BEAUTY AND FASHION CENTRE ABUJA: EXPLORING THE USE OF DAYLIGHT TO ENHANCE VISUAL COMFORT.

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NIGERIA.

DECLARATION

I declare that the work in the project thesis entitled "EXPLORING THE USE OF DAYLIGHT TO ENHANCE VISUAL COMFORT IN THE DESIGN PROPOSAL OF A BEAUTY AND FASHION CENTRE ABUJA" has been performed by me in the department of Architecture Under the supervision of Arc. S. Oluigbo and Dr (Arc.) M. L. Sagada. The information derived from the literature has been duly acknowledged in the text and a list of references provided. No part of this thesis was previously presented for another degree or diploma at any university.

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OLATUNJI, Oluwatosin Signature Date

CERTIFICATION

This thesis entitled "EXPLORING THE USE OF DAYLIGHT TO ENHANCE VISUAL COMFORT IN THE DESIGN PROPOSAL OF A BEAUTY AND FASHION CENTRE ABUJA" by Olatunji Oluwatosin meets the regulations governing the award of the Degree of Master of Science in Architecture (MSc Arch) of Ahmadu Bello University; Zaria is approved for its contribution to knowledge and literary presentation.

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ABSTRACT

Natural light is the essence from which all color reacts and takes existence. It's the all important element in interior design/architecture. It provides a space with genuineness and without it a room can look unexciting, uninteresting and can feel repulsive. Sunlight is an elemental part of our existence and a fundamental component of green design. The purpose of this study is to use as much natural light as possible in designing a beauty and fashion centre to accomplish decrease in energy consumption, low costs, and requires less heating and cooling from the building. The research method adopted for this thesis was based on an in depth literature review and case study of other beauty and fashion centers. Day lit environments increase occupant productivity and comfort, and provide the mental and visual stimulation required to control human circadian rhythms. It also increases energy savings, increase revenue in retail applications. Second, several important factors ranging from design to installation and operation must be carefully addressed in order to realize these benefits. In conclusion a beauty salon and fashion centre can be designed as one single entity. Secondly site orientation and the building morphology are the first basic issues that affect the effective use of daylight in any interior space. Other components such as material use, shading device scheme and sizes of openings are basically used to control the amount and redirect daylight.

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CHAPTER ONE

1.0 INTRODUCTION

1.1 BACKGROUND OF STUDY

Light determines our perception of architecture; it enables us to appreciate the diverse qualities of the space, Size, geometric, shape, texture and color. It is perhaps the element with the greatest influence over the atmosphere of a place. The correct illumination intensifies the poetic and emotional impact of a project. (Verges, 2008)

From the earliest caves, light informed the lives of the inhabitants of a place. Initially it was in the difference between day and night; but as dwellings became more sophisticated, it was by means of openings or windows letting in light. The history of architecture is synonymous with the history of day lighting. From the initial crude openings, letting in light and air, heat and cold, the window was the vehicle for the introduction of daylight, and ultimately to the wondrous interiors of the mediaeval cathedral, the Baroque churches or the many private buildings of the eighteenth century. (Phillips, 2012)

For Many years the study of the illumination of a building was limited to solving functional and safety problems. The main aim was to guarantee sufficient levels of light to carry out any given activity without really taking other factors such as psychological comfort and visual fatigue into account. (Verges, 2008)

Architectural lighting design focuses on three fundamental aspects of the illumination of buildings or spaces. The first is the aesthetic appeal of a building, an aspect particularly important in the illumination of retail environments. Secondly, the ergonomic aspect: the measure of how much of a function the lighting plays.

Thirdly is the energy efficiency issue to assure that light is not wasted by over-illumination, either by illuminating vacant spaces unnecessarily or by providing more light than needed for the aesthetics or the task.

Natural lighting remained the primary means of lighting to all types of building until the early twentieth century, when for various reasons, not least the greater efficiency in the development of electric sources, the primary role of day lighting was beginning to be questioned.

Perhaps the most obvious and certainly the most important aspect of natural lighting is its capacity for change, leading to the infinite variety in appearance of the day lit interior.

1.2 PROBLEM STATEMENT

This thesis attempts to explore the use of day lighting in a beauty and fashion center in order to enhance visual quality. There are various areas in the activities of a beauty and fashion center that involves small and large details of which both day lighting and artificial means of illumination accounts a great deal. Since we live by day and sleep by night, it will obviously be more advantageous to utilize day lighting in order to enhance the visual quality of the space around us. Areas such as tailoring unit, cutting unit, runway, exhibition hall, fitness unit, facial treatments to mention but a few

For Many years the study of the illumination of a building was limited to solving functional and safety problems. The main aim was to guarantee sufficient levels of light to carry out any given activity without really taking other factors such as psychological comfort and visual fatigue into account. (Verges, 2008)

In Nigeria the erratic nature of our energy supply for artificially lighting has done more harm than good in our interior spaces. Most designs by default have incorporated artificial lighting as a means of last resort.

1.3 AIM AND OBJECTIVES

The aim of this research is to explore and propose the effective use of day light in the interior spaces of a beauty and Fashion center. This entails providing adequate day lighting as a substitute for artificial lighting, reduce running costs on energy and to enjoy the varying Qualities of day lighting possible.

The objectives of the study include:

i. To provide appropriate levels of day lighting for various range of functional spaces in a beauty and fashion centre.
ii. To provide effective control of natural lighting in order to prevent heat gain, glare and other problems associated with day lighting.
iii. Determine the appropriate design and type of windows, openings and shading devices that allows the admittance of day light into an interior space
iv. To provide requisite spaces to bring together models, designers, tailors beauticians and cobblers in the fashion industry.

1.4 SCOPE OF STUDY

This research will involve the study of beauty centers and fashion houses in Nigeria as individual business. This is because there is no one single incorporated beauty and fashion house in the country. Centers to be studied will be centers that have state of the art facilities and are up to date in providing related services. Foreign case studies will also be carried out to see how best both beauty centers and fashion houses can be incorporated together for the Nigeria customer in a Nigerian context.

The result of both the local and foreign case study will serve as a guide in the design of the beauty and fashion centre in Abuja. The building will incorporate open and fluid spaces for administrative/Human resources, sales, customer care, maintenance, and conferencing. Other ancillary facilities will be provided including relaxation areas.

In Nigeria, beauty and fashion as a single concept is still relatively new to many. For this reason the cases studied within Nigeria will obviously exhibits a lower degree of sophistication compared to the foreign cases

1.5 JUSTIFICATION OF STUDY

Beauty and fashion goes hand in hand in today's contemporary world as do pen and paper - One to complement the other. In Nigeria, both subjects have over the past been dealt with separately; Tailors and fashion designers to carter for fashion while the beauty salons and hair makers take care of beauty. In Nigeria unfortunately, there is no purpose built beauty and fashion centre existing to embrace both subjects and take care of our growing fashion industry.

Natural Lighting fortunately offers a very good and cheap solution to the increased problem of our erratic power supply. The Need to see well, clearly and precisely is of ought most importance to the cycle of a beauty and fashion center

1.6 RESERCH METHODOLOGY

Various sources of information shall be explored in the course of this research which includes; both primary and secondary information systems in the course of research.

i. **Primary Sources**

The primary sources shall include site assessment reports of existing fashion houses and beauty centers both within the country and outside Nigeria, as well as modeling schools. This is with the aims of establishing their basic requirements. Measurements and photographs shall be taken to support information gathered. Interviews with artists and fashion designers will also be conducted in order to gain insight into processes within a fashion and beauty centre.

ii. Secondary Sources

The secondary sources of data collection shall include consultation of literature on fashion and beauty Centre's, the collection of data extracted from previous publications in books, journals, magazines and reports from interviews.

1.7 DEFINITION OF KEY TERMS

1.7.1 Beauty:

i. The quality present in a thing or person that gives intense pleasure or deep satisfaction to the mind, whether arising from sensory manifestations (as shape, color, sound, etc.), a meaningful design or pattern, or something else (as a personality in which high spiritual qualities are manifest) (Brenda, 2003).

ii. A beautiful person, especially a woman.

iii. A beautiful thing, as a work of art or a building.

iv. Often, beauties. Something that is beautiful in nature or in some natural or artificial environment.

v. An individually pleasing or beautiful quality; grace; charm: a vivid blue area that is the one real beauty of the painting.

vi. Informal. A particular advantage: One of the beauties of this medicine is the freedom from aftereffects.

vii. (Usually used ironically) something extraordinary: My sunburn was a real beauty.

1.7.2 Fashion

i. A prevailing custom or style of dress, etiquette, socializing, etc.: the latest fashion in dresses.

ii. Conventional usage in dress, manners, etc., especially of polite society, or conformity to it: the dictates of fashion; to be out of fashion.

iii. Manner; way; mode: in a warlike fashion.

iv. The make or form of anything: He liked the fashion of the simple, sturdy furniture.

v. A kind; sort: All fashions of people make up the world.

vi. Obsolete. Workmanship

vii. Obsolete. Act or process of making

viii. To give a particular shape or form to; make: The cavemen fashioned tools from stones.

ix. To accommodate; adjust; adapt: doctrines fashioned to the varying hour.

x. Shipbuilding. To bend (a plate) without preheating

xi. Obsolete. To contrive; manage

xii. After / in a fashion, in some manner or other or to some extent; in a makeshift, unskillful, or unsatisfactory way: He's an artist after a fashion.

1.7.3 Day Lighting

Daylight or the light of day is the combination of all direct and indirect sunlight outdoors during the daytime (and perhaps twilight). This includes direct sunlight, diffuse sky radiation, and (often) both of these reflected from the Earth and terrestrial objects. Sunlight scattered or reflected from objects in outer space (that is, beyond the Earth's atmosphere) is generally not considered daylight. Thus, moonlight is never considered daylight, despite being "indirect sunlight". Daytime is the period of time each day when daylight occurs.

1.7.4 Visual Fatigue

A feeling of weariness resulting from a visual task it can be of ocular, muscular or psychic origin. However, there does not seem to be objective proof of a reduction in visual aptitude (e.g. visual acuity) accompanying visual fatigue.

1.7.5 Illumination

i. An act or instance of illuminating.

ii. The fact or condition of being illuminated.

iii. A decoration of lights, usually colored lights.

iv. Sometimes, illuminations. an entertainment, display, or celebration using lights as a major feature or decoration.

v. Intellectual or spiritual enlightenment.

vi. Also called luminance, intensity of illumination. The intensity of light falling at a given place on a lighted surface; the luminous flux incident per unit area, expressed in lumens per unit of area

vii. A supply of light: a source of illumination.

viii. Decoration of a manuscript or book with a painted design in color, gold, etc.

ix. A design used in such decoration.

1.7.6 Visual Quality

Texture - the characteristic appearance of a surface having a tactile quality

Lightness, light - the visual effect of illumination on objects or scenes as created in pictures; "he could paint the lightest light and the darkest dark"

Dullness - a lack of visual brightness; "the brightness of the orange sky was reflected in the dullness of the orange sea"

Softness - a visual property that is subdued and free from brilliance or glare; "the softness of the morning sky".

Color, coloring, coloring, color - a visual attribute of things that results from the light they emit or transmit or reflect; "a white color is made up of many different wavelengths of light".

CHAPTER TWO

2.0 LITERATURE REVIEW

NATURAL LIGHTING IN BUILDINGS

2.1 SOURCES OF NATURAL LIGHTING

Light occurs in nature, and sunlight, moonlight, and starlight are the most important sources of light to life. But because of their need for additional light, humans have learned to create light as well. Understanding the fundamental difference between natural and manmade light is the beginning of understanding light sources.

Natural light sources occur within nature and are beyond the control of people. These include sunlight, moonlight, starlight, various plant and animal sources, radio luminescence, and, of course, fire. Manmade light sources can be controlled by people, more or less when and in the amount wanted. These include wood flame, oil flame, gas flame, electric lamps, photochemical reactions, and various reactions, such as explosives (Mark, 2012).

Due to their obvious advantages in terms of availability, safety, cleanliness, and remote energy generation, electric lamps have displaced almost all other manmade sources for lighting of the built environment. However, because manmade sources consume natural resources, natural light sources should be used to the greatest extent possible. The major source of natural lighting of greatest importance to an architect is the sun. Exploiting it remains one of the biggest challenges to architects and designers (George, 1956).

