Final Architectural Design Studio

DESIGN OF

Recreational Inland Port of Banjir Kanal Timur Semarang

WITH BIOPHILIC DESIGN APPROACH

A Re-vitalitation of Banjir Kanal Timur
as Water Transportation Route

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INTERNATIONAL UNDERGRADUATE PROGRAM IN ARCHITECTURE

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VALIDATION SHEET

Final Architectural Design Studio entitled :

Design of Recreational Inland Port of Banjir Kanal Timur Semarang with Biophilic Design Approach

Perancangan Pelabuhan Rekreasi Pedalaman Banjir Kanal Timur Semarang dengan Pendekatan Biophilic Design

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STATEMENT OF AUTHENTICITY

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Title : **Design of Recreational Inland Port of Banjir Kanal Timur Semarang**

I hereby declare that this design work is the result of my own work and is not the result of plagiarism and does not contain any work that has been submitted for a bachelor's degree at a university or has been published by another person, except in writing referred to in this manuscript and mentioned in the list reference.

Yogyakarta, December 3rd, 2021
Author

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FOREWORD

Praise and gratitude to Allah SWT for His mercy and grace so that the author can complete design and writing entitled "DESIGN OF RECREATIONAL INLAND PORT OF BANJIR KANAL TIMUR SEMARANG WITH BIOPHILIC DESIGN APPROACH". This design work was written to fulfill part of the requirements to obtain a Bachelor of Architecture degree at the Faculty of Civil Engineering and Planning Universitas Islam Indonesia.

The writing of this design work would not have been possible without the help of many people. Therefore, the authors would like to thank to:

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The author is fully aware that this work is not completely perfect. Therefore, all constructive criticism and suggestions for perfection are highly expected. Hopefully this Architectural Design Studio Final Project can be useful for the author and everyone.

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Premise.

Banjir Kanal Timur is one of the second largest canals in Semarang City which acts as a flood controller. Downstream which is not far from the Tanjung Mas port and upstream which is located in the center of Semarang City and the canal route that passes through several tourist destinations in Semarang makes the Banjir Kanal Timur a potential water transportation route that connects the city center, several tourist destinations, and the main port, namely Tanjung Mas. To accommodate this plan, an Inland port is needed which can also act as a tourist destination. Meanwhile, lately the issue of mental health has become more attention to the public. Quality of life does not only come from a healthy body, a healthy state of mind and mentality also greatly influences the quality of a human being doing all his activities. The most common mental problem is depression caused by work-related stress. While architecture can help people to reduce the burden of stress. With a biophilic architectural approach that has an effect on human psychology, one of which is stress relief. Therefore, with a design of recreational inland port with a biophilic architectural approach, it is hoped that it can help solve this problem.

keywords: inland port, tourist destination, biophilic design, stress relieving

Contents.

01 Design Brief.

1.1.1 Lack of Green Space in The City

As the capital city of Central Java, Semarang is the city with the fifth highest density in Central Java. Even though it is a big city, there are still many Semarang City facilities that do not meet the standards. One of them is public green space. The function of green in a city's green space is a balance between air and the natural environment. More than that, there are still many functions of green open space, including aesthetic functions that are useful as a source of recreation and a forum for socializing the community.

The number of green open spaces in Semarang is very uneven, suburban areas with low population density such as Gunung Pati and Mijen Districts have a lot of green open space. Meanwhile, areas with high population density, such as North, West, East, South and Central Semarang Districts have little green open space. The city of Semarang itself has 64 active parks, but only 10 have a capacity of 1.5m2 per person (Arifiyanti, H.N., 2014).

The lack of public green space in urban areas is a factor in the high life pressure felt by the community, especially in urban areas. Therefore, the availability of public green space in cities, especially in urban areas, is very necessary. In addition to functioning as a place for people to socialize and have recreation, public green spaces become a place to rest to seek fresh air in the midst of busy activities in the busy city center, in public green spaces people can relieve fatigue after hard work at a very low cost. In addition, the existence of public green spaces in urban areas is an effective solution in improving the quality of the urban environment, where the greatest impact is the effect on comfort, health, as well as aesthetics and environmental sustainability.

Figure 1 *Green Space Map of Semarang*
Source: Prasetyo, Gunawan, Maksum (2016)

1.1.2 Banjir Kanal Timur Then and Now

During the Dutch colonial period, the Banjir Kanal Timur had an important role in the development of the city's government and economy. Semarang has long been known as a bustling port city with domestic and international traders. Apart from having a variety of natural resources that attract traders, Semarang is also in a strategic position on the trade map of the archipelago. One of the major developments in developing Semarang as a port city was the construction of a canal connecting the Java Sea with the hinterland city. Although large ships could not sail through the canals, small boats and boats were still common in Semarang until the 1930s. In addition to the colonial government, several companies located on the banks of the river also carried out dredging so that ships and boats could be pulled over in their trading areas. If the location of the company and its warehouse is near a river or canal, usually ships with large tonnages will wait around the Tanjung Mas port, then their shipments to the warehouse will use smaller ships (Waloejono, 2015).

Meanwhile, the condition of the Banjir Kanal Timur is now neglected. The canal became shabby, some spots could be found piles of garbage which then became a source of unpleasant odors. This not only disturbs the view and smells bad, it is also bad for the health of local residents around the canal. The villages around the canal were also affected and became slum areas.

In 2017 the Semarang City government held a plan to normalize the two largest canals in Semarang, namely the Banjir Kanal Timur and the West Flood Canal. The normalization began with the West Flood Canal which is now one of the tourist attractions for local residents. This normalization has a good impact on the residents and the environment of the City of Semarang. From a slum environment, residents have new tourist attractions, and urban flooding, which is an annual problem, is reduced. This good impact will be felt even more if the normalization of the Banjir Kanal Timur is completed.

Figure 2 *Banjir Kanal Timur in Colonial Era*
Source: Seputarsemarang

Figure 3 *Banjir Kanal Timur 2021*
Source: Author

1.1.3 Tourism Sector Development

Tourism is one sector that plays an important role in advancing city autonomy which requires the development and utilization of resources and tourism potential in the city. The tourism sector is currently being promoted by the Semarang City Government. Various efforts have been made, such as revitalizing the Old City, creating culinary places, arts, and community empowerment as the government's efforts to make Semarang City a Tourist Destination City and not just a Transit City. Currently, the development of the tourism sector in Semarang is still in the development plan for the city of Semarang. If it is related to tourism, according to Arnould & Price in Aulia Afifah Nur (2017) rivers or canals are one of the elements that have the potential to be developed as tourist objects and attractions.

Based on the Semarang City Strategic Plan (RENSTRA) 2016-2021. The Semarang City Development Goals for 2016-2021 have an overview of the expected results from the goals set by the Semarang City Culture and Tourism Office carrying out the following tasks and functions:

1. Improving the quality and quantity of human resources in the tourism business
2. Increase the number of foreign and domestic tourists visiting
3. Improving tourism marketing development
4. Improving the institutions and stakeholders that organize tourism

1.1.4 The High Level of Work Stress

According to CNN Indonesia, a study has been conducted to calculate the number of sufferers from work stress in Indonesia, the results show that 75% of the Indonesian population experience stress due to work. Even more ironic, this figure is lower when compared to other countries such as Singapore and Thailand which have an average work stress level of 91%. While we know very well that stress has a bad effect on both body and mental health.

Some of the effects of work stress are:

- Physical aspects are increased cholesterol, and coronary heart disease blood pressure.
- Psychological aspects are moody, low trust and irritability, job dissatisfaction.
- Organizational aspects are tardiness, low work performance, and absenteeism. (Gitosudarmo, 2000)

AGE RANGE	NUMBER OF PEOPLE
0 - 5	9,028
6 - 16	14,634
17- 25	15,459
26 - 55	27,264
>55	7,674

Table 1. Age Demography
Source: kecgayamsari.semarangkota.go.id

From the data above, it can be concluded that the majority of the population of Gayamsari District is 26-55 years old where that age is of productive age. According to Ekundayo (2014), the combination of various stressors (stressors at work and outside the workplace) can cause stress, affect morale and reduce work quality. The effects of stress will be more pronounced in workers aged 45 years and over.

1.2.1 Problem Formulation

Backgrounds

1. Lack of green public space in urban area
2. Banjir Kanal Timur
3. Tourism sector sevelopment
4. High level of work-stress

Non-architectural Issues

1. Abandoned and slum East Canal Flood
2. Locals dominated by people with productive age who are dealing with work-stress
3. Semarang need tourism destination development

Architectural Issues

1. Need an Inlnad Port so the canal can be used as water transportation route
2. People need place to release their work-stress
3. Need a recreational place

Formulation

How to design recreational Banjir Kanal Timur inland port with biophilic design approach?

1.2.2 Problem Statement

General Problem

How to design Banjir Kanal Timur Recreational Inland port with biophilic design approach?

Objectives

1. Design an Inland port with efficient circulation for users
2. Design a recreational Inland port
3. Design spaces which help people to release their work-stress

Specific Problems

1. How to design an Inland port integrated into a tourism destination?
2. How to design an Inland Port with efficient in distance, and comfortable circulation?
3. How to design relieving stress spaces with biophilic design concept approach?
4. How to design a tourist attraction along with biophilic design concept?

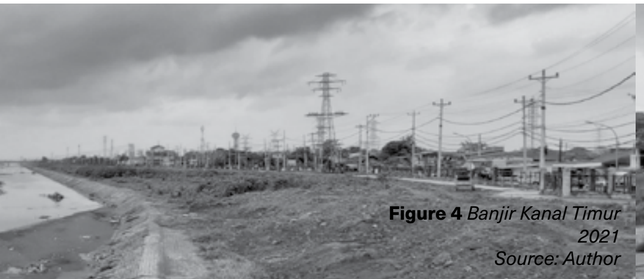


Figure 4 *Banjir Kanal Timur 2021*
Source: Author

Figure 5 *Banjir Kanal Timur 2021*
Source: Author

Figure 6 *Banjir Kanal Timur 2021*
Source: Author

1.3 Design Method

1 Problem Identification

2 Data Collection

3 Analysis

4 Design Strategy

5 Schematic Design

6 Final Design

7 Design Evaluation

1. Problem Identification

Identifying the problem is a first step in planning, an attempt to define and understand the planning problem.

2. Data Collection

At this stage, the efforts made were to collect data through precedent studies, field observations, and literature studies. The data can be divided into two, namely primary data and secondary data. Primary data is data obtained directly from sources of information, primary data can be obtained through surveys and observations. While secondary data is data that comes from the results of research that has occurred, secondary data can be obtained through literature studies from websites, journals, and books.

3. Analysis

The analysis stage is where integrated observations are made based on the problem, design theme, and certain criteria according to the object analyzed by the author. The objects analyzed are building users and site users, site conditions, building functions, space analysis both inside and outside the building, building structure analysis, building form, and utility analysis.

4. Design Strategy

At this stage is where the author generalizes ideas in the form of responses from the results of the analysis that has been done previously. The result of this stage is a solution to the problem that has been summarized in the form of a design.

5. Schematic Design

This stage is the development of a strategy or idea concept. Generate schematic images which are usually 2d and 3d images, and use BIM assistance in the process.

6. Final Design

At this stage, the schematic design is then continued and developed into more detail. This stage is the final stage of the design process, refinement to design details so that all aspects of the building are more visible.

7. Design Evaluation

This stage is the last stage of the entire design process. The final design is evaluated to determine whether the design objectives have been achieved, and whether the design results have resolved the problem.

Route Plan

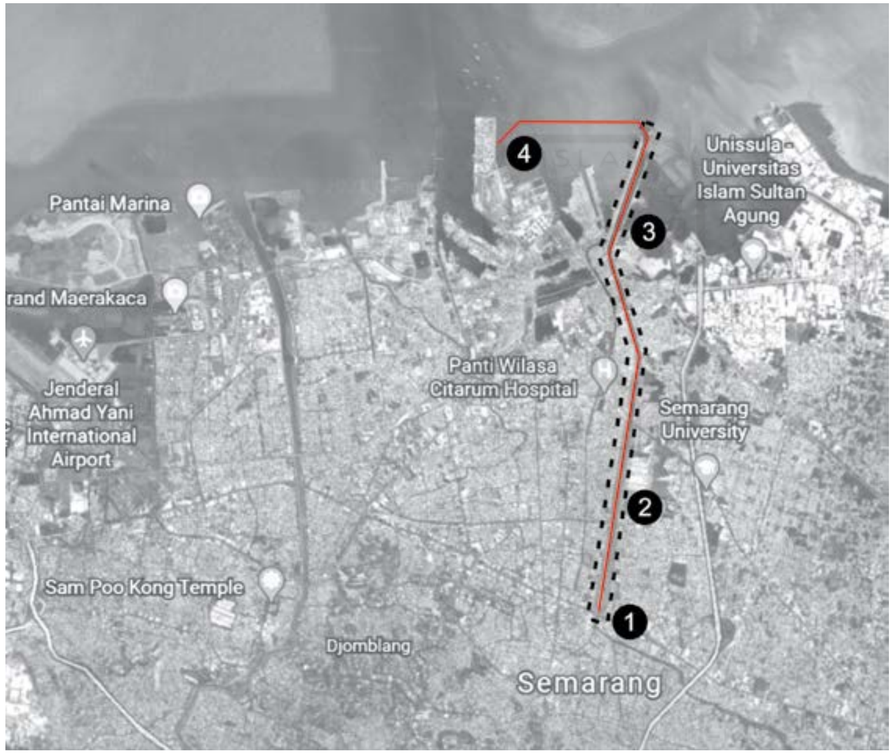


Figure 7 *Vessels Route*
Source: Author

1 **Banjir Kanal Timur Bridge Dock**
Jl. Majapahit, Kalicari, East Semarang

- 1.8km away from Simpang Lima via Jl. Semarang - Purwodadi
- 350m away from the nearest bus stop via Jl. Brigjend Katamso
- 1.24km away from Gayamsari highway gate via Jl. Majapahit

2 **Inland Port**
Jl. Banjir Kanal, Sambirejo, Gayamsari

- 400m away from Great Mosque of Central Java via Jl. Pintu Masuk Selatan
- 3.9km away from Semarang Old Town via Jl. Citarum
- 300m away from Johar Market Relocation Site via Jl. Pelabuhan Ratu
- 600m away from the nearest bus stop

3 **Tambakrejo Dock**
Jl. Penjaringan I, Kemijen, East Semarang

- 1.6km away from TPI Tambakmulyo via Jl. Tambakmulyo
- 1km away from Mangrove Edupark Tambakmulyo via Jl. Tambakmulyo

4 **Tanjung Mas Port**
Jl. Coaster Tanjung Mas, East Semarang

Title : La Línea Borrosa
Designer : Patrick Cordelle
Project Year : 2015
Similarity : Recreational port with connecting pedestrial bridge to a plaza
Difference : Building main purpose and the design approach

Figure 8. *La Linea Borrosa*
Source: Archdaily

Title : Jewel Changi Airport
Architect : Safdie Architects
Project Year : 2019
Similarity : Transportation hub mixed use with tourism attraction and destination
Difference : Building main purpose and the design approach

Figure 9. *Jewel Changi*
Source: Dezeen

Title : Singel Canal
Construction : 1601-1603
Similarity : Canal functioned as water transportation in the city
Difference : Flood control is not the purpose of the canal

Figure 10. *Singel Canal*
Source: Wikipedia

02 Design Preliminary.

Semarang City

Geography

Semarang City is the capital city of Central Java Province. Located at the crossroads of the north of the island of Java that connects the city of Surabaya and Jakarta. Semarang is also located in the Joglosemar triangle (Jogja, Semarang, Solo). Due to its very strategic location, Semarang City is often used as a transit city for motorists from Jakarta to Surabaya, or to Jogja and Solo, and vice versa. With an area of 373.7 km2, Semarang City borders the Java Sea, Demak Regency, Semarang Regency, Kendal Regency, and Grobogan Regency.

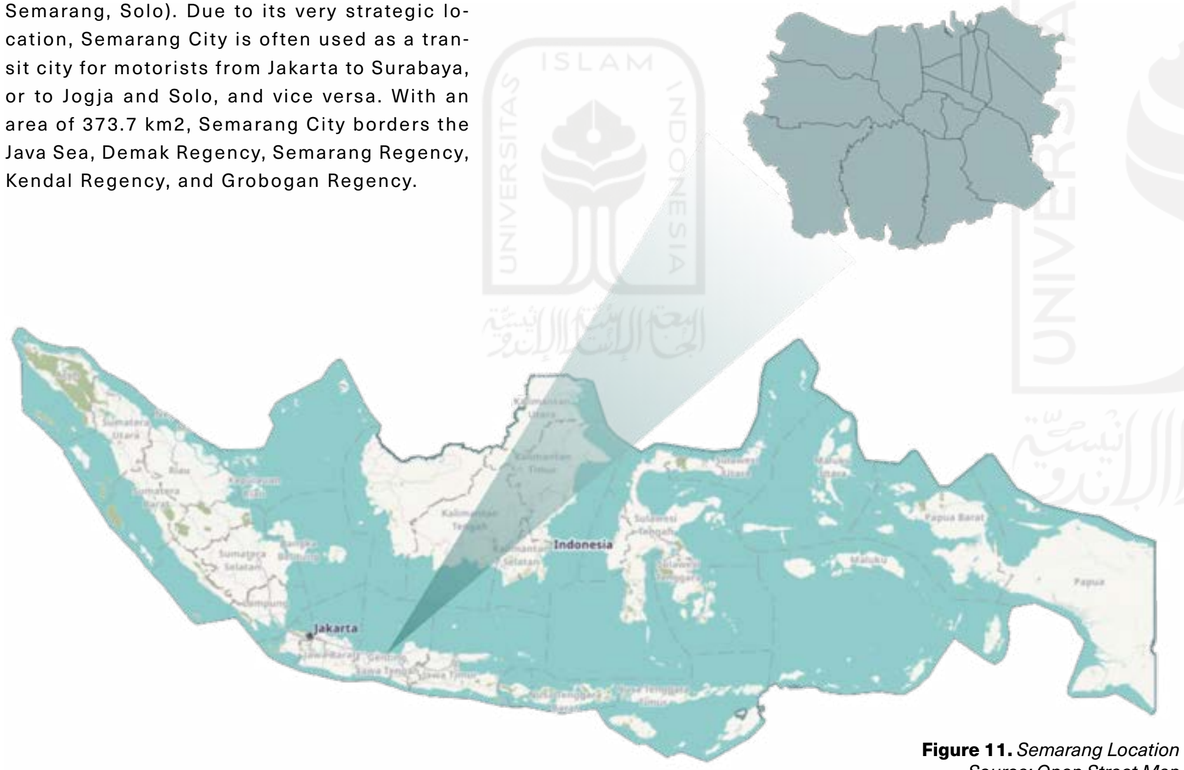


Figure 11. *Semarang Location*
Source: Open Street Map

Topography

The topography of the city of Semarang consists of lowlands, beaches, and hills. The coastal area of Semarang is located in the north which is directly connected to the Java Sea. The coastal area has a slope of between 2-15%, while the hilly areas in the south have a slope of between 15-40%, and in some urban areas it has a slope of more than 40%.

Climate

Based on the geographical location of Semarang City, this area has 2 tropical climates that are influenced by monsoons with 2 seasons, namely the dry season which occurs between April-September and the rainy season which occurs between October-March. While the average annual rainfall is 2.79 mm, the temperature ranges from 23 to 34 degrees Celsius. Humidity conditions in Semarang and its surroundings are on average 77% yearly.

Figure 12. *Semarang Topography Map*
Source: Rizki, Imam Wahyu (2016)

The site is located in Gayamsari District, which has 526.33 hectares and is roughly 5 kilometers east of Semarang City. The terrain rises to a height of 3.4 meters above sea level. Gayamsari District is included in the City Area (BWK) V, which is used as a mixed settlement (trade and office services) and industrial agribusiness, according to the Semarang City Spatial Plan based on the Semarang City Regional Regulation Number 1 of 1999 concerning the Semarang City Spatial Plan. You may claim that this sub-district is one of Semarang's primary economic support structures.

The Gayamsari District has the following administrative boundaries:

- The Gayamsari District has the following administrative boundaries:
- The northern portion is bordered by Genuk District
- The western part is bordered by East Semarang District
- The southern part is flanked by the District of South Semarang
- Pedurungan District borders the eastern half.

Gayamsari District has a population of 75,181 people, with 37,481 women and 37,700 men. Meanwhile, with 18,191 workers, industrial and construction workers dominate the livelihoods of citizens in Gayamsari District. With 16,962 residentxwxws, the last education of Gayamsari District residents is dominated by high school graduates or equivalent.

Figure 13. *Gayamsari District Map*
Source: Google Map (2021)

Building Regulations

Peraturan Daerah Kota Semarang No BCR 6 Tahun 2004 regarding the Detail of Semarang City Spatial Planning (RDTRK) 2000-2010 governs the planning of physical buildings and their boundaries in Industrial, Commercial, Public FAR Facilities, and Residential Areas. The 3.6 regulation reads as follows:

1. BCR (Building Coverage Ratio) of 60%
2. FAR (Floor Area Ratio): 3.6
3. GCR (Green Coverage Ratio) is set at 20%.
4. The building setback from the secondary collector street is 17 meters GCR.
5. The distance between the building and the canal embankment: 3 meters

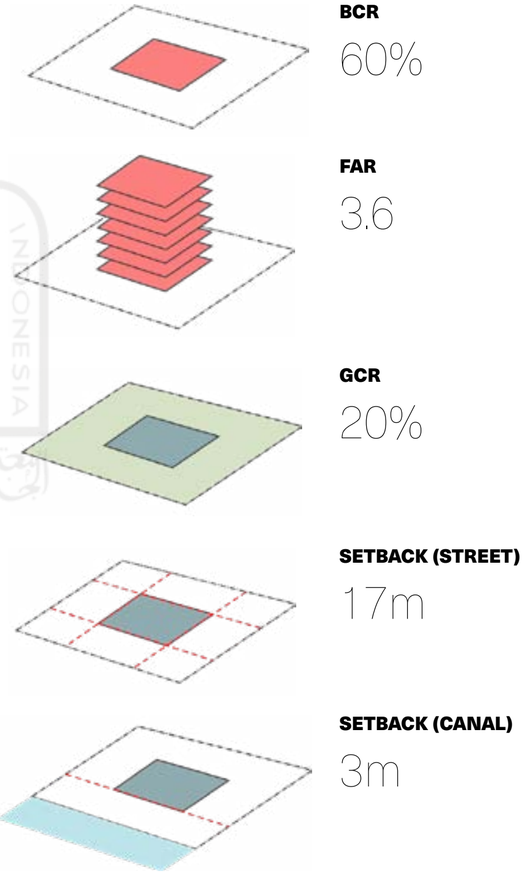


Figure 14. *Building Regulations*
Source: Author

Site

Address : Jl. Banjir Kanal, Sambirejo, Gayamsari
Area : 86,454 m^2

The site is densely inhabited and has a land size of roughly 86,454 square meters, which is thought to be sufficient for the inland port's location. With direct access to the secondary collector road, it is intended that local people and tourists will find it simple to reach the inland port from this location. The Inland Port, which is being built just west of the Great Mosque of Central Java and south of the Pasar Johar relocation site, is intended to boost the number of market and mosque visitors.

