

Ponorogo Performing Arts Center

With Audiovisual Comfort In Tropical Building

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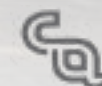
Architecture Undergraduate Study Program



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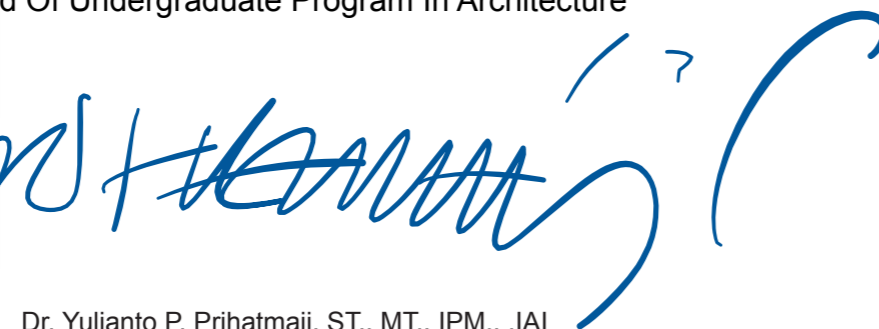

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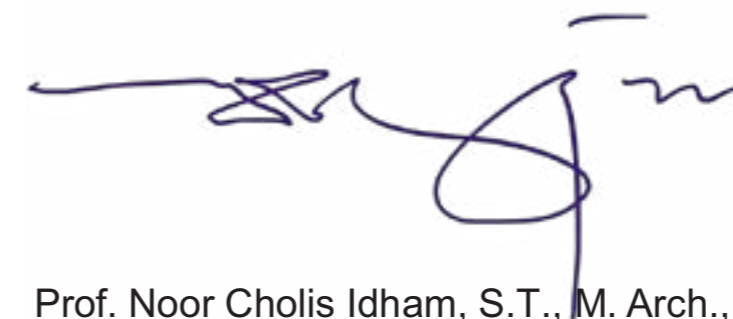
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Yogyakarta,09-02-2021

Author



Rezandi Zaki Rizqiullah

Foreword

Bismillahir rahmanir Rahim,

Praise and gratitude I pray to Allah SWT for all the graces, favors, knowledge and gifts, so that I can go through and complete this undergraduate final project smoothly and well. I hereby thank:

1. My family, especially Father, Mother, and Brother who have given all the prayer support, main support, affection and material.
2. Supervisor Prof. Noor Cholis Idham, S.T., M. Arch., Ph.D., IAI who has guided, provided input and direction in the process of working on this final project.
3. My closest friends are Naufal Al Fikri, Elang Priambodo, Irena Suryandari Fauziyyah, Sinawang Architecture Studio who always support of process at this beloved campus and other friends who cannot I mention one by one.

May Allah SWT give you more blessings.

Amen

Abstract.

Ponorogo Regency has a nickname as one of the developing cultural cities and tourism cities, which are now starting to be visited by many domestic and foreign tourists. One of the famous arts is the Reog Ponorogo dance where in one art it displays 3 types of art at once, namely music, dance, theater/acting art. Currently, the art building facilities have not been supported to accommodate and facilitate the arts.

The concept of tropical buildings emerged because most theater buildings tend to be closed and eventually require mechanical or additional ventilation. So the need for a building design that is able to respond to the micro and macro climate. Apart from the climate factor, the user's acoustic and visual comfort factors must be considered, considering the building that is being stretched is a performance hall for various types of art.

So the approach used in the design this time is tropical architecture which is to respond to the climate of the existing conditions on the site. In addition, the need for performance art as an icon will be able to reflect the culture that strengthens the identity of the Ponorogo Regency and also as a function of public space that is easily remembered and known by the public and foreign tourists.

Abstrak.

Kabupaten Ponorogo memiliki sebuah julukan sebagai salah satu kota budaya dan kota pariwisata yang sedang berkembang, yang kini mulai banyak dikunjungi oleh wisatawan domestik maupun mancanegara. Salah satu kesenian yang terkenal adalah kesenian tari Reog Ponorogo dimana dalam satu kesenian tersebut menampilkan 3 jenis kesenian sekaligus yakni musik, tari, theater/seni peran. Saat ini fasilitas gedung kesenian belum mendukung untuk mewadahi dan memfasilitasi kesenian tersebut.

Konsep bangunan tropis muncul karena kebanyakan bangunan gedung pertunjukan cenderung tertutup dan akhirnya membutuhkan penghawaan mekanik atau tambahan. Maka perlunya sebuah perancangan gedung yang mampu merespons dari iklim mikro maupun makro. Selain dari faktor iklim faktor kenyamanan akustik dan visual pengguna haruslah diperhatikan mengingat bangunan yang di usung merupakan sebuah gedung pertunjukan untuk berbagai macam tipe kesenian.

Maka Pendekatan yang digunakan dalam perancangan kali ini yaitu arsitektur tropis dimana untuk merespon iklim dari keadaan yang ada di site. Selain itu kebutuhan performance art sebagai ikon akan dapat mencerminkan kebudayaan yang memperkuat identitas Kabupaten Ponorogo dan juga sebagai fungsi ruang publik yang mudah diingat dan dikenal oleh masyarakat maupun wisatawan mancanegara.

Content.

Validation Page	i
Supervisor Notes	ii
Statement Of Authenticity	iii
Forewords	iv
Abstract	v

Chapter 1 Introduction

Background	1
1.1 Reional Conditions and Tourism Development Efforts By Ponorogo Regional Government	3
1.2 Tropical Climate And Art Performance Building	4
1.3 The Diversity Of Performing Arts In Ponorogo	5
1,4 Ponorogo Performance Art Existing Facilities Condition	6
1.5 Physical Comfort Demand For Performance Art Building In Ponorogo	7
1.6 Problem Statements	8
1.7 Problem Mapping	9
1.8 Design Method	10
1.9 Problematique	11
1.10 Originality	12

Chapter 2 Design Problem Study

2.1 Contextual Review	14
2.2 Tropical Architecture For Performance Art Building	17
2.3 Art Performance Building Typology	20
2,4 Precedent Studies	30
2.5 Building Code	36

Chapter 3 Analysis And Exploration

3.1 User Behaviors Analysis	39
3.2 Performer Activity Analysis	41
3.3 Space Requirements Analysis	42
3,4 Space Connection Analysis	43
3.5 Property Size	44
3.6 Site Plan Concept According To Tropical Architecture	45
3.7 Building Mass Concept	47
3.8 Main Stage Concept	49
3.9 Building Envelope	50

Chapter 4 Design Result

4.1 Site Plan	52
4.2 Main Stage Plan	53
4.3 Situations	54
4.4 Elevations	55
4.5 Sections	56
4.6 Building Envelope	57
4.7 Main Stage Interior	58
4.8 Structure Integration	60
4.9 Utility Scheme	61
4.10 Barrier Free Scheme	62
4.11 Building Safety Scheme	63
4.12 Building Simulation	65

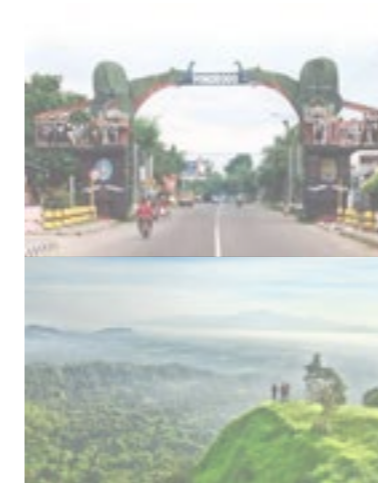
List Of Figures.

Figure 1.1 Ponorogo Satellite Map, Borders of Ponorogo
Figure 1.2 Public Building, Pasar Legi Ponorogo
Figure 1.3 Art Facilities, Gedung Kesenian Ponorogo
Figure 1.4 Reog Mini Performance
Figure 1.5 Theater, Gedung Kesenian Ponorogo
Figure 1.6 Gedung Kesenian Ponorogo
Figure 1.7 Reog Mini Performance, Gedung Kesenian Ponorogo
Figure 1.8 Padhepokan Seni Reog Existing Condition
Figure 1.9 Problem Mapping
Figure 1.10 Problematique
Figure 2.1 Site Location And Neighborhood
Figure 2.2 Site Location
Figure 2.3 Site Ownership
Figure 2.4 Neighborhood
Figure 2.5 Site Accesibility
Figure 2.6 Average Temperature and precipitation
Figure 2.7 Sun path diagram
Figure 2.8 Wind Speed And Windrose
Figure 2.9 Building orientation to the sun
Figure 2.10 Architecture Element, Shading Devices
Figure 2.11 Types Shading Devices
Figure 2.12 Architecture Element, Windbreaker
Figure 2.13 Vegetation Distance
Figure 2.14 Joglo Architectural Principal
Figure 2.15 Wind Flow In Joglo Building
Figure 2.16 Rectangular Stage
Figure 2.17 Fan Stage
Figure 2.18 Horse Shoe Stage
Figure 2.19 Lighting into the stage, Specific and general Lighting
Figure 2.20 Bouncing sound to the ceiling
Figure 2.21 Raising the sound source and tilting the audience area floor
Figure 2.22 Acoustic Devices Materials
Figure 2.23 Normal Eye Viewpoint
Figure 2.24 Boundary Perspective of the Presentation Area
Figure 2.25 Plane angel to center line
Figure 2.26 Reog Performance
Figure 2.27 Warok Dancer
Figure 2.28 Jathil Dancer
Figure 2.29 Ganongan Dancer
Figure 2.30 Reog Mask Dance
Figure 2.31 Traditional Instrument, Reog Performance
Figure 2.32 Music Concert, Gedung Kesenian Ponorogo
Figure 2.33 Shadow Puppets, Gedung Kesenian
Figure 2.34 Theater And Drama Performance, Gedung Kesenian
Figure 2.35 Amphitheater, Chicken Comb
Figure 2.36 Elevation, Chicken Comb
Figure 2.37 Section, Chicken Comb
Figure 2.38 Structure Detail, Chicken Comb
Figure 2.39 Interior, Chicken Comb
Figure 2.40 Singkawang Cultural Art Center
Figure 2.41 Plan
Figure 2.42 Building Envelope
Figure 2.43 Design Phase
Figure 2.44 British Museum
Figure 2.45 Concept
Figure 2.46 Roof Structure
Figure 3.1 Traditional Instrument, Reog Performance
Figure 3.2 Traditional Instrument, Reog Performance

Figure 3.1 General Concept
Figure 3.2 Artist Scheme Activity
Figure 3.3 Management Scheme Activity
Figure 3.4 Visitor Scheme Activity
Figure 3.5 Security Scheme Activity
Figure 3.6 Cleaning Staff Scheme Activity
Figure 3.7 Ticketing Staff Scheme Activity
Figure 3.8 Cafeteria Staff Scheme Activity
Figure 3.9 Art Activities Grouping
Figure 3.10 Space Requirement Analysis Table
Figure 3.11 Space Requirement Analysis Table
Figure 3.12 Property Size Analysis Table
Figure 3.13 Climatic Analysis
Figure 3.14 Surface Area To Sun Radiation
Figure 3.15 Landscape Concept
Figure 3.16 Main Stage Landscape Concept
Figure 3.17 Circulation
Figure 3.18 Building Form Concept
Figure 3.19 Building Configuration
Figure 3.20 Building Structure Concept
Figure 3.21 Building Roof Structure
Figure 3.22 Main Stages Configuration
Figure 3.23 Acoustic Treatment
Figure 3.24 Building Structure Concept
Figure 4.1 Site Plan
Figure 4.2 Main Stages Plan
Figure 4.3 Offices Plan
Figure 4.4 Commercial Area
Figure 4.5 Situation Plan
Figure 4.6 Situation Plan
Figure 4.7 Interior Detail
Figure 4.8 Interior Rendering
Figure 4.9 Structural Integration And Detail
Figure 4.10 MEP Scheme
Figure 4.11 Difable Access And Facility
Figure 4.12 Autodesk Flow Design
Figure 4.13 Velux
Figure 4.14 Reverbration Time Calculation

List Of Tables.

Table 1.1 Number of Arts Organisation In Ponorogo, 2013
Table 1.2 Data of Art Center Visitor And Performance
Table 1.3 Number of Arts Organisation
Table 2.1 Material And Heat Absorption Percentage
Table 2.2 Main Facilities
Table 2.3 Supporting Facilites
Table 2.4 Management Room



Source : Farizal Hakim

Ponorogo City

Ponorogo is known as the City of Reog, because this city is where the art of Reog born, which has now become a tourist icon in East Java.



Source : Simon Bardet

People

Just like the people on the island of Java, the majority of which are workers in the agricultural or agrarian sector.



Source : Wirestock

Cultural And Art

Ponorogo has a very strong cultural basis and therefore it must be preserved and developed. Its cultural potential is in the form of arts.

Chapter 1

Introduction Arts, Cultures And Geograpichal Issues In Ponorogo

Ponorogo City Of Arts

Manunggale Cipto, Roso, Karso Agawe Rahayuning Bumi Reog

BACKGROUND

1.1 Regional Conditions and Tourism Development Efforts by the Ponorogo Regional Government

Ponorogo Regency is a city in East Java Province, Indonesia. Ponorogo geographically located between 111° 17 – 111° 52 East Longitude and between 7° 49-8° 20 South Latitude and has an area of 1,371.78 km². It consists of 21 sub-districts which are further divided into 303 villages and sub-districts. The district is bordered by Magetan and Madiun districts in the north, Tulungagung and Trenggalek districts in the east. Pacitan in the southwest, and Wonogiri, Central Java province in the west. Ponorogo is a city that is strategically located because it is located in the lowlands and part of the highlands and is on the Madiun – Pacitan route.

In 2016, the number of tourist visits was still in the range of 100 thousand, then increased to 150 thousand in 2017, and then multiplied to more than 300 thousand tourists in 2018. The number of tourists visiting Ponorogo Regency, East Java, continues to increase from year to year. year on year, in mid-2019 it reached 500 thousand people, whereas the previous three years it was only in the range of 100 thousand people. Various cultural arts activities are also continuously encouraged. Some are done independently, and some are regional programs in boosting the prestige of Ponorogo cultural tourism in the domestic and international arena.

In representing and realizing the vision of the Ponorogo Regency government, which is to create a prosperous, safe, cultured, just Ponorogo Community based on divine values in order to realize “RAHAYUNING BUMI REYOG” as a goal in the 2016-2020 Ponorogo development, various approaches are considered to be the most appropriate. with the condition of the people of Ponorogo. And therefore the Strategy is the most practical general way in developing all local potential in a global way that is currently owned by Ponorogo Regency. At least there are several strategies that will be used in analyzing problems, processing and finding solutions various problems and the development of social potential in Ponorogo Regency 2016-2020, one of which is carrying out “Equitable development and economic growth, through the development of the tourism sector while still paying attention to environmental sustainability”.



Figure 1.1 Ponorogo Satellite Map, Borders of Ponorogo.
Source : Author, 2021

The vision in development for the next 5 years is to realize the Greatness of Ponorogo Regency (Harmony, Elok, Bergas, Amanah and Takwa) and 4 missions, namely to improve the regional economy based on agriculture and tourism, Realizing community welfare through improving basic services, community empowerment and cultural development, Realizing development quality and sustainable infrastructure and environment. Based on the RTRW of Ponorogo Regency in 2012-2032, the purpose of spatial planning in Ponorogo Regency is “To create a productive regional space based on superior agriculture and tourism so that it is environmentally friendly in East Java”. The policies in spatial planning related to tourism are increasing natural and historical potential in realizing superior tourism development as well as developing leading tourist areas and events. So the main focus in development and development in Ponorogo Regency is the tourism sector which is the leading sector and has a role in supporting the pace of development in Ponorogo Regency.

1.2 Tropical Climate And Art Performance Building

The temperature in Ponorogo throughout the year is relatively the same with an average temperature of 26.4 and the lowest average temperature of 21.6 , and rainfall in this area ranges from 1,400–2,000 mm per year with the number of rainy days ranging from 100–150 rainy days per year. With that condition for the art building with so many people inside the building with the typical of tropical climate building in indonesia is needed system to respond the condition.

So from the several fact and data above the typical building to design have to followed the tropical architecture criteria and one of the factor to achieve comfort is designing the building envelope for the building. The component of the building is walls, Fenestration (windows and door), Roofs. It's very determine the building performance especially for the tropical building cause the materials choosing and the system have implication into the building performance. The wet tropical climate in Ponorogo causes the need for handling in designing a building. This is because of the problems that will arise from the tropical climate that will affect the comfort of its users. So in order to create an organic integration between the building and the space in it with the natural surroundings to achieve the comfort of its users. To achieve this requires some adjustments to the sun and rain. (Ranti 2000)

The climatic factors of one area can affect the shape of an architecture because various human activities require varying climatic conditions. Due to the external climatic conditions that can hinder many human activities, humans build buildings. So with the building, it is hoped that the external climate that does not support human activities can be modified into a more suitable indoor climate. (Kalamang 2010)

Therefore, efforts to develop and utilize the arts are not only focused on the facilities, but also the comfort of the artist when they are performn in it. Both, for the building and the facilities in it are still an obstacle in Ponorogo. For this reason, there is a need for facility that can support activities for artists with a physical comfort due the tropical climate of Ponorogo. The application will be realized through the design of the Performance Building in Ponorogo with a tropical architectural approach.



Figure 1.2 Public Building, Pasar Legi Ponorogo
Source : Author, 2021



Figure 1.3 Art Facilities, Gedung Kesenian Ponorogo.
Source : Author, 2021

1.3 The Diversity Of Performing Arts In Ponorogo

Ponorogo is an arts city, it's typical with Bali where art can be attract the tourist to come and visit Ponorogo. The problem arise when many art performance still not yet facilitated to perform in adequate place according in the type of the arts. So the new design of an Art Center of Ponorogo is proposed to be more concern to facilitate the art and the result is for attract the visitors.

No	Kesenian	Jumlah
1	Reog (mini, dadak, thek)	187
2	Krawitan	218
3	Campursari	52
4	Ludruk/Ketoprak	10
5	Wayang Orang	2
6	Band/Orkes	120
7	Qosidah	16

Table 1.1 Number of Arts Organization In Ponorogo, 2013
Source : Culture, Tourism and Sport Office of Ponorogo Regency

So far, the art building that is still actively holding art performances is the "Padhepokan Seni/Ponorogo Art Center". In this building, a number of art activities and art performances are often held for the residents of Ponorogo. But from the event that held there, there's just several performance that prioritize by the government tourism center.

No	Art Performance	Amount
1	Reog (mini, dadak, thek)	9500
2	Band/Orkes	5200
3	Wayang	4550
4	Teater	1370

Table 1.2 Data of Art Center Visitor And Performance
Source : Culture, Tourism and Sport Office of Ponorogo Regency

From the data Below, we can see that there is 3 kind of art that performs in the building. The order of highest rate of arts is the Reog Mini, music, and theater/wayang. So we can conclude that the dance performance need to be prioritize to the new facilities.



Figure 1.4 Reog Mini Performance, Gedung Kesenian Ponorogo.
Source : Author, 2021



Figure 1.5 Theater, Gedung Kesenian Ponorogo
Source : Culture, Tourism and Sport Office of Ponorogo Regency, 2021



Figure 1.6 Modern Music Performance, Gedung Kesenian Ponorogo.
Source : Author, 2021



1.4 Ponorogo Performance Art Existing Facilities Condition

Padepokan Reog Ponorogo is located on Jalan Pramuka, Ponorogo Regency, East Java. Reog Ponorogo Hermitage is a place used to perform various performances dance activities in the Ponorogo area. This hermitage is a theater an indoor performance that is also the main training ground for dance from various dance groups around the city of Ponorogo. Area this building only consists of one main building and two main buildings supporting building attached to the back.

Padepokan Reog Ponorogo generally a place where an artist can continue to work and develop their work and be able to share or exchanging arts knowledge, in which there is significant interaction good and mutually beneficial relationship with art. Reog Ponorogo art center is a place to teach, develop and preserving the art of Reog Ponorogo through the method introduction and teaching.

The Problem with the roof is when the rain coming the area of stage is getting wet. it's affected to the performer and the activity on the stage. Cause of it sometimes need add more stage inside the stage to prevent the show is stop. not just from that the building element such as wall and the ceramic is getting broken cause of the the building is too open for the sun and water.



Figure 1.7 Gedung Kesenian Ponorogo.
Source : Author, 2021

The picture Above shows the stands of the audience from Padepokan Reog Ponorogo. There are many columns in this grandstand building, so that the view of the audience towards the stage is disturbed.

Because of the climate that occur, like raining the building design cannot deal with the condition. Like the condition of the stage floor is already occurring some cracking and the facilities of the visitor become broke cause in 2019 this building occurring some floods make the element of the building is broken and malfunction.



Figure 1.8 Padhepokan Seni Reog Existing Condition
Source : Author, 2021

Because of the climate that occur, like raining the building design cannot deal with the condition. Like the condition of the stage floor is already occurring some cracking and the facilities of the visitor become broke cause in 2019 this building occurring some floods make the element of the building is broken and malfunction

This Reog Ponorogo Art Center, although named art center but in it there is no place to study, like hermitages in general there are dormitories and other educational facilities. Reog Hermitage Ponorogo is just a place for performances and also a training ground dance art. Therefore, every day this hermitage is quiet and only used if anyone wants to practice dance in this place.

The Building condition for the architectural probelem above occurring and impact of the building design that not responding the climate of Indonesia which is the tropical climate that have 2 season. Where the opening is too wide and the roof is too short to cantilever. It cause the water management and floods can be occurring in this building stage.

From the fact above can be concluded that building for the performing art is still low for the comfort of the both user for the visitor and performer and this condition is the chance to redesigning the building to be more responding the climate and considerate the comfort of the users of this building.

1.5 Physical Comfort Demand for Performance Art Building in Ponorogo

The development of art in Ponorogo is starting to decrease due to modernization and the lack of facilities that can support the arts to develop, but if it is managed properly using modern technology and combined with designing that pays attention to the local context, it can make art interesting and more passionate again.

Ponorogo Performing Arts Building is a place that is used as a venue for performing arts, both dance, music and drama/theater. Related to that, the space requirements must be fulfilled according to its function, so that the message expressed by the art presenter can be captured properly so that optimal performance quality is achieved and satisfaction for the audience considering that the audience who enters a performance building has the right to get comfort, security, adequate lighting. , pleasant sights and good sound quality in addition to the quality of the show itself.

From the data and some of the facts mentioned above, it can be concluded that with a tropical climate, an effort is needed from the building to respond to the theme of tropical architecture on the building envelope. Due to the standard of typology of art buildings which tend to be closed, it is necessary to have a design that can combine tropical buildings and performing arts buildings that can support audio-visual terms but remain comfortable with consideration of the 3 types of art that will be accommodated.

1.6 Problem Statements

1.5.1 Design Problem Formulation

- General Problems Formulation

How to design a performing art building that can be physically comfortable for different performances?

- Specific Problem Formulation

How to design a building envelope to respond to the tropical climate for a performing arts building?

1.5.2 Goal

Designing the performing art building that can accomodate Ponorogo arts performance that can be comfort in audio and visual in tropical climate condition

1.5.3 Target

Designing the art building by meeting audiovisual comfort standards in Ponorogo which accommodates arts that have different demands for audiovisual behavior but also fit in to tropical climate condition.

1.5.4 Design Limitation

a. The discussion is limited to the problem of rearranging indoor and outdoor spaces, namely:

1. The layout of the outer space is related to the pattern of the layout of the building, the layout of the vegetation, the circulation of the outer space, and the shape of the building.
2. The spatial layout is related to the capacity of the space, the interior of the building space, and the shape of the space elements.
- b. The discussion is limited to the issue of physical comfort (Acoustic and Visuals, Thermal) in the performance space.
- c. The discussion is limited to the problem of building envelope to respond to the climate.
3. The arts that will be accommodated are Reog, Modern Music, Theater/Wayang Orang.

1.7 Problem Mapping

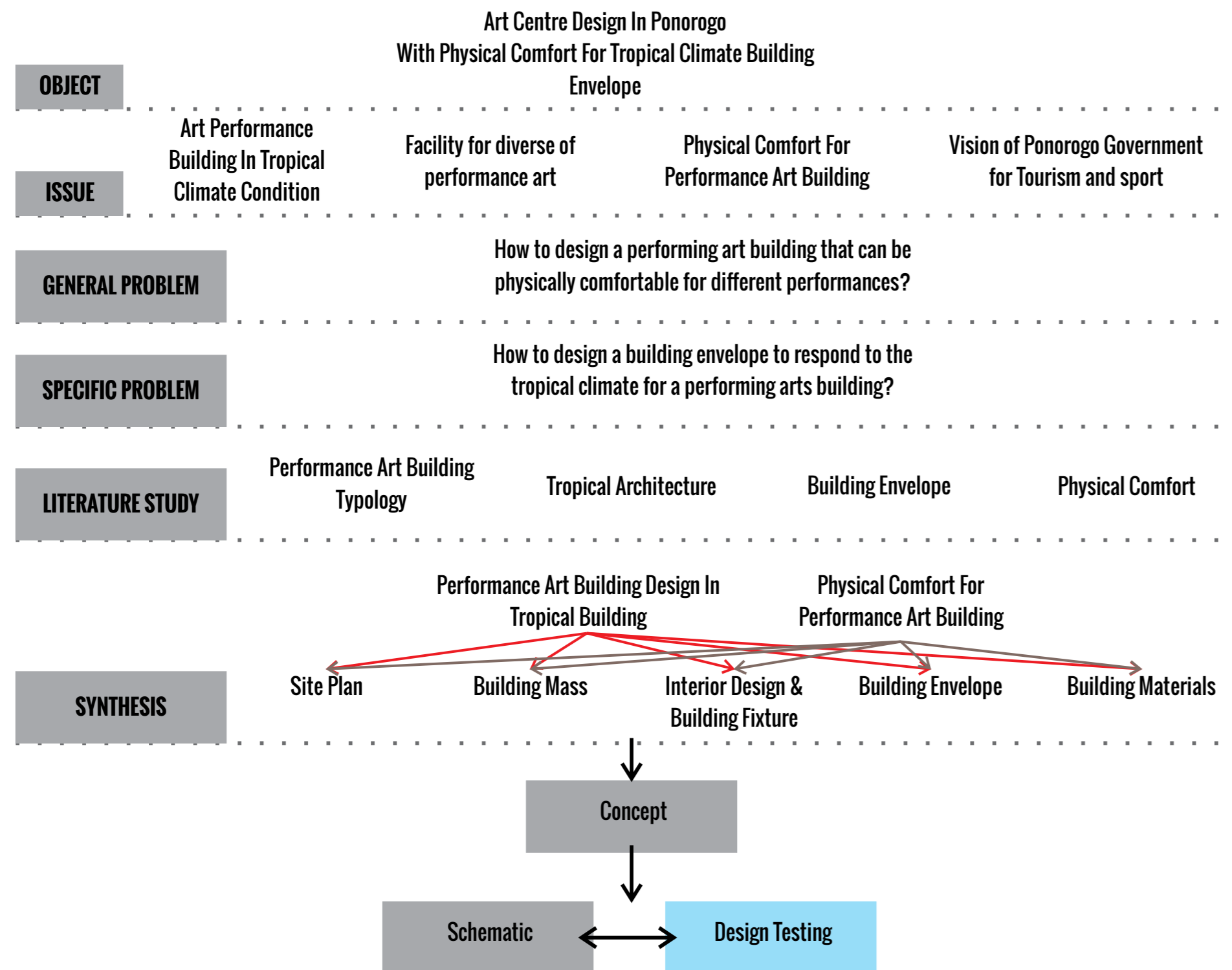


Figure 1.9 Problem Mapping
Source : Author, 2021

1.8 Design Method

1.7.1 Problem

- Primary Data Collection

This is done by collecting data online via the web for site observation and identification.

- Secondary Data Collection

This is done by collecting library studies through books, journals, and websites to obtain data related to areas, facilities, typology of performance art and related theories.

1.7.2 Analysis

- Macro Analysis

Analysis related to problems in the area and context, namely the road area around the site

- Micro Analysis

Analysis related to the need for Performance Art in mass management, sheathing and solving other problems found in buildings

1.7.3 Synthesis

In the form of solving the problems that have been analyzed

1.7.4 Evaluation

Evaluation of the test is carried out using empirical logic and logic methods which refer to a theory which will later be used as a method of testing this design.

