

REPORT ON THE
FIRE FACILITIES OF THE
REPUBLIC OF LIBERIA
JUNE 1962



Public Safety Division
United States Agency for International Development
Monrovia, Liberia

REPORT ON THE
FIRE FACILITIES OF THE
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FOREWORD

Recognition by the Government of Liberia for modernizing its fire services and facilities, has been evident since 1953. The Nine-Year economic development Act of the Republic of Liberia, approved in December 22, 1953, stated:

"It is hardly necessary to justify the necessity for adequate fire fighting services in any community as the necessity is an indispensable part of the services provided in every modern community. At the present time inadequate facilities exist and only for the City of Monrovia, and even in this city great calamity has occurred because of the lack of adequate facilities. Every other city and town in this Republic is wholly without these facilities to the great hazard of life and property; as a result, many lives and much property are annually destroyed. Such a condition is intolerable and requires decisive action on the part of the Government."

The proposals included monetary estimates of \$500,000 total, divided evenly between construction and equipment.

Overtures have been made by Liberian Government officials to include in the A.I.D. programs some capable fire service advisory unit. Initially, visitation to Washington by these officials began as early as 1959. The present Attorney General, Joseph J. F. Chesson, has instituted letters in this regard, stressing the dire need of a factual survey plus a follow-up program of training.

Governmental records are fragmentary with regard to past training, but it appears that some attempt was made in the training here. Oral, vague comments disclose that a fire specialist was brought here by the Government of Liberia. At this point the facts become distorted and fail to clarify what was accomplished, time or duration of stay, and just what personnel was exposed to the program. Brief mention is made only to indicate some exposure, however, observation fails to discern little absorption by personnel.

The Republic has realized the seriousness of the current fire service inadequacy through several serious conflagrations in the last two years. In 1961, the Free Port of Monrovia

suffered a loss of one warehouse, including contents. This fire endangered the entire port facility and only through unusual circumstances was the loss contained to the one building. Shortly thereafter fire destroyed an entire village in the Zorzor area. These incidents intensified the Government's interest in establishing an adequate fire service.

Discussions with the Attorney General indicated an extreme concern of the present state of this service. Attorney General Chesson requested a complete survey of Liberia with particular interest to those areas under development. The survey was to reveal factual data irrespective of stigmatizing personnel in operational control. This report, therefore, is compiled in a manner as to disclose data covering personnel, equipment, and facilities as they appeared to this consultant.

Attorney General Chesson assigned Research Assistant Roland Barnes to accompany this consultant to the various counties and provinces. At this point it should be stated that the gracious cooperation of Mr. Barnes made it possible to develop this survey. His avid interest aided materially in making this consultant's stay both pleasant and productive.

This survey covers the capital of Liberia; Monrovia, in specific detail because here is the seat of the population in density. The areas of Buchanan, Greenville, Harper, Nimba Mountain, Robertsport, Saniquellie and Zorzor are surveyed in alphabetical sequence. Many are the sources of developing raw materials and the population growth rate is, and will continue to be most rapid.

Report content is sub-divided into three distinct sections:

1) Recommendations for development of uniformity in all facets of the fire service, including personnel selection and training, uniform equipment purchases, facility location, and general procedures.

2) A suggested Table of Organization (Chart I), nationwide, to include the development of a Chief Fire Marshal's office which would supervise the operation.

3) Alphabetical breakdown of areas visited with specific recommendations.

The officials of the Government of Liberia are to be commended for their foresight in recognizing the inadequacies of the fire service potential at present. They visualize fully the disaster which would befall if immediate action is

not taken to resolve this phase. Because the economic growth rate is excellerating to a high degree, the development of services of this kind is a necessity.

Attorney General Joseph J. F. Chesson is singled out for a personal commendation because certainly the facts disclose his intense interest in upgrading the agencies under his control. His cooperation and guidance proved invaluable to the consultant.

I GENERAL RECOMMENDATIONS

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Because of the present state of the Fire Service as indicated by this survey, the following recommendations are proposed. These recommendations in no way reflect on any individual or the service itself, but rather are projected to insure a potential for the future. In many instances these are general in scope rather than specific. This is intended. To be specific at this time would tend to defeat the renovation of the Service and result in confusion.

Recommendations

A) A complete reorganization should be accomplished within the Fire Service and a specific table of organization should be designed similar to Chart I. Such would tend to insure not only proper expansion of the Service, but provide for uniformity in all components.

B) An office for a Fire Marshal should be created and the individual so appointed should have sole authority over the entire Liberian Fire Service and be attached to the Attorney General's office, Department of Justice, for administrative purposes only. The selection of this officer should be predicated on merit and possess the qualities of leadership, administrative capability and resourcefulness to control and supervise such on a national scale.

After the careful selection of this officer, arrangements should be made for a period of training in the United States in the fundamentals of fire fighting, plus an opportunity to observe and study the administrative procedures used in the various phases of a stateside fire program.

C) Because of essential economic growth and extension, futuristic plans should be formulated to sub-divide Liberia into two distinct parts; this for the purpose of administration and control. Each district should be assigned an Assistant Fire Marshal whose sole duties would be to control those segments of the Service located in his districts. On assignment, such Assistant Chief would be delegated the responsibility and accountability of those units under his immediate jurisdiction. This would entail inspection, budgeting and establishing of an inservice training program.

The proposal of an Assistant Fire Marshal is based not upon the immediate needs, but rather on the ultimate expansion. This would eventually cause a decentralization of control to

to these offices and provide for better supervision and operation.

D) Regulations and procedures of the Fire Service should be prepared and published to insure a continuity of uniformity throughout Liberia.

E) As provided in the specific area recommendations, truck and engine companies should be formed. These would be uniform in personnel complement insofar as area needs and requirements. In this connection, the staffing pattern should be standardized as it pertains to rank and/or duty hours. Salary rates should be comparable with the National Police Force.

F) An evaluation of current personnel should be initiated and those possessing little potential be eliminated. Such screening process should be conducted through the facilities of the National Police and Security Training Academy which is equipped to provide such service.

G) A definite procedure of recruitment selection should be formulated. Requirements should be standardized as to age, height, weight, physical soundness, etc. Selection should be wholly dependent on meeting requirements and acceptance of training. A specific regulation should be provided that entrance into the Fire Service must be accomplished only through acceptance and training at the Fire Department Training School.

H) Prior to the establishment of a training schedule, definite action should be taken to provide proper facilities and aids at the National Police and Security Training Academy; a fire tower (design available at A.I.D./L); ample cement paved area for training in control and use of all types of fire streams; a complete set of ladders, appliances and equipment carried on the fire apparatus; oil pits, smoke room; valves and connections for standpipes and automatic sprinkler, etc.; be provided.

It would be mandatory to provide a separate water supply at the Academy to insure adequate flow for training purposes.

I) When facilities at the National Police and Security Training Academy are in readiness, a request should be made through A.I.D./L for the purpose of providing a fire service advisor. Definite training schedules can then be prepared. It would hardly be feasible to request an advisor prior to completion of the necessary training aids.

J) Adoption of A Comprehensive National Building Code

The purpose of a building code is to provide for the safety, health, and public welfare through structural strength and stability, means of egress, adequate light and ventilation, and protection of life and property from fire hazards incident to the design, construction, alteration, removal or demolition of buildings and structures. As soon as the fire officials of Liberia have acquired sufficient knowledge in the science of fire protection, they should commence a campaign for the adoption of a comprehensive building code. For instance, in the city of Monrovia most of the modern buildings have open stairways, but to secure fire safety in a building, it is necessary to enclose all stairways and elevator shafts. This is done not only because such an enclosure furnishes a protected means of egress, but because it retards the spread of fire.

