MUSIC RECORDING COMPLEX FOR ABUJA (A DESIGN PROPOSAL)

A THESIS PRESENTED TO THE POSTGRADUATE SCHOOL, AHMADU BELLO UNIVERSITY ZARIA IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN ARCHITECTURE.

BY

ISAH MOHAMMED MAJI

B.Sc. ARC HONS

DEPARTMENT OF ARCHITECTURE

FACULTY OF ENVIRONMENTAL DESIGN,

AHMADU BELLO UNIVERSITY

ZARIA.

DECEMBER, 1989

DEDICATION

To come last but not the least
Holds sway in birth stratifications.
This thesis is dedicated to my
very old parents Maji and Fatima
for their tender care, angelic love
and bearing the ordeal of laying
the eggs before now that the
chicken is finally hatched.

DECLARATION

I, Isah Mohammed Maji do solemnly declare that this thesis has been written by me and it is a record of my research work. It has not been accepted in any previous application for a higher degree unless footnoted.

All quotations are distinguished by Quotation Marks and the sources of informations are specifically acknowledged by means of references.

Signed ----------

22:12:89

CERTIFICATION

This thesis entitled Music Recording complex Abuja (A design proposal) by Isah Mohammed Maji meets the regulations governing the award of the degree of master of Science (Architecture) of Ahmadu Bello University, and is approved for its contribution to knowledge and literary presentations.

Chairman Supervisory Committee	4/1/96 Date
Member Supervisory Committee	Date
Member Supervisory Committee	4/1/96 Date
Head of Department	Date
Dean of Post graduate School	Date

ACKNOWLEDGEMENTS

Academic wayfaring is despondently paddled by destiny. Architecture as a career course has been exploratorily sojourned. Destiny is an inevitable end. I have finally landed on this destination.

My unfathomable thanks first go to Allah the almighty, for creating, sustaining, compassing my thoughts for a career and giving me the herculean disposition to pierce through the gargantuan parsimony that enshrouds the study of Architecture as a course in Nigeria at this late period when the economy is at crose roads.

Secondly, memories of formative school ideas are resounding. My immense gratitude to our mathemathics tutor Mr. Kolchin (A Bulgarian) in secondary school for teaching me good knowledge of Geometry. Coded thrills of appreciations to my secondary school friend and classmate, Mr. Jonathan Yisa for briefing me about what architecture entails at the threshold of my academic excellence in chosing a career.

Oceans full of thanks to all the members of my family especially mummy and daddy who are very old, but not flinching in their moral and financial support fortified by steady endurance.

My Mentor, Arc. Ahmed Datti desrves my gratitude and a word of commendation. He was not only painstakingly thorough but, always accommodating even when supposed to be at rest with his

family in the house. I should also thank Arc. Mbina, head of postgraduate section of the department for scratching an idea about this work which was to be later upgraded to a thesis.

A word of thanks to my friends, near and far relations, and classmates who helped me in one way or the other to finally make this dream a reality.

ABSTRACT

Music is a live organ that is growing in stupendous dimensions particularly in Nigeria as it is all over the world. The changing proportions of music is not unconnected with everyday improvements in technology and electronics. This has given an acme impetus to easy modernization. Therefore, grandiose spree of artists and performers are spurred to sing and perform in glaring terms that befits the ragged relics of mediocrity.

Presently, in the whole of northern Nigeria, no music recording centre can be found inspite of the numerous artists that are around this region. To this end, the inconveniences musical artists and performers experience in travelling for long distances to places like Lagos before their productions are recorded is perturbing. This pathetic plight had made potential artists e.g traditional musicians unheard beyond their country sides. It has become a matter of great concern to the artists and the general public.

From the above synopsis, it is assumed that, the Federal Government along with some private investors are gearing efforts to establish a functional and productive recording complex in Abuja.

This thesis is proposed to offer in matters of decision making and design for such a facility from its inception to

execution. Critically, the domain of this research is in the techniques and components of recording studio construction.

TABLE OF CONTENTS

	PAGE
Title page	i
Dedication	ii
Declaration	iii
Certification	iv
Acknowledgement	v
Abstract	vii
Table of contents	ix
List of figures	xi
Prolegomena	xiii
CHAPTER ONE - THE GENESIS OF MUSIC RECORDING	1
1.1 The empirical forerunners	1
1.2 Electro Acoustic Advances	4
1.3 Techniques of Recording Music	4
CHAPTER TWO - THE PHENOMENA OF MUSIC	10
2.1 Elements of Music	10
2.2 Types of Music	11
CHAPTER THREE - THE DESIGN OF MUSIC RECORDING STUDIOS	15
3.1 Economic Aspects	15
3.2 Site Selection And Development	15

3.3 Acoustic Requirements 16

3.4 Building Components of Studio 20

3.5 Studio Construction Overviewed 48

3.6 Studio Equipments 48

3.7 Ancilliary Facilities 54

CHAPTER FOUR - CASE STUDIES 59

4.1 Criteria for the case studies 59

4.2 E.M.I Nigeria Limited 59

4.3 Records Manufacturers Nigeria Limited 63

4.4 R.C.A. Limited Australia 66

CHAPTER FIVE - SITE 70

5.1 Introduction 70

5.2 Local and Environmental Context 71

5.3 Site Characteristics And Analysis 71

CHAPTER SIX - PROJECT REPORT 81

6.1 Design Brief 81

6.2 Design Preambles 87

6.3 Design Perse 105

6.4 Summary And Conclusions 109

REFERENCES 113

LIST OF FIGURES

FIGURES		PAGE
3.3.1a	Noise Criteria Curves	17
3.3.1b	Sound Transmission Class	17
3.4.1	Antivibration Foundation	22
3.4.3a	Floating Concrete Floors	25
3.4.3b	Floating wooden Floors	25
4.4.4a	Airtight Sealing in Masonry Joints	25
3.4.4b	Multiple Partitions	28
3.4.4c	Resilient attachments of Multiple Partitions	28
3.4.4d	Sheet Lead	28
3.4.5a	Door Stops	29
3.4.5b	Automatic Drop Bar Closer	29
3.4.5c	Sound Insulating Double Door	29
3.4.5d	Staggerred Doors	32
3.4.5e	Sound Locks	32
3.4.5f	Control Window	35
3.4.6a	Hangers used in suspended ceiling	35
3.4.6b	Preventing noise transmission above partition	36
3.4.6c	Applications of Acoustical Ceilings	37
3.4.6d	Suspended Acoustical Tile Ceilings	38
3.5.7a,b,c	Air Conditioning Distribution	43
3.5.7d	Sound Absorptive lining in ducts	43
3.5.7e	Prefabrication noise silencers in ducts	43

3.5	Discontinous Construction	50
4.2	EMI Nigeria Limited	61
4.3	Records Manufacture's Nigeria Limited	65
4.4	R.C.A. Australia	69
5.2	Site Location	72
5.3.1	Rain fall Distribution	74
5.3.2	Temperature Distribution	74
5.3.3	Humidity Distribution	75
5.3.4	Sunshine Distribution	75
5.3.5	Winds and Dust	78
6.2.2i	Eric's Ideas of Dynamism	92
6.2.2ii	Wright's Organic Architecture	95
6.2.4i	Tilapia Habitat	102
6.2.4ii	Aircraft Staff House	105

LIST OF TABLES

TABLE	PAGE
3.4.2	22

PROLEGOMENA

Music recording is a fast paced industry. In less than thirty years, its master recording requirements have progressed from 3 and 4 tracks capacity to 8 - 16, and 24 - 32 track systems. During the same period, the ancilliary equipments and techniques used in recording have been broadened to include digital techniques in signal processing, console automation and most recently, the recording process itself.

Thirty years ago, recording was chiefly concerned with documenting musical events, and the record was ideally a substitute for the event. During the mid sixties however, the phonograph record market changed dramatically; classical record sales dropped to about 5% of the total as the youth oriented "pop music" was born in the studio, and most of its sounds had their first existence over loudspeakers.

Many of the instruments of the new art depend heavily upon electronics and signal processing and it is no longer easy to draw a bottom line between the tools of performance and those of recording. Even the roles of producer, musicians, and engineer have intermingled. It is not uncommon for a musician in the course of his professional growth, to become a producer, or even an engineer. In the early days, these roles were clear and distinct, but the new music has brought them together in a common reactive endeavour.

The design of a music recording complex is a work of professional duality. The architect is more in control, because he conceives, and designs the structure. The design of this structure deserves exhaustive knowledge of acoustics and materials for construction. The electro acoustic engineer is limited to the design, placement and layout of electronic fixtures that will perfect the eventual sound that is being recorded. It is symbolic of a bullet loaded in the barrel. The momentum is ushered by the architect. Hence any jerk due to recoil is born by him.

This thesis delineats areas of acoustics and materials that is useful in designing, and selecting such materials for the construction of music studios.

It is hoped that this work will be of invaluable contribution to knowledge in terms of techniques and components for use in the design of music studios.

CHAPTER ONE

KASHIM IBRAHIM LIB
ABU ZARIA, NIGERIA.

THE GENESIS OF MUSIC RECORDING

"To some people music is like food; to others like medicine; to others like a fan".

THE ARABIAN NIGHTS ENTERTAINMENTS.

(1450)

1.1 The Empirical Forerunners. Alexander Graham

Bell's invention of the telephone, in 1876, drew attention to the problems of the reproduction of speech. One of those that took up the curious interest about its adoption and further investigation was Thomas Alva Edison. He was partially deaf. Towards the end of 1877, Edison wrapped a sheet of tinfoil around a cylinder, set a needle in contact with it, turned a crank to rotate it, and into a mouth piece attached to the needle he shouted the nursery rhyme that goes "Mary had a little lamb". After making a few changes, he cranked the cylinder again and from the horn of the instrument, he heard a recognizable reproduction of his voice. This was the born of the first phonograph. The date of this master invention was August 13th 1877.

After almost a decade of preoccupation with other interests, during which he produced the incandescent lamp, Edison returned

to work on the phonograph. His new model of 1888 employed an electric motor powered by heavy dutied batteries. The new improvements over the initial idea were that of constant speed for recording and play back, together with the superior qualities of wax rather than tinfoil as a recording medium. In 1888, the pianista, Joseph Hojmann aged twelve years visited the Edison Laboratory. He became the first artist to make a phonograph record.

On May 4th 1887, Emile Berliner invented the gramophone. The first drawings in Berliner's invention shows a record wound on a cylindercial support, but by 1888 when he introduced his first model, he had changed to a flat disc record. The groove in the record had a lateral side to side movement.

Berliner used lamp black as the recording medium, and combined this method with an etching process which permitted transfer of the original engraving to copper and nickel. Thus he achieved a permanent master recording, and for the first time, mass duplication of records was possible.

By 1895, Berliner had developed a system utilizing many ideas of his, originally combined with others: Lateral groove, flat disc and a coating of Bell's and Tainters wax. This system stood up as the industry standard for half a century. Thus Berliner deserves a mantle as the father of disc recording and reproduction.

Edison again became active in his search on sound recording and reproduction at the turn of the century. He tackled the problem of the wax mold used initially. This material being a non-conductor could not be electroplated. By 1903, he had worked out an ingeneous duplicating process. Here, the original record with mold wax was placed in a vacuum chamber, with a piece of gold leaf suspended on either side. High tension electicity was then discharged between the two gold leaf electrodes, while the record mold revolved upon this gold film, which faithfully adhered to other original record grooves, a heavier deposit of another metal was then eletroplated. The resulting mold was then solid, durable and negative, from which almost any number of positive copies could be duplicated.

Another earlier contributor to the phonograph process was Eldridge Johnson, who in the 1890's ran a small machine shop in Camden. By 1905, Johnson had improved the disc phonograph that, it sounded as good as the wax cylinder machine and had much greater volume.

Finally in 1902, all the companies and individuals who had patentable intersts got together, their settlement resulted in the formation of companies e.g the columbia (the Bell - Tainters - intersts), Victor (Berliner and Johnson) and Edison.

1.2 Electro Acoustic Advances.

Between the beginning of twenty century and world war one, there was little progress in the phonograph art. The war witnessed many advances in Acoustical theory; the Acoustical horn analysis of webber and the concept of Acoustical and Mechanical impedance by Kennelly and others ushered in the era of scientific electro acoustics. The phonograph was to be its most important beneficiary. The concurrent development of the electronic amplifier provided a further impetus to the art of recording and reproduction.

The best early known effort in that direction was the design of a phonograph recording and recording system by Maxfield and Harrison. Their recorder was a magnetic transducer employing a loaded rubber transmission line as a damping element. Records of much improved modulation and clearity were then possible. With the new method of electrical recording, the sound to be recorded was picked first by a microphone, amplified and applied to the coil of the recorder or cutter.

1.3 Techniques of Recording Music

1.3.1 Disc Recording: After more than three quarters of a century, the disc record remains the most accessible form of recording music. It is the earliest form of mechanical recording. Until the mid twenties recordings were made using

acoustical energy. Performers were placed in front of an assemblage of horns whose throats were all connected to a vibrating diaphragm with actuating stilus. It was a brute - Force system capable of only a few subleties. Replication techniques were crude, and the finished product was quite noisy. The play back process was acoustical as well, and it is amazing that music could pass through the acoustical - mechanical transformation and back again without eletrical gain and still be listenable.

Electrical recording was pursued in the mid twenties because of its objective benefits of greater band width and higher level. Maxfield and Harrison of Western electronics developed the first practical electrical recording system, and with it the door was opened, at least partially, to that creative world of electronics which we are exploring today.

The improvements afforded by the Western electric process soon caught the fancy of record producing companies worldwide, and it made its system available to the industry on a licence with royalty basis. On the play back side, acoustic 'wind up' phonographs continued to dominate the scene as late as the mid thirties. This devices did not disappear althogether until the micro groove long playing record was introduced in 1947.

Because western electric demanded payments for the use of their recording system, EMI (Electrical and Music industries) of England set about to develop their own method.

During the late thirties and the war years, the disc art progressed as best it could under the restrictions of noise and limited playing time which plagued the 78 r.p.m. disc. The desire for a long playing medium had fascinated the industry for years, and 33 1/3 r.p.m discs had been known from the early days of motion pictures and sounds. Significant improvements were also made by Columbia (long playing) record in which Gold mark combined time benefits of 33 1/3 r.p.m. with a quiet vinyl chloride compound and the high frequency capabilities of stilus and groove dimensions significantly smaller than those of 78 r.p.m records. The 'LP' culminated a final doom for acoustical play back devices and provided the way for important developments in phonograph catridge and cutter head design.

In Disc recording, two methods are in use Mechanical and Electrical Methods. In the former, the direct power of the sound that is to be recorded is directed to the recording instrument. The amount of power available to operate the recorder directly from the sound source in the recording room is so small as to make it extremely difficult to make records under natural conditions of speaking, singing or instrumental playing. In the Mechanical process, the artists and performers are grouped very closely about the horn. With such arrangement of musicians, it is difficult to arouse the spontaneous enthusiasm which is necessary for the production of artistic music.

In the electrical process, high quality electrial apparatus with vacuum tube amplifiers are used in order to give more freedom to the artists and better control of the process. This use of high electric apparatus has very distinct advantage over the mechanical method. In the electrical process, the musicians sit at ease in their usual arrangement and are all using the instruments which they would use, were they playing a concert. In this way, the microphone is used to receive the sound in much the same manner that the ears of a listerner in the audience would receive it. In other words, it picks up the sound after it has been properly blended with the reflections from walls of the room. The 'atmosphere' or 'room tone' has been obtained from here. The only problem posed to the studio - director in this process is to achieve proper balance among various musical instruments and the artists. This method is much easier and less tiresome for the artists, and it is usually possible to make more records in a given time.

1.3.2 Stereophonic Recording:

This is a system of sound recording or sound transmission using multiple microphones and loud speakers. Signals are first picked up by the microphnes and are fed to loud speakers located in a geometrical array which corresponds to the microphone array. Thus most of the spatial aspects of the recording environment are preserved.

As a commercial medium, stereo was first demostrated in the motion picture theatres in the late 1950s. The first stereo product issued by the record industry was in 1954, in the two track 19.05cm/s, 0.623cm tape -format. The stereo disc was introduced in 1975 and pointed out the way to rapid acceptance of stereo as the standard medium for home music entertainment. The techniques which have found favour in classical recording are the coincident microphone techniques (where - two microphones are located as closely as possible) and the spaced - apart technique (where two or more microphones are located some distance apart, usually arranged in a line in front of a performing ensemble).

1.3.3 Quadraphonic Recording

This means four channels sound. It was developed in the 1960s. The first releases were in the reel-to-reel tape format. These were followed by tape catridge, and in the early seventies, quadraphonic disc formats.

1.3.4 Magnetic Recording

The magnetic medium has shaped the evolution of contemporary recording in such a fundamental way, that it is difficult to think of the creative process apart from the essential benefits of multitrack capability and ease of editing. It was around the early fourties that all the right ingredients

came together. The Germans developed the magnetophon, a tape recorder embodying H.F.(high frequency) bias and excellent mechanical tape handling characteristics. These early machines were brought back to U.S. after the war and quickly convinced the recording and broadcasting interests that the 'new medium' had substantial advantages over the direct - to disc process of that day. Developments came quickly, and tape manufacture progressed dramatically. By 1950, it had become established as the master recording medium for both the record and broadcasting industries.

1.3.5 Digital Recording

Commercial digital recording dates from 1972, when the Nippon Columbia company introduced an eight channel pulse code modulation (PCM), converter for a standard video recorder. By the end of the seventies, a number of formats had developed and digital recording had made a significant impact on professional recording characteristics.

CHAPTER TWO

2.0 THE PHENOMENA OF MUSIC

2.1 Elements of Music

2.1.1 Scale

This is a series of tones arranged according to rising or falling piters. Composers use many kinds of scale. Most scales are based on octave, except in oriental music. An octave is the interval between two tones of the same note.

Composers often use a short series of notes called motive, as the basis for development of their musical ideas. They harmonise music in chords, which are groups of three or more related tones sounded at the same time. The chords and harmonies in a piece of music are usually based on the same scale. Thus, they are in the same tonality (key) and defines the pitch at which the scale is placed. Each note of the twelve within the octave is the reference point (tonic) of the different key. The passage from key to key governed by certain harmonic relationships is called Modulation.

2.1.2 Rhythm

This is considered as everything that has to do with duration of the Musical sounds. Accent is an important aspect

in Musical rythm. Composers build up music on a pattern of regaularly recurring strong and weak accents. This pattern of accents permits the music to be divided into units of times called measures or bars.

2.1.3 Tempo

This is the rate of speed at which music is played. It is related to, but not part of rythm. A change in tempo can often change the meaning of music.

2.1.4 Tone colour

This is one of the elusive qualities of music. Human voices may sing the same range of notes, yet produce widely different choices of chords which give varying colours. Various instruments affect the tone colour of music they play.

2.1.5 Melody

This is the vital sequence of musical notes of different pitch. The followings are the components of melody

(i) Tonic, the reference point

(ii) Scale, from which notes are drawn

(iii) Direction of pitch movement up or down by conjunct and

KASHIM IBRAHIM LIBRARY
AHMADU BELLO UNIVERSITY
ZARIA, NIGERIA.

disjunct intervals.

(iv) Underlying plan, expressed in harmonic structure and form.

(v) Decorations of notes which, like chromatic notes, express pitch modifications.

2.2.0 Types of Music

Music that is written for instruments is classified according to the number of performers, who play it. One musician plays the solo; a small number play chamber and soul, pop music, funk music while as many as a hundred play orchestra music.

Some instruments like the piano, violin and harl are excellent examples for solo performances. The performer can play more than one tone at a time, giving his music richness and depth. Composers have written vast amounts of music for the solo piano which ranges from simple pieces to 32 complex piano sanatos by Beethoven. The above is generally classed as instrumental solo.

Chamber music is usually written for small combinations of instruments in a number of muscical forms. It was originally played in the chambers (private rooms) rather than in churches or public halls. Musicians play chamber music for the musical satisfaction it provides to themselves and small groups of music

lovers. It was not originally intended for public performances before a large audience. Today, we have chamber pop, funk or soul, jazz and high life musicians.

