DESIGN PROPOSAL FOR MODERN FIRE SERVICE STATION OFFA, NIGERIA

WITH EMPHASIS ON EFFECTIVE CIRCULATION AND FIRE SAFETY IN PUBLIC BUILDINGS

BY

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M.TECH/SET/901/2001/2002

A THESIS SUBMITTED TO THE DEPARTMENT OF ARCHITECTURE, POSTGRADUATE SCHOOL, FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF M.TECH DEGREE IN ARCHITECTURE.

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DECLARATION

I, *ANIFOWOSE,* KAMALDEEN JIDE HEREBY DECLARE THAT THIS THESIS TITLED: MODERN FIRE SERVICE STATION OFFA, NIGERIA "WITH EMPHASIS ON EFFECTIVE CIRCULATION AND FIRE SAFETY IN PUBLIC BUILDINGS" IS AN ORIGINAL PRODUCT OF MY OWN RESEARCH WORK UNDER THE SUPERVISION OF ARC. P.B HARUNA

SIGNATURE, DATE

ANIFOWOSE, KAMALDEEN J.

M.TECH/SET/901/2001/2002

CERTIFICATION

THIS IS TO CERTIFY THAT THIS THESIS TITLED: MODERN FIRE SERVICE STATION OFFA, NIGERIA "WITH EMPHASIS ON EFFECTIVE CIRCULATION AND FIRE SAFETY IN PUBLIC BUILDINGS" IS AN ORIGINAL WORK UNDERTAKEN BY ANIFOWOSE, KAMALDEEN JIDE

OF THE DEPARTMENT OF ARCHITECTURE, (POSTGRADUATE) SCHOOL, FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF M.TECH. DEGREE IN ARCHITECTURE AND IS APPROVED FOR ITS CONTRIBUTION TO KNOWLEDGE AND LITERAL. PRESENTATION.

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DEDICATION

This project is highly dedicated to Almighty Allah, the Owner of the Universe and the Master of the day of Judgement.

Finally, to my loving mothers Mrs S.M. Anifowose Alhaja S. Anifowose and Mrs S. Anifowose. May Allah the Almighty bless you all.

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The greatest glory be to Allah the Almighty, the most merciful and gracious.

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ABSTRACT

From the time immemorial fire has being a very serious problem in Nigeria as its outbreak ravages homes, farmlands, industries and market centres. Although, the occurrences in the past years had every evidences to justified the damages done during that period, because there was no any authority or organisation to salvage the situation. But lately when fire service authority was introduced, it was only the highly populated areas and some city headquarters that benefited. Though, this helps a little in combating fire then. But the increase in population and change in level of technological advancement in some towns and cities lead to the inadequacy of the existing fire station. Because, there were no facilities in some areas and even where there were one, they cannot support the current rate of technological advancement due to the mere fact that the facilities are old and or outdated.

However, base on these premises, this proposal "Modern Fire Service Station Offa, Nigeria" is hinged. It therefore, involves a serious study into the methods that really meets the psychological and physical needs of the entire populace of Offa and its environs.

The design of **"MODERN FIRE SERVICE STATION OFFA, NIGERIA"** consider the prompt 'needs' for an ideal security in safeguarding lives and property capable of invalidating the in-secured environment stressing the need for effective circulation and fire safety in the public buildings of this type.

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CHAPTER ONE

1.0 INTRODUCTION.

It is widely understood that from the earliest time, fire is the burning that is rapid enough to produce heat and light. However, the use and control of fire and its products involves inventions fundamental to human society and culture. Therefore, without them, contemporary technology based society would be impossible. It is more sophisticated today as technology has advanced and made available simpler and technical means of meeting day-to-day demands on direct and/or indirect use of fire (or heat).

So, just as the history of the use of fire can be traced back to man's origin, so also is its application, which in most cases resulted from case of its control. Fire also poses threat constantly to life and property. It destroys billions of Naira in property, ravages vast areas of land yearly (destroying timber and wildlife, ruining grazing lands) and even kills great numbers of person.

An effort to safeguard lives and property evolved the fire fighting organization (fire service station) over the centuries. The station is being made up of trained-men and specialized equipment with effective planning and design to combating any outbreak of fire.

1.5.0 DEFINITION OF TERMS

1. **Arson** – this refers to act of setting something on flame or fire intentionally and unlawfully.
2. **Fire lane**- this is a wide-open path where trees and undergrowth are removed in order to prevent or burnt out forest fire.

CHAPTER TWO.

2.0 .0 LITERATURE REVIEW

2.1 HISTORICAL BACKGROUND OF FIRE FIGHTING ORGANIZATION (FIRE SERVICE STATION.)

Many years ago there were no professionals, fulltime fighters. When a building caught fire, every body pitched in to help battle the blaze. Before fire pumps were invented, people formed buckets brigades to fight fires. Standing-side by side, they formed a human chain from the fire to a near by well or river. They passed buckets of water from hand-to hand to be poured on the flames.

The damages a fire did depended a great deal on where it happened. In the country or ha small village, only a single house might burn down. But in crowded cities, fires often destroyed whole blocks and neighbourhoods before being controlled.

Organised fire fighting, as it is known today can be traced to imperial Rome, where about 32 B.C, Caesar Augustus formed what is believed to have been the first municipal fire department. Romes department is said to have consisted of seven squads, each numbering 100 to 1000 men and

headed by a fire centurion, the first battalion fire chief, who responded to emergencies of his centurions and the squads under their command.

After the fall of Roman Empire, the historical details of fire protection are lacking for centuries.

Earlier than the 11th century information were available, when William the conqueror enforced a fire prevention law in England directing that a bell rung in each community at some time between 7 and 9 0'clock each night. These continue as fire preventive laws were made from years and different regions in Britain, America and some other European countries. As against fire outbreak and causes, and this maintained and developed up-till 12 century as new laws were made on building of houses as against any fire out break. Should the need for protection arises as modern ways and techniques to combating fire have been developed.

More so, along –side the English innovation King Richard I (reigned 1189-1199) decreed that walls 16 feet high 3 feet thick be erected between neighbours to prevent the spread of fire. These walls were predecessors to what are now as firewalls'. Also, in 1302 the city of London, recognizing that thatched roofs held the peril of catastrophic fire ordered them replaced with tile roofs. Buts thatched roofs contributed to the Great fire of London in 1966, indicating that the citizenry failed to use the knowledge acquire in

earlier centuries. This continues as laws, fire prevention laws were then passed to order from regions to regions in Britain and some European countries and America, the insurance companies find their entry into the America fire prevention science. The entry of this organization promoted fire prevention in America. The first insurance firm, the Philadelphia contributorship, formed in 1752, refused to insure houses surrounded by trees. Eventually this exclusion led to the formation of the Mutual Assurance Company in 1784. Its mark (Logo) was the 'green tree' and it specialized in houses surrounded by trees. But it adopted strict rules requiring trimming and limiting the planting of new trees.

Greater selectivity in insuring risks eventually led to improved practices in many industrial and business establishments. More so, the industrial revolutionary trend, which is the fruit of the advancement in science, and technology, which has led to the development of some, fire Igneous likely material now call for the pressing need of how fire can be protected because of its outbreak. At any unforeseen circumstances or time. This now led to the to the establishment of the well—equipped modern fire fighting station.

2.2.0 NATURAL FIRE

Fire existed long before people learned to use it. Lighting belts struck trees and started fires. Volcanoes erupted, and molten lava flowed their sides. Flaming meteors fell to earth. Great seams of coals must sometimes have caught fire. Fire started in deposits of peat or oil.

Natural fires must have seemed very strange to early people. Like the animal they fled in fear from burning forests. Volcanoes erupting terrified them. They could not understand what happened when lighting struck a tree or dry grass and burst into flame. Flame would someday be humanity constant companion. But at first it was only a source of terror.

2.3.0 FIRE AND EARLY PEOPLE.

Human beings are the only creatures who do not instinct flee from fire. In all the worth they are the only ones who have learned to make fire, to control it, and to use it for good. Domestic animals do learns to accept its comforts like the cat or dog before the fireplace. But most animal fear fire.

The earliest people also feared fire, and they lived like animals. When they learned to use fire, their way of life changed. Since then fire has been important to humanity. It was the first source of power outside of human muscular energy. Over thousands of years, it has helped people to master the

forces of nature. Without fire there would be many cold places that people could not live. They would not have much time for pleasure. They would have to work very hard to stay alive. Today world became possible when people discovered that fire was a tool. With fire even the first flickering campfires human beings had begun the long climb into the lighted world of civilization.

2.4.0 FIRE AND COMBUSTION.

What is fire? For more than 2,500 years men have tried to find out Modern Scientist are still not sure they know exactly what fire is. But feel they close to know. They think that fire is a chemical action that occurs very quickly and gives off heat and light.

There are several kinds of chemical action that can result in what we call fire. The most common is the chemical action between oxygen and fuel. If heat and light are given off, you have a fire.

2.5.0 KINDS OF BURNING

In some kinds of burning, no light is given off, if a fuel combines slowly with oxygen, heat alone is given off. That is what happens when iron

rusts. Rusting is a just very slow kind of burning. It is slow, in fact, that you cannot even feel the heat being given off.

Fire and rusting are two kinds of burning or combustion. The word "combustion" comes from Latin word that means "to burn up". Fire is fast combustion. In fast combustion both heat and light are given off, while in slow combustion only the heat is given off.

Sometimes slow combustion speeds up. It becomes fast combustion – a fire. This process is called Spontaneous Combustion. "Spontaneous" means that the fire starts all itself. Spontaneous combustion usually occurs in heaps of oily rags or papers left in attics or rooms where there is littler movement of air.

Heat build up very slowly in such piles. The heat produced as small amounts of oxygen combine with a few oil particles on the paper or rags. Since there is no movement of air, the air does not carry away the heat that builds up. The papers and rags are heated to their kindling temperature.

As soon as this happens, the oil particles combine and rags burst into flames.

Combustion can also be extremely rapid. It may occur so rapidly that an explosion results. An explosion occurs when most o the fuel available burns almost all at once.

2.6.0 CLASSES OF FIRE

Fire is being classified according to what and which materials or extinguishing agents to be used or suitable to prevent and / or stop it from spreading or continue burning. This is done by classifying it according to the principal material involved in the burning and this is done using Alphabetical Orders to differentiate it.

2.6.1 CLASS 'A' FIRES

These are fires involving solid materials usually of organic nature in which combustion normally takes place with the formation of glowing embers, wood, paper, textile etc. They are extinguished by the combustion inhibition provided by heat absorbing effect of water – based liquids.

2.6.2 CLASS 'B' FIRE

These are fires involving liquid or liquefiable solids, burning liquids oil, i.e. Flammable and Combustible liquids, fats paints etc. They are most readily extinguished by excluding air inhibiting the release of combustible vapour or flame, or by interrupting the combustion chain reaction.

2.6.3 CLASS 'C' FIRES

These are fires involving gases or liquefied petroleum gases e.g. methane, propane, butane e.g. They can be extinguished by inhibiting the release of combustible vapour or flame provided by the carbon dioxide gas or dry powder.

2.6.4 CLASS 'D' FIRES

These are fires involving metals e.g. Magnesium, Sodium, Titanium, Zirconium e.t.c

They can best stopped bye the exclusion of oxygen provided by metal powder, limestone e.t.c It is pertinent to note that, use of wrong extinguisher could cause explosion.

2.6.5 FIRES INVOLVING ELECTRICAL HAZARDS

Fires involving electrical hazards do not constitute any specify class of fire. This is so because any fire incident caused by electricity could fall into any of the classes mentioned above. To extinguish fires involving electrical hazards, the current supply must be cut off, and then any of the extinguished methods stated above could be used or suitably applied.

2.6.6 METHODS OF EXTINCTION

1. Smothering: - Elimination of Oxygen
2. Cooling: - Elimination of limitation of heat
3. Starving: - Removing of combustible materials

2.7.0 FIRE HAZARDS IN NIGERIA

It can be traced down the history lane, what numbers of loss hazards of fire have caused this great country. Fire has destroyed lives and property like homes, markets, industries, office and schools. But among all these fire incidents, there are some that are of significant effects to the economy of this great nation. The causes however, of all these fire incidents have been attributed to one thing or the other.

So, the following are the significant hazards caused by fir4e to the county. The first this is the binding, which was engulfed in fire our memories. Also, in addition to this are the market places throughout the federation. These Kano Central Market, popular Oshodi Market, Ibadan market all in the 80's, Warri main market fire incident in 1993 and Kaduna main market and Abuja market which joined the queue recently. All these

and a few others have being a great loss to this country, mainly in the area of economy.

More so, fire has waged serious wars against our industries in the past. Some small – scale industries, which folded up because of fire hazard on their min power operating plant. Some cottage industries, PLATO plastic industries Lagos of 1983. in addition also some filling station are not left out in this saga as many lives and properties have been lost to fire outbreak from filling station (petrol) before a safety act was passed by the government which has no reduced the fire incidents in petrol filling station.

Fire incidents in our home are not also left out in these properties destroyed. Though, hazards of fire in our homes have little effect on our economy compare to that of market places and industries, but it is the most frequent occurrence, which had forced government to take proper preventive measure on course. These above are the hazards among others caused by fire in Nigeria.

2.8.0 CAUSES OF FIRE

Generally, causes of fire can be attributed to peoples carelessness and /or ignorance about fire and fire prevention; not obeying the fire safety building law act; mishandling of flammable liquids such as petrol, kerosene

e.t.c. Also, indiscriminate disposal of glowing materials e.g. cigarette smoking while in bed, and so on.

All these and others stand the causes of fire, which has destroyed lives and properties in the past. Other causes of fire may include be attributed to the following:

1. Overloading of circuits with the use of multiple adaptor
2. Children playing with matches or naked fire
3. Defective heating and cooking equipments
4. Naked light coming in contact with leakages or exposed gas pipes of flammable liquids
5. The use of candlestick without basement protection
6. Arson
7. Lightening

2.9.0 FIRE TRIANGLE

To make a fire, three things are needed

The first is a fuel. Two examples of fuel are wood are paper. Alcohol is a common liquid fuel.

Secondly, oxygen is needed. The fuel combines rapidly with oxygen. When wood burns in bonfires or gas burns in stores, fuel combines rapidly with oxygen in the air.

The third thing needed to make a fire is heat. Paper or wood that is simply exposed to fire does not catch fire. Usually a burning match is applied to paper to make it catch fire. When the paper becomes hot enough, oxygen can begin to combine freely with it. The papers then burst into flames. Every fuel has its own peculiar temperature at which it begins to burn. This temperature is called **KINDLING TEMPERATURE** or **FLASH POINT** of the fuel.

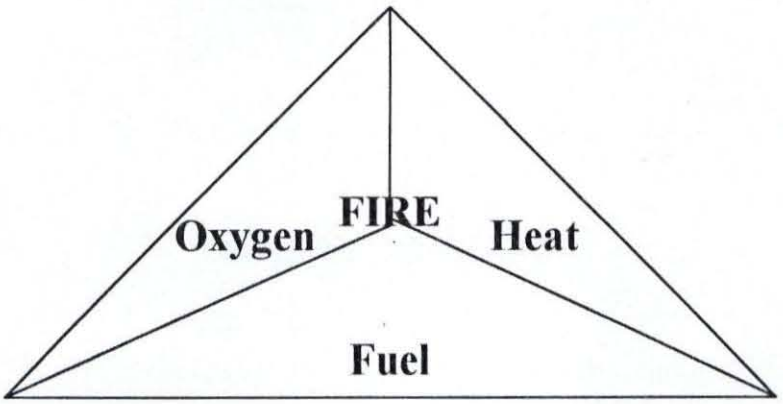
Suppose a burning match raises a stick of wood to its kindling temperature. The wood as a whole does not catch on fire. The reason is that oxygen does not combine with the whole stick. Instead, the heat causes the surface layer of the wood to break up into a gas.

As the heat continues both the gas particles and the oxygen in the air move very fast. In this condition the gas and oxygen particles combine easily and quickly. Heat and light are given off.

So, all the above explanation is stressing the fact that without any of the three components there would be no fire. These are now joined together to form what is referred to as triangle or fire triangle

EQUATION

Fuel + Oxygen (O_2) + Heat = Fire



2.10.0 CONTROL OF FIRE

The factors that determine the rate of burning in a building compartment or confined area can be slimmed down to fuel load and ventilation. The fuel load from building furnishing can vary from room to room and change with time. It is therefore not an easy thing to predict weather fire will be ventilation or fuel control. Consequently, fire resistance for buildings should be determined by assuming that the more destructive ventilation controlled fire would occur.

2.10.1 VENTILATION CONTROLLED

Where the fuel load is considerable and the ventilation is poor, e.g. Basements, building with small area of fixed scaled glazing, theatres, the

rate or period of burning can be prolonged as it will be controlled by ventilation. When windows break, the fire will spread and the rate of burning will increase.

2.10.2 FUEL CONTROLLED

Where the fuel is small and the ventilation is sufficient. E.g. buildings with very large window openings, they will be controlled by the surface area of the fuel. Fuels controlled are of short duration and the room temperature is not excessively high due to infiltration of cooler outer outdoor air. In multi – storey buildings with low ceilings, however, flames can spread from to floor through exterior openings, with high ceilings, flames would be confined to the room.

2.10.3 AUTOMATIC SUPPRESSION

This involves

1) Fire detection and alarming warning
2) Automatic Sprinkler System
3) Foam System

2.10.4 MANUAL SUPPRESSION

This involves

1) Fire detection and Alarm warning
2) Portable Fire Extinguisher
3) Standpipe Fire Hoses
4) Fire department personnel equipments

2.11.0 FIRE FIGHTING AS A CAREER

According to Donald M.O.O' Brien, General Manager, International Association of Fire Chiefs, a fire-fighter must be physically fit, agile and adaptable to teamwork because he must work long hours at a time harmony with other men.

As fire protection must be continuous basis, a man entering into this carrier must expect a long workweek generally 56 hours. In a typical schedule one platoon works 24 continuous hours with the men sleeping in the fire station at night but ready to answer a call.

Initial joining of the fire department is usually limited to men between the ages of 19 and 30. At least, a high school education is required. Entrance is by competition in written civil service examinations, rigorous physical and psychiatric examination, and tests to determine physical,

agility. Successful candidates are then placed on probation and receive rigorous physical, mental and mechanical training at drill schools operated by the departments. Training may cover from two to four weeks to six months before a man is certified ready for assignment to a fire company with two regular fire– fighters commanded by a captain.

After several years of experience and continuous in – service training a man reaches "first grade" fire-fighters status and becomes eligible for competitive promotional examinations leading to officer rank.

Most departments provide special schooling to officer candidates, but nevertheless it is expected a man will make the greatest effort to acquire the special knowledge on his own time and at his own expense.

However, in Nigeria, before anybody can be employed to work as fire – fighter in any fire service organization he must posses all the quality referred to as COPPEDICT.

That is, the prospective fire – fighter must have all these quality.

C - Courageous

O - Observant

P - Patient

P - Physically Fit

E - Endurance

D - Dedicative

I - Initiative

T - Tactive

2.12.0 FIRE FIGHTING EQUIPMENTS

The major pieces of equipment employed by the fire service organization are mainly: The pumper, ladder truck, water – tank; Ambulance; rescue truck and savage truck, in – line inductor, dividing-bridge, hydrant key and bar, foam blanketing and trailer foam monitor. Other equipments and some apparatus include stretchers, fire proof jackets, cork element Rubber booths, Tunic wears, overall wears, hose element. Shear cutter, firemen axe, sledgehammer, Rescue line, ladder, and hand gloves. Special equipments also includes, Hydraulic platform. Emergency tender and foam tender.

