Portfolio
Architecture

BTAR3028 DESIGN STUDIO VI

Y3S3

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20WVR08685

Hi, I shall say it comes to the end of my Bachelors year. This shall be the last time for me preparing this portfolio series. Time flies and surprisingly fast.

This semester was my most challenging semester so far in my student life, and I would say it was quite depressing. I nearly lost my mind, but still, everything held on tightly.

Such a relief that I still manage to make all my submissions on time, despite the transition from online classes back to physical. I had to readjust the physical classes again.

The given brief for this Design Studio VI was a challenging one, from the site to the given programs, all are required to respond effectively to produce a good design. The given time was not able to make my design mature, but it is still an ongoing process.

Lastly, I appreciate the effort of all my lecturers;Ar.Toong ,Cikgu Fadzil ,Ar. Julius and Ar. Ong on guiding us through this last semester. All the best for them in their teaching career.

19/4/2022

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Project 1a

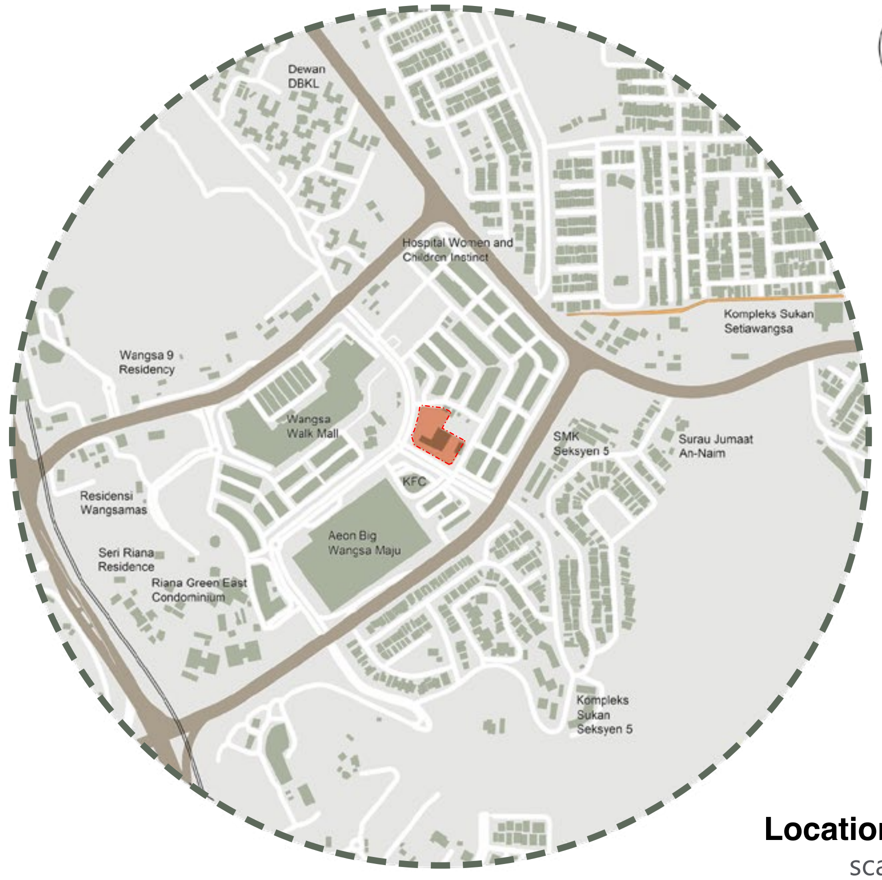
Site Analysis :

Wangsa Maju Site A

To promote Kuala Lumpur as a world class city, new growth areas (Damansara, Wangsa Maju, Bukit Jalil and Bandar Tun Razak) were developed. Wangsa Maju was part of Setapak rubber estates in the 1900s to 1980s, until the township was formed in 1984. The PGK Sdn Bhd and City Hall aims to build a township with mixed development, comprising medium and high rise condominiums, double-storey terrace houses, semi-detached houses, shops, offices and commercial complexes.

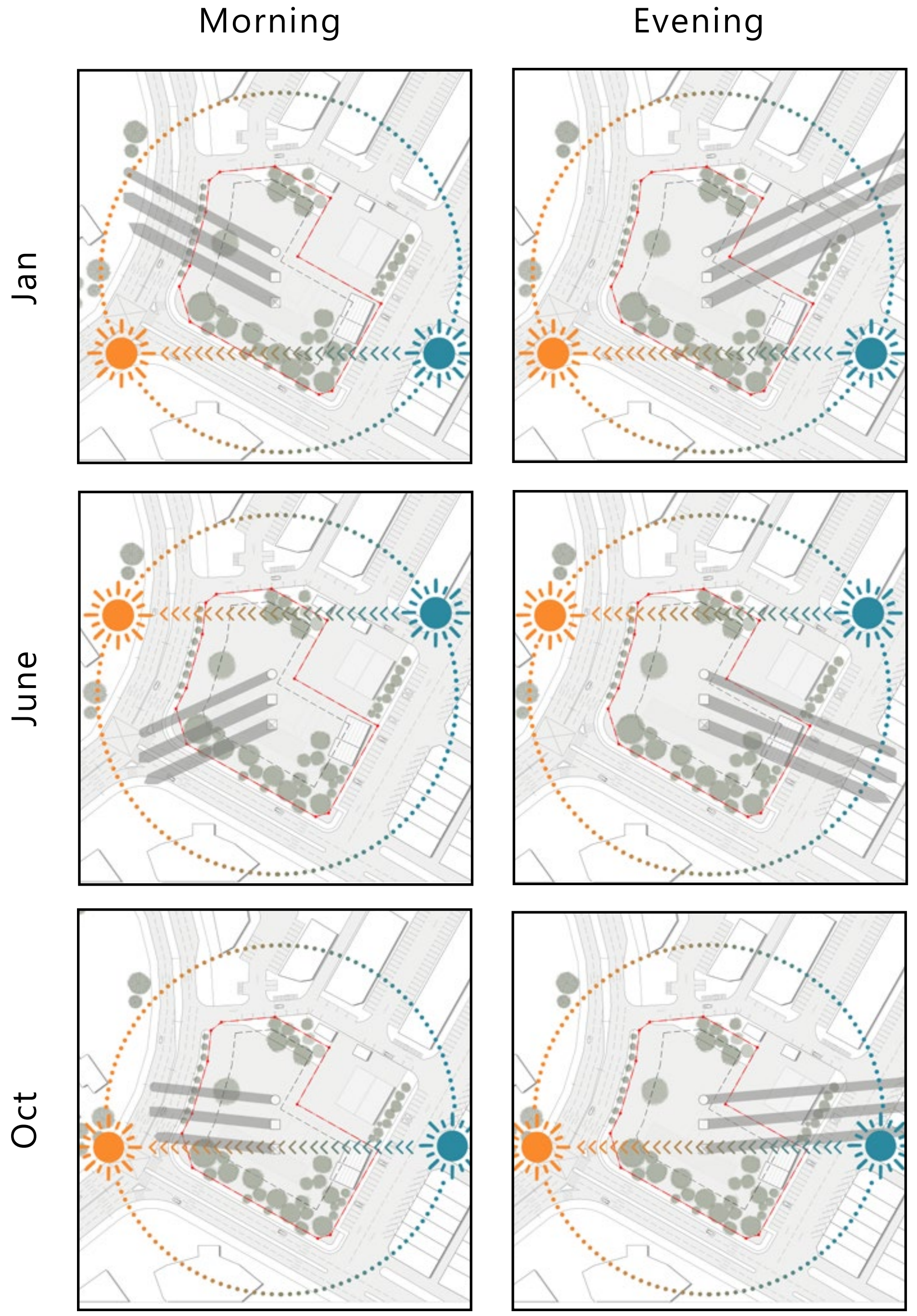
The given site location is an island site surrounded by traffic, with one of its corners facing the intersection of Jalan Wangsa Delima and Jalan Wangsa Delima 1. Its surrounding neighbours are generally shoplots and mix use complex such as Aeon Big and Wangsa Walk Mall.

Key Plan
scale NTS

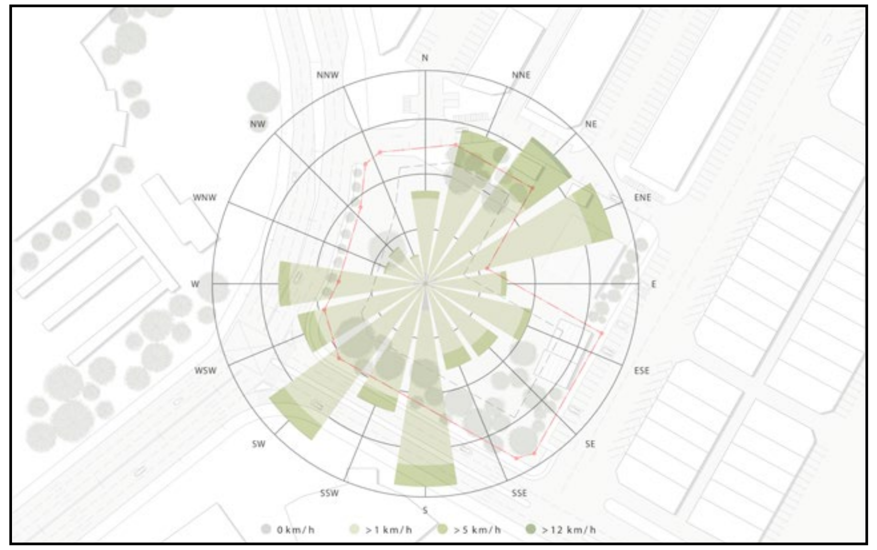


Location Plan
scale NTS

Site Plan
scale NTS



Sun Path



Wind rose

Building Height

The average building height in this suburb area of Wangsa Maju were mainly low rise to medium rise until the recent years of high rise condominium developments. Reasons of low rise development due to development control of hill lands based on Pelan Struktur Kuala Lumpur 2040.

Open Space

There are limited areas of open green spaces like parts for the public in Wangsa Maju. The open green spaces usually limited to the terrace houses residents or the school field for the students.

Legend

- Proposed Site
- 1-3 Stories
- 4-6 Stories
- High Rises
- Green Spaces
- Carparks/ Empty Plot
- a Bukit TM Wangsa Maju
- b Bukit Dinding
- 1 Public Park
- 2 School Field
- 3 Residential Parks

Street Pattern

The overall street pattern is organised as an irregular grid system due to its existing topography landscape.The centralised commercial area has the grid pattern within the main roads. On the contrary the residential buildings were organised in an organic branch system. This street network allows visitors to access the site from different directions effectively.

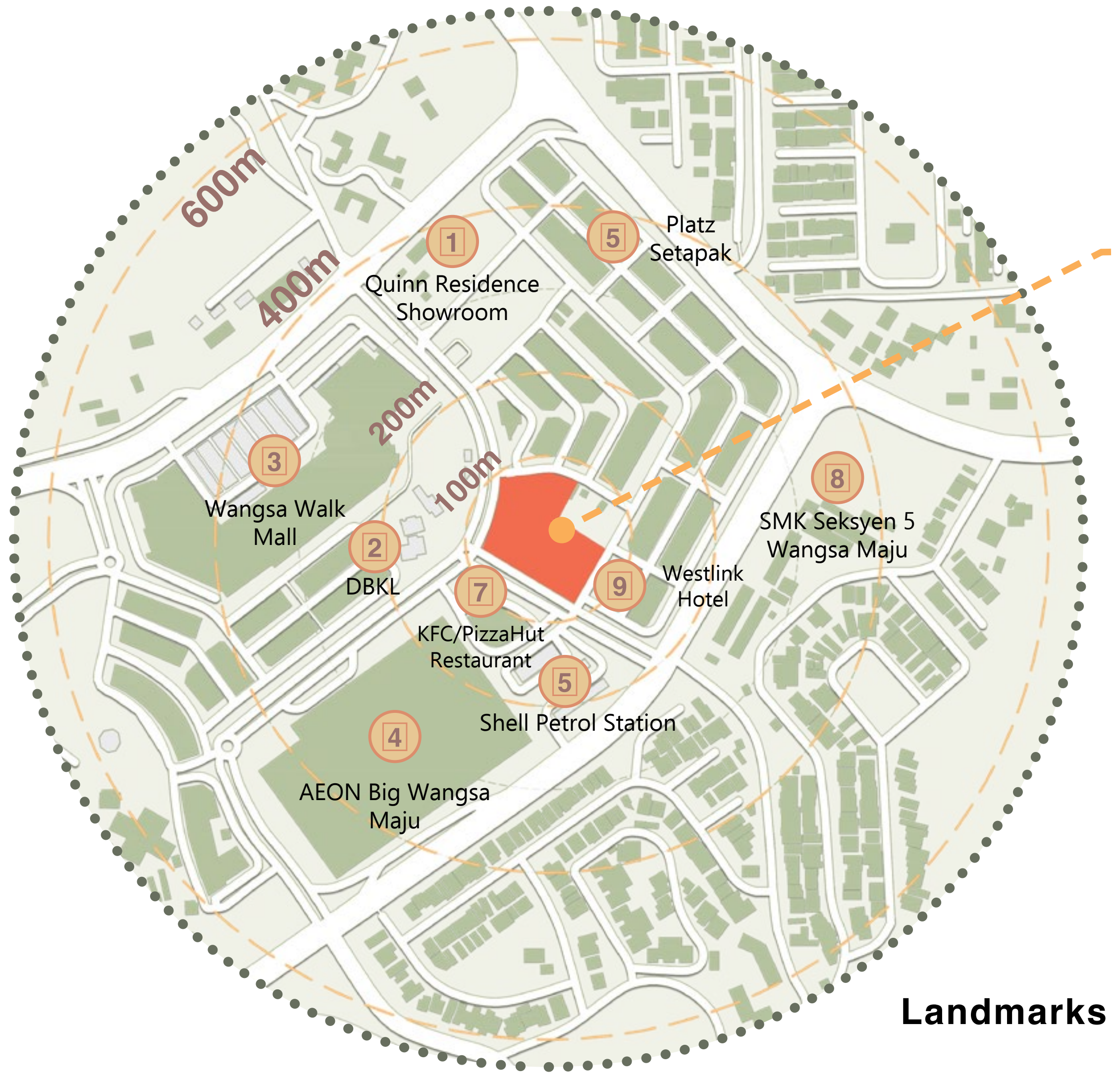
The street network of the commercial area were mostly 1-way streets to control traffic flow and prevent congestion.

Legend

- 1-Way Traffic
- 2-Way Traffic

Advantageous corner to design with the challenge of existing vegetations in front of the corner

Sloped elevation viewed from north and existing carparks to be considered in design



Landmarks

Neighnouring Context
100m Radius

The elevation difference between site and existing substation.

View from the corner next to the TNB substation.

1. Quinn Residence Showroom
A single storey showroom unit with copper and aluminum coloured facade located at the corner of Jalan Wangsa Delima and Jalan Wangsa Perdana intersection. A building that shows the PAC site is close-by.

2. DBKL Branch
Located at the corner shoplot with a high roof profile which includes its signage. Notable corner while comming from Jalan Wangsa Delima.

3. Wangsa Walk Mall
Local Mall houses multiple shops, restaurants and Lotus supermarket under a roof.
The walking distance to the mall from the site allows the visitors to spend time while waiting for events in the PAC.

4. AEON Big Wangsa Maju
An older supermarket compared to wangsa walk mall. Attractive colours from the huge massing leads visitors from the south side along Jalan 34/26 towards the site.

5. Platz Setapak
Outstanding facade finish of an office lot which can be seen from a distance. Thus it informs visitors coming from the north side of Jalan 6/27a.

6. Shell Petrol Station
Local petrol station to refuel vehicles.
Besides providing fuel or rest stops for visitors, it's also a guide for the next junction to site.

7. KFC/Pizza Hut Restaurant
A 2 in 1 restaurant building heavily cladded with aluminum and corrugated panels at a corner lot alone attracts driving customers to dine in or take away.
This allows PAC visitors to have food after or before their visit to the PAC.

8. SMK Seksyen 5 Wangsa Maju
Closest Government school to the site. Opportunity to attract young talents and provide them a better training space under a walking distance away from school.

9. Westlink Hotel
A modified shoplot hotel to allow foreign visitors to stay overnight at Wangsa Maju. Maximise use of aluminum strips facade outshines its neighbouring shoplots.
Opportunity to allow invited foreign performers or audiences to conveniently stay within a walking distance from PAC.

1. Commercial Shoplots
Major landscape of the surrounding site, design considerations to stand out or blend into context.

2. Containers Restaurant
Possible use of corrugated profile to be inspired in design stage

3. Storm Water Drain
Potential main water discharge drain. Deep depths could prevent possible floods.

4. Burger King
Subtle stand alone drive-tru restaurant for different fast food options.

5. TNB Substations
Potiential electrical source, but safety design measures need to be aware

6. Oren Restaurant
Small vibrant restaurant with temporary structure design. Provides food options.

7. Affin Bank WM
Silver aluminum cladded shoplot building that provides design inspiration.

Cooperability

The site is surrounded by a variety of commercial amenities, ranging from a retail mall to shophouses, all of which could help the future PAC in various aspects

Vistas

The site has bad glare control against the scorching sun which may pose an uncomfortable visitors' experience

Accessibility

The site has high permeability which provide possibility of numerous access point according to different design approach and intentions

Circulation

Increase of visitors due to the change of site usage may cause traffic congestion at existing entrance

Project 1b

Touch Stone :

Movement

Observations of the site inspire movements through the playful topography; slopes and elevations.
Movements were described as a narrative arc with a gist of performing art. It begins with exposition, rising action towards a climax. Next it will fall into a resolution which turns into a denouement or the end, before another performance or a story starts the entire cycle again.
The whole process is translated and amplified into a combination of solids and voids with a composition of hierarchy with different levels of elevations and disciplined order which describes the rise and fall;The chosen material and colour compliments the form and does not overtake it, it was meant to focus more on the form itself. However, the surface’s colour and texture gives a subtle beauty from shadows. Next, there are some parts which are more consistent, pausing the narrative phases. Eventually it ends up at the same beginning, which shall be defined by different individuals.

