

EKITI STATE LIBRARY COMPLEX
(Proper Illumination in Public Buildings)

BY



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(ARC/96/7810)

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(M.TECH)

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DECLARATION

I Obanor Andrew Omoruyi, declare that this thesis work is done entirely by me under the supervision of Prof. O.O. Ogunsoye of the department of Architecture, Federal University of Technology, Akure and has not been presented either wholly or partly for any degree elsewhere.

All sources of information contacted have been dully acknowledged.

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CERTIFICATION

This is to certify that this dissertation was carried out by OBANOR ANDREW OMORUYI, as part of the requirements for the award of masters of technology in Architecture.



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DEDICATION

To the Almighty God for seeing me through this programme in good health.

To my family for their encouragement.

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ACKNOWLEDGEMENT

In this epoch of this paper, I came across so many individuals who in one way or the other contributed to the successful completion. Their motivation has brought me this far and so I must acknowledge them. Due to the fact that they are so many, I must apologize before hand to these who one way or the other have omitted. It is not intentional.

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ABSTRACT

Lighting is a main contribution in library design. It influences many imperative factors from user comfort and productivity to perception and connotation of space. However, in this part of the world, problems of improper illumination and the relevant options needed to effectively control and manage the behaviour of light within the architectural space of libraries is the scenario.

The need for adequate emphasis to be laid on its planning, siting and design to suit the needs and requirements of its users is therefore essential. Library lighting is not a trivial matter and therefore deserves more attention than it typically receives from architects and all other consultants.

Lighting from the firmament and the filament is intrinsically linked with library design. In centuries, daylight governed libraries, forgoing built form and determining access hours. Within the last 100 years, the ascendancy of electric lighting has expanded possibilities and added challenges to library lighting design. The recent advent of computers and the light emanating from their screens have provoked consideration of other light issues.

This thesis addresses how to integrate light in all its manifestations within the context of the design of the Ekiti State library complex. A case study with an observation of about 5 libraries in Nigeria is considered with a view to providing innovative library services of high standards regardless of the age of its users thus utilizing all available resources for the provision and support of educational needs.

A critical analysis of their merits and demerits is carried out to enable one to see them in retrospect and serve as a guide in the formulation of new design solutions particularly in the area of the appropriate use of light (both natural and artificial) in a functional library for Ado-Ekiti community and the entire state as a whole.

CHAPTER ONE

1.0 INTRODUCTION

Man as an entity has a thirst for knowledge. Disputing this truism indicates surrendering all progress made thus far in science and technology and subjecting ourselves to the rigors of writing and / or painting on cave walls courtesy of discarded bones.

Knowledge of the above recounted fact (mode of life of pre-historic man) has been made possible by virtue of documented evidence and facts that has been unearthed by individuals pertaining to such fields.* The documented information has to be achieved and preserved through time in order to be accessed by future generations. Herein lays the importance of a library – a compendium of knowledge relative to the seekers intent. The need for adequate emphasis to be laid on its planning, siting, and design to suit the needs and requirements of the community is therefore essential.

A library building is a building in which books and other material such as microfilm, microfiche, audio-visual materials etc. are acquired, preserved, organized and disseminated for the use of students, researchers, lectures and the general library users for study and research.

The building is one of the most important buildings in any community due to its active participation in the teaching and learning programme at all levels. The wide variety of this building range from national library to specialized library and makes the design of this building more complex, hence what is best suited for the different types of libraries is due to its relationship to the communities or organizations they serve may not be best suited for another. Obviously, the library building should house the library's collections, the staffs and also provide adequate reading facilities for its users.

One speaks of the "light of reason" or "truth and light", associating light with the intellect and noble pursuits. In fact, Thomas Jefferson, who cried: "I cannot live without books", went further to comment that although tyrannies had often clouded "science and libraries", America sought to restore "light and liberty" to them.

As Jefferson noted, light in a metaphorical and literal sense is a primary issue for libraries. They are traditionally defined by daylight, not only as it reveals architectural form and provides reading light, but also in terms of how the sun historically determined access hours. Before electric or gas lighting, the dangers inherent in candles or oil lamps unduly exposed the library's valuable resources - its books and manuscripts - to fire risk. Many libraries, therefore, were only open during daylight hours.

Although electric lighting allows extended operation hours today, natural lighting continues to be a key factor in library design. It creates more productive environments and has other advantages, including visual appeal, true color rendition and cost (in contrast to electricity, sunlight is free). Since we are heliotropic beings, lighting plays an important role in our sense of well being, mood and health. Modern electric lighting - sources offering their own advantages - of course, must be integrated into libraries, too, making lighting issues more diverse than ever. Computer screens, an additional light source to be considered, means that in a short time frame, libraries have moved well beyond lighting concerns that traditionally dominated their design.

Lighting is a main consideration in library design, influencing many factors from user comfort and productivity to perceptions and connotations of space.

1.1 AIM

The main aim of this thesis is to provide a functional library for Ado-Ekiti community by paying adequate attention to the appropriate use of light (both natural and artificial) to enhance study and research. It will also "shed light" on this theme by helping clients who are proposing new or renovated libraries to work better with architects and lighting engineers, in order to determine the most efficient and effective elements of a library lighting scheme. Our physical world is, after all, comprised of both natural and man-made elements. The interaction of natural and electric lighting will determine the efficacy of lighting the library and its contents.

OBJECTIVES

The objectives of this design thesis include:

- i. Provision of some functions and services within the library building to meet the obvious demands of its user reading, reference, bibliographies and staff working areas.
- ii. To look into the pattern of light in enclosed space and employing relevant design strategies to enhance, regulate, and control the admittance of light into interior spaces, with regards to the design of a library.
- iii. Ensuring an appropriate reading environment within the various reading rooms by taking special note of the internal circulation, the type of furniture within the rooms, the ventilation and quietness in its interiors.
- iv. To provide for both formal and informal (recreation) learning environments.

- v. To enhance fundamental principles of a good state library set up such as flexibility, versatility, security, compactness, economy, special variety and future expansion among others.
- vi. Provision of adequate number of some special functions and services provided in the library for the convenience of its users like the toilet facilities, photocopy services, computer centre/cyber café, etc.

1.2 JUSTIFICATION OF THE STUDY

According to Bishop Oyedepo in his talk on "searching for the secrets of success" in the year 1998, he said "knowledge (information) is the greatest asset in the school of success".

A library building which contains varied information of interest of its users can be obtained is important to any community. This can be observed in the use of the word information resources center to denote a library often times. The usefulness of the library building especially in this present time of scarcity of books and high cost of the books cannot be over emphasized. The existing state library for Ekiti state is housed along one of the busiest roads in Ado-Ekiti. It was originally a reading centre for ado community. It is faced with a lot of problems which include the following:

- Disturbance from the main road.
- Environmental problems such as poor illumination, poor ventilation, Poor acoustical conditions, etc.
- Inadequate facilities to cater for the needs of readers.
- It's deficiency in terms of security of materials.

Hence there is need for a purpose built library for both present & future needs of the people of Ado-Ekiti the capital of Ekiti State. - "The fountain of knowledge".

This thesis is to ensure that the problem of inadequate illumination that has been observed in the existing library is properly examined and rectified in the proposed library building.

1.3 SCOPE

The scope of this project is to come up with a designed functional sketch proposal for Ekiti State Library, to be located in Ado town. The research is restricted to the illumination of the library building interiors. Focusing more on day lighting and artificial lighting. The study encompasses the use of design techniques or strategies to control the transmission and distribution of light within the architectural space. Also owing to the varied nature of library interiors, the scope would include its internal organization, circulation, the space allocation and the provision of facilities in the library.

1.4 LIMITATIONS OF THE STUDY

Various problems were encountered in the course of this study, but some of them were overcome. Paramount among the problems encountered are:

- That access to relevant architectural drawings was restricted because of security reasons in the British Council Library.
- Inability to get the attention of some Librarians.
- Restrictions of movement within the buildings were encountered when gathering data for case studies.
- Financial constraints were encountered in the course of the research.

1.5 EXPECTED CONTRIBUTION TO KNOWLEDGE

This thesis is expected to enlighten and educate those involved in the planning and designing of libraries on the problems of improper illumination

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and the relevant options needed to effectively control and manage the behaviour of light within architectural space.

1.6 RESEARCH METHODOLOGY

Research is a formal, systematic and intensive process of carrying out a scientific method of analysis. In this project, the following approaches were used to examine analysis and finally propose a befitting library design for Ekiti State.

a. FIELD RESEARCH

A field research was carried out in five Nigerian Libraries, through case studies to get first hand information and to evaluate the merits and demerits of the in designs. Architectural drawings were obtained from the various libraries and photographs were also taken. Personal interviews were conducted on the people using the study area.

b. LIBRARY RESEARCH

A library research was also carried out through literature review of various materials like journals, magazines, published articles, books, etc which are related to this topic to acquire adequate information needed to form a base for this design thesis.

1.7 GOALS OF THE STATE LIBRARY

The following are the goals of the proposed state library in the content of its environment.

- Providing innovative library services of high standard regardless of the age of student/user
- Utilizing all available resources to provide and support the educational needs of every student in furtherance of his/her education.
- Serving as custodian, promoter and propagator of Ondo State Social and cultural heritage.

- Producing location/ venue of social, educative functions for general use at affordable cost.
- To generate revenue for the government.

1.8 / OBJECTIVES OF THE STATE LIBRARY

The objectives of the library for the attainment of the above aims are, among others: -

- To create awareness for library usage in Ondo state
- To serve as depository library for all publications emerging from Ondo State
- To provide ready access to and easy retrieval of publications about Ondo State
- To provide conducive and educative environment for children and adult, working class and applicants
- To encourage and enhance the use of non-book (audio-visuals) as parts of the total learning efforts.
- To form a conjugal apex of library system in Ondo State.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 HISTORICAL DEVELOPMENT OF LIBRARIES

The word library comes from the Latin word "liber" which means books. It was used because libraries of ancient times to the 1900's were largely collection of books.

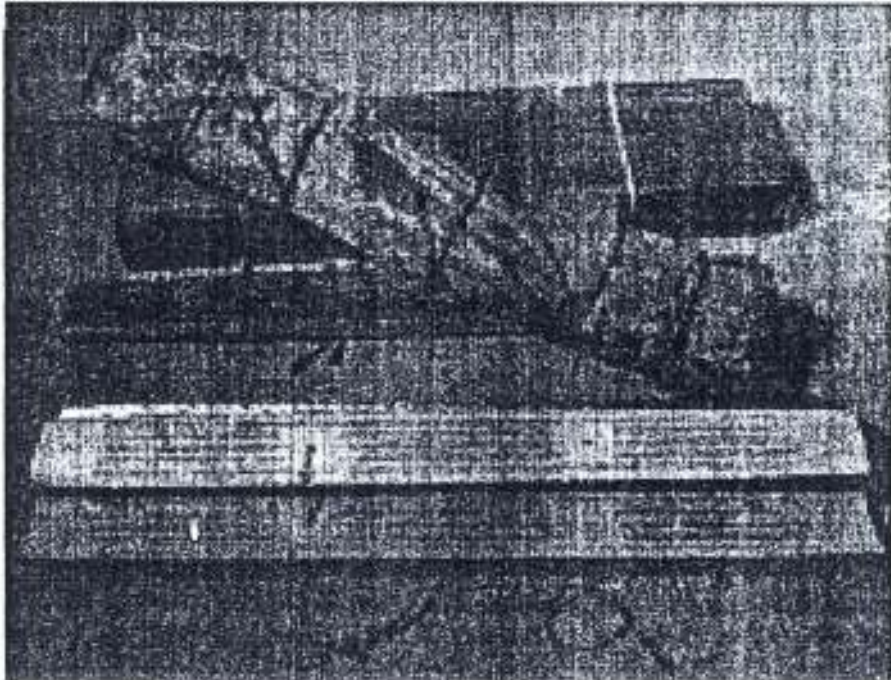


PLATE 1: A PICTURE OF SULTRA SLATE TABLETS USED IN ANTIENT EGPYPT

The history of libraries almost starts with the advent of writing, which not only enabled the conveying of orders and ideas, but also their preservation. In the third millennium, people began to put slate tablets with cuneiform writing scratched into them in a special room, placing them in baskets or jars set on wooden shelves. A shelving system and vertical classification similar to what we use in our libraries today was even discovered in Ras shera's "Library" (C.2000 BC). In Egypt, an inscription

dating from approximately 2500BC mentions the existence of scribe at "the house of books" where rolls of papyrus were kept.



PLATE 2: ALEXANDRIA LIBRARY IN GREECE APPROXIMATELY 560BC.

In 560BC Greek books was written on papyrus and during the classical period there was a book trade, bookstores, copyists' workshops, and public and private libraries. But the great library of the Hellenic world and antiquity in general, remains the one of ancient Alexandria Library reminds us that all human endeavors are organic, they are born, and they live

and then die.



PLATE 3: A ROMAN LIBRARY BUILT BY EMPEROR TRAJAN IN APPROXIMATELY 110AD.

As long as a library is both useful and is used, it will grow. When it no longer answers to its allying, in time it will lose its importance and, at best, its rich collections will be consulted only by anyone at all.

These earlier civilization libraries had a lot in common such as:

- i. Eastward orientation probably to catch the morning light and its warmth suitable for drying up the night damps on the parchments and papyrus.
- ii. Location in the vicinity of temples palaces and princely dwellings.
- iii. The use of precious woods, rich marbles, medallion and inscriptions, ornamentation of ivory, glass as well as ingenious mosaic for more elaborate façade.

The great monastery libraries proliferated throughout Europe from the beginning of eleventh century. They were, for a long time, the seat of knowledge where one could study not only the works of the church fathers (in Greek and Latin) but also those of Greek and Latin philosophers as well as Arab scholars. These libraries were instrumental in the establishment of the power of the Catholic Church. They lasted through the religious wars, and were triumphant in the Counter Reformation, but almost disappeared at the beginning of the nineteenth century. Whereas the center of learning had once been the monastery, it now became the university. The Roman Catholic Church's opposition to the powerful humanist and scientific movement that began sweeping across Europe at the end of the middle ages and its rejection of the enlightenment, gradually caused philosopher, scholars, and students to turn away from the church. Beginning in the seventeenth century, kings and princess, such as Mazarin and the Austrian emperor Charles VI, opened their libraries to the public. Universities, whose ties with religious hierarchies (whether Catholic, Protestant, or Anglican) had disintegrated, built (at considerable cost) great libraries such as those in Cambridge, Dublin and Bologne.

And finally in the nineteenth century, states and cities began to create large libraries, which for the most part, were open to the public and covered all fields of knowledge. Today, the intellectual prestige of a country is still based upon its network of library how much it is used, how well it is organized, and if it is computerized. Culture, most broadly defined, is at last there for everyone.

2.2 EVOLUTION OF LIBRARIES IN NIGERIA

The development of library services in Nigeria began in the late 1920's when the Lagos books club was formed. The members of the club

were formed by a group of expatriate civil servants and a few Nigerians. The book club received a grant of \$6,500 from the Carnegie Corporation of New York in 1932. This made it possible for the book club to be inaugurated in 1932. Books which were formerly owned by the Lagos Club formed the nucleus of the Lagos library.

The Lagos library has a subscription scheme where members had to pay a fee to make use of the library facilities.

Prominent educated Nigerians later developed interest in books and libraries. Many of them acquired books on various subject for their private libraries. Henry Carr, a prominent Nigerian had an appreciable collection of books. At his death in 1945, he had a library of about 18,000 volumes which was later bought by the Nigerian Government.

The British Council library was opened in 1943. It was to serve as an information center during the war period as well as provide facilities for people interested in reading. The British Council later established libraries in Lagos, Kaduna, Enugu, Abuja, Ibadan and Benin-City.

With the establishment of the University College Ibadan in 1948, the nation could look up to a library which could cater for its needs. The University College library, Ibadan under John Thris began to perform some of the functions associated with the national library in some countries. The publication ordinance was passed in 1950 and the law made it compulsory for all publishers to deposit two copies of every book published in Nigeria with Ibadan University college library.

2.3 DEVELOPMENT OF LIBRARY BUILDING FORMS

It was not until the last half of the 17th century that library building took meaningful architectural forms. A number of historic plan types have been identified and they are briefly discussed as follows:

2.3.1 THE CLASSICAL PLAN

It originated in ancient Rome and was characterized by a single monumental hall for the library contents namely books, readers and staff. The hall with its capacity for a few books and few readers were often noisy. The Roman library at Ephesus (A.D. 1070) was a typical example.

2.3.2 THE MEDIEVAL PLAN

It originated in the middle ages and was used for Monasteries, Cathedrals and Small Colleges. It is characterised by a small room with high ceiling and book shelves projecting from the walls like church pews and a central aisle. The Trinity Hall College library at Cambridge designed by Christopher Wren was a prototype.

2.3.3. THE PLAN FOR CLOSED BOOKSTACKS

It emerged in the 19th century and marked with increased book production and development of education. The plan separated readers from books, though within close proximity and provided natural light for readers. Bibliotheque Ste-Genevieve at University de paris, designed by Henry Labrouste in 1843 and built between 1845 – 50 is a good example. It is a long rectangular prototype (80m x 25m), while the British museum library

London (1857) was a circular prototype.

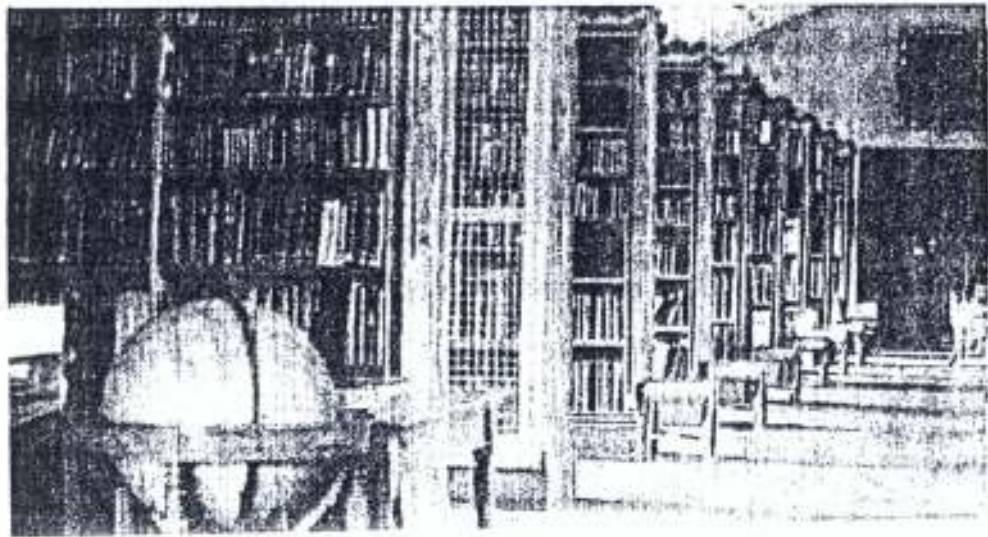


PLATE 4: A LIBRARY UTILIZING OPEN ACCESS PLAN.

2.3.4 THE OPEN ACCESS PLAN

The open access plan library developed in public libraries and later in Colleges and University campuses. This simplest form otherwise known as the "Carnegie Rectangle" is a one – room library with informal loan desk near the entrance in the center of the longitudinal side. It was very compact and economical.

2.3.5 THE MODULAR SYSTEM

The swift success of the modular revolution against monumental libraries gave impetus to the modular system. It takes full advantage of modern technologies including air-conditioning and artificial lighting. In a modular system, all the floor space with exception of such fixed elements as stairways, elevators or lifts, toilets, lobbies and ducts can readily be converted from one function to another. Its major advantage is flexibility while a major demerit is that no bay size is ideal for all purposes. In spite of this difficulty, the modular system is an architectural style suited to this age

and metamorphosed from the renaissance style of library building. The New York University library completed in 1973 is an example.

2.4 TYPES OF LIBRARIES

There are different types of libraries and they are as follows:

2.4.1 NATIONAL LIBRARIES

National libraries are libraries that exist in most countries and are maintained by national resources, usually bearing responsibility of publishing national bibliographical information center. They principally collect and preserve the nations' literature. Most national Libraries receive by legal right one free copy of each book and periodical printed in the country. The bibliotheque nationale in Paris, the British library in London, the library of congress in Washington D.C. are among the most famous in the Western World.

2.4.2 UNIVERSITY AND RESEARCH LIBRARIES

This is the type of library that exists within an academic institution. The invention of printing made it possible for copies of teachers' lectures to be widely disseminated and from that point; Universities began to create great libraries.

The Bodleian library at Oxford University and Harvard University library at Cambridge are good examples of this type of library and are superior to many national libraries in size and quality. Many users seek for the same books at the same time in university libraries, hence, a short-loan collection from which books may be borrowed have been employed to handle the problem.

2.4.3 PUBLIC LIBRARIES

This is a type of library which is now acknowledged to be an indispensable part of community life as promoters of literacy, providers of wide range of reading for reference libraries and wide ranging loan service:

based on systems of branch libraries. The services provided vary in proportion and size to the municipality or area covered and in many cases. They build up collections that relate to local interests and often provided information for local industry and commerce.

2.4.4 SPECIAL LIBRARIES.

This is the type of library that takes special pride in special collections which are built around a special subject interest. Many of this originated with learned societies and especially with the great scientific and engineering societies founded in the 19th century to provide specialist materials for their members e.g. National reference library of science and invention. They are planned on strictly practical lines with collections carefully controlled in size and scope though may be often large and wide spreading in their activities. They are largely concerned with communicating information to specialist users.

2.4.5 PRIVATE LIBRARIES

These are the type of library owned by private individuals and are varied in their range of interest as the individual collects them. They are often able to collect in-depth information on a subject to a degree usually impossible for a public institution and they are likely to be given early information about books of interest to them. They can also give close attention to the conditions of the books they buy e.g. Henry Carr folger.

2.4.6 SUBSCRIPTION LIBRARIES

These types of library are mainly set up by associations of scholarly professional groups for the benefit of academics, colleges and institutions but membership are also open to the general public. Some of them are still in existence e.g. the library company of Philadelphia and the London library.

2.5 PUBLIC LIBRARIES

Public libraries provide communities with a wide choice of more general literature and other information media, with as much as possible displayed on open shelves. In public libraries, reference rooms are provided. They may also be counters for loans from the closed stocks, and free access to the open shelves of magazines, books or separately presented educational materials in reading rooms. Apart from books and journals, almost all the different information media forms are collected and presented for use in an accessible way. The number of reading places depends on the number of users in the various subjects. The information is arranged in a systematic way, i.e by subject.

According to Thompson in his book – “Planning and Design of library buildings”, it says that the main function of the library is to store swiftly to the general public. bibliographical and audio-visual materials and to make them available

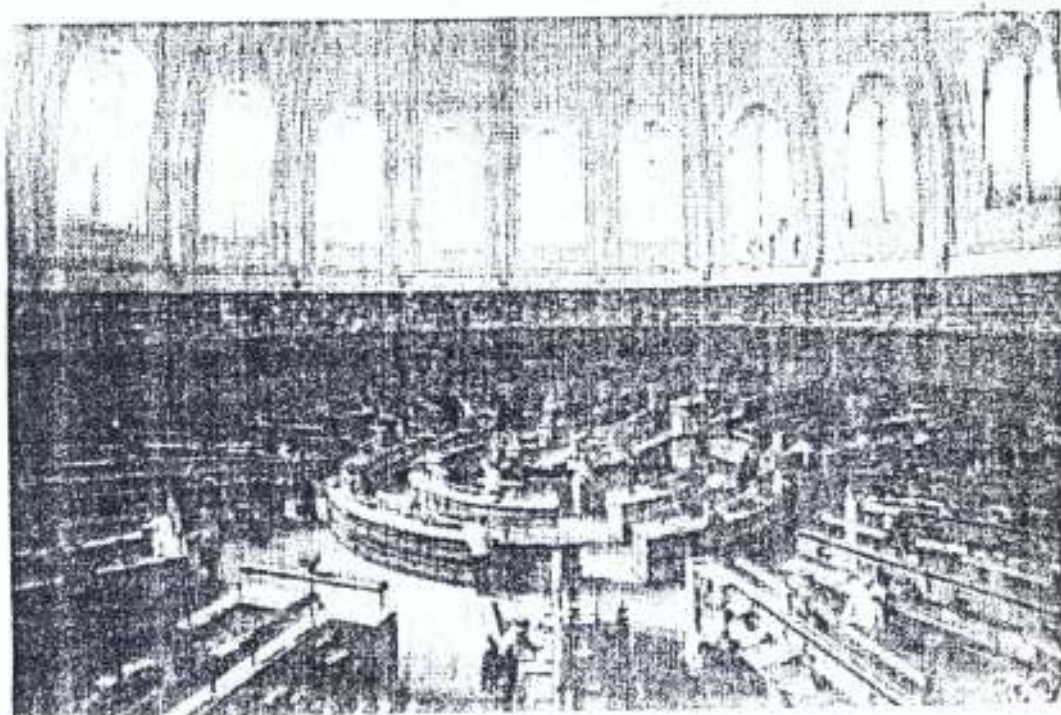


PLATE 5: THE LIBRARY OF CONGRESS THE LARGEST PUBLIC LIBRARY IN THE WORLD.

