



# Master of Architecture Portfolio Design Thesis 2



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# Thesis Topic

## *Industry 4.0 : Industrial Building for Next Generation of SMEs*

### **Introduction**

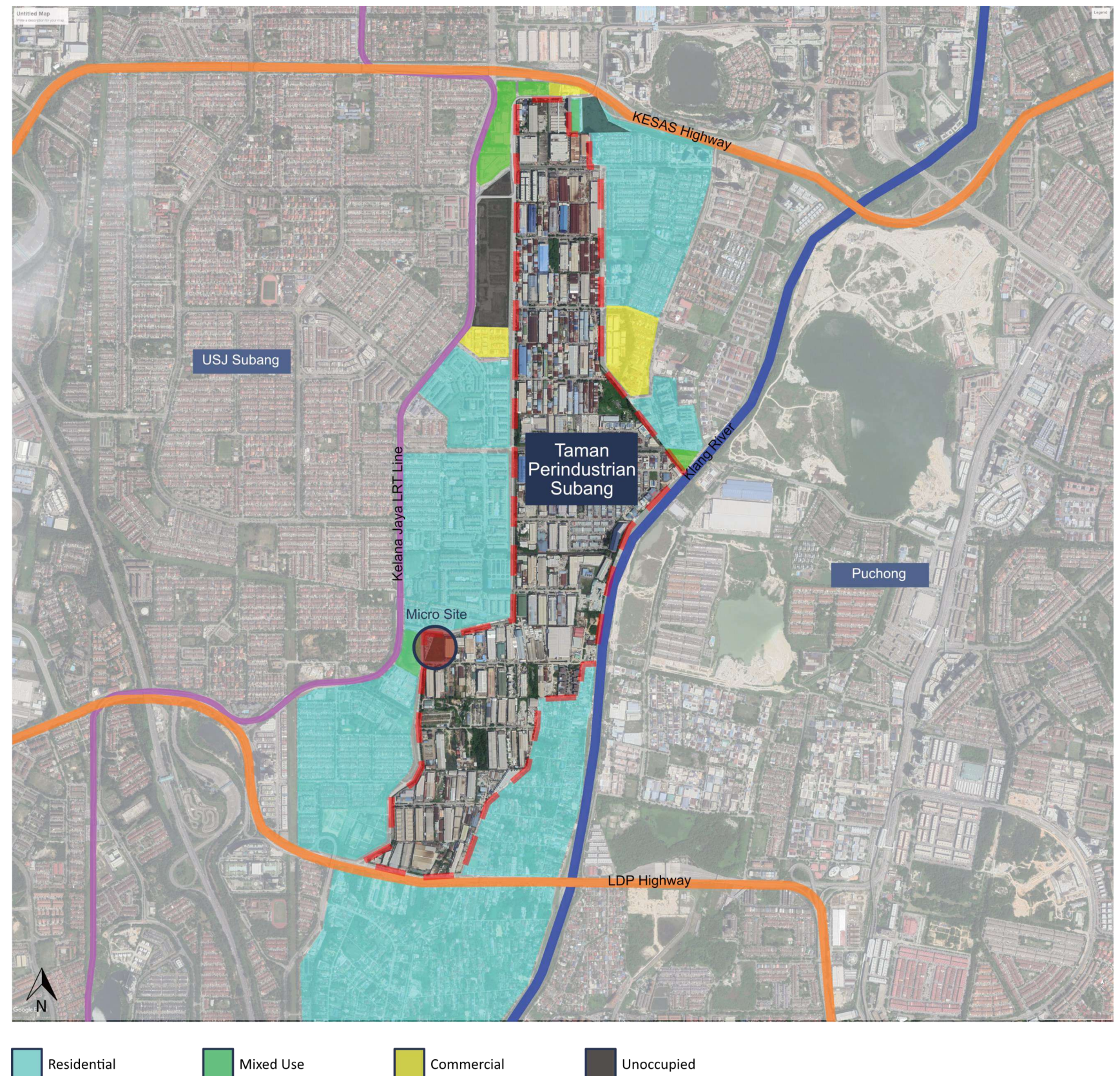
Continuing with the design thesis 1 research, the objective of design thesis 2 is Design a new typology of building design centralising industry 4.0 technology by housing multiple types of SMEs with public engagement in a safe, flexible and sustainable SMEs environment inside a value chain infrastructure.





## Project Site

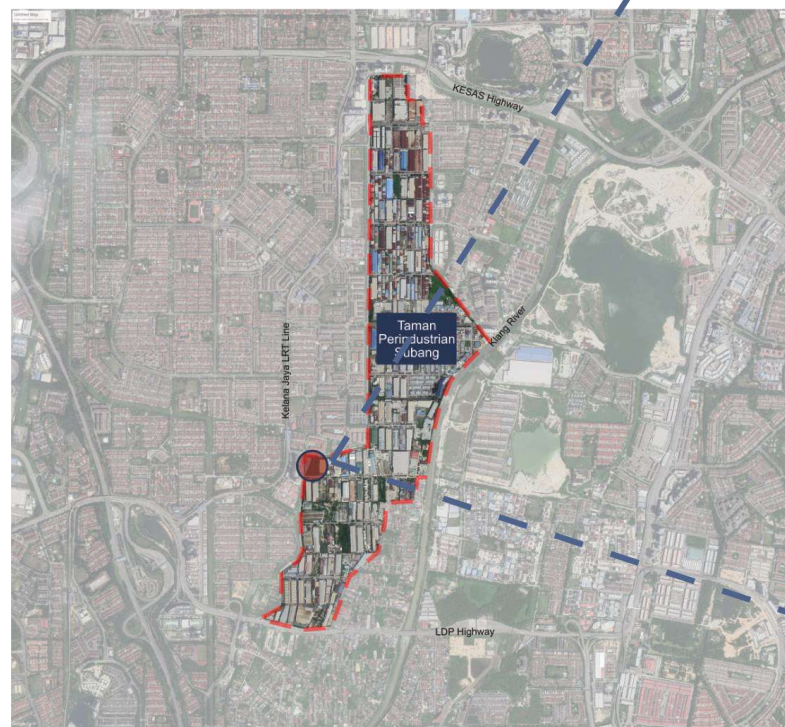
Taman Perindustrian Subang was selected as the project site. 90% of the factory is operated by SMEs in this location. The site is a light to medium industry zone that is surrounded by USJ terrace residential and few mixed development including shopping complexes like subang parade. This site is also well connected by infrastructure like direct access from LDP and KESAS highway. And also a LRT line in near proximity.





## Micro Site

Based on the building program the undeveloped site beside USJ Mall was chosen as the micro site. The site is close to not only industry but also connected to shopping malls, public transport and residential areas that give the building exposure to the public. That provides us with a good strategy location for the first industry 4.0 value chain building in the area.



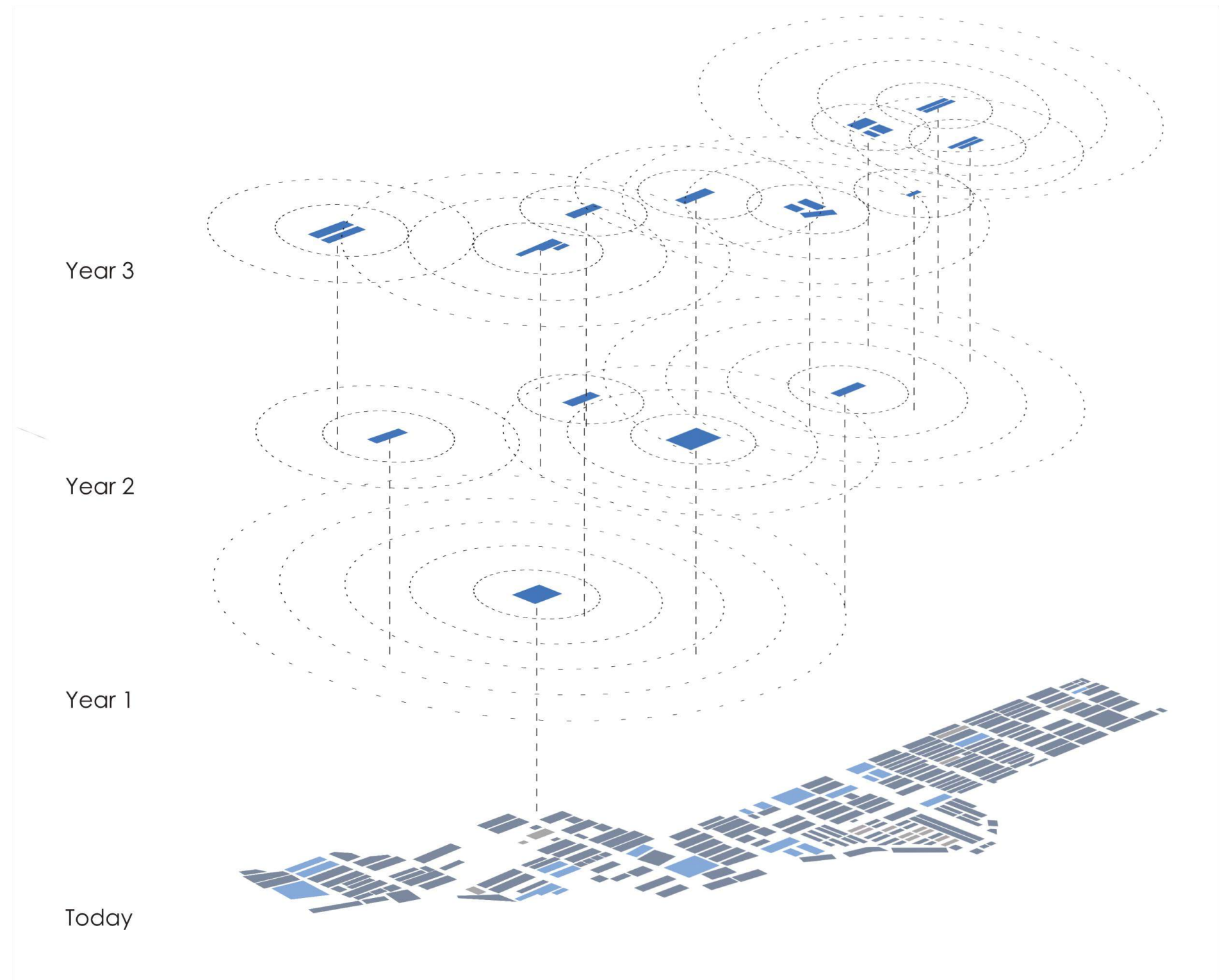


### Building as Industry 4.0 Enabler

The proposed building will be the first building of the site that will connect to the value chain and act as the industry 4.0 enabler.

And from there, the building started to influence its surroundings and other buildings started to be built using the same value chain system that further broadened the infrastructure.

From the start of designing the building, a design method needs to be considered for how it is going to connect to the value chain. The design information can be used in not only architecture but also can integrate production efficiency and be used for the next industry building design this way.



## Propose Program

Connection  
Park

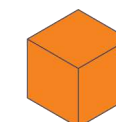
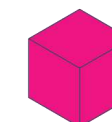
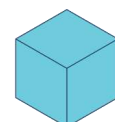
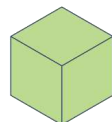
Main  
Building

Production  
Building

Centralized  
Warehouse

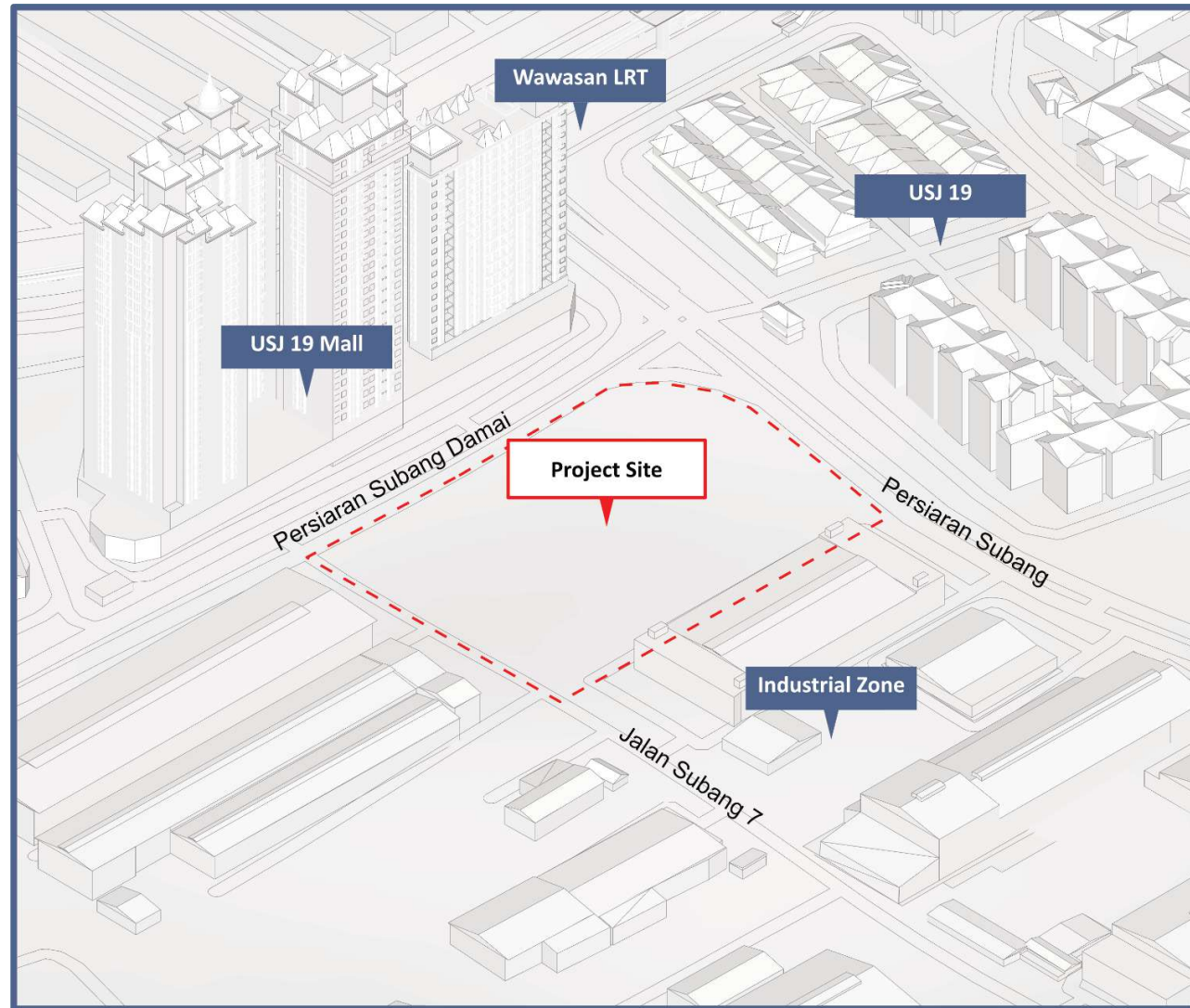
Services

<b>Zoning</b>	Public -Allow all public to access at all time	Semi Public - Open to public in certain period	Private - Only allow invited public to access	Private - No public access allow	Private - No public access allow
<b>Function</b>	A space as connection point to other part of the building at the same time provide public space.	A space that is centralizing industry 4.0 technology for Multiple SMEs to showcase the R&D Process	A space consist of multiple production spaces for different SMEs	A space that as a collection point that house all raw material and finish goods.	A space housing essential services to support the building
<b>Key Activity</b>	Recreation, Connection, Experience	Education, Interaction, Collaboration, Researching, Analysis, Design, Testing, exhibition	Production, Management	Storing, Distribution, Delivery	Data Processing, Building Services



