DESIGN PROPOSAL FOR

NATIONAL CULTURAL CENTRE, CULTURAL ZONE, ABUJA.

WITH EMPHASIS ON

"FIRE SAFETY IN PUBLIC BUILDINGS"

M.TECH THESIS (ARCHITECTURE)

BY

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CERTIFICATION

is thesis **NATIONAL CULTURAL CENTRE, ABUJA,** meets the requirement
the award of a Degree (M.TECH) in the Department of Architecture of the Federal
iiversity of Technology, Minna. Being approved for its contribution to the pool of
owledge.

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DEDICATION

project is dedicated to the Almighty God and to my parents Mr. and Mrs.

abi.

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profound gratitude goes to my maker, the Almighty God who has given me the ›rtunity to obtain this degree in Architecture, my parents, Mr. and Mrs. Owolabi has struggled with God on their side to see me through financially.

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ABSTRACT

cultural practice of the people so it is known today have not digressed from arts, rafts, the religious and such other practices that have characterized lives of the ple since it came into existence. These practices include marriages, occupation, s, burials, etc which cannot be treated in isolation when considering the culture of ple.

h rapid diminishing level of our cultural heritage, it is very essential to look for a to revive, facilitate the periodic origin and provide unity and oneness among ic groups and tribes.

coming together of people of different tribes converging at a point poses the need the safety of these people in and around the building. It is observed that fire safety never been made a top priority in the design of public buildings like the cultural tre simply because it is not considered important. The principal aims of fire safety simply to safeguard life and property and this can be achieved by reducing fire idence, controlling fire propagation and spread, and providing adequate means of ape for occupants of buildings.

e emergence of fire safety technology will eradicate the occurrence of fire and bsequent injury and damage in the centre.

us, the 'NATIONAL CULTURAL CENTRE' is not just to create an environment at will propagate traditional forms and techniques, but also to provide a conducive vironment that is free of fire hazards.

is believed that this project, if well implemented will provide a functional chitecture that will alleviate the promotion of African culture and cultural value in s highest and widest conception.

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CHAPTER ONE

1.0 INTRODUCTION

The origin of culture can be traced back to our forefathers. During that era, culture was the only thing they used as strong form of identification, the culture of a group of people is their entire way of life.

Coming together of people of different tribes and culture for a common interest such as to exchange ideas on their cultural background and values in its complexities is to recreate and consequently to learn more from themselves.

Culture embraces various fields such as economic, technological and scientific methods of dealing with one's physical environment. It also included rules for regulating political and social life, languages, moral values, aesthetics, religious beliefs and practice.

The culture of a set of people consists of patterns of explicit or implicit and of behaviour acquired and transmitted by symbols constituting the distinctive achievements of human group including their embodiment in artifacts.

The essential core of culture consists of traditional ideas and their attached values; culture is more than just a heritage but historical product and expression of man's mode of living.

The impact of western concept and techniques on our culture has resulted in some fundamental changes in our life style. Many of them have completely eroded while some have been modernized. A few of these culture still maintain their original values despite the great challenges of modern civilization, foreign culture, cultural piracy due to the exporting of some of our artifacts abroad.

This thesis is to propose a centre, to revive our cultural activities. This centre shall aid and provide the spirit of oneness to all ethnic groups and tribes in Nigeria, West

Africa and the entire world as a whole. This project shall provide facilities that will take care of preservation and documentation of our cultural elements.

NATIONAL CULTURAL CENTRE, ABUJA.

The proposed national cultural centre will be able to provide a conducive environment for cultural activities. The main auditorium will have a seating capacity of 7,000 and will be aesthetically balanced. It is a place where effective display of indigenous ideas in arts and culture are inter-woven to form one family, which shall protect the image of the nation at large.

1.1 AIMS AND OBJECTIVES

- This project is aimed at providing unity and oneness among ethnic groups all over the nation and the entire world at large, through organized public enlightenment programmes.
- To create an historical value of Nigerian cultural heritage.
- To provide adequate facilities for the revival, resurgence, propagation and promoting African culture and cultural value in its highest and widest conception.
- To facilitate a periodic 'return to origin' in the nation at large.
- To create an environment that will serve to propagate the traditional forms and techniques in music, dance, theatre and visual art of the nation.
- To foster the improvement of opportunities for talented artists and performers to exhibits their form of art in an organized set up.
- To provide a space for the development of the artistic excellence in contemporary and traditional works.

- To provide a medium to enhance and educate people about the concept or cultural philosophy or aesthetic of the people.
- To create an enabling environment to promote understanding in and appreciation of Nigerian and civilization through creating space for organizing lectures, performance, demonstrations etc.

1.2 RESEARCH METHODOLOGY

The collection of data, research and investigation on National Culture Dome and its importance in respect to promotion of national cultural heritage was done through:

- Descriptive survey method: Case studies of existing National Council for arts and culture and cultural centres, questionnaires and direct interview.
- Historical method; Review of literature from thesis works, organizational profiles on Internet, books, encyclopaedia.

1.3 SCOPE AND LIMITATIONS

To achieve the goal of this study, the following facilities are to be provided: administrative building

- Main auditorium hall
- Conference/ banquet hall
- Cinema hall
- Art gallery/ exhibition
- Library
- Mini museum
- Restaurant
- Auxiliary facilities

1.4 DESIGN LIMITATIONS

A diverse system of art, customs, beliefs and lack of homogeneity in cultural activities between the states and ethnic groups in the federation is one of the major constraints in an attempt at achieving an all-embracing design that will meet the demands and aspirations of the people.

1.5 IMPORTANCE OF THE STUDY

The importance of this study is to ensure continuous presence and growth of traditional skills, arts and crafts that were passed from our forefathers, to provide a conducive environment big enough for any national cultural and traditional activities as well as national conferences and meetings, to exhibit and promote our cultural heritage, and to integrate our culture and provide a local environment to complement it.

fitted to survive. The early sociologists wondered if there might be an evolutionary pattern in the development of human culture and social life.

Auguste Comte in his 'positive philosophy' (1851-1854) wrote of three stages through which he believed human thought inevitably moved: the theological, the metaphysical (or philosophical), and finally the positive (or scientific). Herbert Spencer, a sociological 'giant' of the nineteenth century, was enamoured of 'social Darwinism'. He saw social evolution as a set of stages through which all societies moved from the simple to the complex and from the homogenous to the heterogeneous. Implicit in the thinking of both Comtre and Spencer was an optimism, which saw the progress of society unfolding in a way that would gradually end misery and increase human happiness.

Wars, depressions, and totalitarian governments dampened this optimism and made the idea of social evolution seem naive. The cultural relativists denied that one could speak of a 'higher' or 'lower' type of culture and claimed that every culture was simply one of many possible ways of coping with the environment. The anthropologists denied that the direction of change is always from the simple to the more complex and pointed out that many primitive tribes had a far more elaborate kinship system and more ritualistic and ceremonial life than modern societies do.

Culture historians such as Spangler and Toynbee deny the existence of any upward linear progress. They claim that societies have moved in cycles in which democracy and dictatorship follow each other with each great civilization eventually destroyed by barbarians.

Ideas, however, are hard to kill. The notion of social evolution, which in the middle of the twentieth century seemed dead indeed, is very much alive today. One of the factors in its revival is the example of developing countries. As they become industrialized, they copy the technology and economic structures and many other features of the western societies as a part of this 'modernization. More technology brings many common cultural characteristics to any people who embrace modern technology. Paul and Chester, (1984).

2.3 COM PONENT OF CULTURE

The components of culture include: ideology, technology and social organization.

IDEOLOGY- is composed of ideas, belief and values shared by the society e.g. human grouping or a cultural area.

TECHNOLOGY: - innovation, skills, and materials e.g. items used for the satisfaction of feeding, clothing and shelter requirement of the people.

SOCIAL ORGANIZATION- this is the network of rules, roles and relationship that create patterned way of life within an environment.

2.4 ART AND CULTURE IN NIGERIA

Nigeria with an area of 923,768m2 and population of over 10 million, the giant of Africa lies at the altitude of 40-140N. It has a great diversity of people and culture who within her boundaries and whose pattern of living is being determined by their environment.

The richness of material culture depends on how people use raw materials at disposal to meet their needs and give expression to their aesthetic impulses and culture. The raw materials they used depend on the environment in which they live. Most often, rural dwellers make use of cheap materials and those that are available e.g. a Hausa man uses cattle hide for leather. Many craft works are connected with the basic need of food and clothing.

Culture in Nigeria is manifested in art, dance, language literature, folklore, mores, music and the environment. Artifact depicting the early life of Nigerians dates back to 2000 years. Example is the Nok culture of the Nok region, north of the Benue River; characteristics features of these cultures include the terra-cotta figures ad the extensive use of iron.

Art and cultures of Nigeria include; Brass or Bronze casting of the people of Ife and Benin, Archaeological findings at Igbo-Ukwu, Anambra State these have elaborate intricate symmetrical designs. Other forms of art are grass weaving (Northern Nigeria), wood carving (Benin and Awka), Ivory carving (Benin glass and metal works (Bida), leather and calabash (Sokoto, Oyo), pottery (Niger and Imo state), cloth weaving (Abia, Oyo, and Okene) and painting (Kano).

Other forms of cultural events in the country are birth and childhood celebration among the Muslim tribes, the Hausa, Kanuri and Fulani; funerals, common among the Yoruba of the south west and the Ibos in the south-eastern part of the country. They include music, dance and other festivities; reincarnation, common among many eastern tribes such as the Ibo, Igede, Iyala and Idoma. Dance is a vital part of Nigeria social life, it is common in all parts of the country and it comes in different format. Finally masquerades are an essential part of the rituals surrounding the rhythms of life in Nigeria. It is chiefly performed for entertainment.

2.5 DEVELOPMENT OF CULTURE IN NIGERIA.

The federal and state governments have always shown keen interest in the development of arts and crafts as a source of employment and major developing aptitude and have given every possible assistance to the local government to encourage the formation of co-operative societies to advocate the best way of co-operative societies to advocate the best way of increasing production and help to exchange programme in Nigeria and abroad.

In Nigeria today, there is a federal department of culture, which is charged with formulating and implementing cultural policies, also they advise the government on matters relating to arts and culture.

They deal with matters relating to various aspects of Nigeria cultural life. The cultural preservation and statistics division of the federal department of culture is charged with the responsibility of documenting and preserving all aspects of Nigeria cultural relevant information on Nigeria cultural development. They have three major divisions mainly research, the library and Audio units.

2.6 NATIONAL COUNCIL FOR ARTS AND CULTURE.

The national council for arts and culture was established by decree 3 of 1975 after the dissolution of the former Nigeria arts council; it is the custodian of cultural materials for Black and African peoples all over the world. This institution is a vital centre for the study propagation and promoting of understanding of black and African ideas and civilization.

The materials being preserved, utilized and documented represent the contribution made by the intellectuals, writers and artists who were the moving sprits behind the execution of FESTAC 77 (festival of Art and culture). This centre was officially declared a depository for UNESCO books documents etc. This centre consists of four divisions namely archives, library, audiovisual and museum division.

CHAPTER THREE

3.0 RESEARCH AREA; FIRE SAFETY IN PUBLIC BUILDINGS

3.1 EVOLUTION OF FIRE SAFETY IN BUILDINGS

3.1.1 HISTORICAL BACKGROUND

Fires in buildings are nearly always man-made, i.e. resulting error or negligence. Primitive man used heat for cooking, warming and lighting his dwelling with the inherent risk that misuse or accident in his control of fuel might precipitate disaster. Today, as in primitive society, that risk has not been eliminated despite the apparent sophistication of modern living. With the development of habitations, attitudes to fire protection/fire precaution also developed, sometimes subtly, but mostly from bitter experience. The principal aims of fire precautions are simply to safeguard life and property and are achieved by:

1. Reducing fire incidence
2. Controlling fire propagation and spread
3. Providing adequate means of escape for occupants of buildings.

In medieval times, dwellings were mostly timber-framed construction with thatched roofs, and within the walled townships overcrowding, narrow lane ways, over-hanging eaves and indiscriminate use of combustibles provided all necessary ingredients for the conflagrations, which followed.

In 1136 London, Bath and New York suffered severe fire damage, and another disastrous fire in London in 1212 led to the introduction of ordinances regarding certain building uses and materials to be used for new and restored roofs. Hamilton (1958).

3.1.2 THE DEVELOPMENT OF CURRENT FIRE SAFETY REGULATIONS

In effect the data obtained through experience and embodied in the Act of 1774 form the basis of current regulations. Concepts such as:

1. Purpose grouping
2. Space separation between buildings
3. Ignition prevention
4. Compartmentalization
5. Isolation
6. Segregation
7. Constructional component integrity,

Although not expressly stated in the Act of 1774 are embodied in the current fire safety regulation, and by the application of science and scientific methods, the broad principles contained in the Act of 1774 have been validated, modified and adapted to meet the needs and complexities of modern society.

Many 'fire-proof' buildings were only to be destroyed by fire, simply because architects had not yet realized that providing structural elements with a degree of fire was not enough. Often the designers' intention, in providing fire–resisting floors for example, was negated because continuous ducts, staircases, lift shafts, etc., were allowed to penetrate the floors without the provision of fire stops. Eventually after many buildings were gutted the lesson was learned.

At the beginning of the twentieth century the use of reinforced concrete steel –frame constructions assumed importance, but like cast iron, steel, while being non-combustible, provided negligible fire resistance without adequate protection. The regulations in force did not require minimum periods of fire resistance; indeed, the very term fire resisting was not adequately defined. Little work had been done in attempting to identify the factors, which contributed to fire severity and consequently influenced the nature and quality of protection afforded to buildings. Shields and Silcock (1987).

3.1.3 THE DEVELOPMENT OF FIRE SAFETY POLICIES AND STATISTICS

It was now becoming increasingly clear that the notion of 'fire protection', which had evolved as a necessity from past experience was becoming increasingly complex in an evolving society, involved in technological advancement. In 1921 a royal commission was appointed 'to enquire' into the existing provision for;

1. [a] The avoidance of loss from buildings, including the regulations dealing with the construction of buildings.

   [b] Dangerous processes

   [c] Advisory role with regard to fire prevention, and
2. [a] The extinction of outbreaks of fire, including the control, maintenance organization, equipment and training of fire and

   [b] To report whether any, and if so what, changes were necessary whether by statutory provision or otherwise, in order to secure the best possible protection of life and property against fire risks, due regard being paid to consideration of economy as well as deficiency. Moulens and Beufort (1984).

3.1.4 FIRE SAFETY FEEDBACK

A study of the background of structural fire precautions will show a progressive trend, perhaps as a result of some disaster, but it would be a folly to fall into the trap of thinking that the design, construction and management of buildings is a static science and art. It is a dynamic activity producing buildings of increasing complexity for multiple usage and occupancy in an atmosphere of managerial and technological change. The principal lessons to be learned from a study of the development of structural fire protection are:

1) That the protection of life and property from a fire hazard is a complex problem to which there can be no simple solution
2) New materials and new methods of new construction demand new solutions and approaches to an old problem
3) That the introduction of structural fire precaution has contributed significantly to reducing fire hazards and that further developments with regard to testing of materials and components is a natural progression.
4) That building codes contain only minimum requirements
5) That building regulations and codes of practice which embody minimum standards because of the legislative process lag behind research developments and findings.
6) That the best intentions of designers may be entirely frustrated by lack of attention to detail
7) That good housekeeping is essential. Moulens and Beaufort (1984).

3.1.5 THE PERFORMANCE CONCEPT

In order to appreciate the potential impact of the introduction of performance specifications and standards on fire safety engineering, it will be useful to state what is meant by these terms. Performance specification state in precise terms the characteristics desired by the users of a product or system's performance without regard to the specific means to be employed in achieving the results. They do not describe the dimensions, materials, finishes or method of manufacture or assembly;

dimensions, materials, finishes or methods of manufacture or assembly; rather they describe the performance required by the user. Simply stated any material, composite, component or building must be fit for the intended purpose. To establish the fitness for the intended purpose, consideration must be given the user's needs (present and future) and the condition under which the component, etc, will be used. Thus an idea of how the component must perform is formulated which in turn leads to the precise details to be looked for when selecting from available components etc, or when designing new ones.

The development of performance specifications and standards for each material, composite, component, and building will necessitate the following;

1) A definition of user's requirements.
2) The establishment of conditions of use
3) A definition of key criteria for assessment
4) The development of method of performance
5) The setting of levels of performance
6) The relating of levels of performance set to user requirements and conditions of use. Thomas (1984).

3.1.6 SYSTEMIC APPROACH TO FIRE SAFETY

The occurrence of an unwanted fire and subsequent injury and damage represents a failure of the system, which ultimately encompasses all of society. Fire safety technology is by definition integrative in that a system of approach is required, which includes all of the components, e.g. Economics, user's requirements and fire dynamics, in order to determine optimum solutions to problems. Clearly it is essential to have an approach to fire safety engineering which considers fire-related components as an integrated whole, in the widest sense. Such an approach may be called 'systemic'.

However, a systemic approach is not the same as a systematic approach. To see a thing in a systemic way is to perceive system within the situation: to be fully aware of the dynamism and interconnectedness within the entirety, whereas the systematic approach may be thought of as being methodical or tidy. A systemic approach should be systematic, but a systematic approach may not be systemic. The systemic approach requires:

- A statement of the objectives of the fire safety program
- An assessment of the current level of fire safety provision and associated costs
- A definition of the level of fire safety to be achieved

Thus, the systemic approach requires ways of measuring fire safety. Methods have been developed such as point's schemes and mathematical models, which may be utilized in order to evaluate the level of fire safety provision. Shields and Silcock (1987).

3.2 DEVELOPMENTS AND GROWTH OF FIRES IN ENCLOSURES

The growth and development of fire has been shown to be dependent to a large extent on the geometry and ventilation of the enclosure containing fire. Friedman reported the differences observed between fires burning in the open and those in enclosures. The figure below shows effects of an enclosure on the burning rate of a square slab of polymethyl methacrylate, which illustrates the difference between a material burning in the open, and the same material burning under a roof. In the former case, except for the heat required to produce the volatiles from the fuel bed, all of the remaining heat energy is lost to the atmosphere. In the latter case, however, the roof plays a

- Provided that there is sufficient fuel and oxygen available the fire may totally involve the compartment. Ewart (1985).

3.2.2 FLASHOVER

Flashover has been defined as the rapid development of a compartment's combustible contents as they ignite almost simultaneously. Flashover would be the time when flame cease to be localized and flaming can be observed throughout the whole compartment volume, i.e. burning activity changes from being a surface phenomenon to a volume process. It is the transition from the growth period to the fully - developed stage in fire development. It is used in the demarcation point between two stages of a compartment fire, i.e. pre-flashover and post-flashover. Shields and Silcock (1987).

3.2.3 FIRE DEVELOPMENT IN COMPARTMENTS

The time versus temperature development of a fire is shown in the figure below, the curve representing the average temperature determined under test conditions. The period A-B is known as the growth period. It is essentially the pre-flashover period during which the temperatures in the compartment remain relatively low and the chances of escape are relatively high. At B the fire progresses rapidly through flashover to the fully – developed stage and it can be seen that flashover in essence is the transition from the growth period to the fully developed period. During this period all the combustibles in the compartment are burning and the temperature within the enclosure increases sharply. At C the burning period ends, the temperature begins to fall and the decay period begins. During the decay period the temperatures are such that for a period of time the direct threat to other spaces remains because of the risk of propagation by radiation or penetration of constructional components. During the significant role in that the loss of heat energy is considerably reduced and an energy feedback mechanism is created which significantly increases the pyrolisation and hence the burning rate. Ewart (1985).

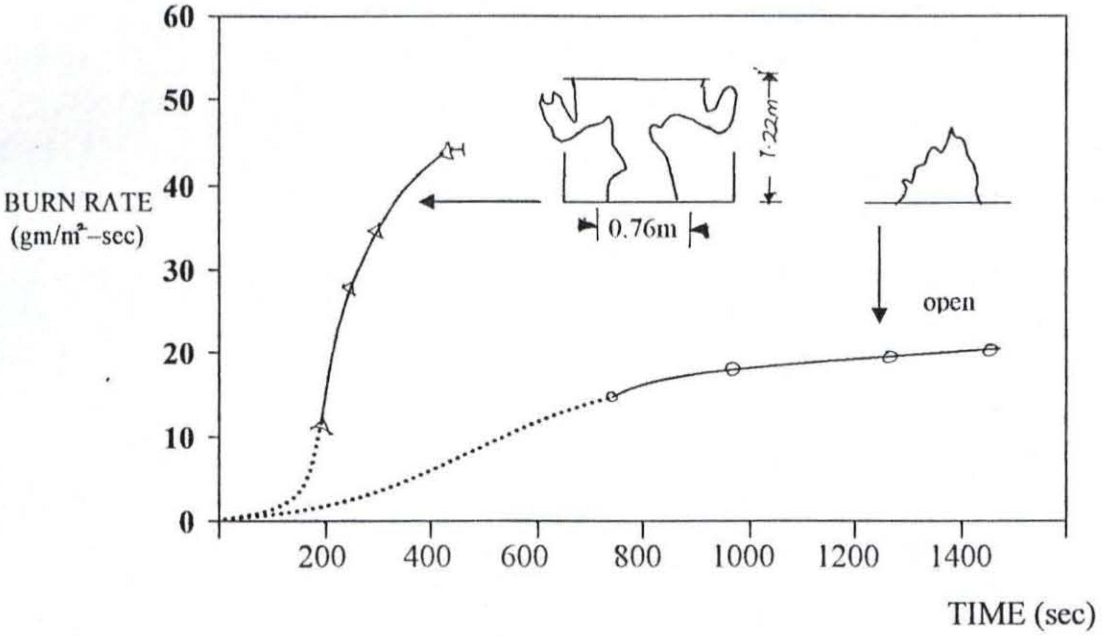


FIG. 3.0: Effect of enclosure on the burning rate of a square polymethyl methacrylate slab.

3.2.1 FACTORS AFFECTING FIRE DEVELOPMENT

A fire usually starts because a material is ignited by a heat source. The development of the fire within the compartment depends on many factors, namely:

- The item first ignited is sufficiently flammable to allow flame spread over its surfaces.
- The heat flux from the fuel package is sufficient to irradiate adjacent fuel packages, which in turn will begin to burn.
- Sufficient fuel exists within the compartment otherwise the fire may simply burn itself out.
- The fire may burn very slowly because of a restricted oxygen supply e.g. in a well-sealed compartment the fire may eventually smother itself

growth period, heat from the fire causes materials in the compartment, e.g. wall lining, to evolve gases and vapours. If the rate of vapour production is sufficiently high, a vapour-air mixture will be formed within the flammability limits which may be ignited by flames from the already burning materials. It follows that the easier a material is to ignite and the greater the rate of heat production is dependent not only on the nature and dimensions of physical characteristics of the material, but also on the heat flux transferred to the material itself. Large expanses of combustible materials, such as wall and ceiling linings, can contribute significantly to the rapid growth of a fire. The radiation from large areas of burning surfaces, exponential rate of flame spread over vertical surfaces, and relatively low ceilings interact to promote the rapid development of fire within a compartment.

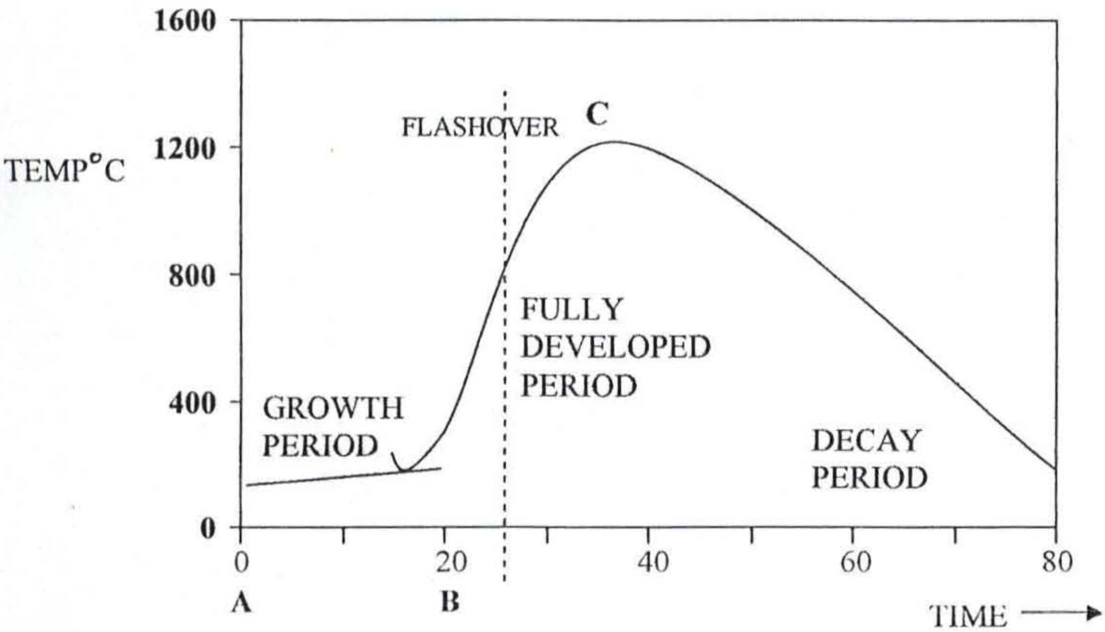


FIG.3.1: Time/temperature fire profile.

Table 3.0: Factors affecting the rate of flame spread on combustible solids

Materials

Chemical	Physical	Environmental
Composition of fuel	Initial temperature Surface orientation	Composition of the atmosphere, temperature
Presence of retardants	Direction of propagation Thickness of specimen Thermal conductivity Density	Imposed heat flux Initial pressure Air velocity
Geometry		

Other factors that affect the duration of the growth period are:

- Spacing of combustible fuel packages within the compartment
- Mass and surface area of the combustible materials dispersed within the room
- Size and location of ignition sources
- Size and location of the openings in the compartment boundaries
- Geometry of the compartment. Shields and Silcock (1987).

3.2.4 FIRE SEVERITY

Fire severity may be simply defined as a destructive potential of a compartment fire, i.e. the potential impact that a fire in a given compartment will have upon the structural and constructional components, which form the compartment and the contents of the compartment. Inevitably fire severity has been linked with structural performance in terms of component's fire-resisting capabilities. Ingberg established a direct relationship between fire- load density and fire severity. This concept has been widely utilized in buildings of various purpose groups.

Fire severity is not a function of a single parameter such as fire load density, but depends on other factors such as ventilation rate, burning rate fire duration and thermal properties of the enclosure construction. The flow of air into a compartment is an important factor in the severity of fully developed fires. Beard (1980).

3.3 FIRE RESISTANCE REQUIREMENTS

Fire resistance is a term, which is generally used to denote the extent to which a structural or constructional component will resist the impact of fire. Fire resistance means the ability of an element of building construction to withstand the effects of fire for a specified period of time without loss of its fire separating and load bearing functions.

Thus the criteria attempt to relate the ability of a structural component to:

- Endure fire without collapse
- Prevent the penetration of flame due to loss of integrity.
- Resist the spread of fire by conduction through the component or by radiation from the face of the component not exposed to the fire.

The factors, which determine the level of fire resistance of structural components, are:

- Purpose grouping
- Height of the building
- Floor area of the building or compartment
- Cubic capacity of the building or compartment
- Location of the component, i.e.

- Ground or upper story
- Basement story. O'Brien and Redding, (1984).

3.3.1 CONSTRUCTIONAL REQUIREMENTS FOR SEPERATING WALLS, COMPARTMENT WALLS AND FLOORS.

The purpose of prescribing constructional requirements for separating walls, compartment walls, and floors is quite simply to ensure that the fire- resistance requirement specified are not negated by faulty construction. Since these components are utilized in the first instance to control the spread of fire within and between buildings it is obvious that the other factors must also considered as well as their fire endurance capability. O'Brien and Redding (1984).

3.3.2 FIRE- RESISTING DOORS AND DOOR ASSEMBLIES

Fire resisting doors are generally required to be self-closing. This means that they must be fitted with an automatic self-closing device. It must be borne in mind that 'self-closing' permits the door to be held open and to close when a threat to the protected space is imminent. This is achieved by closing mechanism being activated by any or one of a number of occurrences, e.g.

1) Operation of a smoke detector dedicated to the purpose
2) Manual operation
3) Failure in power supply
4) Operation of the alarm system

When choosing the self-closing mechanism, consideration should be given to the force required to be exerted to open a door against the self-closing device, particularly in buildings such as schools.

Fire-resisting doors must be considered as a complete assembly, i.e. the nature and quality of the doorframe are important factors, which influence the fire performance of the door assembly.