Vista

View

Figure 15. *Site View and Vista*
Source: Google Street View

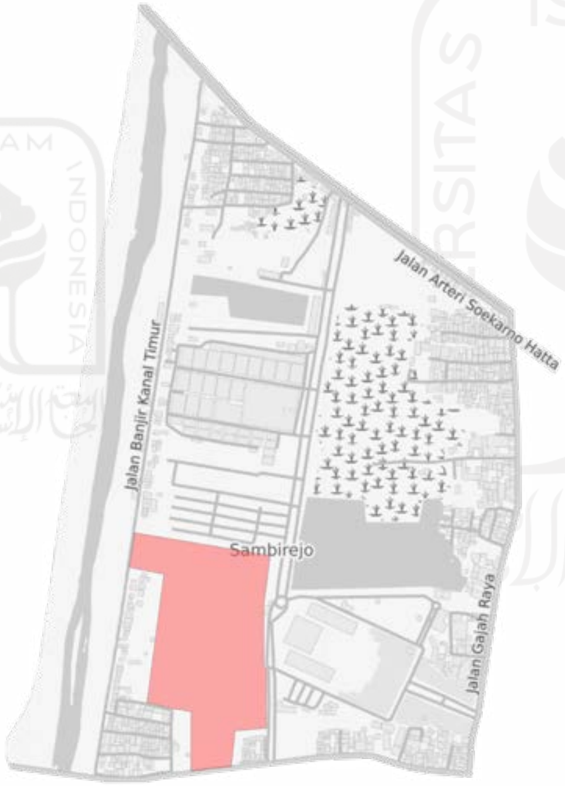


Figure 16. *Site Map*
Source: Google Maps (2021)

Canal

After the West Canal Flood, the Banjir Kanal Timur is Semarang's second-largest canal and serves as a flood control system. The Banjir Kanal Timur was used as a water transportation channel during the Dutch colonial era. However, in 2021, the canal has numerous locations with mounds of garbage and silt deposits that obstruct water movement and cause the canal to become shallow. This causes issues for the city, like flooding and slums. The government also took action by putting together a canal modernization plan. Cleaning the garbage and churning up the soil material in the canal is the strategy employed.The Banjir Kanal Timur's current status (2021) is depicted on the left, while the canal's condition according to the government's plan is depicted on the right.

According to Ma'rruf (2015), the canal condition after normalization would be:

- the water level after normalization is around + 3.57m
- the base elevation of the bridge is around + 8.33m
- free space is at 4.76m

Figure 17. *Banjir Kanal Timur 2021*
Source: Author

Figure 18. *After Normalization Plan*
Source: Ma'rruf (2015)

2.2.1 Typology

2.2.1.1 Inland Port

A port can be defined as a harbor or an area that shelters many boats and vessels (transferring people or cargo) and allows continuous or periodic shipment transactions. A port, according to Layman, is a location where ships can be loaded and unloaded. It is, technically, a point of convergence between freight circulation zones. Ports are the catalysts that kick-start a region's social and economic development by facilitating trade and serving as a social center. Ports are also a key source of employment, as they employ a large number of workers.

An inland port is a port located on an inland waterway, such as a river, lake, or canal, that is connected to the sea or not. The word "inland port" can also apply to a dry port, an inland seaport expansion usually connected to the docks by rail. The inland port in this example is the dock of a tourist boat that anchors along the Banjir Kanal Timur on its way to the ancient town.

The port is in charge of a waterfront that is public land held in trust for the people, and it is tasked with developing this water and land for the public good. Economic benefits to the public include the port's management of water and land for fishing, boating, public recreation, coastal access, healthy ecosystems, and the port's care of water and land for fishing, boating, and public recreation coastal access, and healthy ecosystems.
(Wikipedia, 2021)

General Provisions

1. In the form of terminals and berths equipped with ships, a port consists of land or waters with specified boundaries utilized as a place for government and business activities used as a place for ships to dock, board, and unload cargo. Facilities for shipping and port support activities and a location for intra- and intermodal transportation transfers.
2. A port is everything linked to the performance of port functions to support the smooth, secure, and orderly flow of ship, passenger, and cargo traffic, sailing safety and security, intra-and/or intermodal movement points, and continually promote the national and regional economy. Pay close attention to local laws.
3. River and lake transportation is a mode of transportation that uses ships to move passengers and commodities through rivers, lakes, reservoirs, marshes, floods, canals, and canals operated by river and lake transportation companies.

2.2.1 Typology

2.2.1.1 Inland Port

Type

Load center
A Load Center allows access to regional manufacturing and consuming markets from port terminals. This is the most typical transport function of land terminals, where merchandise is stacked or unwound along a corridor. As a result, the land terminal serves as a hub for the land transportation distribution system. (Rodrigue, Debrie, Fremont, Gouvernal, 2010)

Pier/Dock

Quay Wall
It consists of a structure parallel to the coast, in the shape of a beach wall, that can be erected using various construction methods, such as steel/concrete sheet piles, concrete caissons, or open-filled structures.

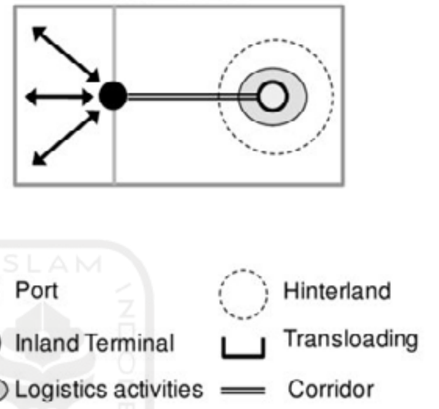


Figure 19. *Inland Port Typology*
Source: Rodrigue, Debrie, Fremont, Gouvernal (2010)

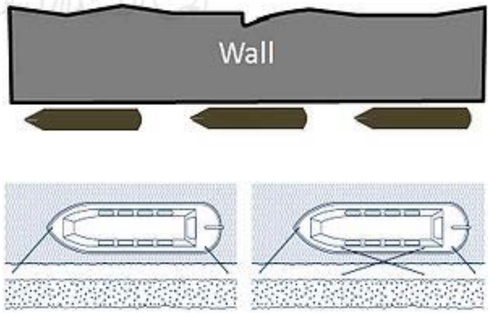


Figure 20. *Dock/Pier Typology*

Dock Studies

A ship's operation is inextricably linked to its supporting infrastructure, one of which is the dock. The pier is a port structure used to dock and moor ships loading and unloading commodities and passengers. The type and size of the ship moored at the port determine the shape and dimensions of the pier.

1. The pier elevation is determined by the river's water level. Pier A's floor elevation is 1.42 meters, whereas Pier B's is 2.6 meters.
2. The pier's length has been determined to accommodate two 19-meter-long ships.
3. The pier's breadth is extended by 7 meters to accommodate the loading and disembarking of people from the ship to the stop and vice versa.
4. The pier includes a 120 mm floor plate construction, 200 mm x 300 mm beam, 400 mm Dluar piles, and dock supporting facilities such as cylinder rubber fenders and 200 mm x 250 mm concrete boulders.

(Ma'rruf, A., 2015)

2.2.1 Typology

Main Facilities

Passenger Terminal
A place to wait before the ship leaves, a way to move from inland water transportation to road transportation, and a way to coordinate the arrival and departure of public transportation.

Load Weight Measurement
Controlling overloading and determining the cargo size carried by ships in coastal waters.

Bridge
Passengers exiting and entering the ship.

Offices
For government-related activities and services like ticket sales counters.

Fuel Storage
For ship use, there are fuel storage facilities.

Supply chain functions

The first layer of the inland port's transportation duties serves various supply chain functions that involve added value on the cargo.

Light transformations
Various product and package modifications meet national, cultural, or linguistic market needs, such as packaging, labeling, or customization. An inland port can be utilized to improve supply chain management flexibility by being closer to final customers.

Postponement
A type of inventory management in which a ground terminal allows deliveries to be directed based on last-minute and last-mile factors by using available waiting times. Inland ports act as a supply-chain buffer, resembling "warehouse-based criminalization" (Rodrigue and Notteboom, 2009). Large merchants with shop systems, who use inland ports to "fine-tune" their distribution, are particularly prone to this technique.

Port Activities

The passenger terminal contains several facilities with a relatively high degree of circulation needs due to its function as a container for the activities of the passenger transfer process. Humans and commodities impact the activities that take place in the terminal, which include (Andiani, 2011):

1. Passengers are split into domestic and tourist passengers who carry out embarkation activities, such as departing from the passenger terminal, and debarkation activities, such as arriving or departing from the passenger terminal.
2. Escort services
3. Terminal employees, i.e. those who are directly accountable for the operational and administrative state of the terminal.
4. Employees of service companies, specifically those who do operational tasks in the passenger terminal, such as ticket sales and distribution.
5. Government employees, mostly in the health, law, and justice sectors (immigration and emigration).
6. The luggage has the following items:
    1. Items that are carried on
    2. Concerns about luggage
    3. Traveling with luggage
    4. Transport of goods

2.2.1.2 Building Circulation

The presence of a significant number of passengers and cargo in this passenger terminal necessitates careful consideration of the passenger terminal's circulation architecture. This is important for multiple operations to function smoothly and efficiently without causing any misunderstanding or cross-over. A well-designed passenger terminal building circulation system can even improve the port's function as a regional gateway. Circulation is a traffic or movement pattern in a space or building that allows for flexibility, economy, and functionality (Cryill, 1975). The achievement, the entry, the circulation pattern, the circulation path, and the layout of the circulation area are all aspects that determine the successful design of a circulation (Ching, 2000).

- How to Reach

The process of traveling (approaching) a building via road access provided or already existing is referred to as the route to reach a building (Ching, 2000).

Direct Reachment

A direct reachment approach uses a straight path parallel to the building axis to travel directly to the entrance point. The visual aim of this attraction is obvious; it might be the complete facades of a building or an extension of the plane's entrance.

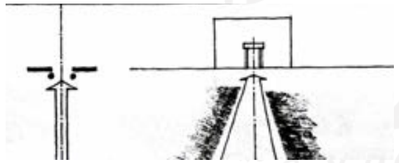


Figure 21. *Direct Reachment*
Source: Ching (2000)

Indirect Reachment

This indirect reachment offers the front facade and the structure's shape directed at a sense of perspective.

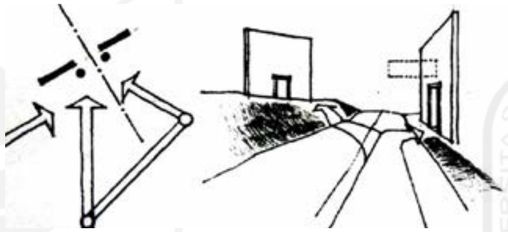


Figure 22. *Indirect Reachment*
Source: Ching (2000)

Spiral Reachment

This spiral-shaped delivery path takes a longer time to complete than other achievement paths. This way invites the path user to circle the building to see it in three dimensions.

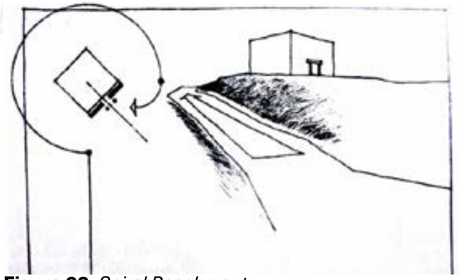


Figure 23. *Spiral Reachment*
Source: Ching (2000)

2.2.1 Typology

- Circulation Pattern

According to Ching (2000), the circulation pattern is required to maximize mobility from one room to another. Circulation patterns can also be used to enhance a building's or space's aesthetics.

Linear Pattern

A circulation pattern takes the form of a line with a direction and can be used to build a row of spaces. Because of its widespread use, this motif appears frequently. The linear pattern at the entry point is designed to clarify the direction that visitors are pointing, let visitors feel the direction of movement so that they can sense the movement, and offer visitors direction.

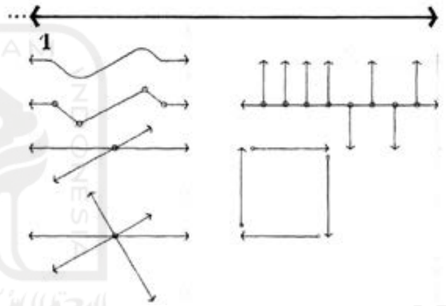


Figure 24. *Linear Pattern*
Source: Ching (2000)

Radial Pattern

The spread or development of a focal point creates a circulation pattern. This radial layout usually offers a lot of wiggle room. This pattern allows visitors to move in whichever direction they wish, making it easy to go to the two different regions. This allows visitors to do activities without having to cycle or pass through certain rooms.

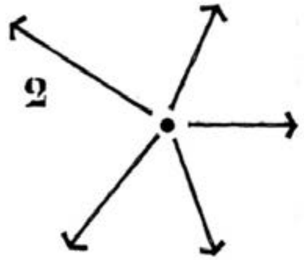


Figure 25. *Radial Pattern*
Source: Ching (2000)

Spiral Pattern

This path consists of a single path that begins at a central point and extends in a circular pattern, circles the center point, and returns. When compared to other patterns, this one delivers more mileage. Provides a circulation flow that surrounds a central location and provides a certain sensation.

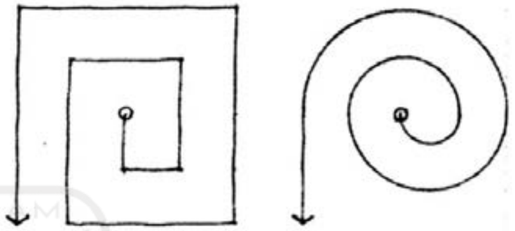


Figure 26. *Spiral Pattern*
Source: Ching (2000)

Grid Pattern

It comprises two intersecting parallel pathways that grow in all directions and have no central point. It creates a square or rectangular space. This structure allows the user to investigate different points along different journeys.

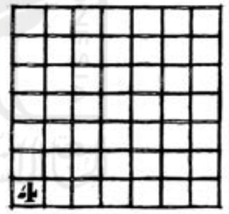


Figure 27. *Grid Pattern*
Source: Ching (2000)

Network Pattern

It's made up of pathways that connect points in space and can adapt to changing situations. Patterns that are more adaptable and often asymmetrical.

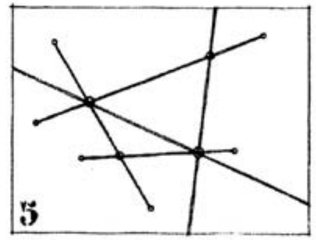


Figure 28. *Network Pattern*
Source: Ching (2000)

- Circulation Space Shape

The shape of the circulation area can be classified as closed, open on one side, or open on both sides, according to Ching (2000).

Closed Circulation Room

The closed circulation area functions as a public gallery or private hallway, connecting the spaces via wall plane openings. When traveling to the specified place, this confined circulation generates a high enough sensation of security, giving the image of seclusion.

Figure 29. *Closed Circulation*
Source: Ching (2000)

Open Circulation Room on One Side

On one side, the open circulation space transforms into a balcony or gallery, creating visual and spatial continuity between the spaces it connects. It provides visual and spatial continuity across the places it connects and allows officers to serve guests.

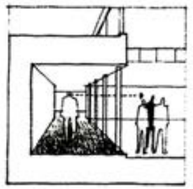


Figure 30. *Open Circulation on One Side*
Source: Ching (2000)

Open Circulation Space on Both Sides

The corridor, which becomes a physical extension of the area it penetrates, is formed by the open circulation space on both sides, forming a row of columns for the tunnel. This strengthens the functions of the two places as points of contact for clients.

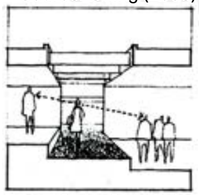


Figure 31. *Open Circulation on Both Side*
Source: Ching (2000)

- Circulation Path

According to Ching (2000), the circulation path is the movement or range of motion of a space linked to function, shape, and other factors.

Through Space

The circulation path through space is a movement or range of motion that connects locations. Visitors can easily access the allocated locations using this circulation path, free of interruptions from activities in the circulation path.

1. Maintain spatial consistency (space integrity, without disturbing other spaces)
2. Displays available space (paths, passageways)
3. Connecting one room to another
4. Using variable road designs, maintain the unity of the existing rooms.

Penetrating Space

Circulation through space is a movement or range of motion that connects one location to another by passing through or through other spaces. As a result, travelers are compelled to pass through particular areas, such as commercial areas. As a result, the commercial space will always be packed.

1. A space's circulation can be continuous along its axis, slanted, or along one side.
2. Circulation can create a pattern of activity and mobility in a given location.

Ends in space

The circulation that finishes in space is a movement or range of motion that serves as a focal point for access to essential linking places and concludes in one space. The purpose of this circulation channel is to direct.

1. The room's layout creates a circulation path.
2. In most cases, circulation comes to a halt in the meeting room.
3. Impression, both functional and formal
4. There is usually only one access road.

2.2.1.3 Spatial Efficiency

According to Ching (2007), Circulation is a line of movement that serves as a sensory linking factor between the areas of a building or a sequence of any outdoor or interior spaces. According to Todd (1987), there are three types of achievement or circulation: straight without impediment, turning, and dodging. Meanwhile, in terms of efficiency, a straight path with no blockage is more effective and efficient in circulation.

Efficiency Distance Achievement

Pynkyawati T. (2014) claims that everyone's walking speed varies depending on various elements such as age, gender, walking time (day or night), air temperature, the purpose of the trip, reactions to the surrounding environment and others. Robert B. Sleight writes in his book The Pedestrian, Human Factors In Highway Safety Traffic Research that the average walking speed for adults and older individuals is shown in the table below:

Adult walking speed	M/Min.	Feet/Min.	Km/H
	84	4.5	4.3

Table 2. *Adult Walking Speed*
Source: Pynkyawati (2014)

Time Efficiency of Achievement

Time is the collection of moments during which a process, activity, or state exists or occurs. In this situation, the time scale refers to the distance between two states or events, or it can refer to the duration of an event. Because of the disparities in the activities and the ways to achieve them, the time achievement reached for both the Inland Port and the Indoor Park buildings can have different results. In this scenario, not all persons will travel to the Inland Port, and not all individuals will go to the Indoor Park. (Pynknyawati, 2014)

Application of Circulation Elements

A sign (signage) is a message or information that occurs consecutively or consistently about important signs and provokes a response in humans," says Lawrence K. Frank. A sign appears consecutively or frequently, but the meaning of this consecutive or regular occurrence is not described further. Hence it will not be considered in the interpretation of a sign for the time being.

Signage, as a fundamental feature that serves as a primary form of communication between humans in a structure or environment, has several significant components. These features will contribute to the sign's overall appearance or physical appearance and the successful delivery of the sign's message.
(Pynknyawati, 2014)

Determinants of Spatial Efficiency

According to Pynkyawati (2014), the following are some of the determining criteria utilized in the preparation of space needs for an efficient spatial arrangement:

- Relationships between activities are viewed from a spatial perspective.

The spatial approach method, which formulates the closeness of activities in composing space based on the relationship between activities, is used to group the items.

- The space approach is based on the demands of the space requirements' dimensions.
- A spatial method based on grouping that includes:
  a. space function grouping
  b. space character grouping

Determinants of Spatial Comfort

On the market is spatial comfort, with a focus on the visual aspects of space. The following elements are considered while defining the level of service to spatial comfort:

- Aspects of user behavior that demand space
- The comfort component of space perception
- Aspects of space accessibility

(Pynkyawati, 2014)

2.2.1.3 Spatial Efficiency

Spaces Programming

The following are some of the determining elements that are employed in the production of spatial requirements with an efficient spatial market arrangement:

- Spatial approach between activity relations

The spatial approach method, which formulates the closeness of activities in composing space based on the relationship between activities, is used to group the items.

- Spatial approach based on the demands of the dimensions of the space requirements
- Spatial approach based on spatial criteria grouping

Space Function Zoning

The partition of an area into various zones based on its original uses and characteristics or intended for the growth of other functions is known as zoning. The partition of zones based on spatial usage control, which refers to activities in the zone, is known as function zoning.

Circulation

Efficiency is the precision with which a method (effort, work) is used to complete a task (without wasting time, effort, or money), efficiency, efficiency. In this approach, space efficiency refers to the effective utilization of space in terms of both activity and time. In the field of architecture, the term “efficiency” is frequently used. The most efficient use of space in terms of activities is to place them according to their location. Time-based efficiency refers to the efficient use of space at different day periods (morning, afternoon, evening).

Users, such as vehicles and pedestrians, are normally distinguished from the circulation system. The circulation system is the most important aspect of a building’s layout. The following are examples of benchmarks or determining factors used in the preparation of the circulatory system:

Vehicle circulation

- easy-to-understand motion patterns
- sensitivity to the site’s natural features

User circulation

- direct access or path of movement
- access or a functional path of movement between activities
- easy-to-understand motion patterns
- accessible locations

Quantitatively

- The elements that determine the smoothness of circulation can be seen quantitatively by looking at how far or how long the actors move. For building users, a distance of fewer than 300m is still manageable and enjoyable to walk.

2.2.1.4 Spatial Connection

Architectural components can be used to connect the two diverse functions into a single entity. The pieces employed are tailored to the space's personality, activity, user, and experience.

