Proposed Broadcasting Training Centre, Itapa Ekiti

(Acoustic Improvement through Space - Function Resolution)

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Certification

This to certify that Johnson O. Fadeyi, with matriculation number LCU/PG/002133 carried out this research work titled “Proposed Broadcasting Training Centre, Itapa Ekiti (Acoustic Improvement through Space - Function Resolution)” in the Department of Architecture, Faculty of Environmental Design, Lead City University, Ibadan, Oyo State, for the award of Master Degree (MSc) in Architecture and this has not been previously submitted.

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Dedication

This thesis is dedicated to God for enabling me and always seeing me through life's challenges; and to my loving family, thanks for being there always.

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I want to sincerely appreciate God Almighty for seeing me through this programme. To

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I hereby put on record that even though the above mentioned institutions have assisted in the process of this research work, I alone stand responsible for the errors, if any, found in the work.

Abstract

Broadcasting Training Centres are important for training broadcasters. Properly trained Broadcasters are part of the essential workforce needed for effective functioning of Radio Stations. Acoustic design is a key part of Radio Station design. Although the live and recording studios receive the most attention with respect to acoustics, other key functional spaces must be properly designed and fitted acoustic wise. Circulation in architecture, is the movement of people and objects between interior spaces in buildings and to entrance and exit points. Circulation spaces are the connectors of other spaces in a design. They allow for transit between functional spaces. However, circulation spaces generate noise, hence they should be properly designed and fitted. This deign thesis seeks to treat the task of meeting acoustic requirement of a broadcast training centre with the basic architectural tool of effective grouping of spaces based on function and noise attributes. This essentially requires that buildings in the proposal should be deliberately designed with circulation in mind as part of the concerns for achieving broader goal of enhancing acoustics. Literature show that resolution of acoustic need is crucial in determining how successful a broadcast radio station design would be. It is on this background that this thesis stands. Four (4) broadcasting training facilities within and outside Nigeria were studied. The methodology adopted is the Case Study approach. Findings showed that in all the case study buildings, consideration was given to acoustic, mostly through material selection. Based on the literature and information gathered from this design thesis, it is recommended that designers should ensure that effective resolution of acoustic requirements should be prioritised from their early design conceptualisations, working in close collaboration with seasoned broadcast personnel.

Keyword: broadcasting, training center, aesthetic, acoustic

Word Count: 279

Table of Contents

List of Tables

List of Figures

List of Plates

Chapter One

1.0 Introduction

1.1 Background to the Study

The process of disseminating information from a source unto a large number of people and over large geographical spaces is known as broadcasting. Globally, broadcasting has become a crucial tool for modern societies. There is a pervasive and continuous need for individuals, businesses, organizations and governments to transmit information from one area of the world to another. This is done to achieve the multiple goals of information, entertainment and education. The broadcasting industry, also known as the Mass Media thus play an important role in the workings of the world. The earliest, most widespread and farthest reaching form of broadcasting is the radio. Radio broadcasting is also the dominant mass medium in Africa (Okoye et al., 2020; Faller, et al., 2002; Myers, 2008; UK Essays, 2021). Television (TV) was a later addition to broadcasting which came after the wide adoption of Radio. At the beginning radio offered only a one way, voice only communication medium from broadcast stations to listeners. However, with advancements in phones technology and its wide use, many radio stations now offers two way interactions between their stations and the listeners. Also, the invention and development of the internet and social media have aided visual transmission of radio programmes, which previously were being done only by the TV stations (Statistics, 2017).

Like other areas of human endeavor broadcasting practitioners need to acquire structured knowledge for effective service delivery, hence, the need for educational institutions such as Broadcasting Training Centre.

Because the quality of broadcasting is largely dependent on audio quality, broadcasting stations often rely on a building, a group of buildings or some structures which are fitted with necessary equipment and constructed to enable a smooth broadcasting experience. However, in these buildings or studios, key considerations are made to ensure that the building delivers on its purpose. One of such considerations is acoustics (Stanca, 2021). Another consideration is effective circulation which enhances productivity (Nazarian, Price, & Demian, 2011). Crucial to the goal of this thesis is seeking answers to how key functional spaces should relate and the materials with which they are finished. The resolution of spaces based on functions and noise attribute is seen in this thesis as crucial to achieving enhanced acoustics in a broadcasting training centre.

A proposal of Broadcasting Training Centre, Itapa Ekiti has made it essential to design an educational facility that will, among other things, meet the acoustic and spatial requirements of a modern broadcasting training institute. It is for the purpose of meeting this need that this study is undertaken. The outcome of this academic effort will therefore form a basis for the design proposal that will be made for the Broadcasting Training Centre, Itapa Ekiti.

1.2 Statement of the Problem

Broadcasting Training Centre Itapa Ekiti requires buildings that will allow for effective acoustics within such buildings so as to enhance the effective training of broadcasters that are fit for the 21st century. However, this targeted goal will only be attained if the buildings housing the training facility are designed in such a way that impediments to enhanced acoustics are resolved. This is the problem which this research addresses.

Although, the architectural design requirements of a broadcast training facility can focus on several requirements like spatial flow and coordination, lighting, ventilation, aesthetics, building concept and building rigidity among others (Secchi et al., 2022; Idowu & Zhou, 2021). Nevertheless in this study, the focus will be on resolving acoustic requirements in a radio broadcast training centre in a way that will aid optimal production of quality broadcasters, and enjoyable learning and accommodation facilities for broadcast trainees.

In summary, this proposal will explore an understanding of the acoustic requirements of a radio broadcasting training centre by carrying out a detailed desk review and by reviewing existing case studies so designed to meet the goal of enhanced acoustics.

1.3 Aim and Objectives

1.3.1 Aim

The cardinal aim of the study is to create a theoretical basis for the design of a Broadcast Training Centre that will be embedded with effective acoustics considerations befitting of a modern contemporary Broadcasting Training Centre.

1.3.2 Objectives

The objectives of this study are to:

1. Draft and develop comprehensive design briefs for buildings in a Broadcasting Training Centre and the complementary accommodation facility;
2. Revise the concept of acoustic design to understand its requirements in Broadcasting Training Centres and similar facilities through a desk review;
3. Evaluate the basic acoustic requirements applicable to the Broadcasting Training Centre by studying existing cases;
4. Analyse the site for the proposed project and its contexts;
5. Proffer attainable architectural solutions and recommendations which centers on achieving enhanced acoustics through effective resolution of functional spaces, based on compatibility of adjoining spaces in the Broadcasting Training Centre to enhance broadcast teaching and learning experiences.

1.4 Research Questions

1. Is the development of comprehensive building design briefs important in the design and development of a Broadcasting Training Centre and its ancillary facilities?
2. Will a desk review of the concept of acoustic design enhance the understanding of its requirements in a Broadcasting Training Centre and similar facilities?
3. How relevant is the studying of existing cases to evaluating the basic acoustic requirements applicable to a the Broadcasting Training Centre?
4. Of what significance is the right selection and proper analysis of the site to viability or success the proposed project?
5. Will proffering of attainable architectural solutions and recommendations which centers on achieving enhanced acoustics through effective resolution of functional spaces, based on compatibility of adjoining spaces in the Broadcasting Training Centre enhance broadcasting teaching and learning experiences?

1.5 Significance of the Study

This study is significant because it provides a valuable body of knowledge on the subject matter of enhanced acoustic in a broadcasting training centre and its accompanying accommodation facility. This will help designers to come up with improved designs that will sufficiently take into account the acoustic requirements of buildings in a broadcasting training centre. Furthermore, the design proposal will serve as a clear example of how to meet the acoustic needs of a broadcast training institution, not just from acoustic science or engineering perspective, but also from an architectural view point using spatial positioning and compatible batching of spaces within the building as tools.

1.6 Scope of Study: Target Group

This design thesis is carried out to highlight how acoustic requirements for a broadcast training centre can be attained through effective and logical grouping of spaces in clusters based on noise generation potentials and noise transmission attributes. This is with a view to meeting and enhancing acoustics by not only considering surfacing / finishing materials as the only means of enhancing acoustics. Rather, **this thesis proposes using effective zoning of functional and circulation spaces as further means of enhancing acoustics in the proposed facility**. The study commences by discussing the historical background and development of broadcasting stations, and then deals with the architectural requirements of a broadcasting training centre with specific focus on its acoustics requirements so as to serve as a basis for the building design proposal for Broadcast Training Centre, Itapa Ekiti. The target group for this thesis comprises of broadcast trainers or tutors, broadcasting practitioners and administrators.

1.7 Operational Definition of Terms

Audio Cables and Connectors - Audio cables transmit audio signals from one place to another, such as from an audio source to the console.

Audio Processor – The audio processor ensures that the amplitude of the audio signal does not exceed the regulating body's limit. Without a processor the signal can become over-modulated, which decreases the quality of the resulting radio signal and can cause splatter on other frequencies.

Broadcasting – The art and practice of disseminating information to large audiences over a substantially large geographical area.

Circulation – The way people move through and interact with a building.

Distribution Amplifier - A distribution amplifier splits the signal from the audio console and sends it in multiple directions without overloading the console output.

EAS Decoder – The Emergency Alert System (EAS) is a nationwide system through which emergency warnings are relayed. The EAS decoder is the piece of equipment at a radio station that listens for emergency alerts on other stations and sends them out over the airwaves.

Equipment Racks – Some audio equipment can be freestanding, but in many cases a studio will want to rack-mount the equipment. There is a wide variety of free-standing wood and metal racks that you can hang equipment in, or install shelves in for equipment that doesn't come with "rack ears". Equipment racks keep the equipment secure and the cables hidden out of the way, which is nice for the aesthetics of the studio, but not necessarily important for basic functionality.

FM – Frequency Modulation.

Headphones – Headphones should be used by anyone speaking into a microphone. This allows the DJ or hosts to monitor their audio levels as they speak. Each microphone in the studio should be paired with a set of headphones

Mixer Or Console – An audio mixer takes input from multiple audio sources and lets the user determine which channels to use in the output, and at what levels. A console is generally the same thing as a mixer, but sometimes has some additional fancy features used just for radio.

Monitor Speakers – Monitor speakers let the DJ listen to what they are playing. The monitor speakers might be internally amplified, or might require an external amp for power. The best monitor speakers have a "flat" response so that the sound coming out of the speakers sounds as much as possible like the audio going into them, but any old speakers will work in a pinch.

On-air Light and Relay Circuitry – An on-air light notifies others outside of the studio when the DJ has microphones on in the studio. There is usually some circuitry outside of the console to turn the lights on and off. It is typically controlled by some switches inside of the console. Mixers not designed for radio probably won't have this feature. An on-air light is not essential, but it will make things easier for the DJ and for any visitors to the studio.

Reverberation Time (R. T.) – This is the time taken for a source sound produced in a room or space to decay by 60dB.

Studio-to-Transmitter Link – The studio-to-transmitter link (STL) carries the audio signal from the studio site to the transmitter (and antenna) site.

Training Centre – An educational facility used for teaching, learning and certification in specific skills.

Chapter Two

2.0 Literature Review

This Chapter explores the main aspects of this design topic by analysing existing works and researches already carried out by other researchers on these areas of discussion. This is carried out with the goal of gaining adequate knowledge of how these issues have been addressed in earlier researches. The themes or key aspects of this study looked at include architectural and acoustic requirements of Broadcasting Training Centres, zoning of spaces, building circulation, historical development of Broadcasting Training Centres.

2.1 Conceptual Review

2.1.1 Architectural Acoustics

Architectural Acoustics can be defined as the science, study and application of acoustic principles as they are implemented inside a building or structure (Balderrama et al., 2022). It can also be defined as the study of the generation, propagation and transmission of sound in rooms, dwellings and other buildings (Stanca, 2021; Ginn, 1978). Architectural Acoustics encompasses core elements such as noise control, speech privacy, passive and active sound reinforcement, paging, and emergency communications (Fausti, Santoni, & Secchi, 2019). Thus, Architectural Acoustics links the countless frequencies and wavelengths of audible sound with the intricacies of architectural geometry, and the characteristics of different finish materials. In this section, room acoustics will be the focus while the science of hearing and sound waves will not be emphasised.

2.1.2 Building Form and Acoustics

The acoustical environment in and around buildings is influenced by a number of inter-related factors associated with the building planning-design-construction process (Cabrera, et al., 2020). To achieve a certain sound or acoustic requirement in a particular room, architects must establish the basic size, shape and finish material of the space in question. In establishing the basic size of a room to ensure effective acoustics, there are recommended standard ratios for the length, width and height of the room (Montes, et al., 2018). Together, these three parameters form the cubic volume of the rom which is very essential in determining the acoustics experience in that room or space (Stanca, 2021; ISO 12354-1, 2017; Degree, 1997;). A general rule of thumb is that ceiling heights should be at least 4.9 metres for audio studio rooms such as for radio broadcasting or for music recordings (Okoye et al., 2020). Zalejska-Jonsson (2019) also stresses the importance of having sufficient ceiling height and states that, "The larger the room, the more ceiling height that's needed".

A study by Meng and Kang (2013) on the impact of building form on the acoustics of a cultural theatre showed that the hexagonal form of the theatre was effective in that it produced a perfect dead sound for the audience and thereby created harmony between the theatre and its listeners. They also opined that the two most important factors to consider when designing any room for sound production are reverberation time (R. T.) and reflection (or echo) of sound. But on a more general level, building forms that are symmetrical complement sound better than asymmetrical buildings (Cotana and Goretti, 2010). According to Cotana and Goretti, (2010), which was also stated by Janjua, Sarker and Biswas (2019), the worst shapes for any building in terms of acoustics are a sphere, a cube and a cylinder/oval room. While the best shapes are either a pentagonal building, a rectangular shaped building or a cuboid in which the height, length and width are determined around excellent acoustics ratios. Just as symmetry is essential in floors and walls, so too ceilings should be symmetrical as much as possible (Stanca, 2021). Furthermore, (Secchi et al., 2022) stated that open plan buildings often have serious acoustical problems due to unwanted sounds filtering through the entire space (Okoye et al., 2020).

2.1.3 Room Acoustics: Reflection, Absorption and Diffusion of Sound

Sound travels as either rays or waves in air, and behaves in specific ways inside buildings (Balderrama et al., 2022). When sound is produced inside a room or building space, it moves in an increasingly spherical manner outwards from the source of the sound (Rodríguez et al., 2022). As it spreads out, the sound waves may come in contact with obstacles such as shelves, walls, doors etc. When this happens, the direction of travel of the sound is altered (ISO 12354-1; 2017). Reflection, Absorption and Diffusion are acoustical tools or properties that describe the acoustic behaviour of different surfaces of an enclosed space (Kumar & Lee, 2019).

2.1.4 Sound Reflection

When sound waves hit flat surfaces like walls, floors and ceilings, sound is reflected back towards the source of the original sound (Rubino, et al., 2019). But with each reflection gotten, some bit of sound energy is lost ((Balderrama et al., 2022; Stanca, 2021). Eventually, the sound dies out when all of its energy is used up (Kuerer, 2002). Reflective materials in buildings are usually hard and relatively smooth surfaces such as gypsum board, wood, plywood, plaster, heavy metal, glass, masonry, and concrete. They are to be of sufficient mass, thickness and stiffness so that they can perform the specific function needed such as avoiding echoes and absorbing low frequency sound energy where it is not desired to have such.

2.1.5 Sound Absorption

On the other hand, when sound hits absorbent and porous surfaces like rugs, draperies and acoustic tiles, the sound pressure generated equals the energy density of the incident radiation and sound is not reflected (Okoye et al., 2020) rather high frequency sounds are absorbed or "soaked up" by these materials (Welch and Fremaux, 2017; Wilson, 2017). Sound-absorbing materials have high absorbing coefficient which is the ratio of the incident sound to the reflected sound and may vary from 0 (no absorption, or perfect reflection) to 1 (complete absorption, or no reflection) (Stanca, 2021; Ngunjiri, 1990). But in using this data, care should be taken to also take the frequency of the incident sound into consideration. The thicker the porous material and/or the deeper the airspace behind the absorbing layer, the higher will be the low-frequency sound absorption coefficients. The absorption coefficient of some building finishing materials at different frequencies in shown in figure 2.1 below.

Material	Frequency, Hz					
	125	250	500	1000	2000	4000
Air, per cu. m.	nil	nil	nil	0,003	0,007	0,02
Acoustic paneling	0,15	0,3	0,75	0,85	0,75	0,4
Plaster	0,03	0,03	0,02	0,03	0,04	0,05
Floor, concrete	0,02	0,02	0,02	0,04	0,05	0,05
Floor, wood	0,15	0,2	0,1	0,1	0,1	0,1
Floor, carpeted	0,1	0,15	0,25	0,3	0,3	0,3
Brickwall	0,05	0,04	0,02	0,04	0,05	0,05
Curtains	0,05	0,12	0,15	0,27	0,37	0,50
Total absorption of one seated person	0,18	0,4	0,46	0,46	0,51	0,46

780120

Figure 2.1: Typical absorption coefficients of 1 m^2 of different materials

Source: (Secchi et al., 2022)

2.1.6 Sound Diffusion

Diffusive surfaces have non-planer forms and help to redistribute and redirect sound energy directed at their surfaces. They are usually convex or randomly articulated in shape help to create a feeling of sound being generated from within the room and also help in prevention of echoes and unwanted cross reflections (Liao, et al., 2021). Curved surfaces (either parabolic or concave) are rarely desirable for proper acoustics. Concave surfaces in churches or auditoriums can be the source of serious problems as they produce concentrations of sound in direct opposition to the goal of uniform distribution of sound (Balderrama et al., 2022). This explains why oval shaped halls and domes have serious acoustics problems in that they have concave surfaces and redirects sound to a narrow point in the room (Okoye et al., 2020). If ever a concave surface is to be used in a room, its focal centres should be outside the enclosed space so as to make the acoustics problems normally associated with concave surfaces less damaging (Ngunjiri, 1990).

Architectural surfaces need to be designed and finished to either reflect, absorb or diffuse sound (Park, Lee and Lee, 2017). The materials and construction elements that shape the finished spaces determine how sounds will be perceived in that space, as well as how they will be transmitted to adjacent spaces (Stanca, 2021).

Absorbent materials such as mineral wool and semi-rigid fiberglass panels are used in a space to control reverberation, sound level, echo and reflection of sound, and to enhance diffusion (Alonso, et al., 2020). All these are done to improve speech intelligibility, improve sound isolation and also to improve the mixing of sound in a room (Ogwuche & Sagada, 2015).

Regardless of the acoustic material used in a building space, its effectiveness is determined by the surface area it covers on the building element (Alonso, et al., 2020). Alonso (2020) therefore recommends that at least 10% of the total surface area of the building elements be treated with acoustic materials for the room to benefit from the treatment.

2.1.7 Room Acoustics: Problems and Solutions

Park, Lee and Lee (2017) discussed different acoustic problems with regards to music education within a studio and also proffered some solutions to them. These acoustics problems are also relevant in this study. For example, a room or building could suffer from poor sound isolation and this can be determined if sound travels from one area to another through:

- Closed doors and windows
- Walls
- Ceiling and floor

- Heating, ventilation and air-conditioning (HVAC) system ducts and vents
- Cracks and openings

Some of these areas of sound leakages are also identified by (Secchi et al., 2022) such as doors and windows, walls and floors. In figure 2.2 below, the uncontrolled transmission of sound through a building can be seen. External noise enters the building freely from the walls and windows, HVAC equipment above the building also generates noise and it is transmitted through the ceiling down to the spaces beneath, vibrations on the floor of the building also adds to the noise and sound leakages occur through doors and over partition walls.

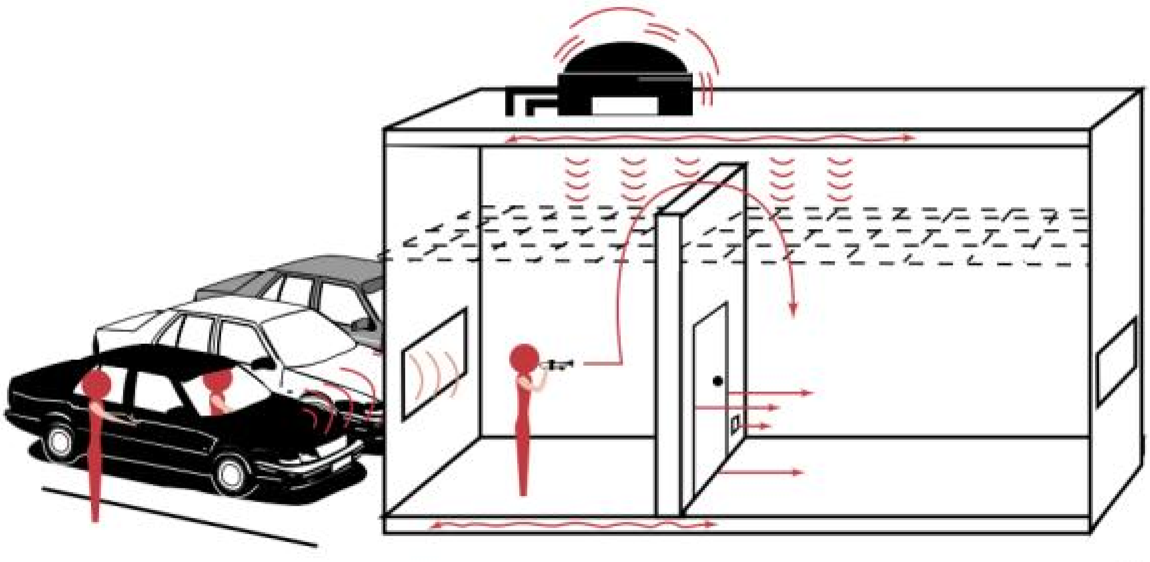

Figure 2.1: Uncontrolled travel/leakage of sound through a building

Source: Secchi, et al. (2022)

Doors and windows are building elements through which sound isolation may not be achieved. To achieve good acoustics, doors should be solidly constructed with the appropriate thickness and they should seal tightly when closed. For windows, studies have suggested that the windows should be made of double panes of sufficient thickness, and adequate air-space of at least 2 inches (Park, Lee and Lee, 2017; liao, et al., 2021). Windows could be angled so as not to be parallel to other windows or walls on the opposite part of the room which could encourage reflection of sound (Stanca, 2021). Also, the windows should seal tightly when closed. For door and window seals, one might consider using a magnetic seal system but if that is not possible, then a dense, flexible material can be used for that purpose. Overall, the goal is to ensure that when the door and/or window is shut, it is airtight (Kumar and Lee, 2019).

Walls are also a membrane through which sound pass between adjoining spaces (Balderrama et al., 2022). Specifically, Arenas and Sakagami (2020) advocates that "to provide adequate sound isolation, walls need to have a great deal of mass, seal at the floor and ceiling deck and around door and window frames, and walls should contain a space of dead air and insulation".

Secchi et al., (2022) also states that in addition to other wall treatments such as including perforated panels or slats on wall surfaces, walls could be convex shaped or angled to produce better acoustic results.

Ceilings and Floors can be given similar treatment to achieve high acoustic performance. Ceiling treatment could take one of two forms: use of false ceiling and use of suspended ceilings (Okoye et al., 2020). False ceilings are ceilings which are independent of the main floor ceiling structure. Suspended ceilings are ceilings which are hung from the structural floor by wire or resilient hangers. Suspended isolated ceilings can be included to existing ceilings which serve as the floor to the space immediately above the given space. The suspended ceiling could be gypsum board with undulating surface and should also be supported by acoustical hangers made of neoprene to increase the overhead sound isolation (Rubino, et al., 2019; Cotana and Goretti, 2010) also identifies ceiling material selection as important in architectural acoustics considerations. In this regard, Balderrama et al., (2022) suggests using acoustic tiles for ceilings. Similarly, the roof structure and roof covering could cause potential sound leakages. Therefore the gaps in corrugated roofing sheets should be filled with sound absorbing materials such as polyurethane.

For floors, the best option is also a floated floor constructed above the concrete floor and in-filled with resilient isolation pad (neoprene or compressed glass fiber) (Fausti, Santoni, & Secchi, 2019; Arenas and Asdrubali, 2019; Cucharero, et al., 2021; ISO 12354-1, 2017). Also, floors can be given carpet or rubber coverings to improve its sound absorbing properties (Karttunen, 2017; Arenas and Asdrubali, 2019).

In addition to the problem of poor sound isolation in buildings, flanking is another problem experienced in room acoustics. In this situation, sound transmission occurs through so-called flanking paths or indirect routes (Rodríguez et al., 2022). The sound transmission path over the partition via a suspended ceiling, against which the partition terminates, is a common condition. Others include interconnecting air-conditioning ducts, doors opening to adjacent rooms via a common corridor, and adjacent exterior windows. The existence of flanking paths means that in some cases it is pointless to construct a high quality insulating wall without making major structural changes in the other building elements of the room (Ginn, 1978). In figure 2.3 below, a schematic presentation of flanking as an acoustic problem is shown.