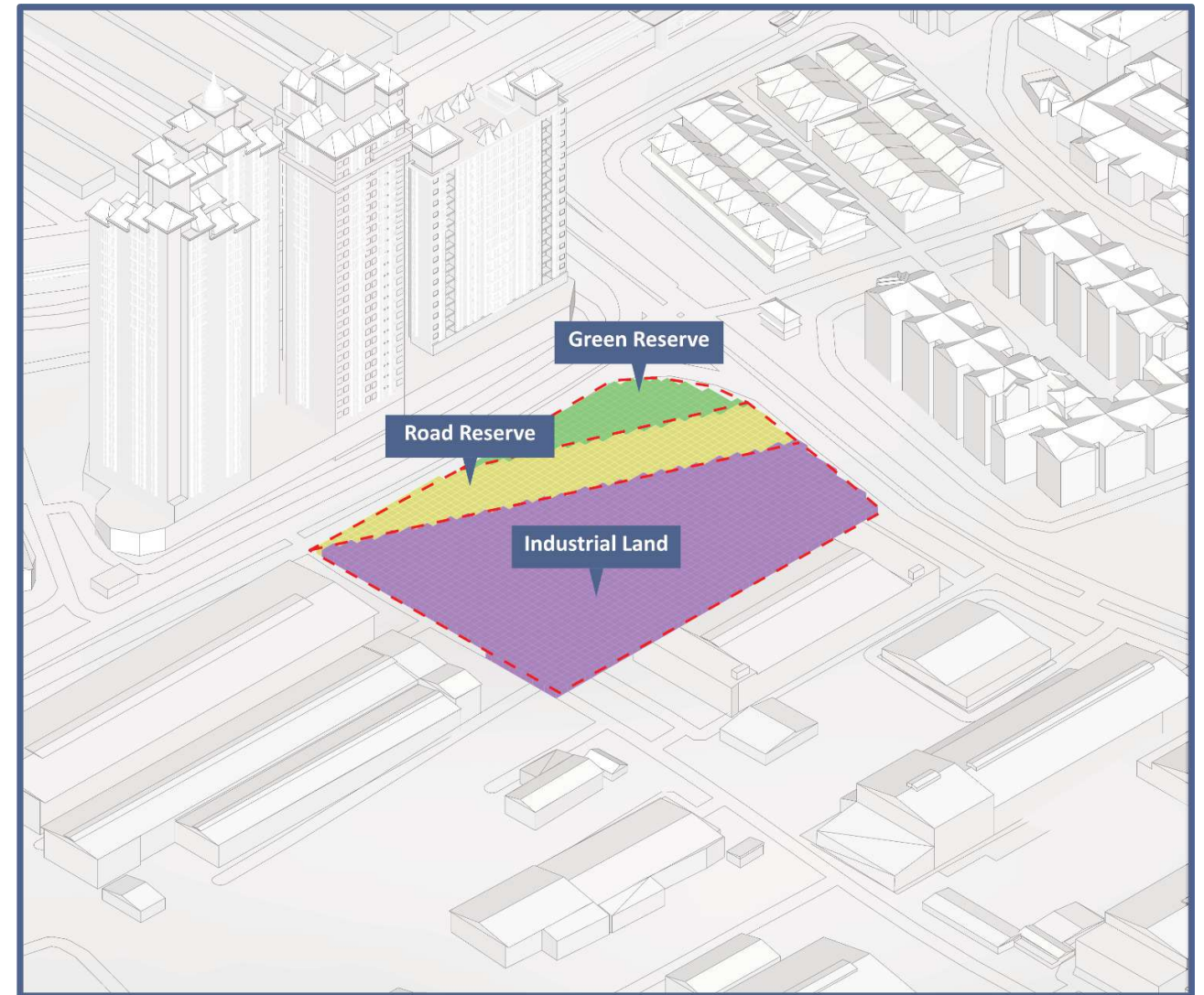


# Massing Transformation 1



1

Site context s study to provide 2 site axis on the microsite to guide the building arrangement into form.

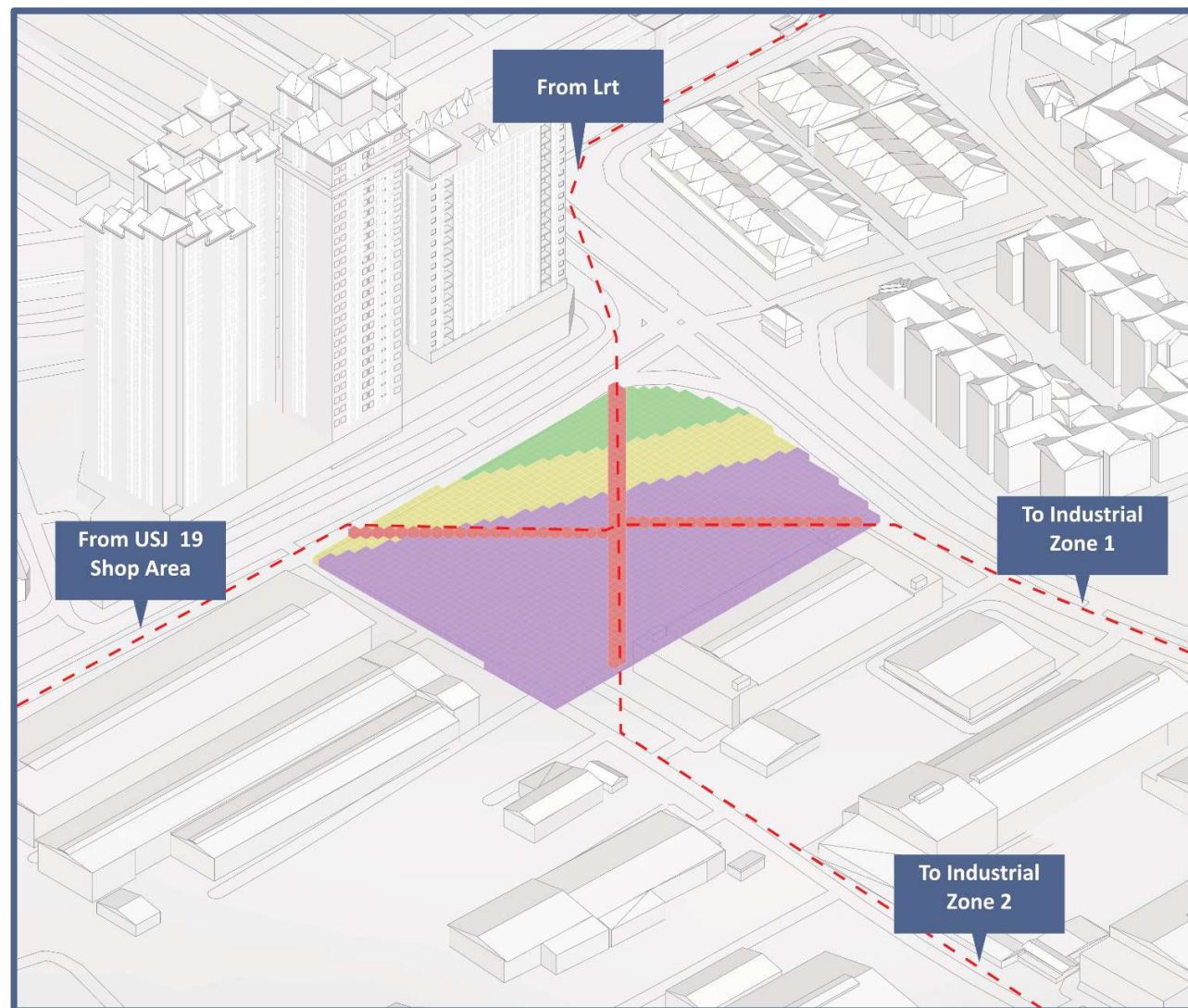


2

The first axis is the site land boundary set by the authority divided by 3 lots in terms of usage.

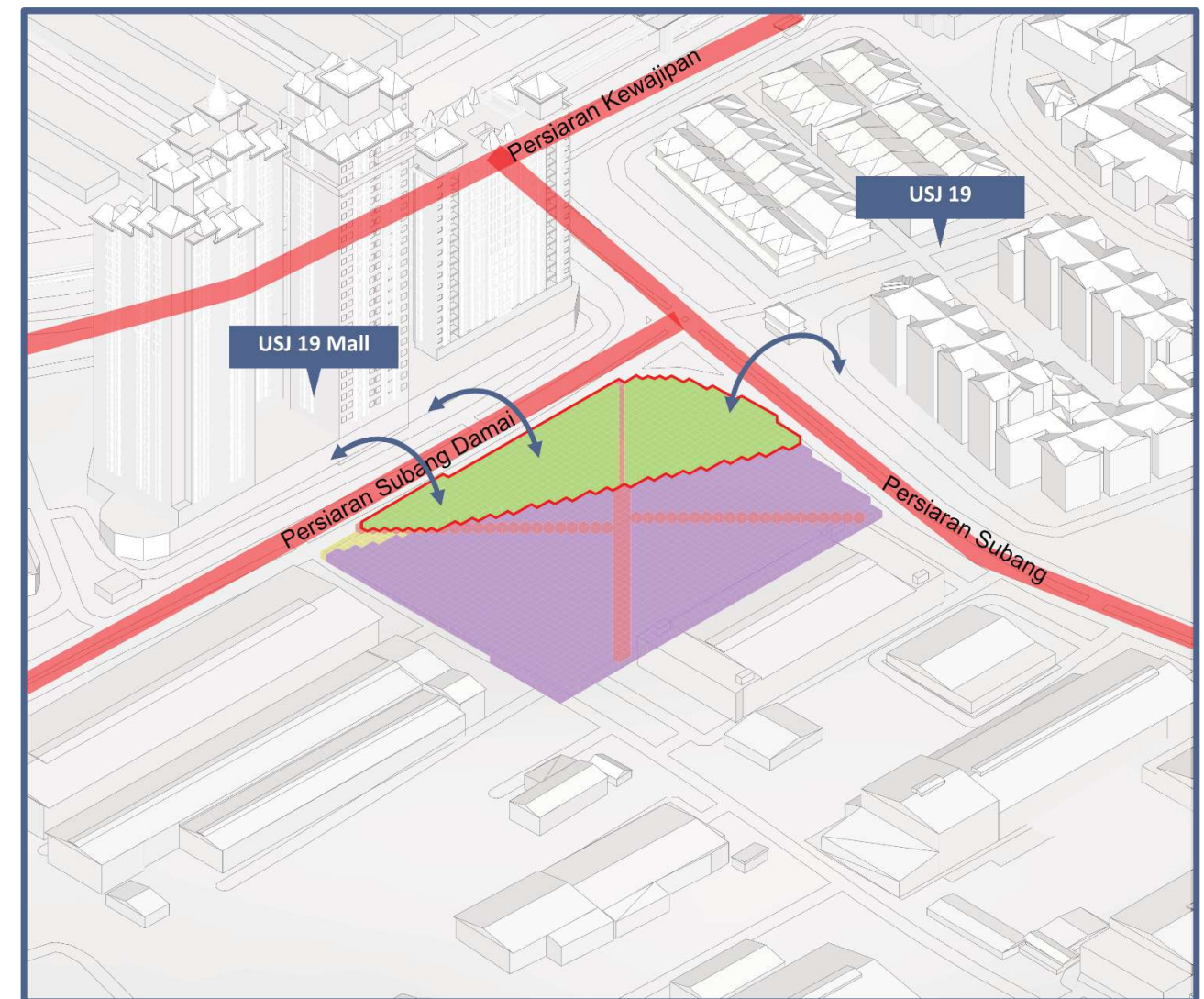


## Massing Transformation 2



3

The second axis is formed by observing public walking patterns on site and the opportunity path that is created if the site is open up to the public. This will form a natural walking habit from the public as they are taking shortcuts through the site.

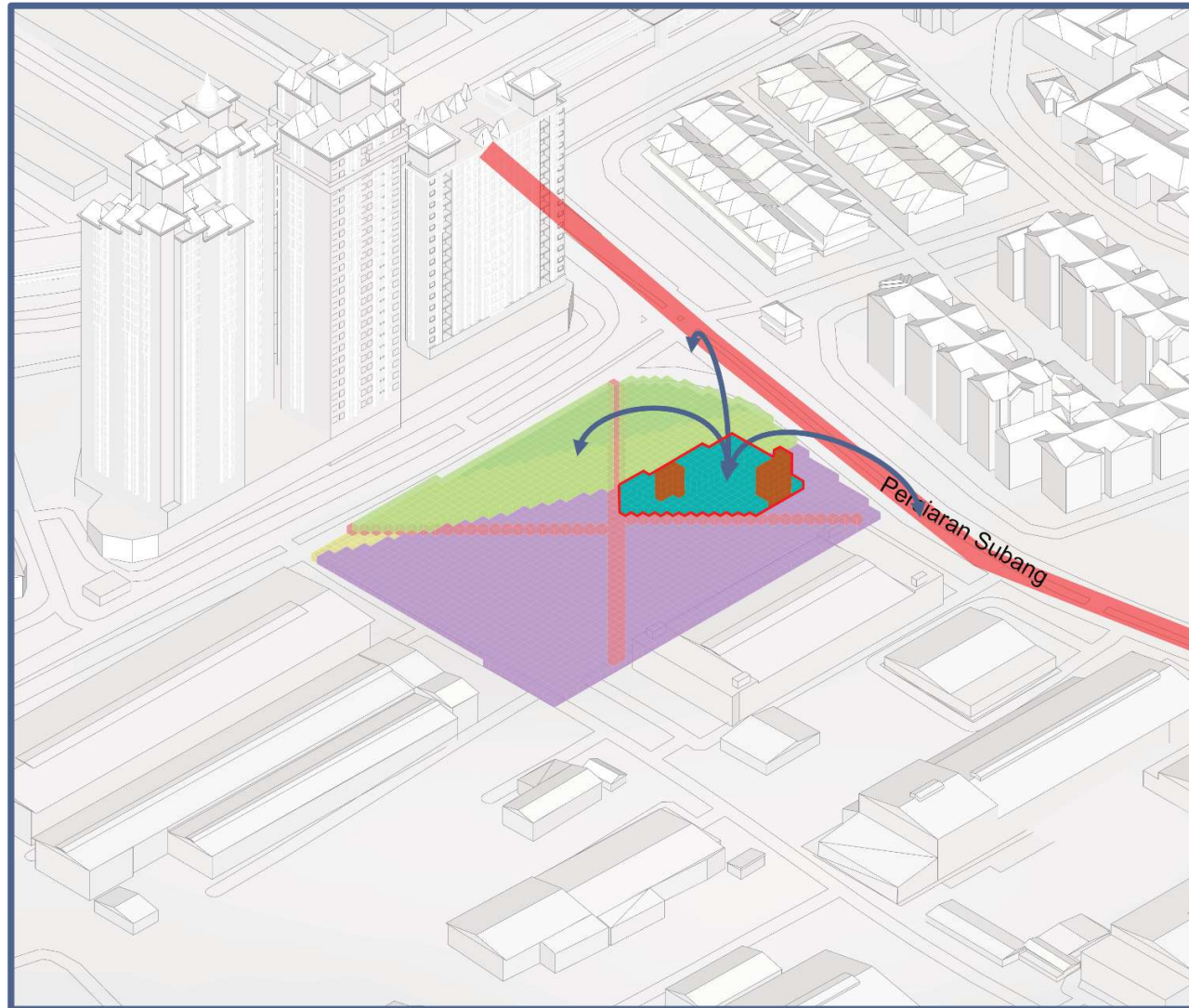


4

Having the site axis, the site zoning is set based on the visibility of the public from the main road. The area that has the most views is set as the public zone and the connection park is introduced at the location.

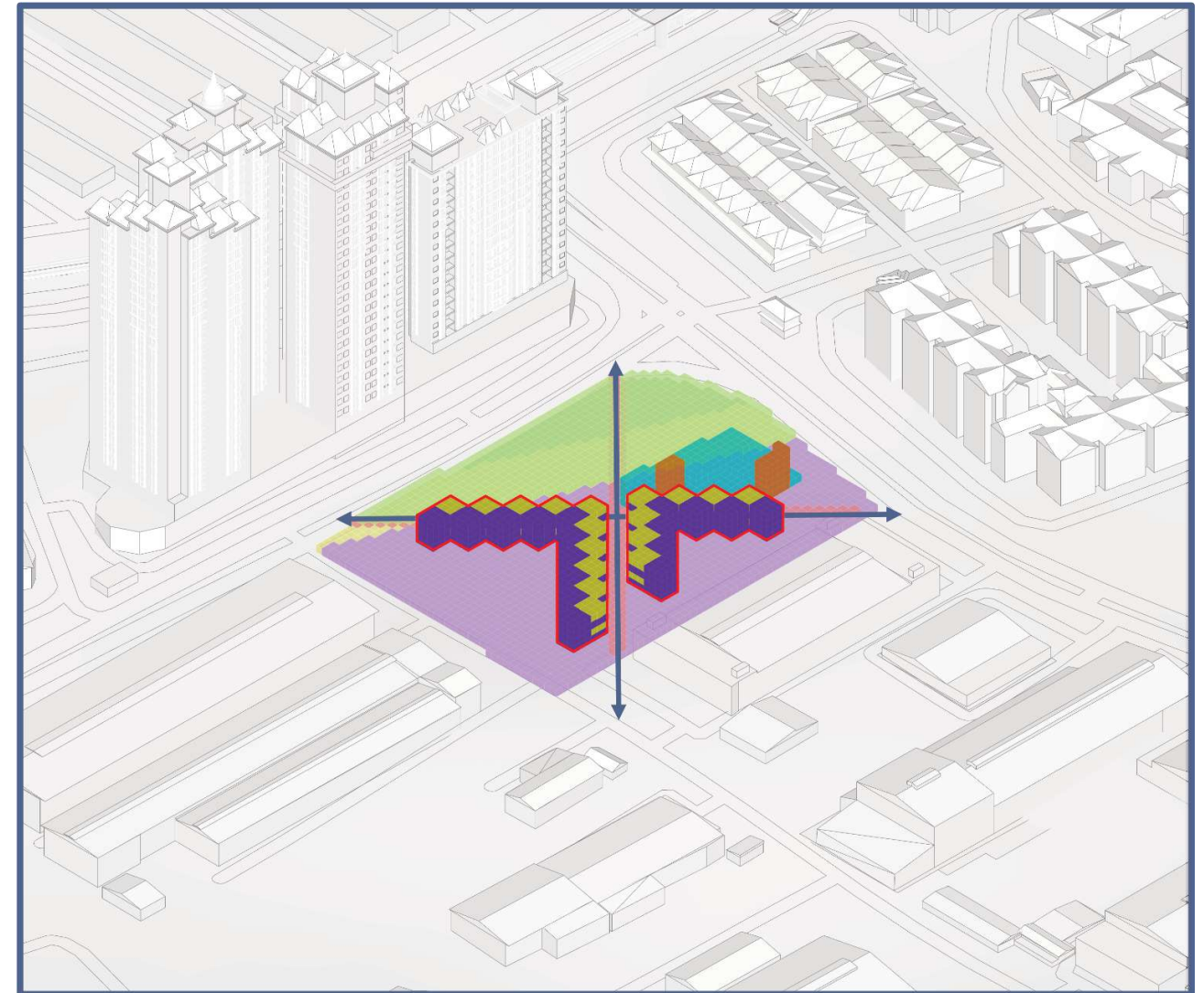


## Massing Transformation 3



5

Then the main building is set to be located at the most visible semi private area beside the park and main road which gives direct access and visibility from the area.

