

CAPE TOWN CENTRAL FIRE STATION

THESIS FOR BACHELORS DEGREE IN ARCHITECTURE

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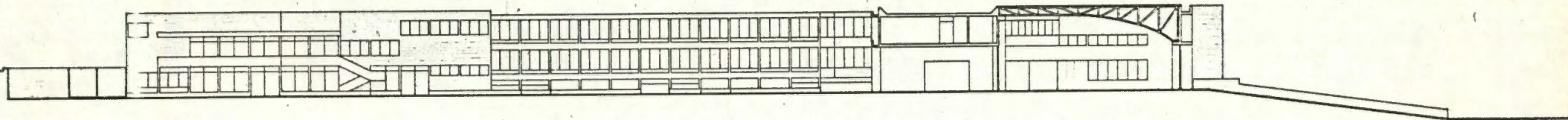
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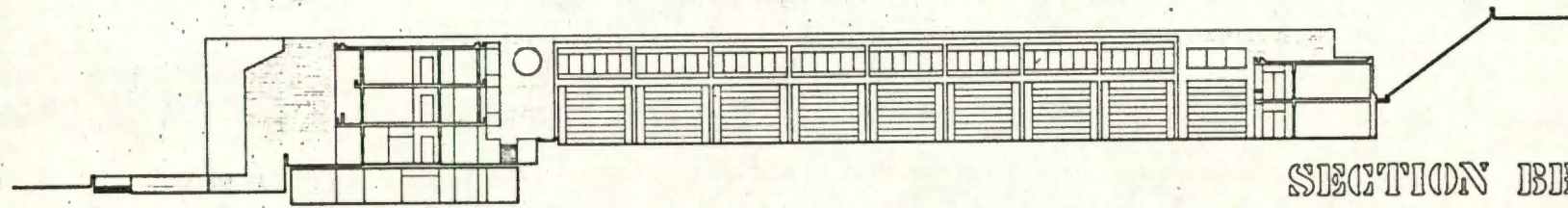
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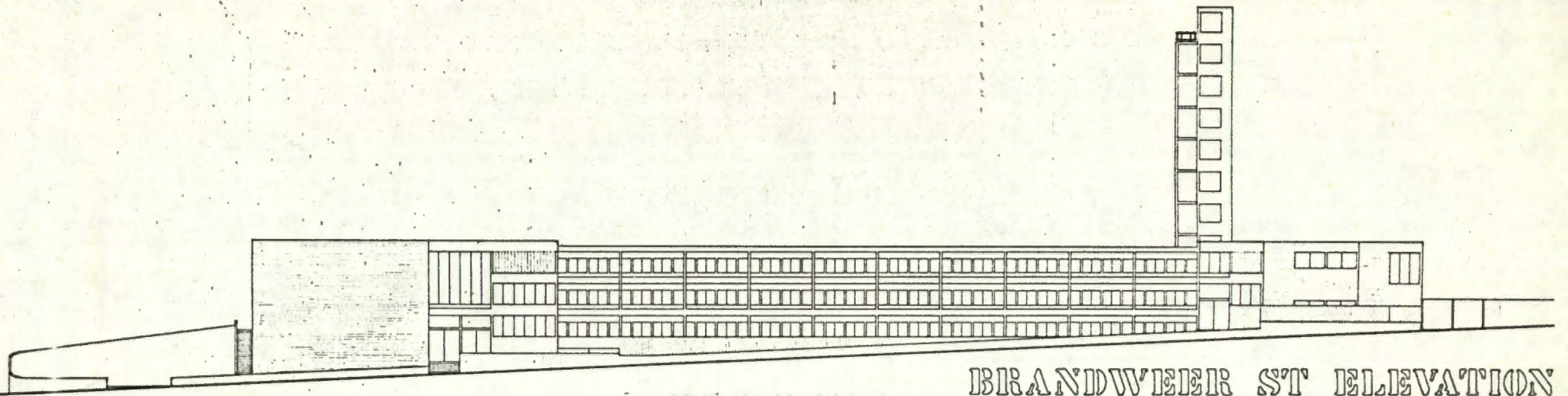
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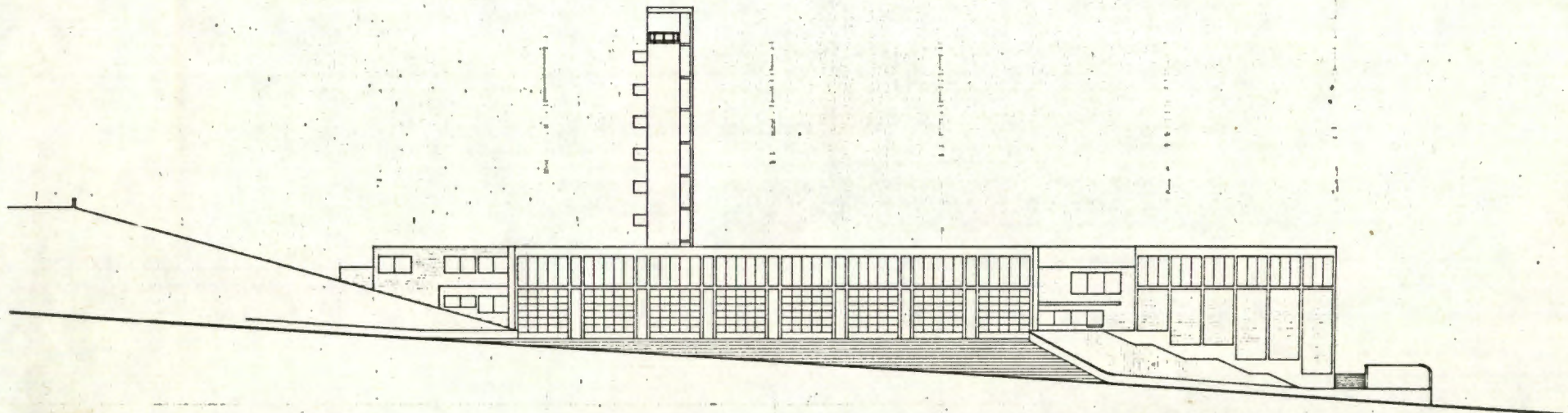
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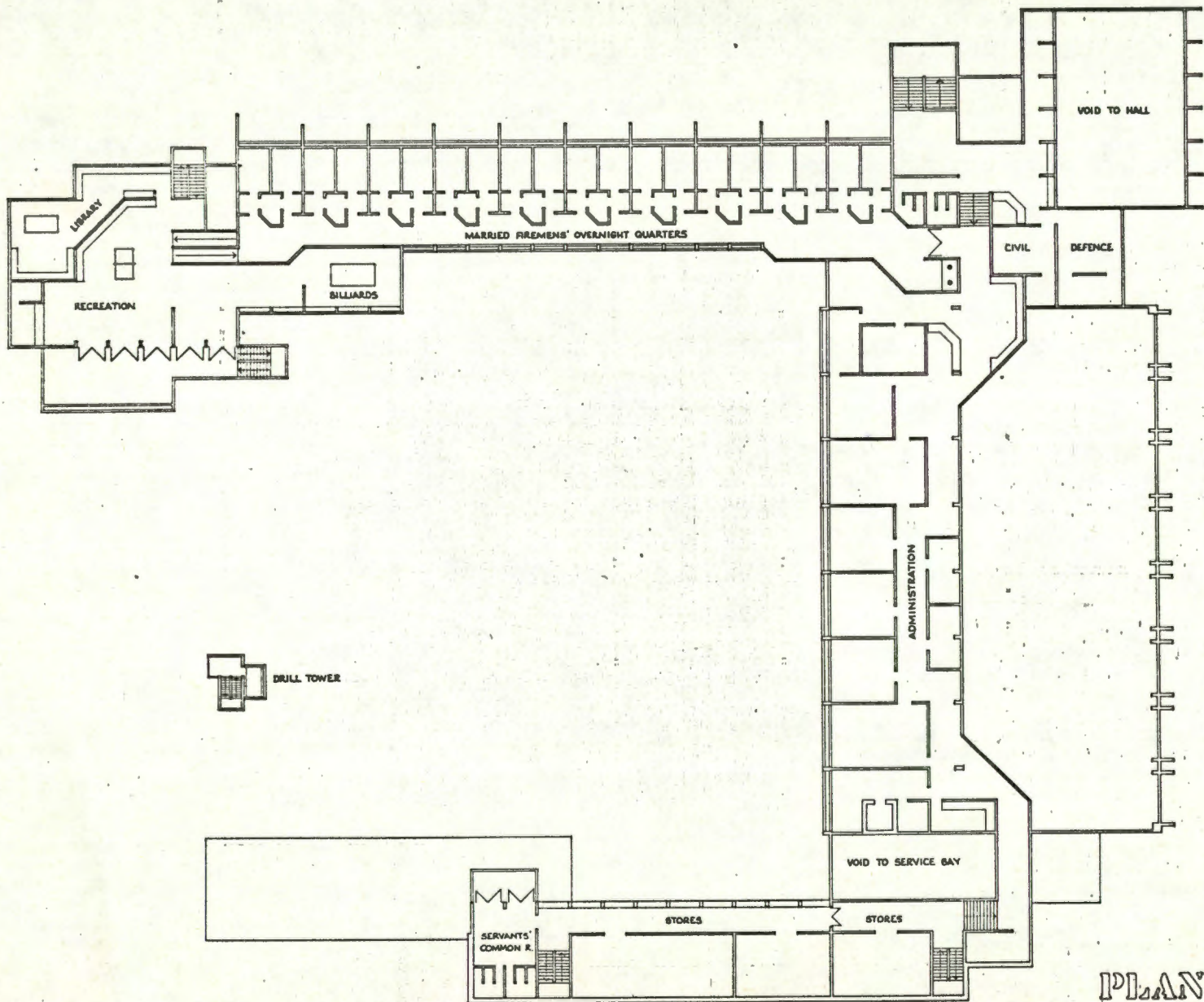
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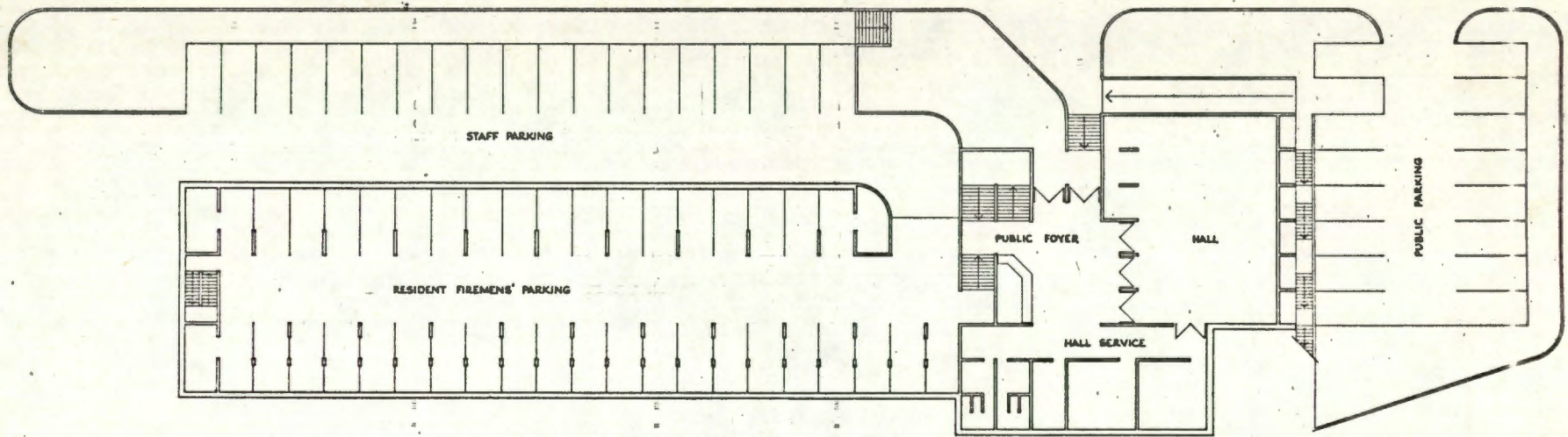
BRANDWIEER ST ELEVATION



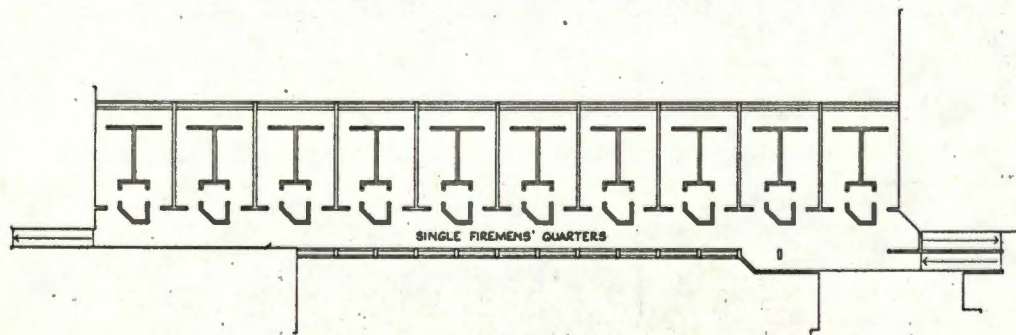
IRDELAND ST ELEVATION



PLAN LEVEL 4



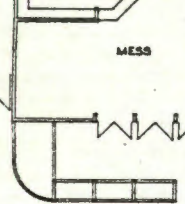
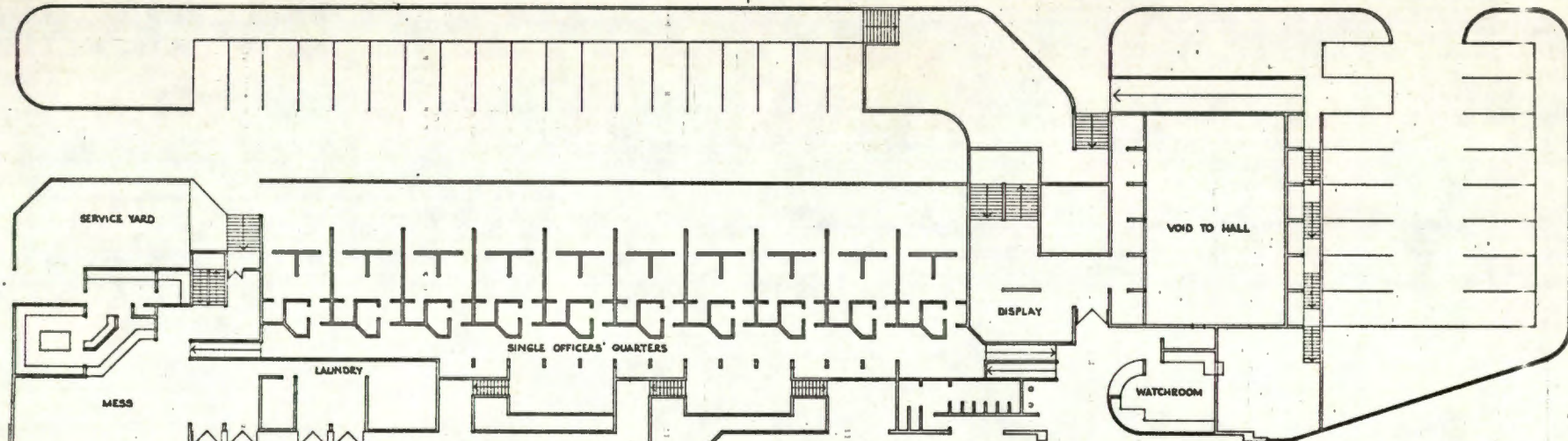
PLAN LEVEL 1



