TUGAS AKHIR – DA 184801

MATERIAL AS ARCHITECTURAL IDENTITY: A Case Study on Dewadaru Airport

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MATERIAL AS ARCHITECTURAL IDENTITY: A CASE STUDY ON DEWADARU AIRPORT

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

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MATERIAL AS ARCHITECTURAL IDENTITY:
A Case Study on Dewadaru Airport

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ABSTRACT

Globalization, commercialization, and mass communication from the Western have brought cultural and geographic uniformity to urban architecture; a phenomenon labeled as placelessness, which signifies the loss of local meaning and placeness. (Merriman 2004; Webber 1964). Kurt Dietrich, (2008) was defined architectural design is "the method of organizing materials and forms in a specific way to satisfy a definite purpose". Indonesian architecture grew from the knowledge and ideas of the people in the terms of constructing material. However, the majority of Indonesian airport passenger terminal haven't yet resemble Indonesian characteristics and identity.

This final project is aimed to redefine Indonesia architectural identity using a specific local material by breaking down to main and most basic architectural principles of Vitruvius: firmitas, utilitas and venustas. In line with Dewadaru Airport case study, result of the design is adjusted by calculation of SKEP / 77 / VI / 2005 and SNI 03-7046-2004 of Airport Area Standardization

The result of this project is application sawdust bricks into main interior areas such as public hall, check-in area and baggage conveyor that is inspired by local woven pattern & application sawdust bricks into some exterior part which is covered from rainwater. Final mass composition reflects the 5 districts in Karimun Jawa: Karimun, Kamagin, Kemujan, Digimon, Paran

Keywords: Architectural Identity; Architectural Principles; Dewadaru Airport; Local Content; Local Material

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Surabaya, 24th of June 2020,

Debora Vianne

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CHAPTER 1
PREFACE

1.1 Background

Walking around cities of northern Europe, it is never hard to find the traditional and the modern side-by-side. That such peaceful and accepted mutual existence of tradition and modernity can exist in Europe, but not Asia, is, perhaps, because Europe essentially created the modern definition of "modernity" by which the rest of the world must live by.

Over in Asia, modernity and tradition are always perceived as enemies. For one to advance, the other must suffer. The two are constantly fighting to win a perpetual zero-sum game. As expected in the most Asian cities, it is no longer surprising for Western tourists to find urban spaces that differ little from the ones in their home countries.

Globalization, commercialization, and mass communication from the Western have brought cultural and geographic uniformity to urban architecture; a phenomenon labeled as placelessness, which signifies the loss of local meaning and placeness. (Merriman 2004; Webber 1964). The essence of architecture as culture-form has especially to do with the formation of personal, social and cultural identities. Architectural identity itself is created from the relationship between the human, the surrounding environment and the local cultures.

1.2 Architectural Issue

Cultural diversity that exists in Indonesia serves as the main point interest that attract the tourists and local community. The development of global world architectural trends should also be able to synergize with the Nusantara Architecture. Airport typology is merely not just as a gateway to an island of Indonesian, but it also serves as the city's iconic architecture.

Looking back from 10 years earlier, the number of airport passengers has increased significantly (BPS Data from 2009 to 2019). Considering this fact, the Indonesian government is working to intensify the construction of airport facilities and infrastructure. However, the majority of Indonesian airport passenger terminal haven't yet resemble what Indonesian characteristics and identity should be.

Kurt Dietrich, (2008) was defined architectural design is "the method of organizing materials and forms in a specific way to satisfy a definite purpose". The choice of characters and how the arrangement of material itself forms the space and how a surface is arranged. Indonesian architecture grew from the knowledge and ideas of the people in the terms of constructing material. Being one of the most culturally rich country in the world, Indonesia has the potential to explore the limitless locally available material here.

The main idea of this project is to define Indonesian identity by using specific local material in line with the context of international airport modern design sense.

(a) (b) (c)

Figure 1. 1 Examples of Indonesian Airport (a) Juanda Terminal 2 (b) Sultan Hasanuddin (c) Interior of Soekarno Hatta Terminal 3 (Media Indonesia,2018)

1.2.1 Location Context

As the largest archipelago in the world, Indonesia consist of 17,508 islands among which 6,000 are inhabited. Even among those habited islands, there are many of those that isolated in the middle of the sea. Usually by the end of the year, these isolated islands which are relying upon the localship transportation being canceled are threatened with the shortage of food supply.

Karimunjawa is an Indonesian archipelago located in the middle of Java Sea. With an area of approximately 71 km2, this archipelago consists of 27

islands in which only 5 of 27 islands are habited. Karimunjawa is currently facing transportation problem about this island's accessibility. Currently the most common transportation used are ships from Kartini Jepara Port. The scheduled departing ships are about four times a week and likely to be cancelled due to the bad weather.

Other opsion to visit Karimunjawa is by using plane and will arrive at Dewadaru Karimunjawa Airport. For the last five years, there have been increasing number of tourist arrivals to Karimunjawa by Dewadaru Airport which taken the government to step up for redesign the passenger terminal building. The development planning of Dewadaru Airport is listed in the Jepara District Spatial Plan for the year 2011-2031.

(a) (b)

Figure 1. 2 Dewadaru Karimunjawa Airport (a) Existing Condition (b) Plan View (Indonesian Department of Transportation,2019)

1.2.2 Local Material Context

Karimunjawa, which is included in Jepara district on Central Java Region, is an area with a characteristic of wood processing industry. This wood industry creates problems because it produces large amounts of sawdust waste which poses a serious health risk to those who are overexposed to it as quoted by Occupational Safety and Health Administration (OSHA).

In addition, Dewadaru Airport is derived from the name of the Dewadaru tree or known by another name as iron wood and has high economic value. Dewadaru tree is merely known as a symbol to Karimunjawa. There is a myth for the local people that taking this tree out of Karimunjawa land may bring

bad luck. Even for now, there is a sign in Dewadaru Airport for leaving this wood before boarding into the aircraft.

Bricks is one of the locally material which is easily can be found in Indonesia. In fact, in every region of Indonesia, almost 80% use bricks as the primary material of masonry. (Matec,2018) Lately the use of clay fired bricks has not been recommended because of its production has hugely negative environmental impact – the pollution produced from the firing process.

Combustion – or the firing process is the most important process of making clay bricks. For every combustion process, 1 ½ trucks of woods are needed for the fuels.

Now, sawdust bricks, produced by Prof Totok could offer an environmentally and economically sustainable solution: the brick is made from recycled industrial waste *(in this case: Dewadaru tree's sawdust*) and doesn't require firing process at all. Referring to SNI 15-2094-1991 concerning about Classification of Solid Red Brick For Walls, this sawdust bricks occupy the class A2 – A1 with the function as partition walls, depending on the percentage of sawdust from the bricks.

(a) (b)

Figure 1. 3 Sawdust bricks (a) Wood residue sawdust (b) Bricks (Amazon,2016)

1.3 Design Challenges

1) This final project is aimed to define Indonesian identity by using specific locally available material.
2) Related with the airport study case, output design is expected to meet technical regulations and design standardization of an airport.

1.4 Design Criteria

Table 1.1 Design Criteria

Topic		Concept
Massing and form		High pitched roof represent Javanese Rumah Kampung in Karimunjawa
Utilitas	Material functionality	- Noise control barrier - As partition wall - Air ventilation
Firmitas	Material Durability & strength	According to SNI 15-2094-1991 about Bricks Classification, sawdust brick is classified for non structural interior material element. For exterior use, sawdust bricks are protected from rainwater with overhang
Venustas	Tectonic details	Inspired by woven pattern which are found in Central Java
	Identity of a Region	Local rattan made furniture and local wood crafting with Javanese pattern

Standard and Regulations	Minimum area	Airport design minimum area regulation calculated based on SKEP / 77 / VI / 2005 and SNI 03-7046-2004
	Security aspect	SKEP 2765 / XII / 2010 the security check point (SCP) are need to be located in two points
Time Aspect	Temporal	Flexibility of form and space to be later developed in the future

Source: Personal Analysis,2019

CHAPTER 2
DESIGN PROGRAMMING

2.1 Activities and Programming

2.1 Program Activity

Classified as Class III Airport, Dewadaru Airport only serves for domestic flights. International flights are served by bigger hubs, such as Jakarta's Soekarto Hatta Airport and Semarang's Ahmad Yani Airport. As the consequence, program activity on Dewadaru Airport are separated into domestic depature and domestic arrival.

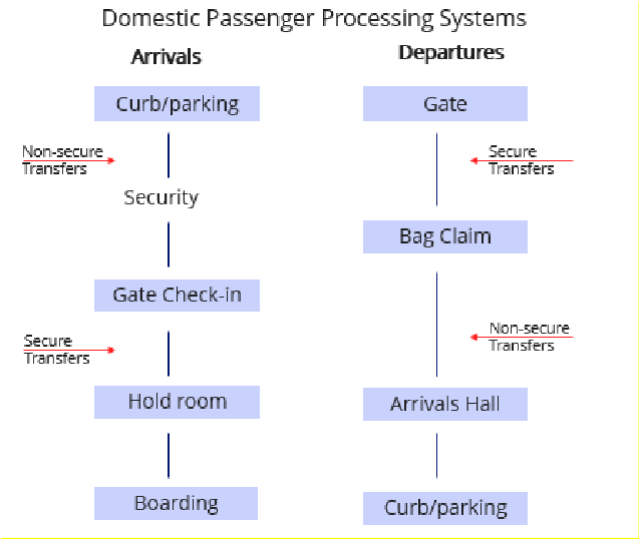

Figure 2. 1 Domestic Passenger Processing System (IATA.2016)

Considering the airport security factors, most of the domestic passenger terminal airport is arranged as diagram below;

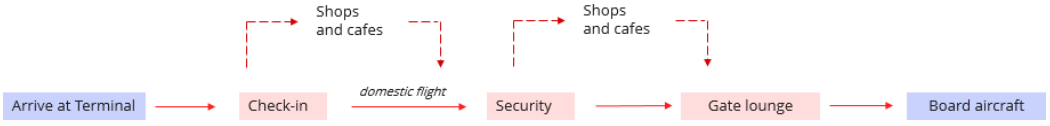

Figure 2. 2 Diagram Domestic Passenger Space Arrangement (IATA,2016)

2.1.2 Spatial Programming

Airport has mainly three function that must be fulfilled: as a gateway for departures and arrivals, to accommodate commercial sectors, and to served administrative function.