1.9 Problematique

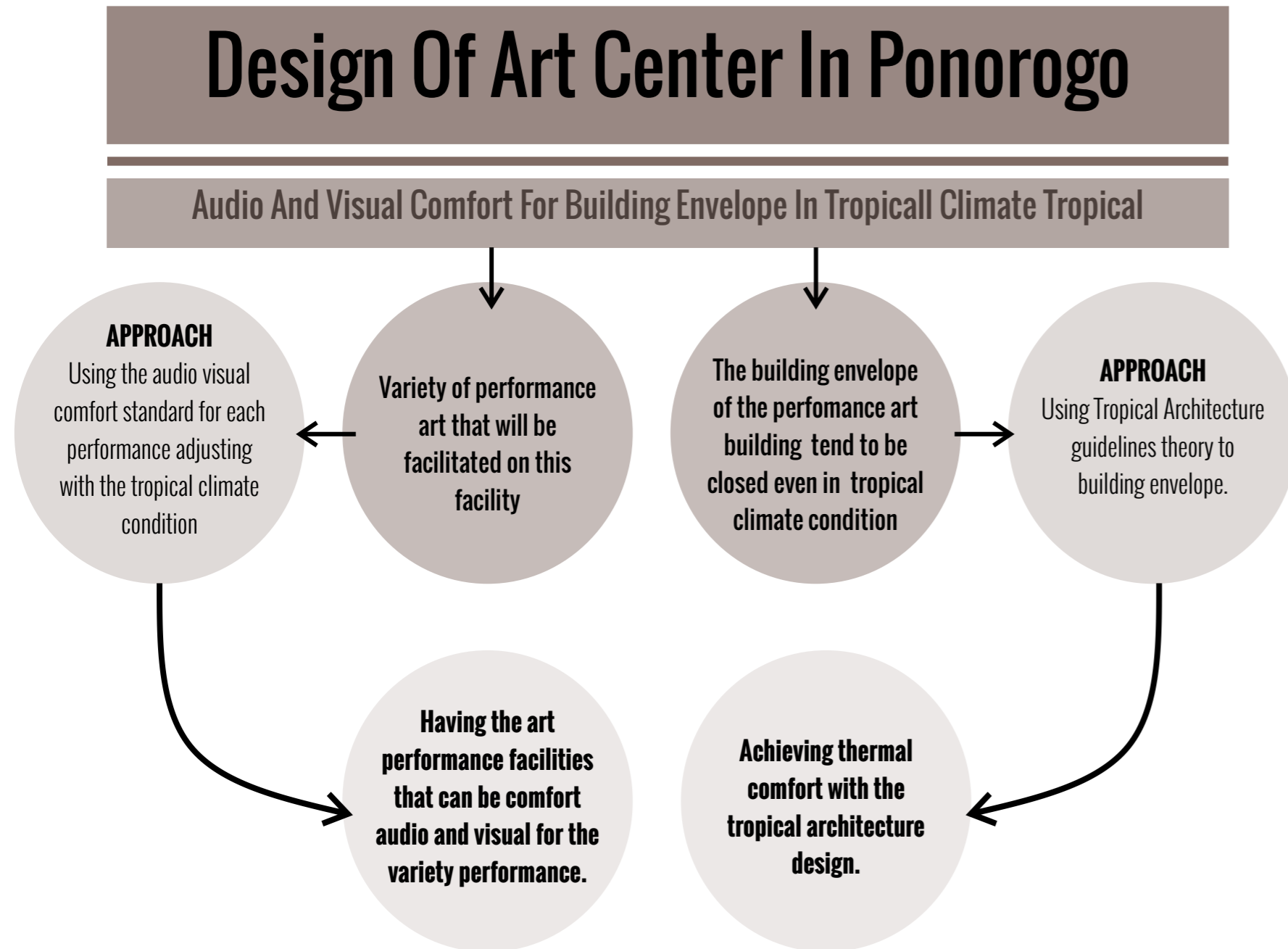


Figure 1.10 Problematique
Source : Author, 2021

1.10 Originality

The redesign of the Reog Ponorogo Art Building For Audio And Visual Comfort For Different Performance Event has never been done by anyone. In order to prevent plagiarism in the process of preparing reports and designing, the following are some designs that are used as a reference :

1. Title : PERENCANAAN DAN PERANCANGAN GEDUNG AUDITORIUM SENI PERTUNJUKAN MUSIK DAN TEATER DI KOTA PALEMBANG

Writer : Fahri Saefuddin

Institution : Sriwijaya University

Year : 2019

Problem : Designing a performing arts auditorium that can facilitate both performance functions, both musical and theatrical performances. The difference is the case context and the art or culture that wanna accomodate

2. Title : GEDUNG KESENIAN TRADISIONAL SURAKARTA

Writer : Pulung Amrih BP

Institution : Islamic University Of Indonesia

Year : 2002

Problem : Designing an Arts Building that can meet the demands for the development and preservation of Surakarta's traditional arts culture. The difference is the case context and the art or culture that wanna accomodate

3. Title : RESORT DI DAERAH WISATA SENGGIGI, LOMBOK BARAT PENDEKATAN ARSITEKTUR TROPIS

Writer : Reza Regipta P

Institution : Islamic University Of Indonesia

Year : 2018

Problem : Designing a Resort with a 3-star standard but with a tropical architectural approach that can maximize the comfort of the resort space both from outside and inside the resort
The difference is the building typology

Chapter 2

Design Study For Art Performance In Tropical Climate Condition

2.1 Contextual Review

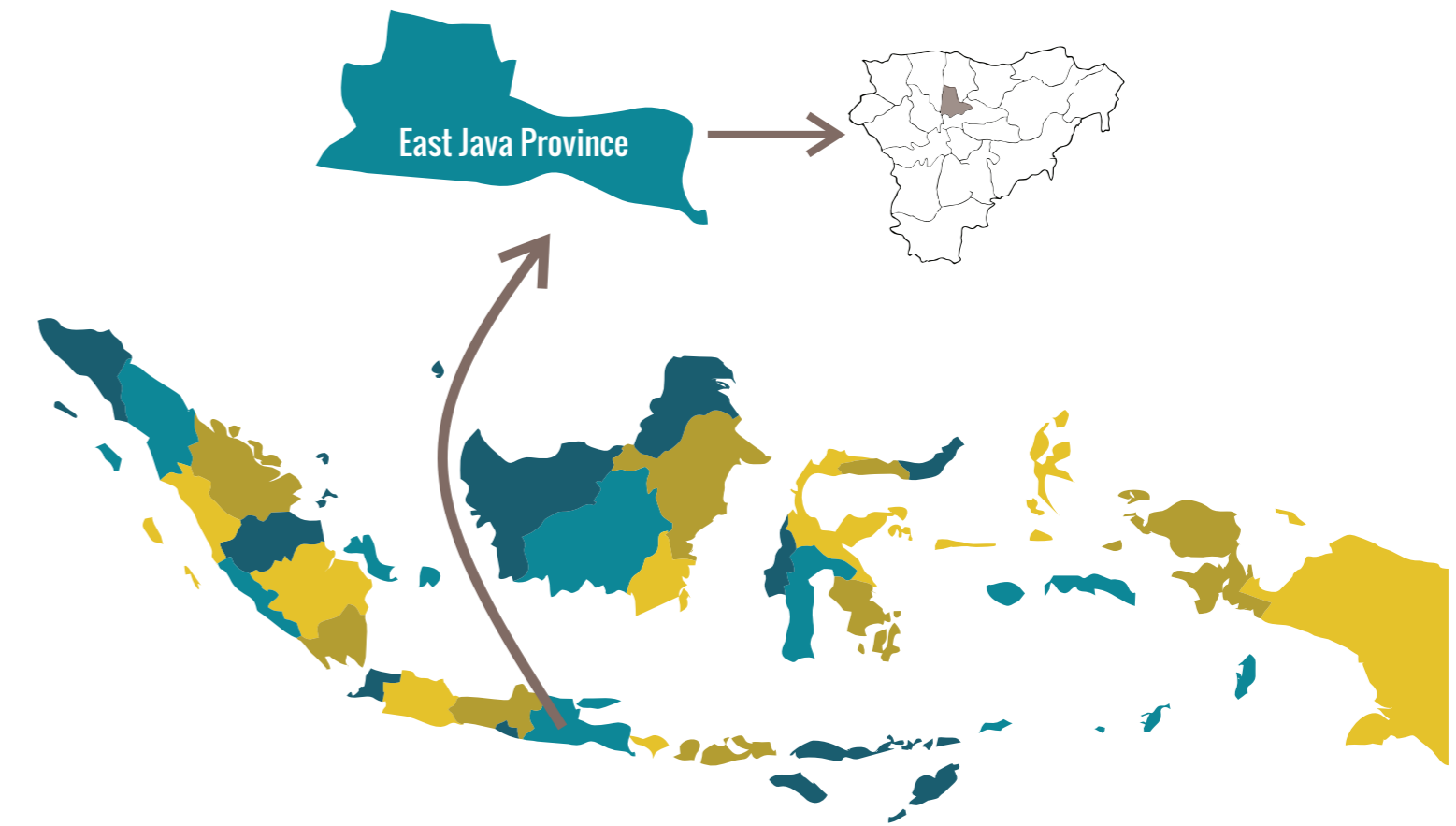


Figure 2.1 Site Location And Neighborhood

Source : Author, 2021

Ponorogo is located in the province of East Java, Ponorogo geographically located between 111° 17 – 111° 52 East Longitude and between 7° 49-8° 20 South Latitude and has an area of 1,371.78 km². Estimates of the population living in Ponorogo 949,320 in 2020 and administratively Ponorogo Regency is included in the residency of Madiun.

And geographically, the contours of the land vary from lowlands to mountains. Because, based on data, 79% of the plains are located at 500 m above sea level and 14.4% are above 500 to 700 m. Therefore, with the variation of the soil, the wind speed in Ponorogo is relatively low, it is rare for heavy rains to occur and cause damage in Ponorogo. And climatologically, the Ponorogo region has a tropical climate and experiences two seasons, namely the dry season and the

And in terms of tourism potential, Ponorogo has a variety of tours that can be offered, the most famous of which is the Reog Ponorogo dance. And it began to bloom and many accessories were sold for Reog Ponorogo knick-knacks. However, with the arts that can be proud of, there is still a lack of facilities to meet the needs of reog performances in Ponorogo.

2.1.1 Site Study

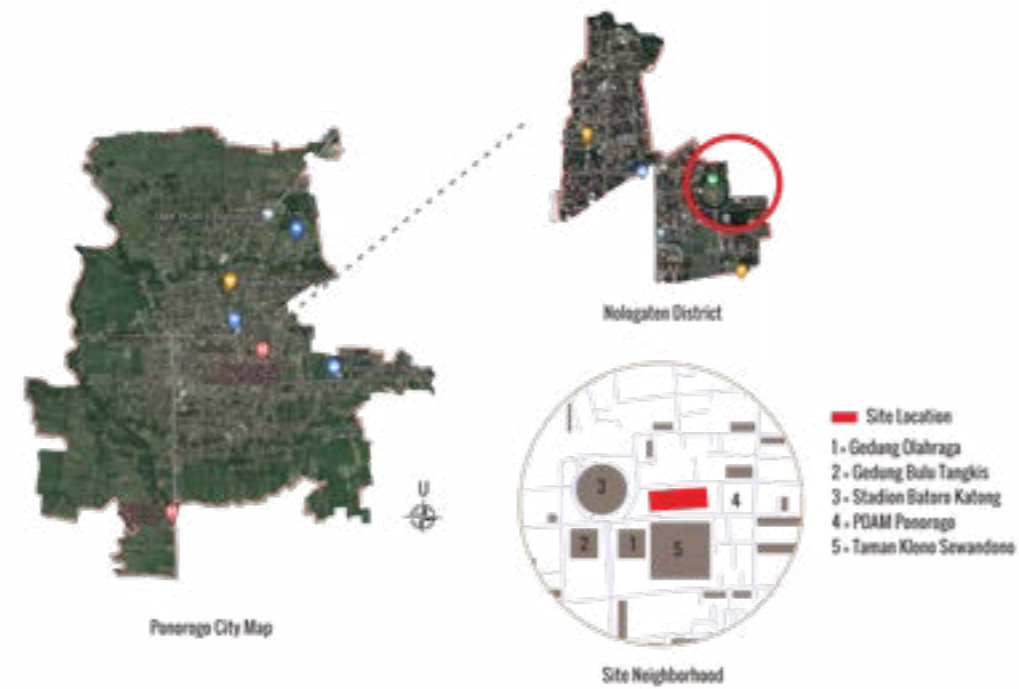


Figure 2.2 Site Location And Neighborhood
Source : Writer, 2021

Location : Jl. Pramuka No.19, Sultanagung, Nologaten, Kec. Ponorogo, Kabupaten Ponorogo, Jawa Timur 63411

Site Area : ± 4400

Reasons :

- Located in the city center of Ponorogo, it's accesible from other public facilities like Ponorogo stadium, Klonosewandono park, and GOR singodimedjo. and 10 minutes from alun-alun Ponorogo.
- The site is surrounded by high building from the intesity of the wind flow quite low.



Figure 2.3 Site Ownership
Source : AtriBhumi, 2021

This land is labeled as used land with an area of 4430 m², and this area is owned by the local government of Ponorogo.



Figure 2.4 Neighborhood
Source : Writer, 2021

This condition is impacting the building quality especially the building have a big opening that can let the noise and pollution can be easy to feel inside the building. And the result the performance of the building is disturbed. So in the design later on will be make a barrier with a combination of natural organic and the barrier wall for avoiding the sound disturbance.



Figure 2.5 Site Accesibility
Source : Writer, 2021

Because there is no public transportation that passing this street such an angkot and city bus, so vehicles such as online transportation and private vehicles are prioritized, so a passenger drop off area and a large parking area are needed in the building area.

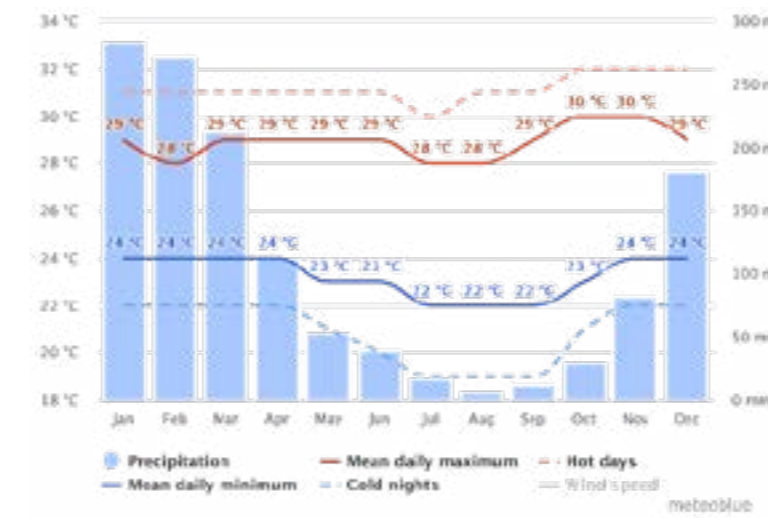


Figure 2.6 Average Temperature and precipitation
Source : www.meteoblue.com, 2021

The trend of climate change and global warming coupled with the urban heat island phenomenon makes the temperature in small cities rise too. In the above data, the average temperature during the day is 28°C and at night it is at 20°C. With the data and facts above, it is necessary to intervene in the climate area of the site with the element of water and multiply trees to reduce and make the environment more comfortable.

And the water element can also cope with flooding in the site area because the intensity of rainfall is quite high in December, January, February, March, April, so we need a drainage system that can take advantage of the existing rainwater runoff.

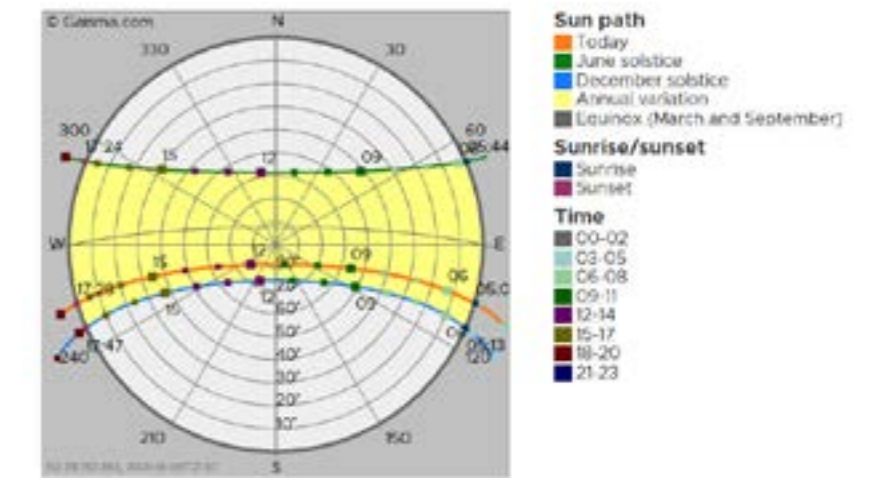


Figure 2.7 Sun path diagram
Source :www.gaisma.com, 2021

From the sun path diagram above it can be determined that the sun tend to radiated the south area. which in the site area of the site is the main facade of the building. And not just the facade but the building orientation for the building itself will be affected and how the shading devices will be responding to the sun and the height of the ceiling inside to maximize the natural daylight.

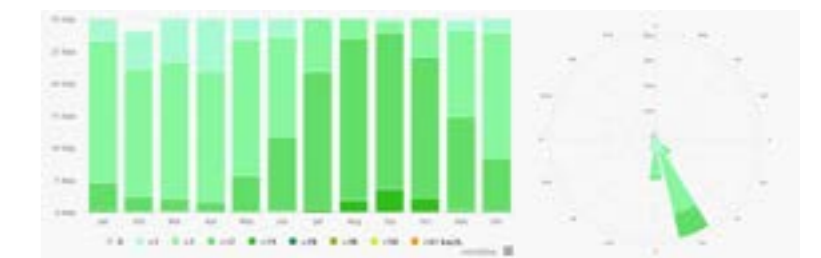


Figure 2.8 Wind Speed And Windrose
Source :www.meteoblue.com, 2021

The average wind speed on the site is in 12 m/s and it's relatively will be slower into the site area because the site is surrounded by high tree and the mid high buidling such an Gor singodimedjo. and the majority wind is come from south east. So later on maximizing the ventilation in the south east area to make the cross ventilation.

2.2 Tropical Architecture For performance Art Building

Tropical architecture is one of the efforts to solve architectural problems in Indonesia, especially in tropical climates. (Karyono 2000) Meanwhile, based on the book "tropical architecture in the humid zone", tropical architecture is a work of human art that can respond to climate. So in solving an architectural problem that exists in Indonesia, especially in a tropical climate, it can be solved with the principles of tropical architecture.

From the basic explanation the comfort factor in buildings in humid tropical climates is the most important thing, the main obstacle in a humid tropical climate is high temperature and humidity throughout the year, it is necessary to anticipate to achieve ideal thermal comfort, That is :

1. Effective temperature approx. 20°C- 26°C TE
2. Humidity around 60%
3. Air movement 0.25 – 0.5 m/s

The tropical art building is a building concept that is able to adapt to the tropical climate and can tend to be open which can be found in all natural conditions of the tropical climate, especially Indonesia. And as a public space, the thermal comfort factor must be considered and one of the features of tropical architecture is thermal comfort, one of the solutions to avoid direct sunlight. There is also an easier solution, namely using mechanical air (AC) but this requires high costs and high maintenance. There are several solutions to solve this problem, namely:

1. Building orientation

In the orientation of the building there are two variables that must be taken into account, namely:

- Building orientation to the sun

Basically, the larger the area that receives solar heat, the hotter the interior of the building. Therefore, the orientation of the building will determine the amount of solar radiation into the building. So it can be concluded that if the design of the building should have the widest side on the side facing north and south.

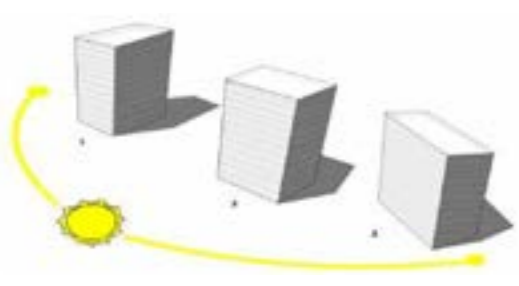


Figure 2.9 Building orientation to the sun
Source : Autodesk, 2021

-Building Orientation To The Wind

In tropical climate areas, wind speeds are generally relatively low at an average of 5-12 m/s. However, the wind is necessary for the exchange of wind in the building (building ventilation). Because basically ventilation is needed to exchange clean air from outside to enter the building and push dirty air inside to get out.

The position of the building that is transverse to the primary wind is very important to consider in the design because this determines the cooling air temperature in the building. The things that determine are the type, size and position of the ventilation holes on the top and bottom of the building because it determines the effect of cross ventilation in the room so that it can improve the thermal quality of the room.

In one study showed that if there is a choice between the position of the building that is transverse to the primary wind is much more needed than to the sun because the heat from the sun can be reduced by the presence of wind rotation in the building. A comfortable wind speed is at a speed of 0.1 – 0.15 m/second, and the magnitude of the wind speed can be overcome by:

1. Free wind speed
2. Wind direction to ventilation holes
3. Ventilation hole area
4. Distance between air intake and outlet
5. The barrier in the room that blocks the air

2. Architecture Elements

-Sun Protection Devices

If in reality on the ground the position of the building in the east and west is unavoidable, it is necessary to have a protector in direct sunlight in order to reduce and protect from direct sunlight inside the building, because the effect of this can result in an increase in temperature and heat the room and create a glare effect in the building.

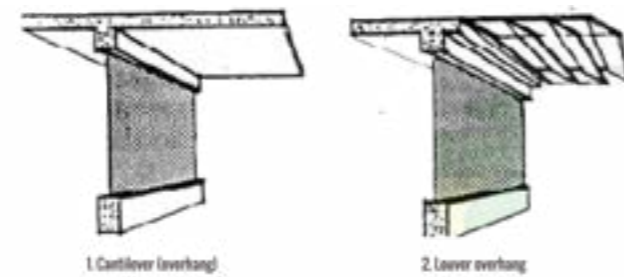


Figure 2.10 Architecture Element, Shading Devices
Source : Egan, 1975

Figures 1 and 2 above are very suitable for field openings in areas that are directly opposite the sun in the north-south area.

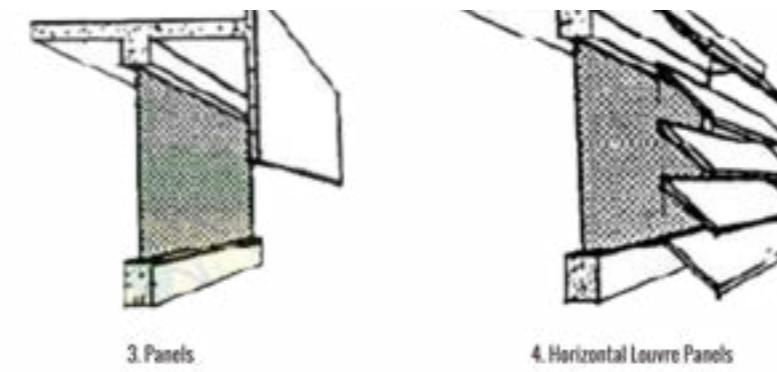


Figure 2.11 Architecture Element, Shading Devices
Source : Egan, 1975

Figures 3 and 4 are very effective for use in areas facing direct sunlight such as the east and west areas of the building.

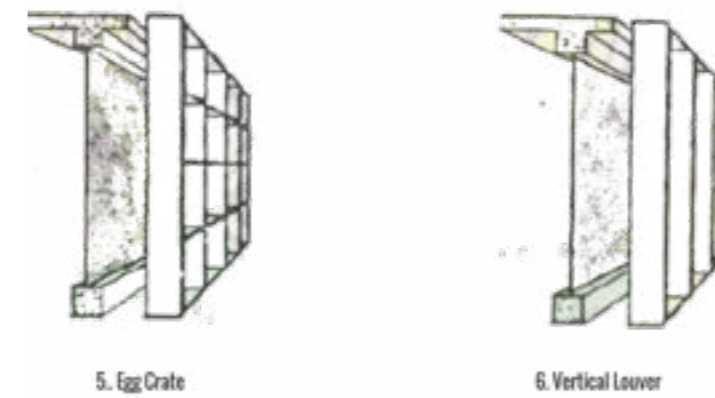


Figure 2.12 Architecture Element, Windbreaker
Source : Egan, 1975

Figures 5 and 6 are very effective for use in the east and west areas of the building. Can be used as a windbreaker in buildings to increase wind speed. Can be combined with sun devices 3 and 4.

- Landscape Element

As one of the important elements in buildings, vegetation such as trees can be used as an reducing to the sun's heat. Because the presence of vegetation in the building area can directly/indirectly reduce the air temperature around it. In the process, the vegetation will absorb the sun's heat and then the leaves will be processed and used for the photosynthesis process.



Figure 2.13 Vegetation Distance
Source : Egan, 1975

Based on White R.F (Concept in Thermal Comfort, Egan, 1975) that the distance of vegetation to the building, the farther away, the better the quality of the wind entering the building. And because of that a group of trees can also be used as a windbreaker because the research can reduce about 35% the speed of the wind that blows. And apart from being a temperature regulator, the vegetation can also be used as an antidote to noise in vehicles. So the vegetation elements in buildings can be used as thermal and noise repellent.

- Water Element

In an effort to reduce the micro air temperature on the site, and affect human psychology. You can also use the water element added to the building. Because in the process the presence of the water element can evaporate water which can manipulate the hot temperature to be cooler in the building area.

3. Building Materials

In the process of heat transfer into the building requires an intermediary. And in this case the building cover materials (Walls, Roofs, Glass) really determine the factor of the amount of heat that enters the building. And this can be proven through material absorption data which can be presented as follows:

Permukaan bahan	%
Asbes semen baru	42-50
Asbes semen sebagai kotek (6 tahun terpelak)	83
Kulit bangunan'aspal	86
Kulit bangunan bila dicat aluminium	40
Gerbang keramik merah	62-96
Seng (baru) 64	
Seng (kotor sekali)	92
II. Solusose cat putih	18
Solusose cat hijau tua	38
Solusose cat merah tua	57
Solusose cat hitam	94
Solusose cat kelabu hitam	95

Table 2.1 Material And Heat Absorption Percentage
Source : Mangunwijaya, 1999

From the comparison of materials above, as much as possible use materials other than asphalt and have dark pigments because the percentage of heat absorption is higher.

Conclusion From the Tropical Architecture strategy for the art performance building how to manipulated the heat and convert it and reduce it with the several strategy that can applied on the design, that is :

1. Roof cantilever / Overhang is quite wide to prevent the direct sunlight to come into the building
2. Building Envelope (Wall and roof) composed with the light colour materials to prevent the excessive heat transfer into the building.
3. Create a cross ventilation design in the buidling.
- 4.Using the shading devices, vegetation, and water element into the building as an heat manipulation.

2.2.1 Javanese Architecture In Responding Tropical Climate

Globally, the climate in the eastern part of the world is tropical, tropical covers several parts of the earth, covers a wide belt around the middle of the earth, covers an area of approximately 23.50 levels towards both poles from the equator and contains almost 40% of the total land surface of the earth, with rainfall relatively high rain, the air temperature is quite high, during the day it can reach 350 C which must be tolerated by tropical communities, the amount of rain that often occurs in the tropics has a high level of density. From the positive side of this situation, the tropics have dense forests, the trees are easy to grow, so there is a balance between extreme weather and the controller, namely trees.

Likewise, in the application in buildings, there is an architectural concept that harmonizes with nature through highlighting and preserving the potential, condition, and local socio-cultural or locality which is then known as local architecture such as in the Java area, namely the joglo building. In this concept the building design harmonizes with nature, through the shape of the building, the structure of the building, the use of local materials, and the natural building utility system as well as conformity to the local climate. So that it can be said that the joglo architecture, indirectly also uses a design approach that is in accordance with the climate.

Buildings in the Java area, especially in Ponorogo, have high roofs and open buildings to cope with the local climate and in accordance with the existing culture, using wood as a local material and slightly transmitting solar radiation. The harmony of Javanese architecture, especially joglo, which can respond to nature has been tested for a long time, so that there has been harmony with the surrounding nature.

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Joglo with continuous roof construction system. This form is most widely used in traditional Javanese buildings. The form of a joglo that uses a sari, with the following characteristics:

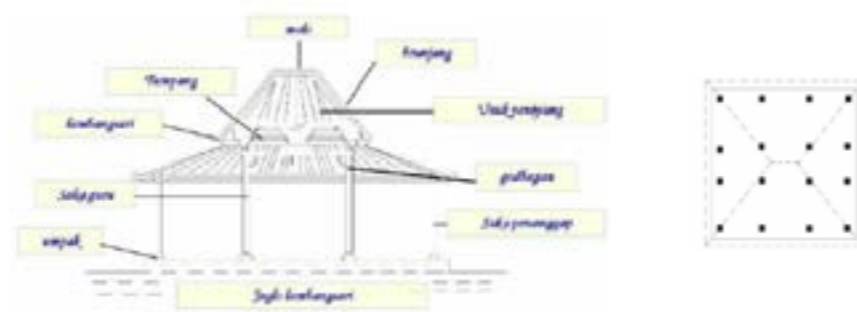


Figure 2.14 Joglo Architectural Principal
Source : Iqbal, 2009

1. Rectangular floor plan
2. Using a rocky foundation, which is leveled land and is higher than the surrounding soil. On top of this bebatur, a pedestal is installed which has been given a purus wedokan.
3. There are 4 saka guru as retainers of the roof of the brunjung which form the pamidangan room which is the central room and 12 saka panampang which supports the roof of the panampang (follower poles), each saka is supported by an umpak using the purus system.
4. Using the roof empyak system. 4 empyak systems used: brunjung and cocor at the top, as well as pan Responds and anchor at the bottom

The ventilation in this joglo house is designed to suit the surrounding environment. The joglo building, which usually has a terraced roof, is getting closer to the center, the distance between the floor and the higher roof is designed not without purpose, but each height of the roof becomes a relationship of stages in the movement of people to the joglo house. with the air felt by humans themselves. When humans are at the very edge of the joglo house, as the border between the outside and the inside, humans still feel the air from outside, but when humans move closer to the center, the air feels cooler, this is because the volume of space under the roof increases. to the middle is getting bigger. Like the theory in building physics, the volume effect actually takes advantage of the principle that a larger volume of air will heat up longer than a smaller volume of air.

