SWARALAYA: Where Music is Born, Felt and Celebrated
“Music Experience Centre”

Sano thimi, Bhaktapur

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of the requirements for the
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CERTIFICATE

This is to certify that the thesis entitled **"SWARALAYA": WHERE MUSIC IS BORN, FELT AND CELEBRATED** at ***Sanothimi, Bhaktapur,*** submitted to the Department of Architecture of Khwopa Engineering College by **Ms. Aliza Shrestha** of Class Roll No. 05/ B.Arch./076 has been declared successful for the partial fulfillment of the academic requirement towards the completion of the degree of Bachelor of Architecture of Purbanchal University.

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ABSTRACT

In an increasingly interconnected and creative world, music continues to serve as a powerful medium of expression, communication, and cultural identity. In the context of Nepal, the music scene has witnessed a dynamic shift, fueled by technological advancement, evolving listener preferences, and the growing influence of both traditional and contemporary genres. The rise of digital platforms and social media has further enabled musicians and music enthusiasts to explore new ways of creating, sharing, and experiencing music. However, despite this growth, there remains a lack of dedicated physical spaces that support musical expression, collaboration, and innovation.

To address this gap, my architectural thesis focuses on the design of a Music Experience Centre,a multifunctional space where artists, performers, and audiences can come together. The project envisions an environment that not only facilitates music production and performance but also encourages exploration, learning, and cultural exchange. It includes rehearsal and recording studios, performance areas, interactive exhibition zones, and informal gathering spaces, creating an inclusive platform for both emerging and established musicians. This centre aims to strengthen the creative infrastructure while fostering community engagement through music.

Special focus is given to acoustic research to ensure high-quality sound environments suited to each function. From studio isolation to live hall acoustics, the design is driven by how space can enhance musical experience. The goal is to create an inclusive platform that nurtures talent, fosters community, and enriches Nepal’s musical landscape.

Key words:
Music Experience Centre, Nepal, Performance Space, Music Education, Cultural Identity, Recording Studio, Interactive Exhibition, Community Engagement, Architectural Thesis, Musical Innovation.

DECLARATION

I hereby declare that the thesis titled “Music Experience Centre” is the result of my independent research and original work. This study has been carried out under the guidance and supervision of Ar. Sunaina Karmacharya, my Thesis Supervisor.

I further confirm that this thesis has not been submitted, either wholly or partially, for the award of any other degree or diploma at any institution. All sources of information and references used during the course of this research have been properly cited and acknowledged.

I have followed the ethical standards and academic guidelines prescribed by Khwopa Engineering College, Libali, Bhaktapur, throughout the research and documentation process.

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Chapter 1 : Project Introduction

1.1: Music

The term music is derived from the Greek word mousike, meaning “art of the muses.” As defined in *The American Heritage Dictionary (Second College Edition)*, music is vocal or instrumental sound having rhythm, melody, and harmony. Music, *according to Wikipedia,* is an art that employs sound and silence, and its most fundamental elements are pitch (which determines melody and harmony), rhythm (e.g., tempo, meter, and articulation), dynamics, and the qualities of sound timbre and texture. The modern-day composer Edgard Varèse calls music “organized sound,” and Bob Marley maybe expressed its profound impact best when he said, “One good thing about music; when it hits you, you feel no pain.”

Music and art are natural parts of the human experience, essential both in creation and reception. Sound is a ubiquitous part of life, and music, one of humanity’s most valued pursuits, has been an integral part of emotional expression, entertainment, and social connection. As a reflection of society, music not only helps preserve tradition but also influences cultural evolution. With the advent of technology, people are exposed to a greater variety of music genres, with greater international interaction and still having firm local connections.

1.2: Music in context of Nepal

Nepal has a rich and diverse musical heritage deeply rooted in its cultural, ethnic, and religious traditions. Music in Nepal has evolved through centuries, influenced by Hindu and Buddhist rituals, folk traditions, and interactions with neighboring cultures like India and Tibet.

Traditional Music

Nepali music is traditionally categorized into folk, classical, and religious music. Folk music varies by region and ethnic group, with instruments like the madal, sarangi, and bansuri being prominent. The Newar community has a well-developed classical music tradition known as Dapha and Gunla Baja, while other ethnic groups such as the Gandharvas (traveling musicians) have played a key role in preserving oral traditions through music.

Influence of Religion and Rituals

Music is an essential part of religious ceremonies, with devotional songs (bhajans) and Buddhist chants forming a significant aspect of spiritual practice. Temple rituals often include traditional musical ensembles, such as Panche Baja (a set of five traditional instruments) used in weddings and special occasions.

Modern and Contemporary Music

In the 20th century, Nepali music saw the rise of recorded music, radio broadcasts, and modern influences from Indian and Western styles. The emergence of Adhunik Geet (modern songs) combined traditional elements with contemporary sounds, making artists like Narayan Gopal and Tara Devi household names. Rock, pop, jazz, and fusion genres have gained popularity, leading to a growing music industry in Nepal.

Fusion and Experimental Music

In recent years, Nepali musicians have explored fusion music, blending folk instruments with rock, jazz, and electronic elements. This movement has led to experimental music spaces where traditional sounds are reimagined in contemporary forms, preserving Nepal’s musical heritage while adapting to global trends.

1.3: Fusion Music and Experimental Music

Aspect	Fusion Music	Experimental Music
Definition	A blend of two or more musical styles, typically combining traditional and contemporary elements.	A genre that explores unconventional sounds, structures, and techniques, often pushing the boundaries of music.
Purpose	To create a harmonious mix of different musical traditions, making them accessible to a broader audience.	To challenge musical norms, experiment with new sounds, and explore abstract or conceptual ideas.
Structure	Usually follows recognizable musical patterns such as verses, choruses, and melodies.	Often lacks a fixed structure, favoring improvisation, soundscapes, and non-traditional compositions.
Instrumentation	Combines traditional and modern instruments (e.g., *madal* + electric guitar, *sarangi* + synthesizer).	Uses unconventional instruments, digital sound processing, field recordings, and modified sound sources.
Influence	Draws from existing genres (e.g., folk-rock, jazz fusion, classical fusion).	May create entirely new sounds, borrowing from avant-garde, ambient, or noise music.
Accessibility	More accessible to listeners due to familiar melodies and rhythms.	Can be challenging or abstract, appealing to niche audiences.
Examples (Nepal)	Bands like *Nepathya, Kutumba*, and *Kuma Sagar and The Khwopa*, blending folk with rock, pop and blues.	Artists like *Kanta dAb dAb, Jijīviṣā, Bākhã, The Flying Spirits, Omg Spark etc.* experimenting with live sound manipulation and digital synthesis.

1.4: A Music Experience Hub

The Music Experience Hub is a dynamic space designed to nurture the fusion of traditional and experimental music. It serves as a platform where musicians can create, collaborate, and perform, blending Nepal's rich musical heritage with contemporary innovations. The hub is not just a performance venue but an interactive environment where sound, space, and audience engagement come together to redefine the musical experience.

At the core of the hub is a versatile performance area, designed with advanced acoustics to accommodate both natural and amplified sounds. Traditional Nepali instruments like the sarangi, madal, and bansuri can be seamlessly integrated with modern digital sound technologies, allowing for unique sonic explorations. The space is adaptable, enabling intimate solo performances, collaborative jam sessions, and large-scale concerts where fusion and experimental music thrive.

Beyond performance, the hub fosters music creation and innovation. Dedicated sound studios and experimental labs provide artists with the tools to explore new soundscapes. Musicians can record, manipulate, and experiment with their compositions using digital processing, live looping, and spatial sound techniques. The integration of an open rehearsal space allows artists to collaborate organically, breaking the boundaries between traditional and modern musical practices.

To enhance audience engagement, the Music Experience Hub offers interactive experiences. Visitors can immerse themselves in sound installations, participate in hands-on workshops, and explor e digital exhibits showcasing Nepal's evolving musical journey. This encourages cultural exchange, where traditional musicians interact with sound artists and experimental composers, pushing the boundaries of music as an art form.

By blending heritage with innovation, the Music Experience Hub becomes more than a performance venue—it transforms into a living space where Nepal's musical identity continues to evolve. It bridges generations, genres, and global influences, creating a sanctuary for artists and audiences to experience music in new and profound ways.

1.5: Project Justification

The Music Experience Hub is envisioned as a space for blending Nepal's traditional and contemporary music, fostering creativity and cultural evolution. While Nepal has a rich musical heritage, there is a lack of dedicated spaces for fusion and experimental music. This hub aims to bridge that gap by providing a platform for artists to innovate while preserving traditional sounds.

Traditional music risks being overshadowed by global influences, and younger generations have limited exposure to indigenous forms. By merging folk instruments with modern soundscapes, the hub ensures Nepal's musical identity remains relevant. Inspired by bands like Nepathya and Kutumba, who successfully blend folk with contemporary styles, the hub will support similar experimentation.

Nepal's music industry is growing but lacks spaces optimized for both traditional and modern music-making. The hub will provide acoustically designed performance areas, sound studios, and interactive spaces, allowing artists like Kanta dAb dAb and The Flying Spirits to explore new genres.

Beyond music, the project promotes cultural exchange, education, and tourism, offering workshops and residencies where local and international artists collaborate. By nurturing emerging talent and fostering cross-cultural dialogue, the Music Experience Hub strengthens Nepal's musical legacy while embracing innovation.

1.6: Project Objectives

- Promote creative expression by designing multifunctional spaces that support rehearsal, recording, and live performances.
- Encourage musical innovation by providing flexible environments suited for fusion and experimental sound practices.
- Foster cultural exchange through open, collaborative zones that connect local and international artists.
- Integrate acoustic performance into spatial design to naturally shape and enhance sound quality.
- Design architecture as a passive amplifier—using materiality and form to manipulate sound without reliance on electronic systems.
- Create immersive user experiences through interactive exhibits and sensory-rich environments.
- Strengthen the creative ecosystem by making music more accessible to communities and emerging artists.

1.7: Project Scope

- Design performance spaces optimized for live music and sound experiments.
- Establish sound studios for music production and collaboration.
- Create interactive areas for immersive music experiences and workshops.
- Organize workshops to enhance musicians' skills in composition and performance.
- Facilitate cultural exchange programs for local and international musicians.
- Provide resources and infrastructure to support Nepal's music industry.
- Integrate architecture to enhance the acoustic experience.

1.8: Project Limitation

- Difficulty in gathering sufficient local or international expert opinions on the subject.
- Time constraints may limit the depth of the study and exploration of all relevant aspects of music fusion and architecture.
- Limited case studies or real-world examples to draw upon for understanding the practical application of fusion music and architectural design.

1.9: Methodology

The following outline methodology was followed for the study:

a) General data and literature survey

The data has been from different sources which are listed in reference for literature study.

b) Case studies

For national case studies existing studios were visited for the study of how each type of production studios should be designed. For following methods were followed:

- Questionnaire
- Photographs
- Existing building survey

Chapter 2 : Literature Review
2.1: History of Music

Music has been an integral part of human civilization, evolving over thousands of years as a form of expression, communication, and cultural identity. It is believed that early humans created music through natural sounds, such as clapping, drumming on surfaces, and vocal expressions. The earliest musical instruments, like bone flutes and drums, date back over 40,000 years, indicating that music has played a fundamental role in human society for millennia.

Fig 2.1: Egypt's music

Ancient civilizations, including those of Mesopotamia, Egypt, China, and India, developed structured musical systems. The Sumerians and Egyptians used music in religious ceremonies, while early Chinese music was based on a pentatonic scale and tied to philosophical concepts. In India, the Vedic chants formed the basis of classical Indian music, emphasizing melody and rhythm. Greek music was highly influential, with philosophers like Pythagoras exploring the mathematical foundations of musical harmony.

Fig2.2: China's music

During the Middle Ages, European music was dominated by religious chants, such as Gregorian chants, which later evolved into polyphonic compositions. The Renaissance period (14th–17th century) saw the rise of more complex musical structures, the development of written notation, and the flourishing of instrumental music. The Baroque era (1600–1750) introduced composers like Bach and Handel, who explored intricate harmonies and orchestration.

Fig2.3: Renaissance period music

The Classical period (1750–1820) brought balance and formality, with composers such as Mozart and Beethoven shaping the foundation of Western classical music. The Romantic era (19th century) emphasized emotional expression and individuality, leading to powerful compositions by figures like Chopin, Wagner, and Tchaikovsky. Meanwhile, folk and traditional music continued to thrive in various cultures, preserving their unique musical identities.

Fig2.4: Classical period music

The 20th and 21st centuries witnessed rapid transformations in music, with the rise of jazz, blues, rock, pop, electronic, and experimental genres. Advancements in technology, including recording and digital production, revolutionized how music was created, distributed, and experienced. Today, music continues to evolve, blending traditional and contemporary elements across cultures, leading to new forms of expression such as fusion and experimental music.

Fig2.5: 21st century music

2.2: Elements of Music

Elements of Music

- **Rhythm** – The pattern of regular or irregular pulses caused in music by the occurrence of strong and weak beats.
- **Pitch** – How high or low a note sounds
- **Harmony** – the relationship between two or more simultaneously sounding notes
- **Pulse** – The beat of the music
- **Texture** – The way in which melody, rhythm and harmony are combined in a piece of music. What each part/ instrument is doing at any given point
- **Timbre** – The tone of a musical note
- **Tonality** – The key in which a piece is written (can change as piece progresses)
- **Duration** – The length of musical note
- **Structure** – The way in which an overall piece of music is arranged into similar and contrasting sections
- **Tempo** – The speed of the pulse
- **Dynamics** – How loud/quiet the music is (either the overall sound or of individual notes/instruments within it)

2.3: Musical Instruments

The following diagram shows the classification of Musical instruments with examples of western instruments and folk instruments.

Classification of Musical Instruments

String Instruments
- 4,6, or 12 strings.
- How to play:

a) With a bow
b) Plucking with fingers
c) Strumming with finger or pick

Example:

Fig2.6: Violin

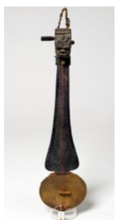


Fig2.7: Arbajo

Woodwind Instruments
- Wind instruments that look like a tube with holes
- Buttons are covered with either fingers or valves.
- Made of plastic, metal, or wood.
- Mouth piece is made of reeds or a narrow air stream

Example:

Fig2.8: Recorder

Fig2.9: Bansuri

Brass Instruments
- Wind instruments made of metal
- Bell on the end
- Middle second made of tubes
- Mouth piece looks like a cup or funnel

Example:

Fig2.10: Trombone

Fig2.11: Narsinga

Percussion Instruments
- Instruments that are played by

a) Striking
b) Beating
c) Scraping
d) Shaking

- Wide variety of instruments

Example:

Fig2.12: Bongo drums

Fig2.13: Madal

2.4: Acoustic Transmission in building design

Acoustic transmission in building design refers to a number of processes by which sound can be transferred from one part of a building to another.

Typically, these are:

- **Airborne transmission** - transmission through air pressure waves
- **Structure borne transmission** - transmission through building structure
- **Flanking Transmission** - A more complex form of acoustic transmission in which vibrations originating from a noise source are transmitted to other rooms within the building, usually through structural elements within the building. For example, in steel frame buildings, effective transmission is noticeable as soon as the frame itself begins to move.

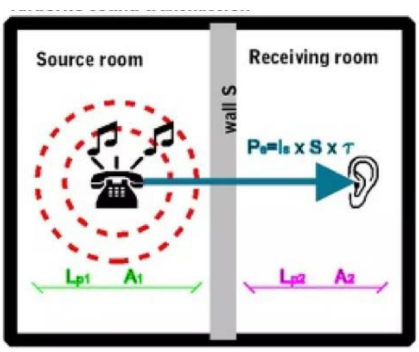


Fig2.14: Air borne sound transmission

Source: Ervine, M. (2023). Sound Transmission Classes Explained. [online]

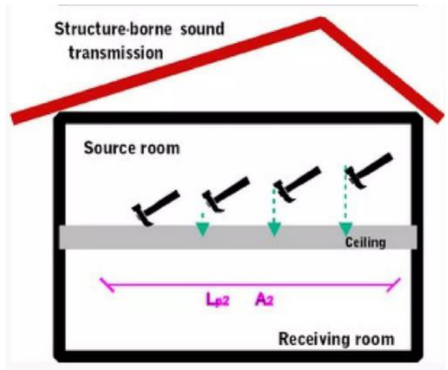


Fig2.15: Structure sound transmission

Source: Ervine, M. (2023). Sound Transmission Classes Explained. [online]

2.4.1: Acoustical Parameter

When a sound wave hits an obstacle, the energy is transferred according to three mechanisms:

- **Absorption:** a part of the incident energy is absorbed by the obstacle
- **Reflection:** part of the incident energy bounces over the obstacle and comes back to the room
- **Diffusion:** the incident energy is spread over due to the geometric shapes of obstacle

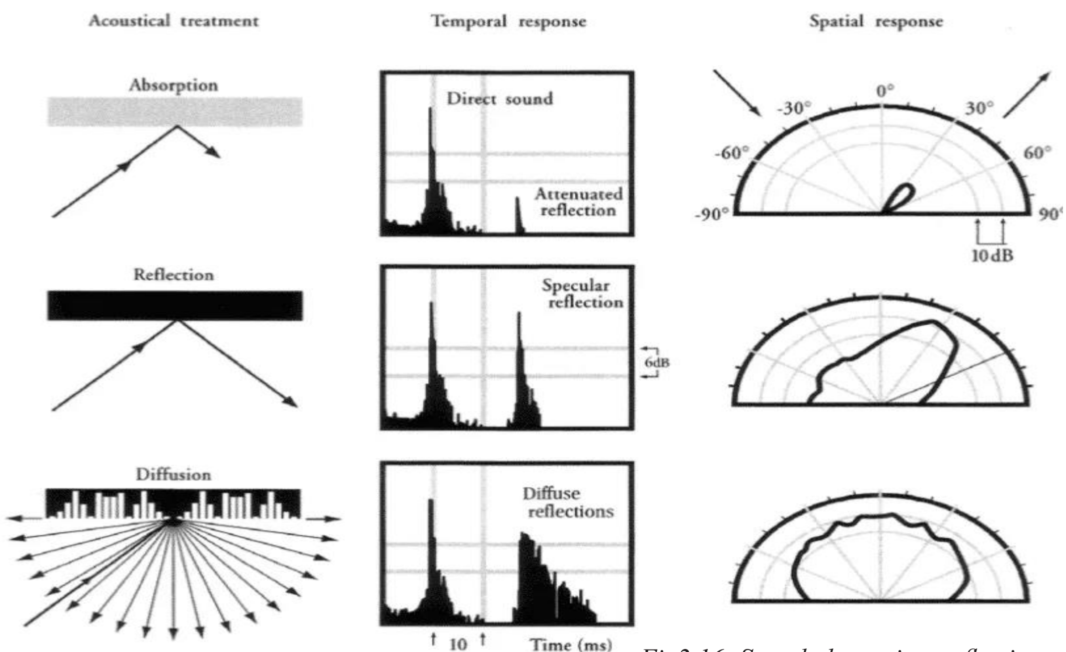


Fig2.16: Sound absorption, reflection and diffusion

Source: Milk Audio Store. (2022), [online]

2.5: Space Details

2.5.1: Recording studio

A recording studio is a facility specialized to sound recording and mixing. Both the recording and monitoring rooms should be acoustically designed to achieve the optimal sound quality. Recording studios are used by a variety of professionals, including musicians and voiceover artists, to record vocals, voiceovers, instruments, and musical soundtracks. A recording studio typically consists of two areas: a "studio" or "live room" where artists play instruments or sing, and a "control room" where sound engineers oversee professional audio equipment for analog or digital recording, routing, and sound processing. Smaller rooms known as "isolation booths" may also be included to isolate loud instruments such

Fig2.17: Recording Studio
Source: barnhousesoundproductions.com/ [online]

A professional recording studio consists of the following rooms and areas:

- A control room where the main monitors, mixer, and outboard are located (required).
- A primary live recording space (required)
- Additional recording rooms with various acoustic properties (optional)
- One or several isolation booths (voice booth, drum booth, etc.)
- Sound locks between the control room and the recording rooms (to reduce sound transmission among the rooms in the complex)
- A machine room (for all noisy studio equipment such as tape machines, hard disk recorders, computers, amplifiers, and so on).
- A lounge for artists to unwind between sessions or for visitors is required.
- Bathroom/WC facilities are necessary.
- A recreational space with a billiard table, table tennis, and other indoor sports is optional.

2.5.1.2: Common recording studio equipment

Computer
For running recording software and managing audio files

Digital Audio Workstation (DAW)
Software for recording, editing, and producing audio files

Audio Interface
Hardware that connects microphones andinstruments to the computer

Audio monitors and speakers
For accurate sound reproduction during mixing and mastering

MIDI Controller
For creating and controlling digital music

Microphones and accessories
Various types for different recording applications

2.5.1.3:Recording studio acoustics

A well-designed recording studio provides an optimal listening environment, enabling audio professionals to make accurate decisions during the recording and mixing processes. The two primary aspects of studio acoustics are acoustic isolation and acoustic treatment.

2.5.1.3.1: Acoustic Isolation

Acoustic isolation prevents sound leakage and external noise interference by using highly insulated walls, doors, and ceilings. Sound transmission occurs both directly and through structural components, requiring high-density materials for effective absorption. Since insulation performance varies with frequency, rigid materials should be avoided, and flexible, uncoupled joints should be used to enhance soundproofing. Proper isolation improves both recording quality and noise control.

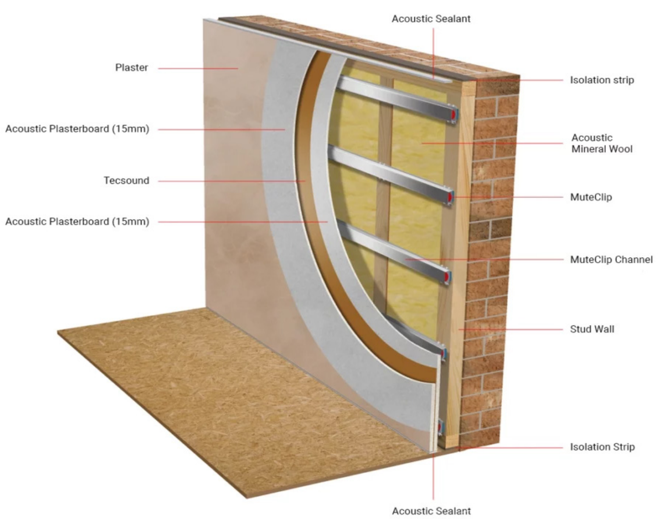


Fig2.18: Sound isolation

Source: ikoustic.co.uk[online]

2.5.1.3.2: Acoustic Treatment

Proper acoustic treatment starts with selecting an appropriately shaped room, with rectangular spaces being preferred over cubic, elliptical, or spherical ones to avoid unwanted sound distortions like standing waves and focal points. Strategic placement of windows, doors, and glass surfaces helps minimize reflections. Speaker positioning is also crucial in achieving balanced sound, as improper placement can cause interference, leading to peaks and dips in frequency response. To address this, far-field monitors are often embedded into wall surfaces, and advancements in speaker technology have further reduced such issues. Additionally, multiple speaker configurations are commonly used to optimize sound quality. Once the room layout and speaker positioning are set, acoustic treatment techniques such as absorption panels, diffusers, and bass traps are applied to control reflections and create a well-balanced listening environment.

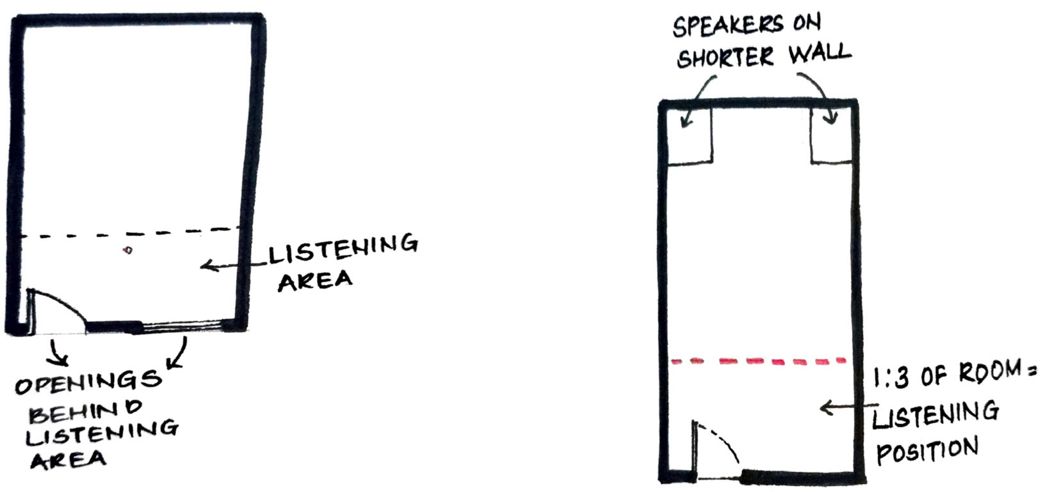


Fig2.19: Acoustic treatment for a room

2.5.1.4:Room shape and size

Key Factors Affecting Room Acoustics

1. Room Size & Proportions

- The dimensions of a room significantly impact its acoustics, regardless of its furnishings.
- Equal or repetitive dimensions (e.g., 10’ x 10’ x 10’ or 16’ x 10’ x 10’) create poor acoustics due to modal interference.

2. Optimal Room Ratios

- R. H. Bolt developed a simple chart to evaluate ideal room ratios.
- A well-balanced Golden Mean Proportion (1:1.6:2.6) is recommended

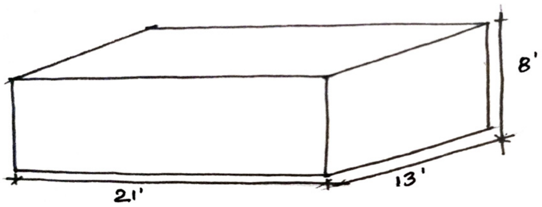


Fig2.20: Example of Golden Mean Pro-

3. Ceiling height

- Tall ceilings improve acoustics, but no part should be lower than 12 feet in performance spaces.

4. Room Shape & Surface Considerations

- Square and rectangular rooms should be avoided due to poor sound distribution.
- Irregular-shaped rooms are ideal for live recording as they help diffuse reflections and prevent standing waves.
- Parallel walls create unwanted sound reflections (ping pong effect), leading to comb filtering and standing waves.
- Concave surfaces concentrate sound and should be avoided, while convex surfaces help diffuse sound for better acoustics.

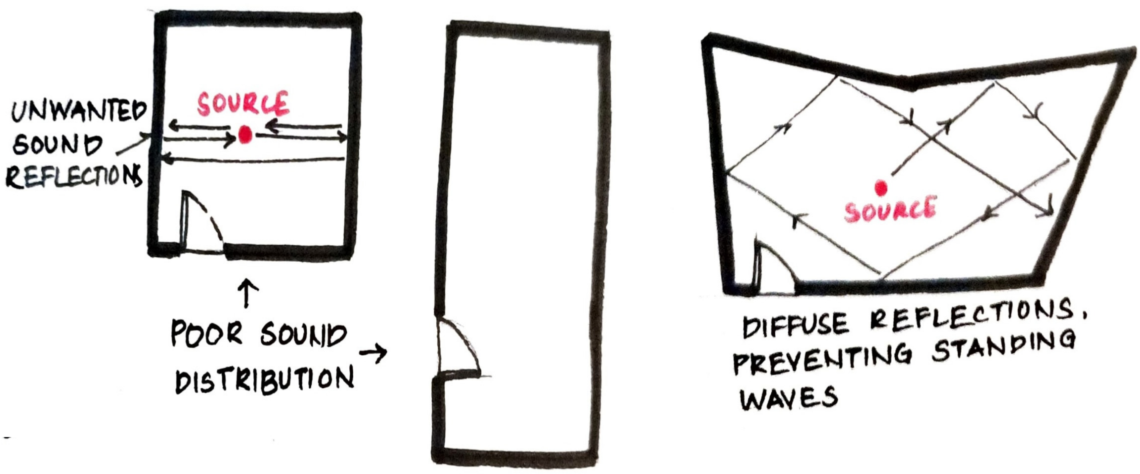


Fig2.21:Room shape & surface considerations

2.5.1.5:Sound Proofing

A well-designed studio must be effectively isolated from external noise to ensure high-quality recordings at any time without interference from traffic or ambient sounds. At the same time, sound generated within the studio, including loud instruments like drums and monitor outputs, should not escape the facility. Noise pollution regulations vary by region, with Germany and Austria enforcing particularly strict laws that require noise emissions from studios to remain within the average ambient noise level of their respective areas. Residential zones have more stringent restrictions compared to commercial areas, making sound isolation a critical aspect of studio construction.

Sound insulation is bidirectional, meaning it prevents both external noise from entering and internal sound from leaking out. To achieve optimal results, acoustic transmission losses must be carefully planned across different frequencies and in both directions. Since various noise sources and musical styles exhibit unique acoustic spectral characteristics, specific insulation methods must be chosen accordingly.

2.5.1.6: Sound Proofing Principles

2.5.1.6.1: Mass principle

There is a direct relationship between the mass of an acoustic wall and the insulation performance achieved: In theory, doubling the mass should result in twice the insulation (+6 dB or +6 STC /Rw). Increase the density of the material to double its mass or double the wall thickness. However, due to lateral transmission (for walls: transmission through the floor and ceiling), the effective increase in insulation efficiency by doubling the mass is only 4-5 dB.

TYPICAL STC VALUES FOR MASSIVE CONCRETE WALLS	
100 mm thick concrete	STC 48
200 mm thick concrete	STC 52
100 mm thick concrete blocks	STC 40
200 mm thick concrete blocks	STC 45
200 mm thick concrete blocks, filled with concrete and plastered both sides	STC 56

Table 2.1:Table of typical STC values of concrete

Source: FH Salzburg mma -music production: recording studio design - fh mma salzburg -music production recording studio design. (n.d.).

2.5.1.6.2: The Mass-Spring-Mass Principle

Just adding mass alone is not a very efficient way to increase the insulation. To achieve the amount of insulation required by a professional studio (STC 85 and more) with a single partition massive concrete wall, the wall should be over 2 m thick.

An efficient principle is decoupling two separate wall partitions, creating a Mass-Spring-Mass system. The advantage of this system is that much higher insulation ratings can be achieved with a lighter construction and without losing too much space due to the wall thickness. The spring in the M-S-M system can be simply an air space that can partially filled with rock wool, decoupling pads using a viscoelastic material or actual steel springs.

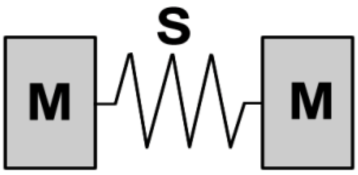


Fig2.22:Schematical Representation of a Mass-Spring-Mass

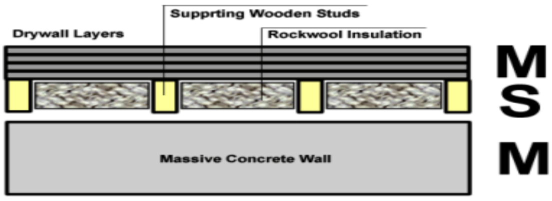


Fig2.23:MSM principle applied to a studio wall construction

Source: FHSalzburg mma -music production: recording studio design - fh mma salzburg -music production recording studio design. (n.d.).

Lightweight studio walls can be constructed using two separate partitions made from relatively light materials, ensuring they are decoupled from each other for better insulation. In a single stud, single frame wall design, insulation effectiveness can be enhanced by decoupling one of the partitions using a resilient channel—a flexible metal rail that attaches elastically to the wall frame. Instead of being directly fixed to the studs, gypsum boards are mounted onto this rail on one side, while on the other side, they are attached directly to the studs. To prevent sound leakage, all joints between boards and corners should be sealed with acoustical sealant. Additionally, the entire wall or ceiling should be installed on elastic pads to minimize flanking transmission. To further improve insulation, the wall cavities should be filled with rock wool, glass wool, or similar sound-absorbing materials.

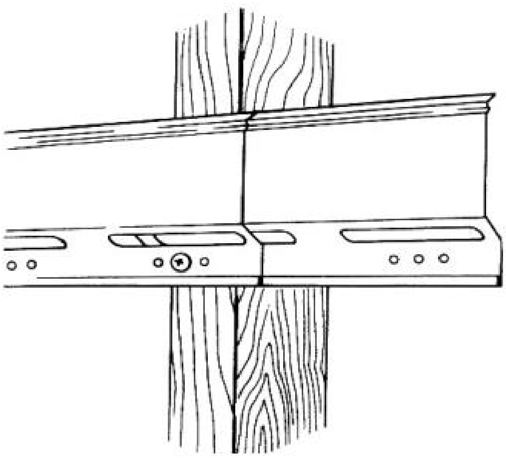


Fig2.24:Detail of a resilient channel, for the elastic mounting of a gypsum board

The factors that contribute to improve sound proofing are:
- The mass of each partition. Higher mass is better.
- The distance between the partitions (in a single stud wall, this is the stud dimension, for example 10x10 cm). Bigger distance is better. The decoupling of the partitions (resilient channel, double studs or separate wall frames; spring decoupling in floor systems).

TYPICAL STC VALUES FOR *DRYWALL CONSTRUCTION* (WOODEN FRAME + GYPSUM BOARD)	
Single frame, 16 mm gypsum board on each side	STC 34-35
Single frame, 16 mm gypsum board on each side + rock wool insulation	STC 36-38
Single frame, 16 mm gypsum board on each side with resilient channel	STC 38-40
Double studs, one layer soft fiber board + one layer 16 mm gypsum board on each side	STC 42
Double studs, one layer soft fiber board + one layer 16 mm gypsum board on each side + rock wool insulation	STC 47
Double frame, 16 mm gypsum board on each side	STC 43
Double frame, 16 mm gypsum board on each side + rock wool insulation	STC 48
Double frame, 16 + 25 mm gypsum board on each side	STC 55
Double frame, 16 + 25 mm gypsum board on each side + rock wool insulation	STC 60
Double frame, 16 + 25 mm gypsum board on each side + rock wool insulation and with additional resilient channel	STC 65-68

Table 2.2 :Typical STC values for drywall construction (wooden frame + gyp-
Source: Ervine, M. (2023). Sound Transmission Classes Explained. [online] Acoustiblok UK.

2.5.1.6.3: Room within Room Construction

Commercial studios often use the room-within-a-room technique for maximum sound insulation. This involves an outer shell made of heavy concrete or masonry to block external noise. Inside, floating rooms are built on separate concrete floors, isolated from the outer shell using elastic pads or springs. Inner walls and ceilings use lighter materials like wood or metal framing with gypsum or plywood panels. Special care is taken to prevent sound leakage at junctions and during the installation of electrical and HVAC systems.

