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REDESIGN OF RANTAU PRAPAT TRAIN STATION

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ABSTRACT

Along with the passage of time, the human need for modes of transportation is increasing. The increasing number of residents is inversely proportional to the limited time they have, so transportation modes such as trains are one solution. Rantau Prapat Railway Station has many shortcomings which of course must be improved and added to be able to serve the community in the future. This redesign is oriented to the community as users of transportation modes, how the flow of human and vehicle circulation is the main problem. The Rantau Prapat Railway Station must also be an attractive city gate, especially since the city of Rantau Prapat is the last destination city on the North Sumatra railway line. Therefore, the application of the Contextual Architecture theme is used so that the design that is set also follows the flow of an increasingly sophisticated future era. How a Railway Station that can function well functionally but can also be a city gate that gives interest to visit.

Keywords: redesign; train; station; railway line; contextual architecture.

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INTRODUCTION

During the leadership of President Joko Widodo and Vice President Muhammad Jusuf Kalla, infrastructure became one of the main focuses of national development in various regions in Indonesia. Based on the 2015-2019 National Medium-Term Development Plan (RPJMN), the direction of national development is to prioritize transportation mode infrastructure so as to create national connectivity that can encourage the strengthening of the transportation mode industry as well as the economy. Construction of transportation facilities and infrastructure, including the construction of the Trans Sumatra Railway to connect the island of Sumatra from the provinces of Aceh, North Sumatra, West Sumatra, South Sumatra and Lampung along 2,168 km.

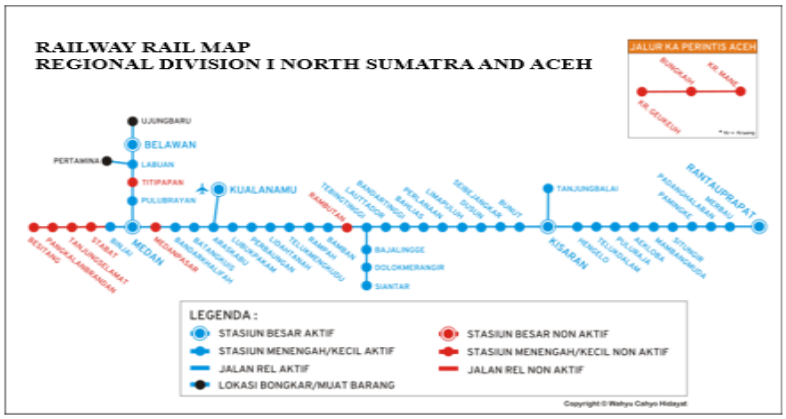

Figure 1. Railroad track map

The aims and objectives of the planning and design of "Rantau Prapat Railway Station" are as follows:

1. Changing or redesigning the Rantau Prapat Railway Station due to several considerations such as facilities and design issues.
2. Application of the Contextual Architecture theme at the Rantau Prapat Railway Station without changing the condition of the existing building.

The formulation of the problem at the Rantau Prapat Railway Station, including:
1. What additional facilities are needed at the Rantau Prapat Railway Station and also changes to its design?
2. How to apply the Contextual Architecture theme to the Rantau Prapat Railway Station without changing the existing condition of the existing building?

The current rail service is a transportation need in addition to other land public transportation such as buses and city transportation. Train is a safe and comfortable long and medium distance travel service. The existence of the train is supported by facilities for station users and services in the train carriages. The comfort and completeness of the station reflects the good and clean condition of the station. This will support the performance of railway employees in creating safe and comfortable conditions (Sulastri.D, et.al, 2020; Anugrah.IA, et.al, 2019; Sah.MB, 2021).

In planning the rail road and rail road planning pay attention to the accuracy and speed in the process. Railroad work must be correct according to standard standards. So that the results of planning can be used over a hundred years (Sanjaya.A, 2017; Sulastri.D, et.al; Syaiful.S, Rulhendri.R, 2014).

