KOGI STATE INVESTMENT HOUSE, LOKOJA THERMAL CONTROL IN PUBLIC BUILDINGS IN A HOT HUMID ENVIRONMENT.

BY

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A Thesis submitted to the Postgraduate School, Ahmadu Bello University, Zaria. In partial fulfilment of the requirement for the award of Master of Science in Architecture. (M.Sc. Arch).

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DECLARATION

I FALADE TOLORUNJU STEPHEN of the Department of Architecture, Faculty of Environmental Design, Ahmadu Bello University, Zaria hereby declare that the work presented in this thesis is a personal academic undertaking executed under the supervision of mentor Arc. A.A. Mbina of the Department of Architecture, Ahmadu Bello University. It has not been accepted wholly or partially in any previous application for a degree and all contribution references have been dully acknowledged.

Falade Tolorunju Stephen
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5/11/98
Date

CERTIFICATION

This thesis entitled Kogi State investment house, Lokoja. Thermal control in public buildings in a hot humid environmental meets the regulation governing the award of Master of Science in Architecture (M.Sc. Arch) of Ahmadu Bello University and is approved for its contribution to knowledge and literary presentation.

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DEDICATION

- Dedicated to the glory of Almighty God, the perfect master Architect of all times.

  To my late father Pa Luke Falade who time and fate never allowed to see the end of this programme.

- To my mother for her love, prayers and understanding.

ACKNOWLEDGEMENT

I am most deeply indebted to God Almighty who has spared my life throughout my stay in this university. I wish to acknowledge with gratitude, the effort and contributions of my supervisor Arc. A.A. Mbina.

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Finally, I strongly appreciate the almighty God, my creator. It is only by his grace and mercy that I came this far.

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ABSTRACT

An investment house is a building consciously designed to accommodate administrative and commercial functions of a corporate organisation that undertake investment activities either on behalf of government or individuals.

The creation of Kogi State in August 1991 brought the need for accelerated development. Also, the adoption of Lokoja as the State Capital led to rapid growth in population and urbanization of the capital.

The above development made tremendous impact on the commercial and economic activities of the people. This brought about the motivation for providing an investment house for the state.

The primary objectives of the thesis are:-

I. To provide an office building that will efficiently accommodate the Kogi State Investment Company.

II. To boast the corporate image of the company.

III. to provide alternative source of revenue for the company through lettable spaces.

The thesis has looked into thermal control in public buildings especially in hot humid environment like Lokoja. This was carried out through case studies of similar buildings and interviews with users of similar buildings.

To make sure the building is in conformity with the local setting, site analysis was done to make sure the design suits the local climate. Brief was developed after consultation with Kogi State Investment Company. This formed the basis for space allocation and subsequently the schedule of accommodation.

The design of the complex is made up of the following, the corporate headquarters, Bank branch. Conference hall and shopping mall including all supporting facilities.

Adequate attention was paid to parking and general security within the premises. It is hoped that this work will contribute to knowledge especially in the area of thermal control in public buildings in hot and humid environment.

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DEFINITIONS

INVESTMENT

Process of exchanging income during one period of time for an asset that is expected to produce earnings in future periods. Thus, consumption in the current period is foregone in order to obtain a greater return in the future.

INVESTMENT COMPANY

An investment company is a corporation or trust formed to invest its shareholders money in a portfolio of securities. Investment companies enables investors to pool their funds so as to minimize risk and maximize gain through diversification and professional management.

HOUSE

A structure designed as an abode for one or more persons. Houses vary in size and magnificence from the crudest huts of primitive peoples of the most luxurious palaces.

EQUITY - Ordinary shares

INVESTMENT HOUSE

An investment house within the context of this thesis shall be defined as a building consciously designed to accommodate administrative and commercial functions of a corporate organisation and other compatible commercial ventures.

SECURITIES

Written or printed documents by which the claims of holders in specified property is secured. They could be slacks, shares, bonds and debentures.

STOCK EXCHANGE

A market where investors buy and sell shares through agents called stock brokers or jobbers. Simply referred to as the exchange or stock market in some places.

STOCK BROKER

A firm or a person who buys and sells securities on behalf of investors for a commission called brokerage.

ISSUING HOUSE

It is a firm that helps to prepare prospectus to sell shares offered to the public by companies and governments. e.g. Merchant Banks.

BONDS AND DEBENTURES

Legal documents representing a promise by the company or by government (in case of a bond) to pay back a loan plus certain amount of interest over a definite period of time.

CHAPTER ONE

1.0 INTRODUCTION

On the creation of Kogi State in August 1991, Lokoja was made the State Capital. The state has high potential for investment and economic growth. This is due to presence of abundant natural resources and its proximity to Abuja the Federal Capital. For proper co-ordination of the above potentials, Kogi State Investment Company was established in 1992. This Company has the intention of putting up an administrative office complex within the state capital. Office buildings have become normal feature of the central business districts of major towns and cities in Nigeria. Kogi State investment company has from inception depended on rented building for all departments and functions. This is making efficiency difficult and expensive. the company has therefore proposed to put up a beffiting office complex that will save time and make staff more effective.

Providing standard facilities are pre-requisite of any modern or ideal office complex. This is one of the goals of this thesis with the believe that it will raise the performance of its users.

However, achieving elegance and beauty drove the thesis on to adopting the resultant form in an attempt to achieve appealing and have an image projecting office complex.

Since office is a place where people work and ineed spend a greater part of their time - these place should therefore be made fairly homely and attractive. It should be a building that the workers would love to be associated with an environment that would stimulate hard work. The building should be one that respond to the climate of the environment.

1.1 PROBLEM DEFINITION

Since the inception of Kogi Investment Company in April 1992, the Company headquarters has been housed in a small residential rented building. Many other rented

apartments scated around its present location are also occupied by the company headquarters staff.

This practice is unwise economically and irrational from the investment point of view. The corporate seat of the company is presently located at Walace road in an out of the reay part of Lokoja township. this location is not good enough for the challenging role being undertaken by the investment company. For the above reason it is wise to re-locate and to give the company a befitting headquarters. Going by the present rate of development in the state, the growth of asset base and expansion of its operational network, a bigger and more flexible space is desirable. This will go along way to enhance proper coordination of the company workforce and make it more result oriented.

The proposed investment house is intended to be a centre of financial business activities that will be able to stand the test of time and boost the investment image of the state. A bank branch with adequate facilities and lettable office spaces for multi-tenant occupancy is conceived to boost the income drive of the company.

1.2 MOTIVATION

Kogi State is blessed with abundant human and Natural resources which make the state a potential industrial giant in the country.

The presence of the above resources and the incorporation of Kogi State Investment Company to harness them is one of the major motivating factors.

The proximity of the state capital (Lokoja) to abuja the federal Capital Territory and the presence of the Ajaokuta Iron and Steel Complex and the Iron Ore Mining Company, Itakpe will all give rise to some downstream projects.

Adoption of Lokoja by the Federal Military government as the National Headquarters of National Inland Waterways is another boost to the investment potential of state.

All the above and the fact that there is no befitting office for the company saddled with the responsibility of Coordinating the investment activities of the state spurred the author into designing an investment house for the state investment company.

1.3 AIM AND OBJECTIVES

The growth of the state development projects and the establishment of Kogi Investment Company made the building of a befitting headquarters to boost the investment image of the state. The thesis shall in the light of the above seek to:

I. To design an office complex that will efficiently accommodate the Kogi State Investment Company.

II. To promote the Investment Image of the company in particular and the state in general.

III. To evolve an architectural design for the complex that will boost the revenue drive of the company through rent collection from speculative users of the lattable spaces.

1.4 RESEARCH METHOD

It is widely believed that the validity of data based source is a measure of the methodology adopted for the study in focus. In order to obtain reliable data for scientific analysis of the task ahead, the following research methods shall be taking.

Literatures reviews on investment operations and related commercial oriented organisations shall be conducted. Personal interview with different Cadres of investment staff will also be carried out in order to obtain first hand information concerning their activities.

For security reasons, restrictions may be encountered along the line concerning some information the author shall try through intuitive decision and participant observation arrive at getting needed information.

Apart from personal visits to make reconnaissance surveys, data relating to the site shall be obtained from various organs of government by personal contacts and discussions.

1.5 SCOPE OF THE THESIS

As much as the ultimate desire of the author is to bring about a well integrated design for the headquarters of Kogi state investment company, certain necessary provisions shall be incorporated for the attainment of desired results.

The scope therefore shall limited to the provision of headquarters office restaurant shopping, all lettable spaces and a bank branch. all the above shall be provided with their associated facilities.

Security measures within and around the building shall be given proper attention.

1.6 ARCHITECTURAL SIGNIFICANCE OF STUDY:

In consonance with the corporate mission of the Kogi state investment company, the design being proposed shall be a symbol of financial stability and reliability to enhance creditability. This is expected to be achieved through design, careful use of materials and construction techniques.

The strategic location of the site which is at one side of the junction of two popular roads in Lokoja commissioner and Lokoja-Kabba Roads call for a design that will make optimum use of the site features. The design of the investment house is intended to stand out yet complimenting the general architecture of the environment to enhance the architecture of the up coming city.

The actualization of this project should form a unique Architectural landmark in the city. It is the aspiration of the author that this project shall serve as a reference material for learning and an attraction in the historical city of Lokoja.

CHAPTER TWO

LITERATURE REVIEW

2.0 HISTORICAL BACKGROUND OF INVESTMENT COMPANIES IN NIGERIA.

Every bank could be said to be a development bank in the sense that all banks are needed to assist in the economic development of the country.

It was because of this overall need for faster economic development that Nigeria made her first efforts in 1928 - 1952 to start banks owned by Nigerians, vis-a vis the lack of concern or interest shown in the matter by existing banks owned by expatriates. Most of such indigenous banks collapsed. But even after a few succeeded, it became clear that those early (commercial) banks could not provide long-term finance needs outside pure trading activities.

Consequently, the Regional governments of Nigeria established different regional development corporations which were expected to play this financial role.

Unfortunately, these development corporations easily became mere tools in the hands of politicians and although they did make tremendous contributions soon after their creation, it was clear that there was still need for more commercial oriented financial institutions whose main functions would be the provision of medium and long-term funds to business establishments.

Just as Nigeria was achieving political independence from colonial rule in 1960, the colonial Development Corporation (later called Commonwealth Development Corporation - CDC) formed three different organisations to perform this function in Nigeria. The companies were not called Development Banks. they were the investment company of Nigeria Limited (ICON) in Lagos, the industrial and Agricultural company limited (INDAG) later named Development Finance Company Limited (DFC) in Enugu, and the Northern

Nigeria Investments Limited (NNIL) in Kaduna. These companies were owned jointly by the Commonwealth Development Corporation and the Central or the respective regional governments.

The Development Finance Company Limited (DFC) was disbanded after the civil war, the investment company of Nigeria limited (ICON) metamorphoses into the Nigeria industrial Development Bank Limited (N.I.D.B) in 1964.

The Northern Nigeria Investments Limited (NNIL) is still in operation although commonwealth Development Corporation has since disposed of its interests in the company to the New Nigeria Development company Limited (NNDC) - former Northern Nigerian Development Corporation.

The Eastern Nigeria Development Corporation (ENDC) was also disbanded after the civil war and with the creation of new states out of the former Eastern region. the Western Nigeria Development Corporation (WNDC) also ceased to be so called as more states were created out of the former Western region. Part of its assets were taken over by O.DUA investment Company Limited which is jointly owned by Oyo, Ogun and Ondo states.

It is sometimes not easy to distinguish institutions generally regarded as development banks from other specialized institutions and agencies created for specific economic development financing purposes. For example, whilst the institutions engaged in direct financing of pure industrial projects are generally regarded by development banks no matter by what name they are called, others that restrict their financing operations to say real estate development and agriculture and those that place more relative emphasis on the gathering of the citizen's savings are sometimes not so regarded.

With the creation of the new states, Development banks or development finance or investment companies have been set up by the various state governments and indeed by the

federal government to deliver credit direct to what is ordinarily referred to as industrial, agro-allied and other sub-sectors of the Nigerian economy. At present, excluding the various state owned agricultural development corporations, the institution generally regarded as such specialist banks included the following:

1. Abuja Investment and Property Development Company Limited
2. Bauchi state Investment and Property Development Company Limited - Bauchi.
3. Benue Investment Company Limited, Benue State
4. Central Investment Company Limited, Anambra State
5. Development Finance and Investment Company Limited - Imo State
6. Investment Trust company Limited - Cross River State.
7. Kaduna Investment Company Limited - Kaduna State
8. Kano State Investment and Properties Limited - Kano State
9. Kwara State Investment Corporation - Kwara State
10. Niger State Development Company Limited - Niger State.
11. New Nigeria Development Company Limited - Kaduna
12. Nigerian Bank for Commerce and Industry - Lagos
13. Nigerian Industrial Development Bank Limited - Lagos
14. Investment and Credit Corporation of Oyo State, - Oyo State.
15. O'Dua Investment company Limited - Ibadan
16. Ogun State Industrial and Financing Corporation - Ogun State
17. Ondo State Investment Corporation - Ondo State
18. Nigerian Agricultural and Co-operative Bank Limited - Kaduna
19. Sokoto Investment Company Limited - Sokoto State
20. Plateau Investment and property development company limited - Plateau State

21. Kogi State Investment Company Limited - Kogi State

These institution command between them total gross asset of over ₦2 billion and total paid up proprietary capital of some three quarter billion naira. they are believed to employ a total of over 7,500 people.

One very important characteristics which distinguishes the earlier statutory development corporations and the development, investment or finance companies and banks is that the former place greater emphasis on promotion of own projects and the setting up of wholly owned subsidiaries for that purpose. While the latter acted more as banks by granting loans and other forms of financial support to clients.

2.1 INVESTMENT COMPANY ACTIVITIES

For an economy as a whole to invest total production must exceed total consumption.. throughout the history of capitalism, investment has been primarily the function of private business; during the 20th century however, governments in planned economics and developing countries have become important investors.

From the stand point of an individual, two types of investments may be distinguished:

(i) Investment in the means of production

(ii) Purely financial investment

Although at the individual level both types may provide a monetary return to the investor, from the stand point of the entire economy, purely financial investments appear only as little transfers and do not constitute and addition to production capacity.

Before the 1930s, investment was thought to be strongly affected by the growing rate of interest, with the rate of investment likely to rise as the rate of interest fall. Since then, empirical investigation has shown business investment to be less responsive to interest rates

and dependent on businessmen's expectations and about future demand and profit, technical changes in production methods, and the expected relative cost of labour and capital.

Because investment increases an economy's capacity to produce, it is the factor responsible for economic growth. for growth to occur smoothly, it is necessary that savers intend to save the same amount that investors wish to invest during a time period. If intended saving exceeds intended investment, unemployment may result; and if investment exceeds saving, inflation may occur.

Source:- Encyclopedia Britannica
Vol. 6 p.9 363

2.2 DIFFERENT FORMS OF INVESTMENT ACTIVITIES

I. Direct Investment

An individual may invest directly, or he may give his money to a financial institution to invest in his behalf. Direct investment outlets available to most individuals consist of stock, shares, bonds, and real estate. Other direct alternatives include personal loans to acquaintances (or relatives) and investing in one's own business.

II. Common Stock

A holder of common stock owns a tractional equity in a corporation. If he holds 100 shares of a firm having 25 million shares outstanding, he owns ½50,000th of the firm. As a stockholder, he receives a certificate and his pro-rata share of any dividends declared by the directors. He may vote for directors. He cannot recover his principal from the corporation (except that in the rare case that the corporation is liquidated, he will receive his pro-rata share of any liquidation proceeds remains after all debts and other prior claims have been paid in full). But he may transfer his

shares to any other investor at a mutually agreeable price. The stock market provides the mechanism for buying and selling shares of stock.

III. Corporate Bonds

Corporate bondholders own a promise (in certificate form) by a corporation to return the bondholder's principal at a specific maturity date; and in addition, to pay (usually every 6 months) a specific amount of interest. Failure to make these payments will lead to bankruptcy, so the probability is strong that the corporation will make all payments as long as it is able.

IV. Preferred Stock.

Preferred stock represents legal ownership but has investment characteristics similar to dept securities. A preferred stockholder accepts a fixed and limited dividend rate in return for a guarantee that he will receive his dividends including unpaid dividends from previous years before common stock holders can receive any dividend.

V. Government Bond

The federal government, the state and local government issue bonds, federal bonds are generally considered as having the least risk of default of any security, they are available in marketable form that may be sold at any time to another investor and as savings bond that could be liquidated prior to maturity only by redemption at predetermined prices that reduce the yield.

VI. Real Estate

The most common single investment of families is in ownership of a home, which combines investment with fulfilment of personal needs. Individuals also invest

in rental properties, farmland, vacant land for speculative appreciation, and mortgages.

Real estate investment are generally less liquid than common stocks, and conversion of even an excellent piece of property into cash may take months.

2.3 Types of Investment Companies

(i) Open-end companies

(ii) Closed-end companies

Open-end investment companies promise to redeem outstanding shares on any business day and normally offer new shares to the public continuously. thus the public buys shares from, and resells shares to, the companies.

Closed-end companies, by contrast, do not redeem outstanding shares and seldom issue new shares after the initial offering. An investor seeking shares of a closed-end company must buy them from shareholder wanting to sell out.

2.4 Kogi State Investment Company Limited (KSICL)

Kogi State was one of the nine states created in August 1991. It was carved out of the old Benue and Kwara States and coincides with the old Kabba province.

The creation of Kogi State was a dream come true after year of expectation. Hence the pioneer administration in the state did not waste time in giving the problems and prospects of economic development the desired attention. The first step in this direction was the setting up of the committee to draft a

blue rint for the economic development of kogi state. The blue print contains far reaching recommendations which, are expected to enhance the rapid industrial development of the state.

2.5 INCORPORATION OF KOGI INVESTMENT COMPANY LIMITED

One of the most important recommendations was the establishment of a state own investment company which will serve as the vehicle for the rapid industrialisation of the state. This came into reality with the incorporation of the Kogi State Investment Company Limited (KICL) in April, 1992.

It is a development finance institution with an authorised share capital of ₦10,000,000:00 and wholly-owned by the state government.

The objectives of the company are to

- Foster the economic development of the state.
- Through the promotion, establishment and operation of viable industrial and commercial projects either singly or in collaboration with the private sector.

Specifically, the scope of operation of the company as outlined in its memorandum and article of Association are as follows.

I. Project Financing

This has to do with the promotion of viable projects and provision of financial assistance for such projects in form of equity and or loan. This they do either solely or in partnership with individuals or corporate bodies.

It also entails the supervision of any industrial project in which the state government has investment.

II. Commercial Activities

The company can engage in various forms of commercial activities which include; commodity brokerage/warehousing, wholesale and retail, trade, export and import etc.

III. Portfolio Investment

This entails purchase of stock and shares of quoted and unquoted companies as well as trading in them.

IV. Consultancy Services in the Area of:

- Preparation and appraisal of feasibility studies
- Financial advisory services
- Project management
- Technical advisory services etc.

These services are available for individuals, corporate bodies as well as state and local government.

V. Acting as a holding Company for the State government

In this regard, Kogi State Investment Company Limited is responsible for holding and managing all state government properties in whatever form.

VI. Trustee Services, such as:

- Pension Fund Management
- Management of trustee deed

VII. Property Development and Management

This involves development and management of landed properties for commercial purposes both within and outside the state.

2.6 Economic Potentials of Kogi State

Kogi State is blessed with abundant human and natural resources which make it a potential industrial giant. These resources and their associated industrial setups are summarised below

Crude oil	Fuel, gas, organic compounds, Tar, ammonia, coke, steam etc.
Ornamental Stones	Ornaments and jewellery
Gold	Ornamental stones & jewellery.

The presence of the Ajaokuta Iron and Steel Complex and the Iron one mining Company, Itakpe will also give rise to some downstream projects such as frundies. Tar distillation plant, carbon black, carbon graphic electrodes, as well as other ancillary products such as nails, pins, bolts etc.

III. Tourism Resources

Kogi State is blessed with natural attractions and historical monuments that can be developed into international tourist centres. This includes:-

1. Lord Lugard's residence and office
2. The sport where the royal Niger Company Flag was lowered in 1890
3. Mount Patti- A massive hill towering over Lokoja with about 15 square kilometer plateau.
4. The Iron of Liberty The spot where slaves were freed in 1860 was marked with two Iron poles referred to as the "IRON OF LIBERTY"
5. **GRAVEYARDS** of the deposed exile enures of Kano, Zaria and Bida during the colonial rule.
6. **THE FIRST PRIMARY SCHOOL** in Northern Nigeria built at about 1860.
7. **THE BIGGEST EUROPEAN COMMENTARY IN NIGERIA.** It contains the remains of the European Solders of the West African Frontier force stationed in Lokoja until 1926 and those of European Missionaries. Some of the tombstones in the commentaries dated back to 1867.

8. **NIGER-BENUE CONFLUENCE**

This forms a beautiful scenery visible either from a boat travelling Southward on the Niger or from the top of mount patti.

9. **AGBAJA PLATEAU**- About Fourteen (14) kilometres from Lokoja is Agbaja, a town situated on top of a plateau which ranges from 335.2 metres to 356.8 metres above see level.

10. **WORLD WAR CENOTAPH:-** This is a war armaria erected in memory of the Soldiers who died during the two world wars. There is a list of names of some solders who distinguished themselves in the wars on a tablet. The state Government has set up a Hotel and Tourism Board with the responsibility to harness, develop and market Tourism resources in partnership with private individuals and organizations. It is in this area that Kogi Investment Company is required to function.

2.2.4 EFFORTS AT ATTRACTING INVESTORS

Despite the availability of these vast natural and mineral resources in the state, the technical skill and funds needed to harness them one lacking. This is the gap that Kogi Investment Company was incorporated to fill. The company is therefore adopting a policy whereby the organised private sector industrialize while government through her agents creates the enabling environment required and make careful planning so as to be able to inject the appropriate role definition between the public sector functionaries and the private sector organisations.

The government through Kogi State investment Company has also worked out a package of incentive for prospective investors. These include:

- Development of industrial layouts and estates with basic infrastructural facilities.
- Establishment of small-scale industrial loan scheme.

- Minimisation of conditions for acquisition of industrial plots.
- State Government's equity participation in industrial projects as a form of encouragement.

Finally, Research and development efforts have equally led the company to embarking on the production of a Business Directory for the State and Development of a brief towards building a befitting investment house. It is the hope of the company that when this projects are emplace they will be of tremendous assistance to the public on investment matters.

2.8 TYPE OF BANKS

The classification of banks is not based on the typology of forms. Rather, it is classified according to their ownership, mode of service/operation and their sources of charter. There are however four major types of Banks operating in Nigeria today by Virtue of decree 25 of 1991. The decree set the guidelines for the banks as follows. The Central Bank of Nigeria (C.B.N) Merchant Banks, Development Banks, Commercial Banks and Savings Institutions. For the purpose of this thesis only merchant and Development Banks shall be explained.

I. MERCHANT BANKS

A merchant bank has been defined by Padonan (1977), as a bank which operates in all or most of the following areas. It offers corporate financial advice on new shares and bonds, issue, capital reconstruction, merger and acquisitions.

- Taking deposit and money market operations and foreign exchange dealings.
- Medium - term lending and syndication of loans, acceptance of credits and all forms of finances.
- It maintains the hold of dealing in quoted and unquoted investments.
- It handles funds management on behalf of clients including pension funds, unit trust, investment trust and wealthy individuals.

The history of merchant Banking in Nigeria dates back to 1960, when the first two financial institutions were registered for merchant banking business. In September, 1960, Phillips Hill (Nig) Limited was registered, while Nigerian acceptance Limited (NAL) was registered in November the same year.

In the Nigerian context, merchant banks provide specialists services like acceptance of bills of exchange, corporate finance portfolio management or equipment leasing.

Their principal functions are the provision of medium and long terms lending (as opposed to short term lending). they also act as issuing houses. The banking act 1969, allows merchant banks to engage in all banking activities except current accounts. Although, they are still allowed to offer such facilities to their large corporate customers.

II. Development Banks

These banks aid development programmes in the country, by providing the principal capital, technical and managerial expertise required to stimulate and sustain rapid economic development. The objectives of individual establishment depends on their development policy and their area of specialisation could be industry, commerce or housing.

The development banks also help to stabilise the economy by meeting the requirement of government development schemes. For example, the federal Mortgage Bank of Nigeria was set up to meet the housing needs of the people. While the Nigerian Agricultural Bank (NACB) and Co-operative bank on the other hand were established to cater for the specific needs of small medium scale farmers. The Nigerian Bank for Commerce and Industry (N.B.C.I) and the Nigerian Industrial Development Bank (N.I.D.B) were set up with the aim of promoting development in Industrial and Commercial sectors of the economy respectively.

CHAPTER THREE

3.0 THERMAL CONTROL IN PUBLIC BUILDINGS

Thermal control in built environmental is concerned principally with the control of the amount of solar radiation that is allowed to fall on buildings.

Solar radiations falls on different parts of a building in varying degree and the reacting effect created thus follow the same pattern. Substantial part of the solar radiation falling on a building falls directly on the roof. Oblique on the wall surfaces and by reflection and conduction from the ground. Control of these sources of solar radiation penetration will lead to such conditions in a building that will be conducive to human comfort.

It should be noted however, that many features of the physical structure of a built environmental can affect the environment's thermal comfort.

As the structure of a community can be controlled by urban planning and design, so also it is possible to modify the urban climate through design. With modification to building openings, orientation, use of passive elements of thermal control it is possible to improve the comfort of the inhabitants outdoors and indoors and to reduce the energy demand of the buildings for cooling.

3.1 APPRAISAL OF THERMAL CONTROL

The problem of thermal control in public buildings in a hot humid environment and creating conditions favourable to man daily activities is as old as the time man sought to come together for public functions and activities that require shelter.

Shelter in the early days of civilization was to fulfil two basic human needs such as protection from the climatic elements and provision of an atmosphere favourable to spiritual endeavour.

Olgyay V. (1963) noted and said "Building designs has reflected, throughout it history the different solutions advanced by each period to the continuing problem of securing a small controlled environment within a large scale natural setting which often contends with adverse forces of cold, heat, wind, water and sun".

To meet the problems of climatic control in an orderly and systematic way requires a polling of efforts by several sciences. The desirable procedure would be to work with, and not against the forces of nature and to make use of their potentialities to create better living conditions in public buildings. It is a known fact that man's energy and heath depend to a very large extend on climatic situation of his environment.

It is also a common experience to find that some days offers atmospheric conditions which stimulates our activities, while on the other hand, other days may depress our physical and mental effort due to excessive heat or cold. It is equally well known that in certain climatic areas, where excessive heat or cold prevails for greater part of the year energy is diminished by the biological strain of adaptation to the extreme conditions.

In view of the above appraisal, the author shall highlight the available options through which Architects over the years have been making efforts to make man comfortable in buildings. Before this is done, relevant terminologies that may be used in the cause of this work are hereby explained.

I. THERMAL CONTROL

Thermal control which is also heat control could be defined as the process by which the inflow and outflow of heat is regulated to achieve a desired indoor temperature.

II. THERMAL COMFORT

This is a level of human well being in response to heat or simultaneous effect of air temperature, humidity, radiation and air movement. The importance of these variable at any

given time depends on how they aid or impede loss of surplus heat from the body to maintain comfortable body temperature at a steady level, surplus heat must be released to the surroundings. This is achieved by convection, radiation, evaporation and to a very small extent conduction.

III. COMFORT ZONE

A comfort zone may be defined as that range of thermal sensation in which the majority of normal healthy persons usually about 80% per cent feel thermally comfortable, neither distracts by feeling of heat or too cold.

The comfort zone varies sharply from group to group as a result of differing habits of dress, seasonal acclimatization, sex, age and daily activities. Generally, the acceptable upper and lower limits of thermal comfort suggests that the comfort zone is somewhere between 22^{oc} and 27^{oc}.

IV. THERMAL CAPACITY

Thermal capacity of a body is the amount of heat energy required to raise the temperature of a body by one unit say 1^{oc} or 1^{of}.o

V. THERMAL CONDUCTIVITY

Thermal conductivity of a material is the rate of heat flow through a unit area of limit thickness of the material for a unit temperature difference across the material.

VI. SOURCES OF HEAT INTO BUILDINGS

The major source of heat into buildings is from solar radiation. Buildings gain heat by conduction through the roofs, walls and by insolation through windows and other openings. Buildings also gain heat internally from occupants, equipments and by natural ventilation.

VII. HEAT FLOW THROUGH BUILDINGS

Heat transmission and absorption by building materials is usually affected by the following factors; Absorptivity, conductivity and thermal capacity of the materials.

The above properties of building materials normally determine the characteristics and possibly selections of materials for ROOFS and WALLS elements.

It should be noted that walls and roofs are the major elements through which heat penetrate into buildings.

VIII. HEAT LOSS IN BUILDINGS

- Buildings loose heat by conduction, evaporation, natural ventilation and through mechanical cooking devices.

3.2 LANDSCAPING AS NATURAL MEANS OF THERMAL CONTROL

Of the many functions of landscaping design in Tropical climate like Nigeria and Lokoja in particular, the use of plant materials to improve environment is of prime importance.