Table 2. 1 Airport Spatial Programming

No.	Type of Space		Dewadaru Airport	Notes
A	Departures			
	1	Drop Off Area	V	
	2	Information Counter	V	
	3	Customer Service Airlines	V	Adjust to the number of airlines
	4	Departures Curb	V	
	5	Trolley Area	V	
	6	Security Check Point 1	V	WTMD, Baggage X-Ray
	7	Depature Hall	V	
	8	Check-In Counters	V	
	9	Baggage Sorting Area	V	
	10	Security Check Point 2	V	WTMD, Cabin X-Ray and body search
	11	Holding Room	V	
	12	Boarding Gates	V	
	13	Cip Lounge	V	Toilet and kitchen
	14	*Fixed Bridge**	*If needed*	
	15	*Garbarata**	*If needed*	
	16	Concession	V	

No.	Type of Space		Dewadaru Airport	Notes
B	Arrivals			
	1	Arrival Hall	V	
	2	Trolley Area	V	
	3	Baggage Sorting Area	V	
	4	Baggage Conveyor	V	
	6	Lost And Found Area	V	
	7	Taxi and Travel Counters	V	
	8	Hotel Counters	V	
	9	Concession	V	
	10	Arrivals Curb	V	

No.	Type of Space		Dewadaru Airport	Notes
C	Supporting			
	1	Men Toilet	V	On departures hall, arrivals hall and curb side. Equipped with luggage storage area, sink,mirror and other needs.
	2	Women Toilet	V	Same
	3	Difable Toilet	V	Can be combined with main toilet or separated
	4	Nursery Room	V	Equipped with sofa, diaper changing table, sink, mirror, dispenser
	5	Praying Room	V	Ablution room, prayer room and shoes / bags storage room.
	6	Warehouse	V	
	7	Janitor Room	V	
	8	M/E Room	V	
	9	Smoking Area	V	
	10	Management Office	V	
	11	Avsec / Security / CCTV Office	V	
	12	Airlines Office	V	
	13	Quarantine Office	V	
	14	AMC and Flops Office	V	
	15	ATM	V	

Source: Indonesian Department of Transportation,2019

2.2 Space Regulations and Requirements

Airport passenger terminal as quoted on Indonesian regulations have some requirements to fulfill, namely:

a) Domestic Passenger Terminal Area Regulations

Referring to Indonesian Directorate General of Civil Aviation Regulation Number: SKEP / 347 / XII / 1999 - PM 178/2015 which states that the minimum area for domestic terminal are calculated of 14 m2 per passenger arriving and departing on the rush hour.

b) Ground Support Equipment (GSE) Area

Ground support services are provided to aircraft while at the terminal gate or remote stand position. These services must be conducted in a safe

and efficient manner, standard locations with ample space for ground equipment placement and operation should be planned on designing process. Figure 2.1 depicts the typical staging area and servicing units for an aircraft.

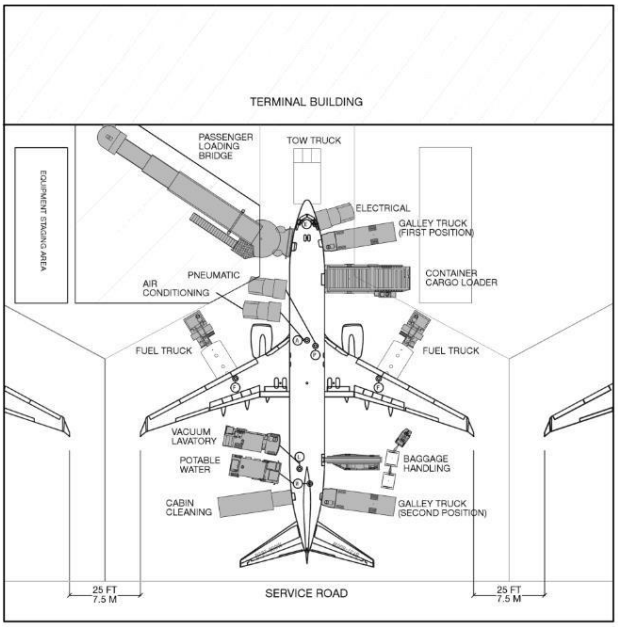

Figure 2. 3 Ground Service Equipment Area (IATA, 2016)

As quoted from Indonesian Directorate General of Civil Aviation Regulation Number: SKEP/77/VI/2005, a staging area should be provided for the necessary ground service equipment (GSE) around each aircraft parking position. This buffer area is located between the apron and the terminal building.

Table 2. 2 Buffer Zone Between Apron and Terminal Building

Buffer Zone Between Apron and Terminal Building	
Airport that serves jet aircraft	25 meters or more (GSE area for 25 meters and pipe placement zone for 5 meters)
Airport that serves propeller aircraft	20 meters or more (GSE area for 20 meters and pipe placement zone for 5 meters)

Source: IATA, 2005

Dewadaru Airport has development plan with Boeing 737-800 as the biggest aircraft that being served. With the boeing 737-800 categorized as

jet aircraft, the minimum staging area between apron and terminal building is set to be 25 meters.

2.3 Site Analysis

Airport typology relies on the airport flight network used. Imam Haryanto defines aviation network as a collection of flight routes in a country or region in the context of scheduled commercial flights that do not change with time. This flight network can then be divided into 4 patterns, namely line network pattern, grid network pattern, hub and spoke network pattern and point to point network pattern.

This final project design context is emphasized at the Airport with the Hub and Spoke network pattern, where when all flights go to one large central location (Hub) and then passengers switch flights to reach their final destination (Spoke) (Kasper, 1988; Dennis, 1994).

Dewadaru Airport which located on Karimunjawa Island is classified as Class III airport with the nearest hub airport is Ahmad Yani Semarang Airport for about 130 km.

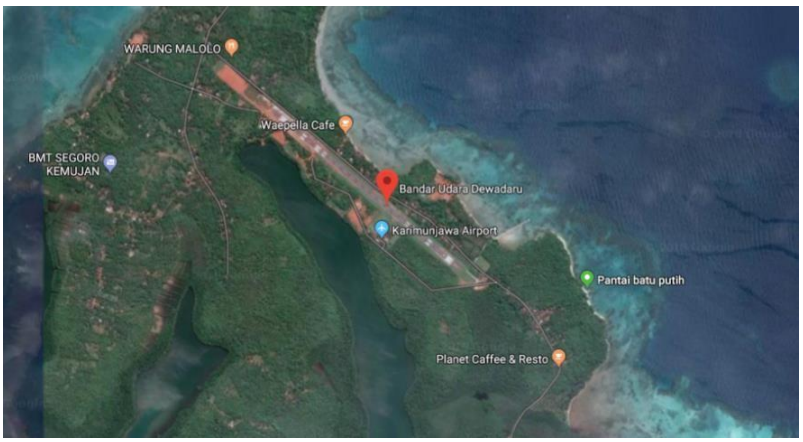

Figure 2. 4 Dewadaru Airport Location (Google Maps,2020)

Dewadaru Airport data is listed on below;

Airport Name	: Dewadaru Airport
Airport Classification	: III
Address	: Kemujan Village, Karimunjawa Island, Jepara District
Province	: Central Java
Function	: Spoke Airport
Administrator	: Indonesian Directorate General of Civil Aviation

Operating Capability : ATR72
Location Coordinates : 5.48.4,45LS/110.28.43,2BB
(-5.801236/-110.478667)
Elevation : ± 8.66 mdpl
Distance to city : ± 78 km to Jepara District

As for now, Dewadaru Airport passenger terminal conditions are currently inadequate by Class III Airport Standards. The current terminal area is 132 m2 and only hold one flight route to Ahmad Yani Semarang Airport.

Figure 2. 5 Existing Condition Dewadaru Airport (Indonesian Department of Transportation,2019)

Since March 15 2001, Karimunjawa has been designated as the one of the seven national marine parks in Indonesia. The local government is planning to develop Karimunjawa towards tourism in improving the community's economy.

Located about 130 km from Semarang,the capital city of Central Java, currently the most common transportation used is ships departing from Jepara. It takes almost two and a half hours from Jepara to Karimunjawa. It is also possible to go by boat from Semarang, but it takes app. 6 hours to get there.

From 2019 data, ships that departs from Jepara Kartini Port have sailing frequency around 4 or 5 times a week. On the other hand, ships from Semarang Tanjung Emas Port only depart once a week. However, when it comes to rainy season, it is common for the ships that they could not operate

due to the bad weather. As the result of this fact, many tourists forced to delay their trip for several days.

2.4 Site Regulation and Related Data Studies

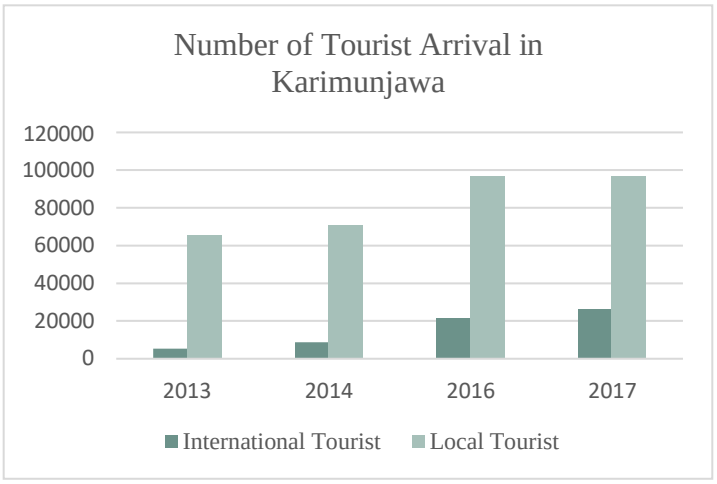

Figure 2. 6 Number of tourist arrivals in Karimunjawa (Jepara Government,2017)

For the last five years, there have been increasing number of tourist arrivals to Karimunjawa. The number of foreign tourist is high, almost 4 times greater than the locals. This fact drives the local government to develop Dewadaru Airport as the Karimunjawa main gateway and city icon. The planned development of Dewadaru Airport, Jepara Regency is listed in the Jepara District Spatial Plan for the year 2011-2031

Rencana Tata Ruang Wilayah Kab Jepara tahun 2011-2031

Pasal 13

(1) Rencana pengembangan sistem jaringan transportasi udara berupa pengembangan Bandar Udara Dewadaru sebagai Bandar Udara pengumpan di Desa Kemujan Kecamatan Karimunjawa.