K) Creation of A Fire Prevention Code

This would tend to lessen the important factors contributing to fire incidents. Note: In the Monrovia area, because of the density of population and building concentration, a Fire Inspector should be included in the Fire Marshal's office. Duties are to inspect and eliminate existing hazards and to control proposed hazardous installations by examining plans and issuing permits if certain provisions of ordinances and laws have been met.

L) Specific laws should be enacted creating regulations relative to (1) transportation, storage and use of explosives, gasoline, flammable liquids; (2) erection of gasoline storage and dispensing stations; (3) location and requirements of dry cleaning establishments; (4) inspection and approval of all public buildings, new or otherwise; (5) condemnation of building in such a state of disrepair as to be a fire hazard; (6) public gathering places such as theatres, schools, auditoriums, etc., and requirements as to standpipes, sprinkler equipment, fire extinguishers, fire escapes in public buildings, and commercial concerns.

M) A standardized records and report system for the whole Fire Service should be devised both for accounting and recording of essential information.

II REPORTS & RECOMMENDATIONS OF
 INDIVIDUAL CITIES

II REPORTS & RECOMMENDATIONS OF INDIVIDUAL CITIES.

A. Monrovia

Description

Monrovia is the capital of the Republic of Liberia and is the largest city (pop. 103,000).

The principal business section of the city occupies the crest of a hill that overlooks the surrounding countryside. The northwest section of the city is on Bushrod Island and consists of an area approximately six square miles. Here is located the chief commercial and industrial section of the city. The Free Port of Monrovia, the principal seaport in Liberia, is located on this island. Another commercial area has developed along the eastside of the Mesurado River, opposite Bushrod Island. The principal suburban areas extend along the ocean beach to the east for over ten miles. The principal businesses center around the growing and exporting of rubber and, just recently, the mining and exporting of iron ore.

It is estimated by the Bureau of Economics and Research that approximately 10,050 structures are in the Monrovia metropolitan area. Several modern multistory buildings have been erected and more are in the construction phase. Practically all of the Western-type homes, office buildings, hotels and commercial buildings are of fire resistant construction. These buildings range in height from one to three stories.

The majority of all the buildings are bamboo huts with sidewalks of either clay or bamboo matting. The roofs are made of thatch, inflammable roofing paper or metal. Hundreds of these buildings have been crowded together in small areas without streets or fire hydrants, thus creating a serious fire problem.

In the event of a fire in one of these over populated districts, fire apparatus must stop at its perimeter. Hose is then laid by hand through the narrow paths that wind between the huts. Fire hydrants are often not available or are great distances apart.

Personnel

Personnel consists of the Fire Chief (\$2,625), Deputy Fire Chief (\$1,800), Assistant Fire Chief (\$1,200), Staff Officer (\$1,200), Fire Officer (\$600), three Section Leaders

(\$540 ea.), six Leading Firemen (\$360 ea.) and an Administrative Assistant (\$600). The personnel is divided into three companies of equal numerical strength; each company has three platoons working eight hours a day, seven days a week.

Training

There is no formal program of training nor are drills held at any time.

Equipment

There are three engine companies in the Monrovia Fire Department. Each pumper is equipped with a 500 GPM pump and a 300-gallon water tank. An inadequate complement of minor equipment and appliances is carried on each fire truck.

Lack of maintenance is reflected by the condition of the apparatus, hose, and fire stations. Some of the most essential equipment in the fire department has been out of service for months due to the lack of repair. Fire apparatus and much of the hose are in need of a thorough cleaning. The condition of the tools and appliances is not indicative of a well-supervised fire service.

Building Code

The rudiments of a building code have been enacted. Zoning regulations designed to control the type and occupancy of buildings are one of its major features; however, this code does not require a secondary means of egress, fire escapes, standpipes, or enclosure of vertical openings.

Remarks

On an average, ten fire responses are made a month. Approximately half of these calls are received by telephone; others reported by messengers, taxi drivers, etc. Many of these calls have been delayed so very often a fire has gained extensive headway by the time fire apparatus arrives.

Pumpers are not equipped with soft suction sleeves; therefore, the department does not make it a practice of hooking pumpers to fire hydrants. Generally, a hydrant stream is used. The capacity of the pumps is not utilized.

Monrovia has no fire alarm system. Telephone service is unreliable and the distribution of phones is seriously limited. For instance, the Free Port which is in

sight of Monrovia cannot report a fire by telephone because service is not available.

The communication requirements of a modern fire department consist of two basic elements: (1) an effective system of rapid communication between the operating units of the department and (2) provision of means whereby a person discovering a fire may promptly report it to the fire department.

Telephone service is the medium by which the majority of fire calls from the public are reported. However, public telephones have certain definite limitations with respect to reporting of fire calls. For instance, at night telephones may not be available to persons on the street; an excited person may not give proper information, or leave the phone before finishing the call. With dial telephones it is not generally possible to trace such calls.

Furthermore, it is desirable to have a system of reporting fires which has built into it a variety of features which are intended to keep the system in operation, even under unfavorable or abnormal conditions. The street box system was developed to provide reliability beyond that considered necessary for commercial telephone systems. This system is provided with facilities for continuous circuit and other tests.

Only one pumper is capable of drafting water; the priming pumps on the other two trucks are not operative.

A 24-foot ladder is the only one carried on the fire apparatus. Its reach is limited to two stories.

Heavy duty appliances are not provided for use where large amounts of water are required. Salvage equipment for use in reducing water damage is nonexistent as are gas masks and protective clothing.

Water Supply System

Monrovia has two water supply sources: Bushrod Island plant and White Plains plant on the St. Paul River. Both water sources are operated by the Department of Public Works & Utilities, Republic of Liberia.

The Bushrod Island operation includes two infiltration galleries that deliver rain water to a wet well and pumping station. The pumping station, designed to deliver .4 MGD, is

equipped with two vertical well-type pumps, each driven by a diesel engine. A chlorinator and chemical feed equipment are provided.

Lack of electric power at the White Plains plants required that diesel generators be provided. These units are used to supply power to run the raw purified water pumps, and other essential services. Dual generating units were installed as a safety measure against mechanical failure; all pumps and mechanical equipment were provided in duplicate, or with sufficient spare parts to insure continued operation when maintenance was required. This is a combination pumping and gravity system.

Four slow sand filters are used to produce a total daily flow of 1.5 MGD which is considered the maximum capacity of the plant. Vertical turbine-type pumps are used for the low-lift raw water pumps. The water flows through the treatment units by gravity to a clear well from where it is then pumped through a 16-inch transmission pipeline to the booster station on Bushrod Island for delivery to the distribution system. The clear water pumps are of horizontal centrifugal type.

Facilities at Bushrod have been provided in a high-lift pumping station to raise pressure in the existing municipal distribution system and to permit the filling of the two reservoirs having a total capacity of 1.6 MGD. Two electric driven pumps are installed at the booster station. An auxiliary electric motor is provided, coupled directly with a stand-by diesel powered unit in the event of failure in the municipal electrical system.

Both plants jointly average approximately two million gallons of water per day at maximum output. It is estimated that if all the requirements could be met, the amount needed would exceed three million GPD. About 20 GPD per capita is consumed. This rate is low because the number of outlets is limited so that perhaps less than 60 per cent of the people use the system. The present water supply is inadequate during the dry season, necessitating interruptions of service for several hours in the evening from one-half to two-thirds of the time. (1)

MONROVIA WATER PROBLEM, L. R. Howson

From all available information, it is believed that the St. Paul River, even in times of drought, will provide adequate water for Monrovia for an indefinite period.