The factors, which affect the fire performance of doors, are:

1) Hinges: hinges with a higher thermal diffusivity will, after a period of heating, conduct heat rapidly throughout the duration of the fire.

2) Intumescents: if intumescent strips are fitted during the test procedure, then in practice it should be fitted to the door edge or frame. The purpose of the intumescent is to prevent the passage of flame and hot gases past the door edges and possibly cause ignition on the side of the door not exposed to fire. When heated, the Intumescent material expands providing a complete seal between the door and the frame. O'Brien and Redding, (1984).

3.3.3 NON-COMBUSTIBILITY EQUIREMENTS FOR STAIRWAYS

Stairways are not generally required to be fire resisting, simply because they are not considered as elements of structure. The construction enclosing stairways may be considered as a protected structure and consequently be fire resisting but the stairway thus enclosed is not required to be fire resisting. Stairways are, however, with a few exceptions, required to be non-combustible. It must be understood that the non-combustibility of a component is no indication of the fire-resisting capability of that component. For example a light metalwork stairway would be non-combustible, but in conventional terms would have little fire resistance. Conversely a component may be combustible and yet be fire resisting, e.g. timber beams or columns. Timber being a sacrificial material in a fire situation can be consumed and yet the component can be fire resisting in terms of stability, integrity and insulation for considerable periods of time. It is perhaps surprising that stairways, which in themselves form essential components of escape routes, should not be required to be fire resisting. Stairways, however, must be considered within the totality of building regulations, which in effect, require a high degree of protection to be afforded to stairways. Appleton, (1980)

3.3.4 PROVISION OF CAVITY BARRIERS AND FIRE STOPPING

Cavities in this context include roof spaces, underfloor spaces, ceiling voids and cavities contained within structural and constructional components.

Obviously a fire starting or perhaps finding its way into such a void could travel undetected for quite some time, thus increasing the risk to the building's occupants. Building regulations attempt to when area or linear dimensions of cavities exceed specified limits.

Cavity barriers may be flexible or rigid and may be required to be fire resisting.

Fire stopping is concerned with ensuring that the fire-resisting capability of a component is not diminished when penetrated, e.g. by pipe or when two components abut. Appleton, (1980).

3.3.5 CONTROL OF FLAME SPREAD ON WALLS AND CEILINGS

Building regulations are of course concerned with the design and construction of buildings and attempt to control fire spread within buildings by prescribing requirements for those surfaces of constructional components most likely to be involved in a fire at a very early stage, e.g. surfaces of walls and ceilings. These exposed surfaces, if combustible, provide large continuous areas over which flame can spread rapidly. Moulens and Beaufort, (1984).

3.3.6 CONSTRAINTS ON THE USE OF PLASTICS ON CEILINGS

The dynamic nature of building design ensures the continuous introduction of new materials and methods of construction. Plastics materials are used for an increasingly wide variety of applications and in many cases act as substitutes for traditional materials such as timber.

The methods of evaluating the fire properties of traditional materials may not be suitable for evaluating the behaviour of plastics materials in a fire situation. Building regulations permit the use of plastics materials used as ceilings provided that prescribed conditions are met, e.g.

I. Specific melting point is not exceeded
II. Burning does not exceed that specified
III. The degree of flammability specified is not exceeded

The potential spread of fire over the surface of plastics is controlled by;

a) Plastics material forming the ceilings
b) Limiting the thickness of the material
c) Ensuring that they any surface within the void exposed above the material meet the requirements prescribed for surface spread of flame characteristics for walls and ceilings
d) Prescribing a sufficiently low melting point for the Limiting permissible area of plastics panels. (Moulens and Beaufort, 1984)

3.4 FIRE DETECTORS

The role of fire detector is not solely to detect fire but to discriminate reliably between the absence and the presence of a fire. If a detector is too sensitive it may give a false alarm for a non- fire condition while a less sensitive device will not raise the alarm quickly enough to prevent possible human material loss. Thus from a practical viewpoint the sensitivity of a detector must be optimised so that it will give an alarm for a reasonably large and potentially dangerous fire. It would seem that if a minimum allowable sensitivity is required then this sensitivity would depend on not only on the detector itself and its mounting situation but also on the rate of growth and spread of the fire. The detection of fire can be classified into three distinct categories:

- Heat detectors (point and line types)
- Smoke detectors
- Flame detectors. Moulens and Beaufort, (1984)

3.4.1 HEAT DETECTORS

There are two main types of detector:

- Fixed temperature
- Rate of rise of temperature.

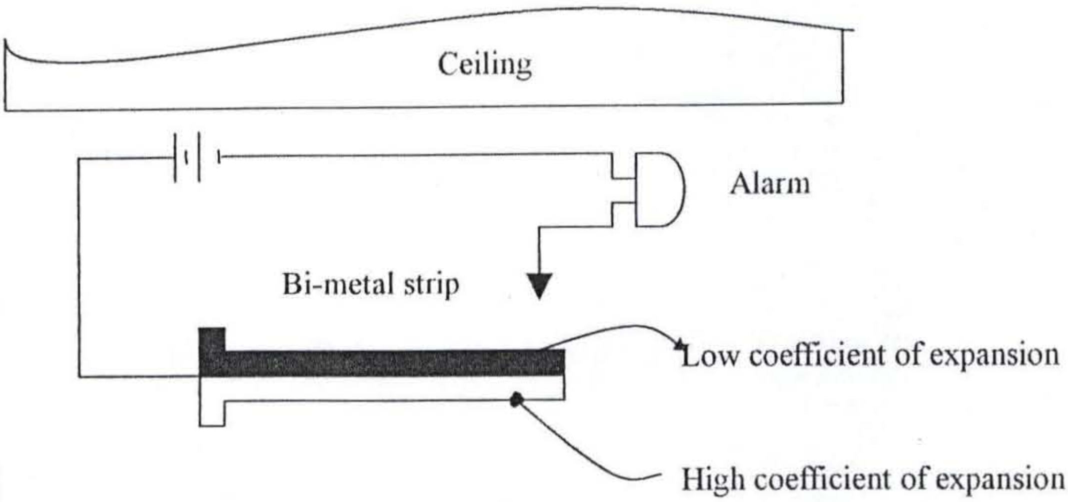
Fixed temperature

In this case the action of the detector relies on a temperature-dependent physical property as illustrated with a bimetallic strip and the air pressure type in the figure below. A sprinkler also falls into this category. A sprinkler has two functions to perform in that it has

a) To detect the fire and

b) To provide extinction.

Each function is performed separately although early detection makes fire extinction easier. The sprinkler is considered to react to heat produced by the fire by mainly convective heat transfer and to a lesser extent radiation.



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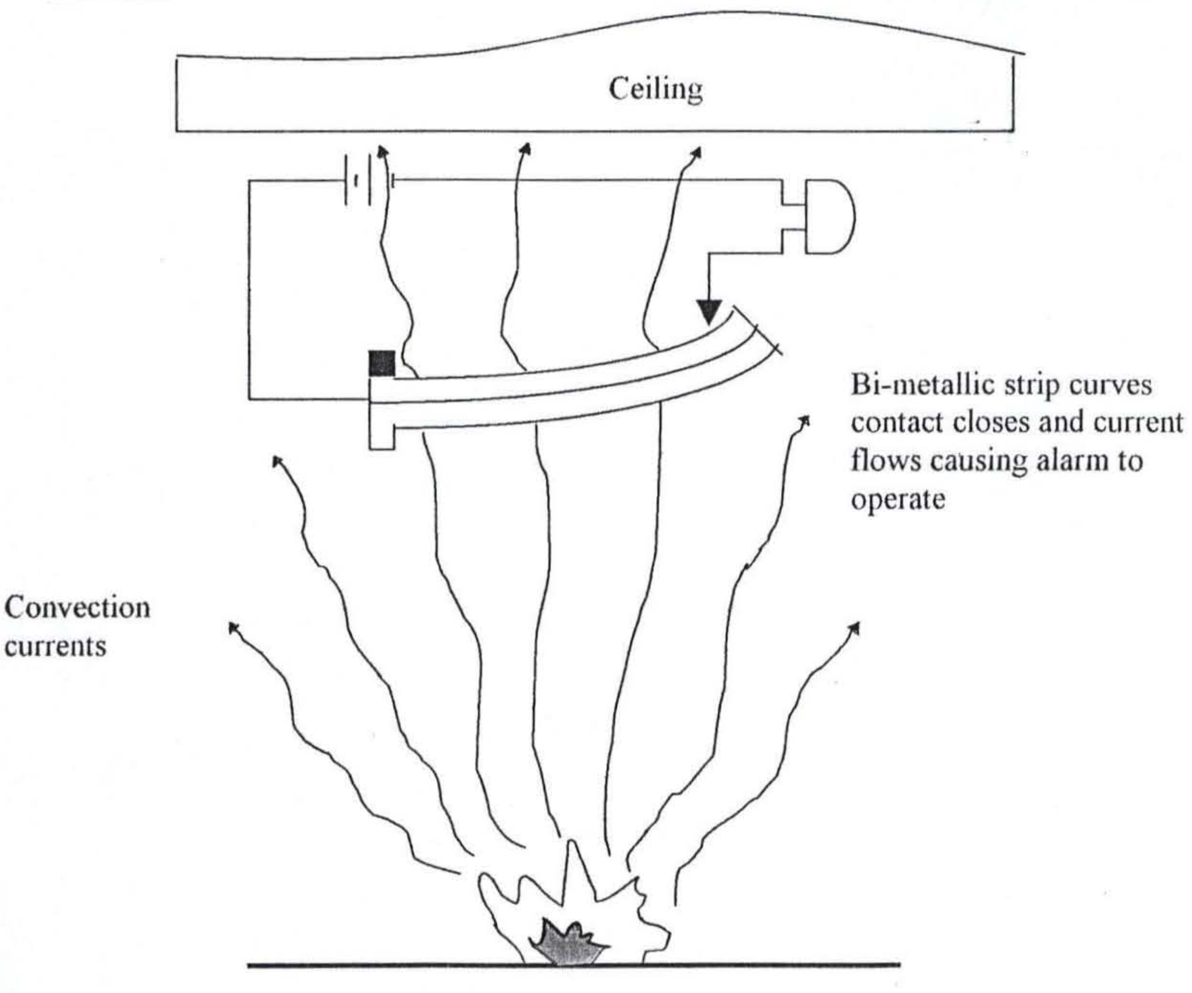


AFTER

FIG. 3.2: Bimetallic strip heat detector

Rate of rise of temperature

This type of detector responds when the rate of rise of temperature of the air and hot gases that flow past it exceeds a minimum rate. This response can be obtained by employing two opposing elements in the detector, which respond at a different rate to this gas flow rate. A suitable mechanism is the expansions of two elements of different thermal capacities say A of high capacity and B of low thermal capacity. The low –thermal –capacity element B will heat up much faster than A and eventually catch it up causing the circuit to be made. However, if the rate of rise of temperature is low enough, the output from the two elements cancel each other. Moulens and Beufort, (1984)

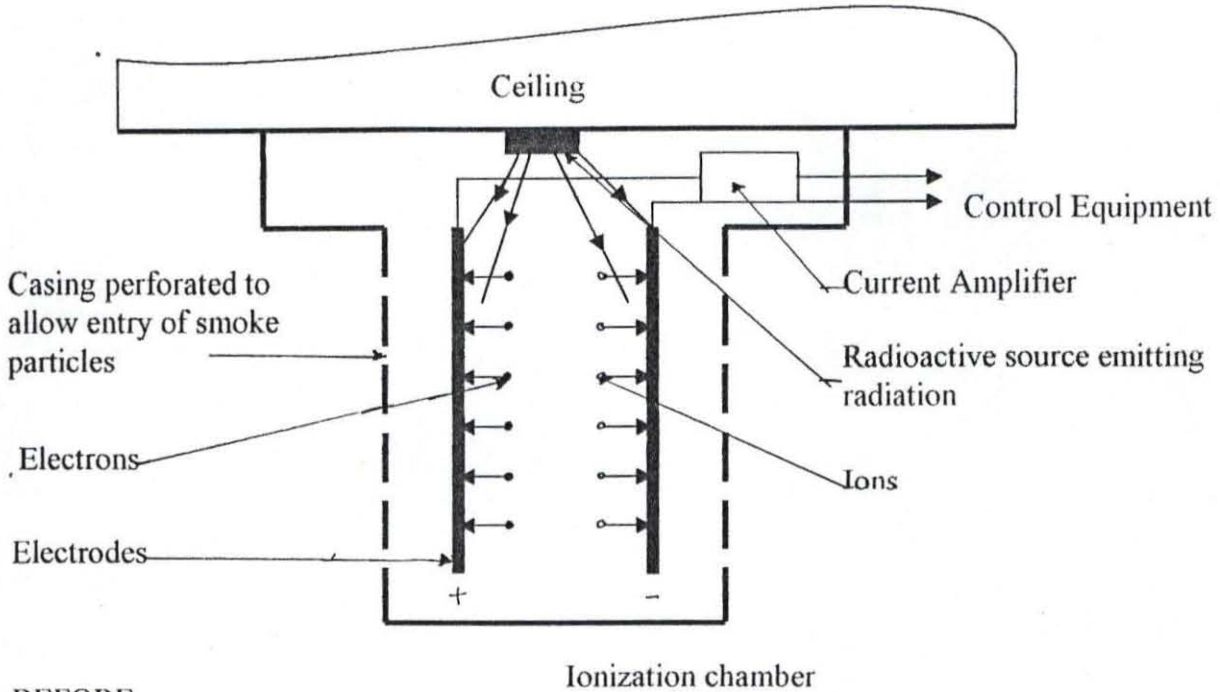
3.4.2 SMOKE DETECTORS

This type of detector must be capable of responding to smoke from smouldering and flaming combustion since the smoke from these fires is significantly different in structure and composition. Smoke from a smouldering fire tends to have much bigger particles of combustion products compared to smoke from a flaming fire where the particles are of much smaller dimensions. Thus a sensitive detector must be able to respond adequately to each type of smoke

The various types of smoke detectors are:

I. Ionisation detector

II. Optical detectors (Moulens, 1984)



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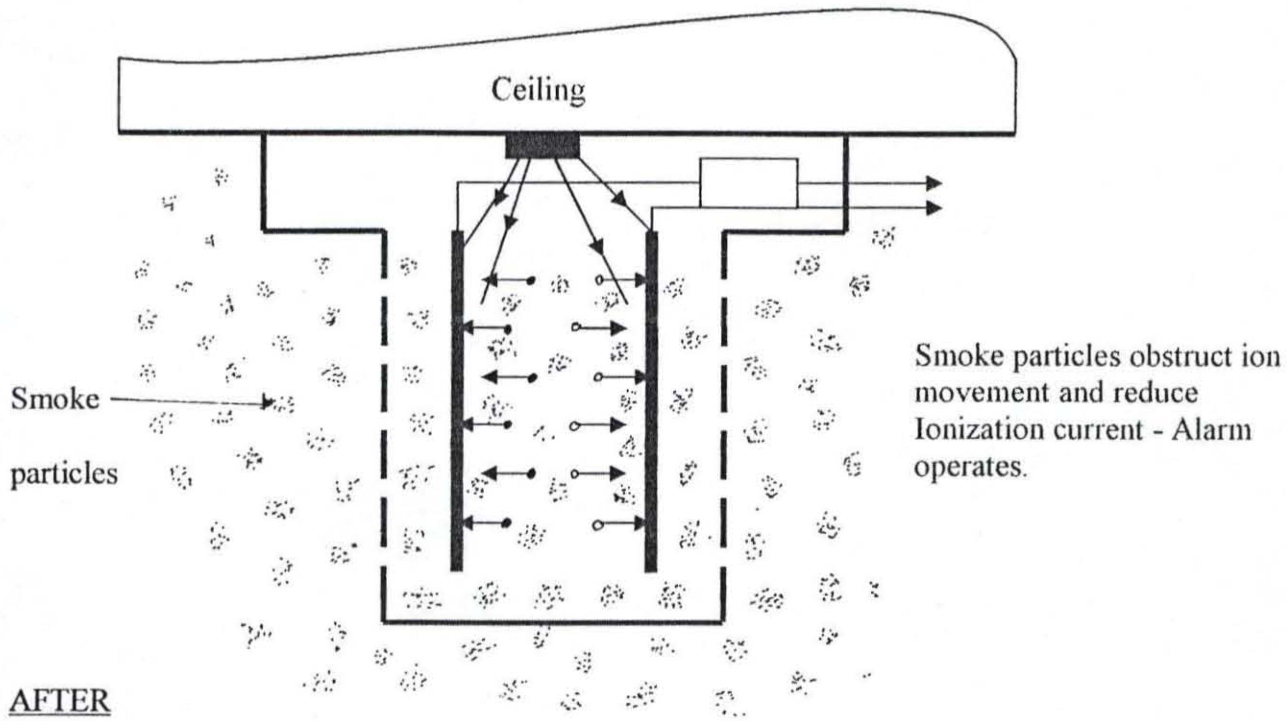


AFTER

FIG. 3.3: Ionisation chamber smoke detector

3.4.3 FLAME DETECTORS

These detectors depend on the recognition produced the burning zone

Infra- red detector

Every fire is capable of producing radiation in the infra- red region of the electromagnetic spectrum.

For typical flame combustion there is characteristics flame flicker, which is a regular changing of the flame intensity, which on detection gives rise to the production of cyclic pulses. If a circuit is used that has been rendered sensitive to this flicker compared to the steady current induced by a fixed intensity of radiation, it gives an alarm signal when the flicker is received. This detector must be able to see the fire and is very useful where large areas are to be protected using several fixed heads or one or two rotating detector heads. This detector has a rapid response since it does not have to rely on smoke or heat from the fire. It can also be used in the open air, unlike the smoke detectors that needs a ceiling to function effectively.

Ultra- violet detector

Since most of the ultra- violet radiation from the sun has been absorbed by the ozone in the earth's upper atmosphere, any ultra-violet radiation produced by flaming combustion will be detected by a photocell sensitive to this region of electromagnetic spectrum. Since there are few sources of ultra-violet radiation wavelength range there is no need to discriminate by flame flicker. However, false alarms may be caused by welding or similar activities that produce ultra-violet radiation. Moulens and Beaufort, (1984)

3.5 EXTINCTION OF FIRE

The early detection and successful extinguishments of a combustion process is highly desirable. There are many practical ways by which this can be achieved, all really centred on the reduction of the flame temperature. When this happen the rate of the exothermic chemical process is reduced.

From the knowledge of the elementary 'fire triangle', the rate of burning may be reduced by;

I. Reducing the oxygen
II. Reducing the temperature
III. Increasing the activation energy

The reduction of the flame temperature can be achieved by one or more of the following methods:

1. Adding dilutents to the flame [to the combustion zone]
2. Flame quenching
3. Cooling
4. Separating fuel from O2 by a smothering process.

Activation energy can be increased by the use of inhibitors. Shields and Silcock, (1987)

3.5.1 TYPES OF EXTINGUISHING MECHANISMS

- Water

When water is sprayed onto the flame of a burning material the water evaporates and so extracts heat from combustion zones. If as a result of this, the flame temperature falls below the lowest allowable adiabatic flame temperature the combustion will terminate. The amount or the rate of water needed to achieve this can be estimated using the 'fire point' theory as shown in the figure below.

A sprinkler is usually capable of delivering a rate of $80gm^{2}$ to a fire below its head and this flow rate should be sufficient to cope with most fire situations.

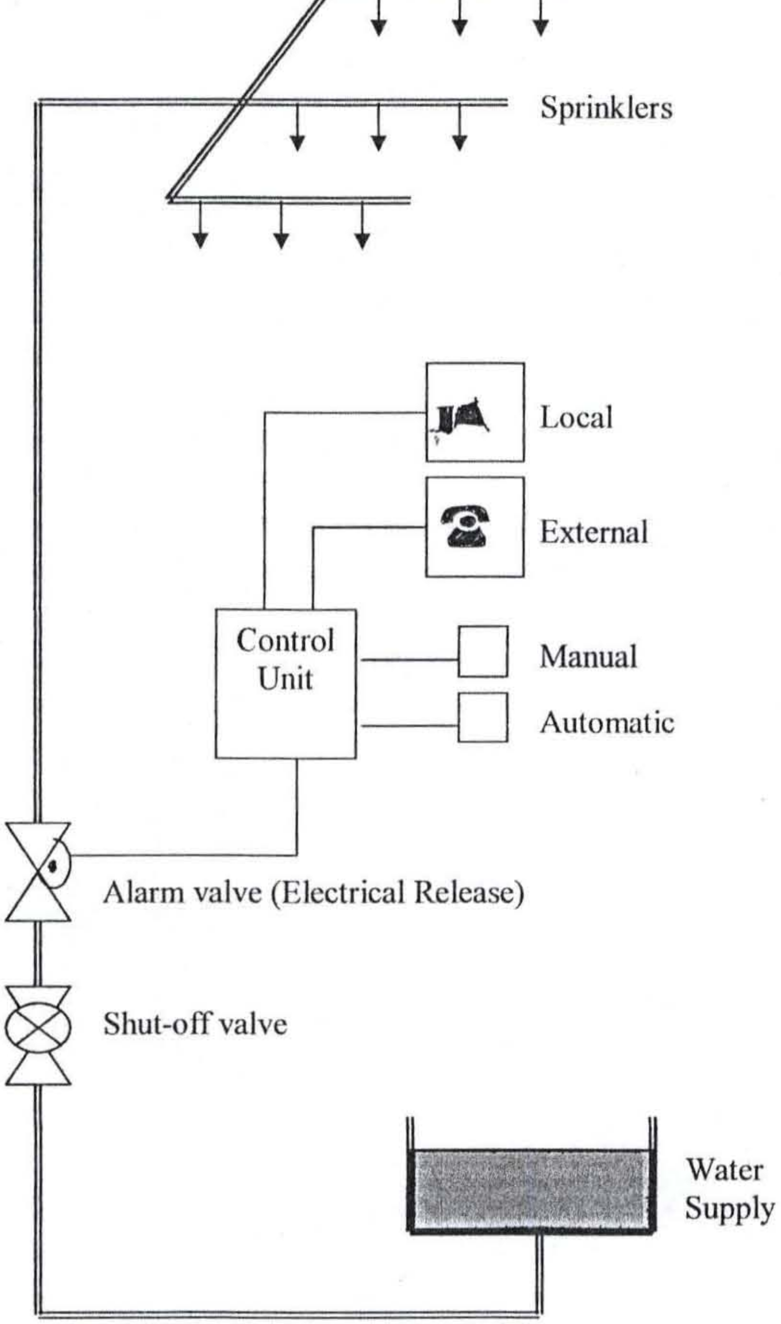


FIG. 3.4: Deluge system.

- **CO_2 [carbon dioxide]**

This process extinguishes a fire by reducing the oxygen content available so that combustion cannot be supported. For example a 30-50 percent concentration of CO_2 can lower the oxygen content to below 10-11 per cent so that usually combustible materials cannot burn. The CO_2 gas is non-conductive and so can be used on electrical fires. CO_2 gas in small doses is non-toxic and non-corrosive typical CO_2 installation is shown in figure below.

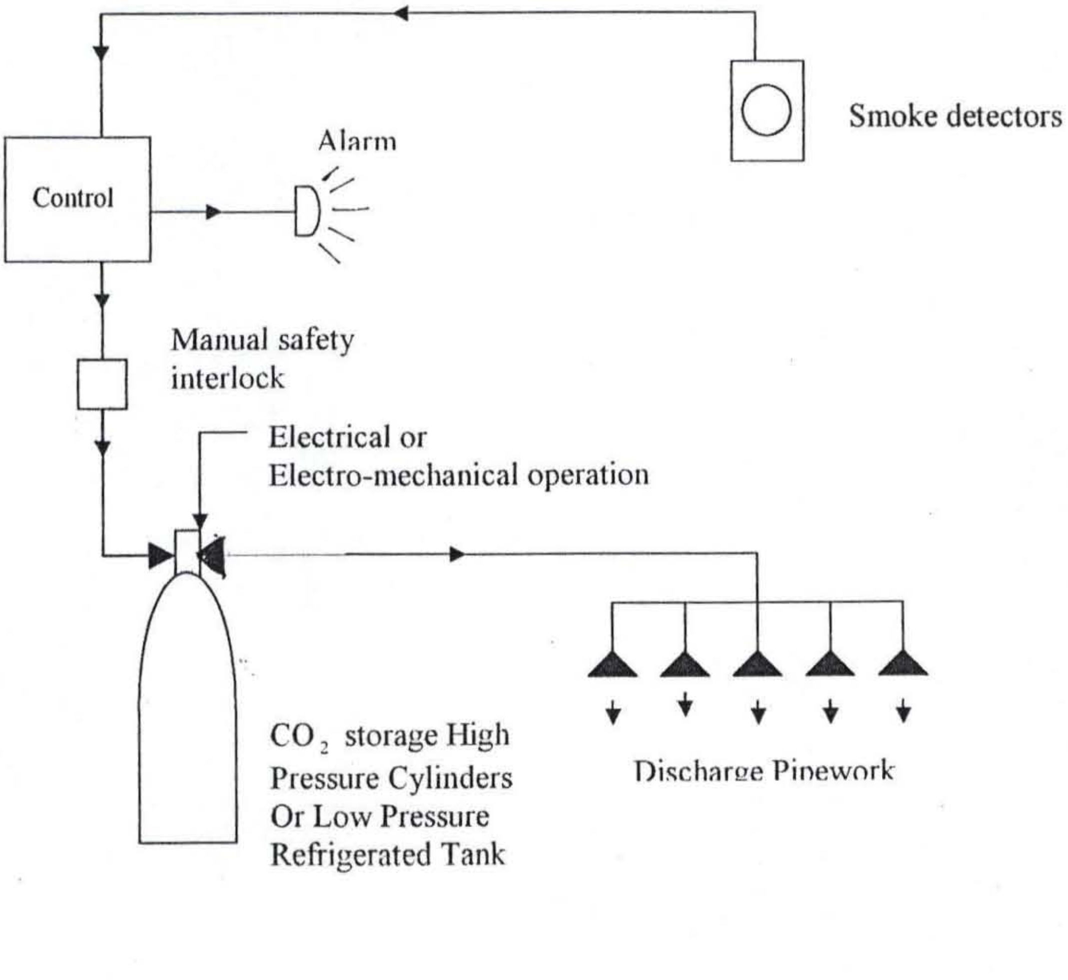


FIG. 3.5: Layout of a CO_2 sprinkler system.

- **Foam**

Here the foam moves or floats above a burning fuel or solid surface, isolating or smothering the pyrolised vapour from the oxygen that is necessary for the combustion process. Provided the foam has an adequate resistance to degradation it will act effectively as an extinction agent. Foam is particularly useful in fires involving oil since if water used as an extinguisher it would sink or possibly create steam or volatile vapour droplets which could be projected from the burning zone to help spread the fire.

- **Powder**

The exact reason why powder can extinguish a combustion process is not known. As a result of recent research it would appear that the phenomenon of flame extinction is controlled by a gaseous reaction of the alkali metal powders and not, as previously thought, by the surface reaction process.

Another feature of the powder is that it can also act as a dilutent to remove some of the thermal energy from the combustion-reaction zone. If the optimum rate of powder is applied to the fire, the fire may be extinguished with the least amount of powder. Powder-type extinguishments are very effective in liquid pool fires. The volume of powder needed to fight a fire depends on the dimensions of the fuel bed, etc, so these devices from a small hand-held device to a mobile tender carrying 2 tones of powder suitable for typical airport fuel-spillage fires. Shields and Silcock, (1987)

3.6 MEANS OF ESCAPE

The objective, which demands the provision of a means of escape is that, the occupants should be able to reach a place of safety, unharmed, in the event of a fire occurring. A place of safety is normally associated with an area outside the building away from the threatened space. However, a place of safety may also be:

1. A protected corridor
2. A protected staircase
3. A place of refuge within the building

Places of refuge are necessary a very tall buildings because the evacuation of these buildings make two hours or more. Refuge floors my be provided every six to eight floors up the building, depending on the nature of the occupancy and the current practice in an emergency, so that occupants of the fire floor, floor below the fire floor and the floor above the fire can be evacuated to a place of safety. Thus, some persons will move downwards towards lower levels whilst the occupants above the fire floor will move upwards away from the fire. The occupants of the other floors immediately threatened would be alerted and evacuation would proceed as determined by particular circumstances. Hom and Carter, (1981)

3.6.1 PROVISION OF ESCAPE ROUTES

In every building there should be available from each story a sufficient number of escape routes so as to ensure the safety of the occupants in the event of fire. It is possible using various modelling techniques to assess number of escape routes available to the occupants of a building throughout the fire development sequence. However, it should be noted that in the development of interspatial relationships within the building, the circulation of people with minimum disruption or interference to the various activities pursued in the building is essential, and consequently the planning of effective means of escape should naturally follow the flow patterns already established. In other words, natural pathways are routes developed in the design and secured by passive and active fire protection, which permit the occupants to proceed to a place of safety. (Hom and Carter, 1981)

3.6.2 COMPONENTS OF ESCAPE ROUTE DESIGN

There are at least seventeen major components in escape route design. These are:

1. Building type
2. Building contents
3. Building occupancy
4. Evacuation time
5. Travel distance
6. Exits
7. Escape route width
8. Enclosure of stairways
9. Lobby approach stairways
10. Doors in escape routes
11. Lighting of escape routes
12. Emergency lighting
13. Construction of egress from windows
14. Fire detection system
15. Alarm system
16. Fire-control systems
17. Smoke-control systems

1. BUILDING TYPE

Building regulations categorize building by notional purpose grouping, which on inspection may be broadly rationalized under the following headings:

a) Residential and institutional buildings

b) Commercial and industrial buildings

c) Assembly buildings

2. BUILDING CONTENTS

The inclusion and subsequent use of purpose grouping in building regulations assumes that each building within a particular purpose group will experience the same fire exposure and consequently that the contents of buildings within the same purpose group are essentially the same.

