A STUDY OF THE EFFECTIVE USE OF LIGHTING IN SHOPPING MALLS A CASE STUDY OF THE MILLENNIUM MALL GWARIMPA, ABUJA

BY:

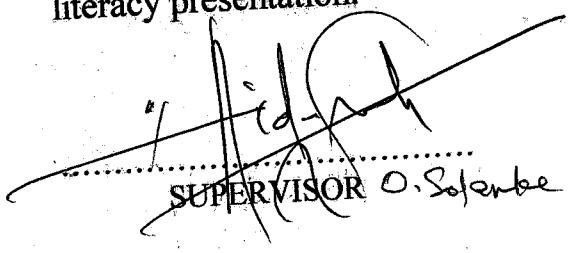
AJUFOH MICHAEL E.O. (B. TECH HONS.)
(M/TECH/SET/99/2000/472)

BEING A THESIS SUBMITTED TO THE DEPARTMENT OF ARCHITECTURE SCHOOL OF POST GRADUATE STUDIES FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA IN PARTIAL FULFILLMENT OF THE REQUIREMENTS OF (M-TECH) DEGREE IN ARCHITECTURE.

JAN 2001

CERTIFICATION

This thesis report entitled ' the millennium mall gwarimpa' by Ajufoh Michael E.O meets the requirements and regulations governing the award of a degree of master of technology in architecture and approved for its contribution to knowledge and literacy presentation.



SUPERVISOR O. Solembe

19/2/2001
DATE

EXTERNAL EXAMINER

DATE

HEAD OF DEPARTMENT

DATE

DEAN OF SCHOOL OF POST GRADUATE

DATE

DECLARATION

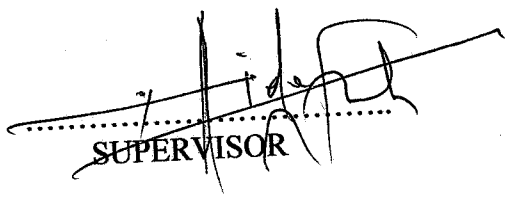
I do hereby declare that the work presented in this thesis for the master of technology in architecture has not been presented either wholly or partially for any other degree .

.....
STUDENT

.....
DATE

.....
HEAD OF DEPARTMENT

.....
DATE



.....
SUPERVISOR

19/2/2001
.....
DATE

DEDICATION

This project is dedicated to my parents , Mr Charles Okeleke Ajufoh and mrs Comfort Ajufoh , the best parents in the world .

ACKNOWLEDGEMENT

To God be the glory, great things he hath done. Thank you dear father for helping me endure all the days of my service on this campus, and now giving me this rare opportunity to see the change in my life, but if this is only the beginning, then surely the end is unfathomable, thank you Jesus.

I' d like to thank the following sets of people for their contribution to my success in school.

First of all I will like to thank my lovely family; my father and my mother, and also my sweet sisters; Aunty Rose, Aunty Titi, Ogugua, Josephine (my unforgettable love), Joy (meguard), Bidemi (iya apati) and Ngozi (bleble) . My niece Ada and Cece (my babies) Eloho (stubborn baby of mine), my nephew, Godwin (Godilo), and the latest arrival into the family, Oghenekome (komsky), I love you guys.

I would like to also thank my one and only brother Mr Maxwell A Ajufoh (big bruver)

I would also like to thank my dean , my father , my friend , and also my supervisor , professor S .O Solanke ,thank you sir for your ideas and great impartation of knowledge into me , God bless you sir .

My head of department Dr (Mrs) S .N. Zubairu, thank you ma for your assistance and encouragement.

My B Tech supervisor, Arc A I Anunobi thanks you sir for all your assistance.

My class mates (members of the senate chambers) , thank you for all your critisms and appreciation .

My circle of friends and friends for life, thank you all for the love and help you showed through the years and through those trying periods of my stay on the campus, thank you for your ideas, your songs, those delicious meals, those soul refreshing, stress removing gists we had, thanks for every thing, I love you guys and god bless you all.

" Petrufsky ' tis not easy ba , na you biko .

ABSTRACT

Trade and recreation inculcated, is the millennium mall Gwarimpa. The mall provides an avenue for the exchange of goods and services to satisfy wants, needs and demands of people. It also provides an atmosphere of relaxation for people.

This thesis shall address the issue of the role of the shopping malls within the community and the requirements for establishing such environment. The information reported shall be presented thus;

The introductory part of this thesis states the purpose of this thesis, its aims and objectives, justification and motivation.

Chapter two, which is the literature review , deals with the evolution of urban spaces , from the Greek agora to the modern malls we have today and also a review of malls from different continents .

Chapter three is the research area and it deals with the effective use of lighting in a shopping mall. It talks about natural and artificial lighting as a means of lighting the interior of a shopping mall.

Case studies where examined in chapter four. They are the Mega plaza in Lagos, falomo-shopping complex also in Lagos and white leys in London.

Chapter six deals with the evaluation, general appraisal and configuration of the intended site.

The design requirements for a shopping mall were stated in the seventh chapter. It also deals with the design concept, its under lining factors and the eventual design proposal.

The final chapter deals with the services required for the successful running of the mall.

The conclusion and recommendations were then made with the inclusion of drawings.

TABLE OF CONTENTS

TITLE PAGE II
CERTIFICATION III
DECLARATION IV
DEDICATION V
ACKNOWLEGEMENT .....VI - VII
ABSTRACT VIII
TABLE OF CONTENTS .....VIII-XII

CHAPTER ONE

1.0 INTRODUCTION 1
1.1 AIMS AND OBJECTIVES 6
1.2 RESEARCH METHODOLOGY 7
1.3 SCOPE OF WORK 7
1.4 IMPORTANCE OF STUDY 9

CHAPTER TWO

LITERATURE REVIEW 11
2.0 EVOLUTION OF URBAN SPACES AND PEDESTRIAN MALLS 11
2.1 URBAN SPACES 11
2.1.1 THE AGORA 12
2.1.2 THE REPUBLICAN FORUM 13
2.1.3 THE IMPERIAL FORUM 14
2.2 MDIEVAL SPACES 15
2.2.1 PIAZZA DEL CAMPO SIENA ITALY 15
2.2.2 PIAZZA MARCO VENICE ITALY 16
2.3 THE RENAISSANCE 17
2.3.1 THE CAMPIDOGLIO ROME ITALY 18
2.4 BAROQUE PERIOD 19

2.4.1 PIAZZA DI SAN PIETRO ROME ITALY 19
2.4.2 VERSAILLES FRANCE 20
2.5 NINETEENTH CENTURY SPACES 21
2.5.1 REGENT STREET LONDON ENGLAND 21
2.5.2 PARIS BOULEVARD 22
2.5.3 GALLERIA VITTORIO EMMANUELE II MILAN ITALY 22
2.5.4 WORLDS COLOMBIAN EXPOSITION CHICAGO ILLINOIS 23
2.6 MODERN PEDESTRIAN MALLS 24
2.7 MODERN URBAN SPACES 27

CHAPTER THREE

RESEARCH AREA

3.0 EFFECTIVE USE OF LIGHTING IN SHOPPING MALLS 29
3.1 LIGHTING 30
3.2 PROPERTIES OF LIGHT 31
3.2.1 COLOUR 32
3.2.2 VISION 32
3.2.3 PERCEPTION 34
3.2.4 PERFORMANCE OF VISUAL TASK 35
3.2.5 BRIGHTNESS RATIO 36
3.2.6 GLARE 36
3.3 LIGHTING NEEDS 38
3.4 ELECTRIC LIGHTING 39
3.5 SWITCHING TECHNOLOGY FOR NATURAL LIGHTING 41
3.6 LIGHT WITHOUT HEAT 42
3.7 NATURAL LGHTING GOALS AND STRATEGIES 45
3.8 NATURE OF DAY LIGHTING 46
3.9 GOALS AND STRATEGIES FOR DAYLIGHTING 48
DEDUCTIONS 50

CHAPTER FOUR

4.0 CASE STUDIES 51
4.1 WHITELEYS LONDON ENGLAND 51
4.1.1 LOCATION 51
4.1.2 LAYOUT 52
4.1.3 FACILITIES 53
4.1.4 APPRAISAL 54
4.2 MEGA PLAZE,VICTRIAL ISLAND LAGOS 55
4.2.1 LOCATION 55
4.2.2 LAYOUT AND FACILITIES 56
4.2.3 APPRAISSAL 56
4.3 FALOMO SHOPPING CENTER, VICTORIAL ISLAND LAGOS.....57
4.3.1 LOCATIN 57
4.3.2 LAYOUT AND FACILITY.....57
4.3.3 APPRAISSAL 58

CHATER FIVE

5.0 DATA COLLECTION 59
5.1 GEOGRHICAL LOCATION 59
5.2 CLIMATE 5.9
5.2.1 RAINFULL 60
5.2.2 VEGETATION 60
5.2.3 TEMPERATURE AND HUMIDITY 67
5.2.4 WIND 62
5.2.5 SOLAR DATA..... 62

5.3 GEOLOGY AND TOPOGRAPHY 62
5.4 SOCIO CULTURAL FACTORS 64
5.5 ECONOMY AND COMMERCE 64
5.6 DEMOGRAPHIC DATA 66
5.7 TRANSPORTATION AND TRAFIC FLOW 66

5.8 EXISTING LAND USE AND FUTURE TRENDS 67

CHAPTER SIX

6.0 SITE ANALYSIS 68
6.1 CRITERIA FOR SITE SELECTION 69
6.2 LOCATION OF SITE 69
6.3 SITE CHARACTERISTICS 70
64 ACCESS AND CIRCULATION 71
65 UTILITY 72
66 EXISTING FEATURES 73
67 GENERAL APPRAISAL OF SITE 73

CHAPTER SEVEN

7.0 DESIGN CONCEPT AND CONSTRUCTION 74
7.1 CONCEPT AND DESIGN 75
7.1.1 SITE CONCEPT 75
7.1.2 DESIGN CONCEPT 76
7.1.3 SPATIAL CONFIGURATION 77
7.2 DESIGN CONSIDERATIONS 78
7.2.1 GENERAL DESIN AND PLANNING CRITERIA 80
7.2.2 DESIN REQUIREMENTS 82
7.3 MATERIALS AND CONSTRUCTION 85
7.3.1 HORIZONTAL STRUCTURAL ELEMENTS 85
7.3.2 VERTICAL STRUCTURAL ELEMENTS 87
7.3.3 FITTINGS AND FINISHES 88

7.4 SPACE REQUIREMENTS 88
7.4.1 COMMERCIAL FACILITIES 88
7.4.2 ADMINISTRATIVE FACILITIE..... 89
7.4.3 RECREATION FACILITIES..... 89
7.4.4 BUSSINESS FACILITIES 90
7.4.5 COMMERCIAL FACILITIES 90
7.4.6 ANCILLIARY FACILITIES 90

CHAPTER EIGHT

8.0 DESIN SERVICES 92
8.1 ELECTRICITY AND LIGHTING..... 93
8.2 VENTILATION AND AIR CONDITIONING 93
8.3 DRAINAGE AND SE4WAGE DISPOSAL .....94.
8.4 WATER SUPPLY 95
8.5 REFUSE DISPOSAL 95
8.6 FIRE SAFETY 96
8.7 SECURITY 97
8.8 VERTICAL SERVICES 97
8.9 MAINTENANCE 99
CONCLUSION 100

BIBLIOGRAPHY

DRAWINGS

CHAPTER ONE

1.0 INTRODUCTION

Traditionally the word mall has meant an area usually lined with trees and used as public walk or promenade. As used today "mall" denotes a new kind of street plaza in central city business areas oriented towards pedestrians and served by public transit

Mall originated from urban spaces, which began with the Greek market place called the agora. During the medieval ages piazzas where mostly built, these piazzas were a combination of urban spaces and mall. This is because they had, the shop, the restaurants, the libraries, the church, the palace of kings and also assembly hall, all inculcated into one urban space. During the Rennaissance the piazzas were carved out of medieval towns. During the Baroque period, plazas were created for the display of religious and civic structures, and had a few shopping facilities provided.

In the Nineteenth Century spaces were being fashioned into pedestrian multipurpose malls. That is the streets were all converted so that as people walked by you could see the shops by the sides. Some streets were even covered,

like the Galleria Vittorio Emanuele 11, In Milan Italy, which was covered with glass and steel.

Now urban spaces are used effectively to provide an atmosphere of shopping and relaxing at the same time. We have different shopping malls in Europe which are effectively combined as urban spaces and it is a constant tourist attraction.

The open market, composed of temporary stalls, is the earliest known arrangement for buying and selling goods. The Greek agora, the center of the city, was both a public meeting place and market. It was surrounded by public buildings with arcades under which permanent shops were built as early as the 5th Century BC, and even at this time both market and shop were zoned for the sale of different kinds of merchandise. The shop itself was the space between the warehouse or workshop and the street where the purchaser stood to do his business.

The Roman forum was originally occupied by a market and shop, but during the Empire Civic and religious buildings were sited here and shops were regrouped elsewhere in specially built market places. Covered market dates from this time; the one at Popeii, built in the 1st Century AD, was typical with walls decorated with mythological subjects and pictures of the goods on sale. Trajan's markets in

Rome, built in the early 2nd Century AD, were the most ambitions and architecturally complex examples of this general type. Each "taberna", or individual shop, has a sales counter toward the front and storage behind, and some times above, and this basic arrangement continued to be used throughout Europe until the end of the 17th Century.

The Moslem and Asian pattern for selling was established in ancient times and has continued with little alteration to the present day. The bazaar grouped together shops and workshops by trades along passages with connections between them.

In the west shops remained open fronted until the beginning of the 18th Century, although the customer was often protected by a canopy or the overhanging upper storey of the building.

The first enclosed and glazed shop fronts appeared in Holland in the late 17th Century: In France they appeared at about 1700, and in England by about 1736. In all these early examples, the windows were glazed in small panes, as larger ones were not yet available. Plate glass was introduced at the beginning of the 19th Century.

Arcaded streets sheltering shoppers were common throughout Europe in medieval times, and stalls and shops under a common roof were introduced in the royal exchange in London in 1566. However, the shopping street entirely protected by a continuous roof did not appear until the end of the 18th Century.

The first large shops or specialized stores were built in Paris after the Revolution. Similar shops appeared in England in the 1830s, the most notable being Kendall Milne in Manchester,

Started in 1831, where all the goods were visibly priced.

As a mall or urban plaza is developed, it should be viewed in the context of the entire downtown. This means that in studying the physical relationships of a mall or the central city and in strengthening the projects identity image, one must go beyond the immediate environment of the mall, and examine the larger central city context.

The cities in which shopping malls tend to do well are those in which the central business district is a strong core of the overall metropolitan area; many people work and shop there. A reason these cities have strong central businesses districts

is that they often have strong mass transit systems bringing people to a central location.

Abuja, which is the location of millennium mall, is the Federal Capital and it has a very strong mass transit system bringing people into it.

1.1 AIMS AND OBJECTIVES OF THE MALL

The aims of the millennium mall are;

- To create a new image for Abuja city.
- To help in poverty alleviation; and at the same time help in providing for the basic needs of the end users.

