PRIVATE F.M. RADIO STATION ABUJA

BY

AMANYI PETER 91/1941

M.TECH ARCH.

SUMITED TO THE DEPARTMENT OF ARCHITECTURE FOR THE AWARD OF THE DEGREE OF MASTERS OF TECHNOLOGY IN ARCHITECTURE (M.TECH)

FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA.

DECEMBER, 1998.

CERTIFICATION

The undersigned, certify that they have read, and recommended to the school Board (i.e School of environmental Technology, Minna) for acceptance of this project title: "private F.M. Radio station Abuja"

Submited by Amanyi Peter in partial fulfilment of the requirements for the degree of masters of Technology (Architecture)

Supervisor

Sign/date

Head of department

Sign/Date

External Examiner

Sign/Date

Dean School of Environmental

Sign/Date

DEDICATION

This project is dedicated to the Almighty God for his guidiance and protection over me and granting me the patience and knowledge to hold stead fast unto my search for knowledge against all odds, that I may know and find the true meaning and power of education.

Praise be the Lord.

ACKNOWLEDGEMENT

I may not be able to acknoledge fully all the individuals that have contributed towards the accomplishment of this project.

However, I am greatly indebted to the following persons: my supervisor Arc. Adesina R.B. for her contributions and understanding; my parents Mr. & Mrs Amanyi for their contributions, all my brothers and friends and the entire Amanyi family for their contributions towards seeing this project through; my head of department Prof. Solanke; my lecturers etc.

My profound gratitude goes to Lawyer & Mrs Andrew Ndanusa for the care and love they showed throughout my stay with them during the period of my academic pursuit.

God bless.

ABSTRACT

Radio broadcast has grown tremendously in Nigeria since it's introduction in the country.

Most states of the federation have one or more F.M. radio stations for quality entertainment. This radio stations are either owned by the state government or pirvate individuals.

Recently, the federal government of Nigeria deregulated Radio broadcasting and issued licences to private bodies who wish to venture into the business of radio broadcasting. This reason has given rise to high level of competition between radio stations hence improving the quality of radio transmission in different states of the federation.

Abuja the federal capital has just one radio station (transmitting in medium wave band), but just recently a proposal for an F.M. (frequency modulated band) radio station for the federal capital was approved and just commenced construction. A private radio station of high technology and personnels will give homes in Abuja the choice of variety in qualitative entertainment. This I intend to achieve by bringing up a design that is unique and can withstand the test of time.

TABLE OF CONTENT

Table of Content (Contd.) ... Page

Table of Content (Contd.) ... Page

CHAPTER ONE

1.1: INTRODUCTION

Systematic disemination of entertainment, information, educational programming and other features for simillaneous reception by a scattered Audience with appropriate recieving apparatus is what Encyclopedia Britanica defines Broadcasting. "Broadcast may be Audible only, as in radio which is aimed at capturing the Audio-consciousness of the individual listener, or visual or combination of both."

The broadcast of a personal or social event contains an element of realiam that is not present in print. This can be easily demostrated by comparing the radio account of a rocket launching and the newspaper version of the same event. To listeners the event is "real" - it is happening at that moment, and they hear the voices of actual participants conveying shades of meaning that are not apparent in print. In addition, listeners hear background sound which enhances the quatity of realism.

Radio has the ability to transport listeners around the world or backward or forward in time. Broadcast may originate from any place and dramatic techniques enables the medium to break the barriers of time.

The purpose of Audio system is to extend the senses of hearing beyound their natural limits. The aspect of natural hearing to be considered in a radio broadcast system includes the ability of the human ear to distinguish the pitch, loudness and distribution of sound.

There are different types of radio stations i.e. The medium wave band, the short wave band, and the frequency modulated band. To a layman, all that matters to him is the ability of his radio reciever to produce nice sound open switching on. If is not

surprising therefore when one wonders how the radio reciever works, who makes it work etc. This factors gave me the desire to handle the design of a building that would be sound, functional and comfortable for a systematic disemnation of sound to listeners in the Federal Capital Territory and it's environs.

1.2: MOTIVATION

Abuja, the Federal capital of Nigeria deserves a standard medium for entertainment and information which from every perspective is the most vital form of communication.

Recently, the federal Government of Nigeria deregulated Radio Broadcasting and issued licences to private bodies who wish to venture into the business of radio broadcasting. This reason has given rise to high level of competition between radio stations, and hence improving the quality of radio transmission in different states of the federation with the Federal Capital not participating. This has motivated me to face the challenge of providing the Federal Capital with a radio station that will stand the test of time.

1.3: AIMS AND OBJECTIVES

(a) To design a radio station that will be acoustically sound and carry out transmission of programmes.

(b) To bring quality entertainment in to homes in the Federal Capital.

(c) To design a radio station with a high quality standard.

(d) To carry out a study on the procedures of broadcasting, personnel and operational spaces with a view to designing a radio station that will meet the demand of these modern day entertainment.

1.4: SCOPE OF STUDY

This project will concentrate on finding Architectural solutions to the acoustic problems in an F.M. radio transmitting station. This will include the study of the functions in an F.M. radio station - the equiptment, personnels production of programmes and other services.

1.5: RESEARCH METHODOLOGY

In order to carry out this study, various methods of obtaining research information or data were employed. This include

- Literature review:- liberaries were extensively used. i.e. finding information by consucting books, journals etc.
- Case studies:- This involves knowing the extent of work carried out in the area of study.
- Interviews:- This method is used by asking quastions from qualified persons who have knowledge about radio stations.

1.6: LIMITATIONS

Inadequate information about cases studied due to security reasons.

CHAPTER TWO

2.1: RADIO BROADCASTING DEVELOPMENT

Only a few years ago, many who were witnessing the burgeoning of television were predicting the imminent death of radio. In fact, however, radio has grown and been greatly strenghtened. It continues as a potent social force, with its national influence channeled through more than 6,000 broadcasting station.

There were more than 450 such stations in the united states in 1970, most of which were broadcasting in the F.M. frequencies reserved for their use by the federal commmunication commission (F.C.C.) between 88.1 and 91.9 megacycles. Others broadcasting in the AM or standard, broadcast channels.

The broadcasting systems of countries outside the united states can generally be differentiated from those in the united states of the basis of the extent and nature of government involvement. Although in all cases government involvement should not be interpreted to mean government control of broad casting, it usually does mean a different system of financing and least the indirect involvement of government in production. Such conditions are frequently accompanied by major national commitments to the educational use of broadcasting.

Radio broadcasting is a means of transmitting information, entertainment, educational programming and other features. For instance, Radio Sweden broadcasts instructional programmes to more than 12,000 participating schools and prints approximately 2 million school radio publications a year (Loney 1964). South Korea has instituted a national instructional radio service over the Korean Broadcasting system which the education ministry regards as very important in the raising of educational standards (Hulsen 1967).

2.2.1: Radio Broadcasting Studio

Planning of Radio studios using the term studios in the broad sense encompasses all facilities for broadcasting excluding broadcasting equiptment for stadiums, arenas, concert halls etc. as this project will centre on planning an individual station, with may be commercial or non commercial.

Planning of a morden radio station, while constrained by the technology of broadcasting, is determined to a large extent by the stations operating practices. It is essential to realize that, while all stations perform the same basic functions, there are wide divergences of operating practices and philosophy. Planning, therefore, starts with a careful analysis of the stations method of operation.

The most important single influence on facility requirements is the type of programming. In current practice this will usually consist of one or more of the following. i.e. music, news and public features, interview and panel discussions and production of advertising commmercials. Some stations may have special requirements for dramatic or Audience participation shows but this is no longer common. Recently, many music oriented stations have adopted authomation, which means basically, that not only the music but announcers commentary, time checks, station breaks etc. are all pre-recorded and all switching is handled Authomatically. This has significant impact on both layout and power requirement. For all stations an important planning question is the extent of "Live" versus recorded programming.

Apart from programming, other planning factors for a studio include

- Hour of operation
- Relationship to public

- Relationship to talent sources
- Government Regulations
- Emergency Broadcasting system (EBS)
- Relationship of studio and transmitter facilities
- Operating procedures

All stations are licensed by the federal communications commission, whose very detailed regulations influence every aspect of operation and hence planning. Regulations, which require constant monitoring of certain devices, influence the configuration of the control room. Most stations are familiar with there requirments, but for a new station, use of an outside consultant may be desirable. As an example, an FCC regulation requiring seperate AM and FM program facilities seperate and, in some cases, apart from the AM facilities in some stations that were formerly combined.

Studios and transmitter may be at the same or seperate locations. Similarly, stations (such as an AM and FM) may share certain facilities.

Most larger commercial radio stations are highly unionized. Work rules vary from one locality to the next and can have sufficient influence on planning of studio facilities. In some locations a disk Jockey may actually operate the tape or turn-table. In other areas, this work requires a studio enginner or even a seperate "platter spinner". Where regulations are less restrictive, one man may act as enginner and announce if he meets the licensing requirements. In all cases, a careful study of operating procedures is essential.

DESCRIPTION OF FACILITES

Radio broadcasting facilities may be considered under

- Technical (on air) facilities
- Support facilities

- Personnel facilities
- Facilities for off-premises operations
- Other broadcasting facilities.

The on-air facilities include the studios and control rooms that form the heart of the stations operation. In contemporary radio, music is almost alway prerecorded, and broadcast involving the public are likely to be recorded off premises at theaters, concert halls, legislatures etc. for these reasons large studios suitable for music or audience participation are not required in the station itself. In the exceptional case of an audience studio, the room would be designed primarily as a theater or auditorium with provision for taping or live broadcasting. This would be a facility apart from the studio.