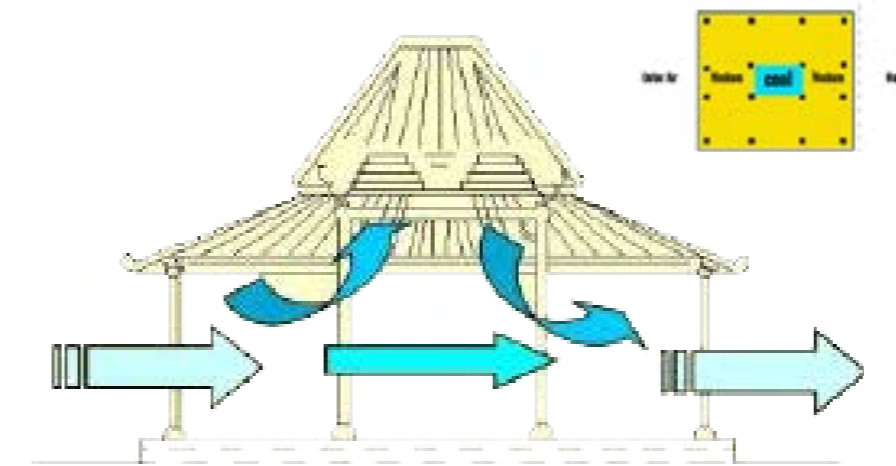


Figure 2.15 Wind Flow In Joglo Building
Source : Iqbal, 2009

The ventilation system in the joglo, as in the joglo ventilation system in general, the wind/air moves parallel, throughout the open space, in the middle part of the room, which is limited by the main pillar/saka guru, the air moves upwards, but then moves downwards again. This happens because the joglo does not have ventilation holes, because it is designed for a continuous roof. This condition is certainly in accordance with the characteristics of the tropical climate which is hot and humid but abundant in wind.

2.3 Art Performance Building Typology

Performance building / art performances as a forum in community activities have functions, among others :

1. As a means and a place to increase creativity and appreciation of art.
2. As a means of education that is entertainment.
3. As a means of exchanging ideas between artists and the community so that an assessment and communication occurs.
4. As a place to accommodate performing arts which are the result of a community culture.

And According to the Regulation of the Minister of Tourism of the Republic of Indonesia number 17 of 2015 concerning the business of performing arts buildings, the Art Performance Building Business is the provision of a place indoors or outdoors equipped with facilities for performing arts activities. The most important thing in designing and developing an art building is that the type of art you want to display will determine the size and type of the auditorium and its supporting facilities. Each art will have its own history, tradition and performance. (Sidiq 2016)

And As the additional According to (Appleton 2008), an art performance building must have the following key requirements:

1. Each individual audience must be able to clearly see the artist's performance, the screen/setting, as well as clearly hear the speech, music and voice.
2. Auditorium design should consider the comfort of the audience, fire safety, quality of acoustics, sound system, and lighting.
3. Technology on the stage and its facilities will continue to develop along with the times.

So later on in designing the have to considered about the integration of the layout of the stage with the acoustical aspect and the lighting. But, also considered based on the performing art context of the art performance that want to accomodate into the building. And that all aspect can be explained and elaborated more on the stage configuration, Lighting, Acoustic Layout.

2.3.1 Stage Layout And Configuration

The stage is a place where a performance takes place where the interaction between the work of the playwright, director, and actor is displayed in front of the audience. It is on this stage that all the performances of the play are presented with the intention that the audience understands the meaning of the story being presented.

The arrangement of the stage is adjusted to the demands of the story, the artistic will of the director, and the stage where the performance is carried out. Therefore, before carrying out stage arrangement, a stage stylist needs to study the performance stage. (Santoso 2008). And from that stamenets we can move in to the shape of the stage configuration, that is :

1. Rectangular Shape



Figure 2.16 Rectangular Stage
Source : Doelle, 1990

(+)The rectangular shape of the room has a high level of sound uniformity so that there is a balance between the initial sound and the final sound. The smaller width side can respond to lateral sounds, amplified by repeated reflections between the sidewalls causing increased pitch fullness, a highly desirable aspect of space acoustics in performance spaces.

(-)The weakness of this form is on the long side, because it makes the distance between the audience and the stage too far.

2. Fan Shape

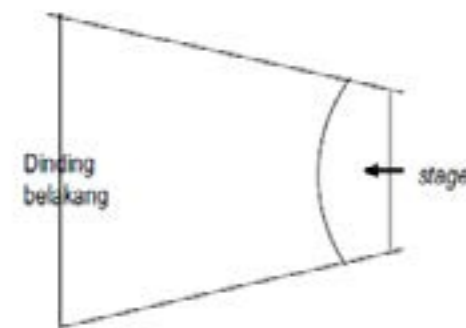


Figure 2.17 Fan Stage
Source : Doelle, 1990

(+) The fan-shaped room can accommodate a large number of spectators, besides that it also provides a maximum viewing angle for the audience.

(-) This form has drawbacks that make its acoustic reputation less good, because the shape of the sidewalls that extends backwards causes a too fast reflection to the curved back wall that creates echo and convergence of sound so that this room tends to have a non-uniform acoustic, with the condition of the area. sitting in the middle of the audience is not good.

3. Horse Shoe Stage

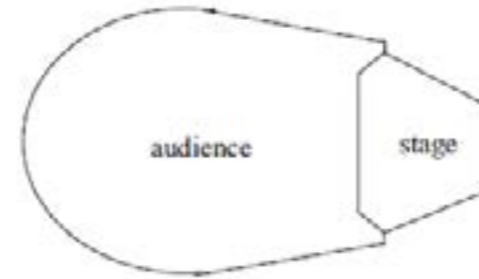


Figure 2.18 Horse Shoe Stage
Source : Doelle, 1990

(+)The shape of the walls makes the distance between the audience and the players closer.

(-) The concave back surface of the wall is not recommended because there will be sound absorption that is too high at the back.

2.3.2 Lighting

Light is the most important element of artistic order in an art performance. The lighting system in question is an artificial lighting system which is divided into 2, namely: general lighting and special lighting.

1. General Lighting

- Lighting in all rooms in the building as long as there is activity in each of these rooms.

- General lighting for the auditorium room is used before the show starts (to make it easier to find a seating position for the audience) and after the show is over (to make it easy for the audience to leave the room / find the exit).

2. Specific Lighting

-Special lighting is used to provide or add special effects in a musical art performance.

-Spot light is used to focus the audience's gaze on the stage when there is a special performance.



Figure 2.19 Lighting into the stage, Specific and general Lighting
Source : Author, 2021

And there is several lighting for the stage performance. there is :

1. Floodlight
2. Beam light
3. Scoop Lamp
4. Fresnel Lamp
5. Profil Lamp
6. Follow Spot
7. Effect lamp
8. Intellegence lamp
9. LED Lamp

So From the reference from the lighting the additional of the art center building to support the visual aspect into the performance the lighting aspect have to be adopted into the interior of the building not just in the main stage area but into the exterior of the building.

2.3.3 Audiovisual Comfort Theory

1. Audio/Acoustic Comfort

In accordance with its main function, namely as a performance hall, one of the requirements that should be met apart from lighting is the arrangement of acoustics or sound systems. Good sound processing will enhance the quality of the performance and create comfort for the audience.

Acoustics is defined as something related to sound or sound, as the opinion (Shadily 1987) that acoustics means sound science or sound science. So the Acoustic System is processing the sound system in a room to produce sound quality that is comfortable to enjoy, is a supporting element for the success of a good design because its influence is very broad and can cause physical and emotional effects in the room so that someone will be able to feel the impressions. certain.

- Sound Behavior

Sound in an enclosed space has a certain behavior when it strikes the walls of the enclosed space, i.e. its energy will be reflected, absorbed, propagated, or deflected depending on the acoustic properties of the covering material. Sound will bounce if it hits several surfaces before reaching the listener. (Mill 1976)

A convex reflecting surface will scatter sound waves, whereas a concave surface such as a dome shape and a curved surface will cause sound reflections to accumulate and not spread, resulting in a concentration of sound.

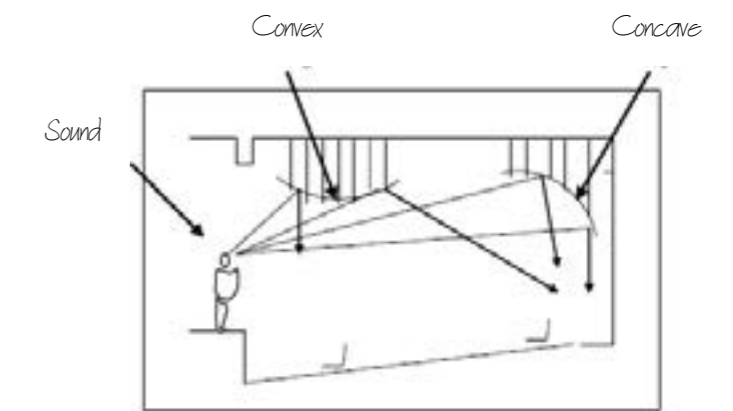


Figure 2.20 Bouncing sound to the ceiling
Source : Doelle, 1990

Sound absorbing surfaces can help eliminate the problem of excessive echo and reflection.

When sound hits a soft and porous surface, the sound will be absorbed by it (Doelle 1990) so that the surface is called a sound absorber. These materials absorb sound to some extent, but good acoustic control requires high sound absorption. Those that support sound absorption are the surface layers of walls, floors, ceilings, room contents such as spectators and curtain materials, seats with soft layers, carpets and indoor air. And the sound can spread up, down or around the room. Sound can also travel through ducts, pipes or corridors in all directions within an enclosed space.

Sound diffraction is an acoustic phenomenon that causes sound waves to be bent or scattered around obstacles such as corners, columns, walls and beams.

- Acoustic requirements for theater

Requirements for a good performance building acoustics (Doelle 1990) that in order to produce good sound quality, in general the performance building must meet the following requirements :

1. Loudness

The lack of loudness, especially in large theaters, is caused by the energy lost in sound wave propagation because the sound travel distance is too long, and sound absorption by the audience and the contents of the room (soft chairs, carpets, curtains). The loss of sound energy can be reduced to achieve sufficient loudness. In this case (Doelle 1990) put forward the requirements that need to be considered to achieve it, namely by shortening the distance between the audience and the sound source, raising the sound source, tilting the floor, the sound source must be surrounded by a sound reflecting layer, the floor area must be in accordance with the volume of the performance building, avoiding parallel reflectors facing each other, and placing the audience in an advantageous area.

So the audience seating distance should not be more than 20 meters from the stage so that the presenters of the show can be seen and heard clearly. However, in orchestra performances or music concerts, the tolerance for the distance between the audience and the presenter can be further up to the maximum distance from the furthest listener is 40m.

The sound source should be raised so that as much of the audience as possible can be seen and heard, thereby ensuring that the sound waves go directly to each listener. The floor in the audience area must be tilted because sound is more easily absorbed when it propagates through the audience at an angled incident light.

The floor slope gradient rule is set not to be more than 1:8 or 30° for safety and security considerations. The slope of more than that makes the floor too steep and dangerous.

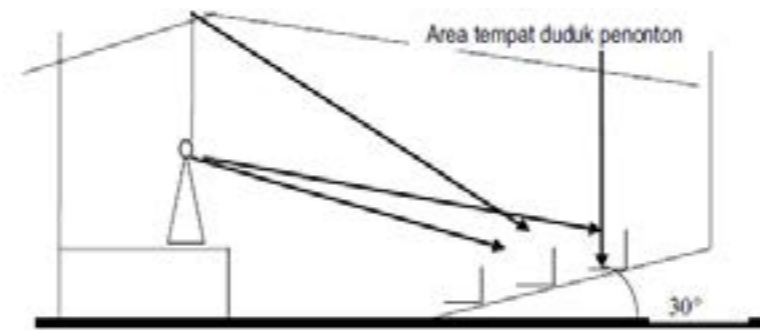


Figure 2.21 Raising the sound source and tilting the audience area floor
Source : Doelle, 1990

To prevent loss of sound energy, the sound source must be surrounded by reflecting surfaces such as gypsum board. So one way to amplify the sound from the stage is by providing a reflector above the front of the main stage to reflect sound directly to the rear seats, where direct sound is heard the weakest. plywood, flexyglass. Sufficient reflecting surfaces (acoustical board, plywood, gypsum board and others) will provide additional reflected energy in each part of the audience area, especially at distant parts. The size of the reflecting surface must be large enough compared to the wavelength. the sound to be reflected. The angles of the reflecting surface must be determined by the law of sound reflection and the ceiling and wall surfaces need to be utilized properly in order to obtain the greatest number of short delayed sound reflections.

2. Even distribution of sound energy in space

Sound energy from the sound source must be evenly distributed to every part of the space, both near and far from the sound source. To achieve this state according to (Doelle 1990) it is necessary to work on processing the elements that make up the space, namely the ceiling, floor and wall elements, by making irregular surfaces, protruding building elements, closed ceilings, protruding boxes. , decoration on chiseled wall surfaces, deep window openings and so on.

Processing the shape of the surface of the space-forming elements, especially on the walls and ceilings with an irregular arrangement and in sufficient quantity and size will greatly improve hearing conditions, especially in rooms with a fairly long reverberation time.

3. The room must be free from acoustic defects

Acoustic defects are deficiencies in the processing of the elements that make up the performance hall that cause acoustic problems. As for the acoustic defects that usually occur in a performance hall that is not designed properly. And the thing to avoid is :

1. echoes
2. long - delayed reflections
3. Reverbration
4. Sound centering
5. Coupled spaces
6. Distortion
7. Sound shadow
8. Whispering gallery

Improving the acoustic quality of a building in addition to considering the details of space design, the use of materials is also part of the main factor to achieve it. After determining the elements that make up the space, the selection of the right material can support the occurrence of acoustic comfort, namely the material on the floor, walls and ceiling.

Porous Material	This material consists of small pores that can absorb small or short sound waves. Curtains are included in the category of porous materials because the characteristics of the curtains are the same as soft materials.
Porous Material	Porous materials are the most efficient sound-absorbing materials, which can convert the incoming sound energy into heat energy in the pores. Examples: fiberboard, soft plasters, mineral wools and insulation blankets.
Fibrous Material	Fibrous material is a material that is able to absorb sound in a wide frequency range. Included in the fibrous material is mineral wool in the form of an arrangement of threads or fibers from natural or artificial minerals such as glasswool and rockwool and carpets.
Absorbent Panel	Absorbing panels are absorbent materials or impermeable materials in the form of panels that can absorb low frequencies efficiently. The types of panel absorbent materials include wood panels, hardboards, gypsum boards, boards such as wood sheets and wood panels that are hung from the ceiling.
Resonance Hole	The resonant hole or cavity resonator serves to increase the reverberation time (RT) at certain frequencies, especially low frequencies.

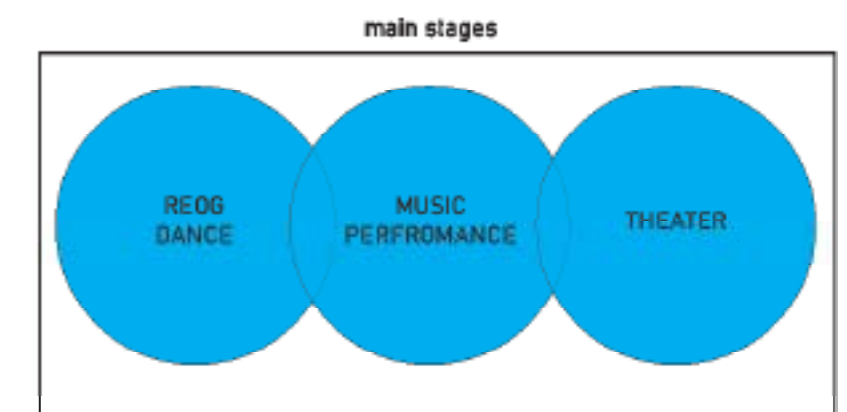
Table 2.2 Acoustic Material Characteristic

Source : Doelle, 1990

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- Acoustic Strategy To Optimize The Performance

Optimization on Reverbration Time for the clarity and the comfort for the variety of the different performance have to be done by the several devices and this strategy is related to reverbration time on the main stages. So later can be improving the quality of the acoustical ambience.



One of the selected acoustic plans is to optimize the space with a reverbration time that meets the standards, especially for the project and also the main stages, this refers to the acoustic planning of the performance art buidling.

- Acoustic Materials

In planning an performance art, materials which have different functions and properties are needed, there are also properties and functions of acoustic materials as follows:

1. Reflector

Acoustic materials with the main characteristic of sound absorption coefficient ≥ 0.30 , generally the material is hard or slippery. This acoustic material functions as a reflection of the sound source towards the audience. The placement in the stages spaces is generally located on the ceiling and also on the wall of the stage area facing the audience.

2. Absorber

Acoustic materials with the main characteristic of sound absorption coefficient > 0.30 are generally soft, porous materials, panels or like hollow resonators. This acoustic material functions as an absorber of reflected sound so that acoustic defects do not occur. The placement in the auditorium space is generally located on the opposite stage wall, the side wall of the audience facing each other, the back wall, and also the audience floor.

3. Insulator

Acoustic material with a function for sound insulation to prevent noise propagation. the placement is generally on the side and back walls of the audience.

4. Diffuser

Acoustic material with the same material characteristic as a reflector or absorber, except that the material arrangement is uneven or irregular. This acoustic material functions as a spreader of reflected sound so that acoustic defects do not occur. The placement in the auditorium space is generally located on the opposite wall of the stage, the side wall of the audience facing each other, and the back wall.



Figure 2.22 Acoustic Devices Materials
Source : Harold Buris Meyer, 1991

2. Visual Comfort

Visual appreciation is a requirement that must be met in the staging room. Changes in the orientation of the direction of view can be met by changing the stage layout. In order to keep the enjoyment of visual appreciation fulfilled, it is necessary to consider adjustments or arrangements of space elements as visual elements, namely the stage and the position of the audience to changes in the layout of the stage itself.

1. Visual Limits And Requirements

a. Farthest audience limit

- To see objects clearly, the maximum distance is 16 meters
- To view objects globally: 32-36 meters

Considering that what is being staged is dance, music, theater, the farthest audience distance is taken at 25 meters.

b. Line of sight requirements

The line of sight is a line that connects the point on the stage to the audience's eye point, with the aim of flexibility and clarity in enjoying the performance towards the stage.

c. Horizontal viewing angle

To measure the extent to which changes to the orientation/direction of view can be made, it is necessary to look at the limits of the visual requirements, so that the enjoyment of the audience can be met. The horizontal viewing angle requirements are as follows:

1. Steady eye point of view

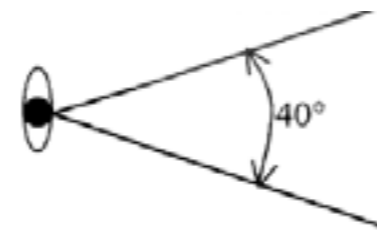


Figure 2.23 Normal Eye Viewpoint
Source : Harold Buris Meyer, 1991

2. Viewpoint of the serving area

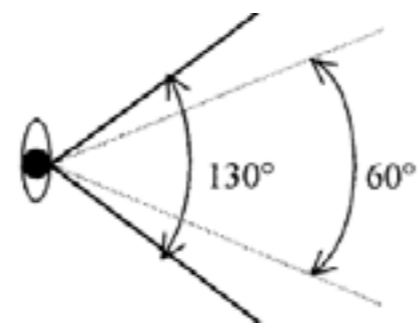


Figure 2.24 Boundary Perspective of the Presentation Area
Source : Neufert, 1991

The limit of the largest presentation area is within the 130° point of view of the front row audience, while the limit of the center of action is set within 60° of the front row viewer's point of view.

3. The front and side seats that are still within the limits of enjoyment to enjoy the show. The plane angle to the center line with the object on the stage is less than 60°

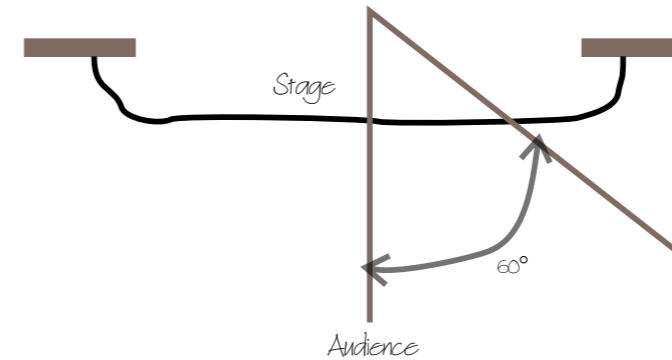


Figure 2.25 Plane angel to center line
Source : Neufert, 1991

4. Limits of the audience's seating area is determined by the fixed point of view of the audience towards the opening side of the stage, this angle is between 30° to 60°.

2.3.4 Art Performance Building Activity

In a performing arts building, there are various activities in it, starting from preparation activities and activities that support the function of the building. So as much as possible every aspect of the main and supporting needs must be fulfilled so as not to interfere with the function of the theater. Because a theater must meet the comfort aspects of the players, organizers and building managers. In terms of function, the activities of the show that will be accommodated there are 3 types of performances, namely music, theater and dance. And each type of art has a different type of activity. Then it can be described the facilities that must exist in the building, namely:

No	Main Facility/Open Stage
1	Main Stage
2	Porch
3	Backstage
4	Dressing Room
5	Practice Room
6	Green Room

Table 2.3. Main Facilities
Source : Author, 2021

No	Supporting Facilities
1	Mechanical Room
2	Canteen/Cafeteria
3	Receptionist Room
4	Ticketing Room
5	Parking Room

Table 2.4 Supporting Facilities
Source : Author, 2021

No	Management Office Facilities
1	Head Chief Management Room
2	Staff Room
3	Storage Room
4	Security
5	Meeting Room

Table 2.5 Management Room
Source :Author, 2021

2.3.5 Ponorogo Performance Art Studies

Ponorogo area is an area that has the nickname as a city of culture and tourism which is starting to develop. One of the areas in. The following are various kinds of art from Ponorogo that are accommodated in this performance building, including:

- Reog Mini Dance



Figure 2.26 Reog Performance

Source : Antaranews.Com

Mini Reog is usually staged in this art building. The art of Reog Ponorogo consists of a series of 2 to 3 opening dances. The first dance is usually performed by 6-8 brave men wearing all black clothes.



Figure 2.27 Warok Dancer

Source : Antaranews.Com

Next is a dance performed by 6-8 girls riding horses made of woven bamboo. This dance is called the Jaran Keping or Jathilan dance, which must be distinguished from other dance arts.



Figure 2.28 Jathil Dancer

Source :

Another opening dance, if any, is usually a dance by a small child who brings a funny scene called Bujang Ganong or Ganongan.



Figure 2.29 Ganongan Dancer

Source : Antaranews.Com

The last scene is Singa Barong, where the actor wears a mask in the shape of a lion's head with a crown made of peacock feathers. The weight of this mask can reach 50–60 kg. This heavy mask is carried by the dancers with teeth. The ability to carry this mask is not only obtained through strenuous practice, it is also believed to be obtained through spiritual practice



Figure 2.30 Reog Mask Dance

Source : Antaranews.Com

- Music Performance

Music is a tone or sound produced from a single musical instrument (melody) or many (harmony), which are arranged regularly to obtain heart satisfaction through the sense of hearing. So from this understanding, art is a product of beauty or human effort. to create beauty based on the need for beauty through arrangement of sound sources with certain arrangements to obtain heart satisfaction that is enjoyed through the sense of hearing.

Each type of music has different characteristics so that it will determine the behavior of artists / musicians as well as the audience, and also affect the needs of the performance space. The types of music and musical characteristics that will be accommodated in this theater are as follows:

1. Reog Dance Music

The accompaniment music is divided into two groups, namely a group of singers consisting of two people singing folk songs, and a gamelan instrumental group consisting of:

1. Two drummers
2. One percussionist or drum canal
3. Two slomporet blowers
4. Two kenong musicians
5. One gong player
6. Two angklung players



Figure 2.31 Traditional Instrument, Reog Performance

Source : Antaranews.Com

2. Modern Music



Figure 2.32 Music Concert, Gedung Kesenian Ponorogo

Source : Antaranews.Com

Music that is based on the principle of modernism, which focuses on broader values for the listener.

Kinds of Modern Music Types of modern music that developed in Ponorogo society such as pop music, techno, jazz, rock, reggae, swing etc.

And the instruments used are different from traditional musical instruments, more to digital music such as piano, guitar, keyboard, drums.

- Theater/Puppets

It is a traditional performance in which a puppeteer demonstrates a story accompanied by gamelan with barrel pelog or slendro. In wayang there are 2 types of demonstrations, namely:

1. Puppets



Figure 2.33 Shadow Puppets, Gedung Kesenian

Source : Antaranews.Com

Each puppet show presents a different story or play. The variety of plays is divided into 4 categories, namely standard plays, carangan plays, composed plays and essay plays. The standard play has stories that are entirely sourced from the wayang library, while in the carangan play only the outline is sourced from the wayang library. Compose plays are not based on wayang stories but use appropriate places in the wayang library, while essay plays are entirely independent.

2. Theater/Acting

Theater is a form of artistic expression with play as the center of attention with motion and sound media that are appreciated/shown to the audience. There are various scales of drama production: medium or regular with 20 players, large scale like Shakespeare's history with lots of extras, and small scale under 10 players.



Figure 2.34 Theater And Drama Performance, Gedung Kesenian

Source : Antaranews.Com

The important preparations in performing arts performances are make-up, fashion, stage, sound and audience. Make-up serves to dress the players so that their faces do not look pale when exposed to sharp lights and can reach the characters they want to show. The dress code is the same, it functions as a regulator of the players' clothes, from materials, models to how to wear them. Fashion also has a close relationship with makeup. Therefore, it is not uncommon for a makeup artist to double as a fashion designer.

2.4 Precedent Studies Related To Performance Art Building In Tropical Country

1. Chicken Comb Amphitheater



Figure 2.35 Amphitheater, Chicken Comb

Source : Archdaily.com, 2021

Located in East Java, precisely in the village of Jengger, the function of this building is as a public space intended for coffee farmers to hold artistic activities and gather around the community. Built at an altitude of 700 above sea level, this semi-open amphitheater uses natural materials that can be found around the site.

By using local materials found around the site, where there are many petung bamboos (*Dendracalamus asper*), the wide-span structure can be applied to buildings that have the shape of a chicken's comb transformation and can be applied in locations that tend to have extreme contours. And the use of natural materials can reduce carbon emissions caused by the construction period. And the use of bamboo material can be a solution for the community to have an affordable public space.



Figure 2.36 Elevation, Chicken Comb

Source : Archdaily.com, 2021

This semi-open amphitheater has a capacity of 300 spectators with natural ventilation in response to wind and sun. In accordance with the context of the building located in a tropical climate. This building has a terraced roof shape and has a steep slope in order to regulate ventilation in the area inside the building and rainwater runoff to make the roofing material durable from rainwater trapped in the natural roofing material.



Figure 2.38 Structure Detail, Chicken Comb
Source : Archdaily.com, 2021

The use of bamboo is very beneficial in areas in Indonesia, especially those that have an earthquake threat, because the flexible nature of bamboo can adjust when an earthquake occurs. And bamboo material that can be replaced easily in case of damage. And the connection of this bamboo using pegs and bolt nuts is considered to be able to respond when an earthquake occurs.

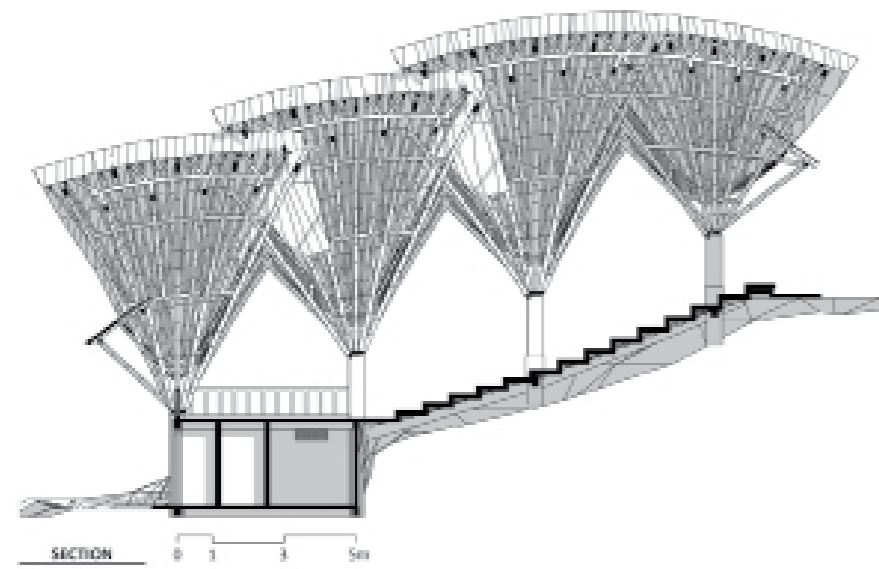


Figure 2.37 Section, Chicken Comb
Source : Archdaily.com, 2021

The configuration of the terraced audience seating adjusts to the response of the building to the steep site. And this is good for performing arts buildings from an acoustic and visual perspective, because the audience behind can see and hear clearly what is happening on stage. And the curved roof shape can reflect sound so that the sound transfer can be well received by the audience and the use of bamboo material is considered to be able to reflect natural sounds or conversations clearly in the building.