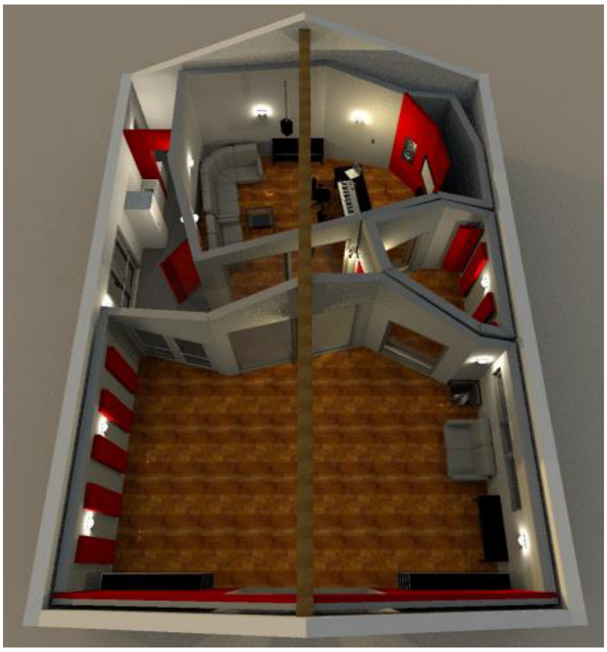


Fig2.25:Example of studio facility using room-in-room construction
Source: Ervine, M. (2023). Sound Transmission Classes Explained. [online] Acoustiblok UK.

2.5.1.6: Acoustic Material

Acoustic materials are things that have ability to absorb redundant noise and enhance transmission of sound. They play an important role in determining the quality of your auditory experience. Acoustics materials can be categorized into sound absorbers and sound diffusers.

2.5.1.6.1: Sound Absorber

Sound waves, when they encounter objects, either get absorbed or reflected. Reflection sends the sound back into the room, potentially causing echoes and reverberation, while absorption converts the sound energy into heat, diminishing its intensity. Acoustics science focuses on balancing absorption and reflection to achieve optimal sound control in a space.

2.5.1.6.1.1: Acoustic foam panels

Acoustic foam panels are a common solution used for controlling sound in various environments, such as recording studios. Made from open-celled materials like polyurethane or melamine foam, these panels absorb airborne sound waves to reduce noise, vibrations, and reverberation. Available in various colors, sizes, and thicknesses, they can be applied to walls, ceilings, and doors. Acoustic foam is lightweight, fire-resistant, and treated for safety, making it an essential material for acoustic treatment in spaces requiring high sound clarity.

Wedge Acoustic Foam | Pyramid Acoustic Foam | Square Grid | Quadritic Residue

Fig2.26: Types of acoustical foam panel

2.5.1.6.1.2: Acoustic fabric panels

Acoustic fabric panels are another sound treatment solution, typically made with a wood frame wrapped in fabric and filled with sound-absorbing materials like high-density fiberglass, glass wool, or foam. These panels are effective in absorbing sound and can be used to improve room acoustics, reducing unwanted noise and reverberation.

Fig2.27: Acoustical fabric

2.5.1.6.1.3: Sound Absorbing Underlayment

Sound-absorbing underlayment materials such as foam, vinyl, and rubber are dense and provide both sound absorption and soundproofing. These materials are generally placed between subflooring and flooring to manage sound transmission. Felt, in particular, is known for being highly effective in reducing sound, making it a popular choice for underlayment.

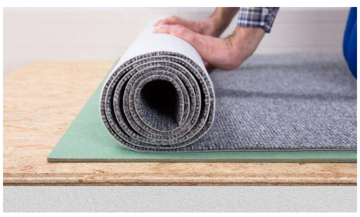


Fig2.28: Sound Absorbing Underlayment

2.5.1.6.1.4: Acoustic partitions

Acoustic partitions, often made of 100% polyester, can be either lightweight or heavyweight. Lightweight partitions are portable and used to divide spaces while controlling sound transmission, offering flexibility in room layouts. These partitions help manage noise levels in spaces that require temporary or adjustable divisions.

Fig2.29: Acoustic partitions

2.5.1.6.1.5: Acoustic mineral wool

Acoustic mineral wool serves dual purposes by both absorbing sound and providing soundproofing. It is fire-resistant, moisture-resistant, and easy to install. This versatile material is used in a variety of settings, including interior panels, ceiling panels, partitions, and even in appliances and machine rooms to reduce reverberation and unwanted noise. Its heat tolerance and lightweight nature make it an ideal choice for creating quiet, controlled environments.

Fig2.30: Acoustic mineral wool

2.5.1.6.2: Sound Diffuser

Sound diffusers are designed to scatter or disperse sound waves, reducing standing waves and echoes, which enhances sound clarity. Unlike sound absorbers that trap or eliminate sound, diffusers maintain the “live” ambiance of a room while improving acoustic performance by reducing unwanted reflections. They are commonly used in critical listening environments, such as recording studios, control rooms, and live music venues, where accurate sound reproduction is essential. Sound diffusers are often used alongside other acoustic treatments like absorbers, bass traps, or ceiling clouds to achieve the desired acoustic result.

2.5.1.6.2.1: Skyline Diffuser

Skyline diffusers use solid square cut blocks of calculated length arranged in a set pattern to scatter sound waves evenly. The pattern of the blocks makes it look like a city skyline.

Fig2.31: Skyline Diffuser

2.5.1.6.2.2: Quadratic Residue Diffuser

A quadratic diffuser uses wells or troughs of calculated depths and widths, also in a set pattern, to predictably control the diffusion of soundwave in an even pattern.

Fig2.32: Quadratic Residue Diffuser

2.5.2: Practice rooms

Practice rooms are dedicated spaces designed for musicians to rehearse, refine their skills, and explore their creativity without external distractions. These rooms are essential in music schools, concert venues, and professional studios, offering an acoustically optimized environment that enhances sound clarity and minimizes disturbances.

A well-designed practice room considers factors such as sound isolation, room proportions, ventilation, and lighting to create a comfortable and productive atmosphere. Whether used for solo practice, ensemble rehearsals, or music lessons, these spaces play a crucial role in the development of musicians by providing a controlled setting for focused learning and artistic growth.sounds from leaking into microphones recording other instruments, or to provide acoustically controlled environments for recording vocals or quieter acoustic instruments. This will include both room treatment and soundproofing.

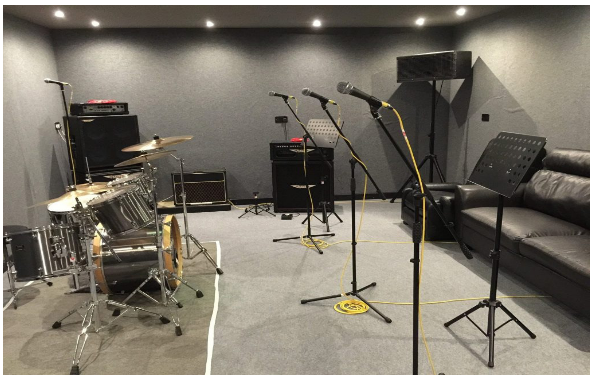


Fig2.33: Practice room

2.5.2.1 Types of Practice rooms

2.5.2.1.1 Solo Practice Rooms

Designing an effective solo music practice room requires careful consideration of dimensions to ensure optimal acoustics and comfort.

Music Activity Space	Area m^2	Height m	Volume m^3	AS2107,2000	DfES,2002	BB93,2003	OCPS,2003	ANSI S12.60
Music theory classroom	50-70	2.4-3.0	120-210	0.5-0.6	0.4-0.8	<1.0	N/A	<0.6
Ensemble /music studio	16-50	2.4-3.0	38-150	0.7-0.9	0.5-1.0	0.6-1.2	0.5-0.7	<0.6
Recital rooms	50-100	3.0-4.0	150-400	1.1-1.3	1.0-1.5	1.0-1.5	N/A	N/A
Teaching/practice room	6-10	2.4-3.0	14-30	0.7-0.9	0.3-0.6	<0.8	<0.5	<0.6
Studio Control room	8-20	2.4-3.0	19-60	0.3-0.7	0.3-0.5	<0.5	<0.6	N/A

Table2.3: Recommended Reverberation Times for Small Music
Source: Osman, Riduan (2010). Designing small music practice rooms for sound quality. [online] Sydney, Australia

RT is the reverberation time in seconds. For ANSI S12.60, DfES,2002 and BB93,2003 the RT is the mid-frequency value of Reverberation Time of the mean of the values in the octaves centred on 500Hz, 1000Hz and 2000Hz. (N/A means Not Available)
(from AS2107,2000, ANSI S12.60, 2002, DfES,2002, DfES(BB93),2003 and OCPS,2003)

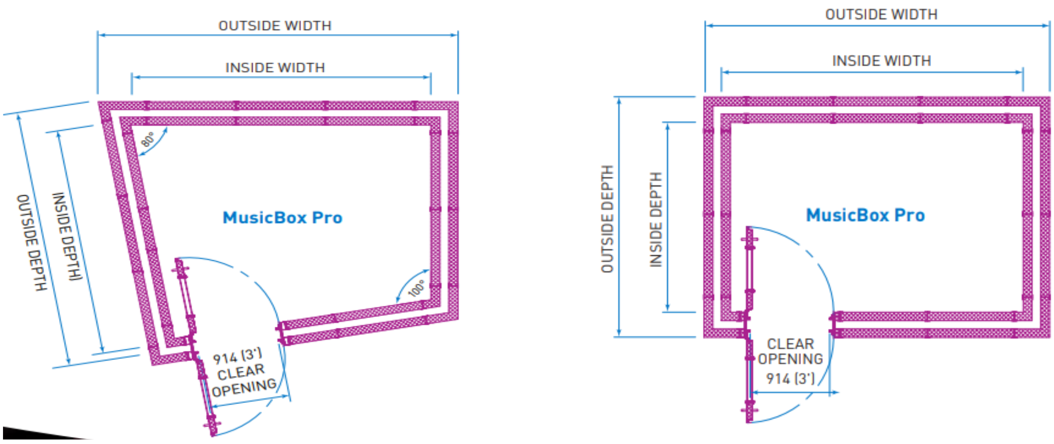


Fig2.34: Modules of IAC Music box

Model	Inside Dimensions			Outside Dimensions		
	Width	Depth	Height	Width	Depth	Height
MusicBox Rectangular Models						
MBPR01	2379mm 7'10"	1290mm 4'3"	2360mm 7'9"	2987mm 9'10"	1898mm 6'3"	2740mm 9'0"
MBPR02	2379mm 7'10"	2295mm 7'6"	2360mm 7'9"	2987mm 9'10"	2903mm 9'6"	2740mm 9'0"
MBPR03	3384mm 11'1"	2295mm 7'6"	2360mm 7'9"	3392mm 13'1"	2903mm 9'6"	2740mm 9'0"
MBPR04	3384mm 11'9"	3300mm 10'10"	2360mm 7'9"	3908mm 12'10"	3504mm 11'6"	2740mm 9'0"
MBPR05	4389mm 14'4"	3300mm 10'10"	2360mm 7'9"	4997mm 16'4"	3908mm 12'10"	2740mm 9'0"
MusicBox Angled Wall Models						
MBPA01	2375mm 7'9½"	1683mm 5'6"	2360mm 7'9"	3041mm 10'0"	2349mm 7'8"	2740mm 9'0"
MBPA02	2375mm 7'9½"	2673mm 8'9"	2360mm 7'9"	3041mm 10'0"	3339mm 10'11"	2740mm 9'0"
MBPA03	3380mm 11'1"	2847mm 9'4"	2360mm 7'9"	4046mm 13'3"	3513mm 11'6"	2740mm 9'0"
MBPA04	4385mm 14'5"	4011mm 13'2"	2360mm 7'9"	5051mm 16'7"	4678mm 15'4"	2740mm 9'0"
MBPA05	5390mm 17'8"	4186mm 13'9"	2360mm 7'9"	6056mm 19'10"	4852mm 15'11"	2740mm 9'0"

Table 2.4: Table showing possible dimension of music box
Source: IAC Music box, Music Practice rooms- Brochure (online)

S.NO	Practice Rooms	Area per person
1.	Vocal	3.5×3.5 sq. ft
2.	Choral (Standing)	0.55 sq. m
3.	String room	5.0× 5.0sq. ft
4.	Keyboard	4.0× 4.0 sq. ft
5.	Percussion (Drum)	7.0× 5.0 sq. ft
6.	Percussion (Tabala)	4.0× 4.0sq. ft
7.	Instrumental	1.9-2.2 sq. m

Table 2.5: Area per person for different instrument practice rooms

2.5.2.1.2 Band Rehearsal Rooms

In band rooms, instructors and students are exposed to high sound levels due to the large number of students playing loudly. Outdoors, such as on a football field, the direct sound level (80-90 dB) comes from the instrument to the student's ear without reflecting off any surfaces. This sound level decreases by about 5 dB for every doubling of the distance from the sound source. However, when the band plays indoors, sound reflects off room surfaces, amplifying the sound level above the outdoor level. To study this effect, computer models of six different rooms, along with an outdoor condition, were constructed to evaluate how adding absorbent materials reduces reflected sound energy in band rooms, as shown in a table with varying acoustical conditions.

	Band Rooms Configurations	
Room	**Description**	**Relative Sound Level (dB)**
Outdoors	Grass Surface	0
Fully reverberant room	Hard ceiling and walls, vinyl tile floor	+18
Band Room with low to moderate ceiling height, some acoustical treatment	Hard ceilings and walls with some absorbent materials on walls, carpet floor	+12
Band room with moderate ceiling height, sound absorbant and diffusing materials.	Room with moderate amounts of sound absorbent and diffusing materials on ceiling	+8
Band Room with desirable ceiling height and added absorbent and diffusing materials	Room with adequate sound absorbent and diffusing materials on raised ceiling	+7
Band room wall absorbent surfaces	Sound absorbing ceiling, sound absorbing panels on all walls, heavy carpet floor	+7

Table 2.6: Summary of relative loudness for various room treat-
Source: Siebein Associates (2003)

A Band Room with a low to moderate ceiling height and some sound-absorbent material is 1-7 dB quieter than a fully reflective room, making it noticeably quieter. Adding more absorbent and diffusing materials can reduce noise by another 1-5 dB, and strategic ceiling height and material choices can further decrease levels by 1-2 dB, resulting in a room that is 2-11 dB quieter—about half as loud as a fully reflective space.

Higher ceilings help diffuse reflected sound by increasing the travel distance before reflection. Diffusing panels on ceilings and walls distribute low-intensity reflections, improving instruction quality by allowing the instructor to hear all sections clearly. In contrast, a fully absorbent room, while having the lowest sound levels, is not ideal for teaching, as it prevents the instructor from effectively hearing students' performance.

2.5.2.1.3 Orchestral Rehearsal Rooms

Designing an effective orchestral rehearsal room requires careful consideration of dimensions to ensure optimal acoustics and comfort for musicians. While specific standards can vary based on ensemble size and musical repertoire, general guidelines include:

2.5.2.1.3.1.Volume and Floor Area:

- **Quiet Music Ensembles (e.g., strings, choirs)**:
  Net Volume: Minimum 700 cubic meters
  Net Floor Area: Minimum 50 square meters, plus 2 square meters per musician
  Ceiling Height: Minimum 5 meters

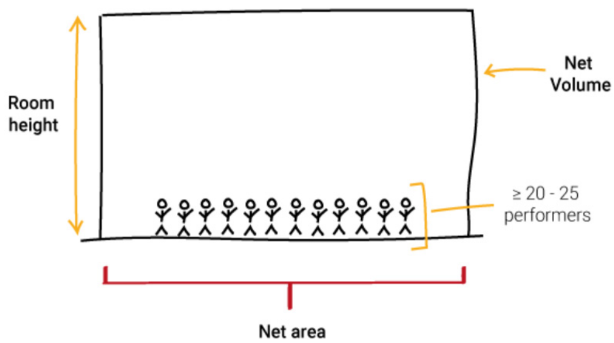
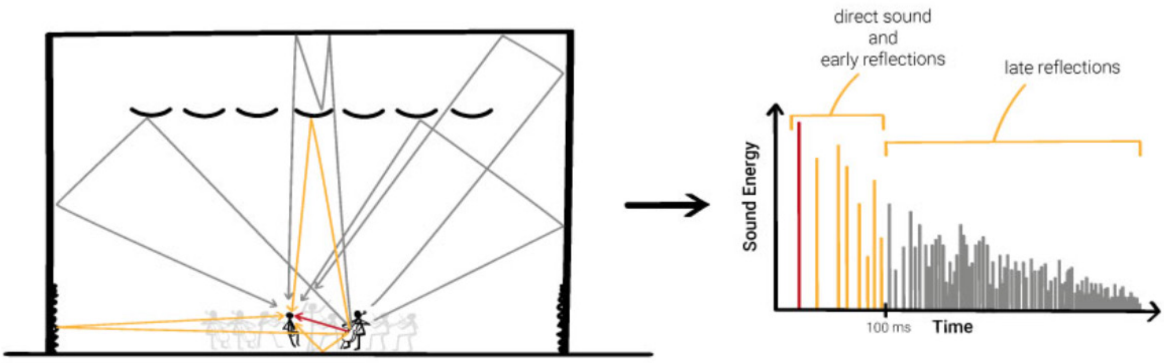


Fig2.35: Large Ensemble room
Source:ateliercrescendo.ac ,Design of rehearsal rooms for orchestras – Part 2: Some acoustic design tips (online)

- **Loud Music Ensembles (e.g., brass bands, symphony orchestras):**
  Net Volume: Approximately 30 cubic meters per musician
  Concert Bands: Minimum 1,000 cubic meters
  Brass Bands: Minimum 1,500 cubic meter
  Symphony Orchestras: Minimum 1,800 cubic meters
  Net Floor Area: Minimum 120 square meters, plus 2 square meters per musician
  Ceiling Height: Minimum 5 meters



2.5.2.1.3.2. Room Proportions and Geometry

- Avoid concave shapes, domes, curved walls, pitched ceilings, and angled walls, as these can focus sound unevenly.

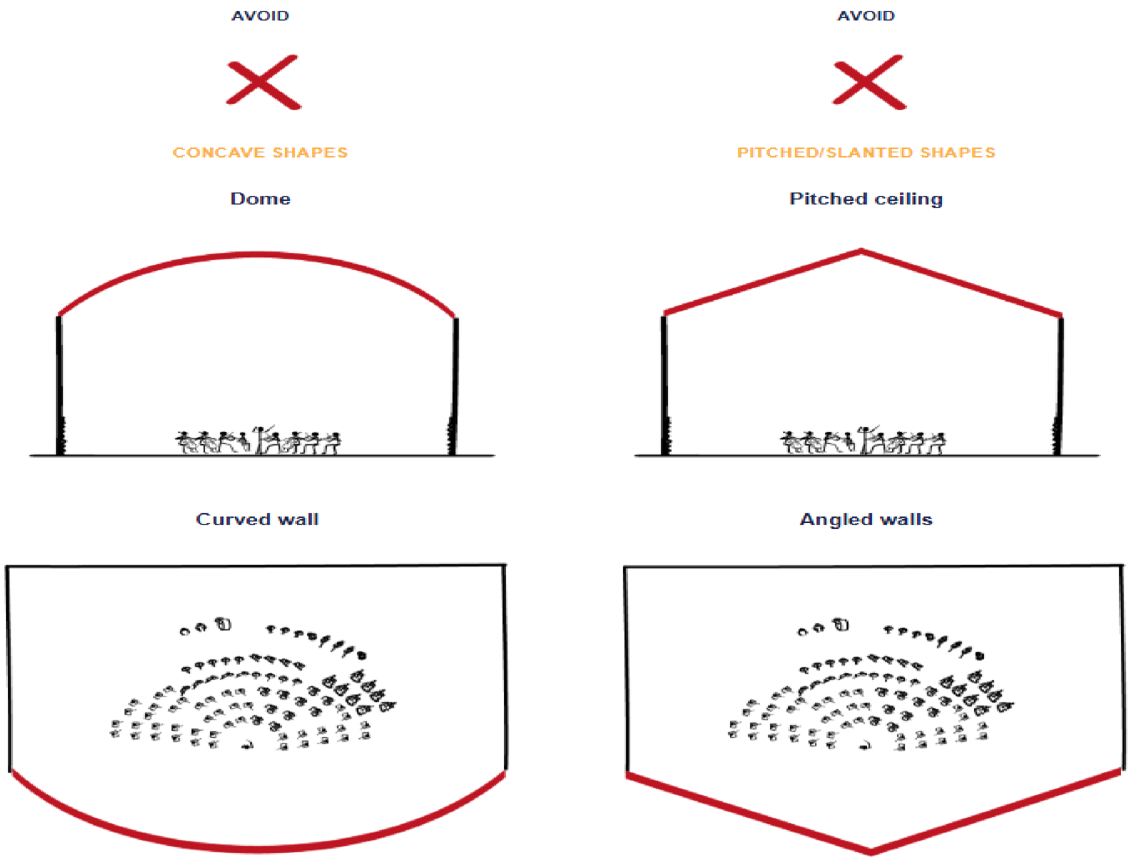


Fig 2.36:Diagram showing to avoid Concave, pitched / slanted surfaces
Source:ateliercrescendo.ac ,Design of rehearsal rooms for orchestras – Part 2: Some acoustic design tips (online)

- A cuboid or "shoebox" shape is often preferred, featuring a rectangular floor area with parallel side walls and a tall ceiling.
- Incorporate sound-diffusive finishes to prevent flutter echoes and promote a diffuse sound field.

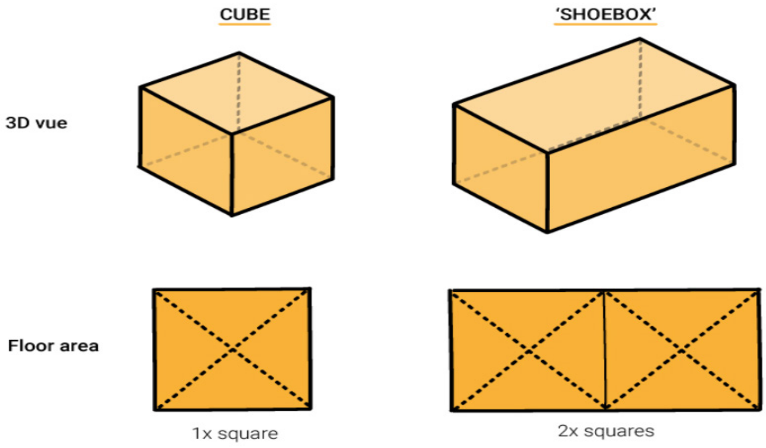


Fig2.37: Shoebox shape

2.5.2.1.3.3 Acoustic treatment for the walls of music rehearsal rooms

The wall behind the orchestra conductor should incorporate sound-absorbing and/or diffusive materials to prevent strong direct reflections. This helps avoid the illusion of a "virtual orchestra" behind the conductor by reducing the impact of reflected sound returning from the wall.

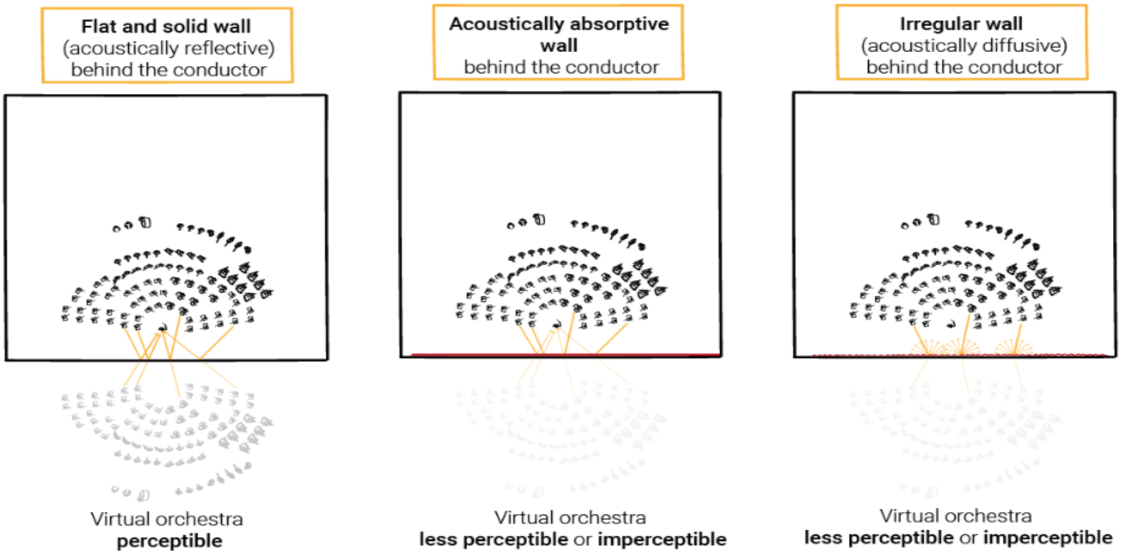


Fig 2.38: Sound absorbing/ diffusive wall

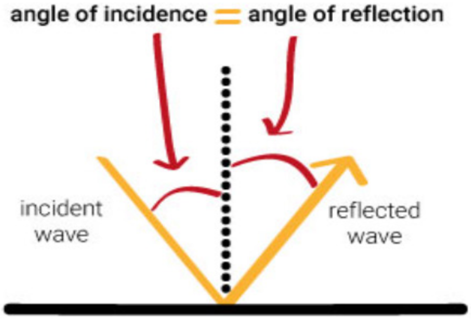


Fig: Specular reflection

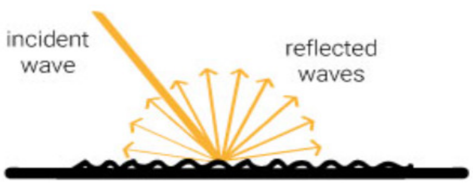


Fig: Diffusive reflection

Source:ateliercrescendo.ac ,Design of rehearsal rooms for orchestras – Part 2: Some acoustic design tips (online)

2.5.2.1.3.3.1 Walls at lower level
Since most musicians face the conductor, sound-absorbing finishes should be avoided at lower levels (below head height). Instead, surfaces should favor elements that reflect and diffuse medium and high frequencies, ensuring that both the conductor and musicians receive lateral sound reflections, which are crucial for hearing themselves and others.

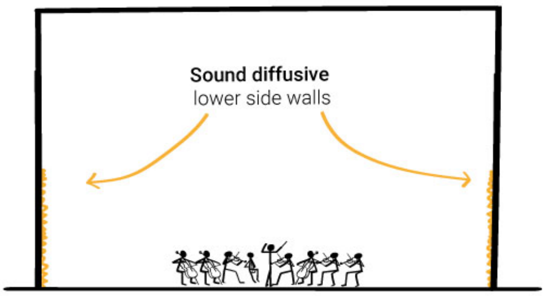


Fig2.39: Sound diffusive on lower walls

However, some surfaces can be designed to absorb low-frequency sound by using materials such as:
- A lightweight sheet, board, or face
- A cavity behind the surface, optionally filled with sound-absorbing material

Examples of such materials include:
- Plasterboard or gypsum-based boards on a frame
- Timber sheets or boards mounted on a frame
- Suspended ceilings

Additionally, on walls farther from the musicians, sound-absorbing finishes may be necessary to prevent unwanted late reflections.

2.5.2.1.3.3.2 Walls at upper level
The upper walls, i.e. approximately above head height, can include sound diffusive surfaces.

However, they are a good location to add broadband absorption materials to lower the overall sound reverberation within the rehearsal room.

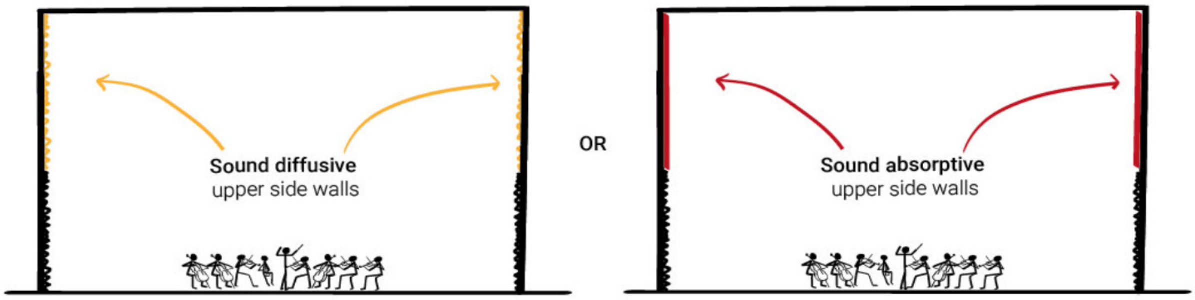


Fig2.40: Sound diffusive or absorptive on upper
Source:ateliercrescendo.ac ,Design of rehearsal rooms for orchestras – Part 2: Some acoustic design tips (online)

2.5.2.1.3.4. Acoustic consideration for the floor of music rehearsal rooms
A hard floor finish fixed directly on concrete provides minimal sound absorption. However, a raised hard floor can absorb some low-frequency sound due to the cavity beneath it. This design benefits musicians, as it maintains strong reflections at medium and high frequencies, which are essential for hearing themselves and others.

For this reason, carpet should be avoided, as it absorbs sound at these crucial frequencies, reducing the effectiveness of lateral reflections. Below are examples of different floor finishes and their sound absorption performances.

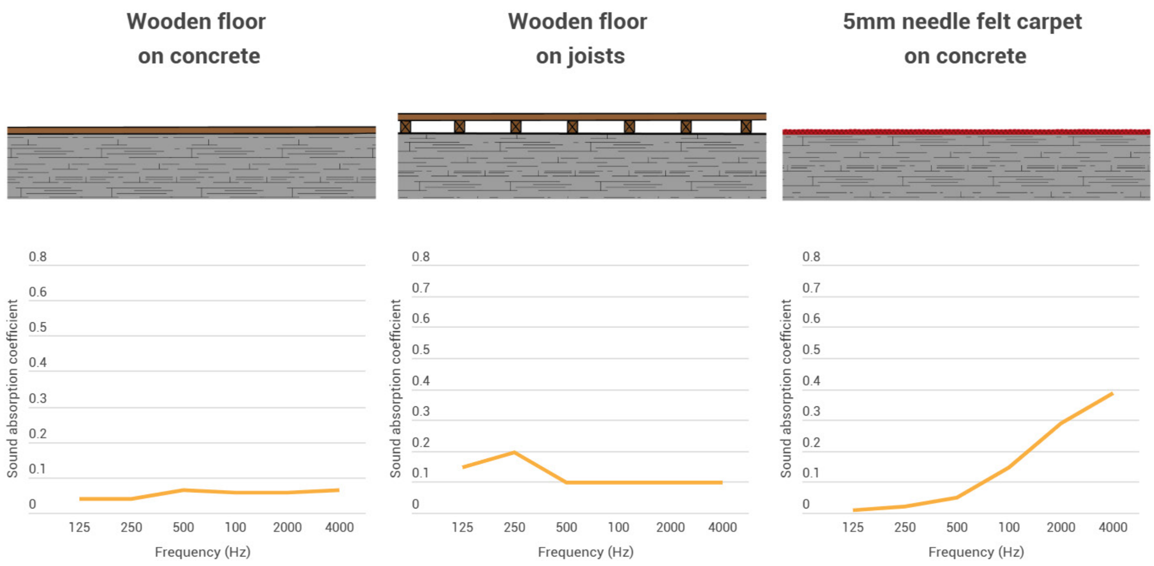


Fig2.41: Sound absorption coefficients of different floor finishes

2.5.2.1.3.5. Overhead reflectors for music rehearsal rooms

In large and tall spaces where orchestras perform, overhead reflectors are often necessary to provide early reflections and enhance acoustic conditions. Additional wall reflectors above head height or orchestra shells can also serve this purpose.

Placement Guidelines:

For large and loud ensembles: Overhead reflectors should be positioned 8-10 meters above the floor.

For small and quiet ensembles: They can be placed as low as 6 meters above the floor.

Design Considerations: Smaller reflectors arranged in arrays are preferable over single large panels to ensure even sound diffusion.

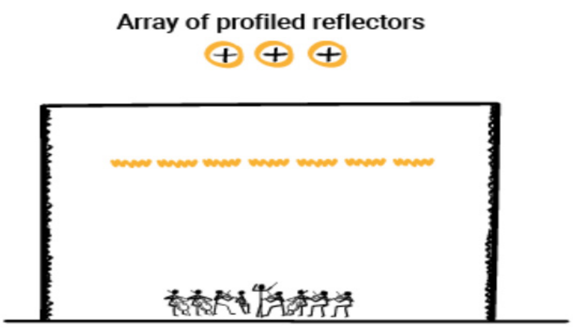


Fig2.42: Types of arrangement of overhead reflectors
Source:ateliercrescendo.ac ,Design of rehearsal rooms for orchestras – Part 2: Some acoustic design tips (on-line)

Recommended Reflector Shapes:
- Convex (curved)
- Random waves
- QRD-type (Quadratic Residue Diffuser)
- Other irregular, randomly shaped surfaces
Flat reflectors should be avoided, as they do not distribute sound effectively.

Material Selection:
Reflectors should be made from dense and stiff materials to prevent sound absorption, especially at low frequencies. Common materials include:
- Gypsum-based panels
- Dense plaster
- Wood particle or fiber-based panels
- Glass

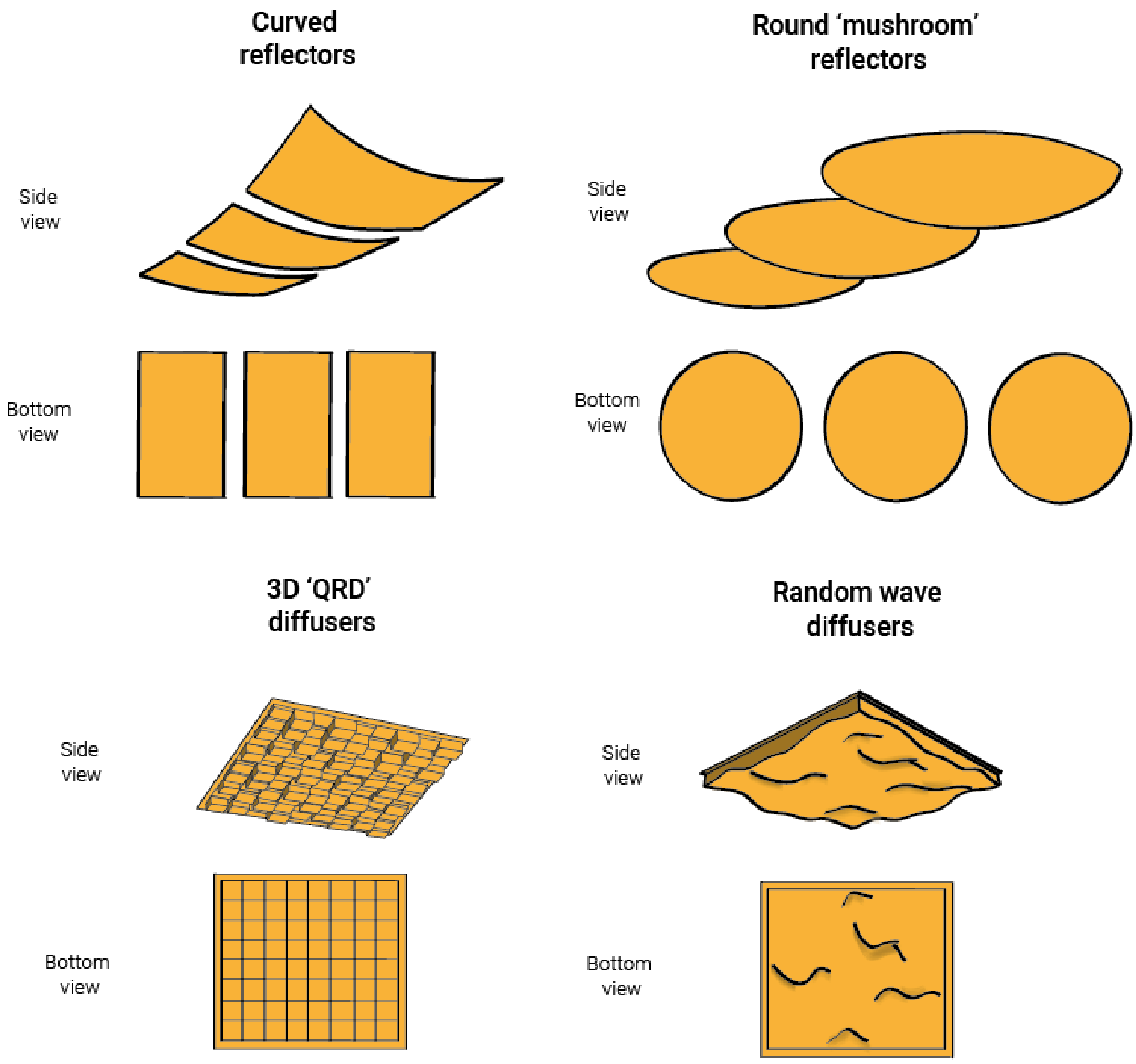


Fig2.43: Types of overhead reflectors
Source:ateliercrescendo.ac ,Design of rehearsal rooms for orchestras – Part 2: Some acoustic design tips (online)

2.5.3: Performance area

2.5.3.1: Auditorium

An auditorium is a space specifically designed to accommodate various audio and visual performances along with their audiences. These venues are commonly found in theaters, schools, community centers, and entertainment facilities. They serve multiple purposes, including rehearsals, presentations, performing arts events, and educational activities.