SUNLIGHT

Sunlight, in the broad sense, is the total spectrum of the electromagnetic radiation given off by the Sun. On Earth, sunlight is filtered through the atmosphere, and the solar radiation is obvious as daylight when the Sun is above the horizon. Near the poles in summer, the days are longer and the nights are shorter or non-existent. In the winter at the poles the nights are longer and for some periods of time, sunlight may not occur at all. When the direct radiation is not blocked by clouds, it is experienced as sunshine, a combination of bright light and heat. Radiant heat directly produced by the radiation of the sun is different from the increase in atmospheric temperature due to the radioactive heating of the atmosphere by the sun's radiation. Sunlight may be recorded using a sunshine recorder, Pyrometer or Pyrheliometer. Direct sunlight has a luminous efficiency of about 93 lumens per watt of radiant flux, which includes infrared, visible, and ultra-violet light. Bright sunlight provides luminance of approximately 100,000 candelas per square meter at the Earth's surface (Tiwari, 2010).



Plate I Sunlight streaming through clouds.

2.2 CHARACTERISTICS OF NATURAL LIGHTING

. The color temperature of the setting sun is as low as 2000K, and the normal sun-and-sky temperature at noon on a sunny day is 5500#6000K. The cold blue light from the winter north sky is over 10,000K. The color quality (CRI) is excellent. However, natural light has a relatively high ultraviolet (UV) light content, which has potential negative side effects such as sunburn and skin cancer. (Mark, 2004).

From an energy efficiency perspective, natural light enjoys a significant advantage over electric light. At least 2.5 times as much air conditioning is needed to cool the heating effect of the most efficient electric light producing the same lighting level as natural light. Thus, if daylight is employed at light levels comparable to or even 50% higher than electric lighting and electric lights are extinguished, a building can be illuminated while saving all of the electric lighting energy and about half of the energy needed to cool the building load ordinarily created by electric lights (Sara, 2011).

2.3 BASIC PRINCIPLES OF NATURAL LIGHTING DESIGN

While natural lighting design can be relatively technical, you can use the following basic principles to develop designs that address natural lighting opportunities.

1. Begin by planning the building such that every regularly occupied work or living space has access to a window, skylight, or other source of natural light. Give high priority to windows that provide a view. Remember that the effective natural lighted area extends into the building only about 2 times the width of a window and about 2 to 2.5 times its height (James, 2012).

2. Minimize the size of the east and west sides of the building and maximize the south and north sides of the building. Because of the seasonally varying paths of the

sun in the sky, it is difficult to design east- and west-facing windows. North-facing windows in the northern hemisphere present no solar heating problems, and south-facing windows are the easiest to protect with passive elements like overhangs, awnings, and light shelves.

3. If a large area of the building is not near a window, investigate top-light skylights in one-story buildings or the top floor of multistory buildings. Simple top-light skylights should occupy 3% to 5% of the total roof area in order to provide adequate levels of interior lighting (Sara, 2011).

4. Protect the interior from too much natural light—2.5 times or higher the level of ordinary electric light—by employing appropriate window glass, exterior shading devices, interior shading devices, or a combination of these (Sara, 2011).

5. Provide an electric lighting system and/or automatic lighting controls to permit harvesting of the energy savings. The best way is to dim the electric lights rather than switch them on and off. Modern fluorescent dimming systems allow natural lighting controls and fundamentally energy-efficient fluorescent and compact fluorescent lighting.



Plate II Natural lighted Airport Terminal with most of the electric lighting extinguished.

2.4 INTEGRATING NATURAL LIGHTING AND ELECTRIC LIGHTING

To harvest the energy-saving benefits of natural lighting, electric lights must be switched off or dimmed. This can be designed in several ways.

• Adequate manual switching or dimming to encourage the user to turn off or dim electric lights

• An automatic photoelectric device in each naturally lighted zone that either switches off lights during daylight periods or dims lights in proportion to the amount of daylight

• An automatic photoelectric system that dims or switches off lighting systems throughout a building in response to daylight

• An automatic time-of-day control system, preferably with astronomic time functions, that switches or dims lights according to a fixed solar schedule

Each approach has merit. It is generally agreed that switching lights is least expensive but dimming lights is most desired. Step dimming has been found disruptive in many situations (Mark, 2004).

The use of both electric light and natural light often raises the question of whether the electric light source should match the natural light. In most cases, choosing an electric light source that is appropriate independent of daylight is probably best. To match daylight, a light source of a very high color temperature is needed; this light would probably appear unusually cool as interior illumination at night.

When integrating electric and natural light, it is common to want to illuminate a skylight to imitate daylight at night, but this approach should be pursued carefully, if at all. Up lighting a skylight tends to send light through the glass and into the sky,

wasting both the light and the energy consumed in creating it. What little light is reflected tends to create glare. However, illuminating the skylight well and splay can be effective. The goal is to create the illusion of sky lighting without trying to match the illumination level.

2.5 FACTORS AFFECTING THE USE OF DAYLIGHTING

The following are the basic factors that affect the use of day light within a building.

1. Characteristics of the lighting'

2. The task.

3. The visual system of the observer.

The following affects daylight within a given space (room)

1. Retina illumination to which the visual system is adapted.

2. Spectral content of the illuminant

3. Light distributions around the target

4. Visual size of target (in units of angle or solid angle)

5. Visual size of background (in units of angle or solid angle)

6. Luminance of the target

7. Luminance of the immediate background

8. Luminance contrast of the target

9. Colour of the target

10. Colour of the background

11. Colour difference between the target and the background

12. Duration of the exposure

13. Temporal frequency characteristics

14. Location of the target relative to the line of sight

15. Movement of the target in the field of view

16. Retinal image quality, as determined by the state of accommodation, pupil size, light scatter, and lens.

2.6 EXISTING PROBLEMS OF DAYLIGHTING

1. Glare: It is difficulty seeing in the presence of bright light such as direct or reflected sunlight or artificial light such as car headlamps at night. Because of this, some cars include mirrors with automatic anti-glare functions.

Glare is caused by a significant ratio of luminance between the task (that which is being looked at) and the glare source. Factors such as the angle between the task and the glare source and eye adaptation have significant impacts on the experience of glare. (Schreuder, 1998)

2. Heat gain: (also known as solar heat gain or passive solar gain) refers to the increase in temperature in a space, object or structure that results from solar radiation. The amount of solar gain increases with the strength of the sunlight, and with the ability of any intervening material to transmit or resist the radiation.

Objects struck by sunlight absorb the short-wave radiation from the light and reradiate the heat at longer infrared wavelengths. Where there is a material or substance (such as glass) between the sun and the objects struck that is more transparent to the shorter wavelengths than the longer, then when the sun is shining the net result is an increase in temperature — solar gain. This effect, the greenhouse effect, so called due to the solar gain that is experienced behind the glass of a greenhouse, has since become well known in the context of global warming.

3. Discoloration

4. Shadows: A shadow is an area where light from a light source is obstructed by an object. It occupies all of the space behind an opaque object with light in front of it. The cross section of a shadow is a two-dimensional silhouette or reverse projection of the object blocking the light. Sunlight causes many objects to have shadows at certain times of the day. The angle of the sun, its apparent height in the sky causes a change in the length of shadows. Low-angles create longer shadows.

There are three distinct parts of a shadow created by any non-point light source after impinging on an opaque object called the umbra, penumbra and antumbra. For a point source only the umbra is cast. These names are most often used for the shadows cast by astronomical objects, though they are sometimes used to describe levels of darkness, such as in sunspots. An astronomical object casts human-visible shadows when its apparent magnitude is equal or lower than −4. Currently the only astronomical objects able to produce visible shadows on Earth are the sun, the moon and, in the right conditions, Venus or Jupiter. (Philip, 1999).

5. Veiling pattern of transmittance. Veiling reflections are luminous reflections from specula or semi-matte surfaces that physically change the contrast of the visual task and therefore change the stimulus presented to the visual system. Veiling reflections and disability glare are similar in that both change the luminance contrast of the retinal image but differ in that veiling reflections change the luminance contrast of the task while disability glare changes the luminance contrast of the retinal image.

2.7 CONTROL OF DAY LIGHTING

Day light cannot be controlled from the source as with artificial light, the only control possible is with regards to how this daylight strikes the building in question and how it gets into the functional spaces provided.

The basic control for daylight in a building is as follows:

1. Natural means: weather and climate are the basic natural means of controlling daylight. This is very obvious between various regions of the earth, for example in January; some people choose not to live in Polar Regions because of the extreme difference in the amount of daylight in summer and winter.

2. Design: Secondly, daylight can be controlled by the type of design adopted for the building. For example designs with large widths, breaths and low headroom with no courtyards cannot admit light appropriately within the core interior space of the building. But with courtyard and double banking appropriate daylight will be admitted into the building.

2.7.1 CONTROL OF DAYLIGHT BY DESIGN

Daylight can only get into a designed space by passing through an opening without any obstruction or by passing through building materials that are transparent or translucent (windows).

There are three possible pathways through which light can reach a point inside a room through glazed windows:-

a. Light from the patch of sky visible at the point considered expressed as SKY COMPONENT. (SC)

b. Light reflected from opposing exterior surfaces and then reaches the point expressed as the externally reflected component (ERC).

c. Light entering through the window but reaching the point only after reflection from internal surfaces expressed as internally reflected component (ERC). (Szokolay 1980).

2.7.2 APPROACHES TO IMPROVING VISUAL COMFORT

In order to ensure visual comfort it is necessary to ensure that the lighting allows a good level of visual performance and does not cause distraction. This can be done by the following:

1. Identify the visual task to be performed and then determine the characteristics of the lighting needed to allow a high level of visual performance of the task, for example, by using the RVP model (Relative Visual Performance model).

2. Reduce disability glare by selection, placement, and aiming of luminaries to reduce the luminance of the luminaries close to the common lines of sight.

3. Reduce discomfort glare by selection and layout of luminaries. Use VCP (visual comfort probability) or UGR (Unified Glare Ration) to estimate the magnitude of discomfort glare.

4. Using high-reflectance surfaces in the space will help reduce discomfort glare by increasing the background luminance against which the luminaries are seen.

5. Consider the density and extent of any shadows that are likely to occur. If shadows are undesirable and large-area shadows are likely to occur, use high-reflectance surfaces in the space to increase the amount of inter-reflected light.

6. Shadows cannot be avoided because of the extent of obstruction in the space, provide supplementary task lighting in the shadowed areas. If dense, small-area

shadows occur in the immediate work area, use adjustable task lighting to moderate their impact.

7. Reduce veiling reflections by reducing the specular reflectance of the surface being viewed, or by changing the geometry between the viewer, the surface being viewed, and the observer, or by increasing the amount of inter-reflected light in the space. If the reflections are occurring on a self-luminous surface, such as a VDT screen, use dark letters on a bright background. This will reduce the impact of any veiling reflections seen on the screen (Peter, 2003).

2.8 USE OF DAYLIGHT IN BEAUTY AND FASHION CENTER

SIDE LIGHTING

Side lighting employs vertical fenestration (usually windows) to introduce natural light. Side lighting tends to introduce light that can be too bright relative to the room surfaces, sometimes causing glare. However, the desirable view provided by windows usually makes glare an acceptable side effect.

Many modern commercial windows employ low-e glazing. Low-e glazing employs two or more panes of glass, one of which is coated with a relatively clear material that reflects infrared energy while passing visible portions of the sun's energy. In any building with a cooling season, low-e glass is essential in minimizing solar heat gain. Reflective coatings can also be used; these make the building look mirrored while further decreasing solar penetration. Tinted glass can also reduce solar penetration and glare. Glazing selection is always a compromise between clarity and energy efficiency.

One way to increase both efficiency and clarity is to employ solar shading other than within the glass. Solar shading uses building elements to prevent direct solar radiation from entering the space during the cooling season. Overhung soffits, canopies, and awnings are the most common forms of external solar shading, while blinds, curtains, and shades are the most common forms of interior shading. Solar shading is difficult to design for east- and west facing Façades because preventing direct solar penetration very early or very late on a summer day is impossible without blocking the view. Interior shading devices should have a reflective surface to reflect unwanted light back outdoors.

Dark shades prevent glare but absorb solar energy and become warm, heating the space. Adjustable exterior shading devices are probably the best means of shielding windows, but architectural and/or construction cost limitations may prevent their use.