Whatever the attention given to the aesthetic use of plant materials, if environmental problems are over looked landscape design will contribute very little to the creation of an integrated environment.

It is important that plant, the building materials, of landscape should be used with understanding and in sympathy with Architectural needs to help to maintain comfortable living conditions in exterior spaces to produce in effect, a natural open-air conditioning system through the manipulation of both climate and micro-climate.

In varying degrees, building developments are affected by both macro and micro climate in the form of solar heat, radiation, glare humidity, still air and dust. All these factors impede physical comfort and all can be alleviated by the careful use of plant materials.

The need for shade in hot environment has always been obvious, though not always appreciated, plantings can be used much more widely to reduce solar radiation and heat build-up, to absorb and reflect heat; to insulate, to reduce sky or reflect glare and to create air movement.

3.3 THE STACK EFFECT

The stack effect refers to the movement of air as a result of differences in air pressure of two bodies of air at different temperatures. when ever there is considerable difference in the temperature of air in the building and the one outside the building possessing adequate air inlets and outlets, air movement results and thus natural ventilation.

3.4 NATURAL MEANS OF THERMAL CONTROL

Wind pressure is the major force responsible for air flow through buildings. The air movement produced by stack effect is often of little magnitude and insufficient for body cooling. A combination of the two often act together to create sufficient air movement within buildings. Some of the natural means of thermal control apart from the two above are:-

I. Landscape planning

II. Orientation of buildings

III. Sun shading devices

IV. Selection of building materials

V. Construction method Adopted

VI. Texture and colour

3.5 ORIENTATION AS MEANS OF THERMAL CONTROL

For a tropical place like Lokoja, one critical wind to seriously consider is the hot dry harmattan carrying wind from the nort-east quarter which is hot and often laden with dust. This blows for four to five months each year and is therefore a constraint on the design of buildings.

The total problem of orientation for buildings apart from the above is composed of many factors they are:-

I. Local topography

II. Requirements for privacy

III. Reduction of Noise

IV. The climatic factors of other winds and solar radiations.

The larger part of the Architects task is to position a building so as to take best advantage of the sun's value for thermal effect, hygiene and psychological benefits.

FIG 1

Building orientation affects the indoor climate in two respects, by its regulation of the influence of two distinct climatic factors, that is, solar radiation heating effects on walls and rooms facing different directions. And ventilation problems associated with the relation between the direction of the prevaiting winds and the orientation of the building.

3.6 EFFECT OF WINDOW ORIENTATION ON INTERNAL TEMPERATURE

The effect of window orientation on the indoor temperature is largely determined by the ventilation conditions and the degree and efficiency of the window shading. when shading is not effective, solar radiation enters through the windows and directly heats the building interior.

3.7 EFFECT OF ORIENTATION ON VENTILATION

The principal requirement for satisfactory ventilation is the provision of openings on both the windward and the leeward sides of a building. Observation in full-scale buildings showed that if there is only one opening, or if two openings are located on leeward sides of the building, the average indoor air velocity is very low and therefore natural ventilation will not be effective enough to ensure human comfort.

3.8 BUILDING MATERIAL SELECTION AS A MEANS OF THERMAL CONTROL

The selection of materials must be based on their suitability for the purpose under consideration, must be readily available, cost effective with good performance in respect to the basic climatic conditions of the environment.

ORIENTATION OF BUILDINGS AND WIND DIRECTION

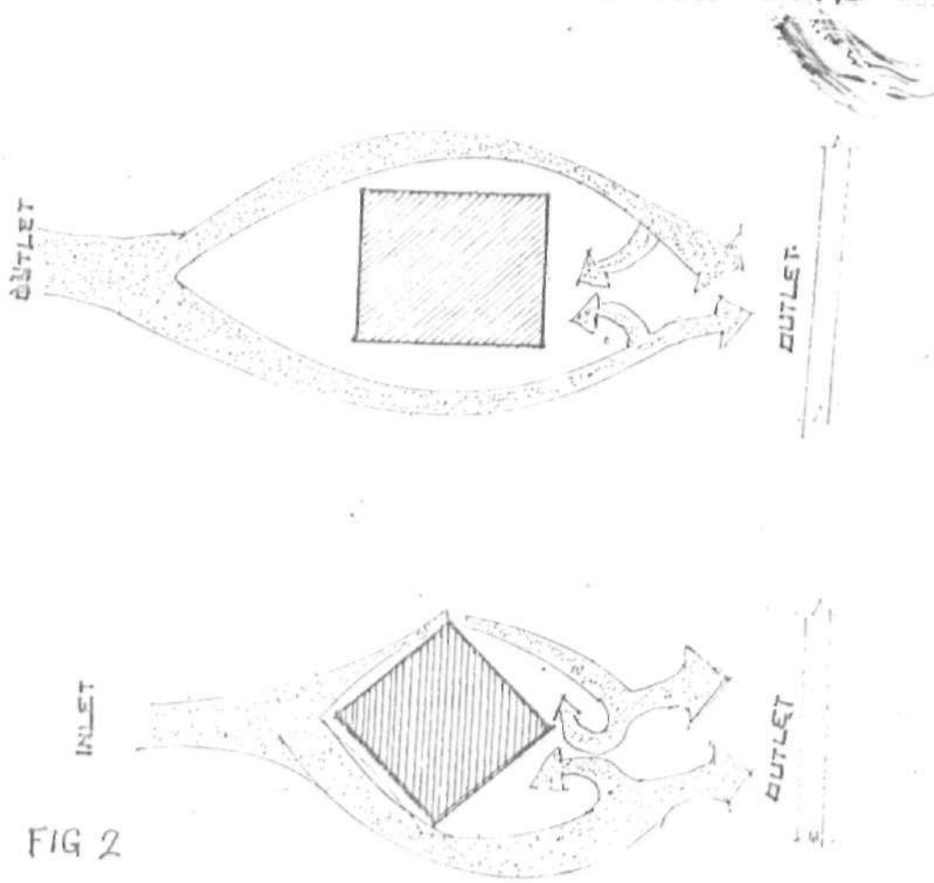


FIG 2

- A WIND FLOW AT 45° TO THE FACADE OF BUILDING AS OPPOSED TO THE TRADITIONAL FACING THE WIND DIRECTION, INCREASES THE AVERAGE INDOOR AIR VELOCITY SINCE THE WIND SHADOW ON THE OUTLET SIDE OF THE BUILDING IS BROADER, AND THE NEGATIVE [SUCTION] PRESSURE IS INCREASED.
- HOWEVER, ORIENTATION TO MINIMIZE SOLAR GAIN, AND RADIATION ARE EQUALLY IMPORTANT,
- THE DESIGNER MUST RECONCILE THESE CONFLICTING REQUIREMENTS.

SOURCE: NBC STANDARD GUIDE FOR NIGERIAN UNIVERSITIES.

The envelope of a building separate the indoor space from the external environment and in this way modifies or prevents the direct effect of climatic variables such as outdoor air temperature humidity, wind solar radiation, rain, snow etc. This envelope is usually composed of two types of materials, Opaque and transparent, although translucent materials are sometimes included.

The quantitative effect of the envelope depends on its thickness and thermophysical properties. The materials within the internal space, such as floor finishes, partitions and even furniture also modify the indoor temperature by affecting the heat capacity of the structure as a whole and the rate of absorption heat generated or penetrating within the building.

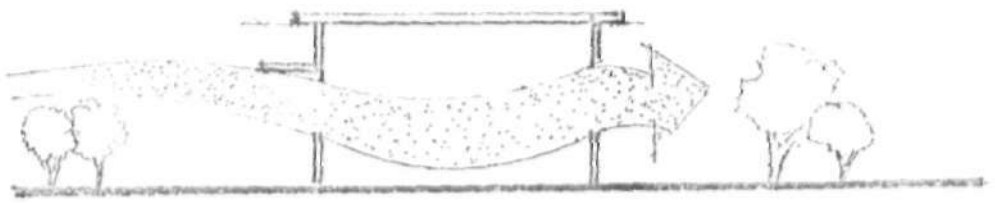
3.9 CONSTRUCTION METHOD AS A MEANS OF THERMAL CONTROL

A good knowledge of ones environment leads to selection of adequate building materials and matching skill of construction. A traditional and Natural example is found in old city of Zaria where compact planning and thick mud walls are adopted in order to meet the thermal requirements to ensure thermal comfort indoors.

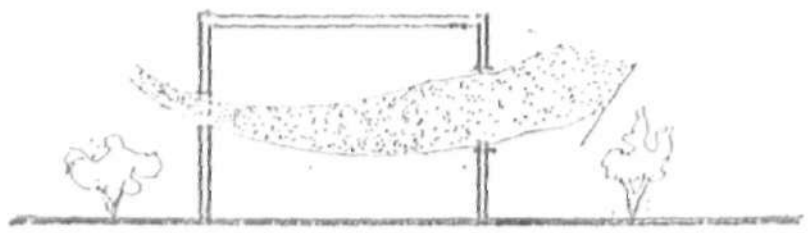
3.1.0 TEXTURE AND COLOUR AS MEANS OF THERMAL CONTROL.

It is an acceptable fact that rough surfaces absorbs more heat than smooth surfaces. A practical example is in the use of texcote and marble. This combination defines texture.

POSITION OF OPENINGS.



- AIR MOVEMENT MUST BE DIRECTED AT THE BODY IF IT IS TO BE EFFECTIVE, WHICH MEANS UP TO A HEIGHT OF 2·0M FROM FLOOR LEVEL.
- HIGH INLET OPENINGS SHOULD ONLY BE USED FOR SECONDARY VENTILATION.



SIZE OF OPENINGS.

INTERNAL AIR VELOCITY CAN BE INCREASED IF THE INLET IS SMALLER THAN THE OUTLET. REFFERED TO AS VENTURI EFFECT.

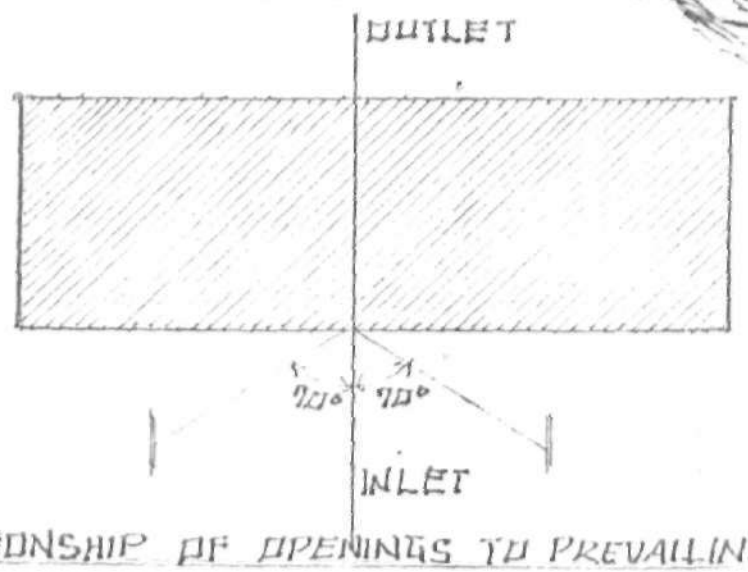


FIG 3

RELATIONSHIP OF OPENINGS TO PREVAILING WINDS.

- IT IS SUGGESTED THAT NO WIND INLET OPENING SHOULD FACE MORE THAN 70° AWAY FROM THE PREVAILING WIND DIRECTION.
- THE RELATIVE POSITION OF BUILDINGS TO EACH OTHER HAS A MAJOR EFFECT ON AIR MOVEMENT AROUND AND THROUGH THE BUILDING.

Source: Guidebook C to Measures to Building Climatic

Colours have different absorbing capacities, black surfaces absorb more heat than light surfaces Hence for thermal control in hot humid environment light surfaces in the interior and exterior will reflect sunlight and thus reduce heat and solar penetration.

3.1.1 SUN SHADING AS A NATURAL MEANS OF THERMAL CONTROL IN PUBLIC BUILDINGS

The need for solar control cannot be over emphasised especially in public buildings in a hot humid environment. Architectural trends today is into exploiting the use of steel, concrete, glass etc to create design fantasy. As a direct result of this trends the interior of buildings are exposed to solar rays via excessive incorporation of glass and related materials in the design of public buildings.

In as much as this is good in enhancing aesthetic value there exist the need to address the problems that are inherent. solar control devices especially sun shading is expected to function effectively in this regard.

3.1.2 SOLAR RADIATION ON BUILDINGS

Solar penetration is not totally unwanted in buildings. In the early hours of the Morning during certain seasons of the year in certain part of the Tropical and Temperate climates and for its therapeutic qualities, some amount of solar energy is desirable in the interior of buildings.

It should, however, be noted that, letting in solar energy into the building for too long can heat up the room beyond comfort level or zone. This could cause fading of paintings and other materials. Similarly shading the interior completely away from solar radiation may give rise to sober atmosphere in the interior.

Bother extremes are undesirable, therefore, the main problem of solar control in public buildings is how to let in the required amount of solar radiation, when required and where needed.

In choosing a device to achieve these objectives care must be taken so that the chosen device:-

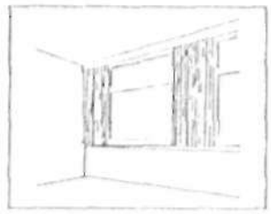
- can protect the opening against agents of unwanted weather.
- can provide privacy where required.
- must allow view through the window
- must be easy to maintain.
- must be beautiful and disallow too much noise penetration.

3.1.3 SOLAR CONTROL DEVICES

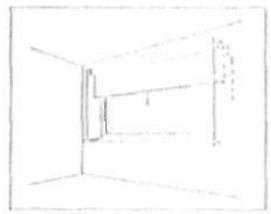
Quite an appreciable types are available. They could be fixed as horizontal or vertical elements placed within or outside window openings. Basically, four different methods of shading are obtainable. They are:-

- Use of specially made glasses or glazing materials
- Double glazing
- Internal shading
- External shading:
  - . Horizontal devices
  - . Vertical devices

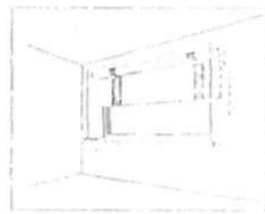
Retractable types



1 Curtains give flexible control for low level sun, but other than domestic use laundering can be problem



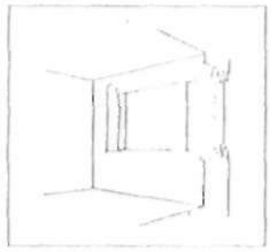
2 Spring roller blind blocks direct sun but maintains some links with outside and allows diffuse daylight through, but open weave materials better



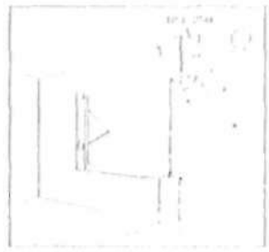
3 Roll roller blind also used as a screen shading type, which allows some ventilation through small louvres



4 Adjustable angle louvre blind also available in aluminium and translucent plastic & also in fully weatherproof casings with motor drive available



5 Venetian blind – gives flexible control of sunlight & ventilation – wide range available, including external types & for use in space in double glazing



6 External awning type of screen control made of canvas – available for commercial use

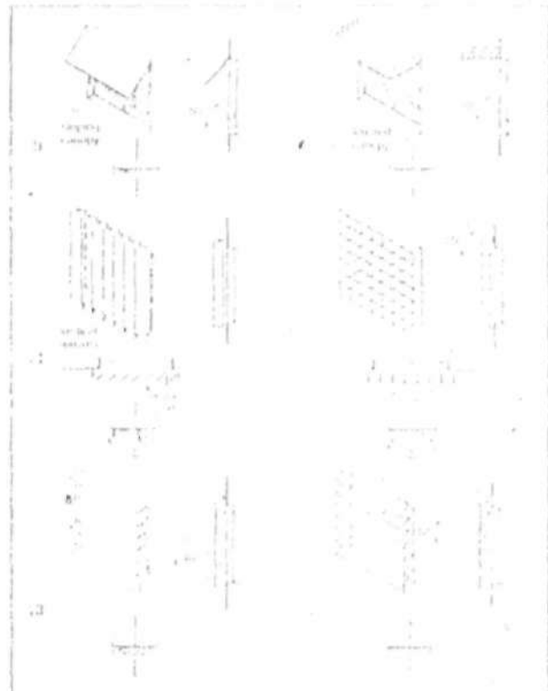


7 Continental type external blind system, Norwegian made & available with aluminium slats



8 Internal vertical pleated blind with translucent fabric for use in double glazing – allows adjustment of daylight & sunlight – available with heat reflective backing

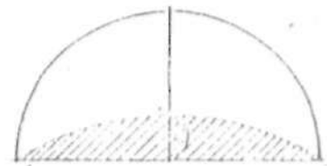
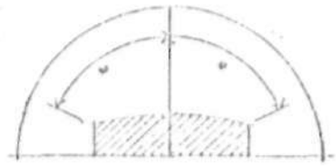
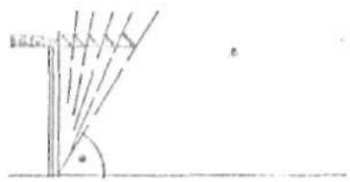
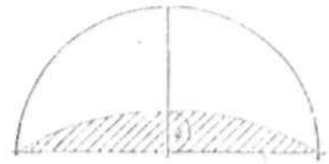
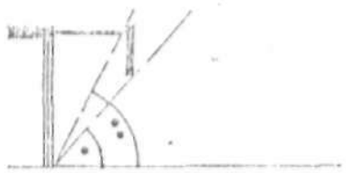
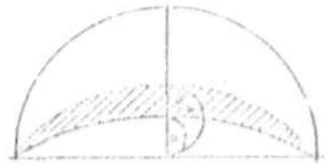
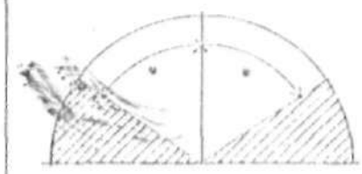
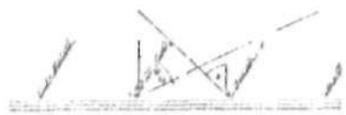
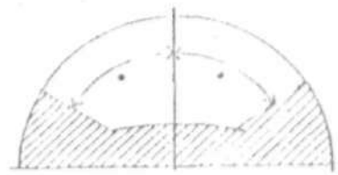
Fixed external types



Fixed external canopies, louvres & screens, often wood, recommended by HMSO, Performance Data Sheet No

FIG 4

Source:- MEWES ET ARCHITECTS' DATA PJ 1406 SECOND INTERNATIONAL ENGLISH EDITION.

Type of shading device	Sketch of shading device	Shading mask on the Shadow Angle Protractor
Continous horizontal projection		
Non continous horizontal projection with sidelap		
Non continous horizontal projection without sidelap		
Tilted louvre parallel to wall		
Fascia parallel to wall		
Vertical projection		
Angled vertical screen		
"Eggerate" screen (combined horizontal and vertical projection)		

145.
STUDIO OTELEKE T.P.

- Egge crate and screen walls
- Other solar control devices e.g greenery and trees

3.1.4 EXTERNAL SOLAR CONTROL DEVICES ROOF AND ROOF OVERHANG

A good percentage of solar radiation falls on the roof. It is therefore important that the structure, slope and reflective qualities of roofing materials is properly considered. Light roofs reflects heat while dark roofs absorb a lot of heat and thereby admit more heat into the interior.

Roof overhangs can offer solar control to a reasonable extent. Roof overhang is advantageous because in addition to providing solar control, a cantilevered roof protects the entire wall surface from driving rain and the paints from fading quickly.

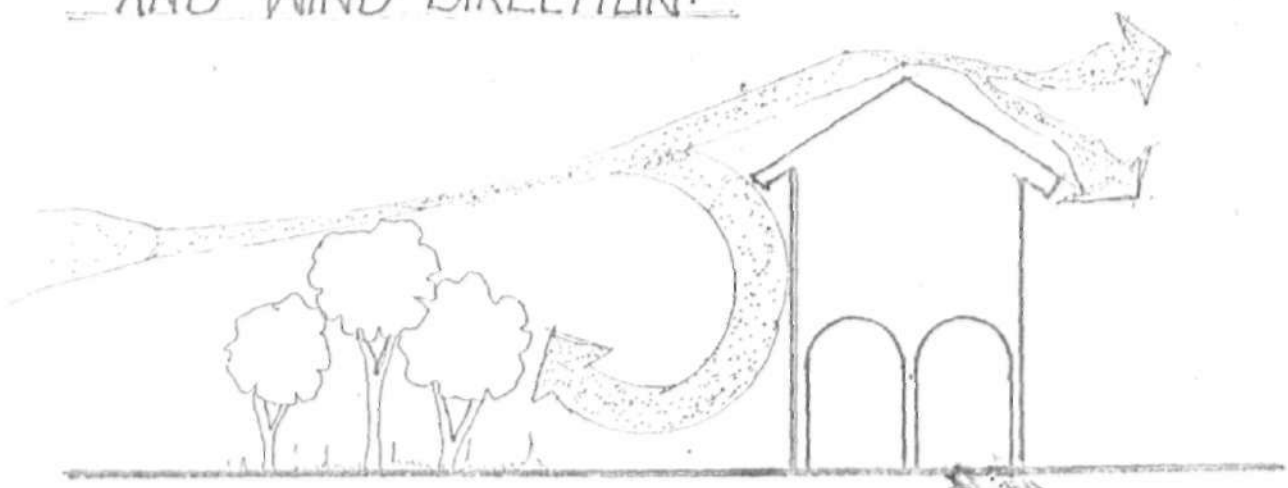
3.1.5 HORIZONTAL DEVICES

These are mostly recommended for use along southern and Northern orientations especially for tropical regions where the latude is below 23^0. It could be fixed or adjustable.

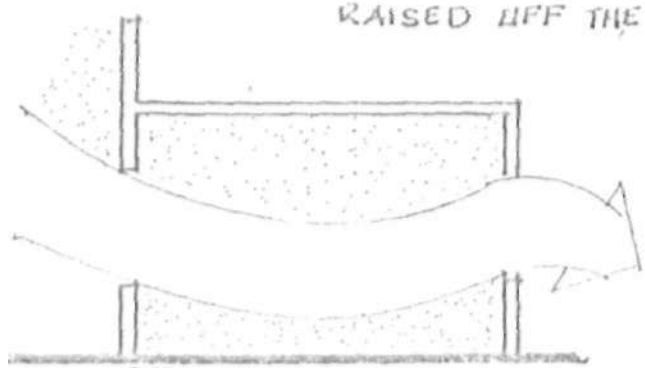
3.1.6 VERTICAL DEVICES

These are mostly effective in Eastern and Western orientations. Fixed vertical devices are recommended for Western walls in hot regions. Vertical devices could be fixed or adjustable.

EFFECTS OF EXTERNAL FEATURES AND WIND DIRECTION.

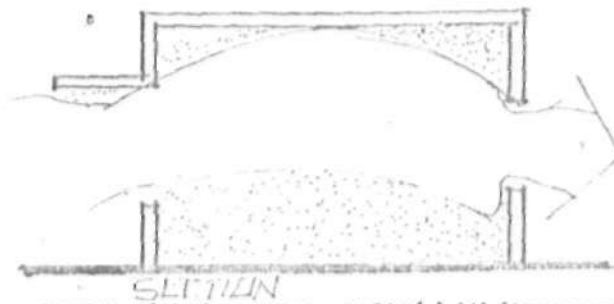


- WIND SHADOWS CREATED BY UP WIND OBSTRUCTIONS SHOULD BE CONSIDERED IN ORIENTING AND SITING OF BUILDINGS.
- WHERE AIR-MOVEMENT IS ESSENTIAL BUILDINGS MAY GAIN BETTER AIR FLOW BY BEING RAISED OFF THE GROUND.



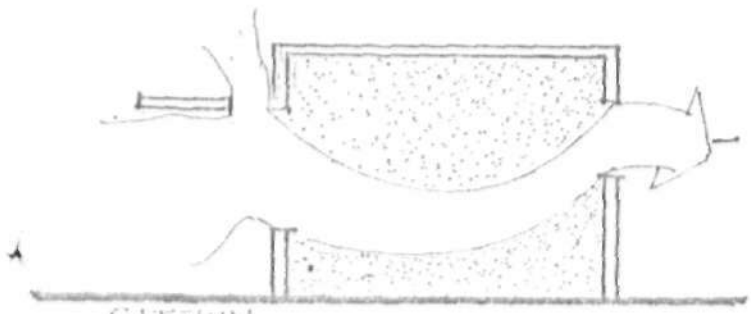
SECTION

- PARAPETS CAN CREAT A FUNNELLING EFFECT.
- EXTENSION OF ELEVATIONAL AREA FACING THE WIND WILL INCREASE THE PRESSURE BUILD-UP.



SECTION

- SASH WINDOWS USUALLY INFLUENCE THE INDOOR AIR FLOW PATTERN.
- A HORIZONTAL PIVOT SASH AND LOUVRE BLADES AT 20° WILL CHANNEL AIR DOWNWARDS INTO THE 2M LIVING ZONE.



SECTION.

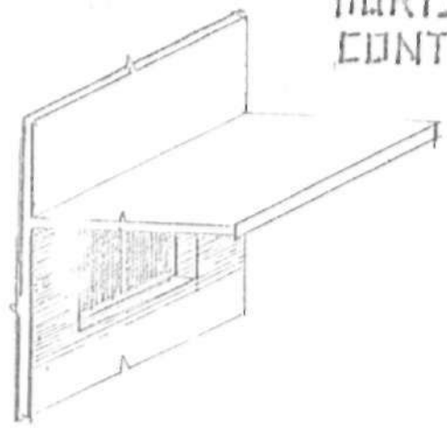
- A CANOPY SHOULD BE PLACED CLEAR OF THE BUILDING TO ENSURE A DOWNWARD AIR FLOW TO THE 2M LIVING ZONE.
- AIR MOVEMENT MUST BE DIRECTED AT THE BODY IF IT IS TO BE EFFECTIVE.

FIG 6

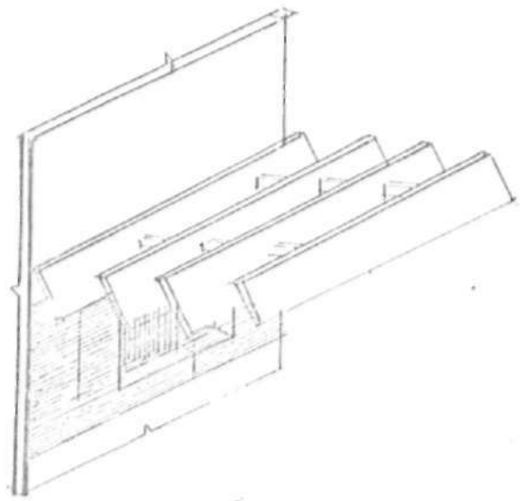
SOURCE:- OGUNSOTE O.O. INTRODUCTION TO BUILDING CLIMATOLOGY

HORIZONTAL SOLAR CONTROL DEVICES

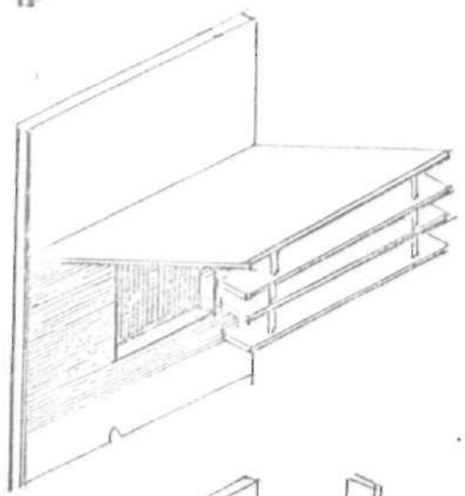
FIG 7.



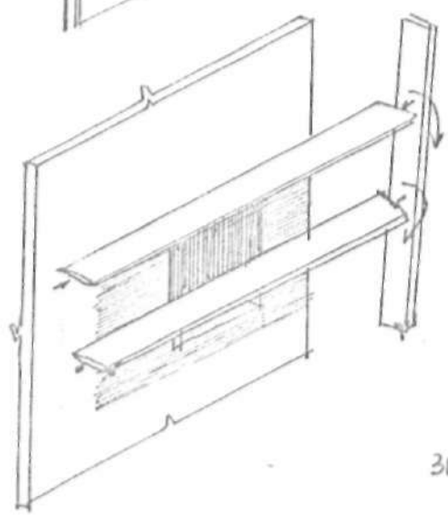
- SOLID HORIZONTAL OVERHANG ARE EFFICIENT ON SOUTHERN ORIENTATIONS.
- IT IS ALSO RECOMMENDED FOR NORTHERN ORIENTATIONS ESPECIALLY FOR TROPICAL REGIONS WHERE LATITUDES ARE BELOW 23°.
- IT TENDS TO OBSTRUCT FREE UPWARD MOVEMENT OF HOT AIR ALONG THE FACADE.



