FINAL PROJECT – DA 184801

SURABAYA 2050 : MACHINE AESTHETIC AS AMBIENCE IN SHIPBUILDING ARCHITECTURE

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APPROVAL SHEET

SURABAYA 2050 : MACHINE AESTHETIC AS AMBIENCE IN SHIPBUILDING ARCHITECTURE

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Periode : Semester ~~Gasal~~/Genap Tahun 2019/2020

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Surabaya, 28 Juli 2020

Yang membuat pernyataan

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FOREWORD

Thank to Almighty God who has given His blessings and strengths for me to finish this final project entitled “Surabaya 2050 : Machine Aesthetic As Ambience In Shipbuilding Architecture” in Department of Architecture FT-SPK ITS 2019/2020. The writer also wish to express her deep and sincere gratitude for those who have guided in completing this paper. A lot thanks delivered to:

1. Mama, Ayah, Mbak Ulul, and my family, who never get tired of supporting me and always got my back.
2. Mrs. Sarah Cahyadini, S.T., M.T., Ph.D. as the supervisor for this final project.
3. Mr. Fx Teddy Badai Samodra, S.T. M.T. Ph.D as final project coordinator.
4. All of my friends (Komodo A51) who always support and help me to finish this final project. Congratulations to all of us for completing this milestone even in a hard situation, the global pandemic. Best of luck to you all.
5. And finally, thank you to myself for staying strong and being able to complete this project amidst the obstacles. I'm so proud of you.

In the future I hope that this final project report will be useful and beneficial. The writer realises that this report still has errors and mistakes. Because of that, the writer apologises if there are any mistakes in this writing. Critics and suggestions to make the report better are always welcomed.

Surabaya, July 2020.

Writer.

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SURABAYA 2050 : MACHINE AESTHETIC AS AMBIENCE IN SHIPBUILDING ARCHITECTURE

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ABSTRACT

The rapid development of technology causes massive changes occur in manufacturing, transportation, agriculture, technology, etc. It also impacts on social, economic, environmental, cultural and other conditions in the world. One of them is the rate of development and use of machines in various fields. Technology in the modern era now has an impact on human activity in the workspace. The increase in the number of machines is projected to reach the point where the machine will dominate the workspace. Along with this, humans are required to be able to adapt to the conditions of the workspace dominated by machines.

In the context of Surabaya 2050, machine dominance is projected to occur in the industrial area of a shipbuilding company in Surabaya. Machines that have specific functions and shapes also have an aesthetic value which can be called machine aesthetic. Machine aesthetics in the workspace can be used as an element to create ambience/atmosphere. This will then be combined with other architectural elements to provide a different spatial experience.

Here, the machine aesthetic principles will be the main focus for creating ambience in the space program which is projected to emerge in 2050. Combined with placemaking concept and experimental approach, the design tries to accommodate new activities in areas dominated by machines. In this project, the new activities will be accommodated by making flexible area and additional areas such as a rooftop, observation decks, and pedestrian way. The ambience can be presented by choosing the appropriate scale and material for the structure to give identity to the building. In conclusion, the design project is conceived as an opportunity for the local context while forming a destination and contemplation on the progressive vision of the company.

Keywords : Surabaya 2050, machine aesthetic, ambience, placemaking, experimental architecture.

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SURABAYA 2050 : MACHINE AESTHETIC AS AMBIENCE IN SHIPBUILDING ARCHITECTURE

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ABSTRAKSI

Pesatnya perkembangan teknologi di bidang manufaktur, transportasi, produksi, dll. berdampak pada kondisi sosial, ekonomi, lingkungan, budaya, dan lainnya di dunia. Salah satunya adalah laju pengembangan dan penggunaan mesin di berbagai bidang. Teknologi di era modern sekarang memiliki dampak pada aktivitas manusia di ruang kerja. Peningkatan jumlah mesin diproyeksikan mencapai titik di mana mesin akan mendominasi ruang kerja. Bersamaan dengan ini, manusia dituntut untuk dapat beradaptasi dengan kondisi ruang kerja yang didominasi oleh mesin.

Dalam konteks Surabaya 2050, dominasi mesin diproyeksikan terjadi di kawasan industri perusahaan pembuatan kapal di Surabaya. Mesin yang memiliki fungsi dan bentuk tertentu juga memiliki nilai estetika yang bisa disebut *machine aesthetic*.. *Machine aesthetic* di ruang kerja dapat digunakan sebagai elemen untuk menciptakan nuansa (*ambience)*. Konsep ini kemudian akan dikombinasikan dengan elemen arsitektur lainnya untuk memberikan pengalaman spasial yang berbeda.

Pada proyek ini, prinsip-prinsip *machine aesthetic* yang digunakan untuk menciptakan nuansa akan disesuaikan dengan proyeksi pada tahun 2050. Dikombinasikan dengan konsep *placemaking* dan pendekatan eksperimental, objek rancang berusaha mengakomodasi aktivitas baru di area yang didominasi oleh mesin. Aktivitas tersebut akan diakomodasi dengan membuat area fleksibel, seperti : atap, dek observasi, dan jalan pejalan kaki. Nuansa dapat disajikan dengan memilih skala dan bahan yang sesuai untuk struktur untuk memberikan identitas pada bangunan. Kesimpulannya, proyek desain dipahami sebagai peluang untuk konteks lokal sambil membentuk tujuan dan kontemplasi pada visi progresif perusahaan.

Kata kunci: Surabaya 2050, *machine aesthetic*, *ambience, placemaking*, arsitektur eksperimental.

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Contents

LIST OF FIGURES

LIST OF TABLES

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CHAPTER 1

INTRODUCTION

1.1 Architectural Issue

The rapid development of technology began to occur after the industrial revolution. In that era, there was a massive change in the way humans manage resources and produce goods. These changes occurred in manufacturing, transportation, agriculture, technology, etc. It also impacts on social, economic, environmental, cultural and other conditions in the world. One of them is the rate of development and use of machines in various fields.

After facing the first industrial revolution that uses steam engines for production and transportation, humans continue to expand the use of machinery in various fields. The discovery of electricity in the era of the second industrial revolution also helped boost productivity and human ambition - especially the elite - in creating new things.

Banham Reyner in the book entitled Theory and Design in the First Machine Age says that the two eras of the industrial revolution also had a big impact on the world of architecture. This then leads to the emergence of the term machine aesthetic. The term machine aesthetic refers to some formal aspects of the machine - specifically the regular and simple form, the smooth contours, the sparkling surface - which is seen as a representation of beauty. This aesthetic aspect became an important element in modern art in the 1920s and 1930s which later became a catalyst for the efficiency of automobiles and other everyday products.

The enthusiasm of modernists in that era gave birth to several works that carried the concept of machine aesthetic, both in the first era (1st machine aesthetic) and the second era (2nd machine aesthetic). The enthusiasm remains more ideological than practical. The machine is considered a savior for designers who fail to understand the reality of mass production. Machine aesthetic in

modernism that are widely practiced can form an international style that is precisely considered an ideal and logical way of realizing the central principles on which modernism is founded.

In the current era, machines do not only accelerate human productivity, but also have been transformed into technologies equipped with Artificial Intelligence (AI) or artificial intelligence. This artificial intelligence is able to make machines have a system to interpret external data correctly. Furthermore, machines can also develop their abilities by learning from the results of data processing (self-learning).

The rapid rate of technological development that is equipped with AI is starting to be felt in several employment sectors. A study conducted by Oxford University shows that 47% of workers in the United States have the potential to lose their jobs due to industrial automation. Human work that is slowly being replaced by machines is now happening in real life.

A study conducted by McKinsey & Company in January 2017 showed that 30% of the tasks of 60% of the types of work available would be done by machines. Both studies are also relevant to the current condition of Indonesia where the use of automation technology has already taken place. In the next 20-30 years, some experts predict that industrial automation will occur in massive numbers. If the era of machine automation dominance is realized, it will affect the workspace area for humans and machines.

1.2 Design Context

1.2.1 Time as Context

Based on several references, to reach an era where machine automation dominates the workspace, Indonesia needs at least 30 years. So that the time context that can be used in this condition is 2050 and thereafter. In addition, the year 2050 also has projections for the creation of engine automation in a massive amount. This is because Indonesia is

trying to catch up to welcome the momentum of 100 years of Indonesia's independence (2045) and the Global Future movement 2045.

1.2.2 Technology as Context

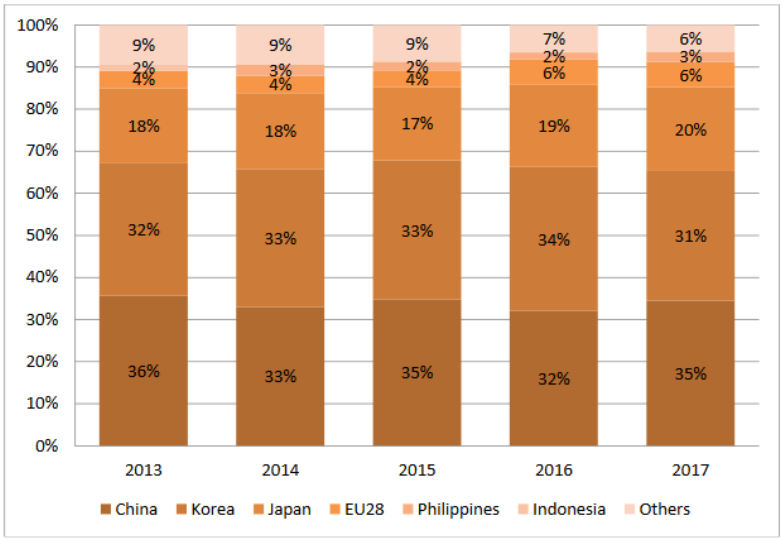
Budi Sutanto, Managing Director of PT Omron Electronics Indonesia, said that the biggest challenge in the manufacturing industry at the moment is reducing operational costs and reducing the supply cycle that must be balanced by increased productivity. One way to overcome these challenges is to increase the use of industrial automation. Industrial automation will give artificial intelligence (AI) to machines so they can complete complex jobs accurately. In addition, industrial automation will add the ability to meet market needs faster, more accurately, but at a more cost-efficient way. The increase in the quantity of machine automation will be in line with the decline in human labor in some fields. Until later it will reach a point where the machine will dominate the workspace.

1.2.3 Location as Context

The location used on this design object is located in the Surabaya City area. Surabaya was chosen because this city is the second largest metropolitan city in Indonesia which is also the center of business, economy, technology and other sector developments. In this era, the city has become one of the producers of sea transportation modes, namely ships. As a maritime country with 2/3 sea areas, Indonesia is currently the top 5 countries in economic income in the field of shipbuilding (based on data from the OECD and Clarkson World Fleet Register in 2018).

So the site chosen for this project is in a shipbuilding company area, located in Perak, Surabaya. The company has main activities such as: producing warships and commercial ships, providing ship repair and maintenance services, as well as carrying out specific engineering at client's request. In 2050, the number of employees (who work on the production floor) is projected to decline along with the development of

industrial automation technology. As a result, the workspace of humans and machines will coalesce up to the potential to give rise to machine domination.



Note: The five largest shipbuilding economies are depicted, measured in CGT.
Source: OECD calculation based on Clarkson World Fleet Register.

Figure 1.1 : The 5 largest shipbuilding economies (measured in CGT) 2018

Source : OECD data from 2018

1.3 Supported Data

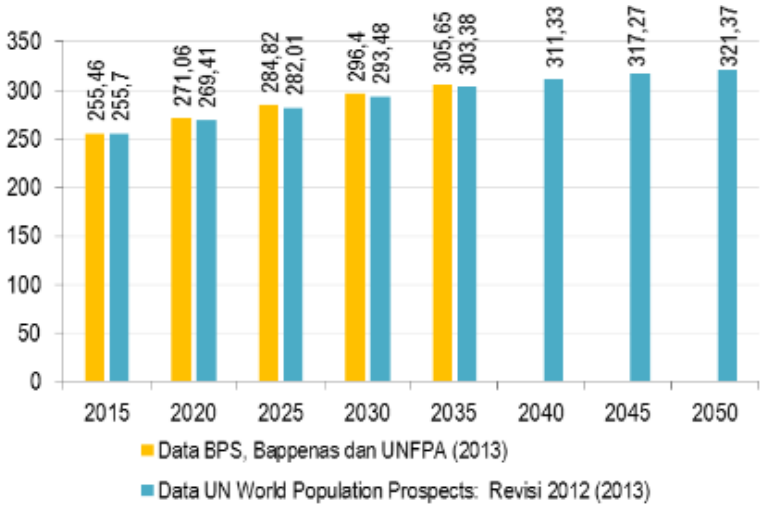


Figure 1.2 : Projection of Indonesian population according to United Nations (2013)

Source : "World Population Prospects: Revision 2012"

In 2013 the population of Indonesia had reached 249.9 million. According to projections made by the United Nations (2013) "World Population Prospects: Revision 2012", in 2050 Indonesia will be inhabited by around 321.4 million people. Two-thirds of this amount will later live in urban areas.

Meanwhile, the results of research conducted by UNIDO (United Nations Industrial Development Organization) showed that Indonesia is now one of the 10 most influential manufacturing countries in the world. Supported by technological developments that have entered the era of the industrial revolution 4.0 that uses the Internet of Things (IoT), Indonesia has a great opportunity to increase production in the manufacturing industry going forward. The connection between the physical system and the cyber is what adds to the opportunity of the manufacturing industry to become a smart industry with the use of automation on all lines.

In addition, in terms of area and diversity of natural resources, Indonesia is a country in ASEAN which has the greatest potential to become a hub for the manufacturing industry in the Southeast Asia region which is projected to create a market with consumers reaching 700 million in the future. Both of these data show similarities about the prospect of increasing machine quantity in the future along with the development of the manufacturing industry in Indonesia. In this era, this has happened in several sectors in Indonesia. The most visible example is in the automotive industry which has applied machine automation in its production process which resulted in narrowing of work space for humans. Even in some special work environments there are already human restricted areas where people cannot enter the work area due to the high risk of danger.