PLAN LEVEL 3

BRANDWEER ST

LB



SERVICE YARD

MESS

LAUNDRY

SINGLE OFFICERS' QUARTERS

DISPLAY

VOID TO HALL

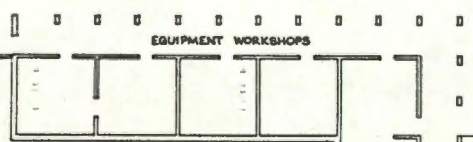
WATCHROOM



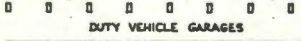
SHAFTING PIT



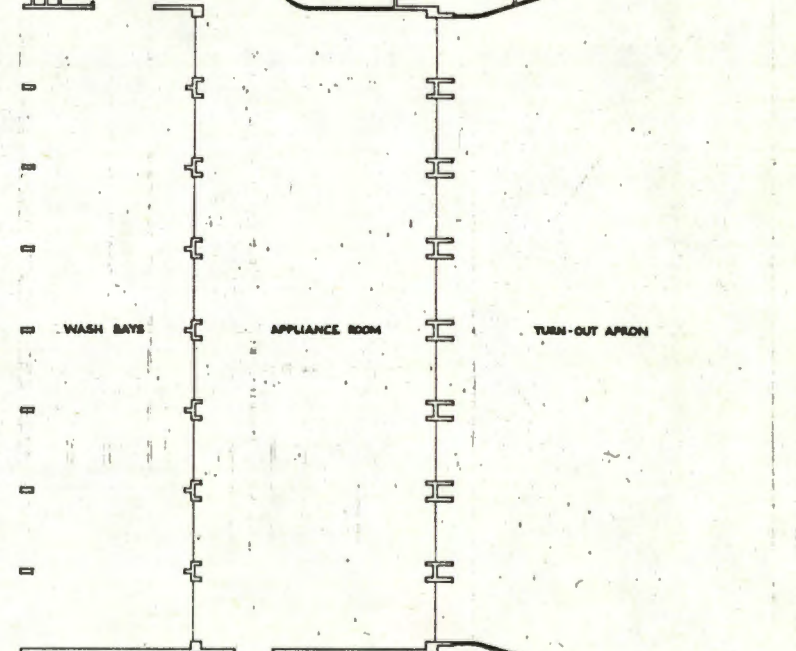
DRILL TOWER



EQUIPMENT WORKSHOPS



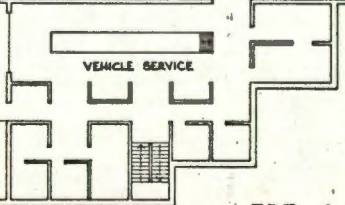
DUTY VEHICLE GARAGES



WASH BAYS

APPLIANCE ROOM

TURN-OUT APRON



VEHICLE SERVICE

ROELAND ST

LB

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INTRODUCTION

A



The fire service is unique in providing for the whole community a form of protection that is beneficial to all. It does not serve any one group of people to the detriment of others, nor can it be manipulated to further political ends. It is an organisation with a highly developed sense of honour, which commands the respect of the people it serves.

It also captures the imagination of the public. Its machines are flashy and exciting, its work vital and dynamic. Contact with the community is essential for the fire brigade, as the number of fires that break out can only be kept under control by increasing the awareness of the community.

For this reason the fire station must not only be a symbol of civic protection, it must be a building that actively reaches out to the people, and encourages them to participate in its activities.

The existing central fire station was built in 1932, and its efficiency is now suffering in two respects. The growth of the brigade has resulted in unplanned expansion of the administrative section of the building, which has caused functional relationships between different activities to become disjointed. In addition, the senior officers feel that there are too many different activities taking place in the station for it to operate smoothly. As well as the normal fire station functions and administrative headquarters, the central station accommodates the workshops and training school which serve the whole brigade.

To overcome these problems, the fire department plans to demote the present headquarters to the level of a sub-station serving the city centre, and to build a new central fire station in Paarden Eiland. In many ways this is an unfortunate decision. The executive, administrative and public-orientated activities will be isolated from the people they serve, and the associations of the central fire station forming a gateway to the city at the top of Roeland Street will be lost.

Furthermore, the same problems of over centralisation affecting the present building will be encountered in the new headquarters.

What I propose, therefore, is that the activities of the present central station should be shared between two buildings.

One will be new Paarden Eiland station, which will be the operational headquarters of the fire brigade. It will have a large number of appliance bays, and will accommodate the operational control for the whole brigade, the central workshops and stores, and the training school. These activities are all best located away from the general public, and their scale is appropriate to an industrial area.

The other building, which forms the subject of this thesis, will be a replacement for the existing central station on the same site. It will act as the executive and administrative headquarters, and will only hold enough fire engines to serve its immediate fire area. It will thus maintain its function as public relations centre of the brigade in its present location, with its advantages of proximity to the city centre, ease of access, and a splendid site.

OBJECTIVES

B



The design of a fire station requires the combination of a number of conflicting requirements. Efficiency is of prime importance, but it must not prevent the resident firemen from finding privacy when they are off duty. The building should attract the community, but provide security against unwelcome intruders. The resolution of these four major requirements is the major objective of this thesis.

B1. EFFICIENCY

The effectiveness of a fire brigade depends on how quickly its men can reach a fire. Flashover time, when the fire begins to get out of control, occurs only 10 - 14 minutes after it has started. Very few fires are reported immediately, so the fire crews are allowed only 5 minutes in which to reach any incident in the city centre.

Within a minute of receiving a call, the men must have boarded their appliances and driven out of the station. Thus the primary consideration is to allow them to reach the engine room as quickly as possible from any point in the station. Circulation time must be reduced to the minimum, and all circulation conflicts avoided.

B2. SECURITY

Security is essential as in times of unrest a fire station is a prime target. The first task of an urban terrorist is to incapacitate the organisations that provide essential services, after which he can wreak havoc without interruption.

The station should be planned in segments, where the operational zone becomes a security area from which the public can be excluded. In times of urban guerilla warfare the watchroom serves as an important centre of communications while the drill yard becomes the equivalent of the medieval donjon.

Sharing this concern for security are the civil defence people who maintain a command post at the fire station. This is a convenient arrangement as they have access to a continuously manned watchroom, and can use the station's lecture hall for public instruction on civil defence.

B3. PUBLIC INVOLVEMENT

The most important function of the fire brigade is to prevent fires from happening in the first place. The only way to do this is to instil in the community a sense of the importance of fire prevention measures.

All citizens should be encouraged to visit the fire station and attend displays, demonstrations, films and exhibitions. The fire station should become a far more public orientated place, where people can get to know the firemen who protect them, and perhaps become interested in participating themselves.

B4. COMMUNITY AND PRIVACY

The firemen live together as a large family, and communal activities are very important to them. However, the idea of community must not be forced on the men. Only by providing each man with a private space which he can call his own can the concept of community living be realised.

It is important, too, that the resident firemen can get away from their work when not on duty, although they live on the premises. The living quarters and recreation areas must allow the men to feel removed from the functional activities of the station, but still be immediately available for response to a call.

LOCATION

C



CI. DISTRIBUTION OF FIRE STATIONS

The Cape Town Fire Brigade operates from two divisions, each served by a divisional station and additional sub-stations located at strategic points in the fire area. The following fire stations constitute the strength of the brigade:-

Northern Division - A Station : Headquarters and Northern Divisional Station
B Station : Sea Point Sub-Station, 6.5 km from headquarters
C Station : Salt River Sub-Station, 4 km from headquarters
F Station : Epping Sub-Station, 14.5 km from headquarters

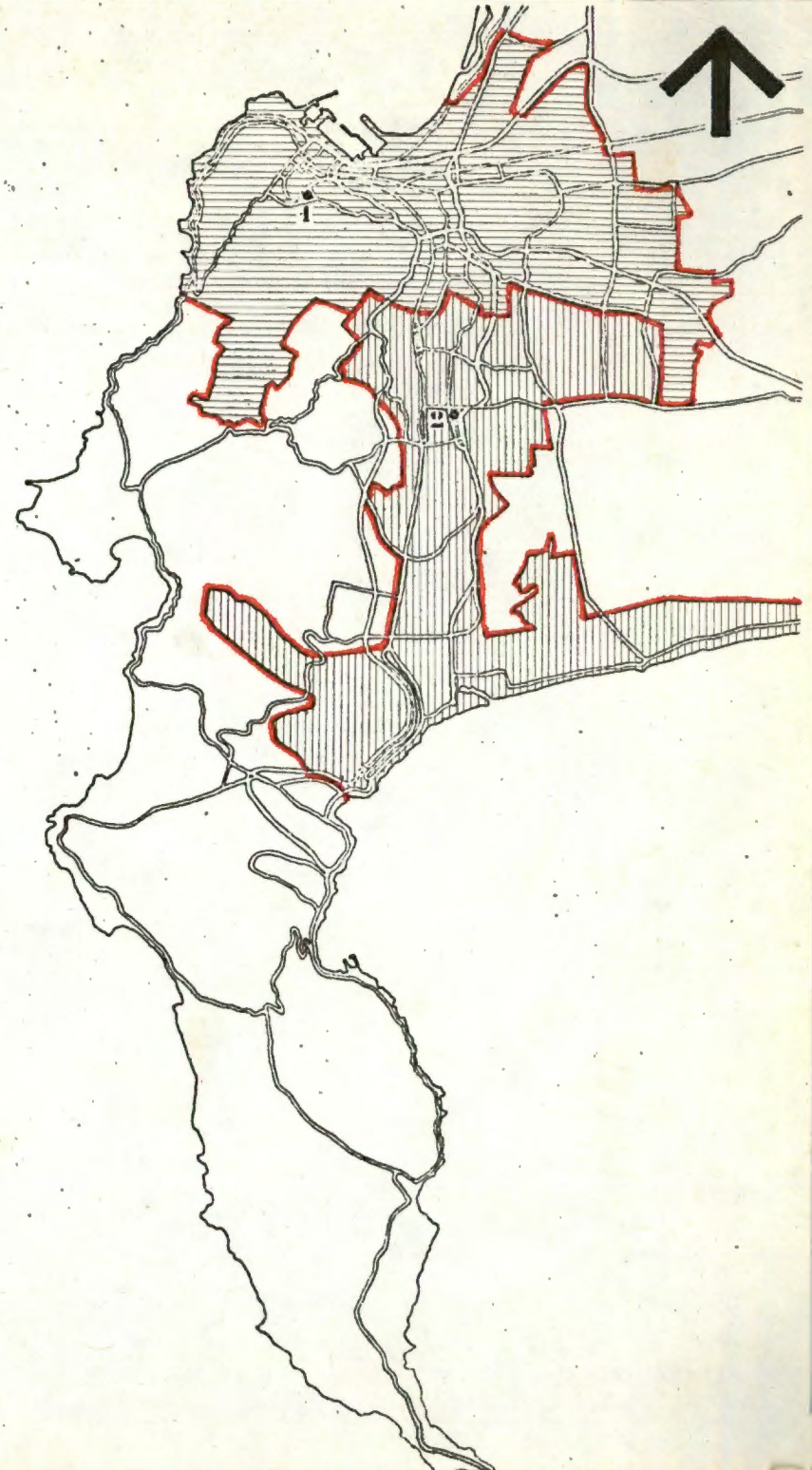
Southern Division - D Station : Wynberg and Southern Divisional Station, 13 km from headquarters
E Station : Lakeside Sub-Station, 24 km from headquarters

In addition, two new stations are planned, one at Paarden Eiland (G Station) and the other at Mitchells Plain (H Station), which is served at present by the station at Wynberg.

