

Renovation of Water-related City Border

The TMC Green Transfer

STUDIO: Delta Intervention Studio P5

NAME: Qian Li

NUMBER: 4329783

TUTORS: Kristel Albers Koen Muler

Board Examiner: Peter Barendse

22/06/2015



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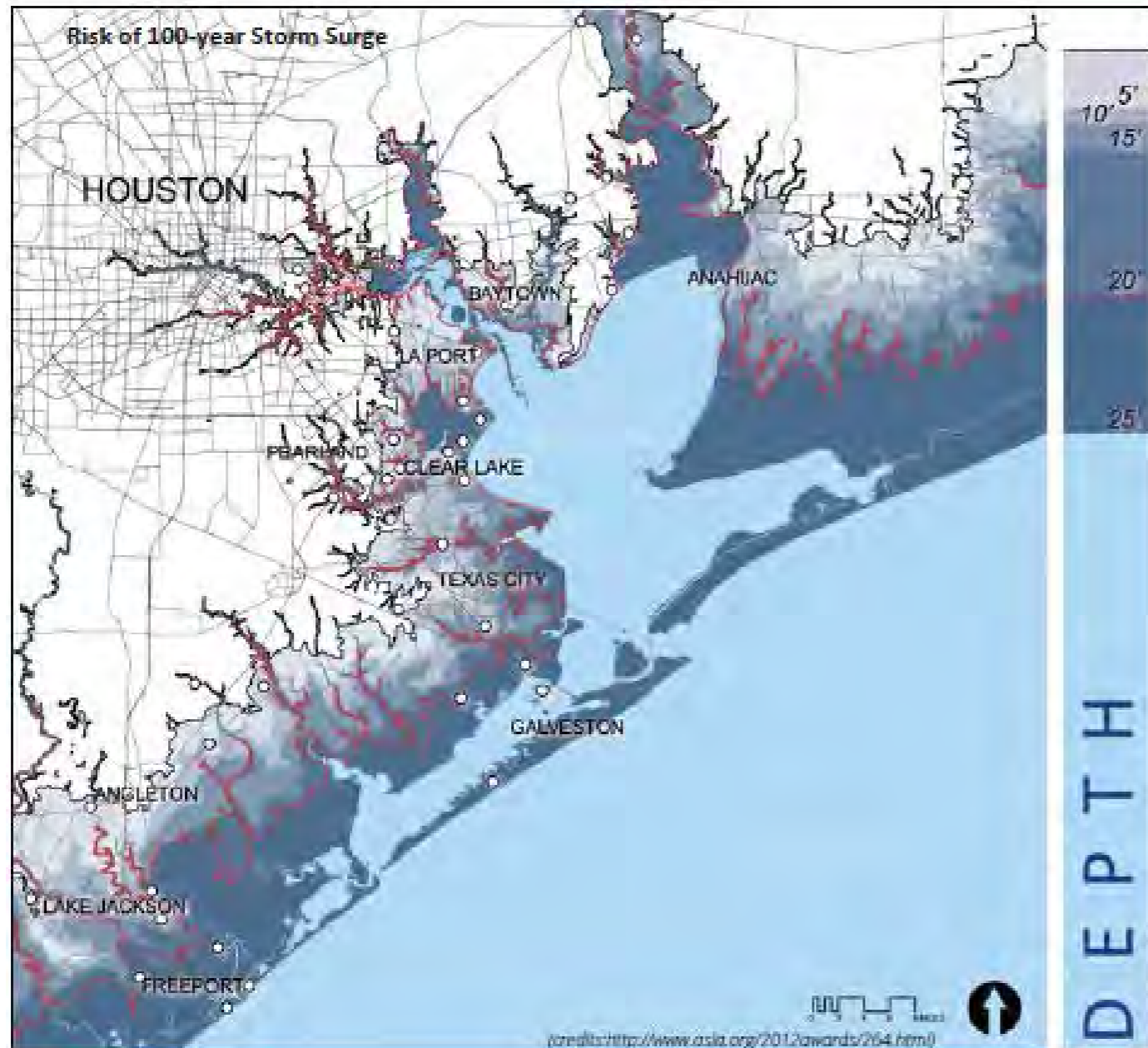
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Part 1 The research for Houston

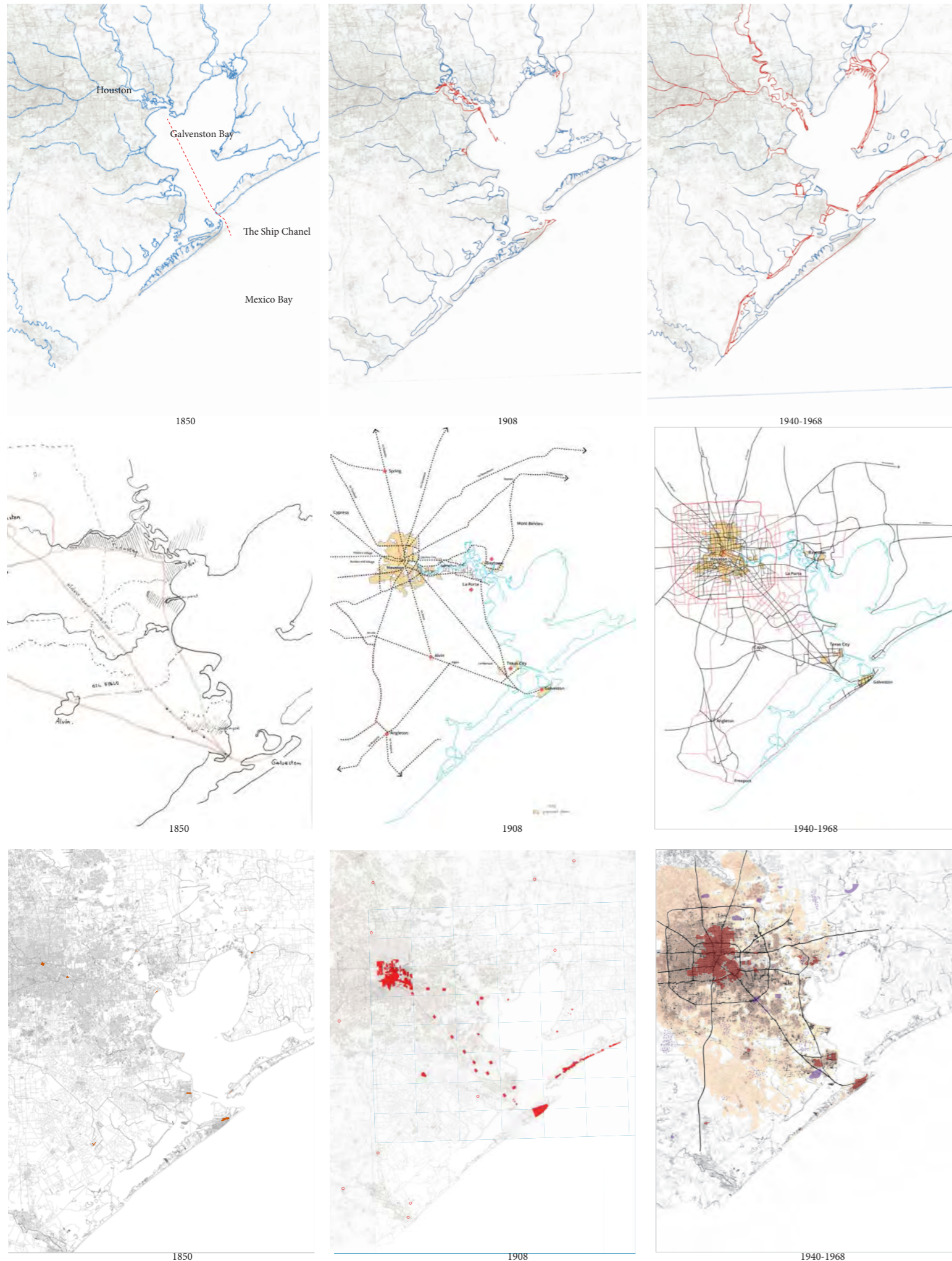
1.1 Introduction

The Delta Intervention Studio Deals with the practical problem of the water-related architecture design and urban planning. It's a combination of architecture, civil engineering and management which provide practical reference for the real project in Houston. Due to a changing climate and changing insights concerning sustainable relations between cities and water-landscapes, new interventions will be needed to create a new urban delta-landscape. The task of an architect in this studio is to develop an architectural object in such a waterscape.

The left map shows the flood risk of Houston and Galveston area within the 100-year storm surge. The areas along Galveston Bay and some rivers have great risk of inundation. Based on the study of the Rice University, Houston, like Galveston, is also threatened by Flooding because of the sea-level rise. Sea level will pose increased hazards to coastal cities in various ways, especially the magnification of inundating storm surges that accompany hurricanes and other tropical storms. From the map of "Current Rates of Sea-level Rise", the sea-level rises 25 inches per 100 years in Galveston.

The Houston city suffered a lot from the flood and storm. In the hurricane Ike, the Galveston island was almost destroyed.





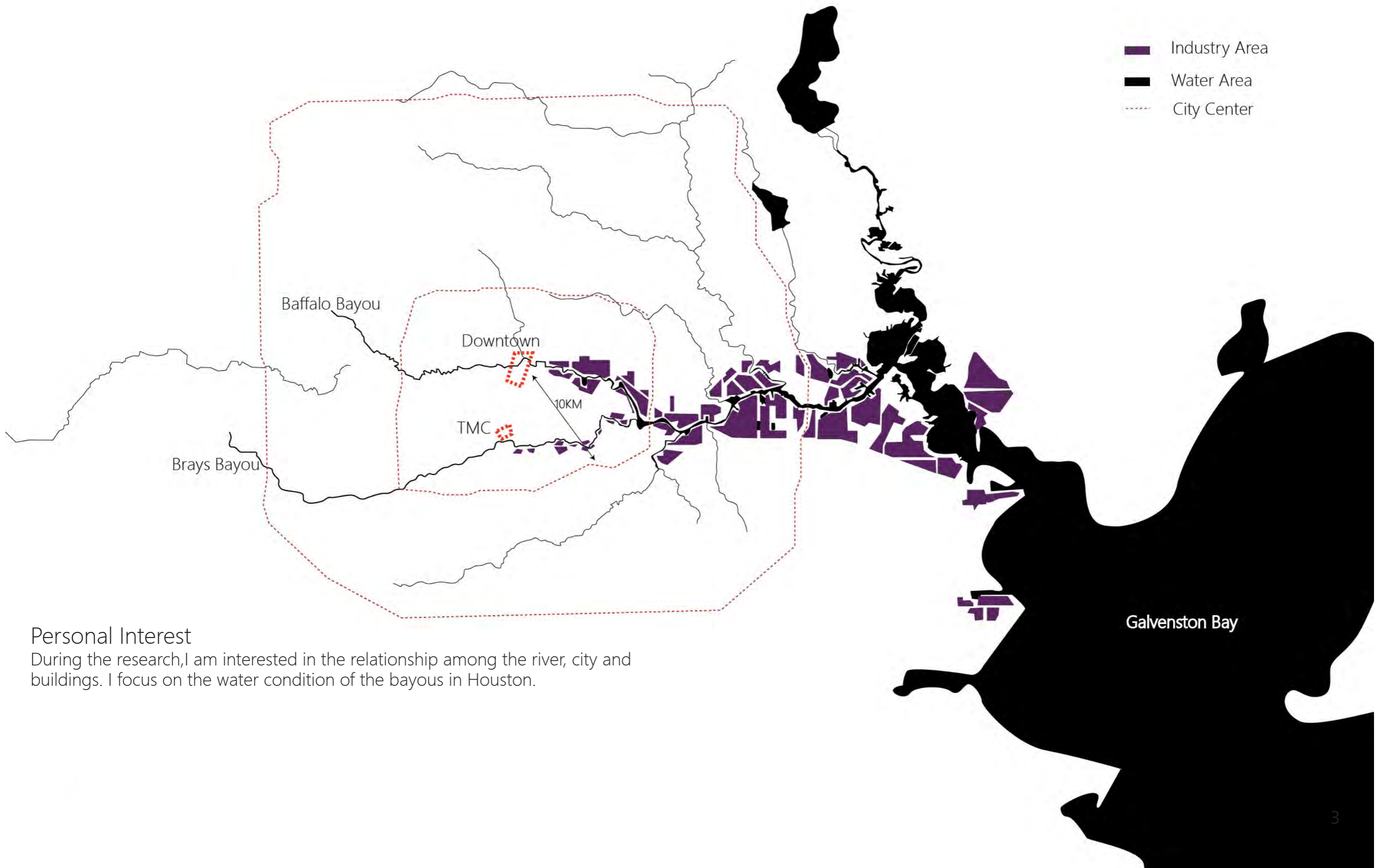
- Coastal line in 1968
- Changes compared to 1940
- Urban area
- Oil field
- Dense urban area
- Roads in 1968
- Roads built 1968- now
- Populated Area in 1968
- Downtown Houston
- Main Infrastructure
- Urban pattern: grid system
- Urban pattern: others

1.2 3X3 Analysis

The pre-analysis of Delta Intervention is undertaken on 3 different layers. First, the water condition. Second, the infrastructure level. Third, the Urban Fabric.

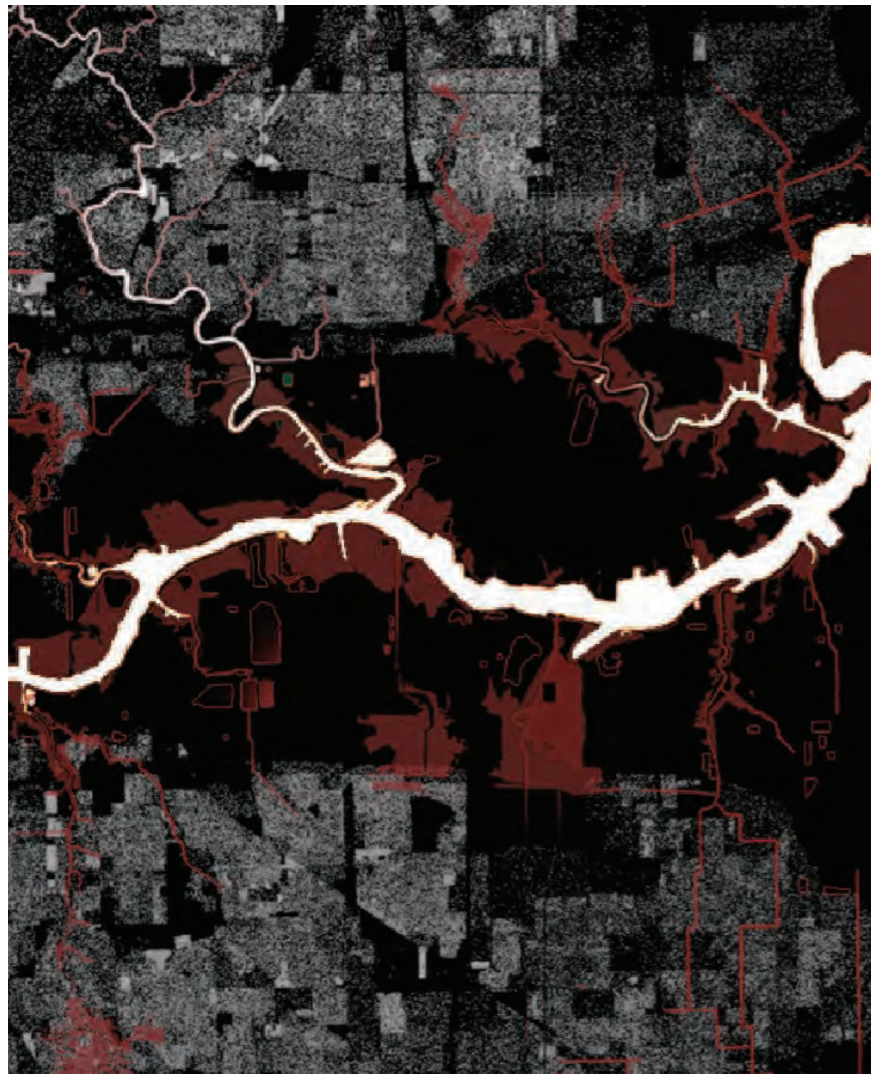
The changes of the Galveston Bay costal line between 1850 and 1968, tell how the development of Houston rely on the water. The industry and shipping contributed a lot to the city, but also changed the water-related condition. Ports, factories, channels are made on the water sides.

The Urban fabric developed around downtown and Galveston Island. Most urban area is far from the bay, but quiet closed to the different Bayous and branches of the rivers.



Personal Interest

During the research, I am interested in the relationship among the river, city and buildings. I focus on the water condition of the bayous in Houston.



■ Flood Control Area

■ Living Area



City, Bayou and Flood

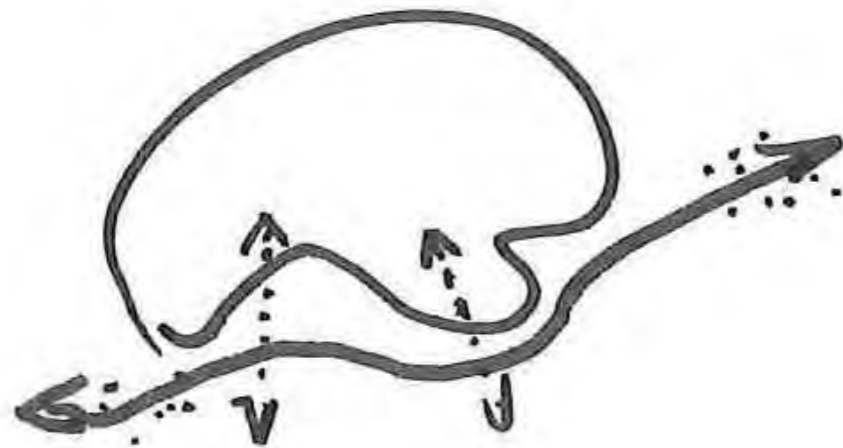
I found the missing link between the inner city and the water area. Some factories and ports located along the bayou separate the waterfront and the community. The green space near the water is in lack of connection and well organization. Also the conflict between the flood defense and the public waterfront reminds me to consider flood defense technology in my architecture design. It is hard for the people to benefit from the waterfront.



How to renovate the water-related city border into better public waterfront with strong link to the inner city, as well as promoting the flood safety ?

1.3 Research Question

How to renovate the water-related city border into better public waterfront with strong link to the inner city, as well as promoting the flood safety ?

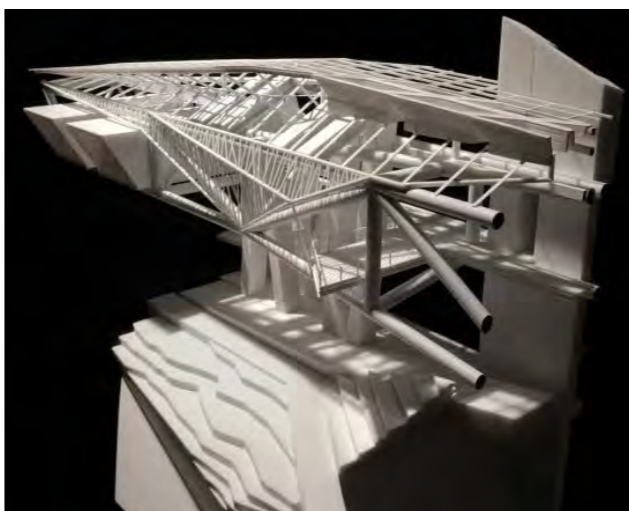
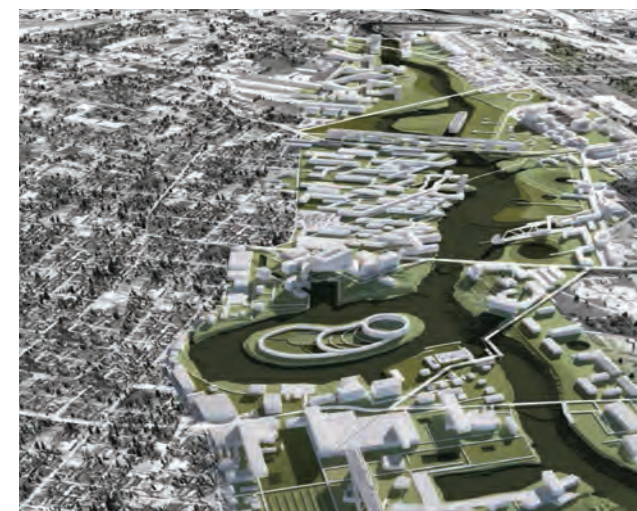




URBAN

LANDSCAPE

ARCHITECTURE



1.4 Research Method

The research method is to define the question in three levels: the city level, landscape level and the architecture level.

As an architecture student, the design will mainly focus on the building, including the structure, material, interior, climate strategy. In order to answer the research question, and to make a continuous logic for this whole design part. The urban planning and landscape for a larger area is also been developed. But the urban design will not go into a lot of detail or too large. It will mainly help to define the architecture project and to show the whole concept of the research.

Part 2 Project Defination



2.1 TMC

I choose the watersides of the Texas Medical Centre along Brays bayou to be the site.

The TMC is consisted of 4 parts in planning. Now, only the Main Campus is finished. The Rice University is just beside the Main Campus.

The Texas Medical Centre Located besides the Brays Bayou, 6 km from the Houston Downtown. The only metro connect them. It is a trend that the city center will expand along the line. The Midtown and museum district are between them.



Programme in Site

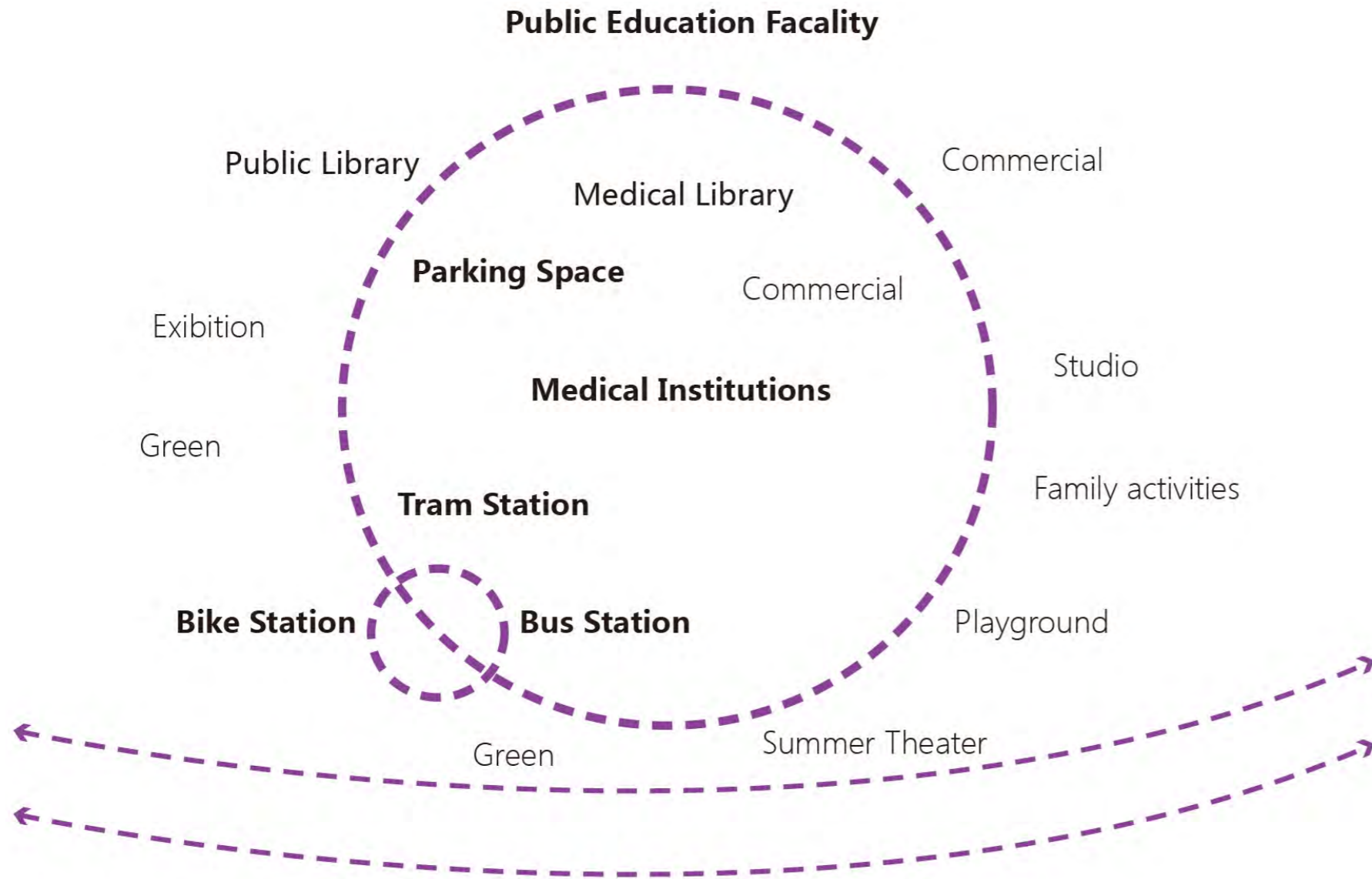
In the visit to TMC, I noticed that the waterfront had great potential to be better and cleaner public space, as it is so closed to the TMC Transfer Centre and the inner green park. It also can be a connection between the Herman Park and the community in the west in a larger scale.



- | | |
|--|---|
| Rice University | Medical Institutions |
| Community | Commercial |
| Buildings | Parking Lot |
| Green Park | Power Station |
| | Green Park |

Programme missed

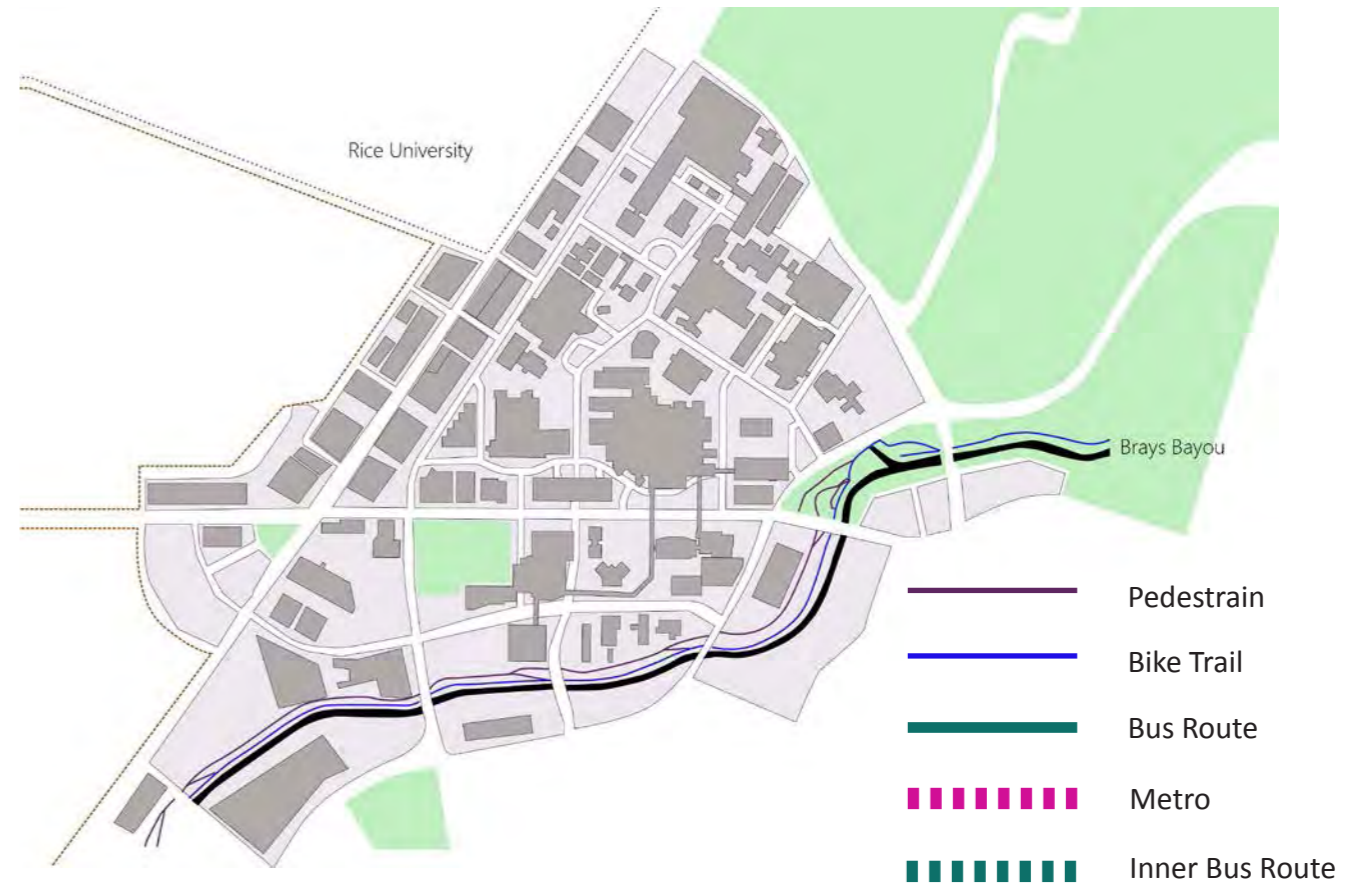
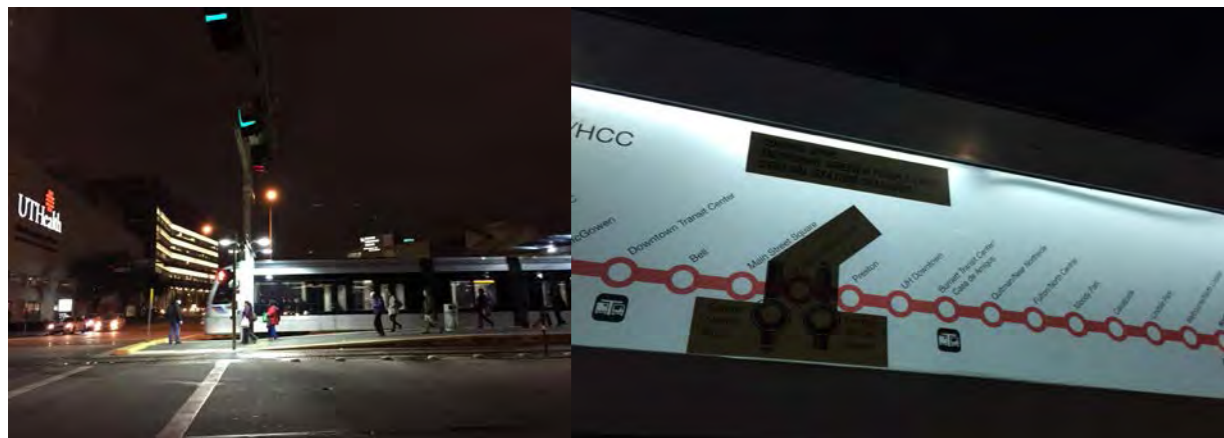
The most institutions in TMC is not open to the public. A public education centre is in need for the whole TMC and the district near it.





Public Transportation

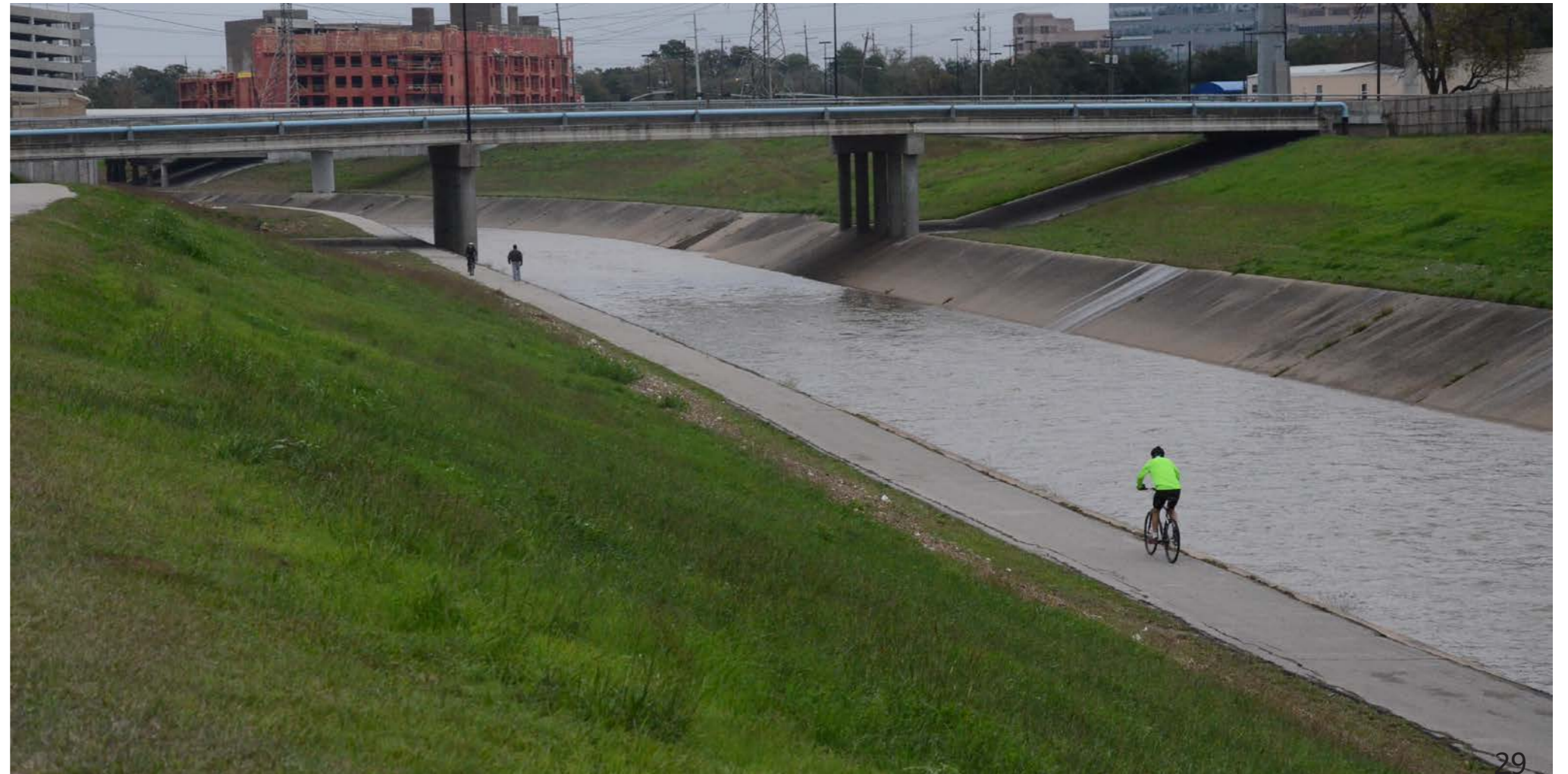
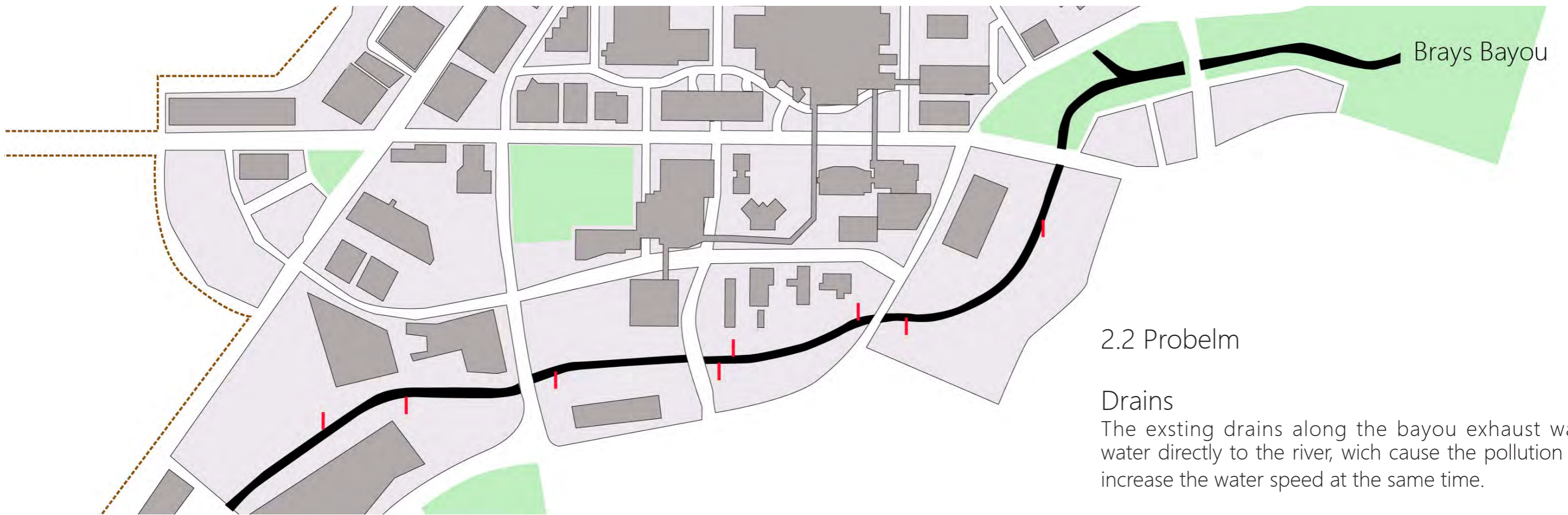
The Metro connect the Downtown and TMC. It takes only 10mins. The Bus shuttle system also have a transfer centre there.

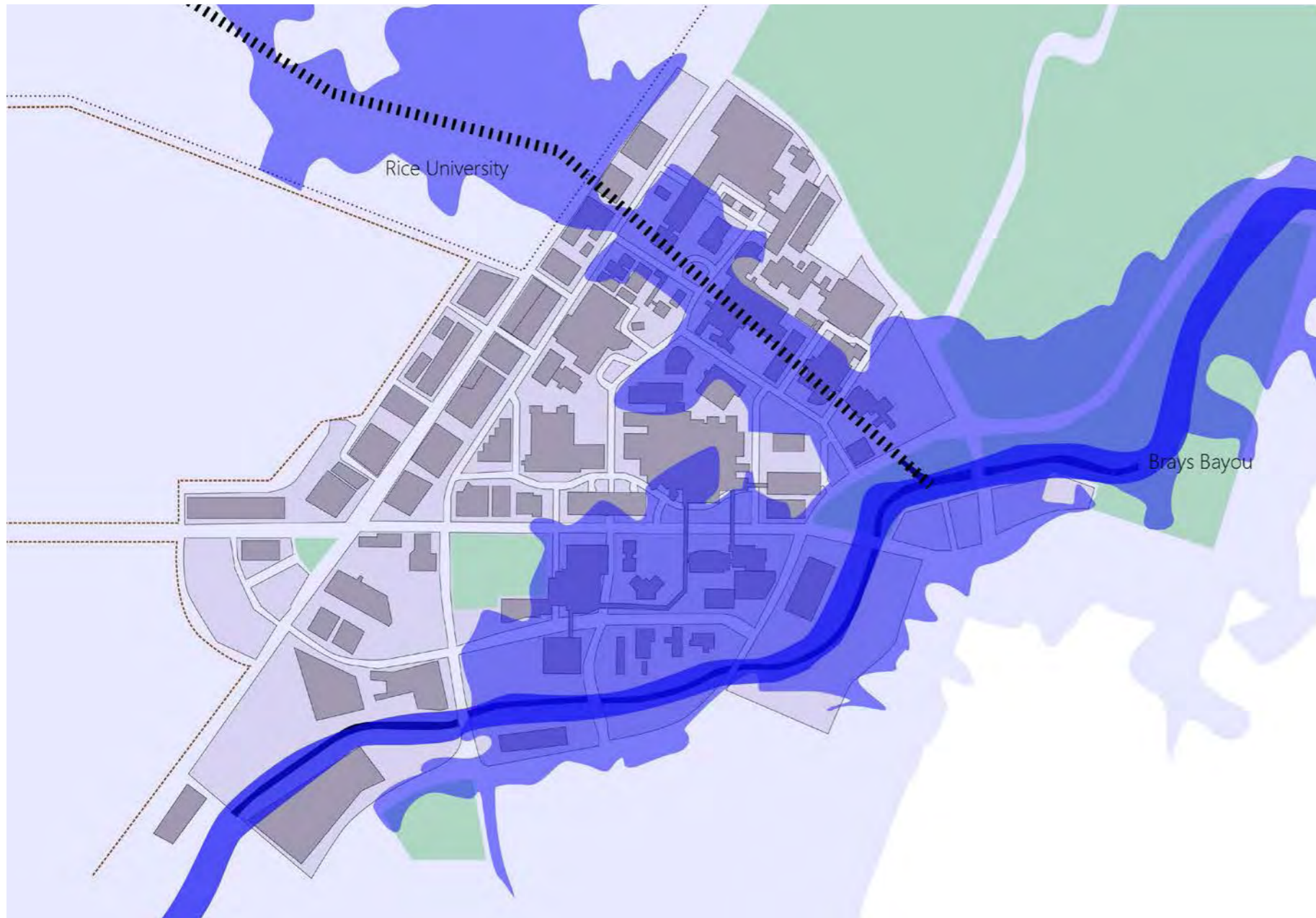


Pedestrian and Bike Trail

The pedestrian and bike trail seems popular for the people in the community. But the environment seems not so good. Waste can be found everywhere.







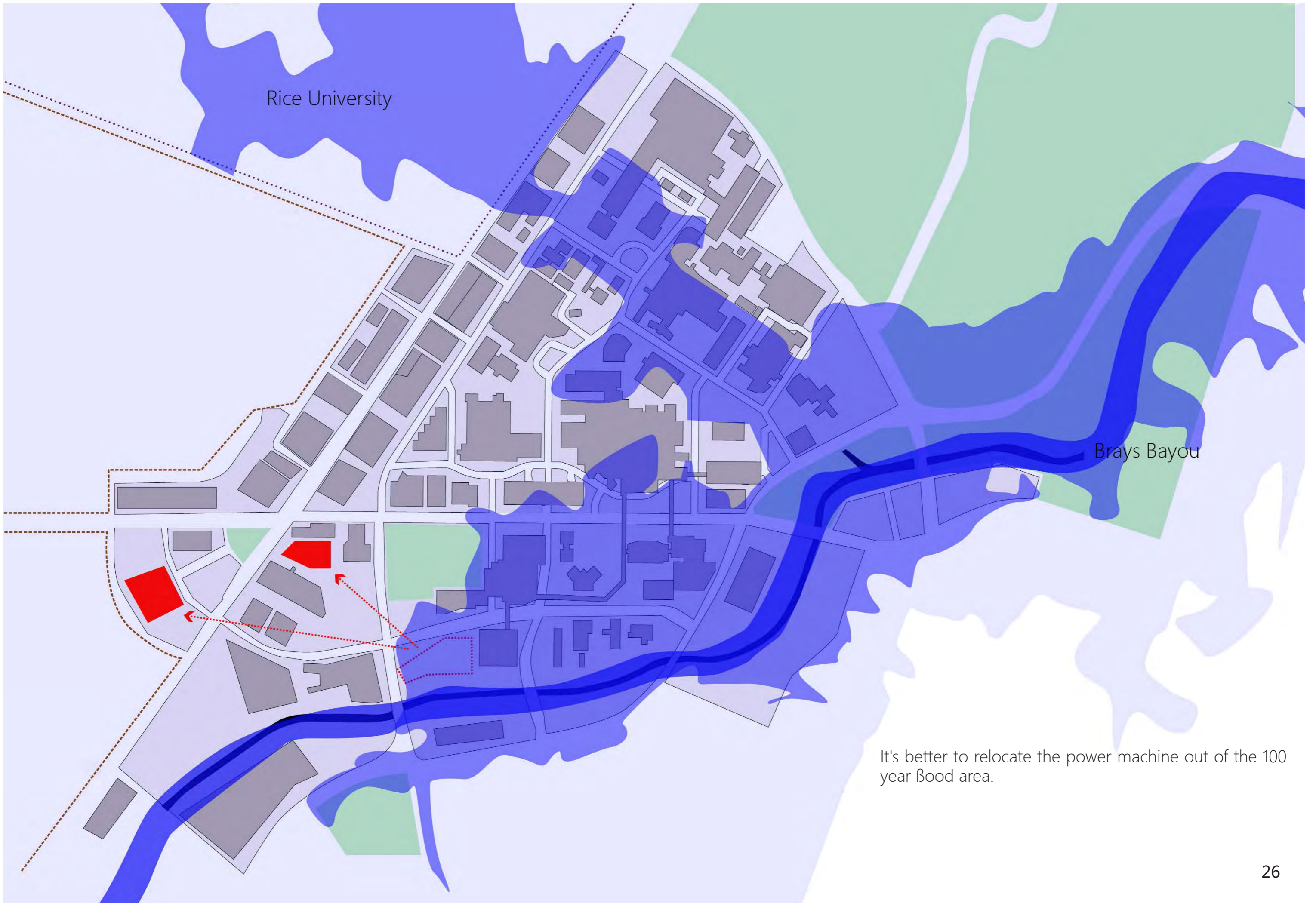
Flood

After the Storm Alison, the TMC was promoted in flood defense. By adding flood gates, wider the Brays Bayou. The Rice University developed advanced features for a real-time flood alert system for the TMC.



- 500 year flood
- 100 year flood
- Brays Bayou
- Harris Gully

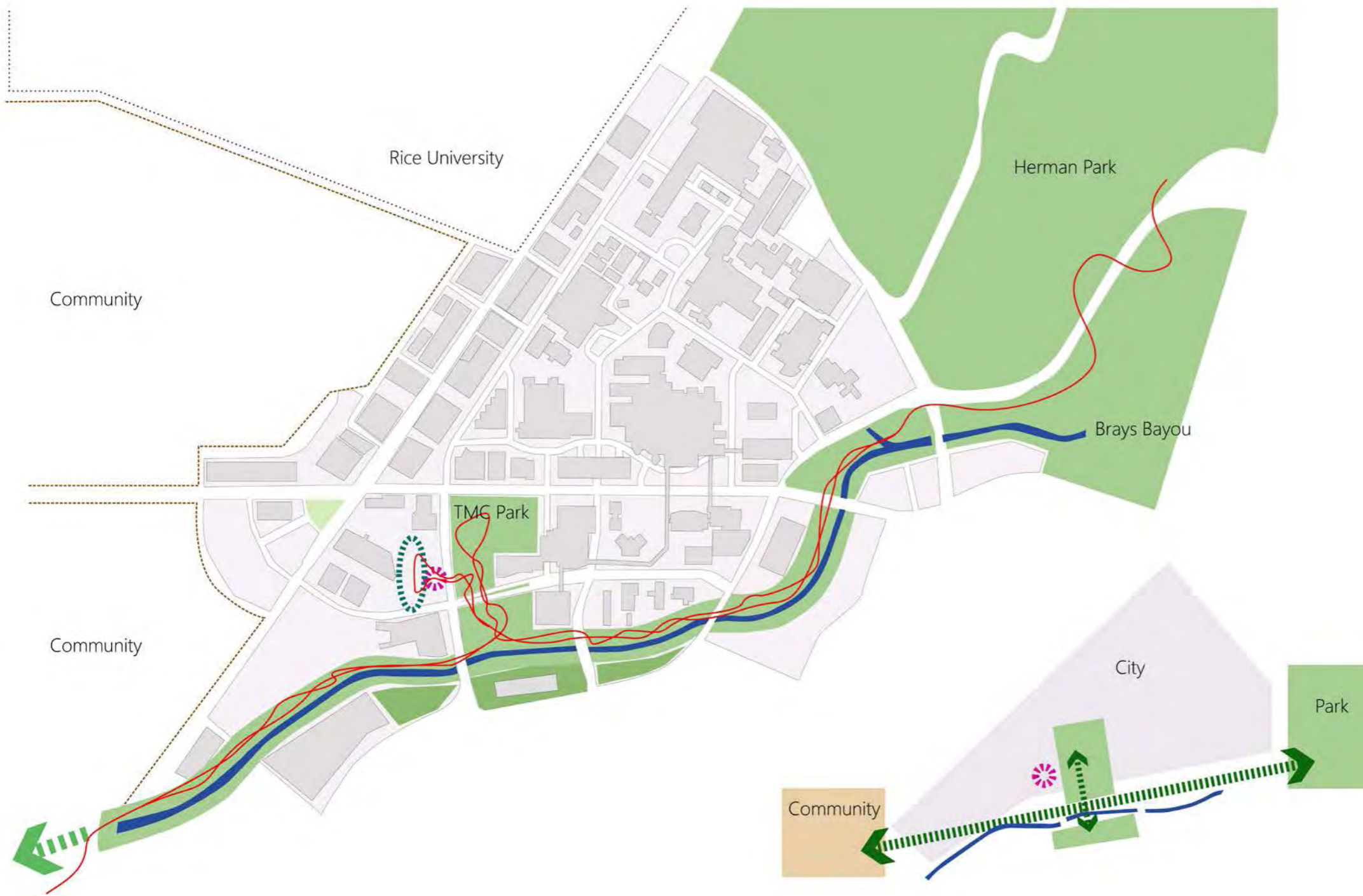




Rice University

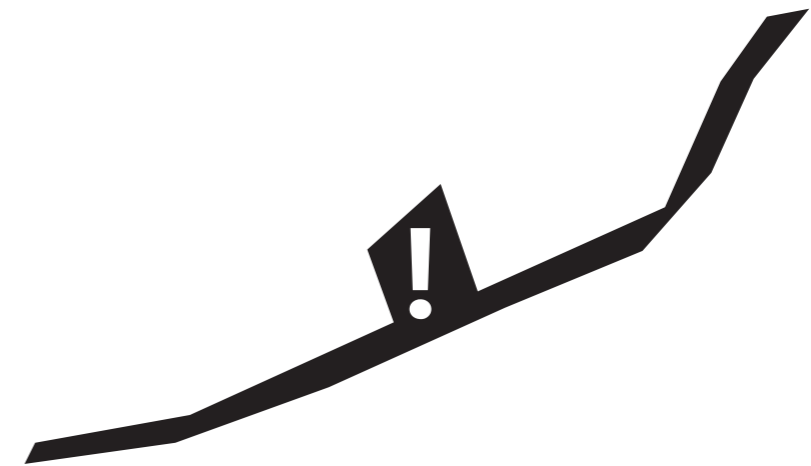
Brays Bayou

It's better to relocate the power machine out of the 100 year flood area.



2.3 Project Strategy

Create a better green waterfront for Brays Bayou, enhance the link between the community and Herman Park, connect the inner city to the waterfront. Get use of the Central Park and Transfer center to make a great access for people to the Brays Bayou.



Concept | **What's missing in the TMC water-related area ?**

Concept | **What's the answer of the project ?**

Function: Public Education
Commercial
Open Public Square
Access to the waterfront

Key: **The idea to value the bayou environment and water condition**

Make people realize the value of Brays Bayou, the importance to protect the waterfront.

Program: **Education center** for medical and water environment.



Part 3 DESIGN

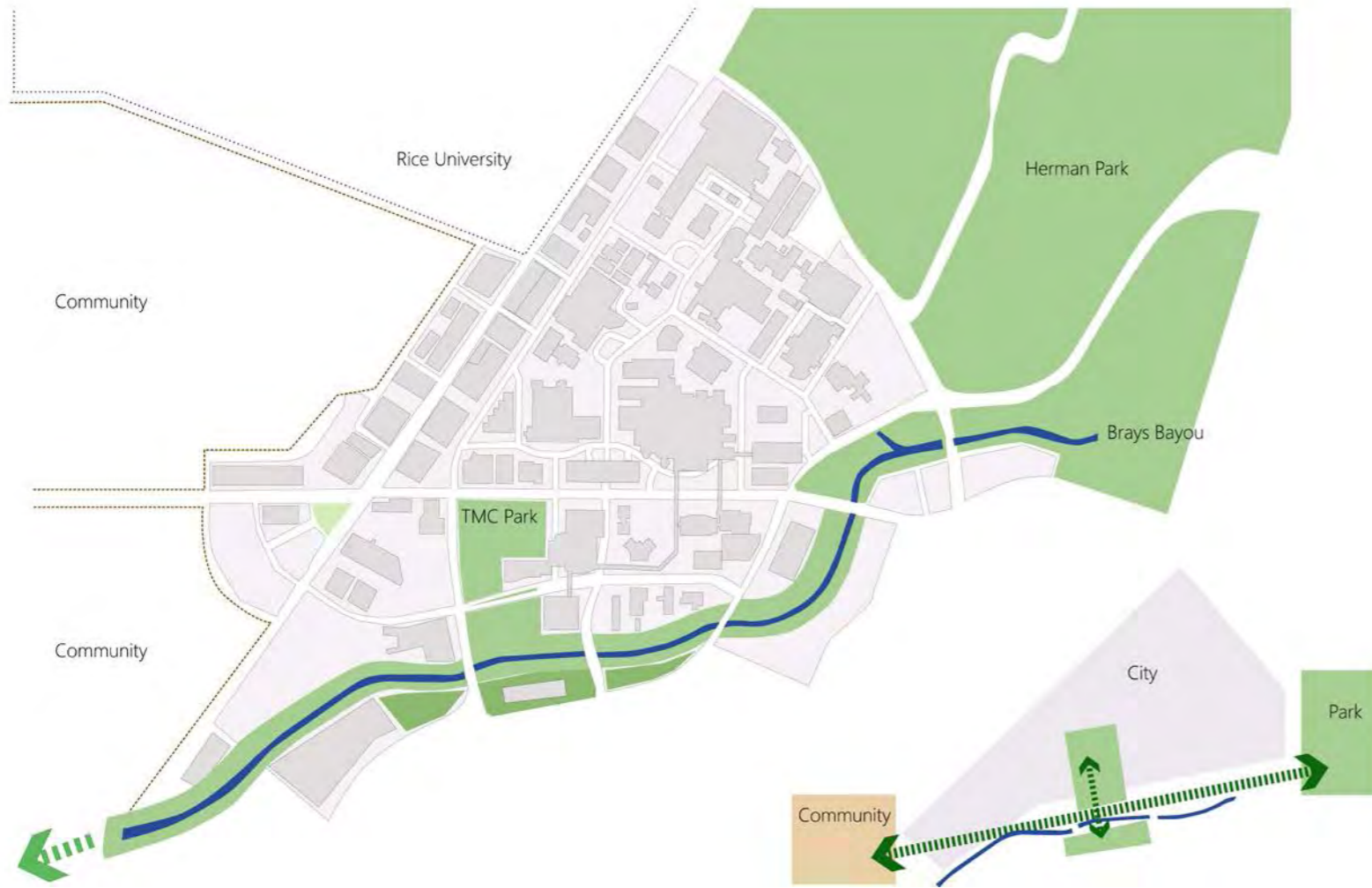


3.1 Urban Design

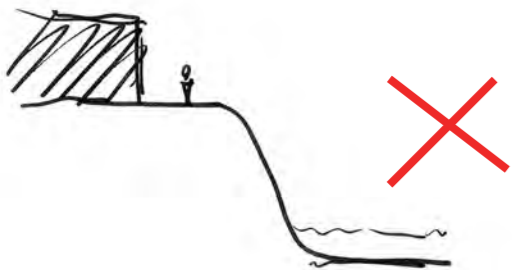
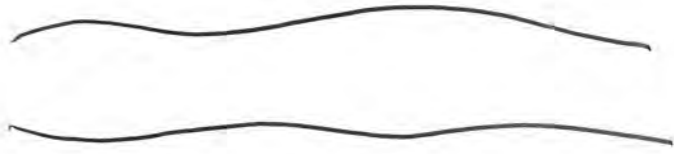
Urban Strategy

The Urban Strategy is to create a better green waterfront for brays bayou, enhance the link between the community and Herman Park, connect the inner city to the waterfront.

Several possible research has been made for the Brays Bayou renovation.

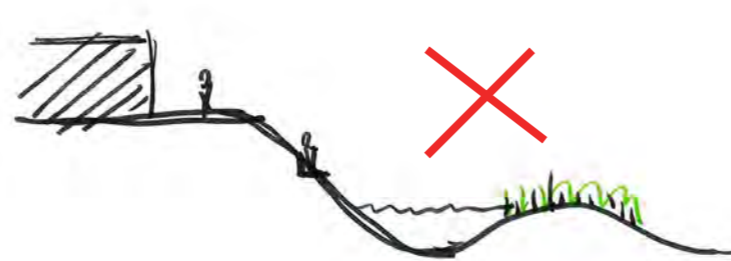
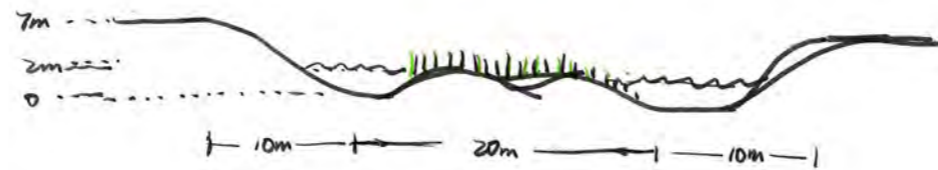
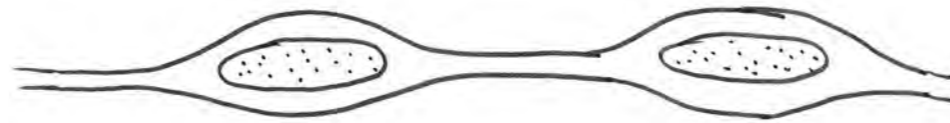


Widen the river directly



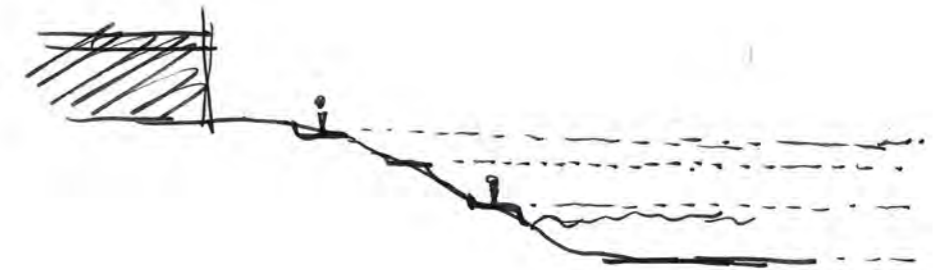
Problem : no interaction space on the bank, people can not touch the water. No purification.

Create delta islands



Problem : People can not use the islands. The bank area is not enough.

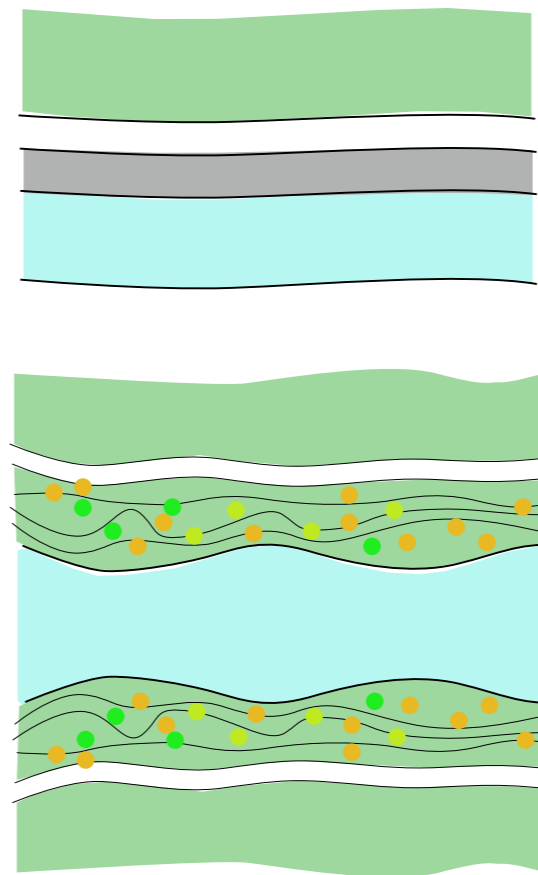
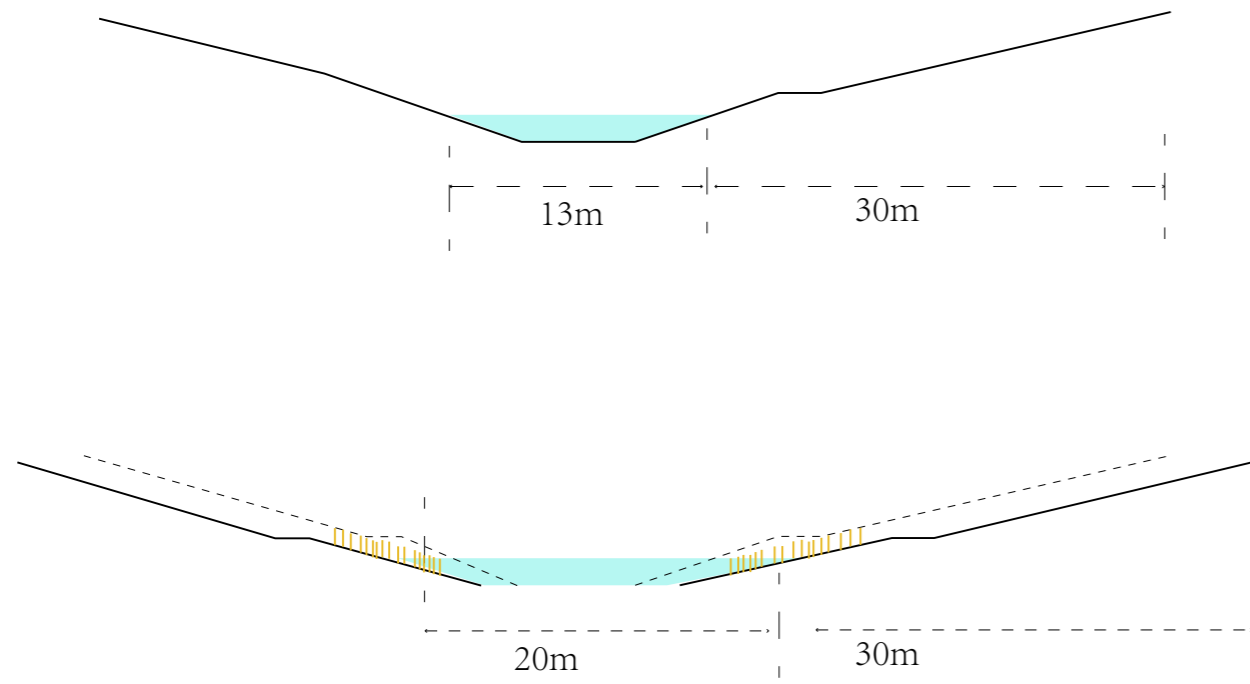
Widen the river / slow the bank / Vegetation cover



Advantages: Vegetation slow and purify the water. People can touch the water. People can experience the waterfront according to different water levels.

