PROPOSED UNIVERSITY SPORTS COMPLEX

FOR

ONDO STATE UNIVERSITY OF SCIENCE AND TECHNOLOGY (OSUSTECH), OKITIPUPA

(ENHANCING COMFORT FOR SPECTATORS IN SPORTS FACILITIES THROUGH ARCHITECTURE)

BY

MONOMIYE, OPEYEMI FOLAJIMI
(ARC/08/4008)

JUNE, 2015

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A THESIS SUBMITTED TO THE SCHOOL OF POSTGRADUATE STUDIES IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF A MASTER OF TECHNOLOGY DEGREE IN ARCHITECTURE, FEDERAL UNIVERSITY OF TECHNOLOGY, AKURE ONDO STATE, NIGERIA

JUNE, 2015

DECLARATION

I, MONOMIYE OPEYEMI FOLAJIMI (ARC/08/4008) of the department of Architecture, School of Post Graduate Studies, Federal University of technology, Akure, hereby declare that the information contained in this thesis is the result of honest research work undertaken and in its entirety, has been a personal academic exercise executed by me under the supervision of Dr. T. O. Odeyale and has not been presented elsewhere for the award of a degree, or any other purpose.

All sources of information and materials consulted have been duly acknowledged.

_____ _____

Monomiye Opeyemi Folajimi Date

CERTIFICATION

This is to certify that this research was carried out by MONOMIYE, Opeyemi Folajimi and submitted to the Department of Architecture, Federal University of Technology, Akure, in partial fulfillment of the requirements for the award of the degree of Master of Technology in Architecture.

_____	_____
DR. T. O. ODEYALE Project Supervisor	DATE
_____	_____
DR. A. A. TAIWO Head of Department	DATE

DEDICATION

This thesis work is dedicated to the Almighty God, in whom we live, move and have our being, whose providence is exceedingly and abundantly beyond our imagination, for His love, grace and mercy, wisdom, care, good health, sound mind throughout the period of undergoing this thesis work.

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ABSTRACT

Sports facilities are important in schools starting from primary and secondary schools down to the universities and colleges. Higher institutions of learning such as the universities usually have a sports complex where most of all their sporting facilities are sited. This design thesis, thus, addresses the design of a University Sports Complex for the Ondo State University of Science and Technology (OSUSTECH), Okitipupa, Ondo State, Nigeria, with a view of achieving comfort for spectators in sporting facilities through architecture. The methodology employed in this research includes carrying out of case studies in some selected university sport complexes to see current situation of the facilities available there most especially as it concerns the spectators. Collection of both primary and secondary data was also necessary for proper analysis and synthesis so as to eke out relevant information. The project analysis has also been done to show the various considerations given to the design. The project appraisal shows the whole essence of the project, the workability of the design and overall benefits. This works includes a series of recommendations useful for achieving best results for university sports complex design.

Key words: Sports complex, sports facilities, spatial planning, environmental comfort

CHAPTER ONE

1.0 INTRODUCTION

The university is a community where many activities go on as obtainable in a normal community. Apart from academic activities which are the primary activities carried out within the university community by lecturers and students, many other activities are also carried out. Such activities include buying and selling of goods and services, social associations, relationships and unions, religious associations and sporting activities. Sport is a major activity which most students and lecturers engage themselves in as extra-curricular activity.

For some persons, sport is simply a means of keeping fit and a form of recreation, while some take it to be competitive. Competitive sporting activities are often organized within a university and among universities within and outside a country. The Nigerian University Games Association (NUGA) games and the West Africa University Games (WAUG) are major competitive sporting events organized for university students. Student athletes compete on these platforms and deserving ones win medals for themselves and their respective universities (Emiola, 2013).

Sporting activities, especially spectator sports or competitive sports, are expected to attract spectators. In some situations, tickets are sold to spectators to enable them gain access into sporting arenas or halls. The number of spectators that watch and cheer athletes sometimes inspires and encourages their performances. Therefore, whether the spectators pay to watch or watch for free, a comfortable environment and sports halls should be provided for them while they watch and cheer their favourite athletes and teams.

Therefore, within a university campus where sport is a major activity, the university sports complex is a major facility that is usually conspicuous due to its necessity. Sporting facilities thus should be designed to be confortable in order to make the entire sport complex functional. (Sport England, 2012). This encourages both students and staffs of university to engage in sports in order to keep physically fit or simply for recreation. Others, especially students who love to engage in competitive sports are also opportune to practice and better their skills.

For well-organized sporting events and activities, spectators are usually attracted to come and watch athletes perform or compete. Some spectators would even have their most preferred sports and athletes that they will be willing to watch at any given time. However, where the sporting facilities are not comfortable for the spectators, competitive sports might not thrive. Where there

are no spectators to watch and cheer athletes, the athletes might be discouraged. Also, where income is expected to be generated during sporting events, such would be impossible where there are no spectators (Chapin, 2002). The number of spectators that are expected to watch matches and games would depend on the provision made for such spectators. Spectator stands both within indoor sports halls and outdoor sports facilities must be adequate and made comfortable enough in order to encourage more spectators' attendance.

University education in Nigeria has continued to evolve since the establishment of the University of Ibadan (UI) in 1948. Other Universities such as the University of Lagos (UNILAG), Obafemi Awolowo University (OAU), Ahmadu Bello University (ABU), University of Nigeria, Nsukka (UNN), Federal Universities of Technology, State Universities, Private universities, Polytechnics and Colleges of Education have all grown over the years in different forms and aspects. Some of these higher institutions have standard sporting facilities while some do not (Ifedili and Omiunu, 2011). Sporting facility is an imperative in higher institutions for both recreational and competitive sporting activities. However, due to lack of comfort in these sporting facilities in some of these institutions, spectators are often discouraged to visit them and athletes do not have spectators to watch them perform. With the establishment of the Ondo State University of Science and Technology, (OSUSTECH) Okitipupa, Ondo State, Nigeria in 2010, there is a need to provide a tasteful sports complex for the institution in order to building a sporting culture into the system of the university and also encourage spectatorship through a comfortable sports complex design.

In this study, chapter one of deals with background information and the aim and objectives of the study. It also states the scope of the study, limitations of the study, justification for the study and research methodology employed in carrying out this research. Chapter two generally deals with review of literatures relevant to the subject matter. Chapter three deals with case studies carried out at sports complexes of four Nigerian universities. These are Obafemi Awolowo University, University of Lagos, Federal University of Technology, Akure, and University of Ilorin. Chapter four deals with the analysis of the site and the project proposal. Chapter five deals with the project appraisal while chapter six gives recommendations and conclusion of this study.

1.1 AIM AND OBJECTIVES OF THE STUDY

1.1.1 AIM

The aim of the study is to design a sports complex that will be comfortable for spectators.

1.1.2 OBJECTIVES

The objectives seek to:

i. carry out case studies of sport complex of selected universities
ii. design comfortable circulation that will be adequate for the expected number of spectators
iii. design sport buildings with good acoustics and thermal control system in keeping with the comfort of spectators

1.2 SCOPE OF THE STUDY

This study deals with the provision of indoor and outdoor sporting facilities for the Ondo State University of Science and Technology (OSUSTECH), Okitipupa and how these facilities can be designed in order to enhance comfort for the spectators that will be viewing sporting activities there.

1.3 LIMITATIONS OF THE STUDY

The limitations encountered in the course of this study include:

i. Lack of easy access to relevant comprehensive literature materials.
ii. Lack of easy access to the current master plan of the Ondo State University of Science and Technology (OSUSTECH), Okitipupa.
iii. Lack of free and easy access into university sports complexes visited for case studies. Some of the sports halls were locked as at the time of visit thereby preventing accessibility into important space.

1.4 JUSTIFICATION FOR THE STUDY

Sporting facilities are important to the development of sports within a university campus. Just as the sporting facilities provided are basically for use by athletes, they are also important to the spectators who watch these athletes. However, sports facilities within most universities lack adequate comfort for the spectators, thus discouraging majority from going to sports venues. For spectator sports where spectators are expected to be present during the sporting events, if the facilities, whether indoor or outdoor, available are not comfortable for spectators, this might discourage the number of spectators in attendance. This might also discourage athletes who have prepared themselves to showcase their talents to expected spectators. Also, revenues that would have been generated through sale of tickets and other goods and services would be lost. It is

important to note that comfort within sporting facilities is a function of factors such as the thermal environment, acoustics, circulation, safety, provision of support facilities and materials used for furniture, building and finishes. Where some or all of these factors are lacking in a sports complex, the level of comfort which spectators will enjoy will be greatly reduced. Therefore, it is imperative for sporting facilities to be designed and constructed to be comfortable for spectators. However, the Ondo State University of Science and Technology (OSUSTECH), Okitipupa currently does not possess a sports complex.

1.5 RESEARCH METHODOLOGY

Data was basically gathered through primary and secondary sources. These were collected, collated, analyzed and synthesized to form the basis of the design approach. The following methods were employed.

i. Data collection

Primary data was collected through relevant case studies and field work. While secondary data was collected by taking a look at past projects, journals, and obtaining data from relevant organization.

ii. Content analysis

This was done in order to put together the data that have been collected, interpret them and synthesis them.

iii. Data interpretation

This has been achieved through two-dimensional drawings, three-dimensional drawings, models and charts.

1.6 CONTRIBUTION TO KNOWLEDGE

The thesis contributed towards adequately solving effective circulation of spectators in sport facilities design.

1.7 DEFINITION OF TERMS

i. **Sport:** an individual or group competitive activity involving physical exertion or skill, governed by rules, and sometimes engaged in professionally

ii. **Comfort:** state of being comfortable. Certain conditions in which somebody feels physically relaxed. Comfort for spectators within a sports complex is a condition in which spectators feel relaxed while watching games of matches, in the use of supporting facilities such as conveniences and in circulation.

iii. **Enhance:** to improve or add to the strength, worth, beauty, or other desirable quality of something.

iv. **Spectator:** somebody who watches or observes, especially somebody who watches an activity or event

v. **Spectator Sport:** A watchable sport. A sport that attracts spectators in large numbers.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 DEFINITION OF SPORT

The Microsoft Encarta Dictionaries (2009) defines sport as a competitive physical activity; an individual or group competitive activity involving physical exertion or skill, governed by rules, and sometimes engaged in professionally. It also defines is as a pastime; an active pastime participated in for pleasure or exercise. Also, the Oxford Advanced Dictionary of Current English defines sports as amusement, fun and activities engaged in as an exercise to keep body, soul and mind together and for “leisure". Also, sports has been seen as essentially a recreation involving physical activity in the form of structured games or play taken for the purpose of recreation or amusement in leisure time and containing an element of competition or challenge against self, opponent, or the elements. Some sporting activities are definitely not just for pleasure but a serious engagement in competitions as obtainable in sporting events such as the Olympic Games, Commonwealth Games, All-Africa Games, the Nigerian University Games Association (NUGA) games and the West Africa University Games.

Ann and John (1978) gave a broader definition of sports as "an institutionalized competitive activity that involves vigorous physical exertion or the use of relatively complex physical skills by individuals whose participation is motivated by a combination of the intrinsic satisfaction associated with the activity itself and the external rewards earned through participation”.

Sport is viewed as a set of specific competitive physical activities based on elements of play, games and contests. Hence, sports can be defined as a structured, goal-oriented, competitive, contest based and liquid physical activity. Sports generally are man-made inventions which constitute parts of a culture. Sports may be strictly defined as physical contest performed for own sake and not for some ulterior end. (McHenry, 1992).

This highlights the distinction between sports and games. Many activities thought of as sports are not really performed for their own sake such as exercises done for the sake of cardiovascular fitness, races run to satisfy a physical education requirement or ball game played to earn a pay check. Sport is a human activity that involves specific administrative organization and a historical background of rules which define the objective and limit the pattern of human behavior, it involves competition and/ or challenge and a definite outcome primarily determined by physical skill. On

the other hand, games are activities with an agreed-on organization of time, space and terrain, with rules that define the objective and limit the pattern of human behavior, the outcome, which is to determine a winner or a loser, is achieved by totaling or accumulating objectively scored points or successes (Odeyale, 2001).

Play is an enjoyable experience derived from behaviour which is self-initiated in accordance with personal goals or expressive imputes; it tolerates all ranges of movement abilities; its rules are spontaneous, it has a temporal sequence but no predetermined ending; it results in no tangible outcome, victory, or reward. (Odeyale, 2001 citing Snyder & Spreitzer, 1983).

From the foregoing, sport is a competitive, human physical activity, governed by institutionalized rules. This therefore warrants some activities to be classified as sport under certain conditions. For example, sailing is a form of recreation and pleasure; it becomes a sport when carried out as a Regatta under competitive conditions and specified rules. Swimming is a form of play when engaged in primarily for exercise and pleasure; it becomes a sport when it is a competitive activity with the aim of defeating an opponent or opponents in a swimming pool and when it is regulated by specified rules governing swimming contests. On the other hand, cock fighting and dog racing are competitive activities regulated by rules, but they do not involve human physical activity. Horse racing and auto racing are sports because human beings manned the animal and machine respectively, which require physical ability, stamina, and exertion of energy and because they are competitive in nature, occurring under certain conditions determined by institutionalized rules (Odeyale, 2001 citing Snyder & Spreitzer, 1983).

Sport, in many people's view and involvement is simply a form of recreation. "Recreation" and "Sport" are two closely related words which are inseparable. The Microsoft Encarta Dictionaries (2009) defines recreation as the refreshment of the mind and body after work, especially by engaging in enjoyable activities, an amusement, an activity that a person takes part in for pleasure or relaxation rather than as work. The word recreation is coined from a Latin word "RECARE" which means to create and become refreshed. Recreation therefore is essentially a renewing experience, a different and refreshing change from daily routine and usual workday experience.

Recreation has also been traditionally described as an activity or experience voluntarily chosen and carried on within one's leisure time, either because of the satisfaction or pleasure it provides or for other important values or benefits for the participant and the sponsoring group or organization.

The word “leisure” above simply refers to the time available for the individual after requirements of work, sleep and other basic duties have been met. Recreation therefore covers any activity taken up during leisure time other than those to which people are normally strictly or compulsorily committed. These activities include various kinds of sports, video games, reading, watching movies and so on.

2.2 HISTORICAL BACKGROUND AND ORIGIN OF SPORTS

Sports can be said to have begun as a form of recreation which is regarded as one of the basic human needs as sources of pleasure, relaxation and excitement. It is not exactly known when recreational activities which metamorphosed into sports were first engaged in. however, from the earliest historical times, indications are that the primitive human engaged in recreational activities, but no records have indicated the exact types they engaged in. It is assumed that many activities were engaged in which include dancing, music, games, festivals and contests between animals and themselves. The ancient Minoans practiced a form of bull fighting as far back as 300BC and were carried on both by the Greek and Romans thereafter. The ancient Egyptians had various kinds games and athletics including wrestling, and by about 1500BC, races by horse-drawn chariots had been developed while the Greeks developed athletic contests that were later developed into the Olympic Games which began in 776 BC and were later reviewed in 1896 in Athens, Greece.

During the middle ages, sports of many kinds existed but the simplest was not available for the serfs or peasants. The lords in the society amused themselves in variety of ways including such games as dice, chess and checkers, plays/ dramas, festivals jousting in which two knights did combat. After the middle ages, new ones began to flourish (for example the circus of today began in England at about 1700’s). Many kinds of sports have since been invented and many have been modified all along requiring new kinds of building and other structures. These have no doubt played influential roles in works of architecture.

2.2.1 THE OLYMPIC GAMES HISTORY

Over the past 3500 years, man’s need for recreation reveals a remarkable ingenuity and continuous determination in devising new forms of games and sports on land, in water and, lately through the air (Cuddon, 1980). As further observed by Cuddon (1980), some sports and games have developed from warfare or from preparations for wars. Some of these sports and games include archery, throwing a javelin, shot put, darts target shooting with rifles and pistols, fencing, jousting, chariot racing, skiing, jujutsu, judo, karate, kendo, aikido. Other sporting events like the biathlon,

the modern pentathlon, the equestrian sports (horse racing or horse riding sports) all have military origins which have become a common sport amongst civilians. Soldiers have been very largely responsible for development of hunting, polo and show jumping.

In the ancient Greece, there were no marked differences sport and war. The Greeks had agonistic spirit which was highly developed and most sports in those ancient times were either a preparation for war or a substitute for it. The Greeks were dead keen to win their sports and were quite prepared to cheat to do so, thus games like chariot racing and horse racing were frequently accompanied by violence and cheating of various kinds.

Despite the level of violence irregularities in the sports of the Greeks, they were however concerned with sports of intellectual and aesthetic levels as well as physical ones. Greek philosophers and artists had their writings and artistic works that depicted the sporting atmosphere. Homer had his description of games while Protagoras wrote a handbook on wrestling. Aristotle's lists of athletic victors are not extent but there are numerous comments in his surviving works on style and techniques in sport and Callimachus, a poet and artist, compiled an encyclopedia of sports and games. Some of the finest examples of Greek pottery and sculpture depict sporting and athletic activities.

The Olympic Games are believed to have begun as early as 1270 BC (98 years before the first recorded hurling match in Ireland) though it is generally accepted that the first official Olympic Games were staged in 776 BC in Olympia, where there was a huge concourse with a main stadium that could accommodate about 40,000 spectators. The Games, thereafter, continued to be held every four years (the Olympiad) until AD 393 when they were banned by order of the emperor Theodosius. They were not to be revived until 1896.

Between the 5^{th} and 14^{th} century, there is not much surviving evidence for sports and games in Europe or, indeed in most other places. From the 14lh century, a wide variety of sports and games became common in Europe. During the latter part of the 16^{th} and during the 17^{th} and 18^{th} century, sports and games became increasingly popular and there are numerous records available for a study of their history. However, the second half of the 19th century is the period of development. Much of the development was achieved in England and Britain. In fact, from the late Middle Ages up to about the 1930s the British contribution to sport and games could not be equaled.

Between 1830AD and 1900AD, many sports and games became popular. In many ways the 20^{th} century has been a period of consolidation and refinement of many with a lot of them becoming

highly professional. During this period, sports had been taken more and more seriously by spectators and participants alike. Professionalism (open or concealed) has contributed to this. At the higher levels, sportsmen and women are more committed and dedicated than ever before, and at the 1896 Olympic Games in Athens some of the athletes who took part were visitors who happened to be in the city at the time.

Since the Modern Olympics began in 1896, it has been organized every four years. Since then, there have been 25 Summer Olympic Games held in 22 different cities and 22 Winter Olympic Games held in 19 different cities. In addition, three summer and two winter editions of the Games were scheduled to take place but were later cancelled due to war: Berlin (summer) in 1916, Tokyo (summer) and Sapporo (winter) in 1940, and London (summer) and Cortina d'Ampezzo, Italy (winter) in 1944. The 1906 Summer Olympics, held in Athens, are no longer officially recognized by the International Olympic Committee (IOC), which refers to them as 1906 Intercalated Games, although they were at the time (Wikipedia, 2015).

In 1976, the games was held in Montreal (Canada), in 1980 it was held in Moscow (Russia; U.S.S.R), 1984 in Los Angeles (U.S.A), 1988 in Seoul (South Korea), 1992 in Barcelona (Spain), 1996 in Atlanta (U.S.A), 2000 in Sydney (Australia), 2004 in Athens (Greece), 2008 in Beijing (China) and the last edition in 2012 was held in London (UK). Three cities have been chosen by the IOC to host upcoming Olympic Games: Rio de Janeiro (Brazil) for the 2016 Summer Olympics, Pyeongchang (South Korea) for the 2018 Winter Olympics, and Tokyo (Japan) for the 2020 Summer Olympics (Wikipedia, 2015).

2.2.2 HISTORY OF SPORTS IN NIGERIA

No one knows precisely when active sports began in Nigeria, but earlier man engaged themselves with traditional sports and games like ‘Ago’ game, traditional Yoruba wrestling (Ijakadi), Linga, hunting and fishing often included in festivals. As could be compared with normal competitors, these involves inter-villages, inter-clans and between various families.

With western developments, sporting events took new shapes. The introduction of football, tennis and other games became popular and other indigenous ones were modernized and revolutionized. Various regional and international competitions soon emerged between cities, clubs, schools and countries to further propagate its development and foster its promotion. Hence the establishment of different associations, commissions and various state sports councils to cater both for its development and the welfare of its participants.

With the government actively engaged in its promotions and its obligations to the people, many philanthropists and companies became interested in sponsoring games festivals and competitions of relevance to them and in so doing help to propagate and promote such games and likewise discover hidden talents that abound in the urban and rural communities.

To further propagate sports in Nigeria, various sporting competitions were held, some annually and others bi-annually among students under associations like Nigeria University Games (NUGA), Nigeria Polytechnic Games (NIPOGA) etc. This has to a great extent helped in unifying the various ethnic groups in the country and in provision of recreational facilities where the competitions are held (Ifedili and Omiunu, 2011). For these and other reasons, provision of sports center has been one of the major necessary facilities in Universities, Polytechnics, and other tertiary institutions has become an imperative.

2.3 THE STADIA

2.3.1 ORIGIN AND HISTORICAL DEVELOPMENT OF STADIA

The stadium is considered as being a pitch or track for athletics or team competition in an area surrounded by rising stepped tiers for the accommodation of standing or seated spectators, with coverings that do however cover the field to enclose the whole building. The Stadium was first produced by the ancient Greeks to fulfill a religious and social need. At Olympia in Greece, a huge sanctuary of temples and altars of various deities housed the periodic fetes, which accompanied the celebrations of most ancient and most revered worship, and made this spot the rendezvous for the whole Greek world. The competitions, which varied in number and nature, began at Sunrise with fool race for single runners, pairs or team of six. Those were followed by wrestling, boxing and the pentathlon, which comprised contests with discuss, javelin, running, jumps and wrestling. All these contests were held in the stadium (Ralph, 1977).

Architecturally, Stadium design is a function of the sports practiced within its walls. Certain stadia are designed for one or more sports such as football and athletics, the main objectives being to provide a combined space for and spectators seating area. Modern stadia derived their forms from either the Greek or the Roman prototypes. The idea to keep alive the classic ideas of physical excellence as part of citizenship gave rise to stadium construction many centuries ago.

Unlike the Greek, the Romans spurn competitive physical sports. They preferred public displays of martial combat as these were considered to be good training for a nation of warriors. The oval

amphitheatre with its rising tiers of seats may be regarded as a compound of two theatres, stage to stage, thus making an auditorium around an elliptical area. These monumental structures were a triumph of Roman art and engineering skill for combination of theatre and competition. However, the stadium as a building type disappeared and in medieval times competitions on foot or horseback were held in open meadows with temporary staging for spectators. It was not until the Olympic Games were reviewed in 1896 that the re-emergence of the stadium at Athens was restored for the first Olympic Games. With accommodation for about 40,000 people, it follows the same long, narrow shape used by the early Greek.

2.3.2 GENERAL PLANNING PRINCIPLE OF STADIA

The design of a stadium is dictated very largely by the anticipated type of activities (main functions and not the auxiliary functions) and by the number of spectators to be accommodated. The outcome can be seen as real and easily recognizable responses to needs with the main objective being to provide a combined space for sports and spectators seating area.

2.3.2.1 THE GRANDSTAND

The overall configuration of the stadium is not only determined by the types of activities but also the number of spectators to be accommodated and the desired maximum viewing distance for comfort which in turn determine the type and overall arrangement of seats and the final configuration. The grandstand is the set of seats arranged with each row above and behind the other and sometimes covered by a roof, from which people may watch sports matches, races etc.

2.3.2.2 LIMIT OF VIEWING

The limit of viewing distance is determined by the ability of the spectator farthest from the activity to be able to distinguish the smallest moving object; this in the ease of football is the ball, but in athletics, it is usually the runner particularly as he approaches the finish line.

The human eye can just distinguish object subtending an angle of one minute of arc at. Its physiology is such that it can only differentiate to any degree, objects subtending an angle of at least four minutes of arc at the eye. This has been shown to be maximum viewing distance for football and when calculated gives a distance of 189.7m, approx. 190m. This is too much for good viewing since the perception of ball and body movement is poor and it must be regarded as the absolute maximum. A better limit is about 150m. This assumed figure is based on a study of football stadia.

Viewing distance can be applied to the extreme corners of the pitch, from which arcs can be described. Their average configuration suggests a circle stuck from the centre spot at a radius of 90m. It is suggested as the desired circle of optimum viewing.

2.3.2.3 PREFERRED VIEWING LOCATION FOR SPECTATORS

The preferred viewing location for spectators is another factor to be considered as this can change the plan of the arena to a large extent. Spectator accommodation, which is in rows parallel to the sidelines and close to the pitch, is self-obscuring. A spectator near a corner of the same side, since the view will be obscured by adjacent intervening spectators, particularly on terraces for standing spectators failure to provide an unobstructed view encourages spectators to stretch and strain and so generates dangerous pressures within the crowd. Viewing can thus be much improved by curving the row of seats in plan.

Another factor that affects good viewing is orientation. An attempt should be made to give both teams, as nearly as possible identical lighting conditions. Orientation should be such that the sun is not a disadvantage to any team. The pitch should therefore lie with its long axis north and south. Spectators like to back the sun, therefore the bulk of them should be placed on the west grandstand.

2.3.2.4 SITE SELECTION

The first consideration when selecting a site for any sport facility is the purpose and type of sport for which the particular ground is to be used for. Large level spaces are required for many of the facilities for games such as cricket and football and great care is therefore necessary in the selection of a site to reduce the cost of leveling.

Minimum area on which athletics field can be arranged is about five acres, ten acres or if possible, more is economical and satisfactory. Major considerations among others are:

i. The question of fund
ii. Accessibility
iii. Leveling and drainage
iv. Information from survey
v. Other special considerations e.g. services such as: Electricity, Water etc.

It is important to note that the orientation of the site with regards to the sun directions must be such that the orientation with the given size of site will allow for the planning of pitch so that the sun is

not entering the eyes of competitors as well as spectators. Another point worth nothing is whether the prevailing wind will be of assistance during game to the team playing in a particular direction. In the case of athletics, it should be determined if it will help or retard the performance of an athlete.

2.3.2.5 PITCH CONSTRUCTION AND MATERIALS

I. Football Pitch

a. Grass field preferred
b. Hard field only for training
c. (90-120)m x (45-90)m allowed with 400m running tracks.
d. Competition field should not be used for practice or training
e. Playing field should be surrounded by a 2m wide free strip
f. Boarders marked by clearly visible lines not wider than 0.12m

II. Goalpost

a. Height up to the lower edge of the cross bar is 2.44m
b. Distance between the posts is 7.32m.

III. Grass Field

A good grass field must satisfy the following:

a. The turf must be free from weeds, must have a uniform appearance in terms of density and colour and should be able to resist everyday use.
b. A specialist attention is required for the cultivation of a turf or lawn for sports.
c. Good permeability of the soil is required to stop the formation of pool of water
d. When soil type absorb water slowly, additional means of drainage is thus required
e. Drainage system mostly involves the burying of pipes which have holes on top to collect the water.