Distribution System

A 16-inch transmission pipeline, 12 miles in length, conveys the water from the White Plains plant to the distribution system in the city. This line is vulnerable to breaks.

The secondary feeders consist primarily of 6-, and 8-inch pipe. The only section looped is the area bound by Nelson and Johnson Streets between Ashmun and Benson Streets. The 8-inch main is reduced to 6-inch pipe as it extends out into the suburban area.

The gridiron is composed almost entirely of 4-inch pipe with a few small areas covered with 2-inch conduits. One of the important business areas is supplied by 4-inch mains. The gridiron and larger pipes cover only a small percentage of the built up city area. Many streets have no mains.

In a comprehensive preliminary report, MONROVIA WATER SUPPLY, prepared for the Department of Public Works & Utilities by Brown Engineers of Monrovia, Liberia, it states on page 44, paragraph 12.2, Fire Protection: "It is mandatory to plan a water system that will provide adequate fire protection because of the unusually great growth and progressiveness of Monrovia. It is likely that a city of such potential will have a modern fire department and its water distribution system must be coordinated with these needs." It further states that, "Hydrants should be installed throughout the city and this can be done as the proposed mains are constructed. All new mains should be at least 4-inches in size."

Contrary to this report, it is found that fire protection engineers give no serious consideration to water mains smaller than 6 inches in diameter. It seems poor economy to install these small 4-inch mains which will not be satisfactory. Advantage should be taken of the special opportunity now presented to start from scratch.

Pressure

The high level of the reservoirs will provide adequate pressure if they can be filled to the design level. This is not the case, however, because the water system does not have the capacity to maintain the maximum daily consumption, plus the requirements of the reservoirs.

Gate Valves

The spacing of these valves does not comply with the minimum requirements of a good distribution system. Hydrant gate valves have not been installed with the hydrants until recently.

Hydrants

The city has only a small number of fire hydrants in comparison to its size. On the few streets which have water mains, the spacing of the hydrants is so great that it would be impractical to line-in and reach certain areas with the amount of hose and equipment available.

Hydrants that comply with the specifications developed by the National Fire Protection Association or other reliable organizations should be selected for installation.

Remarks About the Water Problem

Water is so fundamental a factor in fire fighting that a good water supply is the most important single factor in fire protection. Therefore, it is essential that the fire and water departments cooperate closely in all matters pertaining to fire protection.

The fire department is interested in the location and condition of fire hydrants and in the adequacy and reliability of the water flow from these hydrants. Naturally, the fire department is also concerned with the manner in which the water department supplies water to private premises such as large industrial plants and tall buildings. It also makes a study of the amount of water it can obtain from lakes, ponds, streams, or the sea in event of an emergency.

In the dry season the water supply is inadequate, even for domestic use. This condition will rapidly deteriorate unless something is done immediately to expand the water works. Several nights a week (3 to 4 hours) the water is discontinued. This is a most serious problem for the fire department because it is well known that fires occur at all times. Some means must be provided to turn on the water in case of an emergency so that the tanks on the fire trucks can be refilled and that a water supply will be available for fire fighting.

Another grave problem is the serious deficiency in the number of fire hydrants and their distribution. Still another matter of equal importance is the limited amount of water that these hydrants can deliver. This is due to the

design capabilities of the hydrant itself. The hydrants presently being installed are not suitable for fire service for the following reasons: (1) There is no large opening for a pumper connection. ~~(2) The barrel of the hydrant and the connecting pipe to the water main are too small, thus creating high friction loss.~~ (3) The two 2-1/2 inch connections are so constructed that service with a hard sleeve is impractical and many of the hydrants are placed where the fire apparatus cannot get near enough to use them.

The solution to the Monrovia water problem appears to hinge on whether the Agency for International Development will grant the Republic of Liberia a Development Loan, which it has requested, for the purpose of extending the water supply system, etc. The specifications call for:

- 1) Construction of a new water treatment plant, increasing supply to 10 MGD.
- 2) Construction of a 30- to 36-inch transmission pipeline.
- 3) Improvement and expansion of the distribution system by installing of additional 16-, 12-, 8-, 6-, and 4-inch pipe.
- 4) Construction of additional reservoir capacity where needed.

It is estimated that a city with a population of 100,000 should have a fire flow of 9,000 GPM. At the Free Port area consideration is given to the fact that all closed warehouses have a sprinkler system, but due to the congestion in the movement and storage of cargo, lack of segregation of supplies, the unloading of compressed gases and sometimes explosives at the common dock, it is believed that a fire originating in cargo outside of a sprinkled warehouse may become so intense that it would overcome the capacity of the sprinkler system therein and a severe fire would result. Therefore, it is estimated that an 8,000 GPM fire flow is required. (Over one-half of this amount can be supplied by the two diesel pumps maintained by the Free Port which pumps sea water.) The fire flow for the congested residential area is estimated to be at least 1,000 GPM and the scattered residential hut area 500 GPM.

Note: The new 30- to 36-inch pipeline will enter the city by means of another route, thereby providing a loop with the present line.

Recommendations

- 1) Immediately install two-way radios so the fire department can notify the proper water department official when it desires the water supply turned on.
- 2) The capacity of storage should be increased to provide domestic and industrial demands, plus fire flow of ten hours during any period of five days of maximum consumption.
- 3) The pumping capacity should be sufficient, with the two most important pumps out of service, to maintain the maximum daily consumption rate, plus fire flow at required pressure.
- 4) A minimum water pressure of at least 20 PSI should be provided during fire flow.
- 5) The capacity of the supply system should be increased to maintain maximum consumption demand, plus fire flow.
- 6) The capacity of the water works should be increased in capacity as proposed in application made to A.I.D. (from 1.5 to 10 MGD).
- 7) The electric power supply should be so arranged that a failure in any power line or the repair or replacement of a transformer, high-tension switch, control unit, or other power device will not prevent the delivery in connection with storage of the required fire flow for ten hours during a period of two days with consumption at the maximum daily rate.
- 8) A reserve electric generating capacity or alternate source of supply should be provided to operate all machinery and pumps in connection with storage and other supplies available to deliver the required fire flow for ten hours during a period of five days with consumption at the maximum daily rate.
- 9) The condition, arrangement, operation and reliability of plant equipment should be such that the required water flow can be maintained at all times.
- 10) The reliability of supply mains as affecting adequacy should be such that:
 - a) Sufficient mains be installed so that in the event of a serious break the remaining mains from the source of supply and storage can provide a fire flow of ten hours for a period of five days with consumption at the maximum daily rate.
 - b) In connection with the supply mains, arteries and secondary feeders shall extend throughout the system. They

shall be of sufficient size to deliver fire flow and consumption demands to all areas served; properly spaced (about every 3,000 feet) and looped; valved so that within the distribution system no length greater than one-fourth mile will be affected by a brake.

11) The gridiron of minor distributors supplying residential districts shall consist of mains at least six inches in size, arranged so that the lengths on long sides of the blocks between intersecting mains do not exceed 600 feet. Where longer lengths of 6-inch pipe are necessary, 8-inch or larger intersecting mains should be used. Where initial pressures are high, a satisfactory gridiron may be obtained with longer lengths of 6-inch pipe between intersecting mains. In new constructions, 8-inch pipe shall be used where dead ends and poor gridironing are likely to exist for a considerable period or where the layout of the streets and the topography are not well adapted to the above arrangement. In high value districts, minimum size shall be 8-inch with intersecting mains in each street; 12-inch or larger mains shall be used on the principal streets and for long lines that are not connected to other mains at intervals close enough for proper mutual support.

