BITUMEN DEVELOPMENT AUTHORITY HEADQUARTERS, AKURE

(AN ARCHITECTURAL AID FOR EFFECTIVE ADMINISTRATIVE FUNCTION)

BY

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DECLARATION

I, **Ifaseun Odekunle ODEYEMI** of the Department of Architecture, School of Post Graduate Studies, Federal University of Technology, Akure, hereby declare that this thesis work in its entirety, has been a personal academic exercise executed under the supervision of my supervisors, **Dr. A. O. Olotuah** and **Prof. O. O. Ogunsote** of the Department of Architecture, Federal University of Technology, Akure, and has not been presented either whole or partially for any degree elsewhere before. All sources of information have been dully acknowledged.

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Odeyemi I. O.

CERTIFICATION

This thesis titled - BITUMEN DEVELOPMENT AUTHORITY HEADQUARTERS, AKURE by **ODEYEMI Ifaseun Odekunle** meets the regulations for the award of Master of Technology Degree in Architecture (M. Tech), of the Federal University of Technology Akure and is approved for its contributions to knowledge and literary presentation.

DEPARTMENT OF ARCHITECTURE
THE FED. UNIVERSITY OF TECHNOLOGY
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26/07/18

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DEDICATION

This work is dedicated to **OLODUMARE**, The creator of all, for his guidance and mercy, which ensured that I am still alive today

And

To my parents

Prof and Prof (Mrs) I. B. Odeyemi

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ABSTRACT

In any organization, private or government, the need for a Headquarters building cannot be overemphasized. The Headquarters building should provide comfortable working environment, efficient and strategic accessibility to various parts of the building and also maintain standard and maximum efficiency.

The Bitumen Development Authority (BDA) Headquarters stands as a statutory body, which concentrates more on monitoring the affairs of bitumen and exploration than going into production. The Headquarters building is designed to provide a permanent and adequate accommodation for the staff as well as integrate all the functional units of the BDA under a single architectural complex.

In a bid to achieve a successful and functional design, architecture was used as an aid for effective administrative function.

CHAPTER ONE

1.0 INTRODUCTION.

Bitumen was first discovered in Nigeria in 1900, after which several studies have been carried out on the deposit. Serious Federal Government involvement however started in 1989 when the Committee on the Implementation of the Bitumen Project (CIBP) was established with a mandate to collect and collate information on the occurrence of bitumen in Nigeria as well as to initiate the processes leading to the actualization of the project. In 1995, a new project management replaced the CIBP but unfortunately, the project management achieved little concerning implementation.

In August 2000, the new democratic government of President Olusegun Obasanjo scrapped the project management, and replaced it with a more pro-active committee with a new name 'Bitumen Project Implementation Committee' (BPIC) which was armed with wide powers to ensure a quick and rational implementation of the bitumen project. The committee was specifically empowered to:

(1) Call for bids for allocation of bitumen blocs.

(2) Allocate the blocks within the shortest possible time.

(3) Monitor and supervise the exploration and exploitation of the bitumen

(4) Monitor and enforce environmental safety regulations.

(5) Put in place an environment for the take off of the project.

(6) Enhance community/ investor's relations.

Currently, a bill replacing the BPIC with a Bitumen Development Authority (BDA) has been passed by the National Assembly and awaits the endorsement of the President. The BDA will stand as a statutory body (like the NNPC) to organize and direct activities of the whole project of bitumen. The main function of the BDA is to oversee the exploitation of bitumen in Nigeria without itself participating in the process. In effect, the BDA is a regulatory agency established to monitor all the activities of the mining companies, monitor and regulate mining practices, ensure compliance with environmental laws as well as collect royalties and taxes.

In addition, BPIC has commenced exploratory drilling within the bitumen belt with a view to establishing the reserves. Also, a subcommittee is collating all existing data (including all the 115 boreholes drilled since 1905). A community relation's programme has been put in place in order to avoid social tensions between investors and the host communities.

The BPIC is planning a Bitumen Training Institute (BTI), which will serve as the manpower training and development center for the bitumen project. This will be different from the Research and Development unit within the structure of the BPIC.

1.1 AIM AND OBJECTIVES OF THE STUDY.

The aim of the study is to design a befitting and functional Bitumen Development Authority Head Quarters.

The objectives of this study are to:

(i) provide a permanent and adequate accommodation for the BDA to enable it function effectively.

(ii) integrate all the functional units of the BDA under a single architectural complex.

(iii) incorporate within the design an aesthetic and worker friendly environment.

1.2 JUSTIFICATION OF THE STUDY

At present, the BPIC is being accommodated in a building at quarter 52, Alagbaka, Akure which was donated for its temporary use by the Ondo State Government. In addition, the government has provided an expansive plot of land along Ondo road for the permanent site of the BDA. The present accommodation is grossly inadequate to meet the need of the BDA. Thus there is the need for a bigger and permanent head office to accommodate all the functional units for proper administration and coordination of the Bitumen Development Authority.

1.3 RESEARCH METHODOLOGY.

The methodology adopted in this research include:

(1) Interview with the secretary of the Bitumen Development Authority

(2) Visits to numerous Headquarters, to have knowledge of the functions of Head Quarters and required spaces (Field Research)

(3) Review of selected bibliography. This includes textbooks, pamphlets, periodicals and standards, dissertations from F.U.T.Akure and O.A.U Ife conference papers.

1.4 LIMITATION OF STUDY

In the course of this research, some problems were encountered but were nonetheless tackled.

(1) For security reasons, there is a high level of distrust and reluctance in allowing the taking of snap shots, and the inaccessibility to some basic areas, which should be visited, thereby making the acquisition of some vital information almost impossible.

(2) Unavailability of certain materials, due to improper handling of these materials by staff of offices visited.

(3) Increased level of protocol due to the expectation of appraisals for promotion in some of the places used as case study lead to a level of hostility and unfriendliness from staff and this affected the acquisition of information from these staff.

(4) Certain areas in the office are out of bounds to outsiders and this hinders the research.

CHAPTER TWO

2.0 LITERATURE REVIEW

A typical dictionary definition of bitumen is 'a tar like mixture of petroleum and hydrocarbons'. A more technical definition in the oil industry is: 'A naturally occurring viscous mixture of hydrocarbons, which contains sulphur compounds and will not flow to a well in its naturally occurring state' (Bott, 2000). Usually, the term bitumen refers to petroleum with density greater than 960 kilogram per cubic meter.

Conventional crude oil usually flows naturally or is pumped from the ground, but oil sands must be moved, or recovered in-situ. Deposits close to the surface require in-situ, those more than 75 metres below the surface require mining and recovered more like surphur. Most current in- situ bitumen and oil production around the world come from deposits more than 400 metres below the surface.

Upgrade crude oil is conventional light oil equivalent. The most common products made from upgrade crude oil are transportation fuels like gasoline, diesel and Jet fuel. Others include petrochemicals used in the production of synthetic rubber and polystyrene. When bitumen and heavy oil are processed in refineries, they also produce transportation fuel and some petro chemicals, as well as the asphalt needed for road paving and roofing. (Syncrude, 2001)

2.1 HISTORY OF BITUMEN EXPLORATION IN NIGERIA.

The occurrence of oil seepage and tarsand outcrops over the Okitipupa Structure in the Dahomey Basin provided the initial impetus for oil exploration in Nigeria. So far, a total of

one hundred and fifteen (115) boreholes have been drilled across the basin and have confirmed the presence of oil sands and heavy oil.

Exploration for bitumen in Nigeria began as far back 1905 when Mineral Survey of Southern Nigeria drilled sixteen (16) shallow boreholes in the western –most part of a line of oil seepages now known as the tarsand belt. The wells, drilled near Mafowoku, and Eregu Valley, encountered bituminous sections over the depth ranges of 4m to 9m, with thicknesses generally less than 7 metres.

The Nigerian Bitumen Corporation (NBC) between 1907 and 1914 carried out the next most important investigation. NBC drilled fifteen (15) boreholes east of the area investigated by the Mineral Survey group near the town of Oso, Sumoge, Mofere, Oke-Oyinbo and Oniparanta.

The boreholes penetrated variable thicknesses of bitumen – impregnated sands and grits totaling 286.6m as well as substantial occurrences of sulphur while eleven (11) of the boreholes encountered the Basement Complex.One of the boreholes sites (BH-7 drilled at Agbabu village) in which black heavy oil, drilled by the bottom water under sub-artesian conditions, rises to ground level in the steel casing, can still be visited.

Being the only direct indication of the presence of oil in Nigeria, the tersand belt attracted a number of oil companies. Shell D'Arcy, which started its exploration activities before the outbreak of the Second World war and war came back thereafter as Shell-BP, drilled six wells between 1937 and 1958 with three of them (Araromi-1, Gbekobo-1 and Benin- west 1) penetrating several horizons of oil sands and heavy oil. In 1954, Gulf oil Corporation of Pittsburgh, USA, examined fifteen bituminious sand samples from Aye and

Irele areas in Ondo State. The report of the company authored by Crockett and Wescott, concluded that oil sands was suitable for producing road sufferings asphaltic mixes.

Between 1959 and 1968, Mobil Exploration (Nigeria) drilled four (4) wells (Bodshel, Reppaw-1, and Oyo-1 Afowo-1). Only Afowo-1 well showed evidence of hydrocarbon bearing horizons. In 1966 Tennessee Nigeria Incorporated, acquired an Oil Mining Lease (OML) No. 47 covering approximately one hundred and sixty (160) square kilometers NNE of Lekki Lagos, overlapping part of the area earlier investigated by the defunct Nigeria Bitunen Corporation (NBC). The company drilled a total of six (6) boreholes to investigate the capabilities for primary and secondary or thermal recovery of the heavy oil. Technical problems resulted in very poercore recovery leading to very low volumes on net pay sands. The programme was subsequently abandoned and the Oil Mining Lease (OML) relinquished.

The Geological Consultancy Unit of the University of Ife (GCU) now Obafemi Awolowo University, between 1974 – 1980 conducted the most extensive detailed and publicized exploration activity in the tarsand belt to date. In 1976, GCU in collaboration with TESCO of Hungary, after drilling a number of boreholes, concluded that bitumen-impregnated sands were probably continuous in the subsurface and could be utilized in the road construction and petrochemical industries. Laboratory studies showed that the bitumen was best extracted by the use of the hot water process. The pitch produced from the bitumen was used to produce smokeless domestic briquettes and formed cokes by blending with sub-bituminous coal. GCU estimated that the tarsand belt could contain some one (1) billion barrels of recoverable heavy oil and about thirty-one (31) billion tons of mineral tar sands.

In 1978, GCU drilled four (4) additional deep boreholes near Agbabu town, the results of which reconfirmed the tentative conclusions contained in the 1976 report. They recommended the location of an open cast mine around Ilubirin village. GCU was subsequently commissioned by the Ondo State Government to carry out detailed investigations of a 17km^2 area just north of Agbabu. Forty-four (44) boreholes were drilled in a modified grid pattern in which bituminous sections were recorded.

Estimate of resource for the investigated area was put at 1.6 billion tons of oil sands including 1.0 billion barrels of bitumen. The estimated reserve for the whole tar sand belt through extrapolation, was given as 42.7 billion barrels of bitumen recoverable by surface / near surface mining and in situ methods. The Nigerian National Petroleum Corporation (NNPC) acquired one hundred and fifty (150) line-kilometers of 2-D seismic data comprising three E-W running profiles. The status of the acquisition in terms of processing and interpretation is not known.

JEREZ of Canada, in collaboration with Rofem (Nig.) Ltd drilled 10 boreholes south of the GCU site results were never released. In 2001, the Bitumen Project Akure, Nigeria drilled ten (10) exploration boreholes across the entire 120km outcrop belt in order to determine the lateral and vertical extents of the oil sands. The results essentially confirm earlier CURRENT observations (Odeyemi, 2001).

2.2 PROGRAMMES

The BPIC has already put out advertisements for bidding for the following programmes:

(a) Allocation of blocs to investors for exploration and exploitation

(b) Environmental Baseline Studies

(c) Seismic and Resistivity Surveys over the bitumen belt

The BPIC has started reaching out to interested investors within and outside the country in the last week of January 2001, Committee members have left for Venezuela the USA and Canada to hold-level discussions with experts and investors.

2.3 DEFINITION OF OFFICE AREAS

The main structure of the building consists of the shell and the core. The shell is the permanent part of the building while the core contains all joint services such as elevators, staircases, conveniences and service passages (De Chiara and Calendar, 1980). Below are some of the definitions for standard office areas:

1. **Work Place Area or Useable Area:** Space that people can work in at desks and which include secondary circulation.
2. **Primary Circulation:** These are places that are essential to provide access and means of escape to work places, taking up 10-15% of the work place and links access and aggress points.
3. **Secondary Circulation:** Space connecting groups not adjacent to primary routes to it.
4. **Tertiary Circulation:** Area within groups.
5. **Core:** Space needed for support of buildings e.g. lift, stairs, ducts, lavatories, etc. not more than 20% of the Gross Outside Area. There are four basic positions of the core in an office. These are:

   (i) Central – there is one core which is located at the center and could be symmetrical or asymmetrical.

(ii) Off – Centre (Interior) – this allows perimeter of the building to be used. It is very ideal for large open offices.

(iii) Split (interior) – this permits more flexibility of area division with evenly distributed cores.

(iv) Exterior – this allows the whole office space to be utilized and allows maximum flexibility for tenants.

6. **Gross Outside Area (GOA):** Sum of all constituent office areas including core, structure and perimeter walls.

7. **Net Useable Area (NUA):** Remainder from the subtraction of core, structure and perimeter from the Gross Outside Area.

8. **Special Areas:** Space that cannot be used as off ices for workers but have particular function e.g. archives, restaurants, etc. They vary with respect to the function of office organizations.

2.4 OFFICE BUILDINGS

The basic unit of office space planning is the individual workstation or work center where each employee performs the bulk of his assigned responsibilities. When all workstations are combined, whether departmentally or in some other functional sense, the total workplace or group work center results. (Harns 1982)

The most common of these work centers results.

a. The reception center.

b. Reference service center

c. Data processing center

d. Executive suites

i. The reception center

The reception center serves to promote efficiency in office operations and also serves as a promotional medium of the services and products of the institution/ firm. The visitor gets his first impression of the business as he enters into the reception hall. Since it is the introductory chapter of organization, it should express honestly, reliability and efficiency.

ii. Reference Service Centre

In an attempt to encourage employees to be well informed on both general and special topics, firms or offices have established libraries or reference service centers.

iii Data Processing Centre

This is the space provided for processing data and information. These spaces are the working area for staffs in the office.