2.12.1 LADDER TRUCK: -

Ladder truck carry a power – operated extension ladder that can be 19 – 30 meters or more and can be turned and tilted in any direction portable ladders, extinguisher, life nets, axes breathing Apparatus, rope, floodlights and clean – up equipment are also contained in this truck

2.12.2 WATER TANK/TRUCK: -

Tankers carry up to 30,000 litres of water and have ladders, hoses and other fire fighting equipment.

2.12.3 AMBULANCE

Ambulances are used to provide emergency care and transportation to hospitals, both for the general public and fire fighters.

2.12.4 SAVAGE TRUCKS

These vehicles carry shovels, mops, squeegee brooms and sandals for cleaning along large water proof covers for protecting important items in a building from damage due to water vehicle fire is being extinguished.

2.12.5 CRASH TRUCK

Crash trucks are used in airports to fight fires and handle accidents that involve aircrafts.

2.12.6 FIREBOAT: -

Fireboats are used fighting fires along rivers and in harbour areas. Fireboats carry several nozzles, each capable of delivering water up to 9,500 litres of water per minute. The water is draw per minute. The water is drawn form the river or harbour through pumps on the fireboat.

2.12.7 HELICOPTERS

Helicopters are used in remote area to carry water to the scene of a fire. In large cities, helicopters are sometimes used to enable officers to view a fire incidence from, air in order to evaluate the best means of fighting the fire. They are also use for rescuing people trapped by fire.

2.12.8 HYDRAULIC PLATFORM

This is fire fighting vehicle with an automatic adjusted platform use to fight fires in skyscrapers/tall buildings.

2.12.9 EMERGENCY TENDER

This fire-fighting vehicle that is use for all operations. It has in it resuscitation apparatus and first aid equipment.

2.12.10 FOAM TENDER

This type of equipment is specially designed to fight or combat fire involving flammable liquids. The extinguisher used is always carried by specially design vehicles for this kind operation.

2.12.11 FIRE EXTINGUISHERS

Fire extinguishers can be referred to the materials or chemicals used to quench fire whenever there is a fire outbreak.

2.13.0 TYPES OF EXTINGUISHERS

There are different types of extinguishers, which are being used to tackle unexpected fire outbreak. Different types of extinguishers are being use for different classes of fire. The following are the types available

Water ($H2_0$)

Carbon dioxide (CO_2)

Foam

Dry Chemical

Dry Sand

Bromo Chlorofluoromethane (BCF)

2.13.1 TYPES OF EXTINGUISHERS AND IT USES

XTINGUISHER	USED SPECIALLY ON	NOT APPROPRIATE FOR
. Water type	Class A	Class B and C And Electrical
. Carbon Dioxide (CO_2)	Class B	Electrical fire
. Foam	Class B	
. Dry Chemical	Class D and Electrical fire	
5. Dry Sand	Electrical fire	
6. Bromochlorofluoromethane (BCF)		

CHAPTER THREE

3.0.0 EFFECTIVE CIRCULATION AND FIRE SAFETY IN PUBLIC BUILDINGS

3.1.0 CIRCULATION

The word circulation in a general context can be said to be movement within and around a building environment, in order to bring safety and some degree of comfortability to the occupants. Circulation as the name implies is an important aspect of any design, for it (design) to serve the proposed required function after finishes. For any building design to perform its required function it must be able to accommodate a free and unobstructed movement either from the pedestrian, vehicular or both.

However, control of circulation in a building, especially public building has received a great and utmost attention; thus, a favourable walking environment is created only if the walkway allows normal, unconflicted stride during all expected traffic fluctuations.

Therefore, by considering the two most important elements involved. These two elements involved are the management of pedestrians and automobiles, which will be, treated one after the other. This also will be considered in line with the internal and external environment.

3.1.1 PEDESTRIAN MOVEMENT CONTROL

The control of pedestrian movement in public buildings should be taken care of, both within and outside the building environment, either bungalow or multi-storey building. The least considered designed requirement to the higher other important requirements could be seen from the following objectives. The main objective of pedestrian design can be summarized as.

i.**SAFETY**- reduction of foot and vehicular traffic confrontation.

ii. **SECURITY**- unobstructed view of other pedestrians, good lighting, and conveniently placed police and fire emergency call boxes.

iii. **CONVENIENCE** – foot –traffic control system, easily read signs, comfortable walking distances between parking lot(s) and the building or between one traffic and another office.

iv. **CONTINUITY**- grade separated pedestrian networks above or below street level.

v. **COMFORT** – an aesthetic atmosphere designed in accordance with scientific principle to be stimulating in some areas (complex office fronts and entrances) and relaxing in other (benches)

3.1.2 DESIGNING A SIDE WALK.

Whether a sidewalk is indoor or outdoor, the same width rules should be observed for maximum efficiency and comfort. 450mm on either side or edge to account for the human avoidance pattern; 600mm more on both sides to accommodate standing pedestrian or window-shoppers; 900mm for parking meters, utility poles, trashcans, standing ashtrays, lighting fixtures, fire hydrants, shrubbery, benches, and so on. 3600mm side walk, after these allowance will allow 4 people to walk abreast. In addition to the spatial estimates just given, good sidewalk design should provide the following:

1.Individual freedom to choose one's own normal walking pace.

2.Space to by pass slow –moving pedestrians

3. Easy crossing and changing of direction anywhere, including traffic concentration points.

3.1.2 DESIGN OF BUILDING COMPONENTS.

Functional components are entrances, corridors, stairs, pedmovers, waiting spaces, and directional signs. Good building designs should organize these elements coherently; a building pedestrian circulation system should be direct and uncomplicated, even for first-time or

Infrequent users. If the visual space is confused, pedestrian will become confused.

1 STAIRWAY: - dimensions tend to restrict motions: pace is circumscribed to width of stair tread and riser height, there is a need for railings, and the individuals speed of forward progress is determined by speed of pedestrian ahead.

Important elements of functional stairway are as follows.

Stairway approaches spacious enough to avoid pedestrian line up

- Per person space of 0.9square meter
- Good lighting
- Stair edges, treads and railings designed to assist travel, especially for handicapped persons.
- Rise height less than 175mm, to reduce exertion and improve traffic flow.
- When stairways placed in a corridor, the entrance to the stair governs the corridor design.

2 ELEVATORS- efficient, safe elevator transportation has made skyscrapers possible, thus creating more space for urban populations by moving them up rather than out. There are different types of elevators

i. Sky – lobby elevator – elevator system which divides a building into two or three units, stacked one on top of the other. Passengers going to upper floors take express elevator to an immediate sky lobby, where they transfer to upper floor elevators.

ii. The double Decker system: is a two stories high, with upper and lower compartments. Passenger from two-entrance lobbies: a lower lobby serving odd-numbered floors, and an upper lobby or mezzanine serving even – numbered floors. All these aforementioned components help in the control of circulation pattern of the pedestrians.

3.1.3 VEHICULAR MOVEMENT CONTROL

For effective circulation control in public buildings, vehicular movement should be properly controlled in and out of the site , therefore, easy control of vehicular movement would be based on the adequate design and placement of some devices that will enhance the control of traffic flow. These devices are as follows.

-Entrances and exits

- Parking areas

- Waiting areas

- Site accesses

- Service areas.

- Roadways.

i. **Entrances and exits**:- adequate entrances and exits should be best treated and provided for in any public building of great functionality importance. Entrances and exits provided must be able to perform its functions as required. There should be provision for an emergency exits and service entrance and exit in order to have an effective circulation control guaranteed by avoiding conflicts of vehicular traffic flow.

ii. **Parking areas**:- parking provide an essential link between vehicular circulation way, approach drive and the final destination, they are designed for the safe and efficient storage of cars. In public building, where space and site condition permits, they are usually located beyond the building entrance in such a way as to minimize walking distance back to the building. So all factors attached to the design of parking facilities should be considered to create easy circulation control.

iii. **Site accesses**:- accesses to the building should be attractive and conspicuous, this in order to prepare the guest on arrival from the entrance throat to the parking court. The drive, which may, vary,

swelling at drive entry at curves and at the fore court to allow for easy manoeuvring of cars.

3.2.0 SAFETY

Safety in building can be categorized or differentiated in many ways. Right from a simple building type, to a more complex building design. This may be residential, industrie and public and governmental building types. Safety of occupancy of a building and the building as well are taken importantly and serious attent on given to it, so that the expected success is achieved at the end.

However, part of untiring effort made in order to safe guarding lives and property of the building occupancy and the building itself comes the formation of the standard building codes. To be followed by any proposed developer, architects, engineers, builders and others alike, to guide in planning for safety in building. The first building codes were concerned exclusively with the preservation of human life in case of fire. Today other hazards are considered as well, including earthquakes, windstorms, panic in large crowds, and power failure.

It also now reflects the concern for healthy living and working conditions, as expressed in regulations for lighting, ventilation and plumbing.

But, basically this thesis research area of study will be more elaborate on fire safety in public buildings.

3.2.1 DESIGN FOR FIRE SAFETY

The complexities associated with public buildings, especially multi-storey, can be traced to its initiation as a design.

Architect role in fire safety is the prevention, detection and combat of fire through appropriate design, specifications and choice of materials, among other functions. Events have shown that few efforts have been made to creatively integrated fire requirements into design. In order to achieve fire security, in the public buildings, the following features would be studied.

3.6.0 NOTABLE IMPORTANT FEATURES

To determine which building requirements fit to apply to a proposed building, the structure must first be classified by means of the following.

i. **Location Of Structure Property**:- Since one aspect of fire protection is the restriction of the spread of conflagrations from one building to the

i. **Location Of Structure Property**:- Since one aspect of fire protection is the restriction of the spread of conflagrations from one building to the other, the location of a structure on property is important. Alleys and setbacks serve as firebreaks, thus determining to some extent the degree of fire resistance required and the openings permitted in exterior walls.

ii. **Fire Zone**:- according to the potential fire hazard a function of density, building height, accessibility, and the efficiency of the fire department –urban areas are divided into three classes. The code is more restrictive in areas of greater fire hazards and required less protective features in others.

iii **Occupancy Load**:- public buildings represent an increased risk of panic and require high standard of fire protection. Another factor that receives increasing weight is the disability of some people to move fast and logically, as in the case of hospital patients, especially children residents of homes for the aged, and patients in psychiatric clinics.

iv. Floor Areas:- the maximum floor area permitted in a given fire zone, and for a given use, can be increased by installing an automatic sprinkler system or by subdividing the structure with fire –resistive walls . In the latter case, each area between two separation walls is considered to be a separate building, and automatic fire doors must be installed at all openings.

v. Height:- the same criterion that applies to floor areas also determines the height permitted for a structure. If the building is sprinklered, the height permitted may be greater than it would be for a building of the same type but without sprinklers. Building codes do not usually set height limits for high-rise buildings of type 1 construct ion.

3.2.3 FIRE RESISTANCE

In the case of a big fire, a structure is supposed to resist long enough for the occupants to evacuate the building and for the firemen to extinguish the fire before the structure collapses. Fire resistance of construction elements is expressed in hours, and specific ratings are required for the structural frame, floors, ceilings, walls, roofs and windows. The range of ratings usually extends from 45 minutes to 4 hours.

No construction material is fire proof; even concrete cracks in excessive heat, but the use of vermiculite plaster, gypsum and similar material, increases the number of hours the structure can withstand fames. Asbestos was once widely applied in type I steel construction, but in the light of evidence that it may cause cancer in those who work with it, its use has been limited of late.

i **Flame And Smokes**:- flame and smokes ratings are measures concerning the propagation of flames through certain material and the amount of smoke the burning materials are expected to create. These ratings apply mainly to carpets and surface finishing materials and are usually included in the written specifications of major concern regarding fire and smoke are the furnishings of buildings, since most of the plastic material composing today's furnishing are flammable and produce a great amount of smoke and fumes.

3.2.4 BASIC DESIGN REQUIREMENT FOR FIRE SAFETY IN PUBLIC BUILDINGS.

There are building requirements that are expected for various type of building units. These go in a long way to prevent the outbreak of fire or even to safety of occupancy of the building in case of emergency.

3.2.4.1 EXIT REQUIREMENTS.

a– Exits:- the number of exits required is mainly a function of the number of occupants of the structure. Exits should always be placed in such a way that it will be unlikely for one source of fire to block them all at the same time.

Building codes specified minimum widths of corridors, stairways, and doors along exit or passage ways, by relating to the number of occupants. In some building codes, the total number of occupants to be served is divided by a constant to obtain the required width in meter. Others specify one "units" of exit width (usually 7 metres).

Further specification concerning the escape routes refer to length, fire resistance, lighting, ventilation and directional signs.

Also limited is the total distance any occupants must traverse to reach the nearest exterior exit door or enclosed stair ways. This distance is 45 metre for unsprinklered buildings, 60 metres if the structure is sprinklered.

b- stair-ways:- if the stairway serves as part of the required exit passageway, it is subject to very detailed regulations regarding width, rise and run of steps, size and placement of landings, headroom, handrail, fire resistance of materials and other aspects. One of the stair walls in a high rise building 24 metres high or higher must be a smoke proof tower (fire tower), connected to the interior of the building by way of balconies and open air vestibules or mechanically ventilated vestibules that prevent smoke from entering the stair well, allowing people to escape special requirement to secure a reliable power supply.

For control of smoke during fire, the ventilation system may be designed to switch from recirculation to exhaust only, since there is potential danger that the smoke created by a fire in one area may be blown into other parts of the building thorough air conditioning ducts. Another preventive means is the installation of separate circulation systems for each of the building fire areas.

c- panic:- a major cause of panic is the inability of the occupants of a burning building to see the escape routes as a result of heavy smoke, power failure, or both. Therefore special attention is given to the specifications of exist signs: they must be illuminated at all times, and their power supply must have a higher reliability than that of lighting circuits, separate power sources such as emergency generator or batteries are sometimes required; in other cases the code simply calls for a separate circuit for signs, connected ahead of the main breaker.

d- vertical transportation:- elevators are a very unreliable means of vertical transportation during fire and are never classified as fire escape routes. Not only are they subject to stall because of power failure, but all their electronic controls, including call buttons and photocells for opening and closing automatic doors, are very sensitive to flames, smoke and high temperature. However some codes specify that one or more elevators must be available for firemen during an emergency.

ors can greatly assist firemen in transporting heavy equipment to r floors, in spite of the risk that the occupants will be trapped.

floors are connected with escalators, there is increased danger that flames and smoke will find free vertical pass way over several stories. Thus the building code may require the installation of automatic rolling shutters to close off the floor opening, or the escalators may have to be installed in an enclosed structure with fire –rated doors, similar to that of a stairwell. Or sprinkler system may be required.

e- other exit ways:- moving sidewalks and escalators are generally not permitted as part of the fire escape route. Ramps may be classified as fire exit way if they conform to the code. Sometimes permitted are revolving doors with collapsing wings (i.e. wings that fold flat against each other if people press hard against them).

f.- place of refuge:- places of refuges are areas in high rise building that are separated from the general floor area by means of construction elements with high fire rating. They are located along the escape route, and they must be big enough to accommodate all occupants of the respective floor areas. Places of refuge provide a haven for people while escape route are overcrowded or white others are waiting to be rescued.

3.2.4.2 FIRE PROOFING REQUIREMENT

a Stand pipes:- most codes require standpipes for building of three or more stores. A wet standpipe system is always filled with pressurized water; it supplies cabinets with fire hoses located on every floor and distributed in such way that every area can be reached by at least one hose. This system is designed to be supplied with water from the fire truck. The paper can be located outside, since they are not subjected to freezing, but they are placed in the combined at times to be used by both foreman and occupants. A standpipe (wet) should be able to provide a water pressure of 30KN/m simultaneously on two out lets, for duration of 25 minutes. If in any case, the public water supply is insufficient, an electrical fire pumps should be made available.

b. Sprinklers:- automatic fire extinguishing system have proved to be very effective in many emergencies. Infact, large occupancies fewer fire rated walls and fewer exits are required in a place where sprinklers are installed.

c. fire – rated doors:- doors in separation walls between different fire areas must be fire –rated. Door in separation walls should be equipped with a device that closes them automatically and it should also has a sensor that increase it sensitivity to heat, smoke, or sprinkler water.

d. Fire alarms: fire alarm system for a public buildings with high occupancy rates, should be build with acoustical means to alert occupants of the building only, and also activate a bell in the fire department fire alarms, should be made automatically with the following type of sensors; smoke detectors, which reach to obscuring of light beam; products of combustion detectors operating with ionisation chambers; and temperature detectors, which may be adjusted either to a fixed temperature or to the marginal rate of rising temperature.

3.2.4.3 REQUIREMENT FOR HIGH RISE BUILDING

Some requirements are set aside, which necessitate protection of occupancies in multi-storey building (public building) against the outbreak of fire.

a. Compartmentation:- areas of refuge can be provided either by building each storey with horizontal exits into areas not exceeding 10,000square meters or by subdividing the building into 5 storey compartments by

i. Interrupting stair shafts with smoke barriers every fifth floor,

ii. Using smoke proof enclosures for all stairways, or

iii. Using any other means to prevent smoke from spreading between compartments.

iv. where openings in exterior walls are located vertically, one above the other, compartment is also required between stories by either horizontal or vertical flame barriers at the exterior walls.

b. Control station and communication system:- a central control station for fire department operations, where signal received from much of the control equipment, is mandatory. The control station must also contain two voice communication systems, one for fire department use and the other for communication system with building occupants in locations designed by the section.

c. Fire alarm boxes:- in specified locations, there must be manual fire alarm boxes that are connected to the central control station and the voce communication system.

d. fire detectors:- every mechanical equipment and return air portion of any air conditions system or mechanical ventilation system that serve floors other than the floor on which it is located must have fire detectors that respond to products of combustion other than heat. These detectors must activate the voice communication system and must connected to the central station.

e. Smoke control:- this calls for either mechanical or natural venting of the products of combustion. The following means of compliance may be used. (The view building code section)

i. Panel, openable windows, or windows glazed with tempered glass of size and location specified.

ii.The return and exhaust portion of the mechanical air handling system

iii. A mechanically vented shaft that will provide 60 air changes per hour in the largest compartment served.

iv. Any other means that will provide equipment results.

f. Elevators:- at least one elevator in each bank must provide fire department access to any floor of the building. The elevator must open into a lobby that is separated from the remainder of the building.

g. Sprinkler system alternative:- as an alternative to compartmentation, a sprinkler system may be provided

CHAPTER FOUR

4.0.0. CASE STUDIES

Basically, the significance of the study of existing features of case of proposed work cannot be over stressed. If the proposed work, is meant to solve the problems that have existed in the cases of the existed project of this type.

More so, this study will give more room for the updating of knowledge and a view of creating a balanced intellectual dissension. These aimed at established facts on the areas of successes and failures. However, this is done in order to gather basic information's needed for the proposed work. So that the emerging solution shall have an excellent comparison with the existing cases.

The criterion for the selection of studied area was based on the similarity in character and functions in all ramifications. So, the selected case studies was therefore, originally intended to a solution of the problem in question. The following shows the number of case studies that was carried out in different part of the country, set aside the areas of failures and the area of consolidation.