Project 2

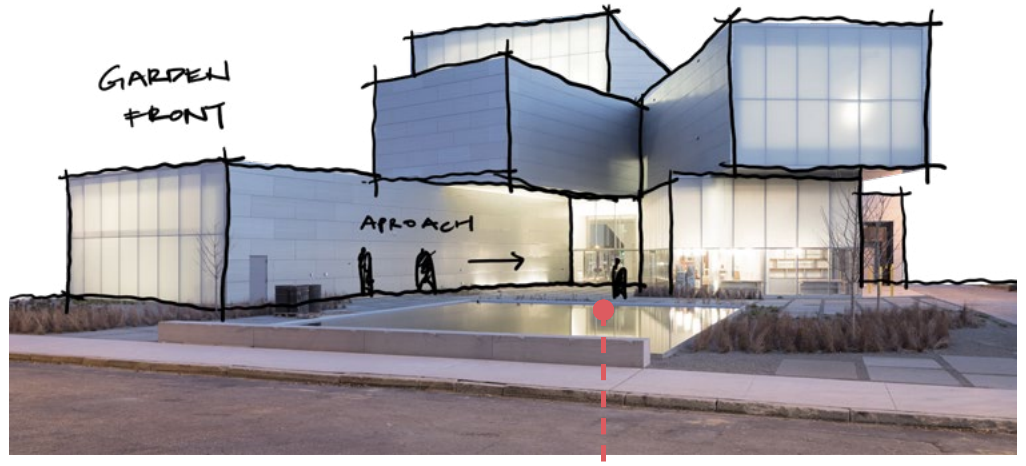
Precedent Studies :

Institute of Contemporary Art, VCU, Richmond, Virginia, USA

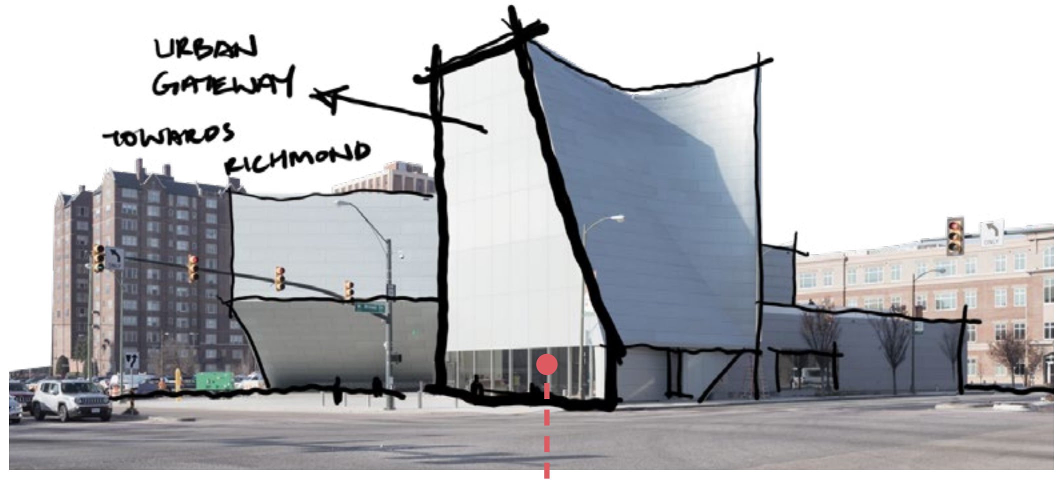
This precedent studies serves as a design reference for the WMPAC. Geographically the context is very different from the given location in the design brief, ICA shares a similar urban context with WMPAC. It is located at a corner of a junction of the town's busiest intersection. The studies led to the approach of responding to the context, how the building creates a dialogue for the local community of Richmond and the students interact together with 2 different entrances.
The main program for this building serves as a contemporary art space for the University, housing forking out gallery spaces, a theatre and a cafe.

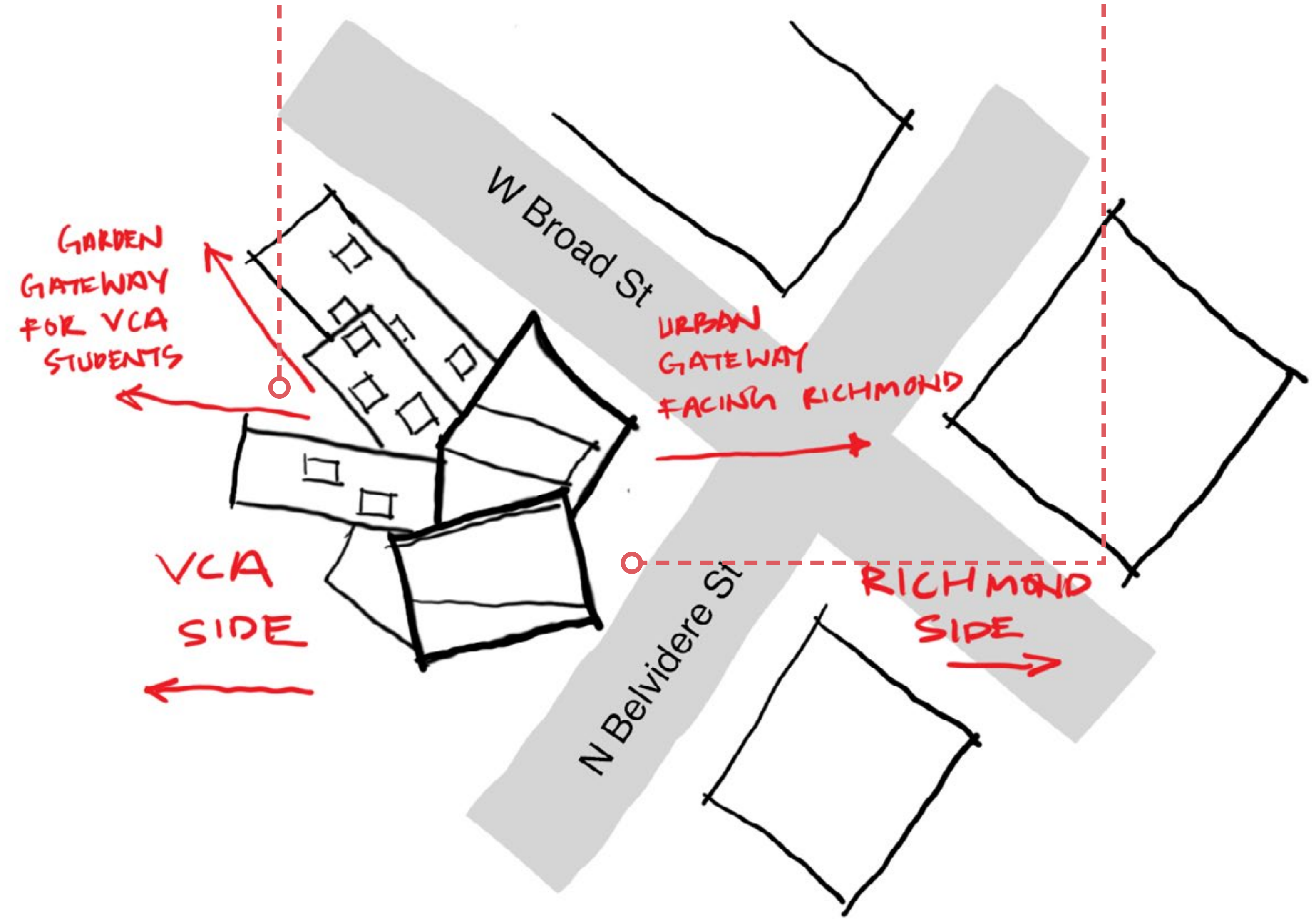
Architect : **Steven Holl Architects**
Year Completed : **2018**
Area : **3809 sqm**
Client : **Virginia Commonwealth University**

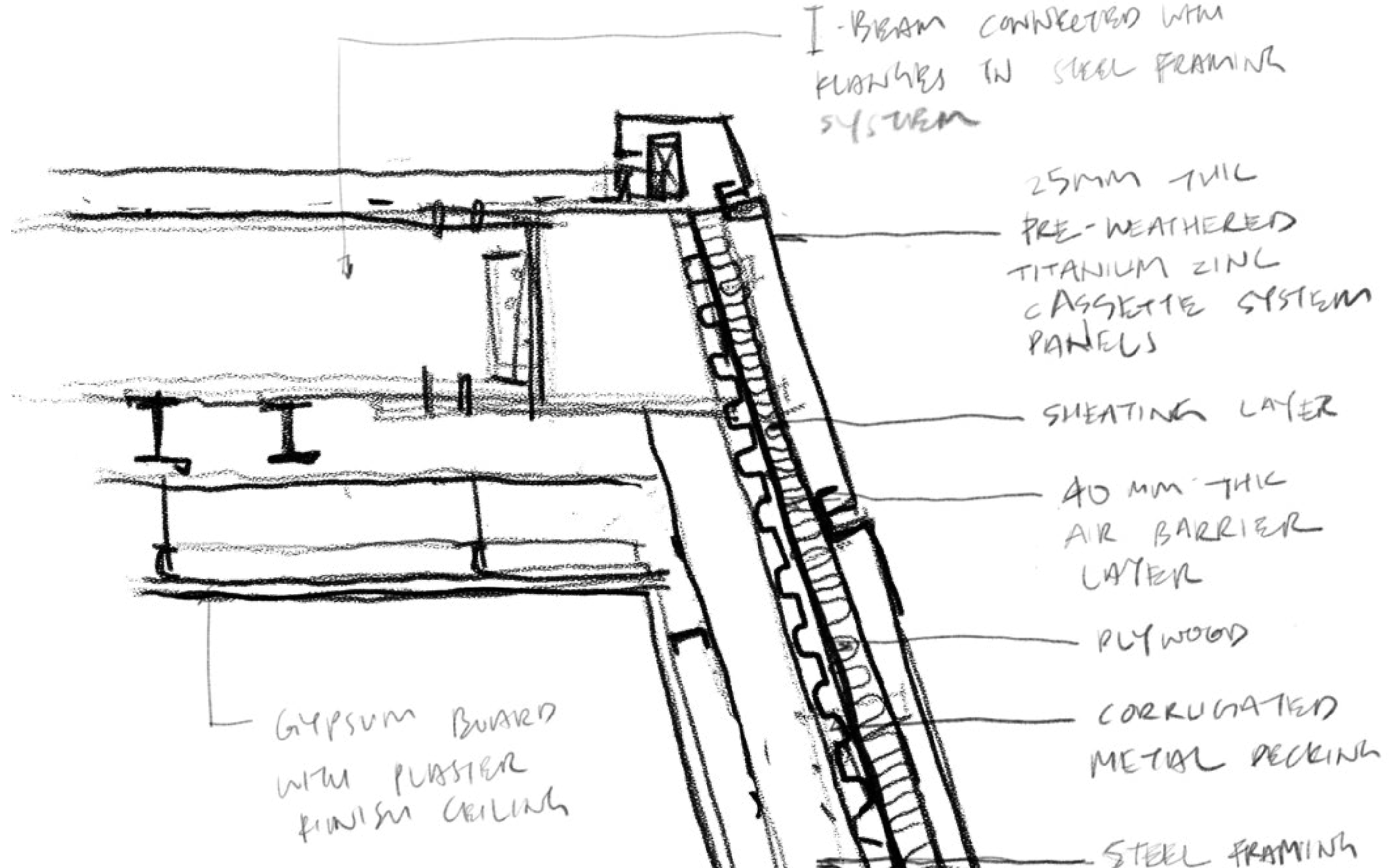
Student Access

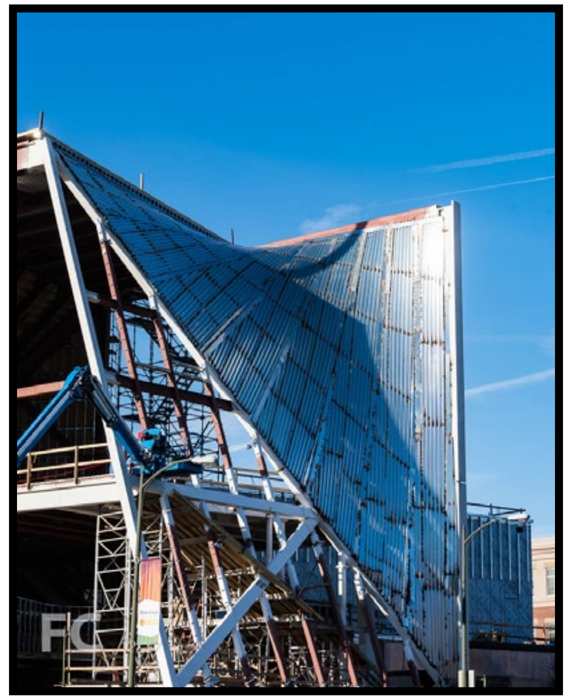


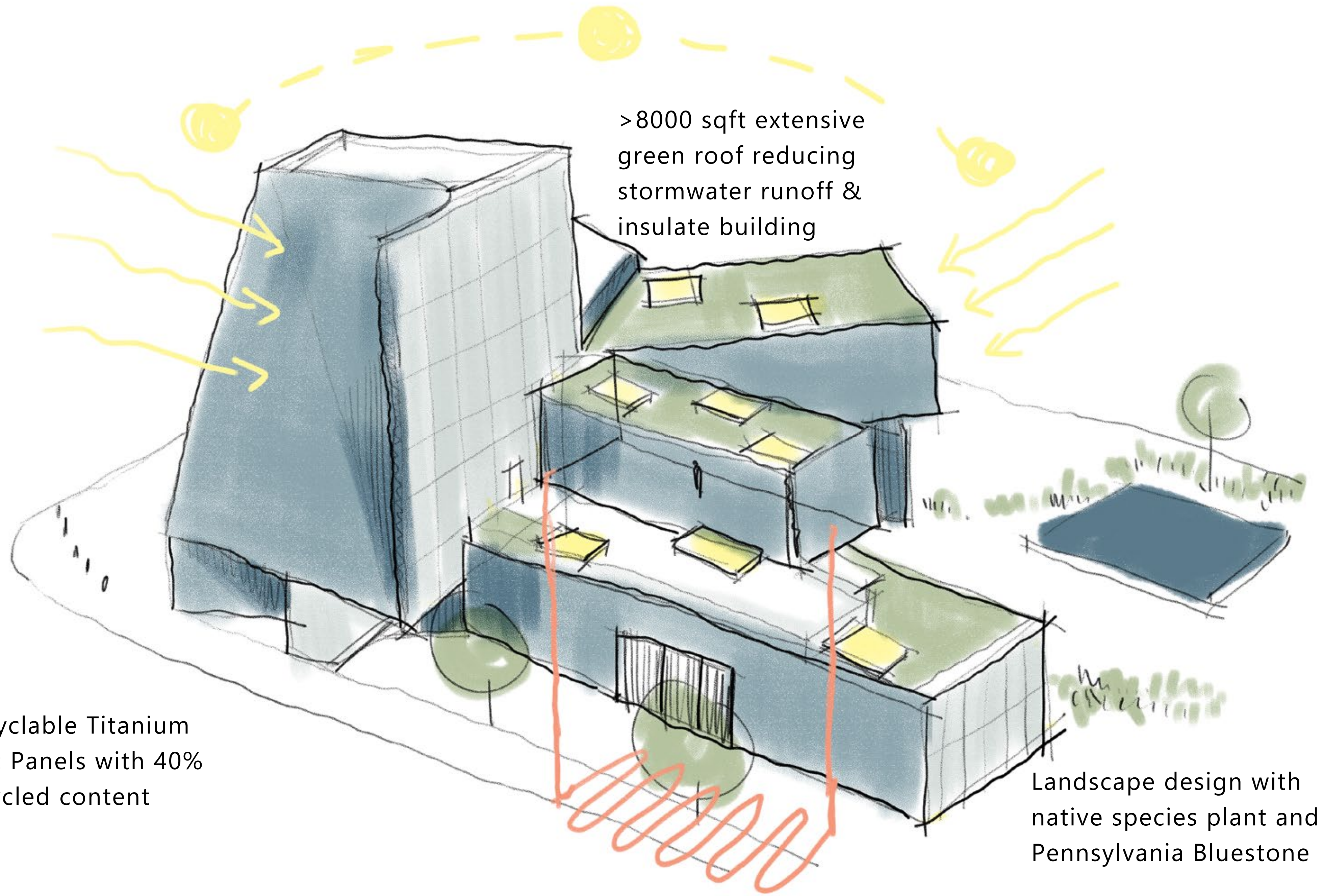
Public Access






I-BEAM CONNECTED WITH FLANGES IN STEEL FRAMING SYSTEM
25MM THIC PRE-WEATHERED TITANIUM ZINC CASSETTE SYSTEM PANELS
SHEATING LAYER
40 MM THIC AIR BARRIER LAYER
PLYWOOD
CORRUGATED METAL DECKING
STEEL FRAMING SYSTEM WITH HSS
STEEL STUDS
PLYWOOD WITH PLASTER LAYER
GYPSUM BOARD WITH PLASTER FINISH CEILING




East- and west-facing translucent cavity walls to modulate light and reduce solar load
>8000 sqft extensive green roof reducing stormwater runoff & insulate building
Recyclable Titanium Zinc Panels with 40% recycled content
Landscape design with native species plant and Pennsylvania Bluestone
Geothermal Wells for radiant floor system

Project 3

Performing Arts Centre :

Wangsa Maju Performing Arts Centre (WMPAC)

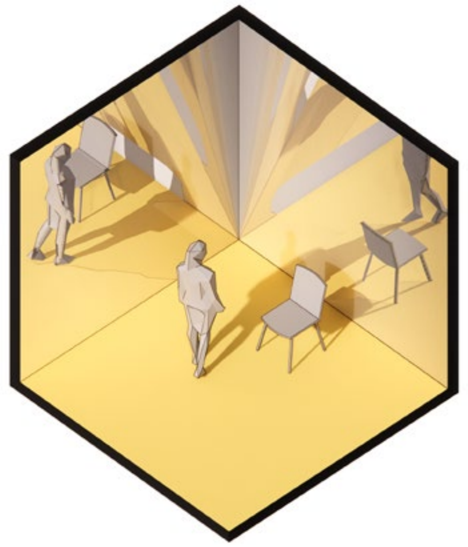
WMPAC, known as Wangsa Maju Performing Arts Centre which is a house of Modern Contemporary performing arts cater for the local community in Wangsa Maju. WMPAC aims to promote the performing art culture into the local context , influencing a culture within the proximity, by opening its doors for every society class within the area. Besides promoting, WMPAC houses an Auditorium and Black Box opened for small-scale performing arts production from young talents, providing a venue for cultivation.
Stretching along Jalan Wangsa Delima, WM Performing Arts Centre attracts the community around with its extruded volume cladded with vibrant red aluminium panels. The massing is hard to be unnoticed given its hierarchy of volume and colour, providing enough contrast to seek attention.