Figure 2.39 Interior, Chicken Comb
Source : Archdaily.com, 2021

2. Singkawang Cultural Center



Figure 2.40 Singkawang Cultural Art Center
Source : Archdaily.com, 2021

A community cultural building located in Singkawang, West Kalimantan, Indonesia. Where in Singkawang there is a diversity of cultures and ethnicities, the image of the designed building has a symbol that can unite these diverse cultures and races. And because of its location in a tropical area, the building is considered capable of applying the principles of tropical architecture and being applied to materials and natural lighting and ventilation in buildings.

This building is the result of the redesign of the cinema building which was then renovated and redesigned to facilitate Singkawang residents to promote and display the diversity of arts that exist in the area. The addition of facilities such as an open garden area and a cafeteria can make visitors enjoy and visit the cultural center. And this building is intended to have an impact on increasing the economy for the Singkawang people.

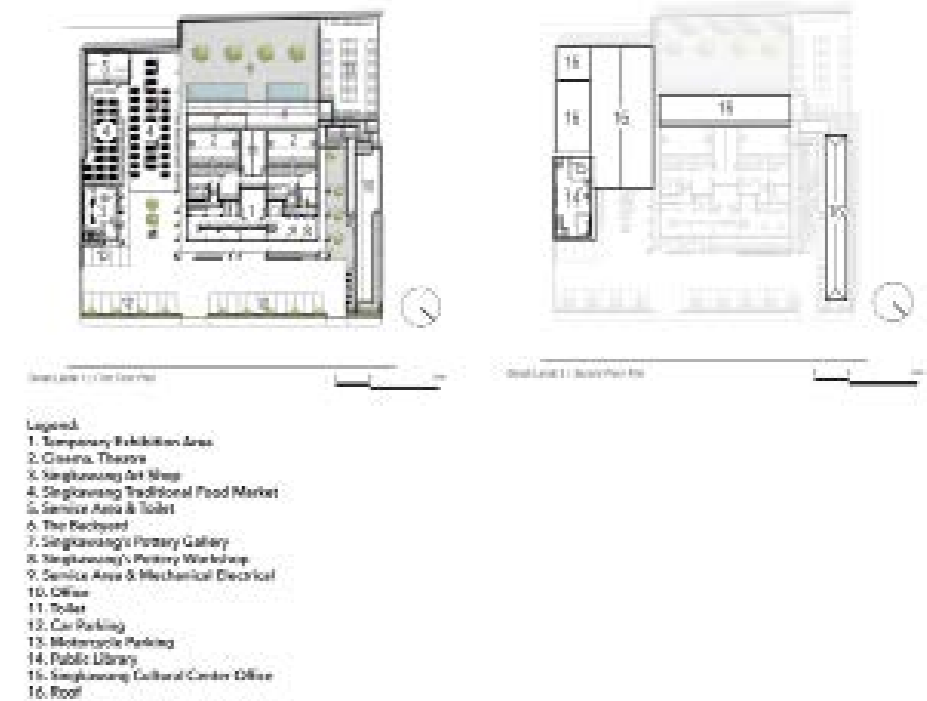


Figure 2.41 Plan
Source : Archdaily.com, 2021

The redesign of the old building is aimed at improving the arts and the economy of the residents, with this the focus of this building is to create an atmosphere of the city of Singkawang and the use of local materials, namely red brick. And respond to Indonesia's tropical climate with a spatial arrangement that responds to the sun and wind. Providing wide openings and cross ventilation in the building can create comfort for visitors to this cultural center.



Figure 2.42 Building Envelope
Source : Archdaily.com, 2021

The combination of a steel construction system and a building envelope using red brick material makes this building able to respond to the tropical climate, due to the characteristics of the brick material which can be a good heat retainer for buildings. And the use of steel in the main structure of the building can make the building look more modern and keep up with the times. And the use of local materials can have an economic impact on the vicinity of the site to have a contribution to reduce carbon emissions and can involve the role of the brick-producing community. It can also give international visitors a representation of the local materials found around the site.

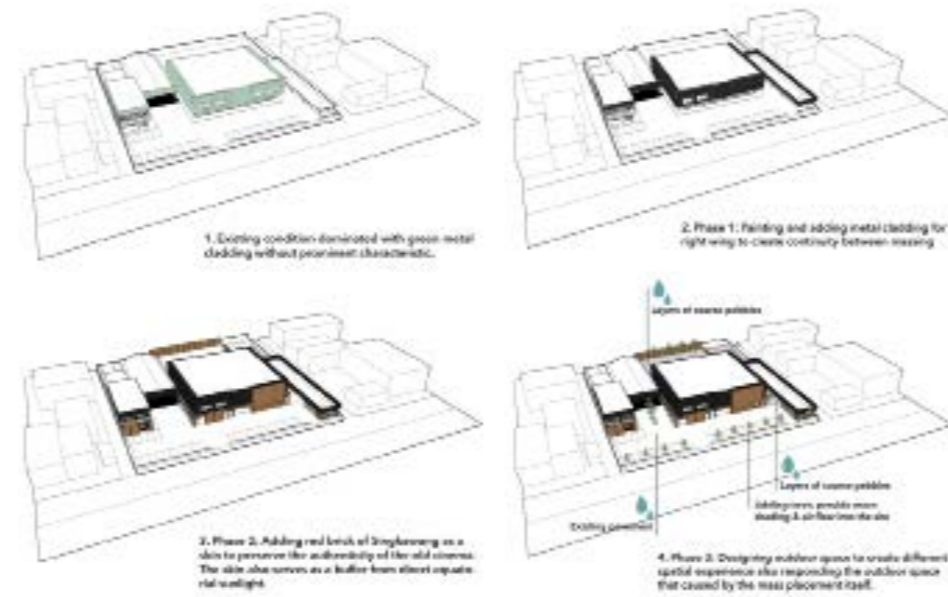


Figure 2.43 Design Phase
Source : Archdaily.com, 2021

3. British Museum



Figure 2.44 British Museum
Source : Archdaily.com, 2021

The courtyard at the centre of the British Museum was one of London's long-lost spaces. Originally a garden, soon after its completion in the mid-nineteenth century it was filled by the round Reading Room and its associated bookstacks. Without this space the Museum was like a city without a park. This retrofit project is about its reinvention. With over six million visitors annually, the British Museum is as popular as the Louvre or the Metropolitan Museum of Art. However, in the absence of a centralised circulation system it was congested and difficult to navigate. The departure of the British Library was the catalyst for removing the bookstacks and recapturing the courtyard as a new public focus.

The Great Court is entered from the Museum's principal level and connects all the surrounding galleries. Within the space there are information points, a bookshop and café. Broad staircases encircling the Reading Room lead to a temporary exhibitions gallery and a restaurant terrace. Beneath the courtyard are the Sainsbury African Galleries, an education centre and facilities for schoolchildren. The glazed canopy that makes all this possible is a fusion of state-of-the-art engineering and economy of form. Its unique geometry is designed to span the irregular gap between the drum of the Reading Room and the courtyard facades, and forms both the primary structure and the framing for the glazing, which is designed to reduce solar gain.

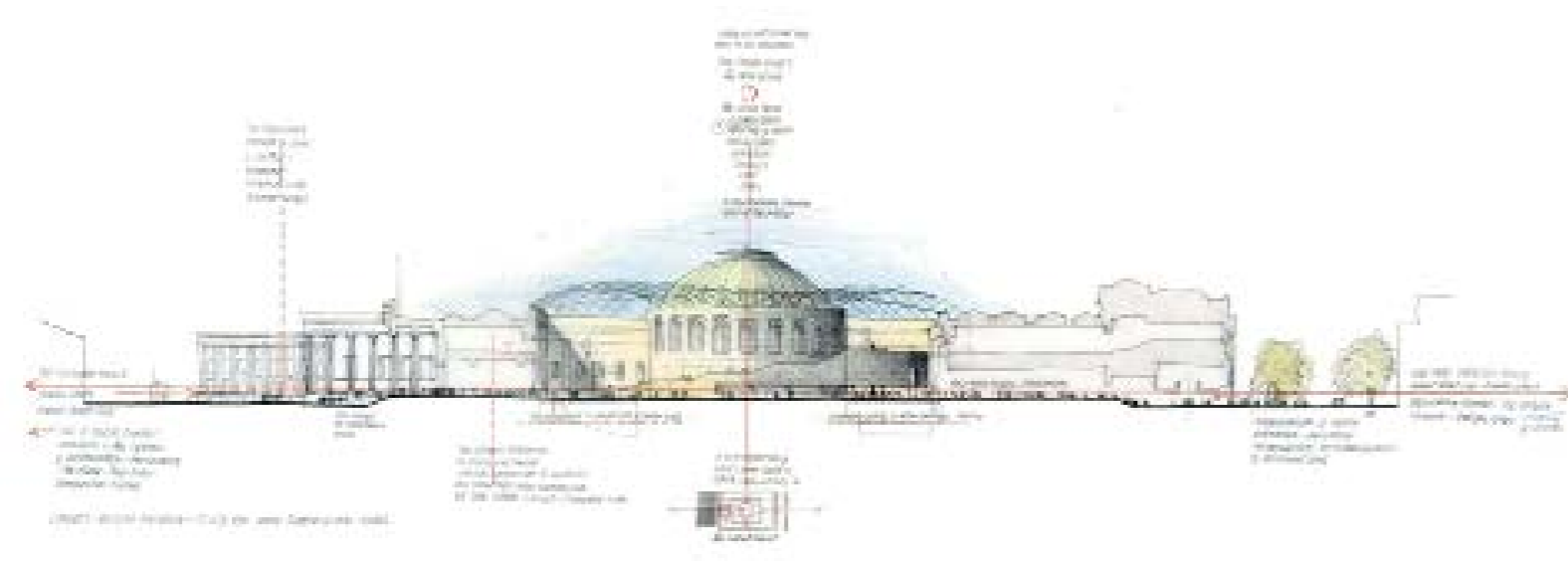


Figure 2.45 Concept
Source : Archdaily.com, 2021

With its mix of architecture and urban design, and its confrontation of classicism with computer-generated design, the British Museum's Great Court is one of the defining buildings. As a cultural square, the Court also resonates beyond the confines of the museum, forming a new link in the pedestrian route from the British Library to Covent Garden, the river and the South Bank. To complement this artery, the Museum's forecourt was restored to form a new civic space. Together with the Great Court, it is a major new amenity for London.

The materials choosing is the steel for this kind of the structure because it's provides high strength and stiffness at relatively low cost. And it's capable to absorbing high stresses and can be produced in the most slender of forms. It's also easily connected by bolting or welding and, with a surface coating, has excellent weathering characteristics.

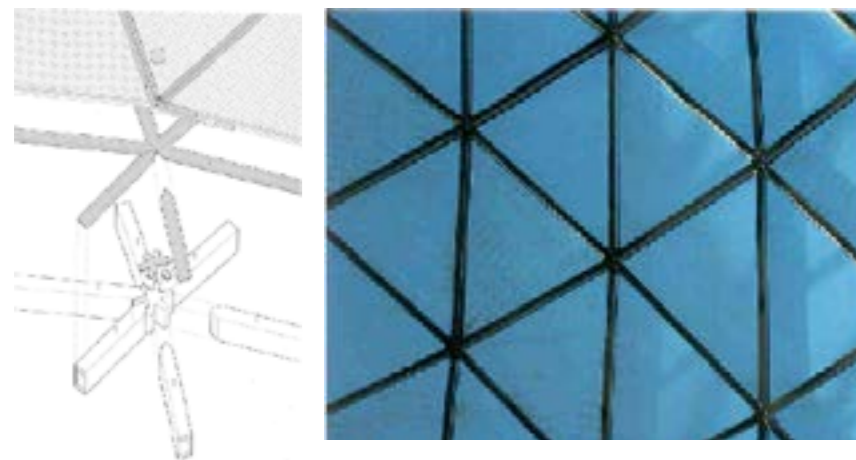


Figure 2.46 Roof Structure
Source : Archdaily.com, 2021

2.5 Building Codes And Regulation Of Ponorogo

Persyaratan Tata Bangunan dan Lingkungan

Paragraph 1

Persyaratan Peruntukan dan Intensitas Bangunan

Building Coverage Ratio

Pasal 14 :

(4) Setiap bangunan gedung umum apabila tidak ditentukan lain, ditentukan KDB maksimum 60 % (enam puluh persen).

Building Floor Ratio

Pasal 15 :

(5) Setiap bangunan gedung umum apabila tidak ditentukan lain, ditentukan KLB maksimum 4 (empat) x KDB.

Building Greenery Ratio

Pasal 16 :

(3) Setiap bangunan gedung umum apabila tidak ditentukan lain, ditentukan KDH minimum 30 % (tiga puluh persen).

Building Height

Pasal 17 :

(3) Ketinggian bangunan deret maksimum 4 (empat) lantai dan selebihnya harus berjarak dengan persil tetangga.

Building Distance

Pasal 18 :

Untuk lebar jalan/sungai yang kurang dari 6 (enam) meter, letak garis sempadan adalah 3 (tiga) meter dihitung dari tepi jalan/pagar.

Fences Height

Pasal 19 :

(3) Tinggi pagar yang berbatasan dengan jalan ditentukan maksimum 2 (dua) meter dari permukaan halaman/trotoar dengan bentuk transparan atau tembus pandang.

Building Architecture Style

Pasal 24 :

(3) Setiap bangunan diusahakan mempertimbangkan segi-segi pengembangan konsepsi arsitektur bangunan tradisional, hingga secara estetika dapat mencerminkan perwujudan corak budaya setempat.

Chapter 3

Design Exploration And Theories Application

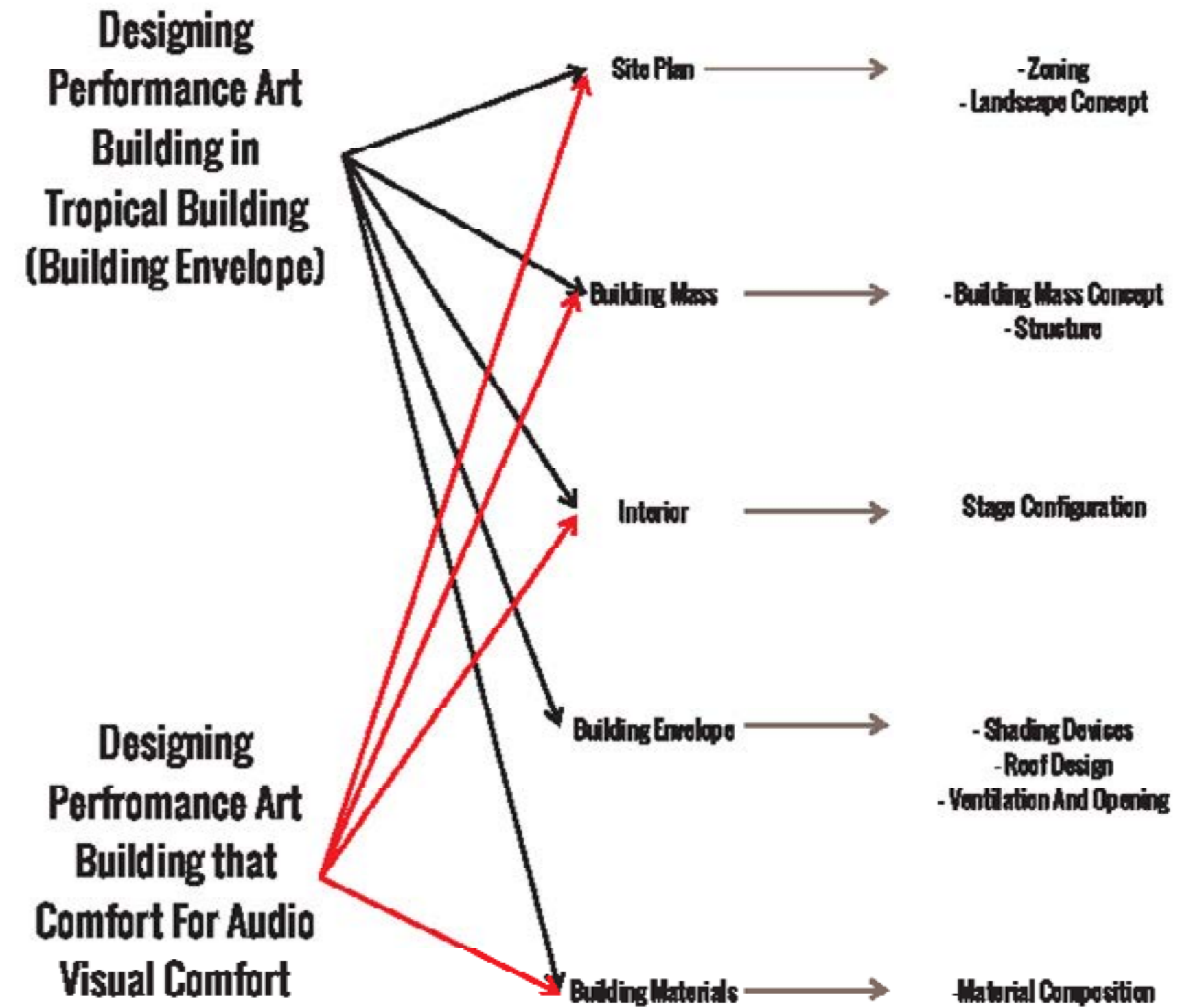


Figure 3.1 General Concept
Source : Author, 2021

3.1 User Behavior Scheme Analysis

1. Type of Users

The users of the Ponorogo Performance Building consist of :

- Guests / Visitors / Spectators
- Performance Hall Manager
- Receptionist
- Artist
 - Performer
 - Crew
 - Agent/Manager
- Security
- Parking Officer
- Ticketing
- Cafeteria
- Cleaning Staff

1. Artist

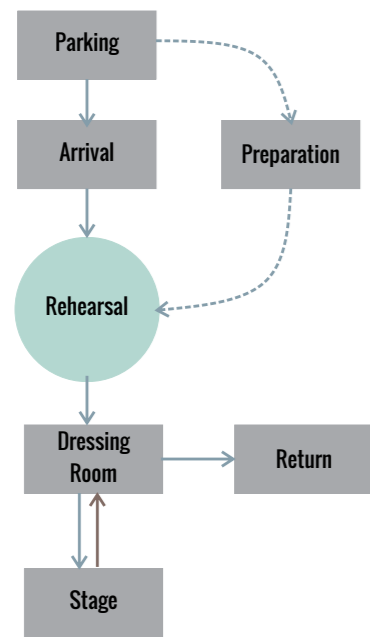


Figure 3.2 Artist Scheme Activity
Source :Author, 2021

Room Requirement:

1. Waiting Room,
2. Dressing Room
3. Preparation Room
4. Main Stage
5. Toilets

2. Management

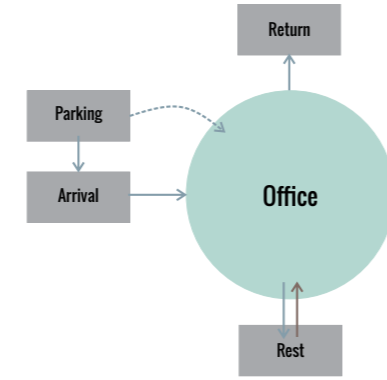


Figure 3.3 Management Scheme Activity
Source :Author, 2021

Space Requirement:

1. Head of Management Management Room
2. Staff Room
3. Marketing Staff Room
4. Finance Staff Room,
5. KM/WC
6. Parking lot

3. Guests / Visitors / Spectators

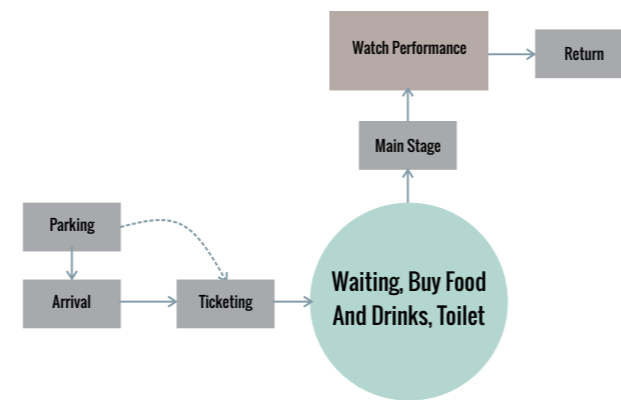


Figure 3.4 Visitor Scheme Activity
Source :Author, 2021

Space Requirement:

1. Parking lot
2. Main Stage
3. KM/WC,
4. Cafeteria

3. Security

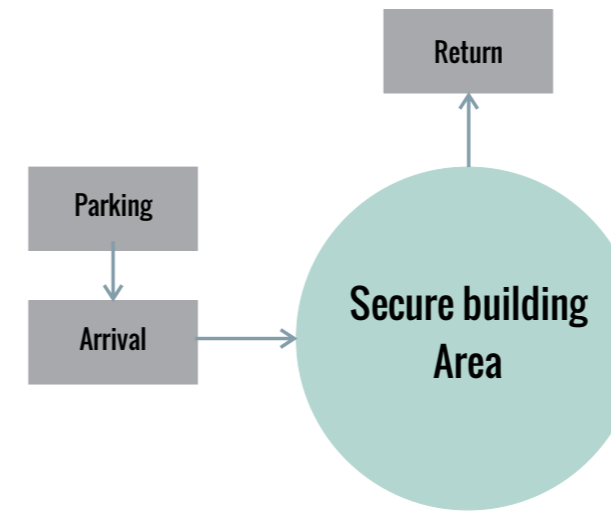


Figure 3.5 Security Scheme Activity
Source :Author, 2021

Space Requirement:

1. Security Post
2. Km/Wc

4. Cleaning Staff

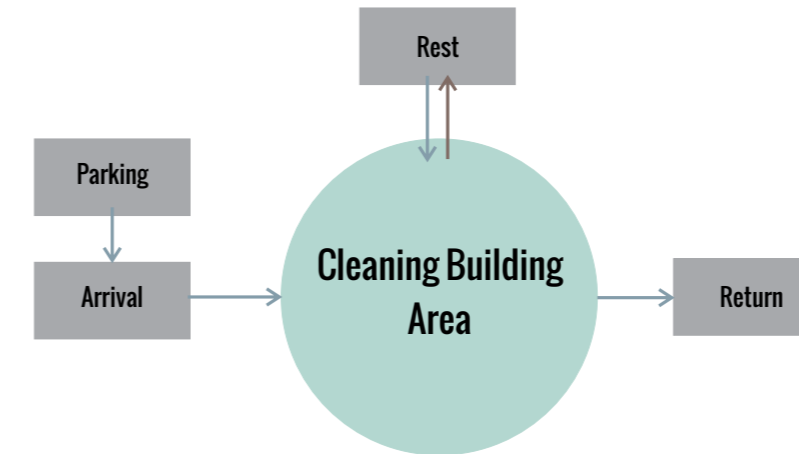


Figure 3.6 Cleaning Staff Scheme Activity
Source :Author, 2021

Space Requirement:

1. Pantry
2. Warehouse/Storage
3. KM/WC

5. Ticketing

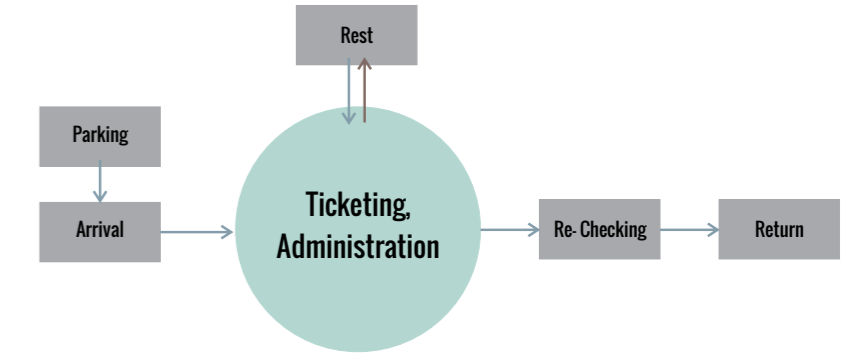


Figure 3.7 Ticketing Staff Scheme Activity
Source :Author, 2021

Space Requirement:

1. KM/WC
2. Ticketing Post
6. Cafeteria

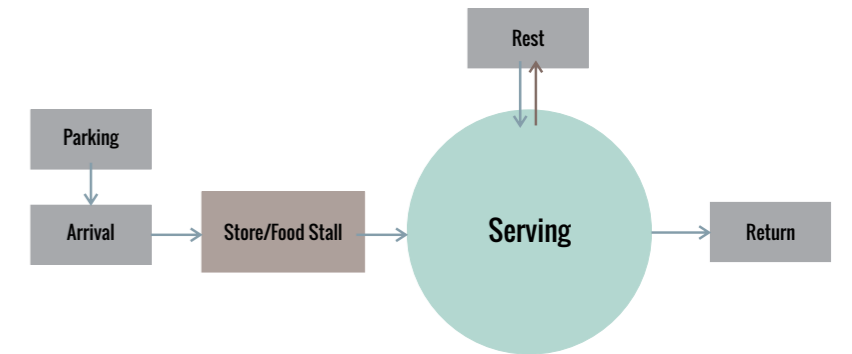


Figure 3.8 Cafeteria Staff Scheme Activity
Source :Author, 2021

Space Requirement:

1. Pantry
2. Warehouse/Storage
3. KM/WC

3.2 Performer Activity Analysis

This Performance Art Center will accommodate community arts activities in the Ponorogo area and become a destination for local and international communities. Then further analysis is needed of actors who are users at this Performance Art Center. Activities/, space capacity and space requirements are aspects that will be analyzed as follows.



Figure 3.9 Art Activities Grouping
Source :Author, 2021

3.3 Space Requirements Analysis

The analysis of the size of the space is done to get each room size that suits the needs of the users in this Performance Center. Some things to consider are:

- The amount of space to accommodate the number of users
- Furniture that suits the needs of artists: Standard is taken form Neufert Architect Data, Time Saver Standard(TSS), and US Study

USERS	ACTIVITY	ROOM REQUIREMENTS (Indoor)	ROOM REQUIREMENTS (Outdoor)	PRIVATE	PUBLIC
Staff/Management					
	Parking	-	Staff parking lot		
	Administration	Office			
	Ticketing	Lobby/Foyer			
	Meeting	Meeting Room			
	Sanitation	Lavatory			
	Cleaning Service	Storage			
	Information	Main Lobby/Foyer			
Visitors					
	Parking	-	Parking lot		
	Getting Information	Information Room/Lobby	-		
	Buying Ticket	Ticketing	-		
	Relaxing	Park,Canteen	-		
	Watching Performance	Performance/Main Stage	Backstages, Storage		
	Going Wc	Visitor Lavatory	-		
	Shopping	Retail, Canteen	-		
Reog Performance					
	Parking	-	Parking lot		
	Practice	Rehersal Room	-		
	Make Up	Dressing Room/Locker	-		
	Property Preparation	Backstages, Storage	Open Space, Park, Foyer		
	Music Preparation	Backstages, Storage	-		
	Going Wc	Visitor Lavatory	-		
	Perform	Theater	Amphitheater		

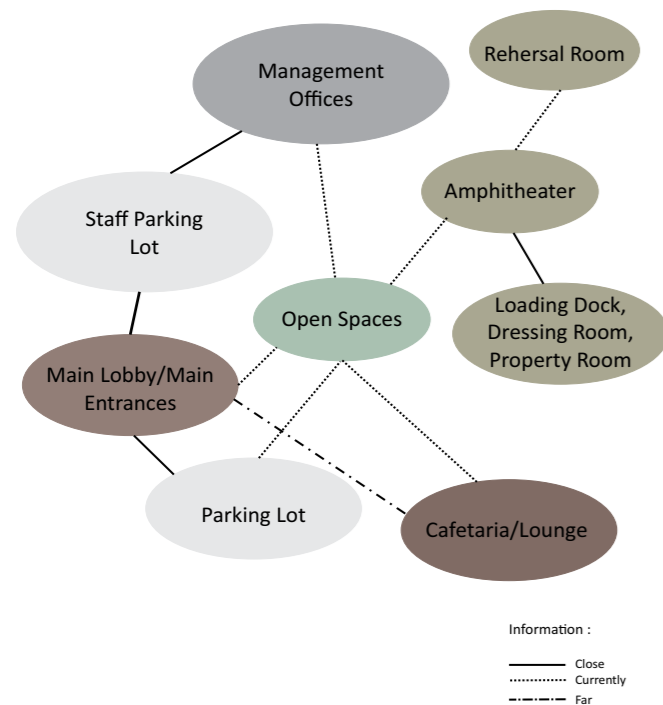
Figure 3.10 Space Requirement Analysis Table
Source :Author, 2021

USERS	ACTIVITY	ROOM REQUIREMENTS (Indoor)	ROOM REQUIREMENTS (Outdoor)	PRIVATE	PUBLIC
Music Performance					
	Parking	-	Parking lot		
	Practice	Rehersal Room	-		
	Make up	Dressing Room/Locker	-		
	Preparation	Backstages, Storage	-		
	Perform	Theater	Amphitheater		
	Sanitation/Wc	Lavatory/Wc	-		
Drama/Shadow Puppets					
	Parking	-	Parking lot		
	Practice	Rehersal Room	-		
	Make Up	Dressing Room/Locker	-		
	Music Preparation	Backstages, Storage	-		
	Perform	Theater	Amphitheater		
	Going Wc	Lavatory	-		

Figure 3.11 Space Requirement Analysis Table

Source :Author, 2021

3.4 Space Connection Analysis



The following is an analysis of the space that linked by proximity. Each function of the space is grouped into three (3) types relationship, namely: close, moderate, and far.