4.1.0 CASE STUDY ONE

FIRE SERVICE STATION, ILORIN

LOCATION: the station is located along the Unity-Taiwo road junction, beside amusement park, opposite Total filling station Ilorin. Kwara state.

Architectural facilities.

-Drill tower

-Workshop

-Parking facilities

-Toilet facilities

-Storage facilities

-Water tanks.

MERITS

- Provision of drill tower for training personnel.
- There is provision of mechanical workshop.
- Provision of machine parking.

DEMERITS

- Lack of good organization of the site (poor orientation)
- There is no provision of health facilities for the worker.
- Inadequate provision of training facilities.

- Lack of parking facilities for public vehicles.
- Administrative facilities no well catered for
- Accommodation facilities not provided.
- Lack of proper maintenance of building
- Lack of staff accommodation.

4.2.0 CASE STUDY TWO.

FIRE SERVICE WORKSHOP, ABUJA.

LOCATION:- It is located at Wuse zone 3 along Wuse general hospital road, adjoining Wuse central police station Abuja. F.C.T.

ARCHITECTURAL FACILITIES

- Drill tower.
- Service bay.
- Training ground.
- Administrative offices.
- General house.
- Gatehouse.
- Fire equipment/machine space.

MERITS

- The site is easily accessible
- There is proper orientation of the building on the site.
- There is good provision of hard landscape facility.
- Provision of drill tower for the training of personnel's.
- There is proper provision of supporting facilities to enhance the effectiveness of the station.

DEMERITS

- The site is not properly demarcated.
- Provision of inadequacy exit and entry gate.
- Lack of an emergency exit for the fire machines in case of the emergency fire alert.
- Lack of basic health facilities.
- Lack of staff accommodation/dormitory.

4.3.0 CASE STUDY THREE

FIRE SERVICES STATION MINNA.

LOCATION:- It is located at Limawa area near Old airport quarter, along Bosso road Minna, Niger state.

Architectural facilities

- Administrative block

- Training ground

- Health centre

- Mosque

- Commandant house

- Gate house

- Generator house

MERITS

- Adequate training ground provided

- A good health facility also provided.

- Good organization of the site.

- Other supporting facilities also provided.

DEMERITS.

- Lack of proper zoning of the facilities on the sites.

- The training facilities are inadequate.

- Inadequate provision of the access to the site.

- Lack of proper building maintenance.

- Officer's mess not provided.

4.4.0 CASE STUDY FOUR

FIRE SERVICE TRAINING COLLEGE. UK

LOCATION:- it is located in United Kingdom (U.K.) of great Britain.

Architectural facilities.

Administrative and training building

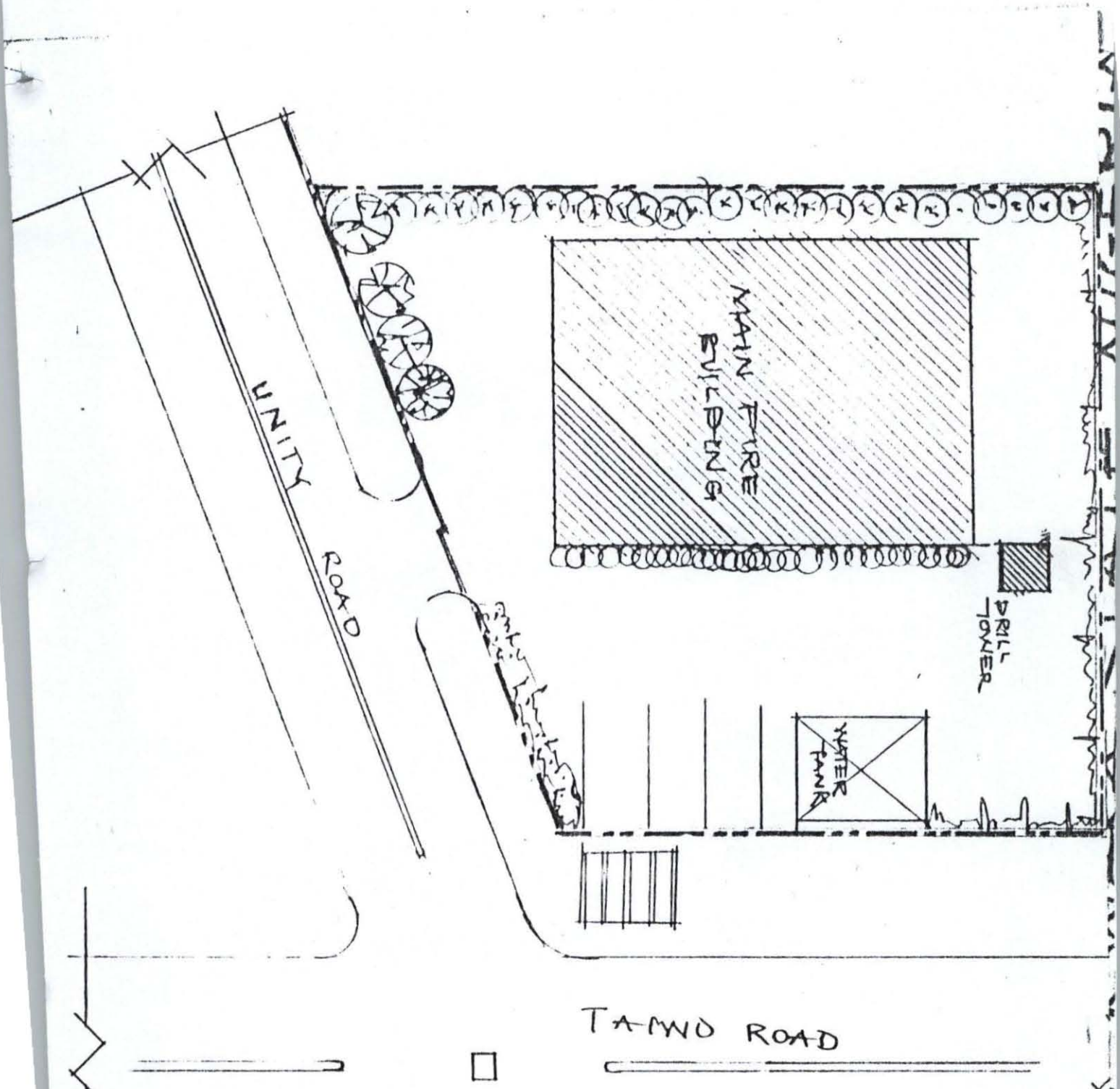
- Learning facilities
- Officers mess building
- Library
- Dinning area.
- Television area
- Common room.

MERITS

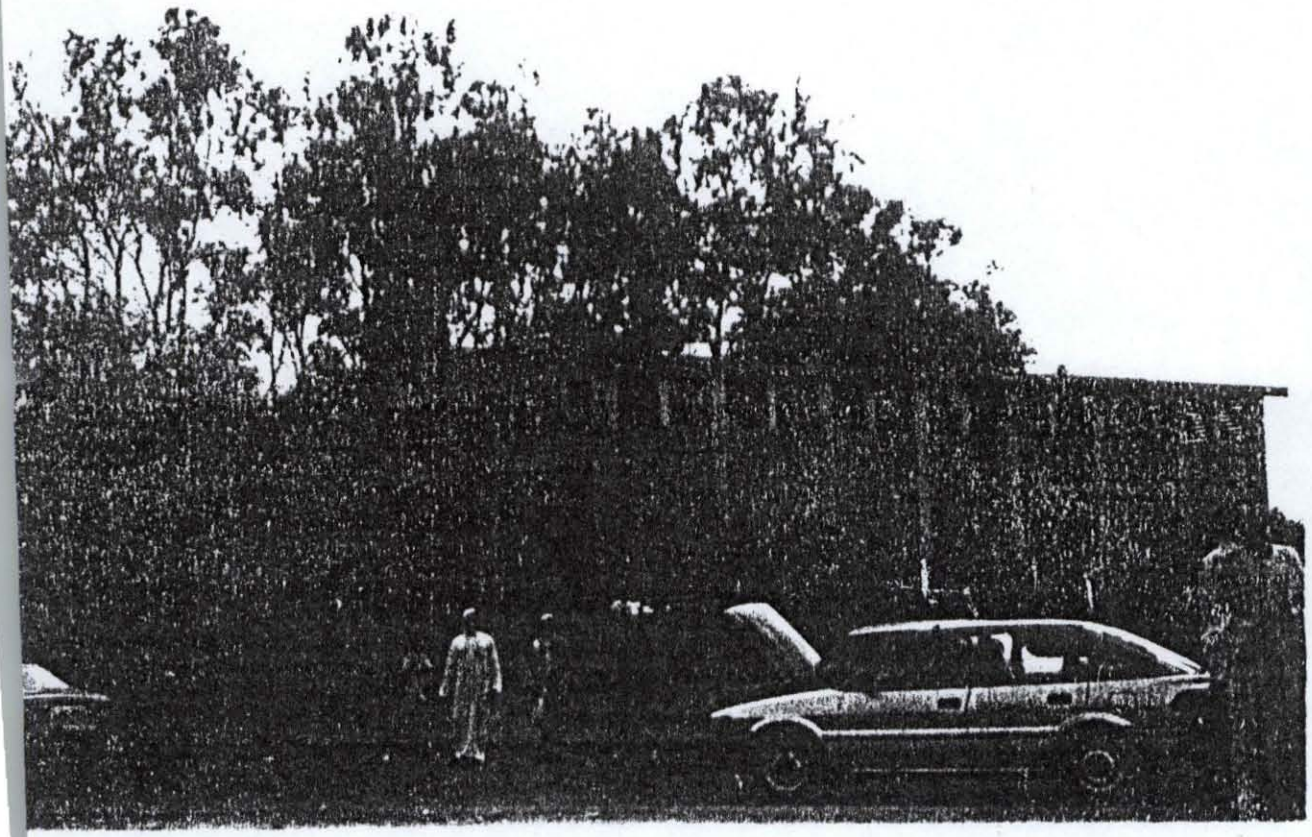
- College library is properly sited against noise problem.
- Adequate eating area are provided for the students
- Facilities are provided properly oriented
- There is room for future expansion.

DEMERITS

- Functional relationships of the facilities are not properly enhanced.
- Site is not properly utilized.



FIG·4·1·1 SHOWING THE LAY-OUT PLAN OF FIRE SERVICE STATION, ILORIN, KWARA STATE



4·1·2 SHOWING THE FIRE MACHINE BUILDING IN PERSPECTIVE
"FIRE SERVICE STATION 1 LORIN"

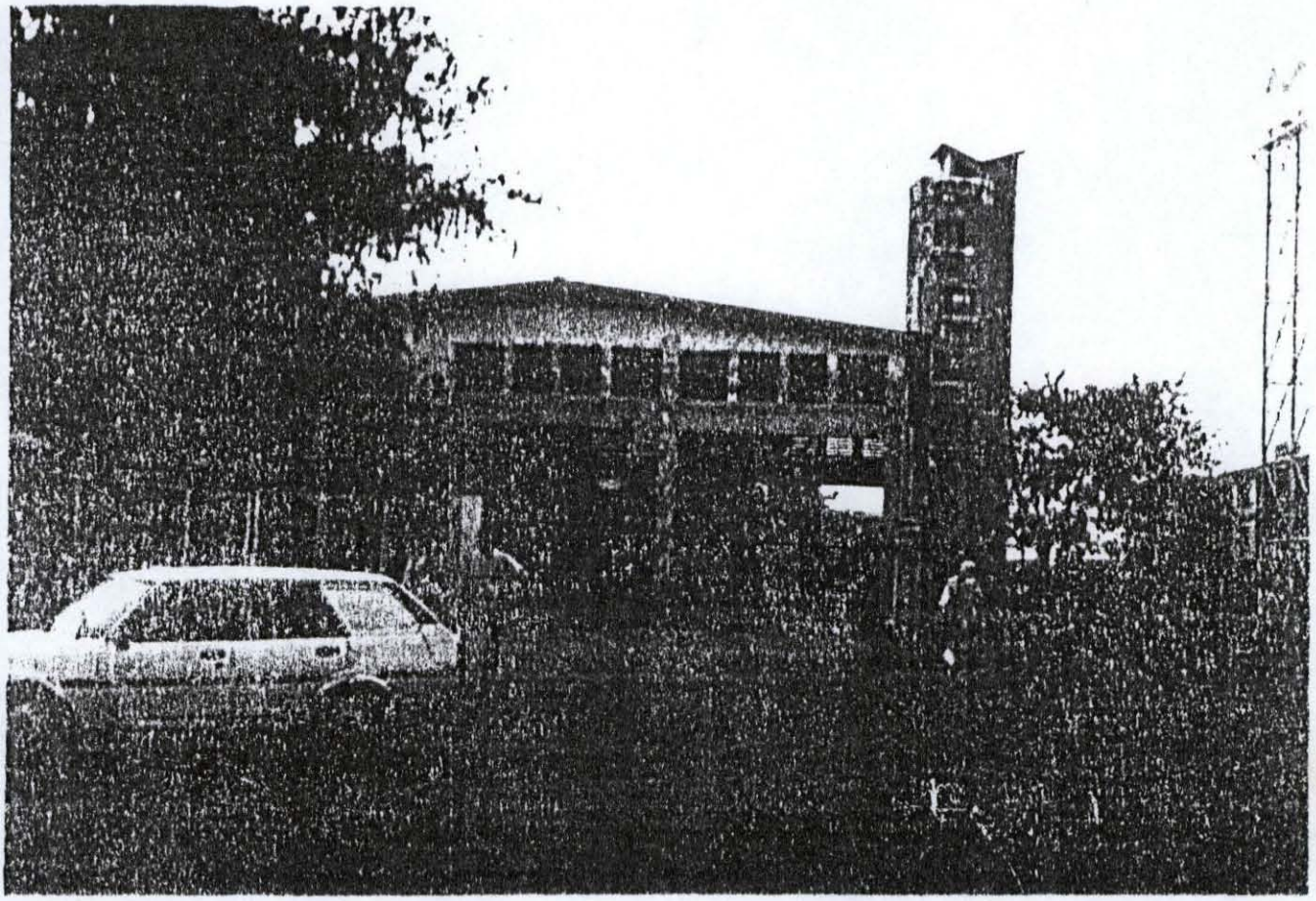
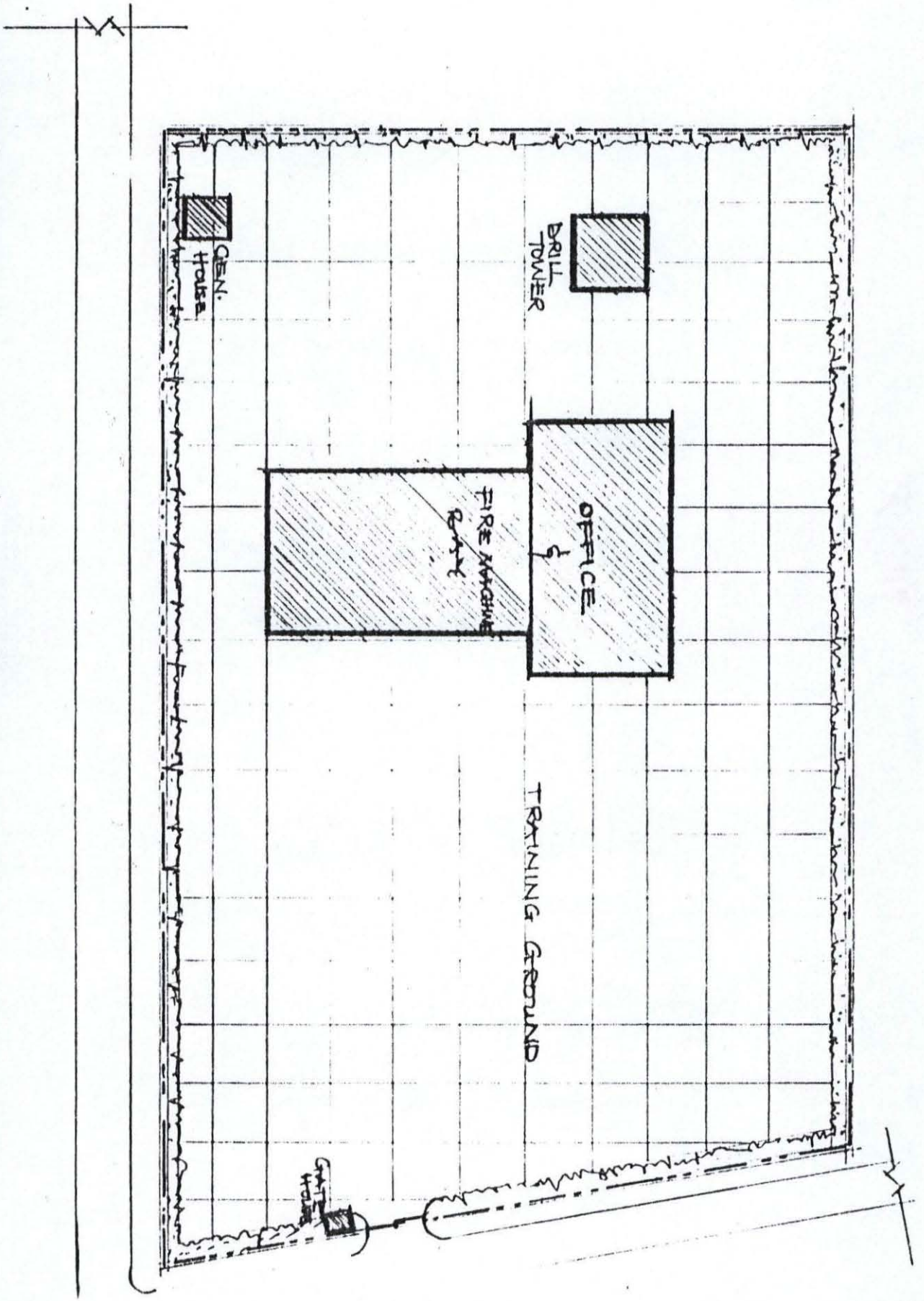


FIG 4·1·3 SHOWING THE FIRE MACHINE BAY AND THE DRILL TOWER FIRE SERVICE STATION ILORIN

FIG 4.2.1 SHOWING LAY-OUT PLAN OF FIRE SERVICE WORKSHOP WUSE, ABUJA.