Theater and auditorium layouts are created to host performing arts and public speaking events, with a strong emphasis on audience sightlines and acoustics. The main feature is the stage, where performances or presentations take place, and it should be visible from all seating areas. Seating arrangements can vary: traditional proscenium theaters have seats arranged in rows facing a stage at one end, while amphitheaters have seating surrounding a central stage.

Some contemporary designs incorporate flexible or movable seating to cater to a variety of events. Acoustics are vital for ensuring sound clarity throughout the space, and lighting for both the stage and audience plays an important role. These venues are used for plays, concerts, lectures, and ceremonies, creating an environment where performers and audiences can engage effectively.

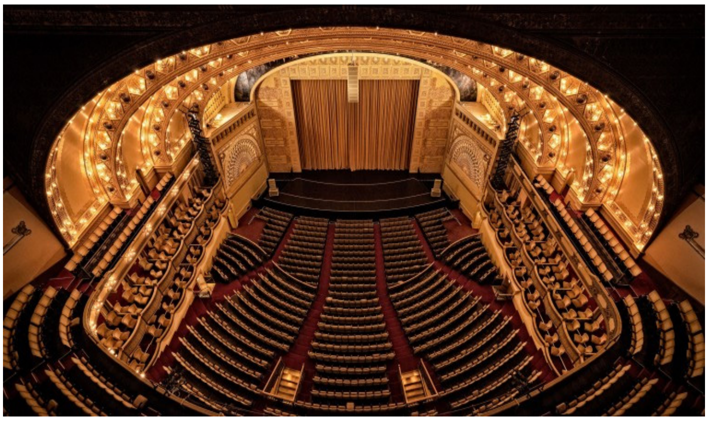
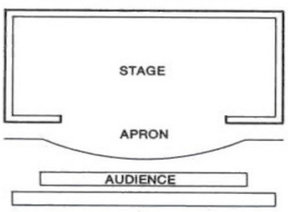
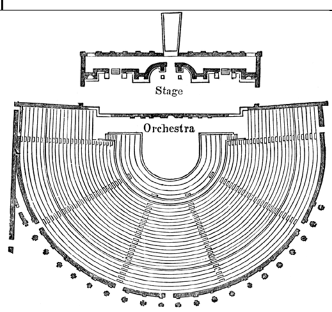


Fig2.44: Auditorium
Source:seechicagodance.com (online)

2.5.3.2: Types of Auditorium

	Proscenium Theaters	Amphitheaters	Multi-Purpose Halls:
Description	Feature a stage at one end with the audience facing it directly	Open-air venues with a central stage surrounded by ascending seating.	Versatile spaces accommodating various events, from theatrical performances to music concerts.
Characteristics	Often include a proscenium arch framing the stage, separating performers from the audience.	Designed to provide unobstructed views and natural acoustics.	Typically designed with adaptable features to support diverse performance requirements.





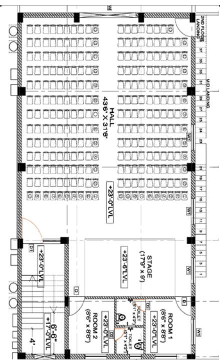


Table 2.7: Types of Auditorium

Fig2.45: Types of Auditorium
Source:bbc.co.uk(online)

2.5.3.3: Parts of Auditorium

2.5.3.3.1: Auditorium Stage

The stage should be sized to accommodate the largest group expected to be featured. Assume that the typical stage is 30-35 feet deep with a proscenium opening of 40-50 feet wide, and up to 30 feet tall. The side stage should be at least half the size of the proscenium opening on each side. Ideally, access to the stage is handicap accessible. That can be accomplished by the construction of side aprons on the same level as the "cross-aisle."

2.5.3.3.1.1: Auditorium Considerations

Dimensions can get tricky, but a good rule of thumb is arranging the size of the auditorium around the type of performance and the number of audience members you plan to seat:
200 seats: 270m²
150 seats: 190m²
75 seats: 125 m²

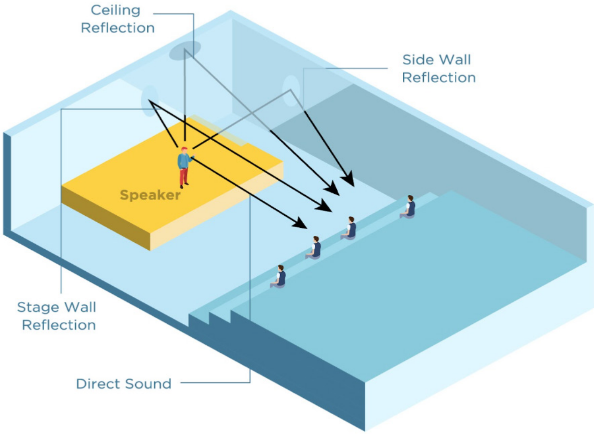


Fig2.46: Auditorium design
Source:archi-monarch.com(online)

2.5.3.3.2: The Main Seating Area

The main seating area is where the bulk of the audience sits. Standard estimates are based around guidelines of approximately 18 sq. ft per person. This allows for aisle ways, sound and light control areas, and entryways that trap the light when late-comers arrive. Viewing angles are critical components of seating layouts; every seat should have a great one. Acoustical control is a science, and the use of 3D computer models is essential to develop the optimum "sound environment" when designing a seating area.

2.5.3.3.2.2: Floor Design

Whether the floor is sloped or level is an important part of auditorium seating design. Many auditoriums use raked seating, which is positioned on an upwards slope away from the stage, in order to give the audience a better view than if the seats were all on the same level.
(Source : trashcansunlimited.com)

When designing a floor space for a theater, consider:
- The impact of both row spacing and the sightline of the audience
- Tier depth
- Tier height
- Numbers of aisles
- Aisle width
- Slope degree
- Any form of construction that might block your audience's view

2.5.3.3.2.3: Types of Seating

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- Tier depth
- Tier height
- Numbers of aisles
- Aisle width
- Slope degree
- Any form of construction that might block your audience's view

Feature	Steeper Ascending Seating	Shallow Ascending Seating
Visibility	Provides better sightlines for all audience members	Keeps audience members closer to the same level
Atmosphere	Enhances drama and theatrical experience	Encourages engagement and communication
Best For	Theaters, concert halls, and playhouses	Lecture halls, business conferences, and seminars
Audience Experience	Creates a sense of depth and immersion in performances	Promotes interaction and discussion
Seating Arrangement	Front rows slope downward, revealing the stage more clearly	Seating is more level, reducing separation between attendees
Audience Needs	Focused on performance viewing	Often includes note-taking, beverages, and snacks
Additional Amenities	May include enhanced stage lighting and sound systems	Requires strategically placed trash cans and recycling bins

Table 2.8: Table showing features of types of seating

2.5.3.3.2.4: Sightlines

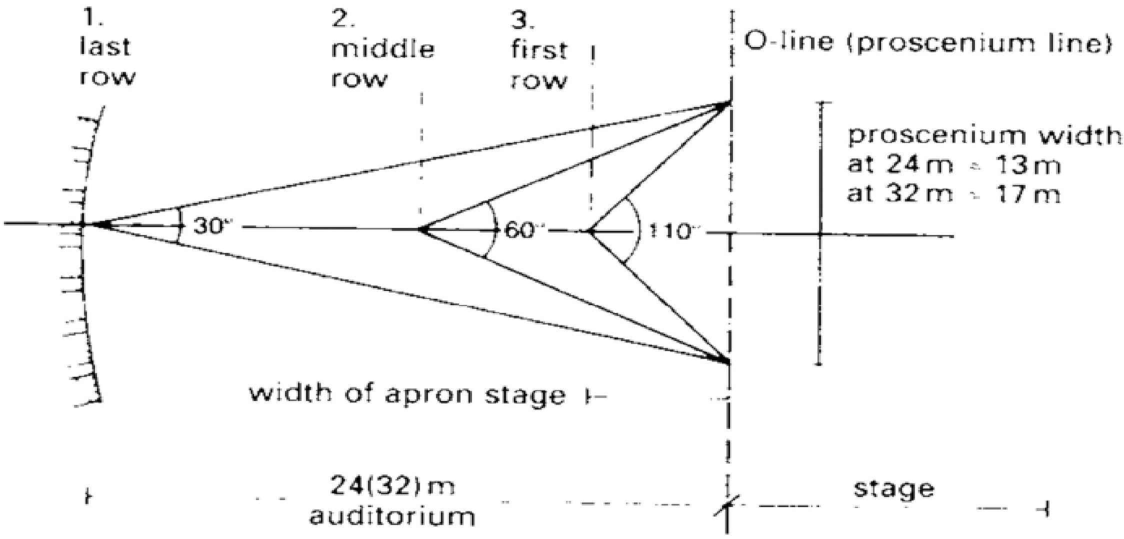
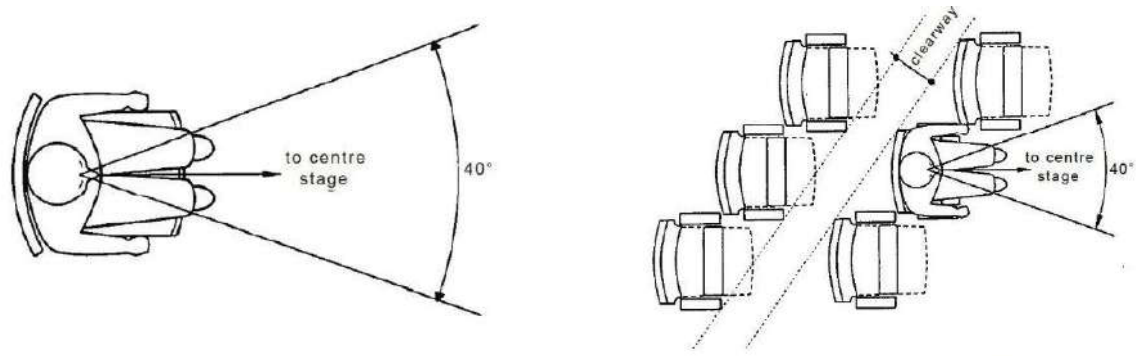


Fig2.47: Sightlines in auditorium
Source: Neuferts Architects Data

2.5.3.3.2.4.1: Horizontal Sightlines

Given a particular size and shape of the platform or stage, horizontal sightlines limit the width of the seating area in the auditorium. This is more critical with the proscenium stage and with film, video and slide projection. Without head movement, the arc to view the whole platform or stage on plan is 40° from the eye, as shown in the figure.



The angle of horizontal vision for a stationary head is 40°

(b) *Where the head angle would exceed 30°, the seats may be angled within the row*

Fig2.48: Horizontal sightlines

Source: Neuferts Architects Data

2.5.3.3.2.4.2: Vertical Sightlines

P: Lowest and nearest point of sight on the platform or stage for the audience to see clearly.

HD: Horizontal distance between the eyes of the seated members of the audience, which relates to the row spacing and can vary from 760 mm to 1150 mm and more.

EH: Average eye height at 1120 mm above the theoretical floor level: the actual eye point will depend on seat dimensions.

E: Distance from the center of the eye to the top of the head, taken as 100 mm or 120 mm as a minimum dimension for the calculations of sightlines. For assurance that there is a clear view over the heads of those in the row in front this dimension should be a least 125 mm.

D: Front row of seats: the distance from point P to the edge of the average member of the audience in the front row.

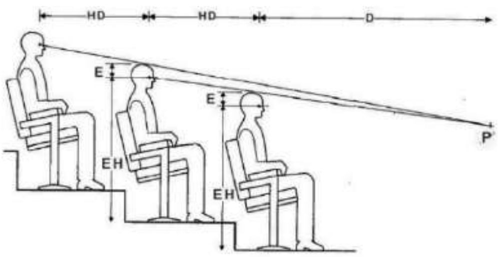
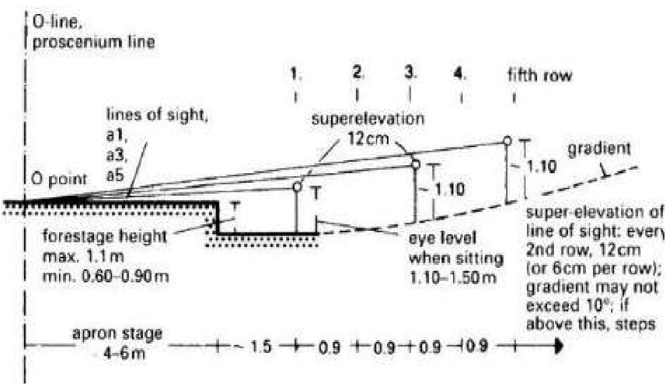


Fig2.49: Vertical sightlines

Source: Neuferts Architects Data



2.5.3.3.2.5 Number of seats in a row

With traditional seating the maximum number is 22 if there are gangways at both ends of the row, and 11 for gangway at one end. Thus in all but the smallest auditorium the gangways divide the seating into blocks. Rows with more than 22 seats are permitted if the audience is not thereby imperiled. A maximum of 16 seats per aisle. 25 seats per aise is permissible if one side exit door of 1 m width is provided per 3-4 rows.

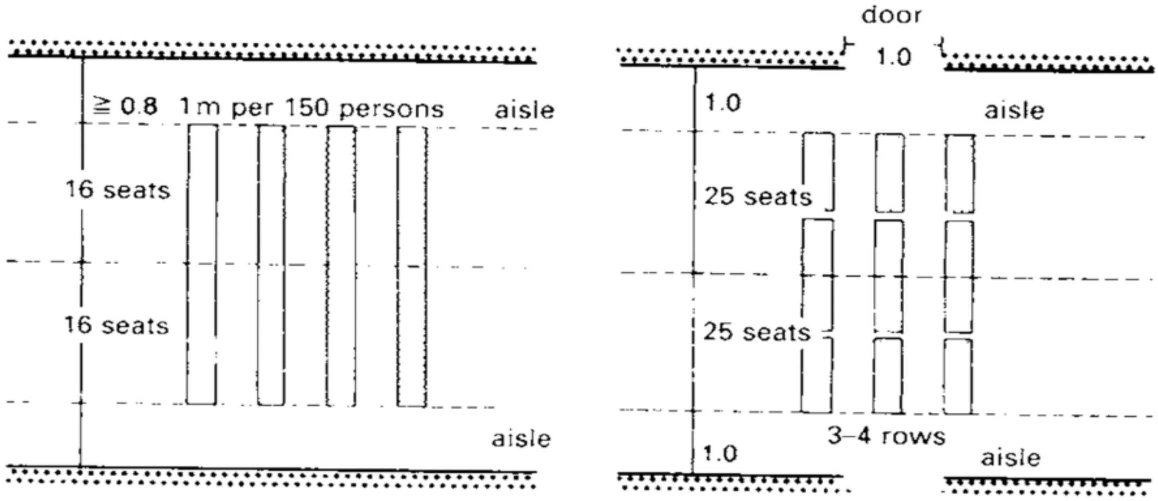


Fig2.50: Number of seats
Source: Neuferts Architects Data

2.5.3.3.2.6 Row to Row Spacing

Spacing is controlled by clearway between the leading edge of the seat and rear back of the seat.

For traditional seating the minimum clearway for people to pass along the row 300 mm and this dimension increases with the number of seats in a row.

For continental seating the clearways not less than 400 mm and home than 500 mm.
Legislation also dictates the minimum row to row dimension at 760 mm this is usually not adequate and the minimum should be 850mm to 900mm for traditional seating.

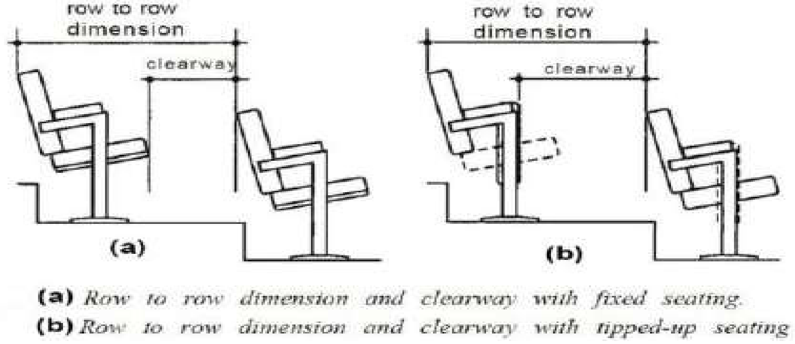


Fig2.51: Row to row spacing
Source: Neuferts Architects Data

2.5.3.3.2.7 Seating density

Seat with arms seat can occupy a space as small as 500 mm wide with a row to row dimension of 760 to 900 mm but can be as large as 750 mm wide by 1400 mm. The area per seat therefore varies between 0.38m2 and 1.05m2. Increased dimensions reduces seating capacity. Minimum dimensions as laid down by legislation offer a low standard of comfort and should not be taken as a norm, but the social cohesion of the audience may be lost if the standards are too high.

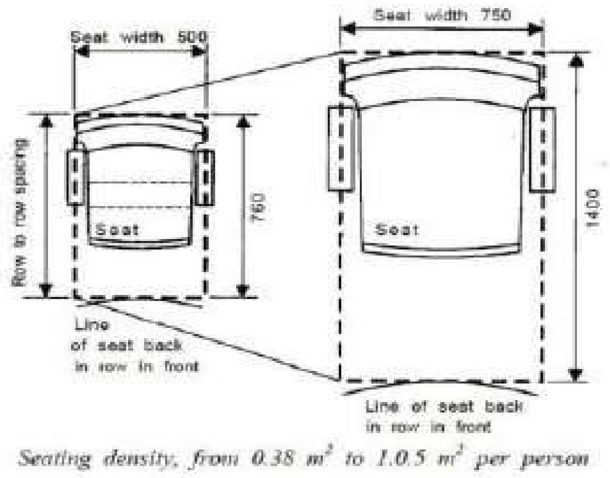


Fig2.52: Seating density
Source: Neuferts Architects Data

2.5.3.3.2.8: Types of Seating layout

Fig2.53: Multiple aisles seating

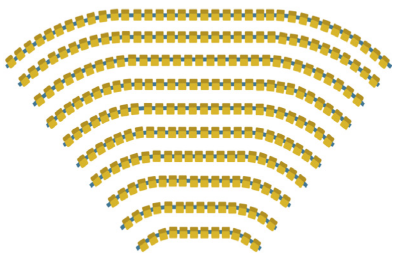


Fig2.54: Continental seating

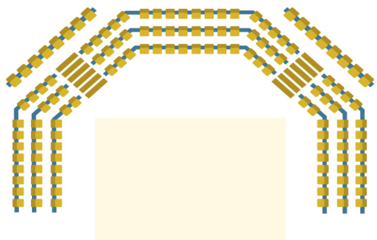


Fig2.55: Horse shoe seating

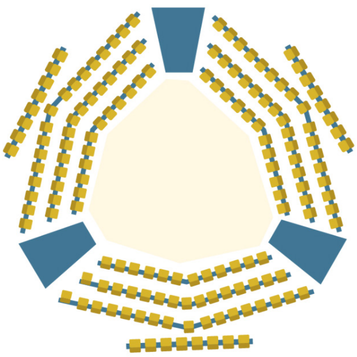


Fig2.56:Vine yard music hall

Fig2.57: Wide Fan seating

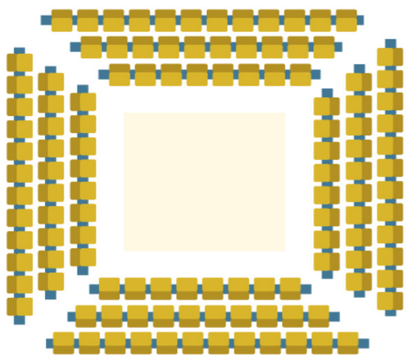


Fig2.58:Arena Stage

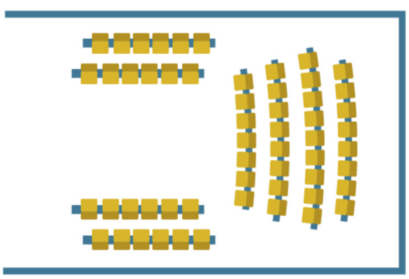


Fig2.59: 3/4 stage

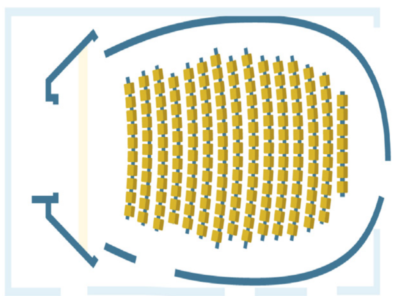


Fig2.60:Proscenium stage

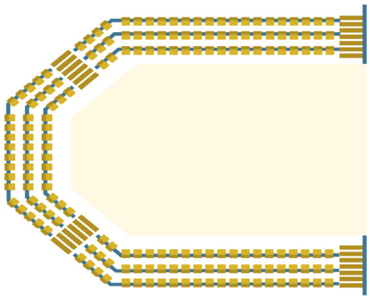


Fig2.61:Thrust stage

Source:archi-monarch.com(online)

2.5.3.3.3: Support areas

If the auditorium is the heart of a venue, the support spaces are its essential structure, ensuring smooth operations.

Front-End Spaces: These include the ticket booth, entrance vestibules, lobby, coat check, retail areas, and concessions. Stylish or discreet trash receptacles are often used in lobbies, while under-counter bins are provided for staff.

Back-End Spaces: These consist of storage rooms, dressing rooms, a green room (which can also serve as a rehearsal or instructional space), set construction areas, and equipment rooms. Modern performance venues incorporate computer-controlled stage rigging and LED theatrical lighting, requiring dedicated space for storage and operation. These areas benefit from commercial-grade or wheeled trash bins to maintain cleanliness and efficiency.

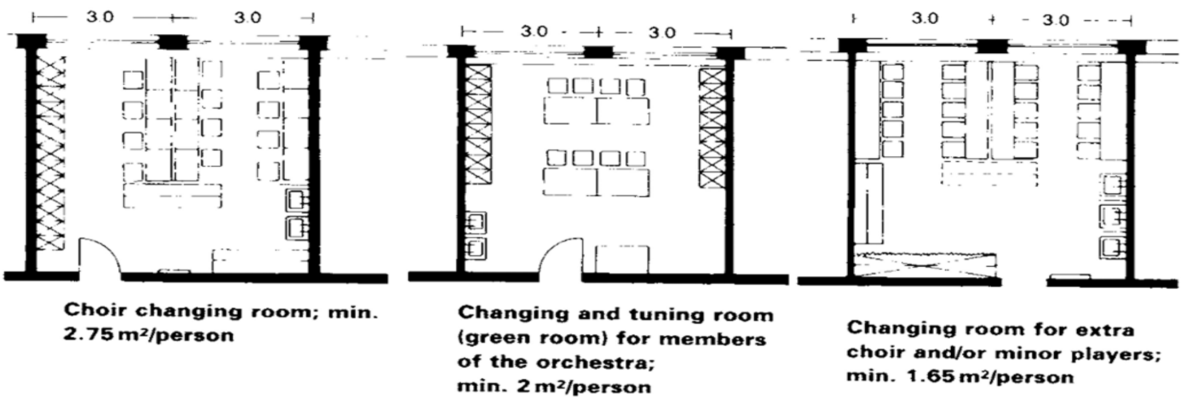


Fig2.62: Layout of Changing/ Green room
Source: Neuferts Architects Data

DESCRIPTION TENANT OCCUPIABLE AREAS	QTY.	SF EACH	SPACE REQ'D.	SUM ACTUAL SF	TENANT USABLE FACTOR	TENANT USF
Entrance				2,096		
Lobby	1	1,500	1,500			
Entrance Vestibules	1	96	96			
Coat Check	1	150	150			
Retail Area	1	200	200			
Media Library	1	150	150			
Main Auditorium				4,800		
Seating (300 seats)	1	3,600	3,600			
Stage	1	1,200	1,200			
Support Spaces				1,300		
Projection/Control Room	1	300	300			
Equipment Storage	1	300	300			
Rear Projection Room	1	400	400			
Public Toilets (Male	1	120	120			
Public Toilets (Female)	1	180	180			
Tenant Suite			8,196	8,196	1.14	9,375
Tenant Usable Areas						18,750

Table 2.9: Auditorium space types

2.5.4: Interactive Sound & Music Exploration zones

Interactive Sound & Music Exploration Zones are designed to engage visitors in hands-on experiences, allowing them to experiment with sound, music, and acoustics in a dynamic and immersive way. These zones cater to all ages and skill levels, blending education with entertainment to deepen the understanding of sound principles and musical creativity.

"The future of museum and gallery layouts is likely to be shaped by immersive and interactive experiences. Building on contemporary trends like digital exhibitions and virtual reality, these spaces could offer more dynamic and engaging ways to experience art and history. Imagine galleries where augmented reality brings paintings to life, or where visitors can virtually step into historical scenes.

There may also be a shift towards more flexible, open spaces that can be easily reconfigured for different types of exhibits. Sustainable design will play a key role, with eco-friendly materials and energy-efficient lighting. Overall, museums and galleries will aim to create more personalized and memorable experiences, blending education with entertainment."

Source: Dimensions.com

2.5.4.1: Aqua Resonance Gallery

Purpose:

A meditative and exploratory space that uses the natural resonance of water to create immersive soundscapes. Visitors experience how water transmits, distorts, and reflects sound through interactive installations like hydrophones, water drums, and ripple-activated tones.

Size: Approximately 50–90 square meters
Ceiling Height: 3.5–4.5 meters

Fig2.63: Aqua Resonance Gallery
Source:pinterest.com

2.5.4.2: Aura Resonance Gallery

Purpose:

A dynamic environment that visualizes and sonifies the energy or 'aura' of individuals using biofeedback sensors (like heartbeat, skin conductivity, or motion). The space reacts in real-time, translating personal data into ambient light and sound compositions.

Size: Approximately 40–70 square meters
Ceiling Height: 3.5–4.5 meters

Sources: Dimensions.com, Whole Building Design Guide, stormaudio.com,Global Expo (online)

Fig2.64: Aura Resonance Gallery
Source: pinterest.com

2.5.4.3 Immersive Tactile Gallery

Purpose:

A full-body experience where sound is felt as much as it is heard. The space integrates vibrating floors, haptic walls, and tactile interfaces that convert music and sound into touch-based sensations. Ideal for inclusive sensory engagement.

Size: Approximately 40–80 square meters

Ceiling Height: 3–4.5 meters

Fig2.65: Silent disco
Source: pinterest.com (online)

2.5.4.4 3D Sound Dome

Purpose:

An enclosed hemispherical space designed for immersive spatial audio experiences. Using an array of strategically placed speakers or ambisonic sound systems, it allows visitors to experience sound from all directions ;above, below, and around, creating a fully enveloping acoustic environment ideal for concerts, virtual soundscapes, and experimental compositions.

Size: Approximately 75-150 square meters.
Ceiling Height: 5-8 meters.

Sources: Dimensions.com, Whole Building Design Guide, stormaudio.com,Global Expo (online)

Fig2.66: 3D Sound Dome
Source: polidomes.com(online)

2.5.4: Administration area
2.5.4.1: Office spaces

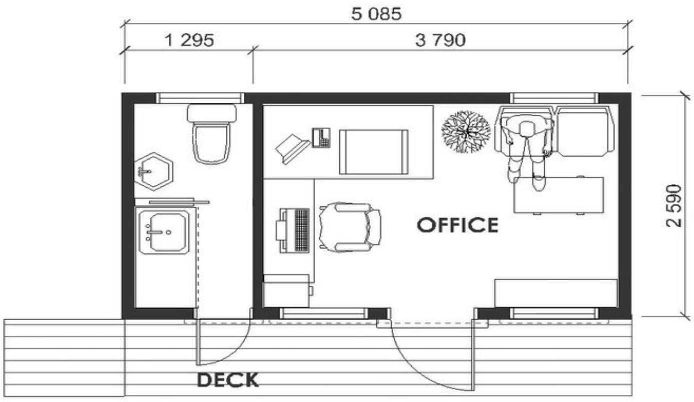


Fig2.67: Office spaces

2.5.4.2: Meeting room

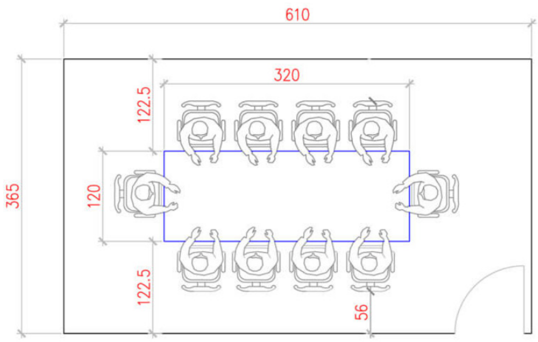
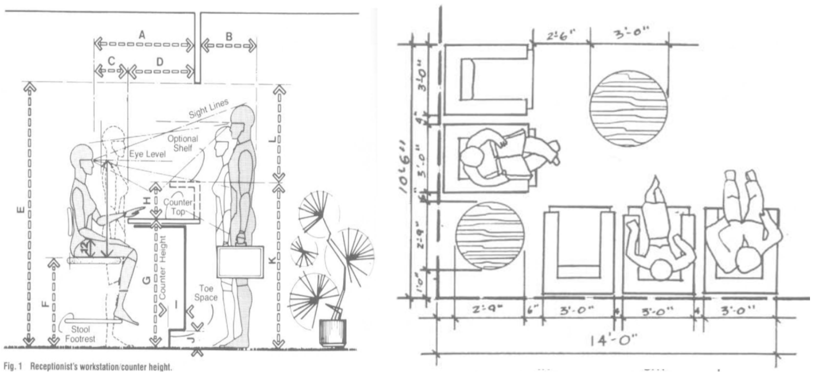


Fig2.68: Meeting room

Room Size (CM)	Seats
430x365	4-6
450x365	6-8
490x365	6-8
550x365	8-10
610x365	8-10
610x390	10-12
640x365	10-12
640x390	10-12
670x365	10-12
670x390	12-14
700x390	12-14
730x390	14-16
850x390	18-20
975x390	22-24

Table 2.69: Seatings in various room sizes
Source: workspace.ae (online)

2.5.4.3: Reception area



A	40–48	101.6–121.9
B	24 min.	61.0 min.
C	18	45.7
D	22–30	55.9–76.2
E	78 min.	198.1 min.
F	24–27	61.0–68.6
G	36–39	91.4–99.1
H	8–9	20.3–22.9
I	2–4	5.1–10.2
J	4	10.2
K	44–48	111.8–121.9
L	34 min.	86.4 min.

Fig2.70: Standards of Reception area
Source: Neuferts Architects Data

2.5.4.4: Cafeteria

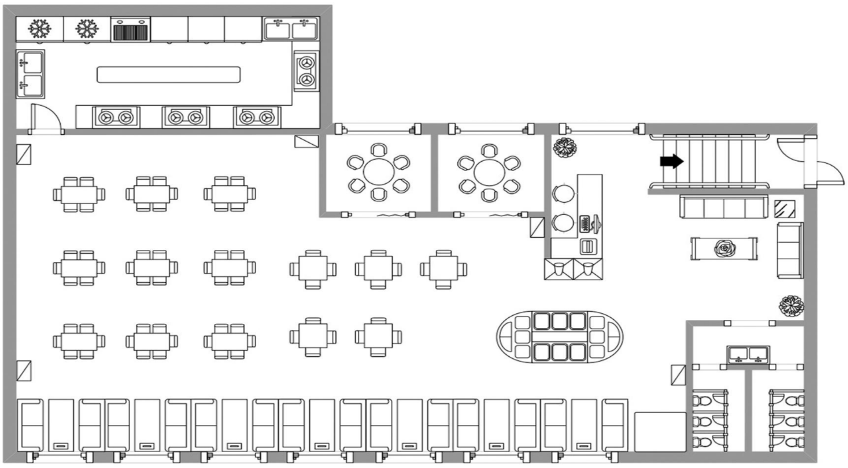


Fig2.71: Typical School Kitchen and Dining Layout
Source: pinterest.com (online)

Space required for service system = 40 – 60 m2 approx.
Dining Room Size = 1.2 – 1.4 m2 per seat
For 50 – 80 occupants: 70 – 112 m2 area
(Source: Neuferts 4th edition)

Space required for kitchen = 0.5 m2 per pupil
Dining Room Size = 1m2 per seat
For 50 – 80 occupants: 50 – 80 m2 area
(Source: Architects' Data)

Counter service = 18 – 20 sq.ft per person
Dining Room Size = 9 – 12 sq.ft per seat
For 50 – 80 occupants: 600 – 960 sq.ft area
(Source: www.oakstreetmfg.com)

2.5.4.5: Security and Survelliance area

The Security & Surveillance Area is crucial in ensuring the safety of visitors, staff, and installations within an interactive music and sound exploration zone. This area integrates modern technology to monitor, protect, and manage the space efficiently.

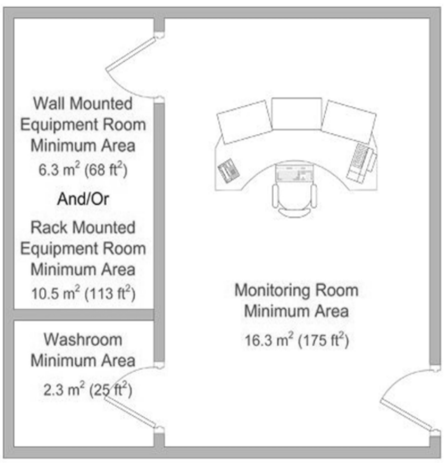


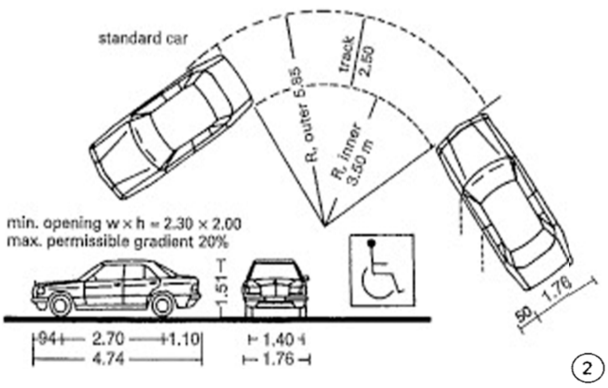
Fig2.72: Plan of monitoring room

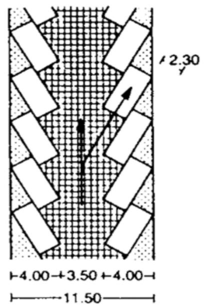
2.5.4.6 Parking

When driveways are less than 20 feet in width, marked separate entrances and exits shall be provided so that traffic shall flow in one direction only.

