

CHAPTER 1

INTRODUCTION

Section I. GENERAL

I-1. Purpose and Scope

a. This manual is a guide and basic reference for firefighting teams and other personnel engaged in fire prevention, firefighting, and rescue procedures at military establishments in theaters of operations. It covers the policies and procedures, equipment, characteristics and chemistry of fire, tactics and techniques of firefighting, first aid, rescue, and fire prevention. It is concerned primarily with structural, aircraft, petroleum and unclear weapon fires, but also discusses explosive, motor-vehicle, and natural cover fires.

b. The material contained herein is applicable to both nuclear and nonnuclear warfare

1-2. Changes

Users of this manual are encouraged to submit recommended changes or comments to improve the manual. Comments should be keyed to the specific page, paragraph, and line of the text in which the change is recommended. Reasons should be provided for each comment to insure understanding and complete evaluation. Comments should be forwarded directly to Office Chief of Engineers, ATTN: ENGMC-FF, Washington, D.C., 20314.

1-3. What the Fire Protection Specialist Must Know

Progress in fire protection within the Army has increased greatly in the last few years. This progress was brought about by the development of new techniques and more efficient equipment. But offsetting this progress, to some extent at least, is the turnover of military personnel. This turnover is a serious drawback to efficiency, but broad training programs, which include the study of chemistry, physics, mathematics, and building construction, now make the firefighter's training a continuing process.

a. Chemistry. The creation and spread of fire is a chemical reaction involving flammable vapors.

Since this reaction can occur under many conditions and circumstances, the firefighter must know the characteristics of fuels and other materials. He gains knowledge through an understanding of the chemistry of fire.

b. Physics. Physics involves the principles of mechanics, electricity, heat, light, and sound. The firefighter needs mechanical knowledge to enable him to operate the fire trucks and associated equipment, and to maintain them so they will always be ready for use. Electricity is a common source of fire. In addition, there is a danger of electrocution, especially in the presence of water, and water is the common extinguishing agent. Heat is a major consideration in the spread of fire and in the physical limitations of personnel. Light is necessary to combat fires at night or in inclosed or **smoke-filled** compartments. Sound (the basis of alarm systems) is the foundation of fast and efficient response to emergencies.

c. Mathematics. The firefighter must know the mathematical formulas used to determine the proper volume and force of extinguishing agents needed. His knowledge of fire department hydraulics enables the engineer, or pump operator, to arrive at the correct nozzle pressure. An error here may cause injuries, extensive water damage, or unnecessary fire losses. Too much water pressure at the nozzle has been known to throw firemen from ladders or out of windows. Wild hose lines can seriously injure or kill people who are struck by the heavy nozzle or hose couplings.

d. Construction. A basic knowledge of building construction is essential for proper forcible entry, rescue, ventilation, or extinguishment. Buildings that look identical on the outside may collapse or burn with great variations of time because of differences in internal design and type of construction. Men who make fire inspections should become familiar with the construction of each building so that in case of fire they will know the approximate length of time the building is safe to

enter and the time at which it must be evacuated before it collapses.

1-4. Policies and Procedures

It is important that a member of a fire protection unit be familiar with the most common policies

and procedures of the fire protection organization of the Army, and the forms used. The policies and forms are described in detail in many Army publications. It is the purpose of this chapter to acquaint the firefighter with those general principles which are important in the proper performance of his duties.

Section II. ORGANIZATION

1-5 Fire Protection

Firefighting science is divided into three phases: fire prevention, rescue, and fire fighting.

a. **Fire Prevention.** This phase establishes standards and practices for the prevention of accidental fires. These standards and practices are controlled by frequent surveys and inspections. Responsibility for inspections and for recommending corrective action is placed in the fire protection organization.

b. **Rescue and Firefighting.** On arriving at a fire, firefighters must determine the exact location of the fire and then act to rescue people, protect exposures, confine the fire, and then extinguish it. While rescue is not needed at most fires, it must be the first concern. The firefighters must stop the spreading of the fire (protect exposures or confine) to other buildings or parts of the building on fire before they can apply themselves to the extinguishment of the fire. Ventilation (removal of smoke, heat, and gases) is a part of the salvage effort which may be required at any time during the firefighting operation. After the fire has been extinguished, a final search is made for glowing spark and embers. This search and the extinguishment of the rekindling potential are known as overhaul.

1-6. Firefighting Units

The firefighting units provide fire prevention service and protective measures in addition to extinguishing fires. They also train auxiliary firefighters, maintain firefighting equipment, and advise higher commanders of fire defense plans. The firefighting units consist of four types of teams. They may be attached or assigned as required to fixed strength units or may be organized into service units (TOE 5-510G). These service units are designed to provide different-size organizations with firefighting team's, depending on the tactical and logistical considerations involved. Command and administrative control are normally provided by the firefighting headquarters team.

a. Team FA, Firefighting Headquarters.

(1) **Capability.** Capable of planning for overall area fire prevention and firefighting program and for controlling assigned or attached firefighting teams.

(2) **Basis of allocation.** Normally one per three to five firefighting teams (FB and FD) and one water truck team(FC).

(3) **Strength.** Aggregate-4, as follows:

| Number | Grade | MOS |
|--------|---------|-------|
| 1 | LT | 9414 |
| 2 | E6(NCO) | 51M40 |
| 1 | E3 | 70A10 |

(4) **Mobility.** 100 percent mobile.

(5) **Major items of equipment.**

Weapons

Individual weapons only.