12) The distribution system should be equipped with a sufficient number of valves so located that no single case of accident breakage or repair to pipe system, exclusive of arteries, will necessitate the shut-down of an artery or a length of pipe greater than 500 feet in high valve districts, or greater than 800 feet in other sections.

13) Hydrants should be so arranged that:

a) in industrial districts hydrants are so placed that an average area covered will not exceed 60,000 square feet;

b) in residential districts a hydrant should be placed at each intersection and set intermediate hydrants where the distance between intersections exceeds 400 feet.

14) All new fire hydrants should comply with the specifications developed by the National Fire Protection Association. In addition to the two 2-1/2 inch outlets, hydrants should also have a large suction connection. Street connections must be not less than six inches in diameter. All fire hydrants without a suction connection should be replaced as soon as possible with the above-approved type.

15) Two permanent-type suction pipes as described below, should be installed on Water Street in the area called Slipway. These hydrants should be spaced so as to provide the best coverage for the use of fire apparatus.

Two permanent-type suction pipes of at least 6-inch piping should be installed on Old Kru Town Road. Such pipes should have a screened intake well below the low water level and outlets should be provided with fire department suction hose thread properly capped. These pipes should be spaced about equal distance apart from the nearest hydrant on United Nations Drive. They would provide access to water in a densely populated area that has no mains and only one access street.

Recommendations - Fire Fighting Facilities

1) Three pumping engines should be acquired with the following equipment:

A. pumping engine of 750 GPM at 150 PSI capacity. Pump should be centrifugal-type and have a priming pump or other acceptable priming device. Priming device to be of such type that it will operate while main pump is engaged and shall not necessitate the shutting down of main pump to reprime. Pump impeller shall be made of bronze; shafts shall be made of stainless steel or other suitable noncorrosive metal. The frame or chassis should be of ample dimension and strength for hard service and be thoroughly braced, riveted, or welded. Hose body should have a capacity of 1,200 feet of 2-1/2 inch and 600 feet of 1-1/2 inch cotton covered, rubber lined, double jacketed hose. Separate compartments should be provided for the hose. The watertank should have a capacity of not less than 400 gallons.

a. A pre-connected 1-1/2 inch line system should be provided.

b. A portable nozzle assembly with 1-3/8, 1-1/2, and 1-5/8 inch tips should be mounted on the right side of the hose compartment. The assembly should be of ample size so that friction loss will not exceed 18 PSI when discharging 600 GPM.

c. A hose reel with a capacity of 300 feet of 3/4 inch booster hose should be connected to the fire pump.

d. Two smooth bore flexible rubber suction of suitable size should be acquired for drafting rated capacity of pump.

e) A strainer for the hose mentioned in (d) should be acquired.

f) A soft sleeve, four inches in diameter, twenty feet long, rubber lined, double jacketed, cotton covered with female connections designed to fit suction connection on apparatus and large outlet on hydrant should be acquired.

g) A reducer, male to female, to be used to connect soft sleeve to 2-1/2 inch hydrant outlet should also be acquired.

h) Two thousand feet of 2-1/2 inch rubber lined, double jacketed, cotton covered hose (mildew resistant cover) for each new pumper should be acquired. All hose, total feet 6,000, half of which will be carried on the apparatus and the remainder in reserve, should be equipped with standard couplings. In addition to the 6,000 feet of hose, such amount as is necessary to equip the apparatus now in service, as described above, should be purchased.

i) Twelve hundred feet of 1-1/2 inch cotton covered, rubber lined, double jacketed hose (mildew resistant cover) with standard couplings for each new pumper should be acquired. Total feet should be 3,600, half of which is to be carried on apparatus and the remainder in reserve. Additional hose should be purchased to equip apparatus presently in service, if needed.

j) Three-quarter inch rubber-covered fire hose (300 feet per new pumper) should be purchased. All 3/4-inch hose on present apparatus should be tested and such additional amount should be purchased as is necessary to fill hose reels to capacity.

k) It is suggested that equipment similar to that listed on Purchase Order #2 Form, Revised April 1956, as used by the Washington, D. C. Fire Department, should be bought.

2. Equipment & Appliances for Pumps Now in Service

Following is a suggested list of equipment and appliances to be purchased for pumps presently in service.

a) Three soft sleeves, 4 inches in diameter, 20 feet long, rubber lined, double jacketed and cotton covered hose with female couplings designed to fit suction connection on apparatus and large outlet on hydrant.

b) Three reducers, male to female, to be used to connect soft sleeve to 2-1/2 inch hydrant outlet.

c) Three 2-1/2 inch combination variable fog and straight stream playpipes, having a fog pattern of 30° to 90°.

e) One pick ax, six pounds in weight.

f) Three New York style claw bars.

g) Three six foot pike poles.

h) Three 12' x 18' salvage covers.

i) Three hose hoists (Wooster Brass style or similar type).

j) Twelve hose and ladder straps (D.C. Fire Department or similar type).

k) Three hand pump-type fire extinguishers with a capacity of 2-1/2 gallons of water. These extinguishers should be equipped with ten feet of 1/4-inch hose and nozzle.

3. New aerial ladder truck should be acquired and equipped as follows:

a) Conventional aerial ladder truck assembly with a 75-85 foot aerial ladder. The ladder should be metal and hydraulically operated.

b) Portable ladders should be of light weight metal designed for fire service, heavy duty construction, and range in size from a six-foot step ladder to a 45-foot extension ladder.

c) Detachable ladder pipe with 1-3/8, 1-1/2, and 1-5/8 inch tips.

d) Such other equipment provided, similar to that listed on Purchase Order No. 2 Form, Revised April, 1956, as used by the Washington, D. C. Fire Department.

4. Suitable automobiles should be provided for the use of the Fire Chief and the Assistant Fire Chief.

5. Plans should be made to set-up a standard municipal fire alarm system in the near future.

6. All fire trucks and chiefs' cars should be equipped with two-way radios designed to operate on the 39 MC band.

Radio equipment is generally installed in all fire department cars and in many cities there is a radio in each station. Radio keeps fire fighting units in touch with headquarters, facilitates the reporting of emergency situations back to headquarters, and is used to request additional assistance, as well as inform other officers and units of alarms with which they may be concerned. The equipping of fire company apparatus with radio makes it possible to assign fire companies on regularly scheduled inspection service with each company spending several days a week doing fire prevention inspections. The driver of the apparatus in such a scheme stays with the apparatus to receive an alarm. Sounding of the siren on the truck would make it possible to assemble the men engaged in inspection with very little loss of time.

In a city where the telephone service is unreliable and the coverage limited, radio assumes a more important roll than usual. If a unit is not equipped with radio, it is out of service the minute it leaves the fire station insofar as the fire department is concerned. It cannot be dispatched on an alarm until it reports back to its quarters. Once all units are equipped, constant communication and supervision can be maintained at all times.

7. a) A central repair shop should be provided, equipped with proper facilities, ample supply of repair parts and staffed with such number of mechanics as is required. These mechanics should be subject to call around-the-clock. If it is necessary to train these men, arrangements should be made with regular fire apparatus manufactures for major service until such time as the training program is completed. If the service is not available, a garage which is a recognized service outlet for a fire apparatus manufacturer may be utilized. Fire apparatus is only as reliable as its maintenance.

b) Equipment should be provided for recharging fire extinguishers such as CO₂, dry powder or foam.