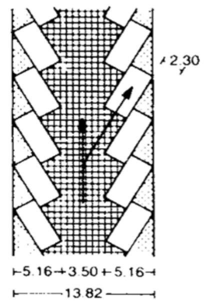
Type	Width	Length
Standard parking space	9 feet	18 feet*
Parallel parking space	8 feet	22 feet
* Parking spaces adjacent to landscape areas may project into the landscape area and be reduced to 16 feet in length when separated from the landscape area by curbing or approved wheel stops.		

Angle	Width: 1 Row Sharing Aisle	Width: 2 Rows Sharing Aisle
90 degree angle parking	42.0 feet	60.0 feet
60 degree angle parking	34.6 feet	54.7 feet
45 degree angle parking	31.1 feet	50.0 feet
30 degree angle parking	28.8 feet	45.6 feet





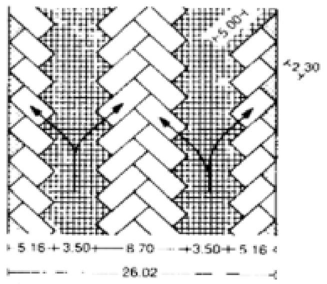
(2) 30° oblique spaces, easy entry and exit, but for use only with one-way traffic



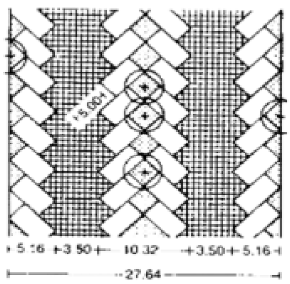
(3) 45° oblique parking, one way traffic only

Fig2.73: Parking layout

Source: Neuferts Architects Data



(7) 45°-angled parking, one-way traffic only



(8) Parking for one-way traffic (with spaces for plants)

Average four wheeler size = 15’ x 6’
Area = 90 sq.ft
Parking Area for 30 four wheelers = 2700 sq.ft
Average two wheeler size = 7’ x 2.4’
Area = 17 sq.ft
Parking Area for 200 two wheelers = 3400 sq.ft

Chapter 3 : Case Studies
3.1: National Case studies
3.1.1: Rastriya Naach Ghar

Location : Pradarshani Marg,Kathmandu
Architect: Ar. Deepak Panta and Dr. Sushil B. Bajracharya
Architecture Style: Neo-traditional Style
Zone: Commercial zone
Building Type: Mixed Use Building (commercial and theatre)

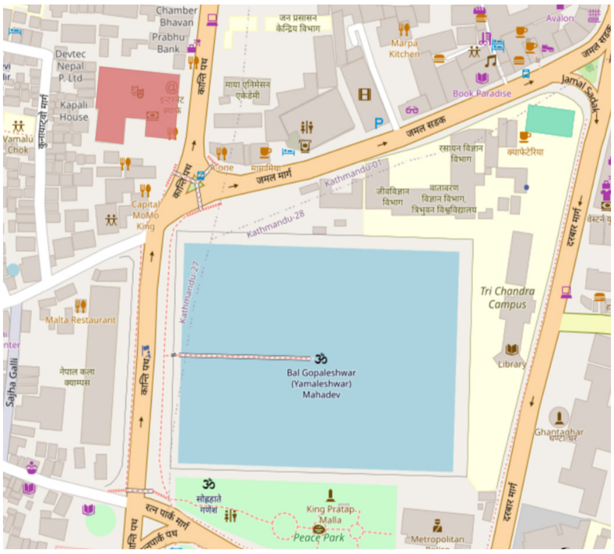


Fig3.1: Location map of Rastriya Naach Ghar

Envisioned as a hub for theatre, music and the performance arts, the Nachghar was first established in 1959 in a bamboo-fenced 450-seater hall. In the ensuing decades, the venue played host to a plethora of cultural events, while giving actors like Bhuwan Chand, Basundhara Bhusal and Subhadra Adhikari a platform that would propel them to fame. The once-iconic Nachghar has, however, slowly slipped out of national consciousness, unable to keep abreast with the more vibrant private theatres.

3.1.1.1 : Architectural Planning

There are basically 4 floors in the main building, five including the basement.
Front part: Commercial
Inner part: Theatre
Basement: Parking
Ground floor: Shopping and green spaces, rehearsal room changing and makeup room, office
1st floor : Stage, Hall and foyer
2nd floor: Balcony hall, Control room and office
Top floor: Technical space above ceiling (catwalk)

Fig3.2: Rastriya Naach Ghar

Site Consideration
One of the most important factors in acoustical planning is ensuring a quiet environment. In cases where this is not possible, effective noise control strategies must be implemented. Nachghar is located in a high-traffic zone within Kathmandu city, which poses a significant noise challenge for theatre activities. To address this issue, the main theatre hall has been oriented away from the main road. Furthermore, the foyer space has been strategically designed to act as a buffer zone, effectively screening out noise from the adjacent street.

Basement
The basement covers an area of approximately 1500 sq.m. with a clear height of 2.5 meters. It is accessible via 1:4 sloped ramps and accommodates 35 cars and 50 two-wheelers. Essential service spaces such as the telephone exchange room, transformer room, and electrical room are located here. A lift is provided for universal accessibility.

Ground Floor
This level comprises commercial spaces, changing rooms, storage areas, and rehearsal rooms. The administrative office is positioned near the southern open courtyard, allowing convenient access.

First Floor
The main auditorium is situated on this floor and is accessed via a 3-meter-wide staircase. The foyer includes a snack bar (currently underutilized as storage) and a partitioned area functioning as an additional administrative space.

Second Floor
This floor includes the auditorium balcony with access from both the foyer and stairway lobby. The projection room is also located here, with a section of it currently rented to a bank.

Third Floor
The third floor houses technical equipment including the lift machine room and an air conditioning unit, both placed on the terrace level.

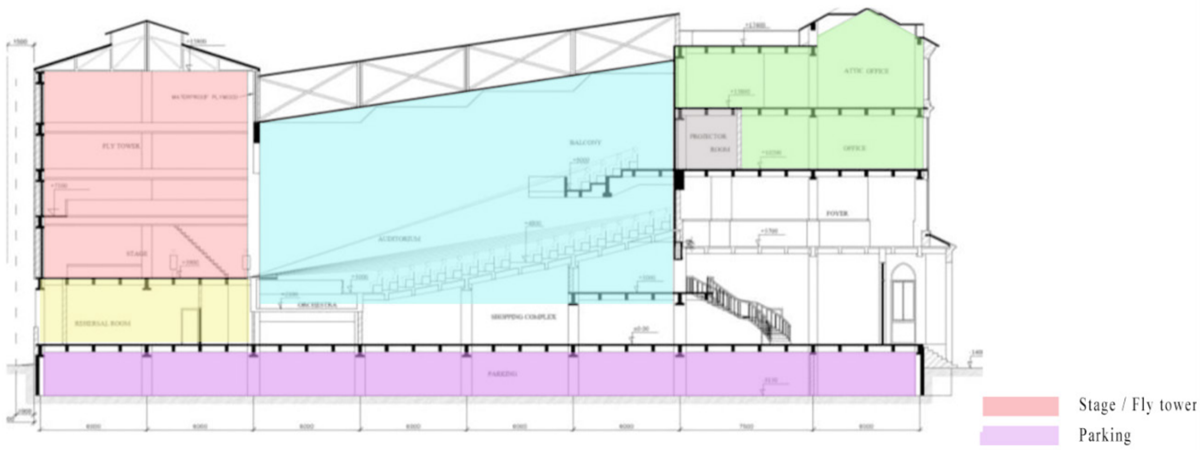


Fig3.3:Section through auditorium

3.1.1.2 : Auditorium design

1. Shape and Size of the Auditorium Hall

The shape and proportion of an auditorium are critical for achieving optimal acoustical performance. Proper geometry helps mitigate sound defects, promoting clarity and enhancing the audience's experience during performances.

At Rastriya Nachghar, the auditorium hall is predominantly rectangular in form, with concave-shaped side and rear walls. The walls and ceiling are designed with varying angles and curves, allowing diffused sound reflections and preventing directional echoes caused by multiple reflections.

Hall Dimensions
Length: Approximately 24 meters
Breadth: 19 meters
Height: 10.82 meters

Seating Capacity
Total seating: 700
Ground floor: 550 seats
Balcony: 150 seats

Supporting Spaces
Located beneath the main auditorium,
the supporting spaces include:
Green rooms
Rehearsal hall
Storage areas

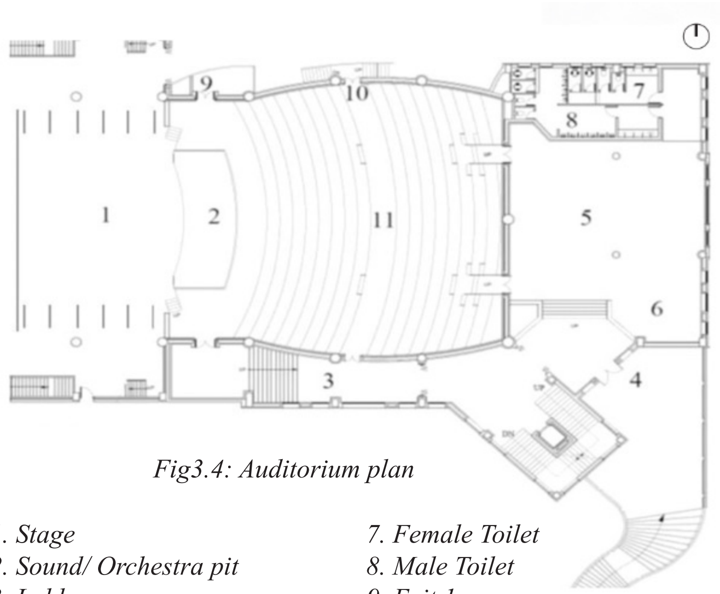


Fig3.4: Auditorium plan

1. Stage
2. Sound/ Orchestra pit
3. Lobby
4. Main Entry to Auditorium
5. Ticket counter
6. Foyer
7. Female Toilet
8. Male Toilet
9. Exit 1
10. Exit 2
11. Seating

Fig3.5: Storage under stage

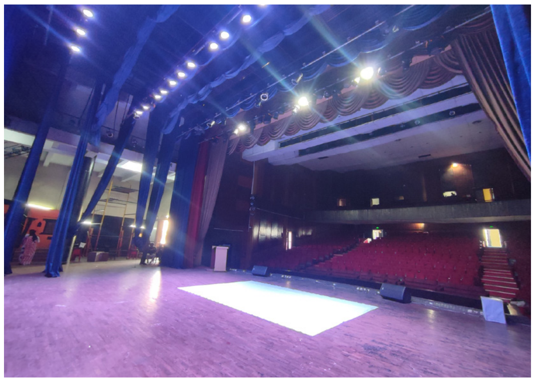


Fig3.6: View from Stage

Fig3.7: Main road and Backstage con-

Fig3.8: Backstage

2. Acoustic Considerations:
Several thoughtful acoustic strategies have been incorporated into the design of Rastriya Nachghar to enhance sound quality and minimize external disturbances. Key measures include:

Lobby as a Buffer Zone:
The lobby functions as a sound buffer between the auditorium and the main road, helping reduce traffic noise intrusion.

Wall Treatments:
The walls are splayed and slightly curved to promote sound diffusion and minimize echoes. The main auditorium wall is a cavity wall, consisting of:
- An outer 9" brick leaf
- An inner 4" RCC wall,
- Lined with glass wool insulation and finished with wooden panels.

Lower Wall Layers:
Up to a height of 3 feet, walls include glass wool insulation behind teak wood battens, aiding in both absorption and diffusion of sound.

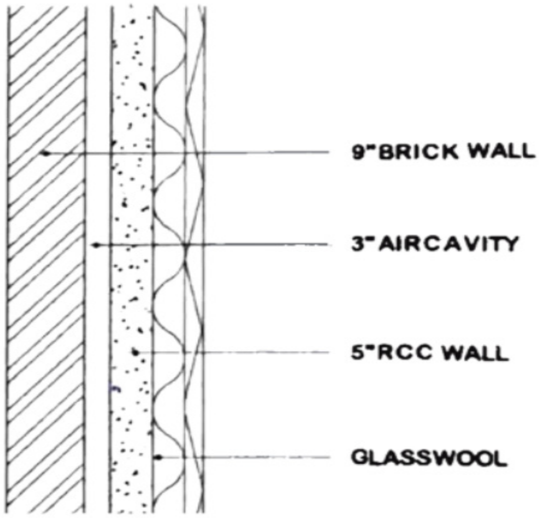


Fig3.9: Wall Treatment in Auditorium

Upper Wall Finish:
Above 3 feet, surfaces are finished with bamboo paneling and wooden strips, contributing to sound reflection and acoustic warmth.

Ceiling:
Composed of perforated cellulose fiberboards, which help absorb high-frequency sounds and reduce reverberation.

Flooring:
Linoleum flooring is used throughout the auditorium for basic sound absorption.
The stage area features wooden parquet flooring, which reflects sound effectively for performances.

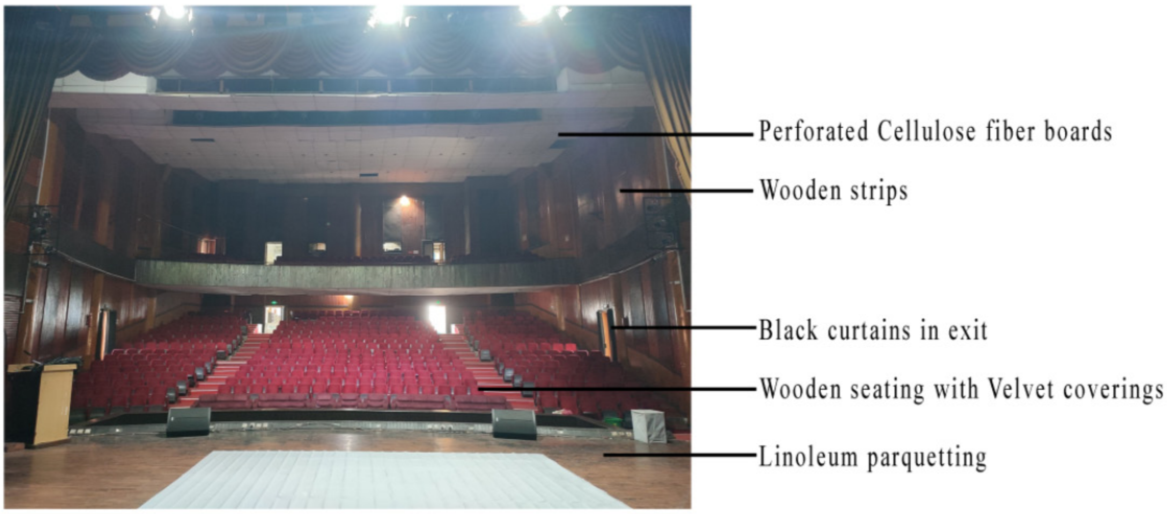


Fig3.10: Materials in Auditorium

3. Door and Sound Insulation
To enhance sound insulation and minimize sound transmission, the auditorium utilizes specialized acoustic doors instead of standard flush doors. These doors are designed with increased mass, as sound insulation improves with door weight and density. Consequently, heavy doors with a thickness of approximately 100 mm have been installed to achieve better transmission loss performance.

4. Walls:
The walls of the auditorium at Rastriya Nachghar have been designed with a multi-layered construction to enhance both structural integrity and acoustic performance. The construction system comprises:
An inner shear wall,
A cavity space, and
An external brick wall.

Side Walls
The lower portion (up to 1200 mm in height) is clad with teak plywood panels.

Above this, vertical pinewood battens (each 8 cm wide) are installed with narrow gaps between them.
These gaps contribute to sound dampening, allowing sound waves to enter and dissipate within the cavities effectively reducing reverberation.

Rear Wall
The rear wall has a concave form, which typically causes focusing of reflected sound.
However, this issue has been mitigated by applying sound-absorbing materials, ensuring that unwanted echoes and focal points are controlled.

Additional Acoustic Elements
Woven bamboo sheets have been integrated at specific intervals along the walls. These are:
- Projected and inclined to scatter sound waves effectively,
- Functioning as natural diffusers, and
- Serving as eco-friendly acoustic materials that enhance the overall acoustic quality of the hall.

Fig3.11: Ceiling Treatment in Auditorium

4. Catwalk:
The catwalk refers to the service area located above the false ceiling of the auditorium. It serves as a maintenance and access zone for various technical and utility functions, including:
- Lighting systems
- Electrical wiring
- Ducts and other service installations

The roofing structure above the catwalk comprises trusses, which are finished with corrugated galvanized iron (CGI) sheets and clay tiles on top, providing both structural support and weather protection.

Fig3.12: Catwalk

4. Fire Safety:
Given that Rastriya Nachghar is a public facility, comprehensive fire safety measures have been incorporated into the building's design to ensure occupant safety in case of emergencies.
- A ramp adjacent to the stage serves as an emergency escape route, facilitating safe evacuation.
- The building is equipped with smoke detectors to provide early warning in the event of fire.
- A steel fire escape staircase is accessible from various levels of the auditorium, allowing for quick egress.
- Water nozzles have been installed on each floor—four in total—to aid in fire suppression.
- Fire sensors and sprinkler nozzles are strategically placed within the main hall and lobby areas for efficient coverage.
- A dedicated water tank with a capacity of ***40,000 liters*** has been provided, with ***20,000 liters*** reserved exclusively for firefighting use.

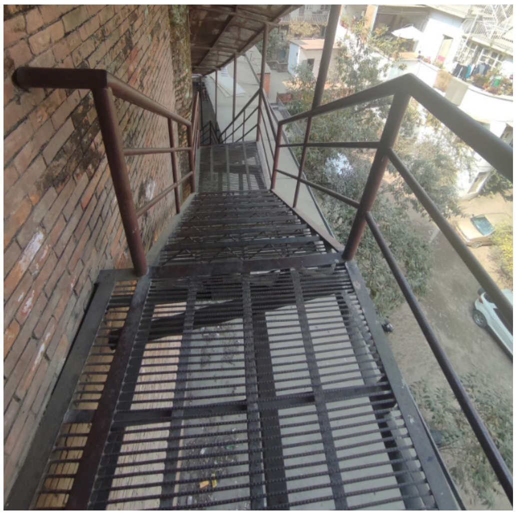


Fig3.13: Fire exit

3.1.1.3 Inferences
- Clear understanding of auditorium layout and spatial organization.
- Includes hall, stage, green rooms, rehearsal spaces, and balcony.
- Public entry from the first floor; ground floor occupied by rental shops.
- Entrance connects to gallery; lift access included.
- Cavity walls, curved surfaces, and buffer lobbies used for sound control.
- Reverberation time (RT = 1 sec), suitable for speech.
- Lobby in front enhances facade and reduces external noise.
- Restrooms and fire extinguishers provided on each floor.
- Lifts make the design inclusive for differently-abled users.
- Commercial spaces support financial sustainability.
- Cavity walls improve acoustics.
- Lobbies function as effective sound buffers.

3.1.2: Music Museum

Location : Teku, Kathmandu, Nepal
Function: Preservation and promotion of Nepali musical heritage
Founded: 1995 by the Music Museum of Nepal Trust
Architecture Style: Traditional Style
Building Type: Cultural Museum, Music Archive

Fig3.14: Location map of Music Museum

Nepal is home to over 100 ethnic groups, each contributing to the nation's rich musical heritage. Together, they have created more than 1,300 distinct designs of musical instruments, reflecting the country's deep cultural and regional diversity.

Fig3.15: Music Museum of Teku

One of the most significant efforts to preserve and promote this musical heritage has been led by Ram Prasad Kadel. He began collecting traditional instruments in 1995 and established a dedicated museum in 2002. Today, his collection has grown to include over 650 instruments, making it one of the most comprehensive repositories of Nepali musical culture.

Kadel follows a sustainable approach to collecting, he refrains from acquiring functional instruments still in use by communities. Instead, he seeks out decommissioned pieces or commissions skilled artisans to create replicas. This ensures that the cultural practice remains uninterrupted while still allowing for preservation.

To help visitors better understand the collection, the instruments are categorized into nine different groups. The museum features interactive elements, including open displays where select instruments can be touched or played, creating an engaging experience for visitors. At the entrance, a striking highlight is the world's largest saarangi, a symbolic representation of Nepali craftsmanship.

Fig3.16: Gallery of Music Museum

3.1.2.1 : Architectural Planning

Design Style: Traditional Nepali architecture with modern interventions.
Materials Used: Locally sourced bricks, carved wood, and stone for authenticity and sustainability.
Exhibition Halls: Main focus of the building; display traditional Nepali musical instruments.
Spatial Organization:
Clear zoning for different categories of instruments.
Designed for smooth visitor flow and easy navigation.
Cultural Integration: Architecture reflects and supports the cultural heritage showcased within the museum.
Performance Space: Temple Plinth for live demonstrations.
Research & Archive Room: Documentation of folk music and instruments.
Workshop Area: For instrument-making and interactive sessions.
Administrative Spaces: Offices for museum staff and researchers

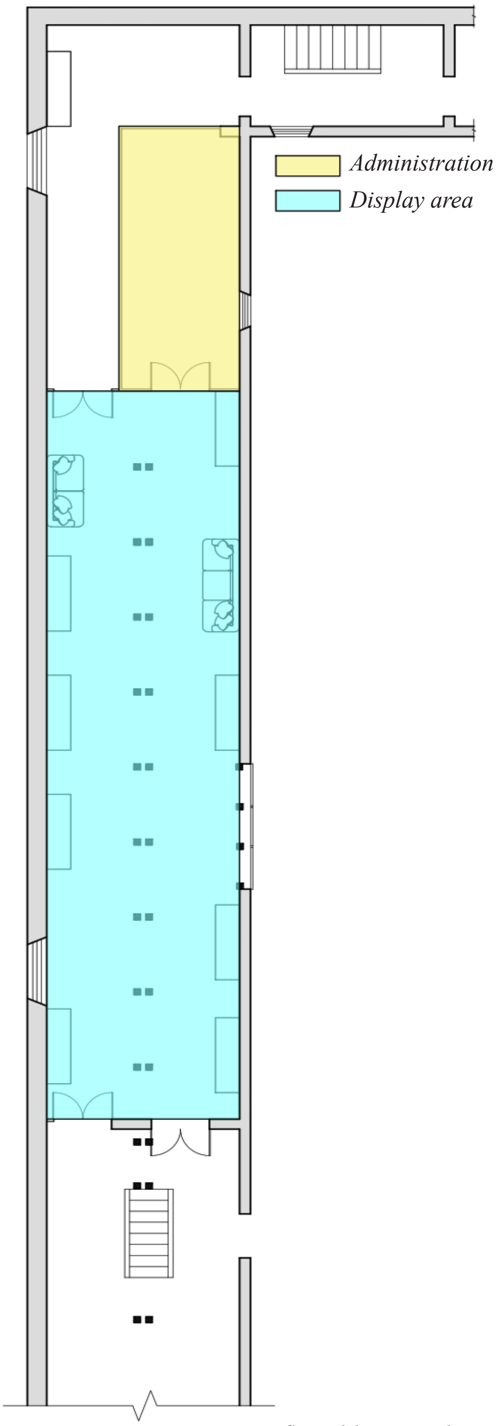


Fig3.17: First floor blow up plan

Fig3.18: Gallery of Music Museum

3.1.2.2 : User Experience & Functionality

Circulation: Clear flow between exhibition and interactive areas.
Engagement: Visitors can listen to and play some instruments.
Inclusive Design: Open for musicians, students, and researchers.

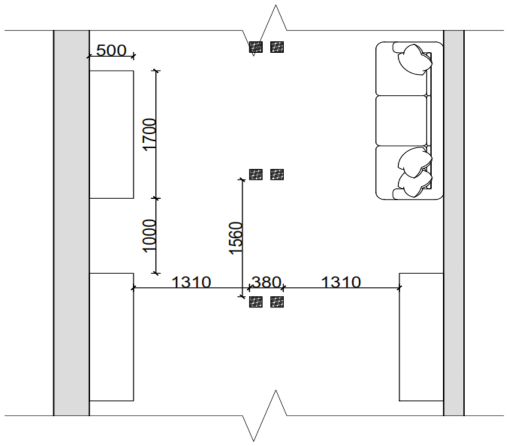


Fig3.19: Blow up plan of main display area with dimensions

Fig3.20: Space utilized between columns

3.1.2.3 : Environmental controls and preservation techniques

Humidity Management: Water is placed beneath display areas to prevent wooden instruments from drying and losing tonal quality.

Temperature Regulation: Indoor temperature is kept stable to avoid warping or cracking of delicate instrument materials.

Pest Prevention with Timur: Timur (Sichuan pepper) is used as a natural repellent to protect bamboo instruments from pest infestation.

Controlled Lighting: Minimal and indirect lighting is used to protect sensitive organic materials from UV damage.

Protective Display Design: Instruments are placed in cases designed to maintain stable microclimates and reduce environmental exposure.

3.1.2.3 : Spaces

Painting and Photograph Display Area: Exhibits a visual journey of Nepal's musical heritage through portraits, event photographs, and traditional artwork, offering cultural and historical context.

Instrument Display Area: Showcases a diverse collection of traditional musical instruments from various ethnic communities across Nepal, organized thematically or regionally for easier understanding.

Library: Houses a rich collection of over 4,000 books related to the folk music of Nepal. This space serves as a valuable resource for researchers, students, and music enthusiasts interested in exploring the theoretical and historical aspects of Nepali music.

Interactive Spaces: Visitors are encouraged to actively engage by playing selected traditional instruments themselves, creating a hands-on, immersive experience that fosters a deeper connection with Nepal's musical culture.

Fig3.21: Photographs displayed at entry of first gallery

Fig3.22: Gifted paintings display

Fig3.23: Display case of wind instruments

Fig3.24: Display case of Percussion instruments

Fig3.25: Library area

Fig3.26: Instruments placed for hands-on experience

3.1.2.4 : Inferences

- Passive humidity control using water under displays helps preserve instrument quality
- Use of local materials (brick, wood, stone) ensures cultural expression and climate adaptability.
- Efficient space planning accommodates exhibition, interaction, and research within a compact layout.
- Traditional design elements are blended with modern museum functions.
- Building maintains a naturally controlled environment suitable for preserving organic materials.
- Interactive instrument zones suggest consideration for acoustics and spatial zoning.
- Architectural choices support both heritage preservation and functional use.

3.2: International Case studies

3.2.1: Chapel of Music

Location: Qinhuangdao, China (on the Bohai Sea coastline)
Architects: Vector Arrchitects
Area: 455m²
Completed: 2023
Function: Seaside concert hall, meditation space, and public retreat

Fig3.27: Chapel of Music
Source: archdaily.com

Design Concept:

Inspiration: Envisioned as a musical instrument that harmonizes sound, light, and air to create a unique musical space.
The design primarily derives from the vertical section, dividing the chapel into two key levels: the Meditation Rotunda (lower level) and the Skylight Music Hall (upper level).

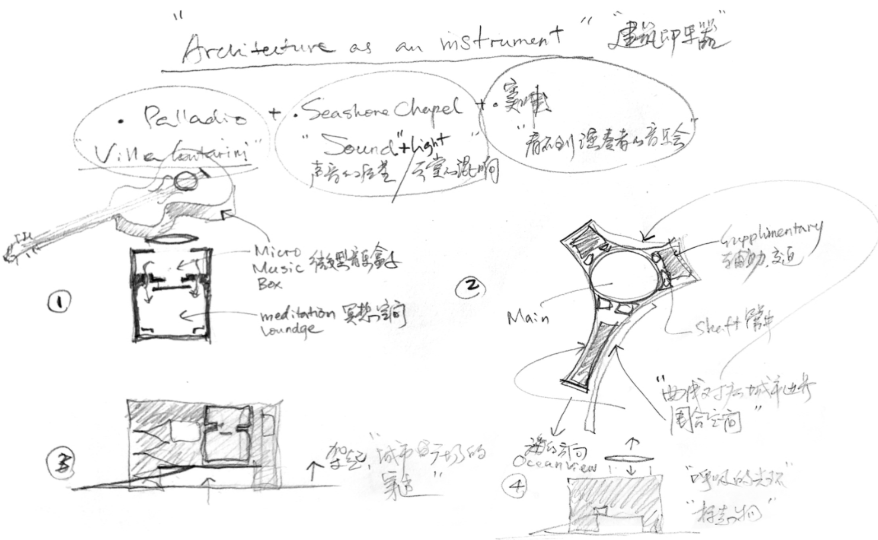
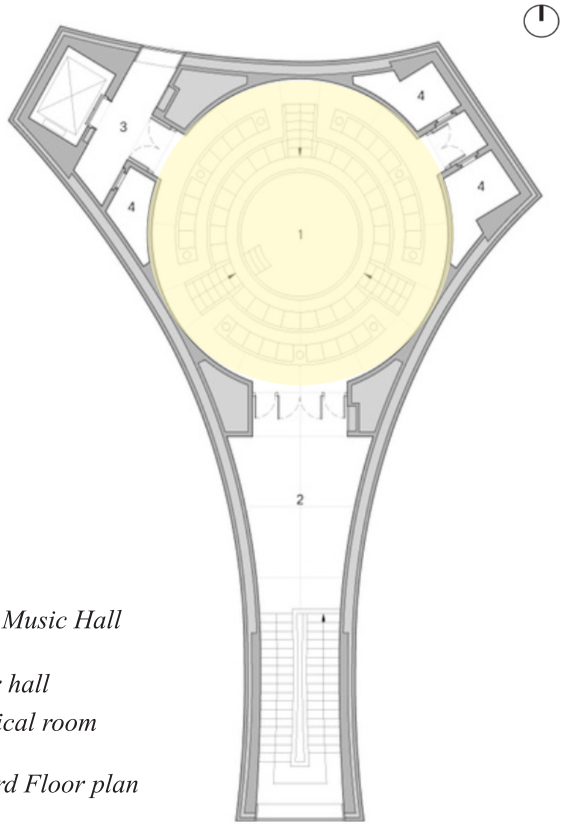


Fig3.28: Conceptual
Source: archdaily.com

3.2.1.1 : Architectural Planning

1. Skylight Music Hall (Upper Level):

• Features a sunken stage at the center, surrounded by 48 spectator seats arranged in two levels.
• Brass sound transmission tubes embedded among the seating allow sound to travel down to the Meditation Rotunda.
• A retractable circular pneumatic roof that opens in good weather, transforming the hall into an outdoor theater.
• The hall acts as a dynamic space, where the environment (sound, light, and air) directly impacts the experience.



1. Skylight Music Hall
2. Foyer
3. Elevator hall
4. Mechanical room

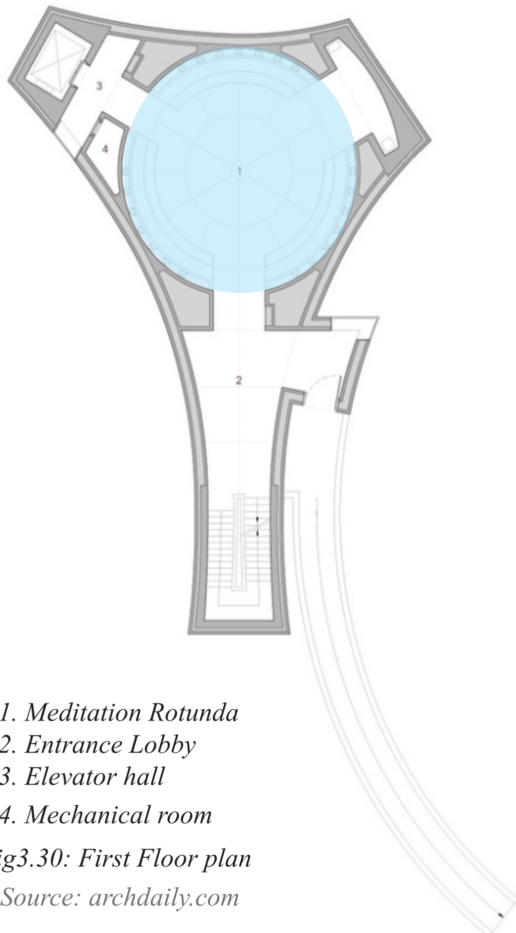
Fig3.29: Third Floor plan

2. Meditation Rotunda (Lower Level):

• ***Height:*** 9 meters.
• ***Walls:*** Glass panels at the corner allow natural light to softly diffuse into the space.
• ***Seating:*** Polished concrete seating arranged along the wall, designed for relaxation, where people can recline and immerse in the environment.
• ***View:*** Large window on the eastern façade offers a view of the sea horizon for audiences leaving after a performance.

3.2.1.2 : Spatial Configuration

• The building has three concave curved outer walls, each responding to different parts of the plaza, adjacent buildings, and the sea, creating diverse public spaces.
• Elevated Design: The building is raised above the ground to preserve the plaza's openness and provide a sheltered space for people to rest.



1. Meditation Rotunda
2. Entrance Lobby
3. Elevator hall
4. Mechanical room

Fig3.30: First Floor plan
Source: archdaily.com

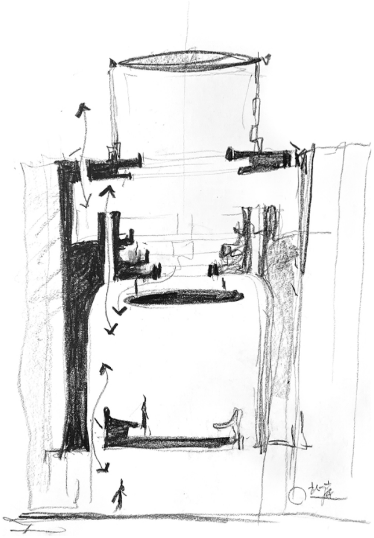


Fig3.31: Conceptual Section
Source: archdaily.com

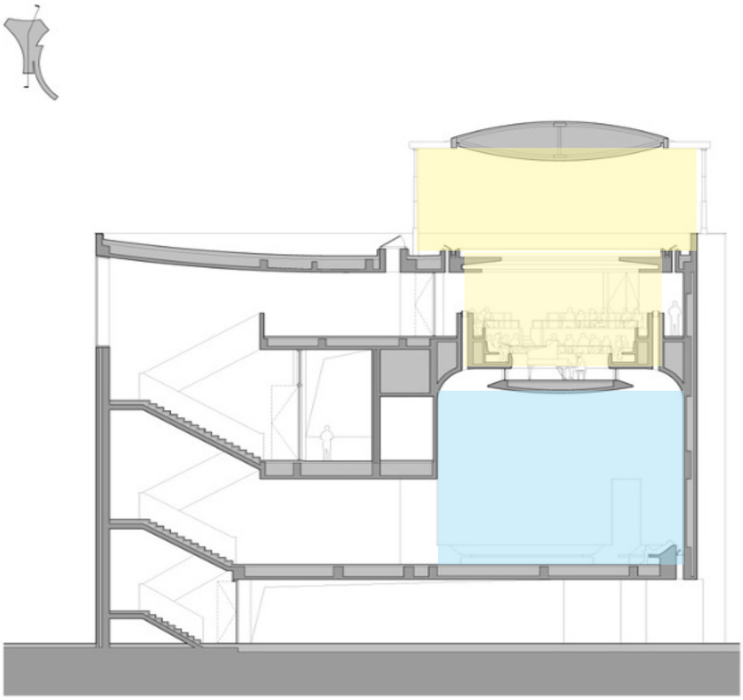


Fig3.32: Section

Fig3.33: Meditation Rotunda

Fig3.34: Skylight Music Hall

3.2.1.3 : Inferences

- The chapel is envisioned as a musical instrument, blending sound, light, and air into a multi-sensory architectural experience.
- The vertical division between the Skylight Music Hall and Meditation Rotunda symbolizes the duality of performance and reflection.
- The sunken stage and intimate seating enhance acoustic clarity and create a close performer-audience connection.
- Brass sound tubes physically connect the two levels, allowing sound to flow and linking spaces aurally.
- The retractable pneumatic roof transforms the hall into an open-air theater, responding dynamically to weather.
- The building's three concave curved walls respond contextually to the plaza, surroundings, and sea.
- Lifting the building symbolizes elevating the musical and spiritual experience above the ordinary.