Concept : Mirror > Inter-dimensional Performance

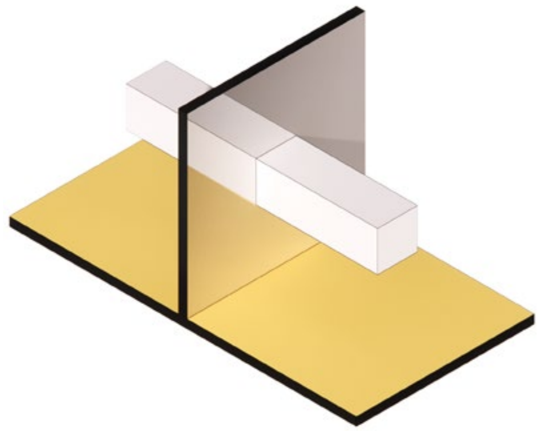
The initial inspiration came from the active use of mirrors in daily lives, especially for Performing Arts. Performers utilise mirrors during rehearsals. Mirrors give a different perspective to the performer while rehearsals, turning them into audiences at the same time while performing in front of the mirror. Practising in front of a mirror helps them to spot their mistakes to prevent it from happening on stage.

Mirrors reflect a space depending on the direction with some light source. The reflected space gives a virtual volume and dimension, mirrors becoming the portal to it. Hence, the interest to explore the world beyond the reflective plane.

The overall form is expressed through clear cut massings instead of material due to local climate constraints. The massing gives a direct dialogue to the local community with the existing hierarchy of form and colours.



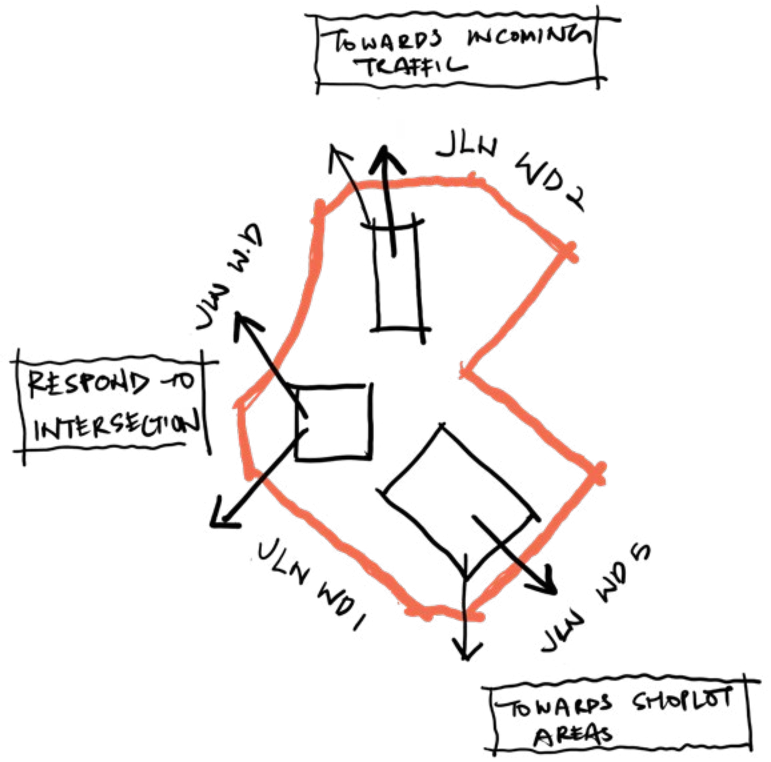
Mirror Dimensions



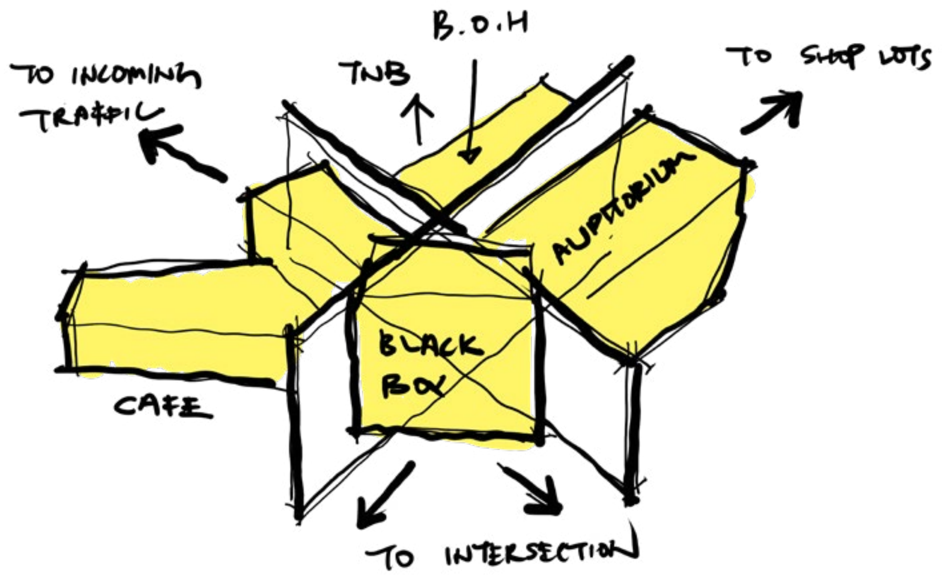
Portal into dimension

Design Intention & Development

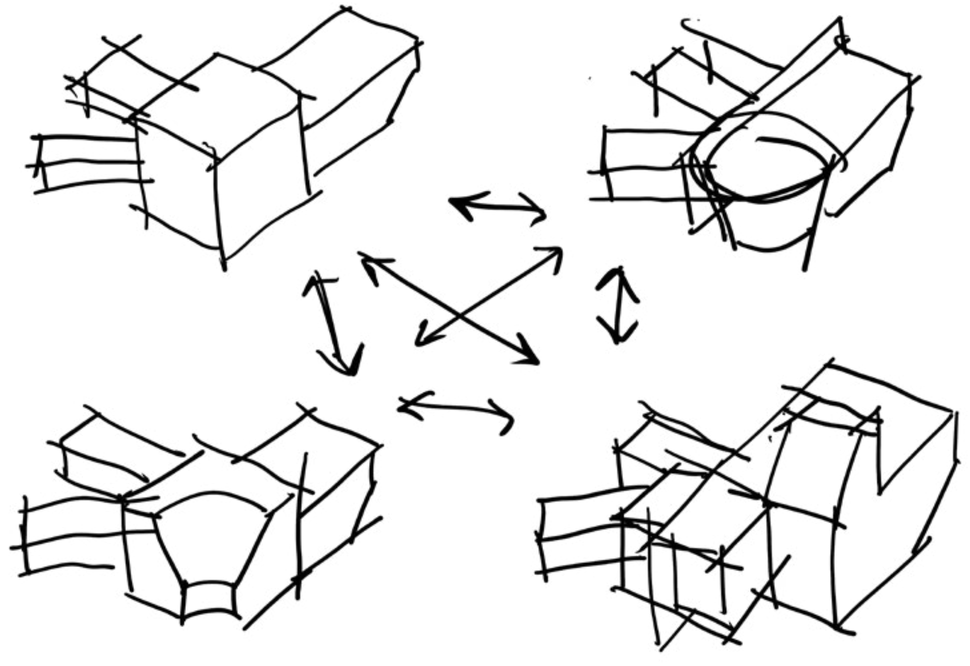
The intention was to have as many approaches as possible, referring to the intended program, precedent studies and site response. The largest human density spaces such as Auditorium, Black Box and cafe set as an attraction to each approach.



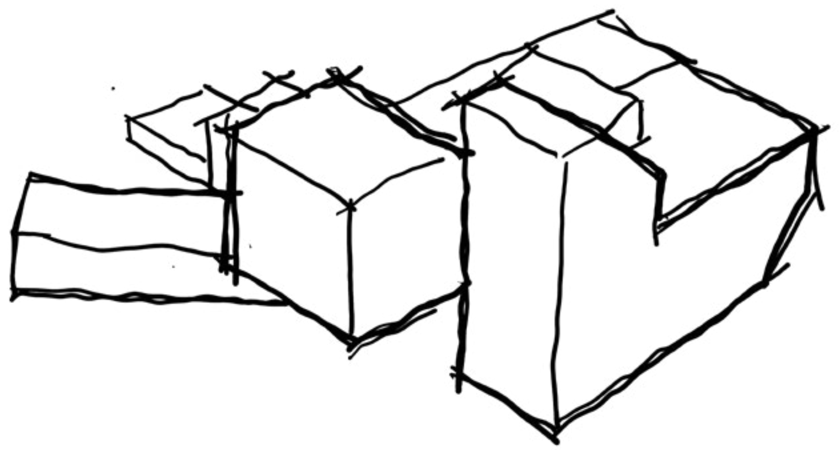
1. Site Response



2. Extrusion to response



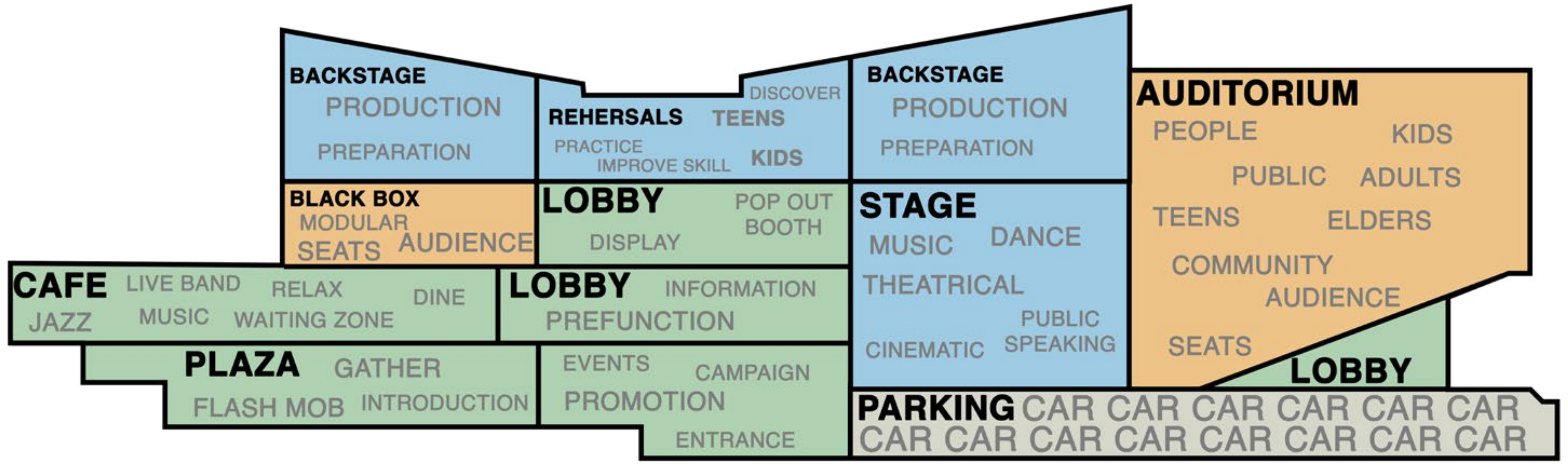
3. Corner form options



4. Current Development

Program

Performing Arts in the local context in general is under rated and the exposure to the public is underwhelming. Therefore, WMPAC seeks to focus more on promoting Performing Arts to the public. Other supportive spaces for screening and production comes along with an effective promotion. With a greater number of people introduced to Performing Arts, there will be a greater opportunity for the other program to develop and sustain in the long term.