3.5 Property Size

No	Room	User Amount	Unit	Standard	Sources	Room Dimension (m2)	Space Requirements		
							Natural Lighting	Natural Ventilation	Soundproof
1	Parking	600	Prsn	Motorbike = 1,5 m2 Car = 15m2	US Study	1200			
2	Main Lobby/Information	25	Prsn	2 m2/Prsn	Time Saver	50			
3	Cafetaria/Waiting Room	50	Prsn	1,5 m2/Prsn	Architect Data	80			
4	Amphitheater	600	Prsn	1 m2/Prsn	US Study	600			
5	Musholla	50	Prsn	1 m2/Prsn	Architect Data	50			
6	Wudhu	15	Prsn	0,5 m2/Prsn	Architect Data	7,5			
7	Visitor Lavatory	10	Unit	Man Women	Architect Data	20			
8	Cafetaria	5	Unit		US Study	80			
9	Retail	1	Unit	6 x 8 m	US Study	48			
Total						2155,5			
1	Parking	50	Prsn	Motorbike = 1,5 m2 Car = 15m2	US Study	200			
2	Loading Dock	1	Unit	3 x 5 m	Time Saver	15			
3	Stage	1	Unit	16 x 9 m	Architect Data	144			
4	Rehersal Room	1	Unit		US Study	224			
5	Property Room	1	Unit	6 x 6 m	Architect Data	36			
6	Make Up Room	25	Unit	2 m2/Prsn	Architect Data	50			
7	Lavatory	5	Unit	Man Women	Architect Data	15			
8	Storage	1	Unit	6 x 6 m	US Study	36			
Total						735			
1	Parking	50	Prsn	Motorbike = 1,5 m2 Car = 15m2	US Study	200			
2	Manager Room	1	Unit		Time Saver	15			
3	Meeting Room	1	Unit		Architect Data	50			
4	Staff Room	1	Unit		US Study	100			
5	Ticketing	1	Unit	3 x 3 m	Architect Data	9			
6	Cleaning Services	1	Unit		Architect Data	9			
7	Security	2	Unit		Architect Data	36			
8	Lavatory	10	Unit	Man Women	Architect Data	30			
9	Storage	1	Unit	6 x 6 m	US Study	36			
10	Pantry	1	Unit			9			
Total						524			
Sub Total						3414,5			

Figure 3.12 Property Size Analysis Table

Source :Author, 2021

3.6 Site Plan Concept According To Tropical Architecture

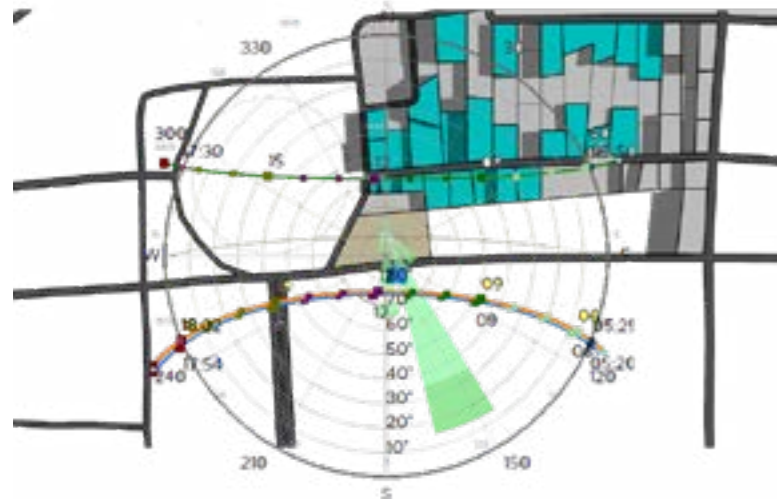


Figure 3.13 Climatic Analysis
Source :Author, 2021

The concept of the Ponorogo mass system performance arts center is the result of the analysis carried out. The Art Center is divided into two main masses. the arrangement of the mass and the direction of the building is adjusted to the line of the sun's circulation on the site, the view, and the direction of the wind.

Some of the functions of the space that will be designed are offices, workshop/studio areas. Meanwhile, the performance area on the ground floor will be used as a public zone such as a performance area (theater), cafeteria.

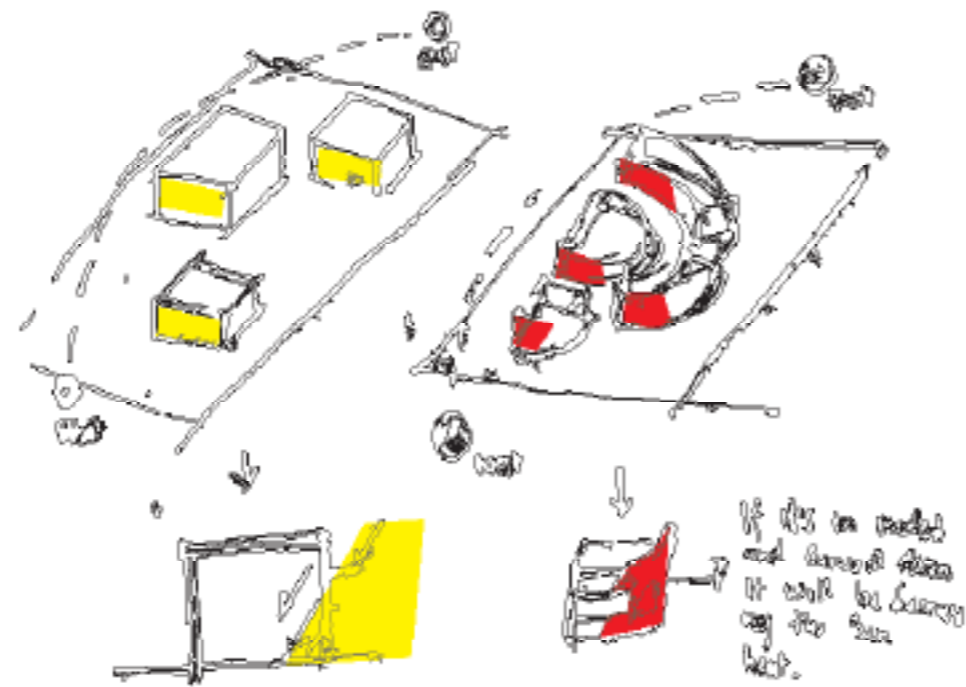


Figure 3.15 Surface Area To Sun Radiation
Source :Author, 2021

The placement of the function is adjusted to the hierarchy from the previous analysis at the stage of the relationship between spaces to create an inner court space in the middle of the building as a transitional space in the building. And the radial configuration can be decreasing the area for the highest point for the sun penetrate in to the building.

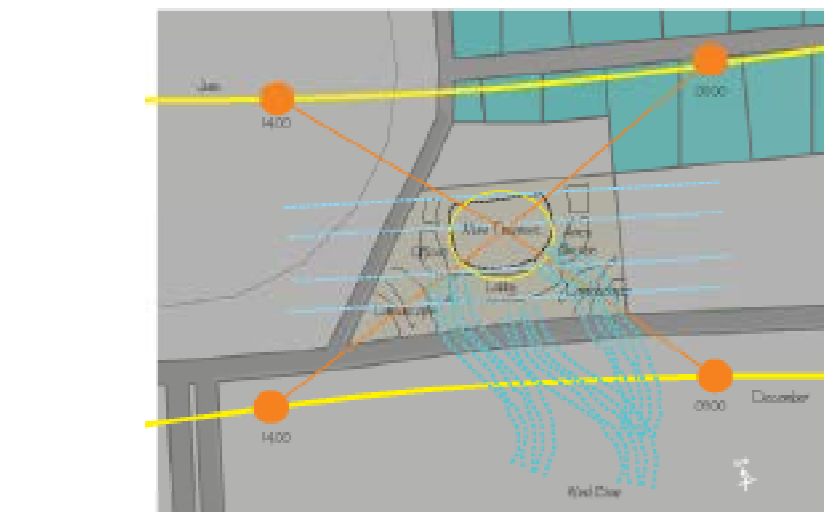


Figure 3.14 Site Plan
Source :Author, 2021

In the concept of site plan, the arrangement of spatial functions is made to adjust to the apparent motion of the sun. The laying of the mass of the building is made separately in order to respond to the movement of the wind to be able to reach inside the building. And the centralized radial shape adjusts to the center of the main function of the main show building / stage for easy access from outside the site.

• Landscape Concept In The Semi Open Stages

The concept of the landscape is to preserved as much as existing tree as possible. There are 2 type of tree in the site area. ketapang tree, and also Trembesi Tree. The additional tree into the middle of the building has a funtion to shade for the visitor before entering the main theater. located in the transition space as an park. And the addition for the pond can be controlling the heat more cooler when performance held in the afternoon.

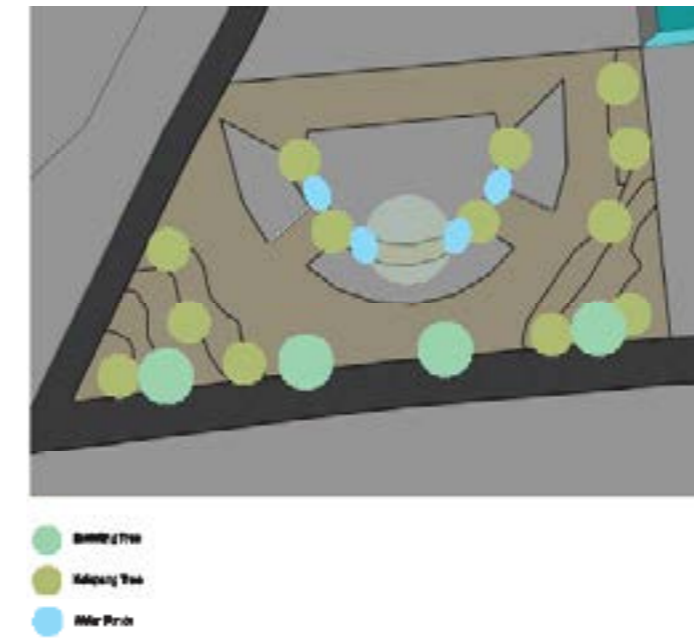


Figure 3.16 Landscape Concept
Source :Author, 2021

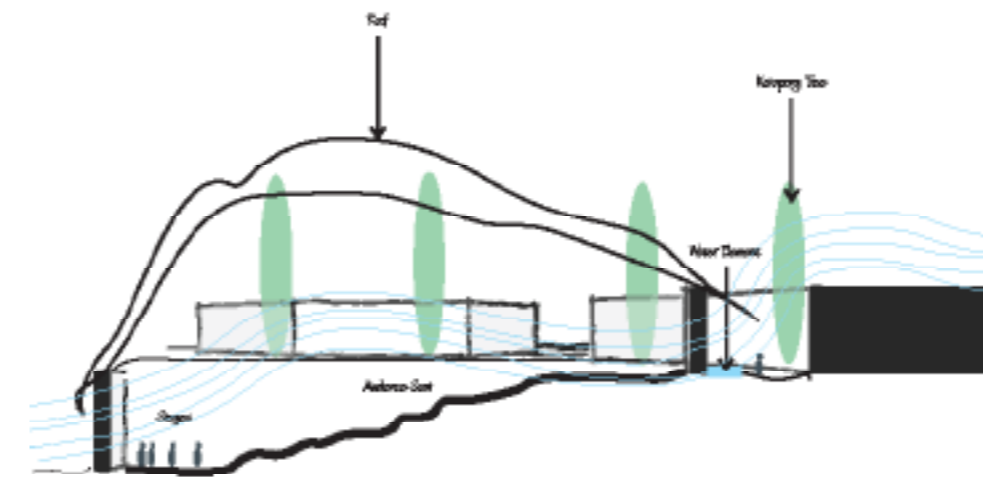


Figure 3.17 Main Stage Landscape Concept
Source :Author, 2021

Wind behavior in the building facade area will be accelerated along with the presence of dense leafy vegetation. According to the theory in chapter 2, it is stated that the presence of dense leafy vegetation can contribute as a wind breaker in buildings which can be reduced by as much as 35%.

And to respond to pollution and noise from vegetation vehicles such as ylang and ylang is very effective in reducing these problems, because according to research (Kurniawan, 2010) it is stated that based on the classification of plants such as ylang and ylang can reduce pollutants effectively because of their dense leaves and can add aesthetics for building pad.

• Circulation

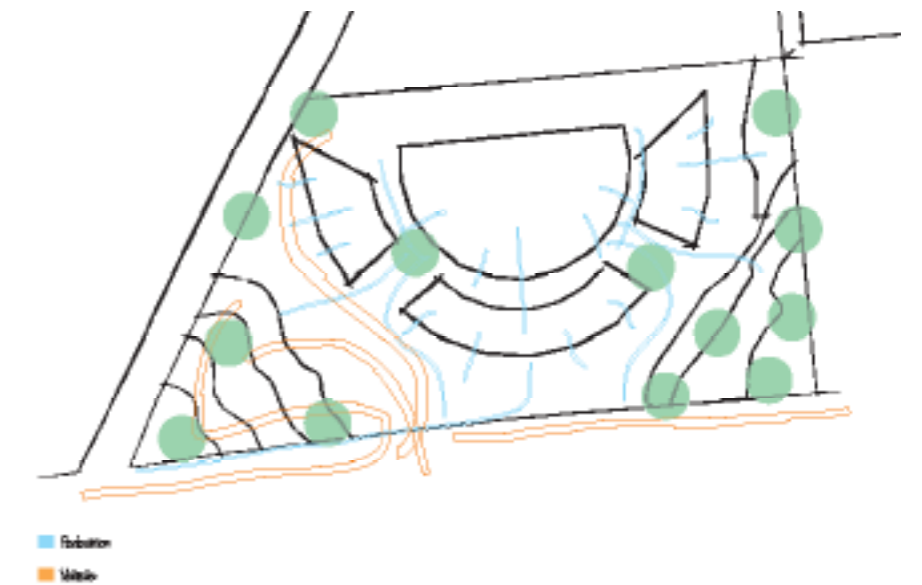


Figure 3.18 Circulation
Source :Author, 2021

The circulation to enter the site is on the south side which is a major road while the west side of the site is for access from the east road of the stadium which is a residential area where the road is quite small to pass.

3.7 Building Mass Concept

- Main Stages Building Form.

The concept of the form of the building uses the principles of Javanese architecture, namely joglo to respond to the tropical climate to be applied to the performance building. The main transformation refers to the traditional Javanese building, namely the joglo typical of East Java. There are basic elements that will be used as a study to design the shape of this building such as elements of shade, stands, and foundations which will be reprocessed into a new, more modern form without compromising its architectural values and principles.

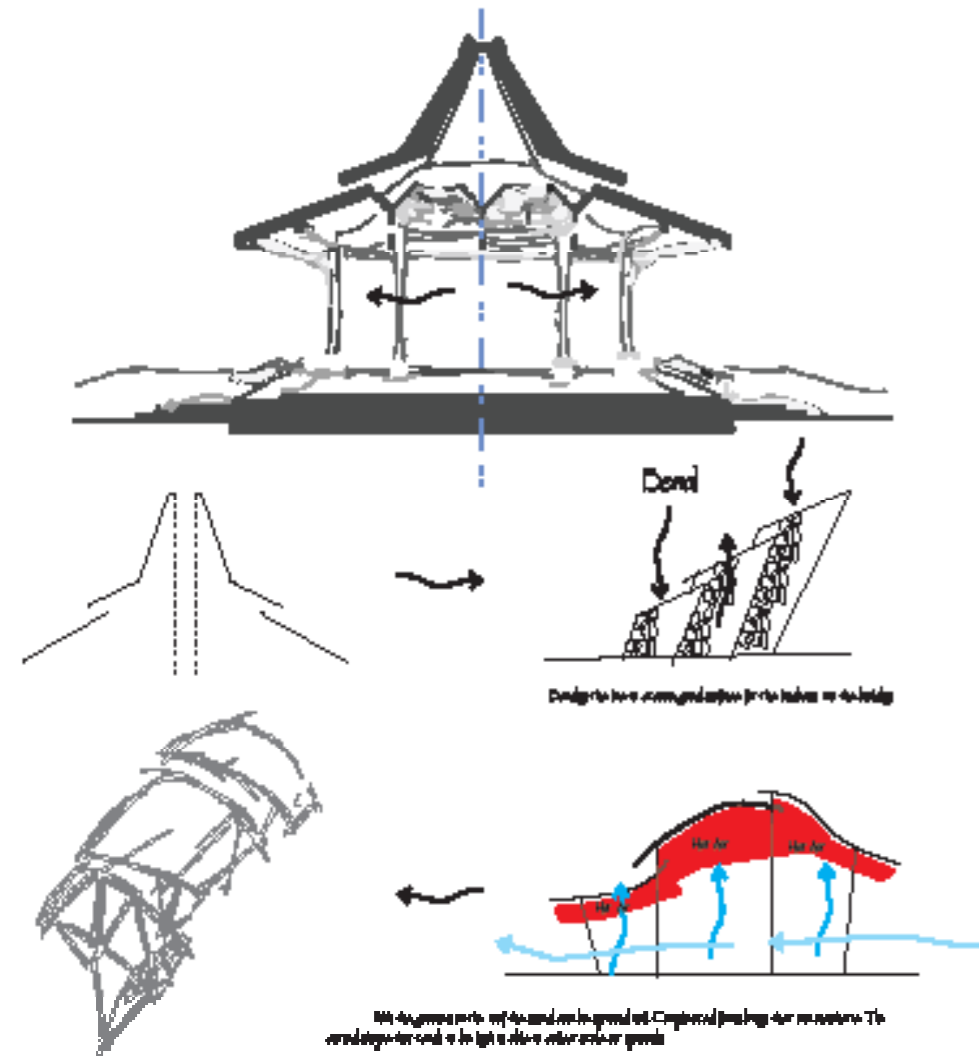


Figure 3.19 Building Form Concept
Source :Author, 2021

- Mass Configuration

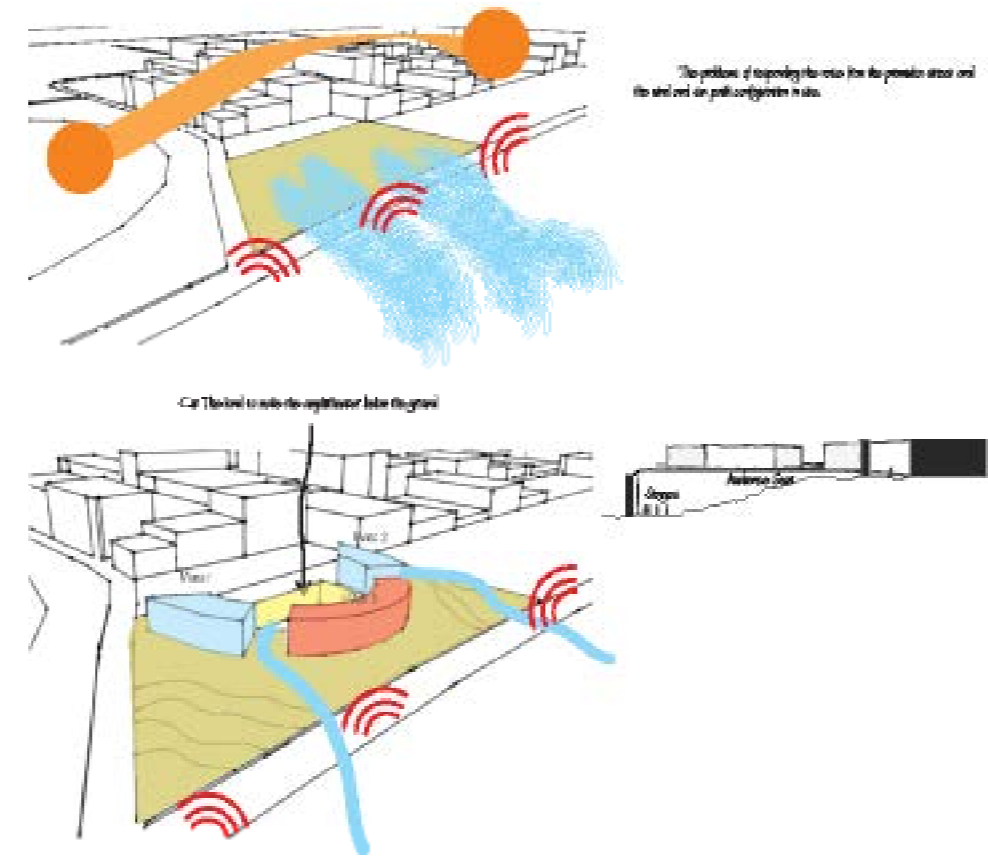


Figure 3.20 Building Configuration
Source :Author, 2021

The building mass configuration for the building base on the site context analysis of the climate and the noise. The building in the red area can be block the noise from the pramuka street. And the building that have separated block can be as an wind acceleration and distributed to area of the site.

The area for the amphitheater create by the cutting the land make the elevation below the site surface. This is have the intention to responding the noise reduction from the pramuka street and make the head ceiling of the building more higher to be create cooler thermal condition in the amphitheater.

- Building Structural Concept

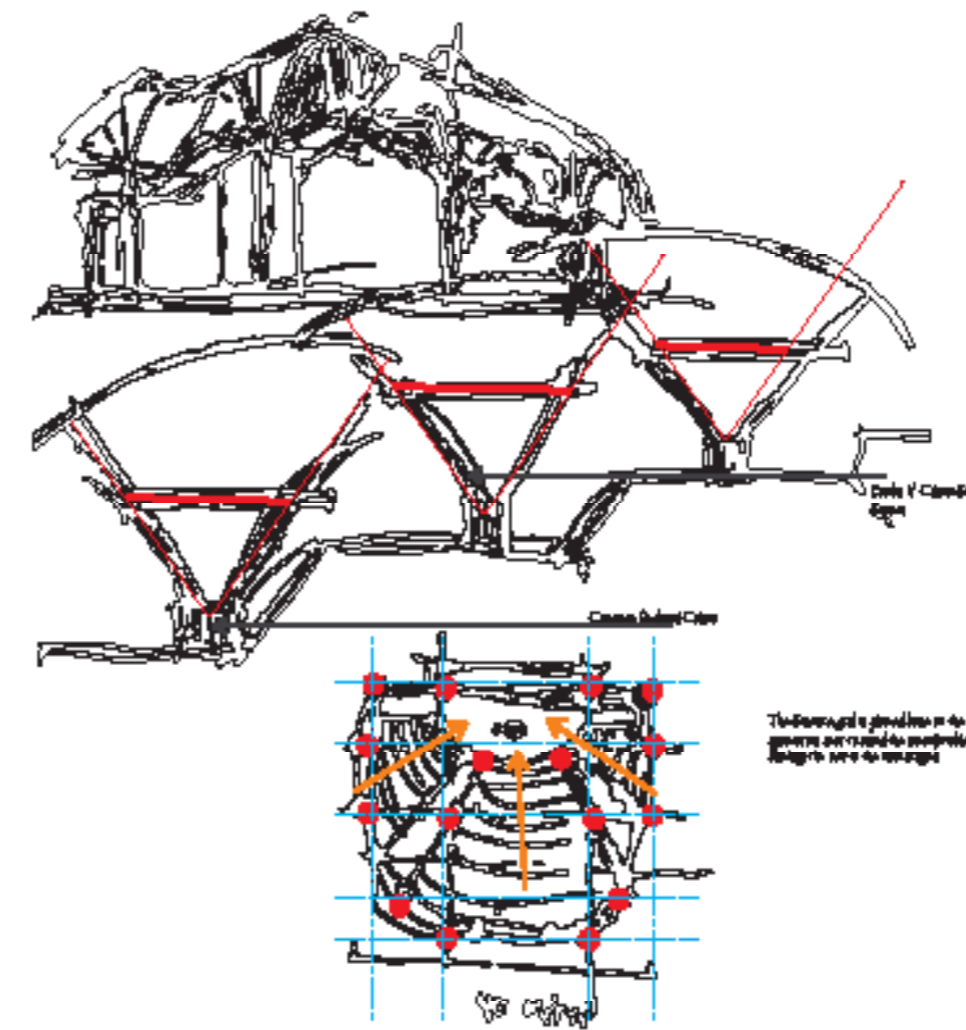


Figure 3.21 Building Structure Concept
Source :Author, 2021

The building structure for the main stages is considerat of the local materials that can be supporting the wide span for the joglo transformation concept. From the precedent of the chicken comb that can be applied to the building the V structure is located based on the visitor seating area, this have an intention to unblocking the view of the visitors and supporting the roof that have a wide span made from Steel with frame structure system.

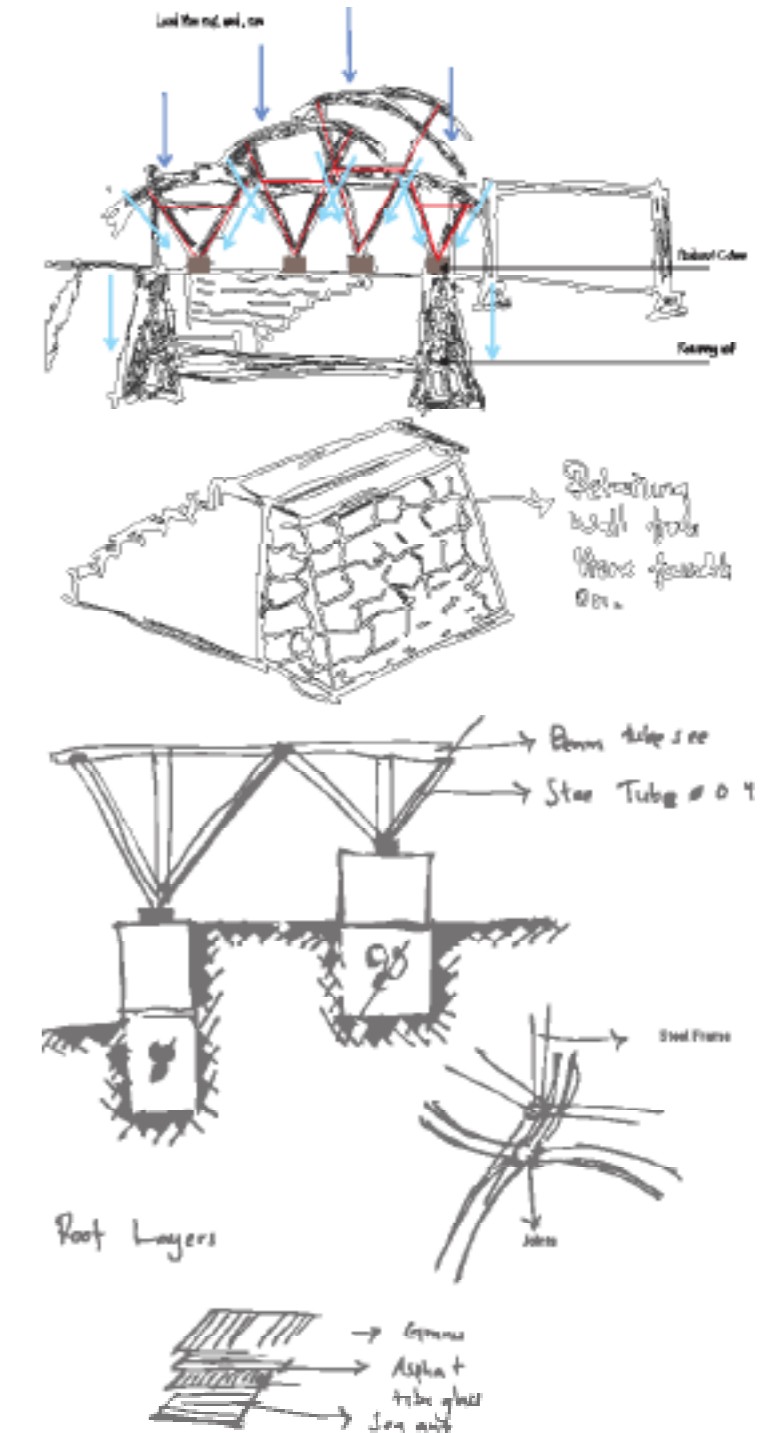


Figure 3.22 Building Roof Structure
Source :Author, 2021

Because the roof is in shell structure sytem and the wide span for supporting the system for the main theaters, the retaining wall use to strengthen the foot of the building. And the function of the Stone foundation of the materials is the local materials and the controlling the cool ambience for the stages area.