Vehicles

| | |
|---------------------|---|
| Trailer, cargo, ¼ T | 1 |
| Truck, cargo, ¾ T | 1 |
| Truck, utility, ¼ T | 1 |

Other equipment

| | |
|---|---|
| Blanket, fire, wool, w/grommets and rope handle | 2 |
| Extinguisher, fire, carbon dioxide, 15 lb (6.76 kilograms) | 2 |
| Extinguisher, fire, dry chemical, 20 lb (9.072 kilograms) | 2 |
| Extinguisher, fire, foam, 2½ gal (9.46 liters) | 2 |
| Firefighting equipment set, repair of extinguishers and fire hose | 1 |
| Light, warning, vehicular, red, w/blinker device | 2 |
| Repair and refill kit, carbon dioxide fire extinguisher | 1 |
| Siren, electric motor operated | 2 |
| Telephone set, TA-312/PT | 1 |

(6) **Method of operation.** Team leader serves as the fire marshal of the installation or area of responsibility. Team members conduct fire prevention inspections and train volunteer personnel in firefighting operations. In addition to planning for overall fire defense and commanding firefighting teams, this team maintains and refills fire extinguishers and makes minor repairs to fire hose.

b. Team FB, Fire Truck.

(1) **Capability.** Capable of providing fire protection, administering timely and adequate first aid, and implementing a fire prevention program for areas housing 5,000 to 10,000 troops, or a warehouse and open storage area of 100,900 square feet (9290 square meters).

(2) **Basis of allocation.** One per installation housing 5,000 to 10,000 troops, or containing 100,000 square feet (9,290 square meters) of warehouse and open storage.

(3) **Strength.** Aggregate—6, as follows :

| Number | Grade | MOS |
|--------|-----------|-------|
| 1 | E-5 (NCO) | 51M40 |
| 1 | E4 (NCO) | 51M40 |
| 3 | E-4 | 51M20 |
| 1 | E-3 | 51M20 |

(4) **Mobility.** 100 percent mobile.

(5) **Major items of equipment.**

Weapons

Individual weapons only.

Vehicles

Firefighting equipment set, truck mounted, structural type, overseas, class 530B or 530C ----- 1

Other equipment

Blanket, fire, wool, w/grommets and rope handle ----- 2

(6) **Method of operation.** Team members provide fire protection for the team's assigned installation or area by conducting fire prevention inspections and by fighting fires. See TM 5-225 for radiological decontamination.

c. Team FC, Water Truck.

(1) **Capability.** Capable of transporting water for firefighting purposes when not enough water is available near the fire.

(2) **Basis of allocation.** One or more per firefighting headquarters (Team FA) as required.

(3) **Strength.** Aggregate-2, as follows :

| Number | Grade | MOS |
|--------|-------|-------|
| 1 | E-4 | 51M20 |
| 1 | E-3 | 51M20 |

(4) **Mobility.** 100 percent mobile.

(5) **Major items of equipment.**

Weapons

Individual weapons only.

Vehicles

Truck, tank, water, 2½-T ----- 1

Other equipment

No other major items.

(6) **Method of operation.** Team transports water for firefighting when sufficient water is not available. Team members may be used as firefighters.

d. Team FD, Brush Fire Truck.

(1) **Capability.** Capable of furnishing protection against grass or brush fires within its assigned area of responsibility when augmented with personnel and additional handtools. Can also be used to a limited degree to combat structural fires.

(2) **Basis of allocation.** One per installation housing 5,000 to 10,000 troops, or containing 100,000 square feet (9290 square meters) of warehouse and open storage.

(3) **Strength.** Aggregate-2, as follows :

| Number | Grade | MOS |
|--------|-----------|-------|
| 1 | E-5 (NCO) | 51M40 |
| 1 | E-3 | 51M20 |

(4) **Mobility.** 100 percent mobile.

(5) **Major items of equipment.**

Weapon8

Individual weapons only.

Vehicles

Firefighting equipment set, truck mounted, brush type, overseas, class 530 B or 530 C ----- 1

Other equipment

No other major items.

(6) **Method of operation.** Team members train personnel of the supported unit in brush firefighting and supervise them when so engaged. Additional handtools (axes, mattocks, brush hooks) must be provided by the supported unit.

1-7. Responsibilities

AR 611-201 lists the duties, skills, and knowledges of the firefighter. Listed below are the primary responsibilities of the fire protection personnel.

a. Fire Chief. The fire chief, under the direction of the fire marshal, supervises the fire protection organization, including management of fire suppression and rescue operations, training and pre-fire planning programs, and maintenance of fire equipment, systems, and devices; he also monitors the fire prevention program. He insures that:

(1) Fire vehicles and personnel are in a state of immediate readiness and availability.

(2) Training and fire prevention programs are carried out.

(3) Resources are efficiently utilized.

(4) Duty assignments, equipment maintenance, and operational procedures are accomplished.

b. Assistant or Deputy Fire Chief. He assists

the fire chief in carrying out his duties and assumes them in his absence.

c. **Station Chief.** Under the direction of the fire chief, a designated person acts as the station chief. Since no position is **authorized** for his duty, the person assigned will also perform duty as crew chief. He supervises all chiefs assigned to his station. He will—

(1) Implement the policies and regulations of the base fire protection organization and higher headquarters.

(2) Respond with his crews to alarms and emergency calls and insure **adequacy** of fire suppression and rescue operations.