In the orchestra music, there are two main groups. Works for soloist and orchestra, and works for orchestra alone. Soloist and orchestra together play several kinds of works.

A vocal soloist sometimes sings with the orchestra in a song cycle. A concert is an extended work in which the 'Rivalry' is expressed by a solo instrument and the orchestra contrasting the individuality and resources of the two.

2.2.2 Voice music

This can be divided into popular and art songs. The few popular songs that were played many years ago usually have greater melody; art songs are series of classical music and remain fresh for a century. The composer uses music to amplify the meanings of the words of poetry e.g folk and popular musics.

The earliest choral music was sang in unison with each person singing the same note. Choruses may have been singing with accompaniment (a capella) or with instruments playing to some melodies that were sang. Nowadays, the practice of part singing is highly developed. Amateur choral societies developed in Europe in the seventeenth century, which the Barber shop quarter became popular in U.S.A. at the same time.

The first opera music used simple chorals (harmony) and were first written just before 1600. These chords allowed the solo voice to sing the words of the text clearly in a kind of simplified musical speech called 'Recitative'. 'Recitative' is opera combined music and stage action. A good opera music is an exciting or moving stage performance and has music that emphasizes the dramatic or comic values of the story. In light opera, musical commedies, the story always has a happy ending. The music is immediately appealing and the purpose is much entertaining.

Oratories use choruses, soloists and instruments to tell a story in music without the staried action seen in an opera. Most oratories have religious subjects. They involve; soloists, at least one drum, often a supplementary chorus and an orchestra. The narration in oratories as in certain types of opera is done by the use of Recitative.

CHAPTER THREE

3.0 THE DESIGN OF MUSIC RECORDING STUDIOS

3.1 Economic Aspects

Monetary and budgetary evaluations are necessary in the initial setting up of a recording studio. The following points are important under economic considerations.

(i) To buy the requipments that will help improve and develop the art of music. It could be a tape recorder, mixer, or syntheziser, various signal processors etc.

(ii) Enough capital outlay to cover running expenses and maintenance. Generally a business plan may be prepared. This essentially will outline the income potential of getting into and staying in business.

3.2 Site Selection and Development

In most locations, recording studios are considered commercial enterprises depending on the level or output capacity. Hence they may be sited in areas zoned for commercial or business purposes. However, small studios may exist in residential areas only if they do not create noise to traffic or

nuisance.

It is also noteworthy to establish the immediate environment around the studio site. An ideal case is to have neighbouring areas that produce less noise and who themselves are tolerable to accepting moderate noise levels. Sites must never have proximity to thoroughfares with heavy traffic as well as approaches to airports.

3.3 Acoustic Requirements:-

3.3.1 Studio noise level requirements

After making the choice of site, the remaining problems of studio isolation and quieting has to be developed and solved. Noise levels are customarily measured according to the accepted noise criteria curves. These are as shown in (Fig. 3.3.1a).

The noise criteria (N.C) curve takes into consideration the sensitivity of the human ears to relatively low frequency noise levels.

With the aid of a sound level meter and an octave band analyser, an acoustical-consultant can be called upon to determine the existing noise criteria level in the space contemplated for the studio. He has to establish the N.C. level of noise existing outside the studio area. A good recording studio should at least be in the N.C 20 to 25 range. If the maximum noise level outside the studio can be measured or

FIG 3.3.1a
NOISE CRITERIA CURVES

FIG. 3.3.1b,
SOUND TRANSMISSION CLASS

estimated with reasonable accuracy, then the N.C. 20 values can be subtracted from the outside noise levels on an octave-band basis to yield the actual isolation requirements for the studio. Table 3.3.1.

If the studio is to be located in relatively quiet surroundings with office areas closeby, then the isolation problem may not be noise from the outside into the studio, but rather *leakage from the studio activity into the relatively* quiet surroundings. This is likely if the studio is to be used for pop-rock music recording. The acoustic consultant must also make another set of measurements, this time assuming N.C. level for the office areas and establishing the highest levels to be encountered in the studio.

Both sets of isolated requirements i.e; from outside to studio or from studio to outside are then compared and the highest value within each octave is noted. These maximum values define the isolation requirements for the studio.

The next step is to identify those wall and ceiling structures which will provide the required isolation. For general isolation purposes, various wall structures are rated according to their sound transmission class (S.T.C) value. These are a set of weighted curves taking into account the relative insensitivity of the ear to low frequency at low levels. The S.T.C curves are shown in fig 3.3.1b.

The following step is to compare the maximum isolation requirements with the S.T.C curves and chose structures which will meet the most stringent requirements. Due attention is then given to openings and fixtures in the openings. Only those fittings such as doors or windows whose S.T.C is comparable with the wall, floor and ceilings requirements of the space will need to be chosen. A small leakage even though a single path between adjacent noisy areas is all that it may take to ruin an otherwise excellent job.

3.3.2 Acoustical conditions within the studio

Most pop-rock studios are on the "dead" or "dry" side, with reverberation times on the order of 0.5secs. A general rule, the average absorption coefficient of a studio is chosen with respect to its volume and the kind of music to be recorded. Large multipurpose studios may be designed with variable acoustics in mind and also with specific areas of the studio made more live than others. In general, an average studio is given a reverberation time of 0.5secs. The Norris-Eyring equation for reverberation time can be solved to arive at an average absorption coefficient for the room treatment. The treatment is then randomly arrayed about the studio walls as is practical.

3.3.3 Acoustical isolation

Musical instruments vary in their normal outputs over a very wide range. A drum set for example is extremely loud, and is customarily true for the drummer and his instruments to be set up in a drum cage, a small hutlike structure, highly damped on the inside and surrounding the player upto a height of about 1 metre all sides. There may be a roof on the structure as well. Such an arrangement allows the player to hear the other performers without having his own percussion instruments interfere with the pick up of other softer instruments.

Various baffles made of absorptive materials upto 15-20cm in thickness are useful in isolating the softer instruments, so that they may be picked up with minimum interference.

3.4 Building components of studio

3.4.1 Foundations

Since the foundation forms a substructure that the building bears on and transmits loads to the ground, its design consideration in music studios is nothing too special, under normal conditions. One of the popular foundation types can be used e.g strip, pad, raft or pile depending on the suitability of any of this to such sites.

However when the site is somewhere adjacent to railroads, rail stations, subways, underground stations, it is necessary to

isolate foundations to studios in this area against vibrations. This is achieved by using lead asbestos antivibration pads. This requires a careful integration with the foundations of the building. This treatment is illustrated in fig. 3.4.1.

3.4.2 Floor area.

The size of the studio is determined by the physical space required for its occupants, equipments and furniture. The smallest dimension is not to be less than 2.4m.

The necessary floor area of a studio is established by working on an average value of space of 1.4 to 1.8m² required by each musician. About 1.85 to 3.7m² may be required for each musician in a larger studio. The extra space is taken by circulation, music stands and microphone placing. An average floor area of 0.37 to 0.55m² is required for singers depending on whether they are standing or seating. If audience perticipation is envisaged, a separate floor area must be set aside for audience seating.

There are no room proportions that are universally or unanimously accepted as optimum. But, for rectangular studios, the ratios for room proportions is illustrated in table 3.4.2. However, it is noteworthy that the significance of room proportions diminishes when;

(i) the studio has a non rectangular floor

FIG 3.4.1
ANTIVIBRATION FOUNDATION
USING LEAD ASBESTOS PADS

STUDIO TYDE	HEIGHT	WIDTH	LENGTH
SMALL	1	1·25	1·60
MEDIUM	1	1·50	2·50
WITH LOW CEILING	1	2·50	3·20
UNUSUAL LENGTH RELATIVE TO WIDTH	1	1·25	3·20

TABLE 3.4.2
RECOMMENDED DIMENSIONS
FOR RECTANGULAR RECORDING
STUDIOS

(ii) ideal reverberation characteristics have been achieved

(iii) acoustical finishes, generally distributed.

(iv) high degree of diffusion has been provided

(v) the volume of studio is above 710m³.

Parallel surfaces are to be eliminated or treated with acoustical materials highly absorptive throughout the frequency range of between 63 and 8000HZ.

3.4.3 Floors

The studio floor should provide adequate protection against airborne and impact noises. The sound insulation of floors can be improved in the following ways;

(i) A soft resilient surface, such as carpeting, cork tiling, rubber of vinyl tiling. This greatly improves impact noise insulation of the floor.

(ii) A floating floor. This considerably improves the sound insulation against both airborne and impact borne noises.

(iii) A solid suspended ceiling improves the insulation against both impact and airbone noises.

Hard, rigid, finishes, over a concrete floor, such as wood, linoleum, vinyl asbestos tile, asphalt tile. Whenever possible, laying a carpet is the most sensible measure for eliminating impact (foot step) noises.

Floating floors can be supported by a continous layer of resilient blanket, resilent mounts, or sleepers, which rests on a resilent blanket or are carried in resilient chairs (fig 3.4.3 a & b). In all cases, the floating floor assembly rests on the structural slab. A floating concrete is about 75mm thick on top of resilinent blanket. Floating concrete slabs are more effective than floating wooden slabs.

Maximum performance of the floating floor is obtained when a consistent and uniterrupted accoustical separation between floating floor and structural slab, but also to avoid any rigid contact between the floating floor and the surrounding walls. The resilient blanket beneath the floating slab is be to adequately protected by a waterproof membrane (roofing felt or polyethylene) against moisture originating from the pouring of the floating floor slab. If the area of the floating slab exceeds 12-14m^2, suitably spaced expansion joints and reinforcing bars should be provided. All pipes, ducts, conduits which penetrates through floating floors should be isolated all around to avoid short circuiting between structural floor and floating slab. see fig 3.4.3b.

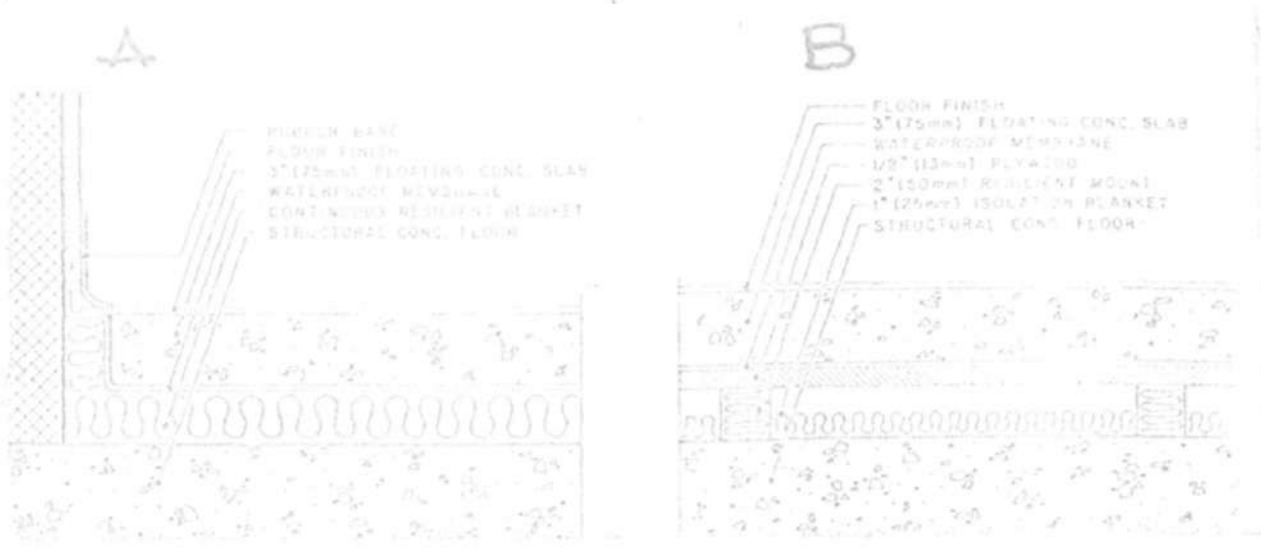


FIG 3.4.3a
FLOATING CONCRETE FLOORS

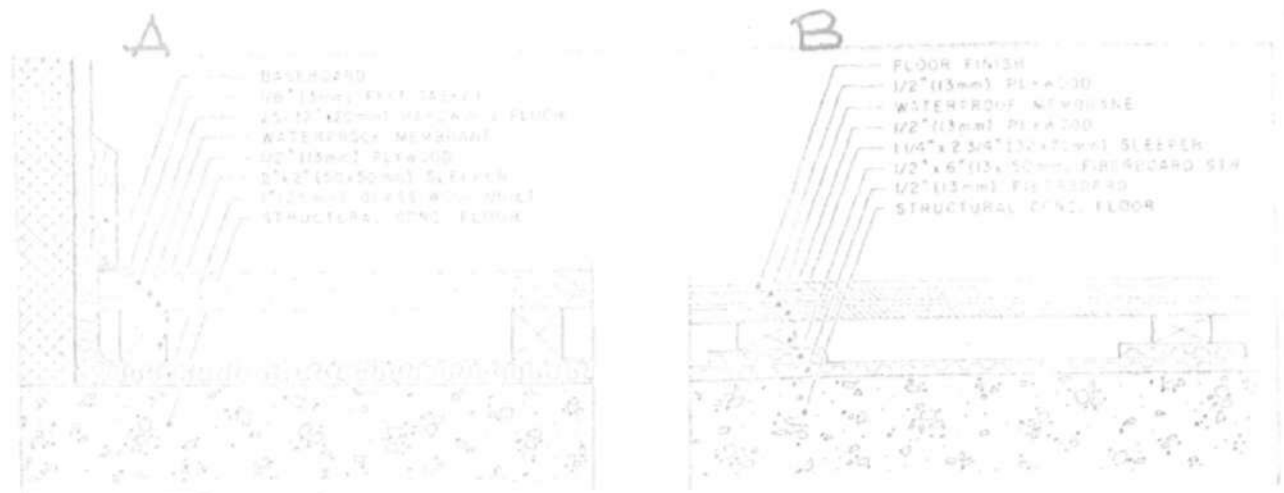


FIG 3.4.3b
FLOATING WOODEN FLOORS

FIG 3.4.4a
AIRTIGHT SEALING IN MASONRY JOINTS

3.4.4 Walls and openings in walls

In the design of studios, sound insulating walls are used. Generally, parallel walls must be eliminated (particularly in medium and large studios) or are treated with acoustical materials highly absorptive throughout the frequency range between 63 and 8000HZ.

Optimum performance against airborne noises can be expected from a wall only if the following points are satisfied;

i) If the wall has a reasonable and uniformly distributed mass over its entire area.

ii) It is constructed both horizontally and vertically as an uninterrupted, complete barrier.

iii) It is effectively sealed around its periphery, between its elements, and around openings made for outlets, switches e.t.c.

(iv) It is built from structural slab to structural slab.

The sealant must be a non setting, non skinning, and non hardening caulking compound. Loose and void mortar joints should be carefully avoided in masonry wall construction because, they create noise leakage (fig 3.4.4a). If no plaster is specified for a masonry wall, its exterior surfaces should be

painted possibly with two layers. Gypsum boards used in dry wall construction should be carefully sealed and taped.

Single wall partitions weight need to be doubled to provide about 5 to 6dB improvement in its S.T.C rating, using a multiple partition it is only necessary where a high degree of sound insulation is required. A multiple partition should include as many of the useful features illustrated in fig 3.4.4b.

Resilient layers (fibre boards, glassfibre etc) semi resilient attachments or resilient clips between individual layers and the inner framing or core of the wall are particularly recommended. These elements are inexpensive, do not require excessive labour and contribute about 2dB to 5dB to the S.T.C rating of a multiple wall. This is illustrated in fig 3.4.4c.

Every attempt is made to increase the weight of a wall without rendering it too stiff. This can be achieved by using sheet lead as wshown in figure 3.4.4d.

3.4.5 Doors and Windows

Doors constitute acoustically weak elements of the walls because of the following reasons.

(i) Their surface weight is normally smaller than that of the wall into which they are built.

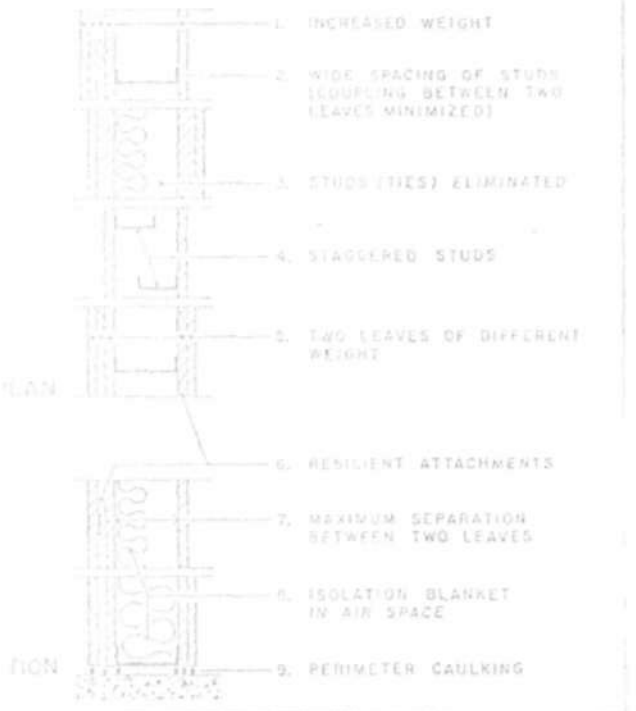


FIG 3.4.4b
MULTIPLE PARTITIONS

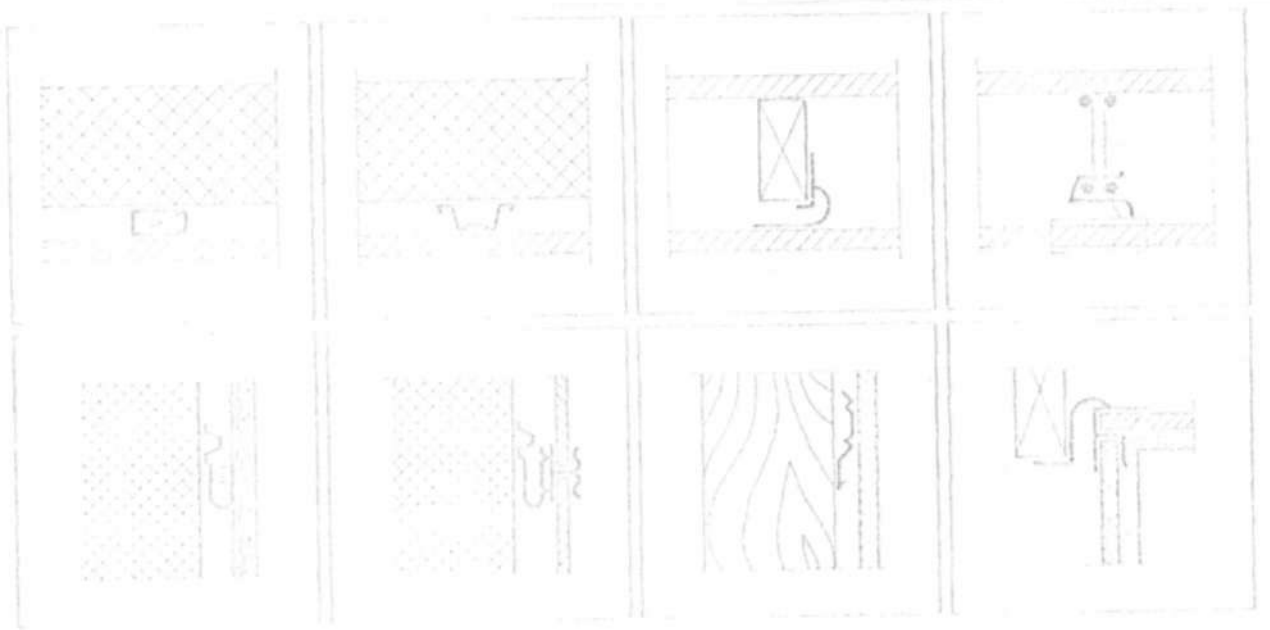


FIG 3.4.4c
SEMIRESILIENT ATTACHMENTS
IN MULTIPLE PARTITIONS

FIG 3.4.4.d
SHEET LEAD

FIG. 3.4.5a
DOOR STOPS USED AT JAMBS/HEADS



FIG 3.4.5b. AUTOMATIC DROP BARS CLOSER

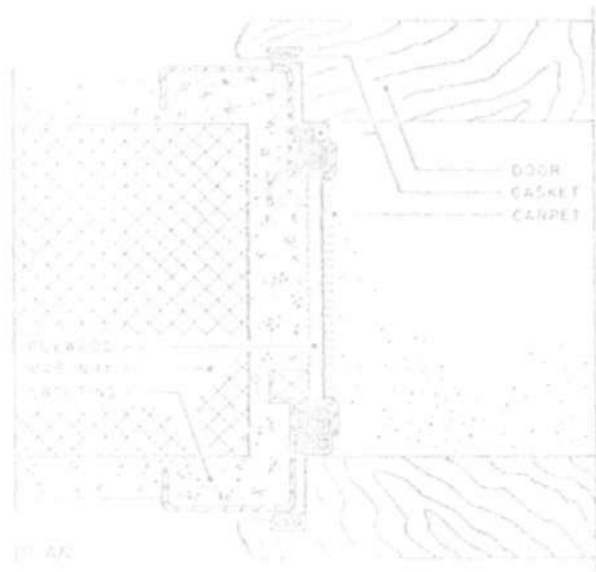


FIG 3.4.5c
SOLID INSULATING DOUBLE DOOR

(ii) The gaps around the edges unless sealed offer an easy passage for the transmission of noise.