3.8 Main Stages Concept

• Main Stages Exploration

1. Reog Dances

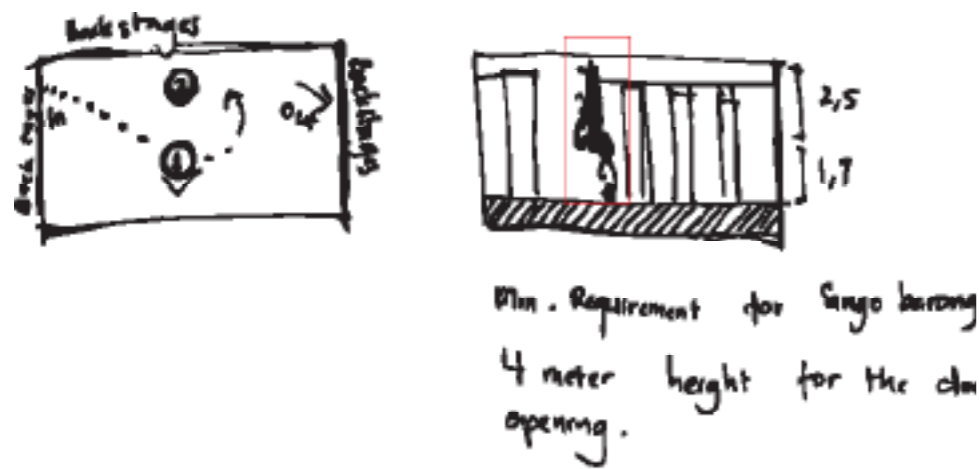


Figure 3.23 Singo barong dance analysis

Source :Author, 2021

For the needs of the singo barong dance, with a 50 kg reog mask, the consideration for the stage must be that it has sufficient height and direct access from the backstages to the main stage. Because the reog mask is very heavy and has a height of 2.5 meters, the height of the main stage door must be a minimum of 4 meters for the speed and access of reog dancers to enter and exit the stage

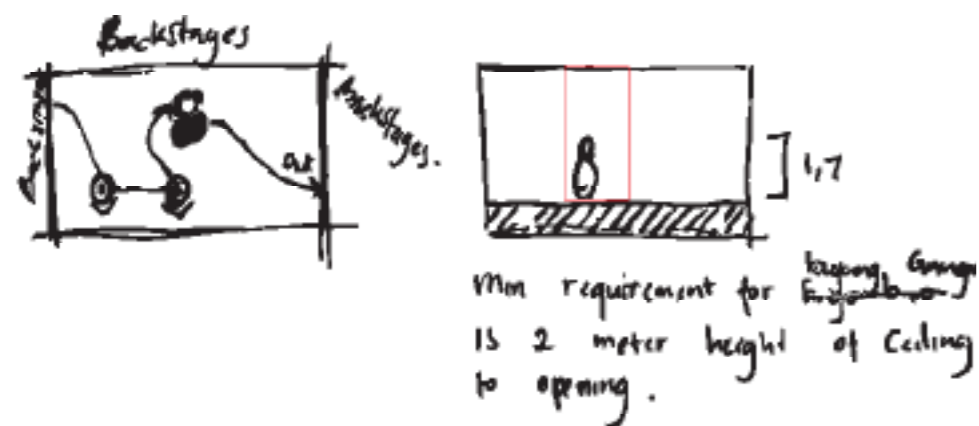


Figure 3.24 Bujang Ganong Dance Analysis

Source :Author, 2021

Bujang Ganong is the most flexible dance among other dances because its characteristics are very free and only danced by one dancer, so the need for the ceiling height is sufficient at a minimum height of around 3 meters. In terms of stage area, it is sufficient for 8 meters to move freely but still within the dancer's comfortable limits.

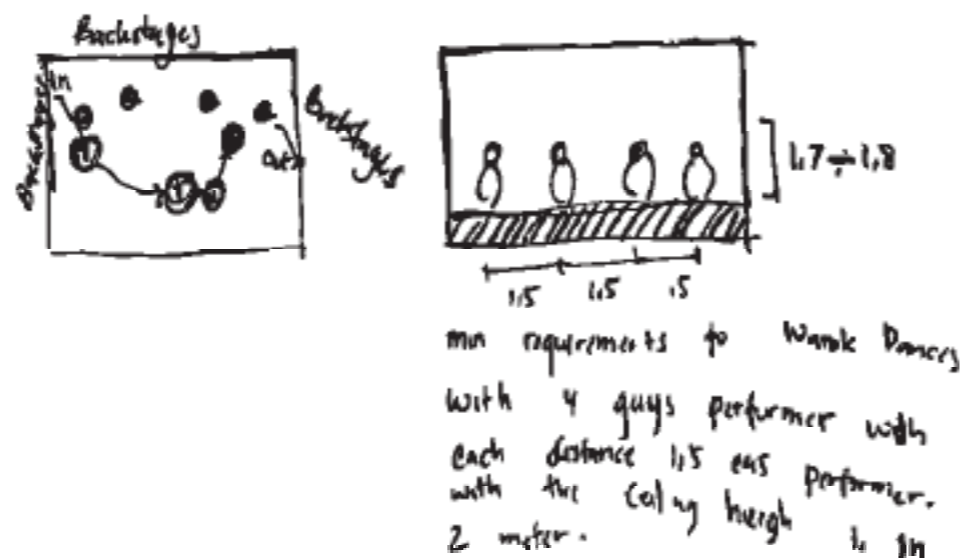


Figure 3.24 Warok dances analysis

Source :Author, 2021

In group dances in the warok dance, it can be concluded that because of the limited dance and fixed and firm position, each dancer needs 1.5 meters of space to provide density and harmony. Then the need for the main stage space at a minimum distance of 5 meters with a box configuration facing the visitors.

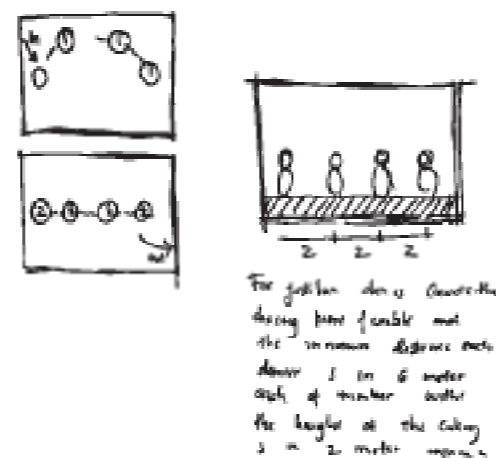
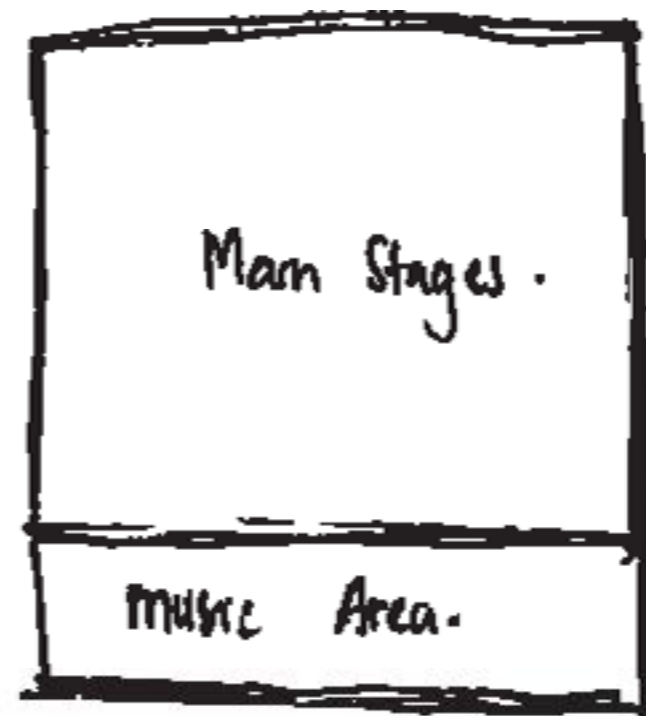


Figure 3.25 Jathilan Dances Analysis

Source :Author, 2021

For the Jathilan dance, because this dance requires a wider range of motion, the distance between the dancers requires a minimum of 2 meters for free movement between dancers to dance this dance. And because this requires jaranan equipment, the floor pattern and ceiling height require a minimum height of 2 meters to provide user comfort.



Audience Seat

Figure 3.26 Reog Music Configuration

Source :Author, 2021

Usually in the configuration of the reog art performance, the accompaniment music can be presented with cassette music. However, because the art of reog is performed live with 12-15 traditional musical accompaniments such as kenong, gong, serompot and some struts to make the configuration of the stage layout feel complete, the music is placed in front of the stage so that visitors can immediately know how the reog music is presented in a Reog Ponorogo dance. As has been presented in the study of chapter 2, the number of reog art performers on accompaniment music is presented by several instruments and 15 musical accompaniments.

2. Modern Music Performances

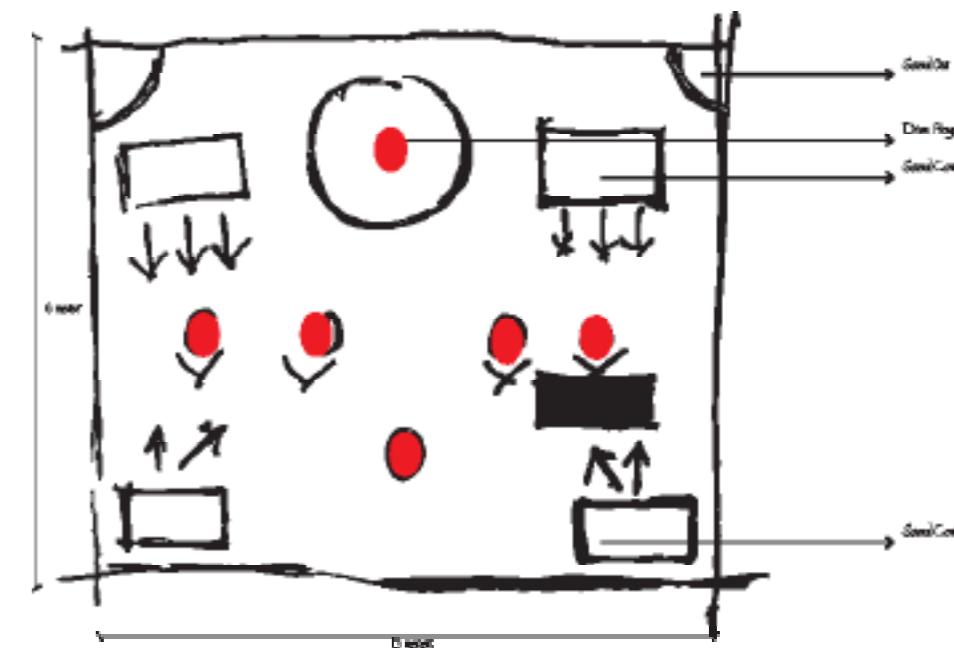


Figure 3.27 Music Performance Configuration

Source :Author, 2021

For stage user analysis for musical performances, the main requirement in terms of stage layout configuration is the area of the stage because the minimum required width is 10 meters wide for the placement of equipment and a minimum of 5 performers and 3 crew who are usually on the stage, the laying of the stage layout can be done. seen above. and the configuration above is a configuration that is not fixed because it is a flexible configuration that adapts to modern music stage performances that are usually displayed in this art building.

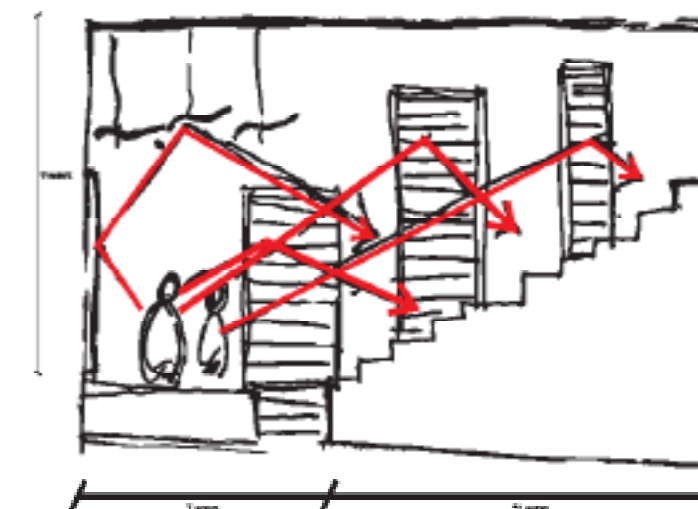


Figure 3.28 Section Stage Performance Concept

Source :Author, 2021

Based on the theory of in chapter 2 that the sound modification to achieve correct loudness, there is an addition in the form of a sound distribution scheme so that the performance achieved is better. Based on the picture above is an image of the sound distribution scheme from the sound source. There are 3 sound distribution schemes, the first is sound reflection from the sound source to the ceiling with the application of the design in the form of false ceiling, then there is stage reflection in the form of a sound source that is reflected to the stage wall area and false ceiling, then there is stage reflection in the form of a sound source that is reflected to the stage wall area and false ceiling before being reflected to the audience, then there is also wall reflection, direct sound and also floor reflection. The sound reflections are in line with the choices of acoustic materials in the design results.

3. Puppets Performances



Figure 3.29 Jathilan Dances Analysis
Source :Author, 2021

In classical Javanese wayang performances, the stage layout configuration is generally divided into 3 main parts, namely accompaniment music, the puppeteer and the puppet box in the middle and the screen wall area at the back. For the laying of these 3 parts, it is adjusted to the difference in the height of the relationship between the accompanist and the main show.

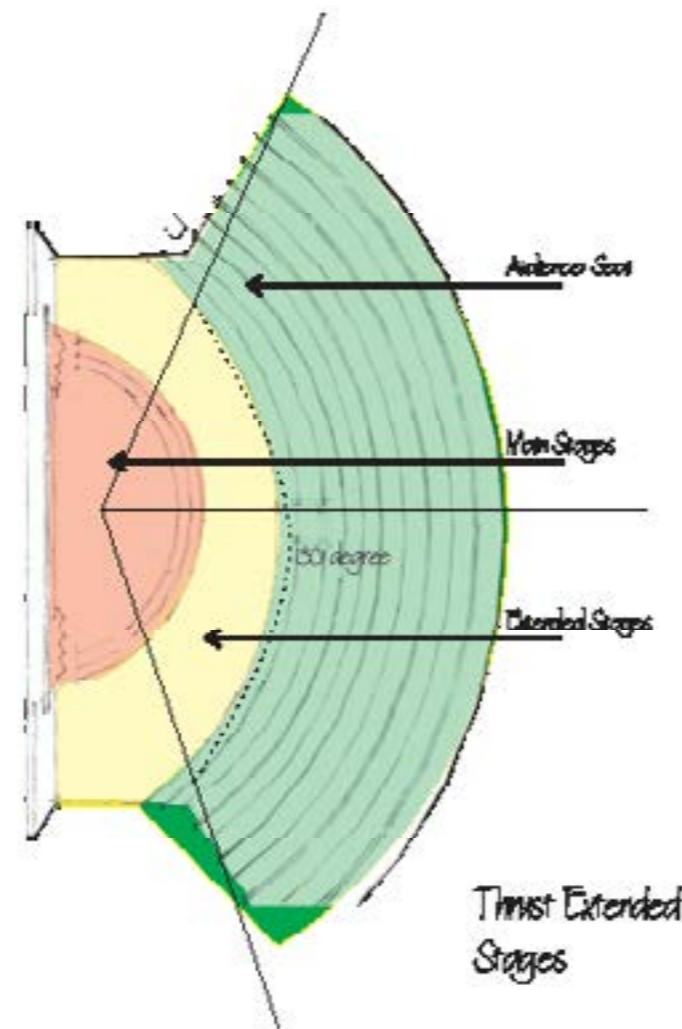


Figure 3.29 Stages Exploration
Source :Author, 2021

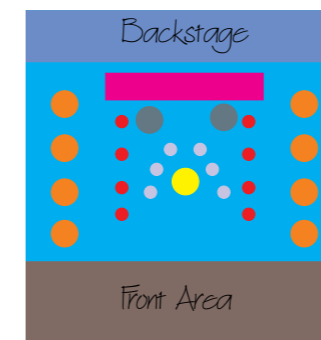
After reviewing the comparison of the types of stages for various types of main stages to support dance, music, and puppet shows. So the thrust stage was chosen, but added with an extended function to support the type of musical accompaniment for dance and wayang people. this aims to support and provide sufficient space for the artists to carry out their actions on stage.

Main Performance Analysis Based on the Thrust Stages

This group is lined up at the back with an unlimited number of members. This group in addition to serving as security assistants also functions as a group that helps the performance of the show as well as a companion group. At certain times, this group also dances, sings, and cheers, which is sometimes followed by the audience present during the performance. The elements of the players in Reog's art are displayed in full. The elements of Reog actors or players include:

1. Klono Sewandono (one person)
2. Old Warok (one person)
3. Young Warok (one person)
4. Jathil (4 to 8 people)
5. Bujangganong/ Ganongan (two people)
6. Pemrong (two people)
7. Pengrawit (eight gamelan players)

Sound System Equipment Due to the rapid development of technology, it also has an impact on traditional arts in almost all corners of the world. The development of the Reog show in Indonesia is also inseparable from this impact. In the past, Reog Ponorogo did not use loudspeakers like a set of sound systems. The musicians only rely on the loud sound of the gamelan in performing their performances. Nowadays, it is not uncommon for them to use loudspeakers in performing Reog Ponorogo performances. The sound system equipment used consists of: mixer control, jack cable, monitor and microphone. With this, the Reog players feel helped because the sound of gamelan and drums is clearer to accompany their performance. Likewise, the benefits of being able to be heard by the audience who are so busy in the performance arena.



- Warok
- Jathil
- Ganongan
- Klono Sewandono
- Pemrong
- Pengrawit

Figure 3.29 Reog Performance Scheme
Source :Author, 2021

An open field performance is a performance that does not require a stage building that separates the audience and performers. Performances in the open field are usually located in a large yard or on a sports field that can be used according to the needs of the show. The performance arena is set up so that it can blend in with the audience so that the audience can also participate at certain times. what if there is an audience who can dissolve interested in the subconscious (ndadi or trance) in the show, then they can immediately join in the show. The following is an illustration of the schematic form of the Reog Ponorogo performance arena.

Description :

- A. : Music player arena
- B. : Arena player Reog
- C. : Performance Arena

The structure of the performance in the open field has five stages which include:

1. Opening Music.
2. Presentation of jathilan dancers.
3. Small ganongan and big ganongan dances.
4. Singobarong and Prabu Klono Suwandono battle dance.
5. Like-like dance / ndadi (trance)

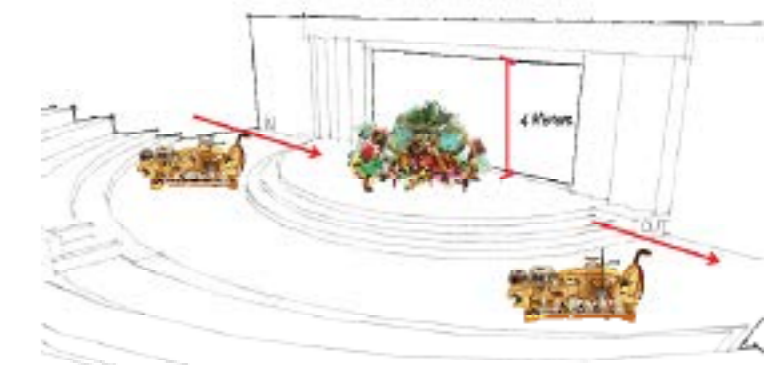


Figure 3.29 Stages Exploration
Source :Author, 2021

Jathilan offering dance is a dance that describes the dexterity and skill of cavalry soldiers who are practicing. The dexterity and expertise of hussars in fighting on horses is shown by the expression and enthusiasm of the dancers. Jathilan was originally danced by men who were handsome or smooth, similar to beautiful women. However, since the 1980s male jathilan dancers have been replaced with female dancers on the grounds that female dancers are more feminine.

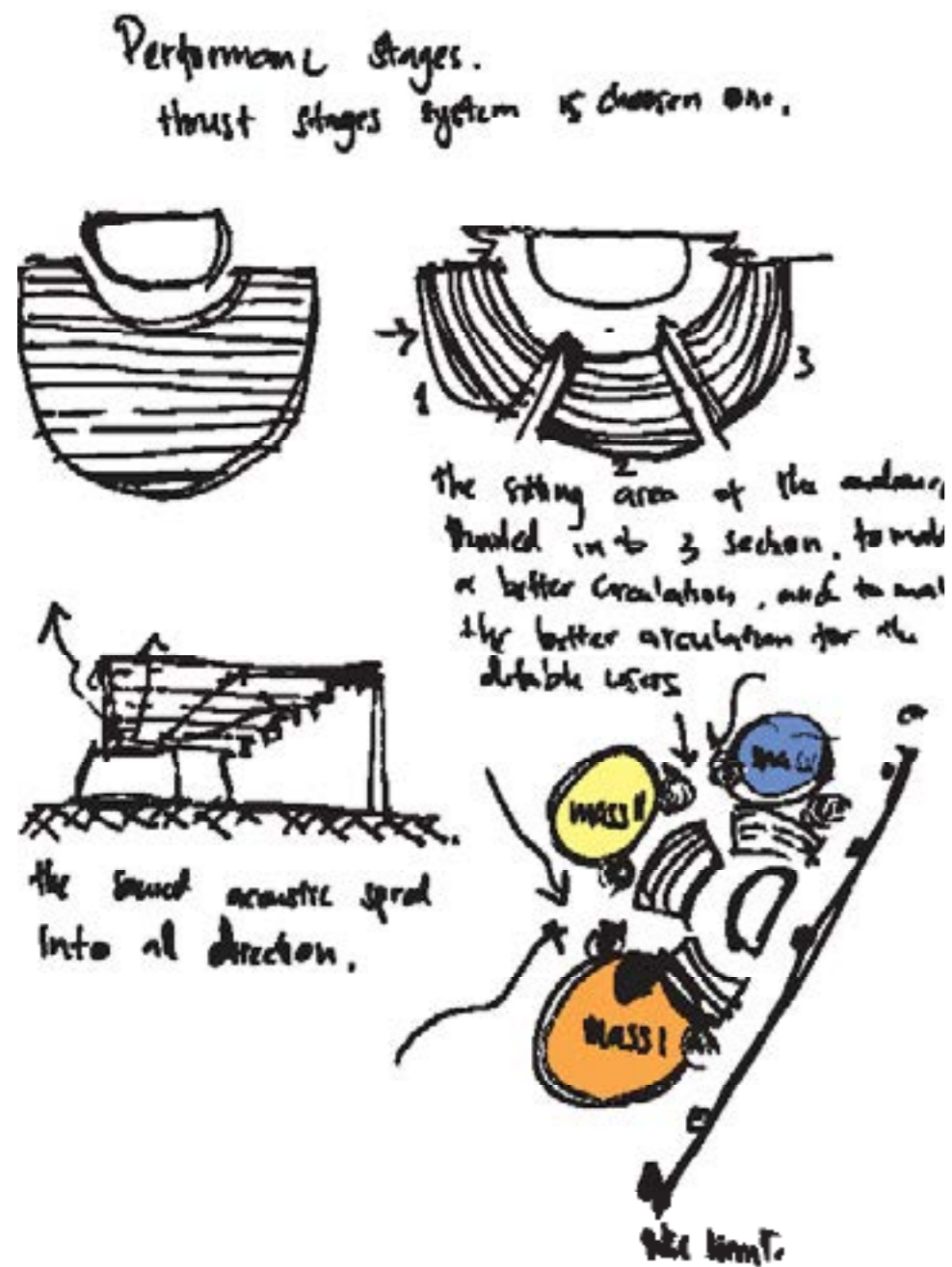


Figure 3.23 Main Stages Configuration
Source :Author, 2021

In the main performance building section, the selection of the type of stage layout is based on the layout study in chapter 2, so the thrust stage layout was chosen because for 3 types of performances that have different characteristics, they can adjust and are maximal for music, dance and visuals from an acoustic and visual perspective.

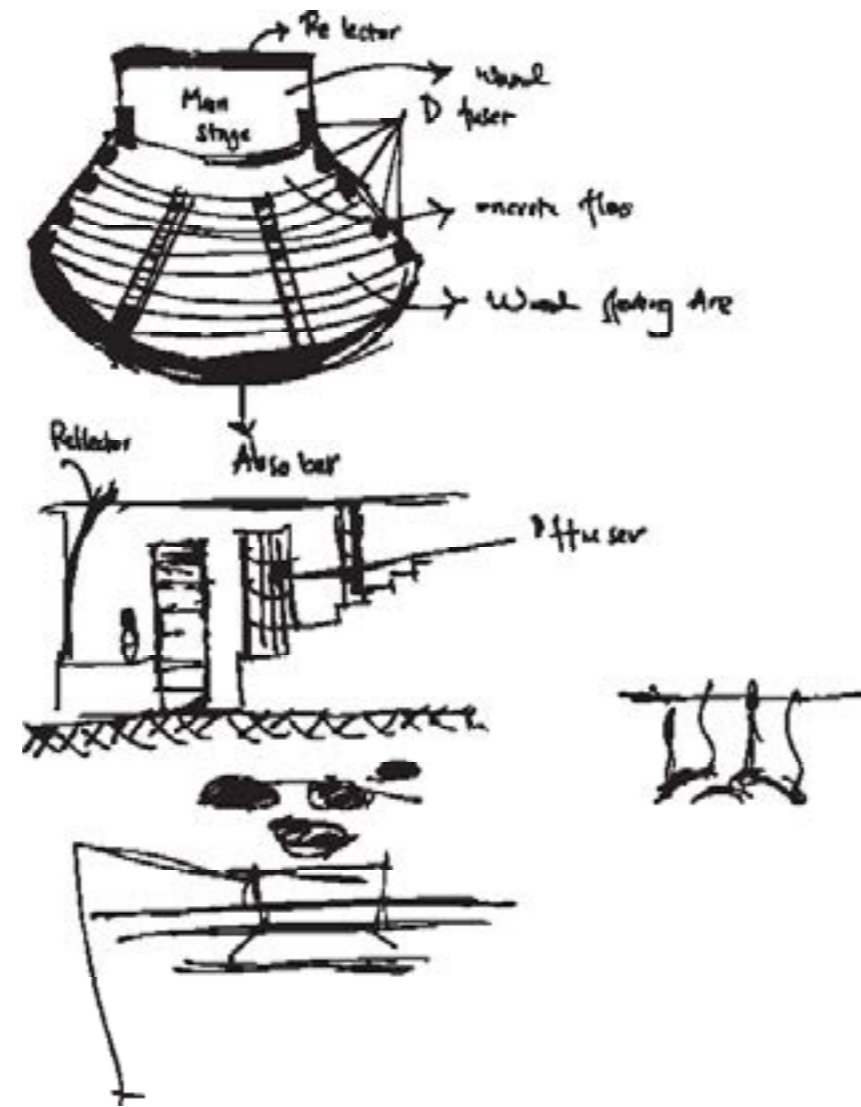


Figure 3.24 Acoustic Treatment
Source :Author, 2021

3 sections in the seating layout for users/audiences, intended to facilitate access to the stage area and 2 access for artists to enter the stage area. Use of ramps to facilitate access for people with disabilities. And the acoustic treatment on the main stage with a thrust stage configuration allows it to spread throughout the audience area and be evenly distributed.

And the placement of the stage area in the middle of the building mass allows it to be protected from critical solar radiation to the east and south of the building. and by placing it in the middle, the air supply that enters and rotates in the stage area can produce cross ventilation.