3. BUILDING OCCUPANCY

The population of a building will be a major consideration in the design of means of escape and will be considered under the following headings:

i. Population density
ii. Population distribution]
iii. Population mobility
iv. Population reaction
v. Population discipline

Population density

In order to calculate the number of staircases it is necessary to know the number of persons likely to be in the building per storey time or compartment. Generally speaking, load-factor data have been derived through experience and follows naturally from good designs, i.e. the number of persons capable of using the building comfortably, relative to the process, activity or function.

Population density may be expressed in different ways:

a) Simply stated as the number of persons the compartment, storey or room is designed to hold, or

b) In the case of flats or maisonettes is designed, or

c) In prescribed cases the number obtained by dividing the area in m^2 of the compartment, storey or room by the occupant load factor specified.

Table 3.1 A range of occupancy load factors

Storey/room type	Occupancy + load factor
Grandstands (without fixed seating)	0.3-0.5
Shopping mall, dance hall, bar, dining room, coffee lounge	0.3-1.1
Offices (depending on floor area)	5-9
Shops	1.8 – 5
Art gallery, museum, library	

Population distribution

It is important to know how the building population is distributed so as to avoid bottlenecks when designing means of escape. Similarly, e.g. in a hotel, parts of the building will be open to the public, these include function rooms and bars, while at the same time parts of the building will be closed to the public; these include sleeping accommodation for residents. Buildings in which people sleep, particularly dwellings, pose the greatest risk. On average 800 people per year die in fire in dwellings as opposed to 200 people per year in other buildings.

Population mobility

The occupants of a building may be very young, old, infirm, disabled, hospitalised or handicapped. If so, careful consideration must be given to designing the means of escape. Experience has shown that old people, for example, will be very reluctant to leave what they consider the safety of their own room and face the perils of an external fire escape in darkness.

It is also inconsistent to expect a physically disabled person to make his way to his workplace normally by means of a lift, and then when danger threatens require him to descend six or seven storeys via a staircase. So it may well be that although in most circumstances the use of lifts as a means of escape is discouraged, situations may arise, e.g. employment of disabled persons, where the use of specially designed and protected lifts may well prove a necessity.

The terms disabled and handicapped must not be confused, as the term handicapped is used here in most general sense, e.g. a young mother proceeding along an enclosed shopping mall with an infant in a pram and a three-year-old child by the hand may reasonably be considered handicapped.

Population reaction

This factor will depend very much on the type of building occupation. In situations where the occupants are familiar with the building layout then orderly evacuation is a possibility, no more than that. However, in buildings to which the public have access and may be described as transient, then the popular account of human reaction to fire is that of panic and it is in this situation that the greatest danger arises. "CANTER," suggests that the notion of panic is unhelpful and perhaps meaningless. The role-playing capability of persons and an appreciation of its significance in an emergency situation is another factor to be considered. This is particularly important for persons employed in or occupying key positions, e.g. in a communication system. Again in hotels where most of the residents are on what can only be described as a short-stay basis, there is little chance of becoming familiar with the building layout and particularly the means of escape. In this situation, if a fire should occur the residents will tend to attempt to leave the building by the way they entered it or are most familiar with, albeit that they may, in fact, be moving towards the fire.

Population discipline

As with population reaction, it is impossible to achieve this with a transient population and great reliance is placed on staff. Consequently, staff efficiency in an emergency is paramount importance and can only be achieved by means of a thorough understanding of the risk involved and training in how to deal with emergency situations. In the Beverley Hills Super Club fire, waitresses escorted people out of the building through smoke.

However, with the best will in the world, training can be negated by simple oversight. If for example, reception of the switchboard is to be used to channel all communications, external and internal, should a fire occur, then such an important position must be manned by trained personnel. This means even when the 'usual' person is at lunch, having coffee, on leave, or absent through illness. Only through training can any measure of population discipline be predictable.

It is also essential to the preservation of a means of escape that the indiscriminate use of decorative panels and plastics be controlled so that the fire resistance of the primary construction (elements structure) is complimented by the proper choice of materials for secondary construction (linings, etc.). In simple terms it would be completely nonsensical to require elements of structure to be fire resisting and sometimes non-combustible while allowing the indiscriminate use of combustible wall linings. Too often the efforts of the architect can be negated by the management of buildings in use, making decisions based on expediency of convenience.

4. EVACUATION TIME

This is the time taken for a person to go from any occupied part of the building to a place of safety. Generally speaking, evacuation time of 2-3 minutes is used in the design of the means of escape from buildings, depending on the type of construction. Obviously this time will vary quite considerably according to a person's speed of travel, e.g. very young or old people will not be able to move as quickly as the average able-bodied person.

As previously stated, a time of 2-3 minutes may be used in design even though the fire-resisting requirement of elements of structure is one hour. Consequently it must become obvious that there is no direct relationship between the two times. In fact, the 2-3 minutes evacuation criterion is derived from studies, which conclude that such a time is reasonable for people to be in a stressful situation before "panic" develops. Thus it is infinitely desirable to evacuate people before such a state of irrational behaviour occurs. Recent works has shown that in many cases people behave rationally in a crisis situation and that panic is often confused with flight behaviour.

In many buildings, such times as 2-3 minutes will not be possible to achieve and each situation must be evaluated individually. Studies in Canada have shown that times of 2½ hours were required to evacuate a multi-storey building. These special circumstances may require places of safety to be provided within the building.

5. EXITS

Entrances, exits and circulation areas are provided in all buildings for normal use, and means of escape considerations should utilize existing arrangements wherever possible. Consequently the primary the primary consideration should be with regard to the sufficiency of existing exits in terms of:

i. Disposition,

ii. Width, and

iii. Number,

And only if existing exits are inadequate in some respect should further design be considered.

Disposition

The position of exits as means of escape in case of fire is absolutely critical. In this respect the '45^0 rule' is introduced. If the angle made by lines joining the exits to any point on the floor of the storey under consideration is less than 45^0 then the disposition of the exits may be considered inadequate. Special situations arise where only one staircase may be provided and careful consideration must be given to plan layout and methods of securing effective means of escape.

Width

It is essential when designing means of escape that bottlenecks, i.e. areas where congestion will occur, be avoided. Thus corridors should not become narrower as they approach a storey exit or staircase.

In most cases the width of exits is not critical in that the number of exits provided for normal use is usually adequate to cope with the number of persons involved.

Building codes have specified a 'unit of exit width' of 533mm. i.e. based on the assumption that 40 persons per minute in a single file will discharge through an exit 533mm wide, or expressed as 100 persons in single file in 2½ minutes, which relates to evacuation times previously discussed. However, a width of 533mm is not acceptable in practice. Indeed, it is positively dangerous, and the maximum width of 765mm is taken to provide a discharge rate of 40 persons per minute (765mm equates to the standard internal single leaf door width).

6. ESCAPE ROUTE WIDTH

Widths of escape routes, e.g. corridors and staircases, should be sufficient to accommodate discharge rates as indicated above. But also, particularly in the case staircase, widths must be sufficient to accommodate these discharge flow rates when the use of one staircase is discounted. This measure provides an additional factor of safety and presupposes that in every conceivable fire scenario only one staircase is usable.

Table 3.2: Guidance on escape route widths.

Building type	Situation	Minimum width of escape route
Institutional	Wheelchair evacuation	1.000m
	Mattress evacuation	1.225m
	Stairway landing	3.000m
Any other building type	Auditoria, theatres, assembly rooms with closely related seated audience	1.225m

Seatways		
Gangway on One side Max. No. of Seats	Gangway on two sides Max. No. of	
7	14	0.300m
8	16	
9	18	
10	20	0.575m
14	27	
Continental seating		0.500m

7. ENCLOSURE OF STAIRWAYS

Stairway should be constructed as protected shafts, i.e. enclosed by a protected structure which meets the requirements of building regulations regarding non-combustibility, fire resistance and surface spread of flame characteristics. Generally speaking no other part of the building should be accommodated within the stairway enclosure except, for example, sanitary accommodation where the possibility of fire occurring is extremely remote.

It is always desirable that a stairway enclosure is in part formed by an external wall. This facilitates ventilation and smoke control and access from outside by fire fighters. If, however, the stairway enclosure projects beyond the external wall of the building and is connected thereto, then either:

a. . The external wall or walls of any part of the building less than say 3m from the stairway enclosure, or

b. The external wall or walls of any part of the stairway enclosure within any 3m from the building;

should be imperforate and not less than a half-hour fire resistance. The greatest personal hazard in a fire situation is that of asphyxiation due to smoke and toxic fumes. Consequently it is essential that escape routes, especially stairways, are provided with adequate means of ventilation. Where external walls enclose part of the stairway that may be achieved by providing openable or permanent vents of say $0.5m^2$. If external walls are not available, vents must be provided at each storey level ducted to the external air in fire-resisting vertical ducts. With smoke outlets from stairways below ground level, care must be taken to ensure that they discharge to the external air and are sufficiently far away from any part of the escape route from the building

8. LOBBY APPROACH STAIRWAYS

Additional protection to stairway can be achieved by providing a lobby or ventilated lobby approach. Generally speaking, buildings over 100m in height require a lobby at every storey level. Special situations such as basements or areas of special fire risk may require a lobby at each storey. In many other cases, depending on the height and type or class of building, protection to the stairway by means of a self-closing fire-resisting door may be sufficient.

9. DOORS IN ESCAPE ROUTES

9. DOORS IN ESCAPE ROUTES

The term 'self-closing fire-resisting door' is self-explanatory. Yet it is necessary to re-emphasise the significance of the words used. Self-closing does not presuppose the door being opened and then closed. The door may be held open, closing automatically in predetermined circumstances. An electromagnetic or electromechanical device activated by suitable smoke sensors may be suitable for holding open a door provided that the door will close automatically if any of the following occur:

a) Detection of smoke sufficient to activate the closing mechanism

b) Failure of the electricity supply to the device

c) Operation of the fire alarm system

d) Operation of manual override switches on the door.

The basic principle is to ensure that in a fire situation the door closes to prevent fire spread and smoke logging of escape route

The performance of fire-resisting doors may be diminished considerably because of any of the following factors:

a) Small variation in door size

b) Use of hinges of incorrect mass

c) Use of hinges which extend to the outside face of the door

d) Locks and latches of incorrect thickness and thermal capacity

e) Bad workmanship in fitting

f) Indiscriminate use of intumescents relative to (e) above

g) Incorrect use and fitting of floor spring and other self-closing mechanisms

h) Inclusion of additional door furniture, e.g. letter plates not included in the doorset tested

i) Changed specification in the doorset facings.

Doors across escape routes generally should, and in prescribe cases of high occupant density must, open in the direction of discharge (escape), or swing in both directions and in the latter case be fitted with a small vision panel so as to avoid injury to persons who may be in the opening arc of the door.

10. LIGHTING OF ESCAPE ROUTES

It is generally expected that adequate artificial lighting be supplied to all parts of modern buildings. Where artificial lighting is supplied to circulation spaces designated as escape routes, it is necessary that protected circuitry be used and where a stairway forms part of the escape route the protected circuitry associated with the stairway should be separate from any circuitry which supplies lighting to any part of the same escape route.

Essentially the foregoing applies to a non-maintained system, i.e. a system where the failure of the mains supply must occur before the emergency mode is activated.

The advantage of using a maintained lighting system is that, should the main supply fail, back-up safety lighting is immediately available. Also normal routine maintenance checks will identify lamps, which require replacement.

11. EMERGENCY LIGHTING

The primary function of an emergency lighting system is to provide illumination in all part of a building to enable the occupants to move round the building or to allow prescribed functions to be carried within the building without interruption. Building regulations prescribe building types in which adequate emergency lighting must be provided to come into automatically during any interruption of the normal lighting system and the table below gives example of situations where emergency lighting in escape routes would be normally provided.

Emergency lighting should:

1. Indicate clearly the available escape routes
2. Provide sufficient illumination along escape routes to allow safe movement towards and through the exits provided
3. Be sufficient to ensure that fire alarm call points and fire fighting equipment along escape routes can be readily located.

Other factors may influence the overall effectiveness of an emergency system e.g. the geometry of the escape route and associated spaces, the colour and the distribution of lighting and the choice of finishing. The emergency lighting power source must also have a suitable capacity for its particular function, and be independent from that of the normal lighting. The capacity or period of operation of the emergency lighting system when activated can range from half an hour to four hours depending on the particular situation.

Independent power supplies can be obtained in a number of ways:

a) In-house generators
b) Batteries
c) Mains power from a separate grid.

Table 3.3: Emergency lighting

Building type	**Description of parts of a building requiring emergency lighting**
Institutional	All circulation spaces, rooms having an occupant capacity of more than 60

Other residential	All circulation spaces, rooms having an occupant capacity of more than 60
Office	1. All circulation spaces without natural lighting and; 2. In a building having a floor at a height of 18m or more above the ground level ❖ All circulation spaces at every level, and; ❖ Any canteen or assembly room having an occupant capacity of more than 60
Shop	All sales areas and circulation spaces Canteens and restaurants having an occupant capacity of more than 60
Factory	All circulation spaces
Assembly	All public areas and circulation spaces
Storage and general	All circulation spaces
All purpose groups	Any basement having an occupant capacity of more than 10

12. CONSTRUCTION OF AND EGRESS FROM WINDOWS

Over the past few years many subtle changes have occurred in the design of window assemblies. These changes have made the construction of and egress through windows an important component of escape route design. Factors such as those listed below can make windows unusable as a means of escape in an emergency:

a) Top hung opening lights

b) Increasing use of 4mm and 6mm float glass

c) Increasing use of safety glazing

d) Double glazing and triple glazing

e) Use of polycarbonate glazing

The tops hung opening lights, are of such dimensions and so inaccessible as to make it impossible to use them as a means of escape. Items (b) and (e) above makes it extremely difficult, in some cases impossible, to break through the glazing material. It is important to be aware of other safety criteria when providing and positioning side-hung windows. It should be done in such a way that during normal usage accidents resulting from opening the window outwards are avoided. The top window component in the provision of means of escape is only important up to about five storeys; beyond this height greater attention should be paid to the other components of escape route design.

13. FIRE- DETECTION SYSTEMS

One method of enhancing escape potential and reducing the fire casualty statistics will be the introduction of fire-detection systems, as a component of escape route design, linked to a warning system which would alert the occupants to the presence of life-threatening stimuli.

14. ALARM SYSTEMS

The primary function of any alarm system is to alert the occupants of a building to the presence of life-threatening agents. Consequently the alarm system must be tailored to and communicate with the building population.

People receive information continuously by hearing, seeing. Touching, smelling and tasting, and the choice of a particular mode of alarm system, based on one or a combination of the above, will depend largely upon the type of building population and the nature of the information transmitted.

An aural alarm system is obviously of little use in a building occupied by deaf people; similarly a visual alarm system is no help to the blind and may do little more than confuse those who are colour blind. Also the nature of the preferred alarm system may vary within a building, e.g. in a large hospital, where sounders may be acceptable in some areas but may be completely unacceptable in intensive-care units.

The development of a satisfactory alarm system must take into account the following factors in order to be effective:

1. The population matrix:
    a) Population type
    b) Population perception
    c) Population decision-making ability
2. The population discipline:
    a) Population action
    b) Population reaction
3. The people management systems, e.g.
    a) Prisons
    b) Hospitals

4. The nature of the information to be communicated:
    a) Warning and action required
    b) Alert, no action required
5. The method of communication:
    a) The message must be
        i. Clear
        ii. Unambiguous
        iii. Not liable to misinterpretation.

15. FIRE-CONTROL SYSTEMS

Fire control systems may be active, passive, or a combination of both.

Passive fire-control systems rely on the fire-endurance characteristics of structural and constructional components such as enclosing walls, partitions, doors and lobbies.

Active fire control, however, is a dynamic system comprising four elements:

a) Detection
b) Warning
c) Calling fire brigade
d) Direct attack.

16. SMOKE-CONTROL SYSTEMS

The escape route is designated a place if safety. Consequently if it is to remain usable in an emergency, the escape route must be protected from fire and the products of combustion. Passive fire protection in the form of fire-resisting constructional components was discussed earlier, but passive fire protection will not prevent the

CHAPTER FOUR

4.0 CASE STUDIES

4.1 CASE STUDY ONE: FCT COUNCIL FOR ARTS AND CULTURE

4.1.1 LOCATION: AREA 10, GARKI, SHOPPING CENTRE JUNCTION, ABUJA

4.1.2 BACKGROUND

The centre is bounded to the west by festival road and post office to the east, Agura hotel to the south and Area 10 shopping centre to the north. The cultural centre is two-storey comprising of four blocks A, B, C and D.

BLOCK A

This is the commercial wing of the complex. It houses a restaurant and a snack bar on the ground floor. The first floor and the second floor houses a restaurant, and lettable offices

BLOCK B

It has a basement, main auditorium cinema hall, and theatre management offices

BLOCK C

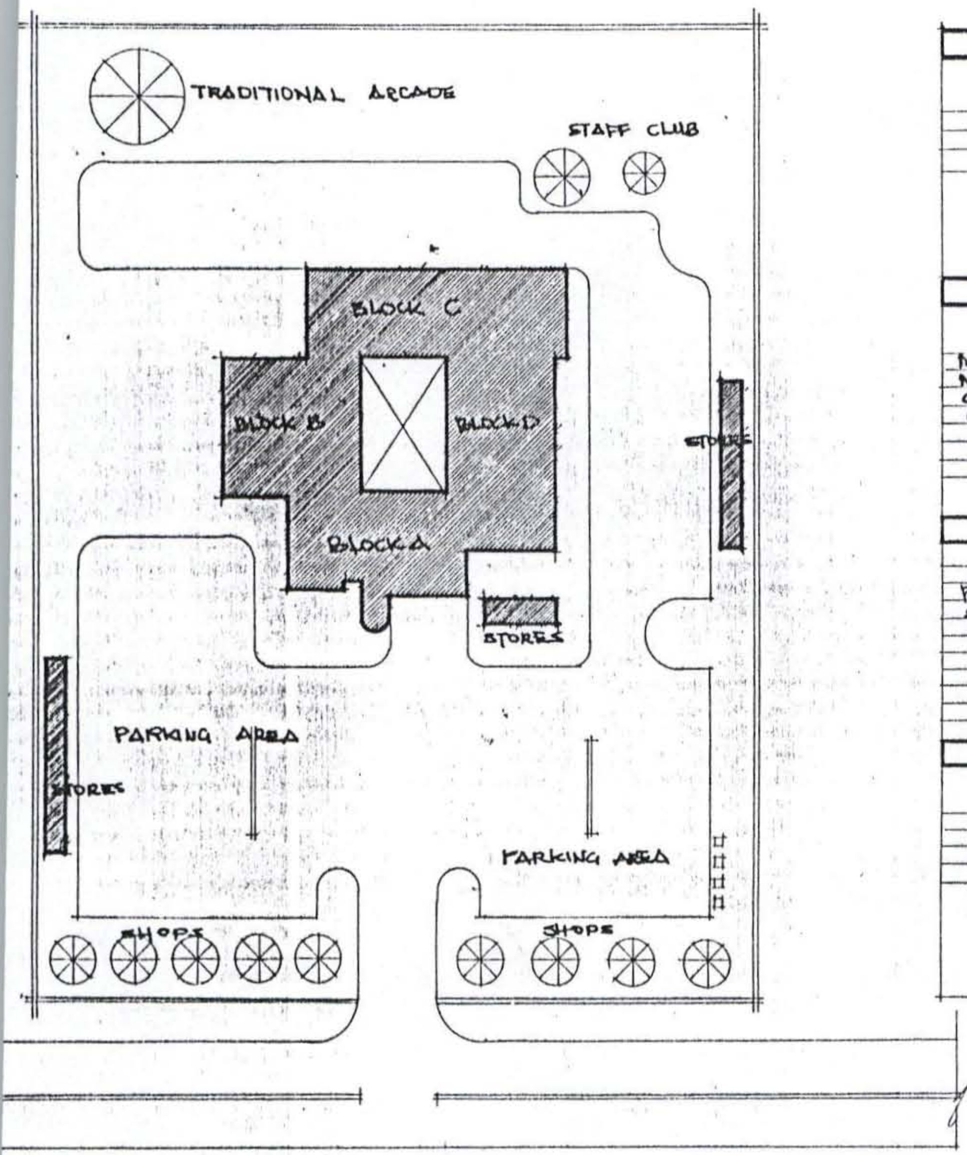
The ground floor houses the office of the assistant director of arts and design, art gallery, head of public relation, planning and statistics offices, exhibition hall, films and festival offices, art gallery, museum, ceramic unit and studio.

4.1.3 MERITS

- It is strategically located with adequate allocation of spaces.
- It is well landscaped-large courtyard suitable for outdoor activities
- The building is aesthetically balanced and has artistic value to its surrounding and immediate environment.

4.1.4 DEMERITS

- There is inadequate provision of parking space for visitors
- The administrative block is not well positioned
- There are acoustic and view problems in the main auditorium.



BLOCK A

CABANA CHEF
RESTAURANT
AMPHI-THEATRE.

BLOCK B

MEETING ROOM A
MEETING ROOM B
CONFERENCE ROOM
CINEMA HALL
THEATRE MANAGEMENT OFFICES
GALLERY

BLOCK C

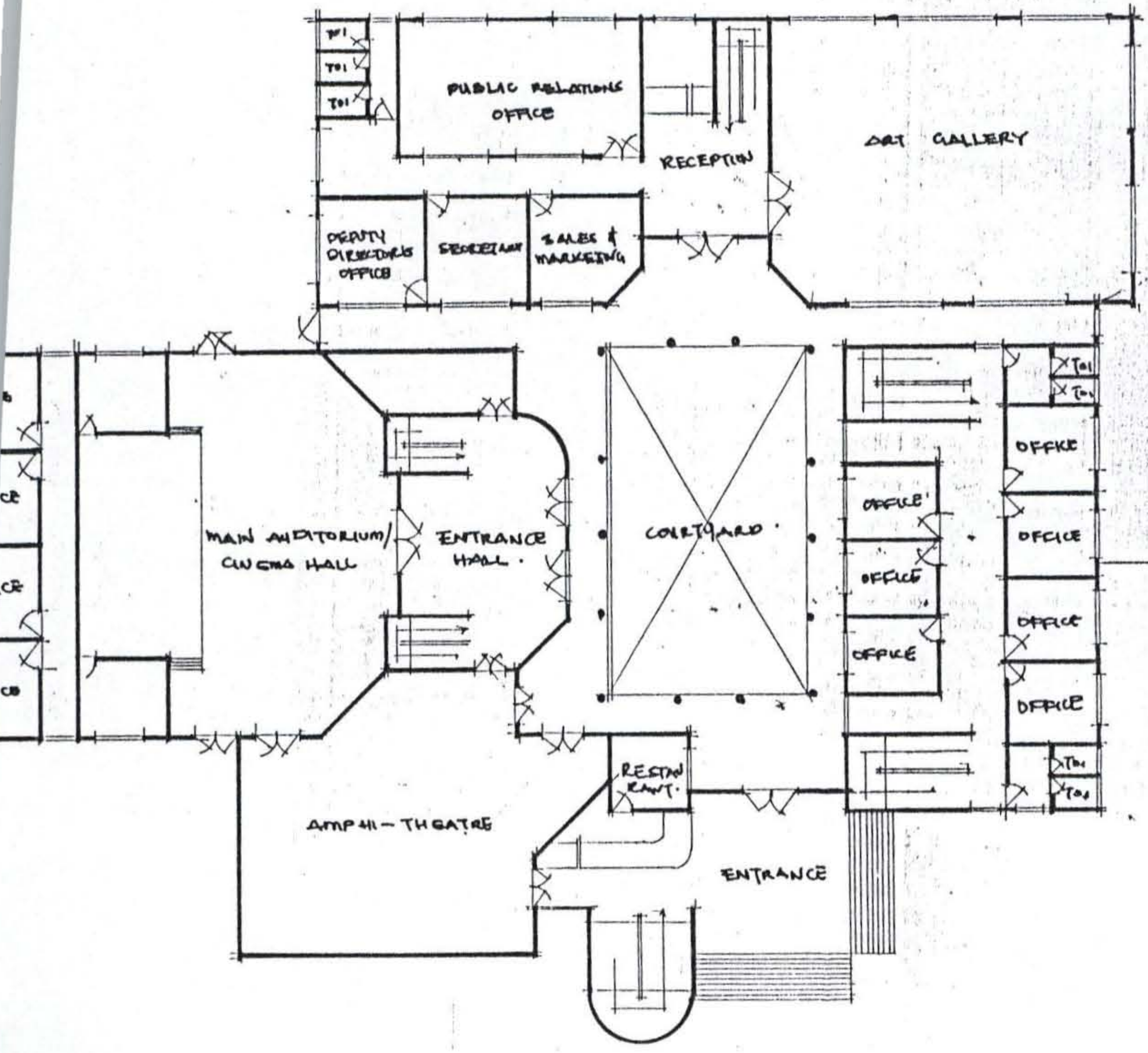
ART GALLERY
PUBLIC RELATIONS OFFICE
SALES AND MARKETING
MUSEUM
HEAD PERFORMING ARTS.
DIRECTORS OFFICE &
DEPUTY DIRECTORS OFFICES
(ADMIN & FINANCE, CULTURE).

BLOCK D.

ADMIN BLOCK
SUPPLY DIVISION.
STUDIO OFFICES (EXECUTIVES)
ART AND DESIGN DIVISION

FOR NATIONAL CULTURAL CENTRE.
MPHASIS ON FIRE SAFETY IN PL

CASE STUDY OF
C T COUNCIL FOR ARTS



TYPICAL FLOOR PLAN

CASE STUDY ONE

F.C.T. COUNCIL FOR ARTS AND CULTURE, GARKI, ABUJA.