2.5.1 FUNCTION OF A PUBLIC LIBRARY

The following are the functions performed by a public library:

- a. Acquiring and organising relevant materials for the use of general library users.
- b. Preserving and transmitting knowledge through bibliographical instruction and proper organisation of the library collections.
- c. Other services offered include inter-library loans as well as photocopying, reading and printing from microforms (microfiche and microfilm).

In addition, an on-line literature search and a literature search on data bases stored on CD-ROM are available.

2.5.2 SETUP OF A TYPICAL PUBLIC LIBRARY

A typical library could be divided into many departments or areas with the following functions:

- i. Technical services department
- ii. Readers services department
- iii. Research and Bibliographic services department
- iv. Non-print media resources unit
- v. Administrative services department

2.5.2.1 TECHNICAL SERVICES DEPARTMENT

This department is also referred to as the processing unit. They are usually behind the screen because their activities are undertaken out of sight of regular users of the library. This department is made up of the following sections:

- i. The Acquisition section
- ii. The Cataloguing section
- iii. The Serials section

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i **ACQUISITION SECTION**

The selection of library materials of all kinds is done in this section by the librarian-in-charge. Once the selection is made and bibliographic data are scrutinized, checking the stock of the library to avoid unnecessary duplication of orders is then made. When any material arrives at the library, they are received here; details of the materials against the details on the order slip are checked and then passed to the cataloguing section.

ii **CATALOGUING SECTION**

Library materials, on receipt from the acquisitions section, are classified and catalogued here. The organisation of materials into a set pattern of classes facilitates the arrangements of these materials on the appropriate shelves with materials on specific subjects being housed together in the same area of the library. Members of this department are responsible for preparing materials for the shelves.

iii **SERIALS SECTION**

Various journals subscribed to by the library are selected, ordered, received, processed and shelved by the serial section. The serials collection is checked constantly to determine if there are any missing issues already due but have not been received, hence, claims are made. Recommendation for additional journals subscriptions are also received from library users.

2.5.2.2 READERS' SERVICES DEPARTMENT

This is the area in which the activities of the library staff are glaringly seen. There are made up of various sections and the number of which depends on the library. Some of the sections are:

- i. The reference section
- ii. The circulation section
- iii. Reserved book room etc.

i THE REFERENCE SECTION

This section specializes in the provision of reference services as well as giving readers' advice in addition to keeping reference materials.

ii CIRCULATION SECTION

This is where materials that go on loan are charged to patrons and discharged on return to the library. Information about a material that is not found where it belongs on the shelf could be sought from the circulation section. Shelving arrangements are also in many libraries under the supervision of the circulation section.

iii RESERVED BOOK ROOM

This kind of service area is usually available in university libraries where study materials are in short supply but in constant and extensive demand are kept for in house use.

2.5.2.3 RESEARCH AND BIBLIOGRAPHIC SERVICE DEPARTMENT

This is usually associated with academic research libraries. It is also made up of these sections:

- i. Documents section
- ii. Private Collection section
- iii. Maps and Manuscripts section

i **DOCUMENT SECTION**

This section houses vital Government publications, Federal, State and other Governmental agencies' publications. International organizations' publications are collected here, processed, stored and used to provide the informational needs of the readers.

ii **PRIVATE COLLECTION SECTION**

This area of the library houses the collection of renowned scholars and important dignitaries in the community. These collections are either donated to the libraries under special conditions such as assurance of proper organisation, preservation, etc.

iii **MAPS AND MANUSCRIPT SECTION**

This section acquires, processes and preserves maps and other manuscripts that are vital to research.

iv **NON-PRINT MEDIA RESOURCES UNIT**

This department has been placed in different departments in different libraries. In some libraries it stands as a separate unit. Here, materials that are not print base are housed, organized, preserved and used for the provision of informational needs of the patrons of the library.

2.5.2.4 ADMINISTRATION DEPARTMENT

This is the strength of the staff both professional and non-professional. The chief librarian is the administrator responsible for the management of materials and human resources in the library. The size of this depends, of course, very largely upon the size of the total library operation.

3.0 LIGHT AND LIBRARIES

3.1 LIGHT BASICS

Light is a form of electromagnetic radiation and is the major medium through which we discover the world around us. As this radiation falls on objects, the brain, through the eye, discerns the size, shape, color, distance and movement of the object. Many factors affect the ability of the brain to recognize these physical properties: the angle and brightness of the light, the texture of the object, the speed of movement, the placement of the object in relationship to other objects, the contrast between objects and the source of the light. The power of light to influence perception, mood and even outward behavior of people is one of the most important aspects of designing with light. Nearly any light source, given adequate illumination level, can meet the purely functional criteria of seeing an object or viewing materials. It is this combination of perception and fact that makes lighting design one of the more elusive aspects of the library planning. The role of the individual designer's preferences, the experiences and perceptions of the librarian or client representative and, finally, the impressions of the staff and patron all will influence the "success" of a particular lighting scheme.

Before addressing strategies for successful lighting, however, it is Necessary to understand basic, key factors about light and our perception of it. Introducing underlying issues is critical before delving into the issue Of integrating natural and electric lighting and how the introduction of computer screens influences overall lighting themes. With this in mind, prime concepts to understand are the functions of light, sources of light, lighting methods, light spectrum, light measurement, reflectance, reflectance of materials, absorbance, transmission and glare : htness ratios.

3.1.1 FUNCTIONS OF LIGHTING

Generally, the purpose of lighting is in two folds: practically to facilitate the performance of visual task and to ensure visual comfort and artistically to create certain emotional effect. According to Tutt and Adler (1979) Light is required in all building for:

- Carrying out task
- The creation of amenity (which is both matter of pleasant and general illumination of interiors whether by daylight or artificial light).
- Creation of deliberate aesthetic effect (such as display, lighting or dramatic lighting of certain kind of interior.
- The provision of safety in and around buildings.
- Keeping interiors of building warm (thermal effect)

3.1.2 SOURCES OF LIGHT

There are basically two sources of light; natural light otherwise known as daylight and man-made light otherwise known as artificial light (electric light). In artificial lighting, the light source itself is under the control of designer (user). In day lighting the source (sun and sky) is given, thus if control is necessary, it must be in transmission and distribution. Artificial lighting is practically independent of location, climate or even of the building fabric, day lighting however strongly depends on the externally given condition (e.g. climate), and its control is only possible by the building itself through design.

3.1.3 LIGHTING METHOD

There are three (3) different methods or strategies for lighting building interior, these are:

- i. **Permanent Day Light:** This is by day lighting alone, with artificial light used only at night or where daylight condition falls below tolerable level.
- ii. **Permanent Supplement Artificial Lighting (PSALI):** It involves daylight permanently supplemented by artificial light. It is the commonest and most economically efficient lighting method. With carefully planned layout of spaces and a well laid out lighting system, task could be carried out throughout the day regardless of outside weather condition.
- iii. **Permanent Artificial Lighting (PAL):** This method involves the use of artificial lighting alone to light interior space with windows used purely for view out to provide interest. The use of Electric Lighting is the common feature, however, this system is not the best form of lighting since it entails high level of technicality and requires a great deal of energy consumption to run successfully.

3.1.4 LIGHT SPECTRUM

Light has many properties affecting human moods and ability to complete work or enjoy leisure time activities. Owing to the physical laws of electromagnetic radiation, only a small band of the spectrum is visible to the human eye. This band commonly referred to as "ROYGBIV" for the Red-orange-yellow-green-blue- indigo-violet range has a nearly uniform spectral composition that produces white light. As a benchmark for white light, midday sunlight is generally considered to contain this full spectrum.

Electric light, by its nature, can only approximate natural light, with different sources varying in their ability to mimic the full spectrum. The particular spectral composition of the lamp will establish its color, rendering one of the choices used in the selection of lighting types. The fuller the

spectral range that a bulb produces, the better the color rendition becomes. For example, low-pressure sodium lights are virtually monochromatic, thus producing a yellow-orange cast.

The color appearance of a lamp is expressed in terms of its color temperature. These temperatures are expressed as degrees Kelvin (K), with light source color varying directly with temperature. The higher the color temperature, therefore, the bluer (cooler) the light. Though counterintuitive, the more yellow (warmer) the light, the lower the color temperature. A bulb's color rendering is designated by the International Commission on Illumination in its color rendering index or CRI. Ratings range from 0 to 100, with 100 expressing the truer color rendition at its color temperature.

One of the important lessons to remember in choosing the color spectrum of a lamp is that the broader the spectrum, the more energy the lamp uses. This relationship between the color spectrum of a lamp and the energy consumption (inversely proportional) should be remembered and used in making lamp choices. It will be a matter of judging energy costs against color rendition. Remember also that the appearance of any object will be determined by the light sources. Knowing that the color spectrum in the lamp will affect the color reflected from the object is of paramount importance in making the choice.

The colors seen when viewing an object is the color reflected by that object. A white object reflects the total light spectrum. A black object reflects nothing absorbing all of the light. A yellow object, for example, will reflect yellow light and absorb the blue. For this reason, light source choice is as important as the selection of project finishes and fabrics. Logically, choices for a building's finishes must be made under the light planned for the space. This critical design consideration is very often misunderstood because of the common myth that an object has an intrinsic color.



3.1.5 LIGHT MEASUREMENT

Light source emits light radiation called flux. The amount of light emitted from a source is measured in lumens, analogous to the flow of water from a garden hose. Knowing lumen value, however, does not tell us how the emitted light is distributed. The initial luminous intensity is measured in candelas (cd) or candlepower, describing beam intensity in any direction. Luminous intensity, therefore, can be compared to garden hose pressure determining rate of flow. This measure is most important when designing with point source calculations.

Lumens eventually reach and illuminate a surface. It is not possible, however, to compare light sources without some uniform method of measurement. Illumination is therefore used to indicate the number of lumens falling on one square foot of surface area. This unit of measure is called a foot-candle (fc) the intensity of one candle flame on a square foot surface one foot away. The Illuminating Engineering Society (IES) publishes light level recommendations, expressed as foot-candles, needed for a specific task, levels affected by many factors, including age (someone older generally needs more for a given task than someone younger persons) and task itself (one needs more light for reading than walking in a corridor).

Based on these recommendations, lighting for general library tasks is set at 75fc. However, general area lighting is one-third of task lighting, or 25fc. Non-critical circulation is a one-third of general area circulation, or 8fc.

3.1.6. REFLECTANCE

We do not want to see the illumination, but rather the amount of light reflected. The brightness of what we see is, therefore, a function of both the illumination levels and the reflectance of the surface. Since brightness is the

illumination reflected off a surface, it is also measured in lumens per square foot. The unit of brightness is given a different name, however, to emphasize that it is a measure of the light coming from an object and not the light going to the object. This measure is referred to as a foot-lambert, defined as follows: "If one square foot surface is illuminated to 4 foot-candles and has a reflectance factor of 0.50, then the brightness would be 2 foot lamberts. This factor is expressed as: $\text{Brightness} = \text{Illumination} \times \text{Reflectance}$."

The point is to avoid over-illumination, so that the library user can work comfortably either with a computer or pen and paper. The IES lighting handbook has been, until quite recently, the standard guide to desirable levels. Opinion nevertheless remain divided on the issue of proper illumination levels, some authorities still recommend higher intensities than the (IES) standard. Ellsworth Mason is one consultant who favors a level between 50-70 foot-candles. Another recent study recommends a range of about 40-50 foot candles in stack areas, so that spine labels may be read easily on the lowest shelves.

Reflected light can affect our ability to use the light source to discern the shape, color or physical characteristics of an object. Reflections that are distractions include:

- i. Reflected glare: or light that is reflected from a glossy surface to the center of our field of vision. This can be avoided by specifying flat or matte surfaces. The light source itself must be adjusted when the task has a glossy surface.
- ii. Veiling reflections: these occur from a bright light source on objects like a shiny magazine page. They are called veiling reflections because they reduce the ability to discern information on the printed page. These

Reflections are specular or mirror-like. For example, some ink or pencil surfaces can appear to disappear under the influence of veiling reflections. Eliminating veiling reflections is one of the major challenges of library lighting design. It is especially a factor with the multiplicity of video display terminals and the number of people reading materials, especially glossy reference materials. On the other hand, reflection is used to advantage in indirect lighting by bouncing light off a reflecting surface.

3.1.9 REFLECTANCE OF MATERIALS

Some materials have practically the same reflectance for all wavelength of light. These do not change the wavelength composition of light after reflection. Other materials are selective in their reflectance, as they may absorb certain wavelength of the incident light, thus the remainder reflected will show a colour effect. See the table showing reflectance of finishes material below:

TABLE 1: TYPICAL REFLECTANCE FOR FINISH MATERIALS

MATERIALS	REFERENCE (%)	MATERIAL	REFLECTANCE (%)
MATERIALS:		GROUND COVER:	
Aluminum, brushed	55 - 58	Asphalt	5 - 10
Aluminum, etched	70 - 85	Concrete'	30 - 40
Aluminum, polished	60 - 70	Grass & other Vegetation	5 - 30
Stainless steel	50 - 60		
Tin	67 - 72		

MASONRY:			PAINT:	
Brick, dark			White	70 – 90
buff	35 – 40		White porcelain	60 - 83
Brick, light			Enamel	
buff	40 – 45			
Brick, red	10 – 20			
Cement, red	20 – 30			
Granite	20 – 25			
Limestone	35 – 60			
Marble,	30 – 70			
polished	90 – 92			
Plaster, white	20 – 40			
Sandstone	60 – 80			
Terra-cotta, white				
GLASS:			WOOD:	
Clear	or 5 – 10		Light birch	35 – 50
Tinted	20 – 30		Mahogany	6 – 12
Reflective			Oak, dark	10 – 15
			Oak, light	25 – 35
			Walnut	5 - 10

SOURCE: Egan (1983). Concept in Architectural Lighting.

3.2.0 ABSORBANCE

This refers to the ratio of light absorbed by a material to the incident light falling on it. Certain surfaces absorb selected wavelength of light falling them thereby resulting in difference in colour between the incident and reflected light. Darker surfaces absorb more light than a bright one.

3.2.1. TRANSMISSION

Some materials when exposed to light transmit a large part of it, these are said to be transparent, while translucent materials applied to those which transmit a part of incident light, but break its straight passage, scatter it in all direction creating diffuse light. Opaque material does not allow the passage of light. The transmission factors are the ratio of the light transmitted by a body to the incident light.

Luminance (L) of a diffuse transmitting material is the incident illumination level times the transmittance; they can be express mathematical as:

$$L = E \times T$$

Where L = Luminance (fc)

T = transmittance (%)

TABLE 2: TYPICAL TRANSMITTANCE OF SOME MATERIALS

MATERIALS	TRANSMITTANCE (%)
DIRECT TRANSMISSION:	
Clear glass or plastic	80 – 94
Transparent colored glass or plastic	3 -5
Blue	8 – 17
Red	10 – 17
Green	30 – 50
Amber	
SPREAD TRANSMISSION:	
Etched glass, toward source	82 – 88

Etched glass, away from source	63 - 78
DIFFUSE TRANSMISSION:	20 - 50
Alabaster	40 - 75
Glass block	5 - 40
Marble	30 - 65
Plastic (acrylic, vinyl, fiberglass, reinforced plastic)	

Source: Egan (1983). *Concept in Architectural Lighting*.

3.2.2 GLARE AND BRIGHTNESS RATIOS

The reflectance of a surface will affect the type of glare associated with that surface. According to Ogunsoye (1988), "Glare is a condition of vision caused by spatial or temporal contrast in lighting or high level of light", hence the source of light becomes too great for the naked eye to handle. As the eye attempts to even out the contrast between the source and the surrounding surfaces, the muscles of the eye have to work harder and more frequently. Tired eyes and increased levels of stress result. Glare within the range that the eye can handle is discomfort glare; glare preventing us from doing a task is disability glare.

In addition to these two glare categories, there is direct and indirect glare. Direct glare is caused when the eye looks directly into the source of illumination. Indirect glare results from light being reflected off surfaces. The relationship of the light source to the center of vision affects the seriousness of the glare. The closer a light source is to the field, the more serious the glare. In addition, the apparent brightness affects the glare. For example, a 100W bulb will have different effect in a room with dark surfaces than in one with light surfaces. Like the glare associated with

glare, the eye has a difficult time adjusting to the brightness ratio between differently illuminated spaces within a building or between the interior and the exterior. Because brightness is a function of reflectance and illumination, the brightness ratio is controllable through good design. Anatomically, the eye is more sensitive to the brightness ratio at the center of the field of vision and less sensitive towards the periphery. By keeping the reflectance of wall surfaces within the following levels, excessive brightness ratios in general work areas of the library can be minimized.

These ratios should be used in the selection of furnishings, fabric, floor and wall coverings, paint and wood for tables. These levels are recommended for areas where high visual performance is required, with the further recommendation that the task should always be slightly brighter than the surrounding.

Light's ambiguity makes it easy to ignore its singularity and underlying concepts. With this section as a backdrop, however, it will be possible to discuss lighting issues as related to daylight, electric lighting, computer screens and library lighting strategies.

3.2 DAY LIGHTING

Library collections contain access to knowledge, yet are more than mere Book warehouses. Traditionally, the best libraries provide users and citizens with innumerable opportunities to explore the world around them, not only by reading the library's books, but also by using and experiencing the library itself. The library should manifest common values. The exterior should relay organizing principles of what "public life" entails; prime interior spaces should be a "meaningful microcosm", offering a reflective world view/order. A common trend found in notable libraries is their use of daylight to reinforce the organizing concepts, as illustrated by the mission

of each particular library. Traditional reading rooms, the library's center, with tall, high windows reflecting the grandeur of the space. To enter this room, the best libraries evoke a keen sense of leaving the street realm and ascending to a book realm, accomplished through varied light levels and other architectural means. Passage and procession are harnessed to express the possibilities of learning, knowledge and attainment. Beyond this, the rooms observe the common rule that light will penetrate approximately 2.5 times the window height. Thus, a large volume with high windows overall provides overall good illumination. Light becomes an integral element of the traditional reading room, for practical use as well as for its symbolic, metaphorical allusions.

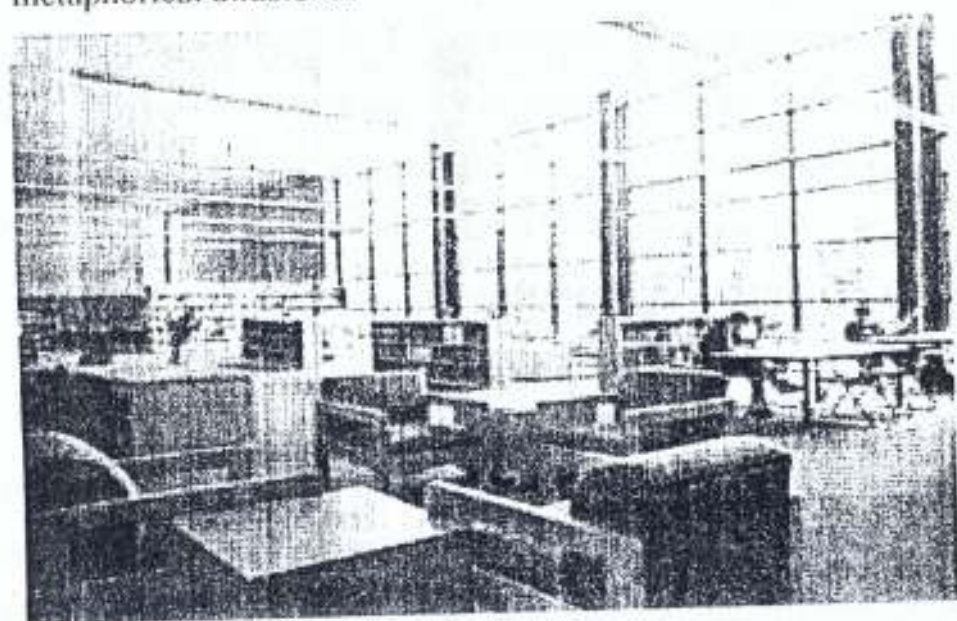


PLATE 6: READING ROOM LIT BY NATURAL LIGHTING.

Day lighting affords great design opportunities for all libraries, no matter what size. While this has been a given example for centuries, cheap and abundant energy has led to diminished emphasis on integrating daylight and architecture. This trend is being reversed as the psychological, Physiological and economic advantages of natural light are rediscovered.

And given that daylight is a free, plentiful, renewable resource at most sites, it should receive prime consideration. With electric lighting commonly accounting for approximately 50 per cent of a library's energy budget, the use of effective day lighting to reduce energy expenditures has become a viable economic alternative.

As outlined in the previous section, fewer than 100fc are needed for the vast majority of library tasks. Since the sun provides over 1,000fc even during overcast sky conditions, the issue is not availability, but rather controlling light. Under clear sky conditions, in fact, some regions have such abundant daylight that exploiting it is like attempting to drink from a fire hose. In arid, desert regions, the challenge is to allow light to enter a building without undesired glare or heat gain. The best architectural designs respond to such circumstances with solutions specific to the region.

Along with these regional considerations, other daylight factors such as the sun's different postures as it sweeps across the sky, natural weather patterns and seasonal concerns, compel and challenge design. In fact, daylight's possibilities and opportunities make it a prime generator of architectural form. The history of architecture can be traced through windows and the architectural means to control and shape light. Islamic latticework shielding occupants from the desert sun, Gothic expanses of stained glass, Japanese shoji screens filtering and diffusing light, and other examples of architectural innovation convey daylight's defining, elemental influence on architecture.

Yet beyond formal, aesthetic concerns, the assets of daylight are reflected in law and legislation through history. From first century AD until the fall of Rome, laws established solar access rights. A British law, dating from 1189 and embodied in an 1832 statute, provides that if a window enjoyed uninterrupted access to daylight for a certain period, that right

became permanent. Solar access prompted planning principles, which once adopted in 1905, affected Boston's urban fabric. In 1916, zoning ordinances were passed in New York that required skyscrapers to be built with setbacks in order to alleviate oppressive street trenches and facilitate sun penetration. In Japan today, building codes dictate that apartments receive four hours of direct sunlight per day.

Innumerable aesthetic and legislative examples reveal the importance of day lighting. Architects can effectively harness day lighting as a powerful resource by being mindful of its principles throughout the design process. The sun's course across the sky is determined by latitude. Site conditions, such as surrounding buildings and vegetation, may also influence solar access for all or part of the year. In a dense urban site, a neighboring building's reflective glazing might give unwanted glare. Understanding how to balance these factors will positively affect how the library is organized, as well as the distribution of window openings and shading devices.

Consider your local conditions, the mix of overcast or direct sunlight, and other climate conditions. Architectural solutions will derive from these variations. For instance, overcast skies are evenly lit (entering sunlight bounces off clouds to produce a diffuse light) so the glare from direct light is not a prime issue. In areas where overcast conditions do not predominate (such as desert regions), direct light may be a prime concern.

Recognize the solar arc. The sun is high at midday and easy to control with minimal overhangs. The rising and setting to the east and west is at low angles and difficult to control. Track these issues against space use. When harnessing daylight, ensure proper control within critical task areas to eliminate glare and unwanted heat gain.

Good regional architecture and vernacular solutions often offer insights. Courtyards in the southwest introduce tempered light in a building's interior. Conversely, traditional, small exterior openings reject light and its heat. In more temperate climates, narrow buildings with an east-west axis offer southern orientation, where south glazing can allow light to be controlled and the difficulties of low east and west sun angles can be minimized.

Orient spaces in the library to take advantage of natural light. If a Meeting room is to be used primarily at night, then daylight may be relatively unimportant. Reading tables, rather than stacks, should be placed adjacent to windows to take advantage of the daylight, with stacks perpendicular to windows to facilitate light penetration.

Recognize that lighting does not stop at the building envelope.

Vines, trees and trellis can give seasonal shading, arresting the hot summer heat but also allowing winter sun to penetrate. Make sure day lighting strategies are reviewed for such seasonal variation. Reflecting pools or snow cover can also be used to introduce reflected light into a library. Or consider how light-colored walks or roofs may be used to reflect light inside.

Lighting balance is important, with sources from two room sides more desirable than from just one. Clerestories and top lighting may be used in deep plan buildings. Direct beam lighting, interior and exterior light shelves and prismatic glazing also introduce daylight deeper into the space. It is also possible to differentiate between windows that provide light and those that provide view or ventilation.

Light colored surfaces offer better distribution, maximizing the light that does enter. Similarly, splaying surfacing adjacent to windows reduces the gradient between the bright source, the window, and its immediate

surroundings. Recognize the advantages of reducing the contrast between light sources and other surfaces.

Consider locating glazing as high as possible to facilitate light penetration. Beyond this, computer programs, such as Lightscape and Lumen Micro, can quantify the performance of day lighting strategies within a proposed space. At the same time, they are able to produce qualitative rendering of the space.

Fluctuating energy prices should also be addressed. Initially and at current energy prices, it may be more cost-effective to ignore strategies like top lighting. On the other hand, if effective top lighting can reduce the number of light fixtures needed as well as energy costs, it might be appropriate. High spaces facilitate day lighting, countered by the cost of constructing a larger volume.

