DESIGN PROPOSAL FOR BADAGRY BEACH RESORT AND SPA, LAGOS

WITH EMPHASIS ON USE OF GLASS AS A BUILDING MATERIAL

M TECH. THESIS (ARCHITECTURE)

BY

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DECLARATION

I, MOWAH A. VICTOR hereby declare that this thesis titled "Badagry Beach Resort and Spa Lagos with Emphasis on Use of Glass as a Building Material" has no bearing to any work carried out by any person or group of persons that have written a project and accepted for Higher Degree.

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CERTIFICATION

I hereby certify that this thesis entitled **BADAGRY BEACH RESORT AND SPA, LAGOS WITH EMPHASIS ON USE OF GLASS AS A BUILDING MATERIAL** written by Mowah Victor Augustine, MTECH/SET/2006/1563 was carried out under the supervision of Arc. P. Haruna and has been prepared in accordance with regulations governing the preparation of projects for the award of the degree of Master of Technology in Architecture, Federal University of Technology Minna, Niger state.

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DEDICATION

This work is dedicated specially to God, the almighty for all his mercies and blessings and giving me the strength and knowledge for this work.

To my parents, Mr. and Mrs. Mowah who are the reason why am alive and have come this far in life.

To my siblings, Chiedu, Sheila Ash, Awele, Marian, Mike, Chinenye and Emeka, thanks for your constant support and encouragement.

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ABSTRACT

The government of Nigeria today calls for foreign investors and partnership from inside and outside the country to improve the economy of the nation and one sector where so many states are tapping the potentials of their God given flora and fauna is the tourism sector. Tourism is a means of attracting and satisfying the needs of tourists and visitors who come from around the world seeking relaxation and recreation and in the course of their stay learn new things about the people, culture and nature of the place they are visiting. The aim of proposed design for Badagry Beach Resort and Spa Lagos is to attract visitors and tourists thereby generating income for the locals and the state government taking advantage of the existing beach filled with palms in that area using glass buildings as a point of attraction. Glass as a material is brittle but recent developments in technology has improved the strength, stability and durability of glass and now glass can be used in load bearing capacities. The proposed project shows the various ways in which glass can be used in building apart from the conventional use in windows and door glazing. Different types of glass like the laminated glass which is very strong and stiff is used for glass floors, partitions, ceiling and roofing and these are shown in the project. Insulated glass (i.g) units are also used extensively in this proposed design project because of their thermal insulation quality and sound insulation qualities because the resort will be filled with lots of noise and this noises has to be kept outside the building. Photovoltaic glass is used to generate power for some parts of the resort and tinted coloured electrochromic glass is used for its aesthetical value and in the control of the intensity of light allowed in the buildings of the resort. Many resorts existing in the country today are not attractive enough because of the use of the conventional materials like concrete and sandcrete walls but with the use of glass in this proposed project as a major building material the aesthetical value would be increased and this would in turn increase patronage and income for the parties involved in the project.

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DEFINITION OF TERMS

RESORT

A **resort** is a place used for relaxation or recreation, attracting visitors for holidays or vacations providing food, drink, lodging, sports, entertainment, and shopping.

SPA

The term **spa** is associated with water therapy/treatment which is also known as balneotherapy, spa towns or spa resorts offering such treatment, or the medication or equipment for such treatment.

BEACH

This is an area of sand or small stones beside the ocean, sea or a lake.

TOURIST

A tourist is a person who is traveling or visiting a place for pleasure.

MASSAGE

Massage is the treatment and practice of manipulation of the soft body tissues with physical, functional, i.e. mechanical, medical/therapeutic, and in some cases psychological purposes and goals. The word comes from the French *massage* "friction of kneading," possibly from Arabic *massa* "to touch, feel, handle" or from Latin *massa* "mass, dough". (In distinction the ancient Greek word for massage itself was *anatripsis*, and the Latin was *frictio*.)

CHAPTER ONE

1.0 INTRODUCTION

1.1 BACKGROUND TO THE STUDY

A **resort** is a place used for relaxation or recreation, attracting visitors for holidays or vacations. Resorts are places, towns or sometimes commercial establishment operated by a single company. Such a self-contained resort attempts to provide for most of a vacationer's wants while remaining on the premises, such as food, drink, lodging, sports, entertainment, and shopping. The term "resort" sometimes is misused to identify a hotel that does not provide the other amenities required of a full resort. However, a hotel is frequently a central feature of a resort, such as the Grand Hotel at Mackinac Island, Michigan, U.S.A. (Resort, www.wikipedia.com 2008).

The need for relaxing the human body cannot be over emphasized especially in urban centers like Lagos where the day to day activities are very stressful and tiring. The hectic traffic and amount of gases inhaled by individuals from cars and general combustion of materials are harmful.

The proposed resort would be a place for relaxing, spending vacations and holidays in a serene natural environment with lodging, speed boat cruise, water front restaurant and bar, camping sites and expeditions. It would also have a spa where care would be given to the body using natural means and massages. It would be a place where nature is at work and at its best free from all the noise, hustling and bustling of the city and full of plant and animal life (flora and fauna).

1.2 STATEMENT OF THE PROBLEM

The health hazards associated with living in a major city such as Lagos caused by the high emission of hydrocarbons and low rate of exercise is a social problem that can be addressed by the proposed design which solves that problem by providing an avenue where people can relax and recreate in a serene healthy environment in tune with nature.

1.3 AIM AND OBJECTIVES

The aim of this design is to provide a functional and aesthetical setting which serves as a place to relax and recreate for visitors using glass in different ways to achieve different shapes aesthetically and structurally while combining it with other building materials and components.

The objectives of this design are;

1. To create an environment for relaxation and social interaction for the general public by providing facilities that would encourage recreation and interaction such as lawn tennis and badminton courts, beach volleyball and swimming pools.
2. To provide comfortable accommodation for the visitors and tourists taking their different social and financial status into consideration in the design of the guest chalets and suites.
3. To bring to public awareness the economic advantage that can be derived from this development by creating job and business opportunities for those living around the area.
4. To provide a forum for development of human values, ensure creative and productive use of leisure time in the resort.

5. To express different uses of glass through the design of the building.
6. To provide other supporting facilities in the resort that would ensure that the resort is one of the best around.
7. To create an environment where circulation can be controlled during peak seasons such as festive seasons when most of the city dwellers come to relax.
8. To achieve self sufficiency i.e. energy generation, conservation and sustainability where the resort would be able to function without the interference of the local power authority due to the incessant power supply by the use of photovoltaic glass in the buildings.

1.4 SCOPE AND LIMITATION OF STUDY

The scope of this project is provide a conducive and secure environment where tourists or visitors can relax and recreate by the beach side free from the touts synonymous with most public beaches in and around Lagos.

The resort would provide facilities like guest chalets and suites, gymnasium, swimming pools, restaurant and bar, indoor and outdoor sports facilities, water sports, shopping arcades, multi-purpose centre for hosting of events, and spa for receiving massages. Other ancillary facilities would be provided such as well landscaped areas and parking spaces.

The limitation of this project is that it is a semi-private resort not meant for the general public but for those who can afford to pay for the facilities and services provided. Also there is a time limit for those not lodging in the resort.

1.5 JUSTIFICATION

Recent technological advancement in the use of glass as a building material makes it the perfect material to use as the proposed resort and spa design is located in an open beach area with lots of sunlight. This sunlight will be tapped with solar glass and due to the flexibility and malleability of glass it can be formed into any shape and used aesthetically to create a serene environment which is therapeutic.

1.6 IMPORTANCE OF STUDY

The study offers an opportunity to evaluate the extent to which the use of glass has advanced both as a building material and an architectural element. It would look into the technological and scientific discoveries in the world of glass and how they can be used aesthetically and structurally in the resort located in a tropical environment like Badagry, Lagos. In order words how architecture can stimulate people to the place. This will contribute also to the evolution and subsequent growth of building types in the country in the 21st century. The design shall attempt to solve aesthetically and practically the problem of using glass as a building material.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 HISTORICAL BACKGROUND OF RESORTS

Up to the end of the 8th century, recreational facilities were mostly confined to the taverns along the highway and in the main destination such as pilgrimage towns, markets and ports. There were major developments in the following categories:

1. Spa resorts for health and entertainment
2. Climatic resorts for treatment of tuberculosis
3. Alpine resort for mountaineering and skiing
4. Seaside resorts for cures and leisure
5. Countryside resorts for camping and hunting

Traditional resorts developed from existing villages and towns thereby changing the town itself or encouraging its growth in its immediate vicinity. The location was largely determined by access and allocation of travel facilities in often-large seaside or lakeside town resorts. The Chinese flower gardens and the Japanese open vista date back to the first century B.C. These may not have been in the strict sense of recreation as they were mostly used as medication arenas and thus a classification under shrines. The advent of industrialization and its consequent adjunct- Urbanization could be said to be responsible for this recreational facilities popularity. The future of many traditional resorts is uncertain as a result of changes in fashion and styles of living. Changes have been predominantly brought about by the developments in transportation thus the people can go where they so desire as long as they can afford it, and return tin due time to continue their vocations. On the whole, many traditional facilities centres encompass a wide

variety of both active and passive leisure pursuits in adding to catering other needs. Thus, it could be said that the concerns for recreation vis-à-vis, its accessibility and affordability have come a long way in determining its effectiveness on the cultural background it serves. It is however possible to introduce new vitality and income by careful planned rehabilitation and orientation towards new market opportunities (weekend recreation) self-catering holidays, sophistication recreation and entertainment. In many situations the resorts itself may be adapted by constructing new focal points and activity. New Jersey is an example where the existing resort may serve as an infrastructural base for extension to new areas. Redevelopment projects, perhaps even than new areas, require survey and appraisals of the resources to identify those which can stand and should be retained and others are best modified.

Many of the principles that apply to new developments are equally applicable to existing resorts. In the early 1930's long before the post war tourism boom, the first planned resorts were beginning to make appearance. This has been described as "The new integrated resort" since they were constructed on new site free from the restarts of previous development. They were comprehensively planned and programmed to ensure at all times the correct scale and charter. The objectives were to achieve in a few years what a century of costly trial and error had achieved in the best traditional resorts.

The state or local authorities have developed some of the planned integrated resorts. Those resorts developed by private promoters have tended to be mainly speculative but there is an increasing awareness of the operational attractions and long-term financial benefits to be gained by comprehensive planning (Ashang, 2004).

2.2 TYPES OF RESORT

2.2.1 Resort at a destination

A commercial establishment at a resort destination such as a recreational area, a scenic or historic site, a theme park, a gaming facility or other tourist attraction competes with other businesses at that destination. Examples would be hotels in and around Walt Disney World, resorts in St. Martin in the Caribbean, and establishments at Aspen, Colorado in the USA.

2.2.2 Destination resort

A destination resort is a resort that contains, in and of itself, the necessary guest attraction capabilities—that is to say that a destination resort does not need to be near a destination (town, historic site, theme park, or other) to attract its public. Consequently, another characteristic of a destination resort is that it offers food, drink, lodging, sports, entertainment, and shopping within the facility so that guests have no need to leave the facility throughout their stay. Commonly these facilities are of higher quality than would be expected if one were to stay at a hotel or eat in a town's restaurants. Some examples are Atlantis in the Bahamas, Costa do Sauípe in the Northeastern Brazil, Laguna Phuket in Thailand and Sun City near Johannesburg in South Africa.

2.2.3 All-inclusive resort

An all-inclusive resort is a resort that, besides providing all of the common amenities of a resort, charges a fixed price that includes most or all items. At a minimum, most inclusive resorts include lodging, unlimited food, drink, sports activities, and entertainment for the

fixed price. In recent years, the number of resorts offering "all-inclusive" amenities has decreased dramatically; in 1961, over half offered such plans and in 2007, less than ten percent do so (Resort, www.wikipedia.com 2008).

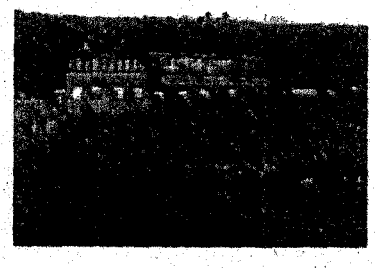

Plate 2.1 The "Paradise" resort in Catskills
Source: resort, www.wikipedia.com

2.3 HISTORY OF SPA THERAPY

The word "spa" may be derived from the Walloon word "espa" meaning fountain. This, in turn, came from the name of the Belgian town Spa, where in the 14th century a curative, thermal spring was discovered. Spa may also originate from the Latin word "spagere" (to scatter, sprinkle, moisten) or may be an acronym of the Latin phrase "sanitas per aquas" (health through water). In Britain, the word spa is still used, whereas in the rest of Europe the term "thermal waters" is preferred. Bathing in thermal water for therapeutic purposes has several descriptions (for example, taking the waters, balneotherapy, spa therapy, hydrotherapy), which will all be used throughout this paper, and are more or less interchangeable.

2.3.1 ANCIENT GREECE AND THE ROMAN EMPIRE

Taking the waters used to be a popular treatment for a wide range of diseases in classical times. The Greeks preferred baths in fresh water from natural resources, although bathing in the sea (thalassotherapy) was also applied. Initially, bathing was confined to the more wealthy people in private baths, but soon public baths were opened. The baths were considered sacred places and were dedicated to several deities.

In Homeric times, bathing was primarily used for cleansing and hygienic purposes. By the time of Hippocrates (460–370 BC), bathing was considered more than a simple hygienic measure; it was healthy and beneficial for most diseases. Hippocrates proposed the hypothesis that the cause of all diseases lay in an imbalance of the bodily fluids. To regain the balance a change of habits and environment was advised, which included bathing, perspiration, walking, and massages. The baths were often combined with sports and education, the precursors of the gymnasium.

Influenced by the Greeks, the Romans built their own thermal baths at mineral and thermal springs. A military presence was often the key to development of such a spa resort. Spas served not only for recuperation of wounded soldiers but also as rest and recreation centres for healthy soldiers. In contrast with the Greeks, who took the waters after intensive physical exercises, the Romans considered the baths more important than the gymnastics alone. Besides cleansing, exercises, socialising, relaxation, and worship, medical treatment was also applied extensively. Spa treatment consisted of application of water to afflicted parts of the body, immersion of the whole body in the water (especially for rheumatic and urogenital diseases), and drinking excessive quantities of water.

Asclepiades (*c* 124 BC), a Greek physician who practised in Rome, introduced general hydrotherapy and drinking cures as treatments. He recommended bathing for both therapeutic and preventative purposes. Pliny the Elder (AD 23–79) assigned different properties and indications for cure to different types of waters. Galen (AD 131–201) also advocated the use of water for the treatment of a variety of diseases. He preferred cold water, a concept that was reconsidered periodically throughout the following ages.

In Rome three different types of baths developed: baths at home (balnea), private baths (balnea privata), and public baths (balnea publica) that were run by the state. With the introduction of aqueducts, the public baths later developed into huge and impressive edifices (thermae) with a capacity for thousands of people. During the heyday of the Roman bathing culture, the inhabitants of Rome used 1400 litres of water per person per day, mainly for bathing. The Roman legions, far away from their homeland, built their own baths at mineral and thermal springs in the newly conquered lands. Examples are found all over Europe.

Throughout the years the Roman bathing culture gradually changed towards a place for relaxation and pleasure, rather than for medical treatment, although this was still provided. The Romans preferred to use the baths and very hot waters for renewing their appetites and thirst, and the baths became, rather, centres for various sexual practices. Deterioration of morals became manifest, the hygienic and medical indications for bathing disappeared, and baths as a haunt for pleasure ruled.

2.3.2 THE DARK AND MIDDLE AGES

With the fall of the Roman Empire in 476 and the rise of Christianity, the bathing culture fell into disrepute and bathing was officially prohibited. Faith in cure through worship and praying was regarded as more important than a medicinal bath. Baths were redeveloped as churches, although some remained available for the aristocrats who were not affected by the church's decrees. The aversion to bathing remained for many centuries. People abstained from bathing as long as possible, sometimes for years.

From the 13th century onwards, baths gradually came into re-use, particularly in southern Europe under the influence of the Moors. Public baths were rebuilt and the entrance was usually free. The baths were often crowded and people bathed for hours, sometimes days in the same bath. Blood letting, enemas, and drinking cures (up to 10 litres a day) were prescribed, although relaxation and pleasure were most often the reasons for bathing.

2.3.3 RENAISSANCE

In the 16th century the image of the public baths again deteriorated in many countries, which led to the closure of many public baths. They were considered to be a source of contagious diseases such as syphilis, plague, and leprosy, and the baths became dangerous meeting places for political and religious dissidents. In addition, owing to a shortage of firewood, public baths became more expensive for a population that had already become impoverished by many wars. Nevertheless, the gentry continued to visit the baths, although they preferred to go to baths from natural sources with warm, mineral water instead of the public baths.

Taking the waters was now no longer a spontaneous activity, but it was increasingly prescribed under medical direction. Several famous Italian doctors recovered lost texts on medical treatment from the ancient world, and the value of balneology as a therapeutic modality was reconsidered. By this time, the first attempts to analyze the waters for their mineral components were made, although the results were often controversial. It was equally important to recognize the quality of each mineral and its effect on the body, as to know which parts of the body might be influenced by taking the waters. In 1553 an encyclopaedic work, *De balneis omniae qua extant*, was published, containing an overview of ancient and modern literature on the use of medicinal water. In 1571, Bacci published *De thermis*, in which he taught the art of the baths from Galen and the Aristotelians. According to Bacci, taking the waters was not a matter of empiricism, but a sound discipline with its own rationale, institutes, and doctrine, which the learned physician alone was qualified to understand. Minardo published in 1594 a compendium on the two baths of Caldiero in Verona. The first bath was used for drinking and bathing, the second was used by bathers with skin conditions, for bathing of animals, and for washing off therapeutic mud. Seventy eight conditions that might benefit from these baths were listed. The treatments consisted of drinking cures, bathing, purging, and application of mud. It was advised to follow this type of treatment for 15 days, and repeat it every year. According to Bacci, essential to the cure was a quiet orderly life in pleasant surroundings with good food and wine, and a maximum of comfort. Therefore, he argued, the baths would do no good to the poor. Other, practical obstacles also restrained the poor from attending the baths: they had no time for leisure and the baths and mud were usually not free.

The new bathing culture that had developed in Italy gradually spread over other parts of Europe, and was particularly popular with the elite. The development of spa treatment north of the Alps was mainly provided by the Paracelsians. By the turn of the 17th century, many spas were rediscovered in France. Two types of spas existed: hot springs for drinking and bathing, and cold springs for drinking cures only. Taking the waters in French spas was a serious activity and quite sober. Doctors created centres for treatment, not for leisure. Much attention was paid to purging, drinking cures, eating well balanced diets, and bathing. In the afternoons some indoor leisure activities were provided. Late in the afternoon, people walked about on the promenade, and went to bed early in the evening. This was in contrast with many other European countries, where in the evenings diverse leisure activities were offered such as theatre and dance.