(2) Pengembangan bandar udara sebagaimana dimaksud pada ayat (1) disusun berdasarkan analisis kelayakan dan ketentuan perundang-undangan.

Pasal 49

(5) Pengembangan prasarana bandar udara mencakup kegiatan:

a. penyusunan rencana induk, Detail Engineering Design (DED) dan Studi Kelayakan pengembangan Bandar Udara Dewadaru di Desa Kemujan Kecamatan Karimunjawa; dan

b. pengembangan Bandar Udara Dewadaru secara bertahap.

In Jepara District Spatial Plan for the year 2011-2031 Article 13 Paragraphs 1 and 2 and in Article 49 Paragraph 5 is already stated that the local government has plan to develop Dewadaru Airport. Indonesian Transportation Office has confirmed that the airport feasibility study has been carried out by the authorized team. The development of Dewadaru Airport will be separated into two phases as stated in table below

Table 2. 3 Dewadaru Airport Development Plan

Aspect	Existing	Target	Notes
Passenger Terminal Area	132 m2	5.000 m2	The biggest plane is planned to be Boeing 737-800 with the terminal building planned to have 1 or 1.5 system
Runway length	1200 m	1700 m (finished in 2017)	
Passenger Terminal Capacity	4.992	180.718	
Rush Hour Capacity	14 pax	235 pax	

Source: Indonesian Department of Transporation,2019

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CHAPTER 3
METHOD AND APPROACH

3.1 Design Method

According to Bernard Tshumi, concept, context, content is one of five main architectural method. This method consist of breaking down the main issue to develope a reciprocal reference strategy between building, content, and the environment.

This project is aimed to define material as architectural identity. Identity is special characteristics of a region (in this case: Karimun jawa) as wood processing industry. Wood industry produces wood waste / residue (later known as sawdust) and developed as sawdust bricks.

The Roman Architect, Vitruvius in his treatise on architecture, De Architectura, asserted that there were three principles of architecture: firmitas, utilitas and venustas. This principles are later applied into material aspect: durability & strength, material functionality & tectonics details.

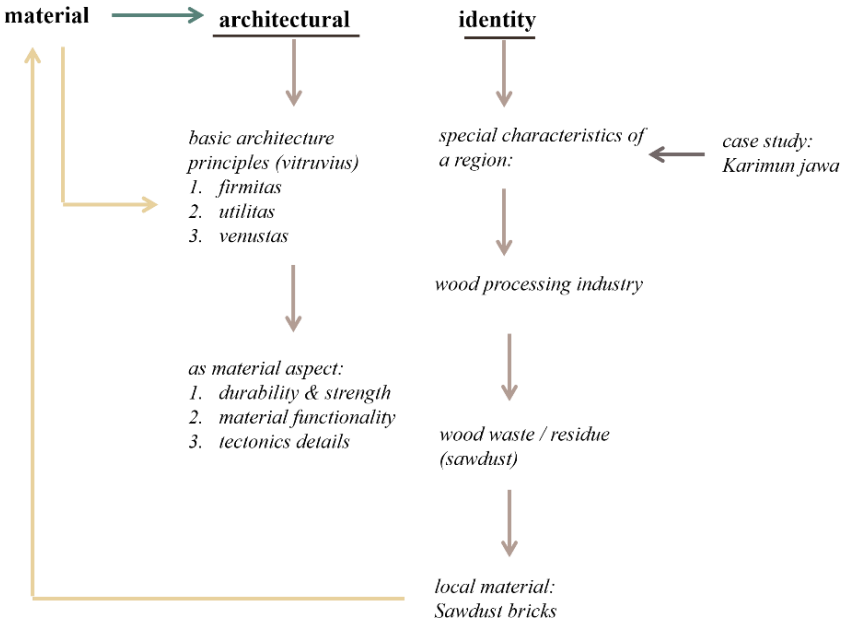

Figure 3. 1 Design Method Mindmapping
(Personal Analysis,2020)

3.2 Design Approach

"Can we produce architecture today that is an architecture of events, the architecture of situations, and that no longer relies on a conventional perception of space?" – Bernard Khoury

Generally speaking, contemporary architecture can be considered to be the architecture of the present day. Contemporary architecture is based on a principle that is shared by all those who practice it: the desire and the will to design and build things that are different from what was done in the past and what is usually done today. Contemporary architecture aims to break away from the processes and ways of thinking that have become standard.

According to Ogin Schirmbeck on his book "*Idea, form and Architecture : Design Principles in Contemporary Architecture*". Contemporary architecture is derived into five main features:

1. Uniqueness of material

   Contemporary architecture is, by nature, unexpected and inventive. This inclination to abandon the norm drives this style more than any specific visual trait and one of the main ways contemporary architecture bucks tradition is by incorporating unique materials into the construction.

(a) (b)

Figure 3. 2 Sawdust bricks & local wood crafting in view
(a) Connecting bride (b) Information Center (Personal Documentation,2020)

2. Bright open interior design

   Contemporary design tries to innovate and evolve with changing trends and ideas. Having a open hall space allows for natural light to penetrate into all the aras. This also creates a sense of unity between the various spaces in the structure. Sometimes less truly is more.

Figure 3. 3 Open Public Hall
(Personal Documentation,2020)

3. Harmony with nature

Contemporary architecture frequently hinges on the desire to create harmony between structure and nature. The prominent use of large glass walls allows boundaries between indoors and outdoors to blur, while overhanging roofs push the architecture into the outdoor realm, creating a seamless sensibility that makes it seem as though the building belongs there.

Figure 3. 4 Large Glass Boundray to Airside Area
(Personal Documentation,2020)

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CHAPTER 4
DESIGN CONCEPT

The main idea of this project is to define Indonesian identity by using local material (specifically: sawdust bricks)

Table 4. 1 Design Criteria to Concept

Aspect	Topic		Concept
Formal Exploration	Massing and form		High pitched roof represent Javanese Rumah Kampung in Karimunjawa
	Utilitas	Material functionality	- Noise control barrier - As partition wall - Air ventilation
	Firmatis	Durability & strength	According to SNI 15-2094-1991 about Bricks Classification, sawdust brick is classified for non structural interior material element. For exterior use, sawdust bricks are protected from rainwater by overhang
	Venustatis	Tectonic details	Inspired by woven pattern which are found in Central Java
		Identity of a Region	Local rattan made furniture and local wood crafting
Technical Exploration	Standard and Regulations	Minimum area	Airport design minimum area regulation based on SKEP / 77 / VI / 2005 and SNI 03-7046-2004
		Security aspect	SKEP 2765 / XII / 2010 the security check point (SCP) are need to be located in two points

Technical Exploration	Time Aspect	Temporal	Flexibility of form and space to be later developed in the future

Source: Personal Analysis, 2019

4.1 Formal Exploration

4.1.1 Massing and Form

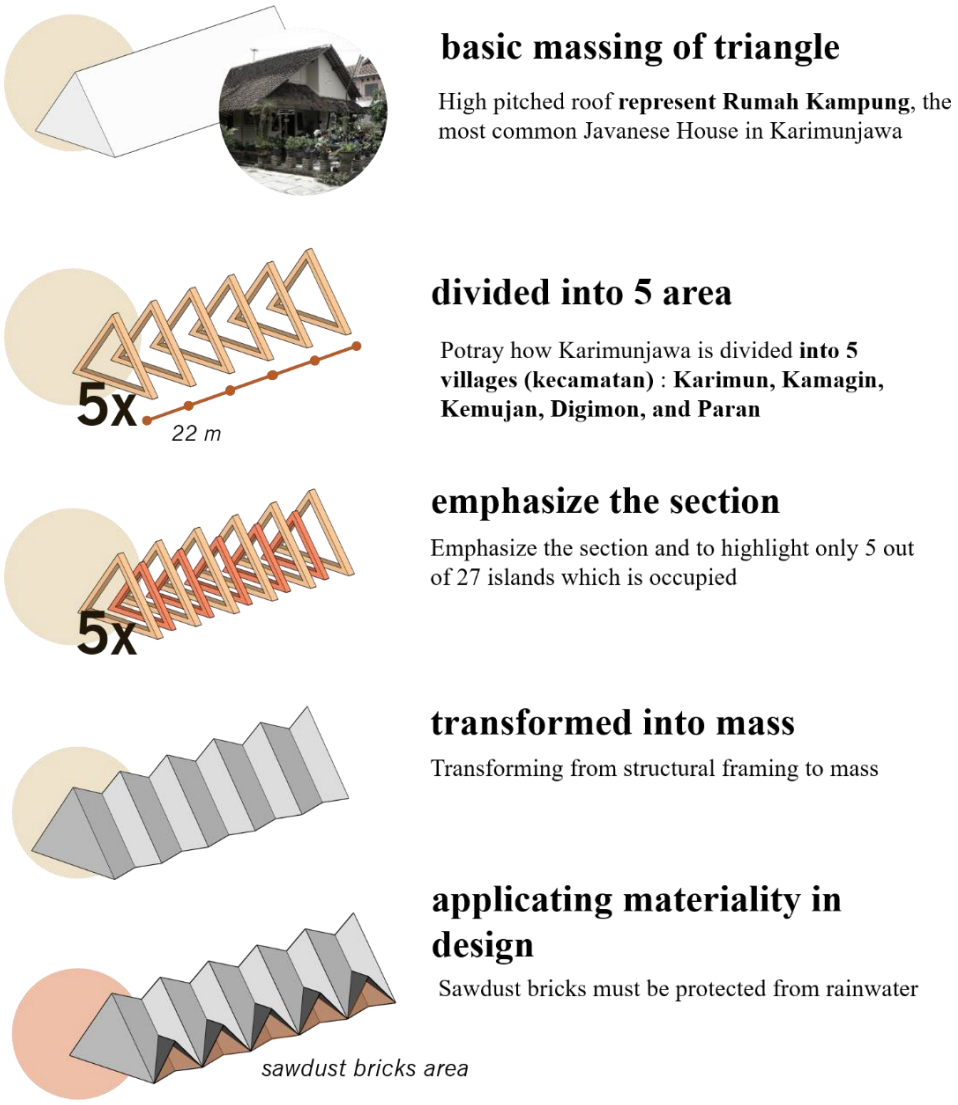


Figure 4. 1 Design Form Diagram
(Personal Analysis, 2020)