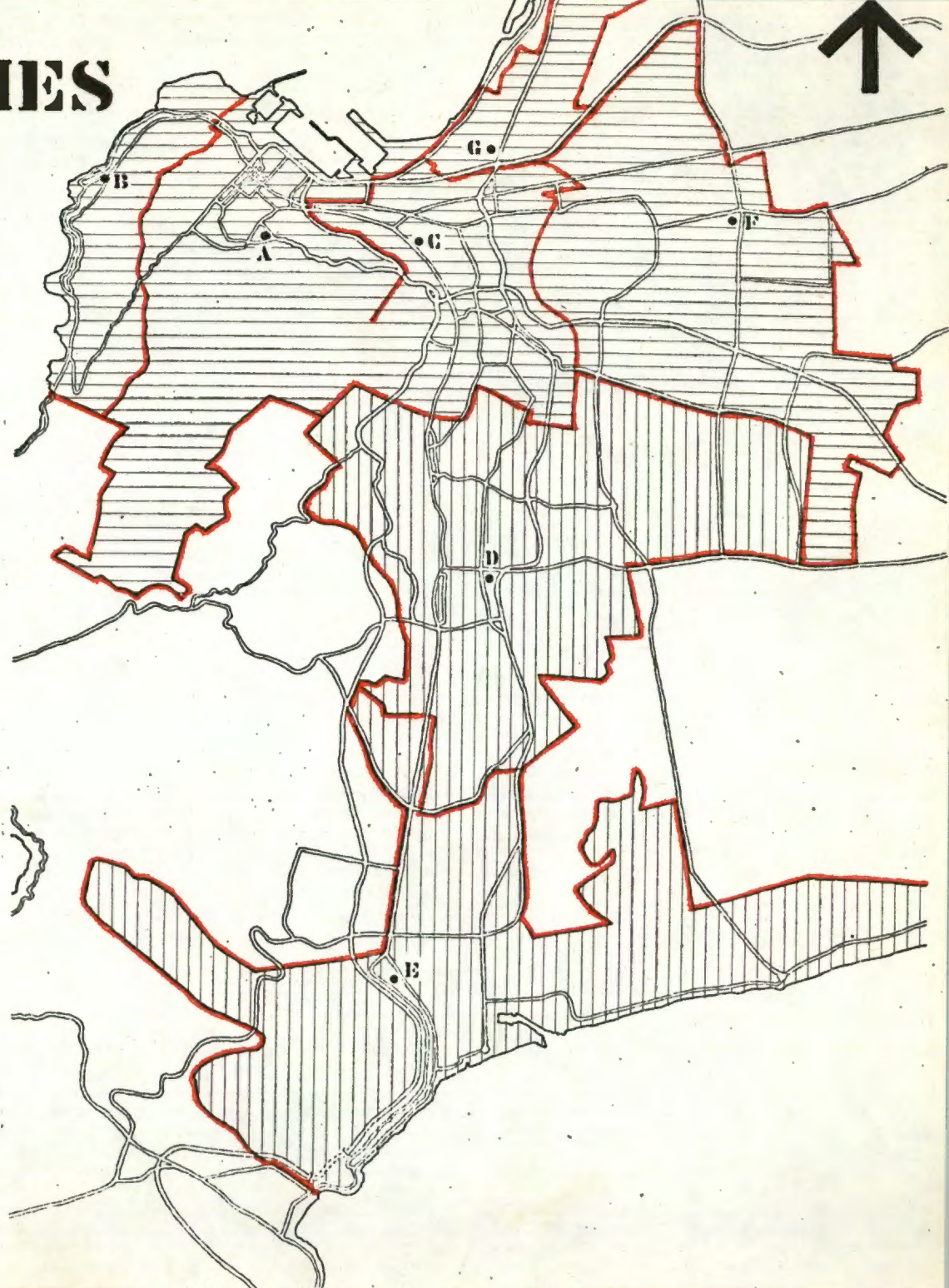
The brigade not only provides protection for the Cape Town municipal area, but also serves the following areas outside the municipal boundary - Pinelands Municipality, Pollsmoor Government Village, Westlake Government Village, Wingfield Aerodrome and Youngsfield Aerodrome.

The docks have their own fire patrol, administered by the Department of Railways and Harbours. It consists of officers and men equipped with two minor fire appliances, and its task is to patrol the area and extinguish any minor fires that occur. In the event of a serious fire they alert the Cape Town Central Fire Station and attempt to keep the flames under control until the main fire-fighting force arrives.

DIVISIONAL BOUNDARIES



STATION BOUNDARIES



C2. SITING

The siting of a fire station must be considered in relation to the size and fire risk of the area it is to protect.

The main duty of the central station is to protect the central city area. This includes the central business district, the commercial and warehouse areas surrounding it, the older residential areas of Vredehoek, Oranjezicht and Tamboerskloof which constitute a considerable fire risk, and the new District Six development.

It must also be well situated to reach bush and mountain fires on Table Mountain, Lion's Head and Signal Hill, and have easy access to its sub-stations in case they need reinforcements.

It is better if the station is not located in the centre of town, to avoid traffic congestion, but it is important that normal social facilities should be close at hand for the benefit of the resident firemen.

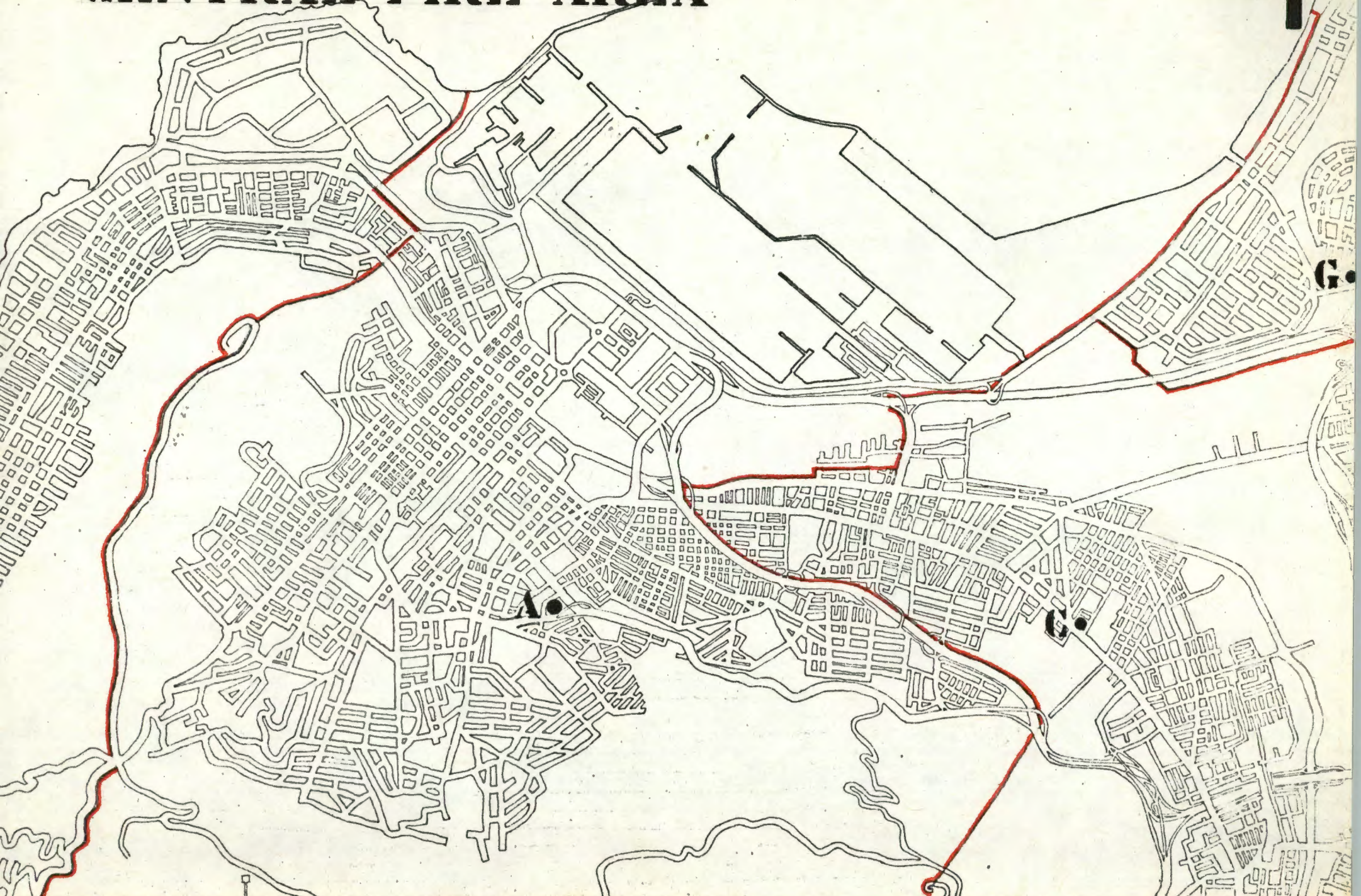
The site should be moderately level, to accommodate fire drill activities, and should be large enough to cope with future expansion. Although some fire authorities dislike placing a fire station on a slope, it does have the advantage that the fire engines can accelerate down to street level and pick up speed quickly without overstressing their clutches.

All these requirements are well satisfied by the site of the existing central station. The area around Roeland Street is not too heavily congested, and allows a quick getaway with immediate access to de Waal Drive and Mill Street. The old residential areas are within easy reach, as are the forested slopes beyond them. Swift access to the city centre is available via Mill Street and Roeland Street, and the projected Maynard Street - Canterbury Street link will

provide a direct route to the docks.

The existing site is particularly well-located for the men living on the premises. It has direct access to public transport, and is close to the shopping facilities provided by the Gardens Centre.

CENTRAL FIRE AREA



OPERATION

D



D1. FUNCTIONS OF THE FIRE BRIGADE

A fire brigade has two main functions - firstly, to prevent the outbreak of fire, and secondly, should a fire nevertheless occur, to prevent loss of life and property, to confine the fire to its place of origin, and to extinguish the flames.

Fire prevention is carried out by a special department of the fire brigade which attempts to reduce the number of fires that occur by educating the public, enforcing by-laws and inspecting premises.

Fire prevention measures can never be fully effective, so the main occupation of the brigade is the fighting of fires. At a fire, the firemen will first do all that is possible to rescue everyone still in the building, they will then attempt to confine the flames and damage to as small an area as possible, and finally they will extinguish the blaze itself. All fires are attacked in this sequence, but if enough men and equipment are available all three stages can be accomplished simultaneously.

The fire brigade also provides protection, in the form of men and equipment, in situations where large numbers of people are collected in a building, or where the risk of fire is inordinately high. Patrols are provided at all theatres where live entertainment is performed, so that if a fire breaks out it can be dealt with immediately.

In addition to its main functions of fire prevention and fire fighting, the fire brigade is often called out to deal with situations beyond the capacity of the average man. Firemen are trained to cope with emergencies like railway accidents, and release people trapped in lifts or under vehicles, rescue men overcome by fumes, pump out flooded basements, save climbers trapped on mountain faces, and retrieve cats from trees.

D2. FIRE PREVENTION

The purpose of fire prevention measures is to reduce or eliminate the hazards that contribute to the occurrence and spread of fire. By enforcing by-laws and inspecting premises, the fire brigade tries to prevent the outbreak of a serious fire.

The most important duty of the fire prevention personnel is to instil a fire prevention consciousness in the public. The greater proportion of fires occurs in dwelling houses, and the only way to reduce this type of fire is by securing the cooperation of the occupants. The activities of the fire brigade are publicised by organising public lectures, film shows and demonstrations, and by distributing pamphlets.

Another major occupation of the fire prevention personnel is the inspection of building plans for compliance with fire regulations. It is important that the fire inspectors not only understand what the by-laws state, but also comprehend what they are trying to achieve. By meetings with architects, clients and builders, they can spread information on the prevention of fire outbreaks generally, the design of buildings to prevent the spread of fire, the means of escape from fire, fire detection and alarm systems, and automatic devices for the extinction or suppression of fires in buildings.

In addition, the fire prevention officers inspect premises within the fire area, and control the registration of premises in which inflammable gases and liquids are kept. They also investigate fires and their cause of origin, providing information that helps the brigade to formulate better methods of attack.

The importance of the fire prevention division can be measured by the 20% reduction in fire losses in brigades where this department is efficiently organised.

D3. ALARMS AND COMMUNICATIONS

The fire service can only succeed in its continual campaign against fire if its communications remain intact. When the system of control breaks down, disastrous fires almost inevitably ensue. The commonest cause of fires developing into large conflagrations is delay in the initiation and transmission of fire calls.

Fire calls to brigades are normally made through the public telephone system or from street fire alarm boxes. The majority of calls are received by telephone, and this system is generally satisfactory. Street fire alarm boxes provide a quicker means of transmitting alarms than the telephone, but their disadvantages are that the caller cannot give any particulars about the fire, and they invite false alarms. The tendency today is to restrict the provision of street alarm boxes to closely built up areas where it might be difficult to find a telephone at night.

Another method of communication is by direct line, which is a telephone connected directly to a fire brigade control. Direct lines are used by hospitals, theatres and some of the larger hotels, but are also placed outside fire stations for use by the general public.

High-risk premises are normally equipped with an automatic alarm system incorporating a fire detection device and an alarm signal. The alarm signal is remitted direct to the nearest fire station.

All fire calls go direct to a central control room where a team of control room operators is constantly on duty to order the appropriate station to turn out appliances. Centralisation of the control room allows the operators to keep track of how many appliances are available to respond in each of the brigade's fire stations.

The fire station itself receives its instructions from operational control in the watchroom, where a duty officer calls up the fire crews. All the alarms in the station are controlled from the watchroom, and every room in the building has an alarm bell and emergency lights, and a loud-speaker through which the duty officer can issue instructions.

The brigade is equipped with a two-way high frequency radio system on the officers' patrol cars and the fire engines, so that rapid communication can be maintained between headquarters and units operating at a fire, and walkie-talkies are used for communication on the fire ground.

The fire department has a direct telephone link with other public services, enabling outside aid to be summoned when necessary. When an alarm is received the traffic department is informed, as their assistance is needed to help the machines get through the traffic more easily. The electricity department is on 24 hour standby in case they are required to switch off the power supply to a building to prevent the firemen from being electrocuted, and the water department is available to concentrate the water supply. The police are also informed, so that they can control any crowds that gather and investigate cases of suspected arson.

In the event of a major conflagration in the city, requiring the attendance of large numbers of men and machines, large areas of the city will be left without fire protection. For this reason the Cape Town brigade has an agreement with the neighbouring brigades of Milnerton, Goodwood and Fish Hoek that in such a situation they will send up to a third of their men and equipment to act as reinforcements in case further outbreaks occur.

