CITY OF SAN DIEGO

OFFICIAL
T10809-201508 FIRE RECRUIT
WRITTEN TEST INFORMATION

DO NOT EDIT OR ALTER THIS DOCUMENT

YOU MUST READ AND STUDY THIS EXAMINATION GUIDE. IT CONTAINS IMPORTANT JOB AND EXAMINATION INFORMATION AS WELL AS SPECIFIC MATERIAL WHICH YOU WILL NEED TO LEARN IN ORDER TO TAKE THE WRITTEN TEST FOR FIRE RECRUIT. DOWNLOAD A COPY OF THIS GUIDE FOR YOUR USE OR SECURE A COPY FROM THE EMPLOYMENT INFORMATION CENTER OF THE CITY OF SAN DIEGO, 1200 3RD AVE., SUITE 101-A, SAN DIEGO, CA 92101.

THIS EXAMINATION GUIDE IS DIVIDED INTO THE FOLLOWING FIVE SECTIONS:

SECTION 1: JOB INFORMATION

This section contains information related to salary, work schedule, training, advancement, as well as a description of what to expect in a job as a fire fighter.

SECTION 2: SELECTION PROCESS

This section provides information regarding each of the components in the Fire Recruit selection process.

SECTION 3: WRITTEN TEST

This section provides a brief description of each of the six subtests on the Fire Recruit Written Test.

SECTION 4: LEARNING TRAINING MATERIAL

This section contains several passages of typical Fire Recruit related training material. **YOU ARE RESPONSIBLE FOR LEARNING ALL OF THE INFORMATION PROVIDED IN THESE PASSAGES.** During the Written Test, you will be tested on your ability to remember what you have read in each passage.

SECTION 5: PHYSICAL ABILITY EXAM

This section describes each event in the Physical Ability Exam and is provided to assist you in evaluating the level of physical fitness you will need to take this test. The Physical Ability Exam will be administered ONLY to those candidates admitted to the final step of the selection process.

DO NOT BRING YOUR EXAMINATION GUIDE TO THE WRITTEN TEST

The pages in this Examination Guide are numbered **1** through **27**. It is your responsibility to make sure you have a complete booklet. If your copy is not complete, you should call the City of San Diego Testing Section at (619) 236-6358 between 8:00 a.m. and 5:00 p.m. Pacific Standard Time.

SECTION 1: JOB INFORMATION

SALARY: Approximately $1187 biweekly while attending the City of San Diego Basic Fire Academy.

SCHEDULE: Most fire fighters work a 24-hour shift which averages approximately 56 hours per week or ten shifts per month.

TRAINING AND ADVANCEMENT: Fire Recruit is the entry-level position leading toward a professional fire fighter career. Fire Recruits attend a 16-week paid Basic Fire Academy which includes course work and practice in fire prevention, fire suppression, emergency medical training, and state and local laws. Upon successful completion of the Fire Academy, Fire Recruits will be promoted to Fire Fighter I and will be assigned to Fire Operations. After one year of appropriate experience and satisfactory service, a Fire Fighter I may be considered for career advancement to Fire Fighter II, approximately $2437 biweekly maximum.

THE JOB: It is important that you have a complete picture of what a fire fighter's job involves, including the less desirable aspects. The information presented below will help you make a realistic comparison of the job duties to your personal skills, abilities and interests.

Fire fighting is physically demanding work. The tools and equipment used on the job are heavy and the fire fighter must be capable of repeatedly handling and operating them over prolonged periods of time.

Fires spread rapidly so fire fighters must work quickly. This urgency places a considerable burden on a fire fighter's endurance.

Fire fighting is always conducted while wearing heavy protective clothing and a self-contained breathing apparatus (total weight is approximately 50 pounds).

Protective clothing greatly retards the body's ability to cool itself. Physical fitness (principally, cardio respiratory fitness in this case) greatly influences how well and how safely a fire fighter can cope with the potentially dangerous heat stress.

Fire fighters are sometimes exposed to extremely hot and toxic environments. This greatly increases the physical and mental stress associated with performing otherwise routine fire fighting tasks. The weight of the protective gear itself increases the difficulty of "routine" tasks by about 33 percent, which again underscores the importance of strength and stamina.

Fire fighters must operate and maintain a wide variety of tools and equipment. In order to properly and safely operate these tools and equipment, knowledge of the underlying mechanical principles is essential (e.g., parts of machines, names and purposes of tools, gear/lever action, parallel forces, weight distribution).

The majority of incidents you will respond to as a fire fighter will include the treatment of medical aid victims, involving minor to severe trauma and potential exposure to communicable diseases. State law requires that all fire fighters be certified as Emergency Medical Technicians (EMT). Additionally, fire fighters must be recertified as an EMT and in Cardiopulmonary Resuscitation (CPR) every two years.

In the San Diego Fire–Rescue Department, a semi-military environment is employed as a means of providing effective and efficient operations. Officers of the department assume responsibility for such operations and orders given by them are to be obeyed without question and should be considered to be direct orders.

SECTION 2: SELECTION PROCESS

WRITTEN TEST DATES: The **Written Test Appointment Notice** which you have received informs you of the exact date, time and location of your written test. **DO NOT LOSE THIS NOTICE. YOU WILL NOT BE ADMITTED TO THE WRITTEN TEST WITHOUT IT. SINCE YOU CANNOT RESCHEDULE YOUR TEST DATE, CAREFULLY NOTE AND REMEMBER WHEN YOU ARE SCHEDULED TO TAKE THE TEST.**

APPLICATION/EXAMINATION PROCESS: For admittance to the test, you must present your Written Test Appointment Notice and official, government-issued, picture identification with your signature. Failure to present your Written Test Appointment Notice AND proper identification at the written test may affect your ability to take the written test and may result in missed job opportunities.

WRITTEN TEST: The written test is a general aptitude test described in Section 3 of the Examination Guide. Section 4 of the Examination Guide contains additional information you will need to study and learn prior to the written test. If you pass the written test, you will be placed on the eligible list which will be used to fill Fire Recruit position vacancies, and will be in effect for one year.

FIRE–RESCUE DEPARTMENT INTERVIEW: Based on the specific requirements of each Fire Academy, the San Diego Fire-Rescue Department will review the list of eligibles certified. Only those candidates with the most appropriate qualifications will be contacted for an appointing authority interview. During the interview, your qualifications, communication skills and other factors related to your suitability and readiness to enter the fire service will be evaluated. If you are successful in the interview, you will continue to the next step of the process.

PRE-EMPLOYMENT REQUIREMENTS: Employment offers are conditional pending the results of all screening processes that are applicable to this job, which may include but are not limited to the following: Confirmation of citizenship/legal right to work in the United States; completion of a pre-employment medical review/exam (which may include drug/alcohol testing); reference checks; and a fingerprint check. The fingerprints will be submitted to the Federal Bureau of Investigation and the California Department of Justice for a conviction record report. Certain positions may require additional screening processes which may include a polygraph examination and/or background investigation. All of these processes must be successfully completed before employment begins. A positive test for alcohol, illegal drugs or inadequately explained prescription drugs, misrepresentation, falsification, or omission of pertinent facts in any step of the screening/selection process may be cause for disqualification and/or termination of employment. Nothing in this job posting constitutes an expressed or implied contract for employment with the City of San Diego. Applicants must notify the Personnel Department of any changes in their name, address (home, email), or phone number or they may miss employment opportunities.

PHYSICAL ABILITY EXAM: You will go on to this next step ONLY if you are being considered for employment as a Fire Recruit. It is a physically strenuous test designed to reflect the physical demands placed on fire fighters during the normal course of their duties. The Physical Ability Exam (PAE) is designed to assess upper and lower body strength, grip strength, flexibility, dexterity, balance, stamina, and cardiovascular (heart and lung) endurance. If you are not in top physical condition, begin NOW to work on areas where you need improvement. You MUST pass the Physical Ability Exam prior to hire. You will be notified of the date, time, and location of the Physical Ability Exam. Information regarding the Physical Ability Exam has been provided in Section 5 of the Examination Guide. **NOTE**: *Candidates who have a Candidate Physical Ability Test (CPAT) certificate from a testing center using the standardized test developed and validated by the International Association of Fire Fighters (IAFF) and the International Association of Fire Chiefs (IAFC), may WAIVE the City of San Diego PAE if their certificate is current and valid at the time of the PAE. For more information on the CPAT exam, please log on to http://www.cffjac.org/jac/cpat/index.cfm.*

ACADEMY TRAINING: The San Diego Fire-Rescue Department Basic Fire Academy is a 16-week comprehensive college-level training program. During this academy you will receive course work and practical instruction in fire suppression, fire prevention, emergency medical training, and applicable state and local laws. If you successfully complete the Fire Academy, you will receive up to 16 units of college credit. You will also be eligible to promote to Fire Fighter I. As a Fire Fighter I, you will typically be assigned to Fire Operations, where you will be involved in various fire fighting operations and situations requiring you to provide medical assistance.

SECTION 3: WRITTEN TEST

The Fire Recruit Written Test is a general aptitude test designed to measure the important skills and abilities needed to become a successful fire fighter. No prior knowledge of technical fire fighting information is necessary to take this written test. All the information you need to know will be provided on the test or in this Examination Guide. Following is a brief description of each of the six subtests on the Fire Recruit Written Test:

SUBTEST 1: ORAL DIRECTIONS AND COMPREHENSION: In this subtest, you will listen to pre-recorded information. During the actual written test, you will NOT have the information in written form, and you will NOT be allowed to take notes. Each recorded message will be recited only once; therefore, you should listen very carefully. You will then be instructed to turn to a specific page in your written test booklet and answer several written test items concerning the passage you just listened to.

SUBTEST 2: BASIC MATHEMATICS: This subtest will assess your skill in performing mathematical computations such as addition, subtraction, multiplication, and division involving fractions, percentages, and whole numbers used to calculate volumes, areas, distances, proportions, and averages.

SUBTEST 3: LEARNING TRAINING MATERIAL: The items in this subtest will be based on PASSAGES 1 THROUGH 7 presented in SECTION 4 of this Examination Guide. **The passages will NOT be available during the written test; therefore, you must**

carefully study and learn the information in Section 4 prior to the written test.

The material contained in the Learning Training Material section were custom developed specifically for this examination, and may not conform to actual fire procedures, practices, equipment, or information in the public domain. These materials may conflict with other sources and/or knowledge you may have about the subject(s).

Your answers to written test items developed from the passages in this Examination Guide must be based only on the information contained in the Examination Guide and not on any other knowledge you may have about the subject. It is important to understand that **you are being tested on your ability to learn only the material provided in PASSAGES 1 THROUGH 7**, and that your **answers should NOT be based on information you may have obtained from any other sources** (i.e., books, prior training, personal experience, etc.).

Do NOT wait until the last minute to study and learn these passages. Try to study and review the material in this section often during the weeks before your written test. The more you study, the better you should be able to answer the items related to these passages on the written test.

SUBTEST 4: READING COMPREHENSION: In this subtest, you will read narrative material, some of which is similar to fire fighting training information. Each passage will be followed by one or more written test items. If you need to, you may refer back to the passage to answer the items. The items in this subtest involve general principles and do NOT require prior fire fighter experience or knowledge to answer.

SUBTEST 5: READING CHARTS, GRAPHS, AND DIAGRAMS: In this subtest, you will be given information in charts, graphs and/or diagrams similar to those found in fire fighting training material. Each will be followed by one or more written test items. If you wish, you may refer back to the chart/graph/diagram to answer the items. The items in this subtest involve general principles and do NOT require prior fire fighter experience or knowledge to answer.

SUBTEST 6: MECHANICAL REASONING: This subtest will assess your ability to understand a variety of mechanical and spatial relationships and concepts. There will be several different types of written test items which may involve the following: The operation of gears, pulleys, valves, and springs; laws of leverage, motion, stability and weight distribution; the ability to determine how something would look if its parts were put together correctly; and the ability to visualize parts of an object that cannot be seen entirely, based on the parts that can be seen. The items in this subtest involve common mechanical and spatial principles and do NOT require technical mechanical knowledge to answer.

SECTION 4: LEARNING TRAINING MATERIAL

PASSAGE 1: HIGH-RISE FIRES AND STANDPIPE SYSTEMS

Fire Department operations in high-rise buildings are inherently dangerous. Fire fighting operations are difficult in buildings that are above the reach of aerial ladders. The design, construction, and population of high-rise buildings increase the problem of search and rescue and fire suppression.