4.1.2 Material Functionality

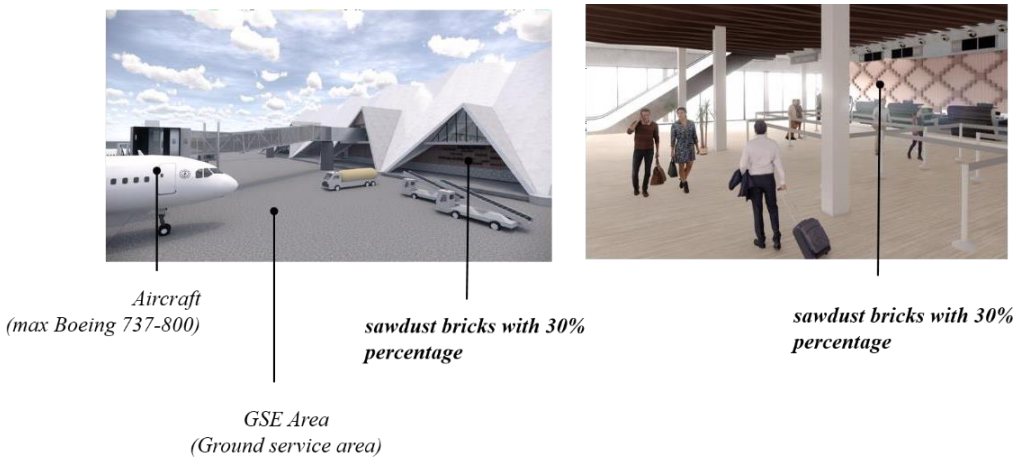
a. Noise Control Barrier

Table 4. 2 Sawdust Bricks Soundproof Test Result

Percentage of Sawdust Composition	Sound Absorption Coefficient at Frequency (Hz)				
	250	500	1000	2000	4000
0%	0.027	0.035	0.095	0.224	0.270
20%	0.301	0.351	0.360	0.379	0.345
30%	0.585	0.553	0.568	0.572	0.523

Source: Purba,2017

Sawdust bricks has the function as noise barrier quoting the research from Simon Purba at Medan State of University.Given the same source of sound frequency on 1000 Hz bricks with 0% variation of sawdust mixture has the lowest sound absorption coefficient of 0.095. While bricks with 30% variation of sawdust mixture has higher sound absorption coefficient of 0.568. From this study it can be concluded that the greater percentage of the sawdust mixture, the more its ability to reduce sound.



(a) (b)

Figure 4. 2 Materiality as Noise Control Barrier (a) Exterior (b) Interior
(Personal Documentation,2020)

b. Partition Wall

According to SNI 15-2094-1991 about Bricks Classification, sawdust brick is classified for A1- A2 Class for non structural interior material element.

Table 4. 3 Bricks Classification for Wall Usage

Klasifikasi Kelas Bata	Kuat Tekan Minimum (kg/cm2)	Standar Penyerapan Air Minimum (%)	Fungsi
A1	20	-	Partition, interior
A2	35	-	Partition, eksterior
B1	50	35	Structural, interior
B2	70	25	Structural, eksterior

Source: Anas,2014

The function of roster bricks for toilet's partition wall is to keep user's privacy. Visually this partition wall is blocking the view of people passing passing by

(a) (b)

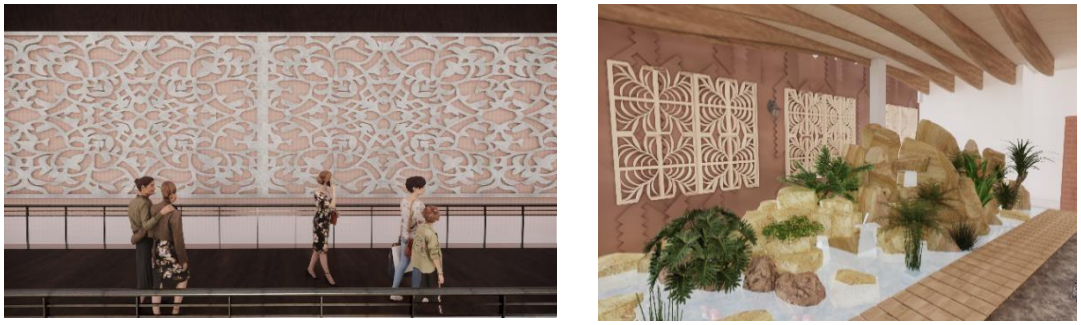
Figure 4. 3 Toilet as Partition Wall (a) 3D plan (b) Perspective view (Personal Documentation,2020)

c. Air ventilation

The function of roster bricks in service rooms such as prayer rooms and emergency stairwells aims to provide air exchange circulation through gaps within the roster bricks.

4.1.3 Identity of a Region

Karimunjawa for its Javanese wood crafting where majority of its furniture products are exported to many countries in the world and famous for its beautiful Javanese pattern.



(a) (b)

Figure 4. 4 Local Javanese wood craving in design
(a) in connecting bridge (b) in public hall
(Personal Documentation,2020)

A common characteristic of this particular Javanese pattern is the application of natural elements in the form of plants to the pattern such as flower petals, leaves, to buds and various spice patterns.

(a) (b) (c)

Figure 4. 5 Javanese wood craving pattern (Dekoruma, 2017)

4.1.4 Tectonic Details

Beside famous for its wood sculpture industry, Karimunjawa is also well known for its rattan and bamboo woven crafts in Teluk Wetan village.

a. *Jruno kembar kecil* woven pattern (drop off area)

Figure 4. 6 Materiality indrop off area details
(Personal Documentation,2020)

b. *Bunga teratai* woven pattern (public hall area – booth)

Figure 4. 7 Materiality in sawdust booth at hall
(Personal Documentation,2020)

Sawdust booth was designed to potray the correlation between sawdust bricks and dewadaru airport. Sand box consist of 80% sand and 20% sawdust (wood waste/residue) is there to represent how sawdust bricks are made of compression technique. Wooden swing made of dewadaru tree wood material. There is also space provided for displaying posters made by local students and tablet simulation that explain the process of making sawdust bricks.

c. *Jari kedidi* woven pattern (check-in area)

Figure 4. 8 Materiality in check-in area
(Personal Documentation,2020)

d. *Liris* woven pattern (exterior part)

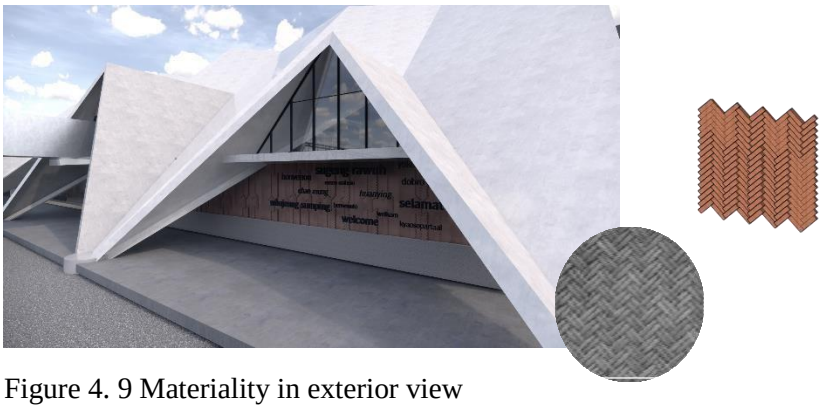


Figure 4. 9 Materiality in exterior view
(Personal Documentation,2020)

e. *Kincir angin* woven pattern (boarding room)

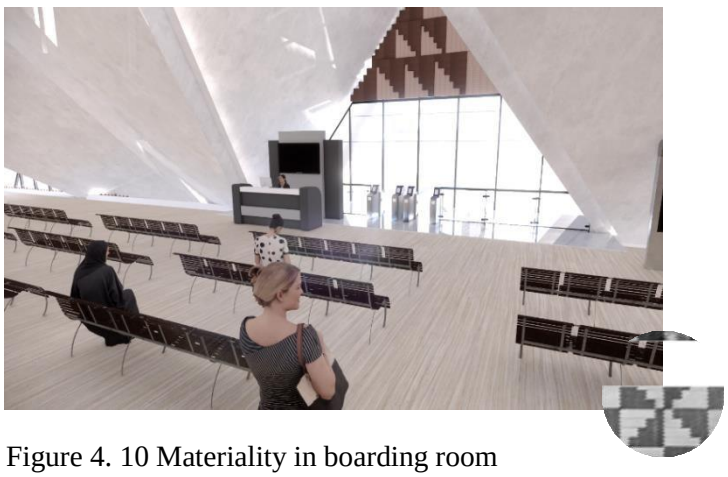


Figure 4. 10 Materiality in boarding room
(Personal Documentation,2020)

f. *Mata ketitir* woven pattern (baggage claim arrival area)

Figure 4. 11 Materiality in baggage claim area
(Personal Documentation,2020)

4.2 Technical Exploration

4.2.1 Standard and Regulation

Referring to SKEP / 77 / VI/ 2005 and SNI 03-7046-2004

Table 4. 4 Airport Area Calculation

No	Type of Facilities	Space requirements calculation	Result (Minimum)	Designed Area	Notes	Assumption
1	Departure Curb	Length : L = 0.095 x a x p + 10% L = 0.095 x 235	23.5 m	**55 m**	a= amount of passenger on peak hour	235 people
2	Departure Hall	Area : A = 0.75 { a (1 + f) + b) A = 0.75 (235(1.5))	352 m2	**429 m2**	b=number of transfer passengers	No transfer passenger (not a hub airport)
3	Area Check-in	Area : A = 0,25 (a+b) A =0,25 (235)	59 m2	**540 m2**	p= the proportion of passengers using cars/ taxi	
4	Departure Waiting Room	Area: A = c (u x i + v x k) /30 A = 235 (80)/30	627 m2	**1.332 m2**	c= the number of passengers arriving during peak hour	235 people
5	Baggage Claim Area	Area : A = 0.9 x c A = 0.9 x 235	211.5 m2	**426 m2**	u = average of longest waiting time (minutes)	60 minutes
6	Arrival Curb	Length of Curb: L=0.095 x c x p	23.5 m	**55 m**	I = The proportion of The longest waiting passenger	