2.3.2.6 PLANNING

The design of a sport facility begins with a statement of purpose, a strategic plan, a budget and then a programme or list of activities, which the building is expected to undergo. Experience and circumspection is pivotal to the design of sports and leisure facilities if the entire project is to succeed. This is true to such an extent that owners who plan a new or renovated project should exercise great care in the selection of a design team which has substantial credentials. If possible,

owners should visit comparable facilities to develop a sense of scale and to sharpen their sense of space, interrelationship, operational characteristics, maintenance cost and general life expectance of such a project.

The principle underlying the planning and design of sports centres are governed by a variety of factors, the main factors being the anticipated type of activity or activities, and the number of spectators to be accommodated. (Culley and Pascoe, 2009).

2.3.2.6 ACTIVITY

The plan of all sports centres is determined firstly by the regulation size of the activity and auxiliary areas, which is the pitch or track on which the activity takes place and its necessary surrounding areas. The activity spaces together with the auxiliary areas are known as the ARENA.

Pitches are rectangular for football, while for athletics the rectangle is increased by semi-circular ends. A football pitch can be inscribed within an athletics track. However, there is a conflict between the best viewing condition for athletics and football when making use of the same arena. The spectator position in an athletic stadium is along the straight and particularly on the home straight and sprint lane side.

Participants' requirements are different; soccer needs changing rooms, showers and massage rooms for the teams and officials perhaps 50 persons whereas athletic event can attract about 160 participating athletics. The athletes also require warming up and assembly area under cover near the arena.

2.3.3 BASIC DESIGN OBJECTIVES OF SPORT COMPLEXES

In the planning and design of an environment, certain objectives are usually put forward in order to achieve the main aim of the design (Sport England , 2012). For a sports complex, these may include the following:

a. Compactness

There are two aspects of this objective which affect the design. The first is the limit of viewing distance while the second is the influence of preferred viewing locations related to the activity arena. In all activities involving spectators the relationship between spectators and performers is crucial. In a theatre, it is vital that the action can be clearly seen and heard. For full appreciation, the audience should be able to distinguish facial and bodily expressions, and must therefore be

close enough to the stage to be able to identify each individual. A football pitch, an athletic field or a sport hall is similar and the arena of activity is just as much as a stage in a theatre.

The human eye can just distinguish object subtending an angle of one minute of arc to the eye. Its physiology is such that it can only differentiate to any degree, objects subtended at an angle of at least four minutes of arc at the eye. This is much too great for good viewing since the perception of a ball and body movement is poor and it must be regarded as the absolute maximum. A better limit is about 150m.

The other factor is the desire which spectators have for preferred viewing locations. This can change substantially, the plan of the arena. A spectator near a corner of the pitch will be obstructed by adjacent interviewing spectators. Viewing can be much improved by setting back the first row of spectators and by curving the rows in plan as obtainable in the ancient Greek Stadia.

b. Convenience

Sports complex made convenient for users would be easily accessible to them, with inviting approaches and unconstrained routes. The convenience of access depends on many factors, the principal ones being the capacity and the type of location (urban, sub-urban or rural).

A study of stadia and sports arena shows that on occasions of important sporting activities, the stadium and its environs are usually congested with vehicles. If the location is in a rural area with large expanse of land, enough parking spaces should be provided. On the other hand, if the location is in an urban area with land constraint, it is better to limit access for vehicles to team members, directors, media, restricting the number to about 200, with general car parking in a series of locations some distances from the sport complex with a park and ride system from those beyond reasonably walking distance.

c. Comfort

In order to achieve comfort, the spectator facilities should be adequate. The seat should be wide enough. Toilet and refreshment facilities, although, used for a very short time, should not be of a low standard. For an outdoor activity area such as football and athletic pitches, there should be provision for a grandstand. It should most preferably be cantilevered to avoid obstruction for the watching spectators. It should also be adequately covered to provide shades from sunlight and protection from rain.

d. Flexibility

The design of a sports complex should be flexible enough to allow for a variety of activities different form sports. A way of achieving this could be by making use of movable partitions as opposed to fixed ones. The sports hall itself can have in-built sliding partition so that the space can be temporarily sub-divided if need be for multi-functional activity. Also the play equipment in the space should be movable for the above objective to be actualized.

a. Economy

Economy, which is an important consideration in planning a sports complex should not be too strong a point to pursue. This is because it will be difficult to achieve best requirements in a cheap sports complex. It might not suit the exact requirements of the site or fit into a comprehensive development scheme.

Sports complexes are very much exposed to the weather; therefore judicious choice of construction materials is a necessary consideration if maintenance cost is to be kept minimal. A similar point should also be made for surfacing materials for the various pitches since they too are always exposed to the weather.

f. Crowd Movement

Great care should be taken in the designing and planning process to avoid building in situations which will inhibit the smooth flow of spectators through the public circulation space and to and from seating areas. The general pattern of circulation, thus, must be clear, orderly and easily comprehensible by the spectators. Graphic aids will help but they cannot overcome built in planning flaws. The design of the circulation system must be diverted towards the reservation of life not the preservation of the building itself. Provided the public may enter and leave the complex safely, all other aspects of venue design take second place.

When the public decides to attend events, it is for enjoyment and part of their leisure time. In this leisure state of mind, panic behaviour is not decisive. Access routes junctions. By breaking the routes down into simple decision, it is more likely that spectators will find their ways without assistance. It is equally important to allow spectators who make mistakes and miss their ways to be able to find their ways back. This correcting route is almost as important to avoid confusion as the primary circulation routes small details along these routes significantly changes in the route are sometimes desirable such as a change in level through a vomitory where it can reduce forward

pushing movement into the seating and improve awareness when exiting, spectators can then see over the head of those in front, improving their awareness of the circumstance ahead.

Good awareness in a venue is important as it is often the unknown which leads to anxiety and that can lead to panic situations. A sports complex should therefore be designed to be as open as possible. This allows crowd to be visually aware of their location and in an emergency, to know where other escape routes may be found if needed. In all, there must be a move to provide better information to the spectators so that attendance level will be maintained and improved upon.

g. Safety

The safety of spectator and participants is a necessary consideration. The sports facilities and structures should be sound and fire resistant and provision should be made for means of escape in cases of fire outbreak and other emergency situations. The seating area should be free of sharp edges and point that can injure spectators.

Recent severe problems in some European football grounds have prompted careful reassessment of the design of large-scale facilities. The main considerations, according to Sport England (2012), are:

- Good seats with clear sightlines and adequate space for every spectator.
- Elimination of lengthy, unprotected staircases.
- Use of shallow gradient ramps for vertical circulation which can also accommodate vehicles.
- Wide and clear upper level concourse.
- Clear route from the stadium perimeter to the seats
- Visible entrances.
- Generous external concourse encircling the entire stadium.

2.4 SUMMARY

This chapter examines some existing relevant literatures the point towards the right direction in order to achieve a well-designed sports complex. With a look into the history of sports and sports complexes and an examination of certain design criteria required for a good sports complex design, the desired result for a befitting sports complex is thus achievable.

CHAPTER THREE

3.0 CASE STUDIES

In order to actualize the design of a functional and befitting university sports complex, it is necessary to carry out case studies of existing sports complex of some universities. These case studies will help to see the existing situations as against the required minimum standards. Merits of the understudied cases can be taken note of and utilized in future designs while design errors or demerits as duly noted can be avoided. The major concern of this design thesis which is hinged on achieving comfort for spectators dominates the purpose of the case studies carried out.

The following case studies have thus been conducted and analyzed with graphical and pictorial representations.

3.1 CASE STUDY 1: OBAFEMI AWOLOWO UNIVERSITY SPORTS COMPLEX

The OAU sports complex is the first in the service of structures to be sighted on approaching the university, from the arterial road leading from the gate and terminating in a T-junction close to the indoor sports hall. It is bounded on the north by the Faculty of Science building, the Oduduwa hall and the University Secretariat. On the east, it is bounded by the arterial road and the Faculty of Health Sciences while Fajuyi hall serve as the boundary on the west.

Fig. 1: Google map image of OAU Sports complex area.

(Source: Google Map Images, 2015)

The facilities on the complex are planned in such a way that they are arranged linearly. The facilities can be seen to be into two divisions; the football pitch and the indoor sports hall on one hand while the lawn tennis, volleyball, cricket and basketball courts are on the other hand. Connecting both halves and acting as a strong unifying force is the long, wide and elevated walkway.

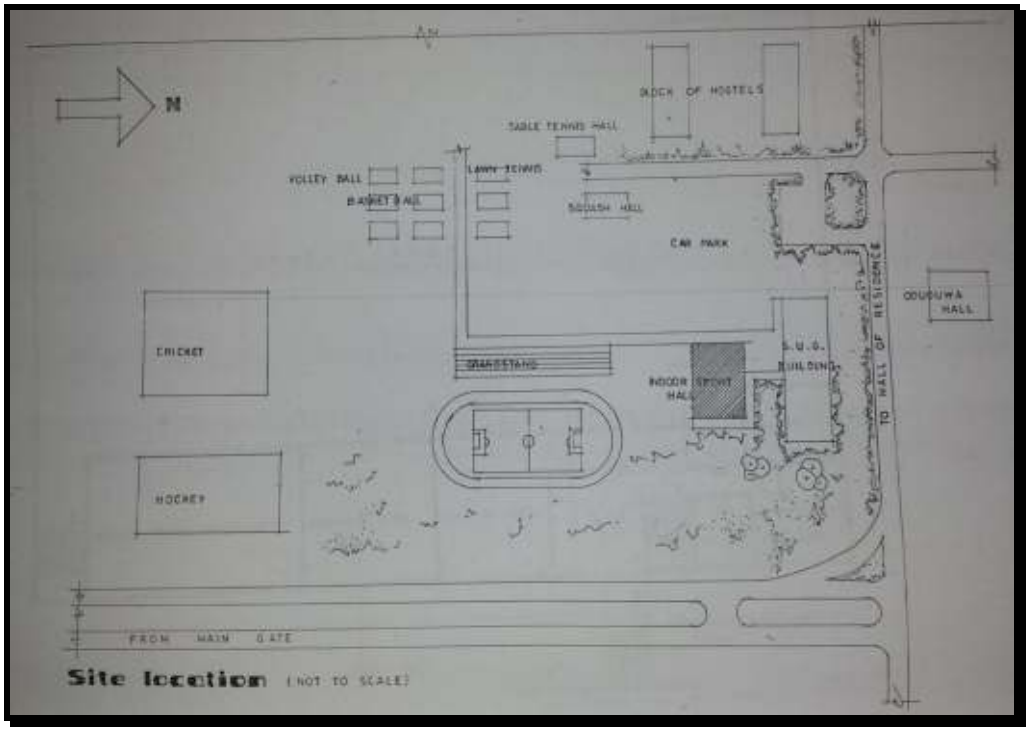

Fig. 2: Showing Sketch of OAU Sports Complex Layout.
(Source: Researchers Archive, 2015)

The position and elevation of the walkway is such that a hierarchy of space is created whereby visitors and spectators to the complex are first brought to this level from various pitches and sports venues. The pitches are separated from one another by 2.5 metre high cross-stitches of steel which functionally acts as a barrier to balls leaving the pitches.

3.1.1 THE INDOOR SPORTS HALL

The approach to the sports hall is through a covered walkway linking it with the Student's Union building. It has a ground floor with two mezzanine floors above. The spaces on the ground floor are reception, committee room, training room and offices. On the first mezzanine floor are spectators viewing gallery, changing rooms (male & female) and lockers. On the second

mezzanine floor are lecture rooms, lecturer's offices, general office and lockers. The dimension of the indoor hall games area is given approximately as 38m x 25m with a head room of about 10m.

Structure: The structural members of the indoor sports hall are reinforced concrete columns with the composite wall of concrete blocks and timber acting as infill. The column hold up the roof consisting of steel girders spaced 2 metres apart. The ceiling is made of stripped timber, arranged in modules of 2 metres each, and are hung from the steel girders. The mezzanine areas are structured by a system of columns and beams.

Lighting and Ventilation: There are two sets of continuous band of windows on the side opposite the mezzanine floors. These windows are located at the upper and lower parts of the wall to receive natural lighting and ventilation. Artificial lighting is also provided with the aid of fluorescent tubes protected by steel cross-stitches attached to the ceiling.

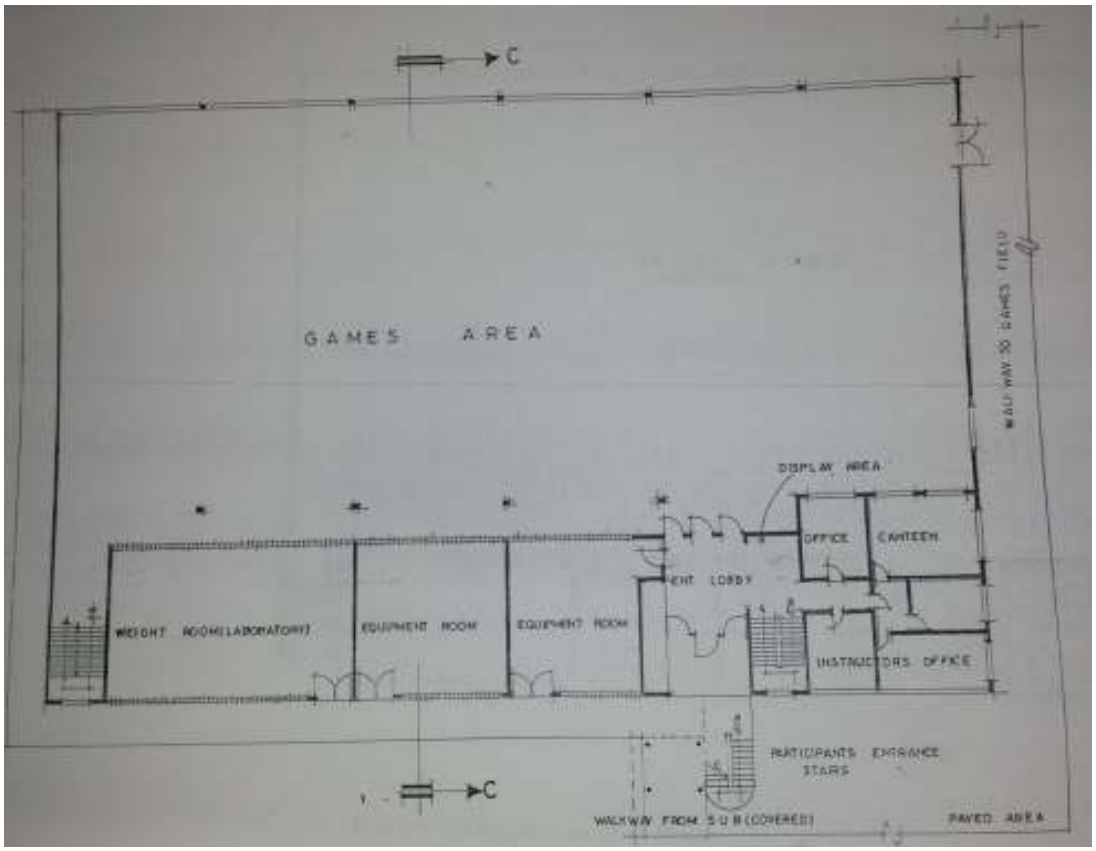

Fig. 3: Showing ground floor plan of OAU indoor sports hall.
(Source: Researchers Archive, 2015)

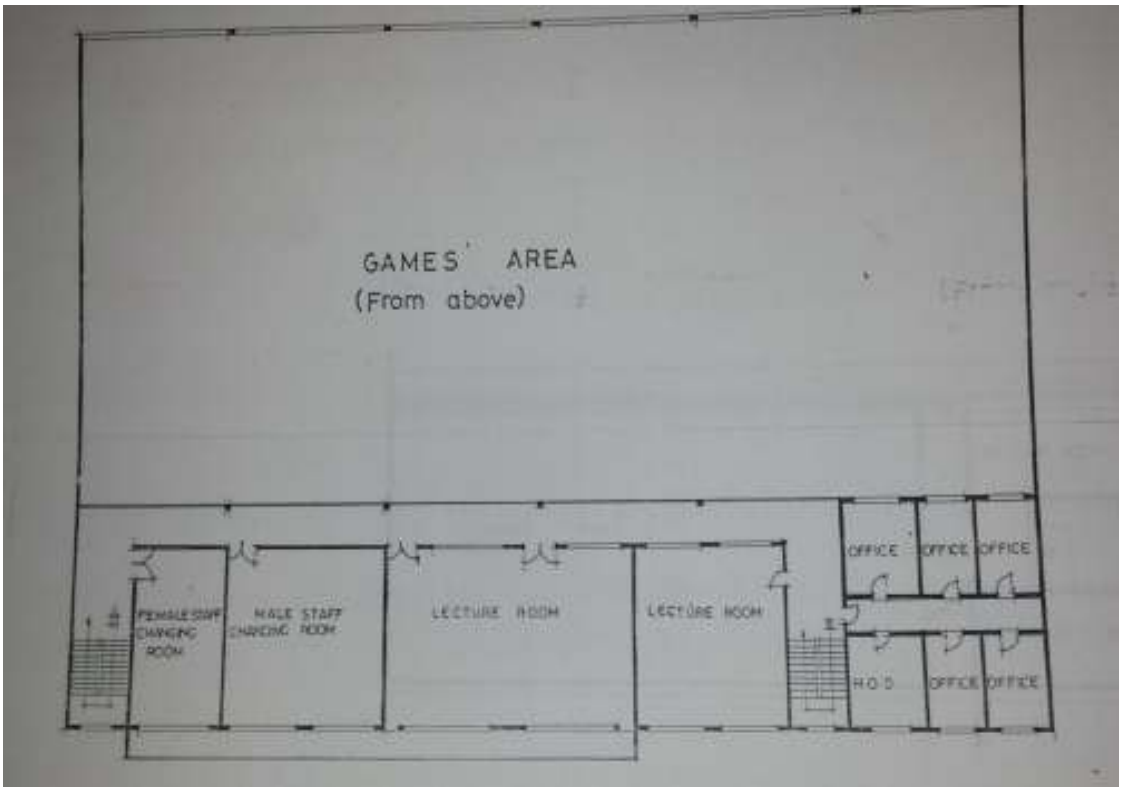

Fig. 4: Showing upper floor plan of OAU indoor sports hall.
(Source: Researchers Archive, 2015)

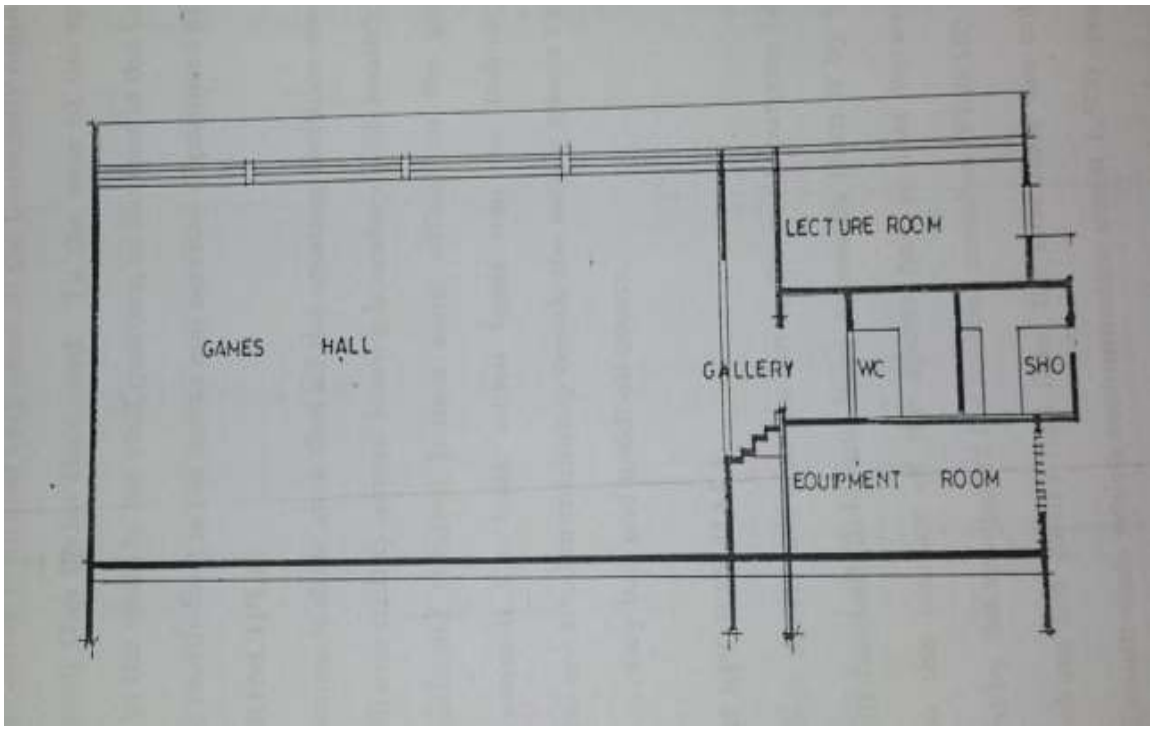

Fig. 5: Showing section through OAU indoor sports hall.
(Source: Researchers Archive, 2015)

Plate 1: Showing interior of OAU indoor sports hall.
(Source: Researchers Archive, 2015)

Plate 2: Showing interior of OAU indoor sports hall.
(Source: Researchers Archive, 2015)

Plate 3: Showing Exterior of OAU indoor sports hall.
(Source: Researchers Archive, 2015)

3.1.2 FOOTBALL PITCH

There is only one football pitch in the complex. It is located immediately next to the arterial road and the first of the facilities lo be sighted. There is grandstand for spectators which is of reinforced concrete and is held in place by reinforced column spaced 3 metres apart. The seats are tiered and made of reinforce concrete (Plate 1).

Area: The area of the pitch is given approximately as 9600m2.

Floor and Court Marking: The surfacing material is turf and the floor marking is white paint. The pitch is drained via a covered gutter that runs round the field, while the turf is watered by floor pipes at various locations especially in the dry season.

Lighting: There is provision for flood lighting for the-area for sports at night.

Plate 4: Showing main pitch with tracks of OAU sports complex.
(Source: Field survey, 2015)

Plate 5: Showing main pitch with tracks of OAU sports complex.
(Source: Field survey, 2015)

Plate 6: Showing tracks during athletics event with at OAU sports complex.
(Source: Google images, 2015)

The above picture shows part of the spectator's grandstand. Only a few part of the grandstand is covered to create some level of comfort for the spectators. The other uncovered parts will cause a considerable level of discomfort to the spectators especially when it is sunny or rainy.

Plate 7: Showing paved walkway at OAU sports complex.
(Source: Field survey, 2015)

The above picture shows part of the walkway around the spectator's grandstand. The width is about 2.4m and this will create some level of comfort for the spectators as they walk around the sports arena.

3.1.3 BASKETBALL COURT

The court shares the same boundary with the Volleyball Court and they are separated from one another by cross-stitches of steel there are 4 courts in all. The dimension of the courts boundary is approximately 80m by 50m.

Floor and Court Marking: The flooring of the court is made of concrete while the surface is painted green colour and white is used to for the marking.

Plate 8: Showing Basketball court at OAU sports complex.
(Source: Field survey, 2015)

Plate 9: Showing Basketball court at OAU sports complex.
(Source: Field survey, 2015)

3.1.4 LAWN TENNIS COURT

The lawn tennis courts are the central facility in the sports complex. Towards the east is the football pitch while on its southern part are the volleyball and basketball courts. The dimension of the courts boundary is approximately 140m by 35m.

Floor and Court Marking: The flooring of the court is made of concrete while the surface is painted green colour and white while yellow colours are used to for the marking.

Plate 10: Showing Lawn tennis court with grandstands at OAU sports complex.
(Source: Field survey, 2015)

3.1.5 VOLLEYBALL COURT

The Volleyball courts, together with the basketball courts, are the sports facilities defining the southern limit of the sports centre. There are 6 courts in all, arranged linearly in 3 pairs. The dimension of the courts boundary is approximately 90m by 50m.

Floor and court marking: The flooring of the court is made of concrete while the surface is painted red and blue colours with white colour is used to for the marking.

Plate 11: Showing Volleyball court with grandstands at OAU sports complex.
(Source: Field survey, 2015)

Plate 12: Showing Volleyball court with grandstands at OAU sports complex.
(Source: Field survey, 2015)

3.1.6 APPRAISALS

a. Merits

i. Provision of grandstands and concrete seating for spectators in some of the facilities, pitches and courts in the sports complex.

ii. Effective utilization of space with the use of levels to separate the various facilities creates a very good scene for the setting.

iii. The linear planning of activities ensures that expansion can be effected when the need arises especially with the present increase in students population.

b. Demerits

i. Most parts of the spectator facilities like grandstands for outdoor pitches are uncovered to protect spectators from rain and sun.

ii. Coverings for grandstand, where available, are inadequate as rain and sun can still disturb spectators who sit under them

iii. The shape of the indoor sports hall lacks adequate aesthetics that may appeal to and attract spectators.

3.2 CASE STUDY 2: UNIVERSITY OF LAGOS SPORTS COMPLEX

The UNILAG sports complex is located very close to the University main gate, towards the south of the Usman Dan Fodio Boolevard. To the west of the sports centre is the students hostel, to the south is the staff quarters, to the east is the University's second gate while to the North-East is the works and services department of the University.

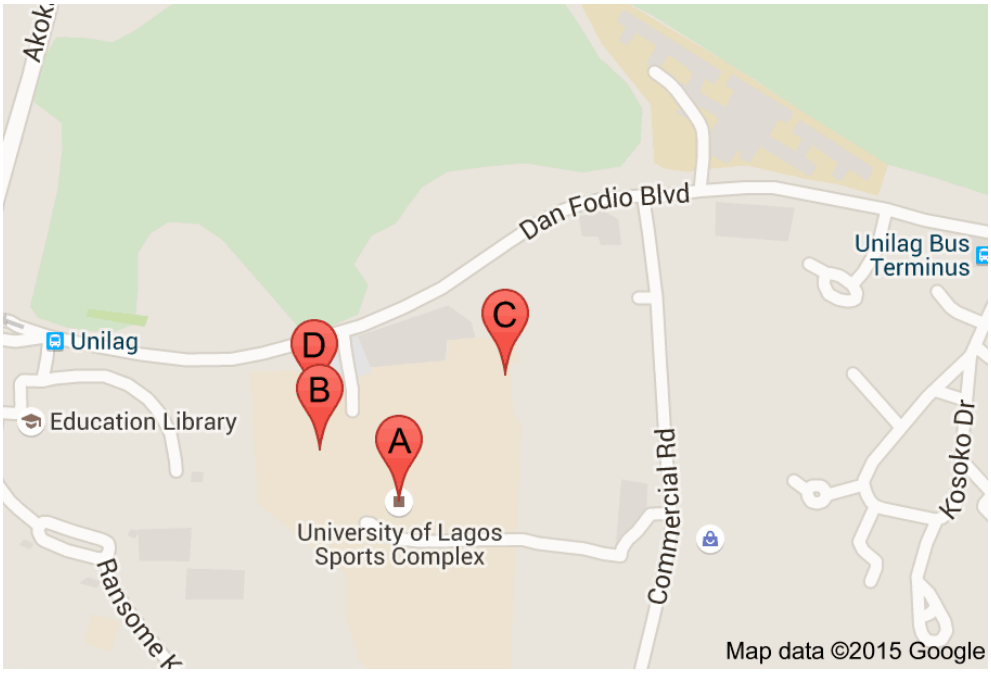

Fig. 6: Google map of UNILAG Sports Sports complex area.
(Source: Google Map, 2015)

Fig. 7: Google map image of UNILAG Sports Sports complex area.
(Source: Google Map Images, 2015)

The planning of the sports complex was done such that all the sporting facilities are located within the same region with one facility almost sharing boundary with another. The Basketball courts are sited immediately beside the indoor sports hall, while at the back are lawn tennis, volley ball and handball courts.

