s) for a chronic medical condition?  | YES | NO |
| 6. Do you have (or have you had within the past 12 months) a bone, joint, or soft tissue (tendon, ligament, muscle) problem that could be made worse by becoming more physically active? <i>(Please answer NO if you have had a condition in the past but it does not limit your current ability to be physically active.)</i> | YES | NO |
| 7. Has your doctor ever said that you should only do medically supervised physical activity?   | YES | NO |

**If you answered YES to ANY of these questions, please follow-up with the extended version of this questionnaire found here:**

<http://eparmedx.com/wp-content/uploads/2013/03/PARQPlus2019ImageVersion2.pdf>

Many individuals may question whether certain conditions are important enough or severe enough to warrant seeing their health care provider or discussing their readiness for physical activity with a qualified exercise professional. No set of guidelines can cover every conceivable situation. In general, if you know that you have a problem or disease, consult your doctor/medical professional. 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 health care provider prior to beginning a fitness program if they have not been physically active prior to the pregnancy.

Make sure as you start becoming more physically active, that you start slowly and build up gradually.

## Smoking and Tobacco Use

Tobacco use remains the leading cause of preventable disease, disability, and death in the United States. Tobacco use including smokeless tobacco and inhaled smoke has been linked to cancer (mouth and lung), lung disorders, and coronary heart disease. Inhaled smoke/vapors (tobacco and electronic (e) cigarettes) 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 uses these products 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 or e-cigarette user may not be able to do as well on an event that involves this type of activity as someone who does not use these products of similar size, ability, and training. The use of nicotine and non-nicotine product through e-cigarettes also impairs the ability of the lungs to perform optimally during the demands of vigorous exercise. Therefore, in order to maximize their potential to do well on the PAT, applicants who use these products are urged to quit as soon as possible. Your health care provider can help you identify a cessation program to be more successful in quitting.

## Weight Control

Carrying excess weight in the form of fat will reduce a candidate's performance potential on the PAT. Excess weight increases the work that the muscles, heart, and lungs have to do when performing tasks. For example, when a person who is overweight walks upstairs, 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 occur ranging from pulled leg muscles to back injuries to a heart attack.

In an effort to promote safety and optimal health, it is recommended that candidates who are carrying excess weight try to lose weight before participating in the PAT. To best accomplish this, candidates should begin a weight reduction program that contains both a nutritional and an exercise component. Weight loss is unlikely to occur by simply starting to exercise. Weight loss is best achieved by: (1) decreasing the amount of food you normally eat by reducing portion sizes, (2) increasing the amount of exercise you are presently getting, and (3) changing a few "bad habits" such as the amount of high fat and calorie dense food selections you may be making. Additional information on each of these actions is provided below.

1. **Through the 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. Nutrition professionals suggest the following method to assess your current calorie intake and to appropriately cut back calories. To determine your current caloric intake:

**Multiply your present weight by the number 15.**

The answer is the average number of calories you should be 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 needed to maintain your current weight, in order 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 reducing your intake by 500 calories per day, you will be able to lose approximately 1 pound of body weight per week. Reducing your intake by 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 increases the chances of gaining the weight back more quickly. So, go slowly and steadily.

Some people will lose less than one pound in one week and perhaps 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.** A fitness 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
<ul style="list-style-type: none"><li>▪ walk 5 miles (takes 100 minutes)</li><li>▪ jog 5 miles (takes about 55 minutes)</li><li>▪ climb stairs for 80 minutes</li><li>▪ cycle or row for 60 minutes</li></ul>

3. **Through appropriate food selection.** Now that you know some of your weight loss options, the next step is to select appropriate foods. The 2015-2020 Dietary Guidelines suggest the following healthy eating patterns and that these patterns of eating should be maintained throughout your life. In order to do this, it is important to identify the foods you're currently eating that are high in empty calories, added sugars, saturated fats, and sodium. Some examples might include:

- fried foods such as french fries, onion rings, fried chicken, etc.
- high fat and sugar desserts such as cookies, pies, cakes, pastries, and donuts
- fatty meats such as bacon or sausage
- high sodium foods including canned soups, pickles, soy sauce, and cured meats

When opting for a healthy eating plan, all food and beverage choices matter. Choose a healthy eating plan with the appropriate calorie level in combination with your exercise level to meet your goals and support your nutritional needs.

Focus on variety, nutrient density, and amount of food that you eat. To meet nutrient needs within your calorie limits, choose a variety of nutrient-dense foods across and within all food groups. A healthy eating pattern includes:

- A variety of vegetables from all of the subgroups - dark green, red and orange, legumes (peas and beans), and starchy (corn)
- Fruits, especially whole fruits
- Grains, at least half of which should be whole grains
- Fat-free or low-fat dairy, including milk, yogurt, and cheese
- A variety of protein foods, including seafood, lean meats, and poultry, eggs, legumes (beans and peas), nuts and seeds
- Oils from unsaturated fat sources (olive oil, avocado, nut oils)

Limit calories from added sugars and saturated fats and reduce sodium intake. Cut back on foods and beverages with these components. A healthy eating pattern should follow the following key points:

- Limit saturated fats (solid oils) and *trans* fats (found in pre-packaged foods), added sugars, and sodium.
- Consume less than 10% of calories per day from added sugar
- Consume less than 10% of calories per day from saturated fats
- Consume less than 2,300 milligrams per day of sodium
- If you drink alcohol, it should be consumed in moderation—up to one drink per day for women and two drinks a day for men.

Shift to healthier foods and beverage choices. Choose nutrient-dense foods and beverages across and within all food groups in place of less healthy choices. Consider your personal preferences to make these shifts easier to accomplish and maintain.

Support a healthy eating pattern for those around you. Everyone has a role in helping to create and support healthy eating patterns. If those around you start to make healthier eating choices, it is easier to maintain these habits for the long term.