8. The use of the fire station at Broad and Mechlin Streets be discontinued.

9. A new station be erected in the same general area with accommodations to house two engine companies, a truck company, fire chief and assistant chief. Facilities should be provided for the proper housing of men, an adequate area for drilling, and the drying and storage of hose.

10) A new fire house should be erected on Bushrod Island in the vicinity of the Free Port for a new engine company.

11) A new fire station should be provided in the vicinity of 18th and Tubman Boulevard for a new engine company. These two installations should have facilities as described above.

12) The facilities of the engine company on Camp Johnson Road should be enlarged so as to provide a classroom and an area to wash the hose.

13) The pumper of Engine Company No. 1 should be placed in a reserve status when the new pumpers arrive. Its condition precludes further dependable service.

14) A fire prevention program should be initiated as soon as personnel has received sufficient training and experience to begin making fire prevention inspections.

The purpose of such inspection is to secure the correction of common fire hazards (e.g., rubbish, unsafe heating appliances, open flames, etc.) and other violations of fire ordinances which daily create dangerous conditions.

Fire inspections can be conducted in two ways, both of which are essential to good coverage. First, radio-equipped fire companies make inspections in their local response areas while remaining in service by radio to answer fire calls. Secondly, individual officers and men are assigned from each company daily to make more detailed inspections.

It is essential for firemen to become well acquainted with types and occupancies of buildings in which they will be called upon to fight fires. Through such inspections, firemen are informed concerning the physical structure of buildings and how fire might spread and consequently how best to fight the fire. This type of program must be supplemented by a fire prevention code.

B. Free Port of Monrovia

Description

The Free Port of Monrovia is operated by the Monrovia Management Company and is the principal import and export center of the Republic. Facilities have been provided for the loading and unloading of all types of cargo, including petroleum products. Several large warehouses have been built and each is equipped with a sprinkler system.

Three sources of water are available for fire protection purposes. The city mains can be utilized to boost the supply in the company's facilities. The plant has developed a private source which it utilizes, together with a 25,000 gallon elevated storage tank. Two diesel powered pumps of 2,500 GPM each can be used to pump seawater into the private mains in event of a fire.

The Port Authority does not have a fire boat. Two tugs have been ordered, each to be equipped with a turret nozzle and a fire pump. No information is available as to their specifications. These tugs will be assigned to regular tug duty but are supposed to be used as fireboats in event of a fire.

Private fire hydrants are distributed around the warehouse area. Hose reels containing 2-1/2 inch hose and playpipes are stationed near the hydrants.

Personnel

Employees have been assigned to specific fire posts in event of a fire but no drills are held nor have these people been trained in the control and operation of fire hoses.

Port Facilities

No segregation of cargo is practiced but the management attempts to keep the cargo moving through the port. A special pier built off the regular docking area is provided for the unloading of gasoline. Fire protection is not provided during this operation.

Remarks

A serious fire occurred here in 1961 when a warehouse and its contents were consumed. It appears that a pile of rubber was stored in a lean-to adjoining a warehouse which was ignited, producing intense heat which soon overcame the design capabilities of the sprinkler system. It was necessary to use all fire fighting equipment to protect exposures.

Recommendations

1) The authorities at the Free Port realizing that it was necessary to provide fire protection for their installation, have equipped their warehouses with automatic sprinklers and provided stationary fire pumps, first aid appliances, and a private water system. At this time it is doubtful if the city fire service is capable of furnishing much in the way of fire

protection. Therefore, it is most important that an effective maintenance and housekeeping program be carried out.

2) All personnel who are assigned fire positions in event of a fire should be thoroughly instructed in all phases of fire fighting from detection to salvage. After the initial instruction, drills should be held regularly with the men actually handling and controlling fire streams. The determining factor in saving property from fire is often the efficient use of available manpower already on the premises.

3) Means should be provided for immediately notifying the fire department upon the discovery of a fire, especially since telephone service does not exist.

4) Stock should be segregated to the most practicable degree.

5) The pier where petroleum products are unloaded should be equipped with suitable sprinkler protection.

6) Cargo should not be stored in the vicinity of warehouses so as to create an exposure hazard.

7) The sprinkler systems should be inspected and given water flow tests at regular intervals.

8) Employees should be instructed in the importance of closing the manually operated fire doors.

9) Provision for the collection and disposal of packing materials and other trash should be provided.

10) Sufficient hose should be maintained on the hose reels to reach a fire in any part of the area covered by the hydrant.

11) A fireboat or other suitable equipped boat should be provided for fire protection. This boat should be equipped with fire pumps, turret nozzles, hose, and other necessary equipment.

12) The crew should be instructed in the operation of this equipment and regular drills should be held at frequent intervals.

C. Buchanan (Bassa)

Description

Buchanan is a small coastal city (population 12,000) located about 100 miles southeast of Monrovia. Most of the buildings in the city proper are made of concrete brick with fire resistant roofs. A modern administration building and a high school are two of the most impressive buildings in the city. Many thatch huts are seen in the outlying sections. Several new streets are being laid in the downtown section.

Lamco, a mining company, is in the process of building a modern port at Buchanan. Facilities are being built to handle the huge amounts of iron ore that will be shipped out of this port. These installations include a railroad yard, power house, huge conveyor belt, accommodations for personnel, etc. A railroad line is also being laid from this port to its mine at Nimba Mountain near the Guinea border.

Private Fire Protection

A jeep equipped with a fire pump, hose, nozzles and other minor equipment has been provided by the company for its own fire protection. A fire brigade has also been organized and the men in this group receive extra compensation. A fire consultant has been engaged and the company is following his recommendations. All buildings will be equipped with suitable extinguishers and the conveyor belt will be sprinkler protected.

A private water supply is being developed. Limited capacity of fire hydrants are spotted around the housing area in which personnel and their families will live.

Personnel

The rank, salary, and number of personnel will be the same as the City of Harper.

Equipment

A new fire truck has been acquired and is now stored in Monrovia. The pumper is equipped with a 500 GPM pump and carries a 500 gallon water tank. A general assortment of minor tools are mounted on the truck and 3/4-, 1-1/2, and 2-1/2 inch hose is carried in the hose body.

Remarks

This city will expand rapidly in the next few years as the port goes into operation. One engine company with well-drilled personnel should provide reasonable fire protection at this time. A close watch must be maintained on developments in this area so that preparations can be made for securing additional equipment and men as needed.

There is no public water supply or fire alarm system, nor has the city any fire protection at this time.

Recommendations

- 1) Temporary quarters should be provided immediately for the engine company so that it can be put in service.
- 2) Preparations should be made to erect a new fire station with essential equipment, including a hose dryer.
- 3) Suitable approaches should be arranged so the fire truck can draft water from the ocean or other available water supplies.
- 4) Wells, cisterns, or storage tanks should be provided where no other water supply is obtainable.
- 5) A practical training program should be implemented.

D. Greenville (Sinoe)

Description

Greenville is a small coastal city (population 3,500) located about 150 miles southeast of Monrovia. The only means of access is by boat or plane. A new highway is being built which will make the city accessible from the interior of the country.

Most of the buildings in the city are of cement block construction with fire resistant roofs, one or two stories in height. A new hospital and an administration building have been built in the last few years. In the outskirts of the city most of the buildings are made of bamboo with the thatch covering. Practically all of the streets in the downtown area are being removed and will be replaced with modern streets and sidewalks.