(3) When first to arrive at the scene of an emergency, **assume** command until the arrival of a senior fire authority.

(4) Supervise and assist in training and instructing the crew members and conducting regular drills to maintain efficiency of firefighting and rescue operations.

d. **Crew Chief.** He will—

(1) Supervise operator **inspection** and maintenance of fire vehicles and insure the upkeep and protection of all fire organization property.

(2) Insure the safe arrival of his vehicles, with its full **complement** of equipment and personnel, at the scene of an emergency.

(3) Respond with his crew and equipment to alarms, fires, common emergencies, vehicle **rescue** emergencies, and routine calls, including reciprocal movements as directed.

(4) **When first** to arrive, assume command until relieved by senior fire authority.

(5) Perform the station chief's **duties**, delegated to him or dictated by emergency conditions.

e. **Firefighters.** Each **firefighter** normally is assigned a specific duty related to equipment operation or firefighting and rescue. All personnel, **however**, will be cross-trained and capable of flexible action in a fire situation and rescue emergency. **Firefighters will—**

(1) Keep apparatus, equipment, tools, and uniforms clean and serviceable,

(2) Respond with the assigned unit to **all** alarms and emergency calls.

(3) Extinguish fires and take necessary **precautions** to prevent their being rekindled.

(4) Be careful to avoid unnecessary damage to or **loss** of department property, or injury to himself or other personnel.

(5) Watch for and protect at the scene of a fire all clues or evidence indicating the fire's cause.

(6) Participate in the fire prevention program.

f. **Training of Fire Truck Operators.** Drivers of emergency type vehicles must attain the following minimum test scores:

(1) Emergency judgment test-108.

(2) Road **test—90.**

(3) Individuals not achieving the above minimum qualifications will have their SF Form 46 and Driver Qualification Record DA Form 348 stamped "Limited License."

(4) Refresher training will be provided annually to assure familiarity with emergency operational requirements for the type of vehicle being operated. Specific attention will be given to the understanding of **legal** limitations required by the installation and by local laws.

(6) Any operator of an emergency vehicle who is involved in an accident will have **his** permit suspended, pending completion of remedial driver training.

(6) Any operator of an emergency vehicle who is involved in an accident and is convicted of any moving violation will have his permit revoked.

(7) Should a requirement exist for the driver to be retrained and tested for driving other than emergency vehicles, the driver's permit will be stamped "Army Limited-Not Valid for **Emergency Vehicle.**"

(8) A 'proper entry' will be made on the Driver Qualification Record (DA Form 348) to assure that the above information and qualifications or limitations are known and available to the motor officer in case of reassignment of the driver **or** loss of a permit.

Section III. FACILITIES

1-8. Introduction

Firefighters often spend 24 hours or more on duty at an assigned locality in order to assure rapid

response to fire alarms. They should be housed in suitable living facilities, when available, including those necessary for comfortable working, **sleep-**

ing, eating, recreation, training, and study. Inadequate facilities can greatly lessen the efficiency of a fire protection organization. When not on duty, firefighters are on call (in case of grave emergencies).

1-9. Structural Stations

A structural fire station must be strategically located in the area it is expected to protect.

a. Usually it is centrally located so **that** each portion of the area will have as much protection as possible without **slighting** any other portion. However, when one portion **is** "high risk" in comparison with the rest of the area, the station's location will naturally favor the **high** risk portion.

b. Reasons for considering an area as a "high-risk" include the speed of ignition of the flammable materials located there, the propagation possibilities, and the potential amount of loss if fire occurs. Those portions of an area containing hospitals\ technical buildings, barracks, headquarters buildings, or other buildings in which life and property loss potential is 'greatest are necessarily classified as critical from the standpoint of fire hazard.

1-10. Crash Stations

The location of the aircraft fire rescue station is limited to the vicinity of the airfield, but its location even within that limitation is of utmost importance. An aircraft **fire** rescue station must be centrally located. At the same time it must be so positioned that there will be an open view of all aircraft activity-including the flying field, runways, ramp, parking areas, taxi strips, and **dispersal** areas-from the crash station.

1-11. Sleeping Quarters

Sleeping or bunking facilities should enable crewmen of both aircraft **fire** rescue and structural organizations to reach the apparatus floor quickly and safely. When the alarm sounds during sleeping hours, a firefighter is expected to awaken, throw back his blanket, spin around and insert both feet into his **boots**, stoop and pull up his pants, run toward the apparatus floor while placing his suspenders over his shoulders, and finally mount the truck, ready for action-all in about **15** seconds. He can do this only if the quarters are so designed that the distance from the sleeping quarters to the apparatus is as short as possible, passageways are wide and clear, and the area is

completely free from obstructions which might cause delay or injury.

1-12. Dining Facilities

Dining facilities included in the quarters must be looked upon as a necessity rather than as a comfort or a luxury, because those periods of absence from the fire station for eating greatly reduce the strength of the organization, **even** if only a few persons are absent for a short time.

1-13. Heating and Sanitation

Each structural and crash **station** should be properly 'heated and ventilated.

a. The comfort of personnel will insure that the men willingly and efficiently **perform** their inside duties, which include keeping the equipment in excellent condition. Training and study periods are even required of seasoned firefighters to advance or refresh their technical **knowledge**. Personal comfort **is** a necessity to the man who is trying to absorb such knowledge, and proper building temperature is necessary for personal comfort.

b. Shower and latrine facilities are essential to the health, comfort, and cleanliness of all fire protection personnel. These facilities should be placed reasonably **close** to the apparatus floor. After returning from a fire, the men are frequently wet, cold, and dirty, and a shower helps to prepare them rapidly for another possible emergency. While showering, the men should keep boots and pants close by so that in case of alarm they can put them on immediately.