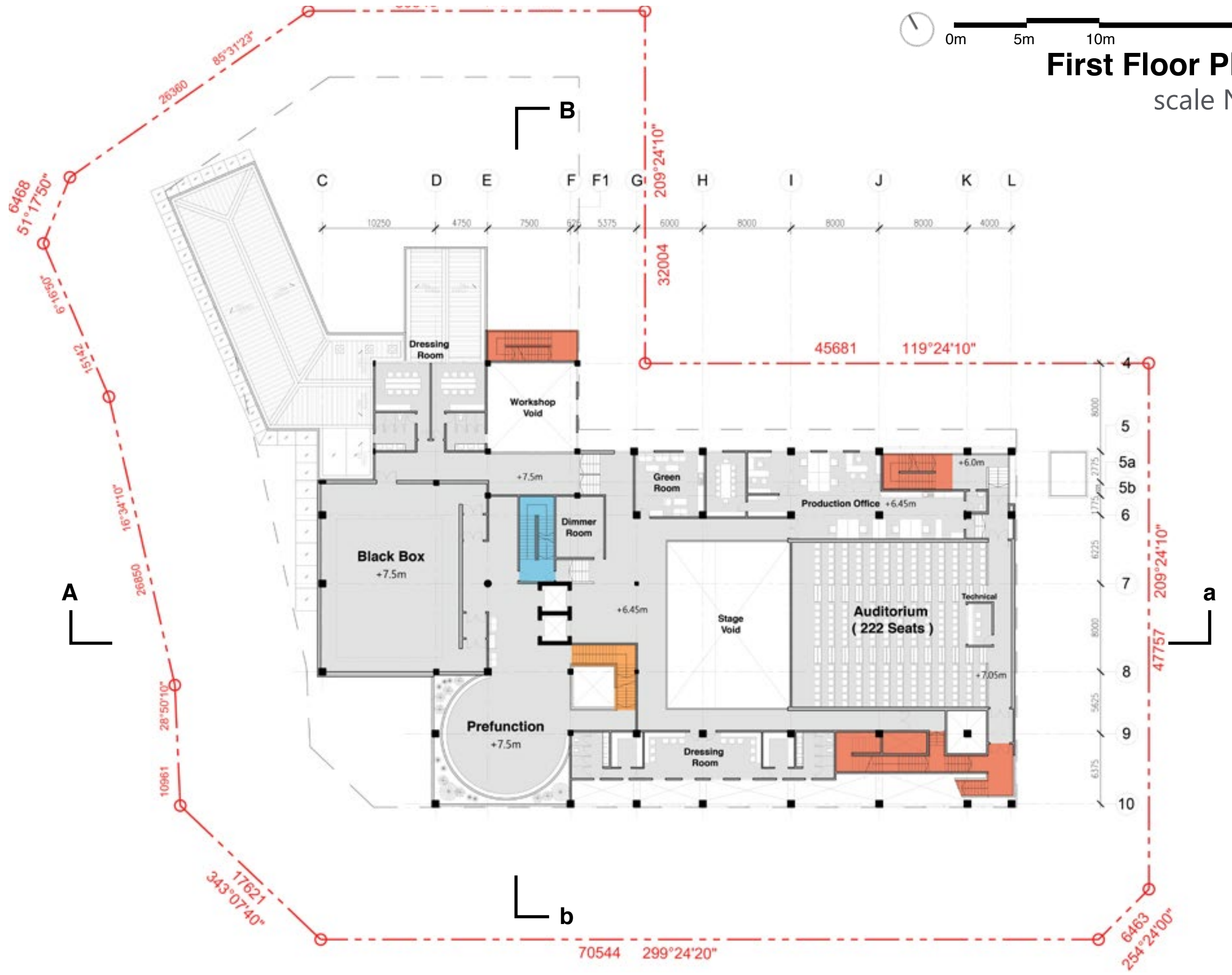


Sub-Basement Plan
scale NTS

Ground Floor Plan
scale NTS

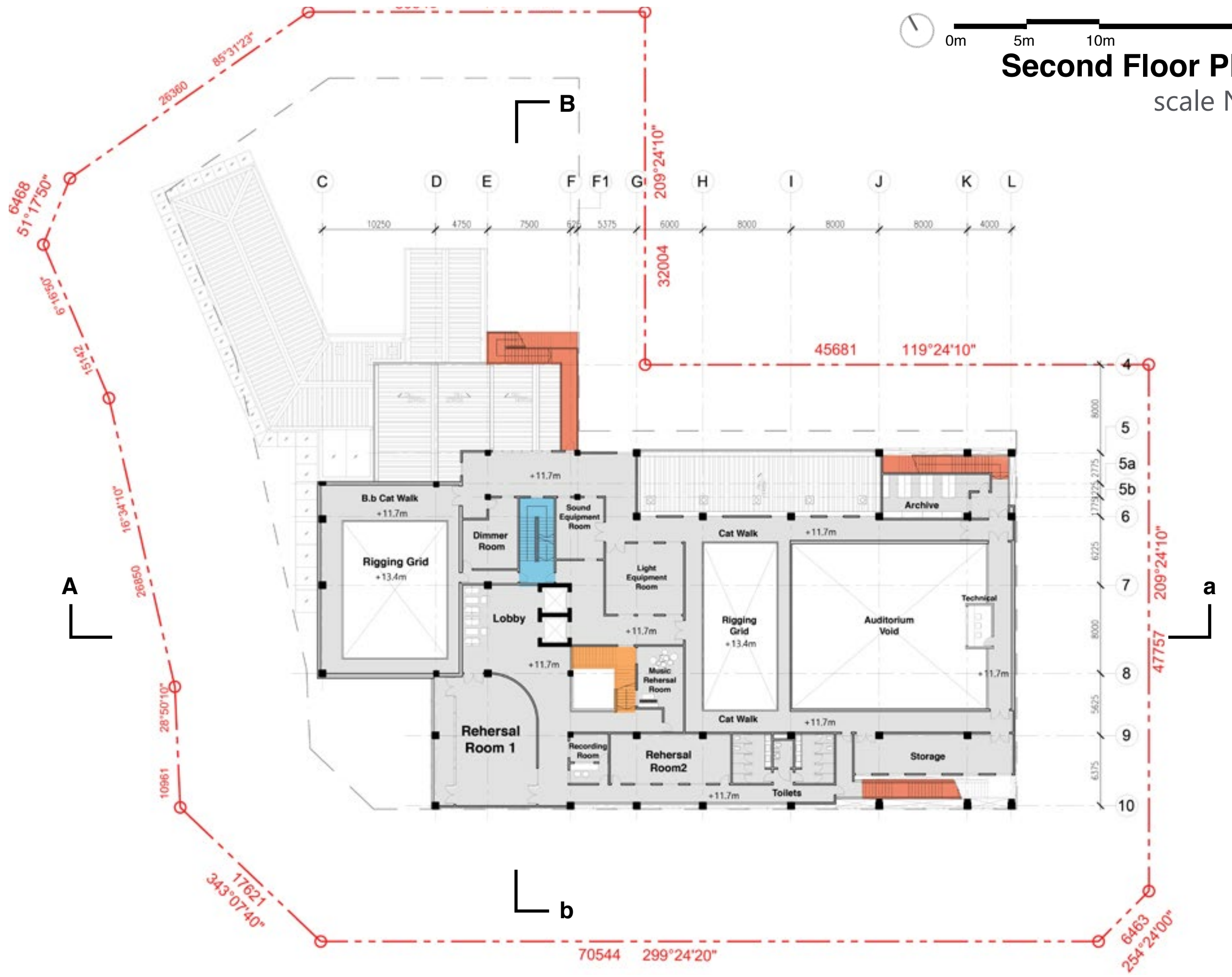
First Floor Plan

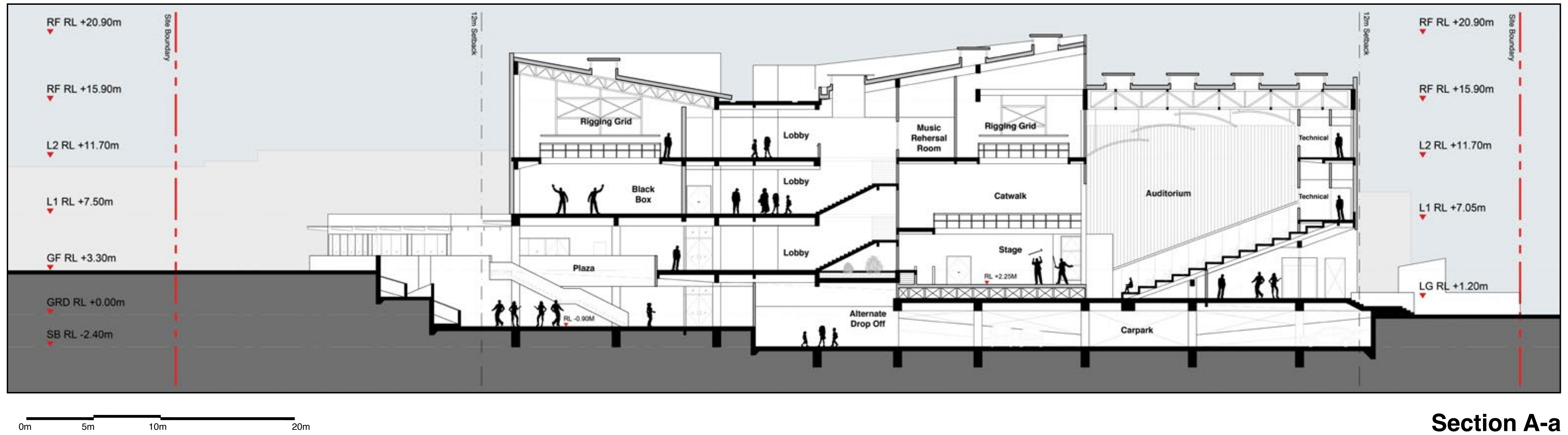
scale NTS



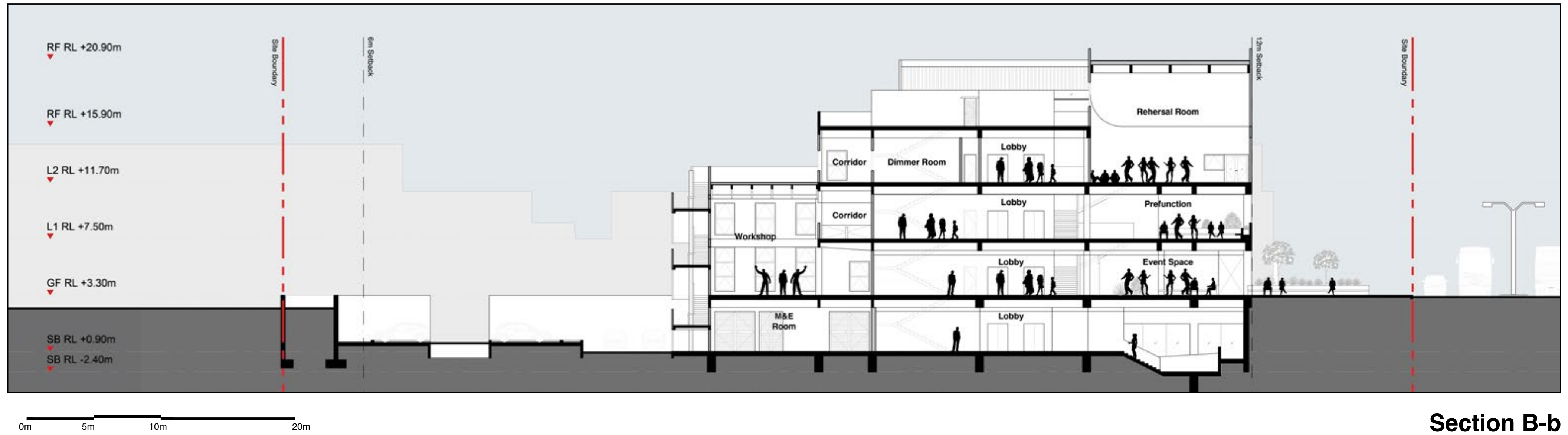
Second Floor Plan

scale NTS





Section A-a
scale NTS

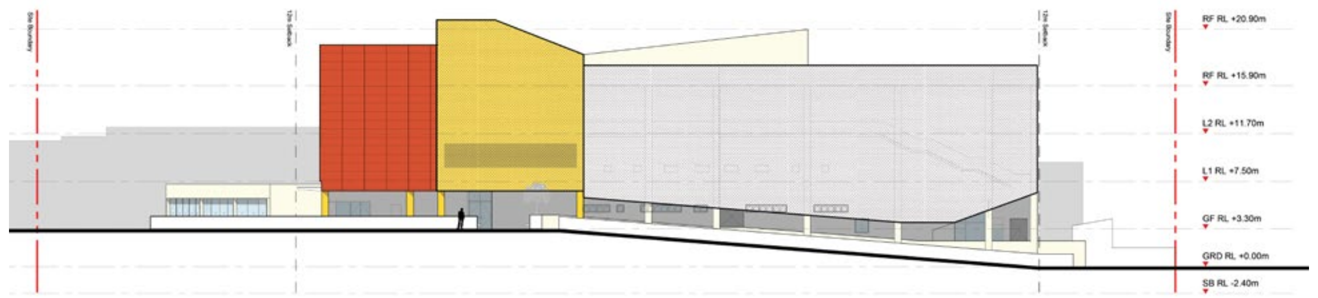


Section B-b
scale NTS

North West Elevation
scale NTS

North East Elevation
scale NTS

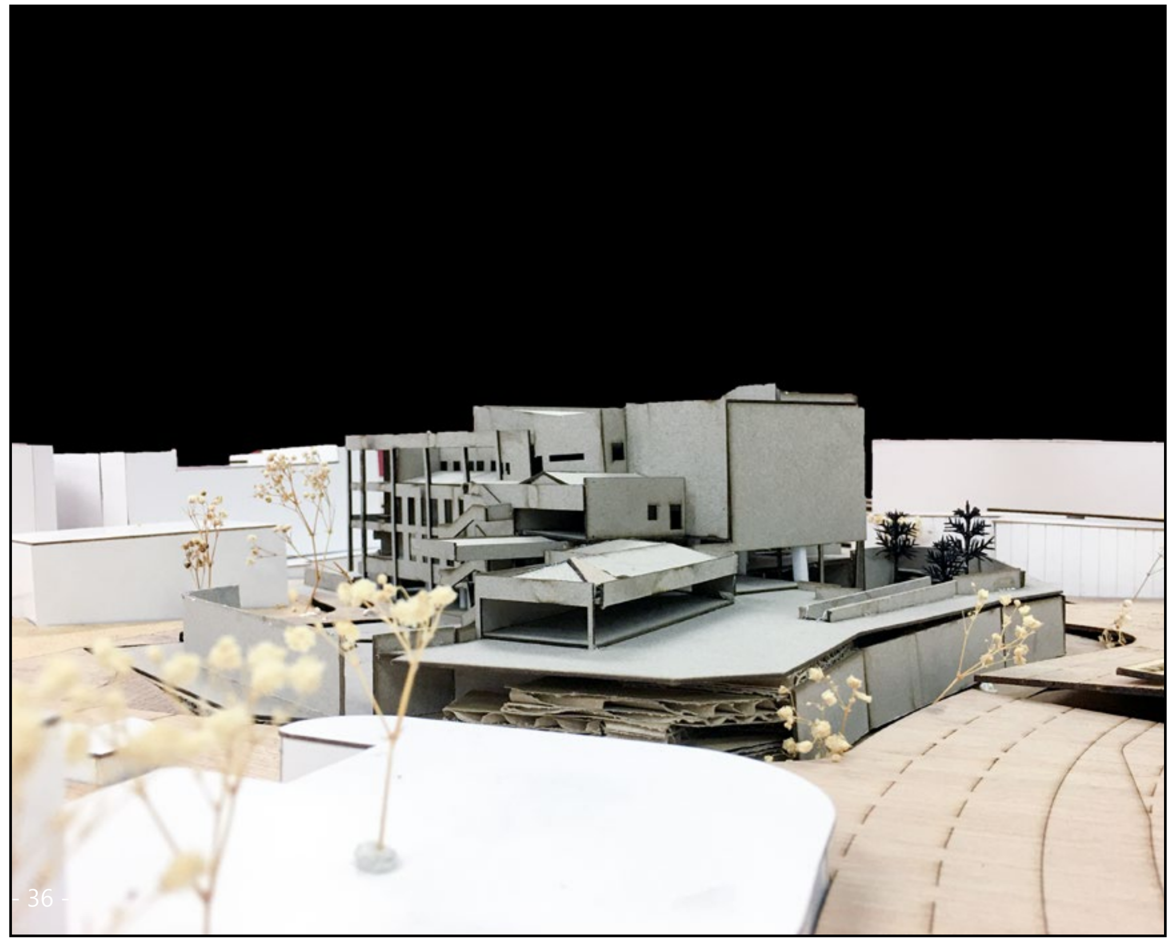
South East Elevation
scale NTS

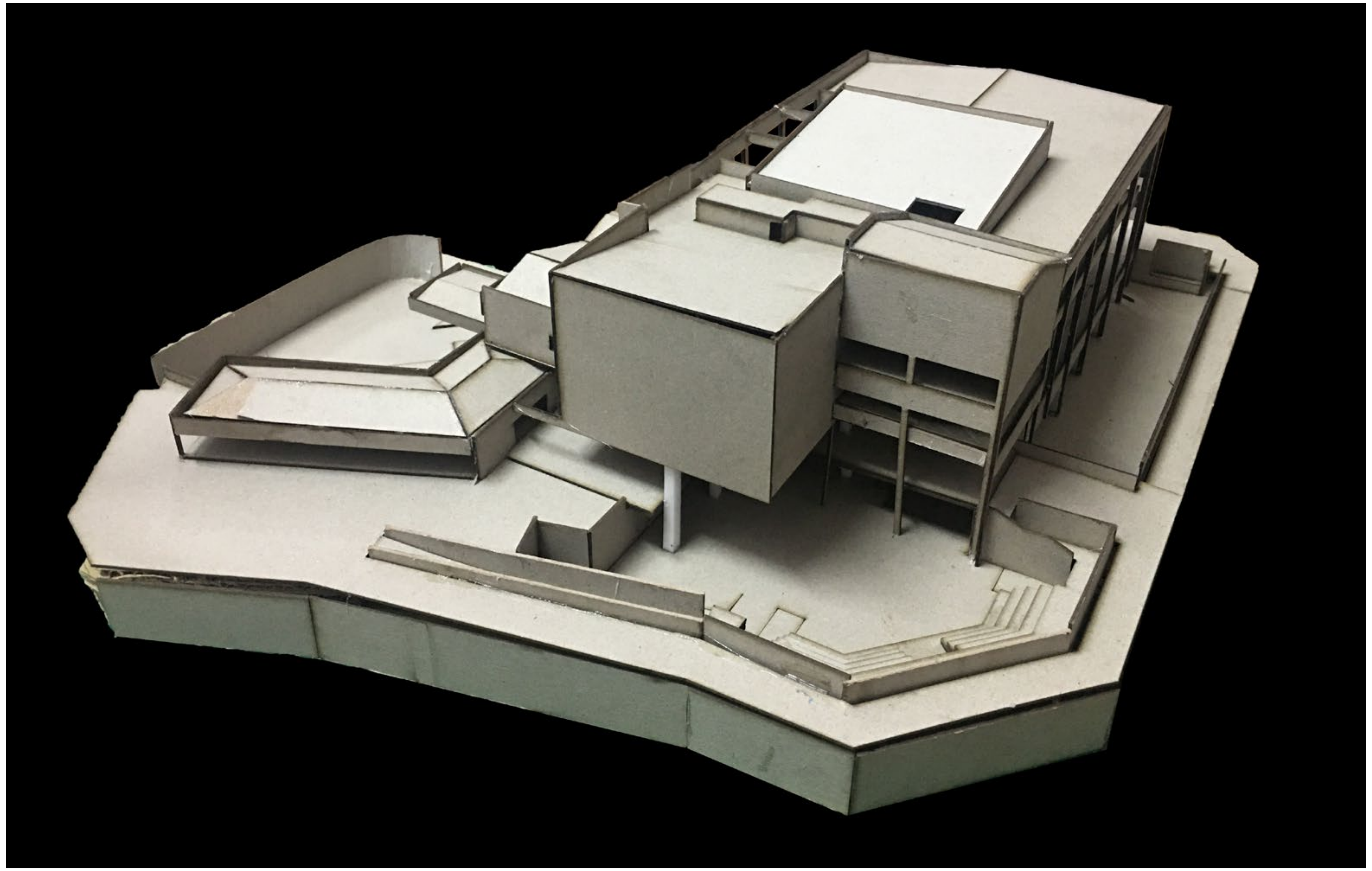


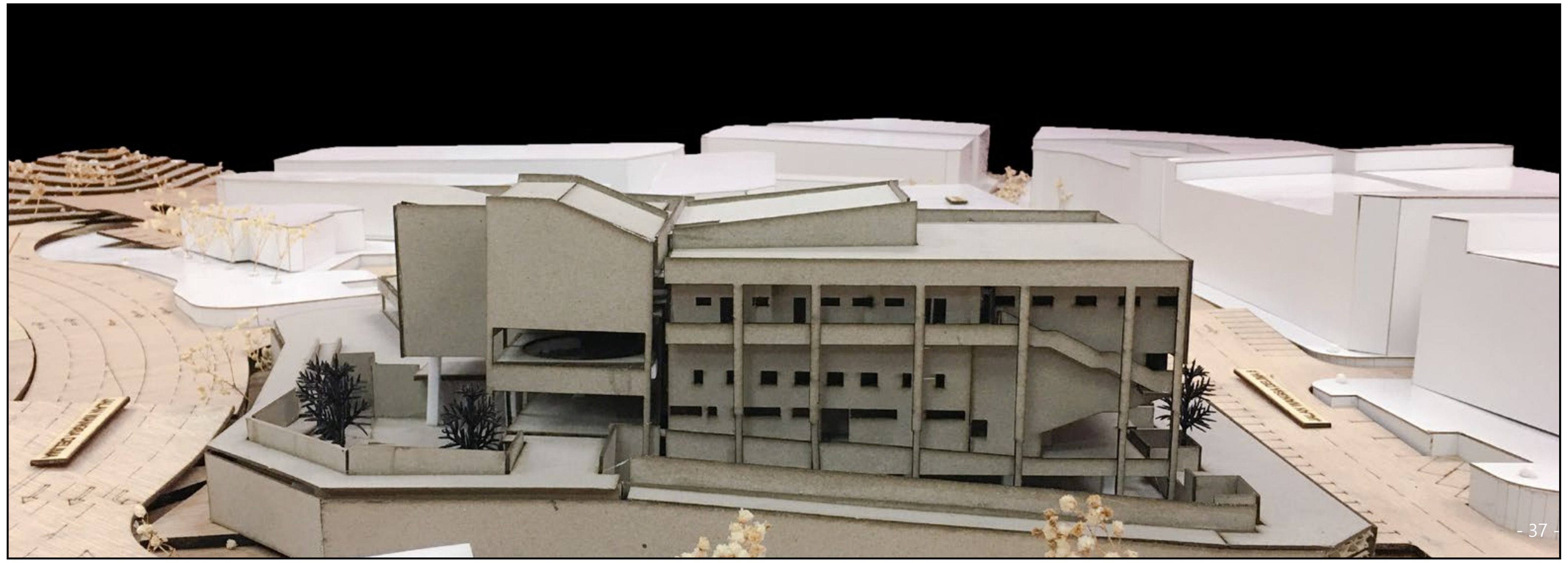
South West Elevation
scale NTS

0m 5m 10m 20m


JALAN WANGSA DELIMA







Appendix

Thematic Essay :

A STUDY ON AUDITORIUM ACOUSTICAL WALLS

A good auditorium design for performances to be enjoyed by the audience required not only visually, but also acoustics. Therefore, this study shows the application of acoustic walls in Auditorium's acoustic design as it is used for the BTAR3028 Design Studio VI subject with a given brief for designing a Performing Arts Centre (PAC) in the area of Wangsa Maju. The design brief shall require an Auditorium space. To achieve clarity in the acoustic wall design, some studies on basic acoustic and sound physics are done along with the existing acoustics products and materials. The methods applied in this study are references from multiple sources and selected case studies of 2 buildings with auditoriums for better understanding of the topic. At the end,the study showed the ideal Auditorium wall design with a combination use of acoustic materials and acoustic products which will be applied in the PAC design.