The objectives include;

- Creating a conducive ground for private investment by providing shops, lettable offices and spaces etc.
- Providing more job opportunities, as the mall would bring in firms, who'll need people and also the restaurants etc, so in all more people will be gainfully employed.
- Making the mall of the highest standard so that tourists and foreign investors would be attracted to the site, thereby generating foreign currency.

1.2 RESEARCH METHODOLOGY

The research methodology adapted includes;

1.2 RESEARCH METHODOLOGY

The research methodology adapted includes;

- Review of relevant publications, journals, magazines etc.
- Visit to existing malls for a clearer idea on what to do
- Personal interaction with the end users so as to know what they really would want to be included in the mall.

1.3 SCOPE OF WORK

As already explained a mall is really a very large project, which entails a lot of facilities being provided. But this particular project will be limited to the basic facilities found in an ideal shopping mall. They include;

1. **SHOPPING HALL:** This has the retail shops, supermarkets, restaurants, game arcade and snack bars.
2. **OFFICES:** This includes lettable offices for banks, and small firms, travel agencies, sports office etc.
3. **RECREATION CENTER:** This includes the swimming hall (indoor swimming pools for both young and old) Indoor basketball and a body fitness club.

4. **LETTABLE HALLS:** So, like the Agora of the Greeks and piazzas and urban spaces of the Romansque and Baroque periods, the millennium mall will also boast of it's own public space. This will include Banquet halls, and multipurpose halls.

All these facilities will be provided in the form of full mall, and signages will be used to enhance visual continuity.

1.4 IMPORTANCE OF STUDY

The importance of the millennium mall can never be overemphasized. It is a place in which to improve the quality and variety of downtown activities. It provides a center for exhibits, concerts, fashion shows, flower shows, antique, car shows, arts and craft festivals and other events.

A well-planned and designed mall creates an improved physical and social environment for adjacent areas as well.

The mall will be a beauty to behold both at night during the day. Effective night lighting will also be used.

The economic impact of the mall is also another important thing to note. The mall is to act as a retail spine or corridor through the downtown. Gwarimpa is a new area and there is a need to plan for the future of the area, as it is far from the main town there is a need to create it's own central business district that will also serve the near by satellite towns.

Most importantly, the mall will assist the federal government in its poverty alleviation programme by creating more job opportunities in the federal capital territory. Also, due to the nature of the income anticipated, the mall will be a

steady source of internal revenue generation for the federal government and also the ministry of the federal capital territory and also for the private investors who are willing to finance the project.

Another note worthy importance is the mall's ability to attract foreign investment. Nigeria is nursing a newborn democracy and so many countries want to come and invest in the country and so the mall will provide an avenue for such investors.

The millennium mall will also be able to sustain itself through the revenue generated. So as earlier said, the importance can never be overemphasized.

CHAPTER TWO

LITERATURE REVIEW

2.0 EVOLUTION OF URBAN SPACES AND PEDESTRIAN MALLS

2.1 URBAN SPACES

The development of urban spaces, which began with the Greek market place called the agora, grew out of a pedestrian-oriented culture long before the invention of the automobile. Early spaces had facilities related to commerce, government, and places of assembly. During this period of time most patrons of these places also resided in the towns in which the urban spaces were located.

The spaces create an image for the city in which they are located; they become a meeting place and a center for various activities that improve the physical and social environment. In the United States urban plazas do not have the same cultural significance as those in Europe. Recently however, specialized mixed-use areas such as festival market spaces provide the flavour of some European squares, provide the user the opportunity to fulfill a specific purpose such as stopping or buying lunch, and also provide the amenities of sculpture, fountains, and well designed street furnishings. Various types of pedestrian malls or streetscapes often link to these mixed-use areas, particularly in larger cities.

2.1.1 THE AGORA

The Mediterranean climate and the hilly rocky landscape inspired Greek towns and architecture. As commerce and government expanded, the agora became the focus of business, the market place as well as the place for assembly, this was the genesis of modern urban space.

The agora was usually centrally located with principal streets leading to it. It had a square or rectangular urban spaces formed by stoas or colonnaded porticos with a façade on one side which provides shelter around the square. Smaller spaces between the buildings led to streets that terminated at the agora.

The Greeks stressed human scale and proportion using a ratio of 1.618:1 in much of their architecture, and therefore the size of buildings was designed to relate to people. Greek architecture in its classical form also represents a sense of harmony as an ideal in it's buildings and towns.

The open space of the agora was widely used. It was a busy place with a variety of activities and functions where people met, talked and conducted business and civic activities. Statues and other sculpture were often place in the major open space as a focal element. Linked to the agora square but not facing it, were the

assembly hall *(ecclesiastron)*, council hall *(bouleuterion)*, and council chamber *(prytaneum)*.

The Athenian agora, which originated about 420 BC, was located to the northwest at the foot of the acropolis, along the route leading to Athens port, Piraeus. From the Acropolis there was a panoramic view looking down to the agora.

2.1.2 THE REPUBLICAN FORUM

Where proportion and size of Greek architecture were based as human scale, the Romans used proportions that would harmoniously relate parts of a building, but they were not necessarily related to human scale. Column types called the five orders of columns included the Greek Doric, ionic and Corinthian. The Tuscan simplified version of the Doric was added as well as the composite, a more ornate form of Corinthian.

The buildings of the Republican Forum (509 – 27BC) in Rome represented increasing political power. The Republican forum, the commercial and governmental center of Rome, began as a market place at the base of the hill known as Capitoline.

The build able area was five or six acres and, at first, buildings were grouped with no apparent relationship to each other except for a narrow axis. As larger buildings were added over a long period of time, the architects began to group the buildings around squares to form urban spaces. Spaces formed by buildings continue to be the principal design approach used in European and American cities.

2.1.3 **THE IMPERIAL FORUM**

The concept of the extension of the Forum stressed open space in contrast to the original Republican Forum. Both Forums were adjacent to each other. The imperial Forum (27B.C – 476 A.D.) had various shaped plazas that were square, rectangular, or semicircular. Each plaza had a colonnade acting as the framework for a focal element, such as a temple, which was located at the terminus of the space. Some individual plazas were lined with colonnades that could also become transitional elements linking various spaces. Single or double rows or columns were used in the ancient Greek manner. Renaissance architects later revived all five of the Roman orders of column.

2.2 MEDIEVAL SPACES

As population increased in size, commerce created the need for market places. Religious ceremonies, governmental events, and theatrical productions were also held in the plaza.

Medieval terms and winding streets with views directed towards nearby buildings or to landmark elements such as the church tower. There was a filling of orientation in the medieval town, and because of the landmarks, one rarely got last. Employing these concept recent American pedestrian malls and other urban spaces used landmark elements such as clock towers for orientation. Examples of medieval spaces are discussed in the following;

2.2.1 PIAZZA DEL CAMPO, SIENA, ITALY

The piazza del Campo was begun in about 1288 and was paved in 1413. It is still one of the finest piazzas in Europe. Located in Siena, an Italian hill town, the space became and is still used as the fathering area for the whole town. The streets leading into the piazza are narrow, and the open space becomes very dramatic on arrival. It has an ordered spatial structure and a sense of enclosure reinforced by limited sightlines. The main streets are lined with shops, and the entrances are located in relation to the placement of the mangia tower. The Gaia

(Gaiaty) fountain was added in 1400 – 1419. Eleven streets radiate out from the square. The overall space has an organic form and gives the general impression of a shell. The piazza was originally used for horse races, which are still held twice a year at the palio festival.

It has peripheral uses around it with small shops, restaurants and cafes. The Town Hall also serves as a museum. The shops, outdoor eating areas, and authentic features make it a popular tourist attraction where people gather and relax.

2.2.2 PIAZZA MARCO, VENICE, ITALY

One of the most famous outdoor spaces in the world, the piazza san Marco developed over several hundred years. The church of san Marco is the primary focus of the piazza created by the strong axis, but it does not dominate the space.

In the sixteenth Century, and evolution of the space began with the objective of perfecting it. The Western side of the piazzetta was redone with the libreria, which started in 1536. It was finished in 1584 when the procuratie Nouve, the new administrative office, was begun on the south side of the main piazza.

The campanile seems to unify the L-shaped space of the piazza and piazzeta. The two above spaces seem to have continuity as one space turns and penetrates or continues into the leg of the other space.

Both sides of the piazza and the front of the libreria have tables and chairs that are used for outdoor dinning. The first seemed floors of the procuratie Nuove are used as a museum.

Overall the square provides an important urban space that serves as a transition between the dense matrix of the city and the openness of the fraud canal. The space has influenced American design because of its sense of place, focal prints, scaling elements such as columns, paving materials and works of art.

2.3 THE RENAISSANCE

The piazzas of the renaissance were carried out of medieval towns and given a monumental scale and form. Sight lines were carefully planned.

The renaissance, which began in Italy about 1430 with architect Brunelleschis dome for the cathedral of San Lorenzo. In Florence for the Medici family, involved the revival of art literature, and learning in Europe and the increased

attention of man's participation as an integral part of the natural world. Examples of urban spaces during the renaissance are discussed below.

2.3.1 THE CAMPIDOGLIO, ROME, ITALY

Capitoline Hill, the location of the campidoglio, was of religious and political importance in ancient Rome and became the location of the city hall in the middle ages.

The campidoglio (capital) was reconstructed by Michel Angelo beginning in 1538. It is a link between the early renaissance in Florence and the Baroque in Rome. Three buildings that form an enclosed space define the urban space. The two buildings at the sides of the space are two stories, while the palazzo del senatore terminating the space is three stories. A statue of Marcus Aurelius had been placed in the space by pope Paul III. Michel Angelo saw a need for a third building to enclose the space, which at that time had only two buildings. The square represents a synthesis of nature and culture providing unity and coherence of design. The major use of the building today is for meusems.

2.4 BAROQUE PERIOD

During the Baroque period, plazas were created for the display of religious and civic structures such as the pizza di san pietro. The spaces could also be renovated, enclosed places such as the piazza Navona in Rome that was rebuilt with new fountains and sculpture, or they could be piazzas built in new locations cities expanded, where there was an extension of open space.

2.4.1 PIAZZA DI SAN PIETRO, ROME, ITALY

Pope Julius II began the foundation for the new St. Peters in 1506. Work was still proceeding in 1606 during the Baroque period *(late 1590's to 1750)* when the long Nave was added. The famous piazza was not completed until after the middle seventeenth century. The overall space by Bernini consisted of three areas, each of which was eventually given a specific name. One of these, the piazza obliqua, oval place of St. Peters, was completed about 1660.

The piazza slopes slightly towards the obelisk located in its center. The Egyptian obelisk resting on four bronze lions was brought from Heliopolis on the Nile Delta. Flanking the obelisk are two seventeenth century fountains.

The piazza di san pietro provides a grand approach to an important monument, and it also provides a huge outdoor space for assembly when crowds gather to hear the pope speak from the paahl loggia. The square easily holds 300,000 people.

2.4.2 VERSAILLES FRANCE

In Versailles, le Notre, a renowned landscape architect developed his greatest work for Louis xiv of France, with construction starting in 1661. Minor changes and additions continued until the death of Louis xiv in 1715.

Le Notre relocated the town, palace, gardens and park by a system of axes. Versailles has a major east-west axis or sight line that links the central line of the park from the center of the palace to the horizon or infinity. The other important axis is perpendicular to the above axis that it crosses at the first terrace west of the palace and continues North and South to the face of the building.

The overall design links the landscape elements together making the concept understandable to the viewer. The system used at Versailles has had much influence on many projects in various countries.

In the seventeenth century, plazas were enclosed isolated spaces, but in the eighteenth century the spaces were more open. An important example of a place that provided open space was the place de la Concorde, in Paris.

The space links the gardens of the Tuileries and the louver with the avenue of the champs Elysees an important shopping street to connect Paris and the palace at Versailles. The place de la Concorde started in 1757 and was completed in the early 1770s.

2.5 NINETEENTH – CENTURY SPACES

2.5.1 REGENT STREET, LONDON, ENGLAND

John Nash designed Regent street in London in 1811 to solve functional requirements of the city. The architect developed plans for Regent street, Regent Park, and park crescent. He understood the social, economical and aesthetic aspect of town planning.

Construction proceeded over a 25-year period. Nash created fine buildings around Regent park and connected it to the city with Regent avenue. The street had a well designed treatment of space without imposing pre-determined architecture into the city. Regent street was a mixture of public buildings and

commercial offices along with residences, hotels, and a church. The mixed uses of the street were an important concept, which is being used widely today in the united states.

2.5.2 PARIS BOULEVARDS

In 1853, Napoleon III put baron Georges Haussmann in charge of rebuilding Paris. Haussmann concentrated on creating new boulevards, many of which cut through medieval streets but improved the road system and also provided new sites for real estate development. Existing slums were demolished to make room for the new design that created a streetscape with street trees planted along broad boulevards and provided an urban design scheme that gained world renown. The entire boulevard system was planned and constructed within 17 years.

2.5.3 GALLERIA VITTORIO EMANUELE II, MILAN, ITALY

In 1867, when this galleria opened, it was the center of Milan's public society, the place to see and be seen. Milan's municipal government now owns it. It was simply the connection of two major generators of pedestrian traffic, the Duomo or Cathedral and lascala, the opera house.

The vertical proportion of the galleria space appears to intensify activity while providing a sense of place. It is not only a place for people to walk but also a

place to go for shopping and relaxing in one of the cafes. The galleria or arcade was a commercial use of the street, which lent itself for use as a major urban center. The arcade also evolved in some urban areas because streets were unpleasant places with narrow or non-existent sidewalks. The concept of the shopping street with separation of pedestrian and vehicular traffic made it more comfortable and safe, anticipating our present shopping malls and pedestrian malls.

2.5.4 WORLD'S COLOMBIAN EXPOSITION, CHICAGO, ILLINOIS

The Colombian exposition of 1893 in Chicago, co-coordinated by architect Daniel Burnham of Burnham & Root, was to demonstrate the latest technology such as the spanning of large interior spaces with iron trusses. This world's fair began the "City Beautiful" movement across the United States in which Civic centers became the major theme with pedestrian – oriented urban plazas, fountains, gardens, planting, and other street furnishings. The City Beautiful movement however did not solve all the needs of the Central City Commercial areas in the twentieth century.

2.6 MODERN PEDESTRIAN MALLS

GERMANY

The idea for traffic free zone came from Western Europe. The first renovation of a street into a pedestrian mall occurred in 1926 in Essen, Germany.

After World War II pedestrian free zones or malls developed due to increased urban growth, affluence, a large number of cars and the dense urban fabric with a relatively high residential population.

In Germany, Cologne, Kassal, and Kiel were the post war leaders. By 1966 there were over 60 pedestrian malls in Germany. These malls developed as an adhoc response to urban congestion in a number of narrow shopping streets.

Following this was a boom in pedestrian malls, which led to 214 malls by 1973, 340 malls by 1977, and 800 malls by the end of the 1980s. The length of the malls also increased from an average of about 250 feet in 1960 to 800 feet in 1973. There were a variety of pedestrian zones. Some had a single pedestrian mall, some had a series of interlocking streets, squares, etc, and some had unconnected areas.