3.9 Building Envelope

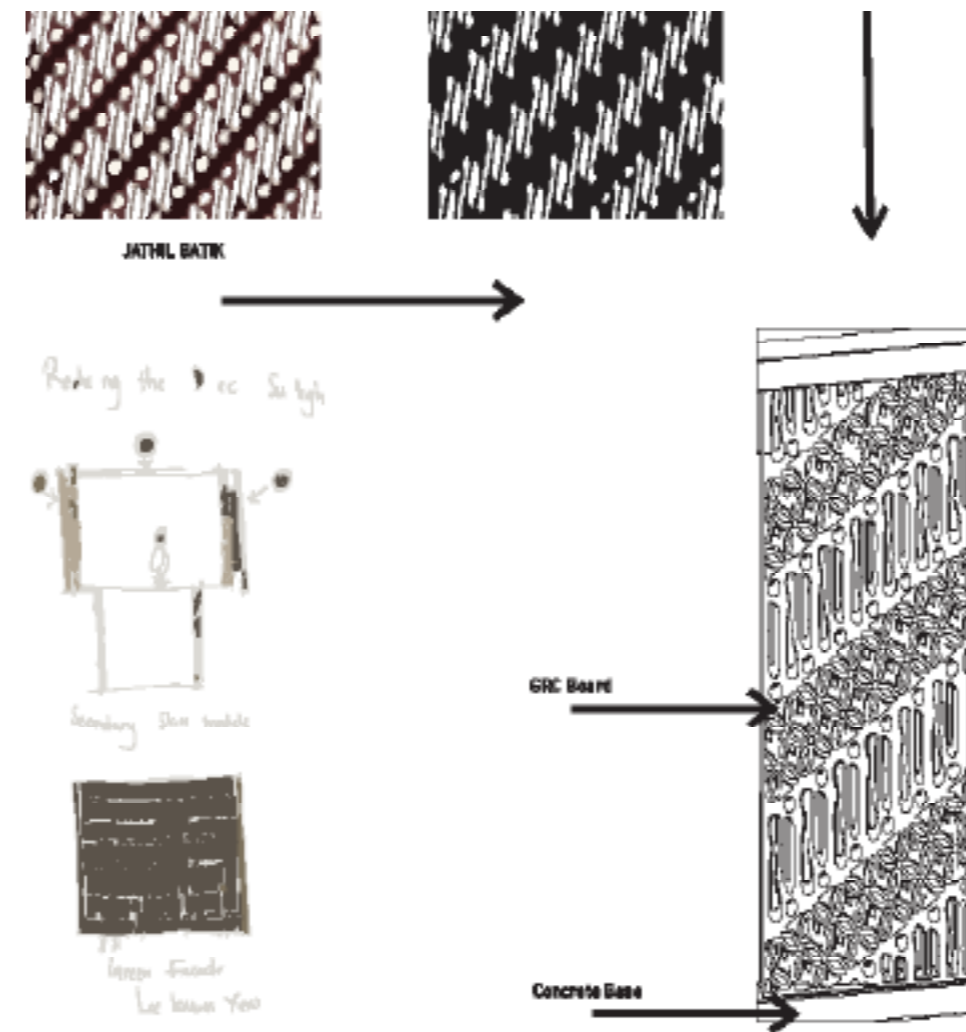


Figure 3.25 Building Structure Concept
Source :Author, 2021

The concept of the building envelope that is planned is a secondary skin in the form of a symbolize the local identity which is the javanese batik that usually used by the jathil and the klono sewandono. And the Second one is to using the vegetation as an additional cooler for the reducing the direct sunlight. The function of secondary skin is to fulfill the requirements to reducing the heat gain the aspects including:

1. As protection from direct sunlight
- Following the condition of the existing site which extends to the east and west, so that most of the buildings are exposed from the east and west sides so that the role of secondary skin is to protect direct sunlight exposure.

2. Building Appearance

This project consists of 4 building masses, where the four masses have different shapes, the purpose of giving this secondary skin or building envelope design has the aim that the three building masses have a design harmony and cooler each of masses and have singularity and tropic ambience.

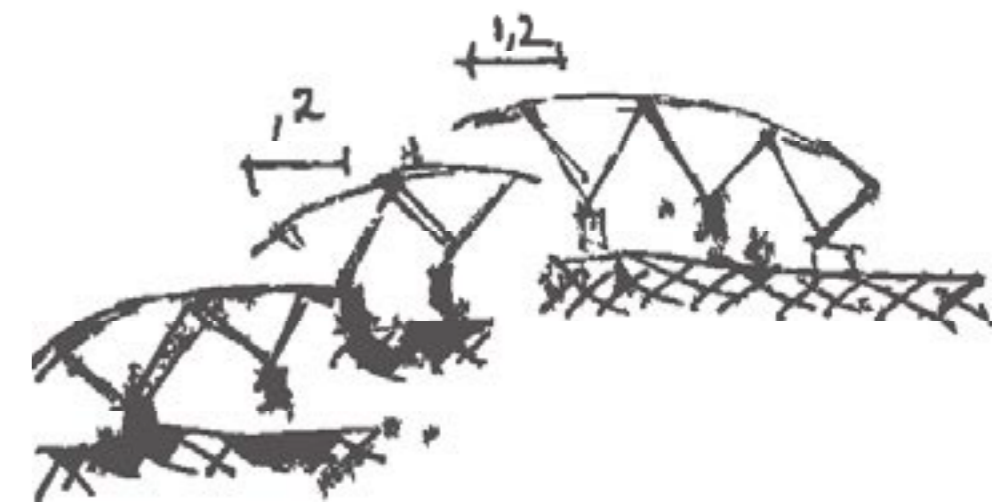


Figure 3.26 Building Structure Concept
Source :Author, 2021

- Roof Overhang

The roof shape is curving so the overhang of the roof that can be adjusted with the climate have to be longer to prevent the rain water to come inside the main stages and have the overlapping about 1,2 meter.

Chapter 4

Schematic Design And Concept Application

4.1 Site Plan



Information :

- | | |
|------------------|------------------------|
| 1. Main Stages | 14. Management Offices |
| 2. Inner Court | 15. Staff Room |
| 3. Women Toilet | 16. Lavatory |
| 4. Man Toilet | 17. WC/Toilet |
| 5. Retail | 18. Meeting Room |
| 6. Main Lobby | 19. Loading Dock |
| 7. Ticketing | 20. Car Park |
| 8. Terrace | 21. Motor Park |
| 9. FoodCourt | |
| 10. Stall | |
| 11. Sitting Area | |
| 12. Man Toilet | |
| 13. Woman Toilet | |

Figure 4.1 Site Plan
Source :Author, 2021

In the main concept of the site plan, the spatial arrangement is adjusted to the condition of the site analysis that has been carried out where the curved shape of the plan can reduce solar radiation during the day. The radial shape centered on the exit main stage serves to respond to noise pollution entering and leaving the building. And the provision of landscapes in the front and rear areas of the building serves to ward off sound from entering and leaving the main stage.

The presence of water elements in the landscape can have an impact on the influence of thermal conditions during the day for the main stage area. And access to enter the mainstage area is a garden divider to create a fresher airflow in the main stage area and the provision of inner court in accordance with the tropical architecture concept can have an impact on controlling comfortable thermal conditions in the building.

4.2 Main Stages Plan

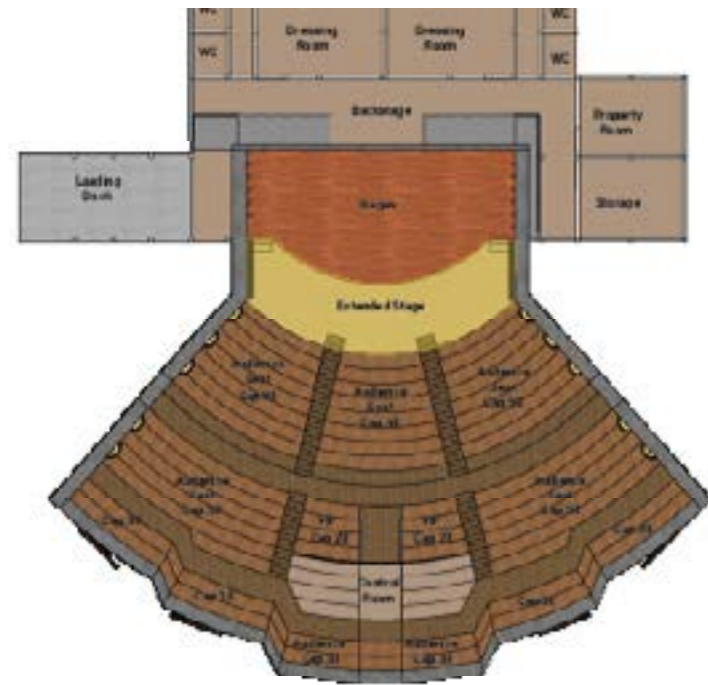


Figure 4.2 Main Stages Plan
Source :Author, 2021

In the main stages area, the backstage and audience seats are separated between those above ground level and the backstage in the basement area. This adjusts to the loading dock area on the left area which is directly connected to the basement area in the office area.

And the main stage area is below ground level to control the thermal to make it cooler and flow the wind to rise to the top so that the circulation of cooler air rises to the top. And in the principle of tropical architecture, the main stage area is made semi-open.

And the support room area for the main stage is placed behind the main stage for easy access. The Main Stages has an 460 capacity with the stages configuration of thrust extended stage to support the additional the traditional music to accompanied the wayang and reog

Offices Plan



Figure 4.3 Offices Plan
Source :Author, 2021

The manager's office area has a close relationship with the main stage area which can be connected through the basement area. To respond to the need for natural lighting. The meeting room area is given a curtain wall to provide lighting into the meeting area.

For the main access on the first and second floors in the hallway, natural air ventilation is provided by providing openings and adding plants to neutralize hot air that enters the building.

Main Lobby Plan

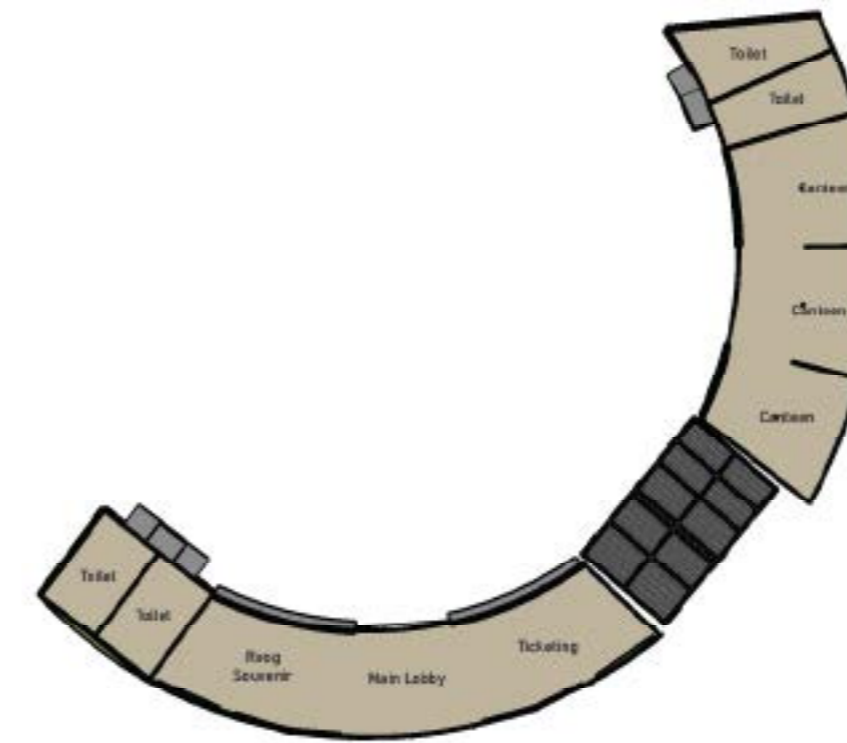


Figure 4.4 Commercial Area
Source :Author, 2021

In the main entrance area of the Padhpehokan Seni Reog building, there is a direct connection between the public space and the Sukowati park and the entrance area is directly related, therefore the radial shape in this plan is to facilitate access for visitors to go directly to the commercial area behind.

And this area is insulated by the central garden area to provide a cross ventilation system in the main lobby area. And giving ventilation with Javanese ornaments to give a look to the facade of the building.

Optimization of space in the commercial area and main entrance is aimed at maximizing the flow of visitors. And because to respond to the climate, the surface is deliberately curved to reduce the area where the sun's heat enters the building.

4.3 Situation



Figure 4.5 Situation Plan
Source :Author, 2021

The response for natural sources in the arrangement of the building in the widest area is placed parallel to the direction of the greatest wind, namely in the southern area of the building. With the separation between the building masses and the provision of a central garden bulkhead, it is intended to provide natural daylighting and cross ventilation in the building space area.

To respond to the noise generated from the main stage area, because according to the analysis the back area of the area is a densely populated area, providing a landscape or forest at the back can reduce noise pollution generated in the main stage area.

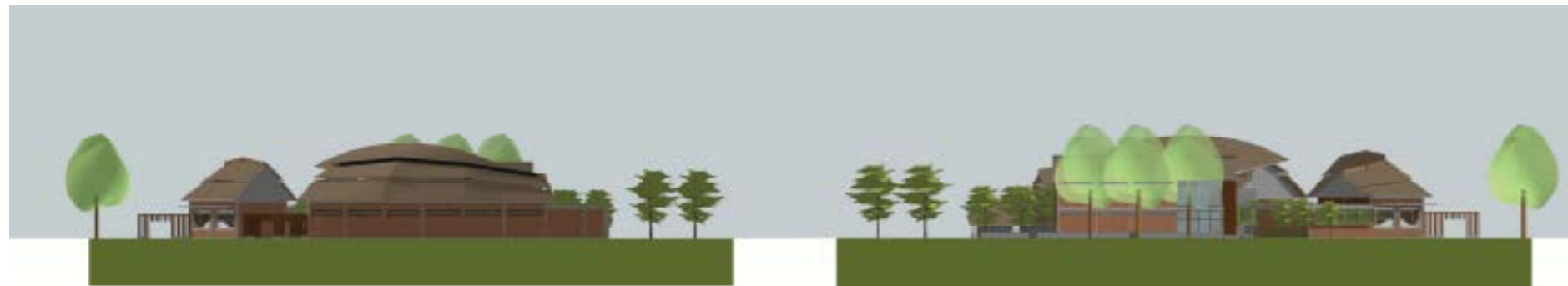
4.4 Elevation



South Elevation

North Elevation

In the design concept of elevation and building envelope, Creating a transition of each building mass with the continuity of the radial movement with the building material of local that is the red brick combine with the exposed materials to make connection of the building more integrated.

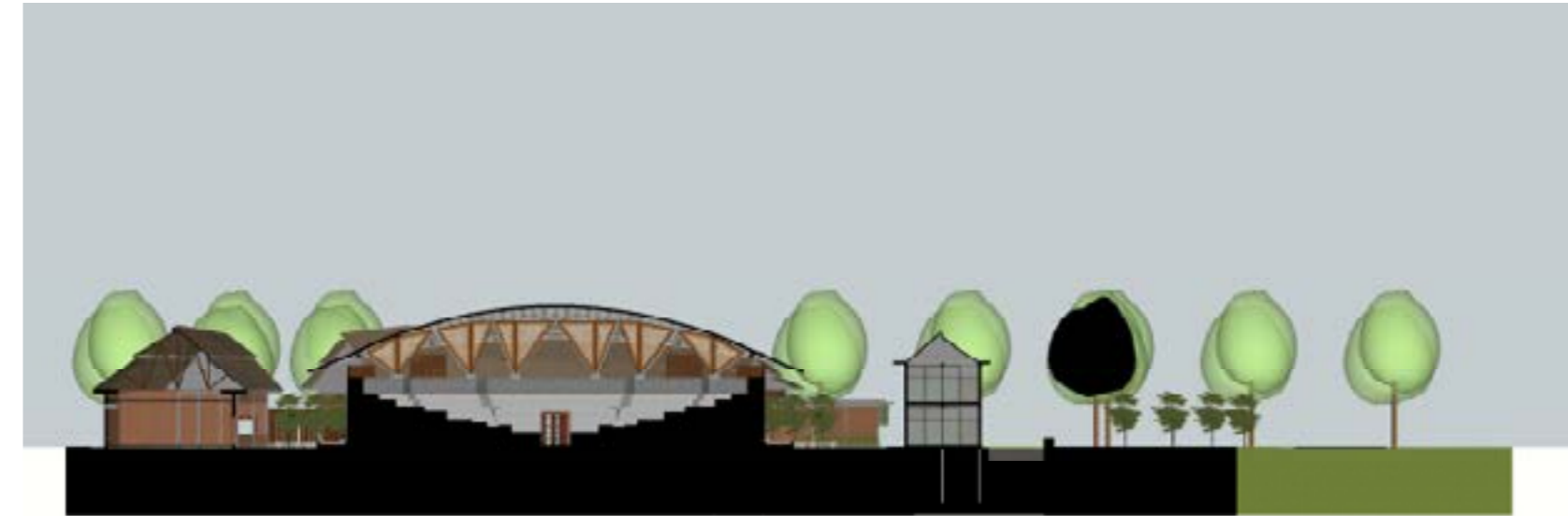


East Elevation

West Elevation

The Air movement between the building make the continuity because of the opening in the southern area and the north area and the placement of the vegetation in the innercourt make the building more cooler.

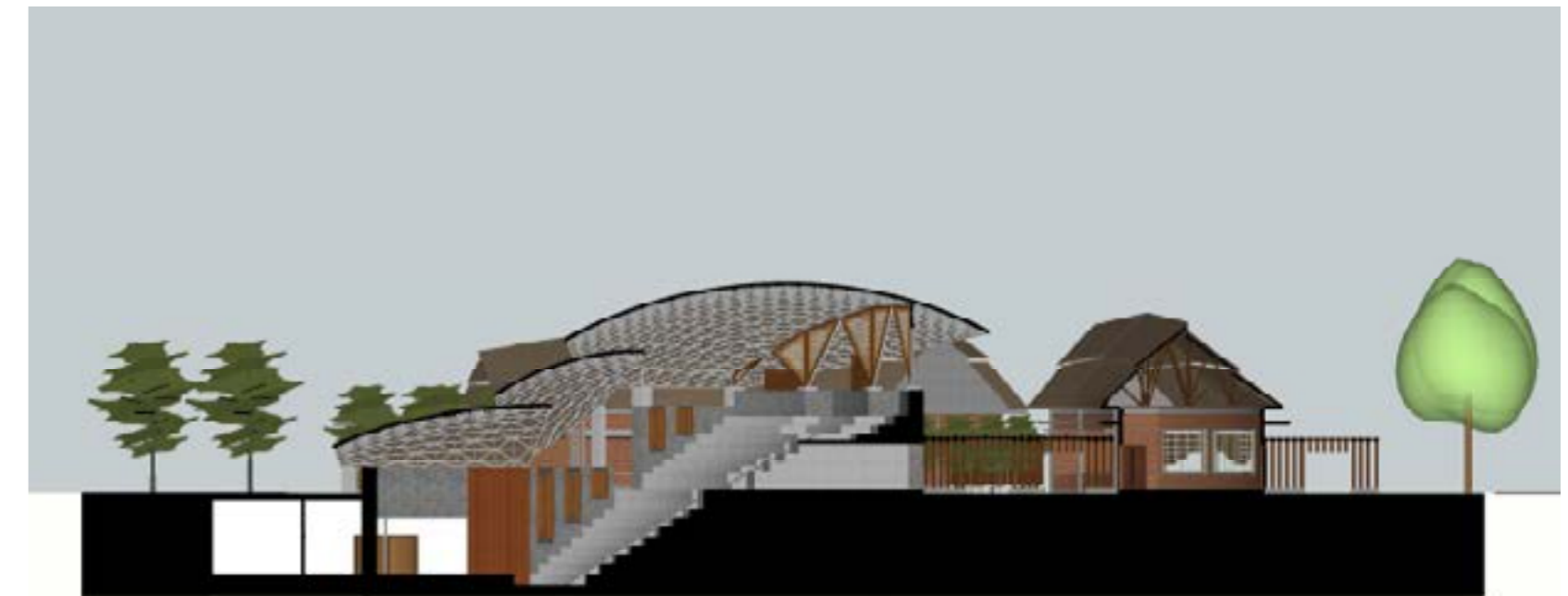
4.5 Section



AA' Section

In The section we can see the integration of the main stages as an center of the building to create the center point of the people flow to coming in to the middle. And we can see the integration of the roof shape and structure based on the concept to let the coller air to come inside the main stage. So the Opening in the southeast are of the building make through the building.

The using of the ventilated roof to create the wind flow of the air to coming inside and changes the hot air and its creating a cross ventilation system. And the Using of the space frame structure to supporting the non coloumn inside the building to make better visual fo the audience to enjoy the performance.



BB' Section

4.6 Building Envelope

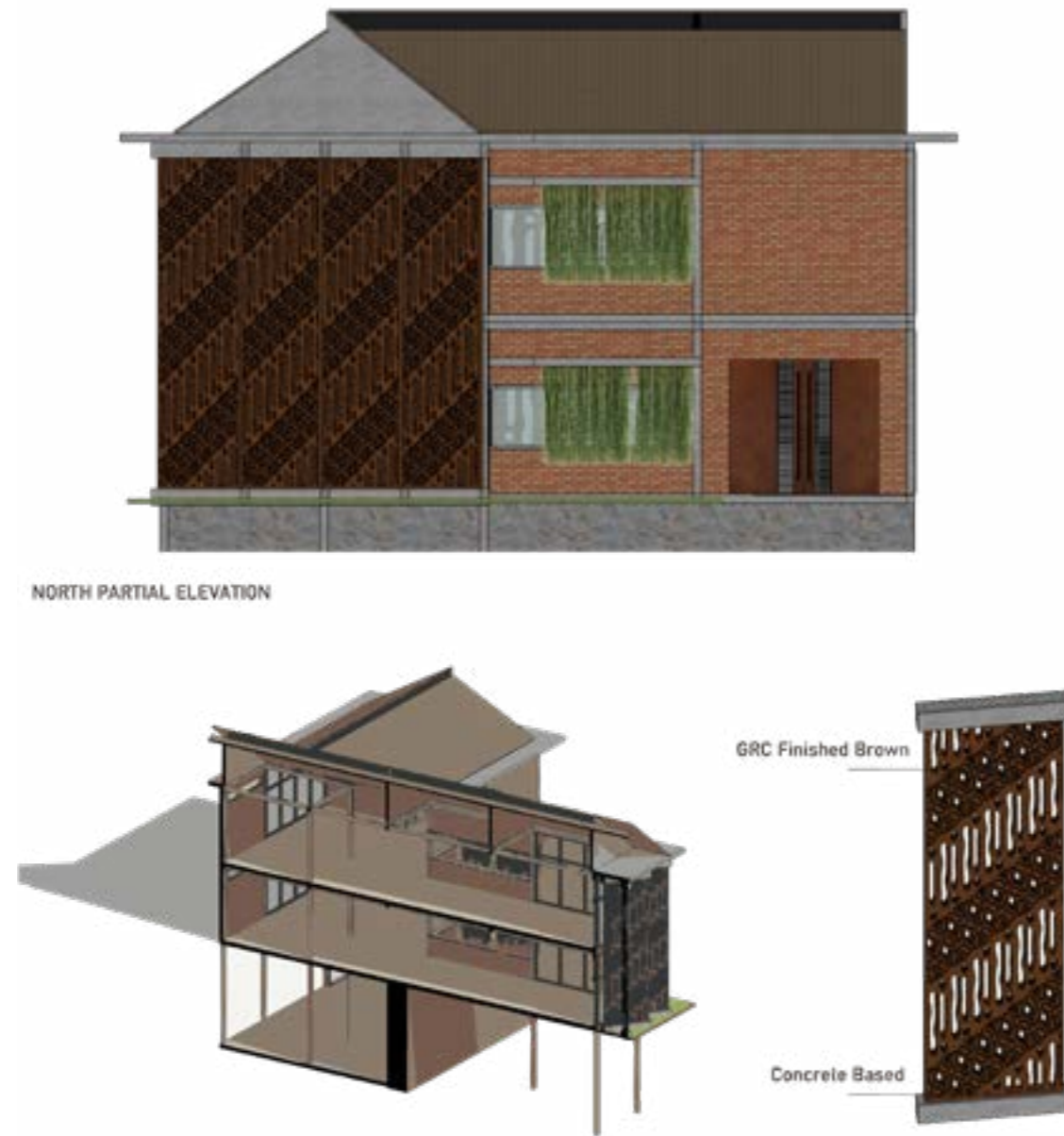


Figure 4.6 Situation Plan
Source :Author, 2021

For the building envelope strategies to reduce the sun radiation in the June especially in 14.00 the secondary skin is put in the nothest part with the motif of batik that can related with the locality culture. The concept of the facade is the dynamic of the flow from east to west side. And the building mass is make curved to reduce the sun radiation.

4.7 Main Stage Interior

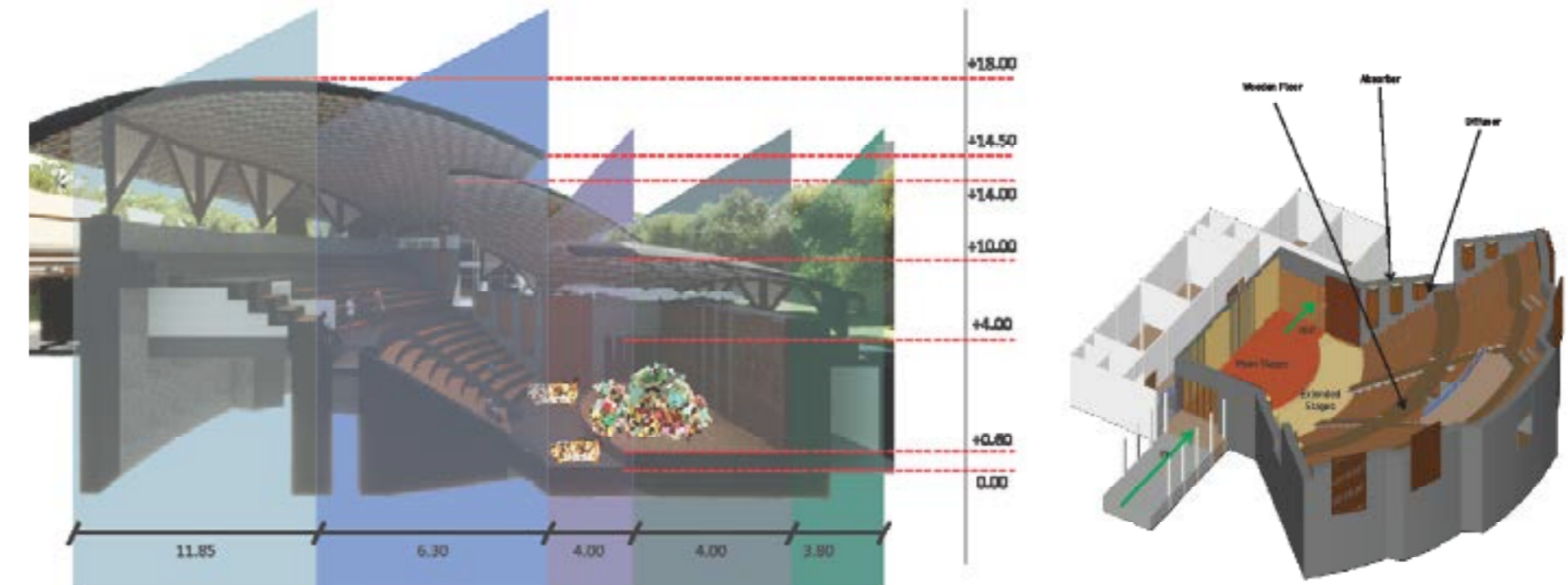


Figure 4.7 Interior Detail
Source :Author, 2021

Main Stages area because the performance majority is reog, the configuration of extended thrust system used to support the 3 kind performance that held in the stages. The thrust stages can support for the visually comfort for the performer to perform well and can be accepted easily as visual for the audience.

For The acoustic wellnes, The stages is suppoting with the acoustic devices such as an acoustic diffuser, Absorber made from harwood and the material for the audience seat is using a wood.