2.3.4 19TH AND 20TH CENTURIES

Around 1800 interest in the bathing culture grew. Further attempts to analyse the mineral water were made, aiming at improving its use in medicine, and at preparing mixtures of water identical to those mineral waters famous for their curative properties. Doctors were convinced that for each disease Mother Nature possessed an appropriate medicinal spring, which could be discovered through chemical analysis of the waters. Priessnitz and Kneipp further developed the principles of balneotherapy (medicinal use of thermal water) and hydrotherapy (immersion of the body in thermal water for therapeutic purposes). Individual treatments were prescribed, based on the composition and temperature of the water. Also, combinations of treatments were developed consisting of hot and cold baths, herbal baths, mud packs, active physical exercises, massages, and diets. Kneipp

advocated a holistic approach to the treatment of a disease. In contrast with the spa resorts, which aimed at the elite, Kneipp directed his attentions to the common man.

The use of mineral waters and the development of hotels and guesthouses at the springs became prevalent throughout Europe and North America. Every spa resort had its own theatre, casino, and promenades besides the bathing buildings. In Britain, Germany, Austria, and Belgium much importance was attached to ostentation. Grand hotels arose with casinos and dancing establishments surrounding the spa resorts. The spa resorts became not only a meeting centre for the elite but also a place of creativity for painters, writers, and composers. The baths were again crowded. Baden Baden (Germany) became the most glamorous resort in continental Europe. It was the place to see and to be seen.

However, in Britain use of the spa declined. The English spa resorts were run by amateurs, and the medical hydrology was poorly organised. The resorts aimed more at pleasure, rather than medical treatment, and were exploited by estate developers with commercial interests. Competition from seaside and foreign resorts, and an economic depression in the 1930s led to a further decline. Eventually, spa therapy was excluded from the National Health Service, which meant that many spa resorts in Britain closed down.

After the second world war and with the rise in welfare, spa treatment became available for the common man in many European countries, mainly owing to reimbursement by state medical systems. Other activities and new treatments were introduced, and balneology, hydrotherapy, and physiotherapy underwent major developments.

In the past decades, a large change in the use of mineral water for the treatment of several diseases has taken place in continental Europe. The medical significance of bathing is now acknowledged, especially by many rheumatologists and dermatologists, and this aspect is considered more important for a number of spa resorts than prestige and leisure. Bathing is usually combined with many other treatments, such as physical exercises, hydrotherapy, and mud packs. The spa resorts are differentiated according to their location (for example, seaside, mountain area) and the chemical composition of their mineral water (for example, sulphurous, bicarbonated, or sulphated). Each spring has its own characteristics and related therapeutic properties. However, a substantial number of spa resorts also direct more attention towards leisure. Steam baths, saunas, whirlpools, and solariums are standard equipment of many such spa resorts, with the main objective being to relax and strengthen the body and mind, and to prevent development of disease. In Britain, a revival of the spa culture may be expected, with the re-opening of the hot springs in Bath in 2002. This spa will offer facilities for medical treatment, but, in addition cater for a growing number of so-called health tourists, who combine their holidays with an investment in wellbeing.

2.3.5 SCIENTIFIC EVIDENCE FOR THE EFFICACY OF SPA THERAPY

Despite the popularity of spa therapy, reported scientific evidence for its efficacy is sparse. A decade ago, Heywood (1990) reviewed well documented records on spa treatment for lead poisoning in the 18th and 19th century in Bath. Paralysis occurring as a result of chronic lead intoxication (colica pictonum) was a common problem in those days owing to the widespread use of lead in household ware, cosmetics, food colorants, wine,

and salts for medicinal use. Already at the beginning of the 16th century, Bath was famous for curing paralysis, even in those patients who were regarded as incurable. The treatment consisted of bathing, drinking cures, diet, and purges. Patients admitted to the Bath Hospital came from all over England, and often had already been treated for their paralysis elsewhere, without success. However, many of these presumed incurable patients were cured after their (months) stay in Bath.

An example can be found in the comparison of medical records of Bath and Exeter Hospitals between 1762 and 1767. During these five years, 285 patients with colica pictonum were admitted in Exeter and 281 patients in Bath. Seventy three per cent of the patients from Exeter were cured or improved, whereas the figure was 93% from Bath. Moreover, the group in Bath included some 80 patients referred from Exeter who had not been cured by treatment in Exeter. From 1760 to 1879, 3377 patients were admitted in Bath for paralysis due to lead intoxication. Forty five per cent were cured and 93% had at least improved.

The high cure rates for paralysis by spa therapy in Bath may be attributed to several factors. Sitting in warm water produces diuresis, with increased excretion of sodium, potassium, calcium, and also lead. Also the good food, exercises, removal from the source of lead, and the large quantities of water rich in calcium and iron contributed to the success of spa therapy in Bath.

In the past decade several randomised controlled trials have studied the effects of spa therapy in rheumatoid arthritis and osteoarthritis. Patients were randomly allocated to receive spa therapy or sham/no therapy. The authors of a recent systematic review on the

effects of spa therapy in rheumatoid arthritis and osteoarthritis stated that a definite judgment about its efficacy is impossible because of methodological flaws in these studies. Overall, the results showed positive effects lasting for three to nine months. Recently, a randomised controlled trial has shown that spa therapy is clearly effective in ankylosing spondylitis. Two intervention groups followed a three week course of spa therapy at two different spa resorts, and were compared with a control group who stayed at home and continued standard treatment consisting of anti-inflammatory drugs and weekly group physical therapy. Significant improvements in function, pain, global wellbeing, and morning stiffness were found for both intervention groups until nine months after spa therapy. (van Tubergen , van der Linden, 2002).

2.4 TYPES OF SPA

Club spa - A facility whose primary purpose is fitness and which offers a variety of professionally administered spa services on a day-use basis.

Cruise ship spa – A spa aboard a cruise ship providing professionally administered spa services, fitness and wellness components and spa cuisine menu choices.

Day spa – A spa offering a variety of professionally administered spa services to clients on a day-use basis.

Dental spa – A facility under the supervision of a licensed dentist that combines traditional dental treatment with the services of a spa.

Destination spa - A destination spa is a facility with the primary purpose of guiding individual spa-goers to develop healthy habits. Historically a seven-day stay, this lifestyle transformation can be accomplished by providing a comprehensive program that includes spa services, physical fitness activities, wellness education, healthful cuisine and special interest programming.

Medical spa - A facility that operates under the full-time, on-site supervision of a licensed health care professional whose primary purpose is to provide comprehensive medical and wellness care in an environment that integrates spa services, as well as traditional, complimentary and/or alternative therapies and treatments. The facility operates within the scope of practice of its staff, which can include both aesthetic/cosmetic and prevention/wellness procedures and services.

Mineral springs spa - A spa offering an on-site source of natural mineral, thermal or seawater used in hydrotherapy treatments.

Resort/hotel spa - A spa owned by and located within a resort or hotel providing professionally administered spa services, fitness and wellness components and spa cuisine menu choices.

The concern of this paper is the resort/hotel spa because that is what the proposed design proposal seeks to address, a resort that offers spa services, other services like accommodation/lodging, recreation facilities for total comfort of the guests.

Typical spa services include:

- nutrition counseling
- weight loss
- medical treatment
- fitness consultation
- cooking lessons
- massage
- facials — facial cleansing with a variety of products
- nail care
- waxing — the removal of body hair with hot wax
- body treatments such as body wraps, aromatherapy
- skin exfoliation — including chemical peels and microdermabrasion

2.5 GLASS

2.5.1 INTRODUCTION

Glass, an amorphous substance made primarily of silica fused at high temperatures with borates or phosphates. Glass is also found in nature, as the volcanic material obsidian and as the enigmatic objects known as tektites. It is neither a solid nor a liquid but exists in a vitreous, or glassy, state in which molecular units have disordered arrangement but sufficient cohesion to produce mechanical rigidity. Glass is cooled to a rigid state without the occurrence of crystallization; heat can reconvert glass to a liquid form. Usually transparent, glass can also be translucent or opaque. Color varies with the ingredients of the batch.

Molten glass is plastic and can be shaped by means of several techniques. When cold, glass can be carved. At low temperatures glass is brittle and breaks with a shell-like

fracture on the broken face. Such natural materials as obsidian and tektites (from meteors) have compositions and properties similar to those of synthetic glass. Glass was first made before 2000 BC and has since served humans in many ways. It has been used to make useful vessels as well as decorative and ornamental objects, including jewelry. Glass also has architectural and industrial applications (Microsoft Encarta, 2008).

2.5.2 BRIEF HISTORY

Naturally occurring glass, especially obsidian has been used by many Stone Age societies across the globe for the production of sharp cutting tools and, due to its limited source areas, was extensively traded. According to Pliny the Elder, Phoenician traders were the first to stumble upon glass manufacturing techniques at the site of the Belus River (Hoover, 2007). Agricola, *De re metallica,* reported a traditional serendipitous "discovery" tale of familiar type:

"The tradition is that a merchant ship laden with nitrum being moored at this place, the merchants were preparing their meal on the beach, and not having stones to prop up their pots, they used lumps of nitrum from the ship, which fused and mixed with the sands of the shore, and there flowed streams of a new translucent liquid, and thus was the origin of glass." (Glass, www.wikipedia.com 2008)

This account is more a reflection of Roman experience of glass production; however, as white silica sand from this area was used in the production of Roman glass due to its low impurity levels. But in general archaeological evidence suggests that the first true glass was made in coastal north Syria, Mesopotamia or Old Kingdom Egypt. During the Late Bronze Age in Egypt and Western Asia there was an explosion in glass-making technology. Archaeological finds from this period include coloured glass ingots, vessels (often coloured and shaped in imitation of highly prized wares of semi-precious stones) and the ubiquitous beads.

By the 15th century BC extensive glass production was occurring in Western Asia and Egypt. It is thought the techniques and recipes required for the initial fusing of glass from raw materials was a closely guarded technological secret reserved for the large palace industries of powerful states. Glass workers in other areas therefore relied on imports of pre-formed glass, often in the form of cast ingots such as those found on the Ulu Burun shipwreck off the coast of Turkey.

During the first century BC glass blowing was discovered on the Syro-Palestinian coast, revolutionising the industry and laying the way for the explosion of glass production that occurred throughout the Roman world. Over the next 1000 years glass making and working continued and spread through southern Europe and beyond.

In the medieval Islamic world, the first clear, colourless, high-purity glasses were produced by Muslim chemists, architects and engineers in the 9th century. Examples include Silica glass and colourless high-purity glass invented by Abbas Ibn Firnas (810-887), who was the first to produce glass from sand and stones. The Arab poet al-Buhturi (820-897) described the clarity of such glass, "Its colour hides the glass as if it is standing in it without a container."

Glass objects from the 7th and 8th centuries have been found on the island of Torcello near Venice. These form an important link between Roman times and the later importance of that city in the production of the material. The center for glassmaking from the 14th century was the island of Murano, which developed many new techniques and became the center of a lucrative export trade in dinnerware, mirrors, and other luxury items. What made Venetian Murano glass significantly different was that the local quartz pebbles were almost pure silica, and were ground into fine clear sand that was combined with soda ash obtained from the Levant, for which the Venetians held the sole monopoly.

Beginning in the late 20th century, glass started to become highly collectable as art. Several of the most common techniques for producing glass art include: blowing, kiln-casting, fusing, slumping, pate-de-verre, flame-working, hot-sculpting and cold-working. Cold work includes traditional stained glass work as well as other methods of shaping

glass at room temperature. Glass can also be cut with a diamond saw, or copper wheels embedded with abrasives, and polished to give gleaming facets; the technique used in creating waterford crystal (Glass, www.wikipedia.com)

2.6 GLASS PRODUCTION

Following the glass batch preparation and mixing the raw materials are transported to the furnace. Soda-lime glass for mass production is melted in gas fired units. Smaller scale furnaces for specialty glasses include electric melters, pot furnaces and day tanks (B. H. W. S. de Jong, 1989).

After melting, homogenization and refining (removal of bubbles) the glass is formed. Flat glass for windows and similar applications is formed by the float glass process, where the molten glass floats on top of the perfectly flat molten tin, thus giving it the name "float glass". Container glass for common bottles and jars is formed by blowing and pressing methods. Once the desired form is obtained, glass is usually annealed for the removal of stresses.

Various surface treatment techniques, coatings, or lamination may follow to improve the chemical durability (glass container coatings, glass container internal treatment), strength (toughened glass, bulletproof glass, windshields), or optical properties (insulated glazing, anti-reflective coating).

2.6.1 GLASS PROPERTIES

There are many **properties to glass** that give it an advantage over other materials. These are:

- Renewable
- Reusable
- Refracts light
- Reflects light
- Can make building more energy efficient
- Improves the views out of a building.

- It can be in different colours
- Glass is flexible in shape it comes in (bricks, pane, triangle, square)
- Frosted glass
- Glass does not change during use e.g. rust
- Doesn't wrap

Basically it's much more flexible and provides more opportunity than other materials.

2.6.2 GLASS AS A STRUCTURAL MATERIAL

With the advent in technology researchers and builders have developed load bearing glass that can serve the purpose of transferring load within a building.

- Glass columns
- Corrugated Glass roofing sheets
- Glass beams
- Structural glass cylinder
- Glass-reinforced cement
- Glass blocks
- Glass floors
- Curtain walls.

Glass Floors

The areas where glass floors are being incorporated are increasing massively, as the demand for larger floor space within office or shopping centres puts pressure to bring light further into building spaces. Glass floors can achieve this and specifications that can take crowd loadings have made glass an ideal option. Glass floors with lighting beneath can also create an eye catching feature.

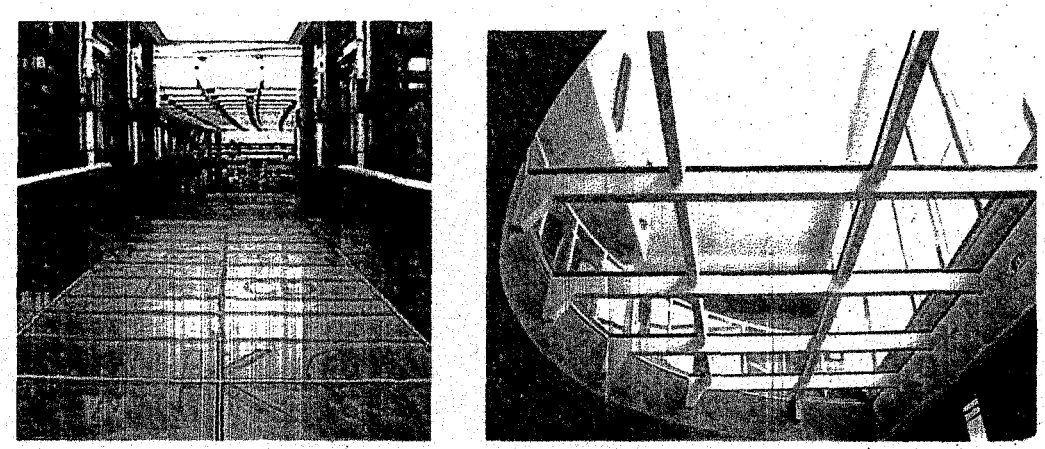

Plate 2.2 glass floors

Source: www.oag.uk.com/oag_images/struct_feat1.jpg

Glass Stairs

Any design using glass in staircase construction adds value to any property. Whether requirement is residential or commercial, designs are provided to ensure the feature staircase adds the 'wow' factor to projects.

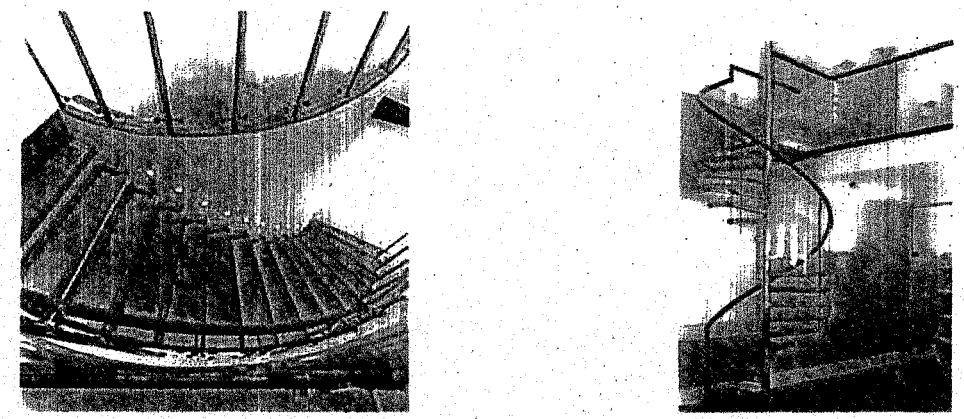

Plate 2.3 different forms of glass stairs

Source: www.oag.uk.com/oag_images/struct_feat2.jpg

Glass Ceilings

With the requirements of most designers to use glass for ease of replacement, cleaning and safety, glass ceiling system allowing maintenance and replacement using similar techniques as standard suspended ceilings are now available. Stunning lighting effects are created to highlight specific areas within a building by incorporating a glass ceiling design with lighting which can help the partially sighted.

Plate 2.4 glass ceiling being used in RBS, Premier Place building

Source: www.oag.uk.com/oag_images/struct_feat3.jpg

Glass Canopies

Glass entrance canopies add to the modern appearance of building entrances and can help make old buildings entrances appear new and modern. However, not forgetting the purpose of a canopy, we have designed integral drainage and decorative techniques to maintain the crisp glass appeal of such a structure. OAG also have the manufacturing resource to create large street canopy structures such as shopping areas and transport interchanges. (www.oag.uk.com/sols_strg.htm)

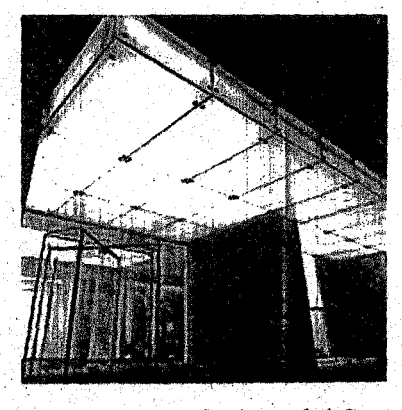

Plate 2.5 glass canopy at 2, Arundel Street, London

Source: www.oag.uk.com/sols_strg.htm

Glass Enclosures

Entrances now require thermal insulation and providing a glass entrance lobby allows designers to maintain a visually clear space for people to enter buildings maintaining good security features whilst providing a stylish entrance. Other types of glass enclosures offer the 'al fresco' feeling by having glass roofs and walls which provide usable space in atria areas without detracting from the open plan design. OAG can

provide such structures whether they are internal or open air locations. (www.oag.uk.com, 2008)

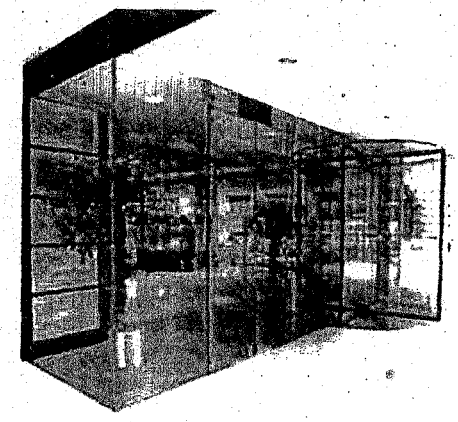

Plate 2.6 a view of a glass façade at Leman Street, London

Source: www.oag.uk.com/oag_images/struct_feat5.jpg

Glass Lift Enclosures

When designing open plan atria, and incorporating lifts, safety of those using these areas is paramount. Lift shafts have to be completely enclosed at any location where the public can access them and many such enclosures have been designed from basement to multiple floor levels. Taking into account the building code requirements and providing fail-safe glass is critical in our designs whilst still allowing visual inspection of the lift mechanism and uninterrupted views from the lift car.