Eventually, during the 1960s and 1970s pedestrian malls became a major urban planning concern in Germany. The Federal Government set guidelines in urban policy for state and municipal agencies to follow. It also developed research on malls and passed legislation to create. Included in the legislation were decisions on creating the malls, their design and construction. Also, over seeing the evolution and character of the malls was part of the legislation.

In many older urban cities such as Bremen, an oval shaped core originally ringed by a wall had bypass roads constructed to divert traffic around the old city. The central downtown core area with its public buildings, the cathedral, railroad station, etc, became pedestrian oriented.

In Hamburg city, government improved pedestrian area by the use of shopping arcades. The arcades were constructed within the re-developed building blocks. The malls helped to stimulate retail trade in the central business district, and reduced automobile traffic congestion. Initially, malls had the approval of the public transportation lobby, automobile drivers, environmentalists and other groups.

In response to the development of suburban shopping centers in Germany in 1971, efforts focused on creating pedestrian malls with clusters of specialty shops, entertainment areas, restaurants etc, to prevent problems that had hurt shopping areas in the United States. Retailing success became dependent on the variety of shops within the malls and related to a widening gap in rent. Structure for those in the mall and in contrast to those outside it.

By the mid-1970s the decision to build pedestrian malls became contingent on whether they would contribute to up-grading the general environmental quality of an area. As malls progressed into this second stage they began to integrate a wider range of buildings and streetscapes, and include a greater number of the cities shops. This led to the renovation and expansion of the first series of smaller malls.

There are recent proposals for design concepts that provide equal co-existence for both pedestrians and automobiles. Integrated systems of circulation for urban areas that balance the need for local as well as long distance traffic are also being studied.

UNITED STATES

In the United States, many cities beginning with Kalamazoo began building malls. To date there are approximately 200 pedestrian malls of various types in the United States. Kalamazoo started with a 2-block mall in 1959. The following year in 1960 a third block was added. 4 fourth blocks was later added, all the blocks are closed to traffic.

The main retail area with two major department stores is concentrated in the original two blocks and about 35 retail establishments are located on the four block mall.

The Kalamazoo mall has been moderately successful over the years and one reason may be that it was developed before the sub-urban shopping malls were established. It has also been renovated twice and has provided the downtown with a focal point.

2.7 MODERN URBAN SPACES

The design of urban spaces and pedestrian malls in the united States can draw on European examples. A sense of place with unique character and scale was provided in European piazzas such as piazza del campo, sienna, Italy where

people can gather to relax. The piazzas have a variety of uses including market areas, civic areas, commerce, religious facilities, and special events such as festivals and horse races. Buildings adjacent to the piazzas were often renovated. In addition there was a sense of containment of the space, which may reinforce mixed feelings of protection and security. In recent times since the streets leading to these piazza were narrow, vehicular traffic has been kept out of these spaces. In the United States, Copley square in the United States was recently redesigned to create such a place.

American cities need uses and adjacent facilities that add life to out door spaces such as shops cafes comfortable and convenient sitting areas, quality paving materials with color and texture, works of art such as sculpture and fountains, and street trees for continuity, shade and seasonal interest.

CHAPTER THREE

3.0 EFFECTIVE USE OF LIGHTING IN SHOPPING MALLS

Obviously, God the creator of heaven and earth knew the importance of light when He said 'Let there be light', and then... There was light. God, I'm sure, wanted to see the beauty of consequent creations

Human beings are not different, as every human depend primarily on sight to learn about the world around and also to appreciate creation, which is aided by light.

Factors such as size, proportion, character and surroundings of rooms and colour scheme have a great psychological effect; all these factors are perceived through the eyes and invariablywith the position of lightning.

Therefore lightning is very important for any environment and for the proposed shopping mall it will play an important role, because shoppers are primarily influenced by their environment. As a result a well illuminated aesthetically pleasing edifice will help in ensuring customer patronage.

3.1 LIGHTING

Lighting is simply defined as a means of providing light.

Since earliest times people have needed devices to help them see after sundown and to illuminate places of shelter. Light from the sun and moon is free but it is undependable, difficult to control and impossible to move. The development of artificial lighting has been marked by the invention of light sources with ever increasing efficiency, output and convenience. The quality of light and the quality of architecture are inextricably intertwined. The architect must accept the light as it is and design the form in response to it, in some cases, in others both the form and the light source are under the architect's control. Thus the architect creates the visual environment by both moulding the material and controlling the light.

The designer should create a quality lighting environment, which includes the lighting necessary for satisfactory aesthetics and biological needs as well as the lighting required to perform tasks. The quality of a lighting environment is not achieved by supplying large quantities of light; rather it lies in the effective utilization and distribution of lighting.

3.2 PROPERTIES OF LIGHT

Light is defined as that portion of the electromagnetic spectrum to which our eyes are sensitive. Humans see light in the visible range, which includes colors beginning with red through to violet.

Light sources are necessary for vision. An object can be seen only if light travels from the object to an eye that can sense it. When the object is itself a light source, it is called luminous; such as the sun and electric lights. Other objects have to be illuminated by luminous objects to be seen i.e lumens from a light source will eventually illuminate a surface.

Illumination is therefore a measure of the number of lumens falling on each square foot of a surface.

1 dimly illuminated white surface is much brighter than a highly illuminated black surface. Brightness is a function of both illumination and the reflectance of a surface. The reflectance factor on the other hand, indicates how much of the light falling on a surface is reflected. Smooth polished surfaces give specular reflections where the angle of incidence is equal to the angle of reflection. Very flat or matte surfaces scatter the light to give diffused reflection. Most real

materials combine these characteristics so that they reflect light in both a specular and diffused manner.

3.2.1 COLOUR

Colour is a quality that an object shows in the light. The colour of a surface is due not only to its reflectance characteristics but also to the spectral composition of the illumination. White light is a more or less even mixture of the various wavelengths of visible light. Although different varieties of daylight and many artificial light sources all supply 'white light', there is obviously a great difference in the composition of these sources and that affects the way we see the colour of things. The effect of light sources on colour appearance is called colour rendition.

3.2.2 VISION

Vision is the eye's ability to sense light. Our eyes convert light into electrical signals that are then processed by the brain. The interpretation of what the eyes see is called perception. It takes the eyes many minutes to adapt to large changes in brightness and during that time vision is not at optimum, constant and rapid changes in brightness also cause stress and fatigue. It takes large increases in light for the eyes to notice a small increase in brightness. Table 3.1 illustrates

commonly experienced brightness levels. The location and brightness of objects in the field of view will have a major impact on the quality of the lighting environment.

	BRIGHTNESS (Foot Lamberts)	
Side walks in a dark night	0.001	Poor vision
Side walks in moonlight	0.01	
Side walk under a dim streetlight	0.1	
Book illuminated by candle	1	Normal indoors Brightness
Wall in an office	10	
Well illuminated drafting table	100	
Side walk on a cloudy day	1,000	
Fresh walk on a sunny day	10,000	Blinding glare
500W incandescent lamp	100,000	

Table 3.1; Commonly experienced brightness levels.

3.2.3 PERCEPTION

The ancient Greeks realized that we do not perceive the world as it actually is. Consequently, they built later temples like the Parthenon so that it would be perceived as correct. This suggests how much perception can vary from what we might expect to see. To create a successful lighting system, the designer must understand the various aspects of human perception. Some are explained below;

a. Relativity of Brightness:

A human being judges the brightness of an object relative to the brightness of the immediate surroundings. Since the renaissance painters have used this principle to create the illusion of bright sunshine, they highlighted objects by creating a dark setting rather by high illumination levels.

b. Brightness constancy:

The brain interprets the visual environment by making adjustments to what the eye sees. The brain is aware that the reflectance factor of a ceiling is constant and that it is the illumination level that varies. Consequently, it interprets the ceiling as having uniform brightness i.e. also referred to as brightness constancy.

c. Colour constancy

The brain's ability to eliminate the differences in colour due to differences in illumination is called colour constancy. This is not possible however, if more than one type of light source is used simultaneously, the brain can not adjust to the colour balance.

3.2.4 PERFOMANCE OF VISUAL TASK

There are many factors that affect the performance of a visual task, some are inherent in the task, some describe the lighting conditions and remainder reflects the condition of the observer.

The actual factor of visual performance is not size but exposure angle. Size of task should also be increased because a small increase in size is equivalent to a very large increase in illumination level.

An increase in brightness results in significant improvements in visual performance, but additional increases yield smaller and smaller benefits. Increase in performance is possible through reducing the background brightness and thereby increasing the relative brightness of the task.

The difference in brightness between a detail and its immediate background is called contrast. When contrast decreases, the other factors of visual performance can be adjusted to compensate.

3.2.5 BRIGHTNESS RATIO

Although the eye can adapt to large variations in brightness, it cannot adapt to two very different brightness levels simultaneously. They can minimize this problem by concentrating on one brightness area at a time. The result is visual stress. If the eye keeps switching between areas of very different brightness, the additional stress of constant re-adaptation is also present.

The designer can avoid these sources of visual stress by controlling the brightness ratios in the field of view. This is accomplished by adjusting both reflectance factors as well as illumination of surfaces since brightness is a function of both.

3.2.6 GLARE

This is 'Visual noise' which interferes with visual performance i.e. unpleasant bright light. There are two kinds of glare, and each can have detrimental effects on the ability to see.

a. Direct glare:

The interference with visual performance caused by unshielded light or window is called direct glare. The severity of the glare caused by a light source is in large part due to its brightness.

However, it is not only absolute brightness but also apparent brightness that causes glare. Direct glare is also a consequence of geometry, and it increases with the size and proximity of the source.

The same light source that creates glare in an office might create sparkle in a nightclub. What is noise in one situation can be information signal in another. Lighting design is not just a problem in physics, but also one in human perception.

b. Reflected glare and veiling reflections:

Reflections of light source on glossy tabletops or a polished floor causes a problem similar to direct glare. This reflected glare is often best avoided by specifying flat or matte surfaces. The reflection of bright light source on task such as a printed page are known as veiling reflections, because they reduce the contrast necessary for good visual performance.

An effective lighting system is ultimately based on an understanding of perception. The importance of quality cannot be overemphasized. The choice of a lighting system should be responsive to all the above mentioned factors.

3.3 LIGHTING NEEDS

The proper use of lighting is important so that human comfort and quality of life are not sacrificed in an effort to achieve fuel savings.

Firstly, lighting levels may not have to be so high as those we have been used to. There is, and probably will be for some time, debate among professionals about what light levels are necessary for human health, comfort and productivity. The designer must make the choice because professional responsibility for client is finally his or hers.

The debate about lighting levels for the interiors of buildings is related to a relatively new measure of lighting, one that measures quality as well as quantity. This measure is called EQUIVALENT SHERE ILLUMINATION (EST). This concept rests on the proposition that visibility is the ultimate objective of any lighting design and that visibility is a function of, among other characteristics,

lighting intensity, absence of reflections *(Veiling reflections and reflection glare)*, and absence of glare.

A lighting design with low intensity and low reflections may well be equivalent in terms of task area visibility to a design which has high intensity and high levels of reflection. The former of course will have a low electrical consumption. ESI, as a method of measuring visibility, is a level of illumination that is reflection-free, such as one might have on a task if surrounded by a diffusely lighted luminous sphere.

It is also important to remember that the electricity consumption by lighting may or may not be a scarce energy source. In most cases it costs money. When electricity is generated by renewable sources such as hydroelectric power or solar radiation, it will not be as important for a designer to provide designs which reduce electrical consumption as it will be in areas where electricity is generated by depletable sources such as coal, oil or uranium.

3.4 ELECTRIC LIGHTING

Whether or not daylight is used, a full electric lighting system must be supplied. When daylight is available all or part of the electrical lighting system can be

turned off thereby saving a significant amount of both electrical energy and electrical demand.

However since twice the required illumination is not visually objectionable, the tendency is to have both the daylight and electrical lighting on at the same time. Consequently automatic controls using photocells to determine how much light is available on the work plane are necessary in most case if daylight is to save electricity.

To take advantage of these automatic controls, the lighting fixtures must be arranged to complement the available daylight. The control can either be on/off type or dimming type. In most cases automatic controls are a necessary part of daylight systems, because people are not motivated enough to turn lights off when they are not needed.

The information collected will aid in producing suitable lighting systems based on the principles of day lighting design with electric lighting as supplementary. The lighting system in a shopping mall should allow the storefronts to be the main attraction. Natural lighting is often used in moderation to give variety and

save power cost. Natural light should enhance rather than dilute the impact of storefronts along the mall.

3.5 SWITCHING TECHNOLOGY FOR NATURAL LIGHTING

Daylight has some qualitative benefits that are, perhaps more valuable than its quantifiable assets. First, it changes in direction, intensity, and colour throughout the day. This variety gives the occupant of a building a constant contact with nature. This constantly changing quality, however, makes daylight somewhat more difficult to quantify and control in terms of providing minimum light levels for tasks.

The technology of artificial-lighting controls, along with various design strategies, provides appropriate responses to this condition without interfering with the natural beauty of the source. For example, control technology which allows fluorescent lighting to be dimmed automatically in response to changing levels of natural light coming from windows or skylights is now available in some hours of the day, when natural lighting is high enough, artificial lighting may be turned completely off.

During other parts of the day, artificial lights may need to be on at low levels to make up for insufficient natural lighting.

In general, there are a variety of approaches to switching artificial-lighting levels off or down when natural lighting is available. All will save electrical energy, they are;

1. **Automatic switching**
    a. Stepped switching
        i. One step (On-off)
        ii. Two step (High-low-off)
        iii. Three step (High-medium-low-off)
    b. Dimming
2. **Manual switching**

3.6 LIGHT WITHOUT HEAT

All light whether electric or natural is radiant energy that is eventually absorbed and turned into heat if the direct sunlight that enters a building is well distributed and does not create excessively high illumination levels, then the heat load from sunlight will be less than from electric lights.

For example, incandescent lamps introduce 12btu of heat energy along with every 1btu equivalent of light. Fluorescent lamps introduce 3btu of heat along

with 1btu of light, while sunlight introduces only about 2btu of heat with every 1btu of light, in addition to the fact that the amount of heat is also a function of the quality of light.

A source of heat gain *(and loss),* which is often overlooked by many designers, is large areas of glass in buildings in hot dry lands. Most authorities in buildings in hot climates are unanimous in their view that glassed areas should be kept to a minimum compatible with adequate natural light requirements. The reason for this lies in the fact that glassed areas permit the progressive build up of long wave energy inside a room, thus giving rise to what is known as the green house effects.

Glass has a little insulation value and heat will flow through it whenever there is a temperature gradient from one side to the other. The extent to which heat is transmitted through glass is also affected by such factors as the angle of incidence, orientation, latitude, window size and the time of the year. The angle of incidence is a factor, which can be used in the design for control of sunlight penetration.

By incorporating certain iron compounds during manufacture, glass can be made to absorb some of the short wave energy falling on it, thus reducing incoming radiation intensity. Most are limited in their effectiveness because their own temperature is raised, which in turn causes an increase in the heat convected and re-radiated into the room. Tests indicate that heat-absorbing glass reduces the amount of solar energy by about 50% of that transmitted through regular plate glass.