(iv) Executive Suites

Spaces provided for the manager or president and his secretarial staff should be isolated at one end of the office for data processing. Among the common ones are typewriters, photocopiers, computers etc, where each deals with the specifics of handling information. Office furniture in this unit includes filing cabinets, desks, tables, and chairs.

Analysis of office buildings:

(a) Type of office plans

(b) Space and size allowance considerations

(c) General principle of office design

(d) Fire safety consideration

(e) Service and conveniences.

2.4.1 TYPE OF OFFICE PLANS

There are two types: close and open office plans:

(A) OPEN PLAN OFFICE

According to Duff, Care and Worthington (1979), this is a new kind of office plan that started around 1958 and 1960, in Europe and later in the US, under the German name of " BUROLAND SCHANFT". Literally "open planning" is the laying out of office spaces without using partitions and refers to a rather specific way of doing such planning; it is mainly the use of un-partitioned spaces.

(i) EUROPE PLAN OFFICE

This open planning is based on a theory that suggests that partitioning is in most cases, not only unnecessary in offices but also detrimental to ideal office functioning. It gives preference to openness.

The term "office landscape" is usually used for planning; it is actually one kind of open planning that was suggested due to extensive use of plants in the first open offices and probably refers to highly irregular arrangement of furniture.

"Open planning offers promises and advantages so significant that any office planning project must include some consideration of it" (Pile, 1978).

(ii) AMERICAN PLAN OFFICE

According to Pile, 1978, this kind of plan office scat majority of workers in open spaces. Large organizations such as insurance companies and certain government agencies could seat hundreds of clerical workers at desks arranged in neat rows in vast un-partitioned spaces. It differs from open planning in that managerial personnel are provided with private spaces and executives are usually located in special rooms remote from the vast pools.

The layout of the office spaces here is based on formal organization and hierarchy; the observed openness is a reflection of the kind of work processes in which the pool is dominant because of the high ratio of clew to managerial workers. These kinds of offices are now diminishing in number as the kind of work that generated them has become increasingly automated.

(B) CLOSE PLAN OR CONVENTIONAL OFFICES

The origin of this kind of planning dates back to the days when large organizations were unusual and when typical organizations had only a few staff. It has its base in the logic of architectural planning as it is practiced in the designs of buildings and some assumptions that were probably made without considering the validity. Office work, "deskwork" is assumed to be a form of study" (Pile, 1978).

Size allocation of the office was based on the departmental make – up of the organization. Access is by a system of corridors that lead from entrances, stairs, elevators, and utilities to the individual offices.

This kind of planning gives every member of an organization, the kind of space in which he or she can best work, it also arranges these spaces in a logical way that makes it

possible to find one's way about. This gives people who need to work a reasonable ease in getting back and forth to each other's work places. When skillfully designed, conventional offices can be attractive and comfortable and emphasize visually, qualities of order, organization, and stability.

2.5 SPACE AND SIZE ALLOWANCE CONSIDERATIONS

Office space is distributed among file space, equipment space, storage, special rooms and basic office space for the users. The breakdown basic space for uses is shown in the table below.

Table 2.1: Basic Space Identification

SPACE IDENTIFICATION	AREA (M^2)
Top Executive	36-54
Senior Executive	9-12
Supervisors	7.2-9
Operators	4.0-5.9

Source: Walley, (1975)

File space is the space taken up by a cabinet and its open drawn in table below:

Table 2.2: Basic File Space

SPACE IDENTIFICATION	AREA (M^2)
Standard Letter File	0.54
Standard Legal File	0.63
Side – Opening Letter File	0.59
Side-Opening Legal File	0.68

Source: Walley, (1975)

Storage rooms include the following: Vault, stockrooms, storage rooms, coatrooms, files store, janitor supplies and equipment room. The sizes of office spaces are broadly categorized into three, which are; small, medium and large. The small space occupies $840m^2$ with a minimum depth of 2.4m.

2.6 THE OFFICE SHELL/ STRUCTURE

The office shell is the main structure (usually permanent) of the building. It consists of the shell and the core. The core contains all joint services such as elevators, staircases, conveniences and service passages. The shell is the envelop of the office space. This space consists of those required for cellular planning and open planning. (De Chiara and Calendar, 1980)

(a) **Density:** - under this, we have:

(i) Restriction of height of building (i.e.) maximum number of floors allowed in the site area

(ii) Plot ratio; which is equal to an area of built floor space /site area.

(iii) Fire brigade and perimeter access

(b) **Lighting and overcrowding:** Under this, we consider the set back allowed.

(c) **Means of escape:** Staircases are best options and should be external. Lifts should be disregarded for escape because of limited capacity, possible delay and electrical failure.

(d) **Maximum travel distance:** Travel distance from any point in an office to any escape route should not exceed 15m. No point should be further than 12.2m unless a second exit door is available. All exits should be fully recognizable. Staircase should have an enclosure of a fire resisting material to prevent smoke and heat penetration.

(e) **Fire fighting access:** - The fire fighting access should;

(i) Be continuous throughout the entire building

(ii) Have access at ground level from street for both staircase and firemen's lift

(iii) Have open able windows at each landing level

(iv) Have permanent ventilation at the top of the enclosure.

(v) The width of the staircase should be 76.5mm for above this area.

(f) **The office Core:** - The location of the core is determined by the means of escape and the type of subdivision of spaces required. A strategic location of

cores can facilitate the multi-tenancy of a speculative building, create a range of spaces, allow for privacy in certain departments, and it is the origin of the main circulation. The design of the core is affected by:

(a) The area and population served by each floor an this affects the number of lifts, stairs, and lavatories

(b) The number of floors, which affects the number of lifts

(c) Additional elements or facilities

(d) Cleaning and maintenance space

There are three categories of spaces that could be by the location of the core:

i. Medium depth space=6-10m deep double space = 14-22m

ii. Shallow depth space =4-5m deep with double space=12m

iii. Deep space =11-19m deep with double space =32m

iv. Very deep space =20m

(g) **The office grid:-**In planning, there are certain grids, which determine the shell and the organization of scenery.

i. Structural grids: Define the zone for major elements such as structure and services. There are horizontal and vertical structural grids in every building.

ii. Construction grids: For subsidiary building elements such as partitions, within the overall discipline of the structural grids.

iii. Servicing grids: Assist in the distribution of service points throughout the building.

iv. Planning grids: Guides the location of workplaces and work groups.

2.7 THE OFFICE INTERIOR

The office interior changes in 6-10 years within the tenance life of the building. Change in the organization of the scenery and alternatives of the office interior arrangement vary. There also exists the cellular office with its privacy, isolation and reduced efficiency in relation to the open plan with its high efficiency. Cellular offices were required for top management required so as to define hierarchy and for confidentiality of work. Open plan offices were viewed as factories, which required individual space. Information was the raw material to be circulated, transmitted, processed and recorded. The need to provide meeting facilities at various levels in the structure and remove sterile look of open plan offices brought in the office landscape and "buroland schaft" (Pile 1979)

An advanced building technology was an antecedent to office landscape. It suspended floors equipment services to available for deep office spaces through suspended floors and ceilings. Office landscape has encouraged innovations in the design of office furniture.

2.8 LIGHTING IN OFFICE BUILDINGS

Lighting generally is needed for seeing but there is variation in the amount of light required for different functions "the amount required for good seeing is greater than that required for more discernment (lighting-3 (light &vision). This illumination resulting from the amount of light entering a workspace can be controlled depending on the amount needed for maximum efficiency.

FACTORS AFFECTING LIGHTING & VISION.

Usually, the ability to distinguish between details varies with respect to some physical factors, which are:

(1) Level of illumination

(2) Size of the space to be illuminated and arrangement for luminance

(3) The level of contrast in the space

(4) Time of viewing

5) Quality of luminance.

2.8.1 ARTIFICIAL LIGHTING

This is any light from direct or indirect generated from a source or sources apart and is used in illuminating a workspace.

The lighting systems can be divided into different parts which is direct, indirect and a combination of then, They are

(1) Indirect

(2) Semi-indirect

(3) Direct-Indirect (General diffuse)

(4) Semi-direct.

(5) Direct

The most commonly used artificial light sources are Incandescent, fluorescent and light-Intensity discharge.

(A) INCANDESCENT LAMPS

Incandescent lamps are produced with a wide variety of sizes, shapes and colors. It is measured in watts and they are commonly bulbs. They usually make use of filaments placed in a glass filled with heat gasses. The most commonly used gas is argon. The incandescent lamps come in different shapes and sizes.

(B) FLUORESCENT LAMPS

In this case, light is produced by fluorescent powders exited by ultra-violet rays in a long tubular bulb with a decried by high efficiency, cooer operating temperature and longer life than the incandescent lamps at the same level of illumination. They are also measured in watts.

(C) HIGH INTENSITY DISCHARGE

They are usually known as mercury lamps, metal halide lamps and high-pressure sodium lamps. They resemble incandescent lamps in that they provide a point source of light and they show relationship with the fluorescent lamps in that are electric discharge lamp.

2.8.2 DESIGN FOR DAY LIGHTING

For advantageous use of day lighting, the following design factors must be taken into consideration. These factors include:

(1) The variation or changes in the amount and direction of the incident daylight.

(2) The effect of landscaping, terrain, topography and nearby buildings on the available daylight.

(3) Luminance and its distribution of clear, partly clouded and overcast skies

(4) Variation or changes in the direction and intensity of sunlight.

The requirement for good day lighting design is through calculated and skillful application of the day lighting techniques.

The primary source of light for day lighting is the sun. The amount of daylight received from the sky and the sun depends on the atmospheric & climate conditions and the position of the sun. The amount of light received from the sky and the direction from which the light readies the windows of a building depend on the cloud pattern, and the location of the windows light also are reflected from the ground, or from other exterior surfaces and is important in daylight design. Reflected light, like any other light sources require brightness control so as to have a conducive interior environment.

The light reflected from the ground on sump elevations usually is 10 to 15 percent of the total daylight reaching a window area.

2.8.2.1 DAY LIGHTING AND BUILDING SECTIONS.

Building sections are the methods used in admitting natural lighting into a building. Building sections can be divided into 2 major parts namely side lighting and top lighting.

Side lighting: - This is the placement of window openings in the sidewalls of the space to be lighted. This type of lighting has both advantages and disadvantages. It's advantages are that apart from admitting light in to a space, it can provide natural ventilation and can afford the space users a view of the out doors. However, the distance from the farthest work area to the window will after a certain distance may not have adequate light and this will cause a

limitation in the design. Also, the brightness of the light from the light source may cause glare if not controlled.

Top lighting: - This form of lighting has no limitation on the width of the lighted space, but this opening can only allow for a view of the sky. Usually, top lighting designs are namely:

(1) Unilateral section

(2) Bilateral section

(3) Roof monitoring section

(4) Clear story section

(5) Saw tooth section

(6) Skylight section

(7) Court yard

(8) Atrium

(Tult and Adler 1979)

CHAPTER THREE

3.0 CASE STUDIES

Existing Head office buildings both foreign and local were used as case studies and these were veritable tools for the research. It has enabled the study of their performances as a means of design solutions and to make an assessment of their socio-economic impact as built forms.

The critical analysis of their merits and demerits has enabled a critical perception of these projects and has also served as a guide in the formation of new design solutions from which attempt have been made to eliminate demerits identified, as well as improving on the merits of such projects so as to conform with the current trends in the world.

3.1 OSHOGBO STEEL ROLLING COMPANY LIMITED, OSHOGBO

LOCATION: Dagbolu, New Ikirun Road, Oshogbo.

3.1.1 GENERAL INFORMATION.

Oshogbo Steel Rolling Company Limited is approximately 220km east of Lagos and is situated at Dagbolu, in the outskirts of Oshogbo and about 10km on the new Ikirun-Offa road. Oshogbo being a commercial focus and an industrial development center, offers a unique location for the steel rolling mill.

Oshogbo Steel Rolling Company is easily accessible by road – being linked by a good road network to major town in the country: by the Ibadan- Gbangan, Oshogbo-Ilesha, Ilobu-Ogbomosho and Ikirun-Offa roads. Oshogbo is also an important railway station on the Lagos-Kaduna flank of the national railway system. The nearby transformer station of

N.E.P.A. national grid, (little less than 5km away from the plant site), provides direct source of power to the plant.

The rolling mill is a single-strand system, which combines wire and light-section facilities designed and equipped with machinery and accessories capable of producing 210,000tons of finished products per annum in a two-shift operation.

The Oshogbo steel rolling company was incorporated in 1981 to manage the affairs of the rolling mill. The mill went into hot test and commercial operation in November 1982 and was officially commissioned on 30th April 1983.

3.1.2 ANALYSIS OF BUILDING.

The architectural composition of the Oshogbo steel rolling company is made up of a two storey Administrative complex with scattered offices and the plant, around it. The main office building basically consists of a rectangular shaped form, with offices on the ground, first and second floors. There is only one staircase serving the whole administrative building.

Other offices sprang up around the building to allow for accommodation of other functions, which could not be housed in the main building. The structural composition of the building shows that, the building is a frame structure made from concrete beams and columns.

3.1.3 APPRAISAL.

MERITS.