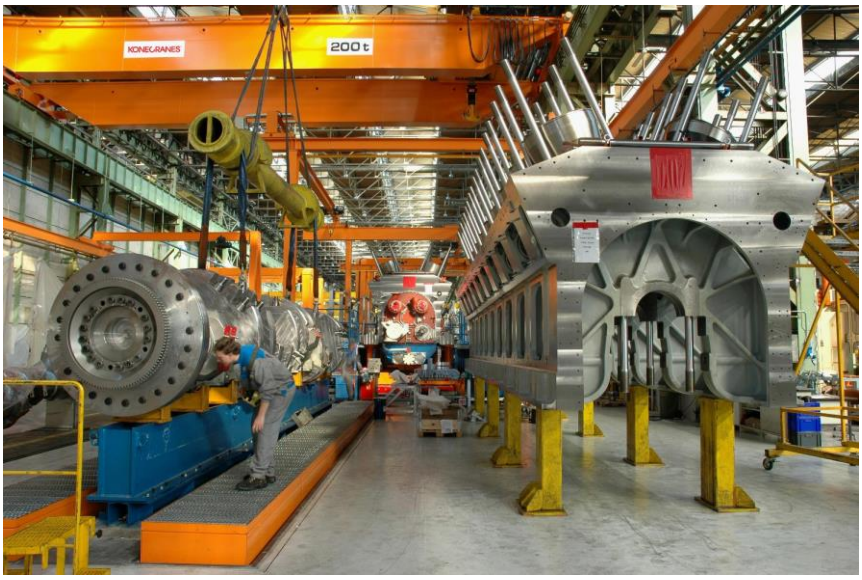


Figure 1.3 : The example of maachine domination in worskspace

Source : corona-australis.cl

Figure 1.4 : The example of machines in the workspace

Source : https://ilpiccolo.gelocal.it

1.4 Design Problems

Based on the study of architectural issues and the existing context, there will be several design problems that arise. Some of them are as follows:

a. How the dominance of the machine will influence the workspace?
b. How machine aesthetic creates the ambience/atmosphere in workspace in the context of Surabaya 2050?

From the two design problems, it can be said that the design will focus on nuances (ambience) and atmosphere (atmosphere) created in a machine-

dominated work environment and its effects on humans. This will refer to designs that have open options. These options can be determined based on architectural settings so that later they are expected to show the aesthetics of machines that display different atmospheres.

Going forward, architecture that focuses on the aesthetics of this machine will discuss the quality of completion of a space and form of the building. Not only visual quality, but also the quality of sensory, auditory, and others. The current constraint is limited data for projections by 2050. In addition, designs with open options also have a high likelihood of producing subjective and qualitative designs. So later there will be a need for common parameters for the design.

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CHAPTER 2

LITERATURE REVIEW

2.1 Design Approach & Method

2.1.1 Design Approach

Responding to the speculative conditions that are projected to occur in 2050, the design approach chosen is experimental and behavioral approach. This will make the design focus more on the human aspects of the work environment which will later be dominated by machines. The word behavior shows humans in their actions, related to physical human activity, in the form of human interaction with each other or with their physical environment (Tandal and Egam, 2011). In this context, human behavior is also closely related to the physical environment, namely machines and workspaces.

2.1.1.1 Experimental Approach

Experimentation consist in deliberate and controlled modification of the condition determining an event, and in the observation and interpretation of the ensuing changes in the event itself (Van Dallen, 1973). In this case, the experimental elements are time, location and condition. An experimental approach will be used to project patterns of activities and human needs that will emerge in the future. So that later will be able to project design criteria for these special conditions.

2.1.1.2 Experiential Approach

Learning through experience involves not merely observing the phenomenon being studied but also doing something with it, such as testing its dynamics to learn more about it, or applying a

theory learned about it to achieve some desired results (Salama, 2010). Experiential learning is contrasted with learning in which the learner only reads about, hears about, talks about, writes about these realities but never comes in contact with as part of the learning process. In this case, the experiential learning will be used to determine the physical environment where machine dominates the workspace. After that, the relations between the setting will be used to connect with the design method, criteria, etc.

The physical environment is variant, diverse, and complex. Buildings and spaces are major components of this environment: planned, designed, analyzed, represented, built, lived in and occupied. They are also experienced, perceived, and studied. They should be redefined as objects for learning and need to be transformed into scientific objects. The experiential approach itself has relation to human behavior.

We shape our buildings, then they shape us (Winston Churcill, 1943). This shows that human behavior is one of the main factor that construct architecture. Humans who have diverse activities can influence architecture from various sides, such as form, function, etc. On the other hand, when humans form buildings to meet their own needs, the buildings are also able to shape the human behavior that lives in them. This shows the correlation between human behavior and architecture.

2.1.2 Design Method

To realise the design concepts, design thinking will be needed to guide the idea into a design. Domain to domain is used to transfer the outside issue into architectural issue, and framework will be the guideline of the architecture issues to reach the design objectives.

The concept based framework is used to mean the schematic conceptual structures which underline all processes in design; methodology is used to mean a set of working methods which share a frameworks; and method is used to mean the particular way the framework is applied to many different situations (Plowright, 2014).

The concept-based framework is used because in this context the design is speculative and has a vision to be formed. By using this framework, it will create a transfer domain that will be able to explain how the projection patterns and what to achieve in the proposal. The method programming will be used to achieve the framework goal.

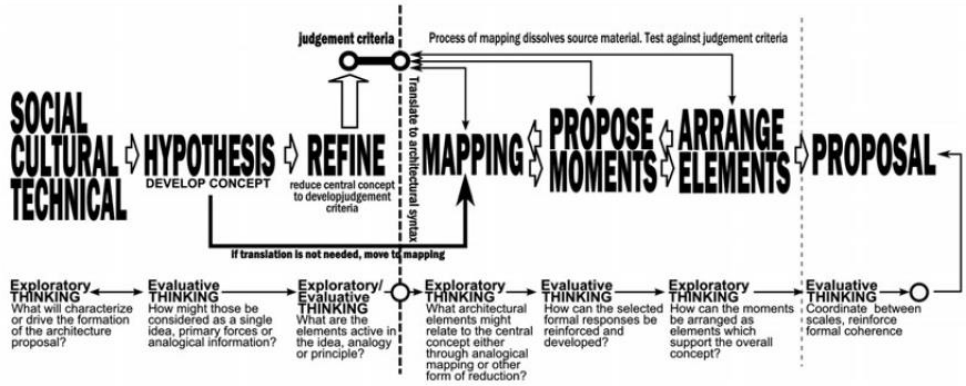

Figure 2 1 : Concept based framework

Source : Revealling Architecture – Phillip D. Plowright (2014)

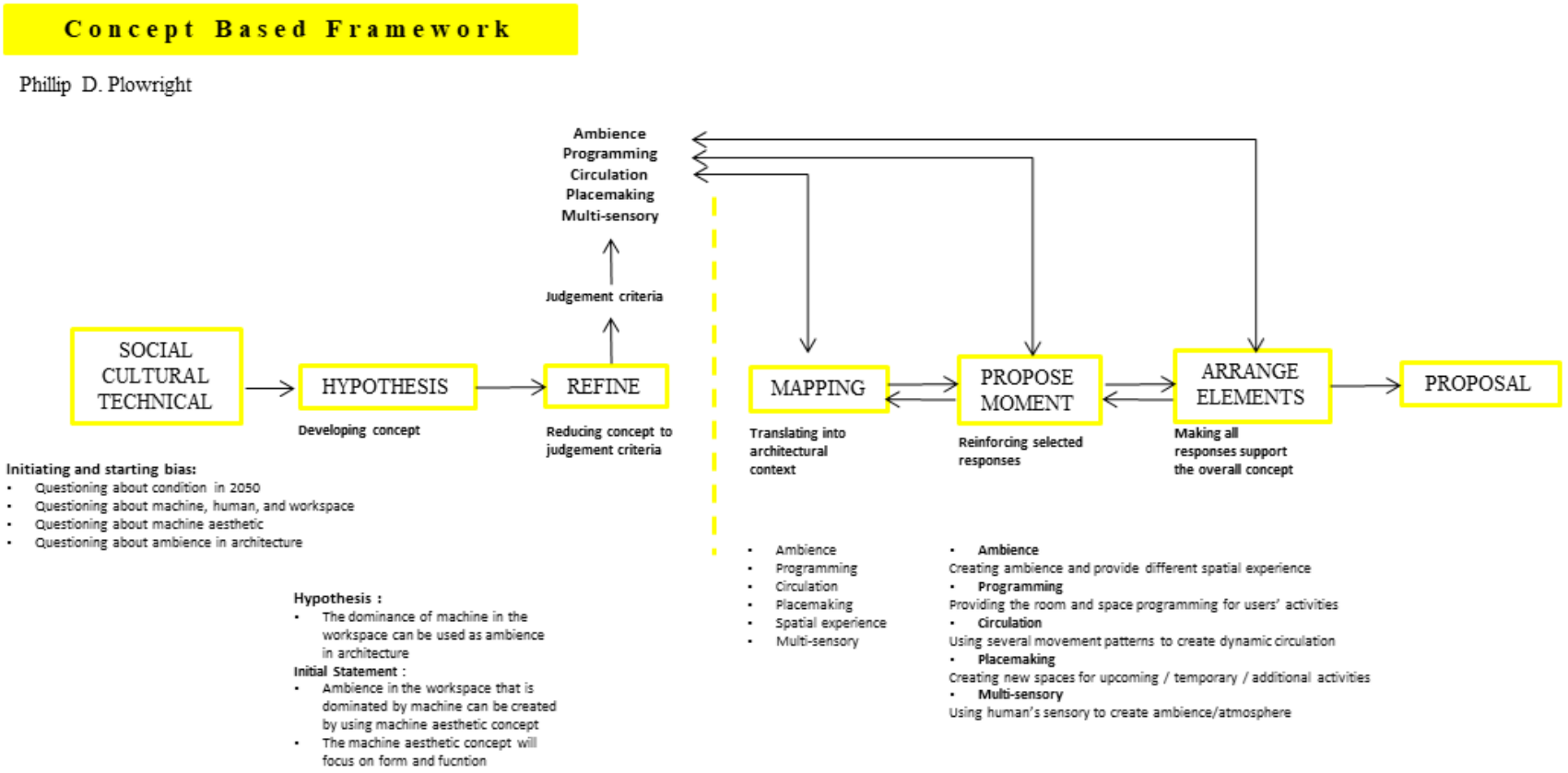

Figure 2.2 : Concept-based framework on this project

Source : Author documentation

2.1.2.1 Programming

The method that will be used in this project is programming. The method chosen to accommodate the newly projected growth phenomenon will increase in design projects. Using this programming method can contain 2 aspects, namely the activities in the design project must overlap, and the design project must be able to adapt to different programs from time to time. The integration of functions and forms results in the exchange of activity space. In this way, the flow not only increases between users of different buildings, but also between users and the building / surrounding environment.

The programming method can be used in the whole area, but the flexible area (material area, observation deck, and additional area) will be the focus in this project. The method itself is choosen by considering the possibility of flexible activities in the area. It is based on the permanent and temporary users' activities.

For example, in the production floor, the material area is used for assembly process of ship component. Once the assmbly process is done, the components are taken to the next workshop for further process. At that moment, there will be an empty space inside the production floor. The space can be used for entertaining/educational function. The events held in the flexible area should consider the working hours in the production floor and always follow the safety rules in the building.

2.2 Literature Review

2.2.1 Machine Aesthetic

Researches have pointed out that the ideas of Le Corbusier's works were the products of the "new spirit" –the industrial, mechanical, scientific spirit of objectivity and precision, solidity and sharpness, law and order of

his own times (Tzonis, 2001). Besides, in the context of Surabaya 2050, the works focused on machine aesthetic, will be focused into 2 aspects: function and form. These 2 aspects will later be used to create the ambience in the design.

The function here plays a role in creating space and relating to patterns of human behavior and activities in it. The function of a building will also represent the architectural response in it. In addition, the function of the building also acts as a container to meet human needs.

Form is very closely related to the visual image of a building. Forms can be realized in the form of buildings as a whole, as well as elements that are smaller parts. Form and function will have visual quality to use aesthetic machines as ambience in architecture.

2.2.2 Placemaking

Place-making – the art of making places for people (Sepe, 2013 xvi) is the creation of unique places that people want to use, to be in, to enjoy, to be a part of, and to remember (Wycoff and Heidel, 2012). In general, this method involves accessibility, or lack of accessibility in human interactive spaces and environments that are keys in placemaking.

This concept can offer solutions to some of the fractured connections among the unused spaces/places. If creating a “Sense of Place” is the main objective of place-making (Wycoff and Heidel, 2012), then understanding of aspects related to the place is an integral part of placemaking concept, asking for an opportunity to investigate the root word, place.

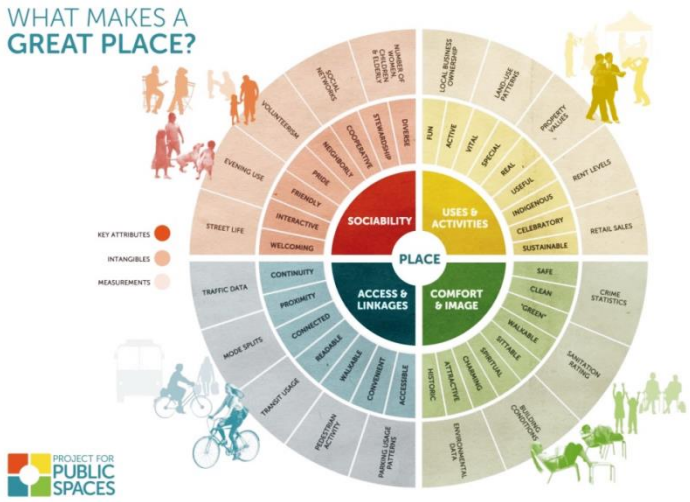

Figure 2.3 : Factors related to placemaking concept

https://www.pps.org/article/grplacefeat

The placemaking concept is expected to create a public space as a living space. In this case, the working space can be either a public space or a living place. Thus can be achieved through the design of places, the experiences, and also the consequences within. From the diagram on the left we can see that there are 4 key attributes in the placemaking concept :

4 KEY ATTRIBUTES OF PLACEMAKING :

USES & ACTIVITIES

- The object has clustered activities
- The design provides well integrated facilities
- Accomodating mutual supports

SOCIABILITY

- Interactive shared space
- The object has spaces for multiple functions (walking, cycling, cars, etc.)
- Supporting pedestrian space
- Responsive to adjacent land use

ACCESS & LINKAGE

- The object is on a human scale
- Legible layout
- The design has a public ground-level uses
- Supporting the pedestrian networks (for social, commercial, aesthetic, experiences)

COMFORT & IMAGE

- Considering the permeability (choice of routes)
- The environment is a safe and well overlooked space
- The design can showcase local assets / public art
- It should be authentic

Figure 2.4: Key Attributes of Placemaking Method

https://www.pps.org/article/grplacefeat

2.2.3 Human Aspect

According to Gibson (Lang), human behavior in relation to a physical setting takes place and is consistent according to time and situation. Therefore, human behavior patterns can be identified for certain physical settings. The frequency of activities that occur in a single or group setting with other settings shows a constant pattern and character in a certain time.