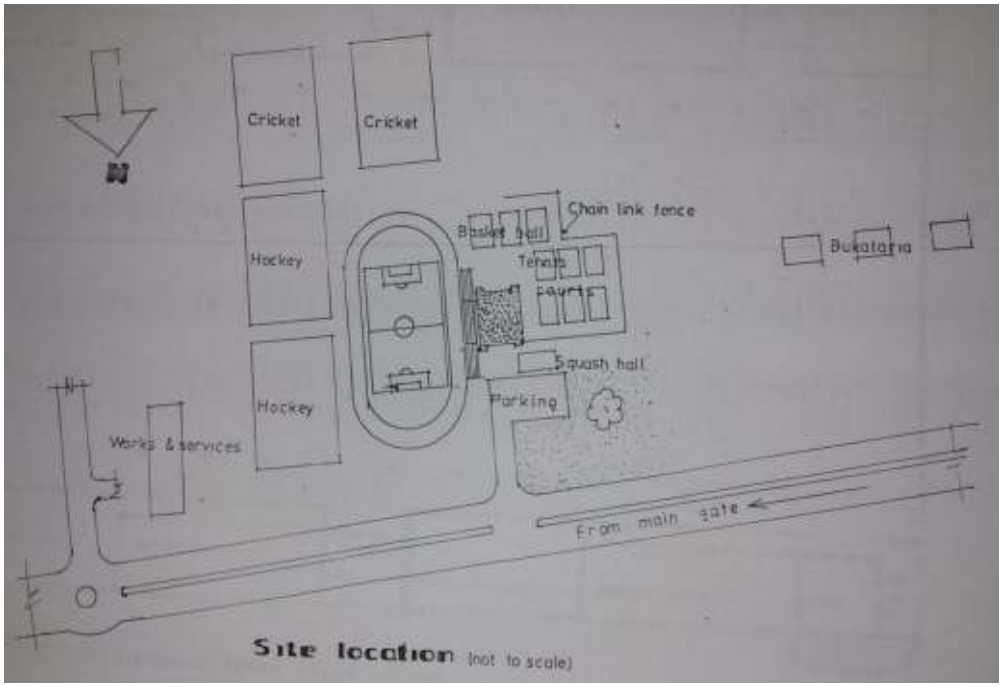

Fig. 8: Sketch of Layout of UNILAG Sports Complex.
(Source: Researchers Archive, 2015)

3.2.1 THE INDOOR SPORTS HALL

The indoor sports hall, also known as the multi-purpose hall, is located directly behind the main football field and is been separated from it by the grandstand. The main access to the interior of the sports hall is the main entrance door between the hall and the grandstand used by the spectators for football matches. Looking downwards into the games hall from the first floor are concrete seating tiers at both north and south ends which accommodate about 1,500 spectators. The stairs leading to the spectators' seats are in semi-circular shapes at the four corners of the hall.

The hall has three main spaces. The games area is centrally located, offices for the coaches and other administrative staff are located to the left, while to the right are changing rooms for athletes as well as the weight lifting/exercise room.

Lighting and Ventilation: The location of the openings aid penetration of natural lighting especially those located at the galleries which are attached to the lower face of steel portal frame at

the roof level. Also, the use of glass louvres aids the achievement of natural cross ventilation into the hall.

Structure: The exterior wall is structured by columns built into the non-structural facade. The tiered concrete seats are held in place by a system of column spaced at about 3.25m centres and horizontal beams. The roof is supported by steel portal frame, on which are steel purlins to which the roofing material is connected.

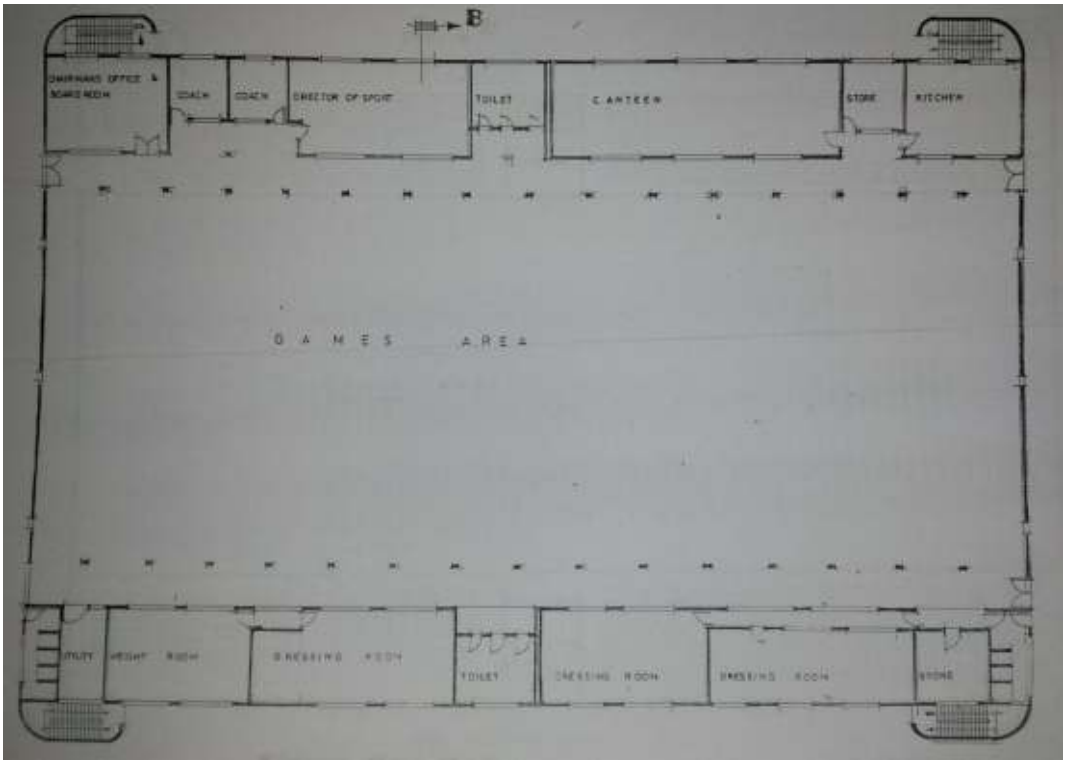

Fig. 9: Showing ground floor plan of UNILAG indoor sports hall.
(Source: Researchers Archive, 2015)

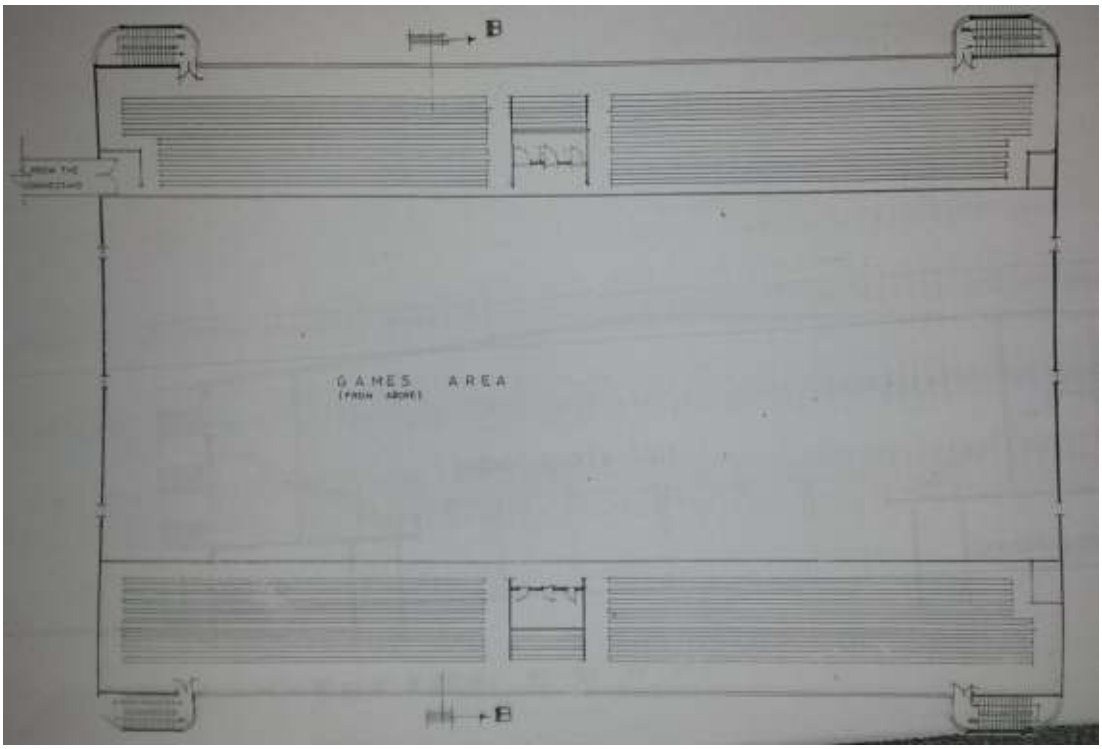

Fig. 10: Showing upper floor plan of UNILAG indoor sports hall.
(Source: Researchers Archive, 2015)

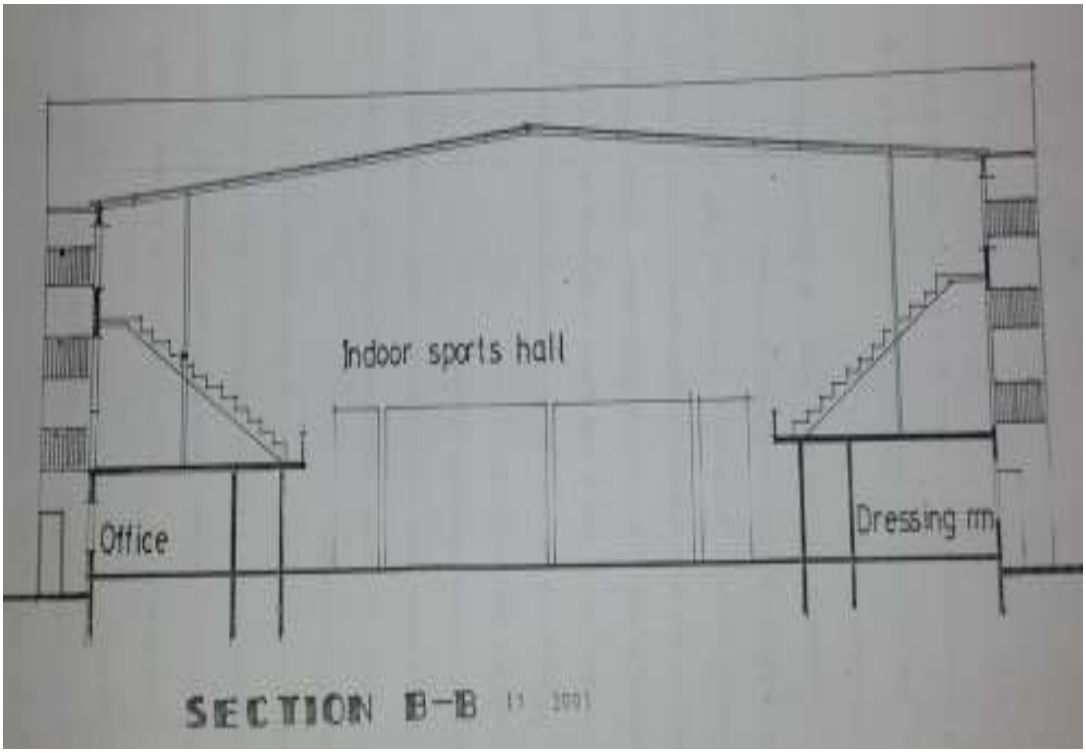

Fig. 11: Showing section through UNILAG indoor sports hall.
(Source: Researchers Archive, 2015)

Plate 13: Showing interior of UNILAG indoor sports hall.
(Source: Researchers Archive, 2015)

Plate 14: Showing Exterior of UNILAG indoor sports hall.
(Source: Researchers Archive, 2015)

3.2.2 FOOTBALL AND ATHLETICS PITCHES

The main football pitch is visible when approaching the sports complex. The pitch is of Olympic standard with 8-lanes running tracks for athletics games. It is very close to the indoor hall and it is separated from the indoor sports hall by the grandstand. The football pitch is served by a grandstand constructed with steel and concrete sections, bolted together for rigidity. The second football pitch is basically a practice pitch hence, has neither grandstand nor running track. The pitches each have an estimated area of about 9,600 sqm.

Floor and Court Marking: The floor is covered with turf (grass). The grass is usually overgrown unless ready to be used for active competition. White is used for the marking.

Lighting: Though the space make use of natural lighting but there are also provisions for flood lighting so that active sports could take place at night.

Plate 15: Showing main pitch grandstands at UNILAG sports complex.
(Source: Field Survey, 2015)

Plate 16: Showing tracks during athletics event with at UNILAG sports complex.
(Source: Google images, 2015)

Plate 17: Showing main pitch with tracks of UNILAG sports complex.
(Source: Field survey, 2015)

3.2.3 BASKETBALL

The basketball courts are located at the southern part of the sports hall and on the south-west side of the main football pitch. There are 3 courts arranged beside one another. The dimension of the pitch is approximately 65m by 45m giving an area of 2,925 sqm.

Floor and Court Marking: The surfacing material is concrete. The colour of the courts is grayish green while markings are in white colour. The area around the court is painted red.

Plate 18: Showing Basketball court at UNILAG sports complex.
(Source: Field survey, 2015)

3.2.4 HANDBALL

The handball court is orientated towards the western side of the sports hall and on the northern side of the lawn tennis court. Both the handball and the lawn tennis courts are separated from one another by cross-stitches acting as barrier. The dimension is approximately 42m by 24m giving an area of 1008 sqm.

Floor and Court Marking: The court is painted grayish green with white colour markings. The area around the court is painted red.

3.2.5 LAWN TENNIS

The lawn tennis courts are orientated towards the west of the sports centre and to southwest of.the indoor sports hall. There are three courts present there.

Floor and Court Marking: This is the same as in handball and basketball courts.

Lighting: Flood lighting is provided for all the outdoor courts so that active sports could take place at night.

Generally, sporting facilities provided at the university of Lagos sports complex include one indoor sports hall, two football pitches, three basketball courts, one handball court, one volleyball court, three lawn tennis courts and one hockey pitch court.

3.2.6 APPRAISALS

a. Merits

i. Effective planning of the sports complex layout, proper zoning of sporting facilities and adequate utilization of space. This will aid spectators' movement from one court or facility to the other.

ii. Presence of grandstands for spectators to sit and feel comfortable while viewing games.

iii. Services such as electricity, water supply, natural and artificial drainage are present hence contributing to the comfort of spectators.

iv. The complex serves as a good recreational place for the University community i.e students, staff, and individual outside the University but within the immediate environs. It is equally been used by students of the department of physical education for practical purposes.

b. Demerits

i. The spectator grandstands for the outdoor pitches are inadequate to cater for the amount of spectators that might want to watch matches or games.

ii. The coverings for the grandstands cannot adequately protect the spectators under it from rain and sun.

iii. The grandstand tiers are simply concrete seats on which spectators sits. This would be uncomfortable to sit upon due to the hardness and when heated up buy the sun.

iv. The natural lighting entering into the indoor sports hall is insufficient to light the hall fully. This could have been improved upon with more openings to the left hand side of the hall as it is done on the right hand side.

3.3 CASE STUDY 3: FEDERAL UNIVERSITY OF TECHNOLOGY, AKURE SPORTS COMPLEX

The Federal University of Technology, Akure (FUTA) Sports Complex is located close to the university main gate (Northgate along Akure-Ilesha expressway), towards the west of the university main road and Usman Dan Fodio road. The university main road runs down the south of the sports complex towards the university senate building. To the east of the sports centre is the students hostel (Abiola and Jibowu Halls). To the south-east are the Students' Union Building (SUB) and the indoor sports halls (table tennis, judo, gym and the chess palace). To the west of the sports complex is the 2,500 capacity university auditorium, Centre for Continuing Education (CCE) building and the Computer Resource Centre (CRC) building.

Fig. 12: Google map of FUTA Sports complex area.
(Source: Google Map, 2015)

The planning of the sports complex was done such that all the sporting facilities are not fully concentrated within the same region. The main football and athletics pitch is grouped together with the basketball, volleyball and lawn tennis courts. The basketball and volleyball courts are to its east of the main pitch while the lawn tennis courts are to the west of the main pitch. The indoor sports buildings are located towards the east of the main pitch, on the other side of the university major road.

Fig. 13: Google map image of FUTA Sports complex area.
(Source: Google Map Images, 2015)

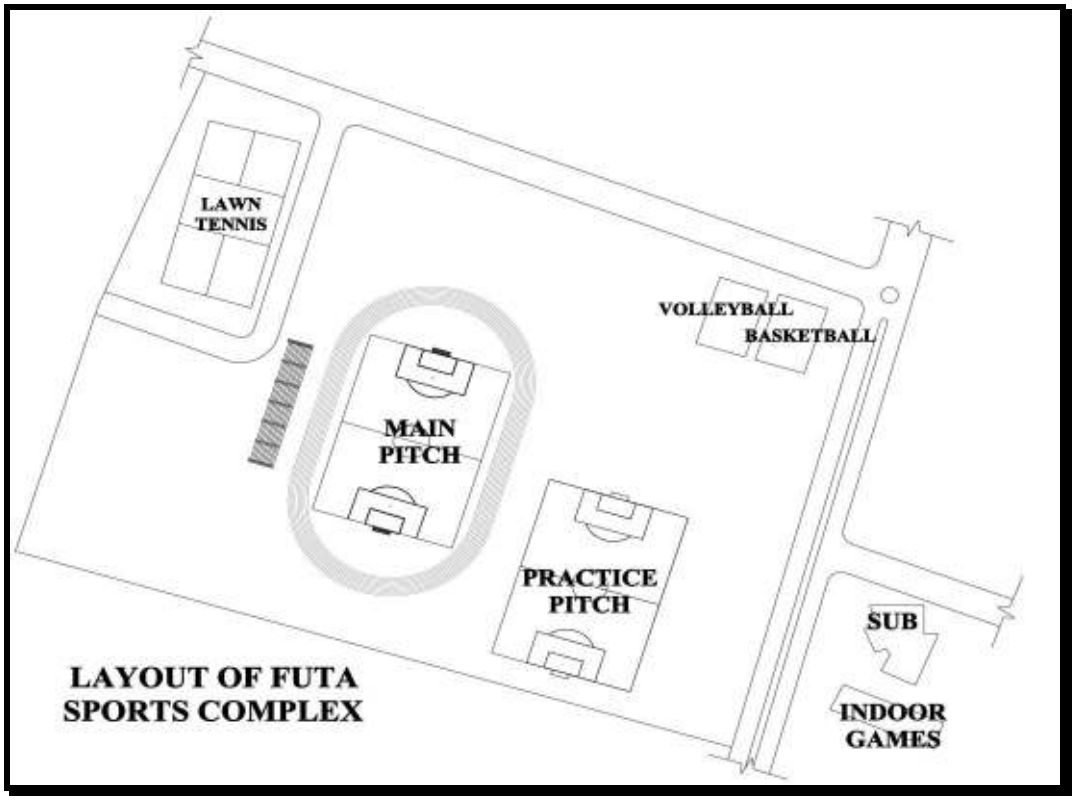

Fig. 14: Showing Sketch of FUTA Sports Complex Layout
(Source: Researchers Archive, 2015)

3.3.1 THE INDOOR SPORTS HALL

The indoor sports buildings are located towards the east of the main football and athletics pitch, behind the Students' Union Building (SUB) on the other side of the university major road. There two main sports building there. The first building has three major spaces for the gym, judo and chess palace while the second building is mainly for table tennis.

The halls have the games area, offices for the coaches changing rooms and conveniences for athletes. The halls are basically for athletes, hence no grandstands or spectator facility provided.

Lighting and Ventilation: The location of the openings aid penetration of natural lighting and adequate natural ventilation.

Structure: The buildings are simple buildings with the width being about 7m and length of about 15m, thus creating ease of construction and roofing. The walls are simply 230mm hollow block walls while the use of columns is not easily noticeable as they would have been embedded into the walls.

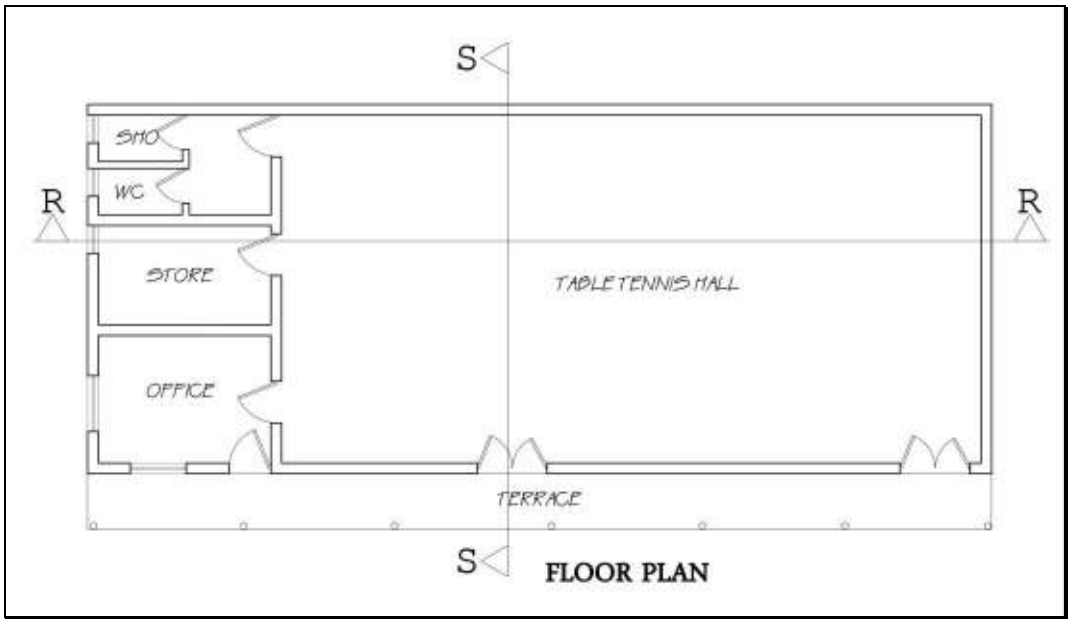

Fig. 15: Showing ground floor plan of FUTA indoor Table Tennis hall. (Source: Researchers Archive, 2015)

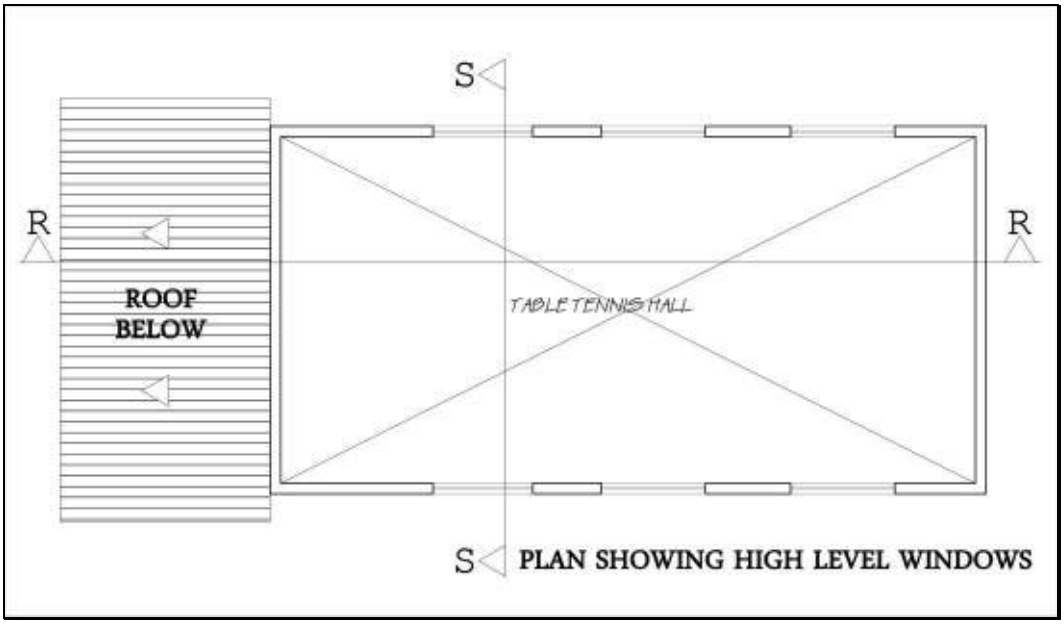

Fig. 16: Showing floor plan (with high level windows) of FUTA indoor Table Tennis hall. (Source: Researchers Archive, 2015)

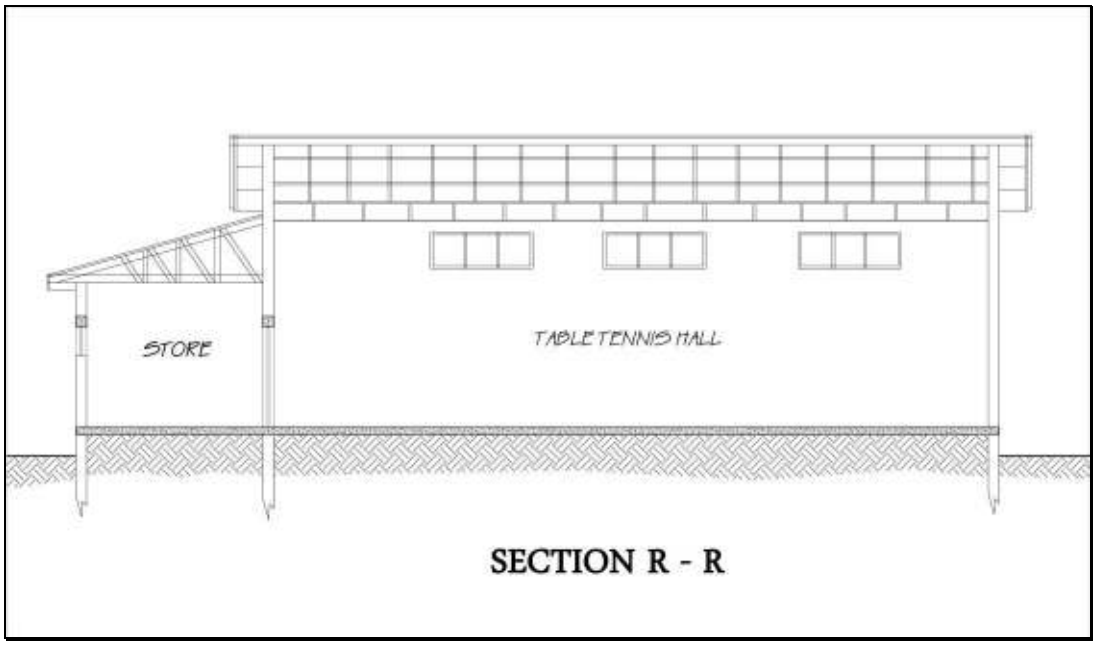

Fig. 17: Showing section through FUTA indoor Table Tennis hall.
(Source: Field Survey, 2015)