RESEARCH METHODS

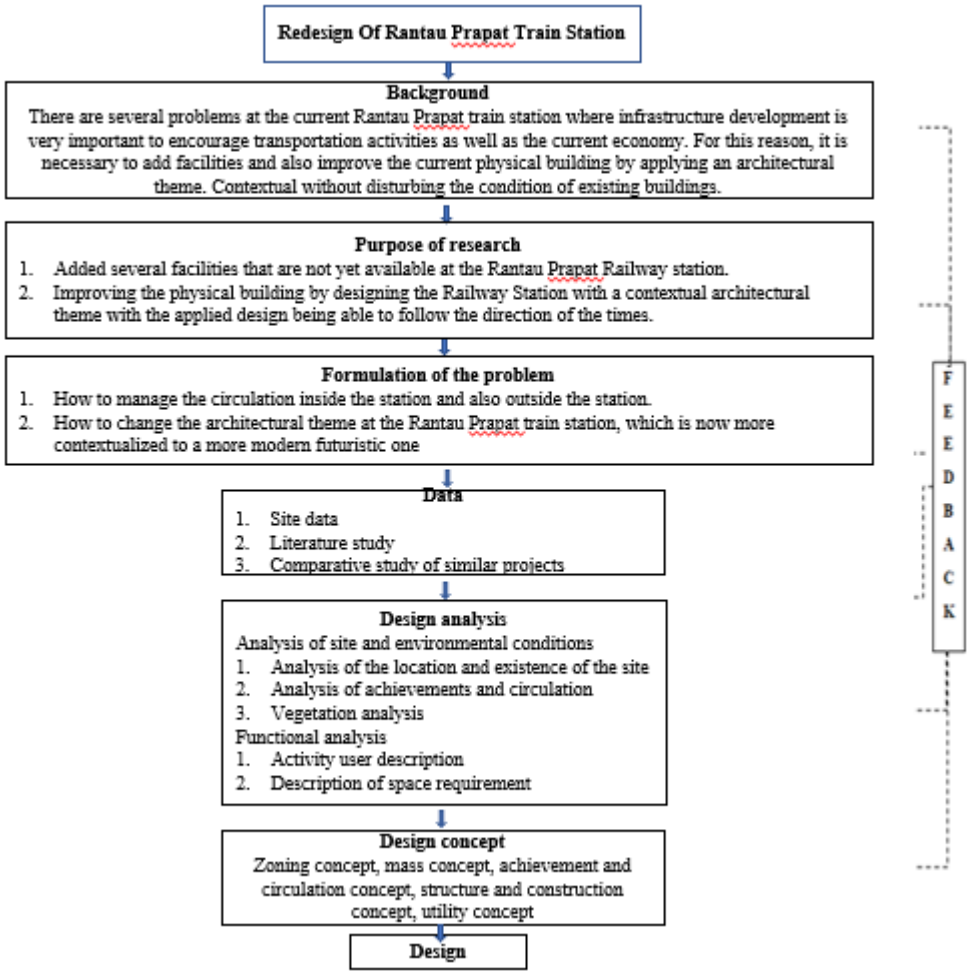

Figure 2. Design schedule

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RESULTS AND DISCUSSION

Definition of Title

The title taken in this final project is "Redesign of Rantau Prapat Railway Station" which can be interpreted as follows:

1. Understanding Redesign
   Redesign is the design involvement of an existing building and making it more complex or enlarging the building context for a design project.
2. Understanding Station
   Station is a place where trains depart and stop to serve the boarding and disembarkation of passengers and/or loading and unloading of goods and/or equipment needed for train operations. (Law. No. 13 of 1992 Article 19).
3. Definition of Rantau Prapat

Rantau Prapat is a capital city in Labuan Batu Regency, North Sumatra, Indonesia.

Indonesian Railway Station Institute

The management of Indonesian railways is currently under one parent company, namely PT Kereta Api Indonesia (Persero) which is a State-Owned Enterprise (BUMN) that provides, regulates, and manages Indonesian Railway transportation services.

Figure 3. Train Logo

Train Station Type

The type of Rantau Prapat Railway Station is a Type C Large Station which will be developed into a Type B Large Station.

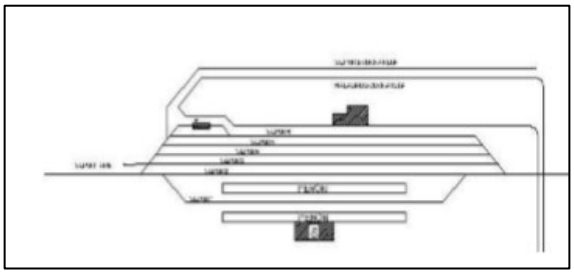

Figure 4. Railroad

Train Type

The type of train used to serve the Medan - Rantau Prapat trip and vice versa is the Sribilah Train which is a train with the CC201 Locomotive type and the following are the specifications.