Better effectiveness can be obtained if the glass is used independently of the structure itself and set away from the wall in a freestanding position. The need to provide effective shading devices is also emphasized. An alternative is to use heat absorbent glass in conjunction with regular plate glass as a form of glazing. The heat transfer reduced in this application is 25%, hence the efficiency is rather limited.

If double-glazing is used, reduction is 45%. The inner pane of regular plate is not only a protection from the layer of warm air immediately behind the outer one but it also acts as a radiation filter to the long wave energy emitted by the heat absorbent glass. If the space in between double glazing can be freely ventilated

so as to remove the air as quickly as possible, the efficiency of the window can be further increased.

Another method of reduction of heat transfer and the entry of solar radiation through glass is obtained by depositing fine semi-transparent metallic coating on the surface of glass during manufacture or by application of reflecting film to ordinary clear glass. However, such coatings absorb largely in the visible glass and reflect mostly in the heat part; thus there is greater light reduction than heat, even though the latter is substantial.

What is really needed is a selective glass that reflects the infrared but not the visible portion of daylight.

3.7 NATURAL LIGHTING, GOALS AND STRATEGIES

The major structural changes in buildings reflected the goals of increasing the amount of light that entered buildings during the ninethenth century. Because artificial lighting had been both poor and expensive until then, buildings had been designed to make full use of daylight.

Large and numerous windows were a dominant characteristic of renaissance architecture. (E) And (H) shaped floor plans were dominantly employed for their ventilation and daylight requirements. New York city enacted zoning laws to ensure minimum levels of day lighting, the laws in England that tried to ensure access to daylight date back to 1187. The masters of twentieth century architecture have continued to use daylight for both functional and dramatic purpose.

3.8 NATURE OF DAYLIGHT

In the second half of the twentieth century, daylight was relegated to a minor issue because of the availability of efficient electric light sources and cheap abundant electricity. It wasn't until the energy crisis of the mid 1970's that the potentials for day lighting was re-examined. At first only the energy implications were emphasized, but now day lighting is also valued for its aesthetic possibilities and its ability to satisfy biological needs.

For most climates and many building types, day lighting can save energy, the maximum "demand" for electricity can be reduced to 50% by the proper utilization of day lighting. Day lighting satisfies biological need for relating to

the natural rhythms of the day. It also creates drama that is much more stimulating than a completely consistent electric lighting scheme.

The daylight that enters a building can have several sources direct sunlight, clear sky, clouds or reflections from the ground and nearby buildings. The light from each source varies not only in quality but also varies in quantities such as colour, diffuseness and efficiency. A day lighting design that works under variable sky conditions such as overcast sky and clear sky with sunlight, will also work under most sky conditions.

The difficulty with the clear sky is the challenge of the direct sunlight which is not only extremely bright but is constantly changing direction. Under overcast skies, the main challenge for the designer is one of quantity, while for clear sky conditions the challenge is one of quality.

The daylight from clear skies consists of two components, skylight which diffuse and of low brightness, and the direct sunlight which is very directional and extremely bright. Because of the potential for glare, excessive brightness ratios and building overheating, it is sometimes assumed that direct sunlight should be excluded from a building. Although direct beam sunlight has a lower efficiency

skylight, its efficiency is comparable to the best electric sources, while its colour rendering ability is superior.

Therefore, it is not a good policy to exclude direct sunlight. With the proper design it can supply high quality as well as high quantity daylight.

Reflected light from the ground and neighboring structures is often a significant source of daylight. It is not even uncommon for reflected light to be the major source of daylight. The reflectance factor of the reflecting surface is critical in this regard.

3.9 GOALS AND STRATEGIES FOR DAYLIGHTING

The general goals for day lighting is the same as that for electric lighting to supply sufficient quality light while minimizing direct glare, veiling reflections and excessive brightness ratios. Due to the limitations of window locations and the variability of daylight, there are some specific goals that refer only to day lighting.

The first goal is to get more light deeper into the building to raise the illumination gradient across the room. The second goal is to reduce or prevent

the severe direct glare of unprotected windows and skylights, another is to prevent excessive brightness ratios especially those caused by direct sunlight.

Lighting should generally not be too directional because of the dark shadows that result. The fifth goal therefore is to diffuse the light by means of multiple reflections off the ceiling and walls.

In areas where there are no critical visual tanks the drama and excitement of direct sunlight can be a major design element. So the sixth goal is to use the full aesthetic potential of day lighting and sunlight.

To satisfy the above-mentioned goals, of good lighting, various strategies are available. The orientation and form of the building are critical to a successful day lighting scheme. It is not only the external form, but also the shape of internal spaces that must be considered. Selection of finishes should be considered early, light finishes are required to increase the distribution and penetration of daylight. The ceiling should have the highest reflectance factor, than back wall, side walls, floor and small pieces of furniture.

DEDUCTIONS

Artificial lighting will be used conveniently with natural lighting so as to achieve the best possible result. Natural lighting will enhance the impact of storefronts along the mall. Artificial lighting will come to play mostly at night where its effect will be felt most and even during the day, the deep interiors that the full rays of daylight cannot reach will be substituted by or supported with artificial lighting.

CHAPTER FOUR

4.0 CASE STUDIES

Shopping centers play significant roles in many communities both internationally and locally. They serve many "clients", developers, retailers, customers and the community as a whole. The architect is required to reconcile the scale of accommodation to efficiently serve its purpose as both a commercial and social gathering point, as well as ensure the structure stands out, as a structural landmark belonging to would be customers.

It is thus mandatory that thorough examination is carried out on existing facilities to study how other architects have tackled the problems inherent in a shopping mall and possible solutions applied. These studies will ensure that shortcomings are avoided and solutions incorporated in the final design process.

4.1 WHITELEY'S, LONDON, ENGLAND

4.1.1 LOCATION

Whiteley's is located in a district referred to as Bayswater in the west end of London, England, United Kingdom. The shopping center is in Queensway street

in Bayswater. There are two subway stations. Queensway station (central line) and Bayswater station (district and circle line) in Queensway.

Queensway is situated in the heart of Bayswater. It is the main street of the district, which is surrounded by other district such as Parklane and Kessington. Bayswater is a high rent high-density area with prime real-estate possibilities. Queensway is lined with restaurants, Italian, Lebanese, Chinese, fast food outlets – Pizza hut, Aberdeen steak house, Macdonald's, Banks – Barclays, Bureu de change, Post office, Grocery store, Hartes, Europa, Pharmacies – Boots, also electric and optical stores.

4.1.2 LAYOUT

The shopping center consists of four floors, with two floors dedicated to shopping, one to restaurant and other recreational facilities and the last to an exhibition hall and cinemas. The layout of the mall is virtually rectangular in shape. There are 3 main entrances into the mall from Queensway; the main entrance is in the middle of the façade facing the street with the other 2 entrances at each end of the façade.

The main entrance is quite impressive the foyer of the entrance has a fountain with two spiral staircases leading to the first floor and a translucent dome over it.

4.1.3 FACILITIES

The ground is dedicated to fulfilling the commercial needs of the customers. There are specialty stores, departmental stores as well as convenience stores.

Some of the stores include perfumeries, Record store, shoes, accessories shops, children's apparel, women's apparel, men's apparel and flower shops.

The first floor is also dedicated to stores as well. They are usually specialty stores such as furnishings – home base; leather goods and suitcase, Gulliver's travel, unisex apparel – Gap, Ceci/Ciee, Departmental store – Marks and Spencer; Book Store – Books, sports store and active ventures.

The second floor is totally dedicated to the customers recreational activities. It accommodates facilities like the restaurants, Chinese (poris), mama Amalfie (Italian), Mexican (chichi's) and also two internet cafes at both ends. The other half of the second floor houses the Cinema with four of it's screens on that floor.

The remaining 4 screens of the cinema are on the third floor. The management also takes up part of the floor area. An exhibition hall is also situated on the third floor.

The toilets for customers are situated on the second and third floors. Parking facilities are provided on three floors behind the center with access to the mall through the second floor. Vertical transportation is provided by 4 escalators 1 stair case and 2 elevators.

4.1.4 APPRAISSAL

Due to its prime location, there is easy access for customers through the subway stations and bus stops provided in that area. It meets the diverse needs of customers by serving as both a commercial center as well as a social gathering point, as it provides for recreational activities especially the cinema, internet cafes and restaurants.

Architectural expression of store fronts allows for maximum enjoyment of window shopping as well as beconing to interested customers. Also vertical movement has been made easy by the provision of 2 elevators and 4 escalators.

Management location is very convenient allowing their activities to run smoothly and undisturbed.

All the facilities provided are clearly marked.

4.3.3 APPRAISSAL

There is enough internal space and so movement is free, its location is also of an added advantage to it. There are no recreation facilities provided for. The building itself is of an old design. Parking space is not adequate and personally, I think there are too many staircases.

CHAPTER FIVE

5.0 DATA COLLECTION

5.1 GEOGRAPHICAL LOCATION

Abuja a symbol of Nigeria's aspiration as city of National unity lies between latitude 8'25'N and 9'20'N, and longitudes 6'39' and 7'30' East of the Greenwich meridian. It occupies an area of 8000sqkm. Bounded to the North by Kaduna State, to the east and south east by Plateau State, to the Northwest by Kwara State and to the west, by Niger State. Being centrally located, the Federal Capital territory is accessible from all these parts.

5.2 CLIMATE

In the Federal Capital territory, the duration of sunshine ranges from 6 to 8 hours per day in the South, and 8 to 10 hours in the north from January to April/May. There is usually a steep drop to a mean of about 4 hours per day in the months of July/August due largely to increase in cloud cover. It starts to rise again in September as a result of decrease in cloud cover.

5.2.1 RAINFALL

Rainfall starts from March in the Southern parts of the territory and from April in the northern parts and ends around October in the northern parts and November in the extreme south.

The duration of the rainy season varies, therefore, from 240 days in the Southern parts to 290 days in the Northern parts. Because of the location of the territory on the windward side of the Jos Plateau, there is a general increase in the total amount of rainfall from the North to the South, rather than the usual decrease which is characteristic of the entire country. Within the territory itself, Northern locations have more rainfall than those in the south. For instance, Lokoja and Makurdi located South of the territory have 1146mm and 1132mm of total annual rainfall respectively compared with Abuja and Jos with 1632mm and 1402mm of annual rainfall respectively.

5.2.2 VEGETATION

The main vegetation of the Federal Capital Territory is guinea savanna, pockets of rain forest, wood savanna, park and shrub savanna are also found. This reflects the true transitional nature of the area as between the southern forest and the Northern grassland vegetation belts. As a result, almost all crops that can be

grown in the southern forest belt and the Northern grassland belt can be grown in the territory.

5.2.3 TEMPERATURE AND HUMIDITY

The Federal Capital Territory, like most parts of the country records its highest temperatures during the dry season months which are generally cloudless. During the dry season, the typical month of which is march, temperatures could be as high as 37 C in the southwest, and about 30 C higher in the north east. This period is characterized by high diurnal range when drops of about 17 C may be recorded between the highest and lowest temperatures in a day. During the rainy season, temperatures drop considerably as a result of dense cloud cover. The diurnal range also drops to about 7 C especially between July and August.

The territory records relative humidity in the dry season of some 20% in the afternoon at higher duration in the northern parts. Sometimes, about 30% is recorded in the extreme south of the territory especially in the areas close to Niger-Benue trough.

5.2.4 WIND

There are two major air masses

a) Tropical Maritime Air masses: This is formed over the Atlantic Ocean to the south of the country. Warm and wrist, it moves in the southwest and Northeast direction, which creates, wet season.

b) Continental Air mass: this develops over the Sahara desert and is warm and dry. Below in opposite direction of Northeast to Southwest, it creates the dry season. The two air masses are characterized by the presence of prevailing winds.

5.2.5 SOLAR DATA

Abuja, according to Mabogunje (1977), is exposed to 2,500 sunshine hours annually. During the dry season, the Northern radiation in the amount of sunshine follows the general trend of increment in cloudiness. The amount of insulation gives room for the use of materials, which can reflect or absorb solar radiation in or from buildings.

5.3 GEOLOGY AND TOPOGRAPHY

Sedimentary rock is the major rock-underlay of the Federal Capital territory. The rock is located in streambeds and consists of sand, gravel and local deposits