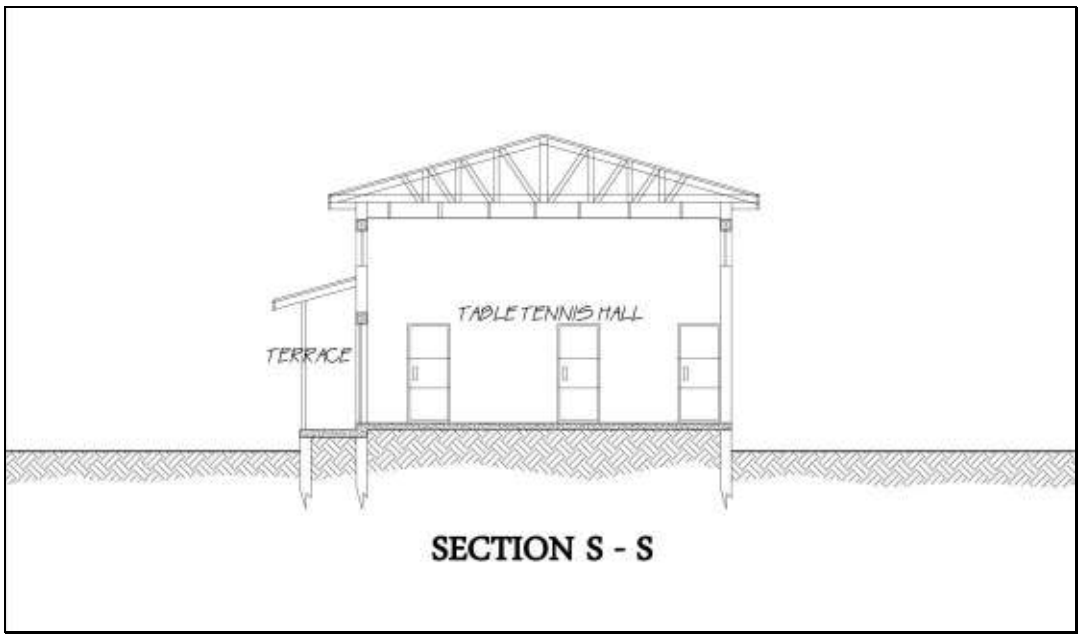

Fig. 18: Showing section through FUTA indoor Table Tennis hall.
(Source: Field Survey, 2015)

Plate 19: Showing interior of FUTA indoor Table Tennis hall.
(Source: Field Survey, 2015)

Plate 20: Showing interior of FUTA indoor Table Tennis hall.
(Source: Field Survey, 2015)

Plate 21: Showing Exterior of FUTA indoor Table Tennis hall.
(Source: Field Survey, 2015)

Plate 22: Showing Exterior of FUTA indoor sports halls.
(Source: Field Survey, 2015)

Plate 23: Showing Exterior (rear view) of FUTA indoor sports halls.
(Source: Field Survey, 2015)

3.3.2 FOOTBALL AND ATHLETICS PITCHES

The main football pitch is visible when approaching the sports complex. The pitch is of Olympic standard with 8-lanes running tracks for athletics games. It is very close to the indoor hall and it is separated from the indoor sports hall by the grandstand. The football pitch is served by a grandstand constructed with steel and concrete sections, bolted together for rigidity. The second football pitch is basically a practice pitch hence, has neither grandstand nor running track. The pitches each have an estimated area of about 9,600 sqm.

Floor and Court Marking: The floor is covered with turf (grass). The grass is usually overgrown unless ready to be used for active competition. White is used for the marking.

Lighting: Though the space make use of natural lighting but there are also provisions for flood lighting so that active sports could take place at night.

Plate 24: Showing main pitch of FUTA sports complex.
(Source: Field survey, 2015)

Plate 25: Showing main pitch with tracks, FUTA sports complex.
(Source: Field survey, 2015)

Plate 26: Showing grandstand for the main pitch of FUTA sports complex.
(Source: Field survey, 2015)

Plate 27: Showing grandstand (rear view) for the main pitch of FUTA sports complex.
(Source: Field survey, 2015)

Plate 28: Showing grandstand (rear view) for the main pitch of FUTA sports complex.
(Source: Field survey, 2015)

3.3.3 BASKETBALL

There is only one basketball court at the FUTA sports complex. It is named as Babatunde Babalola Basketball Court. It is located towards the east of the main pitch beside the volleyball court. The dimension of the pitch is approximately 22m by 42m giving an area of 924 sqm.

Floor and Court Marking: The surfacing material is concrete. The colour of the courts is grayish green while markings are in white colour while the area around the court is painted red.

Plate 29: Showing Basketball court at FUTA sports complex.
(Source: Field survey, 2015)

Plate 30: Showing Basketball court at FUTA sports complex.
(Source: Field survey, 2015)

3.3.4 VOLLEYBALL

FUTA sports complex has only one volleyball court which is named Babatunde Babalola Volleyball Court. It is located towards the east of the main pitch and shares boundary with the basketball court. The dimension of the pitch is approximately 22m by 42m giving an area of 924 sqm.

Floor and Court Marking: This is the same as in handball and basketball courts.

Lighting: Flood lighting is provided for all the outdoor courts so that active sports could take place at night.

Plate 31: Showing Volleyball court at FUTA sports complex.
(Source: Field survey, 2015)

3.3.5 LAWN TENNIS

The lawn tennis courts are orientated towards the west of the sports centre and to southwest of.the indoor sports hall. There are three courts present there.

Floor and Court Marking: This is the same as in handball and basketball courts.

Lighting: Flood lighting is provided for all the outdoor courts so that active sports could take place at night.

Generally, sporting facilities provided at the university of Lagos sports complex include one indoor sports hall, two football pitches, three basketball courts, one handball court, one volleyball court, three lawn tennis courts and one hockey pitch court.

Plate 32: Showing Lawn tennis court with grandstands at FUTA sports complex.
(Source: Field survey, 2015)

Plate 33: Showing Lawn tennis courts at FUTA sports complex.
(Source: Field survey, 2015)

Plate 34: Showing with grandstands (without covering) for the Lawn tennis courts at FUTA sports complex. (Source: Field survey, 2015)

Plate 35: Showing with grandstands for the Lawn tennis courts at FUTA sports complex. (Source: Field survey, 2015)

Generally, sporting facilities provided at the Federal University of Technology, Akure sports complex are two indoor sports buildings, two football (main and practice) pitches, one basketball court, one volleyball court and four lawn tennis courts.

3.3.6 APPRAISALS

a. Merits

i. The zoning and layout of the sports complex sports creates an upportunity for easy access and future expansion.

ii. Presence of grandstands for spectators to sit, especially for the volley ball courts and main pitch.

iii. Services such as electricity, water supply, natural and artificial drainage are present hence contributing to the comfort of spectators.

iv. The complex serves as a good recreational place for the University community i.e students, staff, and individual outside the University but within the immediate environs.

b. Demerits

i. The spectator grandstands for the outdoor pitches, especially for the main pitch, are inadequate to cater for the amount of spectators that might want to watch matches or games.

ii. The Volleyball and basketball courts totally lack grandstands, thus eliminating possibility of a spectatorship spirit. Any willing spectator will have to stand.

iii. The coverings for the grandstands at the main pitch cannot adequately protect the spectators under it from rain and sun. The grandstands for the lawn tennis courts completely lack coverings.

iv. The grandstand tiers are simply concrete seats on which spectators sits. This would be uncomfortable to sit upon due to the hardness and when heated up buy the sun. The grandstands for the lawn tennis courts look unkempt due to complete exposure.

v. The natural lighting entering into the indoor sports hall is insufficient to light the hall fully. This could have been improved upon with more openings to the left hand side of the hall as it is done on the right hand side.

3.4 CASE STUDY 4: UNIVERSITY OF ILORIN SPORTS COMPLEX

The sports complex of the University of Ilorin, Ilorin Kwara State is located along Adesoji Aderemi road, a major road on the university campus, thus making accessibility easy. Its facilities are somewhat up to standard as it has hosted university games and many other sports competitions.

Fig. 19: Google map image of UNILORIN Sports complex area.
(Source: Google Map Images, 2015)

The UNILORIN sports complex facilities are planned to in such a way that all sports facilities are concentrated within the same area. The main football and athletic pitch has next to its south the major university road while other sports facilities have been arranged to the north side of the pitch. Generally, some of sporting facilities provided at the sports complex are the main football pitch, multipurpose indoor sports building for games like basketball, lawn tennis and table tennis, basketball court, volleyball court, handball court and lawn tennis court.

3.4.1 THE INDOOR SPORTS HALL

The indoor sports hall is for multipurpose use. Sporting activities like basketball, lawn tennis and table tennis take place in the hall. The hall is basically for athletes to train, play games and recreate. It is not often used for big competitions. Thus, spectators' grandstands are completely absent. The dimension of the indoor hall games area is given approximately as 30m x 55m with a head room of about 10m.

Structure: The hall is structurally composed of reinforced concrete columns and 230mm blocks as main external wall. The roof is made of steel structure spanning the entire hall and supported by the reinforced concrete columns.

Lighting and Ventilation: The windows are on high levels and bring adequate light into the hall. The windows also aid good natural ventilation.

Plate 36: Showing interior of UNILORIN multipurpose indoor sports hall.
(Source: Field Survey, 2015)

Plate 37: Showing interior (entrance area) of UNILORIN multipurpose indoor sports hall.
(Source: Field Survey, 2015)

Plate 38: Showing exterior of UNILORIN multipurpose indoor sports hall.
(Source: Field Survey, 2015)

3.4.2 BASKETBALL COURT

The court shares the same boundary with the Volleyball Court and they are separated from one another by cross-stitches of steel. The dimension of the courts boundary is approximately 22m by 41m.

Floor and Court Marking: The flooring of the court is made of concrete while the surface is painted blue colour and white is used to for the marking.

Plate 39: Showing Basketball court at UNILORIN sports complex. (Source: Field survey, 2015)

3.4.3 LAWN TENNIS COURT

The lawn tennis court shares the same boundary with the basketball court. It is located towards the west of the football pitch. It has grandstands for spectators. The grandstands are similar to those for the rest of the outdoor pitches

Floor and Court Marking: The flooring of the court is made of concrete while the surface is painted blue colour while white colour is used for the marking. Area around the court is painted red.

Plate 40: Showing Lawn tennis court with grandstands at UNILORIN sports complex.
(Source: Field survey, 2015)

3.4.4 HANDBALL COURT

The handball court at the Unilorin sports complex is located close to the indoor sports building. The court is has its boundaries separated from other outdoor courts. The goal posts, like that of soccer, are intact showing a recent upgrading of the court. The dimension of the courts boundary is approximately 20m by 40m.

Floor and court marking: The flooring of the court is made of concrete while the surface is painted blue and yellow colours while white colour is used for the marking.

Plate 41: Showing Handball court at UNILORIN sports complex. (Source: Field survey, 2015)

Plate 42: Showing typical grandstand for outdoor courts at UNILORIN sports complex. (Source: Field survey, 2015)

3.4.5 APPRAISALS

a. Merits

i. Provision of grandstands for spectators in most of the outdoor pitches and courts in the sports complex.

ii. The indoor sports hall is for multipurpose use thus making it possible for many sporting activities to be carried out there.

b. Demerits

i. Most parts of the spectator facilities like grandstands for outdoor pitches are uncovered to protect spectators from rain and sun.

ii. Available grandstands are inadequate. In case a situation where large number of spectators are available, many would have to stand.

iii. The grandstand tiers are simply concrete seats on which spectators sits. This would be uncomfortable to sit upon due to the hard surface and when heated up buy the sun.

iv. The grandstands for the outdoor pitches generally look unkempt due to complete exposure.

3.5 SUMMARY AND CONCLUSION

This chapter has presented case studies of existing sports complex of the selected universities. Major aspects that contribute to the comfort of spectators were examined. These include, but not limited to, adequate seating capacity in terms of grandstands, covering for grandstands to shield spectators from rain and sun, adequate paved walkways, convenient viewing distances and angles among many others.

Form these case studies, it can be concluded that factors that contribute to the comfort of spectators in a university sports complex are lacking or inadequate in many Nigerian universities. Major reasons for these may include poor funding, lack of interest in spectator sports, corruption and poor maintenance.

CHAPTER FOUR

4.0 SITE ANALYSIS AND PROJECT PROPOSAL

4.1 HISTORICAL BACKGROUND

4.1.1 STUDY AREA: OKITIPUPA, ONDO STATE

Okitipupa is a Local Government Area in Ondo State, Nigeria. Its area lies between longitudes 4^{o} 3' and 6^{o} 00' East and latitudes 5^{o} 42' and 8^{o} 15' North. It has always been known as Ode-Idepe. The name Okitipupa originated from the elevation of the town and the colour of the soil of the town which is red in colour referred to in Yoruba language and its dialects as 'pupa'.Okiti-pupa is derived from Yoruba language Okiti (Hilly) and Pupa (Red) which was used by people travelling from other communities to trade in the Okitipupa central market. Today, inhabitants interchangeably use the names of Okitipupa and Idepe freely.

It is native to the Ikales, who are a sub-set of the larger Yoruba tribe. It has always been the central town for inhabitants of the Ondo South senatorial district of Ondo state comprising Okitipupa, Irele, Ilaje, Ese-Odo, Odigbo and Ile-oluji/Oke-Igbo local governments due to the presence of several amenities. It was a district in the colonial days before Nigeria's independence in 1960. It has a university, a Specialist hospital, several private hospitals, a Magistrate court, a High court, a Police division, an Army Base, Commercial banks and numerous primary and secondary schools.

The Ikale natives are predominantly farmers. The major cash crops being cultivated in the area are Oil-Palm, Rubber and Cassava. They also cultivate Yam, Beans, Okro, Pepper, Melon and Vegetables. Staple food includes but is not limited to Baked cassava popularly known as 'Pupuru', Yam, Rice, Yam Flour and Cassava Flakes (Garri) among others.

It has a market that has been a major shopping centre for traders from all of Yoruba land and beyond since the pre-colonial era due to the palm-oil sold there. A modern market was built by the administration of Chief Herbert Kuewumi in 1979 when he was chairman of the Old Okitipupa Local government before the administration of Dr Olusegun Mimiko as Governor of Ondo state rebuilt the market in 2009. A larger percentage of the roads in the town were constructed by the administration of Dr. Olusegun Kokumo Agagu when he was Governor of Ondo state.

Major industries located in the town include the Okitipupa Oil Palm Plc and Oluwa Glass Factory. Palm-Oil and Rubber plantations litter the landscape. It has an area of 803 km^2 and a population of

233,565 at the 2006 census. (www.ondostategovernment.com, www.onlinenigeria.com, www.wikipedia.com).

Fig. 20: Map of Nigeria Showing Ondo State and Other States

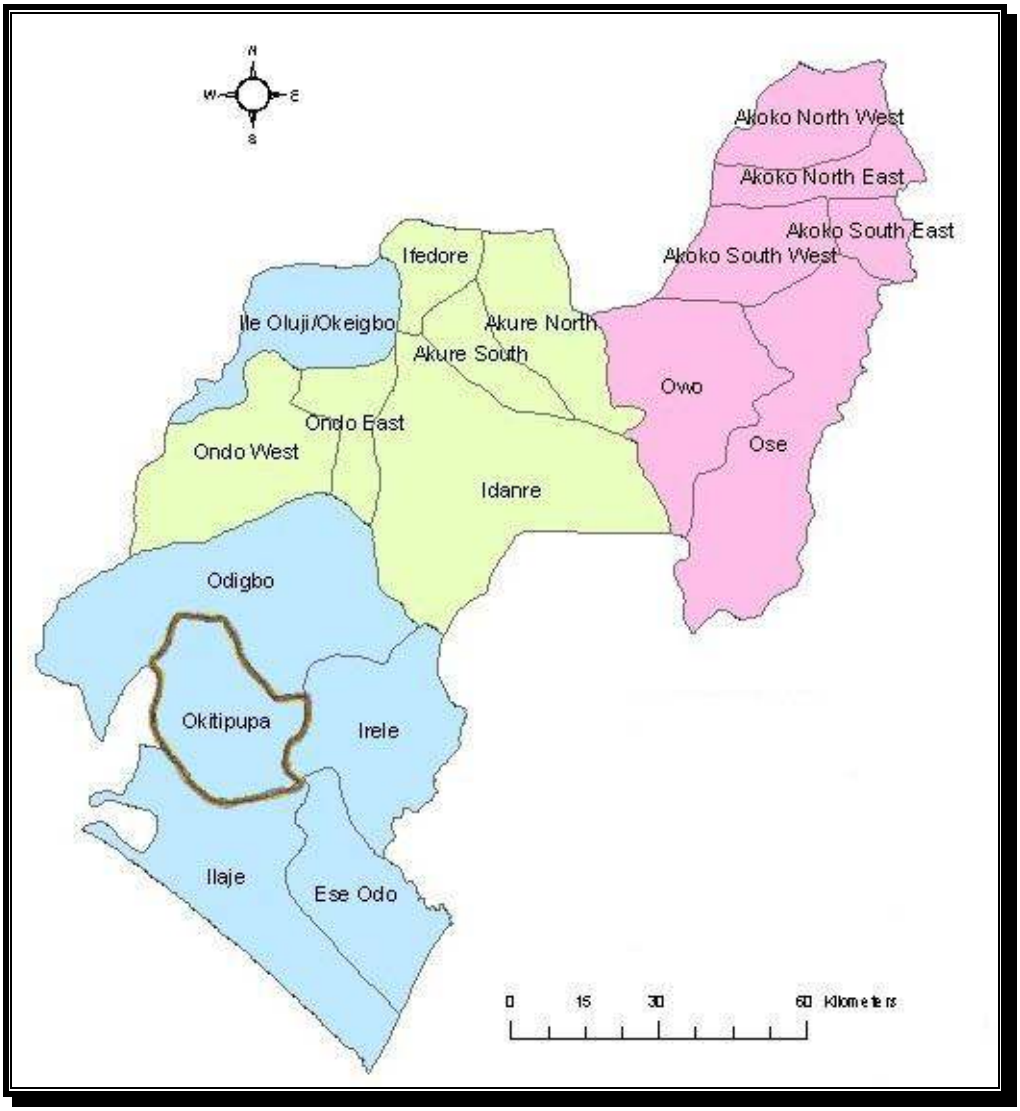

Fig. 21: Map of Ondo State Showing Okitipupa and other local government areas

4.1.2 ONDO STATE UNIVERSITY OF SCIENCE AND TECHNOLOGY, (OSUSTECH) OKITIPUPA

The Ondo State University of Science and Technology, (OSUSTECH) Okitipupa, Ondo State, Nigeria is located at Okitipupa in the Southern Senatorial District of Ondo State Nigeria. The Governing Council of the University was inaugurated on 27th September, 2010 by the executive Governor of Ondo State and Visitor to the University, Dr. Olusegun Mimiko. Academic activities in the institution took off fully in January 2011 while the matriculation of the first set of students was held on Thursday 3rd of March 2011.

The University initially started with one Faculty, the Faculty of Science. The Faculty of Engineering and Engineering Technology, Faculty of Information and Communications Technology, Faculty of Earth Sciences and the Faculty of Agriculture, Forest and Aquatic

Resources are planned to come on stream in the nearest future. OSUSTECH is a technology-based institution which aims at providing the needed manpower training in order to address the critical areas of industrial and technological development of Ondo State and Nigeria as a whole.

The Ondo State University of Science and Technology (OSUSTECH) is currently being piloted to be a world class institution of higher learning that will attract and prepare intelligent and talented young men and women from diverse backgrounds within the State, Nigeria and beyond for all round training and development in science and technology. This will position them for scientific discovery and innovations that will positively impact on the society and influence the decision-making processes of the State and the country at large. The motto of the University is "For Society and Development". The University colours are marine blue and brick red. The marine blue colour represents sea/ocean which characterizes the physical environment of the location of the University while brick red colour symbolizes science and technology. The logo of the University consists of a shield containing an open book symbolizing knowledge, a wheel and laboratory materials depicting science and technology; all supported by a banner on which the motto of the University is inscribed.

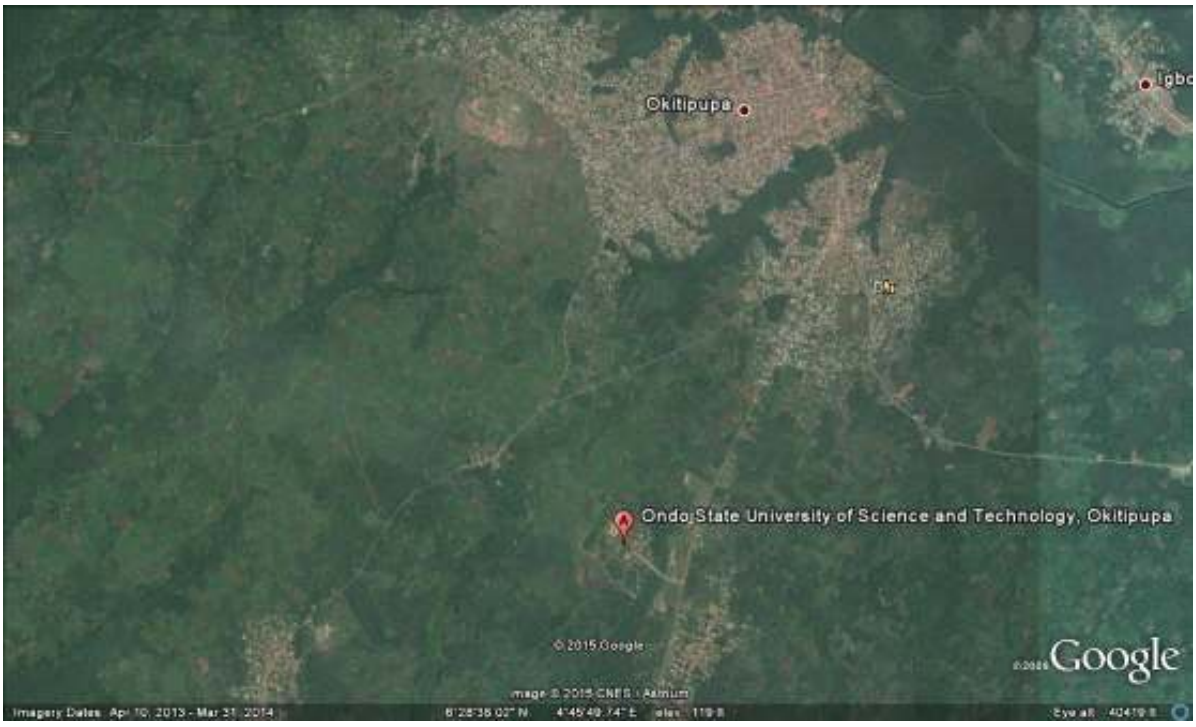

Fig. 22: Google Earth Map Showing Okitiupa Main Town and OSUSTECH Main Campus

Fig. 23: Google Earth Map Showing Okitiupa Main Town

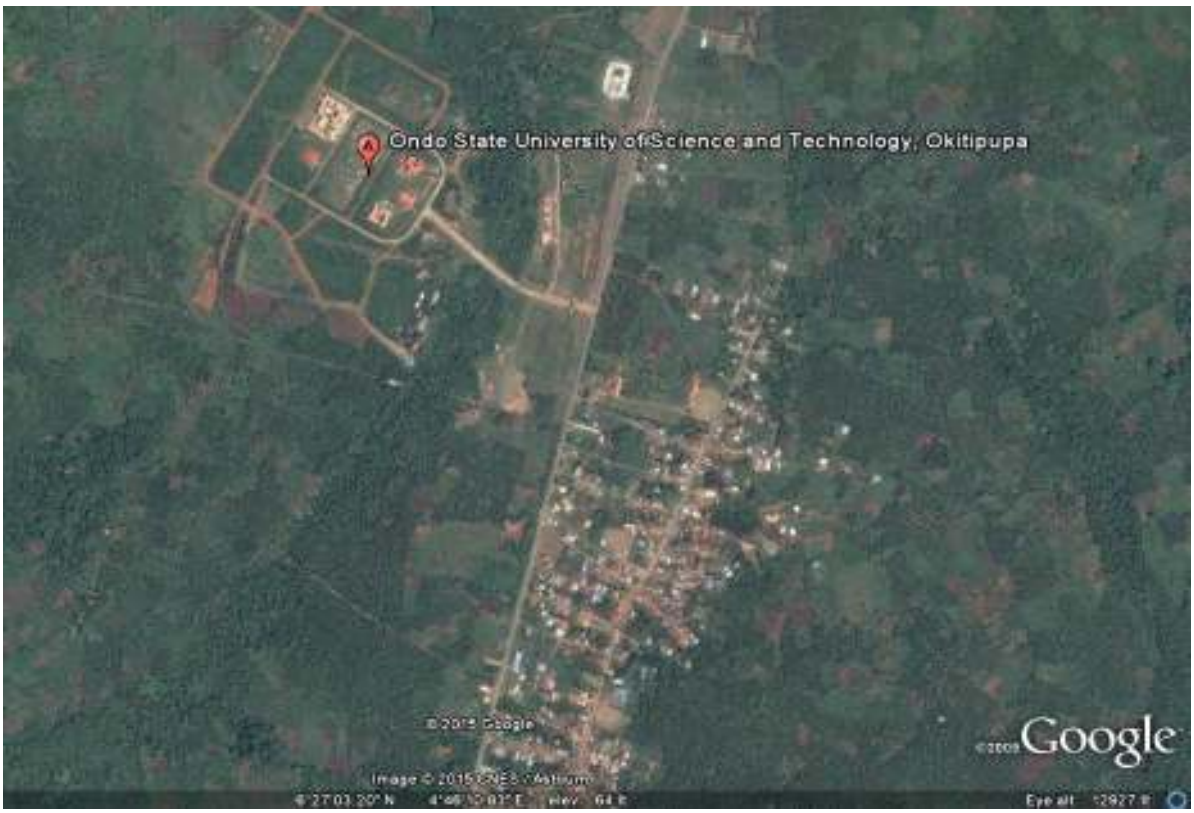

Fig. 24: Google Earth Map Showing OSUSTECH Main Campus

4.2 NEED FOR THE SPORTS COMPLEX

The Ondo State University of Science and Technology, Okitipupa, Ondo State, though quite young and still a fledgling institution, is supposed to have a befitting sports complex to meet the sporting and recreational needs of the university community. However, this aspect of the university facilities is lacking thus requiring proper planning in order to achieve this need.