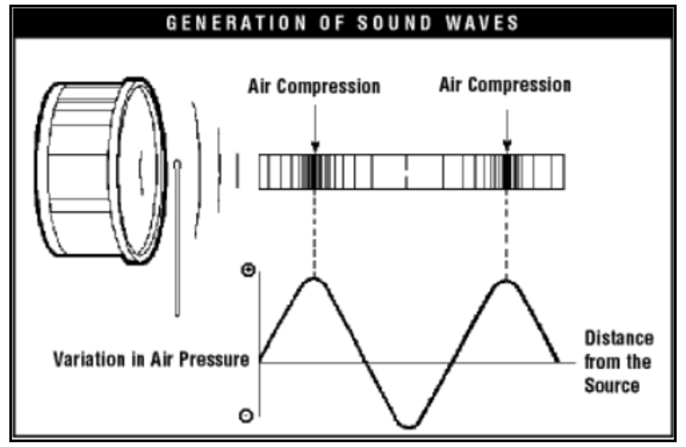
Introduction

Auditorium is a space for large meetings, presentations and performances. They are designed to accommodate large groups of audience. Acoustics is one of the major key factors for a good auditorium experience besides visuals. Acoustics is defined as an interdisciplinary science that involves a study of all mechanical waves in different states of matter which includes topics such as vibration, sound, ultrasound and infrasound (Alibaba and Itontei, Int J Adv Technol, 2016). As auditoriums being a part of sound and noise control, sounds played from the stage need to be enjoyed by the audience, complementing existing visuals, especially for auditoriums in the Performing Arts Centre (PAC). There are plenty of criterias to be discussed in order to achieve good acoustics in the space, one of them is the choice of materials within the auditorium. The choice of materials are selected for floors, walls and ceilings. Good selection of materials will ensure a quality audio experience during a performance. Hence, this discussion shall focus on the choice of a study on auditorium acoustical walls.

What is sound

Sound is produced in waves by vibrations of objects that will reach a listener's ear through different media such as gas,liquid and solid. Regional alternation of air pressure after being pushed by vibrations which travel in air are sound waves. A total number of sound waves produced in a second called frequency of waves. The common unit for frequency is the Hertz (Hz) where 1 Hertz = 1 wave per second. Low frequencies are low pitch around 500Hz or below and give a rumbly sound, whereas high frequencies are high pitched above 2000 which are like crashing cymbals or chirping of birds. Currently, the human ear is able to detect the sound frequency between 20Hz to 20000Hz. Sounds below 20 Hz are infrasound and above 20000 Hz are ultrasound. Low frequency could travel further distance than high frequency due to the size of the wave. When an incoming sound reaches a medium, it will either be absorbed, reflected and transmitted. Absorption is sound energy dissipated to heat. Next, reflection is sound waves bouncing off from the surface. Furthermore the pass through of sound is transmission.

1.



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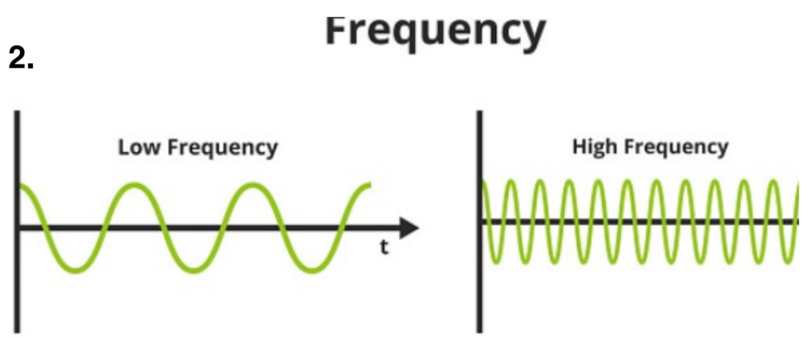

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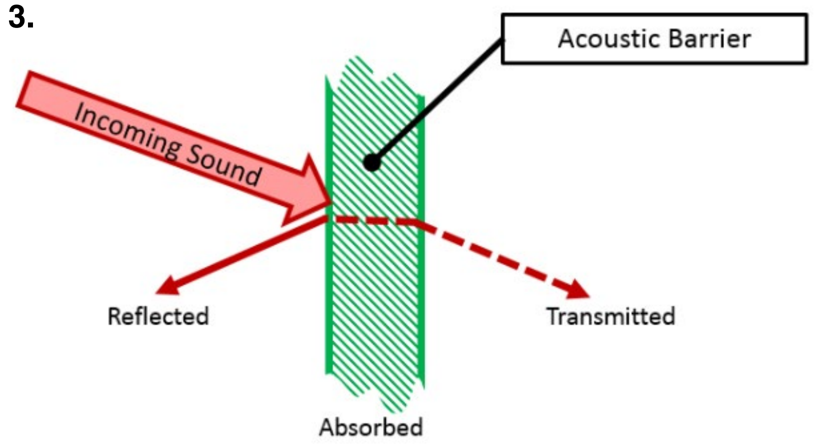


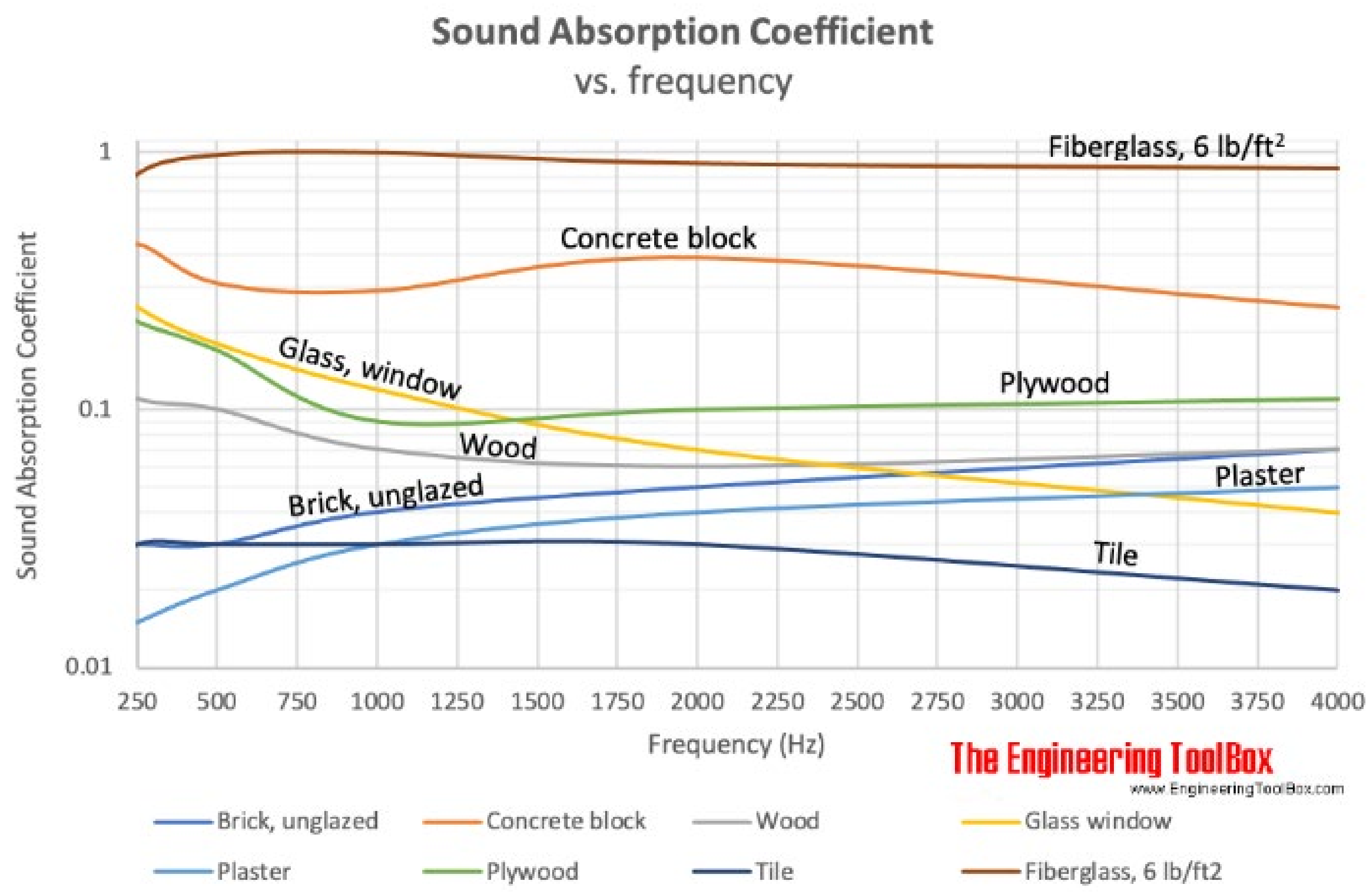
Legend

1. Generation of Sound Waves Illustrated
2. Difference of low and high frequency
3. Travel of sound through medium

Absorption of sound & Sound absorption coefficient

Referring to the law of physics in which energy could not be created or destroyed but can be transformed and transferred, sound energy is transferred to the medium's molecule to create heat energy through vibrations. Heat energy will dissipate into air when the energy is used up through vibrations.

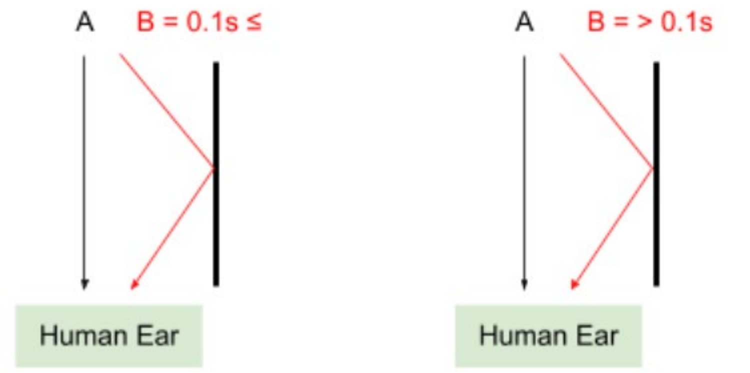
Sound absorption coefficients or Noise Reduction Coefficient (NRC) are the average of how absorbing each material in different frequencies, often times at 500 Hz, 1000 Hz and 2000 Hz. The NRC rating ranges from 0.0 - 1.0. With the NRC of 0.0 meaning the material reflects sounds and does not absorb whereas the NRC of 1.0 does the opposite. The higher the sound absorption coefficient, the more the sound absorbs. In general, soft and porous materials have much higher sound absorption or NRC value than hard and reflective materials. However the coefficient values vary when it comes to different frequencies, some materials are better in absorbing low frequencies than high frequencies or vice versa.



Sound Absorption coefficient vs frequency between different materials, source from The Engineering ToolBox

Reflection of Sound

Sound can be reflected from surfaces with waves bouncing off it. The bounced off sound travels slower as it has a longer travel distance. These sounds are echos or reverberations of sound. Reverberations of sound is when multiple sounds reach the ear within 0.1 seconds within a room dimension of length,width and height of 17 metres. The human brain endures 0.1 second of sound in memory and sound travels at a speed of 340m/s. Based on the formula time = distance travelled / velocity, (34m) / (340m/s) = 0.1s . Thus it explains why reverberation occurs in rooms within a dimension of 17 metres or less. Echos are when the second or more sounds arrive in the ear for more than 0.1 seconds after the first sound. When the first sound dies out and the second sound perceived rather than prolonging the first, it is an echo instead of reverberation.



Reverberation : Sound B arrives human ear less than/or 0.1s after sound path A

Echo : Sound B arrives human ear more than 0.1s after sound path A

Transmission of Sound and Sound Transmission Class

Different types of materials allow different intensity of sound passing through. In auditorium design, sounds had to be limited within the space to prevent it from passing through into another room and disrupt the existing ambience. Thus, to determine how well the materials reduce sound transmission, they are rated under Sound Transmission Class (STC).

The basics of STC involves decibels (DB), which is a measurement of sound intensity or loudness of sound. The table below gives an idea of the DB value. In general the higher the STC value, the better the sound transmission reduction is.

STC	Track Application
25	Normal speech can be easily heard and understood
30	Loud speech can be easily heard and understood
35	Loud speech heard, but not understood
40	Loud speech now only a murmur
45	Loud speech not heard, music systems/heavy traffic noise still a potential problem
50	Very loud sounds such as musical instruments or a stereo can be faintly heard
60+	Excellent soundproofing

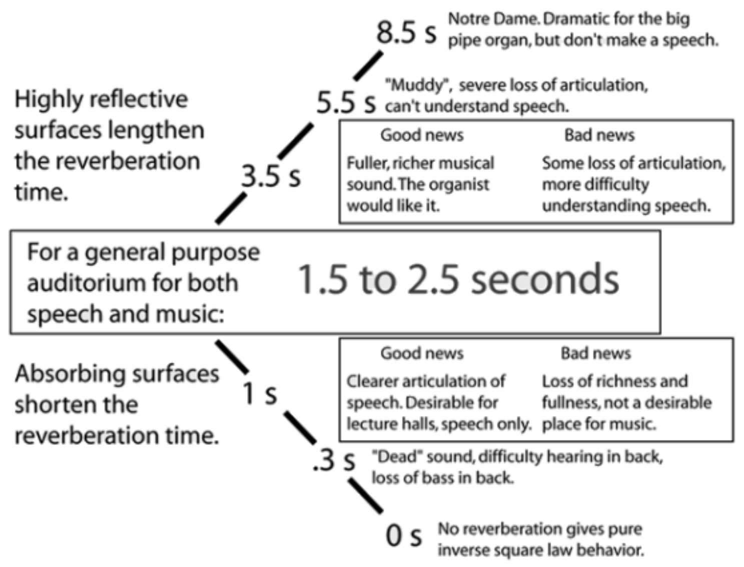
List of Sound Transmission Class

SOUND PRESSURE	SOURCE	SENSATION
130-120 dBa	Jet Aircraft at 100' Bass Drum at 3' Auto Horn at 2'	Physical Pain
120-100 dBa	Thunder, Artillery Elevated Train Discotheque	Deafening
100-80 dBa	Loud Street Noise Noisy Factory Police Whistle	Very Loud
80-60 dBa	Cocktail Party Noisy office Average Street Noise	Loud
60-40 dBa	Noisy Home Inside General Office Conversation	Moderate
40-20 dBa	Quiet Radio Private Office Quiet Conversation	Faint
20-1 dBa	Rustle of Leaves Soundproof Room	Whisper
20-1 dBa	Threshold of Audibility	

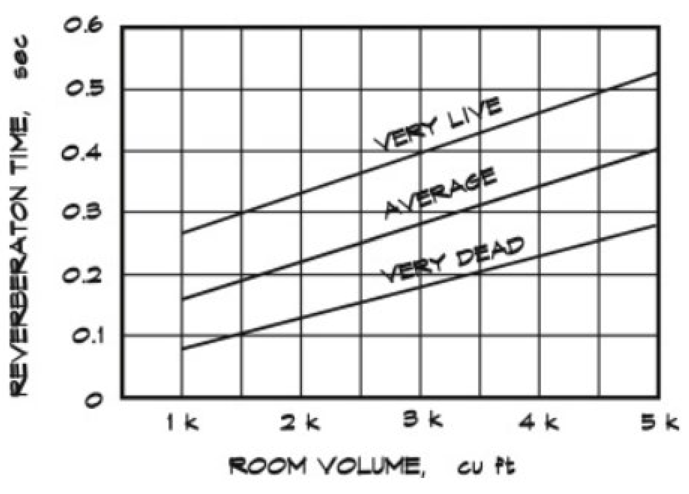
List of Intensity between different decibels