DEFINITIONS: A high-rise building can be defined as a structure more than 75 feet high, or a building that contains a floor area which is located more than 75 feet above the adjacent ground level. A high-rise structure is designed for human occupancy and contains a vertical standpipe. The high-rise building must have an Emergency Operations Manual.

High-rise structures are divided into two classifications: Life Safety high-rise and Existing high-rise structures. Life Safety high-rise structures are buildings constructed since 1975. Existing high-rise structures were built before 1975.

Life Safety high-rise buildings generally have the most modern fire protection facilities available. All Life Safety high-rise buildings have the following components: A Building Control Station or fire control room; standby power and light for emergency operation of the life safety system; a fire department communication system; a public address system; elevator safety provisions; a combined standpipe system; and a central station alarm system.

The Building Control Station or fire control room is the focal point in Life Safety buildings for fire department operations. It usually contains the following components: A voice communications panel for fire department communications; a public address system; a standard hard-wired telephone; controls for the building's heating, ventilation and air conditioning system (HVAC); fail-safe

stairway door release controls; displays which indicate the status of the building's fire alarm, HVAC, elevators and stairway door release system; building emergency operations manual.

Existing high-rise structures may have many of the components of a Life Safety building. Although they may not have a Building Control Station, they may have a lobby console staffed by building security personnel which contains some of the features found in Building Control Stations. All Existing high-rise structures must have the following: Two means of exit from each floor; keys to locked stairwell doors; a means of ventilating the structure (operable windows, fixed tempered glass, or mechanical ventilation); elevator safety provisions which allows fire personnel access to each floor at all times; a Class I and Class II standpipe system, a Class III standpipe system, or a Combined system; and an approved warning system or a public address system (a public address system is required in buildings more than 150 feet in height).

Each high-rise building is required to have an Emergency Operations Manual that is generally located in the Building Control Station, security console, or the building engineer's office. It should contain pertinent phone numbers, floor plans of the building, and other information that could be useful to the fire department.

STANDPIPES: A standpipe system is a wet or dry system of piping and related equipment designed to provide water exclusively for fire fighting. These systems are classified as Class I (dry), Class II (wet), Class III (combination), and Combined Sprinkler-Standpipe systems.

Class I standpipe systems are found in older high-rise structures four or more stories tall. It is a dry system with water supply and water pressure delivered by a fire department pumper through inlet connections. There is a minimum requirement of two 2 ½-inch inlets for fire department pumper connections. All portions of the high-rise structure must be able to be reached by a thirty-foot stream from a nozzle attached to one hundred feet of hose.

Class II standpipes are required in buildings three or more stories tall. It is a wet system directly connected to a water source and is equipped with 1 ½-inch outlets with hose and nozzle, for use by the building's occupants. All portions of the high-rise structure must be able to be reached by a thirty-foot stream from a nozzle attached to not more than one hundred feet of hose.

A Class III (Combination) standpipe system is a wet system directly connected to two separate sources of water. The primary water supply is connected to the municipal water system and is generally connected to the building's fire pump(s) or to internal tanks which supply the building's fire pump(s). It is equipped with 1 ½ -inch outlets with hose and nozzle for occupant use and 2 ½-inch outlets for fire department use. Inlets for fire department pumper connections to the standpipe system are required and are considered a secondary source of water.

A Combined Sprinkler/Standpipe system is required in all high-rise buildings greater than 75 feet tall and built after July 1974. Automatic fire sprinklers are required. High-rise structures over 150 feet tall must have a combined system directly connected to a water supply and must have 2 ½-inch outlets for fire fighter use. It will have fire department inlet connections, a fire pump which supplies water and water pressure to the standpipes, and an on-site water supply. High-rise structures 75 to 150 feet in height may utilize the wet standpipe to supply the sprinkler system.

Dry standpipe risers in structures less than 100 feet in height will use 4-inch diameter pipe; structures greater than 100 feet tall will use 6-inch diameter pipe. The system must flow 500 gallons of water per minute at 65 pounds per square inch at the roof.

Wet standpipe risers utilize 1½-inch to 2-inch pipe in structures less than 50 feet in height. Structures greater than 50 feet in height will use 2½-inch pipe. Buildings greater than 275 feet tall must be sectioned with separate risers for each section. There are no inlets for fire department pumpers since the system is supplied from the municipal water supply.

A Combination standpipe has 6-inch pipe that must flow 500 gallons per minute at 65 pounds per square inch at the roof level. It will have four 2 ½-inch inlets for fire department pumper connections or six 2 ½-inch inlets if the building has three or more risers.

Combined Sprinkler/Standpipe systems are required to flow 1000 gallons per minute per riser and have four 2 ½-inch inlets for fire department pumper connections or six 2 ½-inch inlets if the building has three or more risers.

PASSAGE 2: WILDLAND FIRE FIGHTING

Urban/Wildland Interface fires include fires in brush, weeds, grass, crops, forests, and other vegetation. Wildland fires present problems that are not comparable with other types of fire, including fuel type, topography, and weather. Although cities are heavily urbanized, much potential for wildland fires exists in the form of canyons, dedicated open space, and undeveloped, brush-covered

properties.

An urban/wildland interface fire describes a major fire in grass, brush or forest which spreads to structures, houses, mobile homes, or parked vehicles in or around the area. Fire fighting in brush and wildland areas is extremely dangerous and the dangers are frequently underestimated by many structural fire fighters.

DANGEROUS WILDLAND FIRE BEHAVIORS: A study of wildfires conducted by the National Fire Protection Association identified four types of wildland fire behaviors that kill fire fighters:

1. Fire fighter fatalities often occur at the edge or perimeter of a large wildfire.

2. Fire fighters are often killed when working in and around light fuels, such as grass, brush or marsh weeds; they are generally not killed in large forest fires.

3. Unexpected wind shifts are a contributing factor in fire fighter deaths. Sudden increases in wind speed and sudden changes in wind direction cause the light fuels to "flare up" or "blow up," which can trap and kill fire fighters.

4. Changes in ground elevation increases fire spread, which traps and kills fire fighters on the side of a hill or mountain or on a cliff side. A brush fire spread can double for every 10 degrees of elevation. For example, a hill or slope of 10 degrees can cause a fire burning at a rate of 10 miles per hour (mph) to increase to 20 mph, a slope of 20 degrees will increase the speed of the same fire to 40 mph, and so on.

Large urban/wildland interface fires usually start out as small brush fires. There are 150,000 wildfires in the United States each year, which burn over 2.25 million acres of brush and forest. However, most of these blazes are extinguished when they are smaller than one acre by fire fighters using rakes, shovels, axes, portable extinguishers and small off-road fire fighting vehicles. Successful extinguishment of the small brush fire can prevent the large urban/wildland interface conflagration.

FACTORS INFLUENCING FIRE BEHAVIOR: There are three factors that influence wildland fire behavior: Fuel type, weather, and topography.

There are four classifications of wildfire fuels: Ground fuels which include roots, duff, and subsurface materials which include dried, decomposed leaves, twigs, or pine needles that have fallen from the trees to the ground; surface fuels which include grass, shrubs, bushes, scrub oak, chaparral, marshy grasses, cattails, crops, and other vegetation up to six feet in height; crown fuels which include the tops of trees (most fires involving crown fuels are caused by the vertical spread of flames of a brush fire); and ladder fuels involving dry vines and other vegetation which allows fire spread to the tree crowns. Certain types of vegetation that contain oils that burn, such as eucalyptus, contribute to how quickly the fuel may ignite, burn and spread, as does the fuel temperature, moisture content, and density or arrangement of the fuel. Fuel moisture factors include relative humidity, time of day, fuel size/density, sunlight, live/dead fuel, ground moisture, season, topography, ambient temperature, wind, and precipitation.

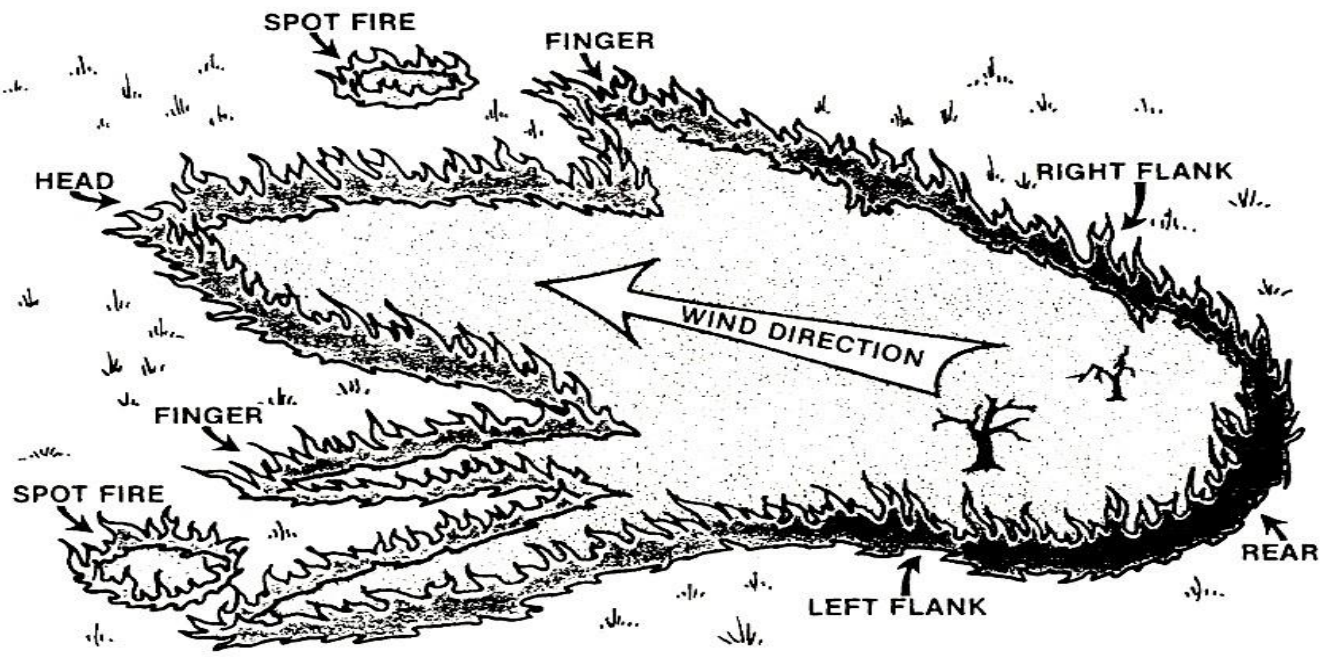
Atmospheric conditions or weather, likewise, affects wildland fire behavior. A stable atmosphere with haze or stratus clouds helps firefighting efforts, whereas unstable weather conditions with cumulus clouds producing erratic winds, adversely impacts firefighting efforts.

Wind is the greatest influencing factor of wildland fire behavior. Winds drive fire and determine a wildland fire's direction and rate of spread. Oxygen supply is increased by higher wind velocities which increase the wildland fire's intensity. Larger wildland fires may create their own weather conditions such as increased winds which suck in air and oxygen, intensifying the fire, and creating updrafts and fire whirls. Wind direction is identified by the direction from which the wind blows. Wind is the most variable and least predictable factor. In southern California, Santa Ana winds are dry winds from the northeast, with relative humidity of five percent, and can have a thirty to forty degree increase in temperature.

Topography is the third factor influencing wildland fire behavior. Terrain, steepness of slopes, and natural or man-made obstacles affect fire fighting strategies. Fire spreads uphill sixteen times faster than downhill primarily because heat from the fire pre-heats the vegetation uphill from the fire. Chimneys shaped by land contours funnel heat and smoke upward and can trap fire fighters. Depressions in ridge tops, called saddles, should also be avoided. Box or narrow canyons allow winds to act like a lid, trapping smoke and heat and drawing in fresh air from the bottom, allowing radiant heat to travel across the canyon. The potential for spot fires in box canyons is great, with potential for a "blow up" condition.

PARTS OF A WILDLAND FIRE: An aerial view of most brush or wildland fires will reveal a large blackened area with flames at

the perimeter edges where fresh vegetation provides fuel. Blackened areas or strips of long, thin sections of fire in some instances may extend outward like “fingers" from the main body of fire. Some distance downwind from the main fire and fingers may be found isolated pockets or small spot fires. “Spot fires” are caused by airborne burning embers which the wind has blown ahead of the main fire. These embers land on the vegetation and create little patches of fire. The leading edge of a moving vegetation fire is called the "head" of the fire and the opposite side of the head of a brush fire is called the "rear.” The left side of the brush fire is identified as the "left flank" and the right side, the "right flank." Inside of the large blackened area of a brush fire may be sections of unburned shrubs or trees, called "pockets." Fire fighters must attempt to control the head of a brush fire. However, fire fighters must be careful in attempting to do this by an aggressive frontal assault into the head of a fire. An onrushing wall of brush fire can overcome the extinguishing effects of even a large master stream.