The 2015-2020 Dietary Guidelines suggest that you use your plate and the room on your plate to devote to different food groups to easily modify the way you think about the proportions of nutrient-dense food you should be eating and those that you should be limiting. A healthy plate should follow the following pattern:



Make half of your plate fruits and vegetables focusing on whole fruits and varying the vegetables. Devote a quarter of your plate to whole grains and a quarter to lean sources of protein. Incorporate in your plate (e.g. yogurt, cheese) or as a beverage (milk) 2-3 servings of fat free or low-fat dairy per day.

### **Meal Planning**

The best way to stay on target for your eating plan is to plan your meals ahead of time. Aim to eat three regular size meals as described above, with small snacks built in at regular intervals every day. The purpose behind this advice is two-fold. 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 by 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 anything and everything even if it doesn't fit within your healthy eating plan. You actually can prevent this by eating regularly.

Select foods that contain complex carbohydrates, lean protein, and healthy fats for each meal. Since carbohydrates empty from the stomach the quickest, they provide an excellent and immediate source of energy. The complex carbohydrate (think multigrain, brown rice) will help maintain your blood sugar for longer, so you don't feel that crash from eating simple sugars (white sugar, white bread, white rice). Protein is the next nutrient to leave the stomach and fat is the last. Both of these nutrients help keep you feeling full for a longer period of time since they stay in the stomach longer.

Here is an example menu with the right balance of fruits, vegetables, lean proteins, and unsaturated fats to keep you fueled.

**Breakfast:** Scrambled eggs (2 eggs, 2 Tbsp low fat milk, 1 tsp vegetable oil)  
 2 turkey sausage links  
 1 slice whole-wheat toast (1/2 tsp margarine, 1 tsp jam)  
 1 cup apple juice

- Lunch:** Tuna-Cucumber Wrap (1 8" flour tortilla, 3 oz tuna canned in water, 2 Tbsp low fat mayo, as many cucumber sticks as you like)  
1 small container of low fat yogurt  
1 cup of low fat milk
- Dinner:** "One Pan Spaghetti" - recipe is in the meal planning guide (2<sup>nd</sup> link below)  
(includes lean ground beef, pasta, and tomato sauce)  
1 cup of broccoli  
1 whole wheat roll with 1 tsp margarine  
1 cup of lowfat milk
- Snacks:** Popcorn (3 cups popped)  
1 large orange

An example 2-week menu with recipes can be found here:

<https://choosemyplate-prod.azureedge.net/sites/default/files/budget/2WeekMenusAndFoodGroupContent.pdf>

<https://choosemyplate-prod.azureedge.net/sites/default/files/budget/2WeekMenuCookbook.pdf>

There are many misconceptions and fallacies about diet 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 fitness programs are effective.*

You cannot lose body fat unless you decrease your total caloric intake (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 back the lost weight. So concentrate on changing your few bad habits slowly and permanently to adopt healthy eating patterns, 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. However, 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 -- we cannot pick our parents. Secondly, the 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 and temptation? 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 or go for a walk. Do you snack while sitting around? Try more movement in general. Think about where you can fit exercise into your everyday routine. For example, take the stairs instead of the elevator OR park and walk to your destination instead of finding the nearest parking spot.

One of the best ways to keep yourself accountable and on target in your weight loss journey is to record what you eat when you eat it. By recording your food choices and the amount you eat, you can keep track of your calories and plan your food choices successfully. Most smartphones have a free app to help you keep track of your food choices and your exercise to help you stay on track. A few examples are MyFitnessPal, Lose It!, FatSecret, Cron-o-meter, and SparkPeople.

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 in. The combination of cutting calories and exercising is the right approach. Set some realistic goals (1-2 pounds per week) for weight loss through a change in eating habits and an increase in exercise. Keep food records to accurately assess what you are eating. Log everything you eat for about a week and assess where you think some changes could reasonably be made. Keep track of your activity. Strive for adding a few extra minutes of activity periodically until you reach 30-40 minutes of exercise a day.

## B. Principles of Training

Some of the terms used in this fitness program are explained below, as are some of the principles upon which this fitness program is based.

### 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. This fitness program is designed to develop all components of fitness because they are essential to performing well 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 Candidate 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 the strength of the shoulder muscles. The performance of an activity improves when the muscle groups that are used within that activity are trained and developed the same way as they are used within that activity.

**One especially important use of training specificity for certain jobs 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 the 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 fitness 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 tobacco use 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 exercising
- Increase body temperature slowly
- Stretch the muscles and joints
- 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 or crunches.

## **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 to always work with a partner who can assist you.

## **Cardiovascular Training**

Cardiovascular (cardio) training is the type of physical conditioning that improves the function of your heart, lungs, and associated blood vessels. The training of the cardiovascular system is accomplished by continuous movement, using large muscle groups. Jogging, bicycling, stair climbing, rowing, walking, swimming, hiking, cross-country skiing, skating, and dancing are examples of cardio 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 PAT 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. Crunches and push-ups 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 fitness program.

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

- ✓ Yardstick and some masking tape
- ✓ Stopwatch
- ✓ 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 of the Guide)

## **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 this Guide.

### **1. Sit and Reach**

Tape a yardstick 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 yardstick. 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 attempts to the nearest inch.



### **2. Crunches**

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 the floor. Eyes stay focused over knees. Hands and arms may be supporting the head, crossed over the chest, sliding up legs, or resting on the floor. Record the number of curl-ups completed in one minute.



### **3. 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 chest is slightly below elbow height. Repeat as many times as possible. Record the number of push-ups completed in one minute.