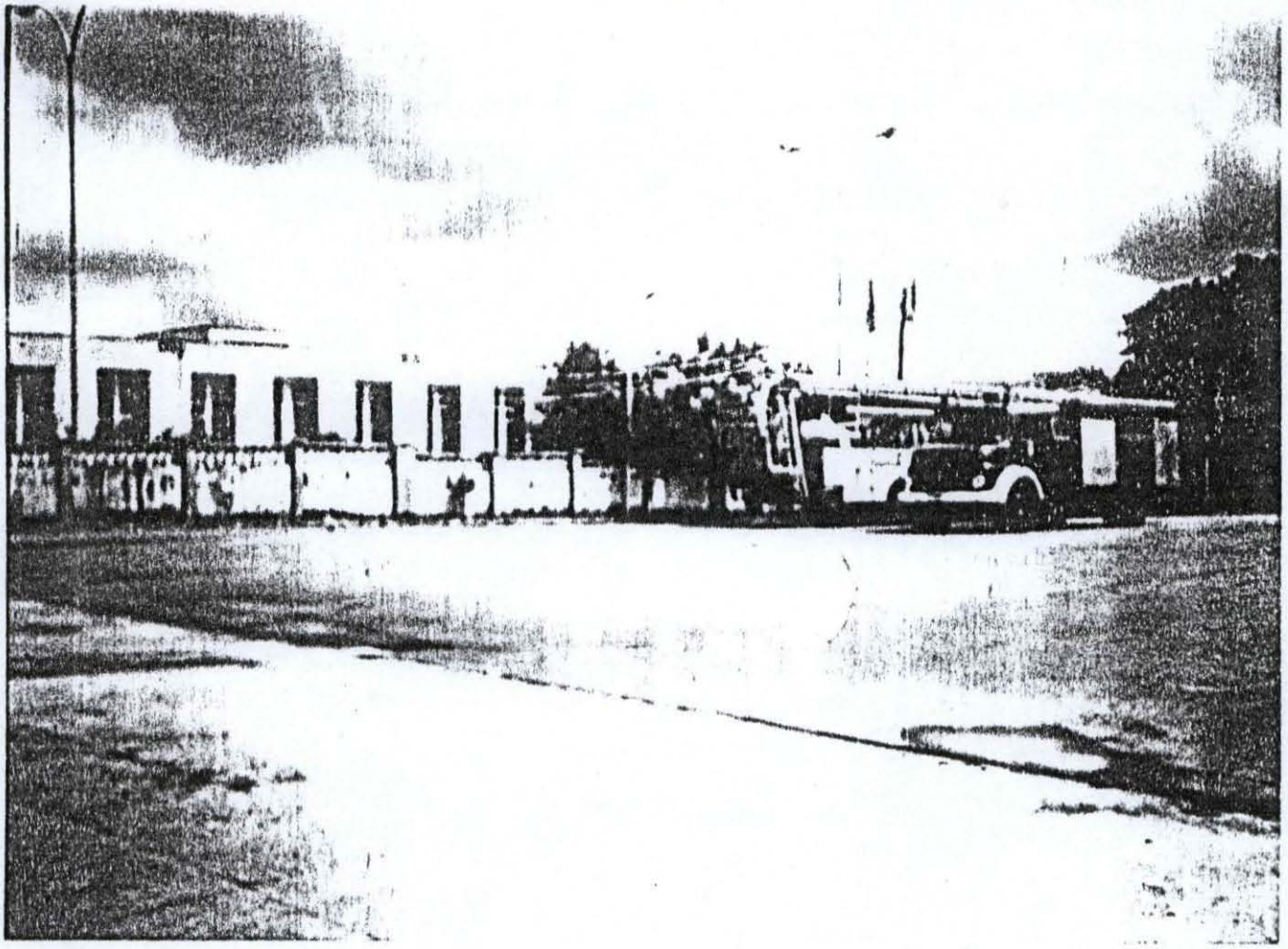
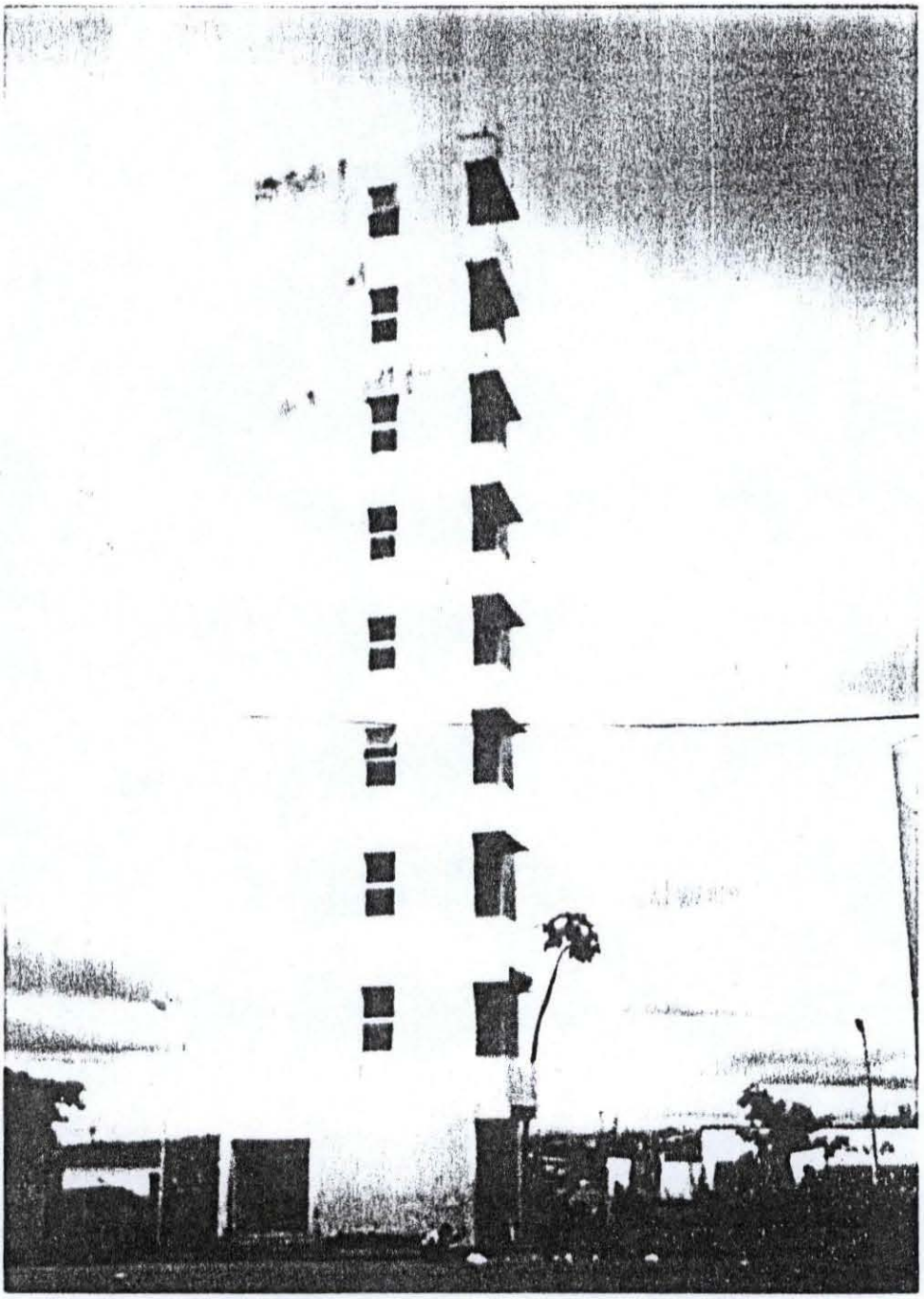


FIG 4·2·2 SHOWING THE PARADE AND TRAINING GROUND FOR FIRE SERVICE WORK SHOP ABUJA



FG4.2.3 SHOWING THE DRILL TOWER FOR FIRE SERVICE TRAINING WORKSHOP ABUJA

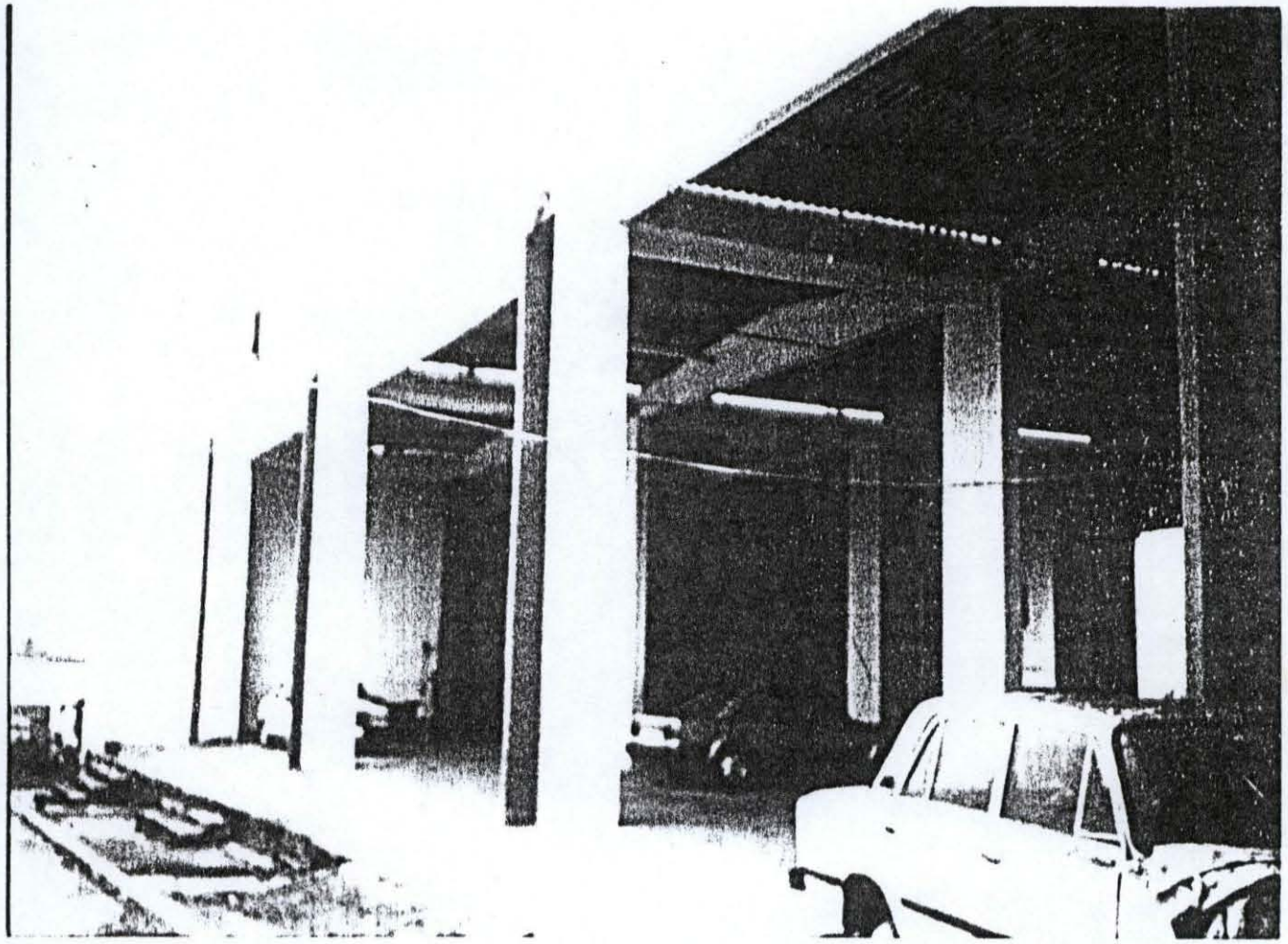
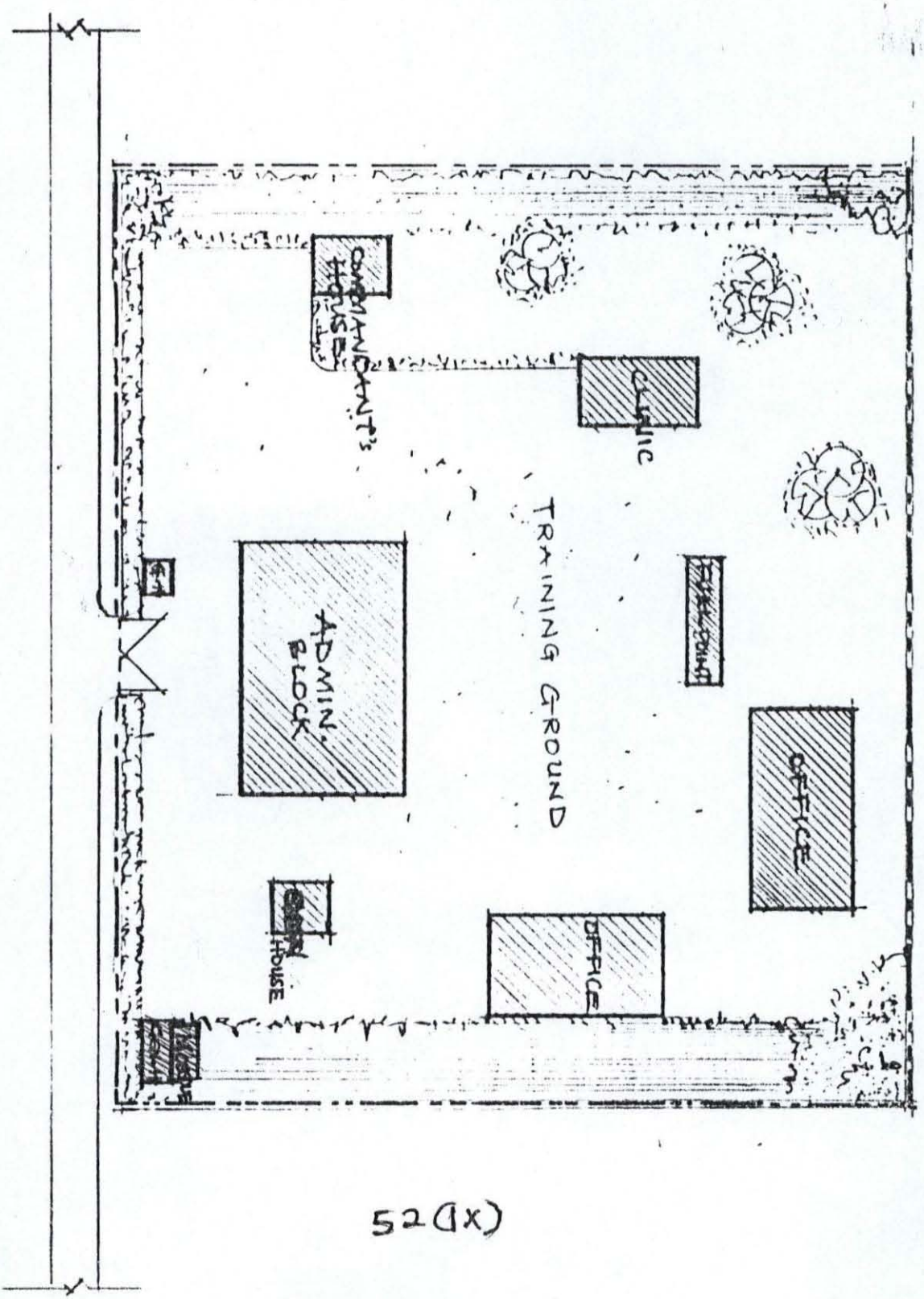
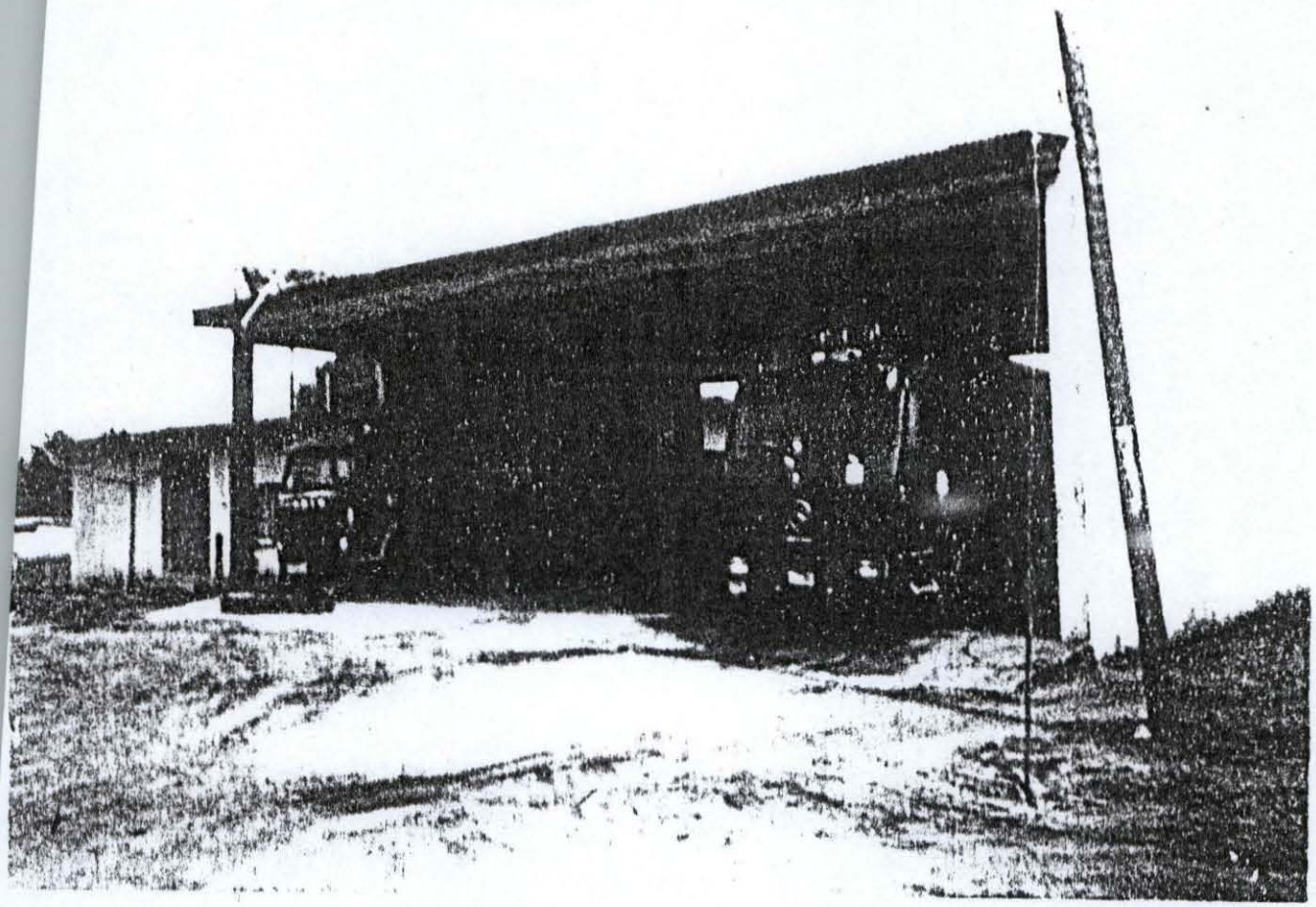


FIG 4·2·4 SHOWING FIRE MACHINE BAY ABUJA

FIG 4·2·5 SHOWING FIRE MACHINE (Ladder Truck)