EXTINGUISHMENT: The control of a small brush fire at the head by fire fighters using hand tools and portable extinguishers controls 90% of most blazes. The head of a small brush fire can be approached safely from either the burned-out blackened area or from the flanks of the fire in a pincer or envelopment type of attack. Positioning fire fighters on a road or firebreak area in front of fast-moving brush fire can be extremely dangerous and should be undertaken only to protect life. An escape route or refuge must be available to fire fighters. When directing a hose stream on a brush fire the water stream should be directed at the brush that is burning and not at the flames. Fire fighters may also play the hose streams on a house with the purpose of wetting down unburned fuel. Fire fighters should not waste their precious water supply attempting to break up heat waves. Fire fighters must realize the priorities of brush fire fighting are different from those of structural fire fighting. When fighting a brush fire, fire fighting priorities are the safety of lives (including those of the fire fighters), protection of property and containment of the fire. This contrasts with structural fire fighting priorities, which are the safety of lives first, fire containment second, and, lastly, protection of property.

HAZARDS: A hazard commonly found in urban interface fires is high voltage towers and overhead electric wires. Ground fires and brush fires sometimes burn beneath and nearby these electric transmission lines. Heavy smoke plumes coming in contact with overhead wires can cause phase-to-ground short circuits that may injure and kill fire fighters. Fire fighters should be extremely cautious when operating hose lines near high voltage wires. In addition, fire fighters should treat high voltage transmission wires as an exposure, attempting to keep flames 100 feet away. Fire fighters operating hose streams should also remain at least 100 feet from the outer electric lines.

PASSAGE 3: STANDARD FIREGROUND PROCEDURES

Standard fire ground procedures are a set of organizational policies and directives that establish a standard course of action on the fire ground to increase the effectiveness of the fire fighting team. Standardized procedures provide for the Fire Department’s consistent and effective operation, particularly during large, complex, or unusual field situations. Standard operating procedures

allow the organization to develop the "game plan" before the fire, which is one of the most important elements of prefire planning.

To ensure success, fire ground command and fire fighting activities require the integrated efforts of the entire team which is, in turn, organized and mobilized under a strong central plan. While the actions of individuals on the fire ground are important, fire fighting operations are conducted collaboratively, as a team.

Foreground standard operating procedures outline and describe an organizational approach to the major categories of fire ground activity. They generally include such areas as:

a. Basic command functions, including a standard method of assuming and continuing command, following Incident Command System (ICS) tenets.
b. A method to divide command responsibility through the delegation of areas and functions.
c. All aspects of communications and dispatching.
d. Fire ground safety.
e. Guidelines that establish and describe strategic and tactical priorities, and related support functions.
f. A consistent method of initial resource deployment.
g. Responsibilities and functions of various companies and units are outlined.

STANDARD FIREGROUND ROLES: A variety of personnel are involved in every fire fighting incident. Standard operating procedures identify and predict the typical participation of each group and create a functional role for that participation. This anticipation of roles and functions becomes an advantage for everyone operating on the fire ground. The basic fire ground staffing includes the following:

Incident Commander: Incident Commanders manage the incident on the strategic level. They establish the overall operational plan, develop an effective organizational structure, allocate resources, assign personnel to carry out the attack plan, manage information to develop and revise tactics and decisions, and continually attempt to achieve the basic command objectives.

As soon as possible after arrival at the incident, the Incident Commander should establish and operate from a stationary command post. This command post should offer a relatively quiet vantage point, with lighting, radio equipment, and sufficient space to access and manipulate computerized and written reference materials. The command system works because the Incident Commander establishes the strategic plan and everyone else follows it.

Typical tasks and objectives of the Incident Commander include:

a. Assign basic fire ground functions and activities to the various companies based upon the capabilities and characteristics of each type of unit.
b. Assign major fire ground functions to the appropriate company that can best accomplish the operation.
c. Integrate the efforts of engine, truck/ladder, and rescue companies to achieve effective fire control and suppression, property protection and conservation, and rescue operations.
d. Increase the awareness and confidence of company members in the standard performance of other companies operating on the fire ground.
e. Reduce the amount and detail of orders required to get companies into action on the fire ground.

Division Officer: Division Officers are assigned by the Incident Commander to manage specific geographic areas of the incident scene or specific fire ground operational functions. Division Officers manage at a tactical level to achieve direct objectives within the overall strategic plan.

Divisions are created selectively (i.e., only the divisions that are required are assigned). For example, there is no advantage in assigning a Roof Division to a structure that is fully involved. When a division assignment is made, the Division Officer physically goes to the area, determines the resources needed, directly manages the companies to achieve the tactical objectives, and communicates with the Incident Commander on the progress of the group. Consequently, the Incident Commander has a method to decentralize the command structure, yet maintain a manageable span of control.

Command Aide: Command Aides assist the Incident Commander and, during large operations, Command Aides may also be assigned to assist Division Officers. Command Aides assist with information and communications management. Command Aides can be any knowledgeable fire ground operator, from a probationary firefighter to a Chief of an adjoining jurisdiction. Typical Command Aide functions include: keeping track of assignments, locations, and the progress of companies, assisting with tactical worksheets, or using computerized and hard copy reference materials and prefire plans. They may also provide reconnaissance intelligence and operational details for the Incident Commander.

Dispatcher: Fire Dispatchers provide the central communications function for the Fire Department. Dispatchers receive calls from citizens requesting emergency services and then enter the location and details of the incident into the Fire Department's Computer Aided Dispatch System (CAD). The CAD system automatically correlates the location, type of incident, and number and type of appropriate units, and dispatches the closest appropriate units to the correct location. While the Dispatcher "voice dispatches" or "airs" the incident, the CAD system relays the details of the incident to each unit's Mobile Data Computer (MDC). In addition, dispatchers continue to support the operation by providing a communications link and assist the command system by dispatching and coordinating the response of any additional resources requested. Dispatch is a critical command system element.

Fire Company: Fire companies are teams of personnel who respond on apparatus to dispatches to fire incidents. They carry out assigned tasks on the fire ground. General classifications include engine, truck/ladder, and rescue companies, as well as special service companies. These companies work under the direct command of the Incident Commander or designated Division Officers. Each company includes a Company Officer who supervises the company's work and is responsible for maintaining communications with the command structure. An engineer/chauffeur/apparatus operator, fire fighter paramedic, and EMT fire fighter complete each company's composition.

The following list represents the standard operations that will normally be performed by engine, truck/ladder and rescue companies and provides the framework for field operations for these companies:

Engine Company Functions:

a. Stretch hose lines
b. Operate nozzles
c. Forcible entry
d. Initial search, rescue and treatment of patients
e. Pump operations

Ladder Company Functions:

a. Search, rescue and treatment of patients
b. Ventilate structure
c. Perform salvage and property conservation
d. Forcible entry
e. Raise and position aerial and/or ground ladders
f. Provide access/check fire extension
g. Operate ladder pipes (aerial ladder and platform apparatus only)
h. Perform overhaul
i. Perform extrication
j. Utilize tools not carried on engine companies

Rescue Company Functions:

a. Transportation of sick and injured to hospitals via rescue ambulance
b. Search, rescue and treatment - Rescue companies should communicate commitment and location to Command and maintain a retrievable status for victim treatment and transportation.
c. Forcible entry
d. Extrication, including specialized rescue and extrication
e. General firefighting duties as assigned by Command
f. Rapid Intervention Crew (RIC)
g. Deployment of air bags and other specialized rescue and extrication equipment

The following Special Service Companies also play an important role at fire incidents:

Support Personnel: Support personnel represent areas of responsibility from within the fire and rescue services and from outside agencies that routinely respond to the fire alarms. They provide services which are often critical to fire fighting operations, such as utility control, (i.e., electric and gas, water supply, mechanical or apparatus repair, special equipment, technical consultation, displaced resident comfort and welfare services). It is important that these services be integrated into the overall command system. Typical services include:

a. Air bottle refill and supply
b. Logistics support

c. Fire fighter rehabilitation support services
d. On scene apparatus refueling at protracted incidents

Fire Investigator: Fire Investigators are responsible for determining the cause and the origin of the fire. At the request of the Incident Commander, or, automatically upon the dispatch of a multiple alarm assignment, they respond to the fire ground and integrate their efforts with the overall operation. Their combination of firefighting experience and skills, combined with the investigative authority of sworn Police Officers, will usually provide the final link in the fire protection system by determining how the fire actually happened.

SPECIAL OPERATING PROCEDURES: In addition to Standard Operating Procedures, Fire departments have Special Operating Procedures which are guidelines used in emergencies of an unusual nature or circumstance, and requiring a public safety function. These Special Operating Procedures are designed to enable the fire fighter to deal with unusual circumstances encountered at emergencies such as with aircraft and cruise ships.

AIRCRAFT EMERGENCIES: Aircraft emergencies will normally be received over the "Hot Line" connecting the Fire Dispatch Center, Airport Tower, Airport Manager, Airport Fire Station, Police Communications Center, and Harbor Police. The Airport Tower will give the type of aircraft, the nature of the trouble or emergency, number of the runway being used, and the time the aircraft is expected to land. Based on the nature of the trouble, Fire Dispatch will announce the type of alert. Units will be dispatched on radio channel 7A and use radio channel 8D for communications. Units will be dispatched in accordance with the following alerts:

Alert I:	Aircraft approaching with minor difficulty. Airport units will respond.
Alert II:	Aircraft approaching with major difficulty. Airport units, Heavy Rescue 14 and Battalion 2 will respond.
Alert III:	Aircraft crash on or near the Airport. Immediate emergency action required. Airport units and first alarm response if on-field, dispatch a second alarm response if in a populated area off-field.
Alert IV:	Bomb threat with an identified suspicious package, substance or possible improvised explosive device aboard an aircraft. Fire department response will include one engine company, Arson Squad, Special Operations Battalion Chief, and Police Bomb Squad.
Crashes off Airfield:	
Alert V:	Aircraft crash in a populated area.
Alert V-Reduced:	Aircraft crash where there is a limited hazard. On a freeway, city street, etc., and there is no fire.
Wildland Alert V:	Aircraft crash in a wildland, unpopulated area.

INCIDENT COMMAND: Oftentimes, responses to incidents in areas of overlapping jurisdiction necessitate that one agency assume overall incident command. The incident location determines which agency has Incident Commander responsibility.

Location	Incident Commander
Freeways	State Highway Patrol
City Streets	Fire Department
County Roads	Sheriffs Department
Water Ways	Coast Guard/Port District
Other Areas	Fire Department

CRUISE SHIP FIRES:

1. FIRST ALARM ASSIGNMENTS**:** Engine Company Operations
   Companies will use radio channel 11C as command channel, channels 11D and 11E for tactical communications.
   a. First-in engine establish contact with the ship's officer-in-charge to determine:
      (1) What is burning?
      (2) Where is fire located (consider hazards of fire in ship's laundry or galleys)?
      (3) When did fire start and how long has fire been burning?
      (4) How did the fire start?
      (5) Any exposure hazards (i.e., adjacent compartments with fuel, dangerous cargo, ship's infirmary)?
      (6) What ship's personnel have done prior to fire department arrival?
      (7) Can fire spread laterally or vertically through elevator shafts or ventilation ducts?

   b. Initiate the following as applicable
      (1) Activate and monitor the ship's fire extinguishing systems. Be aware of the presence of fire fighters or other personnel in compartments where steam or non-flammable extinguishing agents may be deployed.
      (2) Ship's firefighting crews (for initial attack and to guide first-in companies).
      (3) Evacuation of passengers and non-essential crewmembers.

(4) Control ship's ventilation system.
(5) Confinement (watertight doors/fire doors).

c. Go to the ship's bridge; keep ship's officer with company, including ship's first officer to make stability computations.
   (1) Refer to ship's plans to coordinate fire attack in conjunction with ventilation and de-watering procedures.
   (2) Exposures**:** Refer to ship's plans to locate and protect exposures, considering all six sides of the fire.
   (3) Consult with ship's damage control officer throughout fire suppression operation.

d. Find the fire
   (1) Use ship's officers as guides.
   (2) If no hose line has been laid, use safety line.

e. One engine lays the supply line, takes high-rise equipment on board and advance dry lines to fire. The initial fire attack should be made only after a backup engine company is in position. Access may be made via the cargo ports at dock level; this may allow access from below the fire.

f. One engine assists in laying the supply line. That engine's company will take their high-rise equipment on board and stand by as a backup company at the gated wye. They will charge the attack line when directed.

g. One engine will lay a supply line to the first-in truck company for an elevated water supply. The water supply will connect to ship's fire main through international shore connections or companies will use the elevated water supply for supplying hand lines. Report to command for assignment. Companies should use shipboard hose lines as a last resort.

h. Fire suppression: Surround the fire - consider hand lines (always with backup hose lines in place) on all six sides of the fire, include 2 decks above the fire as exposure 4A, 4B, 4C, etc.