(iii) They are considerably smaller than an average partition, consequently their low frequency resonances occur at a more critical range of the audio-frequency spectrum.

Sound insulating doors should be of solid and heavy (rather than hollow-core and light) construction with all edges well sealed. Light weight, hollow core wooden doors are dimensionally unstable and can warp, destroying the seal along the perimeter of the door. Rubber, foam rubber, or foamed plastic strips, adjustable or self aligning stops, and gaskets can be used for sealing the edges of the doors. This is illstrated in fig 3.4a. They are installed so that they slightly compress between door and stop when the door is in a closed position. In simple cases, the bottom edges can have a replaceable strip of felt or foam rubber attached to minimize the gap between the door and the floor. a more effective alternative is to instal drop-bar draft excluders, called automatic threshold closers as indicated in fig 3.4.5b.

Doors that must have high degree of sound insulation are to be built in such a way that there is a separation between the two faces of the door uninterruptedly from edge to edge in both directions. In addition, damping treatments are inserted

between individual layers of the doors. Ordinary doors with surface leather padding do not contribute to the reduction of airborne noises between source room and receiving room; they provide only a negligible degree of sound absorption only in the room facing the leather paddings.

The use of automatic door closers is adequate whenever feasible and applicable in order to avoid the annoying sound of doors slamming. Similarly door-chimes are preferable to door-knockers.

Doors always reduce the overall T.L. (Tansmission loss) of walls in which they are installed. In order to keep this reduction to a minimum, it is good to make the difference between the T.L. of the wall and that of the door between 5 to 10dB. Fig 3.4.5c illustrates a sound insultaing double door with steel frame and perimeter absorption between the doors.

In offices where rooms are located along both sides of the corridor, doors can be staggered so that, noise from one do not penetrate directly across to another fig. 3.4.5d.

For rooms such as music studios, the need for a highly effective and expensive sound insulting door may be avoided using two moderately sound insulating doors, or sound locks fig 3.4.5e.

Windows also constitute weak components in exterior walls and enclosures because, their surface weight is much below that of exterior wall. And their connection to exterior walls unless

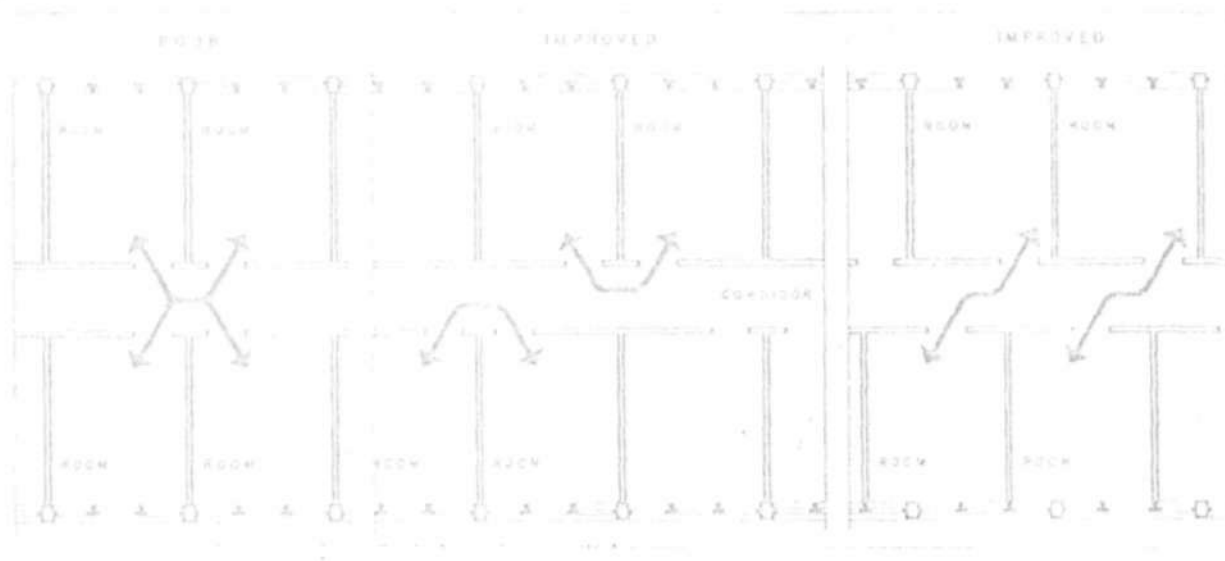


FIG 3.4.5d
STAGGERED DOORS FOR GOOD ACOUSTICAL PRIVACY

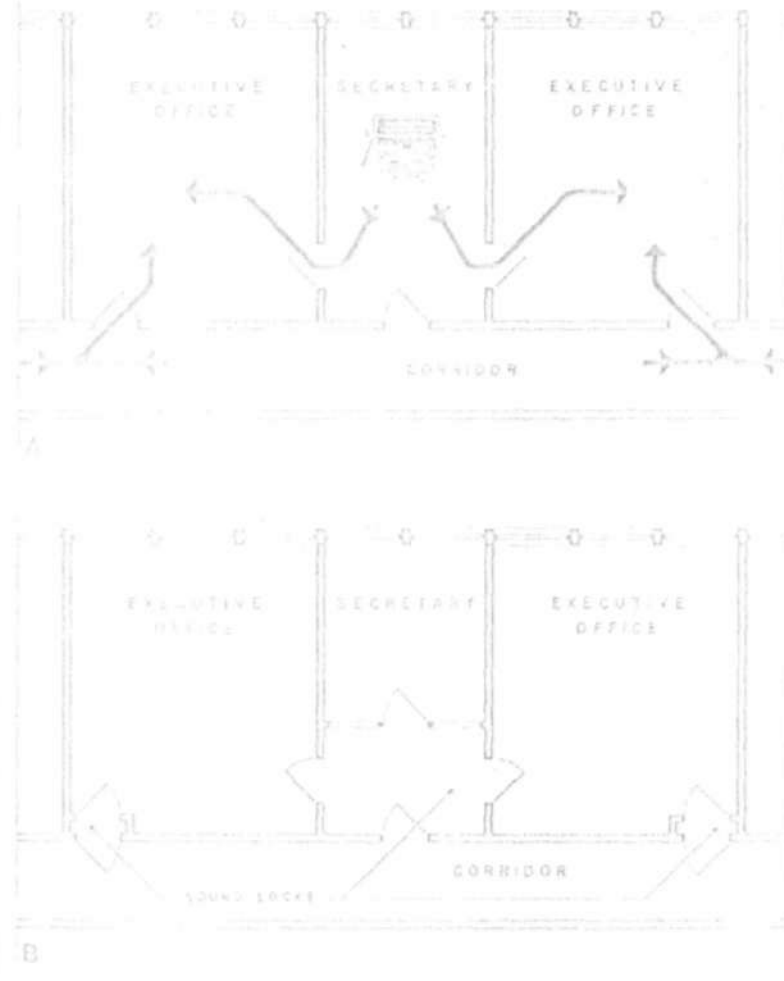


FIG 3.4.5e. A, ORDINARY DOORS
B, SOUD LOCKS

sealed may constitute a direct path for the penetration of exterior noise.

The T.L. of windows depends on the number, thickness, and relative positions of the panes and on their edge connections to the wall. Double glazing, well sealed edges and a minimum distance of about 100 to 125mm between the panes are the basic features of a sound-insulating window.

In music studios that are airconditioned, window areas may just serve as glazing sources in which case. the windows are fixed lights. The T.L. of fixed windows, with thick double panes well spaced and structurally isolated from each other may approximate that of sorrounding wall.

Adding sound absorptive treatment around the perimeter between the panes, mounting panes in an elastic material (cork, felt, sponge, rubber, neoprene) and eliminating parallelism between panes will result in a reasonable increase in the T.L. of windows. Each glass should be of a different thickness or weight per unit area in order to eliminate acoustical coupling and resonance. These methods are used in the installation of control and observation windows in recording studios fig 3.4.5f.

Windows which are moderately sound retarding and manufactured mainly for thermal insulation purposes are available on the market as T-window, thermopane e.t.c.

3.4.6 Ceilings

Suspended ceilings attached to the structural floor contribute substantially to the sound insulation of a floor against both airborne and impact borne noises. Their effectiveness can be improved by the following.

(i) The ceiling membrane must not weigh less than 25kg/m^2. If an absorption blanket (mineral or glass wool) is used in the air space above the ceiling, the weight of the ceiling can be somewhat reduced.

(ii) The ceiling membrane must not be too rigid.

(iii) Direct paths of noise transmission through the ceiling should be avoided by the use of a solid, airtight membrane.

(iv) Gaps between the ceiling membrane and the surrounding structure should be sealed.

(v) The airspace between the ceiling membrane and structural floor should be increased to a reasonable maximum. and an isolation blanket placed in the air space.

FIG 3.4.5f,
CONTROL WINDOW BETWEEN
STUDIO AND CONTROL ROOM

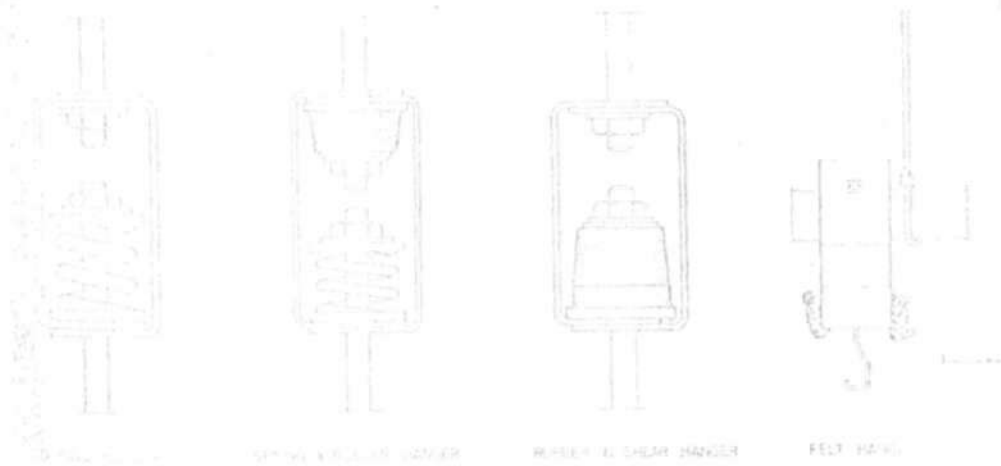


FIG 3.4.6a,
TYPES OF HANGERS USED IN
RESILIENTLY SUSPENDED CEILINGS

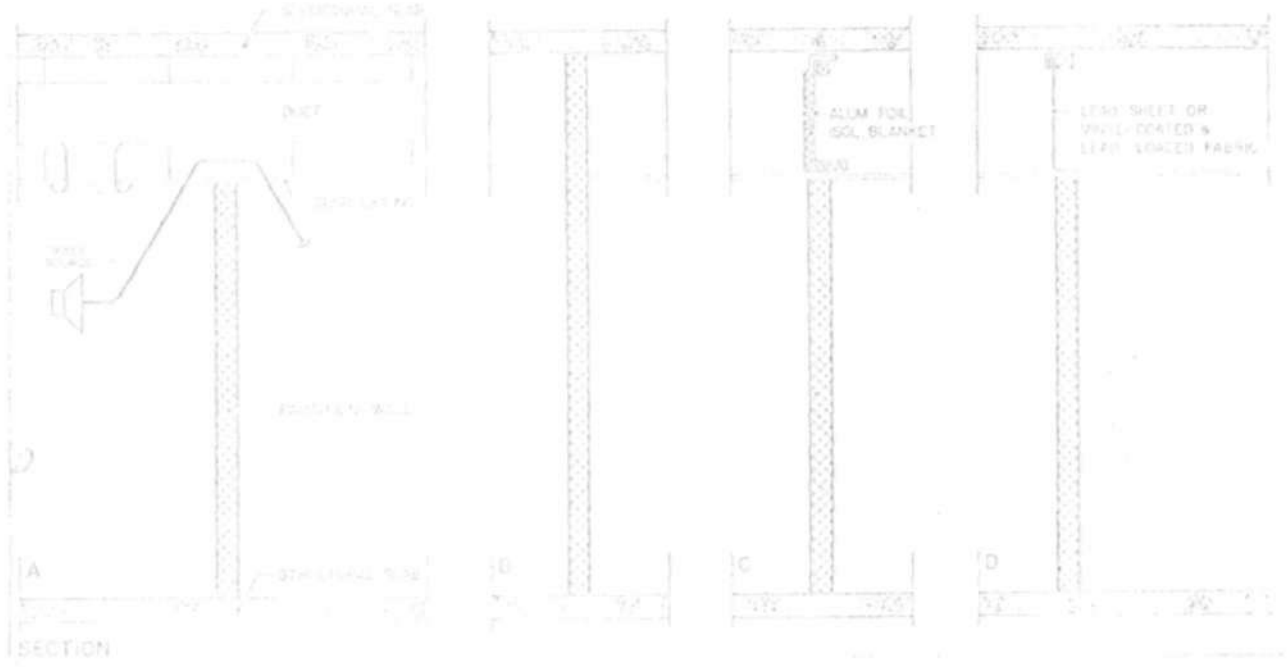


FIG 3.4.6b,

METHODS OF PREVENTING NOISE TRANSMISSION ABOVE PARTITION

A, PARTITIONS BUILT UP TO SUSPENDED CEILING HEIGHT
B, PARTITIONS BUILT UPTO STRUCTURAL SLAB ABOVE
C, ADEQUATE SOUND INSULATION BARRIER IN THE CEILING SPACE

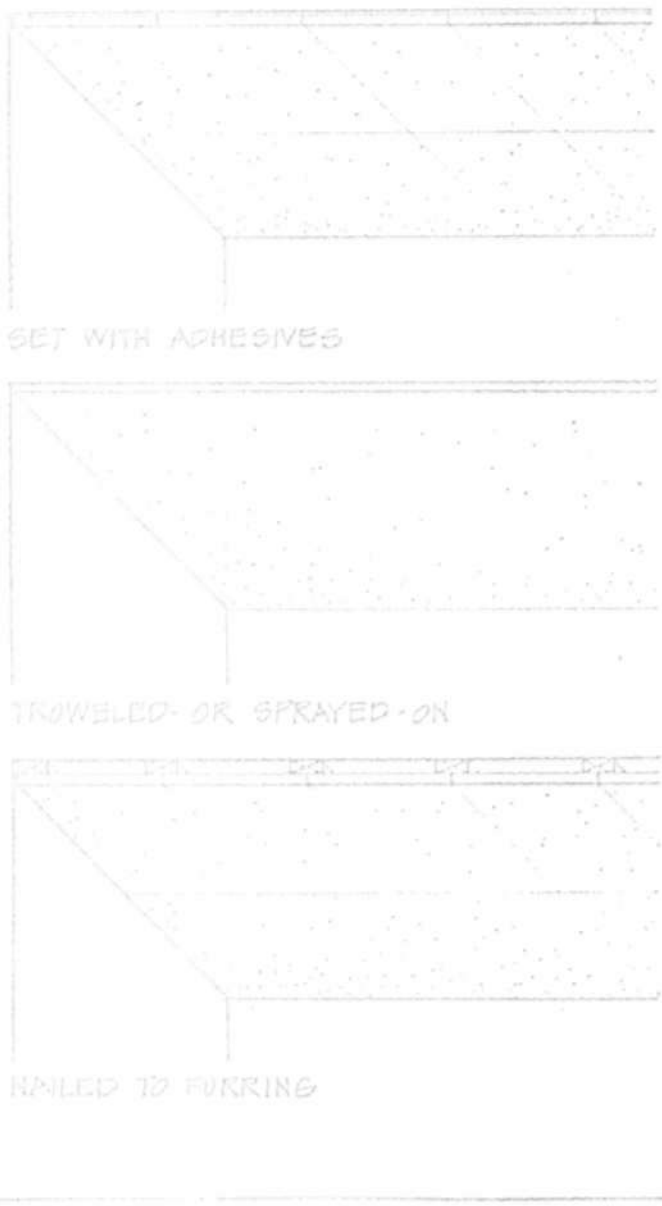


FIG 3.4.6c,
APPLICATIONS OF ACOUSTICAL CEILINGS.

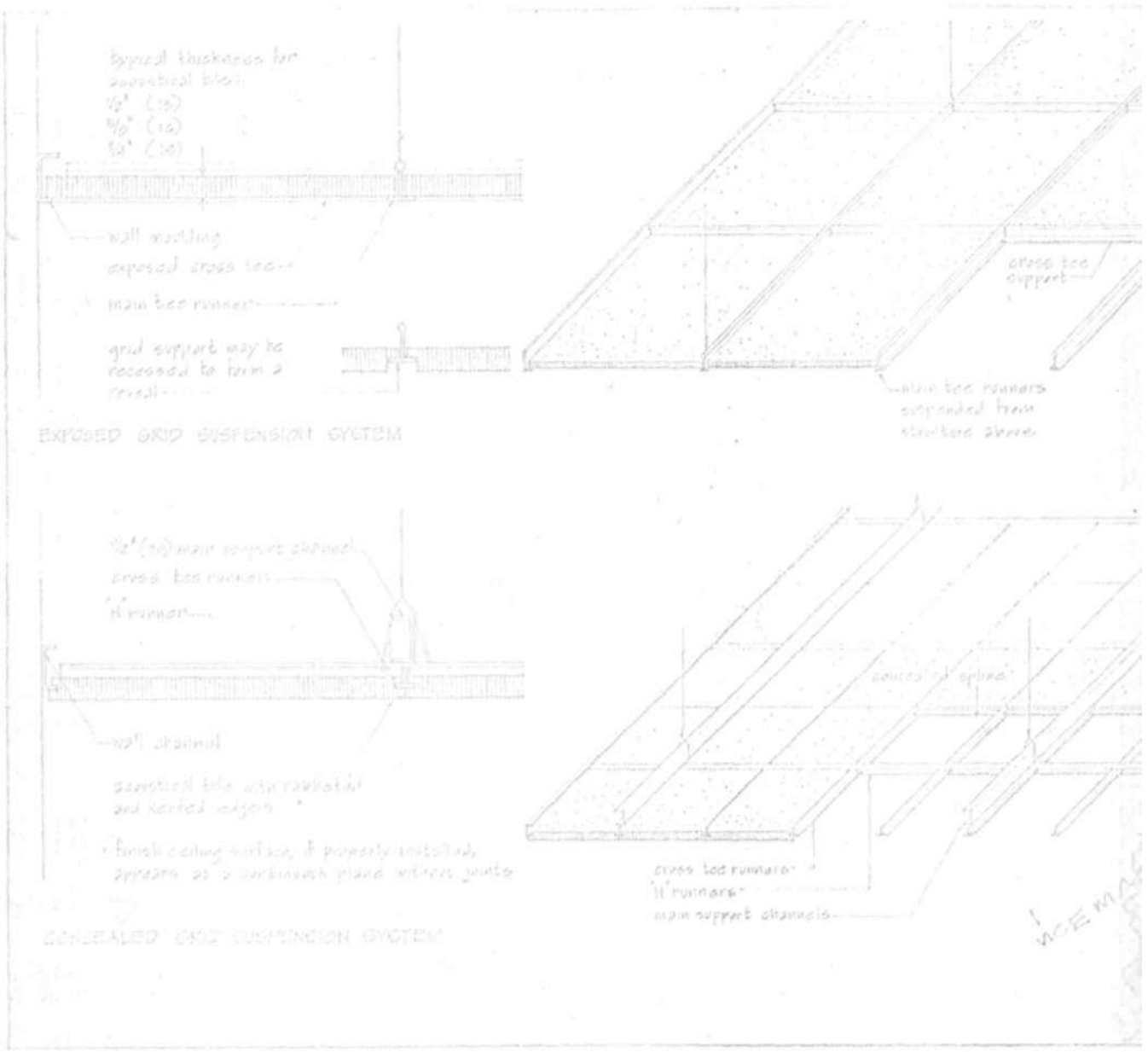


FIG 3.4.6 d

SUSPENDED ACOUSTICAL TILE CEILINGS

(vi) The number of points of suspension from the structural floor should be reduced to a minimum. Resilient hangers are prefered to rigid ones.