3.2.2: Chapel of Sound

Location: Chengde, China
Function: Open-air concert hall, meditation space, cultural landmark
Architects: OPEN Architecture
Area: 790m²
Type: Amphitheatre

Design Concept

- Inspired by natural rock formations, the structure resembles a giant boulder blending into the valley landscape.
- Designed to enhance natural sound, acting like an instrument that amplifies music and environmental sounds.
- Aims to merge architecture with nature, allowing visitors to experience the surroundings through sound and space.

Fig3.35: Chapel of Sound
Source: archdaily.com

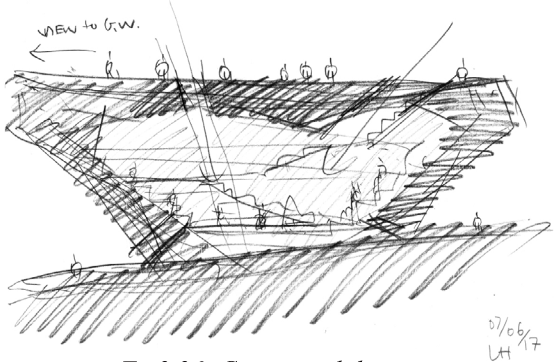


Fig3.36: Conceptual diagram

3.2.2.1 Spatial Configuration

Main Hall: An open-air performance space shaped like an amphitheater.
Roof Opening: Allows natural light and weather elements (rain, wind, snow) to enter, creating a dynamic atmosphere.
Terraces & Platforms: Different levels for seating and standing, offering various perspectives.
Observation Deck: At the top, providing a panoramic view of the valley.
Sound Openings: Irregular voids in the walls that enhance acoustics and connect visitors to nature.

Fig3.37: Roof opening and Terrace

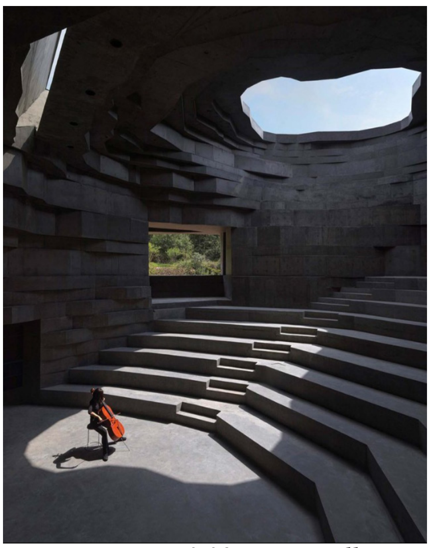


Fig3.38: Main Hall
Source: archdaily.com

Fig3.39: Observation deck and sound opening

3.2.2.2 Acoustic & Functional Design

•The rock-like geometry diffuses and reflects sound, optimizing natural acoustics.
•The porous design allows wind and echoes to create an immersive aural experience.
•The space functions as a concert venue, meditation space, and cultural landmark, encouraging different types of use.

3.2.2.3 Materials & Construction

Material: Cast concrete mixed with local mineral aggregates to mimic the texture and color of surrounding rocks.
Formwork: Custom formwork was used to achieve the layered rock-like effect.
Sustainability: Uses natural ventilation and daylight to reduce energy consumption.

3.2.2.4 : Inferences

- The design emphasizes a strong connection with nature through form and material
- It prioritizes emotional and sensory experiences over conventional architectural solutions.
- Natural acoustics enhance ambient and meditative performances.
- Openings and geometry create a unique spatial and acoustic atmosphere.
- Passive lighting and ventilation strategies reduce energy consumption.
- Sound escapes through openings, reducing clarity for certain performances.
- The space is less usable during extreme seasonal weather.
- Remote location restricts access and limits audience capacity.

3.2.3: House of Sound

Location: Budapest, Hungary
Architects: Sou Fujimoto Arrchitects
Area: 9000m²
Completed: 2021
Function: Museum and cultural space that encourages participation and interaction rather than mere observation.

Fig3.40: House of Sound
Source: archdaily.com

Design Concept:

Architecture aims to cradle visitors and lead them on a journey, allowing them to wander freely through the space.
The building features a continuous flow, allowing visitors to meander, much like sound that permeates a space.

3.2.3.1 Spatial Configuration

Lower Ground Floor :

- It houses temporary and permanent exhibition spaces.

Ground Floor (Open Space):

- The open ground floor serves as the core of the building, where the boundaries between indoor and outdoor spaces blur.
- It acts as a public gathering space, hosting events and activities like concerts, with the landscape seamlessly extending into the museum.

Circular Volume (Upper Spaces):

- Above the ground floor, the floating circular volume houses offices, library, sound studio and video studio.
- It is designed to levitate and is supported by the ground floor, creating a sense of openness and lightness while ensuring spatial fluidity.

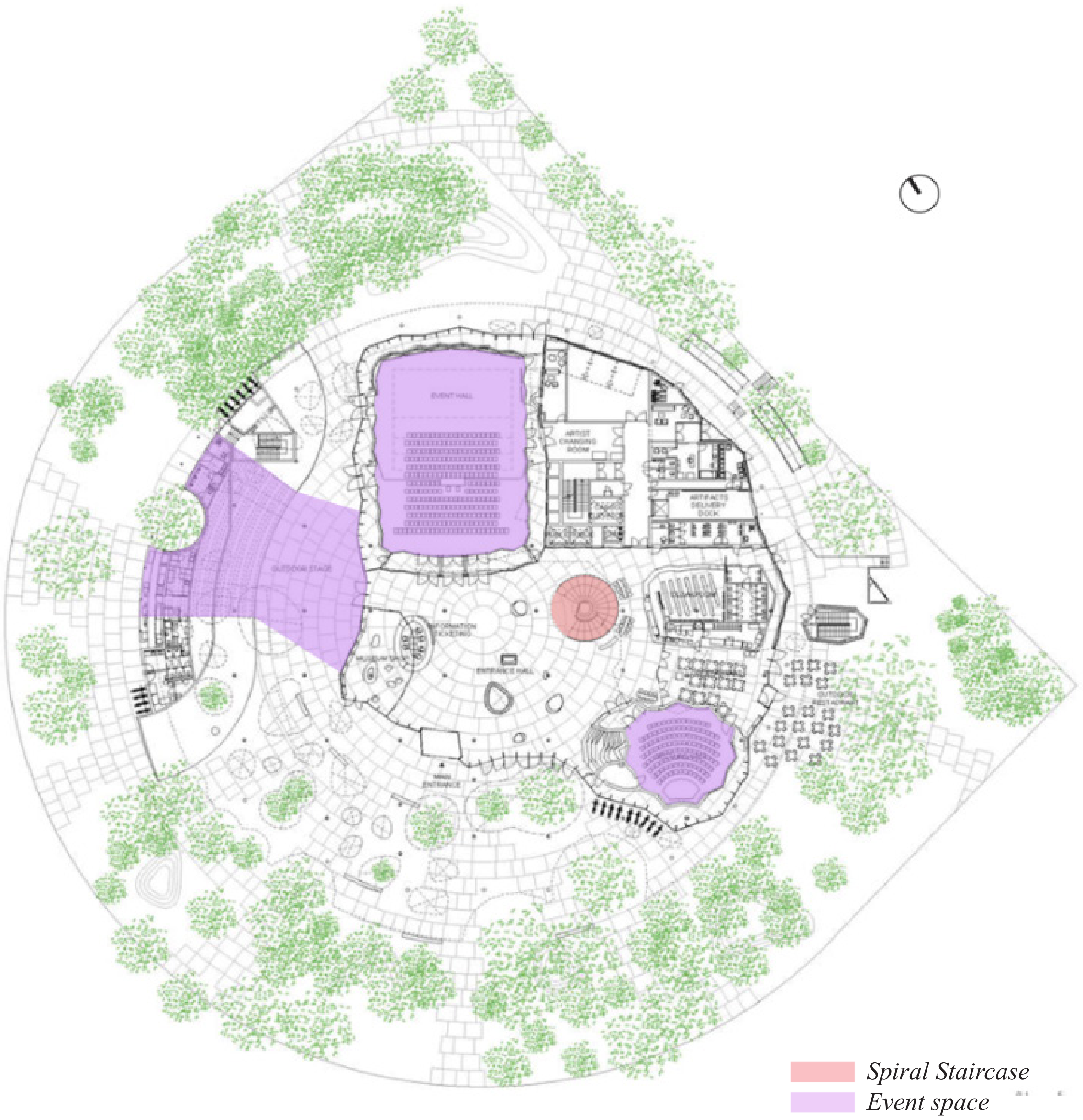


Fig3.41: Ground floor plan
Source: archdaily.com

Spiral Staircase:

• A large spiral staircase connects the ground floor to the upper levels, enhancing the continuity of movement between spaces.

• It symbolizes the flow of people within the museum and aligns with the theme of musical flow and dynamic interaction.

Perforated Walls:

• The perforated walls on the floating volume allow natural light to penetrate and create a relationship between the building's interior and the natural environment.

• These walls symbolize the connection between the museum's interior spaces and the outdoor environment.

Landscape Integration:

• The relationship between the museum spaces and the surrounding City Park is crucial. The open ground floor merges with the park landscape, allowing visitors to wander freely between the museum and nature.

• This connection fosters a dynamic interaction between people, the museum, and the park.

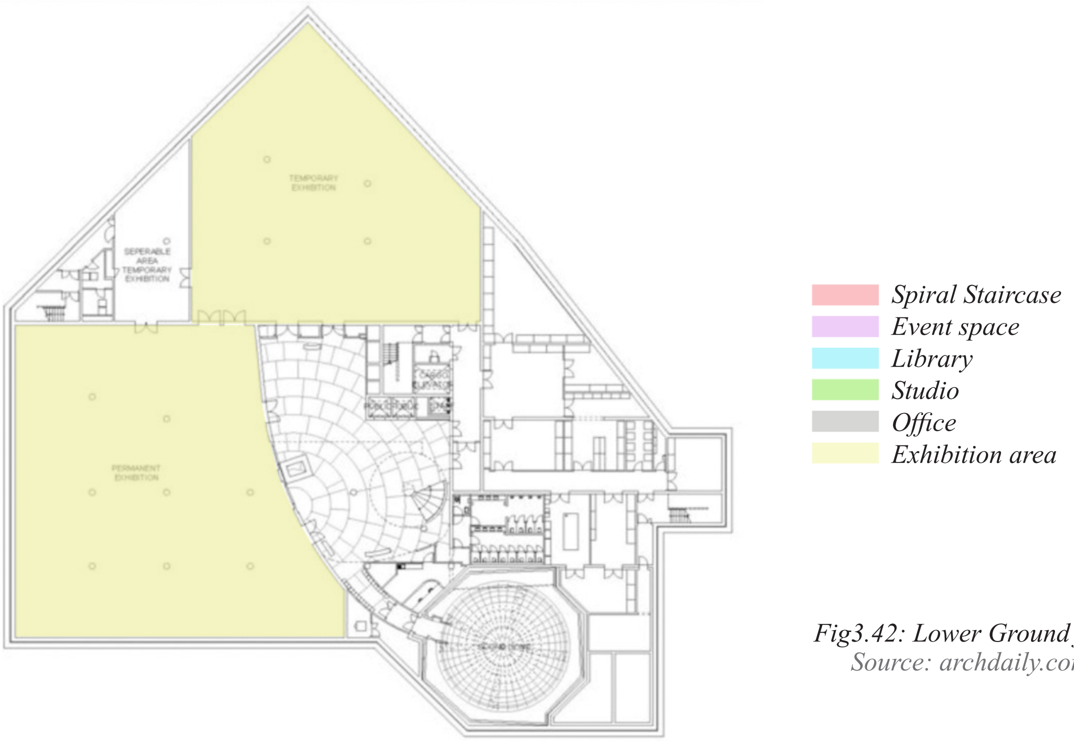


Fig3.42: Lower Ground floor
Source: archdaily.com

Fig3.43: Section

Chapter 4: Program Formulation
4.1: Recording Studio

The audio recording studio is a completely acoustically treated space that is fully equipped audio recording, mixing and mastering equipment and facilities.

Recording studio						
S.N	**Description**	**Area**	**Units**	**Quantity**	**Occupancy**	**Total**
1	Live room	35	sq.m	4	6	140
2	Control room	17	sq.m	3	3	51
3	Sound lock	5	sq.m	1	-	5
4	Isolation booth	4	sq.m	3	2	12
5	Storage	30	sq.m	1	-	30
6	Office/lounge	20	sq.m	1	3	20
7	Toilet	2	sq.m	2	-	4
	Sub total				14	262
	Number					3
	Total				42	786

Table 4.1: Recording Studio

4.2: Practice/ Rehearsal rooms

Practice rooms are small, acoustically optimized spaces designed for musicians to rehearse without external disturbances. These rooms would allow artists to hone their skills, experiment with fusion sounds, and perfect performances before hitting the main stage.

Practice/Rehearsal rooms						
S.N	**Description**	**Area**	**Units**	**Quantity**	**Occupancy**	**Total**
1	Solo practice rooms	5	sq.m	3	1	15
2	Band rehearsal rooms	25	sq.m	2	6	50
3	Orchestral Rehearsal room	40	sq.m	4	10	160
4	Theory workshop area	30	sq.m	1	12	30
	Total				29	255

Table 4.2:Practice/ Rehearsal rooms

4.3: Performance area

A performance area would be a central hub where musicians can showcase their creativity, blending traditional Nepali music with modern genres. It should be designed to offer both intimate and large-scale performances, catering to solo artists, small ensembles, and full bands.

Performance area						
S.N	**Description**	**Area**	**Units**	**Quantity**	**Occupancy**	**Total**
1	Small recital Hall	300	sq.m	1	200	300
2	Outdoor Performance stage	1500	sq.m	1	500	1500
3	Dressing Rooms	25	sq.m	2	12	50
4	Instrument & equipment storage	30	sq.m	1	-	30
5	Technical Control Room	25	sq.m	1	4	25

6	Box Office & Ticketing	20	sq.m	1	2 staffs + waiting area for 6-8 people	20
7	Café & Refreshments area	80	sq.m	1	200	80
8	Exhibition & Merchandising area	50	sq.m	1	20	50
9	Toilets (Male & Female)	50	sq.m	1	25	50
	Total				961	2105

Table 4.3: Performance area

4.6: Interactive Sound & Music Exploration zones

An Interactive Sound & Music Exploration Zone would be a hands-on, immersive area where visitors and musicians can experiment with sound, learn about instruments, and engage with music through technology and architecture. This would enhance both education and creativity, making music accessible to everyone.

Interactive Sound & Music Exploration zones						
S.N	**Description**	**Area**	**Units**	**Quantity**	**Occupancy**	**Total**
1	Aqua Resonance Gallery	70	sq.m	1	15–25 persons	70
2	Aura Resonance Gallery	60	sq.m	1	10–15 persons	60
3	ImmersiveTactile Gallery	65	sq.m	1	10–20 persons	65
4	3D Sound Dome	90	sq.m	1	25–40 seated users	90

Table 4.3: Interactive Sound & Music Exploration zones

4.7: Administration area

The Administration Area would serve as the operational area, managing performances, events, artist coordination, and visitor experiences. It should be efficiently designed for both staff functionality and creative collaboration, ensuring smooth management while maintaining the artistic essence of the space.

Administration area						
S.N	**Description**	**Area**	**Units**	**Quantity**	**Occupancy**	**Total**
1	Reception & Visitor Services	30	sq.m	1	8	30
2	Administrative Offices	15	sq.m	3	4	45
3	Staff Workroom	40	sq.m	1	6	40
4	Meeting & Conference Room	50	sq.m	1	15	50
5	Archive & Records Room	20	sq.m	1	3	20
6	IT & Technical Support Room	25	sq.m	1	4	25
7	Security & Surveillance Room	20	sq.m	1	3	20
8	Staff Lounge & Pantry	35	sq.m	1	12	35
9	Storage & Maintenance Room	30	sq.m	1	3	30
	Total				58	295

Table 4.5: Administration area

4.8: Parking & Support areas

The Administration Area would serve as the operational area, managing performances, events, artist coordination, and visitor experiences. It should be efficiently designed for both staff functionality and creative collaboration, ensuring smooth management while maintaining the artistic essence of the space.

Parking & Support area						
S.N	**Description**	**Area**	**Units**	**Quantity**	**Occupancy**	**Total**
1	CarParking	18	sq.m	44	220	792
2	Two wheelers Parking	1.6	sq.m	140	280	224
3	Security Booth	20	sq.m	1	2	20
	Total				502	1036

Table 4.6: Parking & Support areas

Chapter 5: Site Analysis
5.1: Introduction

Location: Dibyaswori Planning, Madhyapur Thimi, Bhaktapur
Site area: 17050 sq. m (33-8-0-0)
Landmarks: SOS Herman Gmeiner School and National Examination Board
Site Orientation: South- West Orientation
Current use: Open unused land
Access to site: Through 6m wide road connected with 12m main road.
Topography: Sloppy / Terrain land

Fig5.1: Location map of site from Araniko High-

Fig5.2: Proposed site

5.2: Site History

The following images depict the history of the site over the past 15 years. In 2010 AD, the site was primarily characterized by agricultural land, with agriculture being the dominant feature. At that time, planning efforts for the nearby Pepsicola area had already begun, setting the foundation for future development. By 2015 AD, agricultural activities remained prominent, though the surrounding areas had started to show signs of gradual change as the impact of the planning initiatives began to take shape.

Fig5.3: Site during 2010 A.D.

Fig5.4: Site during 2015 A.D.

Fig5.5: Site during 2020 A.D.

Fig5.6: Site during 2025 A.D.

In 2020 AD, the second phase of planning for this area began, following the completion of the first phase in Pepsicola. This marked a significant shift towards urbanization, with infrastructure and development starting to expand. In the present context, the landscape has transformed significantly, with commercial spaces and mixed-use buildings now outnumbering residential structures, signaling the area's growing urbanization and economic development.

5.3 : Physical Context

Fig5.7: Road Hierarchy

5.3.1: Road Hierarchy

The road hierarchy is based on width, determining accessibility and function. The 12m-wide roads serve as the main roads, ensuring primary connectivity. 10m-wide roads are located near the river corridor, possibly influencing development and movement patterns. Internal sub-roads of 8m and 6m accommodate vehicular access, facilitating movement within neighborhoods. Meanwhile, 4m-wide roads are primarily designed for smaller vehicles like motorcycles and pedestrians, enhancing local accessibility.

5.3.2: Open Spaces

Open spaces can be categorized into public and private areas. Public spaces include river corridors and parks. Currently, the park is locked, while the river corridor is more frequently visited by people who go there to relax, particularly between 5-8 pm, which is the peak time.

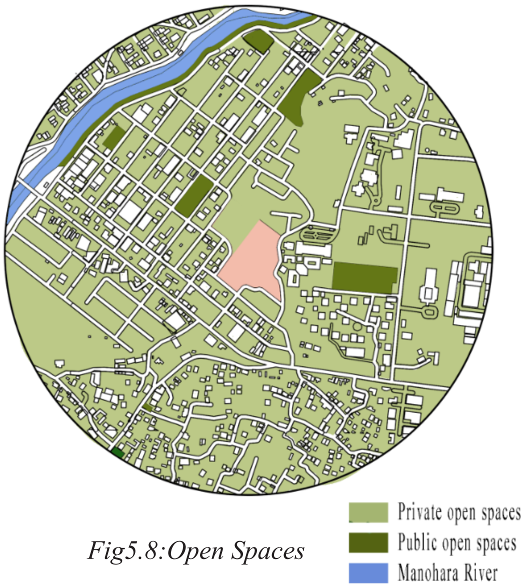


Fig5.8:Open Spaces

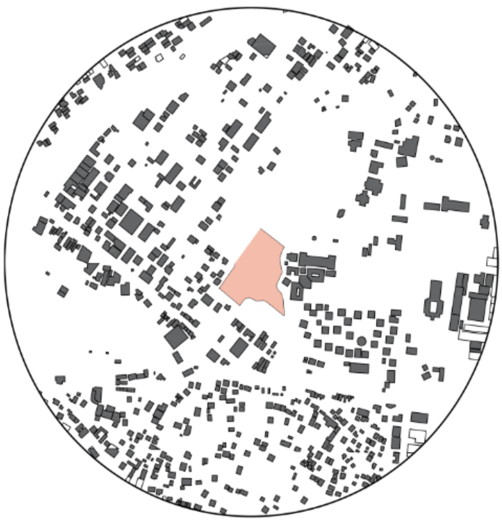


Fig5.9: Figure Ground

5.3.3: Figure Ground

The diagram highlights the "solid" element represents the physical mass of a design, often depicted in dark or solid colors. In contrast, the "voids" are the empty or open spaces, such as courtyards, corridors, etc. are typically shown in lighter colors or as white areas. This diagram helps to visualize the spatial relationships within a design, demonstrating how solids and voids interact to shape the experience of a space.

5.3.4: Building typologies

There is a higher prevalence of commercial areas, cafes, restaurants, and mixed-use buildings, resulting in a greater number of visitors compared to local residents. These spaces are located along the river corridor and the main road. To the east, there is a school area and a government offices.

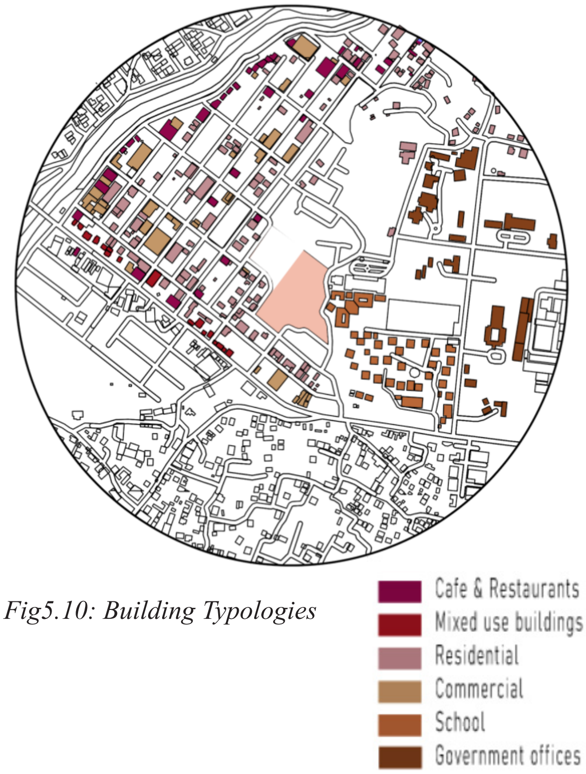


Fig5.10: Building Typologies

5.4 : Ecological Context

5.4.1: Average hourly temperature

-The warmest period is from May to September, with the hottest hours being afternoon (12 PM - 6 PM).
-The coldest months are December to February, especially at night and early morning.
-Evening and night temperatures are generally cool or cold throughout the year.
-During the winter, nighttime temperatures drop to very cold levels, especially between 12 AM - 6 AM.
-The temperature starts to rise in March, reaching a peak in the summer months (June-July).
-Post September, temperatures gradually decrease towards the colder months.

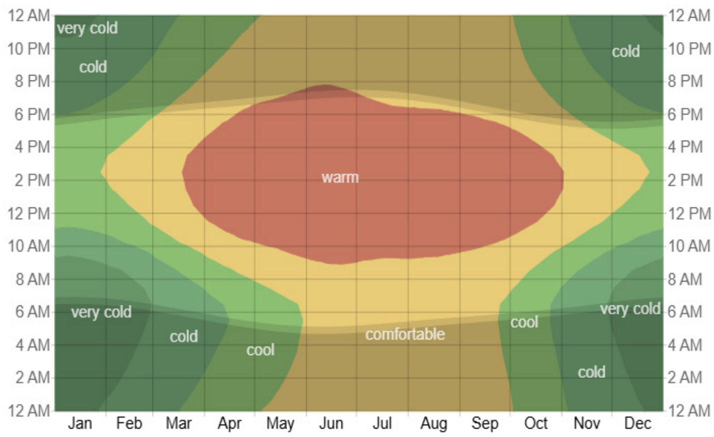


Fig5.11: Average hourly temperature

5.4.2: Average Precipitation

-The year is divided into wet and dry seasons.
-The wet season lasts from around May to September, peaking around July 17 (63% chance of rain).
-The dry season spans from October to April, with the lowest chance of precipitation occurring around November 20 (1%).
-The rain probability starts increasing from March-April, reaches its peak in July, and then declines after September.
-The transitions between seasons occur around May 30 (32% chance of rain) and September 26 (32% chance of rain).

Fig5.12: Daily chance of precipitation

5.4.3: Sun path & Wind Direction

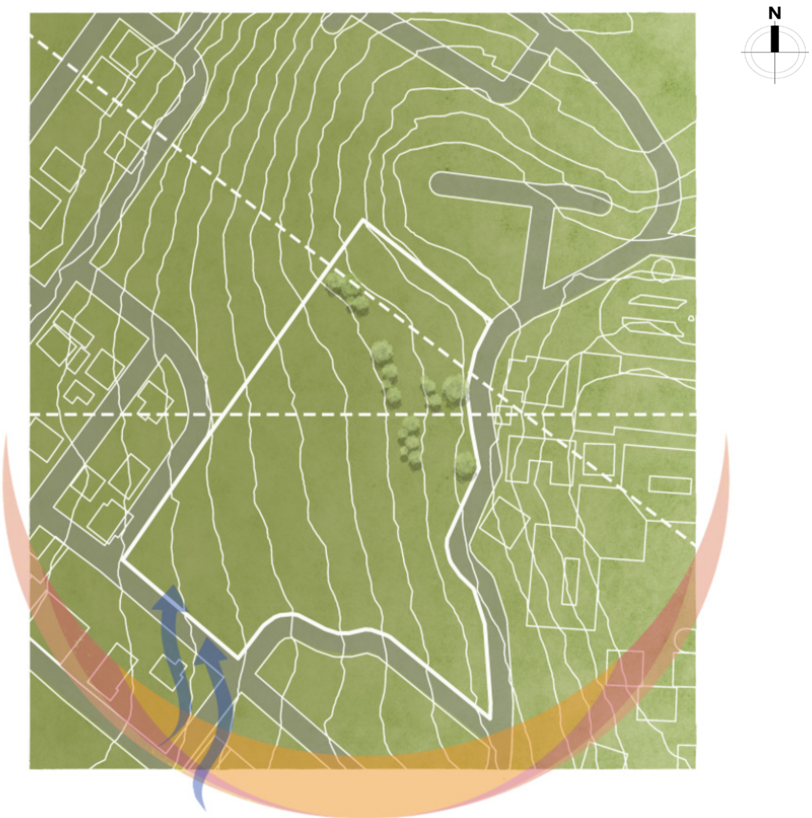


Fig5.13: Sun path & Wind Direction diagram

5.5: Immediate Site Surrounding

Fig5.14: Views from site

5.6: Landmarks

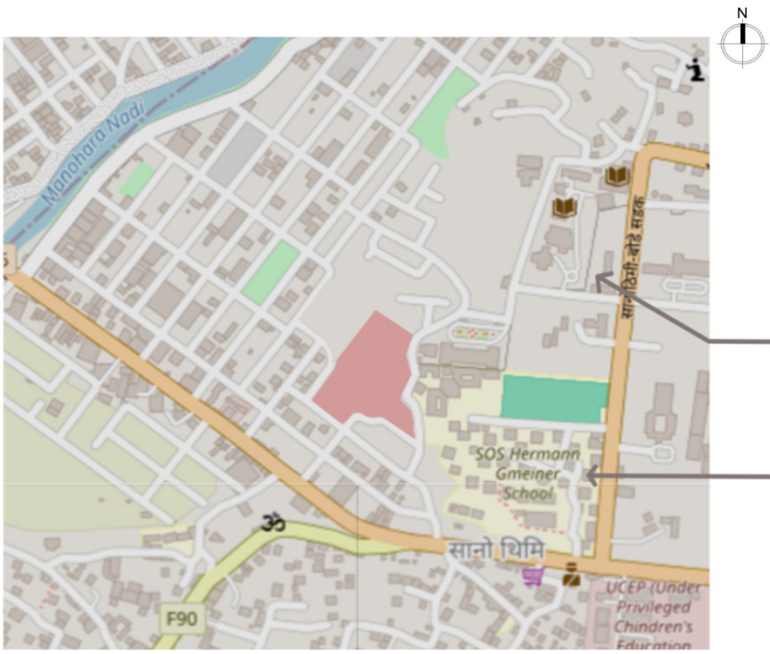


Fig5.15: Prominent Landmarks

Exam Review Office

SOS Herman Gmeiner School

5.7: Surrounding Architectural Styles

Fig5.16: SOS Herman Gmeiner School

SOS Herman Gmeiner School
(Ar. Robert Weise)
-Brick facade
-Sloped roof
-Courtyards
-Green spaces

Fig5.17: Sanothimi Campus

Sanothimi Campus
-Stone facade, Wood Panels
-Sloped slate roof
-Elongated windows
-Use of portal frames
-Green spaces

Fig5.18: Exam Review Office

Exam Review Office
-Brick Facade
-Flat roof
-Green spaces

5.8: Bye Laws

Zone: Special Planning zone
• Ground Coverage: 50% (Plot area more than 4 anna)
• Plinth height: Pitched road-0.45m, Gravel road-0.60m
• Setback: 2m (from edge of road) for assembly hall, 1.5m (from sides of site)
• Floor area ratio: 3.5
• Minimum basement height: 2.7m
• Minimum ceiling height: 2.7m
• Parking: 20% of overall site

For Assembly hall
• Entry way: 2m for 300 people, 0.30m for additional 100 people
• Riser height: 170mm
• Tread width: 300mm
• Min. two staircases

• Rooms with 10+ people must have outward-opening doors without blocking access.
• Rooms with 20+ people must have two doors on opposite sides.
• Buildings must have at least two exits, and all doors must open outward.

5.9: Site Drawings

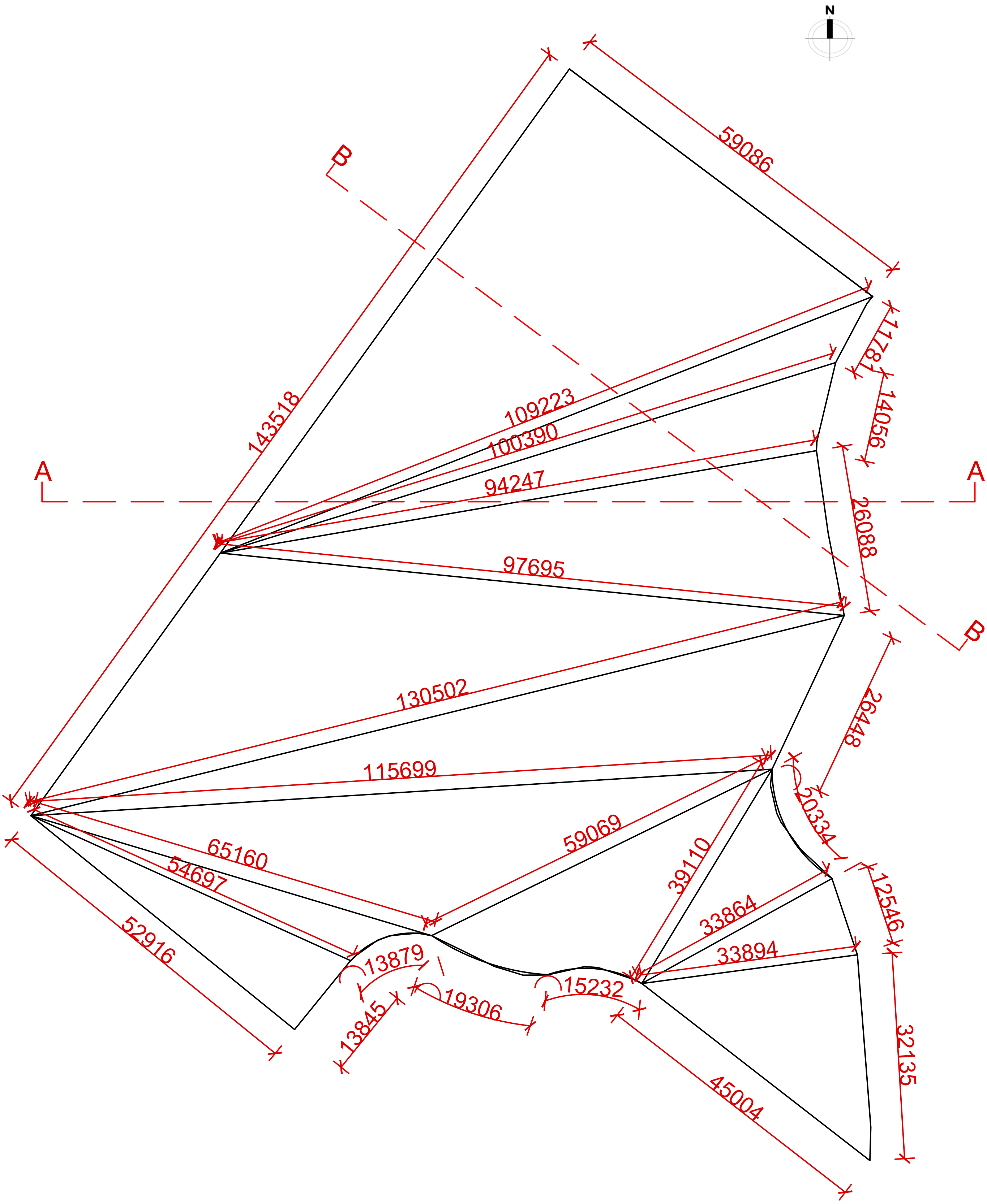


Fig5.19: Site Plan with dimensions
Scale :- 1:1000

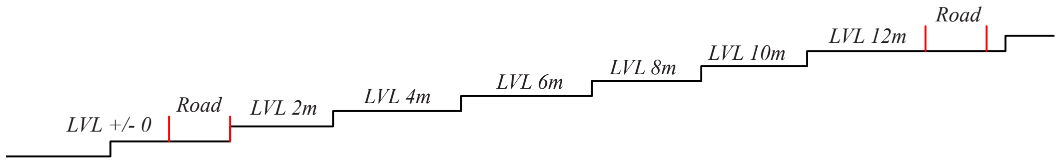


Fig5.20: Site Section at A-A
Scale:- 1:1000

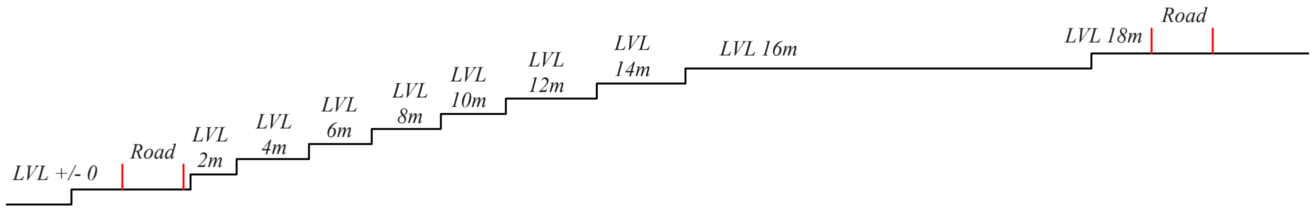


Fig5.21: Site Section at B-B
Scale:- 1:1000

5.10 : Swot Analysis

Strengths

• The site has good access via a 6m-wide road.
• Terrain topography of the site allows easy design of amphitheatres
• Directly visible from the highway
• Presence of trees act as natural sound barrier
• Enhances visitor experience and provides a serene ambiance

Weaknesses

• Quiet surroundings require stronger soundproofing.
• The trees on-site may obstruct design flexibility or require a site-responsive approach.
• The site has a complex and irregular shape, which may make designing more challenging.