A building "owner's manual", outlining cleaning schedules and Maintenance concerns should be developed and employed. For instance, windows or reflecting surface that are covered with grime are not effective. Design intentions must be followed through after building occupancy, not surrendered owing to neglect.

Day lighting affects building form. Optimal lighting might suggest Building orientation in one direction, while urban or landscape features might suggest the opposite. Balancing and juggling different, competing concerns is often necessary, and it is a factor that contributes to architectural richness.

In the context of library design, day lighting is an elemental, motivating issue. Weighing how daylight will enter your library is basic, yet it can be a complex concern. Ignoring its variability and delight, however, is

not prudent in an age when environmental and regional considerations are increasingly predominant.

3.3. ELECTRIC LIGHTING

In many lighting design projects, the location and nature of the task is indiscernible. In library design, however, the tasks are varied and widely dispersed. Individuals may read at a table, scan reference materials at a stand-up counter, read a book in the stacks, search for a title, scan the stock market tables in a lounge chair, or read to children on the floor of the children's room. In concert and conjunction with daylight, electric light must be integrated to address this variety. From library use patterns, one might assume that the entire space should be designed to 75fc. This conclusion, however, would be particularly wasteful from an energy standpoint. It also ignores the design complexity of distributing light on vertical and horizontal surfaces, and prevents the control of its interference on computer screens. Light physics tells us that the amount of light from a uniform linear source (like a fluorescent tube) is inversely proportional to the distance, while light from a point source (like a spot light) is inversely proportional to the square of the distance. Thus with a linear source, light available on a book spine four feet from the source is halved when the book is eight feet away.

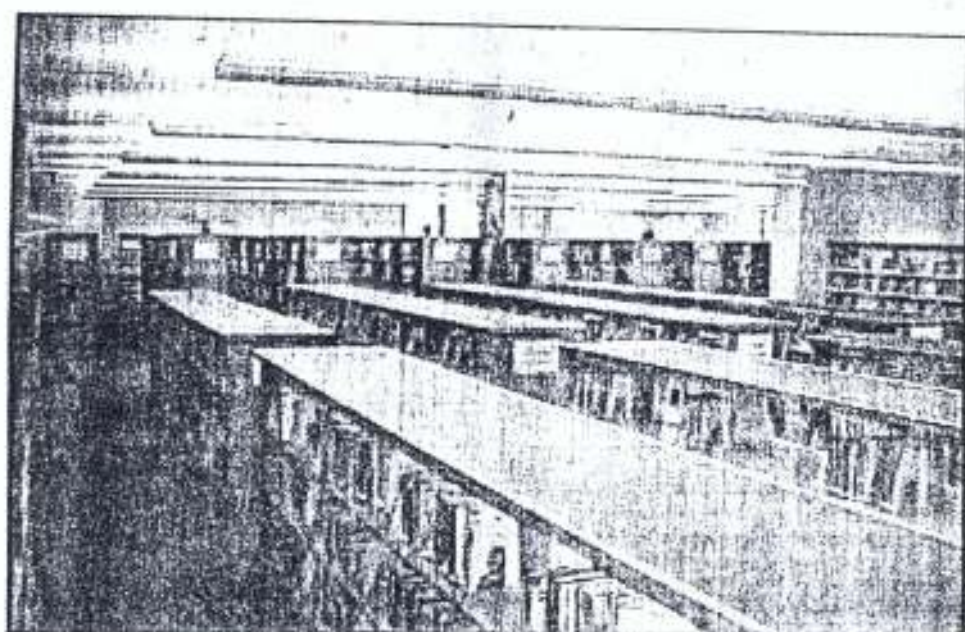


PLATE 7: BOOK STACKS LIT BY FLUORESCENT TUBES

For this reason, the amount of light needed to reach the lowest stack shelf will be the determining design criteria. It follows that the closer the fixture can be placed to the top shelf, the fewer lumens that will be needed to light the book spines from the top to bottom. In short, mathematical equations and calculations, and the cost of paying for electricity, determine the amount of light reaching a task. Use a strategy that enables the spaces to be lit for their purpose, yet one that is flexible if use changes. For example, the lighting scheme at the Brookdale-Hennepin Library in Brooklyn Park, Minnesota, has adjustable fixtures which can slide to new locations without the need to rewire or relocate the primary fixtures.

Other factors to consider in developing a lighting strategy include:

- i. Increase wall reflectance, within contrast ratios, and avoid large Brightness ratios. In general, provide light colored surfaces with a combination of lighting types, both general indirect lighting and direct lighting. Reduce glare by correctly choosing and placing fixtures.

- ii. Provide only recommended levels of illumination. Use lower levels when tasks are not required. Place luminaries where needed. Do not place luminaries indiscriminately; assess locations carefully. Use tasks, safety and overall aesthetics as balanced guidelines.
- iii. When possible, group tasks requiring the same standards of illumination. Consider reducing fixtures and ambient light levels by providing task lighting at tables.
- iv. Coordinate switching with tasks. Do not allow switching to be designed for "operational simplicity" such as all-on or all-off. Use occupancy sensors whenever possible, such as study and conference rooms and restrooms, to light only when occupied.
- v. Use time clocks to control lighting. Turn off fluorescent fixtures if the space is vacant for more than five minutes, and turn off high-intensity discharge lamps if the space is vacant for more than 30 minutes.
- vi. Try to reshelving and clean during regular hours. If this is not possible, train staff on proper switching. Do not allow the staff to simply turn on all lights for convenience. Better, ensure that lights are switched to enable cleaning and reshelving to take place in stages.
- vii. Zone the lighting so that staff areas can be accessed during non-public hours. Concentrate night parking in one area if possible. Zone parking lot lighting for security and needed spaces by activity.
- viii. Compare all lamp alternatives, using lower wattage lamps whenever possible. Evaluate lamps based on efficiency (lumens per watt), lamp color, color rendering, installation and operating cost comparisons. Evaluate replacing existing lamps with lower wattage alternatives.
- ix. Eliminate incandescent fixtures. A compact fluorescent bulb uses 75 percent less energy than an incandescent bulb, which is energy inefficient at

giving light while simultaneously increasing cooling costs. Evaluate heat removal luminaries to reduce cooling costs.

x. Complete a library energy audit. If new construction, gather costs on Comparable libraries. With electric deregulation and rates in flux, it pays to be proactive.

xi. Clean luminaries and replace lamps on a regular schedule. Replace outdated luminaries with the most efficient systems. Use the most Energy-efficient ballasts available.

Many factors will influence lighting energy consumption. Besides Intelligent design and careful programming, individual efforts can make a Substantial difference. Educate the patrons and staff to be energy conscious. Recognize that lighting will typically be 50 per cent of your energy operating costs.

3.4. COMPUTER SCREENS AND LIGHTING

With the advent of the computer, library lighting has become a more complicated proposition. Reading light emitted from a VDT and seeing the image on paper with reflected light establish conflicting light requirements.

Generally, when people work regularly with a CRT they are faced with several different visual tasks. Their eyes can move from the screen, to the background and to adjacent work tasks. Each time the eye moves, it attempts to adjust to the new lighting level. If the degree of adaptation between visual tasks is too great, eye strain and fatigue result - a real problem for long-term tasks, such as for staff and patrons at reference stations.

The most important consideration, in our opinion, is not the final Illumination levels, but rather the difference between illumination levels. For this reason, we have cited the recommended maximum brightness ratios

above. As the library becomes more reliant on information contained "on-screen", it is critical to understand the roles played by uniformity in comfort levels and by efficiency in use of lighting levels. Of equal importance is the issue of light fixture reflections on screens. If the luminary is a "bright source", it can create an uncomfortable field of view for the user, perhaps encouraging the user to "adjust" the brightness of the screen to compensate. This phenomenon is typical - one reason display tubes are lasting only two to two-and-one-half years at some libraries.

Indirect lighting creates uniformity, enabling the user to appropriately balance the ratio between background and screen. Alternatively, deep-cell parabolic fixtures can create a dark appearance when viewed across the library space, thus creating a common dark field to a CRT screen. We recommend, however, that indirect lighting be considered seriously. This recommendation must be considered in the context of the ceiling height, energy management and practical limitations. A minimum ceiling height of 10ft is needed for this to work properly.

Brightness should be controlled within a 60[degrees] to 90[degrees] zone in order to achieve visual comfort. A person will be looking typically at an angle between 60[degrees] and 90[degrees] from vertical; therefore, in this zone the control of the surface brightness of a fixture lens or louver will provide good comfort because of the uniformity (basis for visual comfort probability or VCP). Visual adaptation is another of the computer user's problems. We know that glare is annoying, yet it is not the cause of "eye strain". Instead, strain occurs when the pupil of the eye (the iris) dilates and contracts as it passes from a bright field to a dark one.

Moving often from a reference piece of paper to the screen causes the eye to tire (visual fatigue). For this reason, the Illuminating Engineering Society (IES) has recently recommended lowering the foot-candle levels at

the desktop. The basic goal is to have the CRT screen and the desktop task have similar brightness levels.

Unless the distribution of the light out of the fixture is very broad, the uniformity of lighting levels throughout the space will be poor. For example, a person immediately below a fixture may find the space to be bright while a person between the fixtures may think it is too dark. The parameter that describes the broadness of the lighting distribution from a fixture is its spacing-to-mounting height ratio.

CHAPTER FOUR

CASE STUDIES

The use of past and present projects as case studies serves as a veritable tool in the hand of the researcher. It enables him to study their performance as design solutions and to make an assessment of their social-economic impact as built forms.

Its critical analysis of their merits and demerits enables one to see such projects in retrospect and serve as a guide in the formulation of new design solutions from which attempts will be made do eliminate such demerits identified as well as improving on merits of such projects.

The various libraries studied in the course of this research are:-

- (1) Ekiti State Library, Ado-Ekiti,
- (2) British Council Library, Ikoyi
- (3) Ondo State Library, Akure
- (4) University of Ibadan Library, Ibadan
- (5) Edo State Library, Benin-City
- (6) Broward County Main Library, Fort Lauderdale

4.1 EKITI STATE LIBRARY, ADO-EKITI

GENERAL INFORMATION

If not for the striking sign post reading Ekiti State Library, the State Library of the "fountain of knowledge" could be easily mistaken for a residential building there is no element to indicate that it is a Library.

Thus for a visitor coming with all vigor to read or carry out some research, there is no motivating drive, and where such a drive is inherent, there is no attracting power of the building to sustain and encourage that urge.

The building was converted to the state Library after the creation of Ekiti State in October 1996, by the then Head of State, General Sani Abacha. It was initially reading center for the Ado-Ekiti community. It is located in the hub of the city very close to the govt. office. Its main entrance is via Govt. Office road.

THE DESIGN

The Library's is basically a square and has a floor area of 603.46m². It houses Directors Office, Secretary's Dept. Director's Office Computer room, references enquires, serials, reference, main reading area and a number of offices. The library is a single mass building with a offices. The Library is a single mass building with a large hall in the middle which serves is the main reading room, serials and enquires. Offices, convinces and reference are at the sides. The roof is a gable type with parallel walls on the front and the back of the building.



GROUND FLOOR PLAN

FIG. 1: GROUND FLOOR PLANS OF EKITI STATE LIBRARY

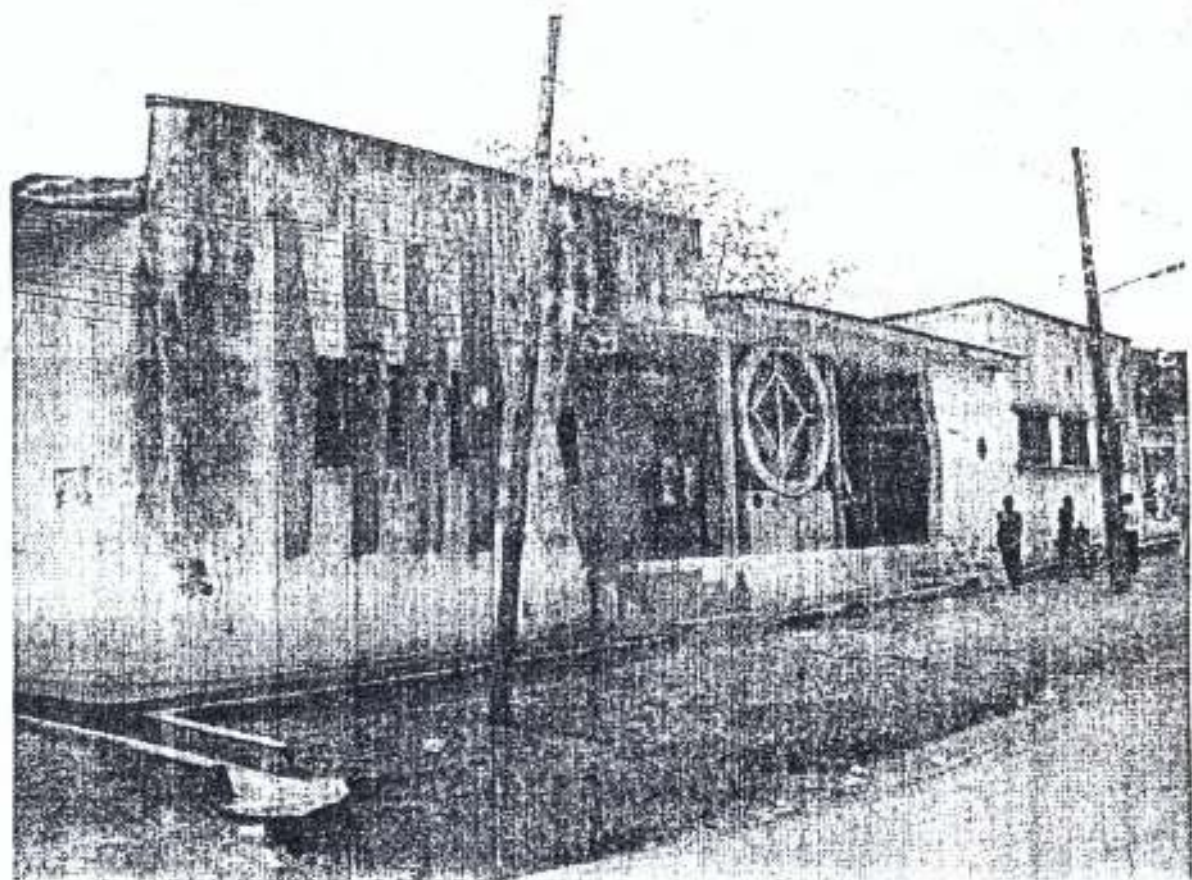


PLATE 8: PICTORIAL VIEW OF EKITI STATE LIBRARY

ARCHITECTURAL APPRAISAL

Merits

- The floor area of the building is judiciously use up by library activities i.e. Economy of space.
- The Library is strategically located such that it can be accessed easily from any part of the city.

Demerits

- The building experiences poor natural lighting in the main reading areas and lobby.
- The aesthetics of the building is not pleasing, as it does not portray a library (on institutional building).

- Inadequate provision of some facilities in the library does not encourage the desired increase in use. E.g. the inadequate reading space, non-functional toilet facilities, non-functional photocopying unit. Etc.
- The terrazzo floor finish creates noise while walking on it which distracts readers in the reading rooms.
- The issuance of taken and supervision force occupants who would have loved to read in a particular place to read in position which may not encourage the occupants to study conveniently. Some users do not like reading close to the windows but may have no choice than to sit there, if the number given to choice them is close to the window.

4.2 BRITISH COUNCIL LIBRARY, IKOYI

GENERAL INFORMATION

The British council library, Ikoyi was opened in 1943. it was to serve as an information center during the war period as well as provide facilities for people interested in reading. The library has move from one building to another, but remained in Ikoyi. It is now situated along Raymond Njoku Way, Ikoyi.

THE DESIGN

The library is housed in the grouped floor of the building. The upper floor is restricted only to staff of the British council. The ground floor contains the entrance lobby, enquires, waiting, references, library services, general reading, cyber café, TV room etc. the entrance lobby has sky light into the waiting areas. The library used artificial ventilation with a central cooling system.

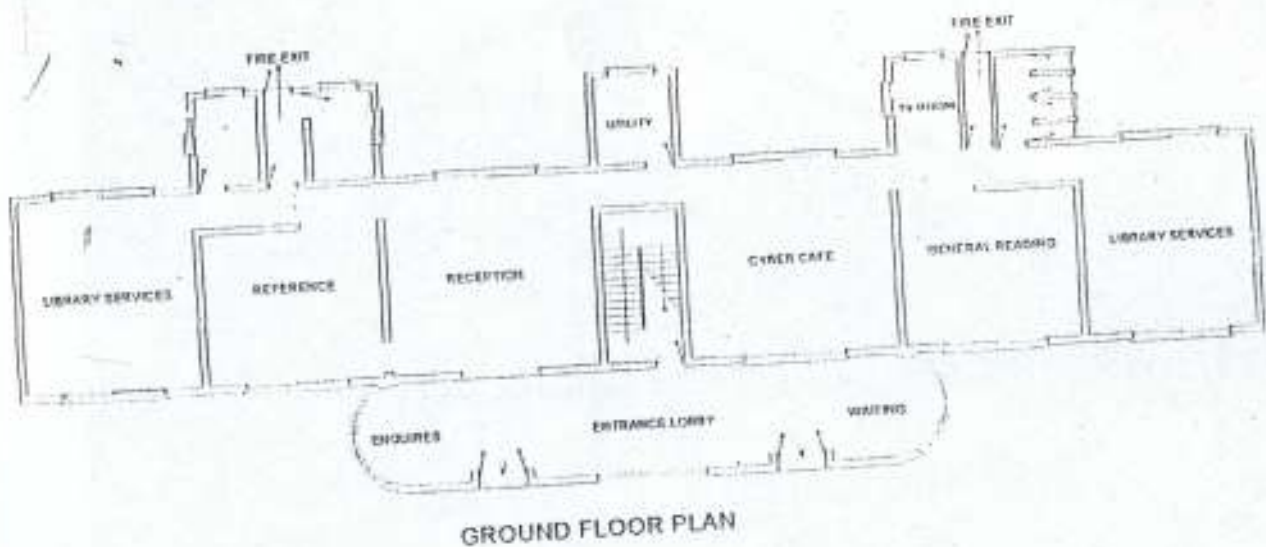


FIG 2: GROUND FLOOR PLANS OF BRITISH COUNCIL, LIBRARY

FEDERAL UNIVERSITY OF TECHNOLOGY LIBRARY
 S.E.T LIBRARY

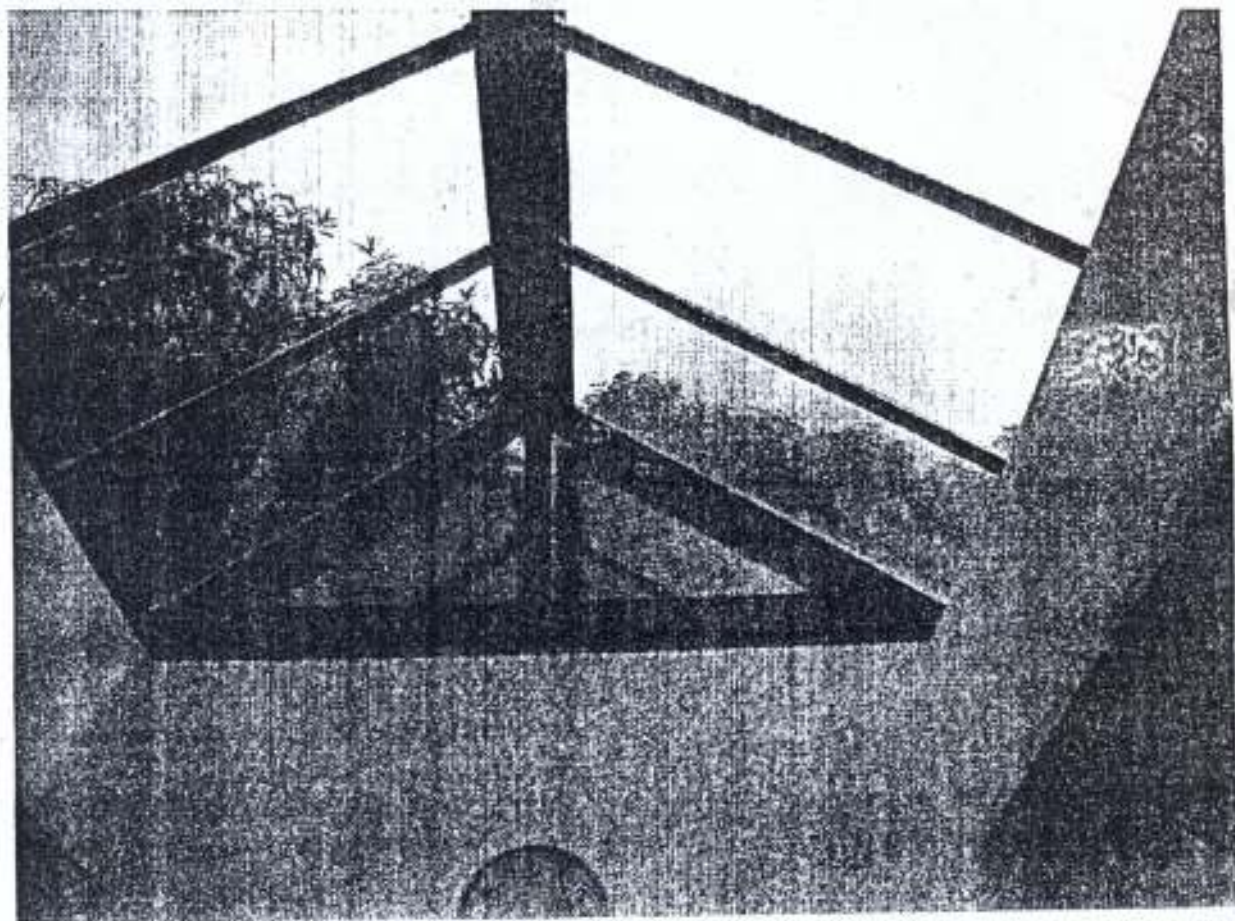


PLATE 9: SKYLIGHT ABOVE ENTRANCE LOBBY

ARCHITECTURAL APPRAISALS

Merits

- The floor area of the building judiciously used up by library activities.
- Adequate entrance and exit points
- Adequate and well coordinated human circulation within the buildings.
- Interior spaces are well illuminated.
- The building is aesthetically pleasant and welcoming.



PLATE 10: PICTORIAL VIEW OF BRITISH COUNCIL LIBRARY

Demerits

- The unscreened tables provided in the reading rooms do not provide its users with the appreciable level of privacy they would have provided if they were screened.
- The tinted glass and the large window area on the south side creates a certain amount of glare and dazzle.
- The facilities provided can only satisfy a very small community.

4.3 ONDO STATE LIBRARY COMPLEX

GENERAL INFORMATION

The library has 3 blocks which were completed by Navy Commander ANTHONY IBE ONYEARUGBULEM Fss, Psc and commissioned by Rear Admiral MIKE OKHAL AKHIGBE Mss, Fsc, Mni Chief of Navy Staff on Thursday 9th February, 1998. 2 of the blocks have 2 floors each. The first block has the administration offices on the 1st floor while the ground floor house the media a resource centre and the multipurpose hall, all in the eastern section of the stepped conference hall.

The library presently has seating capacity of about 600 (including children) and about 50 thousand on lines. It has a staff strength capacity of about 50 workers. The second building houses the library spaces, business centres training school and the technical section.

The administrative offices of the library board chairman, secretary and some other members of the board are located on the 1st floor of the 2nd block. While the lower and 3rd has the technical section and children and adult reading spaces. It also has the training school and the business centres.

The third building is the reference library and it houses the reading room, library offices two other offices and conveniences.

The building has a building height of 3m from ceiling in each floor and an illumination level of about 452inch at table level with a conducive temperature of 25⁰c – 32⁰c.