The ceiling membrane should consist of a minimum of 20mm solid cement plaster layer with caulked joints all round. Fig 3.4.6 (a) shows various hangers used in resiliently suspended ceilings.

Walls built only upto suspended ceiling height suffer a serious reduction in T.L. it is pressing to make the space between a suspended ceiling and structural soffit above the line of the partition wall be adequately sealed. Fig 3.4.6b.

Acoustical ceilings provide integral acoustical treatment along with a finished ceiling surface. They are usually in the form of tiles that may be applied directly to or suspended from the underside of roof or floor constructions.

Acoustical tiles may be of wood or mineral fibre with perforated, patterned, textured or fissured surfaces that allow sound to penetrate into the fiber voids within the tile. These light, low density tiles are fragile and subject to abrasion and impact damage. They are usually factory painted or coated to improve their moisture and abrasion resistance qualities. If repainting is needed, only non bridging paint should be used to avoid closing the surface voids and reducing the tile's

acoustical value. Perforated metal or cement asbestos-clad tiles containing batt or blanket insulation are also available.

Acoustical tiles are available with square cut, beveled, rabbeted, or tongue and grooved edges. They are usually manufactured according to 305mm, 610mm, and 762mm modules.

Factors to be considered in the selection of acostical tiles are;

(i) Acoustical value - usually coded by the manufacturer.

(ii) Fire resistance rating - mineral fiber and metal - or cement asbestos clad tiles are incombustible, wood fiber tiles may be treated to be flame retardent.

(iii) Method of application fig 3.4.6c.

(iv) Tile size and modular dimensions

(v). Light reflectance value - constant, manufacturer's catalogue.

(vi) Appearance - surface texture, pattern and colour.

(vii) Edge conditions - whether flush or articulted.

Acoustical tile ceilings may be suspended to provide a plenum space for mechanical; duct work, electrical conduit, plumbing and recessed light fixtures. The depth of the plenum may vary according to space requirementsa of the utilities and the required floor to ceiling height of the interior. Ceiling systems that integrate the functions of lighting, air distribution, fire protection and acoustical control to minimize the depth of the ceiling construction are available.

Although, the form of suspension systems vary between manufacturers, they all consitute basically of a grid of metal channels, runners and splines. This grid may be exposed, semi concealed or completely concealed. In most suspension systems, the acoustical tiles are removable to provide convenient access into the plenum spaces see fig 3.4.6d.

3.4.7 Atmosphare and Deco

Efforts to make the studio look institutional must be avoided. The feeling should be of warmth so that musicians will feel at ease. The choice of colors and textures should be made early, preferably with the help of a professional designer, so that those choices can satisfy both aesthetic and utilitarian needs.

Lighting is an important element in creating the light atmosphere. Provision should be made to create high illumination when needed, but it must be remembered that most of

the activities will likely take place at moderate to low lighting levels. For best results, the aid of a lighting consultant can be sought.

3.4.8 Studio services

Plumbing noises are seldom excessively loud; they can be annoying and embarrasing when they come from bathroom fixtures. The followings are the main sources of plumbing noise.

1. Turbulent flow of water
2. Water hammering caused by the sudden interruption of water flow.
3. Pump noise caused by motor driven pumps.
4. Loose or defective parts of fixtures
5. Expansion and contraction of piping
6. Drainage of water from bathtubes, toilets, sinks and lavoraties.
7. Running and splashing of water when a bathtub is being filled or a shower is used.
8. Entrapped air in the plumbing system.

As with other noise control, the best approach is to abate noise at the source. For example by;

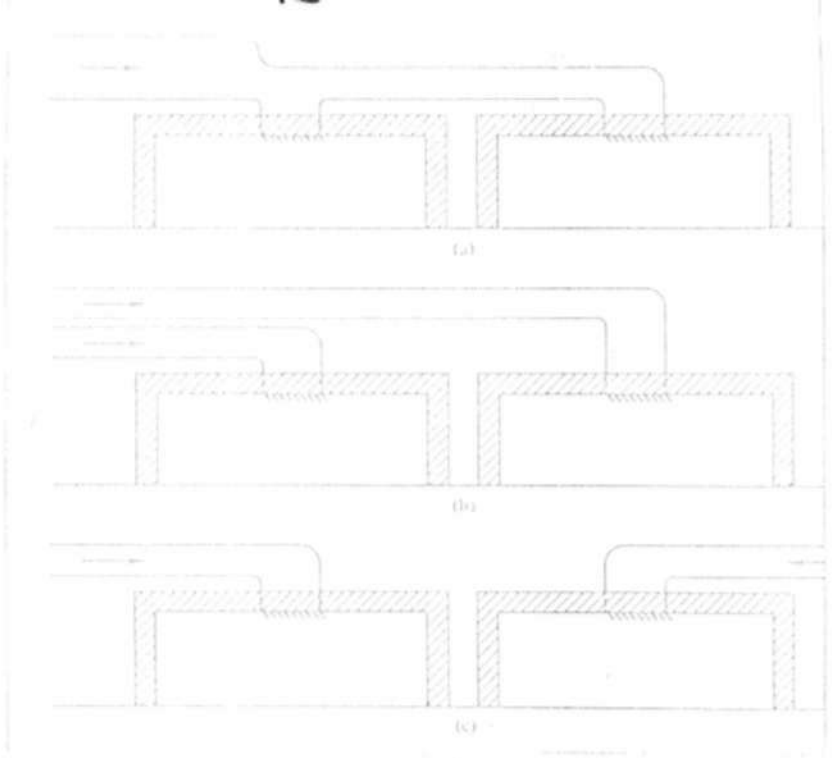


FIG 3.5.7 a, b, c AIRCOND. DISTRIBUTION

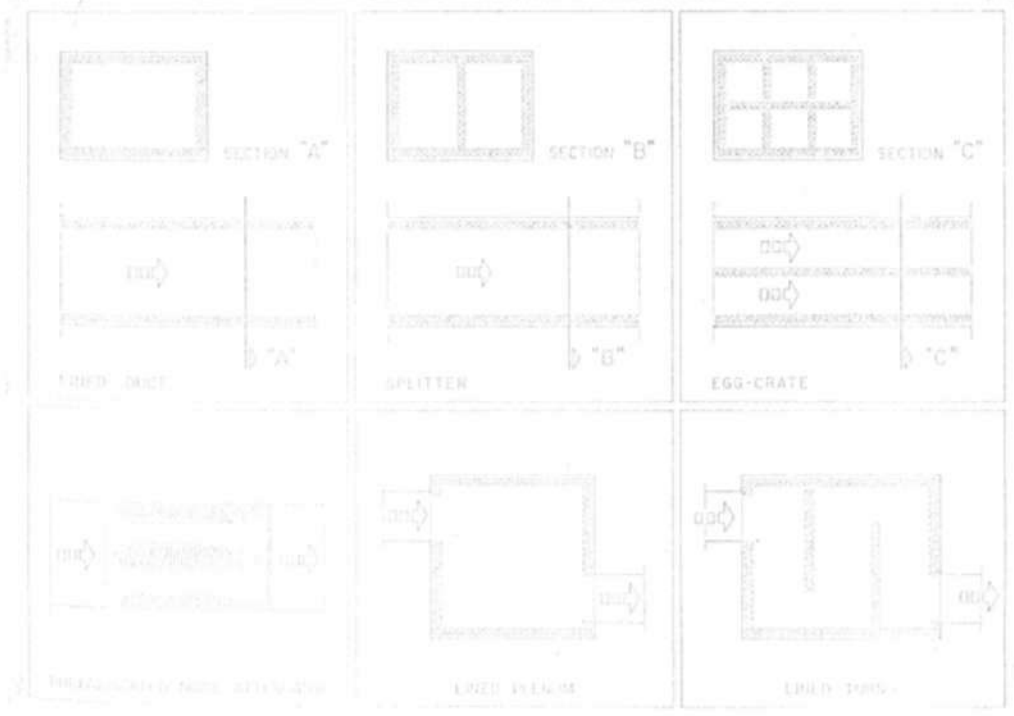


FIG 3.5.7 d,
SOUND ABSORBTIVE LINING IN DUCTS

FIG 3.5.7 e,
PREFABRICATED NOISE SILENCERS IN DUCT

1) Installing supply and drain pipes as far as possible from the studio.

2) By selecting and installing quietly operating fixtures.

An attempt should be made to prevent noise from penetrating into the water pipe or to prevent its transmission from the pipe to the building structure. The transmission along the pipe can be reduced considerably by inserting a flexible (rubber, rubber and fabric, plastic etc.) pipe between the source and the metal pipe.

When noise is transmitted through a pipe, the amount of noise that is radiated by the pipe itself is negligble; most of the disturbing sound is radiated by the building structure such as partitions, slabs, ceilings e.t.c.; to which the pipe is attached: To eliminate this noise, pipes should be attached to massive structural elements (masonny walls) or resiliently mounted. This will provide adequate insulation from their supports by being wrapped in felt, asbestos, rubber neoprene, mineral wool. If all the above methods prove ineffective in reducing the noise, the noise bearing pipes should be screened from the studio area by building them into ducts or shafts.

Noise producing fixtures e.g bathtubs, showers, should be installed on floating floors or resilient underlays such as cork, rubber or neoprene.

In the studio, the noise level created by an air handling system should be in the order of 5 to 15dB range below the desired level of background noise in order to avoid interference of ventilation noise with the enjoyment of music.

Air conditioning is always a problem to be resolved in the design of studios. Where existing sites are being considered for conversion to studio use, existing air conditioning systems should be carefully assessed in the following regards:

1) Is the cooling effort equal to the maximum anticipated load?

2) Does the noise levels of the system meet the noise requirements of the studio?

3) Does the duct work provide sufficient sound isolation between the studio and adjacent work areas?

Where a facility consists of a single studio, things are relatively simple to deal with; the cooling load must be carefully assessed and the ductwork gauged to avoid excessive turbulence. Fans must be isolated so that their noise will not intrude. Where multiple studios are contemplated. If a central A.C. system is to feed the studio units, the distribution system is very important. Two studio units on a single air conditioning feed. The situation is worst (fig 3.4.7a). There

will be a significant improvement where both studios have separate feeds from a common cooling unit (fig 3.4.7b). The best solution is obtained when each studio is served from a different station system. Though more expensive, this method is apt to be more conservative of energy (fig 3.4.7c).

In the control of ventillating and air conditioning noise, attention must be given to three principal noise producing parts of the system:

1) The central mechanical equipment.

2) The supply and return ducts.

3) The supply and return grilles.

The installation of quietly operating equipments, far removed from studios or floors (possibly in the basement or in a separate building) is a way of reducing mechanical noises. Additional methods are:

1. Absorption of noise in duct wall linings (Fig 3.4.7d)

2. Reduction of noise by means of bends

3. Division of noise into several branches of the duct system.

4. Using heavy-gauge metal for ducts, properly braced and stiffened.

5. Supporting ducts by resilient hangers.

6. Acoustical separation of ducts from walls and floors at points of penetration, by means of resilient packing with fiber glass, rubber and neoprene and by caulking the exposed end of the parking.

7. Using boxed-in ducts between gypsum-board enclosures or in shafts.

8. The use of properly shaped streamlined and carefully selected fixtures (grilles) at the discharge end of the duct with adequately low velocity.

9. Spreading noise into the room at supply or return air grilles.

10. Absorption of noise within the room supplied with air.

Thermal insulation installed along the outside surface of a ductwall will contribute, to a certain degree, to T.L. of the duct wall.

Sound absorbing materials, such as glass fiber or mineral fiber boards installed along the inside of rectangular or tubular ducts will increase the reduction of noise along the duct. sound absorbing materials used for duct lining should have a high absorption coefficient, a smooth surface for low air friction, adequate strength to resit disintegration due to air flow and adequate resistance against fire, rot, vermin and odour.

The incorporation of a plenum (an expanded section of the duct) into the duct system with a sound - absorptive interior surface contributes to the reduction of noise within the duct work.

Ducts with small cross sections are more effective noise attenuators than those with larger cross sections. Therefore, when a duct is too short to provide satisfactory reduction of noise, added attenuation can be obtained by diving the duct into a smaller number of lined ducts (egg crate type sound absorbing cells, splitters). (Fig 3.4.7d) or by using prefabricated package.

It is worthy to note that a most effective and economical means of controlling ventillation noise is achieved by concentrating and locating the noise producing equipment as far as possible from the studios. And off course, there are concessions. The airconditioning system can be turned off

during actual recording and turning it on, during breaks for play back.

3.5 Studio construction overviewed:

All the measures discussed so far in this chapter when applied integrally in a single design is called discontinuous construction or box within a shell. Basic elements of such an arrangement are shown in (fig 3.5). The room illustrated here can be used for audio-metric tests, radio or recording studios, or for any other purpose where an extra ordinary degree of acoustical privacy must be achieved. Such rooms are normally accessible through a sound lock and has a floating floor on top of structural slab; the walls built on the floating floor are separated from the load carrying exterior walls. The ceiling is resiliently suspended from the structural floor above. The acoustical separation of the inner shell from the building structure must not be short circuited by rigid connecting links, such as wall ties, ducts, pipes or unisolated windows.

3.6 Studio Equipments:

3.6.1 Consoles:

During the mid seventies, Tascam introduced the first consoles aimed for small recording studio. Since that time many companies have developed small consoles, up to 8-track output

FIG 3.5
DISCONTINUOUS CONSTRUCTION
BOX IN A SHELL STUDIO

capacity and 16 inputs. Noise and distortion characteristics of these consoles can be excellent, but they do not match those of professional consoles.

A typical 16-in; 8-out console will be in the $10,000 range, while the professional model of 32in; 16out variety is in the $40,000 range.

3.6.1 Tape recorders:

Multi channel tape recorders used in the small studio are basically an outgrowth of tape recorder standards as they have developed out of consumer products. While larger studios normally allocate eight tracks to 8.5cm wide tape the so called semi professional studio will use only 1.25cm wide tape for the purpose. Track widths are respectively 1.75mm in the professional format and 1mm in the semi professional format. The smaller tracks and consequent narrower track spacing result in an increase in ground noise level of the track as well as increased cross talk between adjacent tracks.

Noise reduction (usually designated dbx) is available in some more expensive tape recorders. In the 8- and 16-track formats, noise reduction may be considered a necessity because of the narrow track width and the additive effect of noise in the mix-down process. Typical costs for the semi professional machines are usually run $500 - 600 per channel, while the professional charge is about twice of these amounts.

3.6.3 Micophones

These have improved drastically in recent years. The various dynamic models in particular have risen in favour as their prices have gone down. The expensive capacitor models are often rivaled in performance by the less expensive electret types. In matters of selecting the microphones to be installed, the prospective client is adviced to seek the advice of seasoned Engineers as well as musicians. The client should look carefully into the various console options for remote powering of non eletret types of capacitor microphones.

3.6.4 Monitor Loud speakers

High powered monitors with compression H.F. drivers remain the ideal for pop-rock recording, their cost often rules them out in small studios. A number of manufacturers have produced 3- and 4-way systems using direct radiating elements which are quite substantial and can handle in stride the high acoustical output demanded of them. While the costs of one-third octave equalizers intended for loudspeaker use continue to go down, the prospective client is advised to proceed with caution unless he has augmented the L.F. sections of his monitor systems.

In general, the professional manufacturers of low cost monitors provide accurate data on power handling, and their

advice should be followed.

3.6.5 Auxilliary Distribution Systems

Most consoles of recent design provide for a number of one buss feeds to the studio for headphone monitoring. Headphone monitoring enables the players of loud instruments to the players of softer instuments or vocalists during recording activities. Headphone monitoring is essential during over dubbing activities in the master tape. The cue busses should be provided with adequate power amplification for the maximum headphone load which is anticipated. There could also be a provision for individual adjustment of monitor level at each musicians position in the studio.

3.6.6 Direct Feed from electronic Instruments

It is customary for many types of electronic instruments to feed directly into the console at line level. Isolation transformers are essential to this. Often, some degree of padding is desirable as well. While direct boxes are available commercially, the client should prepare to build his own demand.

3.6.7 Auxilliary Signal processing

The studio will have needs for extra reverberation, time delay, equalization and gain manipulation devices. These devices will have to be purchased as required.

3.7 Ancilliary Facilities:

3.7.1 Control Room

Every recording studio is linked with one or more control rooms, where the control desk, that is the nerve centre of the recording session is located. All the sound sources are controlled and mixed here, before the signal finally leaves the transmitter. Visual contact between the studio and control room is provided by a wide control window with an unobstucted view of the studio floor. As long as the studio floor area does not exceed about 75 to 110m², both control room and studio can be on the same floor level. Control rooms linked with studios of larger size must be elevated.

The size and shape of the control room depend on how many people and how much equipment it must accommodate e.g audio-console, monitoring and talk-back facilities, tape and disk reproducers, tape recorders, clock, reverberation control unit, video monitor, intercom key panel and seats for the control personnel.

In control rooms, an R.T. of about 0.4sec is recommended at the mid frequency range.

Some important technical points to note are:

1) Allow adequate space for the control room and its isolation needs at the outset. Tape recorders, most of which can be

operated remotely, should be well out of the way, and there should be a feeling of space around the console.

2) Sight lines to the monitor loudspeakers should be preserved, and the array of the loudspeakers in the room should be symmetrical. Flush mounting of the monitors is recommended.

3) For normal recording and overt dubbing activities, 30 to 35dB isolation between the studio and control room may be sufficient. However, if the studio is used for rehearsal purposes, while transfer or mix down activities are going on in the control room, this will be insufficient. Weigh these requirements at the outset.

4) Most Engineers and producers prefer control room acoustical environments to be neutral, with reverberation times in the 0.25-0.4sec range. Uniform dispersion of sound is a goal, and absorptive materials and treatments are generally randomly arrayed about the space. There could be room for other possible approaches, and designers may prefer to make the forward portion of the control room acoustically dry and the rear part reflective.

In either situation, it is important that low frequency irregularities in response be damped out, and this demands

fairly thick boundaries between the control room and the surrounding structure.

5) Avoid direct access between the control room and studio. Both should open into a common hall way, providing further isolation between the two spaces.

3.7.2 Rehearsal Rooms

In rehearsal rooms, suitably shaped enclosures, provision for adequate diffusion, well controlled R.T., carefully selected and well distributed acoustical finishes and a high degree of noise control will produce acoustically efficient rehearsal rooms. Acoustical conditions in rehearsal halls should simulate those of the auditorium (with audience) capacity with which they are functionally connected.