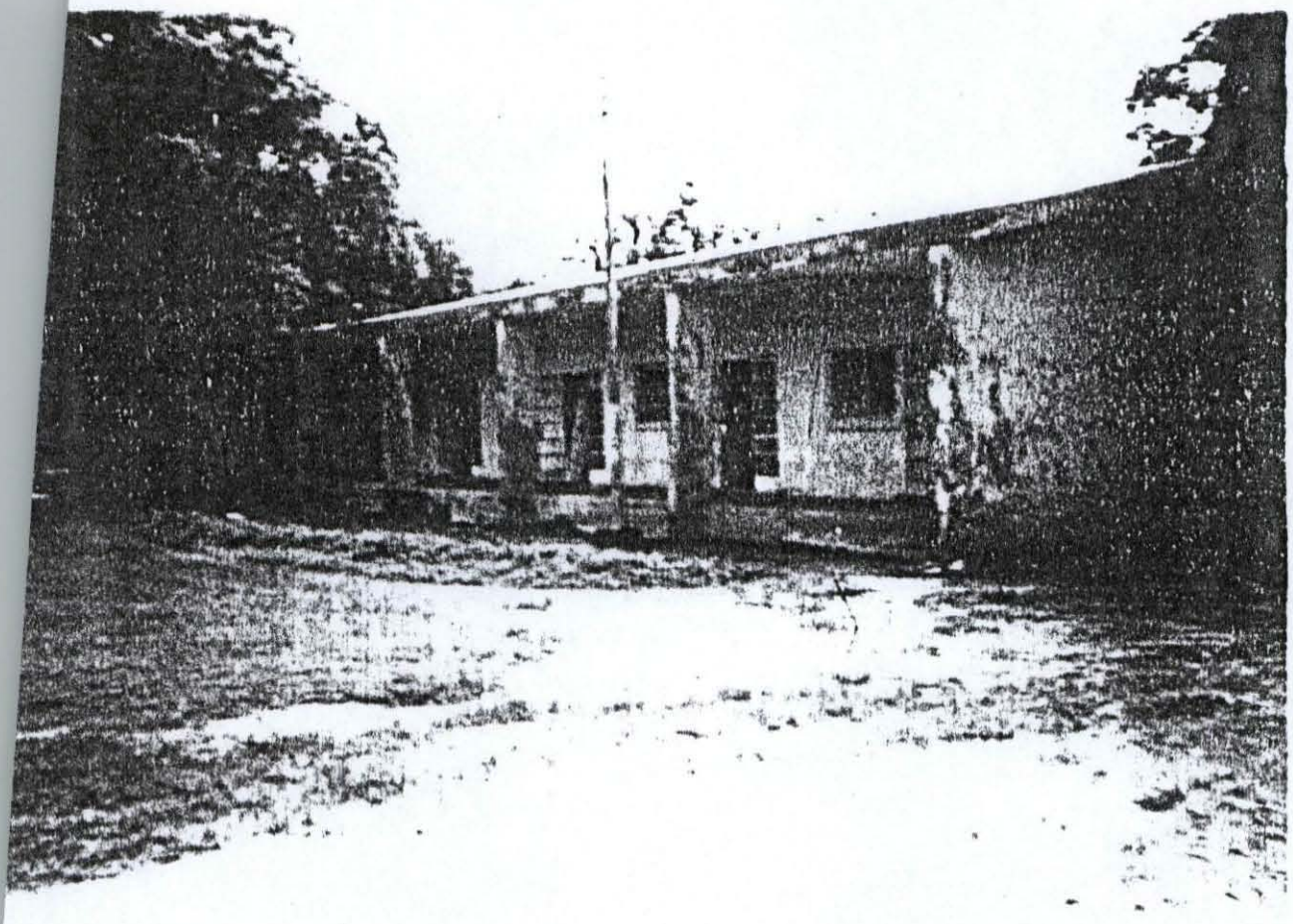
FIG 4·3·1 SHOWING LAY-OUT PLAN OF FIRE SERVICE STATION MINNA, NIGER STATE.





IG 4·3·2 SHOWING FIRE MACHINE BAY APPROACH

G 4·3·3 SHOWING THE CENTRAL CONTROL ROOM AND MACHINE BAY REAR VIEW



IG 4·3·4 SHOWING THE ADMIN BLOCK FOR FIRE SERVICE STATION MINNA

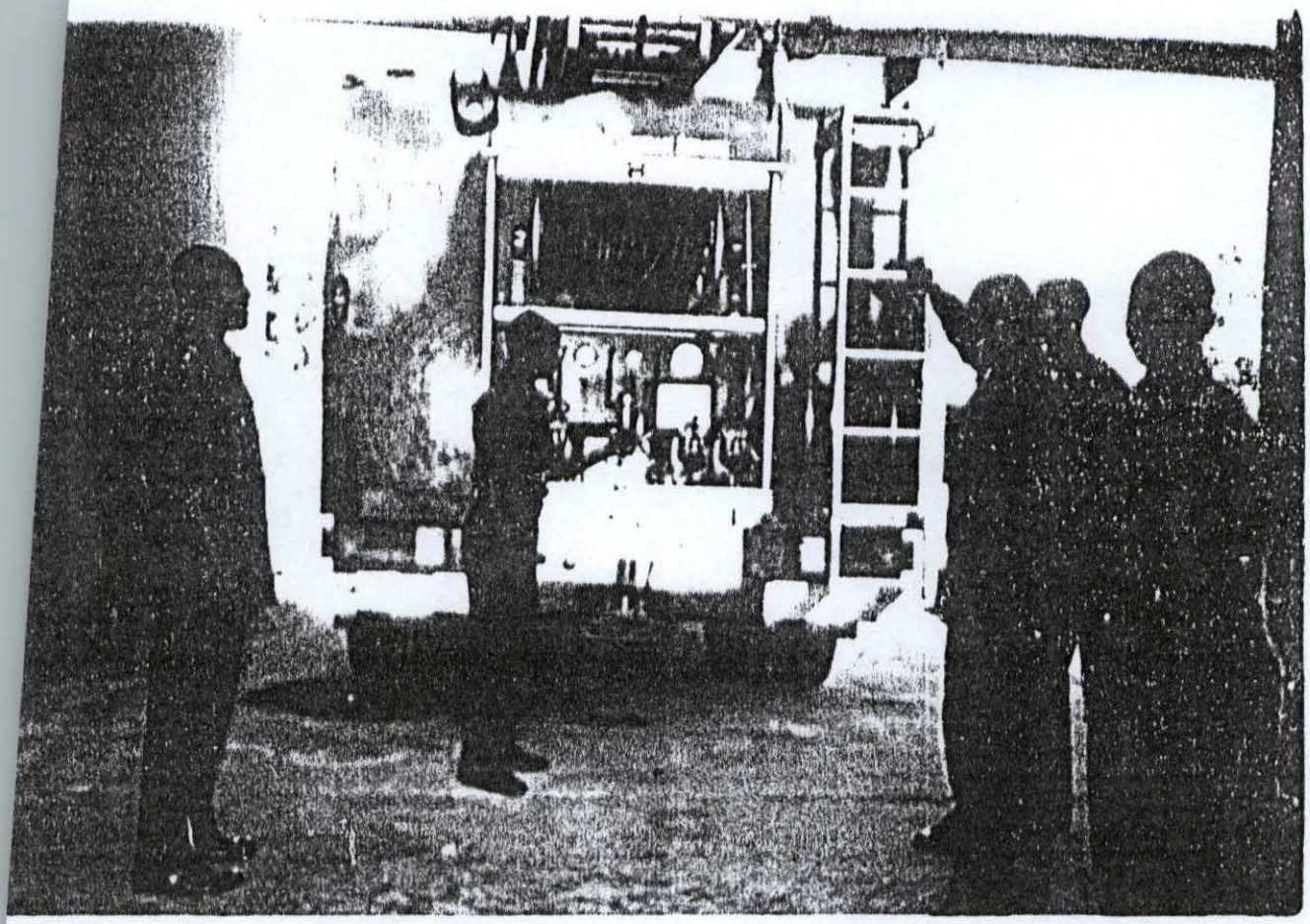
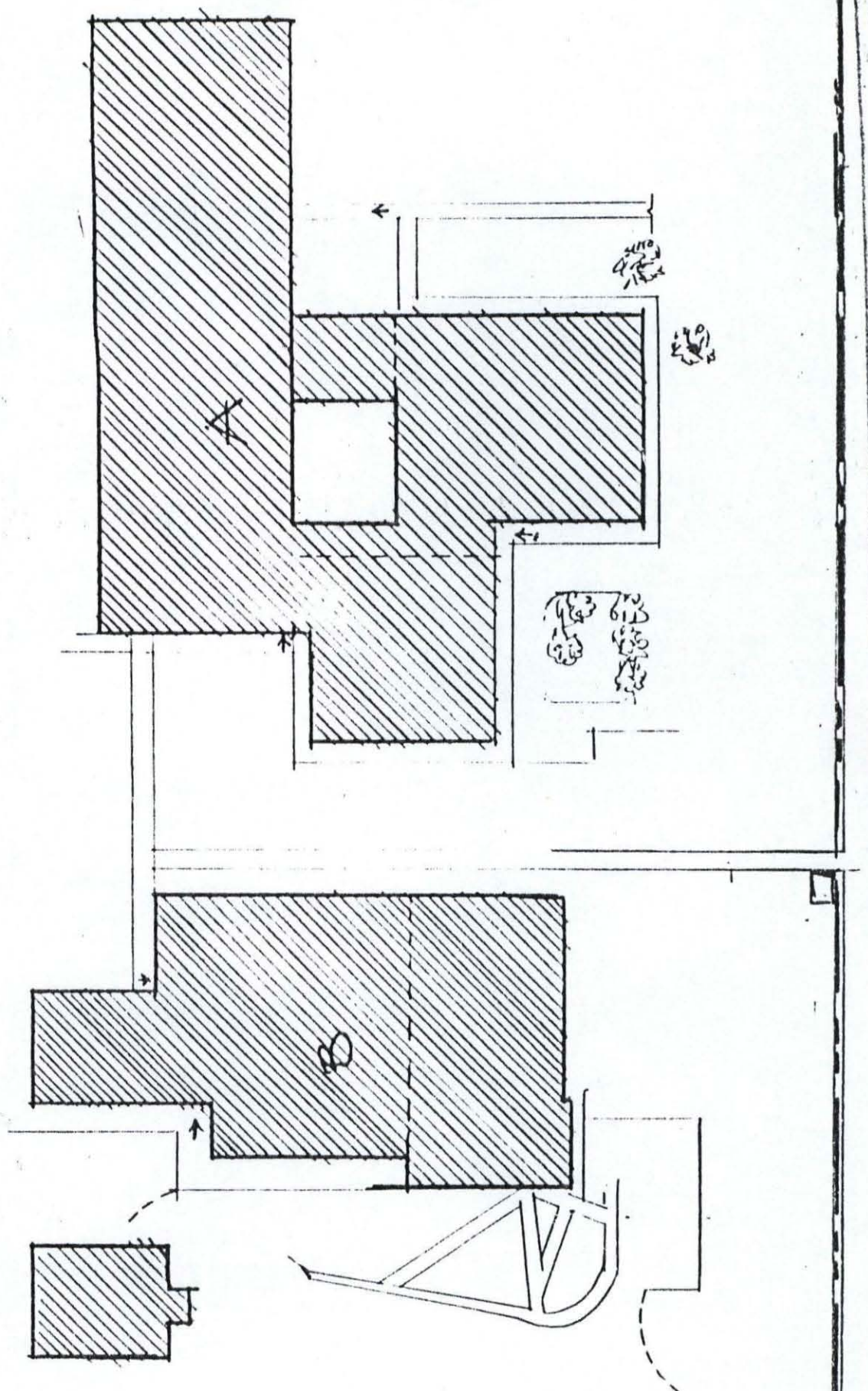


FIG 4·3·5 SHOWING THE FIRE MACHINE WITH OFFICERS AT FIRE SERVICE STATION MINNA



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CHAPTER FIVE

.00 BASIC INFORMATION ABOUT PROJECT LOCATION

5.10. BRIEF HISTORY OF OFFA.

According to the history, it is widely believed that original indigenes of Offa hail fro Ile-Ife, the spiritual home quarters of Yorubas. This tells us that Offa is one of the ancient towns of Yorubas. Though, the exact years of its existence is not known, but from the information according to the historian it was traced to about three centuries old.

The town derived its name from a weapon called "Offa" which literally means "Bow and Arrow". The traditional title is being handed down from one ruler unto another after the death of one since its inception.

However, in a logistic expression, one can probably say that the founder of Offa town; (Olofa); that is the town head, was a hunter and Archer who uses bow and arrow very often.

5.2.0 LOCATION AND SETTING OF OFFA.

Offa is located on the western highland of Nigeria with an altitude of 425m. above sea level on the shield of southern boundaries of Kwara state. It is situated on an undulating land, which is intensively formed, vegetation

5.4.0 TRADE AND INDUSTRY.

Offa town is a popularly known major commercial city in Kwara state. It attracts a sizeable number of traders and shoppers from the rest of other local government in the state. It also attracts people from neighbouring state as a huge considerable amount of buying and selling is encouraged.

The manufacturing sector is comprises of large and small-scale industry using simple or complex machineries. Example of large scale industries are Noble breweries, Okin biscuit factory, Okin foam industry, Olalomi carpets industry, kemtas paper converters, solid minerals industry and host of others, which serve as base of employment to a large number of people.

The small scale industries also include saw mill, structural metal firm, furniture factories, printing and publishing firm, several bakery and confectioneries, handcraft are not excluded.

Amongst commercial trade available are bank, markets, mini-market and supermarket.

5.5.0. POPULATION

When Offa town was the capital of old Oyun local government, the exact population number is net known. But, when it became the capital of Offa in Offa local government in 1991, a census was carried out which give

the population number of Offa and estimated population number till year 2005. Therefore, the population numbers of Offa and Oyun can be seen in the following. The figures show the numbers in 1991 and estimated figure for 2005 for both Offa and Oyun local government areas.

Table 5.5.

Local government area	Population	Estimated Population
OFFA	37,728	79,996
OYUN	32,392	56,209

5.6.0 OCCUPATION

The major occupation of the people of Offa is farming, trading, full time educationalist and local craft making. Farming take about 55% of the occupation pattern in Offa, and some considerable percentage of this take farming not merely on subsistence level but real as a profession. The Savannah level that form the vegetation of the area is highly conducive for production of yam, cassava, guinea corn, maize and sweet potato.

5.6.1 TRADING

The market called "Owode market'' has being the major motivating factors on the aspect of trading occupation by Offa people. Greater percentage of the populace engages in scale of the farm products, and goods like provisions, clothing and cooking utensils in the market place (Owode). A few more has well-established stores and shops dealing in the sales of varieties of material.

However, this contributed immensely to the influx of considerable amount of immigrants from other towns and local government areas.

5.7.0 SOCIAL SERVICE

5.7.1 ROAD

The tarred regional road that passes through Offa and Erin-Ile, Offa and Ajase-Ipo are the major and main road in the town.

From this major road, there are other roads connected to it and from these other roads (minor roads,) access roads and footpath) linked the residential, industries commercial buildings and so on. Most of these road, especially the minor roads are asphalt finished, the minor roads are either finished with surface dressing or ordinary lateritic soil.

Finally, there is also an efficient railway link between Ibadan and Ilorin passing through Offa central station terminus.

5.7.2 WATER AND ELECTRICITY.

There are pipe borne water network connected to the main from the water board. There are also boreholes and well water to supplement the pipe-borne as the need arises. Electricity supply is mainly from N.E.P.A (national Electricity Power Authority) P.L.C and this circulates round the town.

5.7.3 HEALTH SERVICE

Amongst other social and infrastructural facilities in Offa town are health services centres, this include government owned general hospital, private hospital, clinic and maternity home.

5.8.0 GENERAL CLIMATIC CONDITION.

Offa town is found under the climatic region that is called TROPICAL INTERLAND. Therefore all the climatic characteristic of this region will have equal influence on the town.

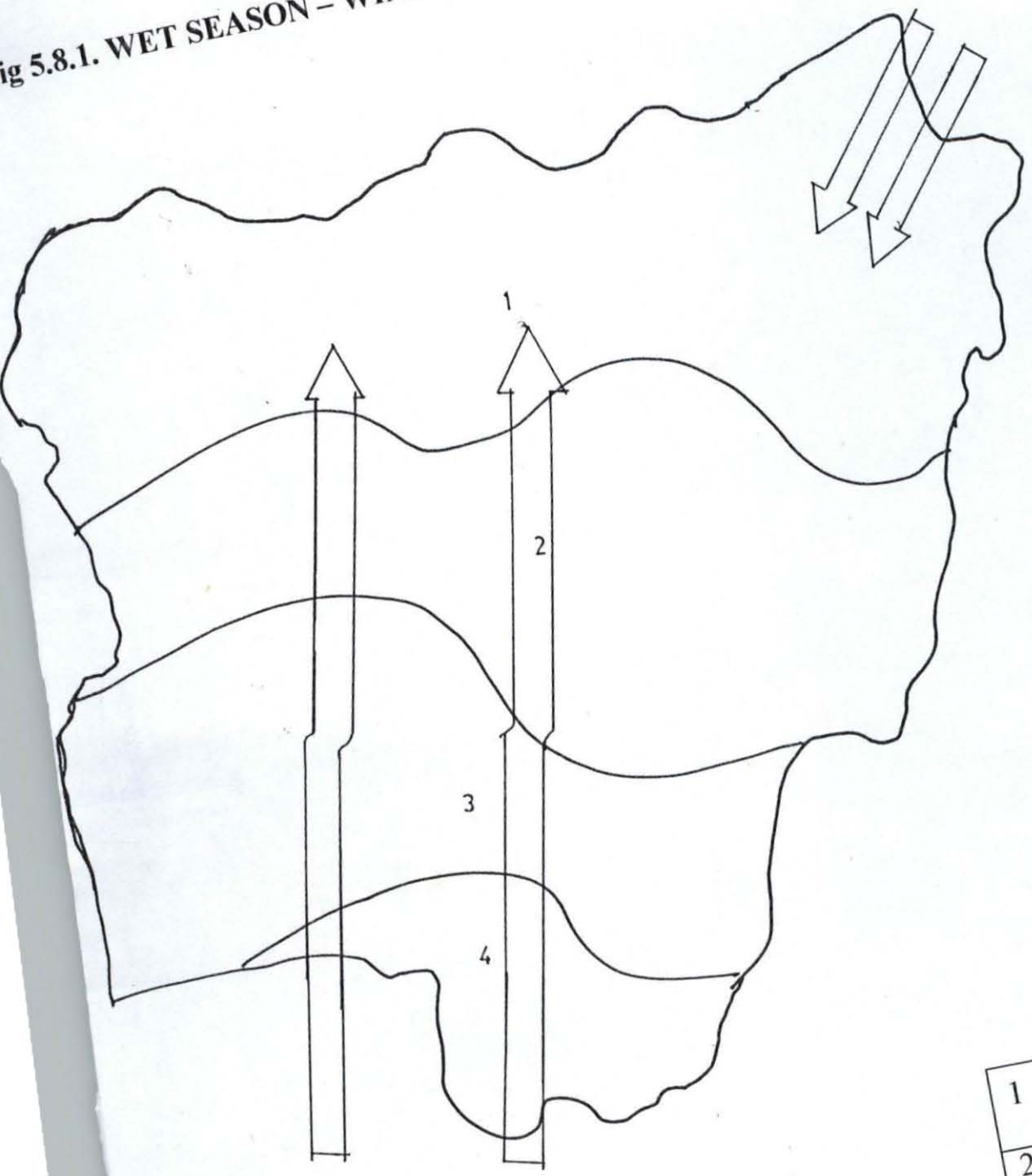
5.8.1 WIND.

There are two prevailing winds namely the rain bearing South-West mansoon wind which blows across the atlantic oceans between the month of may and October, this is call Wet season.

The dusty Northeast trade wind blows through the Sahara desert during the month of November to April with very little rainfall towards April. This is called the dry season and it bring along harmattan during its dries period.