Source: SKEP / 77 / VI/ 2005 and SNI 03-7046-2004

Thus, the result displayed that designed area meet the minimum area requirements

CHAPTER 5
DESIGN RESULT

5.1 Dewadaru Airport Site Planning

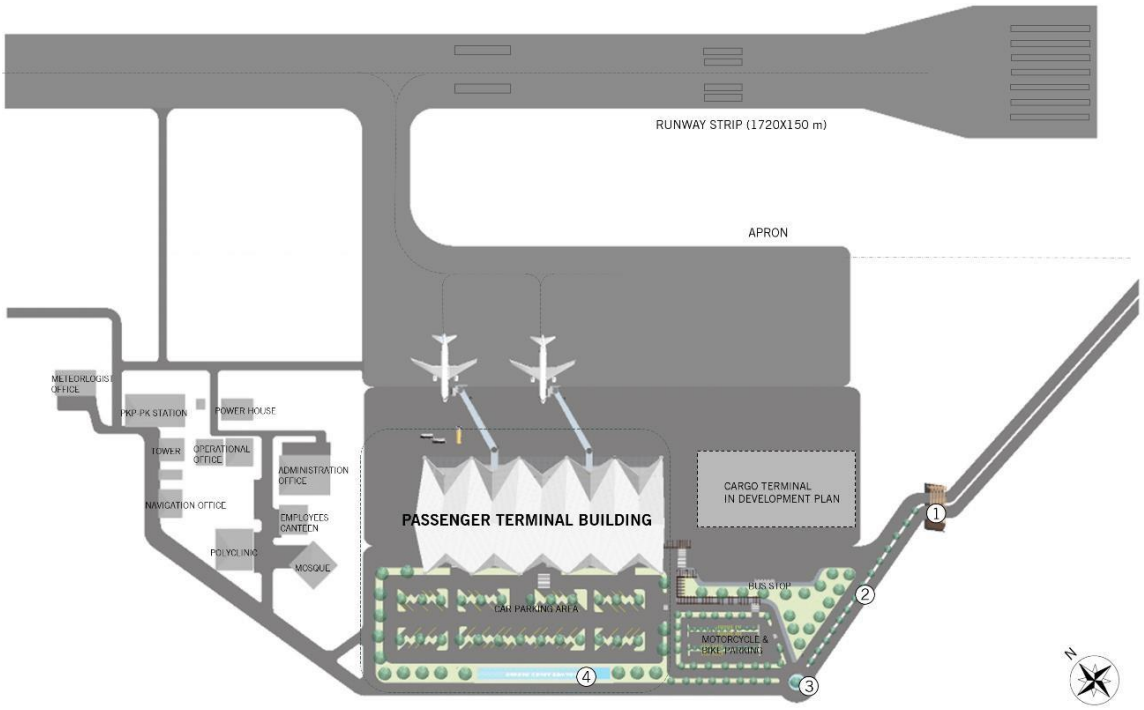


Figure 5. 1 Site Plan
(Personal Documentation,2020)

Dewadaru Airport Data

Building Purposes	: Domestic Passenger Terminal
Category	: Spoke Airport
Max Capacity	: 180.718 / year
Building Area	: 10.450 m2
Operational Area	: 70% - 2 level system
Commercial Area	: 30%
Runway Length	: 1.720 x 30 m
Max Aircraft	: Boeing 737-800

Site Features:

A. Main Front Gate

(a) (b)

Figure 5. 2 (a) Dewadaru Airport Main Front Gate (b) Dewadaru symbol
(Personal Documentation,2020)

Dewadaru Airport Front gate is inspired by Karimunjawa's symbol of dewadaru tree which represent Dewadaru Tree as a symbol of Dewadaru Airport

Figure 5. 3 Entrance View from Front Gate
(Personal Documentation,2020)

B. Dewadaru Statue

(a) (b)

Figure 5. 4 Dewadaru Statue of Dewadaru Tree
(Personal Documentation,2020)

Dewadaru Statue represent the correlation between Dewadaru Tree and Dewadaru Airport as a Karimun Jawa symbol

C. Airport Sign

Figure 5. 5 Dewadaru Airport Sign
(Personal Documentation,2020)

Dewadaru airport sign is located in front of the car parking area on a small pond with 2 water fountain on the left and right side, representing water elements inside the landscape of Karimun jawa's island on the Java Sea.

Site Facilities:

Table 5. 1 Site Facilities

	Area	Capacity
Motorcycle & Bike Parking	825 m2	120 motorcycles &10 bikes
Car Parking Area	4250 m2	156 cars
Bus stop	490 m2	3 bus

(Personal Analysis,2020)

A. Motorcycle Parking Area

Figure 5. 6 Motorcycle Parking Area
(Personal Documentation, 2020)

Provide motorcycle parking space as needed with a capacity of 120 bikes combined with parking lots for 10 bikes. Motorcycle parking area is guarded to enter and leave the area.

B. Car Parking Area


Figure 5. 7 Car Parking Area
(Personal Documentation,2020)

Providing parking lot for cars with a maximum capacity of 156 cars that use a 60 degree layout Car parking area is also equipped with a guard post before entering the parking area for security considerations.

C. Bus Stop (to/from downtown)

Figure 5. 8 Bus Parking Waiting Area
(Personal Documentation,2020)

Located not far from the passenger terminal building, a bus stop with a capacity of 3 parking buses is provided to serve public transportation to / from the downtown & Karimunjawa port. this is because the location of the Dewadaru airport is far from urban areas (around 17 km, 30 minutes drive) so the presence of bus facilities is expected to be one of the options for public transportation

Figure 5. 9 (a) Karimun Island Map (b) Bukit Love Karimun Jawa
(Google Maps,2019)

D. Pedestrian Walking Area

Figure 5. 10 Pedestrian Way to/from Motorcycle Parking Area
(Personal Documentation,2020)

Pedestrian access to the motorized parking lot and bus stop. Pedestrian access is covered to protect the users from the rain and equipped with zebra cross for safety crossing.

5.2 Dewadaru Airport Terminal Building Planning

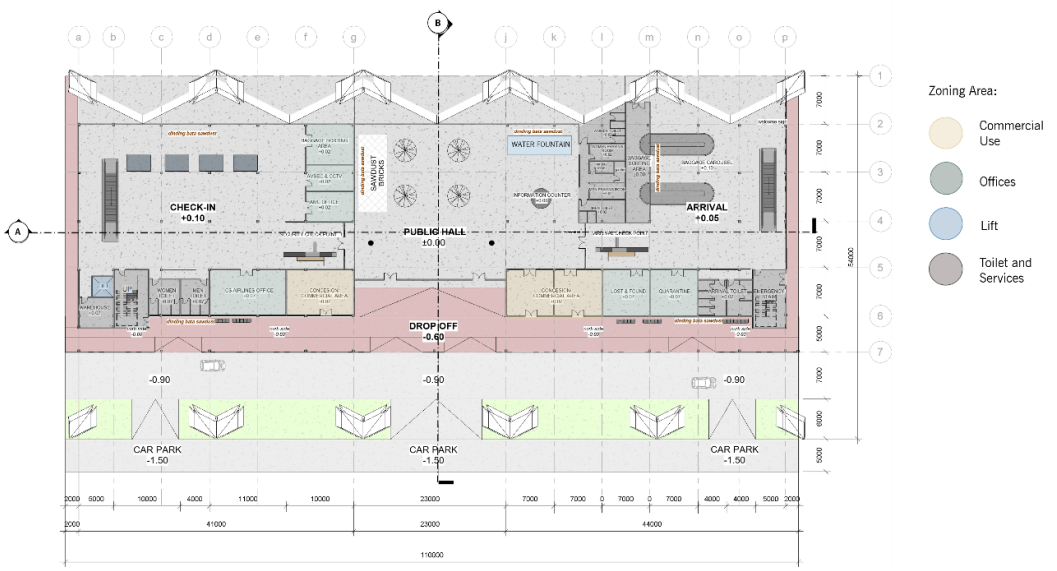


Figure 5. 11 Floor Plan Level 1
(Personal Documentation,2020)

First floor of Dewadaru Airport design contains 3 main areas namely check-in area, public hall and arrival. Entrance will directly lead you to the public hall. The left part of the building contains a check-in area (and security check) descends to the right side of the building to the arrival area which contains baggage conveyor.

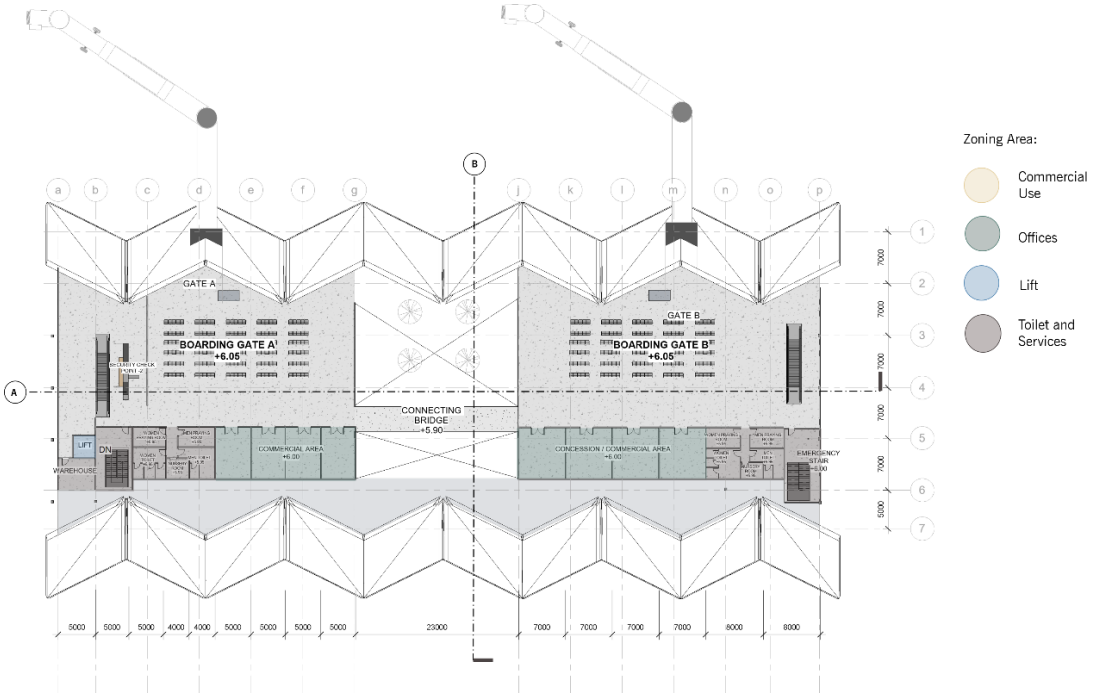


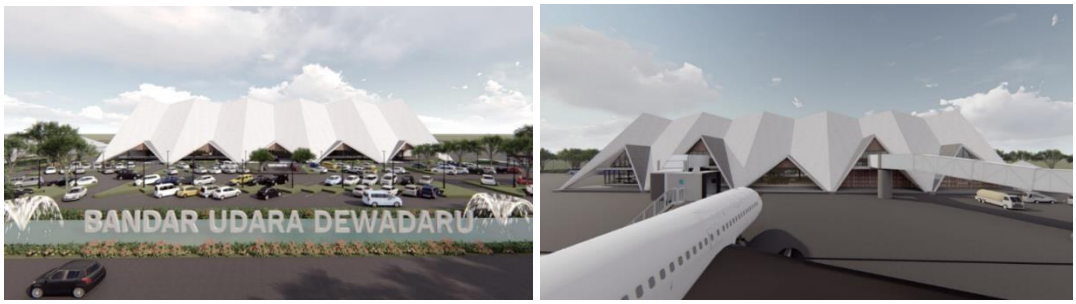
Figure 5. 12 Floor Plan Level 2
(Personal Documentation,2020)