The control room contains a control console for controlling the out put from a studio. In addition, it may house tape players, turn tables, and authomatic switching devices as well as a small amount of disk and tape storage. Plan dimensions are dictated by the equiptment to be used; occupants are one or two persons.

The maintenance shop is an electronic workshop and must be convinient to control and rack rooms. In addition to the usual work benches and test equipment, space must be available for spare parts and portable equipment for use on "remotes".

Similar in appearance and function to the city room of a newpaper, the news room is the central point for gathering and editing of news stories prior to broadcast. In some cases, news may be broadcast directly from the news room. News room will include television monitors, an assignment board, bulletin board, and mailboxes. In some cases, particularly in large networks, seperate offices are required for certain correspondents and writers, these should open onto or be not far from the newsroom.

Ideally the tape and record library should be convinient to the studio, especially for music-oriented stations. For a station featuring popular contemporary music, a space 10 by 15 it should suffice. As part of the library, or closely adjacent to it, should be facilities for Auditing or listening to tape and records.

Station offices will include facilities for executives, sales, programming, accounting, sheduling, operations etc. planning is similar to that for any other office. For most stations good meeting facilities are essential. They will be used for contact with sponsors and public officials as well as staff and should have provision for tape play back and audiovisual presentations. Some stations make effective use of a conference room designed to double as a studio.

Planning of reception areas depends on whether visitors are limited to persons on official business or will include the general public, school children etc.

Need for a cafetaria depends on the size of the station and the availability of other food services facilities. However, it even if a complete cafetaria is not to be provided, consideration should be given to a snack bar with vending machine. This is particulary important for after-hours use when other food services facilities are not available or for operating personnel whose duties do not permit them to leave the station. The snack bar can do double duty as a lounge.

Air conditioning is required in the studio's control and equipment rooms to protect sensitive equipment, as well as for comfort, and it is usually provided in other areas in keeping with modern practices.

RADIO TRANSMITTER FACILITIES

Radio transmitters may be attended or unattended. In some smaller stations, transmitter and studios share a single building; but for AM facilities, this usually means a less than optimum location for one or the other. Besides the transmitter building, the main feature of a trasmitter installation is the broadcasting antenna.

F.M. Facilities are limited to the antenna, which is usually mounted on a tower or mast, plus the transmitter itself. It is common for several F.M. stations to share a single mast or tower as well as for F.M antennas to be mounted an a T.V. or AM antenna tower. The main requirement for an FM antenna is height to clear the sorrounding terrain. F.C.C. regulations control the relationship between height and allowable broadcasting power, which depends on the class of station. Most F.M. antennas are between 200 and 1,000ft high.

Site selection for a transmitter facility is highly technical and is best entrusted to a consulting enginner specializing in this kind of work unless the station itself posesses the necessary expertise. Transmitter location is determined by antenna requirements, which differ sharply for AM and FM. For AM transmitter, a rural location is usually necessary to achieve the required ground conductivity and avoid interference with receiption in nearby homes, as well as to find the space needed for the ground system. F.M. antennas on the other hand, require mainly height and have been successfully located in cities, on top of tall buildings. In addition to the necessary technical considerations, the site should have:

- All-weather access
- Reliable power supply
- Reliable telephone services
- Powking space.

The ground area required by the spread of the spread of the guys and the need to accommodate the ground radial system can be quite extensive. Some of this acreage can be sold or leased or deed for protection and maintenance of the ground system.

Safety should be considered in locating the transmitter building. Although structural tower failure are rare, collapses caused by accident (aircraft) or sabotage are not unknown. If possible, the transmitter building should be so placed that, in the event of such a catastrophe. The tower would be likely to fall clear of the building. An AM transmitter may be located some distances from the antenna. FM transmitters must be as close to the tower as possible, to minimize line losses. AM towers, which are usually of steel, are given a heavy coating of zinc galvanizing. This serves to protect the tower, but it's primary purpose is to provide electrical conductivity. At radio frequencies, the "current" flows mainly along the outside periphery of the tower. Section of the tower must be electrically banded together for the tower to function properly. FM towers serve only to support the seperate antenna and are designed purely for structural considerations. All towers require aviation marking (alternate white and orange striping) and obstruction lighting; details are found in FCC regulations. In addition to space for the transmitter itself, there should be space for the associated equipment racks, maintenance, spare parts storage, and toilet facilities even an "unattended" facility is occupied periodically for inspection and maintenance. If the station is quite remote, minimal kitchen facilities and a shower may be desirable.

The amount of equipment which must be contained in the transmitter building depends on the station's assigned operating power.

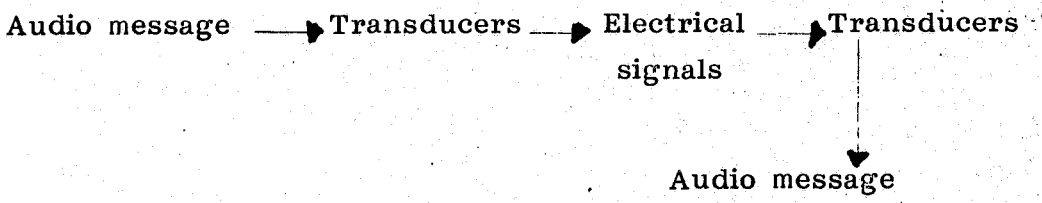
This can vary from 250 watts for very small stations to 50 kivowatts for the larger commercial stations.

Program signals may be brought to the transmitter by leased telephone liner, microwave, or a combination. Some transmitters have two primary power services from different substations and feeders for greater reliability; usually automatic switching between services is included. Emergency power is required for Emergency broadcasting system (tBs) stations and may be desirable for others, particularly where the primary power source is subject to interuption. If provided, it should be sized to handle minimal lighting, tower obstruction lighting, and transmitter ventilation as well as the transmitter itself. The transmitter generates considerable heat, which must be removed by mechanical ventilation. This system consist of a filtered intake with a ducted exhaust connected directly to the transmitter. Dampers are arranged so as to reduce the amount of outside air during the winter and make use of transmitter heat.

2,2,2. Stages of Radio Broadcasting

Radio Broadcasting involves three major stages which include

- Conversion of Audio message into radio or electrical signals
- Transmission of the electronic signals from the studio through antenna.
- Conversion of the electronic/electrical signal into Audio message for listeners to hear.



In a radio studio, Audio messages produced in the studio are sent to an equipment called (P.I.E.) programme input equipment which pre-amplifies signals from the studio before sending it to the Audio processor (uptimum F.M.). The Audio processor filers the signals and at this stage the Audio message is converted to electrical signals before passing to the main transmitter.

In the transmitter, the signal passes through an exciter than to an Intermidiate Power Amplifier (I.P.A) from the I.P.A it passes on to the main power amplifier before going to the fold back which sends the signals out through the antenna.

This signals are in electrical form and has to be converted to Audio signals for listening by radio recievers.