1. The building has adequate illumination using day lighting.

2. The main entrance is quite conspicuous and is easily accessible to visitors.

3. There is adequate shading by trees.

DEMERITS

1 There is no cross ventilation in any of the spaces provided.

2 There are no adequate walkways for pedestrians.

3 The spaces provided are insufficient in number.

4. There is only one stairway in the building i.e. no escape stairway in the building in the case of emergencies.

OSHOGBO STEEL ROLLING COMPANY LIMITED

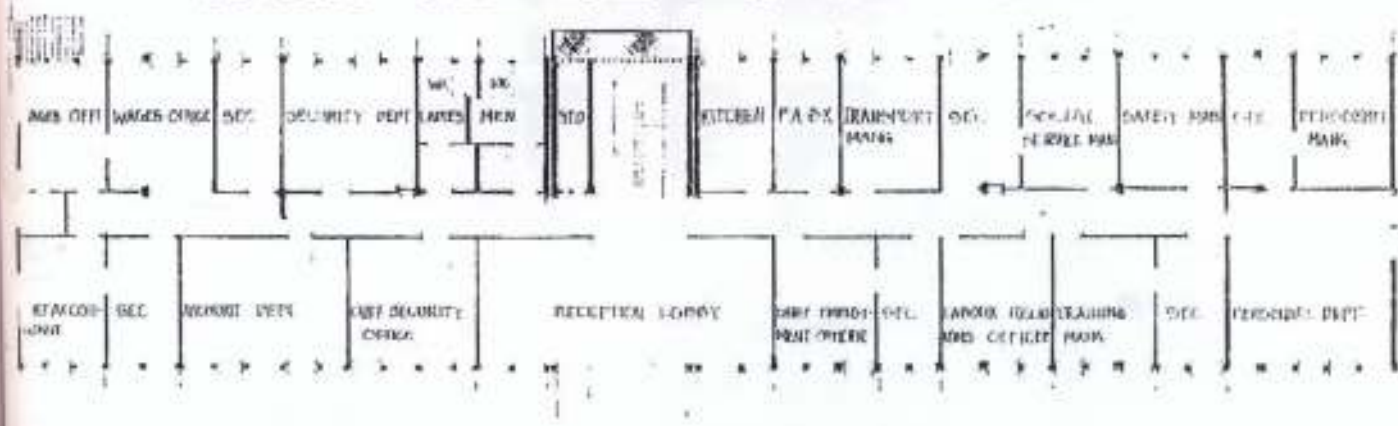


FIG 3.1 GROUND FLOOR PLAN

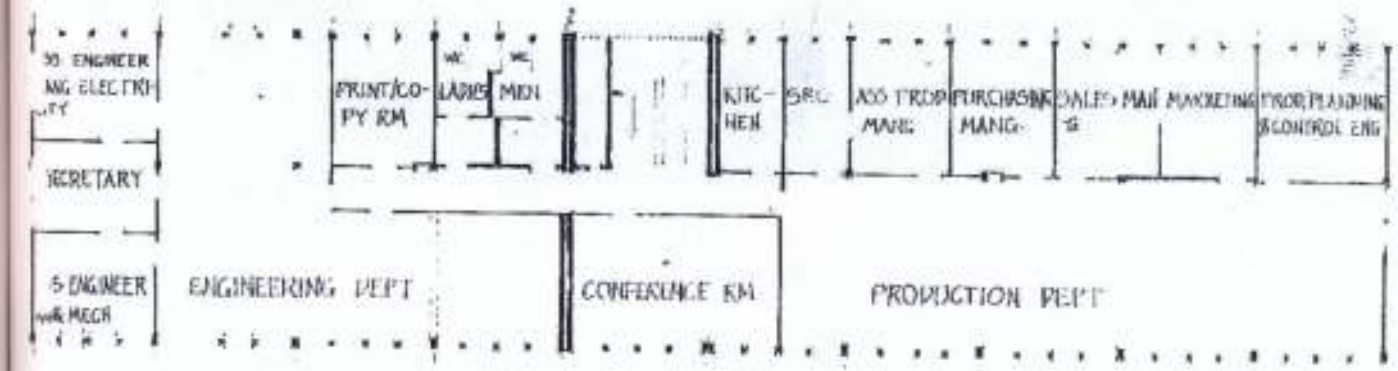


FIG 3.2 FIRST FLOOR PLAN

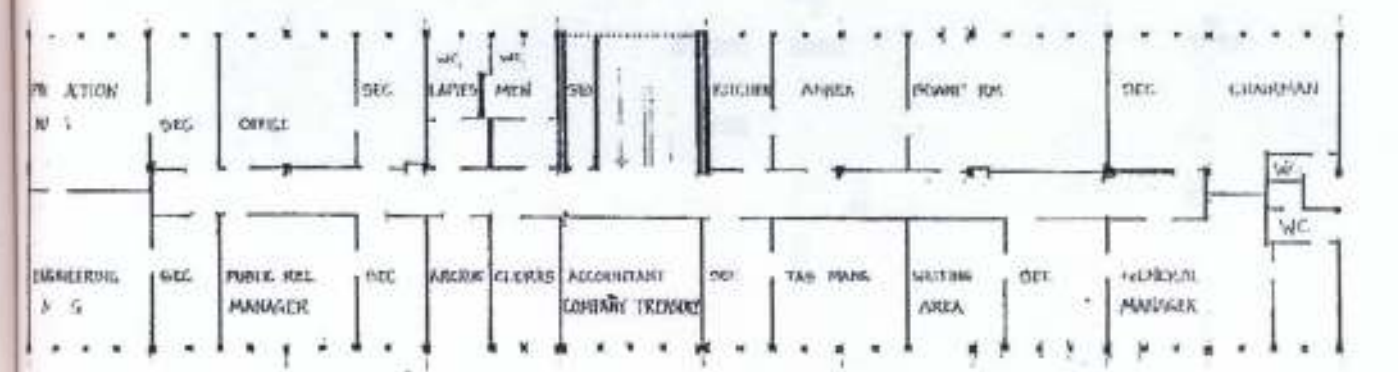


FIG 3.3 SECOND FLOOR PLAN

Plate 1: A picture of Oshogbo Steel Rolling's Administrative Building

Plate 2: A picture of the whole Complex

3. 2 ENUGU COAL CORPORATION

LOCATION: - No 20, Okpara Avenue, Enugu

3.2.1 GENERAL INFORMATION

The coal exploration in Nigeria started as far back as 1916. At present, the Nigeria coal industry has 4 existing mines at Okara and Onpeania underground mines in Enugu state, Okaba surface mine in Kogi state and Owukpa underground mines in Benue state. In addition, there are more than 13 undeveloped coalfields.

The undeveloped coalfields in Nigeria are of two categories, viz: the virgin coal fields where further detailed exploration work and/ or access roadways are required and the developing coal fields where reserves have been proven and mines with access roadways developed.

NIGERIA COAL CORPORATION.

Established by the ordinance Act [No 29] of 1950, the Nigeria Coal Corporation [NCC] became responsible for mining, prospecting and developing Nigerian coal resources. NCC and its subsidiaries are marked for partial privatization and may be managed after privatization by core investors.

3.2.2 ANALYSIS OF THE BUILDING.

The Head office comprises a storey office complex and scattered office around it. The single storey building has its offices along the corridor on the ground and first floors. The building has a central courtyard with a stairway situated along the entrance into the building. Due to

the need for other office accommodation, extension was made to the building and also, individual blocks were built to provide extra office spaces.

Individual blocks provided are bungalows and they accommodate the geological department, personnel department, audit department, survey department and the works department.

The Works Department takes care of the maintenance work, both building and vehicular.

3.2.3 APPRAISAL

MERITS

1. The entrance to the building is well pronounced.
2. There is adequate lighting in the building.
3. There is adequate parking space for the users.

DEMERITS

1. There are not enough shading devices in the building.
2. There is only one stairway to the upper floor.
3. There is no proper drainage.
4. The building cannot accommodate all the required functions, leading to the erection of more buildings

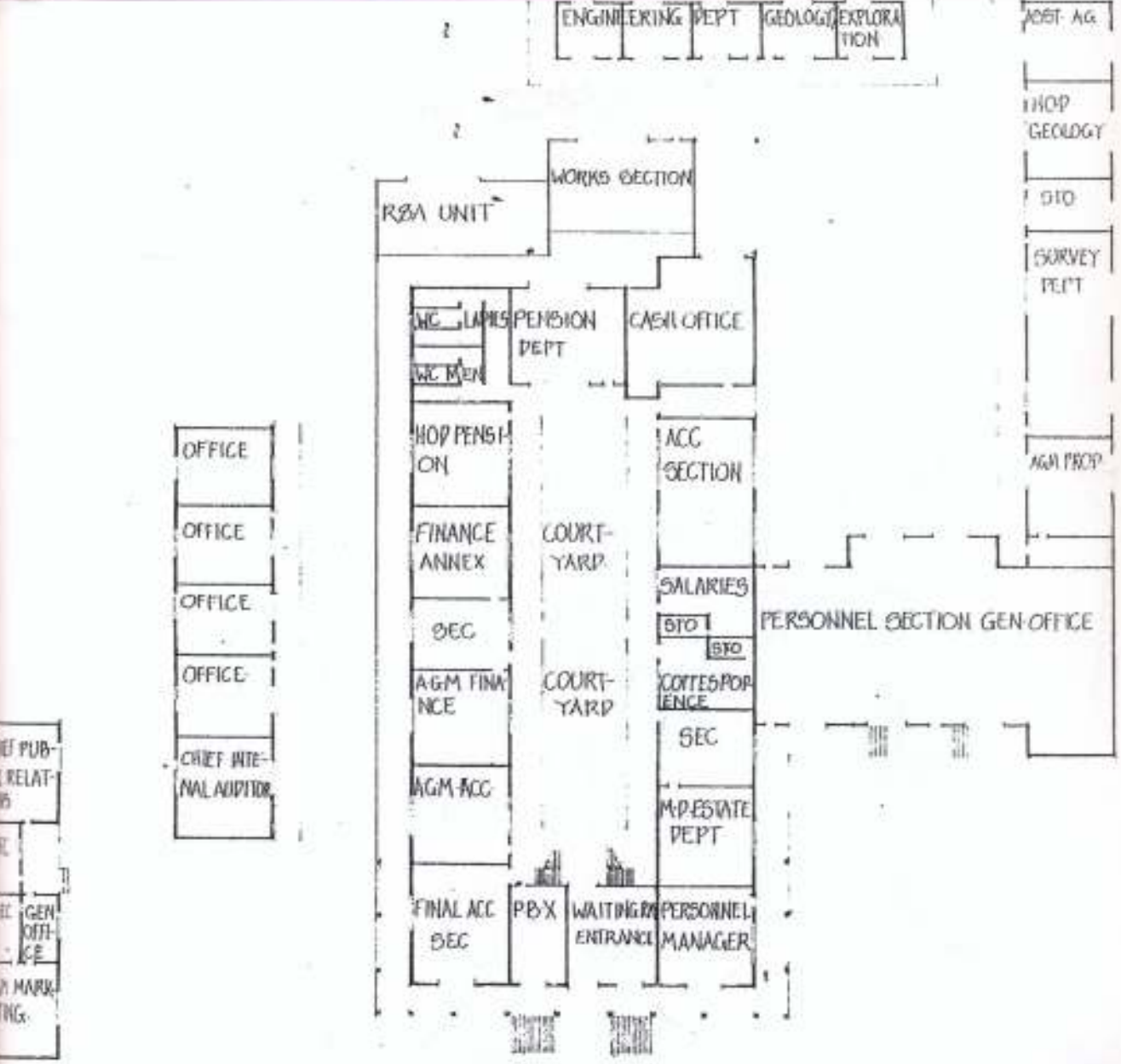


FIG.3.4: GROUND FLOOR PLAN.

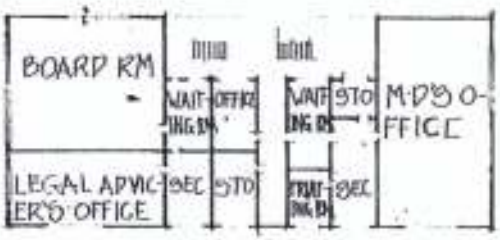


FIG.3.5: FIRST FLOOR PLAN.

ENUGU COAL CORPORATION, ENUGU.