The upper level of Dewadaru Airport consist of transit area before boarding into the aircraft. Before entering transit area, the upcoming passengers must passed second security check point. Total 8 local and imported stores are available prior transit area of the buildings.

Garbarata is a tunnel that can move horizontally (elongated and shortened), vertically (up and down) and rotates by 175 degrees. Referring to PM No. 38 Year of 2015 is the provision of garbarata from the departure terminal, passengers can pass through the gabarata to enter the plane and vice versa from the plane to the arrival terminal.

Figure 5. 13 Illustration of Perspective View
(Personal Documentation,2020)

The exterior appearance of the design of the Dewadaru Airport is inspired by the composition of the *rumah kampung*, the most common traditional type of Javanese housing. Composition that has 5 gates represents 5 districts in Karimun Java : Karimun, Kamagin, Kemujan, Digimon, Paran.



(a) (b)

Figure 5. 14 (a) Front View (b) Back View
(Personal Documentation,2020)

As for proposed structural analysis load from the plate will be distributed to the concrete beam 300x600and then distributed to the concrete column with a size of 400x400 and to the foundation. In general the shape of the building uses WF steel frame that is covered using Aluminium Composite Panel PVDF (suitable for exterior use)

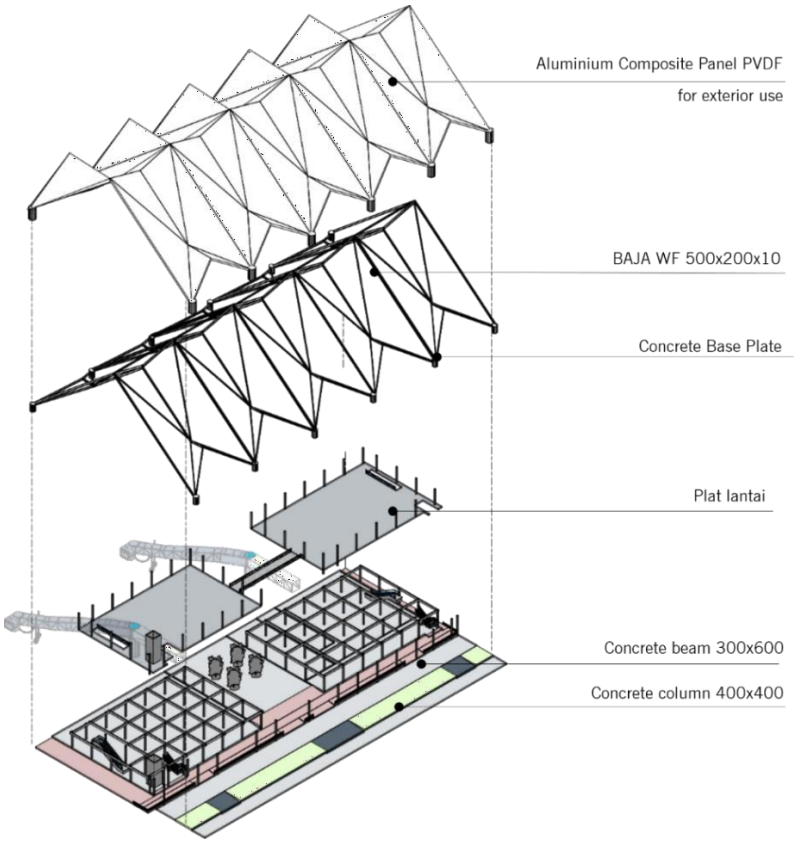


Figure 5. 15 Structure Axonometriy
(Personal Documentation,2020)

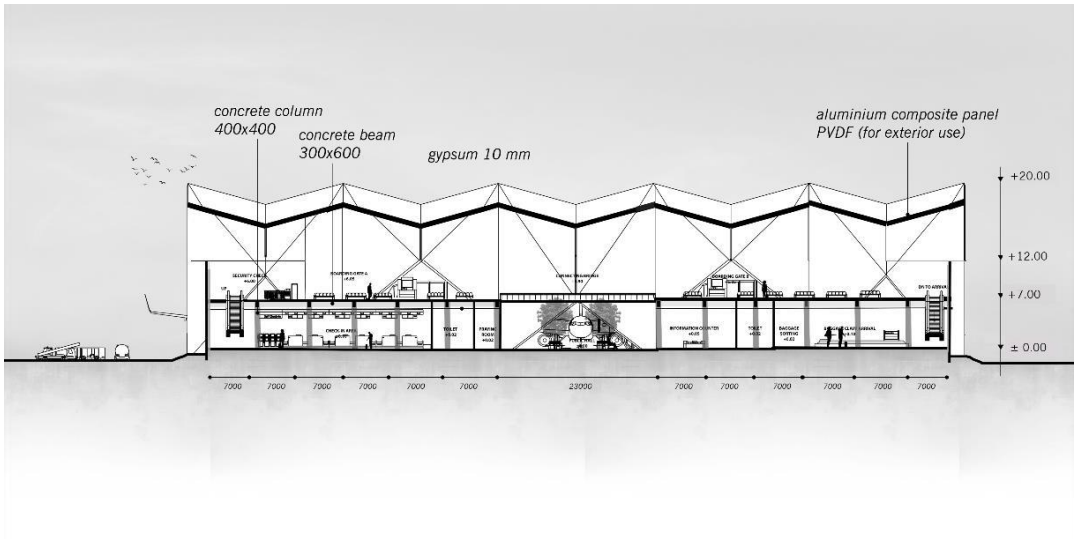


Figure 5. 16 Section A-A'
(Personal Documentation,2020)

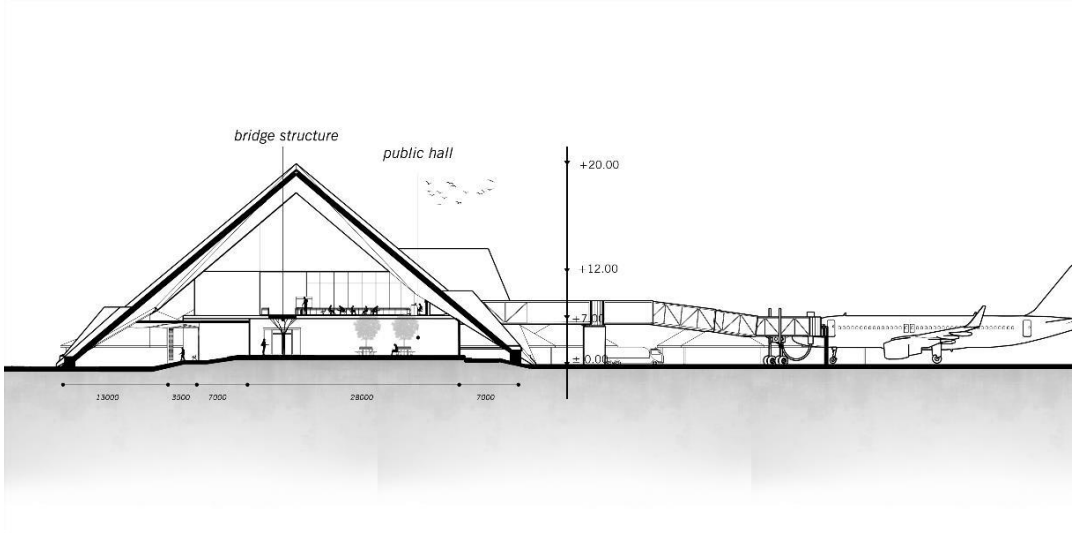
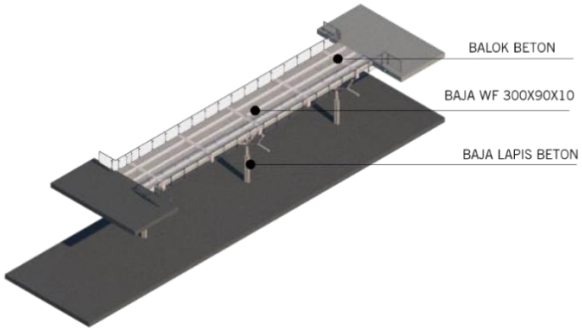


Figure 5. 17 Section B-B'
(Personal Documentation,2020)

Meanwhile, for the load acting on the bridge, the load from the plate will be channeled to WF steel and to columns shaped like a dewadaru tree made of concrete-coated steel.