- LOUVRES PARALLEL TO WALL HAVE THE ADVANTAGE TO PERMIT AIR CIRCULATION NEAR THE FACADE
- SLANTED LOUVRES GIVE BETTER PROTECTION THAN VERTICAL ONES.



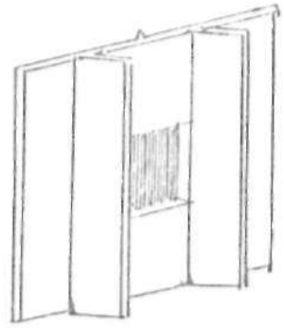
LOUVRES ARE HUNG FROM THE SOLID HORIZONTAL OVERHANG. THIS ARRANGEMENT IS VERY EFFICIENT WHERE PROTECTION IS NEEDED FOR LOW SUN ANGLE.



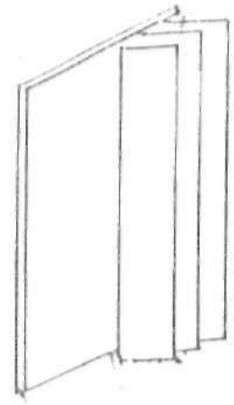
MOVEABLE HORIZONTAL LOUVRES CAN CHANGE THE SHADING CHARACTERISTIC ACCORDING TO THEIR POSITION. CAN BE MADE TO SHUT OUT THE SUN'S RAYS PARTIALLY OR TOTALLY AS DESIRED.

SOURCE: OYNEK [illegible] DOCUMENTATION ON SUN SHADING DEVICES

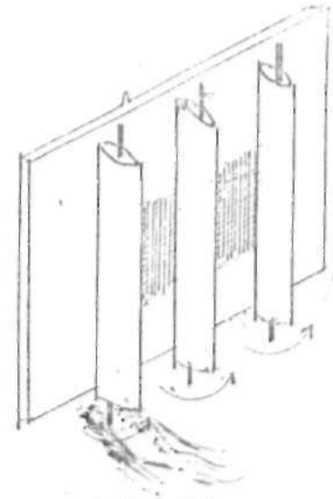
VERTICAL SOLAR CONTROL DEVICES,



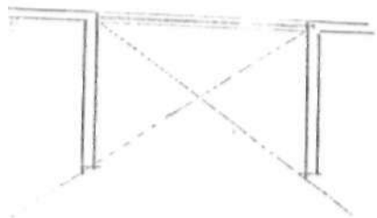
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VIEW



VIEW



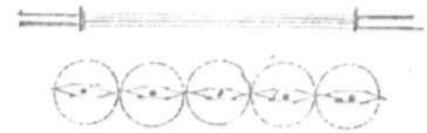
PLAN

FIXED VERTICAL FINS. VERY USEFUL FOR EAST AND WEST ORIENTATIONS.
THESE COULD BE IMPROVED BY LEAVING A SPACE BETWEEN FACADE AND FINS FOR FRESH AIR TO CIRCULATE.



PLAN

FIXED BUT OBLIQUELY PLACED. THIS ARRANGEMENT WITH THE GAP BETWEEN FACADE AND FINS IS A MAJOR IMPROVEMENT ON THE FIXED VERTICAL TYPE.
THIS ARRANGEMEN SHOULD BE SUCH THAT THE FINS INCLINE TOWARDS SOUTH.



PLAN CLOSED

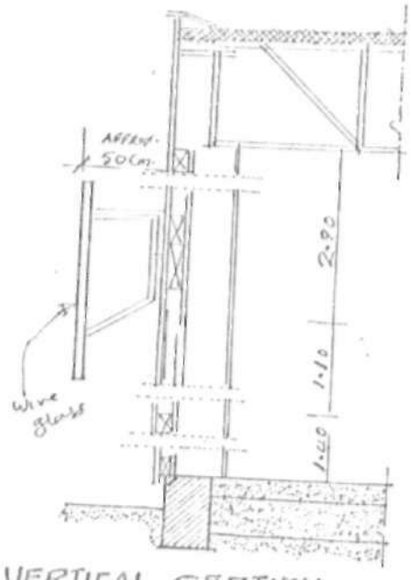


PLAN OPEN.

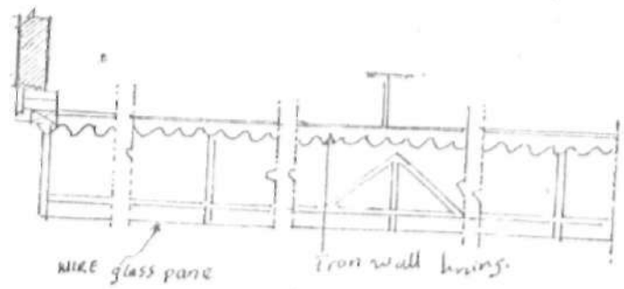
MOVEABLE VERTICAL FINS. THIS COULD SHADE THE WHOLE FACADE OR OPEN IT UP IN DIFFERENT DIRECTIONS ACCORDING TO THE SUN'S INCIDENCE. FINS CAN BE CONTROLLED MECHANICALLY OR BY HAND.

FIG 8

SOURCE :- OYELEKE. T.B. DOCUMENTATION ON SUN SHADING DEVICES.



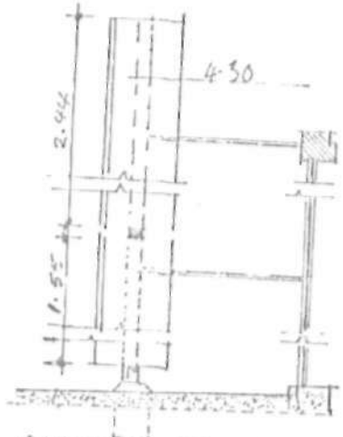
VERTICAL SECTION



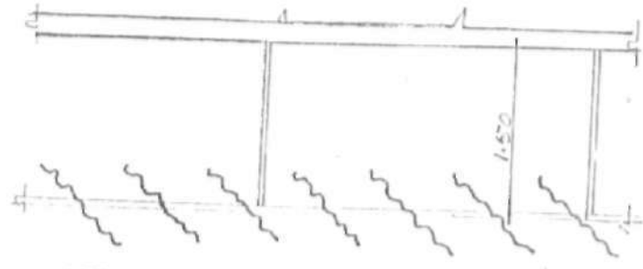
HORIZONTAL SECTION

SUNBLIND TO FRONT OF BUILDING.

- IT CONSISTS OF VERTICAL WIRED GLASS PANE, RUNNING CONTINUOUSLY IN THE LONGITUDINAL DIRECTION, AND MOUNTED OVER WINDOW AT A DISTANCE OF APPROX. 50 CM. FROM OUTER WALL. THE LIGHT DIFFUSING GLASS PREVENTS DIRECT ENTRY OF THE SUN'S RAYS. THE BLIND IS ATTACHED TO A LIGHT STEEL STRUCTURE.



VERTICAL SECTION.



HORIZONTAL SECTION

FIXED VERTICAL SUNBLIND

- FIXED SUNBLIND FORMED FROM OBLIQUELY POSITIONED CORRUGATED ASBESTOS CEMENT SHEETS.
- THE VERTICAL SLABS FORM A LAMINAR GRID WHICH RISES FREELY IN FRONT OF THE FACADE TO WHICH IT IS FASTENED.
- THE 1·5M GAP BETWEEN WALL AND FACADE RESULTS IN AN EFFICIENT DISSIPATION OF HEAT BETWEEN THE LAMELLAE AND THE BUILDING.

SOURCE:- AFOLABI R.A. DOCUMENTATION ON SUN SHADING DEVICES.

3.1.7 PROJECTED SLABS OF UPPER FLOOR

Projected floor slabs of multi-storey buildings are easy ways of affording protection from solar radiation to the lower floors.

Protection from solar radiation depends on:

(a) the extent of the projection, which is turn has economic, aesthetic, and structural implications.

(b) the angle of incidence of the sun ray on the facade. An extensive projection can protect against small angles of incidence while short projections only protect against high angles of incidence.

Advantages.

Projected floor slabs apart from solar control afford people an excellent exterior space which can also serve as escape platform in case of fire out-break.

- It could be very useful during maintenance work on the facade and other parts of the building.
- Wide projected floor slabs sometimes interiup rising heated air in front of the facade and direct heat into the interior.
- Wide projection causes considerable illumination loses in the building.

3.1.8 ADJUSTABLE LOUVES

Usually made of light but durable materials such as plastics (e.g. Luxaflex) and metal e.g (aluminium). these are very effective means of controlling solar ingress to buildings. they can be adjusted for all angles of incidence of the solar radiation.

They could be controlled manually or mechanically. One point needs to be noted however, that a number of these loures are connected by a bar to which the adjusting device is fixed such that a set is moved simultaneously.

3.1.9 SUN-PROTECTION GLASSES

Extensive glazing of the facades as is common with modern day buildings creates the problem of the "Hot house" that's penetration of solar radiation thus causing heating of the inteior as well as glare effect.

In some cases however, heat absorbing and glare reducing glasses are used. these are made by incorporating mineral admixtures in the glass resulting in some degree of tinting. It should be noted that tinting reduces the transmittance of both heat and visual light as well as diffusing the appearance.

There are three types of tinted glasses:

(a) heat absorber only

(b) glare absorber only

(c) both heat and glare absorber

3.2.0 SCREEN WALLS

Screen walls are non-structural walls and are built in-between the structural elements of the building. They are usually built of small repetitive units which form aesthetic patterns. They are used to give obscured view at the same time allows free air movement through.

I. ADVANTAGES

- It is a very reliable solar control method
- It reduces heat penetration into the building

- It also reduce noise penetration
- It ensure good level of privacy where desired though permits day-light effect into the interior.

II. DISADVANTAGES

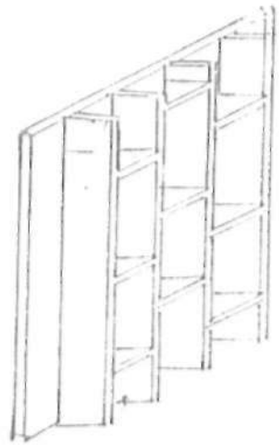
The major disadvantages are:

- Screen wall is not adjustable and therefore allows view in fixed and permanent direction.
- It also cause considerable illumination lost indoors.
- Gives a psychological feeling of one being caged.
- Where components are flat, it could give rise to disturbing shadow pattern.

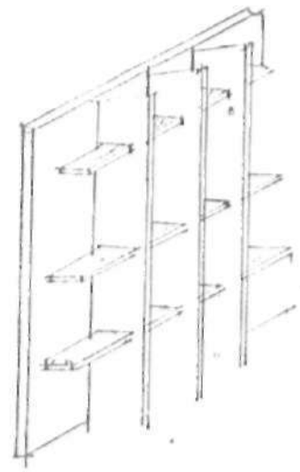
3.2.1 EGGCRATES

Eggcrates are essentially a combination of horizontal and vertical shading devices. It also combines the characteristics of both methods.

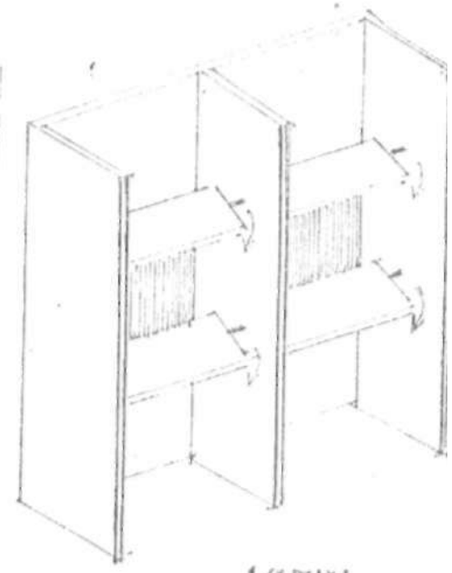
EGGCRATE SOLAR CONTROL DEVICES.



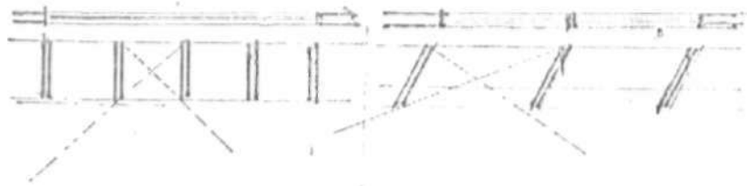
VIEW



VIEW

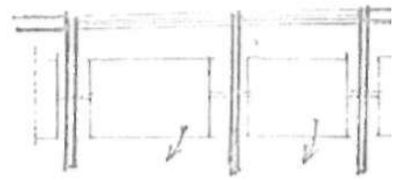


VIEW



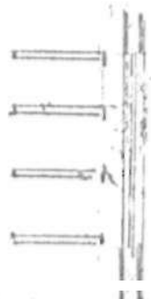
PLAN

PLAN



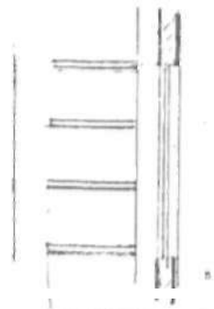
PLAN





SECTION

VERTICAL EGGCRATE



SECTION

EGGCRATE WITH OBLIQUELY FIXED VERTICAL FINS.

EGGCRATE WITH MOVEABLE HORIZONTAL MEMBER.

FIG 10

SOURCE: AFOLABI E.A. DOCUMENTATION ON SUN SHADE DEVICES IN AFRICA (2012)

There are various forms of eggcrates - both vertical and horizontal elements could be intersected at right angles or one obliquely placed to the other but permanently fixed.

Efficiency of Eggcrate shading device could be improved by making one of the elements adjustable.

I. ADVANTAGES

- Require little maintenance after construction
- Offers effective solar control
- Allows free window opening.

II. DISADVANTAGES

- Could result in serious additional cost
- Could be uninteresting aesthetically
- Repetitiveness could be boring

3.2.2 TREES AND VEGETATION

The presence of trees near buildings could play very significant role in the control of solar radiation penetration. Where trees with heavy foliage are planted and are evergreen, they could be very reliable to produce cool and comfortable interior. Grasses and shrubs around a building will reduce reflection and glare from heated ground surface.

I. ADVANTAGES

- Require little maintenance
- Cost little and Available Naturally most of the time
- Allows effective and control air circulation

- Could serve as wind breakers and help regulate micro-climate

II. DISADVANTAGES

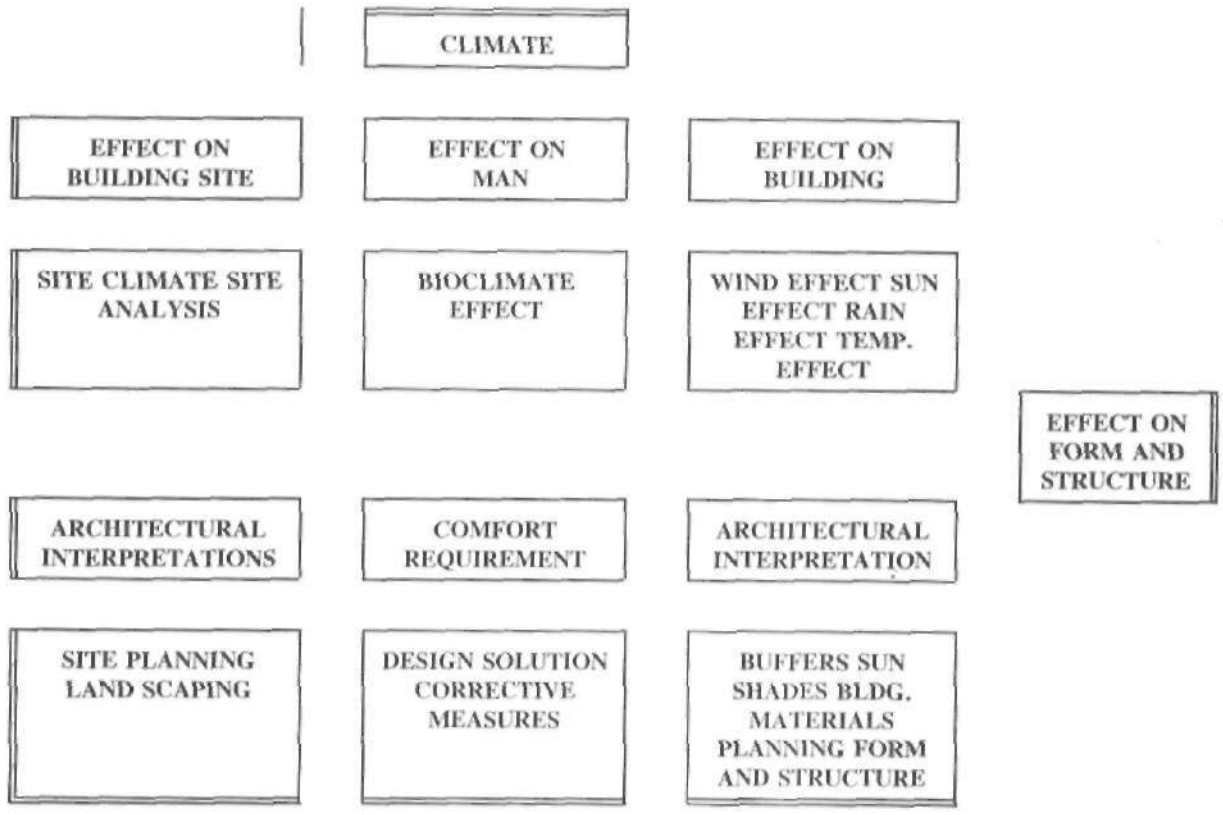
- where foliage is heavy, vegetation could impair view
- Not very effective on multi-storey building
- Could be dangerous if fell and located too close to the building

COMPARATIVE ANALYSIS OF SHADING DEVICES

TYPE OF CONTROL	PERCENTAGE REDUCTION TOTAL HEAT GAIN	PERCENTAGE EFFICIENCY TO ENSURE CROSS VENTILATION	PERCENTAGE OF NATURAL LIGHT RESULTING FROM CONTROL	APPROX. AVERAGE EFFICIENCY AS MEANS OF CONTROL
Curtains	10-20	5-25	30-50	35
Vital venetian winds	20-30	5-90	5-75	64
Heat resisting glass (coloured)	60	70 (Presumed)	40	57
Roof or Corridor overhang	75-80	80-100	40	69
Concrete hood and fins	70-80	80-100	40	70
Louvred hood	87	80-100	77	84
Vertical louvres	70-80	10-50	45-65	54
Horizontal louvres	70-80	15-50	45-70	53
Suspended loaves	80-85	80-100	70-80	82

Source: Afolabi r.A. Table 1

Documentation on sun shading devices as means of solar control



Schematic breakdown of climatic effects **Table 2**

Source:- **Oyeleke T.B.**

The search for African Identity for corporate Building.

3.23 EFFECT OF TROPICAL CLIMATE ON BUILDING MATERIALS

One crucial component of the basic design consideration in tropical architectural designs is the building materials. It is necessary for a designer to make a careful study of the available building materials thereby arriving at the suitable or appropriate materials to be utilised in his environment or even his site to achieve great comfort, durability of buildings and also less cost and inconveniences of construction.

Building materials are said to vary in performance and characteristics as such they respond alot to the natural influence of climate. A building material which is found to be ideal in the tropics may perform very badly when used in a temperate zone or vice versa. When considering building materials for a particular design, the aesthetic value of that material should not be allowed to supersede the behaviour of the material in a given environment. There has to be a natural balance between aesthetics and performance. If this is not obeyed, alot of problems will surely arise by increase in the cost of construction. Inconveniences of erection etc. for example in the Unied States, despite the great variation in climate, one will find out that building materials are almost same for all the regions, popular materials being glass, steel and concrete. This shows that the performance of this building materials within the various climates were overlooked just to achieve an aim of beauty and good aesthetics. This is actually unrealistic as alot of money and time have to be spent to make sure that such materials (which are not in alignment with the climatic conditions) are adapted to the environment in which they are used. e.g. when designing a building in the tropics, and glazed/curtain wall are employed, throughout, great effort will have to be made to make sure that solar penetration and glare is eliminated. This will involve cantilevering of floors projection of fins to serve as shading devices etc. This gives a drastic increase in cost of the building and in fact the material may not survive in the

environment for long despite the spending, and there is likely to be more spending of money in the course of maintenance. Some finishes, however, the functions of a particular building might require the use of particular building materials but there is always a way of balancing the function with the cost and the building materials employed as well as vaying with the climate. Most designers tend to forget this.

To make this point clearer, a typical example will be considered:-

The example is a building designed by C.P Kukreja, an architect and writer, which he illustrated in his book - Tropical Architecture. The building was supposed to be a Union Carbide Research Centre at Bhopal, India. He made use of completely glazed external envelope and the building is situated in a hot climate. This gave rise to a lot of problems of glare, radiation and so on. He claimed that he wants to enable the occupants to have uninterrupted view of a lake around the site as such he employed a reflective film treatment on entire facade to reduce glare and heat. This might be very expensive.

3.2.4 FANS

Fans can be used for circulating air within a space thereby assisting the process of Evaporation from the body and also for ventilation by circulating air through a space and thereby replacing state air.

Ceiling fans and independent plug-in fans are commonly used for circulating air within a space.

The following standards of ventilation are recommended.

SPACE	AIR CHANGE PER HOUR
Auditorium	10 - 15
General Offices	5
Dining Areas	6
Kitchen	15 - 25
Laundry	6
Machine Room and Workshops	8
Training Rooms	16 - 15
Stores	4

SOURCE: NUC DESIGN STANDARDS FOR UNIVERSITIES TABLE 3

In large kitchens, workshops and laboratory laboratories where toxic fumes are likely to pollute the indoor air, extractor fans with suitably designed ducting system, if necessary is recommended by the author. Extractor fans may be installed in internal public toilet.

3.2.5 AIR CONDITIONERS

Thermal comfort require more than having enough control to keep warm in harmattern period and keeping cool during dry hot season.

True thermal comfort means a correct temperature, a correct amount of moisture in the air (humidity) and clean, fresh, odourless air.

This ideal thermal comfort could be achieved through the use of a heating system, a cooling system, air filters and humidifiers as the situation may demand.

Air conditioners provide both cooling and humidification and are sometimes the best solution in difficult climates especially for offices and other public buildings. The major constraint is the cost of procurement and maintenance.

There are different types of air conditioners

(i) Split units

(ii) Central A.C. system

(iii) Room unit

the use of Air conditioner should be decided early at design stage since this will affect the volume of space, aesthetic and size of openings.

3.2.6 HUMIDITY CONTROL IN BUILDINGS

The proper amount of moisture in the air is important for good air conditioning. Excessive moisture in buildings comes from many sources, such as cooking, cleaning, and washing, and from the outside air. To remove excessive moisture from the air adequate ventilation and a humidification system is necessary.

A humidification system takes the moisture from the damp air and passes it over cold coils. When the moisture - laden air passes over the coils, it deposits excess moisture on the coils by condensation. conversely if the air is too dry, the humidification system adds moisture to the air. A device used only to remove the humidity from the air is known as a dehumidifier. A device used only to add humidity to the air is a humidifier. Portable units can be used to humidifier or dehumidify special areas in public buildings.

3.2.7 HEATERS

Heater are more useful in the temperature countries, however they can create additional comfort during harmattan period in Northern Nigeria. Evaporative coolers are in use in hot dry climates.

3.2.8 COMPARISON

After highlighting natural and artificial means of thermal control, let me discuss the significance of the two as per design considerations, Regionalism in Architecture, thermal control and building locations, cost and related implications.

3.2.9 DESIGN CONSIDERATIONS

It is true that the use of air conditioning can provide reliable and controlled comfort conditions within buildings. Its use can be a constrain on the architect in terms of volume of space, choice of building elements and form.

Building volume must be reduced to basic requirements of space as each additional cubic metre of air to be conditioned adds to the capital and running costs of the system. On the other hand, Natural means of thermal control is a lot cheeper in capital requirements, and maintenance.

Air conditioning and other artificial means of thermal control have fundamental design implications which must be decided upon early at the design stage. Failure to do this may lead to serious structural consequences where natural means of thermal control could be applied even to already build environmental in the form of landscaping and shading devices.

3.3.8 THERMAL CONTROL AND REGIONAL ARCHITECTURE

The same building forms, elements and designs are often used in different environments with little or no relevance to the climatic conditions. Most of such buildings do not reflect the climatic character of the environment but are just imposed.

Many reasons may be said to be responsible but perhaps, one of the most decisive in impact is the technological advancement in mechanical house heating and cooling.

Walter Gropious while considering regional climate and Architectural expression wrote and I quote "True regional character can not be found through sentimental or imitative approach by inco-operating either old emblems or the newest local fashions which disappear as fast as they appear, but if you take basic differences imposed on architectural design by climatic conditions, diversity of expression can result".

From the above, it could be stated that, advent of artificial means of thermal control was responsible for the present uniformity that now exist in public buildings with-out due consideration for the climatic requirements of the environment. Whereas natural means of thermal control favours regional Architecture.

3.3.1 THERMAL CONTROL AND BUILDING LOCATIONS

Thermal comfort can be achieved solely through natural means but in many instanless this could not be sustained throughout the year without the use of artificial means of thermal control. In northern climatic zone of Nigeria, it is possible to provide satisfactory thermal condition purely by structural means without resorting to mechanical means as long as the daily temperature does not rise above 27^{oc}.

In the Southern climatic zone, artificial means of thermal control is often necessary in order to provide satisfactory comfort conditions despite the application of natural means

of thermal control. In comparing the two methods as stated above, it is clear that, independent use of any of the two depends on the climatic conditions of the location. In some cases a combination of the two may offer the solution.

Source:- **standard quide for universities n.u.e**

3.2.2 COST AND RELATED IMPLICATIONS.

The initial capital required for artificial means of thermal control in public building if it is to be serviced purely by artificial means could be very high. the running and maintenance cost is also very high. There may be need for stand-by generator to ensure regular power supply which NEPA can no longer guaranteed. All the above are costs that may not be incurred if natural method of thermal control is adopted.

In conclusion of the comparison, I wish to quote Robeit venturi who wrote in the book complexity and contradiction in Architecture. "Architecture occures at the meeting of interior and exterior forces of use and space. These interior and environmental forces are both general and particular, generic and circumstantial. Architecture as the wall between the inside and the outside becomes the spatial record of this resolution and its drama".

In view of the above expression, it is highly necessary for the Architects to look into the best possible ways of adapting public buildings to their immediate environment with artificial means of thermal control serving as additional means of ensuring thermal comfort without which the efficiency of the building will not be seriously affected. It is only by this approach, that regional Architectural expression on public buildings could be enhanced without compromising thermal efficiency.

3.3 MEASURES ADOPTED TO ENSURE INTERIOR THERMAL COMFORT IN HOT, HUMID ENVIRONMENT

ORIENTATION:- North and South (Long axis east-west)

- North and South (Long axis east - west).
- spacing: Open spacing for breeze penetration but protection against hot and cold winds
- Air movement:- Rooms are all single banked with provision for permanent air movement.
- Opening:- Medium openings 20 - 40%.
- Walls:- Heavy external and internal walls
- Roofs:- Light insulated roofs recommended.
- Heavy Rain:- Steep slop recommended for roofs.
- Position of openings:- In north and south walls at body height.
- Solar penetration:- Exclude direct sunlight through the use of shading devices.
- Courtyard:- Recommended to provide much needed air movement and cultural integration. Introverted concept was adopted to achieve this.
- Floors:- Heavy and Insulated against dampness recommended.

CHAPTER FOUR

CASE STUDIES

4.0 INTRODUCTION

Case studies are important before embarking on any design because they give one an insight to approaching the design task. The most important case studies are those taken from an area which has similar characteristics with the one being proposed. However, for the purpose of this thesis, some case studies were taken based on material used while some were based on similarity of functions.

CASE STUDY 1

4.1 KOGI INVESTMENT COMPANY HEADQUARTERS

LIKOJA (TEMPRARY OFFICE)

INTRODUCTION

The present location of Kogi Investment company is a temporary accommodation. It is a rented, residential and privately owned building. The Architect could not be confirmed by the author despite several attempts. In any case the building is located along Aallace road and close to unity roundabout. It would have been a very suitable site for permanent office but property was not up for sale.