Walls or Room Separators

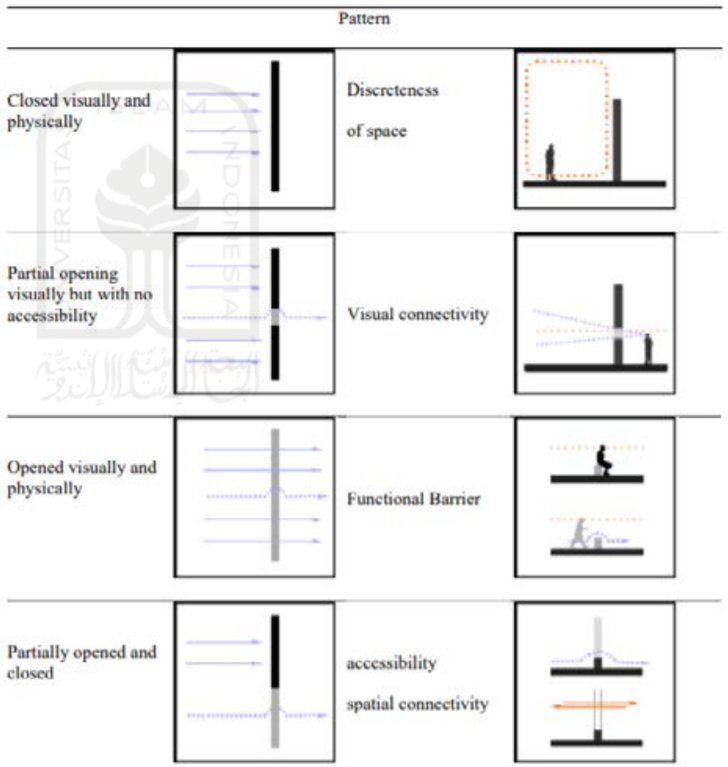


Table 3. *Spatial Connector*
Source: Kim, Y. (2015)

Columns

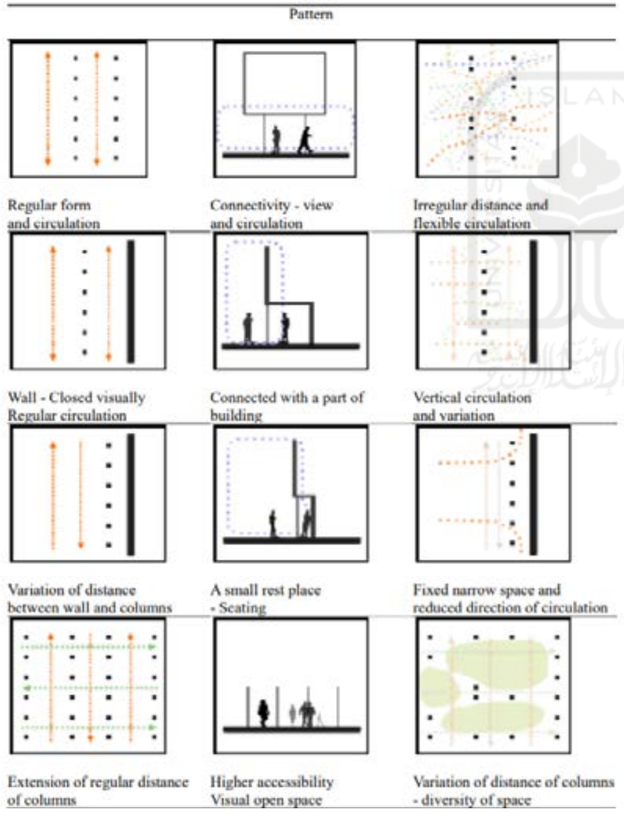


Table 4. *Spatial Connector*
Source: Kim, Y. (2015)

2.2.1.4 Spatial Connection

Floors

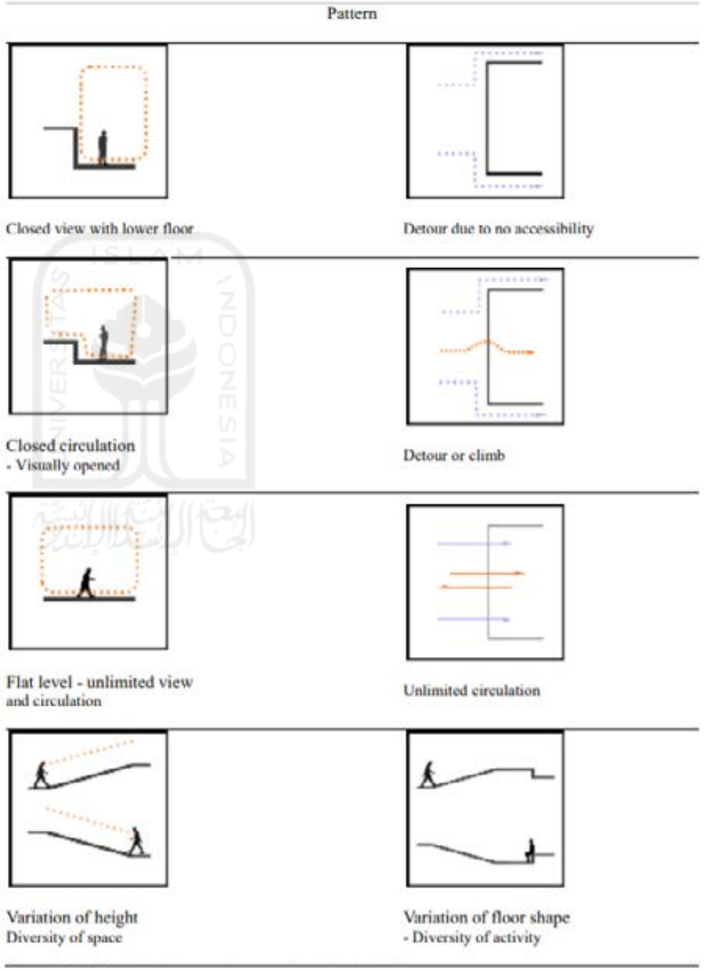


Table 5. *Spatial Connector*
Source: Kim, Y. (2015)

Openings

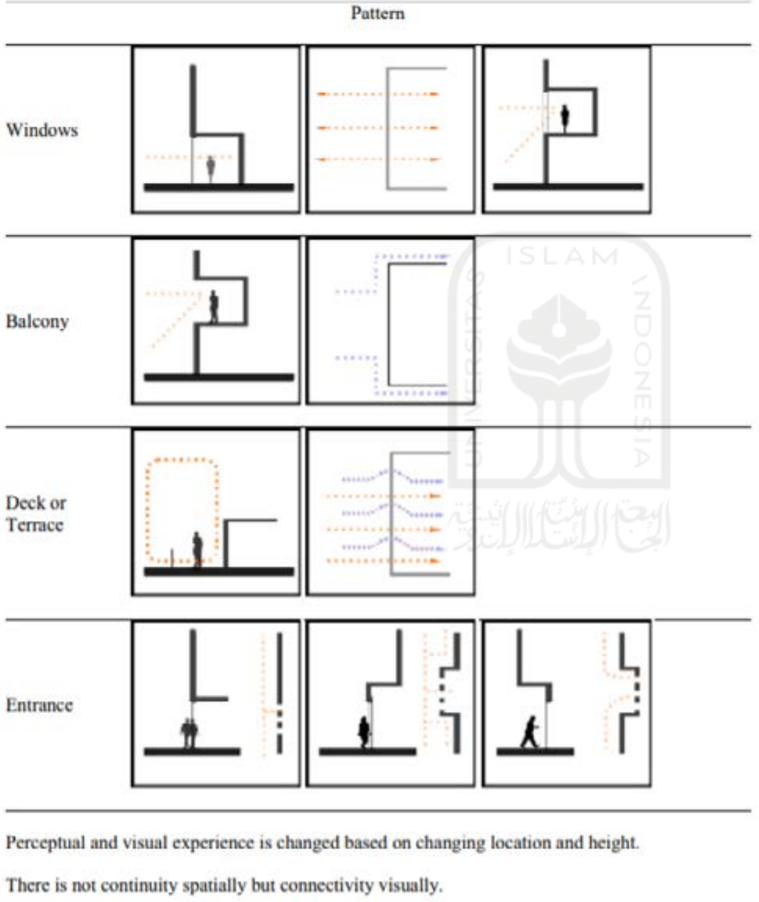


Table 6. *Spatial Connector*
Source: Kim, Y. (2015)

Public Space Criteria

Target User

The average age of Gayamsari District residents is as follows, according to statistics gathered from the Gayamsari District's official website in Semarang City:

AGE RANGE	NUMBER OF PEOPLE
0 - 5	9,028
6 - 16	14,634
17- 25	15,459
26 - 55	27,264
>55	7,674

Table 7. *Age Demographic*
Source: kecgayamsari.semarangkota.go.id

Based on these findings, it can be stated that the population near Inland Port or the Gayamsari District is dominated by persons between the ages of 26 and 55, also known as adults. As a result, the design criteria for green public space will be more focused on satisfying the public space demands of adults.

User Needs of Public Space

According to adult society, green public space plays a critical role as a form of urban infrastructure. Many of the respondents, on the other hand, claimed to visit RTH rarely. The cause for this is the poor state of green public space around their home or the lack of green public space altogether. Adults require green public areas for a variety of reasons, which have been grouped based on the respondent's answer keywords:

Category	Keyword
Environment	Landscape Thermal Spacious Place Nature View Vegetations
Interest	Sports Photography Observing People's Activities Take Pet For a Walk
Work	Near to Workplace
Recreation	Playing Mind Refreshing Body Relaxing
Social	Socializing Hang Out with Friends Spend Time with Family
Facility	Sitting Space Dinning Place Shopping Area

Table 8. *Age Demographic*
Source: kecgayamsari.semarangkota.go.id

- The environment is a non-internal factor. The quality of the area heavily influences people's interest in public space. The terrain, thermal room conditions, vast space, enjoying the view, and shaded foliage are all elements of the atmosphere factor.
- Internal factors such as interest play a role. In terms of interest, it is well known that activities such as taking photographs, sports, walking dogs, and observing other people's activities in public locations are frequently carried out.
- Work is an internal element as well. This component is more concerned with the accessibility of public spaces after work hours.
- It's almost the same as the atmosphere when it comes to recreation. Recreation, on the other hand, is more concerned with the respondents' internal aspects. The recreation component focuses on relaxing, playing, and recharging individuals' thoughts in public settings.
- The internal aspect that causes a person to interact with the community is social. It has elements that are similar to socializing with friends and relatives.
- External aspects that focus on the completeness of facilities available in public spaces, such as cleanliness, security, economics, and available places to eat and shop, are referred to as facilities.

2.2.2 Theme

2.2.2.1 Biophilic Design

Definition

Biophilic design is a conscious endeavor to incorporate an understanding of the innate human need to be associated with natural systems and processes into environmental design. (Wilson, 1984; Kellert & Wilson, 1993)

Biophilic design can help relieve stress, quiet and clarify the mind, and even cure mental illnesses. When we examine the target users in the productive age range and their desire for public space as a stress reliever after work, the effect provided by biophilic design plays a significant part in issue solving. Biophilic design, according to theorists, is the interaction of nature, biology, humans, and design in an artificial environment.

Pattern Principle

The biophilic design contains principles in its application, which are all divided into three main groupings with 14 patterns in the book 14 patterns of biophilic (Terrapin, 2014).

- **Nature in The Space**

1. Visual Connection With Nature
Providing humans with access to natural landscapes and life systems

2. Non-visual Connection With Nature
The senses of hearing, smell, touch, and taste provide a stimulus for connecting with nature.

3. Non-rhythmic Sensosry Stimuly
Provides natural sensory stimulation that draws attention to itself by causing unpredictable movements that the individual may or may not notice.

4. Thermal and Airflow Variability
Humans can experience variations in temperature, humidity, and wind movement systems in space, simulating the natural world.

5. Presence of water
It gives the water element in a place or space to create a state that enhances the individual experience through seeing, hearing, and touching the water element.

6. Dynamic and Diffuse Lighting
To get a condition of time changes that occur in nature, use light intensity and give a kind of light that changes dynamically and spreads naturally.

7. Connection with Natural System
Use natural materials or elements and reduce the processing proceeds to keep the natural shape and qualities.

14 PATTERNS		*	STRESS REDUCTION	COGNITIVE PERFORMANCE	EMOTION, MOOD & PREFERENCE
NATURE IN THE SPACE	Visual Connection with Nature	* * *	**Lowered blood pressure and heart rate** (Brown, Barton & Gladwell, 2013; van den Berg, Hartig, & Staats, 2007; Tsunetsugu & Miyazaki, 2005)	**Improved mental engagement/ attentiveness** (Biederman & Vessel, 2006)	**Positively impacted attitude and overall happiness** (Barton & Pretty, 2010)
	Non-Visual Connection with Nature	* *	**Reduced systolic blood pressure and stress hormones** (Park, Tsunetsugu, Kasetani et al., 2009; Hartig, Evans, Jamner et al., 2003; Orsega-Smith, Mowen, Payne et al., 2004; Ulrich, Simons, Losito et al., 1991)	**Positively impacted on cognitive performance** (Mehta, Zhu & Cheema, 2012; Ljungberg, Neely, & Lundström, 2004)	**Perceived improvements in mental health and tranquility** (Li, Kobayashi, Inagaki et al., 2012; Jahncke, et al., 2011; Tsunetsugu, Park, & Miyazaki, 2010; Kim, Ren, & Fielding, 2007; Stigsdotter & Grahn, 2003)
	Non-Rhythmic Sensory Stimuli	* *	**Positively impacted on heart rate, systolic blood pressure and sympathetic nervous system activity** (Li, 2009; Park et al, 2008; Kahn et al., 2008; Beauchamp, et al., 2003; Ulrich et al., 1991)	**Observed and quantified behavioral measures of attention and exploration** (Windhager et al., 2011)	
	Thermal & Airflow Variability	* *	**Positively impacted comfort, well-being and productivity** (Heerwagen, 2006; Tham & Willem, 2005; Wigö, 2005)	**Positively impacted concentration** (Hartig et al., 2003; Hartig et al., 1991; R. Kaplan & Kaplan, 1989)	**Improved perception of temporal and spatial pleasure (alliesthesia)** (Parkinson, de Dear & Candido, 2012; Zhang, Arens, Huizenga & Han, 2010; Arens, Zhang & Huizenga, 2006; Zhang, 2003; de Dear & Brager, 2002; Heschong, 1979)
	Presence of Water	* *	**Reduced stress, increased feelings of tranquility, lower heart rate and blood pressure** (Alvarsson, Wiens, & Nilsson, 2010; Pheasant, Fisher, Watts et al., 2010; Biederman & Vessel, 2006)	**Improved concentration and memory restoration** (Alvarsson et al., 2010; Biederman & Vessel, 2006) **Enhanced perception and psychological responsiveness** (Alvarsson et al., 2010; Hunter et al., 2010)	**Observed preferences and positive emotional responses** (Windhager, 2011; Barton & Pretty, 2010; White, Smith, Humphryes et al., 2010; Karmanov & Hamel, 2008; Biederman & Vessel, 2006; Heerwagen & Orians, 1993; Ruso & Atzwanger, 2003; Ulrich, 1983)
	Dynamic & Diffuse Light	* *	**Positively impacted circadian system functioning** (Figueiro, Brons, Plitnick et al., 2011; Beckett & Roden, 2009) **Increased visual comfort** (Elyezadi, 2012; Kim & Kim, 2007)		
	Connection with Natural Systems				**Enhanced positive health responses; Shifted perception of environment** (Kellert et al., 2008)

Table 9. *Biophilic Design Patterns*
Source: Terrapin Bright Green

2.2.2 Theme

2.2.2.1 Biophilic Design

Pattern Principle

- **Natural Analogues**

1. Biomorphic forms and patterns
Patterns, forms, and textures are used as structural and aesthetic elements in space to mimic nature.

2. Material Connection with Nature
Use natural materials or elements with little processing so that the final product reflects the local ecology and geology of nature.

3. Complexity and Order
Sensory data that follows a spatial hierarchy similar to that found in nature.

- **Nature of the space**

1. Prospect
Create a broad, open, and breezy environment with an uninterrupted view.

2. Refuge
From both the back and the top, it gives the user a sense of security and protection.

3. Mystery
It is creating an intriguing atmosphere that begs to be explored further.

4. Risk & Peril
It was giving off a distinct sensation of danger or threat while remaining safe.

14 PATTERNS		*	STRESS REDUCTION	COGNITIVE PERFORMANCE	EMOTION, MOOD & PREFERENCE
NATURAL ANALOGUES	Biomorphic Forms & Patterns	•			**Observed view preference** (Vessel, 2012; Joye, 2007)
	Material Connection with Nature			**Decreased diastolic blood pressure** (Tsunetsugu, Miyazaki & Sato, 2007) **Improved creative performance** (Lichtenfeld et al., 2012)	**Improved comfort** (Tsunetsugu, Miyazaki & Sato 2007)
	Complexity & Order	• •	**Positively impacted perceptual and physiological stress responses** (Salingaros, 2012; Joye, 2007; Taylor, 2006; S. Kaplan, 1988)		**Observed view preference** (Salingaros, 2012; Hägerhäll, Laike, Taylor et al., 2008; Hägerhäll, Purcella, & Taylor, 2004; Taylor, 2006)
NATURE OF THE SPACE	Prospect	• • •	**Reduced stress** (Grahn & Stigsdotter, 2010)	**Reduced boredom, irritation, fatigue** (Clearwater & Coss, 1991)	**Improved comfort and perceived safety** (Herzog & Bryce, 2007; Wang & Taylor, 2006; Petherick, 2000)
	Refuge	• • •		**Improved concentration, attention and perception of safety** (Grahn & Stigsdotter, 2010; Wang & Taylor, 2006; Wang & Taylor, 2006; Petherick, 2000; Ulrich et al., 1993)	
	Mystery	• •			**Induced strong pleasure response** (Biederman, 2011; Salimpoor, Benovoy, Larcher et al., 2011; Ikemi, 2005; Blood & Zatorre, 2001)
	Risk/Peril	•			**Resulted in strong dopamine or pleasure responses** (Kohno et al., 2013; Wang & Tsien, 2011; Zald et al., 2008)

Table 10. *Biophilic Design Patterns*
Source: Terrapin Bright Green

Figure 31. *Biomorphic Form Facade*
Source: Aslai. Flickr

Figure 32. *Biophilic Interior Design*
Source: Homeyhomies.com

Figure 33. *Heatherwick Studio*
Source: Dezeen

2.2.2 Theme

2.2.2.2 Recreational

Tourism

Tourism is defined as a travel activity, or a subset of these activities carried out willingly and temporarily to enjoy tourist objects and attractions, according to Undang-undang Nomor 10 Tahun 2001, Tourism Chapter I Article 1. The definition of tourism includes components such as voluntary, temporary travel activities, trips that are entirely or partially intended to be enjoyed, and tourist products and attractions.

According to Yoety (1990), tourist locations must meet three requirements to attract visitors:

- Something to see (having unique things and attractions to entertain visitors).
- Something to do (having activities to engage visitors).
- Something to eat (availability of facilities as support for visitors to carry out activities).

Diversity and the chance to remain longer), as well as something to buy (availability of facilities for shopping, such as local handicrafts or special foods as souvenirs).

Figure 34. *Heatherwick Studio*
Source: Designboom

Tourist Attraction

Most common tourist attractions include beaches, tropical island resorts, national parks, mountains, deserts, and woods, which are examples of natural beauty. Historic sites, monuments, ancient temples, zoos, aquaria, museums and art galleries, botanical gardens, buildings and structures (forts, castles, libraries, former prisons, skyscrapers, bridges), theme parks and carnivals, living history museums, public art (sculptures, statues, murals), ethnic enclave communities, historic trains, and cultural events are all examples of cultural tourist attractions. Industrial and creative tourism are cultural niches that focus on factory tours, industrial history, and creative art and crafts workshops. A lot of tourist sites are also historical landmarks.

Tourist expectations are based on various aspects of the chosen destination, including culture, architecture, food, infrastructure, geography, events, shopping, etc. These qualities draw visitors to the destination and enhance the entire travel experience. The main goal of attractions is to draw customers to a specific location to visit and discover the many attractions while on vacation. Attractions play a particularly important role in the travel and tourism business since they attract people from all over the world. (Wikipedia)

2.2.2 Theme

2.2.2.2 Recreational

Figure 35. *Las Vegas Venetian Hotel*
Source: Activerain

Figure 36. *Las Vegas Venetian Hotel*
Source: Fine Art America

Figure 37. *Las Vegas Venetian Hotel*
Source: Ebookers

Indoor Boat Ride

This structure serves two purposes as a recreational Inland Port. Inland Port serves as a tourist destination as well as a means of infrastructure for canal transportation passengers. Visitors to this building as a tourist site include passengers from ships and people who have come only for sightseeing. Non-passenger tourists may find indoor boat cruises to be a novel experience. Visitors can move from one location to another by taking a boat around the indoor park area, which can also be used as a mode of indoor transit.

Indoor Nature Park

Even though nature is good for our health and well-being, people are spending less time outside. Over half of the world's population now lives in cities, which has curtailed our ability to interact with nature (Zipperer and Pickett, 2012). Despite their physiological and psychological functions emerging from nature, people now spend most of their time in manmade environments (Ulrich, 1983; Wilson, 1984; Kellert and Wilson, 1993).

While urbanization has radically altered the appearance of outside surroundings, the capacity to modify built environments allows for the facilitation of natural connection within indoor spaces and the provision of healthy and health-promoting indoor environments.

Long-standing questions regarding the meaning of childhood are raised when children engage with nature: freedom and control, the combination of play, learning, education, and hands-on natural experiences that can help children grow in body, mind, and spirit.

Figure 38. *Garden by The Bay*
Source: Archdaily

Figure 39. *Jewel Changi*
Source: Selection.ca

Figure 40. *Jewel Changi*
Source: Klook

Figure 41. *La Linea Borrosa Top View*
Source: Archdaily

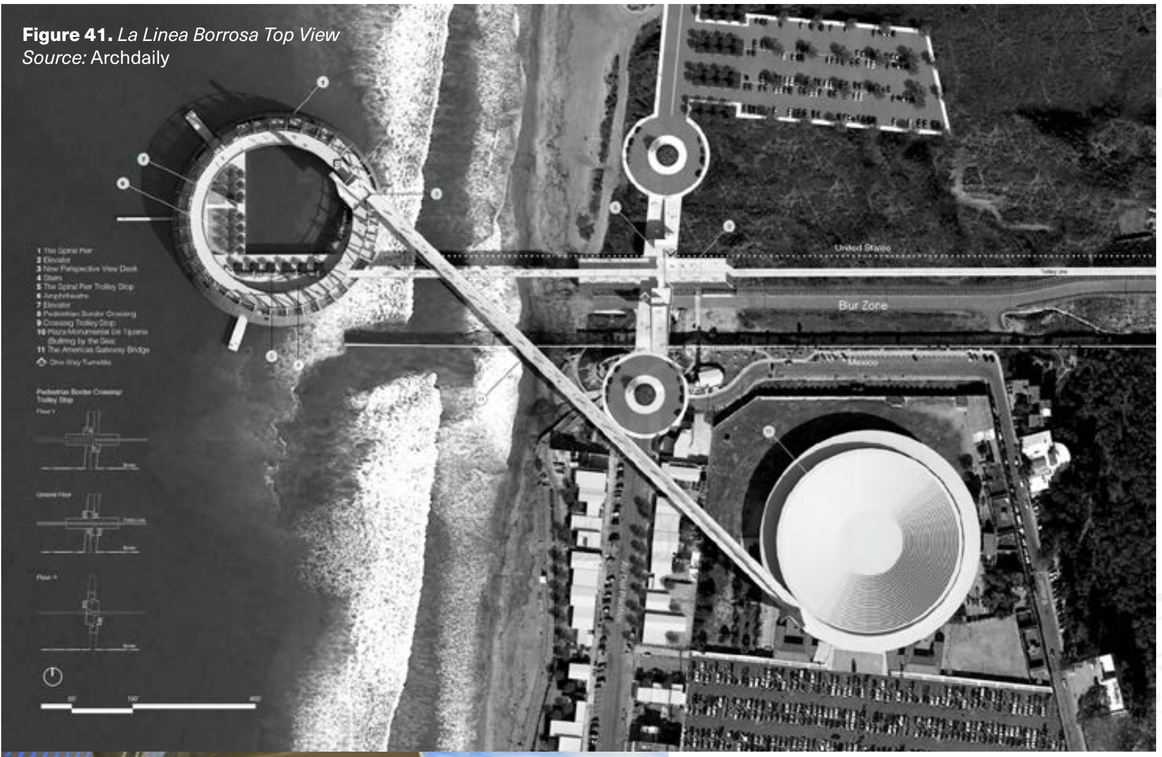


Figure 42. *La Linea Borrosa Ramp*
Source: Archdaily

Title : La Línea Borrosa
Architect : Patrick Cordelle
Project Year : 2015
Location : Tijuana, Baja California, Mexico