How acoustic works in Auditorium

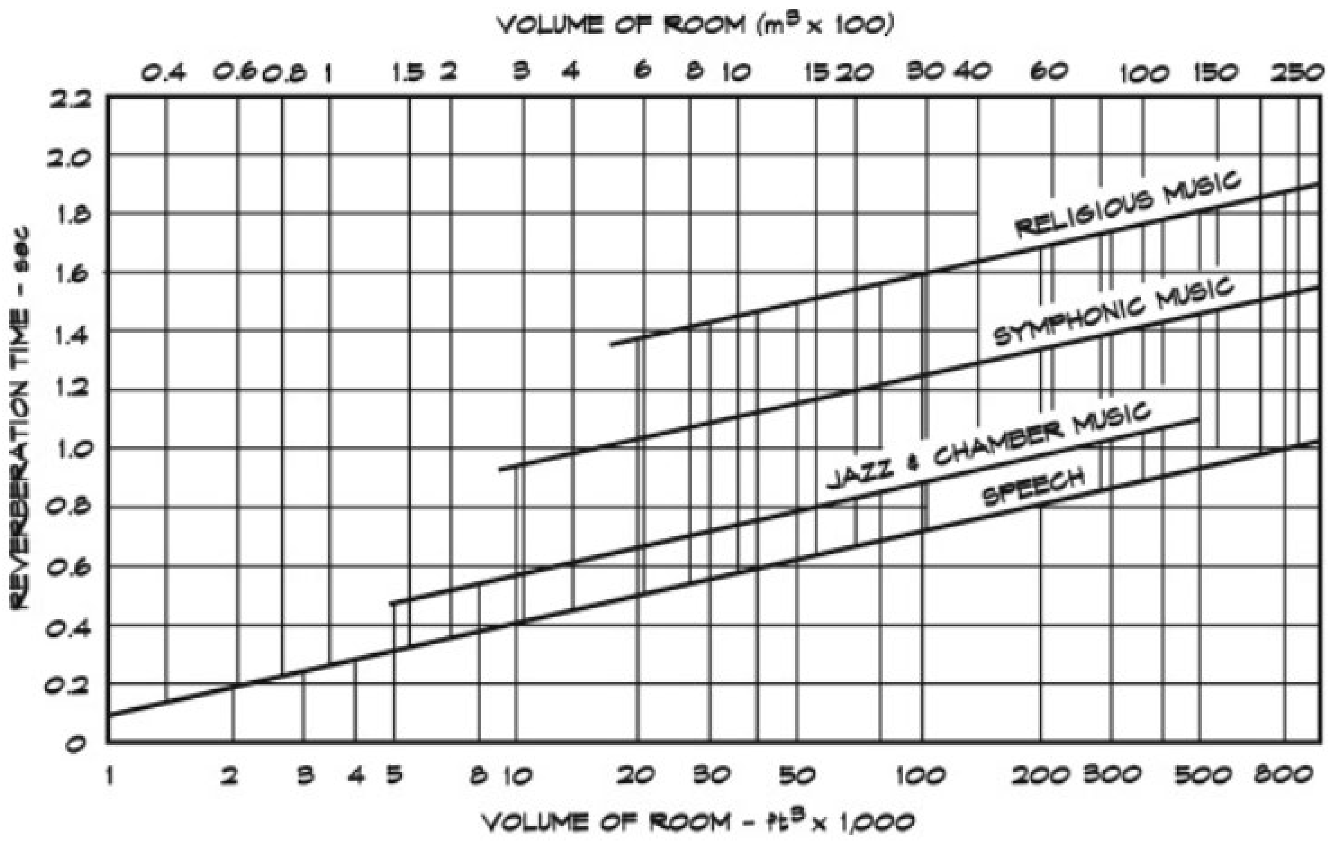
Auditoriums are spaces for live music or presentations with different acoustical requirements. To achieve the acoustical requirements for these events are having the sound to be natural instead of being too 'dead' or too 'lively'. When the auditorium consists of too many hard, reflective surfaces allowing sounds to reverberate around the room, it leads to too lively sounds. On the other hand when there are too many absorption of sound waves, it will lead to a 'dead' room with an unpleasantly quiet room. Therefore, it is required to have a balance of reverberation time in an auditorium to be in between too lively and too dead. For general auditoriums with both speech and music, it is preferred to have a reverberation time between 1.5 to 2.5 seconds as shown in diagram 3 by Nave. However depending on the type of performance, the reverberation time could vary based on table 2.2.2 & table 2.2.3. The reverberation time could be controlled by a strategic use of acoustical products which will be mentioned in this following essay.



Comparison of reverberation times (Nave,1999)



Suggested Reverberation Times for Rooms (Fierstein, 1979)



Reverberation Times for rooms in the 500–1000 Hz Range (Doelle, 1972)

Acoustic products and types of materials

There are a number of acoustic materials introduced into today's auditorium wall designs. Every material plays a role in acoustical control. The acoustical control devices for walls are categorised into four aspects, which are absorbers, diffusers, barriers and isolators.

Sound absorbers

Sound absorbers are porous materials which eliminate sound by redirecting sound into many pathways to reduce the energy. An internal sound quality of a space is improved by sound absorbers absorbing incoming echo and reverberation in it. It helps to eliminate most noise and sound volume but does not help to prevent sound transmissions. Figure 2.3.7 illustrates the effects of absorbers. Image 2.3.1 to Image 2.3.6 shows the common absorbers . These materials usually have a high Sound Absorption Coefficient / NRC higher than 0.75. Depending on the frequency emitted, the coefficient values vary.

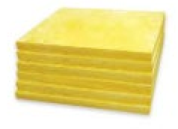


Image 2.3.1 : Fibreglass

Image 2.3.2 : Rockwool

Image 2.3.3 : open cell polyurethane foam

Image 2.3.4 : cellular melamine foam

Image 2.3.5 : heavy curtain blankets

Image 2.3.6 : thick fabric wall coverings

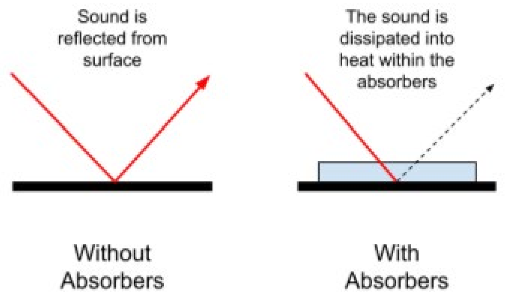


Figure 2.3.7 : Comparison of with or without absorbers

Diffusers

Diffusers are devices that scatter sound over an expanded area rather than eliminating sounds unlike absorbers. The diffusers rely on harder and non porous materials like timber panels, which are relatively reflective. The Sound Absorbing Coefficient / NRC of diffusers are normally as close as 0.0. Besides, the surfaces of diffusers are commonly uneven with varying depths, causing a focused sound to spread in all directions evenly. The spread of sound could enhance a room's atmosphere, making it more lively and reducing localization.

Image 2.3.8 : Temporal diffusers made of timber

Image 2.3.9 : Perforated Metal diffusers

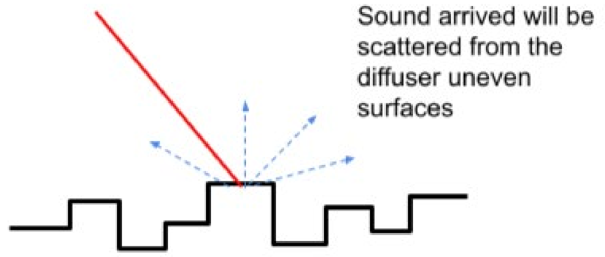
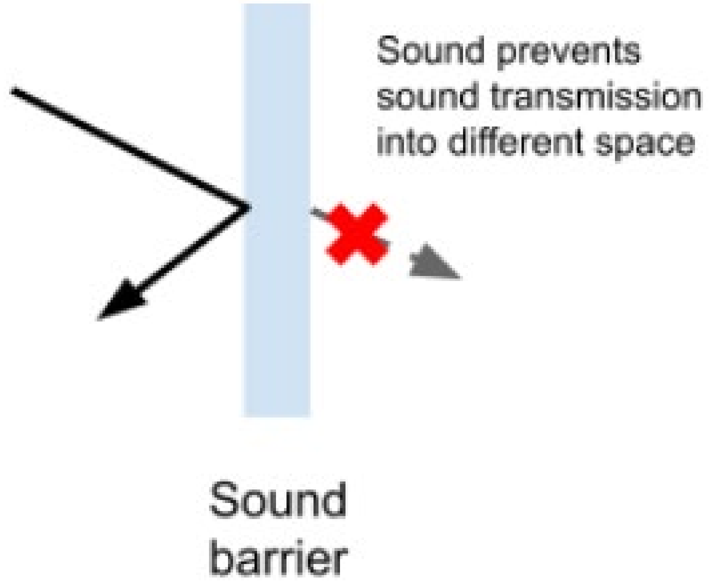


Figure 2.3.10 : Illustration of sound when encounter diffusers

Barriers

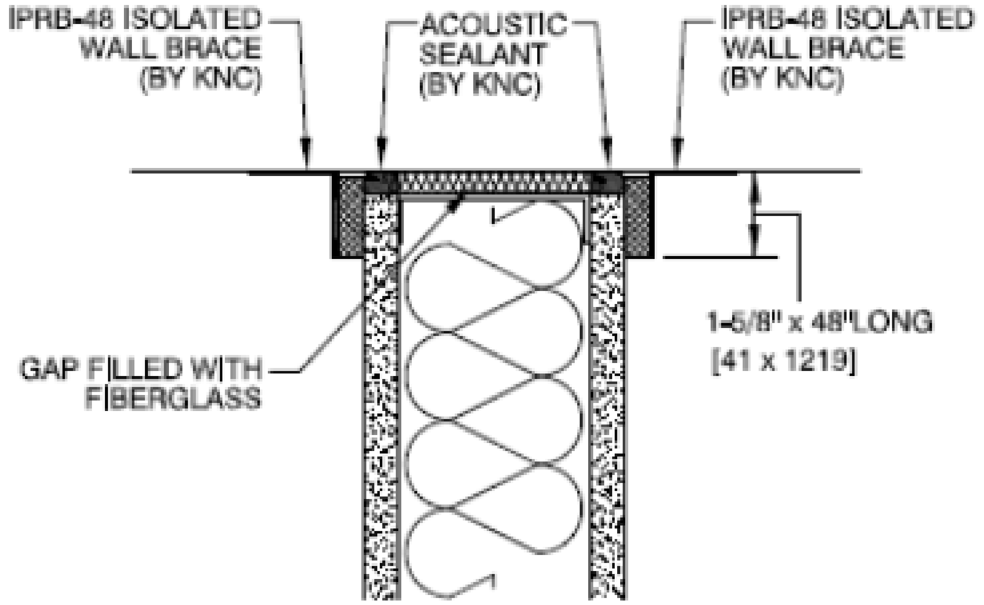
Barriers are heavy and dense materials to prevent sound transmissions. The materials suitable to be barriers are drywalls such as gypsum and sheetrock. There are also thin barrier materials which are lead foil and mass loaded vinyl.



Isolators

Isolators prevent sound transmission through structure elements and services of a building and causing them to vibrate. The common devices for sound isolators are resilient channels for drywall, isolation pads for floors, decoupling hanger for ceilings and special adhesives for walls with nails and screws. Sound isolations require the attention of details during installation.

Masonry isolator bracket



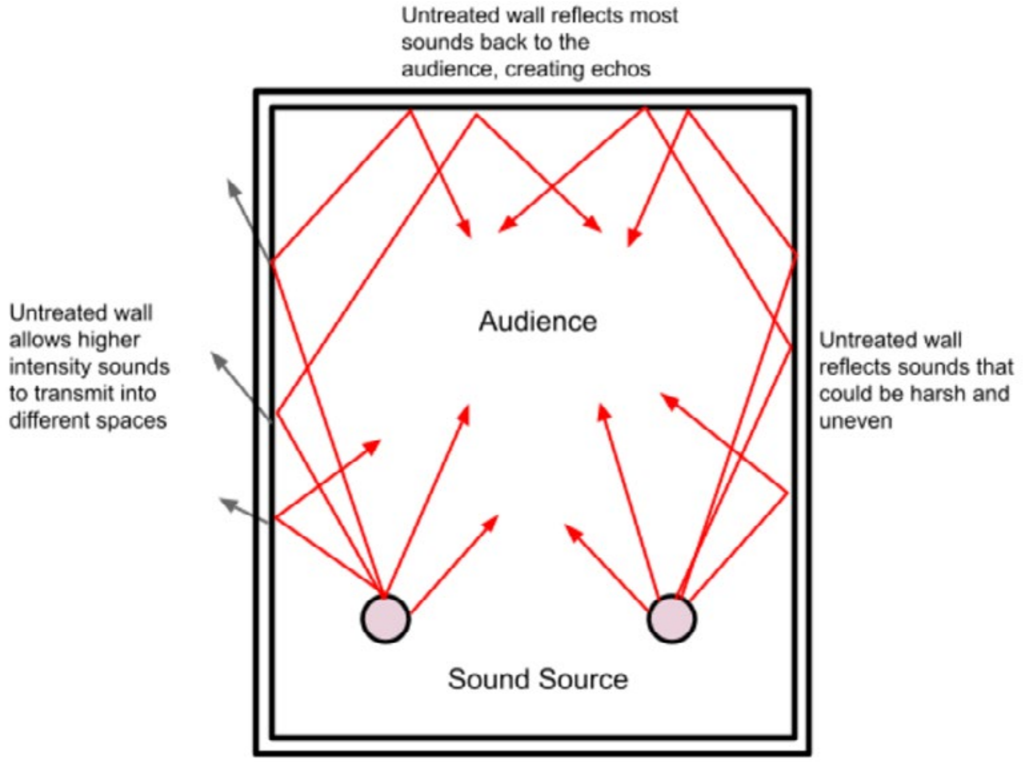
Masonry isolator bracket typical details

Application of Acoustic Products on Walls

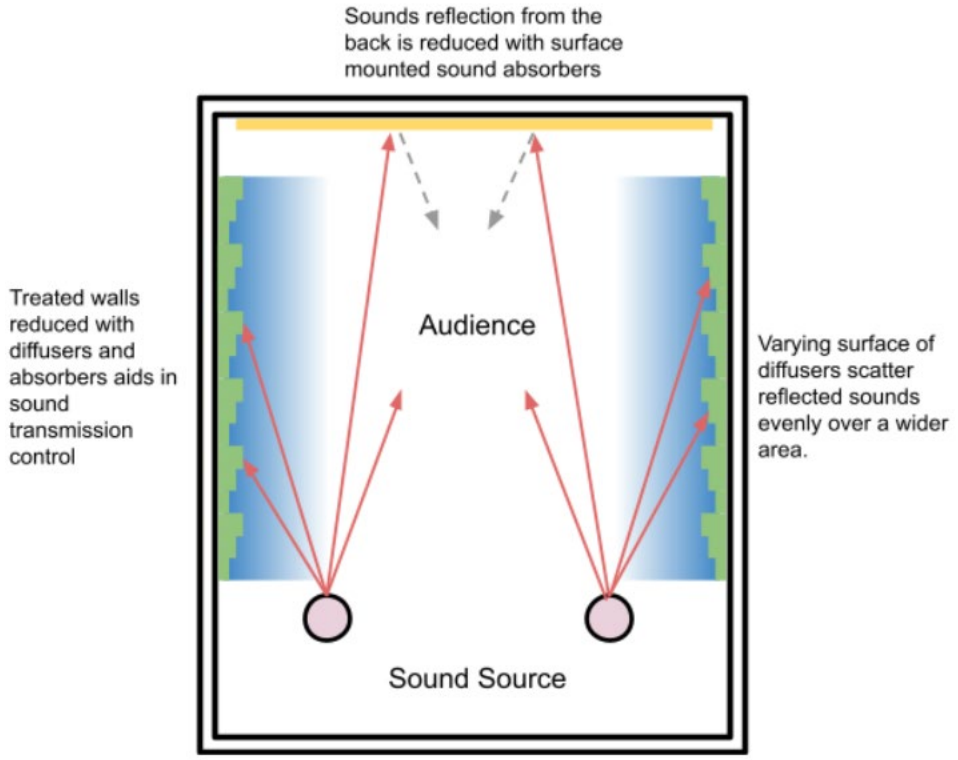
Illustrated at right, an untreated room of masonry wall or drywall creates unwanted sound reflections due to its hard, reflective surface; which creates echoes within the room. Sound or vibration are also able to penetrate out from the walls, intruding other spaces or being intruded by sounds from outside. With the combination of absorbers,diffusers and suitable sound barriers, the effect will be as shown in the figure below it.

A controlled use of absorbers to prevent space becoming too quiet, an example given from Barron (2015) that the Royal Albert Hall in London with over 5000 seats creates an extreme silent space as seats are absorbers. Given that the auditorium will definitely have seats, therefore the walls should have more diffuser panels to control the reverberation time. The masonry walls could also introduce niches, recesses which give depths on the wall's surface will work well as diffusers too.