SPESIFIKASI : LOKOMOTIF CC-201

Sumber tenaga:	Diesel elektrik
Bagian dari seri GE Universal Series	
Perusahaan pembuat:	GE Transportation, Amerika Serikat
Nomor seri:	CC201
Model:	GE U18C
Tanggal dibuat:	1977-1992
Jumlah dibuat:	92 unit
Pembuat ulang:	Balai Yasa Yogyakarta dan Balai Yasa Lahat, untuk lokomotif modifikasi BB203
Tanggal dibuat ulang (rehab):	1989-2004
Jumlah dibuat ulang (rehab):	52 unit dari BB203
Mesin, motor traksi, dan *converter*	
Penggerak utama:	GE 7FDL-8
Jenis mesin:	4 langkah, turbocharger
Generator:	GT 581
Motor traksi:	6 buah, tipe GE 761, arus searah (DC-DC)
Transmisi dan kinerja	
Perbandingan roda gigi:	90:21
Kecepatan maksimum:	120 km/h (75 mph) (sekarang dibatasi hingga 90 km/j)
Kecepatan minimum kontinu:	24 km/h (15 mph)
Daya mesin:	1.950 hp (1.454 kW)
Daya ke generator/*converter*:	1,825 hp (1,361 kW)
Jari-jari lengkung terkecil:	567 m (1,860 ft)
Lain-lain	
Rem lokomotif:	Udara tekan, dinamik, parkir
Karier	
Perusahaan pemilik:	PT Kereta Api Indonesia
Daerah operasi:	Pulau Jawa, Sumatera Selatan, dan Sumatera Utara
Pertama digunakan	1977
Keadaan:	130 unit beroperasi, 7 rusak, 7 menjadi CC204
Data teknis	
Roda	
Susunan roda AAR:	C-C
Klasifikasi UIC:	Co'Co'
Dimensi	
Lebar sepur:	1,067 mm (3 ft 6 in)
Diameter roda:	914 mm (2.999 ft)
Panjang:	14.134 mm (0.04637 ft)
Lebar:	2.642 mm (0.00867 ft)
Tinggi (maksimum):	3.636 mm (0.01193 ft)
Jarak antara alat perangkai:	15.214 mm (0.04991 ft)
Jarak antar pivot:	7.680 mm (0.02520 ft)
Jarak gandar:	3.304 mm (0.01084 ft)
Tinggi alat perangkai:	770 mm (2.53 ft)
Berat	
Berat kosong:	78 t (78,000 kg)
Berat siap:	84 t (84,000 kg)
Berat adhesi:	84 t (84,000 kg)
Bahan bakar dan kapasitas	
Jenis bahan bakar:	*High-speed diesel*
Kapasitas bahan bakar:	3,028 l (0.003028 m^3)
Kapasitas pelumas:	984 l (0.984 m^3)
Kapasitas pendingin:	684 l (0.684 m^3)

Figure 5. Specifications of CC 201. Locomotive

Theme Elaboration
Contextual Architecture

Contextualism in architecture is a situation that does not allow an object that is in a place without considering the objects that are already there, but focuses primarily on the characteristics of the existing objects rather than the objects to be created.

Theme Interpretation

Contextual theme selection takes context into account as an important element in the design approach. Designing existing buildings with new ones to create a cohesive or unified relationship. By strengthening and developing the characteristics of the environmental arrangement or at least maintaining the existing pattern. By following the style of the environment in order to adapt to the context and have a visual unity with the environment and have the same characteristics. Contextual design is a useful development tool because it allows the intended building to be maintained in a good context.

RESULTS AND DISCUCCION
Project Description
General Description

1. Existing Condition
   Rantau Prapat Railway Station has a site area of around 12,743 m2, the site is located on Jalan W.R. Supratman with a road width of about ± 15 m and is a two-way road.

Figure 6. KA station location plan

2. Train Schedule
   The following is a passenger train schedule that stops at Rantau Prapat Station and an example of a train ticket can be seen in the image below.

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KA SRIBILAH (EKSEKUTIF & BISNIS)

MEDAN - RANTAUPRAPAT

Stasiun (Station)	KA U28 Kedatangan (Arrival)	KA U28 Keberangkatan (Departure)
Medan	-	08.17
Lubukpakam	08.52	08.55
Tebingtinggi	09.55	10.10
Kisaran	11.38	11.49
Puluraja	12.26	12.28
Membangmuda	12.47	12.49
Padanghalaban	13.27	13.29
Marbau	13.36	13.38
Rantauprapat	13.57	-

Stasiun (Station)	KA U30 Kedatangan (Arrival)	KA U30 Keberangkatan (Departure)
Medan	-	10.47
Lubukpakam	Ls	11.20
Tebingtinggi	12.19	12.27
Kisaran	13.35	13.45
Puluraja	14.18	14.20
Membangmuda	14.36	14.38
Padanghalaban	15.12	15.14
Marbau	15.21	15.41
Rantauprapat	16.00	-

Stasiun (Station)	KA U32 Kedatangan (Arrival)	KA U32 Keberangkatan (Departure)
Medan	-	15.46
Lubukpakam	Ls	16.27
Tebingtinggi	17.26	17.36
Kisaran	18.55	19.08
Puluraja	19.45	19.47
Membangmuda	20.06	20.08
Padanghalaban	20.46	20.48
Marbau	20.55	20.57
Rantauprapat	21.16	-

RANTAUPRAPAT - MEDAN

Stasiun (Station)	KA U27 Kedatangan (Arrival)	KA U27 Keberangkatan (Departure)
Rantauprapat	-	08.45
Marbau	09.04	09.06
Padanghalaban	09.13	09.15
Membangmuda	09.53	09.55
Puluraja	10.14	10.16
Kisaran	10.54	11.05
Tebingtinggi	12.23	12.32
Lubukpakam	Ls	13.30
Medan	14.04	-

Stasiun (Station)	KA U29 Kedatangan (Arrival)	KA U29 Keberangkatan (Departure)
Rantauprapat	-	15.20
Marbau	15.39	15.43
Padanghalaban	15.50	15.52
Membangmuda	16.26	16.28
Puluraja	16.47	16.49
Kisaran	17.27	17.40
Tebingtinggi	18.53	19.03
Lubukpakam	20.03	20.08
Medan	20.43	-