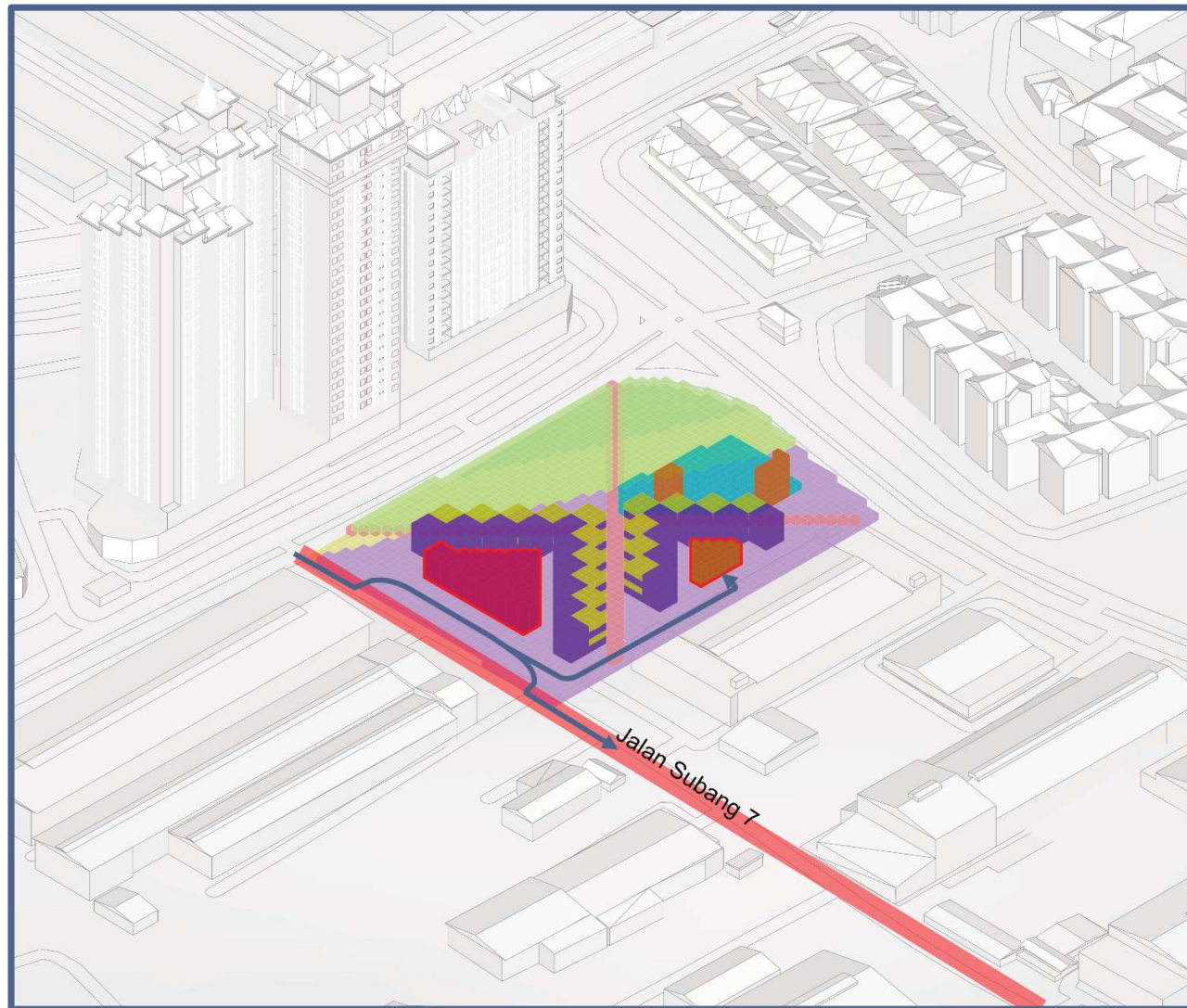


6

2 clusters of production buildings are introduced to be the private zone along the walking pattern axis to allow direct connection to the main building and the public to walk pass and view what is happening inside each production building.

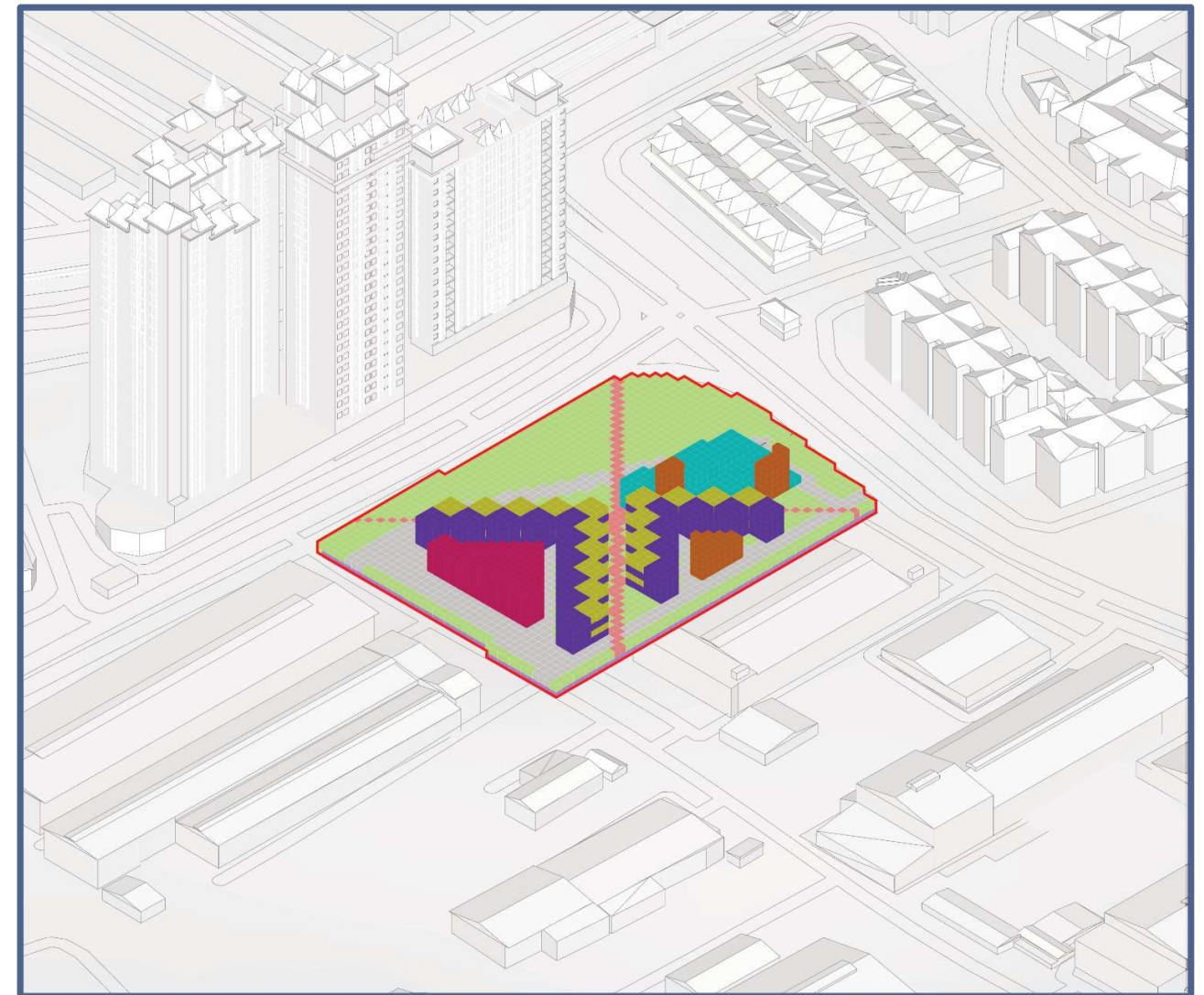


## Massing Transformation 4



7

A warehouse and service building was added behind the production building as they are the most private building that don't want any public to access it. It is directly connected to the service road for not overlapping the circulation from public access.

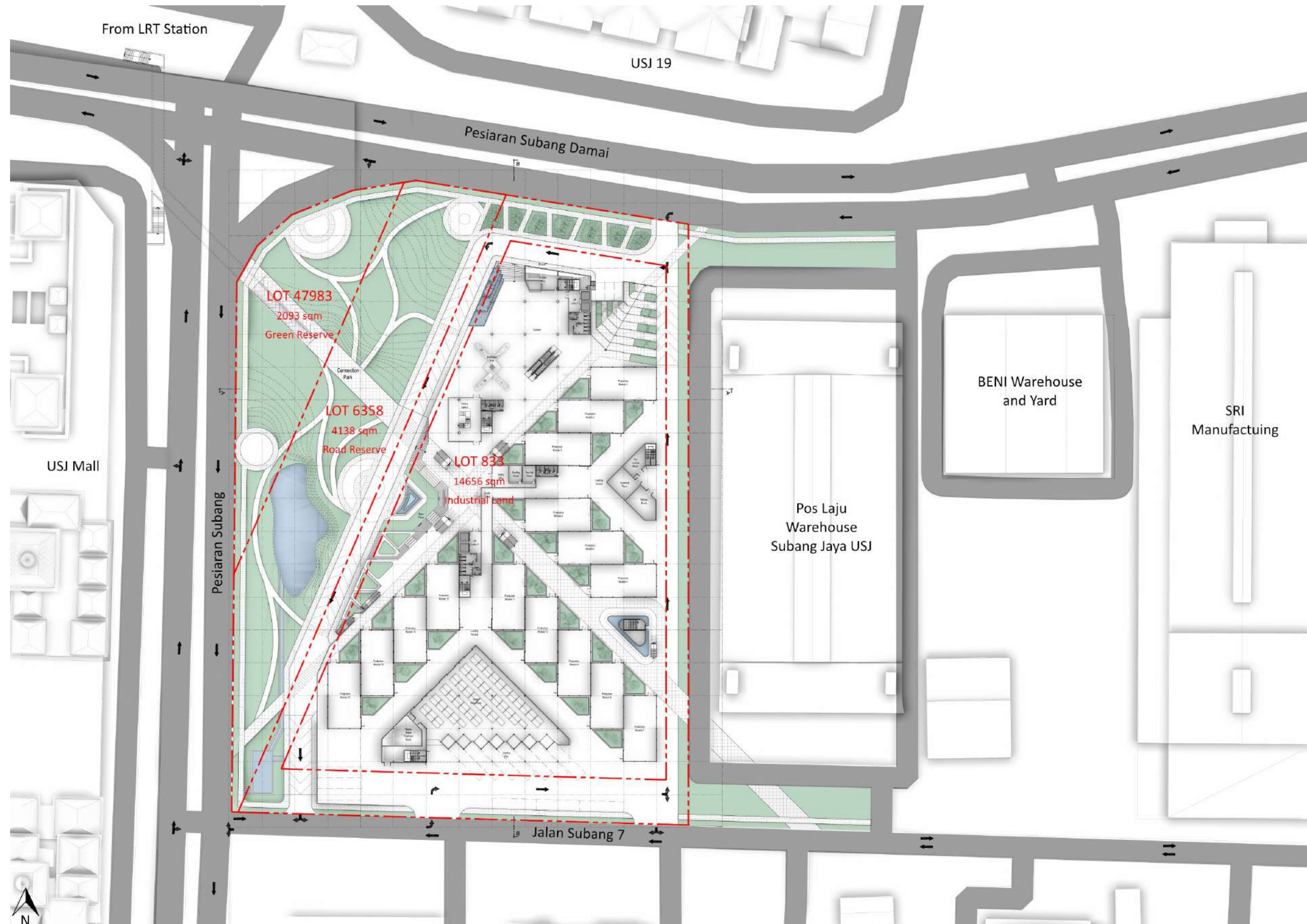


8

The final pixel massing was formed and ready to be developed into space.



# Site Plan





# Zoning Plan

## Zoning Plan



- Public Zone
- Semi Public Zone
- Private Zone

There are 3 levels of site zoning based on the level of public access allowed in the area. Facing the residential is the most public and the zoning is getting more private when reaching the industry zone.



# Circulation Plan

## Circulation Plan



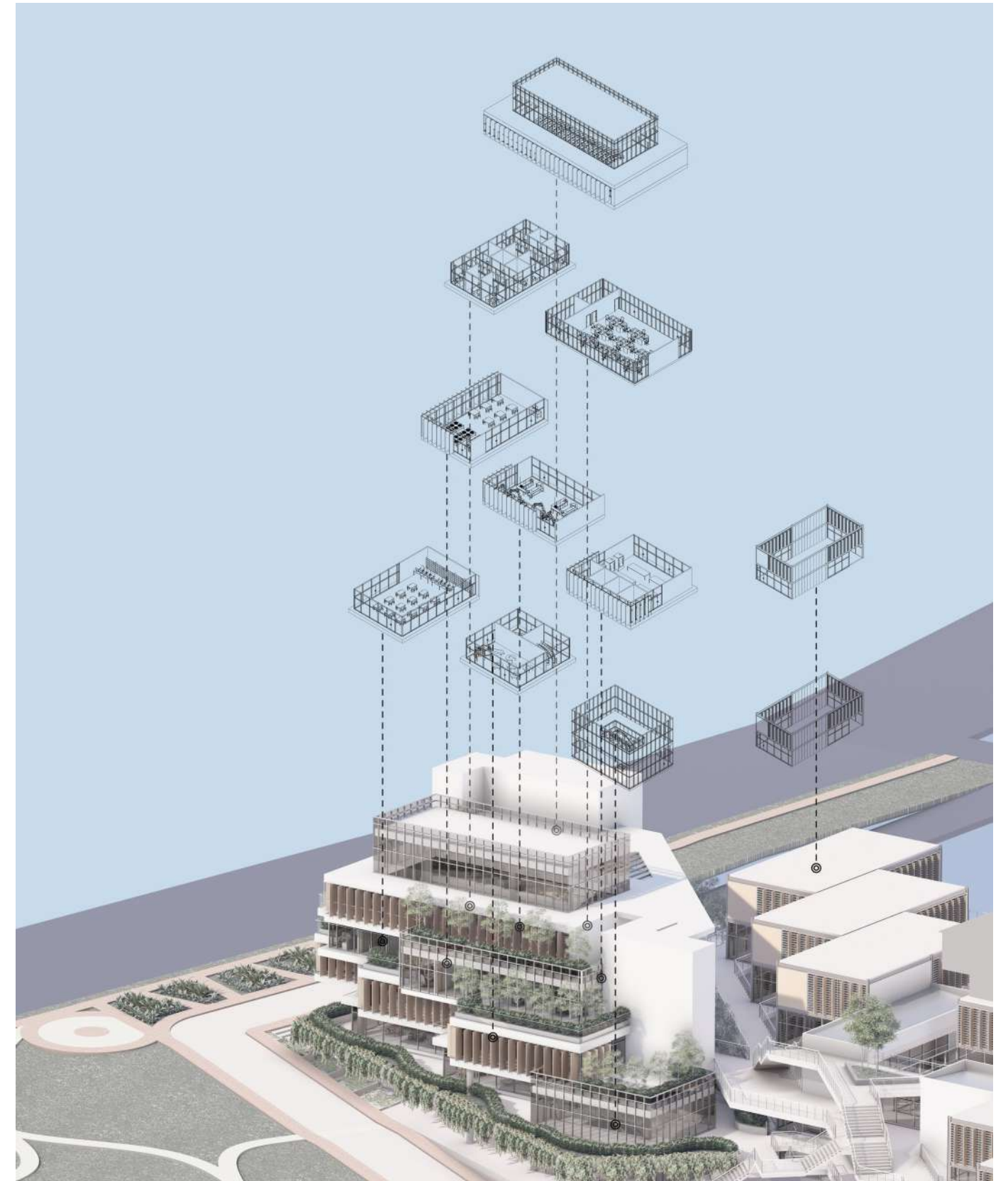
- Pedestrian Route
- Public Vehical Route
- Private Loading Route

The site circulation is designed to have clear separation of access based on pedestrian, public vehicle and private loading vehicle. Each has no cross path with others to create a safe environment for the user.