In the design of rooms for rehearsing music before waxing, the followings are important.

1) Adequate floor area, room height, room shape and volume must be established to achieve proper reverberation, diffusion, balance and blend.

2) Genereous amounts of sound-absorbing materials should be applied to render these rooms sufficiently dead so that the

excessive acoustical power generated by the instruments can be soaked up.

3) Transmission of undersirable sounds between spaces used simultaneously must be reduced to an absolute minimum. Parallelism between opposite surfaces must be avoided in the rehearsal room. At least two adjacent entire wall surfaces, down to their bottom, and most or possibly all the ceiling area should be treated with sound absorbing materials. The use of suspended ceilings here is to be avoided.

3.7.3 Listening Booths

Listening booths are used for monitoring and editing disks, magnetic tapes and other sound programs. Acoustical conditions in listening booths should resemble those of an average domestic living room, with an R.T. of about 0.4 to 0.5sec.

3.7.4 Sound Locks

These are used to enhance better acoustical privacy in the recording studios. This is done to avoid a highly effective and expensive sound insulating doors. Instead of using expensive sound insulating doors, two mederately sound-insulating doors are used. All wall, floor, and ceilings surfaces within a sound lock should be rendered sound

absorptive, in order to achieve a maximum attenuation of noise transmission through the sound lock.

CHAPTER FOUR

4.0 CASE STUDIES

4.1 Criteria for the case studies

The following important points were taken into consideration in each of the case studies.

(i) Type of construction used

(ii) Zoning of activities on the site

(iii) Accessibility

(iv) Services

(v) Number of recording studios and the methods of control employed.

(vi) Type of insulators and absorbers used in the recording studios.

(vii) Expansion possibilities on site

(viii) Parking facilities available on site

(ix) Welfare facilities on site.

4.2 E.M.I Nigeria Limited

This is a music company that specialises in the recording of music and the production of prerecorded cassettes.

4.2.1 Construction Techniques

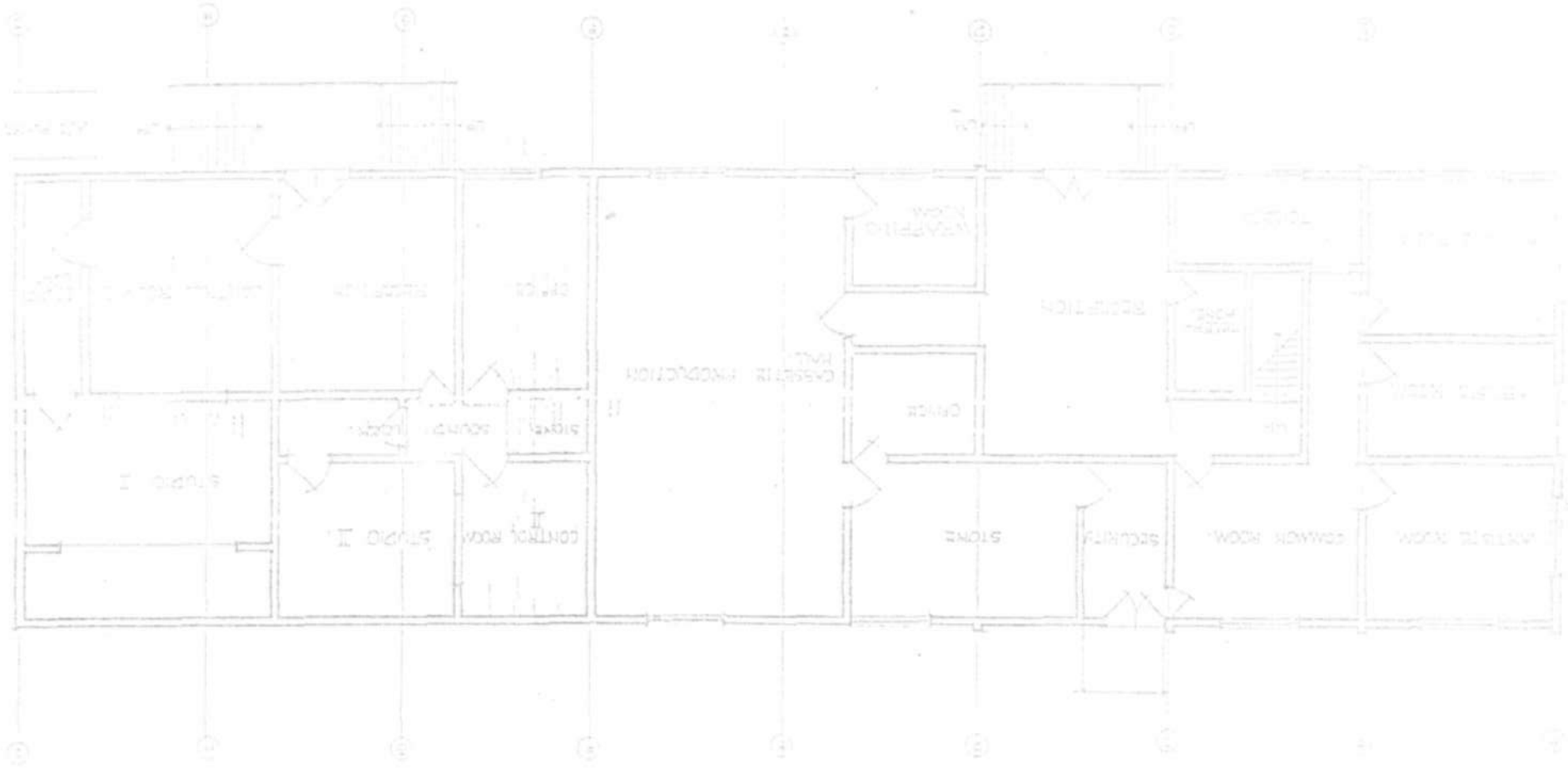
The building is on two floors and the structural system is of beam-column construction and roofed with corrugated sheets. The walls are of sandcrete blocks 230mm thick and plastered both internally and externally. The building generally requires renovation, for the fact that cracks are visible in some parts of the building. Redecoration of the whole building is needed.

4.2.2 Site Zoning

The size of the plot used for this company is about 1,400m² out of which 396m² is built up. Zoning of activities on site is attempted as noticed in the layout of spaces. The recording studios are placed far from the noisy traffic. Office accomodation does not link studio area. However, the placement of the A.C plant very close to the studio has a bad acoustical effects on the studio's indoor environment.

4.2.3 Accessibility

The plot is easily accessible from Oregun road. Before entry into the company, a general check is performed by security men on the incomer.


STUDIO I
STUDIO II
CONTROL ROOM
STORE
OFFICE
SECURITY
COMMON ROOM
MEETING ROOM

4.2.4 Services

Electricity is supplied to the company by national electric power Authority via power lines on the Oregun road. However for power failures, the company has its own stand by generator.

There is a water tank that is elevated on the site. The structure carrying the tank is defaced by over flow of watter from the tank.

Air conditioning units are accommodated in the offices. However, the studios are fed from the central stationed A.C. plant from the outside.

The company is linked to the outside world by the telephone line which is essential for easy communication.

4.2.5 Recording Studios

There are two recording studios in this company; an eight track and a 24 track studios. The eight track studio is also used for auditioning. Each studio is linked to a control room, and entrance to the studio is through a sound lock. Problem of storage area for studio equipments is noticed. The number of studios are also not adequate.

4.2.6 Acoustical Considerations

The walls encasing the studio spaces are made of sandcrete blocks and faced with concrete. The inner concrete

walls are like a box in a shell. The concrete walls are then surface treated with sound absorbing materials. Variable reverberation requirements are achieved by the use of removable booths and electro acoustic devices. The ceilings are white finished and do not lay paralled to the floor slab. Noise insulation value is within an acceptible range.

4.2.7 Parking

There are no defined parking spaces and as such parking is not well organised.

4.2.8 Welfare Facilities

The number of staff are few and as such even a canteen was not included on site.

There is a sleeping area for over night artistes who cannot afford the high hotel bills. The toilets are very few and far from the people it is supposed to serve.

4.3 Record Manufacturers Nigeria Limited

They are mainly concerned with the pressing of records and the manufacture of record discs.

4.3.1 Construction Techniques

The administrative block is a two storey building. The elevation is a skeletal rectilinear form with basic theme of

beam and post structural configuration. The production area is constructed of steel columns supporting steel frames and with a corrugated metal sheet covering.

4.3.2 Site Zoning

The plot is about 2450m² and a built up area of 950m². The administrative area is structurally separate from the production area with the welfare areas further away. Zoning is generally marked but based on functionality.

4.3.3 Accessibility

The site is easily accessible from the Acme road.

4.3.4 Services

Apart from the supply of electricity from NEPA, the company has its private standby generating plant. There is a large water storage tank serving the complex. Also large amount of water is required for the production of record discs.

The design was absent at using natural means of lighting and ventillation. Therefore the design is a non respecter of the environment.

4.3.5 Parking

There is an attempt at segregating the parking spaces. There is one area of parking for the company staff, and other

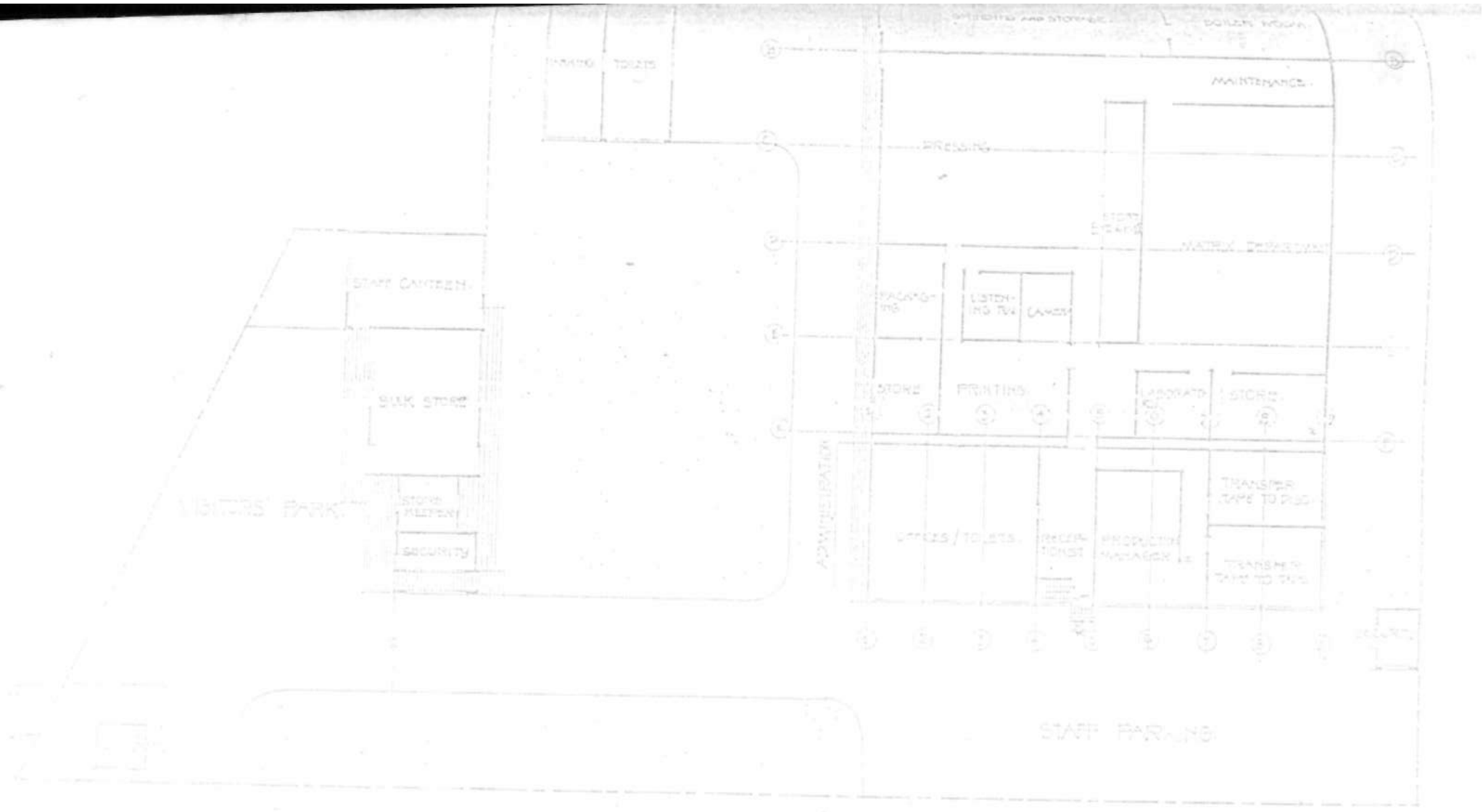


FIG. 4.3 , RECORDS MAN. NIG.

is for the visitors. The visitors are mainly restricted to the entrance focus area of the industry.

4.3.6 Welfare Facilities

A staff canteen is provided for the employee , toilets and changing rooms are also provided on site.

4.3.7 Inspection Areas

The room used for the visual control of records is not well lighted, while the listening room is inadequate. There is no mother control in the industry.

4.3.8 Matrix Department

The area near the electrolytic bath is waterlogged. Methods of draining water should have been incorporated in the design.

4.4.0 RCA Limited, Autralia.

This is a company that specialises in the recording of music, manufacture and pressing of record discs.

4.4.1 Construction Techniques

The walls are of sandcrete blocks. The roof is of a hollow core slab suspended from the column. This material makes

the roof lighter than it would have been, if it were the normal concrete slab that is in use.

4.4.2 Site Zoning

The building covers 3260m² of the site, but the gross area is 3500m² of which production and storage comprises 2200m², administration and services offices 940m² technical services 360mk². The administration and production wings are structurally separate.

4.4.3 Accessibility

The entrance to the site leads one to the administration area, from here, the other sections could be reached. The raw materials are shipped in and out through the side that is bounded by the sea-respectively.

4.4.4 Services

Being a large industry, it has its own electric plant. There is a water storage tank which is necessary for the running of the industry. The company is linked to the busy outside world with telephone lines for communications.

4.4.5 Recording studios

There are four recording studios. Each studio has its own reverberation characteristics to suit different acoustical

requirements. The studios are poorly designed with the absence of sound locks. Absence of control rooms, though it is with the use of audio-visual aids. This is an advantage because it eliminates the cost of building control rooms for each studio. The studios are accessible from the office area. This is not good because of sound leakage and the call for the use of expensive sound insulating doors.

4.4.6 Acoustic Consideration

The walls of the recording studios are lined with sound absorptive materials. There is the avoidance of parallelism between the walls of the biggest studio. There is a wet moat around the area used for recording, this restricts the distance of vehicles and people to the walls of the studios and as such saves money that would have been used in sound insulation.

4.4.7 Parking

Most of the parking is done in front of the Administration building, which is structurally separate from the production area.

4.4.8 Welfare facilities

There is a staff cafeteria for serving meals to the workers. There are toilets and changing rooms in a near central portion. The toilets are sharing a wall with the conference room. This is not good for some acoustic reasons.



FIG 4.4 , RCA AUSTRALIA

CHAPTER FIVE

5.0 THE SITE

5.1 INTRODUCTION

The site for this project from its inception is in Abuja, the nation's Federal capital city. It is located in the city central core of the proposed master plan. This lies among the areas zoned for cultural institutions. Here lies a two hectares parcel of land enveloping some key cultural sub-functions, and generally termed the National Arts theatre.

The national council of Arts and culture in care of the affairs of the National Arts theatre Iganmu Lagos, under the authority of the Federal ministry of informations, youths, sports and culture have juridiction over the land mass outlined for the national Arts theatre.

This site is now being subdivided into some smaller functional facilities. Amongst them are; the centre for Black African Arts and Civilization (CBAAC) - The national house of Fame. The centre for the performing arts, e.t.c.

With the centre for performing arts in mind, a consultation with the officials of the national council of arts and culture gladly received the proposal for the music recording complex to be sited there in Abuja.

This site is confinely a quarter of a circle. It is the third clockwise sector of the circle site marging the national Arts theatre territory.

5.2 Location And Environmental Context

The site for the proposed music recording complex in Abuja is terminally located between the Hyati Regency hotel and the green park area zoned for the national mosque expansion.

By environment, the site is cardinally bounded in the north by the National house of fame which is yet to be constructed, in the south by national mosque expansion site, in the East by the national arts theatre and the telephone exchange, in the West by hyati Regency hotel. F.g. 5.2

5.3 Site Characteristics and Analysis

5.3.1 Rainfall

The start of the rainy season is around 10th of April. The rain tapers off very rapidly after 20th of October. Thus the duration of rainy season is between 180 to 190 days. The following figures illustrate the mean monthly rainfall for Abuja (fig 5.3.1). The mean monthly distribution shows a tendency for concentration in three or four months. In the Abuja area, 60% of the annual rainfall is in the months of July, August and

September. This concentration of rainfall calls for the need of drainage systems that can handle large volumes of water easily.

5.3.2 Temperature

Abuja records its highest temperature during the dry season when there are no clouds. During the rainy season, the temperature is lower due to dense cloud cover. Diurnal annual range is also much lower, sometimes not more than 7°C in July and August. The preceeding temperature conditions dictates, the need for the rectification of the indoor environment for human comfort and proper working of the stored equipments. This calls for a general demand for air conditioning and openings for natural ventillation. Fig 5.3.2 illustrates the temperature distributions.

5.3.3 Humidity

Relative humidity is low in the dry season and reaches a peak in the rainy season as shown in fig 5.3.3. However, in the dry season, there is high afternoon temperatures. And in the wet season, the reverse is the case. It is exceptionally higher reaching 95% in the morning hours of the rainy seasons. This so, creates a heat trap. Since human sensitivity and comfort is greatly affected by humidity, so also are the materials and equipments. This calls for a special air handling plant.