Personnel

Arrangements have been made to acquire personnel. The rank, salary, and number of employees will be the same as for the city of Harper.

Equipment

A new pumping engine of 500 GPM capacity has been purchased and is now stored in Monrovia. It is equipped with minor appliances and a limited amount of 1-1/2 and 2-1/2 inch hose.

Recommendations

1) Temporary quarters should be provided immediately so that the equipment can be put in service.

2) Personnel should be adequately trained.

3) Wells, cisterns, storage tanks and other arrangements should be made for the storage and drafting of water.

4) A new fire house should be built and equipped with the necessary facilities.

* * *

D. Harper

Description

The city of Harper (Maryland County) is situated on the southeast corner of the Republic of Liberia, near the border of the Ivory Coast. It has a population of 8,000 people and is approximately 260 miles from Monrovia. At present Harper can be reached only by boat or plane. A highway network is being developed to ease this situation in the next year.

President William V. S. Tubman was born, reared, and now maintains a house in Harper.

Most of the buildings in the city are masonry with fire resistant roofs ranging in height from one to three stories. Around the outskirts of the city are found many thatch huts which are generally arranged into communities. During the dry season these buildings constitute a considerable fire hazard.

A hospital, mission school, and high school occupy prominent positions near the business district of the city.

Personnel

The personnel consists of a Senior Deputy Fire Chief (\$2,400), an Administrative Assistant (\$600), a Fire Officer (\$600), Staff Officer (\$500), three Fire Engine Operators (\$360 ea.), and six Firemen (\$360 ea.). The personnel is divided into two platoons working twelve hours a day, seven days a week.

Equipment

A 1960 Studebaker pumper equipped with a 500 GPM pump, a supply of 3/4-, 1-1/2, and 2-1/2 inch hose and minor equipment, is provided.

Remarks

Due to the infrequency of response (about one run each month and a half) and the fire resistant construction of building, it is believed one engine company can provide reasonable fire protection at this time, provided personnel is well trained and arrangements are made for obtaining a water supply.

It is realized that no means of communication exists, but unfortunately nothing can be done until a telephone system is installed.

The hazards created by the proximity of the huts and their inflammable construction will not be eliminated until a suitable building code is enacted and enforced.

Recommendations

1) The fire house should be completed and equipped with essential furnishings and a hose dryer.

2) Suitable approaches should be provided so that fire apparatus can be driven close enough to available bodies of water without becoming mired.

3) Wells, cisterns, and/or tanks should be installed where open bodies of water are not available.

4) A practical training program should be implemented.

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F. Nimba Mountain

Description

Nimba is the terminus of the railroad line that is being laid from Buchanan. The great Nimba iron ore mines are located here. A huge self-sufficient mining complex is also being constructed here in anticipation of the opening of the railroad line. An extensive saw mill operation is now providing the ties for the railroad bed. A power plant, railroad yard, conveyor belt and other adjuncts necessary for this type of a project are being constructed. Sewage, water, and highway systems are also in the plans and a large housing project for personnel is now under construction.

Personnel

The only personnel are members of a company fire brigade.

Equipment

A jeep equipped with a fire pump, hose and minor appliances is now in service.

Remarks

This project is a private undertaking of certain mining companies. A fire consultant has been engaged and his recommendations are being followed. The conveyor belt will be equipped with a sprinkler system. First aid fire appliances are being installed in buildings, etc.

This area is going to expand rapidly in the near future insofar as buildings, equipment and personnel are concerned.

Recommendations

At this time no public fire equipment is required as this is a private enterprise.

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G. Robertsport

Description

This is a small coastal village (3,000 inhabitants) situated about 50 miles northwest of Monrovia in Cape Mount County. It is estimated that there are approximately 100 Western style homes here, the majority of which are of fire

resistant construction. About one-half of the buildings are erected on the steep sides of a high hill that overlooks the lower part of the village. Avenues are of laterite and the grades are very steep in places. Because of the terrain, ordinary passenger cars are scarce. Jeeps or Land Rovers are used in this community.

Personnel

None.

Equipment

None.

Remarks

There are no fire protection facilities. The town is practically isolated from other sections of the country due to its location and almost completely circled by water. A small landing strip is available for the use of airplanes transporting passengers and freight.

Recommendations

1) A small trailer should be equipped with a 125 GPM pump, a 100-gallon water tank, 250 feet of 1-1/2 inch hose, and a combination variable fog and straight stream playpipe. This trailer could be attached to a jeep and pulled to a fire when desired.

2) Small dams should be built in the stream that flows down the hillside to the village below so that water will be provided for drafting or refilling of the water tank.

3) Instructions should be given to the civic-minded people who are willing to form a volunteer fire department.

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H. Saniquellie (Central Province)

Description

This is a small town which is located in a peninsular-shaped area of land that projects into French Guinea. Most of the modern buildings are either one or two stories in height and are made of cement blocks. A new market of unusual beauty and size stands on the shores of a small lake near the business district of town.

Personnel

None.

Equipment

None.

Remarks

The basic problem here is the existence of many thatch structures that create fire hazards. An enforced building code is the best means of eliminating such a condition. The fire resistant qualities of Western-style buildings are a large factor in reducing fire incidents.

Recommendations

1) The organization of a volunteer fire department with a complement of qualified personnel should be instituted.

2) A course of instruction should be given so that personnel will be qualified to operate the apparatus and be able to utilize the training in fire situations.

3) A jeep-type vehicle, equipped with a 125 GPM pump, at least a 100-gallon water tank, a 1-1/2 inch hose and variable fog and straight stream playpipe should be furnished and provided with storage to protect it from weather conditions.

4) A series of wells, cisterns, or ground tanks should be provided for water storage.

5) Approaches should be provided at the lake for fire pump drafting.

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I. Zorzor (Western Province)

Description

Zorzor is a small town in the Western Province, located near the French Guinea border.

Most of the Western-style buildings in the town are one-story cement block structures but the majority of the other structures are thatch huts. These huts are built very close together and constitute a large segment of the town. A hospital

and a well maintained school are probably the most important building in the community.

Personnel

None.

Equipment

None.

Remarks

Several serious fires involving many thatch huts have occurred in the Zorzor area in the last few years. The most practical means of preventing these fires is to enact and enforce a code which would require these structures to be built a safe distance apart and to be equipped with fire resistant roofs.

It would be difficult, if not impossible, even for a modern fire department to control one of these fires that developed into conflagration proportions, even if an adequate water supply system were available. It is evident that one fire truck dependent on the limited amount of water carried in its tank would have little effect on such a fire.

Recommendations

1) Efforts should be made to organize a volunteer fire department with competent personnel. If this proves successful, a course of instruction should be given.