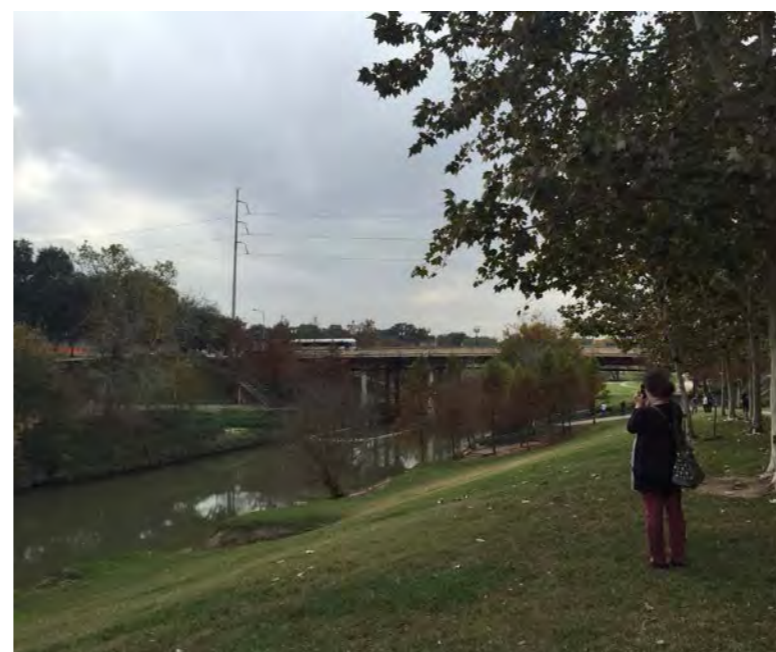
Renovation | Brays Bayou

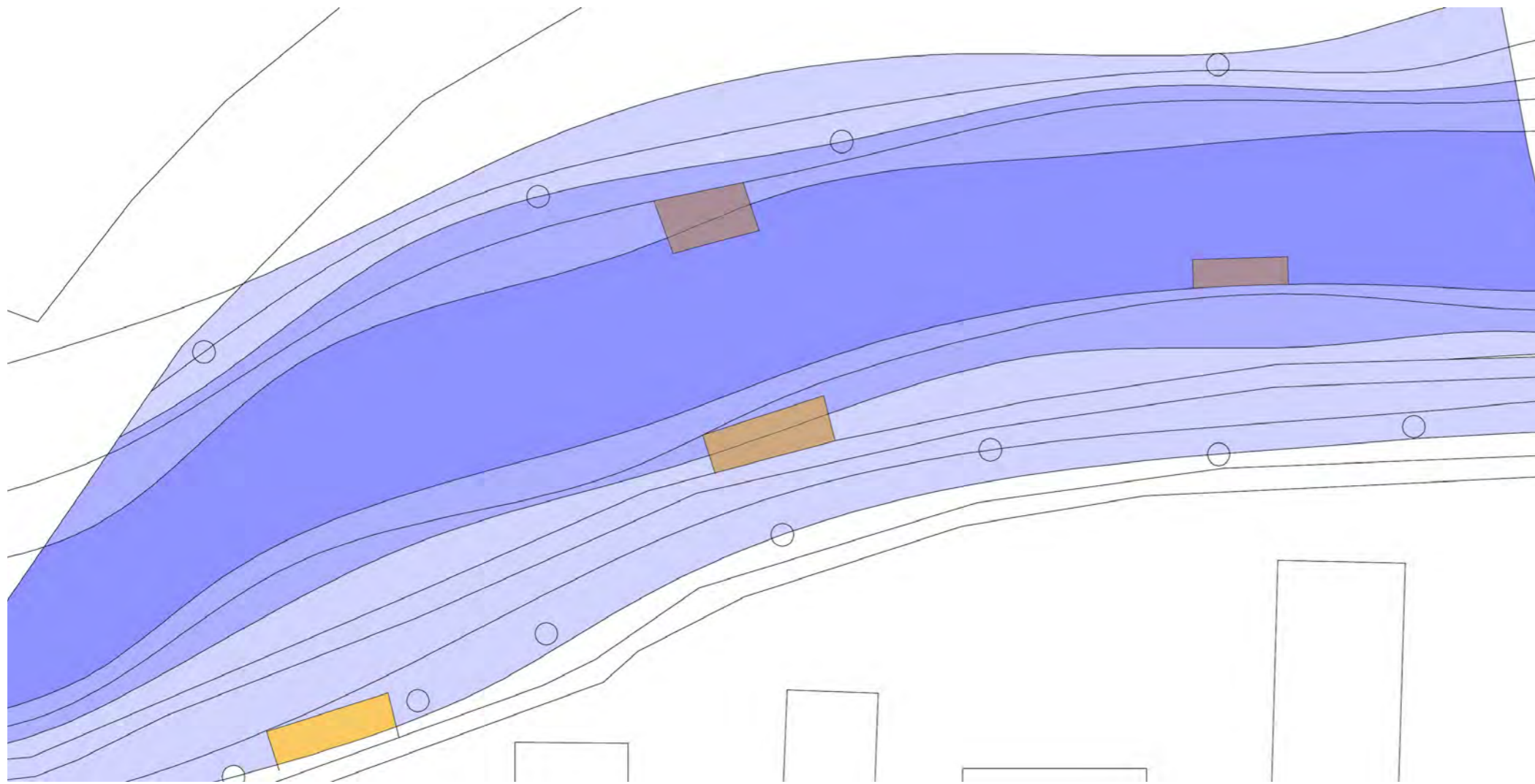
Possible method to renovate the Brays Bayou



Vegetation Bank

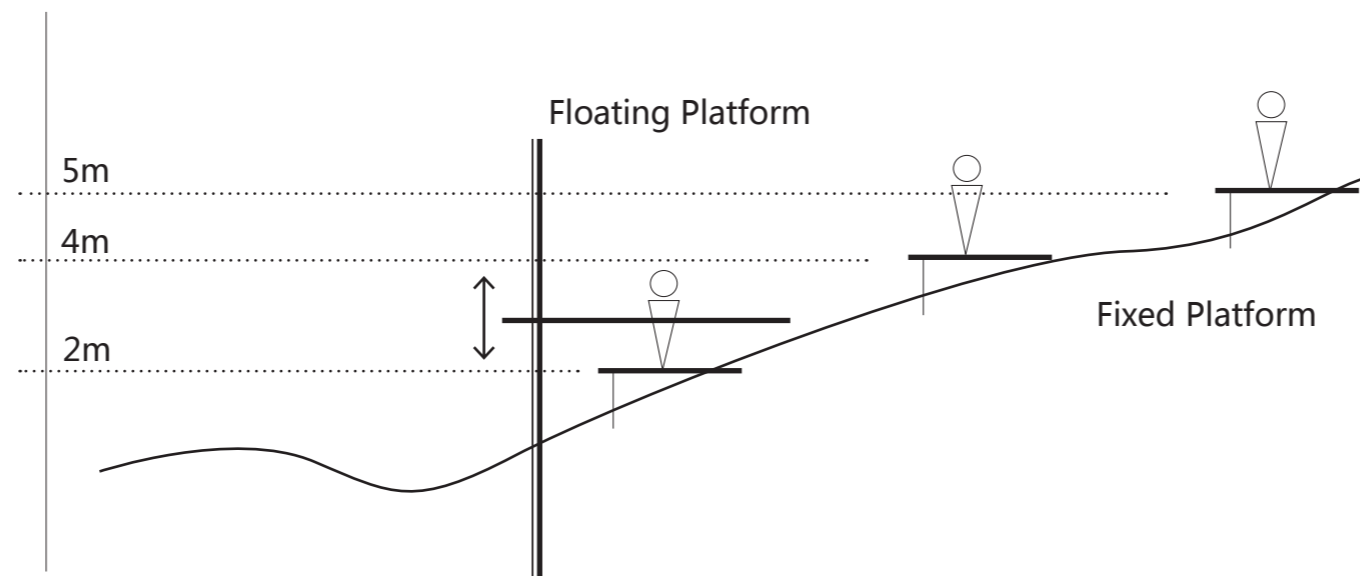
Widen the Brays Bayou, change the concrete bank into vegetation bank, which will slow down the water and purify it. Pedestrian and bike route on different levels will make the waterfront more public and active.

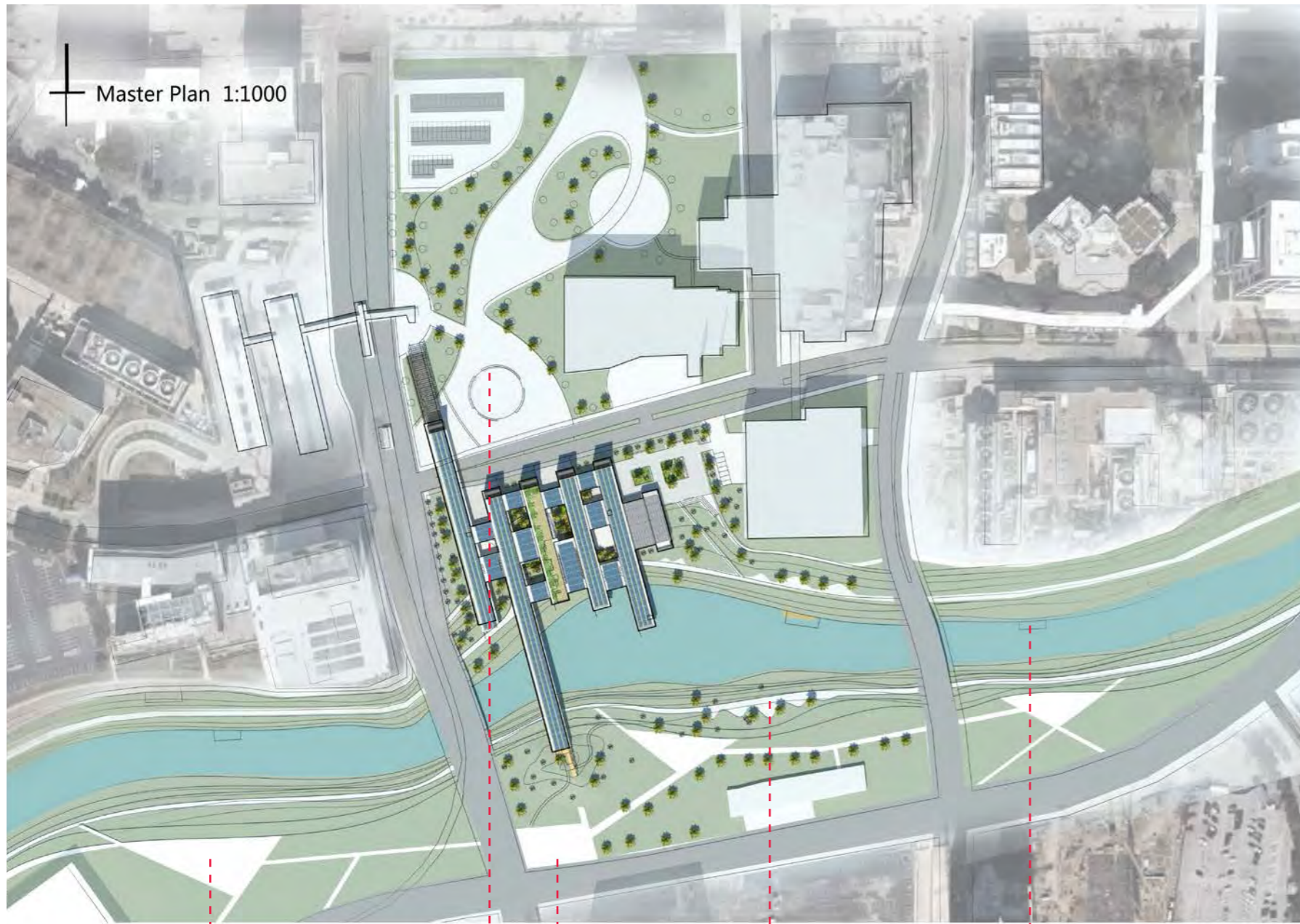




Platforms

Platforms on different levels will provide accesible space for visitors while the water on different levels.





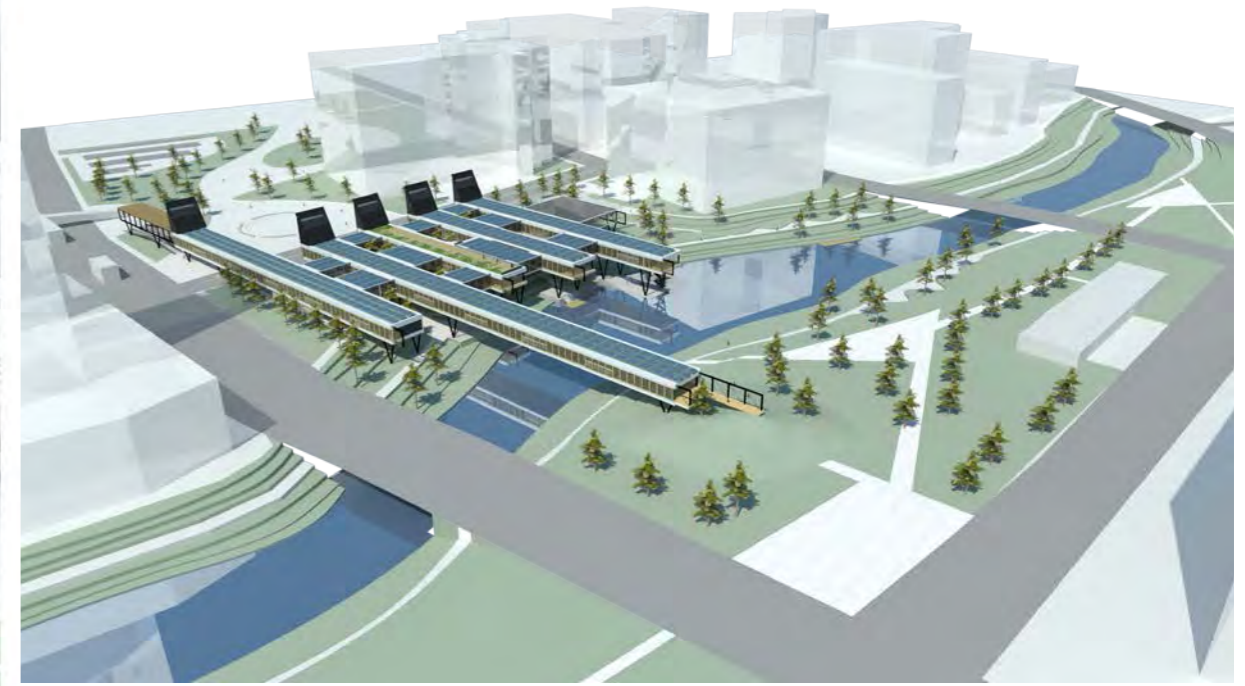
linear Park

South Entrance

Bike Route

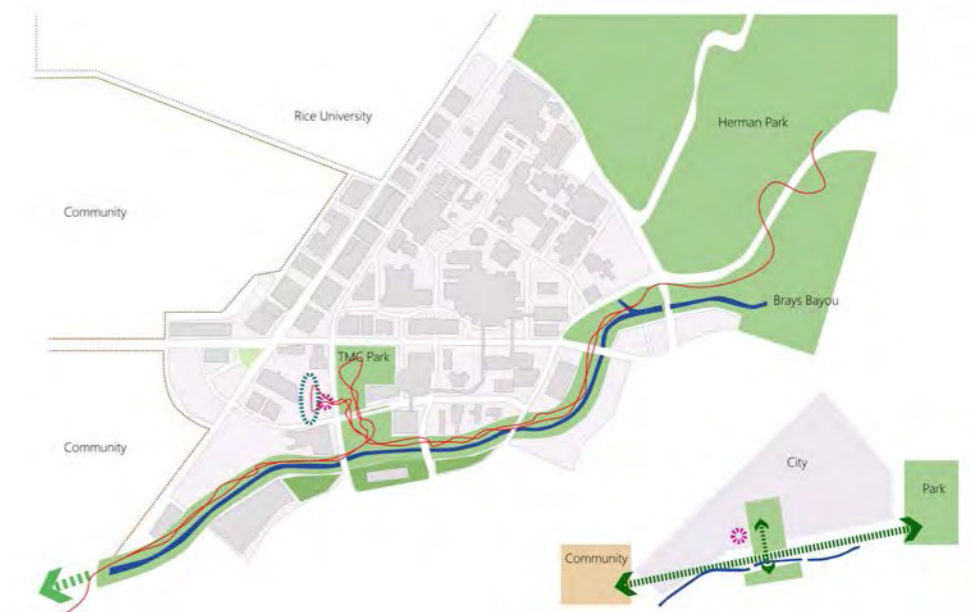
Water-touch
Platforms

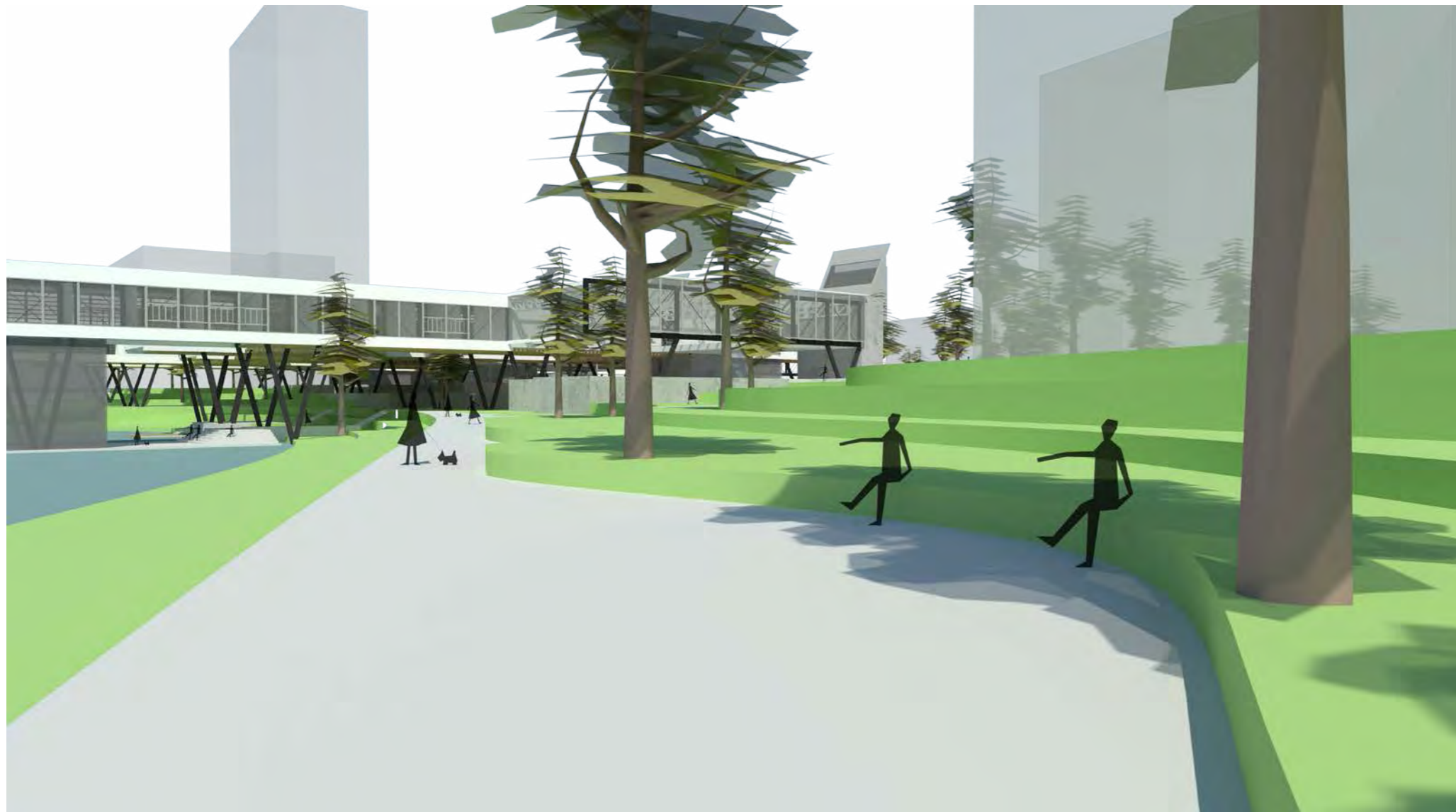
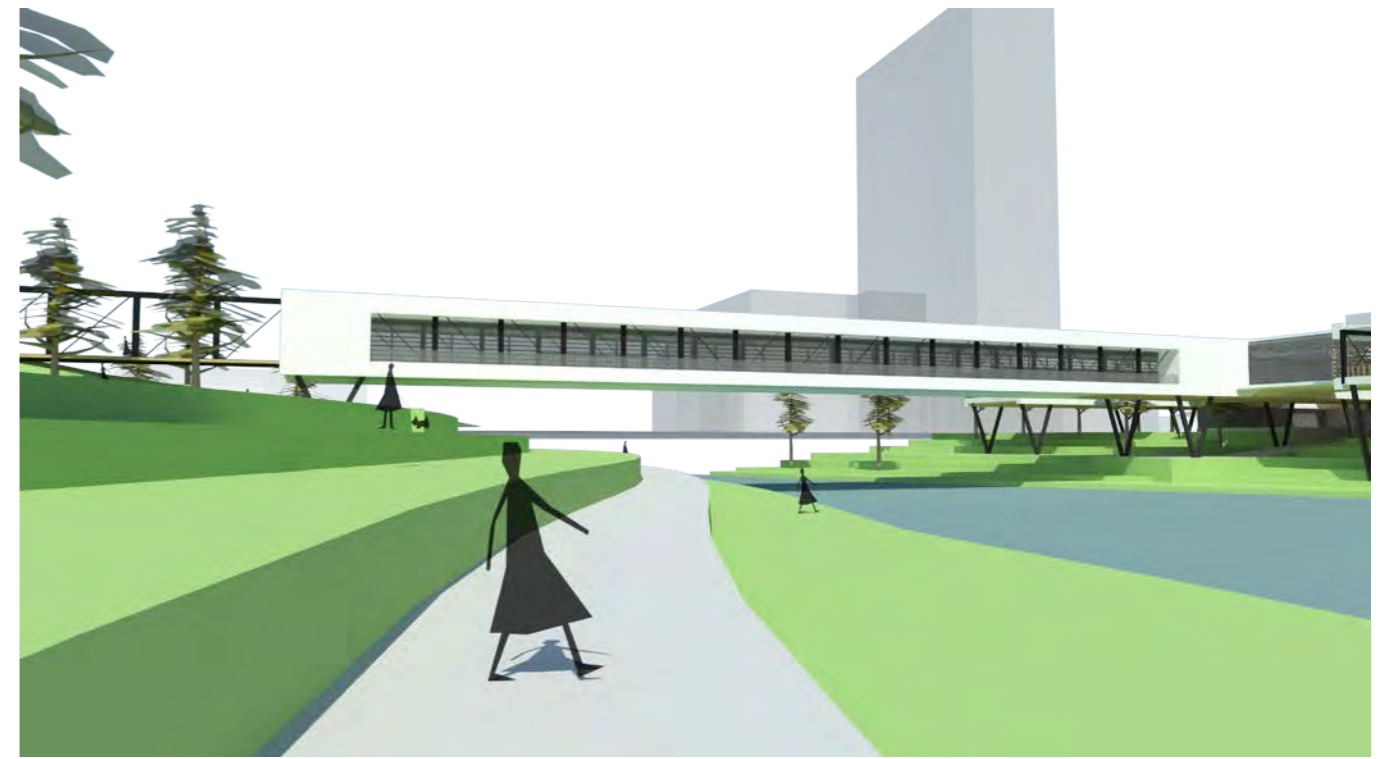
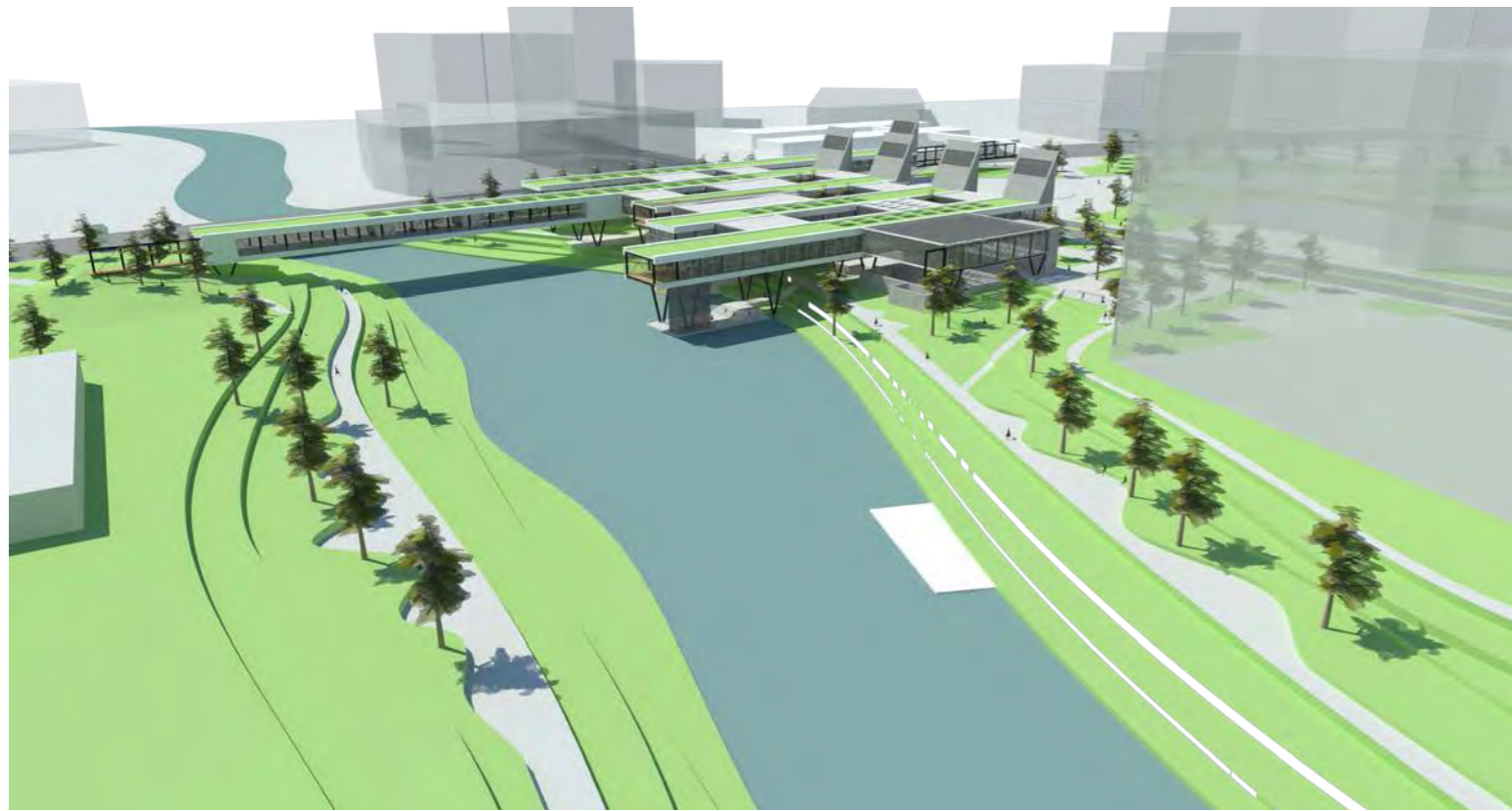
Connection Square



Master Plan

Relocate the Parking Space, integrate the Green Park and the waterfront. Create more pedestrian and view connection between the Transfer Center, the Green Park and the Waterfront.





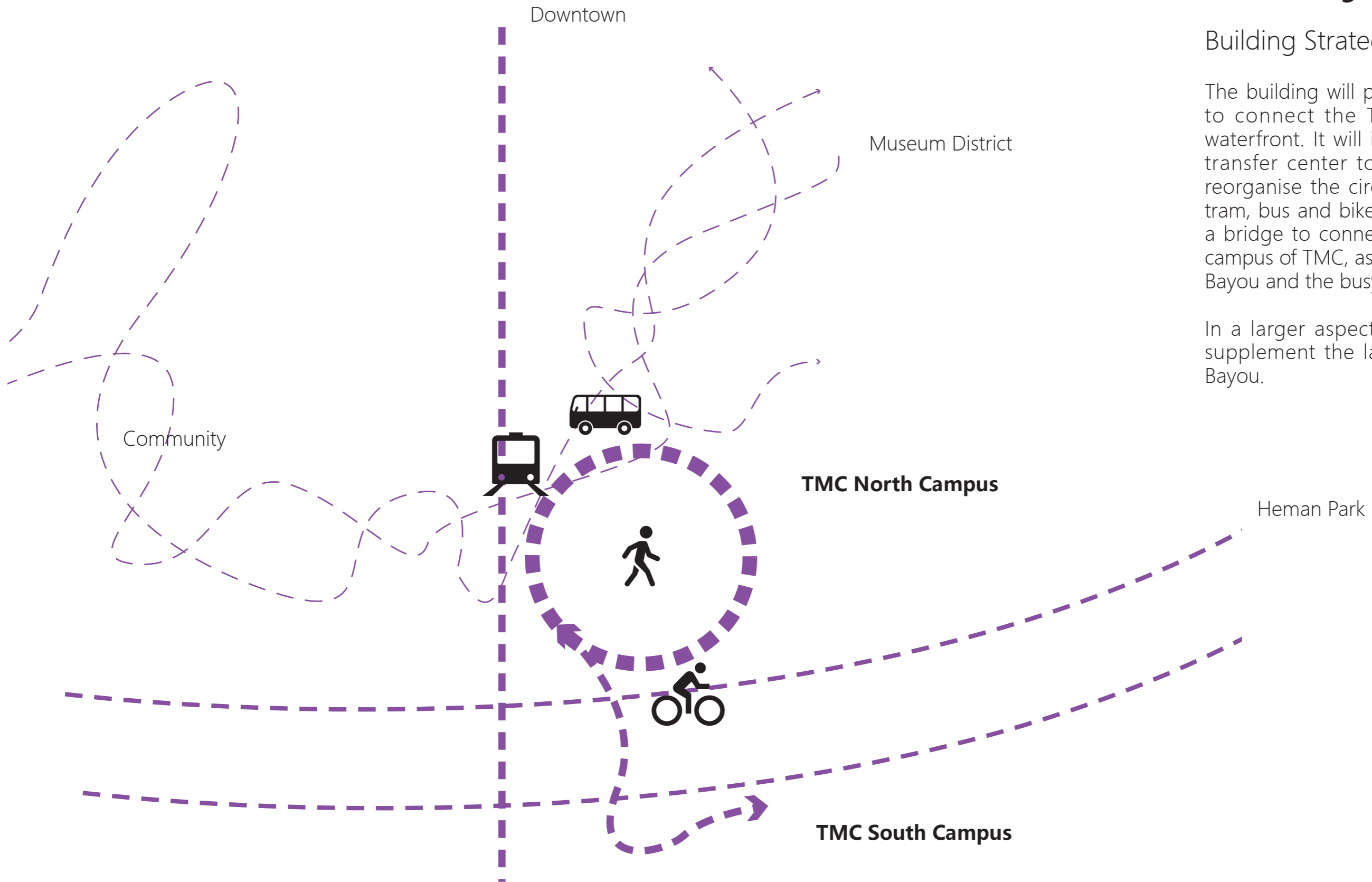
Sketch for the landscape

3.2 Building Concept

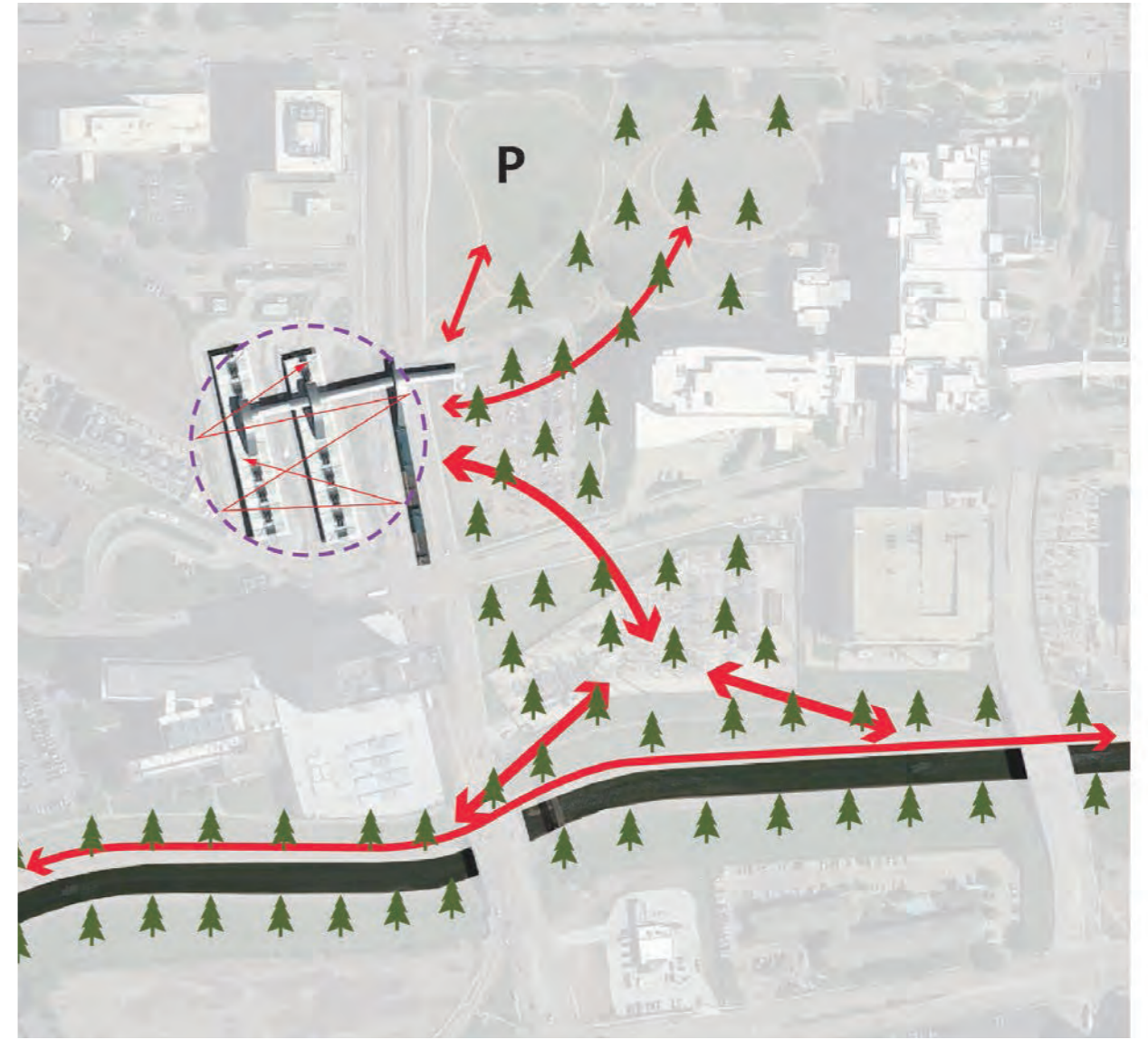
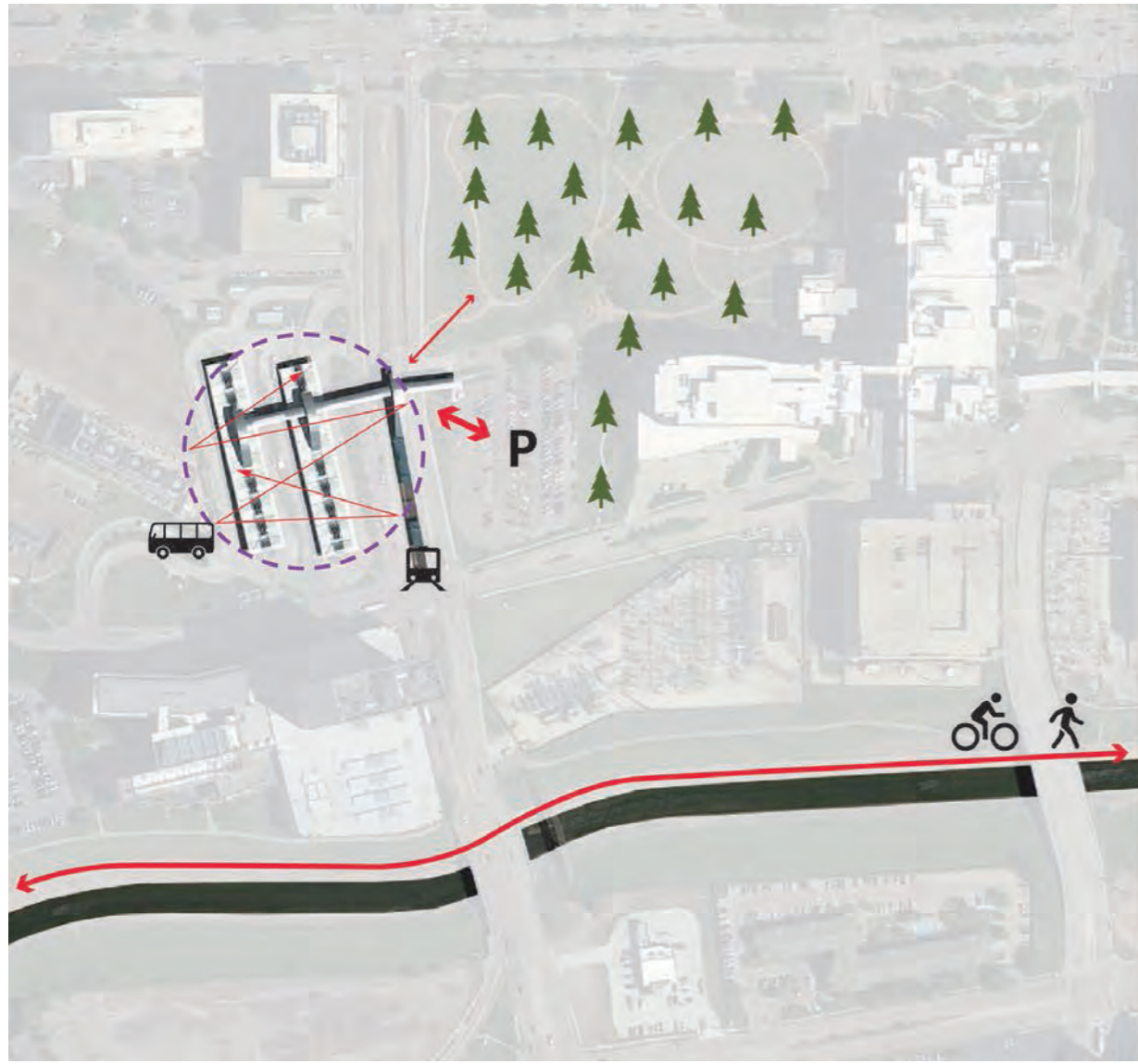
Building Strategy

The building will perform as an motivator, to connect the TMC Campus and the waterfront. It will invite the people in the transfer center to the waterfront. It will reorganise the circulation to connect the tram, bus and bike route. it will also act as a bridge to connect the north and south campus of TMC, as it is ao hard to cross the Bayou and the busy road in Huston.

In a larger aspect, the building will also supplement the landscape for the Brays Bayou.



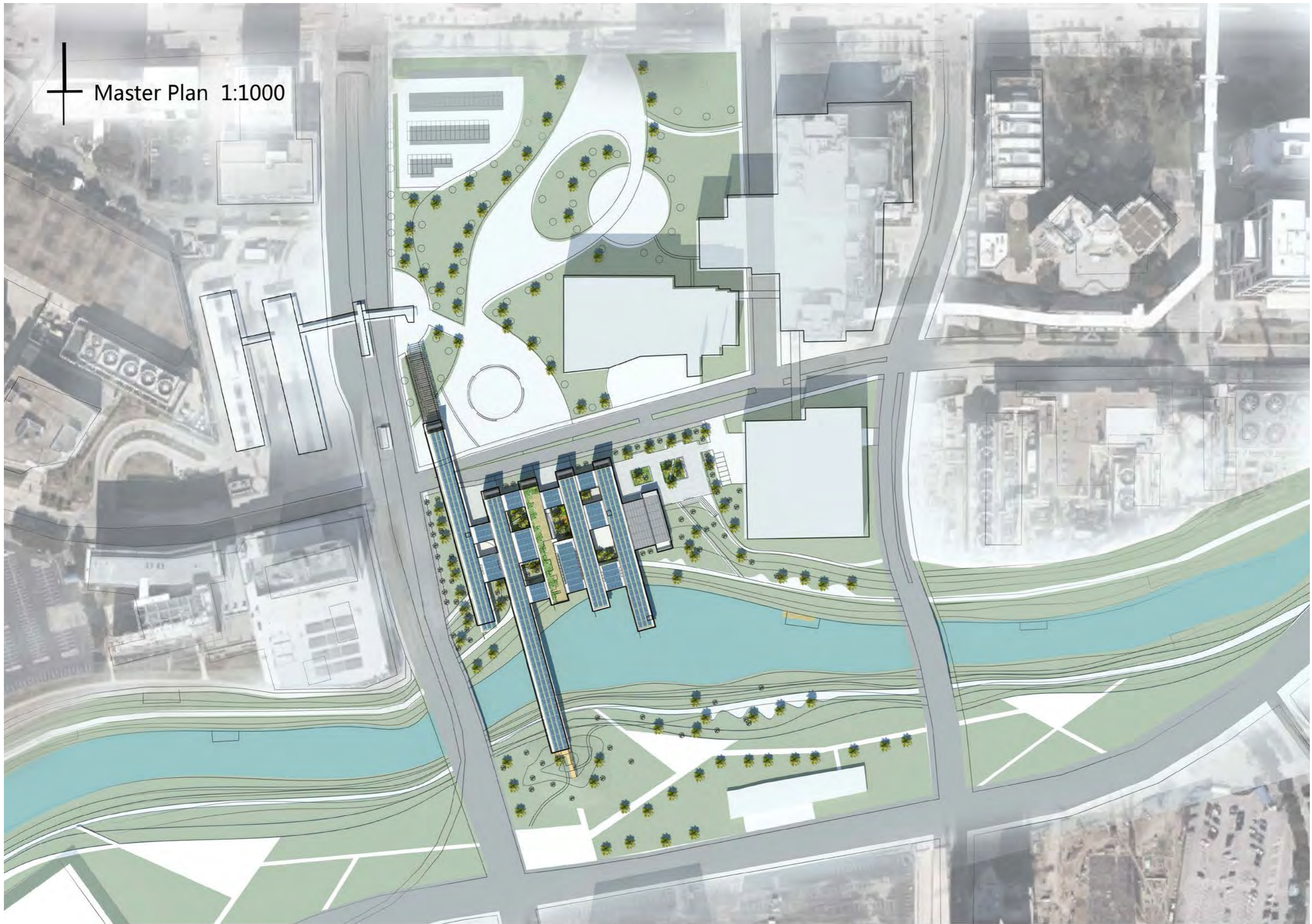




Site Reorganise

Relocate the Parking Space, integrate the Green Park and the waterfront. Create more pedestrian and view connection between the Transfer Center, the Green Park and the Waterfront.

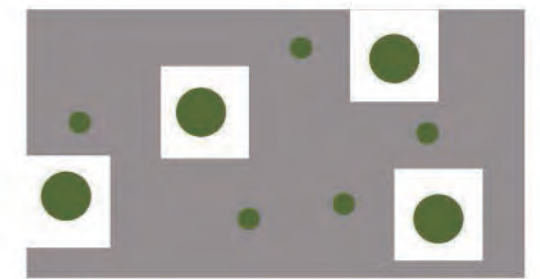
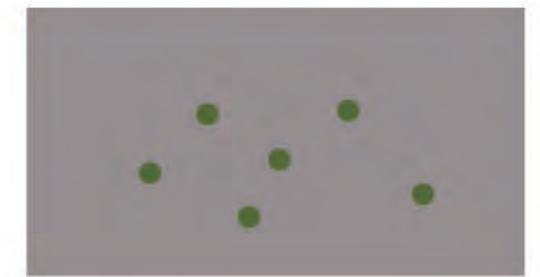
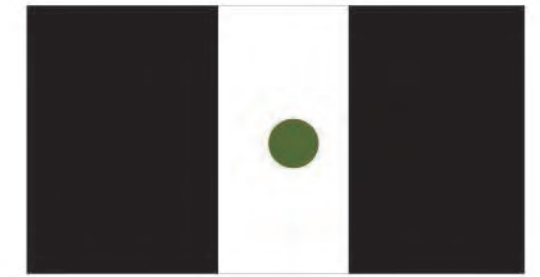
Master Plan 1:1000

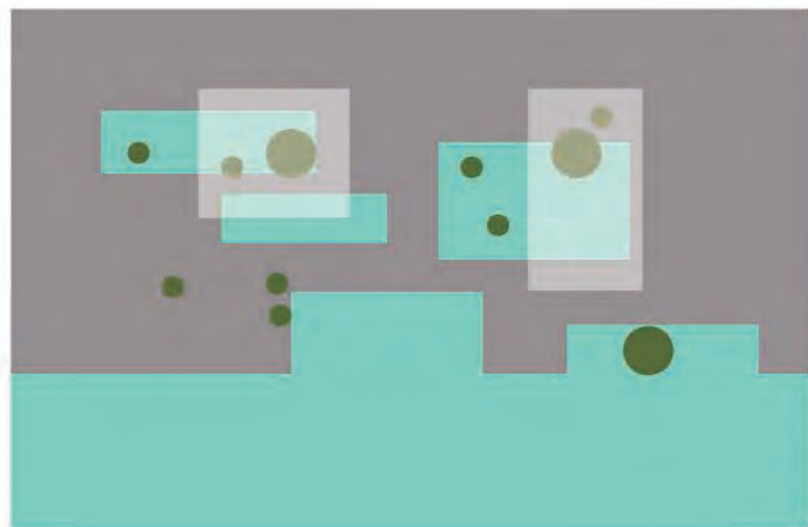
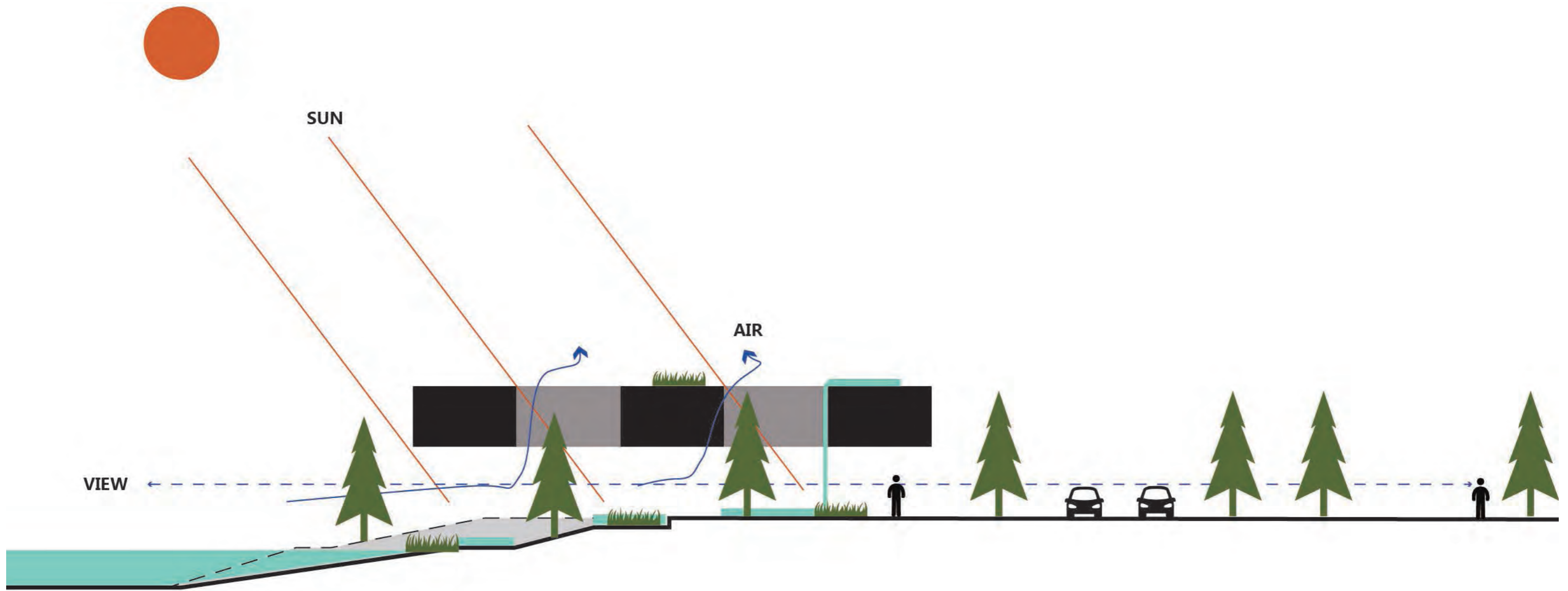




Possible Building Type

The new building should connect the park to the waterfront. It should keep the view connection as well as keeping green elements. It should be a nice access for the people from the transfer center to go to the waterfront.

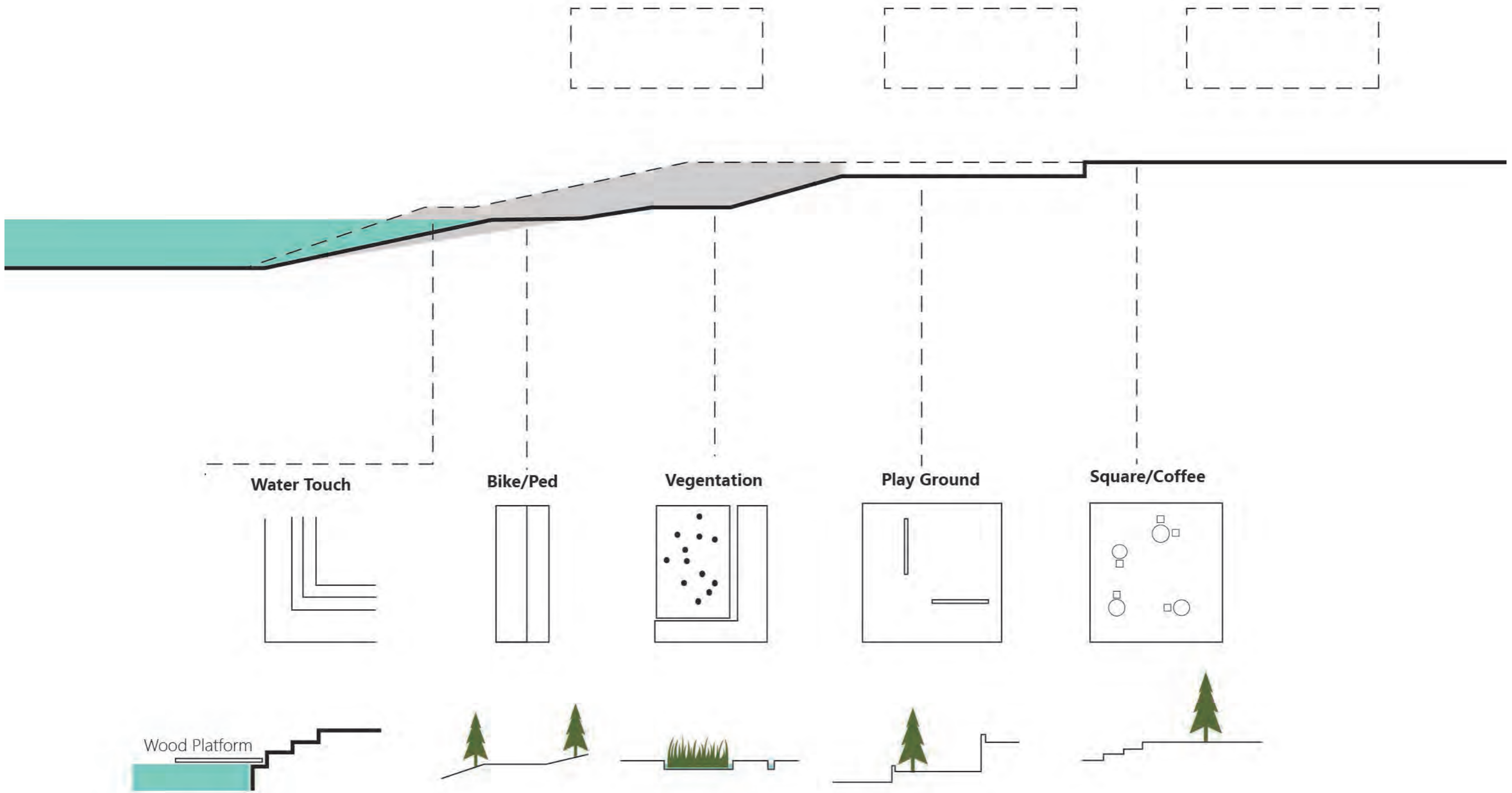




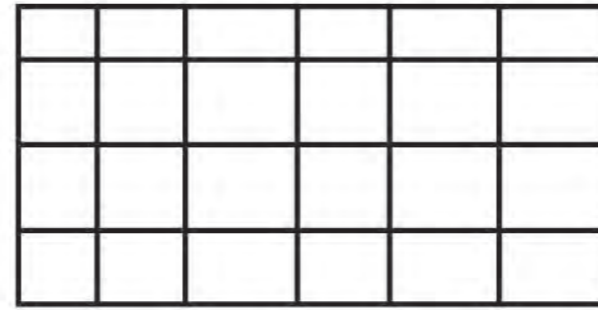
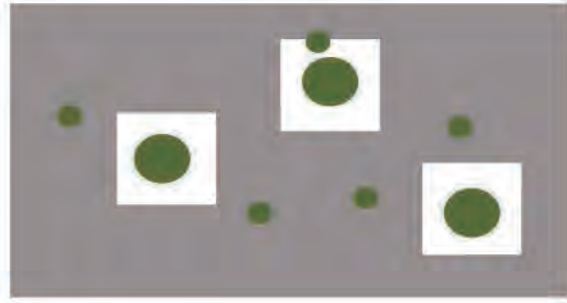
Floating

A floating strategy is chosen for the building. It keeps the view connection, create nice waterfront access and good food safety for itself. It is also a common building language in Houston.

Diferent Waterfront Acitivities



Platform



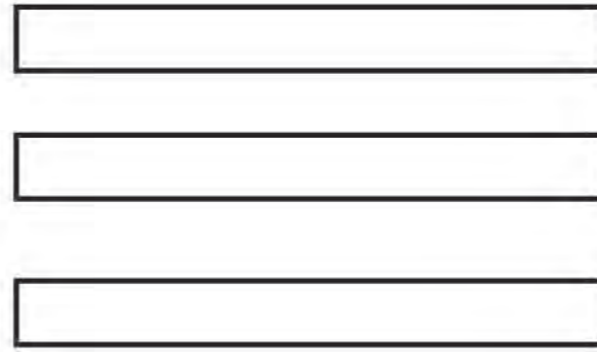
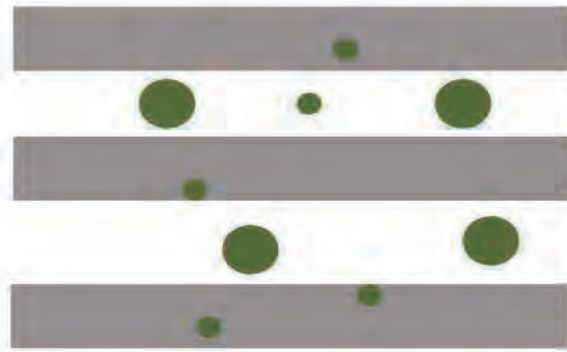
Possible Construction

How to construct such a huge Boating roof is a question for the building.

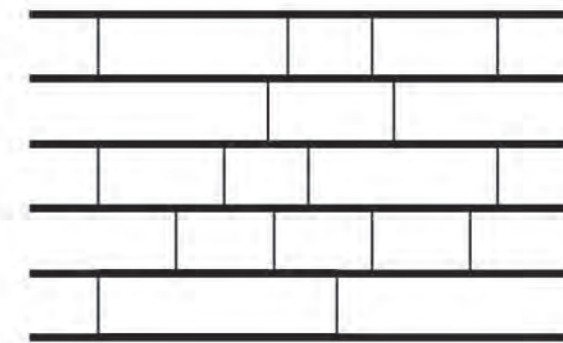
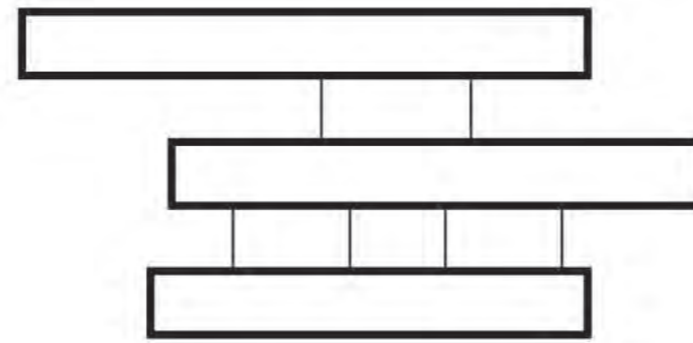
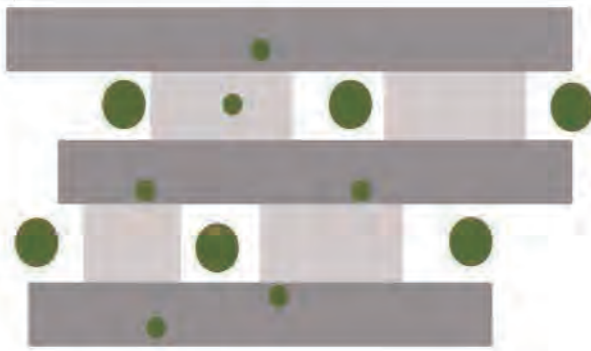
It is a good way to divide it into main structure and secondary structure.

The main structure can lead the movement of people

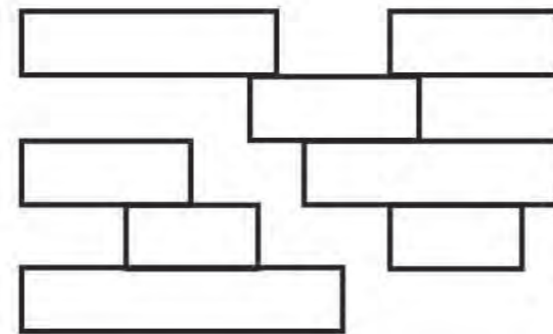
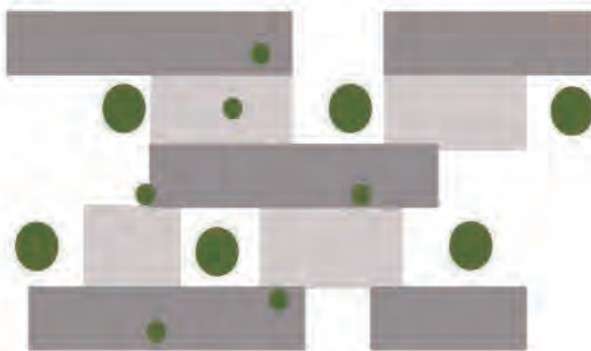
Slides



Main Structure
+
Secondary Structure

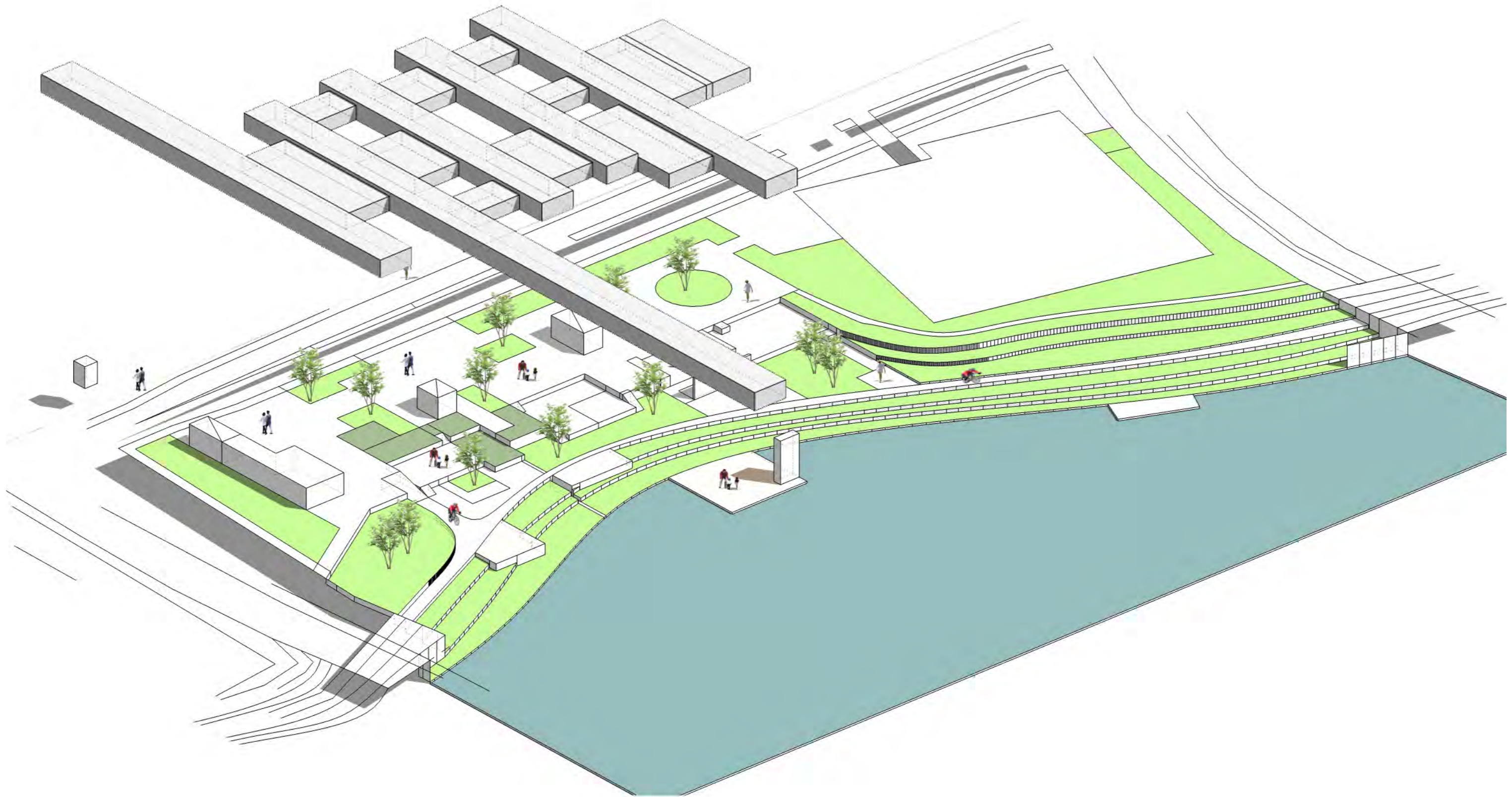


Cubes



First Image--Bridge

A bridge form is a continue of the urban context, as there are a lot of bridges of connect the huge buildings in Houston, as it is too hard to use the pedestrian system on ground. The building actually function as a bridge to cross the Brays Bayou.

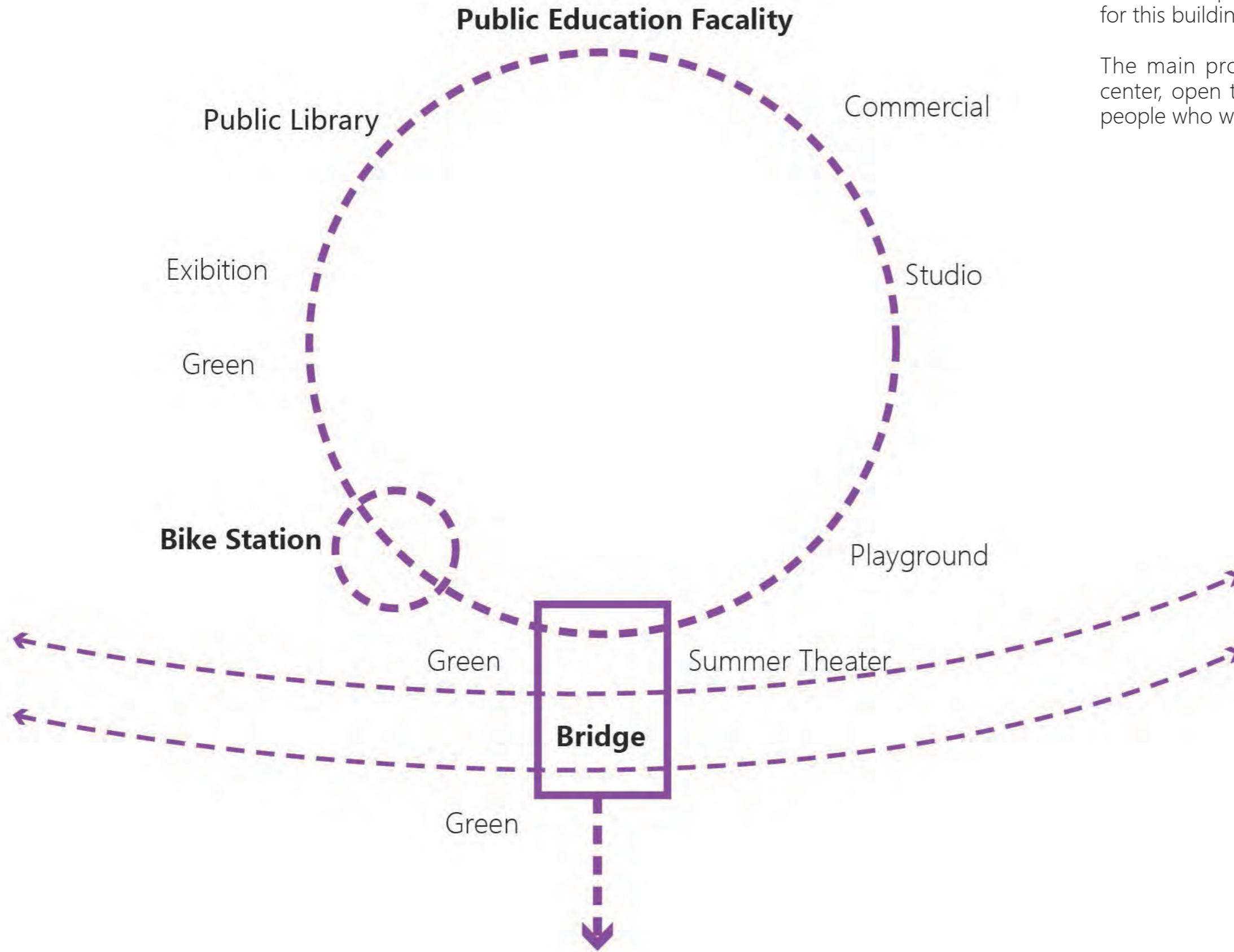


4.3 Programme

Programme required

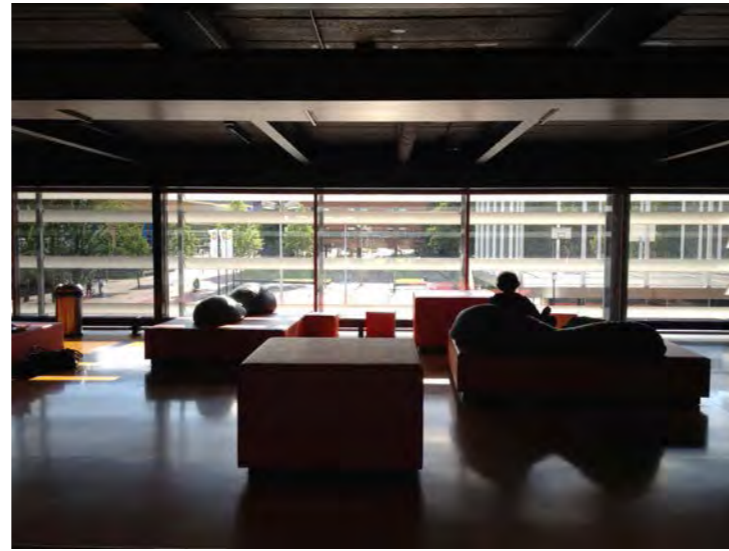
A lot of programmes is missed or less in TMC. In order to achieve the project goal. Several programmes are selected for this building.