Opportunities

• The river corridor serves as a major attraction, drawing crowds and enhancing the active-ness of the design.
• This project's target group is young people, so this area includes hangout spots like cafes, which can serve as a key attraction for youth groups.

Threats

• The presence of nearby commercial establishments might create competition for attention, drawing potential visitors away from the project.
• With fewer residential areas nearby, there may be limited involvement from local residents, affecting community connection and long-term sustainability.

Chapter 6: Design Development

6.1: Concept

"Space as Sound"

Architecture, like music, is composed of rhythm, proportion, silence, and resonance. This project imagines the building itself as a musical instrument—one that doesn't just house performance, but becomes a part of it. Walls don't merely enclose, they echo. Rooflines vibrate with intention. Every curve and material tunes the experience—an environment where space plays sound and users play the space.

6.2: CORE PRINCIPLES

Architecture as Resonance: Walls shaped for echo and intimacy
Space as Performance: Building enables and enhances action
Material as Timbre: Every finish chosen for acoustic and tactile quality
Users as Musicians: People become performers by inhabiting the space

6.3: CASE STUDY REFERENCES

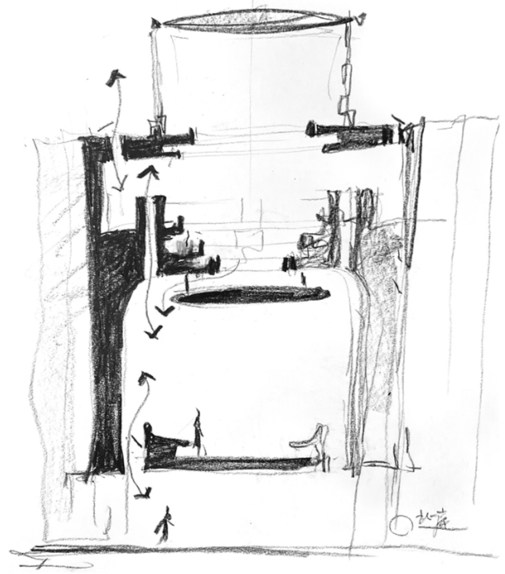


Fig6.1: Conceptual diagram of Chapel of music- envisioned building as musical instrument

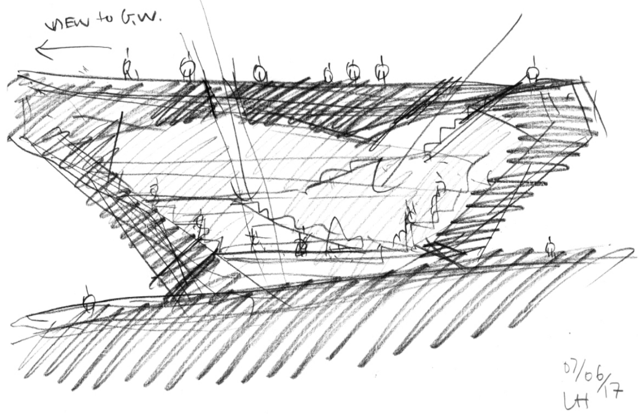
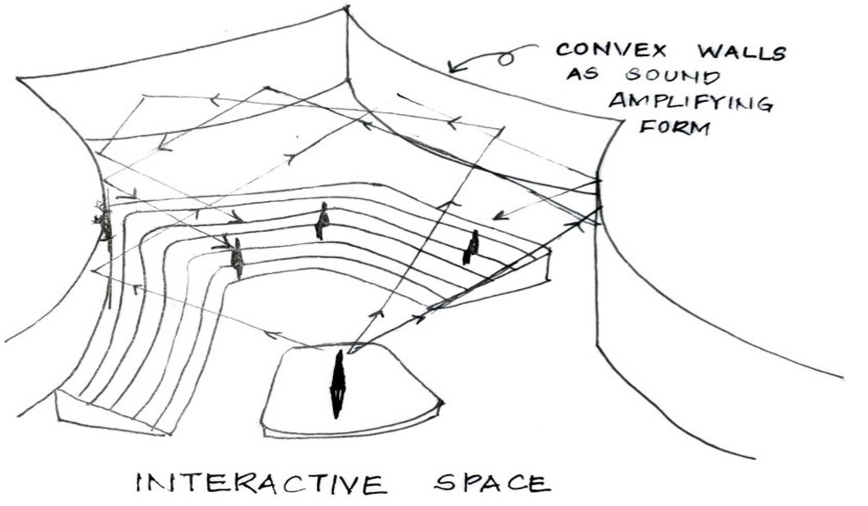
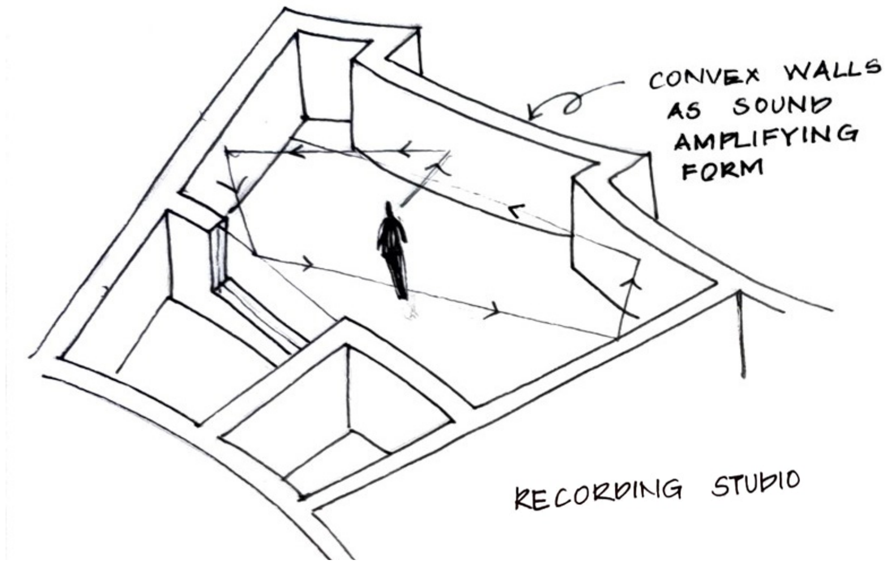


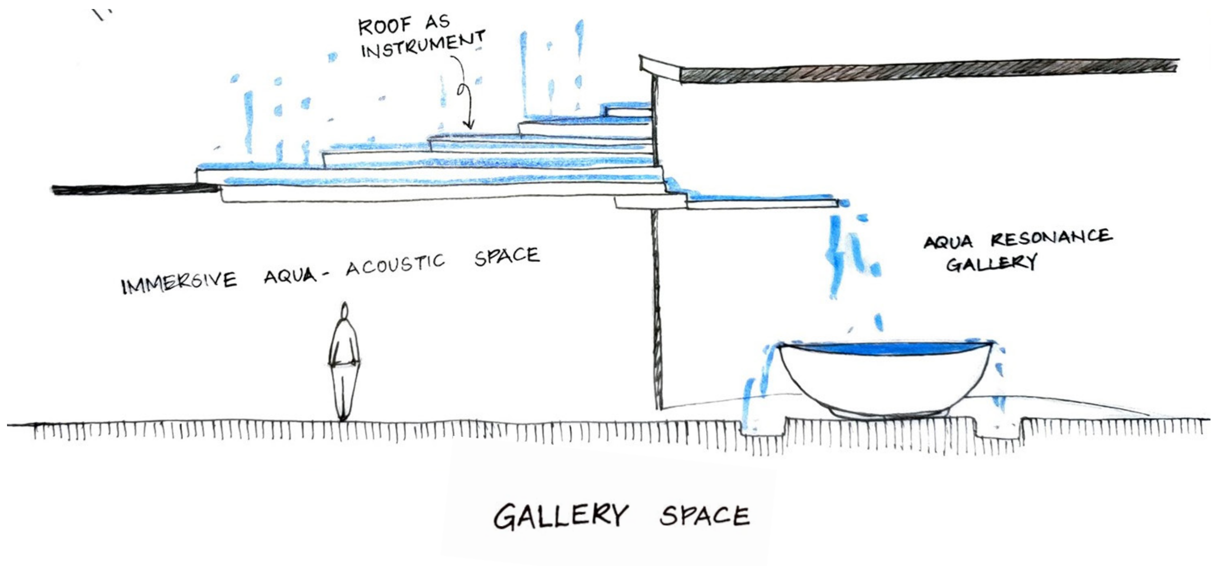
Fig6.2: Conceptual diagram of Chapel of sound- enhance natural sound, acting like an instrument that amplifies music and environmental sounds.

Source: archdaily.com

6.4: SPATIAL APPLICATION

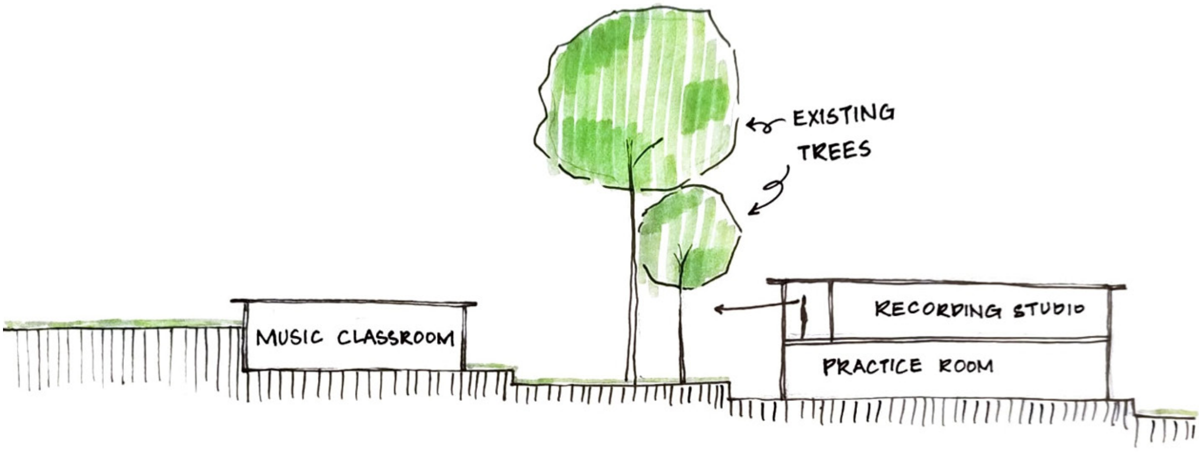


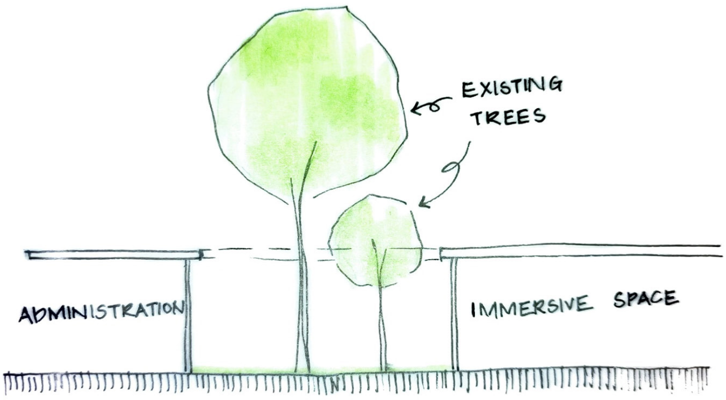




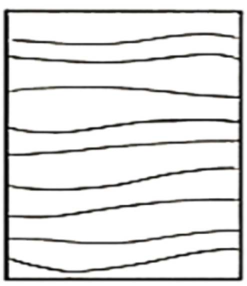
6.5: INTEGRATION OF EXISTING TREES

Since there were existing trees on the site, they were thoughtfully integrated into the design to preserve the natural environment and enhance the overall spatial experience. Rather than removing them, the layout was carefully planned around these trees—creating shaded gathering spaces, natural buffers, and visual connections between built and green elements. This approach not only promotes sustainability but also enriches the ambiance with a sense of calm and continuity with nature.

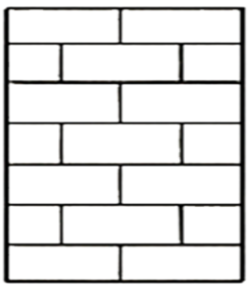




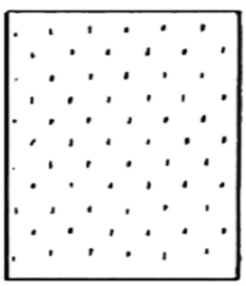
6.6: MATERIAL & ACOUSTIC STRATEGY



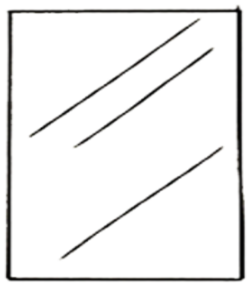
Wood



Brick

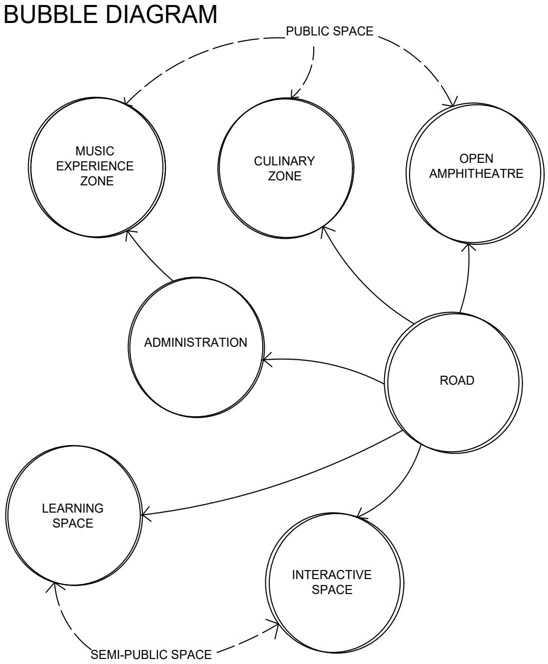


Metal

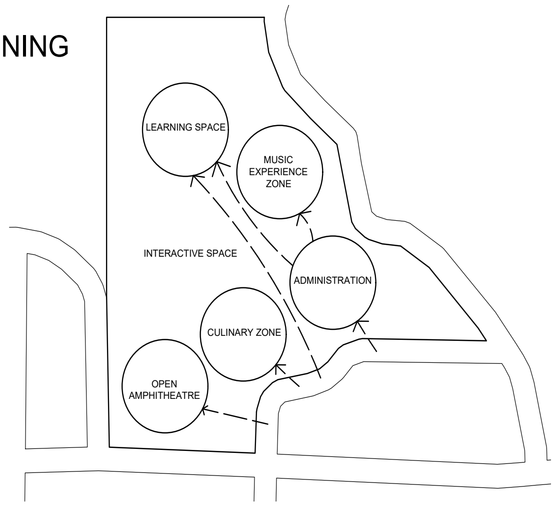


Glass

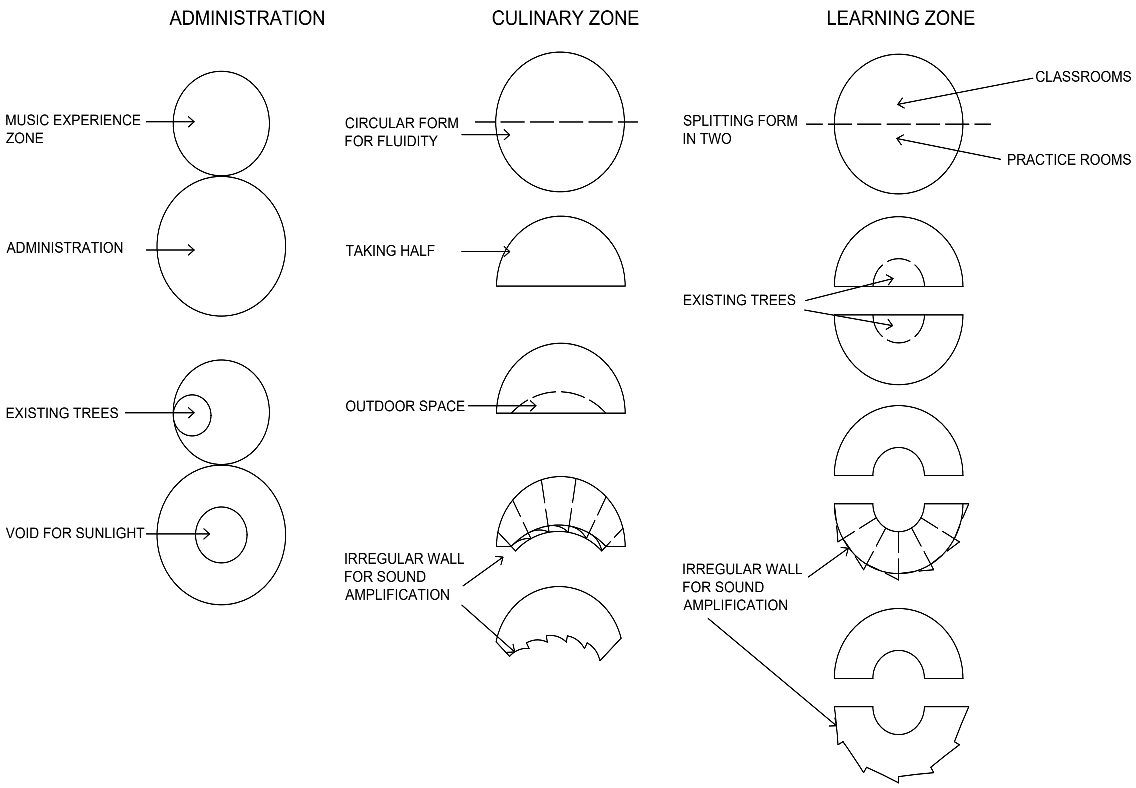
BUBBLE DIAGRAM



ZONING



FORM DEVELOPMENT



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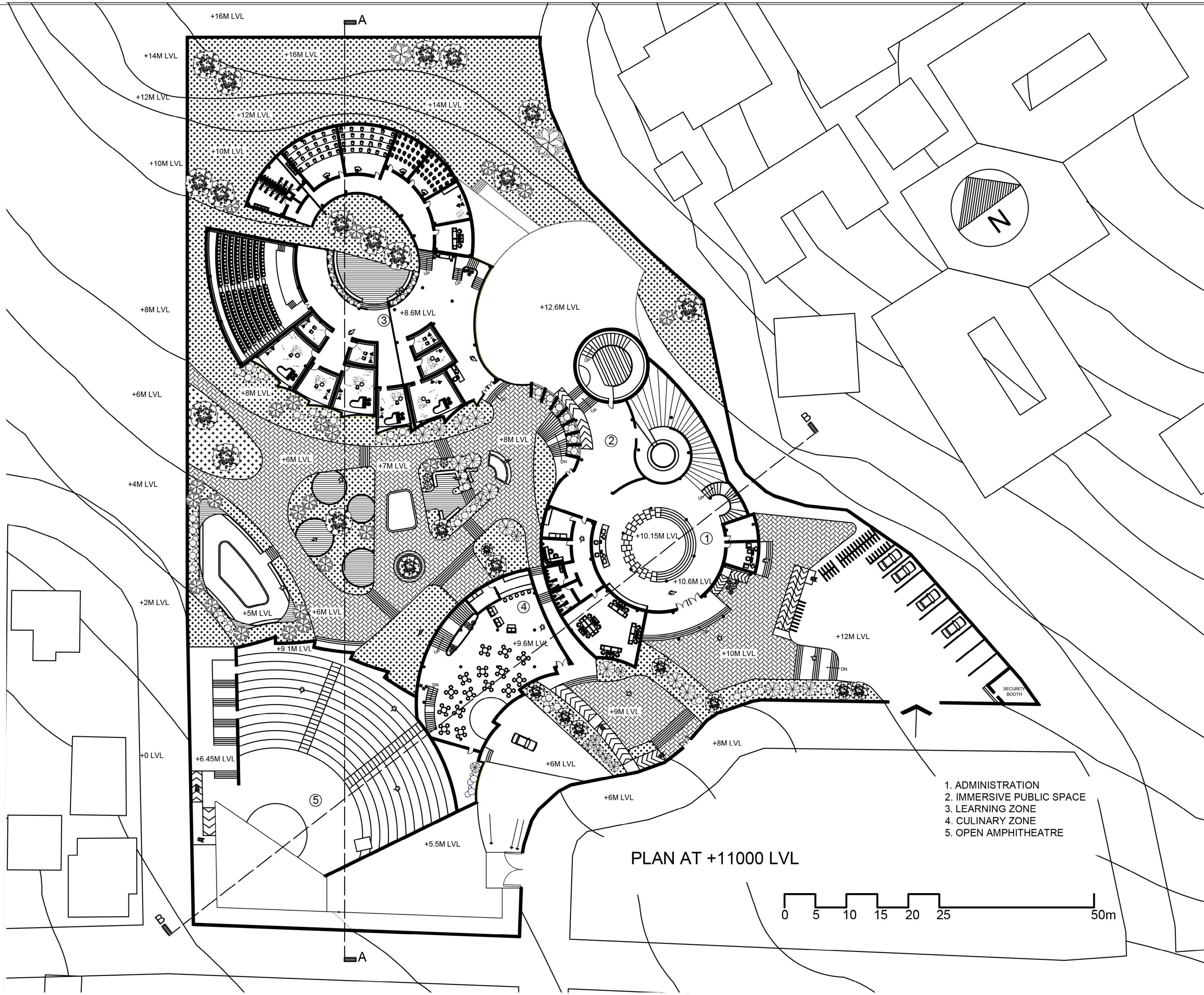

1. ADMINISTRATION
2. IMMERSIVE PUBLIC SPACE
3. LEARNING ZONE
4. CULINARY ZONE
5. OPEN AMPHITHEATRE

PLAN AT +11000 LVL

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SHEET NO.:

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4. CULINARY ZONE
5. OPEN AMPHITHEATRE

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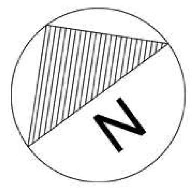
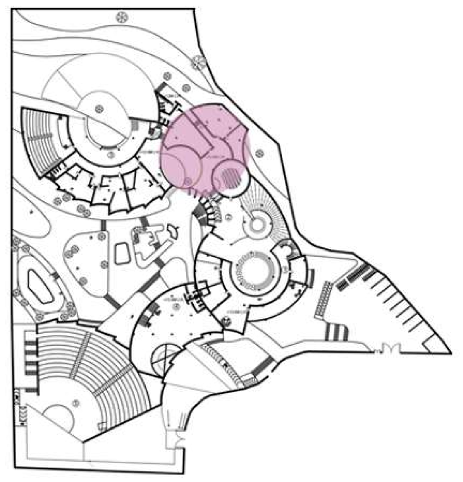
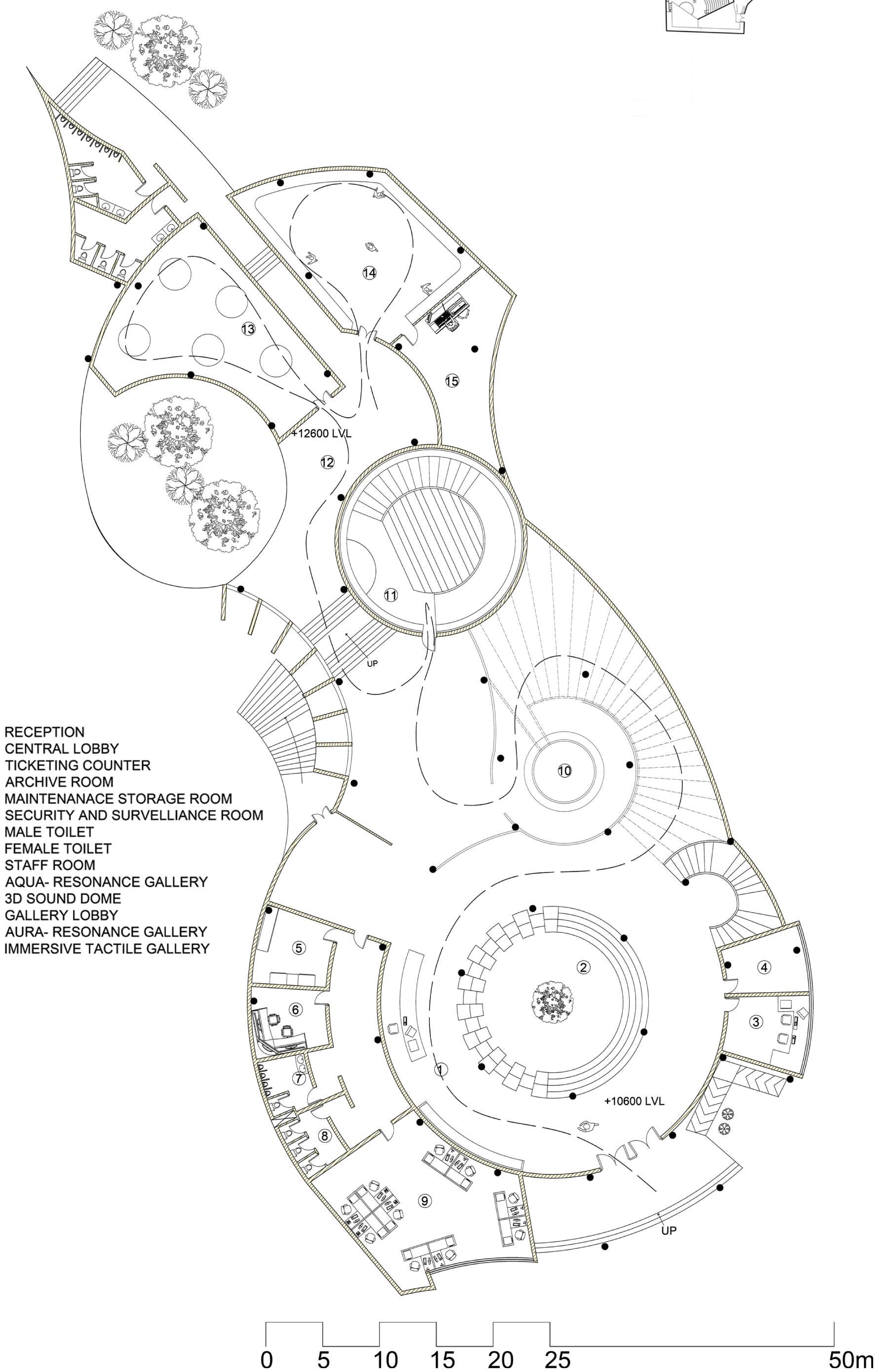
IMMERSIVE SOUND GALLERY

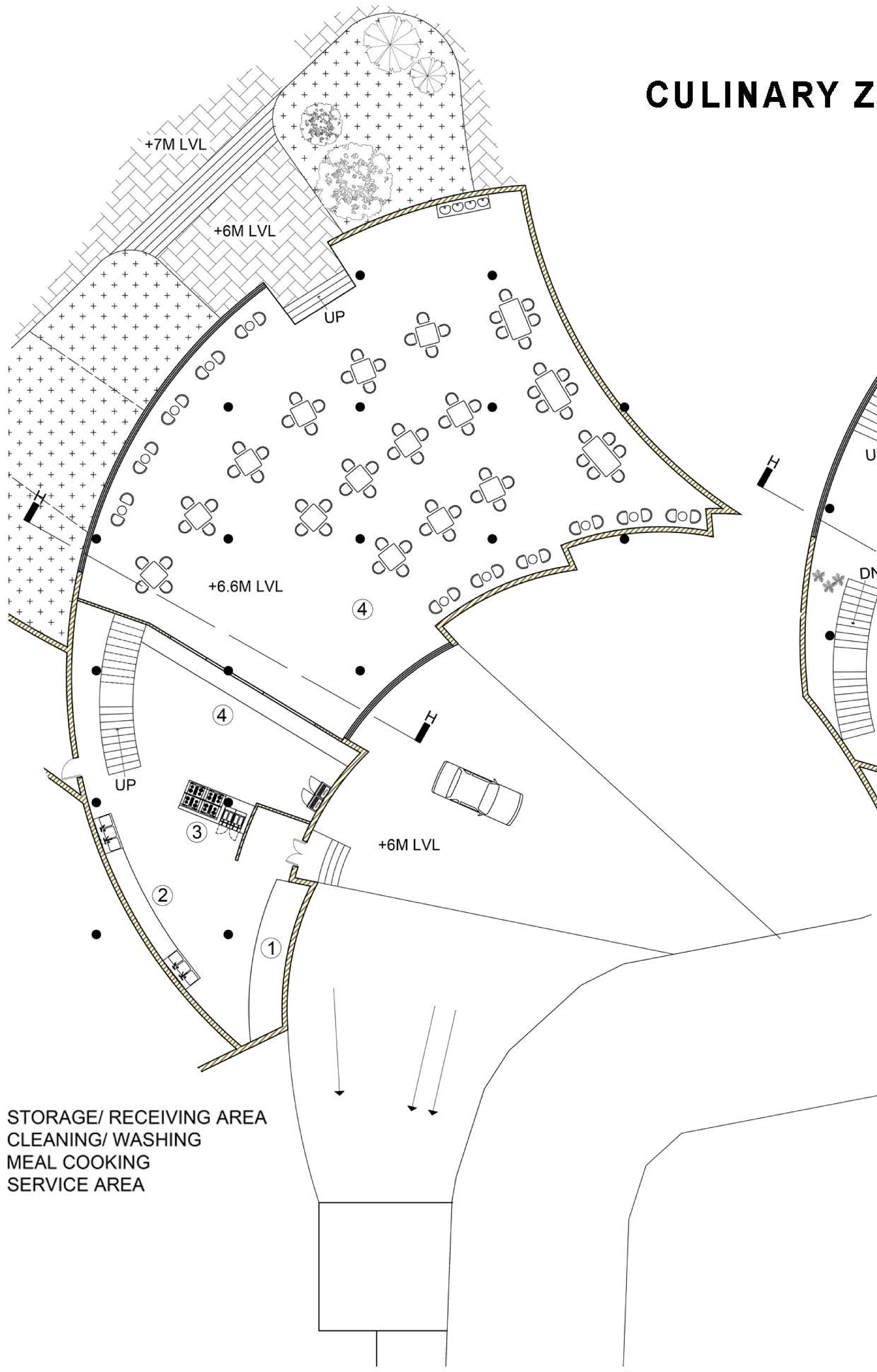






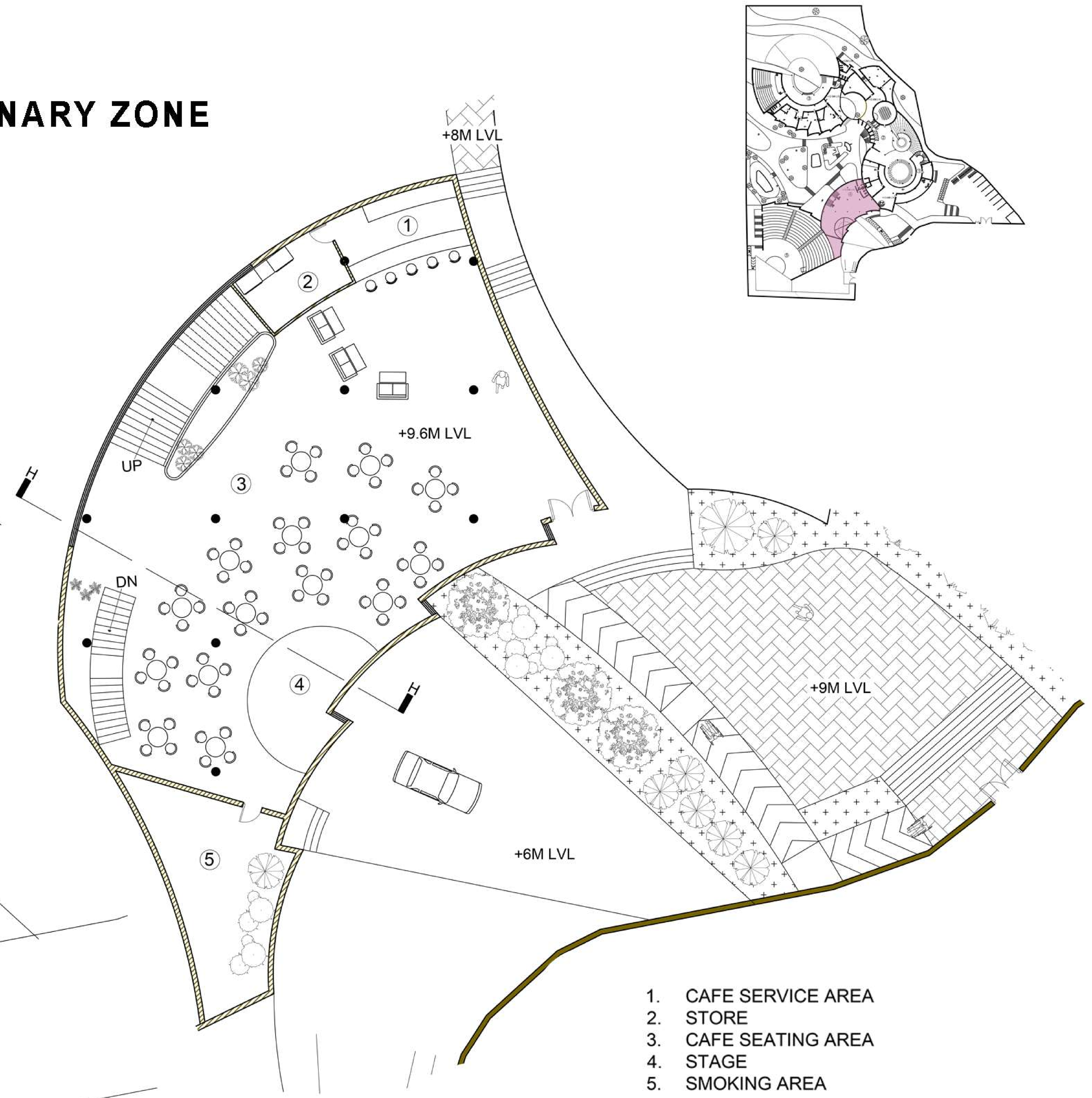
1. RECEPTION
2. CENTRAL LOBBY
3. TICKETING COUNTER
4. ARCHIVE ROOM
5. MAINTENANACE STORAGE ROOM
6. SECURITY AND SURVELLIANCE ROOM
7. MALE TOILET
8. FEMALE TOILET
9. STAFF ROOM
10. AQUA- RESONANCE GALLERY
11. 3D SOUND DOME
12. GALLERY LOBBY
13. AURA- RESONANCE GALLERY
14. IMMERSIVE TACTILE GALLERY