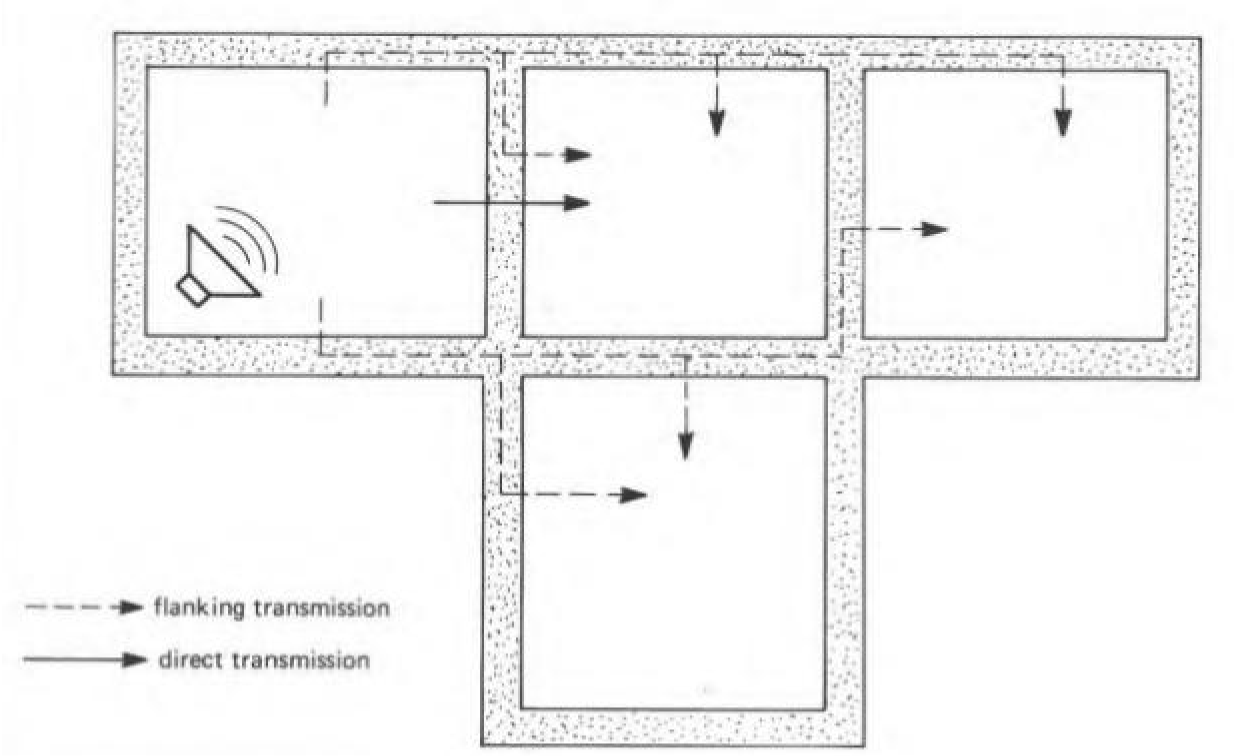

Figure 2.2: Transmission paths between rooms

Source: (Rodríguez et al., 2022)

In general, most rooms with poor acoustics can be corrected architecturally through an inclusion of sufficient surface covering, which would act as sound diffusers and sound absorbers, over the exposed surfaces of the room such as walls, floor, large windows and ceilings (Cavanaugh, 2009; Wenger Corporation, 2000). In addition to this, double construction in-filled with sound absorbing materials like mineral wool is helpful in reducing sound transmission between adjoining spaces (Cavanaugh, 2009; Ginn, 1978). This typically involves construction of double leaf walls i.e. cavity walls, double floors etc. (Ngunjiri, 1990).

2.2 Empirical Review

2.2.1 Historical Development of Broadcasting

History of Radio and Broadcasting Stations

In 1873, James Clerk Maxwell a British physicist, published his theory of electromagnetic (EM) waves. This publication was so significant that it is said to have marked the beginnings of radio communication (Noone, 2013; Feldman, Watson-Watt, & Zworykin, 2008). Although EM waves first found application in light waves, it was found to also be applicable in studies on electricity as discovered by German physicist, Heinrich Hertz (Feldman, Watson-Watt, & Zworykin, 2008).

However, it was a young Italian electrical engineer and inventor, Guglielmo Marconi, that is generally credited as being the inventor of radio (Noone, 2013). This is so because he was the first person to develop an improved apparatus that made wireless communication over large distances possible such as sending commercial messages across the English Channel in 1899 and across the Atlantic Ocean in 1901 (Feldman, Watson-Watt, & Zworykin, 2008).

As the 20^{th} century began, improvements were made in the new wireless messaging system. Some of these included improved tuning devices, antennae and other detectors to help produce clearer sound (Feldman, Watson-Watt, & Zworykin, 2008). After World War 1, there was rapid development in radio communication and in 1922, the first public radio broadcast was achieved in Pennsylvania, United States of America (Faller, et al., 2002). For most parts of the history of radio stations, transmissions have been made in analog formats as either amplitude modulation (AM), frequency modulation (FM) and phase modulation (PM) or their derivatives. In 1933, FM radio was patented by inventor Edwin H. Armstrong. FM uses frequency modulation of the radio wave to reduce static and interference from electrical equipment and the atmosphere. In 1937, W1XOJ, the first experimental FM radio station, was granted a construction permit by the US Federal Communications Commission (FCC) (Faller, et al., 2002).

Between the 1930s and 1950s, it was discovered that radio stations that make broadcasts via EM waves are subject to degradation which defines a station's coverage area. A coverage or service area in turn is defined by two contours: the *interference-limited contour* and the *noise-limited contour*. The noise-limited contour is largely defined by the transmission power of the station, and reception of the signal becomes negligible beyond this contour. The interference-limited contour is largely defined by the interference from collocated stations, i.e., stations having the same carrier frequency but geographically separated by a certain minimum distance. Outside this contour, the level of the interference signal supersedes the broadcast signal, resulting in either no or very poor reception of the original station (Faller, et al., 2002). Thus, these limitations imply that many radio stations can only serve listeners within their geographic location or if they must serve more people, then better equipment that can provide stronger signals are needed. A radio station usually requires a license from the national regulating agency or commission before it can operate within a country.

Since the 1960s, there have been researches into the digitalization of radio owing to the problems associated with analog broadcasting. For one, digital communication allows incorporation of safeguarding measures (i.e., channel coding) to insure the fidelity of the received digital representation of the source signal (i.e., the result of source coding) and regeneration of the signal without accumulative degradation. But it was not until the 1980s that this drive actually gained momentum in the United States (Faller, et al., 2002). By the 1990s and early 2000s, digitized radio broadcasting had been achieved and was now spreading across Europe and America (Faller, et al., 2002). Added to that was the possibility of making radio broadcasts over the Internet which began to gain traction and was actually implemented by some of the biggest media corporations like the British Broadcasting Corporation (BBC) (Feldman, Watson-Watt, & Zworykin, 2008).

Digital and satellite radio have greatly expanded the possibilities of radio. Not only does digital radio provide superior sound quality, but it permits such additional services as multiple audio-programming channels, on-demand audio services, and interactive features, as well as targeted advertising (Feldman, Watson-Watt, & Zworykin, 2008). Wireless Internet allows users of computers and portable media devices to access the World Wide Web from all kinds of locations. Personal digital assistants (PDAs) also use radio to access e-mail and other services, including GPS information from satellites (Feldman, Watson-Watt, & Zworykin, 2008).

2.2.2 Development of Broadcasting in Nigeria

Broadcasting in Nigeria dates back to December, 1932 when the British Broadcasting Corporation (BBC) started what they called the "Empire Service", and Lagos was one of the receiving centers (Adejunmobi, 1974). For two decades after its founding, as the local repeater station of the empire service for the BBC, radio broadcasting served merely, as a tool of the colonial enterprise, being the cultural arm of a political and economic process that consolidated British Rule on Nigeria's shores. All that changed with the birth of the Nigerian Broadcasting Service (NBS) in the year 1951 (Adejunmobi, 1974). The period between 1952 through 1970 saw radical changes in the concept and structure of Nigerian broadcasting. The realities of a young Nigeria's turbulent politics had directly affected the country's radio services. In the 1950s and early 1960s, regional broadcasting corporations in Nigeria were established such as Western Nigeria Broadcasting Service (WNBS), Eastern Nigeria Broadcasting Service (ENBS) and Northern Nigeria Broadcasting Service (NNBS) (Adejunmobi, 1974). By 1970, the 1950 conception of a single, national, noncommercial broadcasting service had evolved into seven separate systems – one national and the others regional in scope--six of which ran advertising (Adejunmobi, 1974). Section 36 (2) of the 1979 Constitution ushered in the third revolution in radio broadcasting in the country. By proclaiming that “The Federal and State Government or any other person or body authorised by the President can own, establish or operate a television or wireless broadcasting station in the country”, this gave statutory basis to the ultimate emergence of private/commercial radio broadcasting 13 years later.

2.3 Design Consideration

2.3.1 Architectural Requirements of Radio Stations

Studio design is a function of many factors with acoustics as the most stringent criteria. Good acoustics design must be enhanced by good planning, layout, materials, surface finishes, shape, choice and design of service systems (Stanca, 2021).

But even before the radio studio building is designed, some points of concern for the architect include site selection and site planning (Secchi et al., 2022). As much as possible, sites selected for radio houses should be those that have low background noise. If the site likely to undergo future developments, these should be captured in the projections of the architect so as to make sufficient provision for the expected increase in noise levels around the radio or broadcast building. In the overall planning and design of radio broadcasting and television studios, there should be proper orientation of the building to reduce noise exposure of occupied and critical spaces. The noise sensitive spaces such as studios should be placed as far away as possible from external and internal noise sources (Okoye et al., 2020)

There is no one way of designing a radio studio (Clark, 2017). The design of radio broadcasting studios is a complex task that is multidisciplinary in nature; it involves the integration of architectural acoustics, electro-acoustics, environmental control, lighting and ceiling systems. (Kurjak, Grubesa, & Domitrovic, 2006). Before designing any radio studio, several questions need to be answered as these will provide a basis for making the design. But in all these, acoustics consideration ranks among the most significant parameters. In fact, it is the singular most important thing in the radio studio (Clark, 2017). This is because acoustics determine speech intelligibility which is an absolute requirement for a radio studio (Kurjak, Grubesa, & Domitrovic, 2006). Other considerations to be given attention in the design conceptualisation are ergonomics, workplace culture and flexibility (Clark, 2017).

Generally, a radio broadcasting station has an audio studio, control room and soundlock (Kurjak, Grubesa, & Domitrovic, 2006). The control room is best built beside the studio and should normally be separated with a wall that offers good acoustic treatment. The control room is visually linked to the studio through specially designed observation window which a good view of the floor of the studio (Karttunen, 2017). This window should also provide an average sound insulation value of up to 40 dB or more (Rodríguez et al., 2022). The size and shape of the Control Room will depend on the furniture and technical equipment it has to accommodate; such as, audio console, monitoring and talkback facilities, disc reproducer, tape recorder and playback unit, clock, reverberation control unit, video monitor, intercom key panel, seats for the control personnel etc. The soundlock on the other hand is constructed to serve as a sound barrier.

Some of the main parts of the radio studio include mixer and continuity suites. The mixer suite is made up of two rooms: the control room and the announcer's studio. The continuity suite also has a control room and an announcer's studio which houses music or record-playing equipment and a microphone (Balderrama et al., 2022).

The following room elements must be integrated functionally and aesthetically into the architectural-acoustical design of Radio Studios (Stanca, 2021)

a. Acoustical treatments and surface finishes to produce the required R.T.;
b. Mechanical and electrical fixtures; such as, grilles, lighting fixtures, speakers, status lights, flick lights, clock, wire moulds, outlets, etc.;
c. Seating, furniture, and permanently installed or portable equipment, as required to achieve the desired sound effect; such as acoustic screens, turntables, sound effect equipment, etc.

In constructing studio buildings, Ngunjiri (1990) advises that the foundations should be constructed in such a way that it does not transmit vibrations and other noise originating from the ground to the building structure. Resilient materials can also be introduced in lighter structural members of the rigid frame structure of the building to reduce transmission of sound through the structural members.

2.3.2 Acoustics of Radio Stations

Ordinarily, the primary design concern of any acoustical room is the reverberation time (Ginn, 1978). But the main focus of acoustics of radio studios is to prevent intrusion of sound from outside, to avoid mechanical noise within the building and to provide internal treatment to ensure vocal intelligibility (Clark, 2017). Radio studios require special acoustics consideration (Rubinato, 2017). Speech or vocal intelligibility depends on a number of factors, including clarity of speech among others (Okoye et al., 2020). Speech clarity is a situation in which a listener can both hear and understand what a speaker is saying. All radio stations pay serious attention to this. And indeed, any room or studio meant for speech should prioritize distinct and clear hearing of the speaker (Balderrama et al., 2022). The mandatory ambient acoustical background which studio spaces must maintain is 25-30 dB (Secchi et al., 2022).

In a study carried out by Kurjak, Grubesa, & Domitrovic (2006) on integrating modern architecture wuth a small radio broadcasting studio, they identified some of the acoustics considerations which are useful in a radio studio design. To control sound in the studio, the walls of the radio studio could be made of gypsum-cardboard panels. Gypsum boards have very good sound isolation properties (Wenger Corporation, 2000). In using this technique, a wooden structure is built onto the interior surface of the brick wall and then overlaid with gypsum board. The spaces behind the panel are then filled with mineral wool or some other material to serve as perforation (Kurjak, Grubesa, & Domitrovic, 2006). The Wenger Corporation (2000) even advocates that double layers of gypsum board be installed on either side of the wall to provide the best acoustic treatment to the wall. See figure 2.4 below. Also, the studio door should receive acoustic treatment to prevent leakages.

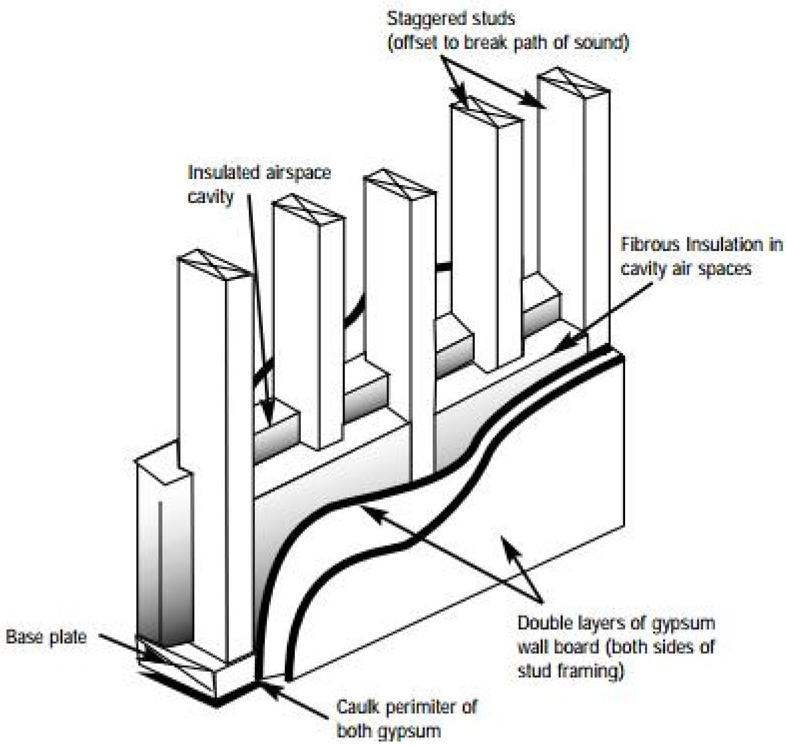

Figure 2.3: Acoustic treatment of radio studio walls

Source: Wenger Corporation (2000)

It is pertinent to state at this juncture that architectural acoustics of radio studios is so important that even changes to the production and transmission equipment in the control room has no significant effect on the acoustics output of the studio as can be seen in the work of Kurjak, Grubesa and Domitrovic (2006) which is being discussed here. This is an area that can only be corrected by architectural design.

In addition, if the control room is to be adjacent to the studio room, then the glass partition between them should not be mounted vertically for acoustical reasons and the glass panes should be tilted to avoid accumulation of dust overtime (Clark, 2017). For the best results however, some radio stations build their studios as a “box inside a box” (Clark, 2017). In this case, a discontinuous construction is used which creates a double skin structure with the studio being an acoustically independent room within another room as shown in figure 2.5 below. This kind of set-up ensures that the studio box is air tight and allows no leakage of sound since the studio is protected from external noise by the airspace and resilient materials in-between the enclosures (Doelle, 1965). It also provides sound insulation of 60-65dB (Ngunjiri, 1990).

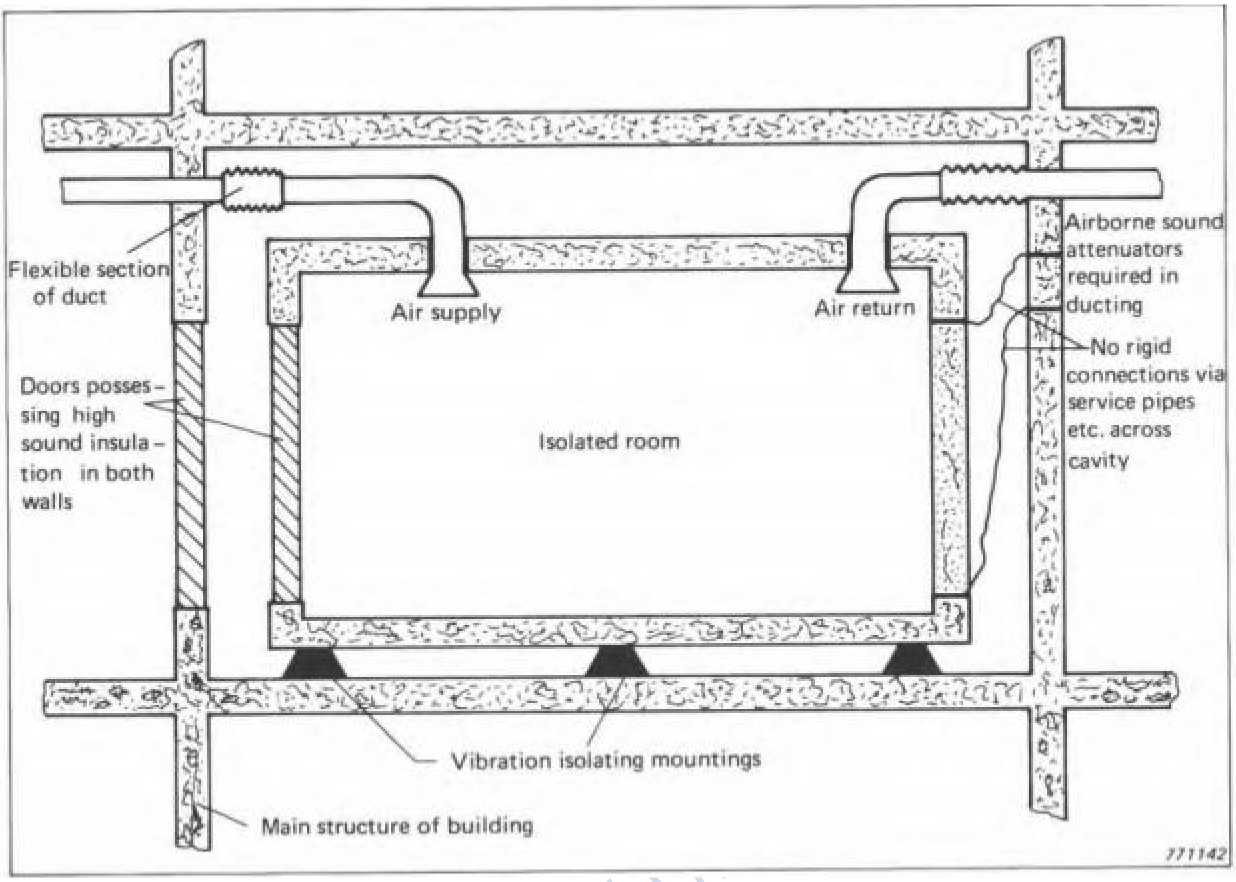

Figure 2.4: Box within a box discontinuous construction: vertical section through an isolated room

Source: Ginn (1978)

Noise generating mechanical and electrical equipment can be located as far away as possible from the studio. Also, the enclosure into which the noise-generating equipment is installed should be airtight so that sound from the equipment is greatly isolated within the room or enclosure (Cavanaugh, 2009) (Ngunjiri, 1990). This is shown in figure 2.6 below

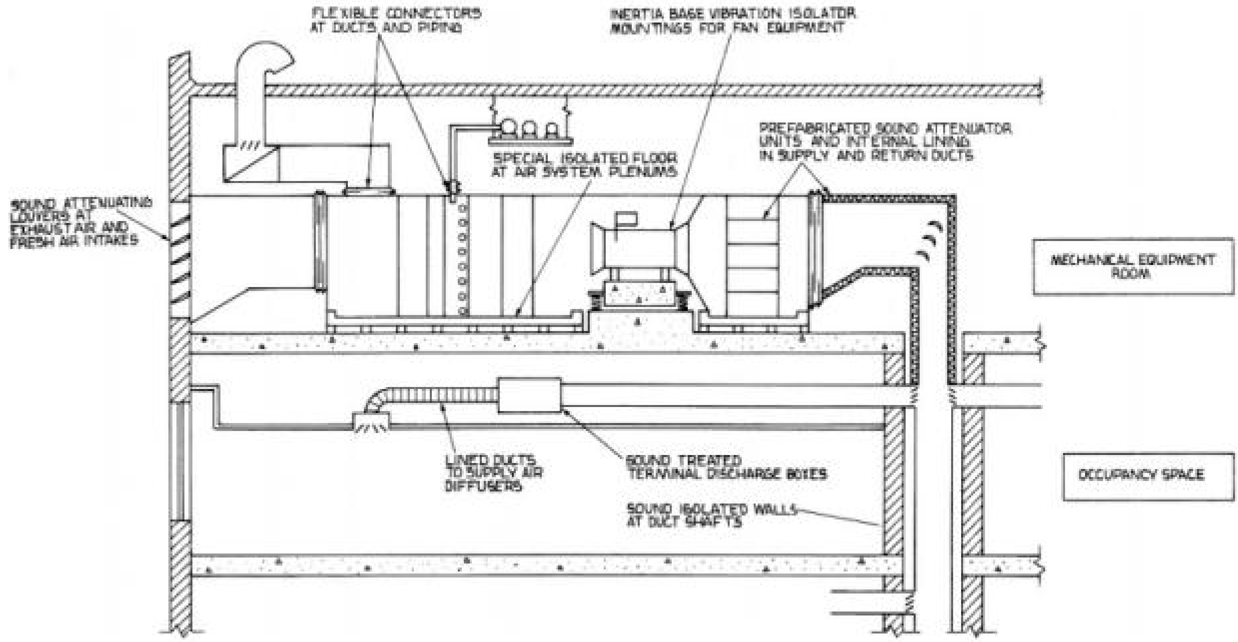

Figure 2.5 Typical mechanical equipment noise and vibration control measures

Source: Cavanaugh (2009)

By design, studios require quiet ambient background (25-30 dB) and hence buffer spaces are preferred between them and other noisy spaces. In conclusion, adequate sound insulation both from the interference of outside noise and between adjacent internal areas and the studios must be provided (Ngunjiri, 1990). Any spaces above any studio should be provided with resilient floors to reduce any impact sound transmission to the studio. Also the studio should have suspended ceiling to increase sound insulation from spaces above.

Summary

In the preceding paragraphs, it has been made clear that architectural acoustics which covers sound theory, acoustic design elements and functional requirements of the space is vital knowledge in order to handle any acoustic design commission such as the design of a broadcasting Training facility. A brief history of radio and broadcasting stations was also discussed. From the desk review done so far, it can be seen that good acoustic design starts with the choice of a site whose background sound levels are low. This is then enhanced by the form, planning and layout of particular activities to attain a separation of noisy spaces from quiet spaces. The choice of materials, placement and construction technique in lectures, rehearsal rooms and studios plays a very important role in the overall acoustic design. All these should be accompanied by carefully designed acoustic details and good workmanship (Doelle, 1965).

Chapter Three

3.0 Methodology- Case Studies

Preamble

This thesis adopts the case study approach as methodology for the project. Case studies are the "study of a situation or an analysis of a particular case or situation used as a basis for drawing conclusions in similar situations" (Cook, Loraine & Kamalodeen, Vimala, 2019). Furthermore, Ale (2008) quoted Eero Saarinen on the importance of case studies in his projects in which Saarinen stated that" Naturally I do not believe in eclecticism or imitation, but I think it is very important to everyone and then to look carefully at the architecture of other times so that we can test the degree of fulfilment of our architecture against the fulfilment of others". On the strength of these, five case studies will be studied for this project which comprises two local cases and three international case studies.

3.1 Case Study 1: Nigerian Institute of Journalism, Ogba, Ikeja, Lagos.

3.1.1 Description of the Building

The Nigerian Institute of Journalism is the foremost school of journalism in Nigeria which specializes in the training of Journalist and professionals in the field of Journalism. The Institute has its own online radio, which is PEN Radio live with our online Newspaper coming on board.

Plate 3.1: Nigerian Institute of Journalism, Ogba, Ikeja, Lagos
Source: Authors field survey

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3.1.2 Appraisal of the Building

Merits

•The studios have their walls and floor insulated. The insulation of the wall and floor is done with the popular method of using a foam covered with a cloth like material for the wall and a rug for the floors.

•There is efficient day-lighting and ventilation

• Easy accessibility to all range of users.

•Use of stairs and ramps to aid vertical circulation.

•Adequate Parking Space.

Demerits

No provision for escape other than the main entrance to the building.

Spaces are too small in the building when compared to the functions being carried out in them.

Plate 3.2: Nigerian Institute of Journalism, Ogba, Ikeja, Lagos (Wider View)
Source: Authors field survey

3.2 Case Study 2: Arizona State University School of Journalism & Mass Communication, Arizona, United States

3.2.1 Description of the Building

• The new six-story, 225,000 sqf, 110-foot tall, LEED Silver building has become an integral part of the fabric of ASU's energizing downtown campus and a harbinger of Phoenix's redevelopment. Delivered in a design-build, fast-track method, work began on design in October 2006 and the school opened its doors in August 2008, 22 months later. School schedules and budgets were both met.

• The exterior is clad with glass, masonry and multi-coloured metal panels – the pattern of the panels is inspired by U.S. broadcast frequency spectrum allocations (the Radio Spectrum). The composition is kinetic and dynamic – symbolic of journalism and media's role in our society. The building's massing incorporates appropriate sun screens on each of the four facades;

• Their specific architectural treatment reduces the heat loads and is one of many of the LEED Silver building's sustainable strategies. Burnished concrete block walls, ground and polished concrete floors and warm wood ceilings further express the forthright and direct nature of news delivery.

• Both the newsroom and broadcast anchor desks are contained within one massive production space with views overlooking the city and beyond. Flanked by state-of-the-art control rooms and edit bays, Cronkite News Watch is in constant communication with itself and the community it serves. KAET Channel 8 Public TV also transmits live from their state-of-the-art studios on the sixth floor. This top floor location allows for long spans and high ceilings, required for the studios, and is constructed of a prefabricated lightweight steel structure. Satellite dishes from transmission are housed on the roof; they are specifically not screened and directly express the building's function as one of communication.

Plates 3.3: Arizona State University School of Journalism & Mass Communication, Arizona, United States.

Plates 3.4: Arizona State University School of Journalism & Mass Communication, Arizona, United States.