KOGI STATE INVESTMENT COMPANY TEMPORARY OFFICE
(SITE PLAN)

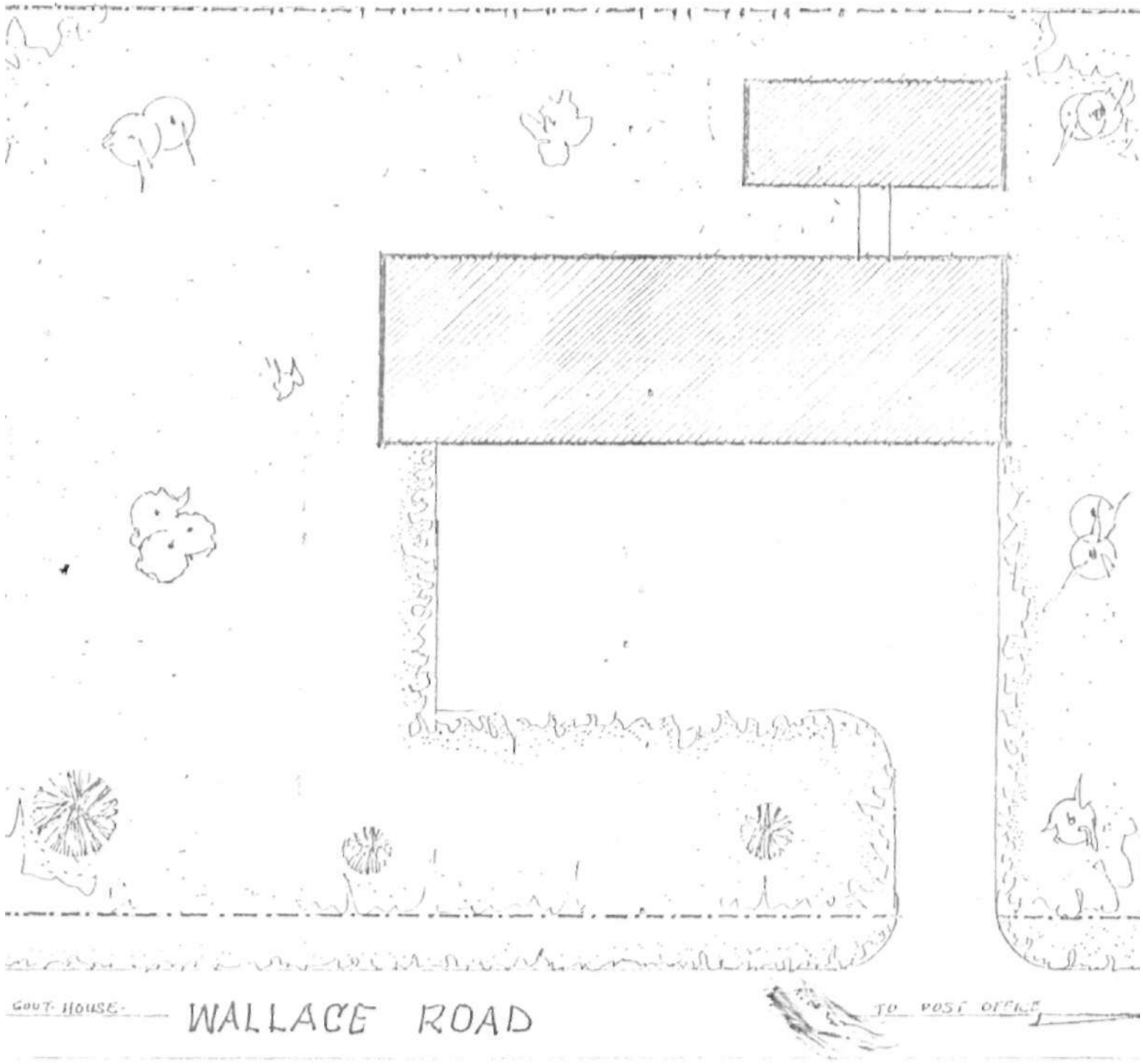


FIG II

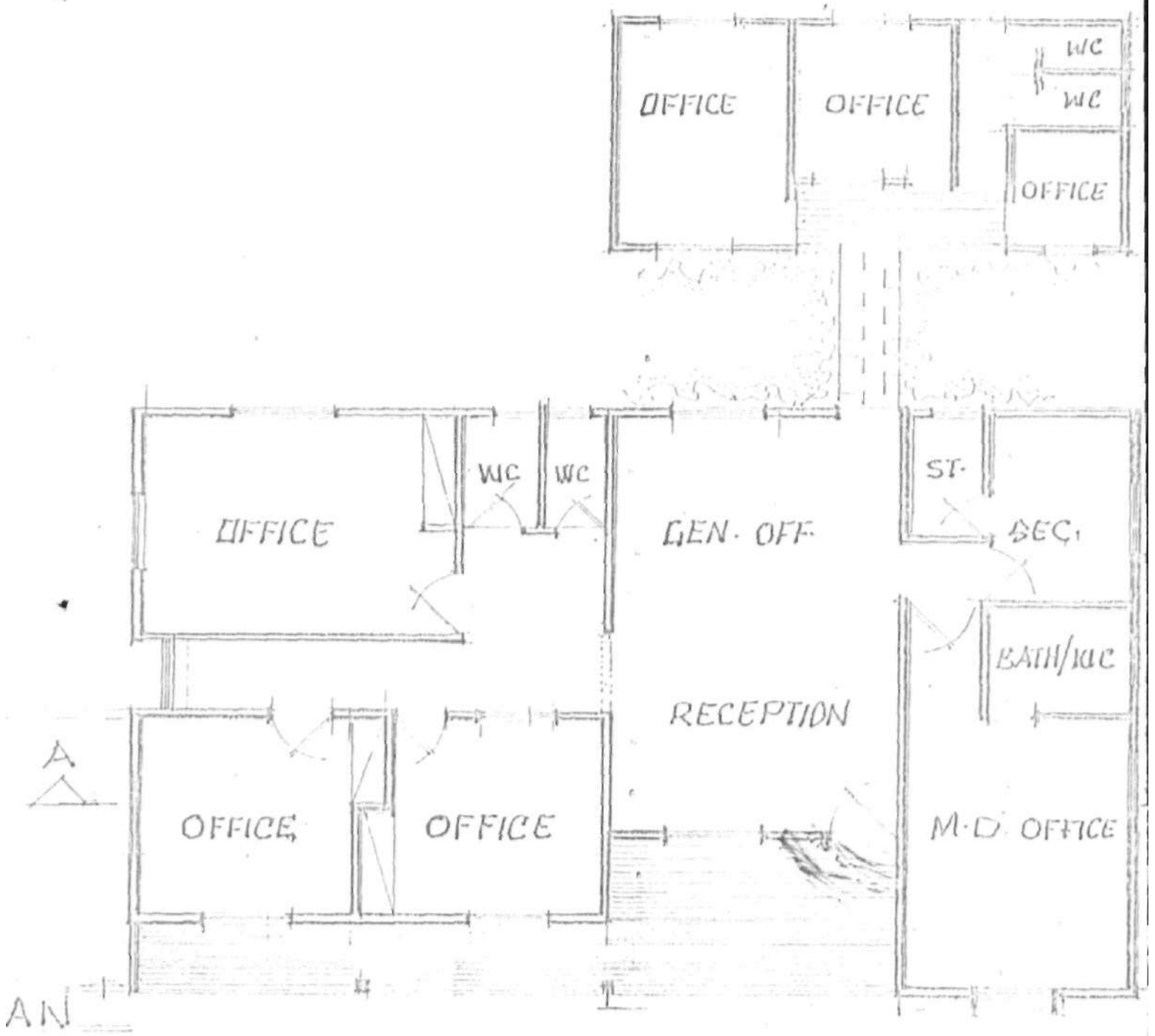

OFFICE
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AN

Fig 12

PLAN.

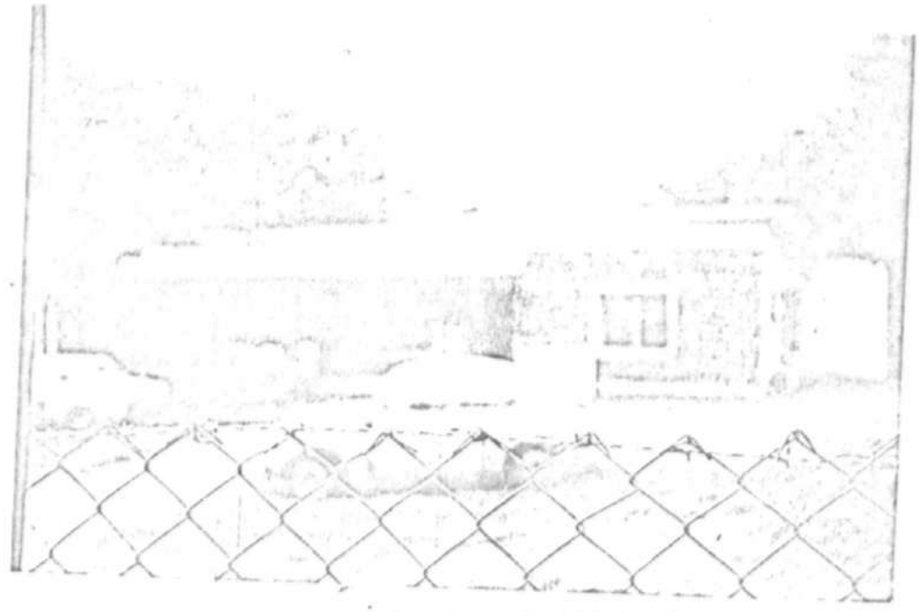


PLATE 1 VIEW FROM WALACE ROAD.

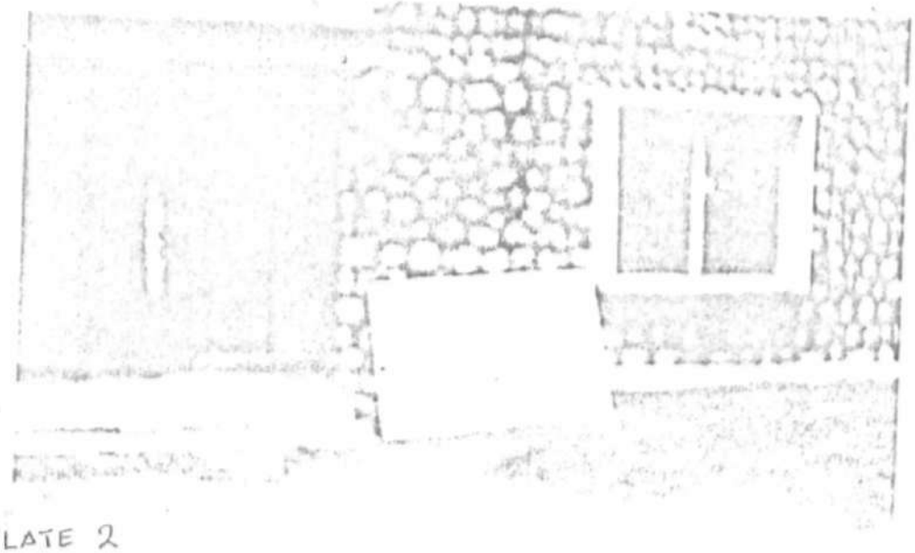


PLATE 2

STONE WALL FINISH AT THE APPROACH.

DESCRIPTION

This building is a four bedroom residential bungalow with boys quarter at the back which is also in use as office space. All useable spaces apart from toilets areas are converted to office spaces. It is really tight and very inconvenient for the staff members. This was later confirmed by the staff through verbal discussion with the author.

STRUCTURE AND CONSTRUCTION

The building was built with sandcrete blocks. All partitions are made of permanent block work. Part of the external wall at the approach is given stone facing as wall finish.

DESIGN

The building is not originally designed for the purpose. It is now serving. It is basically functional in terms of circulation except that it is too small for the organisation. The warehouse is located outside the present premises. The garage is serving as store for grains especially rice.

MERITS

- Though inadequate in terms of number of offices available, the circulation is fairly satisfactory.
- Toilet locations are very convenient for the workers.

DEMERITS

- The building is not befitting the image of the company.
- The site is marshy and therefore there is drainage problems during rainy seasons.

- Available space crossly inadequate for the company's staff strength.

CASE STUDY 2

4.2 FEMI JOHNSON HOUSE - IBADAN

ARCHITECT:- - DESIGN GROUP

CLIENT:- FAMILY JOHNSON AND BROKERS

LOCATION:- DUGBE, IBADAN

CONTRACTOR:- G. CAPPA & D'ALBERTO

DESCRIPTION

This is a modern corporate building in Nigeria located in Ibadan, Oyo State. It is an office block completed in 1986 and owned by a firm of Insurance brokers. The building is made of 10 floors with the insurance firm occupying the 9th and 10th floors and the pent house. All other floors are rented out as office spaces.

ACCESSIBILITY

The building is accessible from a major road which bound the site at the front. On one side of the building is a petrol station, vehicle workshops on the right site and residential building on the left and back respectively. The area is generally sloppy with absence of landscape elements.

FEMI JOHNSON BROKEN HOUSE IBADAN

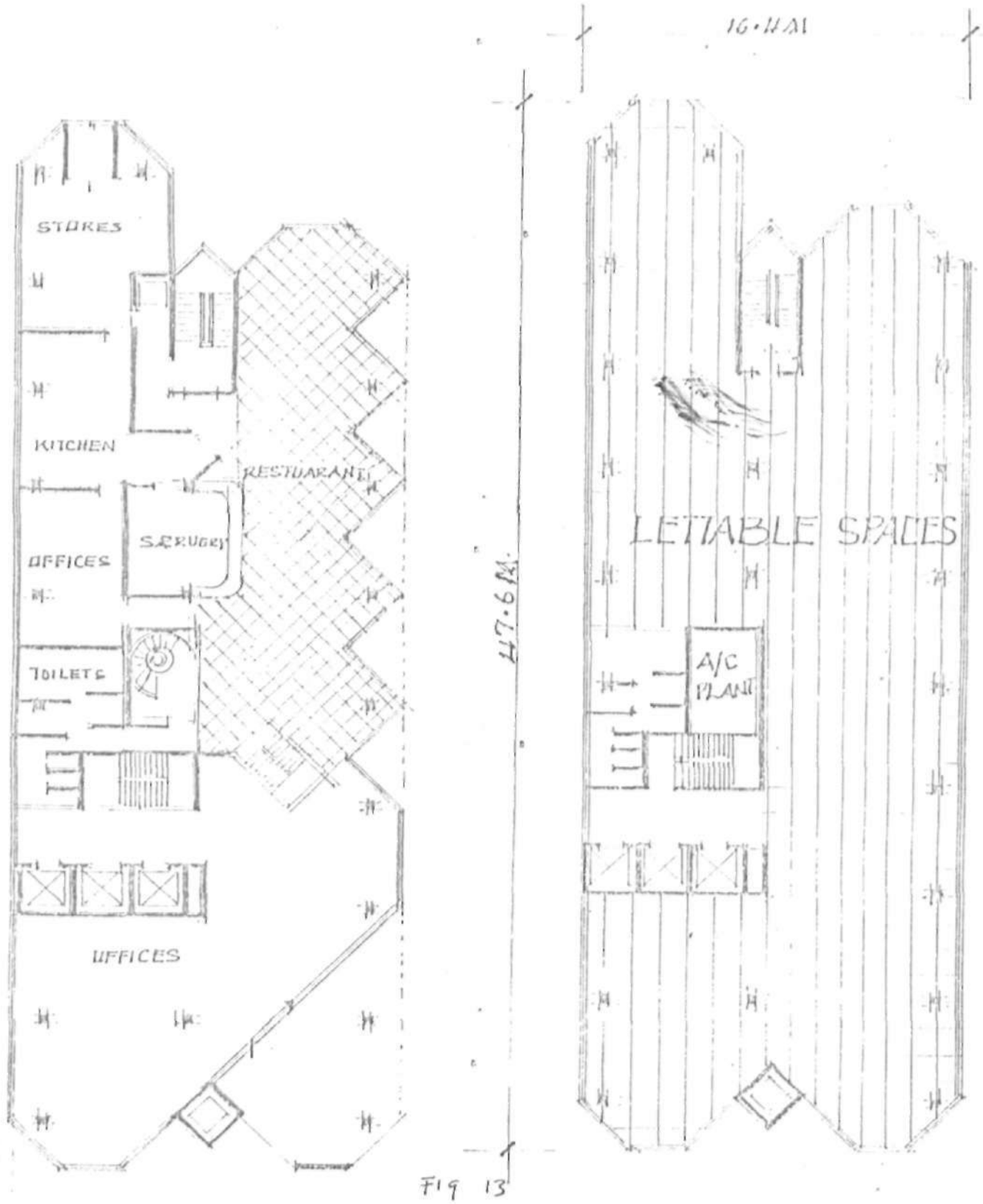


Fig 13

MEZZANINE FLOOR

TYPICAL FLOOR PLAN



PLATE 3 FEMI JOHNSON HOUSE. [ELEVATION]

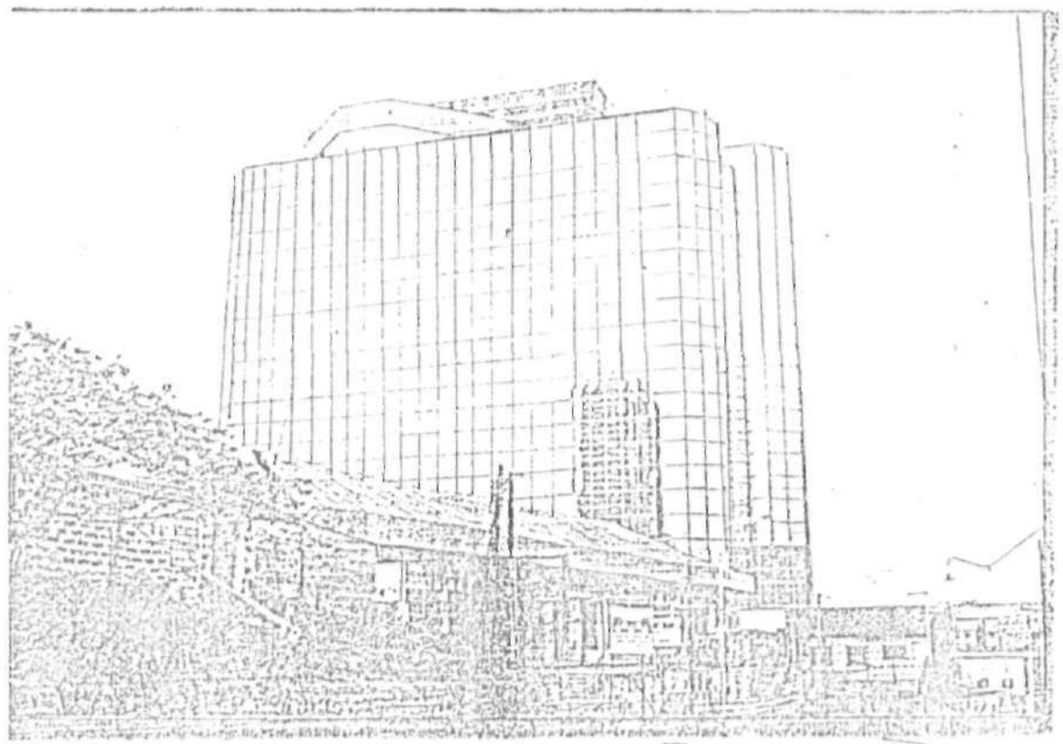


PLATE 4 FEMI JOHNSON HOUSE, IBADAN. [ELEVATION.]

STRUCTURE

The building is made up of precast and reinforced concrete with aluminium frame . glass curtain walling. Glazing was used extensiveness.

The curtain walling is double glazed with special sun protective reflective glazing.

PLANNING

The planning is a "open plan" Concept with the service core centrally located. The core consist of lifts, stair case, Air-conditioning plant and the ducts.

MERITS

- The open plan concept adopted enhances space flexibility.
- The large column spacing imparts a sense of spaciousness.
- The service core is easily accessible from the main entrance.
- Space management skill was well articulated by the architect.

DEMERITS

- Thermal control consideration inadequate even with the use of double glazing.
- The chamfered edges led to wastage of spaces.
- Thermal Comfort depends solely on artificial devices.

CASE STUDY THREE

4.3 NIGER STATE DEVELOPMENT COMPANY, MINNA (NSDC)

ARCHITECTS: - MINISTRY OF WORKS, MINNA

CLIENT: - N.S.D.C

LOCATION: - SECRETARIAL ROAD, MINNA

DESCRIPTION

The building is located on old secretariat road along with other federal and state public buildings. The ground floor comprises of reception, waiting and lettable office spaces.

STRUCTURE

The building is of two storeys constructed with concrete columns, beans and sandcrete hollow blocks. It has simple residential architectural outlook. Moderately glazed with sun shading devices used as aesthetic elements.

DESIGN

The building has sufficient and well planned parking spaces both for staff and visitors. The environment is also served with interesting landscape both at the lawn and shrubs as hedges. The stair case are located to ensure short walking distances for the users. The courtyard concept adopted enhances ventilation, circulation and thus thermal control.

NIGER STATE DEVELOPMENT COMPANY
(SITE PLAN)

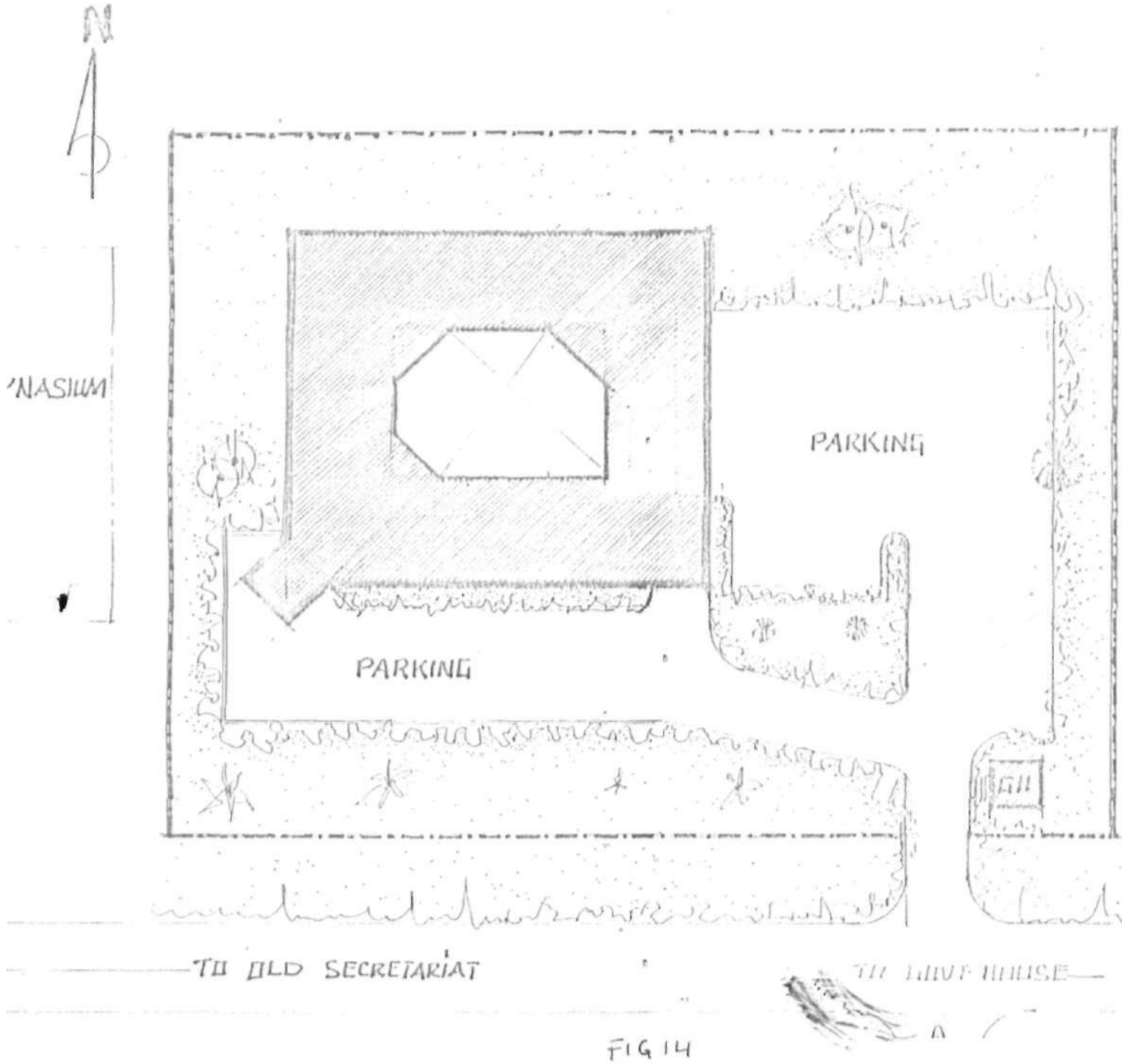
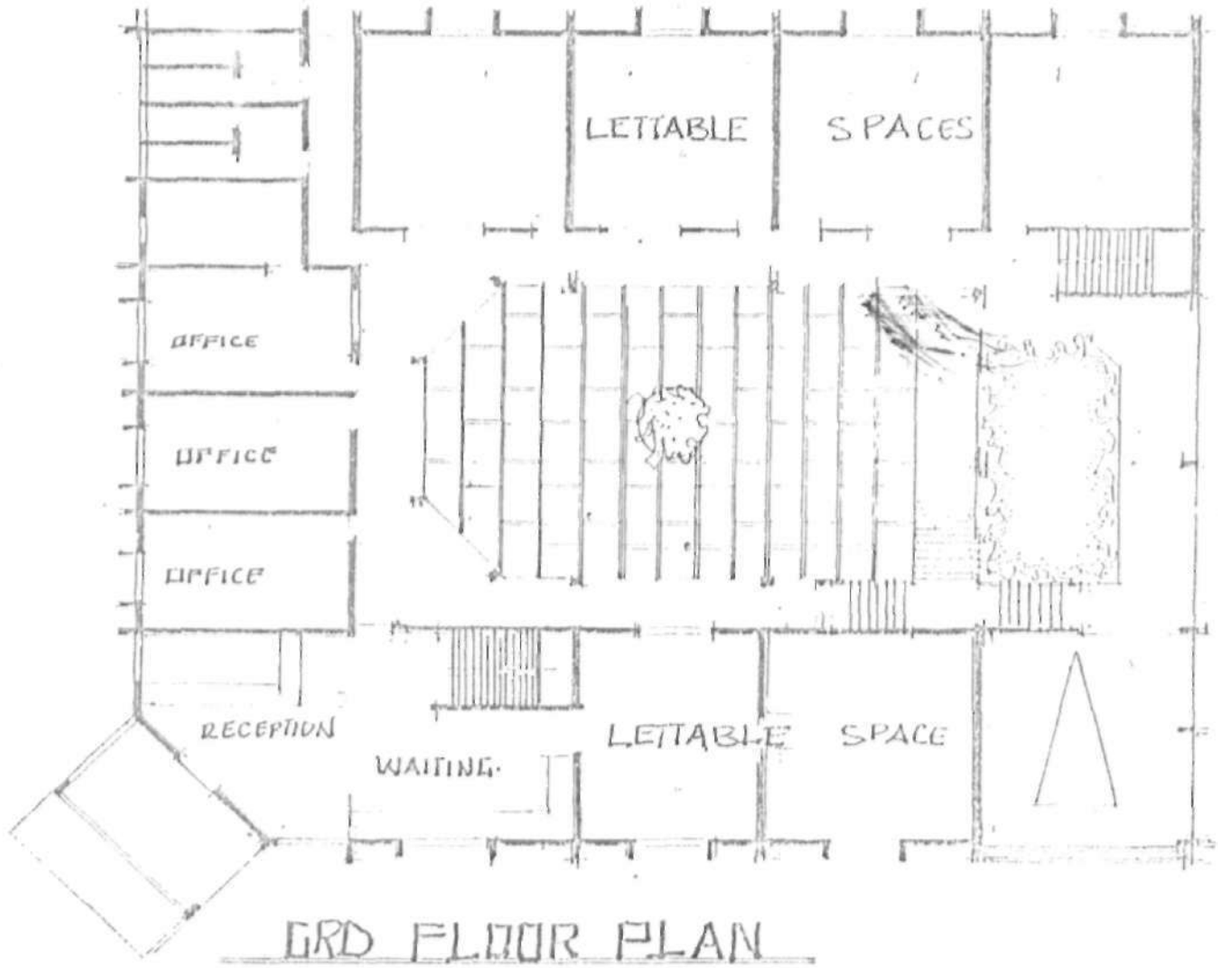
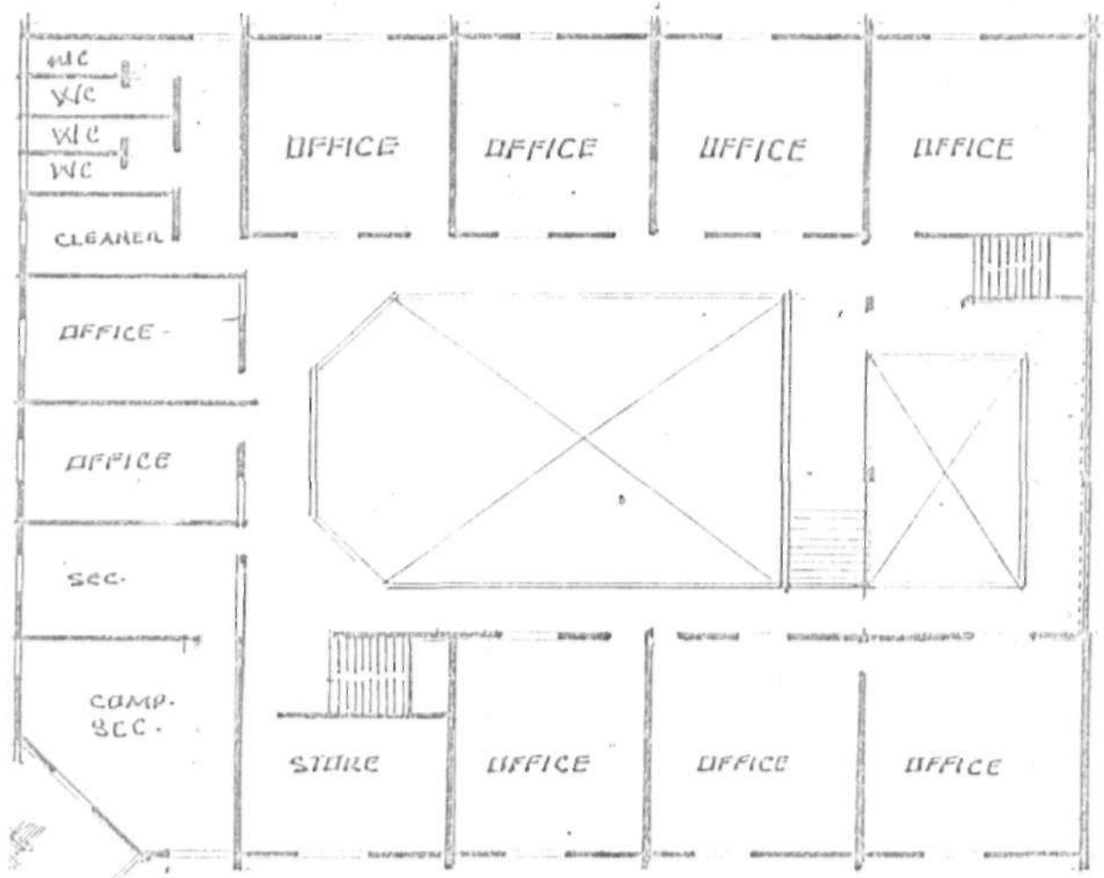


FIG 14



GRD FLOOR PLAN

FIG 15



FIRST AND SEC. FLOOR PLAN.