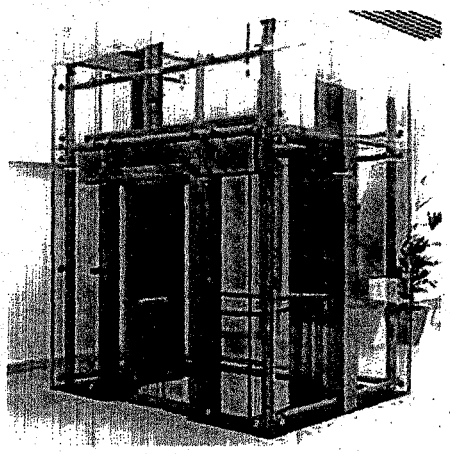

Plate 2.7 view of glass lift at Salvation Army, Queen Victoria Street

Source: www.oag.uk.com/oag_images/struct_feat6.jpg

Glass columns and beams

Plate 2.8 different types of glass columns

Taking structural glass cylinder for example; it is highly transparent and resistant to chemical and thermal stresses. The structural glass cylinder provides an alternative to steel or concrete weight-bearing elements in building construction. To withstand high – compression loads, an outer glass shell is laminated around an inner core glass pipe (www.us.schott.com).

2.7 GLASS AS A BUILDING MATERIAL (ARCHITECTURAL GLASS)

Architectural glass is glass that is used as a building material. It is most typically used as transparent glazing material in the building envelope, including windows in the external walls. Glass is also used for internal partitions and as an architectural feature. When used in buildings, glass is often of a safety type, which includes reinforced, toughened and laminated glasses.

Architectural glass comes in three different strength categories.

Annealed glass is the most commonly used architectural glass. Because it is not heat-treated and therefore not subject to distortion typically produced during glass tempering, it has good surface flatness. On the downside, annealed glass breaks into sharp, dangerous shards. Heat-strengthened and fully-tempered glasses are heat-treated glass products, heated and quenched in such a way to create residual surface compression in the glass. The surface compression gives the glass generally higher resistance to breakage than annealed glass.

Heat-strengthened glass has at least twice the strength and resistance to breakage from wind loads or thermal stresses as annealed glass. The necessary heat treatment generally results in some distortion compared to annealed glass. Like annealed glass, heat-strengthened glass can break into large shards.

Fully-tempered glass provides at least four times the strength of annealed glass, which gives it superior resistance to glass breakage. Similar to heat-strengthened glass, the heat-treatment generally results in some distortion. If it breaks, fully-tempered glass breaks into many small fragments, which makes it suitable as safety glazing under certain conditions. At home you are likely to find tempered or toughened glass in shower and sliding glass patio doors. In commercial structures it is used in unframed assemblies such as frameless doors, structurally loaded applications and any glass where there is a danger of human impact.

2.7.1 LAMINATED GLASS

Laminated glass consists of two or more lites of glass adhered together with a plastic interlayer. Because it can prevent the fall-out of dangerous glass shards following fracture, it is often used as safety glazing and as overhead glazing in skylights. The plastic interlayer also provides protection from ultraviolet rays and attenuates vibration, which gives laminated glass good acoustical characteristics. Because laminated glass has good energy absorption characteristics, it is also a critical component of protective glazing, such as blast and bullet-resistant glazing assemblies.

Laminated glass is normally used when there is a possibility of human impact or where the glass could fall if shattered. Shopfront glazing and windshields are typically laminated glasses. The PVB interlayer also gives the glass a much higher sound insulation rating, due to the damping effect, and also blocks 99% of transmitted UV light.

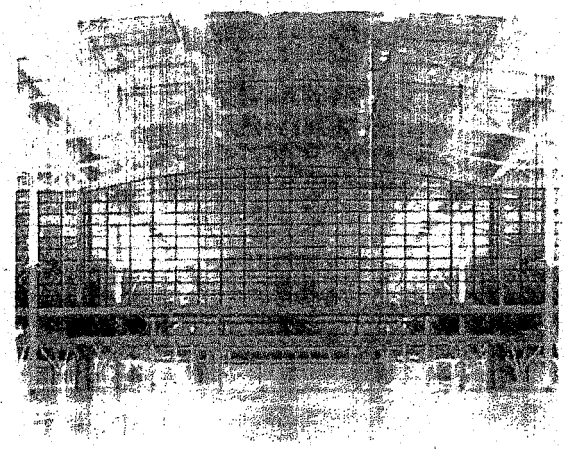

Plate 2.9 Boston Convention & Exhibition Center, Boston, Massachusetts, (2004)

The Boston Convention Center's huge main hall (514,000 square feet) uses moveable wall dividers and double walls made of laminated glass. Since this is floor-to-ceiling glass, laminated glass was used for safety and acoustic reasons creating the program separation while allowing the visual continuity of the space (Charles Blomberg, 2004).

2.7.2 COATED GLASS

Coated glass is covered with reflective or low-emissivity (low-E) coatings. In addition to providing aesthetic appeal, the coatings improve the thermal performance of the glass by reflecting visible light and infrared radiation. Low-emissive (low-E) coatings limit heat gain through the glazing by reflecting heat energy. Reflective coatings reduce interior solar heat gain by reflecting solar energy.

2.7.3 INSULATED GLASS UNITS (IG UNITS)

Insulating glass units (i.g units) consists of two or more lites of glass with a continuous spacer that encloses a sealed air space. The spacer typically contains a desiccant that dehydrates the sealed air space. The air space reduces heat gain and loss, as well as sound transmission, which gives the insulating glass unit superior thermal performance and acoustical characteristics compared to single glazing. Most commercial windows, curtain walls, and skylights contain insulating glass units. Most perimeter seals consist of a combination of non-curing (typically butyl) primary seal and cured (frequently silicone)

secondary seal. The service life of an insulating glass (i.g) unit is typically determined by the quality of the hermetic sealants installed between the glass and the spacers, and the quality of the desiccant.

2.7.4 SHEET GLASS

Sheet glass (sometimes called window glass or drawn glass) was made by dipping a leader into a vat of molten glass then pulling that leader straight up while a film of glass hardened just out of the vat. This film or ribbon was pulled up continuously held by tractors on both edges while it cooled. After 12 meters or so it was cut off the vertical ribbon and tipped down to be further cut. This glass is clear but has thickness variations due to small temperature changes just out of the vat as it was hardening. These variations cause lines of slight distortions. You may still see this glass in older houses. Float glass replaced this process.

2.7.5 ROLLED PLATE GLASS

The glass is taken from the furnace in large iron ladles, which are carried upon slings running on overhead rails; from the ladle the glass is thrown upon the cast-iron bed of a rolling-table; and is rolled into sheet by an iron roller, the process being similar to that employed in making plate-glass, but on a smaller scale. The sheet thus rolled is roughly trimmed while hot and soft, so as to remove those portions of glass which have been spoiled by immediate contact with the ladle, and the sheet, still soft, is pushed into the open mouth of an annealing tunnel or temperature-controlled oven called a lehr, down which it is carried by a system of rollers.

2.7.6 FLOAT GLASS

90% of the world's flat glass is produced by the **float glass** process invented in the 1950s by Sir Alastair Pilkington of Pilkington Glass, in which molten glass is poured onto one end of a molten tin bath. The glass floats on the tin, and levels out as it spreads along the

bath, giving a smooth face to both sides. The glass cools and slowly solidifies as it travels over the molten tin and leaves the tin bath in a continuous ribbon. The glass is then annealed by cooling in an oven called a lehr. The finished product has near-perfect parallel surfaces.

A very small amount of the tin is embedded into the glass on the side it touched. The tin side is easier to make into a mirror. This "feature" quickened the switch from plate to float glass. The tin side of glass is also softer and easier to scratch.

Glass is produced in standard metric thicknesses of 2, 3, 4, 5, 6, 8, 10, 12, 15, 19 and 22 mm. Molten glass floating on tin in a nitrogen/hydrogen atmosphere will spread out to a thickness of about 6 mm and stop due to surface tension. Thinner glass is made by stretching the glass while it floats on the tin and cools. Similarly, thicker glass is pushed back and not permitted to expand as it cools on the tin.

2.7.7 CHEMICALLY STRENGTHENED GLASS

Chemically strengthened glass is a type of glass that has increased strength. When broken it still shatters in long pointed splinters similar to float (annealed) glass. For this reason, it is not considered a safety glass and must be laminated if a safety glass is required. Chemically strengthened glass is typically six to eight times the strength of annealed glass.

The glass is chemically strengthened by submerging the glass in a bath containing a potassium salt (typically potassium nitrate) at 450 °C. This causes sodium ions in the glass surface to be replaced by potassium ions from the bath solution.

These potassium ions are larger than the sodium ions and therefore *wedge* into the gaps left by the smaller sodium ions when they migrate to the potassium nitrate solution. This replacement of ions causes the surface of the glass to be in a state of compression and the core in compensating tension. The surface compression of chemically strengthened glass may reach up to 690 MPa.

There also exists a more advanced two-stage process for making chemically strengthened glass, in which the glass article is first immersed in a sodium nitrate bath at 450 °C, which enriches the surface with sodium ions. This leaves more sodium ions on the glass for the immersion in potassium nitrate to replace with potassium ions. In this way, the use of a sodium nitrate bath increases the potential for surface compression in the finished article.

Chemical strengthening results in a strengthening similar to toughened glass, however the process does not use extreme variations of temperature and therefore chemically strengthened glass has little or no bow or warp, optical distortion or strain pattern. This differs from toughened glass, in which slender pieces can often be significantly bowed.

Also unlike toughened glass, chemically strengthened glass may be cut after strengthening, but loses its added strength within the region of approximately 20 mm of the cut. Similarly, when the surface of chemically strengthened glass is deeply scratched, this area loses its additional strength.

2.8 FUNDAMENTALS IN GLASS USE AS A BUILDING MATERIAL

2.8.1 THERMAL PERFORMANCE (CONDUCTION, SOLAR RADIATION, THERMAL BREAK, COMFORT)

Glass and glazing selection play a key role in determining the overall building's thermal performance. Fenestration thermal performance requirements must be integrated with the design of the building's heating and cooling systems. Single glazing has poor thermal performance and is suitable only for applications where thermal performance is irrelevant, such as interior applications or installations where interior and exterior temperatures do not vary substantially. The vast majority of architectural glazing consists of ig (insulated glass) units. The thermal performance of insulating glazing depends mainly on the solar energy transmittance through the glazing, the reflectance of the glazing (measured by the shading coefficient—the ratio of the solar heat gain through the glazing to the solar heat gain or loss through a lite of 1/8 in. thick clear glass), the width of the air space, and the material and configuration of the spacer around the perimeter of

the unit. Low-emissivity (low-E) coatings limit heat gain through the glazing by reflecting heat energy. Reflective coatings reduce interior solar heat gain by reflecting solar energy.

Thermal performance of glazing is expressed by its thermal conductance, which a measure of air-to-air heat transmission due to thermal conductance and the difference between indoor and outdoor temperature. Conductance is expressed in terms of U-value. A lower U-value indicates reduced heat transfer through the glass.

2.8.2 MOISTURE PROTECTION (WATER PENETRATION, CONDENSATION RESISTANCE)

Since glass itself is impervious to water penetration, glazing waterproofing performance is determined by the glazing method chosen (e.g. wet glazing versus dry glazing) and drainage details of the framing system. Wet glazing most commonly consists of a gunable ("wet") sealant installed over a preformed tape or gasket. Dry glazing systems utilize extruded rubber gaskets as the glazing seals. This system is also referred to as compression gasket glazing because the system relies on compression of the glazing gasket to seal against air infiltration and water penetration. The systems are sometimes mixed, most commonly with exterior wet glazing and interior dry glazing.

Condensation occurs if the temperature of interior frame or glazing surfaces falls below the dewpoint temperature for the interior air. Glazing strategies for limiting condensation include providing glazing with a low U-value and providing supplemental heat to the glazing to increase surface temperatures.

2.8.3 VISUAL (DAYLIGHTING, AESTHETICS)

Glass appearance is influenced by several factors, including tinting (colorants added to the glass batch), reflective and low - E coatings, and opacifiers (for spandrel glass). Photochromic coatings incorporate organic photochromic dyes to produce self-shading glass. Originally developed for sunglasses, these coatings are self-adjusting to ambient

light and reduce visible light transmission through the glass. In architectural glass they are typically used to provide shading.

2.8.4 SOUND (ACOUSTICS)

Acoustic performance of exterior building envelope assemblies is expressed in terms of the Outdoor—Indoor Transmission Class (OITC) rating, which is a measure of the sound transmission loss during standard tests. High sound transmission loss, and therefore good sound insulation, is desirable in most applications. An integrated strategy to limit sound transmission through building walls requires review and testing of the entire wall system, since even small discontinuities in the wall assembly can negate the benefits of a well designed glazing system with a high OITC rating. In general, a higher fenestration OITC rating can be attained by incorporating laminated glass, and insulating glass assemblies (double or triple glazing) because the laminate damps vibration and the air space limits sound transmission. Additional mass in the form of thicker glass lites also helps sound absorption.

2.8.5 SAFETY GLAZING

Fully-tempered or laminated glass is commonly used for safety glazing. Tempered glass limits the risk of injury by fracturing into small fragments. Laminated glass limits the risk of injury by retaining the fractured glass on the plastic interlayer and thereby limiting fall-out of glass fragments. Safety glazing must be identified with an indelible label on the glass indicating its conformance to federal safety standards Wire glass typically does not meet safety standard requirements for safety glazing but is used for fire-rated glazing.

2.8.6 HEALTH AND INDOOR AIR QUALITY

Glazing can contribute to health and indoor air quality problems (by supplying water for mold and mildew growth) by allowing water leakage or condensation.

2.8.7 DURABILITY AND SERVICE LIFE EXPECTANCY

Glass is one of the most durable construction materials, substantially resisting the effects of normal weathering for decades. But glass is also a classic brittle material, suffering significant strength degradation from scratched edges or chips. Most glazing durability problems fall into the following categories (in roughly descending order of failure frequency):

Fogging of insulated glass units is caused by condensation of moist air that penetrates into the air space of insulating glass units through or around the hermetic seal of the unit. Seal failure is usually caused by prolonged water exposure of the perimeter seal, such as occurs when ig units are glazed into frames that do not have functional weep holes to drain water leakage. Premature seal failure can also be caused by discontinuities, poor bond or thin applications of the perimeter seals. To assess the susceptibility of insulated glass units to seal failures, representative units are tested by cycling the units through heating and cooling cycles. Units that pass the test are grouped in three performance levels: Class C, Class CB, and Class CBA. Studies have shown that, in the absence of other deficiencies such as water immersion, after about 20 years the failure rate of Class C or CB units will be about 15% and the failure rate of Class CBA units will be about 2.5%. The desiccant contained in the spacer helps condensation resistance by absorbing moisture built into the unit. Spacers with bent, welded, or soldered corners, rather than corners constructed with slip-in corner keys, are more reliable because they provide a stable surface for primary and secondary seal adhesion.

Similar to insulated glass unit seal failure, laminated glass can delaminate when the edge of the laminated glass is in contact with water over extended periods, causing the interlayer to debond from the glass surface.

Glass fracture is typically caused by impact or by weakening of the glass through the development of cracks, chips or surface scratches. Edge and surface damage can result from careless handling or glass-to-metal frame contact. Fully-tempered glass can break spontaneously from Nickel-sulfide impurities.

2.8.8 MAINTAINABILITY AND REPAIRABILITY

Except for cleaning, glass is generally maintenance-free. Glass used in masonry walls requires frequent cleaning when the building is new to remove alkalis that leach out of the masonry and will etch the glass if left on too long. Some acids used in common masonry cleaners, such as hydrofluoric acid, can dissolve the glass surface and mar it permanently. The deteriorating effect of cleaners is acutest if the glass has a reflective coating on the exterior surface. Cleaning methods for glass should be mild and non-abrasive.

The glazing seals between the glass and framing must be replaced periodically to maintain good performance. Properly installed silicone wet seals should last 10 to 20 years; gaskets 15 to 20 years.

Replacement of failed insulating glass (ig) units is facilitated if the units are glazed from the interior, see the discussion in the relevant window, curtain wall and skylight portions of the design guide, but this glazing configuration typically has less reliable waterproofing performance. Fogged i.g. units cannot be repaired.

2.8.9 SUSTAINABILITY

Insulated glass units have a shorter service life (most practitioners estimate it at 15 to 30 years) compared to monolithic glass, which, if not physically damaged, has an infinite lifespan. The energy savings afforded by insulated glass units usually pays for the replacement cost if the units last more than 15 years. Actual payback periods vary substantially by location.

On the downside, insulated glass units are typically not recycled: since they consist of a mix of glass, metallic glass coatings, sealants, and aluminum spacers, insulated glass units require significant and costly effort to separate the constituent materials. Furthermore, glass is manufactured from relatively inexpensive and abundant raw materials, which makes glass recycling unattractive. At the end of their service life, insulated glass units are generally discarded as general trash. Crushed glass is sometimes

utilized as hard fill. Most glass manufacturing plants recover glass discarded during the float glass manufacturing process and combine them with other batch materials for subsequent production. Overall, the most promising strategy to limit the amount of glazing in the waste stream is find ways to extend the service life of insulated glass units.

2.9 APPLICATIONS OF GLASS USED AS A BUILDING MATERIAL

2.9.1 IMPROVING WATERPROOFING PERFORMANCE

The waterproofing performance of the glazing system depends on the following:

- Details of the framing system that promote drainage,
- Internal framing seals,
- External (i.e. glass-to-frame) seals, and
- Frame perimeter seals and flashings.

Glazing sealants cannot exclude all water, so providing internal drainage is critical. Wet-glazed systems generally prevent water entry around the glass and into the glazing pocket much better than dry-glazed systems. Replacement intervals for dry gaskets and the cap bead of wet-glazed systems are about equal. Table 3.1 lists advantages and disadvantages of both systems. For maximum watertightness, a wet-glazed system, consisting of pre-shimmed butyl tape glazing tape and silicone cap bead, should be specified.