### **4. 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
<b>FLEXIBILITY</b>			
Sit and Reach	Distance:	Distance:	Distance:
<b>MUSCULAR - STRENGTH AND ENDURANCE</b>			
Crunches	No.	No.	No.
Push-Ups	No.	No.	No.
<b>CARDIOVASCULAR</b>			
1.5-Mile Run	Time:	Time:	Time:

You can compare your starting fitness level to that of national fitness standards for your gender and age for the same four assessments in the table below:

### MINIMAL PHYSICAL FITNESS PERFORMANCE REQUIREMENTS CHART

TEST	AGE CATEGORIES FOR MALES				
	20 - 29	30 - 39	40 - 49	50 - 59	60 +
Sit and Reach (farthest reach in inches)	16.5	15.5	14.3	13.3	12.5
Crunches (number in 1 minute)	38	35	29	24	19
Push-Ups (number in 1 minute)	29	24	18	13	10
1.5 Mile Run (time in minutes:seconds)	12:51	13:36	14:29	15:26	16:43

TEST	AGE CATEGORIES FOR FEMALES				
	20 - 29	30 - 39	40 - 49	50 - 59	60 +
Sit and Reach (farthest reach in inches)	19.3	18.3	17.3	16.8	15.5
Crunches (number in 1 minute)	32	25	20	14	6
Push-Ups (number in 1 minute)	15	11	9	* 12	* 5
1.5 Mile Run (time in minutes:seconds)	15:26	15:57	16:58	17:54	18:44

*\* Females in excess of 49 years of age may do push-ups on their knees. Normative data for these age groups have not been established.*

## **SECTION III: FITNESS PROGRAM**

### **A. General Directions for Fitness Program**

The fitness program is divided into the following sections:

- Warm-Up
- Muscle Endurance and Strength Exercises (calisthenics and weight training)
- Cardiovascular (cardio) Training
- Cool-Down

The muscle endurance and strength exercises do not have to be done on the same day or during the same exercise session as the cardio training. 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 and followed by a cool-down. For example, if the muscle exercises are completed on the same day but at a different time than the cardio training, warm-up and cool-down exercises should be performed before and after each of the two exercise sessions.

The muscle endurance and strength exercises can be done in one of two ways, depending on the availability of equipment. Some degree of muscle endurance and strength can be developed by doing calisthenics which requires no equipment, but a greater training response can be accomplished by training with weights. Training with weights can be done either by using free weights, such as barbells or weight machines.

Since there are no equipment requirements for the cardio 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 muscle endurance and strength. A weekly log sheet is provided so that candidates can keep track of their progress in developing muscle endurance, muscle strength, and cardiovascular fitness. Two types of log sheets are provided, one for calisthenics and cardio and one for weight training and cardio. Copies of the log sheet will have to be made for each week of the fitness program.

#### **Training for the Physical Ability Test (PAT)**

Appropriate preparation for the PAT requires the development of endurance and strength 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 lifting and carrying objects over short distances. Both muscle endurance and strength 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 extended carrying of objects or digging with a shovel. Muscle endurance will also 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, a fitness program that consists of calisthenics or weight training can be used to develop in these areas.

It will be necessary for candidates to develop cardiovascular fitness to perform those events that involve continuous activity over an extended period of time, as well as to endure through the entire series of test events. Training for the PAT should include cardio activity on a regular basis.

The cool-down exercises are designed to help develop flexibility in various joints. The stretching exercises have been selected to help develop flexibility in the major joints of the body. Flexibility will be of particular importance to events on the PAT that involve performing an activity within a confined space or under similar conditions that limit range of motion, but it will play a role in all test events.

The sections that follow describe the exercises to develop the four categories of fitness identified previously. The Warm-Up section includes options (including four different circuits) to prepare the body for training regardless of whether that is cardio or muscle focused. The Calisthenics and Weight Training sections

describe the calisthenics and weight training exercises that can be used toward the development of muscle strength and muscle endurance. The Cardio Training section describes a program aimed at enhancing cardiovascular fitness. Finally, the Cool-Down section provides exercises which will aid in recovery from exercise and help develop flexibility. An instructional video has been created for certain exercises as indicated by a play button symbol [  ] after the name.

To access the videos, you will need to navigate with your computer browser to the PSI Candidate Resource Site from which you printed this Guide. The videos are loaded on the same site. You can view a video by clicking on it. The videos are labeled to match the organization in this guide. The first part of the video name is the type of exercise and the second part of the video name (in caps) is the specific exercise. For example, the video for the first exercise on page 20 of this guide is labeled – **Calisthenics: SQUATS**.

## B. Warm-Up

Please complete the warm-up at your own pace and repeat until you have been moving for about 5-10 minutes. This warm-up can include a range of activities to elevate the heart rate and increase blood flow to the muscles.

- Warm-up Circuits (four options below, video available for Circuit #3)
- walk or jog on treadmill or outside
- moderate intensity cycling on an indoor bike
- continuous walking up and down stairs or single step up/down
- stepmill

### WARM-UP CIRCUIT #1

EXERCISE	TECHNIQUE	TIME/REPETITIONS
Wide Squats	Chest lifted; hips lead down to knees	X20
Narrow Squats	Chest lifted; hips lead down to knees	X10
Chest Push-Ups	Arms wide; toes or knees	X20
Triceps Push-Ups	Arms narrow; toes or knees	X10
Plank	Shoulders above wrists; toes or knees	30 seconds
Bridge	Heels close to hips; hips off floor	30 seconds

### WARM-UP CIRCUIT #2

EXERCISE	TECHNIQUE	TIME/REPETITIONS
March or Jog	In place	30 seconds
Lunges (Left Leg)	Left leg back; lower knee towards floor	X10
March or Jog	In place	30 seconds
Lunges (Right Leg)	Right leg back; lower knee towards floor	X10
Hover	Shoulders over elbows; knees or toes	30 seconds
Bridge	Heels close to hips; hips off floor	30 seconds