PASSAGE 4: COMMUNICATIONS

DISPATCH POLICY: The timely response and effective management of Emergency Medical Services (EMS), rescue, and fire control situations represent the highest priorities of the Fire Department. Fire fighters will respond to any emergency situation which threatens life, safety, or property. When emergency calls are received, the Fire Department Dispatch Center will dispatch the closest available unit(s) with the capability to control the emergency situation. In cases where the Fire Department is not the appropriate agency to deliver the needed assistance, or if the situation is not a true emergency, an attempt will be made to place the caller in contact with the appropriate agency. The call routing process must not delay a response to valid emergency incidents, but should attempt to verify the nature of questionable calls. When a positive determination of the need for an emergency response cannot be made, the Fire Department policy is to dispatch Fire Department resources.

JURISDICTION: Fire Department units will be dispatched to all emergency incidents within the City limits. Fire Department units will also be dispatched to borderline locations, when an accurate determination of jurisdiction cannot be made by the dispatcher.

Calls for assistance from public or quasi-public agencies outside the City limits will be dispatched as mutual aid incidents.

Calls for assistance from citizens outside the City limits will be transferred to the appropriate agency. If that agency requests mutual aid assistance, the appropriate units will be dispatched.

DISPATCHERS: The primary responsibility of dispatchers is to determine, without delay, the nature and location of the emergency and the source of the call (call back number) in order to initiate the dispatch process. This information is needed to immediately process the incident. Additional details regarding the incident may be added later.

Fire Dispatchers make the initial determination of the appropriate response, based on information received from the caller. Since the avoidance of unnecessary responses is a basic part of the dispatch function, dispatchers must determine if the caller has a true emergency and whether a Fire Department response is appropriate. When it is determined that an emergency response is required, the call will be entered into the Computer Aided Dispatch (CAD) system. The CAD system then automatically selects units for dispatch according to their distance from the location of the call and the service delivery capabilities of each company. Distance measurements are based on travel distance from a company's station or its current location if it has been temporarily reassigned to

another area. Additionally, Global Positioning System (GPS) capabilities also determine the closest unit to be dispatched due to its current location even if the vehicle is in transit.

Each incident type has unit capability requirements which must be satisfied by units selected for dispatch. The CAD system will add units to the assignment until the capability requirements are satisfied. In addition, the Fire Dispatcher will upgrade the response, as required, until the situation is stabilized.

ASSIGNMENTS: When calls are received in Fire Communications, the incident will be categorized into one of the following standard types of assignments. This assignment will determine the number and type of units dispatched.

Each of these assignments is described below:

1. Emergency Medical Service (EMS) Assignments: For each of the following types of reported EMS incidents, Communications will dispatch the units indicated below.

EM	Basic Life Support (BLS) incident
EM-A	Advanced Life Support (ALS) incident, heavy rescue (RES)
EM-V	Vehicle Accident, BLS (requires engine company)
EM-VA	Vehicle Accident, ALS (requires engine company) RES
EM-VP	Vehicle/Pedestrian Accident (requires ALS unit) RES
EM-VX	Vehicle Accident, ALS and extrication (requires engine AND truck company) RES
EM-X	Extrication for incidents other than vehicular (requires ALS, extrication and RES)
2-1-M	Two-One Medical incident (two ALS units required) RES
1A-M	1st Alarm Medical incident (three ALS units required) Two RES

2. Still Assignment (ST): A Still (ST) assignment will be dispatched for non-structure fires, including vehicle fires. A Still assignment calls for one engine company.

3. Brush Assignment (ST-BR, BR, 1A-BR): Brush assignments will be dispatched for reported vegetation fires.

   A Still Brush (ST-BR) assignment will consist of one engine company and one brush apparatus. A Still Brush assignment will be dispatched for vegetation fires that are small in nature, and the wildland hazard is low.

   A Brush (BR) assignment will consist of two engine companies, two brush apparatus, one water tanker and a command officer. A Brush assignment will be dispatched for vegetation fires that are serious in nature, and the wildland hazard is medium.

   A First Alarm Brush (1A-BR) assignment will consist of five engine companies, two brush apparatus, one tanker, Ranger 31 (when available) and a command officer. A First Alarm Brush assignment will be dispatched for vegetation fires that have the potential of a major situation and this level of resources will be utilized.

   NOTE: Additional equipment for brush fires will be dispatched as a "Special Call" when requested by Command.

4. Two-One Assignment (2-1): A Two-One (2-1) assignment will be dispatched for structure fires which do not indicate the need for a First Alarm assignment. A 2-1 assignment may also be dispatched for other situations where the need for this level of resource is indicated.

   A 2-1 assignment consists of two engine companies, one ladder company and one command officer. Communications will dispatch a utility truck to 2-1 assignments when reports indicate that companies are engaged in active fire suppression efforts.

5. First Alarm Assignments (1A): A First Alarm will be dispatched for structure fires when reports indicate this level of resource may be needed. This may be based on reports which indicate an actual or potential major situation. A First Alarm may be dispatched for other types of incidents at the discretion of Fire Communications. Any unit may request an assignment to be upgraded to a First Alarm when the need or potential need is indicated.

   A First Alarm assignment (commercial structure) consists of four engine companies, two ladder companies, one utility truck and two command officers. At least one ALS unit and one rescue unit will be dispatched on all First Alarms.

   A First Alarm assignment (residential structure) consists of three engine companies, one ladder company, and one command officer. At least one ALS unit and one rescue unit will be dispatched on all First Alarms that indicate a working fire.

6. Greater Alarm Assignments (GA): Greater Alarms are dispatched at the request of Command, when the need is indicated. Greater Alarms require more equipment and personnel than a First Alarm. Resources are doubled for each alarm called.

7. Alert 1, 2 & 3 (A-1, 2, 3): Alerts refer to aircraft emergencies at airports. The number and type of units dispatched (A-1, 2, or 3) will depend upon type/size of aircraft and level of rescue required.

8. Special Duty Assignments (SD): Communications will dispatch one engine company on a Code 3 Special Duty for automatic alarm system incidents with no other report of fire. A Special Duty assignment will also be dispatched for non-emergency situations.

   Communications will dispatch whichever units are capable of providing the needed service, and will designate either a Code 2 (normal driving) or Code 3 response (emergency driving).

9. Hazardous Materials Assignments: Hazardous Materials assignments will be dispatched for incidents reported to involve hazardous materials. These assignments call for the response of the Hazardous Materials Team in addition to the closest unit(s) response.

PROCEDURES/POLICIES:

Special Call (SC): Command at any incident may call for the dispatch of specific units, or types of units, at any time. These units would respond in addition to those units normally dispatched.

Upgrading Assignments: Assignments may be upgraded by Command at any time by requesting the "Balance of ..." and specifying the desired level of assignment.

Specialized Equipment: Communications will dispatch additional specialized equipment on any incident where the need is indicated (e.g., a Foam unit will be dispatched on incidents involving flammable liquids).

Initiating Incidents: Units initiating new incidents should request the desired assignment and give the nature and location to the Primary Channel Dispatcher. Additional information and reports should be given on the assigned Command Channel after dispatch.

Use of Mobile Data Terminals (MDT): Units changing status or performing routine transactions should use Mobile Data Terminals to communicate with the CAD system directly. This relieves traffic on voice channels and increases efficiency of the entire system. If the MDT is inoperative, company officers will transmit information via the radio on the Administrative Channel.

Condition One: Condition One refers to the normal mode of operation for the Communications system. Under this condition, Channel 7B may be utilized for non-emergency communications of an official nature. Incident related communication always takes priority over other traffic.

Condition Two: During periods of extremely heavy traffic, it becomes impossible for Communications to carry on all normal functions. It is necessary in such circumstances to block all nonessential communications. The Communications Supervisor will make the determination when it becomes necessary to restrict communications and when normal communications can be resumed. The announcement "COMMUNICATIONS IS ON CONDITION TWO" will be made over radio channels and the appropriate command will be entered to disable all non-emergency transactions in the computer system.

Move Up Policy: The Communications Captain is responsible for relocating units to maintain the best available coverage for the entire City. This responsibility includes the authority to request companies from neighboring cities and to control or cancel scheduled and nonscheduled non-emergency activities. If overall coverage in the City falls below 12 engine companies and three ladder companies, Communications will immediately notify the on-call Emergency Duty Chief who has the responsibility to authorize the recall of off-duty personnel to staff reserve companies.

Change of Status: All companies are in either AVAILABLE, DELAYED, or UNAVAILABLE status at all times. The status refers to the company's availability to accept a dispatch. Units assigned to an incident are considered unavailable until released. Units which are Available on Radio (AOR) shall monitor Channel 1. Units changing their status to delayed or unavailable should contact Fire Communications, by radio or telephone, and indicate the reason and the length of time they will be unavailable. When becoming available again, units are responsible for reporting this status change to Communications.

Tactical Radio Operator (TRO): The Tactical Radio Operator handles all communications between units assigned to an incident and

the Fire Communications Center on the assigned Tactical Channel. All units responding to an incident shall switch to the assigned tactical channel immediately after dispatch.

Acknowledgement: All units responding to incidents shall acknowledge dispatch by station switch or by Mobile Data Terminals (MDT). If Fire Communications does not receive an acknowledgement within one minute, the Tactical Radio Operator (TRO) will request acknowledgement by radio. Fire Communications will dispatch a cover company if no reply is received after two attempts, while continuing attempts to contact the original company on other radio channels. If unable to contact, the company will be placed unavailable and the appropriate Battalion Chief will be notified of the circumstances.

While Responding: All fire and Emergency Medical Service (EMS) responses will be Code 3 unless otherwise indicated by Communications or Command. On Special Duty responses, Code 2 or 3 responses will be specified by the Fire Communications Center. Units which must travel on freeways to calls will proceed Code 2. While responding, companies may communicate with one another if radio traffic permits. Effective communications during this period can set the stage for effective action and improve the overall rescue and fire attack effort. Factors such as occupancy hazards, access, traffic conditions, and response routes may be communicated.

Additional Information/Subsequent Calls: The Tactical Radio Operator (TRO) will relay any additional information gained from subsequent calls as soon as possible. Additional information and updates will be transmitted to the Mobile Data Terminals (MDT) on all responding units. Companies needing other specific information shall request it from the Tactical Radio Operator.

RADIO PROCEDURES:

Order Model: Radio communications will be regulated by the following order model guidelines:

1. Sender will give unit ID and call the receiver by their unit ID.
2. Receiver will give their ID to indicate they are ready to receive.
3. Sender will then extend message, order, etc.
4. Receiver will give ID and acknowledge receipt of message. A brief restatement is the best acknowledgement.
5. The Tactical Radio Operator will acknowledge all communications directed to it by a brief restatement of the message, with particular attention given to repeating on the scene, size-up and progress reports, recall reports, requests for additional resources and "All Clear," "Under Control," and "Carbon Monoxide below 50 parts per million (CO below 50 PPM)."

Sending Messages: The following guidelines will facilitate the transmission of clear, concise communications. Use the A, B, C's of radio communications: Accuracy, Brevity, and Clarity. Be accurate in what you say, briefly, and clearly state what you need.

1. Before transmitting, know what you are going to say; do not make it up as you go along. Choose precise terms to communicate the desired message as clearly and briefly as possible without wasting air time.
2. Orders received by companies should indicate a specific task which is assigned to the company. It should be of a magnitude that can reasonably be performed by a single company alone or in concert with other companies.
3. In addition to being task-and company-oriented, assignments should indicate an objective to the action. The company should know exactly where to go, to whom to report, what the task is, and the objective of the task. Orders should tell what to do - not how to do it.
4. Speak clearly at a normal rate; neither too fast, nor too slow. Control your emotions and excitement. If you do not consciously control your voice, it will become garbled under stress.
5. Prioritize your messages. Do not use up valuable air time with unimportant messages and insignificant details. Let critical messages go first. Maintain an awareness of the overall situation and how you fit into it.
6. Do not interrupt conversation unless you have Emergency Traffic. Listen before transmitting and wait until a message transaction has been completed.
7. Pause between consecutive messages. This will make it clear when one message has been completed and another started. It will also give other units a chance to get on the air with important messages.