1-14. Training Facilities

For the important purpose of practical training, which serves as a proving medium for theories presented in classrooms, a training ground or area should be provided for fire protection crews.

a. The training ground should be located, if possible, in a position from which response to any part of the area may be made in a minimum of time. Training areas must have a supply of water ample to replenish the supply on the vehicles. Trainers and simulated structures **should** be provided to enable actual fire ignition, control, and extinguishment according to the standing operating procedures.

b. Neither the entire aircraft fire rescue crew nor the entire structural crew will be out of service at any one time while attending **the** training

ground. Reasonably ample protection must be immediately available at all times.

c. A reading or study room is a great asset toward maintaining a progressive study or training 'schedule. A 16-millimeter projector should be available from the signal library for showing training films. A set of technical manuals and orders should be furnished along with any other

helpful publications. The study room must be well lighted, comfortable, and inviting, so as to encourage individual study.

d. A storeroom and repair shop, or a combination of the two, should adjoin the fire station so that crew members studying apparatus there, or working there, will not be far from their duty stations.

Section IV. DA FORMS, REPORTS AND RECORDS

I-1 5. Introduction

Fire protection and firefighting operations require reports and records. These are used for determining the effectiveness of firefighting and rescue operations; for appraising fire prevention regulations, programs, and training; and for evaluating fire protection engineering, equipment, and devices. The statistical data enable the organization to analyze and evaluate its own conditions and affect it changes to improve its efficiency. Reports are required for any fire incident which involves death or disabling injury to personnel or damage to or destruction of any building, structure, grounds, utility plant or 'system, installed or moveable equipment, aircraft, missile, vehicle, material, supplies, and personal property. Also, technical investigations are necessary for fire incidents to analyze causes, contributing factors, and Sects; and to determine the effectiveness of the measures taken or required to be taken to meet other such emergencies. Records are required for fire protection equipment systems or devices that may be peculiar to an installation. Routine should be made of inspection and hazards.

I-1 6. Forms

Listed below are forms to be used for inspection's and test of firefighting equipment.

a. *DA Form 253, Fire Extinguisher Record Tag*. DA Form 253 is attached to each installed extinguisher for recording the monthly inspection and recharging.

b. *DA Form 5-1 (Fire Department Individual Run Report)*. This form is designated to give information on responses made by individual fire units. The form lists information on such matters as time of alarm reception and response, type of apparatus dispatched, location and nature of the emergency (or other type response), equipment used, and hose line operation.

c. *DA Form 5-2 (Fire Report)*. This form is designed to furnish information about fire incidents which affect life or real property. It is used to -

(1) Identify the incident and related operations.

(2) Provide close estimates of monetary loss and the damage or destruction of property, material, and equipment.

(3) Indicate the loss of life and the extent and nature of physical injury owing to fire.

(4) Indicate the extent and nature of contingent loss and its effect on the installation mission.

(5) Determine the cause and contributing factors.

(6) Evaluate and improve fire protection organization, personnel, equipment, training, and procedures.

(7) Determine action to be taken to prevent similar occurrences.

d. *DA Form 5-78 (Fire Hose Record)*. This form records the inspection, test, and maintenance of all fire hoses, the type of coupling, and provides a remarks section.

e. *DA Form 5-118 (Annual Dry Pipe Valve Inspection and Tripping Test)*. This form is provided to record tripping, cleaning, and resetting of dry-pipe and deluge valves with their accessories.

f. *DA Form 5-119 (Automatic Sprinkler and Standpipe Equipment, Inspection and Test)*. This form is used for inspection and tests by maintenance personnel. It is completed as the inspection or test is made for operation of sprinklers, valves, and fire pumps.

g. *DA Form 2404 (Equipment, Inspection and Maintenance Worksheet)*. The equipment inspection and maintenance worksheet is used by all personnel performing inspections, preventive maintenance services, diagnostic checkouts, and

equipment serviceability criteria checks. It provides a standard procedure for temporarily recording equipment deficiencies.

1-1 7. Records and Reports

Records at the installation level will be prepared by qualified fire prevention personnel and will be approved by the operating agency commander or authorized representative. The forms are to be prepared as authorized in AR 310-1, as applicable, and used to record technical details of operations and tests for the following reports (For additional information, see TM 38-750).

a. Automatic Sprinkler Water-Flow and Low Air Pressure, Automatic and Manual Fire Alarm System Report. Complete and permanent records will be kept of the operation of fire alarm systems and of inspections, tests, and services performed. In addition to inspection and test record forms, impairment tags will be provided for use when devices are found inoperable and not immediately repairable.

b. Fire Hazard Inspection Report. This is used for either the fire inspection notice or fire hazard inspection report. The procedure to be used can be determined locally. The main reason for using the fire inspection notice is to streamline action and reduce the time required to complete fire inspection requirements. The establishment of good will and cooperation between the fire organization and the activities occupying the structures will reveal that the majority of fire hazard's can be resolved with this procedure. For situations where the fire inspection notice does not prove satisfactory, or is not adequate, the fire hazard inspection report will be used. Regardless of the procedure followed all fire hazards or deficiencies discovered during any inspection which cannot be or are not corrected during the inspection will be recorded. To insure that all hazards recorded on this form are corrected quickly, followup by the fire inspector is necessary. The time allowed to correct the haz-

ards, which can vary from 1 to 72 hours, depending on the potential dangers involved, will be listed on the form.