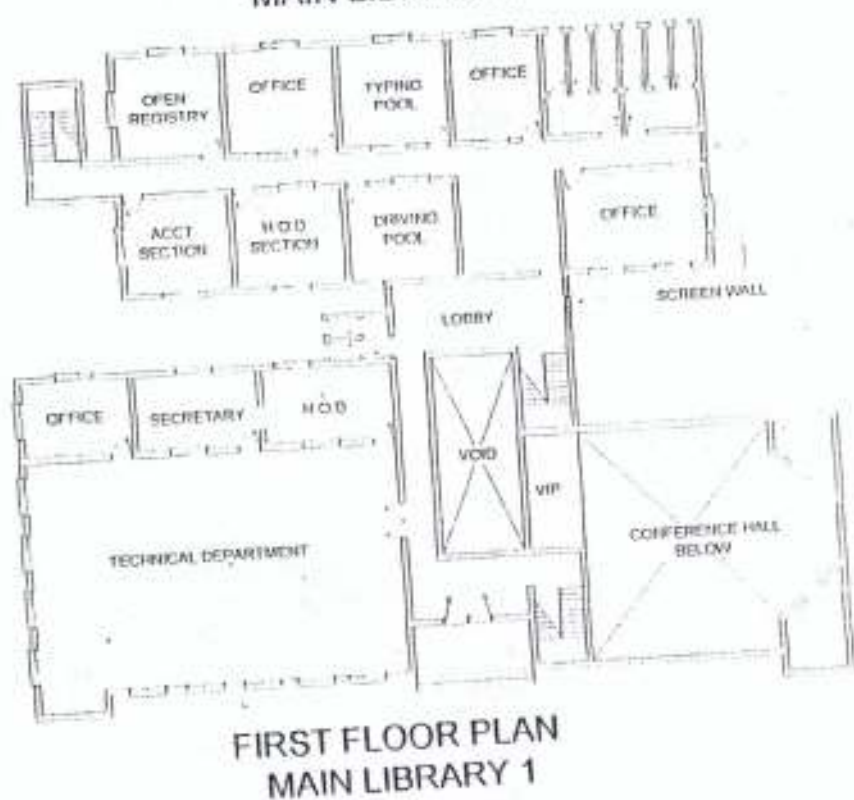
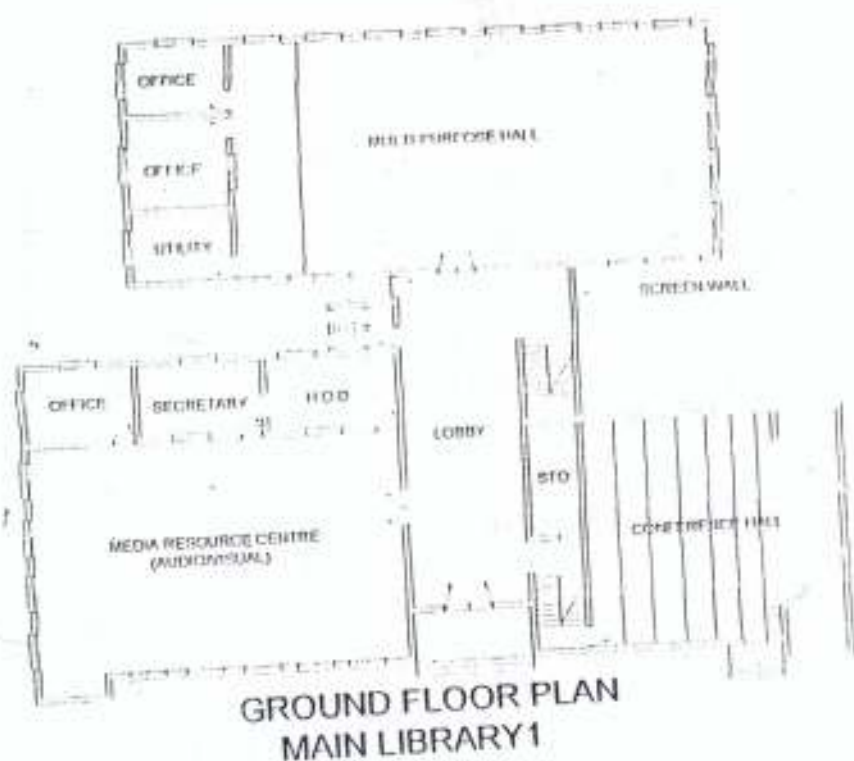
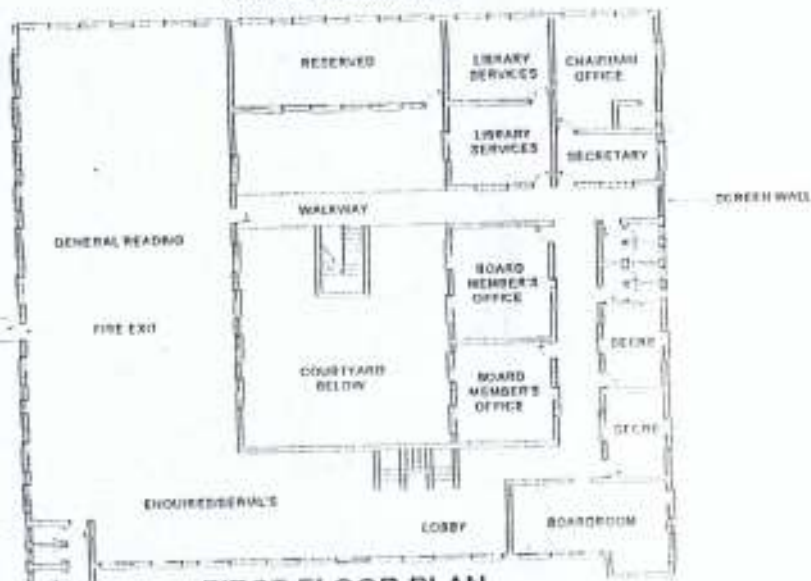


FIG. 3: FLOOR PLANS OF ONDO STATE LIBRARY (MAIN LIBRARY)



**GROUND FLOOR PLAN
MAIN LIBRARY 2**



**FIRST FLOOR PLAN
MAIN LIBRARY 2**



**GROUND FLOOR PLAN
(REFERENCE BUILDING)**

FIG.4. FLOOR PLANS OF MAIN LIBRARY 2 AND REFERENCE LIBRARY)

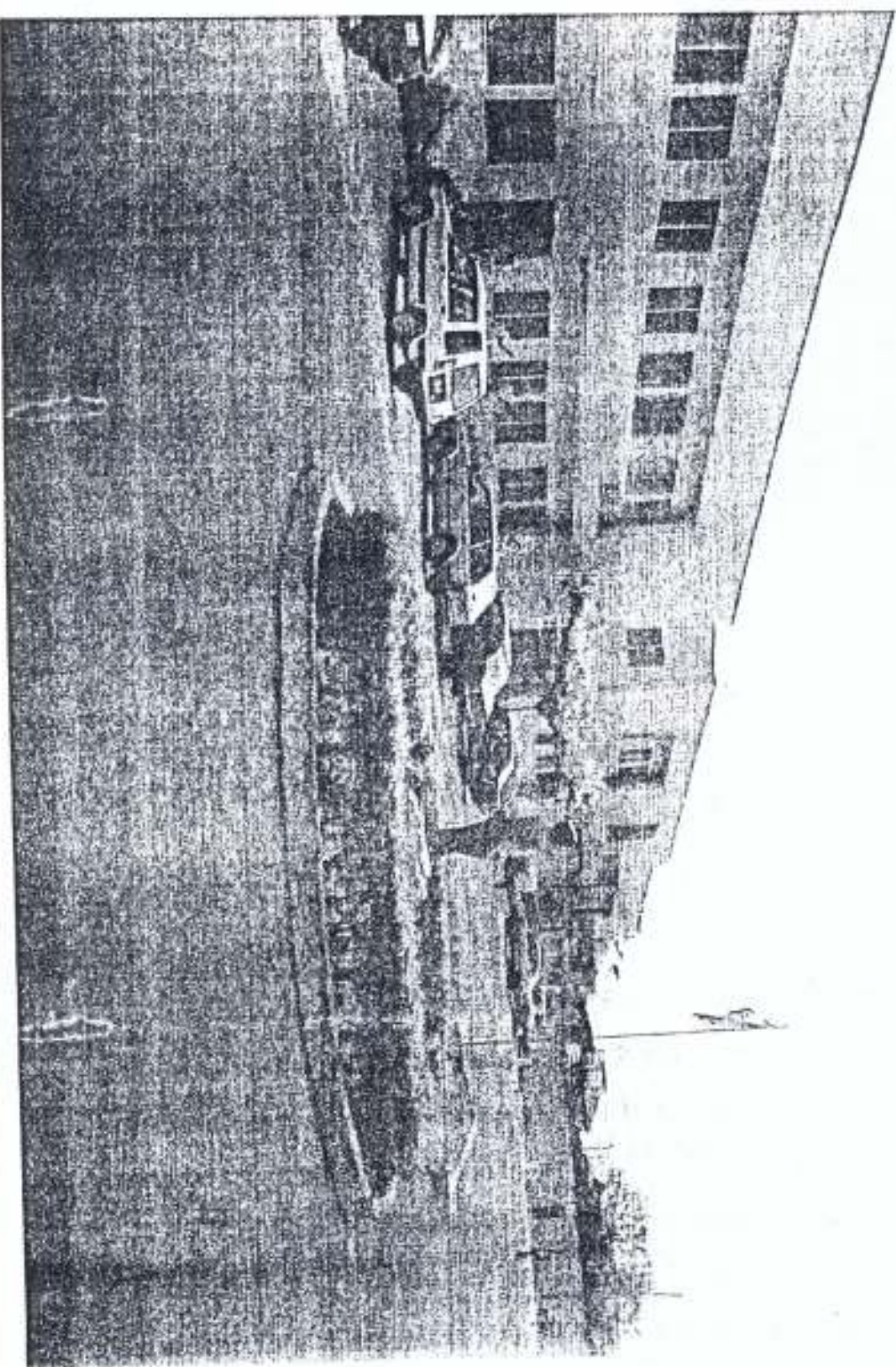


PLATE 11. PICTORIAL VIEW OF MAIN LIBRARY BUILDING



PLATE 12: PICTORIAL VIEW OF REFERENCE BUILDING)

THE DESIGN

The 2 blocks are simple structure, which I supposed were built on the simple concept of accessibility to all parts and maximum circulation. It is also notices the use of shading devices are not so prominent on the building, may be because of the of the east west building orientation.

The plan is basically simply rectangular enclosure with minimum obstruction. Accessibility to all parts of the building is well defined. It has a large open space surrounding, even though not adequate provision was made for children relaxation.

The 2 blocks for the library has all the available spaces, some spaces within the library are not in accordance to National library commission standard.

The structure is constructed on a frame of 6m x 6m modular grid system of construction. The flooring is finished with terrazzo floor finish and the external walls finished which are texcote paints. All structural members - columns and beams are 25 x 22mm is all R.C.

ARCHITECTURAL APPRAISALS

Merits

- The buildings depend mainly on natural daylight which is quite sufficient to illuminate the offices.
- Adequate entrance and exit points.
- The offices are shaded perfectly from the element of weather like solar radiation e.t.c.
- The building successfully houses all the administrative activities of the libraries.
- The building is aesthetically pleasant and welcoming

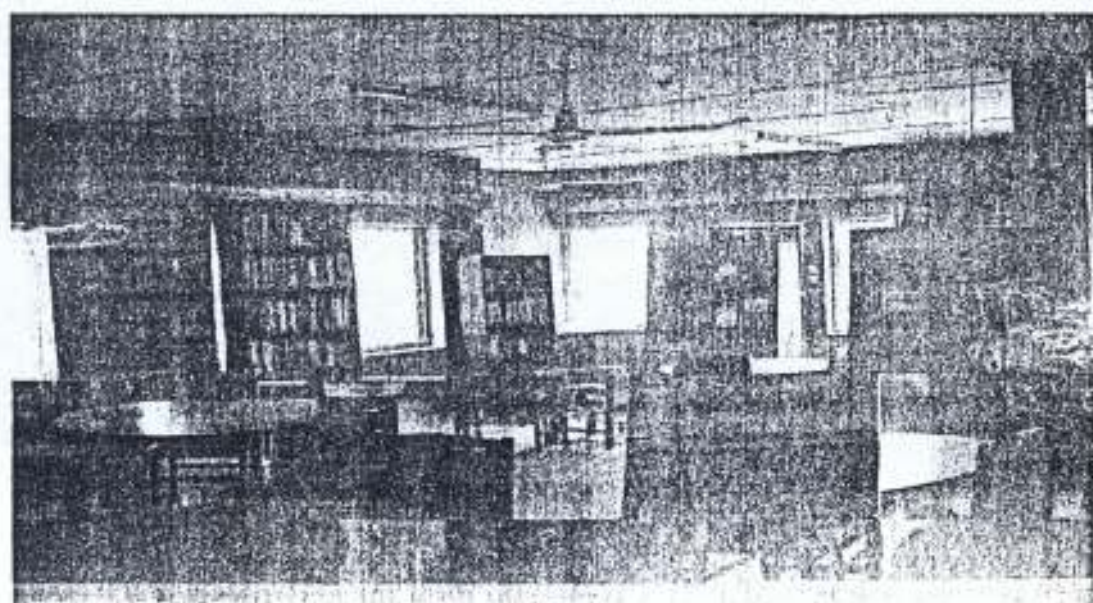


PLATE 13: PICTORIAL VIEW OF READING ROOM (REFERENCE LIBRARY)

Demerits

- The various departments of the library complex are housed in different building there militating against easy flow inter-department.
- Poor illumination in some of the hallways
- Toilets are too far from some offices, thus workers have to travel within the building to use such facilities.
- Horizontal expansion for serious expansion is greatly hindered because no room is given for such and the whole compound is built up.

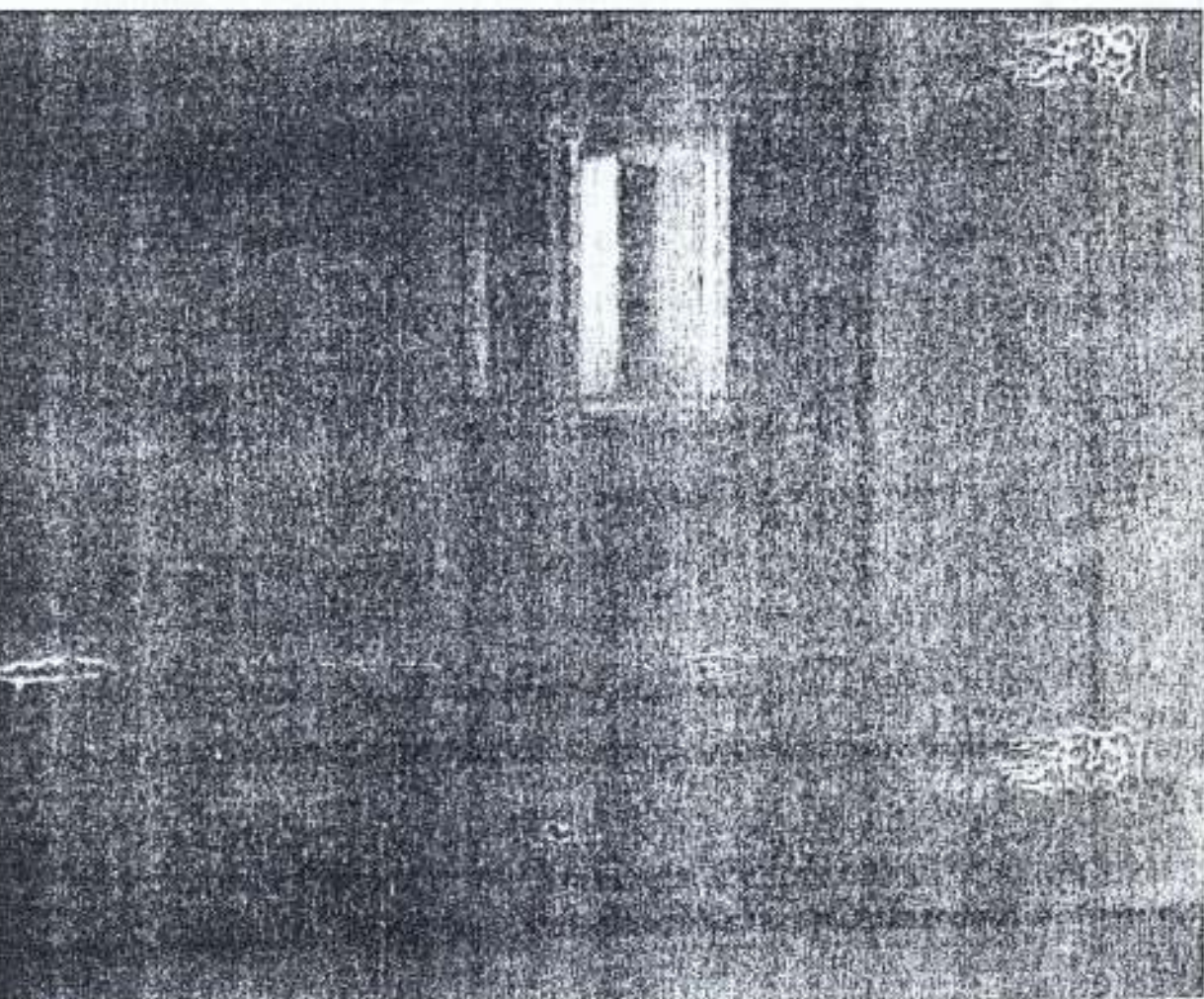


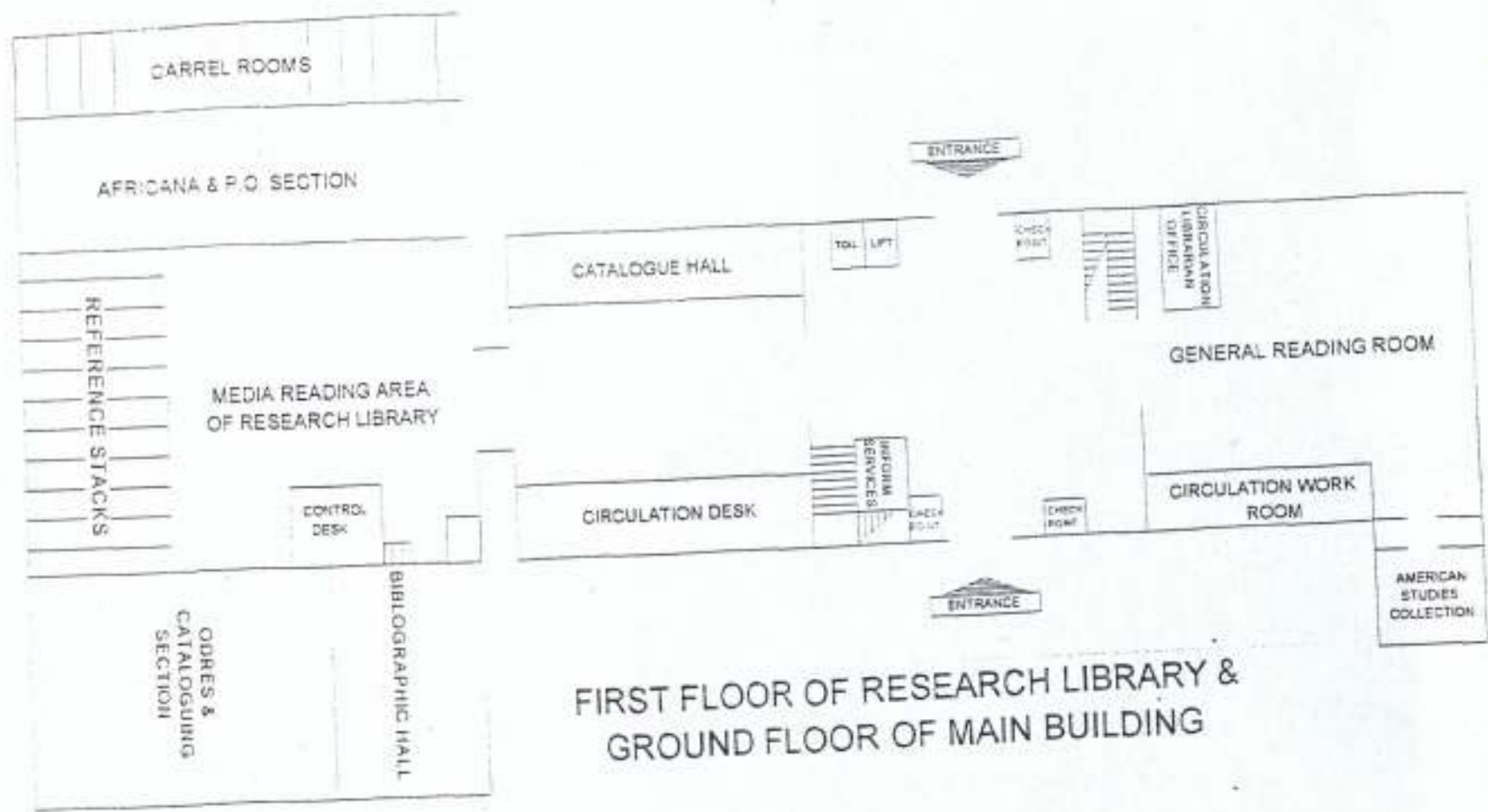
PLATE 14: PICTORIAL VIEW OF BOARD ROOM LOBBY (AT NO. ...)

4.4 UNIVERSITY OF IBADAN LIBRARY, IBADAN, GENERAL INFORMATION

The university library consists of two wings, the undergraduate wing (old) and the post graduate research wing (new). The undergraduate wing was opened in 1954 while the postgraduate wing was opened in 1969. These two wings have a capacity of 500,000 volumes of books with a reader's capacity of 1,250. It has a staff strength of about 200 and the library building is located behind the University sports field, just after the Faculty of Arts building to which is linked.

THE DESIGN

The undergraduate wing has six floors. The basement houses the maintenance and technical services while the ground floor houses the main entrance (i.e. check-point) and the exit Check-out-point), the exhibition, circulation workroom, reserved book room and a general reading room. The other floors contain reading rooms, carrels, offices, stacks and stores among others. In the postgraduate wing, it is on three levels. The basement houses the bindery and lift room, the ground floor houses the restricted materials, office, canteen and conference room. The first floor (main floor) contains the entrance halls main reading area, carrels, stacks and reference among others. The design is to provide suitable condition for both books and readers through maximum utilization of natural ventilation. The postgraduate wing has skylight into the reading room while the undergraduate has continuous horizontal louvers on south and west walls.



FIRST FLOOR OF RESEARCH LIBRARY &
GROUND FLOOR OF MAIN BUILDING

UNIVERSITY OF IBADAN LIBRARY
 S.E.I. LIBRARY
 DATE _____

ARCHITECTURAL APPRAISALS

Merits

- Natural lighting and ventilation is adequate.
- The postgraduate/research wing admits skylight into the reading room through the maroon coloured ceiling made from a dirt resistant glass compound known as fantax.
- The external corridors reduce the effect of solar radiation and glare in the building.
- The old wing through the years has proved to be highly flexible, efficient and economical.

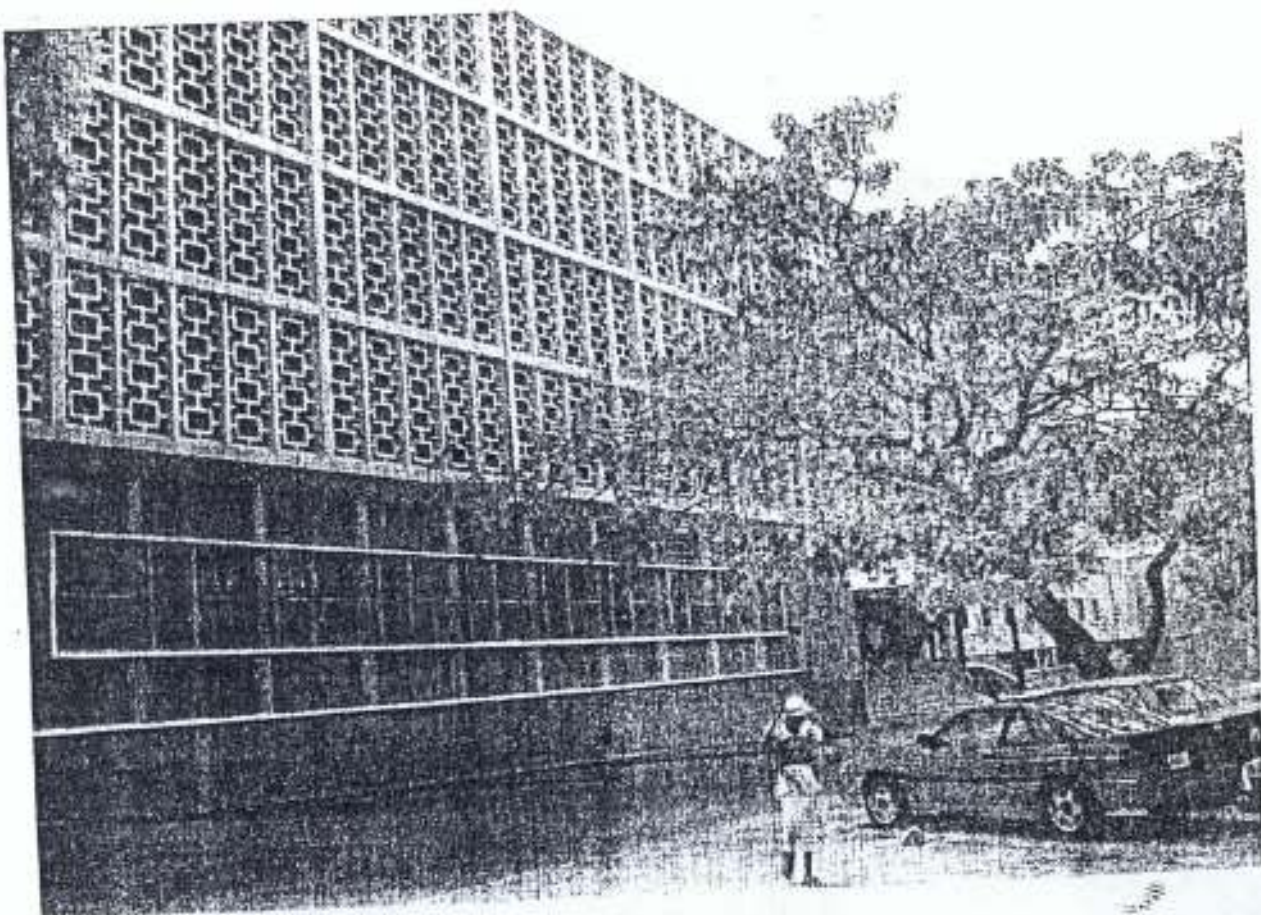


PLATE 15: PICTORIAL VIEW OF UNIVERSITY OF IBADAN

Demerits

- Its adjacent location to the sports centre results in uncontrolled noise during sporting activities.
- The inadequacy of readers' capacity and the volume capacity provided by the library do not meet an appreciable percentage of the students' population.
- The circulation is too close to the entrance with inadequate waiting space which encourages improper checks at the entrance.
- Lack of provision of functions meeting not only the obvious demands of a library users such as the card catalogue, the reading rooms, biographies, etc. but also the less obvious demands of its users such the conversation room the medias room, snacks room, etc.
- The staircase at the entrance does not encourage the use of this building by handicapped students due to the inconvenience experienced in accessing the building.