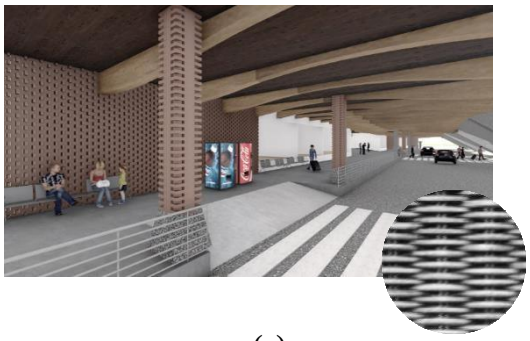


(a)

(b)

Figure 5. 18 (a) Detail Bridge Area (b) Perspective View
(Personal Documentation,2020)

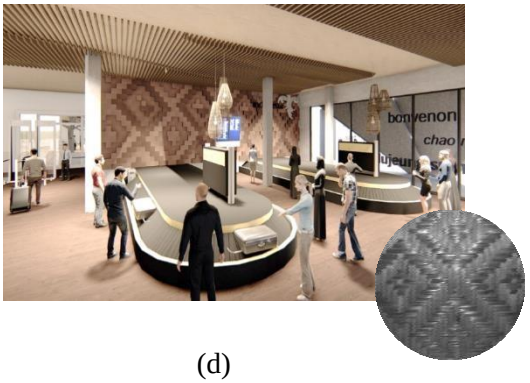
The application of the concept of materiality in the interior design section covers several areas in the design such as: drop off, hall, check-in, boarding room & baggage conveyor. The pattern of sawdust bricks also uses the concept of woven art in Karimunjawa, Central Java.



(a)

(b)

(c)



(d)

Figure 5. 19 Materiality in Interior Design
(Personal Documentation,2020)

5.3 Building Utility Systems

A. Vertical Transportation System

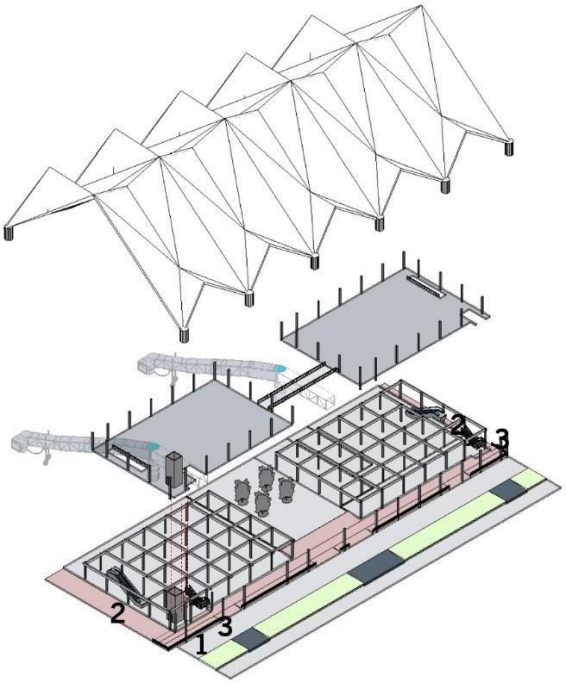


Figure 5. 20 Vertical Transportation Analysis
(Personal Documentation,2020)

Vertical transportation includes:

1. Lift

   Type: Passengers lift
   Capacity : 1250 kg / 16 persons
   Door opening : 1000 x 2100
   Car size: 1600 x 1500 x 2400
   Hoist way size: 2300 x 2200
   Power: 12,7 kW

2. Escalator

   One go up to the boarding area and the other one go down to the baggage claim area
   Type : Step Escalator
   Step width : 1000mm
   Rise: 7000
   Inclination: 30˚

3. Stairs (for staff line & directly to emergency exit)

B. Air Conditioning System

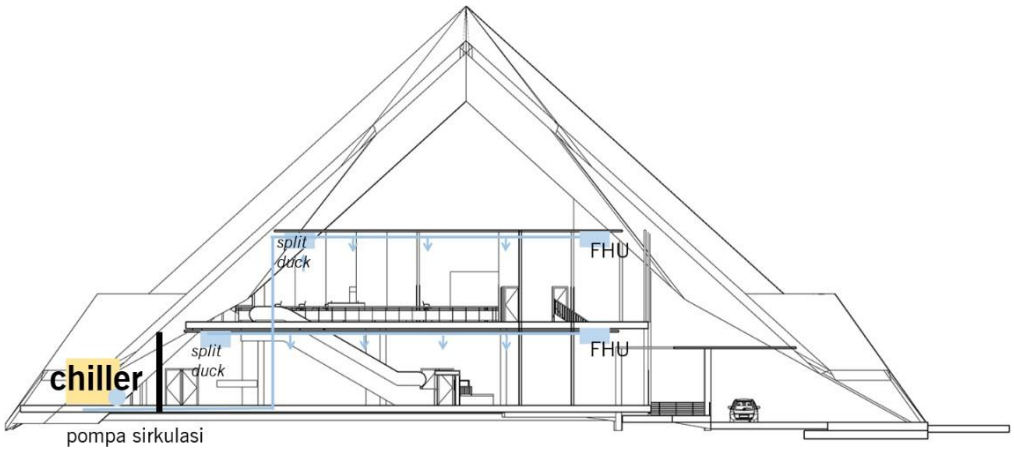


Figure 5. 21 Air Conditioning System
(Personal Documentation,2020)

Using centralized type with cooling tower system 380 TR capacity chillers from Trane which used interchangeably. Chiller is put outside the building to be reduced the noise by sawdust bricks.

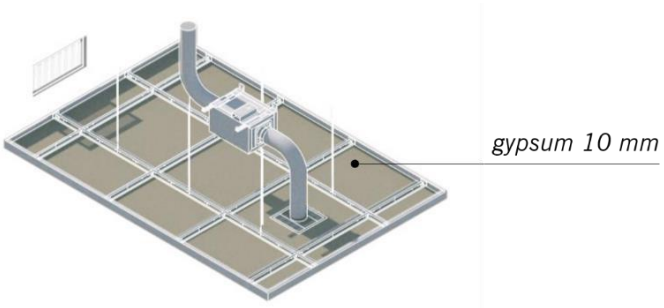


Figure 5. 22 Air Conditioning Detail View
(Personal Documentation,2020)

C. Electricity System

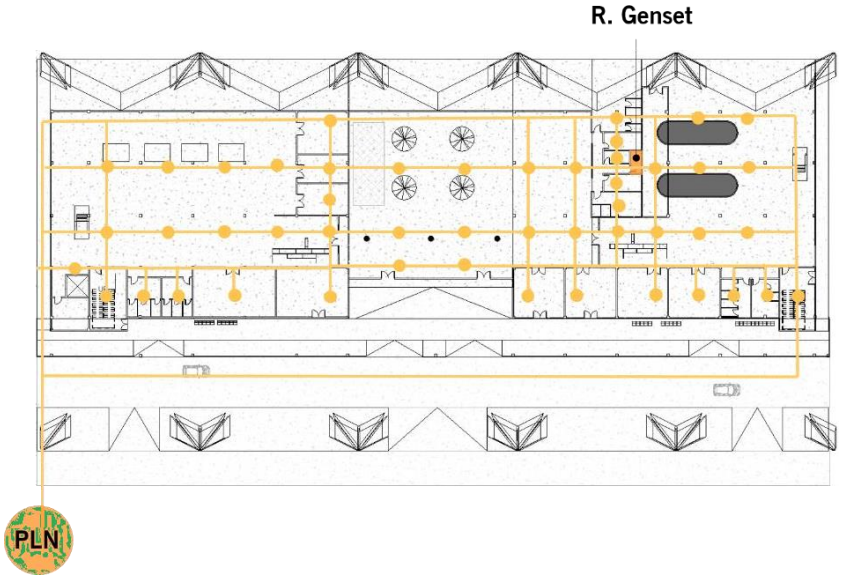


Figure 5. 23 Electricity System
(Personal Documentation,2020)

The main power source to the PLN. As a back up diesel generator which automatically turned on 10 seconds after black out. Diesel generator supported by AVR (Automatic Voltage Regulator) and assisted by the System Governor.

After the power is turned on again a switch (ATS-Automatic Transfer Switch) automatically switches the power supply from the generator to the PLN again

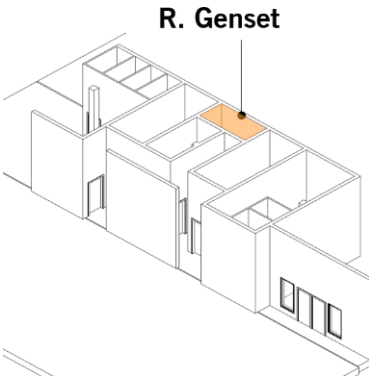


Figure 5. 24 Detail Diesel Generator Room Area
(Personal Documentation,2020)

D. Fire Protection Management

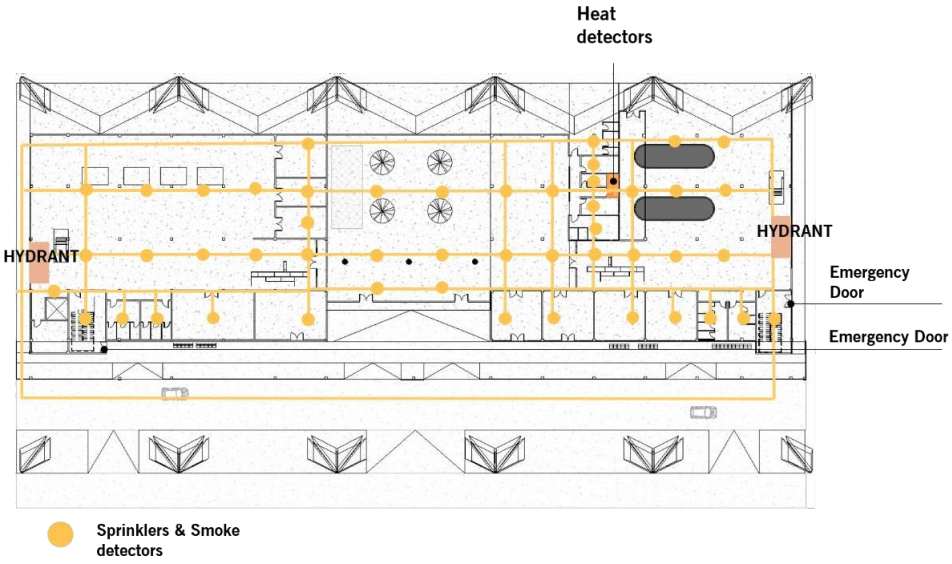


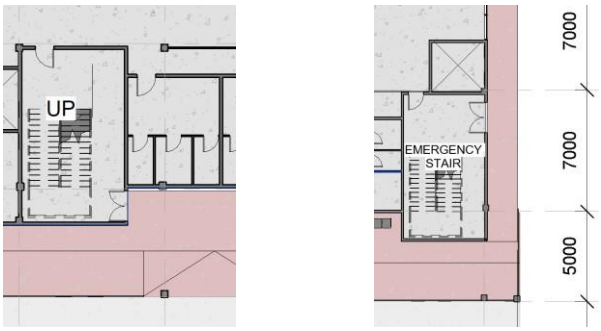
Figure 5. 25 Fire Protection Management
(Personal Documentation,2020)

1. Exits

There are two emergency stairs which directly lead to emergency exit outdoor area.