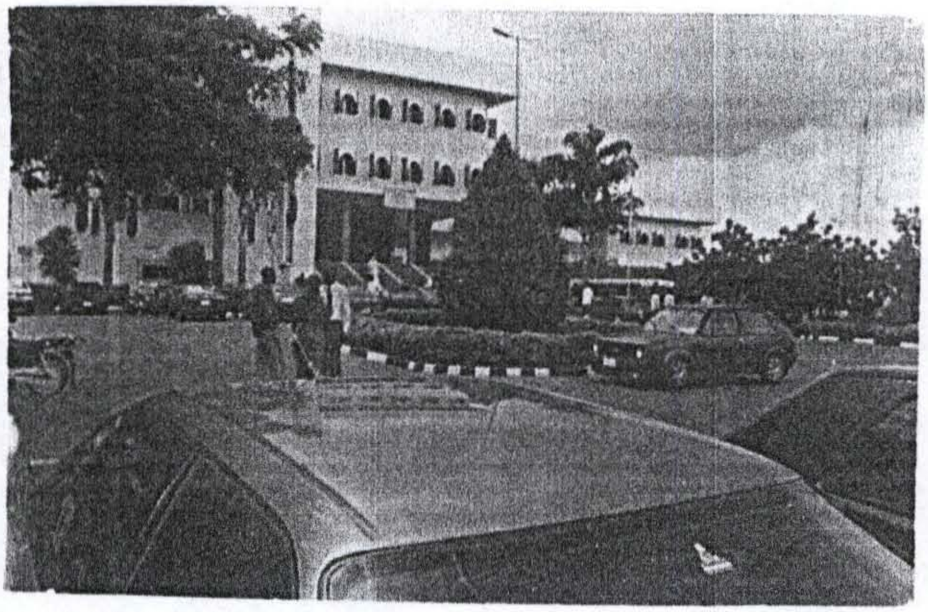


Plate 4.0: The side view of the complex with parking spaces

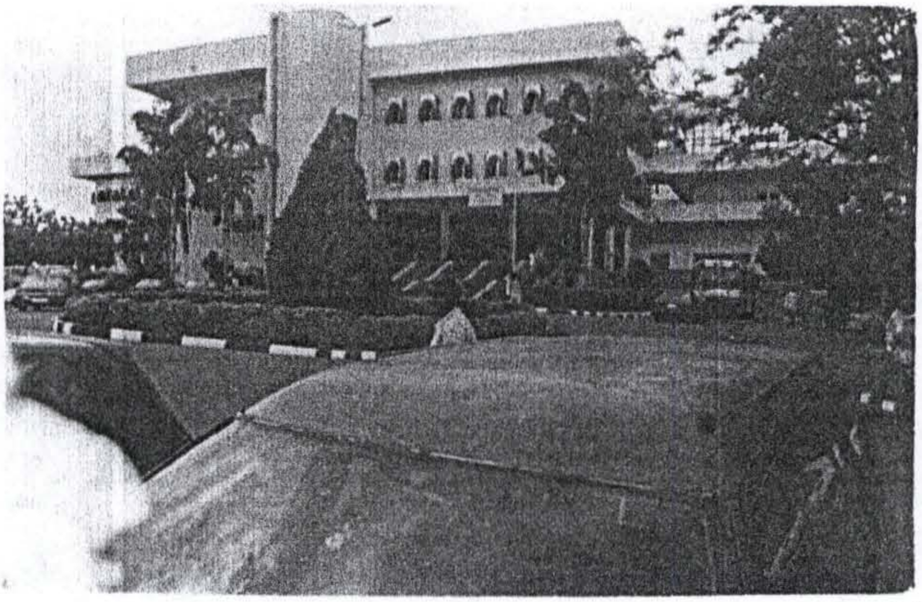


Plate 4.1: The front view of the complex.

CASE STUDY TWO

LAGOS STATE COUNCIL FOR ARTS AND CULTURE, IKEJA, LAGOS STATE.

Plate 4.4: Administrative building.

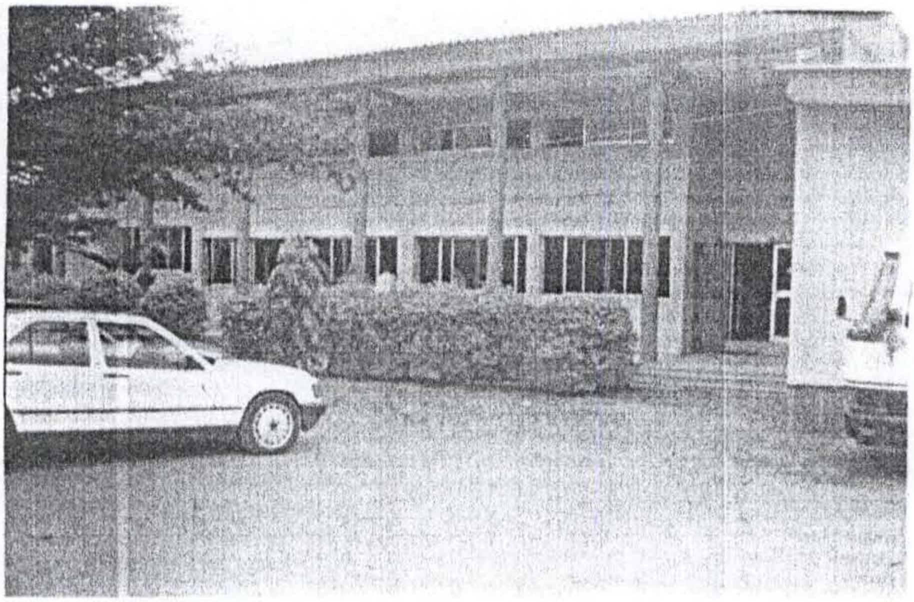


Plate 4.5: Multipurpose hall.

Plate 4.6: Generator House.

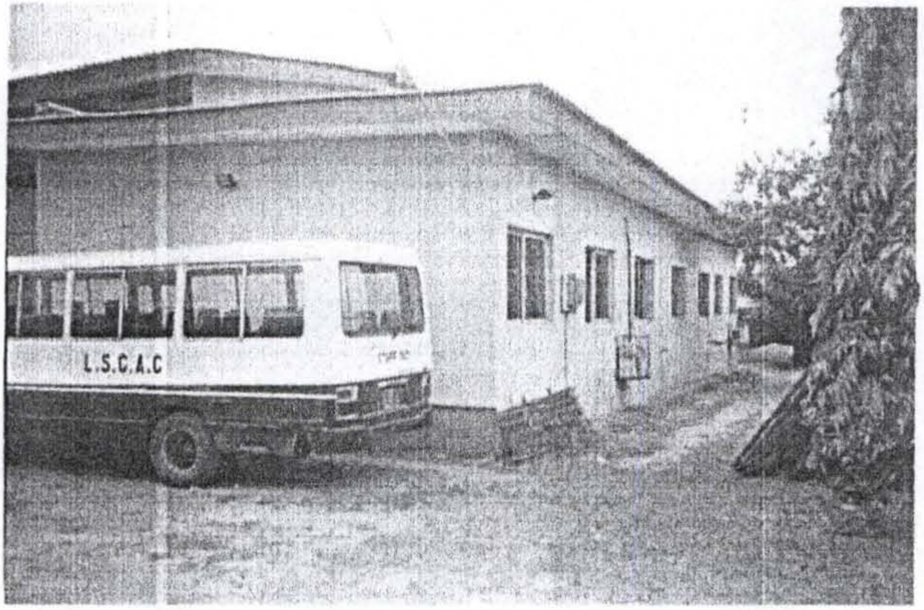


Plate 4.7: Side view of the multipurpose hall.

4.3 CASE STUDY THREE: OGUN STATE CULTURAL CENTRE

4.3.1 LOCATION: IBRAHIM BADAMOSI BABANGIDA BOULEVARD ROAD,

KUTO, ABEOKUTA.

4.3.2 BACKGROUND

The centre was designed by Arc. Femi Adeloye &Associates and constructed by ARON Nig. Ltd. It is bounded to the west by Kuto road, east by Dusmar hotels, north by Saint John's primary and secondary school and south by IBB boulevard road. Existing facilities include:

- Main complex; it comprises of the main hall, two exhibition halls, cinema hall, administrative offices on the first and second floor
- Sit-out for relaxation
- Generator house
- Public toilets
- Security/gate house

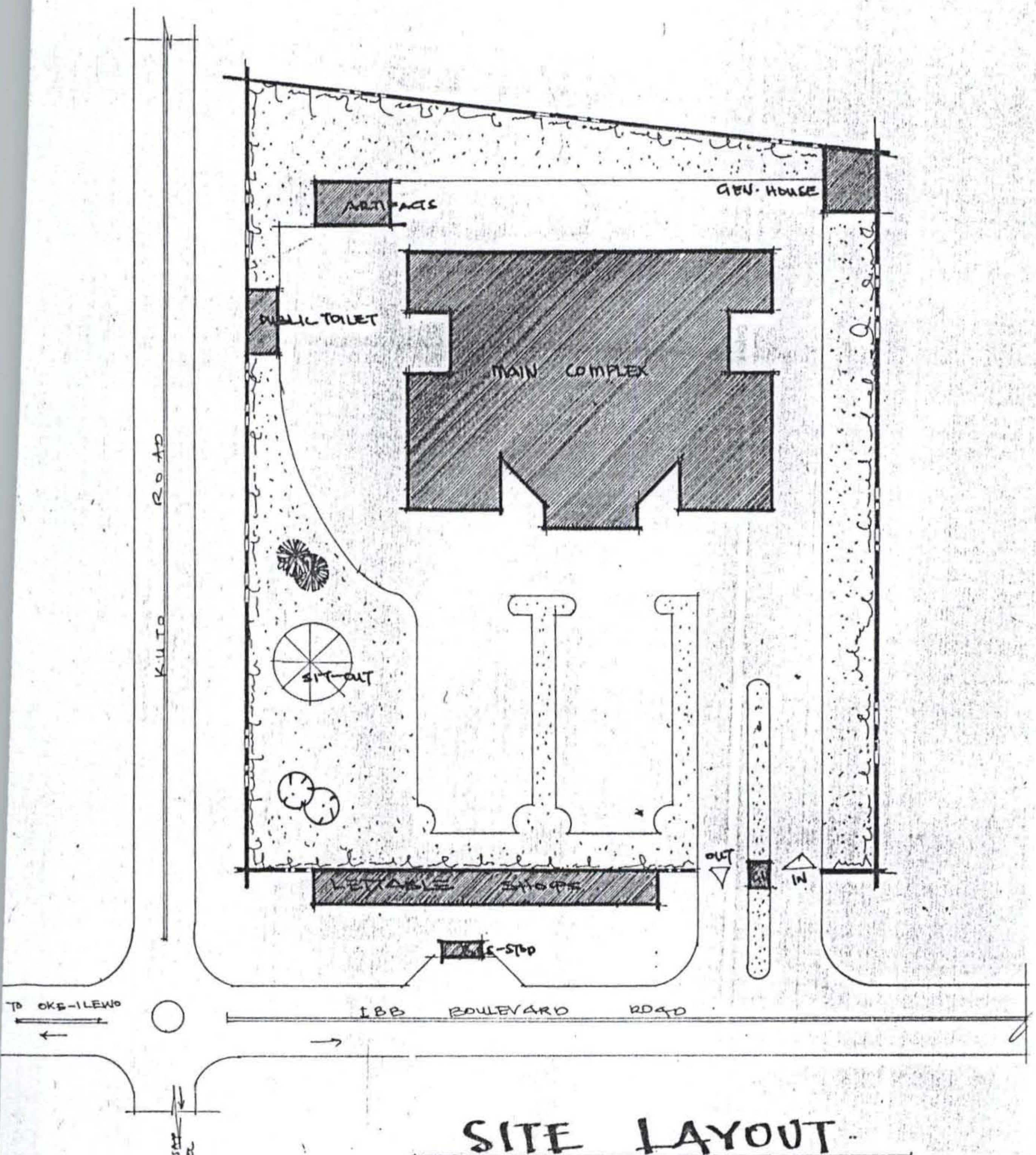
4.3.3 MERITS

- View and sound diffusion is well taken care of in the main hall
- Large spaces are provided for exhibition
- Design is aesthetically balanced
- The site is well landscaped
- The building has architectural relevance to the environment

4.3.4 DEMERITS

- The network of staircases to the theatre hall and exhibition halls and offices are disorganized, it makes the internal access difficult
- Movement within the complex is not well defined
- Offices are not well ventilated
- There is no provision for art and craft village
- It lacks library facility.

CULTURAL CENTRE, KUT



SITE LAYOUT

CASE STUDY THREE

OGUN STATE CULTURAL CENTRE, KUTO, ABEOKUTA.

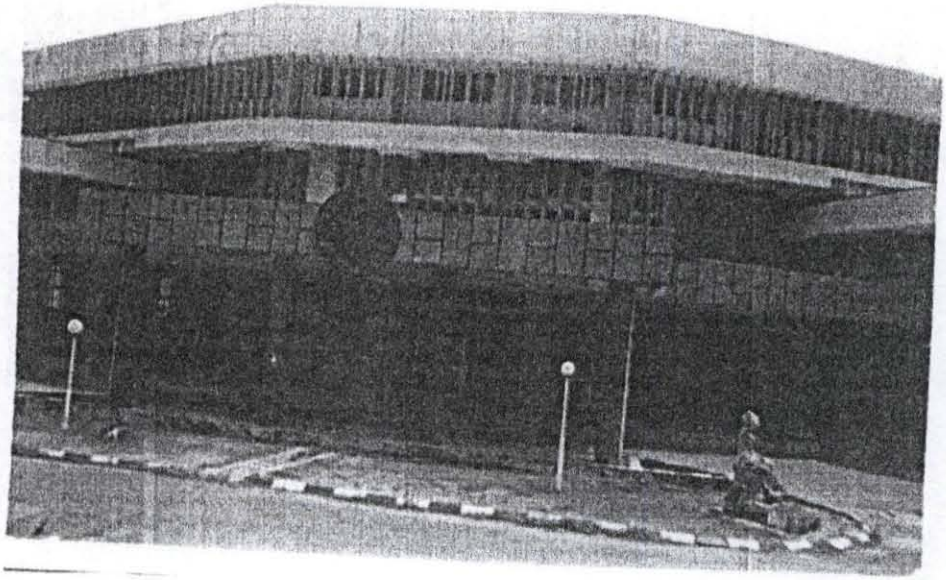


Plate 4.8: Main entrance to the hall.

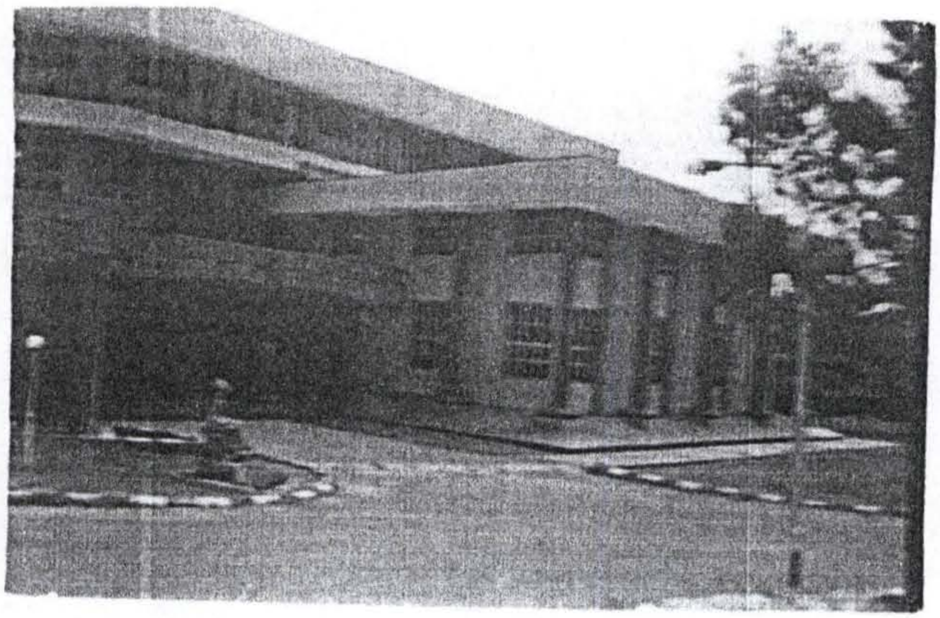


Plate 4.9: Exhibition hall.

Plate 4.10: Exhibition hall and the main entrance.

CHAPTER FIVE

5.0 HISTORICAL BACKGROUND OF THE FEDERAL CAPITAL TERRITORY, ABUJA

A panel was set up by the then military Government of late General Murtala Mohammed in 1975 to examine the desirability or otherwise of the continued retention of Lagos as the nation's capital. The committee recommended amongst others, the need to remove the capital city to a more central location in the country, named Abuja. This was a great extent due to socio-economic and geopolitical constraints, while some communities tended to identify themselves with then capital city of Lagos by virtue of its special location. Others have felt deprived because of distance, infrastructures such as housing, water, electricity and roads which were becoming inadequate to sustain the ever-increasing demand for them in Lagos.

The only option has been the building of a new capital that would be secure, ethnically neutral, centrally accessible, and comfortable and possess adequate land and natural resources to provide a promising base for urban development. A new capital that would be a symbol of unity to meet the aspirations of Nigerians.

The recommendations were accepted and a new location for Nigeria's capital was formalized by decree. No. 6 of 1976. Abuja, An area covering about 8,000 square kilometres was carved out of Niger state, Plateau state and Kwara state.

The federal capital development Authority (F.C.D.A) was by the decree charged with the responsibility of its comprehensive planning and physical development.

5.1 GEOGRAPHICAL LOCATION

Abuja the new capital city is located in the centre of Nigeria. It has a land area of 8,000 square kilometres, which is two and half times the size of Lagos the former capital.

It is bounded on the north by Kaduna state, on the west by Niger state, on the east and southeast by Plateau state, and on the south-west by Kogi state, it falls within latitude $7^0 25^1$N and $9^0 20^1$ North of the equator and longitude $6^0 45^1$ and $7^0 39^1$

Abuja is endowed with rolling hills, isolated highlands and other enduring and endearing features that make it a delightful scenario. It has the combination of the Savannah grassland of the north and middle belt with the richness of the tropical rain forest of the south. It also has rich soil for agricultural cultivation and its climate is quite favourable.

5.2 CLIMATIC CONDITIONS

Abuja is bounded by the Abuja hills to the west, the Zuma-Bwari-Aso hills to the north, the Kanu-Agwai Hills to the east and the Zango-Kuku Hills to the south. These account for its generally comfortable climate. Lying above elevation 1,200 feet, it offers satisfactory geological and soil conditions with good sub-surface conditions for construction and Landscaping.

The predominant vegetation is park savannah, which produces a pleasant open but partially shaded environment. From an aesthetic point of view, the site has exciting visual potential, its gently rolling terrain penetrated by occasional rounded knolls and outcropping presents minimum constraint but offers variety of features.

4.2 CASE STUDY TWO: LAGOS STATE CULTURAL CENTRE

4.2.1 LOCATION: NO133, OBAFEMI AWOLOWO WAY, IKEJA, LAGOS STATE

4.2.2 BACKGROUND

Lagos state cultural centre is directly opposite Oregun junction. It is bounded by N.E.P.A substation on the south, and Lagos state-surveying department on the north.

Existing facilities in the centre include:

- Administrative building; this comprises of the audio-visual, library accounts, research, publication and documentation department, conference room, registry, main hall- performing art division
- Multi- purpose hall
- Art and design studio
- Open ground for outdoor activities
- Gate-house/ security

4.2.3 MERITS

- The cultural centre is strategically located and easily accessible

4.2.4 DEMERITS

- The multi-purpose hall is small [capacity of 250 persons]
- There is inadequate provision of office spaces for effective administration of the centre
- There is no provision for convenience in the multi-purpose hall
- The parking lots are not defined

5.2.1 RAIN FALL

The rainy season in Federal Capital Territory begins around the early part of April, and the rain tapers off very rapidly after the third week of October. Thus, the duration of the rainy season is between 180 days to 190 days

The mean monthly distribution shows a tendency for concentration in three of for months; and 60 percent of the annual rainfall is in the months of July, August and September.

Abuja has frequent occurrences of small rain, which begin with dense, dark cumulous-nimbus clouds with thunder and lightening, followed by strong winds and intense rainfall. The intense rain may last for up to one half hour and is then followed by drizzles of several hours duration. This condition is then followed by a few days of bright, clear skies. The heavy rains are common in the late afternoons at the beginning and end of the rainy season, and often cause serious property damage.

5.2.2 TEMPERATURE AND HUMIDITY

Temperature is defined as the amount or the degree of cold or heat in a body or environment. While in human terms, net radiation is felt as air temperature, the response to which is greatly influenced by the humidity conditions in the air.

Abuja records its highest temperatures during the dry season when there are few clouds. It has been experienced and recorded that there have been changes in temperature as much as 17^0C between the highest and lowest temperature in a single day.

Relative humidity greatly affects human sensitivity to temperature. During the dry season, relative humidity falls in the afternoon to as low as 20 percent in the city. This low humidity, coupled with the high afternoon temperatures account for the desiccating effects of the dry season. In the rainy season, the relative humidity is much higher, especially in the morning hours when it can reach as high as 95 percent. The effect creates heat even though the temperature is slightly lower. The general feeling is always uncomfortably hot when this situation occurs.

5.2.3 WIND AND DUST

The climate of Abuja is dominated by two major air masses. The first is the tropical maritime air mass and the second is the tropical continental air mass. The tropical maritime is formed over the Atlantic Ocean to the south of Nigeria. It is warm and moist, moves inland in a Southwest to Northeast direction. The Tropical continental air mass is over the Sahara Desert and therefore is warm and dry. It blows in Northeast to Southwest direction. The two air masses movement produces the seasonal characteristics of weather conditions in Nigeria. The tropical continental mass is associated with the dry season, and the tropical maritime mass creates the wet season.

The tropical continental mass is associated with the northeast trade winds and the tropical maritime mass gives the southwest monsoon winds. The interface of these two masses determines the intensity and duration of each type of wind over a particular place.

The Northerly flow of air component is weakened is June, and only the Southerly flow predominates. The tropical continental mass increase in intensity in September, over the territory, thus, the northeast trade winds become dominant from October to March. It is always associated with dry cloudless but dust-laden condition called the harmattan.

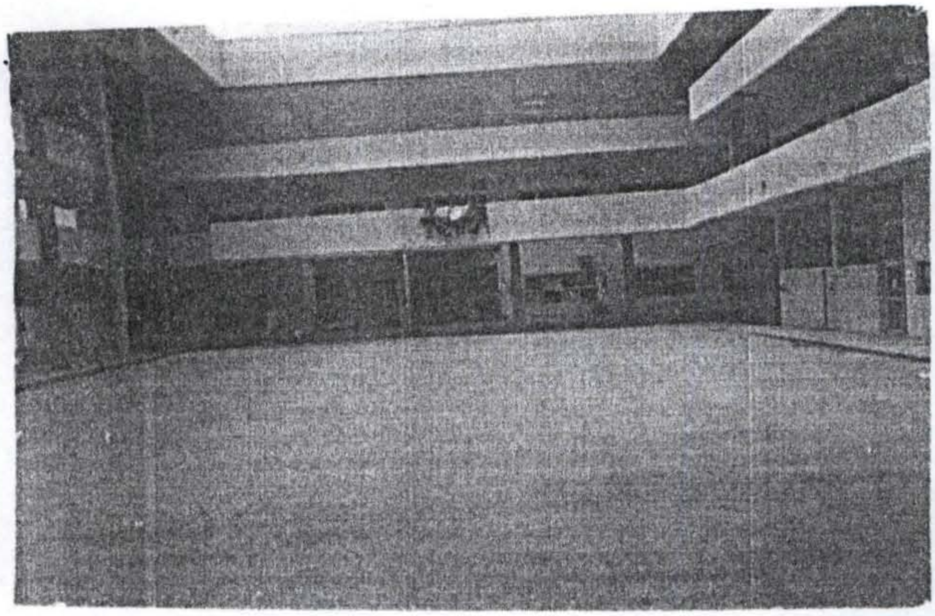


Plate 4.2: The courtyard of the complex.

Plate 4.3: lettable shops and parking area.

Also in this period, the days are always hot and cloudless and this result in a considerable loss of heat by radiation from the earth at night. The temperature drops sharply, often to a dew point, giving rise to early morning temperature inversions and to early mist or fog.

Setting dust particles are also experienced and this has the effect of reducing visibility to a few hundred metres. Nevertheless, when there is day light renewed insulation clears the mist or fog. However, the dust particles continue to float in the air or to settle as film over furniture and other objects.

5.2.4 SOLAR DATA

The F.C.T is exposed to 2,500 sunshine hours annually. The monthly variation for sunshine during the dry season month (November-April) follows the general trend of an increase from over 275 hours. And the decline in sunshine hours becomes more intense as the rainy season progresses and reaches its lowest value in the month of August

5.2.5 GEOLOGY AND TOPOGRAPHY

Abuja is seated on Gwagwa plain, which rises from an elevation of 305m in the East to 610m in the West. The best of the city is concentrated on land with elevations from 350m to 510m. This capitalizes on climatic advantage of higher altitudes.

The upper Gwagwa plains area is dotted by numerous large out crops of rock or near surface bedrock around which makes it necessary to arrange a development. They frequently form interesting and sometimes spectacular shapes, which cut out from the plain; where possible, these have been used as design focal points.

Topographically, the area is typified by gently undulating terrain interlaced by riverine depressions. A reasonable percentage of the total plains areas are occupies by inselbergs and other granitic clusters, and are generally bare and rocky, varying in size, and occurring as isolated masses or in groups abruptly from the plains.

Plains include the older Precambrian unit of metamorphic sedimentary rock and an instruction of younger Precambrian igneous rock. The major rock units underlying Abuja are described below.

(a) SEDIMENTARY ROCK: - This includes Alluvium, in streambeds, located throughout the city; it consists of sand, gravel beds and deposits of clay

(b) IGNEOUS ROCK: - This includes Biotite Granite, large intrusive masses as outcrops in Gwagwa plains, Ryolites small round intrusive surrounded by prophyritic Gneiss.

(c) METAMORPHIC ROCK: - This includes Biotite muscovite sclist, migmatite, that underlie majority of Abuja area, and Granites Gneiss

5.2.6 VEGETATION

The vegetation of the Federal Capital Territory falls within the savannah zone vegetation of the west-African sub-region, smaller areas of rivering forest. Rain forest and savannah woodland occur along streams and in steeper areas.

Park or grassy savannah, which dominated Abuja vegetation, occupied about 53% (i.e. 42,311 km2) of the total area and discontinuous foliage, shrub, grass layer, and few trees characterize it. The composition of park savannah species include a thick, fall grass layer of Andoopogun and Hyperrhenia species and a shrub layer common in terminalia, piliostigma, Amoa, Bamber, Nouclea, Albizia and parkia chippertoniana.

Savannah woodland, occupies about 12.8% or 1,026km^2 of the territory, and occurs mostly on steeper slopes or rugged and less accessible parts. Characterised by a thick continuous canopy of fire resistance species e.g. Afzelia Africana, Pombax Costatum and Vitex Domiani.

Flat plain and undulating terrain rich in shrub savannah vegetation covers 12.9% or 1,032Km of the land area. It is composed of shrub vegetation, well-developed grass layer, and a few scattered emergent trees.

5.3 SOCIO-CULTURAL FACTORS

5.3.1 DEMOGRAPHIC DATA

The population density of the Federal Capital Territory growth rate has been massive due to the physical development present. In 1977, there was a total population of 125,500 people. However, since 1980, when physical development commenced there has been an increase in the population density. In 1991, there were 378,671 people and it increased to 800,000 in 1997.

5.3.2 ECONOMY AND COMMERCE

The inhabitants of Abuja engage in various businesses, which range from farming, fishing, woodwork and craft work.

The farmers' products include maize, guinea corn, millet, and beans. Products derived from woodwork include mortars, pestles, musical instruments, masks. In addition, the ironworkers produce such items as knives, guns, arrows and ornaments. The women practice cloth weaving and pottery making.

Range of business, household, and personal services that supply goods and services to the capital city include:-

a. Large-scale modern retail shopping outlets

b. Private commercial offices in the commercial core, sectors centres and district centres

c. Specialized business services e.g. banking, insurance, real estate etc.

d. Retail establishment are of both modern and traditional form

5.3.3 TRANSPORTATION AND TRAFFIC FLOW

The F.C.T. transportation network provides effective flexibility in transit service within the city and its interaction with the rest of the country. The linear spine/feeder system makes possible a series of entrances and exits to allow buses to move from one district and then return to the spine. In addition, the street pattern allows maximum flexibility in transit service within the sector.

5.3.4 EXISTING LAND USE AND FUTURE TREND

The development of Abuja city is in four phases. Phase one of the city consists of the Central Business District, the three arm zone, Maitama, Wuse I and II, Garki I and II, and Asokoro districts. Phase II consists of Katampe, Mabushi, Utako, Durumi, Gudu, Jabi, Kado, Jahi, Gaduwa, Dutse and Kukwaba national park. The detailed land use plan of phase III and IV are not yet prepared.

The development of the city as an efficient and attractive environment is in stages. The city at the end of stages one and two will accommodation about 150,000 and 1.6 million residents respectively, with a projected population limit of 3.1 million

Table 5.0: LAND USE ANALYSIS

Category of land use	Land budget (hectares)	% of total
Government Activity	500.00 ha	1.96
Services	891.00 ha	3.49
Residential	12,486.00 ha	48.97
Light industries	920.00	3.61
Infrastructures	1,840.00	7.22
Commercial	561.00	2.20
Open space and Recreational facility	8,300.00	32.55
TOTAL HECTARES	**24,498.00**	**100**

Source: Federal Capital Development Authority, Abuja.