D4. FIRE APPLIANCES

A fire appliance is the combination of the apparatus needed to fight a fire and the vehicle to carry this equipment, constituting what is commonly known as a fire engine. Six different types

of fire appliance are used by the Cape Town brigade, each appropriate to a particular fire fighting situation. These are the pump, the pump-escape, the turntable ladder, the hydraulic platform, the emergency tender and the grass-fire unit.

The pump is the principal type of fire appliance used in the service. It carries a main pump with suction and delivery hose, a water tank supplying a low-pressure pump for hoses with shut-off nozzles or a high-pressure pump for fog nozzles, a booster pump and booster hose, and a 9 meter extension ladder.

The pump-escape carries the same equipment as a pump, but with the addition of a 15 meter manually operated extension ladder on wheels. Because of its lightness and manoeuvrability this escape ladder is particularly suitable for entry and rescue work at moderate heights.

The turntable ladder is used for external rescue work at heights inaccessible to other appliances. It carries a 30 meter power-operated extension ladder with a hose line extending to the top, from which a fireman can project a heavy stream of water on to a building.

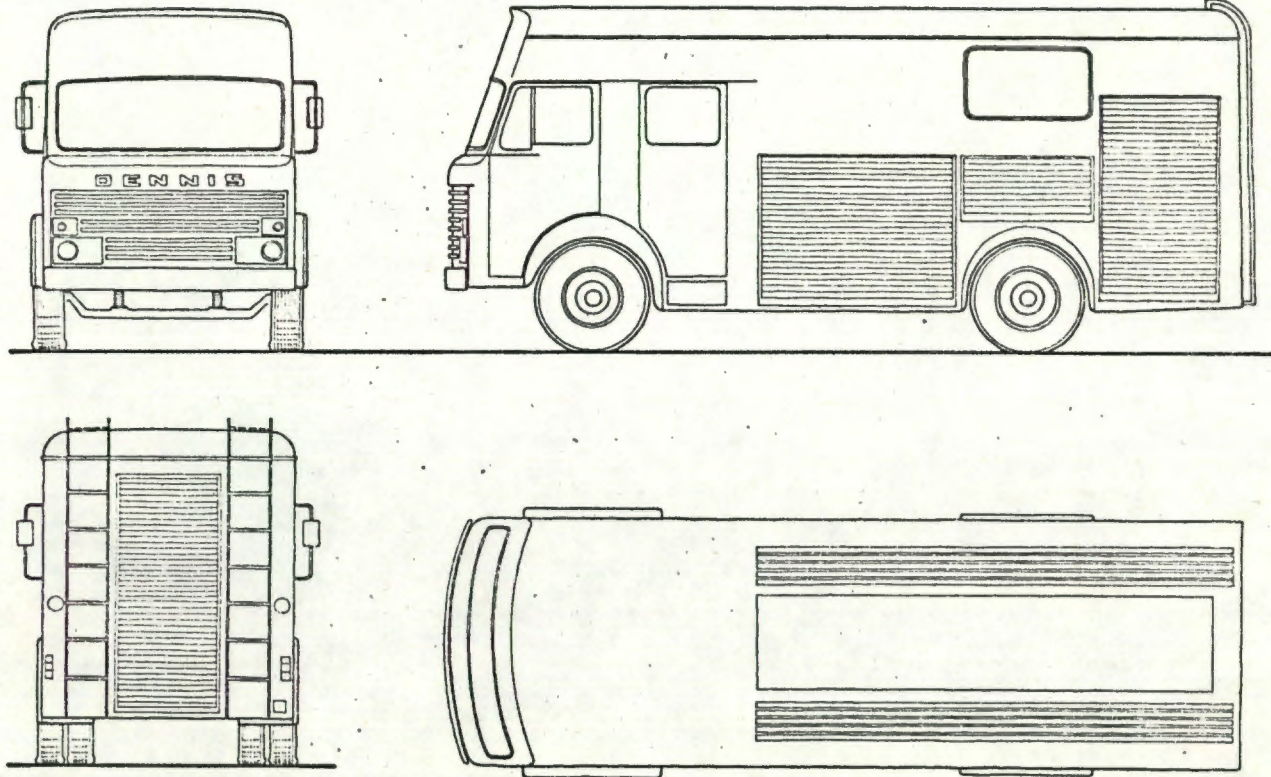
The hydraulic platform is a more recent type of fire appliance, designed for speedy rescue work. It consists of two hinged power-operated booms, at the top of which is a platform for the fireman. A hose monitor is mounted on this platform, and if a building is within the height range of the appliance the top boom can be projected over the roof, enabling the fireman to hose the back of the building.

The emergency tender has a portable pump that allows firemen to attack a fire that is still in its incipient stage. It also carries portable fire extinguishers, breathing apparatus, power-driven cutting tools for use at traffic accidents, and salvage equipment used to minimise water damage at a fire.

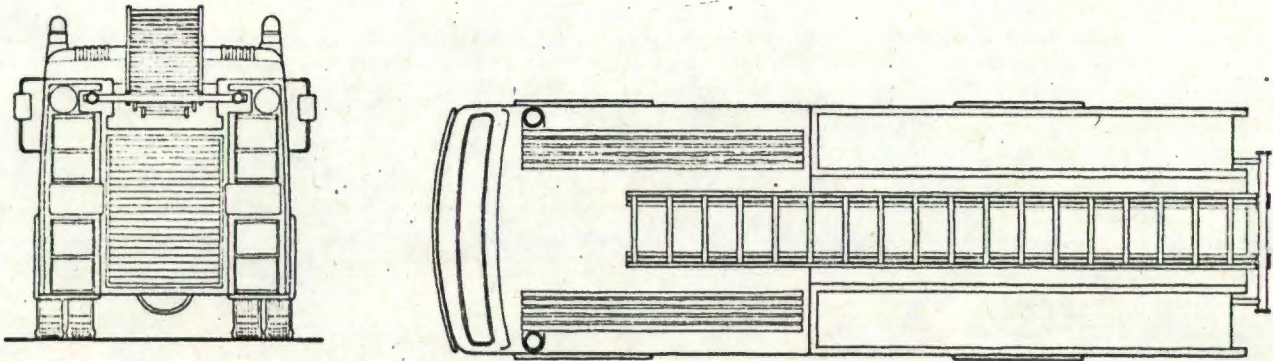
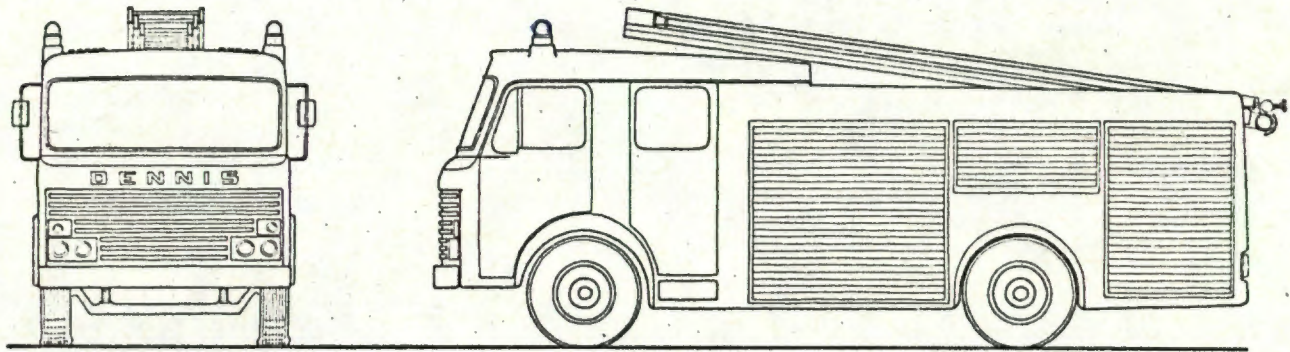
The grass-fire unit is a four-wheel drive vehicle designed to traverse rough terrain normally inaccessible to a major pump. It has a water tank, a pump and hose, and firemen can use the hoses while the vehicle is still in motion.

Qualified firemen are able to perform all the simple operations required to keep the appliances in proper working order, but major repairs are carried out by proper mechanics. At present all the appliances in the brigade are serviced at the central fire station, but in future the workshops will be situated at the new Paarden Eiland station.

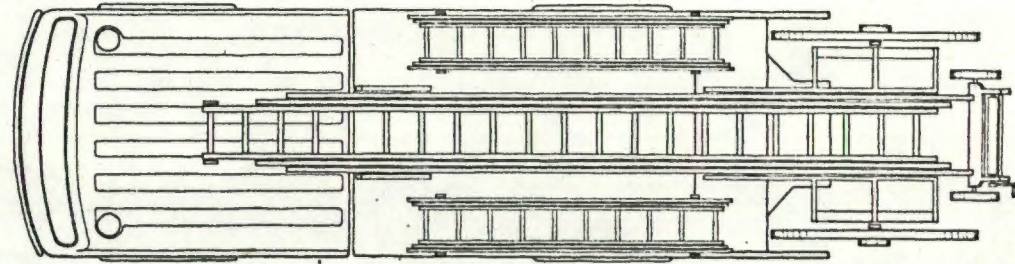
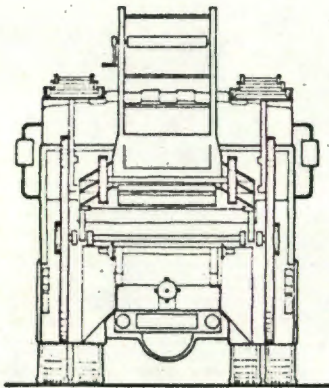
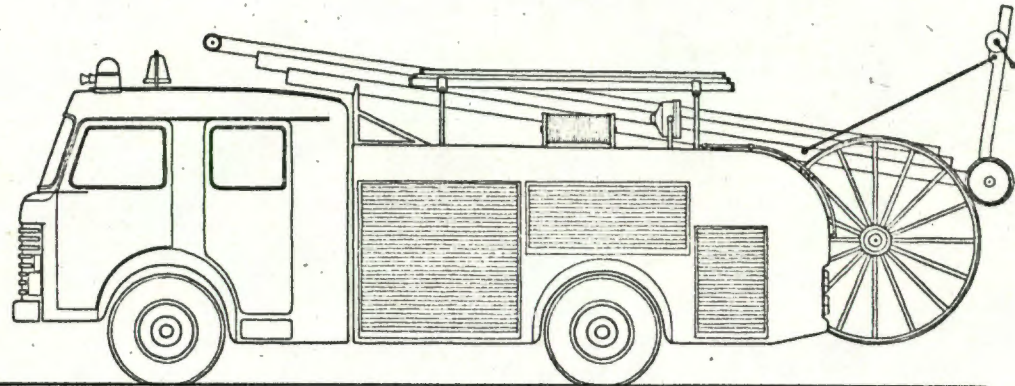
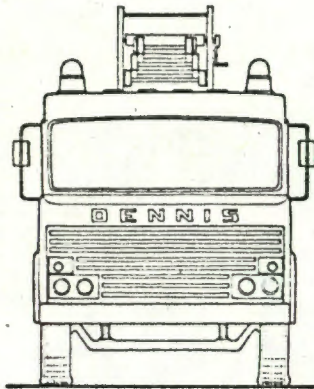
EMERGENCY TENDER



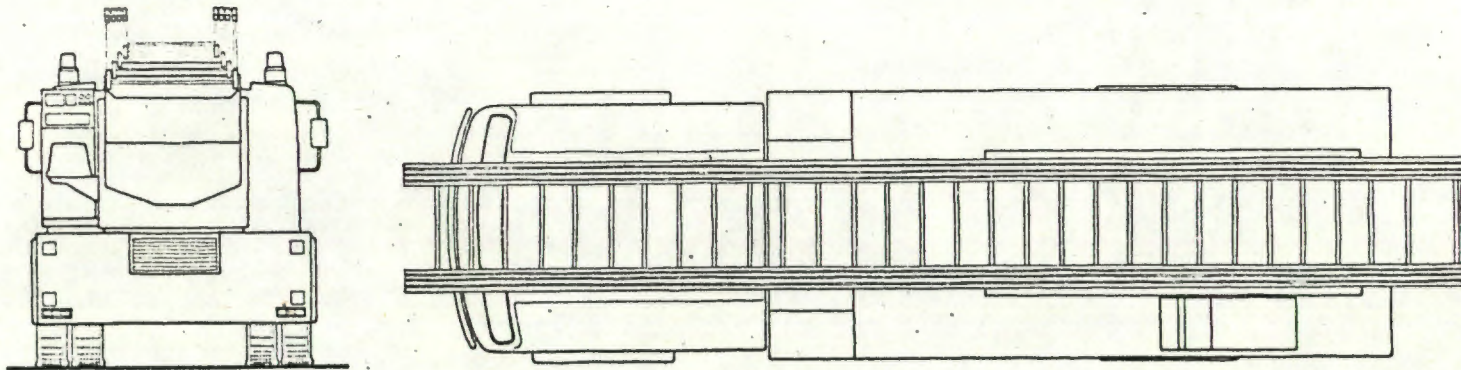
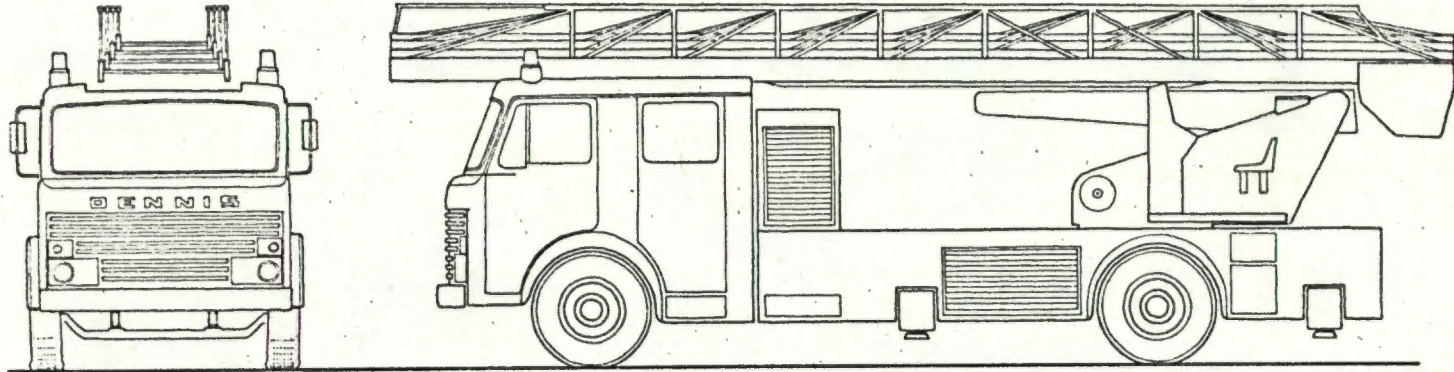
PUMP