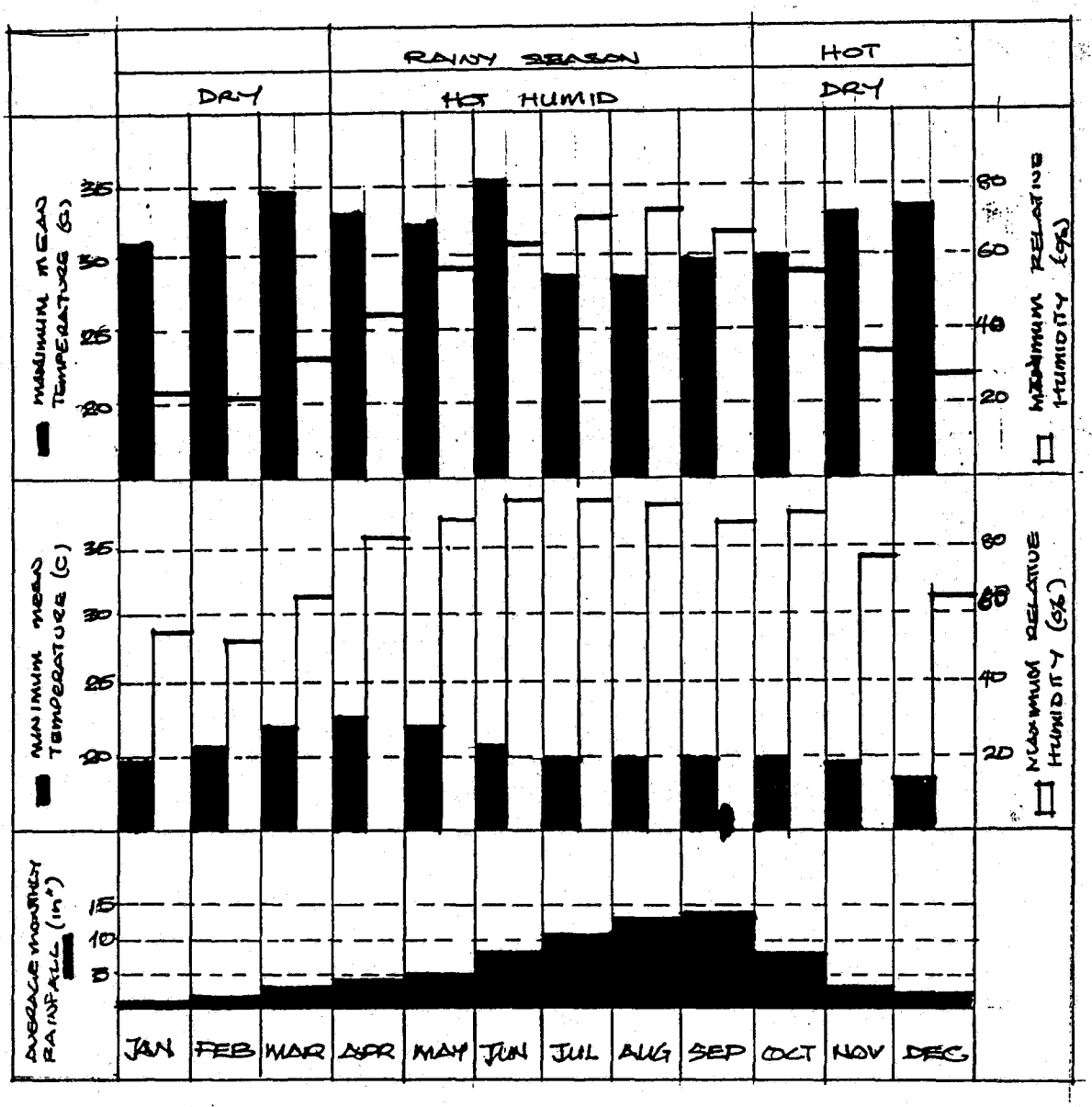
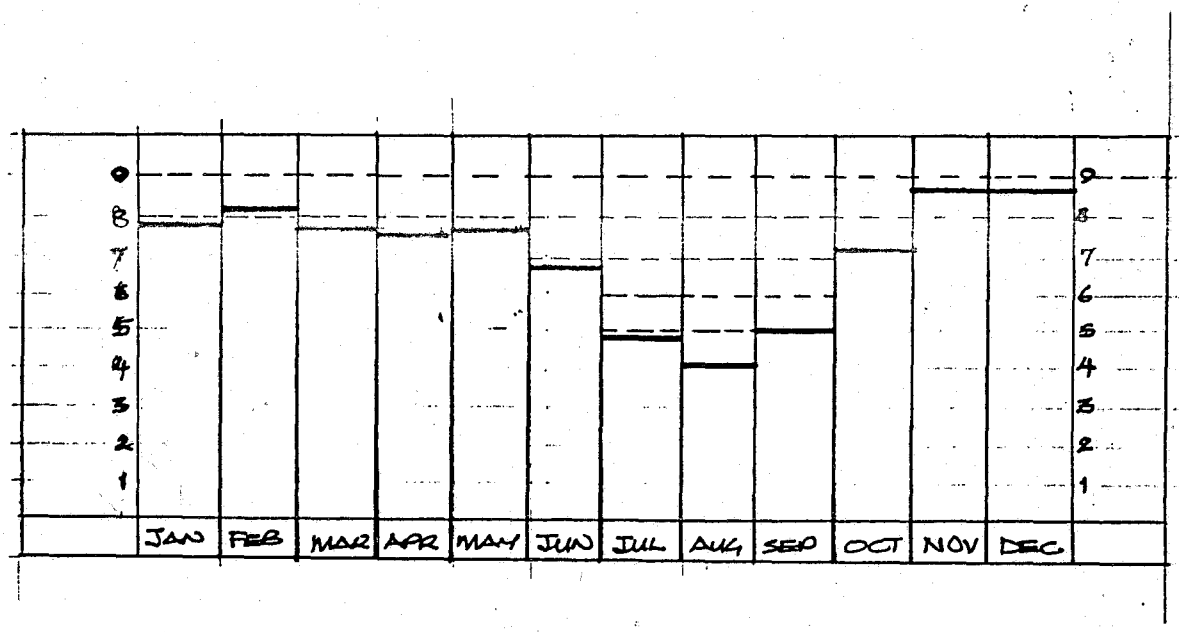

DRY
RAINY SEASON
HOT HUMID
HOT
DRY
MAXIMUM MEAN TEMPERATURE (C)
MINIMUM RELATIVE HUMIDITY (%)
MINIMUM MEAN TEMPERATURE (C)
MAXIMUM RELATIVE HUMIDITY (%)
AVERAGE MONTHLY RAINFALL (in")
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

FIGURE 4:

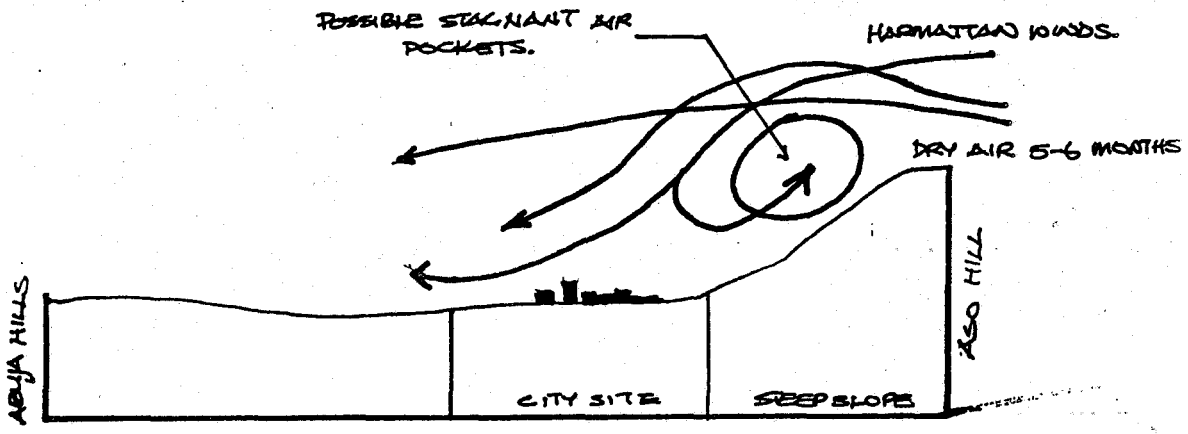

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

of clay. The rock is of medium to high strengths. Thus creating minimum engineering problems during construction. These rocks are normally quarried and used for construction work on sites.

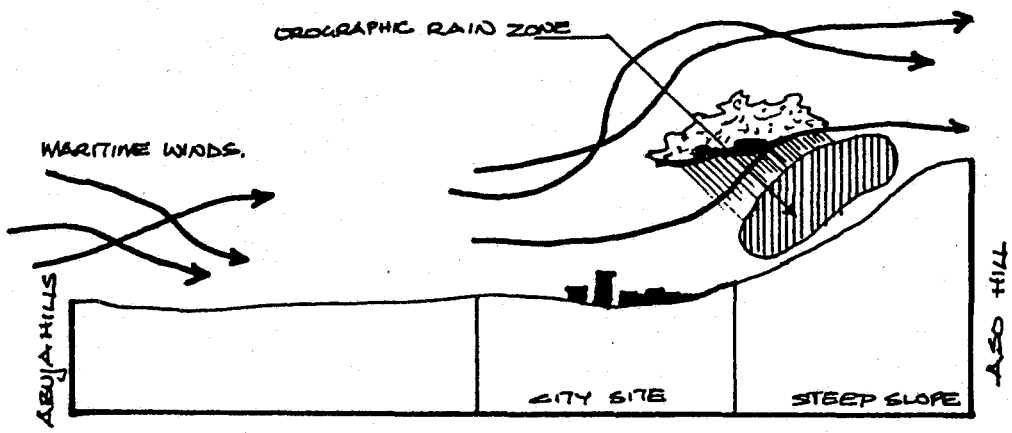
The ingenious rocks include Biotite granite, which comes in two forms such as coarse prophylitic rock and fine medium grained. The metamorphic rocks include the Biotite-muscovit schist. This rock has not created any major constraint to structures proposed in Abuja. Note that no earthquake or landslide has been recorded.

Topographically, the F.C.T has gentle undulating terrain. The variation is between two heights, which vary 50m, or more, it produces the immediate surrounding short vines of less than one kilometer, which are further shortened by the characteristic of park savannah vegetation. Inselbergs and other granite clusters occupying about 80% of the total plain areas, and are generally rocky and occurring as isolated masses or in groups of raising plains.

The linear pattern of these out-cropping contributions to the decision of developing two parallel bound of residential sectors on either side, tearing the more broken landscape as the prominent linear park.



DRY SEASON 5-6 MONTHS.



WET SEASON 6-7 MONTHS

Figure SEASONAL WIND PATTERN.

5.4 SOCIO-CULTURAL FACTORS:

With respect to religious composition adherents of traditional religion dominate the F.C.T. Commenting on the religion of this area in 1954, two renowned British geographers, Buchanaan and Pugh, describe the area as changing tenaciously to various animist beliefs, little influenced by the two world faiths established alongside it. Historical factors seem to be largely responsible for this. Most of the inhabitants of the F.C.T especially the indigenous population have no formal education things are however improving.

5.5 ECONOMY AND COMMERCE

According to "GIANT IN THE TROPIC" Volume two on state surveys carried out by R. K. Udo and A.B. Mamman in 1993, over 20 percent of the F.C.T population are farmers. Public service is becoming increasingly important. The level of self-employment mainly in farming is very high. In terms of returns on investments there are probably no other areas in the country that can compete with the F.C.T. This is especially true of investments in industries and housing where extremely high returns may be expected. In the case of industrial development the F.C.T has a member of advantages. First, it represents industrialization from a zero base since there is little or no manufacturing as yet.

This should ensure minimum returns to the industries, which are pioneers in the territory.

Secondly, the central location of the F.C.T will ensure that industrial raw materials can be assembled from all parts of Nigeria and finished products distributed at minimum cost.

These advantages are in addition to the mineral and agricultural resources base as well as the size of the potential market.

Mineral resources include, marble, tin deposits, building and crushed stones, mica, lead, sand brick/ceramic clay, sand iron, wolframite and tantalite.

Agricultural potential: Ecologically, the F.C.T is a transition area between the grassland zone of the far north and the forest zone of the south. The high agricultural potential in the F.C.T is emphasized not only by the current level of food crop production even with rudimentary methods, but also by the great variety of crops which can be sustained as it does, such crops as roots and tubers (yams), legumes (groundnuts and cowpea) grains (Maize, sorghum and rice),

seeds and nuts (Melon seeds and benniseed) animal products (Goat, cattle sheep) fruits and vegetables.

Forest products: Sawn timber, wood, firewood

Hotels: Nicon Noga Hilton, Agura Hotel, Abuja Sheraton, Silver pot hotels, amongst others.

5.6 DEMOGRAPHIC DATA:

Human population in Abuja, according to the 1991 population census (provisional figures) was put about 378,671. But only ten years earlier, according to the 1973 census, which was rejected by Nigerians, but was in line with the 1963 census (as far as Abuja was concerned), the population was 170,575. This figure was actually not accepted.

5.7 TRANSPORTATION AND TRAFFIC CONTROL

The use of linear spine feeder system makes possible a series of entrances and units to allow buses to loop off the spine and to provide direct service to a distance and then to return to the spine. The direct pattern allows maximum flexibility in transit service between sectors via the transit spine. This is not a fixed feeder crop thus additional access roads to the transit spine have been developed to accommodate projected transit demand. The manner and use of

traffic routes within the city will aid tremendously in determining how the Mall's potential will be fully utilized.

5.8 EXISTING LAND USE AND FUTURE TRENDS

The land use requirements were based on current Nigerian practice and new services delivery systems under development in Nigeria as well as international practice where relevant. Special attention was paid to standard for residential and local public facilities as the major landscaping elements in the city.

The 25,658 hectares include "unusable land" such as rock outcropping or steep slops not otherwise programmed for open spaces. The total city area is equivalent to 256 square kilometers.

Planning and implementation purposes make the development of the Federal Capital City in stages imperative. The main activities, which the central area houses are the client government and business activities of the nation. While a rich mixture of activities is expected in many parts of the central area.

CHAPTER SIX

6.0 SITE ANALYSIS

6.1 CRITERIA FOR SITE SECECTION

The selection of a site accommodate the proposed millennium mall is subject to the site possessing to a great degree some qualifications which apply for the efficient utilization of the shopping mall. The following criteria normally apply;

i). A site available for development and located in the most desirable, general trade area as recommended by an economic survey.

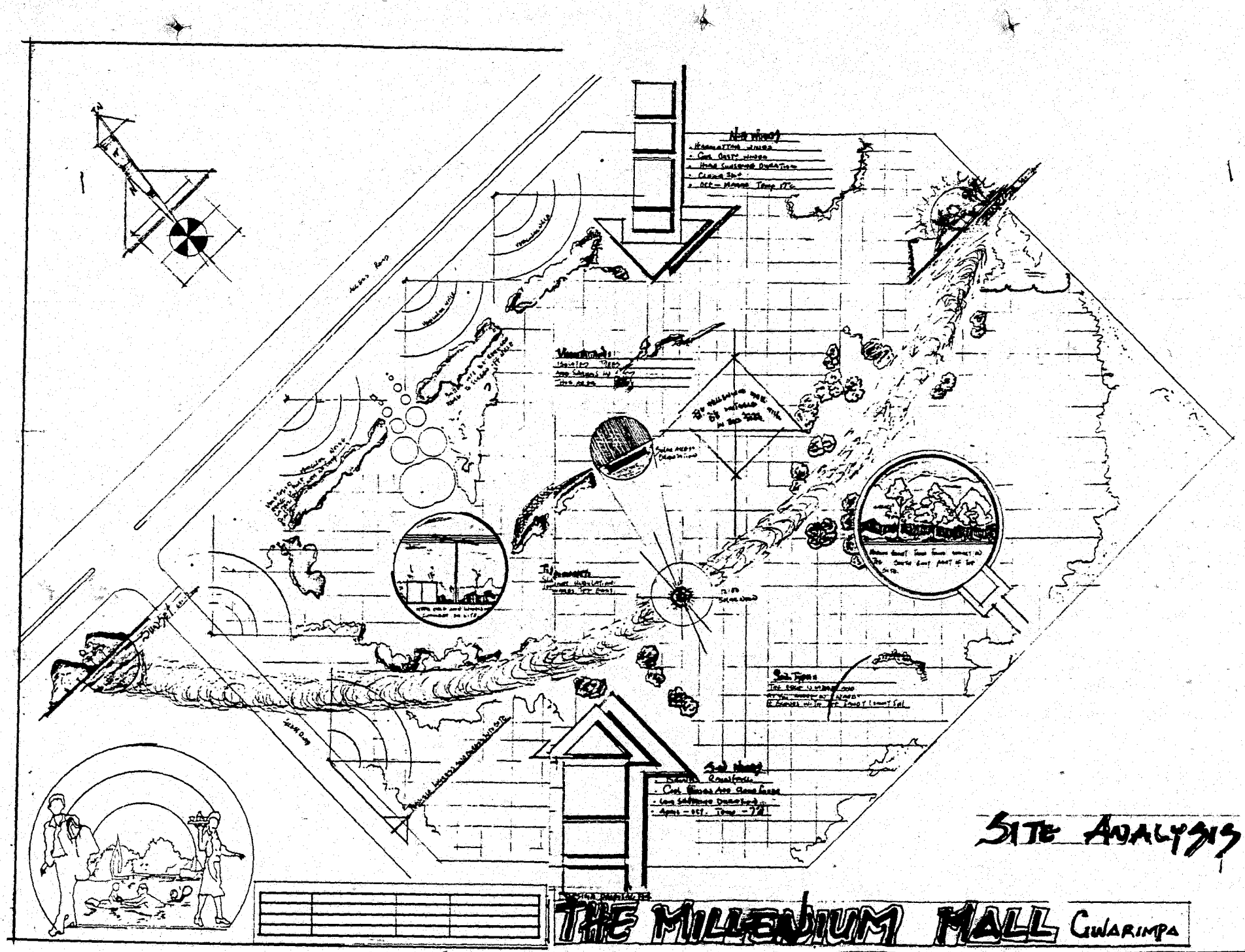
ii). At a location easily accessible to at least one existing or shortly to be constructed major highway preferably to two or more highways, not necessary if suitable access roads exist between highways and the site.

iii). The site should be owned or controlled by the developer or offer the possibility of acquisition.

iv). The land cost must be in proper relation to total capital cost and overall economic consideration.

v). Existing zoning must permit shopping mall development or a reasonable likelihood of rezoning must exist.

vi). The site must contain sufficient land to permit construction of facilities to meet the sales potential.