An additional problem caused by side lighting is the limits of penetration into the space. Generally, the effect of the daylight is lost at a distance from the windows about 2.5 times the window's height. For example, in a room with windows having a maximum height of 8', the maximum useful penetration of natural light is about (8 x 2.5) or 20' (assuming, of course, that no walls are in the way). High windows increase the usable daylight area but can introduce glare.

Many modern buildings employ a light shelf to shade the lower part of the window, or view glazing, permitting clearer glass. The top of the shelf is reflective, intended to bounce light inward and onto the ceiling, which provides for deeper light penetration and improved interior light quality. The daylight glazing is generally darker or more reflective than the view glazing to prevent direct solar radiation and glare from a bright sky.

A light shelf is designed to scoop direct solar radiation into the room and onto the ceiling, where it becomes diffuse indirect light, one of the best types of light for both work and comfort. A light shelf can increase the depth of penetration of daylight by 100% or more, but only when it captures and redirects direct rays of the sun. A light shelf has limited benefit with diffuse light, as from sky without sun and on cloudy days. In general, light shelves work best on the south side of the building (Mark, 2012).

TOP LIGHTING

One of the most common ways to introduce natural light is through skylights and other means of top lighting. Top lighting behaves as direct electric lighting does—by radiating light downward. Principles commonly used for designing electric lighting systems can also be used for top lighting, which is the easiest form of natural lighting and is relatively unaffected by site orientation and adjacent buildings.

Here are several classic prototypes for top lighting.

• The *skylight*, or horizontal glazing, permits direct solar and sky radiation through a fenestrated aperture.

• The *single clerestory* produces both direct and indirect lighting by introducing light through a vertical clerestory window. Depending on the adjacent roof, some of the light may be reflected downward by the ceiling into the space. However, depending on site orientation, the relatively high percentage of direct light can be glaring.

• The *saw tooth single clerestory* produces both direct and indirect lighting but, by bouncing a high percentage off the adjacent slanted ceiling, increases the amount of

downward light and can minimize the amount of direct light. If the saw tooth glazing faces north, it can be an excellent source of natural light for a large interior area.

• The *monitor or double clerestory* also permits abundant daylight, especially in buildings where solar orientation or weather does not permit the saw tooth or other more unusual designs. With proper choice of glazing and overhang, a monitor can produce exceptionally balanced and comfortable daylight (Mark, 2012).

CHAPTER THREE

3.0 CASE STUDY METHODOLOGY

3.1 INTRODUCTION

One of the research methods is consulting literature on beauty and fashion and their centers. And also no research is complete without a close examination of other works of similar nature.

In approaching the solution to any design, it is imperative to consult existing structures for an insight into the basic requirement of the design. The case studies may not have a direct relationship but may contain some aspects which are relevant.

For the purpose of this study, the case studies mainly consist of fashion houses. In the analysis of the case studies, a brief history, the function of the building, the facilities available, the materials of construction and other special features are considered.

3.2 CONCEPT OF BEAUTY AND FASHION

Fashion as defined in Microsoft Encarta 2005 is style in clothing, hair, and personal appearance generally, or the business of creating, promoting, or studying the latest styles or the style of dress, behaviour, way of living, or other expression that is popular at present.

According to Wikipedia, Fashion, a general term for the style and custom prevalent at a given time, in its most common usage refers to costume or clothing style. The more technical term, costume, has become so linked in the public eye with the term "fashion" that the more general term "costume" has in popular use mostly been

relegated to special senses like fancy dress or masquerade wear, while the term "fashion" means clothing generally, and the study of it. This linguistic switch is due to the fashion plates which were produced during the Industrial Revolution, showing the latest designs.

Fashion can be said to be made up of the following components which are entities that can exist on their own in an industry.

i. Hair style
ii. Facial Beautification
iii. Jewelry
iv. Clothing
v. Footwear
vi. Accessories such as head gears, tattoo e.t.c

3.3 CLASSIFICATION OF FASHION

3.3.1 African fashion

Clothing in Africa as elsewhere, has long served more than one purpose. In addition to satisfying human needs for covering and adornment, textiles and clothing provide media for artistic expression for weavers, dyers, tailors, and clothing designers.

For centuries, textiles and garments have been produced domestically — for household and village community members — and commercially, for bartering or sale. Although the earliest cloth was made primarily of local natural fibers, today's African textiles and clothing incorporate a wide variety of materials and styles. The precise origins of cloth production in Africa are lost in time, but archaeological findings indicate some of the earliest sites. Drawings of looms can be seen in the tombs of ancient Egypt, dating back to at least 2000 B.C.E. (Henry, 2005).

Archaeologists have found linen remnants in ancient Egypt, as well as fifth-century cotton cloth remnants in Meroe, in northern Sudan. In West Africa, woven fiber pieces dating back to the ninth century C.E. have been found in Nigeria, and woven cotton cloth dating to the eleventh century has been recovered in Mali (Anthony, 2010).

Traditions of Cloth Production and Design Bark cloth, or cloth made from tree bark, predates the development of woven textiles in most parts of Africa. Today it is rarely used for day-to-day clothing, but some societies use it for ceremonial costumes. The Ganda of Uganda, for example, make fabric from the inner bark of fig trees, which is worn during ceremonial dances and other occasions when ancestors are being honored.

Early clothing in Africa was also made from treated animal hides, furs, and feathers.

Many African societies weave cloth from locally grown cotton. In North Africa and the Sahel, women also spin and weave camel and sheep wool. Other sources of fiber include the raffia palm in Central and West Africa, jute and flax in West Africa and Madagascar, and silk in Nigeria, Madagascar, and East Africa. All these fibers can be dyed using vegetable and mineral dyes.

The two main kinds of textile looms in Africa are the double-heddle loom, used for narrow strips of cloth, and the single-heddle loom, used for wider pieces. The narrow strips are typically sewn together, and then cut into patterns for clothing. The double-heddle loom is generally used only by male weavers, who use it to weave in colored threads and create richly textured fabrics (Judith, 1999).

In addition, weavers in North Africa and in Ethiopia also use ground looms, while looms similar to those used in Southeast Asia are found in Madagascar. Although Africa's weavers produce a wide variety of patterned, colored fabric, they also weave plain cloth. This cloth can either be used "as is" for daily wear around the home, or it can be decorated. Common fabric-decorating techniques include appliqué designs, sewn on in contrasting fabrics; embroidery with brightly colored threads; and dyeing.

Two of the most popular dyeing techniques in Africa are tie and dye and resist dye. In tie and dye, designs are first tied or stitched into the cloth, using cotton or raffia threads. In resist dye, dyers draw on the cloth using an impermeable substance, such as candle wax or paste made from cassava, a tuber. They then dip the fabrics into solutions typically made from vegetable dyes, which color all but the covered areas. Indigo plants are used for deep blue dyes, while reddish brown dyes are extracted from cola nuts, the cam wood tree, and the redwood tree. Greens, yellows, and blacks are prepared from other sources.

Most designs and motifs used to decorate fabric have names. Many designs are associated with particular plants, animals, events, or proverbs, and are often used in other crafts, such as house painting, carving, and pottery. Others incorporate Arabic script, Roman letters and numerals, or line drawings of contemporary objects, such as bicycles and cars. "Traditional" cloth production, in other words, is not only highly varied from place to place but is also influenced by societal and technological change.

In many African societies, men and women are responsible for different stages of cloth production. The gender division of labor, however, varies widely by region, and in many places has changed over time. For example, in Mali, women used to

dye bogolanfini mud-cloth, but today young unemployed men in urban areas have taken up this craft. They typically produce lower-quality cloth, which is sold to tourists or exported. Indigo dyeing is women's work among the Yoruba and the Soninke of West Africa, but among the Hausa, fabric dying is traditionally a men's craft. Commercial textile and clothing production has a long history in some parts of Africa. In Tunisia, weavers and dyers as early as the tenth century C.E. organized guilds in order to protect their business. By the fifteenth century, the dyeing pits of Kano in northern Nigeria were renowned as far north as the Mediterranean coast. They are still in operation today (Henry, 2005).

Clothing Traditions across the Continent in North Africa, nomadic pastoralists in mountainous regions weave animal wool into thick cloth for tents, blankets, rugs, and cushions. The mouchtiya is a capelike shawl worn by married women, and like other clothing materials is woven on vertical looms. Across North Africa, both Arab and Berber influences are apparent in textile designs and clothing styles.

In the highlands of Ethiopia and Eritrea, Amharic and Tigrean women wear kemis, cotton dresses with fitted bodices, long sleeves, and full skirts. The shamma, a light shawl, is thrown over the head and shoulders. A border of woven or embroidered geometric designs highlights the otherwise white cloth. The designs include variations of the cross motif, which is central to the Ethiopian Orthodox Church. Men also wear the shamma, as well as shirts and baggy knee-length pants made of the same white cloth. In colder weather, people of this region have traditionally wrapped themselves in a heavy woven blanket (kutta) or cape (bornos). When it rains they don a wollo, a cape made from finely woven grass. Farther east in the Horn of Africa, the pleated skirts and tight embroidered trousers and veils worn by

Islamic Somali, Harari Oromo, and Argobba women reflect influences from the Indian subcontinent, cultivated over centuries of trade across the Indian Ocean. Pastoral societies in the lowlands of the Horn of Africa, such as the Boran, make some of their own clothing out of goatskin. The women wear leather or cotton skirts trimmed with beads, metal rings, cowries shells, and ostrich eggshell beads, and sometimes painted with cow blood. The cotton woven here is multicolored and striped, not unlike the kikoi cloth found along the Swahili coast of East Africa. In the Sahara and Sahelian regions of West Africa, Tuareg men wrap their heads in a distinctive blue veil. The indigo-dyed wrap is put on during the initiation ceremonies marking the end of boyhood, and thereafter is rarely removed. The indigo from the veil and accompanying robes rubs off onto the skin, hence the Tuareg's nickname, the "blue men." The Tuareg have traditionally purchased their indigo cloth from Hausa traders in markets along the Sahara's southern edge. Elsewhere in West Africa, men in many societies weave cotton cloth in long narrow strips, which are then stitched into large pieces. Among the Asante, the men wrap the long piece of cloth around the waist and then loop it over the shoulder, toga-style. Baggy pants that are tight around the lower leg are popular, as are elaborately embroidered, full-length robes. Women across West Africa commonly tie a long wrap around the waist, accompanied by a wide sash, a matching blouse, and a head wrap.

The Yoruba of Nigeria prepare an indigo-dyed cotton called adire eleso. The artists sew finely detailed patterns onto the cloth using raffia or cotton thread, then take the cloth to a dyer, known as an aloro, who, it is said, works under the protection of the Yoruba spirit Iya Mapo. Similar techniques are also used farther west, among the

Wolof, the Soninke, and the Mandinka, and as far south as the Kasai region in the Democratic Republic of the Congo (Anthony, 2010).

3.3.2 Contemporary fashion

Given the association of Western-style dress with the colonial powers, it is hardly surprising that many African ant colonial movements of the 1940s and 1950s made elements of traditional clothing symbolic of their campaign toward independence. Contemporary African governments and political leaders still exercise important influences over popular clothing styles. After Thomas Sankara came to power in Burkina Faso in 1983, he declared locally woven cotton the national fabric and required civil servants to wear it. In southern Africa, men's "Kaunda suits" are named after Kenneth Kaunda, the former president of Zambia. In South Africa, Gatsha Buthelezi, head of the Zulu-dominated Inkatha Freedom Party, encourages supporters to wear the skins and headdresses of Zulu warriors at public events. South African President Nelson Mandela's taste in brightly-colored shirts has made the newly fashionable. (Khaminwa, 2007)

Economic conditions and changing technologies are also influencing clothing styles. Currency devaluations carried out under structural adjustment economic reform programs have made imported materials and clothing more expensive, but markets for used clothing ("fripperie" in Francophone countries) remain consistently strong. A significant proportion of the used Western clothing sold in Africa was originally donated to charities in the United States and Europe.Whether new or secondhand, Western clothing is considered fashionable in contemporary Africa. So too are "new traditional" clothes, which mix traditional fabrics and styles with synthetic materials and Western designs. For example, Yoruba weavers of the traditional aso oke fabric now incorporate Lurex and rayon threads into their fabric. In Mali, tailors use

bogolanfini mud-cloth to make European-cut blazers, vests, and caps. Often tailors' customers, especially women, commission outfits using locally bought cloth, but based on imported patterns or designs copied from fashion magazines. Growing appreciation for handmade African fabrics, both as pieces of art and as materials appropriate for "high-fashion" clothing, enhance the survival of traditional skills.