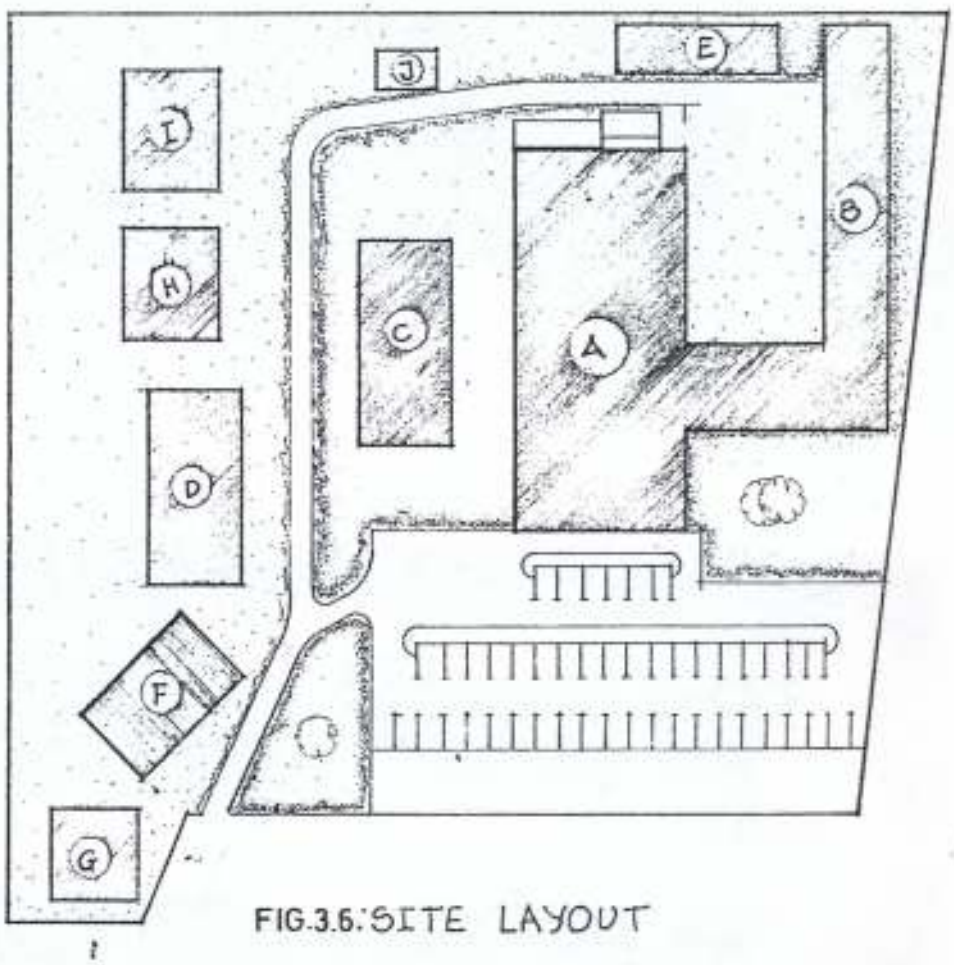


FIG.3.6: SITE LAYOUT

Plate 3: Plate showing the facade of the Enugu Coal Corporation Headquarters

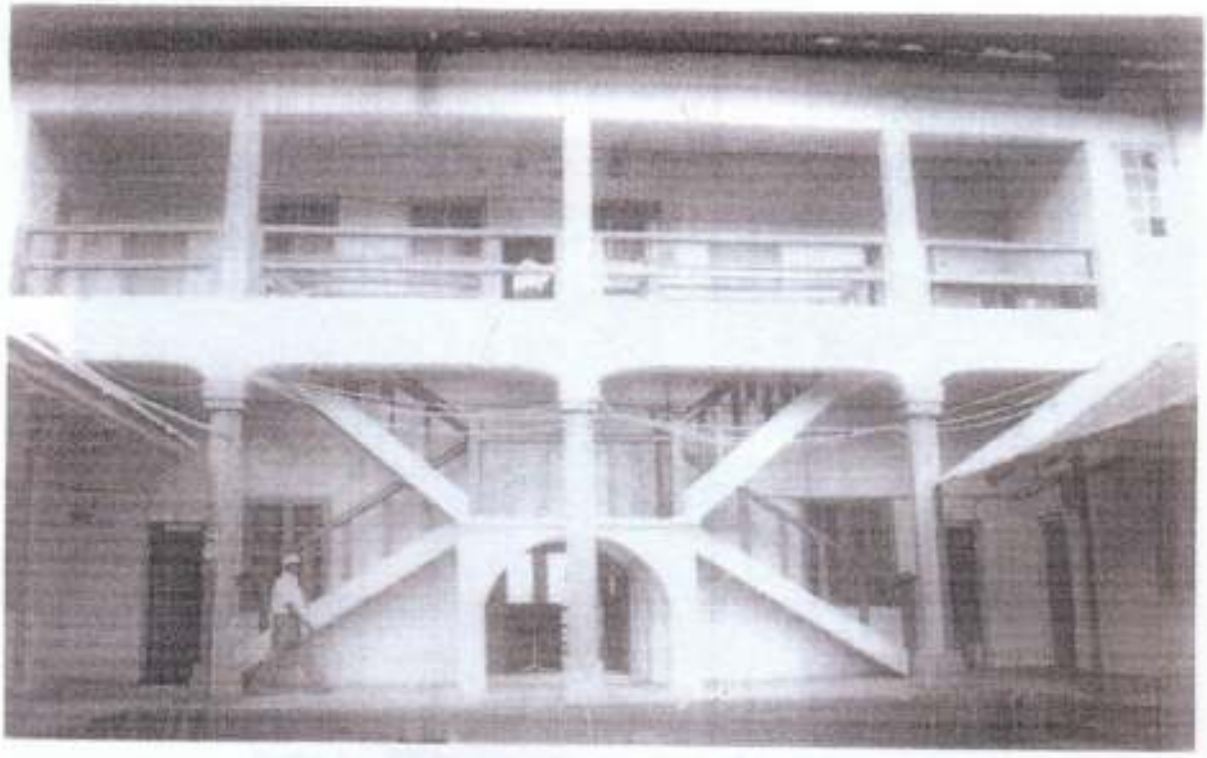


Plate 4: Plate showing Stairway leading to the first floor

Plate 5: Plate showing the scattered buildings around the Headquarters

Plate 6: Plate showing inadequate parking spaces

3.3 HEADQUARTERS BUILDING FOR MACRONIX INTERNATIONAL CO. LTD

LOCATION: Hsinchu, Taiwan

3.3.1 GENERAL INFORMATION

The Headquarters building for Macronix International Co. Ltd was Designed and completed between 1995 and 1999.

The primary challenge in the design and construction of the building was to convert the various negative spaces to valuable assets and create a campus – like environment.

Macronix has on one single site

(1) The Headquarters building

(2) Research and Development Centre.

(3) Staff training and recreation center.

Also there is the production plant, which is being expanded over several phases.

3.3.2 ANALYSIS OF BUILDING

The headquarters building has twelve floors above ground and four floors below. The research and development center is seven stories high.

The headquarters building, which is given a gently curvilinear form, is situated parallel to the access road, with its circular conference and reception rooms projecting above the main lobby to serve as a landmark for the establishment. The seven-story R&D building, with staff dining rooms on the first and second floors, faces the future park. It joins the conference center and the existing production plant on the other side to form a courtyard which provides a pleasant outdoor space where workers can meet and socialize.

3.3.3 APPRAISAL

MERITS

(1) There is proper site planning and landscaping

(2) There is adequate access road to the site.

DEMERITS

(1) The building depends more on artificial lighting and ventilation than natural. This dependence on artificial lighting and ventilation will not work in Nigeria.

(2) There is not enough parking spaces for users.

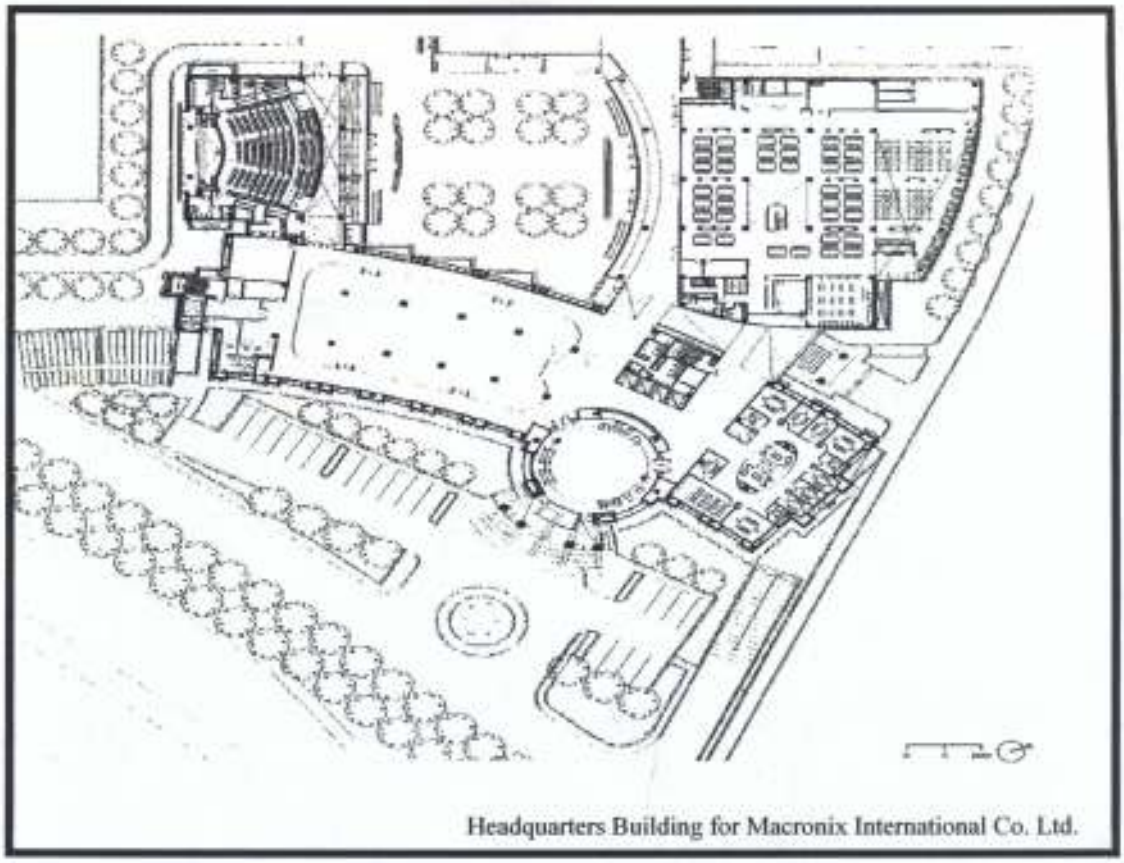


FIG 3.7: **Ground Floor Plan**

FIG 3.8: **Site Plan**

Plate 7: Front Elevation of Micronix International Co. Ltd.

3.4 SUMMARY OF FINDINGS

From the above case studies, a general understanding and idea of the design and planning of head offices was achieved. Since each case study treated has its own peculiar achievements and defects, it would be impossible to give a combined summary of the major issues from the different analysis. Thus, listed below are some of the salient points that were observed from the case studies carried out both from the Nigerian case studies and foreign case study.

A NIGERIAN CASE STUDIES

1. The design of the buildings looks very simple and does not depict what a Headquarters building should look like in terms of appearance/form.
2. There is no definite pedestrian layout thus making the whole layout look unpleasant.
3. The two case studies have become over populated due to expansion of the administrative work
4. There is lack of planning concerning the landscape due to the lack of provision for future expansion.

   Due to space constraint, the orientation of the buildings was not given proper consideration.

B FOREIGN CASE STUDY

1. The building depend more on artificial lighting than natural lighting.
2. The building depend more on artificial ventilation than natural ventilation.
3. A lot of emphasis is made on the landscaping and landscape planning.
4. There is a very good network of roads and enough parking spaces for users.

CHAPTER FOUR

4.0 SYNTHESIS OF STUDY

4.1 PROJECT TOWN AKURE, ONDO STATE

Ondo state was created on February 3, 1976.It is one of the seven states created on the same day. Ondo state was carved out of the old western state with slight modification following boundary adjustments. Ondo state consists of 26 local government areas with the following major towns: -

1. Ondo
2. Ikare
3. Okitipupa
4. Akure
5. Owo

Ondo state lies within the tropics and is bounded to the north by Ekiti, Kwara and Kogi states, Westwards is Edo state, eastward by Osun, Ogun and Oyo states and to the south by the Atlantic ocean. Ondo state experiences two distinct seasons ,which are the rainy season [April- October] and the dry season [November-March].

Due to the fact that rainfall decreases gradually in amount and distribution from the coast to the hinterland, the annual rainfall varies from 2,000mm in the southern part of the state, to 1,150mm in the Northern parts of the state. Due to this, high forest zone or rain forest is found in the south while the northern vegetation is mostly savannah forest.

Ondo state is one of the richest states in Nigeria in the variety and quality of its traditional cultures and cultural ceremonies. The people in the state are lovers of poetries, music and Art. Due to the climatic conditions, the state not only enjoy luxuriant vegetation, but also has a good number of Nigerians major cash crops, which are cocoa, palm produce and timber.

The emphasis on the provision of education for people in Ondo State has led to the creation of many institutions of higher learning. These institutions are: -

1. Ondo State School of Basic Science, Ikare
2. Federal School of Science, Ondo.
3. Federal Government Colleges, Akure and Ido-Ani
4. Federal College of Agriculture, Akure
5. Institute of Agricultural Research And Training, Akure
6. Adeyemi College of Education, Ondo

7. Rufus Giwa Polytechnic, Owo
8. Adekunle Ajasin University Akungba, Akoko
9. School of Nursing, Akure
10. Federal University Of Technology, Akure.

4.2 PROJECT SITE.

The site is located at the junction leading to Engineering Material Development Institute, along the Akure-Ondo road, at the outskirts of Akure town. It has a rectangular shape with an overall size of about two hectares land area.

4.3 PHYSICAL FEATURES.

The general topography of the land is a gentle slope. The site is characterized by ferruginous tropical soil on basic crystalline rocks, which is the same for the whole town [Akure]. This is well drained and moist.

Plate 8: Plate showing the Interior of the proposed site

Plate 9: Plate showing the South-Eastern part of the site

Plate 10: Plate showing the front of the site

Plate 11: Plate showing the North-Western part of the site

4.4 CLIMATIC CONDITIONS.

4.4.1 TEMPERATURE AND HUMIDITY

Cloud cover influences temperature in the area, particularly the maximum temperature and the diurnal temperature range, which is as a result of the dry and wet seasons. The highest temperature occurs during the month of February and March, which could be as high as 36°C. Diurnal range during this season may be as much as 17.8°C. Minimum temperature particularly during the month of December, January and February may be as low as 20°C.

During the rainy season [March- October], maximum temperature range from 20.6°C to 36°C, though the diurnal range is reduced often not exceeding 8.1°C. However, human effort is not a function of temperature extremes alone humidity and wind movement influence the comfort conditions along side temperature.

4.4.2 WIND

The wind direction is influenced by seasonal shifting belts. The tropical continental air mass is formed over the Sahara desert and thus the wind blows from North-East to South-West direction from November to March. This air mass is dry and dust laden and it is also known as Harmattan. On the other hand, the tropical maritime air mass is formed over the Atlantic ocean and it is warm and moist, blowing from South-West to North-East direction during the months of May and September. It brings about the rainy season. The months of April and October are transitional months between dry and rainy seasons.

4.4.3 RAINFALL

Rainfall in Akure in most cases starts from the month of March and ends in November. However, the rainfall is at its peak in the months of June, July, August and September. This phenomenon has implications for planning of drainage works for the expeditious drainage of storm waters. Akure, like other South-Western states in Nigeria often experiences high annual rainfall, thus roofs not properly anchored and those not high enough to allow for easy run – off of water are subject to danger during this season.

4.4.4 SUNSHINE

The earth crust receives solar radiation from the sun, the amount that goes a long way in determining the climatic condition and vegetation cover. The amount of the solar radiation received by the earth surface is a function mostly of cloud situation and the duration of the day from sunlight to sunset.

4.5 VEGETATION

The project town Akure is located within the Rain Forest Zone of the country's natural vegetation belts. The vegetation cover of project site consists of tall grasses and palm trees scattered all over the place.

4.6 DRAINAGE/ TOPOGRAPHY

From the site analysis carried out, it was observed that the site slopes gently towards the North-Eastern axis of the site is thus naturally drains towards that direction.