SITE ANALYSIS
THE MILLENNIUM MALL GWARIMPA

vii). The land must be in one piece, free of intervening roadways, rights of way, basements, way or waterways, or other obstacles that would force development in separate portions.

viii). Utilities available or installable at acceptable cost.

ix). Topography and shape of the site must permit advantages planning and reasonable economical construction.

x). The surrounding road pattern and accessibility must allow full utilization of the business potential.

xi). Surrounding land users should be free of competitive developments and should be of a nature that enhances the operation of the shopping mall.

Rarely will a site completely fulfill all the above requirements and advantages will have to be weighed and balanced against shortcomings.

6.2 LOCATION OF SITE

The proposed site selected for the millennium mall Gwarimpa is located at the junction of the road leading into Gwarimpa. This junction is along the express that leads to the city center.

The site is just before you turn into Kubwa road, the site is bordered on the North by the highway that leads into Abuja Town and that also goes back to zuba park. It is bordered on the south by buildings intending out from Gwarimpa town.

6.3 SITE CHARACTERISTICS

a). Vegetation: The vegetation can be classified as park savannah with scattered trees and tall grasses. The area is covered with tall grasses, and also trees of Medium height. The vegetation is annual with only a few trees species found among the grasses.

b). Geology: The area is almost predominantly under lain by, granite and of the crystalline basement complex. This area is ideal for building foundations and in free from geological hazards.

c). Topography: The site has already been cleared for construction. At present 75% The overall flatness of the site will make construction possibilities relatively uncomplicated through the natural slope.

d). Climate: The climate of the area has temperature varying from 21° – 28.7°c yearly with a total annual rainfall of approximately 1,650mm. About 70% of July, August and September. This factor is of significance in the planning of drainage for the disposal of storm water.

Another climate characteristic of this area in the frequent occurrence of squall line heralded by thunder storms, lightening, strong winds and rainfall of high intensity. This climatic phenomenon often causes severe damage to buildings and it is essential to consider this when designing buildings. The climatic condition from the chosen site will subject to responses in the following areas;

(i). Temperature; the absence of large rocks reduces the occurrences of heat retention and subsequent releases during the evening hours. The vegetation cover also enhances slightly cooler conditions than prevalent in other parts of the city.

(ii). Wind: The presence of a sufficient dense area of trees, and the surrounding buildings provides good protection from the dry, dirty, north-east trade winds as they father over the rolling plains on that side of the site.

6.4 ACCESS AND CIRCULATION

The site of the proposed "millennium mall, Gwarimpa" can be accessed from two sides; either from the highway headed into town or from Zuba, or from the access road into Gwarimpa town.

Circulation within the site is expected to be smoothly carried out with proper planning. The topography of the site makes construction of roads very easy.

There is also a possibility of locating a back entrance which shall serve as a service entrance.

6.5 UTILITY

The site is privy to all essential infrastructural services. Water supply to the site is provided through trunk pipeline leading to ground level storage tanks, which serve various loops.

The master plan provides for a central sewage schemes for the city and the satellite towns including Gwarimpa.

The main objective for the central sewage scheme is to ensure that wastewater resulting from the usage of the copious portable water is properly disposed of without polluting the stream, river courses and the environment.

The main source of electricity supply to the city and other parts of the territory is Shiroro hydroelectric scheme.

CHAPTER SEVEN

7.0 DESIGN, CONCEPT AND CONSTRUCTION

The main objective of Architecture is to give man a dwelling. To dwell however means to "belong to a social system where man's physical counterparts are the figurally defined in individually characterized settlements" (Robert Scranton). It is only through interaction with existing structures of his settlements that man forms an overall image of his environment, thus the importance of an easily perceived and understood arrangement of structures within the environment.

As already been stated, the shopping area is a very important and elemental part of the environment's structural framework, as other facilities tend to gravitate around important shopping centers. Thus the organisation of shopping centers should not be complicated or confusing, but should be simple and well planned such that they allow easy assimilation and facilitate easy and continuous movement within the area.

The millennium mall, is proposed to be a modern shopping center that integrates commercial, business, entertainment and cultural facilities within a carefully

planned framework, separates various modes for the protection of surrounding residential areas from any objectionable use.

7.1 CONCEPT AND DESIGN

The concept development form the basic framework of the thesis, the process deals with the existing natural features on the site and the evolution of forms for the design.

7.1.1 SITE CONCEPT

This is the first part of the sketch design process and is a combination of both physical and natural elements on the site the whole concept development takes into cognizance flexibility, efficiency, adaptation and expansion.

The main objective of site concept is to design a functional architectural layout by:

i. Producing a harmonious and organic flow of architectural entities.

ii. Taking proper advantage of the existing views and vistas.

iii. Organize the natural elements of orientation and circulation around the site.

iv. Produce a concept that will adapt itself to the existing constraints of noise levels, expansion and circulation.

7.1.2 DESIGN CONCEPT

The proposal for this thesis is based on various concepts, which were taken into consideration. Various factors were simultaneously studied, the eventual result which was amalgamated to produce the total concept that governed the design. In the design of shopping centers in general, the basic concepts usually used include the linear, introverted and extroverted concept.

The introverted concept is adopted, where the shopping activity is carried out within the central core or courtyard while delivery of services is carried out at the periphery. The ensuring design concept favoured and adopted is the mall concept where the center is envisaged as a covered street with shops on both sides of the mall.

Relaxation areas as a focus of attention are provided within the mall with some landscaping done by using fountains, large sculptural pieces, flowers and sit-outs.

7.1.3 SPATIAL CONFIGURATION

There are basically five forms of spatial configuration, namely- centralized, linear, radial, grid and clustered configuration. Owing to the advantages derived, a centralized configuration is proposed. This shows a stable concentrated composition that displays the shopping spaces grouped around a large dominating centralized space (which could serve as the landscaped relaxation area in this case).

Primary and secondary magnets are the concepts utilized. The primary magnets comprise of the department store and the supermarket, while the secondary magnets comprise the market halls, restaurant, courtyard/mall, auditorium, cinema and exhibition area. The primary magnets are placed as the points of attraction to the complex with the other magnets placed at strategic points to attract customers and draw them past as many less advantageous shops as possible.

Circulation around the complex shows that the main objective is to keep the pedestrian in a constant state of interest, encouraging him to explore and thereby establish maximum foot traffic through all the retail outlets. Hence, the complex

should complement these activities and avoid the customer losing interest or experiencing fatigue resulting in less circulation within the complex.

7.2 DESIGN CONSIDERATIONS

Certain criteria are outlined within the context of physical architecture so as to enhance the buildings functional qualities. Physical architecture has been mostly related to the form which the architect insinuates into his design.

The choice of a particular form is arbitrary after due consideration of certain facts as enumerated below by Paul Rudolf, a second generation American architect. He called them determinants of form and they are as follows;

i. Environment buildings' relationship with other buildings and site.

ii. Functional aspect.

iii. Particular regional, climatic landscape and natural lighting aspects.

These factors help the architect in the successful evolution of form and major parts applicable will be considered.

In order to enhance good functional qualities in a building, the following are considered.

i. Function;

The functional aspects of a complex would define the best space, adjacency and flexibility of the complex will be replacement of the facilities based on user requirements and degree of use.

ii. Circulation

Forces of conflict would be resolved and grouped to evolve a good circulation pattern within the complex.

iii. Structure

The general question within this context is the implication of structural decisions. This will also reveal the resources available at the design proposal.

iv. Landscaping

The most appropriate approach to landscaping would be sought to see where landscape elements are necessary.

v. Aesthetics

This is usually complex and gives the designer the task of defining it within its own framework. The generation of building rhythm, harmony of the mass,

juxtaposition of the form and the desired imagery required are considered in the evolution of an interesting aesthetic out-look.

vi. Fire hazards

The nature of the shopping mall has necessitated the need to provide safety devices for lives and properties. To this end, measures would be taken to ensure that the number of exits, their location and sizes do not infringe on planning standards.

7.2.1 GENERAL DESIGN AND PLANNING CRITERIA

i. COLUMN SPACING;

Significant dimension is along the mall as this involves the widths i.e. frontages of store. Often used spaces are 6m to 9m, with the most flexible being 12m. Dimension from mall to rear of store can be set by the most economical structural system. It is essential to arrive at the most economical structural, as the roof is a major cost factor.

ii. STORE DEPTHS;

For one-story stores, buildings are usually 36m-45m deep, sometimes more for larger stores. For basements or mezzanines, the depth dimensions are usually

reduce by 20%-25%. To achieve shallow depth without incurring cost for greater mall lengths in relation to floor area "dog-leg" or "ell" is adopted, a larger store around a smaller one.

iii. CLEAR HEIGHTS;

These vary from 3m – 4m or more with 3.5m a good average. Above this clear height there must be adequate spaces for air conditioning ducts, recessed lights, structural systems, etc.

iv. DUCTS AND SHAFTS;

The shell of the buildings must be flexible enough to accommodate any reasonable tenant requirements. It is essential that a schedule of the location and sizes of the principal duct runs and shafts to avoid serious future space problem is set up. This requirement includes special exhaust ventilation through the roof and all mechanical items that can be anticipated.

v. CENTRAL PLANT;

The space to be occupied by all equipment must be determined both in size and location in the earliest planning stages. Central plant equipment can be in a

separate building on the project roof or elsewhere so as it is economical as to design and length of runs.

vi. EXTERIOR WALLS;

As these may have depending on each store's requirements, service doors public entrance doors, trash rooms, show windows etc a modular design that can suitably accommodate for visual effect any of these features is very desirable.

vii. TRAFFIC;

The car capacity for all continuous roadways used for ingress and egress must be sufficient to accommodate present and future through traffic plus the traffic generated by the shopping center. Proper signal controls reservoir lanes, divider strips and other traffic control features must be provided.

7.2.2 DESIGN REQUIREMENTS

For a shopping to be successful a combination of some elements are determinant factors. The required for a successful shopping centers are as follows:

i. COMMERCIAL FACILITIES;

These commercial facilities are usually provided in unit that serves the general public by satisfying their commercial needs. They include departmental stores,

supermarkets, rental shop unit, kiosks etc. These units are mainly located on the ground, first and second floors. Access to the other floors through staircases, escalators and elevators.

ii ADMINISTRATIVE FACILITIES;

This core comprises of the management and administrative units. It is made up of facilities that are concerned with day to day running of the complex. This unit provides services to the complex and general public; they include offices, surveillance offices, security and staff facilities. Located in a separate wing of the mall, comprising two floors.

iii. RECREATIONAL FACILITIES;

These facilities include the additional elements such as restaurant, mall, cinema, games arcade swimming pool etc. That will ensure patronage of customers of different target market. They are mainly located on the first floor of the mall.

iv. BUINESS FACILITIES;

These include the area allocated for business purpose. The area shall be leased on a per meter square (m^2) basis. They are winged into five parts with each having

been proved its toilet facilities. Being located on the fifth and sixth floor they crown the shopping mall.

v. CULTURAL/COMMUNAL FACILITIES;

The communal facilities ensure that the shopping mall is fully integrated into the community by satisfied the basic cultural needs with provision of such units like the bank, day care center, auditorium, art gallery and exhibition halls.

vi. CIRCULATION FACILITIES;

Includes vertical services such as escalators, elevators, and staircases, which provides for the vertical movement between floors in the shopping malls.

Other circulation areas include the mall and passage corridors or walkways in front of the stairs, linking the individual stores into an entity.

vii. ANCILLARY FACILITIES;

This unit facilitates the smooth, daily functioning of the complex. They include the services such as sewage, water, air conditioning, electrical/telecommunication services and delivery areas. They also comprise of

services for the general public and staff such as parking space, pedestrian area, public transportation area and green areas.

7.3 MATERIALS AND CONSTRUCTION;

The process of selecting materials for the construction of any type of building involves a lot of careful consideration and has a strong influence on the design process.

For a public facility such as a shopping mall, safety and security of customers is the primary consideration, subordinate to that are all other considerations such economy, aesthetics etc. Ground surfaces need to be robust, non-slip, replaceable and textured, with a strict avoidance to any sudden drop or change in levels.

Hence the use of glass, concrete and steel in the design.

7.3.1 HORIZONTAL STRUCTURAL ELEMENTS

i. FOUNDATION;

The foundation of a building constitutes its substructure and acts as an anchor between the building and the ground on which it built and also distributes vertical load from superstructure to ground.

A careful analysis of soil type and bearing capacity will influence the choice of foundation type. Also such analysis provides vital basement structures as utilized in the delivery of goods, and refuse disposal.

ii. FLOORS;

The functions which a floor must satisfy/provide include;

a. To withstand load imposed on it.
b. To prevent dampness penetrating the building.
c. To prevent the growth of vegetation inside the building.
d. To provide an adequate surface which meets the needs of user with respect to looks, comfort, safety maintenance etc.

An advance flooring system was adopted, the grid deck comprising of a floor slab with ribbed beams running to both end of the slab and interlocking. The floor has the capacity of spanning large area without support and providing a good aesthetic effect in the interiors.

Retaining wall were applied in the basement areas, as pertinent in its design and construction.

7.3.2 VERTICAL STRUCTURAL ELEMENTS

i. WALLS;

Walls constitute those vertical elements of a structure, which compartmentalize its spaces in the horizontal plane. They may be load bearing or non-load bearing elements.

The consideration for the design of walls in the design varied from place to place. Minimal use of concrete walls was made in the exterior. The walls were used mainly in the interior for partitioning. Most of the wall were non-load bearing elements.

ii.COLUMN,

Columns were used intensively in the design, together with the grid deck; they form the structural framework of the building. The columns were spaced at an interval of 10m. They constitute the load bearing vertical support element of the structure.

iii. GLASS CLADDING CURTAIN WALLING;

Glass cladding constitute the dominant element in the entrance façade the courtyard. The glass allows for the lighting of the interior effectively as well as giving the aesthetic required. Double-glazing was employed using regular plate

glass with temperate glass, to reduce the green house effect within the structure as well as trapping the heat along the corridors.

7.3.3 FITTING AND FINISHES;

Floor finishes will be hard wearing, easy to clean, give an impression of quality and aesthetic, finished in bright colours especially white, especially public and circulation areas. Sliding doors are used especially In public activity areas.