2. Fire Protection System

Sprinklers and smoke detectors for all areas, Heat detector system is put inside machine room



(a) (b)

Figure 5. 26 Direct Exit for Emergency Stair
(Personal Documentation,2020)

E. Water System Management

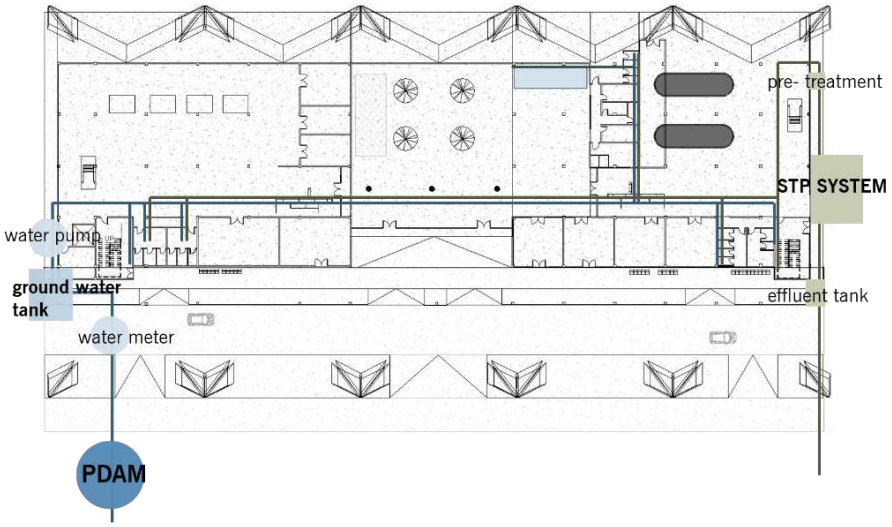


Figure 5. 27 Water System Management
(Personal Documentation,2020)

Clean water is supported by PDAM. On the other hand, grey & black water management is using STP to recycle dirty water and later to reuse it for watering the plants.

F. Security & CCTV Management

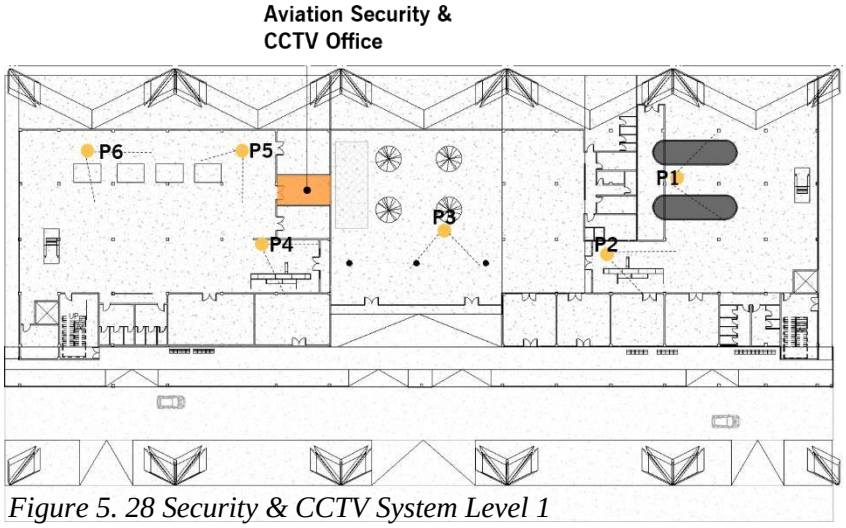


Figure 5. 28 Security & CCTV System Level 1
(Personal Documentation,2020)

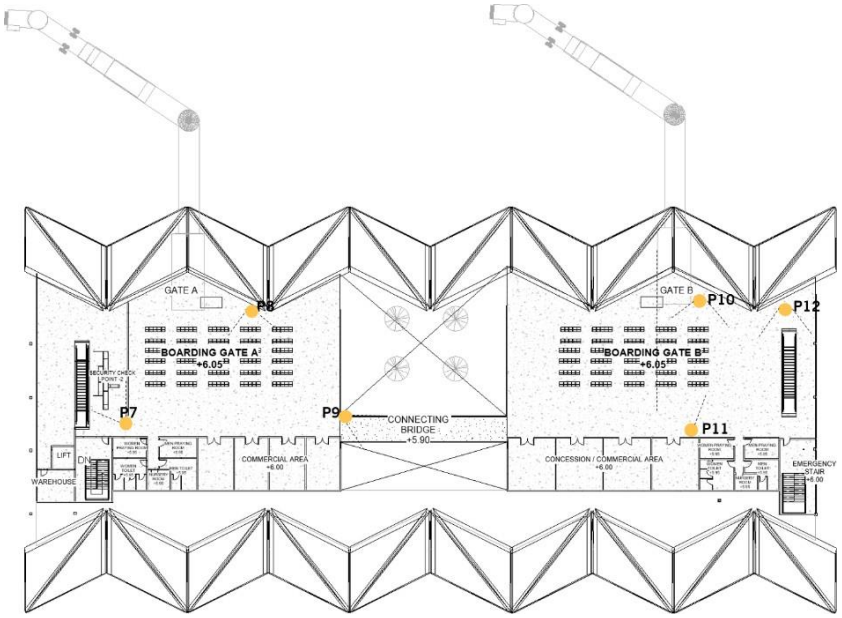


Figure 5. 29 Security & CCTV System Level 2
(Personal Documentation,2020)

Twelve pinpoint CCTV location on all building's corridor are controlled by Aviation Security & CCTV office on the first floor of the building area (after security check point -1)

CCTV Code :
P1 – baggage carousel area
P2 – arrival security check
P3 – entrance / exit
P4 – departure security check
P5 – check in
P6 – check in
P7 – departure security check-2
P8 – boarding gate A
P9 – corridor
P10- boarding gate B
P11 – corridor
P12 – to arrival

CHAPTER 6
CONCLUSION

Architectural design moved forward by pushing the limits through which the materials, new and old, can be assembled, shaped and formed to provide a new awareness in the design process. The impact of design solution may be enhanced or destroyed through the manner by which the architect uses materials in the design composition (Yahya,2014). . Indonesian architecture grew from the knowledge and ideas of the people in the terms of constructing material.

This final project is aimed to redefine Indonesia architectural identity using a specific local material by breaking down to main and most basic architectural principles of Vitruvius: firmitas, utilitas and venustas.

Table 6.1 Materiality in Concept

Aspect		Concept
Utilitas	Material functionality	- Noise control barrier - As partition wall - Air ventilation
Firmitas	Material Durability & strength	According to SNI 15-2094-1991 about Bricks Classification, sawdust brick is classified for non structural interior material element. For exterior use, sawdust bricks are protected from rainwater with overhang
Venustas	Tectonic details	Inspired by woven pattern which are found in Central Java
	Identity of a Region	Local rattan made furniture and local wood crafting with Javanese pattern

Source: Personal Analysis,2019

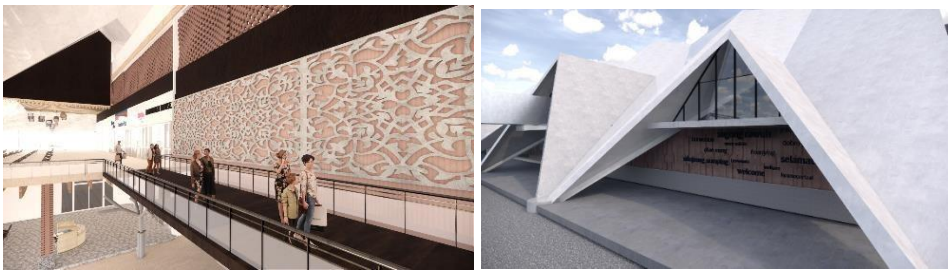
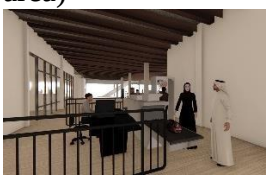


Figure 6. 1 Materiality in Design
(Personal Documentation,2020)

In line with airport design case study, result of the design is adjusted by calculation of SKEP / 77 / VI / 2005 and SNI 03-7046-2004 of Airport Area Standardization

Table 6.2 Standardization and Regulations Concept

Aspect		**Concept**
Standard and Regulations	Minimum area	Airport design minimum area regulation calculated based on SKEP / 77 / VI / 2005 and SNI 03-7046-2004
	Security aspect	SKEP 2765 / XII / 2010 the security check point (SCP) are need to be located in two points (before check-in area & before boarding area)   Figure 6. 2 Security Check Points (a) Before check-in (b) Before boarding Source: Personal Documentation

Source: Personal Analysis,2019

Table 6.3 Minimum Area Requirements

No	Type of Facilities	Space requirements calculation	Result (Minimum)	Designed Area	Notes	Assumption
1	Departure Curb	Length : L = 0.095 x a x p + 10% L = 0.095 x 235	23.5 m	**55 m**	a= amount of passenger on peak hour	235 people
2	Departure Hall	Area : A = 0.75 { a (1 + f) + b) A = 0.75 (235(1.5))	352 m2	**429 m2**	b=number of transfer passengers	No transfer passenger
3	Area Check-in	Area : A = 0,25 (a+b) A =0,25 (235)	59 m2	**540 m2**	p= the proportion of passenger	

					s using cars/ taxi	
4	Departure Waiting Room	Area: A = c (u x i + v x k) /30 A = 235 (80)/30	627 m2	**1.332 m2**	c= the number of passengers arriving during peak hour	235 people
5	Baggage Claim Area	Area : A = 0.9 x c A = 0.9 x 235	211.5 m2	**426 m2**	u = average of longest waiting time (minutes)	60 minutes
6	Arrival Curb	Length of Curb: L=0.095 x c x p	23.5 m	**55 m**	I = The proportion of The longest waiting passenger	

Source: SKEP / 77 / VI / 2005 and SNI 03-7046-2004

Thus, the result displayed that designed area meet the minimum area requirements.

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