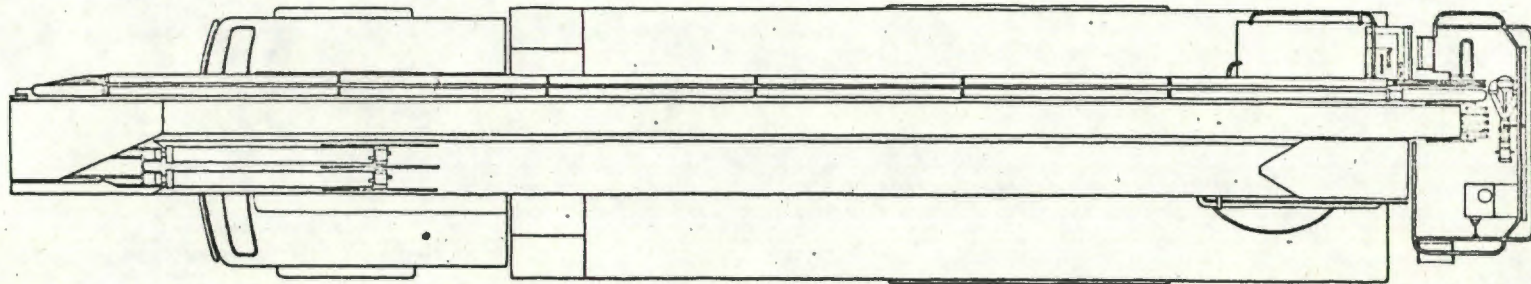
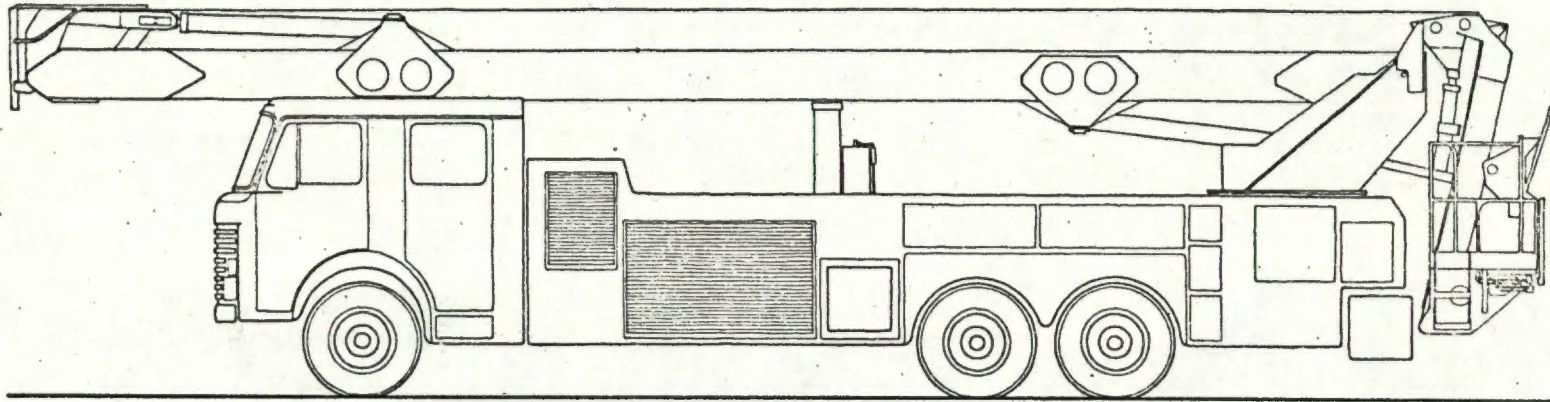
PUMP ESCAPE



TURNTABLE LADDER



HYDRAULIC PLATFORM



D5. FIRE-FIGHTING PROCEDURE

When the alarm bell rings the firemen are allowed one minute to drop whatever they are doing, get to the appliance room, board their machines and drive out of the station. They must pass the watchroom, where the drivers receive their route instructions, before proceeding to the fire engines on which their protective clothing is waiting. Some stations provide a muster bay in the appliance room with the firemen's helmets and tunics hanging on the walls, but the Cape Town brigade feel that this arrangement wastes valuable time. Their firemen continue to dress while actually en route to the fire.

The central station has a set of large maps showing the major and secondary roads as well as the positions of fire hydrants. These, together with a card index system giving particulars of occupancy, use of the building, access and surrounding roads, inform the duty officer of the quickest way to approach the fire. This information is relayed to the officer in charge of the appliances on the way to the fire, thereby reducing the time of arrival.

When the units do arrive at the scene of the fire, the officer in charge sends back one of two calls to headquarters. If he has the situation under control he sends a "stop call" which informs the station that no more appliances are needed. If he feels that the fire is too large for his men to cope with he sends an "assistance call" meaning that further appliances or special equipment are required. Once the men are actually involved in fighting the fire, he sends back periodic informative calls, describing to the duty officer the extent and spread of the fire, whether there are any people in the building who need to be rescued, and other relevant particulars. In this way the fire station can keep in control.

When the fire crews return from a fire, usually wet and dirty, they first have to clean their appliances and prepare them for the next call. Then they enter the wash and scrub area where they

remove the worst of the filth from their clothes, shower and put on clean uniforms, and resume their normal duties.

D6. TRAINING

The fire department is one of the few organisations where promotion is purely from the lower ranks. Every chief fire officer started off as an ordinary fireman. The fireman's training begins with a brief preliminary course, which forms the recruit's initiation period, and continues at intervals throughout his career with ever increasing complexity.

A large proportion of the recruit's training is in the form of fire drill, which takes place in the station yard and consists of mock-ups of situations encountered at actual fires. The drill yard is the nucleus of the training programme, and for this reason it is best to screen it from public view. An audience provides an undesirable distraction and often makes instructors unwilling to point out mistakes for fear of giving the impression that the firemen don't know what they are doing.

Instruction in the form of lectures and films is also given, so that a theoretical basis for fire protection can be developed, and the firemen are encouraged to study during the quieter periods.

The preliminary course consists of six months' intensive training which covers practical and theoretical instruction in the various phases of fire-fighting, the use of fire appliances and equipment, rescue and salvage operations, watchroom duties, and first aid. Recruits also receive instruction in the elementary principles of building construction, hydraulics, chemistry and electricity, in the interpretation of the by-laws governing fire protection, and in fire prevention duties. Special training in the operation of major appliances is given to men

assigned for duty as drivers of fire appliances.

After his six-month period of basic training the recruit takes an oral and practical examination in elementary fire-fighting techniques to become a probationary fireman. Further examinations at yearly intervals raise him through the ranks of second-class fireman and first-class fireman until he becomes a fire officer. After this he need not write any more examinations but is encouraged to take a Diploma in Firemanship with the South African Fire Services Institute.

At present all training is carried out at the central fire station. This is an unsatisfactory arrangement for two reasons. Firstly, the senior officers feel that the activities of the training school disrupt the normal work of the station, and secondly, the training staff prefer to carry out their programme away from the eyes of the public, who frequently visit the central station for administrative reasons. The training school will therefore be accommodated at the new Paarden Eiland station, but provision for firemen's drill and daily practical exercises will still be required at the central station.





-10m



ORGANIZATION

E

E1. PERSONNEL

A fire brigade is the department of a local authority that provides fire protection for the community. Every fire brigade is controlled by a chief fire officer who is appointed by the fire authority to be the executive and administrative head of the fire services in its domain. He is responsible to the fire authority for ensuring that the brigade is organised and managed in accordance with policy.

In large cities such as Cape Town, the area served by the fire brigade is sub-divided into geographical divisions, each under the control of a divisional officer. He is responsible for the operational efficiency of his division, and for the outbreak of any fires in it.

There are eleven senior officers in the Cape Town brigade - the chief fire officer, the deputy chief fire officer, the assistant chief fire officer, and eight divisional officers. One of the divisional officers is in charge of fire prevention, one controls the training school, and the other six are operational divisional officers who work the same 24 hour shift as their subordinates. All the senior officers attend fires with the men where necessary, but in patrol cars, not on the fire engines.

Below the divisional officers are the station officers, fire officers, leading firemen and firemen, who are all actually involved in fighting the fires.

The following are the personnel employed by the headquarters of the Cape Town Fire Brigade:-

Operational staff - Chief fire officer, deputy chief fire officer, assistant chief fire officer, 4 divisional officers, 5 station officers, 9 fire officers, 7 leading firemen, 57 firemen, watchroom attendant, cook.

Non-operational staff - Divisional fire prevention officer, assistant fire prevention officer, 4 fire prevention officers, hydrant officer, 13 hydrant cleaners, senior clerk, 2 clerks, secretary, 2 typists, office attendant, 11 labourers.

E2. DUTY SYSTEM

The duty system used by the Cape Town brigade is called the seven-platoon system, which originated in Scandinavia. The complement of the fire station is divided into seven platoons, of which three are on duty and four are off duty at any one time.

The men work three 24 hour shifts a week (24 hours on, 24 hours off), giving them two days off every week and four days off every seventh week : Friday, Saturday, Sunday and Monday. The shifts are so arranged that no man works longer than 24 hours except in extreme emergencies. When reserves are needed a code message is sent out over the radio and in the press, calling in all off-duty personnel.

All members of the brigade work to this system except the chief fire officer, the deputy chief fire officer, the assistant chief fire officer, the divisional fire prevention officer, and the divisional training officer, who only work a day shift.

E3. HOUSING FOR FIREMEN

The Cape Town and Johannesburg brigades have different views of the subject of housing for firemen. In Cape Town all the firemen live away from the station while in Johannesburg the men and their families all live on the premises.

Both approaches have their advantages and drawbacks. In Johannesburg less firemen need to be employed (in itself a contentious issue) as by living at the station they can work a 48 hour

shift and a greater proportion of the force is available on short call when off duty. However, the initial and long-term cost of housing is high - the Johannesburg brigade spends R2 million every year on building maintenance alone.

From the point of view of the firemen themselves, opinions also differ. Although they acknowledge that the station can operate more efficiently when all the men are immediately available, they feel that it is necessary for the men and their families to get away from their work and make friends outside the brigade. This is particularly important in the case of the married firemen, so no married quarters will be provided at the new Cape Town central station except for the senior officers.

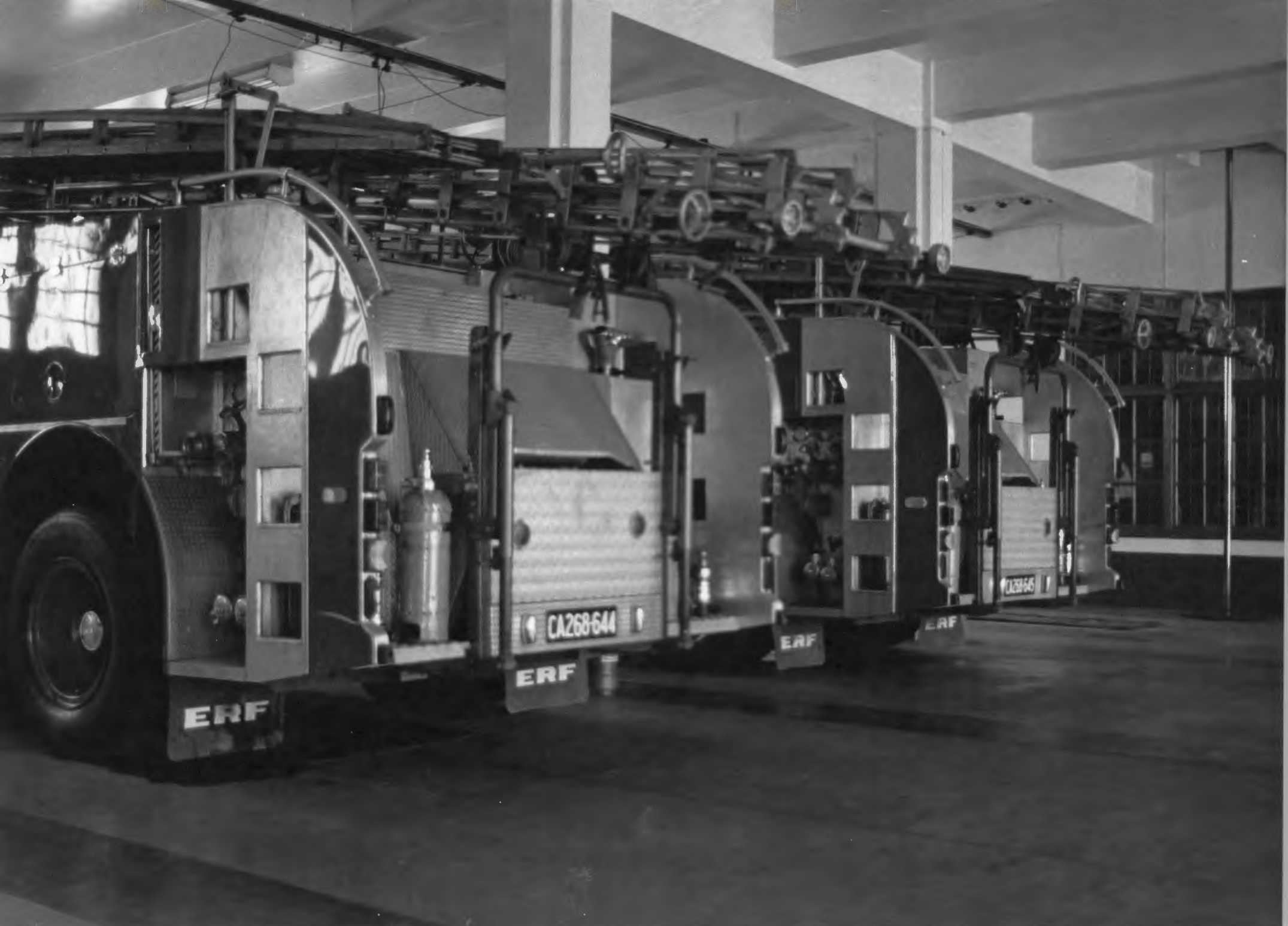
For the unmarried firemen, who constitute 40% of the strength of the brigade, there are considerable advantages in living at the fire station. They do not need the same degree of privacy as the married men, and by living in they will have at their disposal all the recreational amenities of the station. Sleeping quarters have to be provided in any case because of the 24 hour shift, so the extra cost involved in providing permanent living accommodation for the single firemen will not be prohibitive. Additional overnight accommodation will also be provided for the married men on duty.