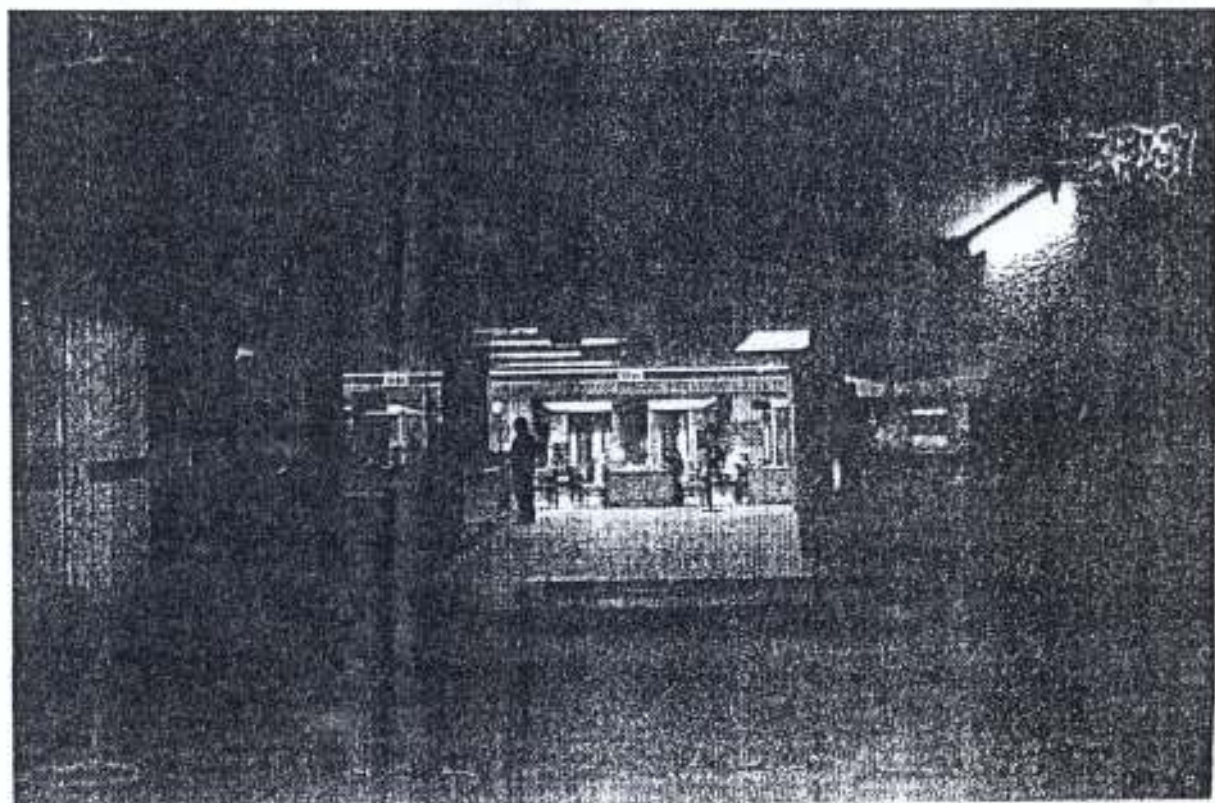


PLATE 16: DARK LOBBY CONNECTING REFERENCE LIBRARY

MAIN LIBRARY.

4.5 EDO STATE LIBRARY, BENIN-CITY.

GENERAL INFORMATION

The ultra-modern Edo state library was built by the administration of his Excellency chief (Dr) Lucky Nosakhare Igbinedion and was commissioned by his Excellency chief James Onenefe Ibori the executive governor of Delta State on Tuesday to 16th November 2004 it consists of two blocks joined to create a tee-shaped four(4) floor building.

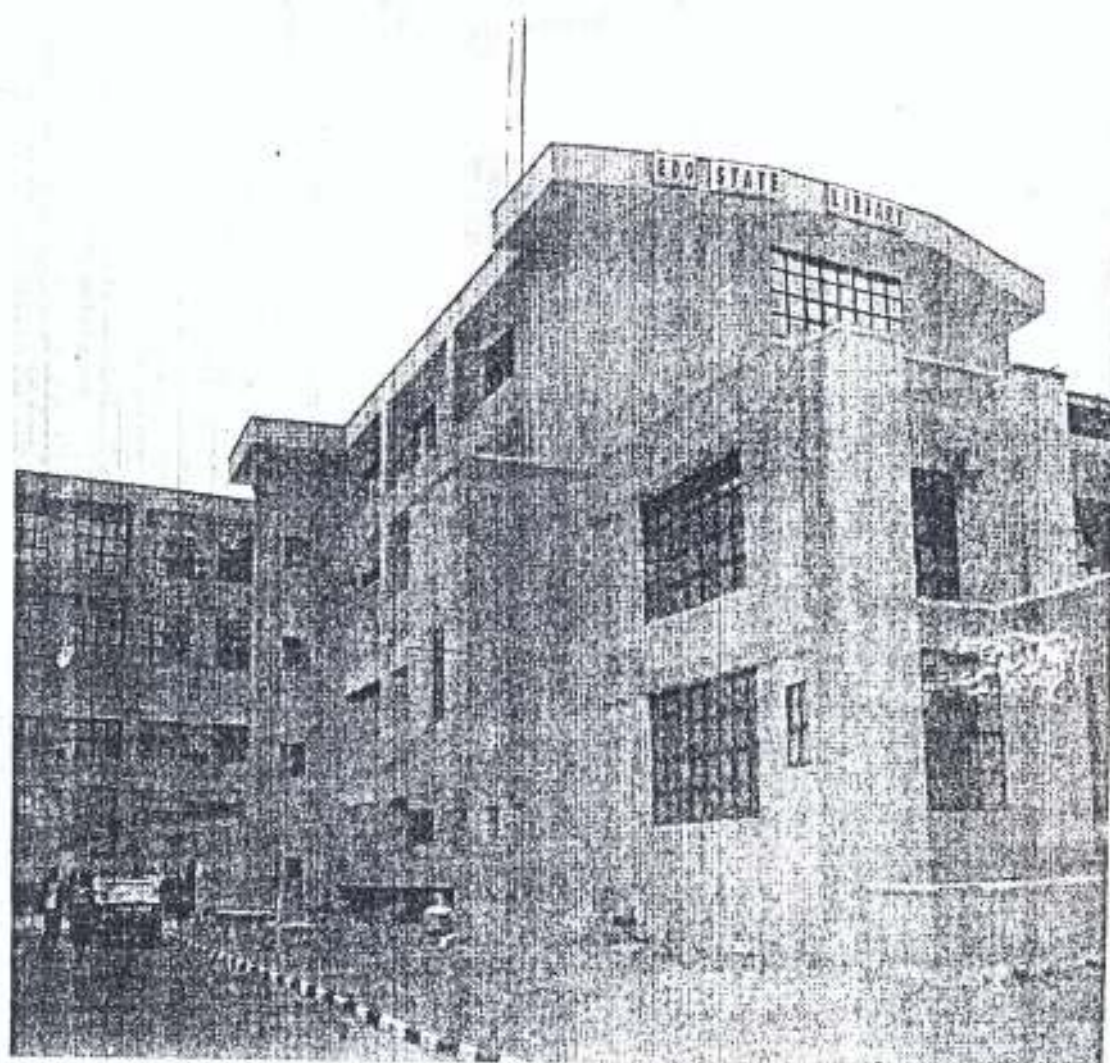


PLATE 17: PICTORIAL VIEW OF EDO STATE LIBRARY COMPLEX

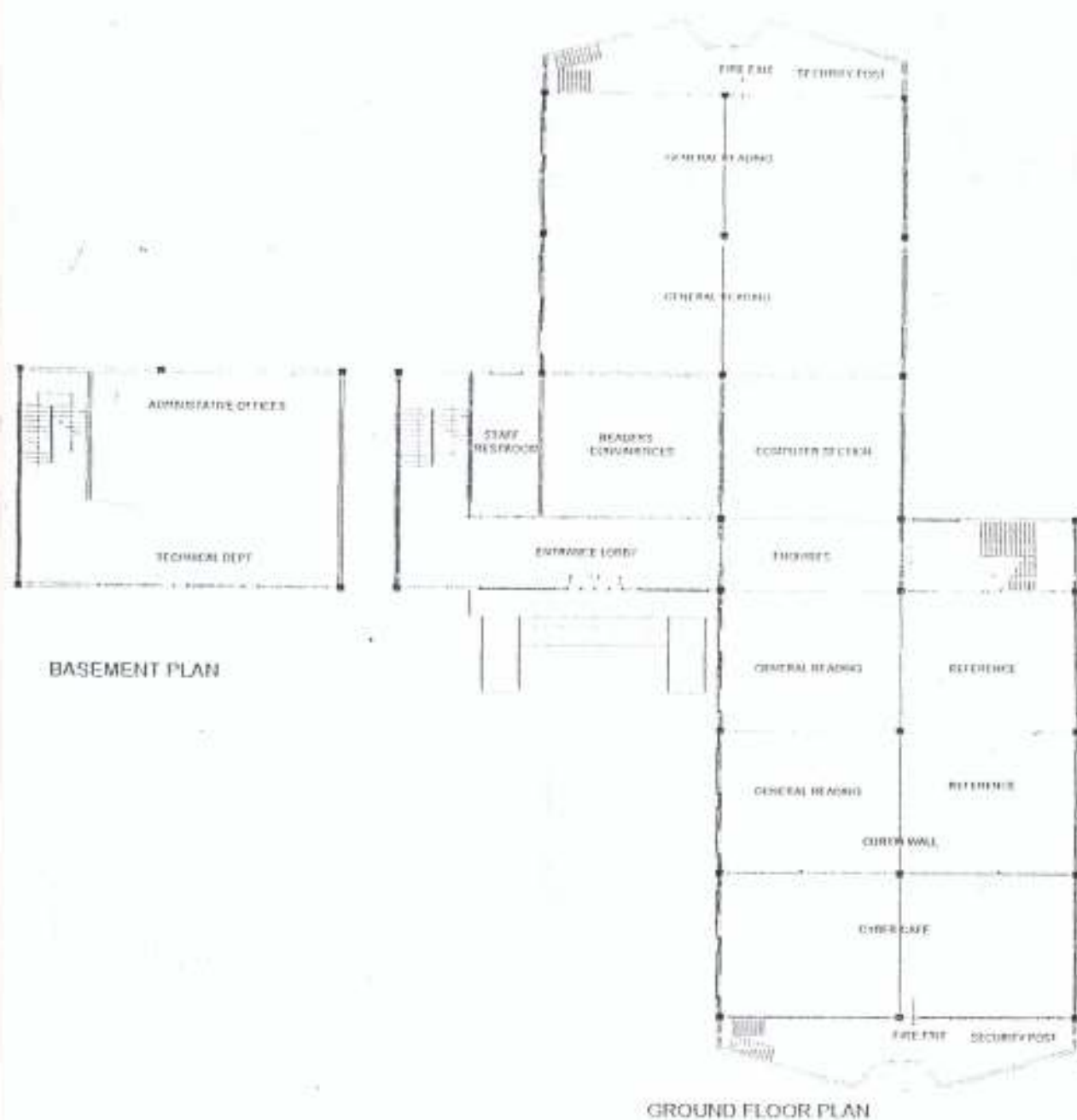
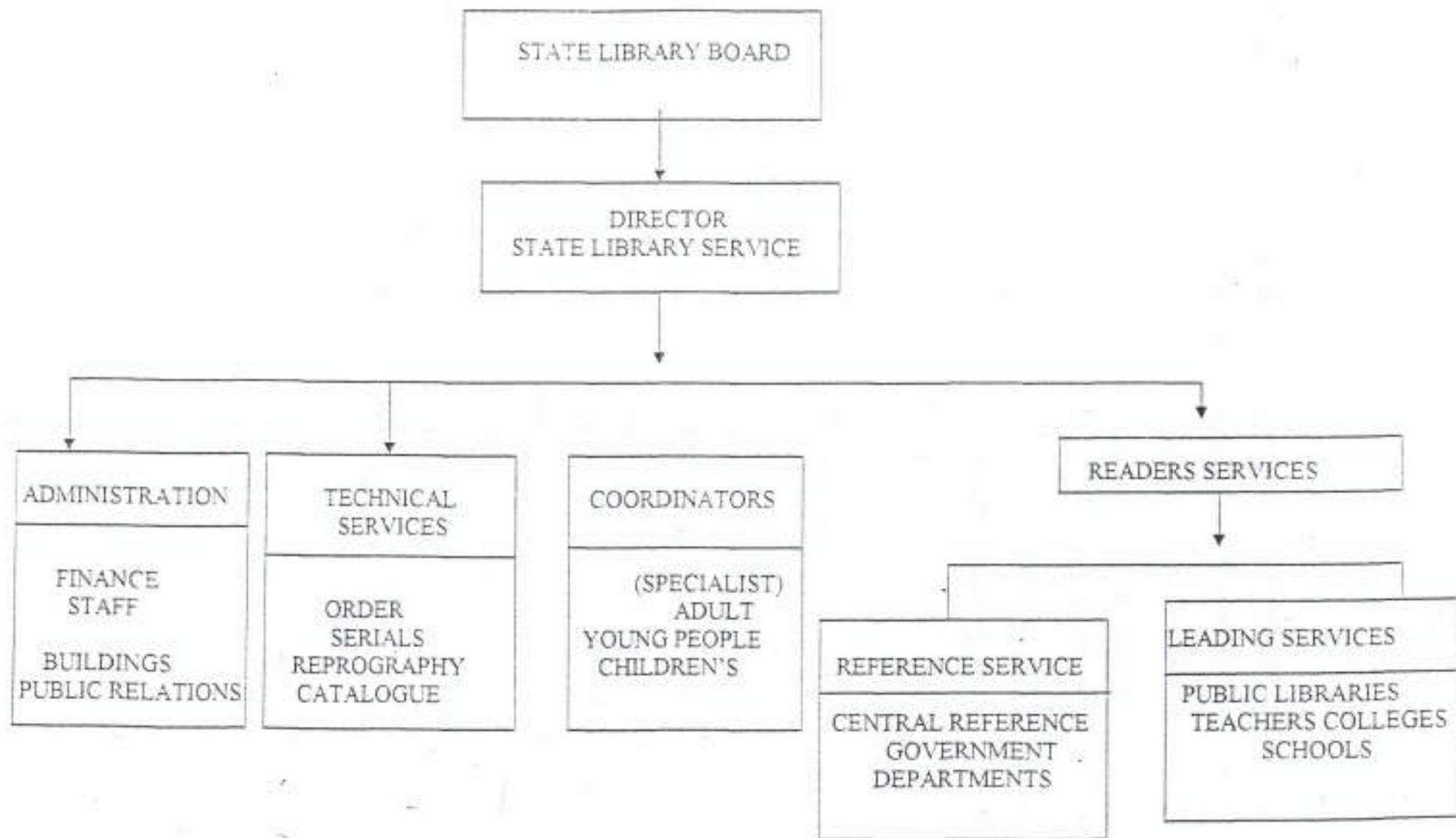


FIG.6: FLOOR PLANS OF EDO STATE LIBRARY COMPLEX

THE DESIGN

The library actually only occupies the basement, Ground and first floors. The entrance of the building is inviting with ramps to provide easy access for disabled users. The basement houses the technical Dept. and Administrative offices. The Ground floor houses the general reading rooms,



ORGANISATION CHART OF EDO STATE LIBRARY BOARD

computer section, enquiries, fire exit, security post, staff rest room, readers' room and cyber-café.

The first floor which is the highest level for the library houses the Exhibition Area, law library, serial section, General reading rooms, children section, Activity room, security post, fire exit. The building has ample surrounding which enhances adequate air movement. The modular system was adopted for its construction and in effect it constrains minimum of structural obstruction. The inner of the main block consists of an escape stair at each end of every floor. The environmental standard is given considerable importance. The plan is simple with minimum structural obstructions. The use of air conditioning is limited to the reading room children section, Audio-video room and selected offices.

It also provides for future expansion. At the time of opening, it could only occupy three floors the remaining floors provide temporary accommodation for Equatorial trust bank and the Nigeria stock exchange thereby reserving these floors for future growth of the library.

ARCHITECTURAL APPRAISAL

Merits

- The entry into the building, through the ramp enables the use of the building by the handicapped
- The projecting floors and the tinted glass help to prevent heat penetration into its interior.
- Natural lighting is achieved in the cyber-café by the use of continuous double glazed partitions.
- The building is adequately ventilated.
- The building is structurally stable and aesthetically pleasing.

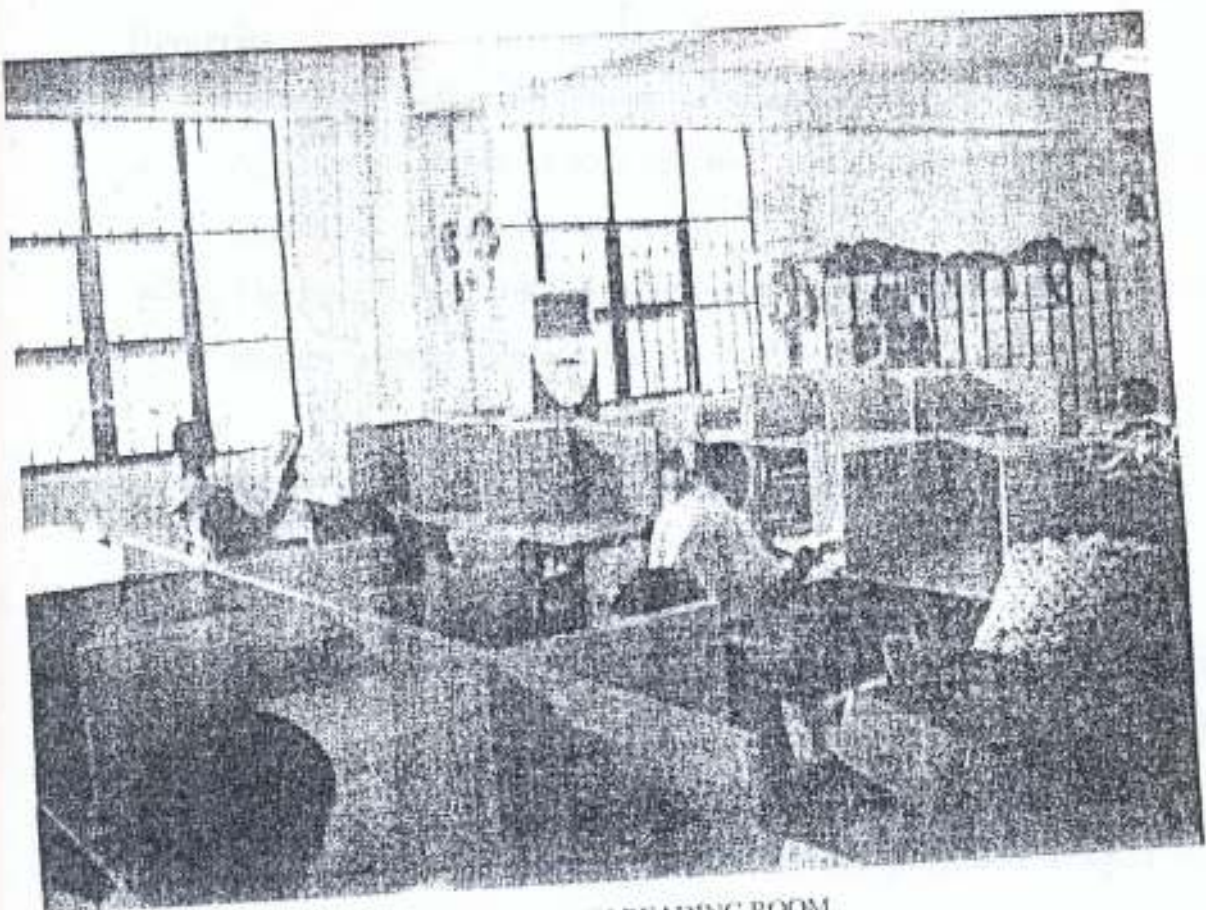


PLATE 18. PICTORIAL VIEW OF MAIN READING ROOM

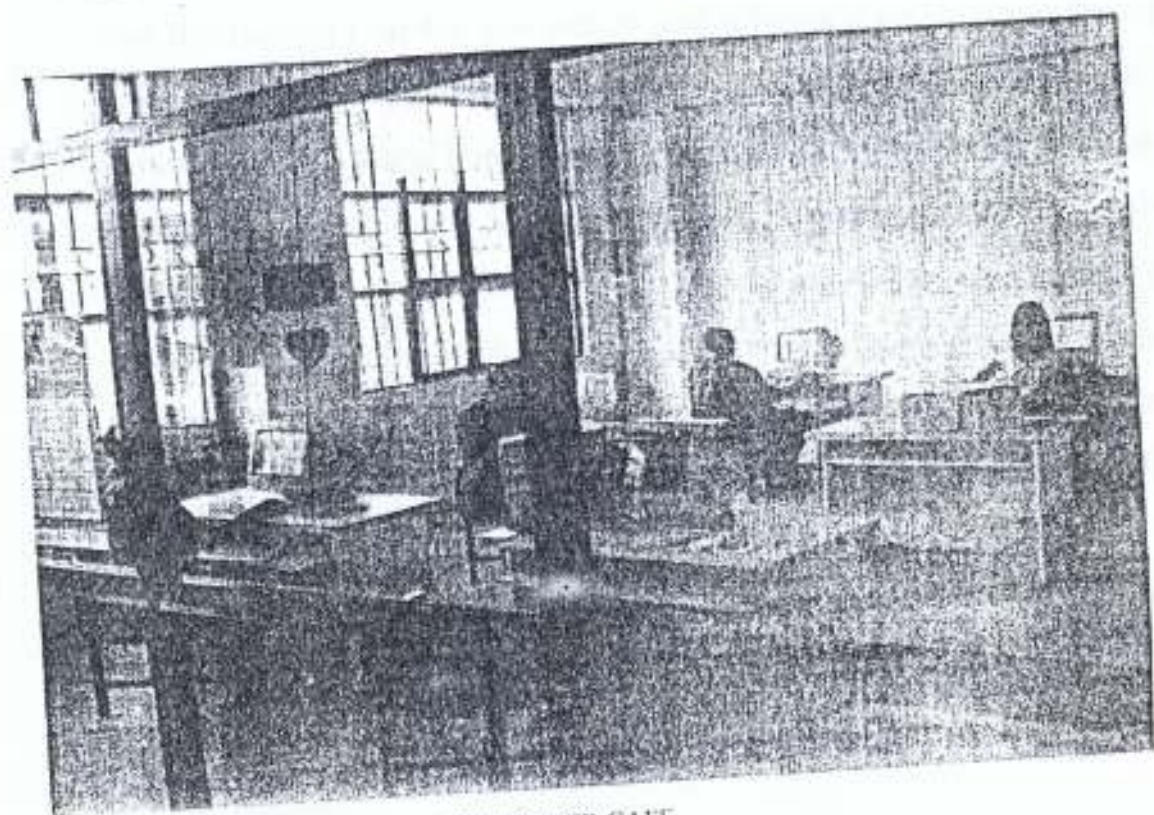


PLATE 19. PICTORIAL VIEW CYBER CAFE

Demerits

- Inadequate lighting condition in basement Area.
- Accesses to some spaces are not well positioned thereby resulting into some space being thoroughfare.
- The tinted glass and the large window area on the south side creates a certain amount of glare and dazzle.

4.6 BROWARD COUNTY MAIN LIBRARY, FORT LAUDERDALE

GENERAL INFORMATION

The Broward county library was opened in 1985 in Fort Lauderdale, Florida. It is owned by Broward County of commissioners. When the library was first proposed, many local leaders argued for a site at demographic centre. But the library director Cecil beach prevailed with a counter-argument that Fort Lauderdale, the area's economic and transportation hub, was the logical seat for a research and reference resources oriented to the business, scientific, and educational communities concentrated there. A joint venture team of Galje Papachristou Smith and Miller & Meier & Associates design and coordinated the construction of library. With a capacity for 2,000,000 volumes of book on open access and a seating capacity of 2500 readers. The building is characterised by projecting succeeding floors with a centrally located circulation on the ground floor. The library has other facilities such as a library for the handicapped, bookstore, gift shop, auditorium and cafe.