Contemporary artists such as Nike Davis, Senabu Oloyede, and Kekekomo Oladepo of Nigeria use indigo-dyed adire cloth in tapestries that explore modern themes. In Mali, Pama Sinatoa in Djenné and Ismael Diabaté, and the Groupe Bogolan Kasobane and the Atelier Jamana in Bamako are renowned for their bogolanfini clothes, while Chris Seydou used bogolanfini-inspired textiles in his contemporary clothing styles. In Nairobi, Kenya, the African Heritage Gallery commissions clothing and jewelry that draws on traditional styles from all over the continent (Anthony, 2010).

3.3.3 NIGERIAN FASHION

The difficulty associated with promoting Nigerian design and clothing may actually be based on the origin of fashion as a concept.

The fashion industry, which is today a multi-trillion dollar business in the world, is understood as part of a cultural and social history. Fashion cannot be separated from our daily lives; even those who refuse to follow fashion, it is argued, do so in order not to partake in trends.

But fashion itself is a modern European phenomenon. Its rise is inseparable from the emergence of capitalism in Europe. Fashion, in a narrow sense, is a development out of the bourgeois 19th Century and the Industrial Revolution. In the words of Mrs. Folorunsho Alakija, former national President of the Fashion Designers Association

of Nigeria (FADAN) and owner of Rose of Sharon (House of Fashion), in her book Fashion: The African Connection, before fashion evolved, there were traditional costumes or clothing worn by people the world over. Apart from its distinguishing factors, clothing was solely used functionally for covering up of the body and for protection from heat or cold or other environmental factors.

In Africa, apart from the use of clothes for decoration of the body, the body was equally adorned with painting, tattooing or by the wise use of jeweler.

Among sociologists, clothing, other than its functionality, has from the beginning of time been used for the decoration of the human body. The origin of fashion, they argue, is therefore, the desire to adorn oneself.

The difference between clothing and fashion in the modern sense, as the argument continues, is that unlike fashion, clothing has no defined purpose.

Many people would have owned few clothes if their desire were solely functional. Fashion, it is said, suggests that man is not satisfied with functionality of clothes alone.

Traditional clothing separates social classes and regional groups. It is standard, and its costumes symbolize a community and constancy. It never changes. City and rural dwellers in Nigeria can distinguish the Eastern way of dressing from that of the Northern or Western as each identifies with the various ethnic groups.

Traditional clothing hardly ever changes. If any change occurs, it is only in very little details, and this can be very slow. It hardly expresses individual personality as it indicates group membership and is timeless.

Fashion, on the other hand, is not standard as it derives its appeal from its transience nature. However, fashion emphasizes belonging to a certain social stratum but it expresses individual personality. In the late middle age, the bourgeois and the

aristocrats began to use clothing not only to separate themselves from other social classes and assert their social positions they also used it to express their individuality. That was when the word fashion became a concept.

Hair has always been seen as part of body beautification for the Nigerian man and woman. In the pre-colonial times, it was given a special attention during important occasions and ceremonies. Men and women, in Nigeria, adorned themselves in almost the same way. Low cut was the norm, as long hair was not given much attention. They could scrape the hair almost bare and leave only some patches.

But this evolved as contact with colonialism affected it. Many readily perm their hair or do jerry curls today. But a glance around will show that the hairstyles of the old have returned, strongly. And it seems to have taken over from the perms and jerry curls.

The return of the hairstyles is a thing of joy to the Nigerian fashion industry. It shows that we are going back to our roots, and that one can still look beautiful with or without curls and silk (Uduma, 2007).

3.4 CASE STUDIES

3.4.1 ROSE OF SHARON, HOUSE OF FASHION, LAGOS.

The Rose of Sharon was established in Lagos in 1986 at No. 1 Olatunde Street Surulere under the name supreme stitches. It is one of the most prominent houses of fashion in Nigeria. The fashion house started in a three bedroom flat with three straight sewing machines, 1 over locking machine and 1 hemming machine. Because of the problem of space, the fashion house acquired the present premises at 13, Adeniran Ogunsanya Street Surulere and on November 15, 1998 after extensive renovation moved into the premises. The fashion house mainly caters for women but

they also make mens clothing. The Rose of Sharon presently employs about forty people.

Facilities

The Rose of Sharon presently has a showroom, reception area, boutique, conference room, workshop, offices, kitchen, and other support facilities. Presently, they have 8 embroidery machines, 18 straight sewing machines, 2 pressers, 3 weaving machines and 1 button hole machine.

Structure

The building is essentially built of block work and roofed with long span aluminium. The doors and windows on the exterior are aluminium framed projected windows and aluminium frame double swing doors. The internal doors are made of carved wood panels.



Plate III: Rose of Sharon house of fashion, Lagos

The reception area is painted white and the ceiling has a plaster of Paris finish with gold trimmings and a rather huge chandelier almost at eye level. The boutique has a separate access on the ground floor.

On the first floor, there is a showroom, the office of the proprietor and secretary as well as sanitary and storage facilities. The workshop is also on the first floor of the building.

The showroom had sliding doors before which mannequins are placed and can be viewed from the street below. The floor has non slip ceramic tiles in the showroom and reception. In the workshop, the floor is terrazzo as well as the stairs. On the façade of the building, the doors and windows have red hoods made of fabric which is a concept borrowed from the European fashion houses.

Merits

i. the workshop is a separate wing of the main structure and is separated by a lobby and staircase

ii. The layout and functional flow suits the functions.

iii. Separate access for staff and clients/customers.

iv. Workshop is well lighted and ventilated.

v. The provision of support facilities like conference room and kitchenettes allow smooth running.

vi. Space available on the ground floor for modeling.

Demerits

i. Showroom is on the first floor discouraging browsing.

ii. No room for further expansion.

iii. No facilities for training.

iv. The building has no African features.

3.4.2 LABANELLA LAGOS

The name labanella is coined from Lagun, Abah and Onella. The designer Abah Kuku is a self-trained designer who has been making clothes for years. In 1972, Labanella started business in a 2 bedroom flat in Calabar Street, Lagos.

Labanella started out with a cutting machine, button hole machine, button tacker, label cutting machine, embroiderer, industrial irons and hand tools. The production of Labanella began with mass produced clothes like skirts /trouser suits in silk and cotton, which they supplied to the boutiques of big departmental stores like UTC, Kingsway and Leventis. The fashion house changed their stock monthly and business thrived until 1983/84 when the company had to stop mass production.

The present premises 38, Adeniran Ogunsanya Street, Surulere and Lagos is currently rented on a long term lease and the workshop situated behind the building was built by the chief designer Mrs. Abah Folawiyo. The fashion house currently has staff strength of 50 people working in the factory as follows; 26 machinists, 16 embroidery workers, 6 pressers and about 6 general hands, head cutter, assistant cutter and 4 designers.



Plate IV: Approach view of Labanella fashion house, Lagos

Structure

The building is generally one of the old houses built in the late 60's for residential purposes in Surulere but as with all premises on Adeniran Ogunsanya it has been converted for commercial purposes. It is built of sandcrete block and roofed with asbestos roofing sheets. The building is L-shaped in plan and the workshop is basically a square. The doors are aluminium frame double swing doors and the windows are aluminum sliding windows.



Plate V: Sowing workshop



Plate VI: Showroom

Merits

i. The ground floor incorporates reception, showroom and boutique in continuous flow encouraging browsing

ii. The workshop set far back prevents the noisy drone of sewing machines from the customers.

iii. On entry, the showroom clearly identifies the function within the building.

Demerits

i. There is no distinct feature that identifies the building as an African fashion house in structure or form.

ii. Its adaptation for a residential building does not give room for flexibility in design.

iii. The orange hoods on the façade tend to project conflicting images of the buildings functions.

iv. The workshop is rather cramped and congested with virtually limited circulation space.

3.4.3 RUSSEL BEAUTY AND FITNESS CENTRE, ABUJA

LOCATION

It is situated along Herbert Macaulay way in Wuse zone 3 Fct Abuja.

STRUCTURES

It has a rectilinear form with reinforced concrete, sandcrete and glass been d major material of construction.



Plate VII: Approach view of Russel beauty and fitness centre, Abuja



Plate VIII: Side view of Russel beauty and fitness centre, Abuja



Plate IX: Gymnasium



Plate X: Fitness Area

FACILITIES

Exercise floor which has an expositive array of keep-fit equipment which include thread-mill stationary bikes, weight machines etc use to keep fit or lose weight.

Free weight room consists of different free weight for people who want to body build. It also has a Jacuzzi, a swimming pool and a beauty clinic.

FUNCTIONAL SPACES

-reception

-offices

-exercise floor

-free weight room

-massage room

-beauty clinic

-changing room

-toilets and bathrooms

Merits

i. The gym is well lighted thereby satisfying one of the major requirements of a gym hall.

ii The fitness machinery are well spaced allowing for ease of use.

Demerits

i Parking is inadequate.

ii Poor location. It is located close to a market thereby disturbing its aim as a gym.

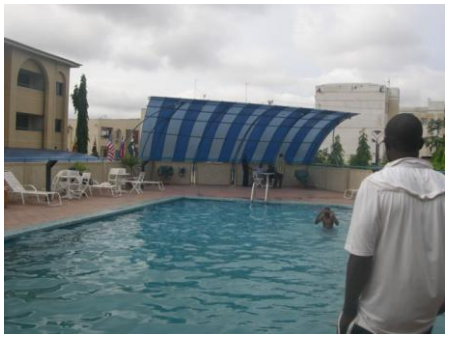


Plate XI: Swimming pool



Plate XII: Entrance to the Gymnasium

CONCLUSION

From the above case studies, several deductions have been arrived at. The existing fashion houses and beauty and fitness centers have been studied and the layout of the various functions observed. The processes entailed in garment making have been observed from design stage to finished product.

In the fashion design, center the space required and specialist's workshops were observed. The workers have been interviewed and their requirement noted.

CHAPTER FOUR

4.0 THE STUDY AREA

ABUJA: THE FEDERAL CAPITAL OF NIGERIA



Figure 4.1 Map of Nigeria

Nigeria is located in Western Africa, bordering the Gulf of Guinea, between Benin and Cameroon, 10^{o}N 8^{o}E and has a total area of 923,768km^2, with varying climate from equatorial in the south, tropical in the centre to arid in the north. Nigeria has 36 states and a Federal Capital Territory at the centre, which serves as the seat of government. The Federal Capital Territory (F.C.T) is located on the Gwagwa plains in the middle – belt zone of the country. It lies between latitude 9.02^{o}N - 9.25^{o}N and Longitude 6.045^{o}E – 7039^{o}E. It has access to all major cities in the country and indeed the continent. The capital city, Abuja is situated in the North –Eastern quadrant of the F.C.T and occupies an area of about 8000sq.km.

The Abuja master plan is similar to Lucio Costa‘s airplane plan for Brasilia and Abuja, in 1976, was selected by the Federal Government to become the new seat of government. By 1992, the first of four stages of this move to Abuja was launched with most of the senior government officials. Besides being the administrative seat of government, Abuja is a beautiful city in a scenic valley of rolling grasslands in a relatively undeveloped ethnically neutral area, surrounded by hills such as the Gwagwa Hills near Suleja, the Chukuku Hills, the Agwai Hills and the famous Zuma rock, just to mention a few.

The considerations for the selection of Abuja as the capital of the country include centrality, climate, land availability water supply drainage and above all ethic neutrality. The master plan of Abuja was designed by Kenzo Tange, in conjunction with other planning agencies. It is however obvious that the design was influenced by the design of Chandigarh, Brasilia, Washington DC and in addition some new towns in England.

This plan focuses on the trilogy of the Nigerian constitution, which separates the power of the government. These are the Executive arm, which is the presidential palace, the legislative, which are the National Assembly and the Supreme Court building for the judiciary.



Plate XIII: Centeral business district, Abuja



Plate XIV National Assembly, Abuja



Plate XV: AsoRock, Abuja



Plate XVII: Zuma Rock, Abuja



Plate XVI: National Mosque, Abuja

Abuja was chosen as the location for this project due to:

1. Proximity and Accessibility

2. Patronage

3. Easy access to raw materials

4. Existing proposals for such centres

5. Pleasant view

4.1 SITE LOCATION

The site is located in Nigeria within the Federal Capital Territory (F.C.T), Abuja. Nigeria is the most populous black nation with rapid demographic and economic growth potential. Abuja is the capital of Nigeria; it has a population of 778,567 people (CENSUS 2006), a land area of 713km^2.