Emergency Traffic: The term "Emergency Traffic" will be utilized by any unit encountering an immediately perilous situation and will receive the highest communications priority from Fire Communications, Command, and all operating units. The air absolutely belongs to any unit giving the "Emergency Traffic" call.

Units may initiate emergency communications by depressing the purple "E" (emergency) button on their MDT, or by verbally contacting Fire Dispatch.

EXAMPLE: "Ladder 16 to Dispatch with emergency traffic." Communications will immediately activate a special tone. The unit will transmit their message. The Dispatcher will repeat the message one time. If the Dispatcher does not acknowledge (i.e., special

tone not activated) the unit will then establish contact with Command and transmit the emergency message. Command will then reinitiate emergency traffic sequence with Fire Dispatch.

Unit Designation: For radio communications, the following designations will be recognized as standard:

Fire Communications Center.....Dispatch
Officer of any unit .....Unit ID
Engineer of any engine .....Engine
Engineer of any ladder .....Truck
Additional portable radio assigned to company .....Unit ID followed by "A"
Battalion Chief .....Battalion
Division Chief .....Deputy

PASSAGE 5: EMERGENCY MEDICAL PROCEDURES

EMERGENCY MEDICAL SERVICE (EMS): Emergency Medical Services (EMS) is a branch of medicine that is performed in the field, pre-hospital (i.e., the streets, peoples' homes, etc.) by Paramedics, Emergency Medical Technicians (EMT's), and Medical First Responders (MFR's).

EMS providers work under the license and indirect supervision of a medical director or board-certified physician who oversees the policies and protocols of a particular EMS system or organization. Due to the nature of the environment in which EMS personnel must work, equipment and procedures are necessarily limited; however, pre-hospital personnel are able to provide a high level of care.

Emergency medical services are provided under very competent and compassionate standards that are based on the most up-to-date science and proven fundamentals. Some basic fundamentals in extreme emergencies begin at the Basic Life Support (BLS) level, especially concerning the administration of Cardiopulmonary Resuscitation (CPR).

CARDIOPULMONARY RESUSCITATION (CPR): Cardiopulmonary Resuscitation (CPR) is a procedure designed to restore normal breathing and assist with circulation after cardiac arrest. It includes the clearance of air passages to the lungs, heart massage by the exertion of pressure on the chest, and the use of drugs.

CPR does not maintain normal cardiac output, but it does support delivery of oxygen to the heart and brain and "buys time" until defibrillation and advanced care can restore normal heart action. When you perform chest compressions and rescue breathing, you are providing oxygen to the heart and brain. In one study, when two groups of victims of out-of-hospital cardiac arrest received defibrillation at the same interval after collapse, those who received immediate bystander CPR were twice as likely to survive as those who did not receive bystander CPR.

Remember the ABC sequence: You must first open the airway (A), then check for normal breathing and give rescue breaths (B) before you check circulation (C).

The correct volume and duration of breaths with either mouth-to-mask or mouth-to-mouth breathing is the volume that makes the victim's chest rise. If you provide mouth-to-mask ventilation without supplemental oxygen, you should deliver the rescue breaths (ventilations) slowly over two seconds. This is the same duration of rescue breaths given with mouth-to-mouth ventilation.

The combination of immediate CPR and prompt defibrillation provides the best possibility of survival after sudden cardiac arrest. CPR will keep oxygen-rich blood flowing to the heart and brain until the defibrillator is used to convert the cardiac rhythm to a perfusing rhythm. Both are important to maximize the victim's chance of survival.

EMS TRAINING: EMS professionals are trained to follow a formal and carefully designed decision tree, flow chart or algorithm, more commonly referred to as a protocol or standard of care, which has been created and approved by physicians. The emphasis in emergency services is on following correct procedure quickly and accurately rather than on making in-depth diagnoses that require much professional training and experience. The use of a **decision tree or algorithm** allows EMS workers to be trained in a much shorter time than physicians, with EMT-Basic classes, for example, as short as 1-5 months. Paramedic training is the highest level of EMT, and allows advanced airway skills including airway tube placement, emergency creation of an airway (crichothyrotomy), and Advanced Cardiac Life Support.

EMS providers, including EMT's and Paramedics, practice various training scenarios that increase their medical knowledge base and practical skill level. Many of the scenarios are based on the "Mega-code" training scenario. Mega-code scenarios are usually multiple medical or trauma scenarios wrapped into one large training scenario. They are typically acute, dynamic, rapidly evolving scenarios based on the use of many various acute care EMS protocols. They can involve the use of a large amount of pharmacological agents, biomedical equipment, and practical therapeutic manipulation, such as the use of Cardiopulmonary Resuscitation (CPR) or the Heimlich maneuver.

An EMS provider can expect to be consistently faced with the decision making process involved in Mega-code scenarios, understanding the importance of moving quickly through a very rigid group of steps, in a very rigid order, time after time, patient after patient. Certain medical modalities must be accomplished before certain others would be effective. A strong example of this is the simple order of Airway, Breathing, and Circulation (ABC's). Breathing cannot be accomplished until an airway is established, and thus, circulation cannot be aided unless breathing is present. This very simple axiom is the basis of almost the entire effort behind the Mega-code scenario.

Standards related to Mega-codes and various examples of Mega-codes can be located in American Heart Association literature, as well as the National Association of Emergency Medical Technicians testing standards, and should be well understood by any EMS provider.

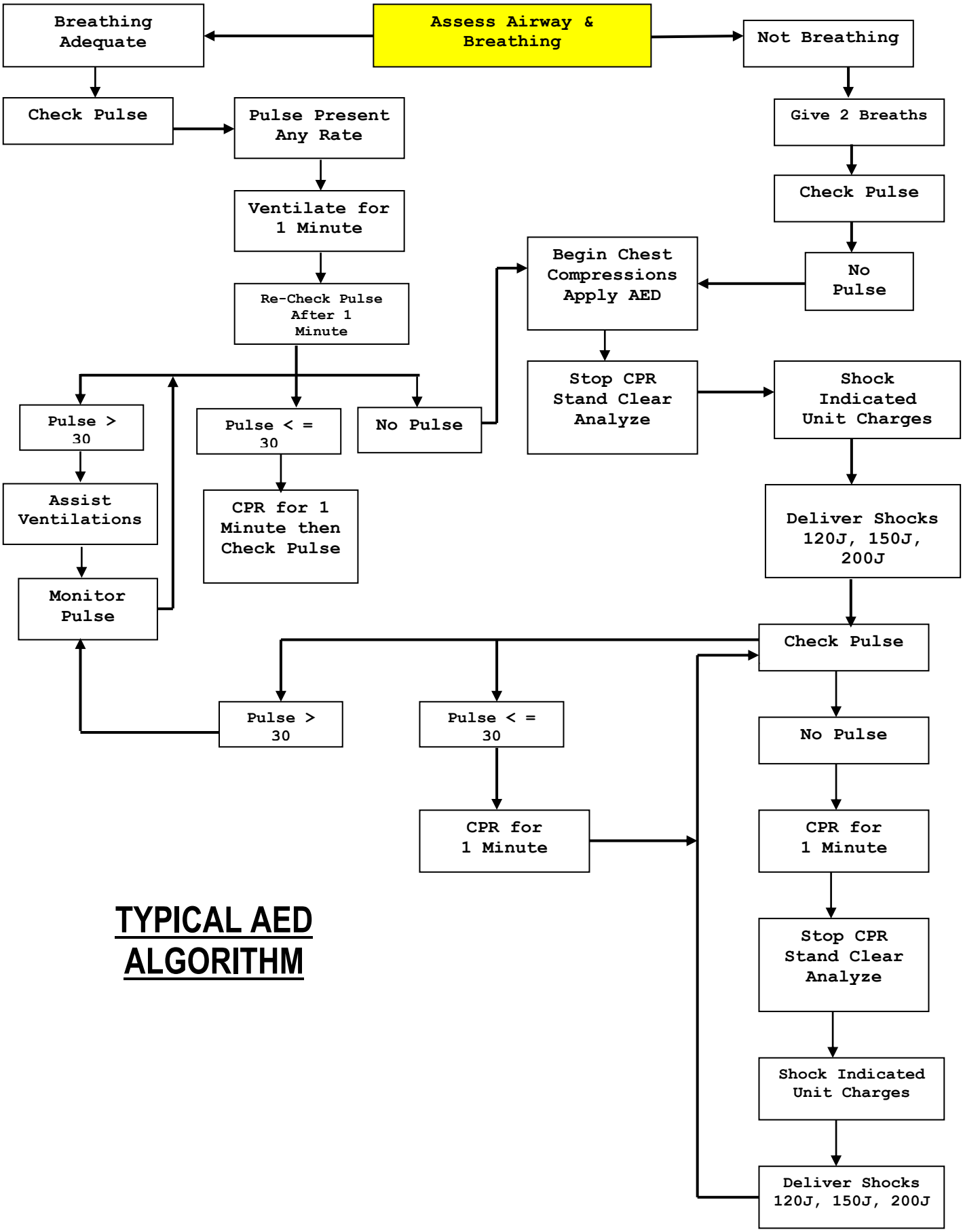
AUTOMATIC EXTERNAL DEFIBRILLATOR (AED): When placing an Automatic External Defibrillator (AED) on a person, the device will signal audibly and visually when an electric shock is indicated. This means the device has detected a cardiac rhythm that is life threatening and requires an electric shock to treat this rhythm. The rhythms that the AED detected are ventricular fibrillation or ventricular tachycardia. These types of cardiac rhythms do not typically generate a pulse that is able to sustain life. The earlier the ability to provide this care, the higher the chances of survival.

INTRODUCTION TO AED ALGORITHM: Automatic External Defibrillators (AEDs) are seemingly becoming as common as fire extinguishers in almost all of our public buildings and even private institutions. Although the device is designed for use by members of the general public, current American Heart Association Basic Life Support (BLS) Guidelines include training for the use of the AED. The AED delivers an electrical shock to the heart in increasing wattage (joules), typically 120J (joules), 150J, then 200J, in an effort to restart cardiac activity.

The use of the AED within the standard BLS guidelines for sudden cardiac arrest victims is outlined in various scenarios in the form of an **algorithm, decision tree, or flow chart**. The algorithm defines each step, in an orderly manner, with the idea that one step must be completed and the rescuer must evaluate the outcome of that step, prior to moving to the next appropriate step.

The algorithm is self-limiting, requiring the rescuer to return to previous described steps, to repeat and re-evaluate the step to determine if a change in the direction of care must be made. Algorithmic configurations, as with the AED, are common training aids to help teach, and to actually follow, during various emergency medical situations. Often, the AED algorithm, in the form indicated, can be found attached or within the AED device for just that reason.

When a rescuer encounters a victim who appears to be unconscious, the rescuer must utilize the ABC's (Airway, Breathing, and Circulation). Using the algorithm on the next page as an example, the first step the rescuer will take is to assess the patient's Airway and Breathing. Depending on the response and/or condition of the victim, the rescuer will then proceed down the algorithm protocols and perform the indicated procedures in sequence, according to the algorithm.



TYPICAL AED ALGORITHM

Any person for whom the 911/EMS system has been activated and meets one or more of the following criteria, is considered a patient when:

a. They have a chief complaint or suspected illness or injury; or
b. They are not oriented to person, place, time and event; or
c They request/require field treatment/transport; or
d. They are a minor who is not accompanied by a parent or legal guardian, and are ill or injured or appears to be ill or injured.

ARRIVAL ON SCENE:

a. First, note the conditions. Is the ambient temperature hot or cold? If inside, is there adequate air circulation? Is the medic rescue unit air conditioning working? Are you parked so that the exhaust is not directed at the patient? Are you out of the way of traffic? Are all of your emergency (code 3) lights on? Have you parked your apparatus for the easiest patient loading access?
b. Second, use your radio's tactical channel to communicate. Let your Company Officer know you are on the scene. Find out from the Company Officer if additional equipment is needed (e.g., backboard, c-collar, etc.). If so, take the equipment with you to the patient.
c. Third, locate your patient(s) and gather the information that you need in a calm, professional manner. The first responder paramedic will begin a patient assessment and start any appropriate treatment.
d. Check with the company officer on the scene, then with other Fire personnel as appropriate.
e. Check the number of patients you will be transporting.
f. Determine if this is an Advanced Life Support (ALS) or Basic Life Support (BLS) call.
g. Obtain the patient's chief complaint. Catalog their symptoms and note them on your palm pilot.
h. Note what treatment has been performed.
i. Carefully observe the condition of the patient(s). Are they stable or unstable?
j. Is assistance of other fire fighters needed in packaging patient(s) prior to transport?
k. Obtain your hospital destination.
l. Check transport code (2 or 3).