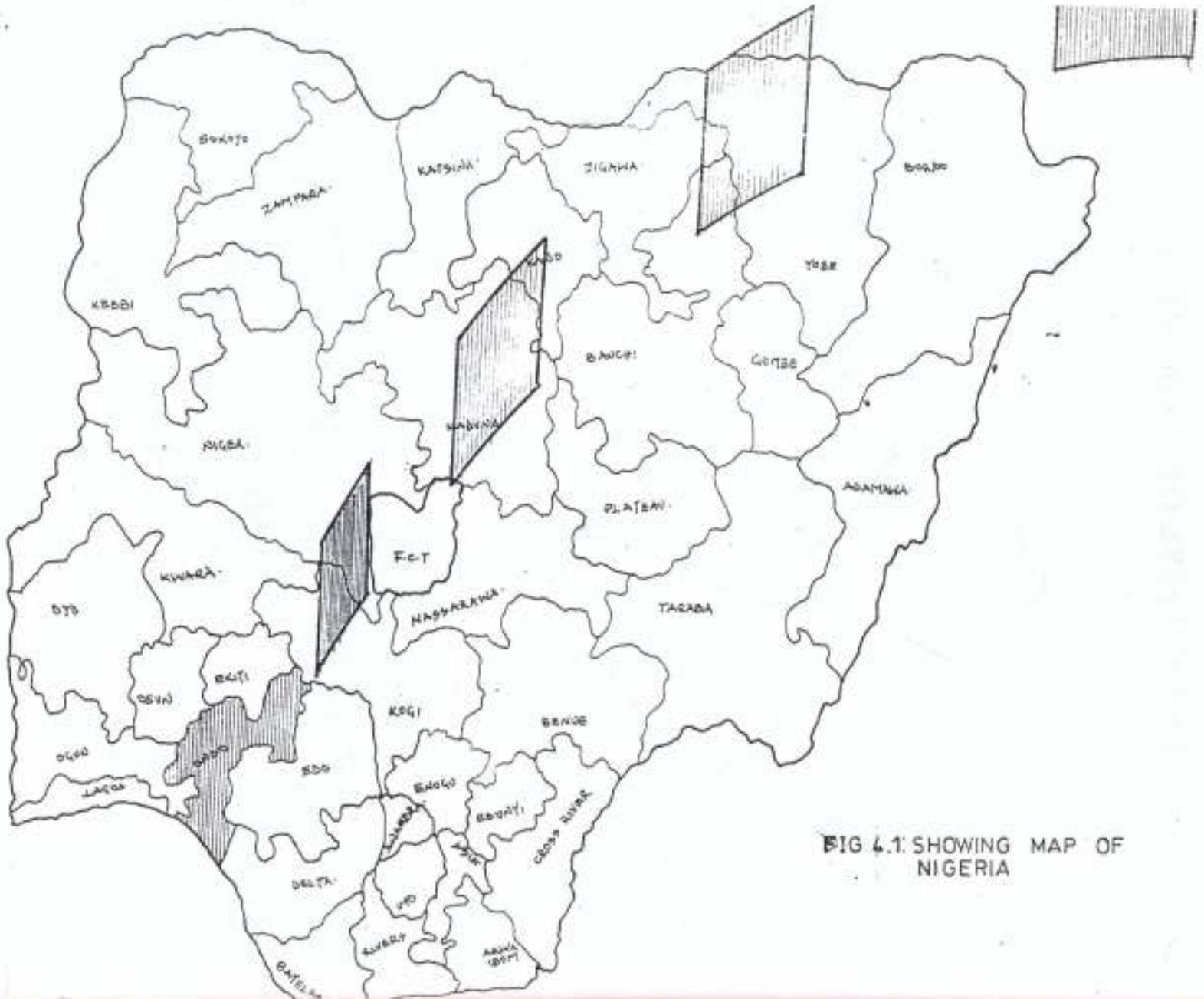


FIG 4.1: SHOWING MAP OF NIGERIA

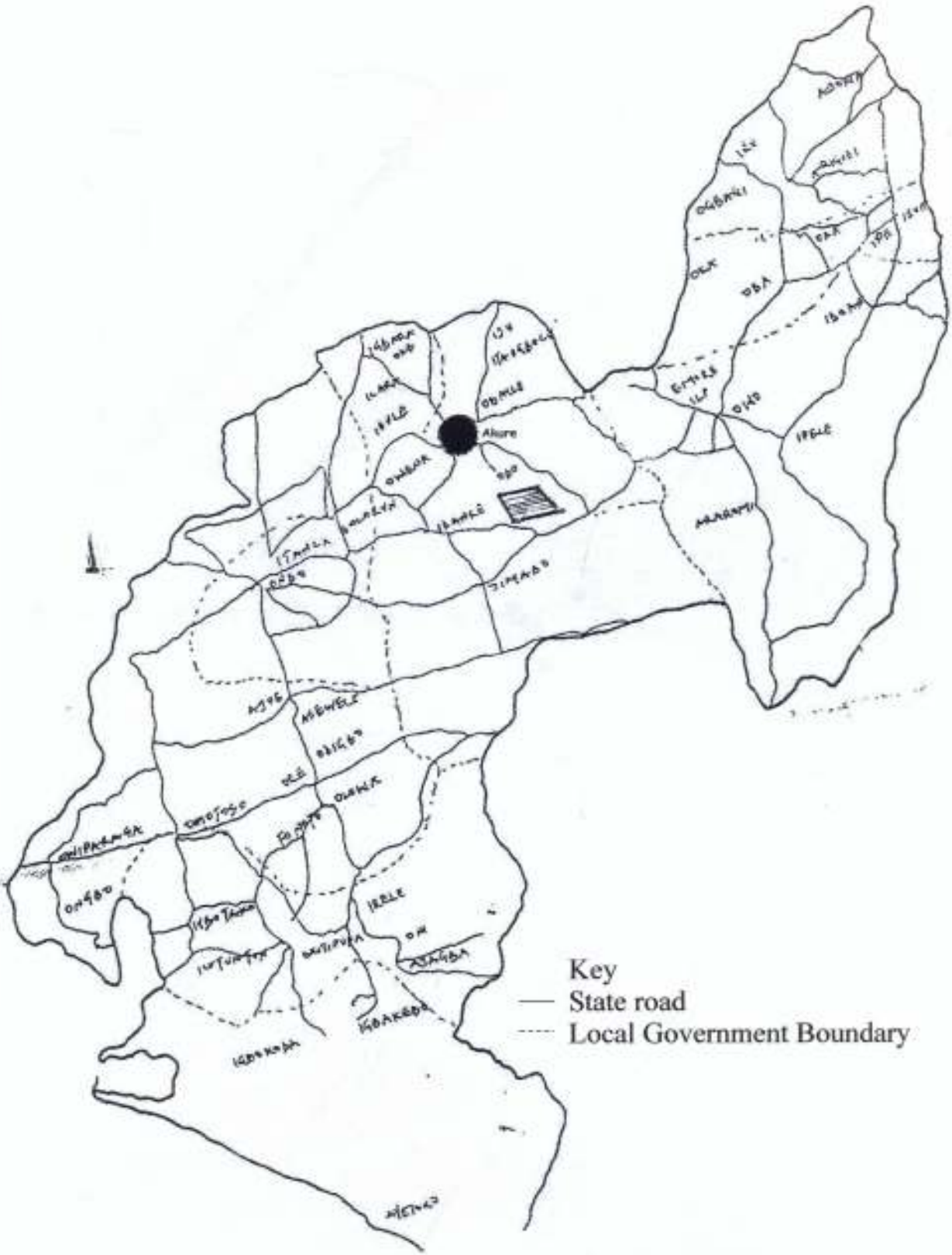


FIG. 4.2: MAP OF ONDO STATE

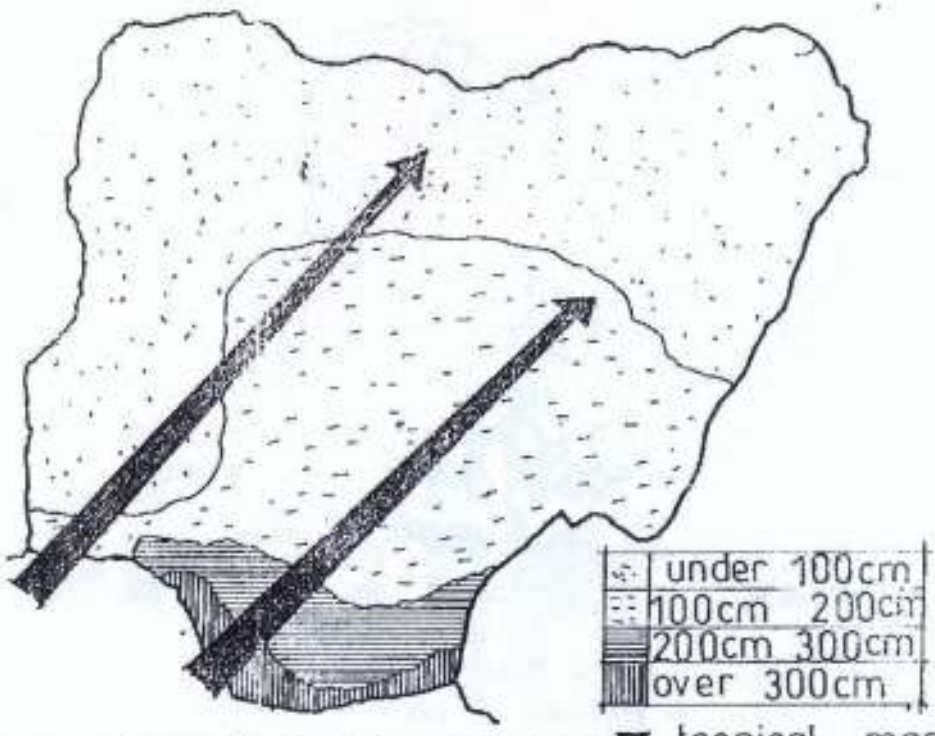
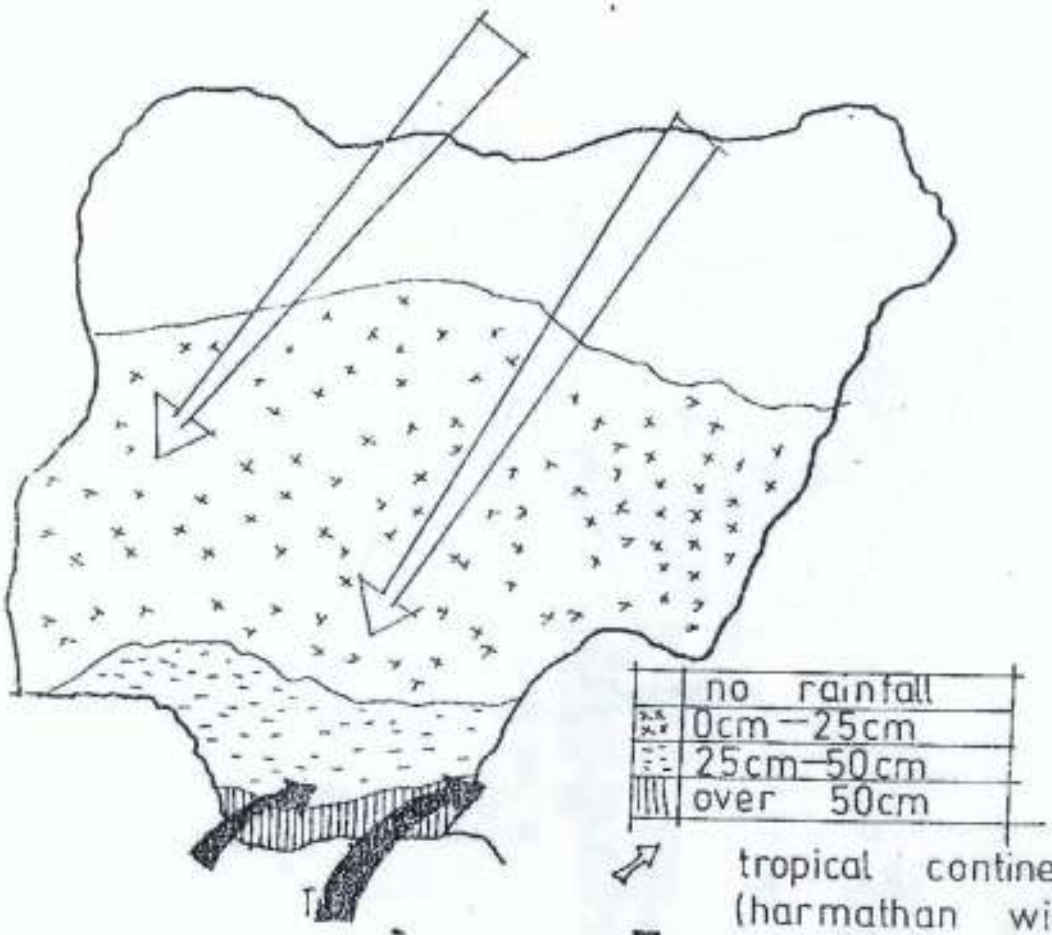


FIG. 4.3: SOUTH WEST TRADE WIND

tropical maritime air mass
(S.W. trade)



tropical continental air m
(harmathan wind)