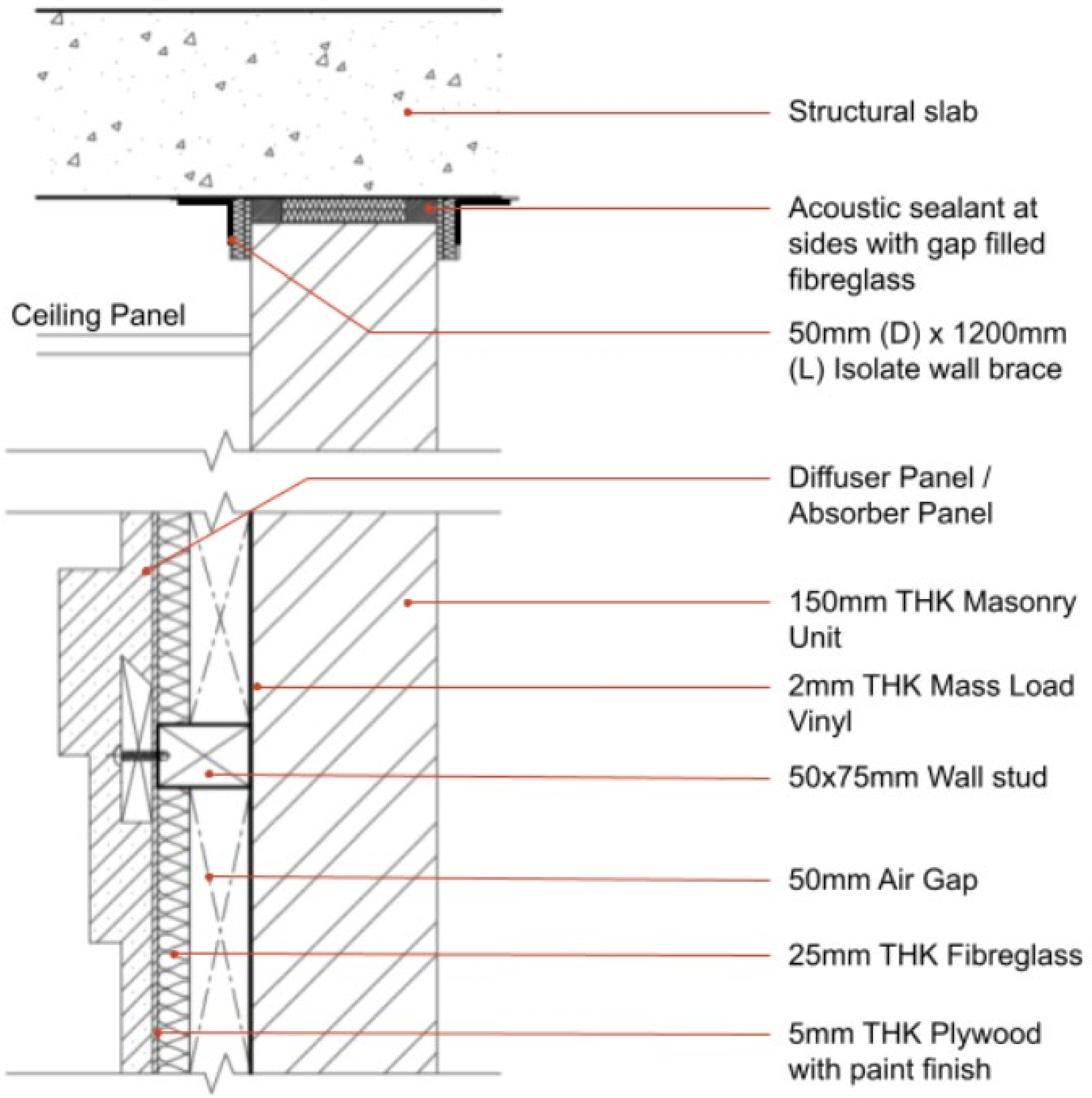
Besides, bare masonry walls could also transmit vibrations with sound flanking into the walls and spreading to other spaces. Hence, sound isolation is required on the wall. There are few methods depending on the budget and area. If both criteria are met, decoupling or adding a drywall will create insulation. Decoupling is adding another layer of wall that creates a cavity space which uses air to prevent sound waves penetrating. For a more affordable option will be applying the mass loaded vinyl.



Acoustic issues from untreated walls



Acoustic solutions from treated walls



Vertical Section of acoustic treated wall

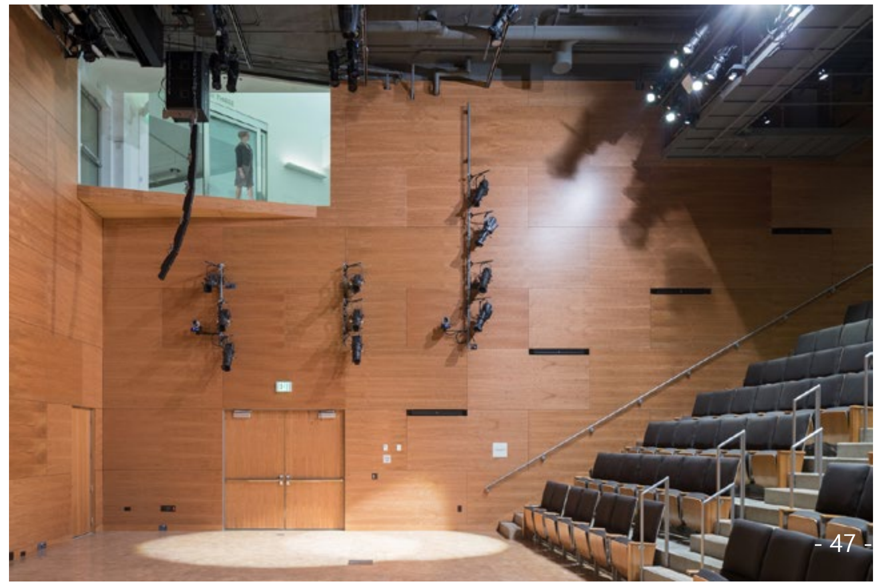
Case Studies

A comparative case study has been done for the analysis of wall acoustic materials. This study shall be looking into 2 auditoriums from different buildings: Institute of Contemporary Art (ICA) in Virginia Commonwealth University in the United States and Kuala Lumpur Performing Arts Center (KLPAC) in Malaysia.

ICA, VCU

ICA is a building which houses different disciplines of contemporary arts from the students in VCU. The building opens for both students and the public access to experience contemporary art. Looking at the wall panels installed in ICA's auditorium, it is a one sided seated auditorium with the seats at one end ascending down to the stage in a 45 degree gradient. The interior walls around the auditorium walls are cladded with certified cherry wood panels of 4' x 8' . Cherry wood panels are timbers. Timber panels are chosen for acoustic purposes in auditoriums because their relative softness cellular structure has different acoustic performance to harder materials such as steel concrete and masonry. Timber tends to absorb sound energy and dampen resonant vibrations; different species of wood will perform differently. In an auditorium, wooden panels generally reflect and absorb low frequencies of (500 Hz or lower) made from the stage area. (Wegst 2006).

It has long been known that exposure of high frequency noise or loud noises within the audible range will cause hearing loss overtime, however 90 seconds exposure of low frequencies could change the way the human's inner ear works, as the ear could be more prone to damage. (Williams, 2014). Based on this fact, it proves absorption of low frequencies from wooden panels are important in acoustic design. Besides absorbing low frequency sounds as mentioned, the cherry wood cladding does reflect back higher frequency sounds to prevent sound penetrating out from the auditorium which affects the other spaces due to its low noise reduction coefficient (NRC) of 0.10 to 0.15. The lower the NRC, the higher the reflectivity of noise and vice versa.This means that the auditorium still produces echoes, however the issue is solved with fabric seats and audiences.



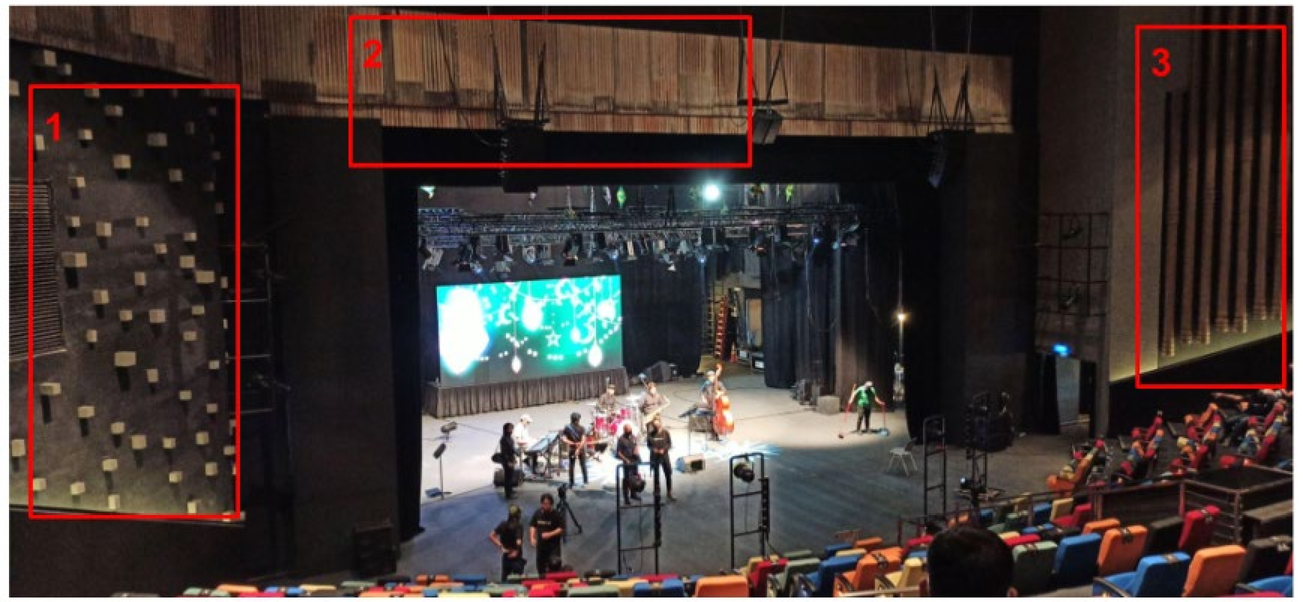
KLPAC

Kuala Lumpur Performing arts centre is an adaptive reuse building which houses 3 different sizes of performing spaces with a main auditorium for general performance (Pentas 1), a black box for experimental use (Pentas 2) and a smaller theatre (Indicine). The study will be mainly focusing on the main auditorium which is Pentas 1.

Around the walls of the auditorium, it uses a varying amount of materials, besides masonry walls, there are recycled materials such as wooden blocks, PVC pipes and zinc sheets.

The surrounding base walls in Pentas 1 are mainly masonry walls. Masonry walls have a low NRC of average 0.00 to 0.05, which shows it could totally reflect sounds within the space and create unwanted echos. Hence, the recycled materials act as diffusers as their surface properties and their density . They have varying depths on the surface which allows the diffraction of sound. From the arrangement of wooden blocks with different depths and dimensions (NRC 0.36-0.39) , to the undulating profiles of zinc sheets (NRC 0.35-0.54) and PVC pipes (NRC 0.01-0.04) . These materials shall scatter the echos effectively with its surface hardness and levels.

As for the auditorium's sound absorbers, fabric panels are installed from floor to ceiling at the opposite end of the stage and 1.4m height of soundboard under the diffusers at both sides of the walls. The height of the soundboards along the auditorium 2 sides prevents reflection on echo into the audience during sitting position. Fabric has a high NRC of 0.80 which allows good absorption of most noise. Besides, curtain drapes at the back stage helps in reducing slapback although it does not significantly help in reducing sound transmission (Lim,2019).



***Legend** : 1. Wooden blocks, 2. Zinc sheets, 3. PVC pipes*

Conclusion

Based on the overall study of acoustics in this essay, there are a number of factors to achieve good acoustics in auditorium walls design. The first step shall be determine the type of programs needed in the auditorium. Different programs required different reverberation time as mentioned in figure 2.2.1 in chapter 2.2 by Nave,1999. Speeches had to be clear with low reverberation time and Music will be more sensational with longer reverberation time.

Next, with a basic understanding of sound physics shall help in determining the sound absorption, reflection and transmission issues. A balance of use in acoustic devices compliments each other in achieving desired acoustics. Too much of either one of the devices reduces acoustic effectiveness and alters the overall ambience in audio. The balance between devices also manage to respond against different ranges of frequencies as different frequencies have different absorption and reflection requirements.

Finally, every part of the auditorium from floors, ceilings, seatings, room temperature could affect the overall acoustics besides walls. Strategic use of acoustic devices and materials with the aid of acoustics consultants in the design stage will achieve acoustic comfort without relying too much on audio devices such as speakers. Everyone in the auditorium deserves a good sound quality in every performance.

BTAR 3028 Design Studio VI (2021/22) Semester 3

Project 3: WM Performing Arts Centre

by Rex Tai Zheng Heng 20WVR08685 RAR 3 G3

Main Facade

Stretching along Jalan Wangsa Delima, WM Performing Arts Centre attracts the community around with its extruded volume cladded with vibrant red aluminum panels. The massing is hard to be unnoticed given with its hierarchy of volume and colour, providing enough contrast to seek attention.

Introduction

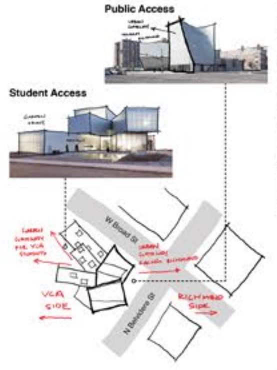
WMPAC, known as Wangsa Maju Performing Arts Centre which is a house of Modern Contemporary performing arts cater for the local community in Wangsa Maju. WMPAC aims to promote the performing art culture into the local context , influencing a culture within the proximity, by opening its doors for every society class within the area. Besides promoting, WMPAC houses an Auditorium and Black Box opened for small-scale performing arts production from young talents, providing a venue for cultivation.

Program

Performing Arts in the local context in general is under rated and the exposure to the public is underwhelming. Therefore, WMPAC seeks to focus more on promoting Performing Arts to the public. Other supportive spaces for screening and production comes along with an effective promotion. With a greater number of people introduced to Performing Arts, there will be a greater opportunity for the other program to develop and sustain in the long term.

Precedent Studies

The chosen study for the WMPAC design reference came from the Institute of Contemporary Art of Virginia Commonwealth University (ICA,VCU) in the USA. Although geographically the context is very different from WMPAC, ICA shares a similar urban context with WMPAC. It is located at a corner of a junction of the town's busiest intersection. The studies led to the approach of responding to the context.



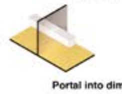
Concept : Mirror > Inter-dimensional Performance

The initial inspiration came from the active use of mirrors in daily lives, especially for Performing Arts. Performers utilise mirrors during rehearsals. Mirrors give a different perspective to the performer while rehearsals, turning them into audiences at the same time while performing in front of the mirror. Practising in front of a mirror helps them to spot their mistakes to prevent it from happening on stage.

Mirrors reflect a space depending on the direction with some light source. The reflected space gives a virtual volume and dimension, mirrors becoming the portal to it. Hence, the interest to explore the world beyond the reflective plane.

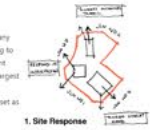
The overall form is expressed through clear cut massings instead of material due to local climate constraints. The massing gives a direct dialogue to the local community with the existing hierarchy of form and colours.

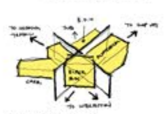

Mirror Dimensions

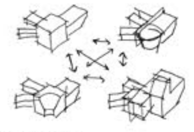

Portal into dimension

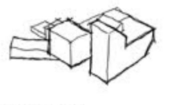
Design Intention & Development

The intention was to have as many approaches as possible, referring to the intended program, precedent studies and site response. The largest human density spaces such as Auditorium, Black Box and cafe set as an attraction to each approach.


1. Site Response


2. Extrusion to response


3. Corner form options


4. Current Development

Site Responses

1. Vehicle Access

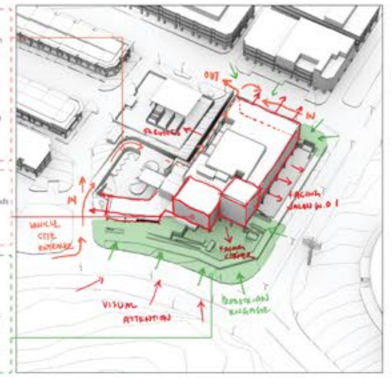
The vehicles are directed to enter the site through the one way alley of Jalan Wangsa Delima 2. The route prevents congestion on the main roads.
The vehicle enters the site via a ramp towards the main drop off, circulates along the Substation side and ramp upwards to exit towards Jalan Wangsa Delima 5. Vehicles could also enter from the same exit to access the sub basement.

2. Visual Attention

Vibrant colours from the sides facing the public, especially at both main roads with the intersection itself.
It delivers a message to express WMPAC's iconic facades.