Studio Products is a recreational port located in Mexico designed by a student from California Polytechnic State University. The purpose of designing this recreational port is to be used as a meeting place and gathering of US and Mexican citizens with the hope of uniting or unifying the two nations in social aspects. This port is above the sea border between the US and Mexico which is connected directly to the monumental square on the mainland by a pedestrian bridge. In the design design, the Architects designed the port in a circular manner with a spiral path that creates a definite and centralized recreation space. (Archdaily)

2.2.3 Precedent Studies

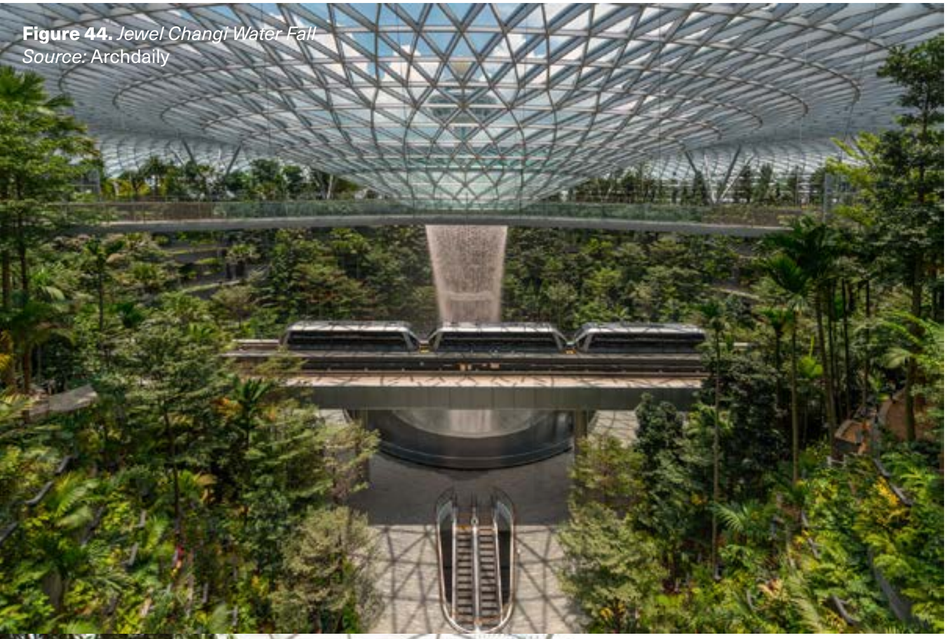


Figure 44. *Jewel Changi Water Fall*
Source: Archdaily

Figure 45. *Jewel Changi Playground*
Source: Archdaily

Title : Jewel Changi Airport
Architect : Safdie Architects
Project Year : 2019
Location : Singapore

Fulfilling its mission as a liaison between existing terminals, Jewel took the initiative to combine two environments — an intense marketplace and a paradise garden — to create a new neighborhood typology-centric community as the heart, and soul, of Changi Airport. Gems weaves together an experience of being in nature with a touch of culture and with recreational facilities, dramatically presenting the idea of an airport as vibrant and vibrant downtown, and by echoing Singapore's reputation as "The City in a Park." A total of 135,700 square meters that can be enjoyed by the central public including facilities for ground airport operations, as well as the presence of indoor parks and recreational attractions, retail offerings, restaurants and cafes, and hotel facilities, all of these facilities provided under one roof. (Archdaily)

Figure 46. *Jewel Changi Section*
Source: Archdaily

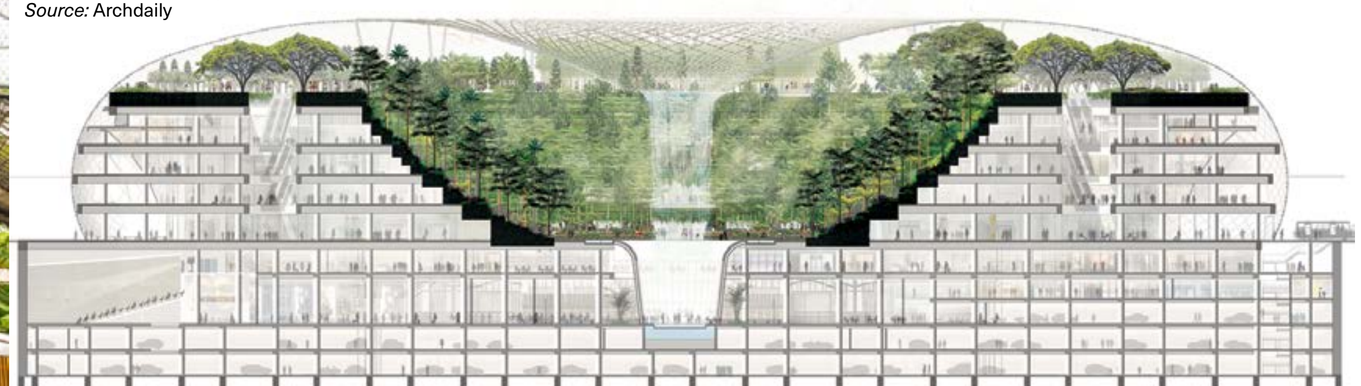


Figure 47. *Indoor Garden*
Source: Archdaily

Figure 48. *Indoor Garden*
Source: Archdaily

Title : Cooled Conservatories at Gardens by the Bay
Architect : Wilkinson Eyre Architects
Project Year : 2012
Location : Singapore

This is one of the designs by renowned architect WilkinsonEyre Architects, a glass and steel cooled conservatory inspired by a Mediterranean climate and plant life and Clouds from the jungle to tropical Singapore. Highlights in the attraction include indoor waterfalls, ever-flowering meadows, flowing vertically tiered plantings, and high-level walking trails through and above tree canopies. (Archdaily)

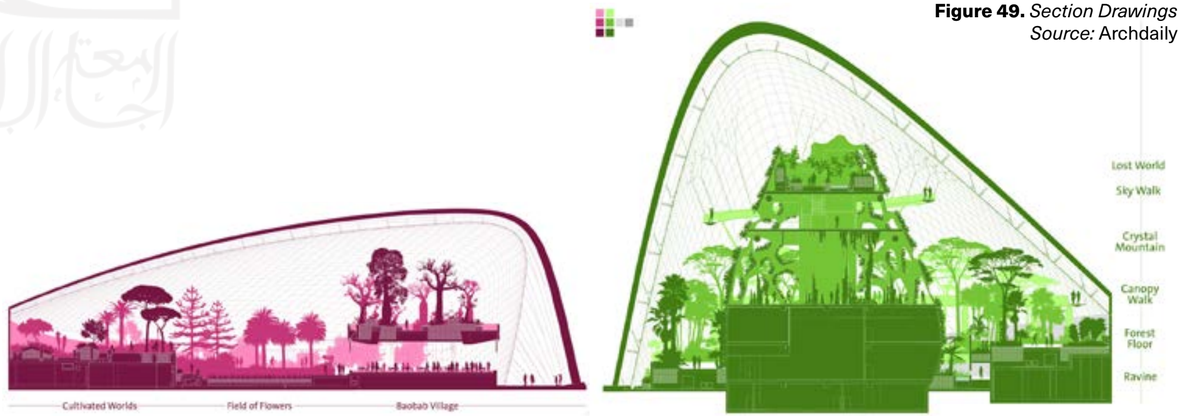


Figure 49. *Section Drawings*
Source: Archdaily

2.2.3 Precedent Studies

Title : Single Canal
Construction Year : 1601-1603
Location : Amsterdam, Netherlands

The Single is one of the canals in Amsterdam. Single besieged Amsterdam in the Middle Ages, used it as a moat when circling the city until 1585, At a time when Amsterdam expanded beyond the Singles. The canal runs from IJ bay close to Central Station to Muntplein square, where it finds the Amstel river which is now the deepest canal in Amsterdam's semicircular canal ring. By the end of the 16th century, Amsterdam was growing rapidly and running out of space. With the construction of the canal project, it is calculated as a way to widen the city by 800m. This canal is known as Singlegracht. Then this Single was founded as a port in 1601-1603 which was useful for facilitating food trade and transportation routes at that time. In the second half of the 20th century the area around the canal was increasingly developed into a tourist area and many buildings became retail shops. (Wikipedia)

Figure 50. *Singel Canal*
Source: Wikipedia

Figure 51. *Singel Canal*
Source: Wikipedia

Site Analysis

Climate

January is the peak of the rainy season according to the analysis of the average rainfall reaching 430 mm with an average temperature level of 27 degrees. Meanwhile, the rainy season in Semarang City is characterized by warm and wet conditions. The wet month is also a time when the sun is longer than the dry season.

Meanwhile, August is the peak of the dry season with an average rainfall of 60 mm with an average temperature of 28 degrees. Signs of the dry season are dry and hot air conditions. This phenomenon occurs when it is happening during the dry season that occurs in the city of Semarang, namely the phenomenon of a decrease in air temperature. It is recorded in the data that in July 2015 the lowest temperature ever recorded was 18°C, this occurred during the dry season in the city of Semarang. The dry season is a period in which exposure to sunlight is shorter than the rainy season.

When the occurrence or arrival of the transition season which often occurs at the beginning and end of the month in the rainy season and dry season, namely in September, October, March, and April. Signs that occur during the transition season can be characterized by humidity. Months where the rainfall is more than 100mm, but less than 200mm. This transition season is characterized by extremely humid air conditions, which can affect the body with a suffocating effect on the body. During the transitional season, the seasonal conditions are ideal for the growth of microorganisms, making it easier for many types of diseases to appear, such as: flu, fever, and skin diseases.

Figure 52 *Sun Path on Site Map*
Source: Google Maps

Unsur Iklim *Climate Elements*	2017	2018	2019
Stasiun Klimatologi Semarang			
Suhu/*Temperature*			
Minimum/*Minimum*	23	22	22
Rata-rata/*Average*	28	28	28
Maksimum/*Maximum*	34	34	36
Kelembaban/*Humidity (%)*			
Minimum/*Minimum*	52	50	47
Rata-rata/*Average*	79	77	77
Maksimum/*Maximum*	94	94	95
Kecepatan Angin (m/det) / *Wind Velocity (m/sec)*			
Minimum/*Minimum*	-	-	-
Rata-rata/*Average*	5	5	5
Maksimum/*Maximum*	26	40	31
Tekanan Udara/ *Atmospheric Pressure (mb)*			
Minimum/*Minimum*	1,008	1,008	1,010
Rata-rata/*Average*	1,010	1,010	1,011
Maksimum/*Maximum*	1,011	1,012	1,013
Jumlah Curah Hujan (mm)/ *Number of Precipitation (mm)*	2,657	2,059	1,272
Jumlah Hari Hujan (hari)/ *Number of Rainy Days (day)*	153	128	113
Penyinaran Matahari (%)/ *Duration of Sunshine (%)*	70	74	78

Table 11. *Iklim Semarang*
Source: Stasiun Klimatologi Semarang

Neighborhood

Drainage network

primary

secondary

Figure 53. *Drainage Network Map*
Source: Peta RTRW Semarang

Electricity network

Extra high voltage line (SUTET)

High voltage line (SUTT)

Medium voltage line (SUTM)

Figure 54. *Electricity Network Map*
Source: Peta RTRW Semarang

Drinking Water network

primary

secondary

Figure 55. *Drinking Water Network Map*
Source: Peta RTRW Semarang

Telecommunication network

primary

secondary

Figure 56. *Telecommunication Network Map*
Source: Peta RTRW Semarang

Garbage network

primary

secondary

Figure 57. *Garbage Network Map*
Source: Peta RTRW Semarang

Street network

secondary artery

secondary collector

Figure 58. *Street Network Map*
Source: Peta RTRW Semarang

Inland Port Analysis

User Analysis

Because its function is used as a container for passenger activities in the process of moving, the passenger terminal has various types of adequate facilities provided with high air circulation requirements. Many of these activities generally occur in a terminal which is the activity most influenced by humans and goods which includes (Andiani, 2011):

1. Passengers are divided into two, namely domestic passengers and tourists, as well as arrival passengers and departure passengers.
2. Visitors
3. Terminal employees, i.e. they who is directly responsible for terminal conditions, both operational and administrative.
4. Service company employees, namely those who carry out operational activities at the passenger terminal, namely ticket sales and distribution.
5. Government employees, namely in the division of health, law (immigration and emigration).
6. Luggage includes:
    1. Carrying goods
    2. More than luggage
    3. Luggage

Facilites Analysis

Meanwhile, other facilities provided at the terminal for passengers can be divided into two main groups, namely (Andiani, 2011):

1. Service facilities and ship passengers
2. Arrival or departure area for pick up or drop off passengers.
3. Parking facilities for cars, motorbikes and pedestrians.
4. Facilities to pick up and drop off passengers, for example bus stops and taxi areas
5. Ticket counter and baggage check
6. Health counter (quarantine)
7. Space for passenger movement
8. Lounge and rest area
9. Supporting service facilities, such as: public telephones and restaurants.
10. Itinerary and route information of facilities
11. Drop-off and pick-up facilities
12. Departure passenger facilities such as: as connecting facilities (cars, belt conveyors)

Terminal management facility

1. Office to manage personnel
2. Immigration Personnel Office
3. Health and quarantine office
4. Office of the security officer.

In matters relating to the passenger and goods transfer system, it can be described as follows (Andiani, 2011).

1. The passenger transfer system is as follows:
2. With a bridge, for efficiency because it can use the bottom area with the top at the same time.

Space Analysis

SPACE NEEDED	PRIVACY	ACTIVITIES	USERS
Main Function			
Lobby	Public	Entering port, Waiting for pickup, Collecting information	Visitor, Passenger, Employees, Officer
Ticket Counter	Public	Ticketing, Baggage checking	Passenger, Employees
Hall	Semi Public	Ticket checking	Passenger, Employees, Officer
Waiting Room	Semi Public	Sitting	
Parking Lot	Public	Parking	Visitor, Passenger, Employees, Officer
Management Offices	Private	Administration, Building management	Officer, Employees
Regulator Offices	Private	Operational control	Officer, Employees
Boarding Room	Semi Public	Sitting, Ticket checking	Passenger, Employees, Officer
Loading Dock	Semi Public	Temporary goods storing	Officer, Employees
Storage	Semi Private	Baggage storing	Officer, Employees
MEE Room	Private	MEE controling	Officer, Employees
Supporting Function			
Food Court	Public	Dinning, sitting	Visitor, Passenger, Employees, Officer
Shops and Retail	Public	Buying and selling	Visitor, Passenger, Employees, Officer

Table 12. *Space Criteria Analysis*
Source: Author

Circulation Flow

Passenger

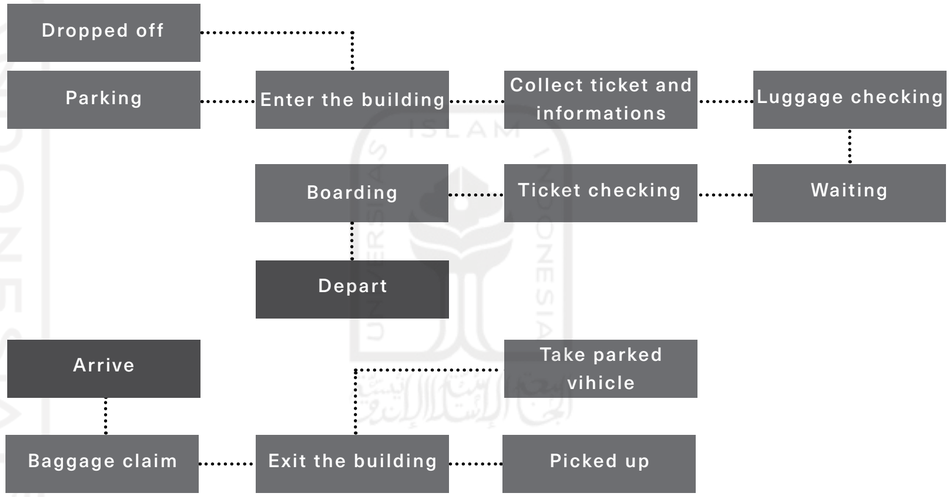


Figure 59. *Passenger Circulation Flow Diagram*
Source: Author

Indoor Park Analysis

User Analysis

The integrated location with the Inland Harbor and located in the middle of a densely populated area means that indoor park users can vary widely and have a large number of visitors.

- Local people living around the Land Port
- Passengers using Land Port
- Tourists who deliberately come for tours can be divided into ship passengers and private vehicle users
- Employees who work inside the Indoor Park

Facilities Analysis

Based on the literature review that has been carried out previously regarding the criteria for public space needed by users with the right target, namely by analyzing correctly what is needed in completing a design, the Indoor Park facility can be known what facilities are needed so that they are right on target and can be used. concluded as follows:

- Playgrounds, although the target users of the playgrounds are adults, it is possible that children will become users of the Inland Port and Indoor Parks
- Jogging track, its function is one of the functions needed by sports users
- Sitting space, to accommodate Indoor facilities. Garden users as a place to gather with friends or family and socialize with other people
- Shops/retails, which are unavoidable as a place to get shopping needs by users of the productive age target. Sometimes these needs also arise unplanned depending on the conditions at the time, by providing shops and retail space can help Indoor Garden users in overcoming the situation when they need it.
- Plaza, for users who want to relax by taking a walk to enjoy the atmosphere of the Indoor Garden comfortably
- Cafes and restaurants

Figure 60. *Vialand Mall*
Source: ar.lifeisgoodontbesad.xyz

Figure 61. *Sitting Space*
Source: L.L. Bean

Figure 62. *Indoor Green Space*
Source: Pinterest

Figure 63. *Las Vegas Venetian Hotel*
Source: Activerain

Space Capacity Analysis

Space Capacity Consideration

In calculating the capacity of room y at the terminal, it is based on several considerations, including the following:

- Activities in it, including function, form, pattern, and mode activity
- Number and types of activity actors, including:
  1. Calculation between numbers and types of vehicles on the ground
  2. Calculation between the number and types of passengers per year and passengers during peak hours
  3. Calculation of the number of employees / terminal managers
  4. Preliminary calculation of the amount
  5. Calculation of the number and types of ships that will dock
  6. Calculation of the number of tourists visiting

Passenger From/To Tanjung Mas Port

According to the applicable regulations, the Minister of Transportation concerning the Master Plan for the Development of the Tanjung Emas Port in Semarang. By doing so according to the calculation, it is estimated that the number of passengers in 2031 will reach 631,440. And it is also assumed that the passengers who will use the Land Port are 40% around 252,576. So it can be concluded that for the monthly calculation of passengers as many as 21048, daily 702, and every 30 hours and it is also estimated that:

Monthly : 21048
Daily : 702
Hourly : 30

Estimated

- The number of embarkation passengers is 60% : 422/day
- The number of debarkation passengers is 40% : 281/day

Tourists

Based on a quote from Gatra.com stating that the average number of tourists visiting tourist destinations in Central Java reached 1000 people per day in 2019. So it can be concluded that in 2019 the number of tourists was 365,000 people. If calculated every year there will be an average increase in the number of tourists by 5%, then in 2031 the number of tourists per year is estimated to be 655,488 people. Can be concluded that every month as many as 54,624, daily 1821, every hour 140.
Estimated:

Monthly : 54,624
Daily : 1821
Hourly : 140

Estimated

- The number of embarkation passengers is 60% : 1370/day
- The number of debarkation passengers is 40% : 914/day

Vessel

According to research conducted by Ma'ruf, A. with the topic of the Banjir Kanal Timur Normalization Plan. The ships that can be used are speedboats with a maximum capacity of 20 people, with a length of 12m, a width of 3m, and a draft of 0.5m.

If the number of passengers from Tanjung Mas Port is combined with tourists, then there are 170 passengers per hour. If one speedboat has a capacity of 20 people, then the number of speedboats it takes as many as 9 speedboats.

Employees

It can be stated that 20% of the total passengers per hour is 34 people.

Vehicle

The vehicles used by visitors are as follows:

- 40% of the total port service users per hour, use a private car with a capacity of 4 people with a total of 68 vehicles
- 20% of the total port service users per hour, using motorbikes with a capacity of 2 people with 41 vehicles

Employee Vehicle:

- 30% by car: 11 units
- 60% using motor: 21 units

Stay Vehicle:

- 1% use car: 19 units

Spatial Organization Analysis

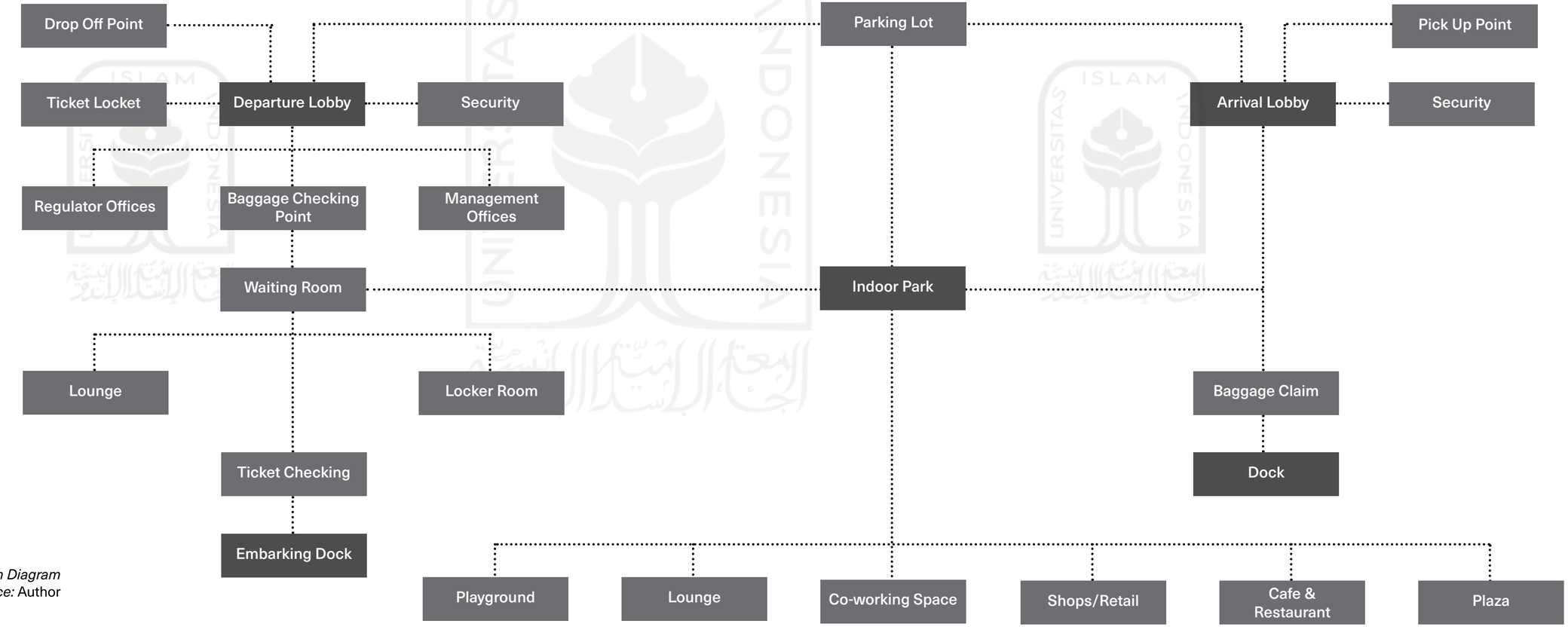


Figure 64. *Spatial Organization Diagram*
Source: Author

Spatial Zoning Analysis

- At a time when spatial zones play a major role in the way of spatial planning in a building. Having a goal can be one way of designing strategies to achieve the desired design goals, namely by looking at the efficiency of building circulation. Classification of a space that can determine the levels of depth of the space and can be part of the-how to get a design strategy.