CENTRAL AREA ABUJA

The central district area is for diplomatic structures and low-density residential areas. The central (core) has been planned to house the following:

A. The three arms: the presidential complex, the national assembly and the Supreme Court building.

B. The cultural spine: the national conference, national archives, national museum, national mosque, national cathedral (national ecumenical centre) and library.

C. The ministerial and state government liaison office.

The central business district is for commercial and economic activities, the central market, the national sport complex the other six districts are for high-density residential housing and supporting facilities for both public, private ownership and prospective developers. The necessary infrastructures road, water telecommunication are provided for, by the appropriate service organization



Plate XVIII: North view of selected site



Plate XIX: South view of selected site



Plate XX: West view of selected site

4.2 SITE ANALYSIS

4.2.1 GEOLOGY

The major rock units underlying the F.C.T sites are in three categories which are metamorphic, igneous and Sedimentary rocks. Site within the city are not expected to present any serious problem during construction. The rocks are migmatite, granite, gneiss, and biotic granite.

4.2.2 TOPOGRAPHY

The site slopes northwards with a total height difference of 3.5m. However, there are no physical encumbrances on site. The natural slope also helps the site drain off surface water into the existing drains.

4.2.3 SOIL

The soil underling Abuja are generally strong and of high bearing capacity due to their rocky nature. This is contrasting when compared to the other parts of the Gwagwa plains. They are typically deep and well drained.

4.2.4 VEGETATION

Generally, the vegetation of the capital city is characterized predominantly by park savannah type due to centuries of destructive exploration of the original woodland. The site just like all other parts of Abuja is dominated by thick tall grasses and shrubs. The evergreen trees are very few, scattered about the site.

4.3 ABUJA CLIMATE

A comfortable living environment will depend on the combination of the climatic elements. The psychometric chart is a diagram which gives the level of comfort within an area based on the combination of the effects of temperatures and relative humidity.

4.3.1 Temperature

Abuja records its highest temperatures during the dry season when there are little clouds. Temperatures recorded within a day are usually highly divergent figures. During the rainy season, the maximum temperature is lower due to the dense cloud cover. However, the highest temperature figures are recorded in March.

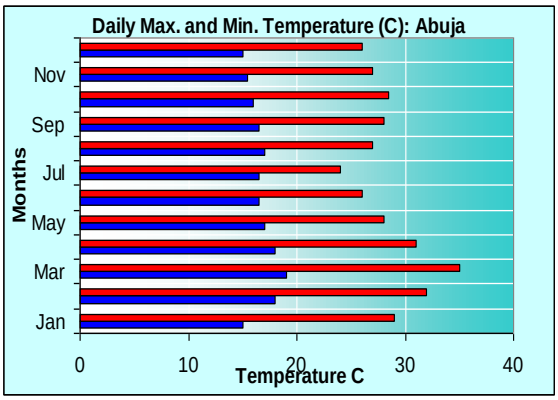


Figure 4.2: Daily Maximum and Minimum Temperature (degree Celsius)

4.3.2 Wind

The prevalent winds in Nigeria are the northeast and southwest winds. The northeast wind is cold and dusty, responsible for the harmattan season. This wind is prevalent between October and March, and usually requires shading. The southwest wind is warm and moist, responsible for the rains. This comfortable wind is prevalent between April and September. The graph below exhibits the rate of evapotransportation within Abuja:

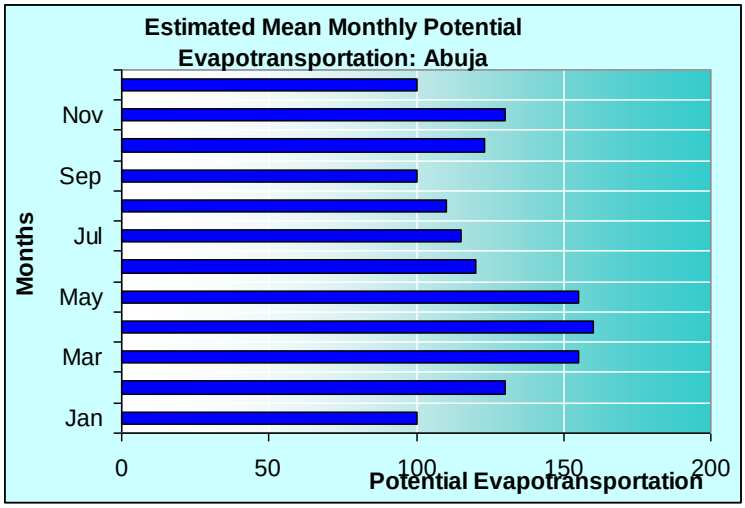


Figure 4.3 : Estimated Mean Monthly Potential Evaporation Transportation

shine as one move northwards from the Atlantic coast. The peak values of sunshine hours and intensity are recorded in august, but the effect is relatively not adverse because the site is in a valley.

4.3.3 Relative Humidity

In rainy season, the relative humidity is much higher, reaching as high as 90%. This is due to the availability of moisture in the air. In the morning hours, the recorded figures are not within the comfort zone of between 30 - 70 % hence, solutions to

arresting such in building have to be worked out by the architect. More so, considerations need to be given to the artworks to ensure the moist weather does not hasten their deterioration. Storages places also need to be kept moist-free.

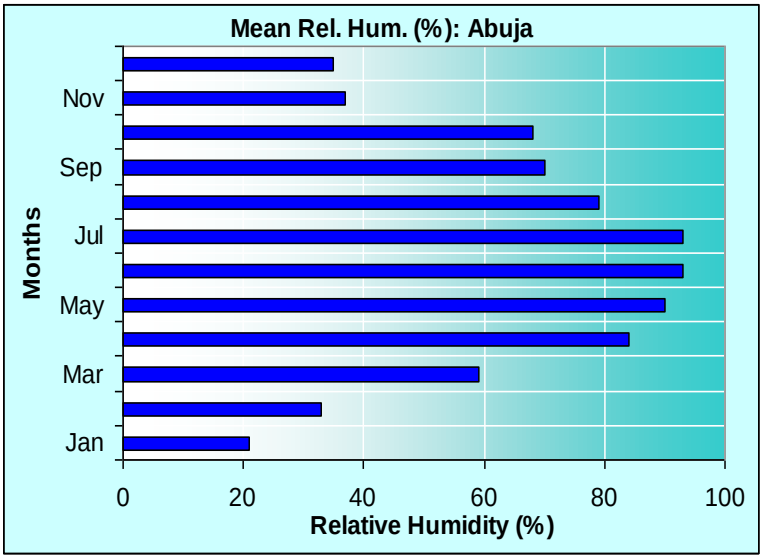


Figure 4.4 : Mean Relative Humidity(%)

The rainy season starts around early April and ends off around October end. The graph below shows that the maximum figures are recorded in July, August and September. This rainfall values show the need for drainage systems that can handle large volumes of water very quickly. There is an already existing drainage system on this site.

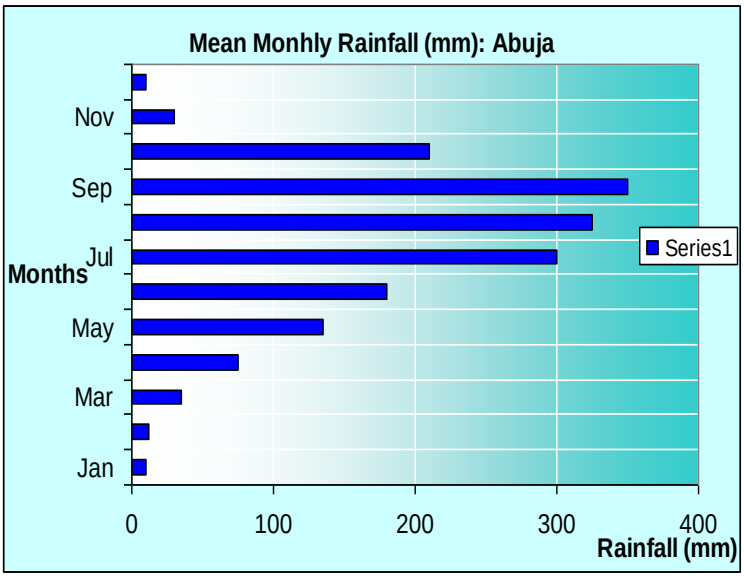


Figure 4.5 : Mean Monthly Rainfall (mm)

4.3.4 Utilities

The site like all the other sites within the central area of Abuja, already have their services connected. This site has a drainage system along the road sides where it slopes to. There is also existing water, electricity, telephone points. It is also connected to the city central sewage system.

CHAPTER FIVE

5.0 DESIGN REPORT

5.1 Beauty and fashion center services



Plate XXI : Consultantbarry.com the fashion industry-Barry

Beauty and fashion services provided by various fashion houses are many and varied they include the following:

- Tailoring
- Jewelry Production:
- Cobbler
- Hats and Bags Production
- Facial Treatment
- Body Treatment
- Holistic Therapies

- Hand and Foot Treatment
- Luxury Packages
- Hair Removal
- Tanning
- Eye Care
- Auxiliary Facilities
- Saloon

5.2 BRIEF FORMULATION

The design brief is derived from the standard requirements of a public assembly facility and adjusted to suit the particular needs of a beauty and fashion center. The scope of the research covers the design of the main complex which is the beauty and fashion center, a lodge and gymnasium. The space requirements for these facilities are analyzed and the schedule of accommodation prepared.

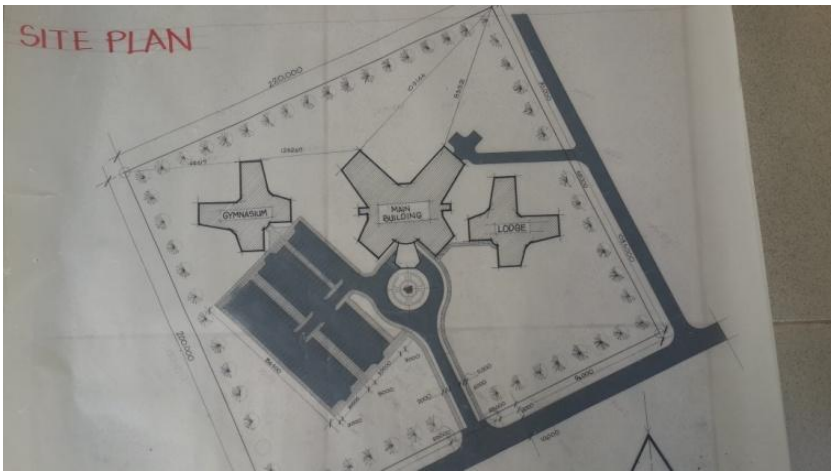
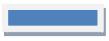
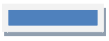
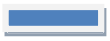


Figure 5.1: Site plan

5.3 FUNCTIONAL ANALYSIS

Table 5.1: Relationship Analysis for the entire Complex

	MAIN BUILDING	LODGE	GYMNASIUM	
MAIN BUILDING				
LODGE				
GYMNASIUM				

KEY: Very Strong Relationshi 

Strong Relationship 

Weak Relationship 

5.4 FUNCTIONAL RELATIONSHIPS

5.4.1 The Main Building for Beauty and Fashion Center

The beauty and fashion center layout comprises of admin offices, restaurant, shops, show room, gallery, run way, jewelry production hall, conference hall, class rooms, tailoring workshop, cobbler workshop, hats and bags production hall, saloon and beauty treatment units.