When a medic rescue unit is the first to arrive on the scene, the first Fire Department Company Officer to arrive at the scene will seek out rescue personnel and ask for reports on the scene situation and all patients encountered. The Company Officer will then take command and responsibility for the incident. All Fire Department supervisors have received the required training and certification as Emergency Medical Technicians (EMT's) to supervise the overall aspects of EMS and patient care responsibilities. Company Officers are ultimately responsible for all patient care and related documentation, regardless whether that care is being provided by paramedics at an ALS level.

TRANSFERRING PATIENTS TO THE GURNEY: The patient's medical condition always dictates the transfer method. Carefully note the following:

a. Is the patient ambulatory/non-ambulatory?
b. Is a c-spine stabilization required?
c. Is the patient stabilized?
d. What personnel are available to assist?
e. Are there any hazards/rough terrain to consider?

Select the method that provides a safe, comfortable transport for the patient. Remember that the selection of the correct lift is as important as any part of the patient's medical treatment. Once the appropriate method to transport the patient is determined, it is imperative that proper lifting techniques are utilized to protect the patient and minimize personal risk of injury.

All caregivers should know their physical capabilities. Remember that they are lifting "dead" weight. Whenever necessary, they should seek assistance or they may harm themselves and/or their patient. Once they have determined they will move a patient, they should use correct lifting techniques. Lift with thigh and buttock muscles. Never lift with the back. Prior to lifting, bend the legs while keeping the back straight. Avoid bending over. Always keep the body as close to the patient as possible. When lifting a patient from the ground, keep one foot slightly in front of the other to maintain balance. When holding or moving a gurney, keep the back straight and tighten the muscles of the abdomen and buttocks. Always maintain firm footing. Stay in shape. Physical fitness is a must on this job.

MOVING THE GURNEY: The goal is to ensure the smooth safe transfer of patient(s) from the scene to the medic rescue unit. The foot end of the gurney always goes first, except when loading. When rolling, have one Emergency Medical Technician (EMT) at each end of the gurney. Both must maintain a firm grip to avoid tipping or tilting the gurney. If the terrain is even moderately rough, it may

be necessary to pick up the gurney to avoid patient injury or additional discomfort to the patient. Remember to ask for assistance if this technique is used. Always inform patients when their gurney will be moved. On rough terrain, explain the process to patients to make them more comfortable with the movement.

SELECTING THE APPROPRIATE POSITION OF TRANSFER: Most patients are transported on gurneys because they provide a comfortable, efficient means of transfer. A major benefit of using gurneys is that they can be placed in or adjusted to a variety of positions to accommodate the condition of the patient. Listed below are some of the patient conditions that require adjustment of the gurney to accommodate the patient.

Chest pain and/or dyspnea: Generally place the patient in a semi-reclining or fully upright position. Ask the patient what position feels best. Note that the cardiac patient in shock is usually best transported in the supine position with the legs elevated to ensure adequate brain profusion.

Unconscious: Remember that management of the airway is the greatest concern. Use the left lateral recumbent position. This will help prevent aspiration if the patient vomits. However, if patients need resuscitative measures, they must be placed in the supine position on a long backboard.

Abdominal pain: Use the supine or left lateral recumbent position with the knees drawn up. Again, patient comfort will determine the position.

Trauma: If there are extremity fractures in the upper body, use the semi-fowlers position. If the fractures are in the lower body, elevate the limbs whenever possible. If splints have been used, be sure they are placed securely on the gurney mattress.

Head injury: In the case of an isolated head injury (no c-spine injury), the patient can be transported in a semi-fowlers position. This reduces the intracranial pressure and decreases the possibility of cerebral edema. If the patient is unconscious or in an altered mental state, use the left lateral recumbent position. Finally, if a spinal injury accompanies the head injury, place the patient on a long backboard, use full c-spine precautions and pay close attention to airway management.

Pregnancy: Women who are in the second or third trimesters or who have been involved in severe trauma should NOT be placed in the supine position. The left lateral recumbent position is usually used. However, if the patient prefers, the semi-fowlers is also a comfortable position. Place the patient in a supine or semi-reclining position with the knees bent and the legs spread apart.

TRANSPORTING THE PATIENT: Once the patient has been placed in the rescue unit, the treatment continues. If the patient requires Advanced Life Support (ALS) measures, the Paramedic must ride with the patient in the back of the medic rescue unit. The Paramedic will be responsible for patient treatment, complete documentation and communications with the medical personnel at the receiving facility. Responsibility of the EMT rescue attendant is to assist the Paramedic with patient treatment and to carefully carry out the paramedic's instructions. Duties may include: 1) acquiring vital signs; 2) performing CPR as instructed by the Paramedic; and 3) assisting the Paramedic with assembly of equipment (e.g., IV's, airway, etc.).

Remember that rescue personnel are responsible for patient transport and transfer. Personnel must also obtain the patient's personal information and complete the transportation ticket. Naturally, medic rescue personnel will only be able to obtain this information if the patient is stable and time permits. Paperwork must never take precedence over patient care/treatment.

If the patient does not require Advanced Life Support (ALS), the call is categorized as Basic Life Support (BLS). This means that one EMT rescue attendant will drive, while the other remains alone with the patient in the back of the unit while en route to the medical facility that the patient has chosen, or that the patient's condition dictates. Continuing patient assessment is the first priority for the attendant with the patient. If necessary, the EMT attendant may request a rerouting if the patient's condition changes for the worse during transport.

On some BLS calls, medic rescue personnel may be asked to transfer more than one patient. This is an appropriate method if both patients are stable. This means one patient will have to be loaded onto the gurney and then transferred to the bench seat in the back of the rescue unit.

Ensure that the first patient is securely seat-belted in place and someone is left to monitor this patient's condition before going back for the second patient. NEVER leave a patient unattended in the back of a medic rescue unit. Transport the second patient on the gurney in the usual manner. En route, it is imperative to continually assess the condition of both patients. This is difficult, but it must take precedence over anything else. Upon arrival at the medical facility, patients will be transferred in the reverse order of how they were loaded. Assistance from hospital personnel may be necessary to avoid leaving one patient unattended while the other patient is being wheeled into the Emergency Department.

Transportation of patients requiring immediate care shall not be delayed. If the Emergency Medical Service (EMS) incident report is not complete when a stable patient is loaded into the rescue unit, the Company Officer may use discretion in holding the medic rescue unit at the scene for a short time while the report is completed. In any case, the Company Officer remains responsible for the complete documentation.

COMMUNICATION WITH PATIENT: Patient communication is of utmost importance. Upon arrival on the scene, try to obtain as much information as possible in a professional, respectful manner. EMS personnel delivering patient care should question and listen to other Fire Department personnel, family members and the patient. Gather insurance information and use the patient's driver license to fill out the requisite paperwork whenever possible. Keep the patient informed of treatment procedures, family location, and what to expect when they arrive at the medical facility. It is the Fire Department's philosophy that the patient should be cared for in a gentle, caring manner.

REROUTING: If the patient's condition deteriorates while en route to the medical facility and advanced life support becomes necessary, decisions will immediately need to be made on whether to reroute. Before doing so, one should quickly evaluate the following:

a. How close are you to the medical facility?
b. How long will it take an ALS unit to arrive?
c. What personnel are available to assist?
d. Can airway, breathing and circulation of the patient be maintained? If not, pull over immediately. Contact Dispatch for an ALS unit and have the driver assist until the ALS unit arrives.

If destinations must be changed, be sure to notify Fire Dispatch of the change via the radio. The Dispatcher will then alert the new receiving facility.

DRIVING MEDIC RESCUE UNITS: Utilize all of the appropriate safety devices to secure all passengers. Be sure that the patient is secure by snapping the gurney in place, and check the straps to see if they are correctly fastened around the patient. While driving, take the following precautions:

a. Reduce speed when crossing railroad tracks, speed bumps and curbs.
b. Turn with a wide berth. Sharp corners can be hazardous to the patient and the rescue personnel in the rear of the unit.
c. Apply the brakes gradually. Again, safety and comfort are key.
d. Realize that everything feels exaggerated when riding in the rear of a medic rescue unit.

PATIENT TRANSFER AT A MEDICAL FACILITY: Medic rescue personnel are responsible for a patient until the patient has been transferred to the appropriate medical receiving facility. The medical personnel accepting the patient must be either a doctor or a nurse employed at the receiving facility. Keep in mind that the condition of the patient upon arrival at the facility is a direct reflection of the care and treatment of that patient before and during transport. Personnel will be evaluated regarding the proper positioning of the patient on the gurney, their continual assessment reports of the patient's condition, and the completeness of their reports.

When wheeling the gurney into the receiving facility, medic rescue personnel must be prepared to give a report of the patient's chief complaint; the mechanism of injury; level of consciousness; treatment(s) performed; patient's responses to treatment; vital signs; and any changes that have occurred while en route to the medical facility. Note that if the patient was transported "ALS," the Paramedic is responsible for communicating this information. Ensure that the patient is transferred to a hospital bed and that all intravenous lines, oxygen tubing, and other personal items are properly transferred with the patient. Then, complete all of the necessary transportation ticket paperwork with assistance from the emergency room admitting clerk.

PASSAGE 6: SELF-CONTAINED BREATHING APPARATUS (SCBA)

A self-contained breathing apparatus (SCBA) is a device worn by rescue workers, fire fighters, and others to provide breathable air in an immediate danger to life and health atmosphere. The term "self-contained" means that the breathing set is not dependent on a remote supply (e.g., through a long hose).

ASSEMBLIES:

1. Back Frame and Harness Assembly: The back frame and harness assembly is constructed of a solid, one-piece, black, aluminum alloy frame. The harness consists of adjustable shoulder and waist straps made of heavy braided webbing. The back frame joins all the assemblies of SCBA together and is welded. The air cylinder is secured to the back frame using a

Kevlar fabric band and a double locking latch. Air cylinders of 30, 45 or 60 minutes can be secured by the Kevlar strap. The two shoulder straps can be adjusted by pulling the excess slack of the straps through the two alligator clips. To release the straps push the alligator clip and pull the slack back through. The waist belt is secured with a single hand release, seat belt style buckle. The weight of the SCBA is designed to be carried on the waist and not the shoulders. This is done by tightening the waist straps snugly and loosening the shoulder straps until weight is relieved from the shoulders. This will prevent fatigue if worn correctly and feels much more comfortable.

There are several assemblies attached to the back frame. At the bottom of the back frame is the pressure reducer and cylinder housing block. This is where you would find the Universal Air Connector (UAC) and Rapid Intervention Crew (RIC) connection. Just right of the pressure reducer is a pouch which holds the dual Emergency Breathing Support System (EBSS) buddy breathing hose. Above the pressure reducer is the electronics module with mounted LEDs and sounders and a sleeve which contains the batteries for the SCBA. The regulator is attached to a low pressure hose which comes over the left shoulder when the SCBA is donned. There is a regulator keeper on the left waist strap and should be used to protect the regulator when not in use. Coming over the right shoulder is the remote pressure gauge which will allow the user to see how much air is left in the cylinder.

2. Cylinder and Valve Assembly: The cylinders are constructed of a lightweight, composite material made of an aluminum alloy inner shell, over wrapped with carbon fiber, fiberglass and epoxy resin.

   Most air cylinders snap into the SCBA with the quick-connect fitting (Hansen valve), allowing for a quick and efficient bottle exchange. These bottles also have a straight Compressed Gas Association (CGA) male threaded inlet for recharging. The exception to this are the 60-minute RIC and some isolated air-tool bottles. These bottles do not have a quick-connect Hansen valve and are connected only through the CGA inlet. Using a quick-connect 60-minute bottle in the RIC pack will not provide air and may have catastrophic results.

   A cylinder valve is attached to each cylinder as an integral part of the unit. This is manually operated and contains a dual-reading primary pressure gauge. The valve cam is turned “OPEN” by turning the valve wheel counter clockwise. Failure to ensure the valve is fully open may induce outlet freezing and prevent air from being provided to the user.

   To “CLOSE” the valve it must be simultaneously pushed in and rotated clockwise. The gauge displays the amount of pressure in the cylinder in pounds per square inch (psi).The fully-charged working pressure is 4,500 psi, labeled “Full”. The cylinder will withstand three times the working pressure charged into the cylinder (approximately 13,500 psi) prior to failure. Located within the cylinder valve assembly is a frangible disc. The frangible disc acts as a safety device and is intended to burst and allow gas to escape to prevent rupture of the cylinder. It is similar in function to a safety relief valve; however, it has no reset capability. The frangible disc is set to burst at 7,500 psi (5/3 the working pressure of the cylinder).