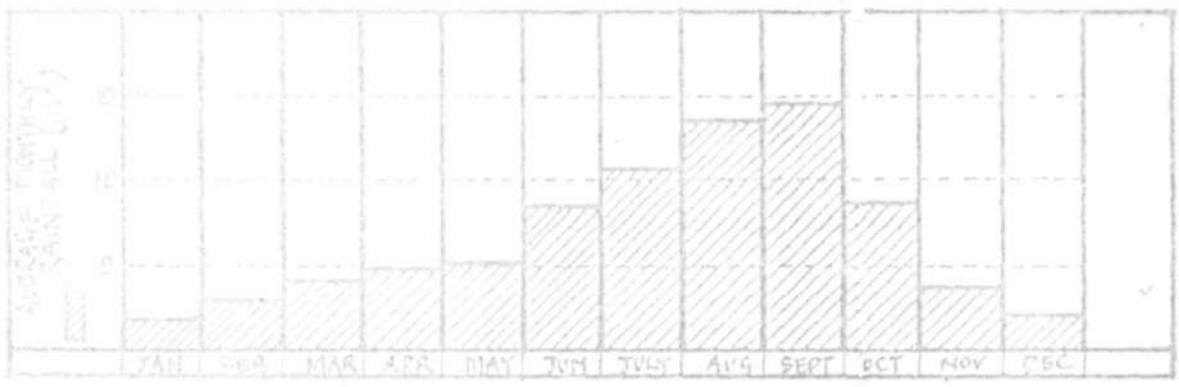


FIG 5.3.1,
FEDERAL CAPITAL TERRITORY
RAINFALL DISTRIBUTION

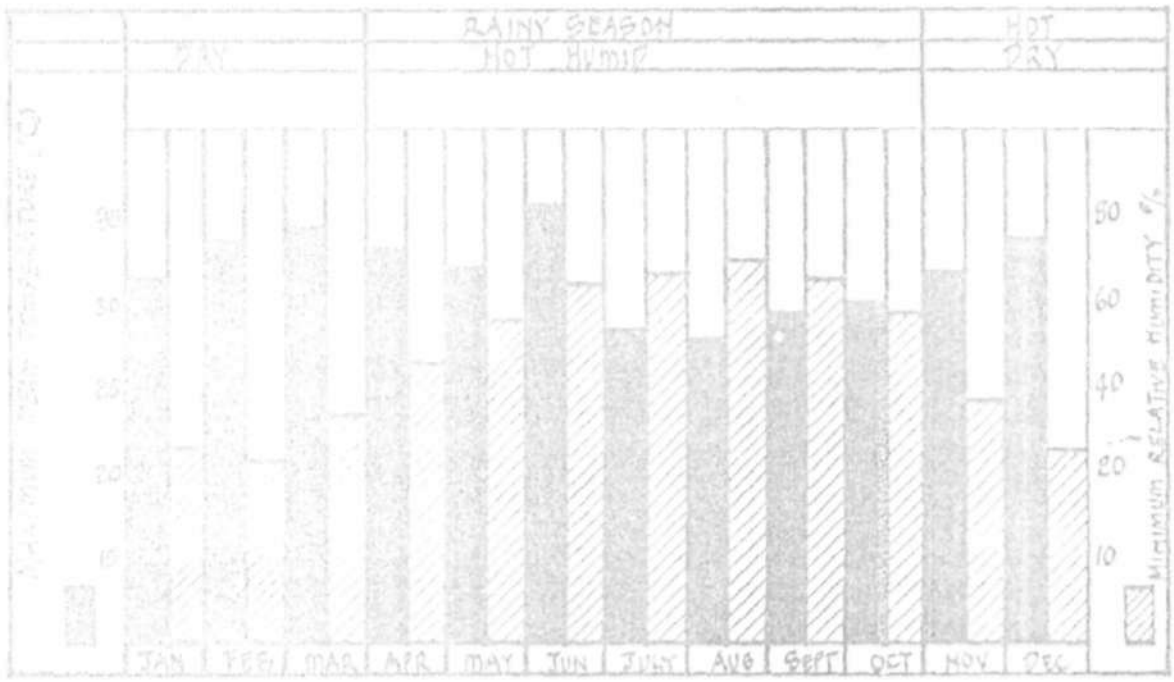


FIG 5.3.2
F.C.T. TEMPERATURE DISTRIBUTION



FIG 5.3.3,
FEDERAL CAPITAL TERRITORY
HUMIDITY DISTRIBUTION

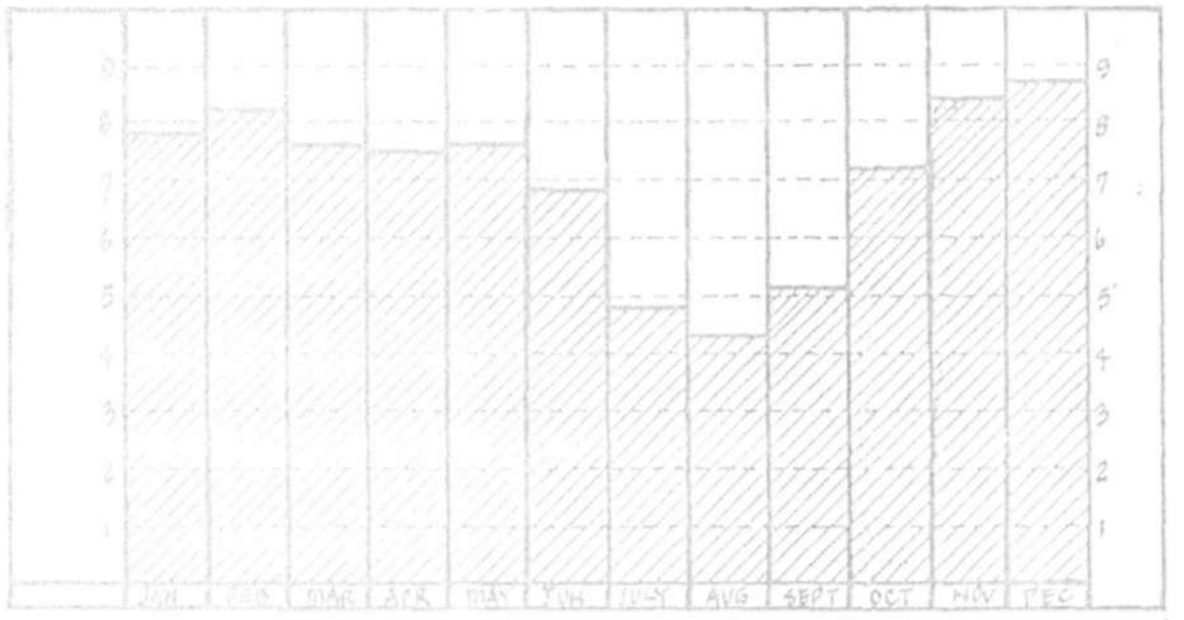


FIG.5.3.4,
FEDERAL CAPITAL TERRITORY
SUNSHINE DISTRIBUTION

5.3.4 Sun and cloud cover

Abuja is exposed to 2500 sunshine hours every year. The monthly pattern of variation is very critical. During the dry season (November to April). The monthly variation in the amount of sunshine follows a trend of an increase from over 275 hours on site. The lowest value of sunshine hours is noticed in August yearly. A critical look at sun and cloud cover calls for its consideration in design. Attention is then paid to insolation, a particular guide to the choice of materials for insulation against incoming uncomfortable heat. Fig 5.3.4 illustrates the hours of sunshine.

5.3.5 Winds and Dust

Two major air masses dominate the climate of Abuja. These are: the tropical maritime airmass and the tropical continental air mass. The tropical maritime is formed over the atlantic ocean to the south of the country and is therefore warm and moist. It moves inland generally in a southwest to northeast direction. The tropical continental wind is developed over the sahara desert and is therefore warm and dry and blows in the opposite direction, north east to southwest. The oscillations between two air masses produces the highly seasonal characteristic weather conditions. The tropical continential air mass is associated with the dry season, and the tropical

maritime air mass creates wet season respectively. The tropical maritime air mass is derived from the soutwest direction and so, openings for natural ventillation should be in this direction. The tropical continental airmass in the north East direction which is not desirable should not be allowed into buildings. Therefore screening of building's openings in this direction by trees and landscaped features is necessary to reduce its activity and proficiency for carrying dust.

5.3.6 Geology

The major rock units underlying Abuja are in three categories.

(i) Meramorphic Rock including Biotite, muscrovite schist, limited to four narrow outcrops bands along ridge tops at the eastern edge of the region. Other underlying rocks in this category art migmatite, porphyritic gneiss and granite gneiss.

(ii) Igneous Rocks including Biotite granite Rhyolite

(iii) Sedimentary Rocks including Alluvium located in stream beds consisting largely sands, with rare gravels bed and local deposits of clay.

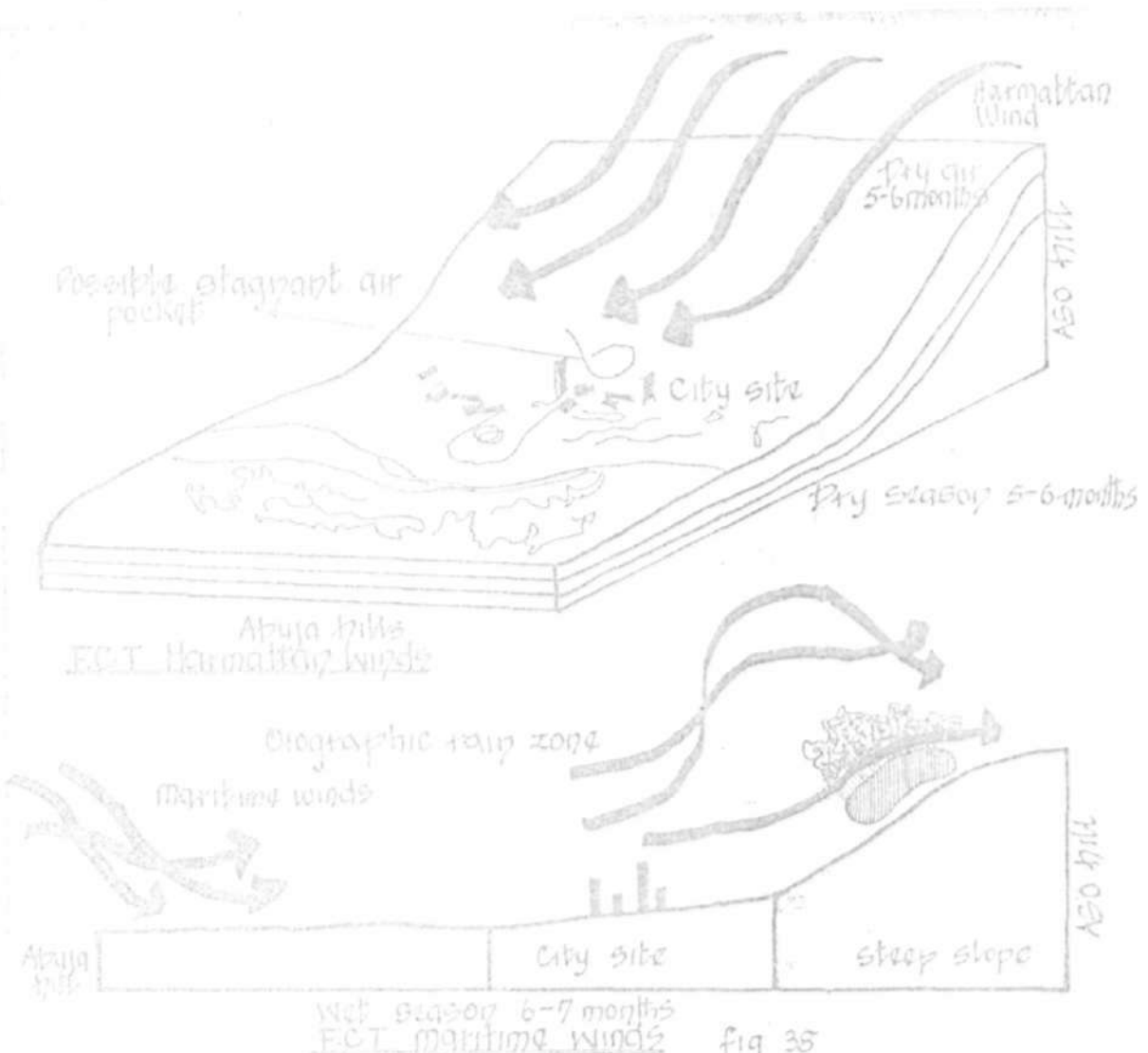


fig 38



F.C.T. Design implications of climate, storm water drainage

FIG 5.3.5,
FEDERAL CAPITAL TERRITORY
WINDS AND DUST

The above rock stucture is not envisaged to pose any geotechnical constraint. Magmatite granitic gneiss and biotite granite are rocks of medium to high strength. The rocks are therefore expected to present a minimum engineering problems if at all.

5.3.7 Soils

The soils underlying the site are well drainged and deep. They are fairly fertile and sandy loam in their classification.

5.3.8 Topography

The site is relatively flat and slopes very gently towards the Southern gulley siding the area for the national mosque expansion. This gulley will collect bulk of the storm water from the complex. Although there are small rock outcrops, these are too tiny to constitute a constraint to any construction. The calculated gradient for this site was 1 in 60 which is about 1.67%.

5.3.9 Vegetation

The general vegetation growth on site is characteristic of a park savanna. Here grows some locust bean trees, sheanuts, mangoes, grassland and leafy-patchy shrubs. The site is a colony of trees and grassland. Major trees to cause constraints are to be removed as indicated in the site analysis sheet. Use-

ful ones that do not belong to this category will be conserved.

5.3.10 Accessibility

The site is bounded by two axial roads. The southern express way from the national mosque through the hyati Regency hotel. The other one is a single carriage way which greases the limit of the site to the maintama village. Considering the volume of traffic flow, point of Ingress and egress is envisaged to be from the road to maitama district. Though the road has a temporary character but, it can be retained even after future developments of the zone.

5.3 11 Noise Sources

Bulk of the noise to be considered in this context come from the airborne category. Environmental noise sources to the site includes; the noise levels from the express way through hyati to the national mosque. This results from the traffic and huming of cars, same is true for the road to maitama village. Environmental noise is also noticeable from the sounding loudspeakers of the national mosque. Decibels of noise is also received from the telephone exchange booth.

5.3.12 Utilities

The site is easily accessible to extensions from the telephone and electricity lines from the two boundary roads. Water supply to the site can be taped from the water mains along the two bounding roads.

5.3.13 Good and Bad Views

Eastern view from the site indicates Hilly and Rocky landscapes which is good and pleasant to the eye. Ugly and bad view is also received in this direction from the telephone exchange and the maitama village.

Southern view locates the national mosque, the Sheraton hotel in the backgroud which are beautiful sceneries.

Western view is to the hyati Regency hotel which is a spectacular edifice.

Northern view is fairly good and it is to the former presidential guest house and a chapel in the foreground.

CHAPTER SIX

6.0 PROJECT REPORTS

6.1 Design Brief

The recording complex is envisaged to be a centre for documenting sound and the production of music. The company requires processed materials from the highly industrialised companies where cassettes (tapes) and record discs are manufactured.

Out of the two major roles that this recording institution will play, documenting sound is purely a technical event. However, musical productions from the various artistes depends on the strength of a number of management consultancies.

From the above synopsis of functions, the following departments are spectacularly delineated for the sound recording complex; Administration, Recording department, Engineering services, Estate maintenance department and welfare (accommodation and catering facilities).

6.1.1 Administration

This is provided for the proper running and upkeeping of the complex. Various categories of staff/personnels who will contribute to the main stay and progress of the dubbing centre are housed here. The Staff capacity to be accommodated here and the required space areas are as follows;

OFFICE SPACE	AREA (M^2)
Entrance Foyer	15
Entrance lobby	24
Receptionist	9
Registry and records	9
General office	15
Reception/waiting	35
Finance clerks	15
Salary accountant	15
Revenue accountant	15
Financial controller	15
Marketing manager	36
Music museum	30
Public relations officer	15
Security office	36
Artiste manager	15
Sec/Typist	12
Director of promotions	15
Secretary and typist	12
Music library	80
Audio visuals	35
Consulting composer	15
Consulting instrumentalist	15
Radio and Television jingler	15

Chief security officer		
General manager		35
Secretary/Typist		12
Admin secretary		15
Personel officer		15
Legal adviser		15
Secretary and typist		12
Telephone exchange room		15
Typing pool		30
Conference room		80

6.1.2 Recording Department

This is the technical area of the complex. It is also the nerve centre of the company. Precautionary steps have been taken into consideration by providing studios for different classes of music. This is for high precision recording. Auxilliary facilities such as transfer rooms and rehearsal compartments are adequately taken good care of in the over all alotment of spaces. The followings are the spaces in this department with their corresponding areas.

SPACE SCHEDULE	AREA (M^2)
Producer	25
Artiste waiting and preparation	75
Male changing	30
Female changing	16

16in - 8 tracks recording studio		35
32in - 24 tracks recording studio		35
Control rooms (2 nos) to above		15 each
Sound locks (2 no.) to above		10 each
Instrumental recording studio		25
Choral recording studio		25
Control rooms (2 no) to above		12 each
Sound locks (2 no) to above		10 each
Mixed rehearsal rooms (2 no)		35 each
Sound locks to above (2 no)		10 each
Instrumental rehearsal room		25
Choral rehearsal room		25
Sound locks to above		10 each
Equipments storage (2 no)		15 each
Movable booths (2 no)		12 each
Listening booths		25
Editing room		30
Tape to disc transfer room		40
Tape to disc transfer room		40
MASS DUBBING HALL		225
Demo and Disc storage		50
Stationery and packages store		50
Finished tapes and records store		150

6.1.3 Engineering Services Department

For the smooth running of the operations and processes in the complex, a block is zoned out with spaces to house personnels to service and maintain the centre's equipments. Plants are also housed here to provide ease of reach and inspection. The detailed spaces in this block and their corresponding areas are as follows;

SPACE SHEDULE	AREA (m^2)
Services Engineers	25
Electronic workshop	25
Instruments repair	25
Electricity plant	25
A.C plant	25

6.1.4 Estate Department

This houses staff and personel whose role is to see to the proper maintenance of the centre's structure and vehicles. The followings are the schedule of space requirements;

SPACE SCHEDULRE	AREA (m^2)
Estate personnels	25
Assistants/Technicians	25
Storage	25
Drawing room	25
Mechanical workshop	25

6.1.5 Welfare Department

Low cost catering services are provided. A canteen for both working staff and artistes and an accommodation block to house the performers. Some artistes may rehearse for weeks before getting their works produced. The lowcost nature of this facility saves them from the ordeal of being charged the normal hotel bill. The followings are the spaces outlined in this department and their corresponding space accommodation.

SPACE SCHEDULE	AREA (m^2)
Canteen	225
Kitchen	100
Cold store	12
Dry store	25
Laundry	80
Drinks storage (2 no)	20 each
Bar	40
Accommodating officer	25
Porters/Janitors	50
Linen store (2 no)	30 each
20 bed rooms	16 each

6.1.6 Auxilliary facilities

SPACE SCHEDULE	AREA (m^2)
Gate house	12
Staff parking	1000
Visitors parking	500
Vehicle manouvering	750

6.1.7 Open Spaces, Parks and Recreation

Effort is made to provide an open plaza at the main entrance into the complex. The accommodation wing is well landscaped with shrubs and water pond. Far back to the rear, an arena of open park is interspaced with two fountains and a water pond. This is envisaged for out door relaxation. This passive out door recreation zone faces a planned area for active out door recreational sports field e.g Badmiton, lawn tennis.

6.2 DESIGN PREAMBLES

6.2.1 Overview of design methods

(i) Pragmatic Design: The earliest designers seem to have taken a highly practical view of their task, using whatever materials that lay to hand, establishing by trial and error what the

materials could do and then seeking them out for conscious putting to those uses. This is a design method that takes into consideration, various design parameters such as climate, available materials, methods of construction. Examples of this approach to design includes regionalism and vernacular Architecture.

(ii) Iconic Design: By definition, this consists of using tried and accepted forms. Historically, it evolved after the pragmatic approach to design. Building types and methods of construction were established pragmatically and then repeated because they were known to work in terms of construction and the modification of climate to the activities it was required to house. In this method, people already knew what the building is expected to be, because they have experienced its kind. It is a design methodology that brings out a building the way it has always been functionally. E.g the design of a school, hospital, offices or any other type of building that has proved that it is worth such a facility. It is something that was evolved out of a tradition. Abstracting essential lessons of earlier Architecture in such a manner that a newly genuine combination can be achieved.

(iii) **Analogic Design:** Analogy is the central mechanism of creativity and it has been intuitively used by all the

architects that will be considered creative at sometime in their careers. Creative analogy always bears a symbolic character with nature's forms and processes or with forms of mechanisms paintings and sculptures. Here, there is emphasis on either biological or mechanical analogies. Analogical design is the second class immagination which need to be stimulated. Creative analogies have been drawn outside Architecture; the shell of Le Corbusier's Ronchamp, the water lilies of Frank LLoyd Wright's Johnson Wax Factory, just to mention a few.

Analogy can also be drawn on some other people's works. For example, one can see analogies with the work of Le Corbusier in the work of Costa, Niemeyer, Lasdun, Tange and nameless others. The work of other architects therefore, is a rich source of analogy and one that cannot be denied. Provided the analogy is an appropriate one, then there is no reason for any one denying it. A good analogy of this kind could be infinitely better than some inappropriate original.

(iv) **Canonic Design**: This could be approached in two ways. One way is to set up one's canonic system. A two or three dimensional grid ensuring modular or at least dimensional coordination in the design and construction. The other way is for one to be given an environmental matrix as a basis, with desirable room shapes and sizes already plotted. The basic dimensions of the grid, in all three directions could be

determined with reference to these shapes and sizes.

The most obvious way of applying canonic design to our problem is to adopt one of the existing building systems. Canonic design is a rational or geometrical system of ordering. Recent flourishing advances in this approach are; modular systems, dimensional co-ordination and systems building.

6.2.2 The evolution of a design theme and philosophy

Of the outlinely reviewed design methods, analogy seems to be the authors ally. Although it is very difficult to say exclusively analogical in the sense that, other design methods also come to play a part, in the eventual realization of a scheme.