FIG. 7: GROUND FLOOR PLANS OF BROWARD COUNTY LIBRARY

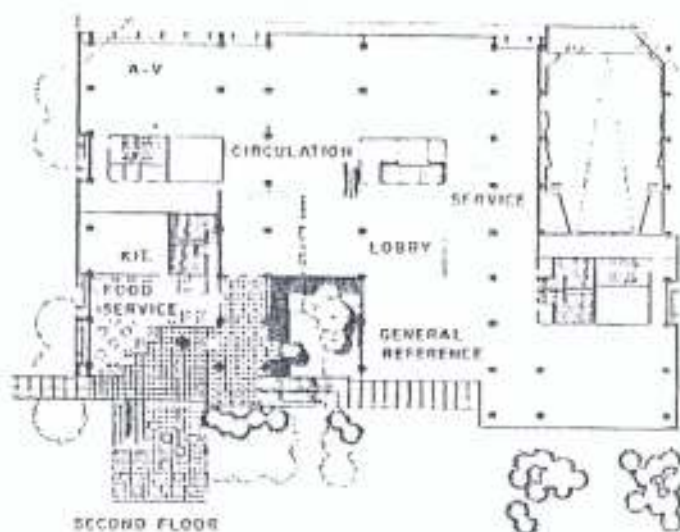


FIG. 8: SECOND FLOOR PLANS OF BROWARD COUNTY LIBRARY

THE DESIGN

The building consists of two main floors. Pushing the building tight to the lot-line on three sides freed half the site for a reserved expansion plot as well as a spacious plaza whose landscape segues to a two-storey interior greenhouse that announces the pedestrian passage wending through the street level shops. For all its inviting openness, however, this vestibule also secures the library above, channeling visitors to the second level reference floor, its only point of entry. From the circulation lobby, a soaring south telescoping light well edged by a cascading open stair steps diagonally to a two storey solarium window, displaying the four stack levels that flow around it. The library floors retreat in size as they rise to two compact administrative areas. The building's exterior treatment was influenced from the outset design architect Robert Gatje's desire "to make a Florida building" redolent of natural elements of the climates: native materials, exuberant greenery and over the entire friendly enemy, the sun. The library precast concrete skeleton is sheathed on its sun vulnerable south, east and west sides with sheer walls of local keystone minimally pierced by windows shielded to tame the insistent sun. On the north, a taut-gray glass membrane stretched across a terraced structure softened by greenery opens the library to a more benevolent sun and its most enticing views.

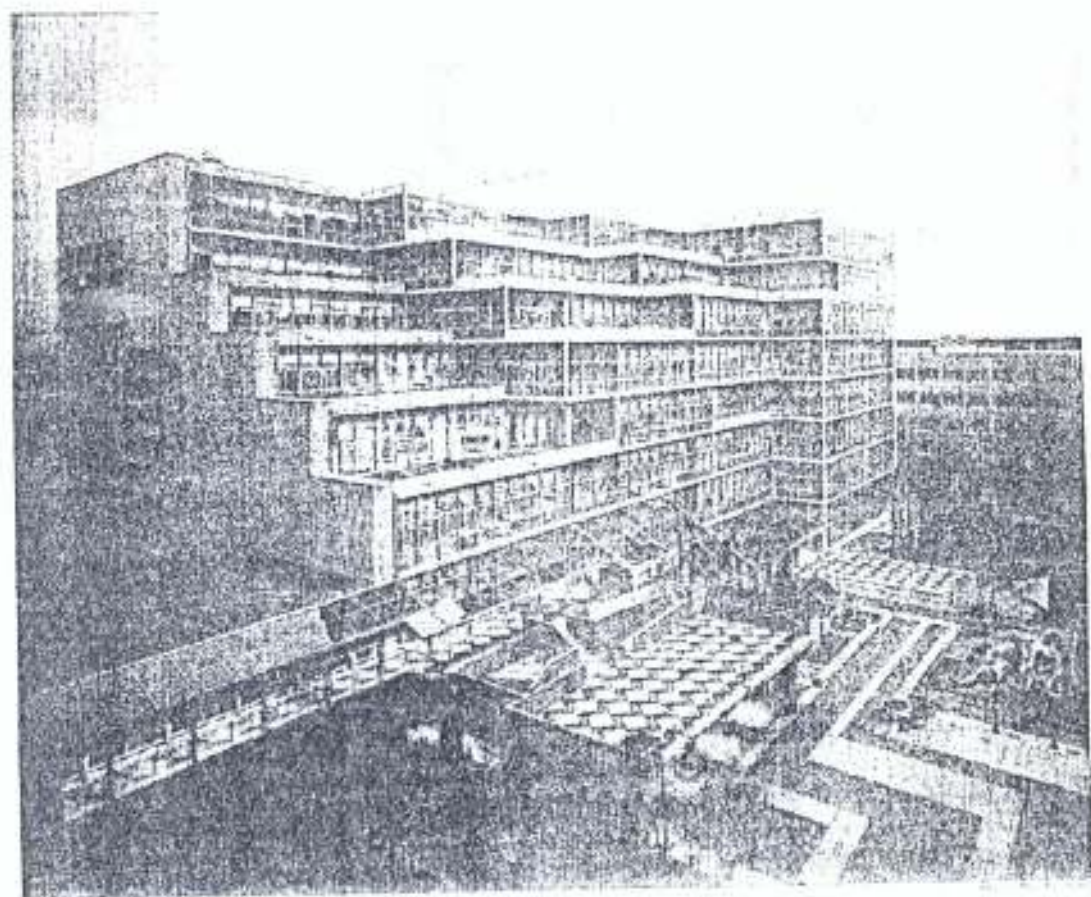


PLATE 20. PICTORIAL VIEW OF BROWARD COUNTY LIBRARY

Merits

- Its compactness minimizes unnecessary walking of long distances in the building.
- The flexibility of the building plan allows freedom of book stack and reading layout in any direction.
- Good interior acoustic achieved by the acoustic tile and carpet finishing.
- The precast concrete skeleton helps to prevent heat penetration into its interior through its sun vulnerable elevations.

Demerits

- Poor special organisation of some functions and services in the interior eg. Far location of the senior administrative offices hinders supervision.

4.7 SUMMARY OF LESSONS LEARNED

There are six major issues that have been learned from the seven case studies, and they are as follows:

- Flexibility, the cannot be over emphasized as the library is a dynamic institution, as knowledge increases so does the amount of information need to be stored increase. The rapid changes in technology calls for spaces that will be able to meet future space needs to accommodate the new technologies. The modular grid system is predominant in all the three case studies. This is to allow for flexible use of the library spaces and allow for easy expansion of the library as its needs grow. This approach to design also allows for conversion of various spaces to different uses without much change to the interior spaces.
- Lighting, the amount of lighting in the library space is also important so as to allow for comfortable reading. The use of natural lighting to reduce the amount of energy needed, therefore reducing overall maintenance cost is also very important. This is achieved by the use of large areas of glazing, with sun control devises added to reduce glare, and excessive heat gain.
- Accessibility, it is important that the library be accessible to every member of the community is, special requirements of disabled persons are catered for in the two international designs. Accessibility

also in terms of location of the facility and the circulation around the facility. The use of ramps is predominant. In the case studies.

Control, this is very necessary as theft is a major problem in library facilities, the location of control areas to allow the staff to monitor the going-on in the library spaces can be seen in the designs, the open space planning of the various spaces also facilitates proper and easy supervision

Organization, the organization of spaces in the library has been identified as a very important factor to allow the user to find his way around the library easily. Proper organization reduces the work done by the staff as different activities are done in particular areas and not repeated in different areas. A good example is the organization of the Edo State library, where different activities are zone separately. The reading spaces are different from the book stacks and from the staff and reference spaces this allows each section to grow without jeopardizing the space requirements for the other sections.

Building significance, there is an attempt to give the library building a significant outlook and make it stand out as a public building accessible to all the community. Also the use of glazing for the reason of transparency, to give the public a good view of the interior and the activities going on inside the building. The seven case studies use a lot of glazing to achieve this effect, and the Seattle public library also uses a dynamic form to differentiate the library form the other high rise buildings in its environment.

CHAPTER FIVE

5.0 SYNTHESIS OF PROJECT LOCATION

5.1 PROJECT LOCATION.

The importance of the proposed library complex to the development of the state was given adequate thought in the choice of its location. The state Ministry of education, which is responsible for the establishment of the library on behalf of the state government, had in mind to locate the project at a place where it will be put into maximum use. The proposed project will serve as a place for educating, enlightening and informing members of the community and would improve the image of the state.

It's located on the Secretariat road which is off the new Iyan road, and has as the state secretariat, legislative house, a fast developing suburb as well as commercial institutions as neighbors. The area is characterized with hills, rocks, stony soil and high load bearing capacity soil.



PLATE 21: MAP OF NIGERIA.

5.2 GEOGRAPHICAL LOCATION

The project town is Ado Ekiti located on latitude $7^{\circ} 4'$ North of the Equator and Longitude $5^{\circ} 4'$ East of the Greenwich Meridian. It is over 400m above the sea level. The town is 13Km North of Akure the Ondo state Capital.

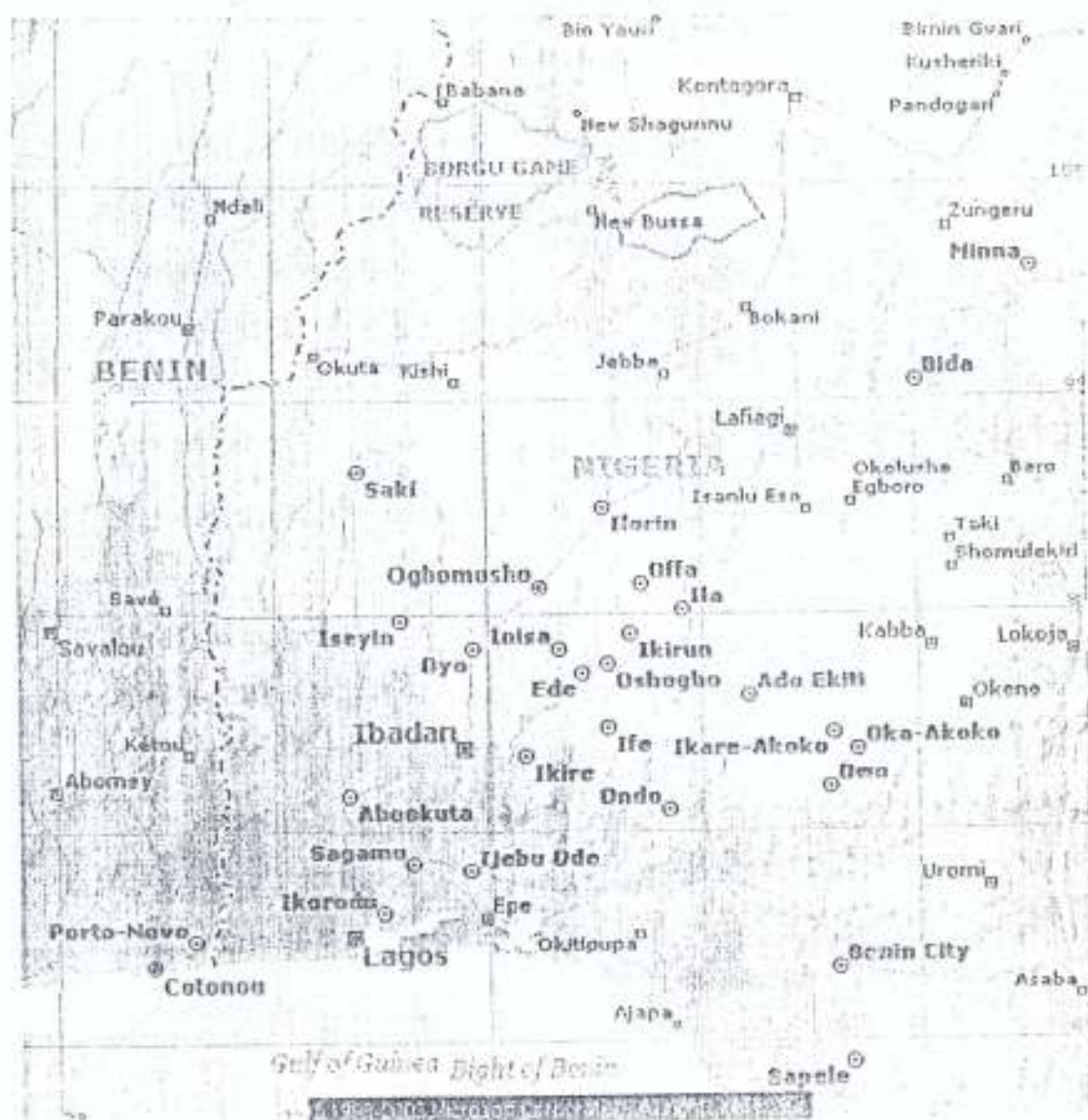


PLATE 22: MAP OF SOUTH WESTERN NIGERIA

5.3 SITE ANALYSIS

5.3.1 LOCATION OF THE PROPOSED LIBRARY COMPLEX.

The proposed site for the state library complex is located on the Secretariat road which is off the new Iyan road, and has as the state secretariat, legislative house, a fast developing suburb as well as commercial institutions as neighbors. The site measures a total area of approximately 11 acres. It is a sub-urban location, about 5km from the city centre. The other infrastructures that exist in the site location are telephone, electricity etc.

5.3.2 SITE SELECTIONS

The site for the proposed library is chosen for a number of reasons among which are the following:

Adequacy of Spaces

A state library is one building that cannot be easily discarded for a new one. Therefore, it becomes necessary to have a site that can adequately provide spaces for the primary library function, the ancillary facilities and projected additions. In this regard, the site is chosen due to its big size, among other reasons.

Central Location

The libraries should be located in a convenient location, although not one as central as to call for unreasonably expensive, monument and un-functional structure. This central location has not have it advantageous only because of easy accessibility from the main road but also that of being accessible. It is important to know that its central location must not be taken as the exact centre of the town/state.

5.3.3 SLOPE AND DRAINAGE.

The site is characterized by a gentle slope that runs from the northwest and eastern ends inwards to form a dry valley at the centre. The centre also shows a gentle slope towards the southern end. Figure x is the analysis of the site showing the gentle slope areas and the dry valley. Consequently, the average slope of the site from the lowest part as discovered graphically is about 4°.

5.3.4 INFRASTRUCTURE

Public amenities, which include Electricity, Access road, Telephone and other Communication facilities, are readily available on the proposed site. These infrastructures can be connected to the site from the mains.

5.3.5 ACCESS

Vehicular access to the site would be connected through the New Iyan road and the Ilawe road. Access to the site shall be linked to these two roads at a reasonable distance from the junction due to busy traffic congestion envisaged in the area. Pedestrian access shall be planned on site to compliment the vehicular routes.

5.3.6 POLLUTION

Air and water pollution are not likely to be problem to the site because the site is located in the outskirts of the city core and far from the industrial zones. Fumes from vehicles, and machine exhaust may constitute the only form of air pollution. Noise from vehicular movements is another form of pollution envisaged. These shall however, be tackled by developing the buffer zone and a well-planned landscape environment.

5.3.7 LANDSCAPE

As discussed earlier, the natural bowl on the site shall be levelled. The slope of the site being above 4° on the average is gentle, therefore area around the site shall be cleared and leveled for car parks and greenery works, trees, shrubs and lawn shall be provided as appropriate.



FIG. 9: SITE ANALYSIS

PLATE 21. PICTORIAL VIEW OF SITE SHOWING VEGETATION

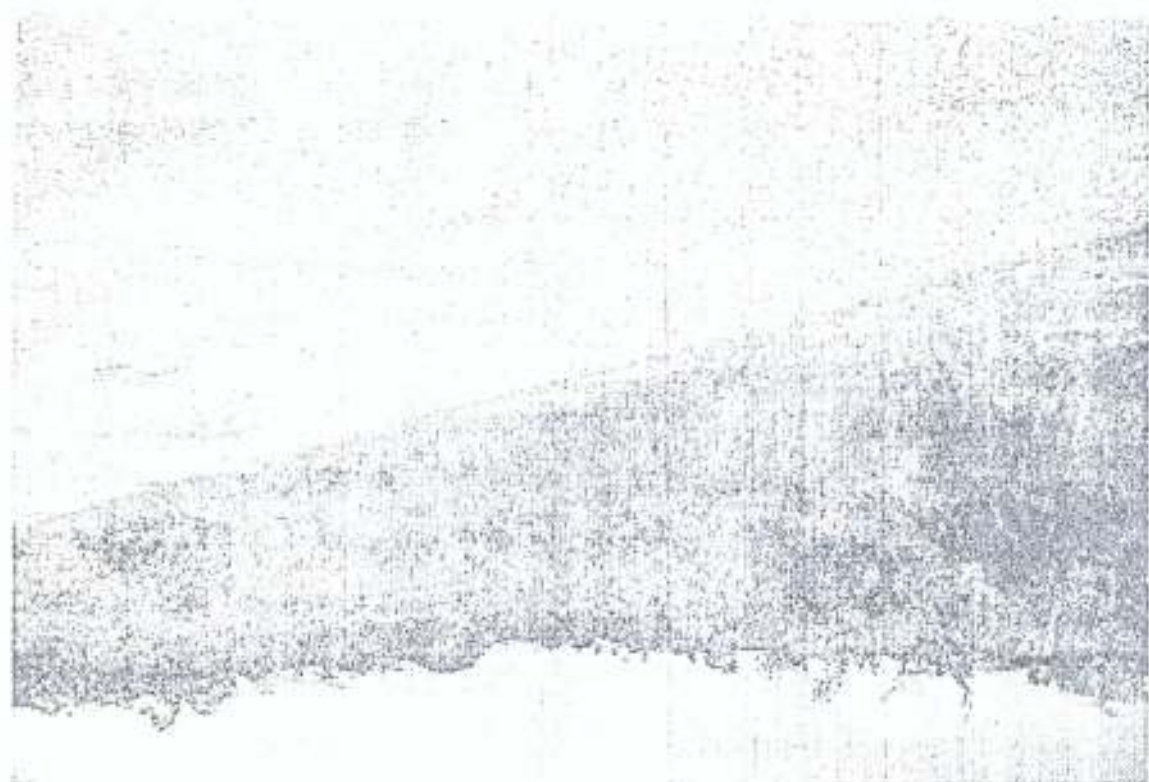


PLATE 22. PICTORIAL VIEW OF SITE SHOWING NEIGHBORING BUILDINGS



5.4 CLIMATIC CONDITIONS

Ado Ekiti is located within the climatic region that is known as the Tropical hinterland. The town lies at some distance below the double maximal rainfall line that runs across the country. Two major influences on the climate of Ado Ekiti are the major wind current. The Southwest monsoon wind and Northeast trade wind. These wind current bring about two distinct seasons namely, wet and dry seasons.

5.4.1 RAINFALL AND WIND

The duration of the rainy season in Ado Ekiti is between 8 months to 9 months annually. The mean monthly distribution shows a tendency for concentration in three or four months and has an average of 250mm of rainfall per day in the wet season. The tropical continental and tropical maritime air mass and the Equatorial Eastern lines affect the town.

There is the presence of series of electric thunderstorms during the beginning and end of the rainy season. The prevailing wind direction is southwest, which is rain bearing since it takes its origin from the sea. The direction of the wind is from the south to the north in the wet season and from then north to the south in the dry season.

FEDERAL UNIVERSITY OF TECHNOLOGY LIBRARY
S.E.T LIBRARY

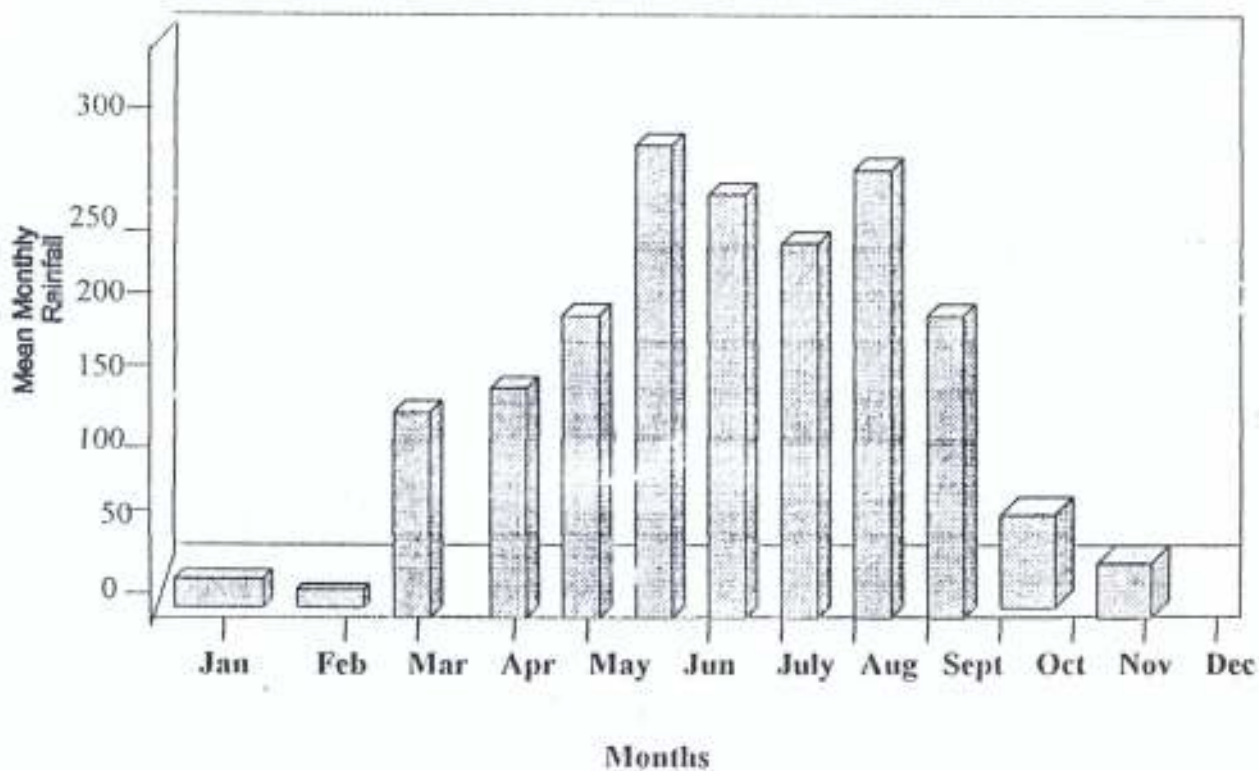
DATE _____

TABLE 4: MEAN MONTHLY RAINFALL

The mean monthly rainfall (mm) distributed all through the year is tabulated below

Month	Jan	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Mean Monthly Rainfall	3.7	1.6	85.2	112.5	134.3	275.6	260.4	221.4	270.3	195.8	25.7	10.2

Bar Chart Showing Mean Monthly Rainfall (mm)



5.4.2 TEMPERATURE

Temperature in Ado Ekiti varies between 35.50 C And 15.40 C annually for the period 2000-2004.the monthly variation of the temperature is tabulated below.