This institution deserves a provision of sports complex for the following reasons:

i. To Meet The Sporting Needs of the University Community

In any University environment, there is a need for a selected area to be planned for sporting activities. The activities can be inter-university games, inter-hall and inter-faculty games. The proposed centre will also be used to train the university sports men and women for different sports.

ii. For The Discovery and Development of Sportsmen

Many students amongst the entire students of the university have potentials in sports. Having a well-planned sports complex would afford many of such students to be discovered and be further developed. This would also improve the sports pedigree of the university by having sports men and women to represent her in competitions. This could also extend to the country at large as many of these representatives from the university can metamorphose into international sports men and women

iii. For Recreation and Social Interactions

Due to the rigours of academic activities, students need an area where they can relax and temporarily escape from the hustle and bustle of the University environment. Some simply want to be fit while some want to watch sports activities or competitions. The proposed centre will provide an appropriate avenue for this.

A University sports complex also provides one of the few avenues where students can have an opportunity of coming together. This makes it possible for exchange of ideas and other development of individual skill. The level of social interaction will consequently be enhanced.

iv. For Generation of Income for The University

The sports complex will be a source of income for the university in form of Internally Generated Revenue (IGR) which will be highly useful in meeting certain financial needs of the university. The provision of a comfortable atmosphere for spectators will encourage more spectators to attend sporting events where tickets can be sold to view matches or games.

4.3 THE PROJECT SITE

4.3.1 SITE LOCATION

The location of the site for the proposed university sports complex is just after the main entrance gate into the campus by the left, along the major road that runs from the main entrance gate into the campus core as can be seen on the master plan of the University.

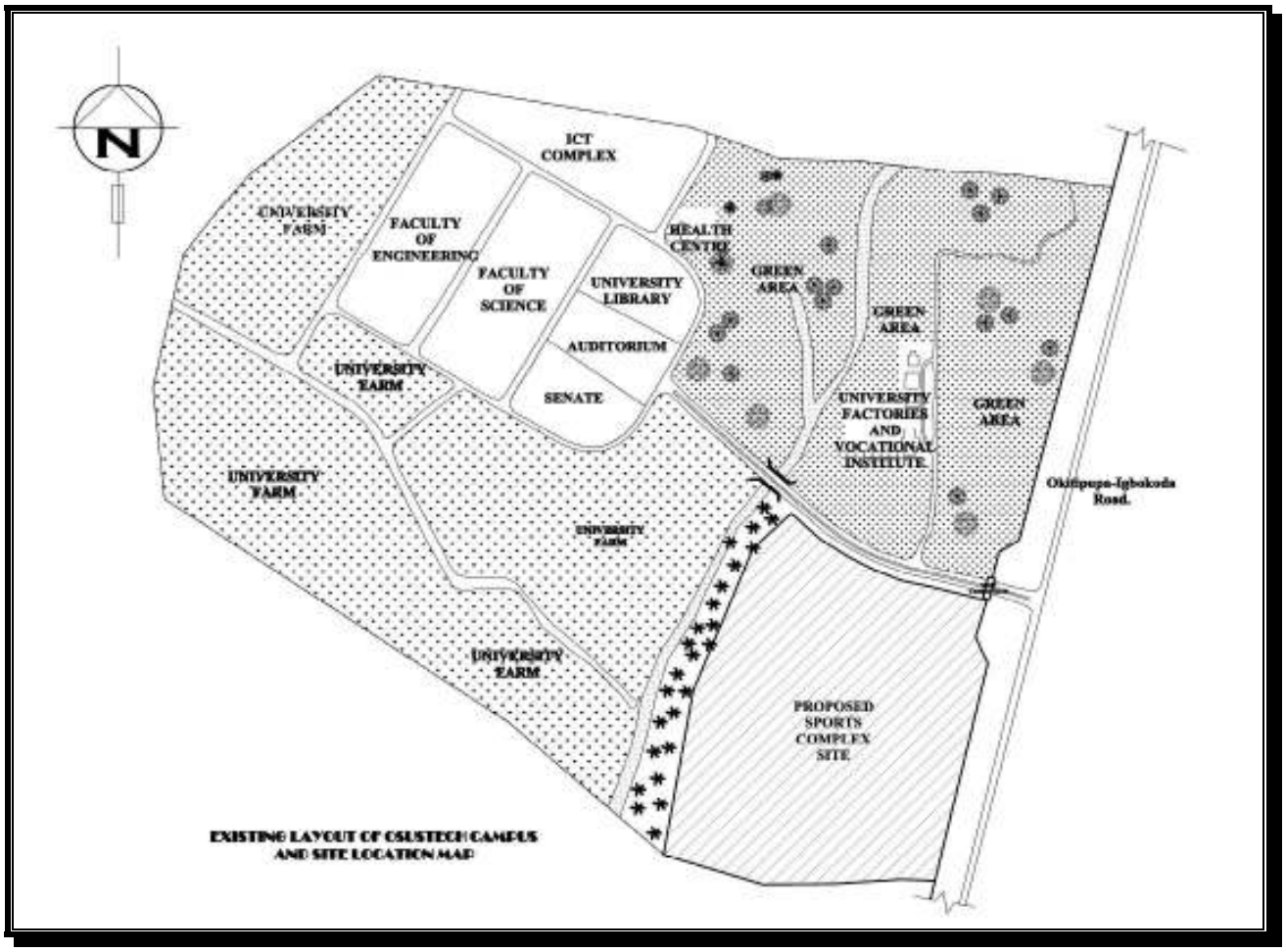

Fig. 25: Existing layout of OSUSTECH Main Campus Showing Site Location of The Sports Complex (Source: Researcher's archive)

4.3.2 SITE ANALYSIS

An analysis of the project site helps and enhances an in-depth understanding of the site condition before the commencement of the design. The suitability of the site for the proposed project and its intended purpose can be determined thorough site analysis. The reason is to achieve the aim of the design. Site analysis helps in the functional development of the relationship that exists between the site and the structures to be placed in it. Every design solution should aspire to be a function of the site and also a direct reflection and adaptation of its environment.

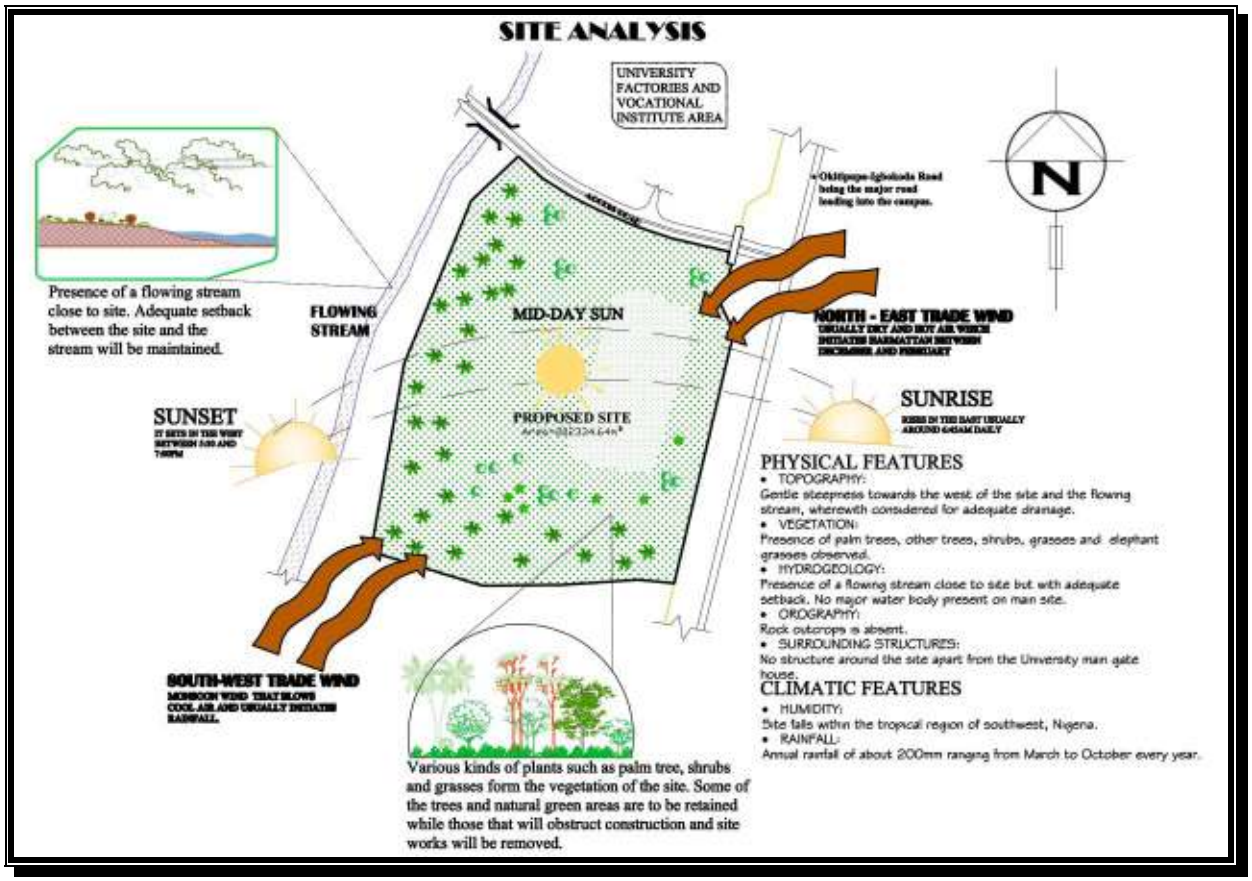

Fig. 26: Showing the Site Analysis (Source: Researcher's archive)

The total area of the site is approximately 20.23 hectares. To the East of the site is the Okitipupa-Igbokoda Road, the major road that links the main campus. To the north of the site is the major road through which other parts of the campus can be linked. On the other side of this road are the university industrial buildings and vocational training institute, all surrounded by large expanse of land. On the Southern part of the site is a large expanse of land with vegetation. On the west of the site, a river flows from in the north-south direction.

4.3.3 TOPOGRAPHY

The site gently slopes towards the east where a flowing stream exits. It is punctuated partly by ridges, isolated residual hills, and other interesting landscapes all of which present an interesting and picturesque landscape. The site has slopes ranging between 5 and 15 percent.

4.3.4 CLIMATE

The climate is tropical in Okitipupa, Ondo State, Nigeria. This climate is of two main seasons: the dry and wet season. The dry season prevails between November and March and the wet season prevailing between April and October.

4.3.5 TEMPERATURE

The average annual temperature ranges between 21.0 ^{0}C to 29.0 °C in Okitipupa. March is the warmest month with an average temperature of 28.6 °C while the lowest average temperature in the year occurs in August, when it is around 25.1 °C.

4.3.6 RELATIVE HUMIDITY

The relative humidity of the site is high all the year round, the most humid months coincide with the rainy seasons spanning between April and October. The relative humidity figures for these months range between 70% and 80%. During the dry season between November and March, the humidity figures range between 60% and 80%. The relative high humidity figures shows that there is a high demand for water consumption and provision of adequate ventilation and cooling through the use of electrical appliances like fans and air condition within the building most of the year.

Table 1: Climatic Data for Ondo state, 2007

S/N	MONTH	AIR TEMPERATURE T°C		RELATIVE HUMIDITY IN %		MONTHLY RAINFALL IN (MM)	NO OF RAIN-DAY	AVERAGE RAINFALL PER RAIN-DAY	TEMPERATURE (CELSIUS) °C	
		AT 10:00 AM	AT 4: 00 PM	AT 10:00 AM	AT 4: 00 PM				HIGHEST (MAXIMUM)	LOWEST (MINIMUM)
1.	JANUARY	18.9	33.1	66.5	64.2	4.4	1	4.4	33.1	**18.5**
2.	FEBRUARY	21.6	33.2	69.2	66.1	21.4	2	10.7	33.2	**21.2**
3.	MARCH	21.2	31.3	71.4	70.5	35.1	6	5.9	31.3	**20.5**
4.	APRIL	20.8	32.4	78.3	74.4	96.5	9	10.7	32.4	**20.3**
5.	MAY	20.1	33.2	78.4	72.5	150.7	11	13.7	33.2	**19.8**
6.	JUNE	21.2	29.6	79.1	78.2	188.6	12	15.7	29.6	**20.3**
7.	JULY	21.4	29.1	78.4	76.5	201.4	14	14.4	29.1	**20.7**
8.	AUGUST	19.6	30.6	81.2	80.6	146.7	12	12.2	30.6	**18.5**
9.	SEPTEMBER	21.0	31.4	90.0	89.5	183.3	11	16.7	31.4	**20.4**
10.	OCTOBER	21.8	33.6	82.4	80.6	129.7	13	10.0	33.6	**21.6**
11.	NOVEMBER	21.6	34.1	86.4	84.2	54.0	3	18.0	34.1	**21.3**
12.	DECEMBER	21.2	33.5	79.5	79.3	20.8	1	20.8	33.5	**20.4**
	TOTAL	**250.4**	**385.1**	**940.8**	**916.6**	**1232.6**	**95**	**138.5**	**385.1**	**243.5**
	AVERAGE	**20.9**	**32.1**	**78.4**	**76.4**	**102.7**	**8**	**11.5**	**32.1**	**20.3**

Source: Facts & Figures on Ondo State (2010).

Table 2: Climatic Data for Ondo state, 2008

S/N	MONTH	AIR TEMPERATURE T°C		RELATIVE HUMIDITY IN %		MONTHLY RAINFALL IN (MM)	NO OF RAIN-DAY	AVERAGE RAINFALL PER RAIN-DAY	TEMPERATURE (CELSIUS) °C	
		AT 10:00 AM	AT 4: 00 PM	AT 10:00 AM	AT 4: 00 PM				HIGHEST (MAXIMUM)	LOWEST (MINIMUM)
1.	JANUARY	19.8	32.7	65.3	61.2	0	0	-	32.7	**19.6**
2.	FEBRUARY	20.5	34.2	67.4	65.1	18.9	1	18.9	34.2	**20.3**
3.	MARCH	21.7	32.9	75.6	72.4	96.7	8	12.1	32.9	**21.5**
4.	APRIL	21.8	32.2	77.1	71.8	174.0	8	21.8	32.2	**21.6**
5.	MAY	21.8	32.1	75.2	74.2	148.8	9	16.5	32.1	**21.4**
6.	JUNE	21.0	30.5	77.5	71.2	303.0	13	23.3	30.5	**20.7**
7.	JULY	21.5	29.3	82.6	80.5	365.5	15	23.8	29.3	**20.2**
8.	AUGUST	22.6	29.2	85.1	80.6	275.9	13	21.2	29.2	**20.4**
9.	SEPTEMBER	22.4	29.7	81.3	77.6	297.0	15	19.8	29.7	**20.6**
10.	OCTOBER	22.8	31.9	82.9	72.5	210.8	10	21.1	31.9	**21.4**
11.	NOVEMBER	22.1	32.6	88.6	80.2	36.0	2	18.0	32.6	**21.5**
12.	DECEMBER	23.5	33.0	71.2	69.8	21.7	1	21.7	33.0	**21.5**
	TOTAL	**261.5**	**380.3**	**929.8**	**877.1**	**1939.3**	**95**	**218.2**	**380.3**	**250.7**
	AVERAGE	**21.8**	**31.7**	**77.5**	**73.1**	**161.6**	**8**	**18.2**	**31.7**	**20.9**

Source: Facts & Figures on Ondo State (2010).

4.3.7 NATURE OF SOIL

The soil/ground of Okitipupa area is dominantly sandy and is therefore vulnerable to erosion and by extension flooding. The soil has a very fertile soil suitable for trees and grass growth. The bearing capacity of the soil will require pad foundation and dip strip foundation in order to achieve stable structures.

4.3.8 W1ND SYSTEM

The two popular conventional winds blowing over the universe affects the site. These are the South West Monsoon wind and the North East trade winds. The South West Monsoon winds which is moisture laden and blows over the period of March to October (wet season) while the North East trade winds is dry, dusty and brings harmalUm. Il blows over the period of November to February (dry season).

4.3.9 RAINFALL

Rainfall season around the site lasts for about 7 months. The annual rainfall is estimated to be about 2000mm (Obasi, 2013). Generally, rainfall on the area could be heavy and is usually accompanied by lightning and thunder at the beginning of the season. This type of rainfall often gives rise to heavy flood and by implication adequate drainage is required on the site.

Table 3: Rainfall distribution for 1991-2000

	1991`	1992	1993	1994	1995	1996	1997	1998	1999	2000
Jan	0.00	0.00	0.00	31.30	0.00	5.40	27.60	0.00	3.20	0.00
Feb	55.30	4.90	34.60	50.90	49.80	93.20	0.00	23.20	21.20	0.00
Mar	171.20	74.90	121.00	74.50	101.00	141.30	0.00	0.20	69.20	87.20
April	295.30	96.70	100.10	186.20	130.70	187.20	219.40	108.90	132.00	187.60
May	204.20	196.10	152.40	192.70	124.60	187.40	219.50	228.50	120.50	124.80
June	281.30	223.90	195.30	263.30	407.50	236.00	276.40	254.60	236.10	384.70
July	552.20	185.00	91.70	0.00	251.30	236.80	71.90	210.90	335.10	169.40
Aug	223.60	52.00	219.40	0.00	319.40	190.90	76.20	40.80	170.70	198.00
Sep	309.60	488.20	351.20	219.10	348.80	302.20	230.10	241.40	253.60	216.30
Oct	204.90	131.40	88.30	165.90	244.30	175.00	187.70	332.30	259.30	176.30
Nov	0.00	67.10	90.30	39.20	36.60	1.60	23.70	63.80	63.80	23.40
Dec	12.60	0.00	5.60	0.00	0.00	0.00	32.70	0.00	0.00	0.00
Mean	192.52	126.68	120.83	101.93	167.83	101.93	120.68	113.77	125.38	138.73

Source: Obasi (2013)

The table above shows that the total mean annual rainfall for the decade (1991-2000) ranges between 101,93mm in 1994 and 192.52mm in 1991 respectively.

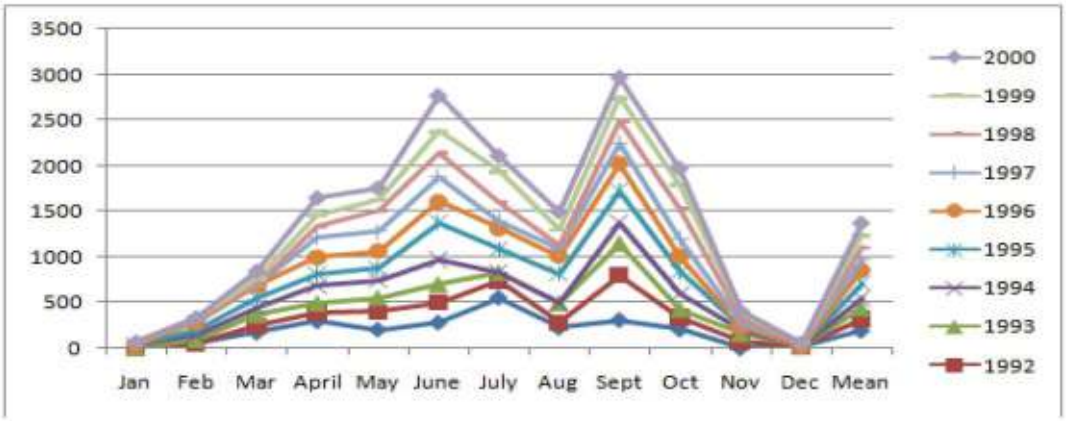

Fig. 27: Annual mean rainfall distribution for 1992-2000. Source: Obasi (2013)

The figure above shows a general rainfall distribution for the decade (1991-2000) with two distinct rainfall maxima in June and September and a noticeable variance (552.20mm) occurring in July of 1991.The spatial distribution of rainfall in this area indicates regularity in time and space. When rain falls regularly there is the tendency for the soil/ground to get fully saturated and under this condition the soil/ground capacity to store water may be exceeded thus forming runoffs that may escape to cover the surface of land as flood.

Table 4: Rainfall distribution for 2001-2007

	2001	**2002**	**2003**	**2004**	**2005**	2006	**2007**
Jan	11.1	0	16.3	4.8	0	7.7	0
Feb	0	11.7	12.7	78.2	12.1	49.1	57
Mar	84.7	124.3	53.8	49.2	161.4	101.1	19.3
April	253.3	175.4	297.5	173.1	108.6	62	113
May	219.4	98.8	111.1	171.6	248.2	189.9	220
Jun	199	264.9	193.2	207.9	298.3	269.3	154
Jul	333.2	294.4	61	171.9	314.6	155.4	77.5
Aug	91.1	237.6	81.4	170.4	30.1	358.9	383.1
Sept	274.8	148.4	556.6	354.1	278.2	183.8	291.1
Oct	66.4	0	184	197.5	142.4	103.9	137
Nov	56.6	0	123.2	37.4	38.4	23	19.9
Dec	1.1	0	0	0	17	4.5	5.4
Mean	132.56	112.96	140.9	134.68	137.44	125.72	123.11

Source: Obasi (2013)

The table above gives the total annual mean rainfall for 2001-2007. The distribution of rainfall indicates that the values vary from 112.96mm in 2001 to 140.90mm in 2003. The dry and wet seasons are clearly shown in the figure below. The distribution of rainfall is consistent with the

pattern in the region showing a single rainfall maximum in September. Rainfall consistency and intensity give rise to runoffs which often cumulates to flooding.

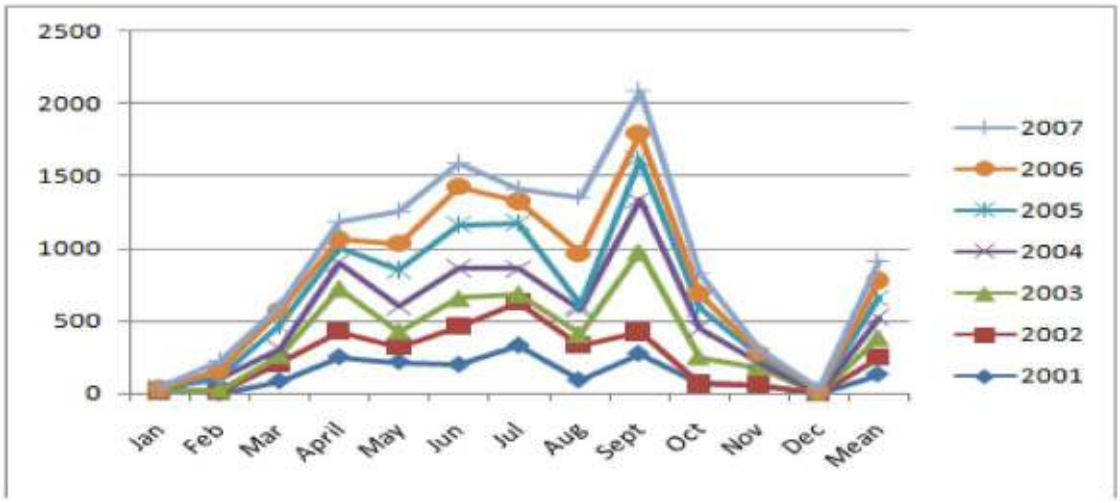

Fig. 28: Annual mean rainfall distribution for 2001-2007. Source: Obasi (2013)

4.3.10 VEGETATION

Ondo state falls within the tropical rain forest belt within Nigeria. Hence, the project site, in Okitipupa, Ondo State, is characterized by slightly dense vegetation growth. Presence of various kinds of trees and tall elephant grasses can be noticed on site. The eastern part of the site where there is a flowing river is predominant with palm trees.

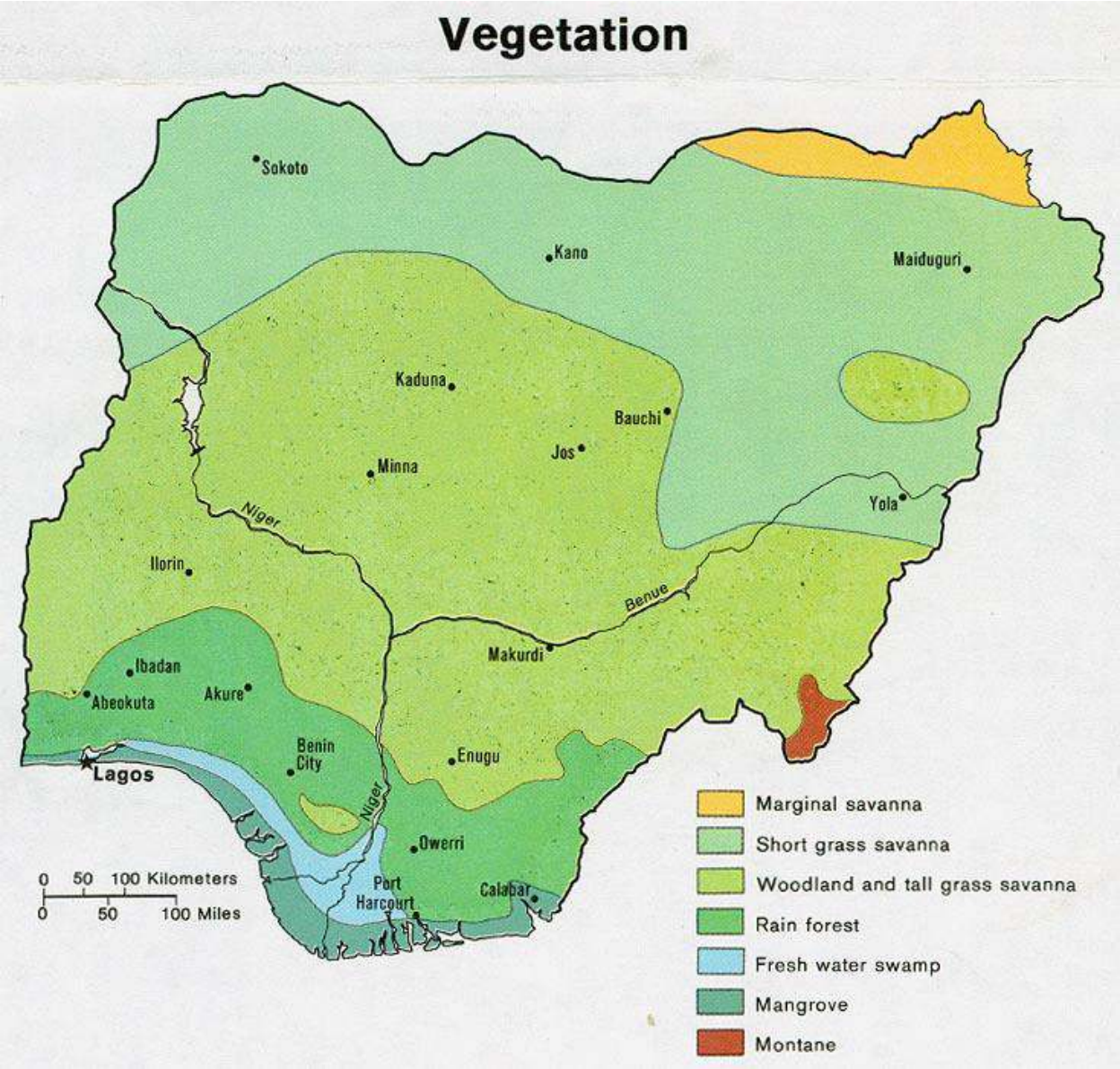

Fig. 29: Annual mean rainfall distribution for 1992-2000. (Source: the-nigeria.com)

4.4 PROJECT ANALYSIS AND DESIGN PROPOSAL

4.4.1 DESIGN BRIEF

A sports complex is a necessity on a university campus. Members of the university community will usually make use of it for sporting activities, for sport competitions, in order to keep fit and for recreation. It is also important to make the sporting facilities comfortable for spectators. This thesis therefore addresses the design of a befitting sports complex for the Ondo State University of Science and Technology (OSUSTECH), taking into consideration comfort for spectators.