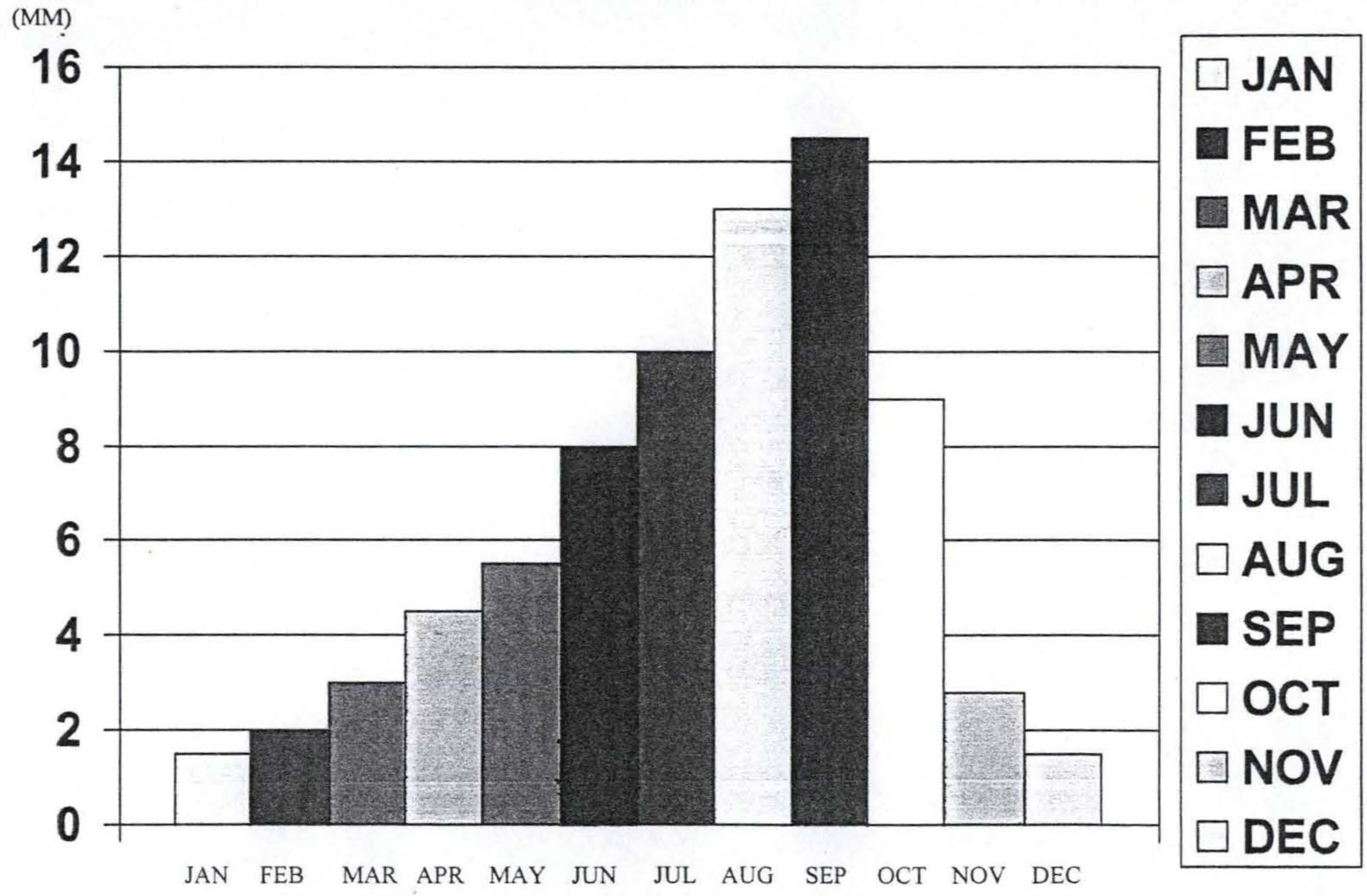


FIG 5.0: MEAN MONTHLY RAINFALL FOR ABUJA

75b

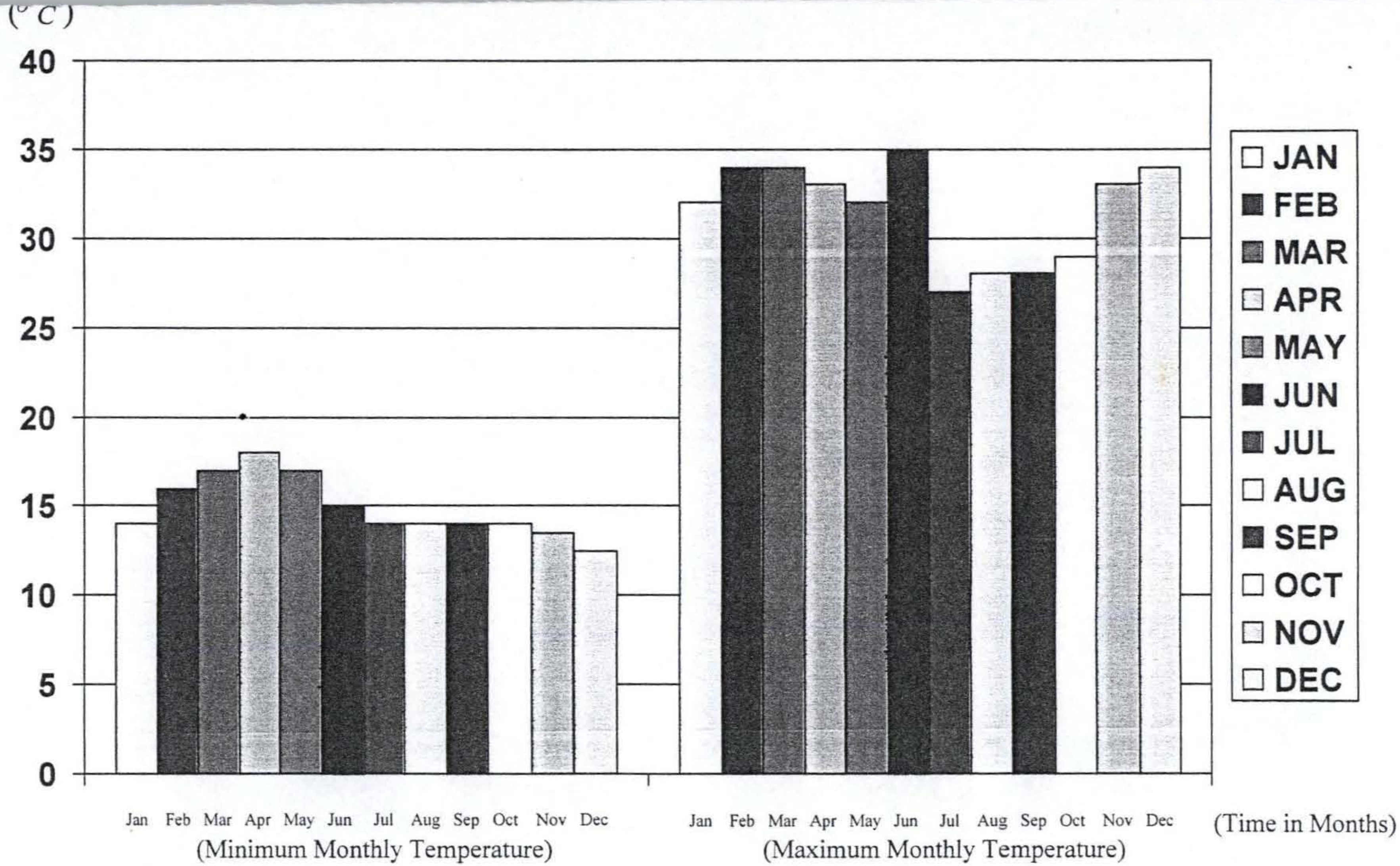


FIG. 5.1: MINIMUM AND MAXIMUM MONTHLY TEMPERATURE FOR ABUJA.

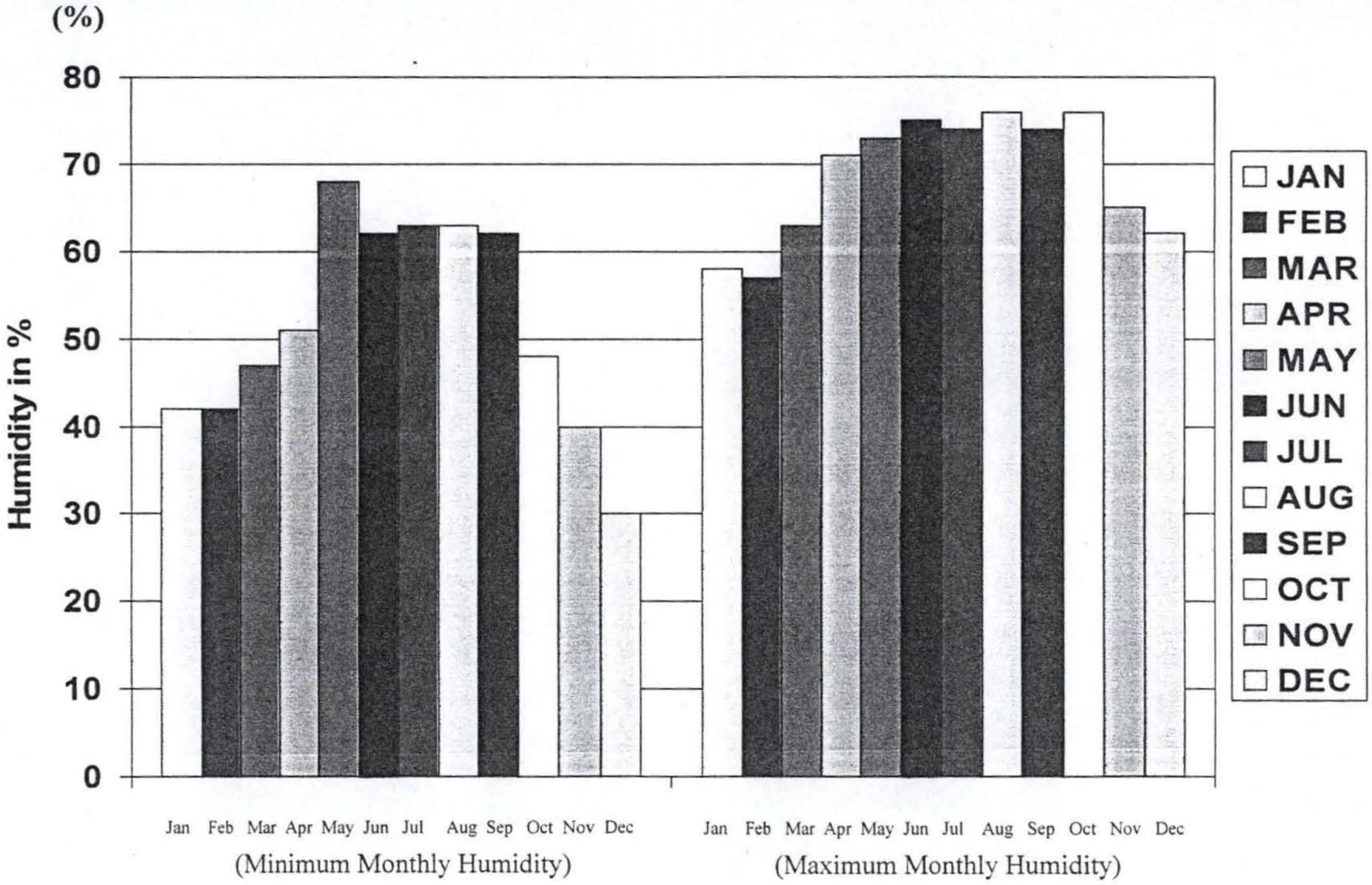


FIG 5.2: MINIMUM AND MAXIMUM MONTHLY HUMIDITY FOR ABUJA.

75d

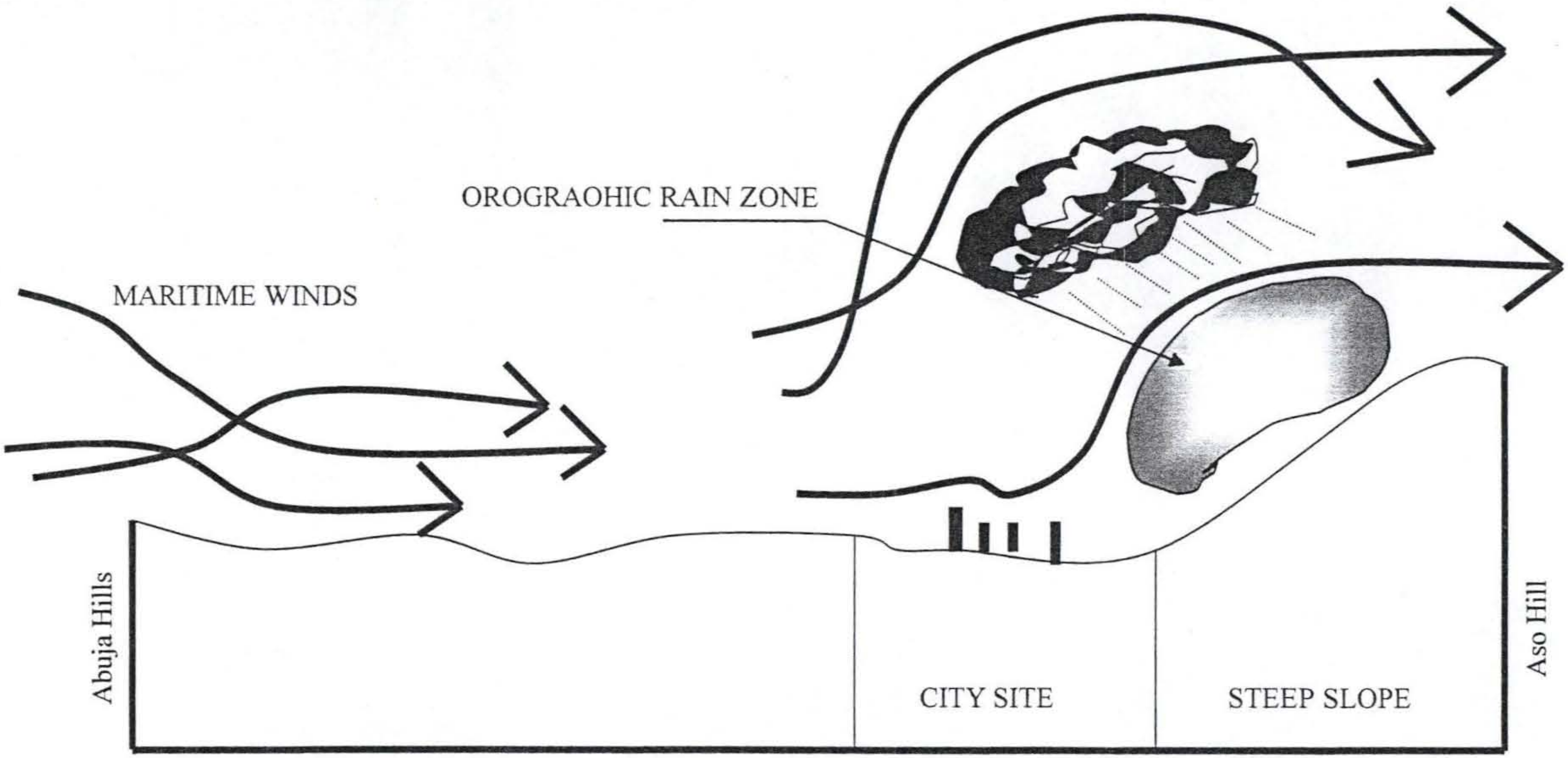


FIG 5.3: WET SEASON 6-7 MONTHS

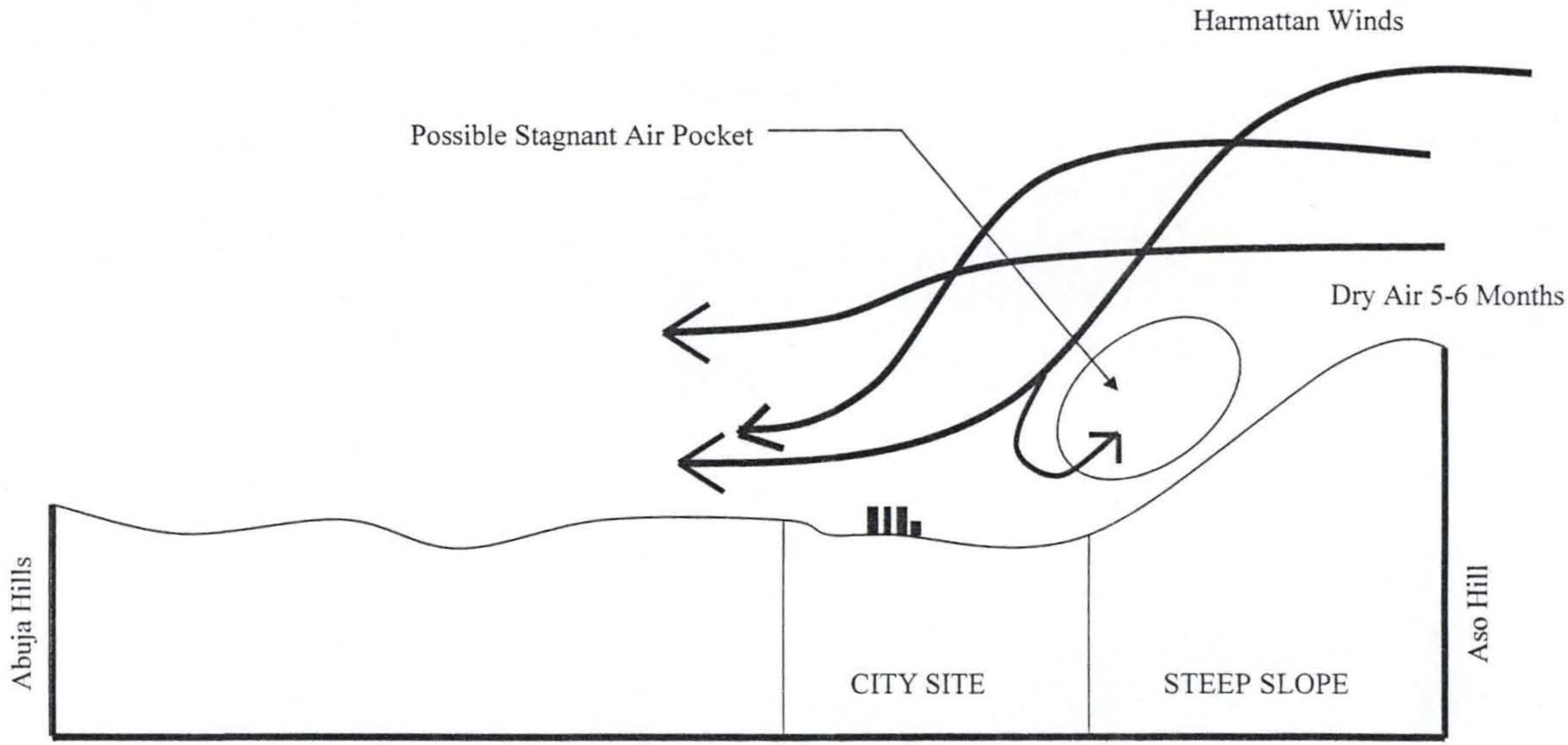


FIG 5.4: DRY SEASON 5-6 MONTHS.

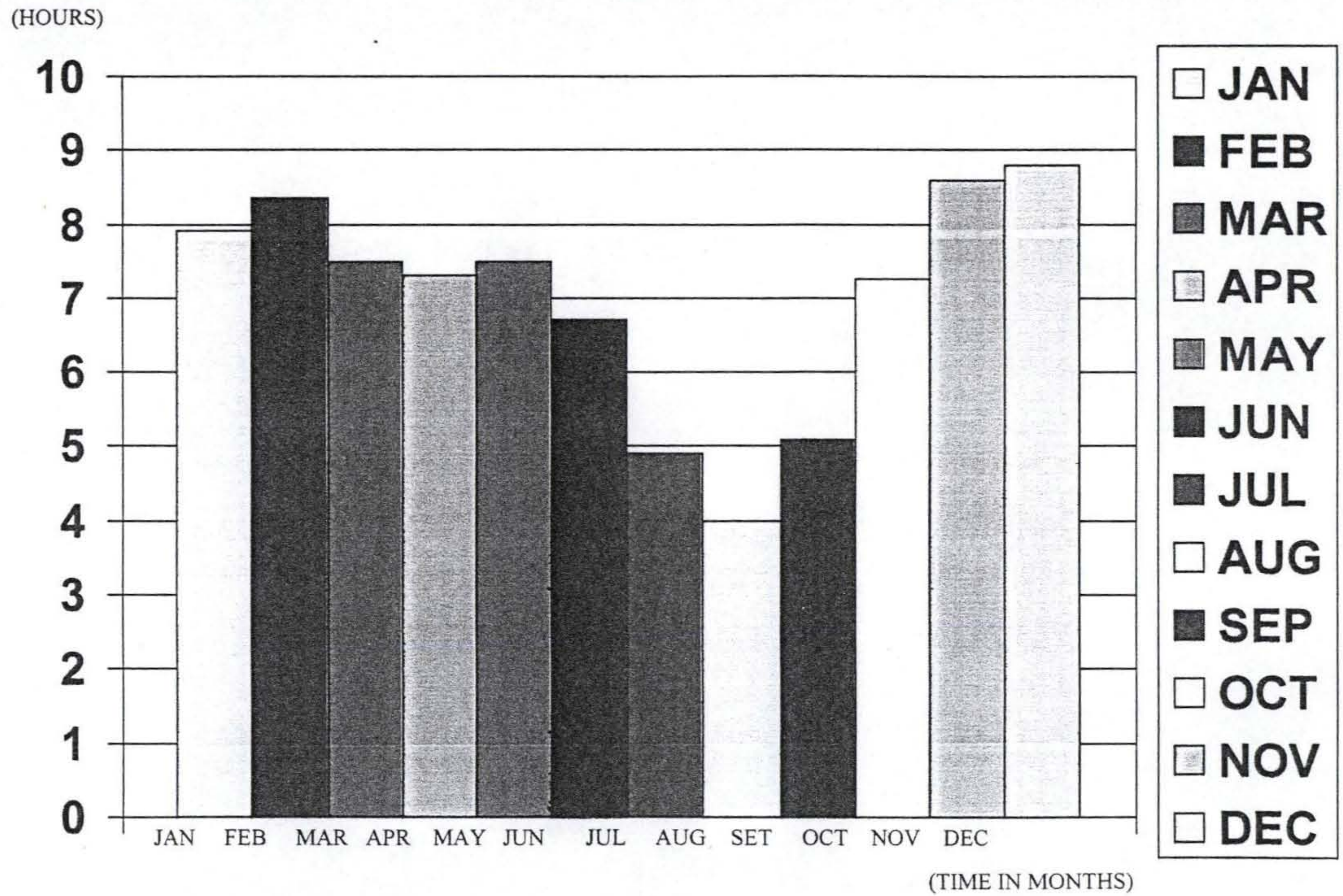


FIG 5.5: MEAN MONTHLY SUNSHINE FOR ABUJA.

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CHAPTER SIX

6.0 SITE ANALYSIS

For any design project to be successful, adequate consideration has to be given to the area where the project will be sited. This clearly spells out what factors (advantages and disadvantages) should be put into consideration before allocation of space and zoning. In any case, for effective analysis of a site, certain criteria dictate why a particular site is chosen as a viable for a specific project.

6.1 CRITERIA FOR SITE SELECTION

This is wholly determined by the functions and design consideration of the project in respect to the physical nature of the soil. There are two factors to be considered in a good site selection. They are:

1. Macro factors
2. Micro factors

Macro factors are as follows:

- ✓ A structure established on the allocated plot and well oriented.
- ✓ A site located at proximity to the nearest city for inter and intra sector trend.
- ✓ A site location that is well accessible.
- ✓ Discouraging traffic between sectors of the centre area and around the site.
- ✓ Micro factors are as follows.

✓ Good transportation and traffic network.

✓ The marked out area on the city master plan.

✓ Network of water, sewage, drainage, electricity, landscape, preservation and pilling care of existing relief.

Having considered the factors listed above; there is every need to have a place that has enough land area to accommodate the intended use and to go with the planning regulation of Abuja metropolis. In addition, there must be easy access with minimal need to look for direction. Consequently, Babayeju Tawose street of the cultural zone in the central area of Abuja city do satisfy the above listed requirement and hence its choice as the site location for the proposed National cultural Centre.

6.2 LOCATION OF SITE

The proposed site is located along, Babayeju Tawose Street of the Central Area of Abuja town. The site is accessed from area 11 through central bank head office road.

Finally, the plot is the first to the right on Babayeju Tawose Street, off central bank road, and adjacent to the national cathedral Abuja.

6.3 SITE CHARTERISTICS

All access routes leading to the site are motor able, which makes it easy to be accessible. The site slopes gently downwards from East to the West of the plot area. The site is sparsely populated with full-grown trees and densely populated with grasses and shrubs with no existing facility.

6.4 ACCESS AND CIRCULATION

The site is easily accessible from the Area 11 of the central area of Abuja city.

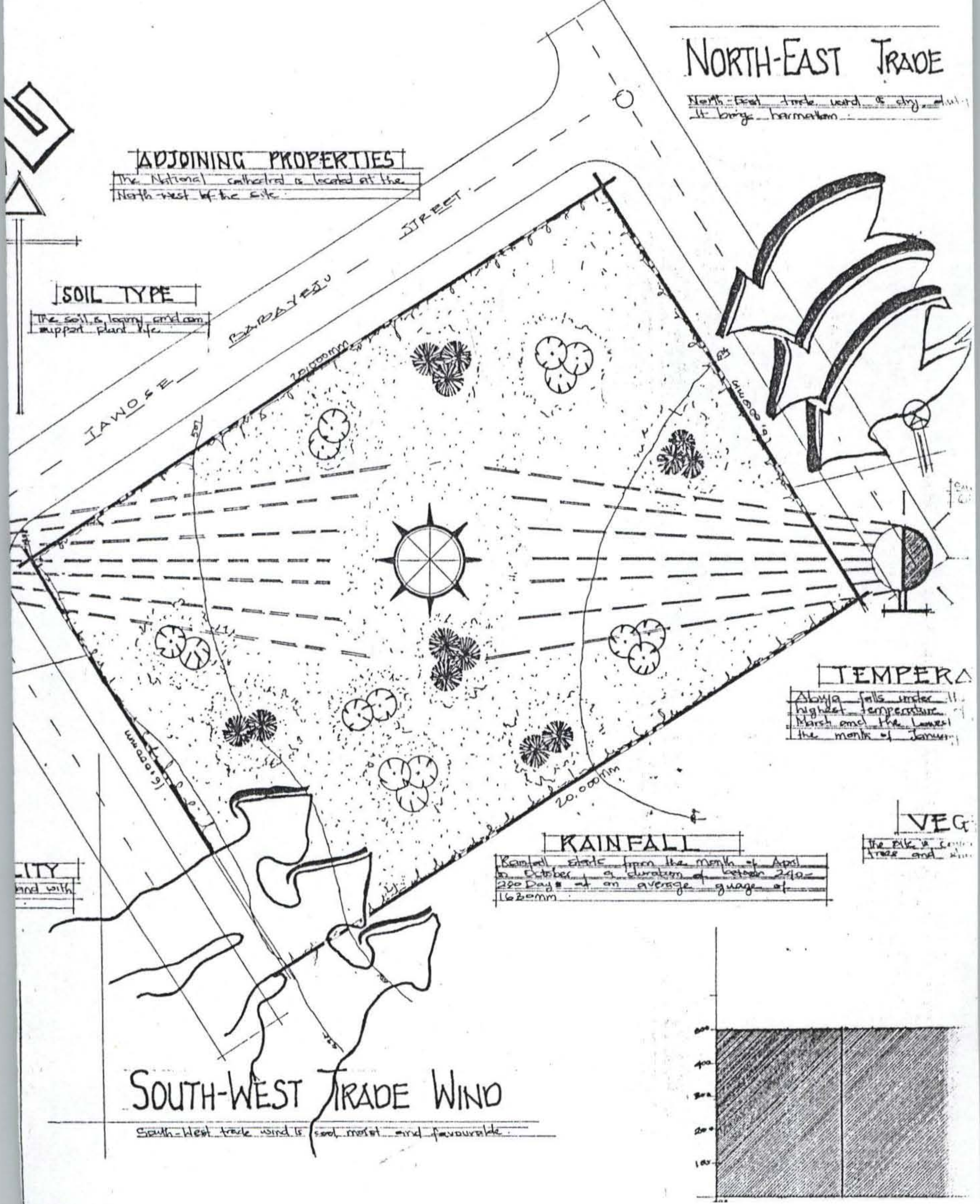
6.5 UTILITIES

Presently On the site presently exist a number of service installations. Telephone poles have been placed from the main access road through the site and also electric poles supplying electricity to the area, also there have been water supply pipe laid passing through the site.