TABLE 5. DRY BULB TEMPERATURE READING FOR ADO EKITI

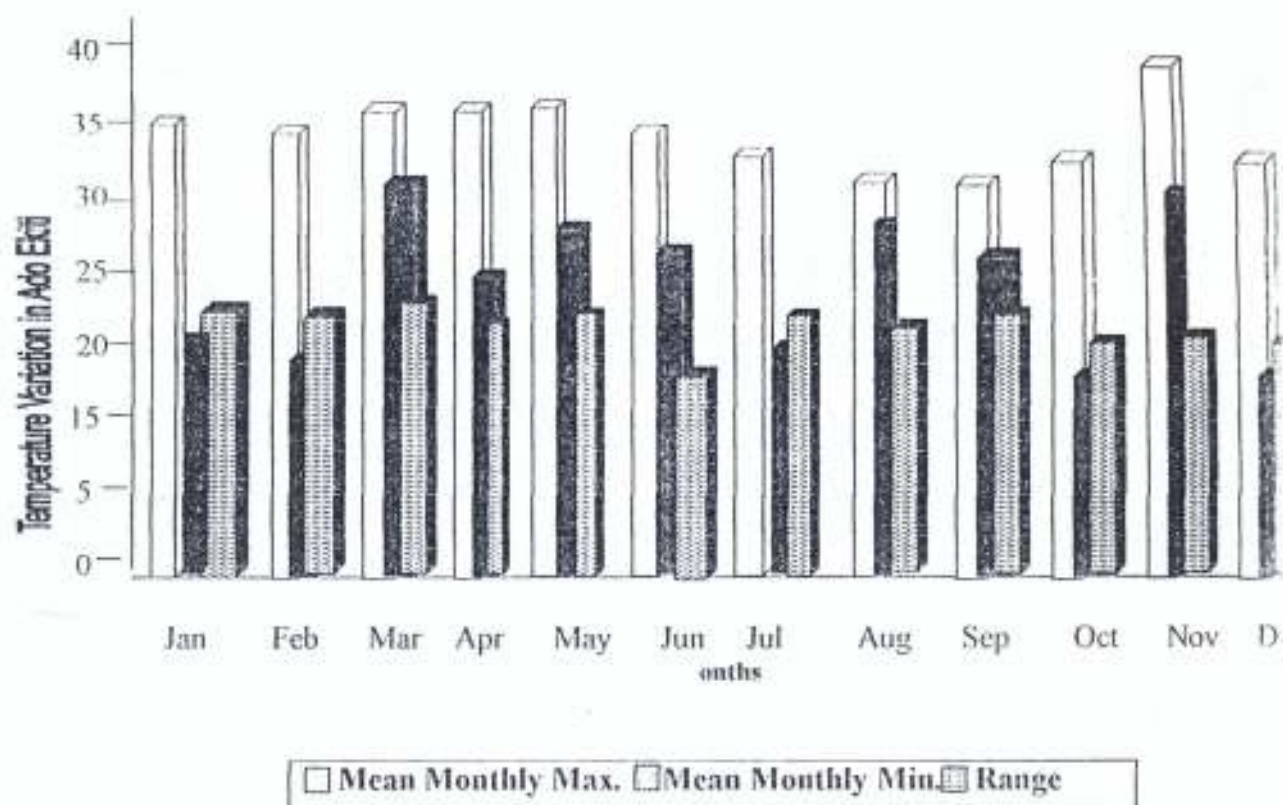
Month	Jan	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Mean Monthly Max.	34.3	34.8	35.0	35.5	34.5	32.3	31.5	30.4	30.0	29.4	34.4	33.1
Mean Monthly Min.	16.1	15.4	18.9	20.5	21.2	22.1	20.8	20.9	20.2	20.8	21.5	18.2
Range	18.2	19.4	16.1	15.0	13.3	10.2	10.7	09.5	09.8	8.6	12.9	14.9

Table showing the temperature variation in Ado Ekiti (in degree cent)

Source: Meteorology department Federal Ministry of Aviation Lagos, 2004

This is brought about by the warm guinea currents that wash the western coastline of Nigeria. Maximum daily temperature ranges from 29°C to 37°C while minimum daily temperature is between 15°C and 22°C. It records its highest temperature during the dry season.

A Bar Chart Showing the Temperature Variation in Ado Ekiti



5.4.3

HUMIDITY

Human sensitivity to temperature is greatly affected by relative humidity. The climatic zone is characterised by high relative humidity. The next table shows the relative humidity for Ado Ekiti taken at 0700hours and 1600hours. During the dry season, relative humidity falls in the afternoon to as low as 9% in the town. This low relative humidity coupled with high afternoon temperature accounts for rainy season. The relative humidity is as high as 75% even though the temperature is slightly lower, the effect is to create a heat trap. While this situation occurs, the general feeling is to be comfortably hot.

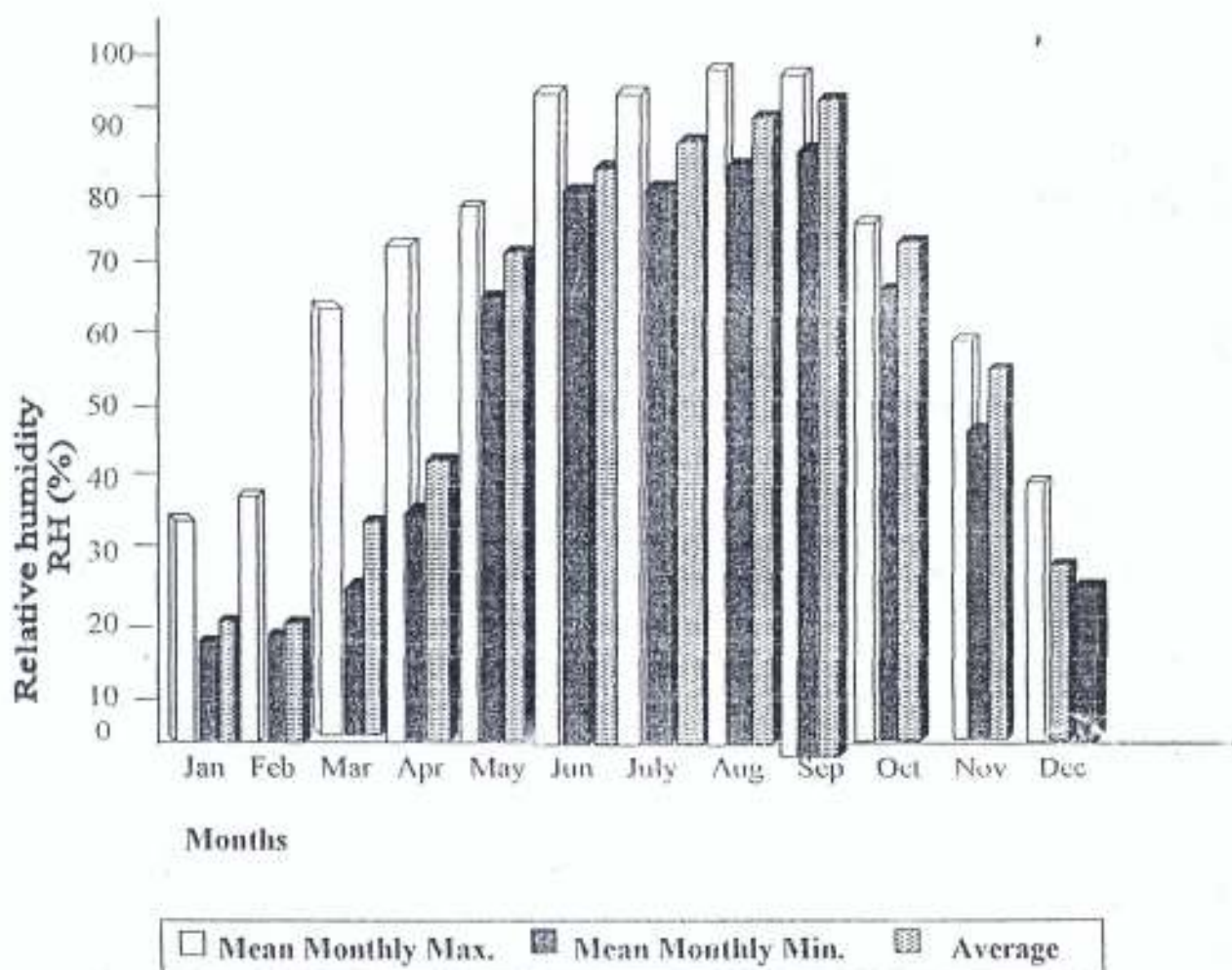
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TABLE 6: RELATIVE HUMIDITY

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
Mean Monthly Max.	35	46	64	74	82	89	95	98	97	74	68	48
Mean Monthly Min.	23	27	36	56	70	75	80	85	83	60	42	26
Average	29	36.5	50	65	76	82	87.5	91.5	90	66	55	37

Table Showing the Monthly Variation in relative humidity.

Bar Chart Showing the Relative Humidity RH (%) in Ado Ekiti



5.4.4 SUN AND CLOUD COVER

The southwestern part of the country has total hours of sunshine ranges from minimum of 1000 hours to 2300 hours. The project town is expected to have 2000 sunshine hours annually. The monthly pattern of variation as shown in the table above is the critical issue. During the dry month (November-March). The monthly variation in the amount of sunshine follows the general trend of an increase from over 215 hours in the site location. As the rainy season approaches, the trend is to increase cloudiness. The decline in sunshine hours becomes more intense as the rainy season continues and reaches its lowest in the month of August.

5.5 THE MAHONEY TABLE

In trying to get a design that will be climatically comfortable, the Mahoney table was used to analyse the climatic data of Ado Ekiti as obtained. The Mahoney table was designed by Carl Mahoney as a result of studies conducted partly in Nigeria it is a set of table use for data collection, thermal stress analysis, determination of necessary remedial actions and specification for sketch and detail design recommendation. Climatic data collected for Ado Ekiti was computed in the Mahoney table and the following was arrived at as shown in the next page.

Iahoney Table-data Collection and analysis

Location		Year		Longitude		Latitude		Altitude		Highest DBT 35.5°C		AMT		AMR	
DO EKITI		2000-2004		04° 70E		02.48N		278.5m		Lowest DBT 15.4°C		26.45°C		20.1	
		Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.		
DBT (°C)	Mean Monthly Max.	34.3	34.8	35.0	35.5	34.5	32.3	31.5	30.4	30.0	29.4	34.4	33.1		
	Mean Monthly Min.	16.1	15.4	16.9	20.5	21.2	21.1	20.8	20.9	20.2	20.8	21.5	18.2		
	Range	18.2	19.4	16.1	15.1	13.3	10.2	10.7	09.5	09.8	8.6	12.9	14.9		
RH (%)	Mean Monthly Max.	68	69	79	77	82	89	95	98	97	96	90	83		
	Mean Monthly Min.	41	35	40	46	70	75	80	85	83	80	76	50		
	Average	56	52	59.5	61.5	76	82	87.5	91.5	90	88	83	66.5		
Humidity Group		3	3	3	3	3	4	4	4	4	4	4	3		
Mean Monthly rainfall (mm)		3.7	1.6	85.2	112.5	134.3	275.8	260.4	221.4	270.3	195.8	25.7	10.2		
Day comfort limits (°C)	Min.	23	23	23	23	23	21	21	21	21	21	21	23		
	Max.	29	29	29	29	29	27	27	27	27	27	27	29		
Night comfort limits (°C)	Min.	17	17	17	17	17	19	19	19	19	19	19	17		
	Max.	23	23	23	23	23	21	21	21	21	21	21	23		
Thermal Stress	Day	-	-	-	-	-	-	-	-	-	-	-	-		
	Night	-	-	-	0	-	-	0	0	0	0	-	-		
Air movement essential	H1	7	0	0	0	1	1	1	1	1	1	1	0		
Air movement desirable	H2	0	0	0	0	0	0	0	0	0	0	0	0		
Rain protection	H3	4	0	0	0	0	1	1	1	1	0	0	0		
Thermal storage	A1	5	1	1	1	0	0	0	0	0	0	0	1		
Outdoor sleeping	A2	0	0	0	0	0	0	0	0	0	0	0	0		
Cold-season problems	A3	0	0	0	0	0	0	0	0	0	0	0	0		

Key
+ Hot discomfort

Source: Meteorology Department

After the proper imputation of climatic data and their diagnosis, the following indications were gotten from the table

- Rain protection is necessary for 4 months; which is from June to September. Rain protection is needed these periods because of high rainfall encountered then, which are usually accompanied with great wind, and if the roof, windows and doors are not adequately protected water can go indoors.
- Air movement is essential for 7 months of the year, which is from May to November. This is necessary for the design to be habitable during those periods. This means that for these period air movement is needed indoor for the inhabitants to be able to survive it.
- Air movement is desirable at zero number of months in a year. This means that air movement will not just be needed for the fun of it.
- Thermal storage is needed for 5 months of the year from December to April to prevent the indoor environment from cold, thus causing discomfort.
- There is no cold-season problem when the cold will become very unbearable in this region.

CLIMATIC DESIGN SOLUTIONS

Climatic design solutions to the climatic design problems to be encountered in the cause of this design project are given in the design recommendation derived from the Mahoney table.

TABLE 8: DESIGN RECOMMENDATIONS FOR ADO-EKITI

Orientation	A1 (0-10) or A1 (11-12) + A3 (5-12)		Long axis east- west	H1
	A1 (11-12) + A3 (0-4)	a2	Compact courtyard planning	7
	H1 (11-13)	b1	Open spacing for breeze penetration	H12
Orientation	H1 (2-10)		Open spacing protect from winds	0
	H1 (0-1)	b3	Compact planning	H13
	H1 (3-12) or H1 (1-2) + A1 (0-5)		Single-banking, Permanent ventilation	4
Orientation	H1 (1-2) + (a1 (6-12) or H1 (0) + H2 (2-12)	c2	Double-banking, temporary ventilation	A1
	H1 (0) + H2 (0-1)	C3	No air movement required	5
	A(0-1) + H2 (0-1)	d1	Large, 40-80% of wall area	A2
Orientation	A1 (0-1)+ A3 (1-12) or A1 (2-5) or A1 (11-12)+ A3 (4-12)		Medium, 25-40% of wall area	0
	A1 (6-10)	d3	Composite, 20-35% of wall area	A3
	A1 (11-12) + A3 (0-3)	d4	Small, 15-25% of wall area	0
Orientation of	H1 (3-12) or H1 (1-2) + A1 (0-5)		In N and S walls at body height	
	H1 (1-2) +A1 (6-12) or H1 (0) + H2 (2-12)	e2	S in el, also in internal walls	
	H1 (0) + H2 (0-1)	e3	Has no climate-related value	
Orientation	H3 (0-2) + A3 (3 - 12)	f1	No special protection necessary	
	H3 (0 -2) + A3 (0 - 2)		Exclude direct sunlight	
	H3 (3- 12) +A3 (0 - 2)	f3	Protect from rain and direct sunlight	
Orientation	H3 (0-2) + A3 (3 - 12)	f4	Protect from rain	
	A1 (0 -2)	g1	Light, low heat capacity	
	A1 (3 - 12)		Heavy, over & hours time lag	
Orientation	H1 (10 - 120 + A1 (0 -2)	h1	Light, reflective surface and cavity	
	H1 (10 - 12) + A1 (3 - 12) or H1 (0 -9) + A1 (0 -5)		Light and well insulated	
	H1 (0 - 9) + A1 (6 - 12)	h3	Heavy, over & hours time lag	
Orientation	A2 (0)		No provision for outdoor sleeping required	
	A2 (1 - 2)	i2	Space for outdoor sleeping required	
Orientation	H3 (1 - 2)		Provision adequate rain water drainage	
	H3 (3 - 12)	j2	Protection from heavy rain needed	
	H3 (0)	j3	No protection from heavy rain needed	

5.7 DESIGN IMPLICATION

The climatic conditions indicate a situation whereby the moist and humid south-west wind gives the rainy season whose duration is much longer than that of the harmattan season due to the dry hot, and dusty north-east trade wind.

As earlier stated, the rainy season lasts for about three-quarter of the year, while the harmattan season last for about one quarter. This has some design implication.

Firstly, the building should be designed so as to prevent direct solar radiation into it through the fenestration i.e. windows entrance, doors e.t.c. especially in the east and west ends.

Secondly, it will be necessary to consider the prevention of rain-water into the building through the fenestration and this can be achieved by incorporating firms, canopies and overhangs into the design.

Thirdly, during raining season the site is often easily flooded being a low flat area, it will therefore above the natural ground level and thus eliminate the incidence of flooding the building.

It will be important to also ensure that rain water or roofs tops is effectively drained off external walls treated with materials which are resistant to any rain-water-induced hazard e.g. fungi attack.

Since the site share a border with the main road, which is always busy, care must be taken to minimise the noise generated by both pedestrian and vehicular traffic along the road. In effect, the library should be recessed from the road and its surrounding planted with trees serve a barrier to noise pollution.

Also, the noisy activities of the library should be concentrated to the main road and the state secretariat while the low noise and quiet activities located further away from them both horizontally and vertically.

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CHAPTER SIX

6.1 DESIGN CRITERION

These refer to the planning and environmental guidelines. Planning guidelines relate to such standards and required qualities as the National Library Commission standards, the qualities of a well planned and designed library; Design Consideration; and the issue of Automation each of which will be discussed as follows.

6.1.1 NIGERIA LIBRARY COMMISSION GUIDE FOR STATE LIBRARY

NLC has recommended some standards which relative to the planning and design of a state library complex throughout the federation. These standards are followings:

- The library should be centrally located in the state capital or local government headquarters.
- 200 (at least) student enrolment capacity should be catered for.
- State Library to accommodate 15,000 volumes of books.
- The Library should have central air-conditioning system with standby generator (if possible)
- An allowance of 35% of the net floor area should be provided.
- The (multipurpose and conference halls) noisy area should be separated from the quiet zone for proper concentration.
- If possible, relaxation area for children and adult is provided

6.1.2 QUALITIES OF A WELL PLANNED AND DESIGNED LIBRARY

A good library building is the product of a successful resolution of the problems of function, aesthetics, quality/strength and cost.

Marcus Vitruvius Pollio, a renowned Roman Architect and Engineer during the reign of Emperor Augustus (early 1st Century) wrote of the three essentials of a building, his book *De-Architectural Libri Decem-firmitas, utilities, as veiwstas* meaning strength/quality function and beauty respectively.

Beauty in a library building and beauty respectively to quality, function and cost.

Brown Harry Faulkner identified ten desirable qualities of good library planning. These, he humorously called Faulkner-Brown's Ten Commandments. He propounded that a library should be:

- Flexible: With a layout, structure and services which are easily adaptable.
- Compact: For ease of movement of the three element of library-books, readers and staff.
- Accessible: From the exterior into the building and also from the entrance to all parts of the buildings interior with an easy comprehensible plan requiring minimum supplementary directions
- Extensible: To prevent future growth with minimum destruction, demolition or disruption.
- Secure: To control user's behaviour and loss of books.

- Economic: To be built and maintained with
- Comfortable: To enhance efficiency of use
- Organised: To ensure appropriate display of books and other library materials to the users.

Constant in environment: For the preservation of library materials.

Specially varied: in its provision of book accommodation and of reader services to give wide freedom of choice.

6.1.3 DESIGN CONSIDERATION

The library building complex should be planned from an inside out i.e. a building is ideally a complete and homogeneous entity and has no inside that can be separated from the outside, not anymore than separating bones or vein of any natural object from the skin. The fact that the exterior of a building fits the inside is not a result of accident but of the disposition of the functional elements in some architectural unity". It follows that the building should:

- Attracts readers by having an inviting exterior and ready access.
- Possess high environmental standards in terms of lighting (artificial & natural), ventilation (natural and mechanical), and noise and beauty and acoustics reasonable cost.
- Not be overloaded
- Give due consideration to construction and maintenance cost from the beginning.

- Allow minimum time waste for communication circulation without conflicts.
- Ensure furniture design and arrangement fit into it.
- Promote and ensure easy use of stacks
- Ensure that the circulation desk is conspicuous materials is given a greater priority than the building itself in the event of fire-out break.
- Enhance security and safety of library material through effective circulation
- Have sound structural components such as treatment of floor, wall and ceiling for reflectance glare, noise durability maintenance cost etc.

6.2 ENVIRONMENTAL GUIDELINES

The Environmental guideline often referred to as environmental standard deal with lighting (both artificial and natural): ventilation both mechanical and natural noise control and acoustics. Each of these will be examined as follows:

6.2.1 LIGHTING

Lighting within a library should

- Allow reading and work to take place in comfort
- Allow the books to be readily satisfactory by seen on shelves
- Enhance the internal and external appear and of the building.

While the intensity of light is very crucial, the architect should be skilled at exploring inter play of such properties as quality colour direction, contrast as well as intensity of light with a view to enhancing both operational efficiency

and aesthetics of the interior environment. In effect, this will indicate change of functions of spaces thereby producing quickness, sparkle interest warmth, and whatever effect the architect desires to create. It is therefore pertinent, that he assesses the acceptable levels of glaze, and contrast in reading accommodations and ensure that these accommodations.

6.2. 1(a) NATURAL LIGHTING

Natural lighting is freely available and its effective utilization depends on the architect's idea on fenestration.

It is every important in Africa and often 3rd world where electricity supply, where available, is unsteady and as much would be much more appreciated to strive For effective utilization of natural lighting and ventilation when designing buildings generally and libraries in particular.

Due to the high costs of procuring the equipment for artificial lighting and mechanical ventilation (e.g. air-conditioners) which often involve foreign exchange coupled with the low level of man-power for steady maintenance and servicing of such equipment either due to high cost or lack of readily available man-power.

However, the following factors must be considered when designing for natural lighting.

- Protection against the hostile environmental conditions like heat cold in glare.
- The enormous variations intensity of natural lighting, e.g. a clear summer day and be twenty-five times brighter than a cloudy winter and as the human eye is very sensitive to change, variation of a tenth of thus amount is unacceptable in conditions readings conditions.
- The conditions change in the angle of light, though predictable is often disturbing to a serious reader.

6.2.1(b) ARTIFICIAL LIGHTING

This can be more readily controlled than natural lighting. The following figures represent the maximum acceptable degree of glare for a room in which each activity is to take place. They are, of course, very general e.g. the wide lighting variation between reading rooms and reading tables only applicable in certain cases.

TABLE 9: RECOMMENDATIONS LIGHTING INTENSITIES

Space	Recommended	Lighting Glare
	Illumination (lose)	Index
Reading rooms	600	16
(Newspaper & Magazine)	450	19
Book stacks	400	19
Reference libraries	600	16
Counters	600	19
Stores	100	-
Offices	400	22
Cataloguing	600	22
Sorting stock room	400	22

Source: Courtesy of Dipe F.A. M.Sc(Arch.) Unpublished Thesis (October, 1990) Univ. Lagos

6.2.1(c) GENERAL LIGHTING

The intensity recommended, in the illumination Engineering Society (IES) code, for reading is 30 lumen sq. feet with glare index. Fluorescent fitting with suitable prismatic diffusers or lowers will give this intensity and with careful design, glare can be avoided. It is important to have some light on the ceiling although much less than that for reading tables.

It is often thought that the ideal conditions for reading are a pool of light on the book and comparative darkness elsewhere. However, this is not so, since it has been proved that the preferred balance of brightness (luminance) for comfortable vision is achieved when the luminance of the space is within the following ratio

- Visual task (the book)
- Immediate surrounding (table top e.t.c)
- Background (walls book-cases e.t.c)

The luminance of a surface measured in (foot-Lambert) is the product of the illumination in it and the reflectance impossible to distinguish between the illumination of a book and that of the table on which it lies. Books are generally printed on white paper a reflectance 0.7 to 0.8 and if the table-top with a reflectance of 0.2 to 0.3 is illuminated more or less uniformly, the required luminance balance between the book and its immediate environment will be achieved.

6.2.2 VENTILATION

In 1929, the American Library Association (A.L.A.) conducted a research on the deterioration of library materials. The findings revealed that wherever inadequate or no measures were taken to control temperature and

humidity or to purify the air, such materials deteriorated either due to damp or dryness and that is very bad in areas with polluted air.

Tests were conducted at the Folger Shakespeare Library in Washington. In effect, temperature was recommended to be kept up to 21°C in cold weather and down 27°C in hot weather, with relative humidity between 40% and 50%. These figures are based on the demand of materials rather than readers and on contributions of climate in the U.S.A

6.2.3 AIR-CONDITIONING

This refers to any method of treating the atmosphere so as to remove those properties, which are injurious to the health/comfort of persons occupying a building or to the conditions of materials stored in the building.

Air-conditioning plant is preferably often installed in a basement area to a roof-top because it will avoid the risk of noise vibration and possible water leaks which all can be very disturbing the activities below the roof-top.

However, due consideration, must be given to natural ventilation since the air-conditioning plant with its numerous disadvantages, may not readily and easily be made good in the event of a break-down coupled with the more common incidences of power-failure in the country.

6.2.4 NOISE CONTROL AND ACOUSTICS

Noise may be defined as any unwanted sound usually generated by other people's activity /activities since that generated by one's own activity is always anticipated and this unlikely to be disturbing.

6.2.4(a) SOURCES OF NOISE

Noise source may be internal or external

Internal source: traffic (due to movement of people readers of worker activities) equipment.

External source: Traffic (pedestrian and vehicular) mechanical (noise from generators or other nearby machines)

6.2.4(b) PREVENTION OF NOISE

The following methods have proved effective in preventing noise.

- Planning :Noise can be controlled at the planning stage by noting the direction and magnitude of external noise and efforts made to locate the noisy activities close to noise source(s).Also traffic segregation within the library is important.
- Construction: The external enclosing wall should have a sound reduction value of not less than 50 decibel (dB).In this regard large glazed area are unlikely to be satisfactory unless double glazing, with a large cavity filled with sound absorbing material is used.
- Finishes: Impact noise can be considerably reduced by using such sound absorbing materials as compact rubber curtains, rug, carpet on floors, cork-tiles or acoustic ceiling and fabric-covered fibre-board for walls among others.

Books on shelves also aid in reducing noise since books are a very good sound absorbent materials.

6.2.4(c) DESIREABLE CONDITION

In reference, periodical and reading areas, a low under-current of continuous background noise is preferable to complete silence or small intermittent noise, which is more distracting.

The acceptance maximum level of background noise in libraries is illustrated in the table below.

TABLE 10: MAXIMUM LEVELS OF BACKGROUND NOISE IN LIBRARIES

Zone	Space	Noise Level (dB)
Quiet	Reading, reference	
	Periodical, open bookshelf Area.	30-35
Low Noise	Catalogue, circulation	
	Loan desk, control exhibition, Staff working area	45-50
Noise	Staffs Cloak rooms, Lobbies, snack-bar, Auditorium	50-60

Courtesy: of Dipe F.A. M.Sc(Arch.) Unpublished Thesis (October, 1990 Univ. Lagos).