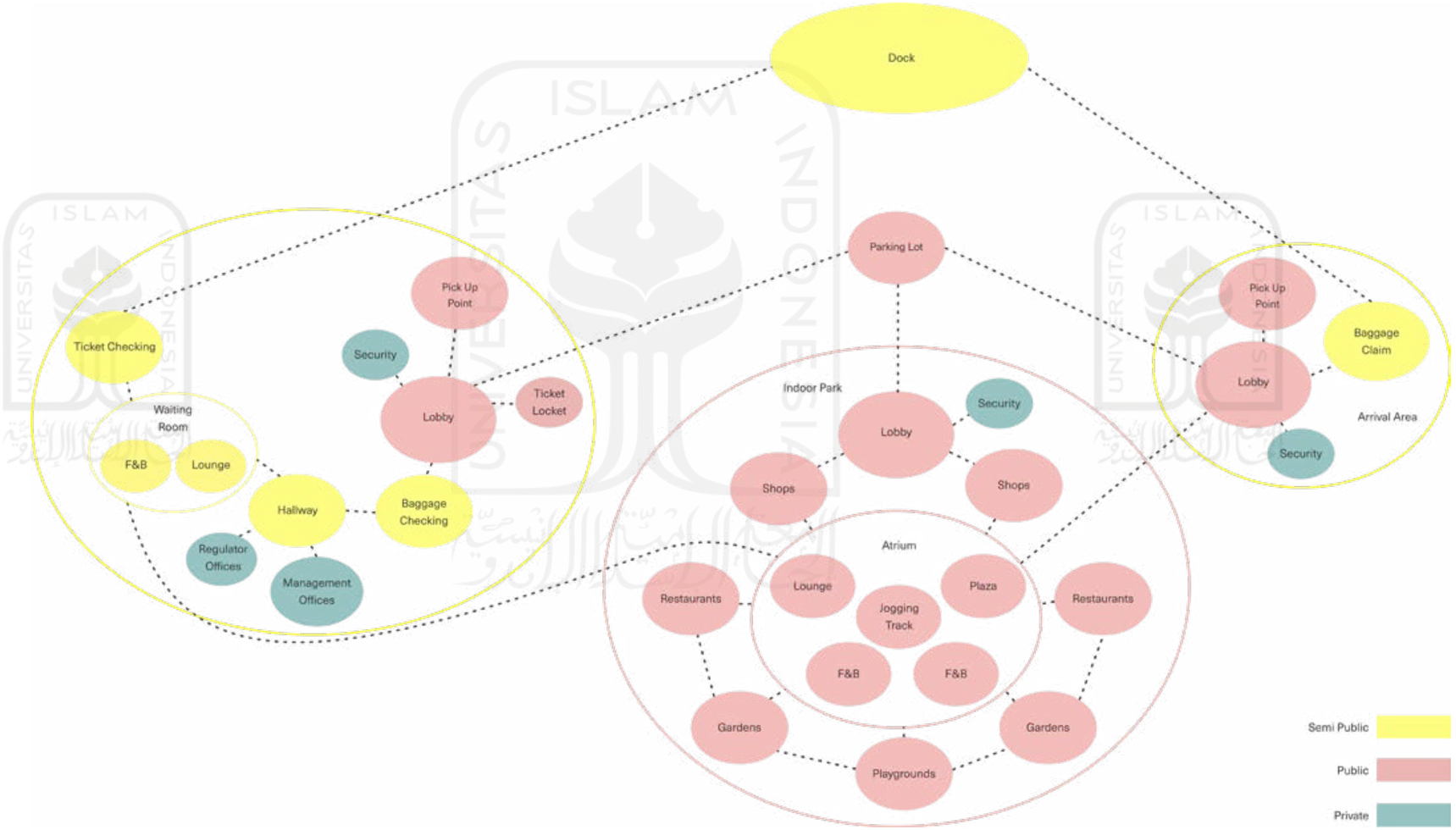


Figure 65. *Spatial Zoning Diagram*
Source: Author

- To apply the design theme, namely by implementing biophilic in the room based on the characteristics of the space and space requirements. Biophilic design focuses on 3 aspects of design, namely natural patterns in space, analogous patterns of nature, and patterns of spatial properties, which have been described in 14 patterns in a design. The following is an analysis of the application of the biophilic concept in buildings:

Biophilic Pattern Principals		Design Concept						
		Entrance	Circulation	Building Mass	Interior		Exterior	Envelope
					Inland Port	Indoor Park		
Nature In Space	Visual Connection with Nature	V	V		V	V	V	V
	Non-visual Connection with Nature	V	V			V	V	
	Non-Rhythmic Sensory Stimuli							
	Thermal & Airflow Variability			V	V	V		V
	Presence of Water					V	V	
	Dynamic & Diffuse Light			V	V	V		V
	Connection with Natural Systems							
Natural Analogues	Biomorphic Forms & Patterns		V		V	V		
	Material Connection with Nature	V	V		V	V		V
	Complexity & Order							
Nature of The Space	Prospect							
	Refuge				V			
	Mystery							
	Risk/Peril							

Table 13. *Biophilic Criteria Analysis*
Source: Author

Nature In Space

- ***Visual Connection with Nature***

The relationship between visual and nature is to connect humans with nature, can provide an experience for humans to see and feel nature directly. This will produce a positive impact caused by the visual relationship between humans and nature, among others, can reduce stress, improve mental conditions, and create a sense of happiness. According to Kahn (2008), when a person sees or enjoys natural visuals, it can actually speed up healing of the stress experienced by a person. To create a visual connection between humans and nature, you can add transparent materials such as glass.

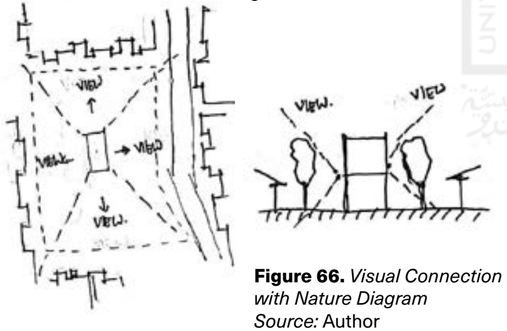


Figure 66. *Visual Connection with Nature Diagram*
Source: Author

The location is located in a dense urban area with residential buildings giving an appearance that does not match the design theme. Because of this, additional elements are needed to improve the appearance of the design, a suitable method for this problem can use vegetation to block the view of buildings around the site, it will give the impression that the building is surrounded by nature.

Designs with a nature theme can be implemented in various ways so as not to give the impression of being boring and will provide various experiences in interacting with nature. In addition to applying nature outside the building, it would also be better to bring nature into the building. By bringing nature into the building, it will provide a more intense relationship between humans and nature.

Figure 67. *Nature Between Space*
Source: Ro-co.uk

Figure 68. *Space in Nature*
Source: Pinterest

Figure 69. *Nature Next to Space*
Source: Pinterest

Figure 70. *Nature in Space*
Source: Psychology in Wellness

Nature In Space

- **Non-visual Connection with Nature**

The relationship between non-visual and nature is like the relationship between humans and nature by passing stimulation to the senses possessed by humans other than the sense of sight, the senses consist of the senses of hearing, smell, and touch, this is what makes humans always remember the natural situation .

Textures

In cultivating taste or to give a natural feel to the sense of touch by giving a natural texture to the design. The natural texture in question is a texture in the form of stone, wood, bamboo, or exposed cement texture.

Figure 71. *Stones*
Source: Google

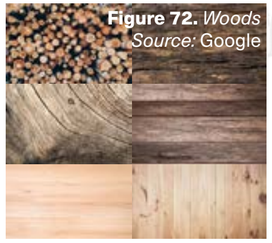


Figure 72. *Woods*
Source: Google

Figure 73. *Bamboos*
Source: Google

Figure 74. *Raw Cement*
Source: Google

Sounds

In urban areas, the location of the site is in urban areas because in urban areas there is a noise caused by vehicle noise or noise caused by human activities. Therefore, it is very important to minimize the noise and create the natural and serene feel that everyone desires. To overcome this, it is necessary in several ways to reduce sound around the location and also inside the building, which include providing a barrier between the building and the sound source, providing vegetation to eliminate noise, and providing a layer of soil that can absorb sound properly. such as providing grass, and reducing from openings facing the noise source.

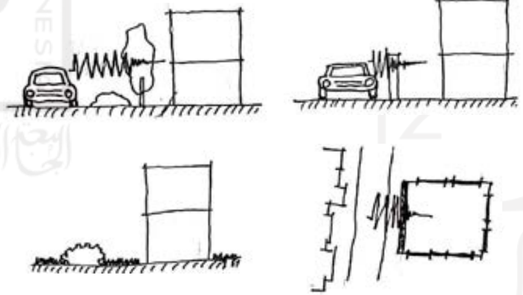


Figure 75. *Noise Reductions*
Source: Author

Smell

Efforts to give a natural aroma can be done by using several plants that can produce an aroma, such as roses, lavender, gardenia, daphne, lilac, paperwhites, mock orange, rosemary, and orchids. These flower plants can give a very strong natural aroma when combined because the aroma of these plants varies and has a different aroma from each plant.

- **Thermal and Airflow Variability**

In an airflow, airflow is a very important aspect in an activity to support the atmosphere of a room. By providing or using air conditioning in the room as a way to provide good air flow is one way that can be done, but this has a negative impact because it is less environmentally friendly resulting from the use of air conditioning. Another way to provide good airflow is to provide passive cooling, which is an alternative way of creating airflow and room thermal conditions. The diversity of the air flow in the room is needed in biophilic designs with the aim of creating a room with a more natural feel.

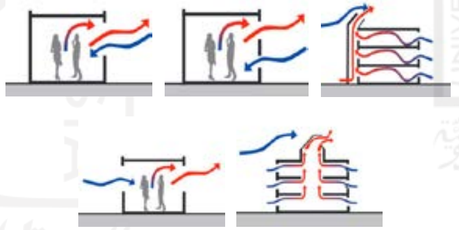


Figure 76. *Passive Cooling*
Source: Google

The use of a passive cooling system based on openings is to make the thickness of the building more effective and the distance used between the openings is not more than 5 times higher than the room.

Figure 77. *Passive Cooling*
Source: Author

- **Presence of Water**

The presence of the element of water is indeed for selfishness, but it can describe the positive impact of the presence of water which can provide a calming feel, encourage reflection, improve mood, and can restore feelings of someone who is cognitively exhausted. The presence of water in a design can help connect humans with nature in various ways, such as visually, auditory, and smelly. according to Alvarsson (2010), when compared with the sound produced from the city or office, the sound of nature can accelerate a person's psychological healing by 37%. And also the presence of water can help increase the effectiveness of a passive cooling system. Some features that can be implemented with water shades in the room are to add an aquarium, water curtain, or pond.

Figure 78.
Water Element
Source: Google

- Using an aquarium provides a multi-sensory experience. However, the resulting impact tends to be small in scope. In addition, the operational and manufacturing costs are quite expensive.
- The water curtain provides a multi-sensory nature experience. As well as giving the impact the sound emitted tends to be strong.
- The use of a pond provides a multi-sensory nature experience. The impact of the sound tends to be natural because of the changing water movements.

Nature In Space

- **Dynamic and Diffuse Lighting**

In lighting problems, even distribution of light in a building is a very important element that must be planned. The lighting in question can be in the form of artificial light such as lamps. However, it would be better to use natural light which has a positive impact on people and vegetation in buildings. To get natural light that is evenly distributed and not excessive, it is necessary to plan building openings. There are several strategies that can be used, namely by using wide openings on the north and south sides of the building, while on the east side it is used for morning sunlight, and for the west side it is used for shading to reduce excess light during the day and night. In addition, also apply skylights to the cavity of the building. The shade of the building is planned and determined based on how much direct sunlight you want to reduce.

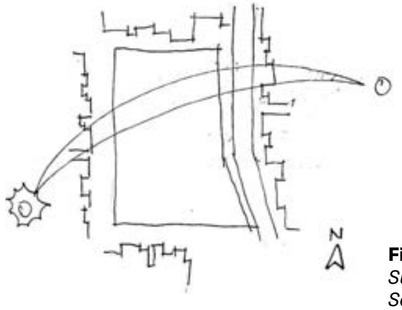


Figure 79.
Sun Path
Source: Author

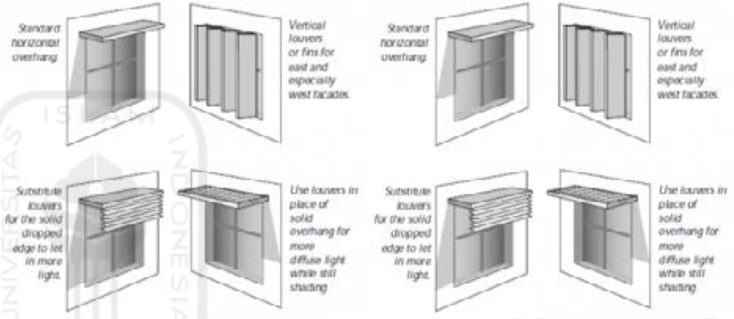


Figure 80. *Shadings*
Source: Autodesk Typepad

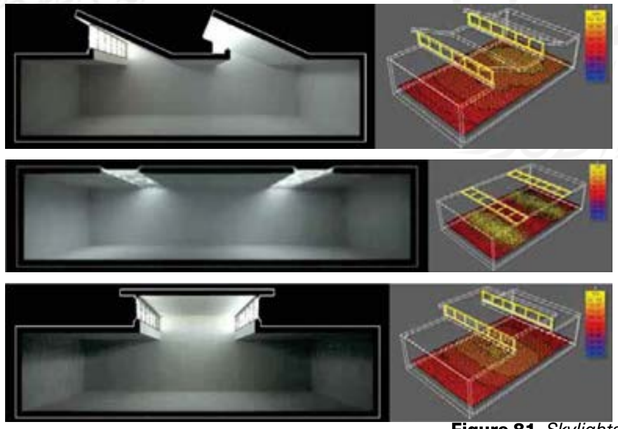


Figure 81. *Skylights*
Source: Course Material "Advanced Architectural Lighting Design" Master of Architecture, Atma Jaya University Yogyakarta

Natural Analogue

- **Biomorphic Forms and Patterns**

The resulting biomorphic shapes and patterns refer to functional forms found in nature, which have properties that are useful for human needs and problems (Kellert & Calabrese, 2015). According to Browning, Ryan, & Clancy (2014), that biomorphic forms and patterns are a reference in leading to forms and functions that exist in nature, to provide needed solutions and human problems. Utilization of natural patterns for a building can give the impression of a room that was originally static to become dynamic. Vegetation is the first thing that comes to mind when planning the natural environment. Trees are one of the vegetation that stands out visually, therefore, the way to adapt existing patterns in nature is to present trees into building structures.

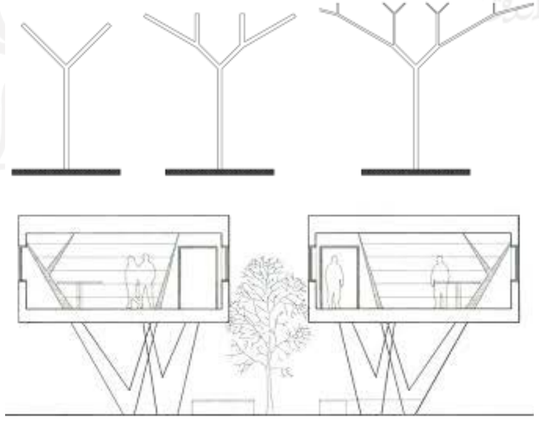


Figure 82. *Columns in Biomorphic Form*
Source: Google

- **Material Connection with Nature**

Materials with natural elements give a different impression and atmosphere compared to other materials. The impact can have a positive impact on those who use it. According to Adi Saputro (Jessica, Autism Care Center, 2010: 75), the choice of color is something that affects the use of buildings, color itself has a perception, emotion, and a person's nature and behavior. In choosing colors to reduce stress, examples of colors that can be used are by applying bright colors such as white, yellow, and green.

Figure 83.
Stone Texture
Source: Gessato

Figure 84.
Wood Texture
Source: Cecobois

Figure 85.
Greenery
Source: Yasushi Okano

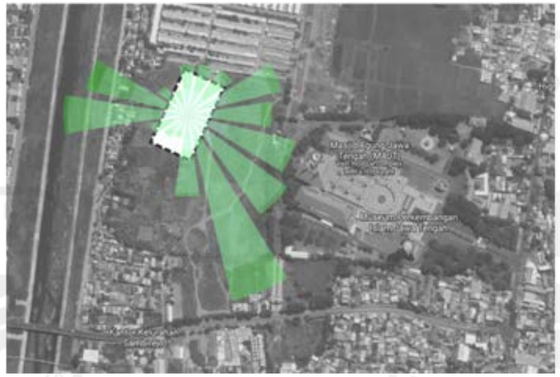
- White, gives the impression of a sense of peace that can be found in materials such as natural stone
- Yellow, gives a calming impression where it can be found in materials such as wood and bamboo
- While green, gives a fresh impression and a cool feeling that can be implemented by adding a plant design

03 *Schematic Design.*

3.1 Mass Orientation

(1)

Figure 86. *Mass Orientation*
Source: Author



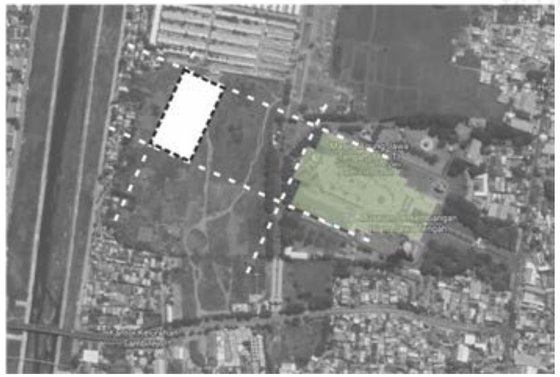
(2)

Figure 87. *Mass Orientation*
Source: Author

(1) The location is next to one of Semarang's icons, the Great Mosque, the view of the mosque is one of the considerations in determining the orientation of the building facing the mosque.

(2) The widest side of the building faces the direction where the wind blows.

(3) The laying of the building mass on the site follows an imaginary line from the axis of the great mosque.

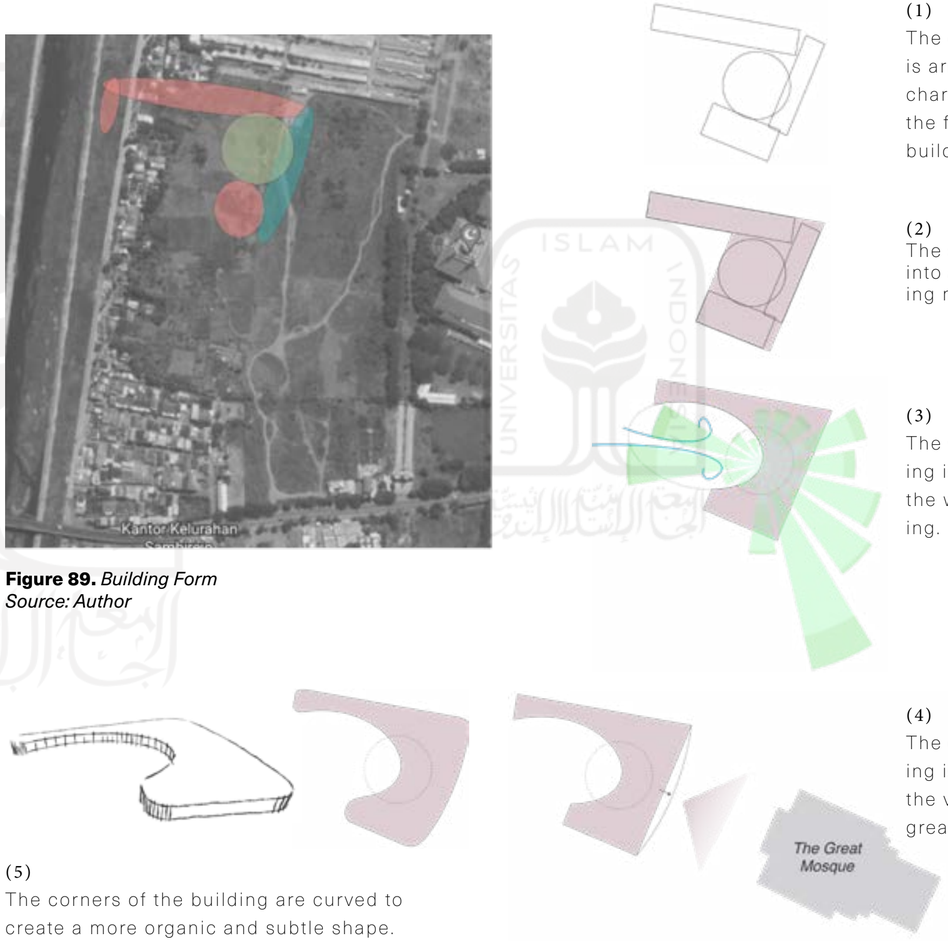


(3)

Figure 88. *Mass Orientation*
Source: Author

3.2 Building Form

Figure 89. *Building Form*
Source: Author



(1)
The organization of space is arranged based on each character of the space and the flow of movement of the building users.

(2)
The spaces is combined into a single unit of a building mass.

(3)
The west side of the building is trimmed to maximize the wind entering the building.

(4)
The east side of the building is curved to maximize the view out towards the great mosque

(5)
The corners of the building are curved to create a more organic and subtle shape.

3.3 Building Circulation

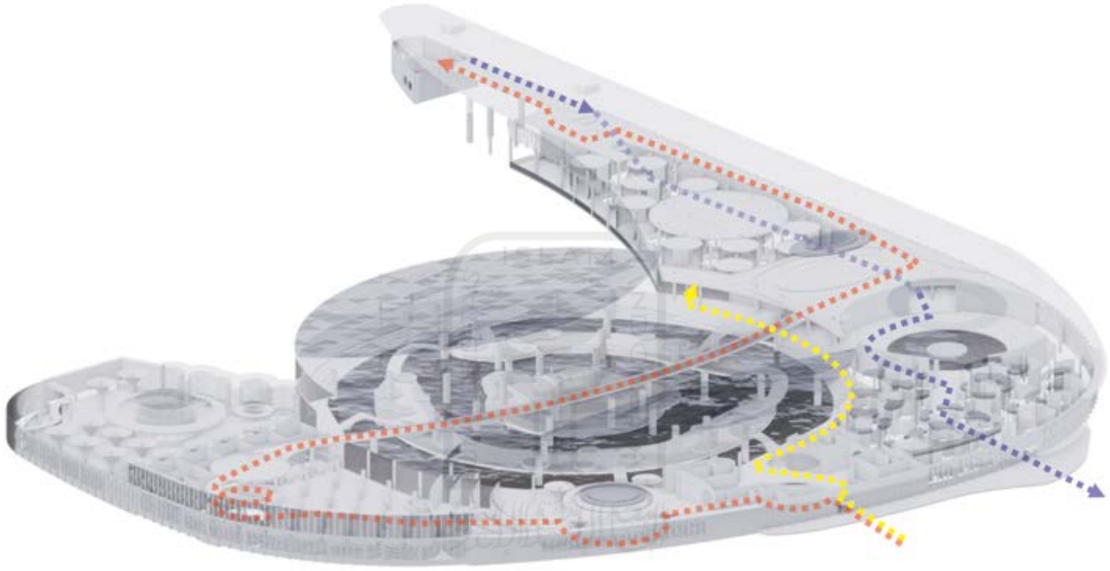


Figure 90. *Building Circulation*
Source: Author

Building users are divided into 3 categories: inland port users, users who just visit for recreation, and employees. The circulation of each category of users is also adjusted to the needs. Without compromising circulation efficiency, each user circulation has a varied space experience.