3.3 Case Study 3: Toni Stabile Student Center, Columbia University Manhattan, New York, USA

3.3.1 Description of the Building

The project are spaces for the Journalism Library, the offices of the Columbia Journalism Review, assorted faculty and administrative offices, and classroom space. Central to the proposal is the introduction of several new spaces to serve as a social and intellectual center for the School: a multipurpose social hub for student-faculty interaction as well as larger meetings with visitors to the school, and a more informal student lounge space and cafe. The social hub accommodates a diverse range of programs: study space for students in between classes, meeting space for students and faculty, informal presentation space for visitors from the journalism industry, and other such communal event spaces for the Journalism School. The cafe is intended to be a louder, more informal space for the School's students, complete with plasma screens and LED signage that will broadcast the news to patrons. Its site at the formerly outdoor space between Journalism and Furnald allows it to engage the campus environment while also remaining within the School of Journalism. A transparent glass structure is proposed to give the School a more active presence on its entry plaza.

Plates 3.5 & 3.6: Toni Stabile Student Center, Columbia University Manhattan, New York, USA

3.4 Case Study 4: The Nigerian Television Authority College - Ntatvc, Jos

3.4.1 Description of the Building

The primary mandate of the station is to broadcast news, programs and events to the populace. To serve a medium of educating, entertaining and disseminating information. The Nigerian Television Authority - also known as NTA - was inaugurated in 1977 and is the government-owned body in charge of television broadcasting in the country. The NTA claims to run the biggest television network in Africa with stations in several parts of Nigeria. Formerly known as Nigerian Television (NTV), the network began with a takeover of regional television stations in 1976 by the then Nigerian military authorities, and is widely viewed as the authentic voice of the Nigerian government.

The college is committed to providing high quality professional and specialized education in television, production and journalism, as a means of fostering and promoting best practices

History

Television began broadcasting on 31 October 1959 under the name Western Nigerian Government Broadcasting Corporation (WNTV). It was based in Ibadan and was the first television station in Tropical Africa. Other Northern parts of Africa already had a television station.

Programming

A number of NTA programs can be viewed online via Africast as well as Telafric Television (US & Canada). NTA News bulletins are frequently aired on Africa Independent Television, and BEN Television in the United Kingdom. The station was made available through Sky in the UK on channel 202, but in early March 2010, they refused to make their channel pay-per-view on Sky. The next day the channel was removed from the Sky EPG. It is also on the IPTV platform SuncasTV, and via free-to- air satellite on Galaxy 19, Intelsat 905 and Intelsat 507

Location: The Nigerian Television Authority - NTA, Jos is located along Old Government House Close, Rayfield Jos, Plateau State.

3.4.2 Appraisal of the Building

Merits

1. There is flexibility in the design of their studio.
2. Proper site zoning.
3. Transmitting hall is on a high level for propagation.
4. Provision of staff restaurant to help in user comfort.

Demerits

1. No escape route.
2. The acoustic material used at the wall and ceiling is very poor.
3. Lighting and Ventilation of the offices is very poor.

4. No provision of parking lots.

Plates 3.7 Control/Editing Room at NTA.

Plates 3.8 Mixed-Used Studio at NTA Centre.

Plates 3.9 News Room at NTA.

Plates 3.10 Teleprompter at NTA.

3.5 Case Study 5 (The British Broadcasting Corporation – BBC)

3.5.1 Description of the Building.

History

On Friday 1 April 1949, Norman Collins, the then Controller of the BBC Television Service, announced at the Television Society's annual dinner at the Waldorf Hotel that a new TV centre would be built in Shepherd's Bush. Transmissions at the time came from Alexandra Palace and Lime Grove Studios (from 1949), and had very few television transmitters. It was to be the largest television centre in the world. Riverside Studios in Hammersmith were used from 1954.

It was planned to be six acres, but turned out to be twice as big. On Aug 24, 1956 the main contract was awarded by the BBC to Higgs and Hill, who also later built The London Studios (ITV) in 1972. The building was planned to cost £9m.

The building features a distinctive circular central block (officially known as the main block – but often affectionately referred to by staff as the doughnut) around which are studios, offices, engineering areas and the new News Centre. In the centre of the main block is a statue designed by T. B. Huxley-Jones, of the Greek god of the sun, Helios, which is meant to symbolize the radiation of television light around the world. At the foot of this statue are two reclining figures, symbolizing sound and vision, the components of television. This structure was originally a working fountain but due to the building's unique shape it was too noisy and was deactivated.

The Design

The overall design for Television Centre, from the air, appears to be like a question mark in shape. The architect Graham Dawbarn CBE (Norman & Dawbarn), drew a question mark on an enevelope (now held by the BBC Written Archives Centre) while thinking about the design of the building and realized that it would be an ideal shape for the site. (*The BBC Quarterly Journal, July 1946*). The building was first commissioned in 1949.

The Studios

The centre's studios are run by BBC Studios and Post Production, a wholly owned commercial subsidiary of the BBC. They range in size from 110 square meters (1047 ft^2) to the vast Studio One (TCI) at 995 square meters (10, 250 ft^2) – the fourth largest television studio in Britain (following The Foundation Studios', Studio A&B, Media City UK's Studio

1 and The Maid stone Studios' studio 5), and is equipped for HDTV production (as are Studio Four, Studio Six and Studio Eight) Wells Matt (1 January 2007).

The Infrastructure

In February 1996, the source of the building's electricity and heating was transferred to an European Gas Turbines (EGT) 4.9MWe Typhoon gas turbine Combined Heating, Power and Cooling Unit. It included a 6MW Thermax air conditioning (cooling) vapor absorption machine (VAM). The £6m HAVC system reduced the centre's energy costs by 35%, and paid for itself within three years. A second turbine was added, without a second chimney. In 2008 however, Tara Conlan (18 July 2008), the BBC admitted that the energy system is only being used for emergency purposes as it became cost-ineffective to use full time.

Excess electricity produced at night has been returned to the National Grid, as originally planned. In November 2003, the turbine's chimney's caught fire, Chris Tryhorn (28 November 2003), which effectively brought TV output in the centre to a halt. Since the fire the turbines have not been regularly used.

3.5.2 Appraisal of the Building

Merits

1. Good Site zoning and spatial distribution.
2. Good Acoustic
3. Advance technology was employed in the construction, lighting, ventilation and acoustic requirements thus making it one of its kind.
4. The BBC Broadcasting Station was built on a very large expanse of land. It stands and still remains the largest Television Center in the world.

Demerits

1. Some of features and statue incorporated into the building for aesthetics were later discovered to be a disadvantage in terms of acoustics. They became source of unnecessary noise in the building which was not good for the studio functions of the Television Station. Hence such features were later deactivated.

Plate 3.11 Picture showing the approach view of BBC television centre. *Source: Wikipedia.*

Plate 3.12 The aerial view of BBC showing the question mark shape. *Source: Wikipedia.*

Plate 3.13: Picture showing the aerial view of BBC television centre. *Source: Wikipedia*

Plate 3.14: The aerial view of BBC from the centre. *Source: Wikipedia*

Chapter Four

4. 0 Site Analysis and Design Synthesis

4.1 Study Area

Every building structure needs a site to be ‘realized’ or developed on. The site is thus a very important aspect of a design proposal being the ‘point’ at which the tangible ‘percentage’ of a development emerges or starts making an impact. The site chosen for any project hence goes a long way in determining the final resultant composition of the structure. The site and its environment determine the structure in terms of contextual appropriateness measured by the geography, geology and geometry. The specific aspects of the site, such as its micro climate, are thus a complex interaction of many factors: orientation, slope, elevation, topography, temperature patterns, humidity, precipitation, vegetation, presence or absence of water, seasonal availability of sunlight and (especially in urban areas) the influence of other buildings.

Site Location – Itapa Ekiti

Itapa Ekiti is a town in Ekiti State, Nigeria. Itapa Ekiti lies on latitude 7° 49’ 0’’ North of the Equator and longitude 5° 23’ 0’’ of the Greenwich Meridian. It is over 400m above sea level. The town is 43km North of Akure, the capital city of Ondo State. The position of Itapa is shown in Plate 12 below.

History has it that Itapa is one of the goddesses worshipped at Ife. Her festival, known as *Utaale*, is held for a period of thirty days and she is been worshipped by the *Ooni* and his people till today. The traditional ruler of Itapa Ekiti is known as the *Owatapa*. According to the most recent historical records, there have been no fewer than 26 kings that have occupied the throne of the *Owatapa.* Some of these rulers carried out projects and policies, and fought wars that have opened up the ancient town to development over the centuries.

Owa Makanjuola Ajaja Ph.D., Ilufemiloye Ola III, (2011-present), emerged as the new Owatapa on 25 November 2011 and was presented with the staff of office as the Owatapa of Itapa Ekiti on 31 March 2012 by the Governor of Ekiti State, Dr. Kayode Fayemi, during his first tenure.

Fig 4.1: Map showing Itapa Ekiti in Regional Context

Source: Google Maps (2020)

The establishment of the Federal University, Oye-Ekiti Pre-Degree Campus in Itapa Ekiti led to a sharp rise in population due to inflow of people, especially civil servants and their dependents from all parts of old Ekiti State and beyond. Subsequently this has led to:

1. Increase in the level of commercial activities.
2. Fierce competition for spaces in the ancient town for individual usage.
3. Increase in recreation and social life

All these have actually made Itapa Ekiti suitable as the location of the proposed Broadcasting Training Centre.

4.1.1 Description and Location Of The Proposed Site

The site for the proposed Broadcasting Training Centre is situated besides Ayedogbon Hotel, along Oye-Ikole Road within the Itapa Township. The site is adjacent to the Federal University, Oye Ekiti (Pre-Degree Campus). See Plate 13 below.

Fig 4.2: Map of Itapa Ekiti showing the major roads bounding the town

Source: Google Maps (2020)

The site is the area suggested by the state town planning office as the site is in the rapidly developing area of the town. Its terrain is almost hilly and this will make the proposed Radio Station more monumental and functional if it is handled well.

The site covers an area of 11 hectares and is in close proximity to the frontage of Federal University of Technology, Oye Ekiti (Pre-Degree Campus). The site is equally linked to the main town and can be easily accessed from every corner of Itapa Ekiti, as well as neighbouring towns. Plate 14 below shows the location map of the project.

4.1.2. Site Selection Criteria

The choices of the site as influenced by the following factors:

a. **Accessibility:** This site is easily accessible from all areas in Oye Local Government Area. It is bounded on the south by Oye-Ikole expressway.

b. **Centrality:** The site is in the central planning area of Itapa. It is at the heart of the layout plan. It is easily reached from the residential areas, hence it will have a great pulling effect on the community.

c. **Land Availability**: Most importantly, availability of land for a project as this is highly considered. It is a virgin land that laterite is being excavated from because of its hilly nature.

d. **Other considerations:** There are some other important factors such as natural factors being considered like topography, vegetation, drainage.

4.2 Project Analysis and Synthesis

4.2.1 Site Climatic and Vegetative Analysis

Itapa Ekiti is located within the climatic region that is known as the tropical hinterland.

Two major influences on the climate of Itapa are the two major wind currents. The southwest trade wind which is warm and moisture laden; and the Northeast trade wind, which is cold and dry. These wind currents bring about the two distinct seasons namely; the Wet season of April to October, and the Dry season November to March. The dry season is accompanied by a cool dust-laden wind, the *harmattan,* which blows strongly between December and January.

Rainfall and Wind

Itapa Ekiti falls within the zone in Nigeria that has an average of 250mm of rainfall per day in the wet season. Average rainfall for a year in Itapa Ekiti is 100cm-200cm. The town has over 9 months of rainfall every year. The town is also affected by the tropical continental and tropical maritime air masses and the equatorial easterlies.

There is the presence of series of electric thunderstorms during the beginning and end of the rainy season. The prevailing wind direction is south-west, which is rain bearing since it takes its origin from the sea. The direction of the wind is form the south to the North in the wet season and from the North to the south in the dry season.

Temperature

January temperature conditions in Itapa Ekiti ranges between 20^{o}-$26^{o}C$ while July temperature condition is below $26^{o}C$. This is brought about by the warm guinea currents that wash the western coastline of Nigeria. Monthly daily temperature ranges from $80^{o}F$ to $94^{o}F$ while the minimum daily temperature is between $69^{o}F$ to $73^{o}F$. The difference between the two is not so large and annual temperature is almost even all the year round.

Humidity

Humidity is between 9% in the *harmattan* season and 1% in the wet season. Evaporation rate is higher during the *harmattan* and very low in the humid periods.

Vegetation

Itapa Ekiti falls within the tropical zones with temperature throughout the year ranging from $21^{o}C$ to $29^{o}C$ and therefore, has temperatures high enough for rapid plant growth. Annual rainfall also varies between 100cum and 200cum. Under the prevailing climatic conditions, Itapa Ekiti falls within the vegetation zone of the high tropical rainforest. The site itself is secondary forest since it has been cleared and cultivated at one time or the other. There are still some large tress and dense bushes on the site. Agricultural activity and laterite excavation is carried out on the site.

4.3 Design Recommendations For Ekiti State

Based on the known climatic data of Ekiti State, it is relatively easy to arrive at a general specification for building design in terms of climate control. The design recommendation for Ekiti State is being arrived at after diagnosis of its climate data through the uses of Mahoney tables. The followings are the recommendations:

i. Use East-West Orientation for the long axis of buildings

ii. Open spacing for breeze penetration

iii. Single banking, permanent ventilation

iv. Use large openings, 40% - 80% of wall area.

v. Openings in north and south walls at body height

vi. Protect openings from rain and sun.

vii. Use light walls and floors

viii. Use light roofs with reflective surfaces and Cavity.

ix. No space for outdoor sleeping needed

x. Protection from heavy rain needed

4.3.1 Brief Analysis

The proposed Broadcasting Training Centre will be a hub of activities for the people of Itapa Ekiti and all Ekiti people at large. The design shall make provision for fully functional facilities for a world-class radio station building, Broadcasting Training building and on site accommodation. It shall provide sufficient activity spaces and good zoning for common functions. To satisfy this need, the following spaces are required.

4.3.2 Brief Development

The various functional spaces is further broken down into their constituent elements. The constituent buildings on the site are the Radio station building, Broadcasting Training building and on site accommodation. The constituent elements and functional spaces must be properly configured to fulfil the goals of the overall scheme.

4.3.3 Design Criteria

The following factors are considered towards an efficient design of the broadcast training centre:

Circulation and Space Organisation

During the process of planning the site, special consideration is to be given to the flow of traffic in and around the site. Diverse site elements were used to order the flow of traffic keeping pedestrians and vehicles with minimal contact. More importantly, the flow of people inside the building is to be carefully designed so as to achieve overall productivity at work. Proper care should be taken in the analysis and integration of spaces in proportion to achieve the anticipated use. The space allocations used for the proposal are drawn from case study of various existing Broadcasting Training Institutions within and outside Nigeria.

Lighting

Lighting can form an important part in the creation of the built environment and has been given serious consideration in the proposal. The quantity of light at any given position should be sufficient but the quality is of overwhelming importance. Both natural and artificial lighting have been employed in the design. The spaces along the courtyards are served with lightning, which is also supported by the windows on the perimeter walls.

Acoustics

To achieve comfort in radio stations and an office environment, especially in certain departments, potential noise has to be taken into consideration. Gypsum boards with the insertion of wool in the centre absorb noise in offices to the lowest bearable level, an enhancement to this is due to the double layer of noise absorbing material at the surface and in-between the boards themselves. The problems of airborne noise and impact noise have also been considered separately.

(a) **Air-bone Noise:**

(1) External vehicular movement.

(2) Fans, air-conditioning vents, cisterns, motors.

(3) Office equipment such as copiers, shredders, typewriters etc

(4) Live and transmitted noise form public areas.

(5) Telecommunication noise

(b) **Impact Noise:**

(1) Water pipes and machinery vibration

(2) Footsteps

(3) Slamming of door, rattling of keys.

It is usually difficult to try and separate noise distinctly but measures have been adopted. These include the use of suspended ceiling, partitioning boards, carpets and office furniture that absorbs noise produced form any of the following categories which is usually achieved by absorbent covering materials

Access

Accessibility both to pedestrians and vehicles are very important in site consideration because a building with poor access network would end up not being utilized and even be abandoned.

Ventilation

Adequate ventilation is also an important indispensable aspect of the design necessary for its functionality. The use of courtyards will help achieve this.

Fire Protection

Building regulation requires that due consideration be given to buildings with respect to fire. The aim is to prevent the start and spread of fire, spread of smoke and facilitate the escape or recue of persons.

Parking

Parking space is an important part of the building landscape. Adequate parking and sufficient lots for the estimated vehicles is essential for a site to function properly and safely.

4.4 Conceptual Development

4.4.1 Functional Relationship

Bubble diagram is used to reveal to relationship between spaces represented using bubbles and arrows. The bubble diagram of the proposed Prestige FM Radio Station building is shown in Plate 16 below

4.4.2 Space Allocation / Schedule of Accommodation

Space Relationship and Analysis

Space analysis can be stated to be the means of controlling the allocation of space in buildings to individuals or specific activities. Space analysis standard was developed to safeguard the interest and entitlement of users of spaces to be provided so as to achieve comfortable and functional spaces. Analysis of spaces in this design proposal is based on the parameters below:

Human space: This is individual space standard multiplied by number of people and added to allowance for immediate auxiliary and other factors which is 15% for primary circulation.

Other Usable Space: It can be determined by the number multiplied by the sizes of equipment or furniture.

Ground Floor

Owing to its easy accessibility it would be in-form of a large office space partitioned into offices with a court yard for effective circulation to enhance worker productivity. The offices accommodated on the ground floor include the following:

i. Entrance Porch
ii. Reception/ Waiting
iii. Cashier Office
iv. General Manager Office
v. Human Resources
vi. Archive
vii. Ramp/ Stairway.
viii. Toilets
ix. Engineering section
x. Production studio
xi. Transmitter Room
xii. Administrative Office
xiii. News Room
xiv. Commercial
xv. Traffic Room

First Floor

This accommodates the core service of the project as well as auxiliary office spaces viz:

i. Reception/waiting
ii. Offices
iii. Stairway/ Ramp
iv. Journalist Lounge
v. Back up Studio
vi. Live Studio
vii. Production Manager
viii. Courtyard
ix. Lobby

Second Floor

It contains various functional spaces that include:

i. Chairman's Secretary Office
ii. Chairman's Office/ Lounge
iii. Green Roof Terrace
iv. Stairways
v. Conference Room
vi. Library
vii. Toilets Facilities
viii. Ramp and Stairways
ix. Lobby
x. Courtyard

Supporting spaces

These are the auxiliary facilities that enhance the broadcasting in a radio station:

i. Vehicular and Pedestrian traffic areas
ii. Gate House,
iii. Power plant building,
iv. Guest House etc.

Thus, the floor area of the spaces in the radio building are shown in Table 1 below:

Table 4.1: Schedule of Accommodation for the Project

SPACE	AREA(m^2)
1) Ground Floor	
• Entrance Porch	• 12.21m^2
• Reception/ Waiting	• 100.1m^2
• Cashier's Office	• 16.0m^2
• General Manager	• 16.0m^2
• Human Resources	• 22.0m^2
• Archive	• 10.4m^2
• Ramp/ Stairway	• 86.4m^2
• Manager	• 23.1m^2
• Toilets	• 25.8m^2
• Courtyard/ Lobby	• 30.25m^2
• Engineering	• 40.0m^2
• Production Studio	• 22.4m^2
• Stairway	• 30.4m^2
• Transmitter Room	• 40.32m^2
• Administrative Office	• 40.32m^2
• News Room	• 47.6m^2
• Commercial	• 47.3m^2
• Traffic Room	• 34.45m^2
2) **First Floor**	

• Reception/ Waiting	• $27m^2$
• Toilets	• $22.0m^2$
• Office 1	• $20m^2$
• Office 2	• $20m^2$
• Office 3	• $30.05m^2$
• Office4	• $28.8m^2$
• Toilets	• $103.24m^2$
• Terrace	• $22.4m^2$
• Stairway	• $151.8m^2$
• Live Studio	• $70.8m^2$
• Courtyard/lobby	• $67.2m^2$
• Back-up Studio	• $30.25m^2$
• Production Manager	• $22.0m^2$
• Journalist Lounge	
3) **Second Floor**	
• Stairway	• $22.4m^2$
• Conference	• $49.28m^2$
• Library	• $47.04m^2$
• Toilets	• $28.8m^2$
• Ramp Stairway	• $86.4m^2$
• Courtyard/Lobby	• $70.8m^2$
• Green Roof Terrace	• $183.6m^2$
• Chairman's Office	• $46.9m^2$
• Chairman's Secretary	• $23.1m^2$
• Chairman's Lounge	• $23.1m^2$

Source: Researcher's Archive

4.5 Construction Materials and Methods

SCHEDULE OF MATERIALS

Floors: In the buildings, in-situ mass concrete floor slab as well as reinforced concrete floor slab are used. While in-situ mass concrete floor slab is used for ground floor in ground floor of the building, reinforced spaced rafter concrete floor slab is used for the suspended floors.

Foundation System: The foundation method will be specified by the engineer in order to withstand the total loads of the structure.

Expansion Joint: Owing to the natural law of expansion and contraction which also occurs in buildings, two leafs of sandcrete hollow blocks with cavity of 50mm will be used at distance interval of twenty meter as expansion joints.

Roofs: Climatic characteristics of Itapa-Ekiti determine the roofing method used while degree of the pitch is being determined relatively to maximize solar energy collection.

Doors: Aluminum doors with well-treated monsonia panel doors will mainly be used. Wired glass panel would also be inserted to flush doors and shall be used in the building.

Walls: Reinforced concrete columns and beans and sandcretes hollow blocks will be used.

Windows: Tinted glass in deep bronze aluminum portables shall be employed in the project.

FINISHES

External wall: Screeding, Sandtex Paints, towel mosaic, fair faced concrete stone facing as specified.

Internal walls: Plaster, Sandtex Paints, acoustic panel, texcoat paints etc.

Ceilings: Asbestos, plastics and acoustic ceiling tiles

Floors: Terrazzo, puctiles, carpet, cement screed and ceramic tiles.

4.6 Building Services

Water Supply

Water supply to the site would also be forming the forming the existing water supply mains along the major road for distribution of water to the site/borehole supported with a reservoir is also required.

Sewage Disposal

There is no public sewage system along Ado-Iyin road which borders the site. Private sewage treatment installations will therefore be built at various locations on site. They will consist of soil pipes, inspector chambers, septic tanks and soak-away pits.

Drainage

Both underground and surface drainage pattern will be used since the proposed site plan is of different level. The drainage method used will be channeled to the public drainage.

Electricity

The supply of electricity power shall be solely from solar energy. And each building will generate its own electric power. This is going to be achieved by using Active solar technology.

Chapter Five:

5.0 Conclusion

5.1 Project Appraisal

This chapter deals with the final design proposal that have evolved as a result of the analysis, synthesis and appraisal of data that was collected. Various design considerations and guidelines which were all discussed in the preceding chapters are guidelines used to arrive at proposal, which could solve the design problems associated with past and present designs. Design considerations includes effective circulation utilization and control, all of which must be death with to form a total environment.

5.1.1 Design Concept

The design concept for this project is based on the idea of radio broadcasting, thereby reflecting the transmission of information. Hence, the central underlying idea is the ***broadcasting speaker*** which influence broadcasting a great deal. It also symbolizes the medium of information transmission and is thus an essential part of human life which bring about exchange of idea.

The design process evolved by visualizing a man's thought regarding its near and further environment. The rectangular shape with void within shows a dynamic form of a radio and its medium of transmission.

Rectangle - The representation of a live radio form in all portion enhancing the concept

Void - the balance transmission medium via a speaker from communal reflection and mindset to transmit the necessary information

This design concept hold important relevance in that it represents the following:

- A ride towards progress and greater height
- A march toward self-actualization

- Information is a sure factor that can enhance inspiration
- A recreated mind means improved information dissemination, productivity and progress

5.1.2 Circulation

Circulation and way-finding refers to the movement and interaction of building users with the building.

Vertical circulation: Stairs are used as a basic mode of vertical transportation between floors. The stairs have minimum widths of 1.5m.

Horizontal circulation: These includes lobbies, atria, entries and exits. The lobbies in front of the vertical circulation are at least 2.4m to allow for easy waiting and landing of users from floor to floor. Wide lobbies connect different sections and are wide enough to encourage free movement of guests, staff and visitors.

Vehicular access: The main vehicular access shall be taken from the Oye-Ikole Road. The roads within the site are to be designed to specifications of the architect and structural engineer. The width of the access road into the site is road is 12 metres with appropriate bends and turning radius. The design also provides vehicular access for drop-off and pick-up of its users.

Pedestrian access: Pedestrian walk ways are used to aid people's movement from the outside the site into the inside and to links the spaces together to aid on-site movement of people. The pedestrian walk ways are to be designed to specification of the architect and the structural engineer. The average width is 1.2 metres. The finished surface should be non-slippery and easily maintained.

Parking: Parking within the Convention Centre site are ground level parking demarcated for visitors/commuters and staffs.

5.1.3 Site Appraisal

The building proposal is expected to interact with the site in certain ways. These interactions are a reflection of the degree to which the proposal affects the site and its surroundings and how the site and its surroundings also affect the building.

Source of pollution on site

The only major pollutant to the site is noise, which arises form vehicles moving on the highway but it was mitigated owing to the set back from the road and also using of green areas.

Positioning of the Building

A broadcasting facility is an important public building that marries the commercial, cultural heritage and recreational lives of the people together. The positioning of the radio station building in the north-western corner of the site allowed for maximum quietness of the environment, easy accessibility, climatic factors such as wind direction, solar insulation and utilization and functional relationship between various units. (See Plate 20 below)

Access and Parking

Adequate car parks and walkways are provided. Environment driveways reach the car parks. Car parks provided are generous in size and laid out with adequate spacing.

Landscaping:

To make the Radio Station appeal to users, landscaping has been designed to be extensive and varied. Hence the design of the landscape to afford a variety of visual and environmental experiences. Landscaping element such as; reflecting pools, paved plaza with hedges, flowers, shrubs and trees as well as sculptural works to add to the image of the Radio Station building and to make its use optimum, are provided.

5.2 Conclusion

The research explores the concept of space – function resolution by means of effective zoning and clustering of key functional spaces as tool to minimise noise generation and transmission. The various strategies which could be incorporated to achieve the desired acoustic in a broadcasting training centre. It goes further to show how these strategies can be used in practice. Importantly, the architectural requirements for broadcasting training centres were highlighted with a view to providing a general guide for architects and designers.