Table 2.1: Wet vs. Dry Glazing (Vigener et al, 2006)

Glazing System	Advantages	Disadvantages
Wet Glazing (Gunable wet seal over back-up rod or glazing tape)	• Improved resistance to water penetration • Protects i.e. unit edges and laminated glass from water and premature deterioration • Reduces glass movement ("walk")	• Requires exterior access for installation, maintenance and glass removal • Highly workmanship dependent (surface preparation, weather, etc.) • Costs more than dry glazing
Dry Glazing (pre-formed rubber gasket)	• Can be done from interior • Less dependent on field	• Not as watertight • Gaskets can shrink, creating

workmanship and weather • Generally less costly than wet glazing	openings for water penetration • Gaskets can roll into pocket and place uneven stress on glass • Glass can "walk"

2.9.2 IMPROVING INSULATING GLASS DURABILITY AND THERMAL PERFORMANCE

The durability of insulating glass units is dependent on the quality of the hermetic seal and the level of protection from water afforded by the glazing seal and the window frame system. The following design requirements are critical to ig unit durability:

Dual seals (butyl-based primary seal and silicone secondary seal) are more reliable and durable than single-seal systems. The continuity and uniformity of both primary and secondary seals is critical, and continuous seals should be stipulated in the specifications. The spacer should be filled with desiccant and constructed with bent, welded, or soldered corners rather than corner keys. The units should carry an approved rating to ensure comparable units have reasonable durability.

Other critical glazing features that should be specified to reduce the risk of insulating glass unit seal failure include properly sized setting blocks (min. 1/4 inch thick) to raise the edge of the insulating glass unit glass above water level in the glazing pocket. The setting blocks must be wide enough to support the entire insulating glass unit cross section and be notched to allow water to drain toward the weep holes. Setting block material must be chemically compatible with the insulating glass unit secondary seal. The frame design must promote water drainage away from insulating glass unit (i.e. sloped glazing pockets, large (3/8 in. diameter) weep holes, and drainage within each glazing opening (i.e. do not use vertical mullions as "downspouts").

Glass manufacturers publish center-of-glass U-values. The perimeter of insulating glass typically has a higher U-value due to heat transmission through the spacer. Fenestration framing will also have a different U-value. Therefore, window and curtain wall manufacturers publish total U-values based on specific glass products glazed into their

systems. Heat loss and condensation problems almost always occur near the glazing perimeter. Thermal analysis of the entire window or curtain wall system, including all perimeter conditions, is required for high-humidity applications or buildings where condensation is a concern.

2.9.3 IMPROVING LAMINATED GLASS DURABILITY

Similar to insulating glass unit failure, failure of laminated glass by delamination is frequently caused by long-term exposure of the glass edge to moisture. Design recommendations to limit the risk of laminated glass failure include the following:

- Protect the edges of laminated glass from exposure to water to limit the risk of delamination. In general, glazing installation details that promote good waterproofing performance and insulating glass unit durability will also result in improved laminated glass durability.
- Some materials used for laminated glass interlayers, such as polyvinyl-butyral (PVB) are not compatible with many building sealants, so some delamination will occur with butt-glazed joints where the sealant is in contact with the interlayer.
- Check the track record of laminated glass products that have several added plastic interlayers for increased impact resistance as some combinations of interlayer products adhere poorly and can cause delamination.

2.9.4 DESIGNING FOR UV PROTECTION

Ultraviolet radiation can cause material deterioration. Methods to provide UV protection, e.g. for libraries or museums, include providing laminated glazing (the PVB interlayer absorbs UV), certain applied films, or curtains and shades. Depending on the thickness of the PVB interlayer, laminated glass can filter out more than 99% of the UV radiation. Applied films are easily scratched and eventually experience color changes, so they are less durable than laminated glazing.

2.10 FORMS OF GLASS

2.10.1 GLASS BLOCKS

Glass block is indeed a unique building material that seems to blend with many architectural styles. In addition, it is a rare oxymoron building material; it can provide privacy, yet permit enormous amounts of light to pass from room to room or from outdoors to indoors. Glass blocks are hollow glass units. Their production involves melting a quantity of glass and cooling it to approx. 1200°C. This doughy mass is subsequently moulded into shells. Two shells are required for each block. they are pressed together and the contact faces reheated in such a way they fuse together. The two outer, exposed faces could be smooth or textured. Glass blocks are produced in certain sizes and are covered by basic standards e.g. the European standard EN 1051.

Glass blocks may be coloured and the surfaces decorated in the most diverse ways. The special forms of the glass blocks enable it to be used as an artistic element. Walls of glass blocks meeting fire-resistance classes G 60 and G 120 are also possible

2.10.2 GLASS FIBER REINFORCED CONCRETE (GFRC)

It is a type of fiber reinforced concrete. Glass fiber concretes are mainly used in exterior building façade panels and as architectural precast concrete. This material is very good in making shapes on the front of any building and it is less dense than steel.

Glass fiber reinforced composite materials consist of high strength glass fiber embedded in a cementitious matrix. In this form, both fibers and matrix retain their physical and chemical identities, yet they produce a combination of properties that can not be achieved with either of the components acting alone. In general fibers are the principal load-carrying members, while the surrounding matrix keeps them in the desired locations and orientation, acting as a load transfer medium between them, and protects them from environmental damage. In fact, the fibers provide reinforcement for the matrix and other useful functions in fiber-reinforced composite materials. Glass fibers can be incorporated into a matrix either in continuous lengths or in discontinuous (chopped) lengths. The most common form in which fiber-reinforced composites are used in structural application is called a laminate. It is obtained by stacking a number of thin layers of

fibers and matrix and consolidating them into the desired thickness. The fiber orientation in each layer as well as the stacking sequence of various layers can be controlled to generate a wide range of physical and mechanical properties for the composite laminate.

The design of GFRC panels proceeds from a knowledge of its basic properties under tensile, compressive, bending and shear forces, coupled with estimates of behaviour under secondary loading effects such as creep, thermal and moisture movement.

There are a number differences between structural metal and fiber-reinforced composites. For example, metals in general exhibit yielding and plastic deformation whereas most fiber-reinforced composites are elastic in their tensile stress-strain characteristics. However, the dissimilar nature of these materials provides mechanisms for high-energy absorption on a microscopic scale comparable to the yielding process. Depending on the type and severity of external loads, a composite laminate may exhibit gradual deterioration in properties but usually would not fail in catastrophic manner. Mechanisms of damage development and growth in metal and composite structure are also quite different. Other important characteristics of many fiber-reinforced composites are their non-corroding behaviour, high damping capacity and low coefficients of thermal expansion (www.wikipedia.com).

2.10.3 CURTAIN WALLS

The modern curtain wall originated around the middle of the 20th century in America; Crucial to its development, besides aesthetic and architectural factors was above all economic. In the 21st-century, the emphasis of curtain wall and slope wall manufacturers is on more highly weather resistant packages with heightened energy efficiency, using more durable and long-lasting materials and finishes, recyclable materials. Glass glazing, long thought to be a building's weak link with regard to energy performance, now rivals insulated walls in its ability to maintain a desired interior climate while reflecting unwanted effects of the sun. Today's walls are more sophisticated in every respect.

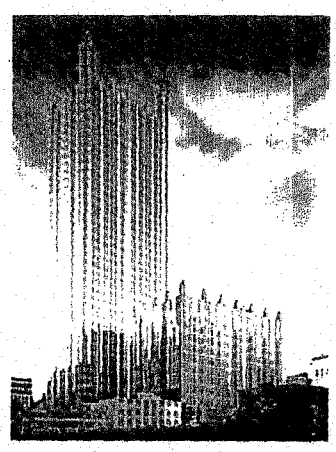

Plate.2.10 showing a glass structure One PPG Place, Pittsburgh, (P.A. John Burgee Architects with Phillip Johnson)

"Today," says Carl Wagus, technical director for the American Architectural Manufacturers Association, "we are working on test methods for evaluating the performance of thermally broken aluminum—we've already developed a series of standards for evaluating thermal barriers structurally."

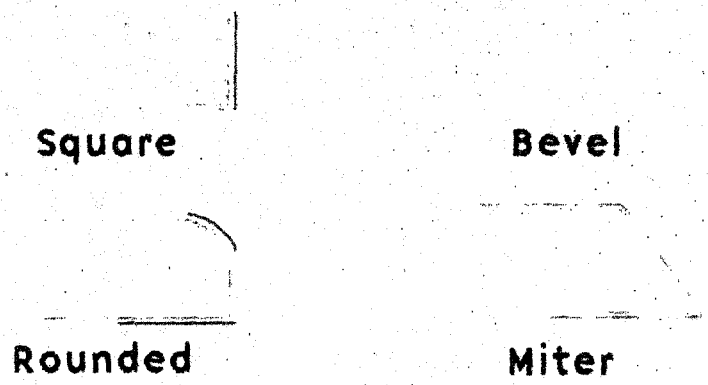

Plate 2.11: Edges for glass as a building material

Source: Microsoft Encarta 2003

The movement to "green" architecture has meant that structural systems are being asked to support more material, including sun shades and light shelves. "Architectural firms say 40 percent of what they are designing right now has some type of sun shade built into the curtain wall system".

2.10.4 GLASSS CERAMICS

Glass containing certain metals will form a localized crystallization when exposed to ultraviolet radiation. If heated to high temperatures, the glass will convert to crystalline ceramics with mechanical strength and electrical insulating properties greater than that of ordinary glass. Such ceramics are now made for such uses as cookware, rocket nosecones, and space-shuttle tiles. Other metallic glasses—including alloys of pure metals—can be magnetized, are strong and flexible, and prove very useful in high-efficiency electrical transformers (Microsoft Encarta, 2008).

2.11 NEW TRENDS IN THE USE OF GLASS

In the past glass was mainly utilized for windows to allow some air and light in to rooms. Today glass is utilized in the construction of several elements of exterior and interior architecture. **Exterior glass architecture** includes facades, display windows' skylights, skywalks, entrances, revolving doors, canopies, winter gardens and conservatories. All of which allow homes to be bathed in natural sunlight with gorgeous outdoor views. **Interior glass architecture** can be used for staircases, elevated walkways and even as traditional walls. There are some houses in which all of the walls are actually glass. Such high quantities of glass previously compromised other aspects such as the heating and cooling requirements. Fortunately such great progress has been made in the glass industry that we now have access a variety of different kinds of glass each with fantastic benefits. One such example is glass with spectrally-selective qualities, which allows light to stream into the house without being harmful or degenerative to occupants and their belongings (Sarah M, 2006).

2.11.1 GLASS FIBRES

It is possible to produce fibers that can be woven or felted like textile fiber by drawing out molten glass to diameters of a few ten-thousandths of an inch. Both long, continuous multifilament yarns and short-staple fibers 25 to 30 cm (10 to 12 in) long may be produced. Woven into textile fabrics, glass fibers make excellent drapery and upholstery materials because of their chemical stability, strength, and resistance to fire and water. Glass fabrics alone, or in combination with resins, make excellent electrical insulation. By impregnating glass fibers with plastics, a composite fiberglass is formed that combines the strength and inertness of glass with the impact resistance of the plastic (Microsoft Encarta, 2008).

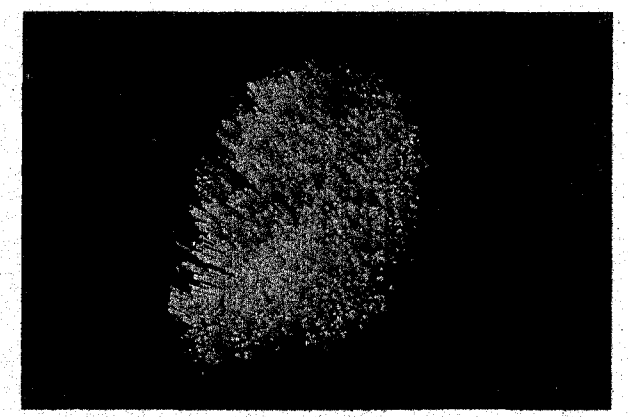

Plate 2.12 Fiber-Optic Strands (Source: Microsoft Encarta, 2008)
A strand of fiber-optic cable reflects the light that passes through it back into the fiber, so light cannot escape the strand. Fiber-optic cables carry more information, suffer less interference, and require fewer signal repeaters over long distances than wires.

2.11.2 TRANSLUCENT CONCRETE

Strands of glass make concrete visibly different, a newfangled version of the old construction standby that offered a combination of aesthetics and practicality.

The translucent blocks are made by mixing glass fibres into the combination of crushed stone, cement and water, varying a process that has been used for centuries to produce a versatile building material. The process was derived by Hungarian architect Aron Losonczi in 2001.

One of the first demonstrations was a sidewalk in Stockholm made of thin sheets of translucent concrete. It looks like an ordinary side walk by day but is illuminated at night by lights under it. It might also be used in an indoor fire escape where you wanted light to come trough in case of a power failure.

2.11.3 LIGHT-CONTROL GLASS

These are sheet glasses that can control the amount of light passing through them. Window blinds won't be necessary if window glasses darken by themselves. Light-control glasses should make this concept a reality. Different types of energy can darken glasses; heat, light, and electricity. The glasses react to each type of energy are called thermo chromic, photo chromic and electro chromic respectively. For example, electro chromic glasses having WO3 multilayer films on the surface changes its colour with a single switch in compliance with a certain degree of voltage to be loaded. Electro chromic glasses are already used for rear-view and side mirrors of automobiles. They will be ideal for windows when larger glass sheets are able to be manufactured.

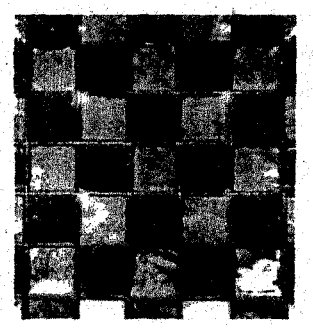

Plate 2.13 Light control glass
Source: Microsoft Encarta 2003

2.11.4 GLASS ADHESIVE STRUCTURAL ELEMENTS

The structural use of glass is limited by the available forming and jointing techniques. Float glass is used to obtain a transparent and smooth appearance but it is either flat or curved to a comparatively large radius. Cast glass can be used to produce channel and slab sections but these lack smooth surfaces and transparency. Work has shown that it is possible to get within 99 percent of fully composite action. With the use of modified epoxy adhesives and saline primers it is normal for failure to

occur in the glass adjacent to the adhesive before the adhesive fails. The figure below shows (at exaggerated scale) the deflections of a glass flange. The glass may carry stresses as high as 140 N/mm^2 and buckling is the more likely cause of failure.

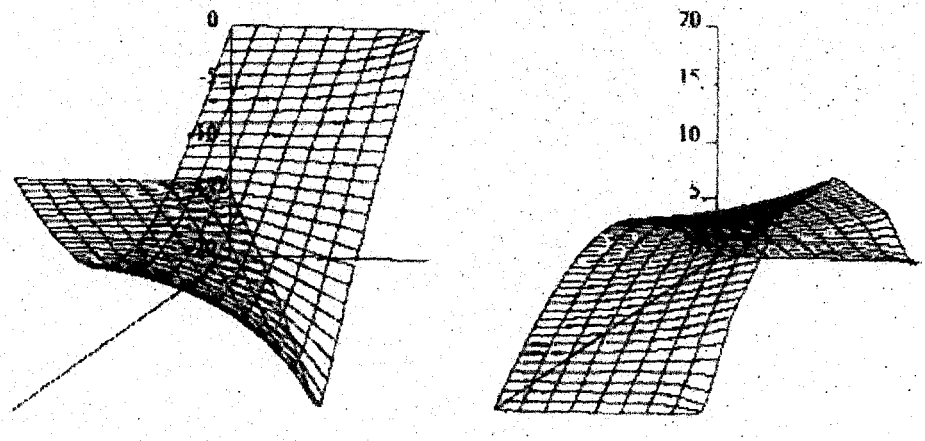

Fig. 2.1 Stress reaction in glass structural element

Source: Microsoft Encarta 2003

2.11.5 FIRE RESISTANT GLASS

Glass for fire protection purposes are divided into two categories

G-glass: this type prevents flames and fumes from penetrating for a specified length of time; radiated heat however is not contained.

F-glass this type prevents flames and fumes from penetrating for a specified length of time but also contains the heat radiation produced by the fire.

2.11.6 GLASS AS AN ACOUSTIC MATERIAL.

Acoustic **Glass Fiber Diffusers** are ideal for wall and ceiling applications in band, choral and music facilities requiring acoustical performance. The acoustic quality of a room can be enhanced with a combination of Wall Panels and Diffusers. Diffusers are constructed of rigid E-glass and are molded in a one-piece shape. They are lightweight and easily installed. There are glass fiber diffuser panels standard finishes with white gel-coat or

optional fabric wrap. Standard sizes range from nominal 2' X 2' to 4' X 8' with custom sizes available. Possibilities are endless with the line of acoustic Glass Fiber & Wood Panels.

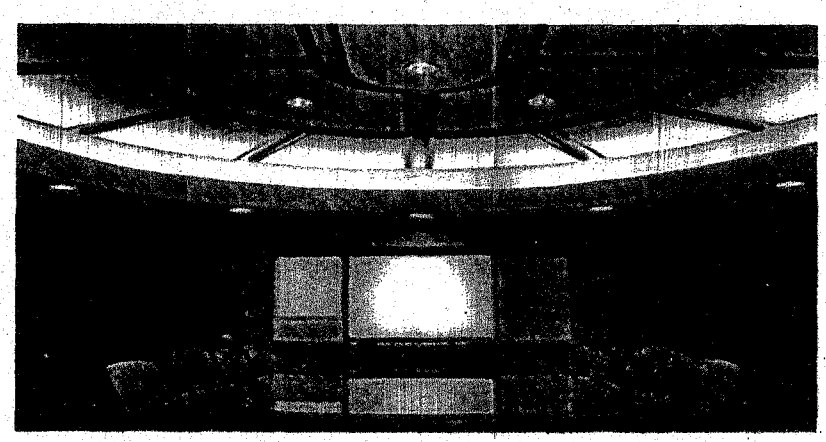

Plate 2.14 Glass used as an acoustic material.
Source: Microsoft Encarta 2003

2.11.7 SELF CLEANING GLASS

A recent innovation is called **self-cleaning glass**, aimed at building, automotive and other technical applications. A nanometre-scale coating of titanium dioxide on the outer surface of glass introduces two mechanisms which lead to the self-cleaning property. The first is a photo-catalytic effect, in which ultra-violet rays catalyse the breakdown of organic compounds on the window surface; the second is a hydrophilic effect in which water is attracted to the surface of the glass, forming a thin sheet which washes away the broken-down organic compounds.

2.12 CONCLUSION

There has been a stylistic evolution in architecture over recent years; if buildings do not have lots of glass in them they are not considered truly 'modern'. New technologies in glass have led to this evolution. Now there is the newly-discovered structural capacity of laminated glass. This is really encouraging; it is a fully-fledged structural building

material that lets you see through it. Laminated glass is strong, it is stiff. Yet it represents a total break with traditional veneer structural building materials because of its transparency. Also the flexibility and durability of glass has made it a major part of architectural building materials used in different forms and in most institutionalized buildings, not forgetting its aesthetic value either plain, coloured or tainted glass is suitable for use in modern day architectural buildings if a statement is to be made.