Stasiun (Station)	KA U31 Kedatangan (Arrival)	KA U31 Keberangkatan (Departure)
Rantauprapat	-	17.10
Marbau	17.29	17.31
Padanghalaban	17.38	17.40
Membangmuda	18.14	18.16
Puluraja	Ls	18.30
Kisaran	19.06	19.19
Tebingtinggi	20.28	20.39
Lubukpakam	Ls	21.37
Medan	22.11	-

KERETA API

BOARDING PASS

nama / name
WIKIPETAN

kodebooking / bookingcode
WIK151

nomor identitas / id number
192192702

tipe penumpang / pax type
UMUM

kereta api / train
ARGO ANGGREK PAGI / 2

no tempat duduk / seat number
EKS 7 : 12A

berangkat / departure
GAMBIR(GMR)
28 JUNI 2017; 09:30 WIB

perkiraan tiba / eta
SURABAYA PASAR TURI(SBI)
28 JUNI 2017; 18:30 WIB

CGMR1_xxxxxxxxxx

check in at CGMR1 28-JUNE-2017 07:50

Figure 7. PT KAI schedule

3. Organizational Structure

The following is an organizational structure at the Rantau Prapat Railway Station.

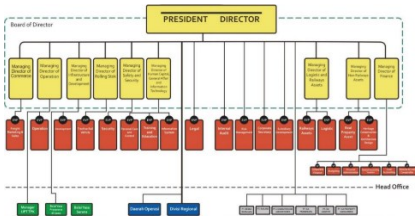

Figure 8. Organizational structure of PT KAI

Site Location Analysis

Site Condition

Figure 7. KA Station location plan

Project Title	: Rantau Prapat Railway Station Redesign
Theme	: Contextual Architecture
Project Status	: Fictional
Location	: W.R. Surpatman Rd.
Village	: Padang Matinggi
District	: Labuhan Batu
Province	: North Sumatra
Land Area	: ± 12,743 m2
Building Area	: ± 2,141.94 m2
Road Width	: ± 15 meters
Site Height	: ± 27.14 masl
Facility	:
- Water	: PDAM source
- Electricity	: PLN source
Building Orientation	: South
Site Limitation	:
- North Boundary	: North Rantau 1 Public High School and Residents' Housing
- West Boundary	: Residents' housing
- East Boundary	: Abdul Aziz Road.
- Southern Boundary	: W.R. Supratman Road and housing residents.

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Environmental Analysis Around the Site

The review of facilities around the site includes facilities located at a radius of 1 km and 2 km. The radius distance taken based on the supporting facilities can be seen in the image below which can support railway activities at Rantau Prapat Station, including:

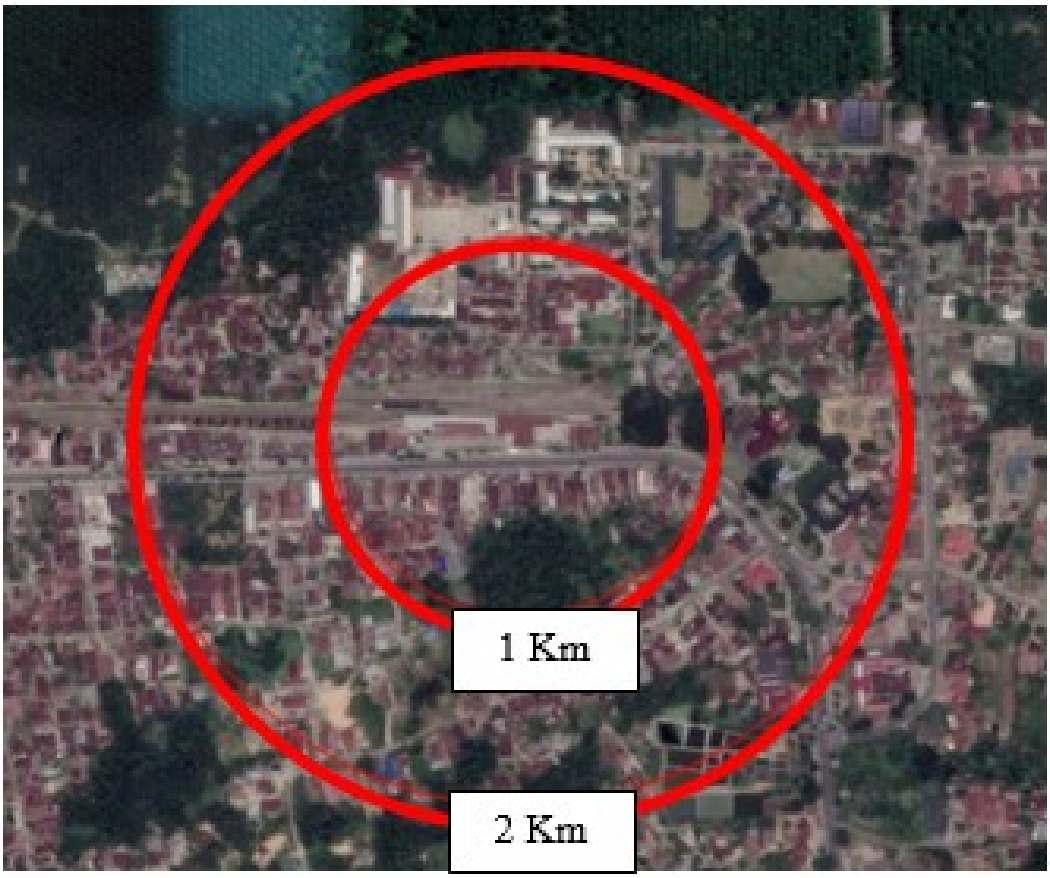

Figure 9. Rantau Prapat Station site

• A radius of 1 km from the site or site contains:
1. SMA Negeri 1 Rantau Utara
2. Kodim 0209 Labuhan Batu
3. Rantau Prapat Branch Post Office
4. Several restaurants
5. Some residential or community housing