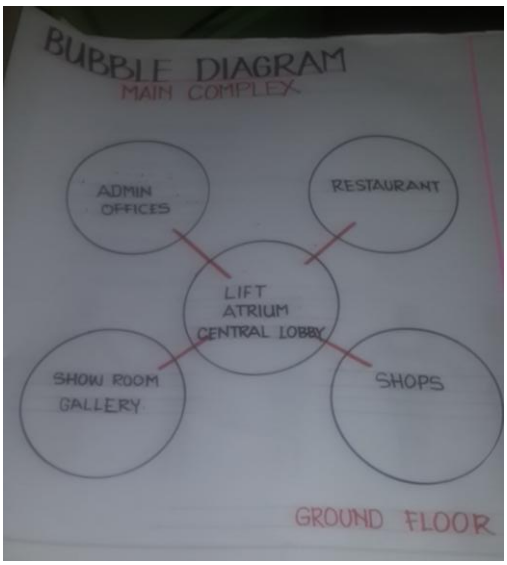


Figure 5.2: Functional flow chats of the main building-ground floor

Source: Author

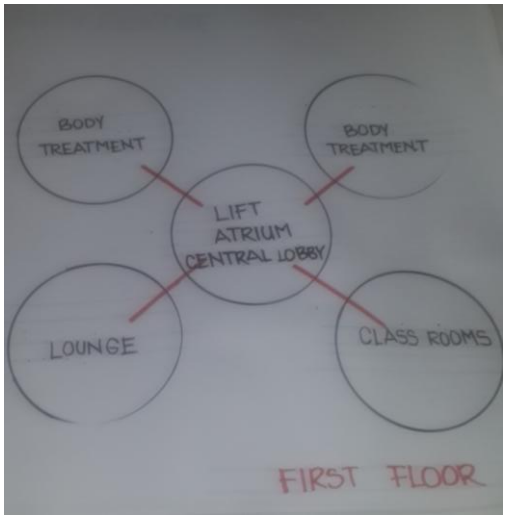


Figure 5.3: Functional flow chats of the main building-first floor

Source: Author

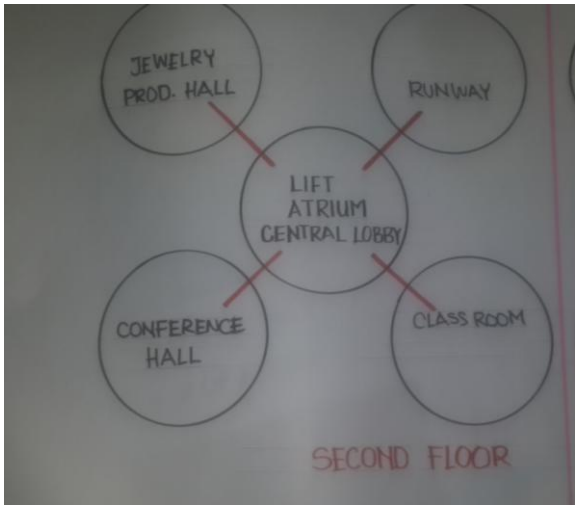


Figure 5.4: Functional flow chats of the main building-second floor

Source: Author

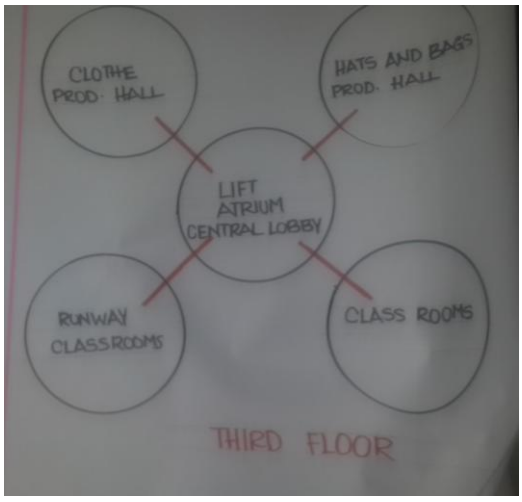


Figure 5.5: Functional flow chats of the main building-third floor

Source: Author

5.4.2 Lodge

The lodge comprises of reception, accommodation and common rooms for students and guest who visit the beauty and fashion center for fashion shows and exhibition.

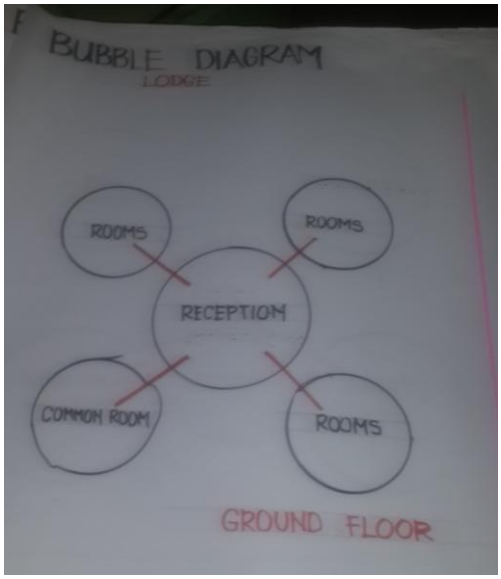


Figure 5.6: Functional flow chats of the Lodge-ground floor

Source: Author

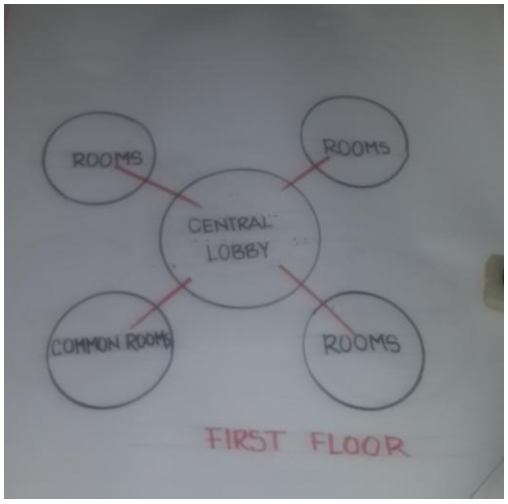


Figure 5.7: Functional flow chats of the lodge-first floor

Source: Author

5.4.3 Gymnasium

The gymnasium is an open space with exercise equipment

These functional flow charts guided the design of the floor plans to produce an organized arrangement of spaces. The shape of the plans was derived from a design concept I got from a butterfly which is a symbol of beauty.

Bases on priority of activities that need light, the activities are zoned within four floors. The offices/shops are on ground floor, production halls are on upper floors for more access to light.

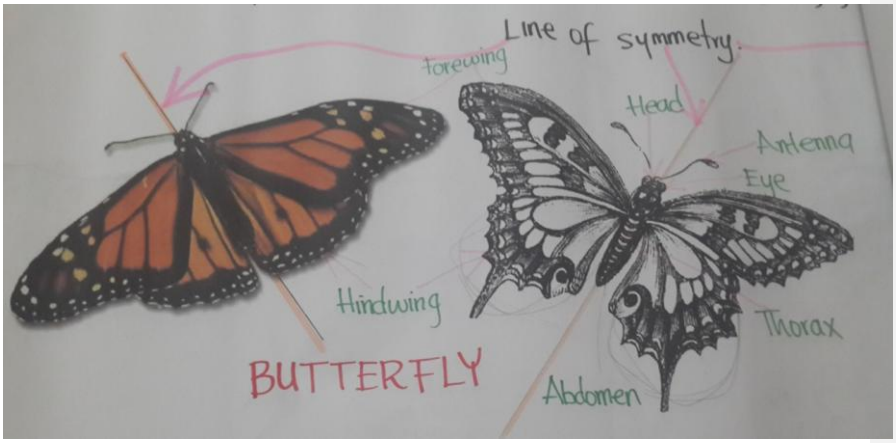


Figure 5.8 Concept development

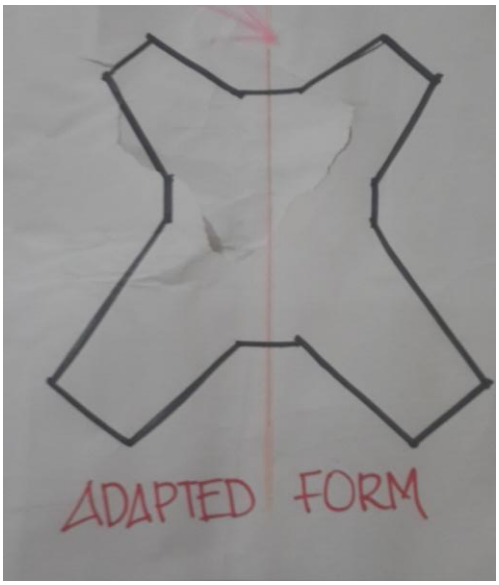


Figure 5.9 Adapted form for floor plans derived from butterfly concept

Source: Author.

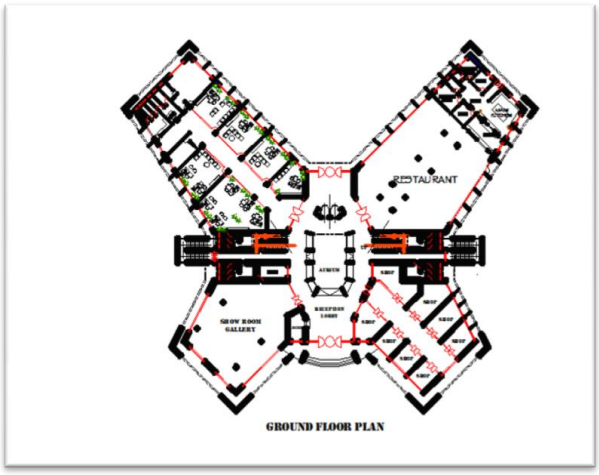


Figure 5.10 Ground floor plan

Source: Author

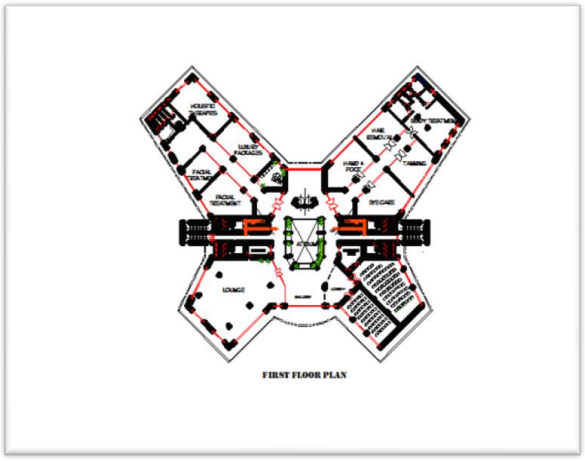


Figure 5.11 First floor plan

Source: Author

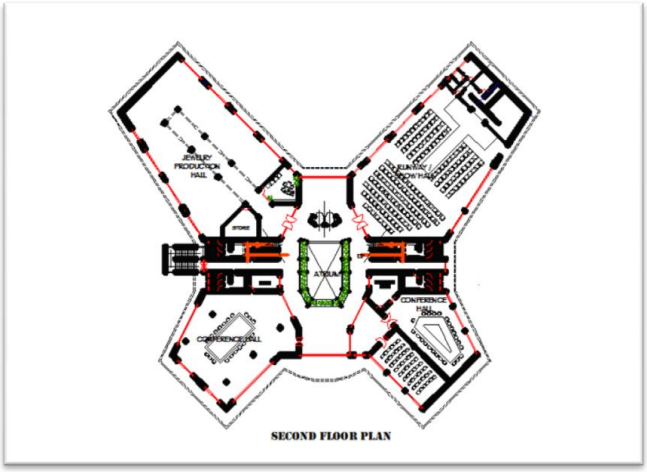


Figure 5.12 Second floor plan

Source: Author

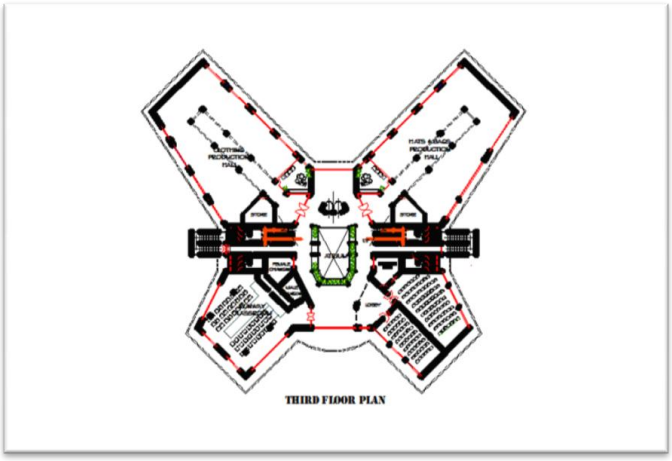


Figure 5.13 Third floor plan

Source: Author

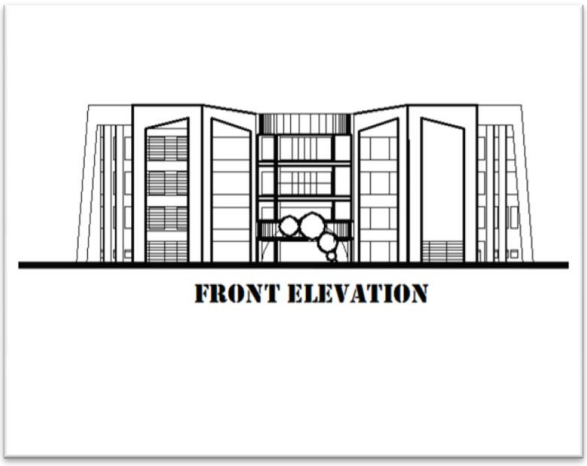


Figure 5.14 Front elevation

Source: Author

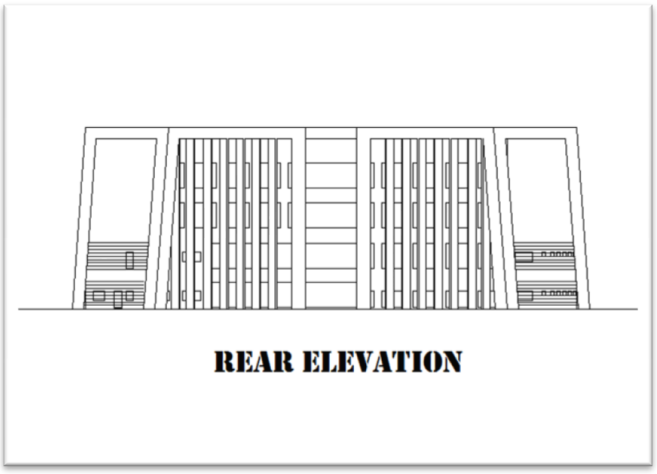


Figure 5.15 Rear elevation

Source: Author.