## Main Building Concept

The concept of the main building is to have multiple spaces stacking on top of each other to create the dynamic facade in order to break through the typical industry building perception. This can create a positive landmark to the area by giving a positive effect on the industry to the public.

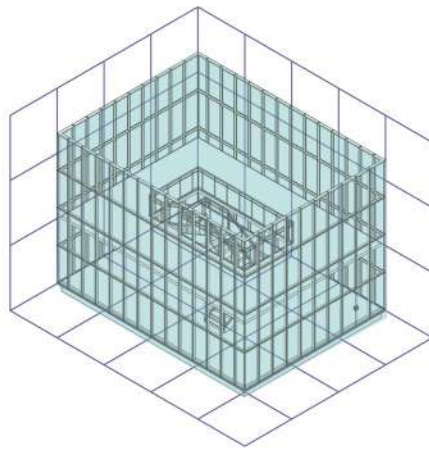




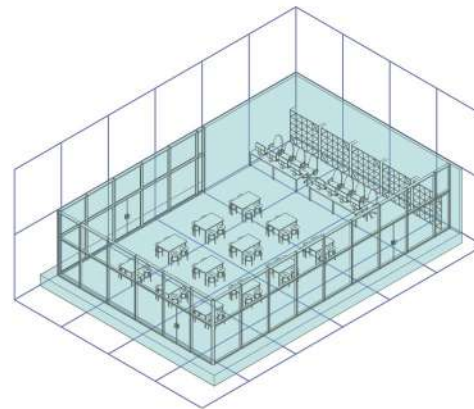
# Space Creation 1

## Education Space

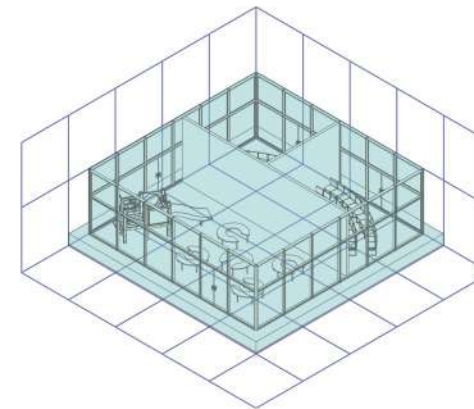
Education space is designed to be an interaction point between the public and SMEs. Its function is to promote a better relationship between both parties.



History Gallery



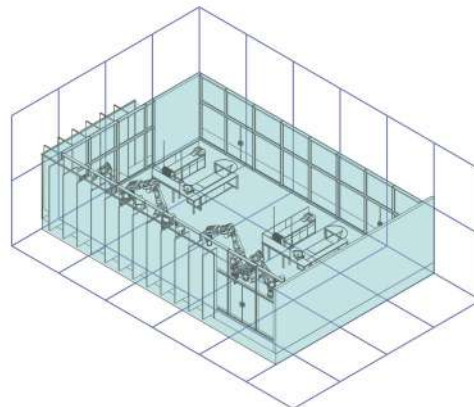
Creative Lab



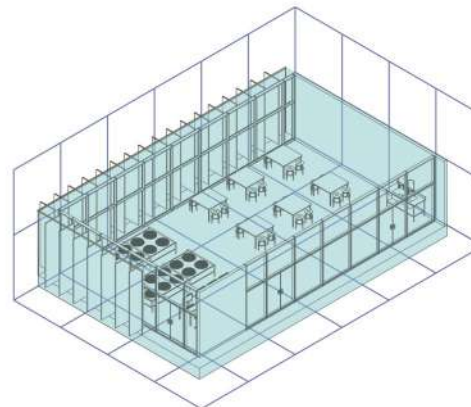
Children Room

## Value Added Space

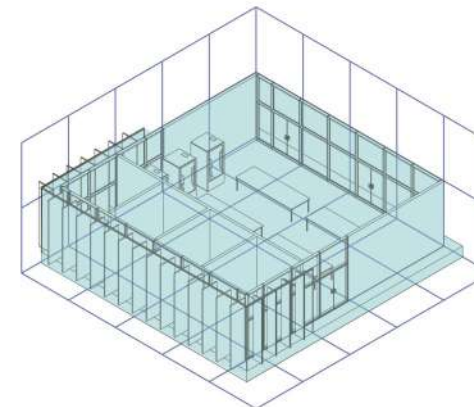
Value-added space is the R&D part of the building to have multiple SMEs sharing the facilities to lower down the high adoption cost of industry 4.0.



Robotic Lab



Additive Lab



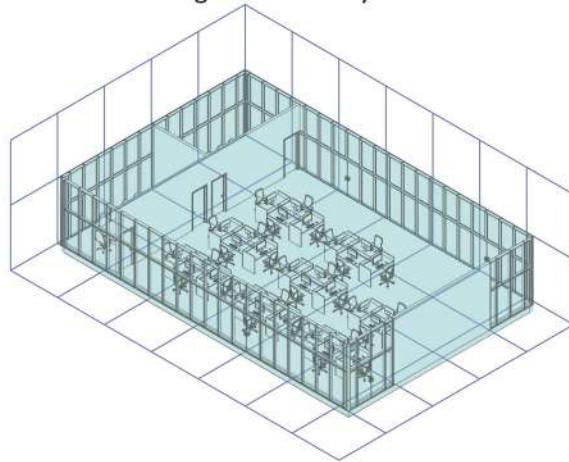
Research Lab



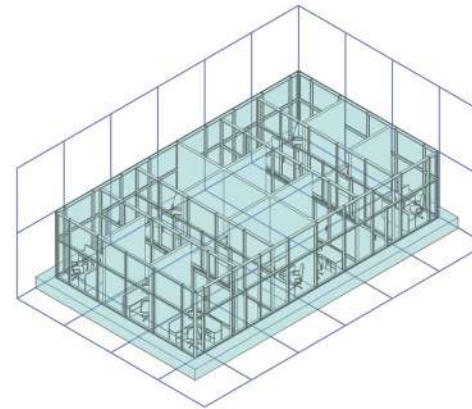
## Space Creation 2

### Office Space

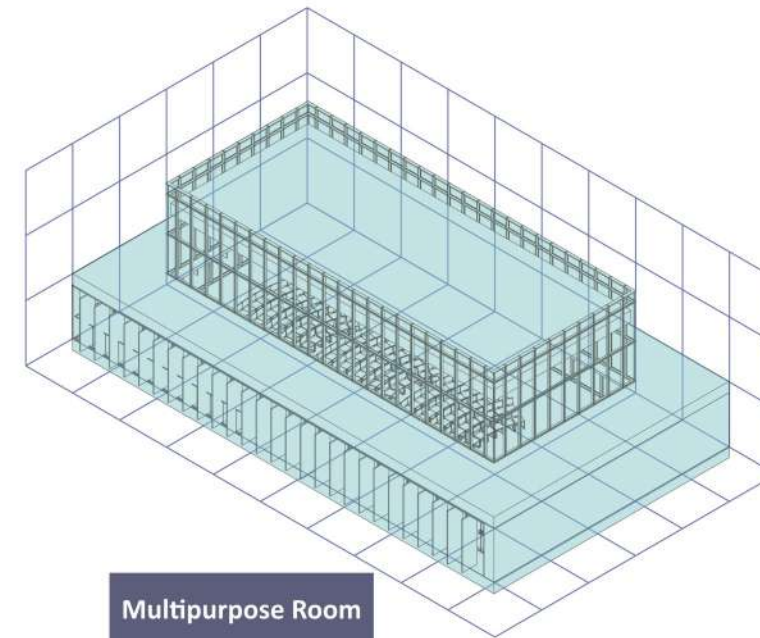
Office space is designed to share open office space to allow SMEs to collaborate among themselves to achieve a stronger community.



Share Office



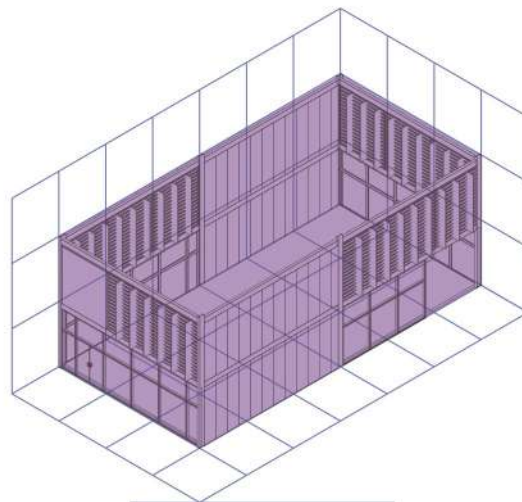
Individual Office



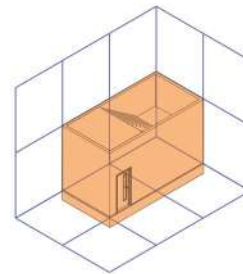
Multipurpose Room

### Others Space

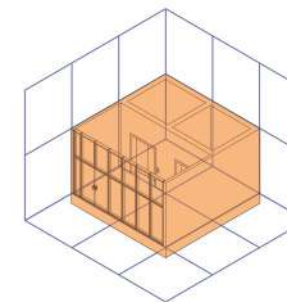
Other spaces like circulation space are designed to cube to allow easy integration into the building system.



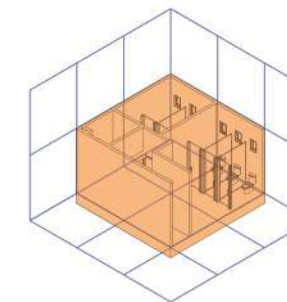
Production Module



Staircase



Lift Lobby

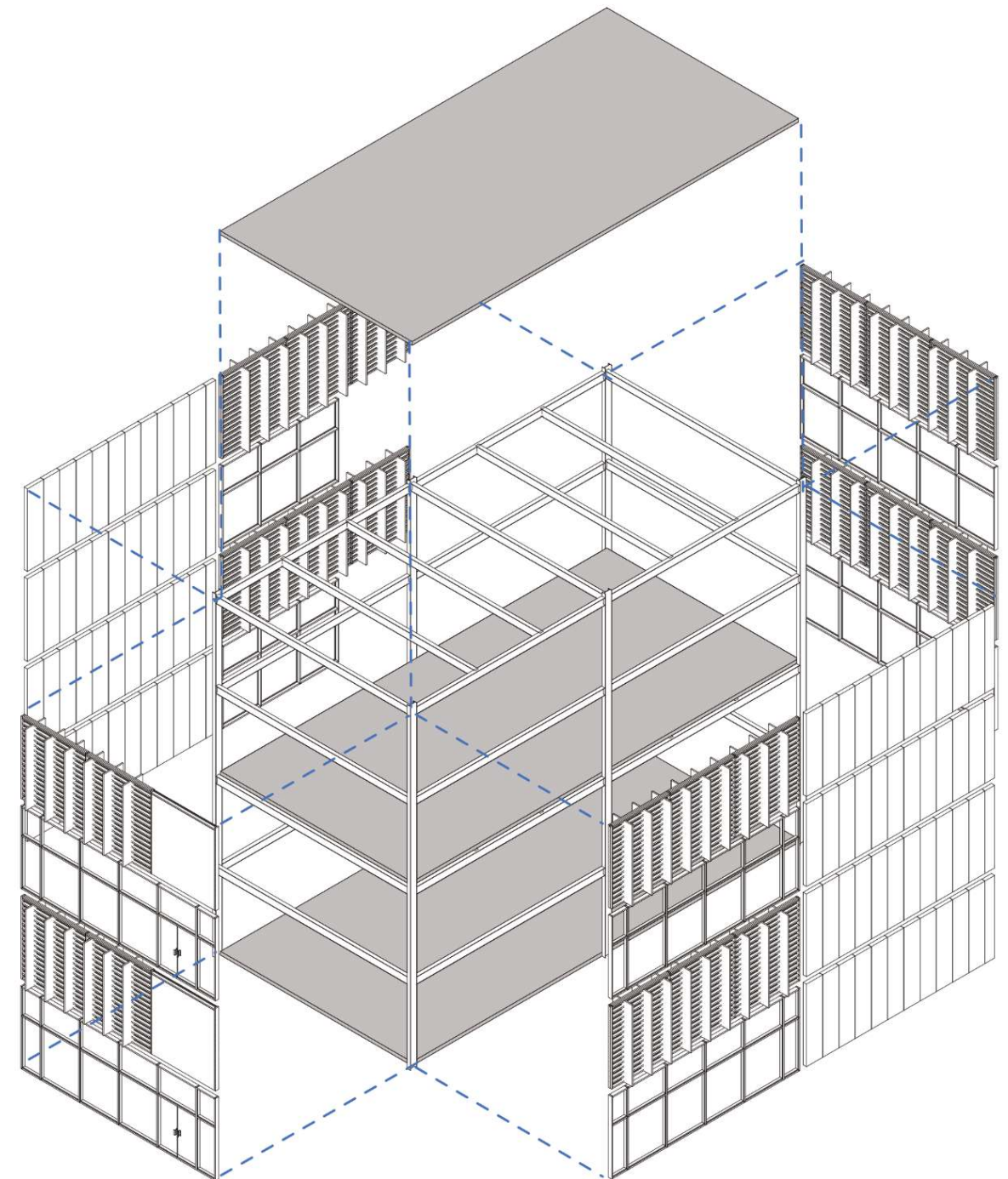


Toilet



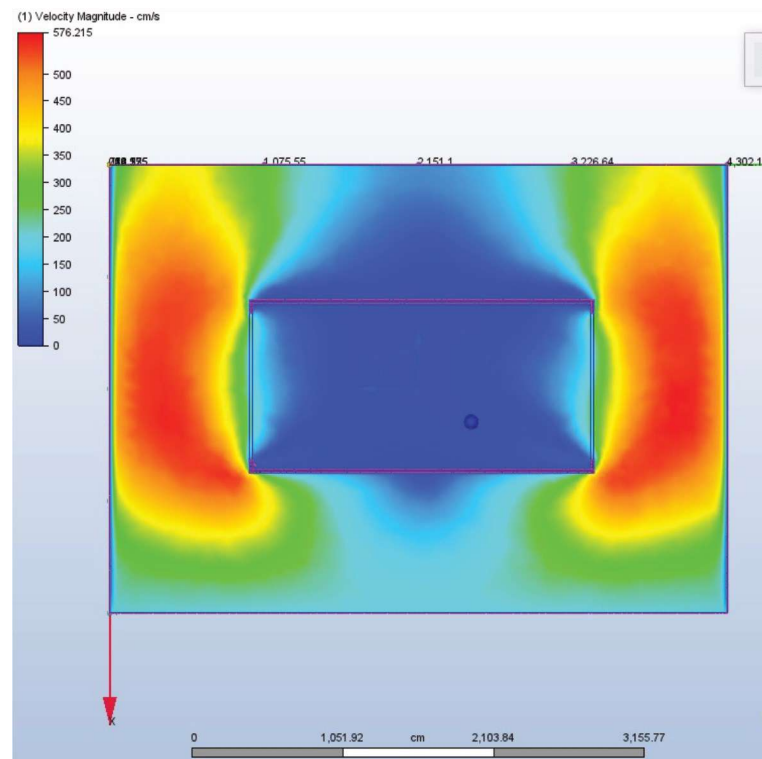
## Production Building Concept

The concept of the production building is to have flexibility of space because the building needs to suit different kinds of SMEs. Therefore the production building implemented a modular system to incorporate different kinds of function. The modular part enabled by industry 4.0 to integrate the building production inside the value chain infrastructure.