6.6 SCENERY AND MAN MADE FEATURES

To the right of the proposed site exists an office complex and adjacent to the site is the National Cathedral, Abuja.

TE ANALYSIS


NORTH-EAST TRADE
ADJOINING PROPERTIES
The National cathedral is located at the North-west of the site
SOIL TYPE
JAWOSE BABAYEJU STREET
20,000mm
KAINFALL
TEMPER
VEG
LITY
SOUTH-WEST TRADE WIND
South-West trade wind is cool moist and favourable

SITE ANALYSIS

ANALYSIS OF THE PROPOSED SITE

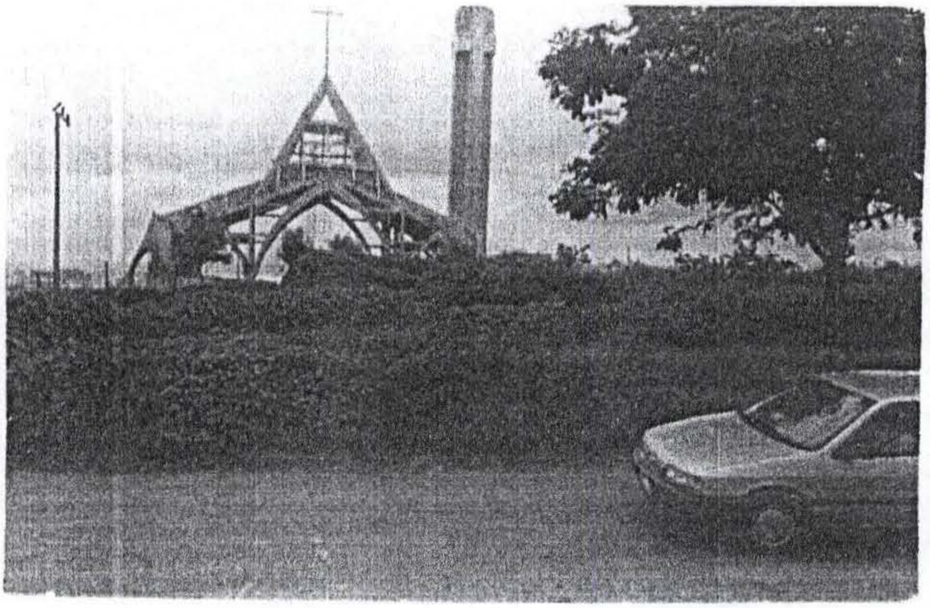


Plate 6.0: The National Cathedral (adjoining property)

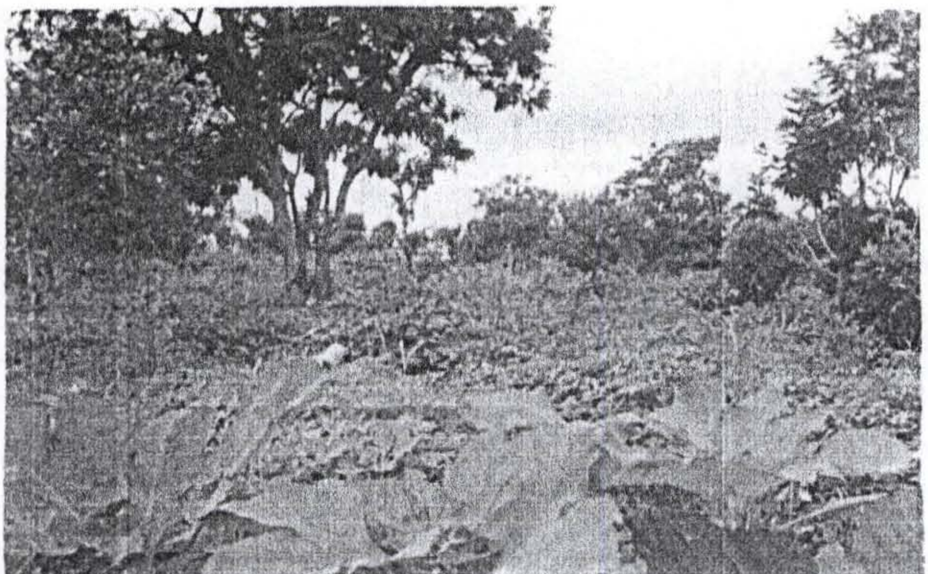


Plate 6.1: Vegetation of the proposed site.

Plate 6.2: The access road, Tawose Babayeju Street.

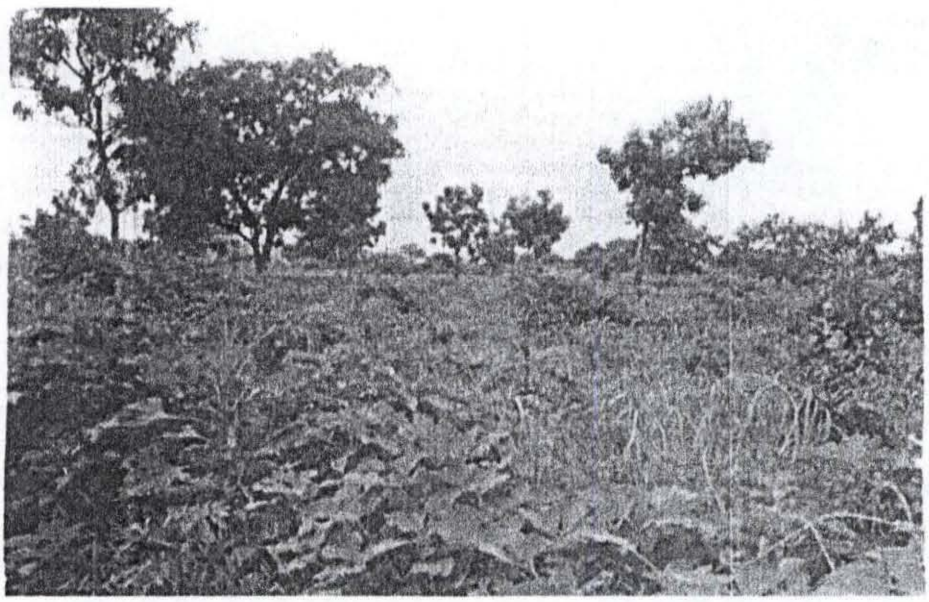


Plate 6.3: The proposed site.

CHAPTER SEVEN

7.0 THE DESIGN

The design is geared towards providing unity and oneness among ethnic groups all over the nation and the entire world at large, through organised public enlightenment programmes, creating an historical value of Nigerian cultural heritage as well as facilitating a periodic return to origin in the nation at large. The success of this design depends on factors like the choice of building materials, the construction techniques as well as the functionality of spaces.

7.1 CONCEPT AND DESIGN

The concept adopted in this design is analogical in nature; a calabash covered with another calabash and is supported at the bottom. The main calabash represents the main structure while the cover represents the roof structure (the dome). Dome signifies power and Abuja being the federal capital territory, which is the centre for power. The metamorphosis of this analogy makes the support below being extended throughout to support the whole structure (column).

7.2 MATERIALS AND CONSTRUCTION

7.2.1 MATERIALS

Diverse materials are employed in the construction of the National cultural centre to achieve the design. These materials include concrete, reinforced concrete, glass, steel, and aluminium. The main important factor here is the weather resistance, durability and maintenance of these materials.

7.2.2 CONSTRUCTION

The foundations to be used for this construction are basically of two types: pad and strip foundation.

Pad foundation for column and strip foundation for non-load bearing walls, though subject to engineers' details or specification. The floor is finished with granolithic because of its durability and inability to produce noise when walking on it. The block walls with reinforced concrete column and beams for walls. The roofing system is the dome construction and is basically of long span aluminium roofing sheet and steel roof members.

For doors and windows, aluminium frames with glass panels are employed. Some part of the building is to be constructed with aluminium frame curtain walls and grills for covering the duct conveying the soil pipe from the toilets.

7.3 SPACE REQUIREMENTS

Space allocation is a very vital aspect of design. Adequate space should be provided to aid circulation, furniture and equipments to be used in these spaces which are either permanent or temporary. Criteria for determining the allocation of space in each unit include:

- ✓ The type of activities that would be accommodated;
- ✓ The equipments to be used;
- ✓ The furniture;
- ✓ Reference to established standards.

7.4 ELECTRICITY AND LIGHTING

The electricity to be provided on site would be tapped from the National electric Power Authority (N.E.P.A.) plc, main supply line that runs underground along the site boundary. The laying of the supply cable will be laid underground to conform to the building regulations of Abuja city and to avoid interference with every view of the centre.

In case of electricity power failure, a standby generator recommended to be provided on site.

7.5 HEATING, COOLING AND VENTILATION

Heating is a natural phenomenon, which needs no artificial means in Abuja being in Tropical Africa, and because this project is to be sited in Abuja, it is the elimination of heat within the building's interior that requires greater attention and not how to heat up the building.

However, cooling and ventilation deserves a lot of emphasis in this design. A mechanical means will be used to provide cooling within the building.

7.6 WATER SUPPLY

Although, water supply pipes are laid on the site, a borehole would be provided to overcome any instability of flow of water from the mains. For water supply from the water board mains, connection to the existing mains is to be made by the plumber. A stuffing box is clamped to the mains and plugged connection to the fernile cock on the crown of the main and the service pipe is to run to the stop valve nearest to the site boundary of the centre. The purpose of the stop valve is to enable the plumber to disconnect the water supply where there is a waste. The service pipe is to run underground and into the buildings.

7.7 DRAINAGE AND SEWAGE DISPOSAL

Surface water includes natural water from the surface to the ground including ground such as fields, paved areas and roofs. Surface water, running along the terrain is to be taken care of in such a way that paved areas are laid to fall to channels that drain off surface water.

The drains will be constructed directly to follow the natural terrain of the site, directed to flow into the main drain. All drains should be constructed to carry water from the roofs above, and also drains should be covered with removable precast concrete slabs to aid cleaning and maintenance. The pipes are to be laid open-jointed to follow the natural depression and valleys of the land.

Septic tanks and soak away pits should be constructed according to engineer's specification to contain all foul water and channelled to the central sewage system of Abuja city. Maintenance of septic tank and soak away pit should be of monthly duration.

7.8 REFUSE DISPOSAL

The disposal shall conform to the sanitary requirement on site and Abuja waste policy. The disposal of refuse shall be done using plastic waste bin with self-closing covers to keep away flies. These are to be placed at strategic positions of about 10m intervals. For the interior spaces of the buildings, waste paper baskets would be provided to be emptied into the waste bins daily. The disposal of the collected refuse from the waste bin shall be by waste removing vehicles to the city main refuse dump and shall conform to the sanitary requirements of Abuja city.

7.9 ACOUSTICS

Acoustic materials to be in each of the arms of the building structure on site are to be in accordance with the functional requirement. Halls longer than 17m will tend to produce sound (echo), therefore there will be need for special treatment for walls and ceiling.

7.10 FIRE SAFETY

Fire safety within the site has been considered to tackle three aspects, which are: life safety, protection and prevention of conflagrations. Chemical fire extinguishers and fire hydrants are to be provided at strategic points within the complex and the site for immediate use. Adequately protected fire exit access directly to the outside is provided within the building. It is envisaged that automatic sprayer system will be provided in all spaces to be triggered by an alarm. Also smoke detectors and fire alarms are provided to notify occupants in the case of fire.

7.11 SECURITY

Security posts/gatehouses are to be located at the main entrance of the site and it is envisaged that security personnel would be provided with modern communication gadgets to monitor the activities within the complex.

7.12. COMMUNITY

The community of the proposed National cultural centre was a major criterion in the site selection for the project. In the land use and location map of Abuja city, it was found out that the proposed site is located at the area apportioned for national buildings within the cultural zone of the central area of Abuja city.

7.13 MAINTENANCE

Maintenance can be defined as work undertaken in order to keep, restore or improve every facility, its service and surrounds to a currently accepted standard and to sustain the utility and value of the facility.

Effective building maintenance requires current diagnosis of defects and implementation of correct remedial measures and all should be based on technical knowledge. Adequate routine maintenance has the function of enhancing safety of the occupants, aesthetics of building and prevention of deterioration and replacement.

Restoration can be referred to as bringing back to good condition of a faulty system while replacement is the changing of the faulty or malfunctioning part of the system.

When a facility is expected to handle a larger number of people on almost daily basis, maintenance is usually brought about by long-term wear and tear of the facility. Also the roofs need special care and attention, hence accesses are provided for the roof to allow regular cleaning and constant checks to prevent leakage and cracks.

7.14. SOLAR CONTROL

Solar radiation from the sun deserves to be considered in the orientation of buildings to prevent excessive heating of the building's interior or glare. The sun is an extremely high-energy source and solar radiation is by far the largest source of energy received by the earth.

The climate of Abuja stresses the need to make the building's occupants to be comfortable. The use of high roofs, thick walls and tinted windows are provided to reduce the harshness of the sunrays striking the interior.

CONCLUSION

Many cultural practices which were handed down from generation to generation are today still in their original forms together under the same roof poses little or no problem, instead will rub minds of the people together for the successful upbringing of the revived cultural practice.

The idea of this centre is such that affords the people on many opportunities of constantly exhibiting their crafts, arts and culture so as to communicate with life and nature, and also to articulate an environment where the language shall be arts and culture.

Fire safety technology has made it possible for the people to have a conducive environment without any threat of fire

The cultural centre will be well embraced by the populace due to their ready supply of arts, crafts and culture, both traditional and modern. This is because the centre will bring the various existing small and highly personalised galleries and workshops in towns together, encourage them to work as associate pressing towards the same goal and objectives

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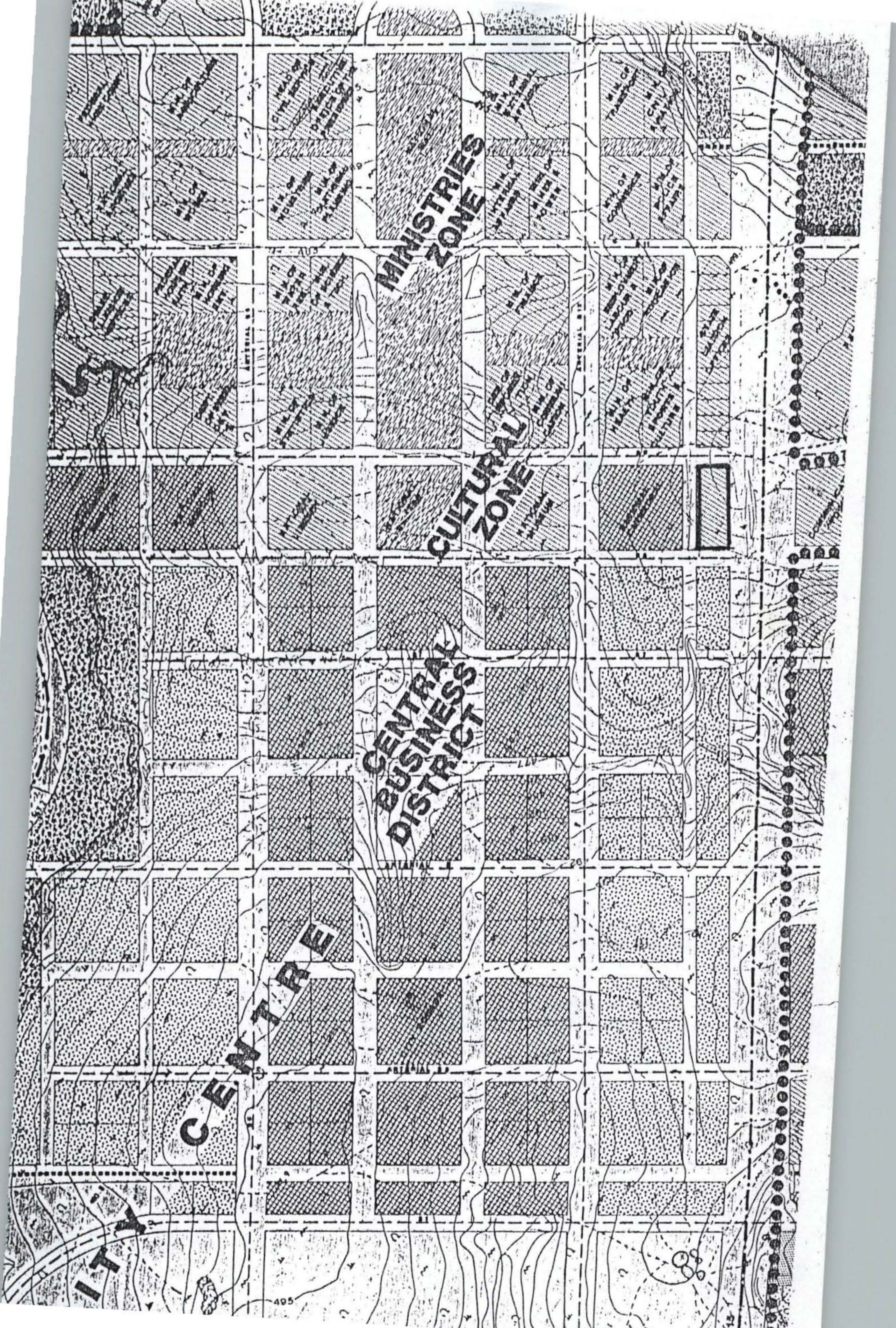
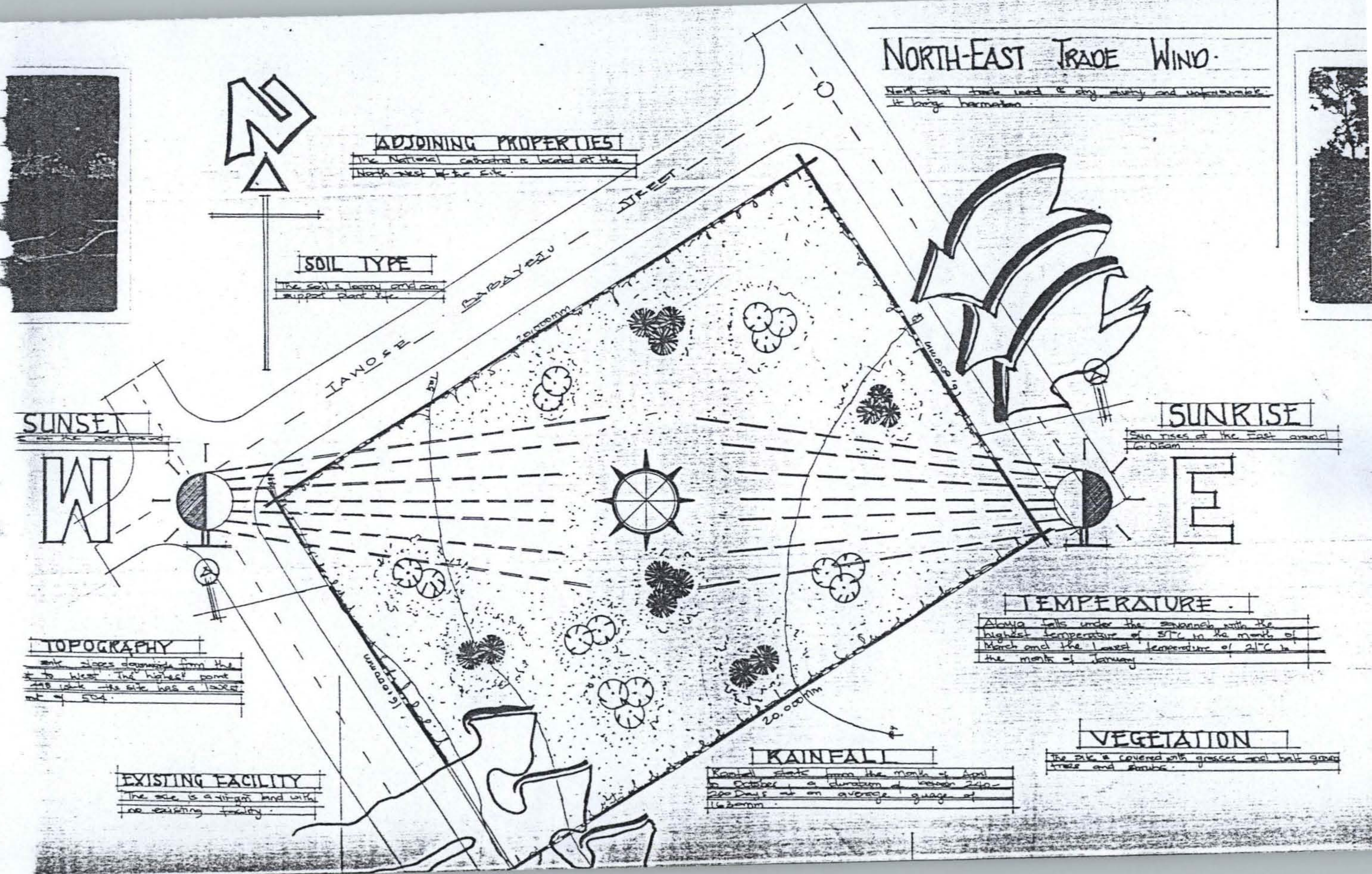
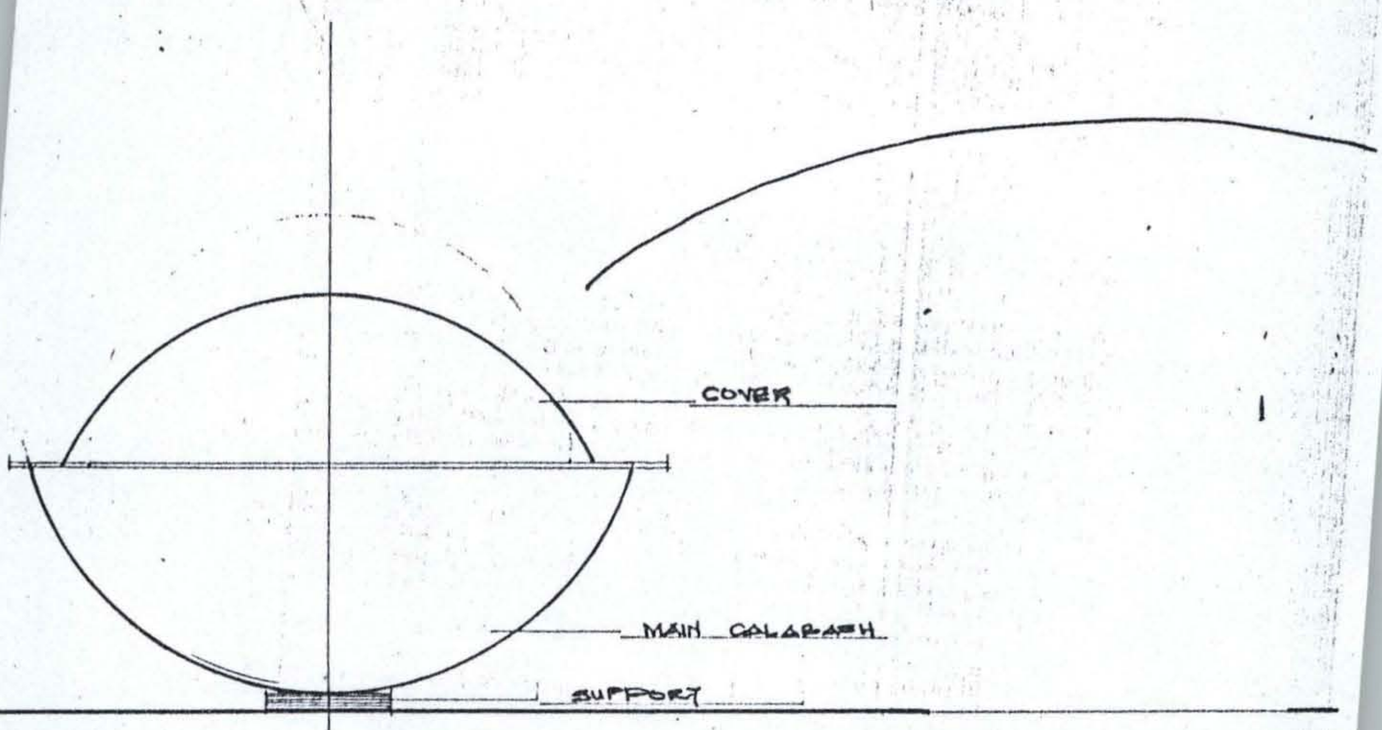


MINISTRIES ZONE
CULTURAL ZONE
CENTRAL BUSINESS DISTRICT
CENTRE

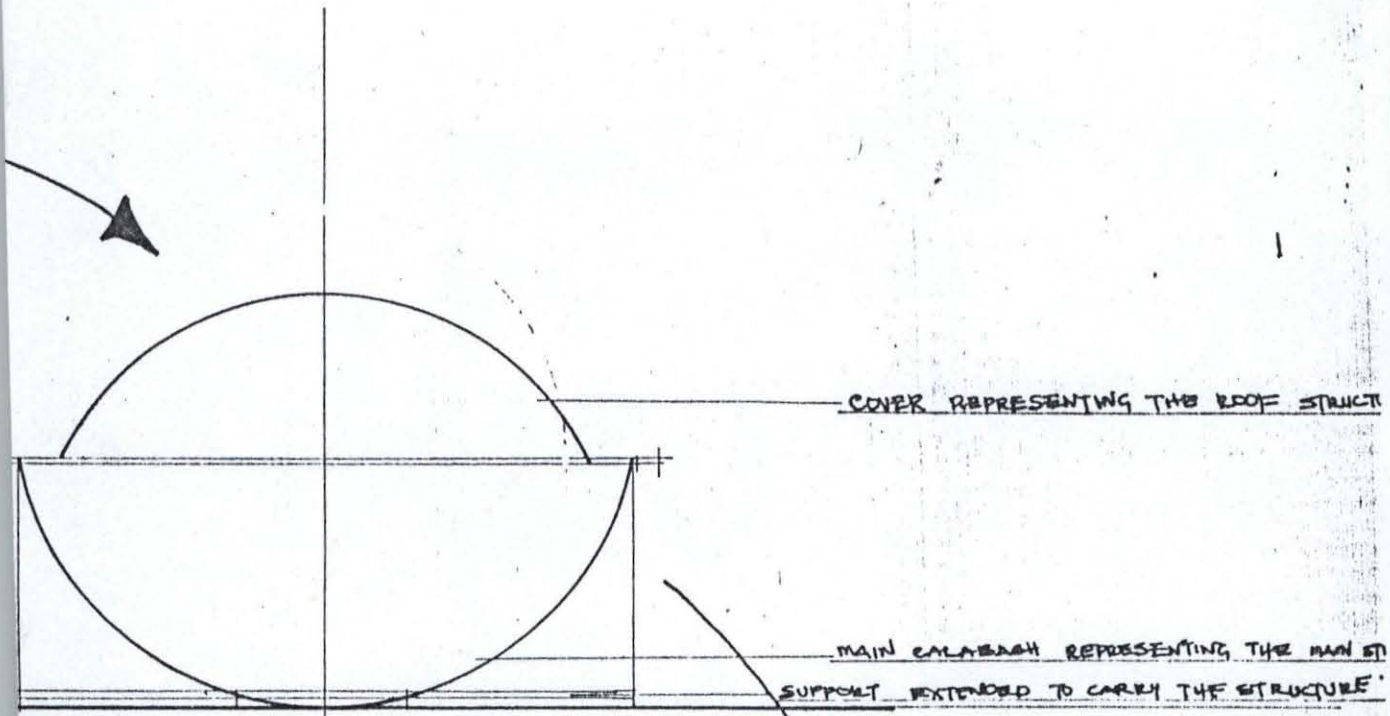


NORTH-EAST TRADE WIND
North-East trade wind is dry, dusty and unfavourable. It brings harmattan.
ADJOINING PROPERTIES
The National cathedral is located at the North west of the site.
SOIL TYPE
The soil is loamy and can support plant life.
IAWOSE BABAYEJU STREET
SUNSET
W
SUNRISE
Sun rises at the East around 6:00am.
E
TEMPERATURE
Abuja falls under the savannah with the highest temperature of 37°C in the month of March and the lowest temperature of 21°C in the month of January.
TOPOGRAPHY
VEGETATION
The site is covered with grasses and tall green trees and shrubs.
RAINFALL
Rainfall starts from the month of April to October, a duration of between 240-290 Days at an average guage of 1632mm.
EXISTING FACILITY
The site is a virgin land with no existing facility.
20,000mm
16,000mm