- Inland port users who leave can feel walking on the bridge that crosses over the indoor park
- Inland port users who arrive are directly connected to the exit but have access to the indoor park by passing through branches with tilting skylights that follow the wind source, with a pond and tree in the middle
- Visitors and employees can immediately feel and see the indoor park up close

3.4 Airflow Variability

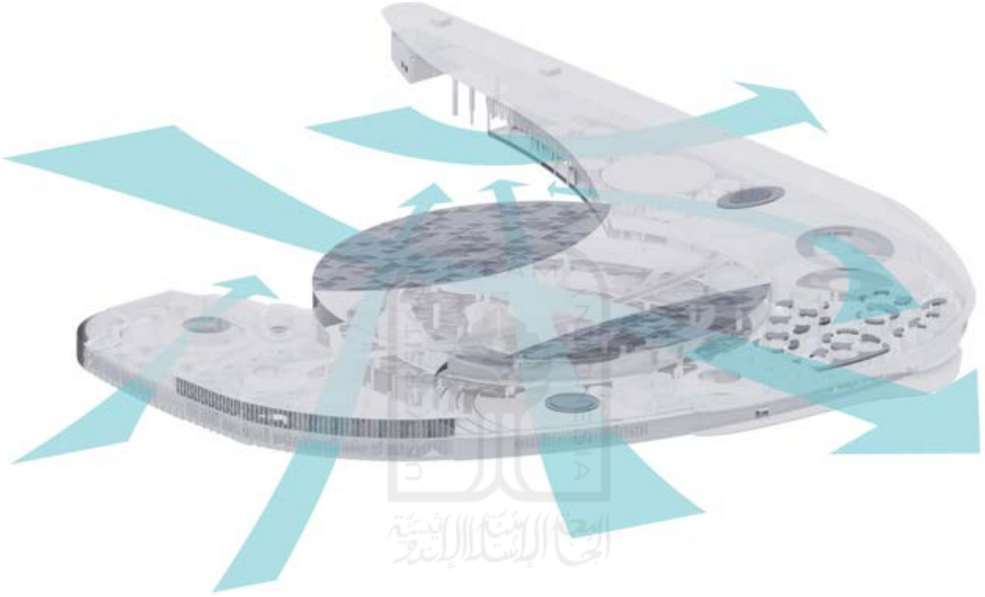


Figure 91. *Building Air Flow*
Source: Author

Use of skylights for ventilation of hot air outlet

Figure 92. *Skylight*
Source: Author

Cross ventilation by considering the direction of the wind source and the movement of hot air that tend to be upwards

Figure 93. *Cross Ventilation*
Source: Author

3.5 Presence of Water

The use of skylights in most spaces also aims to allow rainwater to enter and provide a unique space experience for users inside to feel the presence of rain in the room by hearing the sound of rain, smelling rainwater, and seeing raindrops falling.

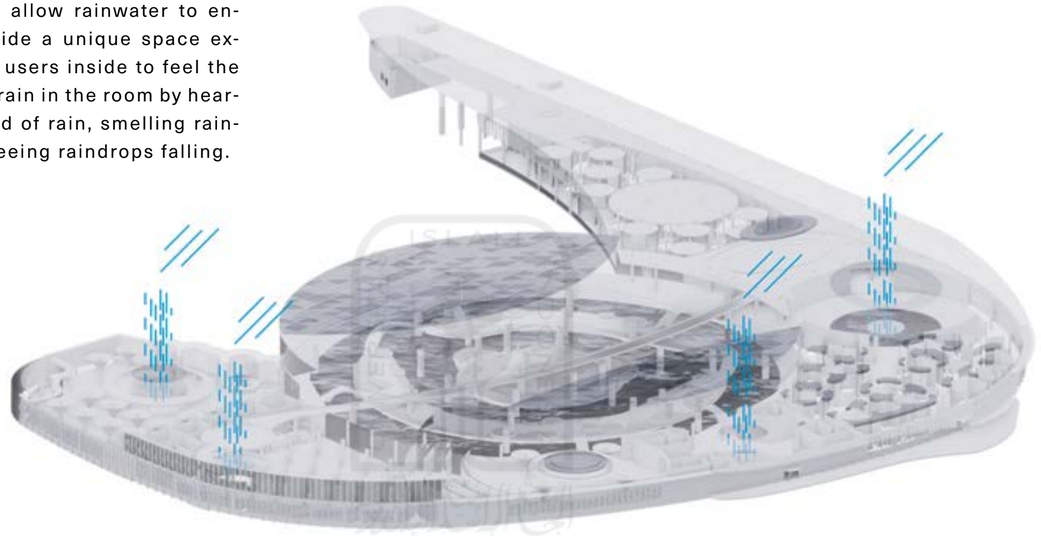


Figure 94. *Skylight Spots*
Source: Author

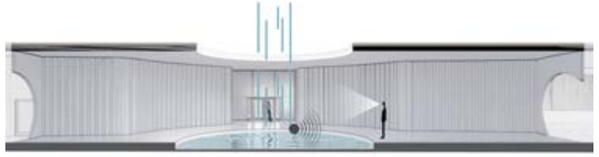


Figure 95. *Skylight*
Source: Author

Skylights with water pool below

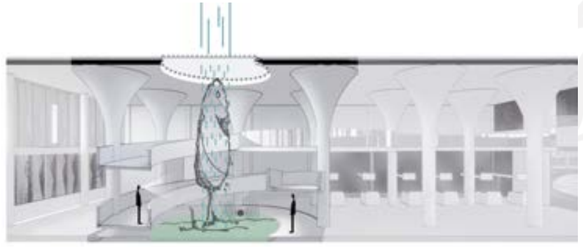


Figure 96. *Skylight*
Source: Author

Skylights with small garden and trees. For skylights with a height of 2 stories, perforated metal plates are installed to reduce the size of the raindrop

3.6 Biomorphic Form and Pattern

Columns

Adapting the shape of the water fountain and tree into a column shape gives a more dynamic impression when compared to a regular column shape. A room that requires a lot of lined columns and uses this form of adaptation will provide a unique space experience, that feels like a room filled with trees like in a forest but with a more calming feeling like a water fountain.

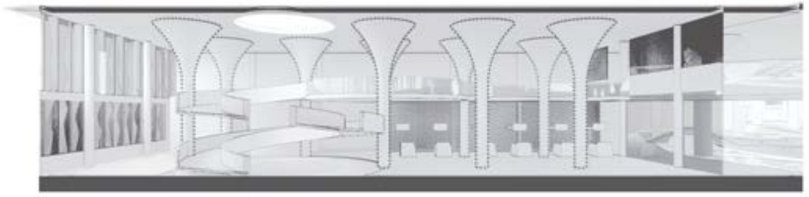
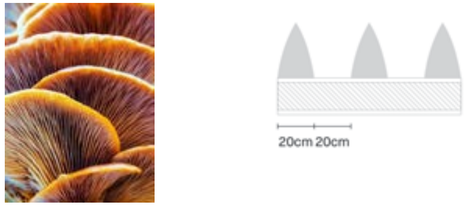


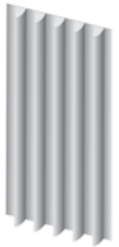
Figure 97. *Biomorphic Form in Columns*
Source: Author

Wall Finishing

Applying a texture adapted from nature into the space gives a sense of the presence of nature in the space indirectly. Mushrooms are one of the most widely distributed elements in nature. Mushrooms themselves have a unique texture, repeated lines form an organic pattern, and seem to flow dynamically, this feeling that given by the texture become the consideration for applying this texture to the design.

Figure 98. *Biomorphic Form in Wall Finishing*
Source: Author





04 Final Design.

4.1 Site Planning

The placement of the building mass takes into account the proximity to the canal and the condition of the existing neighborhood. There is one entrance to the site to facilitate checking of vehicles entering the site, while the exit to the site is available at two opposite points to make it easier for vehicles to reach their destination and reduce the level of vehicle density on the site. The outdoor park is located right next to the building for efficient circulation of users passing from the Inland Port to the park and vice versa. Parking space is available in two places, one is near the entrance to the building while the other is across from the outdoor park. Pedesetrian has a separate lane from the vehicle for safety and comfort. A pedestrian bridge is also available to reach secondary parking lots. For cyclists, there is a lane on the edge of the motorized vehicle lane.

Figure 99. *Site Situation*
Source: Author

4.2 Landscape Design

The material for groundcover uses environmentally friendly materials, porous groundcovers such as paving blocks, wooden decks, and natural stone. The three main types of vegetation at the site are bamboo, cypress, and trembesi. Bamboo has a calming effect on psychology, trembesi is effective as a shade, and spruce is useful for reducing noise. Apart from circulation paths and activity zones, the entire site is covered with grass, greenery, or water.

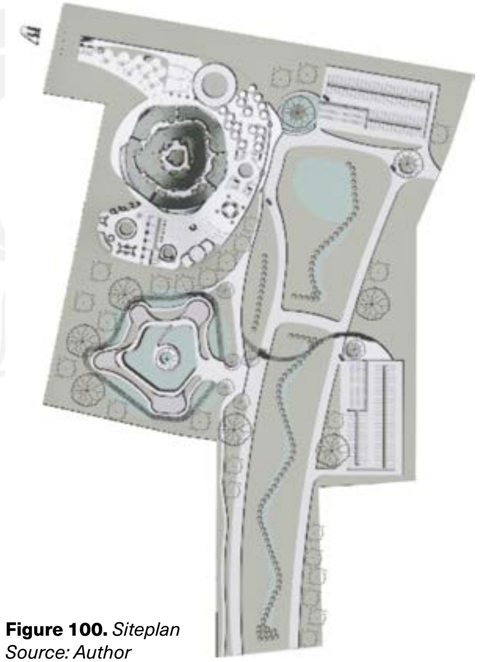
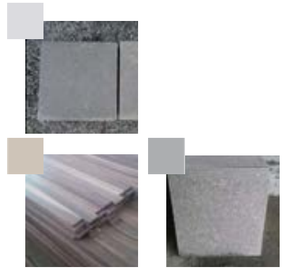


Figure 100. *Siteplan*
Source: Author

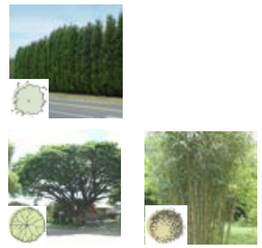
Figure 101. *Hardscape Plan*
Source: Author

Figure 102. *Vegetation Plan*
Source: Author

Wooden decks are used in gardens in fitness and sports zones, and gathering spaces. Paving blocks are used on vehicle paths, while natural stone is used on pedestrian paths.



Bamboo is arranged with grooves in the middle of the boulevard to reduce the impression of a long road. Spruce trees are placed around the building.



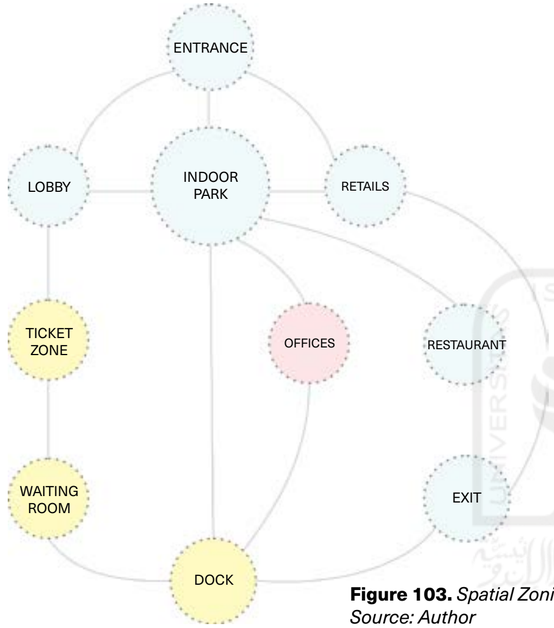


Figure 103. *Spatial Zoning Diagram*
Source: Author

In spatial programming, the indoor park system becomes the main zone and is connected to other spaces. Almost all spaces and activities in the building with these two stories are directly or visually connected to the indoor park. The ground floor is dominated by public spaces (blue) such as the inland port, lobby, retail, and restaurant. But on the ground floor there is also an office in the form of a private room (red). The office location which is located on the ground floor makes it easy for employees to reach the office from the entrance and various other spaces such as an indoor park. While on the second floor there is a waiting room in the form of a semi-public (yellow) room because only passengers who have tickets can enter this room, and a meeting hall for employees or guests of the inland port.

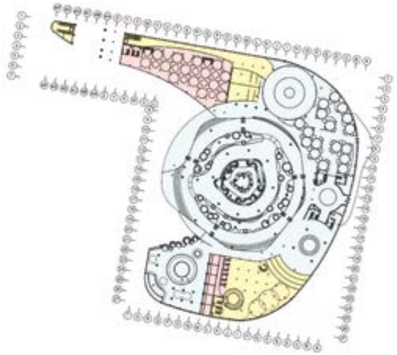


Figure 104. *Ground Floor Zoning Plan*
Source: Author

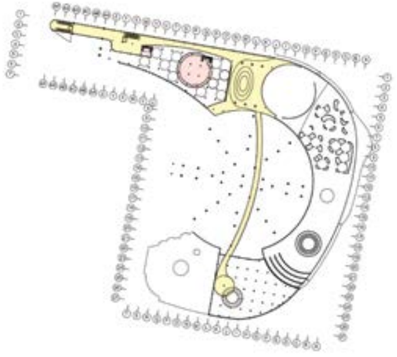


Figure 105. *1st Floor Zoning Plan*
Source: Author

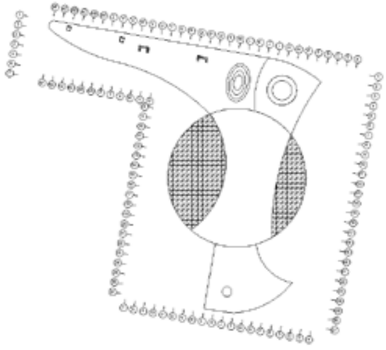


Figure 106. *Rooftop Plan*
Source: Author

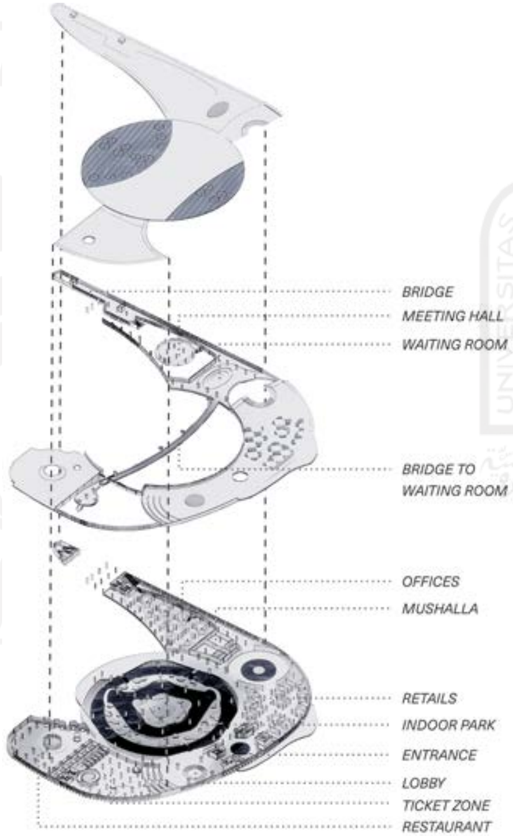


Figure 107. *Exploded Axonometry*
Source: Author

The entrance and exit of the building have different doors. From the entrance, visitors will be at the branch that connects the inland port lobby, indoor park, and retail area. The lobby as the main access for prospective passengers to reach the ticketing zone is directly connected to the indoor park. The ticketing zone is a place where prospective passengers exchange their tickets.

The waiting room is located on the upper floor and is horizontally across from the ticket zone, connected by a ramp as a vertical line, and a bridge that crosses the indoor park as a horizontal line. The waiting room is directly connected to the ship's dock which is connected to elevators and escalators as a means of vertical transportation, also visually connected to the indoor park.

The indoor park is divided into two parts separated by water, the outer zone and the inner zone. The zone is determined based on the activity and the nature of the area, the inner zone is more private, can only be reached by boat, because it is used for activities that require tranquility such as yoga and mediation. While the outer zone is more open to function as a walking and sitting zone. The outer zone can be reached through a stairway from other rooms such as the lobby, restaurant, and even the entrance.

The public restaurant is very open and can be reached from the indoor park, offices, and lobby. Although the offices are private because they are only open to employees, the office location is quite strategic, connected to the indoor park as the main zone in the building, and also connected to the ship dock via stairs. The retail area as the main access to the exit door is also connected to the entrance, indoor park, and circulation of arrival passengers.

4.4.1 Inland Port

The building area that functions as the main facility for an inland port includes the lobby, ticket zone, and dock/pier located on the ground floor. While on the 1st floor there is a waiting room. In addition to space experience as a design consideration, circulation efficiency is also a major consideration. Through the picture, it can be seen the flow of passenger circulation, both arriving and departing passengers. For arrival passengers, from the dock/pier connected to the exit door through the aisle and retail. While departing passengers pass through the bridge above the indoor park for space experience and cut the road for circulation efficiency.

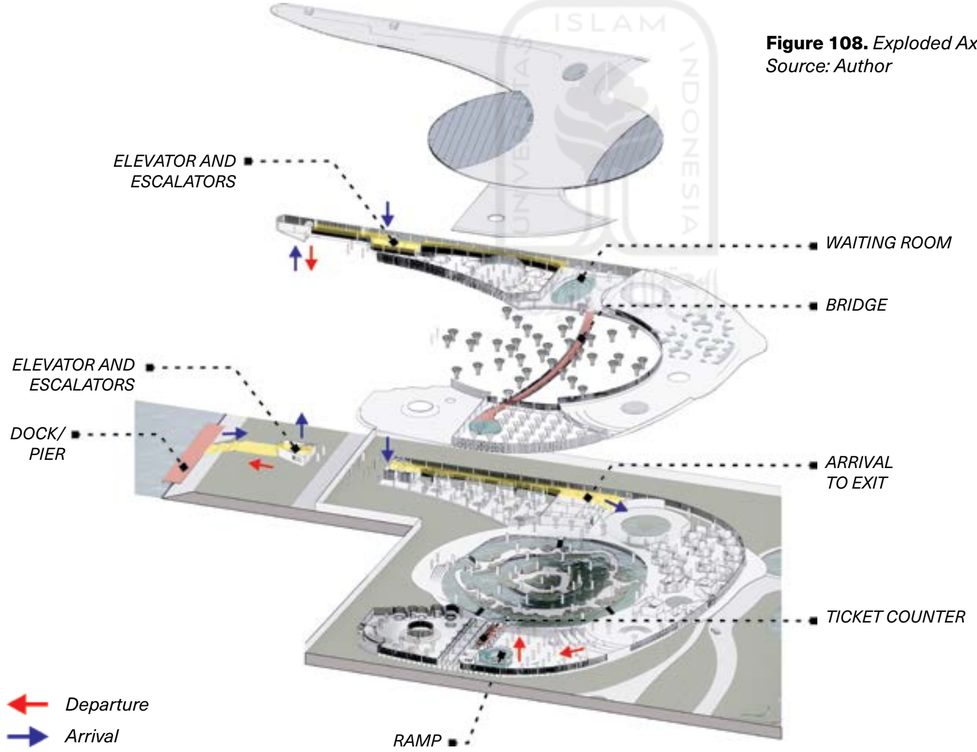


Figure 108. *Exploded Axonometry*
Source: Author

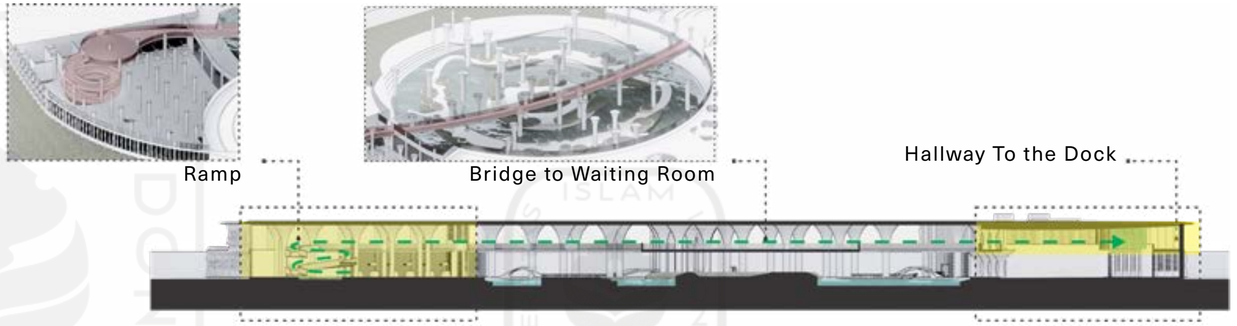
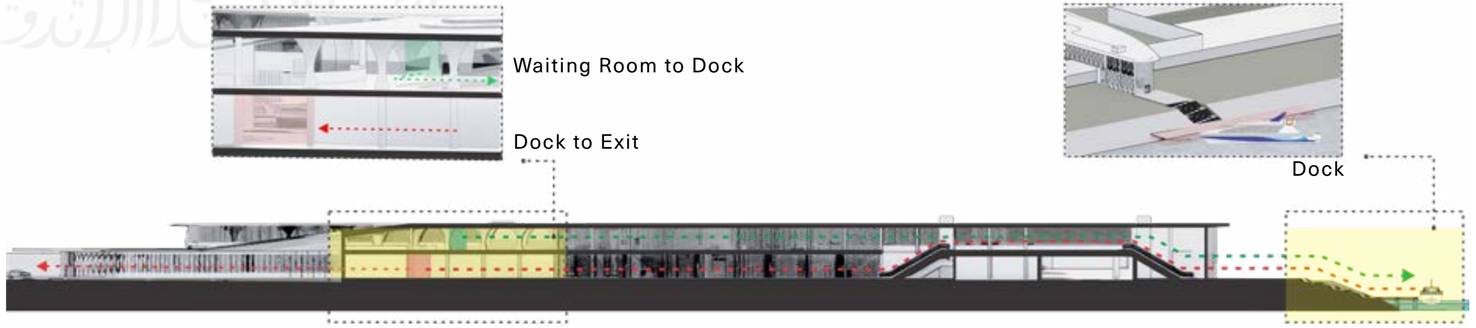


Figure 109. *Building Section*
Source: Author

Figure 110. *Building Section*
Source: Author



4.4.2 Nature in Space

- ***Visual Connection with Nature***

A design with all spaces in the building connected to the indoor park as the center of the building, either directly or visually. As the name suggests 'indoor park' greenery elements become an important point in the design. In addition to being connected to the greenery from the indoor park, greenery is also presented in almost every room/area in the building. In the ticket zone there is a void with smaller trees and greenery on the floor. In the office area each room has access to a small green area. The restaurant also features several spots with green areas, with the main point being a fairly large void in the middle of the room with trees. The retail area also presents many green spots that are connected to each room.