(April-October)

ig 5.8.1. WET SEASON – WIND

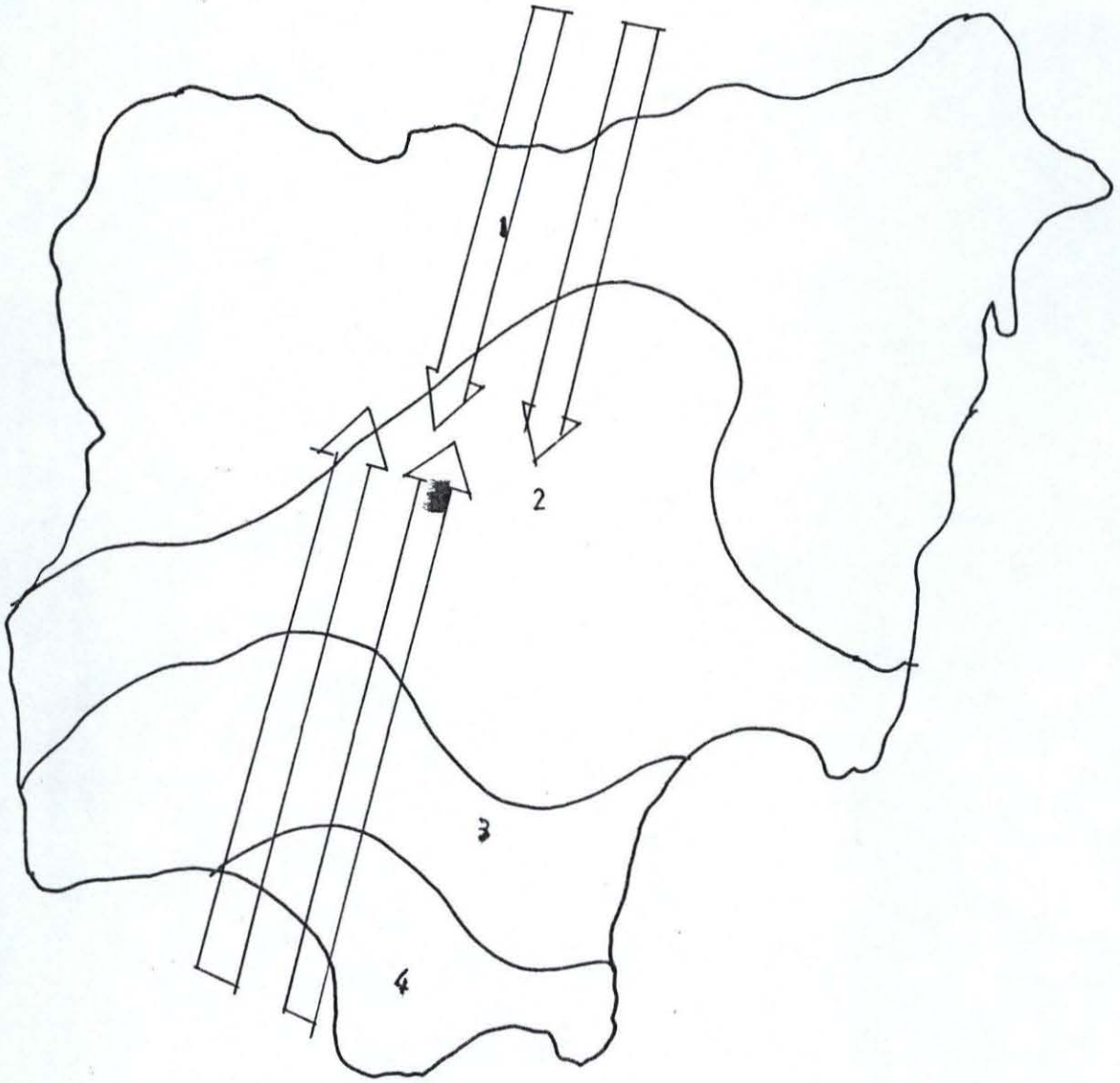


KEY

1	UNDER 40^0
2	40^0 - 80^0
3	81^0 - 120^0
4	OVER 120^0

Tropical Maritime air mash (South-west trade wind)

Fig 5.8.2 DRY SEASON –WIND (November – March)



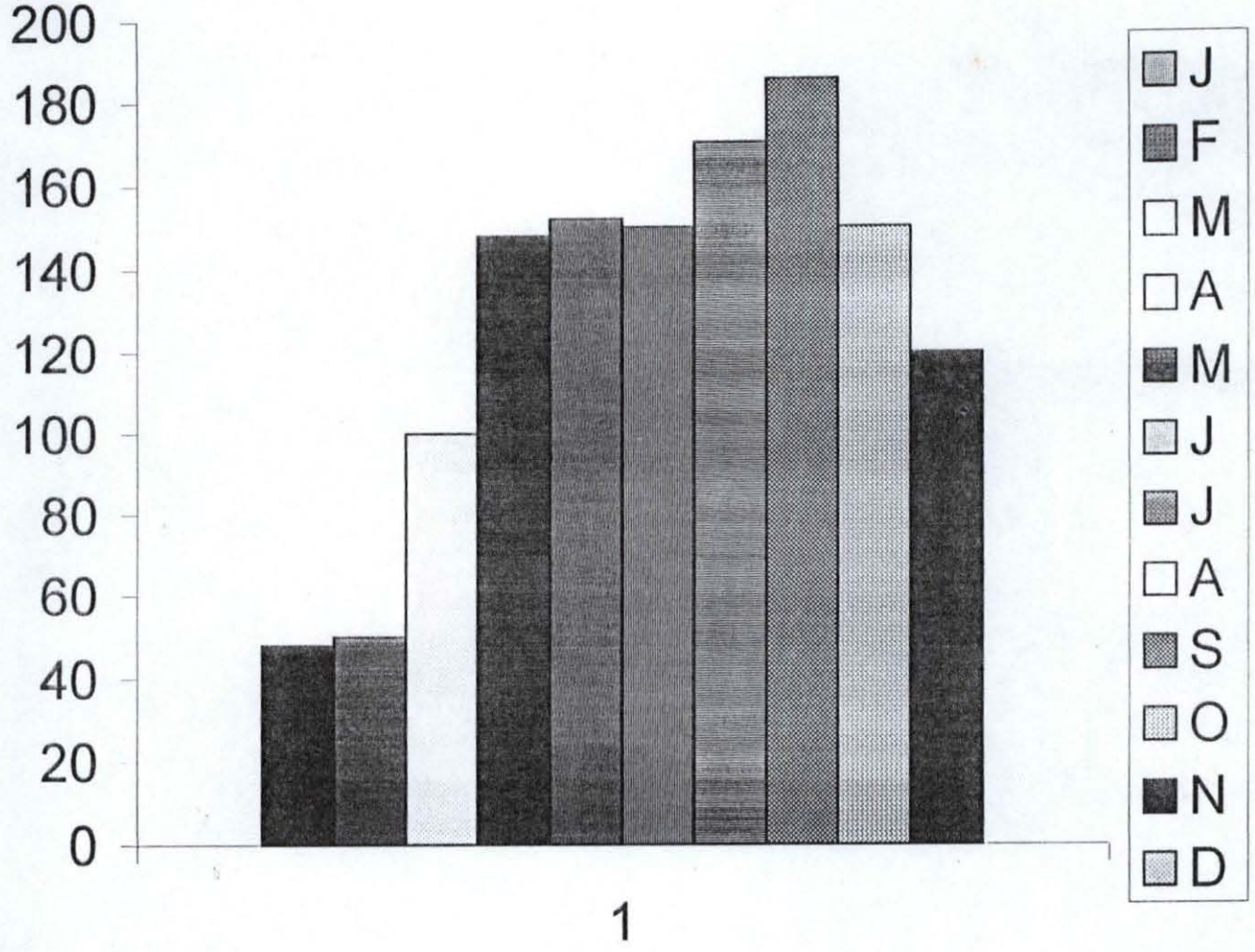
KEY

1	No rain 0- 10
2	10 - 20
3	
4	0VER 20

Tropical Continental air mash (hammattan)
North east trade wind

5·8·3

ANNUAL RAINFALL



5.8.4 **ANNUAL RELATIVE HUMIDITY**

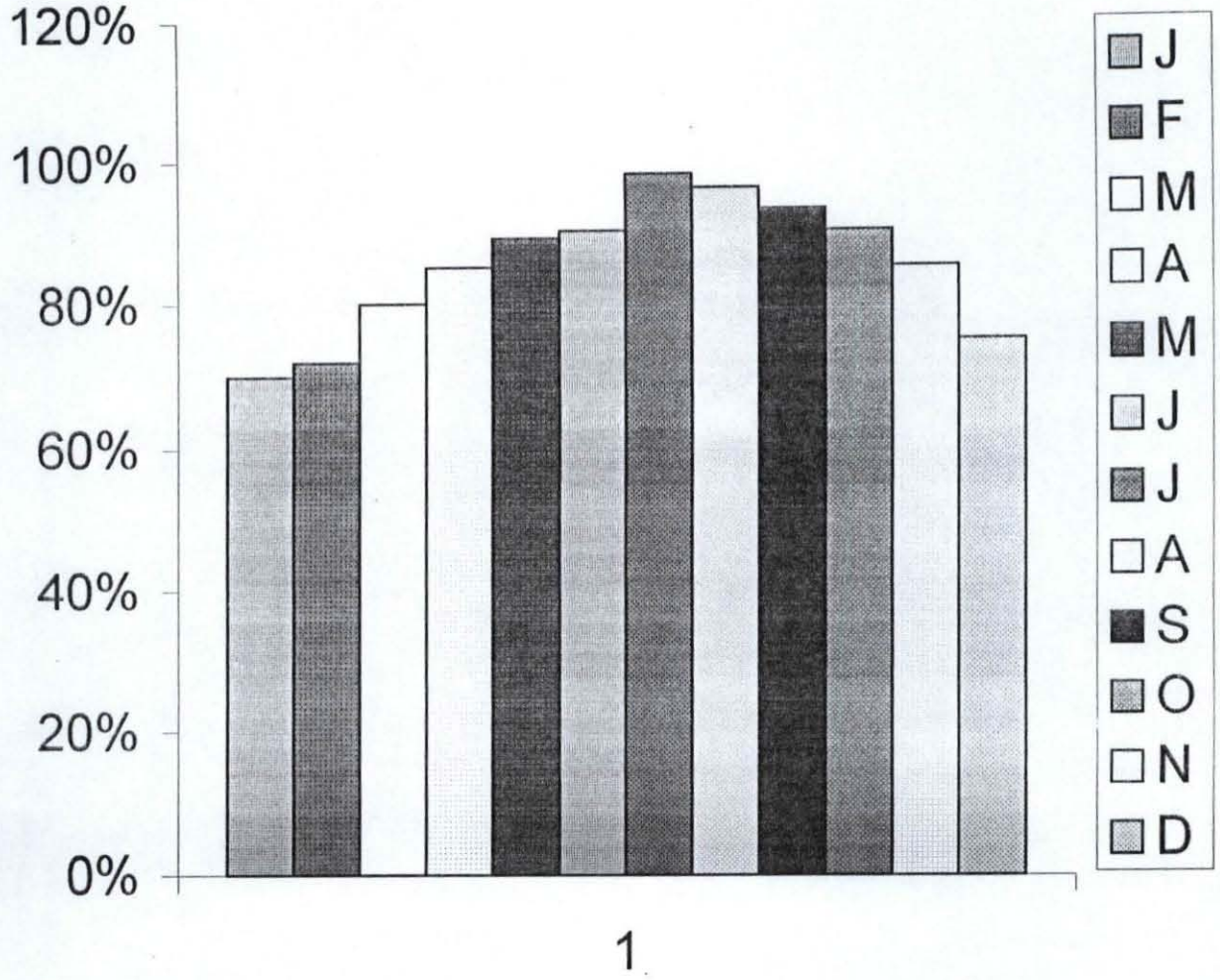


FIG 5.

5.8.2 TEMPERATURE AND HUMIDITY.

Offa town is a place that experience high temperature throughout the year, with a constant increase in daytime temperature during the dry season. The hottest month usually comes in March, and the mean annual temperature range is between 25°C and 35°C.

The coldest period are often noticed during the months of December and January with minimum temperature of 20°C and 18°C respectively and maximum temperature of 33°C and 32°C respectively. More so, it is noticed that during this month harmattan dominate the period and temperature becomes colder at night. Lowest relative humidity is 70% in January and February.

5.8.3 VEGETATION

The vegetation of Offa can be categorized under savannah forest. Because, it is characterized by not very high trees, average height of 4m, grasses of the forest experiences constant yearly burning which has always lead to the ineffective of the trees.

However, deductions from the climatic condition of this area shows that prevailing condition do not pose any treat or serious problem as regard

the planning and design apart from the fact that the roof structure and the roof itself must be well secured against the whirl wind during the dry season.

CHAPTER SIX.

6.0.0. THE SITE

6.10. LOCATION ANALYSIS.

Viability and functionality of any public building depends mainly on the area of location. At times the need for visibility study arises for any building of this nature, to discover whether or not it basic function and the success of its construction aim will be achieved in the end.

The success of an important project of this nature can be lightly influenced by

- Good location
- A conspicuous approach
- Economic serve location which is of paramount importance to the members of the general public
- The site is located at Agun area, along Adesoye College Offa.The site is about 500m away from the bank of Afelele river in Offa, Kwara State.

6.2.0 CRITERIA FOR SITE SELECTION.

The selected site for the proposed project is influenced by some factors, which are of highly importance in the structure of this type, due to it require function. These are seen in the following.

(1) Accessibility

The proposed site is easily accessible as it is linked with various roads in Offa and its environs. The site is linked with Igosun by Offa-Igosun road and with an easy accesses to other neighbouring towns like Ajase_-Ipo through the federal road i.e. Offa-Ilorin road and Ipee town through Offa-Ipee minor road. More so towns like Ijagbo, Erin-Ile and Ilemona can also have easy accesses to the site.

(2) Afelele River.

The relevance of water cannot be over emphasized in the proposed project (fire service station) therefore the site is chosen in order to have easy access to water its demanded, so, this will help in boosting the functionality of the proposed project.

(3) Power supply.

The supply of power to the site will be an easy reach as National electric power Authority (N.E.P.A) Plc. Major line can be tapped easily.

6.3.0. SITE CHARACTERISTICS.

6.3.1. TOPOGRAPHY.

The site is relatively flat, with little or no undulation.

6.3.2 VEGETATION.

There are tall grasses on the site area with little trees to be removed and some maintained for the landcape of the site.

6.3.3. SOIL.

The site is made of laterite soil, which is good soil for building construction with a good foundation system.

6.3.4. ENVIRONMENTAL EFFECTS.

The plants in the site grow the year round due to constant moisture experienced by the soil very close to the riverbank. The site area is always cool due to the effects of the water body.

The water bodies (Afelele river) are very much habitable for fishes and other aquatic organism.