The main programme is defined as a public education center, open to the visitors, nearby neighbors and the people who work for TMC.





Macau Science Center



Utrant Library



Qingdao young activities center



Summer Theater



Bike Renting



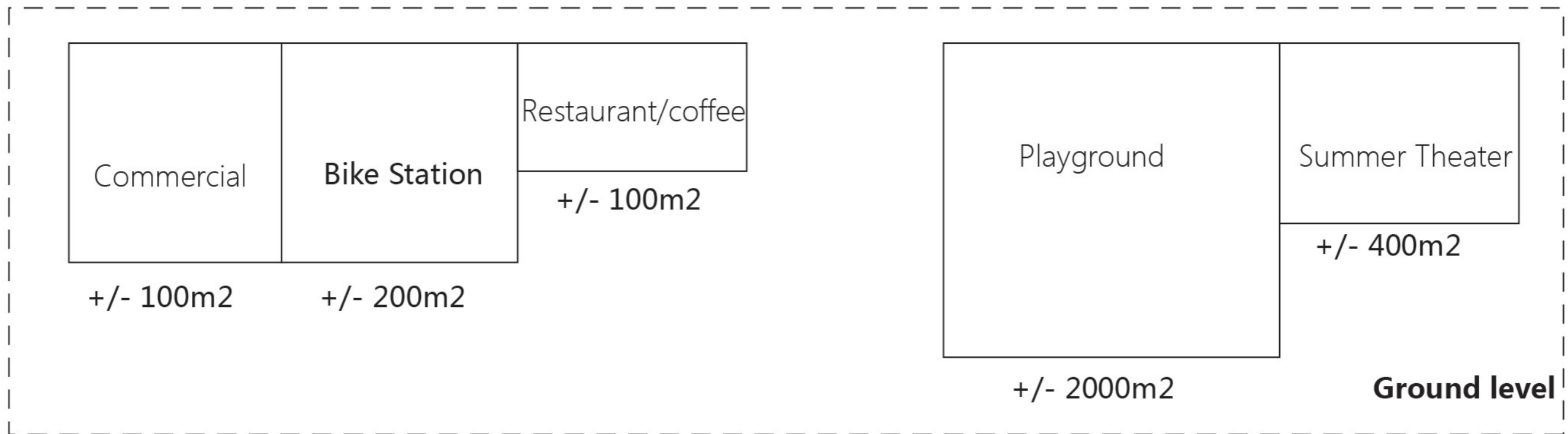
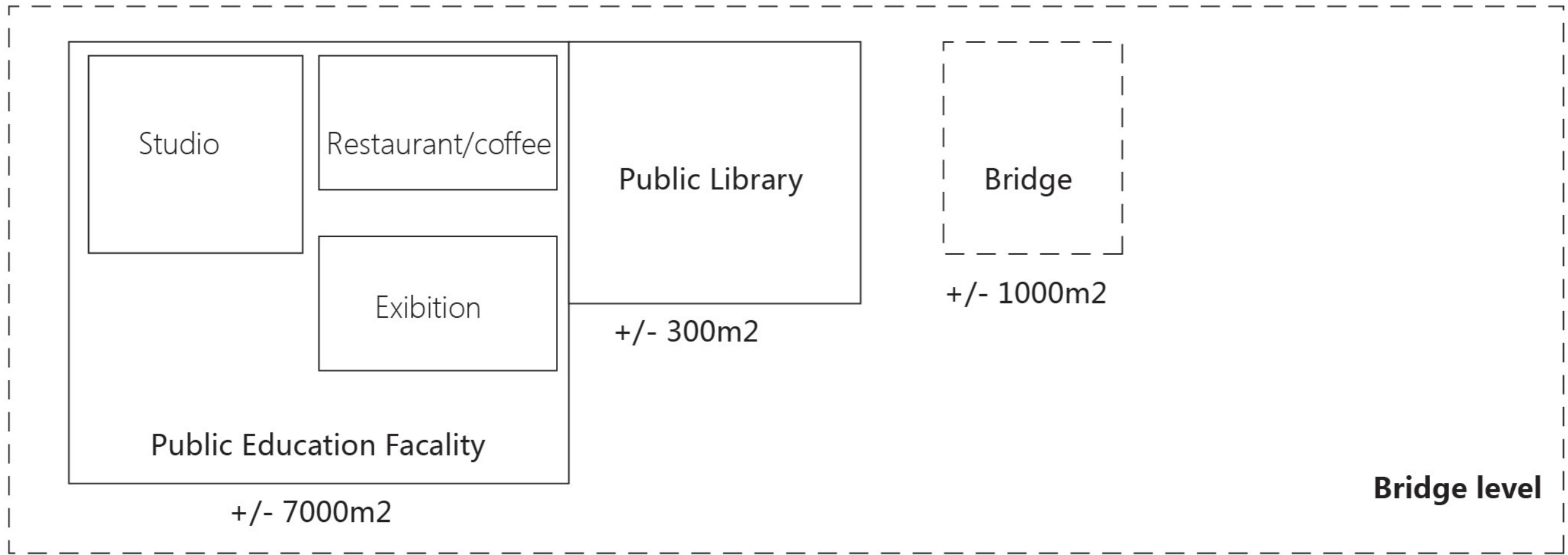
Office

Program Reference

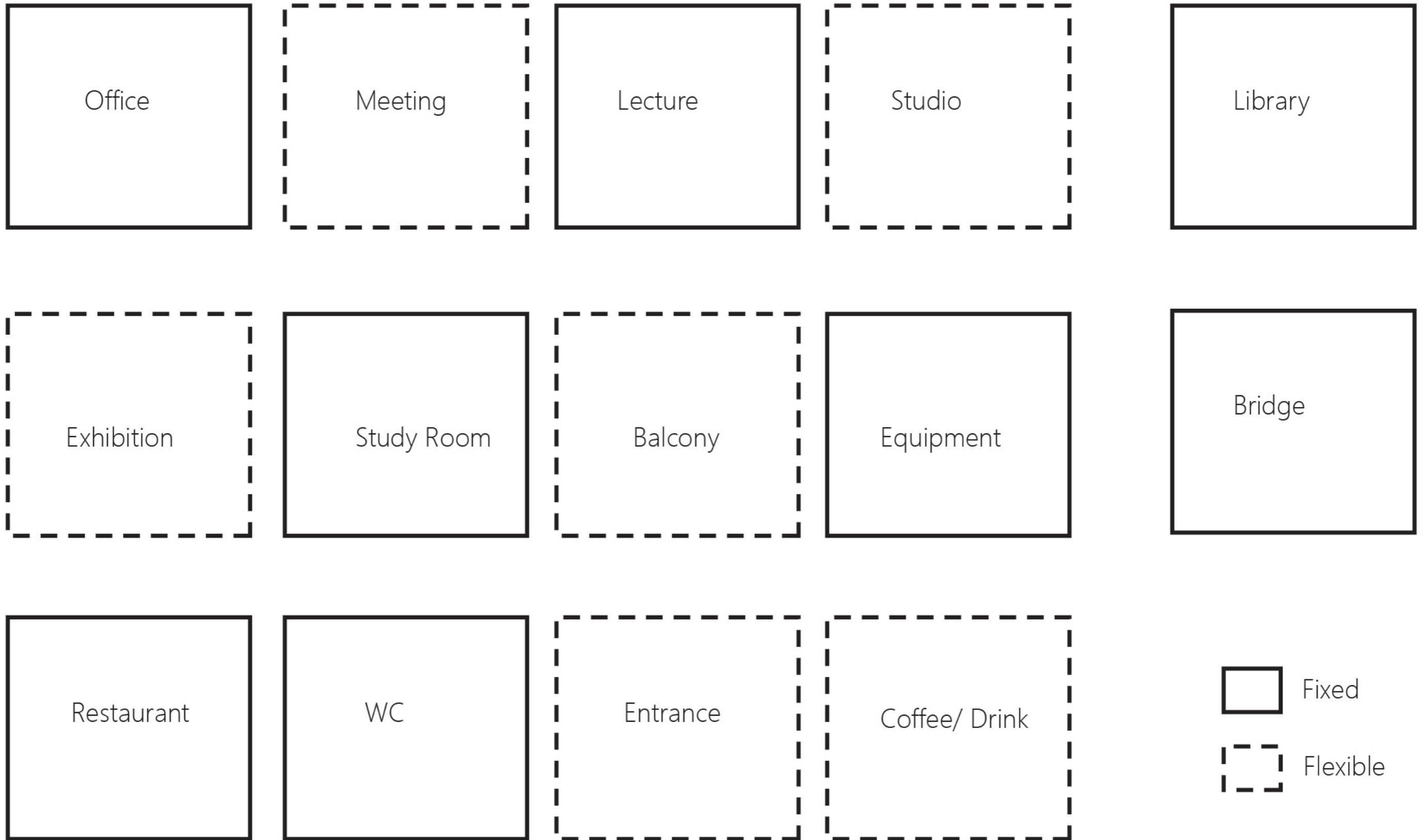
All the program is designed to make the building more public and suitable for the this area. It will provide enough attractive pints and make the waterfront interesting.

On the other hand, it will be flexible to transformed in to office to serve the TMC.

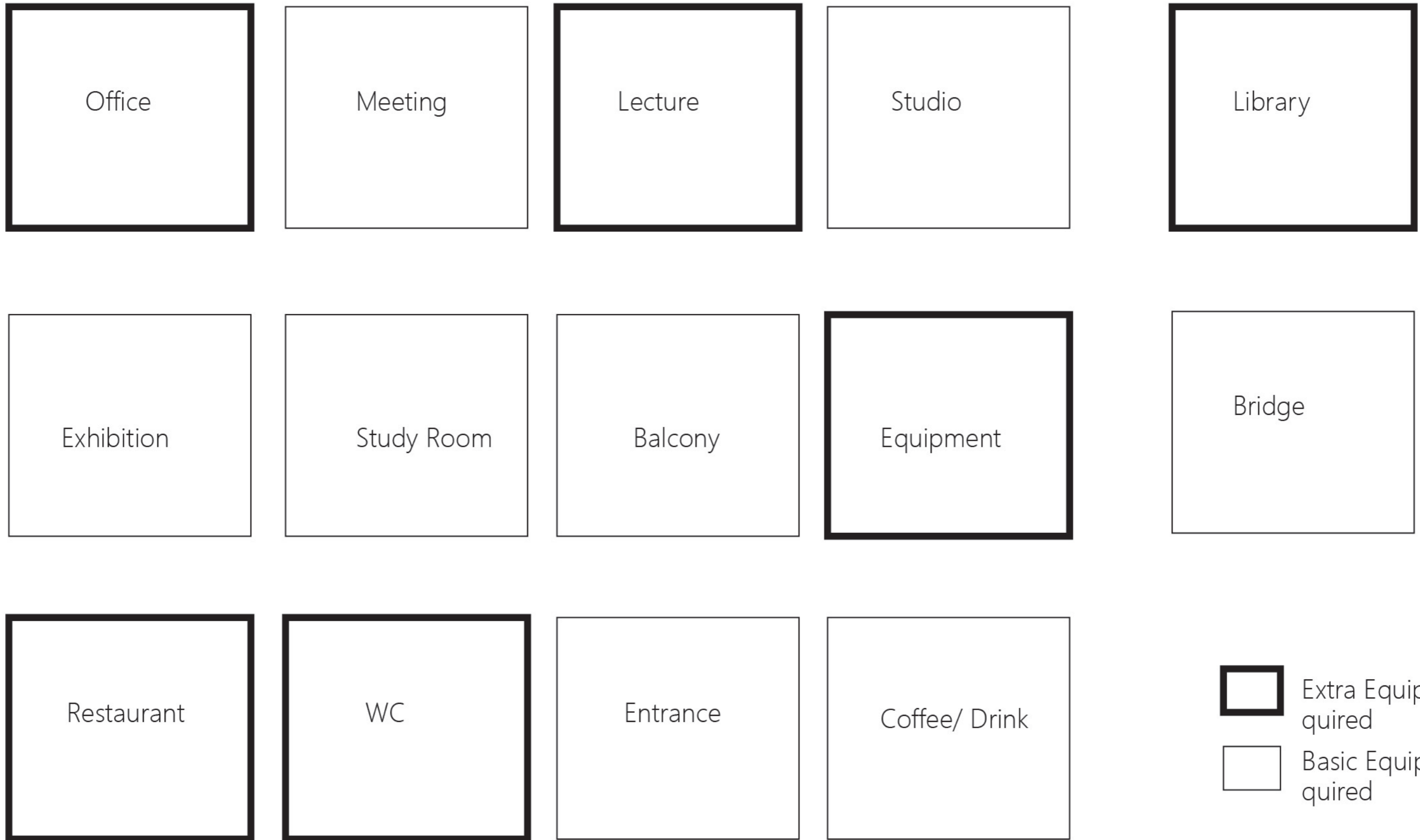
Programme Layout



Programme Flexibility



Programme Equipment



Programme Public/ Private

Office

Meeting

Lecture

Studio

Library

Exhibition

Study Room

Balcony

Equipment

Bridge

Restaurant

WC

Entrance

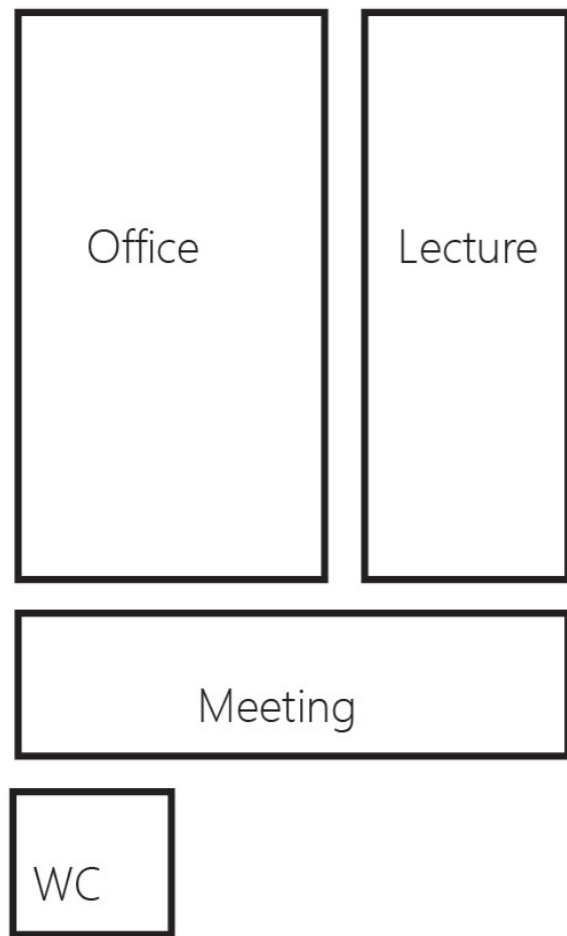
Coffee/ Drink

Public
Private

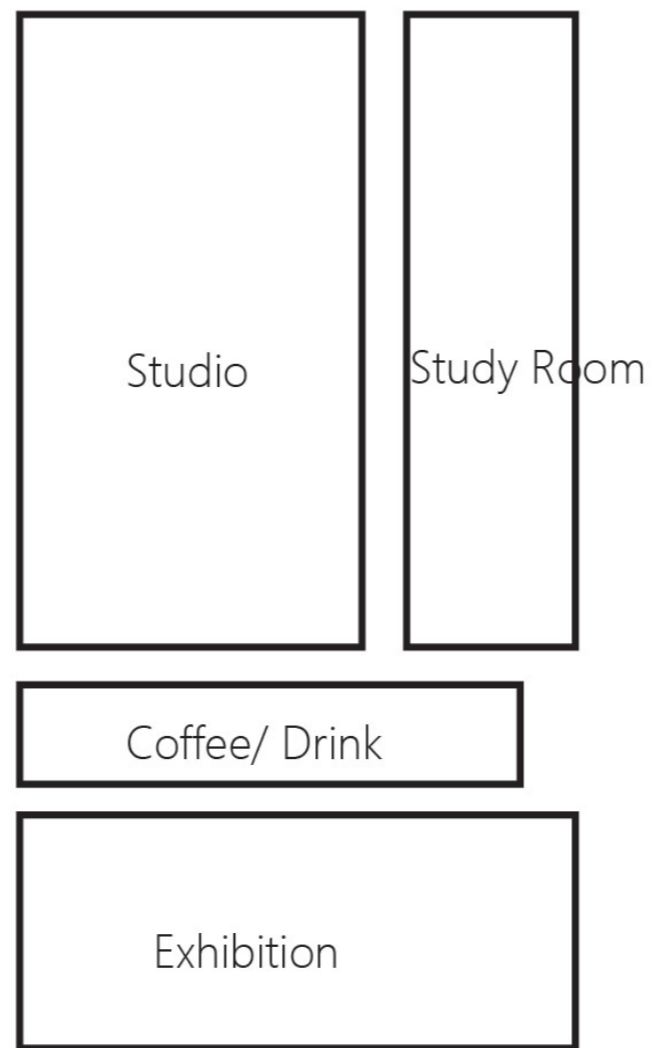
Programme Light Need



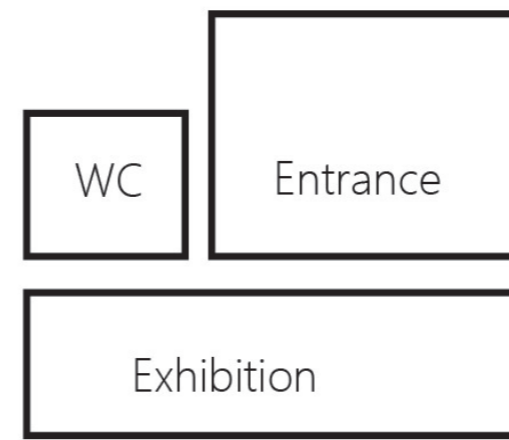
-  More Light Required
-  Less Light Required



+/- 2000m2
Max 200 People



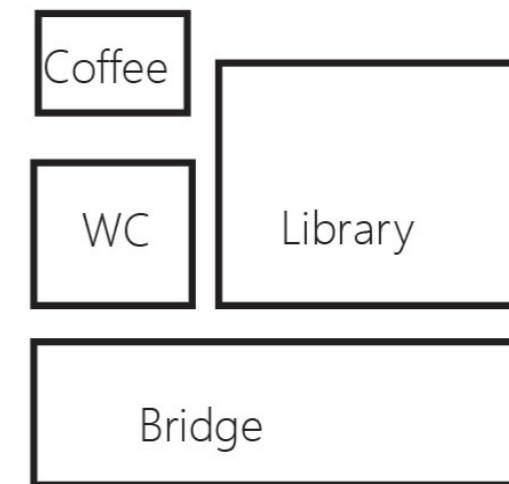
+/- 3000m2
Max 100 People



+/- 1000m2
Max 100 People

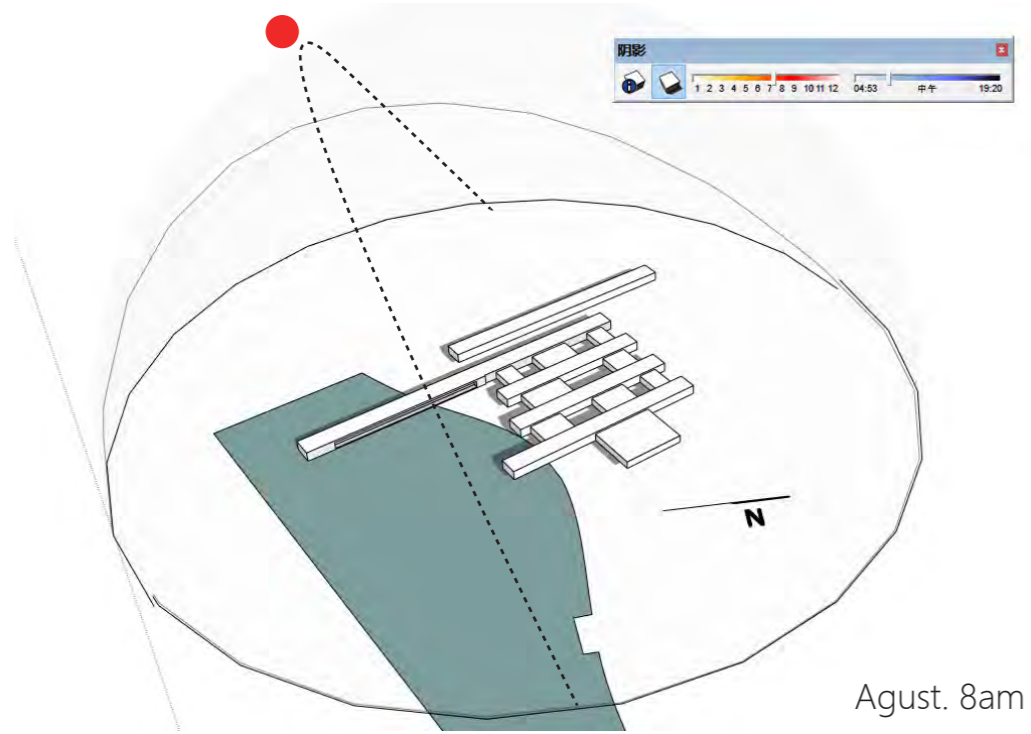


+/- 1000m2
Max 50 People

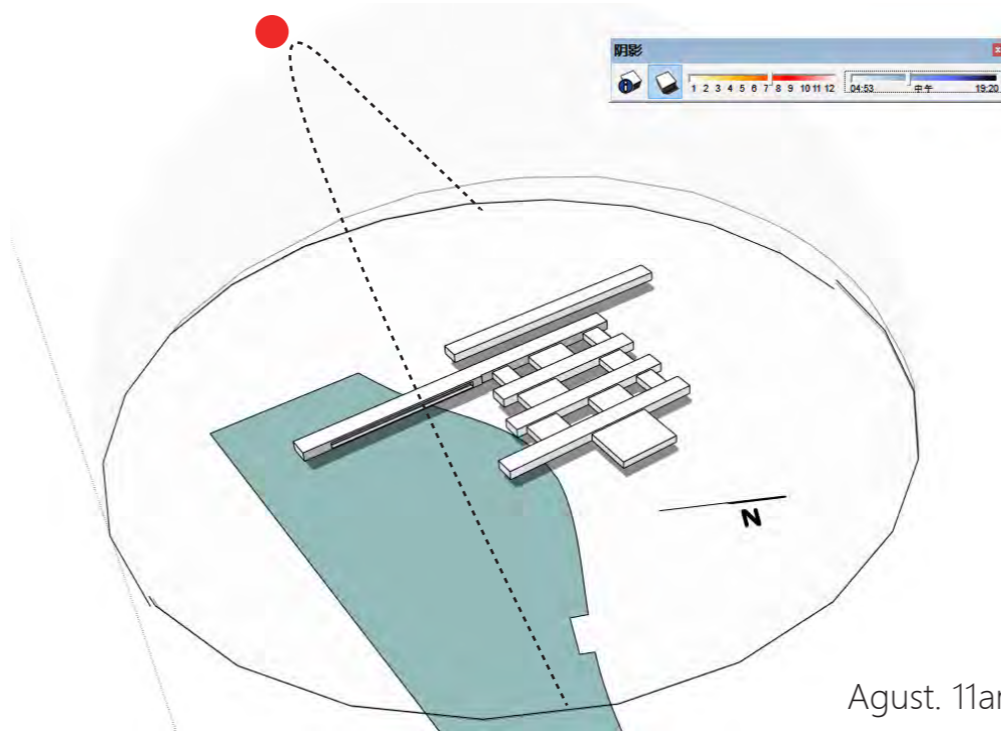


+/- 1300m2
Max 150 People

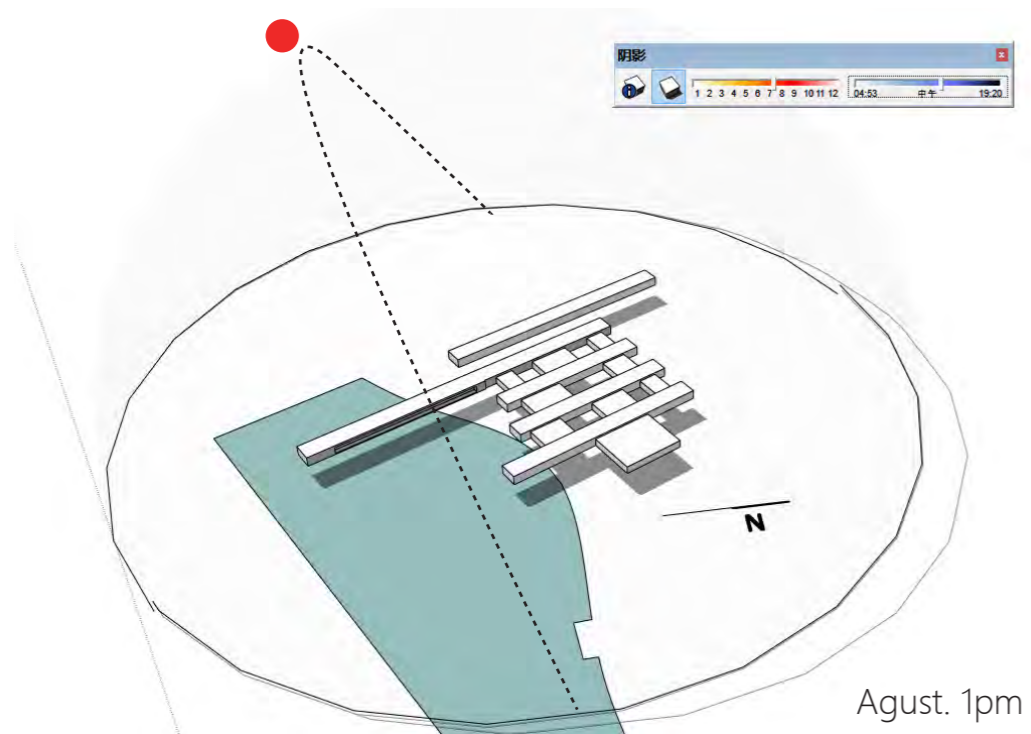
Programe Zone



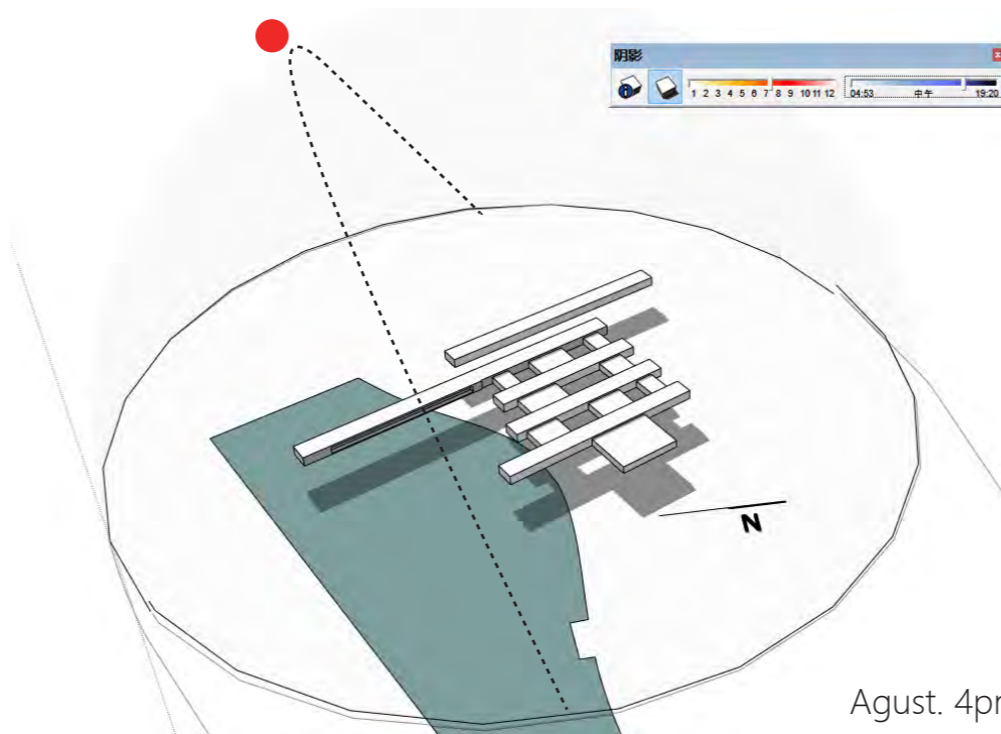
Agust. 8am



Agust. 11am



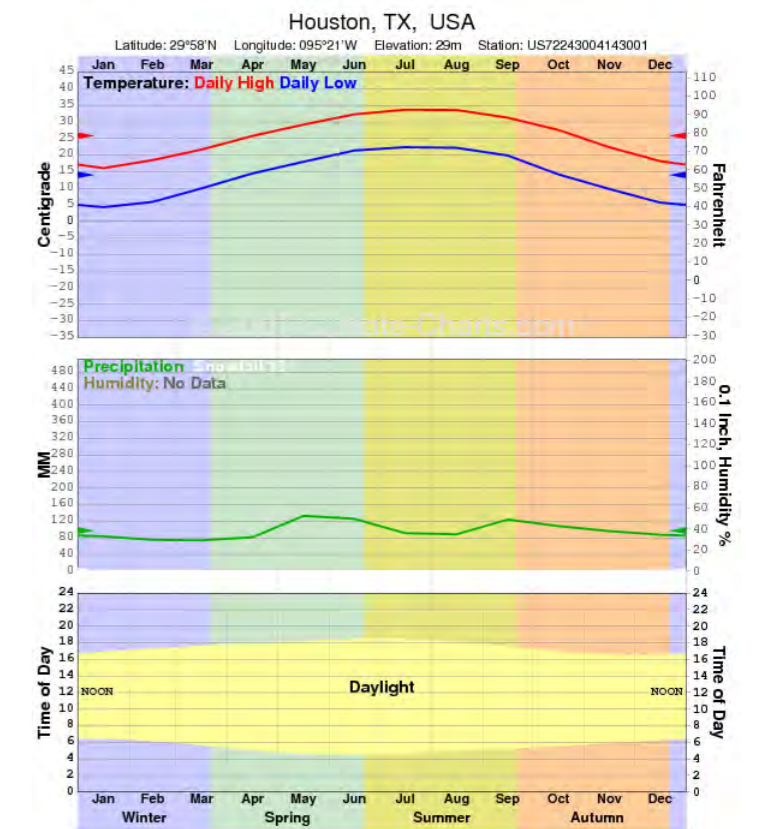
Agust. 1pm

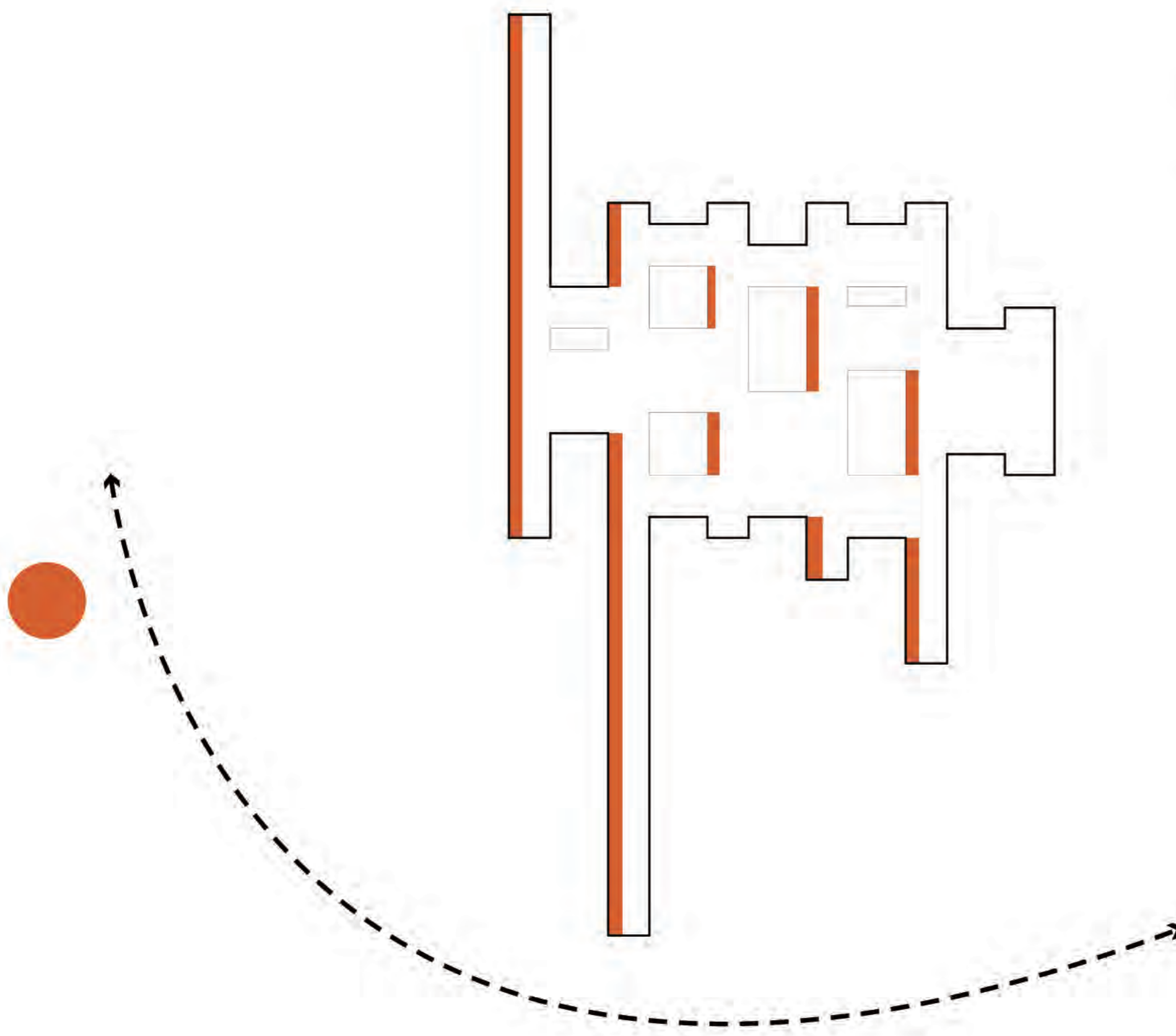


Agust. 4pm

Sunlight

The east Sides of the building will not take too much sunlight, only in the early morning. But the west sie will bear the hot sunlight for the almost 10 hours, which means the shading for the west facade is quite important.





Hot

Pathway
Balcony
Shadow



Cool

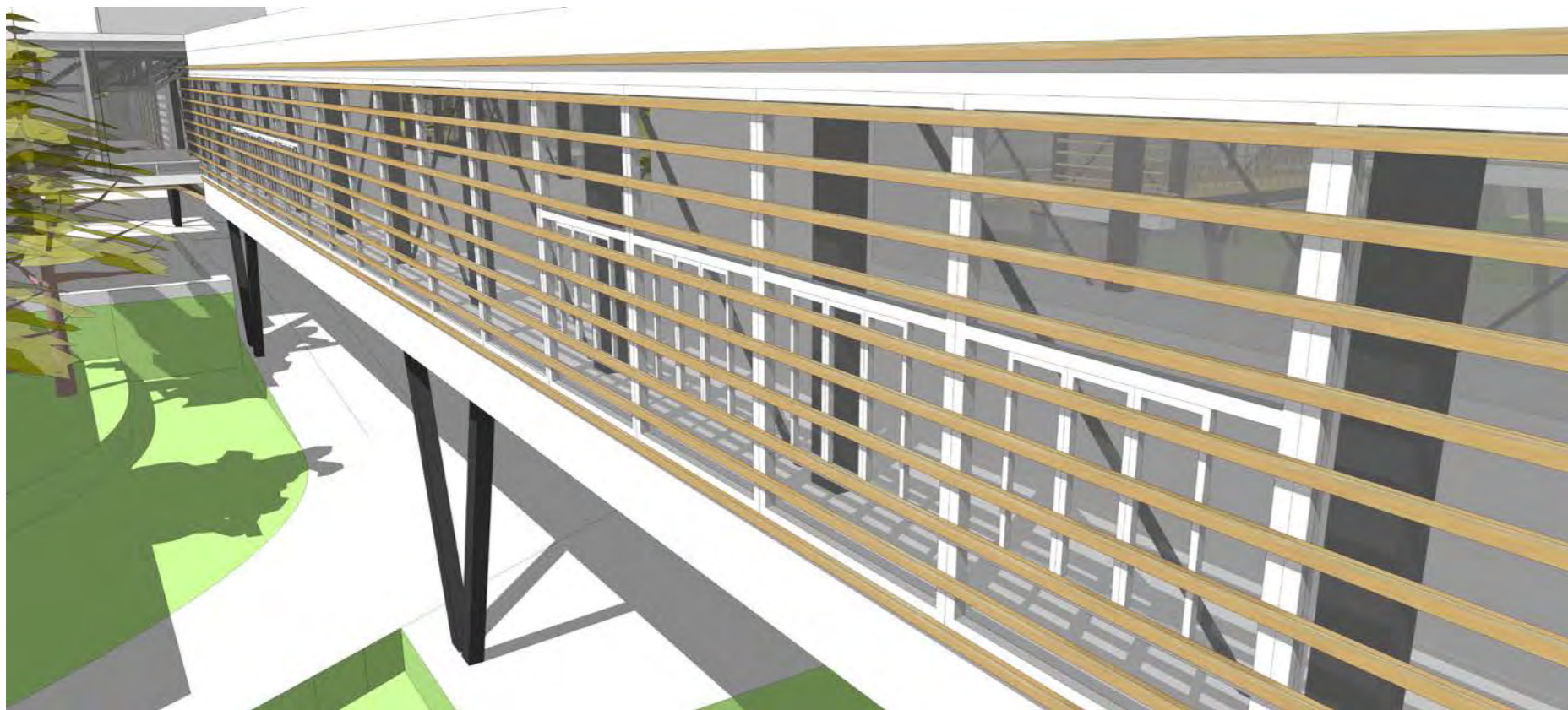
Working
Long stay

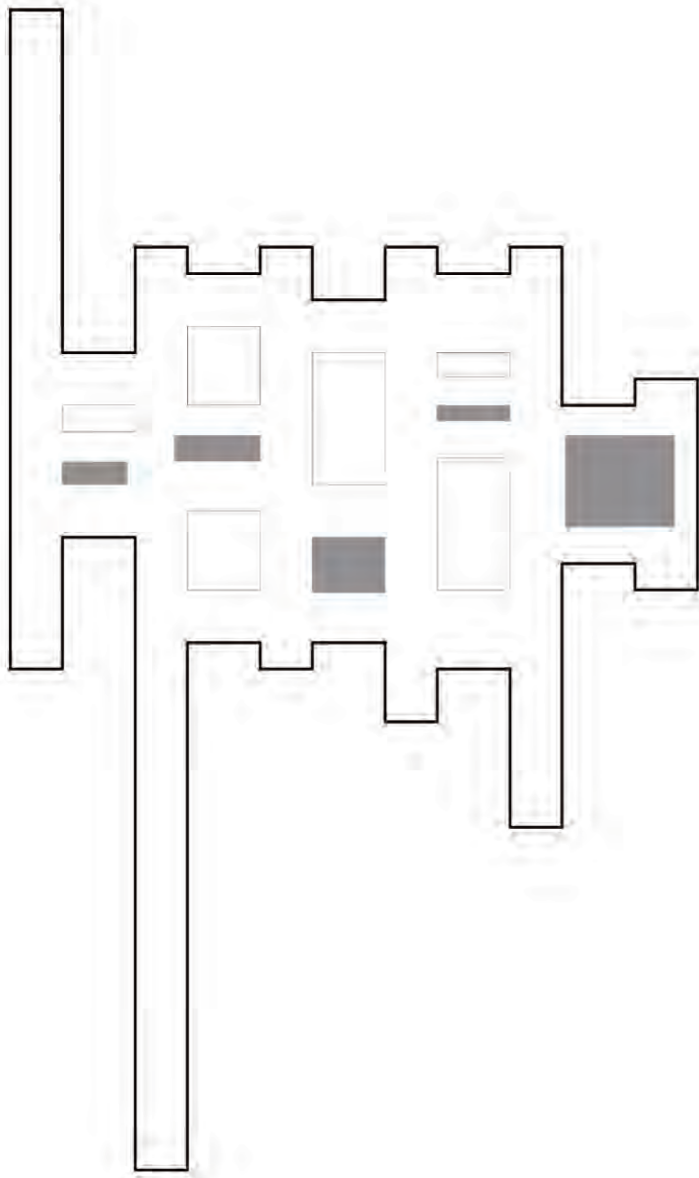




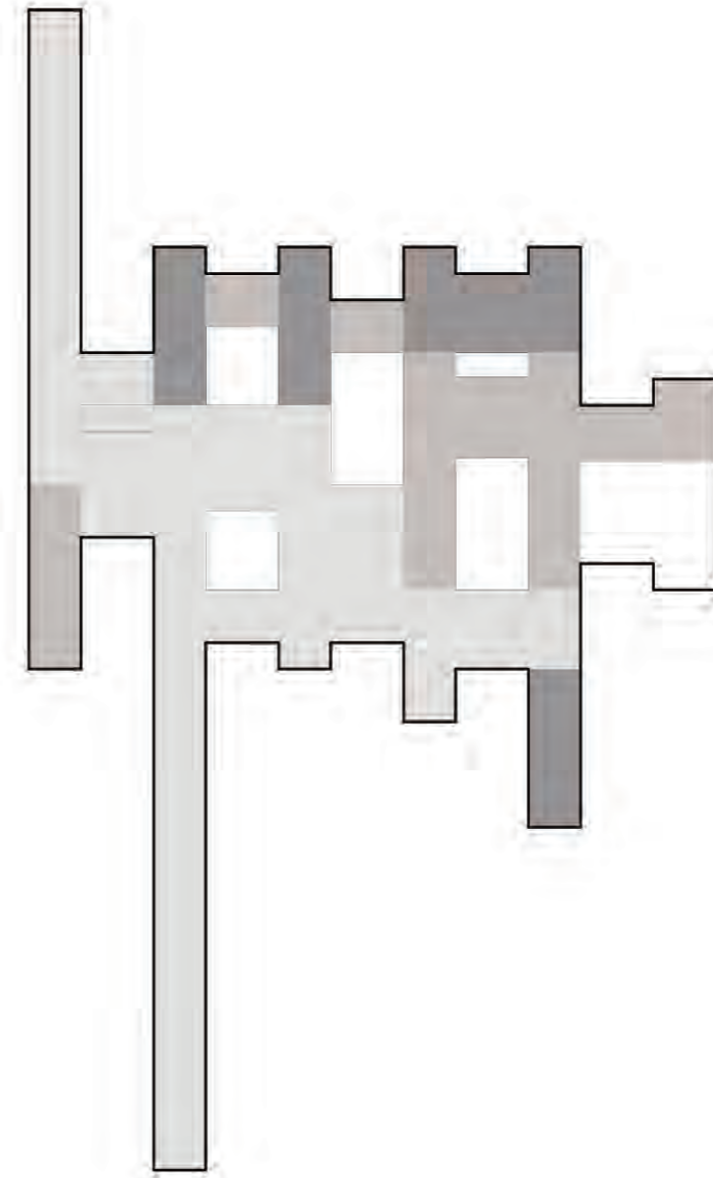
Shading for the west sides

It is better to hange the shading system outside.



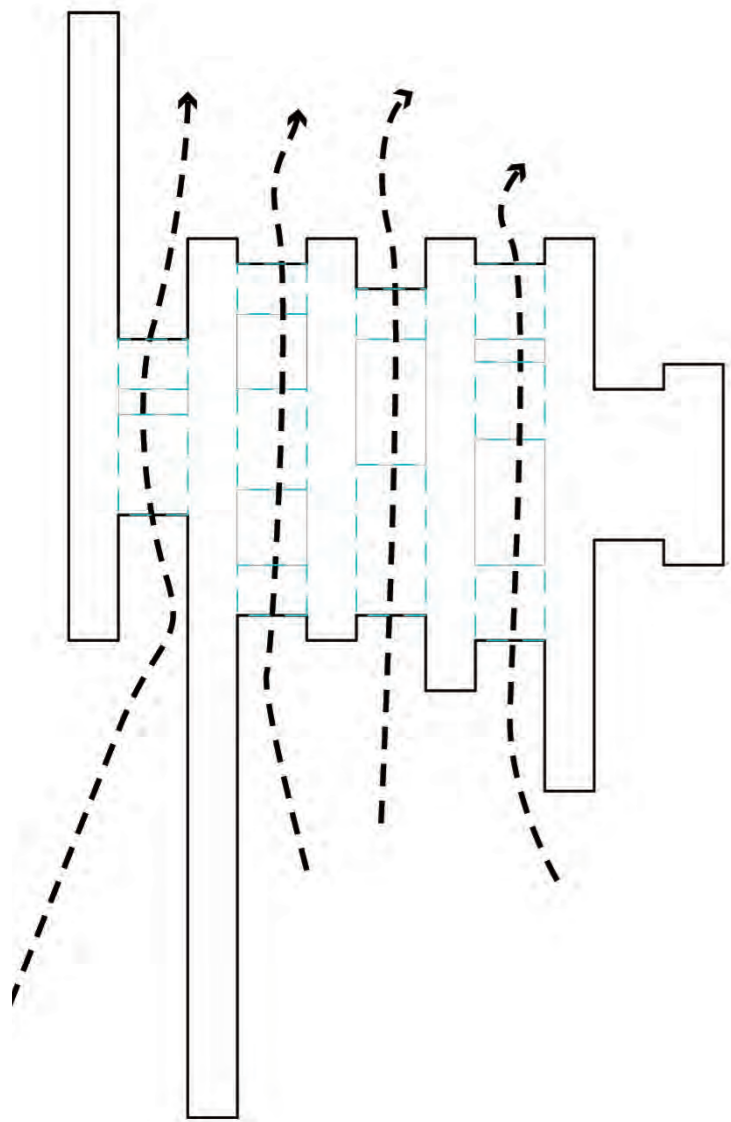


Less Sunlight
Exhibition
Equipment
Lecture room
Summer theater

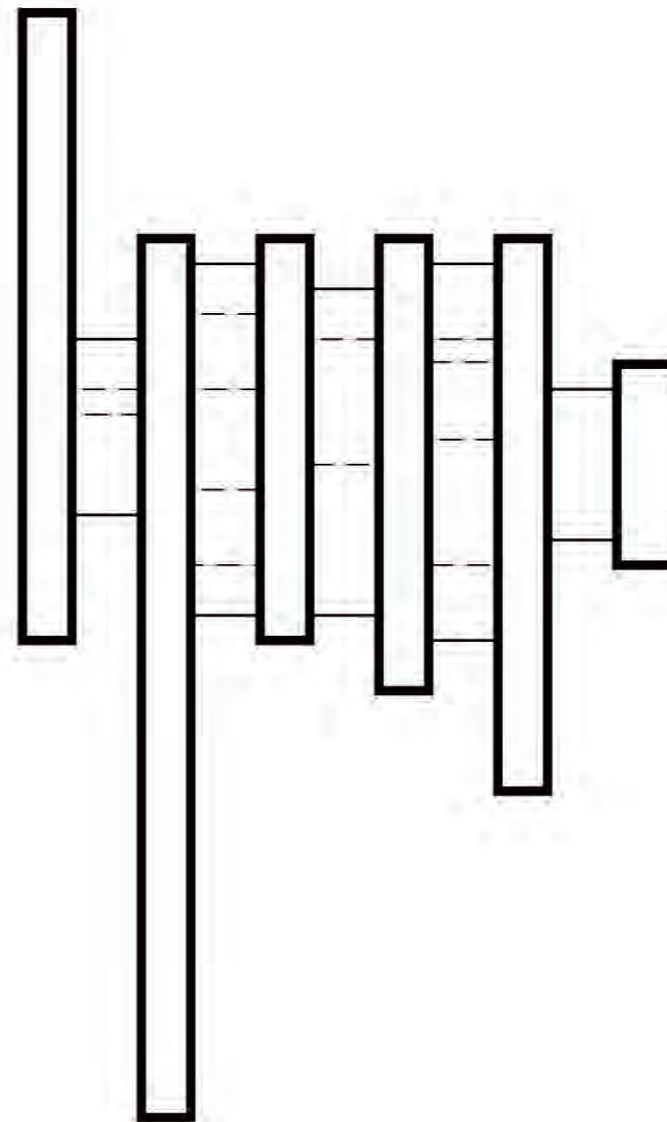


Private
Public





- Transparent /Open
- Exhibition
- Restaurant
- Balcony
- Entrance
- Coffee/Drink



- Flexible/ Less equipment required
- Fixed/ Extra equipment required



5.4 First Floor Program

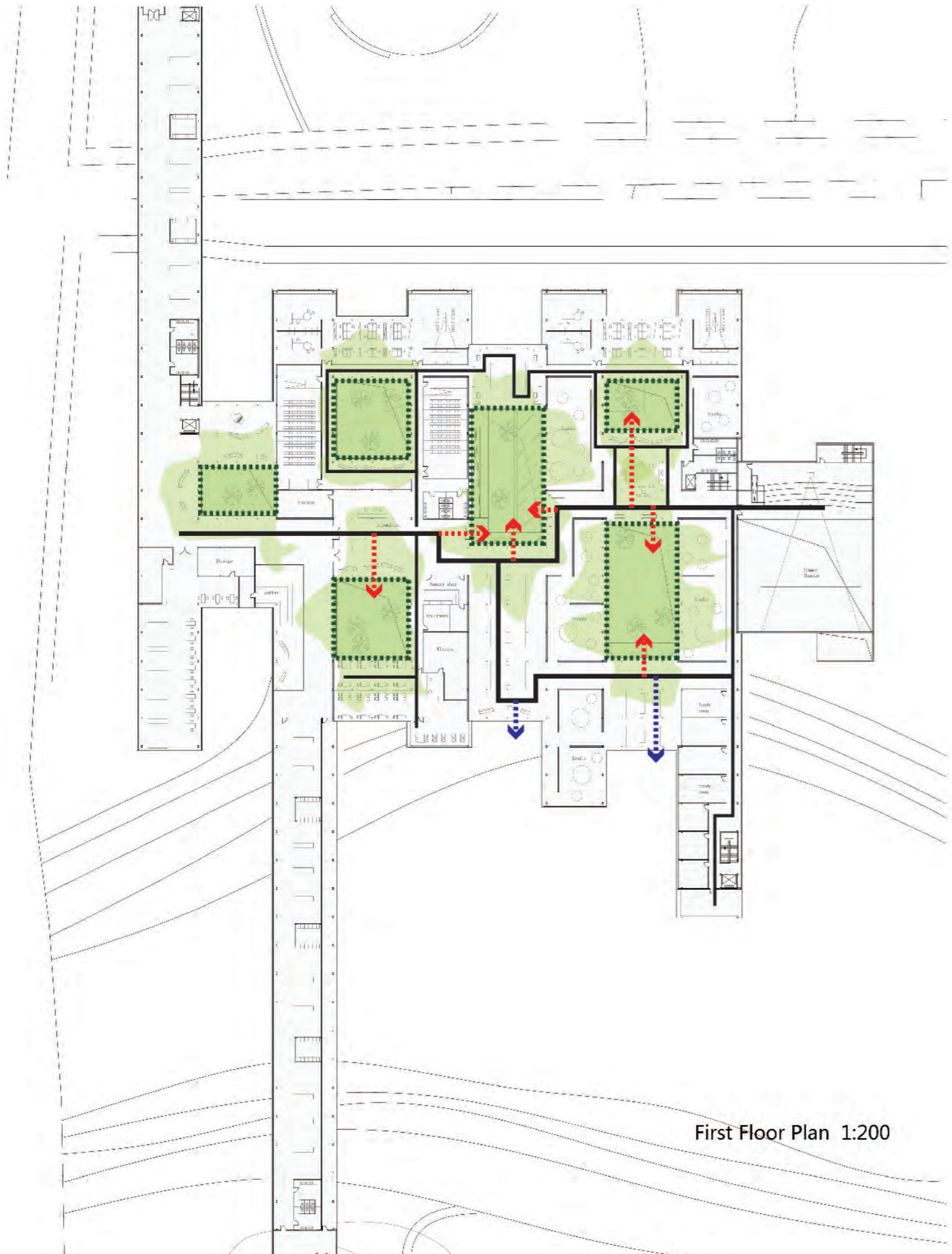
Most fixed space that gathering people is located in the mainstructure. The hanging program is quite flexible and transparent.



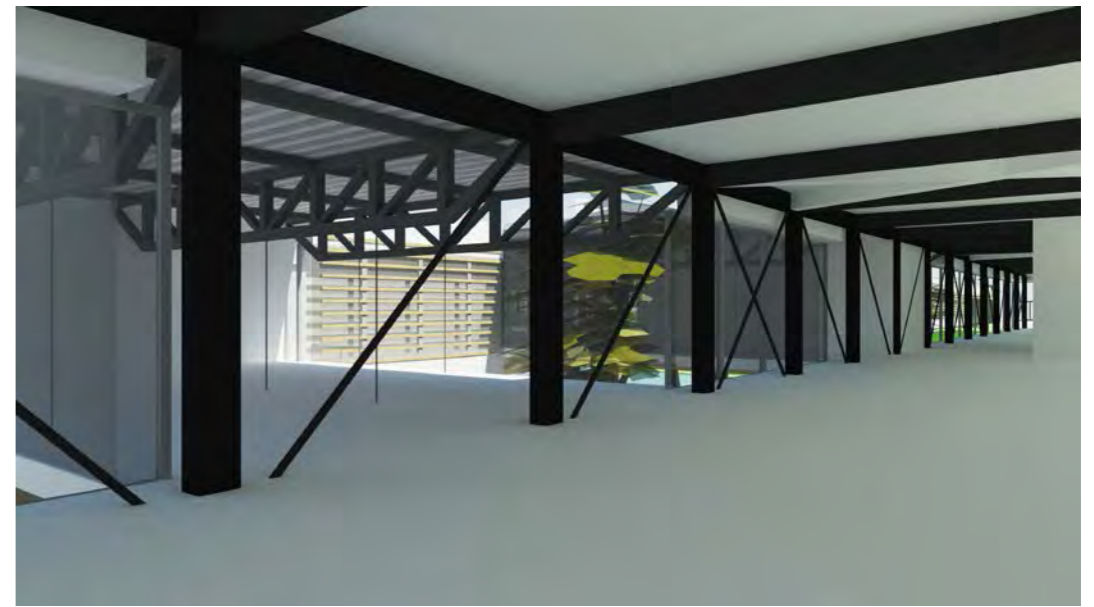
- Restaurant/ Coffee
- Studio
- Office/ Lecture
- Pathway/ Exhibition
- Library/ Study Room



Courtyards
6 courtyards provide the natural light and green view to the interior. Each courtyard focus on different type of inner space.