FIG. 4.4: NORTH EAST TRADE WIND

tropical maritime air m

FIG 4.5 RELIEF AND DRAINAGE

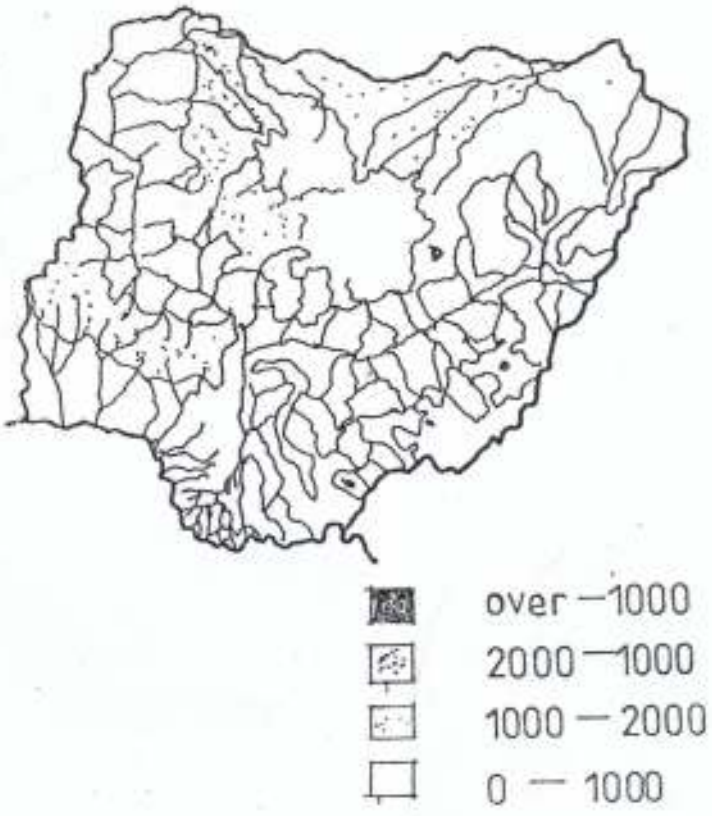


FIG 4.6 GEOLOGY

FIG 4.7 NATURAL VEGETATION

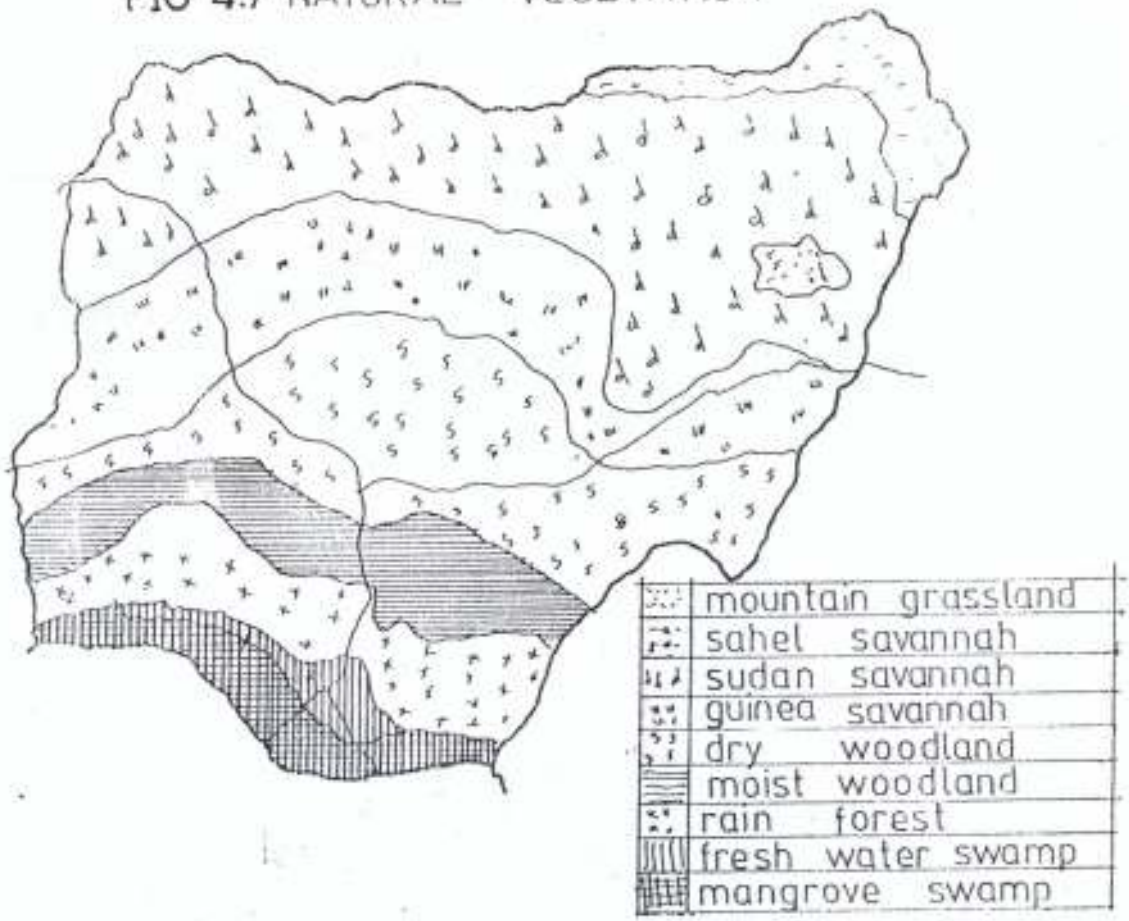


FIG 4.8 NATURAL SOIL

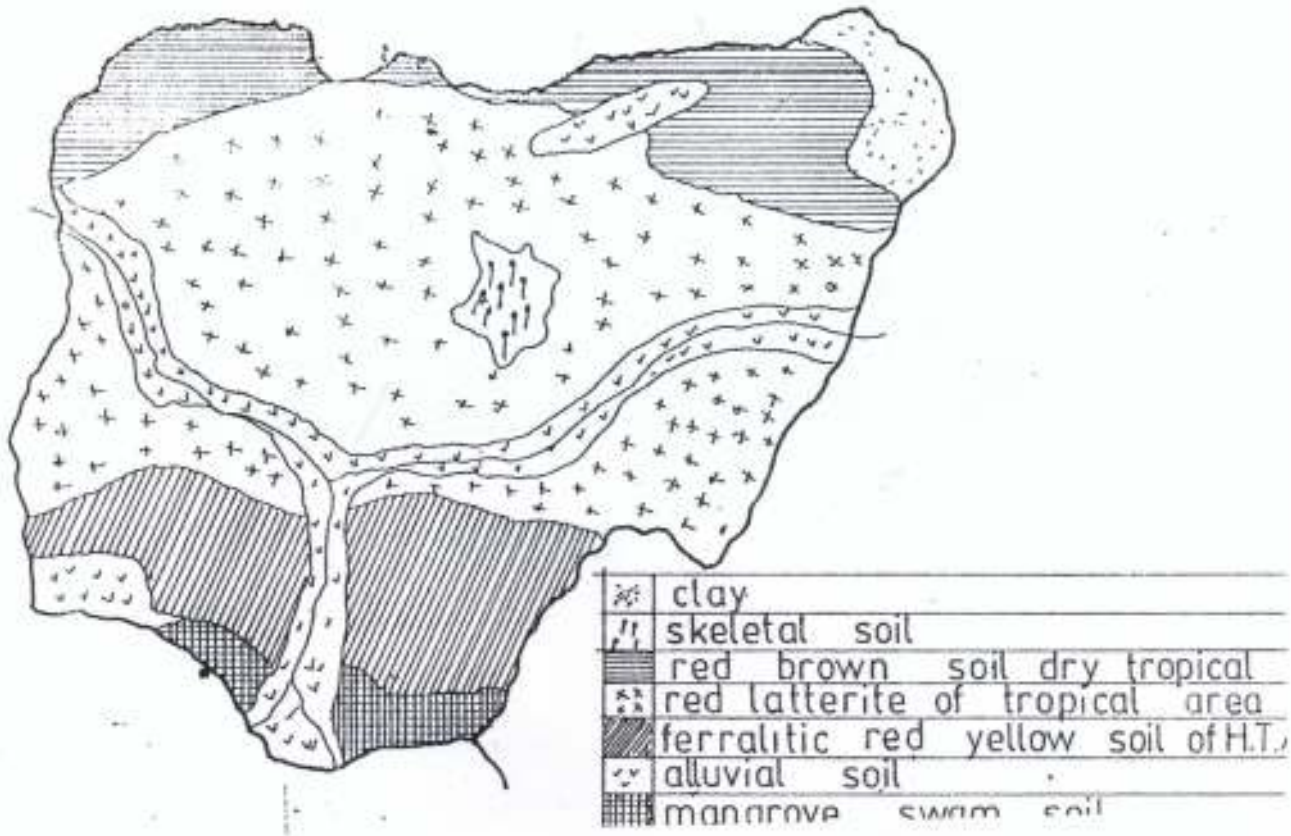
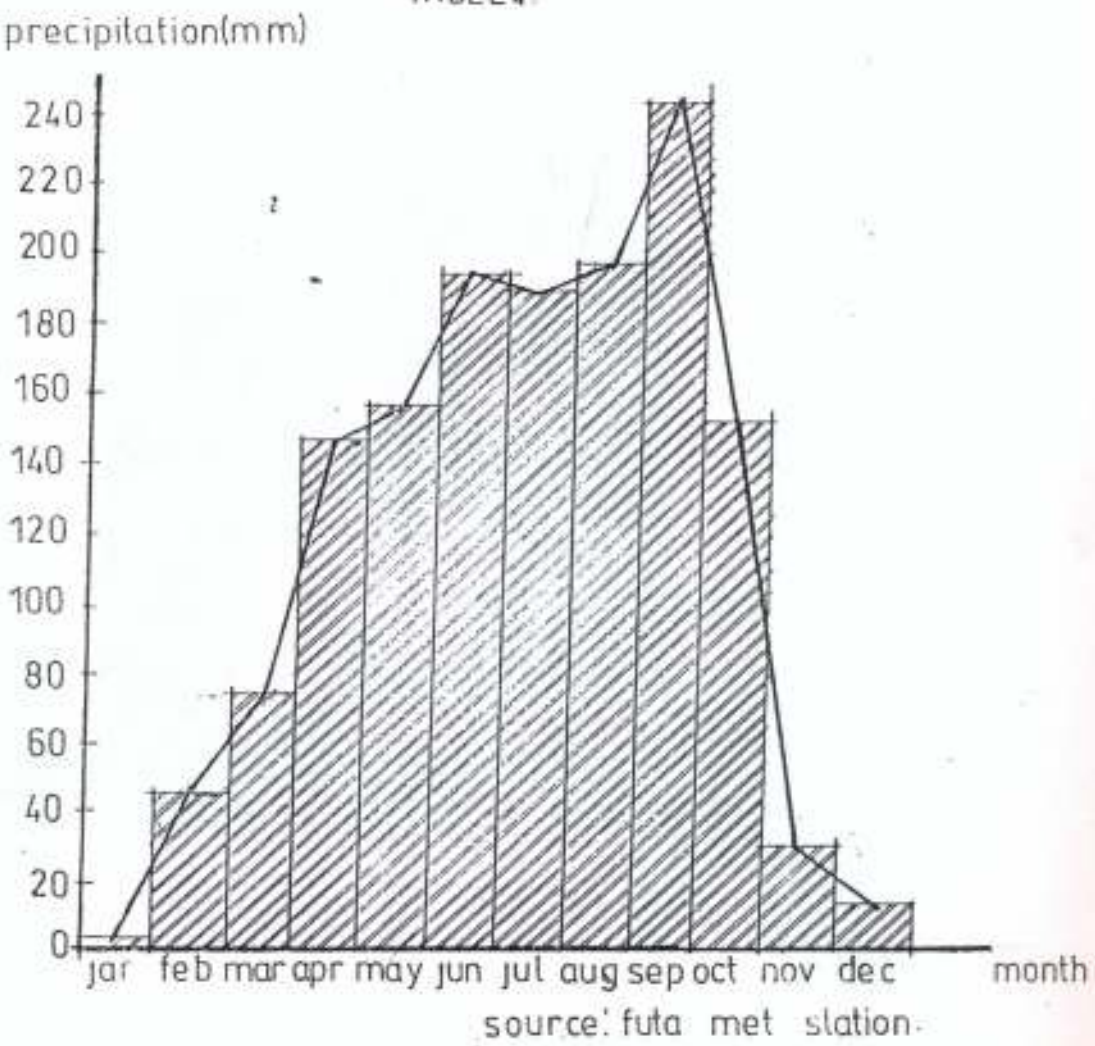


FIG 4.9 MEAN MONTHLY PRECIPITATION OF AKURE FOR 15 YEARS (88—2002)

months	jan	feb	mar	apr.	may	jun	jul	aug	sep.	oct	nov	dec
precipit.(mm)	4.7	43.7	71.3	145.2	155.7	198	194	196	245	151	29	12

TABLE 4.

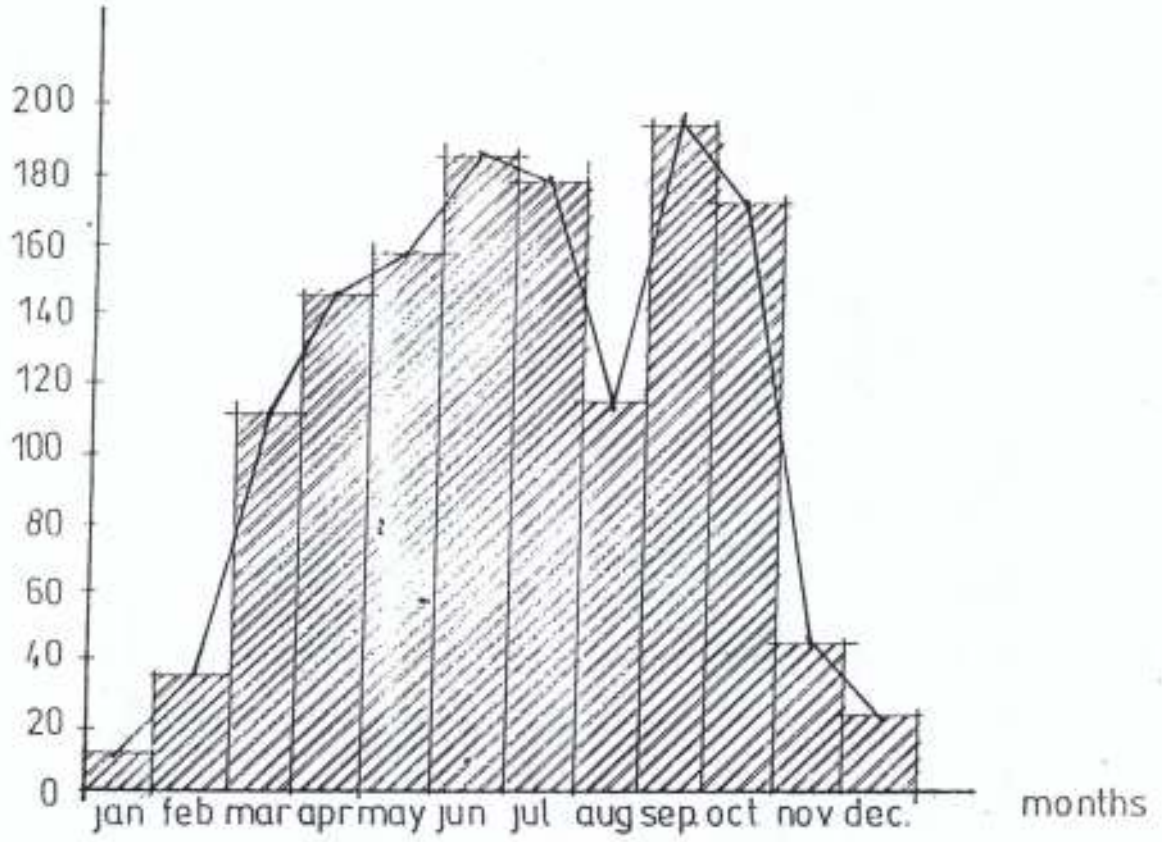


source: futa met station.

FIG 4.10 MEAN MONTHLY RAINFALL OF AKURE FOR 15 YEARS (88 – 2002)

month	jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec
rainfall(mm)	10	35	113	147	160	190	180	117	200	178	51	30

TABLE 4.