### WARM-UP CIRCUIT #3

SUN SALUTATIONS	TECHNIQUE	BREATH
Extended Mountain	Hands above head	Inhale
Forward Fold	Chest to thighs	Exhale
Flat Back Extension	Hands to base of knees	Inhale
Forward Fold	Chest to thighs	Exhale
Lunge	One leg back	Inhale
Down Dog	Hips to ceiling	Exhale
Plank	Slide forward	Inhale
Crocodile	Lower down	Exhale
Up Dog or Baby Cobra	Chest lifts; hips down	Inhale
Down Dog	Hips to ceiling	Exhale
Lunge	One leg forward	Inhale
Forward Fold	Step feet together	Exhale

### WARM-UP CIRCUIT #4

EXERCISE	TECHNIQUE	TIME/REPETITIONS
Stair Walking	Heel strike up; toe strike down	up/down X2
Single Leg Squats	One foot on stair	X10 on each leg
Push-Ups	Hands on stairs	X4-8
Heel Lifts	Toes on stairs; heels drop	X20
Stretch	Heel to hip (quad)	10-20 seconds per leg
Stretch	Heel on stair (hamstring)	10-20 seconds per leg

## 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 muscle endurance in the muscle groups that will be utilized in the PAT. The exercise routine should be performed 3 to 4 times per week. To begin, 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. After that, 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.

### 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. Squats

Integrated exercise with a focus on the lower body (hip, thigh, core).

Stand with feet slightly wider than shoulder-width, move hips back as you squat until the thighs are almost parallel to the ground. The knee 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 (e.g., a backpack).



## 2. Push-Ups

Integrated exercise with a focus on the upper body (shoulder, chest, back, core).

With hands outside the shoulders, lower to the ground until elbows reach a 90-degree angle and lift up while keeping the body as one solid unit from shoulder to hip. Push-ups can be performed on toes (greater load and intensity) or on knees (less load and intensity). Aim at increasing by at least 1 push-up per week.

## 3. Lunges and Backward Stepping Lunges

Integrated exercise with a focus on the lower body (hip, thigh, core).

Stand with feet hip-width apart, step one leg back to a long stride (back heel should not touch ground). Lower the body leading with the back knee to approximately 90-degree angles on both legs. 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 backward with right foot and lower the body weight to a lunge position. Knees bent to approximately 90-degree angles. Push through the front heel in order to bring the right leg back to the initial position.



## 4. Bear Crawl

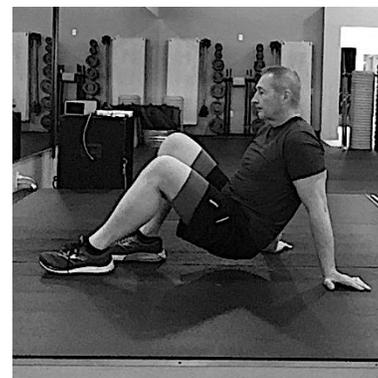
Integrated exercise with a focus on the upper body (shoulder, chest, back, core).

Begin on hands and knees. Lift knees slightly off ground and walk forward by alternating opposite side arm and leg, taking four or more steps and then reversing in the backward direction. Maintain a braced core with hips slightly below shoulders. Increase by at least 1 cycle of forward/backward per week.

## 5. Crab Walk

Integrated exercise with a focus on the upper body (shoulder, chest, back, core).

Begin by sitting on floor with hands behind hips, knees bent, and feet flat. Lift hips slightly off ground and walk forward by alternating opposite side arm and leg, taking four or more steps and then reversing in the backward direction. Increase by at least 1 cycle of forward/backward per week.



## 6. Standing Side Leg Lifts

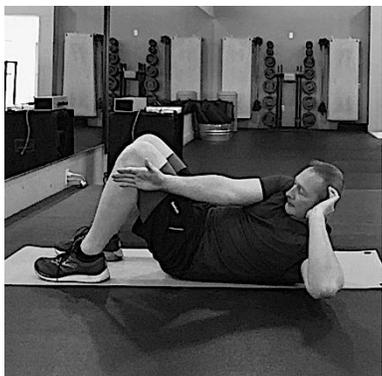
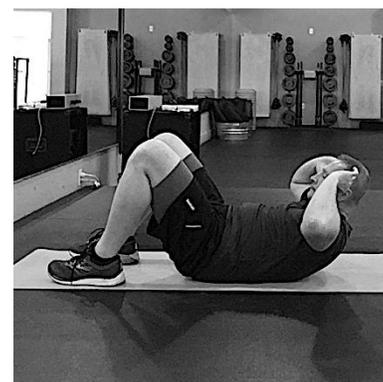
Isolated exercise for the outer and inner thigh muscles.

Stand with feet shoulder-width apart and hands on hips. Transfer body weight completely to the one leg. Slowly lift a opposite leg directly to the side. Slowly lower lifted leg just short of resting foot on the floor. Maintain upright posture. Can be completed with or without a resistance band. Perform the same number of lifts on each side. Increase the number of lifts by at least 2 per week, up to a maximum of 25 per side.

## 7. Crunches (forward)

Isolated exercise for the front core.

Lie on the floor with knees bent, and heels close to hips. Place fingers tips on temples with elbows out of view, pull hips towards ribs, so shoulders lift, and press lower back towards floor. Tuck chin into your chest as you gaze between thighs. Increase by at least 2 per week.



## 8. Twisting Crunches

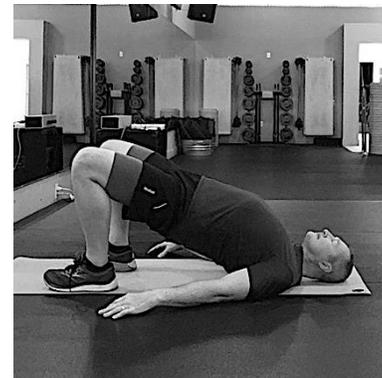
Isolated exercise for the side core.