In addition, there are also possibilities that can arise such as changes in human behavior related to the reciprocal relationship between humans and their environmental settings. In this case, the intended physical environment setting is a machine-dominated workspace by 2050. The physical environment influences the environment reciprocally explained by Gibson (Lang) in the following diagram:

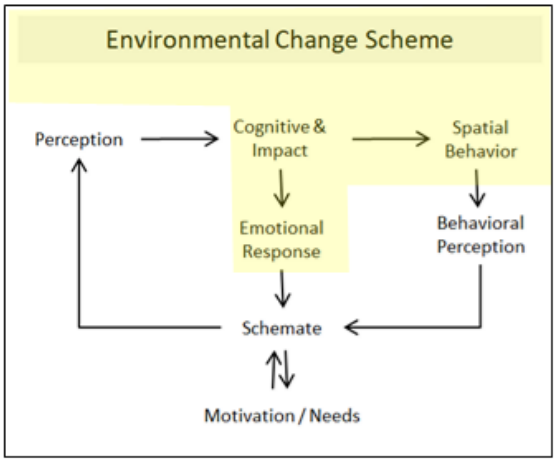

Figure 2.5 : Environmental influence scheme

Source : Diagram by Gibson (Lang)

Human behavior and its relationship with a physical setting actually have a close relationship and the mutual influence between these settings with human behavior. In other words, if there are changes in settings that are tailored to an activity, there will be an impact or influence on human behavior. Variables that affect human behavior (Setiawan, 1995), include:

a. Space.

One of the fundamental principles of the influence of space on human behavior is the function and use of space. The physical design of space has variables that affect the behavior of the wearer. Space that is focused on this context is work space.

b. Form and Size.

The size and shape of the space must be adjusted to the function to be accommodated, the size that is too large or small will affect the psychological wearer. The size or scale of the room will cause different ambience / atmosphere for users.

c. Furniture &Arrangement

Form of arrangement of furniture must be adjusted to the nature of the activities in the space. While the asymmetrical arrangement is more dynamic and less formal. In this case, the placement and program of human and machine space must be considered to create an ideal work space that is able to accommodate human needs.

d. Color

Color has an important role in realizing the atmosphere of space and supporting the realization of certain behaviors. In space, the effect of color not only creates a hot or cold atmosphere, but the color can also affect the quality of the space.

e. Sound, Temperature, & Lighting

Sound can have a bad effect if it's too loud. Similarly, the temperature and lighting that can affect a person's psychological and thermal comfort. The ideal combination will create comfortable ambience for the users.

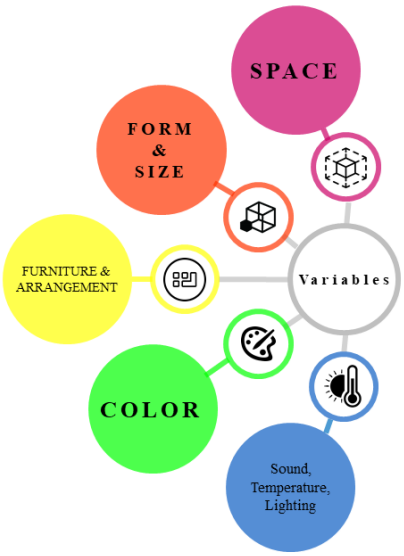

Figure 2 6 : Variables that affect human behaviour

Source : Author documentation

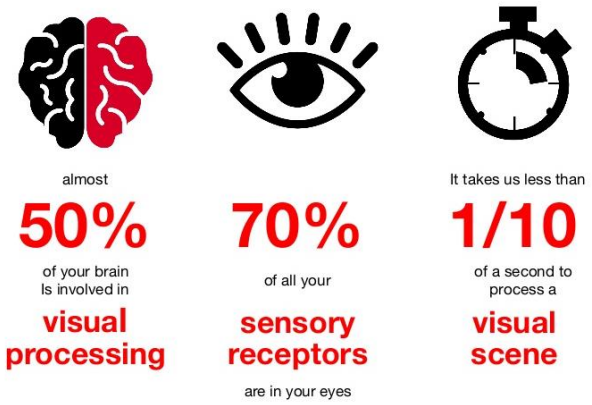

Figure 2 7 : How Visual Affects Human Brain

Source : NeoMan Studio

According to the research from NaoMan Studio and other researchers, almost 50% of the brain is involved in visual processing. These statistics show that the visual of sight has big impact in human's brain. Afterwards, it also has the connection to people's productivity. In order to boost the productivity, the design will later use the physical environment (machine aesthetic) to be the visual point for this purpose.

2.3 Site and Environment Analysis

2.3.1 General Description of Site

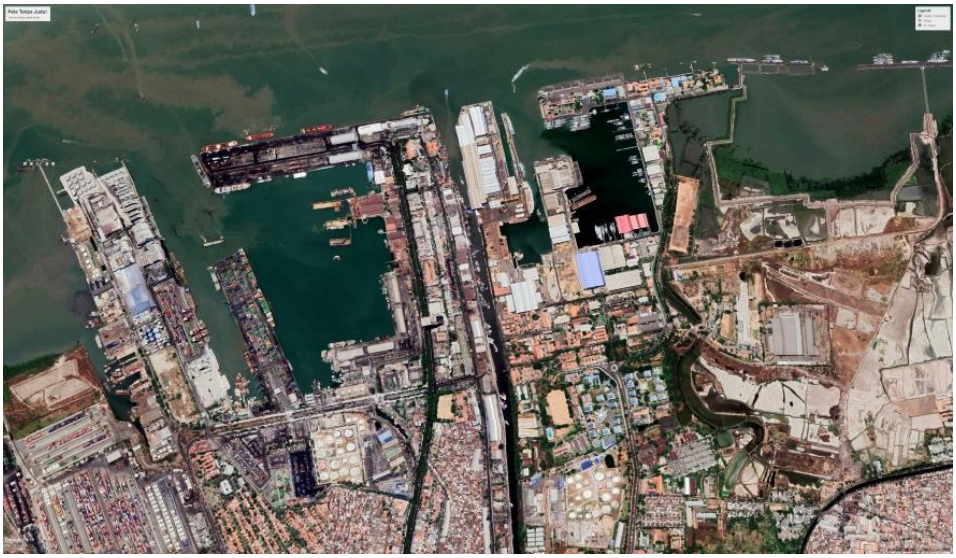

Figure 2.8 : Shipbuilding Company Area, Perak, Surabaya
Source : Google Earth

The site chosen for the project is in a shipbuilding company area, located in the Pabean Cantian, near Tanjung Perak Harbour, Surabaya. The company has main activities such as: producing warships and commercial vessels, providing repair and maintenance services for ships, as well as carrying out specific engineering at client's request. In 2050, the number of employees (who work on the production floor) is projected to decrease along with the development of industrial automation technology. As a result, the workspace of humans and machines will unite, therefore there will be potential to give rise to machine domination.

Figure 2.9 : The shipbuilding company from above

Source : google.com

According to Surabaya City Regional Spatial Planning (RTRW) 2014-2034, the area is categorised as the strategic areas for high-tech interests including shipping Industry Development Zone in the District Pabean Cantian is in Tanjung Perak Development Unit 5. Besides that, the company area and its surroundings are also in the development stage to become a tourist area. An example is Surabaya North Quay (SNQ) as well as around the Jalesveva Jayamahe monument. This opens up opportunities for the company area to provide public access to some of its parts in the future.

2.3.2 Accessibility & Circulation

The site which is located near the sea can be accessed from various direction. It can be easily accessed by the people from east/west/south/north Surabaya. For the existing condition, special permit from the company is needed to enter the area since it is located in the integrated area of the main naval force base. And because some of the location in the site is for war ship and submarine production & development, those areas are restricted for non-workers. The yellow parts of the picture below show the most possible area to be entered by visitors.

2.4 Regulation and Data Review

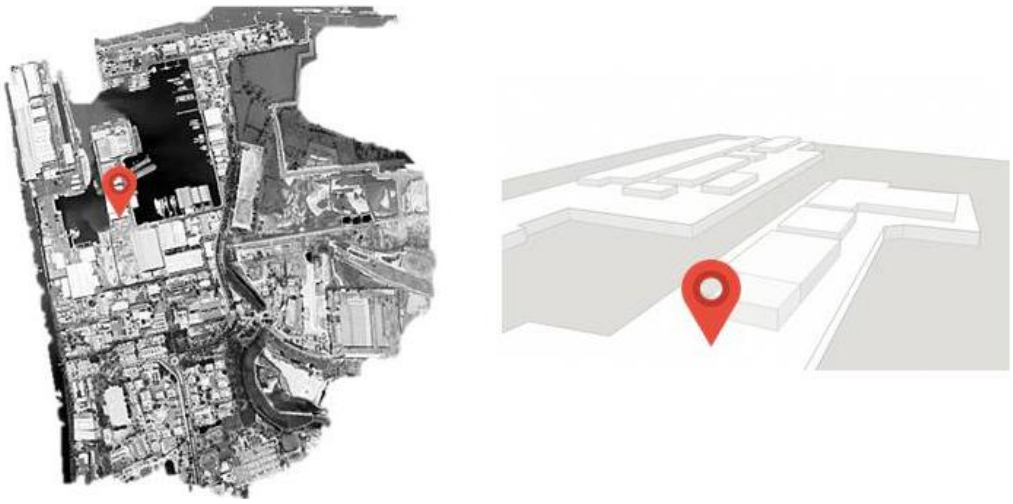

Figure 2.11 : Site Location

Source : google earth & autho's documentation

Based on the Surabaya City Regional Spatial Planning (RTRW) 2014-2034, the site is located in the Pabean Cantikan District , Tanjung Perak, which is a UP 5 area. The area is a strategic industrial category that has major activities in the trade and services sector. The main activity center is located in Tanjung Perak which is the central port in Surabaya. If viewed from the previous period's RTRW, the designation of this regional area is

still the same, namely the industrial and trade areas. So it can be projected that in 2050 this region will still have the same designation so that the design context is still relevant.

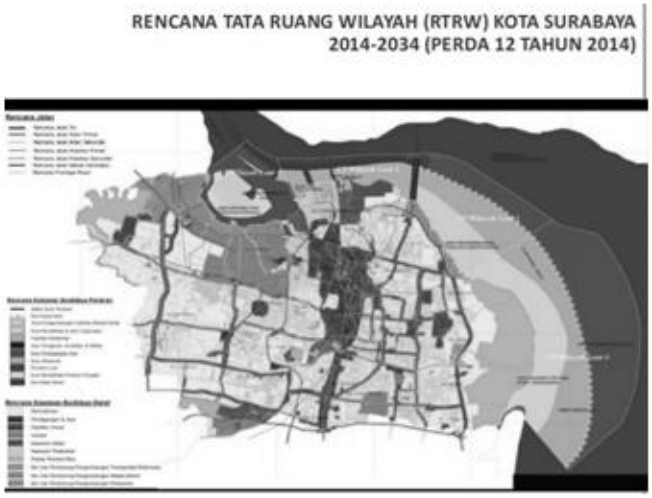

Figure 2.12 : Site Location

Source : google earth

According to the regulation of the mayor Surabaya no. 75 year 2014 concerning technical guidelines for controlling space utilization in the establishment of building in Surabaya City, there are some additional rules about the site. Here are 3 of them :

1. Building intensity; Parking standard; Provide green open space (RTH) of at least 10% (ten percent).
2. Declaration will handle existing waste independently in accordance with applicable rules and regulations.
3. If in the Military / Port area, it must obtain approval / recommendation for the suitability of the area's master plan.

Here are another rules about the site location based on the same regulation :

Table 2.1 : Regulations regarding land use

Source : Regulation of the Mayor of Surabaya no. 75 year 2014

Luas lahan lebih dari 10 Ha

Fungsi Lahan	Proporsi	Status Penyediaan / Penyerahan
Lahan yang bisa dimanfaatkan untuk industri / pergudangan dan fasilitas penunjang lain untuk perdagangan dan jasa, perumahan dan lain-lain (Kawasan	**Maksimal 70% (bukan merupakan KDB)**	
Prasarana, antara lain berupa :		
- jaringan jalan, jaringan saluran pembuangan air (drainase), bozem	Minimal 30 %	Disediakan & diserahkan
- jaringan pembuangan air limbah, instalasi pengolahan air limbah, tempat pembuangan sampah.		Disediakan
Utilitas, antara lain berupa :		
- fasilitas umum berupa jaringan transportasi (antara lain halte, sub terminal, park and ride), sarana pemadam kebakaran, sarana penerangan jalan umum.		Disediakan & diserahkan
- jaringan air bersih, jaringan listrik, jaringan telepon, jaringan gas		Disediakan
Sarana, antara lain berupa :		
- Lahan Pedagang Kaki Lima (PKL) dan perumahan bagi pekerja (khususnya pada kawasan industri)		Disediakan & diserahkan
- Ruang Terbuka Hijau (RTH) yang berupa taman umum / public space / barrier hijau		Disediakan & diserahkan
- Sarana lain / fasilitas umum yang dapat berupa sarana peribadatan, sarana parkir		Disediakan & diserahkan

Table 2.2 : Regulations regarding land use

Source : Regulation of the Mayor of Surabaya no. 75 year 2014

ARAHAN GARIS SEMPADAN BANGUNAN SAMPING DAN BELAKANG UNTUK BANGUNAN NON RUMAH TINGGAL / BANGUNAN TINGGI / SUPERBLOK

NO	TINGGI BANGUNAN	SETARA JUML. LANTAI	GSB SAMPING KANAN	GSB SAMPING KIRI	GSB BELAKANG
1	≤ 25 M	≤ 5 LANTAI	-	3*	3*
2	>25 M sd 40 M	> 5 sd 8 LANTAI	3	3	3
3	>40 M sd 60 M	> 8 LANTAI sd 12 LANTAI	5	4	5
4	>60 M sd 100 M	> 12 lantai sd 20 LANTAI	6	4	6
5	> 100 M	> 20 LANTAI	8	5	8

* untuk panjang/lebar lahan setelah terpotong GSP kurang dari 20 m, tidak disyaratkan. Apabila bangunan eksisting tidak memungkinkan untuk diterapkan GSB pada samping kiri, misalnya pada persil yang bangunannya telah berdiri, GSB dapat diletakkan pada posisi kanan bangunan.

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CHAPTER 3

ACTIVITY PROGRAMME AND OBJECT

3.1 Building Function and Activities Programme

3.1.1 Building Function

In order to respond to existing conditions and projections by 2050, the building is projected to become a mix-used building. The main function of the building is the industrial building, which is accompanied by additional functions in the form of entertainment and education functions. The additional function is temporary so that it can take advantage of empty or unused spaces in the buildings.