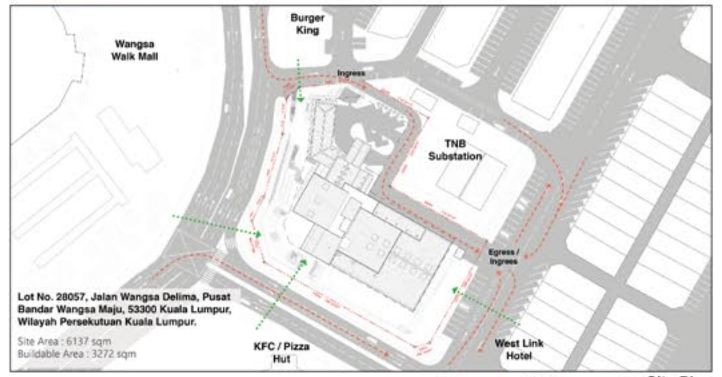
3. Pedestrian Acess

As the site is surrounded by tarmacs, pedestrian pathways with different contrasting materials prevent more tarmac from being offset into the site. Thus, promote more human activities and reduce traffic in sight.
Large area of plaza provides space to allow the program's intention



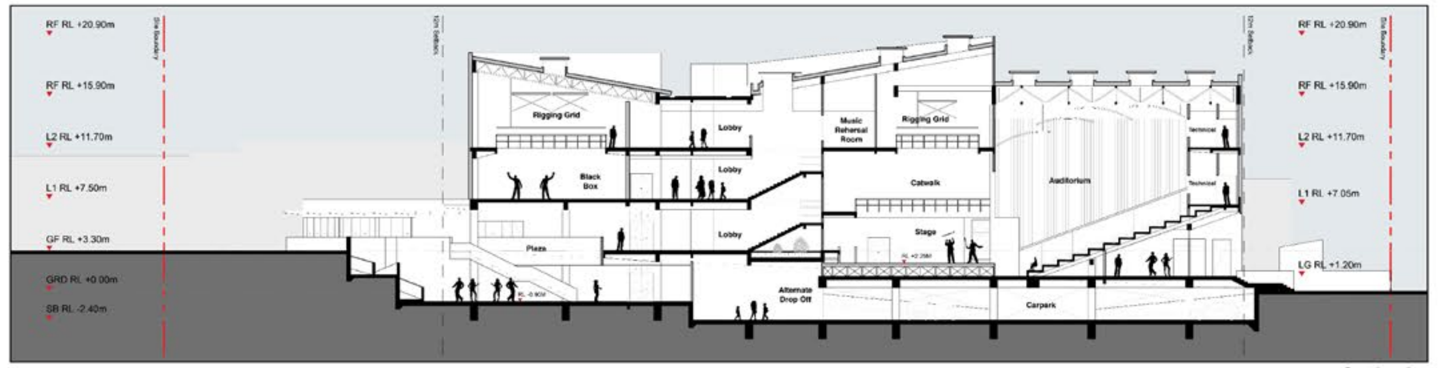

Key Plan
scale NTS


Location Plan
scale NTS

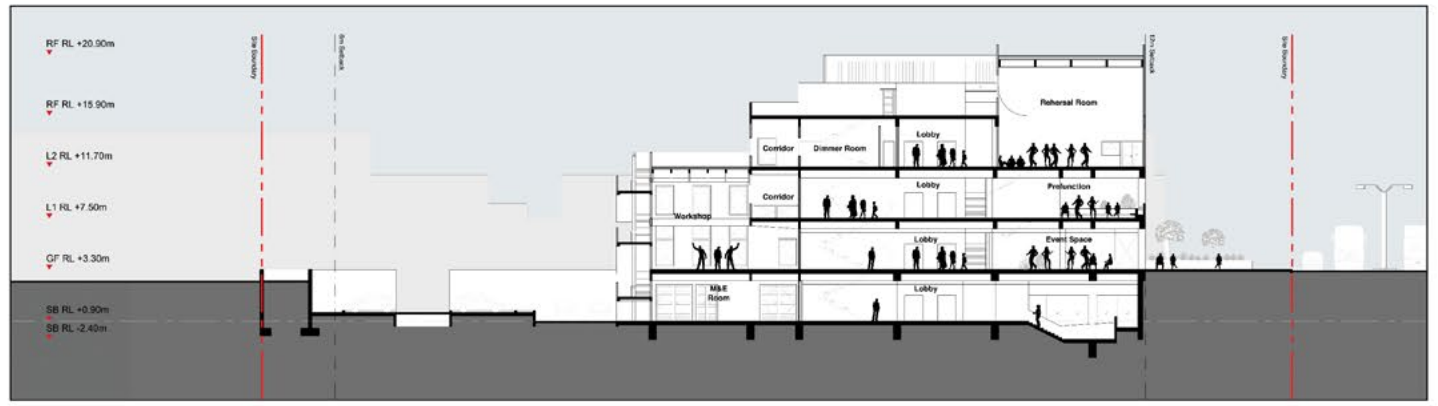


Lot No. 28057, Jalan Wangsa Delima, Pusat Bandar Wangsa Maju, 53300 Kuala Lumpur, Wilayah Persekutuan Kuala Lumpur.
Site Area : 6137 sqm
Buildable Area : 3272 sqm

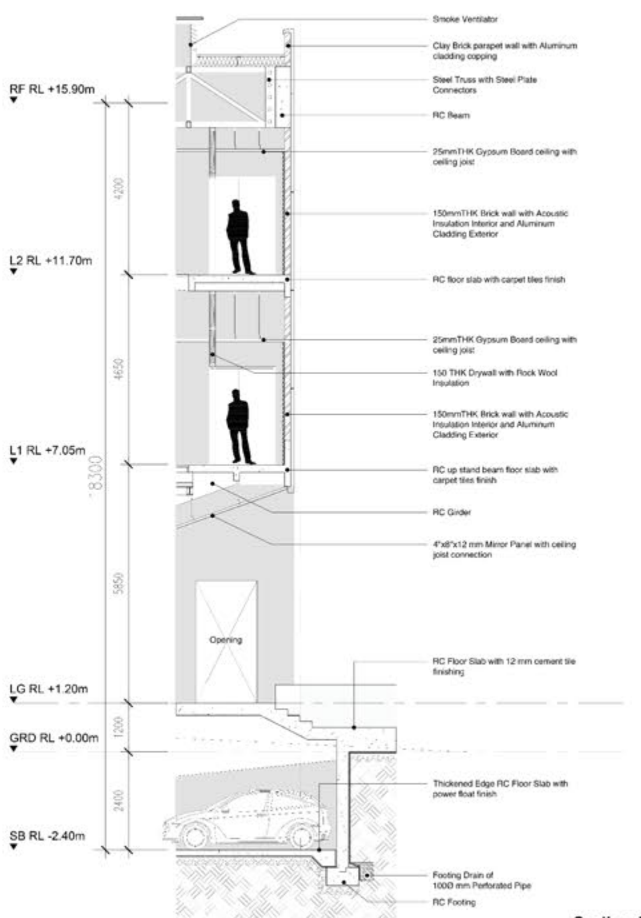
Site Plan
scale 1:500



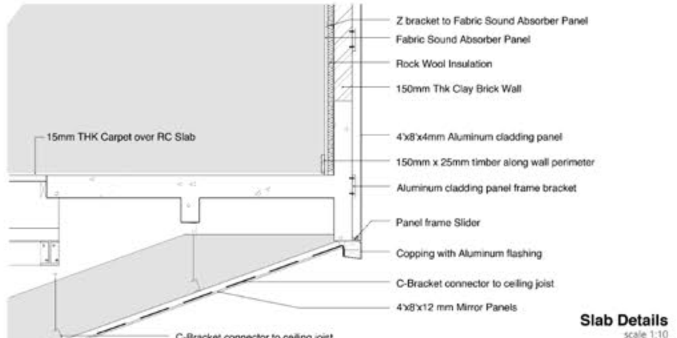
Section A-a
scale 1:100



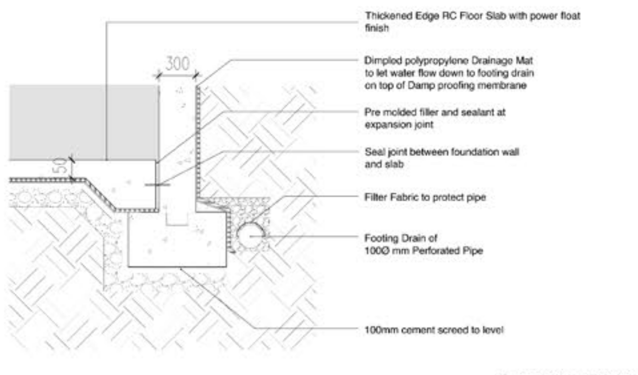
Section B-b
scale 1:100



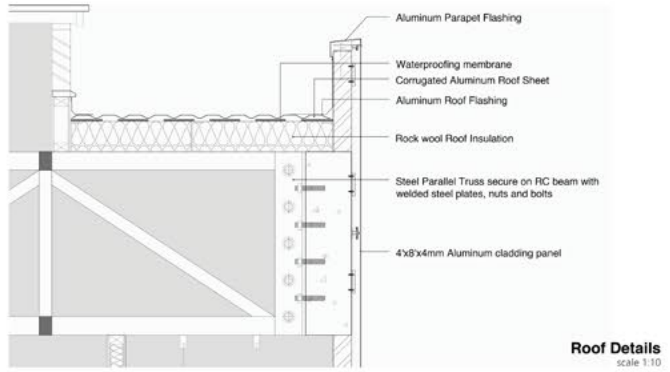
Sectional Details
scale 1:30



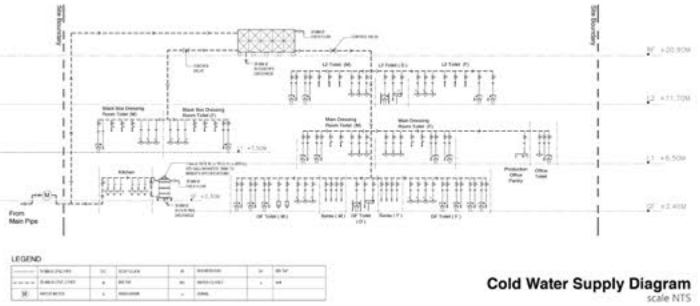
Slab Details
scale 1:10



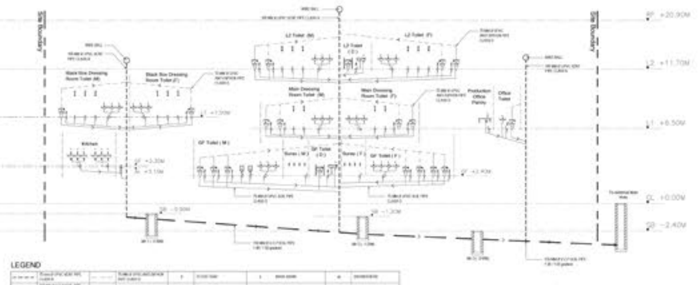
Foundation Details
scale 1:10



Roof Details
scale 1:10

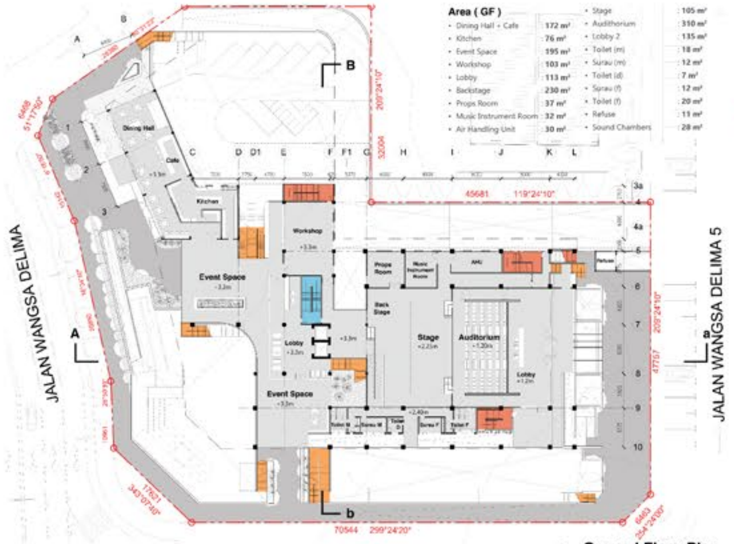


Cold Water Supply Diagram
scale NTS

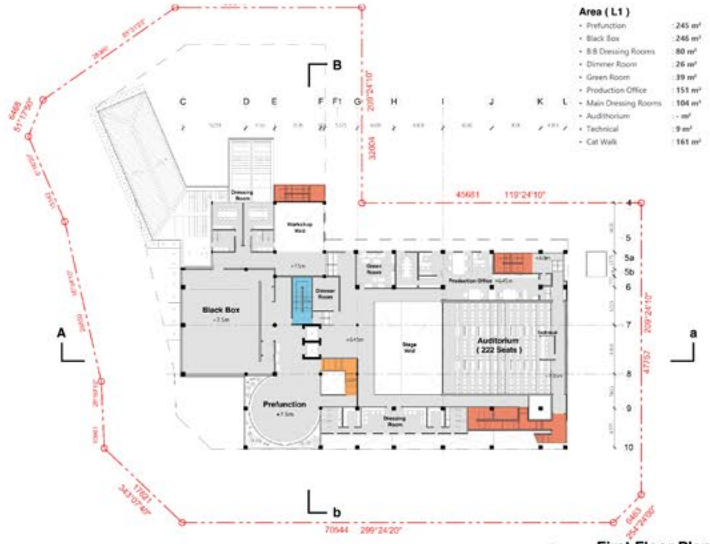


Sewerage Diagram
scale NTS

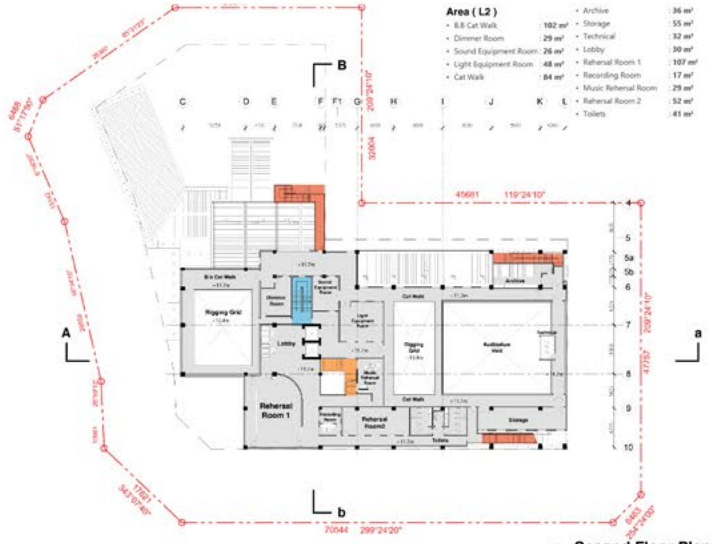
Sub-Basement Plan
scale 1:200



Ground Floor Plan
scale 1:200



First Floor Plan
scale 1:200

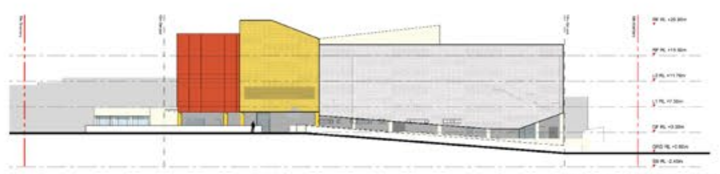


Second Floor Plan
scale 1:200

North West Elevation
scale 1:200

North East Elevation
scale 1:200

South East Elevation
scale 1:200



South West Elevation
scale 1:200

Sustainable Features : Roof + Facade

Wide roof area provides plenty of opportunity to apply sustainable features, from ventilation, lighting, and resources collection.

Smoke Ventilator

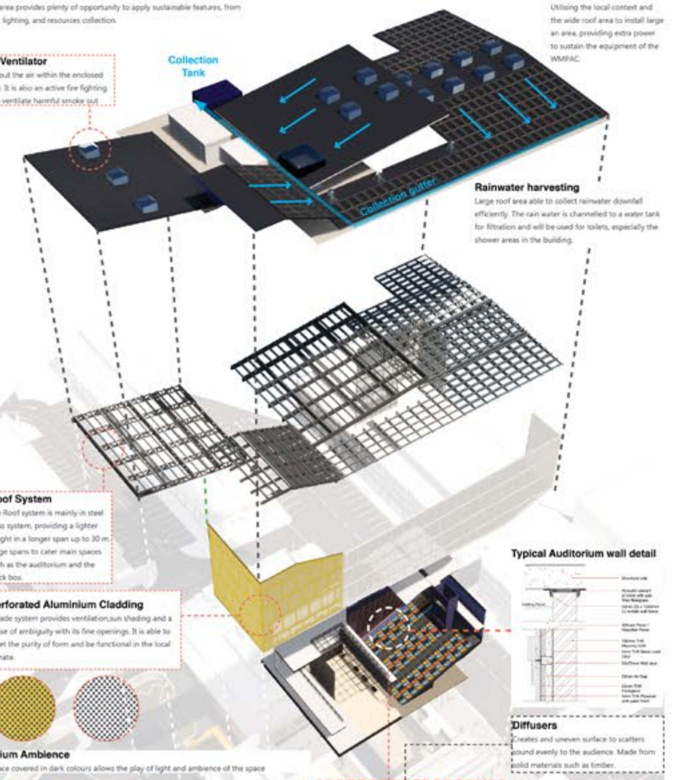
Ventilates out the air within the enclosed auditorium. It is also an active fire fighting strategy to ventilate harmful smoke out

Solar Panels

Utilising the local context and the wide roof area to install large an area, providing extra power to sustain the equipment of the WMPAC.

Rainwater harvesting

Large roof area able to collect rainwater downfall efficiently. The rain water is channelled to a water tank for filtration and will be used for toilets, especially the shower areas in the building.



Roof System

The Roof system is mainly in steel truss system, providing a lighter weight in a longer span up to 30 m. Large spans to cater main spaces such as the auditorium and the black box.

Perforated Aluminium Cladding

Facade system provides ventilation,sun shading and a sense of ambiguity with its fine openings. It is able to meet the purity of form and be functional in the local climate.

Typical Auditorium wall detail

Diffusers

Creates and uneven surface to scatters sound evenly to the audience. Made from solid materials such as timber.

Sound Absorbers

Absorbs incoming sound to reduce sound reverberation with soft materials like the fabric absorbing panels.

Colourful Seatings

Randomised colours give an impression of audience attendance. Soft cushions also act as sound absorbers.

Gangways

Adequate gangway width provides accessibility and means of escape. Covered in carpet for noise reduction.

Auditorium Ambience

Interior space covered in dark colours allows the play of light and ambience of the space

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