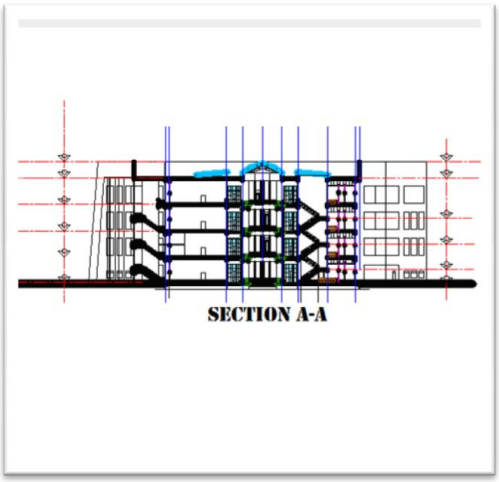


Figure 5.16 Section A-A

Source: Author.

5.5 SITE ZONING CONCEPTS

The site was zoned to adapt to the absence of restrictions and constraints presented as a result of the following factors which are likely to affect the orientation and use of the facilities provided in the complex.

- Noise
- Access
- Views

5.5.1 Noisy and Quiet Zones

Noise sources on the site are mainly traffic, and pedestrian movement. The most detrimental being traffic from the minor and major access roads.

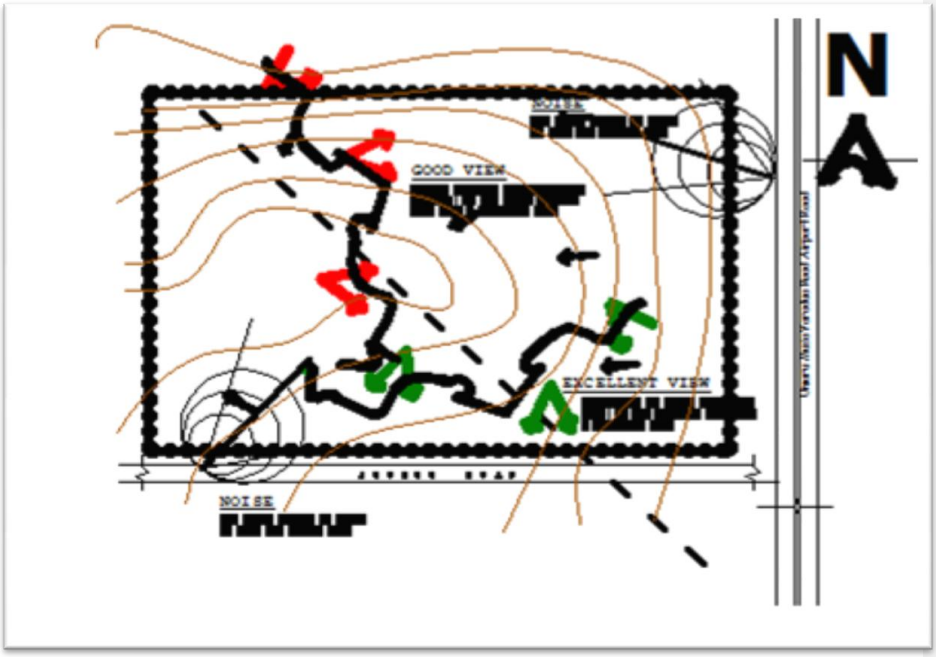


Figure 5.17 Site Zoning

Source: Author.

The noisy areas will also be of necessity the public areas and the quiet zones will be serving as private areas. Noise pollution from vehicular traffic surrounds the site to the south west.

5.5.2 Possible Ingress and Egress Zones

The major and minor access roads can both be used for access to the site however for security purposes access will be taken from the minor road.

5.6 DESIGN SOLUTION TO USE OF DAYLIGHT TO ENHANCE VISUAL COMFORT

Factors considered when making the decision on the strategy to adopt for day lighting.

- Climate orientation
- Site characteristic
- Size and proportions of windows
- The glazing System
- Views
- Natural ventilation
- Control

Putting into consideration the above factors here are some design solution used to maximize daylight in the design of beauty and fashion center.

5.6.1 Site orientation

In order to utilize light on all four sides of the building the concept based on orientation is to have the building placed in such a way that all external walls (over 90%) at an angle of 45° plus or minus 10°.

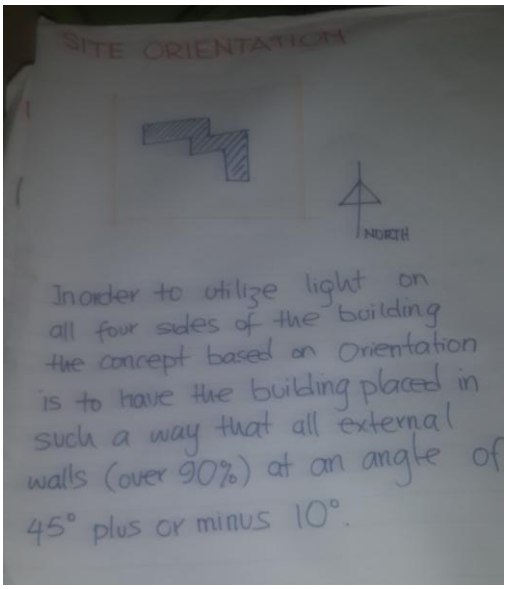


Figure 5.18 Site orientation

5.6.2 Use of forms

Based on research, use of basic forms for large buildings have a basic problem of deep planning for light and ventilation which make such buildings highly dependent on mechanical means.

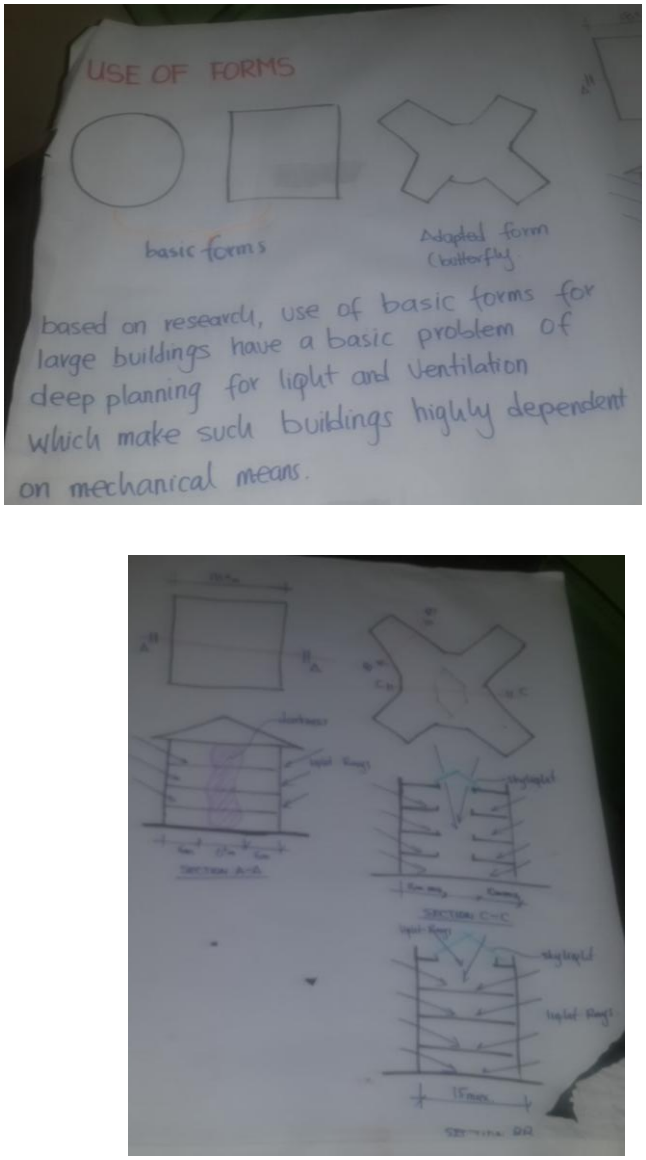


Figure 5.19 Use of forms

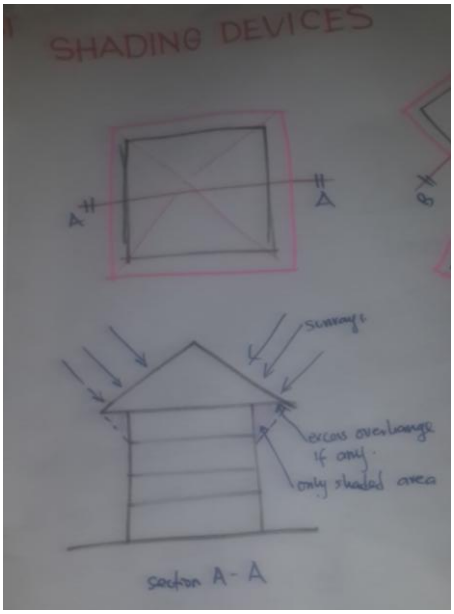
5.6.3 Shading device

The use of sun control and shading devices is an important aspect of many energy-efficient building design strategies. In particular, buildings that employ passive solar

heating or day lighting often depend on well-designed sun control and shading devices.

Thus, solar control and shading can be provided by a wide range of building components including:

- Landscape features such as mature trees or hedge rows;
- Exterior elements such as overhangs or vertical fins;
- Horizontal reflecting surfaces called light shelves;
- Low shading coefficient (SC) glass
- Interior glare control devices such as Venetian blinds or adjustable louvers.