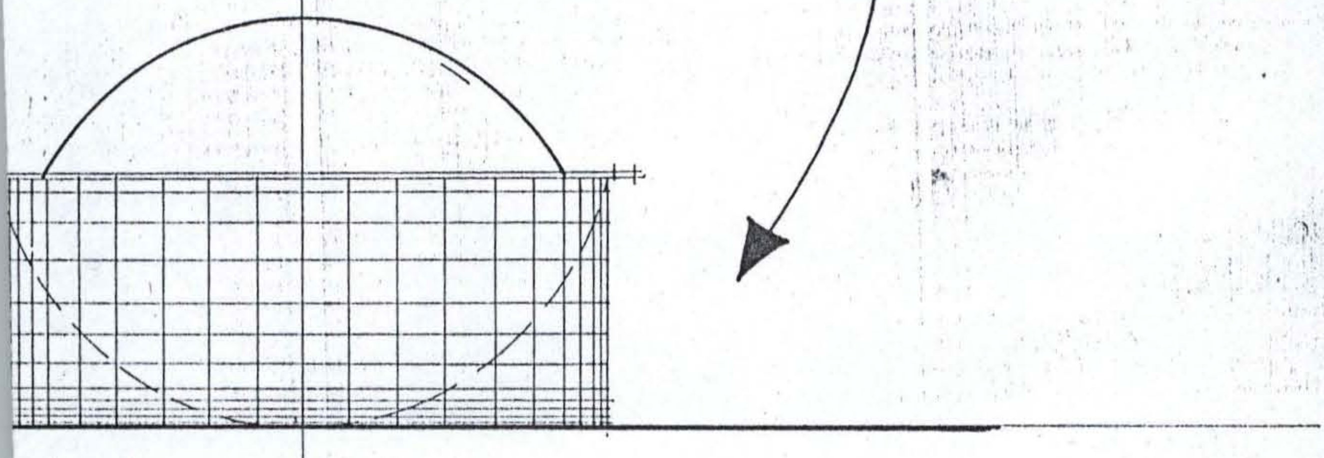


STAGE 1

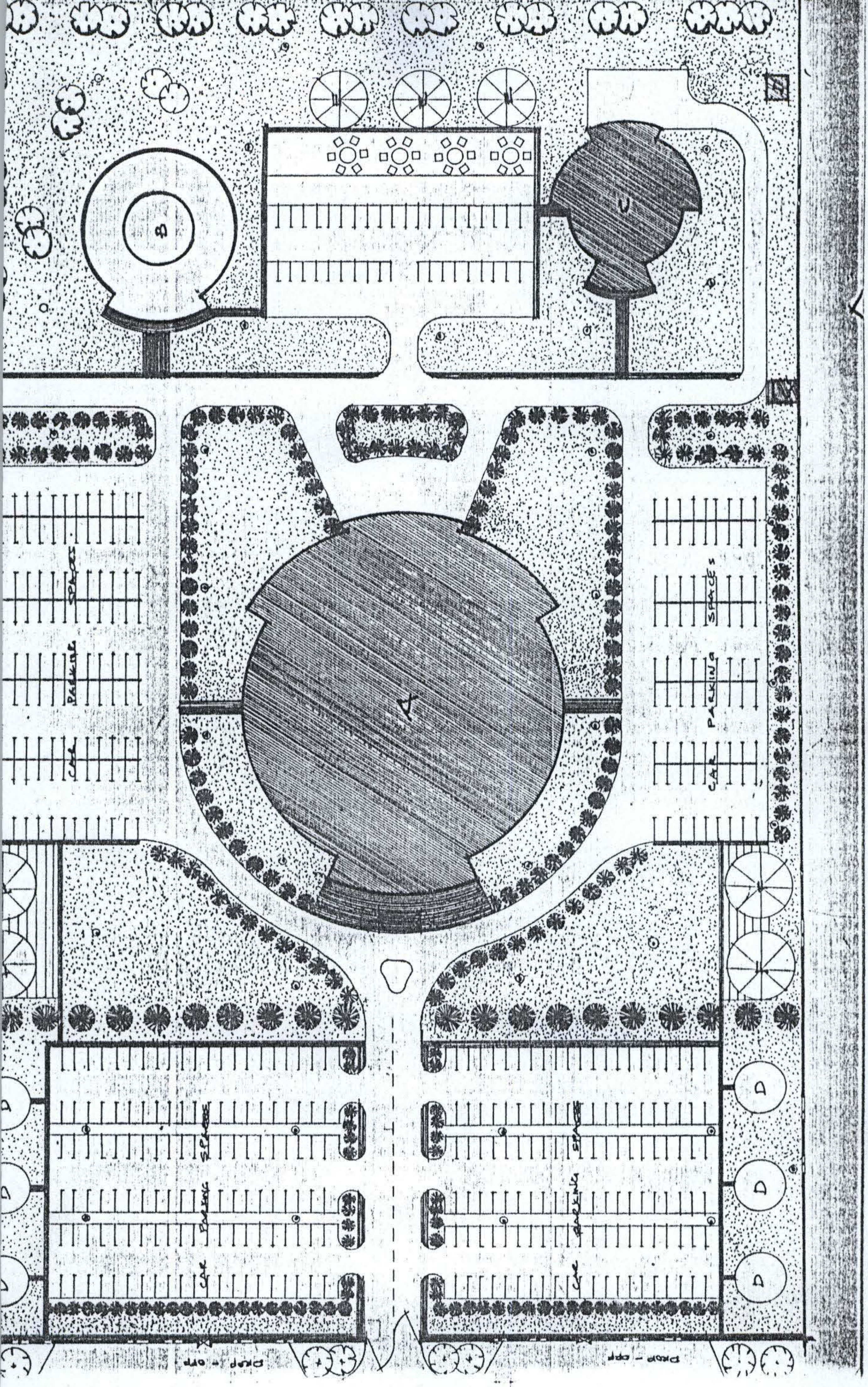
FOR NATIONAL



STAGE 2



STAGE 3


A
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CAR PARKING SPACES
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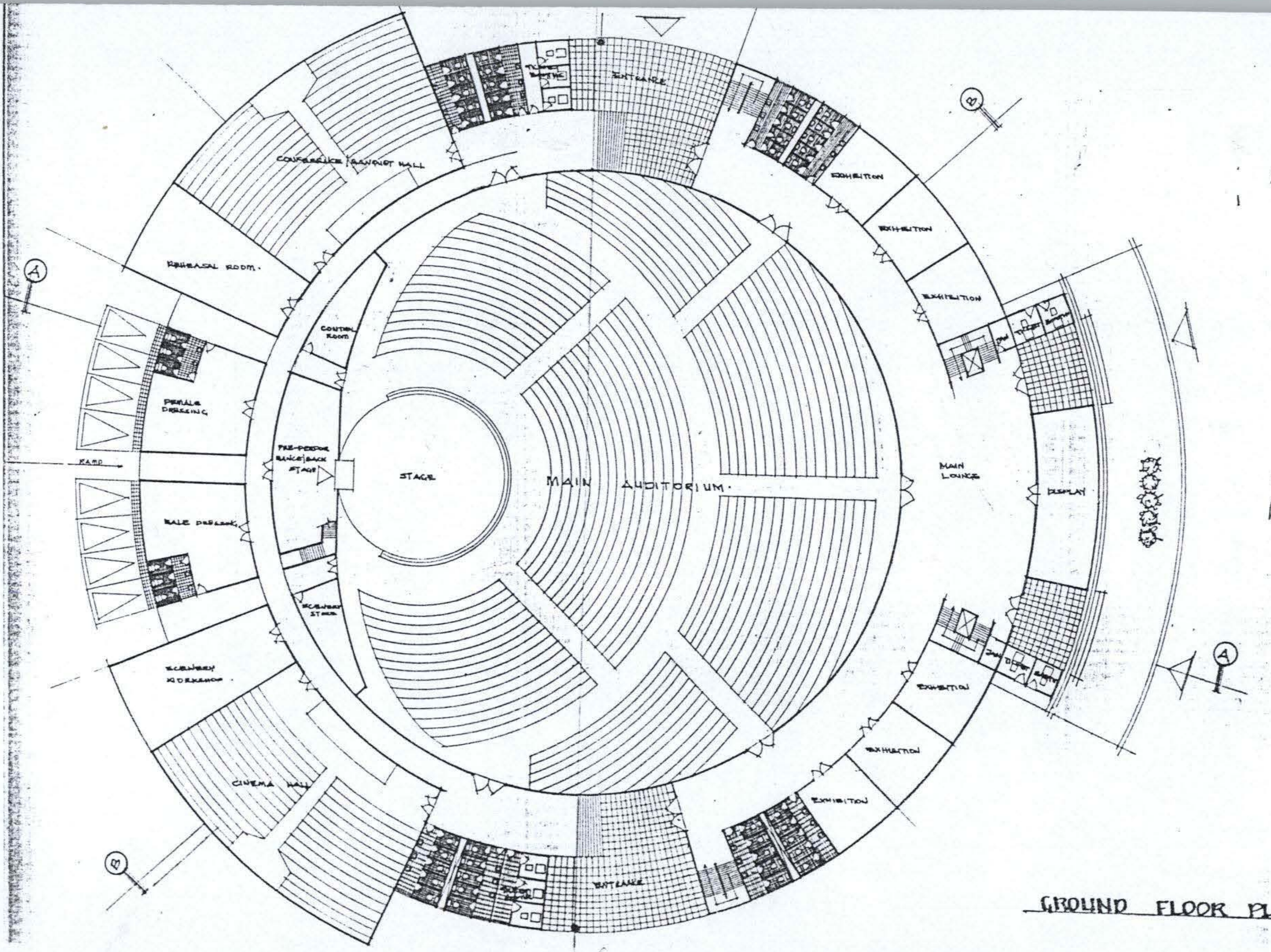
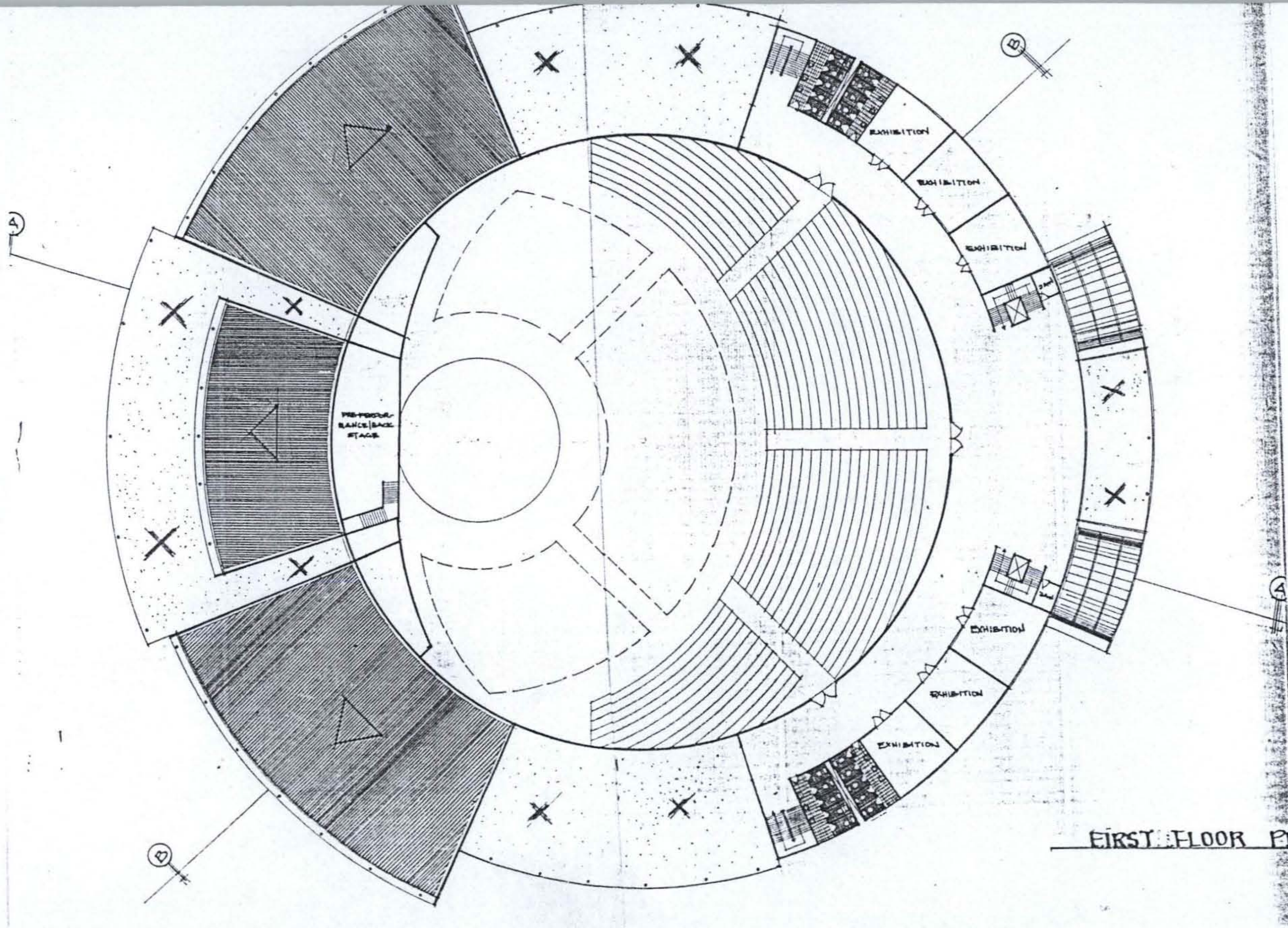
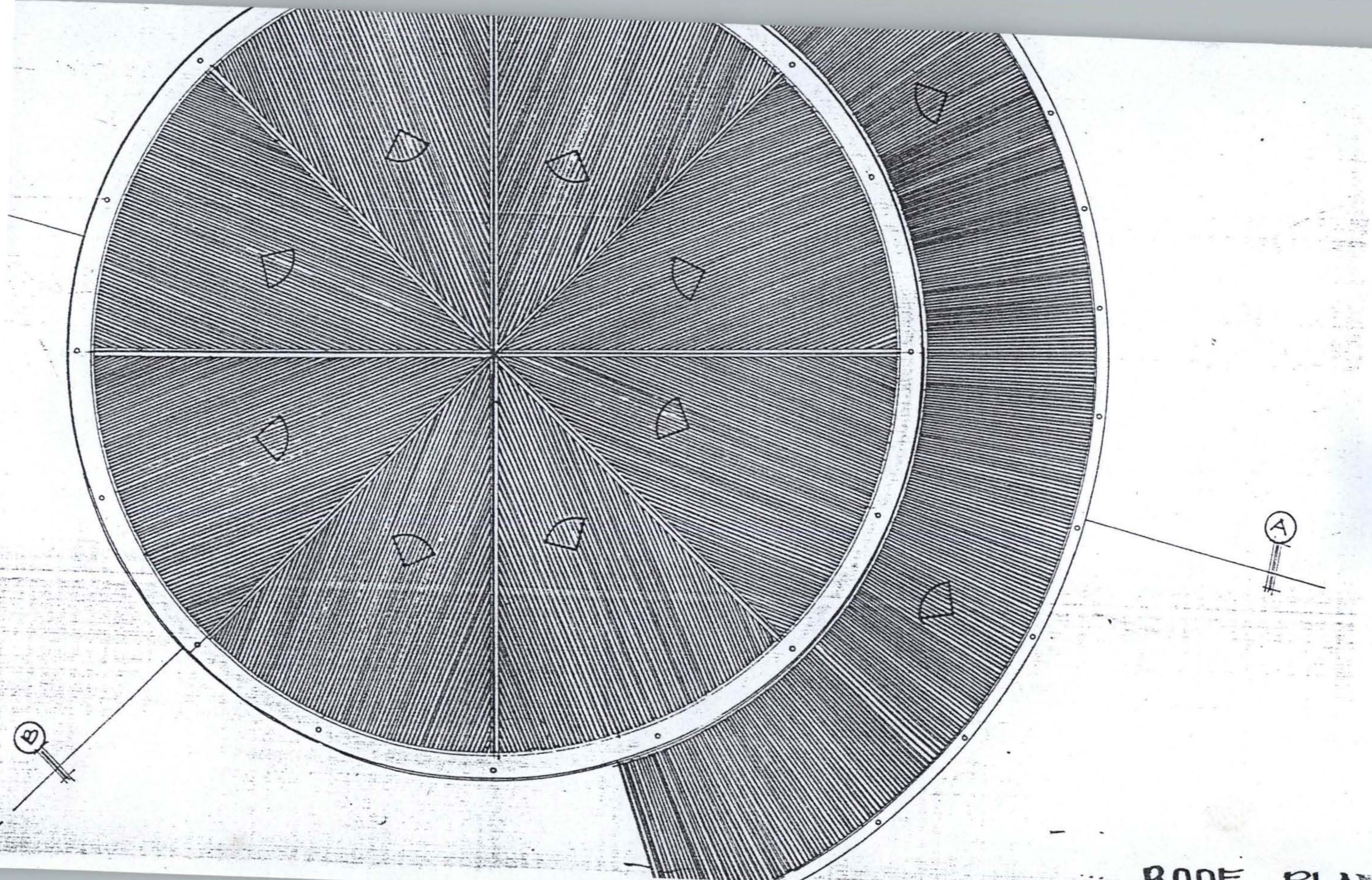
DROP - OFF