Lie on the floor with knees bent, and heels close to hips. Place fingers tips on temples with elbows out of view, reach one arm across opposite thigh, so the shoulder lifts. Tuck chin into your chest as you gaze to the fingers of the reaching hand. Perform the same number of lifts on each side. Increase by at least 2 per week.

## 9. Bridge

Isolated exercise for the back core.

Lie on the floor with knees bent, and heels close to hips. Place arms at side of hips with hands flat. Push through heels to lift hips, activating glute muscles. Lower halfway back to floor and repeat. Increase by at least 2 per week.



## 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 muscle endurance and strength. The program provided here will exercise all the major muscle groups that will be used in the PAT. A progressive training program that extends up to 16 weeks is presented on the next page. The table recommends the following:

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

Repetitions (reps): Refers to the number of consecutive times the exercise is done without interruption or rest.

Set: One set equals the number of repetitions performed for one exercise. If the recommendation 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 recommended for this program can be performed through the combined use of free weights and weight machines, or through the use only of a weight machine. 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 challenge you for the beginning 4 reps, then add increments of 5 lbs. until you feel that the weight represents an overload for that muscle group. Another way of determining the initial load is to use the maximum load you can move once 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 below.

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 + 5 lbs.	4	3
7	IL + 5 lbs.	5	3
8	IL + 5 lbs.	6	3
9	IL + 5 lbs.	7	3
10	IL + 5 lbs.	8	3
11	IL + 10 lbs.	4	3
12	IL + 10 lbs.	5	3
13	IL + 10 lbs.	6	3
14	IL + 10 lbs.	7	3
15	IL + 10 lbs.	8	3
16	IL + 10 lbs.	9	3

### Weight Training Progression

#### 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. Squats

Integrated exercise with a focus on the lower body (hip, thigh, core).

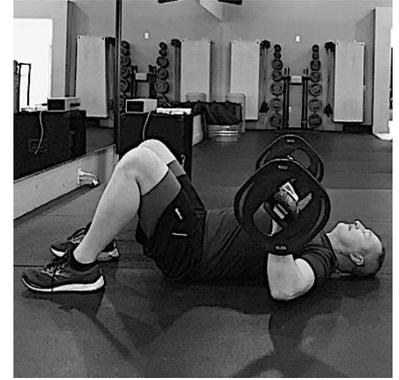
Stand with feet slightly wider than shoulder-width, move hips back as you squat until the thighs are almost parallel to the ground. The knee should be aligned towards the second toe, and the knees should not travel beyond the mid-foot. Hold for 1-2 seconds. Return to the standing position. Suggested initial load: 1/2 of body weight.



## 2. Bench Press

Isolated exercise with a focus on the chest.

Lie on your back on a bench or floor with your feet flat. Hold the bar above the chest with an overhand grip, hands wider than shoulder width, and elbows softly bent. Lower the bar until the elbows are at 90 degrees and then return it to the starting position. Suggested initial load: 1/3 of body weight.



## 3. Clean and Press

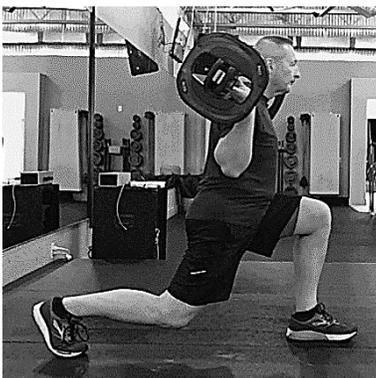
Integrated exercise with a focus on the legs, shoulders, and back.

Begin with arms long and bar in front at hips. Pull the bar up close to the body, sink into a shallow squat as elbows flip below bar. Press bar above head, keeping elbows slightly bent and in front of ears. Lower the bar to chest, sink into another shallow squat as elbows flip above bar. Slowly lower bar back to starting position. Suggested initial load: 1/3 of body weight.

## 4. Deadrow

Isolated exercise with a focus on the upper and mid back.

Stand with feet hip-width apart. Bend knees, tip from hips and push hips behind heels with upper body diagonal over thighs so that the bar is in front of knees. Pull bar towards lower abdominal muscles by squeezing shoulder blades into spine. Slowly lower bar back to knees and stand. Suggested initial load: 1/3 of body weight.



## 5. Lunges and Backward Stepping Lunges

Integrated exercise with a focus on the legs and core.

Stand with feet hip-width apart, step one leg back to a long stride (back heel could not touch ground). Lower the body leading with the back knee to approximately 90-degree angles on both legs. Press back up to starting position. Perform the same number of lunges on the other side. Suggested initial load: 1/3 of body weight.

## 6. Standing Triceps Extension

Isolation exercise for the back of the upper arm.

Stand with feet hip-width apart one foot forward of the other and knees slightly bent. Hold plate or dumbbell above head and bend elbows to lower plate behind head to the base of neck. Straighten elbows to lift plate up, returning to the start position. Suggested initial load: 1/4 of body weight.



## 7. Biceps Curls

Isolation exercise for the front of the upper arm.

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 toward chest, then slowly lower the bar to the starting position. Suggested initial load: 1/4 of body weight.

## 8. Heel Raises

Isolation exercise for the back of the lower leg.

Stand with bar or pack or plates in hands, raise upward to the ball of feet and slowly lower heels towards the floor. Suggested initial load: 1/3 of body weight.



## 9. Lateral Raises

Isolation exercise for the shoulders.

Stand with feet shoulder-width apart. Hold dumbbells at each side with palms facing the body and lift up almost to shoulder height. Slowly lower back to initial position. Suggested initial load: 1/8 of body weight.

## 10. Standing Side Leg Lifts

Isolated exercise for the outer and inner thigh muscles.