Various types of glass have been used at various parts of the buildings in the proposed design for Badagry beach resort and spa especially laminated glass which is strong and stiff. Laminated glass was used as a roofing material in some parts of the multi-purpose halls due to its good acoustic nature. Insulated glass (i.g) units were mostly used in the glazing of the façade of the administrative block and suites because of its thermal insulation nature. Electrochromic tinted glass was used in other parts of the façade of the building as it reduces the amount of heat and humidity coming from outside the building to the inside. Photovoltaic glass was also used in combination with other glass types in the guest chalets and the administrative block to generate power needed. Tempered glass was used in the glazing of the windows and doors of the guest chalets due to safety and security reasons to avoid injuries in case of damage. Coloured bent glass was used in the restaurant to improve the aesthetic appearance and give a clear view of the beach from the interior as the guests enjoy their meals.

All these qualities of glass and advancements made in the glass industry influenced the use of glass as an area to emphasize on and a major building material to use in this project.

CHAPTER THREE

3.0 MATERIALS AND METHODS

3.1 THE PROPOSED SITE

The proposed site is located along the Lagos- Badagry expressway, 5km after the Suntan Beach. It is 102 km from the Seme border i.e. the border between Nigeria (Lagos) and Benin (Cotonou). This site is situated along the sandy Atlantic coastline of Badagry area and is filled with palm trees of different height which would be integrated in the final design thereby preserving its natural form.

3.2 RESEARCH METHOD

3.2.1 METHOD OF DATA COLLECTION

The method used to carry out the data collection is basically two namely:

Descriptive and Historical Methods

Historical methods: Basically the approach intended in the method of research in this project will be essentially through;

- Case studies of facilities of similar interest to my project
- Research through books, journals, seminars, media articles etc.
- Research on the internet (World Wide Web)
- Through questions to be put forward to tourists in the field and staff of some resorts

Descriptive methods: Review of existing and similar case studies and designs relevant to the area of study are analysed and used as main guidelines. Interviews were also conducted

3.3 INTRODUCTION TO CASE STUDIES

The case studies conducted or carried out is to enable an establishment of a firm foundation for the project design, and also have a good understanding of resorts; what they are composed of and how they work both in Nigeria and the world. It became paramount that there is a need to know about existing resorts, their mode of construction and maintenance, problem faced and how to solve them in the proposed badagry beach resort and spa design.

Therefore case studies of different resorts and related facilities were carried out to achieve the mentioned aims and objectives above. In this regard, case studies were carried out on the following namely;

3.3.1 CASE STUDY ONE

EKO TOURIST BEACH RESORT

LOCATION

This is a beach and holiday resort located at km 22 Lagos-Epe expressway, Ibeju Lekki, Lagos state. It shares a boundary with the children's amusement park located on the eastern side of the resort. This resort is owned by the Lagos state government but maintained and managed by a private firm.

FORM AND LAYOUT

The site is built on 10 hectares of land. It is defined by a fence except at the beach line for security purposes and to restrict encroaching by uninvited guest and visitors. The site is generally planned to accommodate all the facilities provided which include the guest chalets that are in a linear form along the paved walkway created for easy accessibility.

The guest chalets are evenly spaced to allow for proper ventilation and circulation also allowing for the beautiful landscape provided around the buildings. There are three entrances to the beach front to allow for easy access by guests lodging at the chalets. There is also a beach pavilion at the beach front for entertainment purposes for artiste to perform when there are shows at the beach. The guest chalets range from single room en-suite to room and living room, to the 2-bedroom apartment designed to satisfy various tourists and visitors. The administration building is to the west of the site very close to the police post.

FACILITIES

The facilities provided in this resort are numerous including; 150 guest chalets of 5 categories: A. single room, bed size 4X6ft (en-suite)-20 nos.

B. similar to A but bigger 5X6ft bed size-20 nos.

C. single room en-suite with balcony, bed size 6X6ft with kitchenette-40

D. room and living room en-suite with kitchenette, bed size 4X6ft -30 nos.

E. 2-bedroom apartment designed for family of four- 40 nos.

Swimming pool, 2 lawn tennis court, beach volley ball, beach football, pool (snooker) table, table tennis, multi purpose hall, mini hall, syndicate hall and beach pavilion. There is also a restaurant and bar at the administration building, 300KVA and 500KVA generators for power, water treatment plant and toilet at the beach side.

APPRAISAL

MERITS

1. The site is well planned for easy circulation and accessibility for the visitors and staff.

2. Internal floor space in the guest chalet is adequate because circulation is easy.
3. Parking space provided follows minimum standard of 1 parking space to a room thereby it is adequate for the number of chalets provided in the resort.
4. The area is well landscaped with green grasses, shrubs and trees to aerate the environment and provide shading from the sun.
5. Good security provided as there is a police station in the resort.
6. Rooms provided are cross ventilated.

DEMERITS

1. The distance from the administration building to the guest chalet A and B is far for room services.
2. The use of metals close to the salty beach makes them corrode and not last long.

Plate 3.1 Entrance to Eko tourist beach resort

Source: researcher's field survey

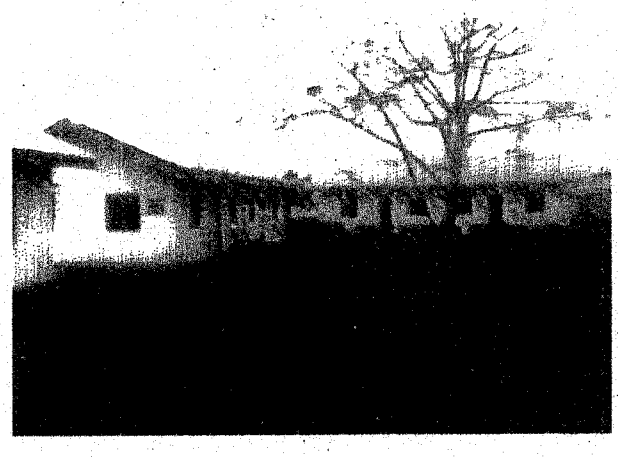

Plate 3.2 View of guest chalets and landscaped area

Source: researcher's field survey

Plate 3.3 Interior of the administrative building

Source: researcher's field survey

3.3.2 CASE STUDY TWO

HERMITAGE GARDENS RESORT

LOCATION

Hermitage resort is a secluded private resort on the Lekki/Ajah pennisular at Tiye village near Akodo, Lekki local government area of Lagos state.

FORM AND LAYOUT

Hermitage gardens resort is a privately run resort and it is not open to just anyone only those who can afford its services. Because of its nature it is fenced all round to maintain that privacy and it provides for only 90 suites which is minimal compared to that of Eko tourist which is open to all. The resort is on a a hectare piece of land stretching from the road to the beach line. There is a setback of about 70m from the lekki express road. The executive suites, restaurant and bar are located within the administrative building while the guest chalets are at the rear of the site. There is a multi purpose hall for hosting events and occasions to the west of the administrative block. There is also a cyber café and the manager's office located opposite the administrative block.

FACILITIES

Hermitage gardens resort has the following facilities; 1 restaurant, 4 conference rooms, 1 gymnasium, 2 swimming pool (one for adult and the other for children), 4 power generators, private treatment plant for water supply, a beauty parlour, a mini mart, beach front for relaxation, and a mini zoo with alligators and monkeys.

APPRAISAL

MERITS

1. Large executive suites with luxurious interior decoration fit for royalty.
2. Spacious and well circulated site.
3. Well spaced guest chalet to enhance ventilation and lighting in buildings.

4. The site is well landscaped to add to its aesthetical value as a resort and to attract visitors.

5. The environment is conducive to those visitors that which to relax and recuperate from any ailment.

DEMERITS

1. The parking space provided is inadequate compared to the number of guest they are accommodating in a situation where they all come with cars.

2. Long narrow lobbies in the administrative building leading to the executive suites that are not naturally lighted.

Plate 3.4 Exterior view of the Administrative block

Source: researcher's field survey

Plate 3.5 A view of one the blocks of the guest chalets

Source: researcher's field survey

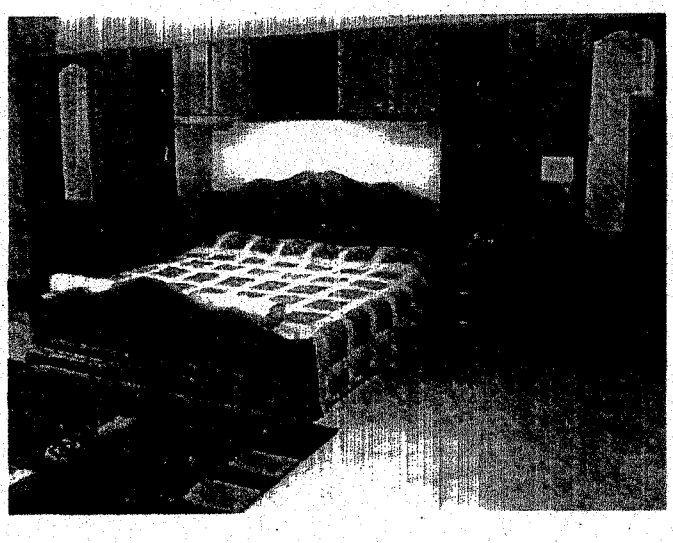

Plate 3.6 Interior of executive suite

Source: researcher's field survey

3.3.3 CASE STUDY THREE

OBUDU RANCH RESORT

LOCATION

This facility is located on a relatively flat plateau, on the Ishie ridge of the Sankwala mountain ranges. It is approximately 110km east of Ogoja, Cross River state of Nigeria. The nearest town is Obudu, which is about 60km from the ranch resort.

FORM AND LAYOUT

The site is particularly not defined by a fence rather the ends are terminated by valleys. The buildings are all bungalows and are well spread on properly landscaped plain networked by motor-able roads. The activities are arranged in the site in a manner that separates noise and traffic, allowing for rest area and recreational areas. The character of the building is quite western and the walls are predominantly finished with stone pitched ornaments. The hospitality, catering, staff accommodation and indoor recreation are on the highest plain; the conference centre and outdoor recreation are on the next level while the farms and animal sheds, police station and clinic are at another level. The local community and the market are on the lowest level.

FACILITIES

The facilities are numerous including a variety of chalets and suites, the restaurant and bar, sit-outs, maintenance section, staff quarters, tennis court, gymnasium, executive and presidential wings, conference hall, play ground for kids, clinic, police station, bee-hive, pig sties, horse and cattle stables, grazing land(freisland)poultry and picnicking ground.

APPRAISAL

MERITS

1. The development is well integrated with the community.
2. The layouts of chalets are well organized.
3. It can easily be accessible by road especially at plateau level.

4. The site offers adequate and total leisure, recreation and peace.

5. It offers very beautiful scenery and breath taking views.

DEMERITS

1. Inadequate parking for visiting tourists especially guests.

2. The accommodation is not of high luxury status.

3. The road up the hill is too narrow and windy. It also does not have barricades at the edge of the valley. This can cause a lot of anxiety to tourists.

4. The scope of the project is quite small compared to the land available.

Plate 3.7 External view of guest chalets

Source: www.visitcrossriver.com

Plate 3.8 Cable cars at the ranch

Source: www.visitcrossriver.com

Plate 3.9 Dangerous bend up the hill of the ranch road

Source: www.visitcrossriver.com

3.3.4 CASE STUDY FOUR

CARMEL FOREST SPA RESORT, ISRAEL

LOCATION

The Carmel Forest Spa Resort lies in the heart of the Carmel Forest, set amidst 15 acres of private woodland. Only 50 minutes drive from Tel Aviv and 20 minutes from Haifa in Israel.

FORM AND LAYOUT

Nestled in the lush green forest, facing the deep blue sea, this is the ideal place to relax, be pampered and rejuvenate. The Carmel Forest Spa Resort, Israel's largest and most luxurious spa, invites you to take time out, to invest in pampering your body and refreshing your soul and to recharge your batteries so that you can cope with the

pressures and pace of modern life. Dozens of health and beauty spa treatments for body and face and a wide range of activities for body and soul. Workshops, gourmet (kosher) healthy cuisine and many pampering treats - all designed to renew body and soul, a truly life-enhancing experience.

FACILITIES

There are 126 luxurious and elegantly designed guestrooms and suites at the Spa: with: coffee, phone, radio, TV, air condition. These rooms are;

Carmel Deluxe Room – This is a double room with a sitting area and a view of the forest and sea.

Tsameret Room – This is a double room with a sitting area and a balcony, with 2 sun loungers, overlooking the forest.

Garden Room – This is a Tsameret room with direct access to the gardens of the resort and the outdoor swimming pool.

Carmel Suite – This is an elegant, luxurious room with a salon and balcony, with 2 sun loungers, overlooking the forest.

Tsameret Suite – These are very spacious, elegant, luxurious room with a salon and balcony, with 2 sun loungers, overlooking the forest.

The Resort Offers:

A Spa that offers 2,500 square meters of pampering, 2 swimming pools: a covered, heated pool and an outdoor pool in the Spa garden (in season), Authentic Turkish Hamam, Dry and wet saunas (separate for men and women), State of the art fitness room, Exercise room, Well equipped 152 seat auditorium, Modular meeting rooms, Reading room, Music room, Games room- billiards, cards and more, Tennis court, Hairdressing

salon, Spa shop, selling cosmetic products and sports clothing, all exclusive to the Carmel Forest Spa Resort, aromatic oils and more.

Restaurant: Three meals a day are included in the room rate. A meat menu is served at lunch and dinner and the emphasis is on healthy, gourmet cuisine (kosher).

APPRAISAL

MERITS

1. The facilities on the resort are well arranged and planned.
2. The resort is located in a very conducive and relaxing environment within the Carmel forest and nature around it.
3. The rooms provided are very spacious and comfortable.
4. Easy circulation within the rooms and within the site.

DEMERITS

1. The building depends greatly on artificial lighting.
2. The resort is not environmentally friendly because most of the natural environment was destroyed to erect the structure.

Plate 3.10 A view of the sun loungers overlooking the forest

Source:

www.inisrael.com/isrotel/hotels/carmel_forest_spa_resort

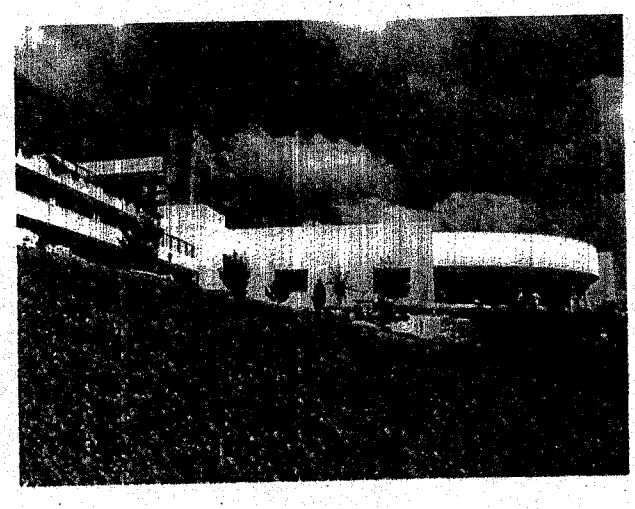

Plate 3.11 An exterior view of the Carmel resort

Source:

www.inisrael.com/isrotel/hotels/carmel_forest_spa_resort

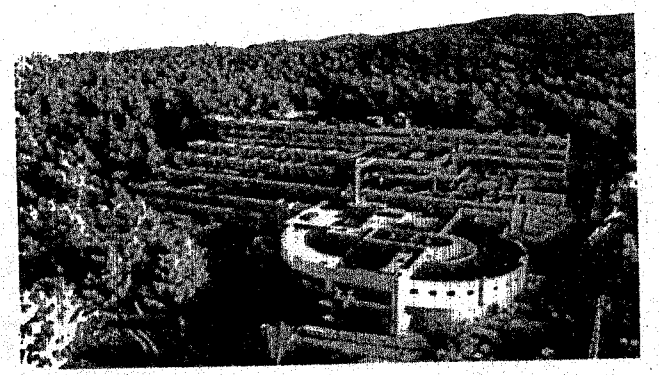

Plate 3.12 Aerial view of the resort

Source:

www.inisrael.com/isrotel/hotels/carmel_forest_spa_resort

3.4 DATA COLLECTION

Lagos state is the ever expanding economic nerve centre of the country. It lies to the south-western part of the Federation. It shares boundaries with Ogun State both in the North and East and is bounded on the west by the Republic of Benin. In the South it stretches for 180 kilometres along the coast of the Atlantic Ocean. The smallest State in the Federation, it occupies an area of 3,577 sq km. 22% or 787sq. km of which consists of lagoons and creeks. It has a variegated culture because of its exposure to numerous cross-cultural influences thus putting it in a unique position in Nigeria (Lagos, www.e-nigeria.net).

Importantly though, a detailed consideration of the widest possible range of factors will still throw up Lagos as one of the most suitable places in Nigeria for the citing of this project. This is because of its cosmopolitan nature, its agreeable climate, vis-à-vis sustainable development and its potential as a tourist destination.

Beyond generalities however, the choice of Badagry, Lagos for the location of the **Badagry beach resort and spa** is informed by the following detailed study of the climatic, socio-cultural and economic character in this chapter.

3.5 CLIMATIC CONDITIONS

3.5.1 TEMPERATURE

In all the south-western states of Nigeria, the temperature conditions are similar and Lagos state is no exception. The temperature is determined by the relative humidity. The highest temperatures are experienced during the dry season between the months of February and March when mean monthly temperature is about 32°C. Heavy rain clouds which may remain unbroken for weeks lower the temperature during the months of June September. The south-monsoon wind is the predominant wind which is responsible for

the climatic conditions. The north-east trade wind is not severe in Lagos, as the harmattan season lasts for only a few weeks.

YR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	MEAN AVE
2001	27.0	31.1	35.6	35.4	33.2	29.9	29.2	29.4	29.7	32.1	32.7	32.7	32.9
2002	27.5	32.0	34.8	36.5	34.4	30.5	29.4	27.6	29.4	32.4	34,6	33.7	33.3
2003	28.4	31.5	35.3	36.1	32.1	31.9	29.3	29.9	30.5	32.5	32.3	33.0	33.6
AVE	27.6	31.5	35.2	36.0	33.2	30.8	29.3	29.0	29.9	32.3	33.2	33.1	33.3

Table 3.1: MEAN MAX. MONTHLY TEMP (^{0}C) (Source: Meteorological Department, Alausa secretariat, Ikeja)

3.5.2 HUMIDITY

Relative humidity is high almost all year round with the exception of the short harmattan period .humidity levels sometimes reaching 90% during the peak of the rainy season. This affects temperature levels greatly and human comfort. The average relative humidity is between 70-80%.