FUNCTIONAL ANALYSIS

FUNCTIONAL FLOWCHART

(a) MAIN FIRE BUILDING

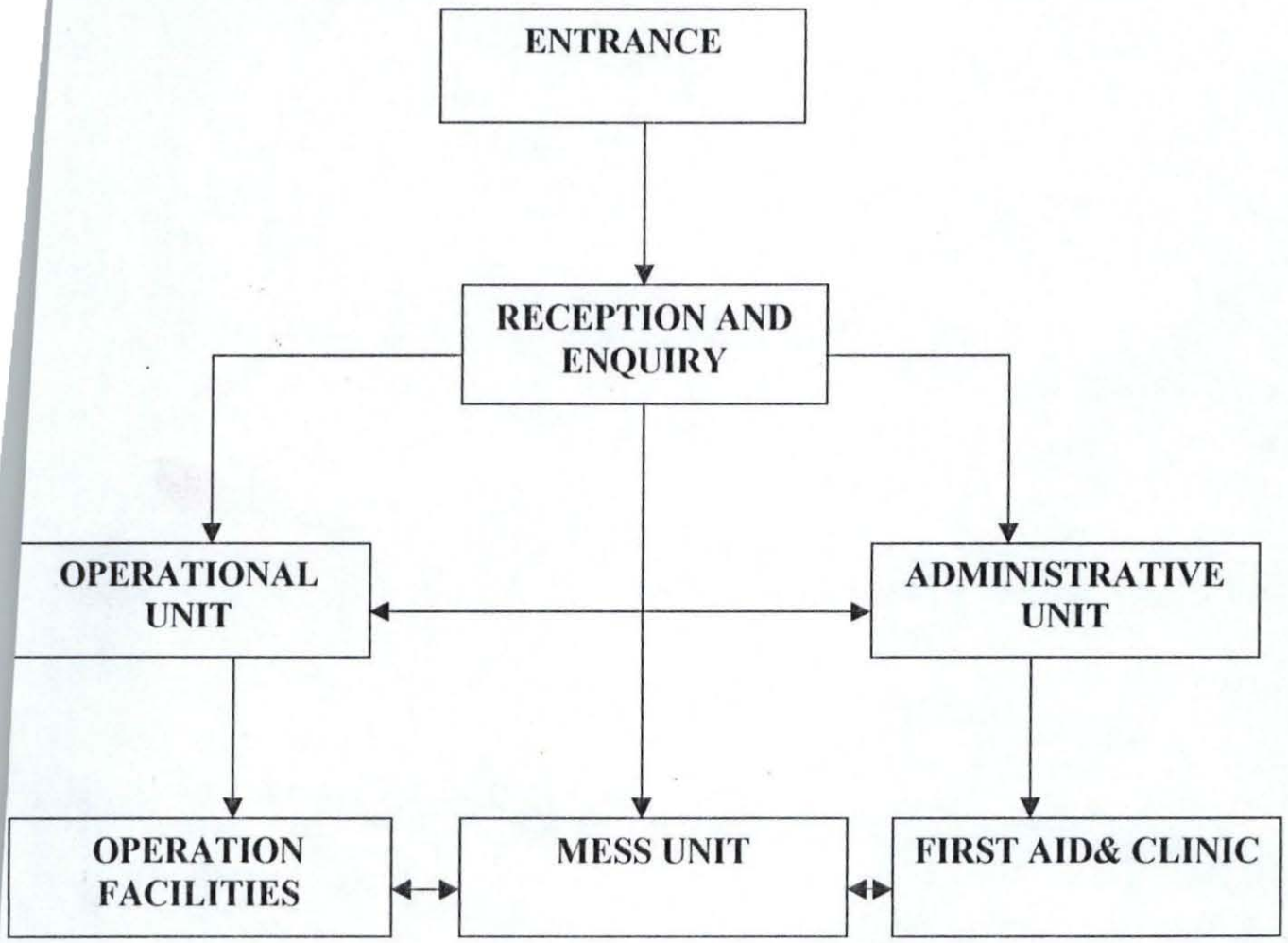
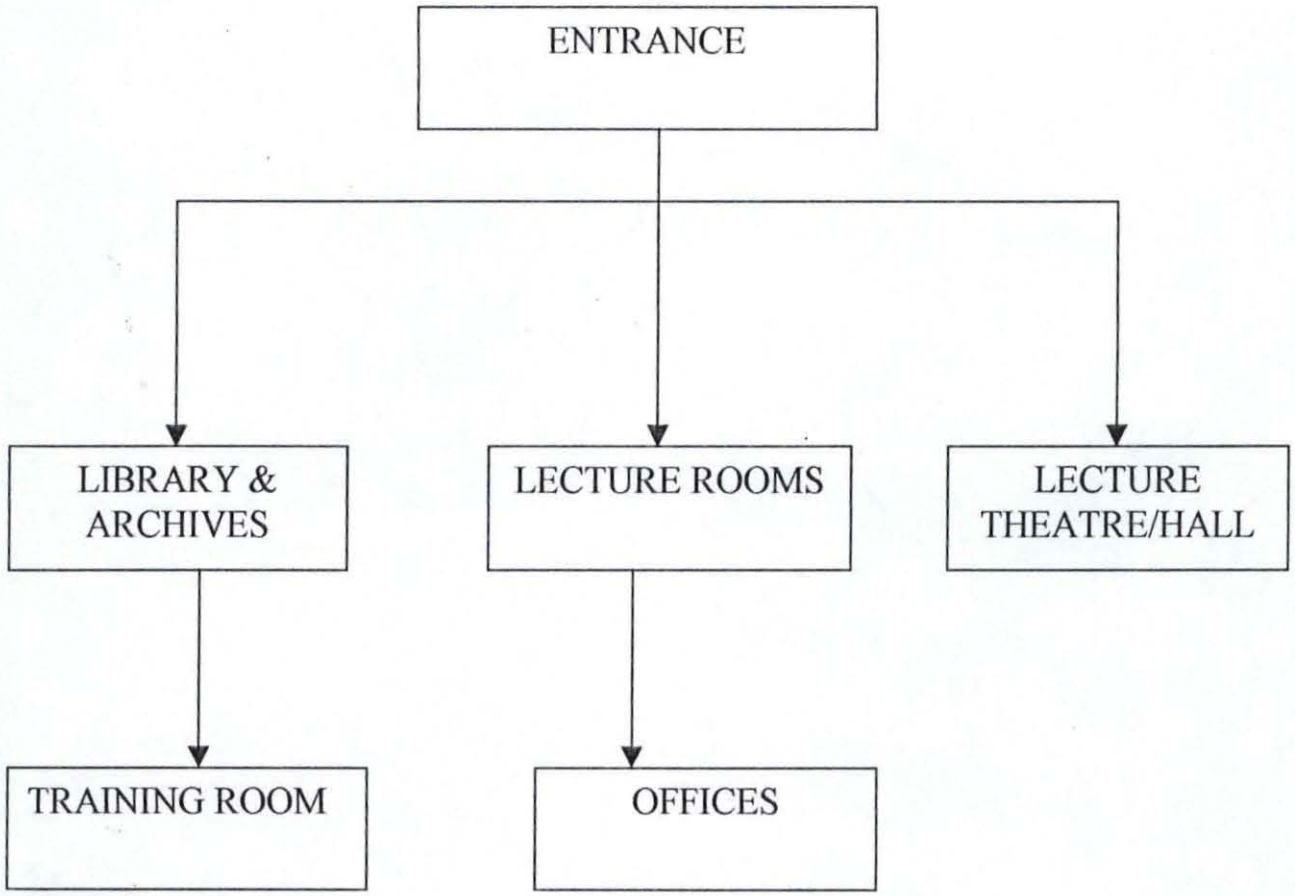
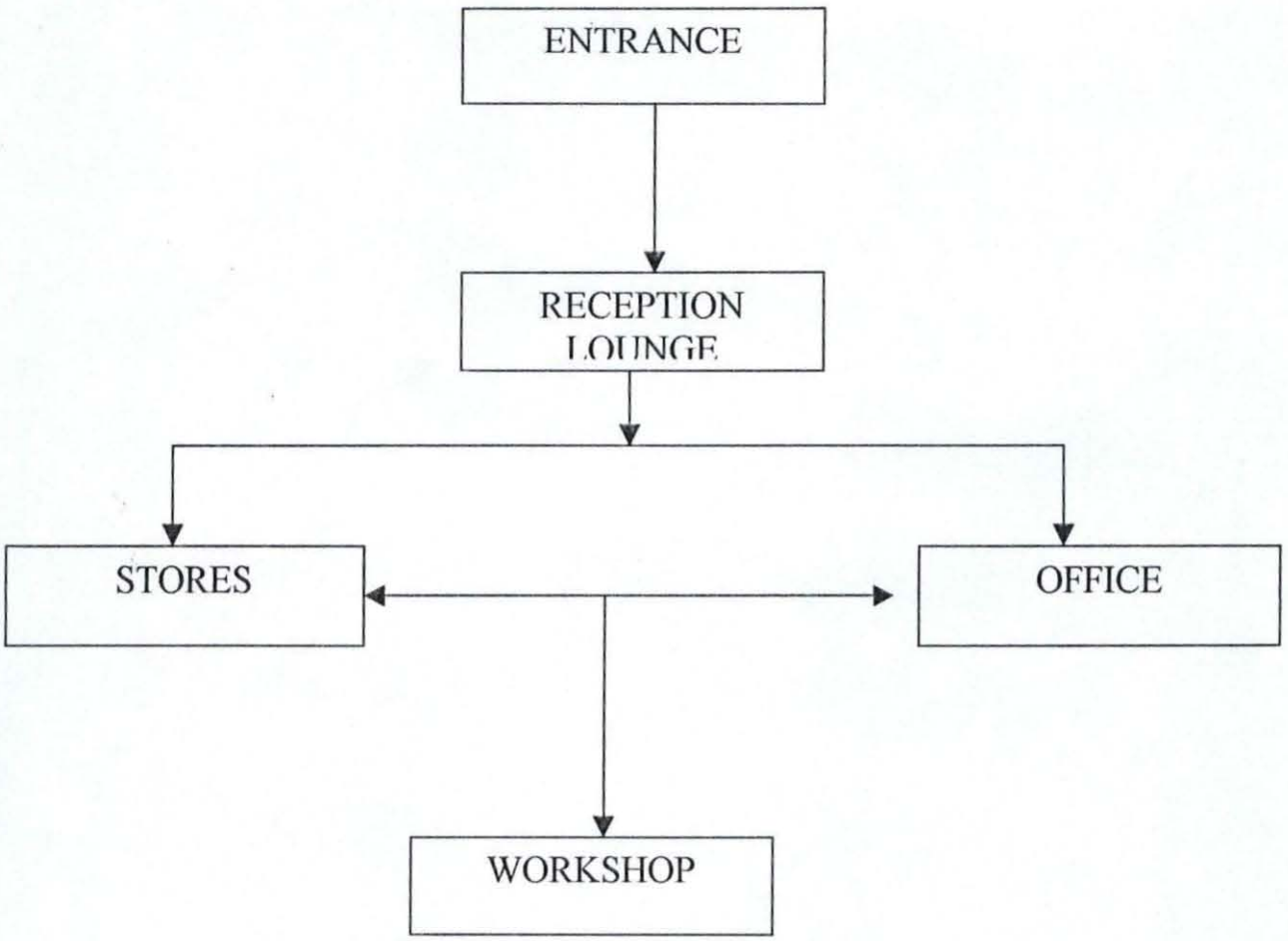


Fig 5.8.6

TRAINING CENTRE



5.8.7 MAINTENANCE BUILDING



SPACE ANALYSIS

DESIGN COMPOSITION AND SPACE REQUIREMENT

Table 7.0: Main Fire Building

Space	Number (s)	Dimension	Total Area (m^2)
Entrance Porch	1	4.0 x 2.5	10.00
Entrance hall	1	8.0 x 7.5	60.00
Reception/ Enquiry	1	5.6 x2.5	14.00
Elevator	1	1.8 x1.6	2.16
Stair	1	5.4 x 2.6	14.04
Information centre	1	5.4 x2.4	12.96
Exchange room	1	2.8 x2.5	7.00

SPACE ANALYSIS

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Table 7.1: Administrative Unit

Space	Number (s)	Dimension	Total Area (m^2)
Shops	4	6.0 x4.0	96.00
Double Office	12	6.0x4.0	288.00
Single Office	6	3.0x4.0	72.00
Escape or Service Stair	1	4.8x2.0	9.60
Store	1	6.0 x4.0	24.00
Board room	1	-	75.60
Communication room	1	-	62.50
Radio room	1	5.4 x3.8	20.50
Manager's Office	1	5.6 x 4.0	22.40
Auditor's Office	1	5.6 x3.6	20.16
WC's	16	1.8 x 1.2	34.56

Table 7.2: Operation unit

Space	Number (s)	Dimension	Total Area (m^2)
Fire men Lounge	1	7.0 4.0	28.00
Fire machine hall	1	22.2x 11.0	244.00
Fire dressing / equipment	1	10.0x4.5	45.00
Hose wash and repair	1	13.0x5.0	65.00
Hose store	1	5.0x3.2	16.00
Operation room	1	7.0x5.6	39.20
Watch / rest room	1	6.0x4.5	27.00
Quiet room	1	8.0x6.0	48.00
Changing room	1	8.0x5.0	40.00
Wash and shower	1	8.0x5.0	40.00
WCs	4	1.8x1.2	8.64
Chief operation office	1	5.0x5.0	25.00
Repair workshop	1	5.0x4.0	20.0
Spare part store	1	4.0x 3.0	12.00
Oil store	1	4.0x2.5	10.00
Emergency power room	1	4.0x3.0	12.00
Appliance room	1	8.0x3.6	28.60
Oil binder room	1	4.0x3.6	14.40
Chemical extinguisher room	1	4.0x3.6	14.40
Meeting room	1	6.0x5.0	30.00
Reading room	1	5.0x3.6	18.00
Fire prevention room	1	6.0x4.0	24.00
Salvage & humanitarian room	1	6.0x4.0	24.00

7.1.2 SITE PLANNING CONCEPT

The site with its multiple of functions and activities ranging from the main operational building, training centre, maintenance unit and training

ground e.t.c. Call for a site planning concept that can reflect proper coordination among all these mentioned activities. Thus, the site-planning concept to this proposal will be strictly peg down to flexibility of circulation among the pedestrians, the vehicles and other required functions.

However, a proper, zoning technique will be adopted so that all activities within the site can follow a congruous way of modification.

DESIGN

The design of modern fire service station Offa shall have a great relevance to the surrounding public without or little disturbance to the echo-system. It shall also go far in blending without the conflict in traffic and change in environmental features.

7.1.4 DESIGN PHILOSOPHIES

The study and design of a modern fire service station within the content of the need, is more than just a mere providing facilities which will cross the interest of the public towards a good development.

But to provide an avenue which will harmonize physical and psychological satisfaction with the provision of a standard and required structural elements for the prevention and its environ.

7.2.0 MATERIALS AND CONSTRUCTION MATERIAL.

7.2.1 MATERIALS

Building materials are the physical components employed for use and manoeuvring to result in the physical realization of a tangible product of the ideas as illustration in a design. However, architect have serious role to play

Functional analysis:- this stage involves identifying and deforming the function i.e. recognizing the various units make up a facility.

Function relationship:- this entails the establishment of the relationship (links) among the units, especially closely linked and unrelated ones.

A flow is thus created within and among the several flow charts and triangles of function.

Space analysis:- this analysis is carried out for furniture, equipment, and other related functional facilities. This is broken down into furniture spaces, equipment spaces, utilization spaces, circulation spaces and service spaces, all these are tabulated.

Therefore the structural load of this building will be carry by the beam through the columns down to the foundation.

7.2.3 WALLS.

The walls of all the building structure in the site would be constructed of sandcrete block and plastered with cement mortar. Some areas would be made of stabilized brick in order to reduced excessive heat generation, transmission and radiation. Most of the walls of the approach/front façade especially the main building would be constructed curtain walling.

ROOF

Most part of the entire structure would be roofed with long span aluminum roofing on the timber structures simply supported by columns and load bearing walls. The administrative unit would be roofed with a concrete folded plate and barred vault for the machine hall supported by the steel structure and columns.

7.2.5 WINDOWS.

Windows will mainly be aluminium sliding type. Fixed glazing will be utilized for areas like the snacks and bar, and indoor games.

7.2.6 DOORS

All external doors will be of anodized aluminium frame, and timber panelled doors for the interior. Aluminium glass panelled doors will also be employed in some parts of the interior.

7.2.7 CEILING

The ceiling will be cellotex sheet sprayed with sandtex against any eventual fore outbreak

7.2.8 FINISHES

In selecting appropriate finishes for walls and ceilings, a serious study should be employed. This will go in a long way to study the appearance (aesthetics), cost of maintenance and its resistance to fire and above all the material durability.

More so, other factors are resistance to condensation, acoustic properties and provision of a smooth, even surface.

However, the wall shall be plastered and a suitable colour that will blend with it immediate surrounding environment. The ceiling finished with cellotex and protected against fire sandtex spray on it.

CHAPTER EIGHT.

8.0.0 DESIGN SERVICES

8.1.0 LIGHTING

The lighting of the interior will be based mainly on natural daylight to create an air comfortability especially in the offices, mess units, clinics and operation unit in the main building and other building structures on the site. Artificial lighting system will also have a role to play as it enables taking place at any time of the day and night.

8.2 WATER/DRAINAGE

The need for water is very important and extensive in fire stations, as constant supply of it will highly be essential. All rain water shall be drain through plastic pipes to create gutter, covered with concrete slab and channel to the existing lake adjacent to the site. All needed water for all operation will be supply from the river the propose water treatment unit.

8.3 ELECTRICAL SERVICES.

Conduct system shall be employed for the internal wiring in all the structures. The source of power to the site shall be from the National Electric Power Authority NEPA pl.c. a standby generating plant which start automatically incase of power failure.

8.4 MECHANICAL SERVICE (heating and cooling)

A comfortably equalized thermal balance is of paramount importance for human comfort irrespective of the activities involve within the building. So, in order to attain maximum utilization and optimal participation in the activities, the environment must be conditioned to human comfort irrespective of the kind of being.

Therefore, an effective mechanical use of controlling internal temperatures and humidity (ies) will be encouraged trough the use of air conditioner system which warms, cools or humidities as the need arises. Central air conditioner system will be designed for the the centre with it service pipes channelled through the walls and the roofs (ceiling) so that it will work in accord with natural ventilation from the openings.

8.5 FIRE SAFETY

Fire outbreak in buildings are merely always man – made i.e. resulting from errors or negligence. So, the principal aim of fire precautions are simply to safe guard lives and property and these can be achieved by the following.

1. reducing fire incidence
2. controlling fire propagation and spread
3. providing adequate means of escape for the building occupants

Therefore, for effective control of fire that may occur in the building, both manual and automatic control devices would be employed. For the purpose of enhancing fire security. However, the control of fire in this centre will base on the detection and extinguish of fire.

8.6 FIRE DETECTION

A good fire detector must be able to discriminate properly as to when there is fire or not. The best fire detectors are the false alarm. In a public such as this, the suitable detector will be heat detector, smoke detector and flame detector. The mode of operation will be automatic, an emergency alarm is blown when there outbreak of any the mentioned above.

8. 7 FIRE EXTINGUISHING

The Availability of various methods of extinguishing different types of fire has made it possible for us to address the prospect problem in question. While the addition of diluents to the combustion / flame zone, coolant concept using water and carbon dioxide, using isolation concept (foam process) and the chemical /physical inhibitor process.

So, for the purpose of this project, different methods of extinguishing will be available at the area of need. Starting from automatic sprinklers in

the kitchen of the officers mess, hose reel and carbon dioxide in a big wear the stairs landing and Halon gases where necessary.

8.8 LAYOUT PLANNING OF THE SERVICES

Electrical, plumbing and mechanical are the main services that will be accommodated on the of the proposed project. All these will be installed through underground and include the following

i. Sewer Pipes

ii. Electrical Supply Cable

iii. Water main

iv. Telephone cable

Therefore, in layout planning of these, various municipal departments in charge must be limited for an adequate or paper coordination. So that a standard, logical and economic plan and installation programme is formulated.

8.9 SECURITY

It is paramount to secure and safeguard life and properties within the centre. There is one main ingress point from where cars and pedestrians movement are controlled into the site. There is an service /emergency

ingress provided for the fire machines for easy movement without any obstruction. A perimeter fence would also be provided with security outpost for control

CONCLUSION

The utmost strife in order to achieve excellence is conspicuous, as it is exhibited in all the structures provided for in this project. However, n this pursuit also, fundamental issues in the design for circulation and fire safety established, and the area of maintenance properly addressed.

This implied that this project would, in no doubt provide adequate security in safeguarding lives and property of the entire populace.

This was made possible as a result of undertaken studies and propositions of architectural solutions to the research in question.

However, this project has been able to achieve this through the design of a functional, aesthetical, balanced and realistically viable solution, which is of high significance to a work of this kind. Therefore, should this research work made to prevail in the entirety of this nation, disasters from fire will be completely reduced or made to occur no more.