First Floor Plan 1:200

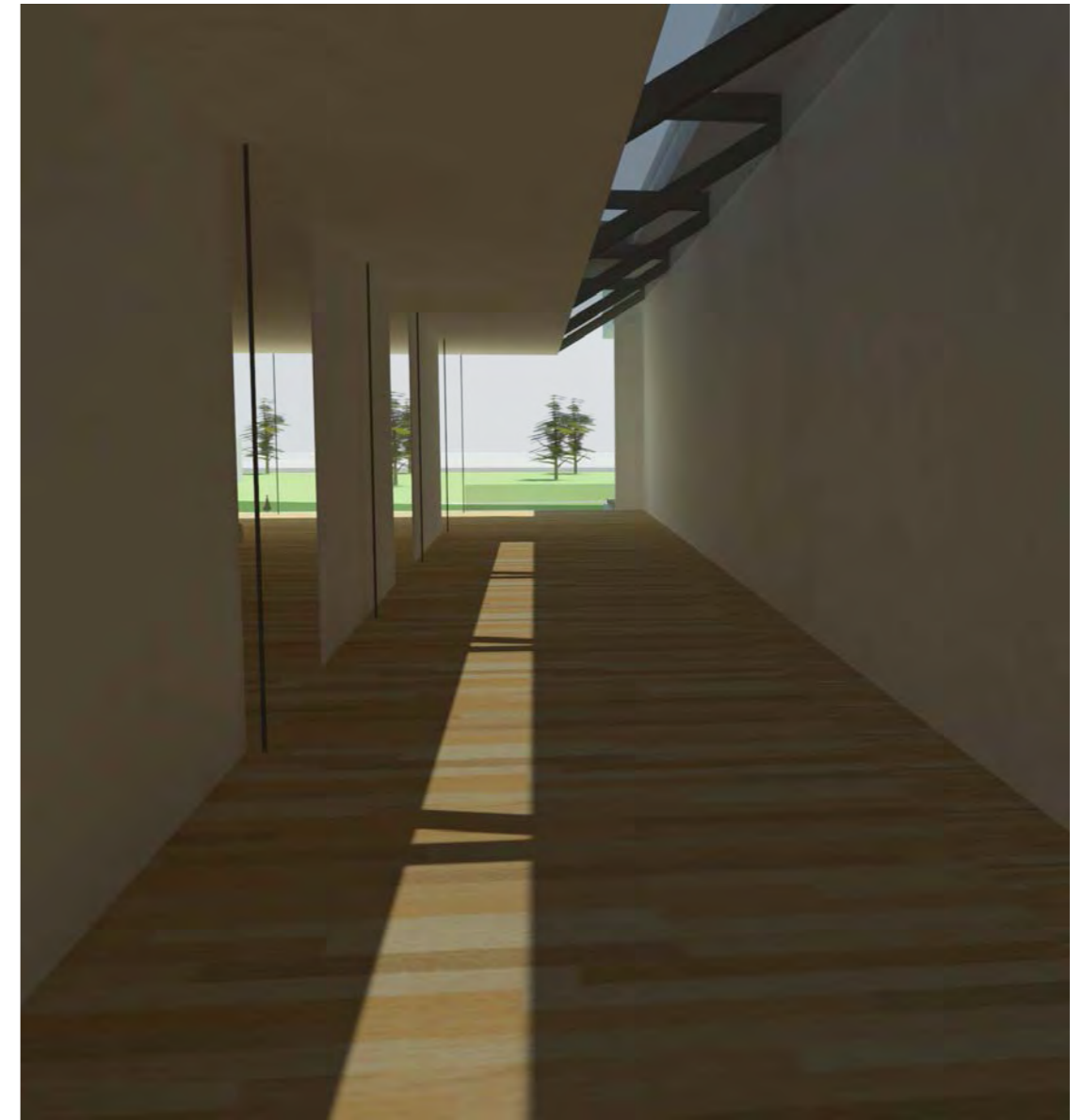


View to the Courtyards

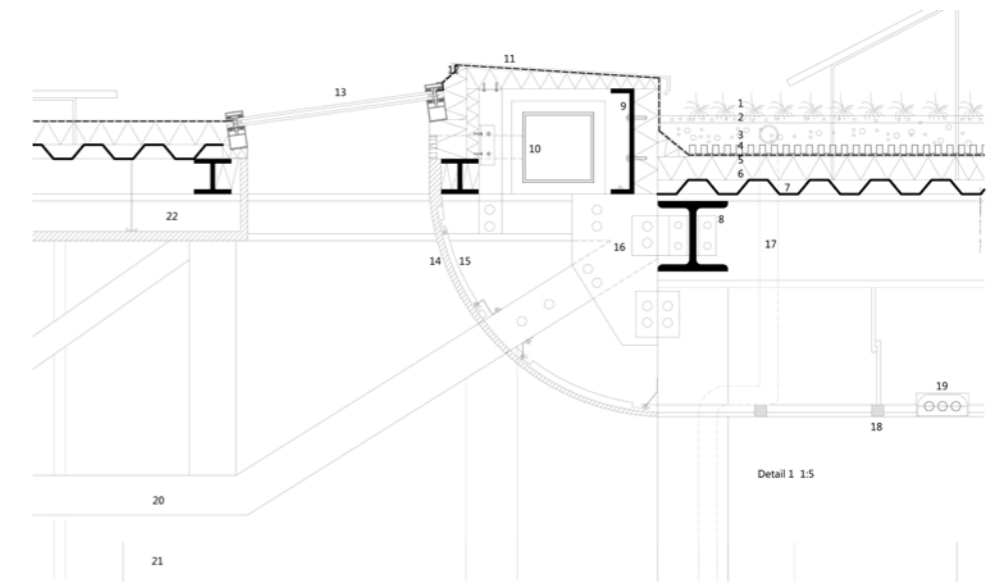


Interior Material

Wood Boor + Glass facade + Aluminum frame + Stell columns +Wood Shadings



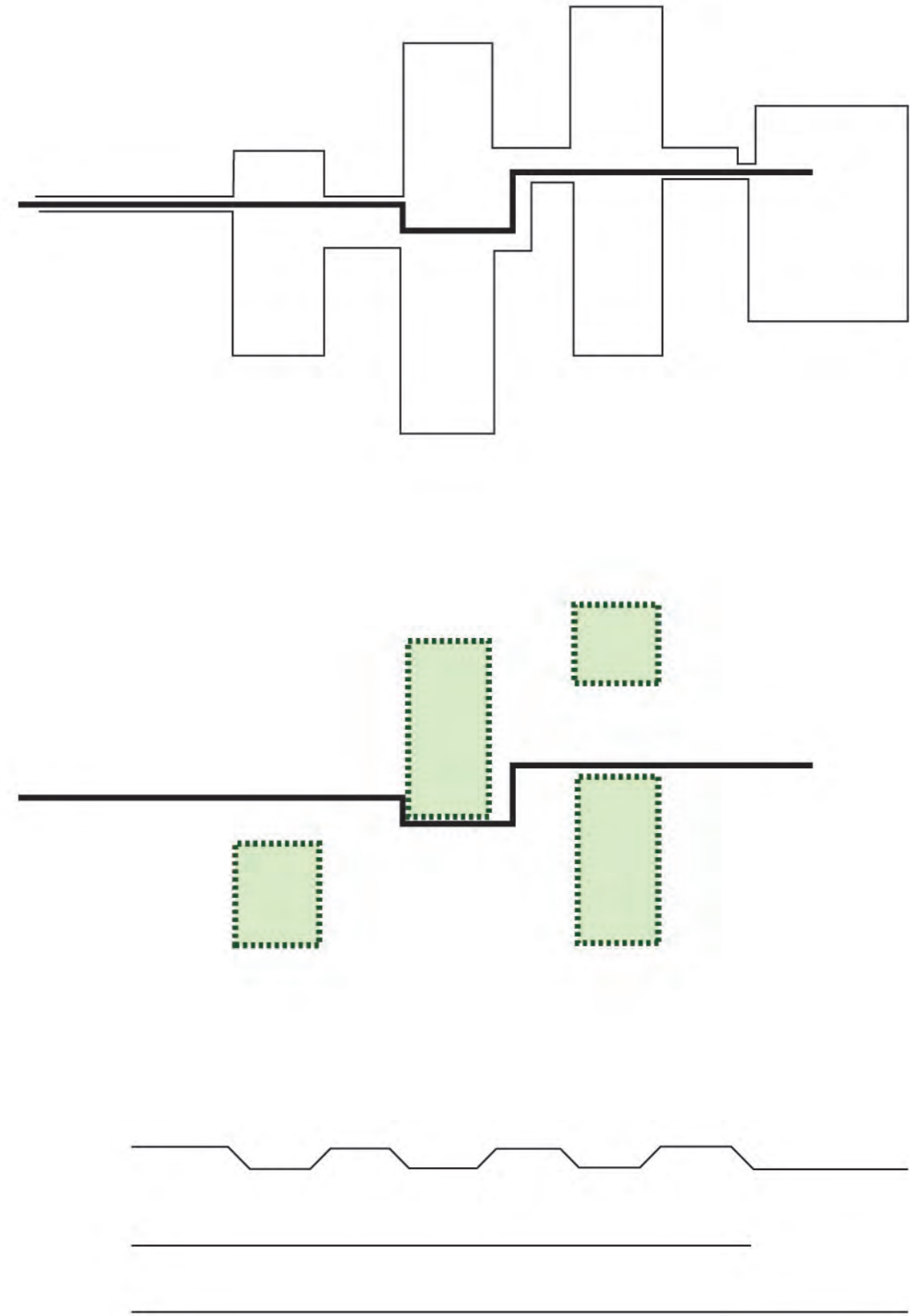
Exhibition Space and Sky windows

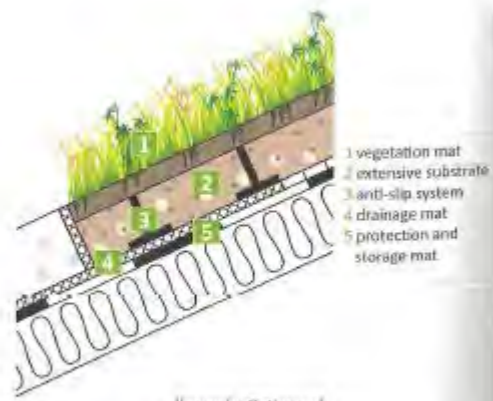




First Floor Plan 1:200

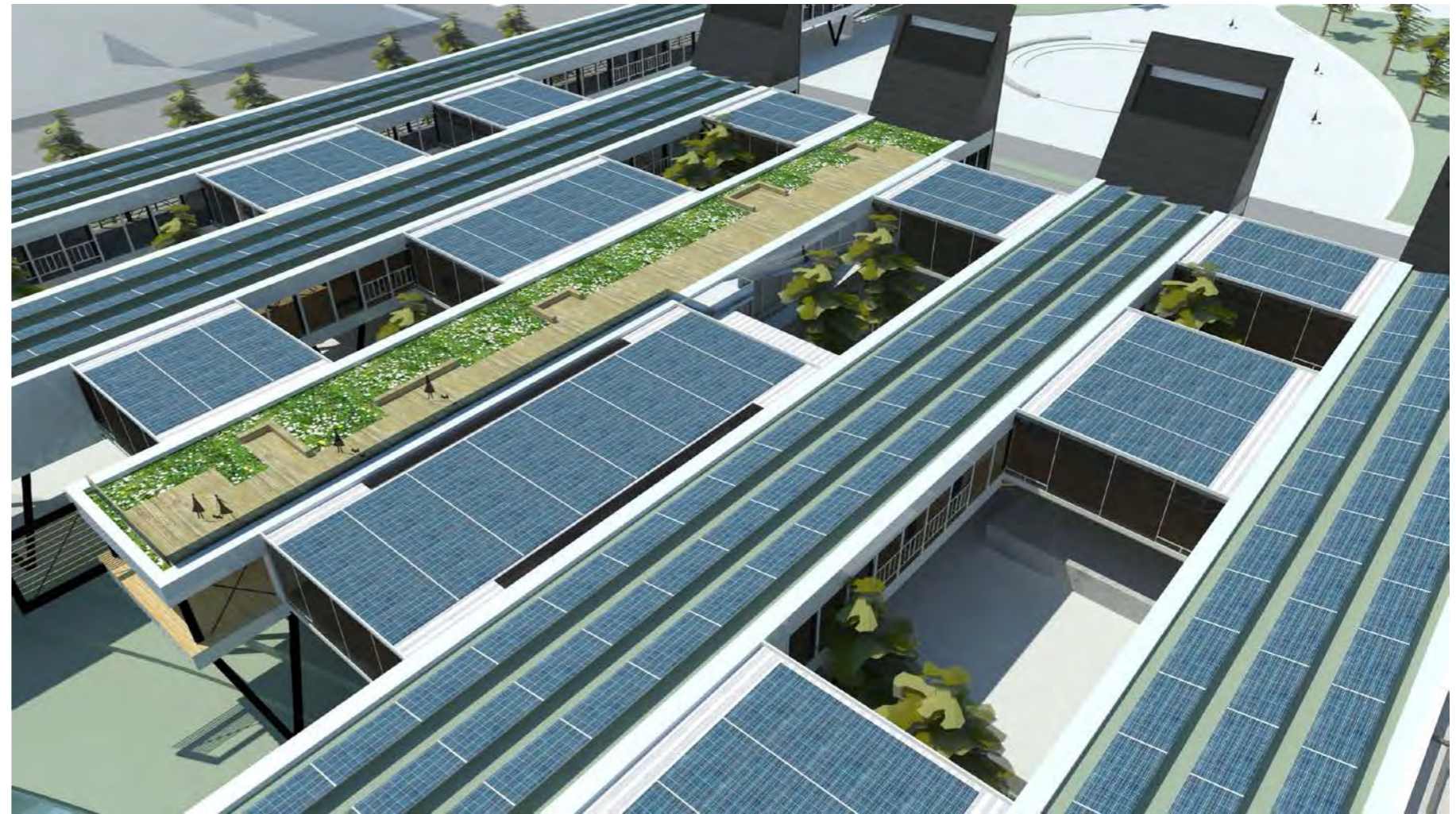
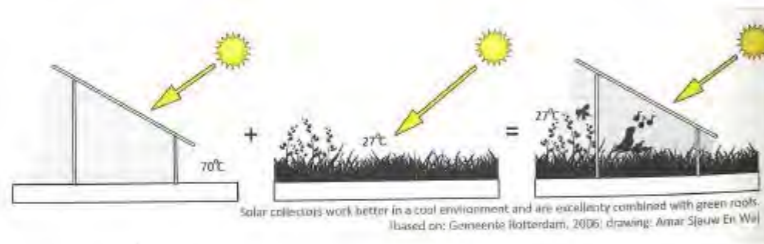
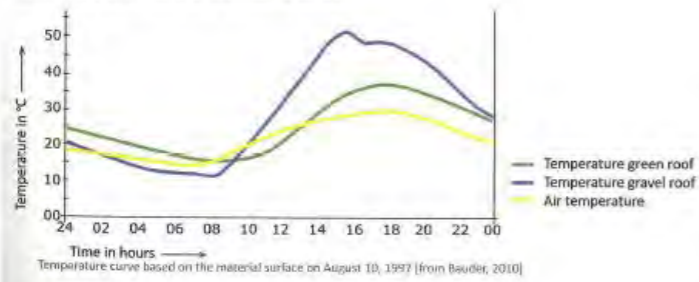
Route Experience





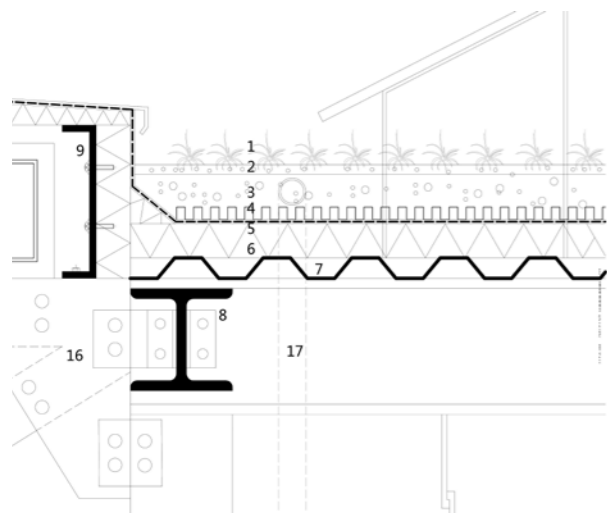
(image by Optigroen)

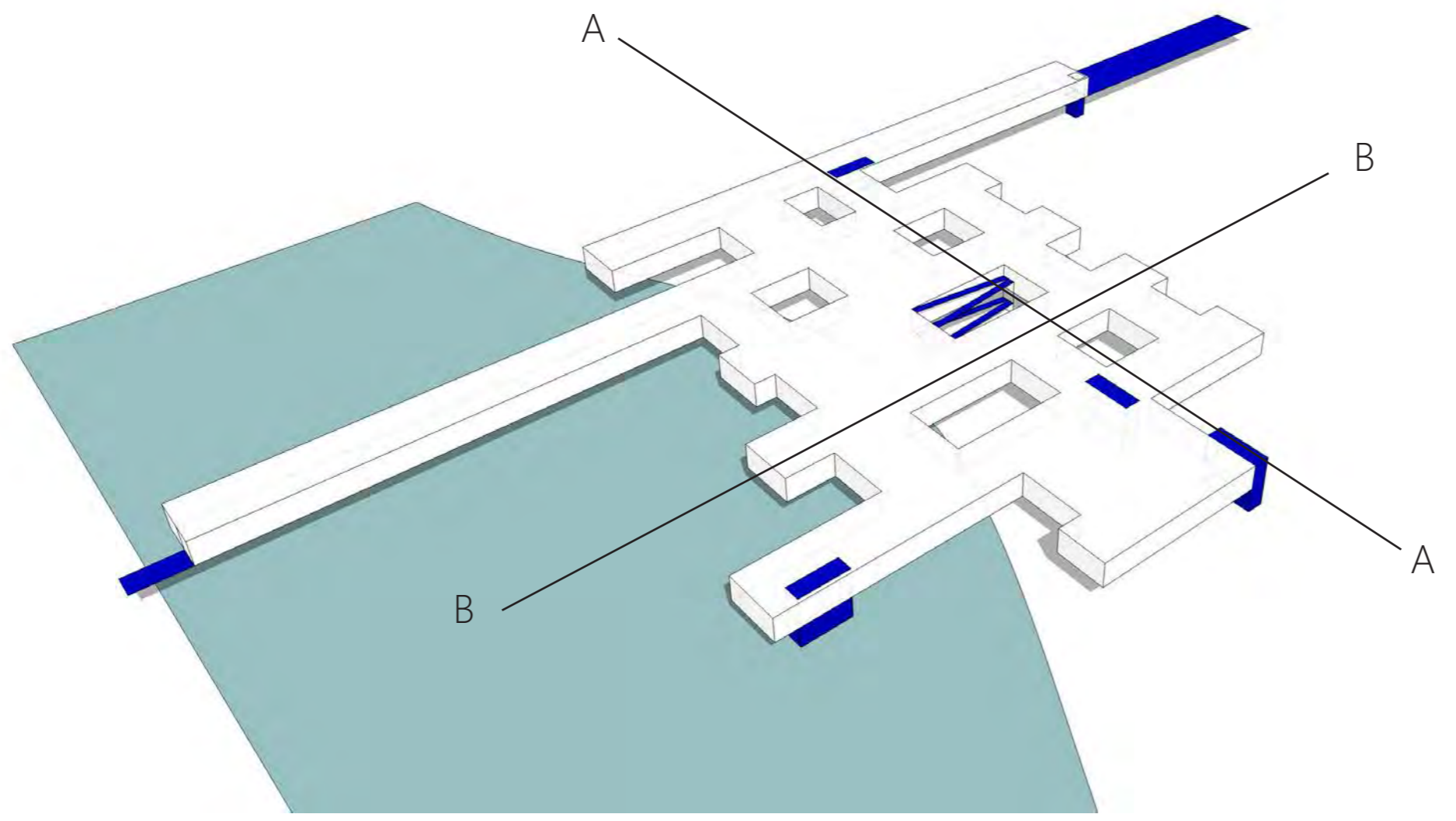
Temperature curve based on the material surface:

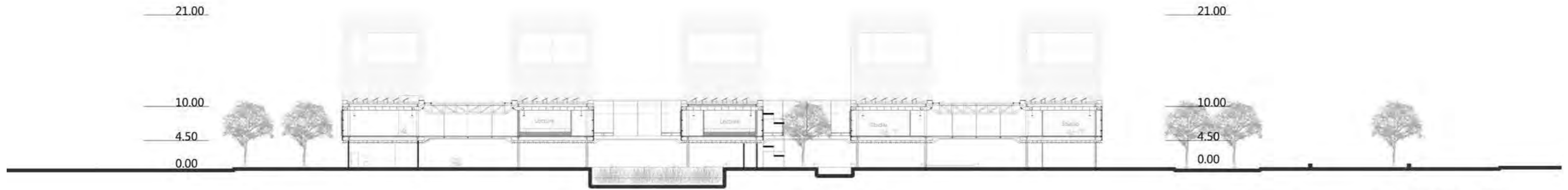


Roof

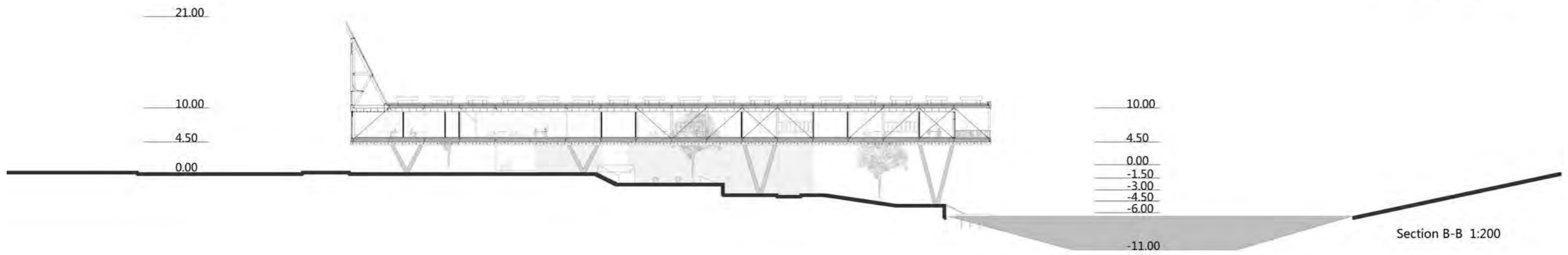
The combination of Solar Panel and the Green roof will make the energy system work better.







Section A-A 1:200

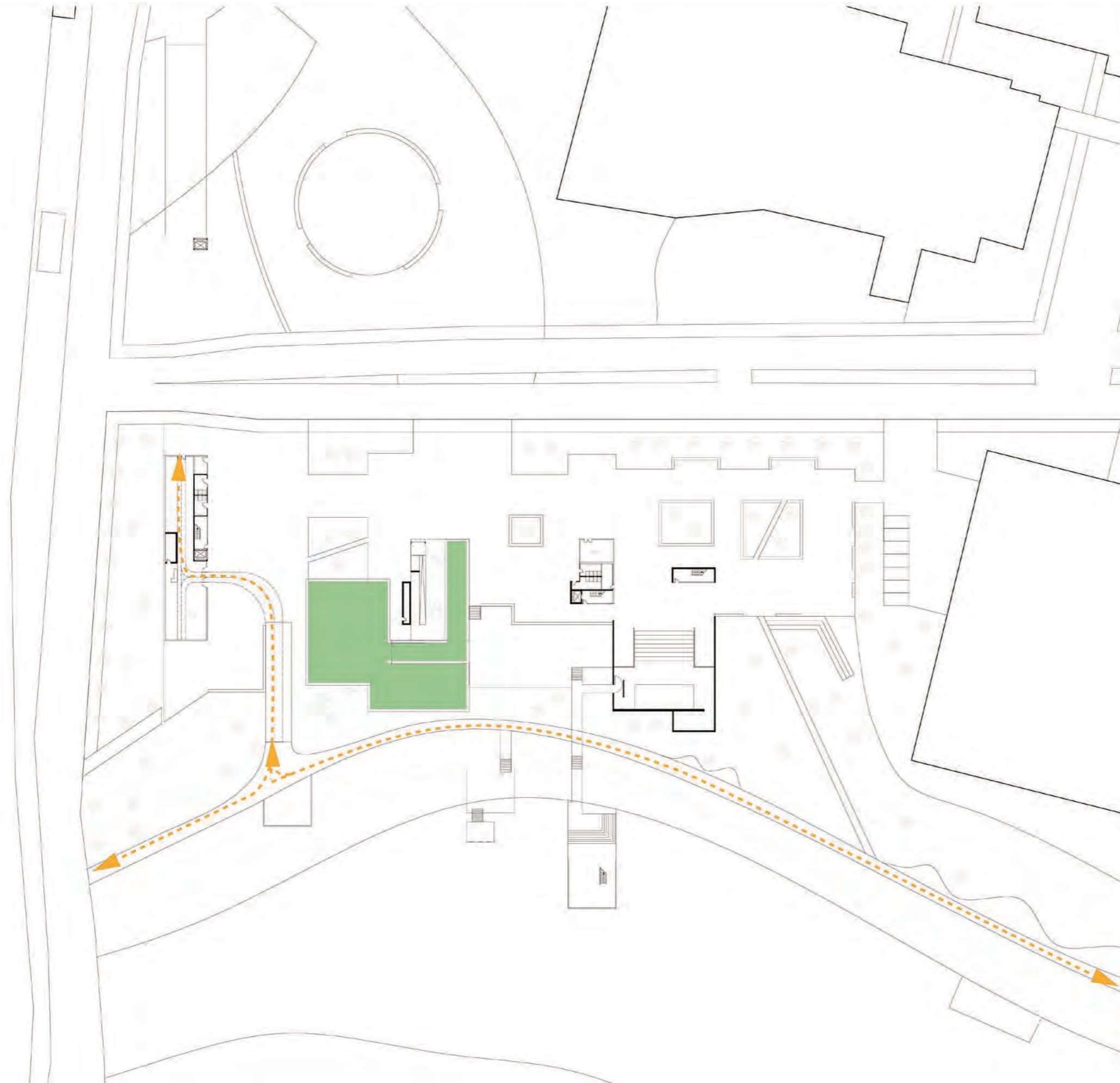


Section B-B 1:200

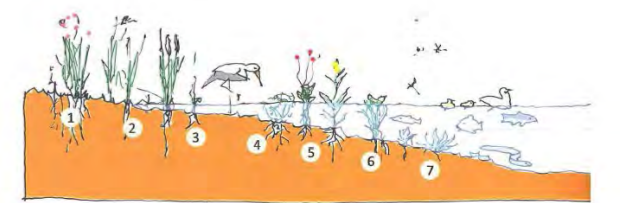
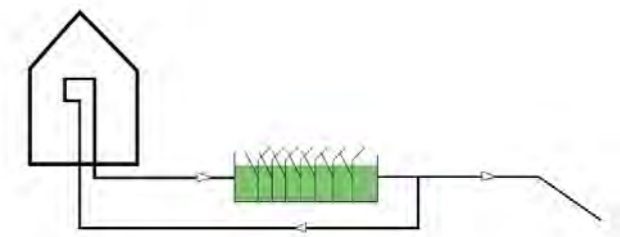


North Facade 1:200

Ground level Landscape

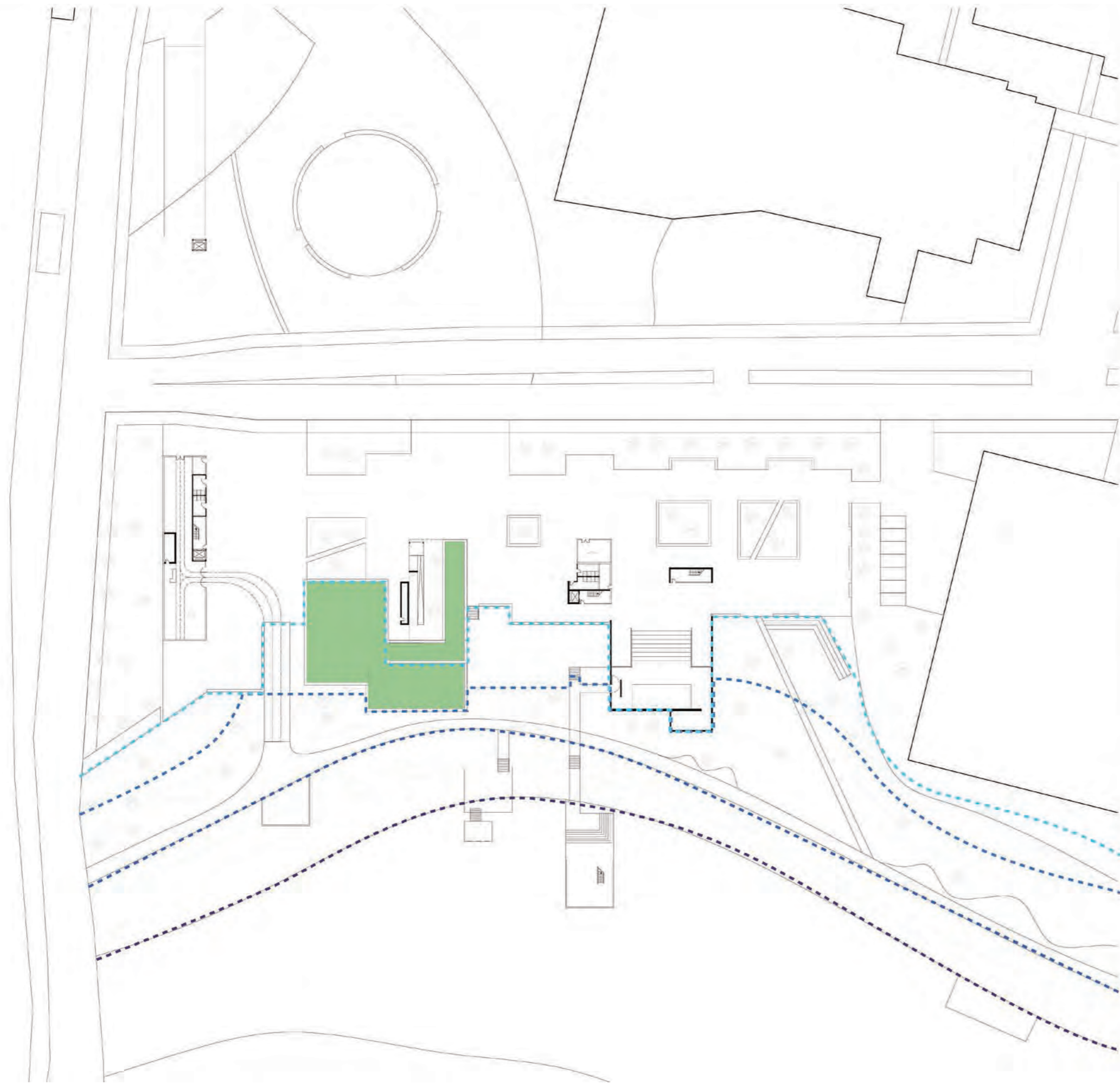


1:1000000



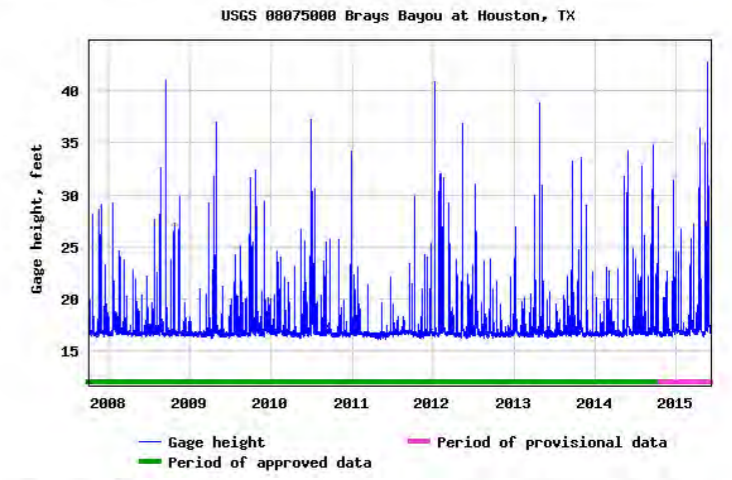
- 1 Flowery grassland;
- 2 Vegetation from moist soil;
- 3 Vegetation from wet herbaceous vegetation (puddle-,marshy);
- 4 Marsh plants in shallow water;
- 5 Marsh plants in deeper water;
- 6 Floating plants;
- 7 Underwater plants.

Green bank scheme (based on STOWA, 20)



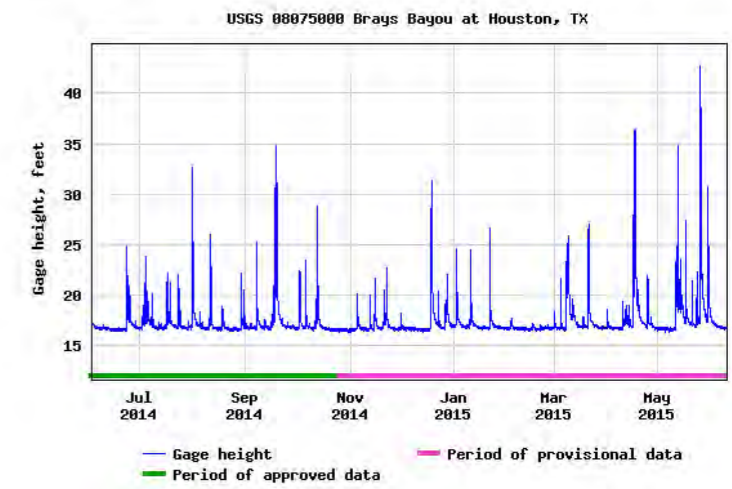
Gage height, feet

Most recent instantaneous value: 16.87 06-10-2015 03:45 CDT

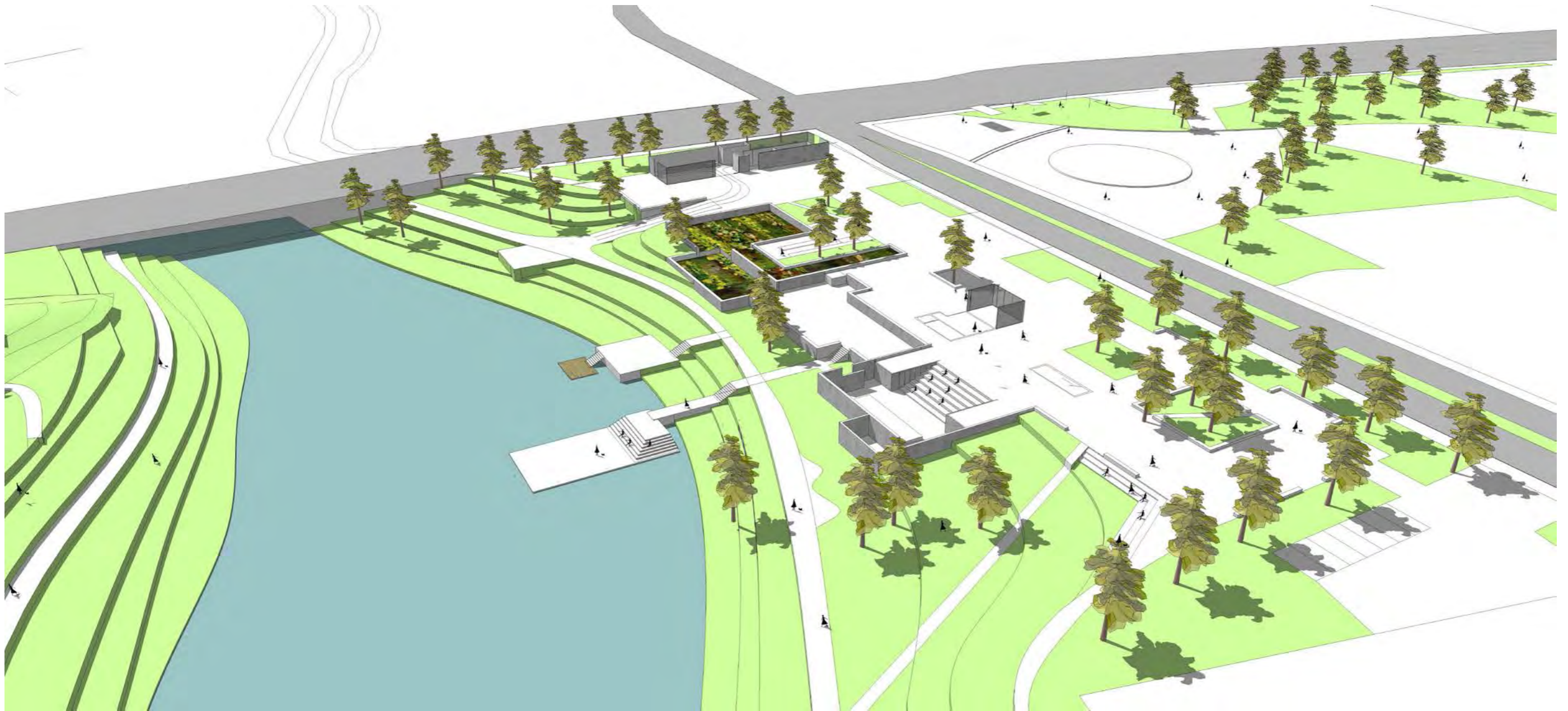


Gage height, feet

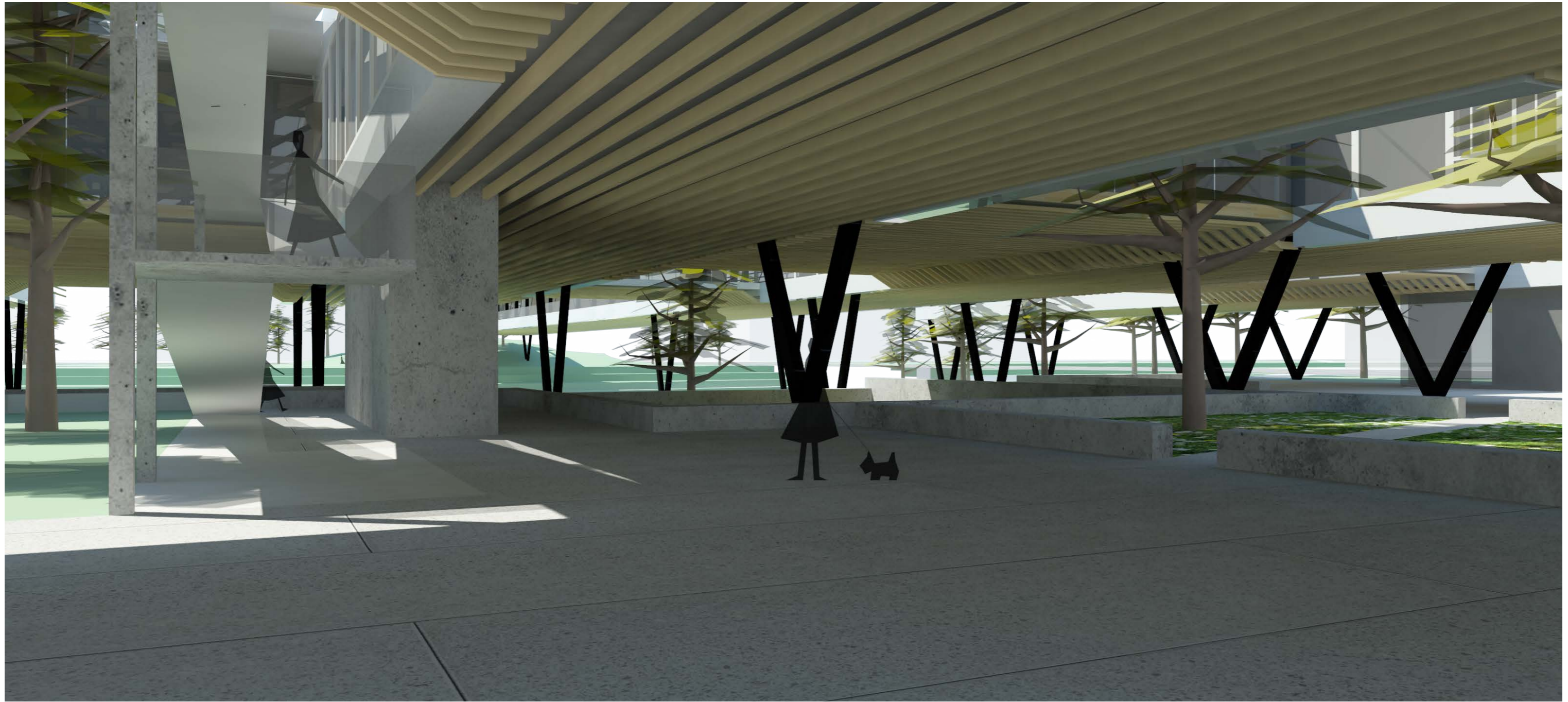
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STATION: 08075000

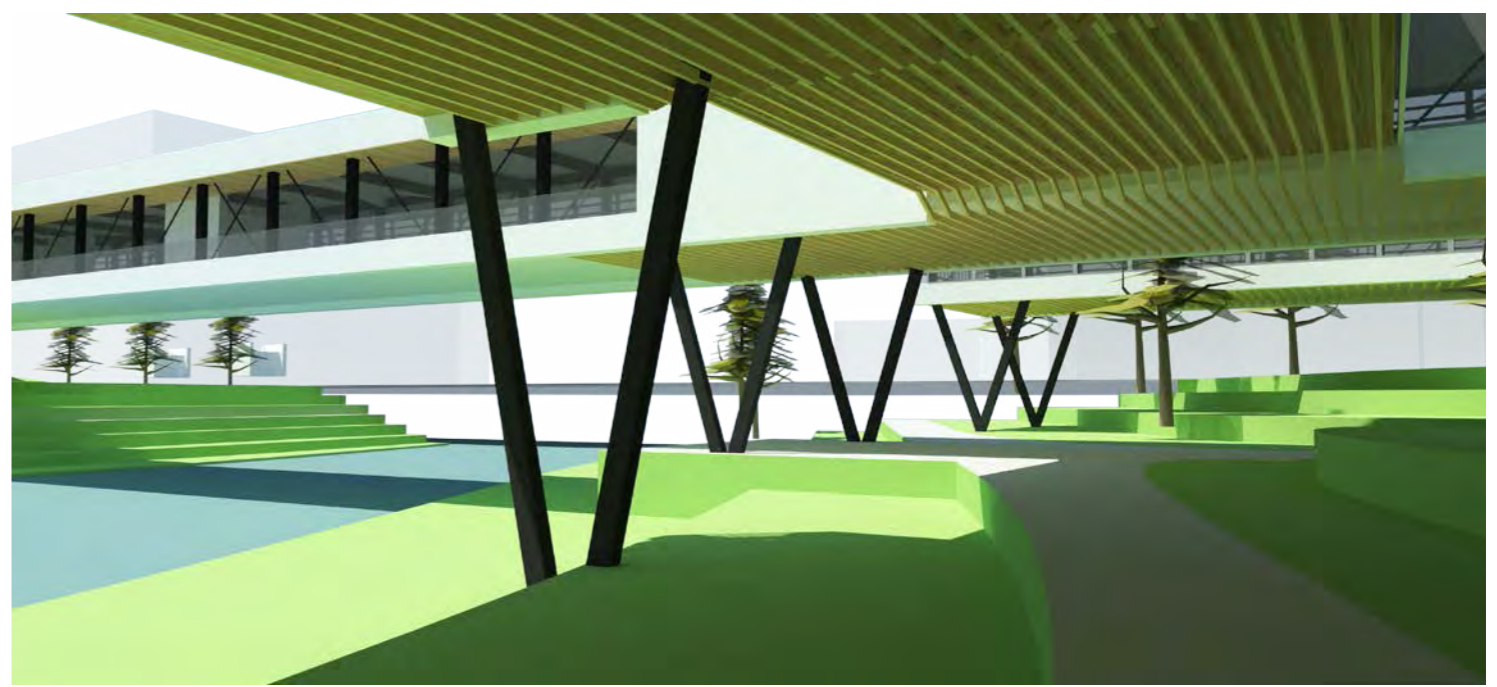
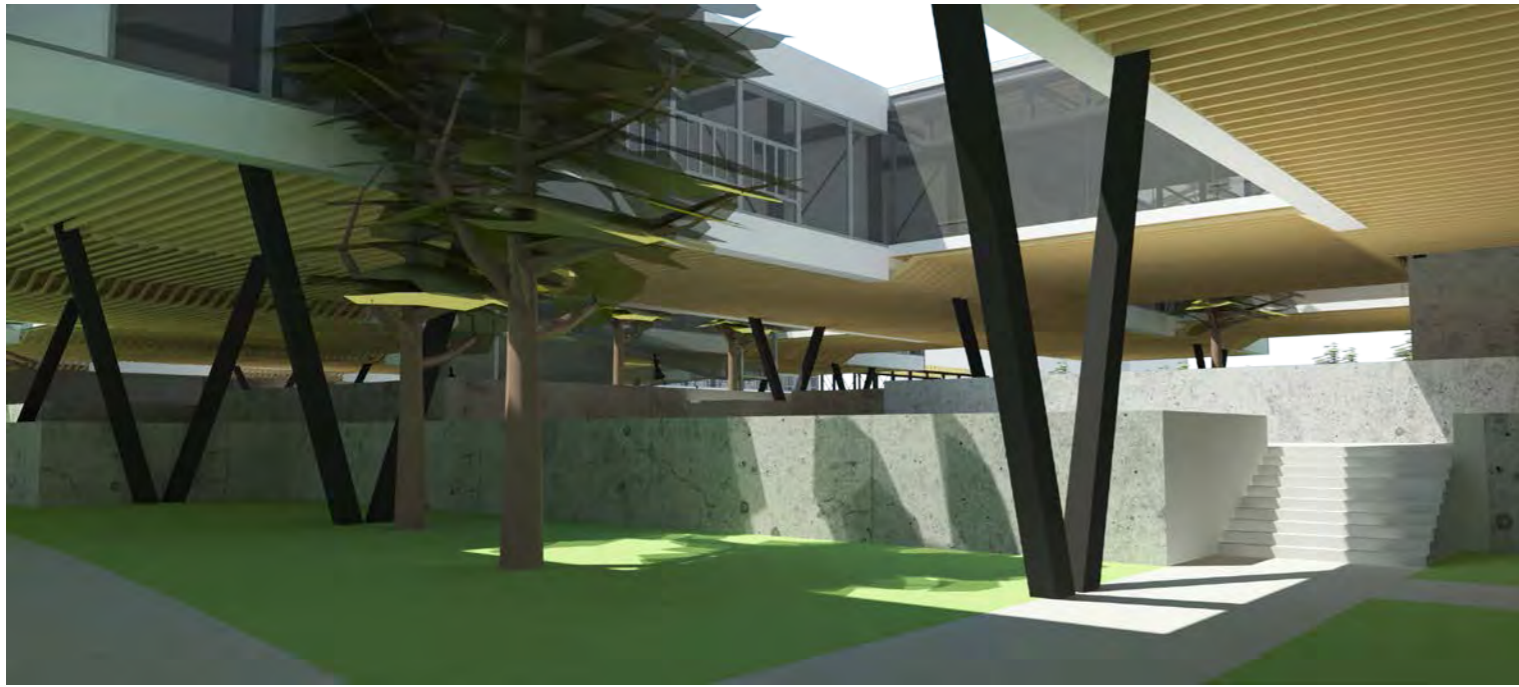
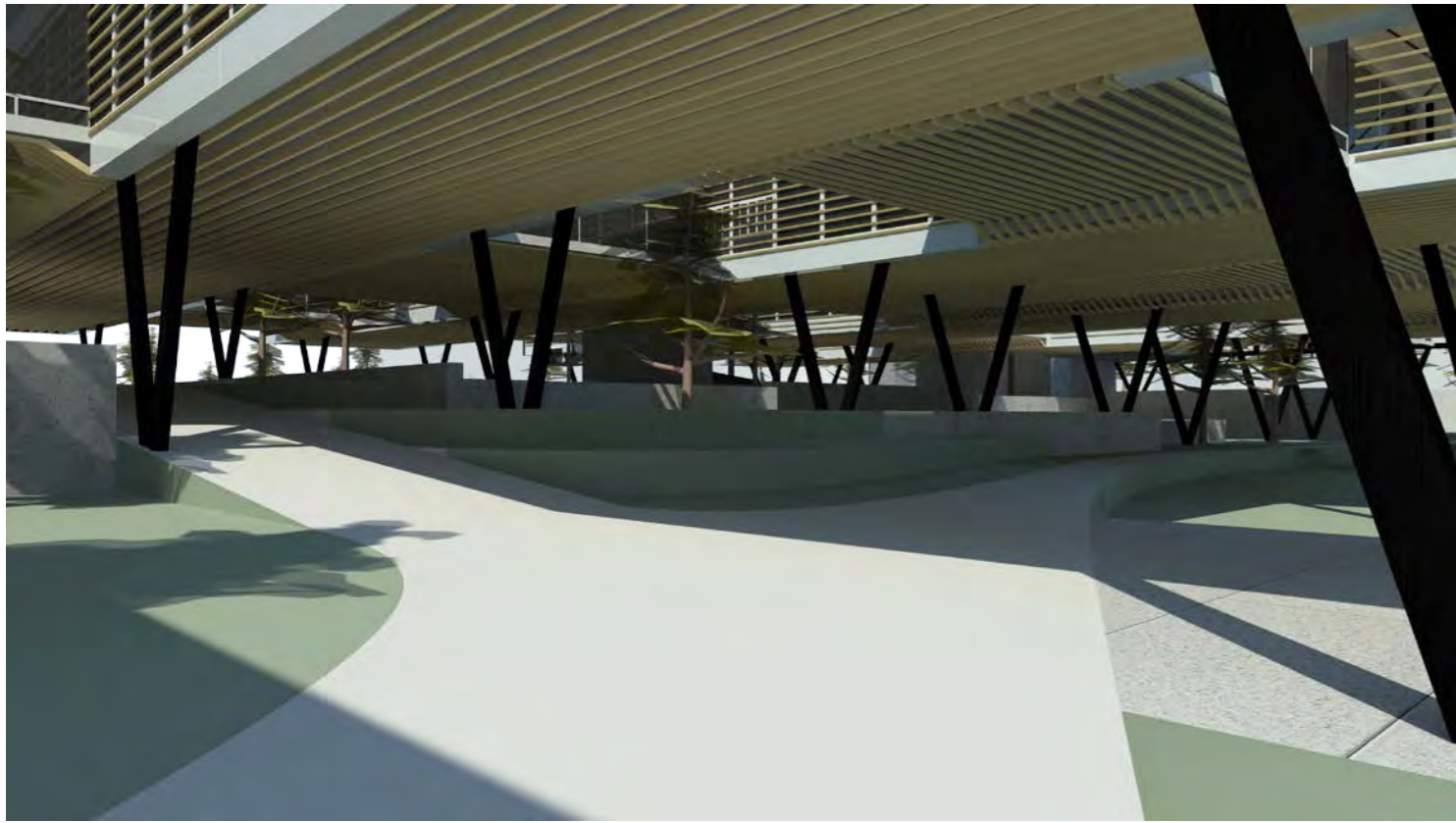


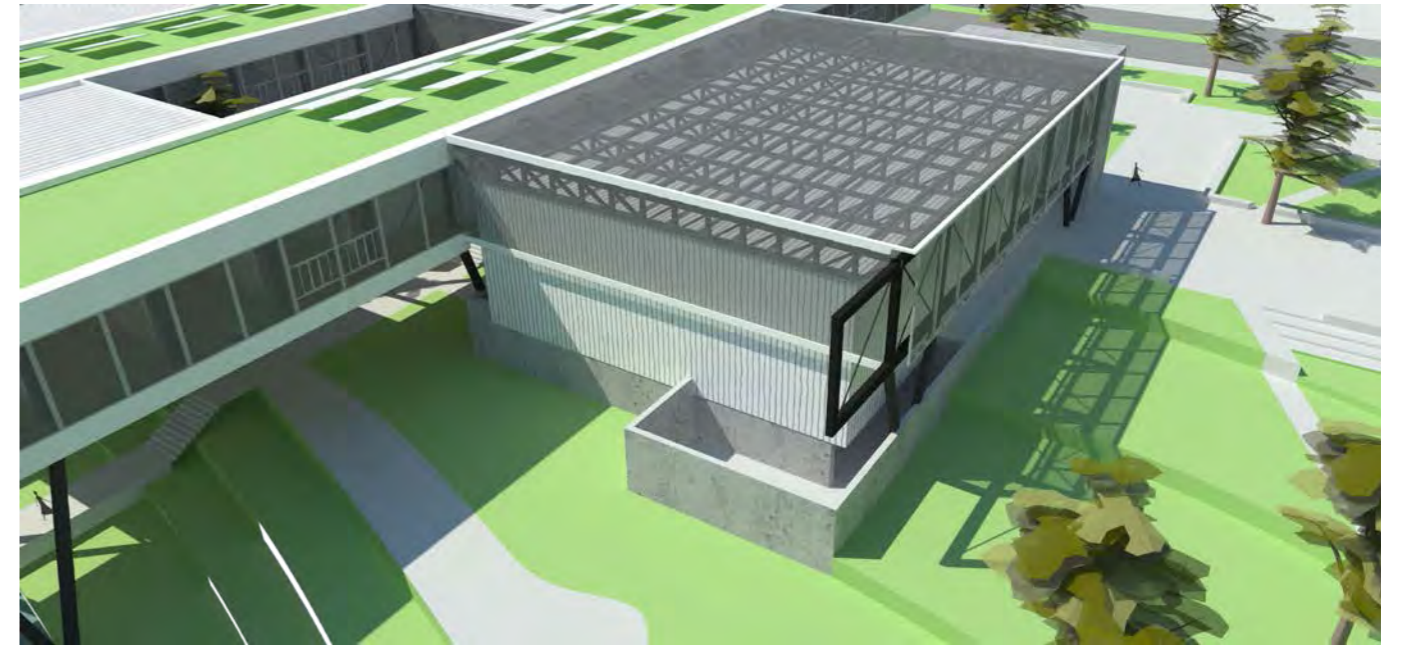
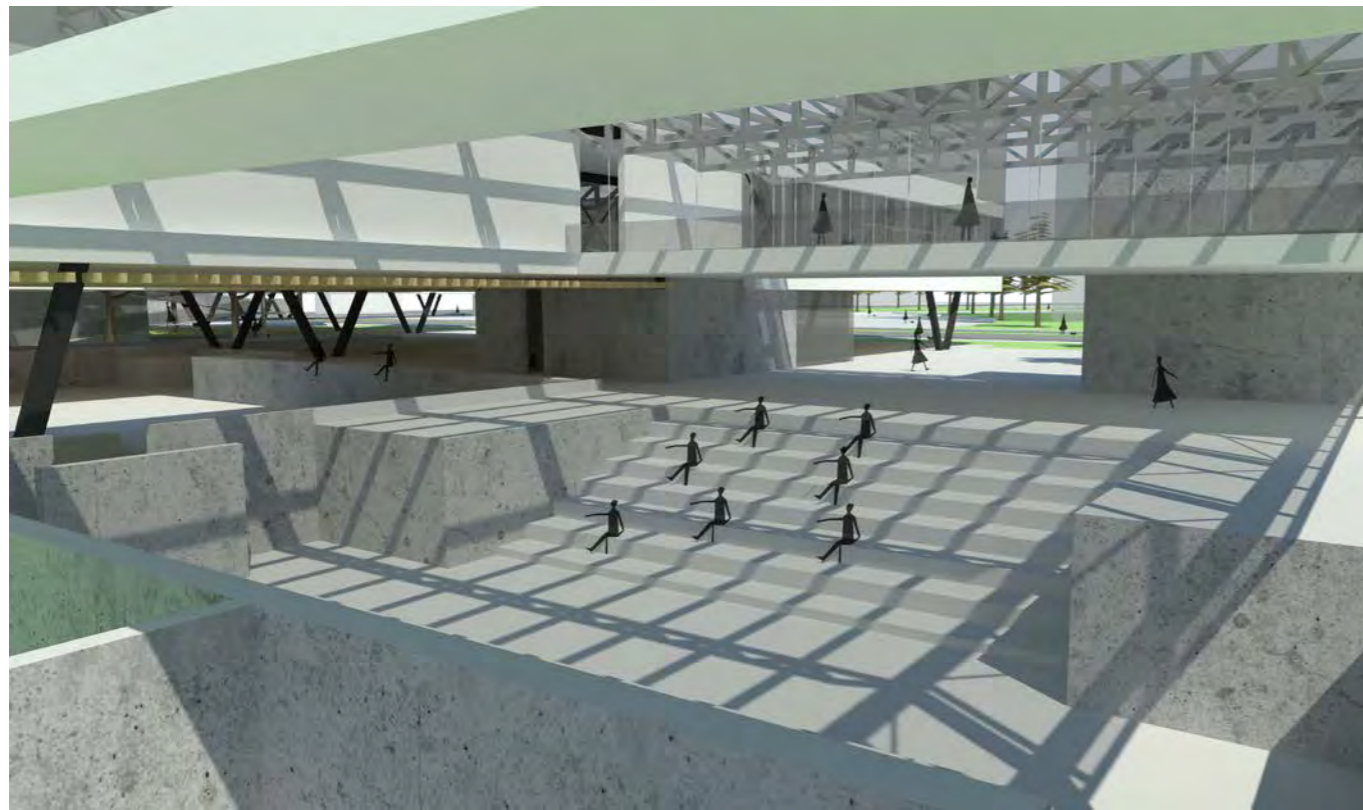
Ground level Landscape



Ground level Materials

Concrete walls+ Stell Columns+ Glass Windows+ Concrete Pavement+ Grass land+ Vengitation Purify Poor

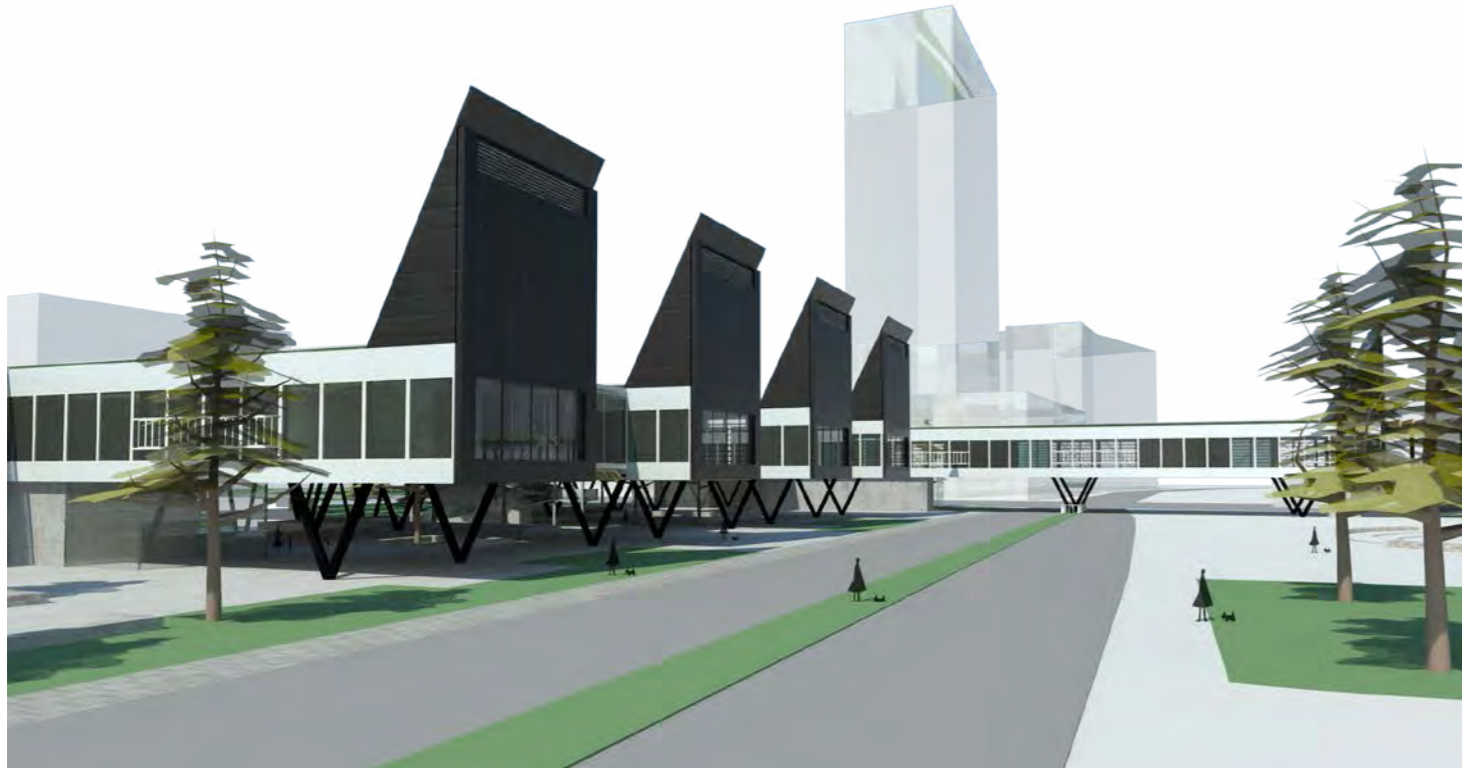




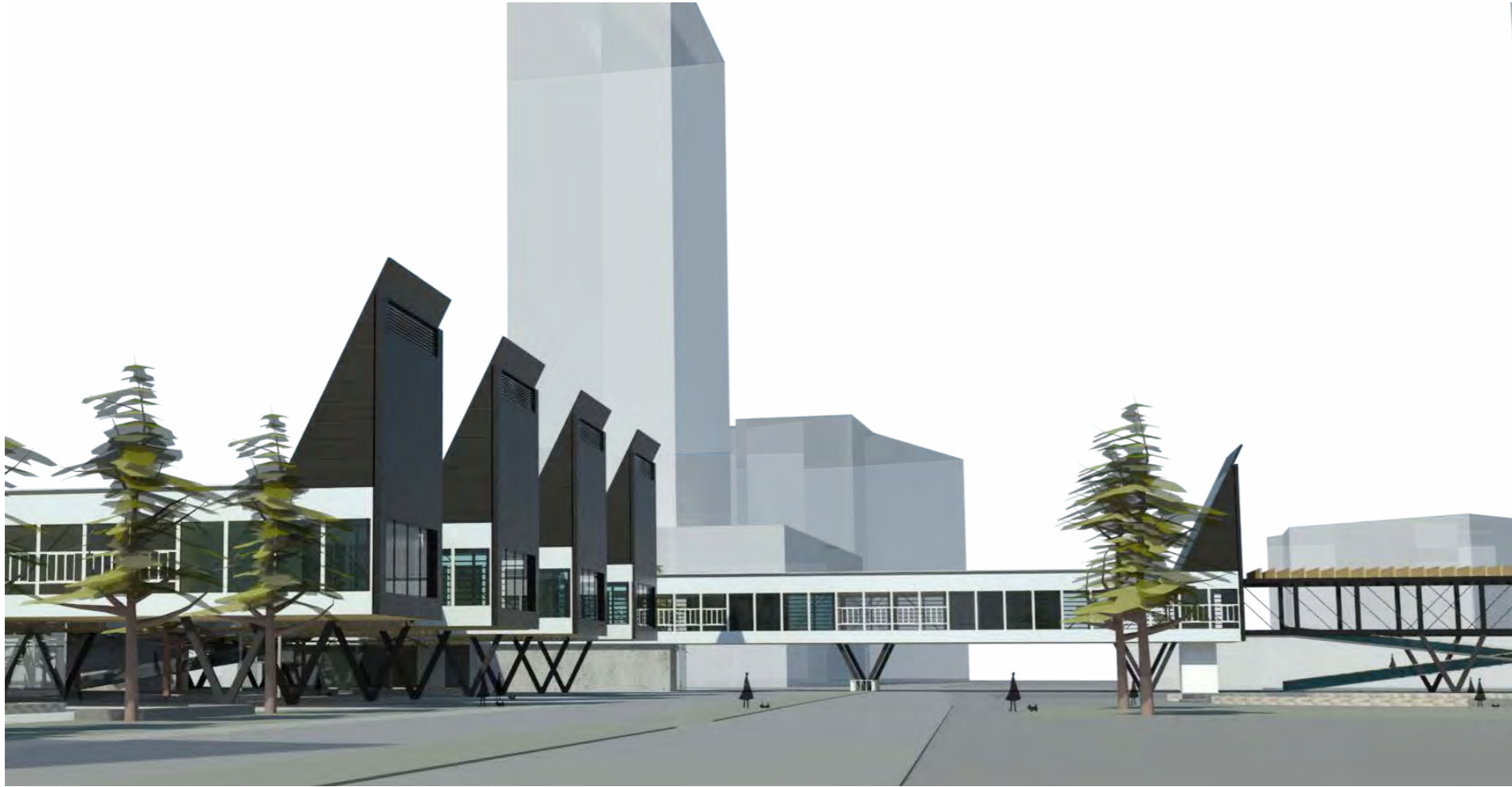
Summer Theater

Open Style

Closed by curtains



Bridge crossing the Road

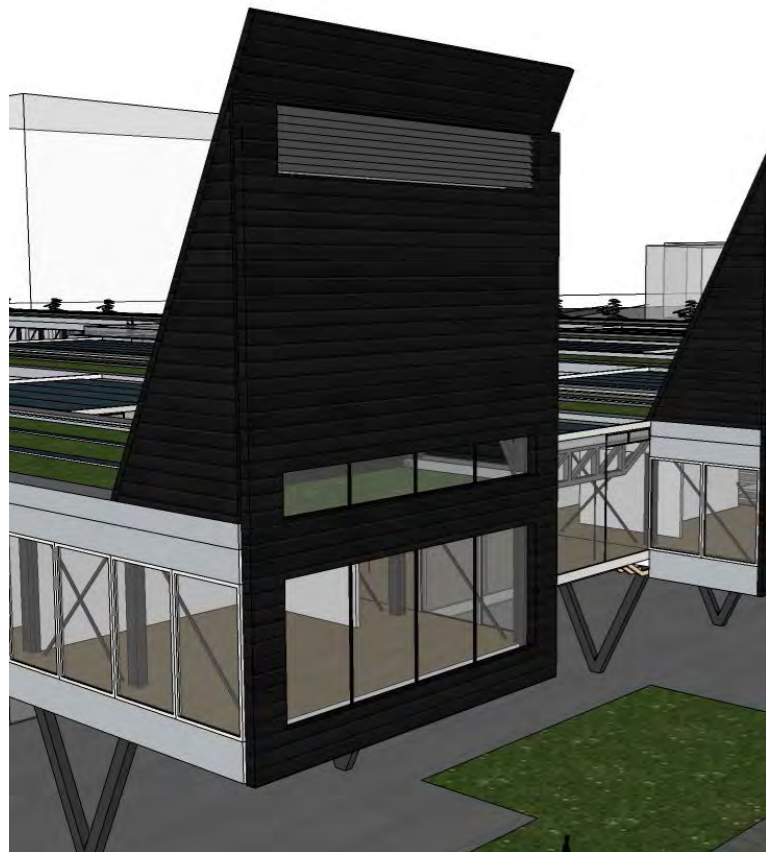


Middle School, Australia

Continuity of the main street facade

Aluminum Clading
Aluminum Window Frame
Fiber cement Clading

Steel Truss



1



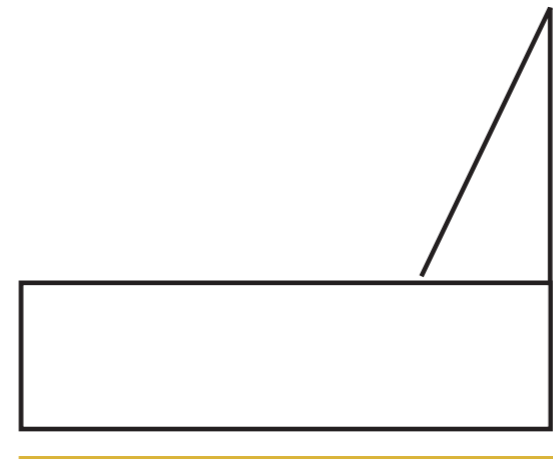
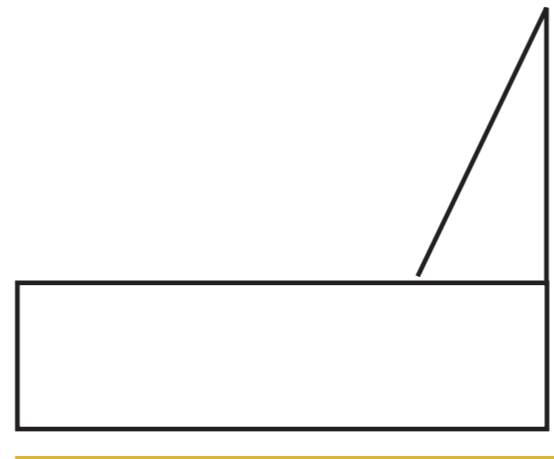
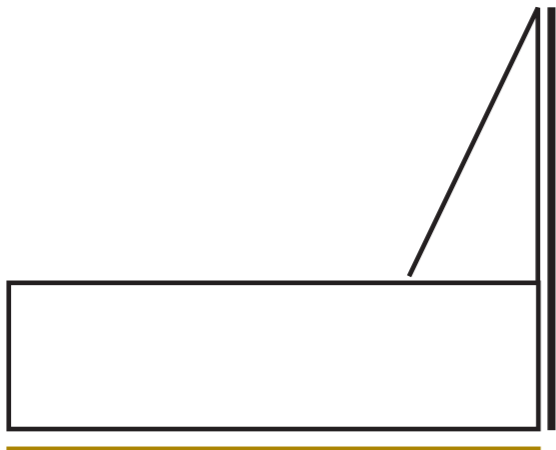
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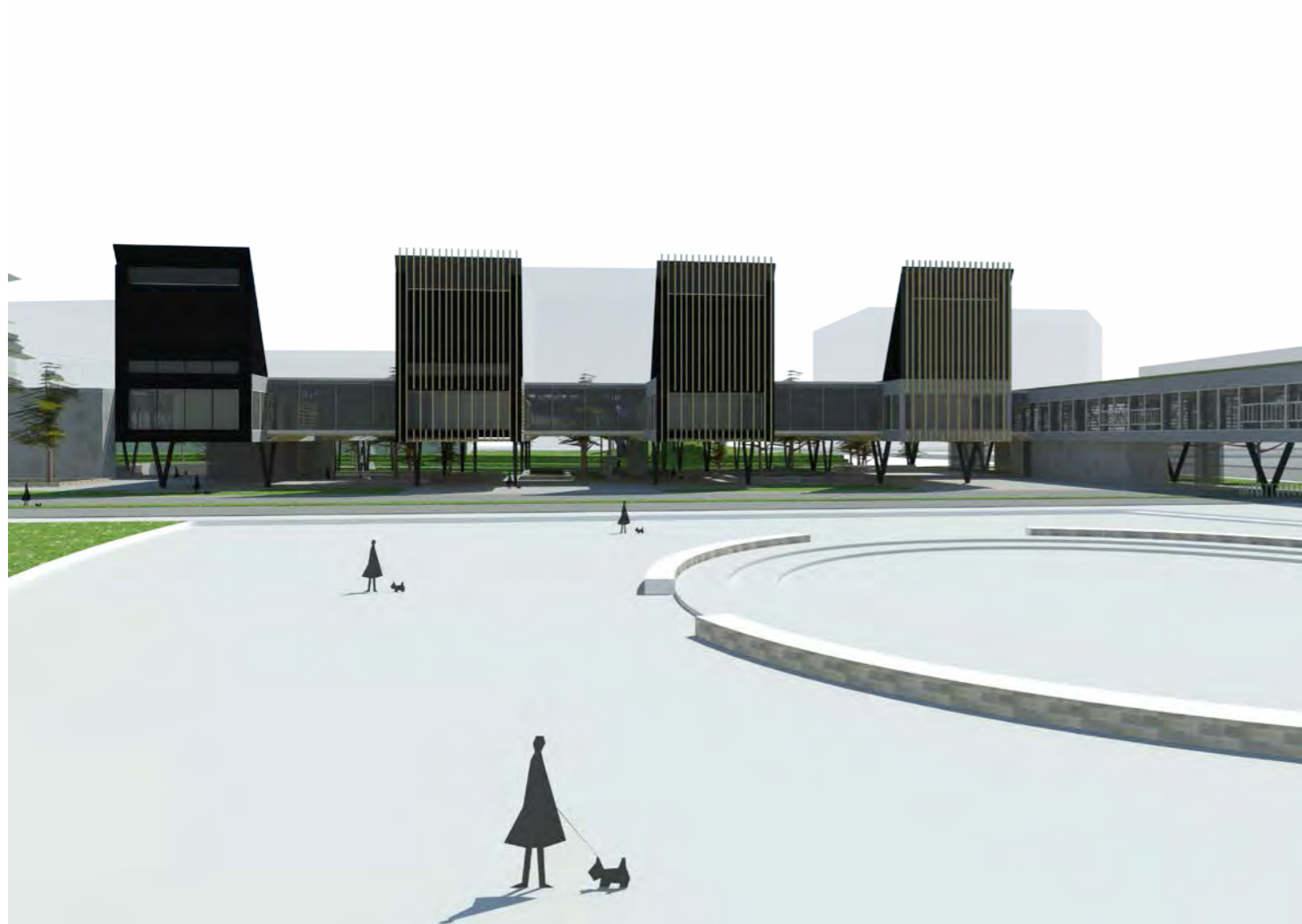