Fig 16



PLATE 5 VIEW FROM SECRETARIAT ROAD

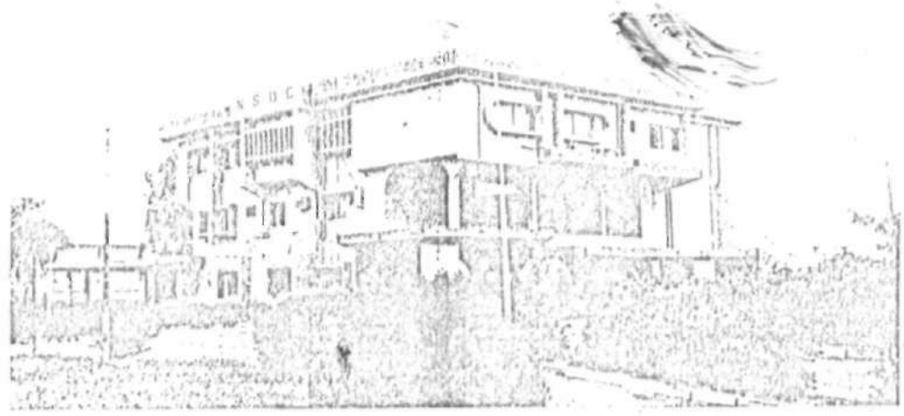


PLATE 6 APPROACH VIEW.

MERITS

- The courtyard concept adopted by the designer allows good thermal control by enhancing air movement.
- The landscaped surrounding apart from aesthetics also serves as passive element of thermal control. It regulates temperature and controls glare.
- Shading devices were incorporated to check solar penetration and to add glamour to the aesthetic of the building.
- The painting adequately integrate the building to its immediate environment.

DEMERITS

- Permanent partitions used do not allow for flexibility in the use of space.
- some of the occupants have to walk fairly long distances before getting to the toilets.

CASE STUDY FOUR

4.4 EUROPEAN FREE TRADE ASSOCIATION HEADQUARTERS, GENEVA SWITZERLAND

INTRODUCTION

The association is jointly run by countries within the European economic community. It is located in Geneva Switzerland on a site made available by Fipol, A. foundation responsible for housing international associations in the city.

DESCRIPTION

It is a nine storey building, built to accommodate 500 workers.

The building has an area of 6500m^2 for offices and 450m^2 for storage of records and 2,300m^2 for conference and hall facilities. Accommodation on each floor is as follows:-

- First Basement:- services.

- Second basement - services and parking ground floor: Coffee bar and Conference rooms.

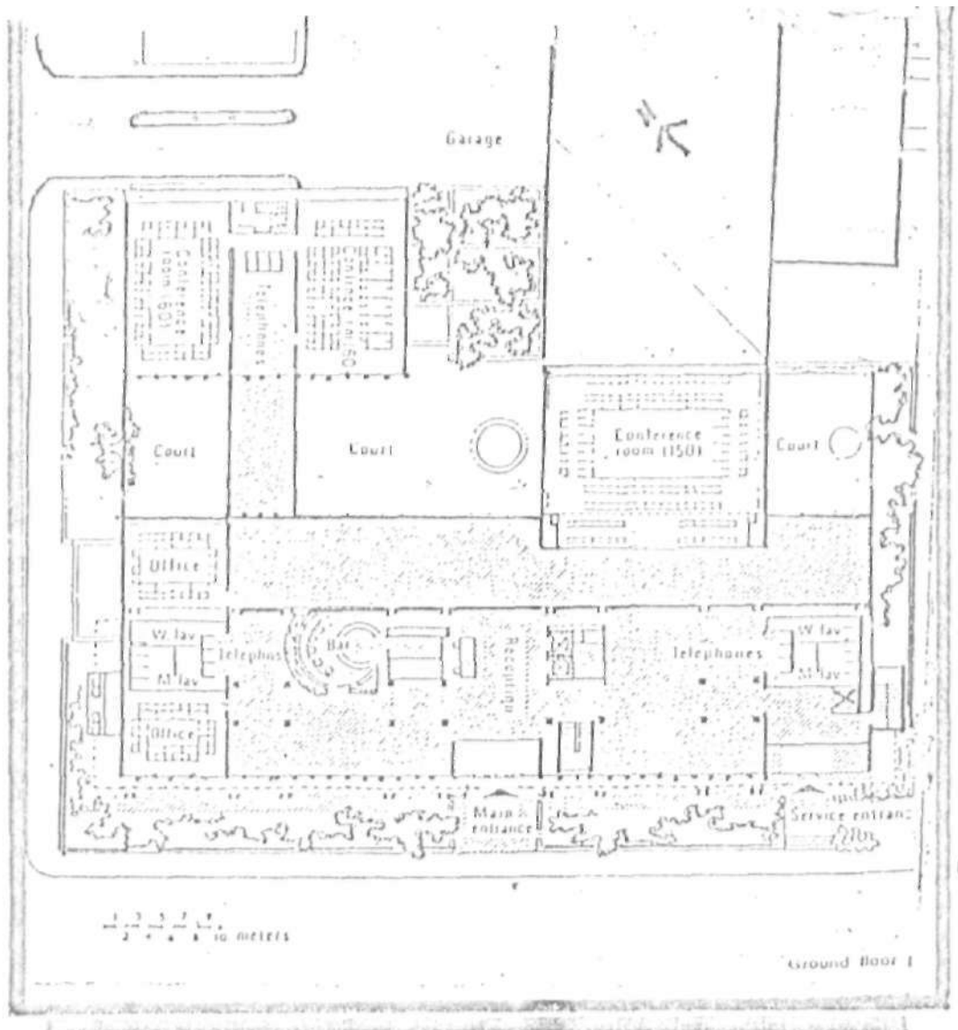
- Mezzanine floor:- Exhibition, Gallery, Interpreters and press offices.

1st - 6th floors:- Offices

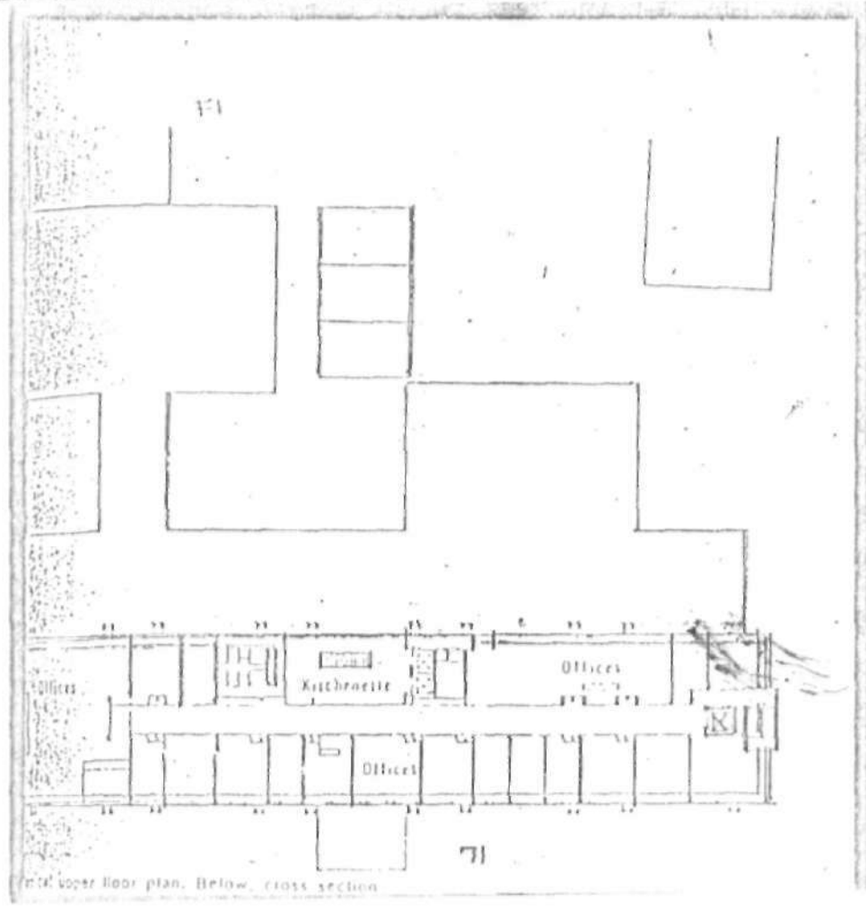
Seven floor:- Staff club porters flat and services

ACCESSIBILITY

The location is highly accessible, central and befitting to an international organisation. Easy movement and interaction is well facilitated through planning.



GROUND FLOOR



TYPICAL UPPER FLOOR

FIG 17

STRUCTURE:

The building is constructed principally with reinforced columns and beams. This columns formed free standing portal frames at both sides of the building and to the roof top.

Lateral stability was achieve by placing escape stair Tower at the ends of the elongated structure. This also serve as fire escape stairs. The facade consist of aluminium framed curtain walling with anodised panels pivot windows are used throughout the ground level, while exhibition areas are made of heat absorbing glass.

Two - eight persons capacity lift are available in addition, document conveyor serves all the floors.

FINISHES

Finishes were essentially granite outside. Emulsion paint in the interior, Glazing was done with glass of various capacities.

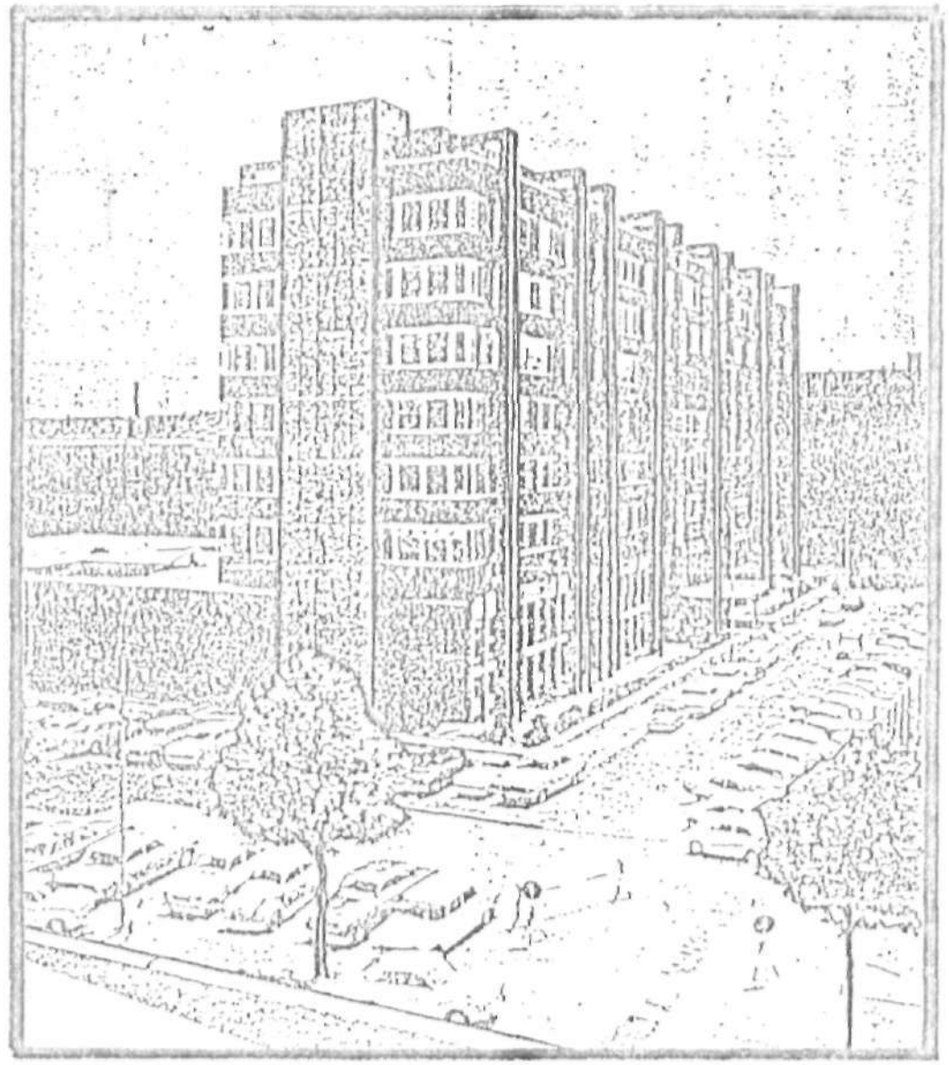
MERITS

- The building is easily accessible.
- Adequate parking spaces were provided.
- Energy conservation very adequate because of small openings and space economy.
- Service core fairly accessible.

DEMERITS

- The composition lacks coherence and unique character.
- Permanent partitioning of the offices do not give room for flexibility in space utilisation.

EUROPEAN. FREE TRADE ASSOCIATION HEADQTRS



PERSPECTIVE

PLATE 7

CASE STUDY FIVE

4.5 "EROS HOUSE" CATFORD, LONDON

ARCHITECTS:- - OWEN LUDER AND GROUP

CLIENT: - INSURANCE COMPANY

LOCATION: - CAFFORD, LONDON.

DESCRIPTION

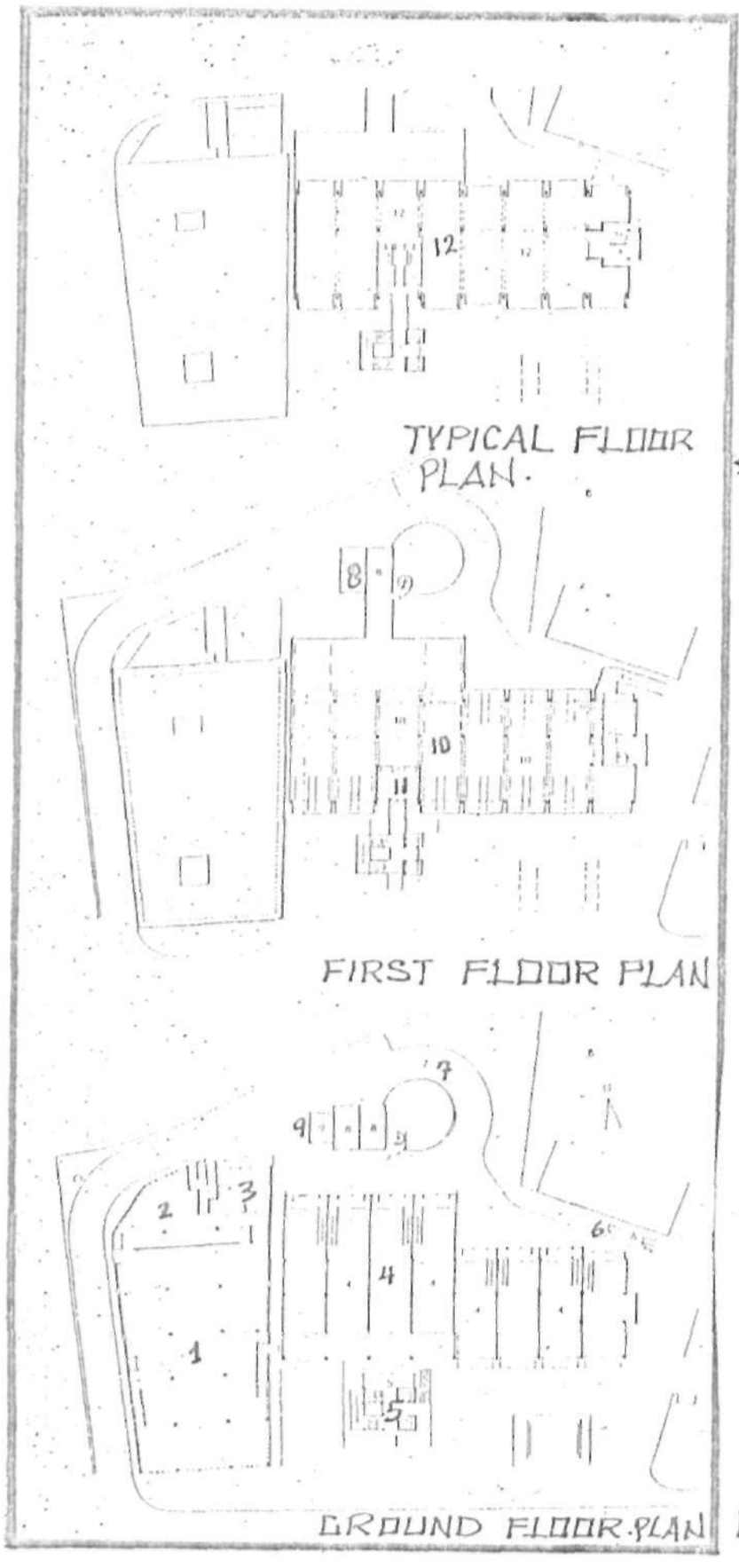
The building consist of a long eight storey edifice. It has a separate rectangular staircase and lift tower which on the ground floor contains the two main entrances to the office floors. There is also a car lift at the back of the building.

The supermarket is located at the Western side of the building but detached.

STRUCTURE

- The load bearing structures of the building is clearly discernible from outside.
- On the different floors, the glass ecased bays protrude between the columns like drawers.
- The reinforced concrete frame is of exposed shulterboard concrete.
- The infill panels on the end elevations consist of precast concrete.

EROS HOUSE, LONDON



KEY

1 SUPERMARKET
2 PRODUCE ROOM
3 LOADING BAY.
4 SHOPS.
5 ENTRANCE HALL
6 ESCAPE STAIR.
7 CAR ROUNDABOUT
8 CAR LIFT.
9 SUBSTATION.
10 CAR PARK.
11 LOBBY
12 LETTABLE OFF-SPACE

PLANS

FIG 18



PERSPECTIVE

PLATE 8

DESIGN

The combination of supermarket and individual shops with public plaza and the commercial atmosphere of the office block apparently resulted in an interesting concept.

A looker arriving from the South west is impressed by the monumentality of the building which rises to three different levels.

MERITS

- The open planning concept adopted by the architects enhances space flexibility.
- The massing of the different segments of the complex gave very impressive Architecture.
- The zoning concept allows good interaction between different functions with minimum circulation confusion.

DEMERITS

The detached location of the service core makes a bad case for the building because of cost and walking distance required of the users.

Too much repetiveness on all the facades could be boring.

SUMMARY OF CASE STUDIES

It was observed that the commonest service core type adopted in most of the case studies conducted is the single interior service core. This could be centrally or peripherally

located. This system is widely adopted because of its advantages; such as the near equal access to functional areas, and easy identification.

Other common features includes the accommodation of Bank branch within the corporate Headquarters to provide the much need liquidity, lettable offices, space for shops and supermarket are also provided in some cases for speculative users. It was also observed that the split core system is not common in use due to unnecessary cost and complexity.

It was also observed that glass is extensively used in some building purely for its aesthetic and elegance without consideration for possible internal thermal discomfort such massive use of glass can cause.

The stated objectives in addition to observations from case studies will form the main frame for my proposed investment house with emphasis on climatic control.

4.6 INDEPTH INTERVIEWS WITH OFFICE BUILDING USERS.

In a project of this importance, it is very necessary to conduct some research among the would be users of the facilities to be provided and users of similar buildings in and outside Lokoja.

A total of 40 people were interview. 28 people were investment company staff while 12 were workers from similar highrise buildings outside Lokoja.

Among the investment company interviewed, 5 of them were senior staff, 13 were intermediate while 10 were junior staff.

From the 12 interview from outside Lokoja 3 were senior, 4 intermediate and 5 junior staff.

90% of investment company senior staff favoured highrise building. They were of the opinion that it is less noisy and more presitegious. They added however, that all safety facilities must be provided. These are standby generator, fire escape staircase and adequate natural ventilation in case of power failure.

30% favoured office building that will spread on the ground. They did agreed that the building may not be elegant but could be considered to be easier to use. 55% of intermediate staff interview favoured high rise building while 45% preferred that office should spread on the ground. The favourites of highrise said there will be more privacy, neatness and improved fresh air. The remainly 45% are essentially afraid of fire outbreak and vertical manual transportation.

Out of the 10 junior staff interview 30% supported highrise because it is a sign of economic progress of the people. 70% of them opted for spreading office building because it allows them to interact with other people easily without any fear or danger.

60% of those interviewed outside Lokoja were of the view that a corporate building should be highrise, the reasons were that it promotes the image of the company brings people of different professions together. Out of the 40% some were indifferent while others said there is need to ensure proper service of facilities before they can vote for highrise of buildings.

In summary, it can be concluded that highrise buildings are generally favoured than office spread on the ground. Highrise office building is architecturally appealing and add more to the landscape of the environment.

CHAPTER FIVE

PROJECT LOCATION, LOKOJA

5.0 INTRODUCTION

Before August 1991, Lokoja was just one of the local government headquarters in the then Kwara state. With the creation of additional states in Nigeria by the Federal Military Government on the 27th August, 1991, the status of Lokoja change to that of a state Capital and the growth Centre of a geopolitical and development region called Kogi State.

One of the earliest actions of the government as an aftermath of the state creation was the enactment of the edict declaring Lokoja metropolitan area which was put at a radius of sixteen kilometres around the town centre marked by point at the general post-office, covering a total area of 804.57sq.km.

5.1 HISTORICAL BACKGROUND

Lokoja is located between a range of hills called mount patti and the confluence of rivers Niger and Benue. It is strategically located and did serve as a place of refuge for those fleeing for safety.

The rivers serve as navigable water ways which have contributed in no small way in directing the history of the town and in the subsequent development.

Details of the activities of the indigenous population in the confluence area is obscured leading to claims and counter claims to the town by these indigenous

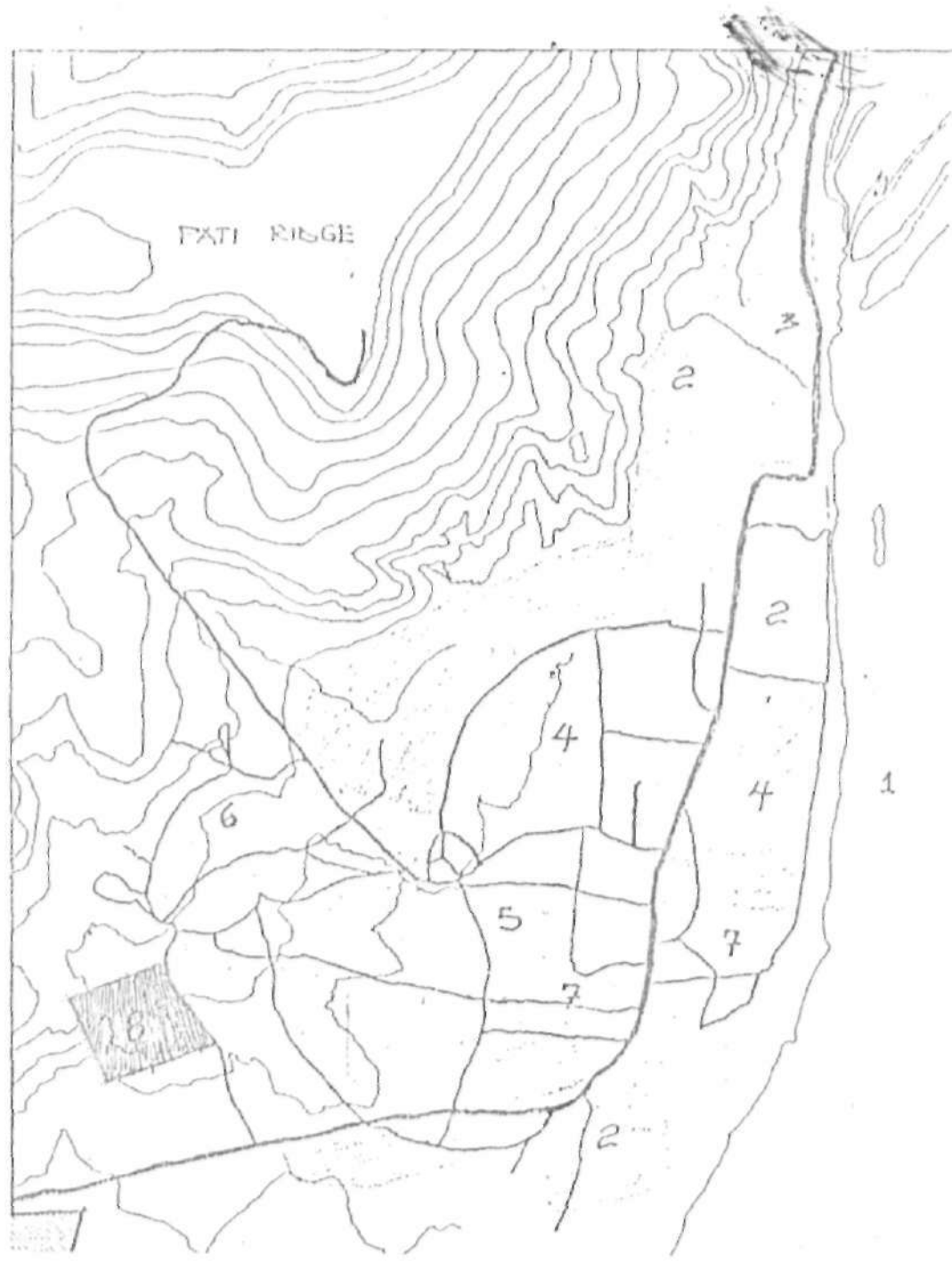


Fig.19 Extract of Lokoja Map Showing the Proposed Site.

LEGEND

1. River Niger
2. Residential Areas
3. Commercial Areas
4. School or Open Spaces
5. Govt. and Civic Buildings
6. GRA
7. Staff Quarters
8. The proposed site

82 8 2

peoples of Oworo, Igala, Ebira and Yoruba origins. However, the fact of the physical location of the town fuelled the interest of European explorers and the missionaries in the area in the early 19th century. This European penetration into Lokoja represents a most significant landmark in the history of the town.

Beginning by the way of exploratory expeditions, the penetration was aimed primarily at exploiting the rich confluence resources as well as finding viable outlets for the growing European industries.

The metamorphosis of Lokoja actually began with the exploratory journeys of Mungo Park, who in 1775, undertook to explore the river Niger. His work was followed up by a Briton, William Baikie, who is still generally associated with the founding of modern Lokoja. He was on expedition in the area in 1854 in the company of Samuel Ajayi Crowther. A treaty was negotiated with the Attah of Igala for the cession of an area within the present day old market for a model farm.

William Baikie further encourage the British people to settle in the town as a base for their commercial activities. He also brought liberated Africans as emigrant settlers and encourages indigenous population. Most of whom were then on mount patti to come down and form a settlement with visitors.

As a result of this Lokoja was catapulted from a transit trading point to a viable commercial centre for European firms in the early 1860s and beyond. The town thus acquired the status of a consulate in 1865 and subsequently became the headquarters of the Northern protectorate in 1900.

Although Lokoja's fame began to decline in 1904, when its headquarters status was moved to Zungeru, which was further North probably due to its centrality. The town

witnessed an upsurge of diverse ethnic groups who settled to exploit the benefits accruing from european activities.

Lokoja is therefore a heterogeneous collection of diverse ethnic groups.

Having found themselves in Lokoja with the same aim, the various African cultural groups formed a single political unit. They still live today mainly in their respective (Anwas) quarters acquired or allocated to them during the early stages of habitation. Those are:

- Hausa - Angwa Rimi, Angwa Kura
- Oworo - Karaworo, or sqalamia leikum
- Nupe - Angwa Nupawa and cantonment
- Bassa-Nge - Adankolo and Lokongoma
- Igala - Kporoka
- Ebira koto - Patankoto
- Yoruba - Shaba yagi.