An essential requirement is to provide housing for the senior officers, who must be available to attend any emergency with the men when necessary. Of the eleven senior officers, two are permanently stationed at Wynberg Divisional Station, so housing must be provided for nine senior officers and their families. The housing will be accommodated at the South-West end of the site, amongst the pine trees along the edge of Brandweer Street, but the design of the units will not form part of this thesis.



ACCOMMODATION

F



The accommodation requirements of a fire station can be subdivided into three major areas, each of which needs a certain degree of isolation from the others. The security area, which the public is not normally allowed to penetrate, consists of the operational area, the training facilities and the workshops. The public area includes the administrative offices, the civil defence quarters, and the multi-purpose hall and foyer. The private area comprises the living and recreation accommodation for the resident firemen, and it must have privacy from the public and operational areas.

Fire stations have a long hard life, and an important consideration in the design of a station is to reduce the amount of maintenance required. Finishes must be chosen with regard to durability, maintenance and ease of replacement. Those that are integral with the structure of the building are generally more satisfactory than applied finishes, and where surfaces do have to be applied it is better to use a finish made up of a number of small elements than to use continuous materials whose replacement is difficult and costly.

F1. OPERATIONAL

A fire station is planned around the appliance room. This room is used solely for the accommodation of fire-fighting appliances, and should be free of columns and projections that might restrict movement.

The front of the room must be set back from the road to allow room for a safety apron to turn out appliances. The surface of this apron should be ribbed to provide good traction for the fire engines, and should slope towards the road so that water can drain away.

Behind the appliance room are the covered washing bays. In some stations an enclosed wash-down area is designed as an integral part of the appliance room, which is thus deep enough to accommodate

two appliances, one behind the other. This arrangement improves the working conditions of the men, but negates the very principal of the washing bays - to prevent soot and dirt from being brought into the building.

The size of the appliance room is determined by the number of fire engines to be accommodated. It must be able to store the appliances without crowding, to permit quick boarding of machines in response to alarms, and must be large enough to park and manoeuvre present and future appliances, anticipating changes in the size and design of the vehicles. Eight major fire appliances must be accommodated at the central station - two pumps, a pump-escape, a turntable ladder, a hydraulic platform, an emergency tender and two grass-fire units.

The appliance room is divided into separate bays, each containing one machine. The appliance bays must be 6 m wide, and their depth should allow for a clearance of 2 - 3 m behind and in front of each appliance. Each bay has a door at the front and a door at the back, so that appliances do not have to reverse into the appliance room when returning from a fire. The doors at the front should be capable of opening quickly and easily, and are electrically operated with an additional manual control in case the automatic gear fails. The doors must be 4.5 m wide and 4.5 m high, and the ceiling height should be at least 6 m.

A ceiling is desirable as men work in the appliance room and some kind of temperature control is necessary. Open trusses have the advantage that they increase the volume available for cooling.

The room must have a non-skid floor which is maintenance free and has a firm foundation to carry the weight of the appliances. The centre panel of each appliance bay must be of oil resistant material, and the floor should be waterproofed and graded towards the front doors for drainage when it is hosed down. Glazed split tiles are suitable for ship runways, which must be profiled against vehicle entry to prevent collision with the front doors, and quarry tiles are recommended

for the remainder of the floor, as they are attractive and hard wearing.

A high level of natural lighting is required in the appliance room - the window area must be at least 15% of the total floor area. Artificial light fittings must be fixed in the spaces between the appliances, rather than above them, and must not obstruct the doors when they are open. This also applies to the coloured emergency turn-out lights provided in each bay to show which appliance is to respond to a call. Electrical sockets are needed in the floor for the immersion heaters used to warm the oil in the appliances' engines, and for connections from the battery chargers in the battery room.

The operational control of the fire brigade has two components, the control room and the watch room. The control room receives fire calls for the whole brigade and orders the appropriate stations to turn out appliances. The watch room only receives alarms from people who report fires at the station, and its main duty is to mobilise its own forces. The control room will be incorporated in the Paarden Eiland station which is to be the operational headquarters of the brigade, so only a watch room is required at the administrative headquarters.

The watch room is the control centre of the fire station itself. It must be designed to give direct access and a view into the appliance room, and it is an advantage if it can also command a view of the turn-out apron in front. The duty officer receives all calls for assistance in the watch room, either from people reporting fires in person or from the control room. He then alerts the men on duty, gives them instructions on which appliances are to attend, the destination and the quickest way to reach it. There must be a hatch from the watch room into the appliance room through which the duty officer can hand these instructions to the drivers of the fire engines.

The room must accommodate a console with a switchboard for internal alarms, a file of running

cards, street addresses and street maps, and there must be enough wall space for a large map of the area. Free movement in the watch room is essential, and good natural lighting is required. In addition a toilet and wash basin are required for the duty officer.

Space is provided in a duty room adjoining the watch room for duty officers to carry out administrative work. It must also have room for an area where reports are written and duties pinned up.

There must be a wash and scrub area with showers and toilets on the ground floor, opening directly off the appliance wash bays. This allows a separation of wet, dirty activities from dry, clean activities, and keeps soot and dirt out of the main building when firemen return from a fire or drill operations.

Closely related to this area must be a room equipped for drying wet uniforms. It must be large enough to hold the uniforms of all the men on duty during one shift, and heating facilities for quick drying are incorporated.

There is a sick bay where a doctor comes in to consult patients, an arrangement that provides better control than allowing the men to go out and visit a doctor. It is also used as a first aid room for treating firemen injured on duty, and for routine checkups. It should have a waiting room with a desk for administrative work, and a consulting room with an examination table.

F2. TRAINING

The drill yard is used for fire drill operations, as a secondary access to the appliance room, and for general maintenance. It must be at least 30 x 25 m in extent, and most of the area should be free of obstructions. It is an advantage if it is screened from public view so that crowds

will not gather to watch the drill sessions.

The yard should contain a drill tower, one or two hydrants, a drafting pit and a water sump. Effective drainage must be provided and the yard should be floodlit. The environment of the drill yard is important, and planting could be introduced. The firemen are not occupied all the time when they are on duty and like to sit in pleasant surroundings when they are not working.

As it is not practicable to carry out drill operations on actual buildings, a tower must be provided. It must be located so as to allow the appliances to manoeuvre in front of it, and should be designed to simulate conditions at an actual fire in a multi-storey building. The tower must be at least 18 m high, and the interior is provided with platforms spaced at 3 m intervals, linked together with cat ladders. Windows are fixed between the platforms on the drill face of the tower, and they must have timber replaceable sills as the hook ladders used in fire drill wear them out very quickly. The windows should be large enough to allow the practising of friction-line escapes, and the tower must have a riser system and a sprinkler system installed.

A hose drying compartment is incorporated in the drill tower as this is the most effective way of drying fire hose. An electrical hoist is mounted at the top of the tower to pull up the hoses, which are draped over a bar and hang down on either side. This allows the hose to dry completely as air can circulate freely around each length. There ought to be a close relationship between the drill tower and the hose storage room, so that hoses can be stored immediately after being dried.

A smoke chamber should be provided at the base of the tower for training with breathing apparatus. It has a smoke and heat inductor and extractor, and the outer walls must incorporate panic doors in case accidents occur. The interior of the chamber is completely sealed - no light or air can enter.

A drafting pit, which can also be used as a swimming pool, must be provided for drill purposes and for testing the appliance pumps. It must be accessible to the fire engines and should have a heavy concrete apron on one side to carry their weight. The main part of the drafting pit should be 3 m deep, but it must also have a separate portion with a depth of 9 m for deep lift testing.

A lecture room is needed for theoretical instruction, which must be large enough to accommodate the whole establishment and a number of visitors. It has blackboards and screens, a raised platform for demonstration purposes, and facilities for projecting films. In the new central station the lecture room activities will be incorporated in the multi-purpose hall.

F3. MAINTENANCE AND STORAGE

Each fire station has a suitably equipped workshop where the firemen carry out whatever minor repairs and adjustments they are competent to undertake. The workshop is therefore used for servicing the vehicles, as major repairs are carried out elsewhere. An inspection pit must be provided in the floor, and a workbench is needed with storage space for tools and equipment. The inspection pit must be tiled for easy maintenance, and is shallower than usual as the axle height of a fire engine is higher than that of a normal vehicle.

The fire engine's batteries are always kept in peak condition. To achieve this, battery chargers are used and adequate spare battery cells are kept in a battery room with a lead-lined sink. A tyre store is needed to keep a supply of spare wheels, and an oil store must be provided with a 150 mm threshold across the doorway.

An underground petrol storage tank is necessary, with the pump located in the drill yard. All tank filling operations must take place in the open air, not inside the building.

All fire stations have a hose repair shop, which should be conveniently located next to the base of the drill tower. Direct access to the hose-drying compartment allows the men to inspect the hose as it is withdrawn from the tower. A hoseroom store is also required. The hoses are rolled up and stored on racks 600 mm deep and 750 mm high. The store must be cool, as excessive heat damages the hose, which has a protective plastic coating that disintegrates in unfavourable conditions.

The breathing apparatus workshop is a clinical area - all the walls must be tiled. It has a workbench with water supply in the centre of the room, with access all around, and storage space must be provided for spare sets of breathing apparatus.

The fire extinguisher workshop is a messy place, as all the work is done on the floor. This should be screeded and drained for hosing down operations. A workbench with water supply is needed, together with adequate storage for serviced fire extinguishers.

There is a carpenters' workshop for furniture repairs. A fire station should be as independent as possible and labour costs can be reduced by utilising the fireman's time when he is on duty but not actually attending a fire. New work is also done here, and the workshop can serve as a hobbies area for the firemen during their off duty hours.

A workshop must also be provided for an electrician who carries out maintenance on all the electrical appliances used in the station as well as servicing the alarm systems and automatic control mechanisms.

Fire stations anticipate power failures by keeping a standby generator which operates automatically during an electrical breakdown to supply power to the automatic electrical devices.

A compressor room is needed with piping to the appliance service bay and the breathing apparatus

workshop, and high-tension and low-tension chambers must be provided for electrical supply.

Storerooms are needed for miscellaneous supplies and equipment. An auxiliary store is used for the storage of auxiliary equipment used on the appliances, such as 7.5 m long ladders. The metal-lined double doors to this store should be carefully positioned to get the ladders in and out. A main clothing store carries the uniforms and personal equipment issued to the firemen, and a general store is required for maintenance equipment and materials, fuel, paint and miscellaneous supplies. In addition a cleaners' store and a garden tool store must be provided.

F4. ADMINISTRATION

The administrative offices are visited by members of the public, so they must be closely related to a public entrance with a reception counter and waiting area. The offices should be semi-private, and visitors will be directed to them by the receptionist.

The central administrative section expands together with the growth of the brigade, so extendability is essential if future disruption in the organisation of the brigade is to be avoided. Office accommodation is needed for the fire prevention department, the senior officers, and for general administration.

Fire prevention - An area must be provided for the inspection of building plans, together with an office for the senior fire prevention officer, an office for his assistant, and an office for another 4 fire prevention officers. This section is the most public-orientated and should have access to the multi-purpose hall for demonstration purposes.

Senior officers - Private offices are needed for the chief fire officer and his deputy and

assistant. These offices must also be accessible to the general public. A boardroom is required for conferences and disciplinary meetings, and it is an advantage if all these rooms can overlook the drill yard for purposes of supervision.

General administration - Private offices must be provided for the use of the divisional officers and the station officers, but one large space can accommodate all the general administrative staff. A stationery store, a record room and a strong room are needed, as well as a tea kitchen.

Male and female toilet facilities must be provided. They must be separated from those used by the firemen, but could be shared with the multi-purpose hall.

F5. CIVIL DEFENCE

A civil defence outpost will be located at the central fire station. It will consist of an operations room linked to a communications room, from both of which the public are excluded, an administrative office and a restroom, and a reception area.

The reception area is the only part that the public will be allowed to enter. During an emergency they will be attended to by a public relations officer who will be properly briefed on the prevailing situation. Press conferences will also be held in this area.

The operations room acts as the nucleus of the command post. It must accommodate a data bank, a conference table and work space, and have generous wall space for maps. There should be no permanent division between this room and the communications room which houses radio booths for the civil defence operators.

The administrative office is normally used for the routine running of the command post, but during an emergency it is handed over to the Town Clerk, who is the chief of civil defence, for

consultation and private interviews. A restroom with toilet facilities is also required, for men and women manning the centre under siege conditions.

F6. LIVING QUARTERS

In the older stations the men usually had a large dormitory to sleep in. However, individual rooms for the men reduce friction in the brigade, give more opportunities for studying, and make the job more attractive. Good living conditions are more important to the fireman than a high salary.