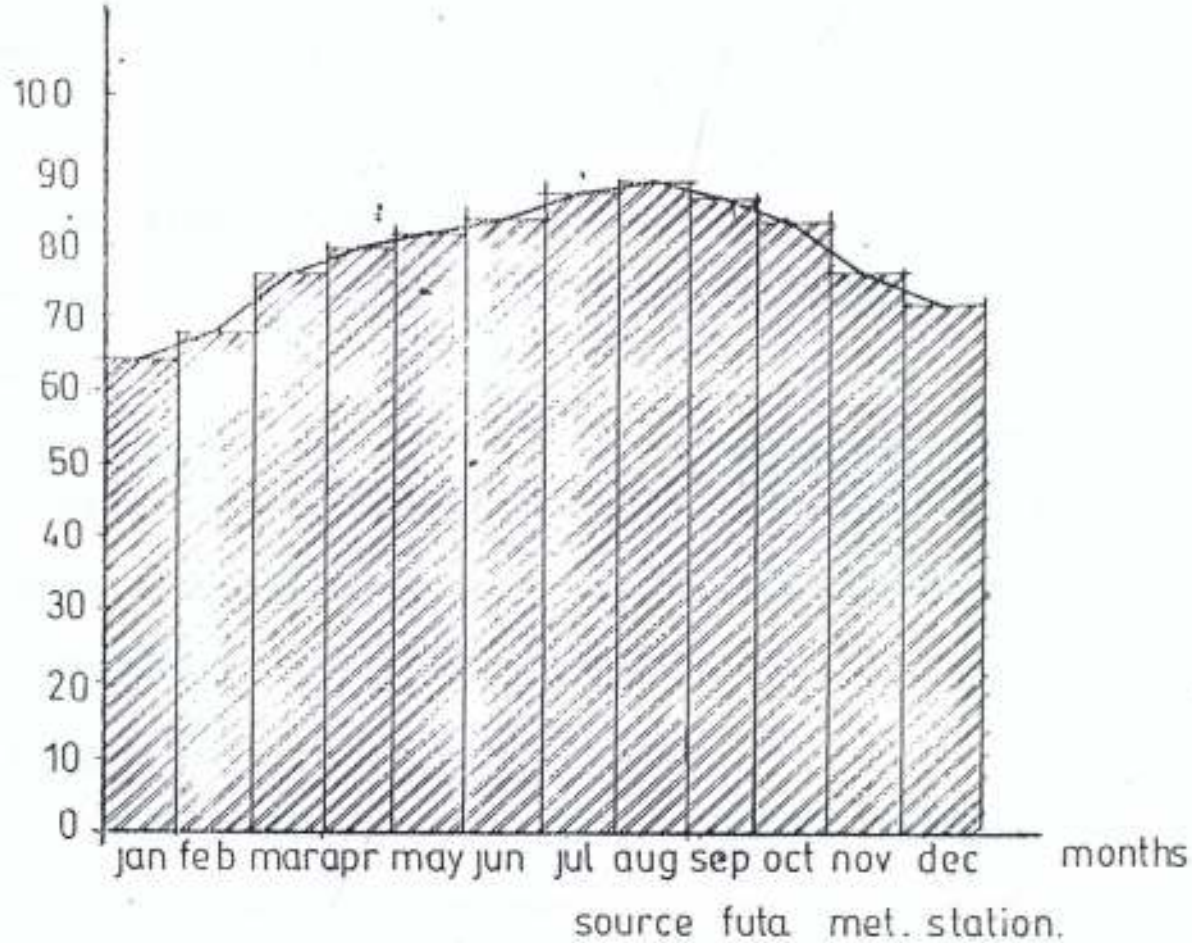


source: futa met. station.

FIG 4.11 MEAN MONTHLY RELATIVE HUMIDITY . OF AKURE FOR 15 YEARS (88–2002)

month	jan.	feb.	mar.	apr.	may	jun.	jul.	aug.	sep.	oct	nov.	dec.
rel. humi%	64.9	68.4	76.1	79.9	81.9	84.2	86.9	87.3	86.4	83.2	76.9	70.7

TABLE 4.



source futa met. station.

CHAPTER FIVE

5.0 DESIGN PROPOSAL FOR BITUMEN DEVELOPMENT AUTHORITY HEADQUARTERS, AKURE

5.1 INTRODUCTION

In the design of the headquarters building, due cognizance was taken of the functions of the various spaces and units in the building These include solution to design problems that were encountered like ventilation, overcrowding and lighting and also the client requirements and anticipation. For there to be a design there must always be a concept to guide the design. The concept covers the evolution of the structure relative to the form and its suitability to the site.

5.1 DEVELOPMENT OF CONCEPT.

The conceptual idea behind the proposed design is the integration of two conceptual approaches. They are:

PRAGMATISM: This involves the consideration of the stated requirements of the design.

SYMMETRY AND BALANCE: This involves the use of symmetry for the approach in order to create an orderly environment that enhances dignity, strength and control.

Also, the design façade also gives a sense of balance.

5.3 BUILDING DESIGN CONSIDERATIONS.

Office organizations are seldom static, they change rapidly more than the building itself. Personnel leave or are promoted, new staff are employed and also more fundamental management objectives and styles of operation continuously evolve in response to market conditions and other external forces. Such development usually leads to changes in spatial requirements and equipment.

Care is normally taken to avoid obsolescence in new buildings and optimum requirements are provided, to avoid the organization outgrowing the building thereby necessitating putting up a smaller unit elsewhere. Due to this, "open office", planning is considered, to guarantee flexibility in the spatial arrangements and easier supervision of personnel.

The need to provide a pleasant environment for the building is necessary and the feasibility of the office environment in terms of flow pattern is given a critical attention as this building is designed to be an umbrella for a series of interrelated clerical and decision making activities.

5.3.1. PLANNING PRINCIPLES OF DESIGN

The analysis and research, which effected the procurement of this design brief, were developed from a private interview with the secretary of the bitumen project implementation committee and also interviews with some of the other staff in the Technical section, Accounts section and Administrative section of the BPIC. The sizes given to the spaces were got from research into reference standards and careful analysis of the case studies discussed in the preceding chapters of this thesis.

The content of the design brief is basically the various functional space requirements and allocation with an indication of the magnitude of the proposed Headquarters building

The general principles of office planning revolves around the following:

1. Workstations are made of chairs and desks, which are considered in office planning.
   (a) Desks are arranged to face same direction.
   (b) Desks are arranged in twos or multiple of twos in open office.
   (c) Desks are placed about 1.8m apart.

(d) Position of desks allows for adequate sight of door

(e) In open offices, supervisor should be positioned close to the lounge or secretary.

(f) Employees whose functions result in receiving visitors, are stationed close to the entrance.

2. Heavy-duty equipment are placed against the wall or columns to avoid overloading. Where possible they are placed on ground floor or basement.

3. Flow is made simple

4. Workflow system determines to a large extent the form of planning employed and how the spaces are distributed. The layout conforms to and complements the predominant work requirements of offices.

5.3.1.1 SERVICES AND CONVENIENCES

The administrative building(s) would be provided with important utilities and amenities such as water supply, sewage disposals, storm water drainage, fire protection and electricity.

Water Supply: Water supply would be from a borehole, which should be sunken on the site. Water from the borehole is pumped to an overhead water reservoir lank; the water then falls by gravity to supply the building. A roof tank will be placed on the building, which would meet its water needs. Water supply system should also be able to provide sufficient capacity and pressure for fire fighting.

Sewage Disposal: It is essential to cater for the large number of people who would use the building. A pied sewage system is recommended. It shall be underground. The basic sewage system is the soak away septic tank system. Adequate sizes shall be provided. All drainage pipes shall be concealed.

Storm Water Drainage: Rainwater will be drained along drainage ditches, which will discharge into covered concrete channels along sides of the roads.

Fire Safety Consideration and Protection: Adequate measures shall be adopted to check against fire and combat it when necessary in addition to fire resistant materials being used in the course of construction.

The possible sources of fire should be well furnished with smoke detectors. Provision of two hose lines of adequate length and diameter connected to pipes should be made. These should have equal diameter and specified pressure on each floor level. Fire resistant and non-combustible materials should be used in floors, walls, ceiling, roofs. These materials should have a fire rating up to one hour.

More so, exits from the building should lead to a safe place in or accessible to the open air. From an escape staircase, at the ground floor, the rout must lead to the final exit doorway.

A well-heralded entrance has been provided. Stairs are located where they can easily be sighted. Width of staircases are not less than 2.30m. The riser is between 145m to 180mm. Ventilated lobbies are provided. Fire fighting equipment like sprinkler, sand and water are provided for. Exit doors open outside and are compressed to be impact resistant. Furthermore, a fire-fighting vehicle is expected to be stationed at the institution's maintenance.

The Fire Protection Act: The Fire Protection Act applicable in Nigeria provides that adequate detection and warning facilities be installed in every public building. To this effect, a combination of smoke and heat detectors with appropriate alarm and control system are to be located at every accessible space in accordance with British standard codes of practice.

Causes of fire could be from;

(a) Electrical faults arising from failure to service equipment

(b) Faulty cooking appliances

(c) Overworking electrical equipment

(d) Carelessness when smoking

(e) Faulty electrical or wrong connections.

In summary, the fire protection measures for any modern building should be:

(a) Portable fire fighting equipment to be installed along escape routes

(b) Means of escape

(c) Access for the fire service

(d) Structural fire protection

(e) First aid equipment

(f) Automatic fire sprinklers

To users of the building, means of escape is very important as such, the design and protection of escape routes is therefore paramount. The elements of the corridors leading to escape routes as well as normal entry and exit points are expected to be fie resistant to ensure safety from heat and smoke.

Electricity: This is the responsibility of the National Electric Power Plc., but standby generators to take care of incessant power cuts are expected to supplement it. Electricity for the site will be got from cable which is a 1.50mm^2 link cable between switch station and a cable F6 that is a 70mm^2 loop feeder cable.

Mechanical Facilities: Mechanical services include all forms of services and systems to aid or create a particular condition in the center. This involves.

- Air-conditioning system and forced ventilation to improve human comfort.
- Elevators, escalators and conveyor belts to aid movement of people and services respectively.
- Air-conditioning and Forced Ventilation: Air conditioning and the act of inducing ventilation in a public centre of this nature are very important. This will improve comfort, create a controlled environment thereby increased the efficiency of employees and participants activities per house.

Air-conditioning: This refers to a situation where ventilation and humidity of the air is generated by mechanical means to achieve a comfortable level. Three systems are in use:

- Unit Air-Conditioning System
- Split Unit Air-Conditioning System
- Central Air-Conditioning System

Unit Air-conditioning: These are usually small units with capacity ranging between 15-70KW. They are installed in walls or within window openings with part of it projecting to the outside, to enable it get rid of condensed water and heat as well as getting an intake of fresh air. Their use in buildings creates a feeling of unclean surfaces thereby reducing the aesthetic value of the building structures.

Split Unit Air-Conditioner: Have the following attributes/ characteristics:

- It does not require building alteration if there is a break down of any part of effect installation
- It is bulkier

- It does not work on the principle of external supply of fresh air for cooling
- It is very flexible and can be placed inside or outside the building, rooftops usually.
- It does not make as much noise as the regular

Central Air-Conditioning System: This is a very large and highly demanding unit. It requires a lot of ducting work for supply and cost much to purchase, while its breakdown may lead to a total disruption and loss of stored items in the centre. Specialist services are required for installation and maintenance. It also requires special building space and condition thus an increase in installation cost.

In general, Air Conditioning system when used may affect the whole building and result to a huge loss and the use of the unit system may create unpleasant facades on the overall aesthetics of the center.

In this design, a split air-conditioner is proposed for most partitioned centers including offices. However, achievement of natural ventilation will be pursued as much as possible in the design, except in areas where functions necessitate artificial ventilation.

5.3.1.2 SPECIAL SERVICES AND CONVENIENCES

There include provision of kitchenette, staff lounge and restaurant service for the public. These are necessary for good working conditions and efficiency in productivity. Conveniences such as the toilets are made adequate and wash hand basins are also be provided.

Table 5.1 Wash hand Basin Provision

No of Employees and Regular visitors	No of Wash Basin	No
1 – 5	1	
16 – 30	2	Add 1 basin for every 25 Persons in excess of 100
31 – 50	3	
51 – 75	4	
76 – 100	5	
Over 100		

Source: De Chiara, and Callender, (1980)

5.3.2 INTERIOR CHARACTER IN BUILDINGS

5.3.2.1 LIGHTING IN THE OFFICE

Natural light can be put to use in the office, but must be controlled to some extent. Direct sunlight may produce glare, cause discomfort and eyestrain. Natural light could be captured and controlled as it penetrates through the glass or window, commonly in use in contemporary architecture.

Proper use of sliding or casement windows that diffuse light and products that could be used to prevent solar rays are recommended. Shading devices are also used to control solar radiation and to allow enough quantity of light in.

Artificial lighting is provided to the office building by indirect lighting.

5.3.2.2 COLOUR IN OFFICE

Colour has an effect on the lighting conditions. Colour influences the illumination level available for the various types of work and the visual comfort. The use of colour influences the following conditions in the office such as (i) Prestige (ii) Health (iii) Morale (iv) Efficiency.

The principles of colour selection for wall surfaces apply to the surface colour of office furniture. These colours reflect the purposes for which the spaces are being used and are durable as well as economical. Shades of cream, blue, green, black, grey, are adopted because they depict a business environment. Potted plants are at certain positions to give a pleasant and relaxed atmosphere. The latter would help put people at ease, as many people tend to be tense in office environments.

FLOOR COVERING

There are many floors covering available. Floor covering for an office environment should create a quiet related atmosphere in which to work. It should also have a feeling of luxury, which enhances workers' satisfaction. Exposing concrete floors in the office should be avoided at all cost. Hard surfaces reflect sounds instead of absorbing them. Resilient covering such as rubber, asphalt and cork tile, are the preferred floor covering for reducing office noise from footsteps e.t.c.

For the purpose of this design, well cut and fixed terrazzo flooring used. This is suggested as a result of the low cost of maintenance of the floor type as well as its durability.

WALL COVERING

Usually, rooms has considerable absorptive material in it, the wall, furniture, ceiling and floors as well as the people and their clothing. To reduce the noise level in offices, the absorption materials must be increased considerably. Fabrics in upholstered office furniture, as well as in draperies have noise reducing qualities and are used for both wall and window treatments.

Acoustic plasters are use but are not popular in offices due to the high cost of installation and difficulties encountered in redecoration.

CEILING COVERING

Wall and ceiling surfaces in modern offices are often finishes in hard gypsum plastic applied on concrete. Materials mostly used as ceiling covering to reduce noise is the Acoustic tiles. For the purpose of this design, the use of these tiles is limited to areas of special need such as the Board rooms and the conference rooms.

5.3.3 NOISE AND NOISE CONTROL IN OFFICES

The generation of noise in the office or its environment could be very unpleasant. It diminishes the work efficiency, interferes with communication and makes concentration difficult.

A basic fact, involved in all noise control systems is, either to control the source of noise or to utilize sound absorbing material to muffle or absorb sound waves. To reduce the noise created by office work, a good layout is used to decrease the distance of noise

generated from outside and in some cases eliminates or reduces its intensity if the office is relocated.

5.3.4 OFFICE ENVIRONMENT

The office environment plays a large role in the human behaviour of the office staff and the productivity team, work convenience and comfort of the office.

Physical factors as lighting and acoustics, noise elimination, floor covering, effective use of colour in the office makes up a significant part of the office. Another important factor is the way traffic will be handled in the immediate environment of the administrative building.

5.3.5 SEPARATION OF TRAFFIC

This is very important for the success of the centre. It involves the separation of:

1. Service cars from customers traffic
2. Pedestrian from vehicular traffic

Separating service cars from customer's traffic:

This is of great importance and includes service traffic created by service vehicles for deliveries, garbage and trash collection, repair crew, service workers, employees (at times) and tenants collecting their goods from the service yards.