Today none of these groups live in Isolation, but side by side with pockets of other constituent ethnic groups especially with the population influx resulting from state creation. This explains the absence of traditional and cultural festivals and in part why none is powerful enough to dominate the other. At various times, Lokoja was the provincial, divisional and local government headquarters.

Towards North-West of the town is dominated by a high plateau which is known as the patti ridge. This has an altitude of about 400 metres above sea level.

The town is penetrated by a number of seasonal streams which joint either the Niger or Meme river. Most parts of the town forms an undulating land.

5.2 DEMOGRAPHY

The growth of Lokoja started in 1854 but more rapidly since 1991 when it became the capital city of Kogi state. The population of Lokoja by 1963 was 22,931. It is estimated that it would be about 355,000 by the year 1993.

The active population that is the labour force population ratio is estimated to be in the region of 45 percent of the total population. This ratio is generally high since it is generally accepted internationally that the labour participation can seldom rise to more than 44-45 percent.

5.3 BUSINESS POTENTIALS

The business entrepreneurship of the people has been nurtured and sustained over the years. This has resulted in the establishment of a variety of commercial and industrial ventures. Today, the major occupation of the people includes fishing, commerce, blacksmithing, clay crafting and farming. A reasonable percentage of the population is engaged in civil service work. There are a few number of industries. Lokoja is blessed with both human and natural resources with a good number of institutions. Banking business in Lokoja is quite similar to any state capital of the same status in Nigeria. Five different commercial banks are currently in full operation in Lokoja township. There are some community banks and mortgage institutions servicing the business and official transactions at the state capital.

5.4 ETHNIC COMPOSITION

The major ethnic groups in Lokoja are the Nupe, Yoruba, Igala, Ibo, Igbira and Bassa Komo. The Nupe have cultural and ethnic affinity with the Hausa, while Hausa language

used to be the most commonly spoken in the twon. The Christian population, principally the Yoruba, Igala and Igbo sub-cultural groups are still able to portray their various cultural backgrounds. However, the boundaries between the Islamic life style and the average muslim culture is blurred. The two popular regions of Christianity and Islam are almost equally represented.

5.5 PHYSICAL CONSTRAINTS TO DEVELOPMENT

Lokoja town can be said to take advantage of the stoppy land between the ridges of mount pati and the river Niger.

The terrain is therefore very rugged with developments enmeshed in a system of rivers and their tributaries. All the tributaries emptying into Niger.

The natural morphology always play Keyrole in determining the pattern of the town and the possible future growth direction.

To the North of the town, around the "new market", the Niger to the East and mount patti to the west almost meet to form a bottleneck for development. If the town is to develop or expand North wards. It has to "jump" this bottleneck to open up. Filele and Abuja road areas are not fully integrated into the Lokoja metropolis due to intervening distances. However, the potential for growth is there especially with the sifing of projects like ADP headquarters, mechanic village and the state Trade fair complex. Crossing the river Meme has a constraint. The Southwards development of the town will open up this part to effectively integrate the eastern side of the state. The terrain is not too difficult here. The eastern edge of the town is the river Niger. The prospect of the town crossing the river to form a metropolis with the eastern end is remote.

The river is thus the major constraint to any urban growth in that direction. The area with least resistance to urban growth is the West particularly along the old Okene/Kabba road all through to by-pass.

5.6 CLIMATE OF LOKOJA

Lokoja, the capital of Kogi state has two main seasons; the wet season from May to September and the dry season from October to April.

Each of these seasons is characterised by a specific type of prevailing wind. The wet season brings with it south West trade winds originating from the equatorial belt and blowing from the high pressure zones which occur over the atlantic during this period. The dry season is accompanied by the harmattan, a dust laden wind blowing from the North east.

Lokoja lies in the tropical climate region. Rain normally begin to fall in late March, but maximum precipitation generally occurs towards the end of the season. The dry season with Temperature up to 38% brings draught conditions. The mean annual rainfall in Lokoja averages over 900mm.

5.7 SUNSHINE AND RADIATION

Lokoja, a tropical city experiences allot of sunshine. The hours of bright sunshine are greatest during the months of December, February and March. The average daily sunshine period is about eight to nine hours, while nine hours is the highest sunshine period.

The lowest sunshine is in the months of May, August and September. Radiation brings about glare effect which should be guided against in design. To this and the orientation of the building and possible shading devices should be used to check the problem of glare.

5.8 TEMPERATURE.

The maximum monthly mean temperature is 37.60^{oc} while 19.10^{oc} is the minimum monthly mean temperature. The hottest period of the year is between mid February and mid-April with the maximum and minimum temperature of 38.3^{oc} and 25.8^{oc} respectively.

The temperature graph shows that there is thermal discomfort throughout the year with temperature variation of up to 10^{oc} on the average.

MONTHS	SUNSHINE HOURS
JANUARY	7.0
FEB.	8.0
MARCH	8.5
APRIL	6.8
MAY	5.0
JUNE	7.0
JULY	7.0
AUGUST	6.2
SEPTEMBER	4.72
OCTOBER	5.5
NOVEMBER	7.2
DECEMBER	8.8

Table 4 Sunshine Hours

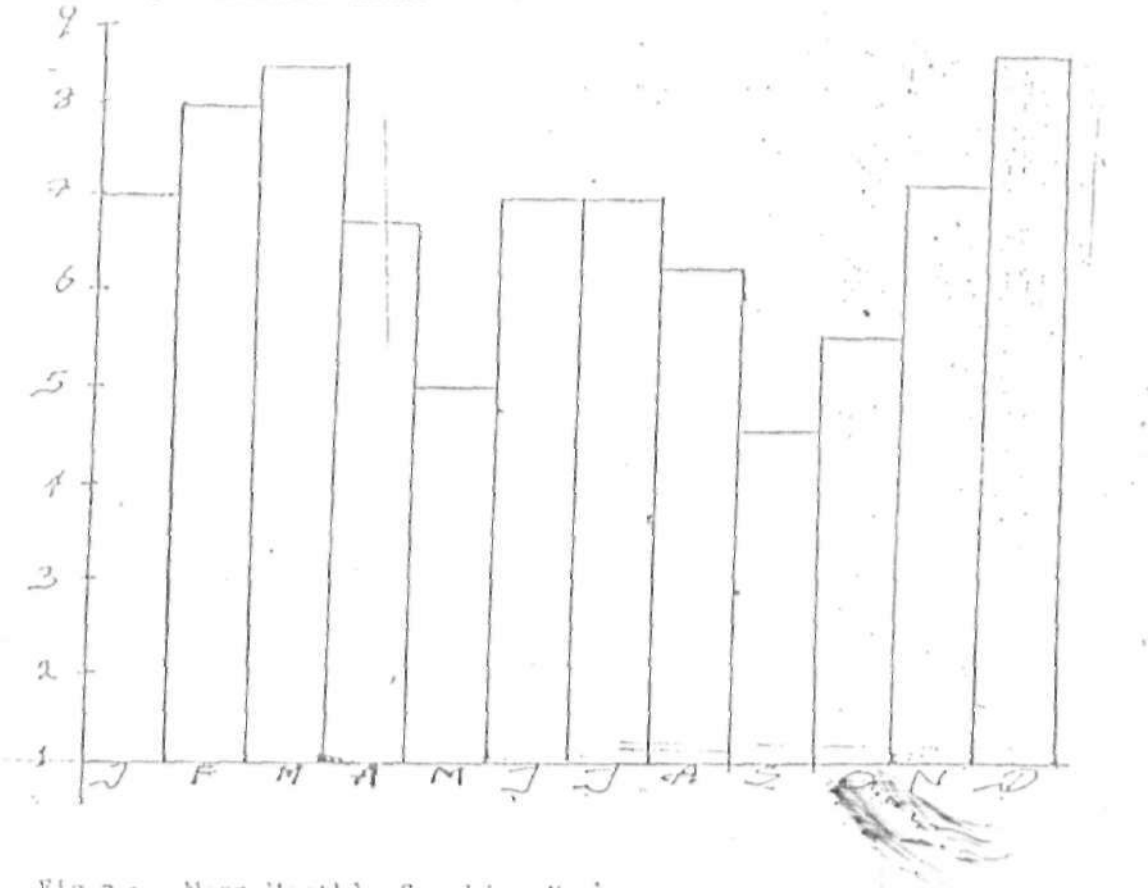


Fig.20 Mean Monthly Sunshine Hours
Source:- NMT Lokoja.

5.9 RAINFALL

Lokoja is within the middle belt area of Nigeria. It has two main seasons which are the wet and dry seasons. The wet season is from March to October while dry season is from November to early March. The highest rainfall is usually recorded between July to September and it ranges between 180mm about 280mm. The lowest rainfall usually occured between November to January and it can be as low as 1.0 - 4.0mm.

5.1.0 WIND

The two most prevailing winds are the North east trade winds which brings harmattan, a dust-laden wind blowing from the desert between the month of November and February and the South-west trade wind which is humid in nature and brings the cool breeze from attantic occan between the months of March and October. This breeze brings about the rainfall.

MONTHS	MAXIMUM	MINIMUM TEMP. °C
JANUARY	34·91	19·10
FEB.	36·60	22.50
MARCH ·	37·60	25·10
APRIL	36·60	25·30
MAY	33·90	24·40
JUNE	31·90	23·50
JULY	30·60	22·80
AUGUST	30·40	22·90
SEPTEMBER	30·70	22·90
OCTOBER	32·20	22·90
NOVEMBER	34·70	21·10
DECEMBER	34·80	20·10

Table 5 Mean Monthly Maximum and Minimum Temp.

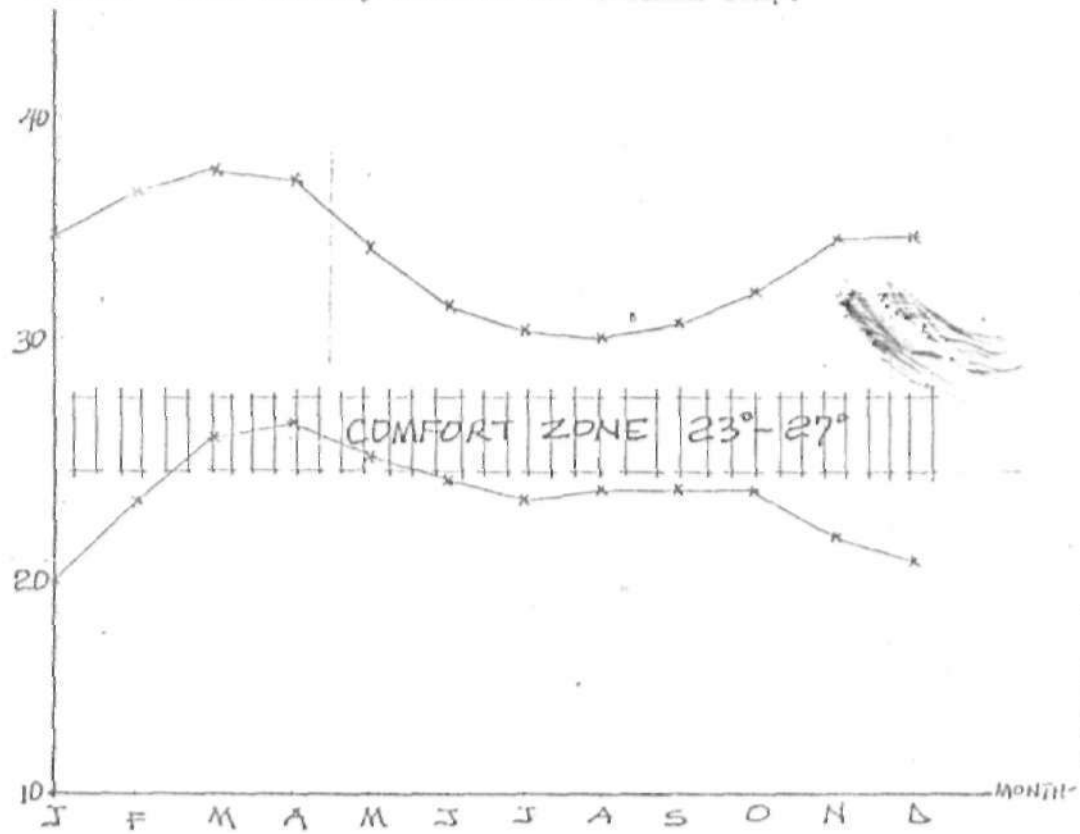


Fig. 21 Mean Monthly maximum and minimum Temp. $^{o}_{C}$

5.1.1 RELATIVE HUMIDITY

Relative humidity in the wet season exceeds 81 percent in the morning. In the dry season, the harmattan winds help reduce the relative humidity from a level of 80 percent to about 65 percent.

5.1.2 GEOLOGY

Lokoja and its surrounding area are underlain by igneous and metamorphic rocks belonging to the basement complex. This complex is composed mainly of granite mica, gneisses and metasediments. The area features a rough terrain with a mountainous landscape and high-lying flat areas, forest and valleys.

5.1.3 SOIL AND VEGETATION

Erosion which is partly due to the general lack of vegetation is very serious in Lokoja. The erosion is preventing the accumulation of soil and exposing the fresh rock surface to weathering. The thin soil cover is derived from endelying metamorphic and igneous rocks.

5.1.4 TOPOGRAPHY

Lokoja town is situated at the confluence of rivers Niger and Benue. It lies on the West Bank of the river Niger at an altitude of 125 metres above the sea level.

MONTHS	RAINFALL (MM)
JANUARY	2·2
FEBRUARY	29·30
MARCH	22·50
APRIL	54·50
MAY	152·90
JUNE	174·50
JULY	272·90
AUGUST	254·10
SEPTEMBER	182·15
OCTOBER	128·8
NOVEMBER	1·0
DECEMBER	4·3

Table 6 Mean monthly values of the daily Rainfall.

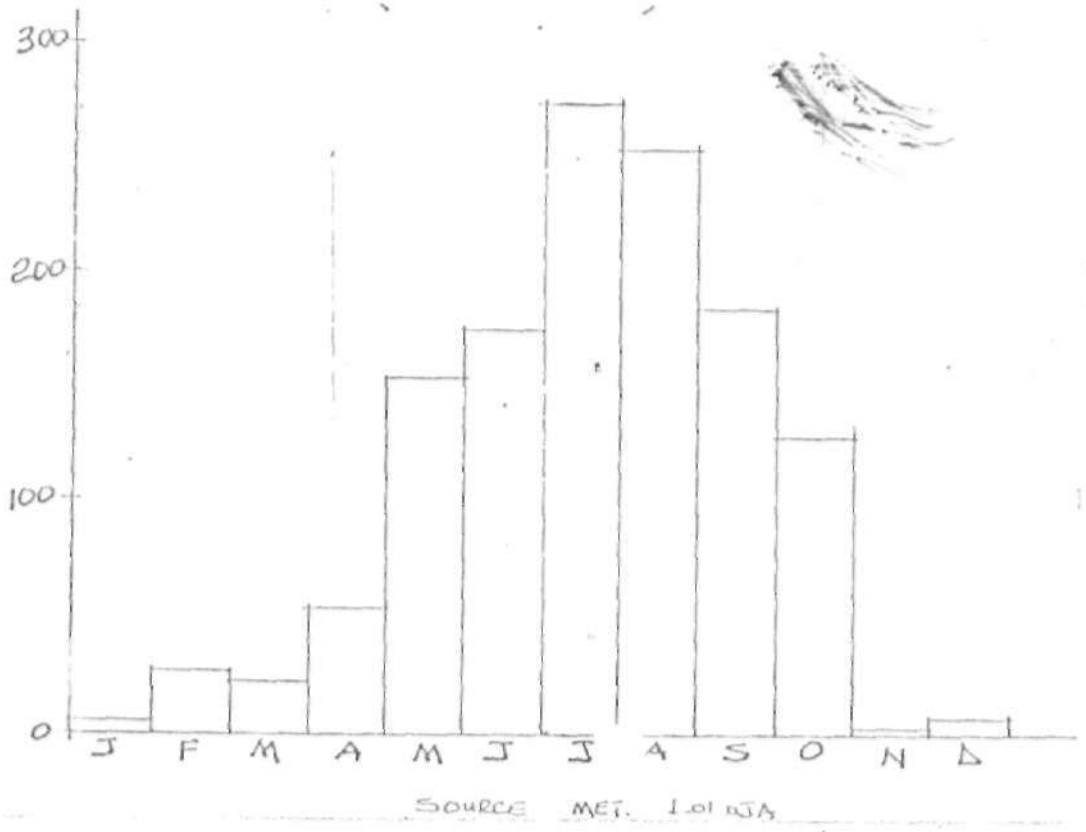


Fig.22 Mean Monthly Values of Daily Rainfall (mm)

CHAPTER SIX

DESIGN CONSIDERATIONS

6.0 IMAGERY AS CRITERIA IN INVESTMENT HOUSE ARCHITECTURE.

To the Architect, as to an average man on the street building of significance are expected to suggest their functions. Some of such buildings expresses their functions interms of tradition and repetition and therefore become a common language, examples are churches, mosques, cinema halls and factory buildings.

But unlike the above buildings. Investment buildings is not easily evolved by expression of facades and configuration of plans.

Presently, from the case studies conducted by this designer several state investment companies occupy rented buildings which were renovated and repartitioned to suit their special needs only. In such situations very little could be done towards evolving an image creating investment building.

However some states like Kwara and Kaduna saw the need to boost their corporate image and commissioned corporate headquarters. By so doing these state succeeded in carving out an identity for themselves through architecture. For the purpose of image boosting such building were highrise, elegant, attractive and imposing to create the desired confidence in investment business. In a nut shell, imagery in investment building could be achieved through extensive use of concrete, glass and steel (curtain wall) at a very strategic location. It is important to note that the site location has an added advantage in image creation within commercial circles.

6.1 CRITERIA FOR SITE SELECTION

- government policy statement on urban development and renewal efforts favoured the site that was meant for public use especially for commercial and office purposes.
- To explore the natural endowment of the site in terms of human traffic and high business transactions that strive in the area.
- The location of the site within the up coming business district of Lokoja is an added advantage.
- The site being bounded on two sides by streets greatly help out in its accessibility.
- the site is sloppy North wards. The design is intended to be integrated to take full advantage of the site situation.

6.2 RESTRICTIONS ON SITE

- From the site plan apart from the fact that the site slopes towards the north there seems to be enough land for immediate and future use.
- Vehicular movement around the site is however fairly high and this is expected to increase as the city develops. For this reason efforts has to be made to reduce traffic congestion at the entrance to the building site.
- Inview of the climatic condition of Lokoja. the type of shading devices to be used has to be studied to ensure effectiveness.
- The height restriction around this area is a maximum of 12 storeys. This will be strictly adhere to by the designer.

6.3 CIRCULATION

- In a building Complex of multiple functions, there is bound to be various security problems. There is the need to control and monitor staff, customers and visitors - coming in and out of the building premises.
- It is important to consider circulation requirements of the various groups of functions that take place in the building. It is possible that lettable office spaces can be more frequently used by the public depending on the type of activities allowed to be accommodated. It is quite desirable to separate such activity areas from the bank branch.
- Personal safety of the investment company staff and that of bank branch or any other occupant for that matter should be taken seriously.

It is therefore desirable to direct visitors to a common Lobby which is usually manned by receptionists and security agents to provide the needed functions.

To avoid wandering within the building premises, direct, defined and unfragmented external circulation is being conceived. Separation of vehicular and pedestrian access are desirable.

To enhance and facilitate security measures, separate and direct bullion entrance is created. Well resolved circulation also will help in achieving easy and effective surveillance work by the security personels.

6.4 ESCAPE ROUTES

In the event of fire outbreak and subsequent panic situation that follows, escape routes become very desirable for the evacuation of occupants to safety.

In highrise buildings, major components of escape route consist of unobstructed circulation spaces and well positioned escape stairs.

The requirements for means of escape are summarized as follows.

- Maximum travel distance with escape possible in one direction only 12.2 metres except for on the ground and first floor when it may be 30.5 metres.
- Maximum travel with escape possible on alternative direction 46 metres with no point more than 12.2 metres to nearest exit door.
- Maximum distance between two adjacent exits from a storey - 61 metres. At least one fire fighting stair is required in buildings with floor over 18.3 metres above ground level.

Such stair should be:-

- continuous throughout the building.
- Have access at ground level direct to open air.
- Have openable windows at each landing level.
- Have permanent ventilation at the top of the enclosure of minimum 5 percent of enclosed area.
- Have protected and ventilated lobby at each floor.

Source: Olaitan J.O. Trade bank corporate headequarters unpublished M.Sc. Thesis 1994

THE OFFICE BUILDINGS

The modern office building is unique and has special characteristics that distinguish it from other structures. The characteristic features of the modern office which differentiate it from all others is the audience it stands to serve. In a way, it is a symbol of ultimate achievement of the machine age. K.H. Riphan in his book office Building and layout said office is "a building which serves as administrative and planning centre for a machine society and a building in which machines themselves are relatively in significant".

Office buildings are the largest and most complex structure ever built solely for human beings and to respond to their changing needs. An office building should be built around the functions it houses. An office should be planned so that its spaces are broken down into separate units which still function as a cohesive whole. Spaces should be flexible such that the size and grouping of units can be carried out when the need arises. Office should be a building adaptable to interior changes (K.H. Riphan). The office building by a new concept must allow for extreme fluidity within its walls, and more often today must also be building so that future additions can be made to the building itself.

Conclusively, the new science of office space planning and administrative includes - The new dimensions:

- The new possibility for open and unbroken space made possible by technological advancement.
- The need to handle large groups of people with visual contacts in large areas of space to get the best possible efficiency called for the best possible patterning.

6.6 FINANCING THE PROJECT

Though, Kogi State investment Company is wealthy owned by the state government. The company has a fairly strong cpital base due to the assets that were transferred to the state from Kwara and Benue states apart from state grants.

The Financing of this proposal shall be a joint venture between Kogi state Investment Company, Kogi foundation with the state government making the largest contribution. Kogi Investment Company shall however be the client and therefore be responsible for the management of the project both during and after construction.

6.7 TYPES OF OFFICES

Two categories office buildings exist. Custom builds and speculative builds. Custom built is when an organisation decided to build or develop an office to occupy itself and meet her set of requirements. This type of office is specially designed to meet the organisation's need and ought to reflect the image of the organisation atimes.

Speculative as its name implies is a design type not tailer made for a specific organisation. This is a kind of development built and given out in rentage. The building is designed to attract largest possible range of interested tenants. However all office designs have basic principles.

i. **THE SHEEL:-** This is the type of office that is design to meet the needs of the organisation concerned. When this type is maintained the design has to be handled in such a way that it will be able to meet and satisfy the numerous and varying needs of the organisation. the structure is expected to last as long as the building will be useful.

ii. **SETS:-** Constant re-arrangement of office scenery to meet changing short term needs of an organisation with the scale of time atimes measured in weeks. Scenery elements are being positioned and re-positioned constantly to reflect the short term changes that might have been reflected within the organisation. The scenery elements include desks chairs, screens and partition which are done to meet immediate needs.

iii. **THE SCENERY:-** This last as long as the tenancy of the building still exists. Furniture, interior fittings are designed to organisation's taste and requirements. Scenery is always in existence as long as tenancy or lease is still in existence and it is expected to cover a reasonable number of years.

There have been developments in office buildings which have seen long term shall diminishing as short term scenery especially furniture, which absorbs more and more functions, carrying services, visual and acoustic, separations and decorations are now frequently achieved by

6.8 OFFICE SERVICES

The discovery of telecommunications equipment and office automation has greatly led to high demand for services in office which in rapidly increasing at proportions that has to be taken seriously. Co-axial cable access for terminals are often required in most co-operate offices to today. This is very vital in order to provide grid to which each work station can have easy access without dangerous trailing wires. Such grids are:-

i. Distribution through floor grid are at 1800-200 centres and its suitability and adaptability to services requiring small diameters is highly recognised.

ii. Distribution through perimeter and partition walls. This is however, suitable where shallow space and services are incorporated into shell and it is quite economical.

iii. The creation of false floor is often another diamension taking towards effective servicing in other design. The height of service duct could be between 50-500mm. This is adaptable to any kind of office space. The only demerit with this system is provision of double floor which could be expensive.

iv. The distribution through fin walls is another common approach in office servicing. Points are at desk top height and they are suitable for people working in small clusters in a deep office space.

v. Distribution through false ceiling is also highly practicable. the mode of servicing is flexible and adaptable to any kind of space. The only problem with this system is safety if not properly detailed. This is widely used and more economicall than false floor servicing.

6.9 Acoustic Considerations.

Many acoustical problems in buildings can be avoided by considering the broad requirements early in the design process as rectification and adjustments made later are rarely satisfactory or economical.

I. Hall shade

For very large auditoriums depending on the use to which it will be put, the shape or form plays very significant role. If the auditorium will serve for speach making, the horse-shoe or Fan shapes are usually very satisfactory.

II. International Noise Sources

Because effective noise insulation is often impractical and usually costly, nose generating areas should be sited away from noise-sensitive areas. In modern non-industrial buildings, the mechanical plant room is likely to be the noisiest area hence buffer zones formed by corridors, storage areas or landscapped open spaces are useful as control measures.

III. External Noise Sources

The most disturbing kind of external noise affecting buildings is transport noise from road vehicles, aircraft or railways.

An essential characteristic of such sources is that they are not generally under the control of those affected by their noise. It is hence essential to zone noise-sensitive areas away from such sources.

IV. Impact Borne Noise

Noise is transmitted through the material on impact. This is affected by the density of the materia in question. The denser the material, the lower the

transmission. For building purposes, concrete is the most suitable material against impact-borne noise.

V. Air-borne Noise

the sound is transmitted through the air. This is generally affected by openings. Any form of opening in a partition will seriously impair sound insulation. Consideration will hence have to be given to such openings to reduce noise.

6.1.0 Structural sound Insulation

(i) Floors: An acoustic problem associated with floors is the direct structural excitation of a hard surface floor by footsteps. Thick carpets are an acceptable solution. where not feasible, a floating floor must be used if footstep noise is to be avoided in the room beneath.

Airborne sound insulation of a floor can be improved by suspending an impermeable ceiling below it, but the improvement is often limited by structural limitations on its weight and height.

(ii) Walls: The materials used for the wall and its thickness are primary factors in sound insulation. Sound absorbing materials such as wood slats and thick curtains can be used in conference halls or committee rooms.

6.1.1 Terminologies in Institutional Architecture

The efficiency of office buildings is usually measured in terms of ratio of usable office area to gross area of building.

- Usable Area (Workplace Area) These are spaces in which it is possible for people to work at desk. It includes secondary circulation.
- Special Areas. These are spaces which cannot be used by office workers, but is dedicated to particular functions e.g. archives, Restaurant etc.

- Core. A core is a space needed for the support of the building e.g. lifts, stairs, ducts, lavatories, lobby and receptions.
- Gross Outside Area (GOA). This is the sum of all constituent office Areas including core, structure and perimeter walls.
- Net Usable Area (NUA). This is the area that remains when core, circulation space, like corridors structures and perimeter walls are substracted from gross outside Area (GOA). Core in multi-storey office building should occupy no more than 20% of the gross outside area. Primary circulation usually take up between 10-15 percent of net usable area.

6.1.2 SECURITY CONSIDERATIONS IN DESIGN OF MULTI FUNCTIONAL COMPLEX

In view of the technological development of our time, investment houses now carry more responsibilities and more image concious. The traditional fortress - like look to enhance security has now been blended with architectural fantancy and imagery.

For a developing Country like Nigeria and an up-coming state like Kogi state cash economy still serve as the major means of financial transaction.

Gynonymous with economic growth in Nigeria is the growth in crime. The increasing sophistication of crime especially armed robbery require serious attention in terms of effective surveillance in banks and other commercial buildings.

Security problem shall be discussed inder two major headings:- operational security problems and physical security problems.

I. PHYSICAL SECURITY PROBLEMS

Crimes interms of robbery and burglary can be carried out during or after working hours. Control problems and effective surveillance concerning the visitors,

customers and staff movement during operating hours in around the building premises shall be addressed by the author.

Though effort shall be made not to discourage public patronage of the various commercial services.

II. OPERATIONAL SECURITY PROBLEMS

In bank design, the location of important functional areas such as strongroom, bullion park, safe and vault, bookroom, archives, tellers (cashier counter) note counting room poses serious problems. All the areas mentioned have to be located strategically to facilitate effective auditory and visual surveillance.

The last here for the architect involves satisfying the security requirements as well as the desired circulation flow of various functions.

III. FENCE

Adequate provision for fencing shall be made the question of providing solid or semi solid fence and the height for security considerations shall be addressed since intrussions through the fence is possible after business hours.

IV. PARKING

Provision of adequate customer and staff parkings is very vital. Easy entrance to the complex. Inview of the multiple functions to be accommodated is a design problem to be addressed.

V. ENTRANCE LOCATION

The task here involves making of seperate entrance for staff of Kogi state Investment Company of shop owners, Bank branch and their various customers.