• Radius of 2 km from the site or site there are:
1. PT. PLN
2. PDAM Labuhan Batu Tirta Bina
3. Elpi Al Aziz General Hospital Rantau Prapat
4. Several restaurants
5. Some residential or community housing

The location of the site that has been determined is a very strategic railway line because it is surrounded by public buildings. The development of the Rantau Prapat Railway Station is expected to facilitate the surrounding environment as a means of transportation between cities in order to increase tourist activities visiting the city of Rantau Prapat and also as a mode of transportation. plantation or oil transportation.

Noise and Dust Analysis

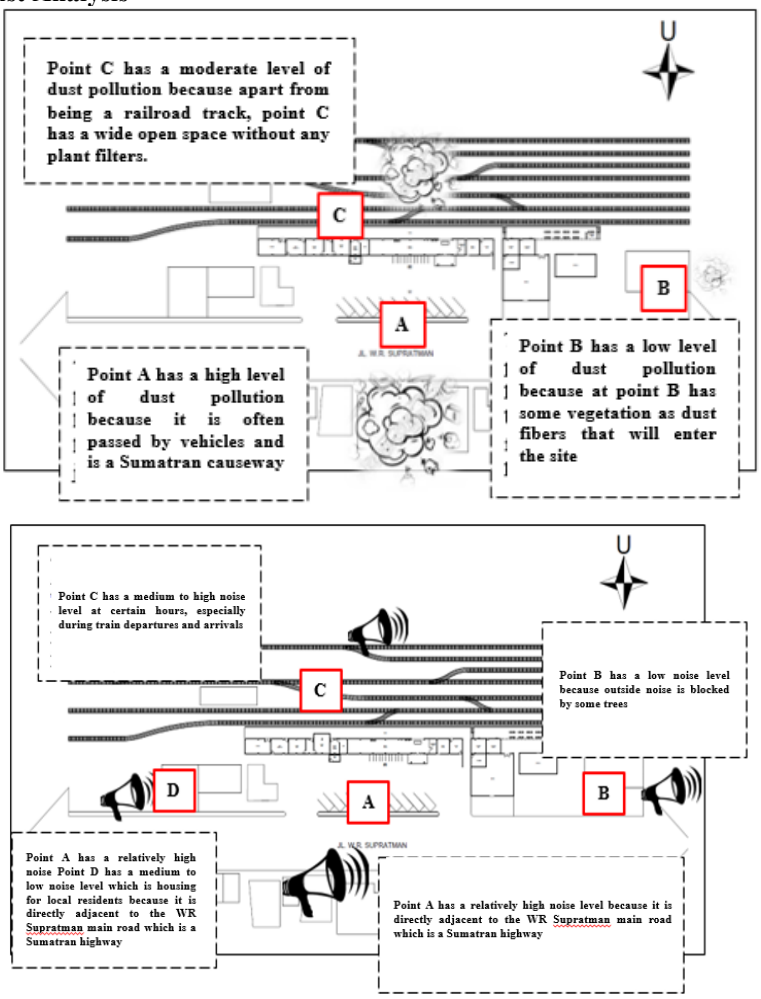

Figure 10. Noise analysis

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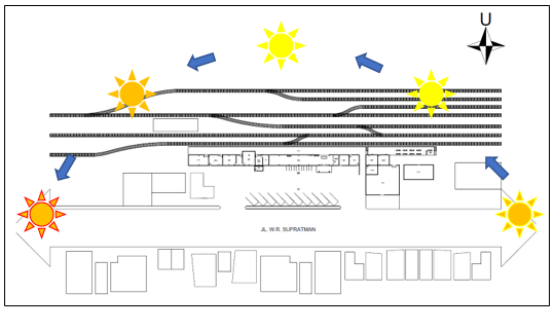
Conclusion:

The alternative that will be used to reduce the level of dust and noise intensity is to add more suitable vegetation at point A without disturbing the view inside.