Separation of pedestrians from vehicular traffic

Clear separation of pedestrian from vehicular traffic is of a high necessity to shield the customers form the danger, noise, fumes and confusion created by the vehicles, which

may disorient the customers' attention and thus distorting the functionality of the scheme as an educational centre.

This may result to a diminishing interest for the centre on the part of participants, which in effect is detrimental to the organisation. The separation is achieved by:

- Broad walk-ways with good landscaping, visible from main routes and free flowing into and out of area without congestion.
- One way traffic with relevant traffic signals. In this design, one-way traffic method was adopted for effective traffic separation. In this design, the 90° parking arrangement is adopted.

Staff car parking must be separated and entry accessed from service areas and not from public/customers access point. Certainly a car parking area for visitors, tenants and centre management will need to be provided as part of the service areas.

Parking arrangement namely 45^0 60^0 and 90^0 could be adopted for parking stalls width.

Table5. 2: Private Parking

Angle	**Minimum (m)**	**Normal (m)**	**Maximum (m)**
90^0	2.59	2.67	2.74
60^0	2.53	2.59	2.68
45^0	2.49	2.53	2.60

Source: De Chiara and Callendar (1980)

Table 5.3: Service Vehicles

Types of Truck	Max Length (m)	Max width (m)	Max weight	Turning circle	Internal Radius	Height (m)
Rigid vehicles	10.0	2.5	28.5	13.0	7.2	4.1
Articulated vehicle	15.0	2.5	32.5	14.5	5.7	4.1
Fuel engine	10.0	2.3	120	22.0	6.3	3.5
Dust cards	8.0	2.4	13.0	18.0	6.3	4.7

Source: De Chiara and Callender (1980)

5.4 DESIGN CONSIDERATION

5.4.1 FORM/SHAPE

The shape of proposed bitumen development Authority is a combination of rectangles with the one in the center being the largest. The front or façade of the building is glazed and the building is a frame structure.

The façade of the building is well celebrated, giving the building an air of dignity and strength.

5.4.2 ARCHITECTURE OF THE IMMEDIATE ENVIRONMENT

Due to the huge size of the site and also the fact that the bitumen development Authority is at the inception stage, over half of the site is left for future development.

LANDSCAPING

Landscaping occupies an important consideration in the whole scheme. This implies that the success of the total design and the built environment depend partly on the efficiency of its landscape. The landscape is so designed therefore to achieve three basic functions:

1. A sociological function:- Landscaping to give visual physical and informative value.
2. Psychological function:- Landscaping to realize consciously or sub-consciously a desirable effect.
3. A bio-climatic function:- Landscaping to influence microclimate

This is achieved by a systematic study and use of various landscaping elements, which could be divided into two:

1. Natural elements
2. Artificial elements

Natural Elements:- These include natural resources on site, which could be adapted wholly or remodeled into the design.

Artificial Elements:- These are man-made landscaping elements e.g. statues, fountains kerbs, slabs, light fittings, site furniture are also to be incorporated into the landscape.

Kerbs and Slabs:- These are to be functionally used either as surface covers or for determining pedestrians' routes. They could also be used as barrier to traffic flow. They should be used only where necessary on the site. They should be finished in tiles, low grade coarse, stones, concrete slabs, kernel shells or marble as the case may be.

Lighting – should be well sited for functional aesthetic purpose as discussed earlier.

5.4.3 SECURITY

The safety of the items in the headquarters building, staff and the building itself forms an important consideration in site planning.

In lieu of this, the units of the complex are such that they are within the security network of the whole administrative block. Effective planning is done to reduce the role of human security.

Parking spaces are planned such that inlet to and outlet from the parking areas are controlled effectively for security reason.

Escape routes are planned into the building and the entire site. The executive and management staff have private routes that are not accessible to the general public.

5.5 BUILDING DESIGN CRITERIA

The design criteria for the project are as follows:

1. Design brief and brief development
2. Space requirement analysis
3. Schedule of accommodation

5.5.1 DESIGN BRIEF AND BRIEF DEVELOPMENT

5.5.1.1 DESIGN BRIEF

From information, gotten from case studies and interviews with the officials of BPIC it was realized that the bitumen development authority stands as

(1) A monitoring body.

(2) An exploration body to acquire information on other places in the country where bitumen exists.

(3) A research body so as to get more usefulness for Bitumen

(4) As an administrative body for the bitumen project management.

5.5.1.2 BRIEF DEVELOPMENT

The bitumen development authority is divided into departments and units sections, which are.

(1) Director Generals Office

(2) Administrative Department.

(3) Exploration Department

(4) Research and Development

(5) Personnel Department

(6) Public Relations Department

(7) Library and Annual Reports Department

(8) Monitoring Department

(9) Technical Department

(10) Security Unit

(11) Auxiliary, which consists of the staff clinic and staff canteen.

These departments were further divided into units for a more effective dispensation of work in the Building. These units are illustrated below.

1. **DIRECTOR GENERALS OFFICE/LEGAL DEPARTMENT**

a. Director Generals Office (Secretary's Office, personal assistants office, Board room, Achieve, waiting room).

b. Head Legal unit (Secretary's waiting room, Archive, general office).

2. **ADMINISTRATIVE DEPARTMENT**

a. Head of Administrative Department's Office (Secretary's office, waiting room, archive).

b. Chief accountant's Office (Secretary's office, waiting room, general office).

c. Chief auditor's office (Secretary's office, waiting room, general office).

d. Head, pension gratuity and wage's office (Secretary's office, waiting room, general office).

(1) Head, purchasing unit's office (Secretary's office, waiting room, general office).

(2) Head, finance unit's office (Secretary's office, waiting room, general office).

(3) Head, treasury unit's office (Secretary's office, waiting room, general office).

(4) Head, marketing units office (secretary's office, waiting room, general office)

(5) Telephone room (P.A.B.X.):

3. **EXPLORATION DEPARTMENT**

a. Head, exploration Department's office (Secretary office, waiting room, archive)

b. Head, geology unit's office (Secretary's office, waiting room, general office)

c. Head, survey unit's office (Secretary's office, waiting room, general office).

d. Head, geophysics units office (Secretary's office, waiting room, general office)

e. Head, mining units office (Secretary's office, waiting room, general office).

4. RESEARCH AND DEVELOPMENT

a. Head Research and developments office (Secretary office waiting room archive).

b. 4 office for researchers

c. 5 laboratories

d. 3 offices for technologist

e. Darkroom.

5. PERSONNEL DEPARTMENT

a. Head, personnel department's office (Secretary's office, archive, waiting room)

b. Safety managers office (Secretary's office waiting room, general office)

c. Employment manager's office (Secretary's office waiting room, general office)

d. Training Manager's office (Secretary's office waiting room general office training rooms).

6. PUBLIC RELATIONS DEPARTMENT

a. Head, public relations Department's office (Secretary's office, waiting room, general office).

7. LIBRARY AND ANNUAL REPORTS DEPARTMENT

a. Head, library and annual reports Department office (waiting room, secretary's office, library)

b. Head, library units office (Secretary's office waiting room, general office)

c. Head, Annual report units office (Secretary's office waiting room general office)

8. MONITORING DEPARTMENT

a. Head, monitoring department's office (Secretary office, waiting room, general office)

b. Head, production monitoring units office (Secretary's office, waiting room, general office)

c. Head, Rent and Taxes monitoring units office (Secretary's office, waiting room, general office)

d. Head, environmental monitoring units office (Secretary's office, waiting room, general office)

e. Head, Royalties monitoring units office (Secretary's office, waiting room, general office)

f. Head, remedial monitoring units office (Secretary's office, waiting room, general office).

9. TECHNICAL DEPARTMENT

a. Head, technical department's office (Secretary's office, waiting room)

b. Head, Geologists & Geophysics units office (Secretary's office, waiting room, general office

c. Head, Chemists units office (Secretary's office, waiting room, general office)

d. Head, Mining Engineers units office (Secretary's office, waiting room, general office)

e. Head, Drillers & Transportation units office (Secretary's office, waiting room, general office)

10. **SECURITY UNITS**

a. Chief security officer's office (Secretary's office, waiting room)

b. 2 changing rooms (male & female).

AUXILIARY

STAFF CANTEEN

(1) Kitchen

(2) Junior staff canteen

(3) Senior staff canteen

STAFF CLINIC

(1) Chief medical officer's office (Secretary's office waiting room, injection room).

(2) Dentist's office (Secretary's office)

(3) Ophthalmologists office (Secretary's office)

(4) 2 changing rooms (male & female)

(5) 2 wards (male & female)

(6) Pharmacy

(7) Card room

5.5.2 SPACE REQUIREMENT

5.5.2.1 SPACE PER PERSON

In the provision of spaces in buildings, some evidence suggests that the area per person decrease as the number of room occupants increases up to about five people. After this, there is little or no change in the average provision and people tend to use between 4 – 5m^2 of occupants like the Director General, Head of Department Heads of units, and secretaries, larger space area is provided to match the function of the space with the space area allocated ranging between 12.96 to 42m^2.

5.5.2.2 SPECIAL ACCOMMODATION.

(a) LAVATORY ACCOMMODATION

In this design proposal stairways and toilets are designed together to form the service core of the building. On the each floor of the proposed design security posts are provided to monitor the people using each floor.

(b) THE BUILDING

Headquarters building should be regarded as a viable and flexible structure. It should be capable of growing with the community and the department it serves. Thus in the design, the growth potential of the departments is considered thus the design addresses not only the present needs of the agency, but also its future needs.

5.6 STRUCTURAL SYSTEM

The structural system for the Bitumen Development Authority makes use of the frame structural system, where rigid elements, monolithically connected, can span spaces by redirecting loads by means of their bulk e.g. columns and beams.

5.6.1 WALLS

The walling material used depends on the function of the space. The external walls consists of sand create block walls. Some of the internal walls are made up of sandcrete blocks and curtain walls.

5.6.2 FLOOR SLAB

The floor is designed as waffle floor slab laid over 400mm diameter circular columns at a span natural of 6.0metres between columns and inbuilt beams running along its grid.

5.6.3 ROOF STRUCTURE

The complex makes use of hip as roof for central building going to 6 floors and for the side appendages going to 3 floors.

5.7 THERMAL COMFORT

The thermal comfort of the building occupant is put into consideration while designing. This has to do with ventilation and factors of solar radiation.

Ventilation is the inflow of fresh air into a physically enclosed space. Ventilation effect is measured in terms of the rate of air change over time in a living space. Air changes

resulting from ventilation also improves the cooling effect of the space and its occupants. There are two forms of ventilation, there are:

(a) Artificial Ventilation

(b) Natural Ventilation

5.7.1 ARTIFICIAL VENTILATION

This is the use of mechanical devices to achieve and control airflow. They are usually employed when it is impossible to achieve natural ventilation due to the nature of space and improper positioning of openings. They help to control temperature use, humidity, air purity, and movement f desired level to ensure comfort.

5.7.2 NATURAL VENTILATION

This is the natural flow of air, which does not depend on any mechanical aid but relies on natural forces. Natural ventilation is a result of movement of air due to temperature differences (stack effect) of external fresh air and unfit (polluted) air inside the space as well as movement due to difference in air pressure between the windward and leeward side of the space.

Due to Nigeria's electricity problem, emphasis is laid on natural ventilation rather than artificial ventilation. In order to achieve natural ventilation, such factors as orientation, vegetation and fenestration are given due consideration.

Air once directed into the building, tends to keep going straight until it is obstructed does not move directly form the inlet to the outlet, except in special cases. The pattern of an incoming breeze is not affected by the location of the outlet. The size of the outlet does have an effect in cross ventilation. If the inlet-to-outlet ratio is exaggerated, the result will be a very fast movement of air through the inlet. The best way to ensure good air speed throughout the interior is to have the outlet about 10 percent larger than the size of the inlet.

CHAPTER SIX

6.0 RECOMMENDATIONS AND CONCLUSION

6.1 RECOMMENDATIONS

The world is fast becoming a global village owing to the advancement in technology and development. This has led to a continuous evolution of functions due to the provision of improved architectural designs and new concepts. Modern office building therefore has to be dynamic and designed for the present use and the expected use in future so as to ensure that the building does not become obsolete.

1. In the planning of a Headquarters administrative building, the Architect should be involved right from the inception stage and made to realize the intricacies of administrative building.

2. As a Headquarters building the need to symbolize and make it an official edifice must be emphasized.

3. The Headquarters building should be designed such that it is flexible and the spaces provided in the building should allow for expansion.

4. The atmosphere around the environment should be attractive. This can be achieved by proper landscaping.

5. The building should be adapted in such a way as to accommodate other initiative.

6.2 CONCLUSION

The Bitumen Development Authority Headquarters has been carefully designed and planned to create a flexible environment, which enables proper function, and working environment for staff and other users connected to the function. It was observed from critical studies that built environment contributes to the level of efficiency of inhabitants of office buildings. Therefore, the architectural aid for effective administrative function as addressed in this thesis will improve in no small measure the efficiency and behavioral pattern of staffs at work.

The tropical condition, which includes the sun, wind and rainfall amongst others, has been properly considered in the siting of the building for maximum comfort of the users.

It is hoped therefore, that the execution of this project will provide users the opportunity to deviate from the current and rigid kind of design devoid of form and character, which exists in the country.

REFERENCES

Ajenifujah. A.O (2002): *Administrative Building for Adekunle Ajasin Polytechnic Owo*. Unpublished M.Tech. thesis, Department of Architecture, Federal University of Technology, Akure. 123pp.

Alaba. A. (2001): *The Community Court of Justice for ECOWAS Countries (An Architectural Aid to Judicial promptness)*. Unpublished M.Tech. thesis, Department of Architecture, Federal University of Technology, Akure. 125pp.

De Chiara, J and Callendar, J. H. ed (1980): *Time Saver Standards for Building*, 2nd edition Great Britain. Granada Publishing Ltd.

Duffy, F. Care C. and Worthington, J. ed (1979): *Planning Office Spaces, London*. The Architectural press Ltd.

Harns, D. (1982): *Planning and Designing the Office Environment*. New York, Van Reinhold Company

Neufert, E. (1982): *Architect's Data*. 3rd Edition, Great Britain Granada Publishing Ltd.

Petroleum Communication Foundation (2000): *Canada's Oil Sands and Heavy Oil*. Gray's Publishing Ltd

Pile, J. (1978): *Open Planning: A Handbook for Interior Designers and Architects.* Architectural press, London.

Odeyemi. I. B (2001): *Facts About Nigerian Bitumen* (unpublished article).

Tult, P. and Adler, D. ed (1979): *New Metric Handbook London.* Architectural Press Ltd London.

Walley, B. (1975): Office *Administration* Handbook. London Business Books.