3. Pressure Reducer Assembly: The pressure reducer is located on the bottom of the back frame connected to the cylinder housing block, where the air cylinder is connected. It is a redundant dual path reducing system broken down into the primary and secondary reducer. During normal operation, air is supplied from the cylinder and valve assembly to the regulator through the primary reducer. Pressure from the cylinder is reduced from 4,500 psi to 85-110 psi.

   If the primary reducer fails or becomes blocked, the air supply automatically flows through the secondary reducer to the regulator via the automatic transfer valve. If the secondary reducer becomes active the Vibralert activates to alert the user the primary reducer has malfunctioned. If this should happen in an incident, the user should exit the immediate danger to life or health (IDLH) atmosphere immediately. The secondary reducer transfers airflow from 4,500 psi to 145-175 psi.

   The pressure reducer is also equipped with a low cylinder transfer valve which activates the Vibralert when the cylinder pressure reaches 25% (approximately 1,100 psi). The user shall exit the IDLH immediately upon any activation of Vibralert.

4. Remote Gauge: The remote pressure gauge is located on the right shoulder harness and is attached to the pressure reducer and the electronics module. It has a mechanical gauge that indicates to the user how much air is remaining in the system. The gauge must read within 250 psi of the primary cylinder gauge and consists of a glow in the dark backing with readings of 10, 20, 30 and 45. The first 25% of the gauge is marked in red and the top 25% is marked green denoting full.

   There are two buttons located on the remote gauge, a red manual alarm and a yellow reset button. Pressing the red button triggers the manual alarm to sound. The alarm will activate even if the SCBA is not in use. The yellow button is used to reset the SCBA during pre-alarm or full alarm with just two presses. Holding the yellow button also performs a battery check. To do

this, press and hold the yellow button until you get a color showing on the remote pressure gauge and the back frame LEDs. Red denotes batteries need to be changed and green shows batteries are in good working condition.

Pak-Alert Sensor Module: The Pak-Alert sensor module assembly alerts of a downed fire fighter utilizing audible and visual indicators. The system incorporates dual visual and audible alarms. The sensor module is located on the back frame and harness assembly and on the user's right shoulder strap in the remote gauge. It is powered by the three (3) "C" cell batteries in the sleeve located on the back frame. When the air cylinder is charged the sensor module automatically turns on. This will be indicated by a green flashing LED light on the sensor module and with an activation chirp.

In the event the user remains motionless for 20 seconds, a pre-alert will cause the sensor LED lights to flash RED and a two-toned alert to sound. After the tones increase and 10-12 more seconds pass, the Pak-Alert will go into full alarm. This causes the sensor LED lights to flash RED and a high frequency three-toned alert to sound.

The system also has a "hands-free" reset which is activated by a slight movement of the SCBA when the system is in a pre-alert mode. Full alarm can only be reset by pushing the reset button on the remote gauge twice. Once the breathing apparatus is shut down and the air bled from the system the Pak-Alert needs to be turned off by pressing the reset button twice.

5. Mask-Mounted Regulator: The mask-mounted regulator is the link between the low pressure hose from the pressure reducer and the face piece. It regulates the air to the face piece and provides several emergency functions. Normal operation of the regulator provides air upon inhalation and has a capacity of 500 liters per minute. Externally it contains a purge valve (red), a donning/doffing switch (black), and a Heads-Up Display (HUD). Inside the breathing regulator assembly are the Vibralert low air pressure warning device, a diaphragm, and several other internal regulating components.

   The regulator mounts to the face piece by a spring-loaded latching mechanism.

   The breathing regulator can be disconnected from the low pressure hose during emergency use with a quick disconnect fitting. The breathing regulator shall be kept covered at all times when not in use to prevent dirt and loose particulate from accumulating inside its mechanisms.

   Purge Valve: The purge valve allows air to bypass the breathing regulator and is used in situations where the face piece needs to be purged, defogged or in the event of a breathing regulator failure. To open the valve, turn the valve knob counterclockwise one-half turn. To close the valve, turn it clockwise one-half turn. Normally this valve will remain in the closed position.

   Donning Switch: The donning switch is a black rectangular-shaped button located on top of the breathing regulator assembly and functions to control air flow to the face piece. Pushing the donning switch downward will stop air flow; when the user inhales sharply, air flow will resume.

   Heads up Display: The heads up display (HUD) utilizes LED indicator lights to allow the user to monitor the remaining air supply and battery life. The HUD is located within the breathing regulator and is visible to the user through the face piece during fire fighting operations. When the SCBA is first charged, all lights appear on the HUD for 20 seconds. Then the lights illuminate to show the proper pressure.
   • Full- Two solid green lights
   • ¾- One solid green light
   • ½ -Yellow light flashing slowly
   • ¼ -Red light flashing rapidly

   Vibralert System: The Vibralert system located in the regulator alerts the user to a diminished air supply or malfunction by causing an audible alarm to sound upon inhalation and simultaneously causing a vibration of the face piece. Under normal operations, the pressure reducer uses its primary system to provide air to the regulator at 85-110 psi. When air pressure falls below 25% or there is a mechanical malfunction of the primary system, a transfer valve redirects air through a secondary system. This secondary reducer functions at a higher pressure (145-175 psi) which activates the Vibralert alarm.

   Vibralert will operate under the following conditions:
   • Air cylinder pressure falls below 25% of full (~1,100 psi)
   • A failure occurs within the primary reducing system

- Buddy Breathing with a user that has less than 1,100 psi
- Initially upon opening the cylinder valve, to indicate the system is activated

Diaphragm: There is a diaphragm inside the regulator which activates and deactivates air flow. If the regulator is Chemical, Biologic, Radiation, Nuclear (CBRN) compliant, it will have orange Scott regulator lettering and be indicated by a "+" in the name; if it is not, the sticker will be white.

6. Face Piece: There are two primary types of face piece masks used by many Fire departments, the Scott AV2000 and AV3000. Each is comprised of a lens, face piece seal, nose cup, head harness, and straps.

   AV2000 are an older mask version and are no longer in production. Some individuals, however, continue to use the AV2000 due to a better fit. It has three sizes indicated by a colored face piece seal (Small/Green, Medium/Black, Large/Red).The masks are nonadjustable and use a clamp-type voice-amp adapter. One has four attachment straps, the other has a dual seal and five straps (the fifth being on the top) to meet NFPA requirements for fit while wearing WMD adapter attachments.

   Both styles of AV3000 masks are highly customizable with various-sized face piece seals and nose cups. The size of each AV3000 or AV3000 Sure Seal is indicated with circular color inserts behind the head harness anchors and a letter at the bottom of the seal. The sizes are Small (Green/S), Medium (Black/M), and Large (Red/L).There are two styles of nose cups, colored black or gray. The black nose cup is available only for the AV3000 and comes in four sizes (S, M, L, XL).The gray is available in three sizes (S, M, L), indicated by a small letter on the left side of the nose cup. Black nose cups are designed to be placed inside the seal while gray nose cups are designed to be outside the seal.

   The AV3000 head harness is available in two sizes, standard (SD) and large (L) and can be determined by looking at either of the upper head harness anchors. The AV3000 Sure Seal has only one universal size. Both are made of Kevlar and have flame resistant straps.

   The face piece consists of a poly carbonate plastic, hard-coated to resist abrasion. Additionally there is an eyeglass adapter and a Mask Seal Kit to improve fit. Each is able to mount a screw-type voice amp adapter on the wearer's right. It is critical that the face piece fits properly. If it does not fit and a proper seal cannot be obtained, the user is not protected.

PASSAGE 7: SAFETY

Fire fighting is a dangerous occupation, exposing personnel to many serious risks such as burns, smoke inhalation, carbon monoxide poisoning, blood-borne pathogens, electric shock, and entrapment. Most fire fighters injured in the line of duty suffered minor injuries such as lacerations and contusions, or other minor injuries from tripping hazards and falls. Over 120,000 fire fighters are injured each year and on the average, 150 die in the line of duty, annually. The ability to identify and react properly to hazardous situations and conditions will result in the reduction or elimination of serious and debilitating injuries and deaths.

Safety starts when you first become a fire fighter and it is an attitude that you must develop, sharpen, and retain throughout your career. Safety relates to the quality of life. Each fire fighter's goal should be to end their careers as healthy as possible. Practicing safety will help ensure that that goal becomes a reality. Safety is a commitment we make to ourselves and our coworkers that, not only will I practice safety, but I will also watch out for you. Teamwork and camaraderie are what built the fire service. Practicing safety will keep it growing.

Safety is an integral part of all fire department operations. From the moment you take your oath as a fire fighter, safety must be integrated into all aspects of your professional behavior and work practices. Mental preparation and training are the tools required to achieve the objective of a safe and healthy career. A strong positive attitude towards safety is the key factor in an injury-free career. This attitude must be reinforced down the chain of command from the Fire Chief to the fire fighter. Your company officer or first-line supervisor plays a major role in the prevention of accidents. This passage discusses the relevant laws, regulations and agencies governing fire fighter safety, and includes guidelines for operating safely at various types of incidents. It also includes the principles of accident prevention, risk management, and hazard analysis.

ACCIDENT PREVENTION: An accident can be defined as an unplanned or unsought event, or series of events, resulting in death, injury, occupational illness, or damage to, or loss of, equipment or property. Accident prevention is a program directed toward the elimination of unsafe acts, unsafe equipment, or hazardous environments.

The key principle in accident prevention is controlling the relationship between man, machine, and media (environment). Safety authorities believe these are the three basic accident-causing agents, referred to as the "three Ms." All three have one element in common, human beings. People cause the majority of accidents either by committing unsafe acts or by having knowledge of an unsafe condition and allowing it to go uncorrected. The Injury and Illness Prevention Program required by California State Senate Bill 1119 recognizes this concept. Machines and media can be controlled by engineering specifications, fire department standard operating procedures, and training. But the human element is more difficult to control. Personal attitudes probably impact safety more than anything else. Attitudes can be defined as strong beliefs, opinions, and habitual ways of doing things. Misaligned attitudes towards safety can perpetuate the occurrence of accidents. A major responsibility of any safety program is to help people recognize, remember, and make allowances for their limitations of perception and reaction. Frequently, it is people misjudging their capabilities and corresponding limitations who cause accidents.

Before an accident occurs, there are hidden causes. Hazards don't just happen; they are caused by unsafe attitudes, unsafe behaviors, and unsafe conditions:

- Unsafe attitudes: These are the seeds of an accident about to happen. They are thoughts and feelings of impatience, boredom, overconfidence, or recklessness. These attitudes are in control when you are distracted, rushed or inattentive.
- Unsafe behaviors: These are the driving forces of accidents. Unsafe behaviors are in control when you take unnecessary risks, do not use personal protective equipment (PPE), or use tools improperly.
- Unsafe conditions: These are accidents waiting to happen. These are in control when you don't prevent, remove, and report safety hazards.

The key to an effective safety program starts with the first line supervisor or company officer. The first level of supervision must train their personnel in the recognition of hazards, the potential injuries that can be received, and methods by which to avoid those hazards. The first-line supervisor sets the example: a major concept of instruction is that people learn more by what they see than what they are told.

Remember, safe conditions can be created by using safe procedures, removing and reporting hazards, inspecting for hazards, and using safety equipment.

HAZARD ANALYSIS: A hazard is defined as an accident-causing opportunity or source of danger. Hazard analysis is a method of analyzing and identifying control measures to reduce or eliminate risk of operation.

Hazard controls designed to eliminate or reduce the hazard can then be implemented. Hazard controls can be accomplished either by an administrative or engineering process. Administrative controls are established by management through developing and implementing policy. Engineering controls include isolation of hazards, procedural changes, specification changes, or warning equipment.

REPORTING HAZARDS: All personnel have a responsibility to maintain a safe work area. This is accomplished by conducting inspections and reporting and/or eliminating hazards. Hazards can be reported verbally to your first-line supervisor or by using designated forms such as the "Report of Unsafe Conditions, Hazards or Near Misses." Other entities to report hazards to include the Safety Officer or the City's Risk Management Safety Division.