Quarters for the single men are normally housed over or near the appliance room, and present practice is to provide the men with double rooms, each with a wash-basin, and communal ablution facilities. This arrangement still gives insufficient privacy - the firemen prefer to have single rooms where they can sleep and study without being interrupted by inconsiderate room mates.

It is preferable, therefore, to provide suites of two single rooms sharing a bathroom, with movable partitions so that if the firemen want to they can reorganise the space as a small flat with a shared bedroom, a bathroom and a living area. It is customary to separate the officers from the men, and to provide them with a higher standard of accommodation. This requirement could be satisfied by using the same suite as a small flat for a single officer.

The bathroom should have a shower, a WC and a wash basin. No baths should be provided, as men are less likely to slip when getting out of a shower to answer an emergency call. Adequate movement space must be available for the men to manoeuvre during emergencies, and easy access to the appliance room is essential.

Kitchen facilities are needed for the single quarters. The kitchen must be able to supply the

full range of meals to all the men on duty as well as to the single firemen who live at the station. It must have a pantry and servery as well as a preparation area, and a toilet and wash basin must be included for the cook. The firemen are not allowed in the kitchen, so a small tea kitchen should be provided in the recreation area where they can make themselves coffee.

The dining room for serving tea and meals to the firemen must be located next to the kitchen. It should have a pleasant view and possibly open on to an outdoor terrace for use in fine weather. The men in the mess will be fully dressed and can run straight to their machines if the alarm sounds, so the dining room can be located some distance from the appliance room.

Laundry facilities must be provided, with convenient access to the drying room and a drying yard. The laundry must accommodate laundry trays, washing machines, an ironer and a spin-dryer, and a closet for the storage of bed linen and towels is also needed.

F7. RECREATION

All stations provide their personnel with recreation and canteen facilities, which include a library and reading room, a billiard room, a recreation room for general relaxation and leisure, and a hall for filmshows and gymnasium activities. The main recreational centre for the inhabitants consists of the library, billiard room and recreation room. The library must be a separate space, but the remaining areas should allow for a variety of activities to occur. A private firemen's entrance to the station should be located near this recreational centre, while the multi-purpose hall must be situated near the public entrance as it is also used by the community.

The library serves as a combined reference, writing and study area where the firemen can read current periodicals and newspapers, and borrow books. Although it forms part of the recreation

area it must be separated from the noisier activities, and must be isolated from the commotion of the drill yard.

The billiard room is essential as men on duty may not leave the fire station. It must accommodate a full-size match table requiring a clear floor area of not less than 6 m x 10 m for proper cueing space. Fixed seating must be provided around the walls, and a considerable amount of space is required for cueing racks and marking boards.

The recreation room acts as a club room for the firemen not on active duty, and serves a variety of uses. It is the social centre of the brigade where men can meet, bring their friends and entertain their girlfriends, watch TV and play table tennis. The canteen should be an integral part of this area. It is like a tuck shop, with a serving counter and seating area, and it should also open on to the drill yard. Male and female toilets for visitors must be provided in this area.

A gymnasium hall is provided so that the firemen can keep themselves physically fit. It should be a large unobstructed space with a high ceiling and good natural lighting. Artificial lights must be protected from damage by ball games, and the floor should be constructed of wood strips laid on joists. Badminton requires an area of at least 16 m x 10 m, so the hall should preferably be no smaller than 18 m x 12 m. A store must be provided for gymnasium equipment, and changerooms are needed for visitors, although showers are unnecessary.

As the gymnasium will also be used for film shows and functions and as a lecture hall, it must have a cinema screen with a raised projection enclosure, a store for tables and chairs, and male and female toilet facilities for visitors.

F8. SERVICE

Garage accommodation is required for duty vehicles not housed in the appliance room. These include a 3 ton truck and a 1 ton truck for general purposes, three minibuses, and three officers' patrol cars.

Lockable garages are also needed for private vehicles belonging to the resident firemen, together with parking facilities for the rest of the brigade personnel and a separate parking area for visitors.

A service entrance must be provided with an enclosed yard, allowing turning space for vehicles bringing deliveries and removing refuse. This yard should be closely related to the kitchen, and an area for drying laundry is also required.

The firemen only look after their appliances and equipment. They do not service the building, so restroom facilities in the form of a common room and male and female toilets are needed for servants.

F9. ACCOMMODATION SCHEDULE

OPERATIONAL

Appliance room - 8 appliance bays 6 m x 18 m - 900 m²

Watch room - 45 m²

Duty room - 30 m²

First aid room - 30 m²

Wash and scrub - 6 showers, 2 WC's, urinal and wash basins

Drying room - 30 m²

TRAINING

Drill yard - 30 m x 25 m minimum

Drill tower - 3 m x 3 m x 18 m high minimum

Drafting pit - 6 m x 9 m x 3 m deep

MAINTENANCE AND STORAGE

Appliance service bay - 100 m²

Oil store - 15 m²

Tyre store - 15 m²

Battery room - 20 m²

Hose workshop - 40 m²

Hose store - 40 m²

Breathing apparatus workshop - 40 m²

Fire extinguisher workshop - 40 m²

Carpenters' workshop - 60 m²

Electricians' workshop - 30 m²

Compressor room - 15 m²

Emergency generator room - 15 m²

HT and LT chambers - 15 m²

General store - 60 m²

Auxilliary store - 45 m²

Clothing store - 45 m²

Cleaners' store - 15 m²

Garden tool store - 15 m²

ADMINISTRATION

Reception and switchboard - 15 m²

Waiting area - 30 m²

Office for divisional fire prevention officer - 20 m²

Office for assistant fire prevention officer - 15 m²

Office for 4 fire prevention officers - 30 m²

Area for reading plans - 30 m²

Office for chief fire officer - 25 m²
Office for deputy chief fire officer - 20 m²
Office for assistant chief fire officer - 20 m²
Board room - 30 m²

Office for divisional officers - 15 m²
Office for station officers - 15 m²
Office for general administration - 40 m²
Record room - 20 m²
Strong room - 10 m²
Stationery store - 15 m²
Tea kitchen - 15 m²
Male toilets - 2 WC's, urinal and wash basin
Female toilets - 2 WC's and wash basin

CIVIL DEFENCE

Reception and waiting - 20 m²
Administrative office - 15 m²
Operations room - 30 m²
Communications room - 15 m²
Restroom - 15 m²

LIVING QUARTERS

Single firemen's quarters - single rooms for 30 men, with shared bathrooms, 6 m x 3 m - 540 m²
Single officers' quarters - single rooms for 6 officers, with private bathrooms, 6 m x 6 m - 216 m²
Married firemen's overnight quarters - double rooms for 20 men, with shared bathroom, 6 m x 3 m - 180 m²
Married officers' overnight quarters - single rooms for 4 men, with shared bathrooms, 6 m x 3 m - 72 m²

Kitchen - 50 m²

Pantry - 15 m²

Dining room for 60 men - 100 m²

Laundry - 30 m²

Linen closet - 15 m²

RECREATION

Library and reading room - 75 m²

Billiard room - 75 m²

Recreation space - 150 m²

Canteen - 25 m²

Multipurpose hall 9 m high - 300 m²

PT equipment store - 20 m²

Public changerooms - 20 m²

Chair store - 20 m²

Projection room - 15 m²

Hall foyer - 75 m2

Tea kitchen - 15 m2

Male toilets - 2 WC's, urinal and wash basin

Female toilets - 2 WC's and wash basin

SERVICE

Garages for 8 duty vehicles

Garages for 40 single quarters

Parking for 40 staff

Parking for 20 visitors

Service yard

Drying yard

Servants' common room - 30 m2

Male servants' toilets - 1 WC, urinal and wash basin

Female servants' toilets - 1 WC and wash basin

DESIGN

G



G1. SITE ANALYSIS

The site of the central fire station is located on a fairly steep slope : the land falls 12 m altogether over its length, and 6 m along the shorter side facing Roeland Street. A fire station, however, needs a large flat area for the activities of the drill yard, and the original solution to this problem was to cut and fill on a large scale, as can be seen on the contour plan. The results of this are a steep embankment at the back of the site behind the existing workshops, and a sharp drop down to road level as one proceeds along Brandweer Street towards Roeland Street. The Jutland Avenue bridge, which was built many years after the existing station, forms another embankment on the south-east edge of the site.

Vegetation on the site consists of a group of trees along the south-west embankment, and a few more trees forming a garden in the northern corner of the site. This garden is poorly developed and could be dispensed with if necessary : it is instinctive that when asked if there were any trees of the site, one of the senior officers only mentioned the pines on the embankment. These ought to be preserved as together with the sharp drop in the topography they effectively divide the site into two parts, the upper of which could be used to locate activities requiring privacy from the main fire station.

Potential access at the moment is limited to the two opposite ends of the site, which has the disadvantage that only the Roeland Street entrance leads to the central area. Brandweer Street is below the level of the drill yard for most of its length and apart from a small area at the beginning of the bend in the road, it can only give access to the upper part of the site.

Splendid views of Table Mountain and Lion's Head are afforded by the site, although unfortunately the 3 storey bulk of the Siemens building cuts off the view to Signal Hill from the northmost corner of the site. The Jutland Avenue bridge obstructs the view towards Devils Peak, and the

distant view towards the sea is marred by the 2 storey industrial development across Roeland Street.

The south-easter is deflected by Table Mountain to become a very strong south-west wind which has been known to break window panes on this side of the existing building. The rain bearing winds, which blow from the north-east in this case, do not cause much discomfort.

The greatest traffic noise is experienced from Jutland Avenue, but Roeland Street also carries heavy traffic. Very few vehicles use Brandweer Street, and noise is not a problem on this side of the site.