All fittings in general shall be mounted as required on walls and ceilings. The fitting should be selected in a manner that will contribute to the interior aesthetic and design of the enclosure.

7.4 SPACE REQUIREMENTS

The spaces provided in the design have been determined based on certain standard requirements, in some cases as deemed fit to the peculiar nature of such spaces. They are as follows;

7.4.1 Commercial Facilities;

	Area (m^2)
Departmental Store	$360m^2$

Supermarket	240m^2
Electronic Stores	180m^2
Furnishing	120m^2
Apparel	216m^2
Accessories	216m^2
Other Shops	420m^2
TOTAL	**5900m^2**

7.4.2 Administrative Facilities

	Area(m^2)
Management	144m^2
Security surveillance	144m^2
Information	72m^2
Staff Facilities	360m^2
TOTAL	**576m^2**

7.4.3 Recreational Facilities

	Area (m^2)
Cinema	480m^2
Restaurant	720m^2

Games arcade	180m2
Swimming pool	280m2
TOTAL	**1660m2**

7.4.4 Business Facilities

	Area (m^2)
5office wings (2floors).	3730m^2

7.4.5 Communal Facilities

	Area (m^2)
Bank	480m^2
Exhibition hall	480m^2
Day care Center	180m^2
TOTAL	**1140m^2**

7.4.6 Ancillary Facilities

	Area (m^2)
Parking space	7680m^2
Circulation (corridors, lifts, escalators).	5680m^2
Courtyard	400m^2

Toilets	912m^2
TOTAL	**14,672m^2**

CHAPTER EIGHT

8.0 DESIGN SERVICES

The services within a building include the design, installation, distribution and maintenance of utilities in a building. These utilities refer to the ventilation and distribution of air, plumbing, sewage disposal, fire safety precautions, energy conservation and acoustics.

As a general rule, designers should integrate the formal requirements of architecture and building services within a consistent and visually coherent structure. This principle needs, however to recognize that the life of building services is shorter than that of the structure itself by factor of as much as 3 to 1.

This means that the lighting or the ventilation system operational within the mall may be totally renewed several times, each upgrading requiring new stanchions, fresh duct lanes or even completely new technical approaches. The circle of changes, and different life spans, of individual part of the building, suggests that accessibility and renewability are key considerations in the design process.

8.1 ELECTRICITY AND LIGHTING

The main supply of electrical power is provided by the National Electrical power Authority. The supply is stepped down from the 13KVA transmission lines by a step-down transformer and alternative source of power supply is provided in the form of a stand-by generator. The generator should be equipped with an inbuilt automatic starter which will activate it, ones there is an interruption in the main supply system. The power is initially transferred to feeder pillars situated around the complex, before finally being utilized within the complex.

Natural lighting is used extensively in circulation areas; the mall, corridors, escalators and elevators, and courtyard. While artificial lighting was used in complementing natural light. Artificial lighting was used in displaying wears and illuminating shopping areas, exhibition halls restaurants and game arcades amongst others.

8.2 VENTILATION AND AIR CONDITIONING

Building in which people live and work must be ventilated to replenish oxygen, dilute the concentration of carbon dioxide and water vapor, and minimized unpleasant odors. A certain amount of air movement or ventilation ordinarily is provided by air leakage through small cervices in the building's walls, especially

around windows and doors. Such haphazard ventilation may suffice for homes, but not for public building such as the shopping mall.

An artificial ventilation system shall be employed. A centralized air conditioning system being complex must be installed when the building is constructed, in recent years these systems have increasingly been automated by computer technology for the purpose of energy conservation.

The design of an air conditioning system depends on the type of structure in which the system is to be placed, the amount of space to be cooled, the number of occupants, and the nature of their activities. Air conditioning units are rated in terms of effective cooling capacity, which should be properly expressed in kilowatt units.

8.3 DRAINAGE AND SEWAGE DISPOSAL;

This is achieved by the provision of a network of soil piping connected to inspection chambers, for onward transportation to the central sewage treatment plant.

The sewer scheme for Abuja is planned in such a way that sewage is collected from the neighborhood through, tertiary sewer lines via secondary lines to interceptor sewer lines. The discharged sewage is collected to trunk sewer lines for conveyance by gravity to the central treatment plant for final treatment.

Site drainage is by means of water sprouts and pipes for storm water into the main sewage lines.

8.4 WATER SUPPLY

The main water supply source is the Usuma Dam for a population of up to 1.6 million. The transmission from treatment plant is facilitated by gravity through four major trunk pipelines leading to the ground level storage tanks, which serves the various loops. Each storage tank serves an independent distribution loop. The loops are designed in such a way that two adjacent loops are joined by valves, which can be opened in case of failure from any of the tanks.

8.5 REFUSE DISPOSAL

Refuse disposal is of utmost importance in any living environment. Refuse waste collection is done by means of refuse bins kept at strategic locations; circulation areas, stores, toilets, cinema, auditorium and other areas These bins shall be

emptied constantly by designated employees such as janitors, into incinerators placed in the maintenance zone. Refuse receptacle are also placed under stair cases when full, they are rolled to the cover refuse collection point/incinerator. Refuse vans are used in emptying contents of the incinerator; they take the refuse through the ramps to the basement and then are transferred to the incinerator.

8.6 FIRE SAFETY

Adequate precaution shall be taken in preserving human life and properties from through fire or other hazards. Prevention measures to be used include;

i. Provision of escape roads/stair cases at not more than 45m apart, exits shall be properly defined with signs and lighting.

ii. The use of fire detection devices such as smoke/fire alarm, for alerting fire services and people of an outbreak; as well as the use of sprinkler devices to retard spread.

iii. Provision of temporary fire fighting gadgets shall be made for use before the arrival of the fire brigade. Such devices include portable extinguishers, fire hydrants and hoses, which should be well positioned and easily accessible.

iv. The risk area should be compartmentalized like kitchens for restaurant, compartmentalization of shop unit should be used to prevent spred of

fire by raising walls over and above the roof and with use of reinforced concrete slabs.

8.7 SECURITY

Due to the nature of the activity carried out the building, security is a very pertinent issue. The property in the shopping mall is of high value; therefore protection from vandalisation and theft is important. The use of close, circuit television monitors shall be strongly encouraged within the complex and shopping areas. A security post shall be established on each floor and also tagging shall be employed.

8.8 VERTICAL SERVICES

The vertical movement of people and freight within relative confined areas such as shopping areas, office building-is usually accomplished by means of elevators, up and down, escalators are moving staircases from one story of a building to the next, and moving side walks carry people horizontally or at a slight inline.

Elevators;

Modern elevators are pulled from above by steel cables, though hydraulic elevators are still in use in some high-rise buildings and some heavy-duty freight elevators.

A cable hoisted elevator travels up and down in a shaft, which has doors opening from within each floor. Above the shaft, in a room of its own, is an electric motor with a governor to control speed and panel of switches and relays-called a control unit to control shopping, starting and reversing. The steel cables that cab is looped around a drum attached to the driving motor. The greater the weight in the cab, the tighter the cable grips the drum. From the drive mechanism the cable drop down the depth of the elevator shaft, holding a heavy counter weight.

Escalators;

The escalator is a moving staircase in which the steps move as a unit upward or downward at an incline of about 30^{o}. The advantages of the escalator over the elevator are a greater passenger capacity, continuous availability, comparatively small space requirements and operating cost.

Staircases and Ramps;

The staircases employed were fire escape staircases, placed at the periphery of the structure. They were half-turn staircases rising to a landing between floors, turns 180^{o}, then rises parallel to lower height to flow above, hence half turn.

The ramps are for delivery of goods and refuse disposal.

8.9 MAINTENANCE

The materials specified have a relatively low maintenance level. The management of the facility through the janitors employed shall ensure the daily maintenance of the facility.

The tenants however shall have a responsibility of maintaining their shops and ensuring its continued existence in suitable condition.

CONCLUSION

The millennium mall Gwarimpa was an attempt made towards achieving certain aspired goals, which will serve as a yardstick for measuring the successes of the scheme at the end of the design process.

The case studies helped in identifying some areas of problem and solutions were sought for them.

The mall can pass for a community center as well as a market; it could also pass for a commercial center.

The comfort and convenience of the customers was one of the important factors that were taken into consideration. Shopping experience was made as satisfactory as possible. Movement was made as safe and enjoyable as possible with the provision of enough escalators and elevators.

Also effective use of lighting was examined properly. Utilizing both natural and artificial lighting in circulation areas.

Hopefully with proper management and maintenance the millennium mall Gwarimpa would not only create an excitement within the people of Gwarimpa

and Abuja as a whole, but it will also form a standard for the country from which other such type will be measured.

BIBLIOGRAPHY

1 Abubakar R .T (2000) Design proposal for the Abuja mall, (m-tech design thesis, unpublished)

2. Architects Journal, (1985), no. 22 vol.181, pp, 55 – 59, 29th of May

3. Chudley R. (1984), Construction technology vol. 4. Longman publication 2nd ed.

4. Fernandez E.O, Woods J.E. And, Faist A.P, (1980) Building Energy Management; Conventional and Solar approaches. (Proceedings from the international congress Povoa de varzin, Portugal, 12-16th may)

5. Givoni B. (1976), Man, Climate and Architecture. Van Norstrand 2nd Ed.

6 Littler J and Thomas R. (1984), Design with Energy; The conservation and use of Energy in a Building. London University press.

7. Meyer W.T. (1983), Energy, Economics and Building Design. McGraw Hill productions.

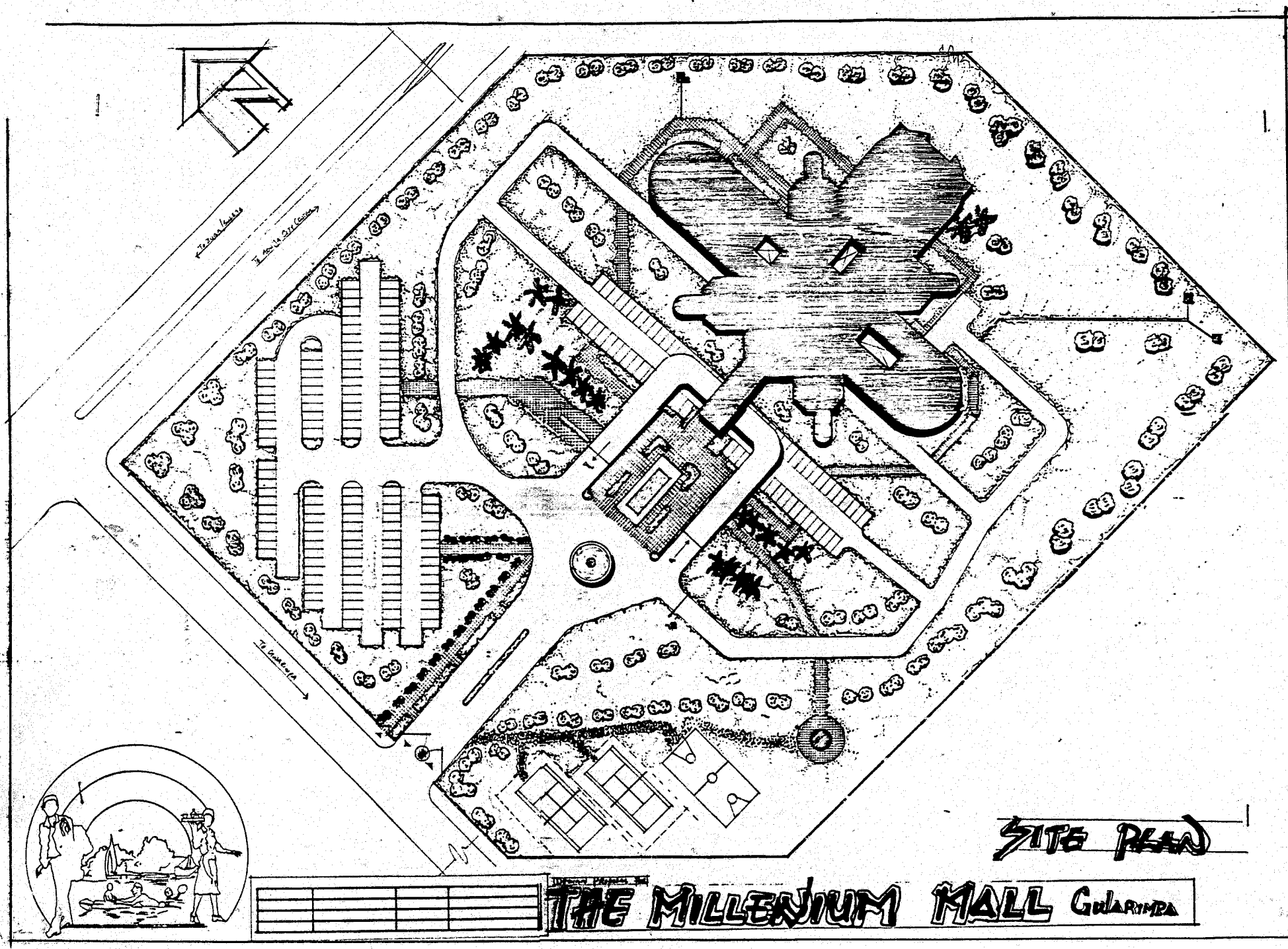
8. Mcguiness W.J. (1971), Mechanical and electrical equipments for buildings. John Wiley press, 5th Ed,

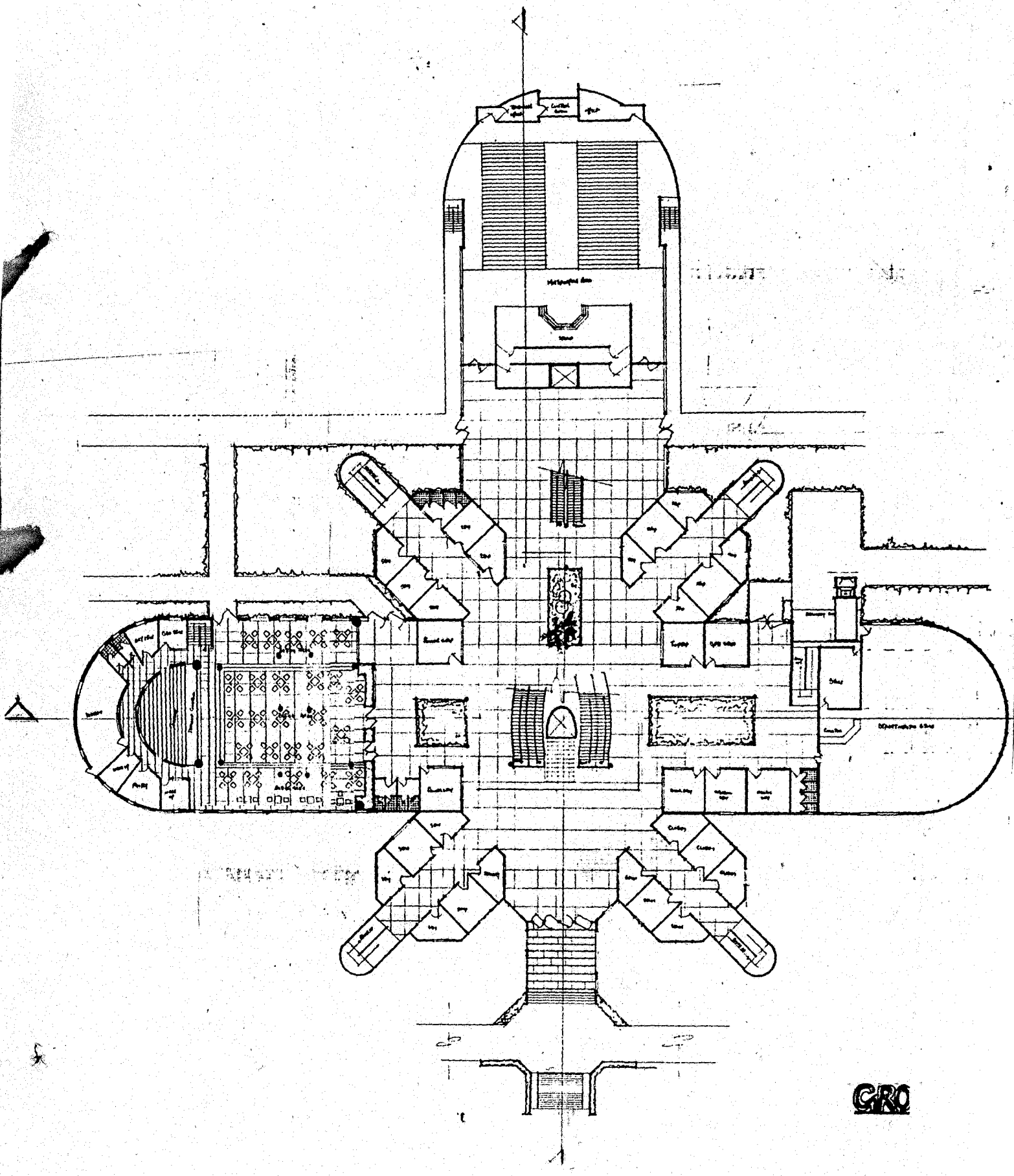
9. Neufert E. (1980), Architects data, B.S.P professional books 2nd (international) English Ed.