Stand with feet shoulder-width apart and hands on hips. Transfer body weight completely to the one leg. Slowly lift the opposite leg directly to the side. Slowly lower lifted leg just short of resting foot on the floor. Maintain an upright posture. Can be completed with or without a resistance band. Perform the same number of lifts on each side. Increase the number of lifts by at least 2 per week, up to a maximum of 25 per side.



## 11. Hover or Plank

Integration exercise for the core.

Stack your shoulders over either your elbows (hover) or wrists (plank) as you lift your body off the floor on either your knees (less intense) or toes (more intense). Start by holding the position for 10 seconds for 3 sets. Increase the time by 5-10 seconds each session up to 60 seconds.



## 12. Opposite Arm and Leg Lifts

Integration exercise for the back.

Begin on hands and knees. Raise the left arm to shoulder height and the right leg to hip height. Lower to starting position. Repeat on other side. Increase by at least 1 per week, up to a maximum of 15 raises per side.



*NOTE:* In order to train grip strength, you could purchase a pair of closing grippers. Or take a large, heavy book and grab it in a pinch grip position (fingers on one side, thumb on the other). Next, “walk the book” in your hand by moving your fingers up and down the spine while you hold the book in mid-air.

## E. Cardiovascular Training

The cardiovascular training is designed to develop endurance needed for the PAT. 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 cardiovascular conditioning should be evident after 10-12 weeks of consistent training. The following program is designed with a progression that extends up to 16 weeks. If you continue to train for longer periods, progressively increase the distance while maintaining the intensity at 7-8

minutes per mile. If needed, 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 Climbing Program**

Keeping a moderate but steady pace, ascend stairs to the second floor from where you start (for example, from the first to the third floor) and then descend back down the stairs to the level from which you started. 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 exercise, 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. After that, try to increase the number of round trips you make during the 10 minutes. The cardiovascular training is designed to develop cardiovascular endurance as well as muscle endurance in the legs. Both of these components of fitness are needed for the PAT. The stair climbing program should be done 3 times per week, or as indicated. This activity can also be completed on a treadmill set at an appropriate incline.

## **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 cardio training, walk for a total of about 5 minutes. Afterward, do the following stretching exercises. If your work out session consisted of only the muscle endurance and strength exercises, perform the following stretches when complete.

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

## **Exercise Descriptions**

### **1. Quad Stretch**

Stretch for the front of the thigh.

Stand using an object or wall for balance if necessary. Keeping hips and shoulders straight forward, pull one heel back towards hips. Maintain upright posture while pushing thigh forward until you feel the stretch in the front of the thigh. Repeat on the other side.



### **2. Hamstring Stretch**

Stretch for the back of the thigh.

*Option A:* Stand facing sturdy surface approximately 2-3 feet high. Keeping hips and shoulders straight forward, place one heel on top of surface. Maintain a flat back while hinging slightly forward at the hips until you feel the stretch. Repeat on other side.

*Option B:* 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.

### **3. Calf Stretch**

Stretch for the back of the lower legs.

Stand about arms distance away from a wall or stable surface. Step one leg back and slowly drop the heel to the ground. Bend and straighten the knee slowly with the heel down. Repeat on the other side.



#### 4. Chest Stretch

Stretch for the chest.

Clasp hands behind back. Squeeze shoulder blades together and pull hands away from body.



#### 5. Side Reach

Stretch for the outside torso.

Standing with feet shoulder-width apart and knees slightly bent, reach one arm up as the other arm slides down the thigh towards the knee until you feel a stretch from under the arm to the hip. For an additional stretch, gently grab the wrist of the lifted arm. Repeat on other side.

#### 6. Shoulder Stretch

Stretch for the shoulders.

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. Side-to-Side

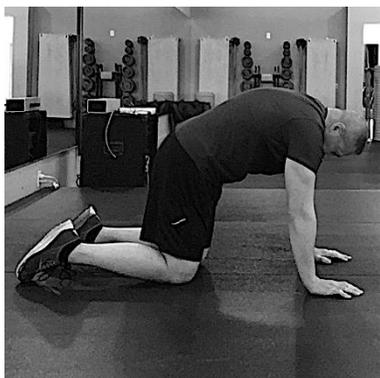
Stretch for the side neck.

Slowly turn head and look to right, then slowly turn head back to center then slowly turn head and look to left. For an additional stretch, gently place pressure down with hand as up push into hand with the head. Repeat on other side.

## 8. Forward and Down

Stretch for the back neck.

Slowly tuck chin into chest and look down. For an additional stretch, gently place pressure down with hands as up push into hands with the head.



## 9. Kneeling Cat Stretch

Stretch for the upper back.

Begin on hands and knees with back flat (parallel to floor). Arch back up pulling in with abdominals and curl chin towards chest. Return to flat back position.

## 10. Hip Stretch

Stretch for the inside and outside thigh, deep hip.

Sit in a cross-legged position with hands gently resting on knees. For an additional stretch place ankle on opposite knee or calf.



## 11. Knees to Chest

Stretch for the lower back.

Lie on the floor on your back. Pull knees toward chest with hands clasped across shins.

## 12. Childs Pose

Stretch for the lower back, deep hips, and chest.

Begin on hands and knees separated to shoulder and hip width. Push hips behind knees and lower chest to thighs. Relax as you feel ribcage expand on thighs.