3.1.2 Activity Programme

Based on the existing conditions and the projected flexibility of space in the building, the activities that will occur in the work area are grouped into primary (primary) and additional (secondary) activities. The main / primary activity in a building is an activity that involves human interaction with machines, in this case the production process on the work floor (production floor) as well as matters relating to management / administration. While secondary activities on objects are activities that are not permanent (temporary activities).

This activity can involve internal users (workers) and external (outside communities). Secondary activities that arise will support the emergence of new space programs on building objects. The proposed range of activities is the development of the place making design method with adjustments to the function of the design object.

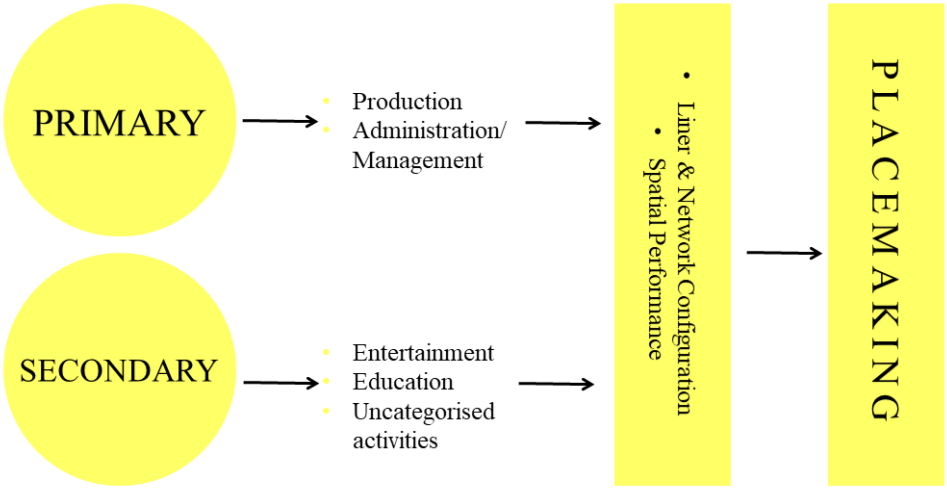


Figure 3.1 : Scheme of developing placemaking concept

Source : Author documentation

3.2 Space Requirements

Determination of the space to be developed in this design object is based on existing conditions and projections of the emergence of activities and new space requirements in 2050. Activities and spaces are grouped based on the frequency of activity and space needed. Following is the explanation table:

Table 3.1 : List of Space Requirement

Source : Author documentation

No.	Activity Type	Activity List	Space Requirement
1.	Primary	Production, Assembly, Material Cutting, Material Moving (Loading), Administration & Management, etc.	• Production Floor • Administration Room • Warehouse
2.	Secondary	Taking a Rest, Eating, Worshiping, Changing clothes, Industry Visit, Workshop/Training, Entertainment, etc.	• Production Floor • Rest Room • Musholla • Additional Area • Flexible Area

The dimension in the table below is a standard that applies to the space requirements of the design object. The size can change as needed but the numbers listed in the table are the minimum size. The space dimensions in the following table are taken from several sources, including: Time Saver Standard for Building Types (TSS) by Chiara, 2001, Data Architect by Neufert, 1970 (NDA), and precedent studies (P).

Table 3.2 : List of Room Capacity & Area

Source : Author documentation

No.	Room Name	Capacity	Standard Area	Total Area	Source
1.	Production floor				
2.	Administration room	>5 people	15-25 m^2	15-25 m^2	NDA
3.	Warehouse	1	35 m^2	35 m^2	TSS
4.	Cafetaria	50	@7,2 m^2	41,4 m^2	NDA
5.	Changing Room	30 people	@0,50 m^2	30 m^2	NDA
6.	Toilet	5	@1,6 m^2	8 m^2	NDA
7.	Musholla	25 people	@0,96 m^2	24 m^2	P
8.	Workshop area	1	60 m^2	60 m^2	TSS
9.	Entertainment area				

3.3 Activity and Space Requirements

In this case, the space requirements that are designed must meet the applicable space requirements. But there are some spaces that have special criteria to achieve. This is because the function of space is not specifically regulated related to its categorization. The following is a table of space-specific criteria that needs to be achieved:

Table 3.3 : Space Requirement and Criteria

Source : Author documentation

No.	Space	Criteria
1.	Production floor	The configuration of the machine in the production floor area should highlight the aesthetic machine so that it can provide different ambience to users. Circulation and configuration on the production floor should be able to be a liaison between spaces in buildings. Production floor has a sufficient level of flexibility so that when there is an empty space it will be able to be utilized as a space program with new functions.
2.	Entertainment area	Entertainment area will be one of the flexible areas, depending on the working time on the production floor. If there is an empty space, then the entertainment area can be formed while still paying attention to the safety factor of users.
3.	Educational area	Educational areas can be created when there are outside users who are conducting visits or studies that require interaction on the production floor. Because it has no physical boundaries, the educational area also becomes a flexible area while still paying attention to the safety factor of users.
4.	Additional area	Additional area can be in the form of circulation which becomes a link between other areas, both vertically, horizontally, as well as connecting the interior and exterior of the building.

3.4 Variety of Users

In this design project, the main users are internal workers of the shipbuildidng company. In addition, there are also secondary users, namely external communities who visit the object within a certain period of time. Workers become the main users because the intensity of the use of objects / buildings is higher than secondary users. However, workers do not access objects / buildings within 24 hours in 7 days. The machine-equipped design has working hours and pause hours. This time difference can be used to create new space programs that can accommodate a variety of new activities.

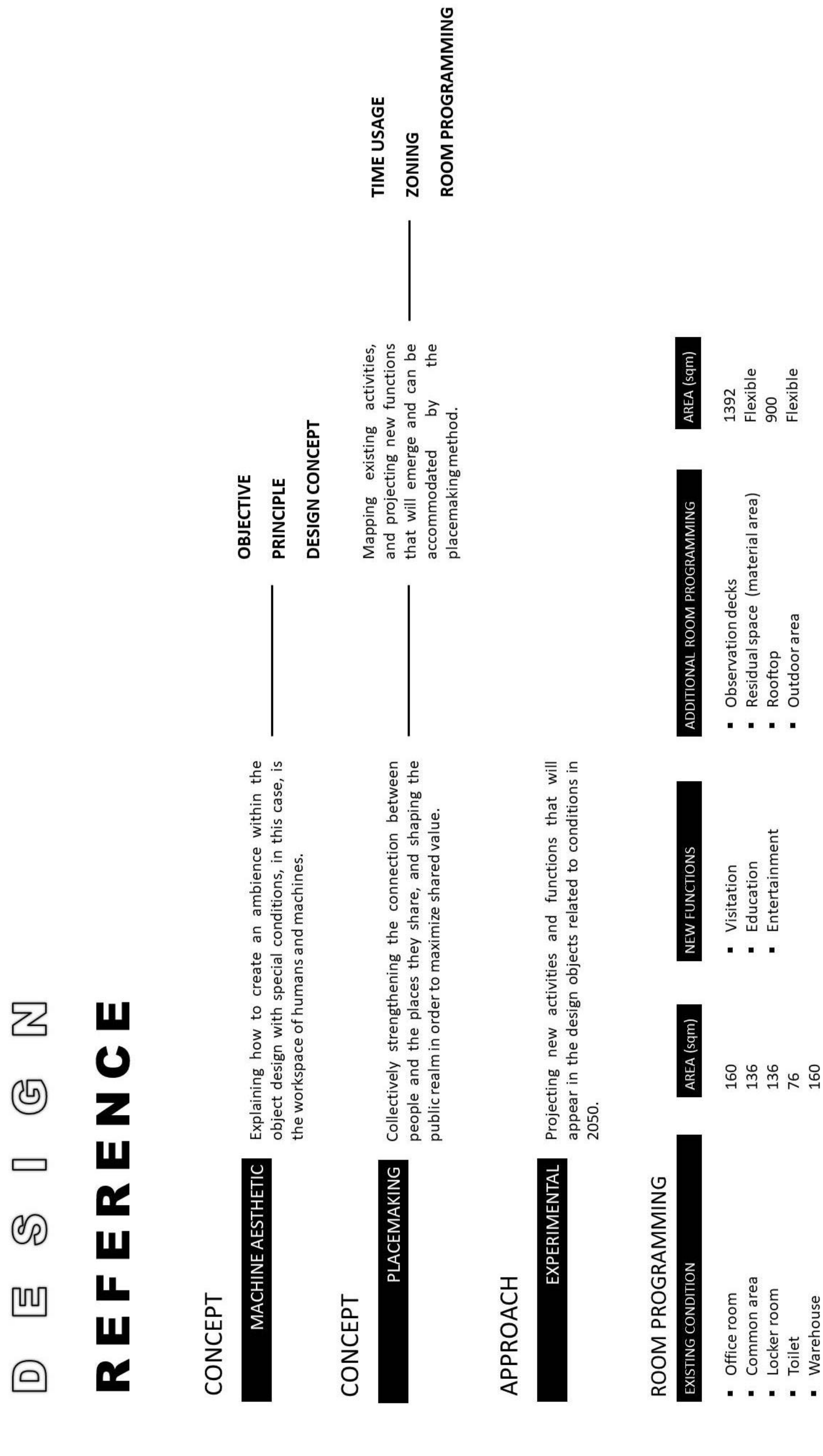


Figure 3.2 : Design Reference

Source : Author documentation

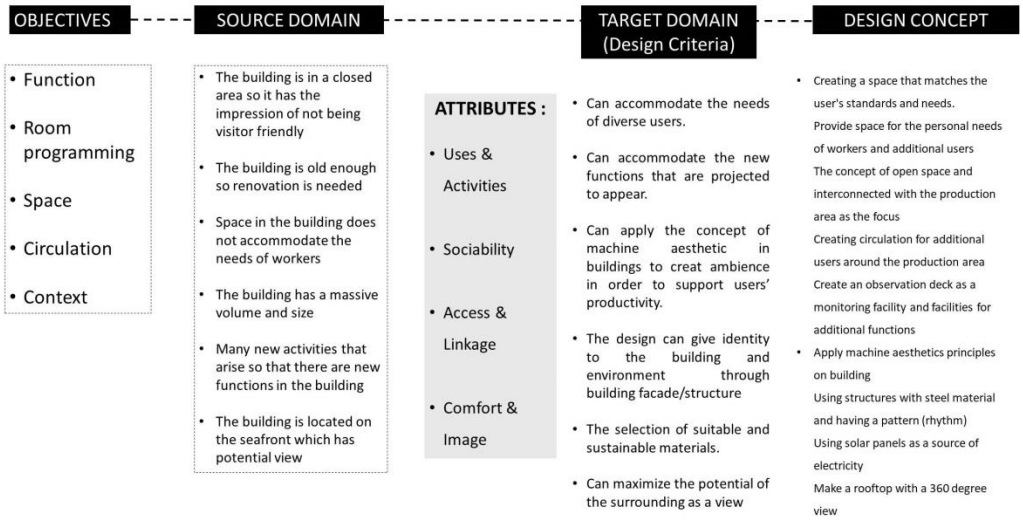


Figure 3.3 : Design Concept Diagram

Source : Author documentation

CHAPTER 4

DESIGN CONCEPT

4.1 Formal Exploration

4.1.1 Machine aesthetic

Machine aesthetic in architecture refers to architecture that suggested something machine-made, acknowledging industrialization, mass-production, and engineering, or that used elements of metal structures (ships, aeroplanes, motorcars, etc.) in an eclectic fashion, more a matter of arriving at an appearance than of actually being what it seemed, a fact that contradicted demands for honesty and truth in architecture.

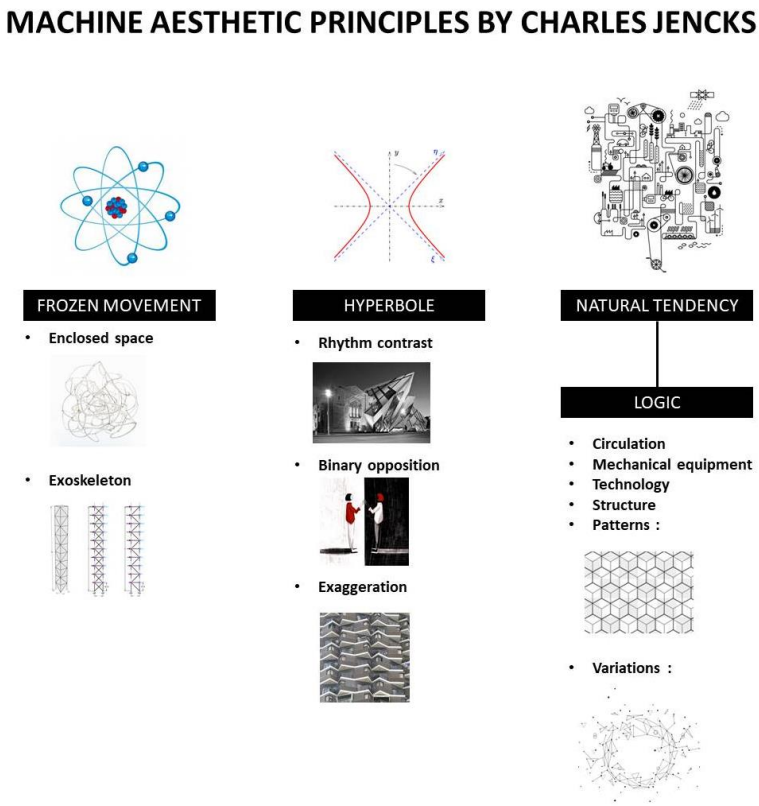


Figure 4.1 : Machine Aesthetic Principles By Charles Jencks

Source : Author documentation

When machines dominate the workspace, human can use their space not only for works, but for another activities. In this project, the workspace configuration provides different ambience/atmosphere for users. Thus can lead to several new activities related to education (for workshop, visitation, etc.) and entertainment (sport, music, movies, etc.) These activities can be done either when the production floor is working or stopping. It also has relations with special occasions such as holiday or event held in the company.