- ***Non-visual Connection with Nature***

The floor in the building uses natural materials such as wood(brown) and natural stone, as well as exposed concrete(grey) which also gives the impression of nature. Exposed concrete is used as floor material in indoor park areas, ticket zones, and branches that connect several spaces. Wood that has a warm impression is used in the inner zone of the indoor park as a place of mediation/yoga. The restaurant floor also uses wood as a floor material because it gives a warm impression that can increase appetite. While natural stone is also used in the restaurant area to add to the impression of nature in the room.

Water elements(blue) can also be found in various places, such as connecting branches of several spaces, and of course an indoor park with a boat path function.

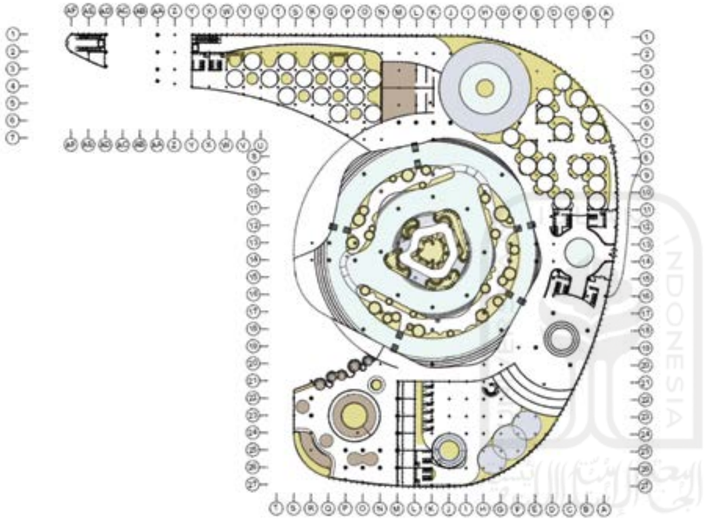


Figure 112. *Natural Material in The Building*
Source: Author

- ***Natural Analogue***

The use of secondary skin on the column is shaped like a combination of a tree with a water fountain. Columns with these sacred skins can be found in most areas of the building, such as the lobby, restaurant, waiting room, and the most visible column patterns are the indoor park and ticket zone. In the ticket zone there are 29 columns with the secondary skin with a distance between columns of 6m and a column height of 9m. The room which is practically full of columns makes the space feel like a water fountain forest.

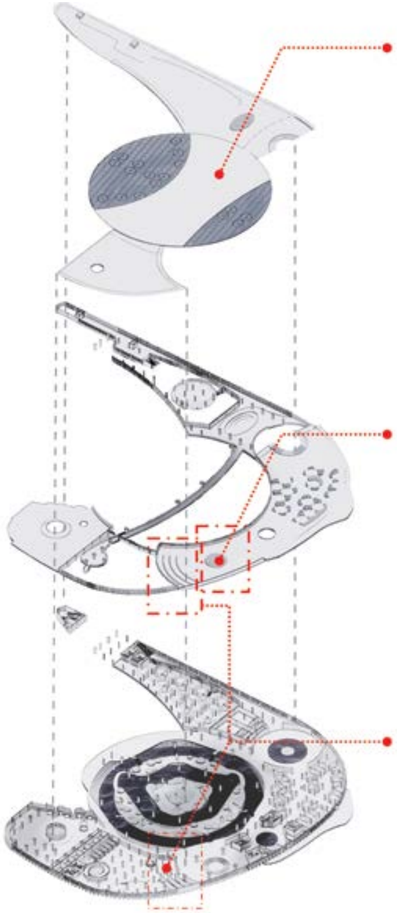
Figure 111. *Visual Connection with Nature*
Source: Author

4.4.3 Dynamic Lighting

To give a more natural impression, dynamic space lighting is needed in the building. As the center of the building, the indoor park is one of the spaces with a roof design with the aim of using daylight to create dynamic passive lighting. A circular room with a roof that uses 2 different materials, a glass roof for brighter lighting, and a twinwall corrugated uPVC roof for darker lighting. With the type of roof that alternates, it will provide a more dynamic lighting of the space and give a feel with light that feels more natural in the room.

The indoor skylight design was upgraded by using colored glass to make the light in the room with a certain color. The use of skylights is used in several rooms such as waiting room and lobby. This ceiling has 3 layers, with 2 layers of skylights above the roof slab, and 1 layer of down ceiling. The colors used are purple on the bottom layer, pink, and yellow on the top layer. This colored ceiling in addition to making the lighting of the room more attractive, the color also has a healing effect on human psychology.

Colored glass skylights are also applied to the connecting gate between the lobby and ticket zone. This gate has 4 layers with each having a different glass skylight. Almost the same as the ceiling, but the daylight is reflected on the wall. To make a layered colored wall into a gate. The colors used are blue on the outermost layer, then purple, pink, and yellow on the innermost layer. The four colors also have a healing effect on psychology, and reduce stress on humans who see it.



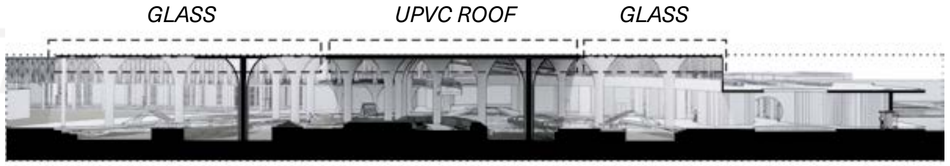


Figure 113. *Roof Material Variability*
Source: Author

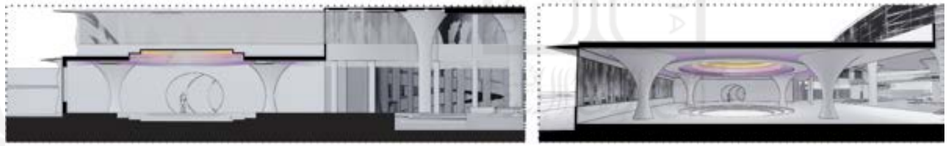


Figure 114. *Colored Glass Ceiling*
Source: Author

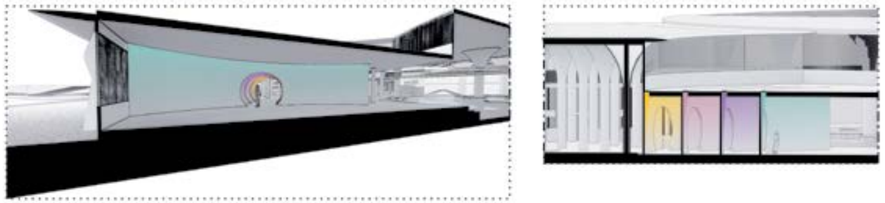


Figure 115. *Wall Reflection of The Colored Glass Skylight*
Source: Author

4.4.4 Indoor Park

The indoor park located in the center of the building is the main attraction for buildings that function as recreational inland ports. The form of this indoor park is in the form of an island surrounded by water elements as a boat path used for transportation to reach the islands. These islands take the form of a toll road that connects all areas in Semarang as a symbol of the form that unites Semarang.

Some of these islands have varying land contours (up to 1.1m) to create a more natural impression and serve for privacy and reduce noise for zones that require tranquility such as yoga and meditation zones. The entire contoured area is covered with greenery and vegetations.

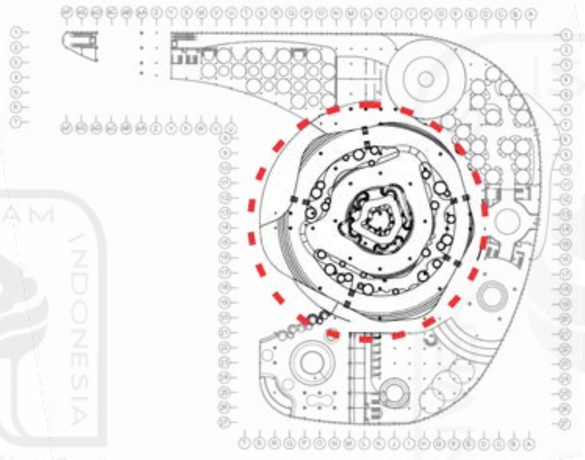


Figure 116. *Indoor Park Floor Plan*
Source: Author

The islands consist of two zones, namely the outer zone island (green) and the inner zone island (red). In the outer zone the contours still tend to be flat, with greenery and carrara white marble floor materials. The outer zone is a walking zone and sitting area where users can relax and relieve stress. To reach the outer zone the user can go through the ladder bridge or use a boat for a different experience. While in the inner zone, the contours of the land vary, surrounding the island like a 'fort'. The inner zone functions as a zone that requires calm, such as yoga and meditation. To reach the inner zone the user needs to take a boat.

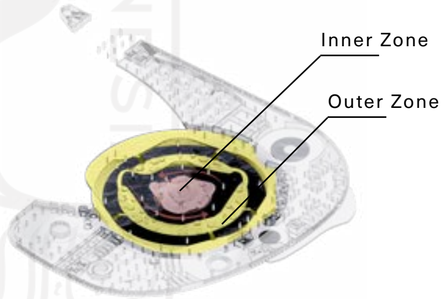


Figure 117. *Indoor Park Zones*
Source: Author

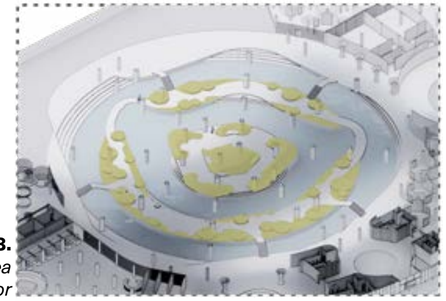


Figure 118.
Greenary Area
Source: Author

Figure 119.
Lifted Ground Area
Source: Author

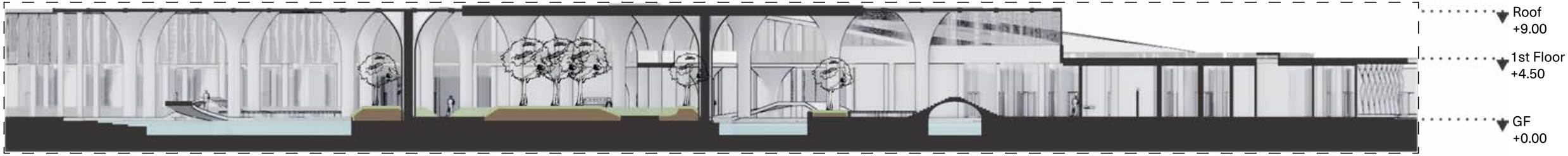


Figure 117. *Indoor Park Section*
Source: Author

4.4.5 Port Offices

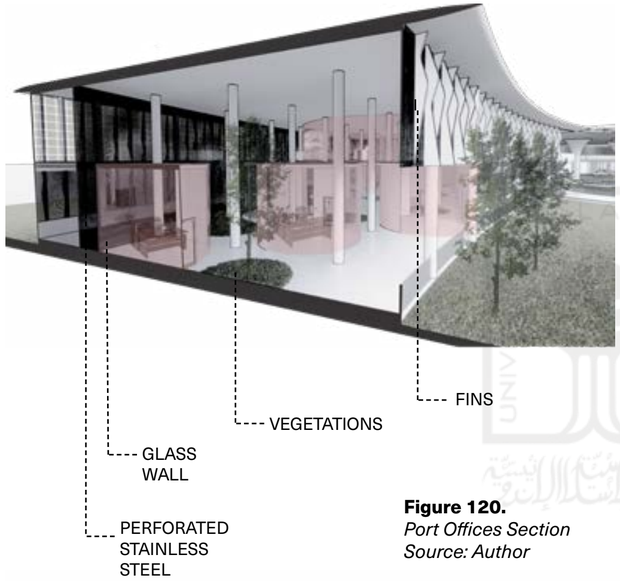


Figure 120.
Port Offices Section
Source: Author

The offices for Inland Port employees and regulators are located on the north side of the building. From the office area it is directly connected to the main part of the building, namely the indoor park, and is also directly connected to the bridge that leads to the ship's dock/pier. The ground floor office area consists of office spaces, while on the upper floor there is a meeting hall.

Each office room is in the form of a circle, and is separated from one room to another. The wall material uses glass to give the impression of being spacious, open, and visually connected to the vegetation outside the room, while on some sides of the room that is directly opposite other rooms, brick walls with white paint are used for user privacy. The distance between the rooms is used as a small garden with vegetation. Office enclosures also use perforated stainless steel for passive cooling. At the front of the office there is a communal space for employees to sit and rest.

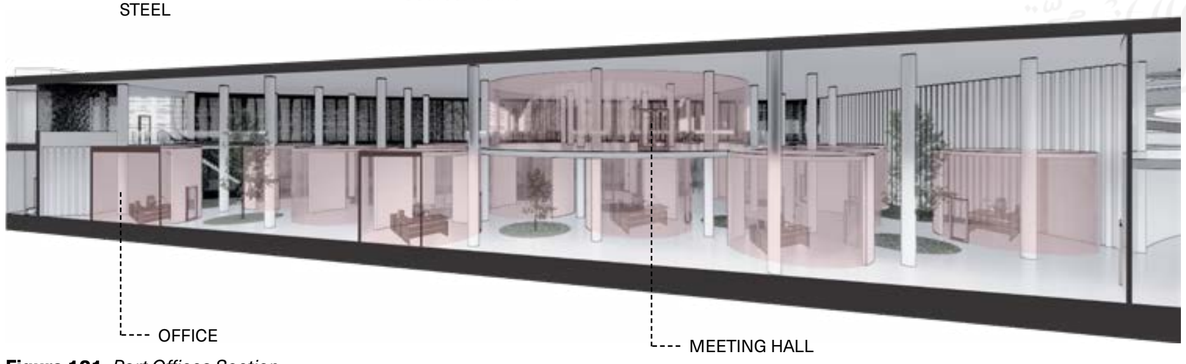


Figure 121. *Port Offices Section*
Source: Author

4.4.6 Retail Area

The retail area location is directly connected to the entrance and exit. Each retail space has its own space in the form of a circle, and is separated from other retail spaces. The walls use glass for a broad and airy impression, as well as to show off the selling items that are in the room seen from the outside, but on some sides of the retail space that is directly connected to the retail space next to it, the walls use bricks with white paint to provide boundaries between retail spaces. . In each retail space there is a small garden around it for a green impression, and the ceiling of each garden is open with an up ceiling as a skylight for natural lighting and passive cooling.

Figure 122. *Retails Section*
Source: Author

4.5 Building Structure

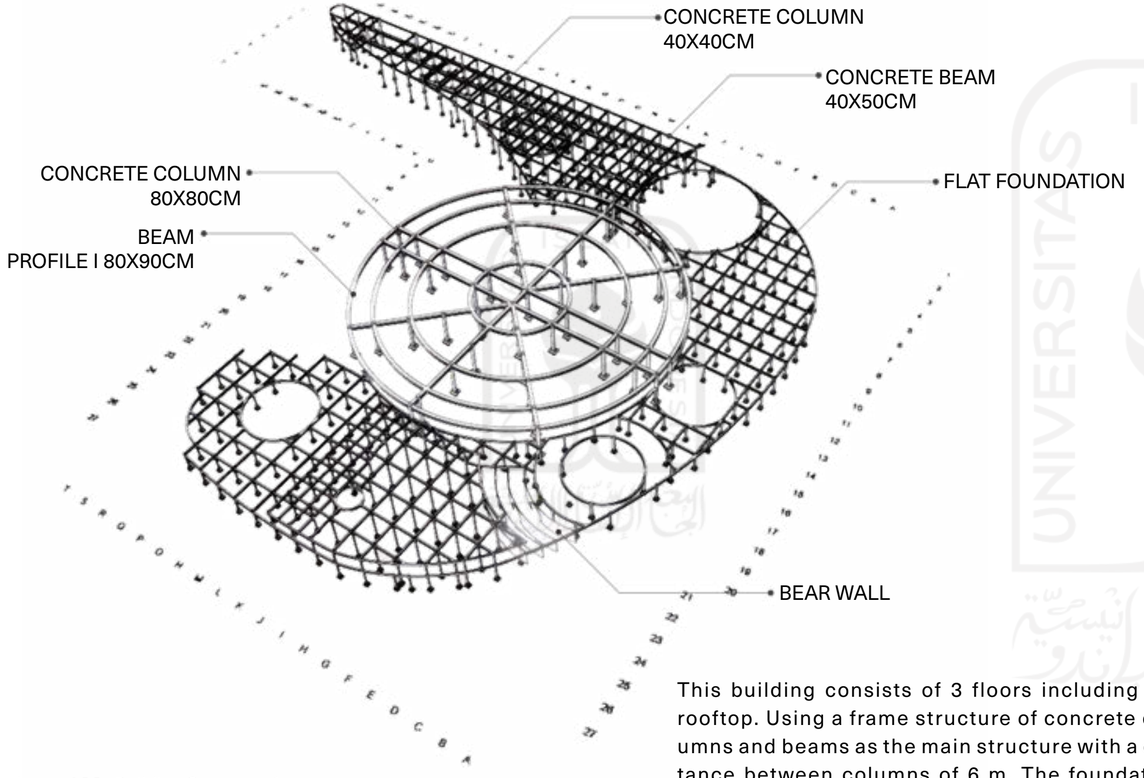


Figure 123. *Building Structure Axonometry*
Source: Author

This building consists of 3 floors including the rooftop. Using a frame structure of concrete columns and beams as the main structure with a distance between columns of 6 m. The foundation uses a flat foundation. The main column uses 40x40cm concrete. While the indoor park area uses 80x80cm concrete columns, with I-profile steel beams with dimensions of 80x90cm. the dividing wall of the lobby and ticket zone uses a bear wall to reduce the visible column.

4.6 Barrier Free Design

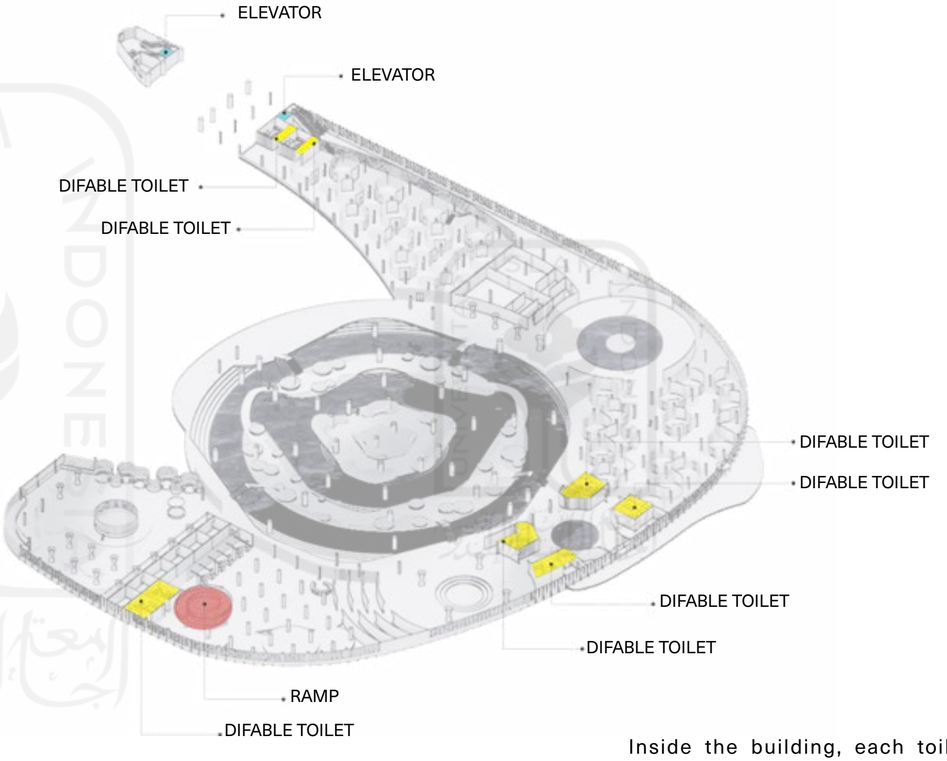


Figure 124. *Barrier Free Design Ground Floor Plan*
Source: Author

Inside the building, each toilet has a special toilet for the disabled, with a total of 8 toilets consisting of 4 male toilets and 4 female toilets. Vertical transportation available for the disabled are two elevators on the bridge leading to the dock/pier, and a ramp in the ticket zone.

4.7.1 Exterior

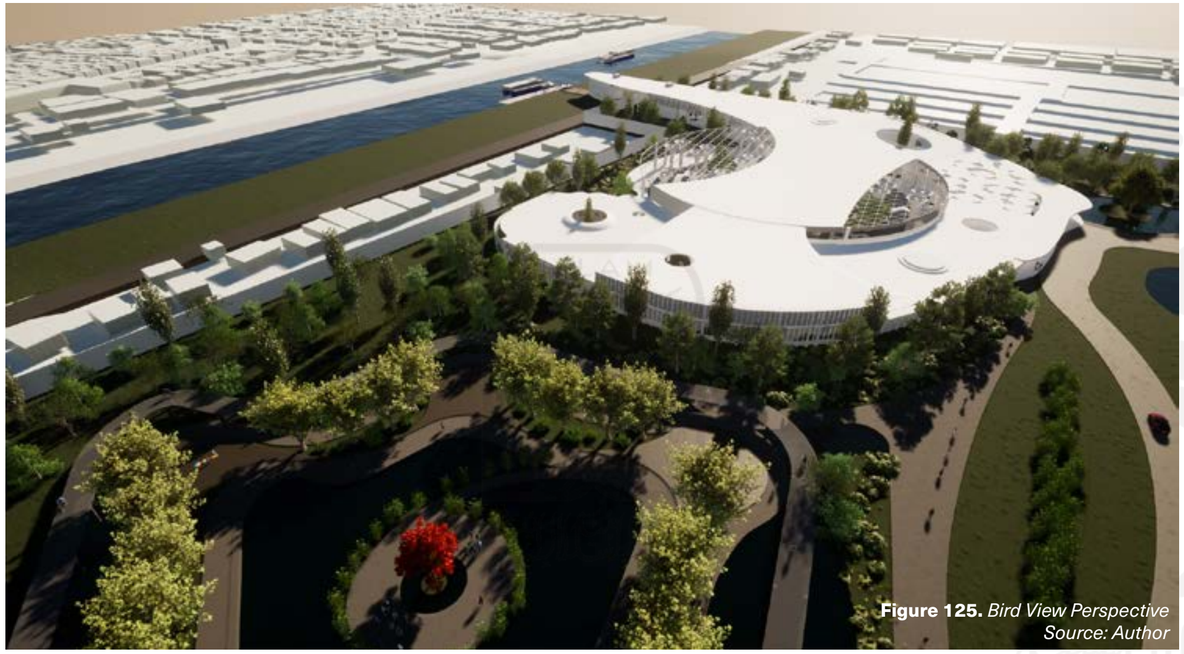


Figure 125. *Bird View Perspective*
Source: Author

Figure 126. *Entrance and Exit Perspective*
Source: Author

Figure 127. *Pier/Dock Perspective*
Source: Author

Figure 128. *Outdoor Park Bird View*
Source: Author

Figure 129. *Outdoor Park*
Source: Author

Figure 130. *Bicycle Lane*
Source: Author

4.7.2 Interior

Figure 131. *Entrance*
Source: Author

Figure 132. *Lobby*
Source: Author

Figure 133. *Ticketing Room*
Source: Author

Figure 133. *Branch Between Departure Hallway and Retails*
Source: Author

Figure 134. *Waiting Room*
Source: Author

4.7.2 Interior

Figure 135. *Restaurant*
Source: Author

Figure 136. *Restaurant*
Source: Author

Figure 137. *Restaurant*
Source: Author

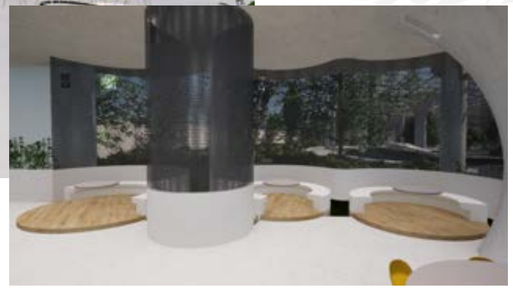


Figure 138. *Restaurant*
Source: Author

Figure 139. *Retails*
Source: Author

Figure 140. *Retails*
Source: Author

4.7.2 Interior

Figure 141. *Port Offices*
Source: Author

Figure 142. *Port Offices*
Source: Author

Figure 143. *Indoor Park*
Source: Author

Figure 144. *Inner Zone*
Source: Author

Figure 145. *Outer Zone*
Source: Author

05 Reflection.

5.1 Biophilic Design

Question:
What are the differences between this biophilic design and biophilic design in general?
Is biophilic design in general gives the effect of stress relieving?