Notable grand masters of modern movement whose works inspired me and probably gave formative ideas are briefly reviewed below.

(i) Erich Mendelsohn: Symbolic and emotional emphasis in the work of the new paintings formed a basis for mendelsohn's own architectural credo, and their graphic work offered ideas for representation that he quickly assimulated into.

His own manner of design is one that is seemingly working up an arcitectural idea from an expressionist sketch. He was always guided by his personal philosophy of 'Dynamism' which was demonstrated at a very early age. An attitude to design that was

FIG. 6.2.1:
SUPREMATISING ERIC'S ARCHITECTONIC
IDEAS OF DYNAMISM/EXPRESSIONISM

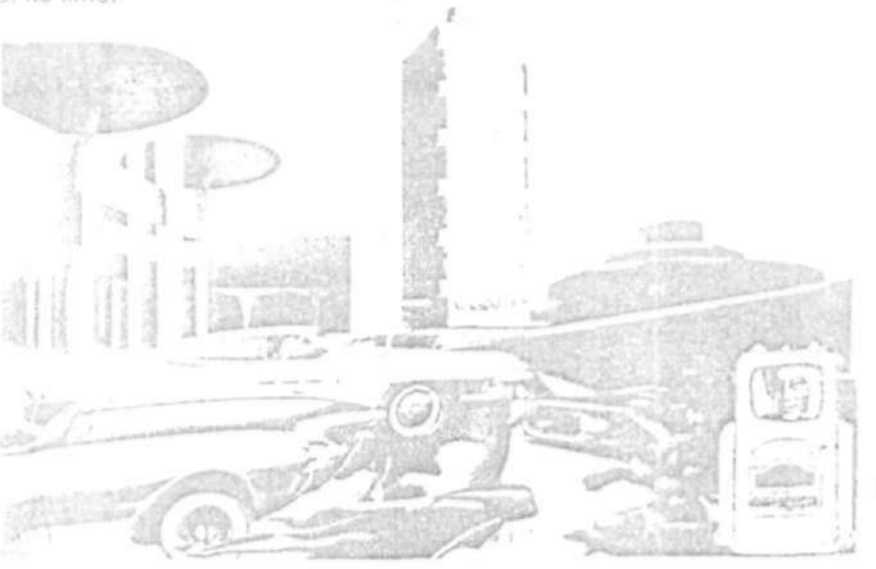
both idiosyncratic and brilliant.

Mendelsohn was greatly interested in expressionism as a movement. And this movement undoubtedly had some effect on his mind and works.

The application of expressionism to Architecture is superficially simple. The character of a thing and the purpose of a building are synonymous. The essential character of a building is determined by its purpose. Therefoe, the theme is to know the building's purpose and you have its character, and the subject of architecture as the emphasis, or expression of that character. However, expressionism could be more of a contributional influence in the association of organic life with Architectural forms. This was an important principle in Mendelsohn's early works.

In his early works, he tried to symbolize modern technological terms, the purpose of a building by its external forms. In this way, a factory for the production of cars infact had something of the spirit of motion and stream lining in its shape. A sacred building was something of the majesty and awe inspiring qualities that one will associate with the God head. A train station symbolising some external forms of a moving train, a steel factory brought out with exuberant expression of the plasticity of concrete and mass emphasis of use of steel. This unique adoption of expressionism probably formed the background character of Mendelsohn evolving the perspective of

The Johnson Wax office and research laboratories built at Racine between 1936 and 1948 typify Wright's approach... inspiration from organic structures, use of new technology and continuity through the innovatory use of traditional materials. Here the column supports are based on a mushroom or lilypad to produce a structural form in advance of its time.



The research tower is based on the tree: its basement the roots, its service core the trunk and its cantilevered floors the branches and foliage.

But externally the buildings are real Art Deco streamlined American architecture like a juke box, Cadillac or electric guitar.



Wright also designed high blocks of apartments, but not like the European "match-boxes". The Price Tower, Oklahoma, is firmly based on organic principles with Amerindian influences.

FIG 6.2.2.ii,
THE EPITOME OF F.L.WRIGHT'S
ORGANIC ARCHITECTURE

In this, Wright saw the horizontal line symbolizing and evoking oneness with nature as opposed to the vertical, which symbolizes man's domination of nature. There are other key principles and philosophies that guided Wright's temperament in his own type of architecture. But his direct analogy with nature's form was strikingly imaginative and creatively significant. He outlined architecture to be a subject that should obey nature's laws, purposes and processes.

A typical example of Wright's imaginative, architectonic principles and philosophies applied to his buildings is the Johnson Wax office and research laboratory built at Racine between 1936 and 1948. Inspirations from organic structures, use of new technology and continuity through the use of innovatory trade materials. Here, column supports are based on a mushroom or lily pad to produce a structural form in advance of his time.

The research tower in his complex is based on the tree concept. Its basement forms the roots of the tree, its service core is the trunk and its cantilevered floors symbolise the branches and folliage.

Figure 6.2.2(ii) shows such how such ideas were realised.

Conclusion: Erich and Wright are geniuses whose works cannot be exhausively stressed in terms of the steps they climbed on the ladder of analogical form perception with its manners of clarity and perspiarity in achitectonic terms. Although, they may be

convergers or divergers in a more critical evaluation. Erich tended to be lured into mechanistic terms of symbolising forms while, Wright a sympathiser and a genius that held respectability for nature's forms (biological - life or non living).

Sieving, brushing and distilling all the design methods, founding them on some master's work which formed formative background, I have coined a hypothetical design approach by way of hybridizing the formative ideas. This approach, I name - 'Symbolic Analogy and Visual Effigy' (SAVE).

In the coined (SAVE) approach to design, the nature of the form to be symbolised is non classed or confined to the adoption of one and jettisoning the other. The appropriate form can be either natural or mechanistic. The right choice is a matter of subjective gambling. "Let the building take the form that the architect perceives ideal for the function, character and purpose of that structure" by the author.

6.2.3 The Quint essence of SAVE Manifesto

Symbolic Analogy and Visual Effigy is a time saving way of evolving forms. Its guiding principles as devised by the author as follows;

1. Accumulate all data about the project in question, analyse the data, synthesise it and make conclusions.

2. Bring out the plan of the facility based on certain philosophies and on the normal design parameters e.g functions, environmental matrix, economy, construction techniques e.t.c.

3. Conceive a character about which the building will exhume a theme of the function of the building or some peculiarities about the site, or the environmental setting. For example, building a house near a river could take the form of a boat, a ship or some biological forms in the river e.g a fish. One could continue to be specific and name the fish. Mechanical, inanimate process can also be perceived e.g tidal movements, ocean currents movement of the water in its valley e.t.c.

4. Superimpose the conceived idea on the plan to bring out the form. Here, a cautious agreement is reached by way of manipulations of the plan and form. If the whole perceived analogy cannot be superimposed, then make provisions for elements common to such object or form to be symbolised at certain critical views where it will seem clear or exaggerated. In this way, elaborate symbolization is possible at points of focus or at interesting viewing points. E.g the entrance gate, the entrance canopy, entrance foyer e.t.c. Also on the landscape sculptural pieces may be carved to take certain forms. If the conceived analogical form cannot be suprimposed, try several other of nature's forms or mechanisms. For example, a

living house in cross rivers state of Nigeria where the site is near a river or in the country side may take the form of a fish, a crab or a snail. In this way, the form is emblematic. Another example is a convocation square for a higher institution. The form of the structure may take the shape of the convocation cap, the scdhool's emblem e.t.c, e.t.c.

5. SAVE holds the idea that form should follow function. But the two must unfold simultaneously in clear unity. All the functional requirements are satisfied first in design and then bringing out the perceived form. Though the process is a dual one which can be made to go simultaneously. In either case, the plan is brought out first.

6. The beauty and elegance of a structure is perceived and appreciated by the human eye three dimensionally, form perceptions and imageries are not vividly appreciated in plan, but in elevations or the overall three dimensional view - perspective.

7. Symbolic Analogy and Visual Effigy is likely utopian in the sense that it probably ignores the reality of the situation in practical economic terms. Cost implications and structural realisations are dazzling constraints.

8. The building with its services must be brought out in one. Care must be taken to conceal services pipes where necessary so as not to make or disfigure the originallly conceived form of the building.

9. Openings in the wall e.g windows should be positioned to satisfy its function and not conflicting with the form's - configuration. In such instances where it is difficult to realise the functional location of openings, appendages of some sort may be used to conceal exaggerated, detailed openings. The architect is then left to chose the symbolic element that will go with the main form of the building.

10. In the overall design of the structure, no one component is treated in isolation. Everything is made to harmonize with each other so that, the conceived analogical form is arrived at for visual judgements. If the roof is envisaged to be a constraint, subjective concealment can be ushered with the projection of the parapet walls. Cable networks can also be used to give the required catenary that will conform with the form.

6.2.4 A case study of author's past works

Symbolic Analogy and Visual Effigy (SAVE) is a hypotheti-

cal school of thought in the pipeline. I have used it in some past Academic exercises that yielded recognition and resounding successes. It has been in my past works to demonstrate the lucid adoption of its principles and philosophies. The followings are the documentary report of some excercies approached on SAVE guide lines. These are as follows;

i The Tilapia habitat (Fig 6.2.4(1))

A family house sited near a river that has fishing potentialities.

The plan is simple and rectilinear. It satisfies the owners functional requirements. The ground floor comprises of the main lounge, kitchen, garage, pantry, a sit out, entrance foyer, a guest bedroom self contained with a sit out.

The upper floor plan consists of the master bedroom with a toilet and study, a family lounge, an extra bedroom for children and a family terrace (roof garden).

The conceived biological analogy is achieved by playing with the parapet walls and the fore and back side of the building. The form is symbolised in the two front and back elevations. The other side elevations were designed normally by projecting lines from plan. Fixedly for reasons that their view is not conspicous or not significant.

313586

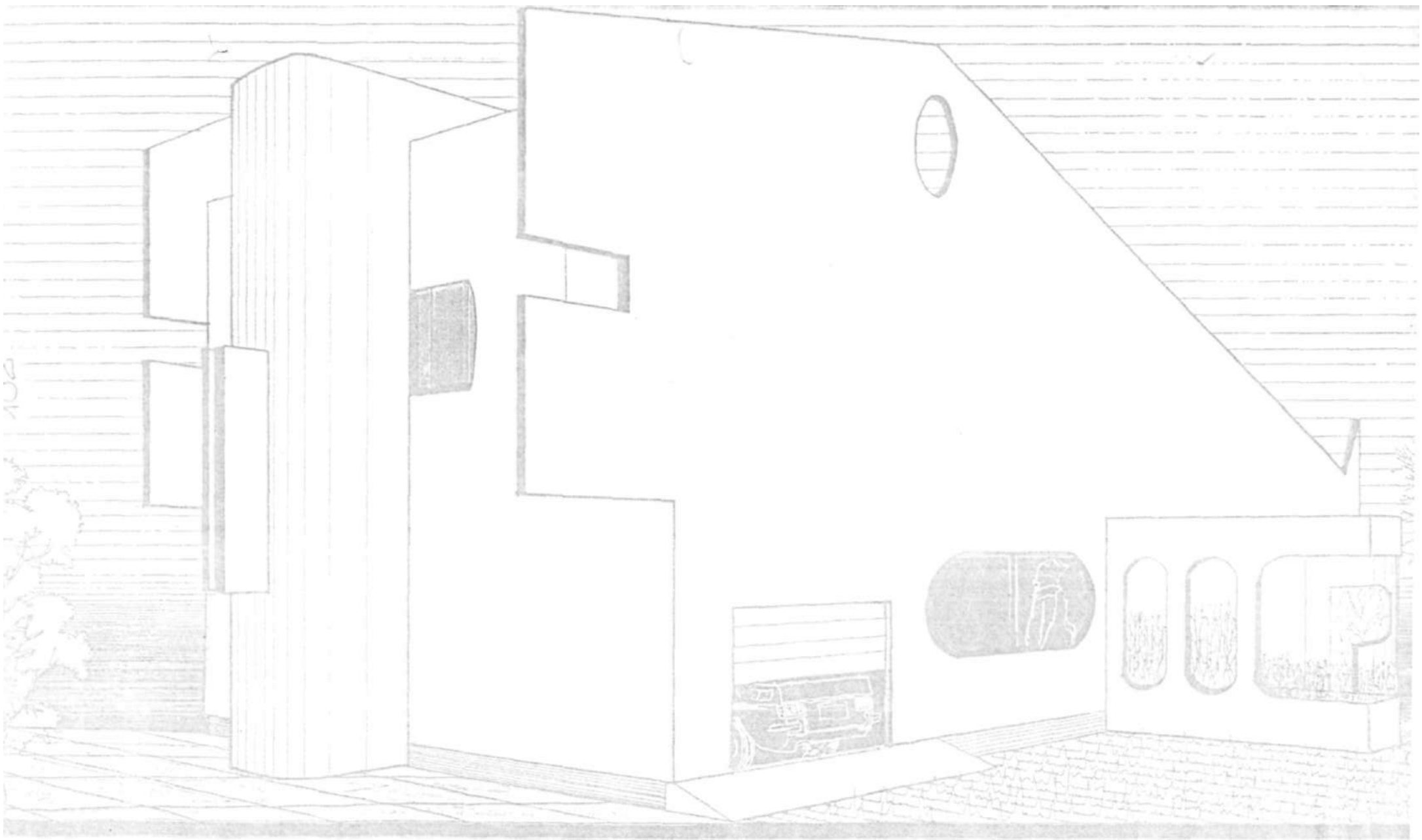


FIG. 6-2.4 i, TILAPIA HABITAT designed by author '83.

PERSPECTIVE

(ii) An Air Craft Staff House (Fig 6.2.4ii a & b)

A staff house for two air craft personnels. Pilots if you like. The building is designed twofold one house is the mirror image of the other.

One part of the house in plan consists of: a garage, a kitchen and store, a lounge, a dining room, two bedrooms, and a toilet, a foyer and a sit out. The two houses are separated with a common wall that bisects them into two equal halves. Each house has an extension at the end of the shared wall for outdoor activities. The shared wall is extended out at the entrance and garrage ends for easy manipulation.

The conceived mechanicalistic analogy of an air craft is achieved in the elevational character of the building. The two garages and the utilities end form the cylindrical pattern of the air craft's body. The wings are emphasised by the parapet walls on the two equal sections remaining. The symbolic character is exuded by the design of the approach (front) and rear elevations to bear with what an observer sees when an air craft is viewed from the tail end. The side elevation gives a close analogy to what is seen from the side view of an aircraft.

In either case, the plan was drawn first, satifying all the functional requirements. The conceived form was only later projected by way of design manipulations.

6.2.5 Impact Realisation of S.A.V.E in the design of the complex

A tripodal conceptual theme was evolved. Tripatite symbolic representations of myth, the physics of sound and the origin of sound is exuded. All these are combinely celebrated in effect to their convinient manifestations in the various design drawings.

The mystical point of the concept is a thing of philosophy. An elemental perception of music to the satient beings. The quotable philosophy about what music is all about. Thus; "music is like a fan". This beautiful quote from a famous philosopher in the Arabian Night's Entertainment forms the fulcrum of the mystical analogy. It is mystical because it is a thing of the mind. The theme was adopted in bringing out the overall plan of the centre. The plan is a thing that is hiden after the structure is erected. So it becomes a thing to be expected. Visual imagery is not made out of it at that instance.

The second theme, expressing the physics of sound in clear, visual architectonic terms. Music is wanted sound and sound is generated by a scientific mechanism. It is produced by waves. Therefore, wavy building facades were celebrated in the design of the elevations. Waves are physical characteristics of sound, they can be observed and measured. This is why they are symbolized in the elevations for visual effigy. The character of the waves also differ, musical notes are sounds of high frequency. Hence their wavy form is rectilinear and different

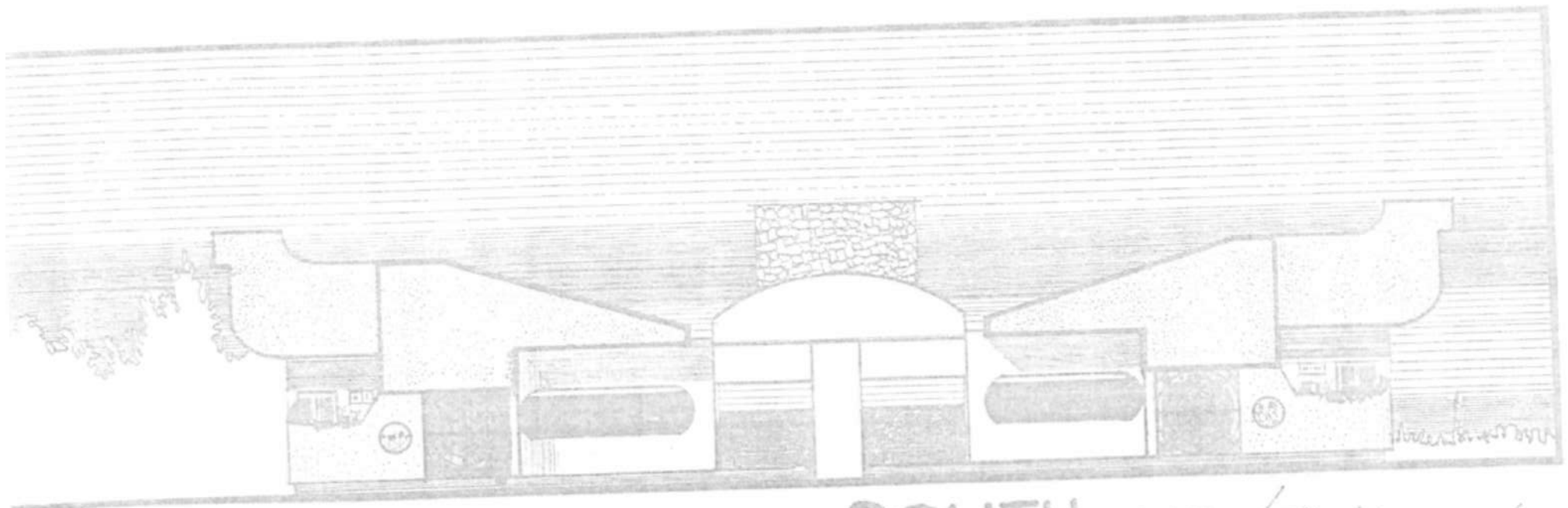


FIG 6.2.4.iia AIRCRAFT STAFF HOUSE, SOUTH END VIEW. by author '88.