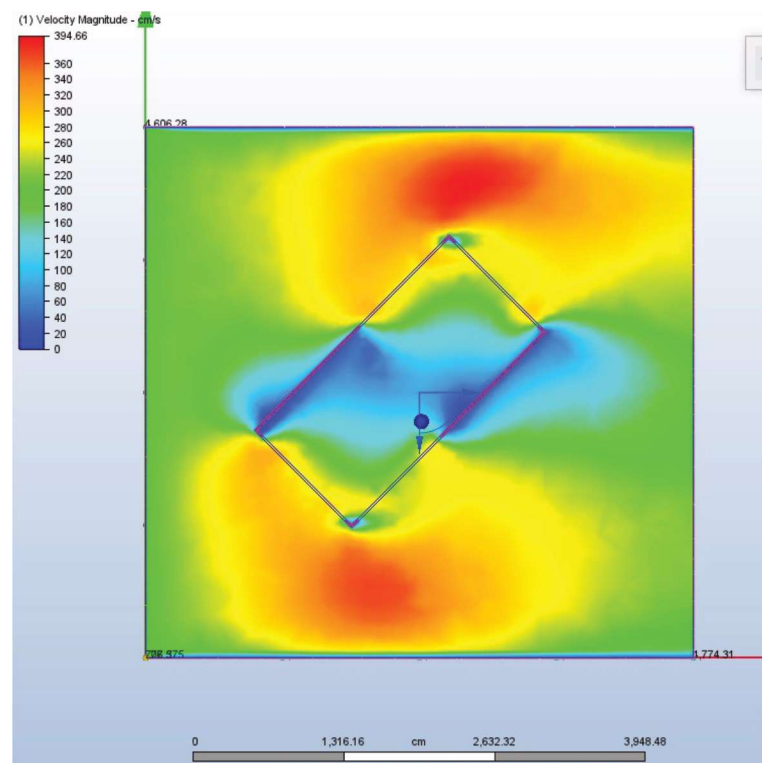




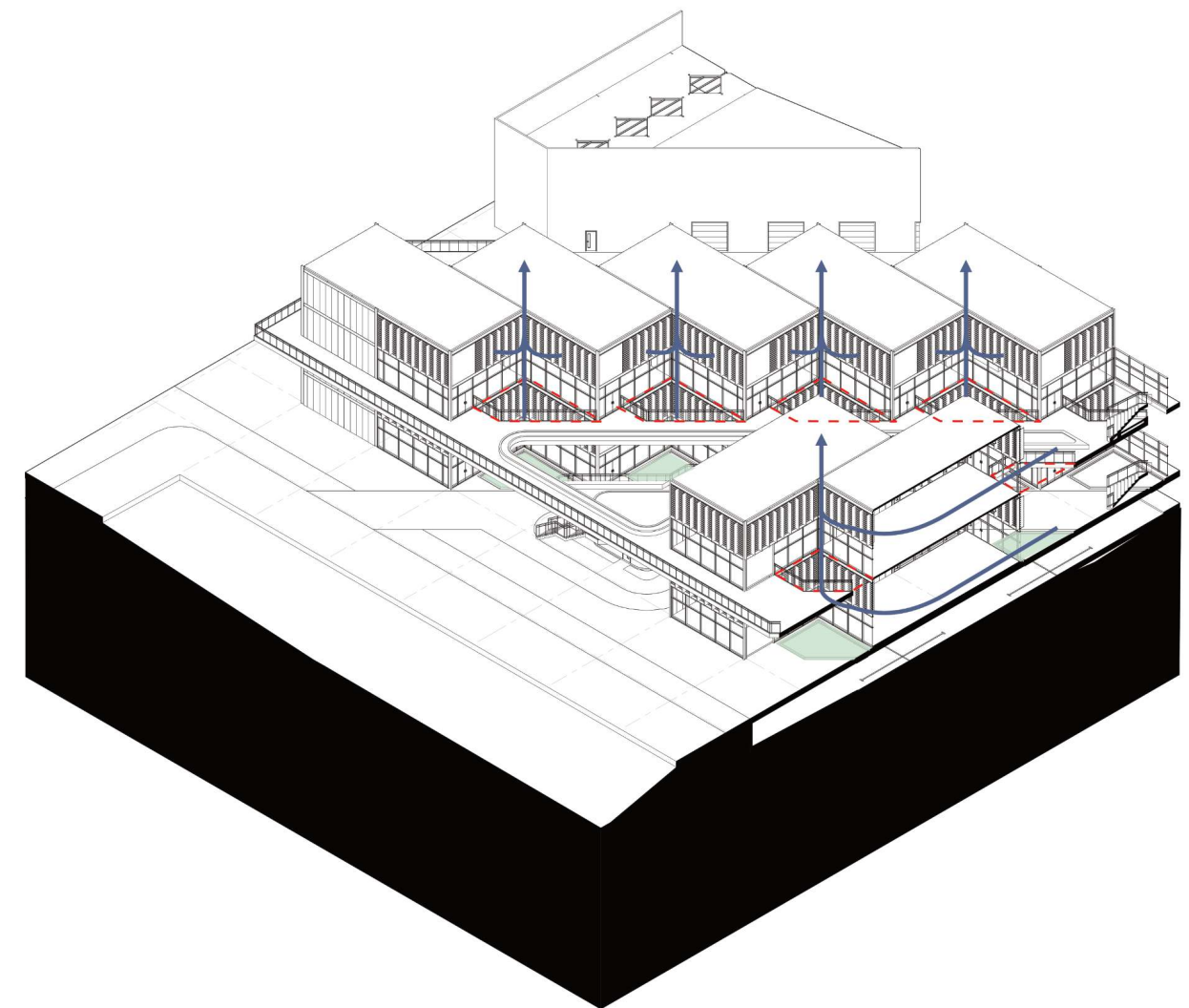
# Production Building Arrangement



The module is arranged in a 45 degree arrangement because in studying the natural ventilation and sunlight of terrace typology, the building interior does not have sufficient sunlight and wind, hence they must use artificial solution.



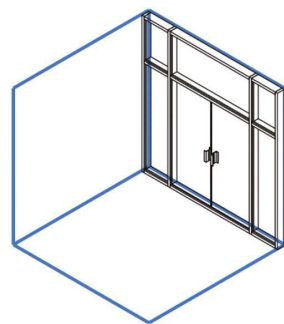
When the building is angled 45 degrees, the building receives 60% more natural ventilation capability and with the help of IOT sun and wind shading, we can control the allowable natural sun and wind entering the building. Therefore, this form was chosen for the building.



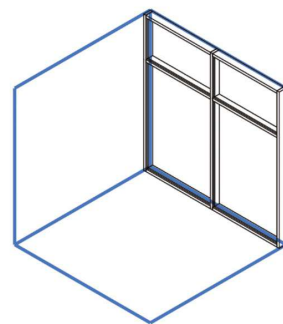


## Modular Part

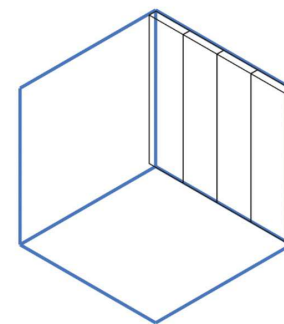
Every part is the standard 3m x 3m size that is easy to fix and remove for remodelling the unit.



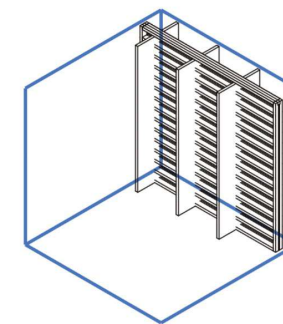
Glass Door



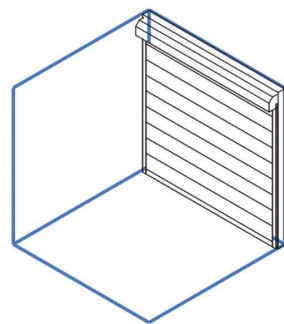
Glass Wall



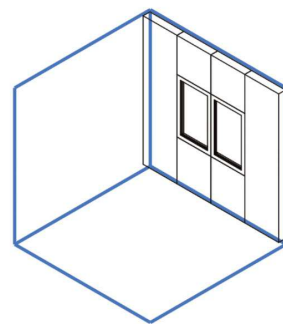
Precast Wall



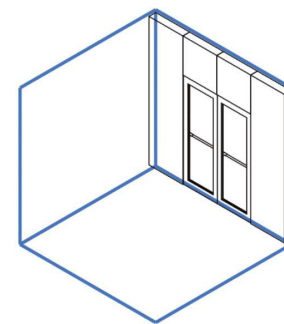
Active Sun  
Shading



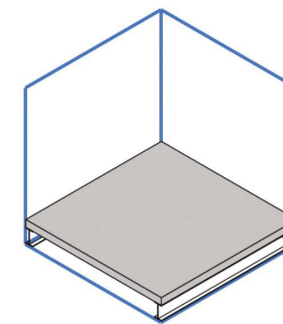
Roller Shutter



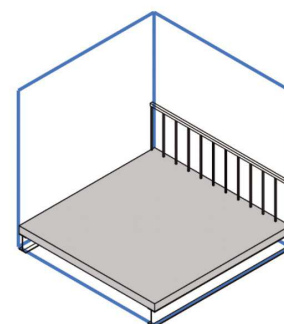
Precast Wall  
with Window



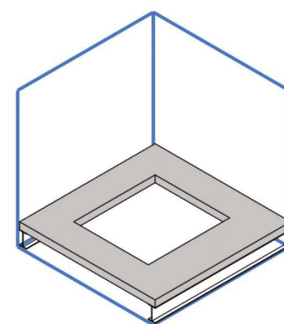
Precast Wall  
with Door



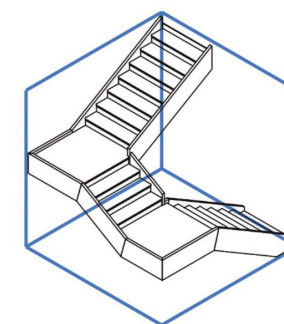
Precast Slab



Precast Slab  
with Railing



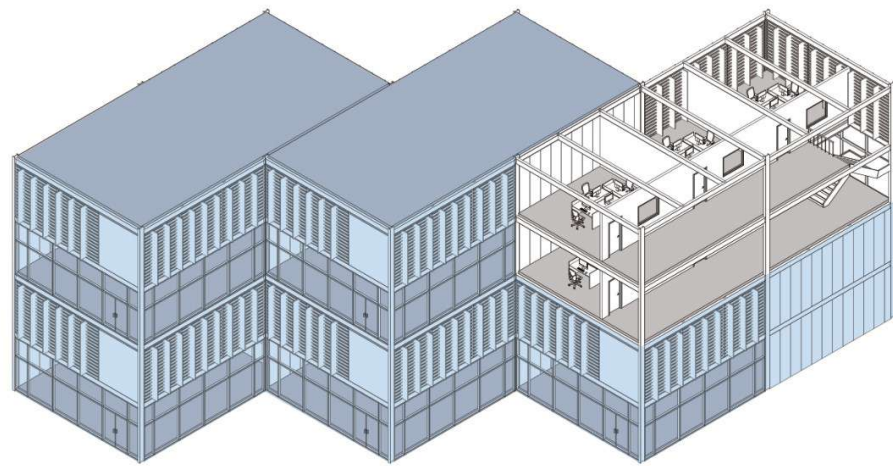
Precast Slab  
with Opening



Steel  
Staircase



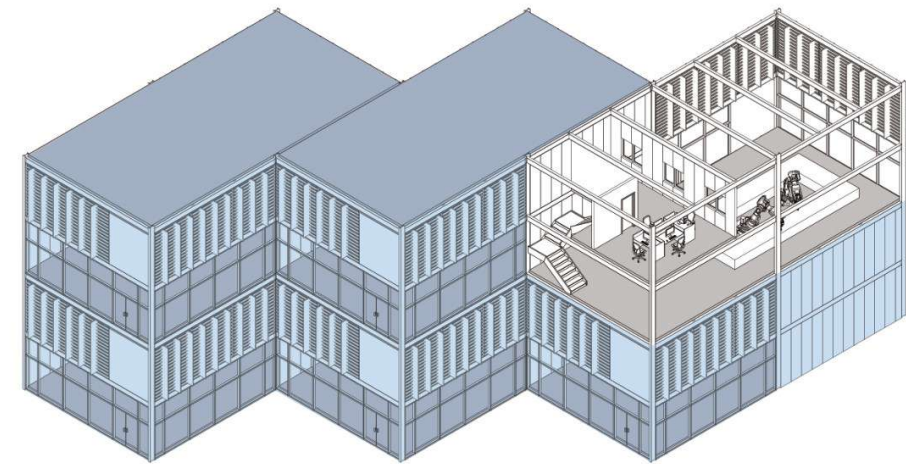
## Modular Possibility 1



### Startup

The module can be subdivided into 5 to 6 smaller units for startups to join the SMEs industry.

Carpentry Workshop

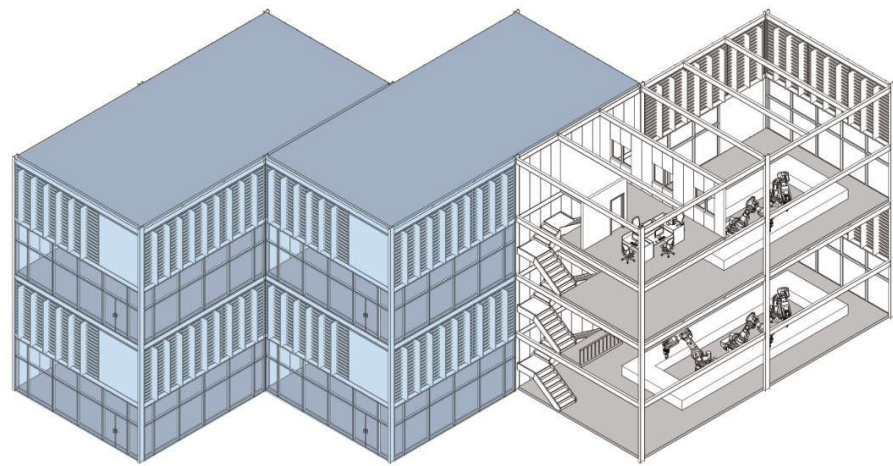


### Carpentry Workshop

This setup is for carpentry that needs a small production space as a workshop and a mezzanine floor for officers.

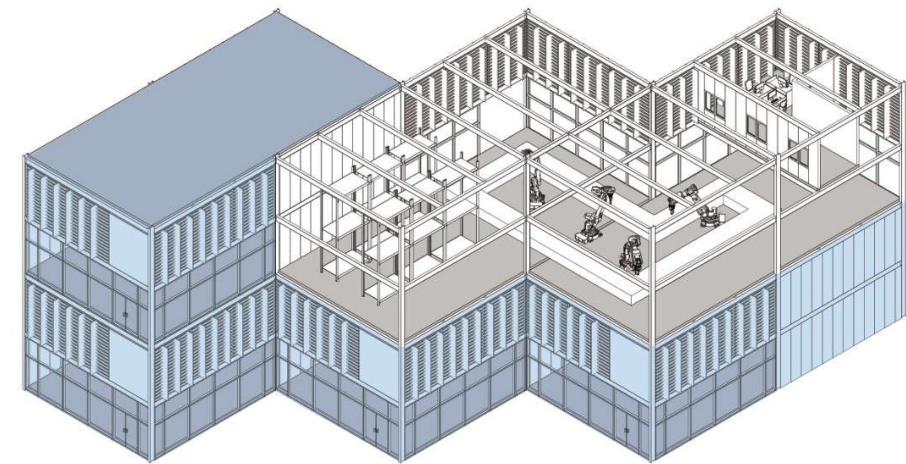


## Modular Possibility 2



### Car Workshop

This setup is for a car workshop at the same time producing their own spare parts for the car. Level 1 is for repairing work, and Level 2 is for production work.

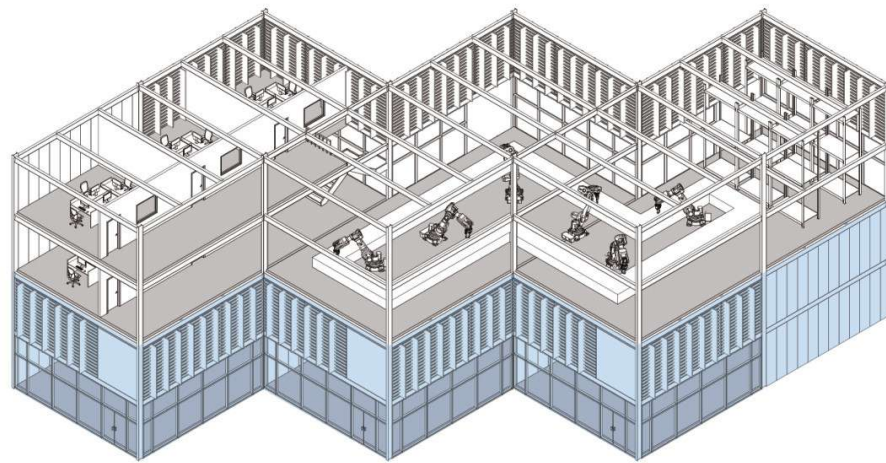


### Furniture Workshop

This setup is for furniture production that requires moderate space for production. At the same time a space to store material and a small office inside the area.