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC
2000	50	55	62	63	78	83	85	86	84	70	52	50
2001	53	61	63	63	76	81	87	89	86	74	53	41
2002	50	67	70	74	80	79	87	85	80	75	57	61
AVE	51	64	65	66	78	81	86	87	83	73	54	51

Table 3.2: MEAN MONTHLY HUMIDITY LEVELS (%) AT 0900HR DAILY (Source: Meteorological Department, Alausa secretariat, Ikeja)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC
2000	23	40	43	42	52	68	73	71	69	53	39	22
2001	23	42	47	40	51	66	75	79	71	55	41	24

2002	24	44	40	44	65	61	71	73	67	58	40	40
AVE	23	42	43	42	56	65	73	74	69	55	40	29

Table 3.3: MEAN MONTHLY HUMIDITY LEVELS (%) AT 1500HR DAILY (Source: Meteorological Department, Alausa secretariat, Ikeja)

3.5.3 SUNSHINE

In Nigeria, the total sunshine hours experienced increases as you move northwards, ranging from 1300hours in the Niger delta area, to 3200hours in the extreme northern parts of the country. The Lagos territory experiences an average of 2100 sunshine hours annually. Monthly variation in sunshine hours forms the critical design issue. The onset of rainy season generally results in less sunshine and increased cloudiness, while the dry season records higher hours of sunshine.

3.5.4 RAINFALL

The rainy season usually ensues in late February or early march and tapers off in late November, with slight differences from year to year. Monthly rainfall distribution shows June, July, August and September as the months with the highest rainfall while the remaining months within significantly lower levels. Rainfall in the area is characterized by thunder, lightning and intense rainfall which can lasts for up to an hour before ending in drizzles that can last for several hours.

YR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	MEAN AVE
2001	9.7	13.8	65.8	98.7	141.7	250.0	253.3	249.7	176.6	138.7	58.9	4.8	121.8
2002	7.8	19.7	55.5	100.6	137.4	135.5	175.0	181.1	382.1	131.8	60.2	5.0	116.0
2003	10.0	17.9	52.2	107.4	199.5	181.0	198.6	159.9	137.0	141.4	95.6	4.5	108.8
AVE	9.2	17.1	57.8	102.2	159.5	160.2	202.3	246.7	231.9	137.3	71.5	4.8	115.5

Table 3.4: MEAN ANNUAL RAINFALL DISTRIBUTION (Source: Meteorological Department, Alausa secretariat, ikeja)

3.6 GEOLOGY AND TOPOGRAPHY

Lagos lies on a geological base of undifferentiated complex of mainly gneiss and magnetite. There are strongly foliated rocks occurring as outcrops in some places. There is evidence of good soil as reflected in the number of high-rise buildings that dot the landscape; shrubs and trees also thrive luxuriantly along the coastal areas. Lagos-island though prone to flooding is naturally protected against excessive damage by its natural gentle slope towards the lagoon and the surrounding waters. Drainages run across the relatively flat area.

3.7 SOCIO CULTURAL LIFE

One phenomenon that cannot be ignored in the socio-cultural context of Lagos state is that of imminent culture loss. They have resisted substituting foreign culture assimilated for their own culture and have thus enriched their original culture immensely with the inclusion of cultural elements from Sierra Leone, Brazil and Afro-America.

The four major groups who form the major citizenry of Lagos state are the Aworis, and Agudas who were Brazilian returnees, the other two groups of Lagos State citizens are the Ogu people of Badagry and its environs, and the Ijebu in Ikorodu and Epe Local Governments. This is in addition to several settlers from other West African countries like Liberia, Sierra Leone, Togo and Ghana who are also part and parcel of Lagos citizenry. Lagosians say to have been born in Lagos bestows upon one the life-long capability for survival and have a praise for Lagos;

Eko Akete, Ilu Ogbon

A r'omi sa

Legbe legbe

A ro de, de, ti ko le ja

Oba ma pa'lu Eko re!

A literal translation which conveys the pride and depth of feelings attached to a city which has realized for many their fantastic dreams goes thus;

Lagos, the capsule of wisdom,

Bedecked with

Interminable stretches of water

Swinging precariously, never to crash

May the good Lord never destroy Lagos!

For a state where 22% of its land mass is occupied by creeks and lagoons and whose entire southern border is bounded by the Atlantic Ocean, water is a veritable lifeline. The main traditional occupations are farming and fishing. Another great resource in the state, the palm tree provides palm wine for drinking, palm-oil for cooking, palm-kernels for oil and fuel as well as building materials in the form of fronds for roofing and trunks for pillars. Several cultural displays and festivals such as the **EPE BOAT REGATTA, EGUNGUN, SATO, EBI, FANTI** and **ADAMU ORISA** festivals are deeply-rooted in the existence of Lagos.

3.8 ECONOMY AND COMMERCE

The greatest resource of the state is its people and their endless capacity for trade, commerce and industry. With such am elaborate and complex historical background, it is inevitable that the city of Lagos and the entire people of the state must profit from ventures others might very well find unprofitable. Anything sells in Lagos. Any market works, and any service is available!

Even in the midst of worldwide economic recession, business interests still prosper in Lagos. As businesses and industries which had attempted to spread out into other parts of the country began to cut back, they invariably strengthened their base in Lagos, thus consolidating their gains in their area of greatest profitability. No wonder it is common place to find the head-office of most corporations, companies and industries in Lagos. Another sector of the economy which witnesses significant level of activity is the real

estate. The massive demand for adequate housing far outstrips supply, this is besides the high premium placed on the purchase of land. This has thus brought about a geometric escalation of the value of real estate and heightened the condition to one of almost reckless profiteering. Consequent upon this, the construction industry is also booming, offering employment to thousands of professionals, tradesmen and craftsmen.

Besides all these sectors of the economy, Lagos state also has an active civil service which shows a significant level of activity but has been greatly depleted with the move of the capital city to Abuja.

On the whole Lagos state acts as unstoppable machinery which generates industries, services and products, and this has made the state not only prosperous but the most dynamic in the nation.

3.9 DEMOGRAPHY

Lagos has a blend of resourceful population owing to its advantageous location on the West African coast. By 1851, the population of the city was highly diversified consisting of free men and slaves from every tribe, but of course the Yoruba were in the majority.

Lagos has a very diverse and fast-growing population, resulting from heavy and ongoing migration to the city from all parts of Nigeria as well as neighboring countries. In 1992 Lagos had an estimated population of about 1,347,000. The population of its metropolitan area was about 10.1 million in 2003. The United Nations predicts that the city's metropolitan area, which had only about 290,000 inhabitants in 1950, will exceed 20 million by 2010, making Lagos one of the world's five largest cities (Microsoft Encarta, 2008).

3.10 TRANSPORTATION AND TRAFFIC FLOW

Arrival into the city is either by air-at the Murtala Mohammed international airport, by road through the various entry points which are the Lagos-Ibadan express road, the Badagry express road and the Lekki-Epe express road, or by water via the Atlantic

Ocean. The major transportation means within the city is by road, although a moribund railway system abounds which amount to nothing. The Lagos lagoon and several creeks also offer a means of transportation to several of the coastal areas and swamps for economic and commercial activities.

Traffic flow in Lagos is extremely poor with the prevalence of what is commonly referred to as 'go slow' on most major roads. The volume designed for in the master-plan did not envisage a population explosion in the manner that is being experienced in Lagos. It did not also take cognizance of the massive daily migration to and from the Lagos Island at the start and close of business each day where transit flows highly in the peak direction thus resulting in traffic congestions.

Restraints or limits exist in the form of building codes and other regulations, most states have building and traffic codes to ensure safety, traffic and density control, health, welfare of the people, etc, although in Lagos this is hardly been adhered to.
Traffic regulations from the town planning department specifies that a minimum distance of at least 45 meters from the center of a highway to the site boundary line should be maintained. The table 5.5 shows road types and their reservations.

TYPE OF ROAD	ROAD RESERVE (M)	TYPE	NUMBER OF LANES	GENERAL WIDTH (M)
1. Express way	90	Dual	4 - 6	3.5
2. Ring road	90	Dual	4 - 6	3.5
3. Primary arterial	90	Dual	4 - 6	3.7 – 5.0
4. Secondary arterial	45 - 50	Single	2 - 4	1.8 – 2.5
5. Distributor	18 - 25	Single	2	1.8 – 2.5
6. Access	11	Single	2	1.8 – 2.5

Table 3.5: PLANNING CODES FOR TRAFFIC REGULATION (Source: Lagos State Urban Development Board)

Comparing data for household vehicle availability for corresponding development periods with Abuja shows a lower availability of household vehicles than Abuja, yet it

assumes poll position when compared based on traffic congestion. Presently, expansion of existing roads is going on, alongside construction of new ones – especially around the proposed site on the Lagos-island. The potential for reducing traffic congestion however lies in developing a smooth mass transit system, offering both the speed and flexibility inherent in the use of small automobiles.

3.11 EXISTING LAND USE AND FUTURE TRENDS

Lagos is a highly commercial city, and shows a variegated pattern of land use. Although an obvious attempt was made at zoning the city into specific land uses as;

- central business district/commercial core
- industrial areas
- national cultural institutions zone
- high density residential areas
- seat of government/GRA
- Tourist destinations etc.

the present land use trend in Lagos does not demarcate one area for commercial activities while restricting the other to residential purposes, as every where in Lagos is now considered as an ideal site to start business. More recently, sand-filling and restriction of the coastline has been the trend to salvage land for more construction-mainly real estate.

This is expected to continue for a while because of the high cost of land. While some farming activities do occur, it is mostly dispersed and no longer on a large scale. Table 5.6 shows the current land use trend.

Land Use	Area (in Hectares)	% of Total Area
1..Total Residential area	440	32.6%
2. Commercial	70	5.2%
3. Industrial	370	27.4%
4. Government Institution	118	8.7%
5. Educational	102	7.6%

6. Undeveloped Land (farms, open spaces)	20	1.5%
7. Road reservations	230	17.0%
Total	1350	100.0%

Table 5.6: LAND USE AND ALLOCATION. (Source: Lagos State Urban Development Board)

3.12 SITE ANALYSIS

Site analysis is an integral part of pre-design analysis, which involves all physical, ecological, climatic, geological and infrastructural analysis of the site. A pre-knowledge of the site will create possible guideline for good planning and design to suite the site so that it may have a sense of place in function, stability and aesthetics. The site climate and physical structure is determined by respective variable, which should provide design guidelines for the layout, orientation and treatment of spaces, shade, shape and height of the building.

3.13 CRITERIA FOR SITE SELECTION

As a prelude to the actual analysis, it is necessary to set out the criteria employed in its selection. .the process of selecting a site for the **Badagry Beach Resport and Spa** involved firstly, a selection of a suitable city and subsequently the particular site.

In choosing the location for this facility, the following factors formed the crux of issues considered.

I. Compatibility with its national scope.
II. The potential for greater impact.
III. Tourism potential
IV. Socio-economic and cultural context.
V. Centrality and proximity.
VI. Suitable urban culture.

In order to achieve a well planned project, it has to start from the choice of site. It is important to know how the site and the project are going to be related for best results.

A careful study of the Lagos land use map has enabled me choose a site in the Badagry area of the state due to the following reasons;

i. The site is located along the coast (beach line) which is a potential tourist site.
ii. It is located at the outskirt of the city which makes it a good site free from the hustle, bustle and pollution of the city.
iii. There is land available for this project and with room for future expansion.
iv. The site is situated in the Badagry area of Lagos with lush palm trees scattered around giving it a natural serene look with the beach which is the major attraction for tourists.
v. The site allows for effective patronage and consequently will create a maximum utilization of the Resort.
vi. There is a rush to this area during the festive and holiday periods, therefore the issue of advertisement or fear of tousists coming in does not arise.

3.14 SITE LOCATION

The site is located along the Lagos- Badagry expressway, 5km after the Suntan Beach. It is 102 km from the Seme border i.e. the border between Nigeria (Lagos) and Benin (Cotonou).

3.15 SITE CHARACTERISTICS (INVENTORY)

A site inventory includes all that is on site, around the site, above the site and also underneath the site.

3.15.1 EXISTING FEATURES ON SITE

The site has lots of scattered palm trees and low and tall grasses can be noticed from the entrance of the site. The site slopes downwards from the express road at an angle of about 3^{o} which was caused by the draining pattern of the site where all water drains to the sea.

The site is also filled with shrubs and a thick vegetative cover but clears out on approach to the beach.

3.15.2 EXISTING FEATURES AROUND THE SITE

The site is an empty vast land with no man-made features around it except the Lagos-Badagry express road which was constructed to link the country to the neighbouring Benin Republic. There is a small fishing village around the site at about 2km from the site.

3.15.3 EXISTING FEATURES ABOVE THE SITE

There is no low tension cables, no electric poles but a telecommunication mast can be noticed around the site. So facilities like electricity have to be generated internally by the Resort.

3.15.4 EXISTING FEATURES UNDERNEATH THE SITE

Soil is noticed underneath the site; the sandy soil characterised by its sharp crystalline nature could get water logged during heavy down pours which causes a seasonal flowing stream at the side of the site to the sea.

3.16 ACCESS AND CIRCULATION

The site can easily be accessed through the Lagos-Badagry expressway which is a dual carriage federal road.

3.17 UTILITIES

The utility that is available on site include telecommunication which is provided by one of the major telecommunication networks in the country.

3.18 SCENERY/MAN-MADE FEATURES

There are no man-made activities on site except the telecommunication mast nearby and the small fishing village huts. The natural scenery is the lush vegetation characterised by palm trees both short and tall with shrubs and grasses.

3.19 ENVIRONMENTAL PROBLEMS

The site being located along the express road is liable to noise pollution due to moving vehicles as a result of traffic from people leaving the country. The saline nature of the soil can cause corrosion to the metals used on site so adequate protection should be given these elements.

3.20 DEDUCTION

For any successful project to be embarked upon; a site inventory has to be taken considering the above factors; noting all that is above, around, underneath and on the site. The site has to be located in such a manner as to be accessible. It is also essential to put into consideration; the utilities that have been made available and those not available, man-made and natural features existing on the site as well as the environmental problems associated with the site, are bound to affect the design process. Putting all these factors into consideration, the site chosen is still the best because it is free from human degradation and fit for a place for total tranquility.

CHAPTER FOUR

4.0 RESULTS

4.1 DESIGN REPORT

This chapter aims at explaining the various elements of the design, the spaces provided and the construction technique to be employed in the construction of the proposed Badagry beach resort and spa design.

4.2 SCHEDULE OF ACCOMMODATION

ADMINISTRATION & SUITES

GROUND FLOOR

Space	**No. Of units**	**Area (m^2)**
Entrance	1	16.79
Hall and lobbies	1	162.81
Reception	1	8.8
Atrium	1	28.27
Office	1	19.88
Lounge	1	48.16
Toilet facility	2	28.14
Sick bay	1	9.45
Staff changing room	1	14.10
Utility and laundry	1	36.34
Restaurant	1	35.34
Kitchen/store/servery	1	31.74

Table 4.1 *Space requirement for ground floor*

FIRST AND SECOND FLOOR

Space	**No. Of units**	**Area (m^2)**

Suites	6	93.36
Staircases	2	21.6
Toilet facility	6	35.04
Lobby		43.04
Terraces	6	12
Atrium	1	28.27

Table 4.2 *Space requirement for first and second floor*

THIRD AND FOURTH FLOOR

Space	**No. Of units**	**Area (m^2)**
Lounges	3	62.04
Bedrooms	3	62.04
Jacuzzis	3	17.28
Staircases	2	21.62
Lobby		43.04
Atrium	1	28.27

Table 4.3 *Space requirement for third and fourth floor*

SPA

GROUND FLOOR

Space	**No. Of units**	**Area (m^2)**
Reception	1	
Admin./services	1	
Café	1	
Male changing room/bath	1	
Female changing room/bath	1	
Saunas	3	

Massaging rooms	7	
Store	1	
Staircases	3	
Lobbies		
Outdoor Swimming pool	1	

Table 4.4 *Space requirement for ground floor*

FIRST FLOOR

Space	**No. Of units**	**Area (m^2)**
Hair dressing salon	1	
Skin exfoliation	1	
Make up	1	
Manicure and pedicure	1	
Facials	1	
Changing rooms	2	
Shops	2	
Mudbath room	1	
Massage rooms	6	
Jacuzzies	2	
Store	1	
Staircases	3	
Lobby		

Table 4.5 *Space requirement for first floor*

RESTAURANT

Space	**No. Of units**	**Area (m^2)**
Dining area	1	150.81
Bar	1	14.14
Staff cloak room	1	12
Toilet facility	1	12
Office	1	7.2
Servery	1	7.2

Kitchen	1	21.07
Waiters room	1	9
Lobby		4.41
Cold and dry store	1	16.66
Circulation space		91.9

Table 4.6 *Space requirement for restaurant*

MULTI-PURPOSE HALL

Space	**No. Of units**	**Area (m^2)**
Auditorium	1	560.3
Stage/ backstage	1	66
Toilet facilities	2	36
Hall 1	1	254.5
Hall 2	1	254.5
Staircases	2	28.8
Lobbies		320.59
Entrance porch		44

Table 4.7 *Space requirement for multi- purpose hall*

GUEST CHALETS

TYPE A

Space	**No. Of units**	**Area (m^2)**
Room	1	
Toilet/bath	1	
Dressing area	1	
Entrance porch	1	

Table 4.8 *Space requirement for type A*

TYPE B

Space	**No. Of units**	**Area (m^2)**
Lounge	1	
Bedroom	1	

Toilet/bath	1	
Entrance porch	1	

Table 4.9 *Space requirement for type B*

TYPE C

Space	**No. Of units**	**Area (m^2)**
Lounge	1	17.68
Bedroom	2	35.36
Bar	1	2.25
Toilet/bath	2	17.68
Terrace		4.5

Table 4.10 *Space requirement for type C*

4.3 DESIGN BRIEF

The design is aimed at providing facilities that will be used to create an aesthetic environment which is therapeutic in nature. The badagry resort and spa would consist of the Spa, Gymnasium, auditoriums for events and occasions, hotel and other chalets for accommodation, restaurants where healthy foods would be served to boost better health and many other adjoining facilities. These facilities would be designed and arranged in a manner that the end users would be made to take walks thereby exercising in the process. The use of glass as a major building material would make the resort aesthetically pleasing to the end users thereby attracting more people to this resort and generating more income while providing jobs for the indigenes.

4.3.1 CONCEPT AND DESIGN

Concepts are ideas existing in human imagination that integrate various elements into a whole. This imagination is portrayed in diverse forms and becomes something that can be felt, seen and carried out in a livable project.

The Badagry beach resort and spa is essentially a gathering place for people i.e. a place where people come to relax and recreate and also get different types of body and skin therapy in the spa available.

The design concept is derived from one of the major species of animals found in the sea i.e. the crustaceans. A crustacean is an invertebrate animal with several parts of jointed legs, a hard protective outer shell, two pairs of antennae, and eyes at the end of the stalks e.g. lobster, crabs, shrimps, crayfish, shell fish, prawn, oysters, mussels, clams. Crustaceans are basically made up of 3 parts: an external skeleton, a segmented body and protective outer shell. The proposed buildings would be composed of: a shell roofing system made out of reinforced concrete shells using wire mesh i.e. the protective outer skeleton, these shells would be segmented and an inner body structure made out of different types of glass.