3

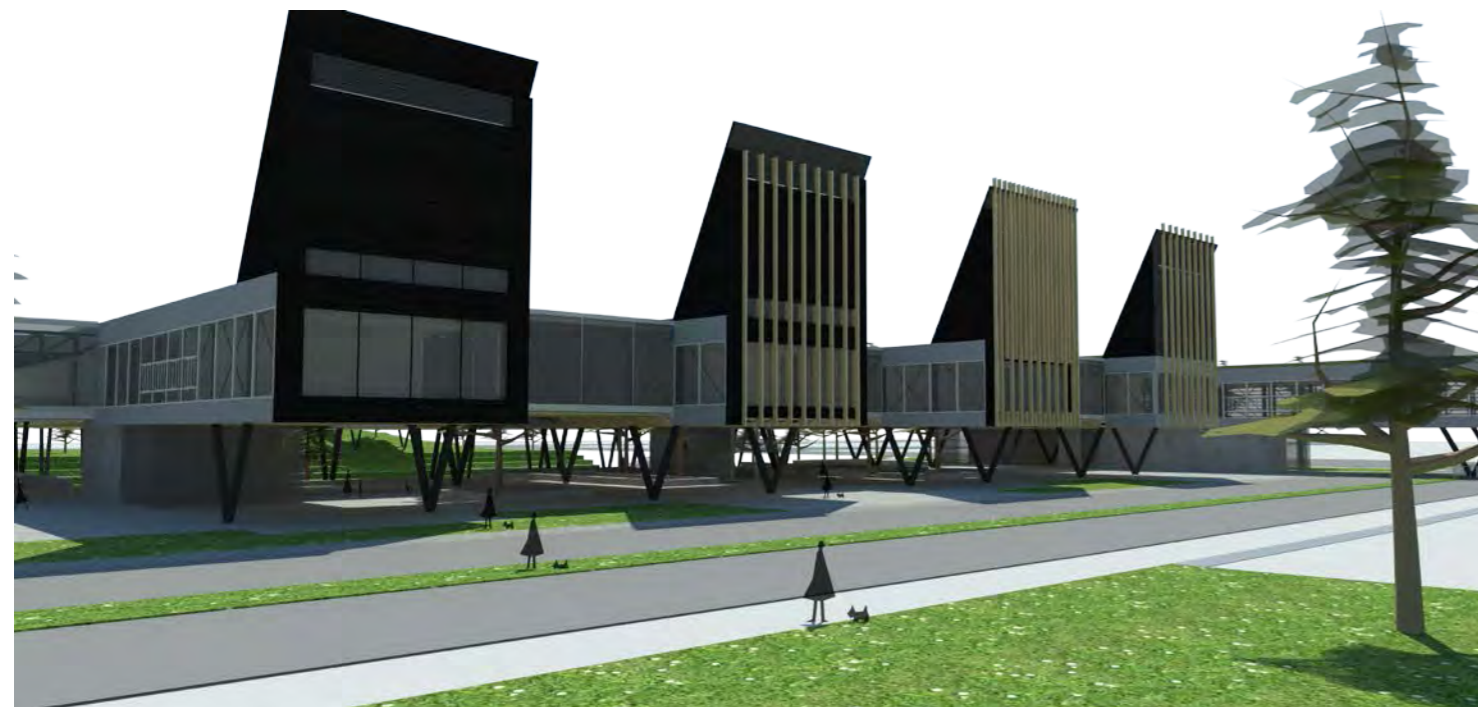
4

Different Facade Options



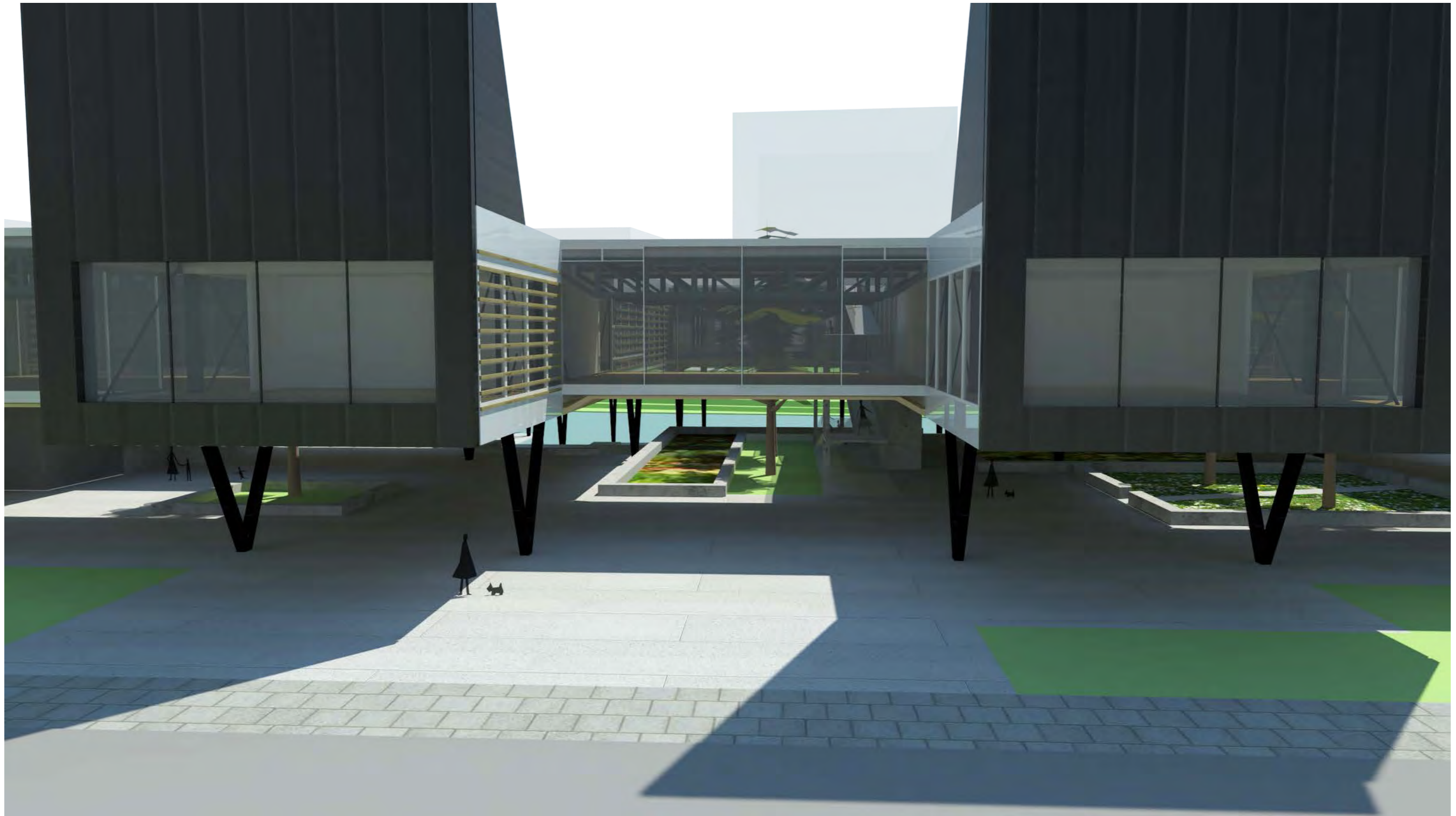


Different Facade Options

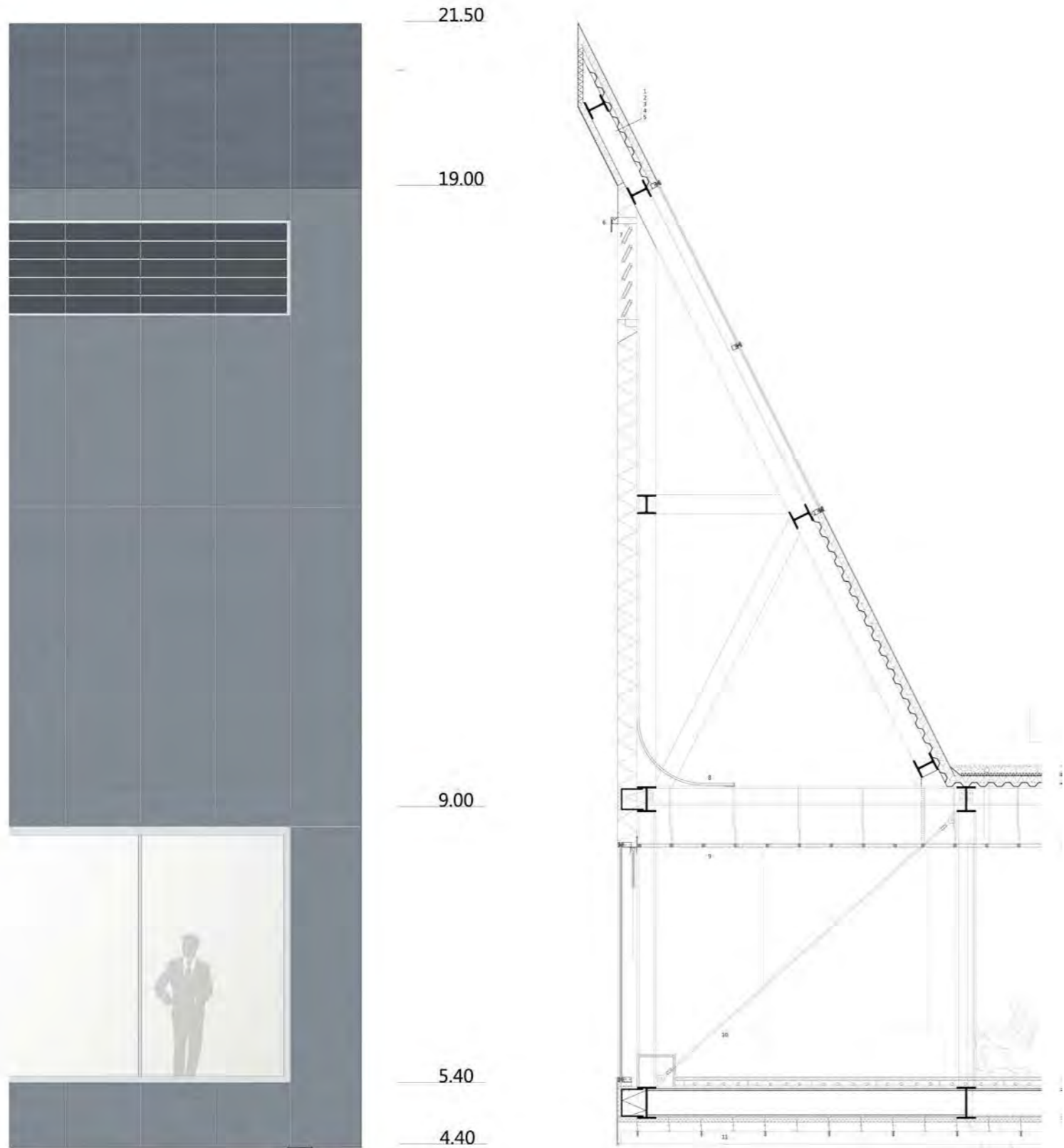




Preferred Facade



Preferred Facade
Identity between the transparent part and the solid part.

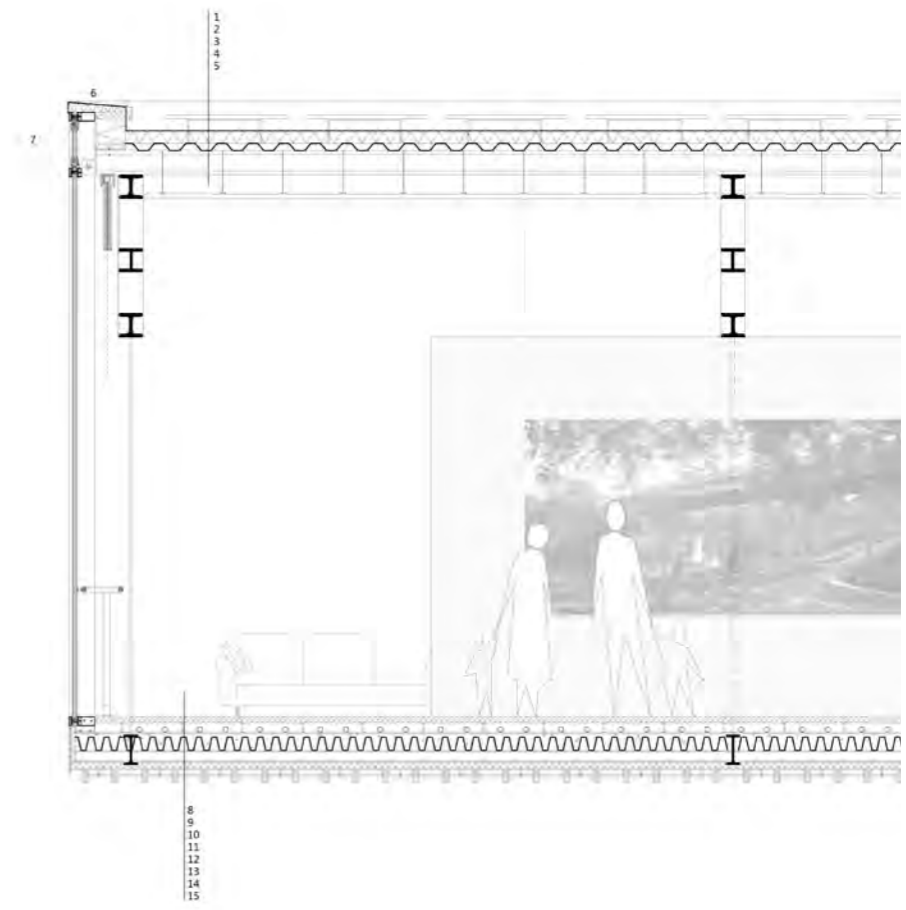
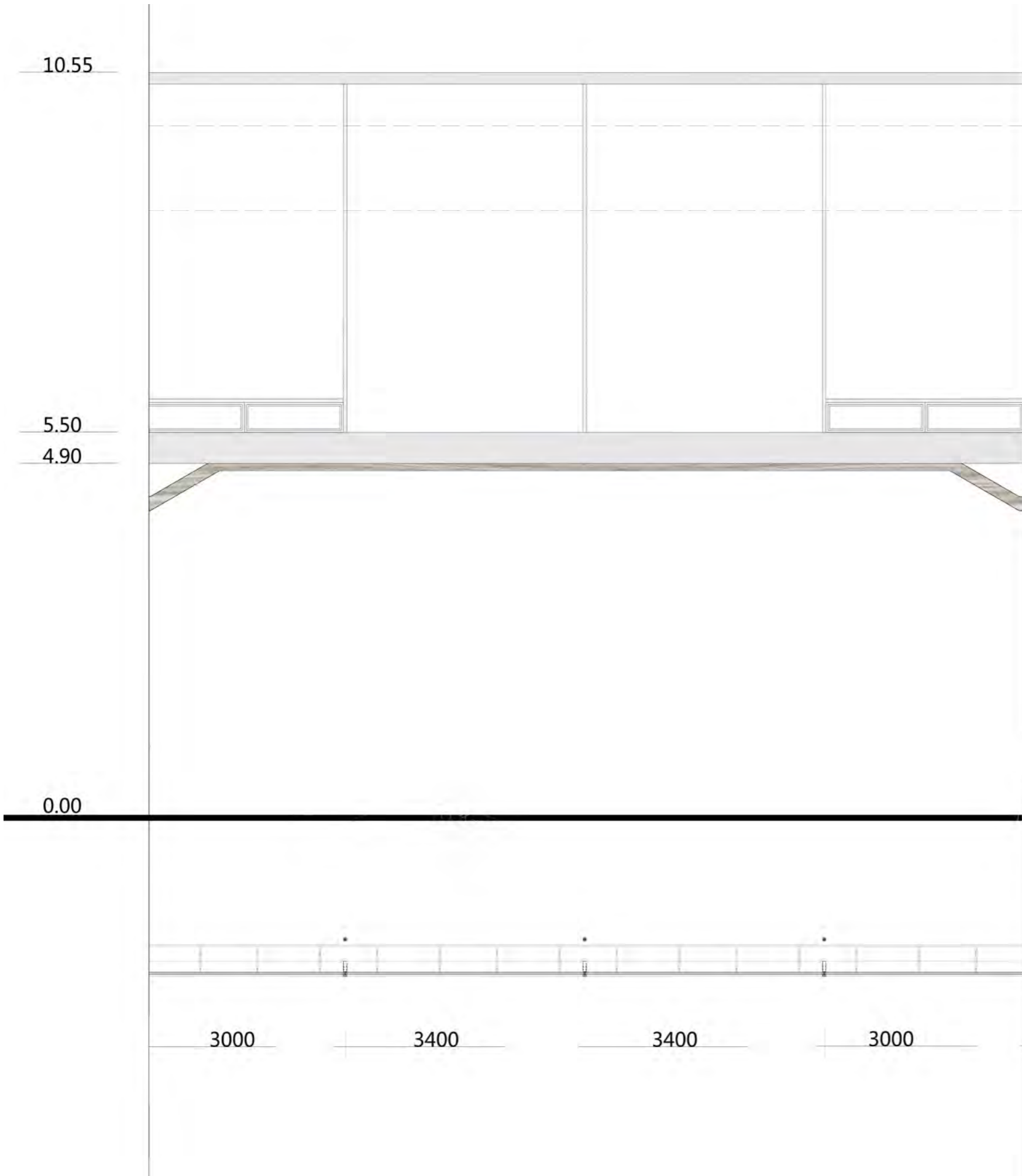


- 1 fiber cement panel 15mm
- 2 water proof
- 3 insulation layer
- 4 steel deck
- 5 HE beam 20X20mm
- 6 aluminum water drop
- 7 aluminum louvers
- 8 Black light absord board
- 9 aluminum grid ceiling
- 10 steel cable
- 11 wood ceiling

5000 5000

Facade Fragment 3 1:20

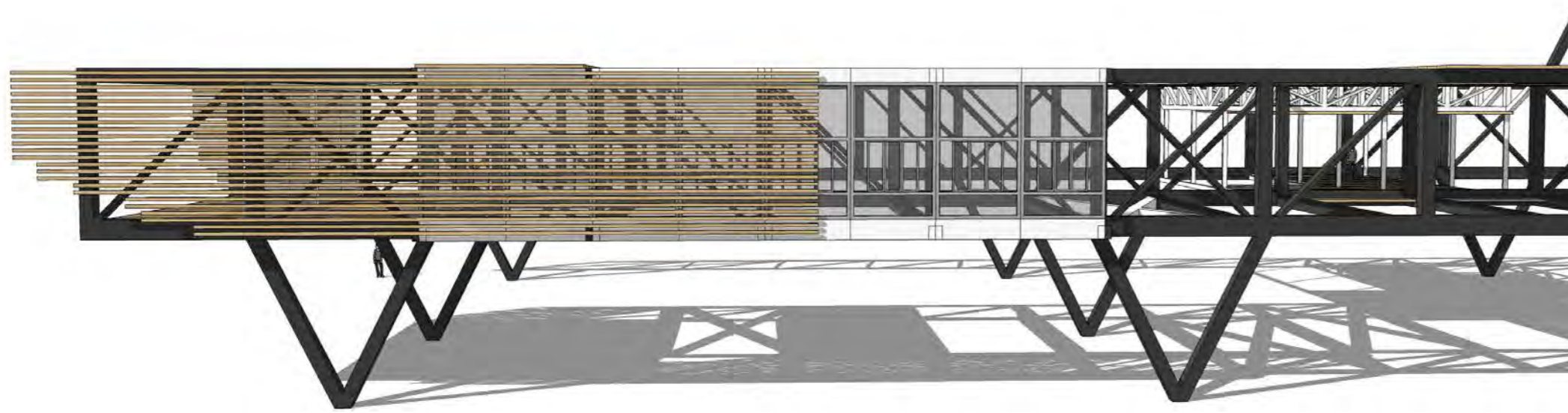
North Facade



- 1 solar panel
- 2 water proof
- 3 insulation layer
- 4 stell floor
- 5 HE stell beam 20x 20mm
- 6 aluminum clading
- 7 open window
- 8 wood floor cover
- 9 heat-pump water tubes
- 10 insulation layer
- 11 steel deck
- 12 HE steel beam
- 13 insulation
- 14 water proof
- 15 wood ceiling grid

Facade Fragment 2 1:20

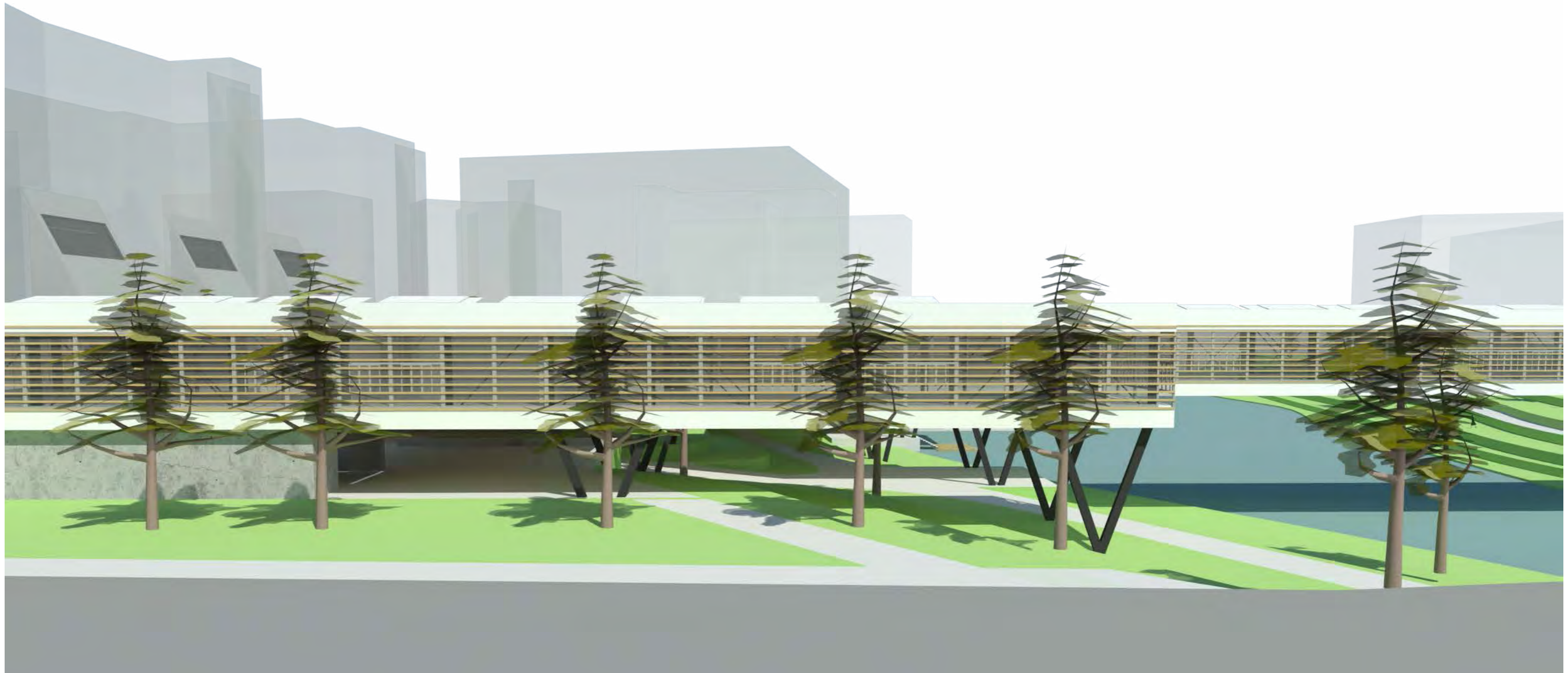
Hanging parts facade



Long facade
Wood Shading
Aluminum Window Frame

Steel Truss

Concrete walls on ground level

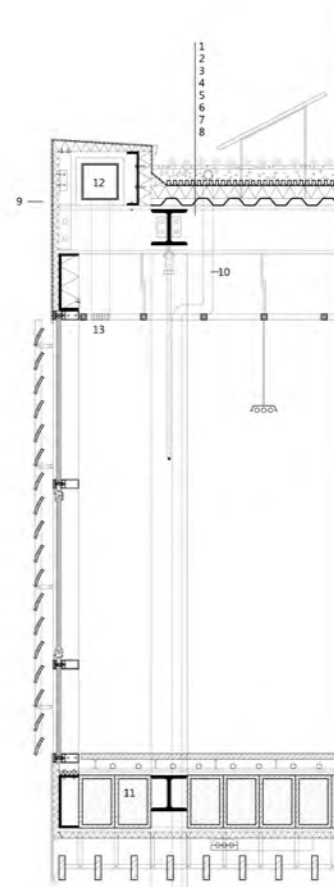


10.55

9.00

4.50

0.00



- 1 vegetation
- 2 light substrate
- 3 drainage layer
- 4 storage mat
- 5 water proof
- 6 insulation layer
- 7 stell floor
- 8 IPE stell beam 50x 30mm
- 9 aluminum clading
- 10 sweage pipe
- 11 wood box 50x35mm with stabilized sand
- 12 ventilation pipe
- 13 air exhausting

Facade Fragment 1 1:20



5000

5000

5000

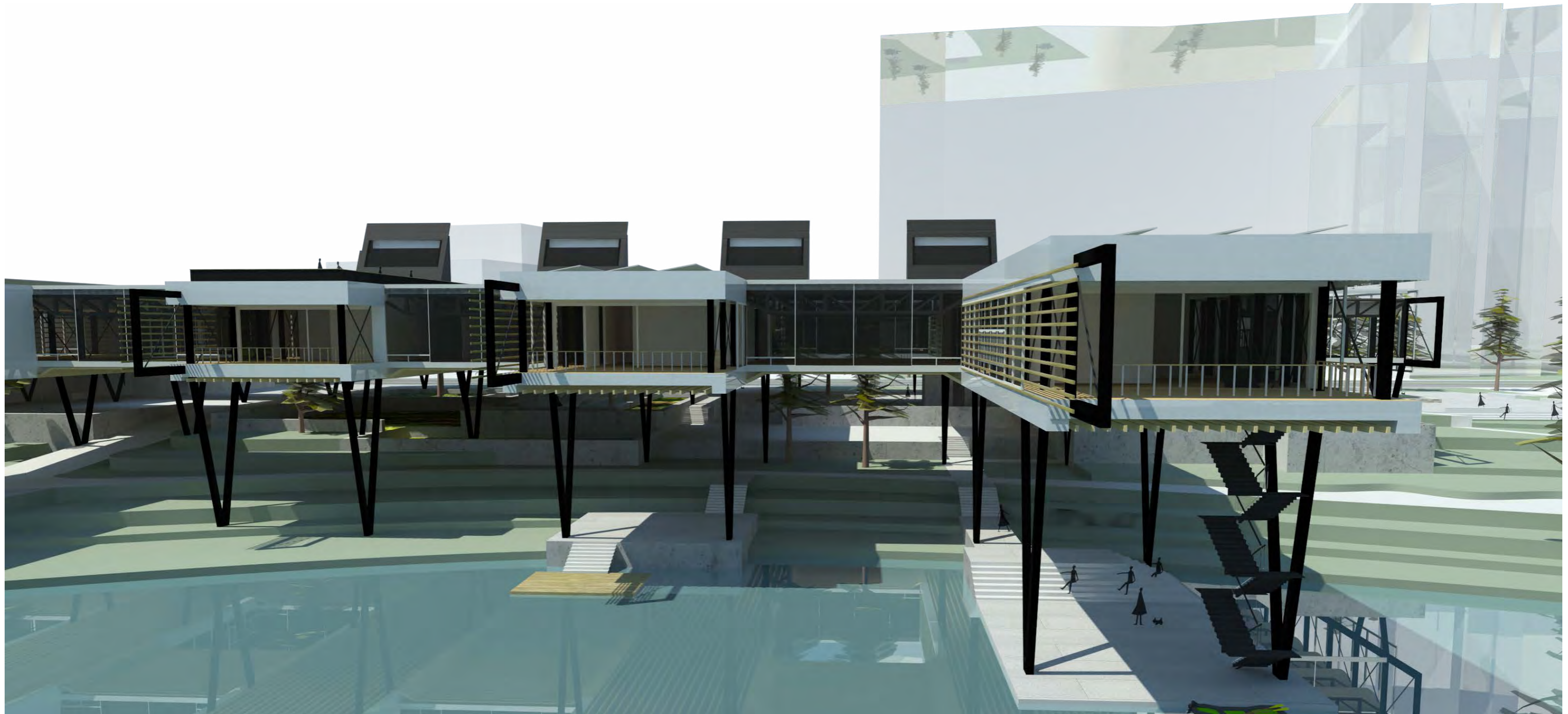
700

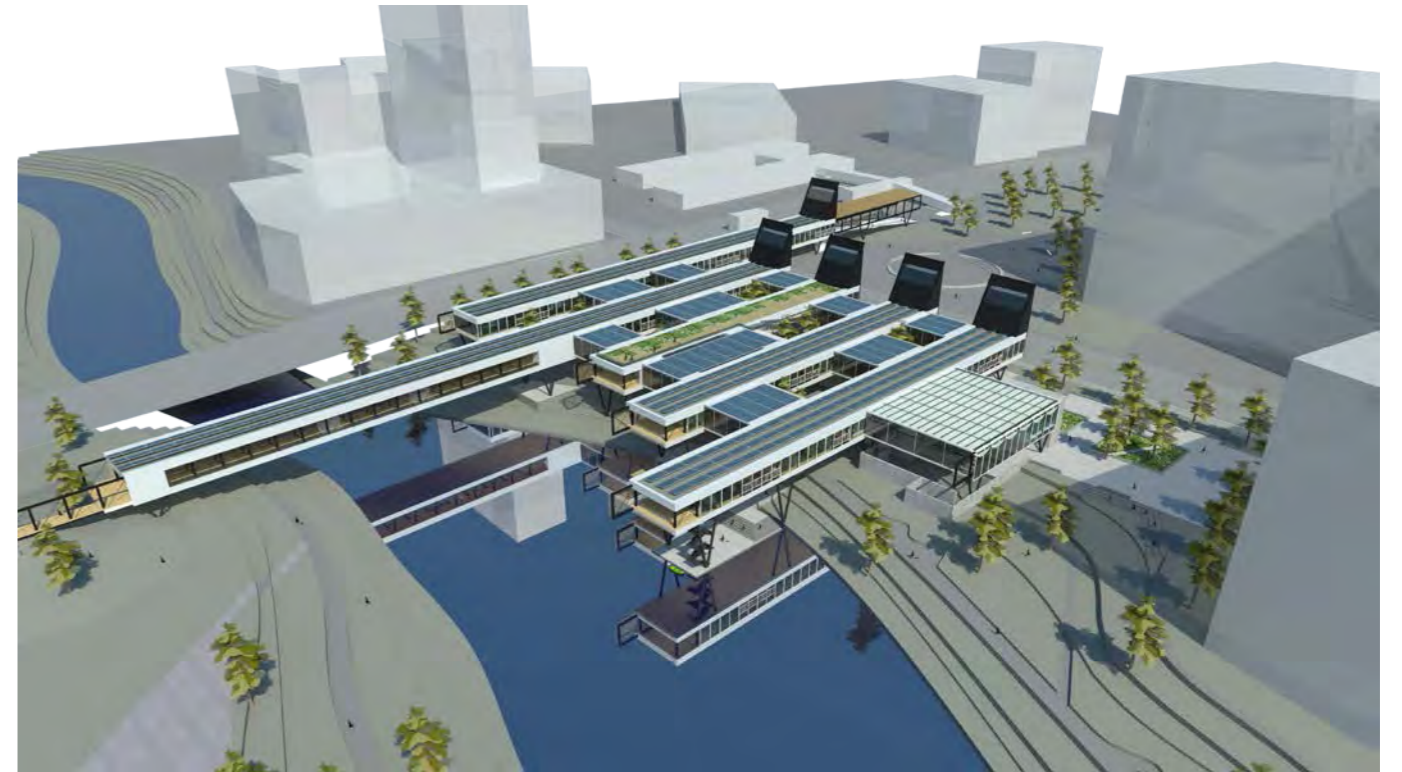
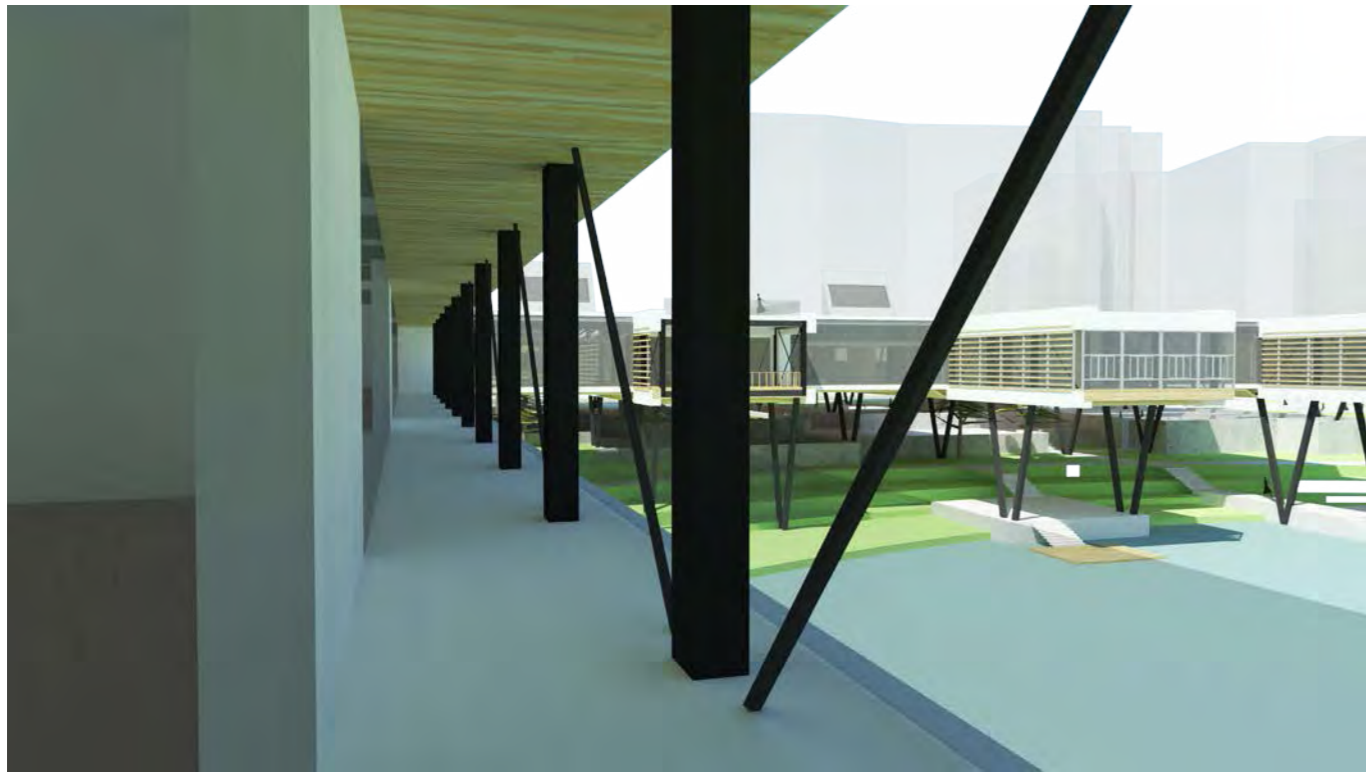
Long Facade



Short facade
Wood Shading
Aluminum Window Frame

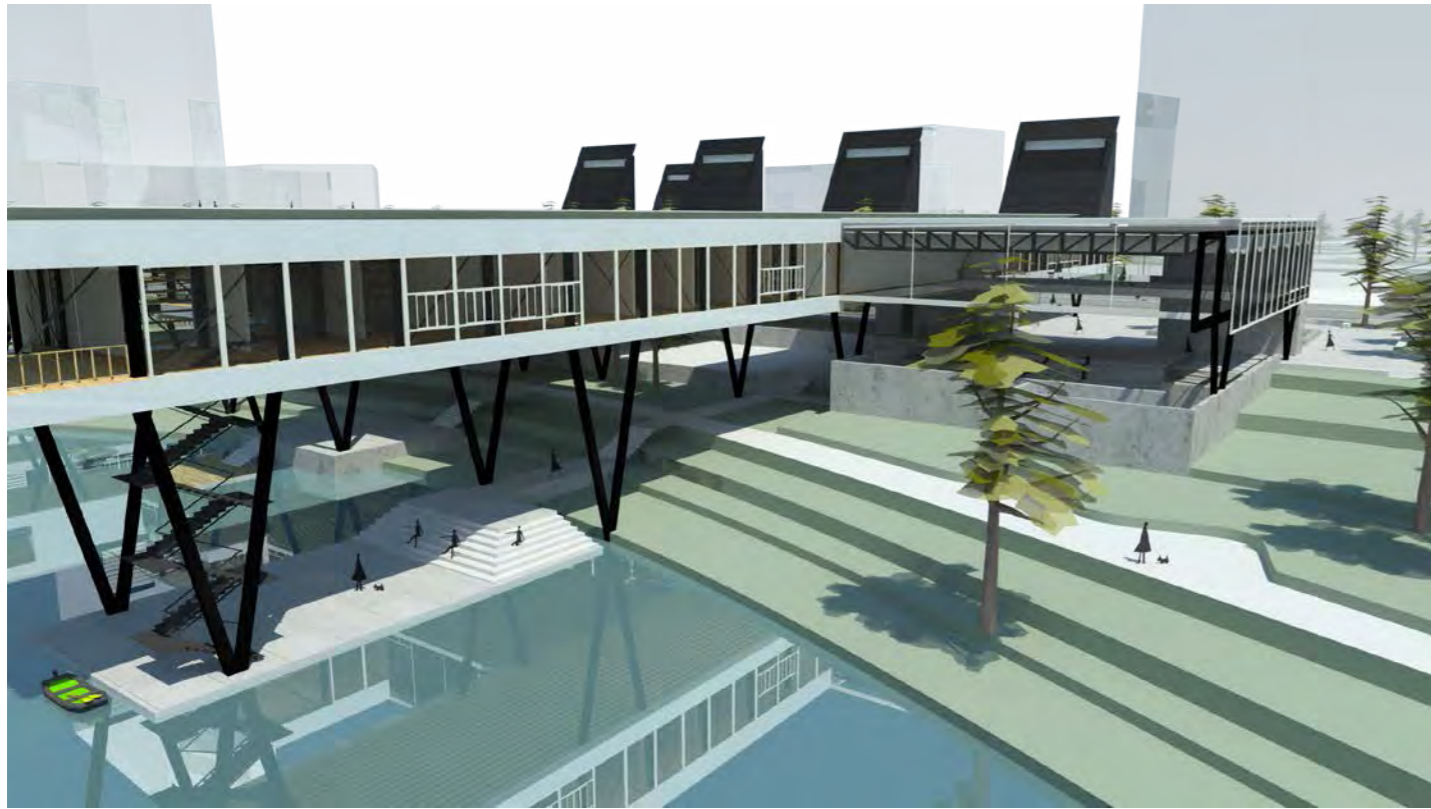
Steel Truss



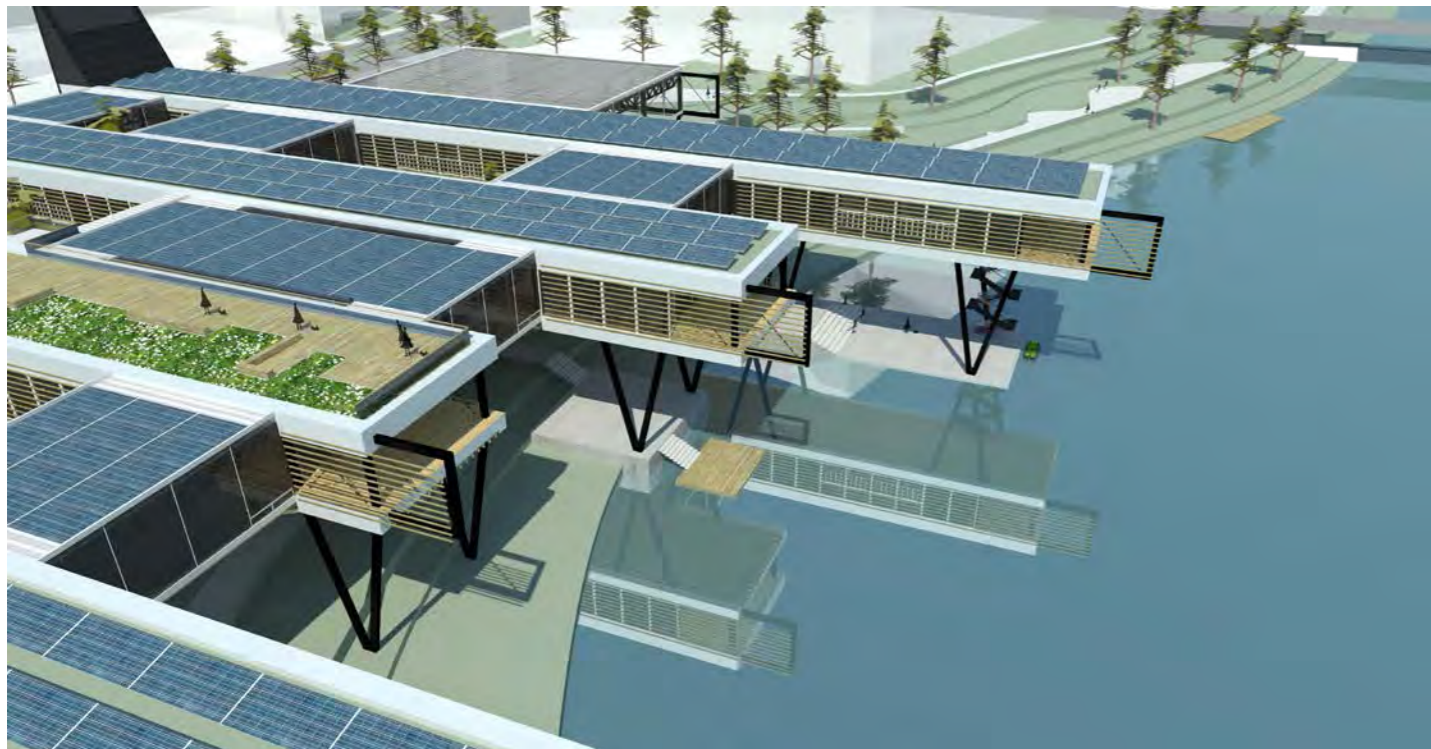


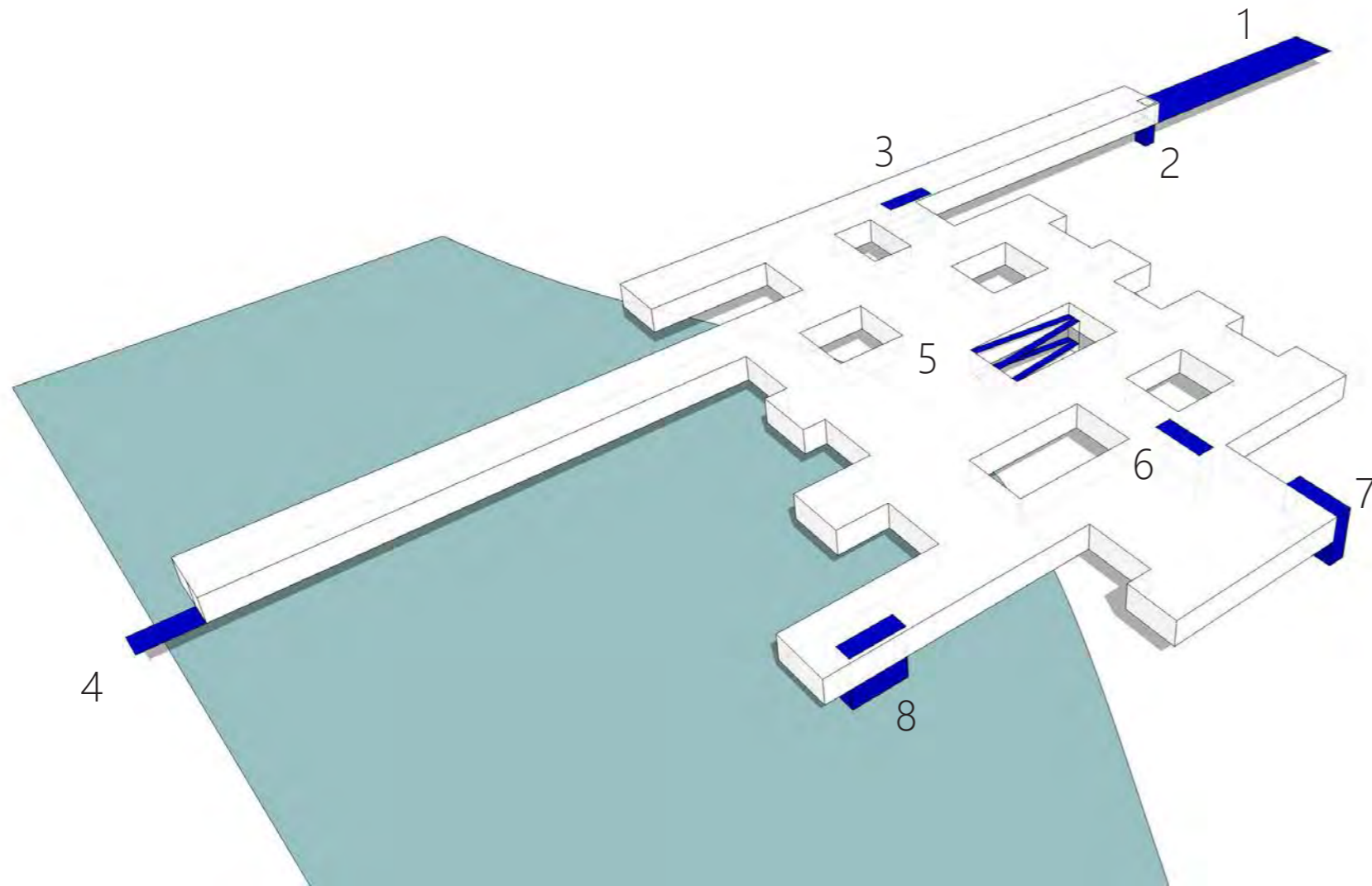
Bridge crossing the River





Watersides





3.4 Accessibility

1 Ramp from the Transfer Station/ Park

2 Disabled Elevators

3 Main Stairs and Elevators from ground

4 Access to the South Campous

5 Ramp in Courtyards, directly into the education enter

6 Serve people who work in the Education center or know it well

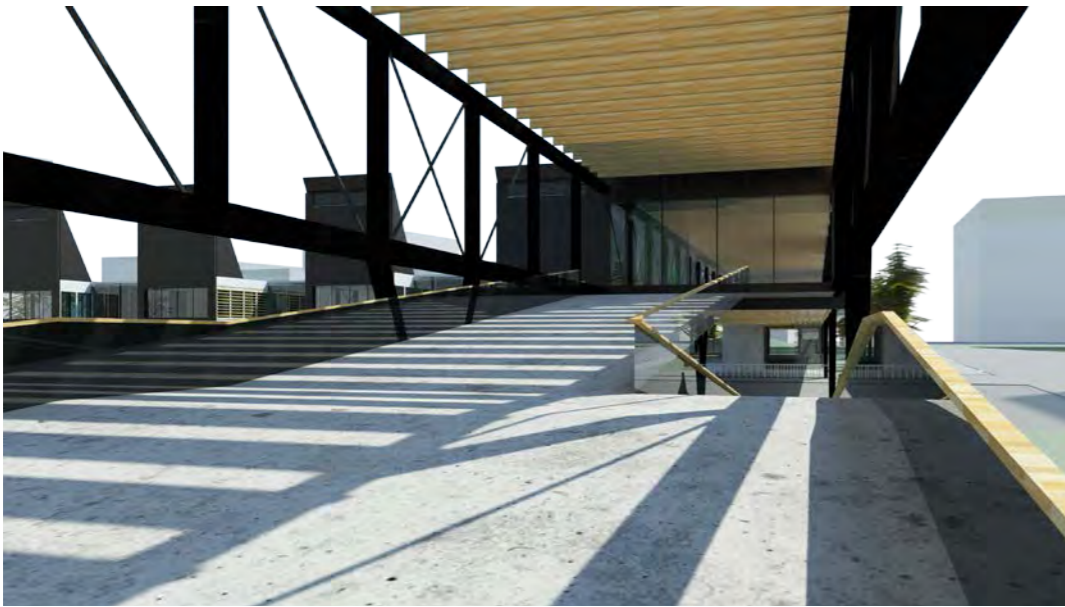
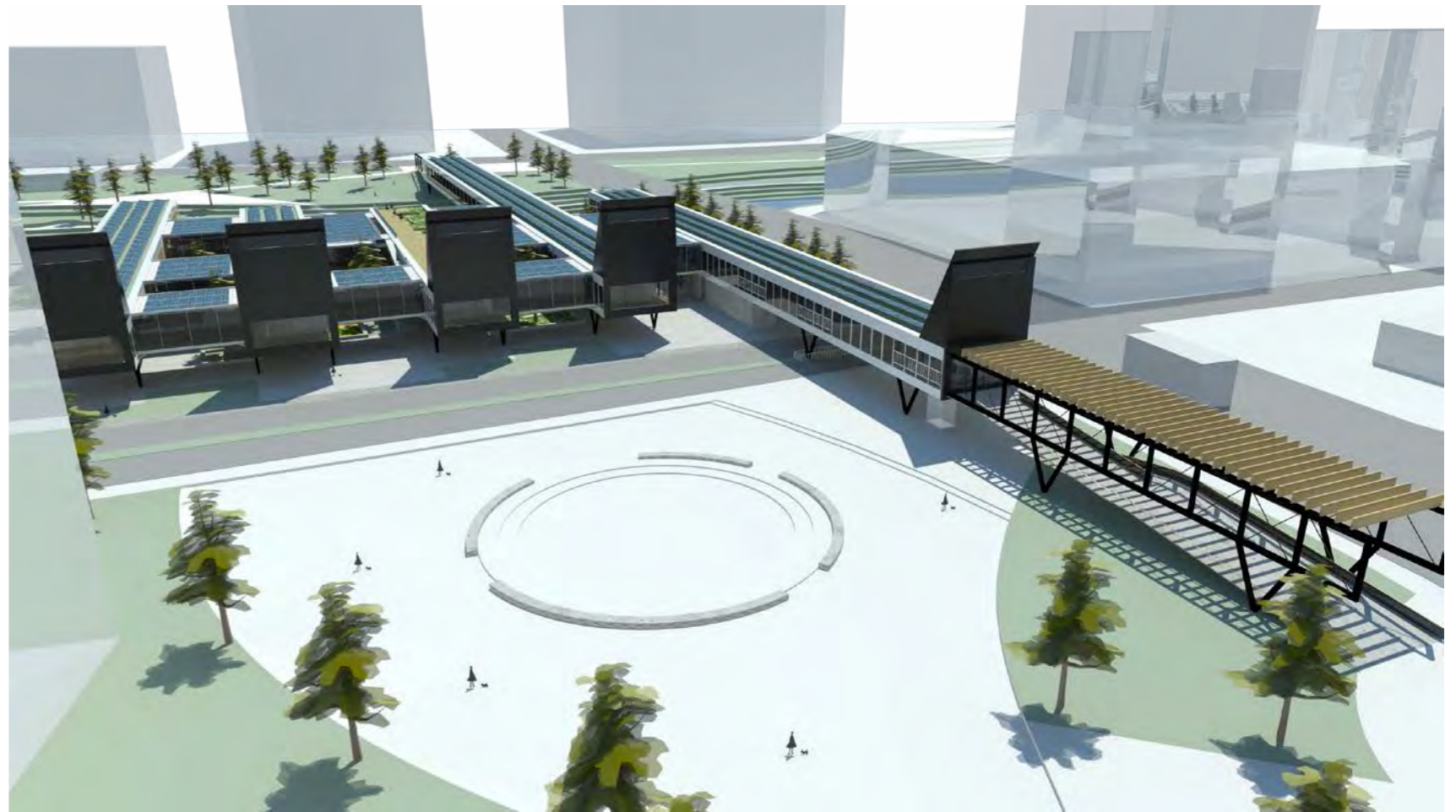
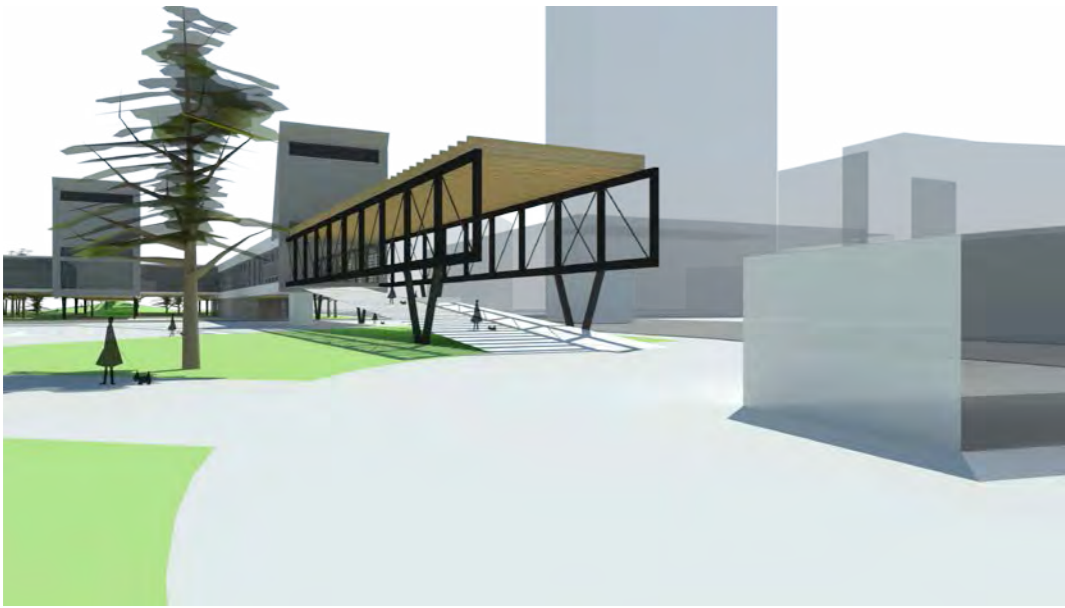
7 Emergency exit from the theater

8 Transparent Staircase on water

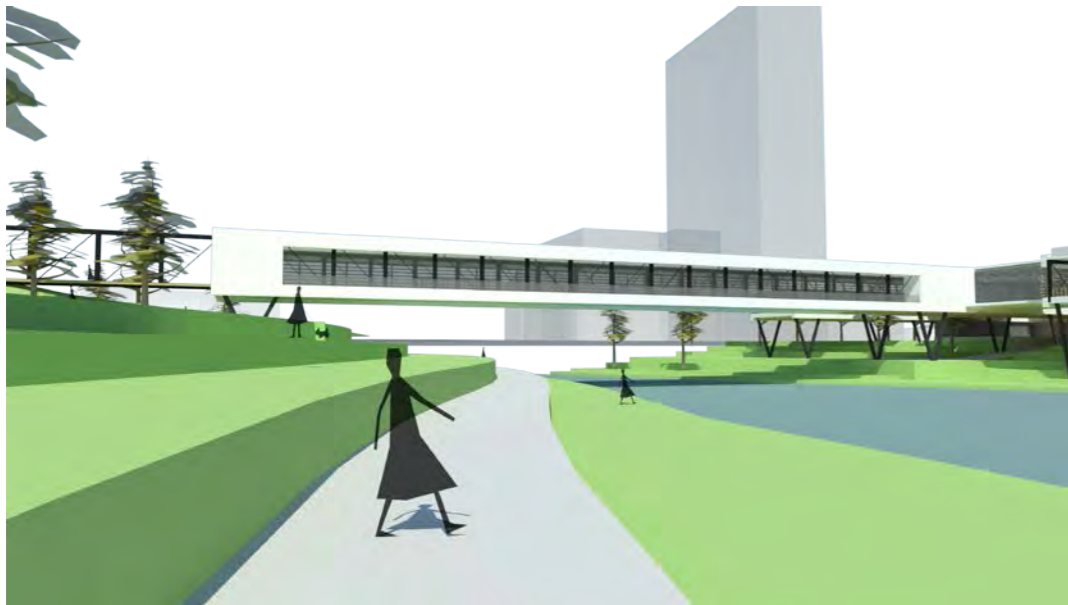
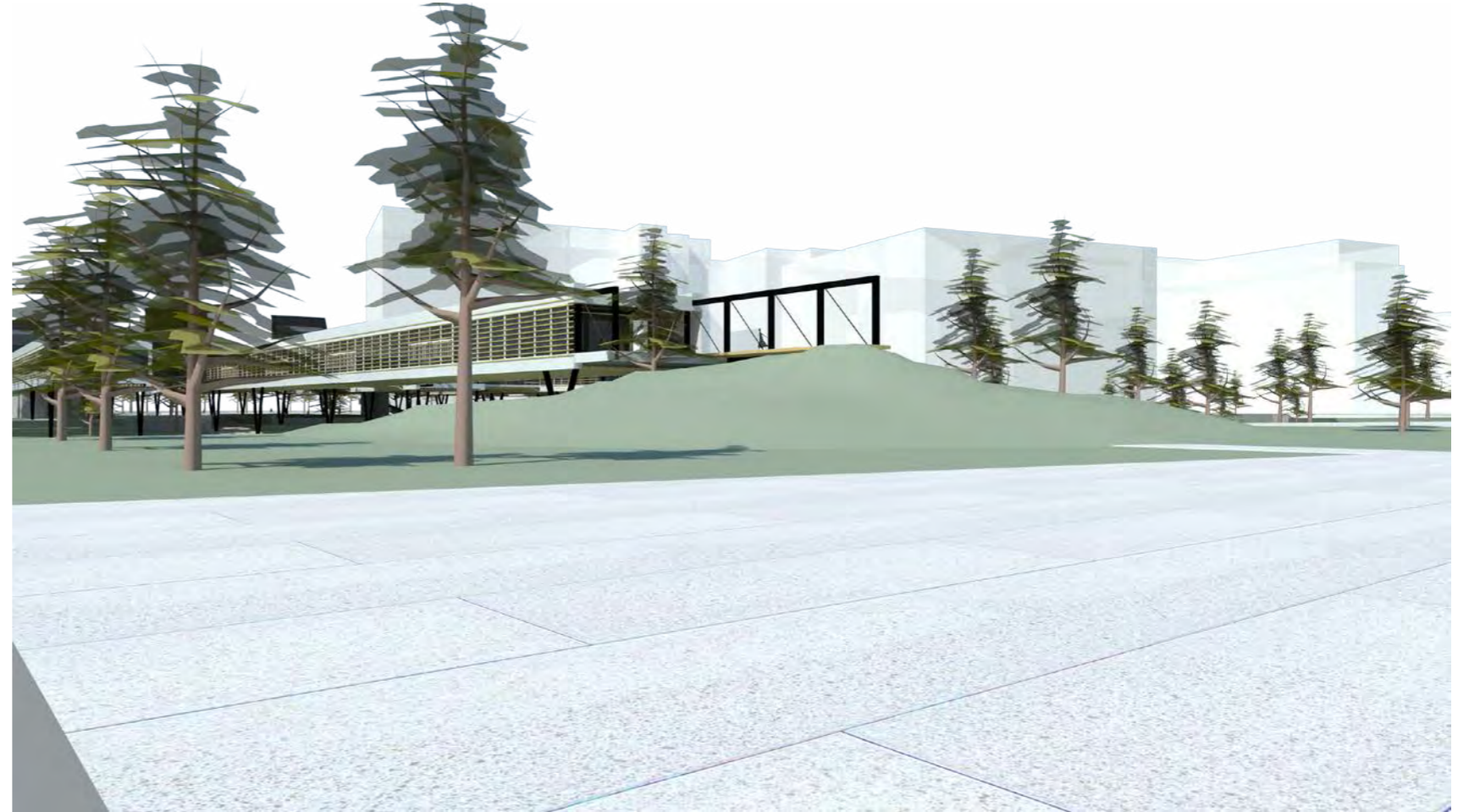
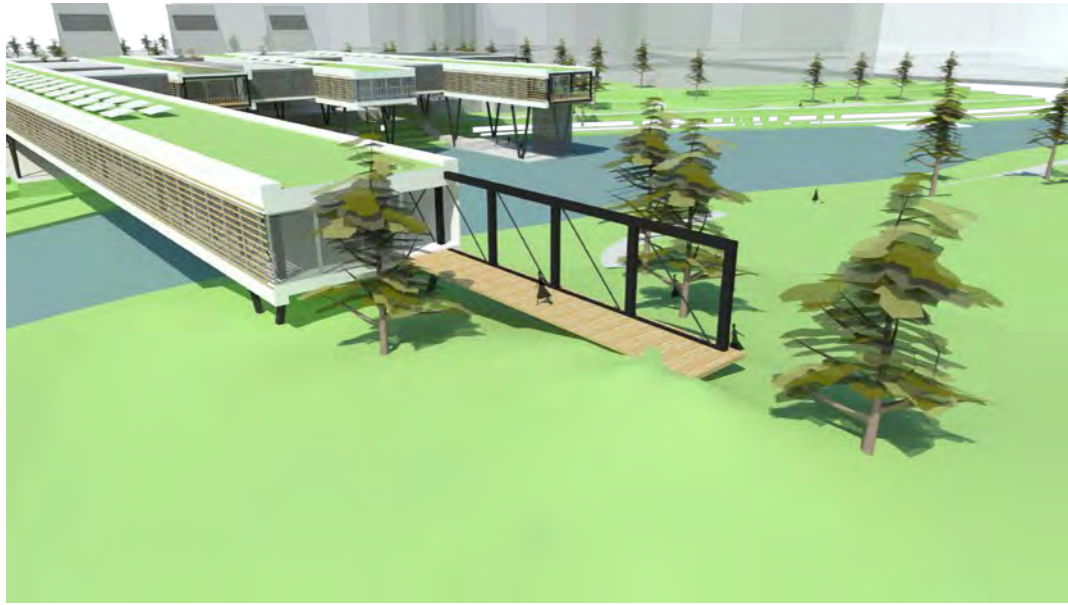