c. The Training Timetable. The training timetable is a simple chart to assist the supervisor in identifying, planning, and scheduling the training needed by his employees. It is a means of recording the operations each employee can perform, the operations in which each employee needs to be trained, and the date when this training should be started. The chart may vary in form and size, depending on the purpose, the size of the work force, and even the complexity of the work itself. It may also be called a training schedule or work chart and its essential features may be incorporated in an operations guide, work distribution chart, or control chart. However, when once prepared, it gives an overall picture of the specific training to be done in that unit. If the training timetable is correctly used, it serves the following purposes:

- (1) Aids in identifying, planning, and scheduling training.
- (2) Checks on the extent to which training is carried out as planned.
- (3) Aids in determining whether there will be a trained staff as needed to accomplish the mission.
- (4) Aids in assigning workers,

d. Log. Each fire protection organization will maintain a daily log containing information on duty personnel assignments, vehicle movements and mechanical status, response to fire incidents, emergencies, false alarms, alarms received, alarm transmissions over automatic manual, sprinkler systems, special exercises, names of visitors, injuries to personnel, etc. This log may be typed or prepared by hand on 8 x 10½-inch (20.3 by 26.7-centimeter) bond paper and maintained in a bound notebook. It will be reviewed and approved by the senior officer in charge at the close of each work shift.

Section V. COMMUNICATIONS

1-1 8. Introduction

The fire protection facilities of an installation must include an adequate communications system. This system consists of telephone systems, automatic, manual, and waterflow alarm systems, two-way radios, and visual and aerial signals.

1-1 9. Telephone Systems

Facilities for reporting fires on posts, camps, and stations have, at most locations, been standardized.

a. Fires may be reported through the installation telephone system or through a special system

of outside fire reporting telephones installed in boxes, and connected directly to the alarm board at the main fire station.

b. External fire-reporting telephones are housed in metal boxes mounted on poles or external walls of buildings, and are placed so that one of them can be reached rapidly and easily from any possible post location. These boxes are painted red and usually have a red target light mounted over them so they will be visible at night.

c. To report a fire over the fire reporting telephone, a person must open the box, lift the telephone receiver, and give the information to the alarm board operator.

d. In outdoor storage areas where post telephones or fire reporting telephones are widely scattered, signs should be posted throughout the area to show where these fire reporting facilities are located.

1-20. Automatic, Manual, and Waterflow Alarm Systems

In the following systems, alarms are transmitted by electrical impulses and recorded on a tape in the central fire station alarm room.

a. Automatic Fire, Detection and Alarm Systems. These systems are installed where it is not feasible to install automatic sprinkler systems. Dormitory type combustible buildings with individual sleeping rooms should have automatic fire detection systems.

(1) These automatic fire detection and alarm systems incorporate some devices sensitive to heat, fire, and smoke. These devices cause an electrically operated transmitter to send a coded signal to the fire station alarm system.

(2) Heat-sensitive devices used in fire detection systems may be either fixed-temperature or rate-of-rise thermostats. Fixed-temperature thermostats will actuate the transmitter when a predetermined degree of temperature is created by unusual circumstances. Rate-of-rise thermostats will actuate the transmitter when a fire or other source of heat causes the temperature to rise at a rate faster than normal. The rate-of-rise devices must be used with fixed-temperature devices.

b. Manual Alarm Systems. Manual alarm systems are usually installed in areas not provided with sprinkler or automatic fire detection systems. Watchman service is often provided in these areas. Manual alarm boxes are located strategically throughout an area and are usually operated

by opening the box and pulling a lever. (Due to the different types of boxes, the operation will vary.) Only a local alarm is normally provided. Under certain conditions a coded signal may be sent to the fire station alarm system.

c. Waterflow Alarm Systems. Waterflow alarm systems are those that transmit a coded signal to the fire station alarm system when a ruptured sprinkler head causes water to flow through the pipes of a sprinkler system. Loss of air pressure in a dry-pipe system will cause a local alarm and may also transmit coded signals to the fire station alarm system.

1-21. Fire Department Radios

The provision of two-way radios for structural fire apparatus is not a substitute for a fire alarm system because such radios usually are not available to post personnel for reporting fires.

a. Radios installed on structural apparatus are used successfully for issuing detailed and specific orders to fire crews while they are enroute to the scene of an emergency and at any other time when the apparatus is away from the station.

b. Radios are usually installed in the smaller, faster vehicles, since these trucks are normally the first to arrive. Upon arrival, auxiliary equipment or additional emergency assistance can be ordered by radio without delay.

c. The frequency of radio equipment on the crash rescue apparatus should be the same frequency as the airfield radio tower.

d. Portable radios for firefighters are advantageous. They permit firefighters to engage in various activities and be available for fire call.

1-22. Radio Terms and Procedures

Several standardized radio terms and procedures must be understood and used by fire crews.

a. Terms.

(1) "Roger" means "received your message."

(2) "Wilco" means "received your message and (where applicable) will comply."

(3) "Say again," "I say again," and "That is correct" are self-explanatory. To correct something said, the word "Wrong" is used, followed by the correction.

(4) "Wait," if used by itself, means "I must pause for a few seconds" and requests the other station to stand by (refrain from transmitting) for a period not to exceed 30 seconds.