CHAPTER THREE

3.0: CASE STUDIES

3.1: F.M. RADIO STATION MINNA

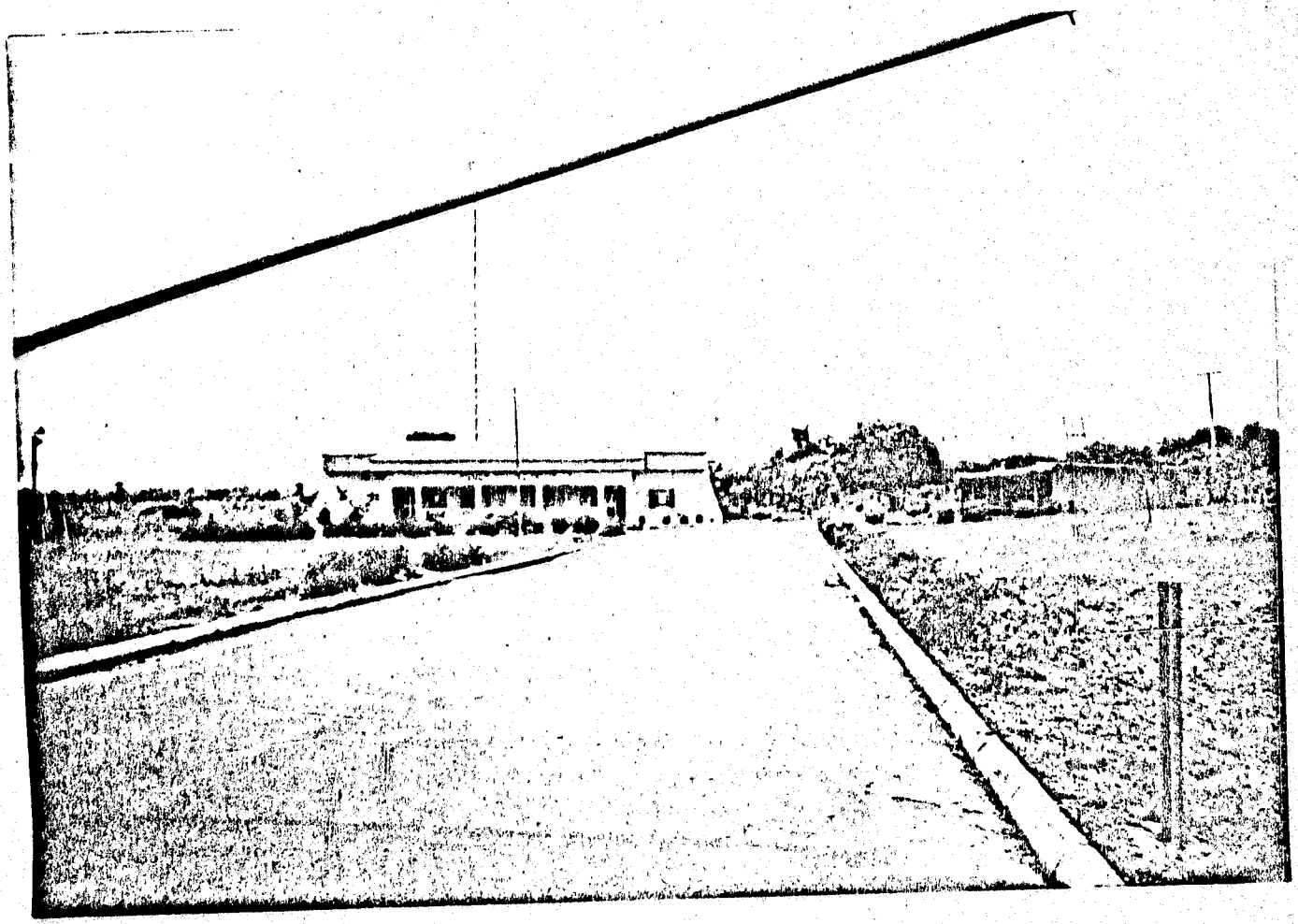
1.1.3: Introduction

F.M. Radio Transmitting Station Minna is situated at Maitumbi in Minna the capital of Niger State. The station was established in November 1995. It is managed by the Niger State broadcasting service (N.B.S). The station is a complex having a transmitting capacity of 30kw(F.M). The station has two transmitters with only one functioning know. It has two studios, a control room, music library, reception, transmitter room which is also within the complex and offices for staffs. The mast on which the antenna is mounted has a height of 300meters - transmitting on 91.2 F.M. band.

3.1.2: Architectural Evaluation

F.M. Radio transmitting station Minna is located in Maitumbi. Just from entrance to the premises, is a straight road which leads to the main building which houses offices such as

- Reception
- Library
- Studios 1,2 and 3
- Transmiter room
- Station enginers office
- Managers office
- Power house
- General office
- Toilets.



APPROACH.

The station has car park for its staffs. The antenna is mounted on a mast 300 meters high and just behind the transmitter room.

3.1.3: Observations

(i) Merits

a. Good site location

(ii) Demerits

a. Poor Architectural presentation of forms

b. Poor maintenance of equipments

c. No landscaping elements

d. Inadequate workers facilities

e. Inadequate parking spaces.

3.2: F.M. RADIO STATION ABUJA

3.2.1: Introduction

F.M. Radio station Abuja is situated along Abuja - Suleja road on strabay hill in Abuja the Federal Capital of Nigeria. The station is still under construction and has almost reached completion. The station is owned by the Federal Capital Development Authority (F.C.D.A.). The station is a complex having a transmitting capacity of 25kw (FM). The transmitter room is situated on a hill about 50 metres away from the station.

The station if commence operation will be using two transmitter for transmission. The antenna is mounted on a mast 250 meters high.

3.2.2: Architectural Evaluation

F.M. Radio Station Abuja is linked by a tarred road which turns round the hill the station is situated. The road goes in a turn as it gains hight to the point the station building is located which is about 40-50 metres from the ground.

On reaching the top of the hill, a straight road leads to the main building which houses offices such as

- Reception
- Performing studio
- Resting room
- Library
- Stores
- Studios 1,2 and 3
- Toilets
- Offices for staffs.

The complex is a one storey building with only one stair leading from the ground floor to the ifrst floor.

3.2.3: Observation

(i) Merits

a. Good functional flow

b. Up to date equipments

c. Good site selection

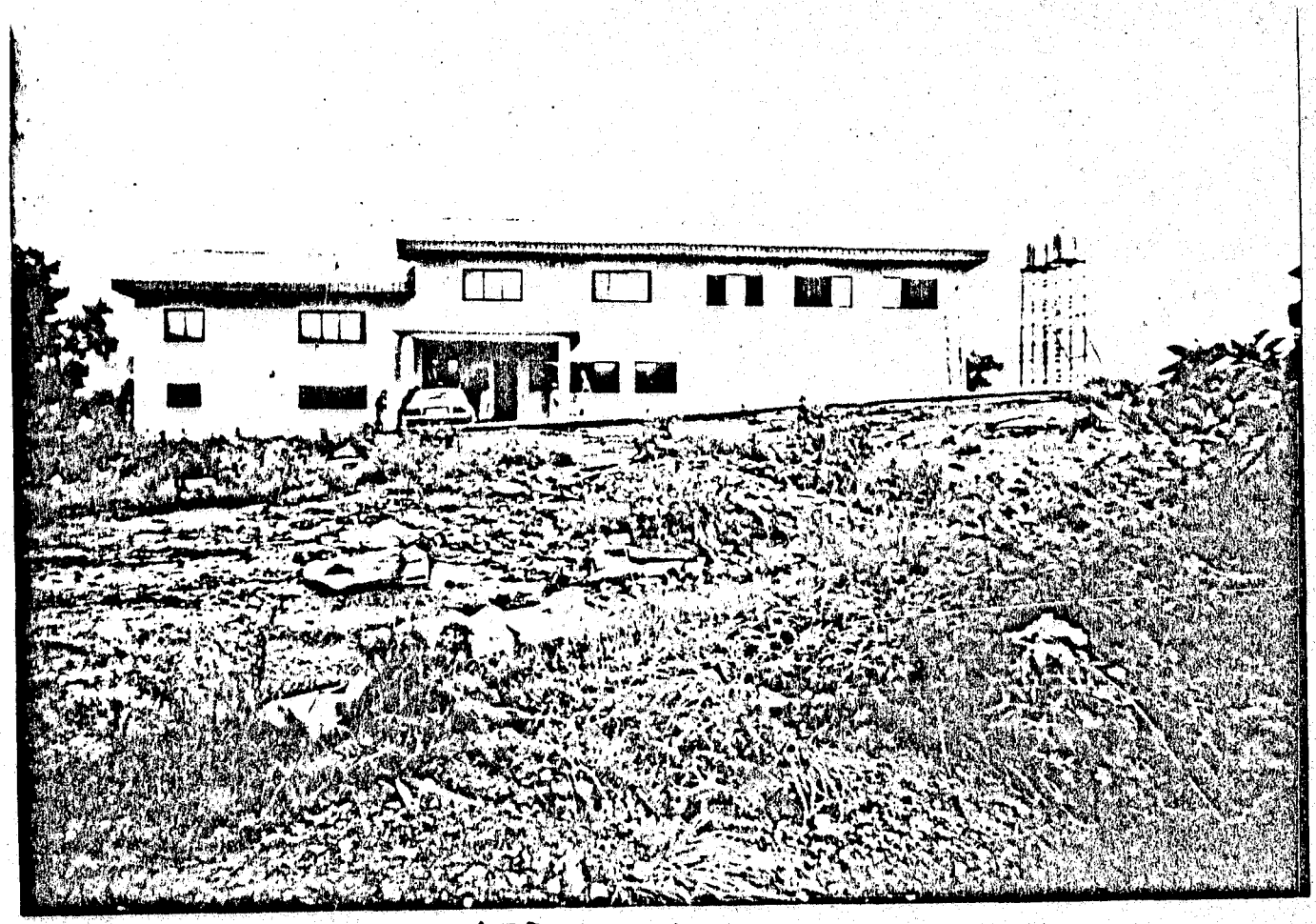
d. Use of natural Land form.

(ii) Demerits

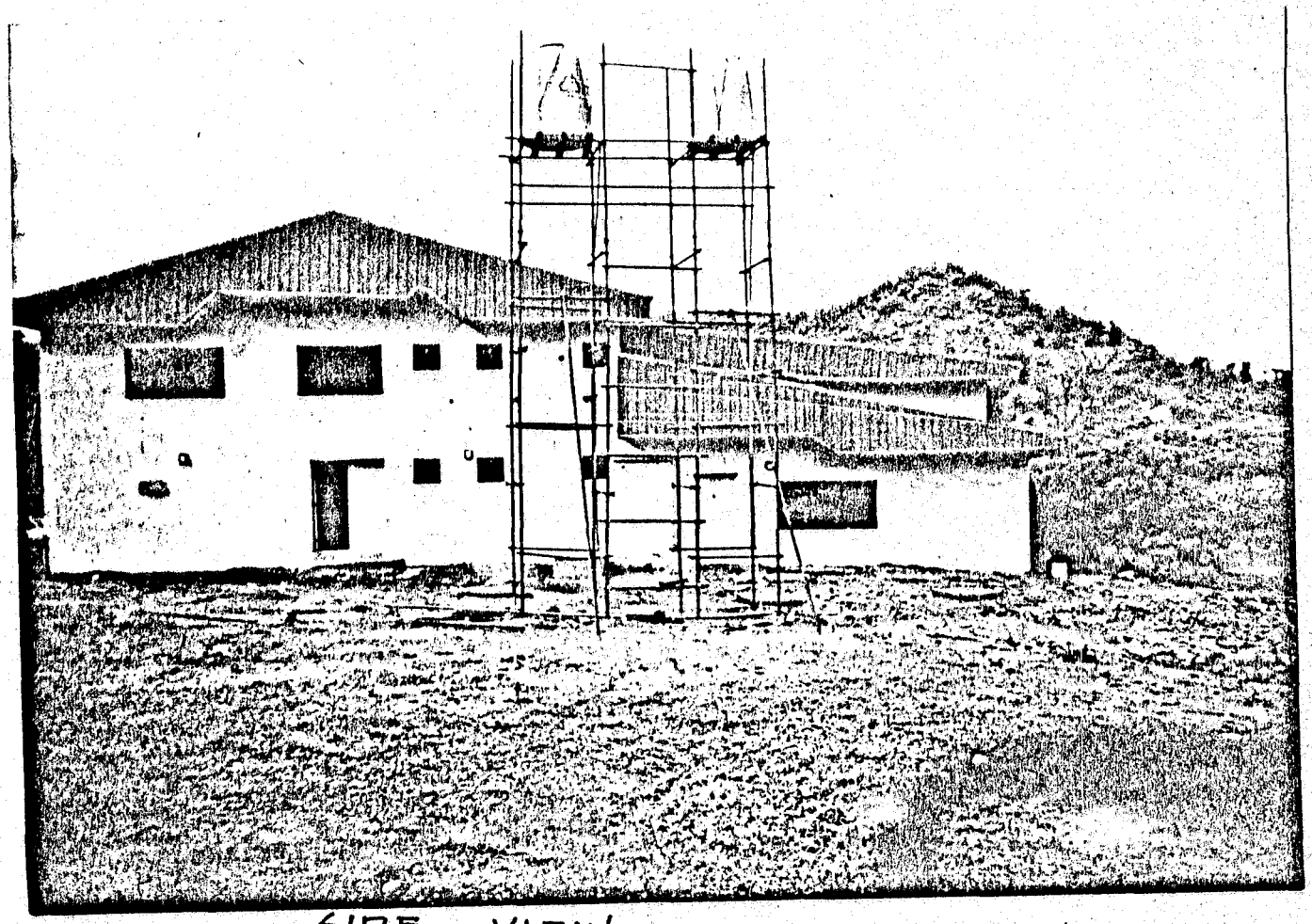
a. Poor representation of Architectureal form.

b. No parking spaces

c. No workers facilities.