Central Courtyard

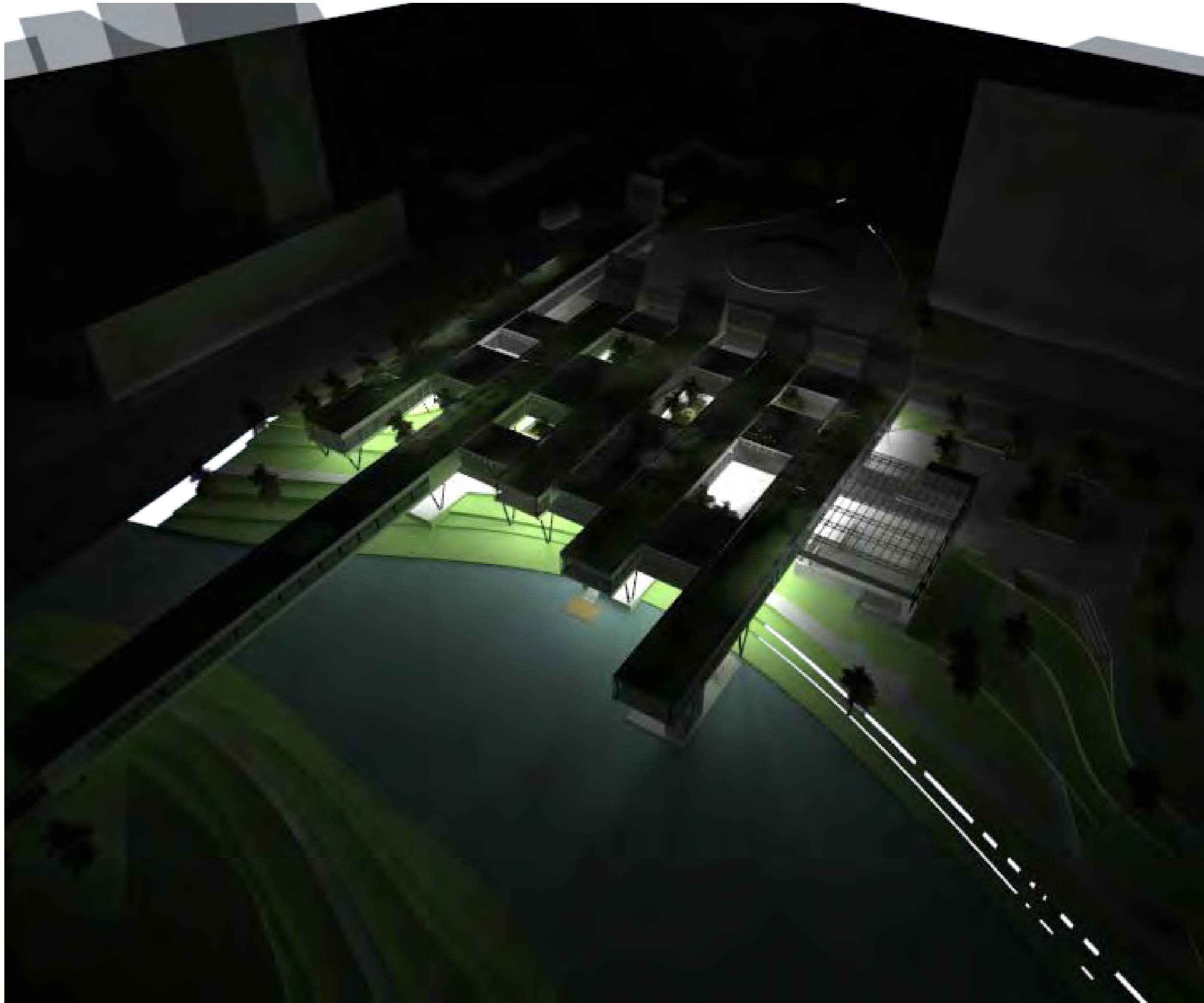




Access from the Station Side



Access from the South Campus



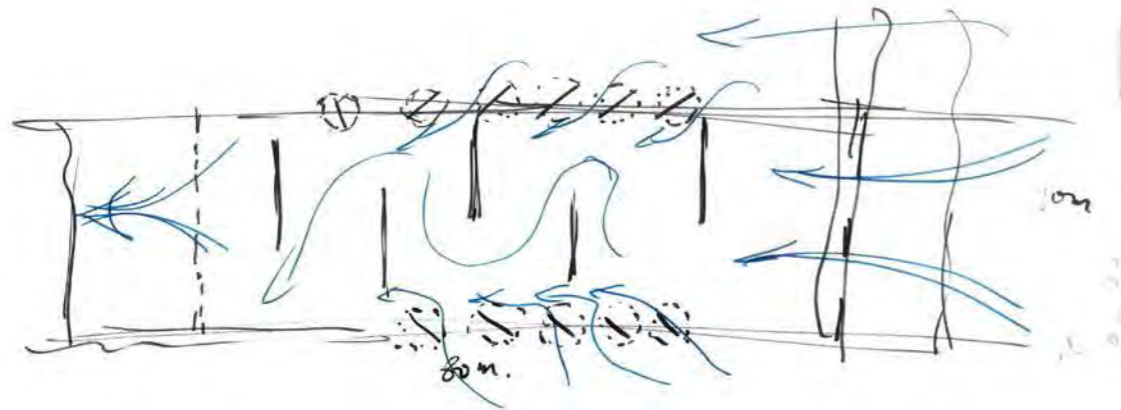
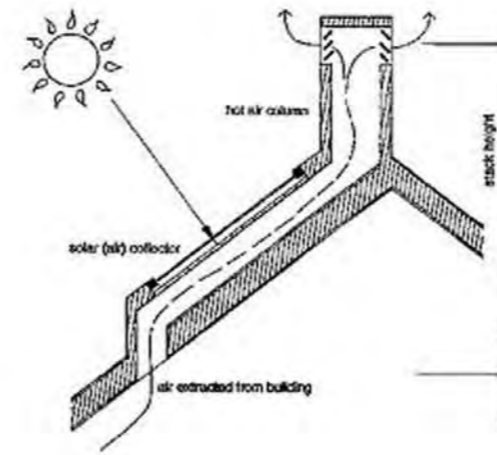
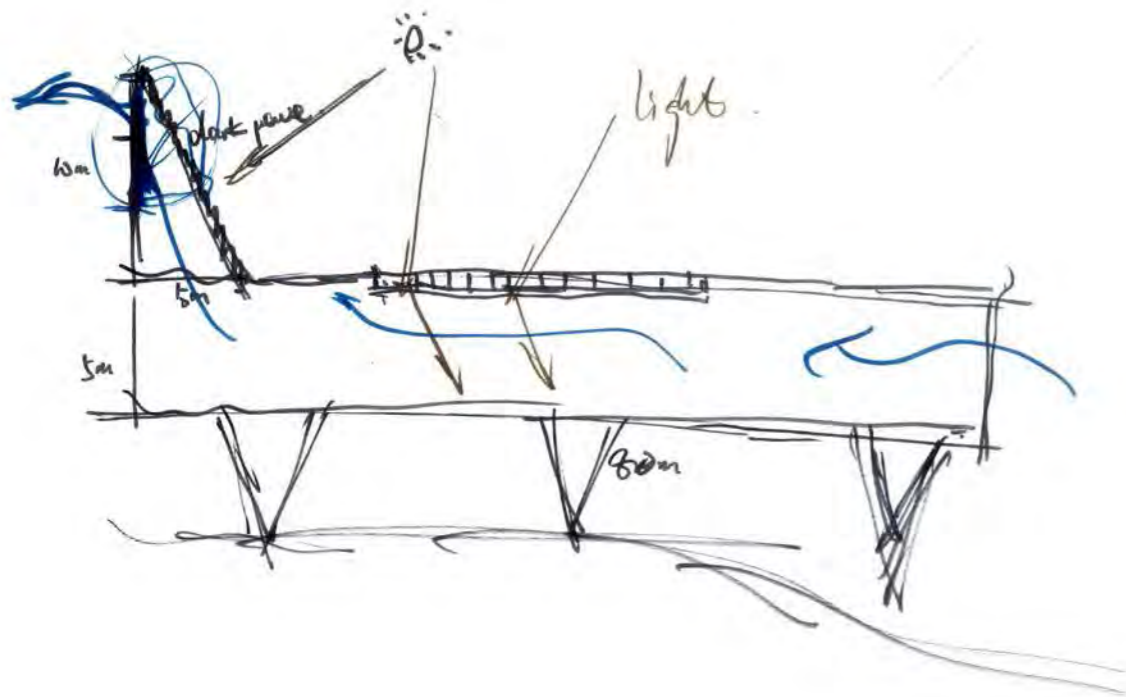
Light View

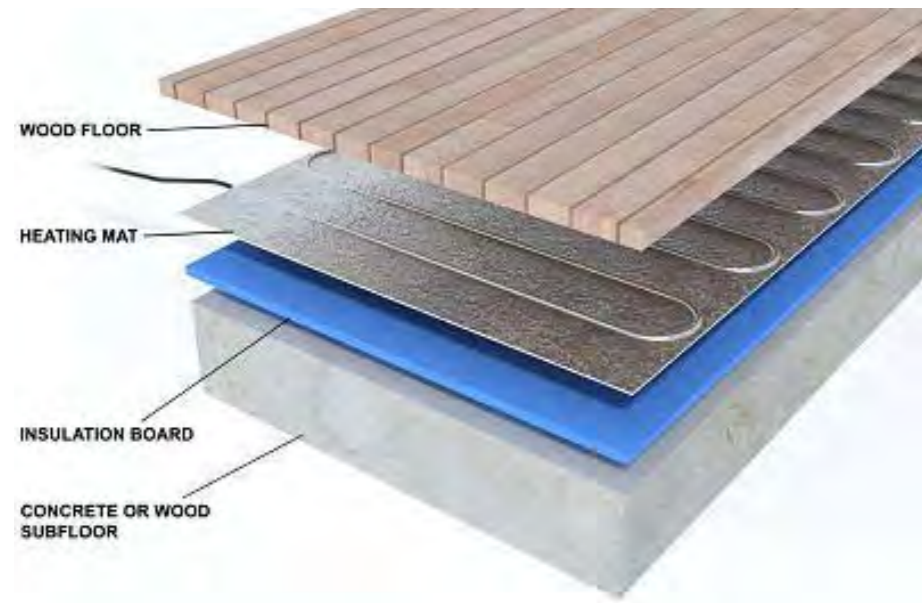
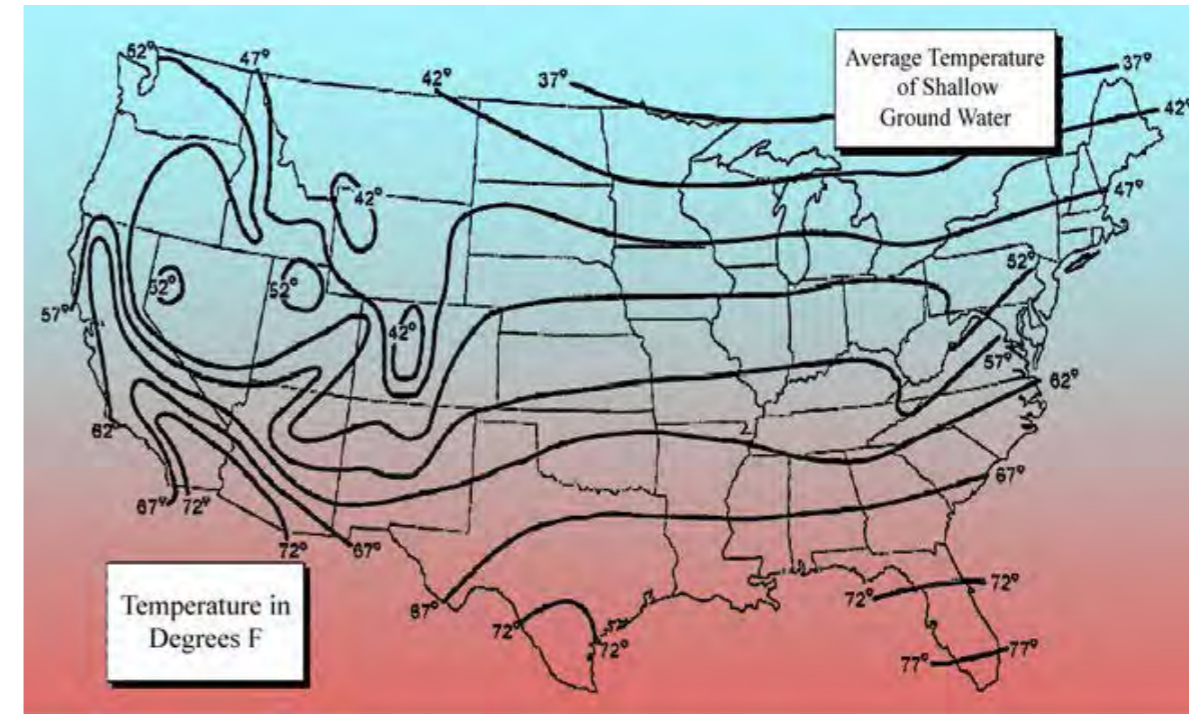
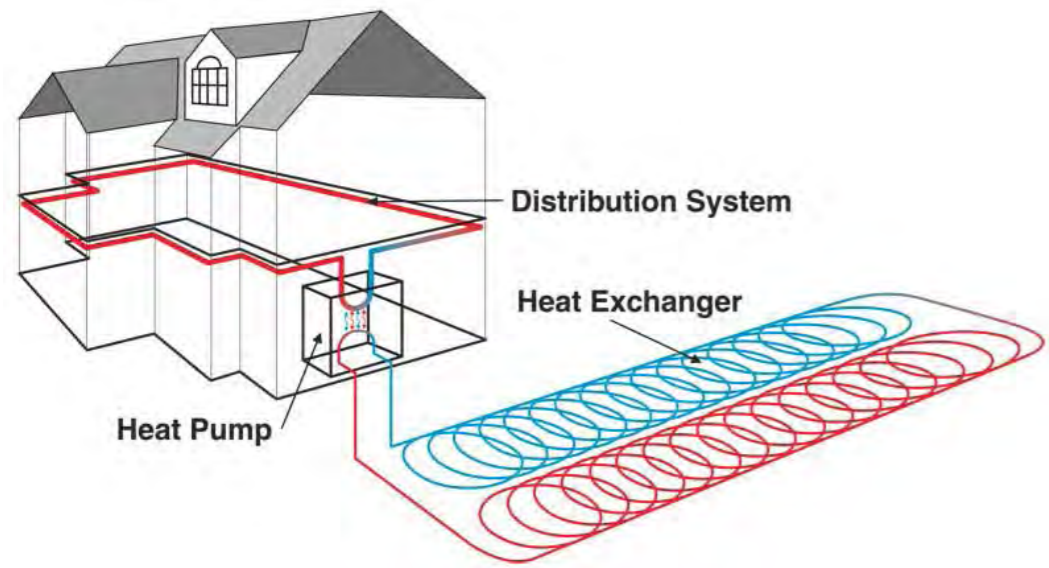
3.5 Climate Strategy

The climate strategy is going to get use of the sunlight and wind in Houston to achieve better natural ventilation.

A additional ventilation tower is designed to heat the top air. Open windows is going to invite the cool air from the bayou.

Heat pump system is also suitable for this project.

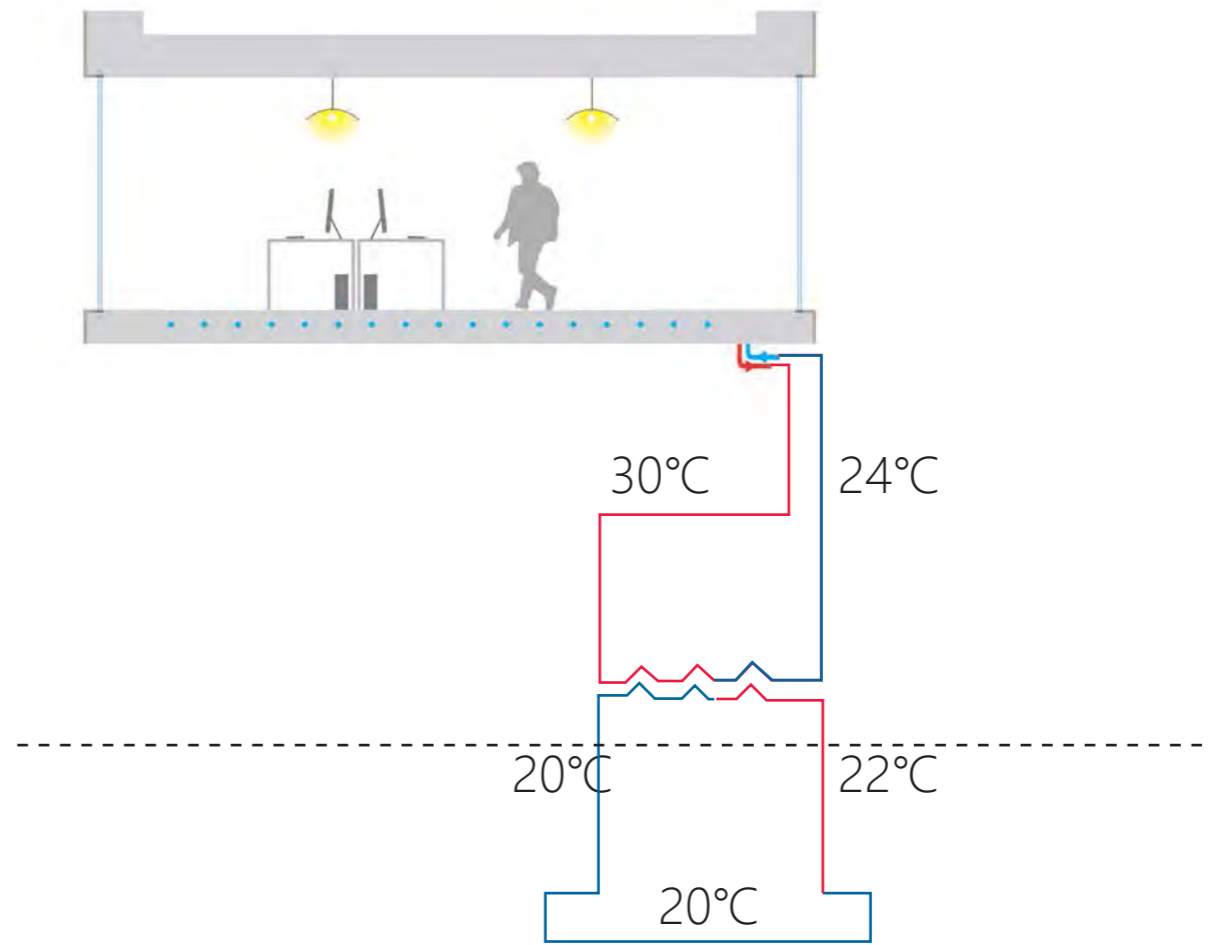
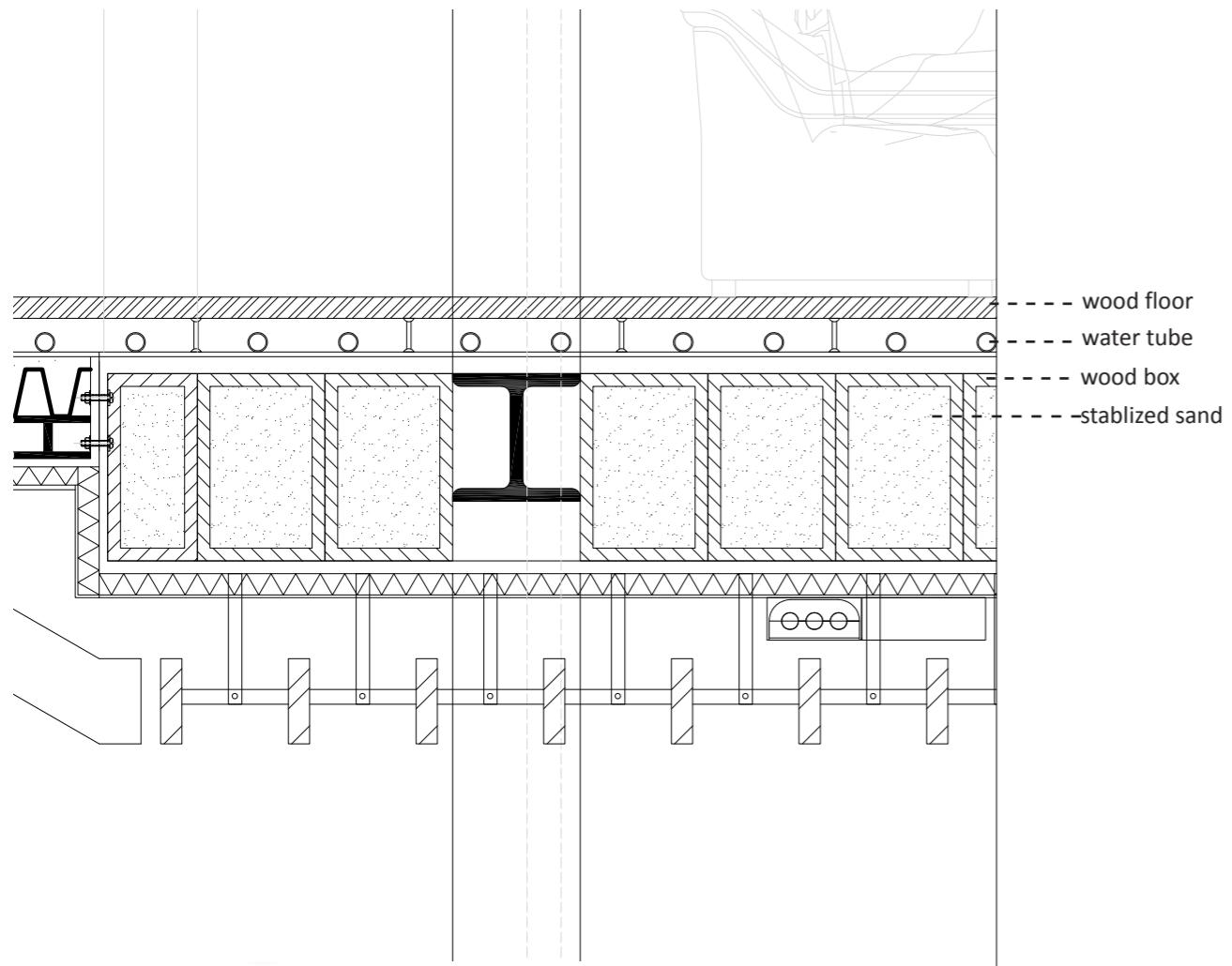




Heat pump

The average ground water temperature in Houston is 20°C , which makes the heat pump system works very efficient.

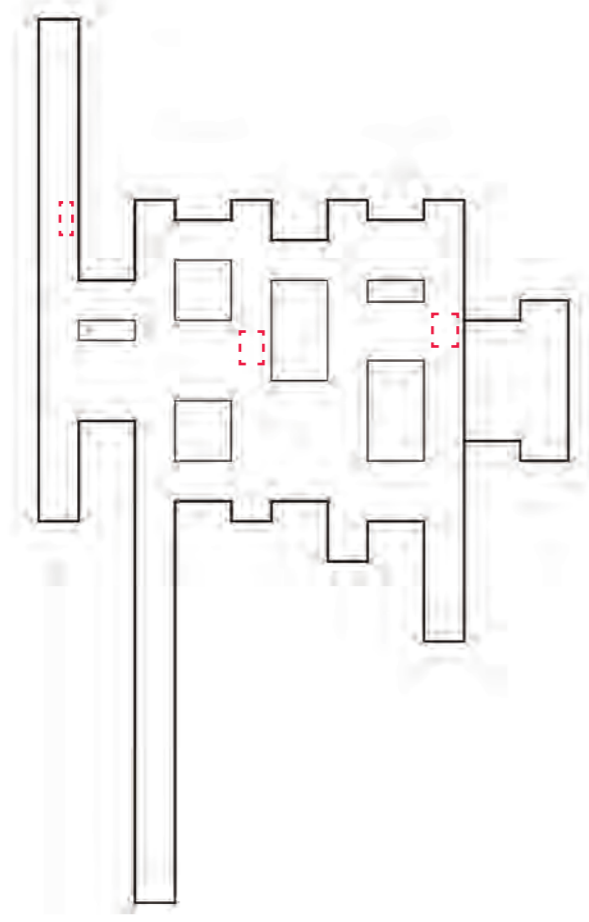


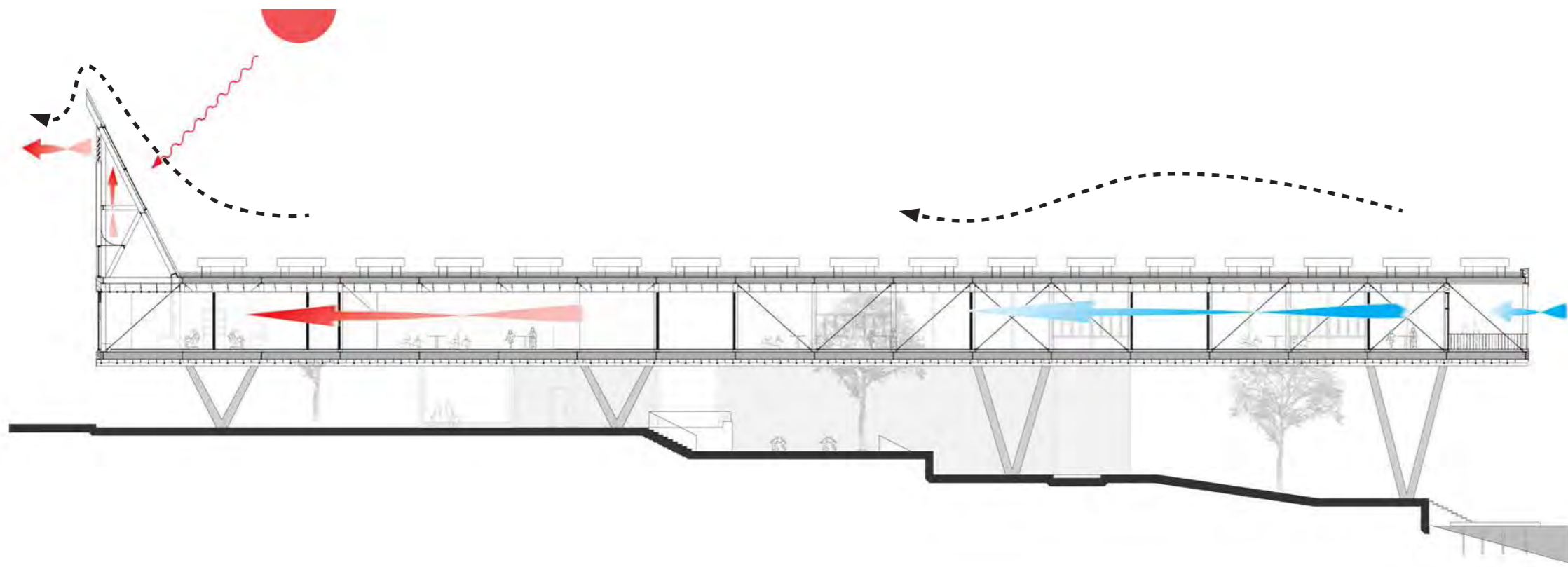


Heat pump

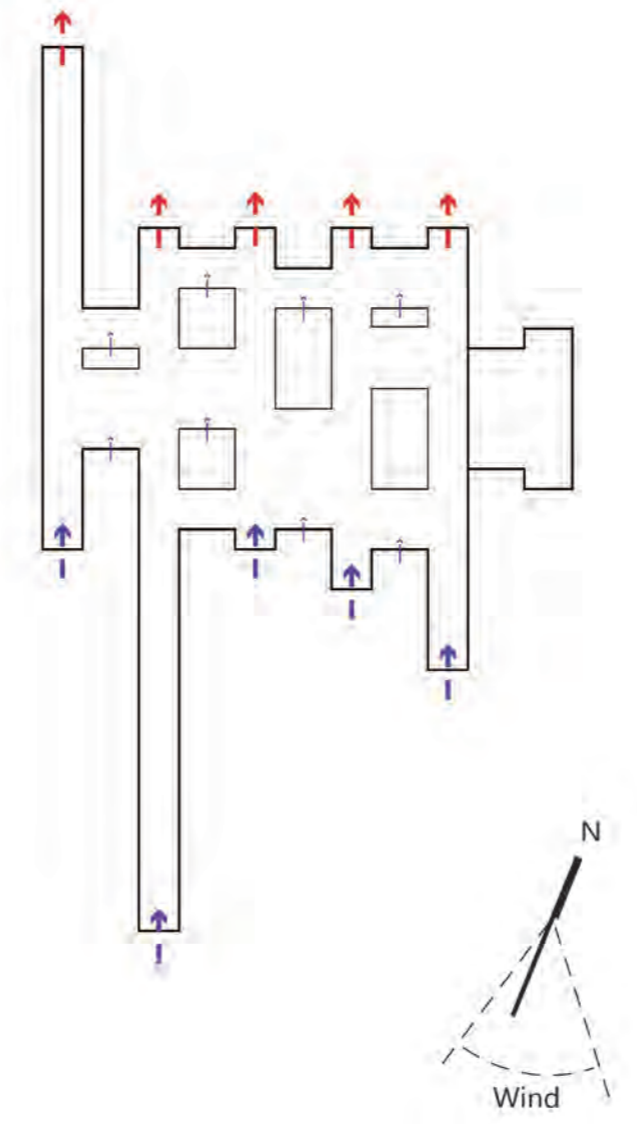
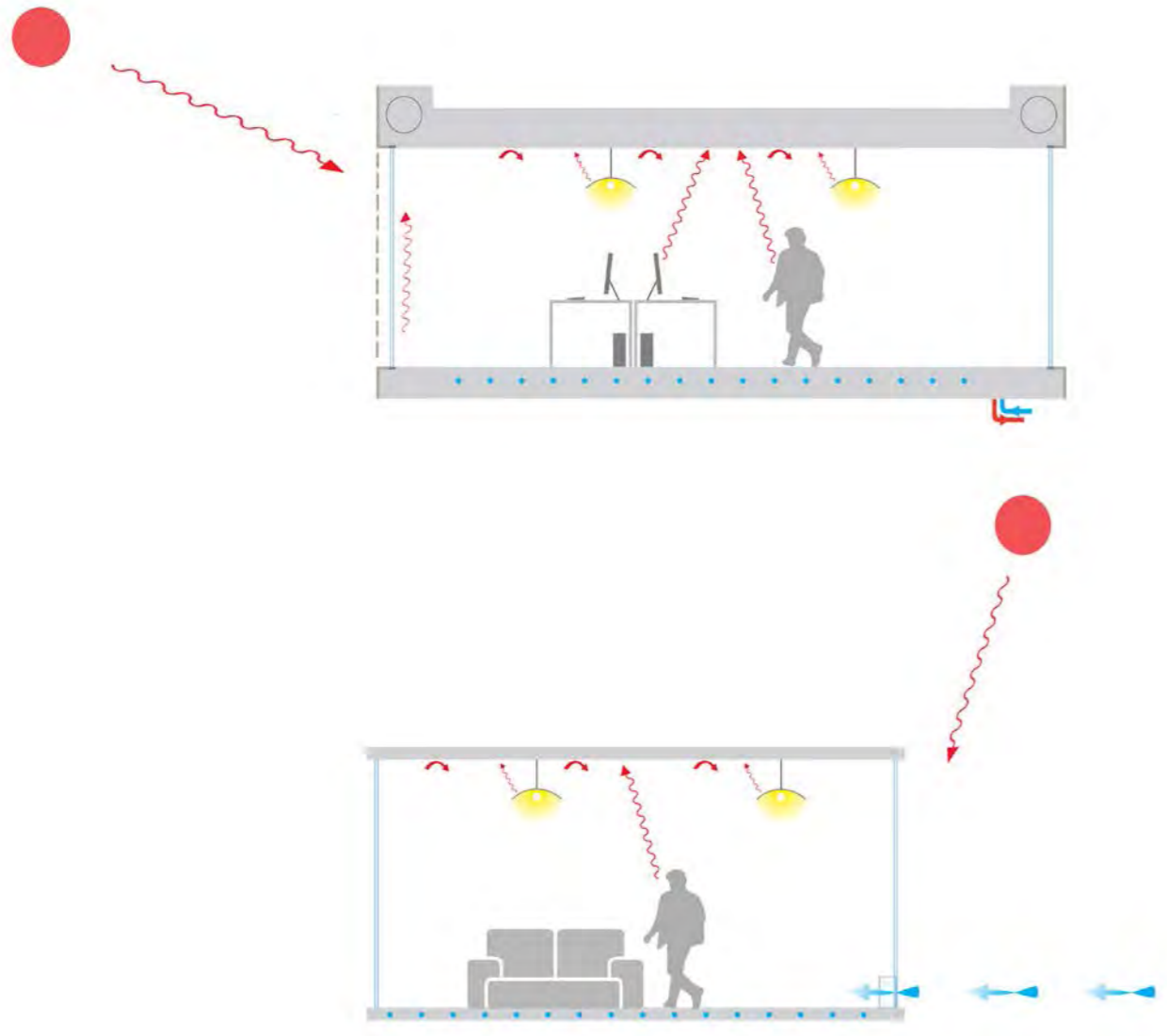
The stabilized sand in the wood box provide enough thermal mass for the building.

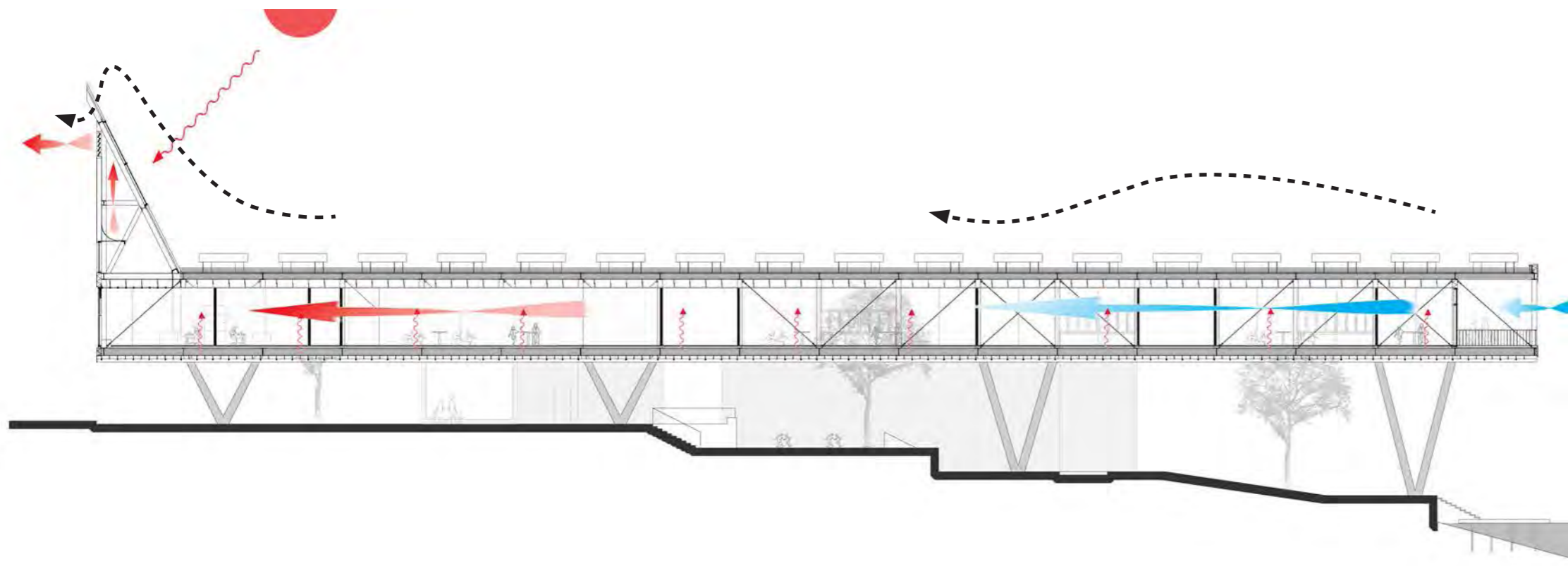
The equipment will located in three place.



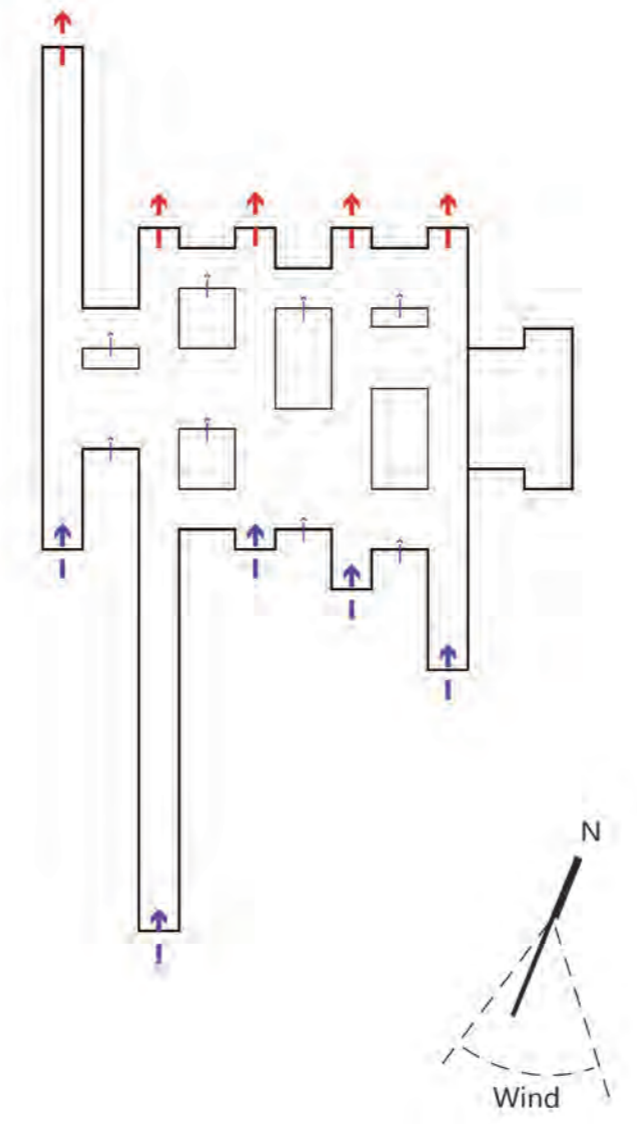
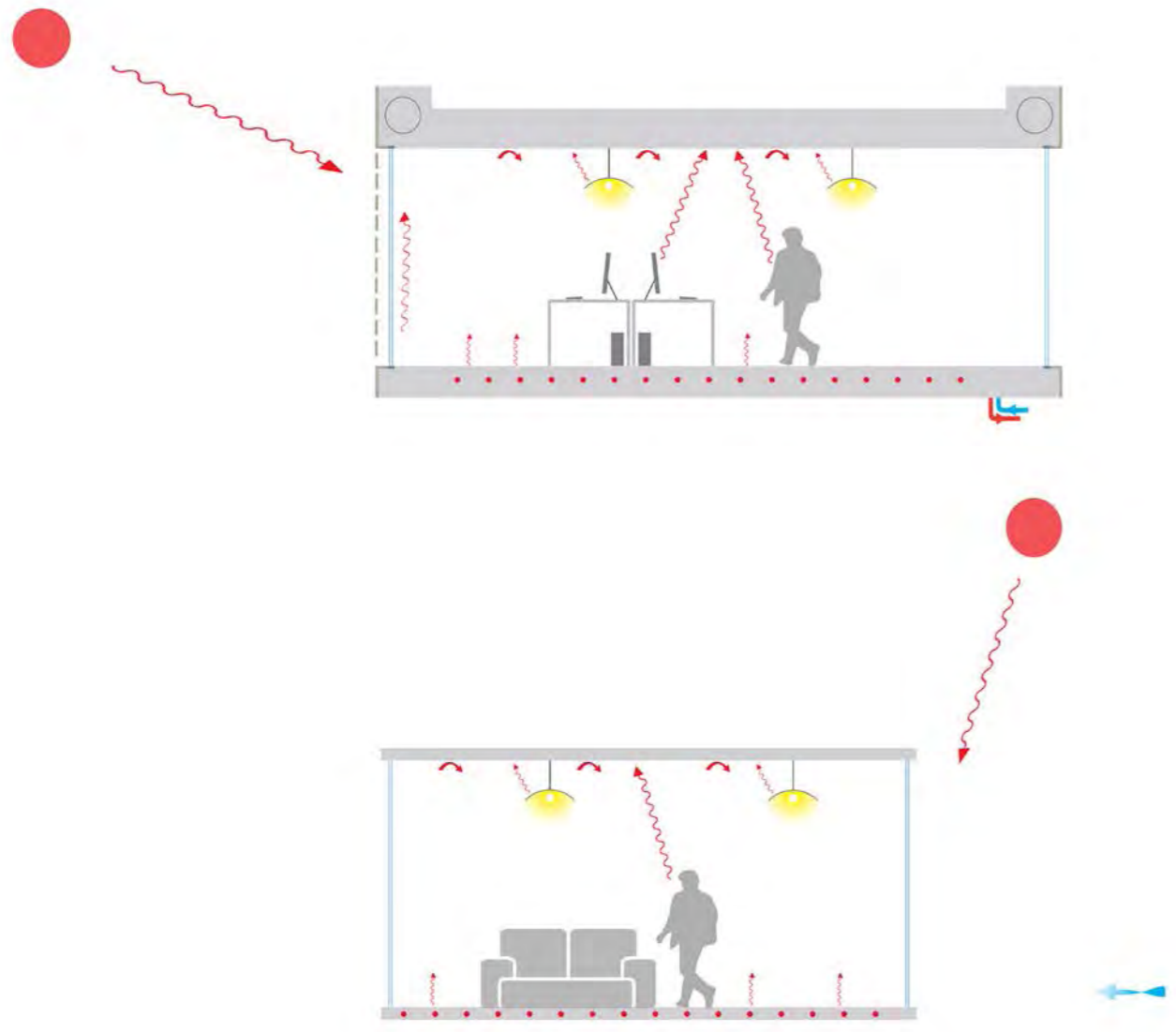


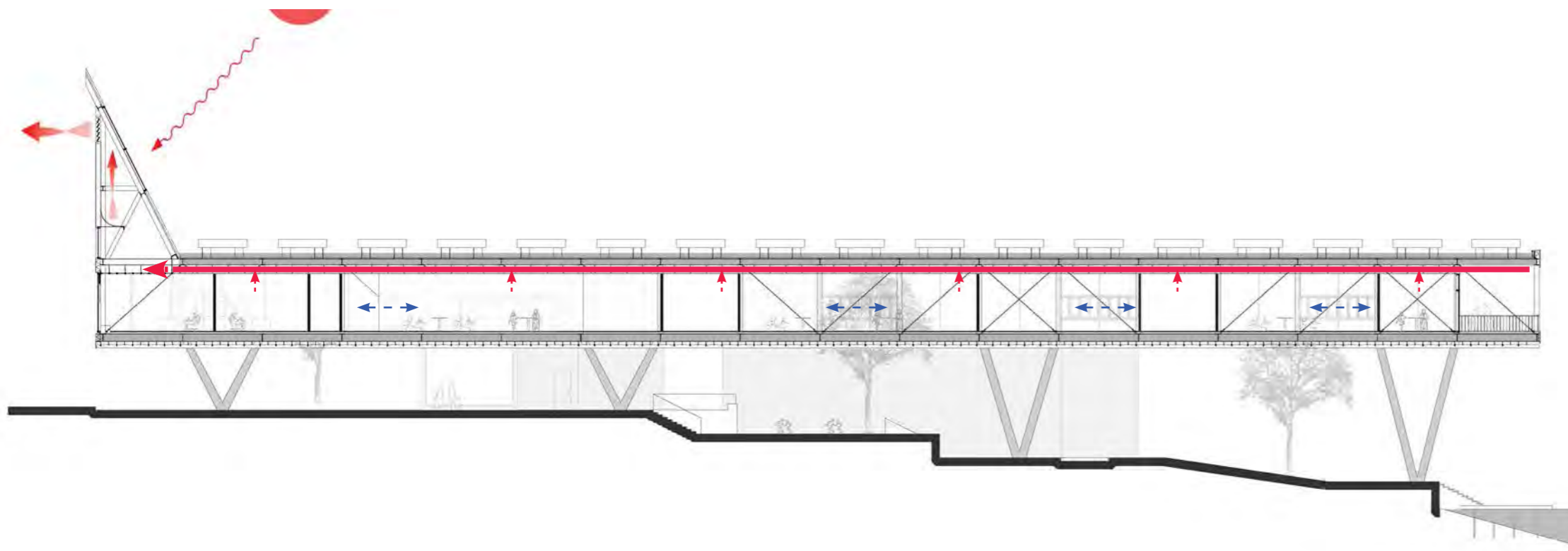
Sunny with wind
Summer



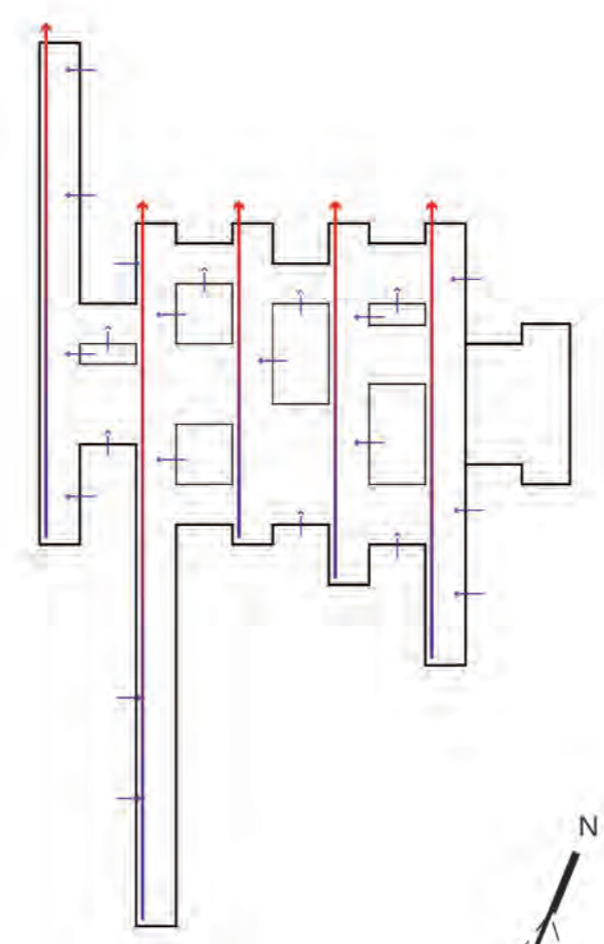
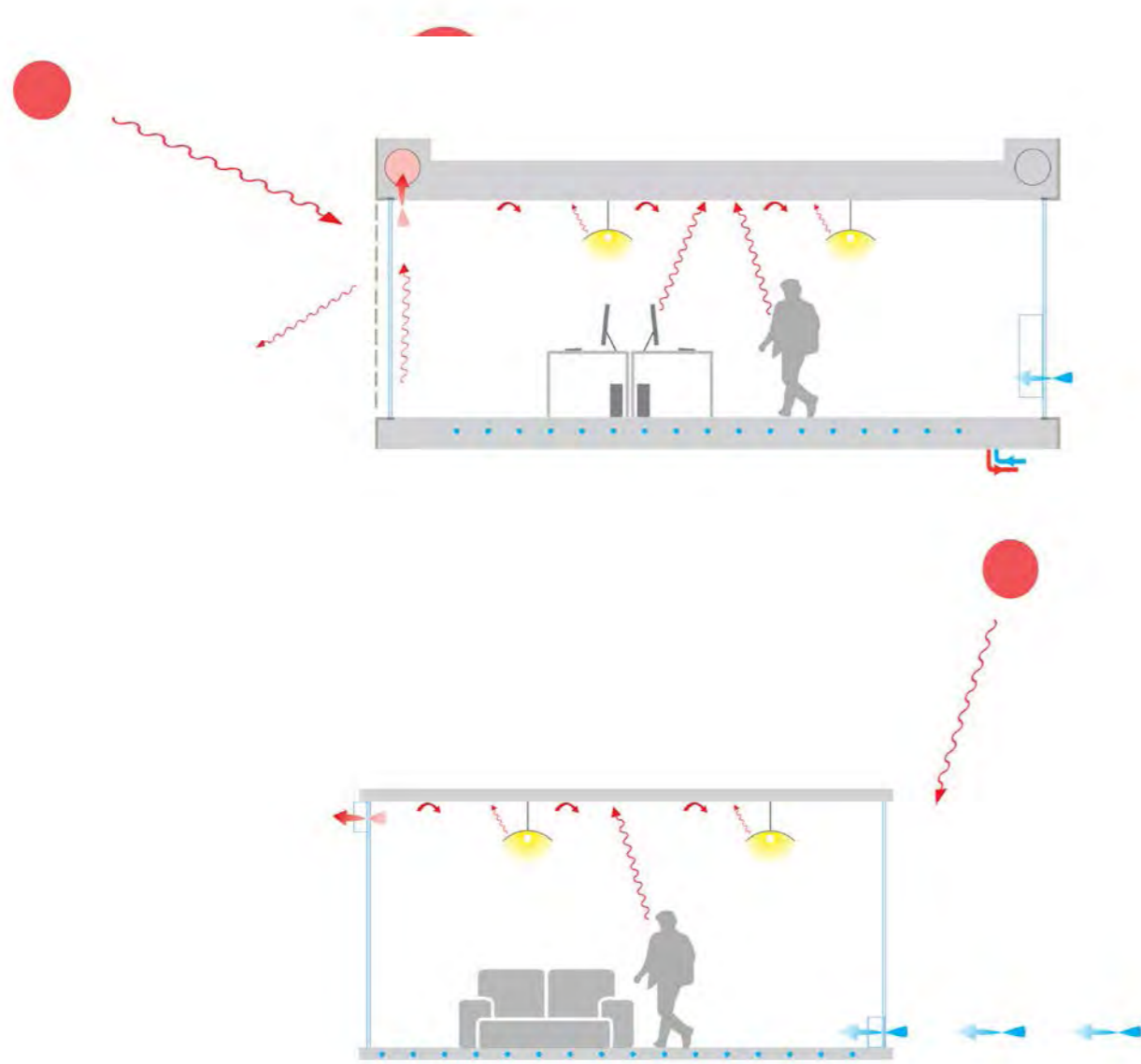


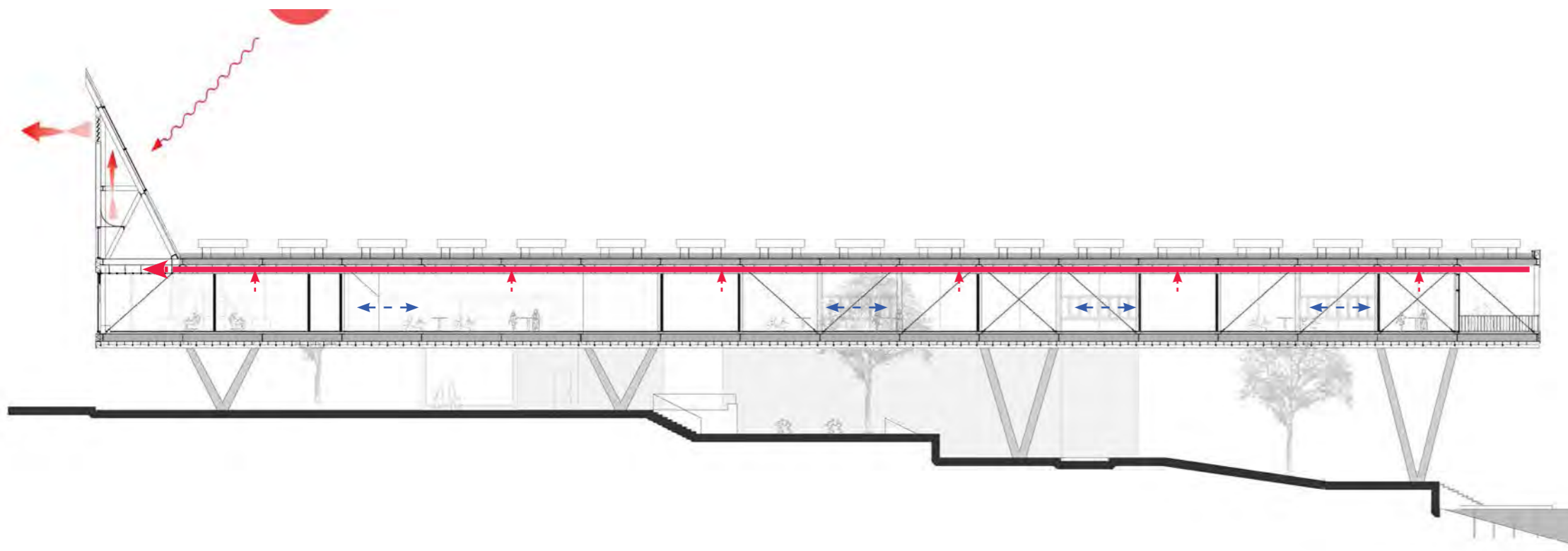
Sunny with wind
Winter



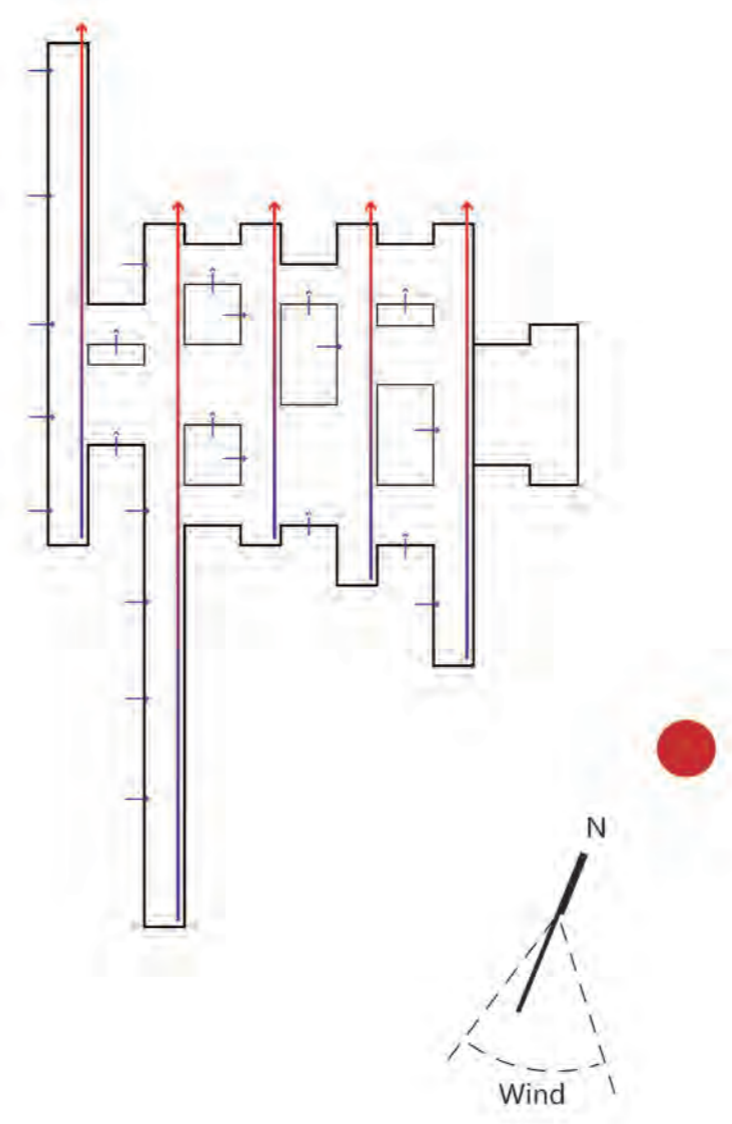
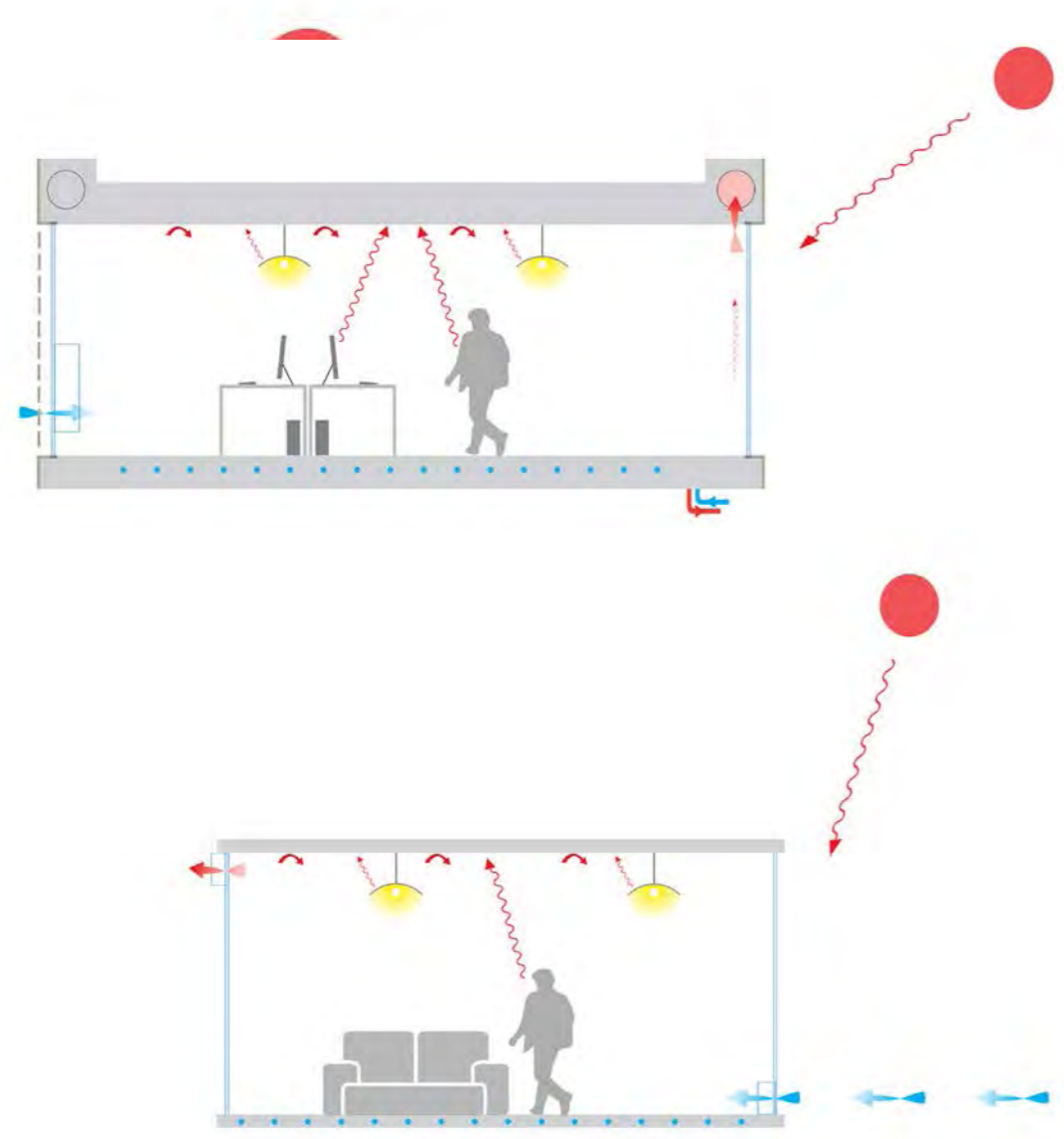


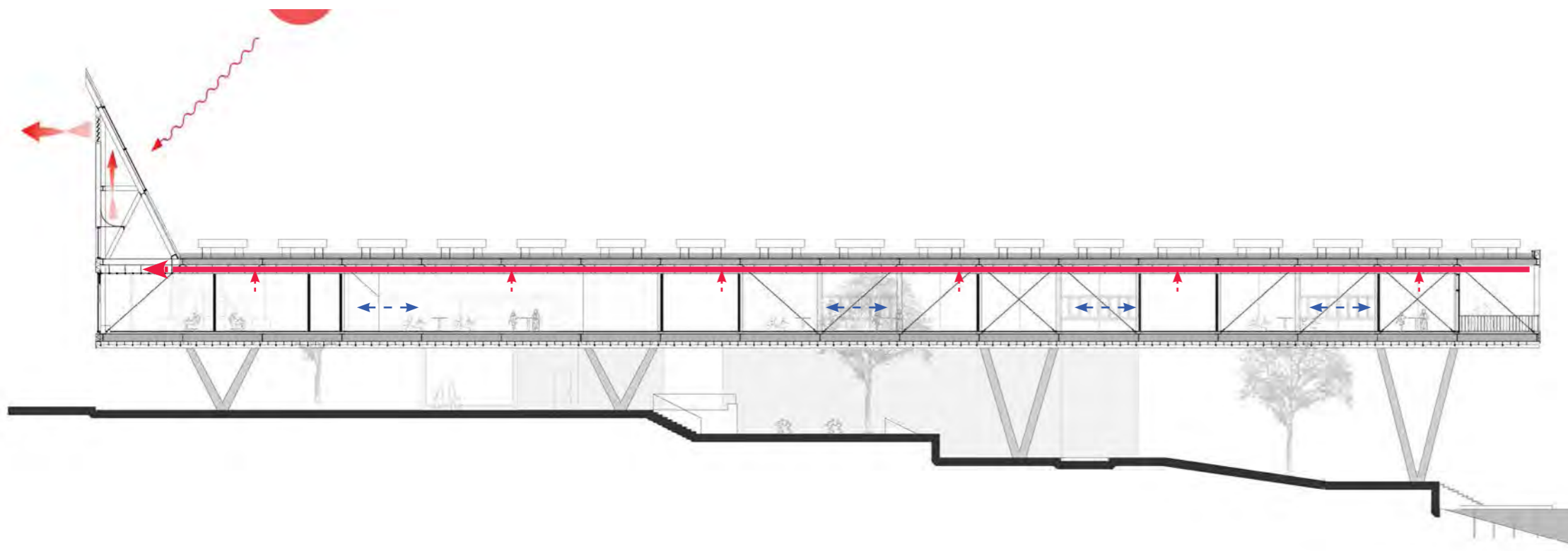
Cloudy with no wind
 Summer
 Morning



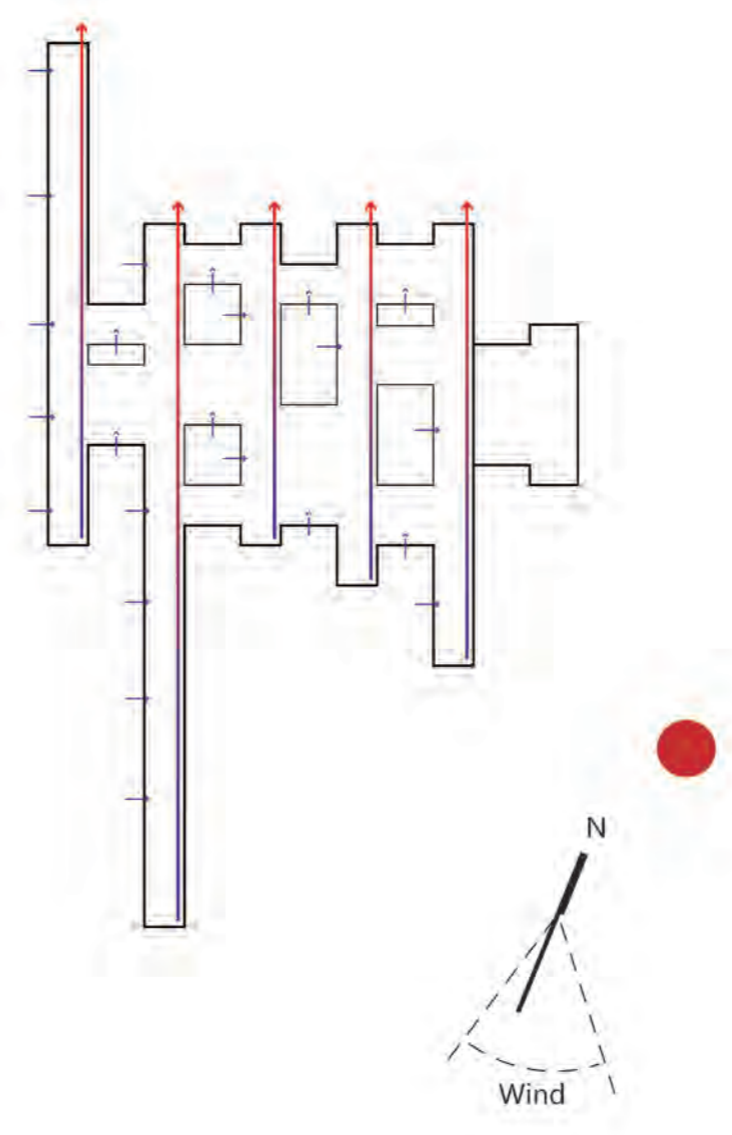
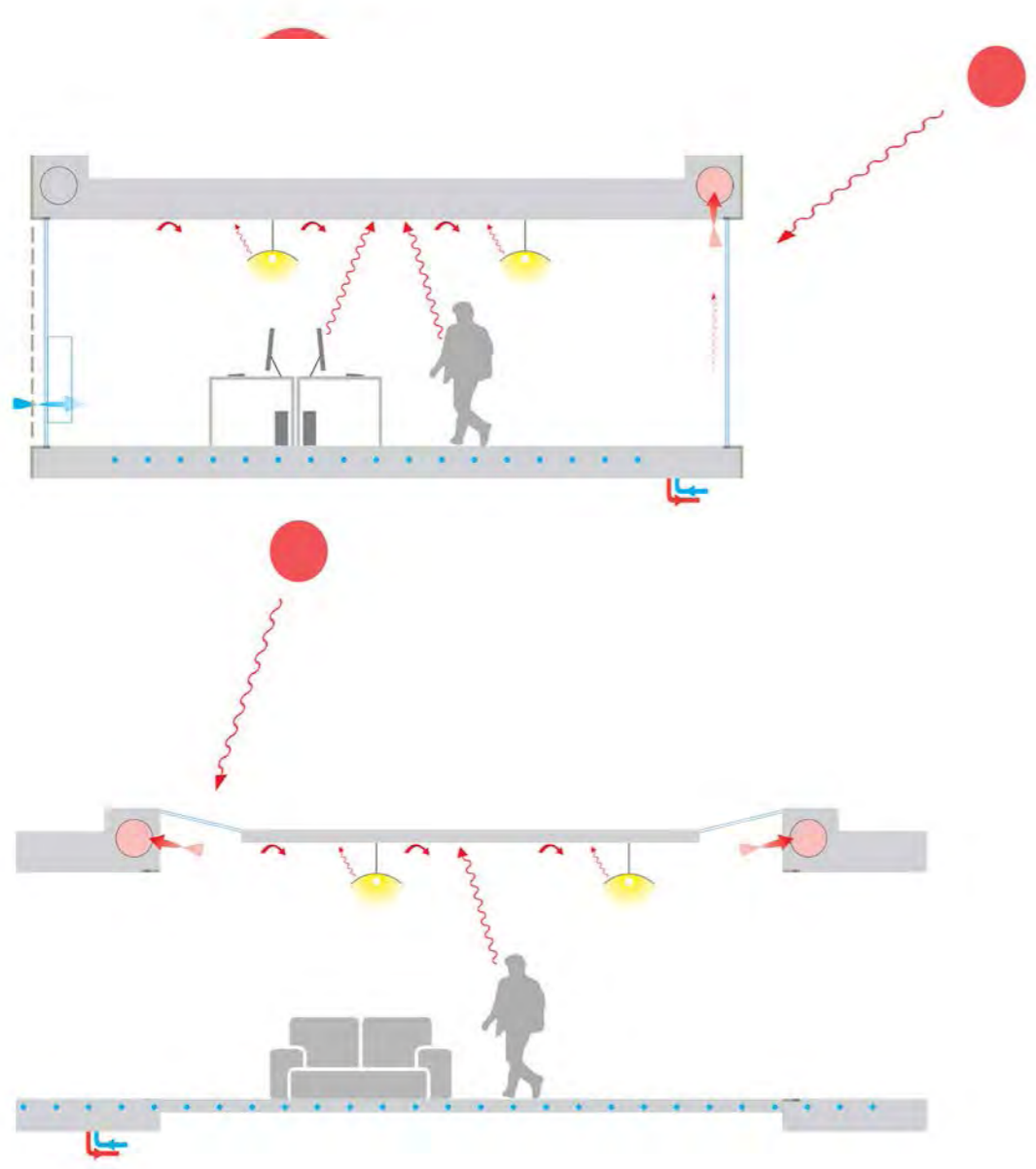


Cloudy with no wind
 Summer
 Afternoon





Cloudy with no wind
 Summer
 Afternoon



Program	Total Area (m2)	Light (W/m2)	Equipment	Open hours per day	Energy
Office	890	25	10	12	1034kwh
lecture	314	15	10	6	
lobby	310	25	10	12	
Studio	600	25	10	12	
Restaurant:	330	25	10	12	
Shop+coffee	126	25	10	12	
Study room	244	25	10	12	
WC	160	25	10	12	
library	520	25	10	12	
Exhibition	641	10	5	12	
Office relaxing area	200	10	7	12	
Storage	100	10	3	12	
Outcoffee	140	15	5	14	739kwh
Bridge library	1130	15	5	14	
Piano	145	15	5	14	
Circulation space	2550	15	5	14	
Out door	300	15 only at night	0	14 2h lighting at night	9kwh
Summer theater	236	5 only at night	0	24 4h lighting at night	163kwh
Ground ceiling	8170	5 only at night	0	24 4h lighting at night	
Total					2062kwh

Energy Cost

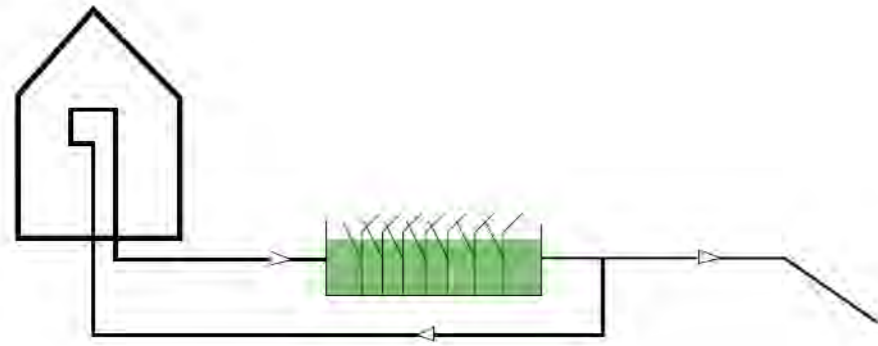


Area	P	Time	Energy
5710m ²	100W/m ²	8~10h 70% efficient	4568~5710kwh X70% =3197kwh~3997Kwh >3093kwh

Conclusion

The Solar Pannel System can provide enough energy for the artificial light and basic equipment power, in good days. Consider the weather in Houston, it is supposed to work well.