CULINARY ZONE



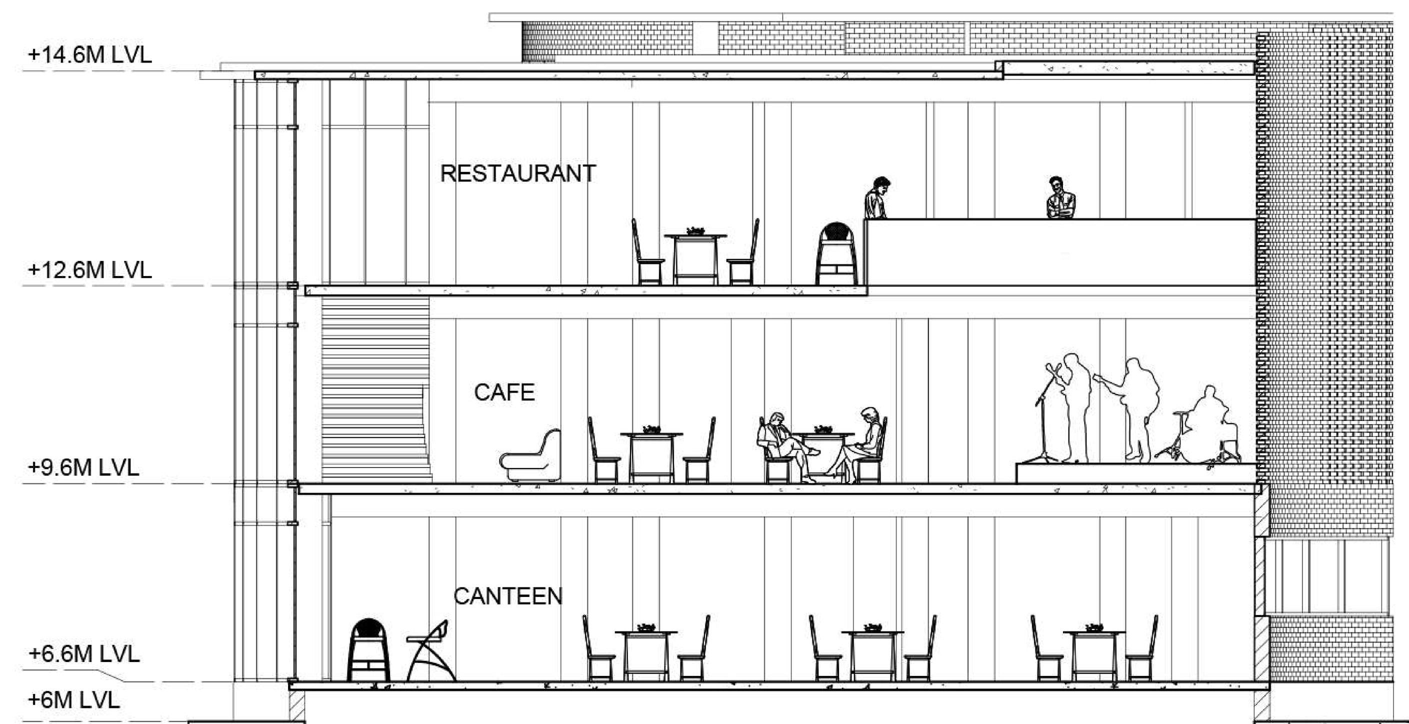
1. STORAGE/ RECEIVING AREA
2. CLEANING/ WASHING
3. MEAL COOKING
4. SERVICE AREA

GROUND FLOOR (CANTEEN)

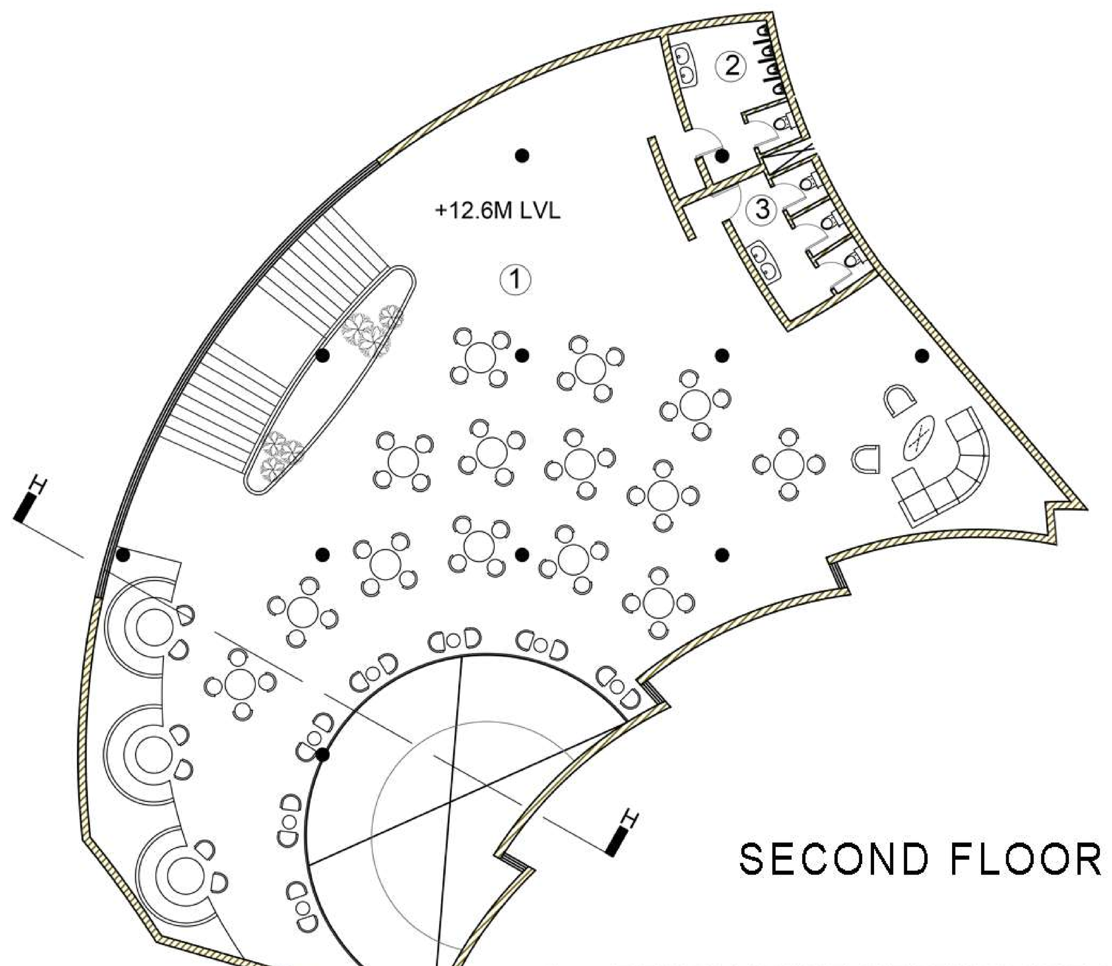


1. CAFE SERVICE AREA
2. STORE
3. CAFE SEATING AREA
4. STAGE
5. SMOKING AREA

FIRST FLOOR (CAFE)

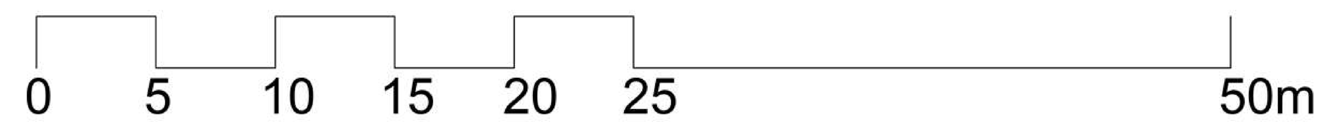


SECTION THROUGH H-H



SECOND FLOOR (RESTAURANT)

1. RESTAURANT SEATING AREA
2. MALE TOILET
3. FEMALE TOILET



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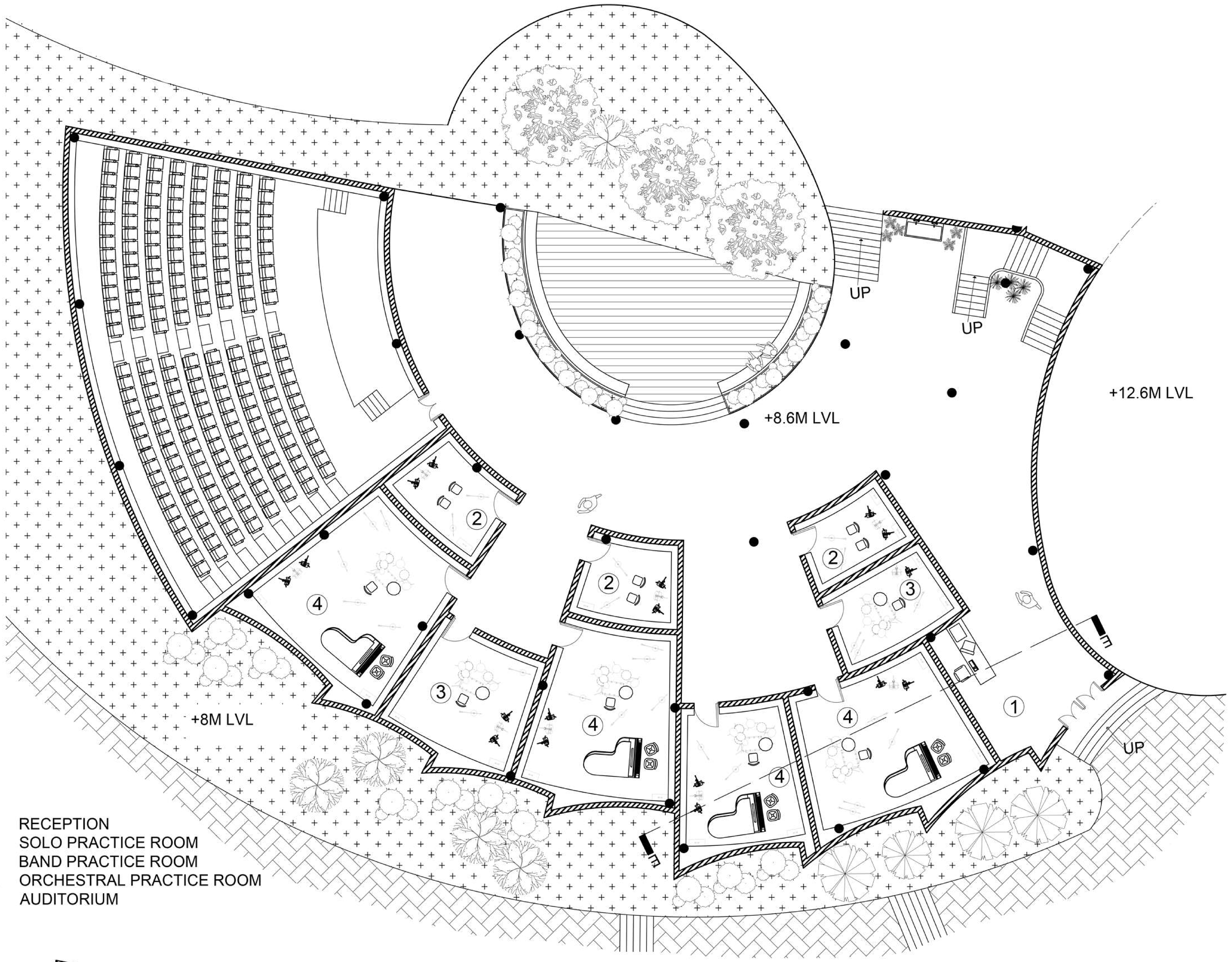
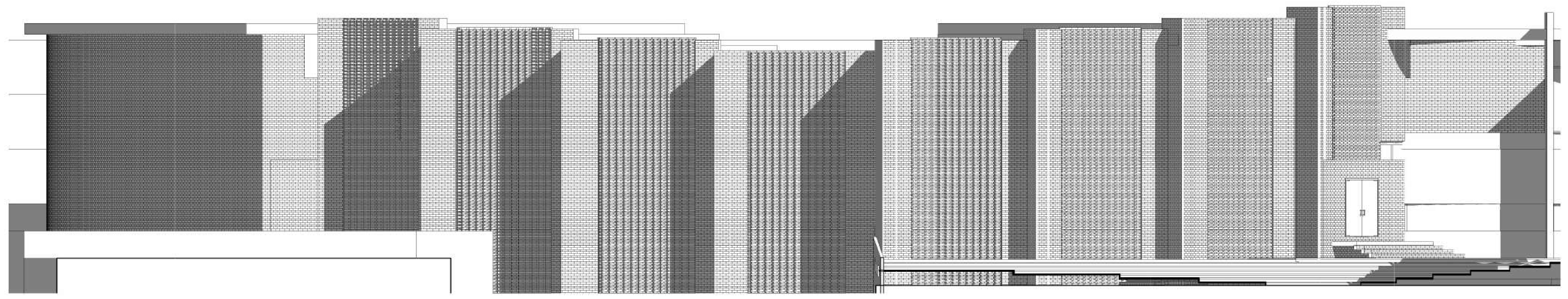
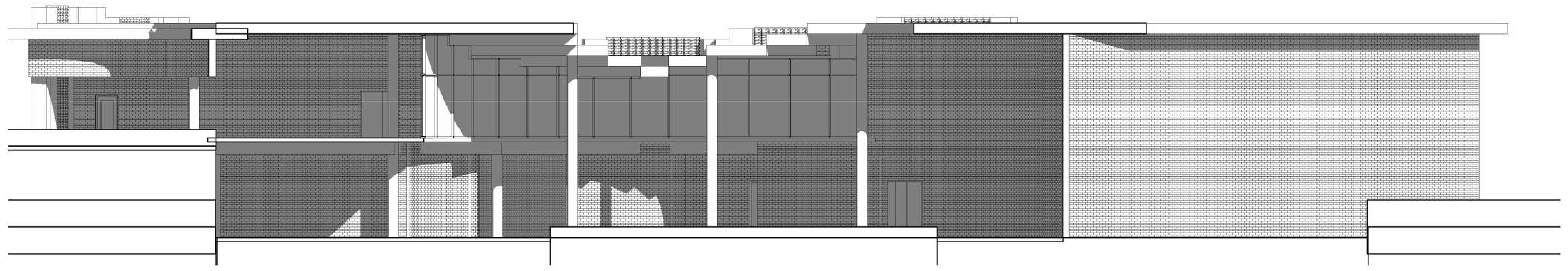
REHEARSAL AREA



1. RECEPTION
2. SOLO PRACTICE ROOM
3. BAND PRACTICE ROOM
4. ORCHESTRAL PRACTICE ROOM
5. AUDITORIUM

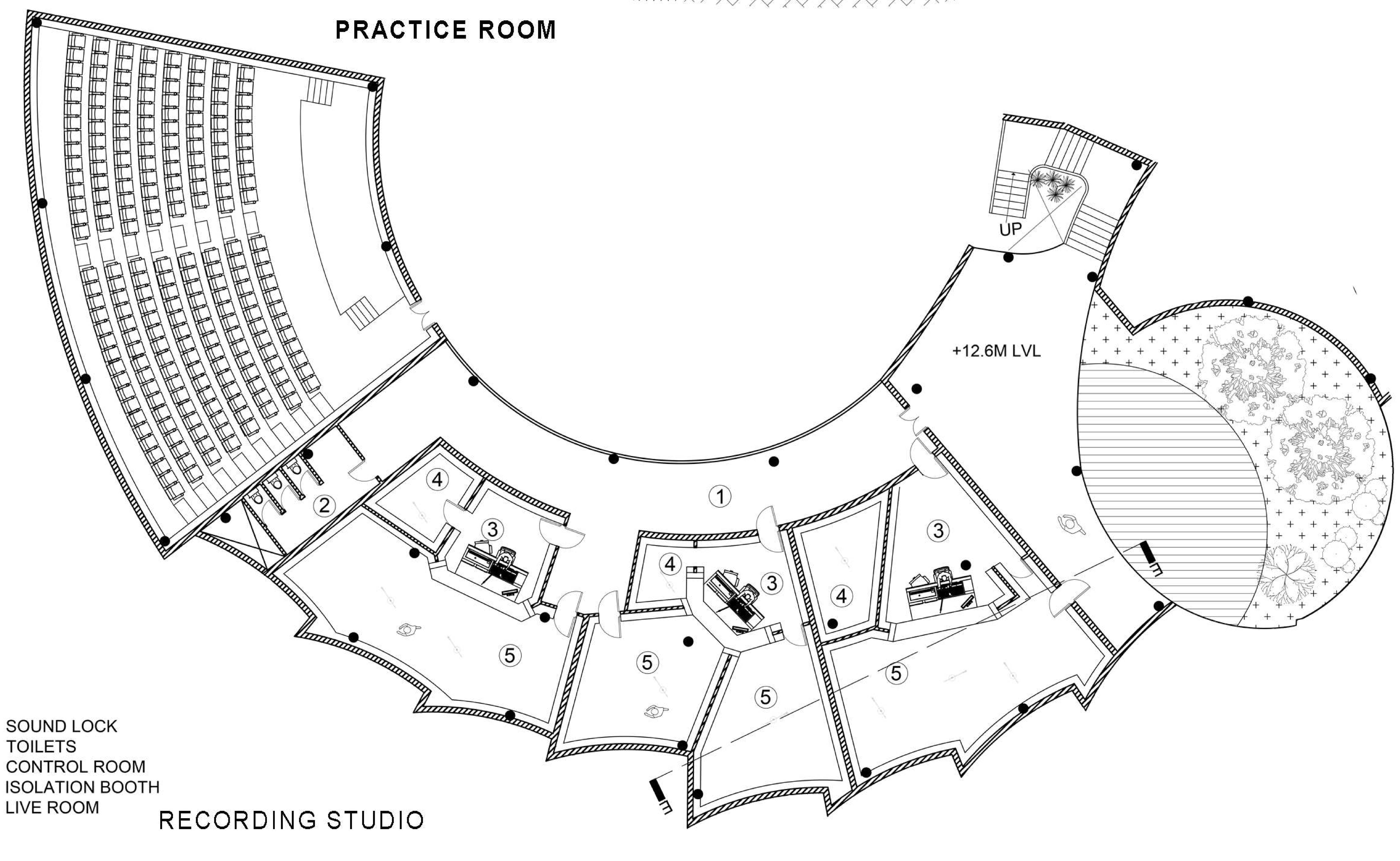


FRONT ELEVATION



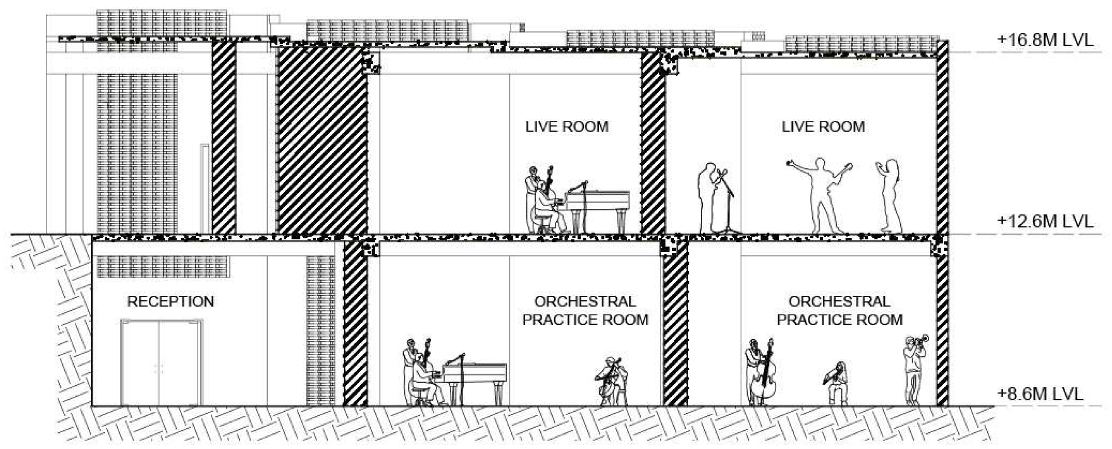
BACK ELEVATION

PRACTICE ROOM

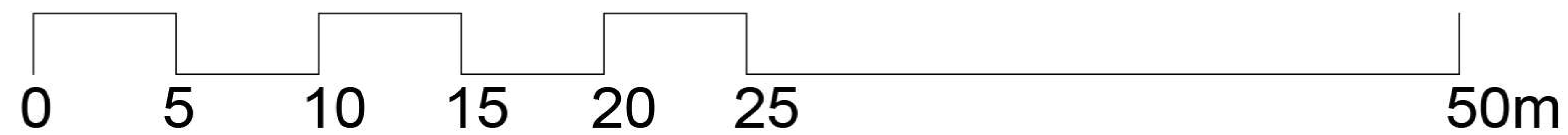


1. SOUND LOCK
2. TOILETS
3. CONTROL ROOM
4. ISOLATION BOOTH
5. LIVE ROOM

RECORDING STUDIO



SECTION THROUGH E-E



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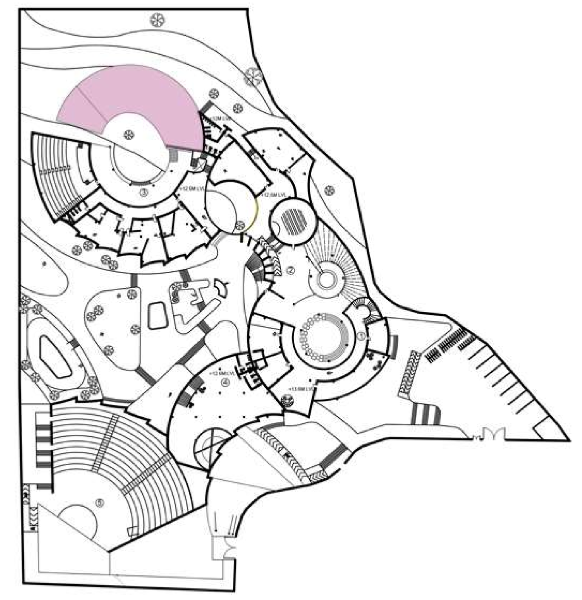
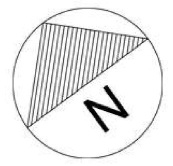
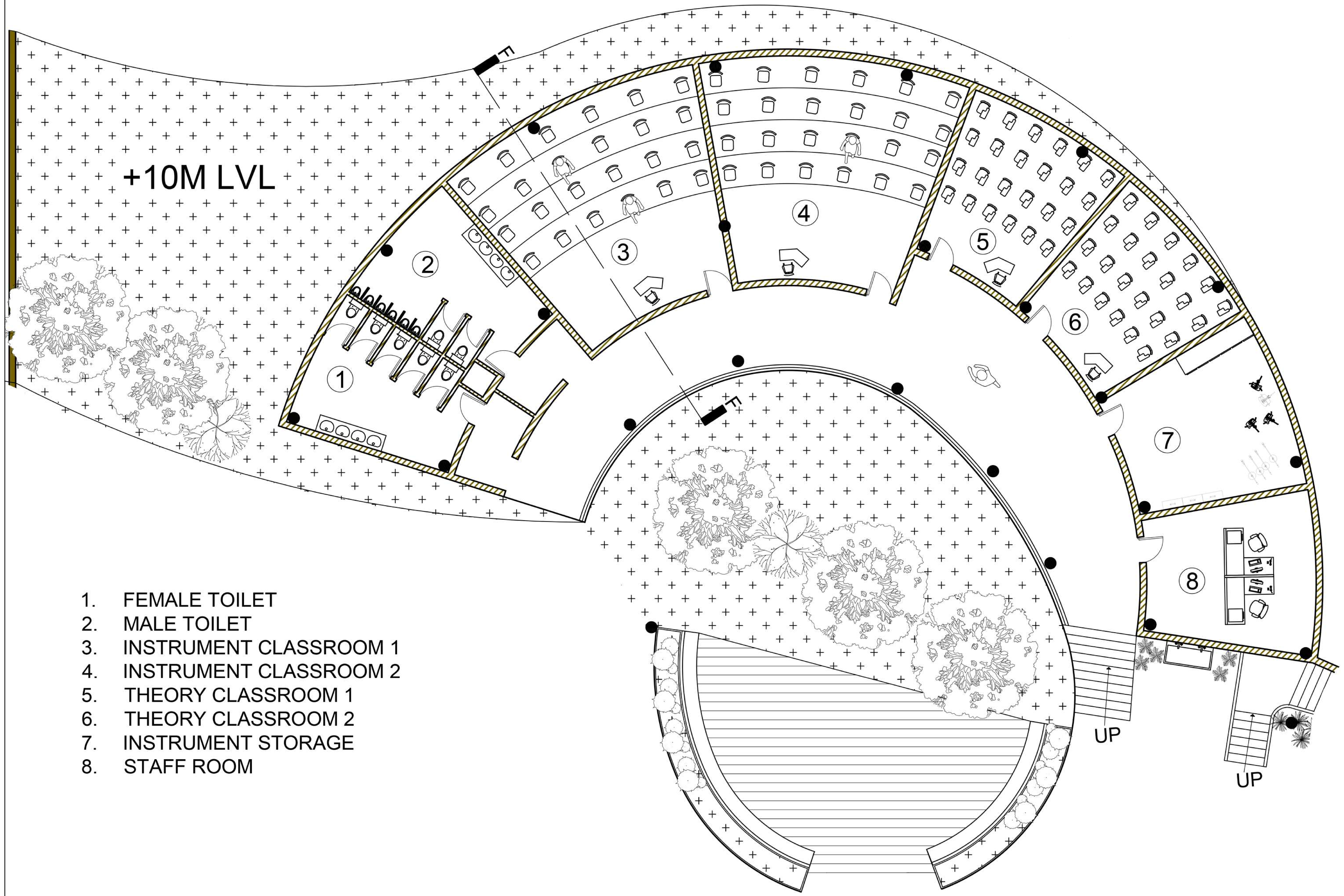
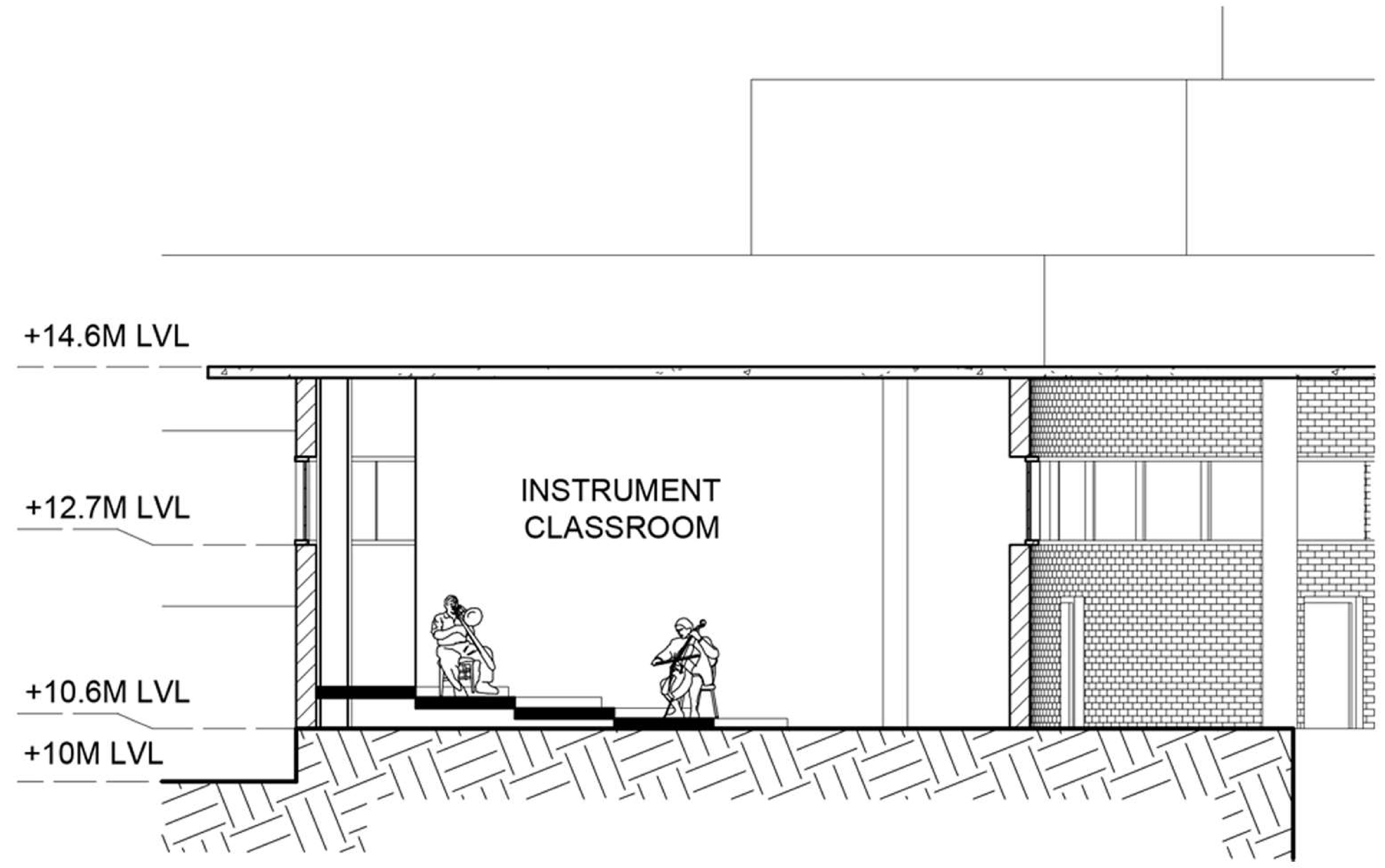
LEARNING ZONE



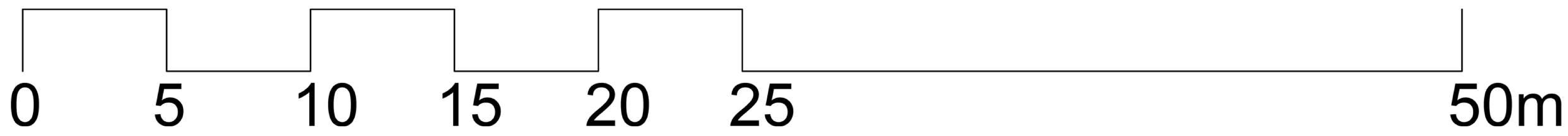




1. FEMALE TOILET
2. MALE TOILET
3. INSTRUMENT CLASSROOM 1
4. INSTRUMENT CLASSROOM 2
5. THEORY CLASSROOM 1
6. THEORY CLASSROOM 2
7. INSTRUMENT STORAGE
8. STAFF ROOM