Spatial components of buildings such as stairs, ramps, lobbies, receptions are veritable sources of noise generation. Hence, proper zoning is an important aspect in the design of buildings in which little or no noise transmission is a major design consideration. The literature and case studies analysed showed that this concept is known in developed countries and developing countries such as Nigeria. However, in terms of adopting these ideas in actual building designs, the actual application is quite different. The case studies also gave further pointers on how to apply these ideas of zoning to enhance acoustics in broadcasting facilities. The outlined strategies were then applied to the design of the Broadcasting Training Centre, Itapa Ekiti. Nonetheless, more research is still required on the various methods and consideration needed for the widespread adoption of this concept.

5.3 Recommendations

The design of a broadcasting training centre is a specialized design having some peculiarities that makes it distinct from other facilities. However, some of the following recommendations are important in the design of a broadcasting training centre to ensure effective reduction of noise generation and transmission:

1. Proper consideration should be given to proper zoning and clustering of functional spaces during the design stage of radio station buildings.

2. Building zoning is important so as to achieve proximity of related spaces within the proposed facility. This will help to greatly segregate low and high noise generating areas.
3. Architects should be further sensitized on the need for energy-efficient buildings and adoption of clean energy sources such as solar power. This approach has the potential to help reduce noise especially from power generating rooms.
4. Proper consideration should be given to the climatic condition of existing site before designs are carried out in order to arrive at eco-friendly designs.
5. Proper orientation of buildings and the type of building form should be considered right from the conceptual stage of design to enhance the achievement of comfort in buildings.
6. The right specification for building materials, fenestration type and size and insulation should be used in achieving comfort in public buildings.
7. Buildings in a Broadcasting Training Centre should have horizontal circulation paths that are sufficiently wide to aid unobstructed movement.
8. Buildings in a Broadcasting Training Centre should be accessible to a wide range of users, irrespective of age or physical impairment.
9. Importance should be attached to ease of access and movement for visitors and service requirements.
10. Receptions, stairs, corridors, power generating rooms in media houses should be conceived, designed, constructed and finished with acoustic enhancing materials.

REFERENCES

Adejunmobi, J. A. (1974). *The development of radio broadcasting in Nigeria, West Africa.* Masters Thesis, North Texas State University, Denton.

Alonso, A., Patricio, J., Suárez, R., Escandón, R. (2020). Acoustical Retrofit of Existing Residential Buildings: Requirements and Recommendations for Sound Insulation between Dwellings in Europe and Other Countries Worldwide. *Build. Environ.,* 174, 10677.

Arenas, J.P. (2020). Sakagami, K. Sustainable Acoustic Materials. *Sustainability*, 12, 6540.

Balderrama, A., Kang, J., Prieto, A., Luna-navarro, A., Arztmann, D., & Knaack, U. (2022). Effects of Façades on Urban Acoustic Environment and Soundscape : A Systematic Review. *Sustainability*, 1–19.

Cabrera, D., Yadav, M., Holmes, J., Fong, O., & Caldwell, H. (2020). Incidental Acoustic Retroreflection from Building Façades: Three Instances in Berkeley, Sydney and Hong Kong. *Build. Environ.,* 172, 106733

Centre for Excellence in Universal Design. (n.d.). Entrances and horizontal circulation. In *Building for Everyone: A Universal Design Approach.* National Disability Authority.

Clark, M. (Ed.). (2017, November). The Modern Radio Studio. Retrieved July 4, 2020

Cotana, F., Goretti. M. (2010). Acoustic classification of buildings: impact of acoustic performances of a high energy-efficient building on quality and sustainability indicators,Proceedings of 20th International Congress on Acoustics, ICA 2010, 23-27 August, Sydney, Australia

Cucharero, J., Hänninen, T., Makkonen, M., Lokki, T. (2021). Acoustic Coatings—A Discreet Way to Control Acoustic Environment. Front. *Built Environ.* 7, 665332.

Decree of 5 December (1997). Passive Acoustic Requirements for Buildings. National Association for Thermal and Acoustic Insulation: Milano, Italy.

Doelle, L. L. (1965). *ACOUSTICS IN ARCHITECTURAL DESIGN.* Ottawa: NATIONAL RESEARCH COUNCIL CANADA: DIVISION OF BUILDING RESEARCH.

Faller, C., Juang, B.-H., Peter, K., Lou, H.-L., Ramprashad, S. A., & Sundberg, C.-E. W. (2002). Technical Advances in Digital Audio Radio Broadcasting. *PROCEEDINGS OF THE IEEE*, *VOL. 90, NO. 8*, pp. 1303-1333.

Fausti, P., Santoni, A., Secchi, S. (2019). Noise control in hospitals: Considerations on regulations, design and real situations. *In Proceedings of the InterNoise, Madrid, Spain*, 19–22 June

Feldman, L., Watson-Watt, R. A., & Zworykin, V. K. (2008). Radio. Redmond, Washington, United States of America: Microsoft Corporation.

Ginn, K. B. (1978). *ARCHITECTURAL ACOUSTICS* (2nd ed.). Bruel & Kjaer.

GSA. (2012, May 11). Circulation: Defining and Planning. Washington DC, United States of America.

Idowu, D., & Zhou, W. (2021). Land Use and Land Cover Change Assessment in the Context of. *Water*, *13*(1105). https://doi.org/://doi.org/10.3390/w13081105

ISO 12354-1 (2017). Building acoustics—Estimation of Acoustic Performance of Buildings from the Performance of Elements—Part 1: Airborne Sound Insulation between Rooms, *Appendix H. ISO: Geneve, Switzerland*.

Jaafaru, F. (2015). *An Assessment of Bioclimatic Design Principles in Optimising Energy Efficiency in Design of State Convention Centre, Kaduna.* Department of Architecture. Unpublished Dissertation.

Janjua, S. Y., Sarker. P. K., Biswas, W. K. (2019). A review of residential buildings' sustainability performance using a life cycle assessment approach, *Journal of Sustainability Research,* Vol. 1, No. 1, e190006. https://doi.org/10. 20900/jsr20190006.

Karttunen, S. (2017). Using Social Media at a Radio Station. *Thesis, Media Engineering, Helsinki Metropolia University*.

Kocabaş, Ş. (2013). *Evaluation of Circulation Paths in Public Buildings in terms of Accessibility: Re-functioned Public Historic Buildings in the Nicosia Walled City.* Masters Thesis, Eastern Mediterranean University, Interior Architecture, Gazimağusa, North Cyprus.

Kuerer, R.C. (2002). Classes of Acoustical Comfort in Housing: Improved Information about Noise Control in Buildings. *Appl. Acoust.,* 52, 197–210.

Kumar, S., Lee, H. (2019). The Present and Future Role of Acoustic Metamaterials for Architectural and Urban Noise Mitigations. *Acoustics,* 1, 590–607.

Kurjak, M., Grubesa, S., & Domitrovic, H. (2006). ACOUSTICAL SOLUTIONS IN MODERN ARCHITECTURE. In J. Eberhardsteiner, H. Mang, & H. Waubke (Ed.), *The Thirteenth International Congress on Sound and Vibration.* Vienna.

Kusumarini, Y., Yong, S. d., & Thamrin, D. (2012). Entrance and Circulation Facilities of Malls in Surabaya: A universal interior design application. *Procedia - Social and Behavioral Sciences, 68*, 526 – 536.

Kwon, H.-a., & Kim, S. (2019). Characteristics of Residential Space in Response to Changed Lifestyles: Focusing on the Characteristics of Residents and the Relationship between Individual and Family. *Sustainability, 11*. doi:10.3390/su11072006

Liao, G., Luan, C., Wang, Z., Liu, J., Yao, X., Fu, J. (2021). Acoustic Metamaterials: A Review of Theories, Structures, Fabrication Approaches, and Applications. *Adv. Mater. Technol.,* 6, 1–29.

Meng, Q., Kang. J. (2013). Influence of social and behavioral characteristics of users on their evaluation of subjective loudness and acoustic comfort in shopping malls, *PLoS One*, Vol. 8, No. 1, e54497. https://doi.org/10.1371/journa l.pone.0054497

Montes-González, D., Barrigón Morillas, J.M., Godinho, L., Amado-Mendes, P. (2018). Acoustic Screening Effect on Building Façades Due to Parking Lines in Urban Environments. Effects in Noise Mapping. *Appl. Acoust.,* 130, 1–14.

Myers, M. (2008). *Radio and Development in Africa.* International Development Research Centre (IDRC) of Canada.

Natapov, A., Kuliga, S., Dalton, R. C., & Hölscher, C. (2015). Building circulation typology and space syntax predictive measures.

Natapov, A., Kuliga, S., Dalton, R. C., & Hölscher, C. (2019). Linking building-circulation typology and wayfinding: design, spatial analysis, and anticipated wayfinding difficulty of circulation types. *Architectural Science Review*. Retrieved from https://doi.org/10.1080/00038628.2019.1675041

Nazarian, M., Price, A., & Demian, P. (2011). A review of different approaches to access and people circulation within health-care facilities and the application of modelling, simulation and visualisation. *Proceedings Architectural Management in the Digital Arena*, (pp. 219-231). Vienna.

Ngunjiri, F. (1990). *Design Considerations In Television.* B. Arch Research, University of Nairobi, Department of Architecture, Nairobi. Retrieved July 4, 2020

Noone, L. (2013). *Radio in the Digital Age:*. University of Dublin, Trinity College.

Okoye, P. U., Ngwu, C., Okolie, K. C., & Ohaedeghasi, C. I. (2020). *Severity of Impact of Music Acoustics on Sustainability Performance of Buildings in Anambra State Nigeria*. *7*(2), 13–26. https://doi.org/10.13189/eee.2020.070201

Park, S. H., Lee, P. J., Lee, B. K. (2017). Levels and sources of neighbour noise in heavyweight residential buildings in Korea, *Applied Acoustics,* Vol. 120, 148-157, https://doi.org/10.1016/j.apacoust.2017.01.012

Rodríguez, J., Alba, J., & Rey, R. (2022). A Multifunctional Solution for Simultaneous Sound Insulation and Acoustic Conditioning — An Example of Application in a. *Buildings*, *12*(123), 1–20.

Rubino, C., Bonet Aracil, M., Gisbert-Payá, J., Liuzzi, S., Stefanizzi, P., Zamorano Cantó, M., Martellotta, F. (2019). Composite Eco-Friendly Sound Absorbing Materials Made of Recycled Textile Waste and Biopolymers. *Materials,* 12, 4020.

Secchi, S., Setola, N., Marzi, L., & Amodeo, V. (2022). Analysis of the Acoustic Comfort in Hospital : The Case of Maternity Rooms. *Buildings*, *12*(1117), 1–15.

Stanca, S. (2021). IMPROVING BUILDING ACOUSTICS. *Journal of Applied Engineering Sciences*, *11*(2), 137–142. https://doi.org/10.2478/jaes-2021-0018

Statistics (2017). [online]. California: Google Inc;. URL: https://www.youtube.com/yt/press/statistics.html.

UK Essays (2021). Radio as a Medium of Mass Communication in Today's World. www.ukessays. com/media/radio-medium-mass-communication.

Welch, D., Fremaux. G. (2017). Why do people like loud sound? A qualitative study *International Journal of Environmental Research and Public Health,* Vol. 14, No. 8, 908, 2017. https://doi.org/10.3390/ijerph14080908

Wilson, J. (2017). The sound of sustainability: acoustics in high-performance design, *The Building Green Report,* Vol. 26, No. 9, 1-19.

Wood, J. (2017). *Creating Better American Cities: A Study of Circulation and Common Spaces of Public Housing.* University of Arkansas. Fayettville: Architecture Undergraduate Honors Thses. 25.

Yadollahi, M., Mirghasemi, M., Zin, R. M., & Singh, B. (2014). Architect Critical Challenges as a Project Manager in Construction Projects : A Case Study. *Advances in Civil Engineering*, *205310*, 1–15.

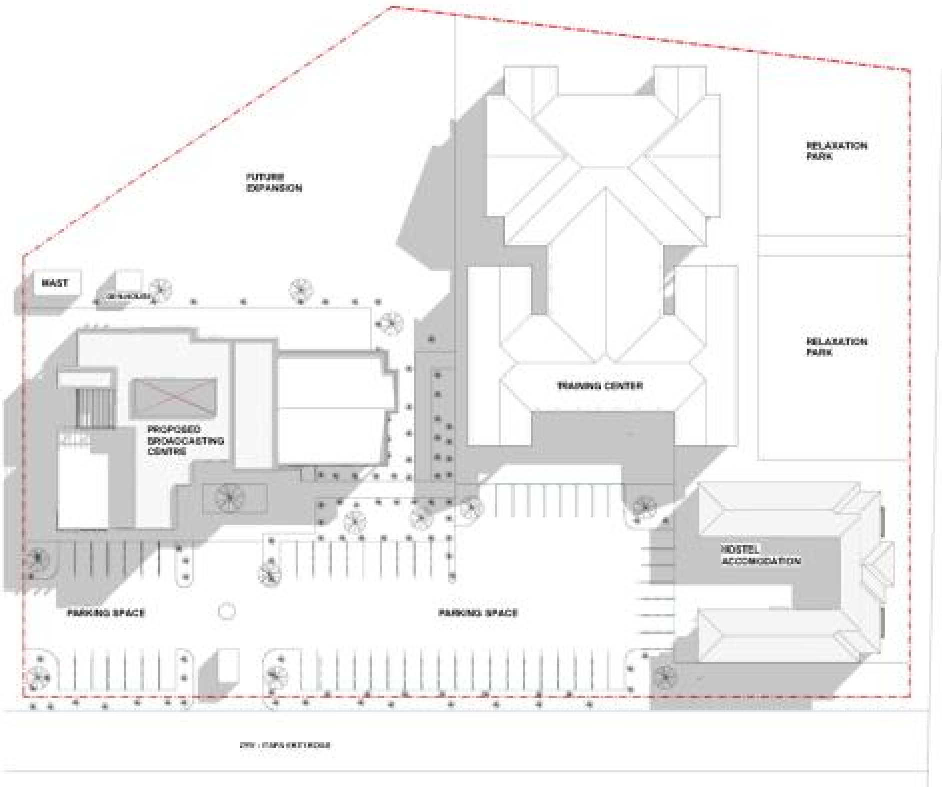
Zalejska-Jonsson, A. (2019). Perceived acoustic quality and effect on occupants' satisfaction in green and conventional residential buildings, *Buildings,* Vol. 9, No. 1, 24. https://doi.org/10.3390/buildings9010024

Site Design on Physical Activity: Research and Intervention Opportunities. *American Journal of Preventive Medicine, 28*(2S2), 186–193.

Appendix I

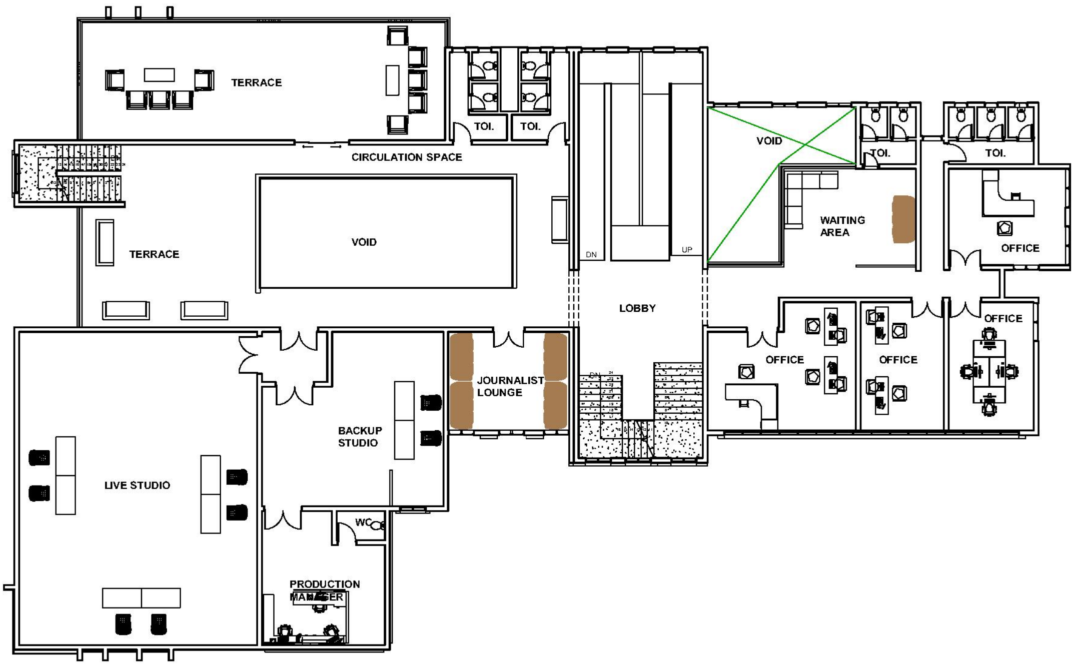
Presentation Drawings

Site Plan

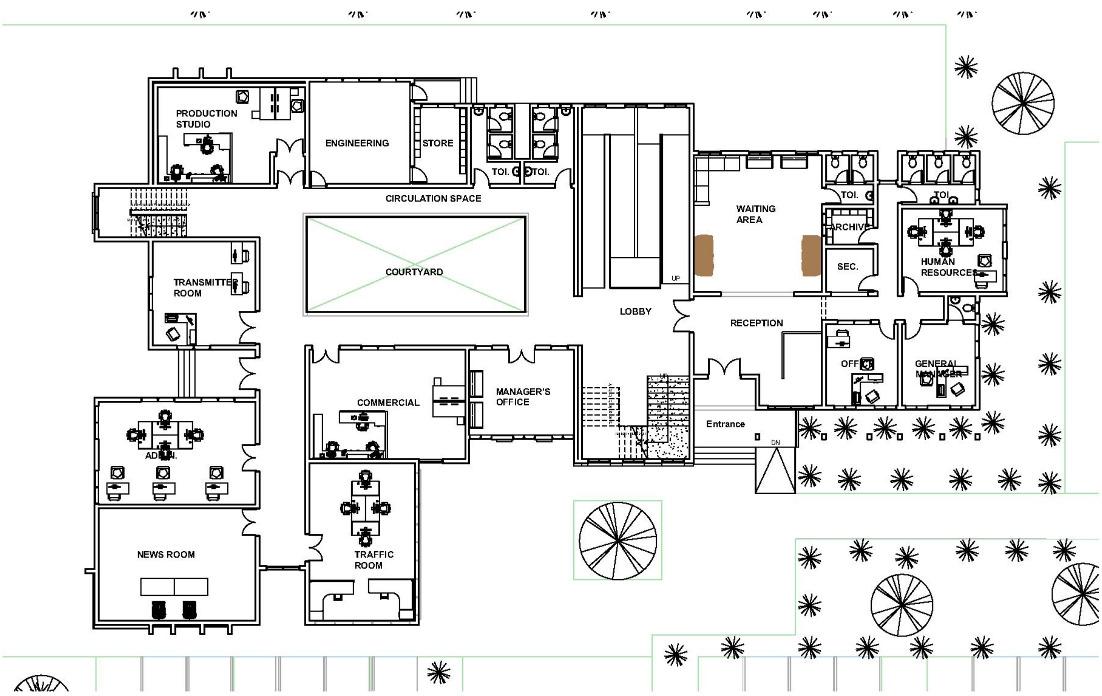


Ground Floor

Plan



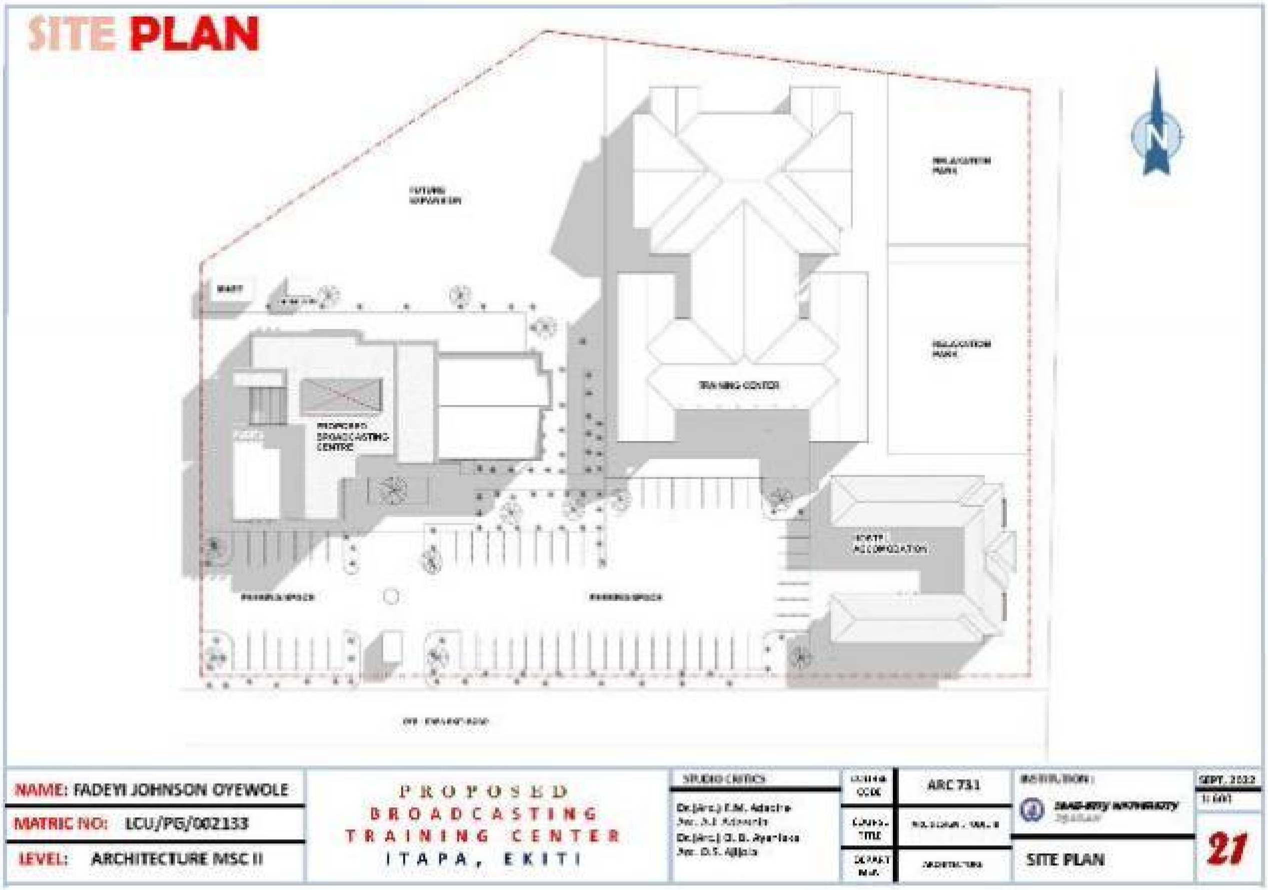
First Floor Plan



Second Floor Plan

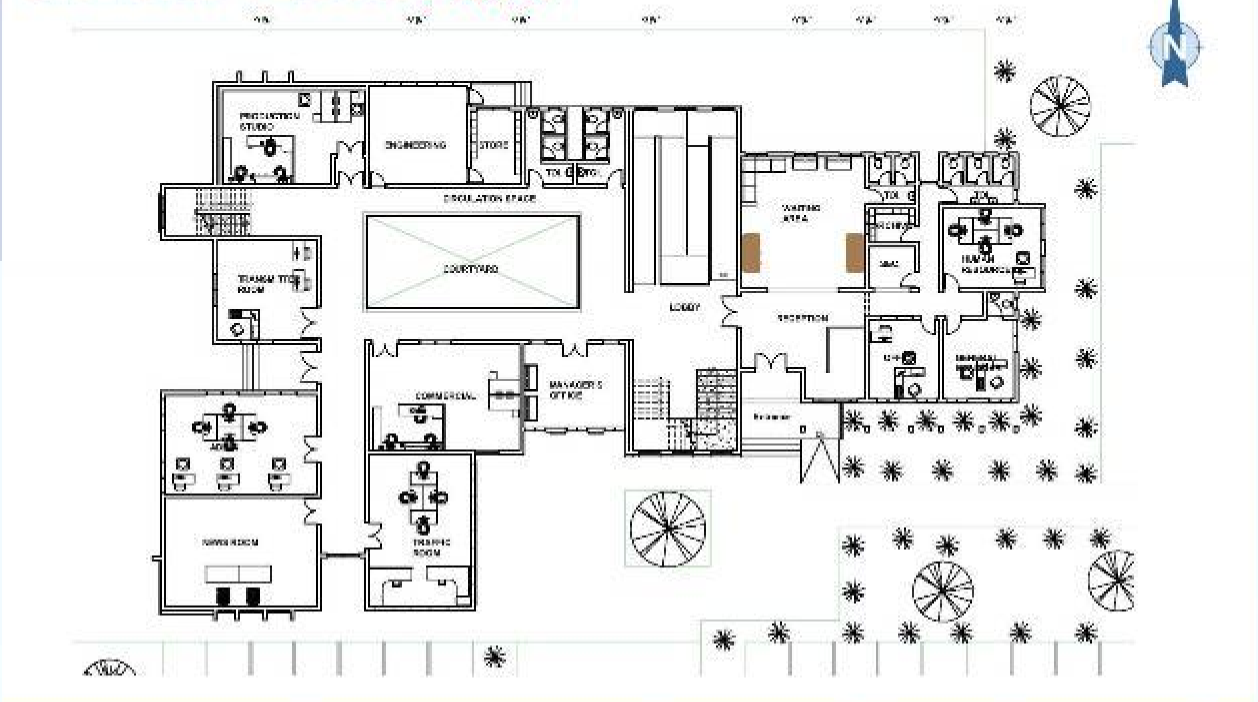
Perspectives

3-D View



SITE PLAN
FUTURE EXPANSION
TRAINING CENTER
PROPOSED BROADCASTING CENTRE
PARKING SPACE
PARKING SPACE
NAME: FADEYI JOHNSON OYEWOLE
MATRIC NO: LCU/PG/002133
LEVEL: ARCHITECTURE MSC II
PROPOSED
BROADCASTING
TRAINING CENTER
ITAPA, EKITI
STUDIO CRITICS
ARC 731
SITE PLAN
SEPT. 2022
21