The major facilities and spaces to be provided include:

A. A major indoor sports building with halls for specific games
B. A multipurpose indoor sports hall for various kinds of sports
C. Outdoor pitches
D. Spectator stands for indoor and outdoor pitches
E. Administrative area and offices
F. Car park
G. Conveniences

4.4.2 BRIEF DEVELOPMENT

The information obtained through the brief has provided the necessary framework for the design of the proposed sports complex. The project site has been chosen in conformity with the area allocated for sports complex in the master plan of the university campus. However, the area of land selected is adequate for the proposed project and has been adjudged suitable due to the terrain of the land. The site has been studied and analyzed in order to determine the best orientation, arrangement and design of facilities that constitute the entirety of the sports complex.

Thus, after thorough investigations of the requirements for the design, the necessary facilities needed for this design project has informed the provision of two main units which make up the facility;

A. A major indoor sports building with halls for specific games
    i. A table tennis hall
    ii. A hall for judo/boxing and other martial arts
    iii. A major basketball hall
    iv. Administrative area and offices
B. A multipurpose indoor sports hall for various kinds of sports
C. Outdoor pitches
    i. Main football pitch

ii. Football Practice pitch

iii. Basketball courts

iv. Volleyball courts

v. Lawn Tennis courts

vi. Handball courts

D. Spectator stands for indoor and outdoor pitches. Beneath the grandstands are spaces such as:

i. Offices

ii. Changing rooms with conveniences

iii. First aid rooms

iv. Equipment rooms

v. Storage rooms

vi. Conveniences

vii. Commercial spaces such as shops and eateries

E. Car park

4.4.3 DESIGN PHILOSOPHY

The design of a sports complex for the Ondo State University of Science and Technology (OSUSTECH) is an imperative so as to meet the sporting and recreational needs of the university community. It is also of paramount importance to make the sports complex comfortable for spectators who would gather to view sporting events. Therefore, the philosophy behind the design is has been tailored towards making the sports complex meet the primary need of athletes and spectators.

The sports complex is designed to in such a manner that will encourage members of the university community to engage in sporting activities for both competitive and recreational purposes. When athletes partake in sporting events, most especially competitive sports which a well-designed sports complex, spectators are bound to come and watch. The design thus incorporates aesthetics in the indoor sports buildings and the entire sports complex in order to attract spectators to the

sports complex. Also, as spectators are expected to be gathered in large numbers, the sporting facilities have been designed to enhance the level of comfort which they will enjoy in order to encourage them to keep coming back. Hence, the overall philosophy that piloted the design is to achieve a sports complex that will encourage participation in sports, increase spectatorship and ultimate create a comfortable atmosphere for spectators.

4.4.4 DESIGN CRITERIA

The design of a university sports complex is a broad and an all-encompassing design. It is not limited to the provision mere sports pitches and spectator stands. It involves the provision of various outdoor and indoor facilities that are necessary to make life easy for both athletes and spectators and even staffs. Necessary facilities, apart from major outdoor and indoor pitches with respective spectator grand stands, include car park, road and pedestrian walkway networks, administrative unit, shops and eateries, conveniences, open spaces and an interesting landscape among other things. Being a sports complex, it is expected to have many interrelated but relevant parts thereby necessitating the use of a large expanse of land at a strategic location for accessibility.

The proposed university sports complex for the Ondo State University of Science and Technology (OSUSTECH) is not just a cursory sports facility meant to meet a ritualistic requirement of a university having a sports complex but a carefully planned project to meet the needs of athletes and spectators. The uniqueness of this sports complex has necessitated the scope of this design proposal to include the provision of standard sporting facilities that supports sporting activities and a comfortable atmosphere for the spectators using the result of the analysis, synthesis and appraisal of all relevant information gathered and various highlighted design considerations and guidelines which include; site zoning and proper planning, adequate circulation, comfort for spectator, effective natural lighting, ventilation, material selection and best practices and so on.

4.4.5 DESIGN CONSIDERATION

In in order to achieve a suitable design solution, rapt attention has to be given to some criteria which will serve as guiding principles for the design. The design of the proposed sports complex shall take into consideration the type of materials and construction technology to be employed in the construction of the project in order to achieve natural ventilation and lighting, illumination, energy efficiency, reduction in energy consumption, reduction in waste during use of the sports

complex, standard sporting facilities for athletes and ultimately to create comfort for the spectators that will visit the sports complex.

It is of paramount importance to effectively allocate spaces to ensure functionality for both the indoor and outdoor sport facilities and generally within the different parts of the sports complex. The topography, existing site features, site orientation, accessibility and landscape are also taken into consideration. General design considerations for this project has been classified into environmental considerations and the users‘ considerations.

4.4.5.1 ENVIRONMENTAL CONSIDERATIONS

The whole site on which the sports complex is to be constructed forms the primary environment of the sports complex. Therefore, in order to design a sports complex that will conform with its immediate environment, some physical and environmental criteria have to be taken into consideration.

a. Site Organization

Site organization is of great importance in a design of this scope. Site organization calls for proper and effective usage of the available land for the provision of various facilities for both athletes and spectators within the sports complex. The site is to be properly managed for the convenience, comfort, health, safety and satisfaction of the end users.

b. Access

Access into the sports complex site is achieved through a definite point of ingress and egress to the site. Such access point can be monitored and controlled for safety and security reasons and vehicular and pedestrian control. Vehicular access has been provided through the major tarred road that leads into the main campus. Pedestrian access route has also been planned to complement the vehicular routes.

c. Site Zoning

The site shall be zoned into three broad areas: the car park, the indoor sports halls and the outdoor pitches. The different units are to be located on site in an organized form.

The proper orientation and arrangement of the sports buildings, the topography, landscape, natural site features and so on have been critically examined for optimal consideration in the design solution.

d. Topography and Landscape

The natural topography and landscape of the site is to be considered to determine best form and extent of modification to be done during the design. For a sports complex, flat terrain is desirable for the location of outdoor pitches for sports like football, basketball, volleyball, handball, track events and field events. Hence, the landform and terrain has to be taken into consideration as a major aspect of a good design. The natural barrier located in site shall be useful for exercises, stamina building and enhancing endurance skill of the athletes especially during training sessions.

The existing natural landscape of the site is to be incorporated into the design to enhance a natural feel around the sports complex. The sports complex environment would be enhanced and sustainable through the constant incorporation of natural features on site as dictated by the principles of organic architecture. This will go a long way in creating an enabling habitat and a beautiful landscape for a good sporting environment suitable for both athletes and spectators.

e. Circulation

Effective circulation within the sports complex is of great importance especially during sporting events that will attract large numbers of spectators. Creation of wide pedestrian walkways that links all sections of the sports complex is important as people (athletes, officials and spectators) move about from one facility to the other.

f. Lighting

In order to achieve a functional design, the issue of natural or day lighting is taken into consideration in the design especially for indoor sports halls and other interior spaces. Use of courtyard, large windows, high-level windows, glass blocks and various types of openings is necessary. However, louvers, sun breakers, roof over hangs and other sun shading devices are also used to protect the interior spaces from sun glare and effect of rainfall.

g. Ventilation

Ventilation is necessary in order to substitute fresh air with vitiated one especially for indoor sports halls and other interior spaces. During rigorous exercises, training and sports competitions, a lot of heat will be generated, hence there is need to define the areas requiring an enormous amount of natural ventilation. Also, this is important in order to make the spectators feel comfortable while watching games and competitions. Use of mechanical heat extractors and air conditioners maybe required at certain points.

h. Orientation

The orientation of the site is considered in order to know the position where sunrise and sunset occurs so that this will not create difficulty for the athletes during sporting activities be it training or competitions especially for outdoor sports facilities. All outdoor pitches and play areas are to be properly placed to give ample chance for their use at all hours of the day.

i. Climatic Consideration

The micro-climate of the site has to be taken into consideration in order to achieve a design that will perform well under the climatic condition. The climate of the site is of great concern to the designer as this invariably determines the type of building technology in design and construction. The prevailing wind, temperature, rainfall, relative humidity, air temperature and so on should be considered as they all have their effects on the performance of the athletes and the comfort of the spectators.

j. Construction Consideration

A buildable and structurally stable design is of paramount importance to avoid difficulty in construction and structural failure. However, issues of cost should not be allowed to override necessary construction details. Attention is given to the following:-

- Achieving a clear floor area within the sports hall buildings without undue column that might hinder visibility and easy circulation in the interior of structures.
- The size of the structures is to be of manageable dimensions.

- ❖ Expected life span of the buildings and other facilities are considered since the sports complex shall be in a constant use
- ❖ The flexibility of the internal spaces.
- ❖ The usage of the building which involve generation of sound, shock and vibrations.

k. Support Infrastructures

Support utilities required in the proposed sports complex include lighting, water supply, electricity and communication.

i. Lighting and Illumination

Basically, the lighting system are of two types which are the natural lighting (day lighting) and the artificial lighting (used during the night and for spaces devoid of natural lighting during the day). Natural lighting into interior spaces will be resolved through the design solution. Artificial lighting comes from lighting fittings and fixtures such as bulbs, fluorescents, halogen lamps etc. which require electricity supply that comes from the national grid and power plants. The types of light fittings and fixtures for internal and external lighting should be portable, functional and have long life span.

ii. Water

The sports complex is expected to be used by many athletes and spectators. Thus, enough water will be required for cleansing, preparation, consumption, drainage purposes etc. For storage purposes, elevated water tanks and underground reservoirs will be provided.

iii. Electricity

Power supply from the mains via the national grid shall form the major source of electricity to power the appliances and lighting fittings. However, due to epileptic power supply that characterizes the nation's power sector causing incessant power outages, use of supplementary power supply in form of giant - power generating plants should be made available.

iv. Communication

Communication within and outside the sports complex shall be facilitated by the use of telephone, mobile phones, intercoms, internet, public address system and other communication accessories. Erection of telecommunication masts around the sports complex to aid use of mobile phones and the internet would be facilitated.

l. Financial Considerations

The major source of fund for the project is the Ondo State Government – founder and owners of the university. However, the government, in conjunction with the school management, can partner with interested private bodies and individuals to generate enough funds that will foster the construction of a tasteful sports complex. The proper funding of the project is necessary for proper execution so as to achieve intended goals and aspiration of the project to a satisfactory level.

Therefore, in order to financially considerate, a modular coordination will be put in place in the structuring of each building and placement of the general sporting facility in zones that will enable the development of the sports complex in phases. The cost-in-use of the facilities is another aspect of the financial consideration. Hence large number of the sporting and spectator facilities provided shall be open to the general public which will generate funds which will be used in the maintenance of the entire sports complex. Proper and astute management of the complex will also make it a source of internally generated revenue (IGR) for the university.

m. Safety and Security Considerations

Adequate and well planned security measures are to be put in place to ensure safety of lives and properties. The sports complex will have expensive equipment, sporting accessories and spectator facilities that must be protected from theft, vandalism and destructions. The design therefore, is to reflect close knitted functionality which discourages theft, vandalism and destruction. Also, adequate sense of safety must be felt by the spectators for them to be comfortable within the sports complex.

Emergency exits, fire escape routes, fire-fighting equipment and vehicles are provided to forestall any fire outbreak in the design. The use of courtyards and fire resistant materials lesson the tendency for fire accident.

4.4.5.2 USERS' CONSIDERATION

The consideration of the users plays a vital role in the design of the sports complex. Various categories of people within and outside the university campus will be expected to visit the sports complex either as athletes or spectators. This thus, would determine the users' consideration that would be given to the design of the sports complex, which include: Status, Gender, Age and Season.

i. Status of users

The knowledge of the social, physical and economic status of prospective users of the sports complex is of great importance in determining the type and number of sporting facilities and ancillary facilities such as parking lot, conveniences etc. to be provided in the.

ii. Gender

It is expected that the greater percentage of sports complex users would be male as more male tend to engage in sports and as spectators than females. Therefore there will be more convenience provision for male.

iii. Age

Most of the sports complex users within and outside the university campus will be adults. Thus emphasis may not be placed on the provision of children's facilities like children playground.

iv. Season

The population of users of the sports complex is expected to be seasonal. Spectators, who would constitute the vast majority at the sports complex at a particular time, would only be available during sporting events. Athletes and sports men and women who would use the sports complex for various sporting activities would be relative few as spectators seldom watch training or practice sessions. Owing to this fact, provision is made for extreme conditions of population increase during the expected periods of sporting events or competitions.

4.5 PROJECT PROPOSAL

4.5.1 THE SITE CONCEPT AND DESIGN

The design of the entire sports complex site (site plan) and the individual structure within the complex was based on a concept of balanced design employing the combination of flexibility,

hierarchical and clustered spatial organization principles. For a project of this kind and magnitude, consisting of large, dominating and self-imposing structure (the main pitch) and a number of secondary spaces which include the indoor sport halls, lawn tennis courts, basketball courts, volleyball courts and netball courts etc.), an hierarchical organization in which related functions are arranged close to one another (probably in clustered form) is considered a suitable and functional architectural composition.

The main pitch for football and other track and field games is uniquely significant, thus necessitating it to be centrally placed in the site in relation to other facilities on the site. It has been placed just after the indoor sports halls in such a way that it can be appreciated without the indoor sports halls obscuring its view. At the same time, the indoor sports halls constitute major architectural edifice that will interest spectators as they approach the site. Thus both were place in such a way that they will welcome spectators and users of the sports complex while still allowing for a clear view for the main pitch. Other outdoor sports facilities which are mainly the lawn tennis courts, basketball courts, volleyball courts and netball courts have been placed after the main pitch as these will accommodate lesser number of spectators and users that will flow into the sports complex at a given time.

The design of the site plan has been concerned with the allocation of space for appropriate uses, the arrangement of structures to provide effective relationship among structures, the provision of access to structures in an attractive and safe manner. The site design thus, involves the design of access, driveways, walkways, services, car park spaces, drainage and utilities, the preservation of the natural endowments on the site, and its enhancement by landscaping.

4.5.2 STRUCTURE/ELEVATIONAL CONCEPT

The concept behind the design of the indoor sports halls, which are the main buildings on the site, is based on major factors which include the function of the buildings, (form follow function), the structural requirement, the spatial requirement and distribution involving the facilities concerned and the aesthetic outlook of the building.

4.5.3 PARKING SPACES

The parking spaces were arranged to adequately cater for the users of the sports complex. A major car park has been created to cater for the parking needs of the staffs at the sports complex, spectators and other users of the sports complex. This is to prevent excessive vehicular movement within the sports complex which might cause accident. Another smaller parking has been created

for buses and other vehicle that would be brought to the sports complex by competing athletes and officials.

4.5.4 LANDSCAPING

The whole complex is beautifully landscaped with a lot of green area apart from the playing field surfaces with grasses such as the main football pitch and the football practice pitch. Other areas are also well landscaped with trees and hedges which are used to direct traffic, expecially pedestrian traffic within the site.

4.5.5 OFFICES, SHOPS AND OTHER ANCILLARY SPACES

The ample spaces beneath the grandstands for the indoor and outdoor sports facilities have been carefully utilized to provide ancillary spaces. These spaces include offices, storage rooms, equipment rooms, shops and so on.

4.5.6 TOILETS AND SHOWERS

Adequate numbers of toilets were provided both for spectators, athletes and officials and as dictated by requirement standards. Also, showers were provided for athletes in order to use after sporting activities.

4.6 SUMMARY

This chapter examines the project site analysis and project proposal. It explores the project area being the study area beginning with its historical background. It also presents the Ondo State University of Science and Technology, (OSUSTECH) Okitipupa, Ondo State which is where the proposed university sports complex is to be sited. The need for the sports complex has also been examined which include; to meet the sporting needs of the university community, for the discovery and development of sportsmen, for recreation and social interactions, for generation of income for the university.

CHAPTER FIVE

5.0 PROJECT APPRAISAL

5.1 APPRAISAL OF PROPOSED SCHEME

The design of a sports complex of this magnitude giving special attention spectators demands careful planning from the early stage of the design in order to enable the entire aim of the project to be achieved. The proposed sports complex is going to be an integration of most important functions that accommodates athletes and spectators from the members of the university community and the general public. The sports complex is conceived to be that which enhances comfort for the spectators and a suitable and sustainable sporting facility for athletes within and outside the university campus. A sustainable building and construction technology is to be employed in achieving a sports complex with sports halls having monumental edifice and well planned outdoor spaces with sporting relevance for the university community. This sports complex, which is very flexible in its uses, is expected to contribute greatly to the sporting need of the university, comfort of spectators and IGR of the university.

The proposed sports complex is expected to improve the status of the university with regards to the educational standards of the country. It is also going to be iconic and a strong landmark within the entire university campus. The sports complex is meant to improve the sporting culture and concomitantly, the fitness (through participation in sports) of members of the university community, improve social interaction among students and staffs through sports and it will also encourage many spectators to attend sporting events regularly. The sports complex is also expected to be opened to people outside the university who would want to organize sporting events there, depending on the management of the university. The project site have been adequately planned and coordinated in the design with the provision of pedestrian walkways, car parks and lawns, to compliment the main sporting facilities provided.

The main indoor sports hall has three halls in one building, with two of them being of the same size and capacity. The hall to the left will be mainly used for table tennis while other sports could also take place there depending on the prerogative of the management of the sports complex. The hall to the left will be used for martial arts sports such as taekwondo, judo and karate. Other uses could also be allowed in the case of the hall to the left as previously stated. This only shows the flexibility of the design in other to achieve more functional usage to the halls. The hall in the

centre of the building has been designed for basketball with the minimum required area and clear height.

The second indoor sports hall building, with a single hall is a smaller building when compared with the first sports hall building with three halls. However, its single hall is bigger in area and volume than the basketball hall of the bigger sports building. This hall is meant to serve as a flexible multipurpose indoor sports hall for various sports such as badminton, volleyball, handball, lawn tennis, table tennis and basketball.

5.2 STRUCTURAL ANALYSIS FOR THE PROPOSED INDOOR SPORTS HALLS

The indoor sports halls buildings have been designed as frame structures in order to transmit load from the columns and beams to the foundation. The external and internal walls are basically non-loading bearing walls (this creates the possibility of using long strip windows). This frame construction system allows for flexibility of spaces and safety in loading. The frame structure was majorly achieved with carefully spaced reinforced concrete columns and connecting beams.

The height of the sports halls and lack of internal supporting walls and columns have given way to serious consideration of lateral loading brought about by wind action and other forces that might act on the buildings. The resultant forces must be resisted and transmitted through the available number of supporting columns and any load bearing walls to the foundation.

i. Foundations

This is the first structural element for consideration of stability of any structure. The selection of the foundation type for the indoor sports halls was greatly influenced by the strength requirements of the structures as well as the bearing capacity of the soil on which the structure would stand. Therefore, due to the nature of the soil, a combination of deep strip foundation and pad foundation would be used to achieve a stable structure. The design and construction of the foundation and other major structural elements would be according to the structural engineer's detailed drawings. However, for external works such as fences and sewage treatment chamber, foundations are to be strip foundations made from mass concrete cast in-situ. A hardcore of approximately 200mm to 300mm diameter granite should be fitted and a damp-proof membrane sandwiched in the oversite concrete to assist in preventing the floor from being damp and cold.

ii. Floor slabs

The ground floor slab (oversite concrete) will be plain mass concrete laid with wire mesh according to the structural engineer's specification. Upper floor slabs are to be constructed using the normal reinforced concrete massing as designed and specified by the structural engineer.

iii. Walls

Within the scope of this design, walls generally should be non-load bearing. All external walls are 230mm hollow blocks while 150mm hollow blocks are used for internally portioning of few spaces such as toilets. Glass blocks were also used of enhance transmission of natural day light in some areas such as stairs, showers and toilets.

iv. Roof Structures

Due to the span of the halls, the roof structures are mainly steel sections in form of barrels. The proposed roof shall be carried mainly by the reinforced concrete columns, chiefly by those arranged on the left and right side of both sports buildings.

5.3 STRUCTURAL ANALYSIS FOR THE PROPOSED OUTDOOR GRANDSTANDS

The construction of the grandstand will seem like the construction of a stair, but with lager treads and risers. Also, the grandstands have spaces underneath that have be designed as normal building spaces which will require a construction that follows the pattern used for normal structural buildings. The grandstands are composed essentially of two main structural elements which are the reinforced concrete columns and beams. The beams are structurally inclined to span between the retaining walls and the columns and they support the tiered steps for the accommodation of seated spectators. All structural constructions will however be subject to the structural engineer’s specifications and detailed drawings.

i. Foundation

Just as it is the case for the indoor sports halls buildings, this is the first structural element for consideration of stability of the grandstands. A combination of deep strip foundation and pad foundation would be used in conjunction with a raft foundation specifically for the retaining wall in order to achieve a stable structure. The structural engineer’s detailed drawings would be the basis for the construction of the grandstand foundations and other major structural elements.

ii. Floor slabs

The floor slab (oversite concrete) for the spaces beneath the grand stand will be in line with that of the sports halls which is plain mass concrete laid with wire mesh according to the structural engineer's specifications.

iii. Walls

The main structural wall used in the construction of the grandstands is a retaining wall which serves as a demarcation between the space beneath the grandstand and the earth and hardcore filling in the grandstand. Apart from the retaining walls, all other walls are partitioning walls. The all external and internal walls are 230mm thick hollow block walls except for few spaces such as toilets and showers where 150mm thick hollow block walls have been used for partitioning and as dwarf walls.

iv. Roof

The proposed roof for the grandstands is a cantilevered steel structure. The cantilevered steel structure is carried by several, equally spaced, giant steel structures mounted just behind the grandstands. This roof system will demand serious structural calculations, detailed structural design and specifications all to be done by the structural engineer.

5.4 MATERIALS AND FINISHES

A proper selection of materials and finishes for floors, ceilings and walls for the sports complex buildings contribute greatly to the comfort of the spectators, performance of athletes, their safety, sustainability and aesthetics of buildings and structures. The finish materials patterns, textures, and colors, together with the geometry, help define the architectural quality and identity of the sports complex. The proposed sports complex project must be structured to be operated and maintained with minimal resources while the materials and finishes selections must be based on durability, ease of maintenance, resistance to vandalism, environmentally friendliness, fire resistance, cost effectiveness, and aesthetic appeal.

i. Floor Materials

Finishes chosen are to provide slip-resistant surface for indoor spaces and outdoor grandstands surfaces. The surfacing material chosen for the proposed indoor sports hall is timber. Timber is chosen because of its ability to offer most of the requirements of quality surfacing material in terms of sound and proper rebound and response to movement of ball and players. This shall cover

only the area marked for the games within the hall. Other floor areas around the indoor and outdoor pitches and other ancillary spaces will be covered with other suitable materials.

1. Monolithic Materials

   Concrete - with appropriate finish to provide slip-resistant surface in ancillary areas.

   Hardened finish where required.

2. Unit Materials

   a. Natural granite

   b. Manufactured granite

   c. Terrazzo - precast only, up to 600 mm. x 600 mm. slip resistant texture, with sealed surface

   d. Quarry tile

   e. Paver brick - dense, hard

   f. Unglazed ceramic tile

   g. Vinyl title - non-public areas only.

   h. Cement Terrazzo (special/hard aggregates, abrasive aggregates and installation control); thick set installation.

ii. Wall Materials

Walls are to be made of hollow blocks with high quality internal and external rendering and painting to client requirements and capability. The walls of the indoor sports halls shall be cladded with tongued and grooved timber panels for good rebound surfaces and acoustics. Other wall materials will be selected based on the clients capability and preferences.

1. Monolithic Materials Concrete with sealers (with sufficient surface texture to conceal minor soiling and damage without complicating maintenance procedures, or constituting a hazard to clothing or skin of patrons).

2. Unit Materials

a. Unglazed and unglazed ceramic mosaic tile

b. Precast concrete

c. Structural glaze faced concrete masonry units

d. Vitreous enamel steel panel – noncombustible assembly

e. Glass Partitions: - These are to be custom designed to suit the requirements of the various internal spaces such as offices.

f. Reinforced cast-in-place concrete shall be used as retaining wall for the external grandstands

iii. Door Materials

1. Flush hollow metal doors and frames:
    a) Public areas - alkyd enamel finish
    b) Non-public areas - alkyd enamel finish.
2. Wire glass at doors with vision panels
3. Stainless steel doors.

5.5 SERVICES

The following shall be considered under services

- Lighting and illumination
- Ventilation
- Acoustics
- Drainage system
- Water supply and treatment
- Power supply

i. Lighting and Illumination

Lighting is one of the most important factors in the sports complex especially in the indoor sports halls. Before lighting for sports hall can be considered, knowing the activities that will be taking

place in the hall is of importance. Satisfying spectators' requirement (especially their visual needs in enhancing their comfort) and standards of play is also of great importance.

a. Spectators

The spectators must be able to move with trend of activities in the games hall. For this to be achieved, viewing distance of the farthest spectators from the centre of the games hall is an important factor to be considered when the illumination required is being determined. Adequate glare control is very crucial.

b. Finishes

In the use of finishes, there must be contrast in brightness or colour or both with the background for objects to be clearly seen. The greater the contrast, the more clearly the objects are seen. Therefore, the colour and reflectance properties of the various surfaces in the sports hall are to be collected. To avoid reflection from windows and artificial light sources, wall finishes shall be provided with uniform distribution of light so that when viewed from any point, uniform brightness will be seen throughout the entire game hall.

c. Natural Daylight

As accommodation vary in sports halls, care shall be taken in the positioning of day light glazing to avoid glare from windows and penetration. Uniformity of illumination is one of the most important requirements considered in sports halls design.

d. Artificial Lighting

In sport halls, light fittings are usually ceiling mounted but there are cases of wall mounted flood lights for direct or indirect lighting. Iodine quartz Hood light luminaries mounted in deep ceiling will be used in supplementing natural lighting. This will reduce glare to the barest minimum.

e. Outdoor Courts

Daylighting is not a problem here except for evening games. Therefore, standard approaches that involve the use of flood lighting system would be employed.

ii. Ventilation

Ventilation in a simple term is a phenomenon that involves air movement – to remove used air or vitiated and to replace it with fresh and new air. This process (replacement of still air with fresh air) will help to maintain a steady and healthy supply of oxygen within the indoor spaces for sports buildings and grandstands. With proper and adequate ventilation, thermal comfort (comfortable temperature) will be achieved. Ventilation will also reduce the effect of high level of humidity prevalent in hot-humid zones. Ventilation is achieved by natural and artificial means.

a. Natural Ventilation.