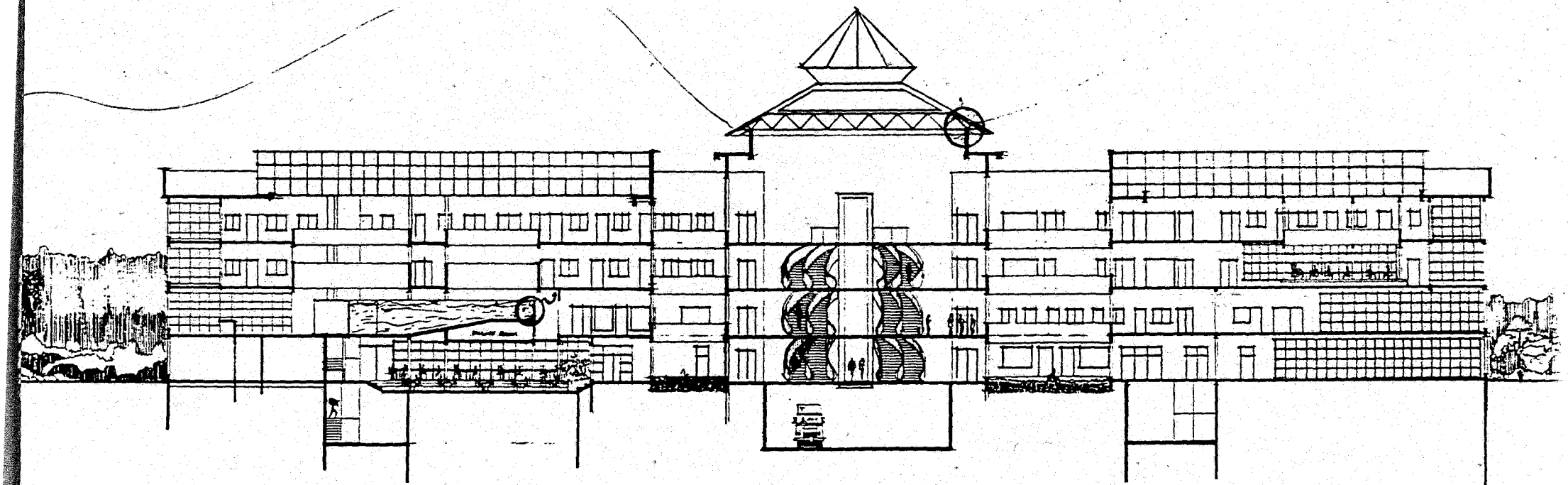
10. Marcus T.A and Morris E.N. (1980), Buildings Climate and Energy. John Wiley press.

12. Rubenstein H.M. (1992), Pedestrian malls, streetscapes and urban spaces. John Wiley and sons publication.

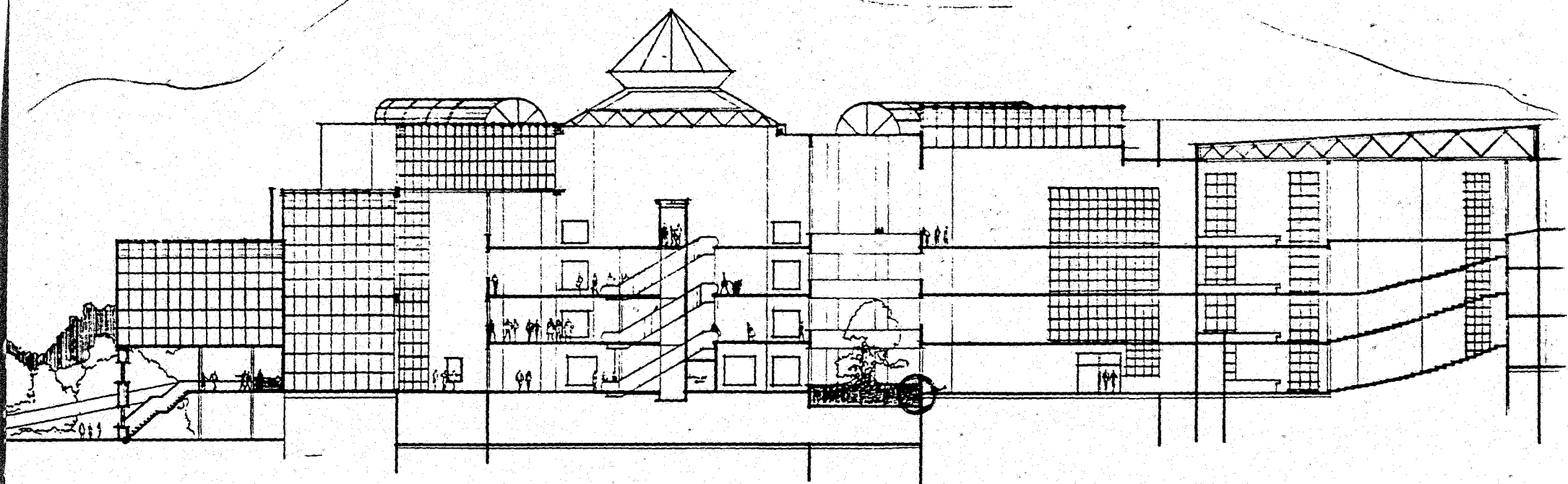
13. Saini B.S. (1980), Buildings in Hot Dry Climate. John Wiley.


SITE PLAN
THE MILLENNIUM MALL GULARYMBA

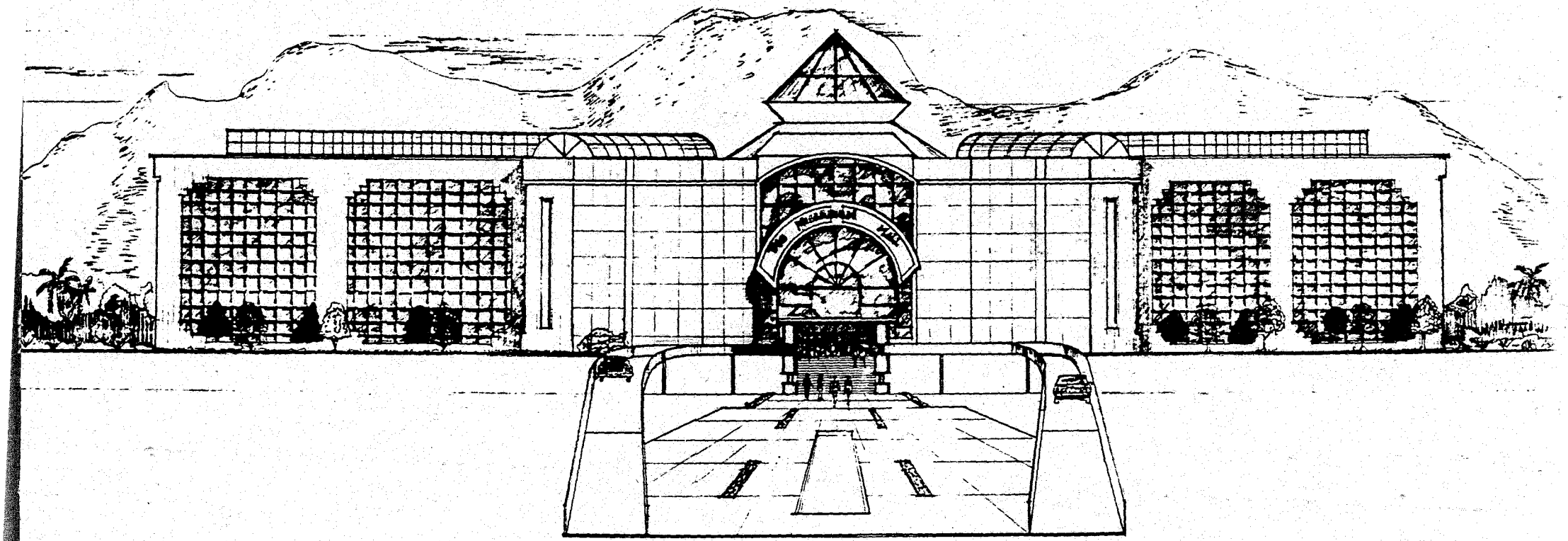




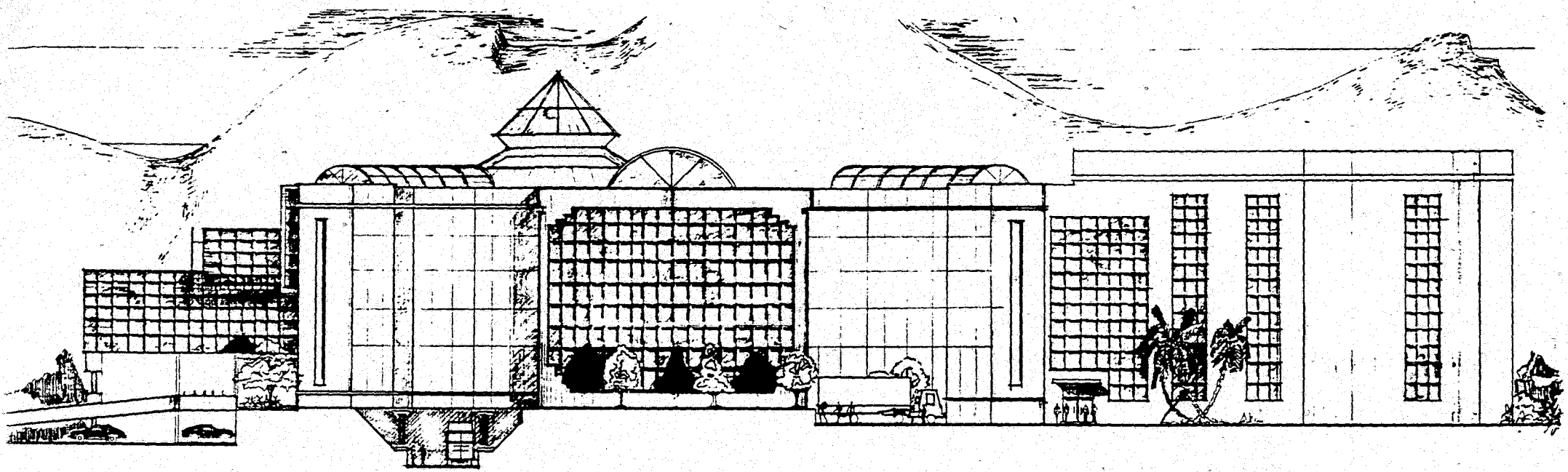
Section A-A



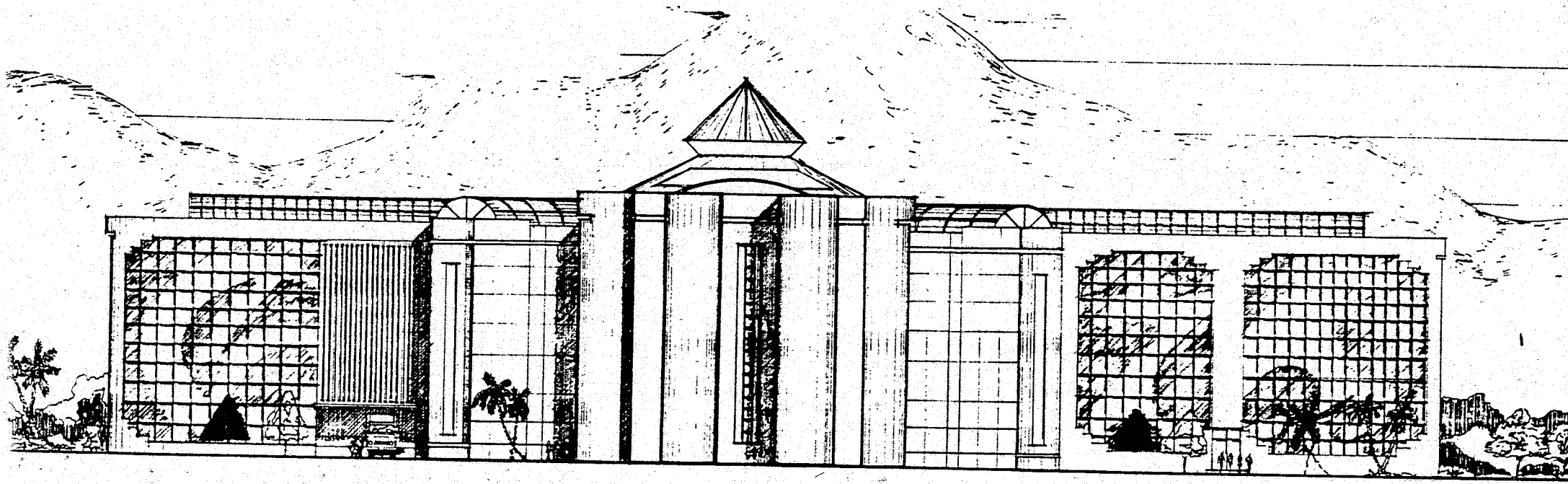
Section B-B



APPROACH ELEVATION



SIDE ELEVATION



REAR ELEVATION