GROUND FLOOR PLAN



NAME: FADEYI JOHNSON OYEWOLE
MATRIC NO: LCU/PG/002133
LEVEL: ARCHITECTURE MSC II

PROPOSED BROADCASTING TRAINING CENTER ITAPA, EKITI

STUDIO CRITICS
Dr.(Arc.) F.M. Adedire
Arc. A.I. Adewale
Dr.(Arc.) O. D. Ayanlade
Arc. O.S. Ajijola

COURSE CODE: ARC 731

INSTITUTION: LEAD CITY UNIVERSITY IBADAN

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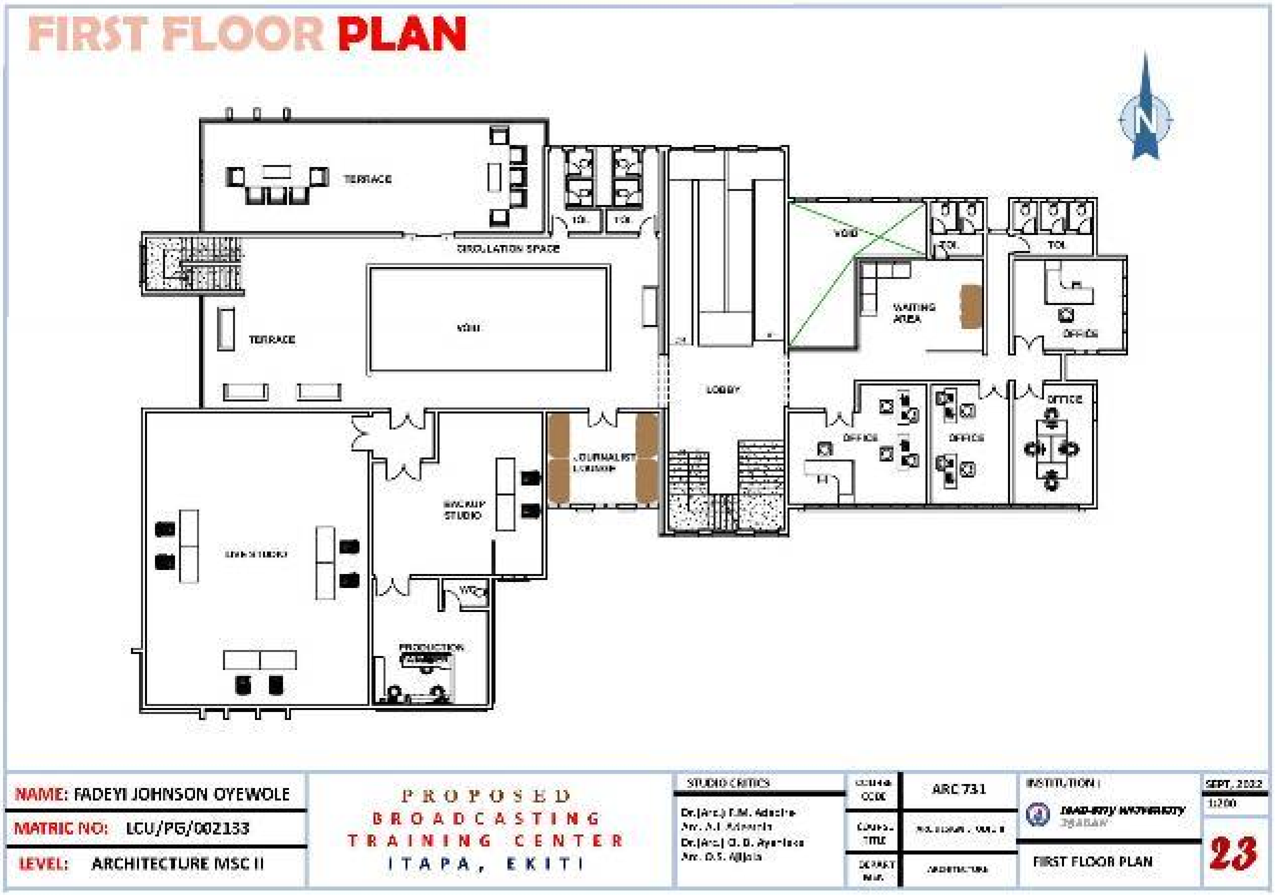
GROUND FLOOR PLAN

22


FIRST FLOOR PLAN
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TOI.
CIRCULATION SPACE
VOID
TERRACE
LOBBY
VOID
WAITING AREA
TOI.
TOI.
OFFICE
OFFICE
OFFICE
OFFICE
JOURNALIST LOUNGE
BACKUP STUDIO
LIVE STUDIO
WC
PRODUCTION
NAME: FADEYI JOHNSON OYEWOLE
MATRIC NO: LCU/PG/002133
LEVEL: ARCHITECTURE MSC II
PROPOSED
BROADCASTING
TRAINING CENTER
ITAPA, EKITI
STUDIO CRITICS
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INSTITUTION :
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FIRST FLOOR PLAN
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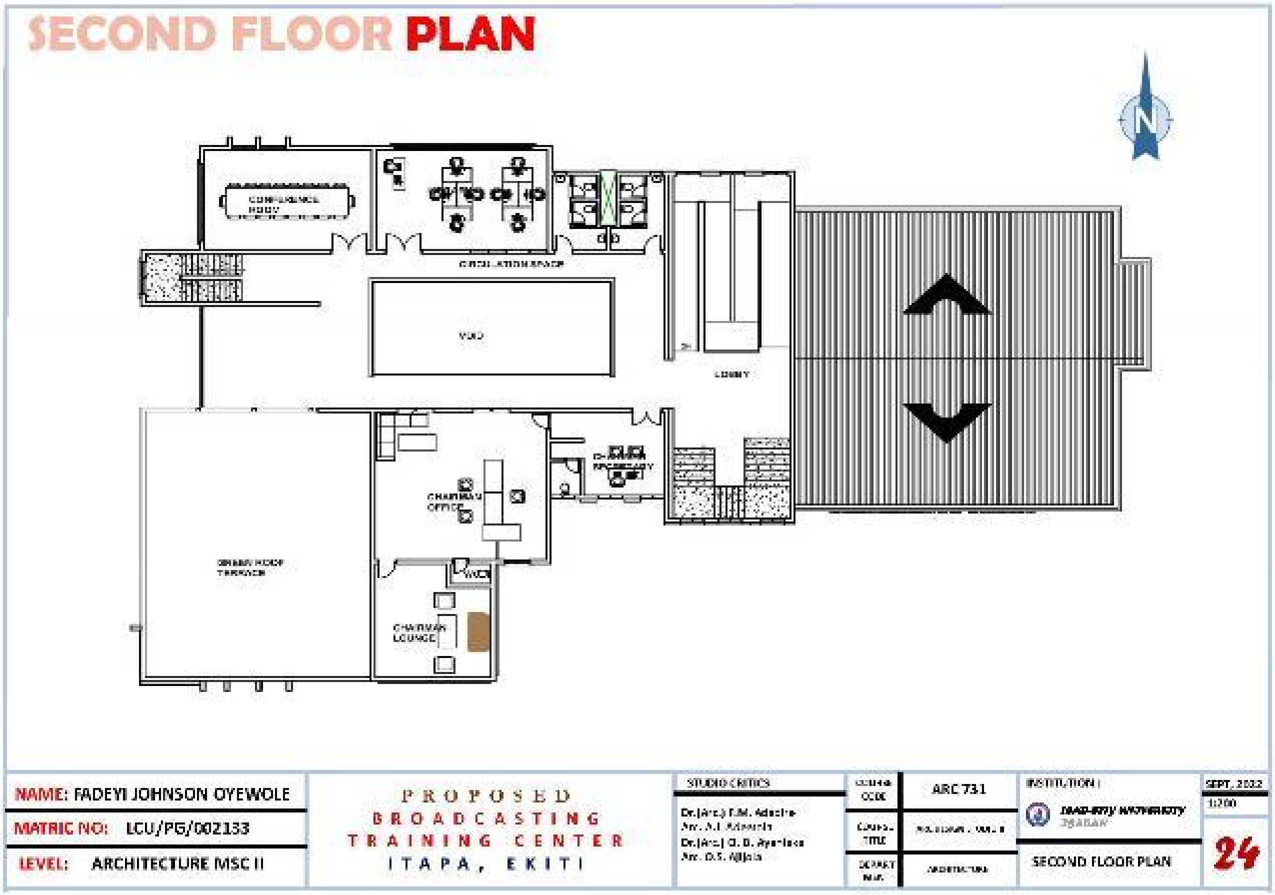
SECOND FLOOR PLAN
N
CONFERENCE ROOM
CIRCULATION SPACE
VOID
LOBBY
CHAIRMAN OFFICE
CHAIRMAN LOUNGE
GREEN ROOF TERRACE
WC
NAME: FADEYI JOHNSON OYEWOLE
MATRIC NO: LCU/PG/002133
LEVEL: ARCHITECTURE MSC II
PROPOSED
BROADCASTING
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INSTITUTION :
SECOND FLOOR PLAN
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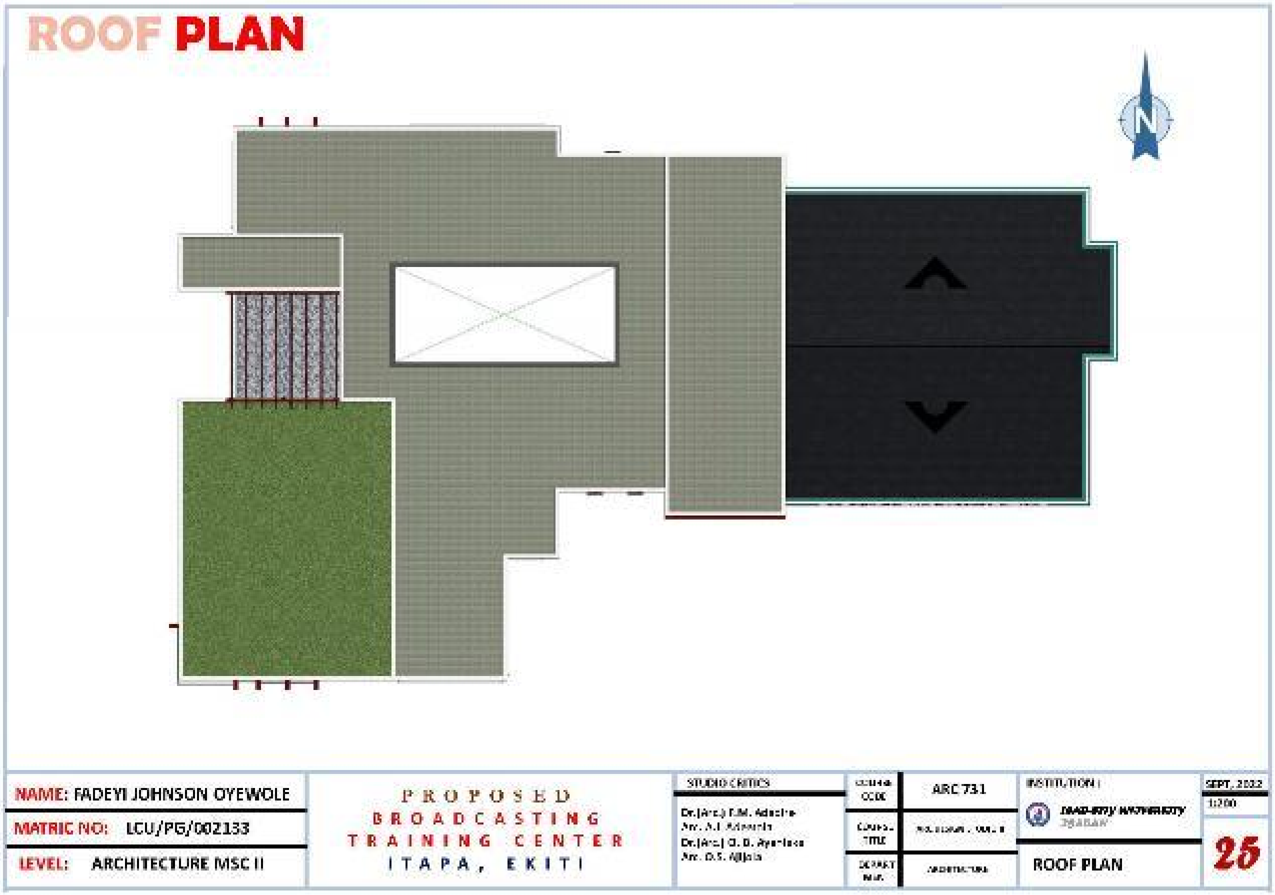
ROOF PLAN
N
NAME: FADEYI JOHNSON OYEWOLE
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STUDIO CRITICS
ARC 731
INSTITUTION :
SEPT, 2022
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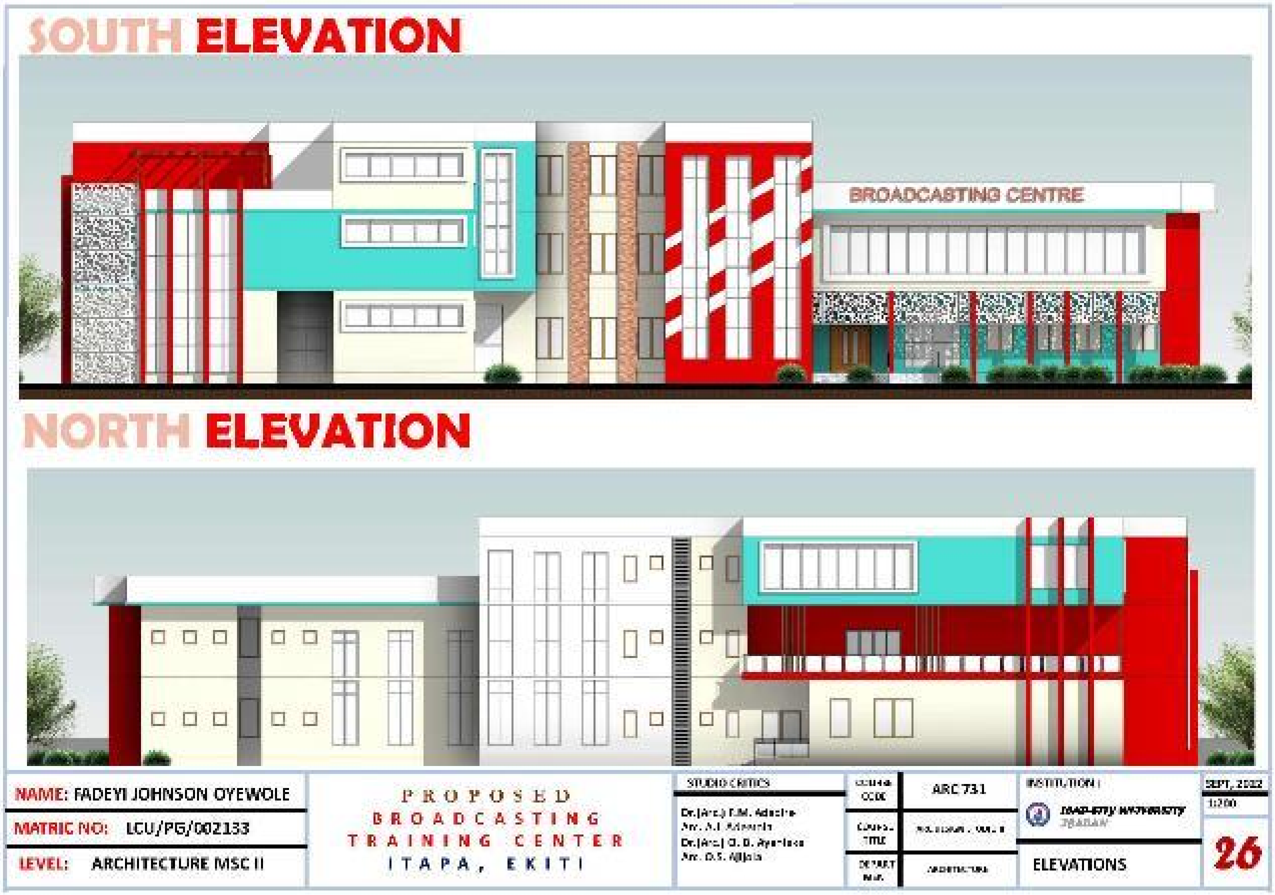
ROOF PLAN
25



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BROADCASTING CENTRE
NORTH ELEVATION
NAME: FADEYI JOHNSON OYEWOLE
MATRIC NO: LCU/PG/002133
LEVEL: ARCHITECTURE MSC II
PROPOSED
BROADCASTING
TRAINING CENTER
ITAPA, EKITI
STUDIO CRITICS
ARC 731
INSTITUTION :
ELEVATIONS
SEPT, 2022
1:200
26

WEST ELEVATION

NAME: FADEYI JOHNSON OYEWOLE
MATRIC NO: LCU/PG/002133
LEVEL: ARCHITECTURE MSC II

PROPOSED BROADCASTING TRAINING CENTER ITAPA, EKITI

STUDIO CRITICS

ARC 731

INSTITUTION:

ELEVATIONS

SEPT, 2022
1:100
27

EAST ELEVATION

NAME: FADEYI JOHNSON OYEWOLE
MATRIC NO: LCU/PG/002133
LEVEL: ARCHITECTURE MSC II

PROPOSED BROADCASTING TRAINING CENTER ITAPA, EKITI

STUDIO CRITICS

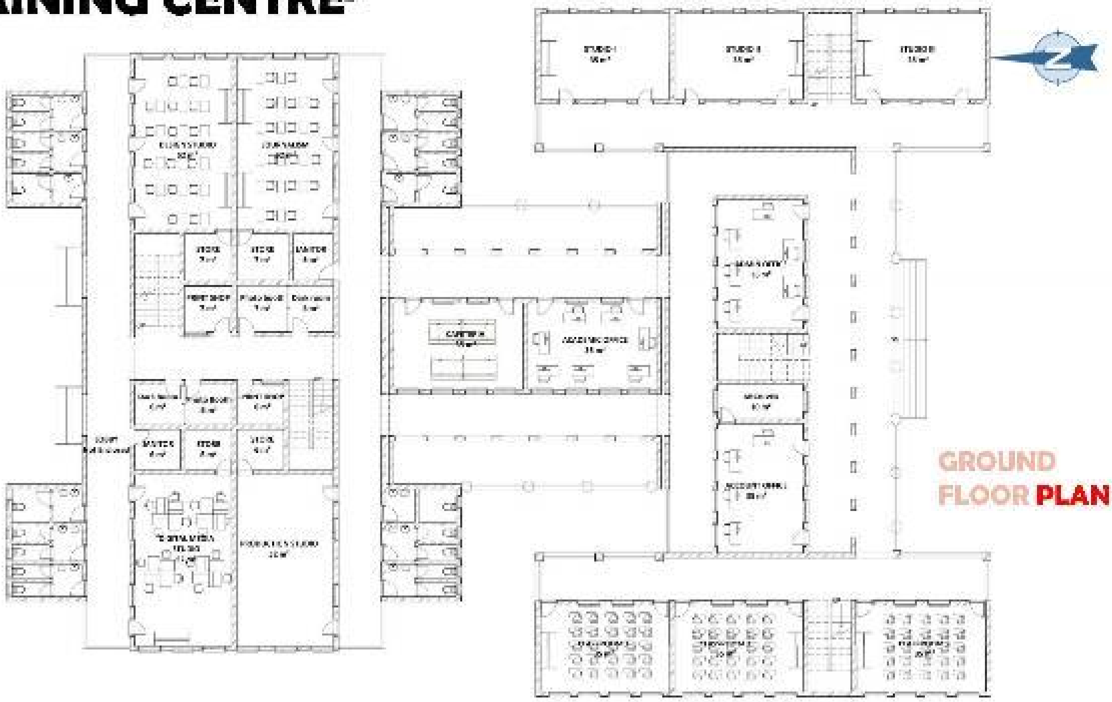
ARC 731

INSTITUTION:

ELEVATIONS

SEPT, 2022
1:100
28

TRAINING CENTRE



NAME: FADEYI JOHNSON OYEWOLE	PROPOSED BROADCASTING TRAINING CENTER ITAPA, EKITI	STUDIO CRITICS Dr.(Arc.) E.M. Adedire Arc. A.I. Adewole Dr.(Arc.) O. D. Ayanlade Arc. O.S. Ajijola	ARC 731	INSTITUTION : SEPT, 2022 1:300
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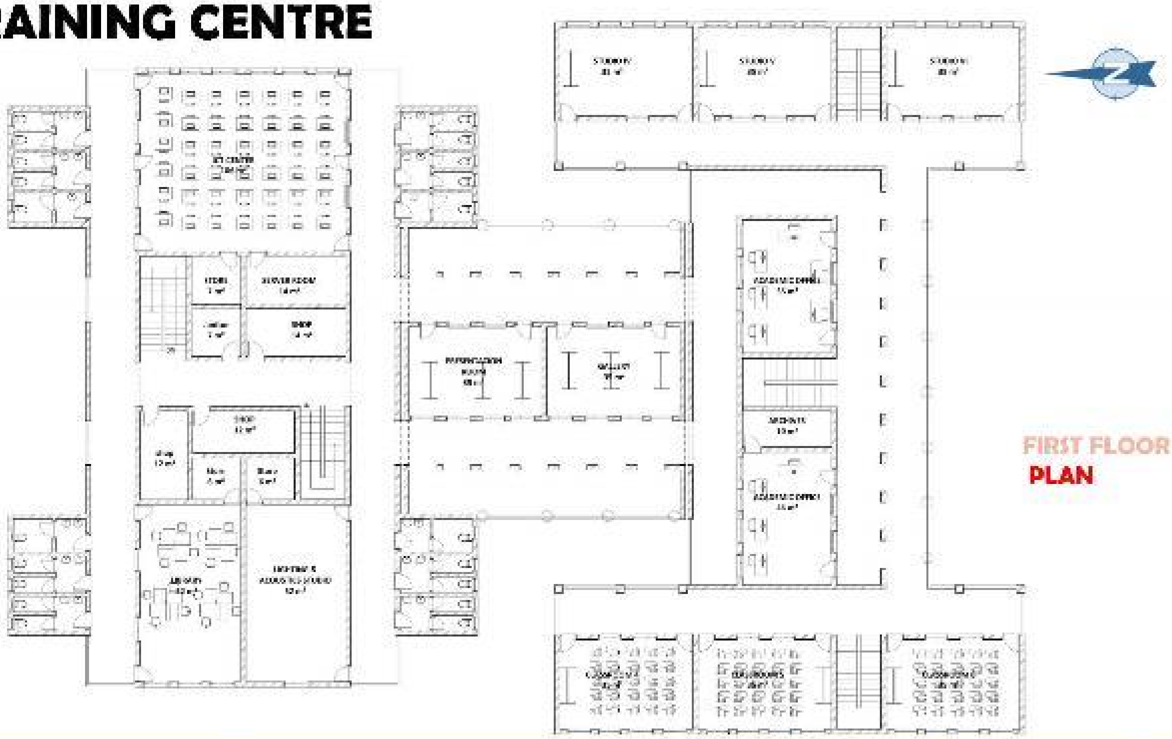
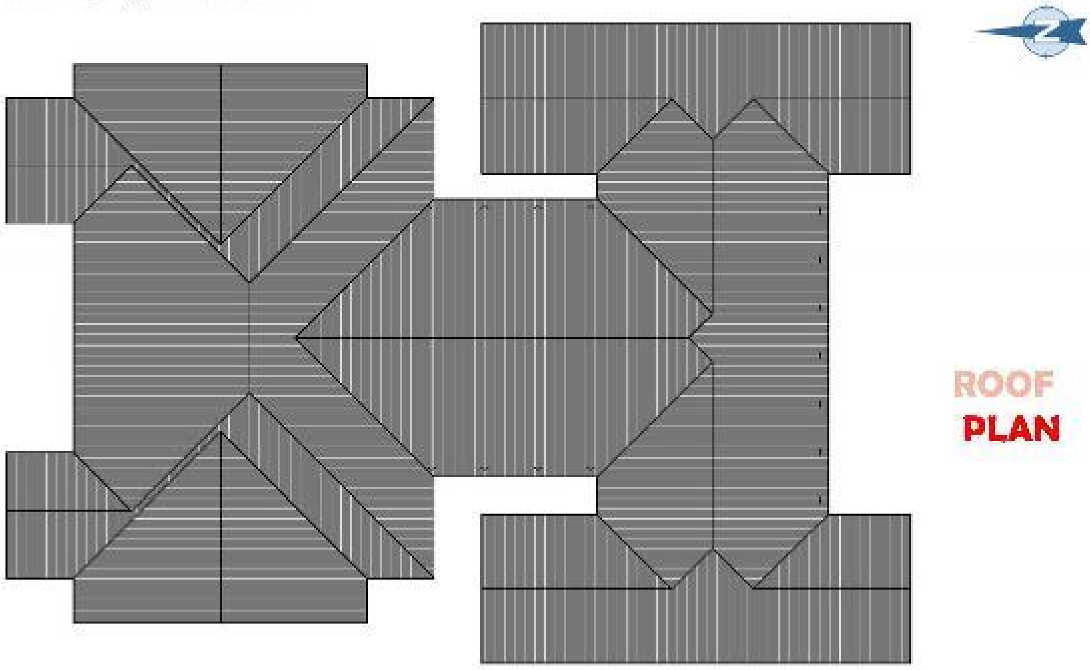
LEVEL: ARCHITECTURE MSC II				TRAINING CENTER 39

TRAINING CENTRE



NAME: FADEYI JOHNSON OYEWOLE	PROPOSED BROADCASTING TRAINING CENTER ITAPA, EKITI	STUDIO CRITICS Dr.(Arc.) E.M. Adedire Arc. A.I. Adewole Dr.(Arc.) O. D. Ayanlade Arc. O.S. Ajijola	ARC 731	INSTITUTION : SEPT, 2022 1:300
MATRIC NO: LCU/PG/002133				
LEVEL: ARCHITECTURE MSC II				TRAINING CENTER 40