APPROACH



SIDE VIEW.

3.3: FEDERAL RADIO CORPORATION OF NIGERIA(FRCN) ABUJA

3 3 1 Introduction

The federal radio corporation of Nigeria Abuja has it s studios and broadcasting facilities located at Gwagwalada area council while the network studio is in Garki (area 1) in Abuja

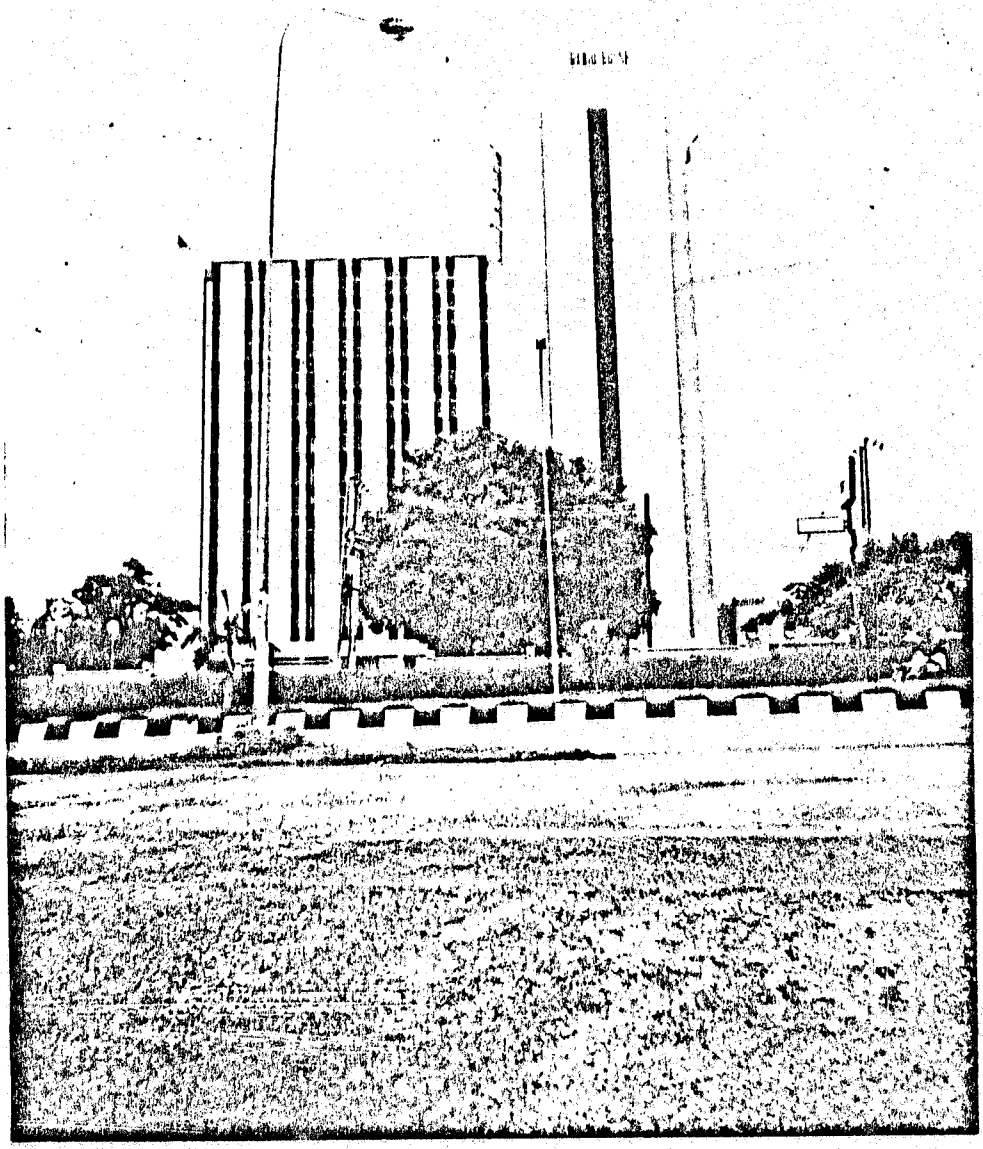
The broadcasting station at Gwagwalada was formerly radio Abuja until the idea of making Abuja the Federal Capital of Nigeria became obvious then it became Radio Nigeria Abuja broadcasting National programmes.

The transmitter and studio facilities are located in Gwagwalada. The Federal Ministry of Information having it's offices in the Radio House Abuja is a parastatal under the federal radio corporation of Nigeria Abuja.

3.3.2. Architectural Evaluation

Radio house is located at area 10 in Garki area council of Abuja It is a complex of Ten floors with the F.R.C.N. occupying the gound floor first, second and third floors. Departments here include

- Corporate planning department
- Directorate of Technical services
- Secretarial/legal services department
- Audit department
- Marketing department
- Accounts department
- Directorate of news and programmes
- Directorate of finance and supply
- Directorate of personnel management and administration
- Director generals office.



RADIO HOUSE ABUJA.

3.3.3: Observations

(i) Merits

a. Good Architectural representation of form

b. Good Aesthetic value

c. Up to date broadcasting equipments.

d. Well landscaped.

(ii) Demerits

a. Inadequate parking spaces

b. Inadequate workers facilities

3.4: VATICAN RADIO ROME

3.4.1. Introduction

Vatican radio in Rome is one of the two earth stations for satellite transmission and the F.M. antennas are located on the tower of the palazzina Leo (xiii) on vatican hill.

The station broadcsts programmes on 3 difference F.M. frequencies (i.e. F.M. 96.3 MHZ, F.M. 103.8 mHZ, F.M. 93.3 mHZ)

Vatican radio broadcasts to over 170 countries in 34 languages. Its programming schedule offers a unique combination of news, current events, music, culture, liturgies, spiritual reflections -------- But vatican Radios primary purpose is to put people in touch with the center of the church and its visible head-the pope.

The English programme fulfils the purpose in a magazine style format that aims to inform, instruct, and inspire. The English programme informs with features that look at the moral and ethical issues behind.

The news head lines; it instructs with programme that give guidance and clarification on questions concerning the catholic faith; it inspires with series on prayer and spirituality, and with stories that dramatize the ordinary lives of extraordinary people.

The station was founded in 1931 with transmitters capacity of

6mw - total power: 1035kw

12sw - total power: 2615kw

4Fm - total power: 50kw.

3.4.2: Architectural Evaluation

The vatican radio is a very large radio station with massive and complex structures with the highest building having 10 floors. The station has about ten different structures on site and they are linked together by walk ways directly or indirectly.

The station has antennas mounted all around and over it. It has

3 (OM) antennas

29 (OC) antennas

2 rotating (OC) antennas

3 logarithmic rotating antennas.

The station has a total staff of 412 (248 men and 108 women).

3.4.3: Observations

(i) Merits

a. Up to date equipments

b. Good Asthetic value

c. Good use of Natural land forms

d. Good landscaping

Vatican Radio - statistics 1995

Transmitters
6 MW - total power: 1035 kW
12 SW - total power: 2615 kW
4 FM - total power: 50 kW