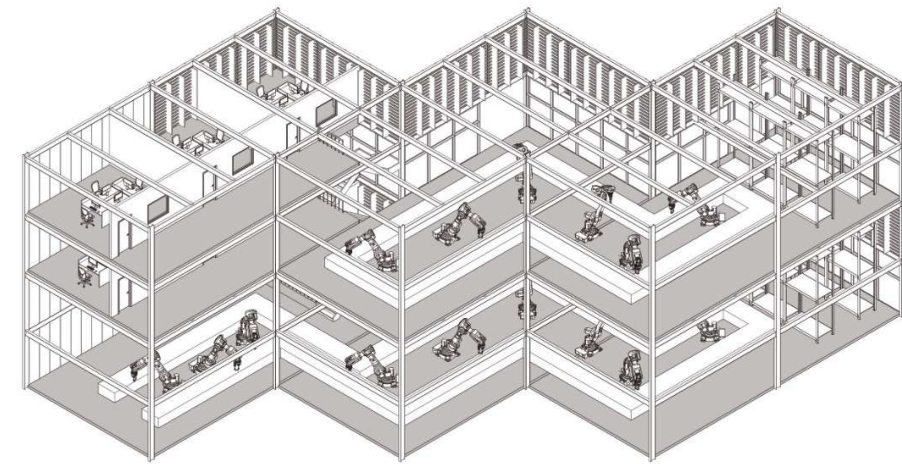


## Modular Possibility 1



### Steel Workshop

This setup is steel production for construction or manufacturing use. It has a larger production area and a bigger office for designing steel work.

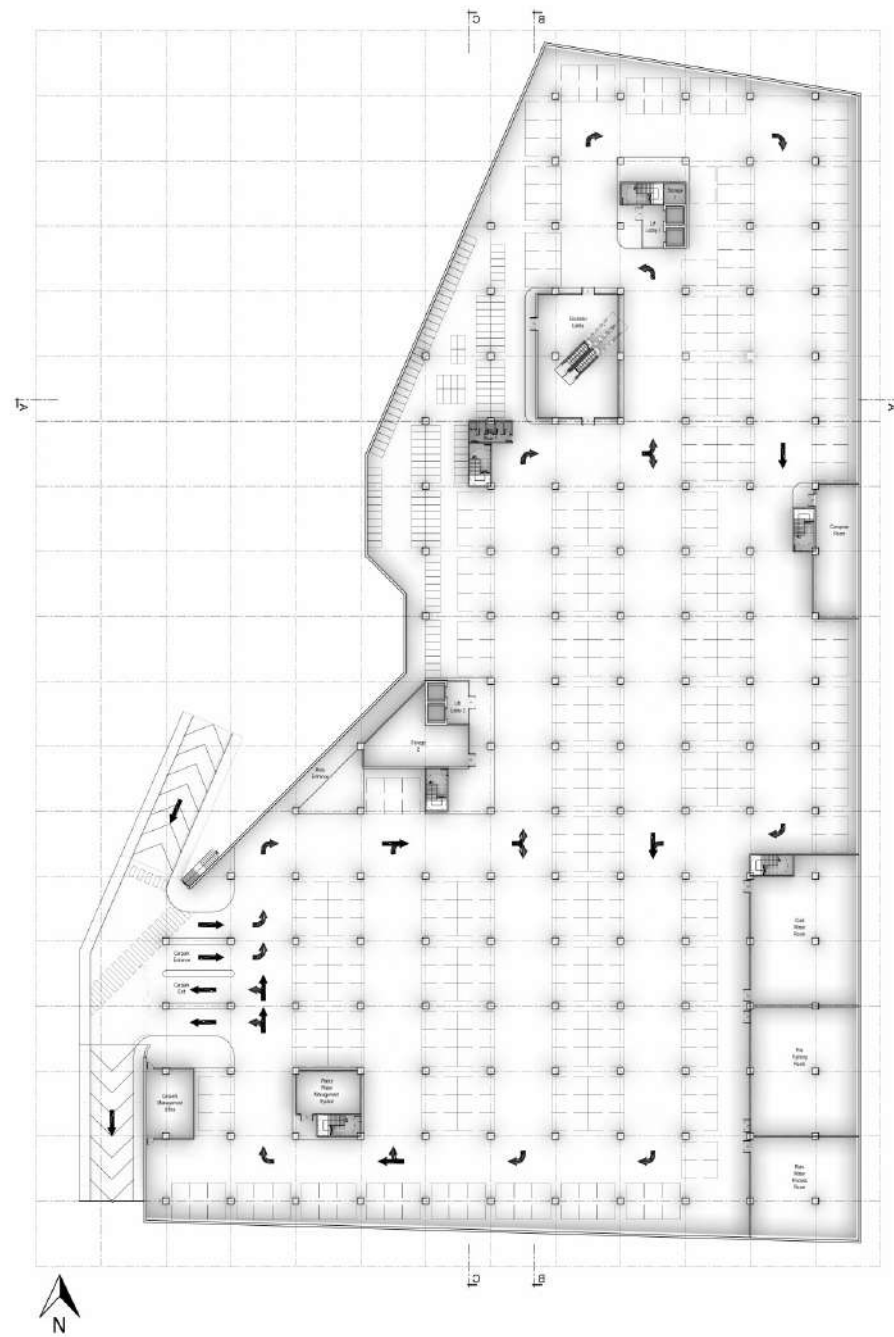


### Machinery Workshop

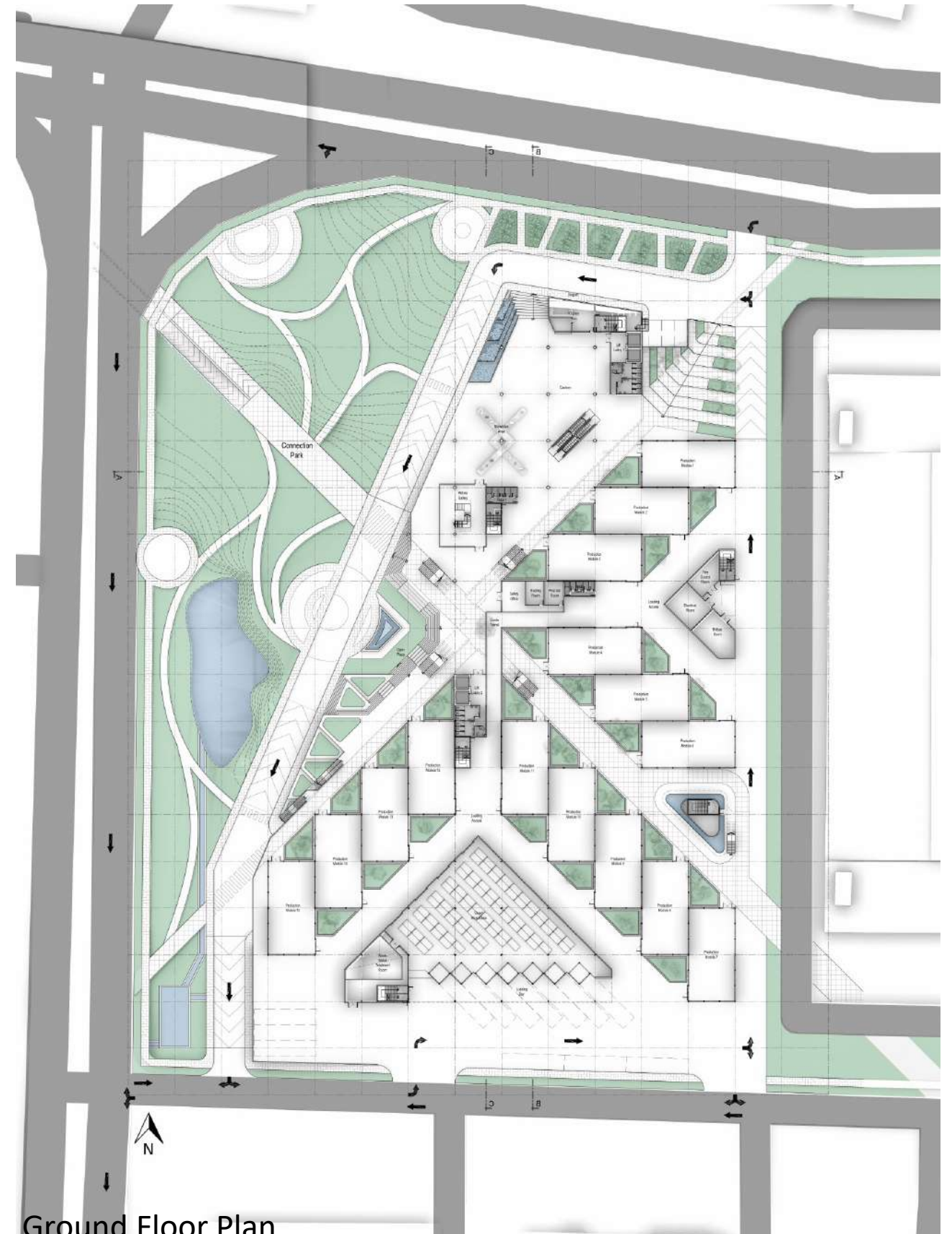
This setup is for machinery part production which requires large space for the manufacturing belt to run through from one floor to another. A large storage space is also provided.