TRAINING CENTRE



ROOF **PLAN**

NAME: FADEYI JOHNSON OYEWOLE
MATRIC NO: LCU/PG/002133
LEVEL: ARCHITECTURE MSC II

PROPOSED
BROADCASTING
TRAINING CENTER
ITAPA, EKITI

STUDIO CRITICS
Dr.(Arc.) E.M. Adedire
Arc. A.J. Adewale
Dr.(Arc.) O. D. Ayanlade
Arc. O.S. Ajijola

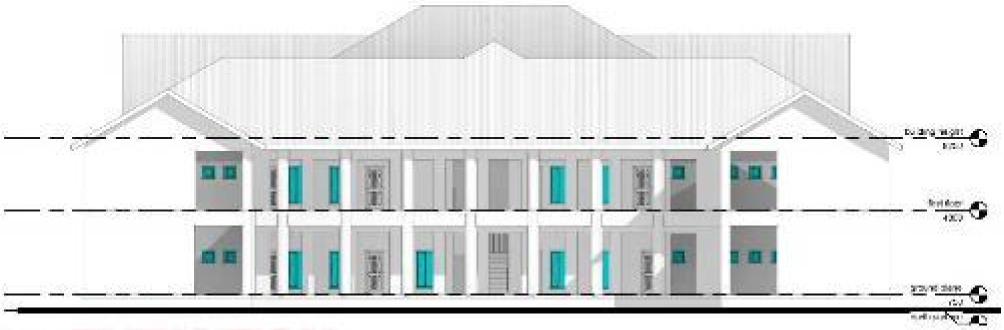
ARC 731

ROOF PLAN

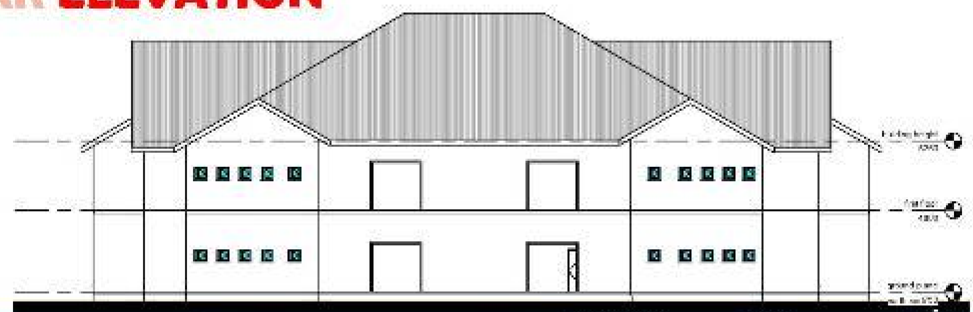
SEPT, 2022

41

FRONT **ELEVATION**



REAR **ELEVATION**



NAME: FADEYI JOHNSON OYEWOLE
MATRIC NO: LCU/PG/002133
LEVEL: ARCHITECTURE MSC II

PROPOSED
BROADCASTING
TRAINING CENTER
ITAPA, EKITI

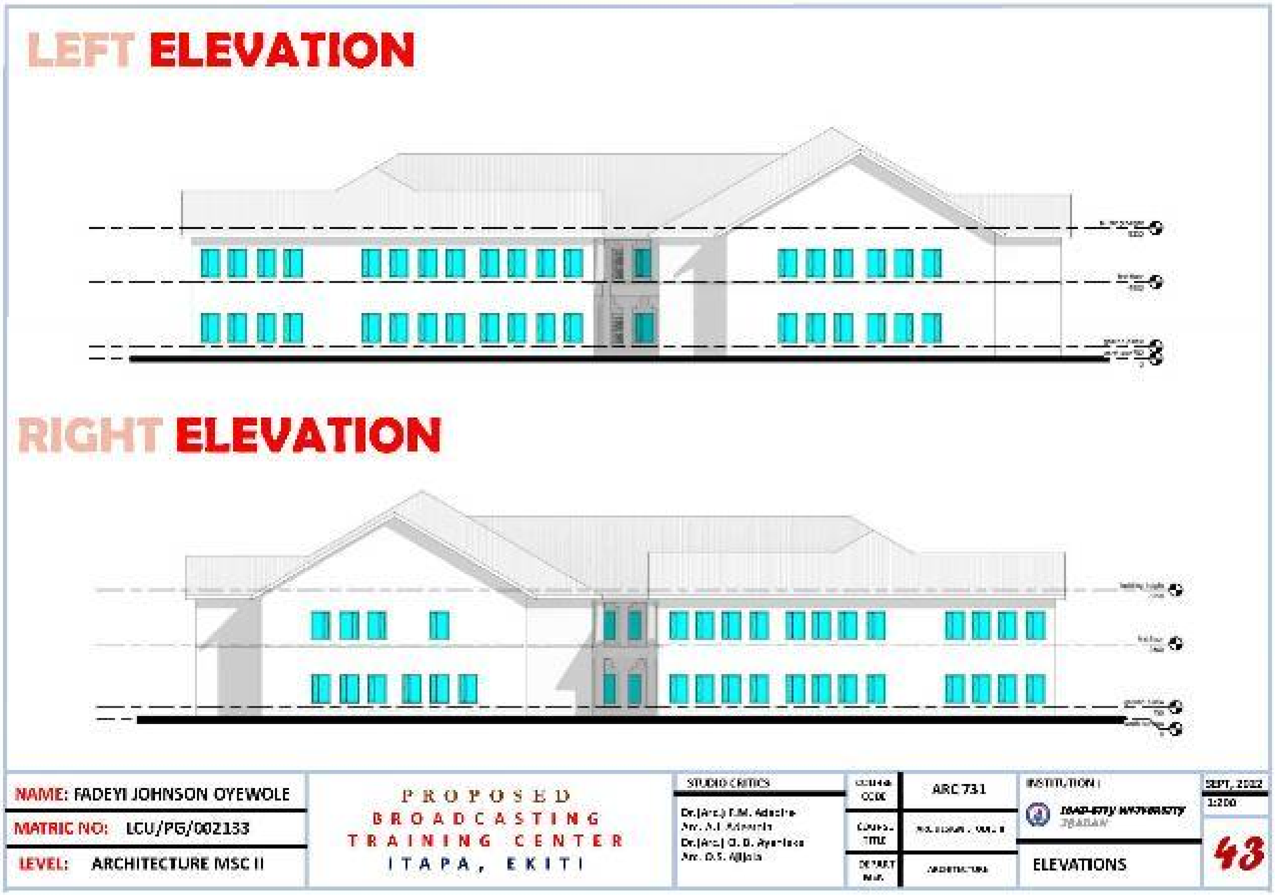
STUDIO CRITICS
Dr.(Arc.) E.M. Adedire
Arc. A.J. Adewale
Dr.(Arc.) O. D. Ayanlade
Arc. O.S. Ajijola

ARC 731

ELEVATIONS

SEPT, 2022

42


LEFT ELEVATION
RIGHT ELEVATION
NAME: FADEYI JOHNSON OYEWOLE
MATRIC NO: LCU/PG/002133
LEVEL: ARCHITECTURE MSC II
PROPOSED
BROADCASTING
TRAINING CENTER
ITAPA, EKITI
STUDIO CRITICS
ARC 731
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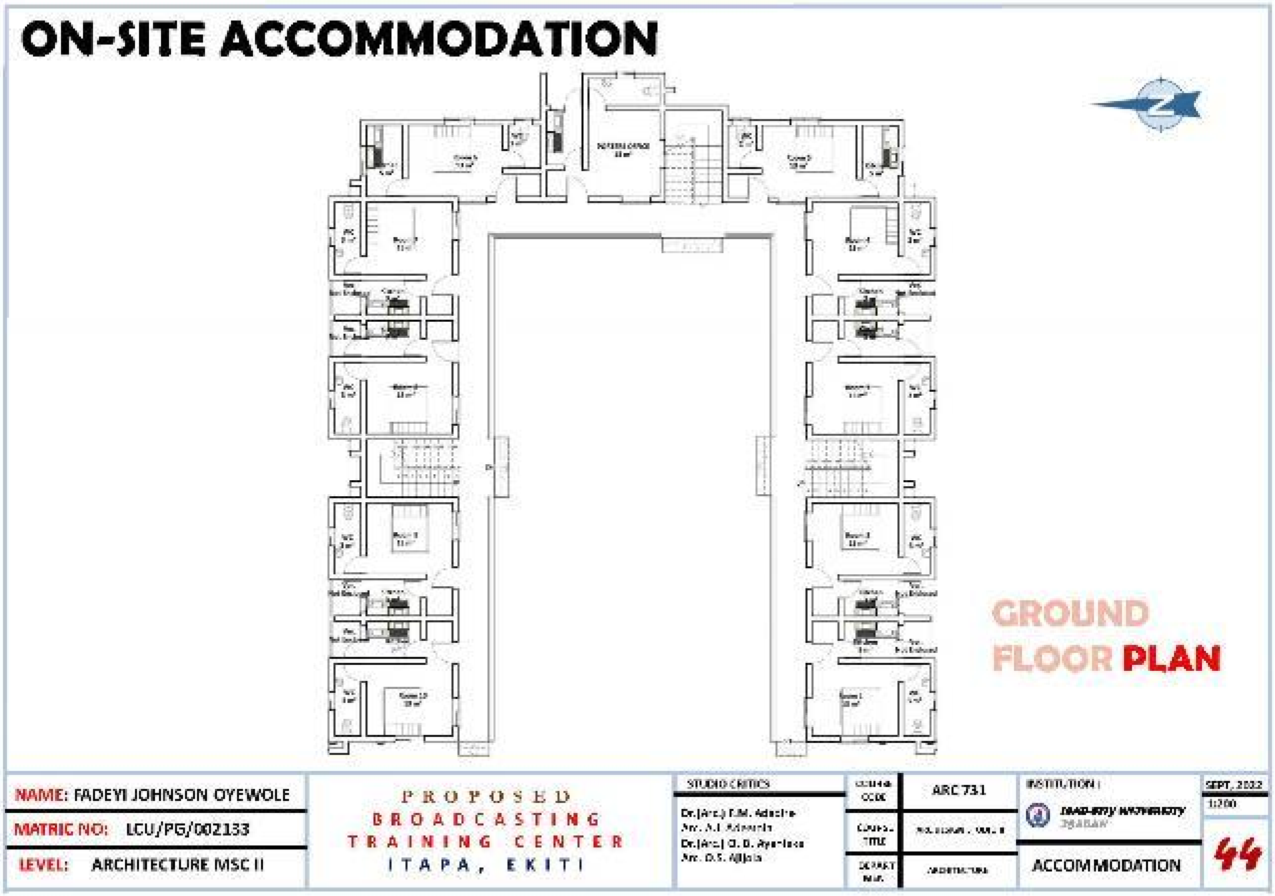
ON-SITE ACCOMMODATION
GROUND
FLOOR PLAN
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MATRIC NO: LCU/PG/002133
LEVEL: ARCHITECTURE MSC II
PROPOSED
BROADCASTING
TRAINING CENTER
ITAPA, EKITI
STUDIO CRITICS
ARC 731
INSTITUTION :
SEPT, 2022
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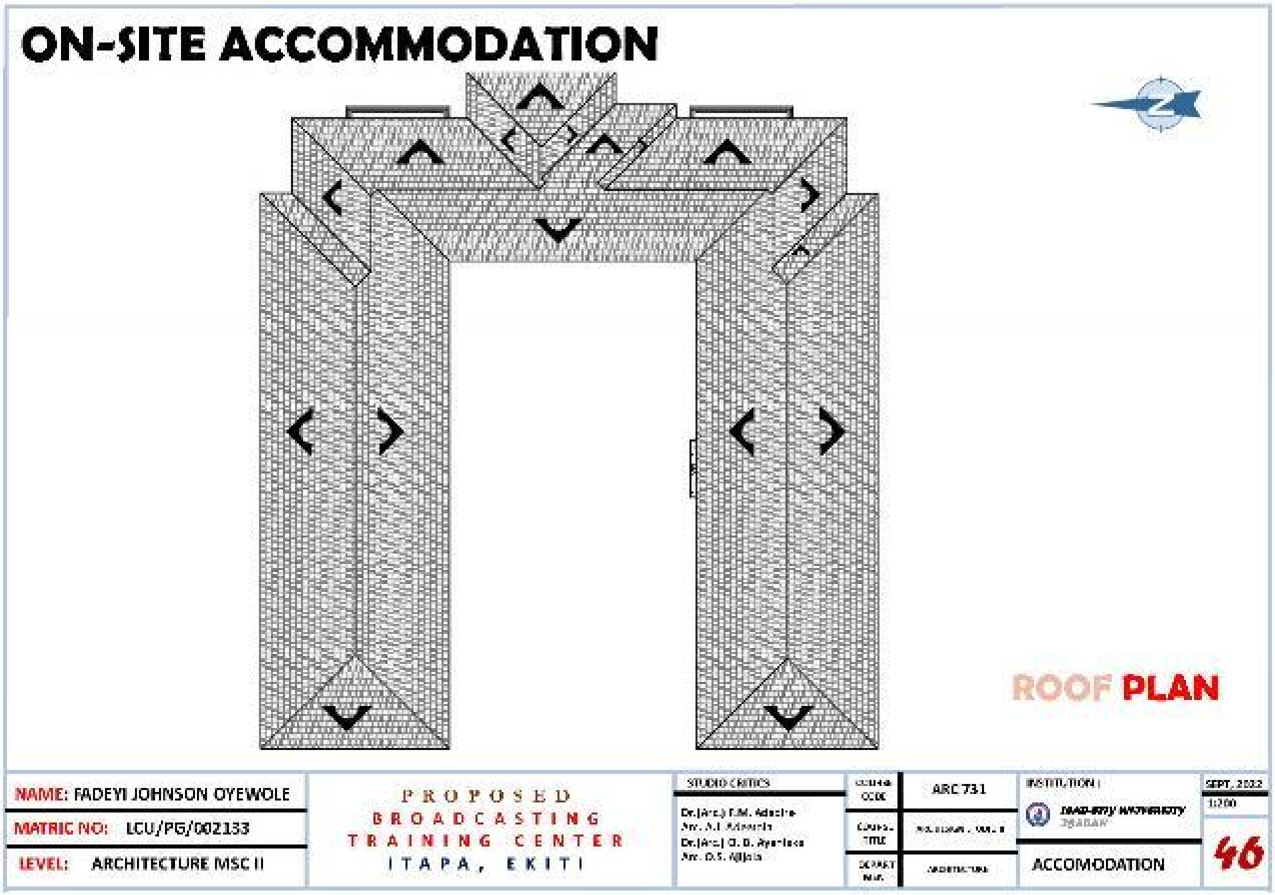
ACCOMMODATION
44


ON-SITE ACCOMMODATION
ROOF PLAN
NAME: FADEYI JOHNSON OYEWOLE
MATRIC NO: LCU/PG/002133
LEVEL: ARCHITECTURE MSC II
PROPOSED
BROADCASTING
TRAINING CENTER
ITAPA, EKITI
STUDIO CRITICS
ARC 731
INSTITUTION :
SEPT, 2022
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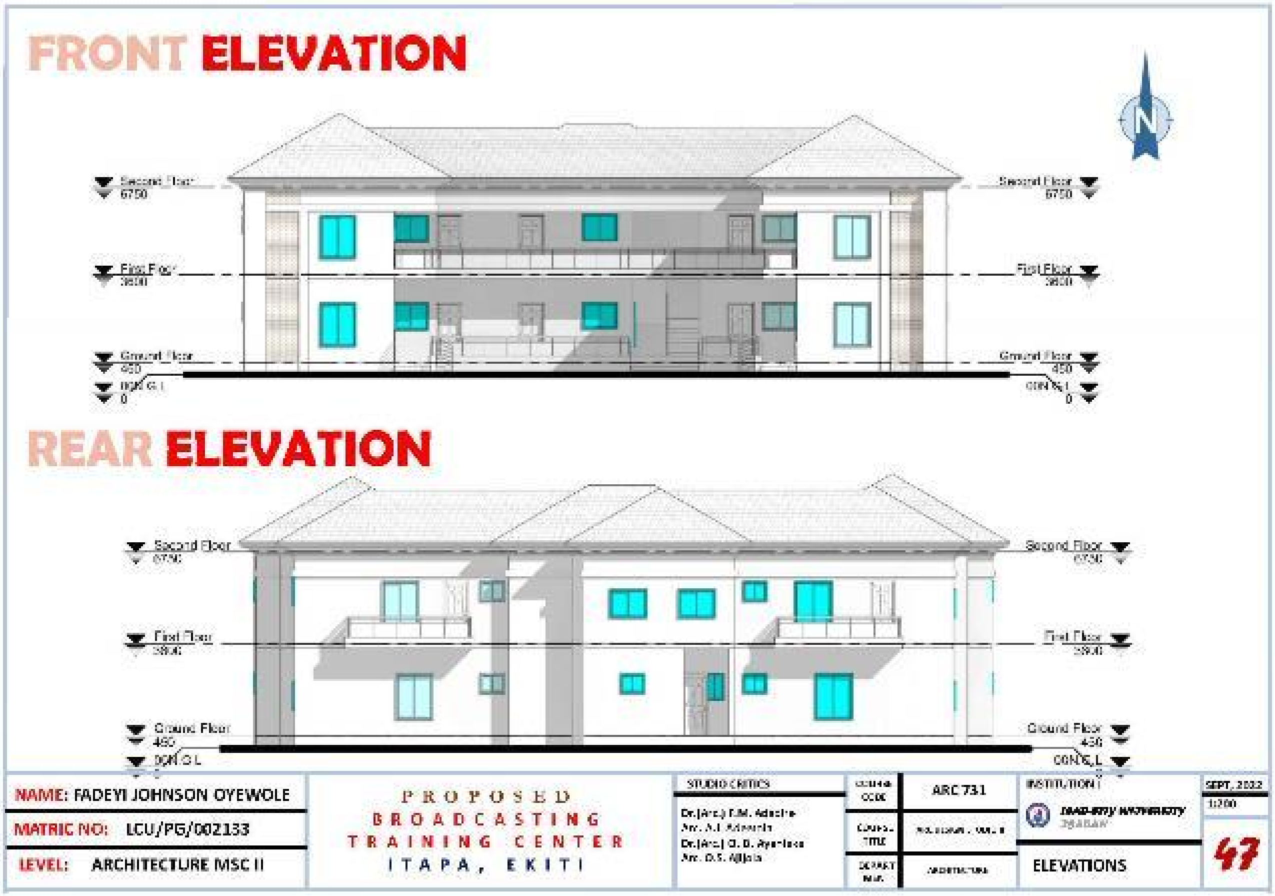
FRONT ELEVATION
Second Floor
6750
First Floor
3600
Ground Floor
450
0
REAR ELEVATION
NAME: FADEYI JOHNSON OYEWOLE
MATRIC NO: LCU/PG/002133
LEVEL: ARCHITECTURE MSC II
PROPOSED
BROADCASTING
TRAINING CENTER
ITAPA, EKITI
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ARC 731
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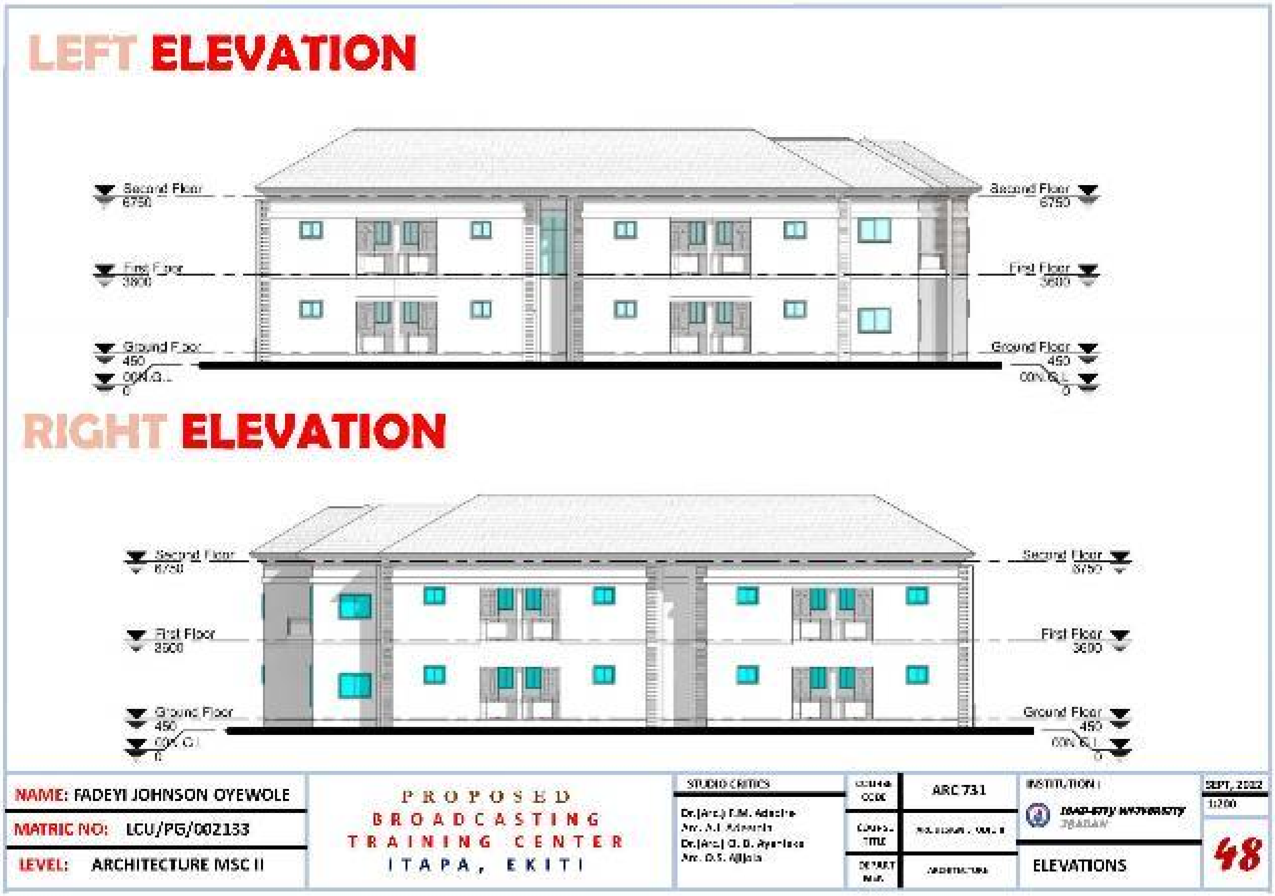
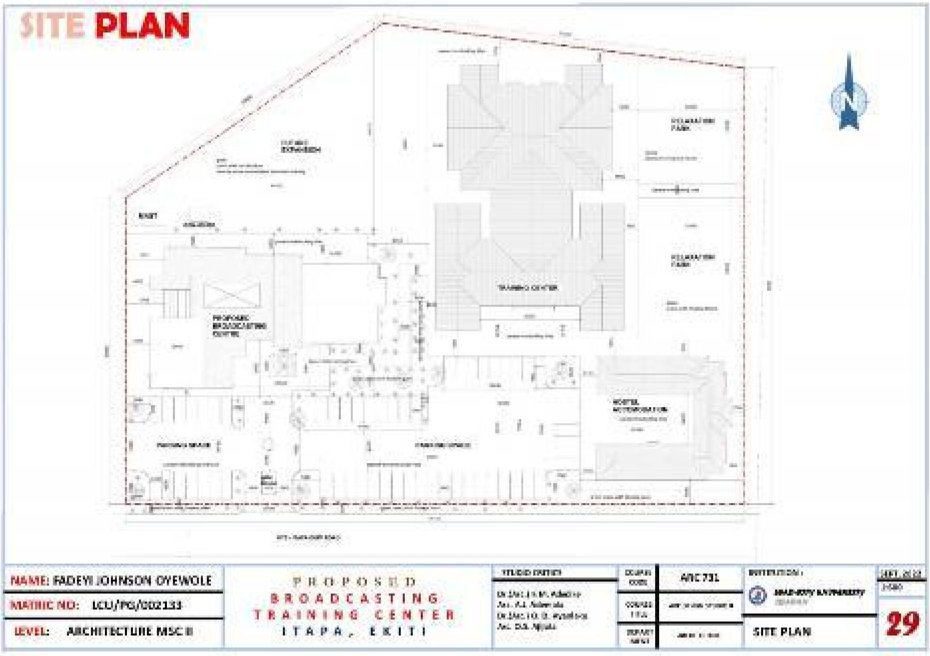
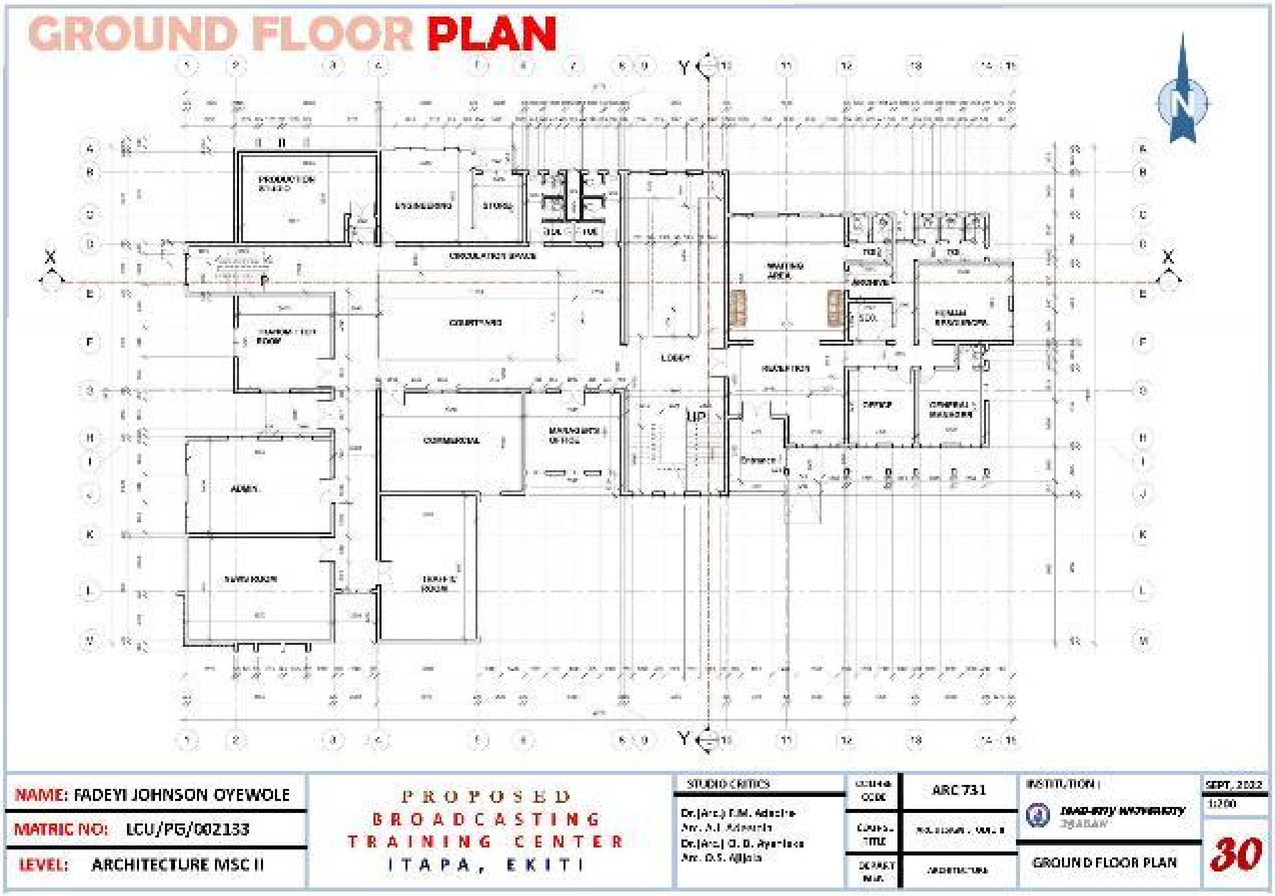
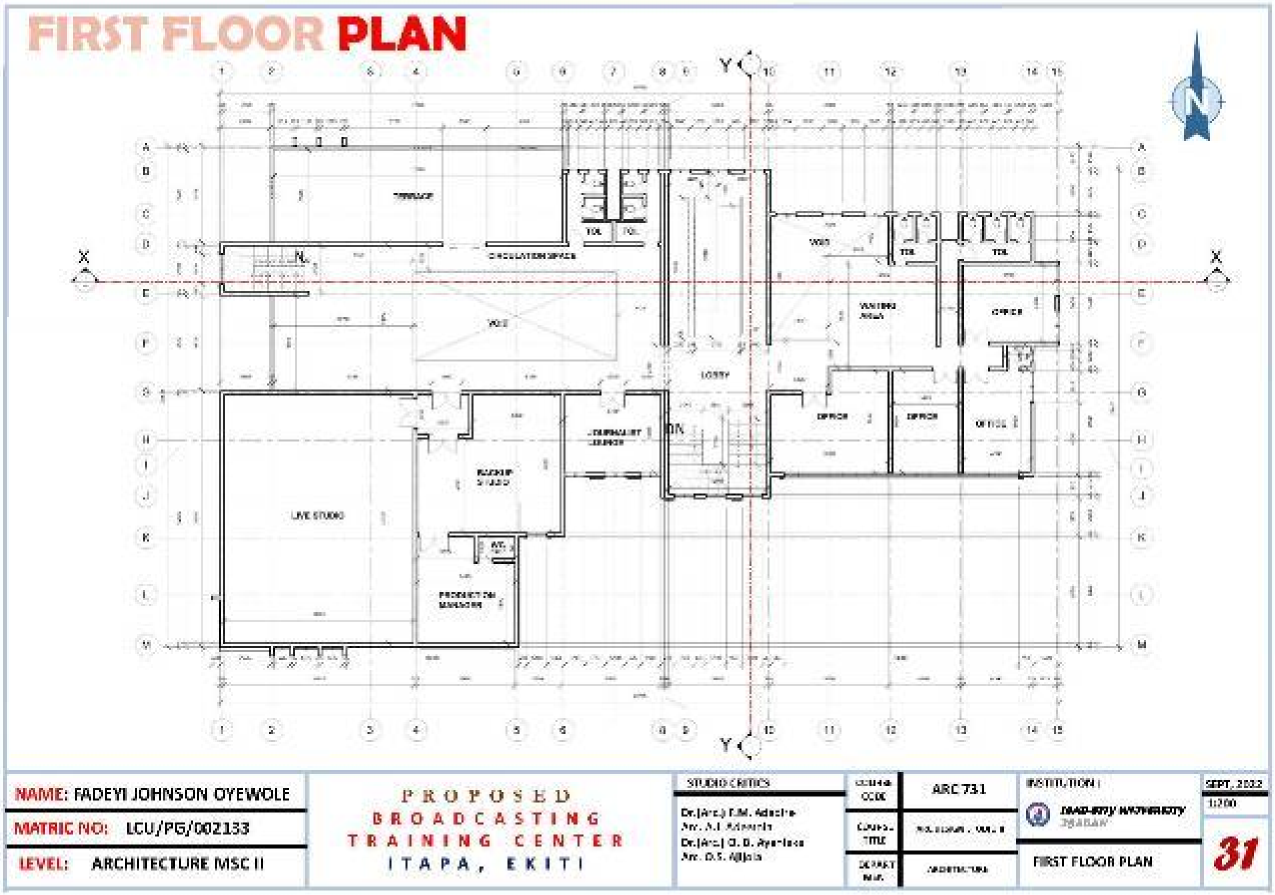