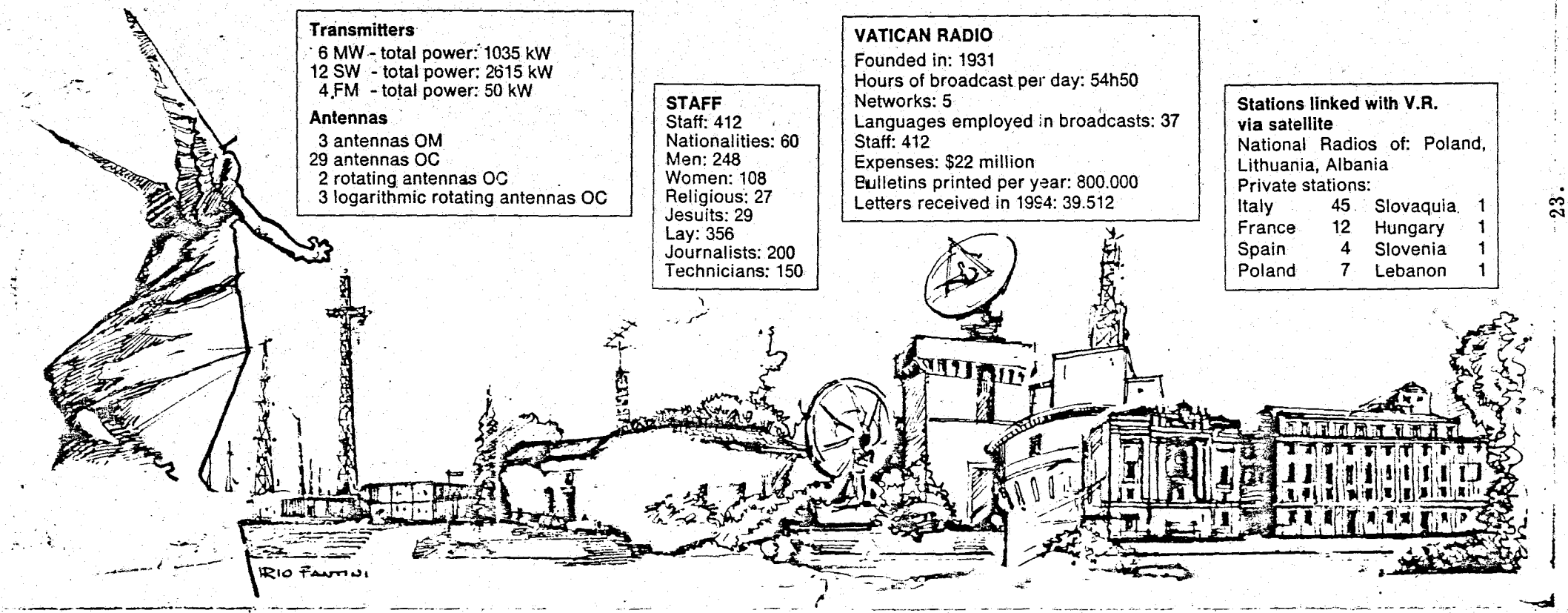
Antennas
3 antennas OM
29 antennas OC
2 rotating antennas OC
3 logarithmic rotating antennas OC

STAFF
Staff: 412
Nationalities: 60
Men: 248
Women: 108
Religious: 27
Jesuits: 29
Lay: 356
Journalists: 200
Technicians: 150

VATICAN RADIO
Founded in: 1931
Hours of broadcast per day: 54h50
Networks: 5
Languages employed in broadcasts: 37
Staff: 412
Expenses: $22 million
Bulletins printed per year: 800.000
Letters received in 1994: 39.512

Stations linked with V.R. via satellite
National Radios of: Poland, Lithuania, Albania
Private stations:

Italy	45	Slovaquia	1
France	12	Hungary	1
Spain	4	Slovenia	1
Poland	7	Lebanon	1



CHAPTER FOUR

4.0: THE SITE

4.1: LOCATION

The site chosen for this project is in Abuja the Federal Capital of Nigeria .

Abuja lies on longitudes 7^{o} and 1^{1} test and latitude 9^{o} 12^{1} North with a population fairly distributed around it in all direction.

The Federal Capital Territory, lies just north of the wide alluvial plains formed by the confluence of the Niger and Benue rivers. The Jama's platform, a cononuation of the Jos Plateau extends well into the middle of the territory. For major rivers flows south wards to the Niger/Benue either through the Federal Capital Territory or adjecent to it. The Gurara rivers flows through the territory along it's western edge.

4.2: SITE CHARACTERISTICS

Geology/Topography.

Plains include the older precambrian unit of metamorphic sedimentary rocks and intrusion of younger precambrian igneous rock.

The Federal Capital is known to be rocky having it's soils developed on the basement complex. They have been divided into ten complexes on the basis of parent material and texture..

4.2.2: Vegetation

The Federal Capital Territory has a mixed vegetation of savanna grassland and parkland forest with thick undergrowth. Park savanna is typically a stratified community with a discontinous canopy, shrubs

and grass layer. The riverrine complex occurs on low level channel banks of water courses and along stream valley bottoms of ten interupted by patches of rain forest, shrub savanna vegetation occurs on flatter plains and undulating terrain.

It is comprised primarily of shrub, vegetation with developed grass layer and a few scattered evergreen trees like daniella, parkia, Khaja, heem (dry zone mahogany) and albizia.

4.3: CLIMATIC CONDITIONS

A comfortable living environment will depend on maximizing the aspects of the environmental factors which reduces heat and effect humidity and protect from dust. The most relevant climatic data for the Federal Capital Territory are those of Suleja, which shows mean annual rainfall of 1.632mm. The seasonality of this rainfall creates distinct wet and dry seasons. The seasonality is caused by the interplay between two major air streams. The raining season normally occurs between April and December. The rain causes marked environment changes. Rain brings new fresh leaves and shade of decidous trees. The dry seasons normally extends from November to the end of March; with no significant rainfall during this period.

4.3.1: Rain fall

The start of the rainy season, in The Federal Capital Territory (FCT) is around April, the rain tapers off very rapidly after the 20th of October. Thus the duration of the rainy season is between 180-190 days. 60% of the annual rainfall is in the month of July, August and September. Squall lines are frequent and are thought to originate from the Jos Plateau region and travel from east-west

across the Federal Capital Territory. It is most common in the late afternoon: at the beginning and end of the rainy seasons. This concentration of rainfall shows the need for drainage system that can handle large volume of water very quickly.

4.3.2: Temperature/Humidity

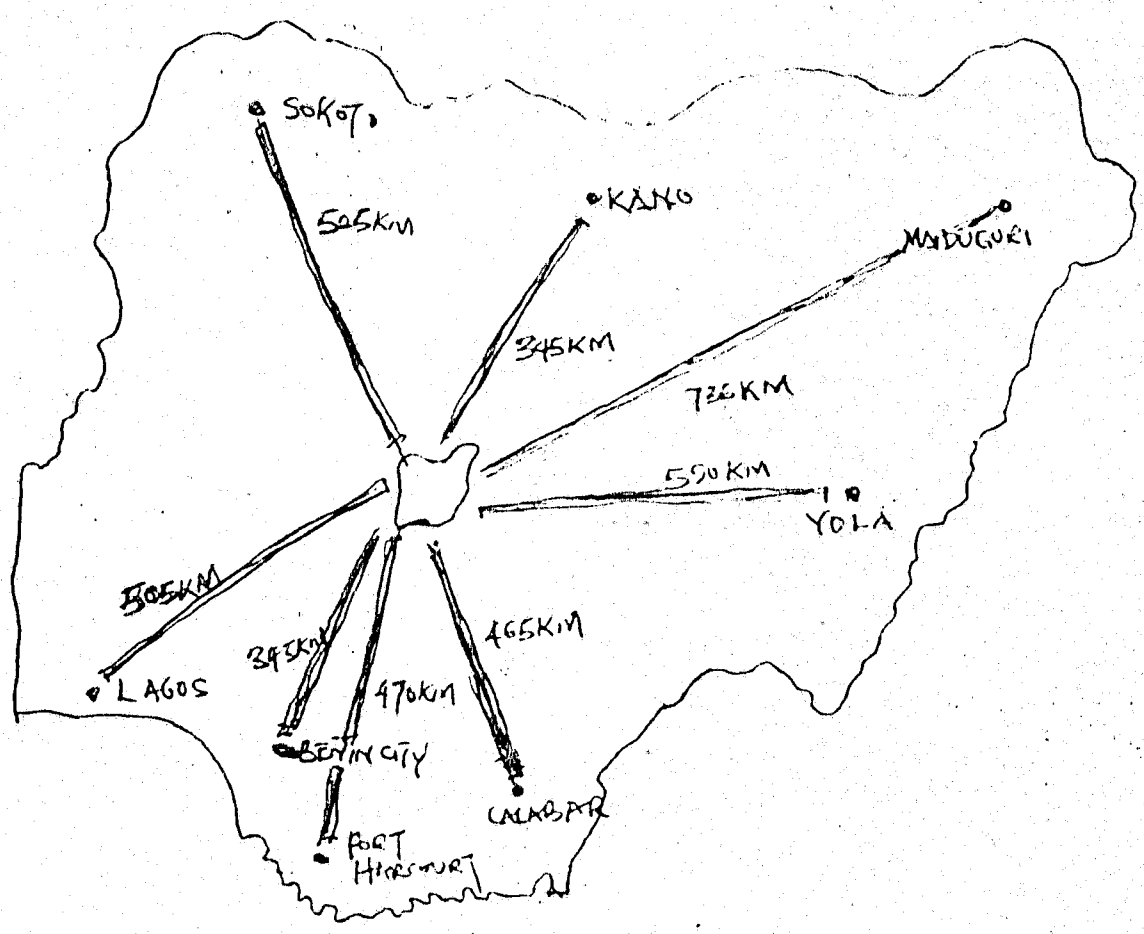
Radiation in human terms is felt as air temperature, the response to which is greatly influenced by the humidity condition in the air. The Federal Capital Territory records it's highest temperature during the dry season when there are few if any cloud. Changes in temperature of as such as 17^{o} centigrate have been recorded between the highest and lowest temperatures in a day. During the rainy season; the maximum temperature is lower due to the denser cloud cover. The temperature change per day is lower and sometimes not more than 7^{o}c in July and August.

During the dry season, relative humidity falls in the afternoon to as low as 20% in the (F.C.T.). This low relative humidity, coupled with the high afternoon temperature is the desicating effect 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% even though the temperature is slightly lower, the effect is to create a heat trap.

4.3.3: Sunshine/Cloud Cover

In Nigeria, there is a general increase in the total hours of sunshine further north from the atlantic coast. The amount of sun shine ranges from a minimum of 1.300 hours in the Niger delta to cover 3,200 hours in the extreme north east of the country. The Federal Capital Territory is exposed to an average of 2,500 sunshine hours

PHYSICAL LOCATION



CENTRALITY OF ABUJA F.C.T

annually, (Mabogunge, 1977).