(5) If the pause is to be longer (up to 1 minute), the expression "Wait out" is used.

(6) To request an even longer standby period, the expression "Wait — Out," is used in which the blank is replaced by a numeral indicating the number of minutes the other station is requested to stand by.

NOTE

Standby periods usually are requested by an operator who **has** to perform a duty that takes his attention away from the transmitter/receiver or who has to handle communications of higher priority or greater urgency. When requested to stand by, a station normally is expected to remain in this status until advised or invited to resume transmission.

b. Numbers. To transmit numbers, the following standard pronunciation should be used:

| Numeral | Spoken as |
|---------|-----------|
| 0 | zero |
| 1 | wun |
| 2 | too |
| 3 | thu-ree |
| 4 | fo-wer |
| 5 | fi-yiv |
| 6 | six |
| 7 | seven |
| 8 | ate |
| 9 | niner |

c. Letters. When it is **necessary** to identify a letter of the alphabet or to spell a word, the new standard phonetic alphabet should be used:

| Letter | Word | Pronunciation |
|--------|----------|----------------|
| A | ALPHA | (Al fah) |
| B | BRAVO | (Brah voh) |
| C | CHARLIE | (Char lee) |
| D | DELTA | (Dell tah) |
| E | ECHO | (Eck oh) |
| F | FOXTROT | (Foks trot) |
| G | GOLF | (Golf) |
| H | HOTEL | (Ho tell) |
| I | INDIA | (In dee ah) |
| J | JULIET | (Jew lee ett) |
| K | KILO | (Key loh) |
| L | LIMA | (Lee mah) |
| M | MIKE | (Mike) |
| N | NOVEMBER | (No vem ber) |
| O | OSCAR | (Oss cah) |
| P | PAPA | (Pah pah) |
| Q | QUEBEC | (Kwi beck) |
| R | ROMEO | (Row me oh) |
| S | SIERRA | (See air ah) |
| T | TANGO | (Tanggo) |
| U | UNIFORM | (You nee form) |
| V | VICTOR | (Vik tah) |
| W | WHISKY | (Wiss key) |
| X | XRAY | (Ecks ray) |
| Y | YANKEE | (Yang kee) |
| Z | ZULU | (Zoo loo) |

Words not understood will be spelled phonetically. For example, phonetic transmission of "Type 0-5" would be made as follows: "I spell: tango—Yankee-papa-echo, zero-fi-yiv."

d. Calling Procedure. To establish communication with other units make the initial call-

(1) Once communication is established, begin each message with the truck's identification and conclude with the proper closing remark. All messages will end in "over" or "out," whichever is appropriate. "Over" means "my transmission is ended ; I expect a response." "Out" means "this conversation is ended, and no response is expected." "Over" and "out" are **never used together** to end a transmission.

(2) Crews should keep radio equipment clean and protected from the weather. Particular care must be given to the condition of the battery, which must be tested frequently and charged when necessary.

1-23. Hand Signals

Standard throughout the services are the visual signals between the senior man in charge and the pump operator at structural fires. These signals may be given by hand during the day or by flashlight or lantern during the night. They cover most of the orders usually transmitted from the senior man to the pump operator. The pump operator must be constantly on the alert for signals and must acknowledge all signals by repeating them. Standard signals are easily understood since, in most cases, they suggest the action desired. Signals should be **deliberate**, for careless signals may be misunderstood. If necessary, additional signals may be developed to fill special needs. However, they should be distinctly different from standard signals and should be understood by all concerned. The standard hand signals are **charge line, shut off water in line, cease operations, increase pressure, and decrease pressure.**

a. Charge Line. During the day this signal is given by raising both arms vertically from the shoulders, palms to the front, and holding them stationary until the signal is acknowledged, as shown in A, figure 1-1. At night it is given by holding a flashlight or lantern in one hand and raising the arm vertically above the head. The beam is directed toward the pump operator and the light swung horizontally above the head, as shown in B, figure 1-1.

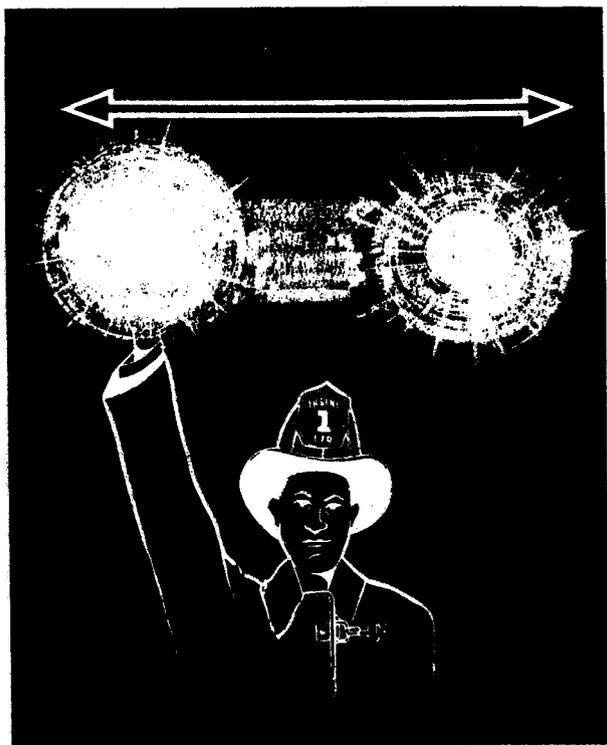
b. Shut Off Water in Line. This signal is for a temporary shutdown to allow for line repairs or