Water circulation

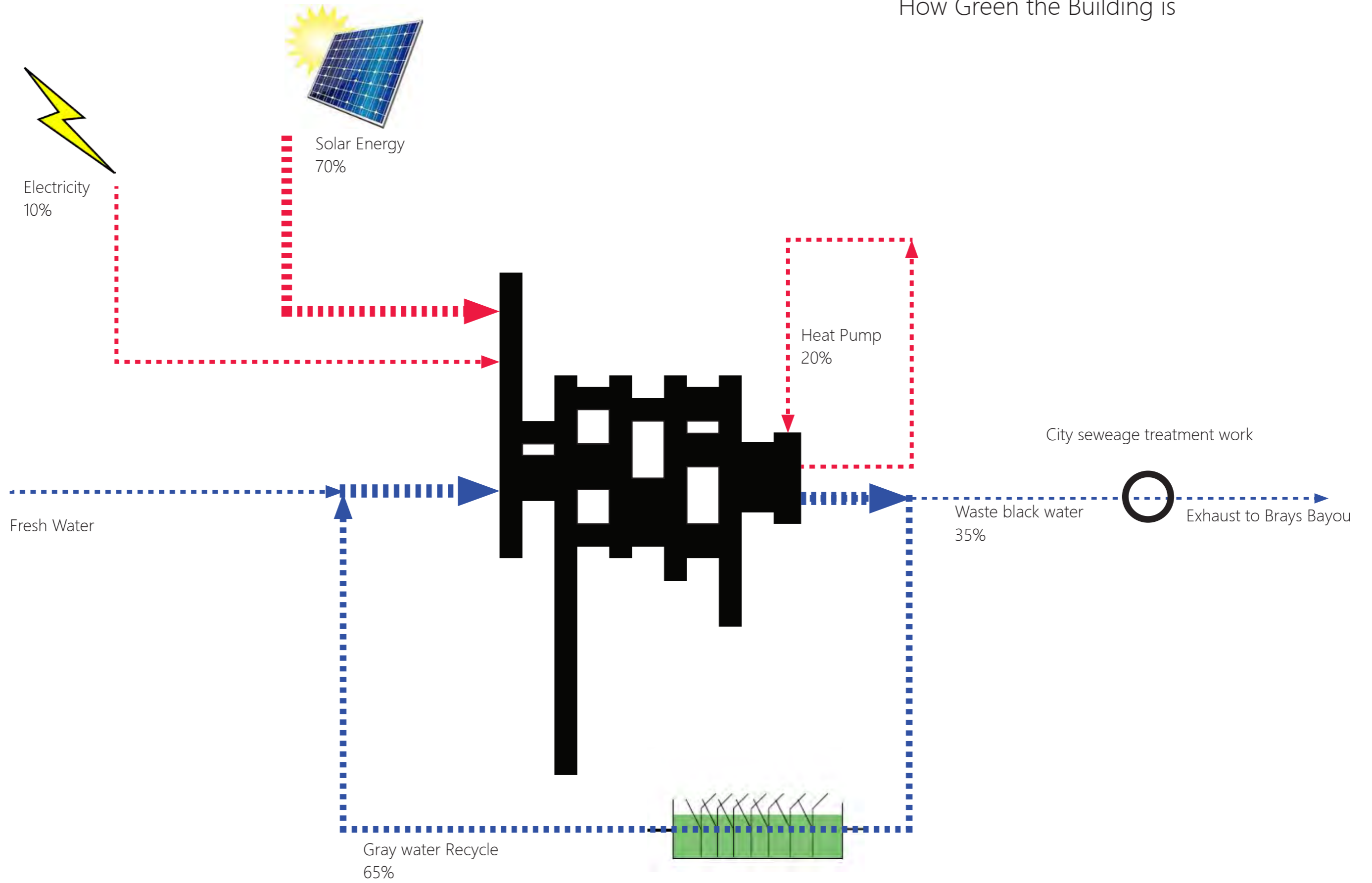
Max People	Average Time	Black water Producing	Gray water Producing
600	6~8h/day	Toilet 5L/flush	Wash room 2L/flush
		Resturant 5L/person/meal	Resturant 15L/person/meal
		Total Max	Total Max
		$600 \times 5 \times 4 + 600 \times 5 \times 2 = 10800\text{L/day}$	$600 \times 2 \times 4 + 600 \times 15 \times 2 = 22800\text{L/day}$

Work Efficence	Maxinum Wetland Need	Wetland in Design
1000L/15m ² /day (water quality level 3)	$22800 / 1000 \times 15 = 342\text{m}^2$	1000m ²
500L/15m ² /day (water quality level 5)	$22800 / 500 \times 15 = 684\text{m}^2$	

Conclusion

The atificial wetland is enough to purify the gray water and recycle it to wash the toliet. In this way, it can reduce the need of the fresh water for the building.

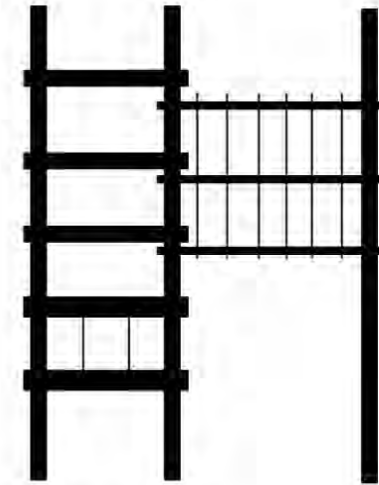
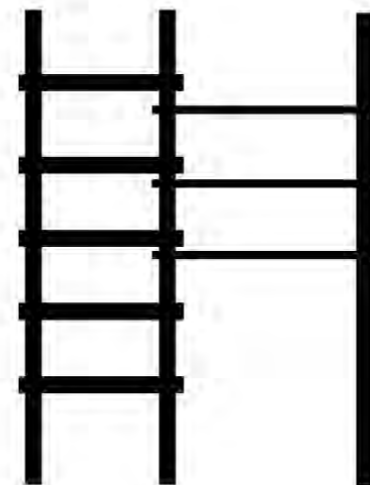
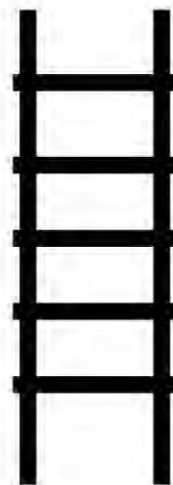
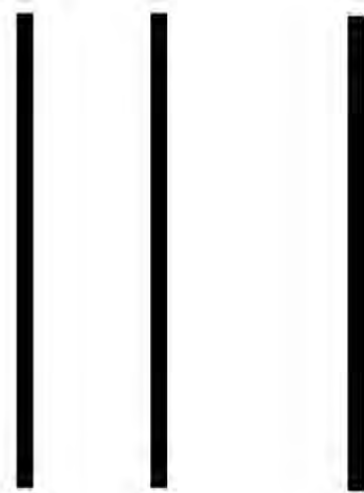
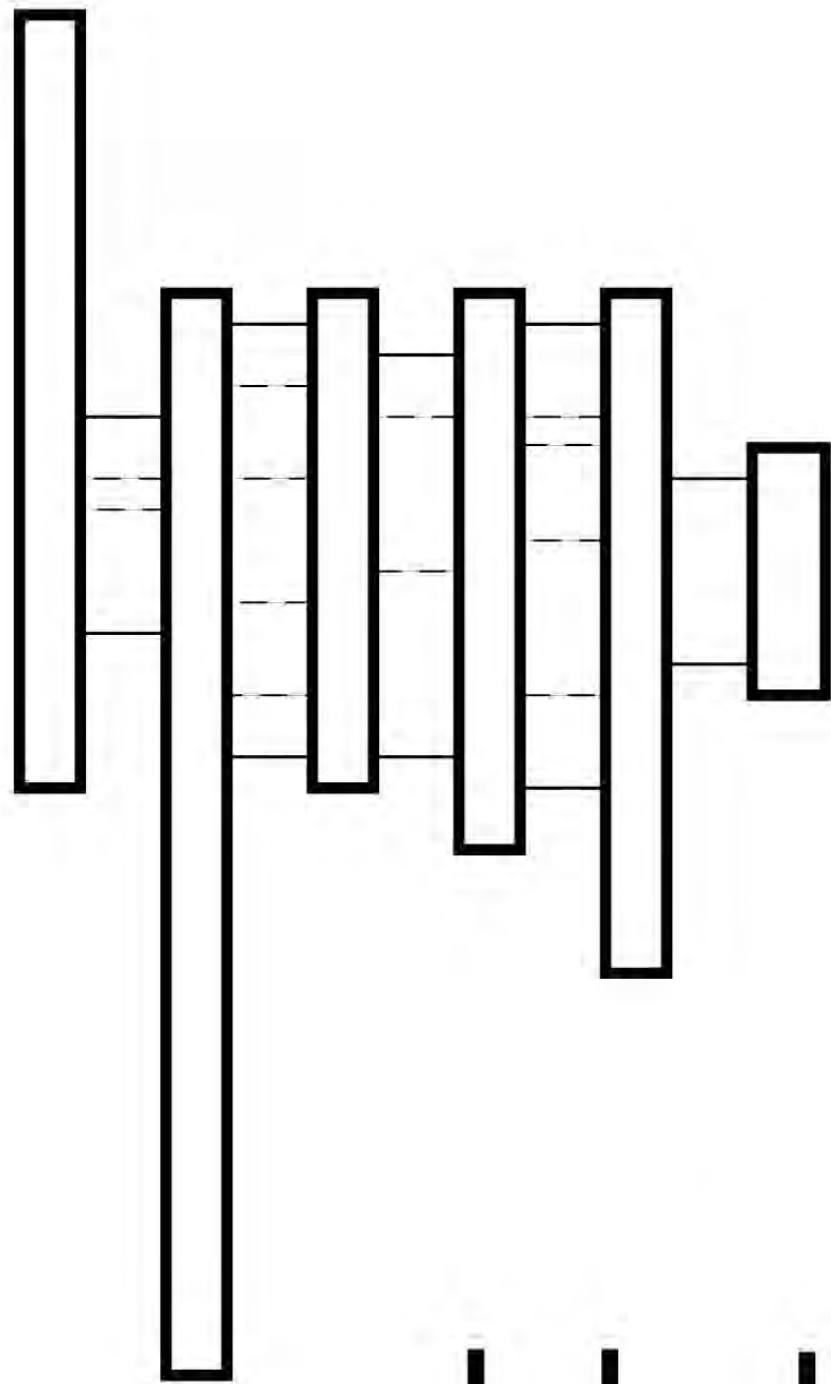
How Green the Building is

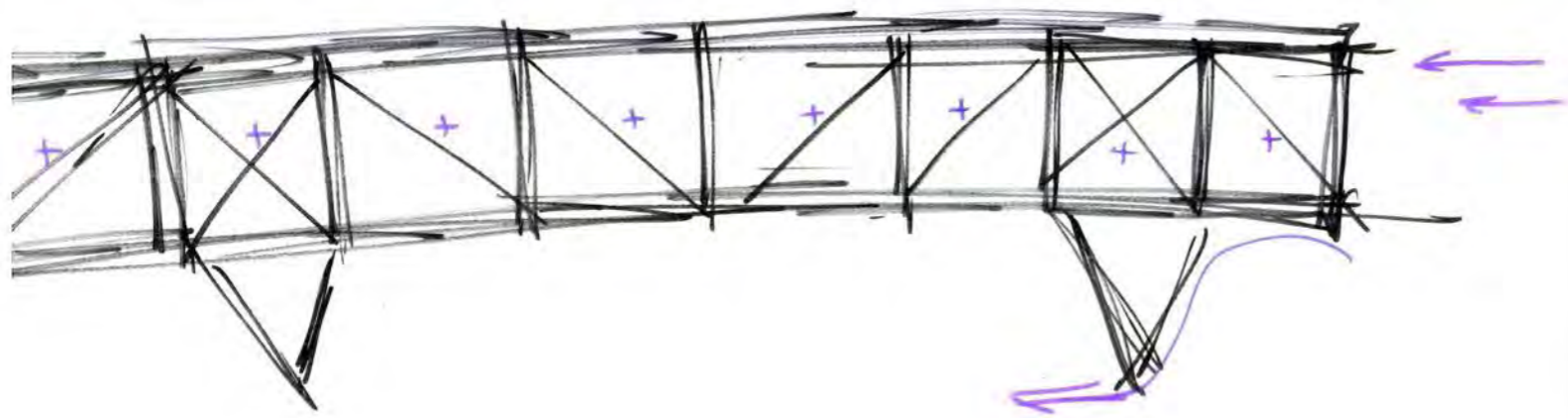


3.6 Structure

The structure is designed as the concept "Main and Secondary", "Stand and Hanging".

This concept goes deep in to the whole system as well as the details.



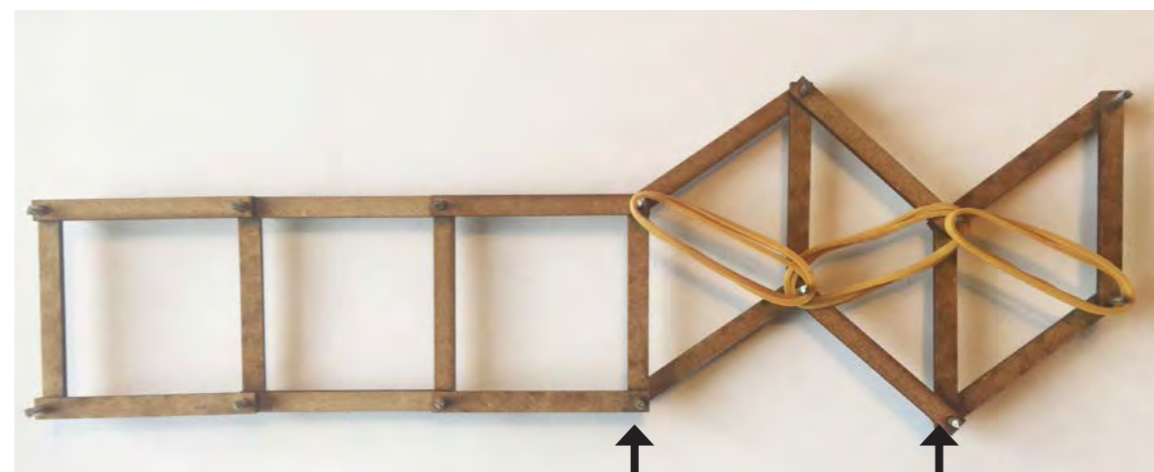
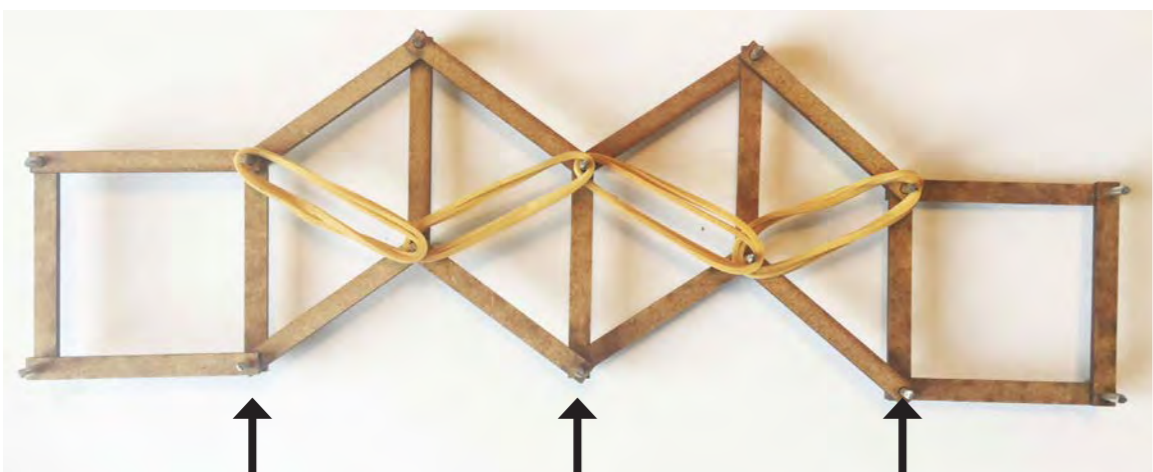
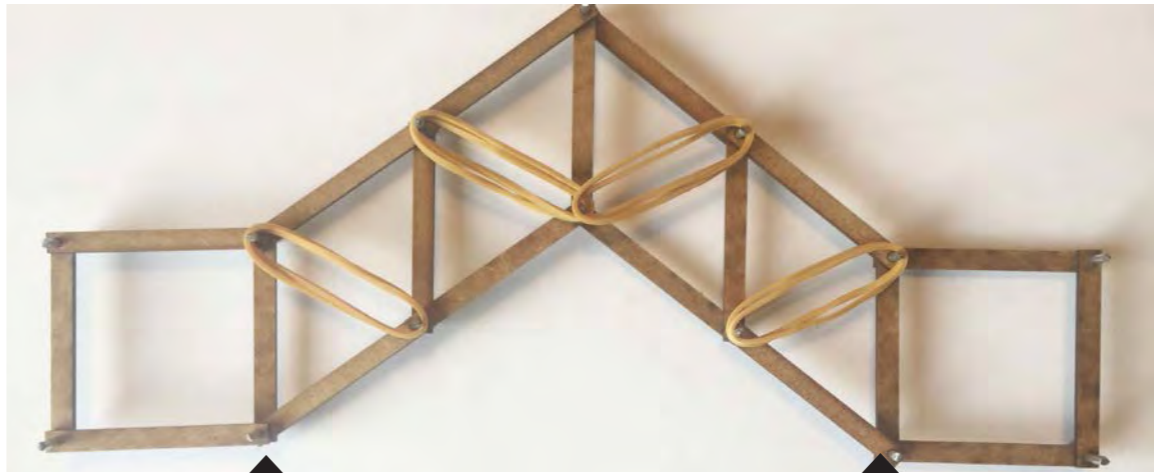
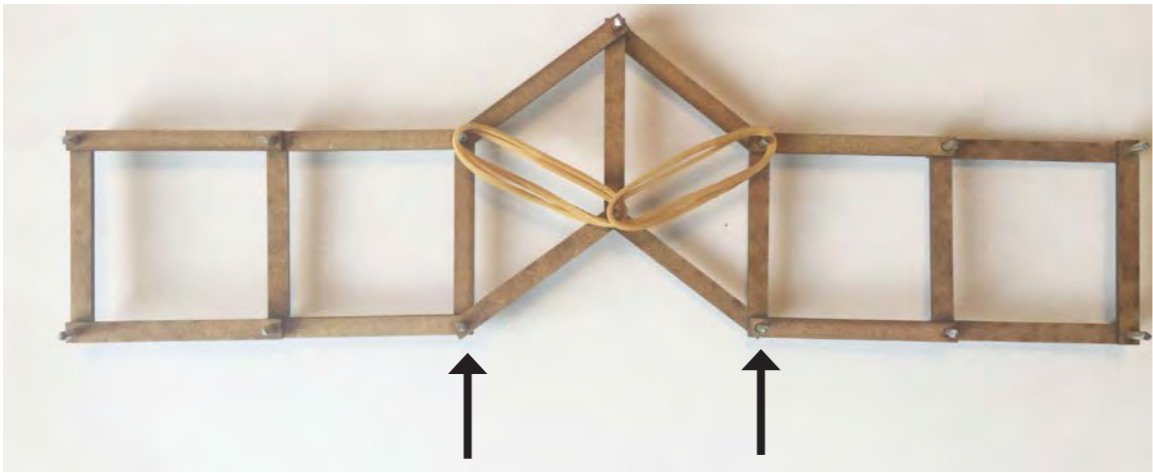


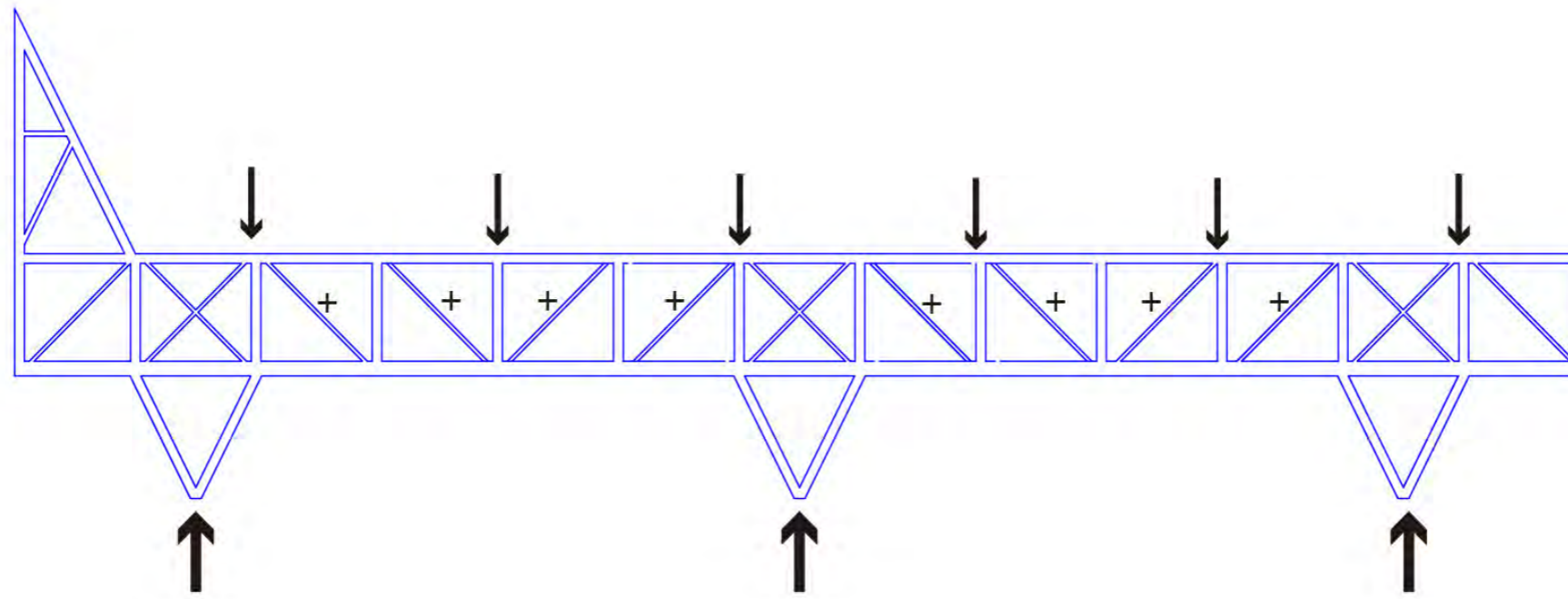
Explore the trusses





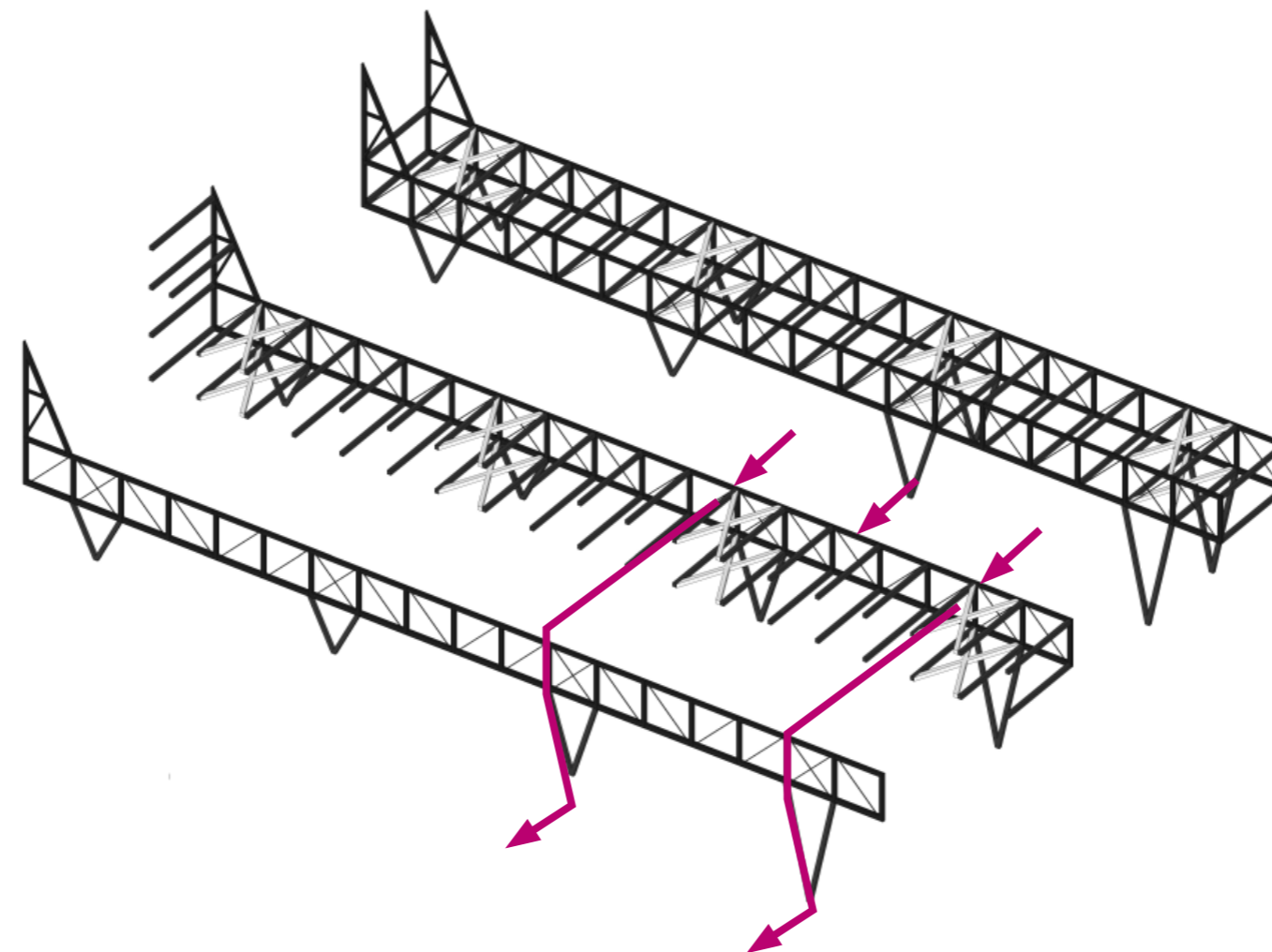
Explore the trusses





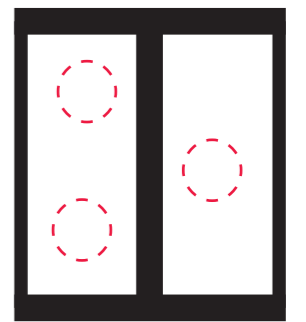
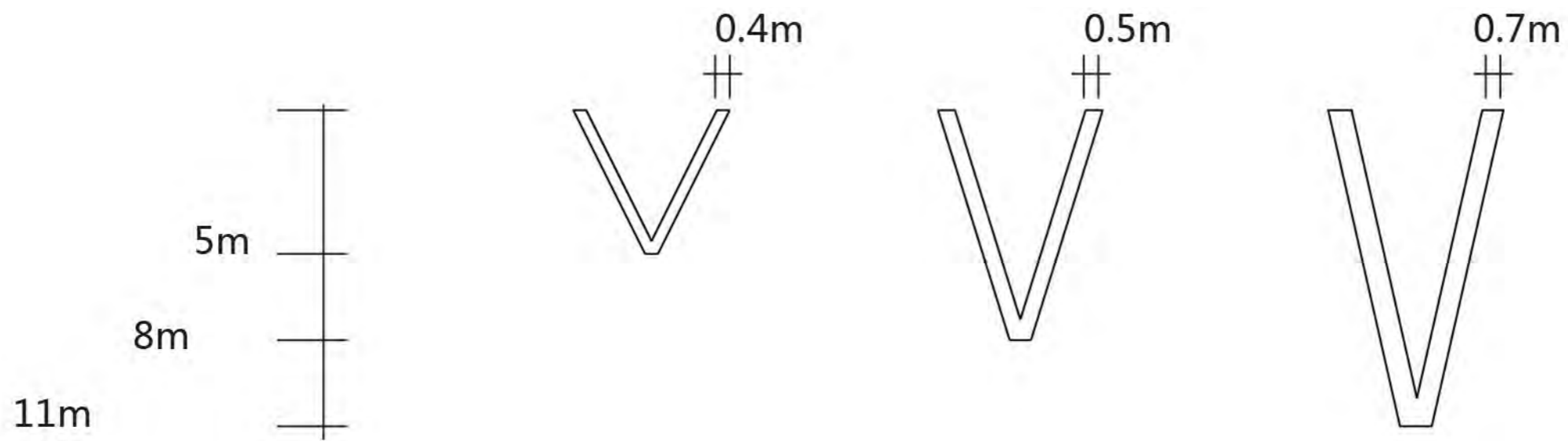
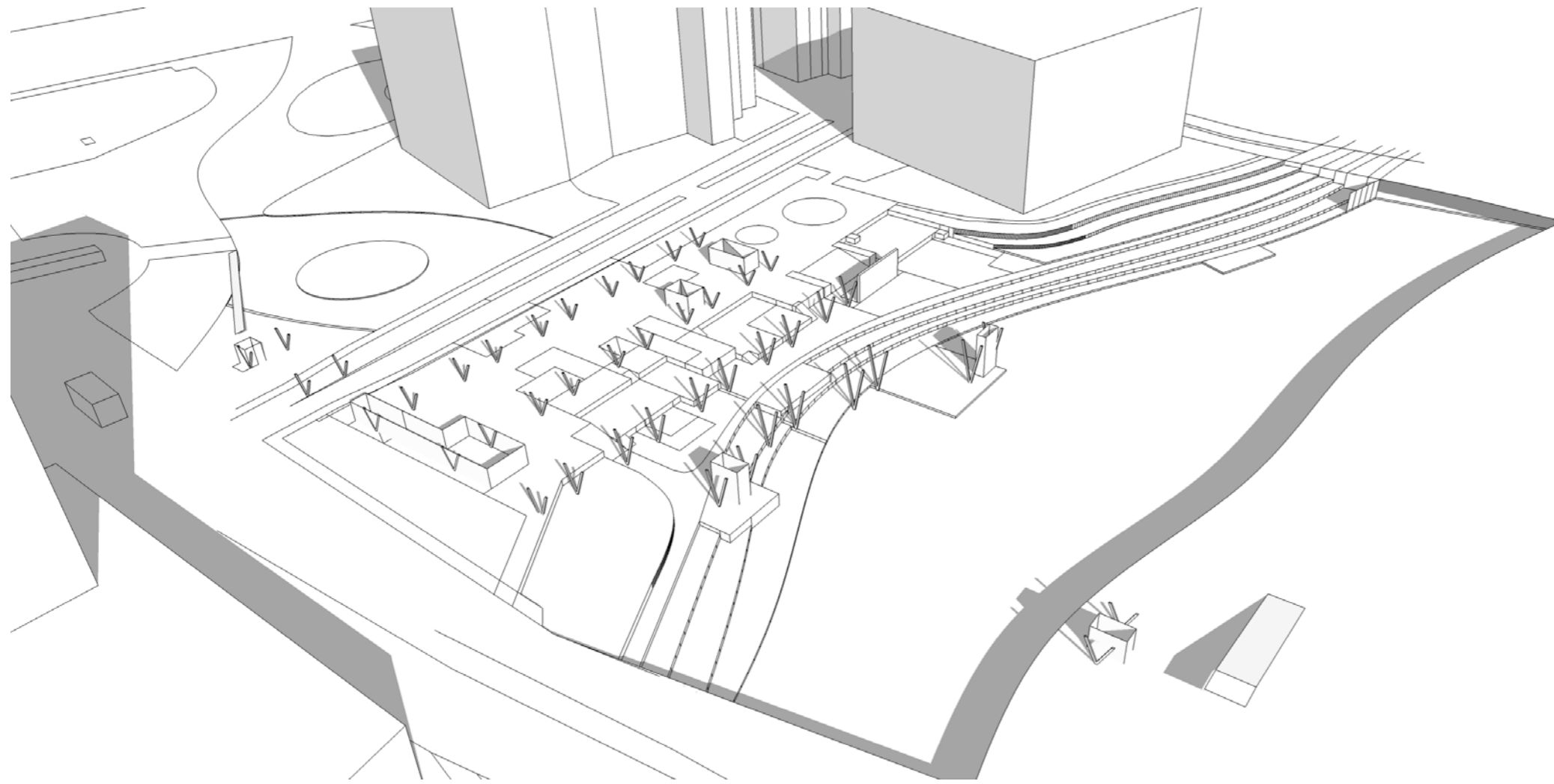
Main Structure

Explore the trusses

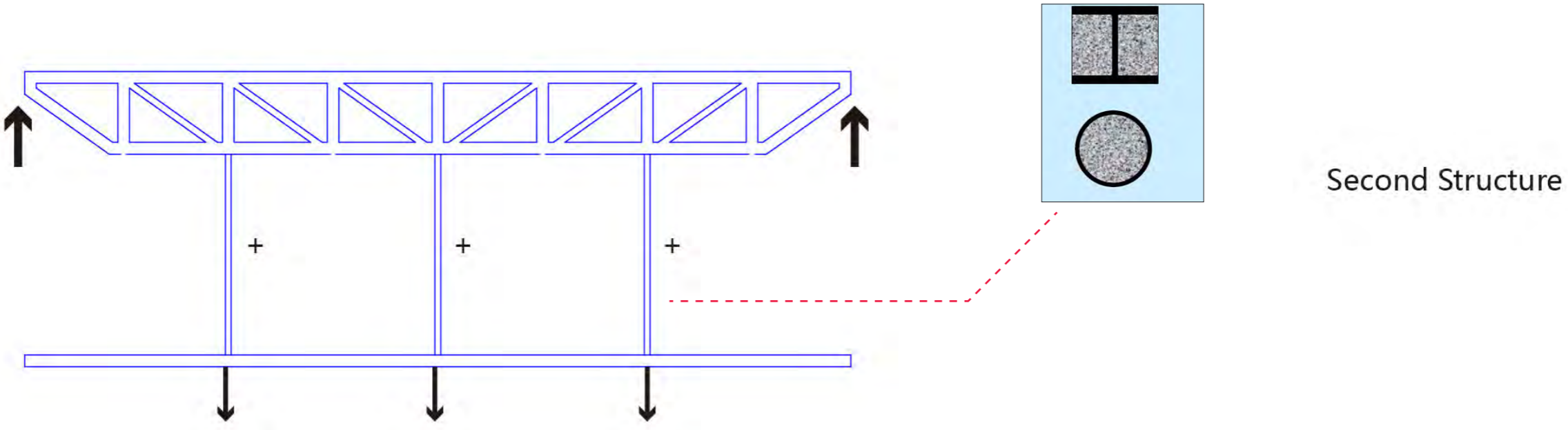
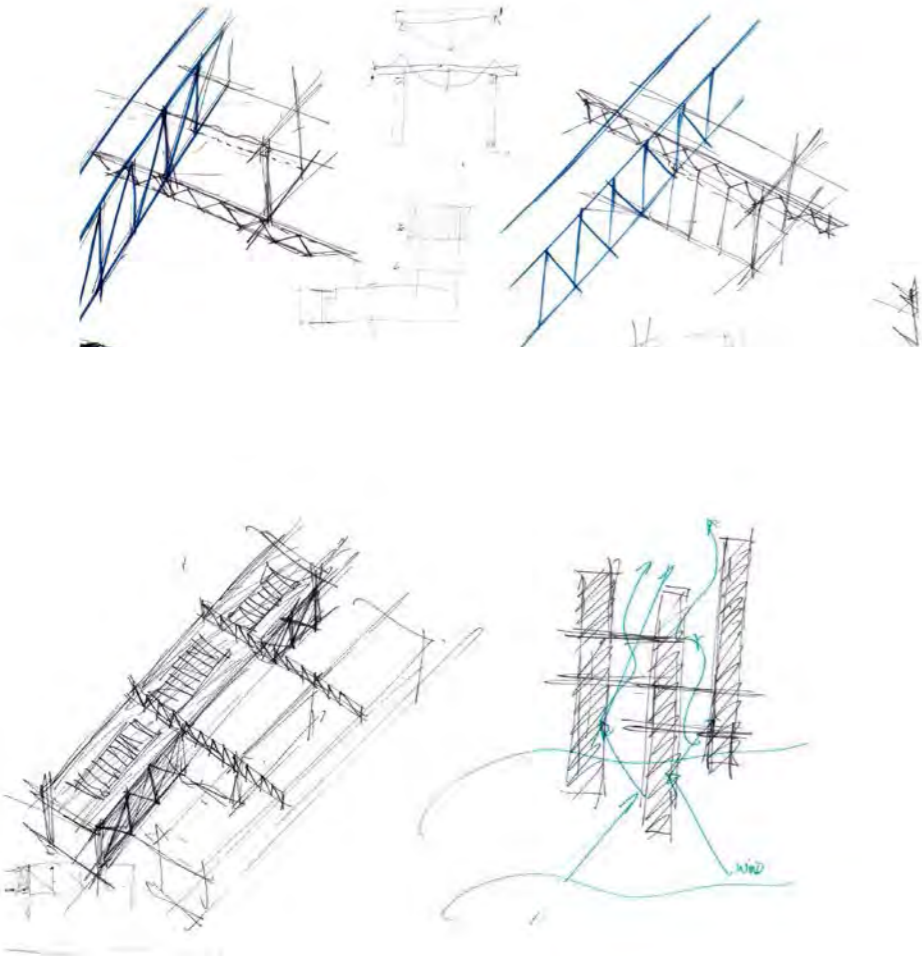


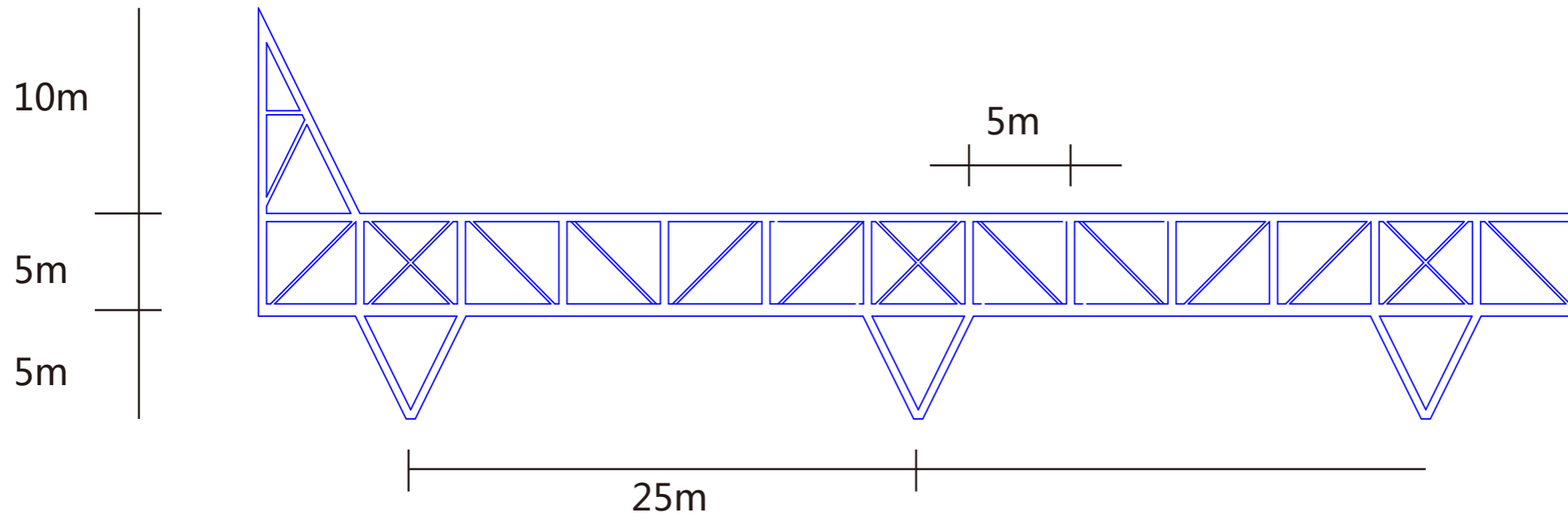
Explore the trusses

The supporting structure ranges according to the height. The H-beam will be covered to leave space for pipe and wires.

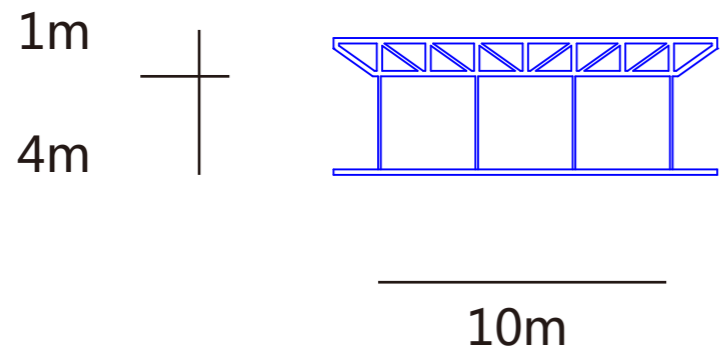


Hanging System

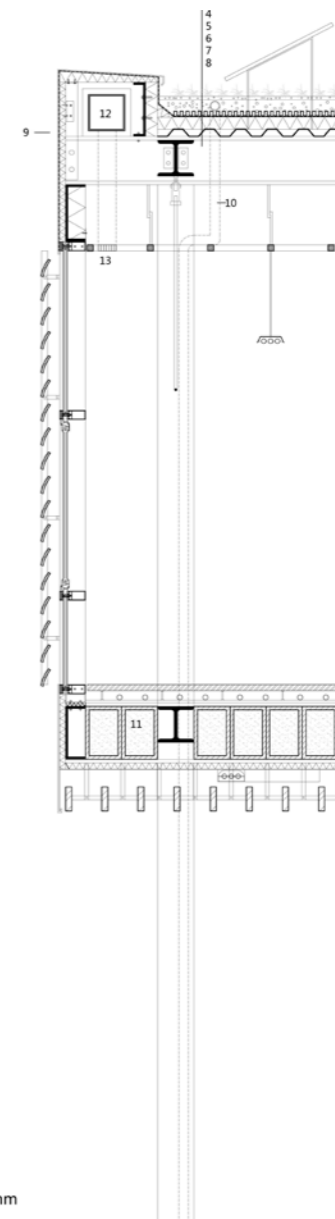
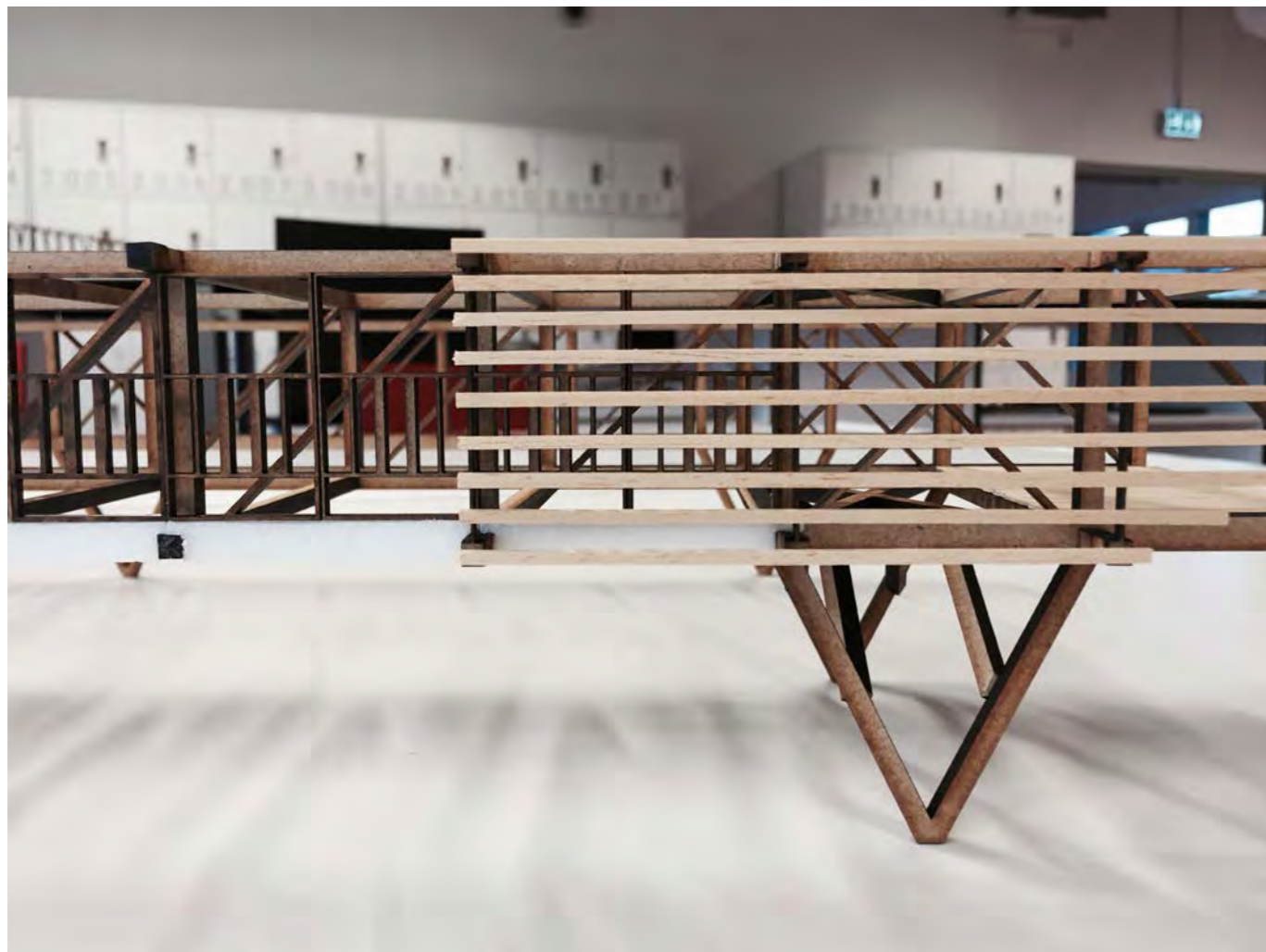
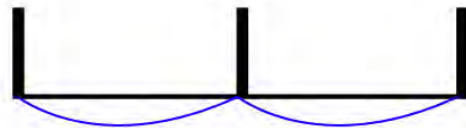
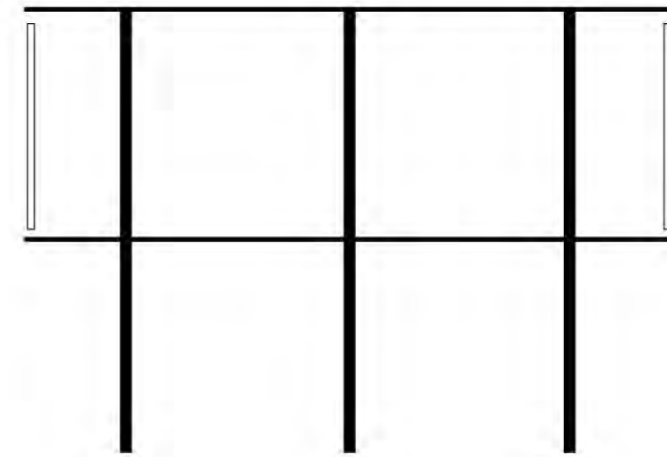
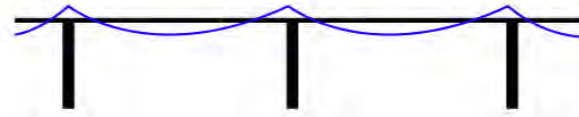
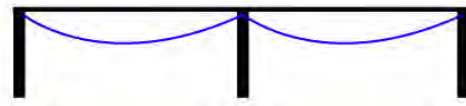




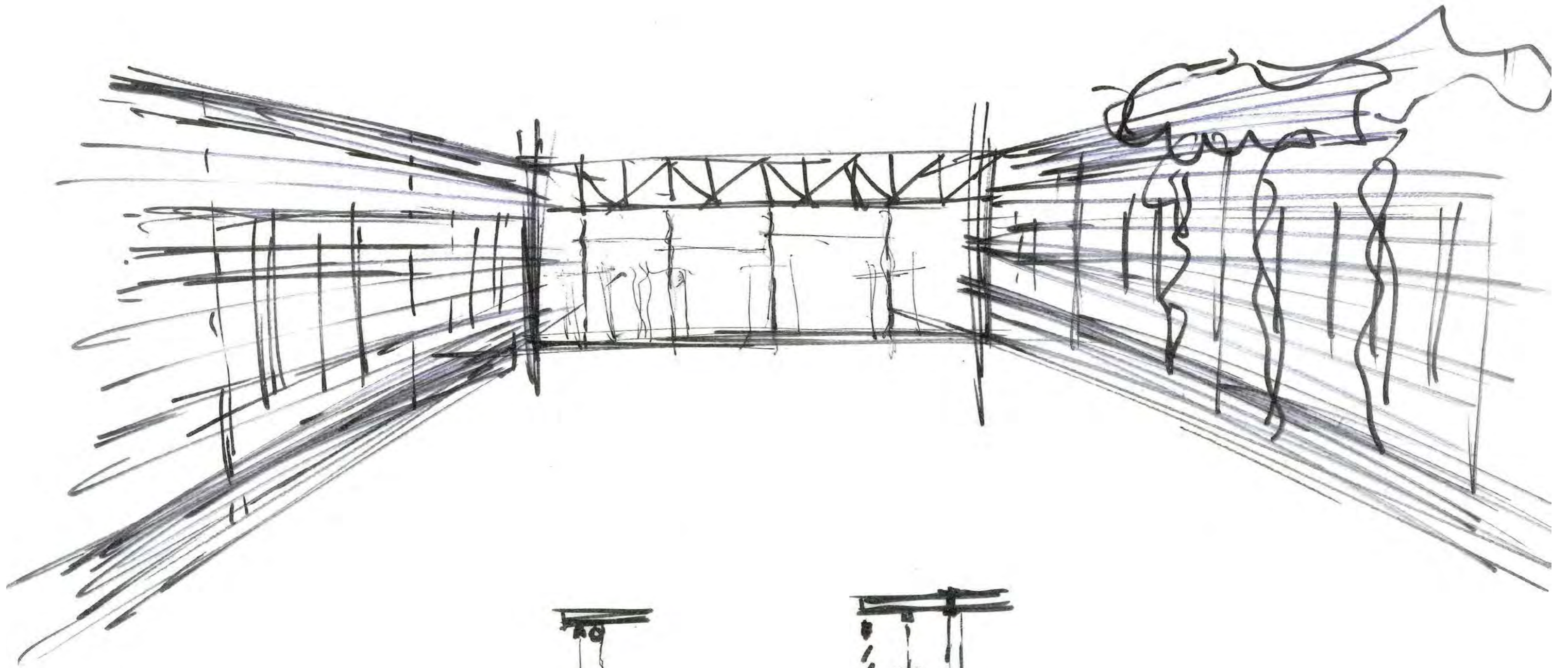
Main Structure



Second Structure



- 1 vegetation
- 2 light substrate
- 3 drainage layer
- 4 storage mat
- 5 water proof
- 6 insulation layer
- 7 stell floor
- 8 IPE stell beam 50x 30mm
- 9 aluminum cladina

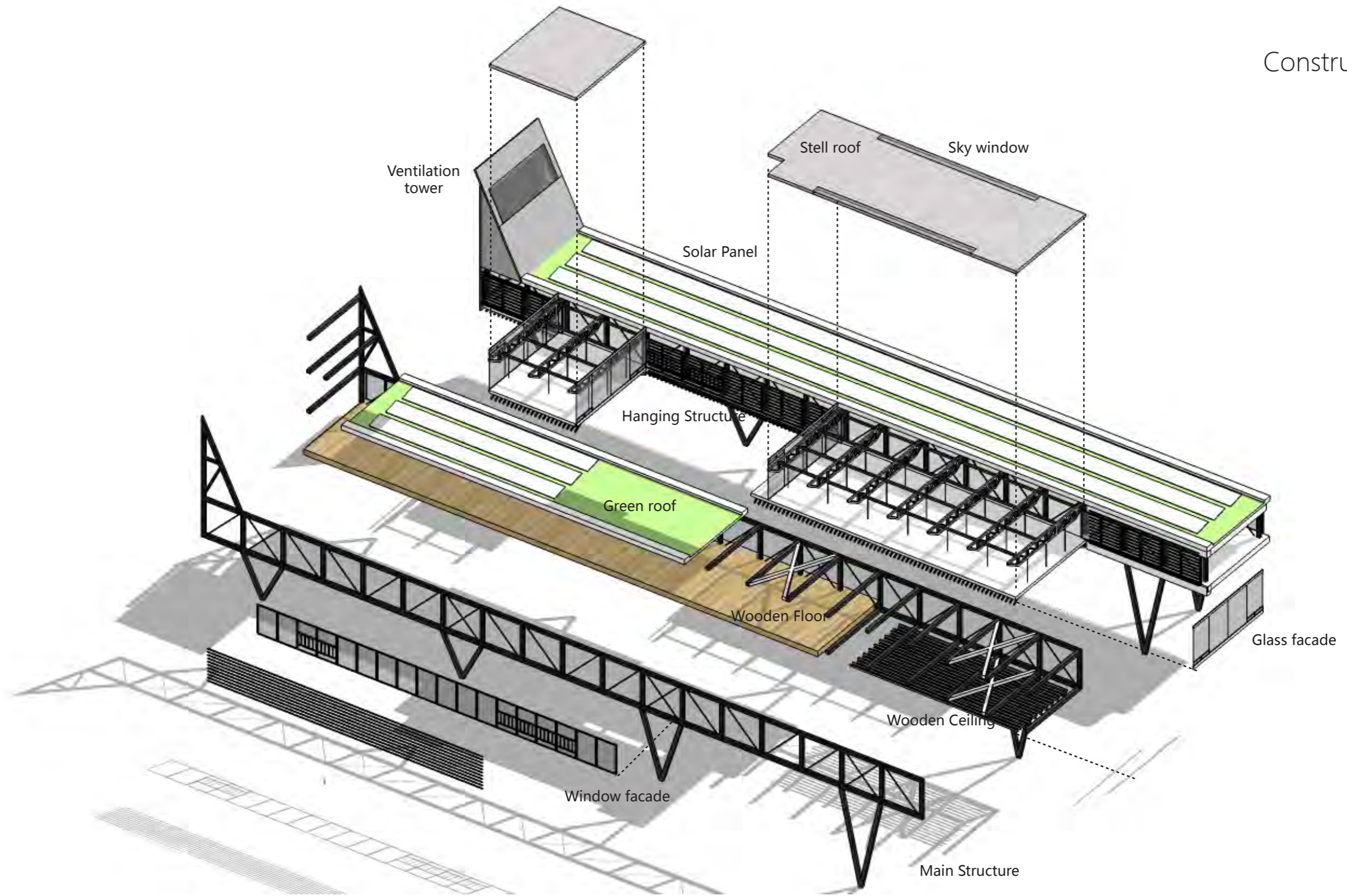


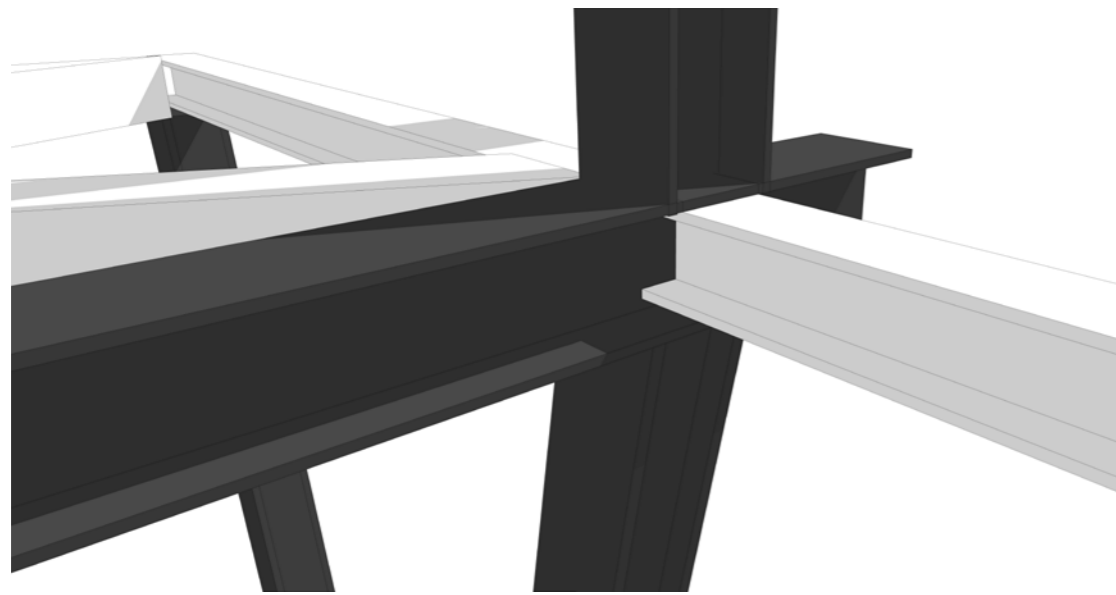
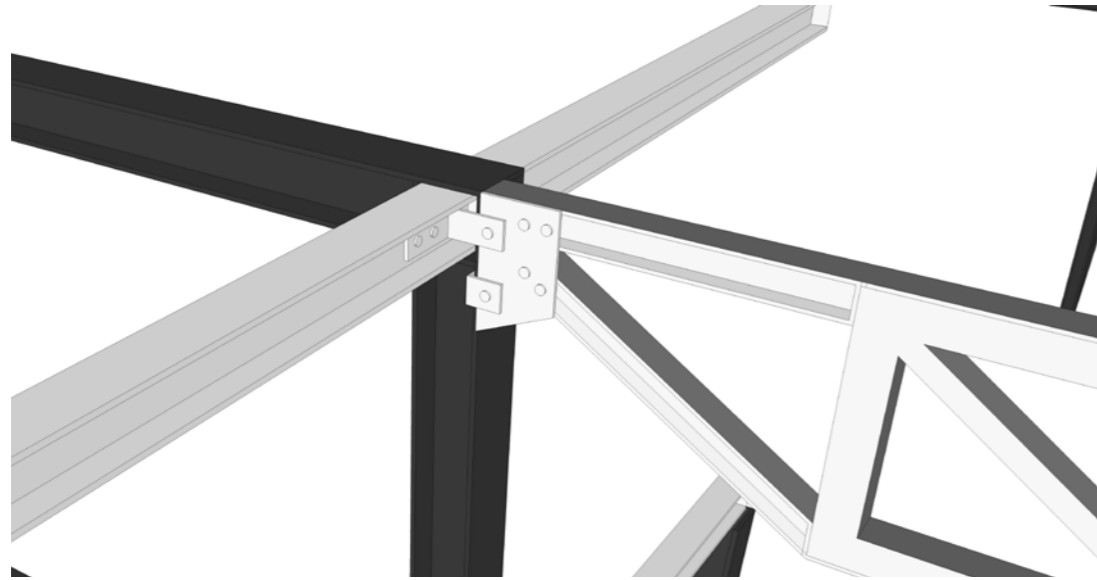
Shading for Hanging parts