Natural ventilation is a challenge in the designs of massive buildings such as a sports hall. Therefore, a careful and deliberate modeling of the anticipated movement of air throughout the station is necessary. The proposed project would employ the use of large simple openings to aid natural ventilation within. The basic form of the sports buildings is the optimum shape required to achieve this. A courtyard system has also be used to futher enhance this. This natural ventilation maintains air movement and keeps summer temperatures at comfortable levels, assisted by solar shading from the large overhanging eaves to the east and west elevations. Other factors like size of openings and their position, building interior plan, design of inlet and landscape may arise from design decisions. When wind pressure is very high, some measure of control can be employed. Natural elements such as landscaping (planting of trees) and the use of structural devise like fins overhang serve as wind breakers.

b. Artificial Ventilation

Due to the fact that natural ventilation cannot be totally relied upon to provide controlled conditions, mechanical methods are often employed. Basically, this entails the manipulation of the temperature and relative humidity within a space and the movement and composition of the air mass across it. But due to the resultant effect of the heat generated from the mechanical device, and also, the epileptic power supply common to Nigeria, more attempts should be made in attaining maximum natural ventilation in the design of the indoor spaces for sports and offices sports buildings and grandstands. Nevertheless, both artificial and natural ventilation should be employed in the proposed sports complex.

iii. Acoustics

The basic purpose of architectural acoustics is to provide a satisfactory acoustic environment for whatever uses the space is intended. In almost any situation, one can determine what the environment requirements are, and then proceed to design to satisfy these requirements. Acoustics of an environment has the ability to affect the way people (spectators, athletes and officials) behave. Excessive noise and poor speech intelligibility may lead to frustration on the part of the sports complex users especially in confined areas such as the indoor sports halls and offices.

In order to create comfort for the spectators, the acoustic design of the sports complex buildings must provide a good aural environment, in which people (spectators, athletes and officials) can communicate clearly and easily, and the build-up of excessive noise is suppressed. Public address (PA) announcements must be easily heard and understood. A comfortable acoustic environment must also be provided for the employees in the nonpublic areas.

If a room is finished with materials which are highly sound reflective, then sound will persist for a long time and will seem to come from all directions and the spaces will probably be less pleasant than the one which has a moderate amount of sound absorptive finishes. Therefore appropriate selection of acoustic materials is very important. Selection of the appropriate finishes providing effective sound absorption can control the level of reverberation and provide a comfortable acoustic environment. Under these aural conditions, standard speakers can be used to achieve a good level of speech intelligibility. In the outdoor spaces and generally within the site, in order to reduce the noise generated in the sports complex from spreading to and disturbing other areas close by on the campus, landscaping with trees and shrubs will be largely used.

Acoustical Treatment and Materials are most effective when applied near the source of the noise. Designers shall take these into consideration in selecting acoustical materials and shall create solutions regarding easy accessibility to the materials for replacement. Options may include:

a. Cementitous spray-applied or trowel-applied acoustic materials (above reach of pedestrians).

b. Non-corrosive metal panels (with or without perforations) with wrapped acoustical material. Metal panels may have applied coating or natural brushed finish.

c. Rigid, cellular glass block.

d. Suspended acoustic tile (in nonpublic areas only).

e. Cellular glass blocks (typically concealed behind metal panels).

iv. Drainage System

Drainage of the entire sports complex will be mainly achieved by utilizing the natural slope of the site which is towards the west of the site and where there is also a flowing river. Drainage of the outdoor pitches will be achieved through combination of good design, construction and the use of buried drain pipes and other ground drainage trenches connected to the central drainage system. The pitch will be given a slope of between 1:6 and 1:8 and the main fall of which will be across pitch rather than in the direction of play.

v. Water Supply

The sports complex requires constant water supply for usage in the toilets and showers and for other important and incidental uses. Apart from the major university water supply system, provision of borehole will be ensured and located at a sufficient distance (within the site) from septic tanks to prevent contamination. In the case of forms and its distribution system, there will be an overhead tank supplied by means of pump from an underground tank located nearby and supplied from the main supply pipe. Water from the overhead lank will be distributed to relevant part of the site thorough pipes.

vi. Power supply

The existence of high-tension lines along the site boundaries guarantees prompt and efficient power supply to the site and this would be judiciously utilized in the proposed development.

v. Maintenances

Proper maintenance of every single facility on the sports complex is important to ensure longevity and sustainability of the entire complex. The sports complex will be effectively utilized by promoting cleanliness and interesting vicinity that will be achieved proper maintenance. Therefore, routines would be developed for weekly, monthly and seasonal care in the sports centre. A regular inspection of the sports complex and its activities can reduce rate of deterioration before it becomes costly and dangerous.

Corrosion, leakages and deterioration should be properly considered for all the outdoor courts due to the effects of weathers and especially in the swimming pool so that water loss would not be rampart in case of leakages. Marbles and tiles would be used for some of the external finishes and the swimming pool to reduce the extra cost of re-painting.

Every facility and item in the sports complex will definitely be subject to indifferent, delinquent and irresponsible behaviours which might warrant vandalism and faster deterioration of the sports complex over time. So vandalism and other destructive acts will be properly guided against with the employment of security men to properly monitor every activity within the sports complex day and night.

5.6 SUMMARY

This chapter deals with the appraisal of the proposed sports complex. It discusses the structural analysis for both the indoor sports halls and outdoor structures. It also deals with the appropriate materials and finishes required for the actualization of the sports complex. It further talks about the services required to enable a smooth running of the sports complex.

CHAPTER SIX

6.0 RECOMMENDATIONS AND CONCLUSION

6.1 RECOMMENDATIONS

A university sports complex should be planned to be one of the important facilities that make up the totality of the university campus. It should be structured to improve sporting activities and attract large number of spectators. Therefore, in order to achieve a standard, befitting, viable and cost-effective university sports complex, the following recommendations have been made:

i. The design and construction of a university sports complex should be painstakingly executed in order to have a tasteful sports complex and meet up with required standards.

ii. Members of the university community should be encouraged to participate in sporting activities in order not to make the sports complex a wasting asset.

iii. Interesting sports events should be organized regularly by the university sports unit in order to attract spectators who would be opportune to appreciate the comfort that has been provided for them within the sports complex.

iv. Astute efforts should be made in generating funds by issuing reasonable and affordable tickets to spectators who come to view sporting events in the sports complex. Such funds generated will be used for the operation and maintenance of the sports complex and it will also add to the Internal Generated Revenue (IGR) of the university.

6.2 CONCLUSION

In conclusion, it is imperative that sporting activities in a university be taken to greater heights through the provision of a university sports complex that will be used by athletes and spectators. It is also essential to develop spectatorship spirit in people (members of the university community and outsiders) in order to encourage athletes and improve sports generally. A careful architectural planning and design of a university sports complex is thus essential due to the enormity of such project. It will be improper to clear just a small portion of land and call it a games field within a university campus or just a small scope sporting facilities where very few athletes simply dissipate energy without being noticed. A standard university sports complex is the ideal thing in meeting the sporting needs of the university community. Also, a well designed and constructed sports complex will attract athletes and spectators in large numbers. Therefore, adequate measure should

be taken in making the sports complex comfortable for the spectators who would contribute greatly to the liveliness and usefulness of the sports complex.

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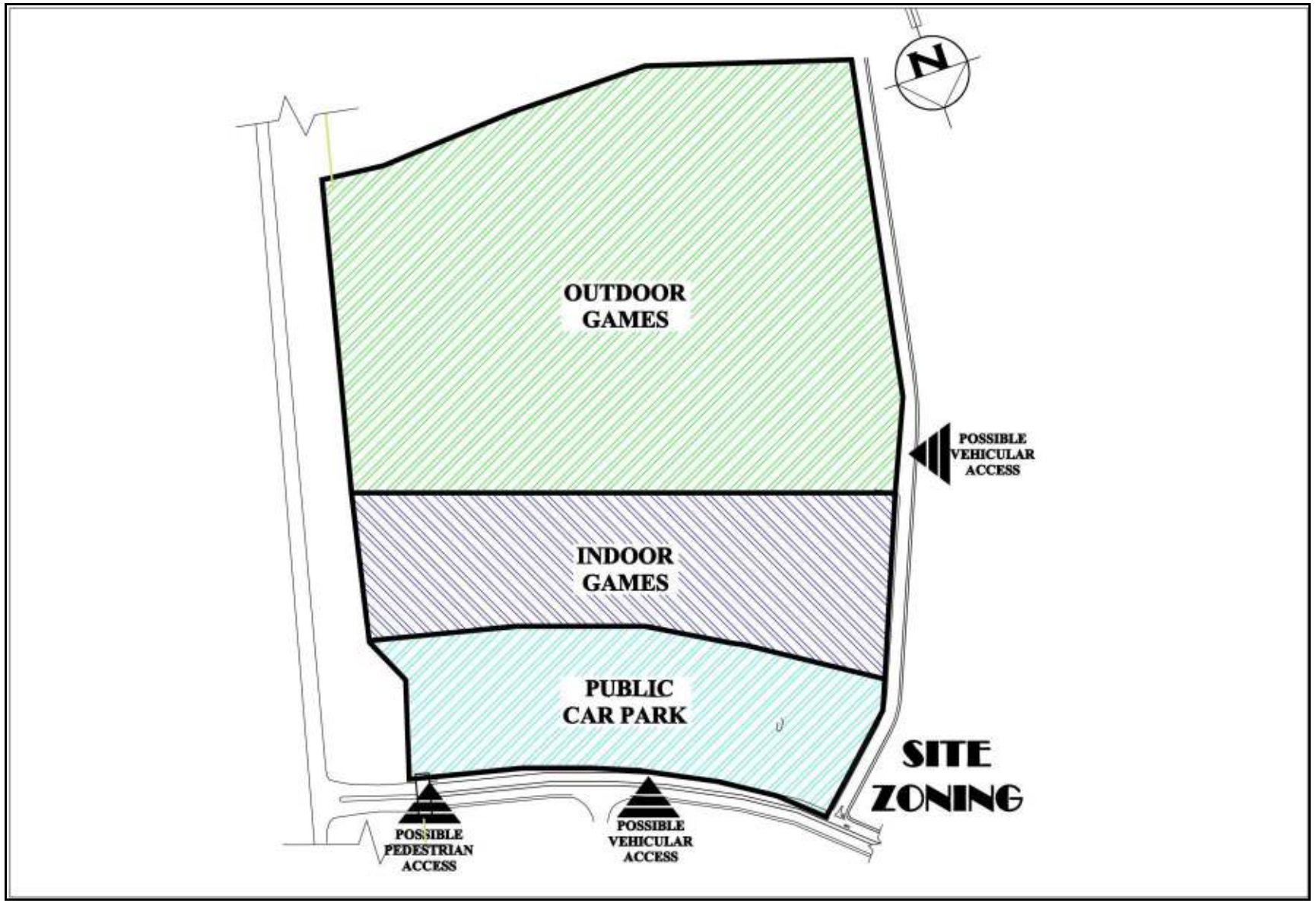
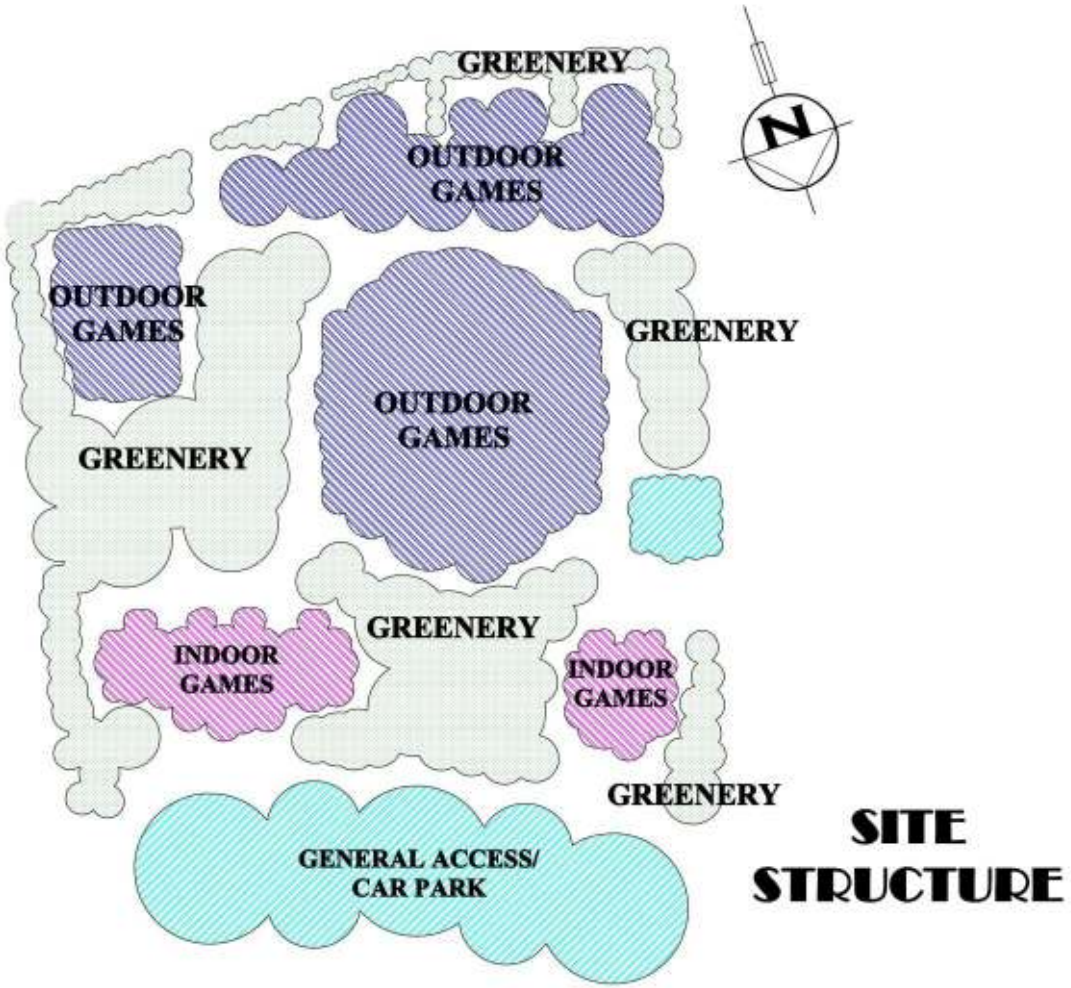
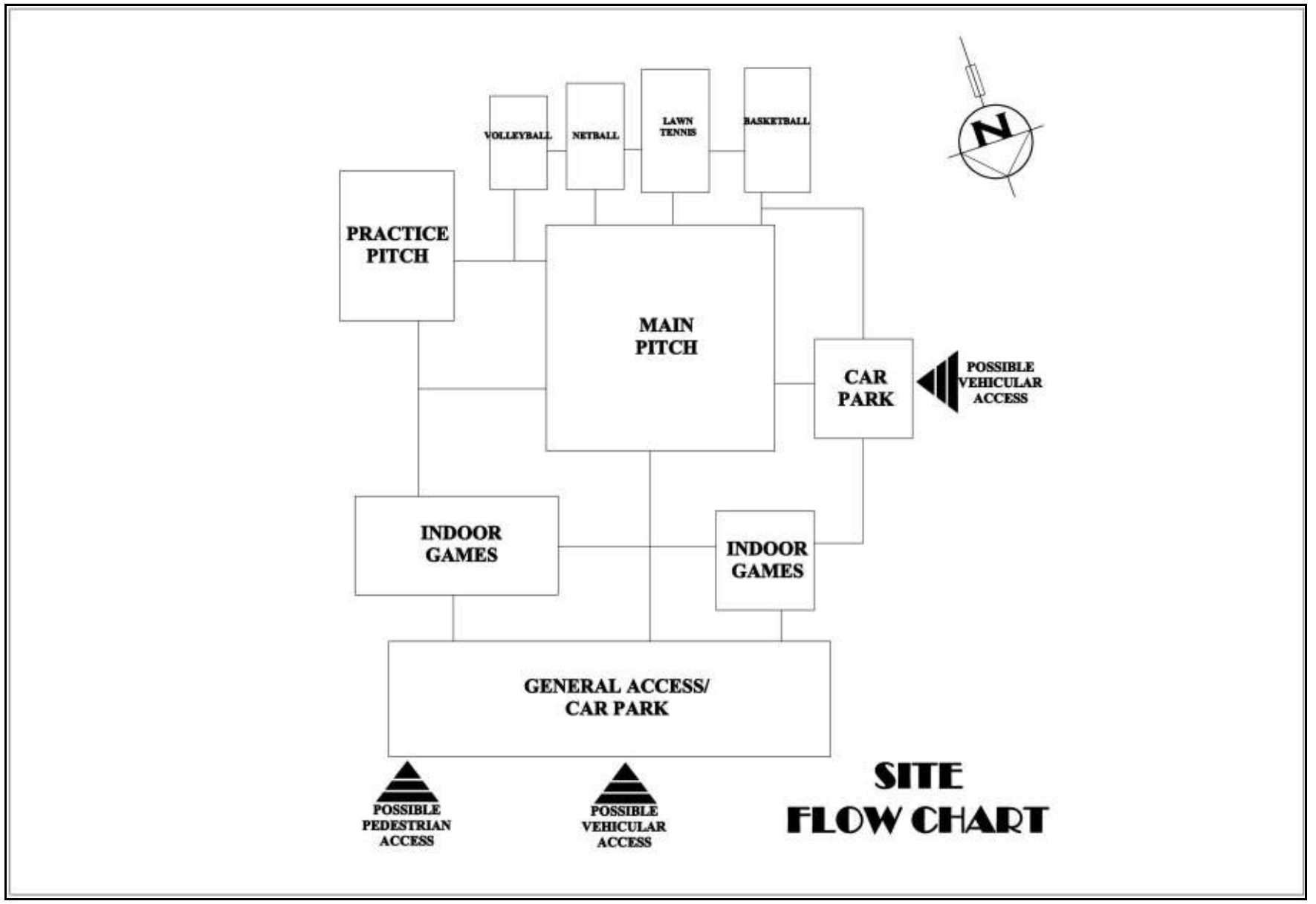
APPENDIX


N
OUTDOOR GAMES
INDOOR GAMES
PUBLIC CAR PARK
POSSIBLE VEHICULAR ACCESS
POSSIBLE PEDESTRIAN ACCESS
POSSIBLE VEHICULAR ACCESS
SITE ZONING

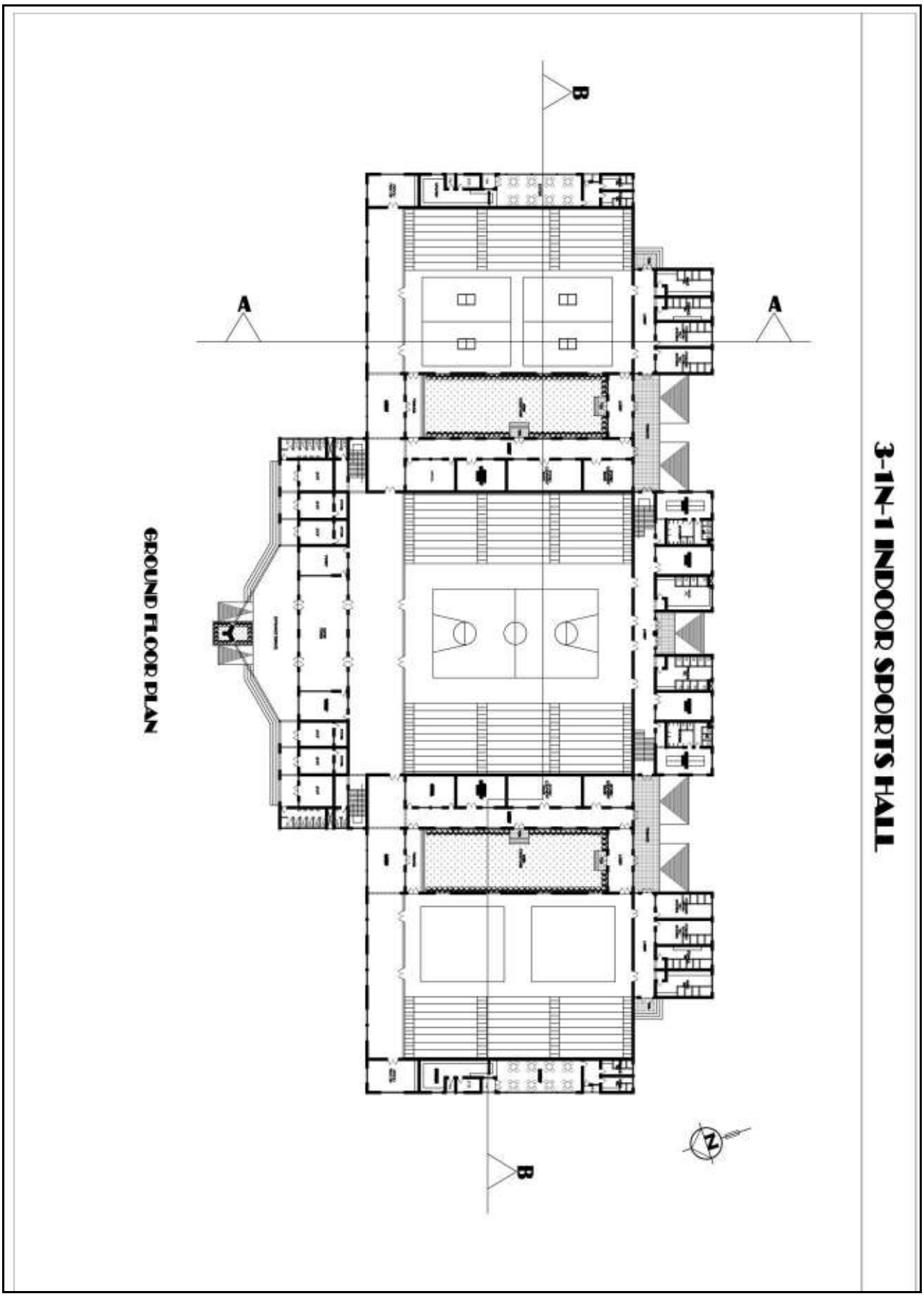


SITE STRUCTURE

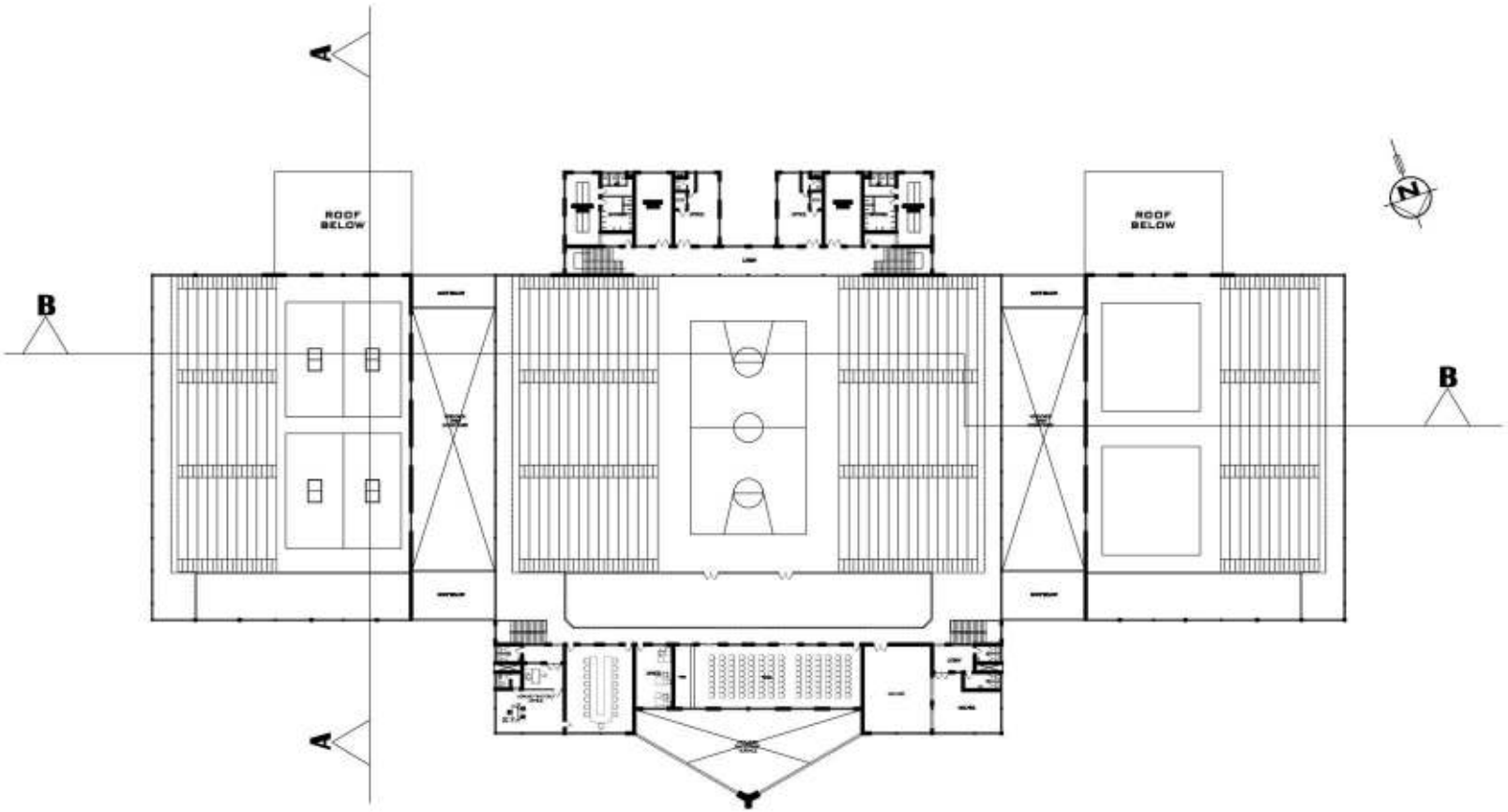

VOLLEYBALL
NETBALL
LAWN TENNIS
BASKETBALL
N
PRACTICE PITCH
MAIN PITCH
CAR PARK
POSSIBLE VEHICULAR ACCESS
INDOOR GAMES
INDOOR GAMES
GENERAL ACCESS/ CAR PARK
POSSIBLE PEDESTRIAN ACCESS
POSSIBLE VEHICULAR ACCESS
SITE FLOW CHART