**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.

*NOTE: The model in the videos and photos is Lieutenant Colonel Bill Horgas, Pennsylvania State Police (PSP), Retired. Bill retired from the PSP after 33 years of service. He worked in various capacities during his career including Patrol, Crime, Staff, and Drugs. He served as Troop Commander and Area Commander. He is a graduate of the FBI National Academy and had been an instructor for Leadership in Police Organizations. Prior to his retirement, he was the Deputy Commissioner of Operations for the PSP. Also in the videos is one of the Exercise Physiologists who developed this fitness program, Dr. Jinger S. Gottschall. Dr. Gottschall earned her doctoral degree in integrative physiology from the University of Colorado at Boulder and continued her academic career as a postdoctoral fellow in neurophysiology at the Emory School of Medicine. She is currently an associate professor at The Pennsylvania State University studying the effectiveness of various exercise regimens.*

## SECTION IV: WEEKLY LOG PAGES

### A. Weekly Log: Calisthenics and Cardio

Date of First Day of Week: \_\_\_\_\_ Weight: \_\_\_\_\_

Training Week Number: \_\_\_\_\_

<b>NUMBER OF REPETITIONS (#) OR TIME (T)</b>				
Exercise	Session 1 Date: _____	Session 2 Date: _____	Session 3 Date: _____	Session 4 Date: _____
Squats (#)				
Push-Ups (#)				
Lunges (#)				
Bear Crawl (#)				
Crab Walk (#)				
Standing Side Leg Lifts (#)				
Crunches (#)				
Twisting Crunches (#)				
Bridge (#)				
Running Program (#)				
(T)				
Stair Climbing Program (#)				
(Max = 10 min) (T)				

#### Reminders for Warm-Up and Cool-Down

**WARM-UP -**

Circuit #1: Wide Squats, Narrow Squats, Chest Push-Ups, Triceps Push-Ups, Plank, Bridge

Circuit #2: March or Jog, Lunges (left leg), March or Jog, Lunges (right leg), Hover, Bridge

Circuit #3: Extended Mountain, Forward Fold, Flat Back Extension, Forward Fold, Lunge, Down Dog, Plank, Crocodile, Up Dog or Baby Cobra, Down Dog, Lunge, Forward Fold

Circuit #4: Stair Walking, Single Leg Squats, Push-Ups, Heel Lifts, Quad Stretch, Hamstring Stretch

**COOL-DOWN -**

Quad Stretch, Hamstring Stretch, Calf Stretch, Chest Stretch, Side Reach, Shoulder Stretch, Side-to-Side, Forward and Down, Kneeling Cat Stretch, Hip Stretch, Knees to Chest, Childs Pose

## B. Weekly Log: Weight Training and Cardio

Date of First Day of Week: \_\_\_\_\_ Weight: \_\_\_\_\_

Training Week Number: \_\_\_\_\_ RM: \_\_\_\_\_ Sets: 3/Session

<b><u>LOAD (L), REPETITIONS (#), OR TIME (T)</u></b>					
Exercise		Session 1 Date: _____	Session 2 Date: _____	Session 3 Date: _____	Session 4 Date: _____
Squats	(L)				
Bench Press	(L)				
Clean and Press	(L)				
Deadrow	(L)				
Lunges	(L)				
Triceps Extension	(L)				
Biceps Curls	(L)				
Heel Raises	(L)				
Lateral Raises	(L)				
Standing Side Leg Lifts	(L)				
Hover or Plank	(T)				
Arm/Leg Lifts	(#)				
Running Program	(#)				
	(T)				
Stair Climbing Program	(#)				
(max=10 min)	(T)				

### **Reminders for Warm-Up and Cool-Down**

WARM-UP -

Circuit #1: Wide Squats, Narrow Squats, Chest Push-Ups, Triceps Push-Ups, Plank, Bridge

Circuit #2: March or Jog, Lunges (left leg), March or Jog, Lunges (right leg), Hover, Bridge

Circuit #3: Extended Mountain, Forward Fold, Flat Back Extension, Forward Fold, Lunge, Down Dog, Plank, Crocodile, Up Dog or Baby Cobra, Down Dog, Lunge, Forward Fold

Circuit #4: Stair Walking, Single Leg Squats, Push-Ups, Heel Lifts, Quad Stretch, Hamstring Stretch

COOL-DOWN -

Quad Stretch, Hamstring Stretch, Calf Stretch, Chest Stretch, Side Reach, Shoulder Stretch, Side-to-Side, Forward and Down, Kneeling Cat Stretch, Hip Stretch, Knees to Chest, Childs Pose

## SECTION V: APPLICATION OF THE FITNESS PROGRAM TO SUBSTATION TECHNICIAN TASKS AND THE PHYSICAL ABILITY TEST

The PAT is designed to assess your capacity to perform the tasks ordinarily performed by a Substation Technician while on the job. The fitness program described in this Guide 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 fitness program are selected to improve muscle strength, muscle power, flexibility, cardiovascular endurance and muscular endurance. The fitness program will condition the individual muscles and muscle groups involved in the tasks performed by a Substation Technician and the events that make up the PAT. The following table provides additional information to explain the link between the exercises in the program and specific events that make up the PAT.

PAT Event	Substation Technician Task	Exercise
<b>500 mcm Cable Cut Event - Ratcheting Cutter Version</b>	Cutting cable with manual cable cutters	<p><b>Calisthenics:</b> Squats, Push-Ups, Bear Crawl, Crab Walk, Crunches (forward), Twisting Crunches, Bridge</p> <p><b>Weight Training:</b> Squats, Bench Press, Deadrow, Standing Triceps Extension, Biceps Curls, Lateral Raise, Hover/Plank, Opposite Arm and Leg Lifts</p> <p><b>Aerobic Training:</b> Running Program</p> <p><b>Cool-Down:</b> Quad Stretch, Hamstring Stretch, Calf Stretch, Chest Stretch, Side Reach, Shoulder Stretch, Side-to-Side, Forward and Down, Kneeling Cat Stretch, Hip Stretch, Knees to Chest, Childs Pose</p>
<b>Lattice Rack Climb Event</b>	Climbing a lattice structure to a height of 21 feet	<p><b>Calisthenics:</b> Squats, Push-Ups, Lunges and Backward Stepping Lunges, Bear Crawl, Crab Walk, Standing Side Leg Lifts, Crunches (forward), Twisting Crunches, Bridge</p> <p><b>Weight Training:</b> Squats, Bench Press, Clean and Press, Deadrow, Lunges and Backward Stepping Lunges, Standing Triceps Extension, Biceps Curls, Heel Raises, Lateral Raise, Standing Side Leg Lifts, Hover/Plank, Opposite Arm and Leg Lifts</p> <p><b>Aerobic Training:</b> Running Program, Stair Climbing Program</p> <p><b>Cool-Down:</b> Quad Stretch, Hamstring Stretch, Calf Stretch, Chest Stretch, Side Reach, Shoulder Stretch, Side-to-Side, Forward and Down, Kneeling Cat Stretch, Hip Stretch, Knees to Chest, Childs Pose</p>