Interior Material

- Wall Area
- Fabric+Fiberglass+Foam (Absorber) ($\alpha = 0,7$)
- Hardwood (Diffuser) ($\alpha = 0,3$)
- Floor Area
- wooden floor ($\alpha = 0,1$)

α = Sound absorption coefficient

Main Stage Interior Perspective



Figure 4.8 Interior Rendering
Source :Author, 2021

4.8 Structure Integration

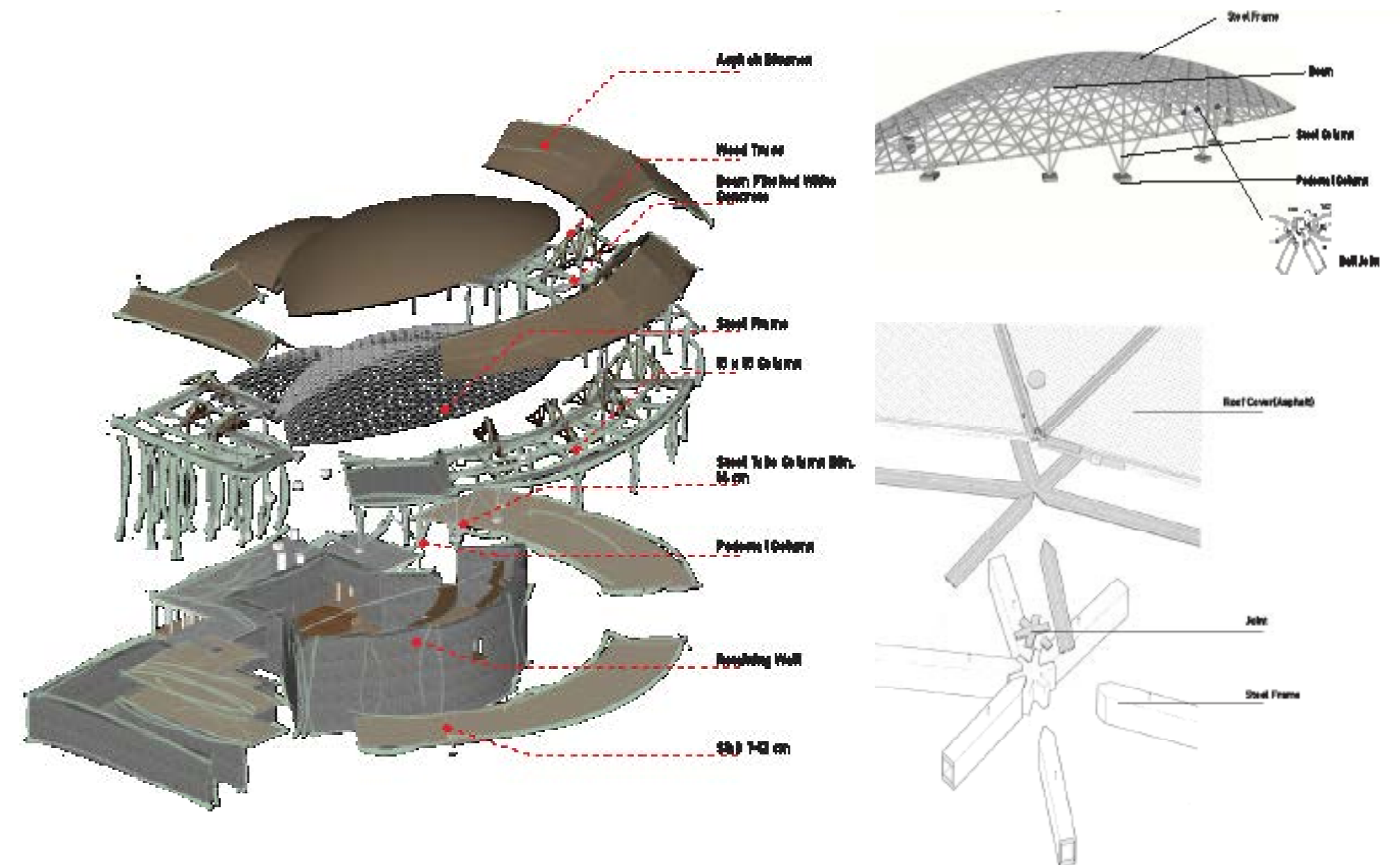


Figure 4.9 Structural Integration And Detail
Source :Author, 2021

Structural Integration from lowest part of the structure until the highest part of structure. The lowest part is the footplate foundation as the foundation, after that goes to the column and beam with a steel material, and then the frame truss roof structure as the structural part that exist in the top part.

For the main stages area the the roof structure using the steel that connect each part uysing a ball joint for the shell structure system with the space frame. This structural system is sumpporting with the column that directly connect to the pedestal column then continuing the load to the ground.

4.9 Utility Scheme

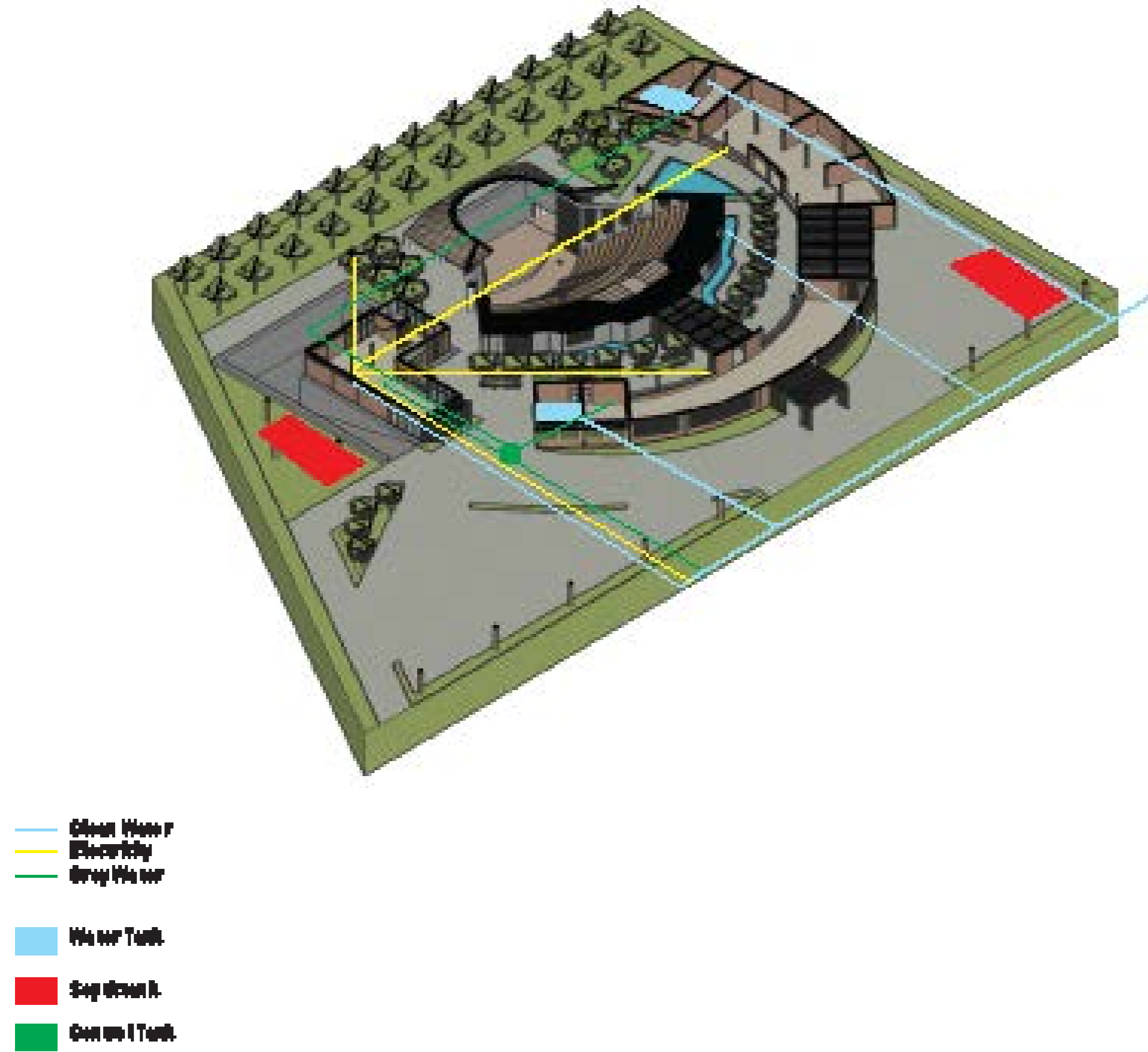


Figure 4.10 MEP Scheme

Source :Author, 2021

The utility system in this design The clean water utility network system in this design uses a down feed system with water sources coming from PDAM is pumped into the water tank shown on the first floor before being distributed to the ground floor. The dirty water system is divided into 2 different pipes, namely for black water and grey water.

Electricity needs are taken from PLN which is supplied from a power pole at the south of the site. Electricity will be supplied to the transformer located in the technician's room on the ground floor before it is distributed to the Main Stage for electrical.

4.10 Barrier Free Scheme



Figure 4.11 Difable Access And Facility

Source :Author, 2021

Building design has provided points that can facilitate access for people with disabilities. Special parking or the diffable parking is provided at the front of the main entrance of the building which is also equipped with an access corridor for diffables using stone pavement. And in the main stage the acces is without stairs for the difable so it can be directly into the main stage. And the special space is availablein the middle of the stage.

4.11 Building Safety Scheme

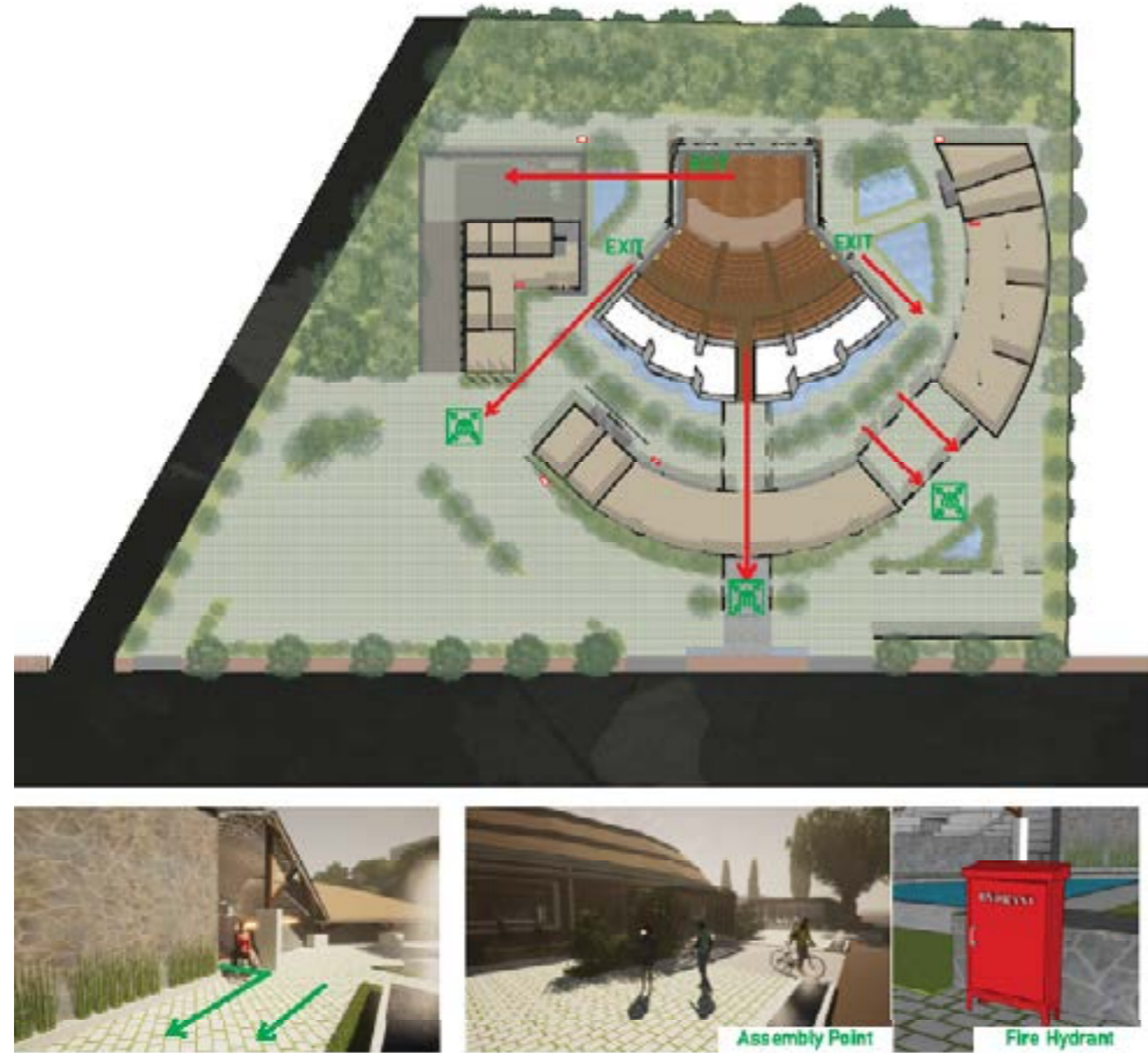


Figure 4.12 Building Safety Planning

Source :Author, 2021

In these emergency scheme of the building, the evacuation route of the building vertically using the main road with supported with ramp to make easiest to disability to access it or the one that has been provided by the building is made with a width of 2 meters so that if there is panic there is no pushing between users. As assembly points in an emergency situation, the assembly points are placed in 3 area which is in parking area and also the entrance to the site because the site conditions are big. And For the fire security in each building mass there is hydrant to make the first treatment to the firefighter to find the nearest water resources.

4.12 Building Simulation

4.10.1 Flow Design - Wind Simulation

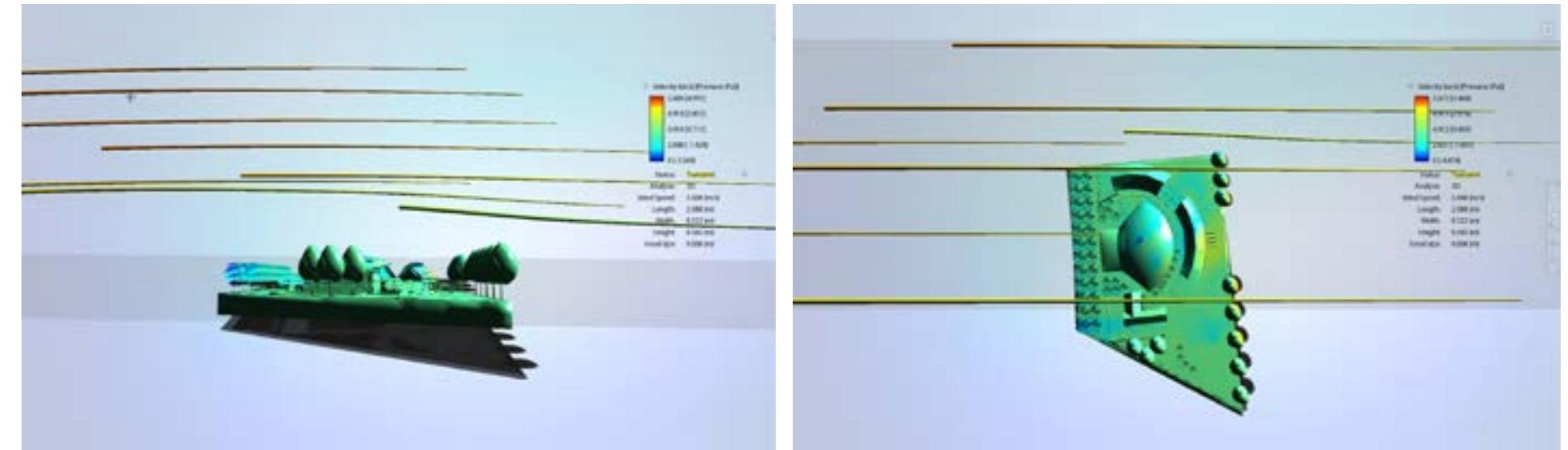


Figure 4.13 Autodesk Flow Design

Source :Author, 2021

The result of the test shows that the cross ventilation works on this building configuration. Although the speed was decreased when the wind enter the building but still there are air movement inside the building.

4.10.2 Velux - Natural Lighting

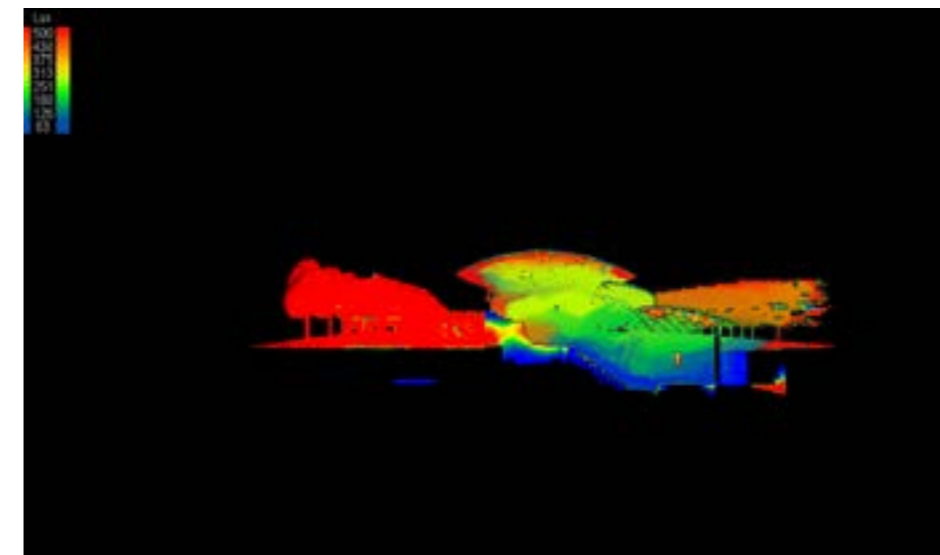



Figure 4.14 Velux

Source :Author, 2021

The building tried to used natural lighting in the day time by adding the opening in the and also the shading. As we can see that the natural lighting can enter the building and meet the standard of 300 lux for Main stage.

4.10.3 Reverbration Time Calculation - Acoustic


Kalkulasi Total Penyerapan Suara, RT dalam ruang
 Berdasarkan rumus dalam referensi Tardif tentang akustik ruang untuk memperkirakan tingkat akustik ruang
 Nama Ruang
 Ruang Ruang
 Transmisi RT
 Transmisi RT
 Transmisi RT
 RT yang dihasilkan dengan menggunakan penyerapan suara karena adanya, bila ternyata ruang volume yang tidak memenuhi standar maka perlu ditinjau penyerapan suara, termasuk di dalamnya

No	Nama	Luas/Volume	Material	Klasifikasi	RT Ruang 1					Total penyerapan suara (m ²)	RT Ruang 2	Total penyerapan suara (m ²)
					1.25	2.50	5.00	10.00	20.00			
I. Dinding Dinding												
A.	Dinding Dinding	2100,00	Brick	0,05								
B.	Dinding Dinding	1000,00	Brick	0,05								
C.	Dinding Dinding	1000,00	Brick	0,05								
II. Dinding Dinding												
A.	Dinding Dinding	1000,00	Brick	0,05								
B.	Dinding Dinding	1000,00	Brick	0,05								
C.	Dinding Dinding	1000,00	Brick	0,05								
D.	Dinding Dinding	1000,00	Brick	0,05								
E.	Dinding Dinding	1000,00	Brick	0,05								
F.	Dinding Dinding	1000,00	Brick	0,05								
G.	Dinding Dinding	1000,00	Brick	0,05								
III. Dinding Dinding												
A.	Dinding Dinding	1000,00	Brick	0,05								
B.	Dinding Dinding	1000,00	Brick	0,05								
C.	Dinding Dinding	1000,00	Brick	0,05								
D.	Dinding Dinding	1000,00	Brick	0,05								
E.	Dinding Dinding	1000,00	Brick	0,05								
F.	Dinding Dinding	1000,00	Brick	0,05								
G.	Dinding Dinding	1000,00	Brick	0,05								
IV. Dinding Dinding												
A.	Dinding Dinding	1000,00	Brick	0,05								
B.	Dinding Dinding	1000,00	Brick	0,05								
C.	Dinding Dinding	1000,00	Brick	0,05								
D.	Dinding Dinding	1000,00	Brick	0,05								
E.	Dinding Dinding	1000,00	Brick	0,05								
F.	Dinding Dinding	1000,00	Brick	0,05								
G.	Dinding Dinding	1000,00	Brick	0,05								
V. Dinding Dinding												
A.	Dinding Dinding	1000,00	Brick	0,05								
B.	Dinding Dinding	1000,00	Brick	0,05								
C.	Dinding Dinding	1000,00	Brick	0,05								
D.	Dinding Dinding	1000,00	Brick	0,05								
E.	Dinding Dinding	1000,00	Brick	0,05								
F.	Dinding Dinding	1000,00	Brick	0,05								
G.	Dinding Dinding	1000,00	Brick	0,05								
VI. Dinding Dinding												
A.	Dinding Dinding	1000,00	Brick	0,05								
B.	Dinding Dinding	1000,00	Brick	0,05								
C.	Dinding Dinding	1000,00	Brick	0,05								
D.	Dinding Dinding	1000,00	Brick	0,05								
E.	Dinding Dinding	1000,00	Brick	0,05								
F.	Dinding Dinding	1000,00	Brick	0,05								
G.	Dinding Dinding	1000,00	Brick	0,05								
Summary												
Total Penyerapan Suara										0,788	0,788	
RT Ruang 1										0,788	0,788	
RT Ruang 2										0,788	0,788	

RT = 0,05

$$RT = \frac{0,05 \cdot V}{\Sigma a + \alpha V}$$

RT = waktu yang diperlukan bunyi yang berenergi berputar sekali dalam ruang (s) di dalam ruang
 V = volume ruang dalam feet kubik
 a = penyerapan suara total dalam RT
 α = koefisien penyerapan suara

Penyerapan suara

> Nilai yang menunjukkan penyerapan suara total dalam ruang

$$a = \Sigma S \cdot \alpha$$

a = jumlah luas permukaan (m²)
 α = koefisien penyerapan suara


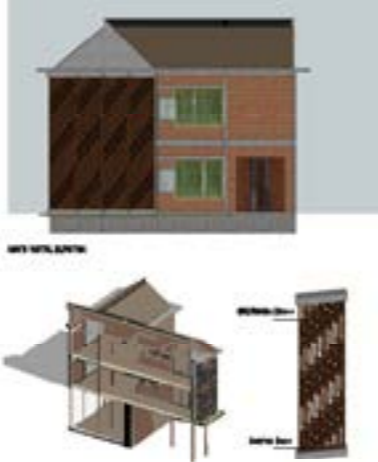
Dalam kondisi tertentu penyerapan suara diabaikan:


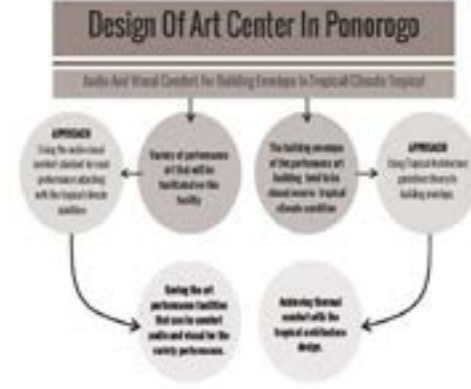

$$RT = \frac{0,05 \cdot V}{a}$$

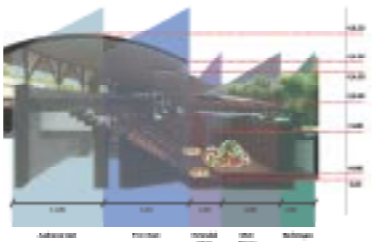
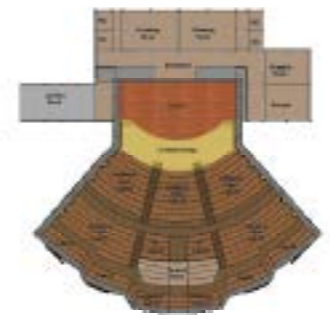
Figure 4.15 Reverbration Time Calculation
 Source :Author, 2021

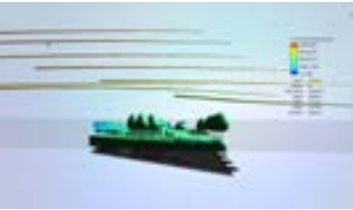
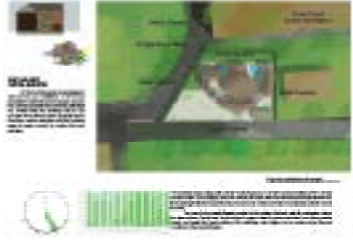
Based on the final results of the reverberation time calculation, the result of schematic design produces a number that successful in closed to the reverbration time standard because they achieved the reverbration time standard which is 0.788 that almost succesfull for the additional of the acoustic devices. Cause of the factor openness of the building the clarity from the rain can little bit distracting the performance.

Chapter 5 Design Evaluation Results

Jury	Comment	Responses	Detail	Page
Dr. Yulianto P. Prihatmaji, S.T., M.T., IAI, IPM	What is your most consideration in your design? Describe with your analysis and drawing.	<p>- The deepest part in the design is the application of the tropical building concept to this building, through the arrangement of the mass of the building against the direction of the sun, and the placement of a secondary skin on the facade area facing west Arabia. And the formation of mass based on the direction of the sun and its lowest angle. Design a mass that follows a single bank that is favorable for air circulation to enter and leave the building.</p> <p>- In the main function of the building, namely the main stage which is designed to meet the standards of 3 types of art, namely music, dance and wayang/drama performances. Audiovisual comfort followed by natural lighting and ventilation that can support and provide comfort for visitors.</p>	 <p>- In the site plan section, it can be seen that the mass placement is based on a radial shape which can reduce solar radiation. And the placement of the garden function between the building masses to meet the needs of wind circulation and this is based on the site analysis that has been carried out in chapter 3 and the attached sketches.</p>  <p>- For the building envelope using secondary skin which can represent local culture and as an image of Ponorogo, the jathilan batik motif is applied to the building envelope.</p> <p>- The shape of the roof is based on the principle of tropical architecture which has natural openings and ventilation to provide space for wind to enter the building freely.</p>	

Jury	Comment	Responses	Detail	Page
Dr. Yulianto P. Prihatmaji, S.T., M.T., IAI, IPM	Is there any difference between audiovisual comfort in tropical climate and sub-tropical climate? Describe more about that in your design	The basic difference when designing buildings in subtropical and tropical areas is the opening of the building. Because in a tropical climate the climate is the main factor in the initial design idea, giving the openings and thermal engineering in the building. And how designs in tropical areas tend to be semi-open, this follows natural resources that can have an impact on buildings such as wind and sun. And in subtropical areas tend to be closed.	 <p>In the study of precedents, it has been stated that the design of buildings in sub-tropical areas tends to be closed due to the winter season. Meanwhile, tropical areas tend to be open to maximize the entry of wind rotation and reduce solar radiation.</p>	34
	With read carefully your design report (specially page 10), how to design your project?	The first thing is the collection of primary data, namely from locations and interviews, then looking for solutions to problems through several sources, namely those that lead to solving problems that exist in the field. Then design based on regulations and look for alternative solutions using theories that have been searched in the field or from the internet.	<p>Already tell in the chapter 2 and 3 for the data and analysis</p> 	10, 11,12
	Show us how end user enjoy your building.	Visitors can enjoy the atmosphere of a tropical building that is designed naturally and directly into the building. which is comfortable for the disabled and as a shared public space that has a garden function to enjoy the beautiful atmosphere of green plants and in terms of the openness of the building.	 <p>And in the main stages that already provided for the audiovisual comfort for the audience to enjoy the main stages.</p>	60,62,63

Jury	Comment	Responses	Detail	Page
Dr. Ing. Putu Ayu P. Agustiananda S.T., M.A	How the stage configuration can be fit in for the 3 performance art that you try to provide in your design	From the drawing that already provided in DD Page number 22-24 already shown the basic requirements for the performances activity and scheme due the main stages. And already attached with the analysis about the basic requirements for the 3 kind of arts that will be provided in the main stages.	 <p>In the main stages area, the backstages and audience seats are separated between those above ground level and the backstages in the basement area. This adjusts to the loading dock area on the left area which is directly connected to the basement area in the office area.</p> 	Writing Products : 49-52 Ded : 22-25

Jury	Comment	Responses	Detail	Page
	Related to your tropical architecture concept how can you show the result from your design and prove it on the rawing!	<p>site analysis that has been carried out where the curved shape of the plan can reduce solar radiation during the day. The radial shape centered on the exit main stage serves to respond to noise pollution entering and leaving the building. And the provision of landscapes in the front and rear areas of the building serves to ward off sound from entering and leaving the main stage.</p> <p>The presence of water elements in the landscape can have an impact on the influence of thermal conditions during the day for the main stage area. And access to enter the mainstage area is a garden divider to create a fresher airflow in the main stage area and the provision of inner court in accordance with the tropical architecture concept can have an impact on controlling comfortable thermal conditions in the building.</p>	 	- Writing Products Chapter 2 Contextual Review And Site Review - Building Simulation page 25 - Writing Product Chapter 3 Page 47

References

- Ranti, S. (2000). Rumah Tropis. Jakarta: Penerbit Djambatan.
- Kalamang, M.I.D. (2010). Pengaruh Iklim Terhadap Bentuk dan Bahan Arsitektur Bangunan. Jurnal Peradaban Sains, Rekayasa dan Teknologi Sekolah Tinggi Teknik (SITTEK) Bina Taruna Gorontalo, 1(1), 1-10.
- Karyono, T.H. (2000), Mendefinisikan Kembali Arsitektur Tropis di Indonesia, Majalah Desain Arsitektur, vol. 1, April, pp. 7-8.
- Egan, M. David (1975), Concept in Thermal Comfort, London: Prentice-Hall International.
- Mangunwijaya, Y.B., (1988), Pengantar Fisika Bangunan, Jakarta: Djambatan
- Shidiq, S., 2016. Jenis-Jenis Pertunjukkan Ruang Seni
- Appleton, Ian. 2008. Buildings for the Performing Arts. London: The Architectural Press Ltd.
- Santoso., 2008. Panggung Pertunjukkan Seni
- John M. Echols dan Hassan Shadily. 1987. Kamus Inggris Indonesia. Jakarta:Gramedia
- Mill, Edward D. 1976. Planning, London: Newness-Butterworth
- Doelle, Leslie E. 1990. Akustik Lingkungan. Jakarta: Erlangga
- Mediastika, Christina E. 2009. Material Akustik Pengendali Kualitas Bunyi pada Bangunan. Yogyakarta: Erlangga.
- Burris-Meyer, Harold. 1964. Theatre And Auditorium. Reinhold Publishing Cooperation.
- Ernst, Neufert. (1991). Data Arsitek. Jakarta: Erlangga. Ching, Francis