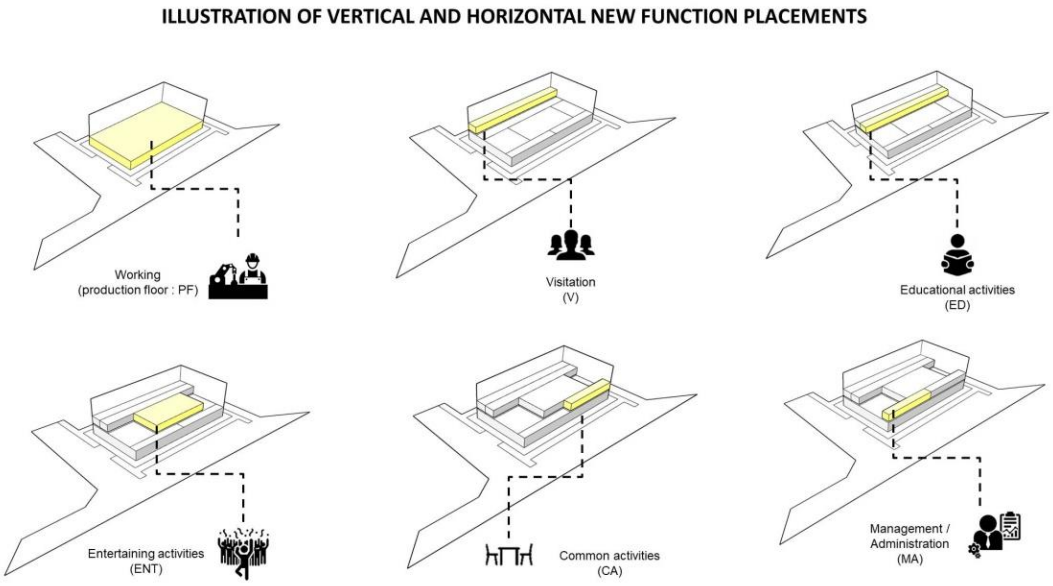


Figure 4.2 : Illustration of Vertical and Horizontal New Function Placements

Source : Author documentation

The rapid development of the current activities in the existing building will bring changes in the space requirements and the adjustment of new functional facilities, which means organizing the auxiliary circulations such as vertical transportation system, corridors, pedestrian ways at the outside of the building. It will keep the quality of the production process while still providing flexible space for further expansion. Based on its production process and the logistics requirements,

the object design features a distinctive scheme – it is also a multi used space that can function as an educational/entertaining area.

Going forward, architectural design will be an exploration of machine aesthetic configurations that are combined with the placemaking concept to support the new additional functions. Besides as design concept, here machine aesthetic has a role as:

4.1.1.1 Concept : Exploring the Sensing

Within this scope, machine aesthetic act as one of the concept to respond to an experimental approach that refers to the Surabaya 2050 context. This was chosen because it saw the potential and projections of the development of the site as one of Indonesia's maritime wealth. And in order to reach the goal, some of the elements of the concept will explore more about visual, auditory, thermal, and configuration.

The visual of the machine aesthetic concept will focus on the form and function. This can be influenced by the type and size of the material, material properties, and configuration. In addition, visuals of machine aesthetic can also be seen from the physical building which will be more likely to use industrial concepts to achieve harmony between the interior and exterior.

Auditory exploration of this concept can be achieved by utilizing the sound produced by the engine, people, or even artifial sound like music. In addition, sound is also able to affect ambience depending on its frequency. A voice that is too loud can interfere with comfort while a voice that is too soft can cause reduced information being heard. In this design concept, sound is one element that is able to influence ambience not only within the design object, but also outside of it.

Heat-balance theory lacks a coherent explanation to account for people's responses to outdoor conditions since it ignores the effects of psychological and behavioral factors (Lin & Matzarakis, 2008;). Evidenced by the results of numerous field studies, although the effects of microclimatic stresses can in part be predicted by

physiological indices, still substantial difference remains between the actual comfort assessment and predicted assessment when applying the heat-balance index to naturally ventilated buildings. The thermal factors here can be influenced by the production process and the natural process (sun, body metabolism, etc.).

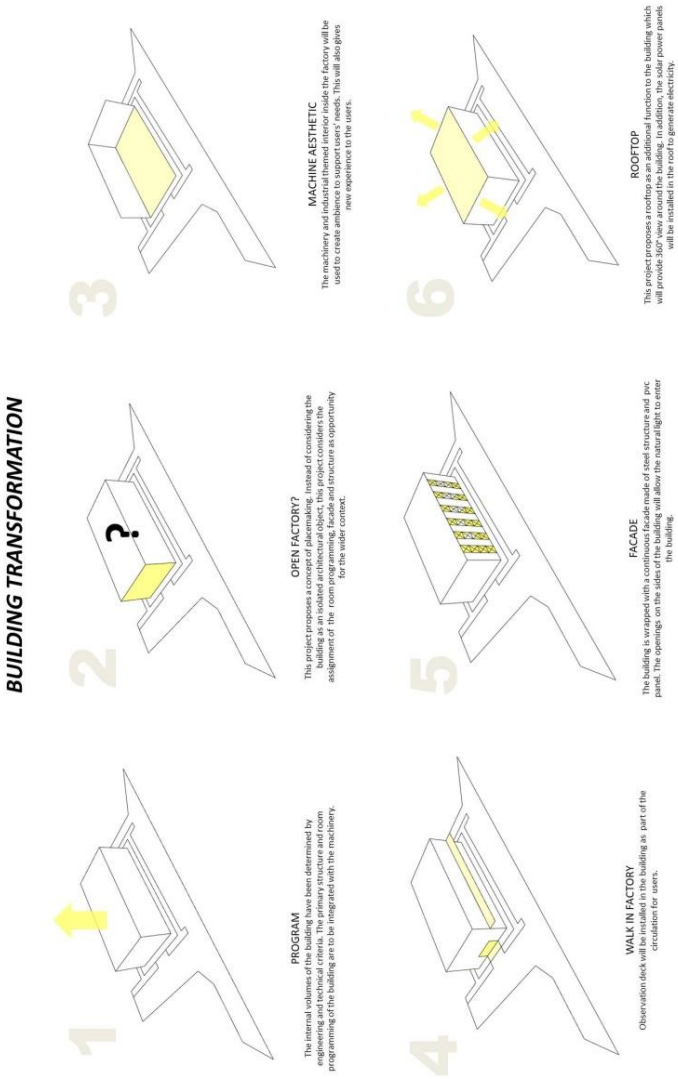


Figure 4.7 : Building Transformation

Source : Author documentation

4.1.1.2 Concept : Exploring the Configuration

In this design, one of the proposed concepts is exploratory configuration related to the lacemaking design method. The movement system can become the means towards more efficient land usage through which wider urban functions may be served (Thomas, 2016). An urban system manifests itself in many scales: an urban room, a public space, a neighbourhood, a district, an entire city and even a region (Karimi, 2012). Therefore, in this object the concept of exploring the configuration can be reached by analyse the moevement patterns.

Movement patterns within an urban environment are broadly represented by the following typical configurations, in either pure or composite form (Thomas, 2016) :

1. **Linear configurations** that are a primary organising element catering for cars, vehicle, people and services. As part of a movement system, they are not confined to a straight line, but could be slow or tight curvilinear.
2. **Grid systems** create nodes at regular intersections that yield square or rectangular fields of space.
3. **Network configuration** that is in essence a random system connecting specific important nodal points in urban space.
4. **Radial systems** that are capable of providing efficient circulation, providing they are supplemented by oncentric circulation and depending on other factors.
5. **Spiral configurations** that are continuous systems originating from a central point and becoming increasingly distant from it.
6. **Composite configurations** that are more common than the preceding pure forms, and the movement systems of most towns that have evolved organically from dynamic growth transposed through socially and economically determined desire lines.

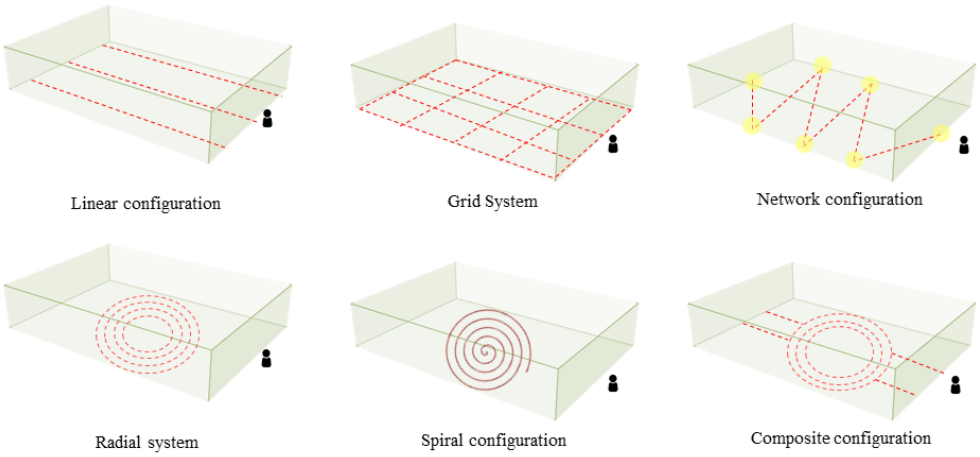


Figure 4.3 : Illustration of movement patterns

Source : Author documentation

4.2 Technical Exploration

The space program is determined based on existing conditions and the projected flexibility of space and work hours that will occur in the context of Surabaya 2050. The production floor area is the main area of the design object. Other functions are placed in the same building mass while still considering several technical aspects / provisions.

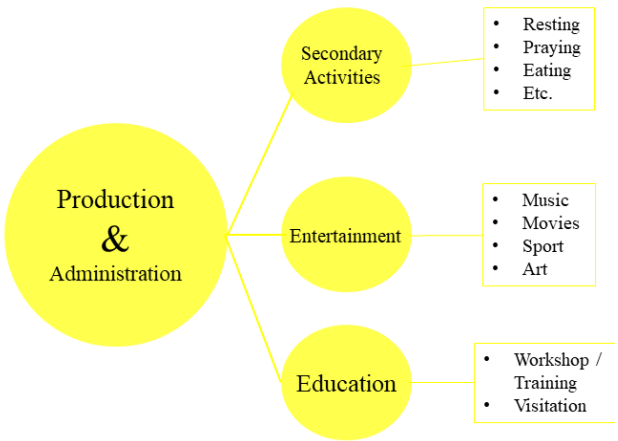


Figure 4.4 : Room progamming concept diagram

Source : Author documentation

Location	*Activities*
Production Floor	• *Production* • *Entertainment* • *Administration* • *Education*
Rooms	• *Administration* • *Secondary Activities*
Additional/ Flexible Area(s)	• *Entertainment* • *Education*

Table 4.1 : Room programming

Source : Author documentation

Design concept

MACHINE AESTHETIC	PLACEMAKING	DESIGN CONCEPT
A. Enclosed space B. Exoskeleton C. Rhythm contrast D. Binary opposition E. Exaggeration F. Circulation G. Mechanical equipment H. Technology I. Structure J. Patterns K. Variations	1. Clustered activities 2. Integrated facilities 3. Mutual supports 4. Legible layout 5. Public ground –level uses 6. Scale 7. Shared space 8. Responsive to adjacent land use 9. Safe & well overlooked space 10. Pedestrian network 11. Authenticity 12. Iconic structures	• (A1, A2) Additional function to accommodate the new activities. • (A3, A4) Providing the space based on its production process and the logistics requirements • (A5,A7) Creating shared spaces for the public (permanent/temporary users) • (B6, B12, C11, D12, E6, E12) Appropriate scale of structures to give identity • (F1, F2, F3, F8, F10) Providing good circulation inside & outside the building • (G2, G9, H2, H9) Integrating the production floor with the surrounding area • (I11, I12, J11, k12) Giving variations of patterns and material in the structure to give authenticity **will be explained using pictures/illustrations*

Table 4.2 : Design Concept

Source : Author documentation

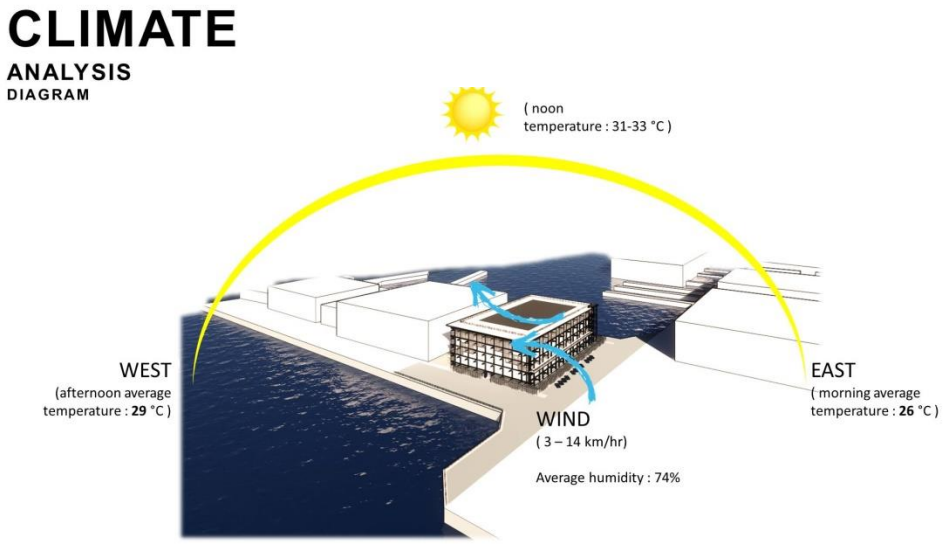


Figure 4.5 : Climate Analysis Diagram

Source : Author documentation

The object is designed by using consideration towards the climate analysis. From the analysis, a building in the seashore area should have protection from the sun, the wind and the sea. But in the samte time a building must use the natural energy to provide thermal comfort for the users. Therefore, this design proposes a semi open building with high openings and ventilations to provide natural circulation and sunlight for the users.

For the aspect of structure, the design object will use materials that are in accordance with the concept of machine aesthetic, namely materials that resemble industries such as: steel, pvc panels, concrete, etc. Certainly materials will be adjusted to improve building performance and provide thermal comfort to the user. In addition, for the utility aspect, it will adjust to the electricity, air, safety and maintenance requirements of the building, and pay attention to security in the building system.

CHAPTER 5

DESIGN

This chapter will discuss object design based on formal and technical exploration. Explanation will include drawings of plans, views, pieces, siteplan, layout, utilities and other supporting images.