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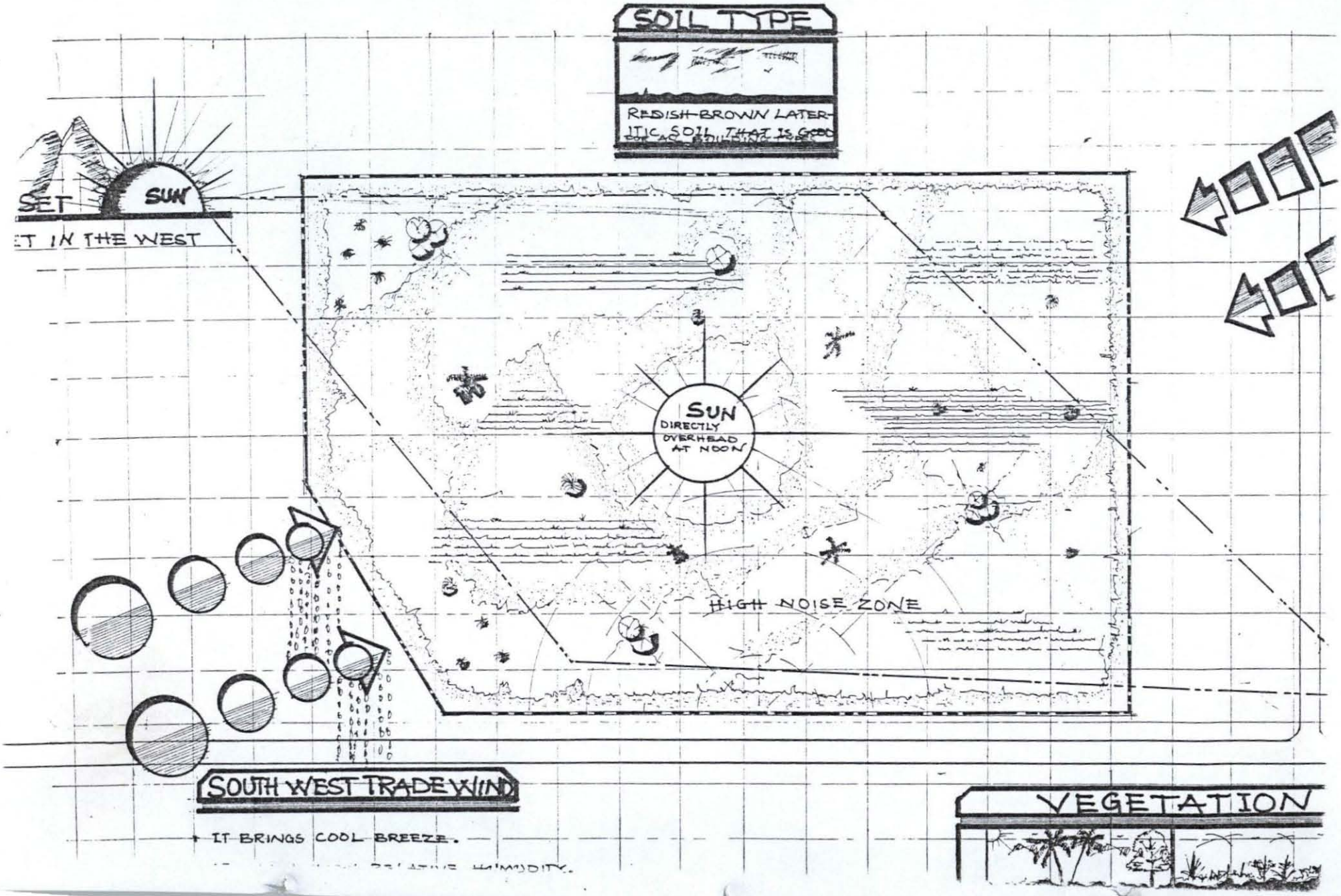
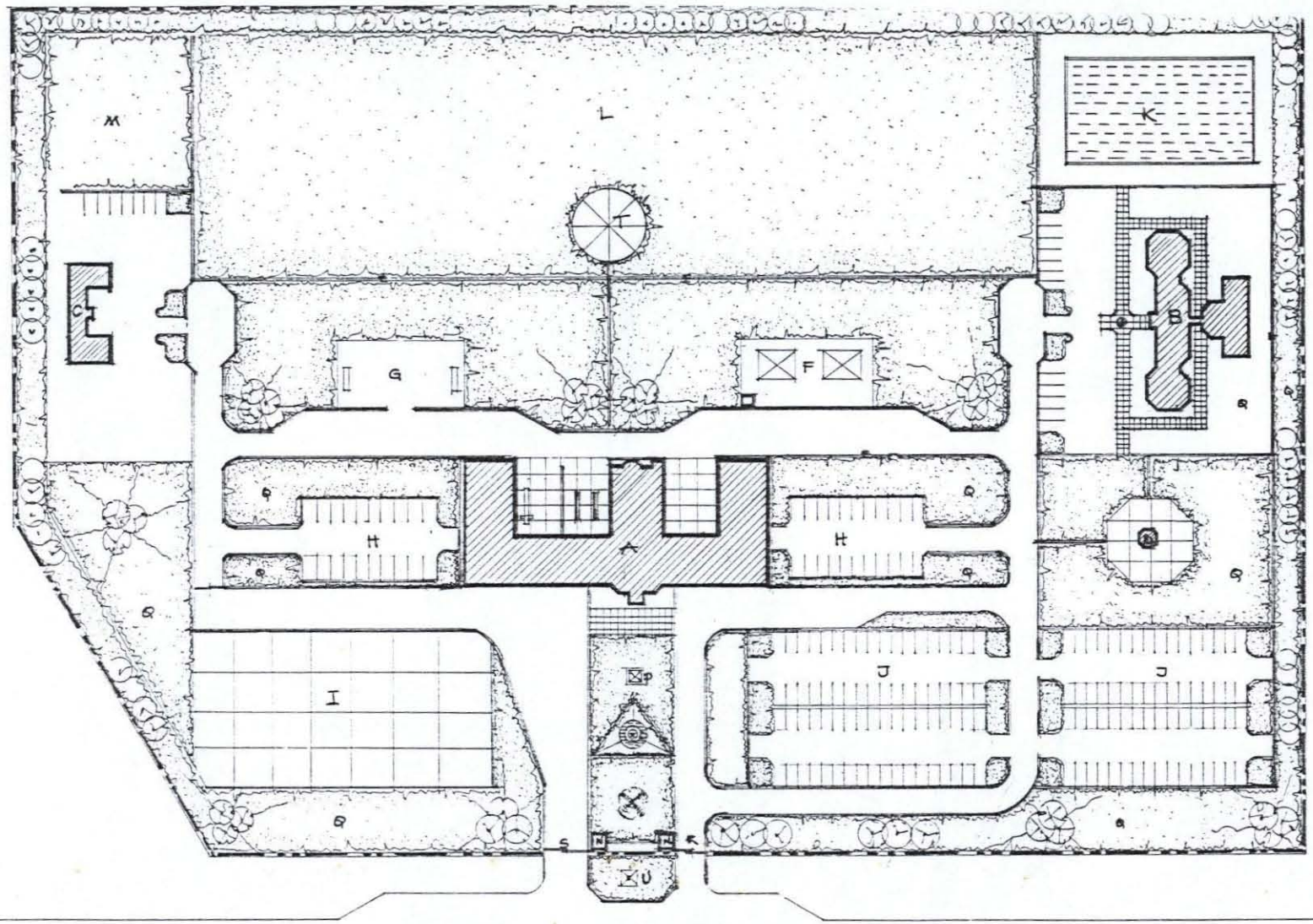
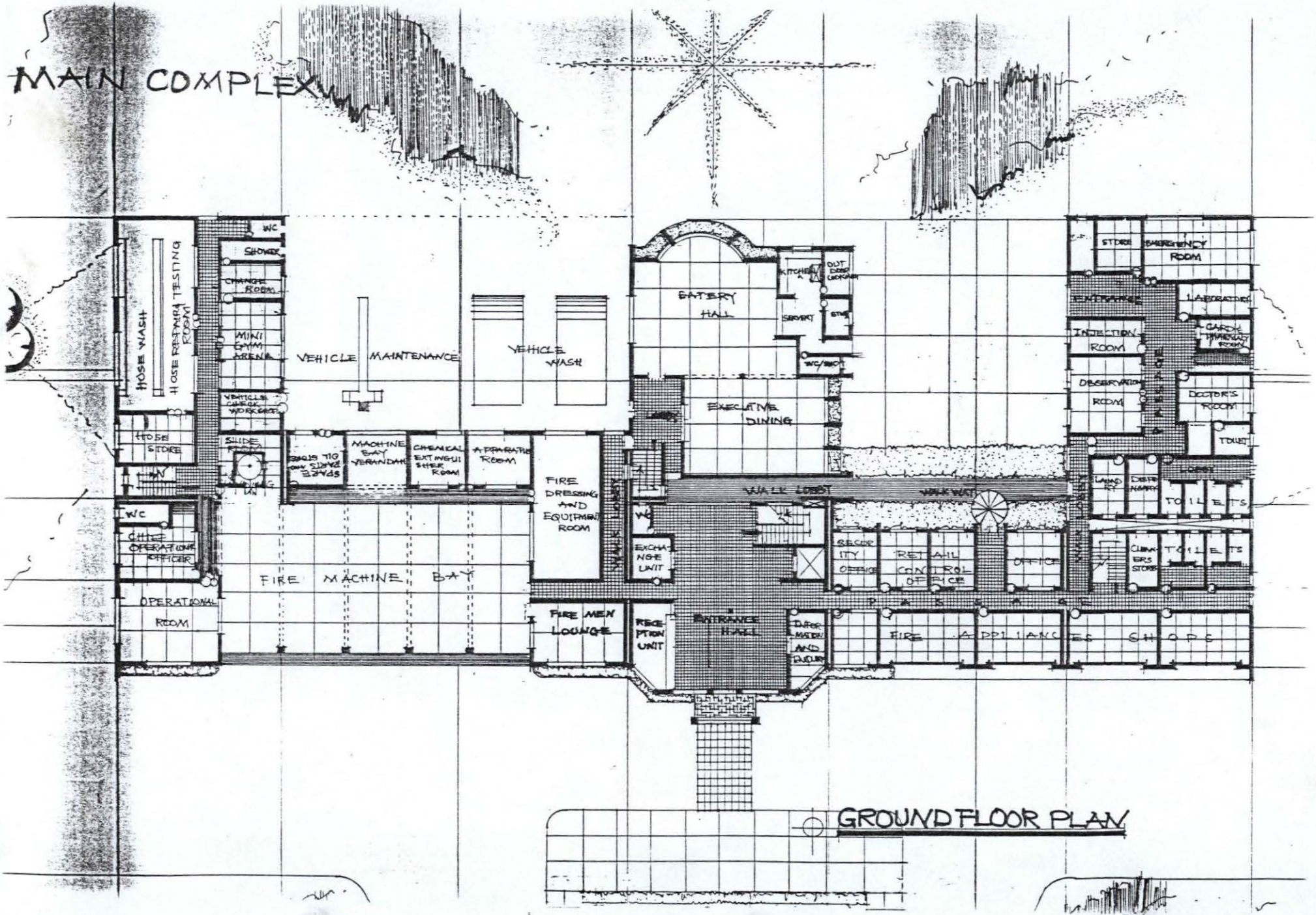
SITE ANALYSIS



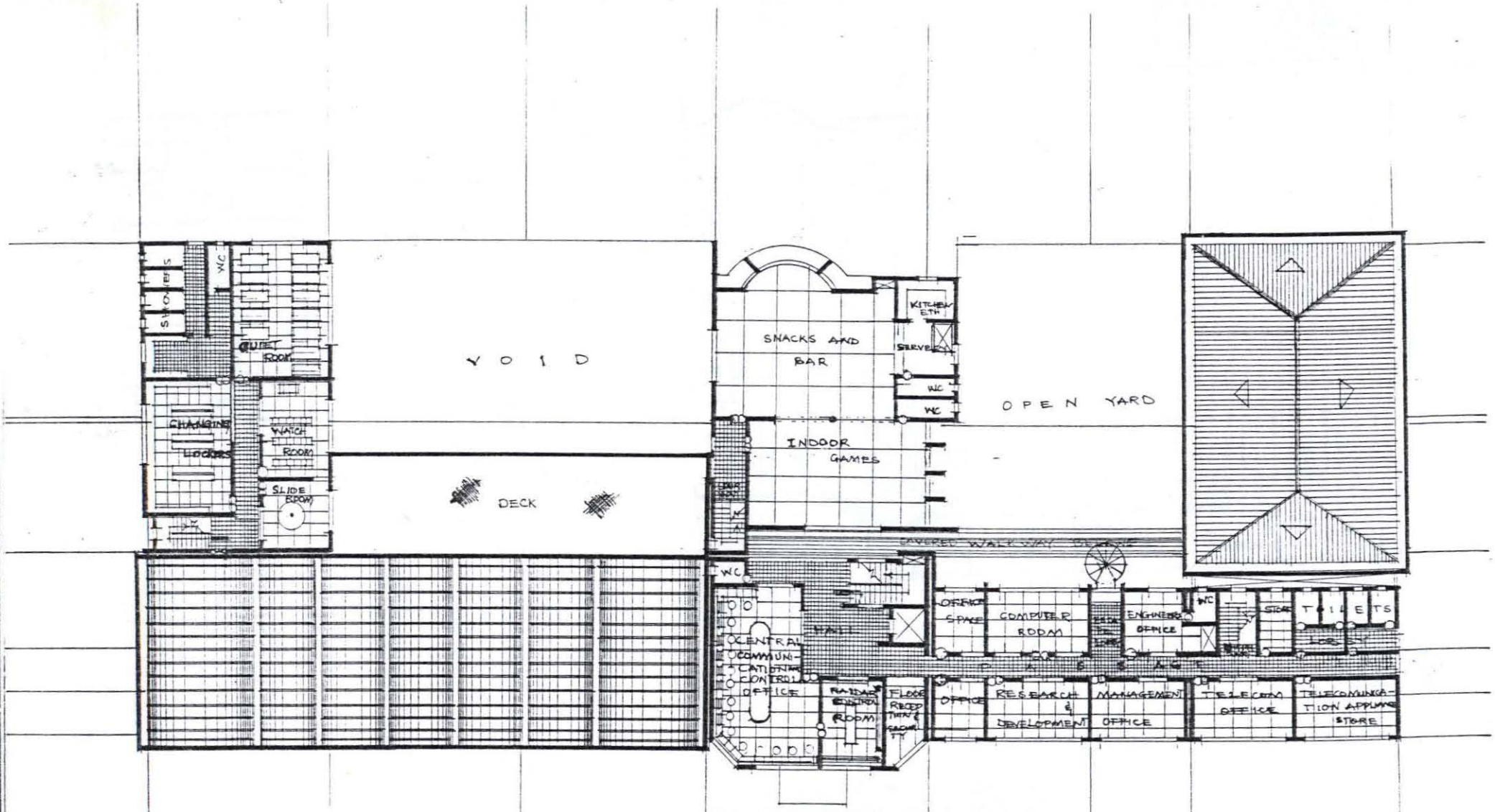


SITE PLAN

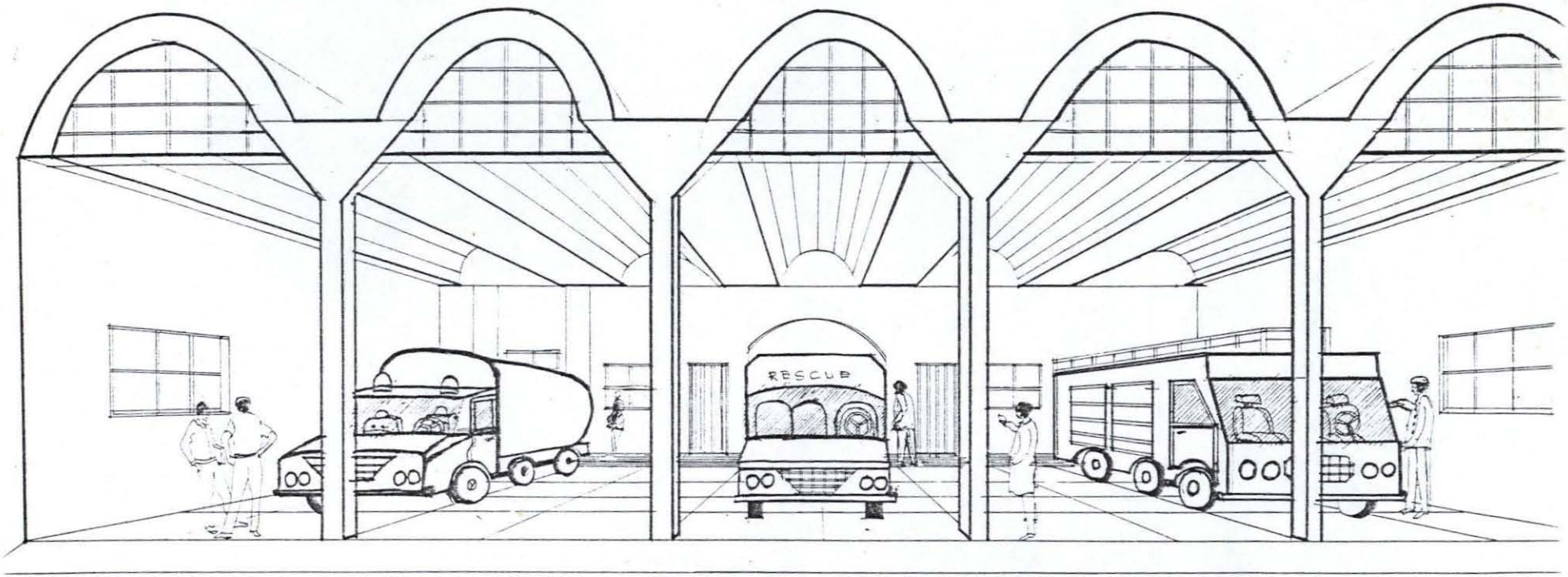
MAIN COMPLEX



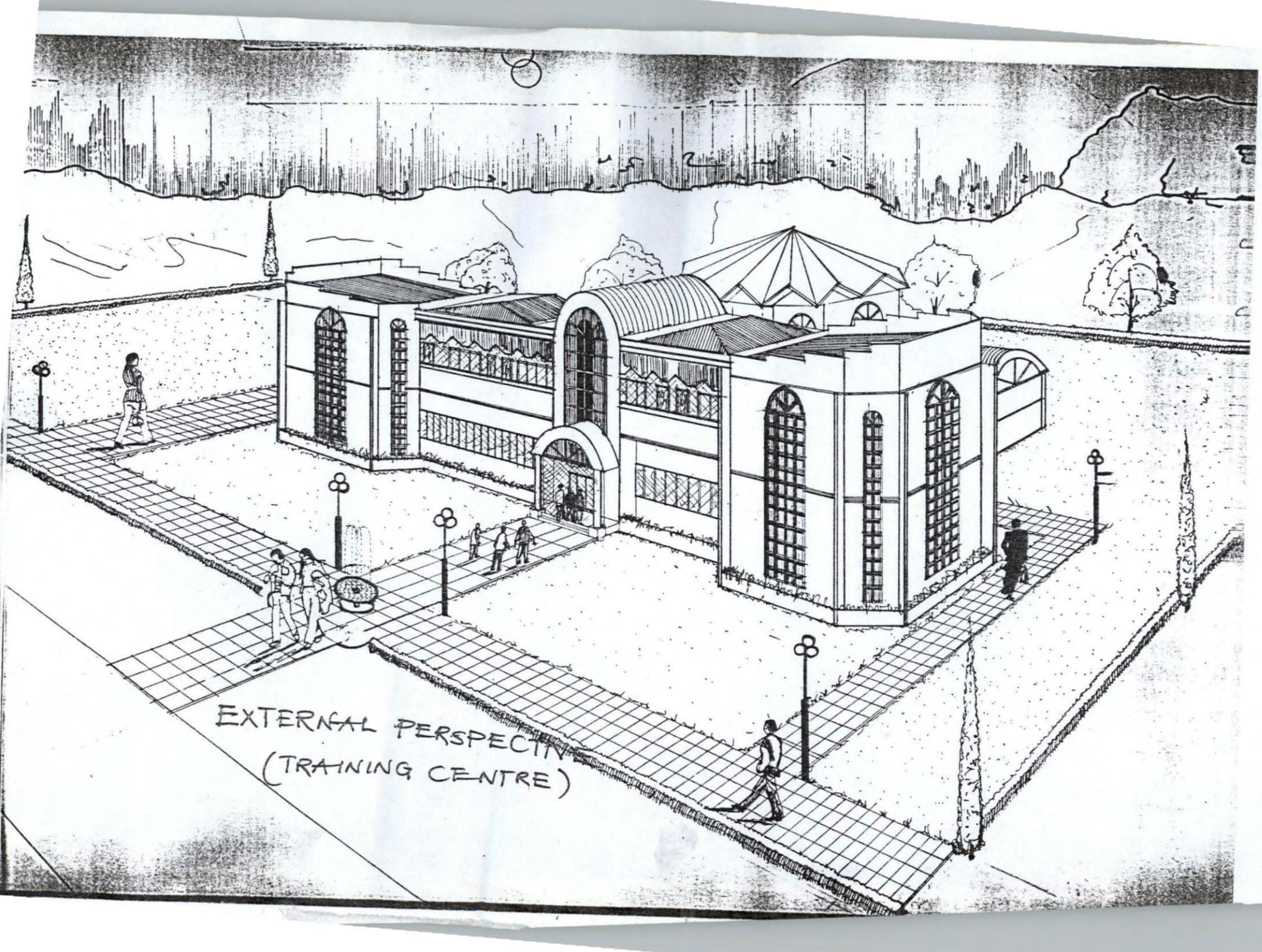
GROUND FLOOR PLAN



FIRST FLOOR PLAN



INTERIOR PERSPECTIVE


EXTERNAL PERSPECTIVE
(TRAINING CENTRE)