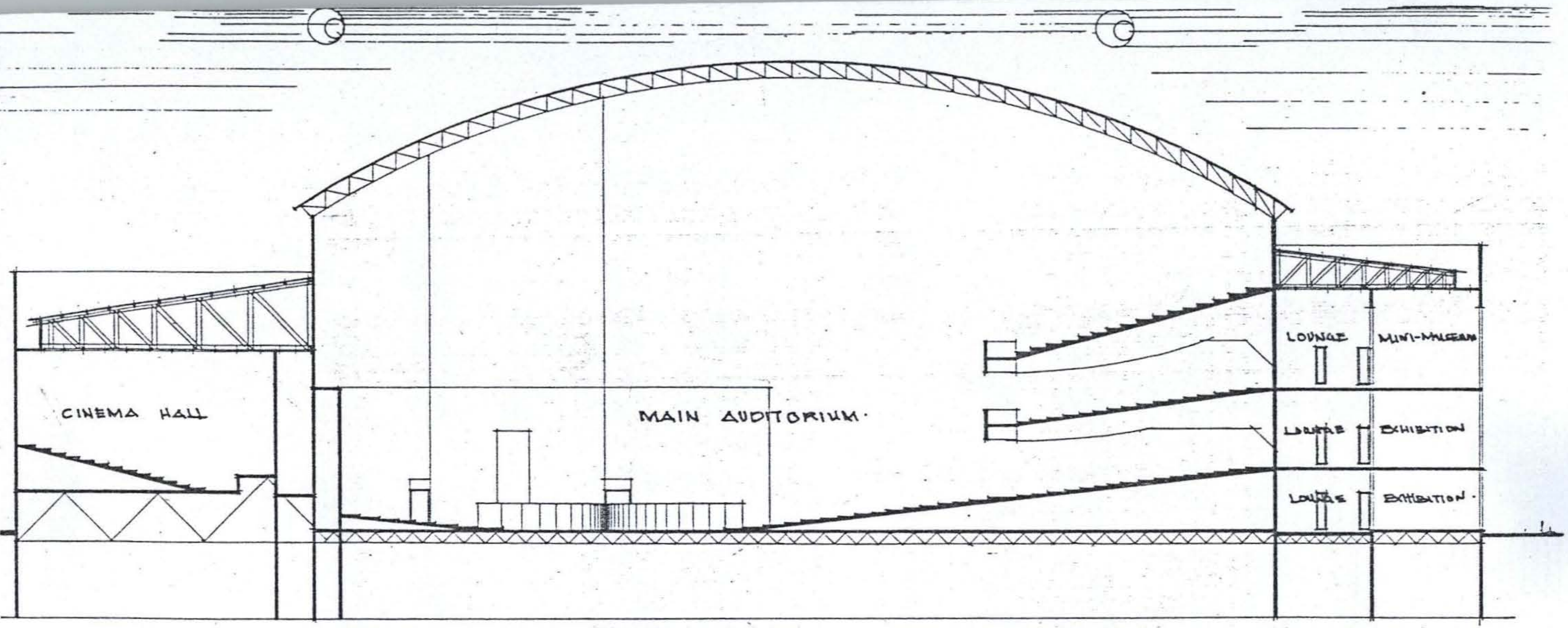
GROUND FLOOR PL



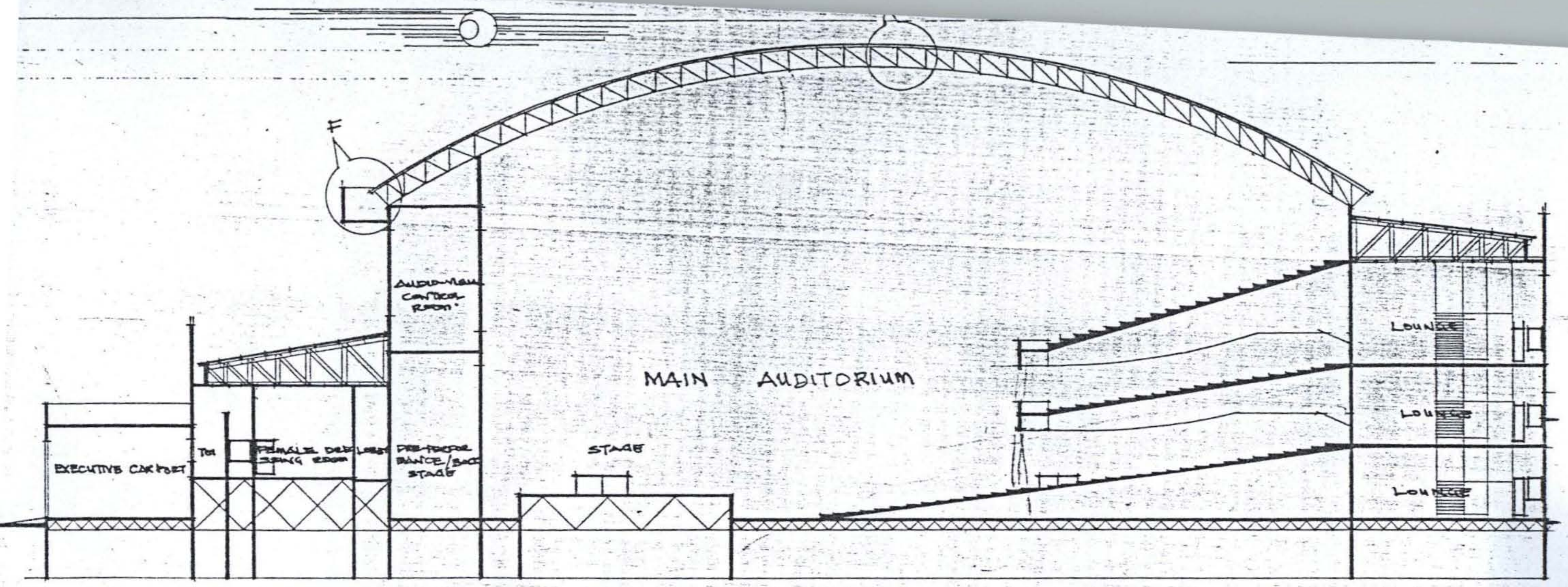
FIRST FLOOR Pl



ROOF PLA

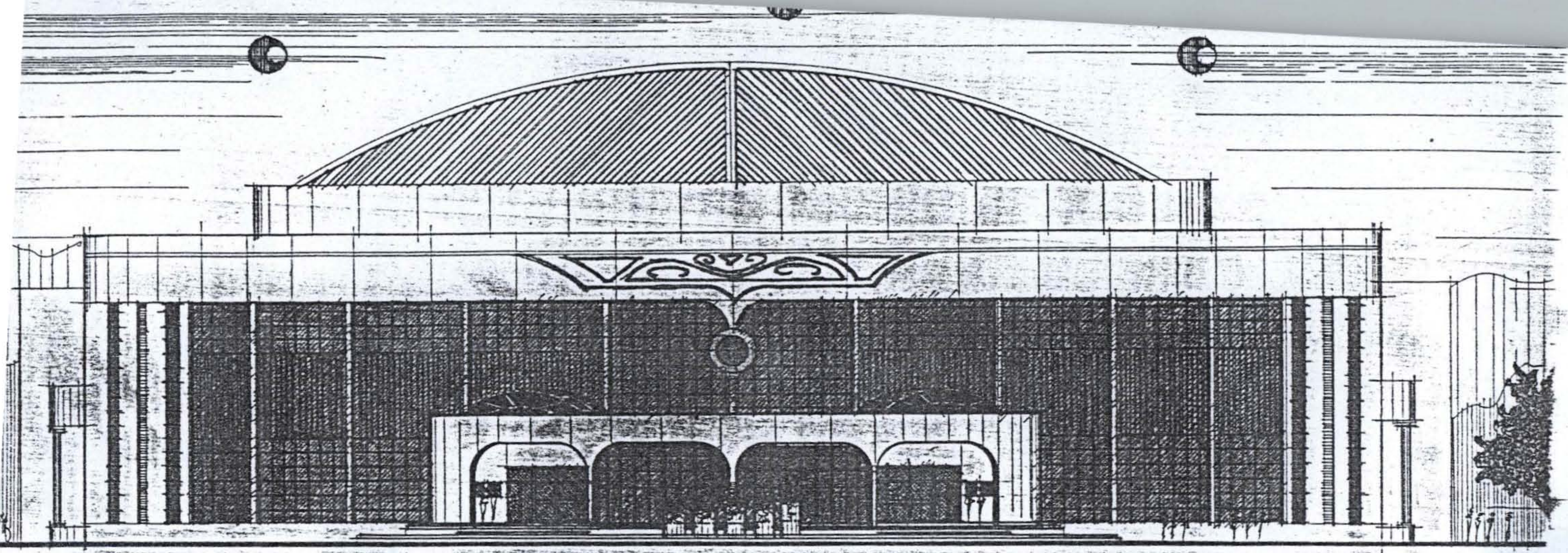

CINEMA HALL
MAIN AUDITORIUM
LOUNGE
MINI-MUSEUM
LOUNGE
EXHIBITION
LOUNGE
EXHIBITION

SECTION

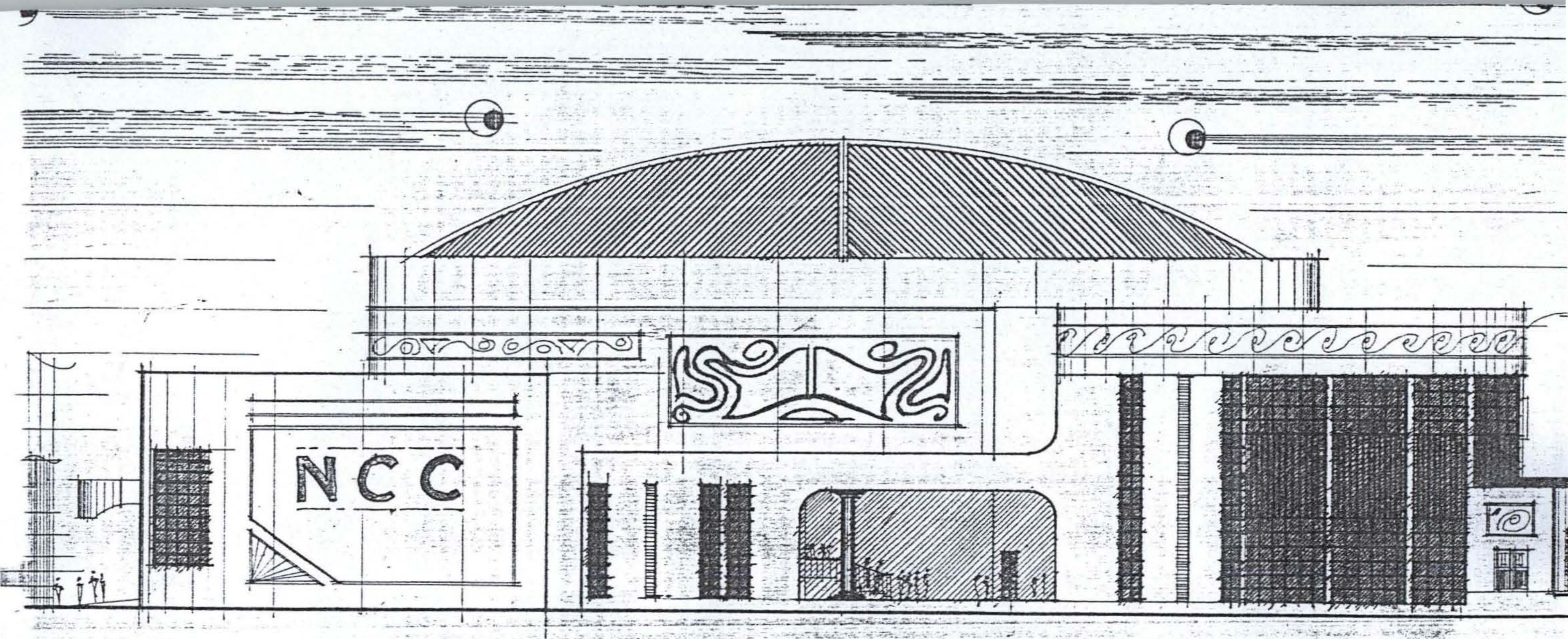


MAIN AUDITORIUM
STAGE
LOUNGE
LOUNGE
LOUNGE
EXECUTIVE CARPORT
TOI
F

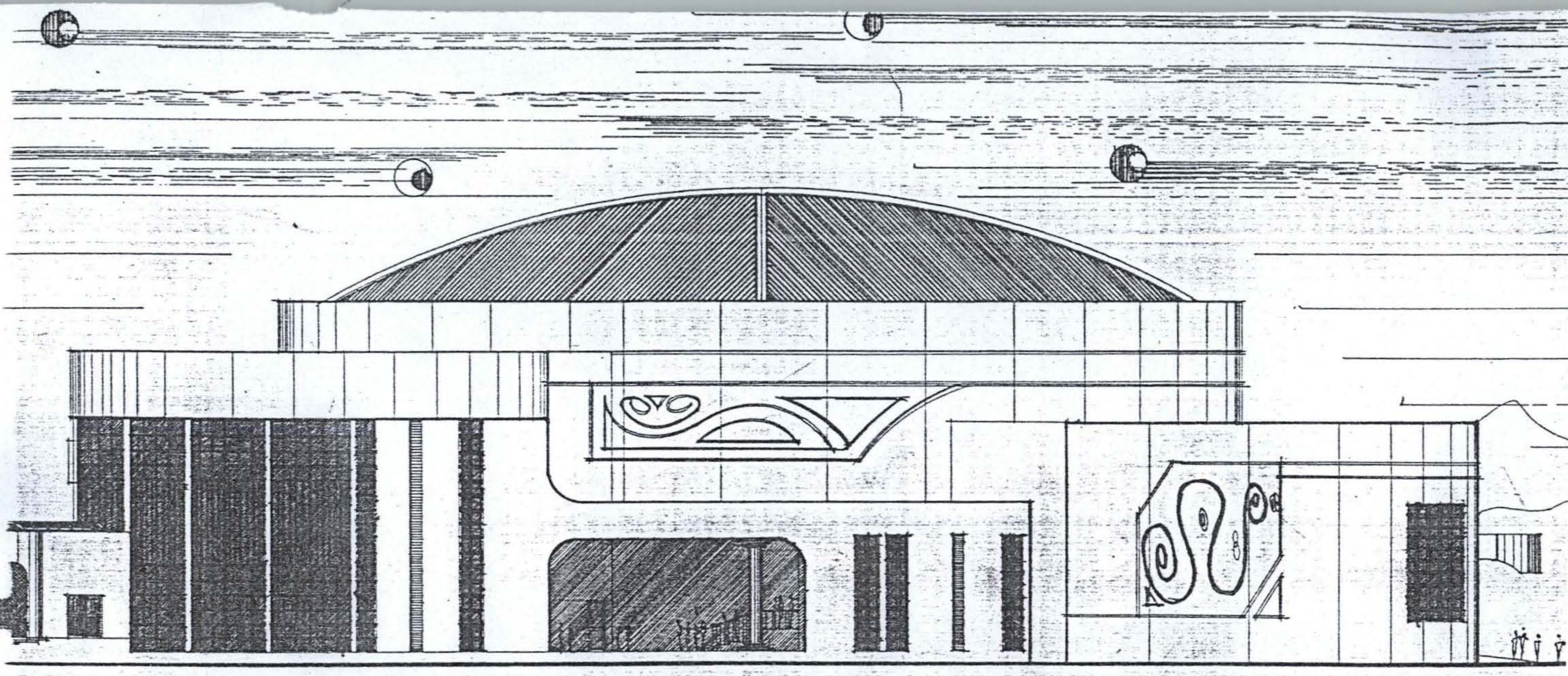
SECT



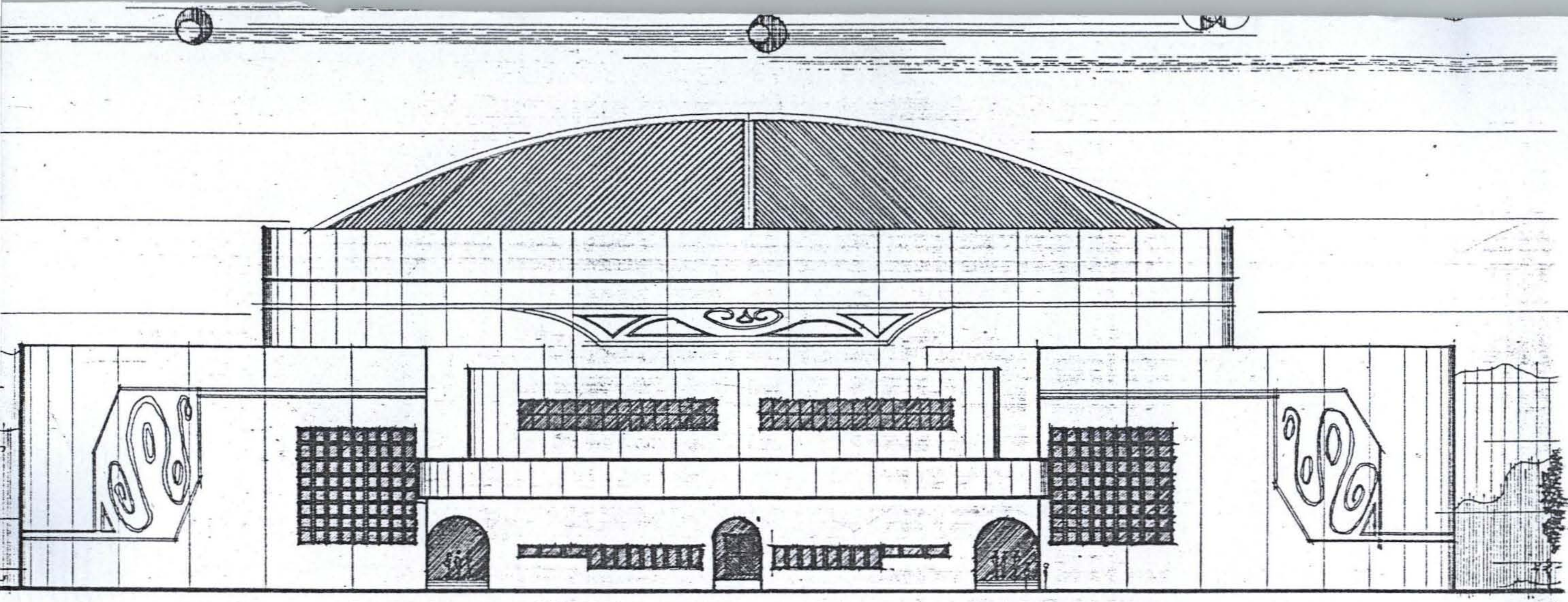
APPROACH ELEVATION



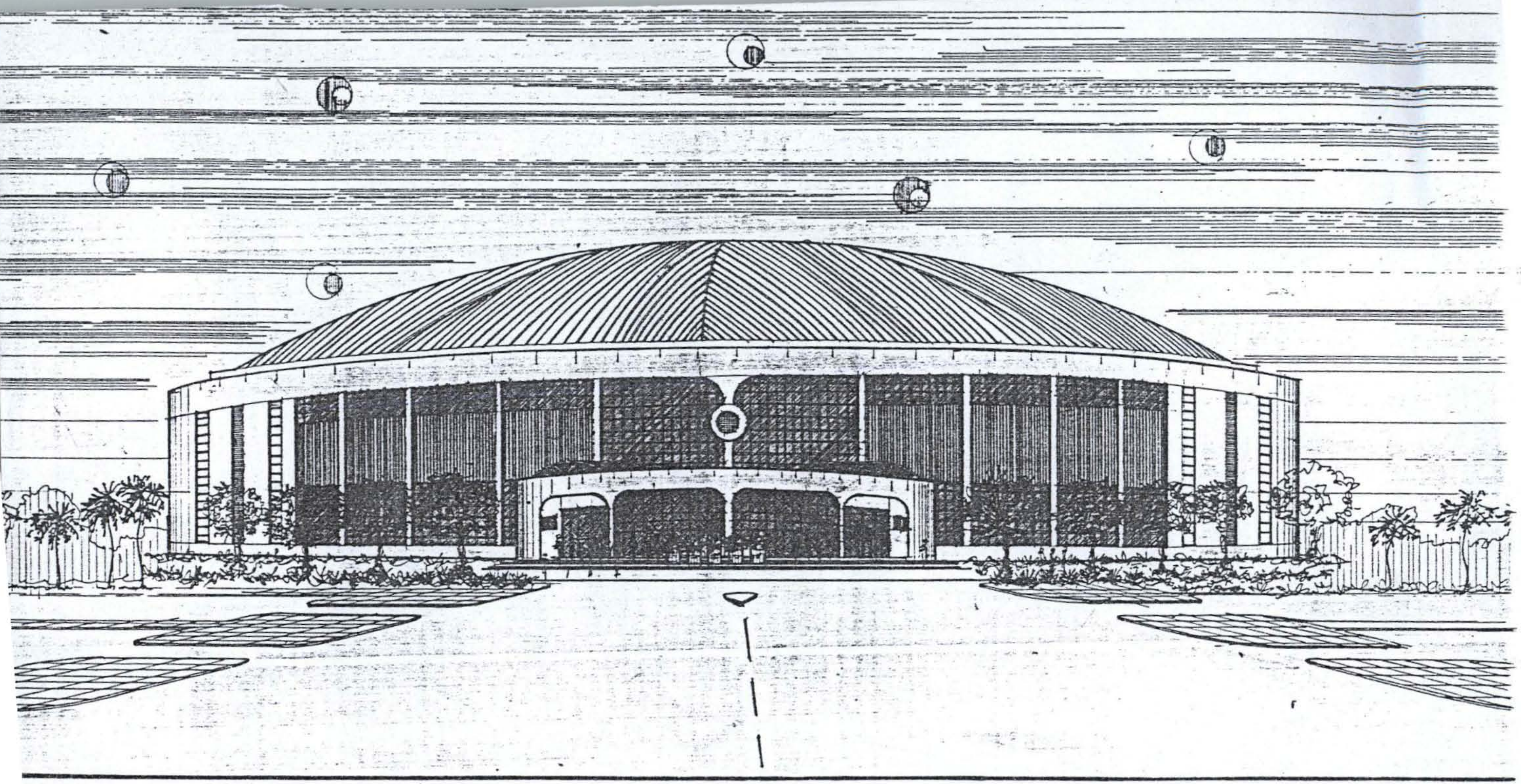
LEFT SIDE ELEVATION



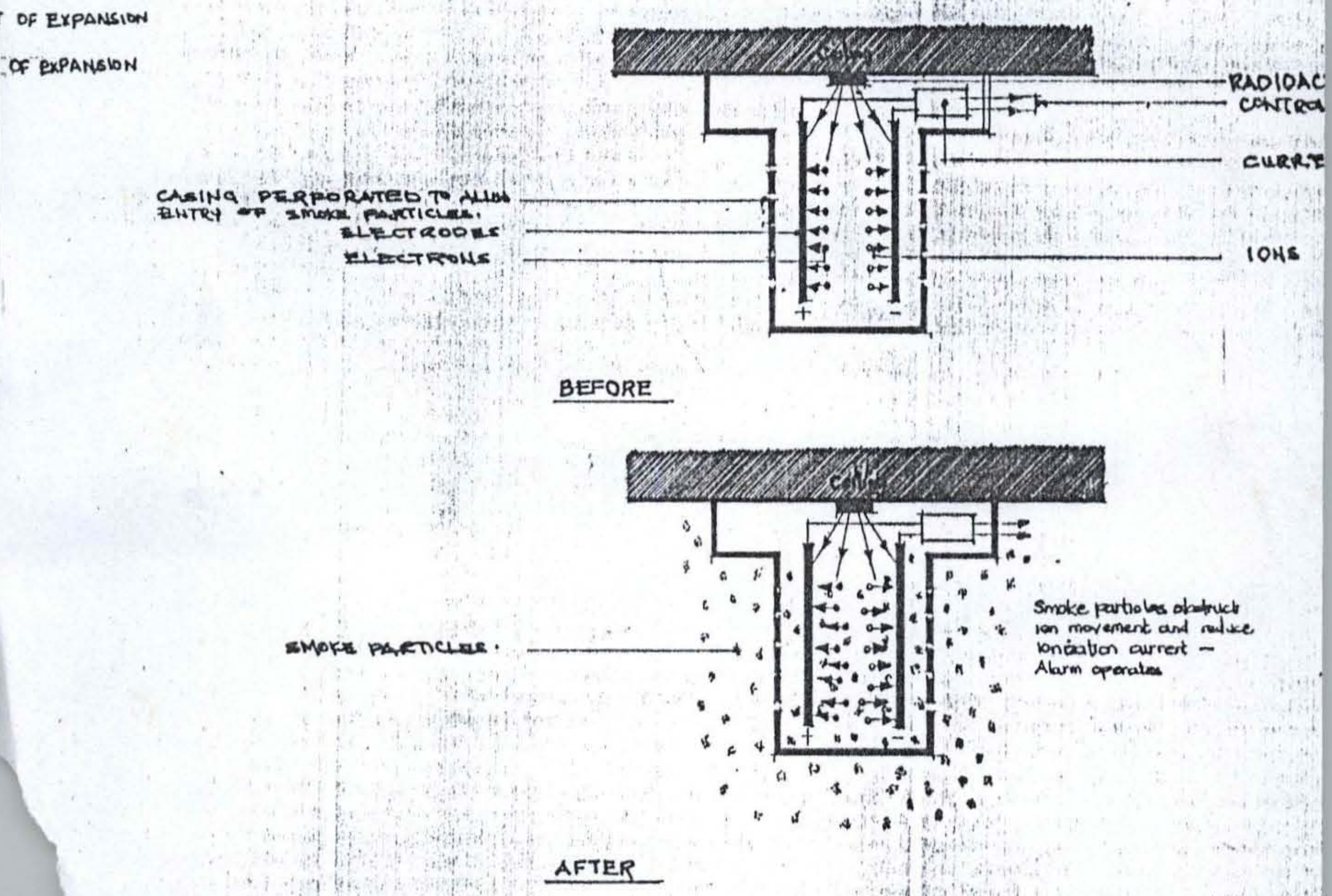
RIGHT-SIDE ELEVATION



BACK ELEVATION -

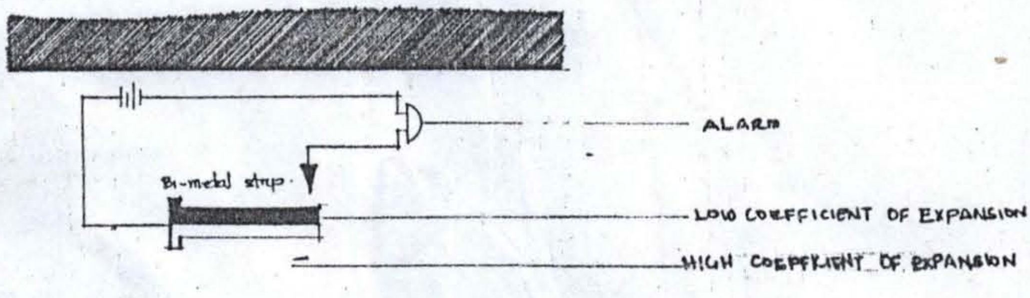


PERSPECTIVE VIE

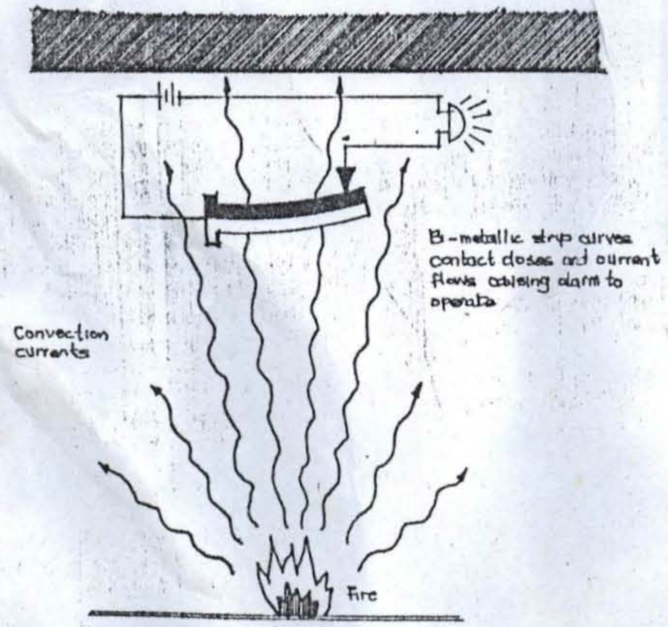


DETAIL D

IONISATION CHAMBER SMOKE DETECTOR.



BEFORE

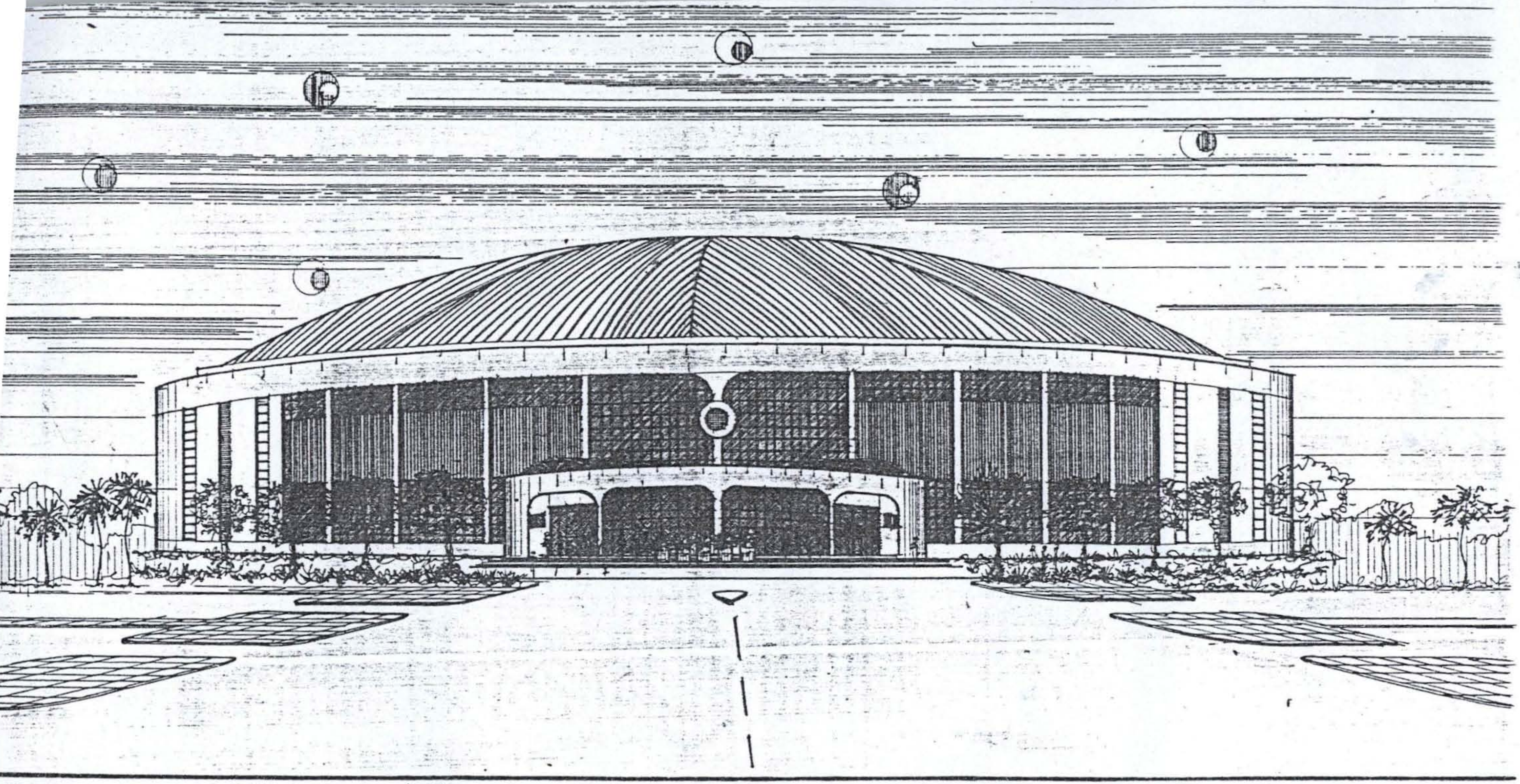


AFTER

CASING PER
ENTRY OF S

DETAIL C

ALLIC STRIP HEAT DETECTOR



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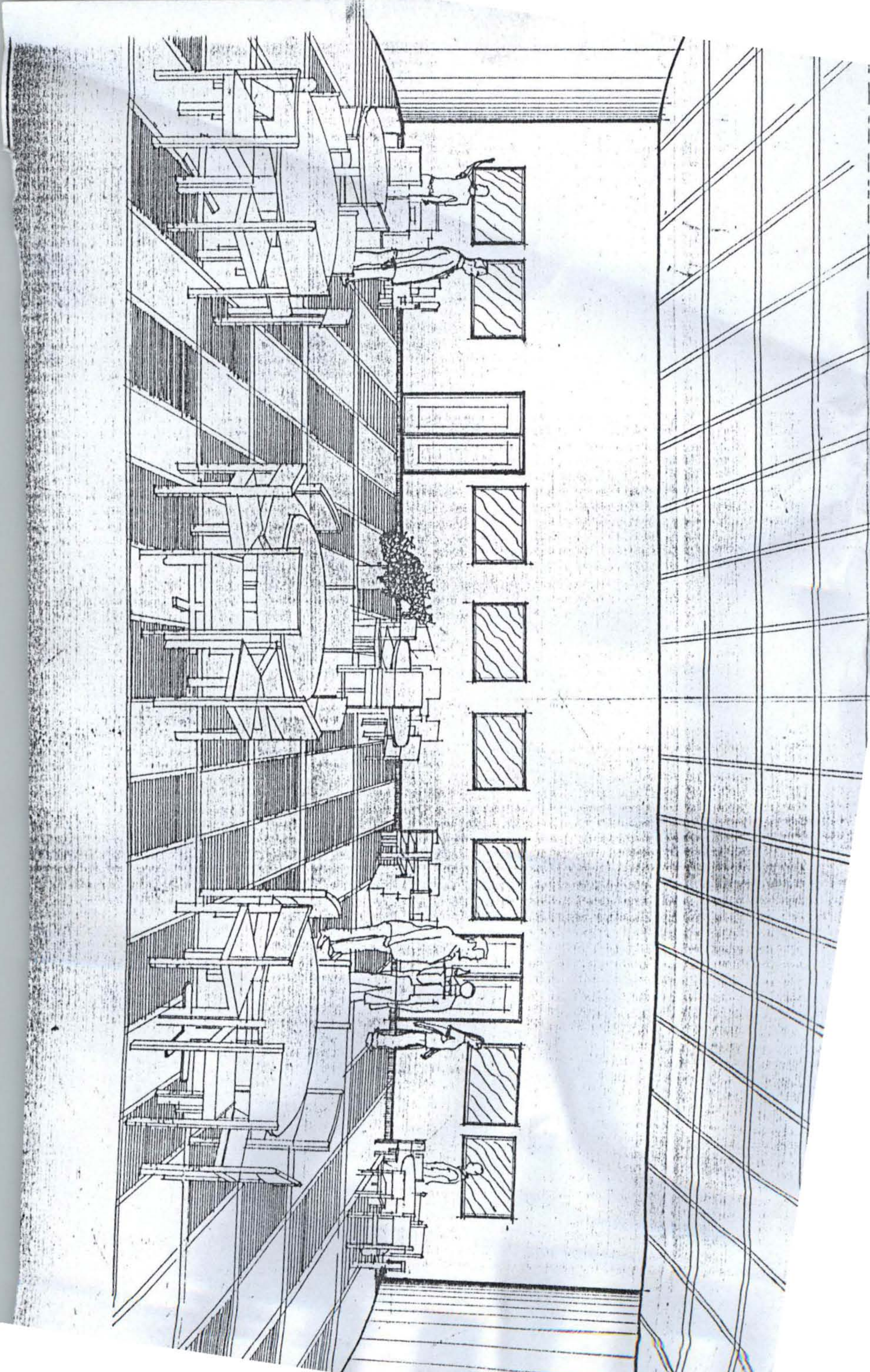

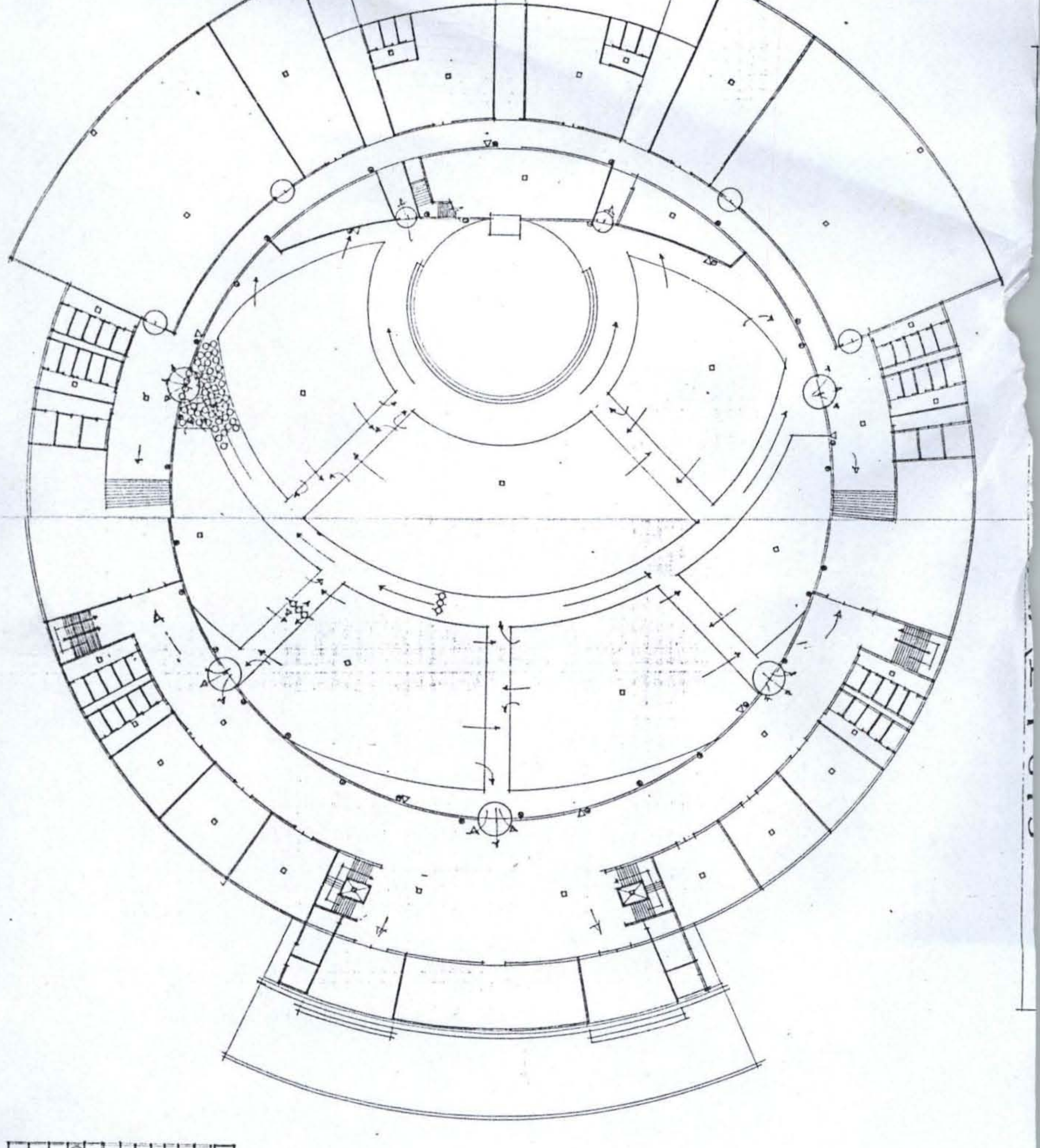
LEG
Ceiling
Smoke
Wall
Wall
Sidey