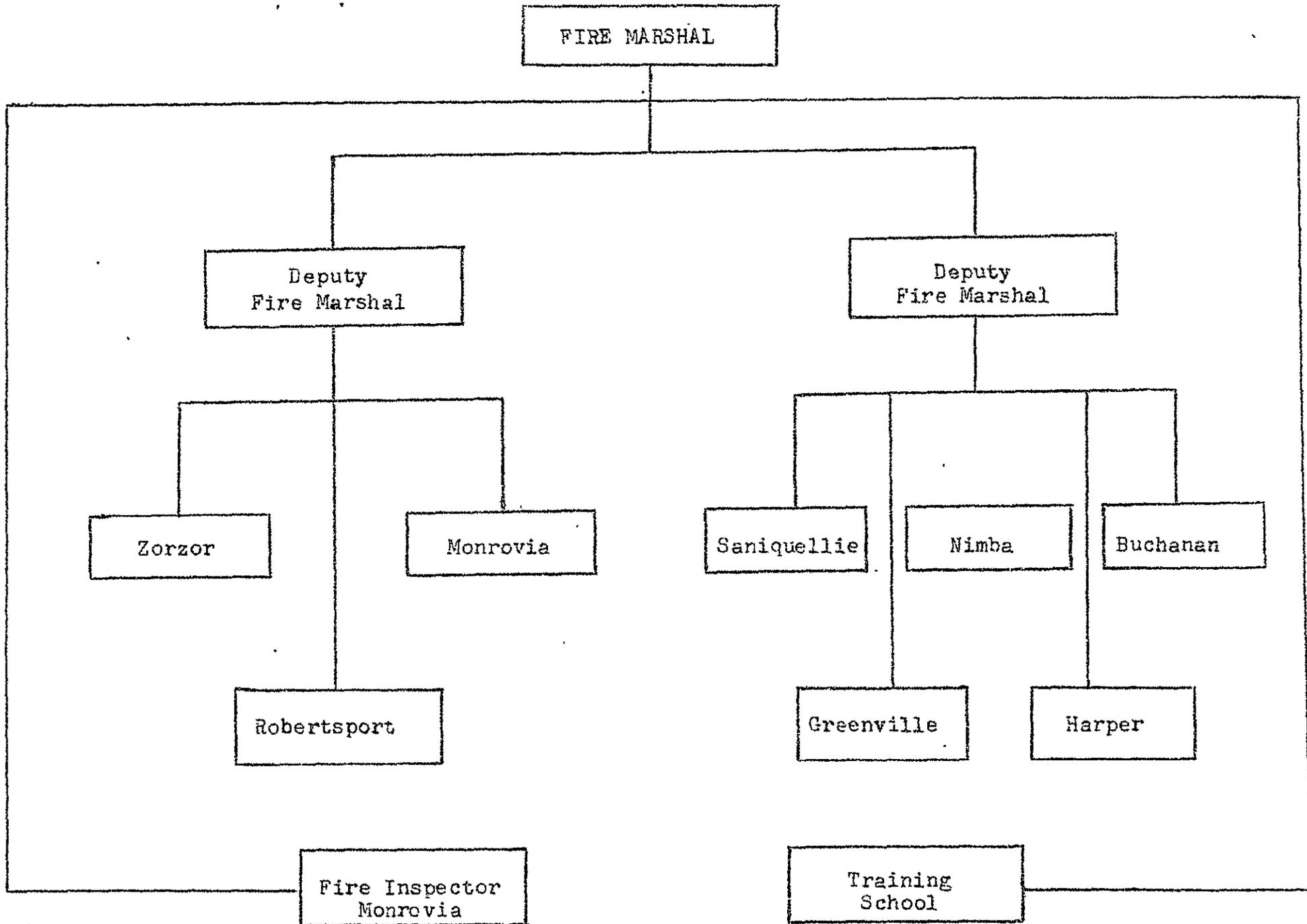
2) A jeep-type vehicle equipped with a 125 GPM pump, a water tank of at least 100 gallons, a 1-1/2 inch hose, and a variable fog and straight stream playpipe should be furnished and protected from weather conditions.

3) A few well placed ground tanks, cisterns, or other water storage facilities should be built for water storage.

4) A suitable approach should be provided at the creek below town so that water could be drafted without danger of the jeep becoming mired.