LEFT ELEVATION
Second Floor
6750
First Floor
3600
Ground Floor
450
RIGHT ELEVATION
Second Floor
6750
First Floor
3600
Ground Floor
450
NAME: FADEYI JOHNSON OYEWOLE
MATRIC NO: LCU/PG/002133
LEVEL: ARCHITECTURE MSC II
PROPOSED
BROADCASTING
TRAINING CENTER
ITAPA, EKITI
STUDIO CRITICS
ARC 731
INSTITUTION :
SEPT, 2022
1:200
ELEVATIONS
48

Appendix II

Working Drawings






FIRST FLOOR PLAN
TERRACE
CIRCULATION SPACE
VOID
TOIL
WAITING AREA
OFFICE
LOBBY
JOURNALIST LOUNGE
BACKUP STUDIO
LIVE STUDIO
PRODUCTION MANAGER
NAME: FADEYI JOHNSON OYEWOLE
MATRIC NO: LCU/PG/002133
LEVEL: ARCHITECTURE MSC II
PROPOSED
BROADCASTING
TRAINING CENTER
ITAPA, EKITI
STUDIO CRITICS
ARC 731
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SEPT, 2022
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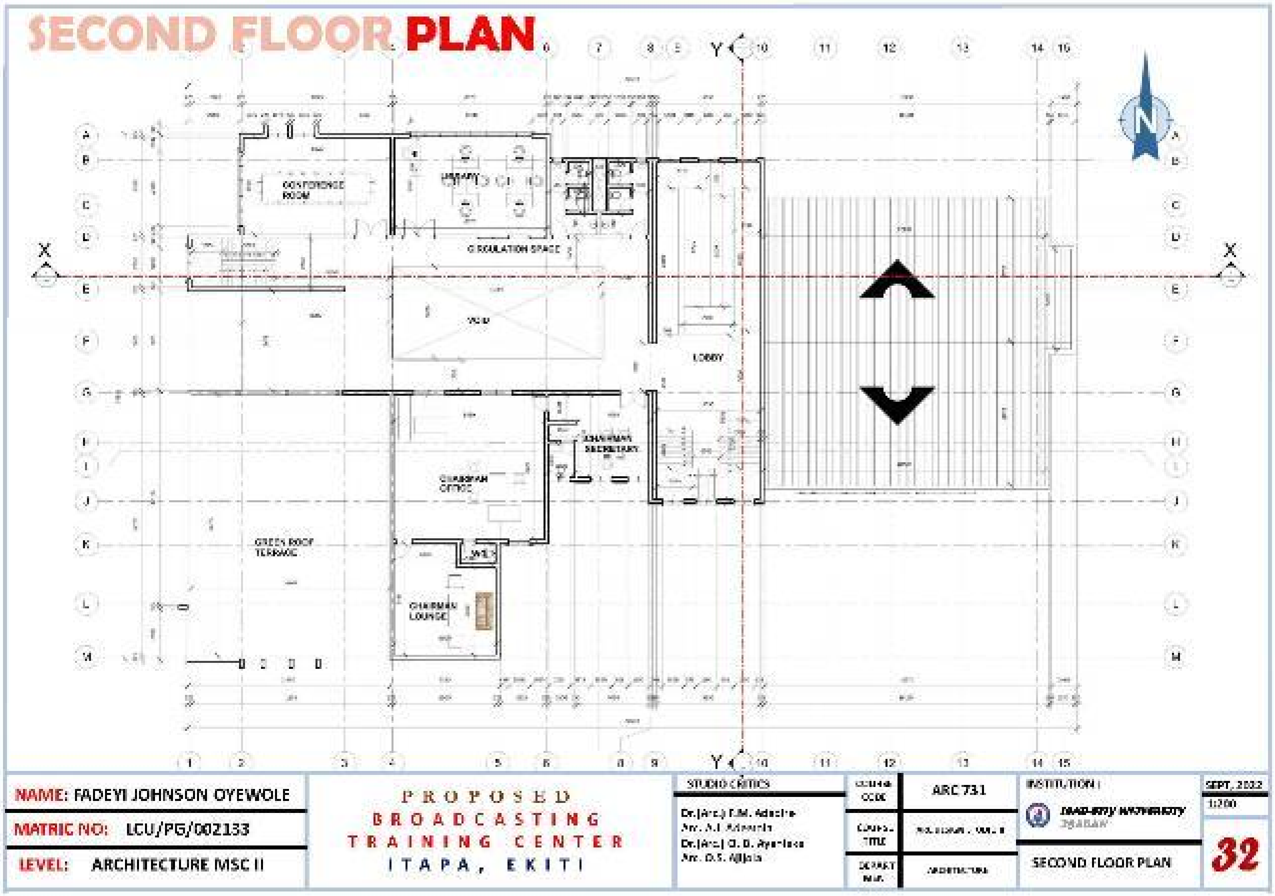
FIRST FLOOR PLAN
31


SECOND FLOOR PLAN
CONFERENCE ROOM
LIBRARY
CIRCULATION SPACE
VOID
LOBBY
CHAIRMAN SECRETARY
CHAIRMAN OFFICE
GREEN ROOF TERRACE
CHAIRMAN LOUNGE
NAME: FADEYI JOHNSON OYEWOLE
MATRIC NO: LCU/PG/002133
LEVEL: ARCHITECTURE MSC II
PROPOSED
BROADCASTING
TRAINING CENTER
ITAPA, EKITI
STUDIO CRITICS
ARC 731
INSTITUTION :
SEPT, 2022
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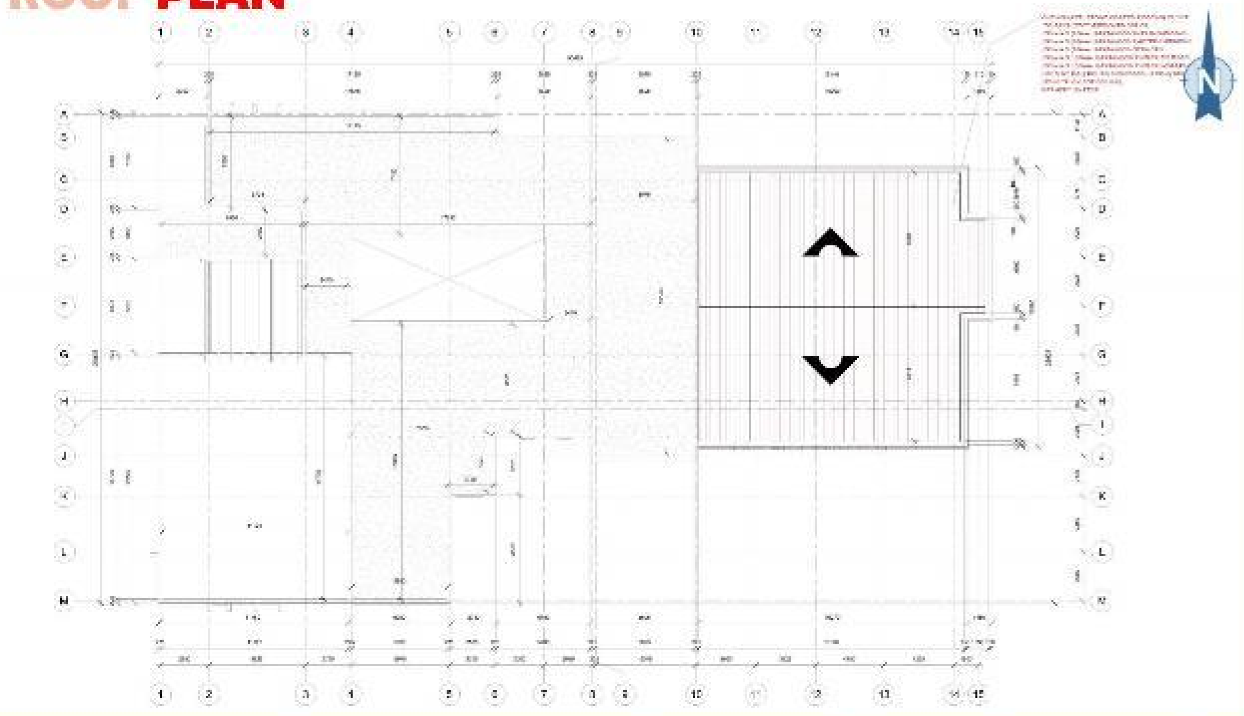
SECOND FLOOR PLAN
32

ROOF PLAN



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MATRIC NO: LCU/PG/002133
LEVEL: ARCHITECTURE MSC II

PROPOSED BROADCASTING TRAINING CENTER ITAPA, EKITI

STUDIO CRITICS

COURSE CODE: ARC 731

INSTITUTION:

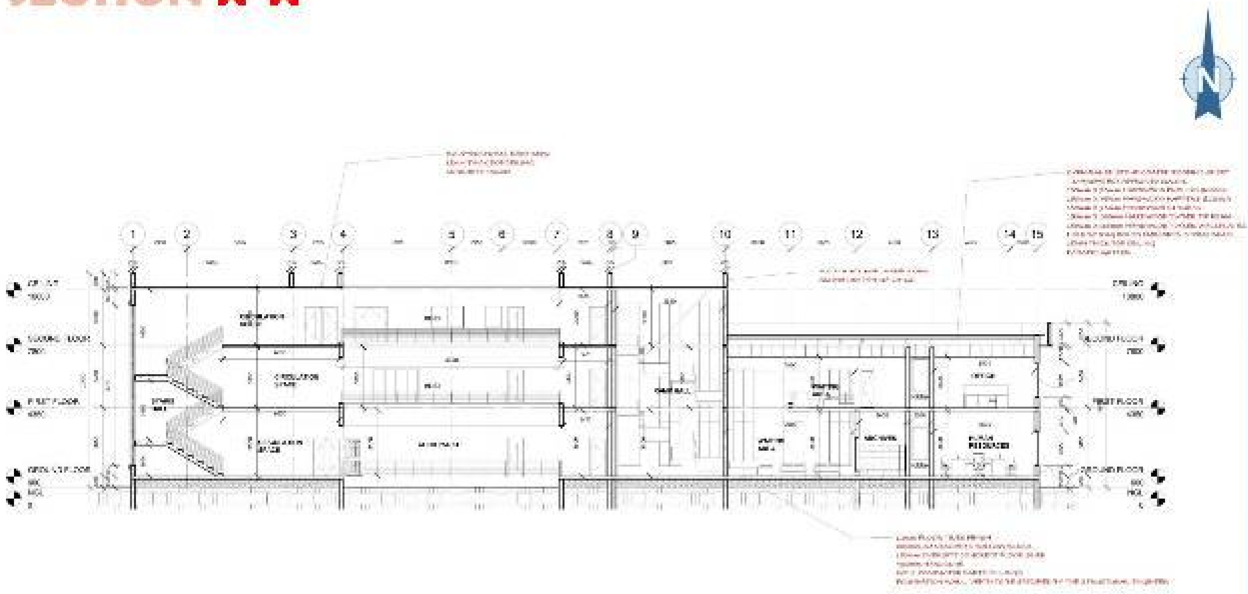
SEPT, 2022

1:200

ROOF PLAN

33

SECTION X-X



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MATRIC NO: LCU/PG/002133
LEVEL: ARCHITECTURE MSC II

PROPOSED BROADCASTING TRAINING CENTER ITAPA, EKITI

STUDIO CRITICS

COURSE CODE: ARC 731

INSTITUTION:

SEPT, 2022

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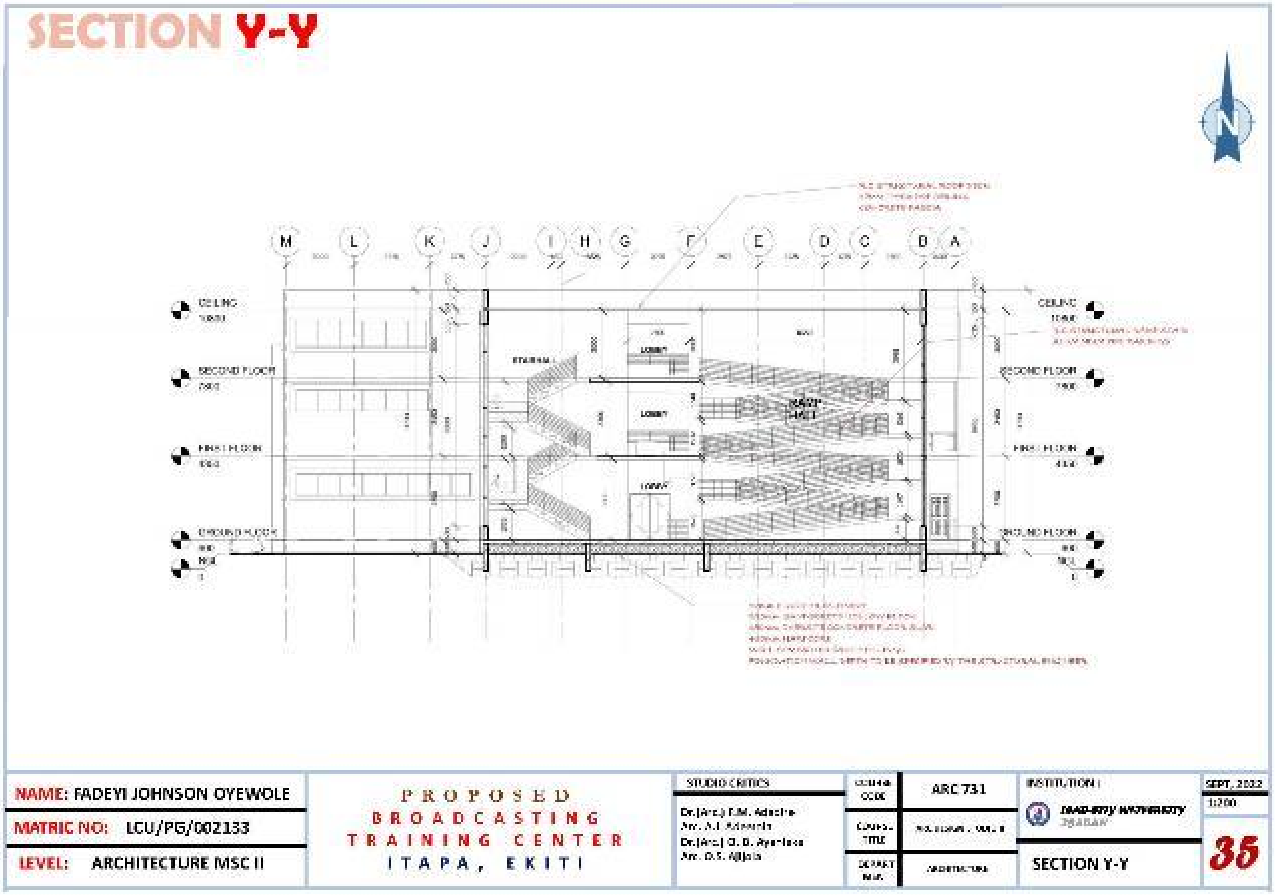
SECTION X-X

34


SECTION Y-Y
CEILING
SECOND FLOOR
FIRST FLOOR
GROUND FLOOR
LOBBY
NAME: FADEYI JOHNSON OYEWOLE
MATRIC NO: LCU/PG/002133
LEVEL: ARCHITECTURE MSC II
PROPOSED
BROADCASTING
TRAINING CENTER
ITAPA, EKITI
STUDIO CRITICS
ARC 731
INSTITUTION :
SEPT, 2022
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SECTION Y-Y
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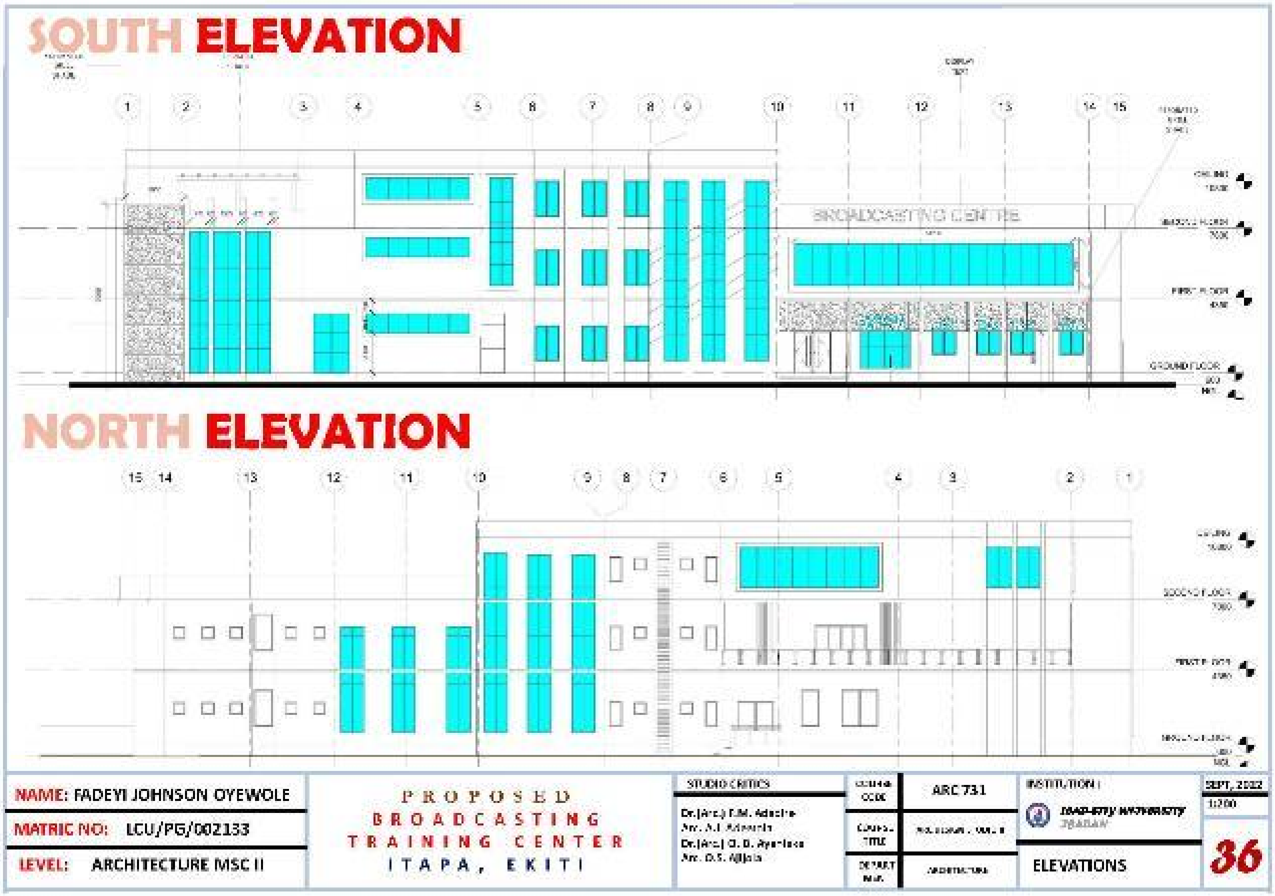
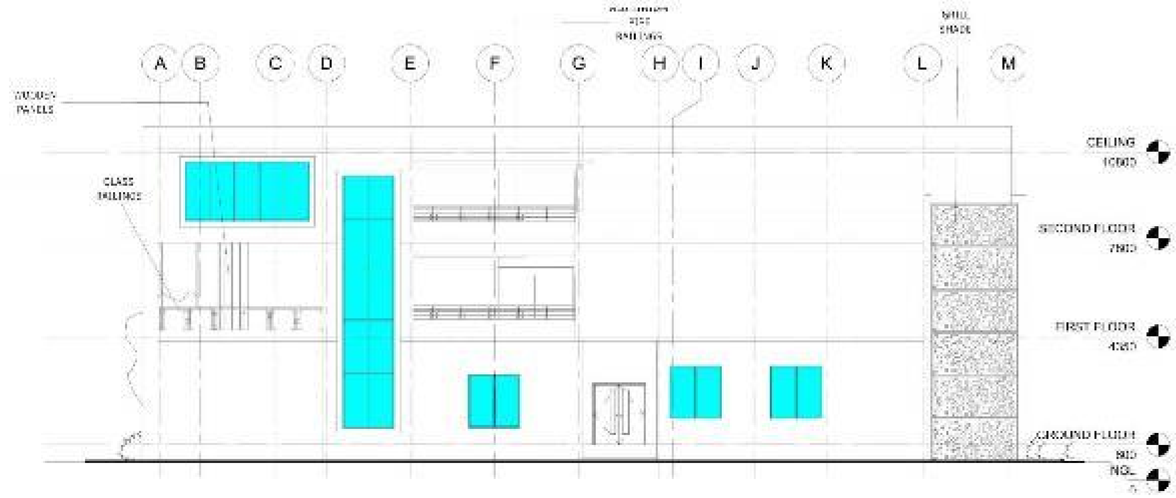

SOUTH ELEVATION
BROADCASTING CENTRE
NORTH ELEVATION
NAME: FADEYI JOHNSON OYEWOLE
MATRIC NO: LCU/PG/002133
LEVEL: ARCHITECTURE MSC II
PROPOSED
BROADCASTING
TRAINING CENTER
ITAPA, EKITI
STUDIO CRITICS
ARC 731
INSTITUTION :
SEPT, 2022
1:200
ELEVATIONS
36