During the dry months (November - April), the monthly variation in the amount of sunshine follows the general trend of an increase from over 225 hours on the Abuja city site. As the rainy season approaches, the trend is to increase cloudiness. The decline in sunshine hours becomes more intense as the rainy prograesses and reaches it's lowest value in August.

4.4: SITE SELECTION

4.4.1: Macro Selection Factor

In 1975, the Federal Capital development Authority was established by federal decree and charged with the development of a new federal capital for Nigeria. The need for a new federal capital was necessitated by the problems facing Lagos as the capital of Nigeria. This problems include inadequate land space for development etc.

In view of the above, a new capital which is more centralized and will serve as a symbol of Nigeria's unity and greatness was proposed.

Macro factors that motivated my choice of site in the federal capital territory are

- to bring quality entertainment into homes in the federal capital
- to contribute to the greatness and unity of the Federal Capital Territory.

4.4.2: Micro Selection Factor

The site for my proposed project in the FederalCapital Territory is on the north west side of (A.Y.A) in Asokoro distric of Abuja.

The site is on the left hand side of the road on entering Abuja town from Nya-Nya area council also in Abuja. The site is just directly opposite the Sani Abacha barracks and is located on a hill about 40 metres from the gorund.

Micro factors that contributed to my choosing of site are

- The site is located in a way that it will aid good transmission because of it's height.
- The site is close to good source of power supply and easy transportation for staffs.

4.4.3: Site Analysis

The site will be analysed based on physiographic characteristics and perceptual characteristics which includes; climatic factors, topography, vegetation, drainage, soils and geology and also perceptual analysis aimed at identifying usual or perceptual assets and liabilities as a bases for determining major opportunities and constraints for design process i.e. noise intrusion, dust/vehicular pollution, highway access etc.

Important consideration which must be taken into consideration when designing are - humidity, rainfall, wind direction and prevailing wind, temperature and radiation.

The site is on a hill about 40m from the gound level and has a steep contour. The characteristic vegetation type is park savannah which normally produces open but partially shaded environment. The soil are well drained and of the magmatite metamorphic rock out crops which are redish brown in colour.

With this revealing datas about the chosen site, effort should be made to plant trees on the site to avoid erosion and also buildings will be oriented to take advantage of north-south breeze effects.

AVERAGE MONTHLY RAINFALL (cm).

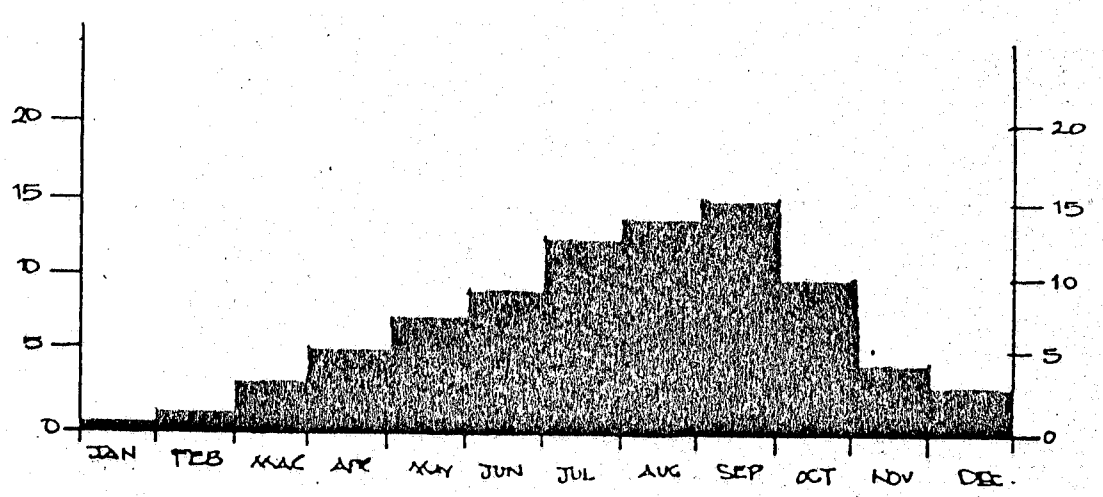
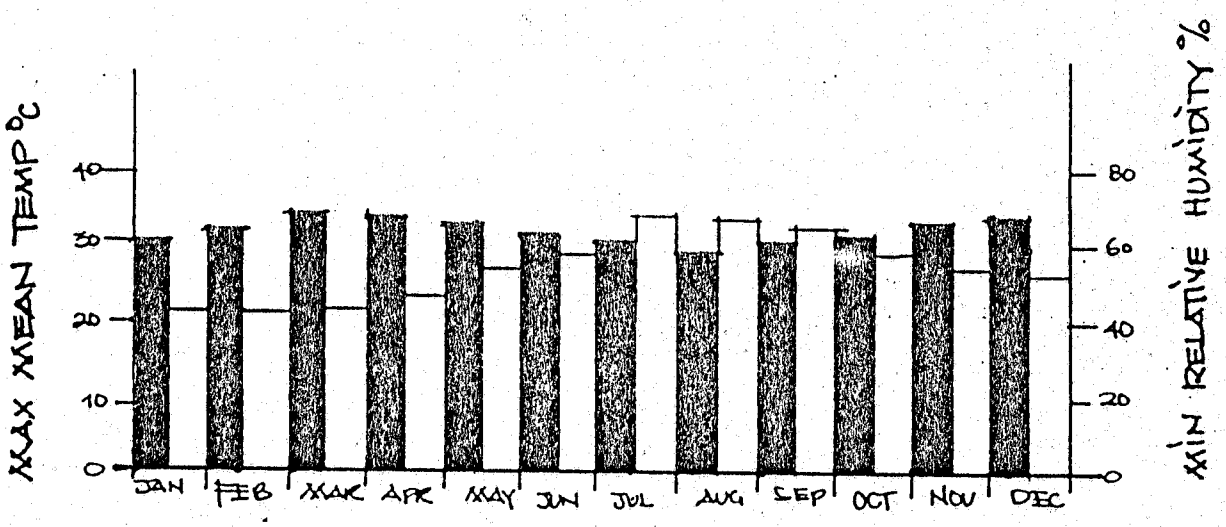


FIG. 1



MAXIMUM MEAN TEMP / MINIMUM RELATIVE HUMIDITY.

FIG. 2

MIN MEAN TEMP. / MAX RELATIVE HUMIDITY.

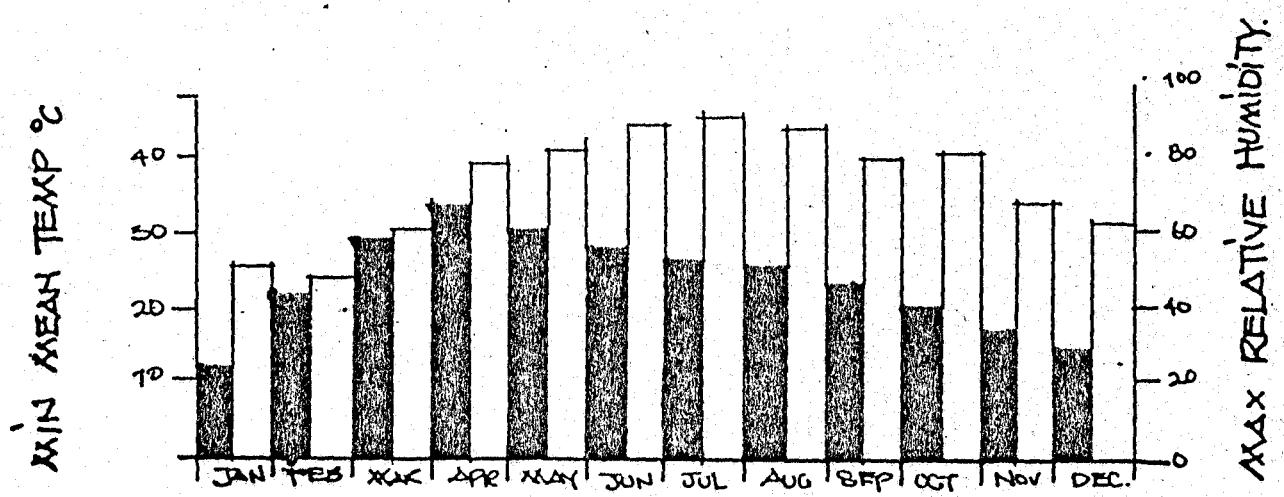


FIG-3

MEAN MONTHLY SUNSHINE DURATION. [HOURS]

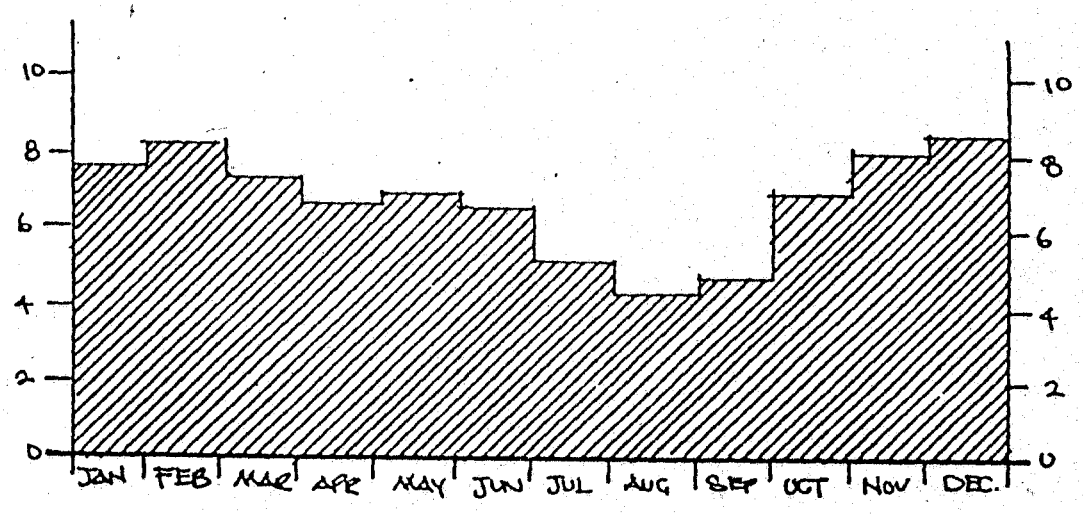


FIG.