VI. BULLION ACCESS

Access to the bullion and from bullion to bank need to be short fast and uninterrupted by traffic. For this purpose, a low density traffic route shall be considered. The author shall not resist possible changes if the need do arise.

VII. PEDESTRAIN ACCESS AND CIRCULATION

Direct access to the halls may not be the best. Controlled entrance lobby with security devices is essential to monitor and direct public movement in and out of the building.

VIII. GATE HOUSE

Problems associated with gate House are synonymous with fencing. Forceful entry into the building premises can be controlled by Providing only few accesses with security gate house. One major problem for consideration here has to do with multiple usage of the building. The control of customers, visitors, banking staff and other private staff occupying lettable office spaces become difficult during and after operating hours.

Effort shall be made to limit the number of access to the premises for security reasons.

6.1.3 SCHEDULE OF ACCOMMODATION ADMINISTRATION

UNIT	NO. REQ	UNIT AREA	TOTAL AREA	SCHEDULE ACCOMMODATION	NO. REQ.	UNIT AREA	TOTAL AREA	UNIT	NO. REQ.	UNIT AREA	TOTAL AREA
Managing Director C.E./Toilet	1	m^2 48	m^2 40	Audit Assistant	1	24	24	Engineers	2	30	66
				Senior Executive				Q/S	2	30	66
Private Secretary	1	24	24	Officers	2	24	44	Builders	2	30	66
Personal Assistant	1	36	36	Account Clerks	2	24	48	Tech. Officers	4	20	86
Manager Admin.	1	36	36	General Office	1	36	36	Studio	1	48	48
Company Secretary	1	36	30	Store	1	3630	30	Sec/Waiting	1	30	30
Secretary/Clerk	1	24	24	Total =			$324m^2$	Stores	1	24	24
General Office	1	36	36	**INVESTMENT DEPARTMENT**				Total =	Total		$458.0m^2$
P.E.O	3	24	72	Investment Manager	1	36	36				
Board Room	1	72	72	Investment Executives	3	30	90	Lettable Space			
General Store	1	30	30	P.R.S Officers	3	30	90		=		$1,200m^2$
	Total		360	Marketing Officers	2	30	60	**BANK BRANCH**			
				Purchasing Officers	2	30	60	Managing Director/ Toilet	1	40	40
FINANCE DEPARTMENT		m^2	m^2	General Office	1	30	30	Secretary	1	24	24
Finance Manager	1	36	36.	Store	1	24	24	Pers. Assistant	1	24	24
Chief Accountant	1	30	30	Total=			$390m^2$	D.G.M. Operation	1	30	30
Deputy Chief Accountant	1	30	30	**PROPERTIES DEPARTMENT**				D.G.M. Corp. Dev.	1	30	30
Sec./Waiting	1	36	36	Property Manager	1	36	36	Banking hall	1	144	144
Internal Auditor	1	30	30	Architects	2	30	60	P.R.O. Total=	1	30	30 $322.m^2$

SCHEDULE OF ACCOMMODATION

UNIT	NO. REQ.	UNIT AREA	TOTAL AREA	UNIT	NO. REQ	UNIT AREA	TOTAL AREA	UNIT	NO. REQ.	TOTAL AREA	TOTAL AREA
SHOPPING MALL		m^2	m^2								
Lockable Stalls	44	20	880 m^2								
SUPPORTING FACILITIES											
Restaurant	1	216	216								
Kit./Store	1	72	72								
Reception/Lobby	1	60	60								
Telephone	1	15	15								
Conference Hall	1	320	320								
Parking	112	18	2,016								
Grand Total			5,333.0m^2								

CHAPTER SEVEN

DESIGN REPORT

7.0 INTRODUCTION

This chapter dwells extensively on the detailed description of the design proposals interms of space logistics and concepts. Design task forms the main basis for evolving a scheme that satisfies the objectives and aspirations of this thesis work. The satisfaction of the users needs in terms of space and thermal comfort are important factors to be considered in the design proposal that aims at providing befitting corporate building for Kogi investment company.

7.1 DESIGN TASK

For the purpose of this thesis the following are the design tasks.

- provide a befitting expression of corporate architecture that is capable of projecting the corporate image of Kogi investment company and investment potentials of the state in general.
- To evolve a design proposal that its functionality does not depend on artificial means of thermal control but just as an alternative to natural means of ensuring thermal comfort in the building.
- To offer a proposal that could boost the revenue drive of the company through rent collection from speculative users.

7.2 SITE PLANNING

The acces into the site through Lokoja - Kabba road has been analysed to be the strongest point from which the complex can be visually appreciated. But for safety purposes

the main access is to be tapped from the less busy commissioner road from where two sets of parking spaces are accessible. The main visitors and staff car park. Drop off point at the main entrance canopy is necessary in bad weather before parking. Pedestrians come in via two bustops on both major roads few metres from the junction. From here paved wolkways lead accross well landscaped lawns to the main entrance and other access points. Service entrance is along Lokoja-Kabba road.

FUNCTIONAL RELATIONSHIP

The individual functions within each zone are articulated to attain a convenient flow diagram in relation to one another. Such functional spaces are designed such that they can be independent of other zones. As a result, the complex is such that the corporate Headquarters and the Bank Branch can function as independent entities.

This approach allows for separate management in-line with the commercial nature of the project. All the public serving areas are located at the ground and first floor level including the bank branch and shopping malls for easy access.

7.4 DESIGN CONCEPT

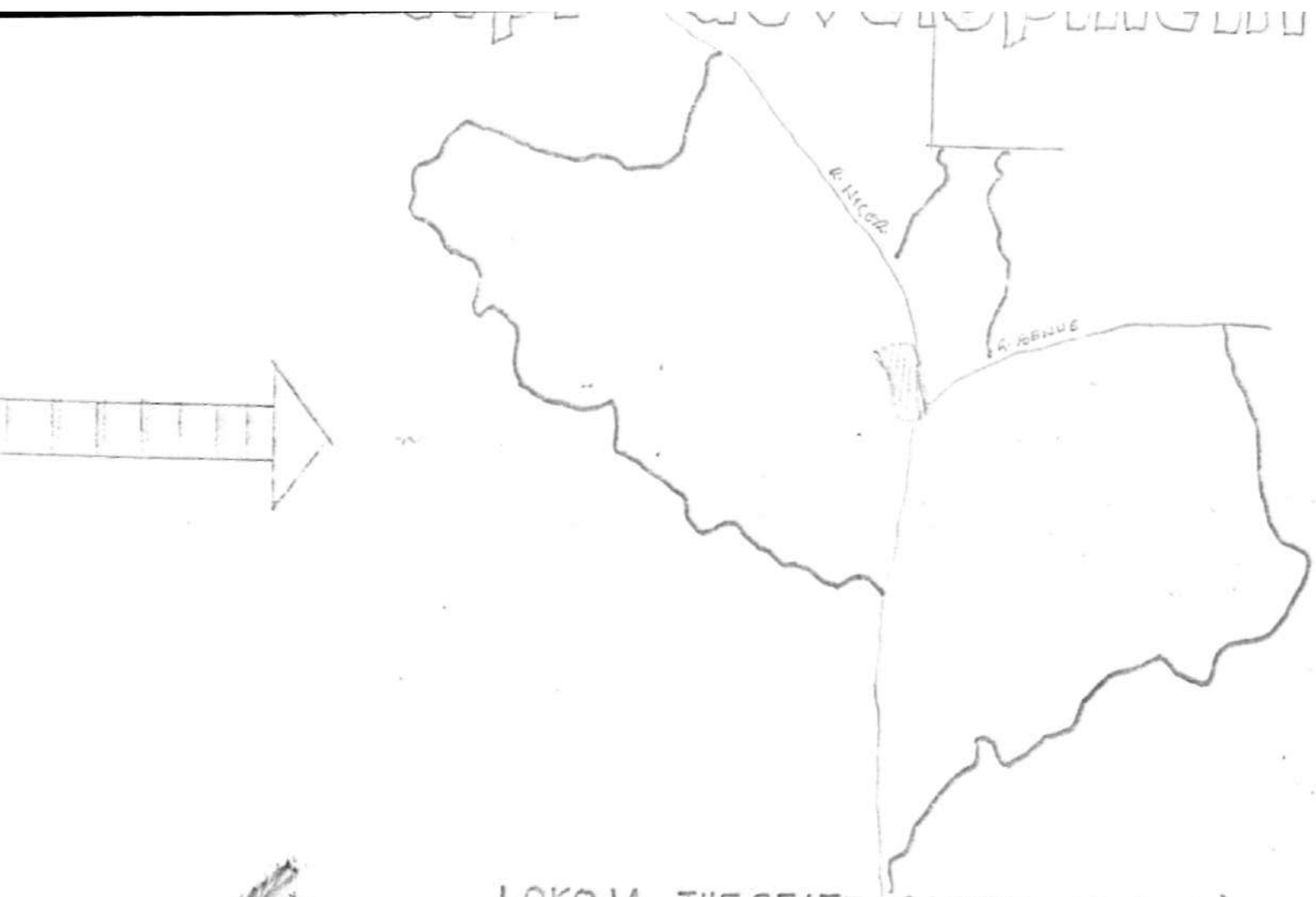
In any architectural endeavour it is important for the designer to be mindful of the architectural expression that is being put across to the society. Forms and concepts serves as the means by which space is perceived and experienced. It is therefore expedient to assess and discuss it in any piece of architecture. It is also worthwhile that concepts should take its roots in familiarity or identification with the environment within which the project is to be located.

After analysing the environment, including the confluence which is the most important landmark in the state. A concept reflecting the coming together of the people as the case of the confluence is adopted. The nthnic groups and made up the state are the Igalas, Ebiras, Okuns and the minorities. These people came together for common economic progress and development. The three segments of the design represents the three enthnic groups with the minorities at the centre. This composition was harmonized by the designer to symbolise strenght, stability and reliability in business transactions of the company. One of the major design task of this thesis is to promote the investment image of the company. This shall be giving due consideration on the elevation.



THE CONFLUENCE IS THE MOST OUTSTANDING LANDMARK IN KOGI STATE
IT IS OF HIGH ECONOMIC POTENTIAL TO THE STATE.
THE STATE IS HIGHLY IDENTIFIED WITH THE CONFLUENCE.

EBIRAS

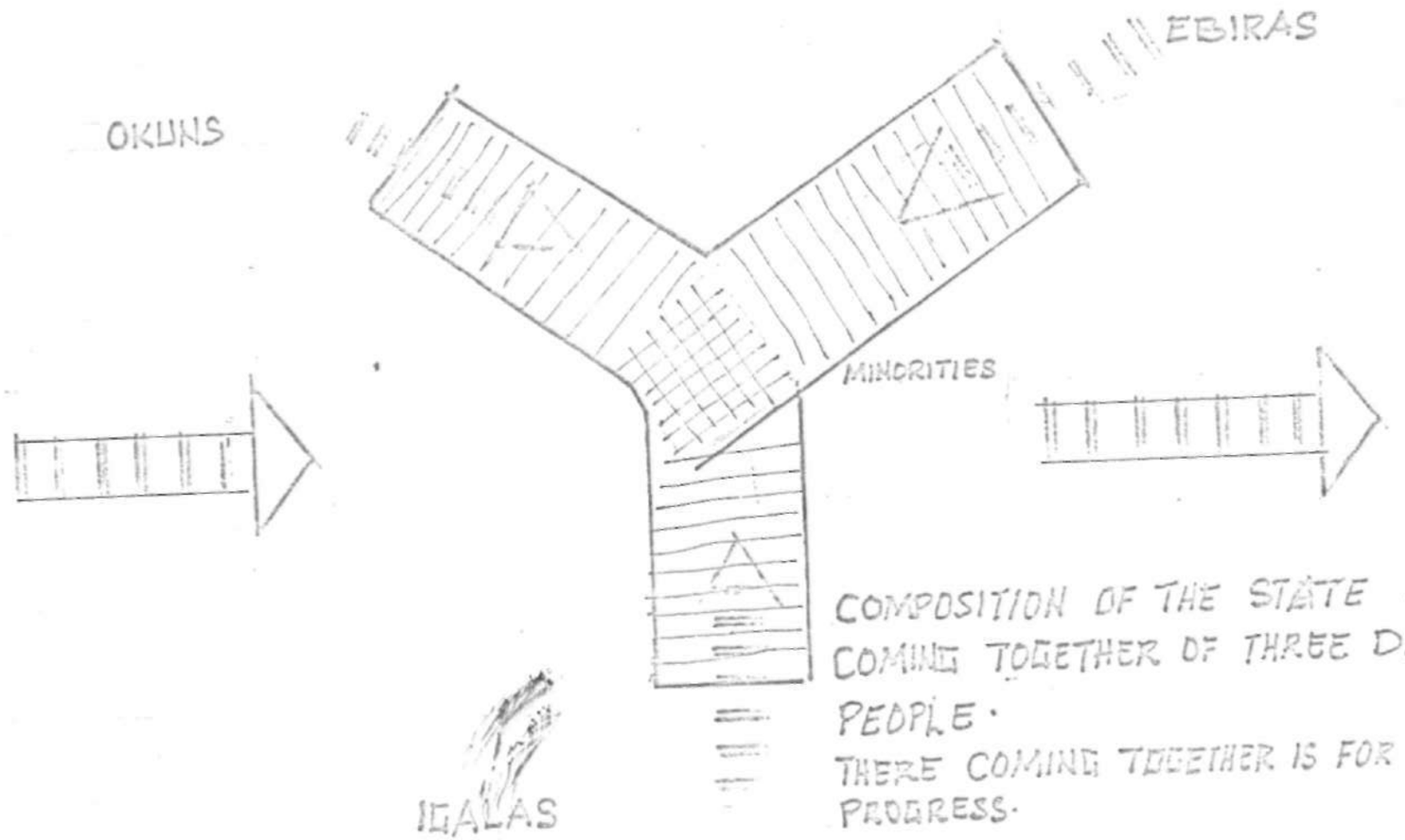


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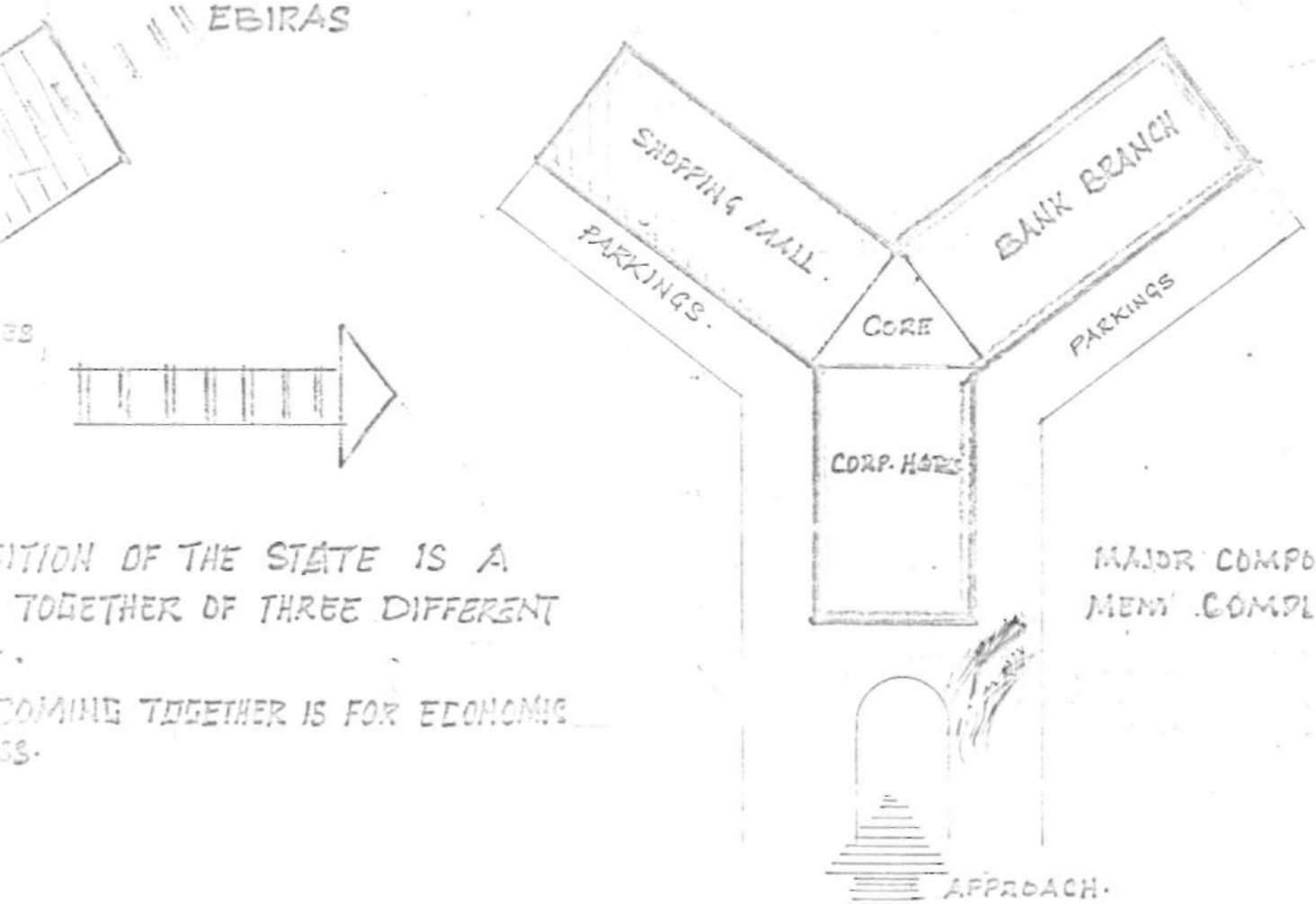
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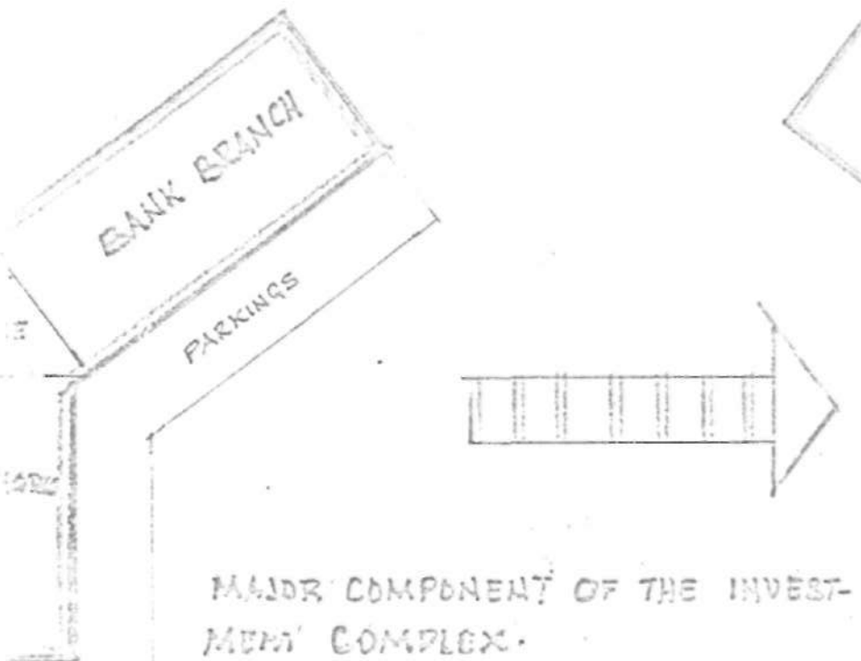


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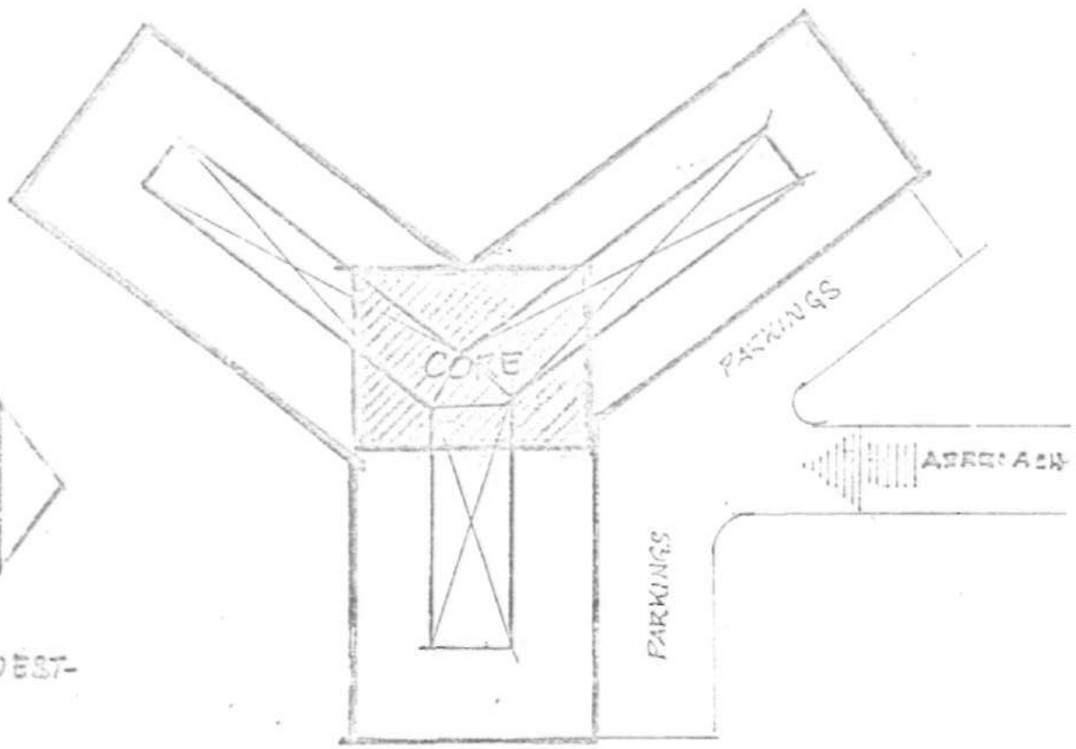
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MENT COMPLEX.

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MAJOR COMPONENT OF THE INVESTMENT COMPLEX.



ADOPTED CONCEPT; INTROVERTED TO AVOID DOUBLE BANKING, INVIEW OF CLIMATIC CONSIDERATIONS

APPROACH.

HOUSE, LOKOJA.

NAME	FALADE T.S.
SCHOOL	DEPT. OF ARCH A.B.U. ZARIA
SCALE	SEPT.

STRUCTURES AND FABRICS

The structure proposed is essentially that of reinforced concrete frame system consisting of reinforced concrete columns, beams and floor slab Sandcrete blocks and curtain walls where used are adopted as non load-bearing cladding and partition materials respectively.

Considering the available technology in the construction industry in Nigeria today, and the commercial viability of the project, moderate wall finishes are recommended. Such finishes includes mosaic tiles and marble tiles to a moderate extent especially at the public areas like service core, entrance and reception areas.

High pitched roof is used to avoid leakage as well as creating the desired effect in sympally with the surrounding architecture. The use of concrete roofing is highly minimised for economy, maintenance and thermal control.

The complex consists of three main blocks separated by settlement joints:-

- 30 metre long east and south shopping malls
- 30 metre long North-west bank branch
- 24 metre square central core.

7.6 SERVICES

A network of utility services are already available on the two erterial roads that access the site. Such services include water supply, electricity and telephone lines. The proximity makes connection of lines easy. To create good water head pressure for better supply, overhead reservoir is proposed with pumping station at ground level.

7.7 FIRE CONTROL

For efficient fire control in the building, certain precautions have been taken during the design stage. This include the reduction in the use of combustible materials like timber trusses, timber and synthetic cladding materials. Fire rated doors are proposed for use in fire-prone areas. Compartmentalisation of fire-risk area like the basement floor is adopted to check fire spread. Fire alarm device and wate sprinkler systems are proposed for the building functional areas.

Areas like stair halls, lobby, kitchens, basement that are susceptible to fire incidence are to be provided with smoke detectors, water hoses and hydrants are located at reasonable and conspicuous intervals.

7.8 FIRE ESCAPE STAIRS

For the provision of escape stair to be effective the following requirements were conformed with:

- the travel distance between exit point in the building is minimised.
- the escape stairs are continuous throughout the building height.
- they have access at the ground level direct to open air.
- they have openable windows at each landing with permanent ventilation at the top of the enclosure.
- the passages to the escape stair are free, uninterrupted with levels and free from all encumbrances.

7.9 DRAINAGE AND SEWAGE DISPOSAL

The drainage pattern has been dictated largely by the topography of the site. The general slope is towards the north with vertical difference of 3.2 metres between the highest and the lowest points respectively. Drains of adequate size to cater for a quick disposal of surface water has been proposed. Adequate perimeter drains of the site is also well considered. Apart from rain water drainage, provisions were also made to dispose off liquid wastes from sinks, lavatory, basins and excrements. The use of ducts for drains, sewer treatment chambers like soakaway pits and septic tanks have been provided where necessary. Inspection chambers/manholes are also provided to facilitate drains clearing.

7.1.0 AIR CONDITIONING

Unitary and split Air-Conditioning system are proposed. Easy maintenance and handling are more assured. Split Airconditioners are recommended for banking halls and where large gathering of people is expected. Board rooms, computer rooms and restaurants are such functional spaces that require split air conditioners.

7.1.1 DESIGN COMPONENTS

For a modern office complex and corporate premises to be feasible and viable, available standard data revealed that at least 70 percent of the built-up area shall be available as useful office spaces. The remaining 30 percent of the built up area shall account for services and circulation. Corporate headquarters typical of an investment building consist of various functional units. These units have been synthesized to produce a whole complex.

The distribution and description of the components and their relative positions on the site are as follows.

7.1.2 THE CORPORATE HEADQUARTERS

The headquarters of Kogi Investment Company is accommodated on the 7th 10th floors of the building.

It is centrally located between the segments that made the confluence configuration. The approach made the corporate office prominent and highly visible. It radiate and overlook the interesting scenery of the environment including the patti hill.

7.1.3 BANK BRANCH

The bank branch forms a very prominent component of the complex. It has a rectangular form consisting of a sub-basement. All important security functions of the bank branch, such as the bullion park, vault, achieves, bookroom and safe deposit room are located in the sub-basement. The bank hall is located on the ground floor while the administrative office for the bank is located on the first floor. The fire hydrant room and other technical installations are located at the sub basement.

7.1.4 SHOPPING MALL

The shopping mall is located on the south-west and eastern axis of the scheme. The shopping malls are designed as a variety of retail shops, stores and other related facilities which are integrated as an entity. This is to give maximum shopping convenience to the traders and shoppers thereby creating maximum exposure to the merchandize and thus improving the level of commercial activities at the state capital.

7.1.5 BASEMENT FLOOR

This houses the bullion park and executive parking for bank branch. All important security functions of the bank branch, such as the bullion, vault and achieves etc are located in the basement.

7.1.6 SERVICES CORE

The importance of service core in highrise buildings can not be over-emphasised. It is a critical aspect that 9 designer must put in order. This is because it serves as a yardstick for assessing success or failure of any high rise design. After a careful study of various core locations available in the design of multi-storey office buildings. The designer decided to choose the most suitable for the scheme, considering ease of maintenance and cost. The designers choice is the single zone pheripheral core location which ensures adequate ventilation of lavatories.

7.1.7 MAINTENANCE AND MANAGEMENT

Property management has become so important that it has to be addressed. Contracting the management and maintenance to professional bodies appear to be viable solution, which is recently being adopted. A periodical maintenance of the building is to be organised and specifications of the architect strictly adhered to.

It is necessary that this building takes a comprehensive insurance policy as recent event of arson on public buildings has shown.

7.1.8 EXPRESSIVE GLASS FORMS

It has been long in tradition that glass is regarded as prestigious material for use on buildings. Quite a lot of examples of such abounds in our midst today especially in the corporate buildings. Glass, steel and concrete are material elements of international style and their combination has high expressive power as evident in buildings such first bank building, Lagos, I.M.B. Plaza Lagos Femi Johnson House, Ibadan etc.

Different forms and qualities exist in practice but the most likely to be chosen by this designer is that which expresses the spirit of present trends and have capacity for thermal reflection.

7.1.9 ELEVATIONS

On elevation projections, emphasis was placed on visual impression to be received by an observer.

The elevational composition is basically the integration of verticality cut into by horizontality and combined with minimum expressive use of glass to give good and befitting visual impact. The spreading nature of the segments is to symbolise stability and reliability.

The facades are welcoming and expresses hospitality of the state, while portraying vernacular architectural image of the state and her people.

CHAPTER EIGHT

8.0 SUMMARY

The process of producing a design that will satisfactorily meet the needs of the Kogi State Investment Company and other occupants with regards to ensuring thermal control made case studies of existing similar buildings meritable.

An attempt has been made towards achieving certain aspired goals which will serve as a yard-stick for measuring the success of the scheme. The problems relating to climatic control in public buildings in hot humid environment were identified in the case studies taken, and possible solutions were sought for them.

The primary objectives of the design are:-

I. To provide an office building that will efficiently accommodate Kogi State Investment Company.

II. To boost the corporate image of the company to ensure patronage from the public.

III. To provide lettable spaces for speculative office users.

IV. To source revenue for the company for alternatively and to provide conducive investment data centre for the public and private initiatives.