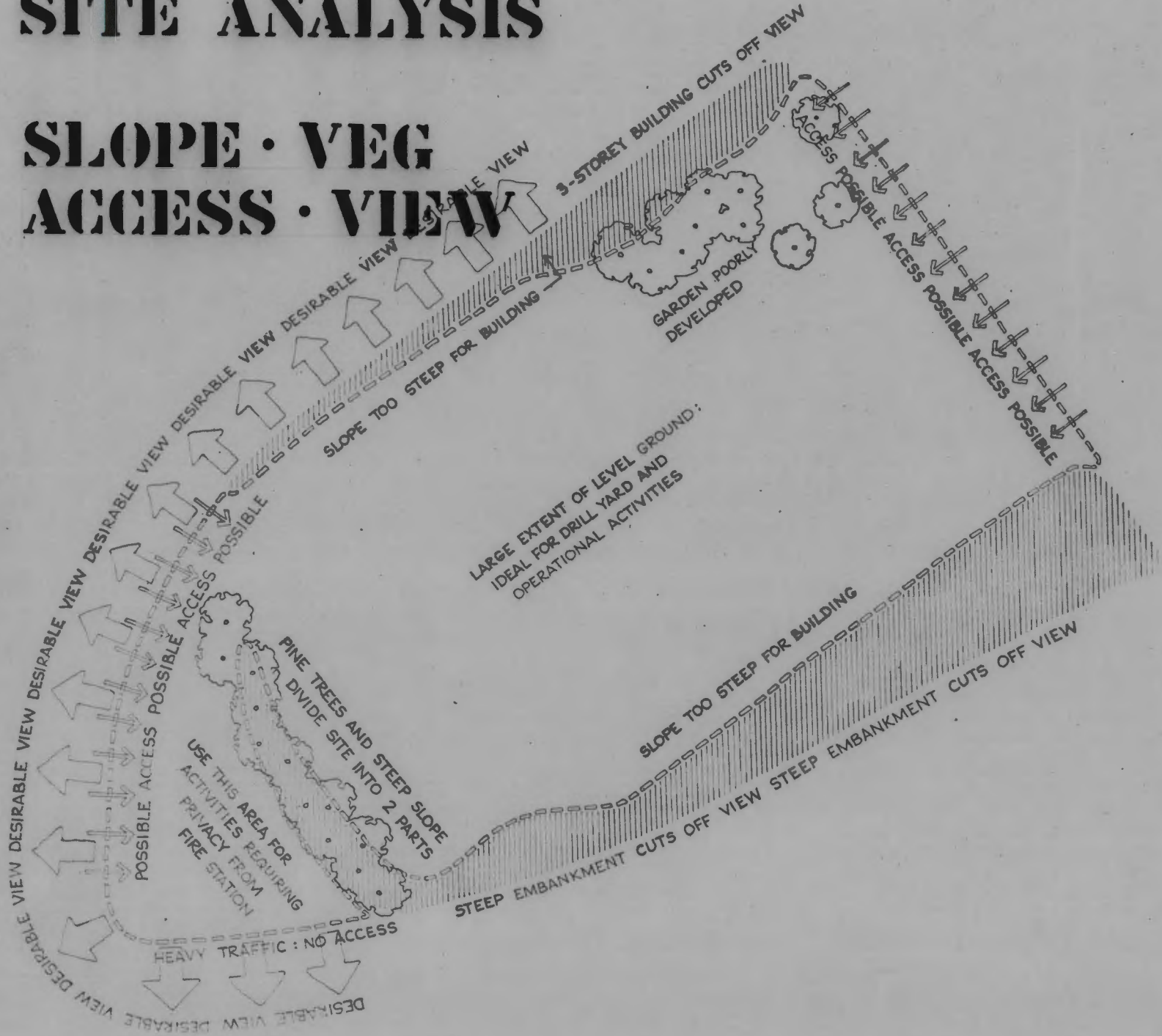
SITE PLAN 1m CONTOURS



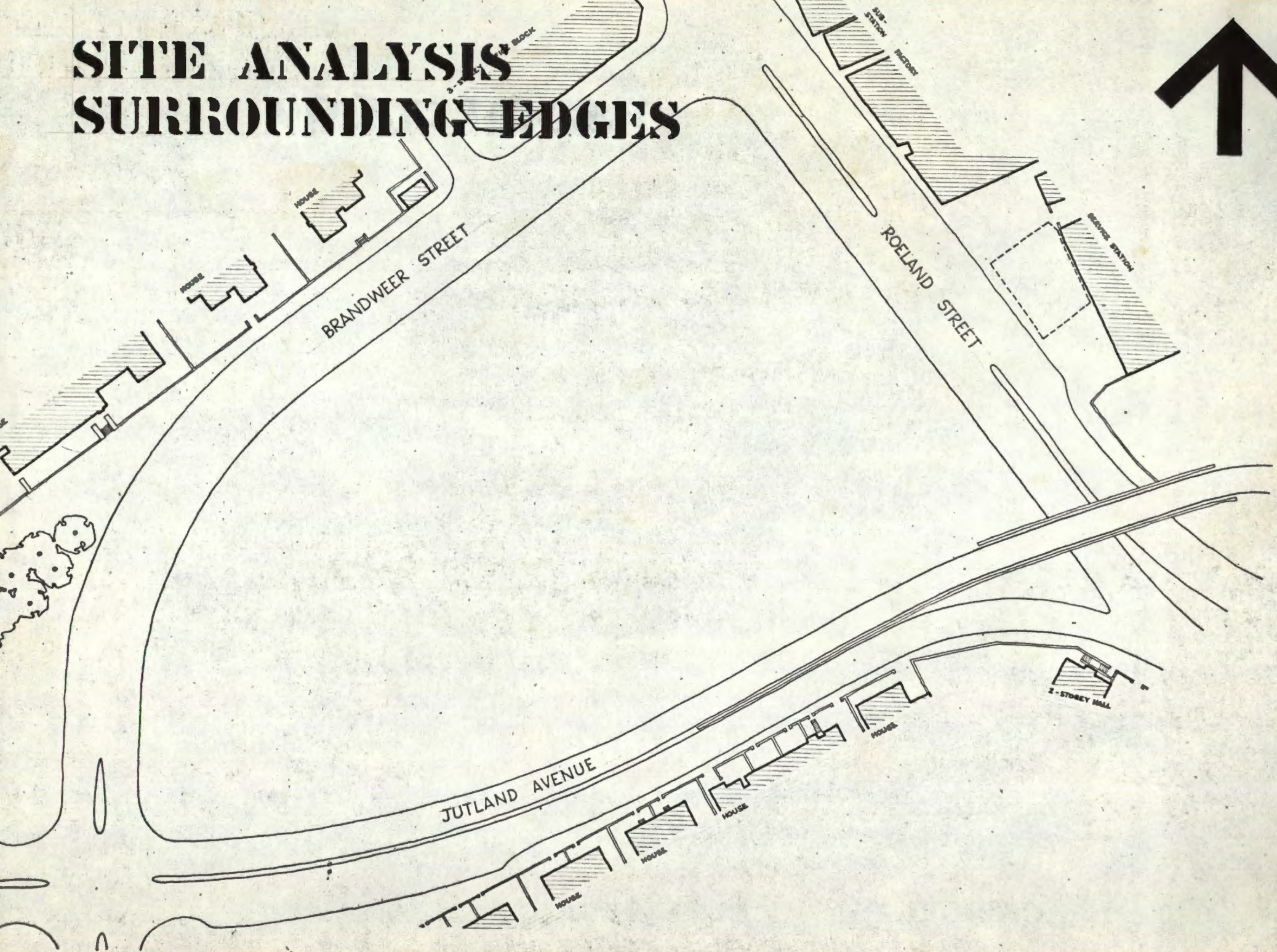
SITE ANALYSIS



SLOPE · VEG ACCESS · VIEW



SITE ANALYSIS SURROUNDING EDGES



HOUSE

HOUSE

BRANDWEER STREET

JUTLAND AVENUE

HOUSE

HOUSE

HOUSE

HOUSE

2-STORY HALL

ROELAND STREET

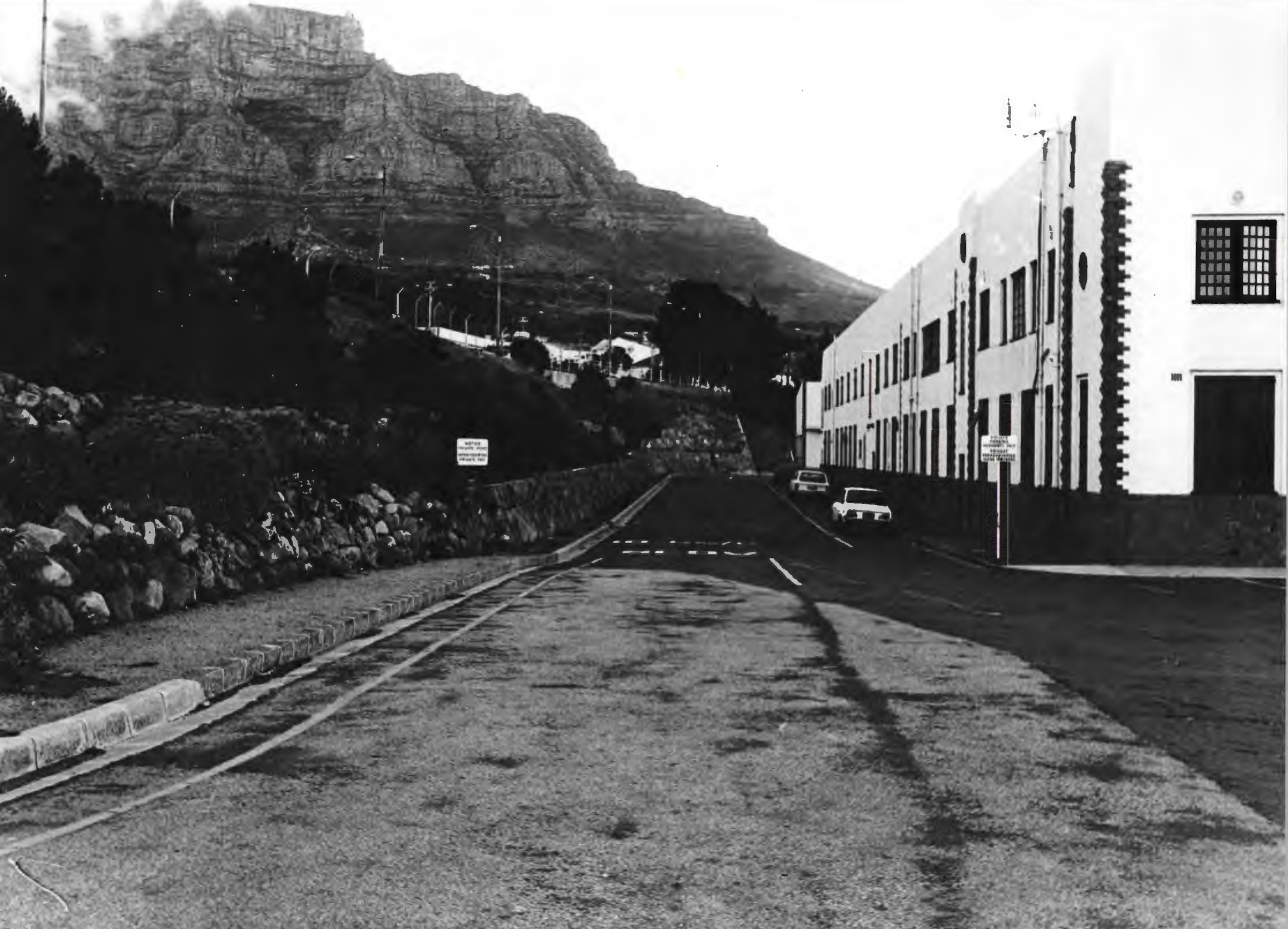
BUS STATION

FACTORY

GARAGE STATION

3-STORY BLOCK











G2. DESIGN SOLUTION

The design of the building and the location of its widely differing activities has largely been influenced by the site, and the site in turn has been affected by the building. The major topographical features are the large flat central area sloping down at the front to Roeland Street, the two steep embankments on the south-east and south-west edges of the site, and the sharp drop down to Brandweer Street to the north-west. In the design of the new building, the longitudinal section through the site shows that little has been changed, but larger differences are evident in the transverse section.

In the longitudinal section the upper part of the site has been utilised for the senior officers' housing, which is screened from the drill yard by the belt of trees and the sharp drop of the embankment. Beyond the drill yard are the appliance bays which still face Roeland Street. Apart from the fact that this is the only part of the site that can accommodate a 50 m wide turn-out apron, the fire engines should be visible from Roeland Street - they are the brigade's biggest attraction.

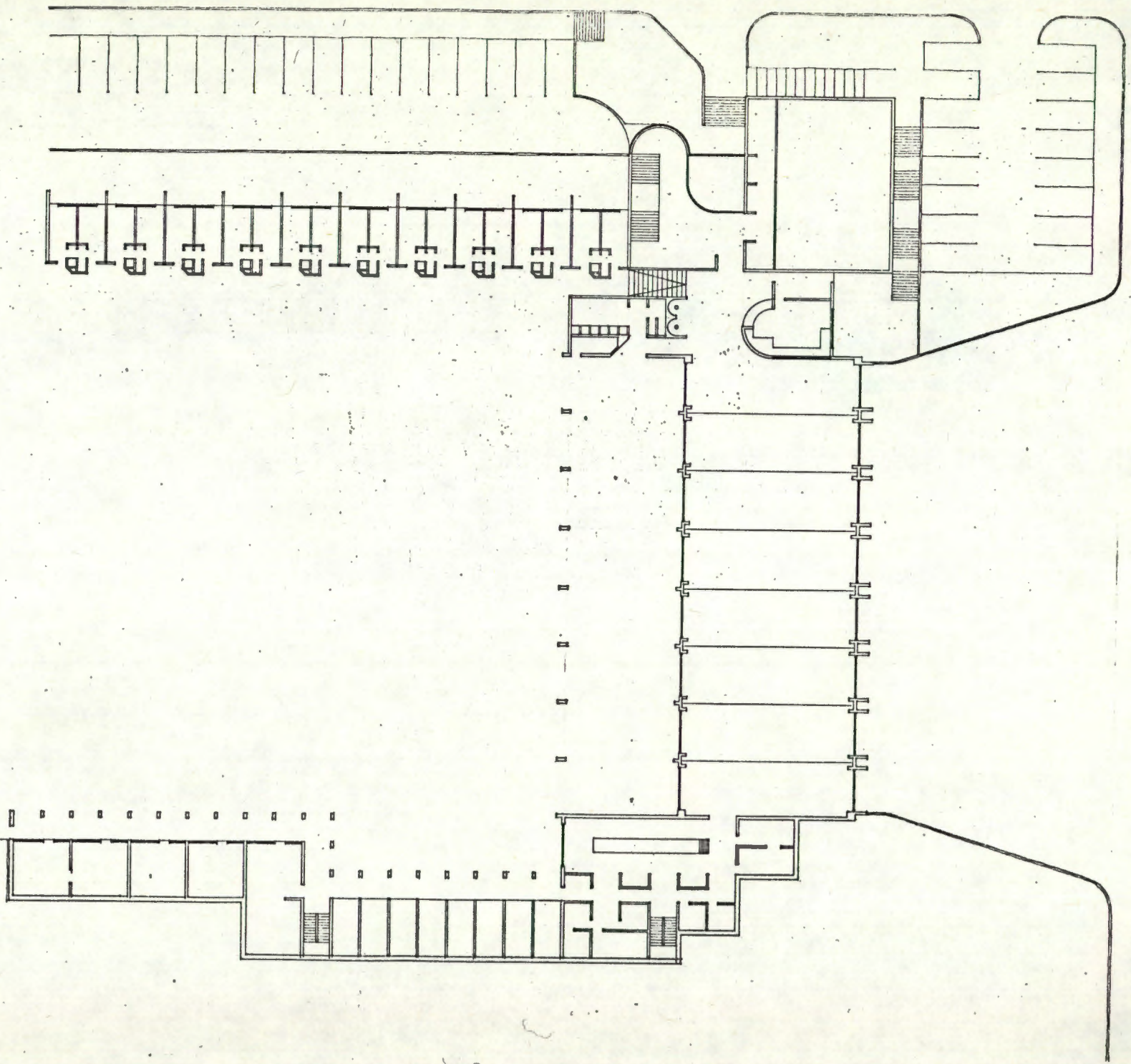
In the transverse section the service road between the existing building and Jutland Avenue has been dispensed with, and the station is now built into the embankment. The workshops are situated along this edge and open on to the drill yard. On the Brandweer Street side the steep cliff-face separating the street from the building has been excavated, allowing the main access to the building to be located on this side.

The public entrance, with a separate parking area for visitors, is in Brandweer Street, close to its conjunction with Roeland Street. From the public parking area there is also an outside staircase leading directly to the watch room, for people reporting fires in person. Further up Brandweer Street, just where the road begins to curve, is the single entrance to the drill yard.

From here there is access to the kitchen yard for service vehicles, and an entrance to the staff parking along the boundary which dips downwards to allow access to the basement parking for the resident firemen.

Beyond the staff parking is a garden for the firemen, with patios for the officers' accommodation on the ground floor and balconies for the firemen on the next level, both of whom have the benefit of a view of Table Mountain and Lion's Head. The overnight accommodation is on the top floor, and no outdoor space has been provided as the rooms are not used during the day. On the other side, the drill yard is on a level half-way between the ground and first floors of the residential wing. This not only forms a privacy barrier between the two, but also means that ramps of only half a level can take the men up or down to the appliance room, thus reducing turn-out time. The sliding pole is only used at night by the men on the top floor.

On the south-west end of the residential wing is the firemen's entrance, beyond which are the mess and the recreation area. The only outsiders using this entrance will be the firemen's friends, who may visit them in the recreation area. The public entrance is on the other end of the living quarters, and opens directly on to the multi-purpose hall. Vertical access leads to the civil defence quarters located above the watch room, and to the administrative block. This is situated over the appliance wash bays, enabling the officers to see the drill yard from their desks, and allowing visitors to see the fire engines in the appliance room below, without actually entering the operational area.



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II



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