A — DAY

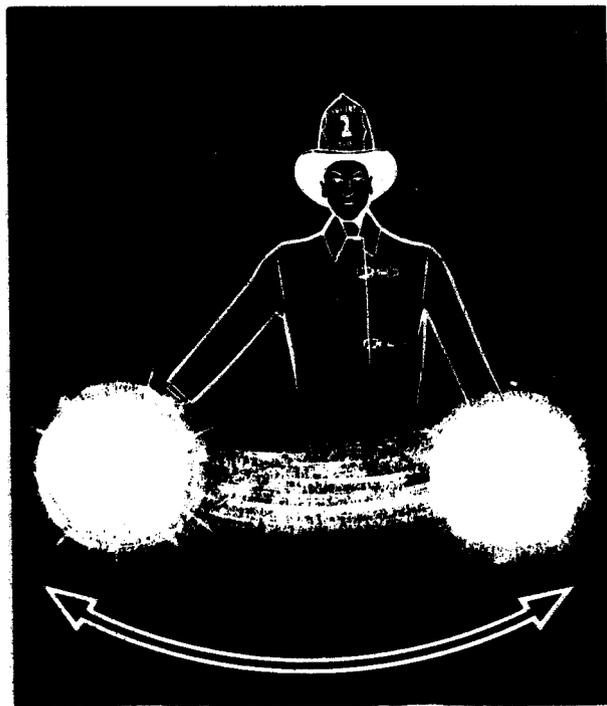


A — DAY



B — NIGHT

Figure 1-1. Charge line.



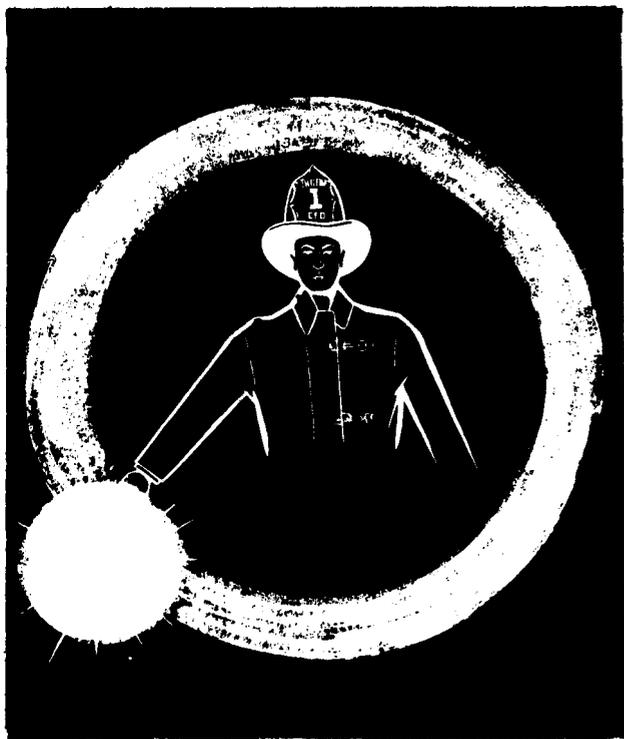
B — NIGHT

Figure 1-2. Shut off water in line.

changes. On receiving it, the operator closes the discharge valve, but continues to pump and holds himself ready to open the valve at the proper sig-



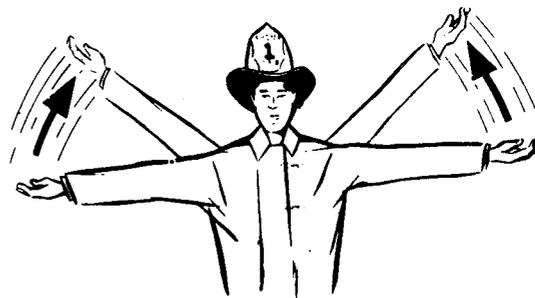
A — DAY



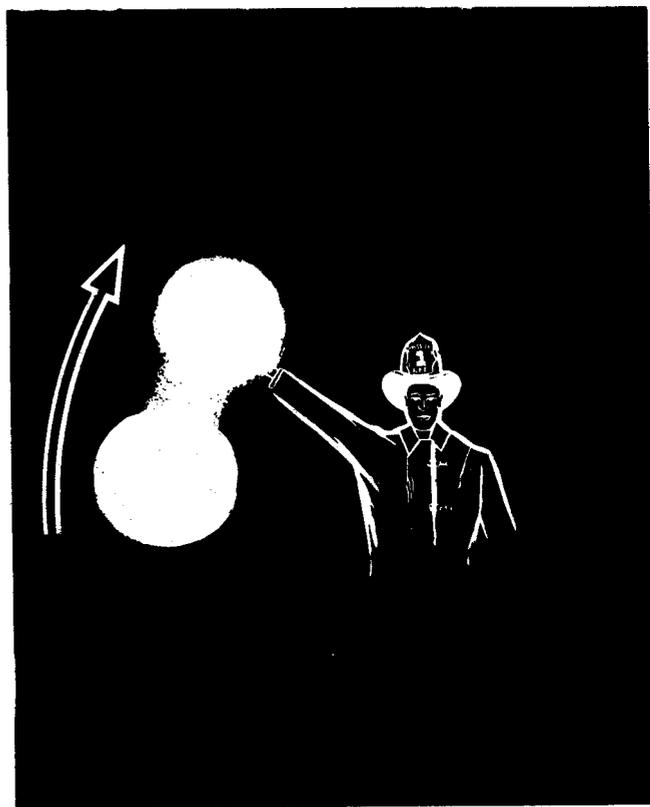
B — NIGHT

Figure 1-3. Cease operations.

nal. During the day the signal to shut off the water is given by extending both arms downward at an angle of 45°, crossing them in front of the body, and swinging them back and forth, as shown in A, figure 1-2. At night, it is given by extending one arm downward at an angle of 45°, directing the beam of the flashlight or lantern toward the pump operator, and swinging the arm back and forth in front of the body as shown in B, figure 1-2.