PROPOSED SITE.

CHAPTER FIVE

5.0: ACOUSTICAL REQUIREMENTS FOR A RADIO STATION

5.1: NOISE ACCEPTABILITY

Noise control in radio stations includes the assement of how much noise can be allowed in any given set of circumstances, noise control does not mean reducing every thing to absolute silence, even if they were possible it could certainly not be desirable.

Noise control rather mean a regulation of the amount of sound energy that reaches observer to a level which satisfier certain requirement for the environment in which he is placed. One may ask why is the environment important. We can see the reason if we consider some of the more important ways in which noise can affect people

i) it can damage heaving threshold shaft

ii) it can interfere with speech communication

iii) it can upset concentration and thereby cause a drop in efficiency.

iv) it can annoy.

The importance of the environment is hence that it determines which type of critaria we should be airming for. As there are different environments hence different critarias for noise level.

5.2: NOISE LEVEL REQUIREMENTS

Most normal ears have an average audible range of frequency from 20Hz to 20KHz. The limit of audible intensities of sound are

are described as the threshold of audibility or of hearing. This corresponds to about 10-12 watt/m^2 or zero dB. The threshold of feeling is approximately 120 dB and the threshold of pain is 140dB.

Sound intensity of about 100dB may produce instant damage to the ear. However, there could be some period that one may hear very well i.e sound is low and this period is temporary threshold shift (T.T.S.). That which has permanent effect on the ear is reffered to as permanent threshold shift (P.T.S.). The ear requires approximately 1 second to respond fully to a continous sould level presented to it and after 3 seconds the responds drops gradually due to fatigue.

5.3: STUDIO AND CONTROL ROOM ACOUSTICS

In radio studios it is usually desireable to employ as much sound absorbing treatment as possible. Similar consideration is given to the acoustical treatment in control rooms that are associated with studios. The followings are considerations for radio studios and control rooms.

5.3.1: Design Requirements

To understand the acoustic requirements of radio studios and control rooms. Their acoustical characteristics is explained in the following manner.

(a) Reverbration Time Versus Studio Volume;

The importance of reverbration control in the acoustic design of studios has called for the introduction of reverbration Time (RT). This is the time taken for the sound pressure level in a room to decrease by 60 dB after the initial sound is put off. Calculation of reverbration time to indicate the amount of absorption required is not within the scope of this study.

(b) Reverbration Time Versus Frequency:

The reverbration time of radio studios and control rooms preferably should not be a function of frequency and, under any circumstances, shall not deviate from a uniform characteristic by more than the tolerance level.

(c) Reverbration Time Versus Location:

The reverbration characteristics shall be uniform throughout the working area of a studio and the sound delay characteristics shall be a smoth logarithmic function. No standing waves below 200Hz shall exist at any location within the room.

5.3.2: Construction Requirements

The following considerations must be met when designing a radio studio.

(a) Mechanical Noise:- The acoustical treatment of studios and control rooms shall not be a potential source of noise, such as rustling, rattling or crackling when excited by land sources of any frequency in the audible frequency band.

(b) Ageing: The acoustic properties of acoustical treatment shall be such that it does not change with time temperature, humidity or degree of cleaniness.

5.3.3: Sound Isolation in Studios and control Rooms

"Sound isolation is the provision of a barrier to the flow of vibrational energy from one point to another" (Ian Sharland, 1986). This is by the use of vibrational isolators in form of steel spring.

In radio studios layout planning, sound isolation problems can be materially lessened by judicious location of the studios with respect to each other and in relation to areas from which noise may arise. Placement of studios and control rooms immediately adjacent to each other by a common wall should be avoided since the attenenuation of the common wall is not likely to prove adequate.

Generation of excessive noise by plants should be prevented by taking reasonable precautions. This can be achieved by locating the plant away from the studio, control room etc. Floor, wall and ceilling isolation should be employed.

Noise may enter a studio area through floor slabs, building columns, ceiling and other structural members. Under these circumstance, little sound isolation can be expected from noises originating below a studio by mere bloating only the floor, or from noise sources above by floating only the ceiling, or from adjacent areas by floating only the walls. Where impact noise are likely to be transmitted from one area to another through

a common floor slab, reasonable reduction in the transmission may be achieved by cutting the studio slab completely away from the slab in the area in which the noise originates.

The following constructions practices will fulfil the ambient noise level requirements already discussed:

1. Studio Roofs and outside Walls:

   Where radio studios are located with their roofs exposed to the sky or immediately adjacent to outside wasll, particular attention must be paid to isolation from potential noise from traffic (including acroplanes), wind, thunder and adjacent building construction. Cavity wall construction is recommended for these areas.

2. Partition Attennation:

   All walls, floors and ceilings of all studios, control rooms and other critical areas shall provide sufficient sound attenuation to achieve the ambient noise level criterion set forth. A study of the project by a qualified acoustic expert is necessary in order to establish precisely the amount of partition sound attenuation required in order to meet the specified ambient noise level.

3. Door Ways:

   All door ways and any associated sound locks into studios and control rooms shall provide at least 50dB attenuation all frequencies within the range of 50 to 15,000Hz.

4. Adjacent Studios/spaces:

Studios, halls etc. located side by side so as to share a common wall shall be made to utilize a cavity wall construction, the walls being acoustically isolated from each other.

5. Corridors:

Corridors adjacent and above radio studios can be a very serious source of noise. Accordingly, the wall and ceilings of these corridors shall be treated with sound absorbing materials, the floor shall be covered with impact absorbing rubber tile or equivalent.

6. Duct Work:

"Air conditioning ducts and others shall provide at least 50dB attenuation between different rooms at all frequencies within the range from 50 to 15000Hz" (Rosner Television systems Inc., 1971).

5.4: SOUND ABSORBING MATERIALS AND CONSTRUCTION

The principle of sound absorption is to reduce the amount of reflected energy by transforming it into some form of energy other than vibrational energy. An absorber partially convert the absorbed sound energy into heat but mostly transmits the remaining to the other side of the layer unless there is an impervious heavy barrier to prevent such transmission.

Sound absorbing materials are classified into the following

1. porous absorbers
2. panel absorbers
3. cavity resonator

5.4.1: Porous Absorber

The two factors which have most bearing on a materials capacity to absorb sound are porosity and flow resistance. Porosity is the fraction of unit volume of the material which is taken up by the air contained in that volume.

Flow resistance is a measure of the ease with which an airflow can pass through the material.

As the sound waves move through the material, the small pores between fibres present passages of high frictional loss to the small displacement of air as the pressure wave as it passes through the absorption material. Therefore less energy emerges from the material after reflection from the wall, the remaining having been transformed into heat energy inside the material.

A material which allow the passage of sound energy without much reflection, at the same time provide sufficient resistance to the flow of energy during transmission, is a good absorber, we have to decide how it is to be arranged on the surface and the quantity required. To achieve a fast rate of absoption of energy per unit time, the material should be placed to occupy the region of air near the partition where acoustic velocities of the air molecules are highest.

Porous absorbers includes the following: soft plasters, fibre boards, mineral wool and isolation blankets. Commercial porous absorber are divided into three categories.

a) Pre fabricated Acoustical Unit:

These include textured cellulose, mineral fibre files, lay in panels and perforated metal pans with absorbent pada method of fixing is based on manufacturers specification.

b) Acoustical Plasters and Sprayed-on-materials

Usually suitable for curved and irregular shaped surfaces. They are applied by a spray gun or by hand trowellings.

c) Acoustical (isolation) Blanket

Manufactured from rockwood glass fibre, hairfelt etc. They are installed on a wood or metal framing system. Their thickness vary between 25mm to 125mm. Their absorption increases with thickness particularly at low frequencies.

Carpets can also be used as acoustical materials as they absorb airborned sound within the room. They absorb impact noise considerably from floors above and eliminate surface-shuffling of feet, making of funiture, etc.

5.4.2: Panel(or membrane) absorber

This absorber works based on the concept that any impervious material. Installed on a solid backing but seperated from it by an air space will act as a panel absorber and will vibrate when stuck by sound waves.

"The greater the amplitude of movement (in the case of panel absorbers) the greatest is the energy lost in overcoming its informal friction" (Ian sharland, 1986)

The following are list of some panel absorbers:

a) Gypsum board

b) Suspended plaster board

c) Wood/hard board panels

d) Rigid plastic boards.

e) Wood floors and platforms

f) Window glazing and doors.

5.4.3: Space Aborbers

Space absorbers are sound absorbing materials used in acoustical treatment of space when conventional acoustical treatment is impossible.

They can be suspended as individual units from the ceiling. They are made of perforated sheets (Aluminium, hardboard, steel etc.) In panels, prisons, cubes, spheres and cylinder shapes. "They are generally filled or lined with sound absorbing materials such as rock, wool, glasswool etc. They are easily installed or moved without interfering with existing fixtures" (Abudu, K.T.A., 1981).

5.4.4: Cavity Resonators

"These are rigid walls containing a body of air. The air which moves in a relatively small passage will have to expend some energy in overcoming the frictional resistance. The greater the amplitude of ascillation the more energy is lost in overcoming friction" (I an Sharland 1986).