RISK MANAGEMENT: The key to eliminating accidents is to identify hazards and risks before they can cause an injury. There is significant risk involved in firefighting and emergency operations; as such, fire fighters are typically injured at a rate of four times that of private industry. Risk is defined as the measure of the probability that a hazard will result in an accident with definable consequences. The concept of risk management compares the potential for the accident to occur with the severity of injuries that could be received by such an accident. The degree of risk varies, depending on whether the operation is intended to save a life or to contain a fire. The same degree of risk taken to save a life may not be the same needed to confine a fire. When performing emergency operations, risk management shall be utilized on the following principles:

a. Activities that pose a significant risk to fire fighters shall only be taken when there is potential to save lives. The protection of life is the highest priority of all fire fighters.
b. Inherent risks are those risks that are typically encountered when protecting property and actions shall be taken to reduce or avoid these risks.
c. No risk is acceptable when there is no possibility to save lives or property.

Risk benefit analysis is an extremely effective tool that can be used by all personnel to reduce accidents and injuries. Risk benefit analysis is simply evaluating the performance of a task compared to the potential benefit derived from that task. As an example, the risk of attempting a rescue in a totally involved structure is much greater than the benefit received. However, there is a greater benefit of performing a rescue of a trapped auto accident victim even though there may be significant risks involved such as downed power lines or fuel spill.

There are a number of operations that pose a risk to fire fighters. These include collapse rescue operations, responding to and returning from alarms, operating on a roof, operating above a fire, wildland fires, and aerial ladder operations. Risk can be controlled through the implementation of safety policies, standard operating procedures, hazard analysis, and training.

ACCOUNTABILITY: Good communication on the fire ground is essential to fire fighter safety. Due to the stressful and chaotic nature of emergency incidents and fire fighting, breakdowns in communication are common and often result in tragedy. For this reason, a physical system for tracking personnel and their activities is mandated by Occupational Safety and Health Administration (OSHA) anytime personnel enter an Immediate Danger to Life and Health (IDLH) atmosphere.

An Accountability Officer is required at all utilized entrance and exit points on an IDLH atmosphere in order to ensure accurate accountability. The Accountability Officer is tasked with identifying all personnel and knowing their assignment, location, as well as recording their time of entry.

It is ultimately the responsibility of all fire fighters to report to the Accountability Officer with their identifiers upon entrance and exit from an IDLH atmosphere. The importance of this cannot be stressed enough as your life may depend upon the information held by the Accountability Officer. More accountability is included with the RIC team (Rapid Intervention Crew and Accountability).

TWO IN, TWO OUT: In addition to accountability, OSHA mandates the adherence to the "Two-in, Two-out" policy when working with an IDLH atmosphere. The first part of this policy (Two-in) states that a fire fighter shall never enter into an IDLH atmosphere alone. There should always be (at least) two fire fighters together when they enter a location. In the event that one fire fighter needs to exit, both or all shall exit together so that no fire fighter is left alone.

The second part of this policy (Two-out) refers to a safety system to protect fire fighters. Where two or more fire fighters enter a structure with an IDLH atmosphere, at least two more fire fighters must remain outside, ready to help in case of an emergency. When a team enters an IDLH atmosphere (the Two-in), two more fire fighters (the Two-out) will be standing by at the entrance in full personal protective equipment (PPE) and self contained breathing apparatus (SCBA), ready with rescue tools, in order to rapidly enter the building if the team inside becomes endangered, lost, or trapped.

The only exception to the "Two-in, Two-out" rule is if the first arriving crew receives a report of a KNOWN rescue or when the fire is still in the incipient phase and can be extinguished with an extinguisher.

RAPID INTERVENTION CREW: A Rapid Intervention Crew (RIC) is based on the principal of the Two-in, Two-out system, only it takes precautions a step further. RIC calls for the establishment of a crew of four fire fighters to be standing by, outside the structure, ready to enter the building to rescue a trapped or downed fire fighter. RIC is also tasked with preparing the building for an emergency escape, which is known as "softening the structure." This calls for removing bars off windows, unlocking doors, and placing ladders to windows in case the crews inside need to escape in a hurry. RIC is also responsible for gathering a cache of emergency rescue equipment and spare air bottles outside the structure in the event of a downed or lost fire fighter. Fire Departments also use the terms for the RIC as Rapid Intervention Team (RIT), Rapid Entry Team (RET) or Fire fighter Assist and Search Team (FAST) to describe the function of RIC. Regardless of the name, the teams perform basically the same tasks.

GENERAL SAFETY ISSUES: There are general safety issues involved with all incidents. In any situation there are slip, trip, and fall hazards. Always observe and note the conditions of the environment in which you are working. Adequate lighting of the area will help identify those hazards that can result in falls, especially in an overhaul situation.

It is prudent to remove all jewelry as it may become entangled or snagged in machinery or other material. It is common for rings to get snagged which results in de-skinning or severing of the finger.

Back strains are the most common type of injury sustained by fire fighters. Because of this, proper lifting techniques must be employed. Always lift with your legs and not with your back. If the load is heavy or awkward, get assistance. Keep the load close to the body. This prevents undue strain on the back.

Hydration is another important area that is often neglected. The effects of dehydration are cumulative and you may not even recognize the symptoms. It is important that you drink water often. The sensation of thirst is often not a good indicator of body fluid levels. By the time you feel thirsty, you are already low on fluids.

Prior to taking prescription medications, always ask your doctor what effects the medication may have with regards to your duties as a fire fighter.

Fire fighters must consider personal safety and safety of crew members in all tasks encountered as a fire fighter including but not limited to Structural Fire Fighter, Wildland Fire Fighting, Vehicle Fires, Traffic Accidents and Vehicle Rescues, Medical Aid Incidents, Hazard Material Incidents, Airport Rescue Fire Fighting (ARFF), Miscellaneous Rescue Incidents, and the Emergency Response to all incidents. As fire fighters learn more about each task and the state's requirements to prevent accidents in each element of fire fighting, they become engrained rules to live by. For example, to assist fire fighters in safely performing their duties during wildland fires, several acronyms have been created to remind us all of the dangers and safety considerations of wildland fire fighting.

10 Standard FIRE ORDERS

F Fight fire aggressively but provide for safety first
I Initiate all action based on current and expected fire behavior
R Recognize current weather conditions and obtain forecasts
E Ensure instructions and assignments are given and understood

O Obtain current information on fire status
R Stay in communication with crewmembers, your supervisor, and adjoining units
D Determine safety zones and escape routes
E Establish lookouts in potentially hazardous situations
R Retain control at all times
S Stay alert, keep calm, think clearly and act decisively

18 Situations that Shout "WATCH OUT"

1. Fire not scouted and sized up
2. In country not seen in day light
3. Safety zones and escape routes not indentified
4. Unfamiliar with weather and local factors influencing fire behavior
5. Uninformed on strategy, tactics, and hazards
6. Instructions and assignments not given and understood
7. No communication link between crewmembers and supervisors
8. Constructing line without a safety and anchor point
9. Building line downhill with fire below
10. Attempting frontal assault on fire
11. Unburned fuel between you and the fire
12. Cannot see main fire, not in contact with anyone who can
13. On a hillside where rolling material can ignite
14. Weather and fuel getting hotter and drier
15. Wind increases and/or changes direction
16. Getting frequent spot fires across line
17. Terrain or fuels make escape to safety zones difficult
18. Taking nap on or near fire

LCES (Lookout, Communications, Escape Routes, and Safety Zones)

There are specific procedures and personal safety equipment that must be worn in its entirety for each emergency event to which a fire fighter will respond. There is also specific care and cleaning of each garment and piece of safety equipment that is issued to a fire fighter. Every person has a duty to themselves and to those who serve alongside them to stay diligent and safe. Safety is not merely a set of rules or regulations that are issued in a mandate or directive. Safety is an attitude. In order to be safe, we

must all commit ourselves to a career of professionalism based upon the training and rules that are provided to us. Standard operating guidelines must be adhered to in order to achieve a common goal, serve the community to the best of our ability and to live a long and healthy life. Act safe, be safe, live safe.

SECTION 5: PHYSICAL ABILITY EXAM

The job of a fire fighter is one of the most physically demanding jobs in North America. It requires high levels of cardiopulmonary endurance, muscular strength, and muscular endurance. The City of San Diego Fire Recruit Physical Ability Exam (PAE) is designed to simulate actual job duties on the fireground. The Physical Ability Exam will be administered ONLY to candidates admitted to the final step of the selection process.

Detailed information regarding the Physical Ability Exam will be provided to the successful candidates who must pass the Physical Ability Exam in order to be considered for employment as a Fire Recruit.

IMPORTANT NOTE: *Candidates who have a CANDIDATE PHYSICAL ABILITY TEST (CPAT) certificate, which is current and valid at the time of the PAT, may waive the City of San Diego Physical Ability Exam. The CPAT was developed by the International Association of Fire Fighters (IAFF) and the International Association of Fire Chiefs (IAFC). While there are other testing centers where instruction, practice and testing of candidates are conducted, those in the State of California may visit the California Fire Fighter Joint Apprenticeship Committee (CFFJAC) website at http://www.cffjac.org/jac/cpat/index.cfm for further information on the CPAT, enrollment procedure, testing centers, and other details.*

There are eight separate events in the City of San Diego Fire Recruit Physical Ability Exam. In order to pass the test, you must complete all eight events in seven minutes or less, with no disqualifying errors (errors will be explained to you at the test). This is a physically strenuous test designed to simulate the actual physical demands placed on fire fighters. It is designed to assess upper and lower body strength, grip strength, flexibility, dexterity, balance, stamina, and cardiovascular (heart and lung) endurance. **IF YOU ARE NOT IN TOP PHYSICAL CONDITION, IT IS HIGHLY ADVISABLE THAT YOU BEGIN NOW TO IMPROVE AREAS WHERE YOU MAY NEED TO INCREASE YOUR FITNESS LEVEL.**

Each event is described in detail below. You do not need to memorize the events or sequence. If you are scheduled to take the Physical Ability Exam, you will receive additional information about the test and Test Monitors will provide step-by-step directions at the time of your actual test.

EVENT 1 - DRY HOSE DRAG: A 150-foot length of 2 ½ inch dry hose (which equals approximately a 165-pound pull) with associated fitting will be coiled on the ground in a manner which simulates a hose coil in the rear of a fire engine. You will place the hose line over your shoulder, grip it with your hands, and run 150 feet along a marked straight line.

EVENT 2 - LADDER LIFT AND CARRY: You will lift a 14-foot (40 pound) ladder off of brackets, carry the ladder around a marker 45 feet away, then replace the ladder on the brackets. The brackets are 6 feet 8 inches high, and the bottom edge of the ladder is 5 feet 3 inches high, which simulates the ladder bracket on a fire truck.

EVENT 3 - HOSE DRAG AND RESCUE: You must drag a 1 ½ inch charged hose line, filled with water under pressure (which equals approximately a 35-pound pull) through a tunnel which is 16 feet in length and 48 inches in height. At the end of the tunnel, you will leave the hose and drag a 150-pound sled (which simulates an unconscious victim) back through the tunnel. The 48-inch height of the tunnel requires you to crouch or bend over which simulates conditions within a burning structure where heat and smoke in the upper part of the room require the fire fighter to move about in a limited vertical space.

EVENT 4 - CHARGED HOSE LINE ADVANCE: A 2 ½ inch charged hose line, filled with water under pressure (which equals approximately a 160-pound pull) will extend from a fire hydrant to the test area, laid out so that a portion of it is snaked to provide slack for advance. You will pull the hose forward 25 feet; then, beginning with a 90-degree right turn, you will pull the hose around a curved path, also 25 feet in length. The path that you are to follow will be marked.

EVENT 5 - LADDER EXTENSION: You will fully extend a 35-foot, 160-pound ladder by pulling down on the halyard (rope) and then lower the ladder to its original starting position. This is equivalent to pulling 80 pounds up 17 ½ feet, half of the ladder's total weight and height. The ladder will be in a fixed upright position.

EVENT 6 - STAIRWELL ADVANCE: You will place a 30-pound air tank on your back. Next, you will lift a 55-pound ribboned hose bundle and place it over your neck or shoulder. Then you will proceed a total of 100 feet on level ground, then up several flights of stairs. At the top, you will drop the hose bundle and proceed with Event 7.

EVENT 7 - EQUIPMENT HOIST: While at the top of the stairwell, you will use a rope to hoist a 55-pound hose bundle up to the top

of the window ledge. A hose/rope roller attached to the window ledge will allow you to lean back and place one foot on the ledge to assist in the hoisting operation. You will then descend the stairs and remove the air tank.

EVENT 8 - RESCUE TOOL LIFT AND CARRY: You will lift a 73-pound simulated rescue tool off a two-foot high bench. You must carry the tool around a marker 45 feet away and return it to a four-foot high table.