# Floor Plan 1



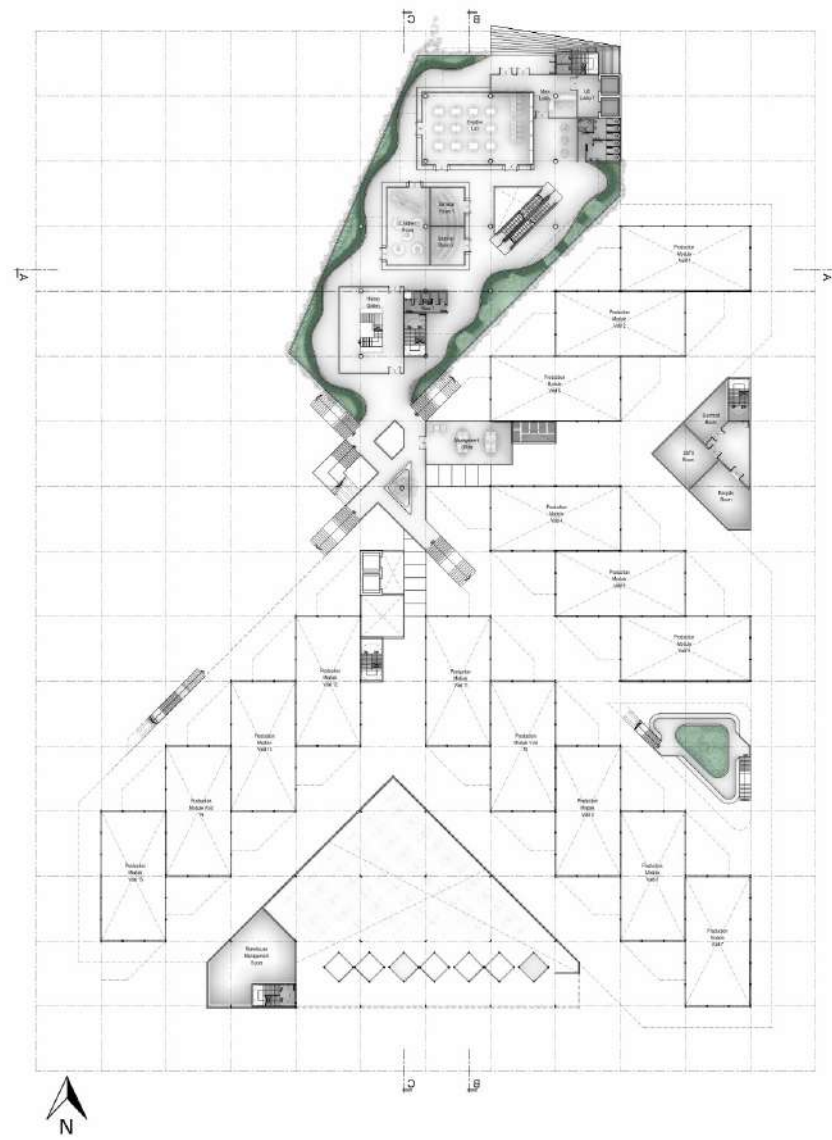
Basement Plan



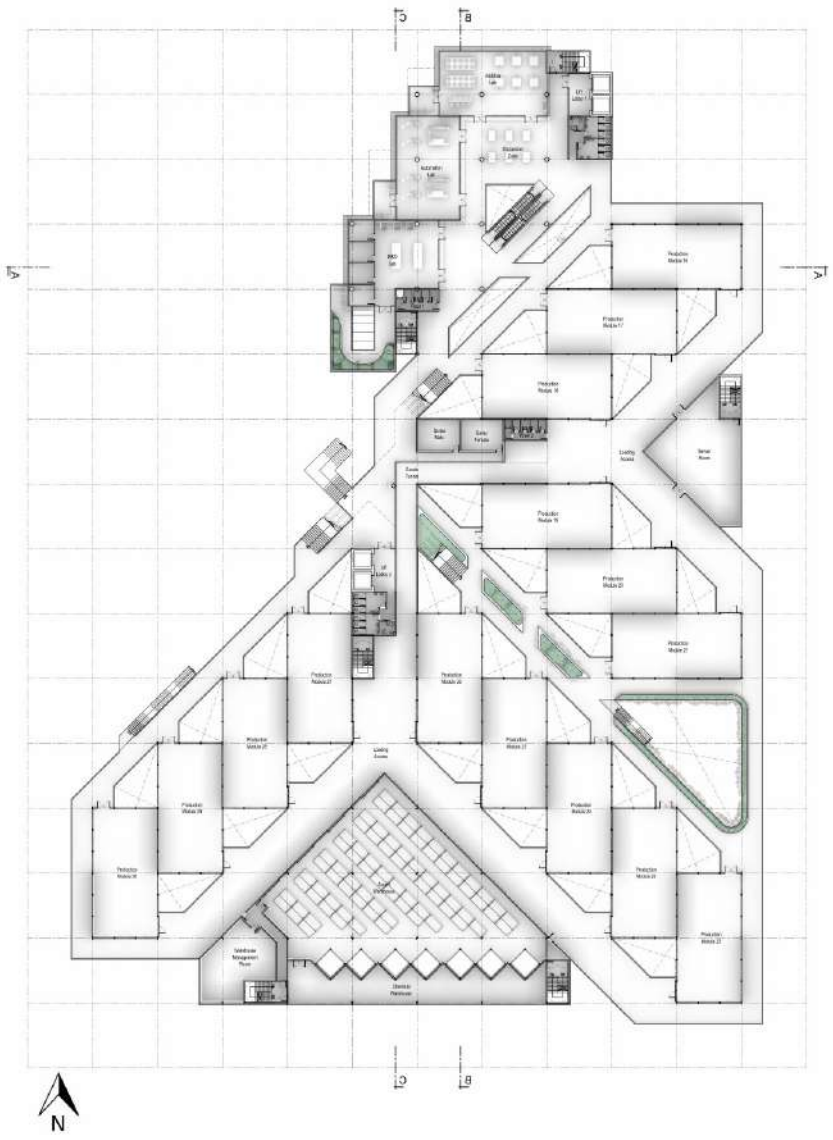
Ground Floor Plan



Floor Plan 2



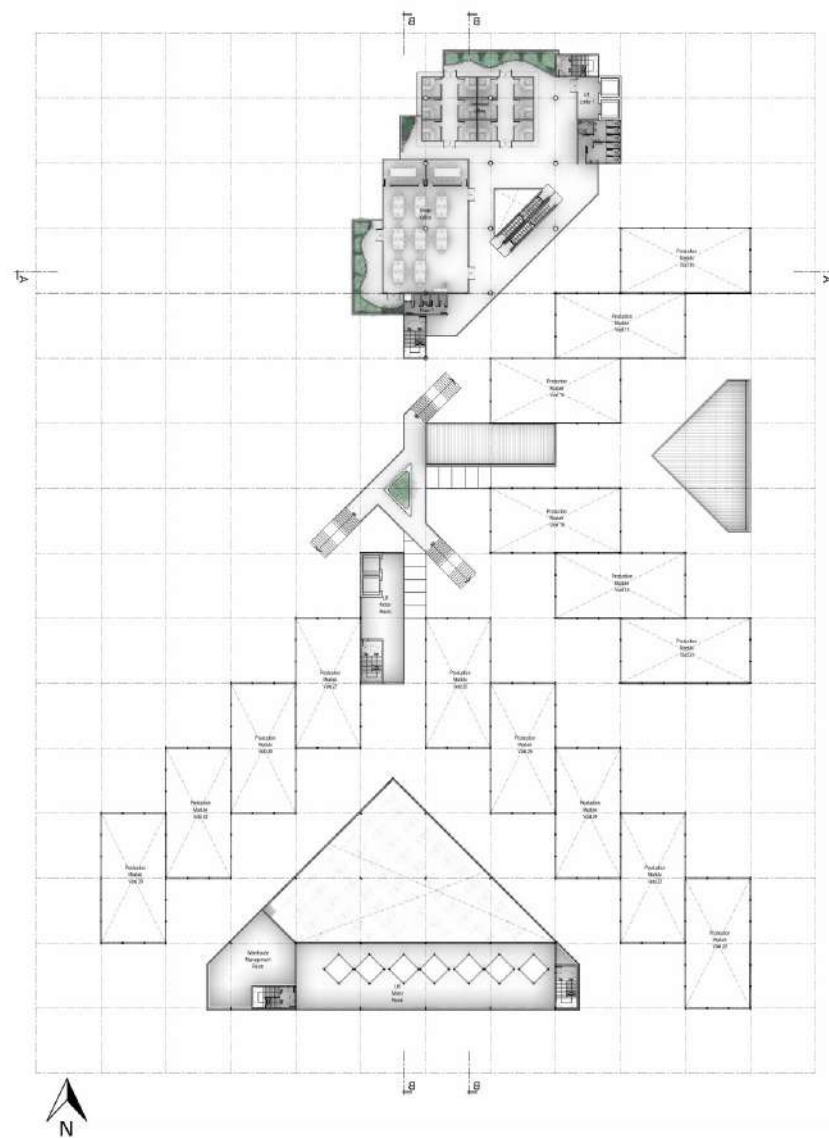
First Floor Plan



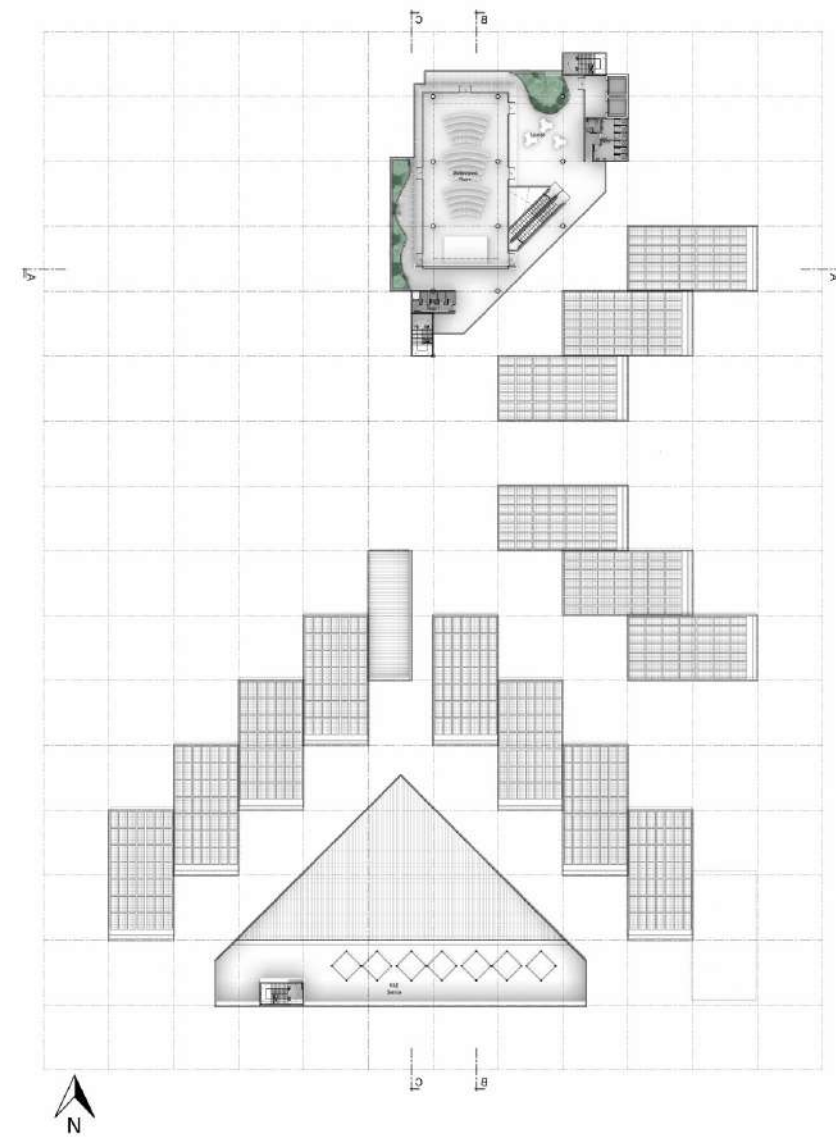
Second Floor Plan



## Floor Plan 3



Third Floor Plan

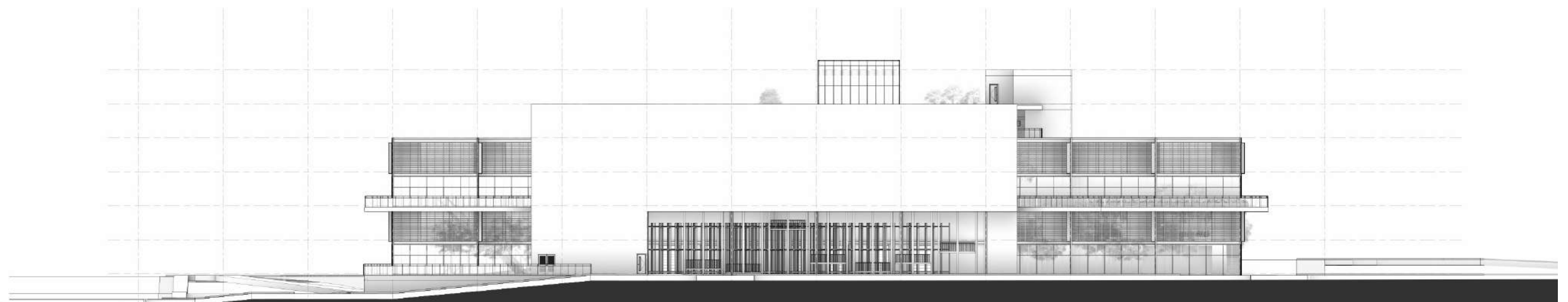


Fourth Floor Plan

## Elevation 1



Front Elevation



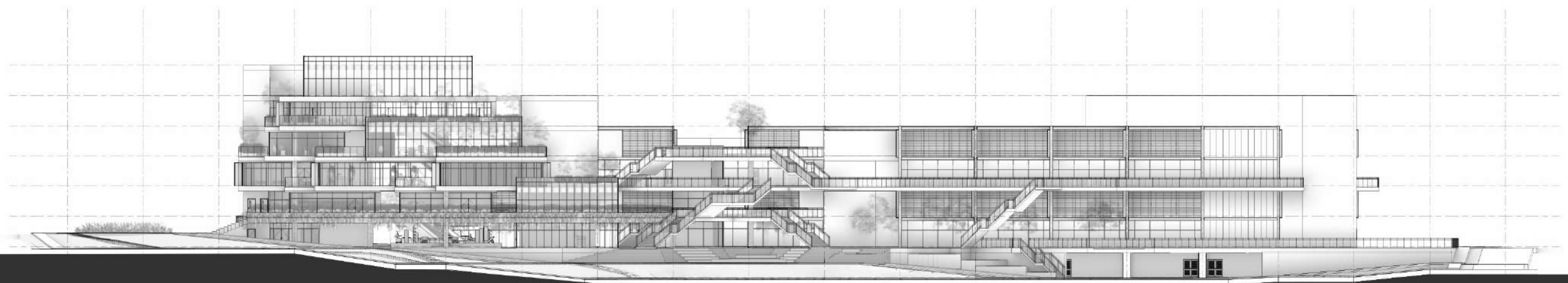
Rear Elevation



## Elevation 2



Left Elevation

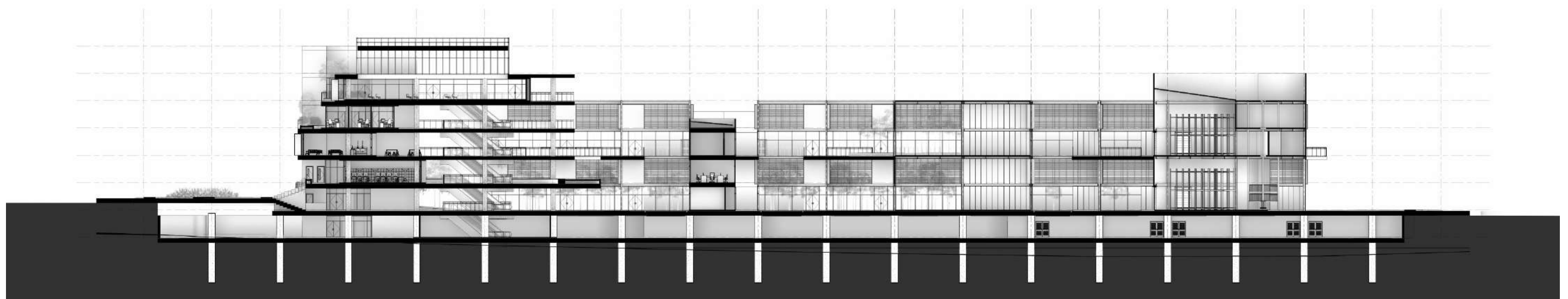


Right Elevation

# Section



Section A-A



Section B-B



# Sectional Perspective



Section C-C



## Perspective 1



Centre Plaza View



Walkway Between Main Building and Production Building View



Main Building Internal View



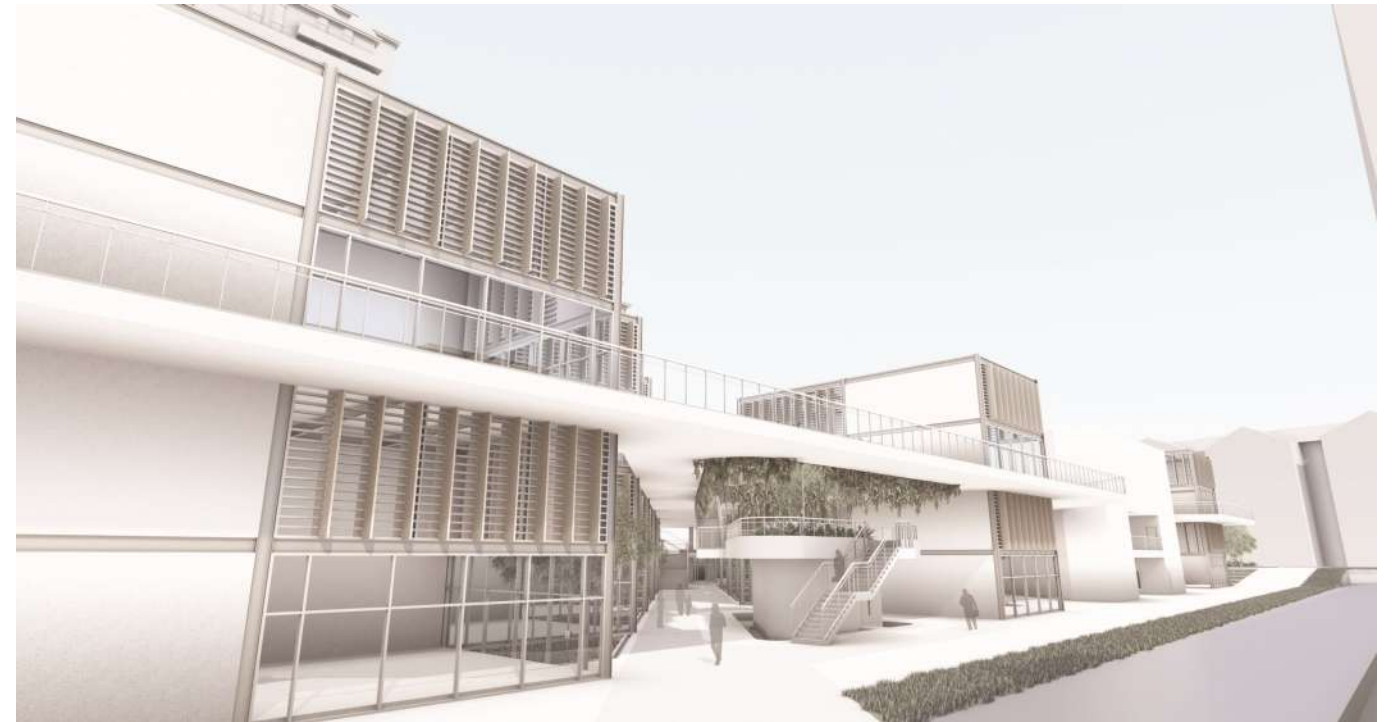
Office Balcony View



## Perspective 2



Walkway Between Production Building View



Centralized Warehouse View

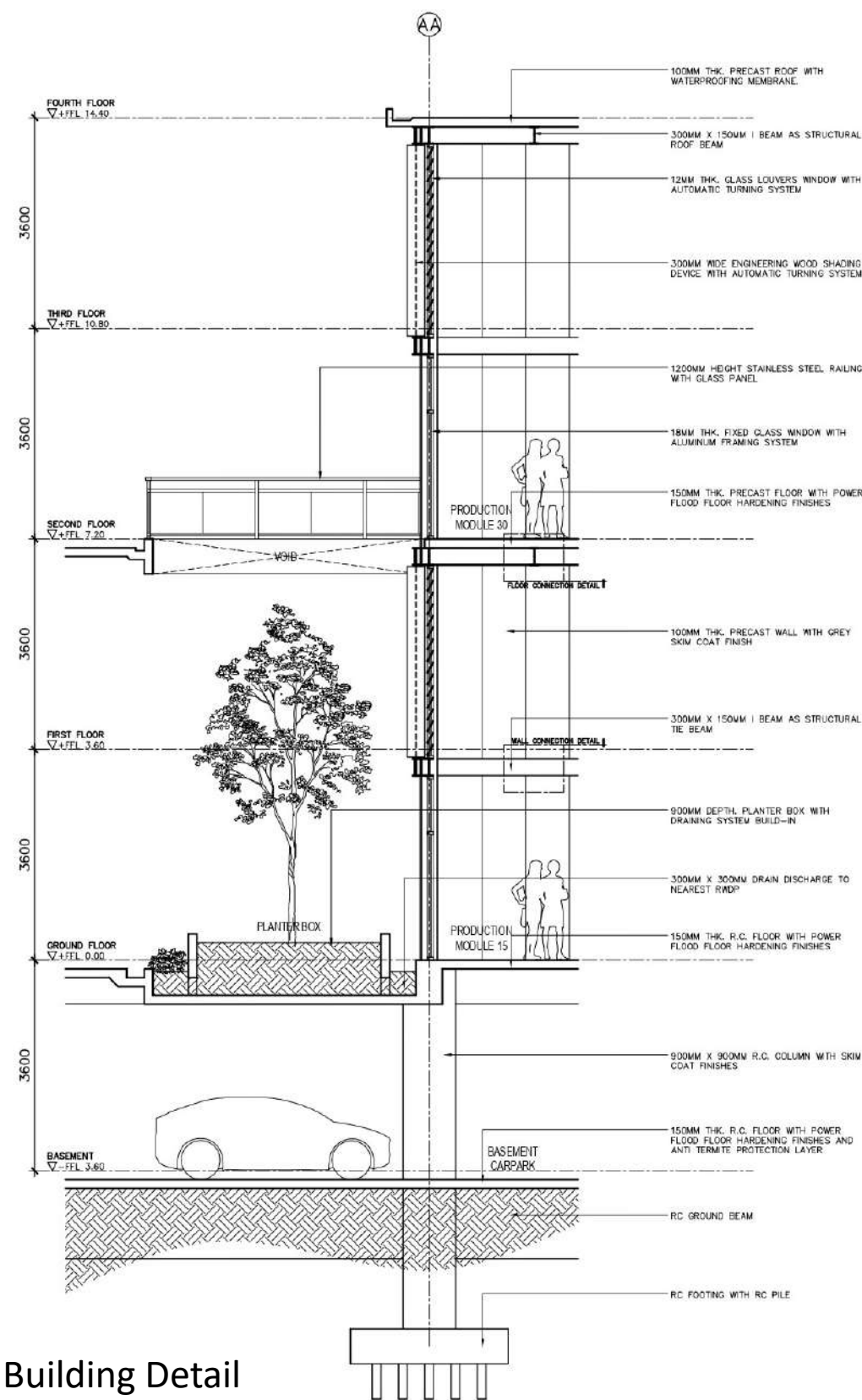


Production Building Service Road View

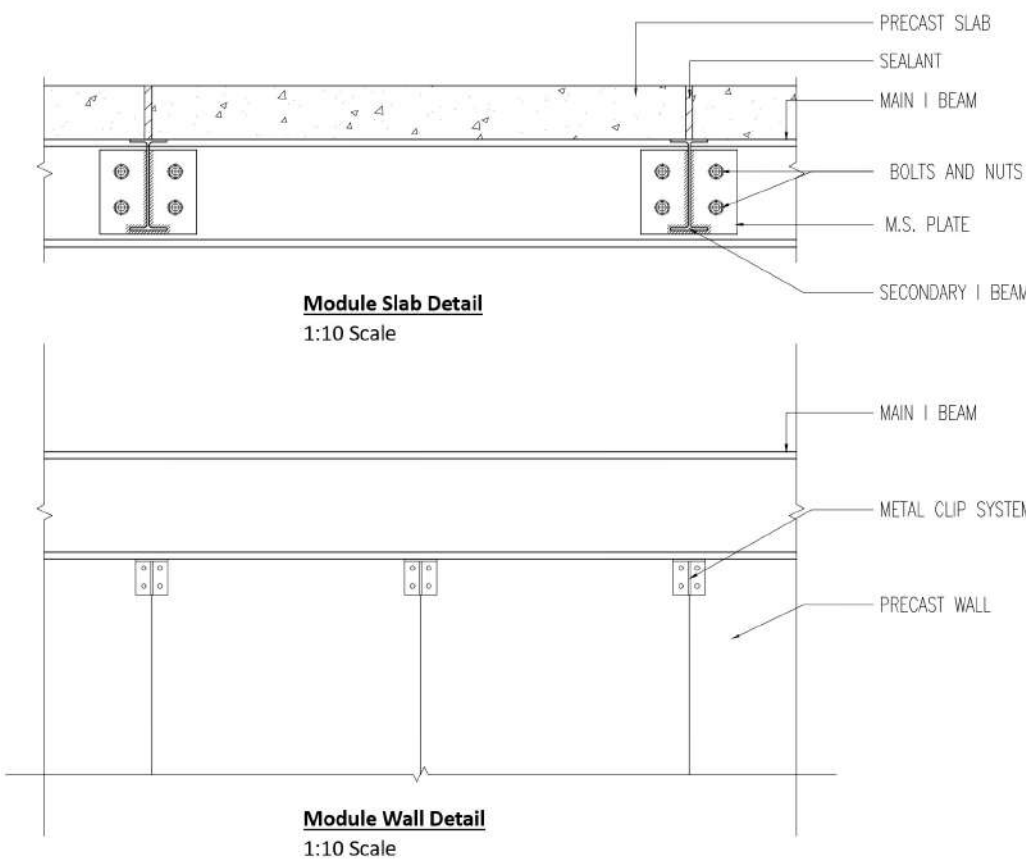


Production Building Internal View

# Building Detail



Production Building Detail





# Development Order Calculation

## A) KELUASANTAPAK

NO LOT	MP	KP	EKAR
LOT833	14656	157755.87	3.622

## B) PENGIRAANNISBAH PLOT& BANIRDINDING

KIRAAN NISBAH PLOT	
NISBAH PLOT =	JUMLAH LUAS LANTAI KASAR (BUILT-UP AREA) KELUASANKAWASAN TAPAK
NISBAH PLOT =	( 11998 MP/ 14656 MP ) 1: 0.82
KIRAAN NISBAH KAWASAN PLINTH (BANIRDINDING)	
BANIRDINDING (PLINTH AREA) - KESELURUHANTAPAK	
BANIRDINDING =	JUMLAH LUAS TANAH YANG DIDIRIKAN BANGUNAN X100%
BANIRDINDING =	( 5322 MP/ 14656 ) 36.31 % (MAKSIMUM 60%) X100%

## C) PENGIRAAN KAWASAN LAPANG

JUMLAH KESELURUHAN KAWASAN LAPANG:	0.918 ( 25.36 % )			
KELUASAN PERIMETER PLANTING	= 900 MP	0.222 EK		
KELUASAN KAWASAN LAPANG/ HIJAU/ LANDSKAP	= 2817 MP	0.696 EK		
KELUASANTAPAK CADANGAN	= 14656 MP	3.622 EK		
PERATUS KAWASAN LAPANG/ HIJAU YANG DIPERLUKAN	= 14656 X	5%	=	732.8
PERATUS KAWASAN LAPANG/ HIJAU YANG DISEDIAKAN	= 3717 /	14656 X100	=	25.36163

## D) PENGIRAAN RUANG KANTIN / PANTRI

RUANG KANTIN/ PANTRI:	245			
2% KELUASAN DARI LUAS LANTAI KILANG/ PEJABAT	=	8840		
KELUASAN LANTAI KASAR KILANG/ PEJABAT	=	8840 X	2 %	= 176.8
0.5% KELUASAN DARI LUAS LANTAI GUDANG	=	3158		
KELUASAN LANTAI KASAR GUDANG	=	3158 X	0.5 %	= 15.79
KELUASAN PANTRI YANG DIPERLUKAN	=	176.8 +	15.79	= 192.59
JUMLAH KELUASAN PANTRI YANG DIPERLUKAN	=	245		
JUMLAH KULUASAN PANTRI YANG DISEDIAKAN	=			

## E) JADUAL PENGIRAAN LUAS KASAR (GFA)

TINGKAT	JUMLAH MP	KP
TINGKAT BAWAH	5322	57285.53
TINGKAT ATAS	6676	71859.87
JUMLAH	11998	129145.4

## F) JADUAL PERINCIAN KELUASAN LANTAI KASAR

TINGKAT BAWAH	KELUASAN
KILANG	2617
GUDANG	1175
PEJABAT	1530
JUMLAH KESELURUHAN	5322

TINGKAT ATAS	
KILANG	2710
GUDANG	1983
PEJABAT	1983
JUMLAH KESELURUHAN	6676

PERBEZZAZONE	JUMLAH
KILANG	5327
GUDANG	3158
PEJABAT	3513
JUMLAH	11998

G) PENGIRAAN PENYEDIAAN RUANG SOLAT/ MUSOLLAH	