In general, biophilic designs do have a stress relieving effect. In this building, biophilic has a big role. Main attraction also applies biophilic design as a basic concept. The spaces provided for activities that support the user to reduce stress consist of elements that are aspects of the biophlic design. The main attraction is in the form of an indoor boat ride, which is in direct contact with the water element. Space for ordinary activities such as sitting and walking can also help reduce stress. Like a space for meditation and a walk in the indoor park. The spatial pattern of space in the building is also part of the biophilic design. An example is in the retail area, the circular form of space makes space for winding circulation and provides a more dynamic space experience. The biophilic design is also part of the space for circulation, for example in the layered wall that connects the lobby and ticketing area, there are 4 wall layers with colored skylights in 4 different colors which have a stress relieving effect.

Figure 146. *Inner Zone of Indoor Park as Meditation Space*
Source: Author

Figure 147. *Indoor Boat Ride as Tourism Activity*
Source: Author

Figure 148. *Retail Spatial Form*
Source: Author

Figure 149. *Colored and Layered Wall for User Experience*
Source: Author

5.2 Recreational Attraction

Question:
As a tourist destination, what is the main attraction?

The indoor park as the center of attraction of the building has the shape of islands with water surrounding it. The water becomes a space for the main recreational activity, namely the indoor boat ride. Apart from being a recreational activity, indoor boats are also used as a means of transportation for visitors who want to use the inner zone of the indoor park.

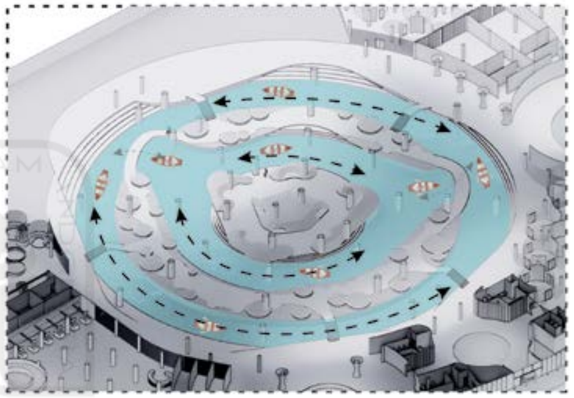


Figure 150. *Indoor Boat Ride Area*
Source: Author

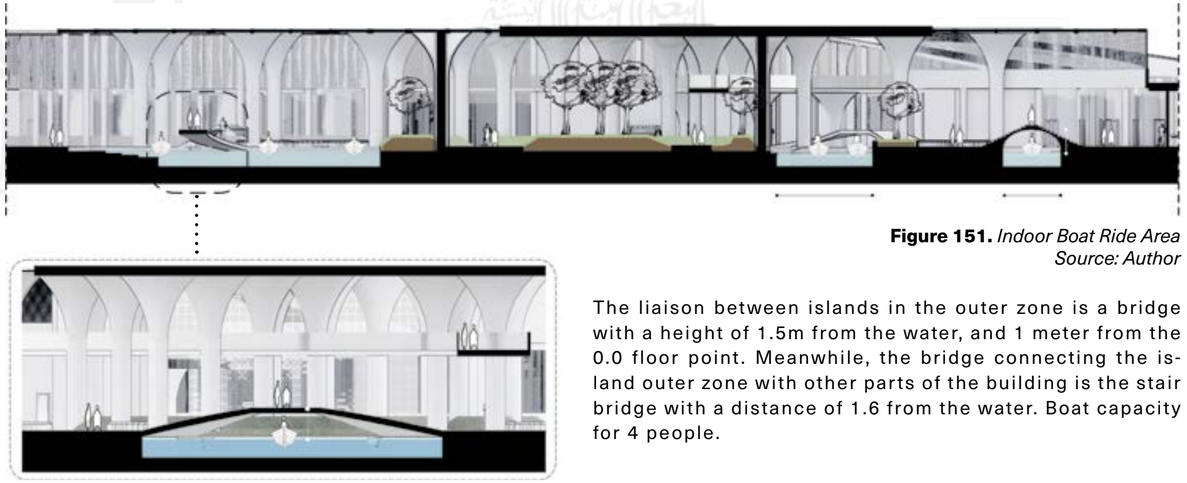


Figure 151. *Indoor Boat Ride Area*
Source: Author

The liaison between islands in the outer zone is a bridge with a height of 1.5m from the water, and 1 meter from the 0.0 floor point. Meanwhile, the bridge connecting the island outer zone with other parts of the building is the stair bridge with a distance of 1.6 from the water. Boat capacity for 4 people.

5.3 Circulation Management

Question:
Since there is only one entrance, how to arrange circulation paths for two different types of users, visitors and passengers?

There are two points where the passenger and visitor routes will be separated, namely at the entrance and arrival hall. At both points there is a circular space that aims to separate the circulation flow of the two different users.

Meanwhile, the zone for passengers is separated from the visitor zone. On the ground floor, the special passenger zone is located in the ticketing zone and the arrival hall. At the entrance to the ticketing zone, which is connected to the lobby, there will be a security check that ensures only passengers can enter the room.

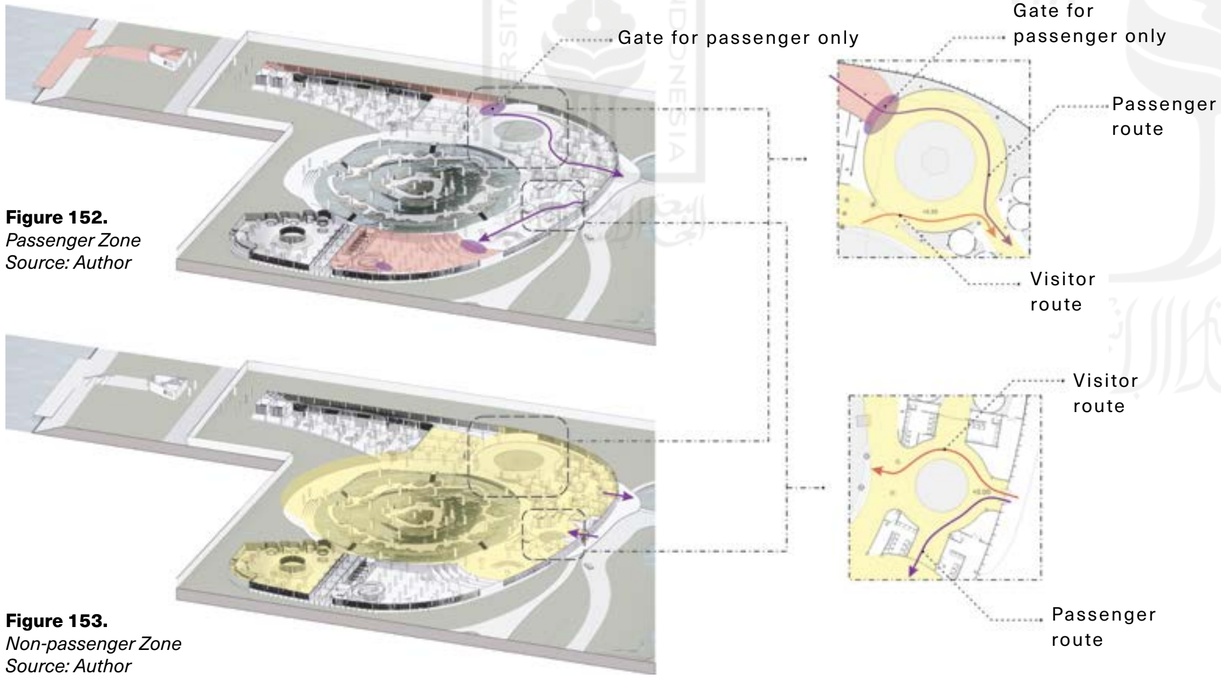


Figure 152.
Passenger Zone
Source: Author

Figure 153.
Non-passenger Zone
Source: Author

5.4 Thermal Comfort

Question:
With a short but wide building, and rooms that do not use air conditioner, how do you ensure thermal comfort in the building?

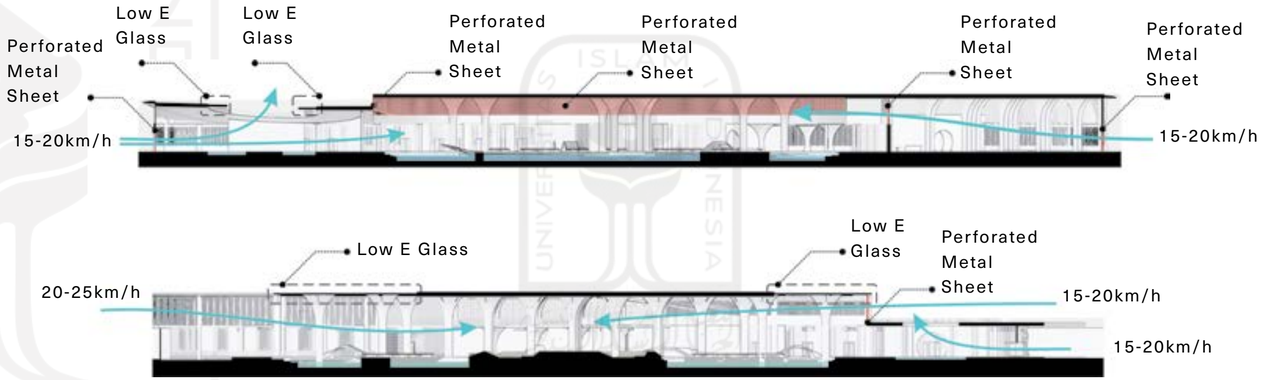


Figure 154. *Passive Cooling Planning*
Source: Author

For the purpose of passive cooling, there are several ways to do it. First with architectural elements. Almost the entire building envelope uses perforated metal sheet so that wind can enter the building and cross wind circulation occurs. Then the glass skylight material uses low e glass to reduce the intensity of solar heat that enters the building. Second, with natural elements such as water and vegetation available in almost every room, it aims to provide natural cooling for the room.

05 *References and Attachment.*

References

CNN Indonesia. (2018, July 10). *Dibandingkan Singapura, tingkat stress Indonesia Lebih Rendah.* https://www.cnnindonesia.com/gaya-hidup/20180710143643-255-312964/dibandingkan-singapura-tingkat-stres-indonesia-lebih-rendah>

Arifyanti, H., Awaluddin, M., Sabri, LM. 2014. *Analisis Ruang Terbuka Hijau Kota Semarang Dengan Menggunakan Sistem Informasi Geografis*. Jurnal Geodesi Undip Volume, Nomor 1. (ISSN: 2337-845X)

Marine Insight. (2021, August 26). *What Are Different Types of Port For Ships?*. https://www.marineinsight.com/ports/what-are-the-various-types-of-ports/.

Denman, R. 2001. *Guidelines for community-based ecotourism development.* WWF International

WIkipedia. (2017, August 26). *Pelayaran Sungai dan Danau/Pelabuhan Pedalaman.* https://id.wikibooks.org/wiki/Pelayaran_Sungai_dan_Danau/Pelabuhan_Pedalaman.

S, Etsa., K, Emilya. 2014. *Sirkulasi Penumpang Terminal Kapal Laut.* Langkau Betang, Vol. 1/No. 1/2014. DOI:10.26418/lantang.v1i1.18812.

Irsyadi, A., Setiawan, W. 2018. *Kajian Perbandingan Sirkulasi Bangunan dan Pencapaian Terhadap Transportasi Umum Pada Bangunan Mixed-use.* Sinektika Jurnal Arsitektur Vol. 15 No. 1. (ISSN: 1411-8912).

Kecamatan Gayamsari. (2021). *Geografis dan Penduduk.* https://kecgayamsari.semarangkota.go.id/geografis-dan-penduduk.

Wibowo, A. 2016. *Kriteria Ruang Publik untuk Masyarakat Usia Dewasa Awal*. Prosiding Temu Ilmiah IPLBI 2016.

Peraturan Menteri Perhubungan. 2013. *Rencana Induk Pelabuhan Tanjung Emas Semarang.*

Blarraw. (2020, May 14). *Spatial Organization in Architecture*. https://blarrow.tech/spatial-organization-in-architecture/.

Kim, Y. 2015. E*xploration of Connectivity Between Urban Plaza and Mixed Use Buildings.* University of Massachusetts Amherst https://doi.org/10.7275/7048514.

Firdausi, F., Prasetyo, E. 2017. *Pendekatan Transprogramming untuk Mewujudkan Efisiensi Ruang berdasarkan Perubahan Aktivitas dan Waktu.* Jurnal Sains dan Semi Pormits Vol. 6, No. 2 (2017) 2337-3520.

Ma'rruf, A., Graha, A., Salamun., Ismiyati. 2015. *Pengembangan Sungai Banjir Kanal Timur Semarang Sebagai Transportasi Sungai untuk Tujuan Wisata.* Jurnal Karya Teknik Sipil Volume 4, Nomor 4.

Browning, W.D., Ryan, C.O., Clancy, J.O. (2014). *14 Patterns of Biophilic Design*. New York: Terrapin Bright Green llc.

Pynkyawati, T., Aripin, S., Iliyasa, E., Ningsing, L., Amri. 2014. *Kajian Efisiensi Desain Sirkulasi pada Fungsi Bangunan Mall Dan Hotel BTC*. Jurnal Reka Karsa. Teknik Arsitektur Itenas No 1 Vol 2.

Ching, F. 2000. *Architecture Form, Space, and Order.*

Kim, Y. 2015. *Exploration of Connectivity Between Urban Plaza and Mixed Use Buildings*. Masters Theses. 229.

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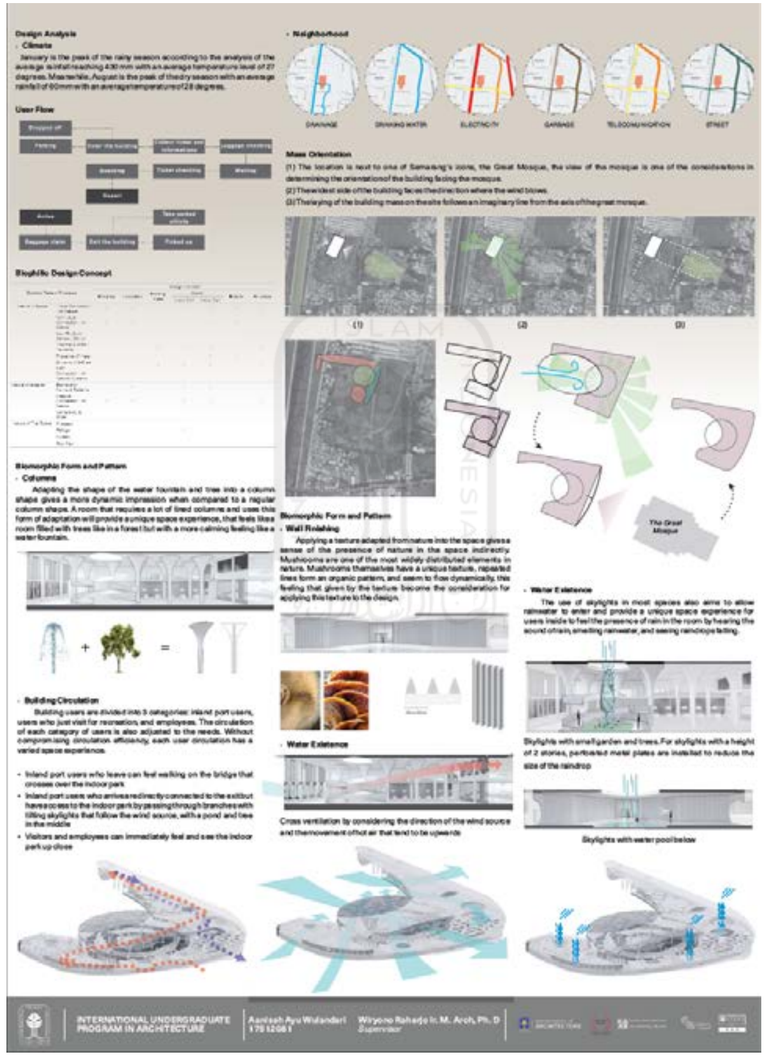

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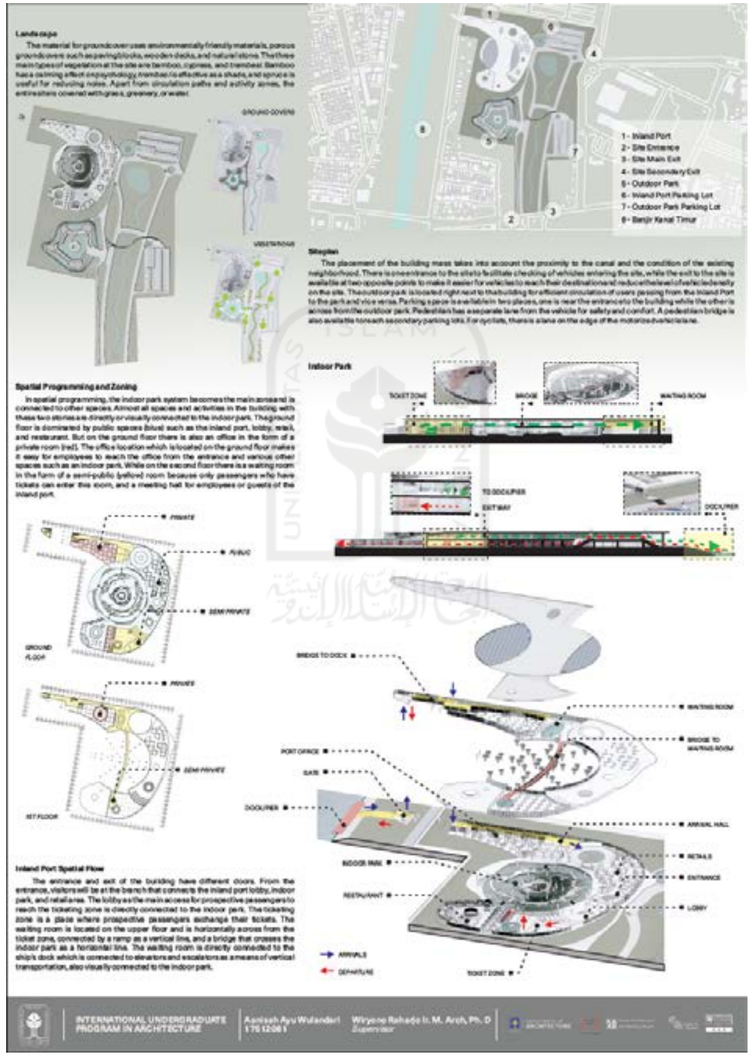

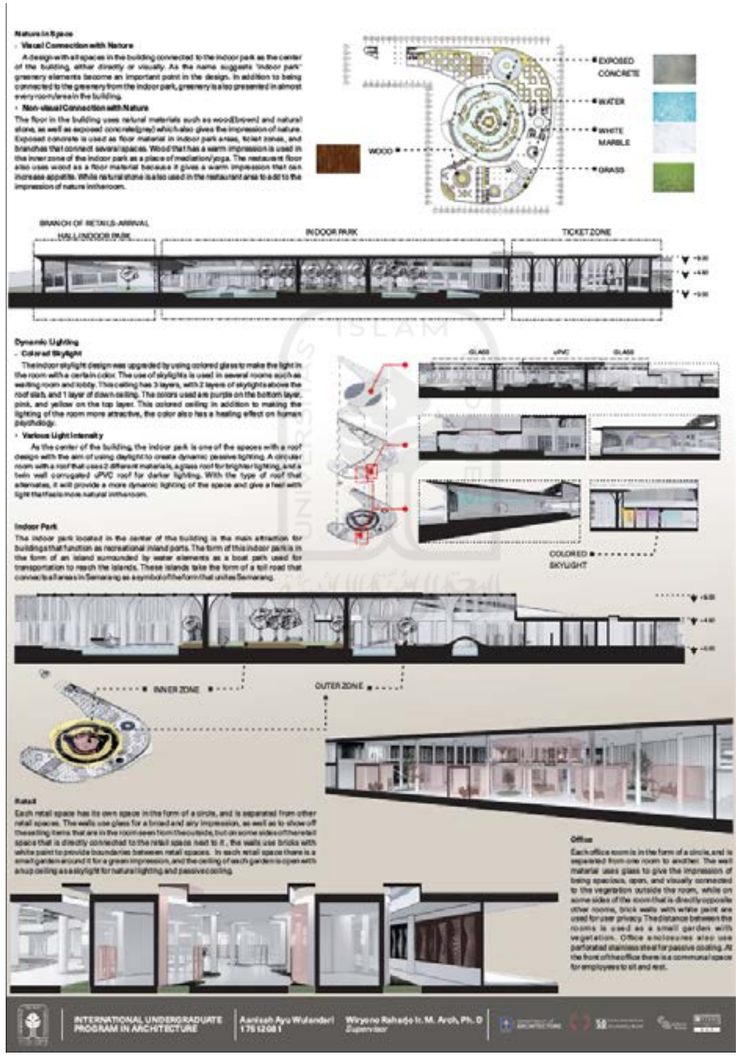

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