5.4.5: Conclusion

In radio broadcast, noise critaria demands absence of any noise likely to interfere with subject sound. This is achieved by the use of barriers which resist the flow of sound energy from one point to another.

Sound isolation in radio broadcasting can be achieved by the use of porous absorvers or panel (mentrane) absorbers or cavity resonators.

CHAPTER SIX

6.0: DESIGN BRIEF DEVELOPMENT

6.1: INTRODUCTION

Abuja the Federal Capital of Nigeria deserves a standard medium for entertainment and information disemination which from every perspective is the most vital form of communication.

This project concentrates on finding Architectural solutions to the problems of acoustics in radio stations and this include the study of the functions in an F.M. radio station - the equipment, personnel, production of programmes and other services.

6.1.1: Brief Formulation

In formulating this brief therefore, the basic requirements of a radio transmitting station are considered and the rest deduced from studies on existing radio stations.

The brief for this project is formulated on the premise that this proposal is a private radio station which will serve a defined geographical area as Authorized.

This indicates that programming will reflect the size of the area to be served, which in this care covers the whole of the Federal Capital Territory and it's environs.

6.2: SPACE REQUIREMENT ANALYSIS

The facilities provided in the proposed radio station are deduced from studies on existing radio stations both within and outside the country.

In view of the fact that studios and technical rooms are very difficult and costly to expand, the basic shells are designed to be large enough to accommodate all anticipated requirements.

The facilities to be provided falls under these divisions

i) Administration

ii) Account/Audit

iii) Programming

iv) Staff facilities

v) Security and Environmental (site)

Essentically, space standards arrived at shall be striely adhered to with adjustments and allowances made were necessary.

Shcdule of Facilities

a) Administrative Division

1. General manager
2. Board room
3. Manager admin
4. Admin officers
5. Corporation secretary/legal adviser

b) Commercial division

1. Commercial manager
2. Commercial officers

3. Public relations officer

c) Accounts/Audit Division

1. Accountant
2. Accounts officers

d) Programming division

1. Programmes director
2. Producers
3. Reference library
4. Librarian

e) New and current affairs

1. Controller of news
2. Executive editor
3. News presenters
4. News room
5. Library and Archives

f) Studio/studio supporting facilities

1. Studios
2. Transmitter room
3. Contol rooms
4. Electronic workshop

5. Audiotape library

6. Chief engineer

7. Techicians

g) Staff welfare facilities

1. Restaurant

2. Kitchen

3. First aid room

4. Store

h) Site facilities

1. well landscaped environment

2. visitors car park

3. staff car park

4. gate house

5. generator house

The following space standards have been used in computing the actibity areas.

1. Administration Division

Accomodation	Unit	Area	Total
Reception	1	64	$64m^2$
Admin office	1	35	$35m^2$
General manager	1	40	$40m^2$
Board room	1	80	$80m^2$
		TOTAL =	$254m^2$

2. Commercial Division

Accomodation	Unit	Area	Total
Commercial manager	1	35	$35m^2$
P.R.O.	1	35	$35m^2$
Commercial office	1	45	$45m^2$
		Total	$115m^2$

3. Accounts/Audit Division

Accomdation	Unit	Area	Total
Accountant	35		$35m^2$
Accounts office	45		$45m^2$
		Total	$80m^2$

4. Studio/Supporting Facilities

Accomodation	Unit	Area	Total
Studios 1,2,3, & 4	4	20	$80m^2$
Control rooms 1,2,3 & 4	4	20	$80m^2$
Recording studio	1	30	$30m^2$
Recording studio control	1	20	$20m^2$
Music studio	1	120	$120m^2$
Rransmitter room	1	60	$60m^2$
News room	1	60	$60m^2$

Library/Archive	1	60	$60m^2$
Tape Library	2	40	$80m^2$
Conviniencies	8	4	$32m^2$
Electronic w/shop	1	80	$80m^2$
A/c Plant room	1	40	$40m^2$
Director	1	30	$30m^2$
Producer	1	30	$30m^2$
		Total	$722m^2$

5. Staff Facilites

Accomodation	Unit	Area	Total
First aid	1	20	$20m^2$
Telephone	1	20	$20m^2$
Restaurant	1	100	$100m^2$
Kitchen	1	35	$35m^2$
Store	1	20	$20m^2$
Conviniencies	8	4	$32m^2$
		Total	$137m^2$

6.3: SITE PLANNING/ZONING

The site planning in based on the noise level at various locations on site. The noise level decreases as one progresses away from the main road. This has influenced the location of facilities on site. The studios and transmitter are located farthest, since quite and vibration free environment is derived.

The zoning is based on it's functional requirement. The concept is therefore termed suitable for a radio station, as it strives at providing an arrangement that is adequate for trafic flow, building orientation, location of services and parking lots.

6.4: DESIGN CONCEPT

In designing a radio station, one thing is clear, and that is transmission inrelation to reception.

Transmission can be more appreciated if it can be recieved at the other end of the transmission.

When I first thought of designing an F.M. station, what flashed on my mind was a radio reciever because it is the only means transmission can be heard.

A typical radio receiver having a main body and speakers by it's sides can stand as a symbol of beauty, and this symbol, I have modified to be an Aesthetic piece on the front facade of my proposed F.M. radio station.

6.5: DESIGN APPROACH

The architectural form evolved by weaving together the design concept with an analysis of physical and environmental functions of the site, and the desire to create a relationship between the spaces people occupy and the landscape they review from those spaces. Areas given considerations include.

- Building designed against external influence on site
- Studios located farthest on site; this shelters it from traffic noise and vibration.
- Building having a single focal entrance
- Carpark located to give a natural progression to entrance
- The main entral hall is the control for staff, artists and visitors
- Artist entrance seperate from main entrance
- An analysis of physical and environmental functions on site.
- Sun shading devices to prevent mroning and late afternoon sun penetration
- View of landscape from offices not blocked by shading devices.
- Internal circulation connects support facilities and office areas,
- Studio areas require enclosure and privacy and no out look.

CHAPTER SEVEN

7.0: CONSTRUCTION AND SERVICES

7.1: BUILDING STRUCTURE

To avoid aircraft noise and other forms of noise through the roof, all the studio areas are of reinforced concrete slab, beams and columns with an in-filling panels of block walls and glass partition walls.

The top floor area is roofed with steel members and covered with long span aluminium roofing sheet.

7.2: EXTERNAL WORKS

The relationship of the building to it's immediate external spaces is considered adequately.

Precast concrete elements are used as slabs and kerbs for landscaping. The drive way are constructed of far while foot paths are covered with precast concrete paving units to reflect the construction material of the building.

7.3: STUDIO FINISHES

Studio floor: - radio studio floors require a careful consideration. Successful radio studios have been bult using a common floor slab. Again this is very much a function of the secound levels expected within the rooms. Where extreme sound level are

unavoid able in the studios, floating floors are placed supported on springs. Corridors within the studios are carpeted to minimise foot impact noise.

Studio Doors:

Doors are the Achilles heel of every studio installation hence I used a sound lock arrangement of two sounds doors seperated by a small vestibule. It is analogous to a light lock at the entrance to a photographic dark room in that it prevents accidental sound leakage into the studio if the door is opened while the studio is in use.

7.4: AIR CONDITIONING

Air conditioning is required in the studio's control and equipment rooms to protect sensitive equipments as well as for comfort and it is usually provided in other areas in keeping with modern practices. Special consideration given to the duct work to prevent it from carring unwanted sound from one room to the other.

7.5: FIRE PROTECTION

For fire protection purposes, Automatic fire detectors and carbon dioxide sprinkler have been fitted because liquid sprinklers may damage the equipments.

Also enough escape routes provided in case of fire.

7.6: SERVICES

Plumbing:-

The plumbing system in the station are hidden by provision of ducts. the drinking water pipes are carefully seperated from the waste pipe to avoid contermination.

All the waste pipes are channelled to a central drainage pipe which carries the waste to a central septic tank and roak awaypit.

Electrical Services:-

Electricity connection is from a nearby service line (N.E.P.A) with three phase connection to avoid power failure. In any case, an automatic generator is to be provided which switches on Automatically when N.E.P.A. Takes off light.

Security:-

The profection of the building and it's contents, life and properties etc. are the security we are talking about here. There is why there should be security post at the entrance gate and within and around the station.

With Technological advancement, close circuit televisions and time lapse cameras will be fitted in the station to upgrade the security.

Land Scape

Since the site has a natural vegetation of shady trees and rocks, this adds to the beauty of the site along side the shrubs and carpet grasses which are to be planted as hedger along the road side and parking areas.

CHAPTER EIGHT

8.1: AESTHETICS

The general impression of a building is produced by it's mass and it largely depends on the proportion and detailing of it's facades.

There are two types of facade. Generally those with uniform frontage and those with break and projecting features.

This radio stations facade is made of a uniform partern and since Architectural design cannot be controlled by hard rules, it is a system of compromise between materials and artistic requirements reflecting always the critical inteligence.

8.2: GENERAL APPRAISALS

The main aim of this project is to design a radio station that will be acoustically sound and carryout transmission of programmes that will be of benefit to the people of Abuja and it's environs.

With the studies carried out so far on the functions in radio broadcasting stations, it's equipments, personnels, production of programmes and other services I know so many problems will be solved as regards entertainment in the Federal Capital Territory.

8.3: CONCLUSION

Radio broadcasting stands the only medium for entertainment and infomation which contains an element of realism, hence individuals and the government should contribute to make it grow.

8.8: APPENDICE

BIBLIOGRAPHY

1. Encyclopedia Britanica, Vol II
2. Merit students encyclopedia Vol. II
3. Time saver standards for residential development by Joseph De Chiara.