5.1 Formal Exploration

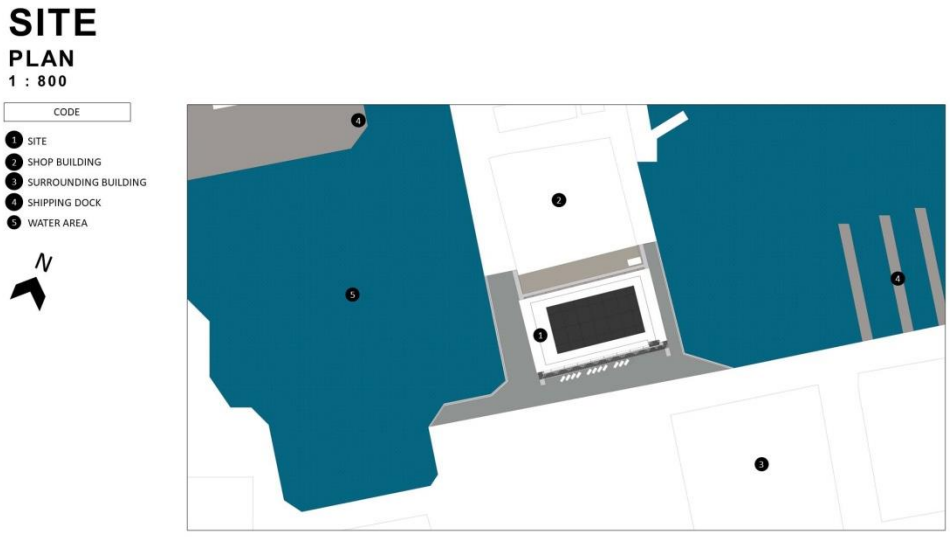


Figure 5.1 : Siteplan

Source : Author documentation

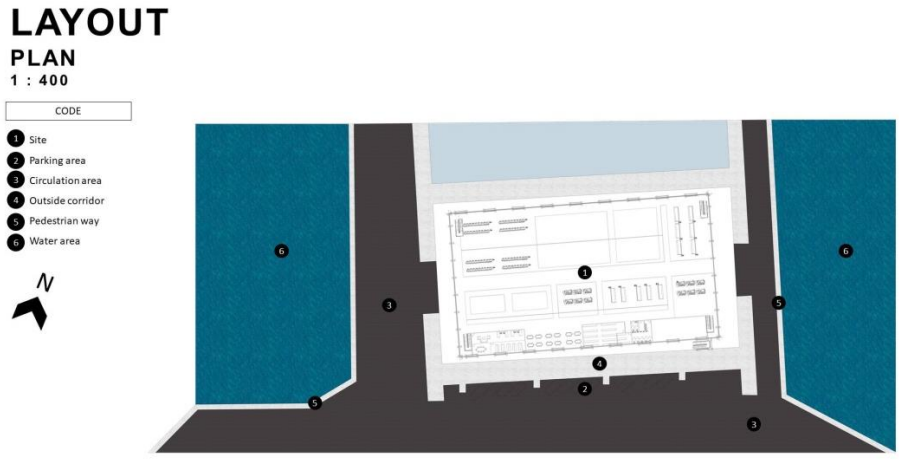


Figure 5.2 : Layout plan

Source : Author documentation

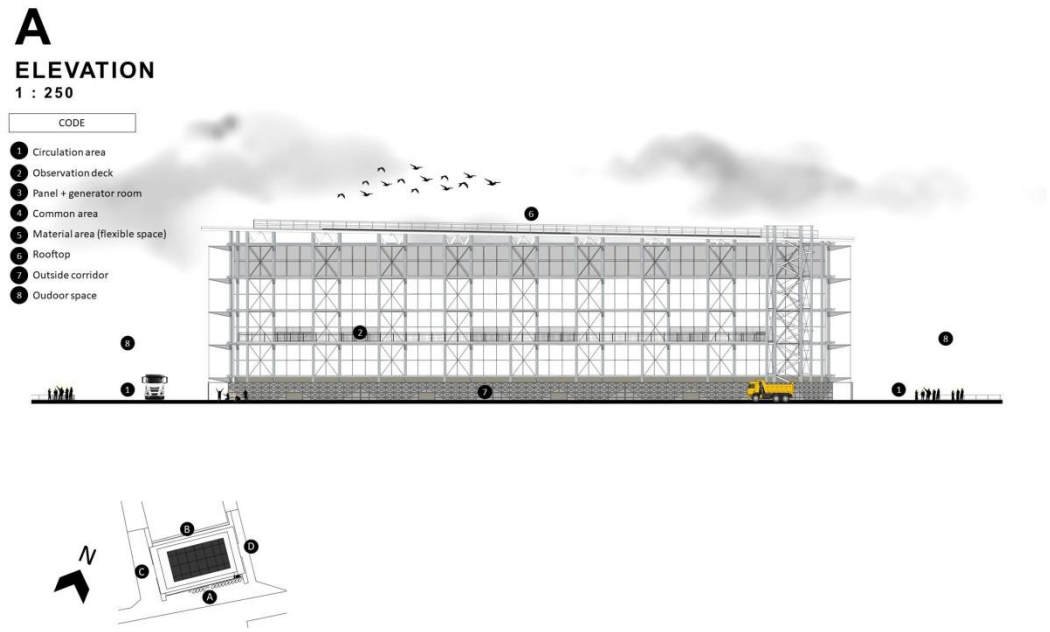


Figure 5.3 : A elevation

Source : Author documentation

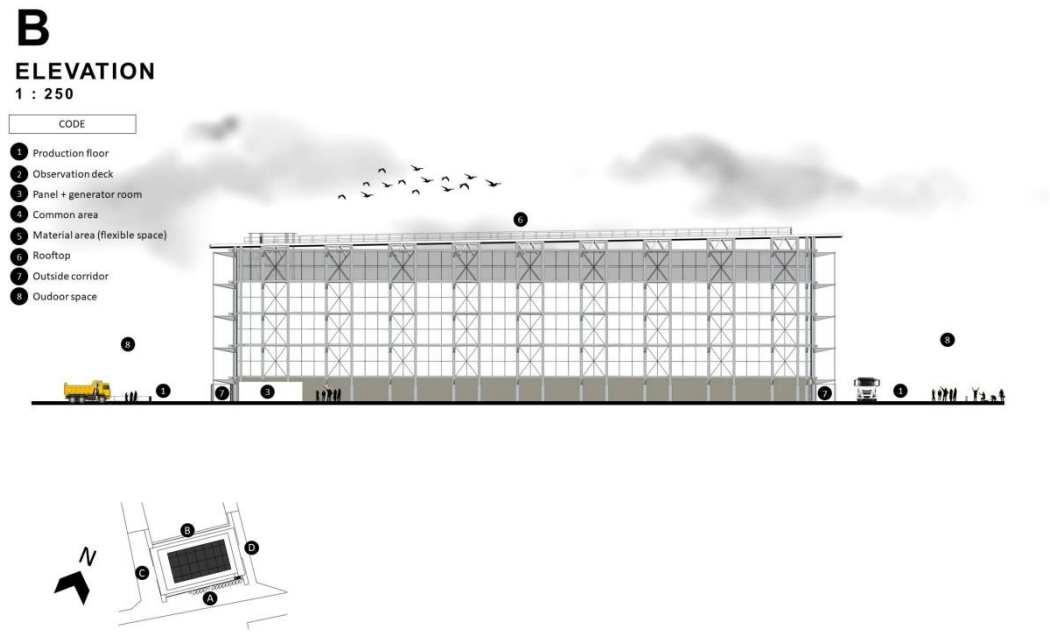


Figure 5.4 : B Elevation

Source : Author documentation

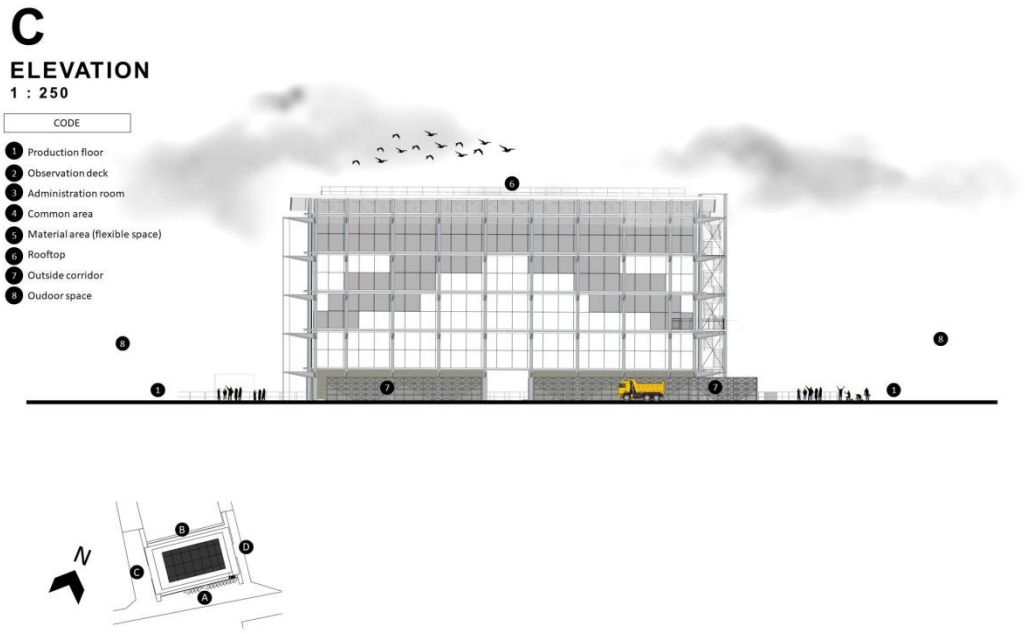


Figure 5.5 : C Elevation

Source : Author documentation

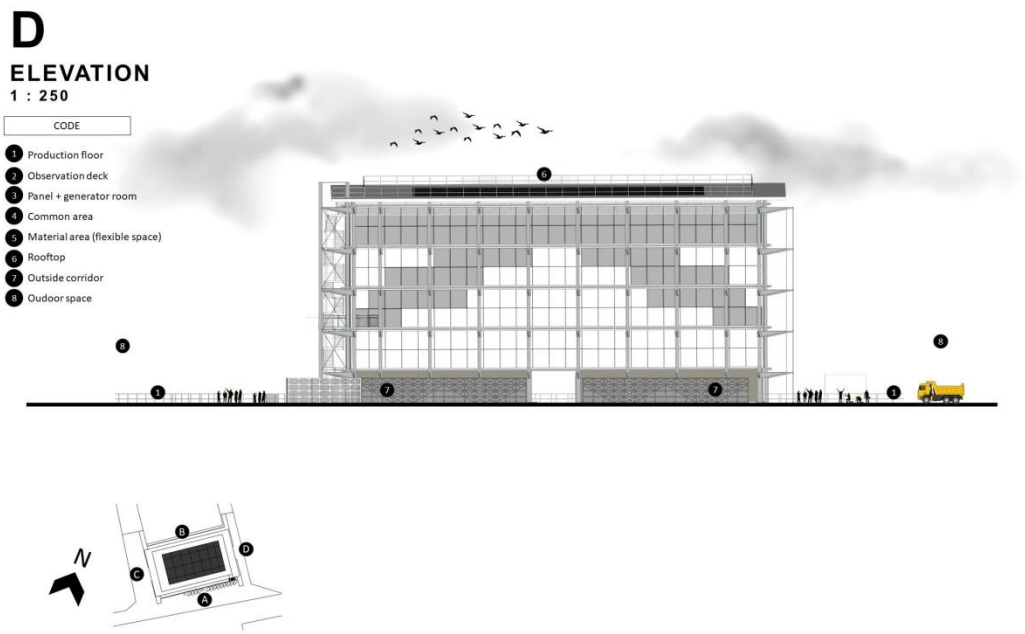


Figure 5.6 : D Elevation

Source : Author documentation

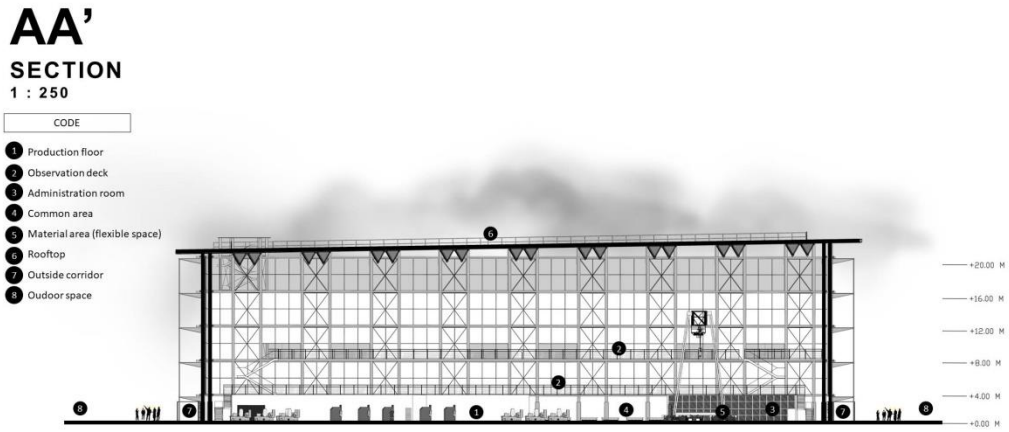


Figure 5.7 : AA' Section

Source : Author documentation

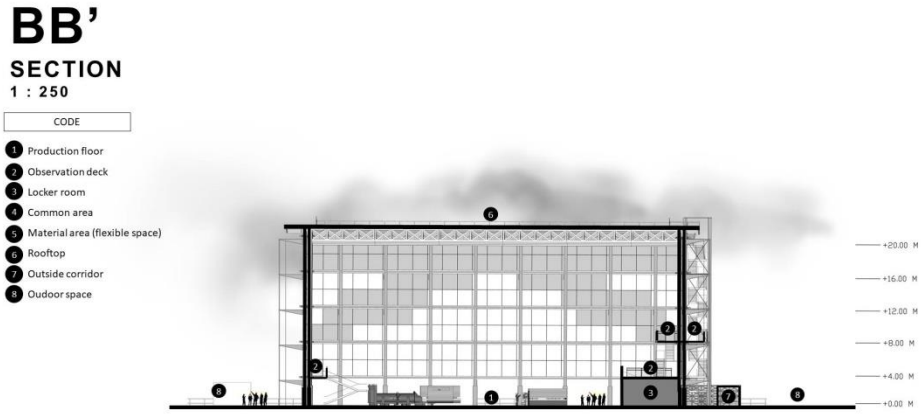


Figure 5.8 : BB' Section

Source : Author documentation

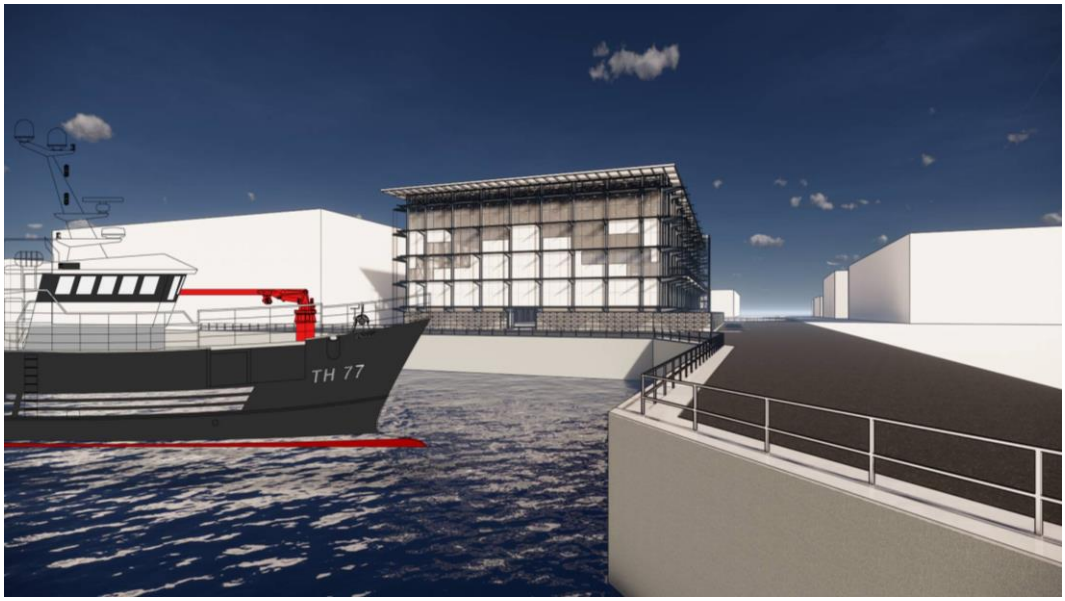


Figure 5.9: Exterior Perspective 1