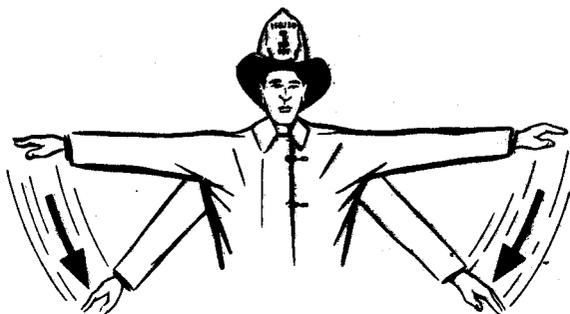
A — DAY



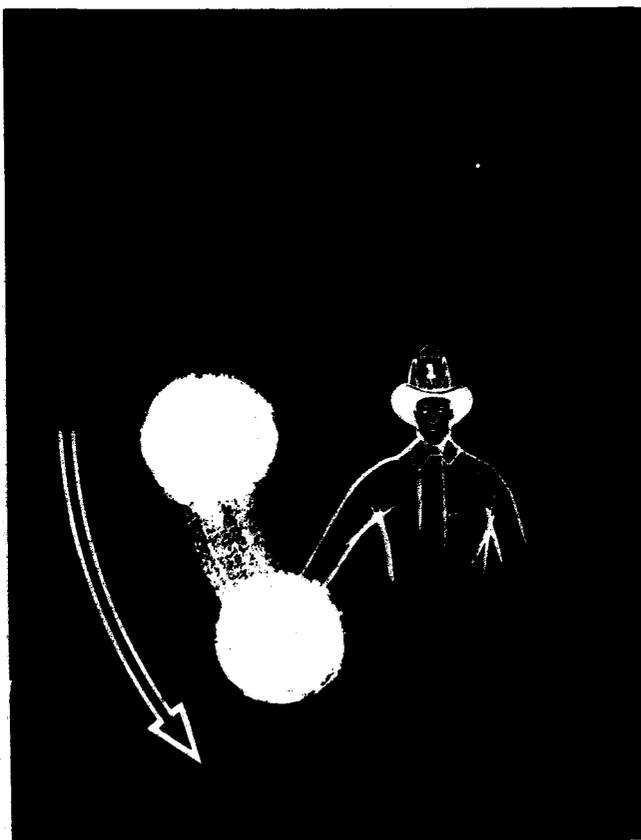
B — NIGHT

Figure 1-4. Increase pressure.

c. Cease Operations. This signal means that the operation is over. On receiving it, the operator disengages the pump, **disconnects all lines**, and picks up his equipment. During the day, this signal is given by **describing** a circle in front of the body with an extended arm, as shown in A, figure 1-3. At night, it is given by **holding** a flashlight or



A — DAY



B — NIGHT

Figure 1-5. Decrease pressure.

lantern in the hand and following the same procedure as for daytime, as shown in B, figure 1-3.

d. Increase Pressure. This signal is given **once** for each **10 pounds** (4.5 kilograms) increase of pressure required. During the day this signal is given by extending the **arms horizontally** and sideways from the shoulders and raising them to a **45° angle, palms up**, as shown in A, figure 1-4. At night it is given by extending one arm horizontally and sideways from the **shoulders**, holding a light in the hand with the beam directed toward the pump operator, and then raising the arm upward **45°**, as shown in B, figure 1-4.

e. Decrease Pressure. Each signal indicates a **decrease** in pump **pressure** of **10 pounds** per square inch (0.7 kilograms per square **centimeter**). During the day the signal is given by extending the arms horizontally from the shoulders and lowering them to a **45° angle, palms down**, as shown in A, figure 1-5. At night it is given by extending one arm horizontally from the shoulder, holding a light in **one** hand with the beam directed toward the pump operator, and then lowering the arm to a **45° angle**, as shown in B, figure 1-5.

1-24. Other Characteristics of Alarm Systems

A functional fire alarm system must have the following characteristics.

a. Distribution and quantity of the alarm boxes must be such that they **can** be easily and quickly reached from any possible fire emergency location. The operation must be so simple that persons under the strain of excitement are able to report the location of the fire accurately. Alarms must be transmitted without interference by **nonemergency** communications. The system must be able to operate properly under stress of time and **adverse** climatic conditions. Alarm systems must survive fires and other conditions which may tend to cause a circuit break.

b. The most frequent causes of alarm failures and inaccurate impulses **are** the result of falling poles and trees, faulty wiring involving commercial utilities, impact of motor vehicles, wind, sleet, snow, electrical storms, sewer explosions, and excavations which cut or disturb underground wires. To assure the dependability of the alarm systems they must be inspected and **tested** frequently and kept in the optimum operating condition.