CHAPTER SEVEN

7.1 DESIGN BRIEF

The proposal is the design of a state library for Ekiti State as the nerve centre of the academic activities in the state.

The client is Ekiti State Government, Ministry of Education and is proposed for the use by students and staff even workers in Ekiti State and probably beyond. It is proposed for a projected population of about 1000 to 1600 readers. The multi-purpose hall takes 1250 seats with staff strength of 280 people of administrative and Technical personnel in the library complex, it is also proposed to house 500,000 volumes of books and other library material.

In this regard, a site that will adequately big enough to accommodate the five categories of library function, (i.e Reading, Shelving spaces, Guide Area, Staff Offices and Auxiliary spaces) and still have provision for future expansion will be very satisfactory. This is derived from the fact, that a library expansion is one building that cannot be easily discarded for a new one due to inadequacy of landscape. An open plan based on modular systems of construction will be advantageous if adopted. This has the merit of bringing books and readers together when and where required apart from enhancing flexibility.

It is imperative to remember that its provision will be influenced to a large extent by the academic activities of the students.

7.2 DESIGN CONCEPT

The total design concept is a combination various ideas to cater for different criteria in the design of a library.

7.3 PRAGMATIC CONCEPT

This is more concerned with the use of stated functional requirements. It enables one to organize the form of the building. The intrinsic value inherent in the Y-shape plan is allowing for adequate lighting and ventilations

7.4 FLEXIBILITY CONCEPT

Flexibility in recent libraries has been conceived as the creation of floors on which almost any library activity can happen. Programs are not separated and rooms or individual spaces are not given unique character. In practice, it means that the bookshelves define generous reading areas at the opening, and then expand inexorably to encroach on public space. Ultimately, in this form of flexibility, the library strangles its own attractions. The strategy employed in this design divides the building into spatial compartments dedicated to and equipped for specific duties. Flexibility can exist within each section, but not at the expense of any of the other compartments... change is possible by deliberately redefining use, rededicating compartments to new programs.

7.5 ORGANIZATION OF DIFFERENT ACTIVITY CLUSTERS (ORGANIZATIONAL CONCEPT)

The program identifies different platforms on which library activities take place. They include

1. Children's library
2. Reference library
3. Book stacks
4. Reading room

5. Training
6. Staff work areas

Each of these identified platforms is accommodated in independent spatial compartments and they are arranged using a noise level criterion. Therapy creating (3) three Noise Zones, Noisy Zone, Low-Noise Zone, Quiet Zone.



PLAN ORGANISATION

Sectional organization

FIG. 10: SECTIONAL ORGANIZATION



SECTIONAL ORGANISATION

Plan organization

FIG. 12: PLAN ORGANIZATION

(1) The building consist of (3) three blocks joined by and atrium. Creating a Y shaped object each block has (3) three atria.

(2) The branch blocks accommodate the public activities while the stem block accommodates the activities of the library staff.

(3) In the public area the children's section is located on the ground floor, as children do not need much concentration for learning on this same floor is the circulation desk.

The first floor accommodates continuous rows of book stacks. While the second floor accommodates the main reading rooms and cyber-café.

The auditorium building is isolated from the major building due to the nature of activities that might take place within it. Activities like receptions, seminars and various meetings. These are very noisy activities that will disturb the library patrons therefore the need for separation. It also serves as a space for various cultural activities e.g the staging of a play.

7.5.1 BENEFITS OF THE ORGANIZATIONAL CONCEPT

The grouping of various like activities enables for interaction among the users of the library. As the library is not separated into sections, all readers having different interests read in the same reading room these allows for interaction among people of different interests.

The circulation for the staff is separated from the circulation for the public. It allows for the use of different enclosing membranes while the public volume is enclosed in glass to give the passer by a view of the activities in the space and to invite him into the space the staff volume is enclosed with

block work and smaller windows to reduce distraction and to give privacy to the worker.

It also allows for isolation of the different spaces for effective thermal control.

7.6 ACCOMMODATION SCHEDULE

7.7 CIRCULATION

The circulation pattern outside the building will be essential pedestrian with some parking facilities for staffers, readers and users of the multipurpose hall still separate parking lots can be allotted to multi-purpose hall and the business centre/

The internal circulation pattern is proposed to be discouraged thoroughfare arose functional spaces. It will however minimize travel distances between the spaces.

7.8 LIGHTING

The proposed lighting strategy for this design is by day lighting also with artificial lighting used only at night or where day light condition falls below tolerable level. Although due to psychology reasons artificial lighting in such public buildings are always needed during the daytime, this is not undermine the possibility of this strategy.

Effective lighting in this proposal would be achieved through the appropriate use in building element (i.e wall, ceiling and roof), material and finish. Windows with sizes proportional to working area would be provided and wall would be painted with colour that would enhance the brightness and reduce the effect of glare of the interior. Roofing lighting will be employed couple with the innovative use of the "Danpalon technology". Ceiling with moderate reflective characteristics would be used taking into consideration the need to eliminate glare.

It allows for the use of different enclosing membranes while the public volume is enclosed in glass to give the passer by a view of the activities in the space and to invite him into the space the staff volume is enclosed with block work and smaller windows to reduce distraction and to give privacy to the worker.

It also allows for isolation of the different spaces for effective thermal control.

7.6 ACCOMMODATION SCHEDULE

**SCHEDULE OF ACCOMODATION
(GROUND FLOOR)**

SN	SPACE	NO.	AREA(m ²)	NO OF USERS
1	RECEPTION SECTION	1	340m ²	100
2	CIRCULATION DECK	1	140m ²	4-7
3	CATALOGUING	1	100m ²	4-6
4	ACQUISITION	1	130m ²	4-6
5	TYPING POOL	4	120m ²	5-8
6	WORK ROOM	1	120m ²	10-12
7	REFERENCE SECTION	1	1100m ²	100
8	CHILDREN LIBRARY	1	100m ²	20-30
9	AUDIO VISUAL SECTION	1	210m ²	100
10	YOUNG ADULT SECTION	1	150m ²	30
11	PLAY AREA	2	200m ²	30
12	OPEN OFFICE	2	75m ²	8-12
13	STORAGE	1	100m ²	4
14	SECURITY POST	3	20m ²	1-2
15	TOILET	32	2m ²	1

**SCHEDULE OF ACCOMODATION
(FIRST FLOOR)**

S/N	SPACE	NO.	AREA(m ²)	NO OF USERS
1	DIRECTORS OFFICE	1	80m ²	3-6
2	DPT.DIRECTORS OFFICE	1	72m ²	3-6
3	BOARD ROOM	1	150m ²	12-24
4	ADMIN SECTION	1	150m ²	20
5	ACCOUNTS SECTION	1	150m ²	20
6	STAFF LOUNGE	4	180m ²	10-30
7	BOOK STACKS	2	1025m ²	48
8	BUSINESS CENTRE	1	70m ²	5-20
9	TOILET	32	2m ²	1
10	SECURITY POST	3	20m ²	1-2

SCHEDULE OF ACCOMODATION (FIRST FLOOR)

S/N	SPACE	NO.	AREA(m2)	NO OF USERS
1	MAIN READING AREA	2	80m2	144
2	CYBER CAFE	1	320m2	70
3	VIRTUAL LIBRARY	1	320m2	70
4	OUTDOOR READING AREA	2	480m2	50
5	SECURITY POST	3	20m2	1-2
6	TOILET	24	2m2	1

7.7 CIRCULATION

The circulation pattern outside the building will be essentially pedestrian with some parking facilities for staffers, readers and users of the multipurpose hall still separate parking lots can be allotted to multipurpose hall and the business centre/

The internal circulation pattern is proposed to discouraged thorough faze arose functional spaces. It will however minimize travel distances between the spaces.

The use of "open plan" as a means of distributing light into interior space would also be adopted. Atria will also be use to achieve effective lighting.

7.9 VENTILATION

Although the library building is proposed to utilize natural ventilation to the optimum level, the use of mechanical ventilation means (i.e fans and air-conditions) is not ignored. A central air-conditioning plant may be installed but essentially, unit air-conditions will be employed in such areas as micro-form areas audio-visual area and strong room for rare books among others, in the absence of a central air-conditioning plant for the whole building. However electric fans may be installed in the other areas. It must be pointed out that air-conditioning has the functional advantage protecting books and other library material from dust etc. and promoting the comfort of readers and library staff.

7.10 DISABLED READERS

The need for three classes of readers is not ignored in the proposal, from the exterior into the building ramp is provided for then while within the building lift may be made available for them or special area provided for them on the ground floor. Therefore adequate provision is made for them.

7.11 SIGN POSTING

Good sign posting and directional marks will be incorporated in the proposal in order for readers to readily find their way within the building.

7.12 SECURITY

The security of books and other library materials which all constitute one of the three elements of library i.e. readers, staff and books/other materials –plays a very important role in the planning and designing of a good building. In this regard, one central entrance is proposed for readers and security point by the entrance lobby for checking in and out of readers.

Also a service entrance with an adjacent office for library supervision is proposed for security reasons in the staff work-areas. This office will readily assist the library supervision in monitoring movement of materials in and out of the work areas.

Apart from book theft and mutilation by readers, the protection of the building against fire outbreak is not ignored. In effect, smoke detectors, alarm systems and portable fire extinguishers are proposed to be strategically located within minimum travel distance throughout the building.

7.13 STRUCTURE

The library complex is proposed to be constructed on a structural grid of 5m x 5m. This will allow for flexibility in planning as well as greater accommodation space for readers and books.

Only the columns and beams will be the load – bearing elements. This implies that all walls and partitions will be infilling non-load bearing panels. A ribbed floor system, with suspended ceiling to accommodate the service where necessary, is also proposed.

The Multi-purpose and / or the conference hall will be stepped to give good visual comfort to all the users concerned and all foci are directed to the stage.

7.14 MATERIALS

The interior of walls will be rendered with pointing after plastering while partitions will either be polished or pointed. The exterior walls will be finished with alternating combination of ash-colour tyrolene and butter-colour paint. This will enhance conformity and unity of the building with the surrounding building.

The floors which will be hard had durable of terrazzo floor finish are proposed to be covered with carpet and rugs in special areas. The suspended ceiling will be of ribbed wooden battens while long span aluminum will be used for roofing.

7.15 SERVICES

Water supply electricity and telecommunication network are proposed to be connected from the mains of supply by their respective statutory authorities.

The fixed elements such as stair-cases, lift and lavatories are proposed to be centrally located with a view to minimizing structural obstructions. Therefore, interior load-bearing walls are to be avoided. Their lavatories are planned such that their ducts are on external walls for ease of piping to salvage and maintenance also.

7.16 LANDSCAPE

The whole site is to be landscaped with the building considerably raised about the ground level to prevent flooding. This access into the library building is by means for a combination of steps and ramp both at the main entrance and the service entrance. Trees and flowering shrubs are planted

around especially by the border of the roads with a landscaped with green areas linked by inter-looking passed areas.

8.0 CONCLUSION

In the past 100 years, library lighting has evolved rapidly, from dependence on natural light to the integration of electric lighting. The emergence of computer screens in the past three decades has also greatly impacted lighting issues. Balancing these different light sources can be a complicated proposition, yet becomes manageable when daylight and electric light are envisioned as a building system that works in concert together. From site selection and programming to fixture, finish and equipment selection.

Planning a new library buildings cannot be achieved without deciding on priorities. This thesis therefore has attempted to look at the design of this buildings, the problems of the building and various solutions have been proposed in order to create an appropriate in-door environment for study and research.

A thorough examination of activities of readers has been discovered to be a necessity to the creation of a well designed library which in turn will encourage maximum desired use and discourage disuse. The appropriate environment so created will ensure adequate planning to meet the obvious and less obvious demands of its interiors and also ensure adequate planning to meet an appreciable percentage of the readers population in the provision of essential facilities.

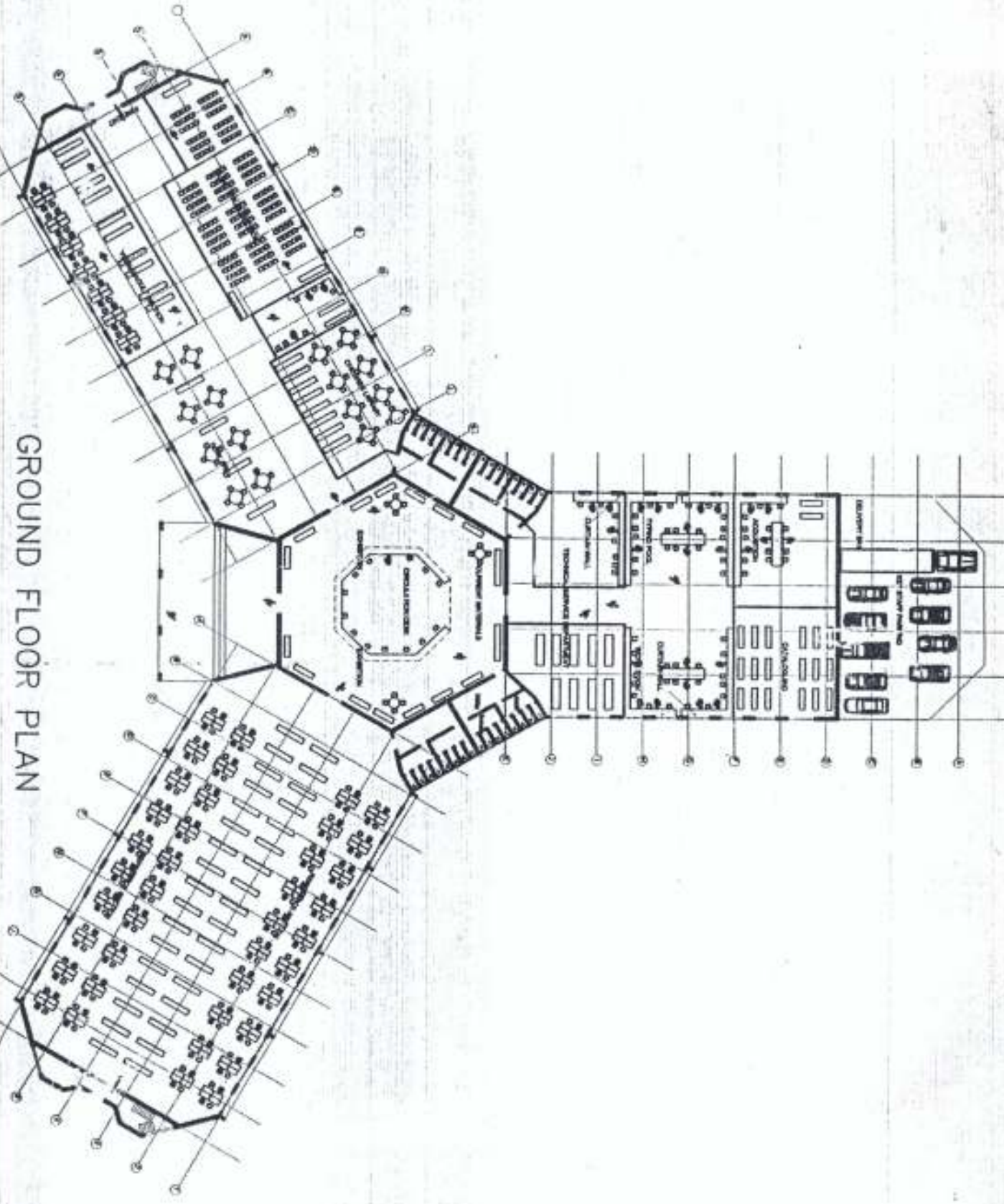
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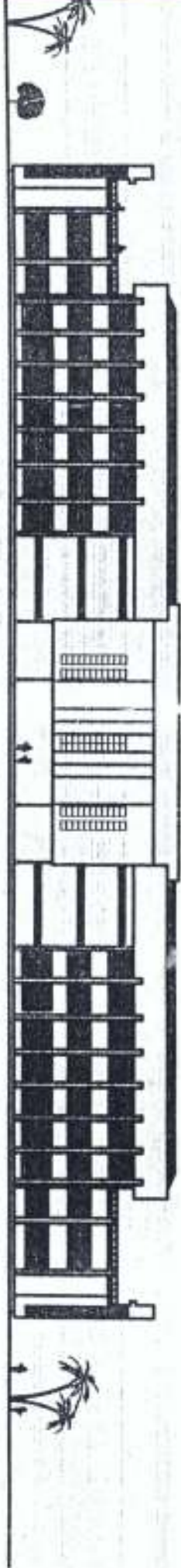
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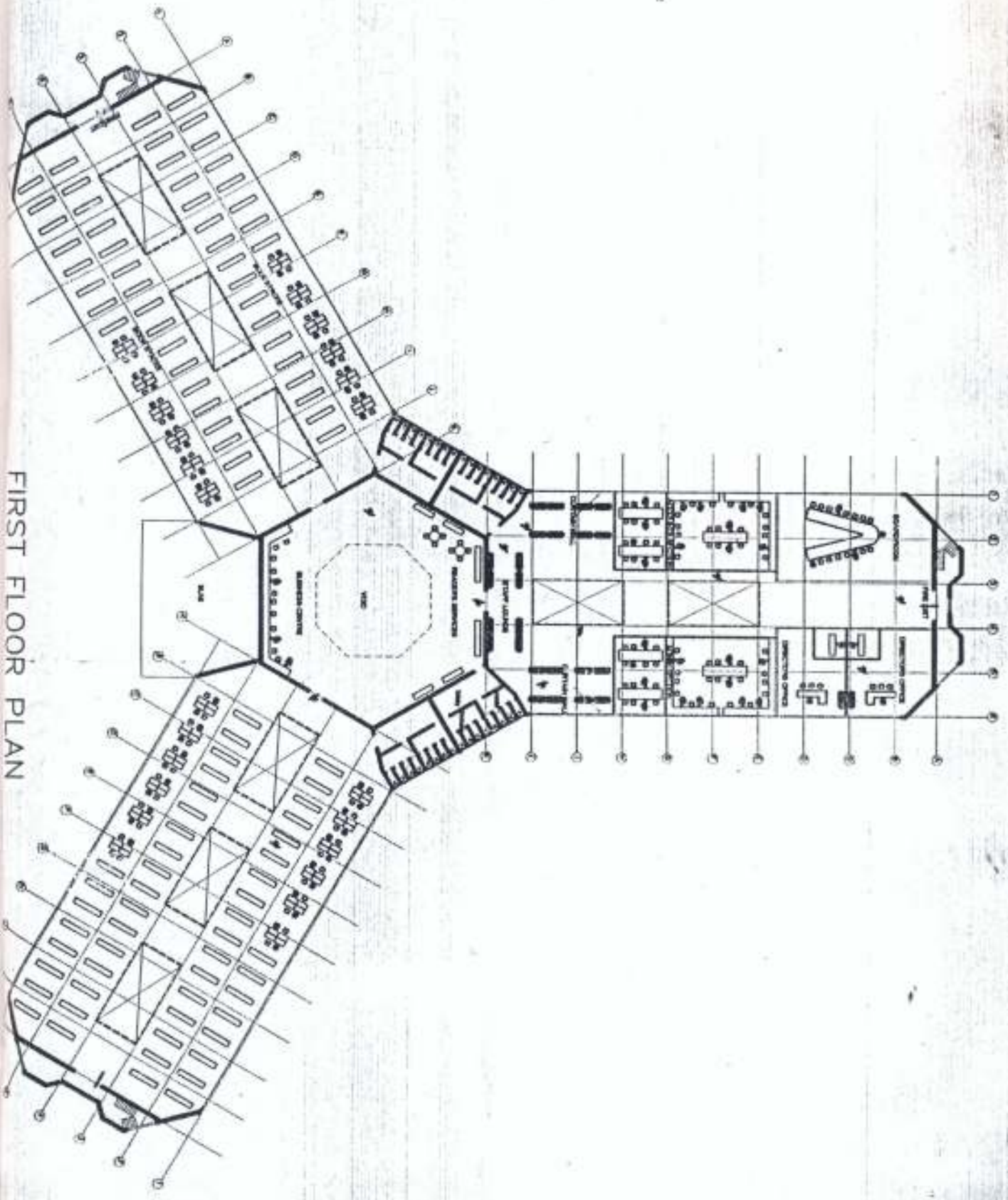
GROUND FLOOR PLAN



rear elevation



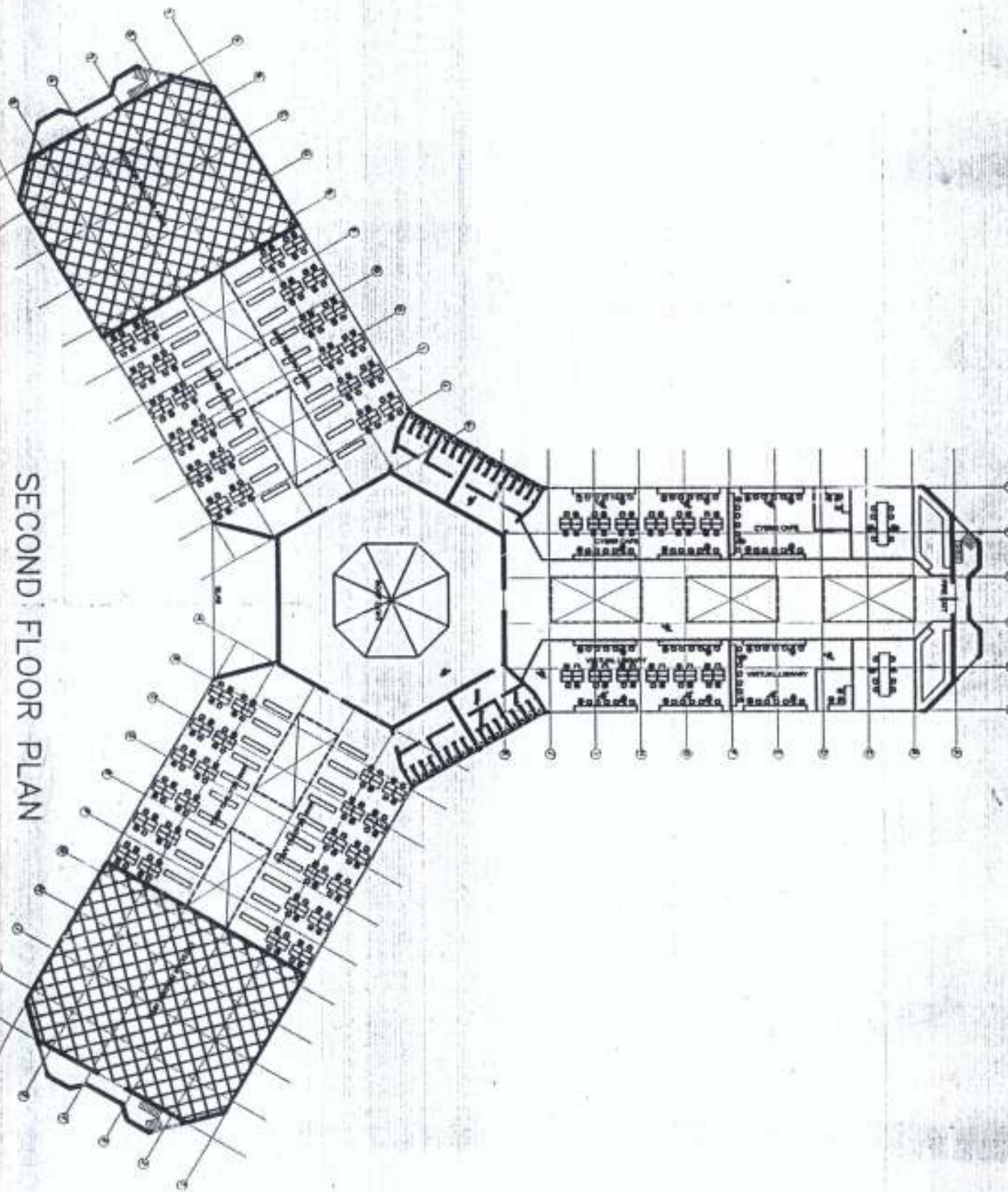
FIRST FLOOR PLAN



FEDERAL UNIVERSITY OF TECHNOLOGY LIBRARY
S.E.T LIBRARY

DATE _____

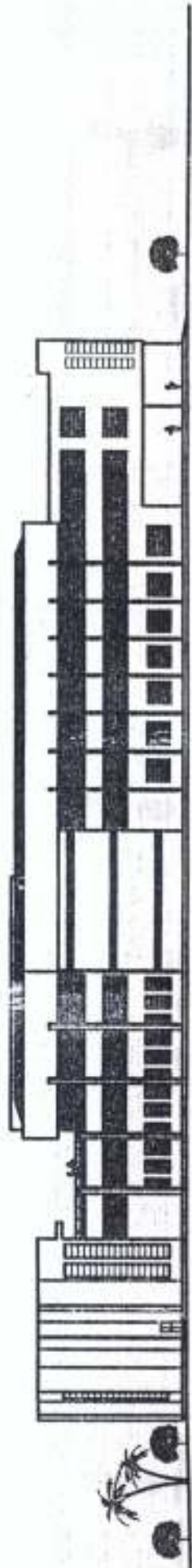
SECOND FLOOR PLAN





the approach





right side elevation