Source : Author documentation

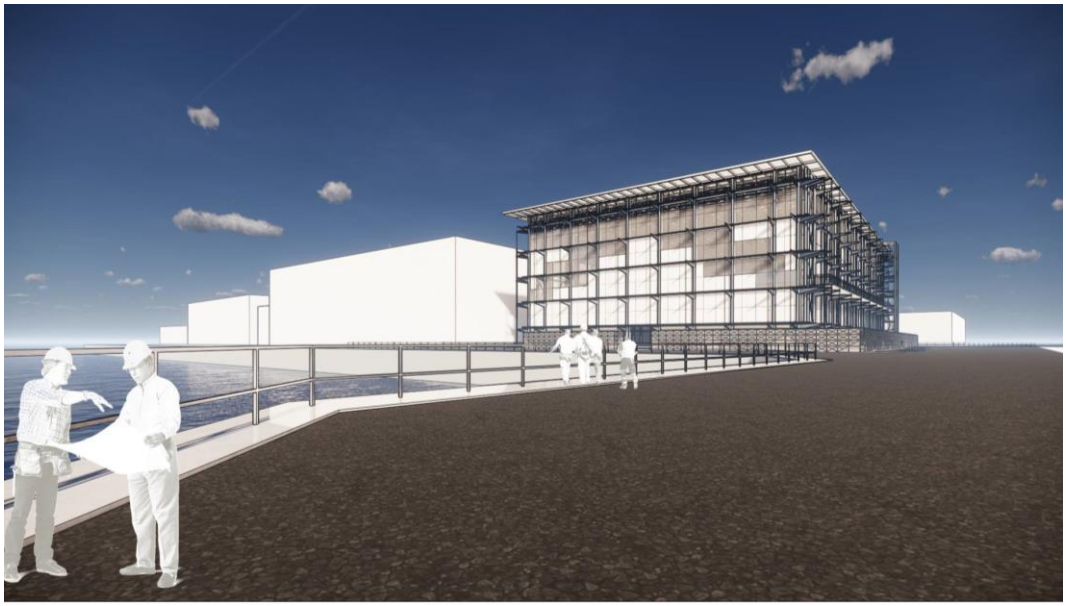


Figure 5.10 : Exterior Perspective 2

Source : Author documentation

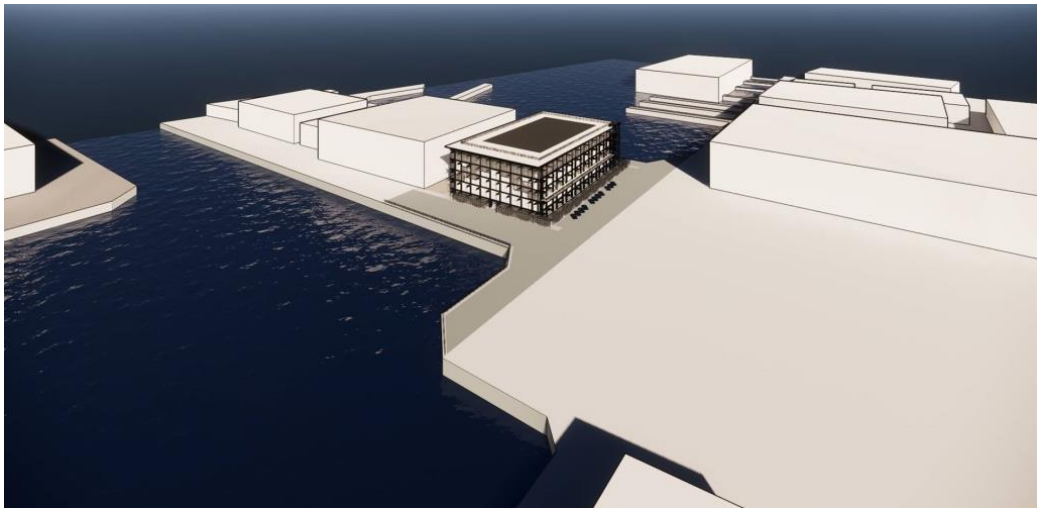


Figure 5.11 : Bird Eye View

Source : Author documentation

Figure 5.12 : Exterior Perspective 3

Source : Author documentation

Figure 5.13 : Structure Detail - Tectonics

Source : Author documentation

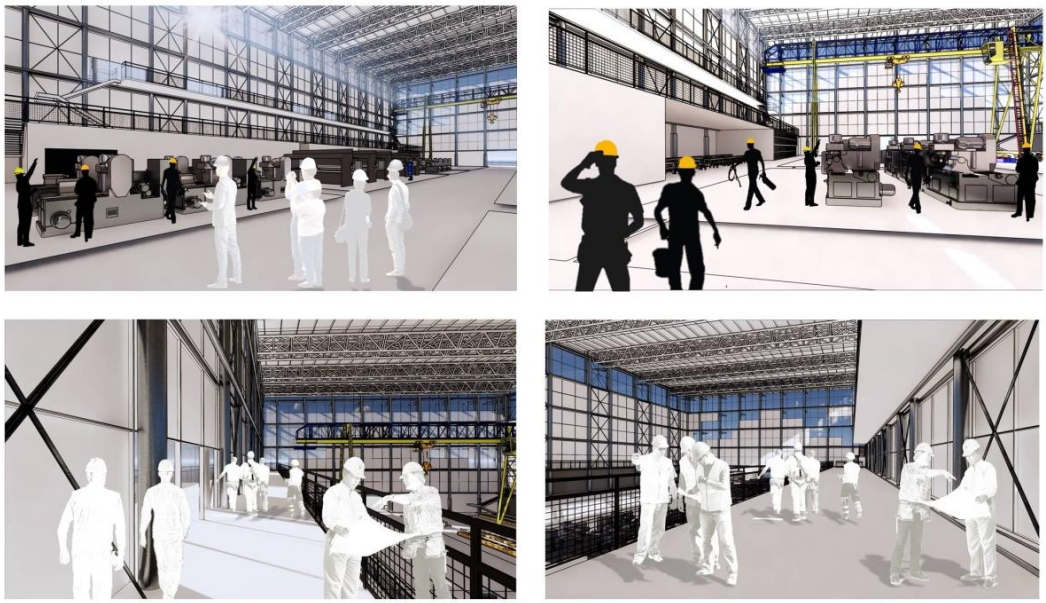


Figure 5.14 : Interior Perspective 1

Source : Author documentation

Figure 5.15 : Interior Perspective 2 (Common area – Administration room)

Source : Author documentation

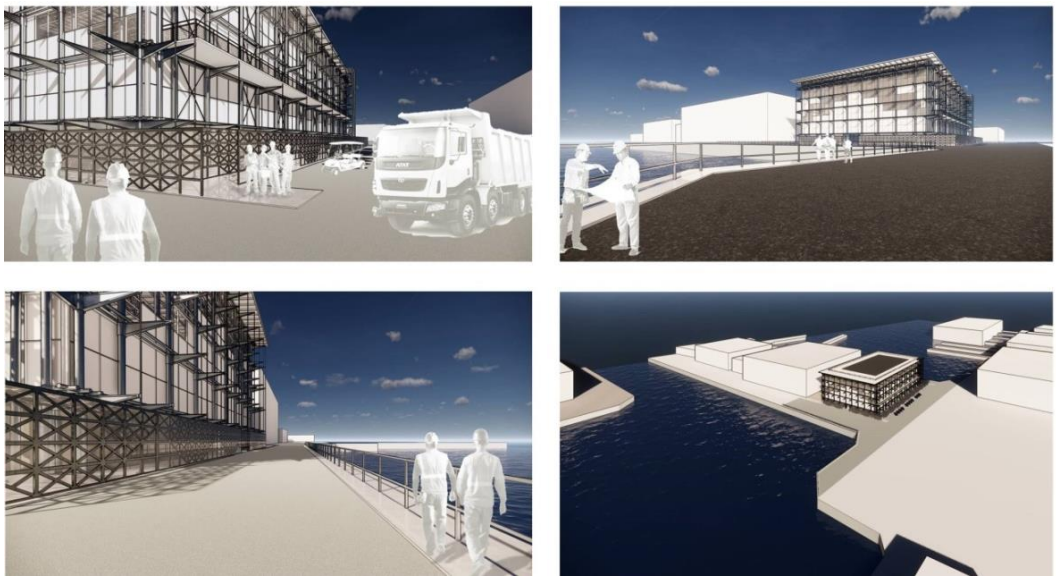


Figure 5.16 : Exterior Perspective 4

Source : Author documentation

Figure 5.17 : Exterior Perspective 5

Source : Author documentation

Figure 5.18 : Material Area (Flexible Area)

Source : Author documentation

Figure 5.19 : Material Area (Flexible Area)