The concept of zoning is employed in the planning of the site where noise prone areas are carefully separated and the aerial view of the site would be like crustaceans washed off the sea shore on the beach.

4.4 MATERIALS AND CONSTRUCTION

The choice of material to use in the building facilities entails a lot of consideration based on range of factors such as safety, security, durability, strength etc. these factors would be considered when using the different type of glass which is the main material for different parts of the building. The type of glass selected and used is based on distinct characterising properties such as strength, stiffness, reaction to chemicals fire resistance thermal conductivity, and their acoustical properties. Materials will be considered on the

basis of their economic, mechanical an aesthetical consideration so as to provide a structurally more stable and balanced building. Some of the basic materials employed in the design of this facility are discussed below:

(i.) **CONCRETE**

Concrete is a mixture of cement, water, and aggregates. Its characteristics vary according to that of its constituent elements and the mix ratio. The way in which the concrete is mix, placed and finished also affects its quality. Though concrete is strong in compression. It is rather weak in tension and to make up for its weakness steel is used to reinforce it. This combination results to reinforced concrete which is extensively used in this project because of its framed structure nature for beams, columns, lintels, slabs and roof gutters.

(ii.) **SANDCRETE BLOCK**

This is a mixture of cement, sand and water formed and hardened into modular building units. Blocks are employed in the construction for partitions and use to fill in space between structural members as exterior walls and load bearing walls in some supporting facilities.

(iii.) **ALLUMINIUM**

Aluminium is a lightweight, silvery metal. Aluminium is a strongly electropositive metal and extremely reactive. In contact with air, aluminium rapidly becomes covered with a tough, transparent layer of aluminium oxide that resists further corrosive action. For this reason, materials made of aluminium do not tarnish or rust.

Aluminium is widely used in this project for doors, windows, frames, electrical cable conduit and roof covering.

(iv.) **STEEL**

Steel is a form of iron produced from iron ore, coke, and limestone in a blast furnace. Molten pig iron is poured into an open-hearth furnace for conversion to steel. Excess carbon and other impurities are removed to make it strong.

Steel is widely used as roof strut members and also as reinforcement for beams, slabs and columns.

(v.) **GLASS**

Glass, an amorphous substance made primarily of silica fused with alkaline at a high temperature. The silica is generally obtained from sand, quartz or flint, and the alkali is generally soda-ash (obtained from seaweed) or potash (obtained from brushwood). To these fundamental materials, other ingredients are added to obtain different effects. The addition of lead, for example, produces glass of a distinctive clarity and brilliance. Glass can also be coloured by the addition of sulphides or metallic oxides. It is used extensively for glazing of windows and doors and the coloured glass is used as roofing for the sky lights.

(vi.) **TILES**

Tile is a thin slab of glazed or unglazed fired clay used structurally or decoratively on floors, walls, and roofs. It is widely used on floors of this project due to its durability and low cost of maintenance.

(vii.) **PAINT**

Paints are liquids that solidify when exposed to air, and are used to cover surfaces for decorative and protective purposes. Paints are formed by mixing a pigment (the substance

that provides colour) with a binder, a fluid vehicle, such as linseed oil, that solidifies when exposed to air. It is used for the finishing of the entire project.

(viii.) **CARPET**

Carpets are heavy fabrics commonly made of wool and used as floor coverings. Although wool is often used for warp, cotton is more common because of its smooth surface and its resistance to stretching. It is usually woven in one piece, can be of any size and can cover an entire floor. It is extensively used for the floor and wall finishing of the cinemas due to its good sound absorbing property and for the banquet hall and gallery.

(ix.) **MINERAL WOOL**

A lightweight fibrous material made from slag or glass, used for insulation, packing material, and filters. A layer of sound-absorbing mineral wool is used as part of the ceiling to prevent any structural noise.

4.4.1 CONSTRUCTION

Site preparation include such activities such as site clearance, setting out, location of building line, noting the existing features on ground and deciding those to be retained. Because the planning of the site is important, the design as taken into consideration both physical and climatic factors dictating the orientation of the building and related service activities to ensure an integrated functional flow on the site.

I. FOUNDATION AND STRUCTURAL SYSTEM

This is part of the building that carries both imposed live and dead load, transmitting them over a sufficient area of soil to avoid undue settlement. The soil bearing capacity determines the type of foundation system that is to be used, so also is the potential form

of the superstructure. A damp-proof course is also going to be used to avoid penetration of moisture from the ground.

II. FLOORS

The ground floor consists of layer of 150mm thick concrete to be laid over a bed of well compacted hardcore of at least 300mm thick. The damp-proof is placed in between this layers after which a cement sand screed (1:3) of a minimum thickness of 19mm is finally laid over it.

The upper floors are to be constructed with 150mm reinforced concrete slab before the appropriate finishes are applied. Also for the lobbies of the executive suites, glass floors are used for its structural and aesthetic value.

III. WALLS AND WALL FINISHES

Wall are vertical structure forming an inside partition or an outside surface of a building and are composed of bearing elements i.e. columns and beams. The columns and beams support the floors or roof systems above them which are then in turn supported by the foundation. The external walls must be durable, resistance to wear and environmental conditions.

The internal walls which are either non-load bearing, also serves as dividing elements of spaces with their surfaces designed to be durable and heat resistant. Glass partition walls are used in most parts of the building to divide spaces.

IV. DOORS AND WINDOWS

Doors and windows provide for physical, visual and light penetration into and through building interior, while enclosing interior space and maintaining continuity of building. Exterior doors and windows must be weather-tight and seal when closed. The doors must

be large enough to allow for easy circulation of people, equipments and furniture's or facilities. Other factors that need to be considered are ventilation, security, view and possible need for light. The sizes, proportion and location of the door and windows have been carefully planned keeping in mind the obtainable standard sizes from the manufacturer.

V. ROOF AND CEILING

An efficient roof is that structural member which can carry it own load as well as wind load, keep out rain, snow and wind, it also prevent excessive loss of heat through it. The roof system must be able to resist fire. It must be compatible with the wall and or column through which load is transmitted to the foundation.

The choice of any roofing system should be considered base on economy of erection, maintenance, durability and potential heat loss or gain.

4.5 LANDSCAPE AND EXTERNAL WORKS

The design makes use of the two classes of landscape elements (hard and soft landscape elements) to create a serene environment and coordinate pedestrian and vehicular traffic in such a way that pedestrians can almost avoid crossing roads within the complex and yet engage in their activities. The site is so design that golf carts can be driven within and around the entire site whereas vehicular movements are restricted to the major roads alone. The provision of walkways round each facility makes access a lot easier, while soft landscape elements used include; royal palm hedges, yellow bush, umbrella trees, masquerade and grasses for shade and ground cover while maintaining the natural palms originally on the site.

4.6 DESIGN SERVICES

4.6.1 ELECTRICITY AND LIGHTING

The main source of power supply to the proposed beach resort is from the city's Power Holding Company of Nigeria (PHCN) mains. Due to the fluctuation in power supply from PHCN source, the Resort will also be connected to an alternative internal power generated from solar panels and stored to sustain the power requirements of the Resort in case of power failure.

Power socket outlets will be provided for the various sections of the Resort, the administration and suites, the spa, the multi-purpose halls and the restaurant. Circuit breakers are also to be in place to avoid damages to entire electrical system.

Electrical conduits will be run within concrete floor systems and walls for the convenient access to floor and ceiling outlets.

Light fixtures and switches are usually the most visible parts of electrical system to be located for convenience and in coordination with visible surface patterns. Wall plates for these devices will be provided in good location on the site for the installation of a stand-by generating plant to serve as alternative power supply.

4.6.2 HEATING, COOLING AND VENTILATION

Proper solar orientation will be ensured to minimize heat gain within the built area. But for more thermal comfort to be achieved, an artificial means of air regulation will be in place. The environmental comfort factors that can be regulated include; the surrounding

air temperature, the surrounding surface radiant temperature, relative humidity, air motions, dust and odours. There will be a central heating, ventilation and air-conditioning system with a control room for the entire blocks.

4.6.3 WATER SUPPLY

The main water supply source is from the water treatment plant and reservoir in the site itself. This water is drawn up from bore holes dug up at strategic points on the site and then treated, also adequate overhead and underground tanks are provided to ensure storage of water in case of water shortage on site.

4.6.4 DRAINAGE AND SEWAGE DISPOSAL

The drainage condition around the site is a lot easier because the land has a gentle slope which will help drain water and sewage. The drainages around the site will collect the bulk of waste water, channelling it to the main drainage.

4.6.5 REFUSE DISPOSAL

However, storage containers, metal refuse container will be placed at strategic locations for effective refuse disposal or collection within the environment. This will later be emptied into the city's waste control centre; The Lagos state waste disposal board. It is here sorting is done for recycling and burning in incinerators.

4.6.6 ACOUSTICS

Effective control of external noise begins by good site planning, zoning and screening out of all access roads remains the best.

The source of noise within the site is mainly from human activities and vehicular movements while the basic source within the building is by trading, interaction and movements of goods and humans.

Therefore, noise breakers like trees will be used to check noise caused by vehicular activities, placing of recreational areas away from quiet areas by zoning to minimise noise generated during recreation and also selection and use of good acoustical materials especially sound absorbent materials for interior finishes of walls, floors and doors. Building elements like acoustical ceiling, sound absorbent double-glaze panels and fibre glass surfaces would be used for the ceiling, doors and windows (fenestrations) to minimise the noise or sound that leaves a particular shop, room or space.

4.6.7 FIRE SAFETY

Fire accidents are always due to human carelessness or negligence. The principal aim of fire protection is to safeguard lives and property.

This is done by ensuring means of escape to occupants of a building. The role architecture plays in fire prevention, detection and combating is through the appropriate design, specifications, and choice of materials.

The use of fire resistant materials and non-flammable materials in preventing fire spread.

With all the above precautionary measures being observed in the design and construction stage, fire is not totally eliminated. Fire equipment like smoke detectors, fire alarms, sprinklers should be put in place as well as hydrants.

4.6.8 SECURITY

The Badagry beach resort and spa will have its own security measures to protect the entire site; the blocks and valuables in them.

This is achieved with the use of frameless, bullet-proof (laminated glass) for the entrances, storages and exhibition halls. Partitioning glass blocks and burglary proofs.

The security post is also to have an electronic close circuit television control unit, with hidden cameras. This is to monitor activities within the building and also outside the building.

4.6.9 COMMUNITY

Badagry is a peaceful tourist community; part of the objective of the Resort and spa is to work toward unifying our diverse culture, creating an enabling environment for entertainment, relaxation and acquisition of quality goods and services.

The centre will cause an emergence of a broad based, diverse and vibrant means of livelihood and investments for those inhabitants of the community that would take advantage of the services the resort has to offer to attain better living condition and human development.

4.6.10 MAINTAINANCE

Maintenance can be defined as any work undertaken in order to preserve, restore or improve any part of a building, its services and surrounding to a currently acceptable standard and sustain its utility and value of its facilities.

Although, the choice of materials must satisfy low maintenance cost, yet periodic checks will be done to ensure good maintenance culture and also a maintenance manual will be given to the appropriate authority of the Resort.

The maintenance manual specifies how and when a facility should be maintained.

The basic reasons being;

i. To ensure safety of visitors and workers
ii. To ensure safety and quality of goods and services rendered to the customers.
iii. To maintain the service life of facilities e.g. lighting, security systems and ventilation systems.
iv. To prevent deterioration of the structure
v. To maintain decorated surfaces or finishes.

4.6.11 SOLAR CONTROL

Proper and adequate solar orientations minimize excessive heat gain within the internal spaces of the building. With the use of solar control glazing; argon filled and double-glazed panels and glass blocks. This helps eliminate certain harmful rays from the sun; e.g. ultra-violet rays.

With effective landscaping; the planting of trees to face the sun's direction serves as sun screens. This is to reduce the solar effect the sun has on the building and its inhabitants.

5.2 CONCLUSION

From the research done, it can be seen that there is need for a resort to be in a safe, conducive, relaxed and noise controlled environment with some form of recreation added to it. It is in this light that this research for a beach resort and spa with emphasis on use of glass as a building material was undertaken to provide a platform from which the people of Lagos and visiting tourists can recreate and relax. This environment helps provide a means of interaction recuperation and rehabilitation.

The method of construction and use of materials are aimed at giving the structure stability and controlling impact and airborne sound keeping in mind that it should have protection from moisture, be economically viable and offer maximum security to its occupants. The design of the building expresses functionality, utilization of space and ease of human traffic flow within a structure that provides maximum comfort because standard measures are taken to protect the building and the occupants actively and passively.

5.3 RECOMMENDATION

The proposed Badagry beach resort and spa is a project that solves a particular social problem which is common in major cities of the world i.e. "stress" and in turn provides an avenue for recreation and recuperation. It would also serve as a tourist site and when compared to other resorts and spas in the world, it is recommended that such a world class facility be provided in a city like Lagos.

The use of glass would be recommended as a major building material in this proposed design because of its flexibility, malleability, strength and aesthetic value as it can be used in different colours and shades. Due to recent technological advancements made, glass can also be used as structural elements in columns, beams and staircases thereby making it the perfect material to use by other architects in subsequent projects.

In other to make this project self sustaining and to solve the constant power problem associated with major Nigerian cities, the use of solar glass is recommended in this project and for future developments in the country. These solar glass cells would be installed with other glass types in all the facilities provided. Then each facility would be connected to the central solar power generation plant in the resort thereby solving power outages and making the project self sustaining and eco friendly.

Due to the large scale nature of facilities to be provided in this project and its cost implications, a Public Private Partnership (PPP) is recommended to finance this project and then BOT (build, operate & transfer) would also be recommended so this facility is maintained properly before transferring to the final owners. In the same vain it is recommended that this concept (BOT & PPP) be emulated by private developers and the government to help build the tourism sector of the economy.