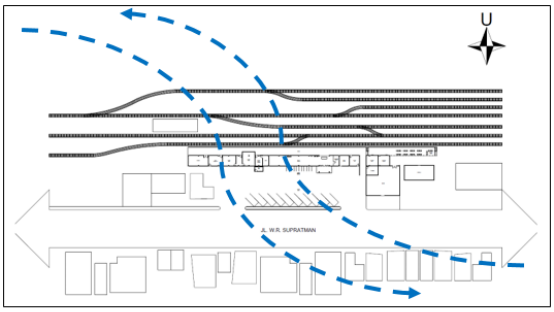
Analysis of the Sun and Wind



Sumber : Analisa Pribadi, Skala 1 : 500 (2019)

Figure 11. Analysis of the sun and wind

The east sun is a good sun that is found in the morning in the range of 6 am to 10 am. While the sun during the day in the range of 11 to 2 in the afternoon has a very strong exposure or intensity of light from sunlight because the position of the sun is very close to the earth. While the west sun is in the afternoon in the range of 3 pm to 5 pm. The site is divided where on the east side there is 20% morning sunlight, 60% of the afternoon sun is right on the top of the building and 20% of the afternoon sun is on the west side.



Sumber : Analisa Pribadi, Skala 1 : 500 (2019)

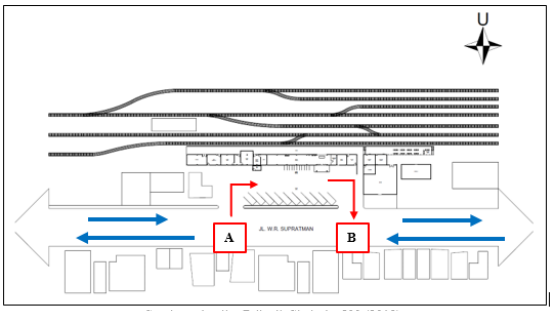
Figure 12. Analysis of the sun and wind

High levels of light and heat intensity are released directly from sunlight and wind that blows from Southeast to Northwest and vice versa which can disturb the comfort of visitors who come and managers.

Conclusion:

Based on the results of the existing analysis, ways to reduce heat in areas exposed to excessive sun exposure are by using plants as wind filters and also shade and applying lattices to several parts of the place or room.

Entrance Analysis



Sumber : Analisa Pribadi, Skala 1 : 500 (2019)

Figure 13. Entrance analysis

Analysis of the achievement to the site where the main entrance at point A and also the exit at point B have been determined through the W.R. Supratman highway which has a road width of ± 15 m, and has a two-way path.

Parking Analysis

In addition to the parking module, the parking area has the availability of land to accommodate vehicles, both cars, motorbikes, or public transportation such as taxis and buses with capacities as shown in the table below.

Table 1. Parking analysis

No	Transportation type	Station class		
		Big	Medium	Small
1	Private car	200	100	20
2	Taxi	20	10	5
3	Motorcycle	300	150	100

Conclusion:

Based on the results of the existing parking analysis, the Rantau Prapat Railway Station will use a parking barrier application system and also a parking module as follows:

1. Parking lot divider with ornamental plants or shrubs
2. Park the car with a parallel angle of l80º and also an angle of 45º
3. Parking motorcycles at an angle of 90 .

Building Analysis

Building Characteristics Analysis

The appearance of the Rantau Prapat Railway Station building must be adapted to the contextual architectural theme with the development of the train station itself, such as changing the facade or adding new buildings or facilities without changing the existing structure of the existing building.

Building Mass Analysis

The mass pattern that will be applied is a compound pattern equipped with a bridge infrastructure link between the first building and the supporting buildings. The basic shape of the mass will be used in accordance with the Contextual theme, namely a rectangle combined with a circle in order to create a modern and not monotonous impression.

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Figure 14. Analysis of the building period

Building Circulation Analysis

Circulation is an achievement made by humans to achieve the desired functions in buildings. Judging from the building system, circulation is divided into horizontal and vertical circulation.

Based on the results of the existing analysis, the horizontal circulation pattern that will be used at the Rantau Prapat Railway Station is a linear pattern and a grid pattern, while the vertical circulation that will be used at the Rantau Prapat Railway Station are escalators, stairs and also ramps for disabled users and goods.