Source : Author documentation

5.2 Technical Exploration

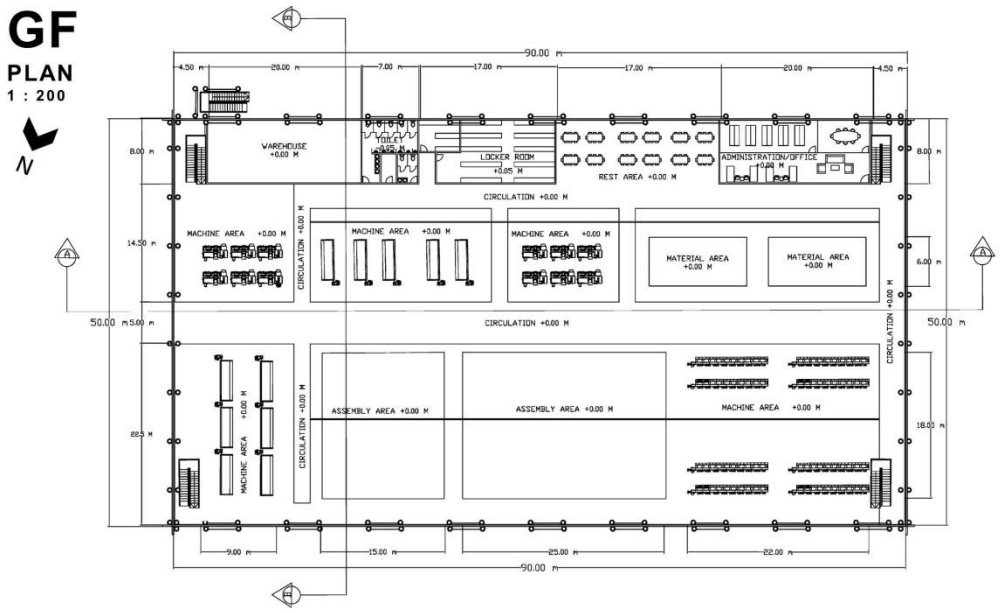


Figure 5.20 : Ground Floor plan

Source : Author documentation

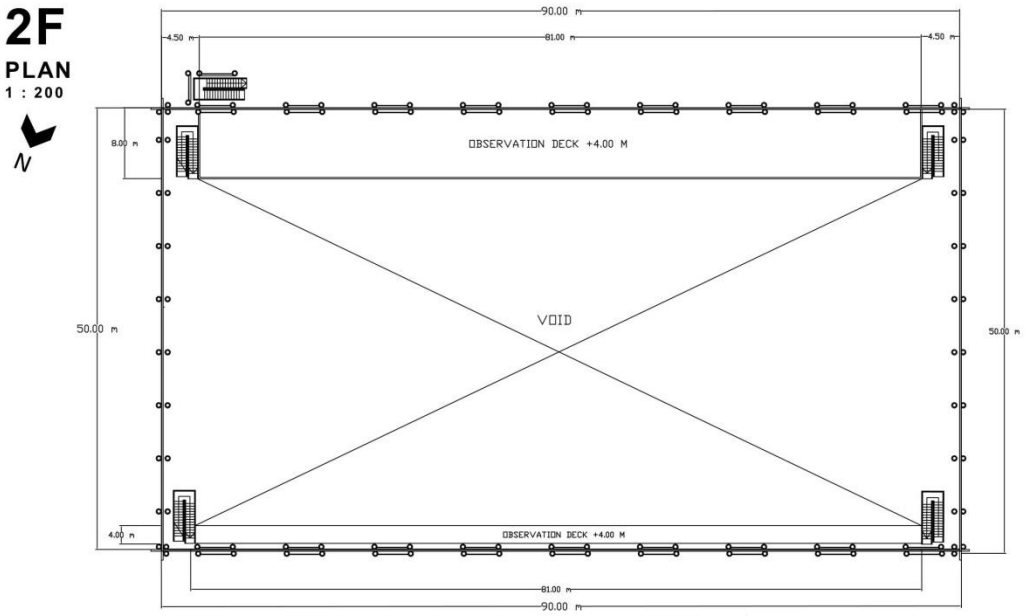


Figure 5.21 : 2nd Floor Plan

Source : Author documentation

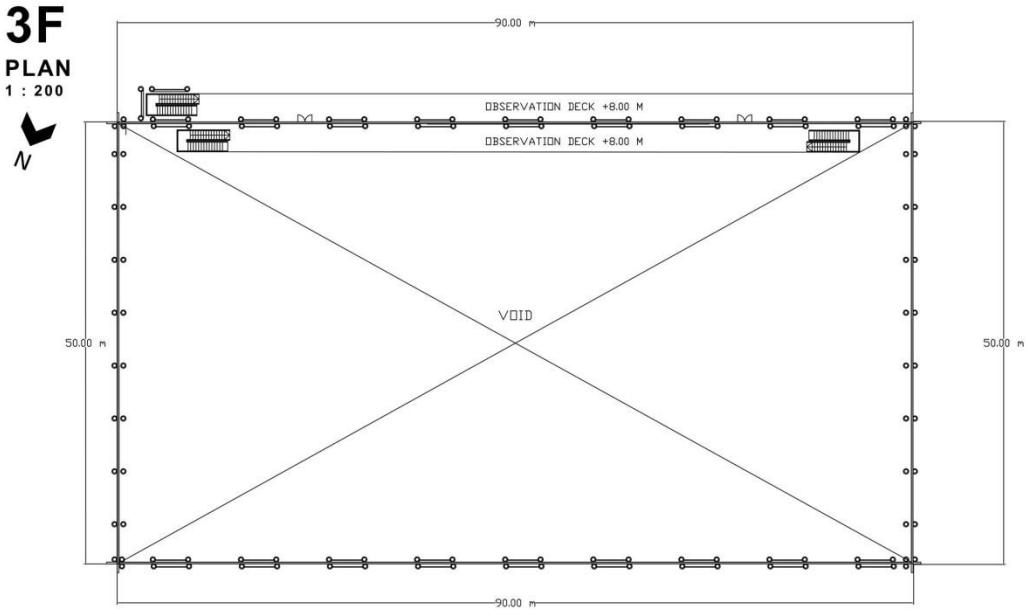


Figure 5.22 : 3rd Floor Plan

Source : Author documentation

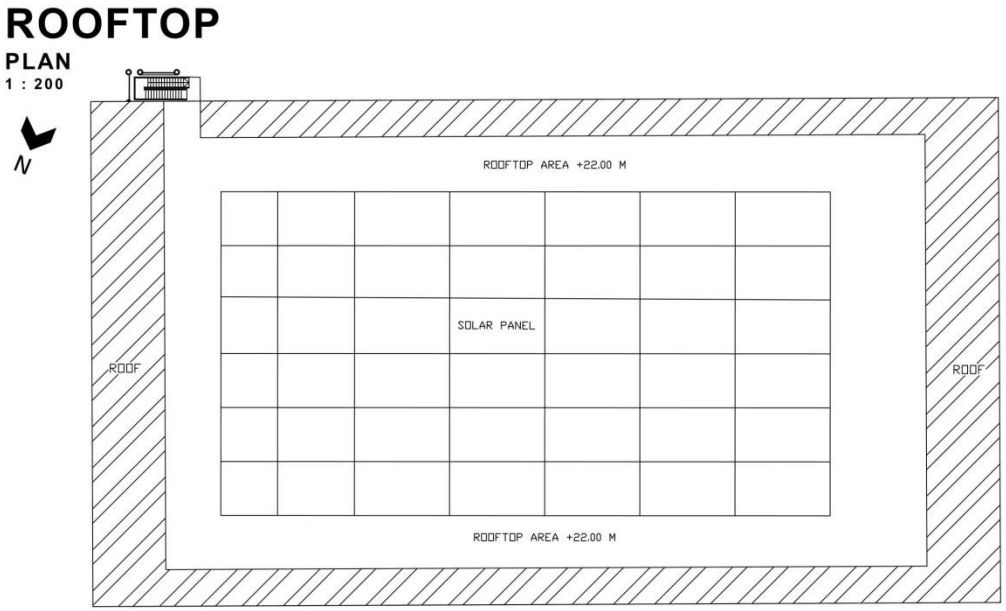


Figure 5.23 : Rooftop Plan

Source : Author documentation

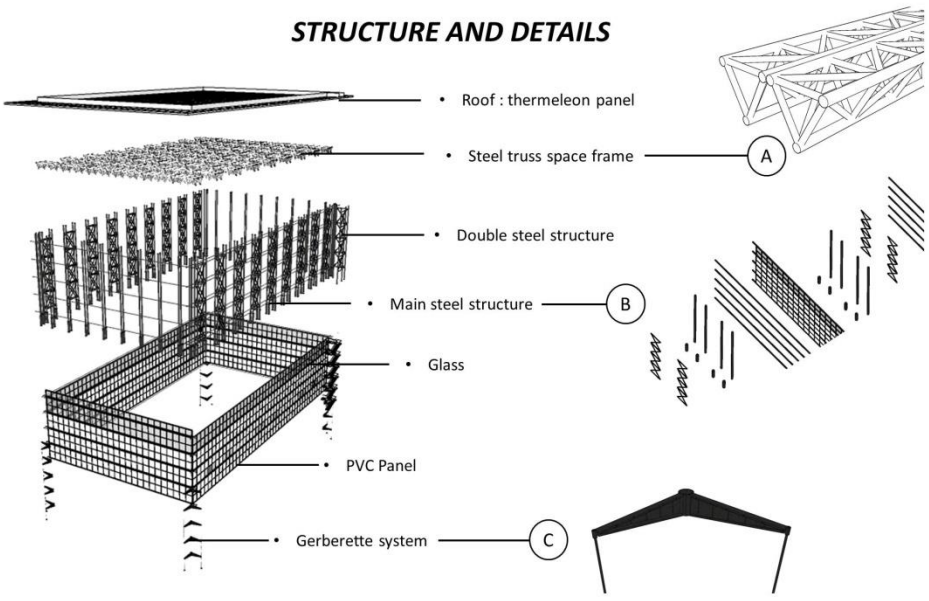
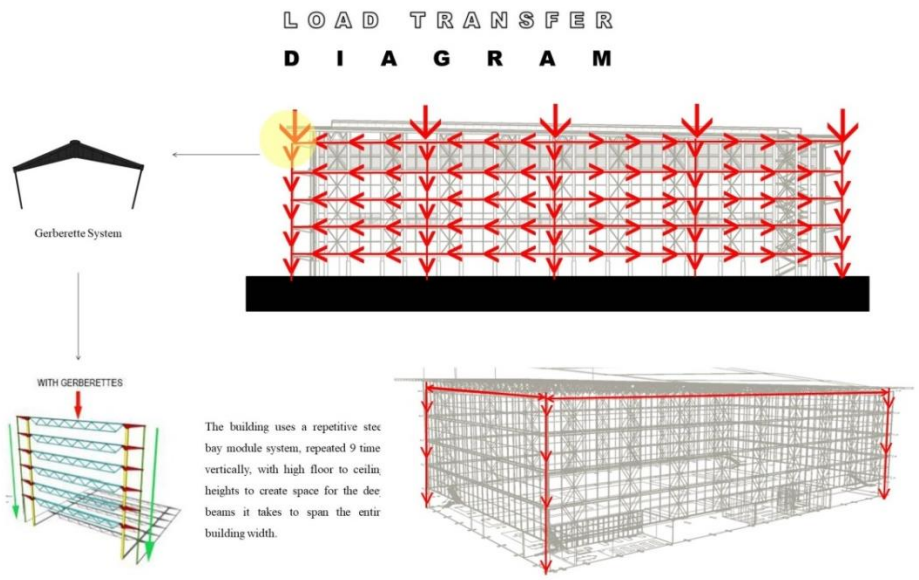


Figure 5.24 : Material Area (Flexible Area)

Source : Author documentation



The building uses a repetitive steel bay module system, repeated 9 times vertically, with high floor to ceiling heights to create space for the deep beams it takes to span the entire building width.

Figure 5 25 : Material Area (Flexible Area)

Source : Author documentation

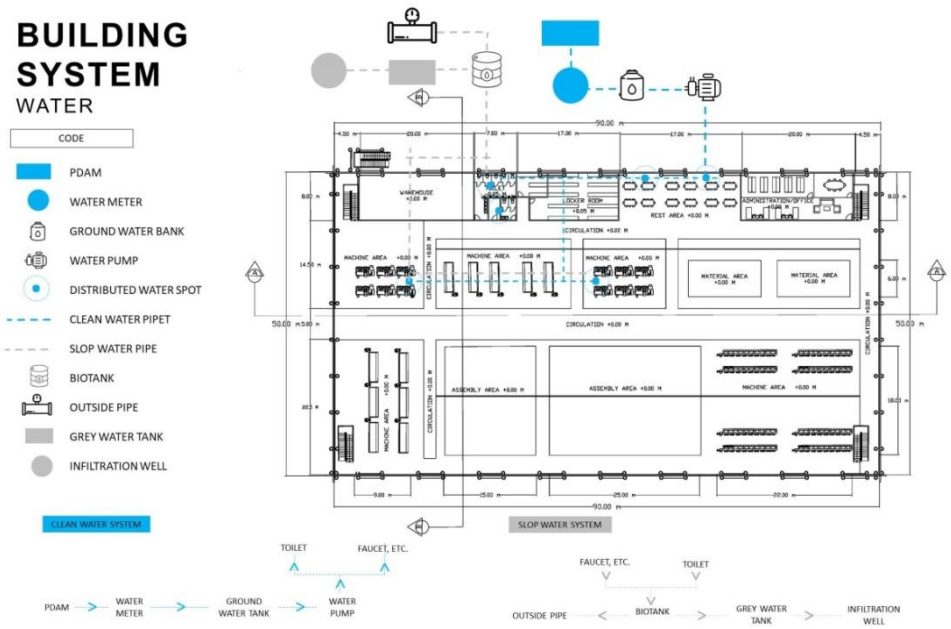


Figure 5.26 : Material Area (Flexible Area)

Source : Author documentation

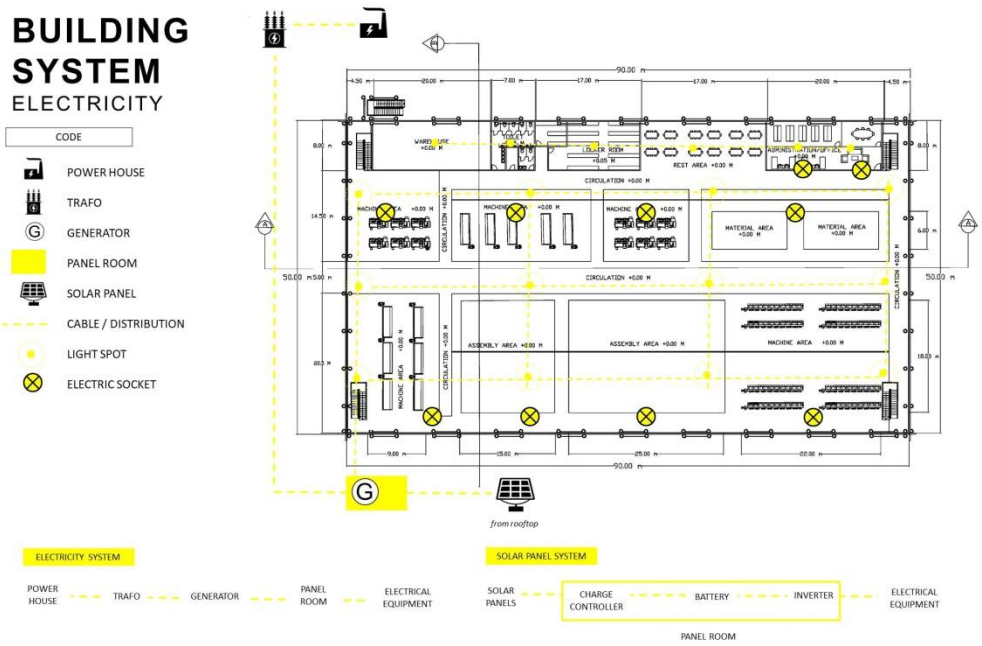


Figure 5.27 : Material Area (Flexible Area)

Source : Author documentation

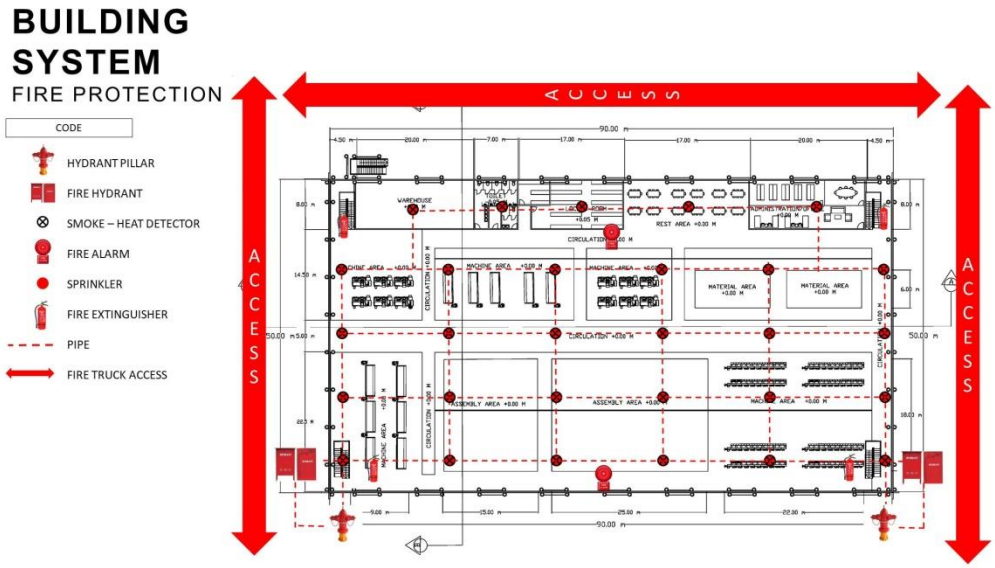


Figure 5.28 : Material Area (Flexible Area)

Source : Author documentation

CONCLUSIONS AND FUTURE PLANS REGARDING CONTENT IN THE FINAL PROJECT

Technology in the modern era now has an impact on human activity in the workspace. The increase in the number of machines is projected to reach the point where the machine will dominate the workspace. Along with this, humans are required to be able to adapt to the conditions of the workspace dominated by machines. In the context of Surabaya 2050, machine dominance is projected to occur in the industrial area of PT PAL INDONESIA. Machines that have specific functions and shapes also have an aesthetic value which can be called machine aesthetic. Machine aesthetics in the workspace can be used as an element to create different ambience/atmosphere as spatial experience for users. This will then be combined with other architectural elements to provide a different spatial experience. The machine aesthetic aspect of the designed object will adjust the projections of the industrial situation in 2050. By using the placemaking concept and experimental approach, the design tries to accommodate human activities in areas dominated by machines. The design also tries to create a new space program that is able to accommodate inside and outside user activities while still being connected to the engine area. Machine aesthetics will be the main focus for creating ambience in the space program which is projected to emerge in PT PAL in 2050.

In the future development of designs, there are still many aspects that can be projected along with the increase in data on projections in 2050. With this data, the space requirements in this particular context can be further mapped. So that later space and architectural programs that will emerge can adjust the context of 2050 to produce new ambience and spatial experiences.

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