WEST ELEVATION



NAME: FADEYI JOHNSON OYEWOLE
MATRIC NO: LCU/PG/002133
LEVEL: ARCHITECTURE MSC II

PROPOSED BROADCASTING TRAINING CENTER ITAPA, EKITI

STUDIO CRITICS

ARC 731

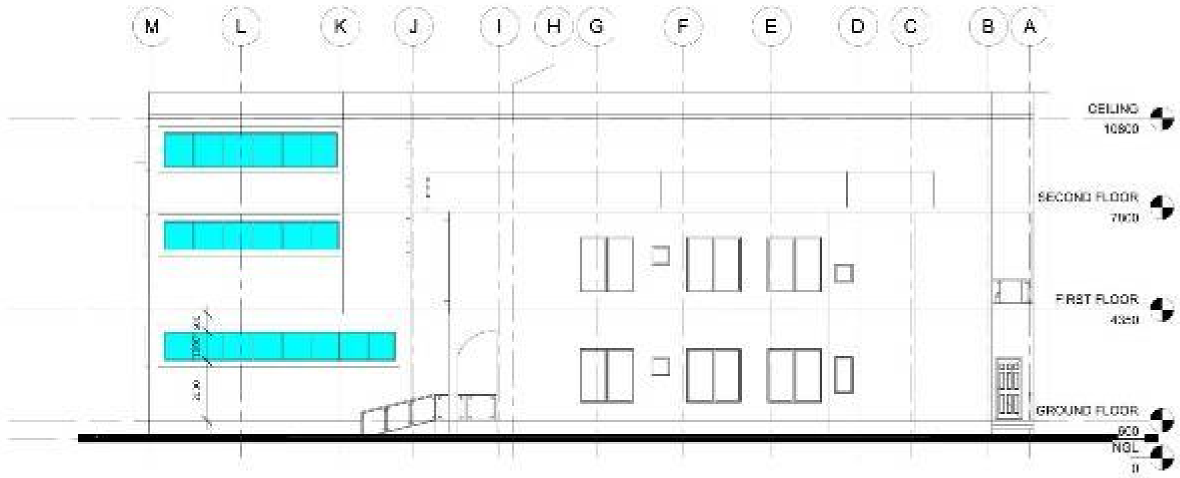
INSTITUTION:

SEPT, 2022

ELEVATIONS

37

EAST ELEVATION



NAME: FADEYI JOHNSON OYEWOLE
MATRIC NO: LCU/PG/002133
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PROPOSED BROADCASTING TRAINING CENTER ITAPA, EKITI

STUDIO CRITICS

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INSTITUTION:

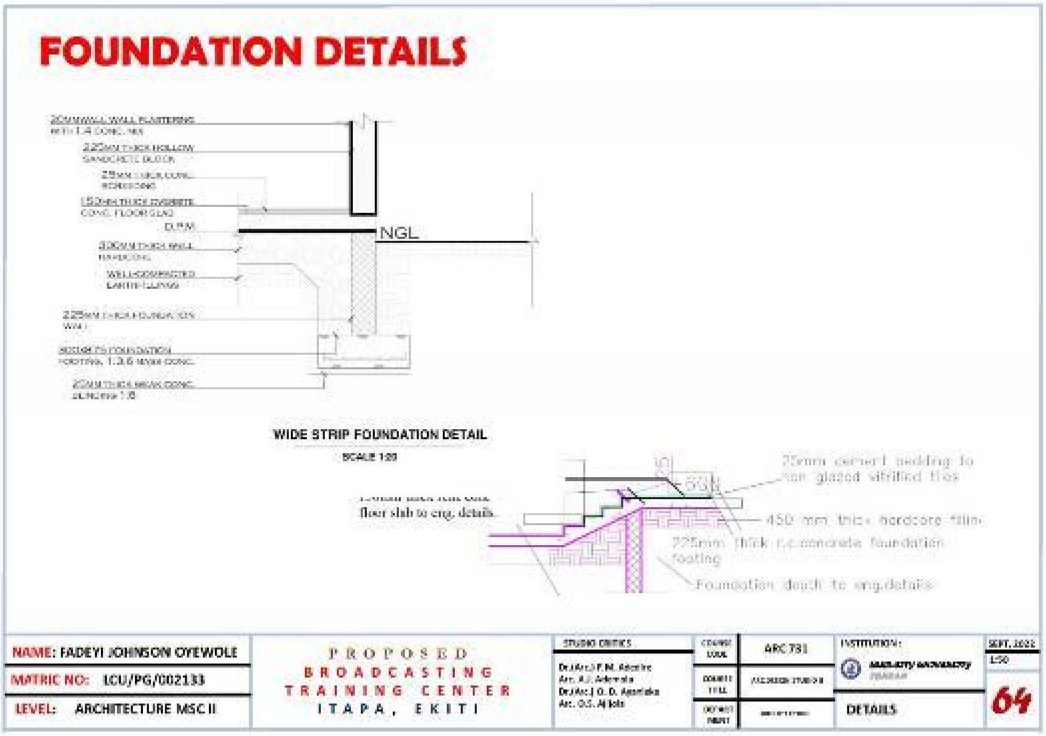
SEPT, 2022

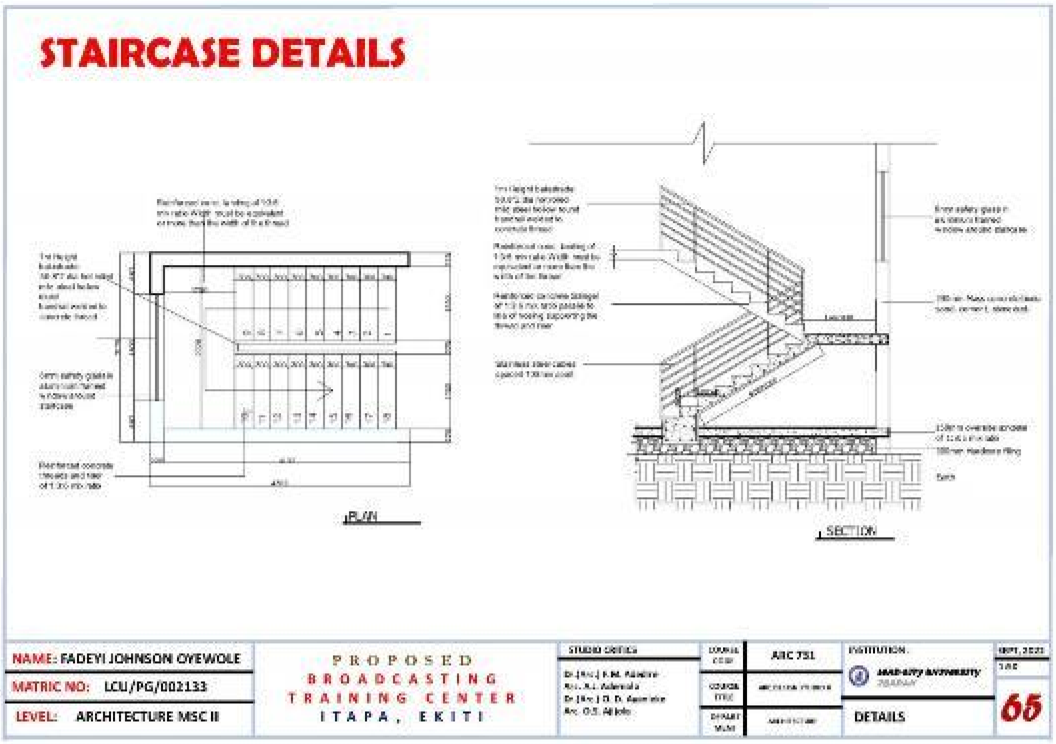
ELEVATIONS

38

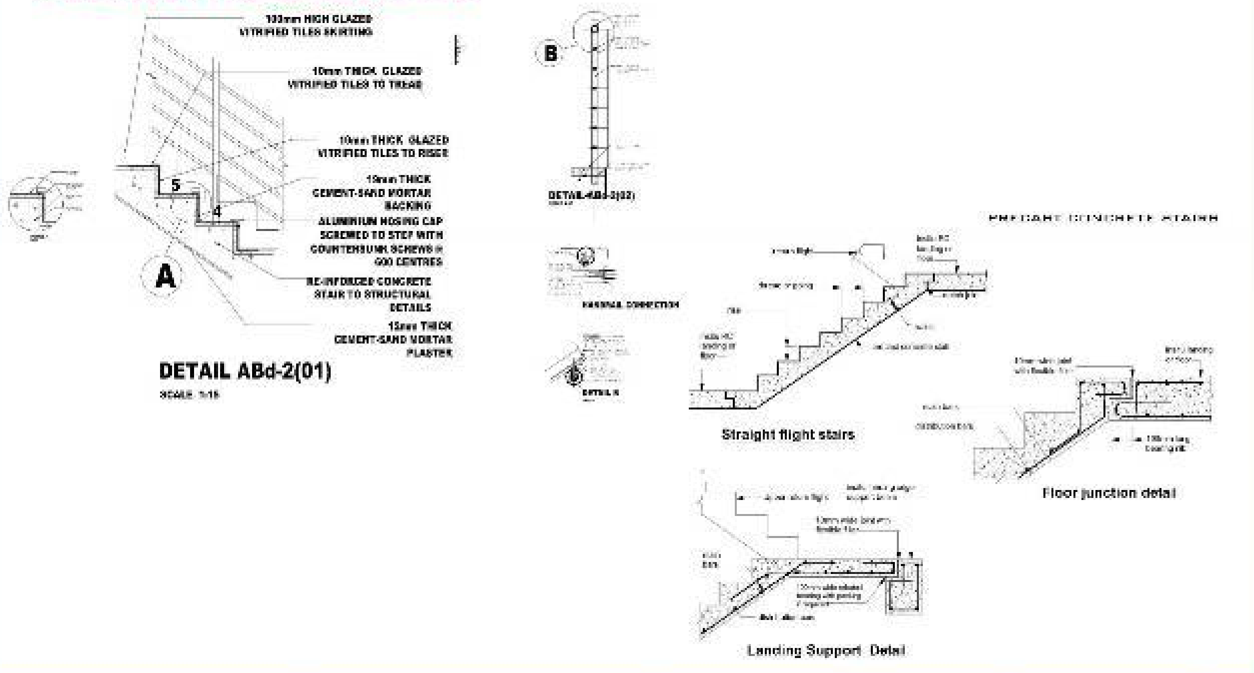
Appendix III

Details





STAIRCASE DETAILS



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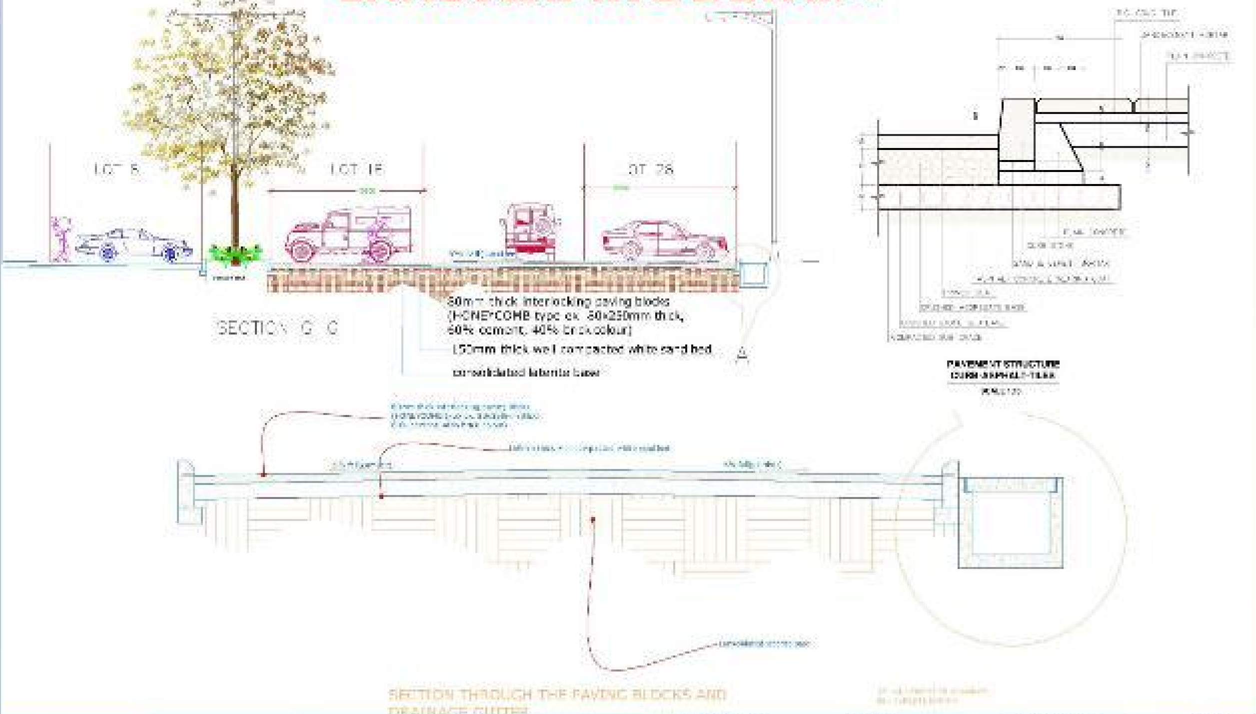
LEVEL: ARCHITECTURE MSC II			DEPARTMENT: ARCHITECTURE	DETAILS — 66

LANDSCAPING DETAILS



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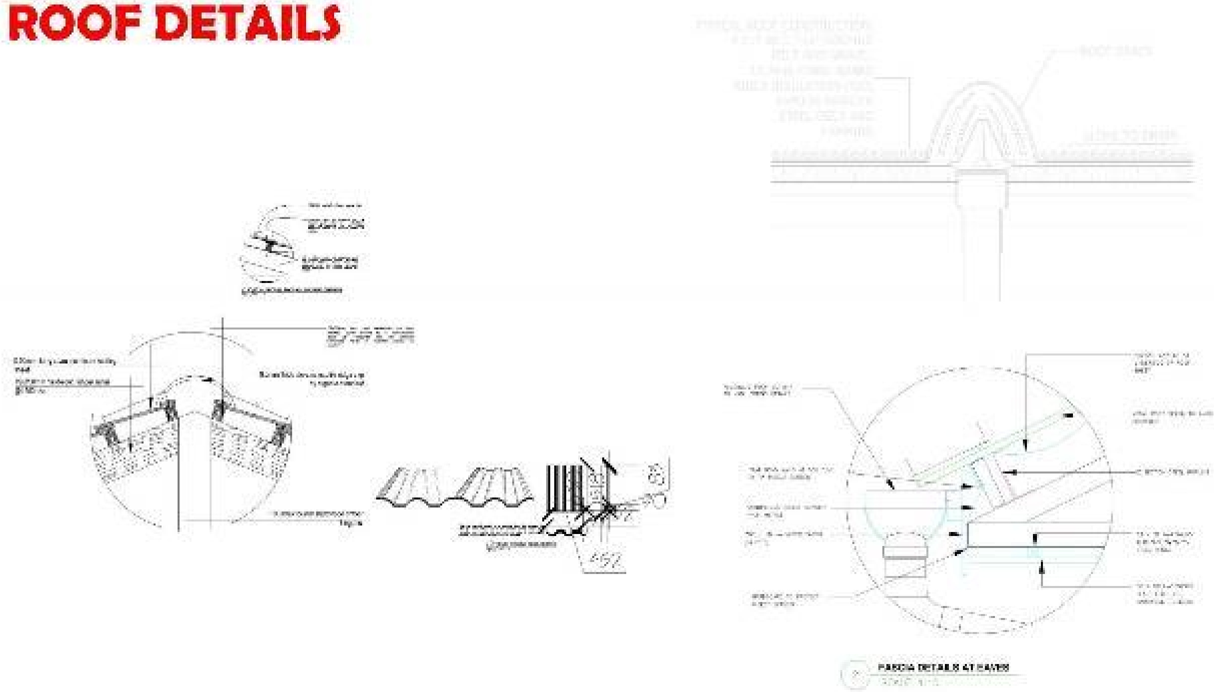
LEVEL: ARCHITECTURE MSC II			DEPARTMENT: ARCHITECTURE	DETAILS — 67

ROOF DETAILS



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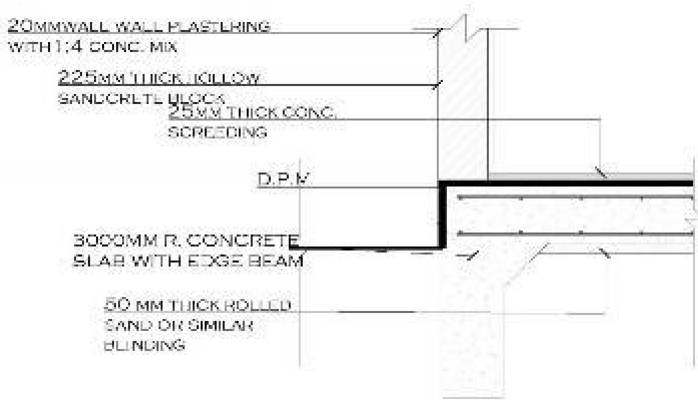
MATRIC NO: LCU/PG/002133		Dr.(Arc.) E.M. Adeoye Arc. A.I. Adewola Dr.(Arc.) O. B. Ayanlaja Arc. O.S. Ajijola	COURSE TITLE		1:20
LEVEL: ARCHITECTURE MSC II			DEPARTMENT	ARCHITECTURE	DETAILS 68

SLAB DETAILS



REINFORCED CONCRETE SLAB WITH EDGE BEAM

SCALE 1:20

NAME: FADEYI JOHNSON OYEWOLE	PROPOSED BROADCASTING TRAINING CENTER ITAPA, EKITI	STUDIO CRITICS	COURSE CODE	ARC 731	INSTITUTION : SEPT, 2022
MATRIC NO: LCU/PG/002133		Dr.(Arc.) E.M. Adeoye Arc. A.I. Adewola Dr.(Arc.) O. B. Ayanlaja Arc. O.S. Ajijola	COURSE TITLE		1:25
LEVEL: ARCHITECTURE MSC II			DEPARTMENT	ARCHITECTURE	DETAILS 69

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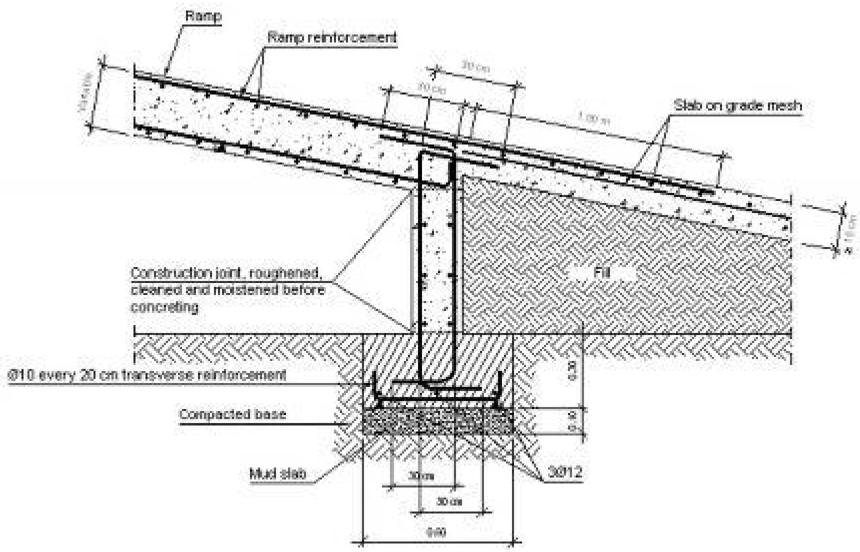

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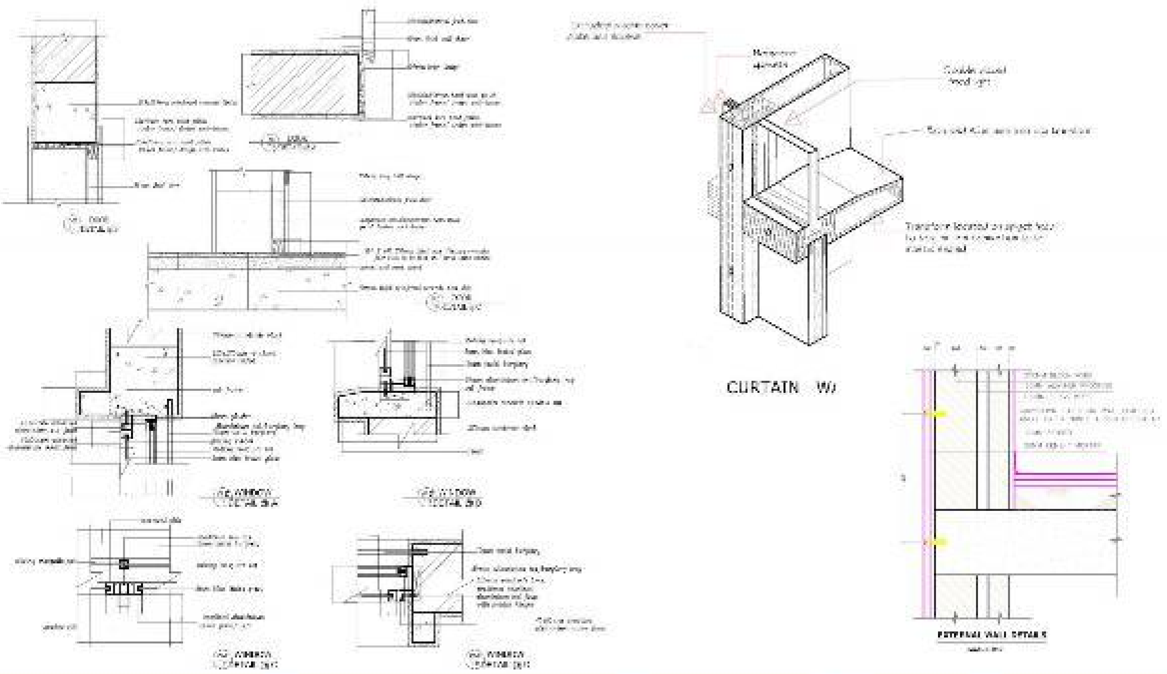
MATRIC NO: LCU/PG/002133
LEVEL: ARCHITECTURE MSC II

PROPOSED BROADCASTING TRAINING CENTER ITAPA, EKITI

STUDIO CRITICS
Dr.(Arc.) E.M. Adedire
Arc. A.I. Adesola
Dr.(Arc.) O. D. Ayanlade
Arc. O.S. Ajijola

COURSE CODE: ARC 731
INSTITUTION: LEAD CITY UNIVERSITY IBADAN
SEPT, 2022
1:20
DETAILS
70

DOOR AND WINDOWS DETAILS



NAME: FADEYI JOHNSON OYEWOLE
MATRIC NO: LCU/PG/002133
LEVEL: ARCHITECTURE MSC II

PROPOSED BROADCASTING TRAINING CENTER ITAPA, EKITI

STUDIO CRITICS
Dr.(Arc.) E.M. Adedire
Arc. A.I. Adesola
Dr.(Arc.) O. D. Ayanlade
Arc. O.S. Ajijola

COURSE CODE: ARC 731
INSTITUTION: LEAD CITY UNIVERSITY IBADAN
SEPT, 2022
N.T.S
DETAILS
71

Bio data

A. Personal data

1. Name:	Johnson Oyewole FADEYI
Permanent home address	No 3 Akogun street, off Alaikia, Isebo Rd Amosun Egbeda L.G.A Ibadan.
Contact Address	13m Fadahunsi Onilegogoro Street, Premier Hill, Mokola, Ibadan.
Email Address	fadeyijoyewole@gmail.com
Phone Number	08030509386
2. Date of Birth	06 June 1972
Place of Birth	Ile – Ife Osun State
3. Nationality	Nigeria
4. Next of King	
Name:	Yetunde Folashade Fadeyi
Address	No 3 Akogun street, off Alaikia, Isebo Rd Amosun Egbeda L.G.A Ibadan, Nigeria

B. Education Background with Date

i. Institution Attended with Date

i. Leadcity University, Toll Gate, Ibadan Oyo State December 2020 till date

ii. Joseph Ayo Babalola University Ikeji Arakeji Osun State 2018 to 2020

iii. University Of Jos, Terminus Jos, Plateau State 2008 to 2011

iv. Bayoro University Kano, Kano State. 2000 to 2003

v. The Polytechnic Ibadan,HND oyo State. 1994 to 1997

vi. The Polytechnic Ibadan, OND Oyo State. 1990 to 1995

vii. Onaolapo Memorial High School, Ikirun Osun State. 1984 to 1990

viii. St. Pauls Anglican Primary School, Ikirun Osun State 1978 to 1983

ii. Qualifications with Dates

i. MSc Architecture 2022

ii. BSc Architecture 2020

iii. PGD Architecture 2010

iv. PGD Environmental Management 2003

v. HND Architecture 1996

vi. OND Architecture 1992
vii. West African Examination Council 1990
viii. Frist leaving Certificate 1983

C. Working Experience with Date

MD CEO Fads Consult Ltd Oyo Ibadan 2021 till Date

Project Architect: International Architects 2016 to 2021

Architect Assistance: Savannah Consultants, 19 Durbin Kastina Road, Kano 2000 to 2016

Graduate Architect: Akstar Associates Dantata House, Kano 1999 to 2001

National Youth Service Crops, Akstar Associations Dantata House, Kano 1998 to 1999

D. Membership of Academic

Nigeria Institute of Architect

International Professional Managers Association, Certified International Professional Manageers CIPm Uk. October 2018

E. Publication

F. Referees

1. Arc. Afolabi Adedeji

   International Architect Ibadan. 08060020100

2. Arc. Lola Oyenekan

   Arkibest consultant Ltd, Ibadan 08063630345

3. Dr. Yinka Babarinde

   University College Hospital, Ibadan. 09082666385

-------------------------------------- ----------------------------

Signature Date

University Compliance form

This is to certify that this thesis by Johnson Oyewole Fadeyi with Matriculation Number LCU/PG/002133 in the Department of Architecture, Faculty of Environmental Design, Leadcity University, Ibadan is in full compliance with the approval of the University's format and style.

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Signature Date