SECTION THROUGH F-F



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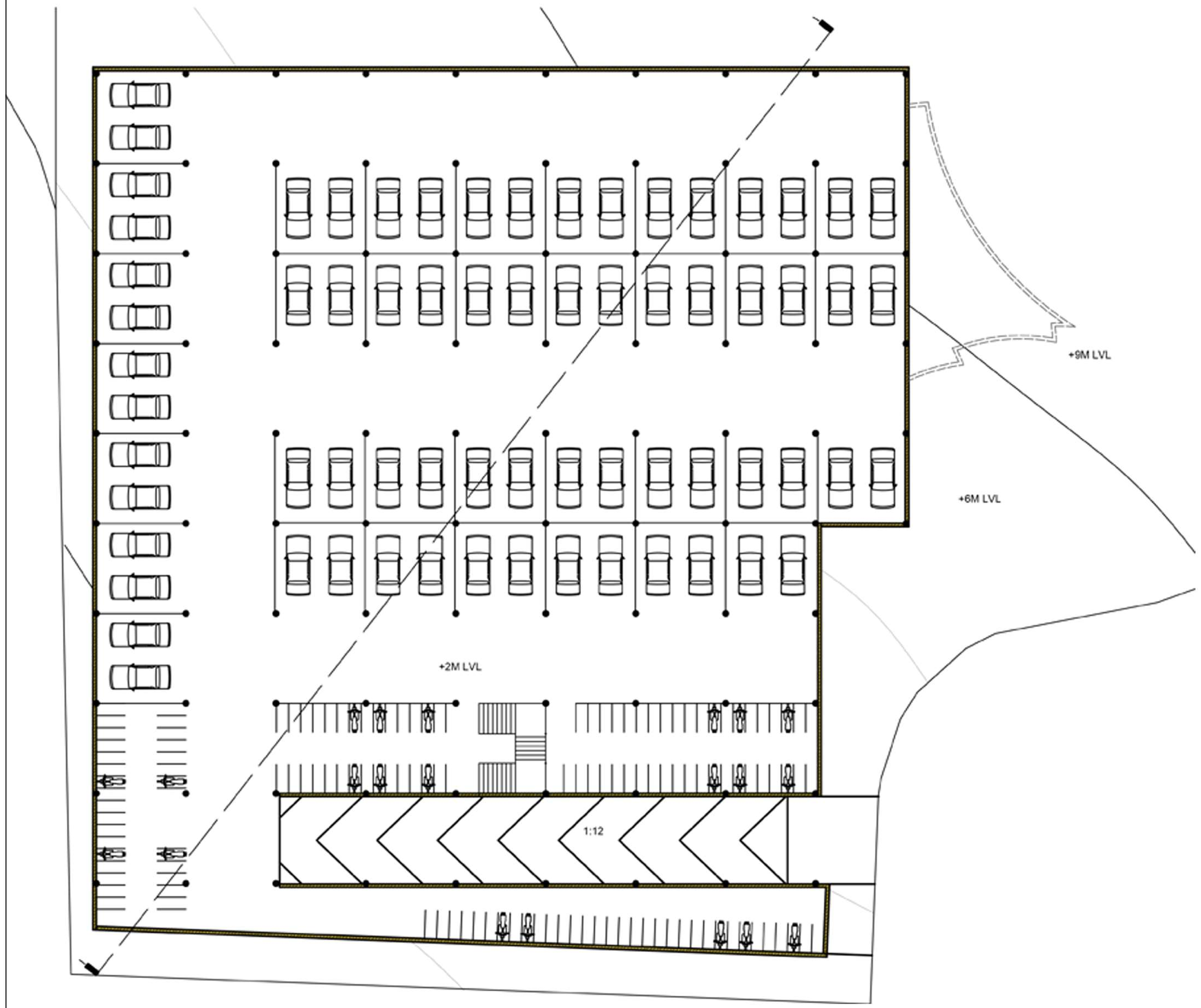
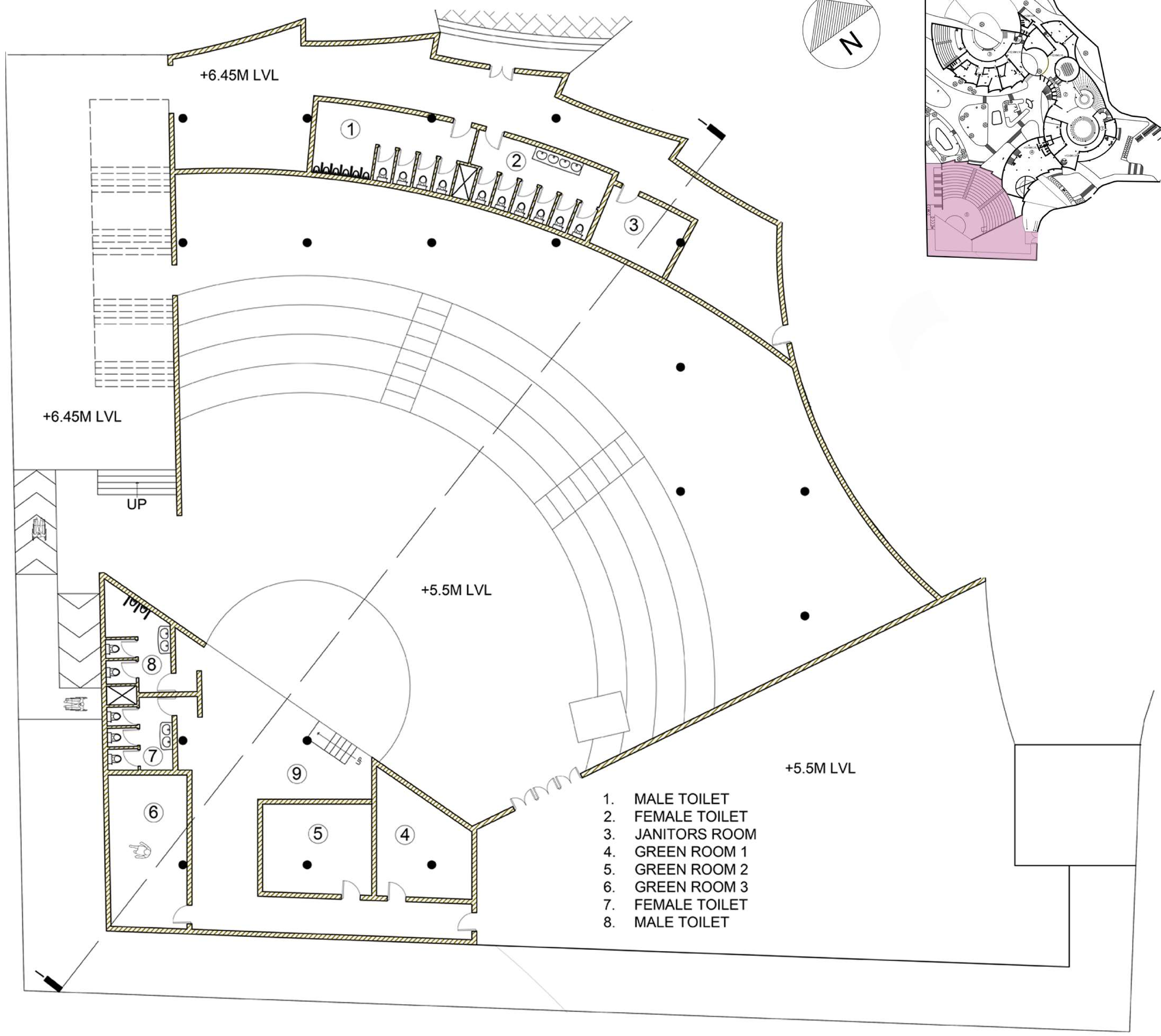
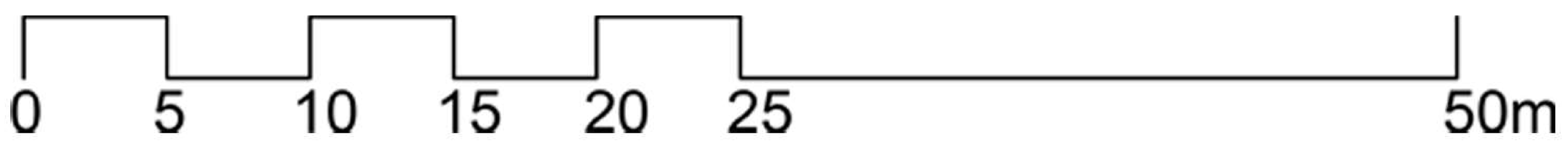
OPEN AMPHITHEATRE

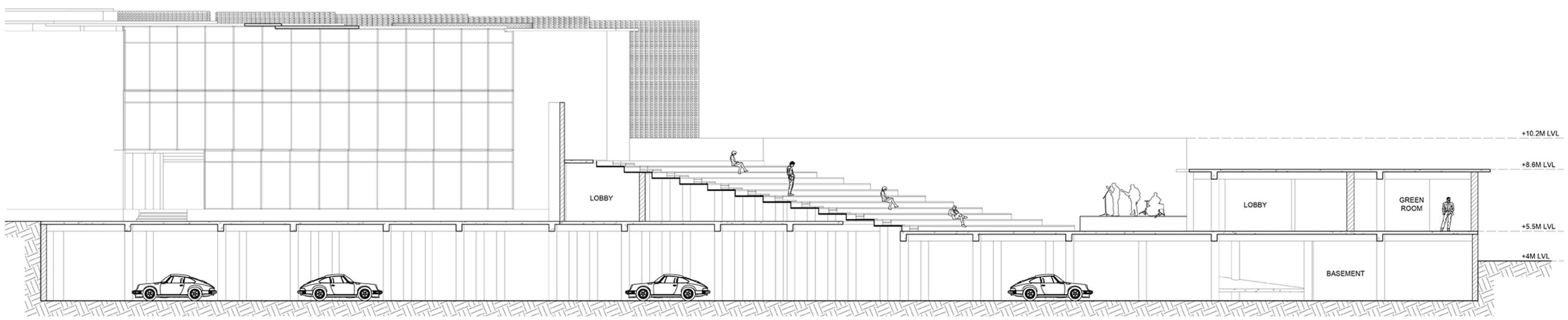


BASEMENT PLAN

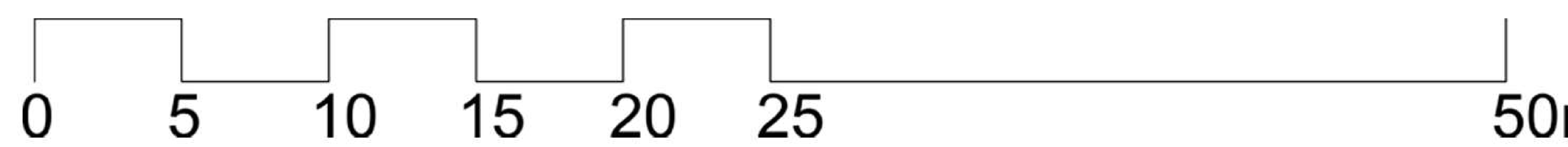


PLAN AT +5.5M LVL





SECTION THROUGH I-I



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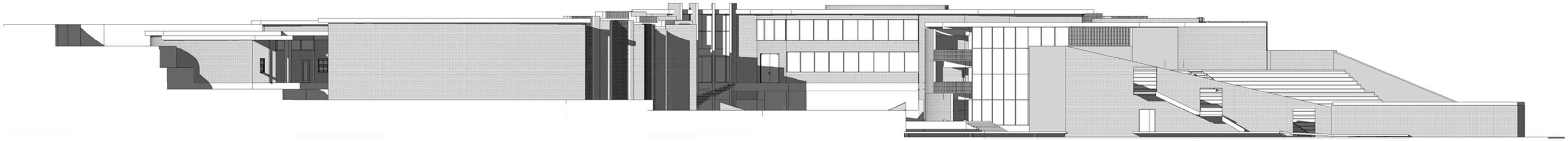
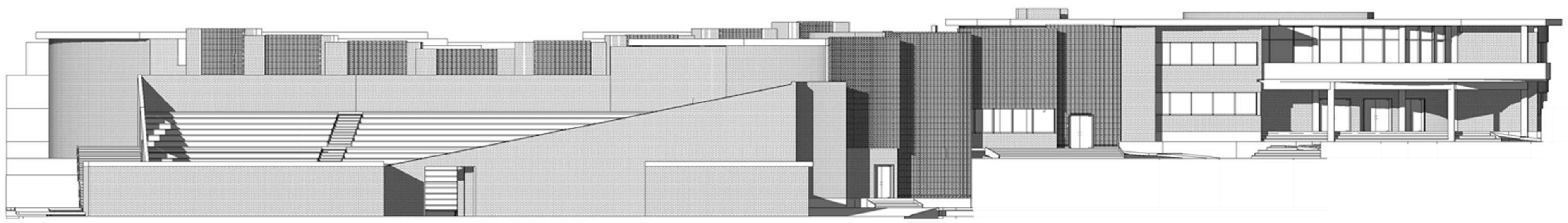
ELEVATIONS

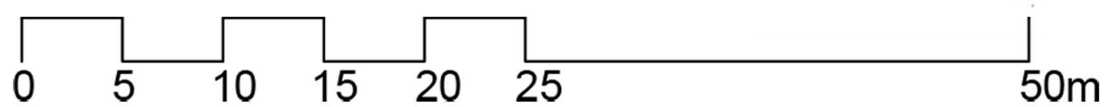
EAST ELEVATION



WEST ELEVATION



SOUTH ELEVATION



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ROLL. NO.: 760105

DATE: 2025-08-20

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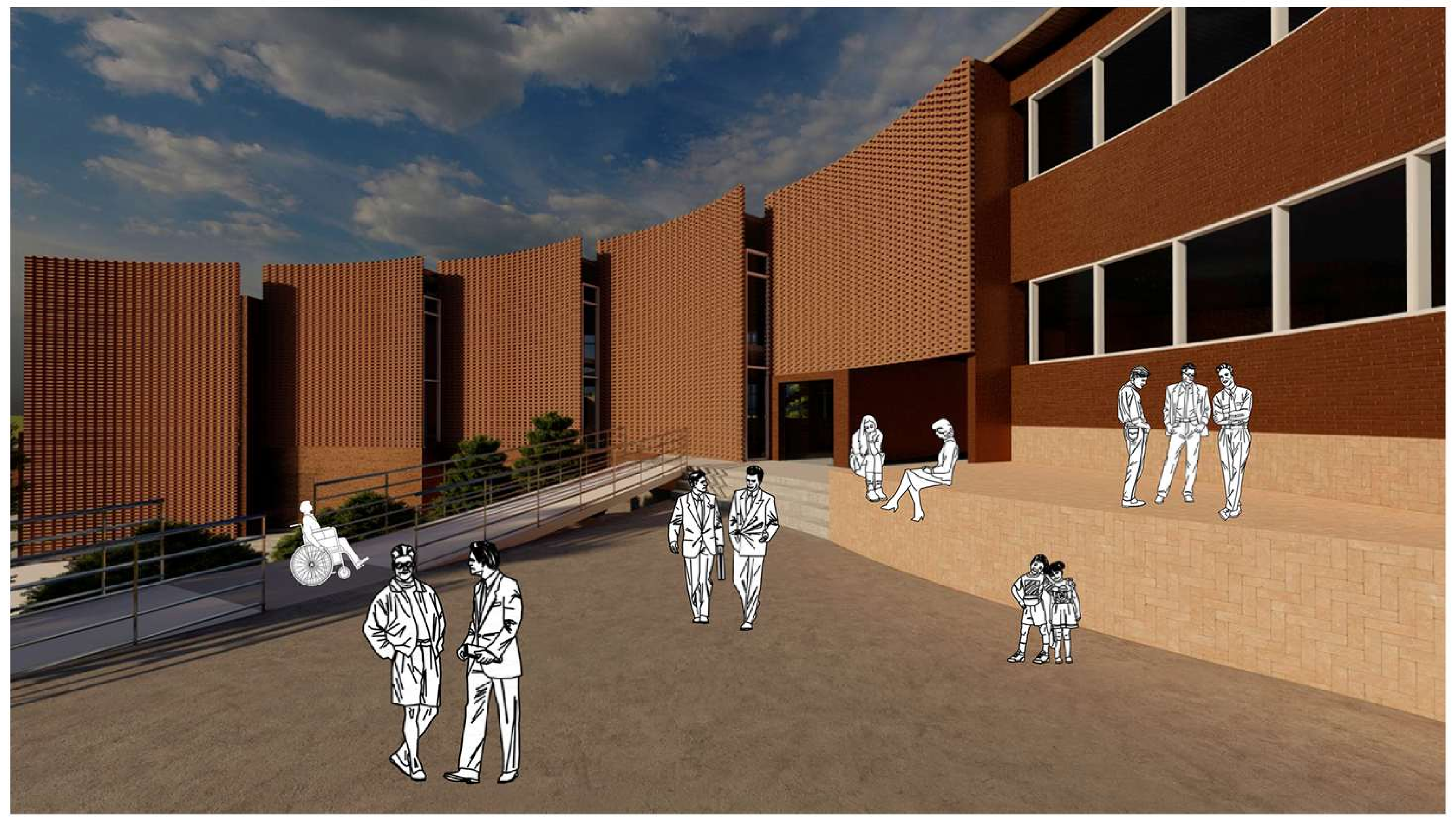
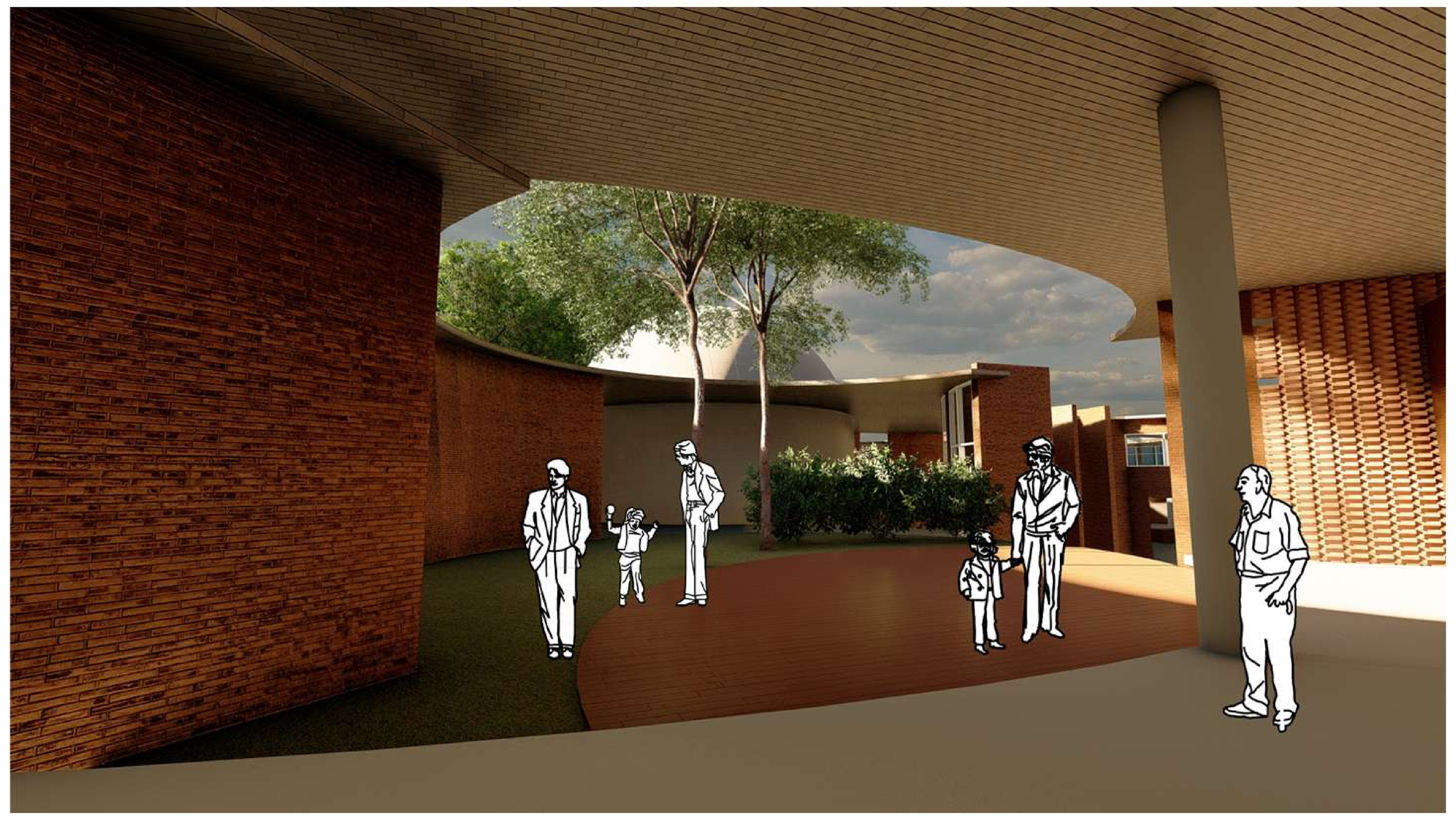
RENDERS



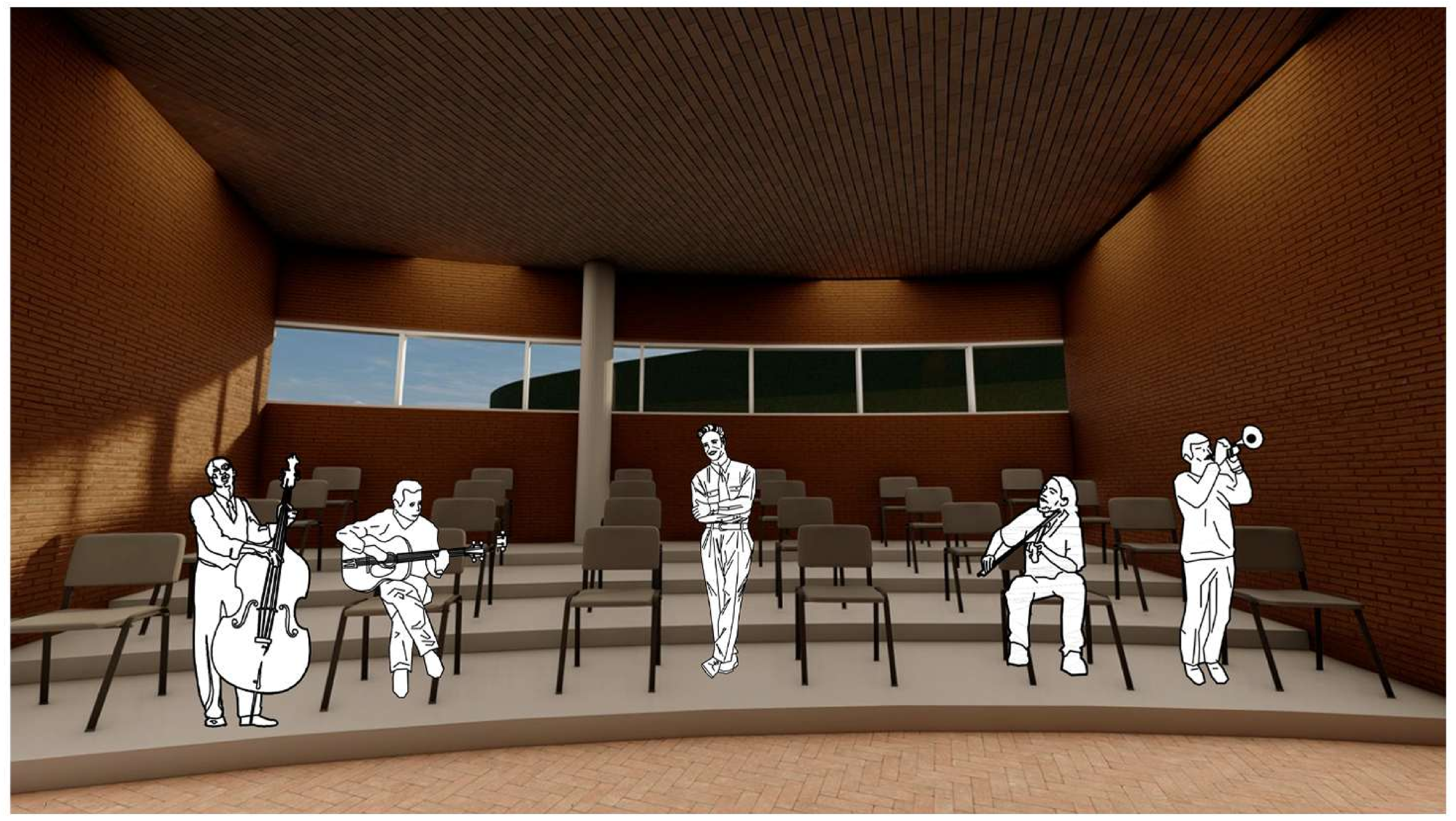
CAFE FACADE

CENTRAL INTERACTIVE
SPACE

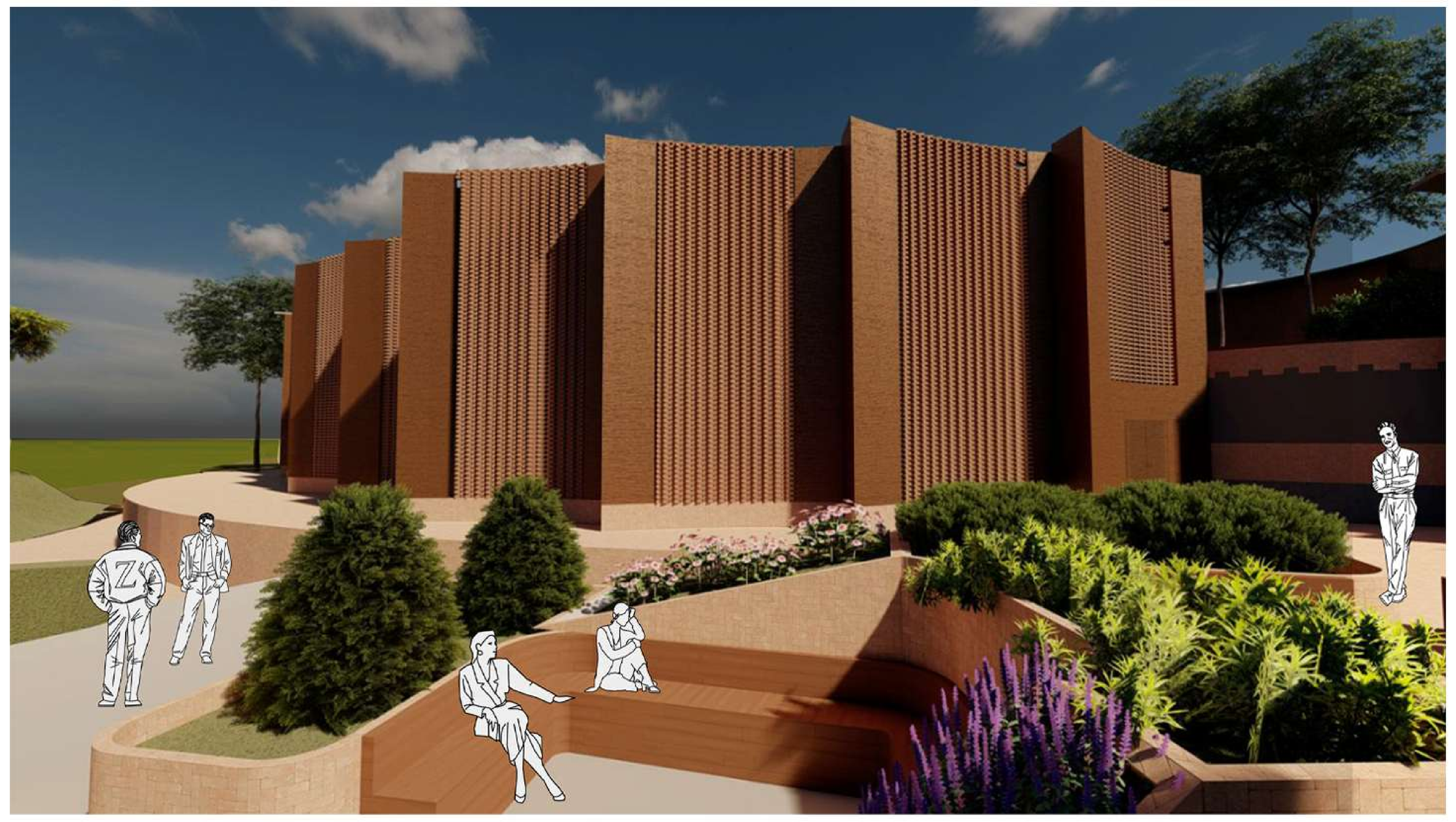


INTERACTIVE SPACE FOR
RECORDING STUDIOS

WATER BODY IN
INTERACTIVE SPACE



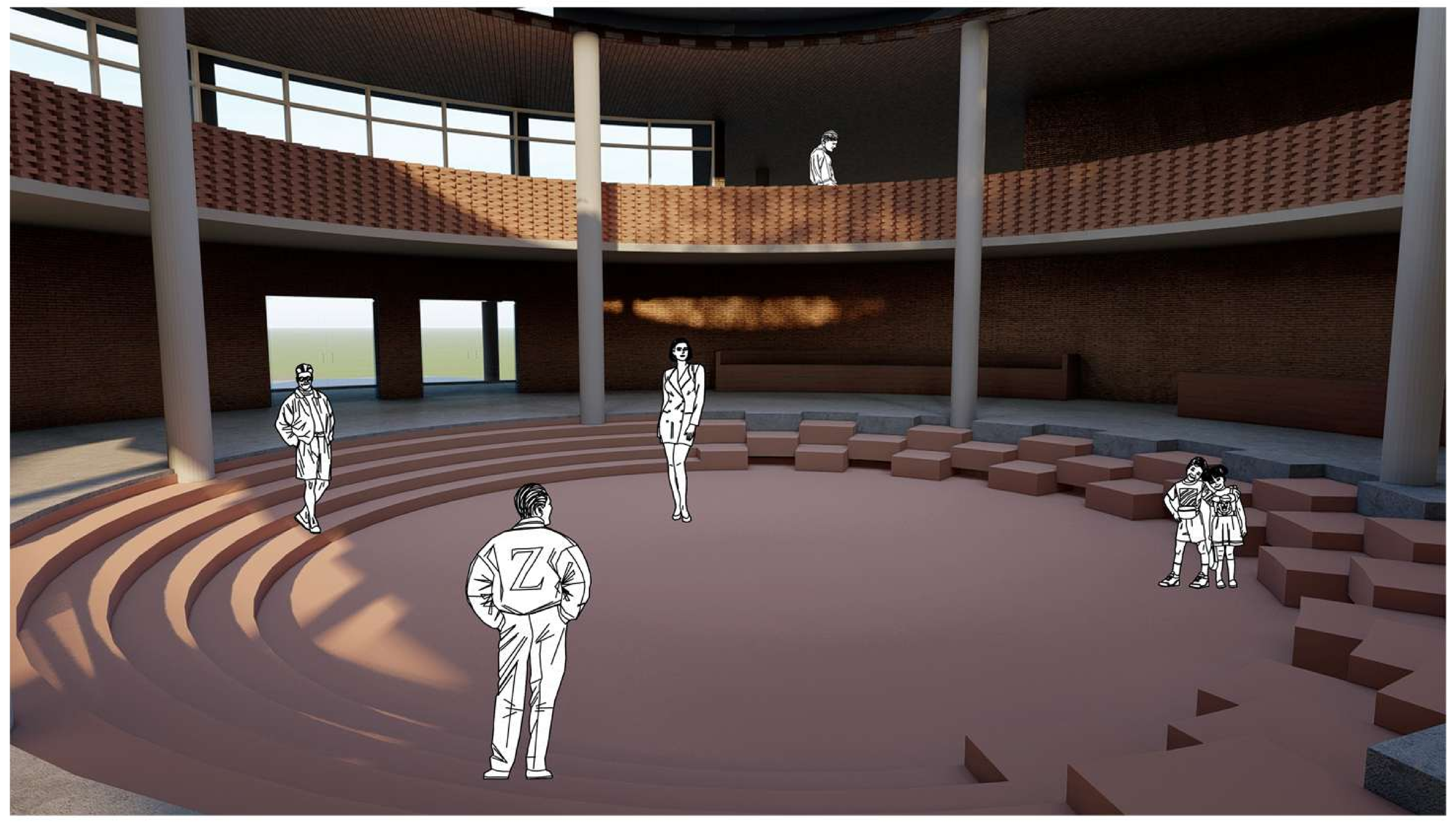
MUSIC CLASSROOM



PRACTICE ZONE FACADE

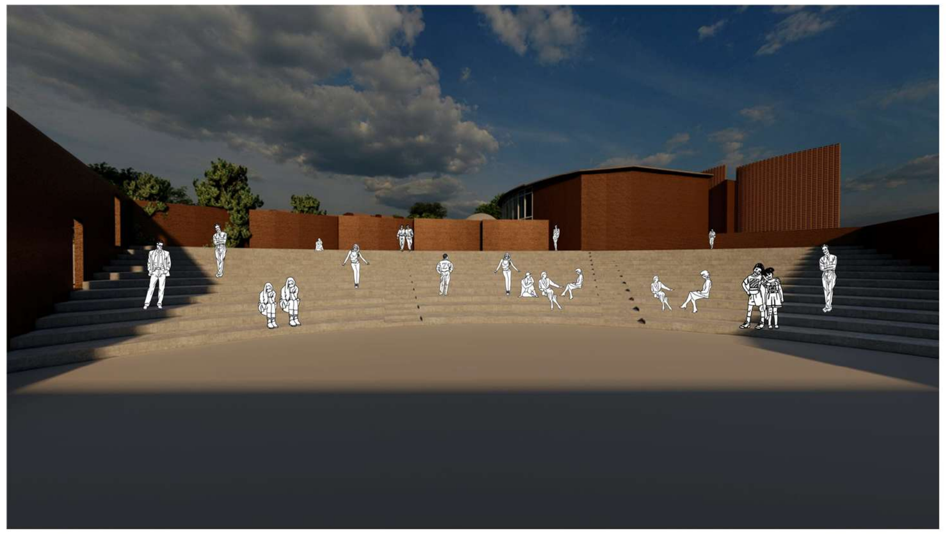
INTERACTIVE SPACE FOR
LEARNING ZONE

ENTRANCE VIEW

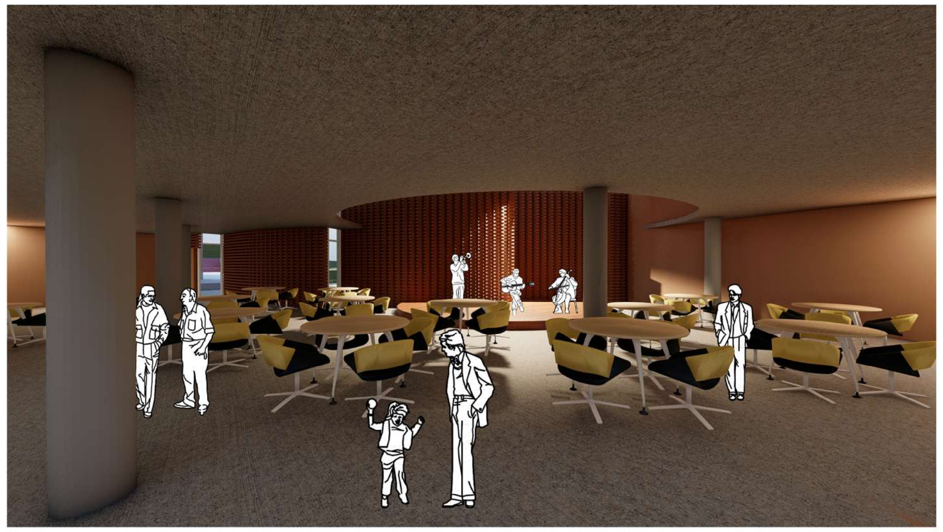


INTERIOR OF LOBBY AREA

RENDERS



VIEW OF SEATING AREA

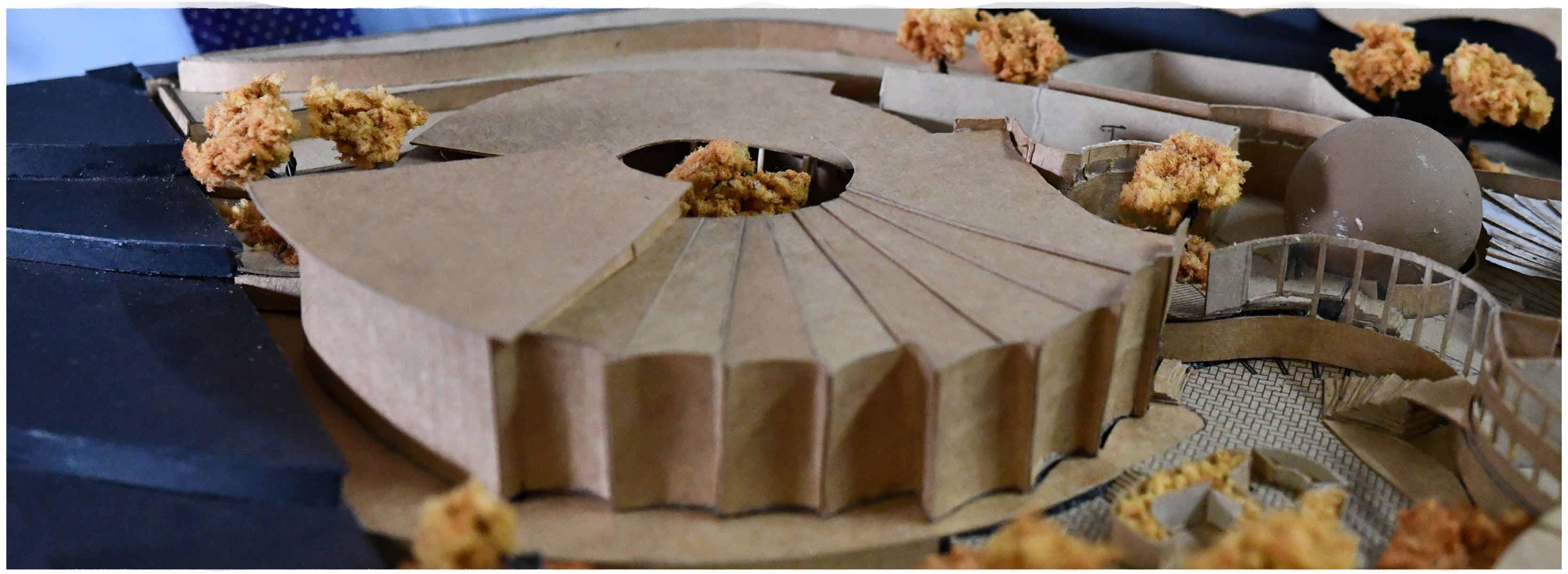


CAFE VIEW

LOUVERS

PURBANCHAL UNIVERSITY KHWOPA ENGINEERING COLLEGE DEPARTMENT OF ARCHITECTURE LIBALI, BHAKTAPUR	FINAL PRESENTATION	NAME: ALIZA SHRESTHA	DATE: 2025-08-20	SHEET NO.:
	B. ARCH. THESIS	ROLL. NO.: 760105		

MODEL



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