PAT Event	Substation Technician Task	Exercise
<b>Surge Arrestor Lift and Carry Event</b>	Lifting / Lowering a 50-pound object between ground level and waist level	<p><b>Calisthenics:</b> Squats, Push-Ups, Lunges and Backward Stepping Lunges, Bear Crawl, Crab Walk, Standing Side Leg Lifts, Crunches (forward), Twisting Crunches, Bridge</p> <p><b>Weight Training:</b> Squats, Bench Press, Clean and Press, Deadrow, Lunges and Backward Stepping Lunges, Standing Triceps Extension, Biceps Curls, Heel Raises, Standing Side Leg Lifts, Hover/Plank, Opposite Arm and Leg Lifts</p> <p><b>Aerobic Training:</b> Running Program, Stair Climbing Program</p> <p><b>Cool-Down:</b> Quad Stretch, Hamstring Stretch, Calf Stretch, Chest Stretch, Side Reach, Shoulder Stretch, Side-to-Side, Forward and Down, Kneeling Cat Stretch, Hip Stretch, Knees to Chest, Childs Pose</p>
<b>Confined Space Entry Event – Breaker Version</b>	Climbing into and out of a confined space; simulating work inside of the confined space	<p><b>Calisthenics:</b> Squats, Push-Ups, Lunges and Backward Stepping Lunges, Bear Crawl, Crab Walk, Standing Side Leg Lifts, Crunches (forward), Twisting Crunches, Bridge</p> <p><b>Weight Training:</b> Squats, Bench Press, Deadrow, Lunges and Backward Stepping Lunges, Standing Triceps Extension, Biceps Curls, Heel Raises, Lateral Raise, Standing Side Leg Lifts, Hover/Plank, Opposite Arm and Leg Lifts</p> <p><b>Aerobic Training:</b> Running Program, Stair Climbing Program</p> <p><b>Cool-Down:</b> Quad Stretch, Hamstring Stretch, Calf Stretch, Chest Stretch, Side Reach, Shoulder Stretch, Side-to-Side, Forward and Down, Kneeling Cat Stretch, Hip Stretch, Knees to Chest, Childs Pose</p>
<b>Ladder Carry Event</b>	Maneuvering / Carrying a ladder; climbing a ladder; and simulating working hands-free on a ladder	<p><b>Calisthenics:</b> Squats, Push-Ups, Lunges and Backward Stepping Lunges, Bear Crawl, Crab Walk, Standing Side Leg Lifts, Crunches (forward), Twisting Crunches, Bridge</p> <p><b>Weight Training:</b> Squats, Bench Press, Clean and Press, Deadrow, Lunges and Backward Stepping Lunges, Standing Triceps Extension, Biceps Curls, Heel Raises, Standing Side Leg Lifts, Hover/Plank, Opposite Arm and Leg Lifts</p> <p><b>Aerobic Training:</b> Stair Climbing Program</p> <p><b>Cool-Down:</b> Quad Stretch, Hamstring Stretch, Calf Stretch, Chest Stretch, Side Reach, Shoulder Stretch, Side-to-Side, Forward and Down, Kneeling Cat Stretch, Hip Stretch, Knees to Chest, Childs Pose</p>

PAT Event	Substation Technician Task	Exercise
<b>Bucket Truck Event with Insulator Task</b>	Climbing in and out of a bucket truck; riding in a bucket truck; and simulating working at a height of 40 feet	<p><b>Calisthenics:</b> Squats, Push-Ups, Bear Crawl, Crab Walk, Standing Side Leg Lifts, Crunches (forward), Twisting Crunches, Bridge</p> <p><b>Weight Training:</b> Squats, Bench Press, Clean and Press, Deadrow, Standing Triceps Extension, Biceps Curls, Heel Raises, Lateral Raise, Standing Side Leg Lifts, Hover/Plank, Opposite Arm and Leg Lifts</p> <p><b>Aerobic Training:</b> Stair Climbing Program</p> <p><b>Cool-Down:</b> Quad Stretch, Hamstring Stretch, Calf Stretch, Chest Stretch, Side Reach, Shoulder Stretch, Side-to-Side, Forward and Down, Kneeling Cat Stretch, Hip Stretch, Knees to Chest, Childs Pose</p>

## SECTION VI: REFERENCES

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

The American College of Sports Medicine, *Guidelines for Exercise Testing and Prescription*, 10th edition, Williams and Wilkins, Baltimore, 2018, with the permission of the editor

U.S. Department of Health and Human Services and U.S. Department of Agriculture 2015-2020 Dietary Guidelines for Americans, 8<sup>th</sup> Edition. December 2018

[https://health.gov/dietaryguidelines/2015/resources/2015-2020\\_Dietary\\_Guidelines.pdf](https://health.gov/dietaryguidelines/2015/resources/2015-2020_Dietary_Guidelines.pdf)

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### CONCLUSION

This Candidate Preparation Guide represents an attempt to familiarize you with all aspects of the PAT, 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 PAT and on the job.

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