Functional Analysis

Activity Pattern Analysis

A. Circulation and Departure Process of Train Station Passengers.

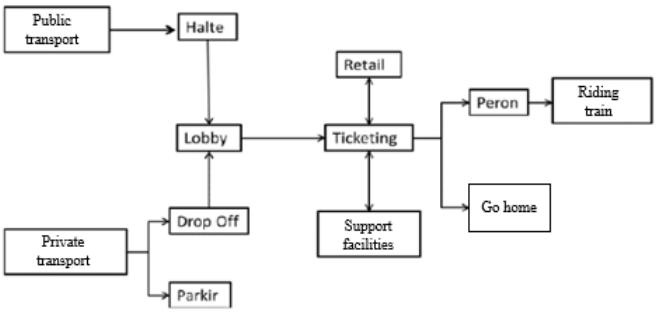

Figure 15. Analysis of activity patterns

B. Circulation and Process of Passenger Arrival.

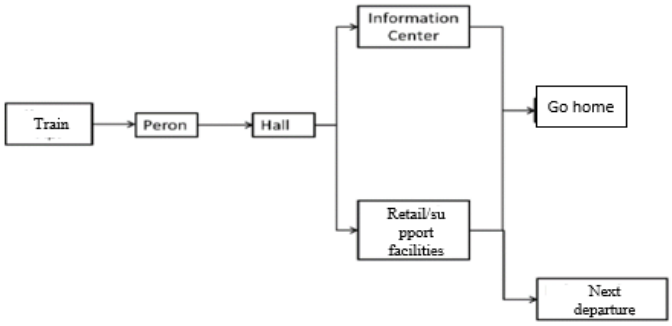

Figure 16. Analysis of passenger arrivals and circulation

C. Circulation and Arrival Process for Station and Bus Stop Pick Ups.

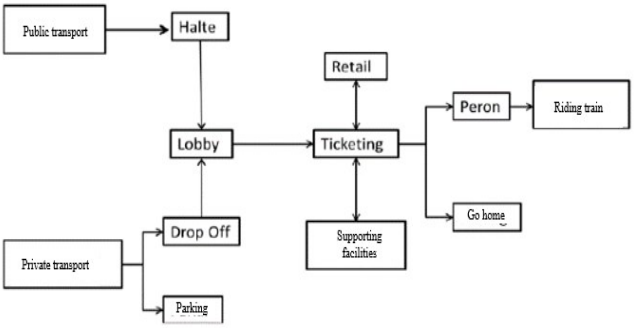

Figure 17. Analysis of circulation and arrival process for pick-ups and bus stops

D. Circulation and Arrival Process for Station and Bus Stop Managers.

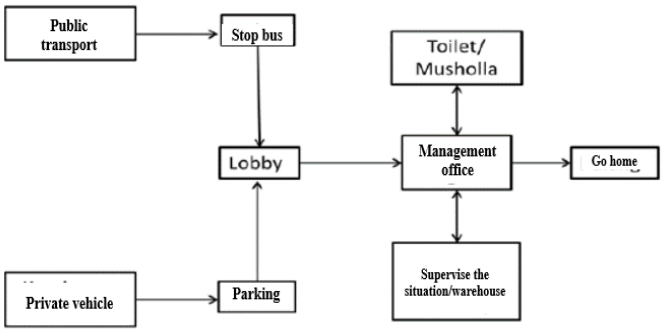

Figure 18. Analysis of circulation and arrival process for station and bus stop managers

Tread Concept
The Concept of Noise and Dust

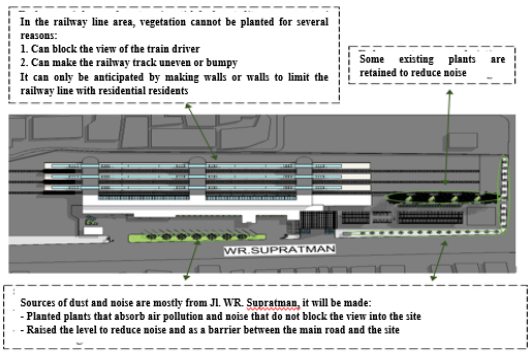

Figure 19. Analysis of the concept of noise and dust

Sun and Wind Concept

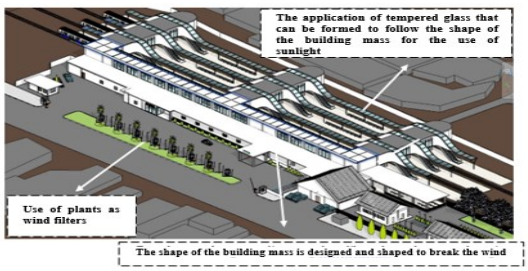

Figure 20. Analysis of the concept of sun and wind

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Entrance Concept

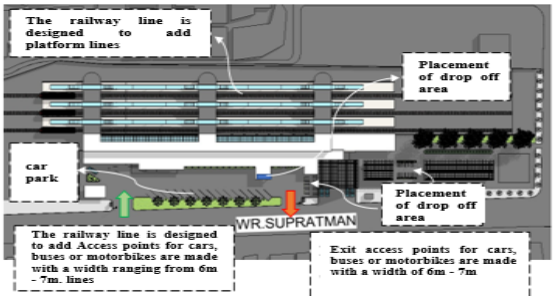

Figure 21. Analysis of the entrance concept

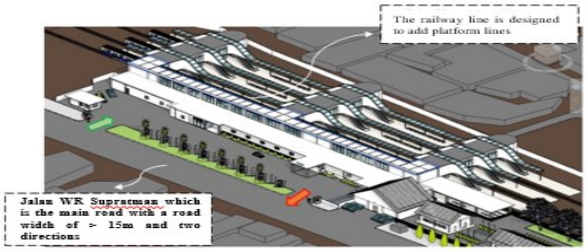

Figure 22. Analysis of the entrance concept

Building Concept
Building Form Concept

The concept of the existing building form of the Rantau Prapat Railway Station will be developed and modified slightly from the previous form.