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III CHARTS

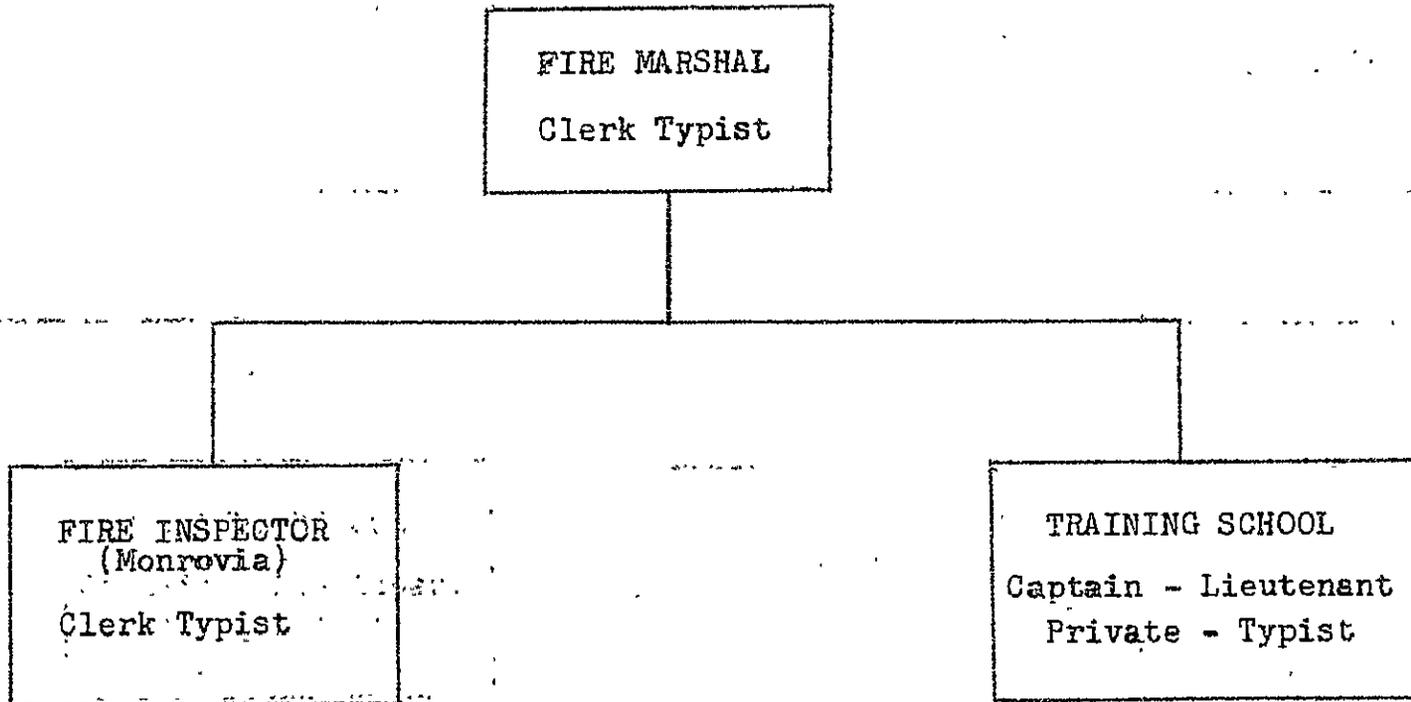


FIRE ORGANIZATION, REPUBLIC OF LIBERIA

Chart I

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* SPECIAL FACILITIES*



MONROVIA FIRE SERVICE

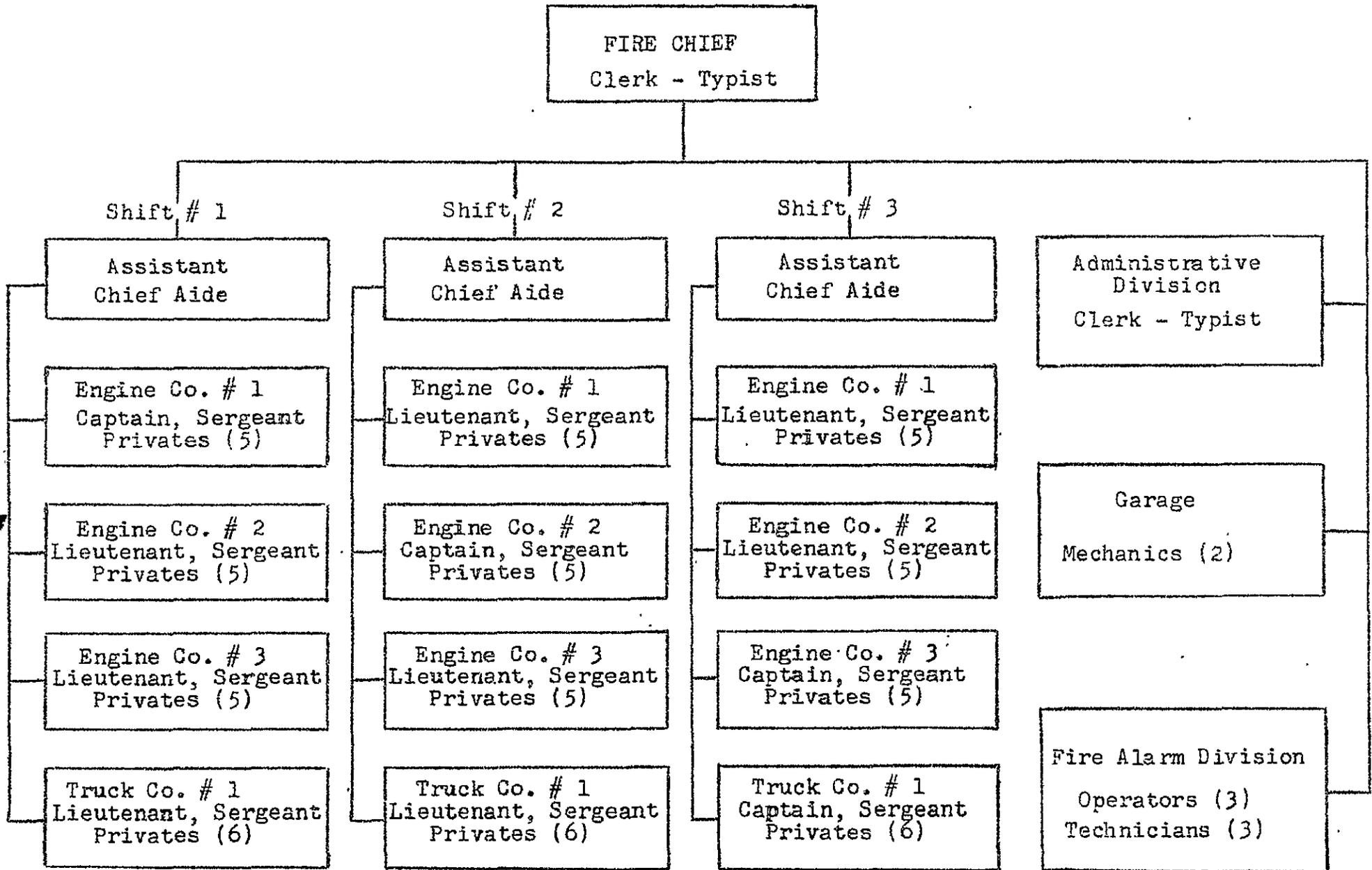


Chart III

NOTE: There are five (5) Engine Companies in the Fire Service. Engine Companies # 4 and # 5 will be manned like Engine Companies # 1 and # 2, respectively.

ORGANIZATION
Small Cities - Liberia

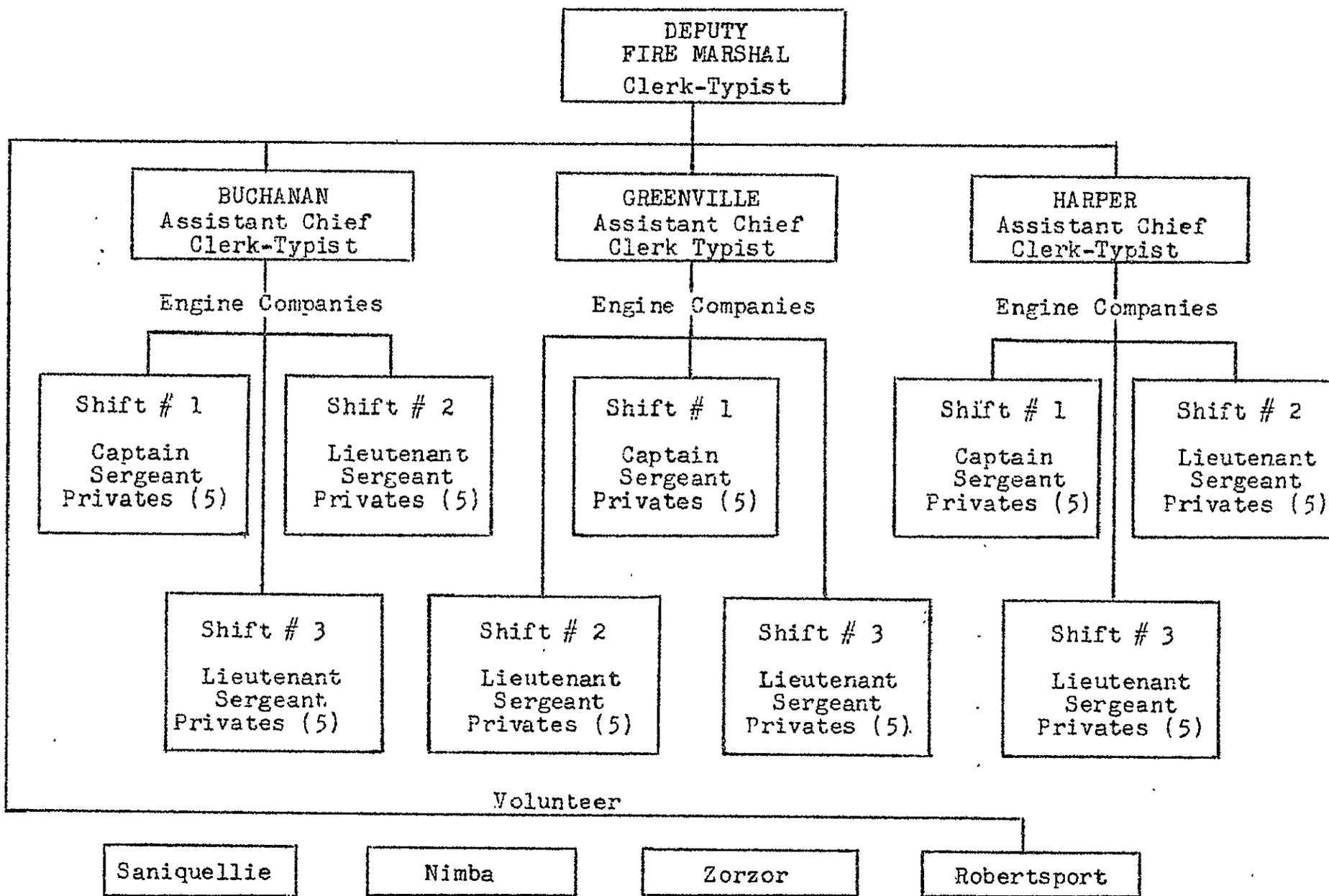


Chart IV

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