SITE BUBBLE DIAGRAM

SITE PLAN

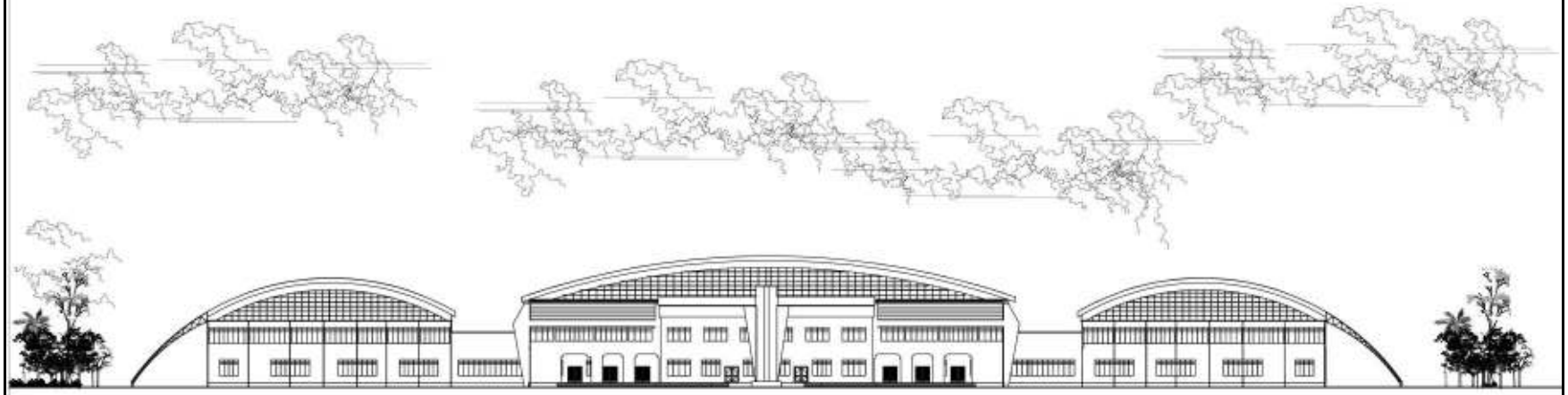

3-1N-1 INDOOR SPORTS HALL
GROUND FLOOR PLAN
A
A
B
B
N

3-IN-1 INDOOR SPORTS HALL

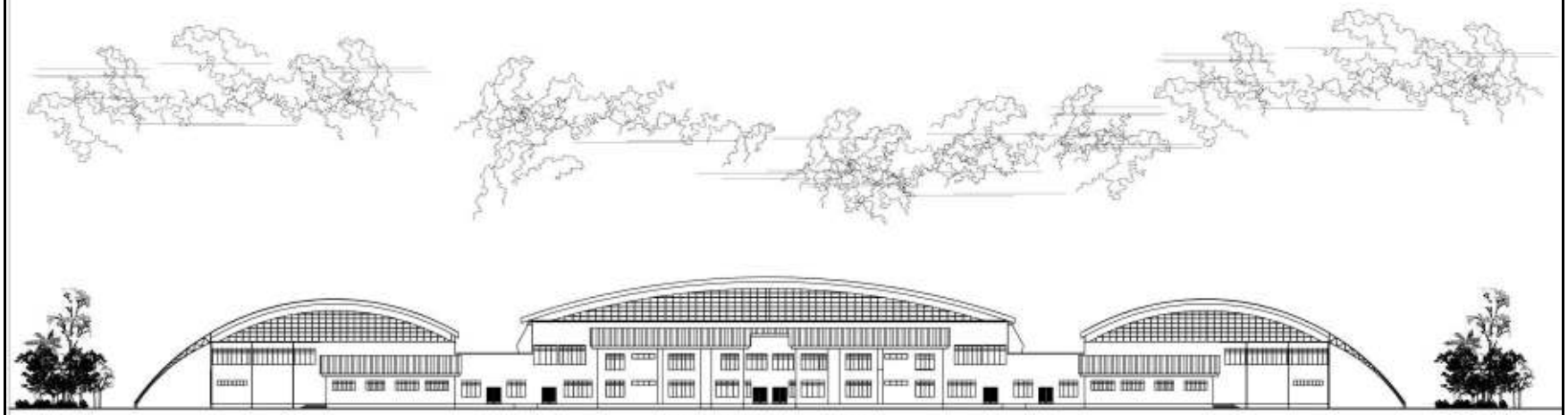


UPPER FLOOR PLAN

3-IN-1 INDOOR SPORTS HALL

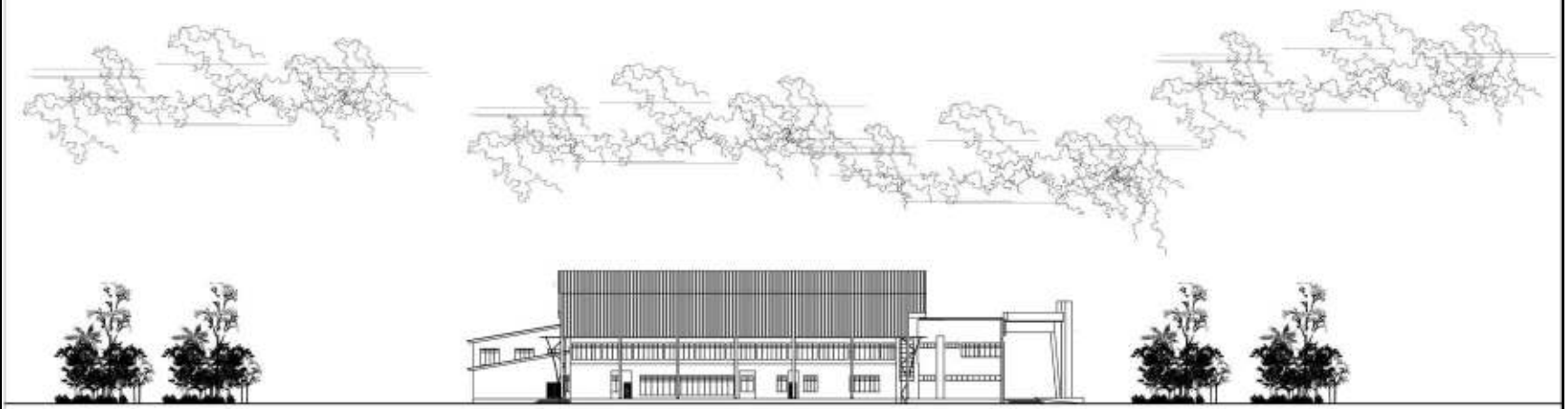


NORTH ELEVATION



SOUTH ELEVATION

3-1N-1 INDOOR SPORTS HALL



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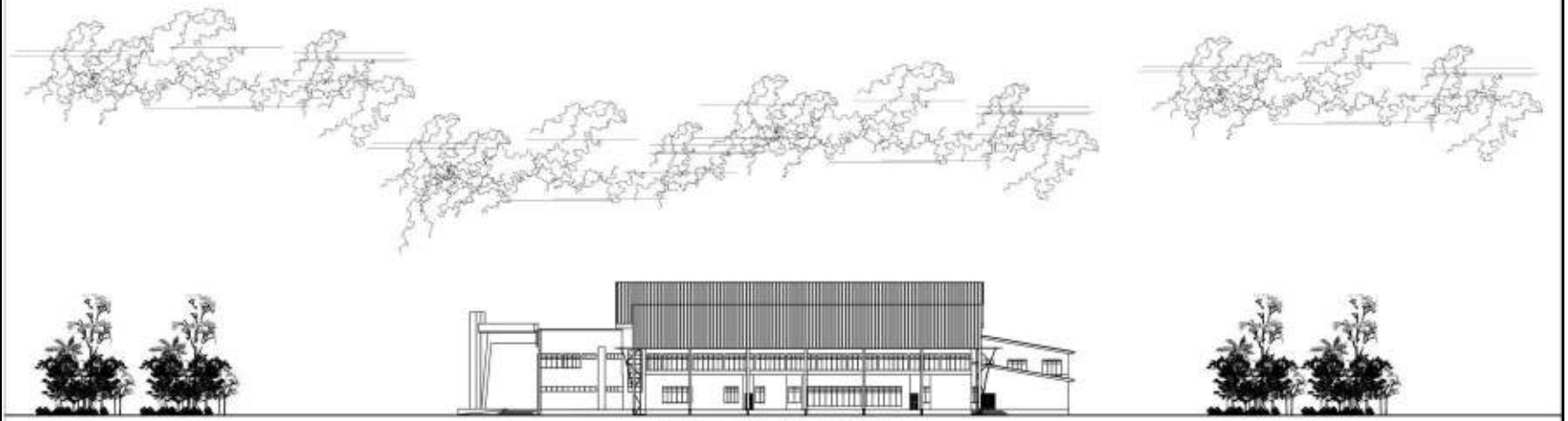
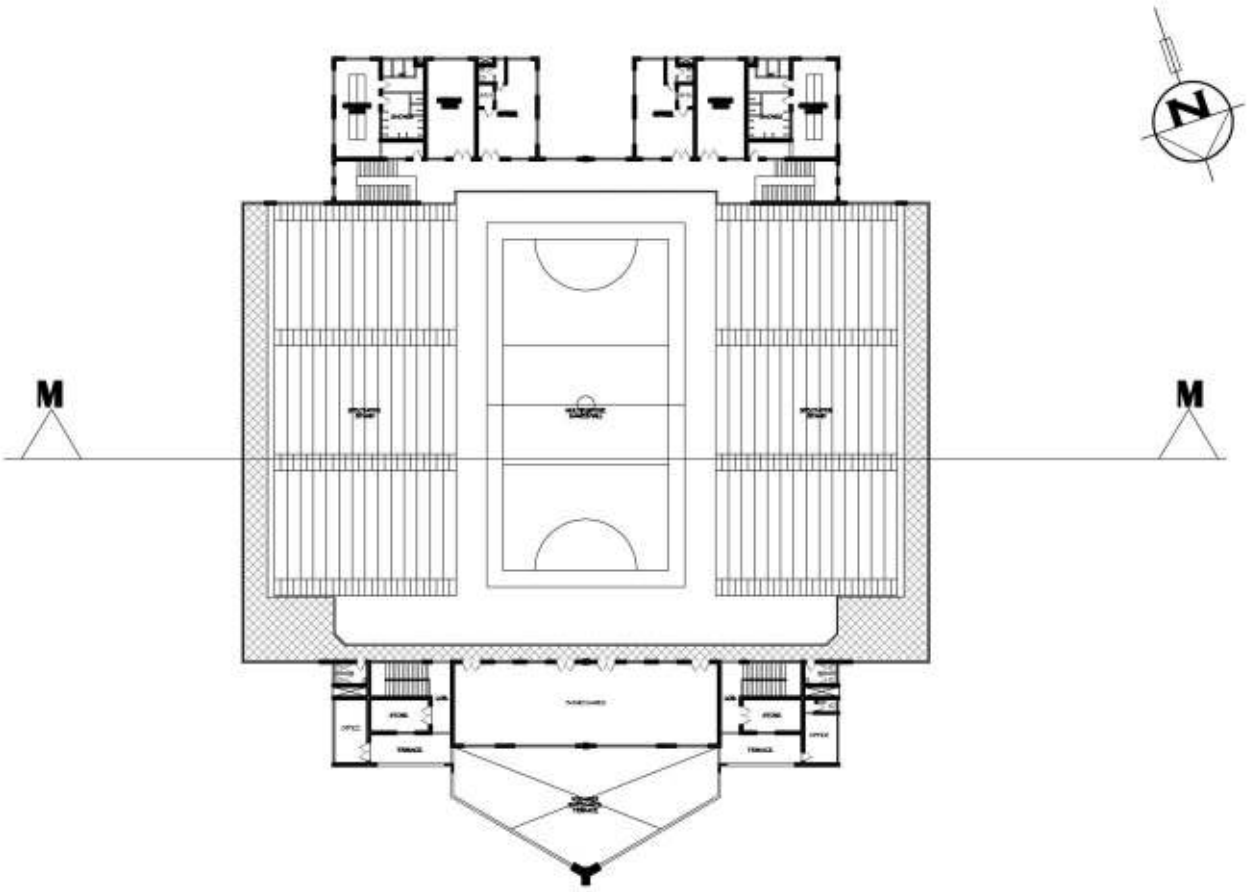


NORTH ELEVATION

MULTIPURPOSE INDOOR SPORTS HALL

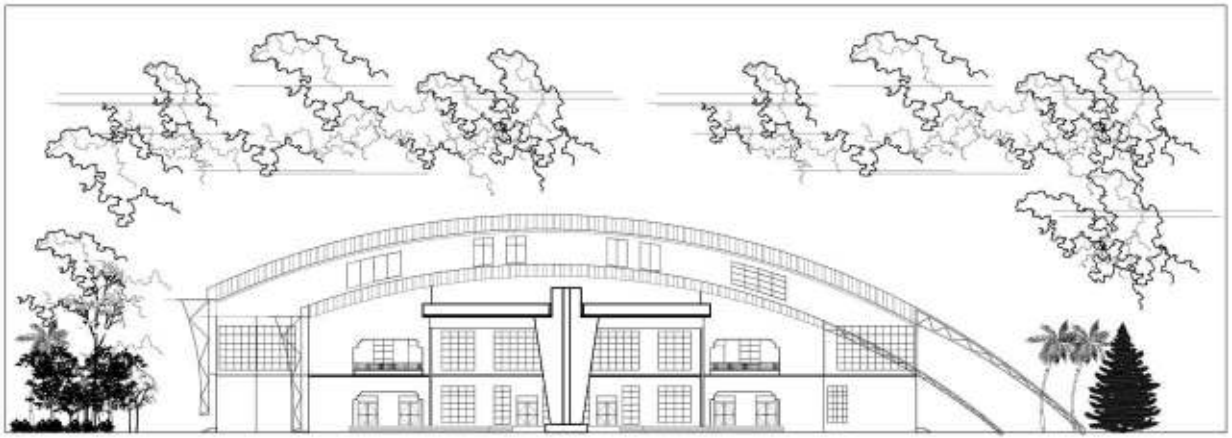
GROUND FLOOR PLAN

MULTIPURPOSE INDOOR SPORTS HALL

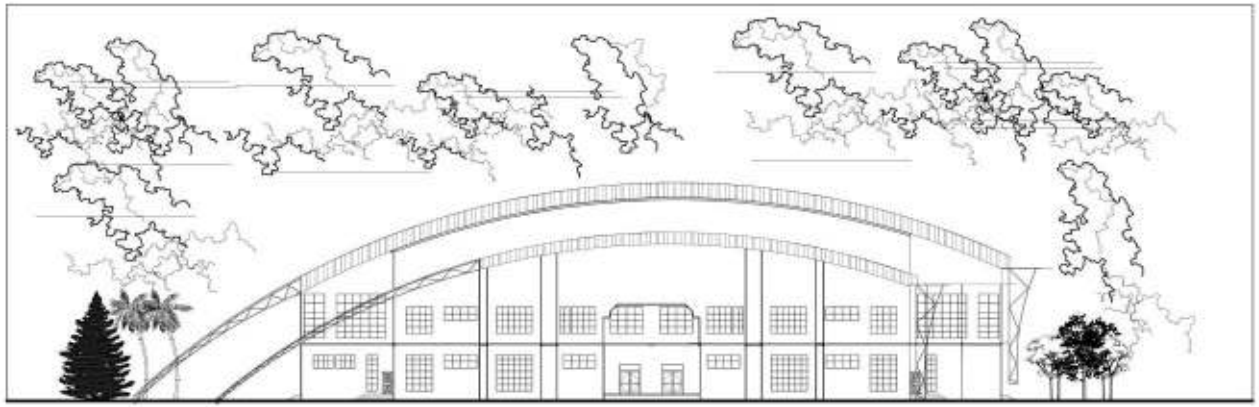


UPPER FLOOR PLAN

MULTIPURPOSE INDOOR SPORTS HALL

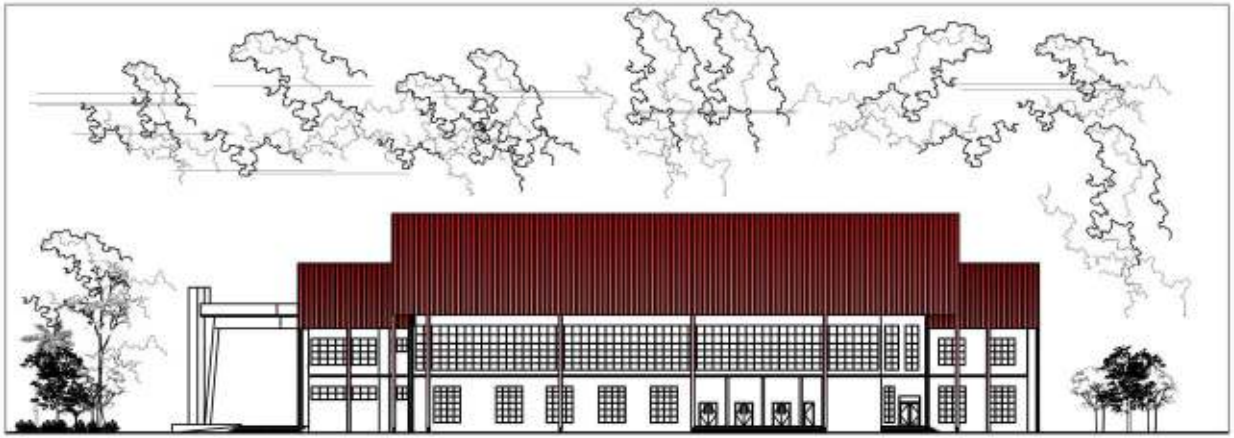


FRONT ELEVATION

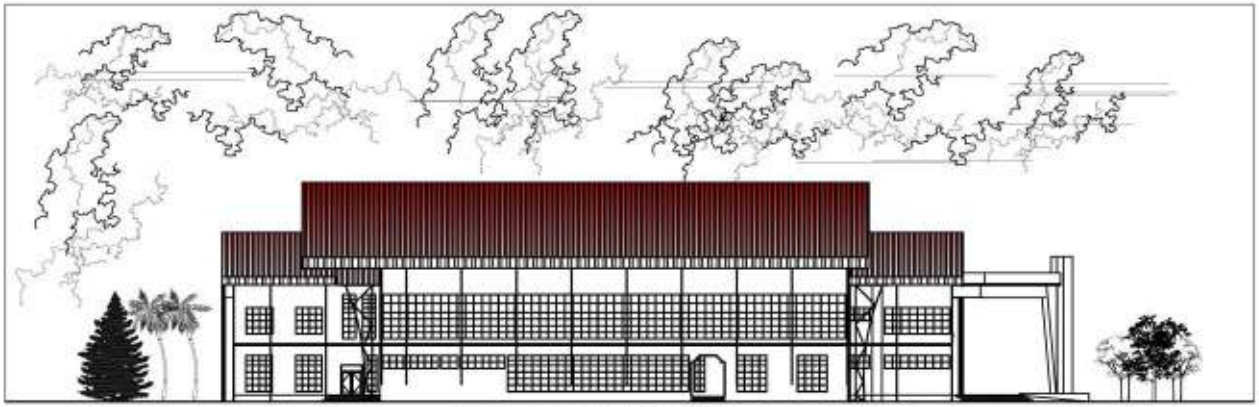


BACK ELEVATION

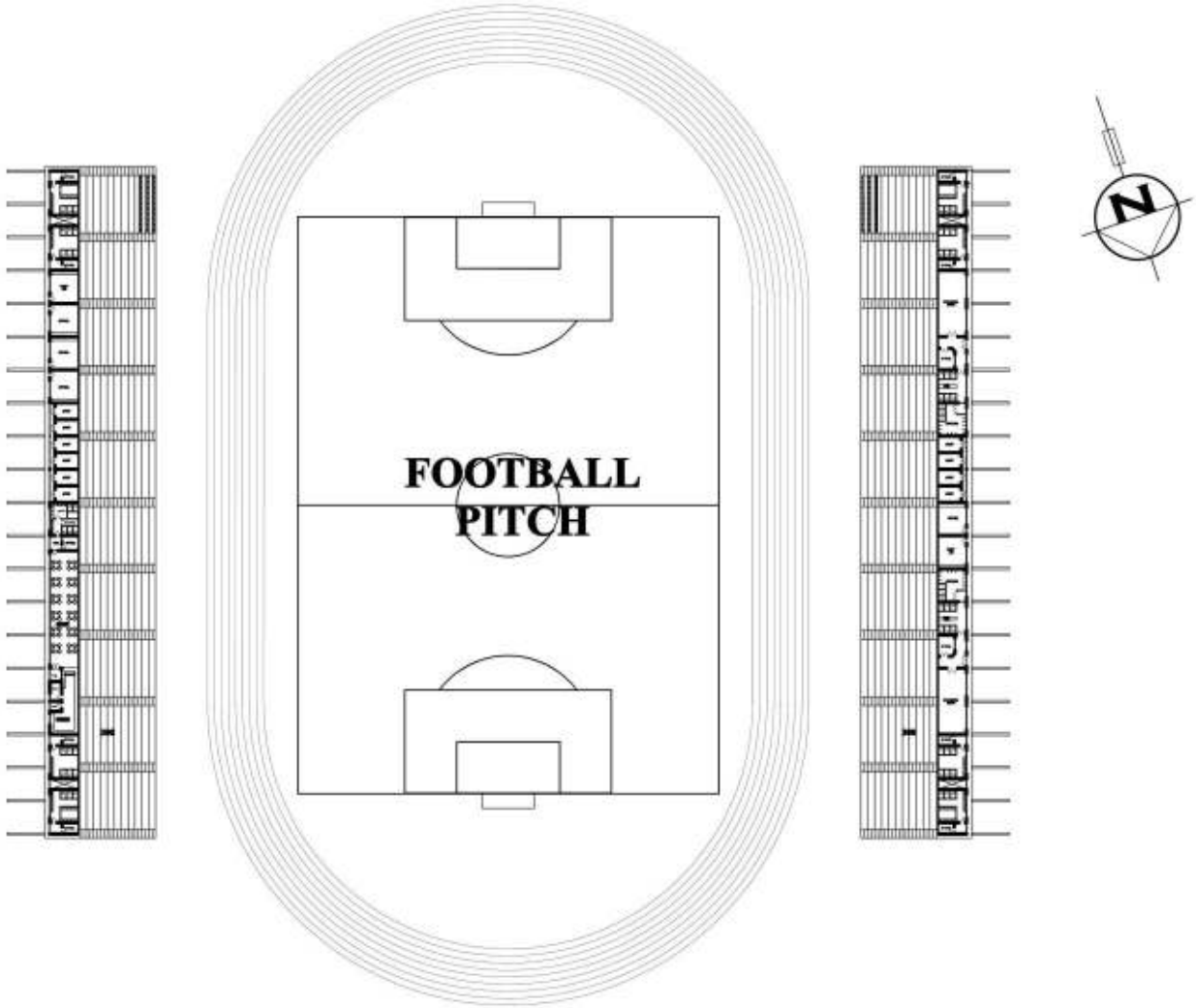
MULTIPURPOSE INDOOR SPORTS HALL



RIGHT-SIDE ELEVATION

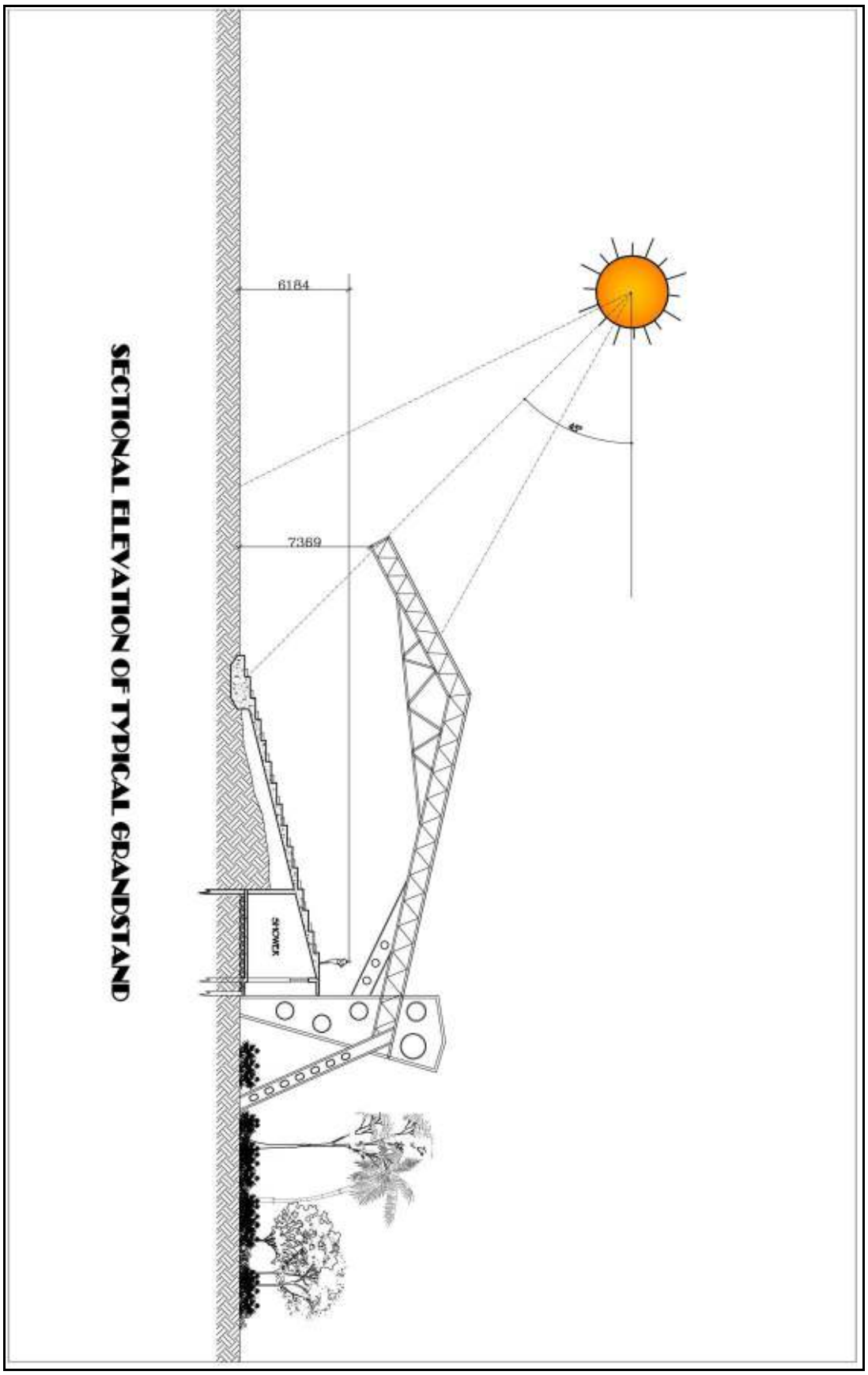


LEFT-SIDE ELEVATION



MAIN FOOTBALL AND ATHLETICS PITCH

BASKETBALL COURT


SECTIONAL ELEVATION OF TYPICAL GRANDSTAND
6184
7369
45°
SHOWER