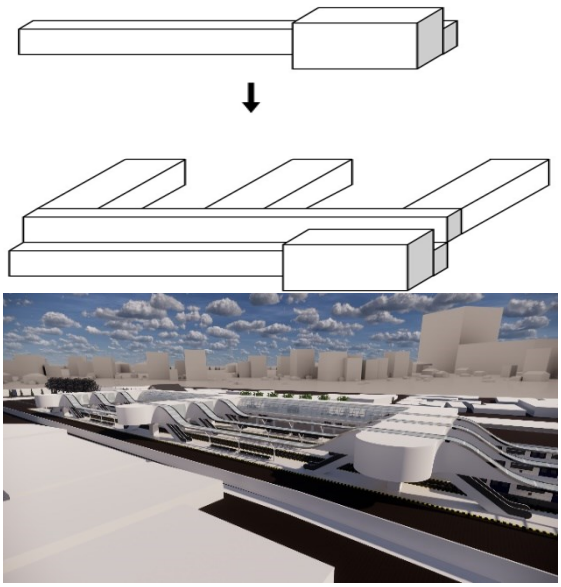

Figure 23. Concept analysis of building form

Building Functional Concept

Space Program Concept

Table 1. Space program concept

Space	Space requirement	Calculation/Standard (m2)	Capacity	Source	Large (M^2)
Rantau Prapat Train Station					
R. Stationmaster	R. Stationmaster	15 – 25 m^2/ unit	7 – 8 person	BPSS	24 m^2
R. Deputy Station Master	R. Deputy Station Master	10 – 15 m^2/ unit	3 – 5 person	BPSS	15 m^2
PPKA Room	PPKA Room	-	8 – 10 person	BPSS	18 m^2
PAP room	PAP room	2 m^2/ person	2 person	BPSS	4 m^2
Customer Service	Customer Service	-	6 – 8 person	BPSS	15 m^2
Finance Room	Finance Room	2,625 m^2 / person	4 person	Assumption	10,5 m^2
	Brangkas	-	-	Assumption	4,5 m^2
Multipurpose room	Multipurpose room	-	40 person	Assumption	80 m^2
Equipment Room	Equipment Room	-	4 person	Neufert	16 m^2
Railway Crew Room	Railway Crew Room	3 m^2 / person	7 – 8 person	BPSS	24 m^2
Train Crew Rest Room	Train Crew Rest Room	3 m^2 / person 6 m^2 motion circulation	8 person	BPSS	30 m^2
Security Guard Room	Security Guard Room and CCTV	-	5 person	BPSS	13,5 m^2
	detention room	-	2 person		1,5 m^2
Janitor's Room	Janitor's Room	-	3 person	Assumption	9 m^2
Hall room	Hall room	-	40 person	Assumption	100 m^2
Counter Room	Counter Room	1,5 m^2 / person 6,5 m^2 motion circulation	4 person	BPSS	12.5 m^2
VIP Lounge	VIP Lounge	-	15 person	BPSS	90 m^2
Public Waiting Room	Public Waiting Room	-	35 – 40 person	Assumption	120 m^2
Platform	Platform	-	45 – 50 person	Assumption	256 m^2
Health Service Room	Health Service Room	-	5 person	BPSS	15 m^2
Public toilet	Men's Toilet	3 m^2 / person	15 person	Neufert	45 m^2
	Women's Toilet	3 m^2 / person	15 person	Neufert	45 m^2
Islamic Prayer Room	Prayer Room + Imam	2 m^2/ person	10 person	BPPS	20 m^2
	Cleansing room	-	-	BPSS	2,625 m^2
	Tool Case	-	-	BPSS	2,625 m^2
	Terrace	motion circulation	-	BPSS	10,75 m^2
R. Breastfeeding Mother	R. Breastfeeding Mother	-	3 person	Assumption	15 m^2
Warehouse	Warehouse	-	-	Assumption	25 m^2
Luggage	Luggage	-	-	TSS	160 m^2
Retail	Retail	16 m^2 / unit	-	Neufert	160 m^2
Parking	Parking and Drop Off	12,5 m^2 /vehicle 2 m^2 / motorcycle	-	Neufert	230 m^2
Smoking Area	Smoking Area	-	6 person	Assumption	12 m^2
Janitor	Janitor	4 m^2 / unit	2	Assumption	8 m^2
Panel Room	Panel Room	9 m^2 / unit	1 person	Neufert	6 m^2
Chiller Room	Chiller Room	-	-	-	6 m^2
Pump Room	Pump Room	6 m^2 / unit	6 person	Neufert	36 m^2

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Security post	Security post	3 m^2/ person	3	TSS	9 m^2
ATM	ATM	5 m^2/unit	1	TSS	5 m^2
Vertical Circulation	Escalator	24 m^2	1	Neufert	24 m^2
	Ladder	25 m^2	1	Neufert	25 m^2
	Ramp	4 m^2	1	Neufert	8 m^2
Amount					1713,5 m^2
Circulation 30%					514,05 m^2
TOTAL					2227,55 m^2

CONCLUSION

Rantau Prapat Railway Station has many shortcomings which of course must be improved and added to be able to serve the community in the future. This redesign is oriented to the community as users of transportation modes, how the flow of human and vehicle circulation is the main problem. The Rantau Prapat Railway Station must also be an attractive city gate, especially since the city of Rantau Prapat is the last destination city on the North Sumatra railway line. Therefore, the application of the Contextual Architecture theme is used so that the design that is set also follows the flow of an increasingly sophisticated future era. How a Railway Station that can function well functionally but can also be a city gate that gives interest to visit.

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