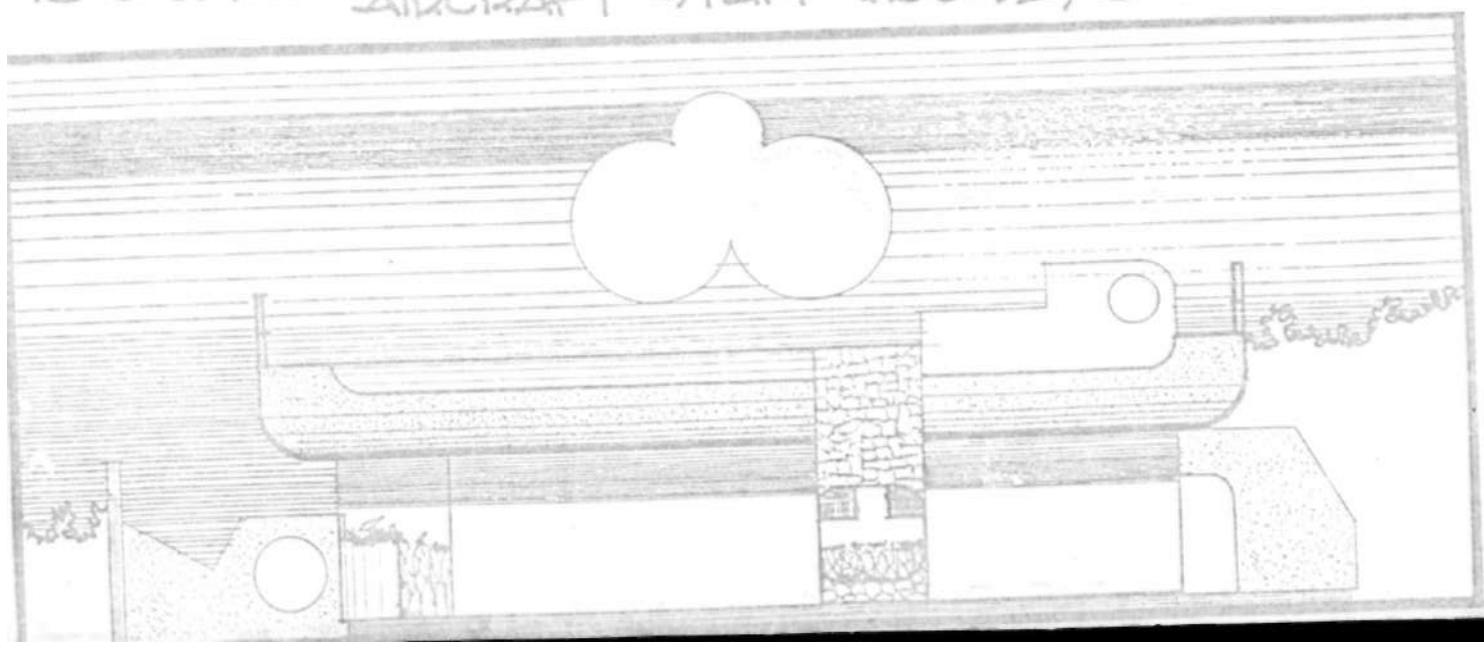


FIG. 6.2.4 iib)
EAST END VIEW

from the curvelinear (sinusoidal) wave motion.

Of all things that may produce music, a musical instrument could be identified as one Pseudo-casted sections of the elevations symbolize the drumset as a musical instrument. The realisation of these themes is briskly evident in the eventual plan and forms to be discussed below.

6.3 Design Perse

6.3.1 Site plan/concept

Zoning of the departments on site is based functionally, and complementarily zoning by noise levels. Thus, the administration comes first with other functions radiating out within the confinements of the conceived local fan. Studio areas are situated in the core and buffered by open courts. Immediate barriers are ushered against environmental noise sources e.g Traffic noise. This is achieved with the dampening storage spaces and the natural vegetal-tree growths. Noise generating plant and equipments are situated far from the studio area.

6.3.2 Plans

Simple harmonious combination of dual angular character to realise the originally conceived model of a local fan. Justifiable Juxtaposition of Administration block made to vanish

towards the entrance plaza at 45° with rectilinear planes forming the edge of the fan. Other bounding sections i.e transfer department and the welfare department spread fairly out at 22½° to the trailing axial bisector. Along this disecting axis lie the studio block and the accommodation wing.

The administration and accommodation blocks are on three floors (ground inclusive). The studio wing is on two floors, with the ground floor partially in the basement. Other sections like the transfer and warehouse department, the canteen and its accessory, the engineering services department and the estate wings are all single storeys.

6.3.3 Elevations

Distinctively a celebration of the preconceived ideas of waves and that of a drum piece. Thus, in the administration and the accommodation block, their opposing front and rear views are designed with this symbolic theme. Here non-loabearing vertical sun breakers depict a high frequency wave motion as seen in a vertical plane. In the canteen wing and its accessory, simply precasted vertical breakers flank the window areas. The visual representation of the drumset is partly realised in the engineering and the estate departments with part of the transfer sections by design manipulations. Pseudo casted exageration of the walls helped in realising the dream concept.

6.3.4 Structures

The structural form of the complex is markedly distinct of beam and post support systems. Walls play greater role of supporting the beams and the roof structure. The striking wavy sun breakers do not play any structural function. Their support and stability conditions is by resolution of forces. The vertical breakers are systems of resultant forces. Their support is basically in the adjoining column. Here, the resultant force to be supported in the structure is broken down into vertical and horizontal components which later find their transmission to the ground through the column and the floor slab.

Timber lattice roof system is used for the transfer, enginerring and estate departments with long span aluminium as roofing materials. The canteen section is roofed with space frames. The accommodation and administration blocks are roofed with simple structural timber trusses. The studio block is exclusively double roofed with concrete for acoustic reasons.

Strip foundations are used because of the suitable soil conditions. Except in the studio block where raft foundation is used and it was because of the basement.

6.3.5 Drainage

Roof gutters are used in the administration, accommodation and canteen blocks. Down spouts drain the water

to the siding ground gutters. The engineering services department together with the transfer department and the recording block are drained in ground gutters. A collector drain ground gutter is designed following the profile of the sit in the north west direction to the temporary stream. Surface drain gutters are also provided along the profile of the road networks.

6.3.6 Services

The recording department is richly ventillated mechanically. The central air-conditioning plant serves the rooms through a network of distribution and return pipes along the corridor. Possible feed to other sections is also considered., Generally, ductwork for the distribution are made to pass through plenum spaces in the ceiling.

6.3.7 Acoustics

The acoustical requirements of the rooms were taken into careful consideration in the overall design of the studios and the rehearsal rooms. Absolute acoustical privacy which is needed by the studio block is provided by the design and layout of the spaces and the use of structure together with finishes. Thus, two garden courts bound the block on the two sides flanking the studio along the axial bisector. The intervening spaces between the studio and the neighouring functions are

with the knowledge of technical requirements of studio constructions. The role of an acoustician needs to be played here. A good knowledge about the studio equipment is also necessary. If practical applications of these principles is not possible, then consultations with the engineers (acoustician and electronician) is necessary to bring out the wholesome piece.

In this thesis, a chronological research has been conducted on many, if not all the vast technical requirements in recording studio design. This was by way of deductive research. Crowning professional endeavours were unleashed by evolving a design hypothesis 'Symbolic Analogy and Visual Effigy'. This is tested on the design of the complex. Rational assesssment of its success is left to the on lookers, even a layman.

This research work has delineated all the components and techniques of music recording studios. It will go a long way in improving the crude, improvised and arbitrary choice of materials for studio constructions. A dawning school of thought was evoked and its principles applied on the project. This remains as a predisposing strand of ideas available for testing and confirmation on other projects by every good willing designer.

The concluding design hypothesis is an inspirational, thought provoking enigma that was posed to code architecture into visual language terms. This unveils the mysteries about vaque design approaches, absent of vivid visual imageries and

simulations.

In laconic terms, if this hypothesis is adopted in designs, then architecture will be a street subject of discussions. Thus the arhitect will not need to lacerate and elucidate his design principles with much ennui. The eventual building will speak visually even to laymen. This was an attempt to seek polished dimensions in design outlooks. Tracking down historical tram ways, such eviction had been advocated by the German philosopher, NIETCHE:

"He who wishes to be creative must first destroy and smash accepted values".

Finally it is also the author's dream that if this project is implemented, our music culture will be proficiently improved with no bounds.

REFERENCES

1. Eargle, J. (1980) Sound Recording (2nd Ed.)
Van Nonstrand Reinhold Company New York.

2. Slot, G. (1959) From microphone to Ear (2nd Ed)
Modern sound - recording and reproduction technique
N.V. Philiphs' Gloeilampen fabrieken, Eindhoven Holland.

3. Roye, E.H. (1978) Disc Recording and Reproduction
Dowden, Hutchinson and Ross, inc.

4. Doelle, L.L. (1972) Environmental Acoustics
McGraw-Hill Book Company

5. Parkin, H.P. Humphreys, H.R (1969) Acoustics noise and Buildings
Faber and Faber London.

6. Wayth, J.O. (1949) The Practical applications of acoustic principles
Charles Birchall and Sons LTD. London

7. Gyang (1986) Acoustics. Unpublished part III lectures
Department of Architecture, Ahmadu Bello University, Zaria.

8. Caleb, M.G. (1987) Kaduna music industry
- Acoustics and interiors
Unpublished M.Sc. Thesis. Ahmadu Bello University, Zaria.

9. Iniobong, J. U. (1981) Music centre, Kaduna
Unpublished M.Sc Thesis. Ahmadu Bello University, Zaria.

10. Ching, F.D.K (1975) Building construction illustrated
Van Nonstrand Reinhold Company New York.

11. Burberry, P. (1979) Environment and Services (4th Ed)
Halsted press New York.

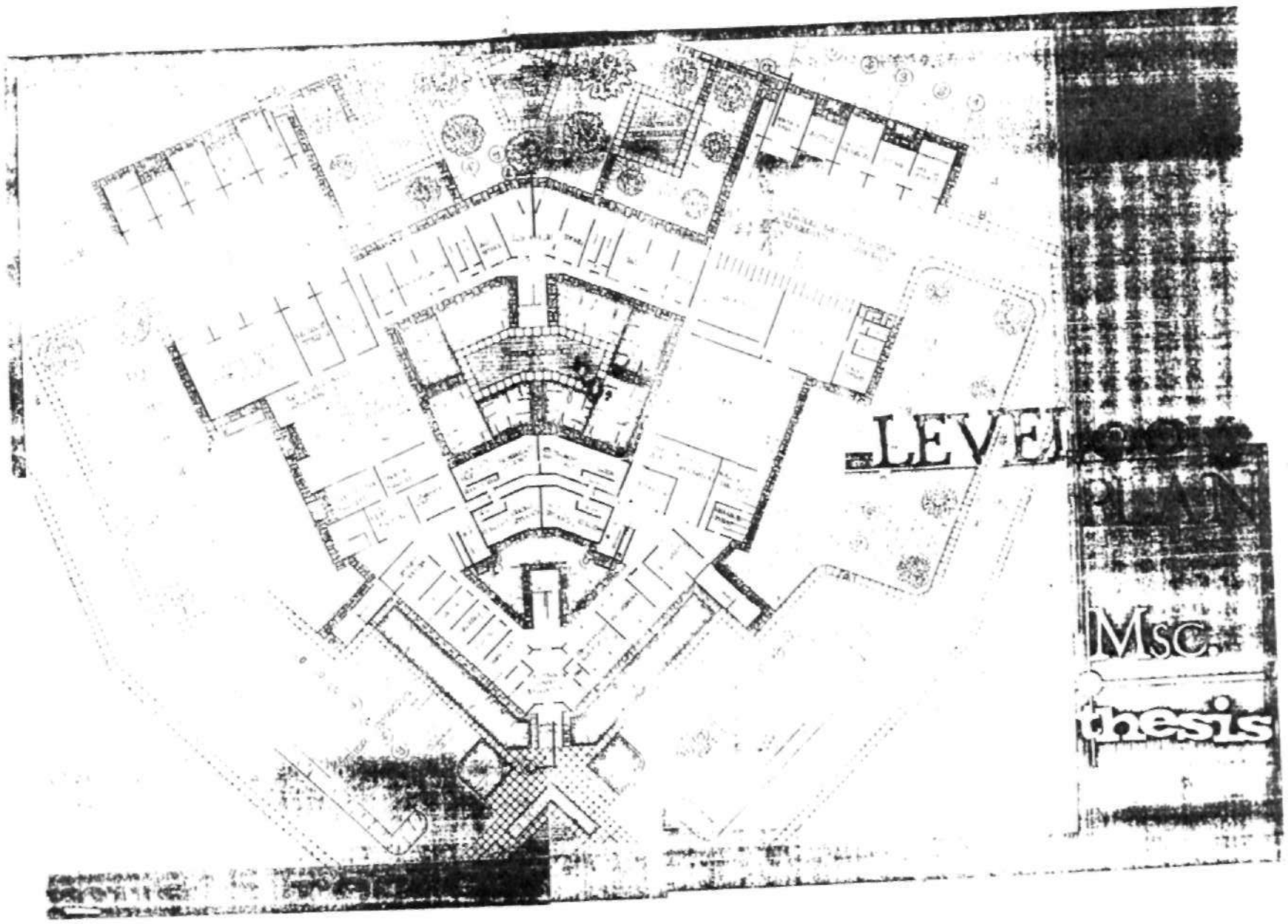
12. Broadbent, G. (1973) Design in Architecture
John Wiley and sons London.

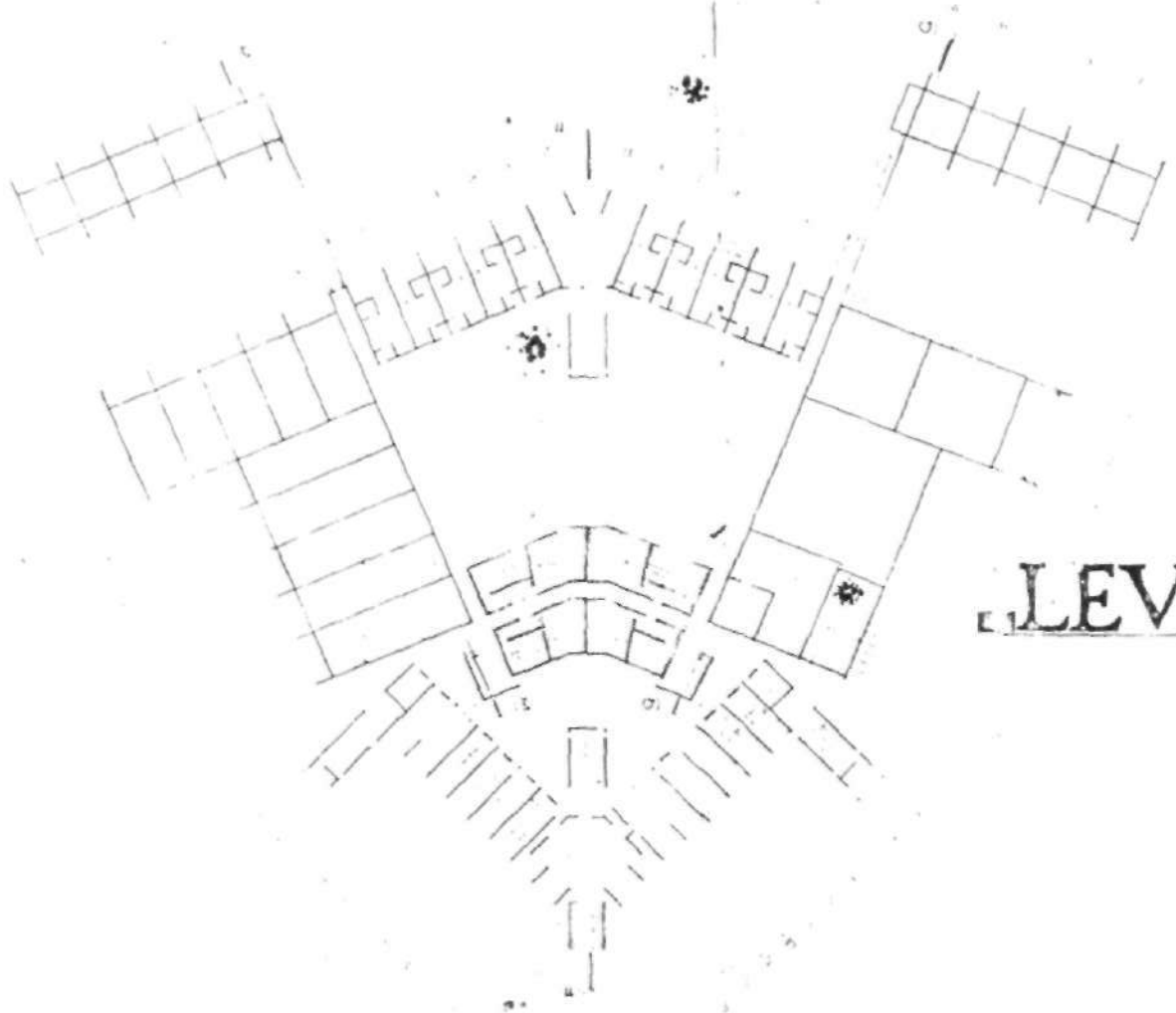
13. Whittick, A (1956) Eric Mendelsohn

14. Doenfsy, S. (1966) Modern Architecturte and Expressionism

15. Heleman, L (1986) Architecture for beginners

16. Adeyemi, E.A. (1986) Concepts and Methods Unpublished
Lecture notes


LEVEL
PLAN
Msc.
thesis



note

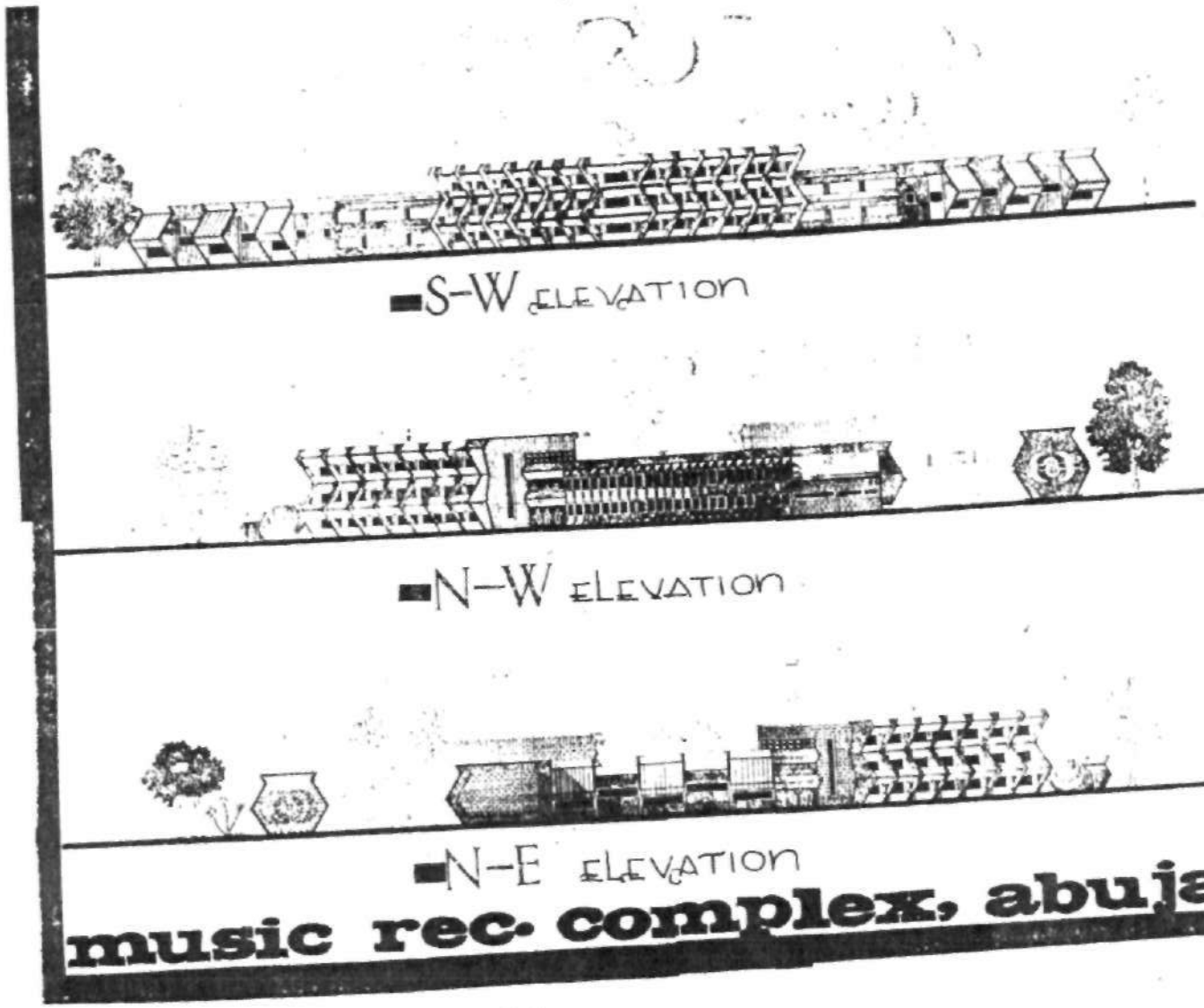
LEVEL 100

PLAN

SCALE 1:200

MSQ ITUA

music rec. complex, abuja.



music rec. complex, abuja.

note

SCALE

C.YDE elevations

KASIM
AHA
ZAKI
LIBRARY
UNIVERSITY