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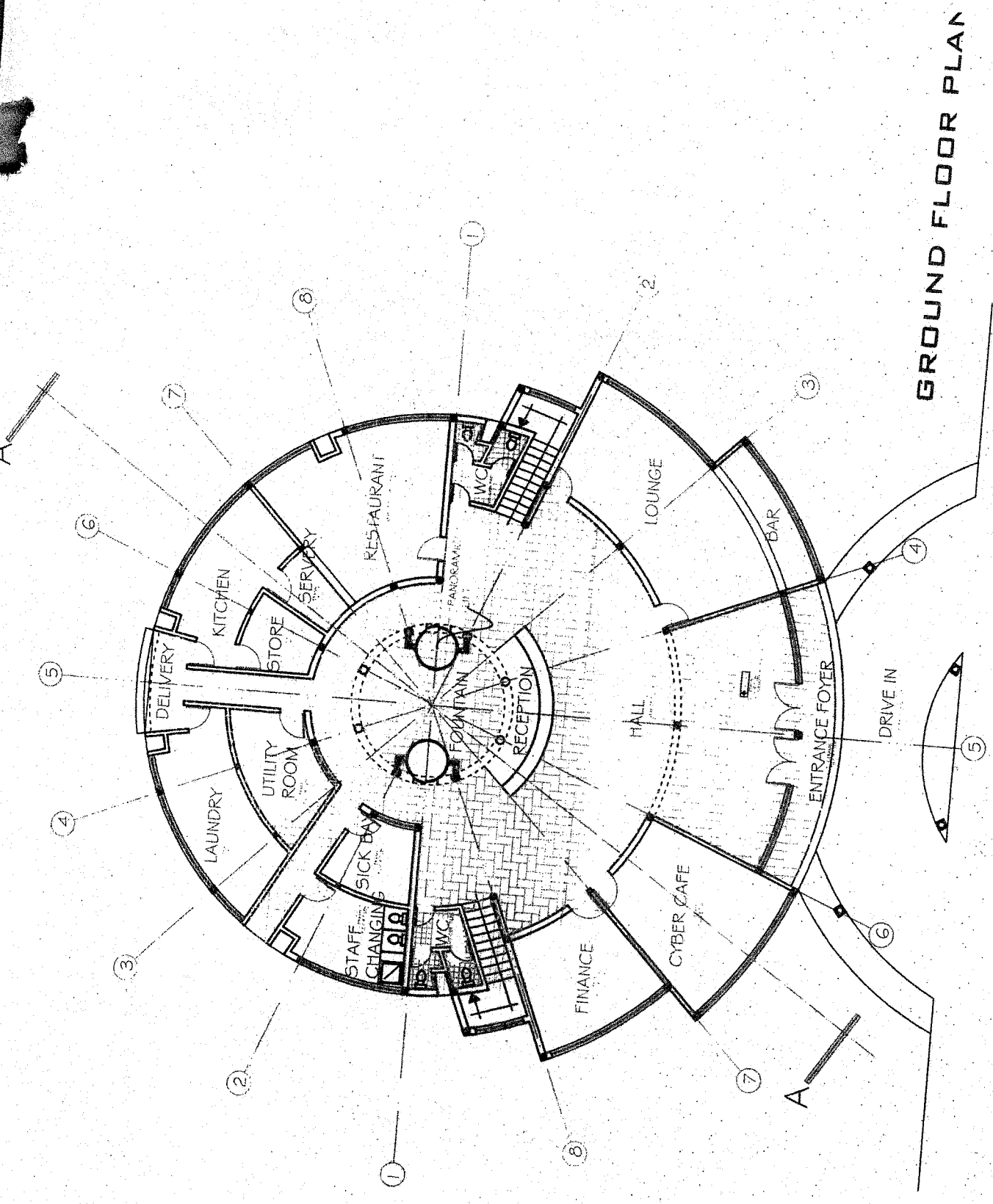
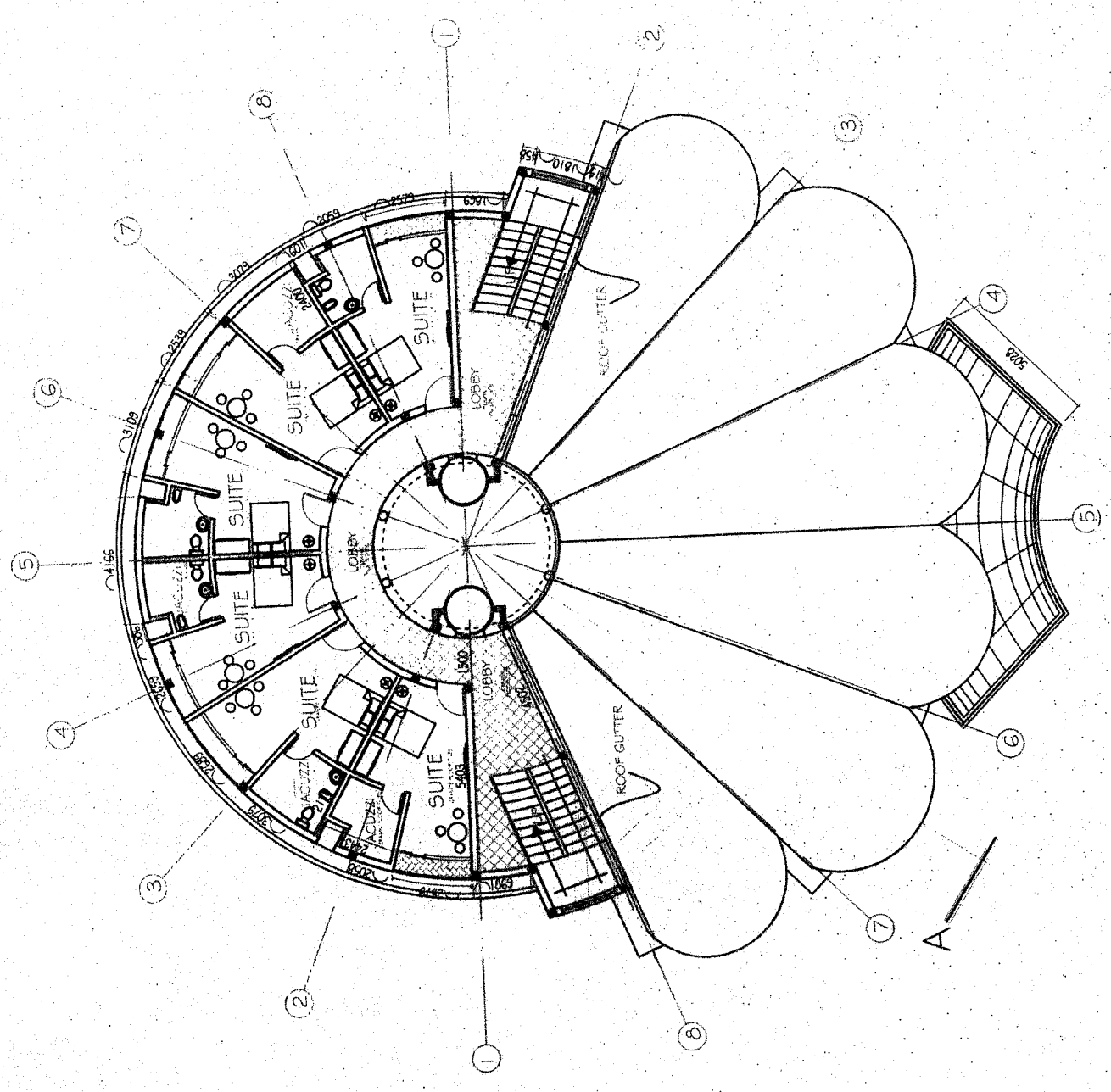
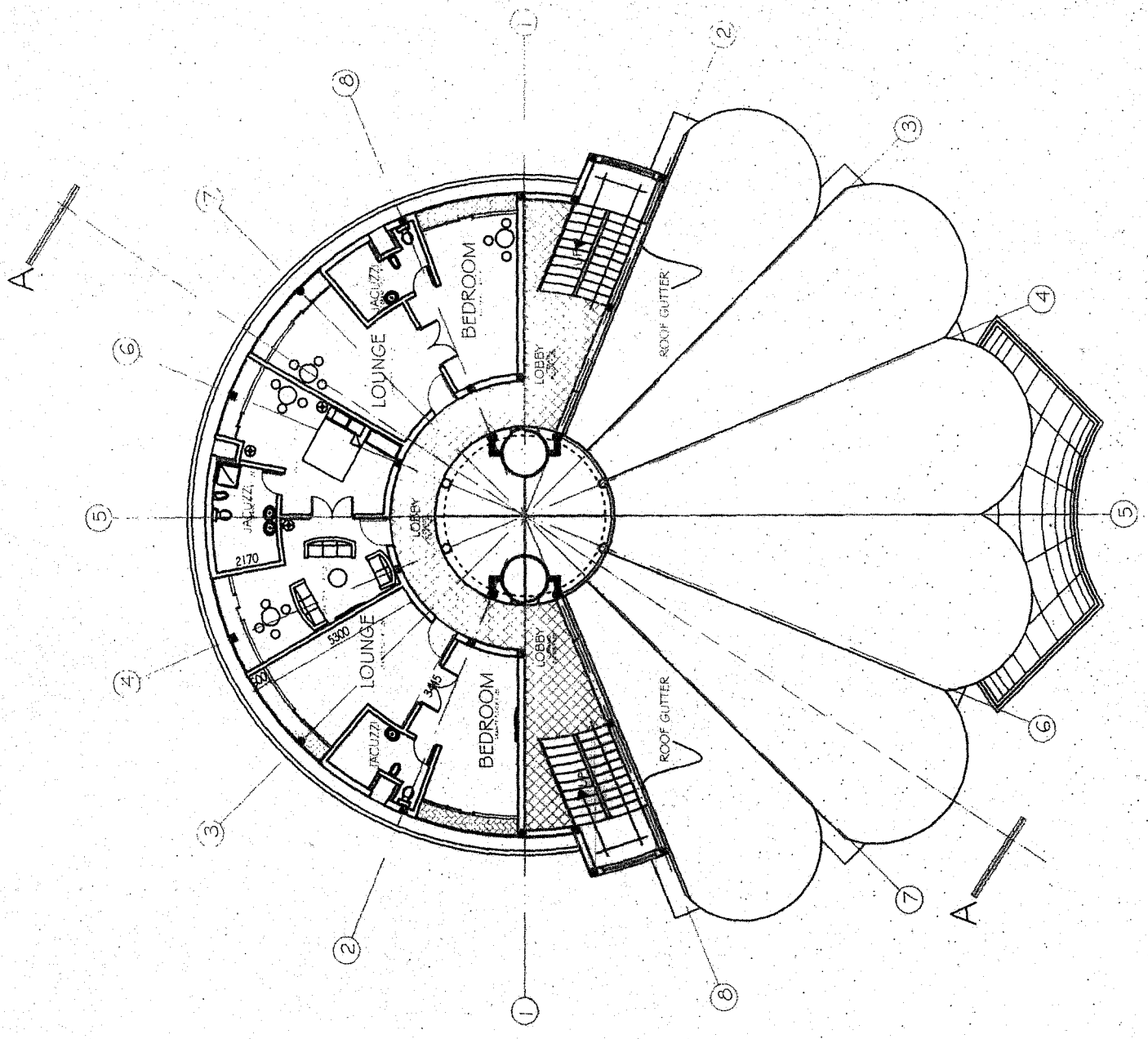


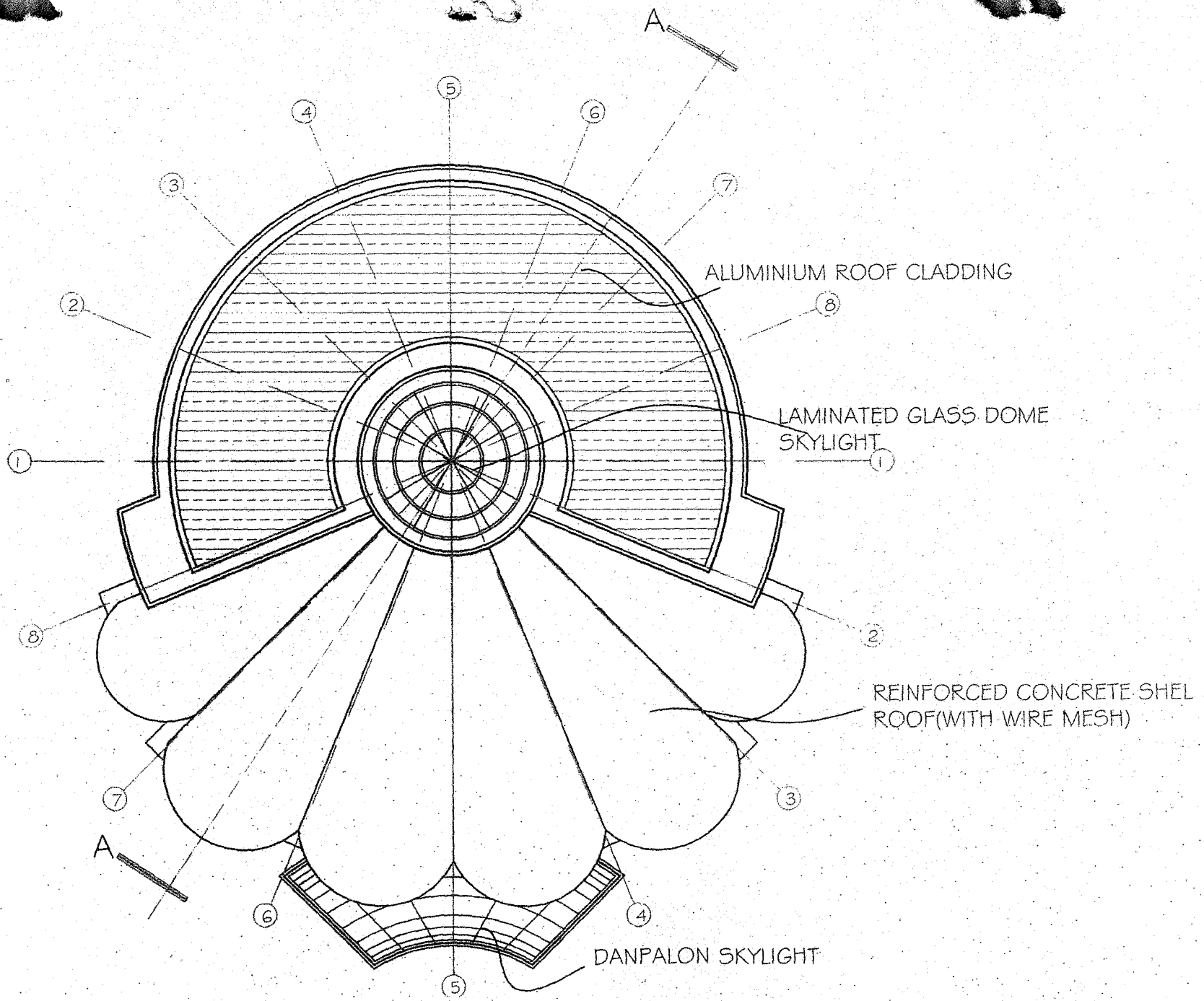
APPENDICES 1 GROUND FLOOR PLAN



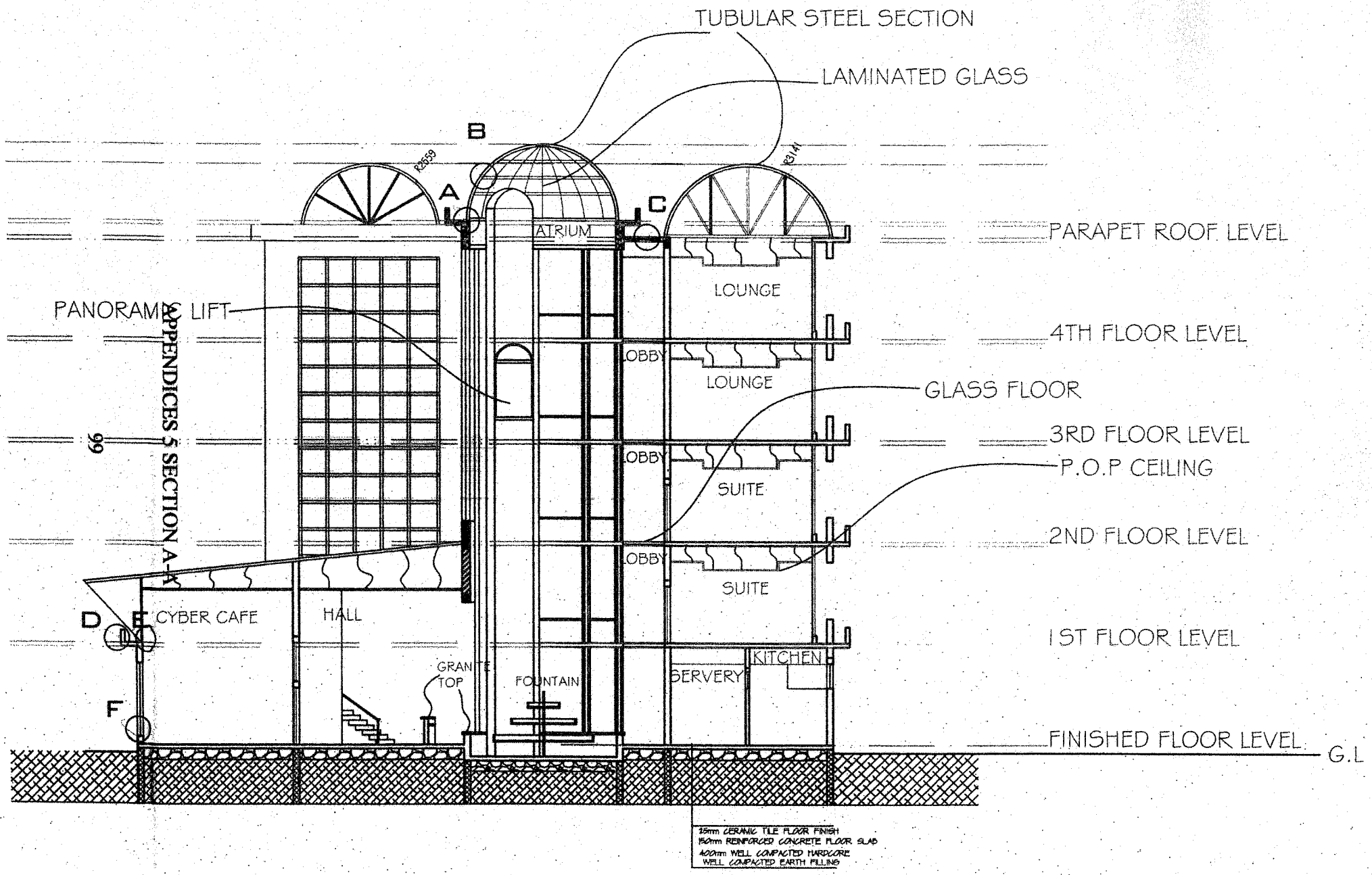
APPENDICES 2 FIRST & SECOND FLOOR PLAN



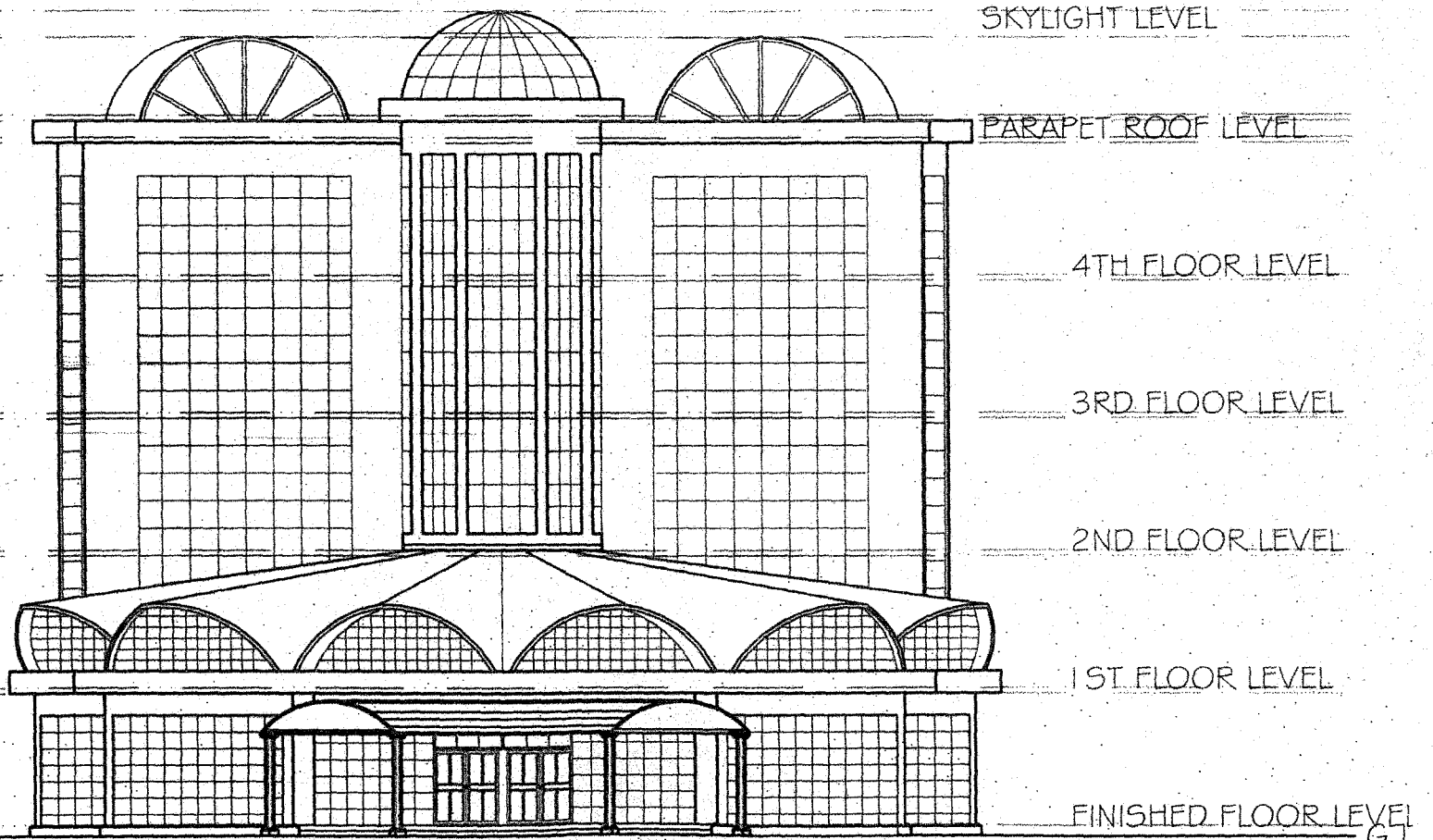
APPENDICES 3 THIRD AND FORTH FLOOR PLAN


A
A
1
2
3
4
5
6
7
8
ALUMINIUM ROOF CLADDING
LAMINATED GLASS DOME SKYLIGHT
REINFORCED CONCRETE SHEL ROOF(WITH WIRE MESH)
DANPALON SKYLIGHT

ROOF PLAN


TUBULAR STEEL SECTION
LAMINATED GLASS
B
A
C
R2559
R3141
ATRIUM
PARAPET ROOF LEVEL
LOUNGE
PANORAMIC LIFT
4TH FLOOR LEVEL
LOBBY
LOUNGE
GLASS FLOOR
3RD FLOOR LEVEL
LOBBY
SUITE
P.O.P CEILING
2ND FLOOR LEVEL
LOBBY
SUITE
D
E
CYBER CAFE
HALL
1ST FLOOR LEVEL
KITCHEN
GRANITE TOP
FOUNTAIN
SERVERY
F
FINISHED FLOOR LEVEL
G.L
15mm CERAMIC TILE FLOOR FINISH
150mm REINFORCED CONCRETE FLOOR SLAB
400mm WELL COMPACTED HARDCORE
WELL COMPACTED EARTH FILLING

SECTION A-A



APPROACH ELEVATION