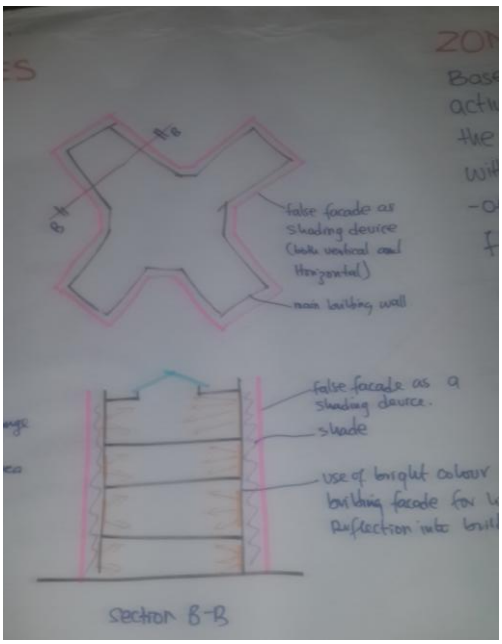


Figure 5.20 Shading device

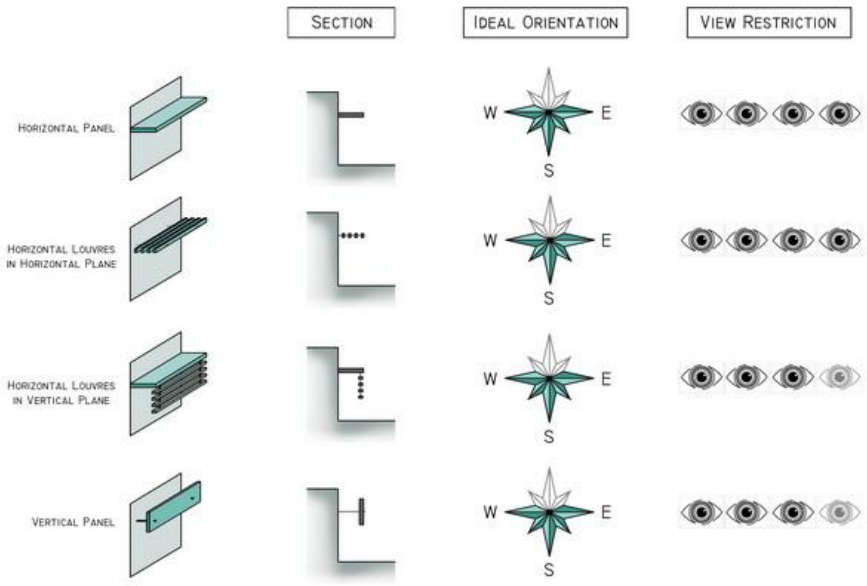


Figure 5.21 Basic Typology of Horizontal Shading Devices for Southern Exposures

Where sun is hitting the facade from a south-easterly or south-westerly direction, vertical devices can effectively block the sun. Egg crates are often used on non true south facing elevations as well.

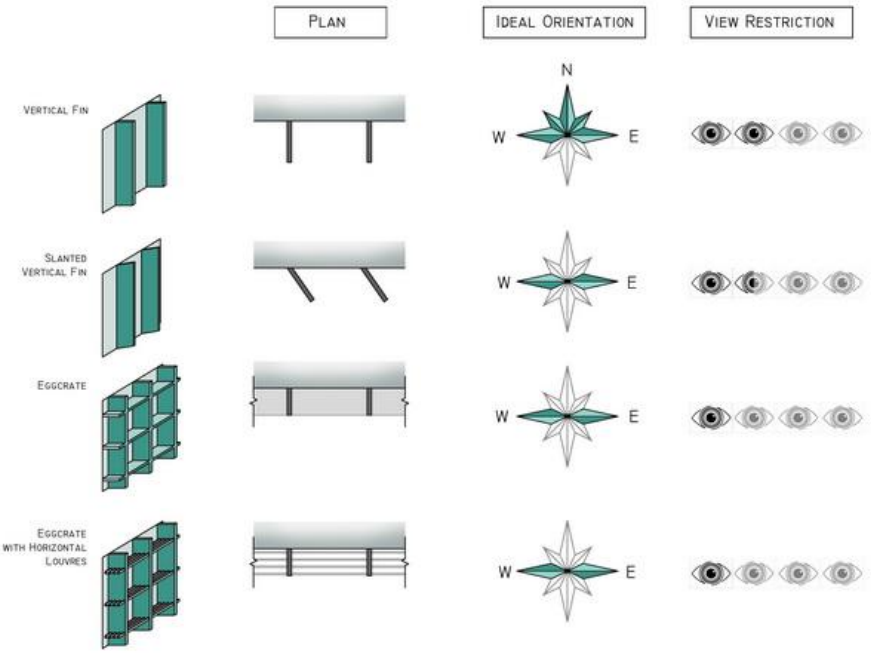


Figure 5.22: Shading Devices for Non Southern Exposures

The general configuration of the building can also be modified to alter the orientation of windows for heat avoidance.

5.6.4 Natural ventilation

Natural ventilation is the process of supplying and removing air through an indoor space without using mechanical systems. It refers to the flow of external air to an indoor space as a result of pressure or temperature differences. There are two types

of natural ventilation occurring in buildings: wind driven ventilation and buoyancy-driven ventilation. While wind is the main mechanism of wind driven ventilation, buoyancy-driven ventilation occurs as a result of the directional buoyancy force that results from temperature differences between the interior and exterior.

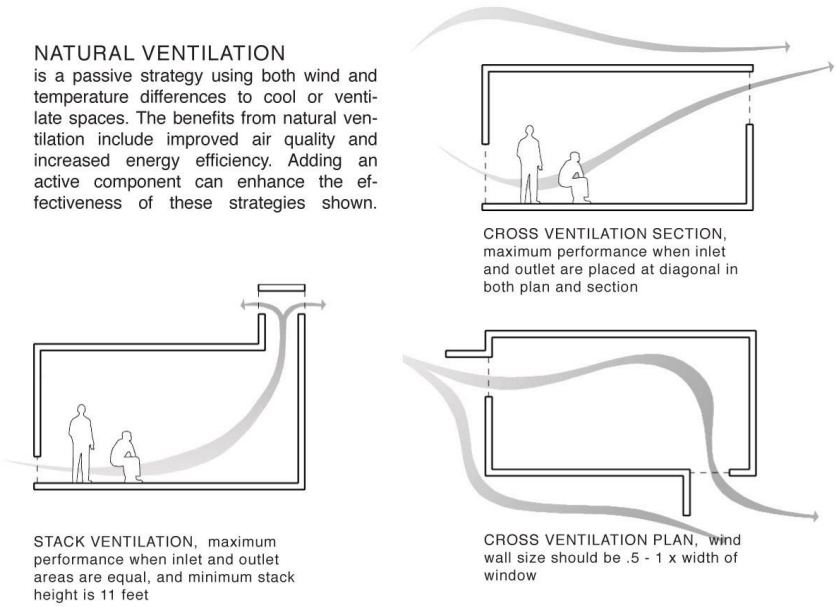


Figure 5.23 Illustration of natural ventilation

CHAPTER SIX

6.0 CONCLUSION AND SUMMARY

6.1 SUMMARY

The modeling of daylight in buildings is a challenging problem of increasing importance. Careful management of daylighting in a building is crucial in minimizing the environmental impact of a structure (U.S Department of Energy, 2006). It also has the potential to produce positive effects on health (Veitch, 2005), (Webb, 2006), well-being and, possibly productivity (Cuttle, 2002), (Heschong-Mahone Group, Inc., 2003), (Kim, et al., 2005).

In addition to these benefits, it remains a predominant factor in how a space is revealed and perceived by its users (Lam, 1986), (Guzowski, 2000).

Therefore, a major challenge that designers face is to effectively combine the many performance parameters involved in daylighting with aesthetic considerations. These parameters include daily and seasonal variations, the delicate balance between sufficient illumination and visual comfort, and the thermal aspects of incoming solar radiation, amongst others. Only if this integration happens early in the design process can it have a significant impact on energy savings and ultimate building performance.

Light occurs in nature, and sunlight, moonlight, and starlight are the most important sources of light to life. Daylight though being the very first of all sources of light has over the years being neglected for artificial sources. Consequently, the recent need to go green in order to save the earth and mankind has recently made designers (Architects) very conscious of the use of daylight in order to cut down energy cost and other adverse effect of artificial sources of light.

Review of relevant literature in this thesis shows that Daylight can naturally be controlled by the weather and climate of the particular site in question and artificially by using appropriate Design solutions.

This thesis established certain design criteria and principles for using day lighting. These where examined and analyzed for purpose of how they will be incorporated into the design of a beauty and fashion centre.

Finally a design proposal was done for a beauty and fashion centre with a main aim utilizing and maximizing day light for illumination.

6.2 CONCLUSION

The overall aim of a successful daylighting design is to increase the amount of useful daylight in an architecturally satisfying way. This strategy aims to maximize its penetration and its potential in enhancing aesthetics while addressing – or pointing out to - its major liabilities such as glare, thermal discomfort, and overheating risks, seasonal and weatherbased performance variability and, potentially, privacy concerns. The designer is thus faced with a range of parameters and variables to reconcile, which strongly fluctuate over time but need to harmoniously merge with his overall design scheme.

The intent of the thesis was to examine daylight and see how it can be fully incorporated into a design in order to enhance visual quality- Meaning the design is meant to minimize the use of artificial light within the day. From in-depth study of the literature gotten and established principles/standards about daylight, the following facts have been established.

1. The short distance (6m) in which daylight travels makes it unsuitable for deep planning without courtyards or skylight.

2. The inability of daylight to meander in path hinders it full utilization in complex designs with deep interiors and scattered spaces.

3. The Weather and Climate are the first important factors that govern the design strategy to be used for maximizing daylight in a building.

4. Building Orientation and selection of type of shading devices are design considerations that complement each other and as such go hand in hand.

5. The use of a prototype window and door size opening for all buildings without calculations or considering if luminance will be adequate or excessive is a very wrong practice that has become a cliché for Nigerian designers.

6.3 RECOMMENDATION

From this research the following recommendations are made.

Building engineers and architects should get to explore a large realm of design alternatives for their projects, including advanced technological solutions which are responsive both to performance criteria and to the more subjective issue of architectural quality. Lightsolve will provide them with a new form of project deliverable for their studio or to their clients and help them better envision how their space will perform and appear over time and under varying seasonal and weather conditions. In an indirect sense, Lightsolve will also teach the user which kinds of design changes are commonly needed for optimal daylight performance.

Additionally, manufacturers and vendors of advanced daylighting materials or systems are other obvious recipients of this work. Lightsolve will provide their clients with intuitive ways of assessing, choosing, and optimizing the use of their products based on their performative and aesthetic effects in architectural spaces.

It's obvious that most Nigerian commercial buildings are not designed for multipurpose use and when they are leased or rented out for other uses order than the ones they are design for, problems concerning daylight will arise because task has changed, users have changed, and so also will the components of the space. Architects and Designers of commercial structures should be encouraged to design structures that are flexible and adaptable for other uses.

There will be a need for NIA or other concerned professionals in the building industry to come up with policies and bodies that will be able to checkmate inappropriate balancing between the use of artificial and day light in a building.

Further research that will maximize use of light beyond enhancing visual quality should be encouraged especially with the drastic weather change we are experiencing in Nigeria.

Further research in building materials and the effect of daylight on them should be encouraged.

6.4 ~~6.4~~ CONTRIBUTION TO KNOWLEDGE

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The knowledge of day lighting design is not just how to provide sufficient daylight to an occupied space, but how to do so without any unwanted side effects. Further than adding windows or skylights to a space, it involves cautiously balancing heat gain and loss, glare control, and variations in daylight availability.

The union of these requirements and its relevance in a proposed building attempting to bring all aspect of beauty and fashion to a solitary point makes this study exceptional and will form a reference point for other scholars interested in this field of study.

REFRERENCES

Anthony Appiah, Henry Louis Gates. 2010. *Encyclopedia of Africa, Volume 2.* Publisher; Oxford university press.

Brenda Laurel 2003, *Design Research: Methods and perspectives.* Published by MIT press 2003.

Derek Phillips 2012, *Day lighting.* Publisher; Routledge.

George M.B. 1956, *Natural light and the inside-outside heliodor.* Published by School of engineering and architecture university of Kansas, 1956.

Henry Louis Gates Jr. 2005, *The Encyclopedia of the Afican and African American experience.* Publisher Oxford university press.

Judith Perani, Norma H. Wolff, 1999. *Cloth, dress and art patronage in Africa.* Published by Bloomsbury Academic.

Khaminiwa M. 2007, *History of clothing in Africa.* Source: Africana.com

Mark K, James B. 2004, *Lighting design basics.* Published by John Wiley & sons 2004

Mark Karlen, James R. Benya, Christina Spangler (2012) *Lighting Design Basics.* Publisher; John Wiley & sons. 2012.

Mireia Verges 2008, *Light in architecture* Published by page one.

Peter Robert Boyce. 2003, *Human factor in lighting, second edition.* Publisher CRC Press, 2003.

Sara el hawary 2011, *Lighting principles in interior design of management spaces.* Published by Helwan university applied arts interior design and furniture.

Schreuder D.A. 1998, *Road lighting for safety.* London: Thomas Telford publishing. Retrieved May 13 2010.

Szokolay S.V. 1980, *Environmental Science handbook for architects and builders.* Published by Wiley, 1980.

Tiwari G.N. 2010, *Fundamentals of photovoltaic modules and their applications.* Published by Royal society of chemistry.

Uduma Kalu 2007, *African Heritage.* Just another word press.com weblog.