The problems relating to shopping malls, bank branch and office complex were identified and as far as possible architectural solutions were sought for them. The thesis has looked into thermal controls in public buildings and how spaces despite their diverse activities relate to one another and at the same time meet the users requirements. The thesis has shown that corporate architecture is generally made of monumental buildings with some traditional pecularities in a given environment.

To make sure the building is in conformity with the local setting, a regional and site analysis was done to make sure the design suits the local climate.

The design was made taking into consideration the clients needs and standard requirements, for effective and condusive operation in an ideal office environment as well as site demands. It is my belief that the design will meet the taste of Kogi State Investment Company.

8.1 CONCLUSION

This thesis work has succeded in being a proposal based on the organisation and arrangement of different functional spaces with thermal control considerations to form a cohesive whole. At the same time creating an impressive image for the various activities in a condusive human environment. Finally, it is hoped that this contribution to knowledge will serve as a reference medium in the design of public building especially with emphasis on natural means of thermal control in hot and humid environment. The thesis has been of immense intellectual enjoyment, producing new discoveries and addtions to knowledge.

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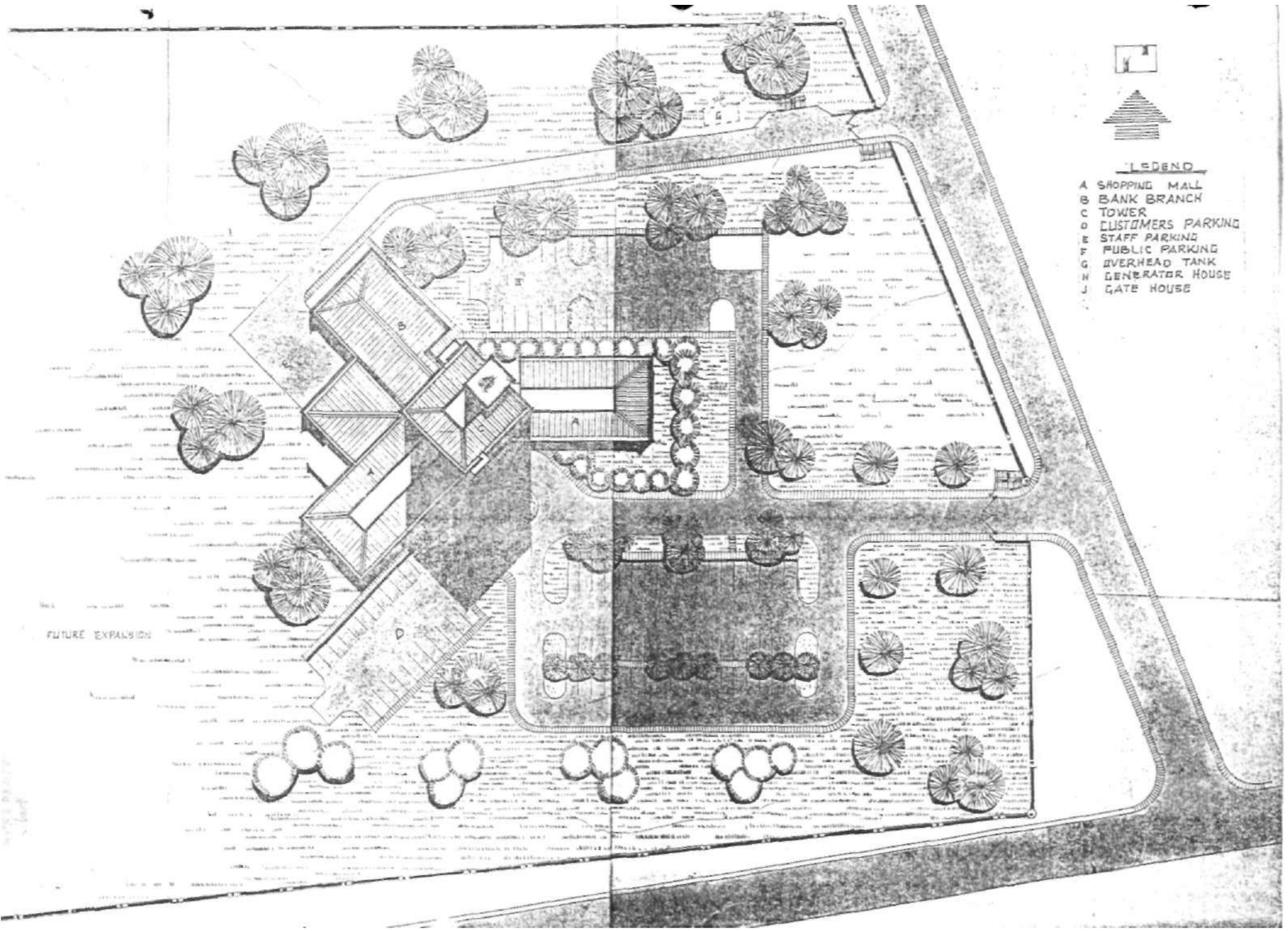
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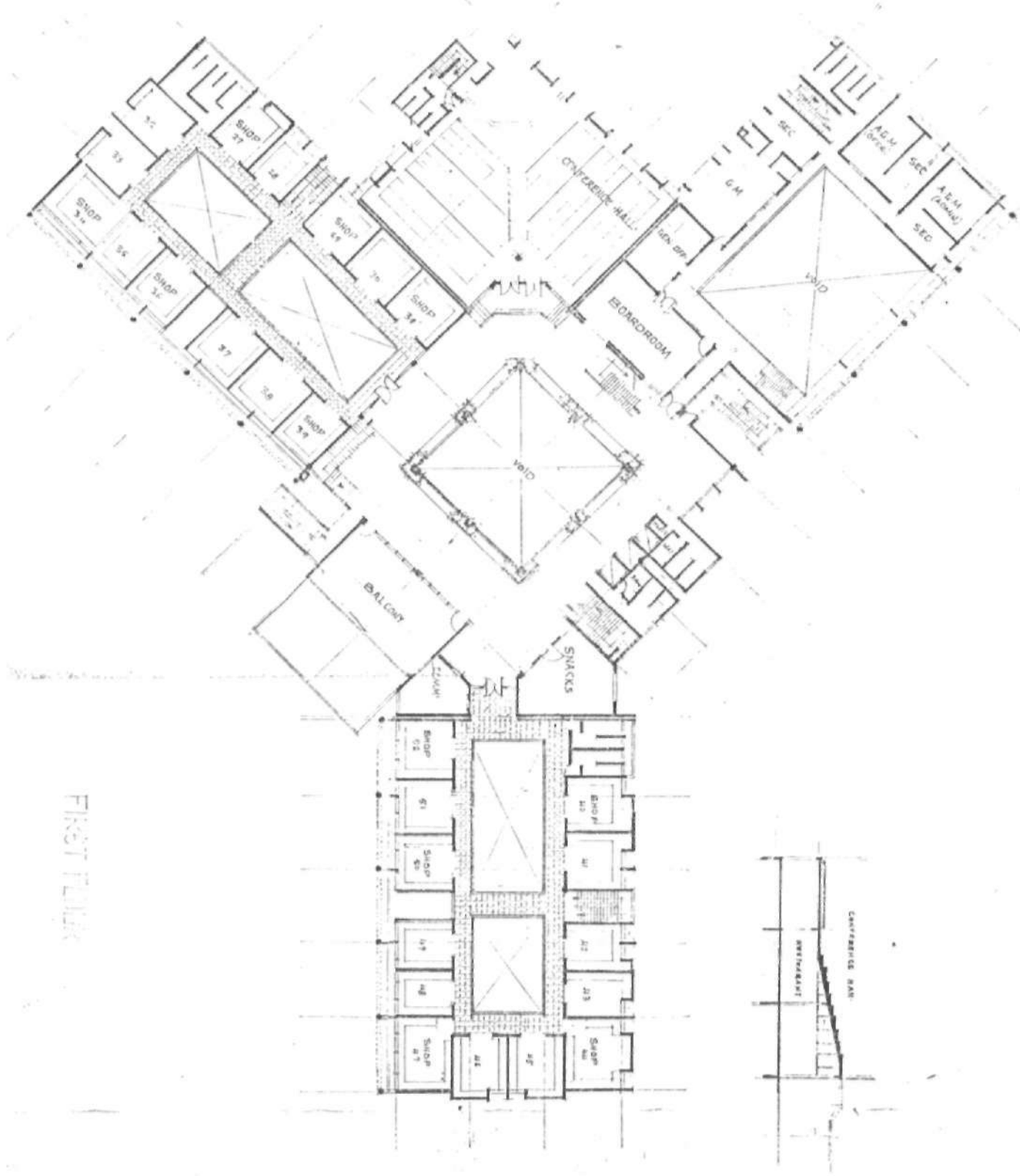
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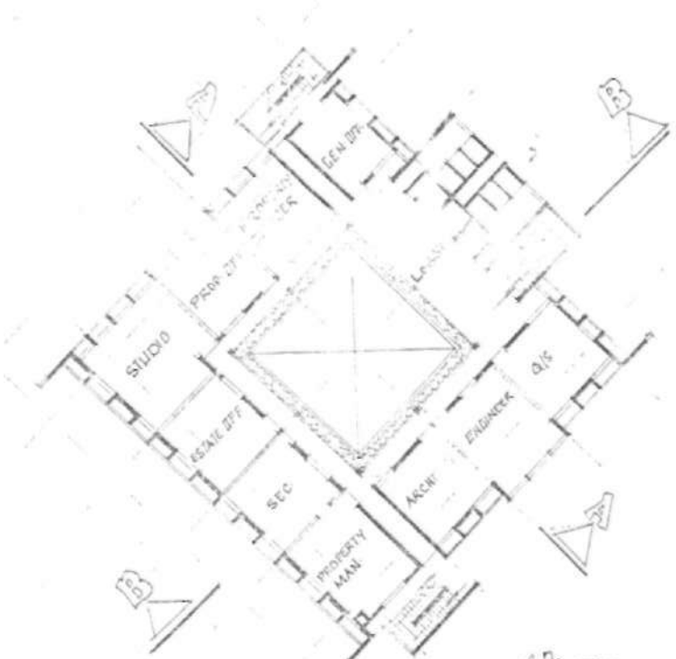
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LEGEND
A SHOPPING MALL
B BANK BRANCH
C TOWER
D CUSTOMERS PARKING
E STAFF PARKING
F PUBLIC PARKING
G OVERHEAD TANK
H GENERATOR HOUSE
J GATE HOUSE
FUTURE EXPANSION

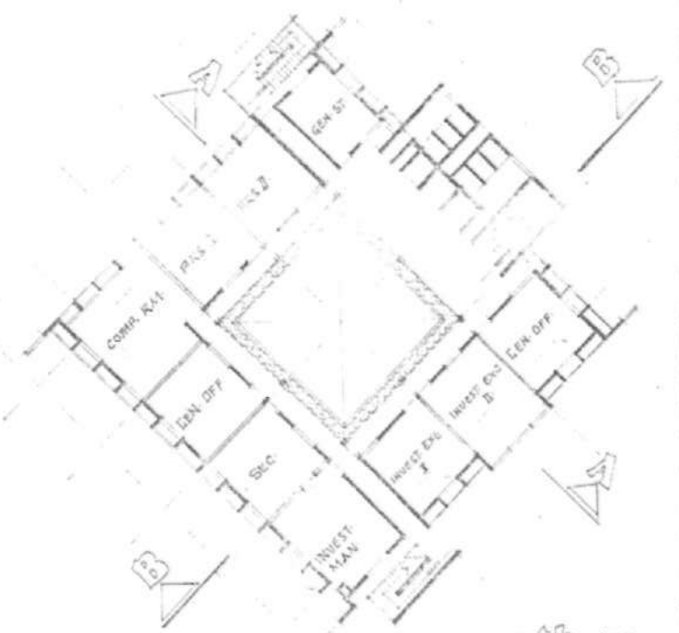

SHOP
CONFERENCE HALL
VOID
BOARDROOM
BALCONY
SNACKS
SEC.
G.M.
A.C.M.
MEN
WOMEN

2nd – 6th Floors
(Typical floors)

KSIC Offices

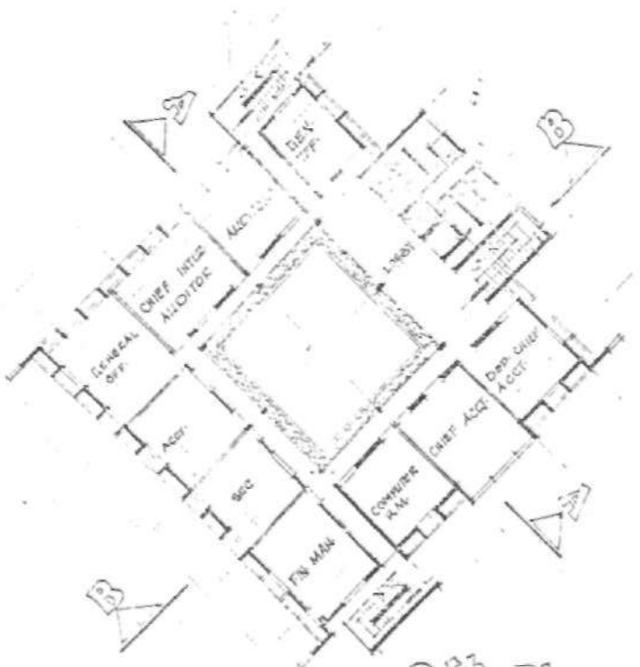


7th Floor

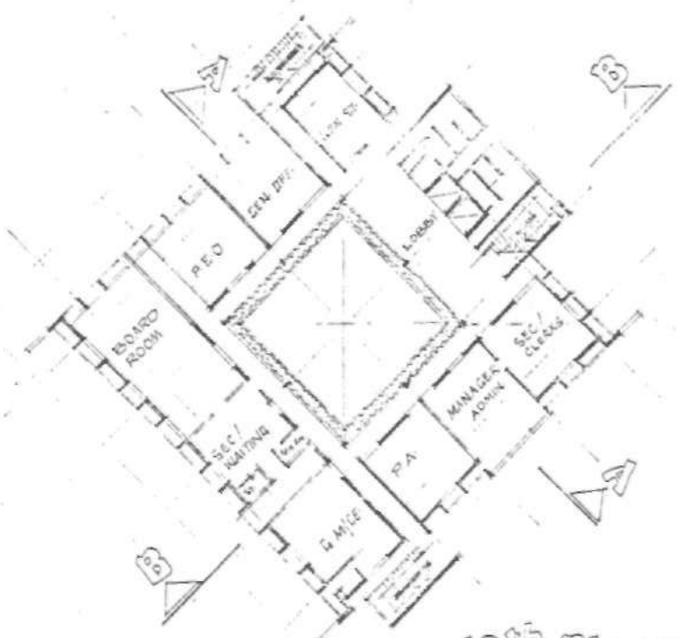


8th Floo

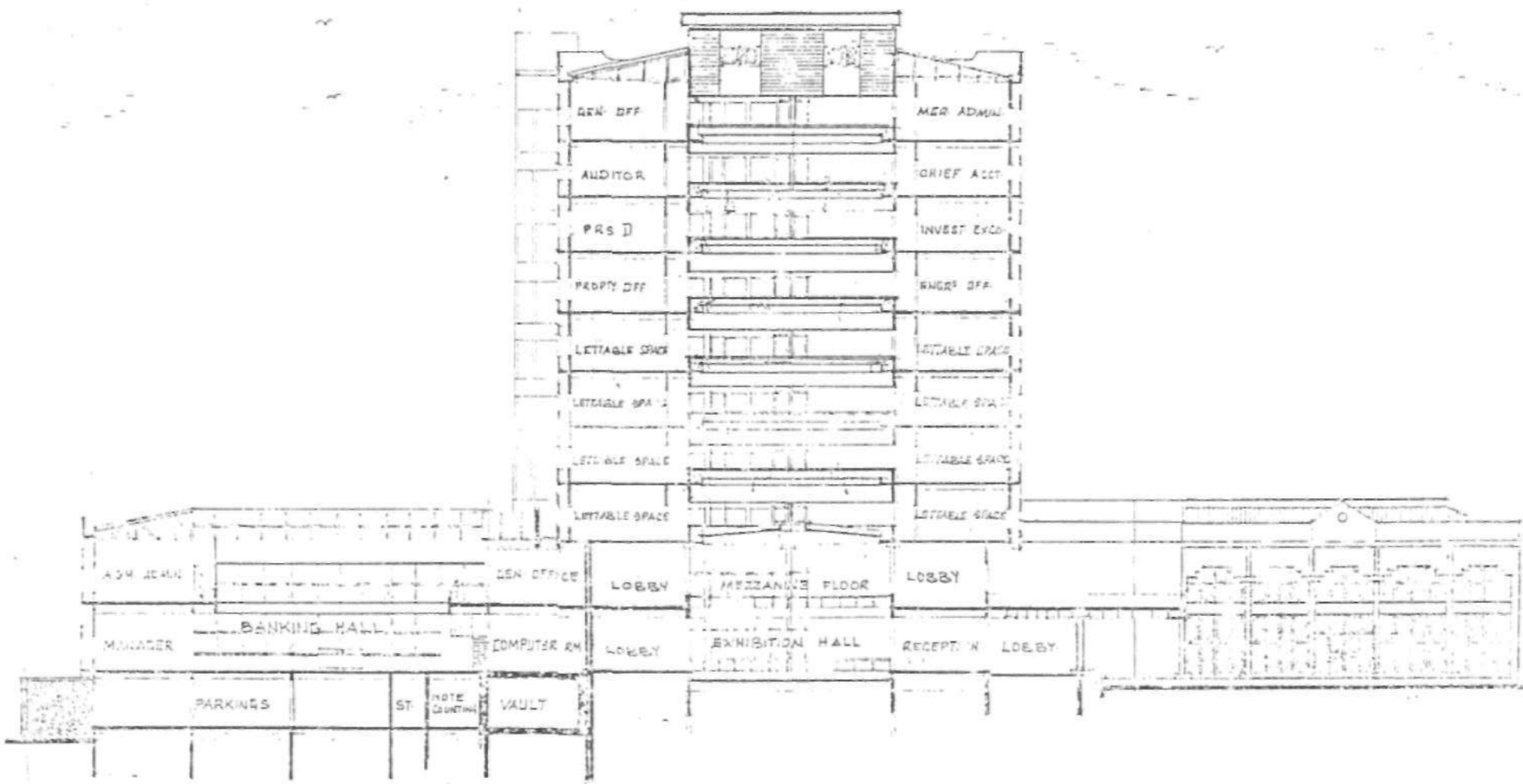
KSIC Offices



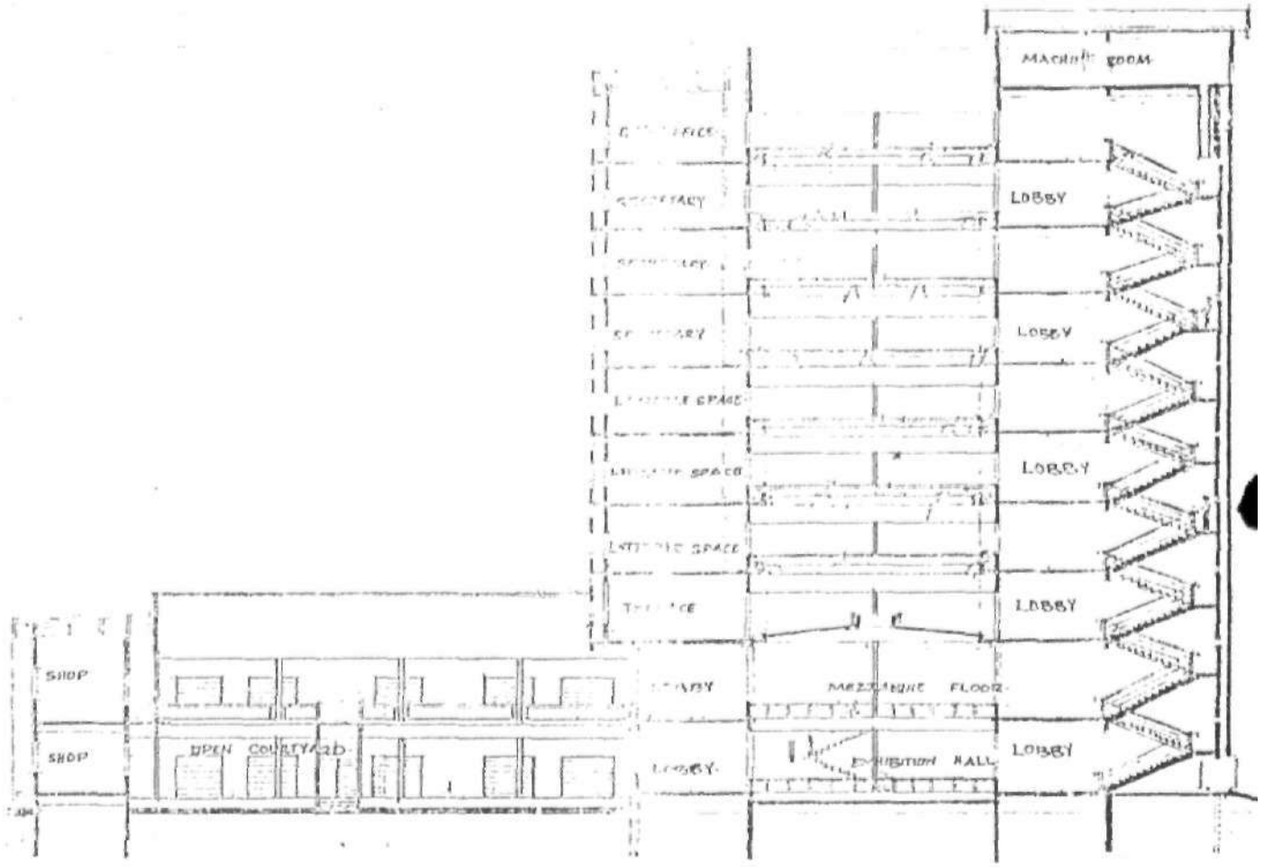
9th Floor



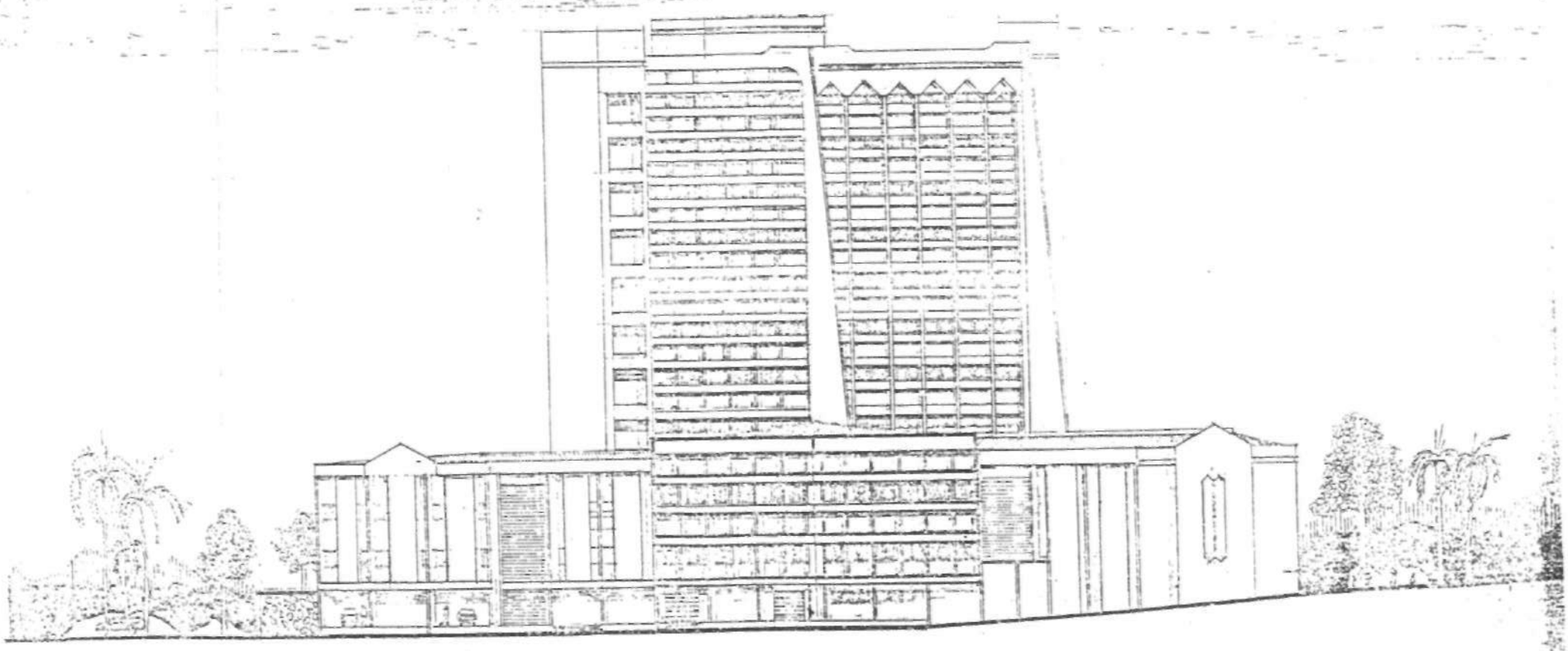
10th Floor


GEN. OFF
AUDITOR
PRS D
PROPTY OFF
LETTABLE SPACE
LETTABLE SPACE
LETTABLE SPACE
LETTABLE SPACE
MGR. ADMIN
CHIEF ACCT
INVEST EXCO
ENGRS OFF
LETTABLE SPACE
LETTABLE SPACE
LETTABLE SPACE
LETTABLE SPACE
A.G.M. (BANK)
MANAGER
BANKING HALL
PARKINGS
ST.
NOTE COUNTING
VAULT
GEN. OFFICE
COMPUTER RM
LOBBY
LOBBY
MEZZANINE FLOOR
EXHIBITION HALL
LOBBY
RECEPTION
LOBBY

SECTION A–A

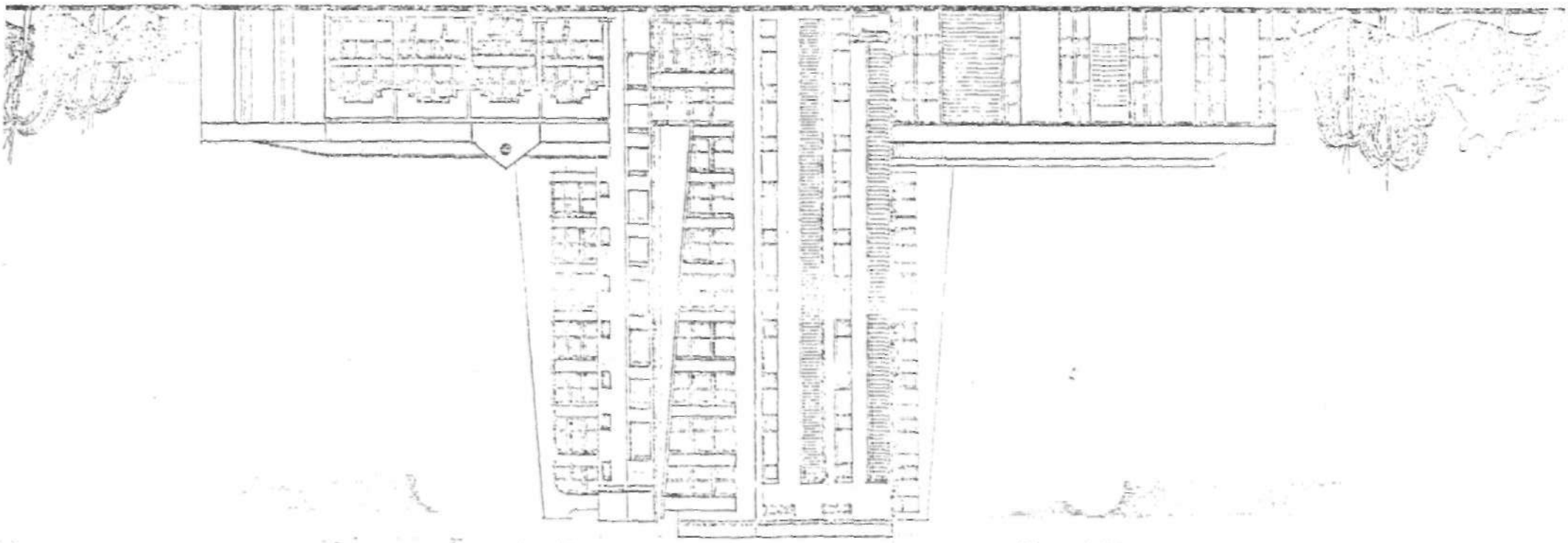

LOBBY
LOBBY
LOBBY
LOBBY
SHOP
SHOP
OPEN COURTYARD
MEZZANINE FLOOR
EXHIBITION HALL
LOBBY

SECTION B–B



West Elevation

North Elevation





EAST ELEVATION

NORTHERN ILLINOIS