RUANG SOLAT/ MUSOLLAH :	9 MP (LELAKI) 9 MP (PEREMPUAN)
KELUASAN RUANG SOLAT LELAKI DENGAN TEMPAT MENGAMBIL WUDHUK	
=	3.95 M X 3.675 M = 14.52
KELUASAN RUANG SOLAT PEREMPUAN DENGAN TEMPAT MENGAMBIL WUDHUK	
=	3.925 M X 3.675 M = 14.42

## H) PENGIRAAN TEMPAT LETAK KENDERAAN GARISPANDUAN

TEMPAT LETAK KERETA							
KILANG	1 TLK	:	92.9 MP	RUANG LANTAI KASAF	+	10 %	PELAWAT
BIASA	=	5327 /	92.9 *	=	57.34123		
PELAWAT	=	57.341227 X	10 %	=	5.734123		
DIPERLUKAN	=	57.341227 +	5.734123	=	63.07535		
DISEDIAKAN	=	115					
PEJABAT	1 TLK	:	46.4 MP	RUANG LANTAI KASAF	+	10 %	PELAWAT
BIASA	=	3513 /	46.4 *	=	75.71121		
PELAWAT	=	75.711207 X	10 %	=	7.571121		
DIPERLUKAN	=	75.711207 +	7.571121	=	83.28233		
DISEDIAKAN	=	110					
GUDANG	1 TLK	:	232.2 MP	RUANG LANTAI KASAF	+	10 %	PELAWAT
BIASA	=	3158 /	232.2 *	=	13.60034		
PELAWAT	=	13.600345 X	10 %	=	1.360034		
DIPERLUKAN	=	13.600345 +	1.360034	=	14.96038		
DISEDIAKAN	=	20					
JUMLAH DIPERLUKAN	=	63.07535 +	83.28233 +	14.96038 =	161.3181		
JUMLAH DISEDIAKAN	=	115 +	110 +	20 =	245		
TEMPAT LETAK MOTOSIKAL							
JUMLAH	1 TLM	:	185.8 MP	RUANG LANTAI KASAF			
DIPERLUKAN	=	11998 /	185.8 *	=	64.57481		
DISEDIAKAN	=	148					
TEMPAT LETAK LORI							
JUMLAH	1 TLL	:	929.9 MP	RUANG LANTAI KASAF			
DIPERLUKAN	=	11998 /	929.9 *	=	12.90246		
DISEDIAKAN	=	13					

PERATUS LUAS LANTAI PEJABAT BERBANDING LUAS LANTAI KESELURUHAN				
PERATUS LUAS LANTAI PEJABAT BERBANDING LUAS LANTAI KESELURUHAN	=	RUANG LANTAI PERJABAT		
	=	JUMLAH LUAS LANTAI KASAR		
	=	( 3513 MP/ 11998 )		X100%
		29.27988 % (MAKSIMUM 30%)		

	Office	Production	Warehouse	Carpark
GF	1530	2617	1175	12151
1F	570	93	311	
2F	538	2617	1175	
3F	449	0	497	
4F	426	0	0	
=	1983	2710	1983	

# Fire Fighting Diagram

## Occupant Load and Capacity of Exits Calculation

The occupant load is designed according to Seventh Schedule Calculation of Occupant Load and Capacity Exits in UBBL.

### Factory Calculation

Building Function: Factory

Building Gross Area: 4330 m<sup>2</sup>

Building Occupant Load per square meter: 1.5Gross

Building Occupant Load:  $4330 / 10 = 433$

Capacity of Exit: 60 per unit

Exit Width Required:  $433/60 = 7.2\text{unit}$

Total Exit Width Required:  $7.2 \times 550\text{mm} = 3960\text{mm}$

Total Number of Staircase: 9

Redundancy Calculation:  $9 - 1 = 8$

Minimum Width per Staircase:  $3960\text{mm} / 8 = 495\text{mm}$  (Minimum 8 Units = 1100mm)

Therefore, minimum width of residential staircase is 1100mm.

Staircase Provided = 9unit x 1500mm width

**Legend**  
Fire Staircase  
Escape Route



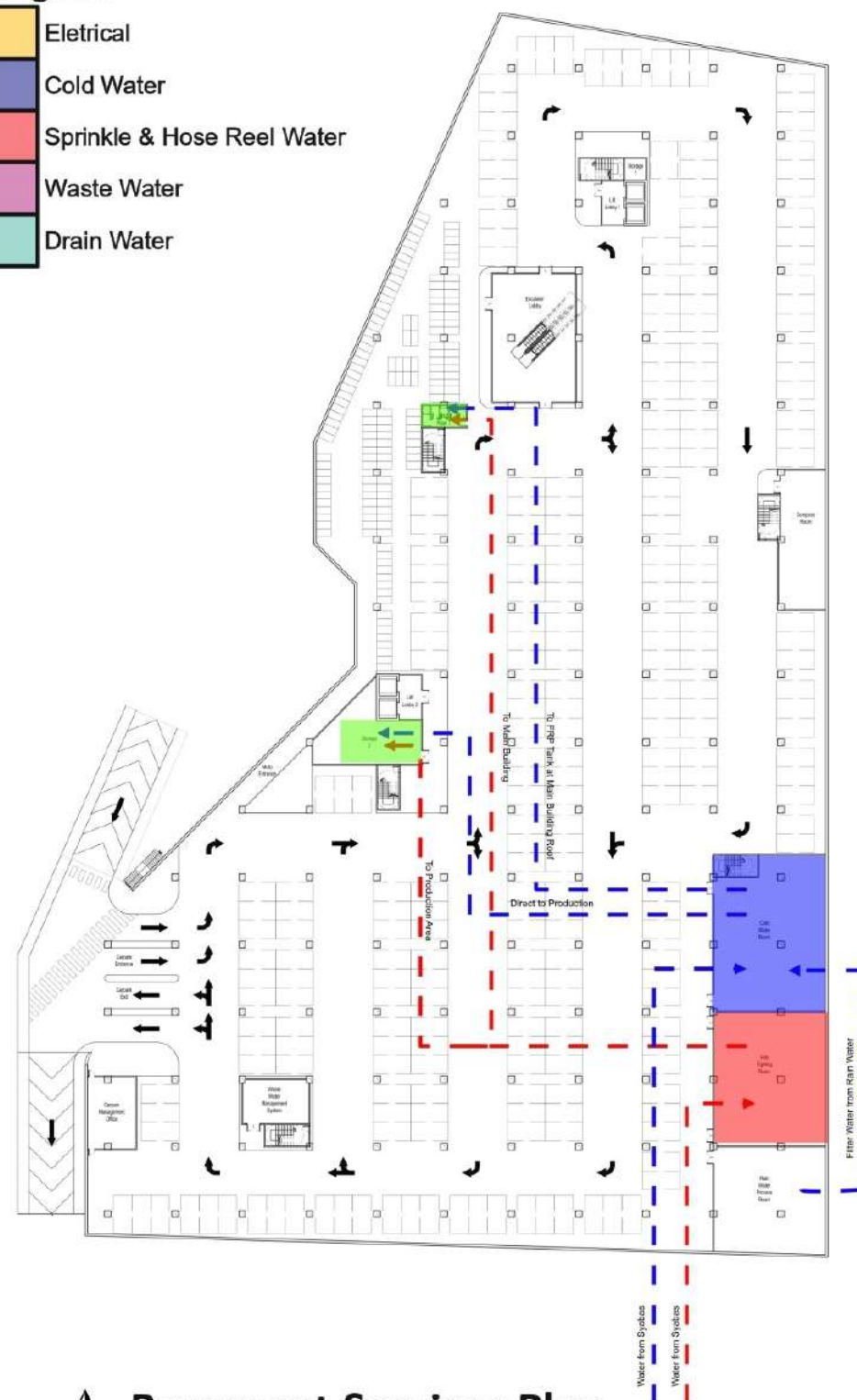
**Second Floor Bomba Plan**  
N.T.S Scale



# Building Services Diagram

## Legend

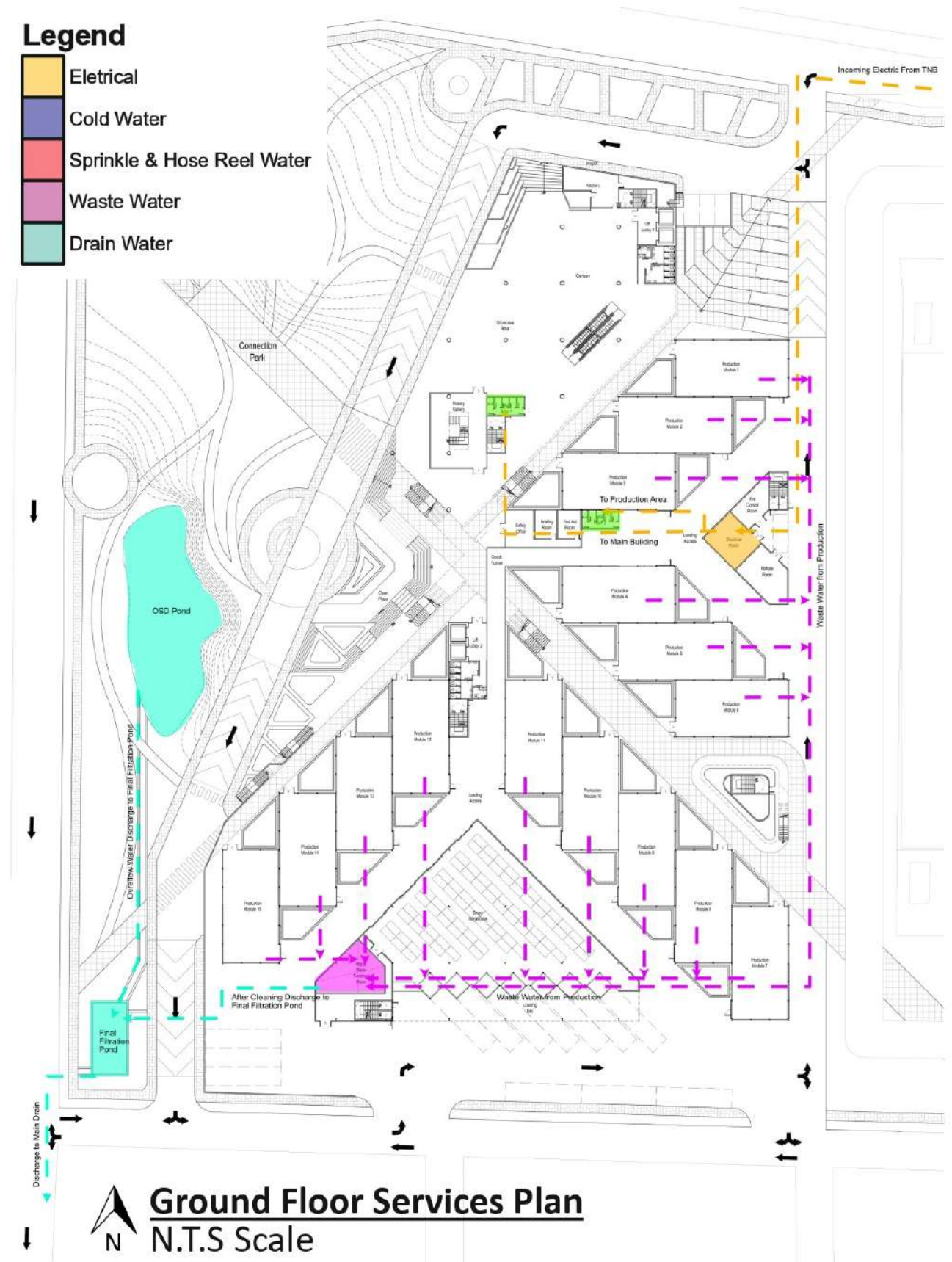
- Electrical
- Cold Water
- Sprinkle & Hose Reel Water
- Waste Water
- Drain Water



**Basement Services Plan**  
N.T.S Scale

## Legend

- Electrical
- Cold Water
- Sprinkle & Hose Reel Water
- Waste Water
- Drain Water



**Ground Floor Services Plan**  
N.T.S Scale