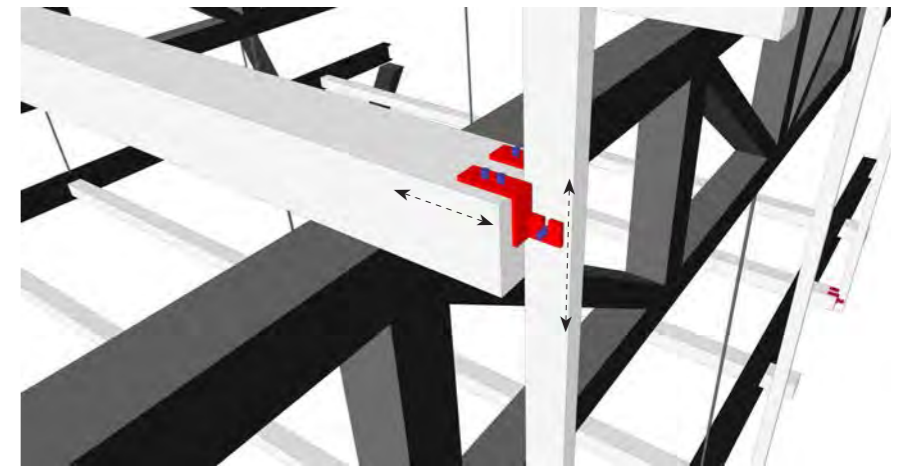
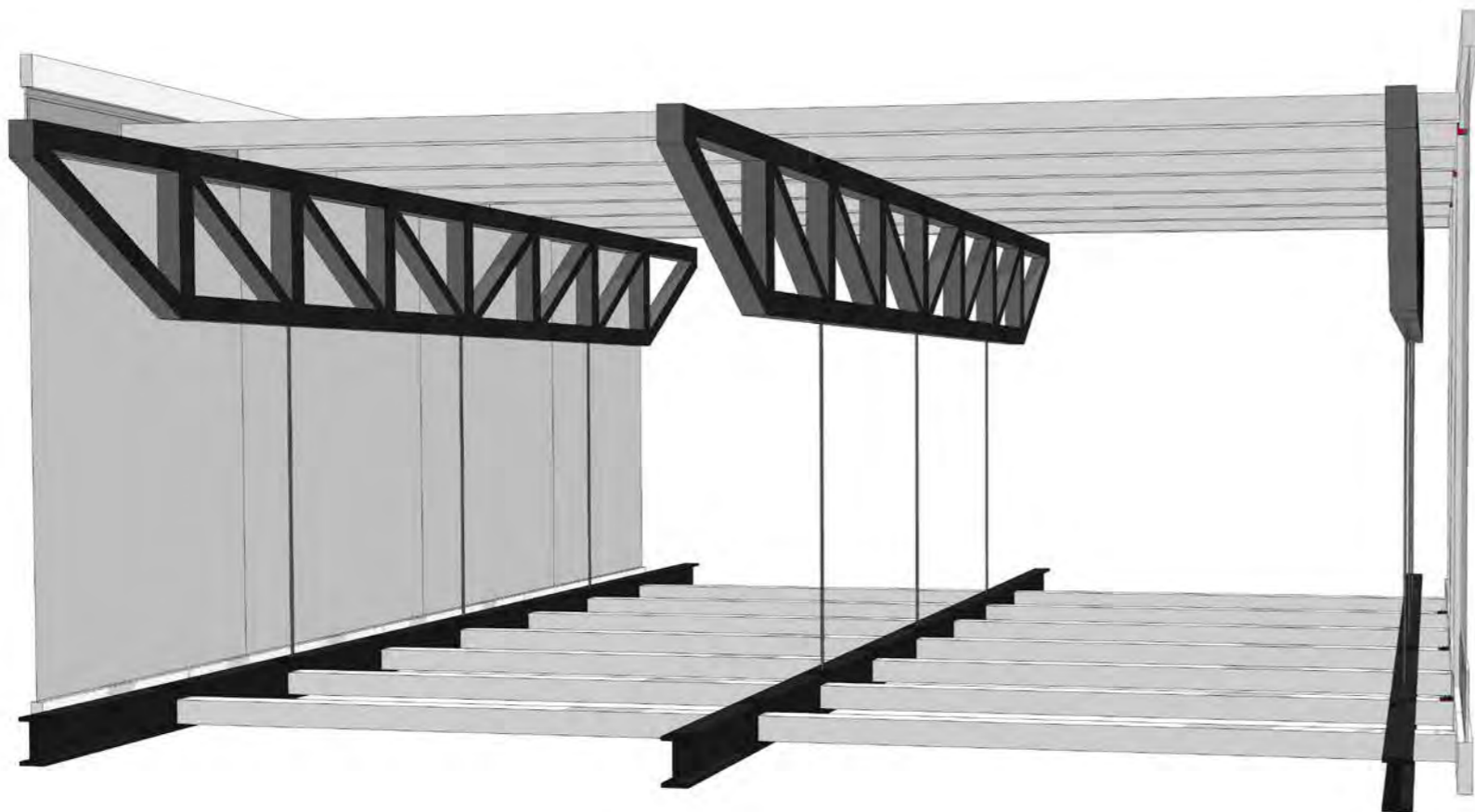
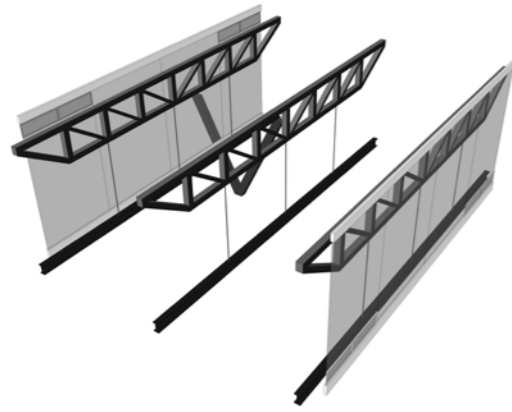
Shading for Main Structure

Construction



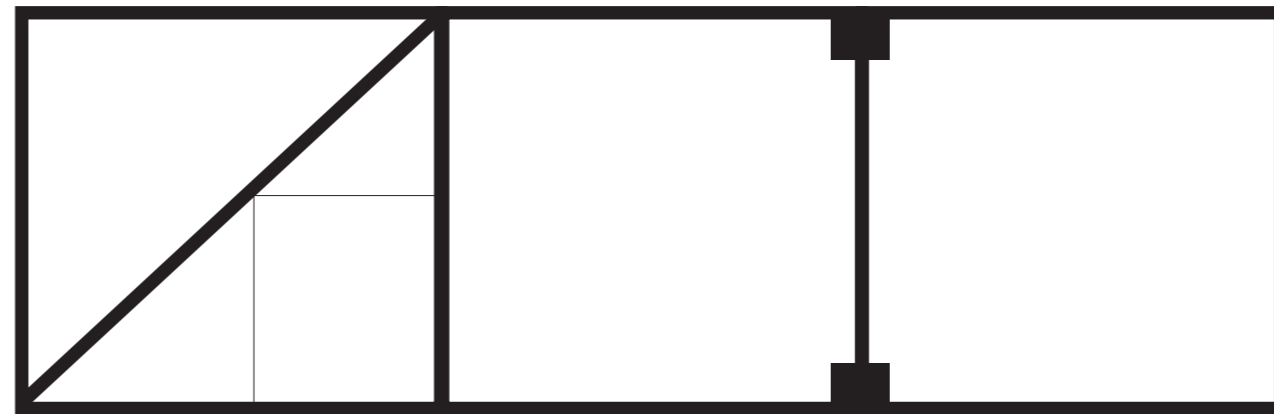
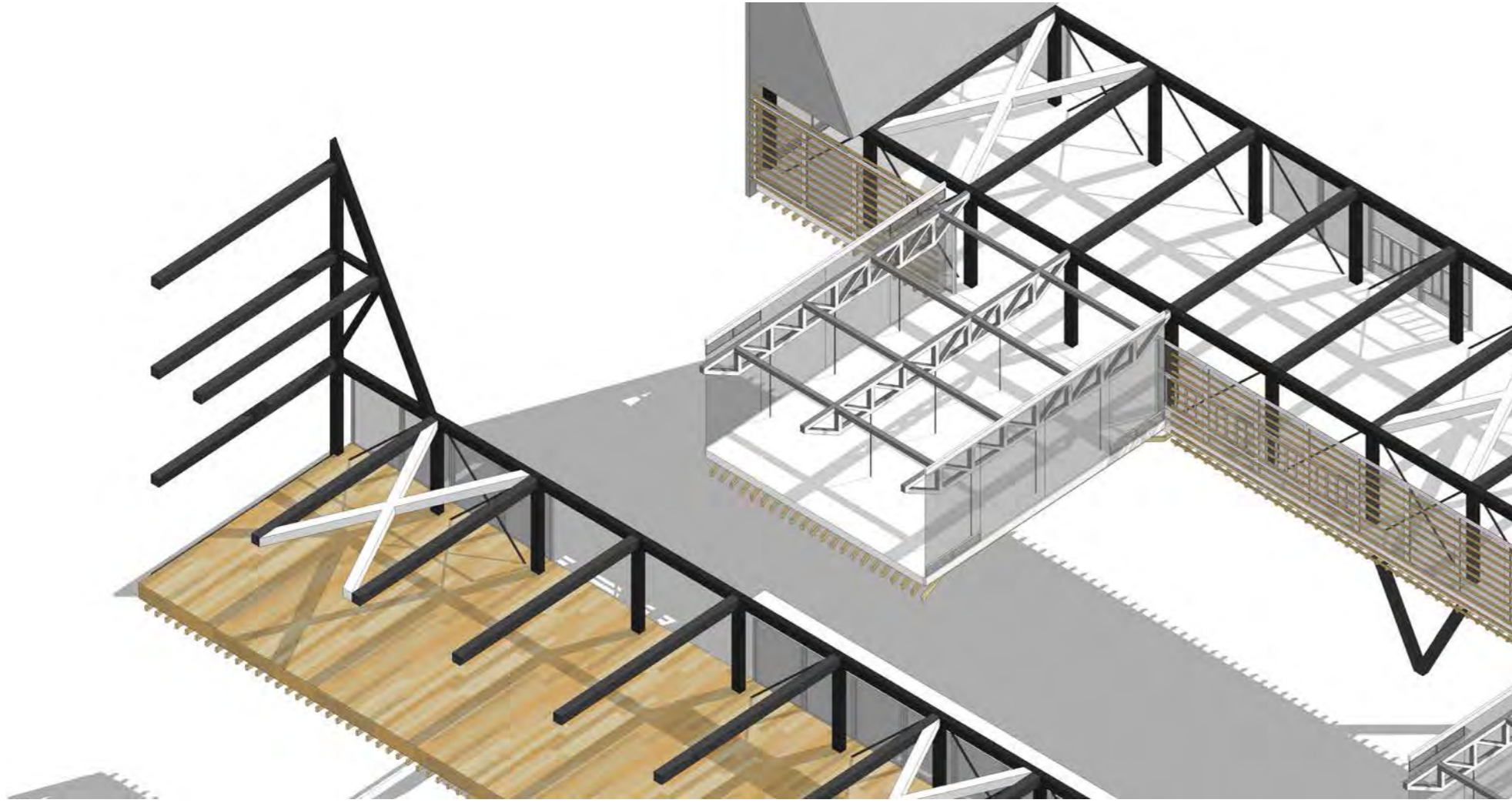


Joints of the beams

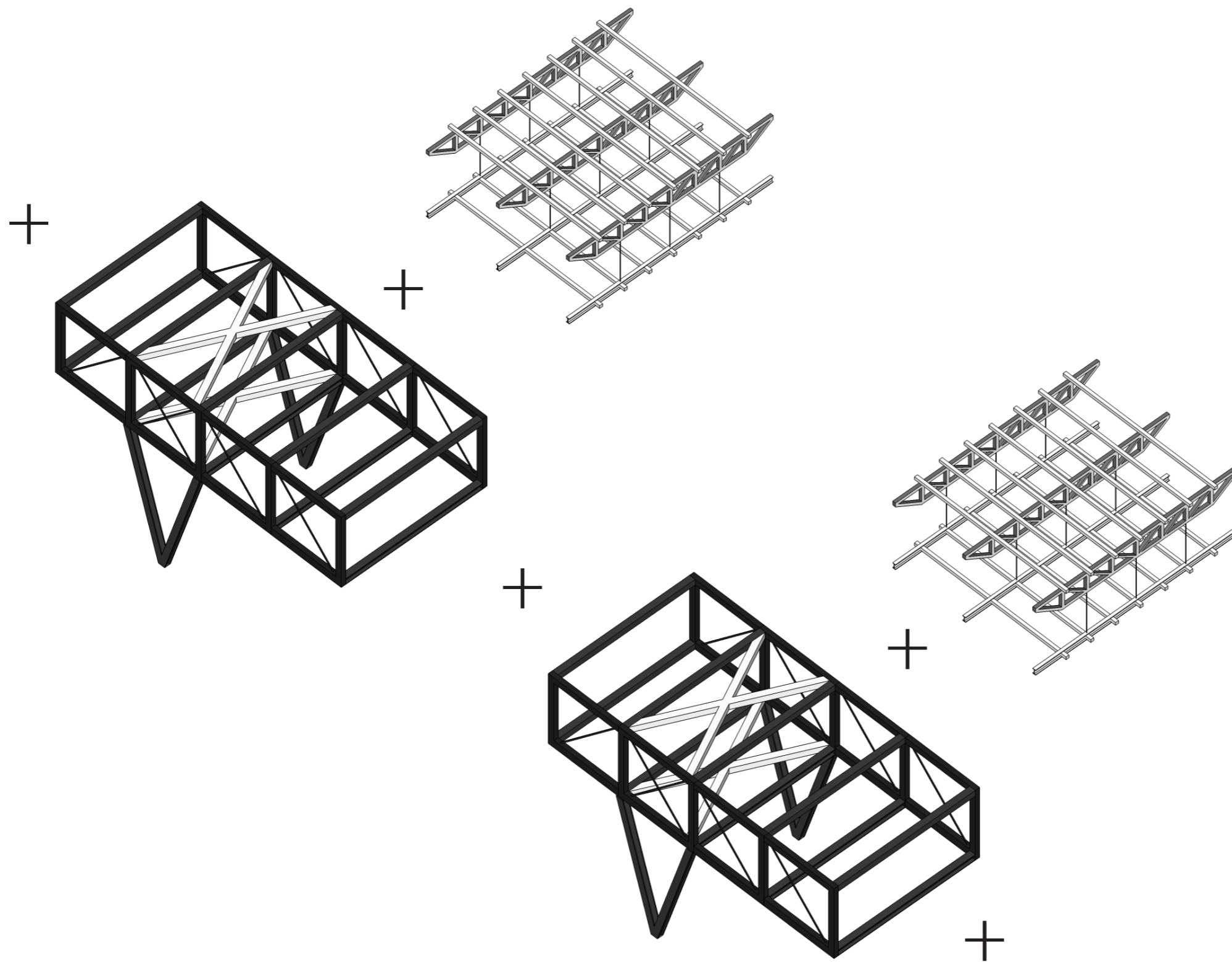


Joints of the facade

Adjust the Joints

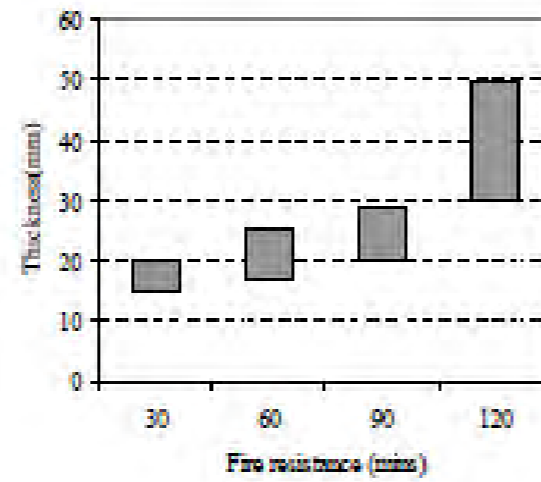


Combination





(a)



(b)

Figure 3.3 Board fire protection (a) Fixing of boards to steel column; (b) Fire resistance

Fire protection

Combine the Board fire protection and the intumescent coatings

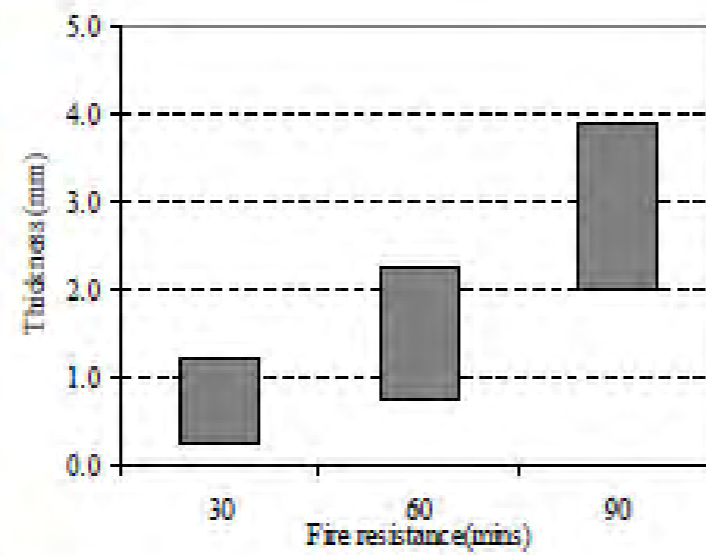
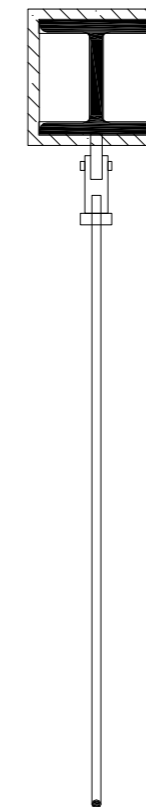
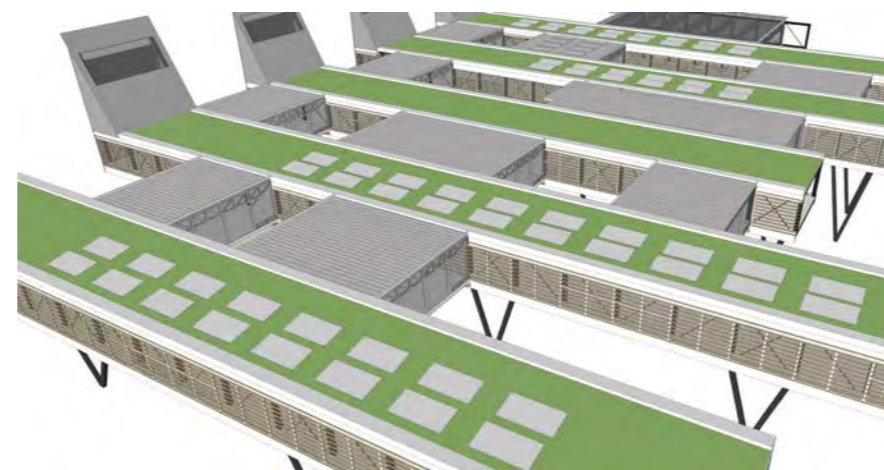
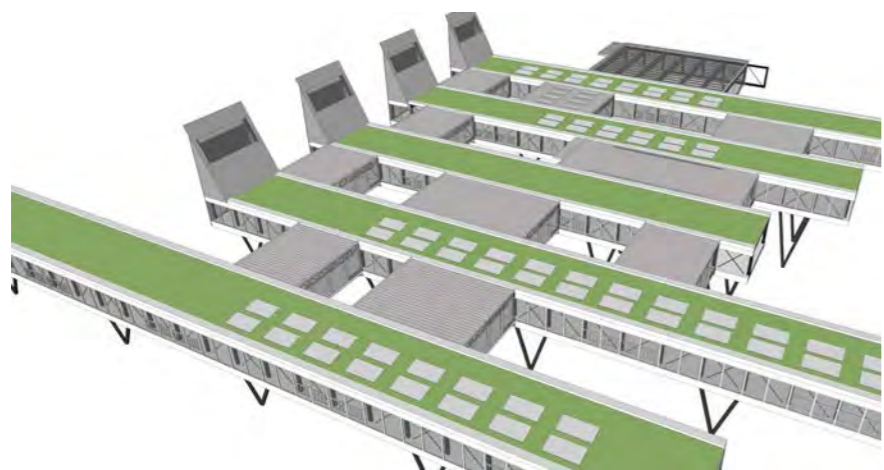
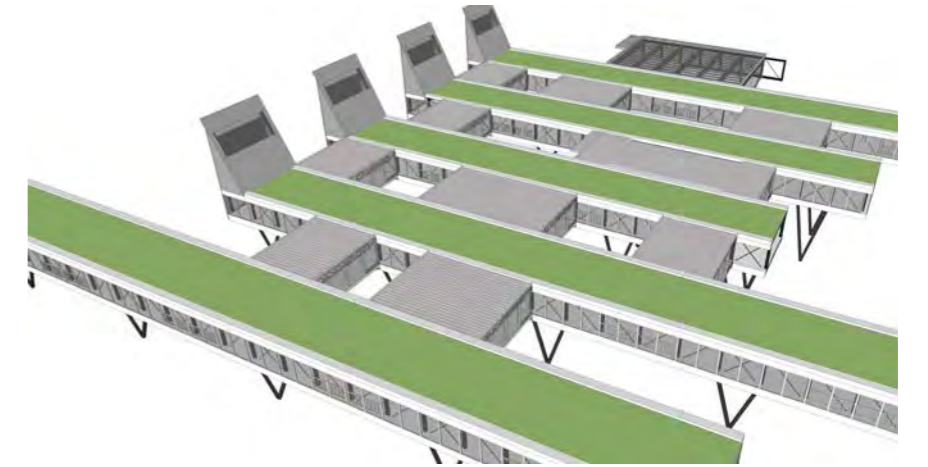
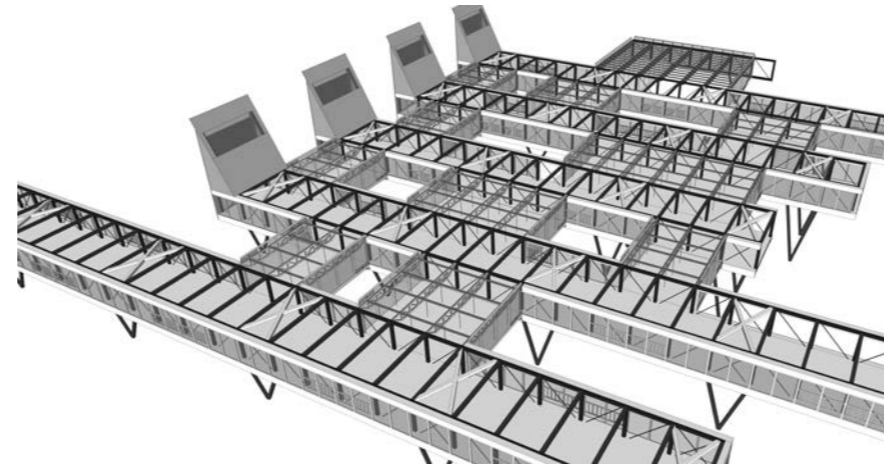
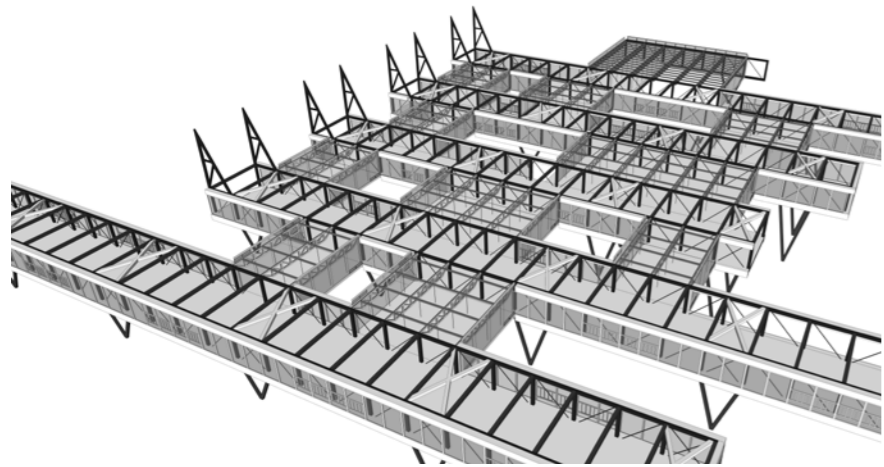
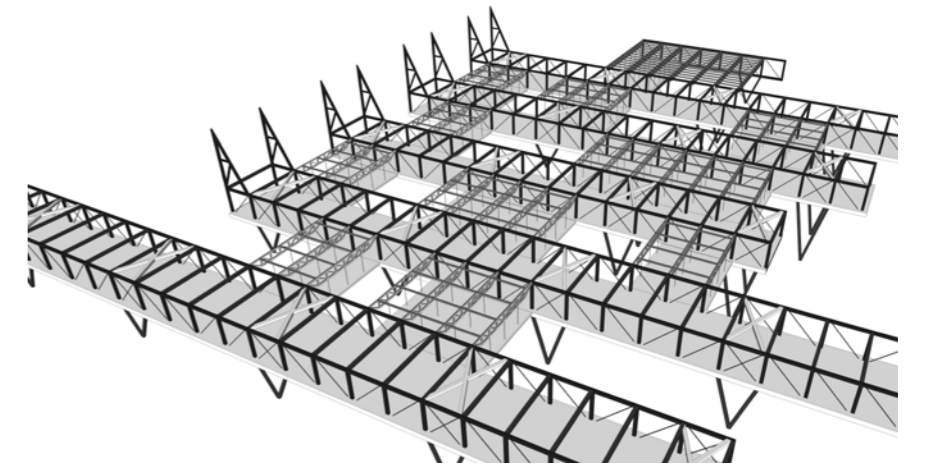
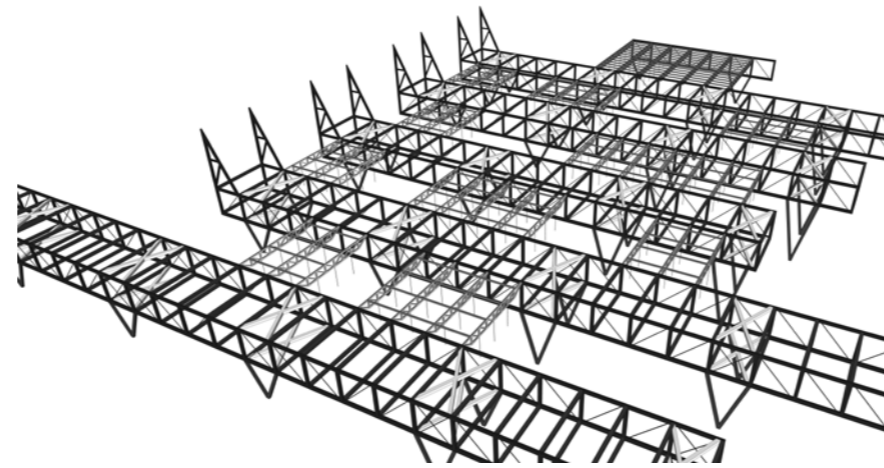
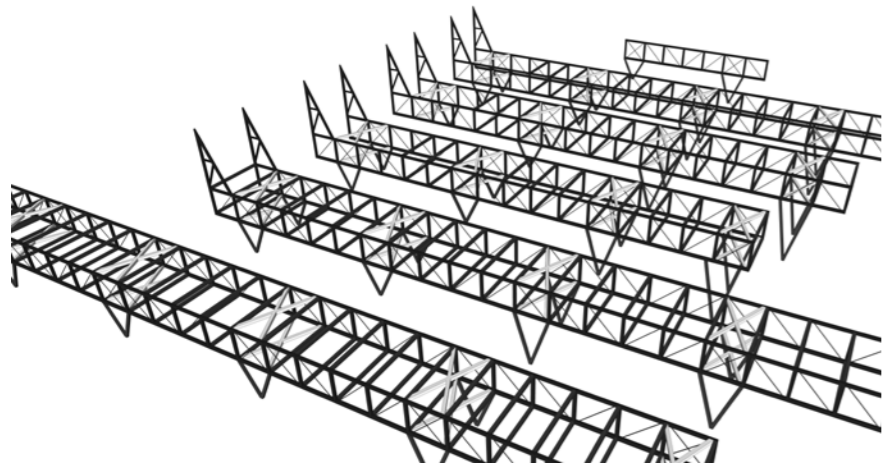
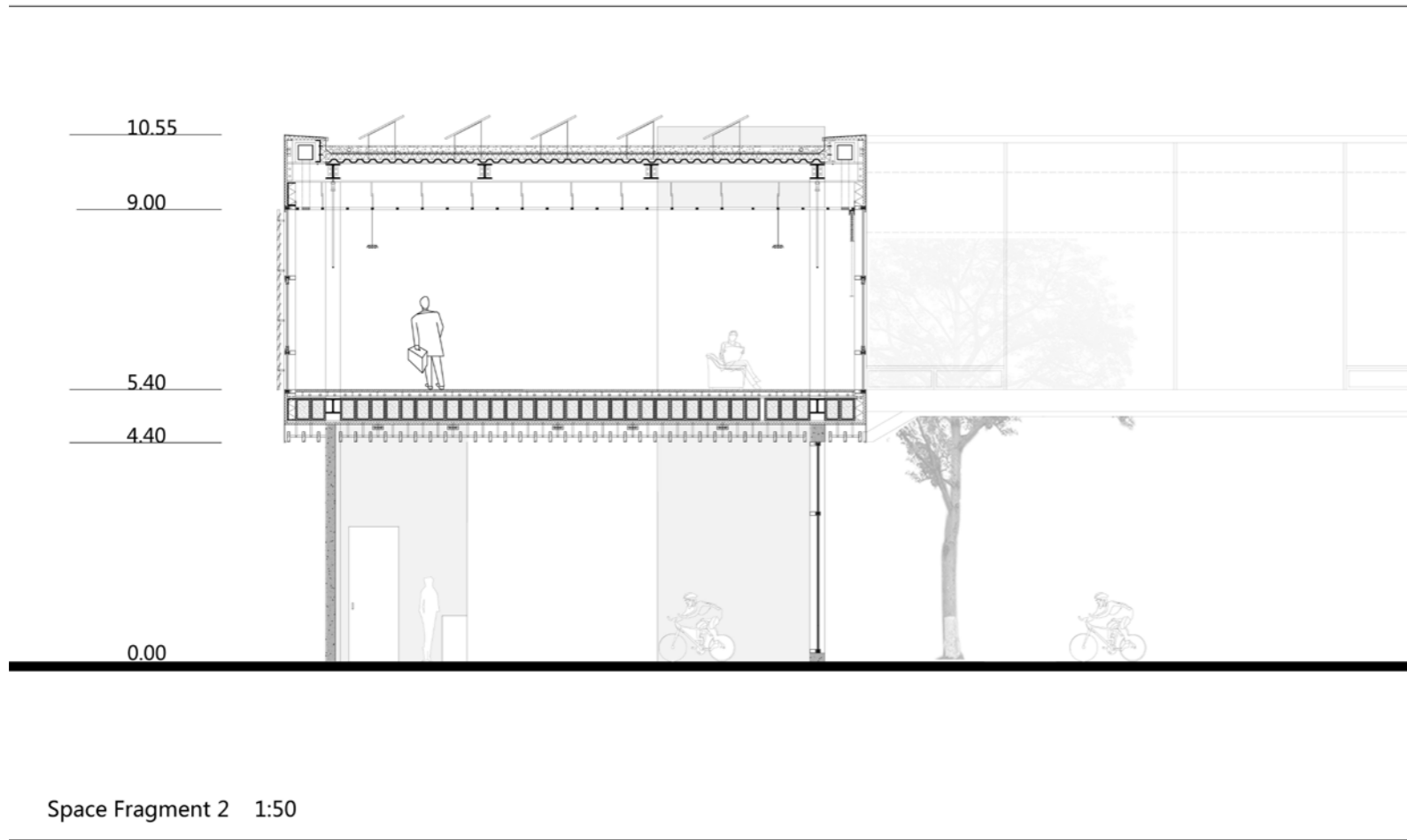


Figure 3.5 Intumescent coatings

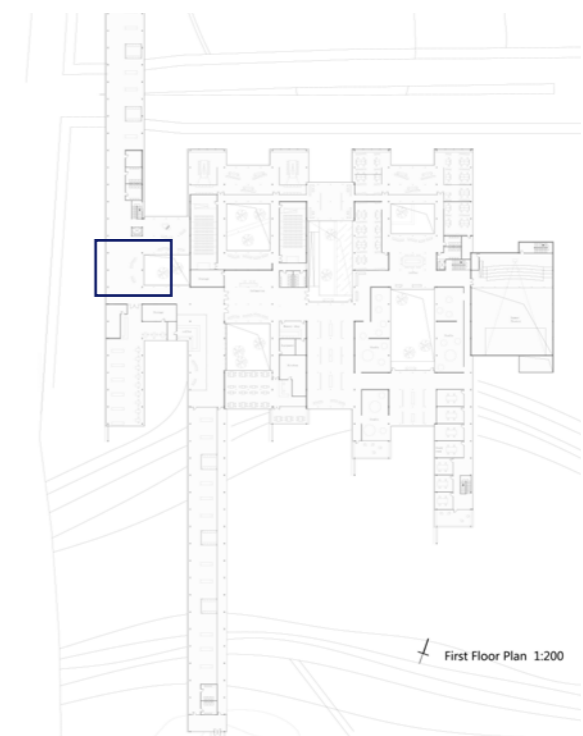
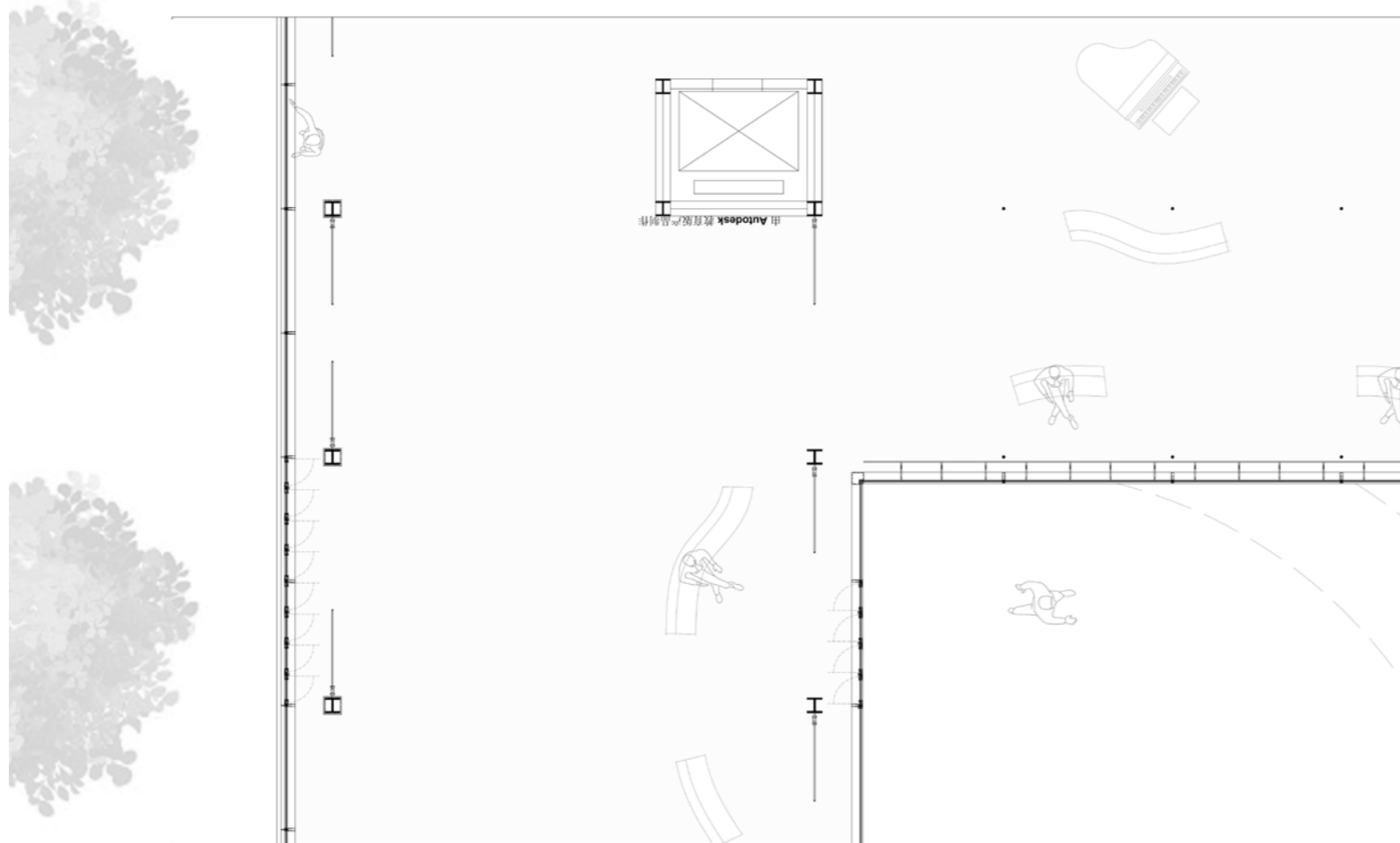




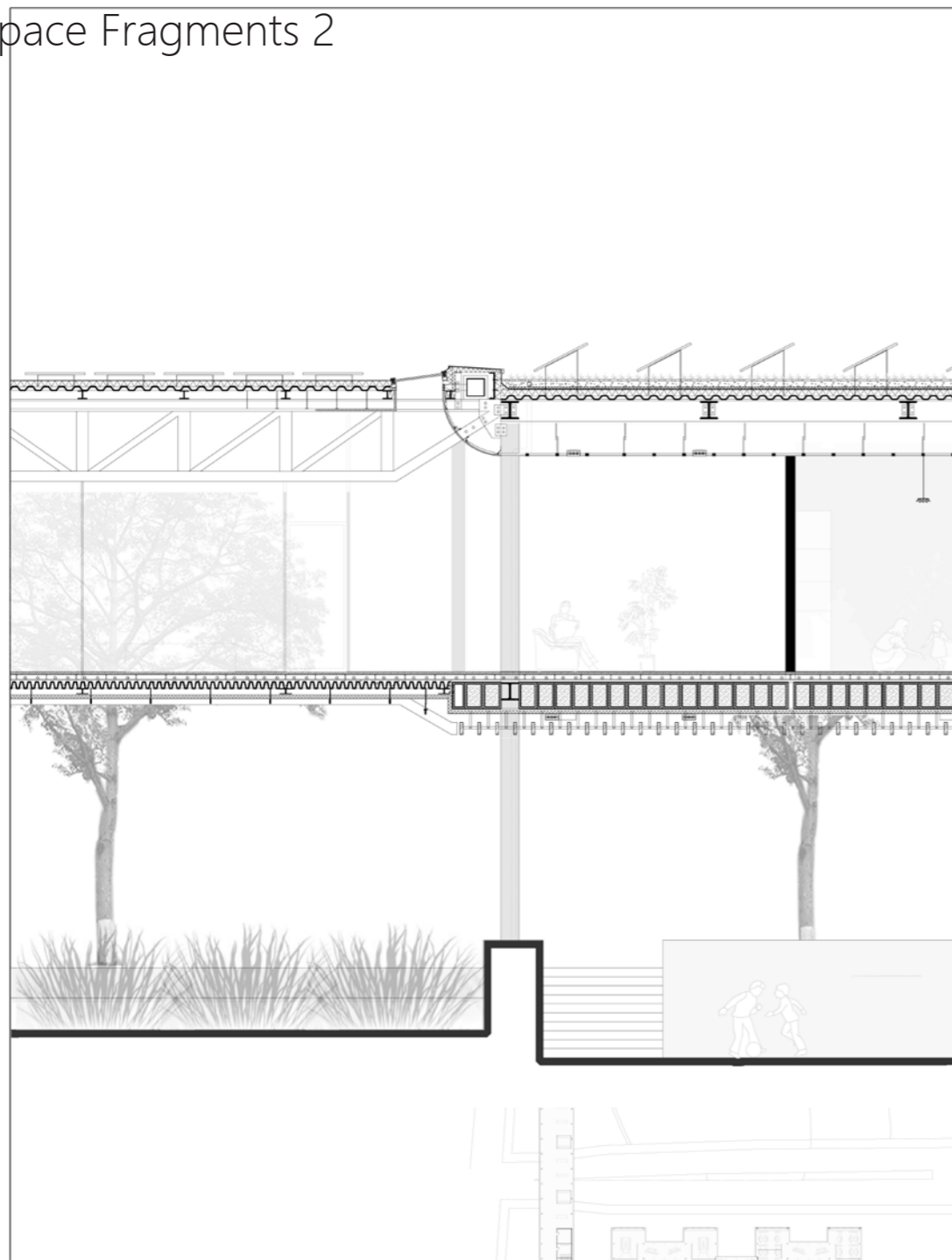
Building Process



Space Fragments 1



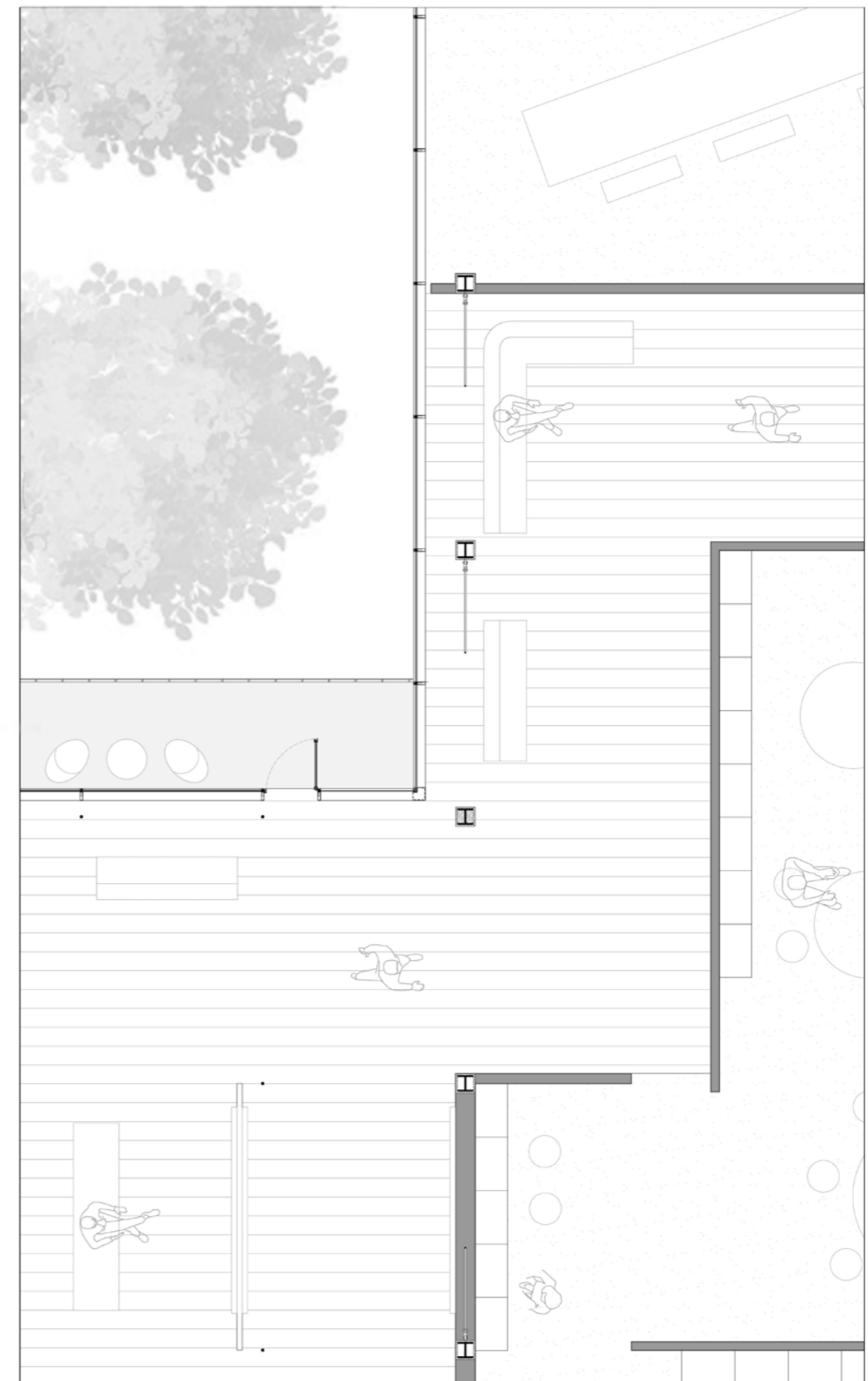
Space Fragments 2



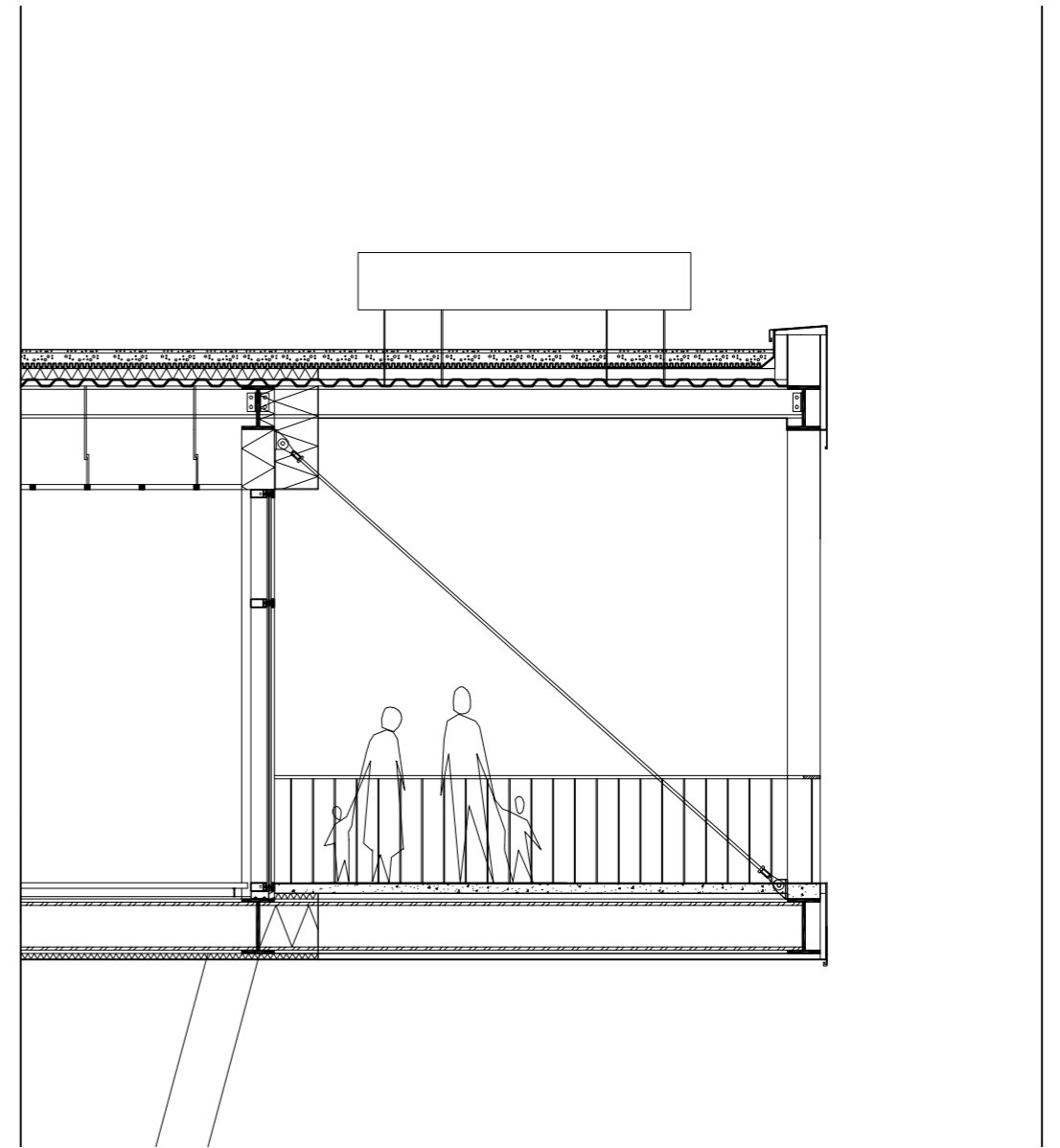
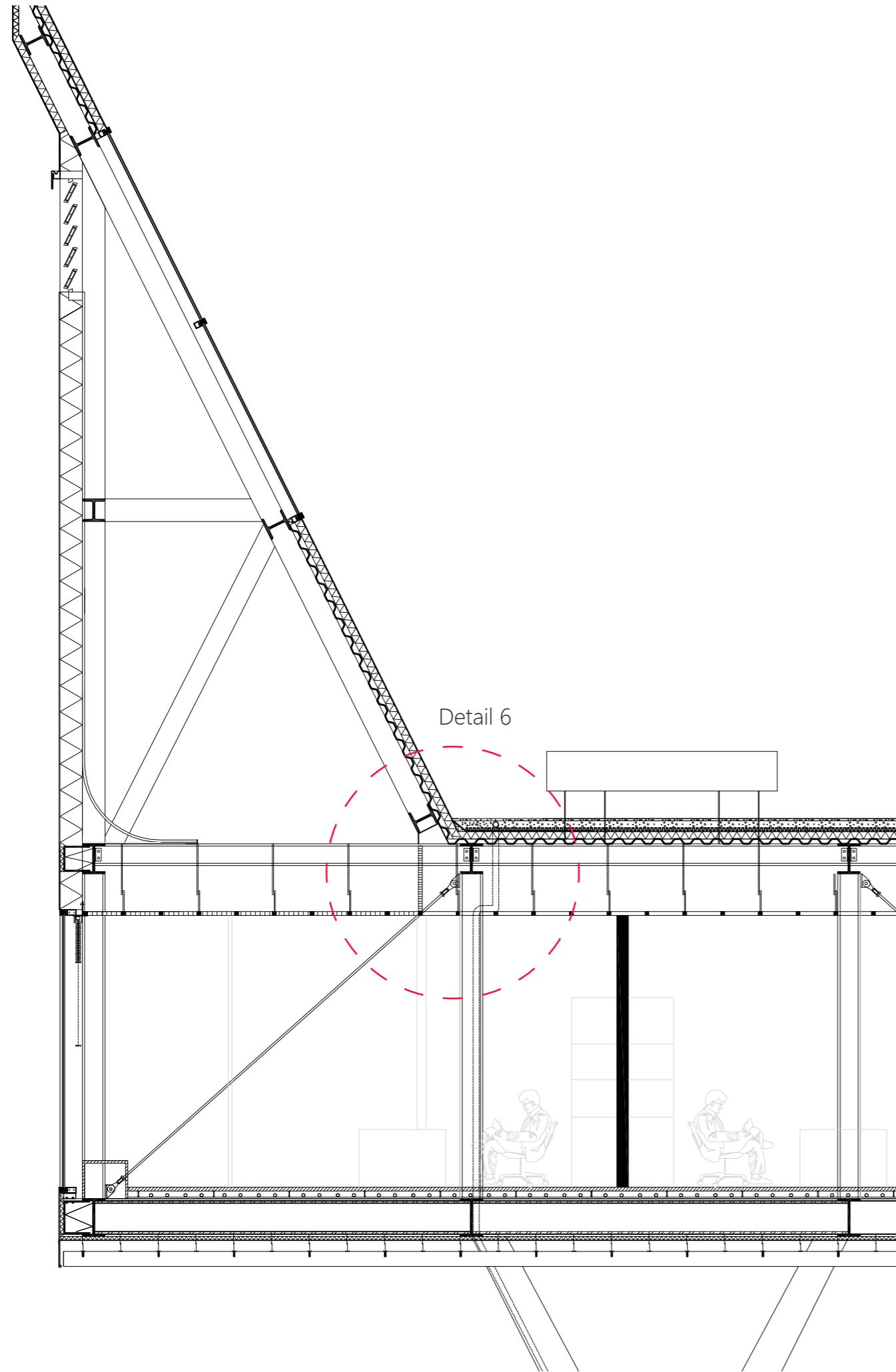
Space Fragment 1 1:50

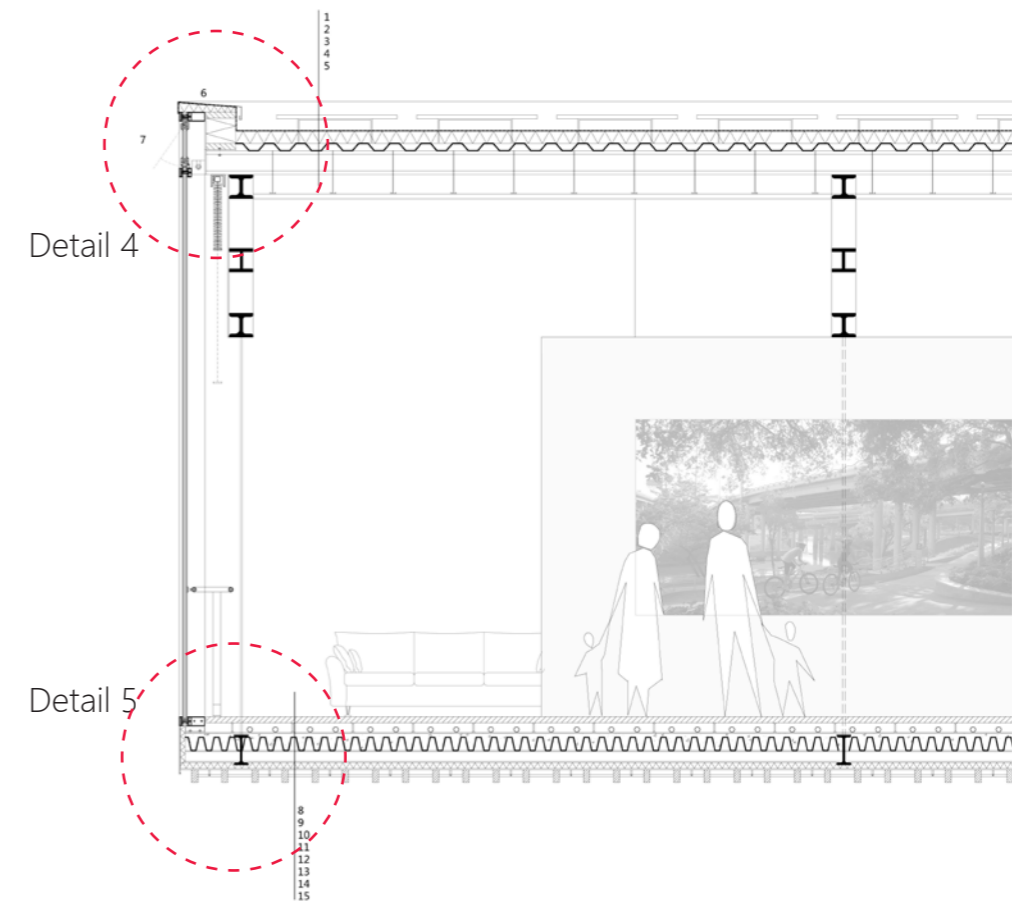
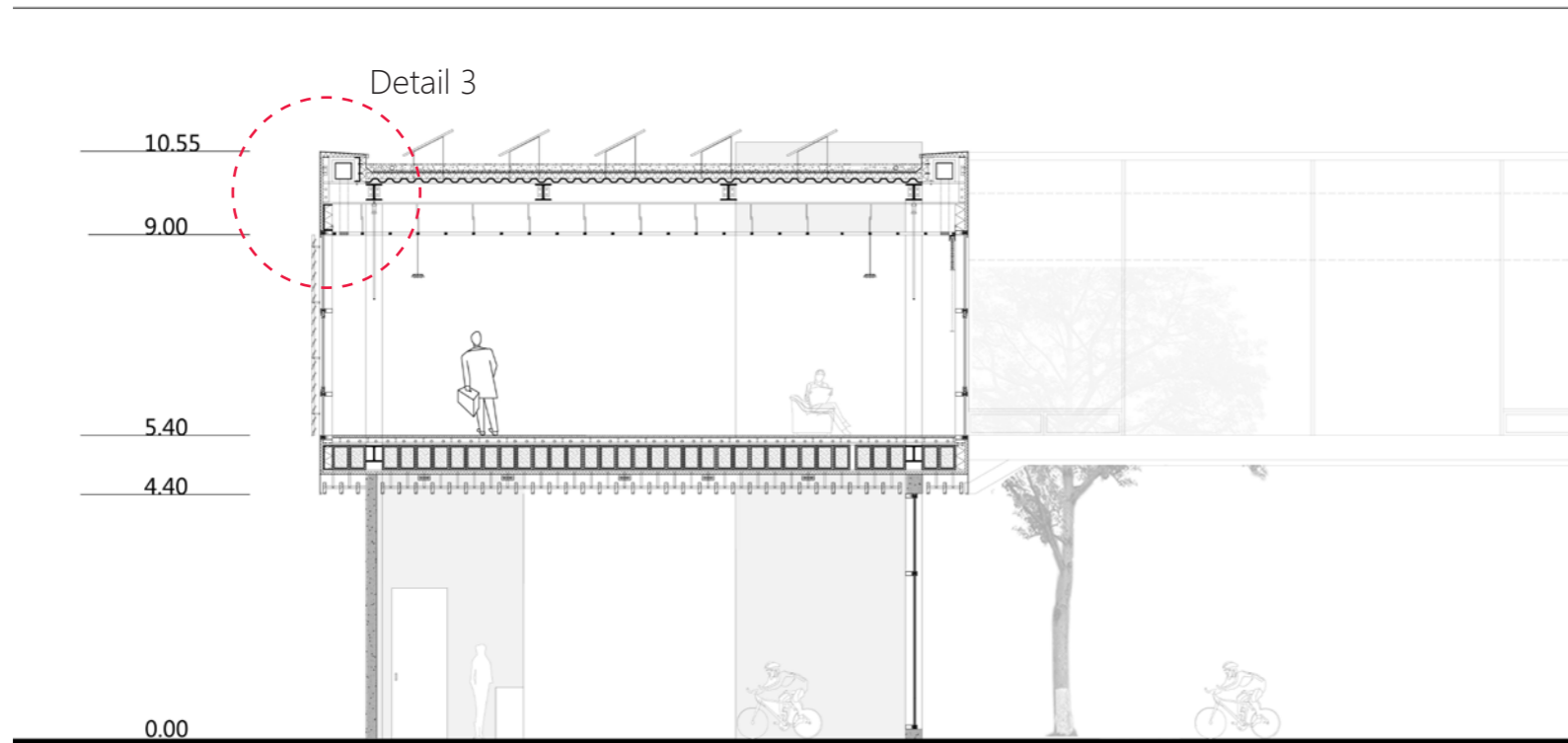


First Floor Plan 1:200



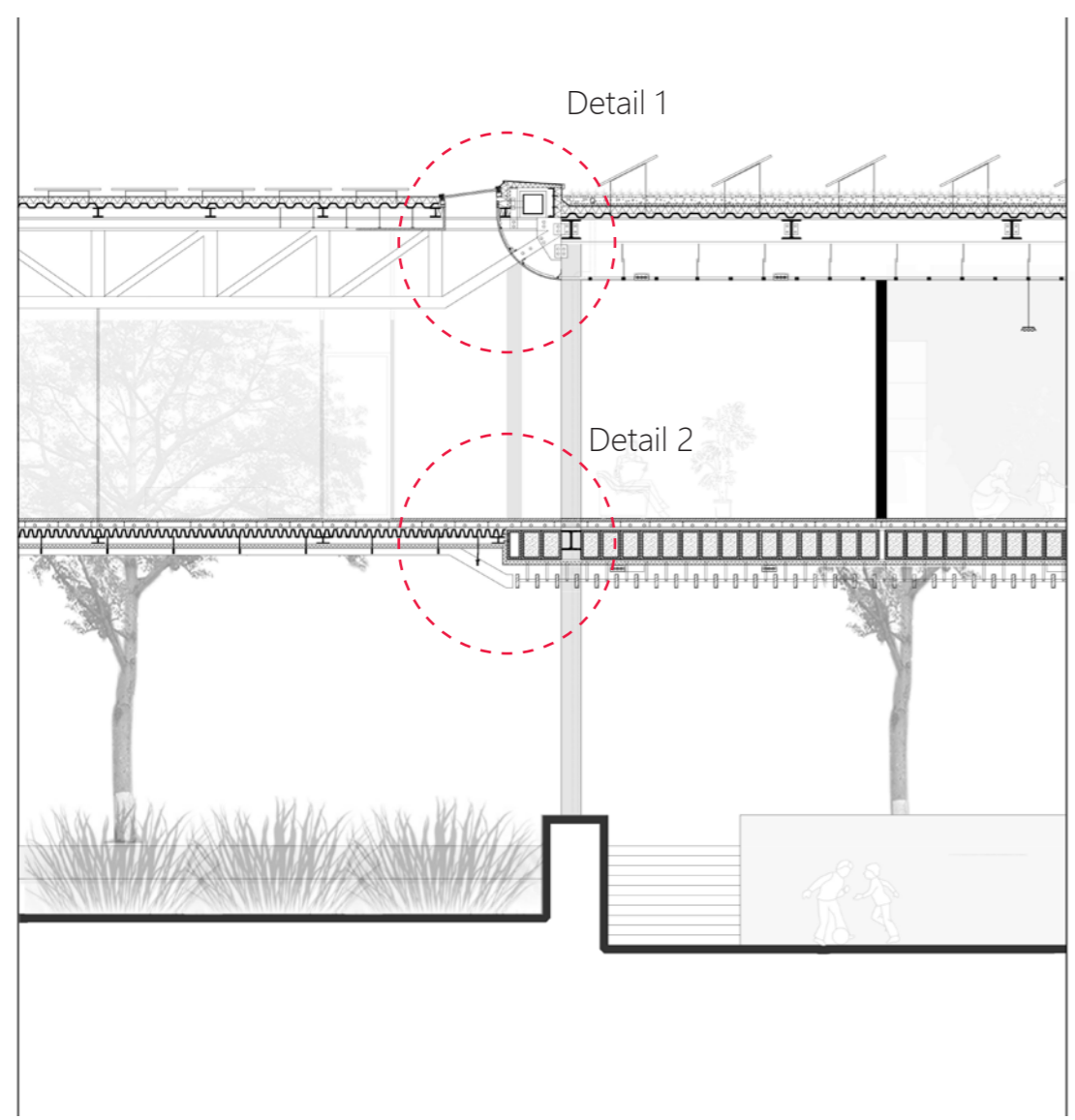
Tower and Balcony

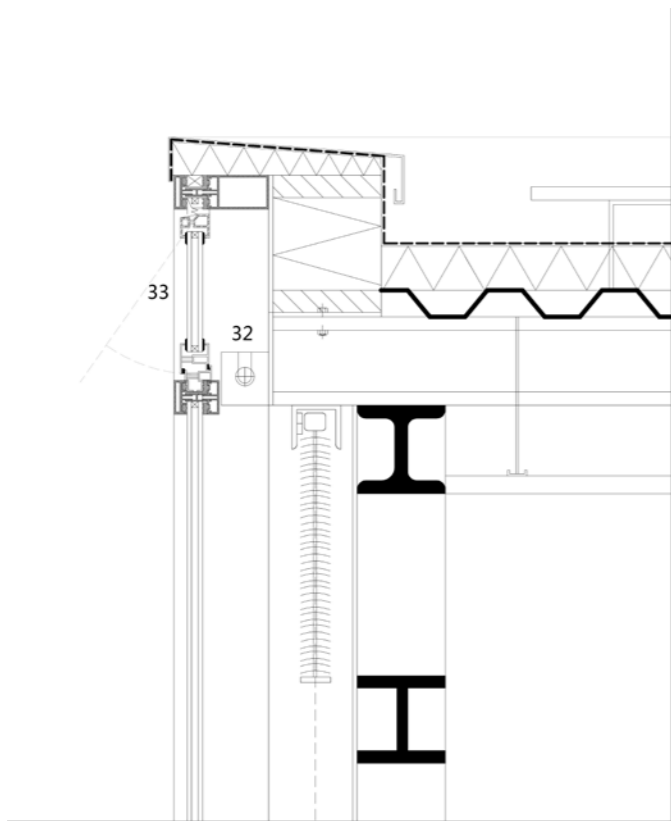




- 1 solar panel
- 2 water proof
- 3 insulation layer
- 4 stell floor
- 5 HE stell beam 20x 20mm
- 6 aluminum clading
- 7 open window
- 8 wood floor cover
- 9 heat-pump water tubes
- 10 insulation layer
- 11 steel deck
- 12 HE steel beam
- 13 insullation
- 14 water proof

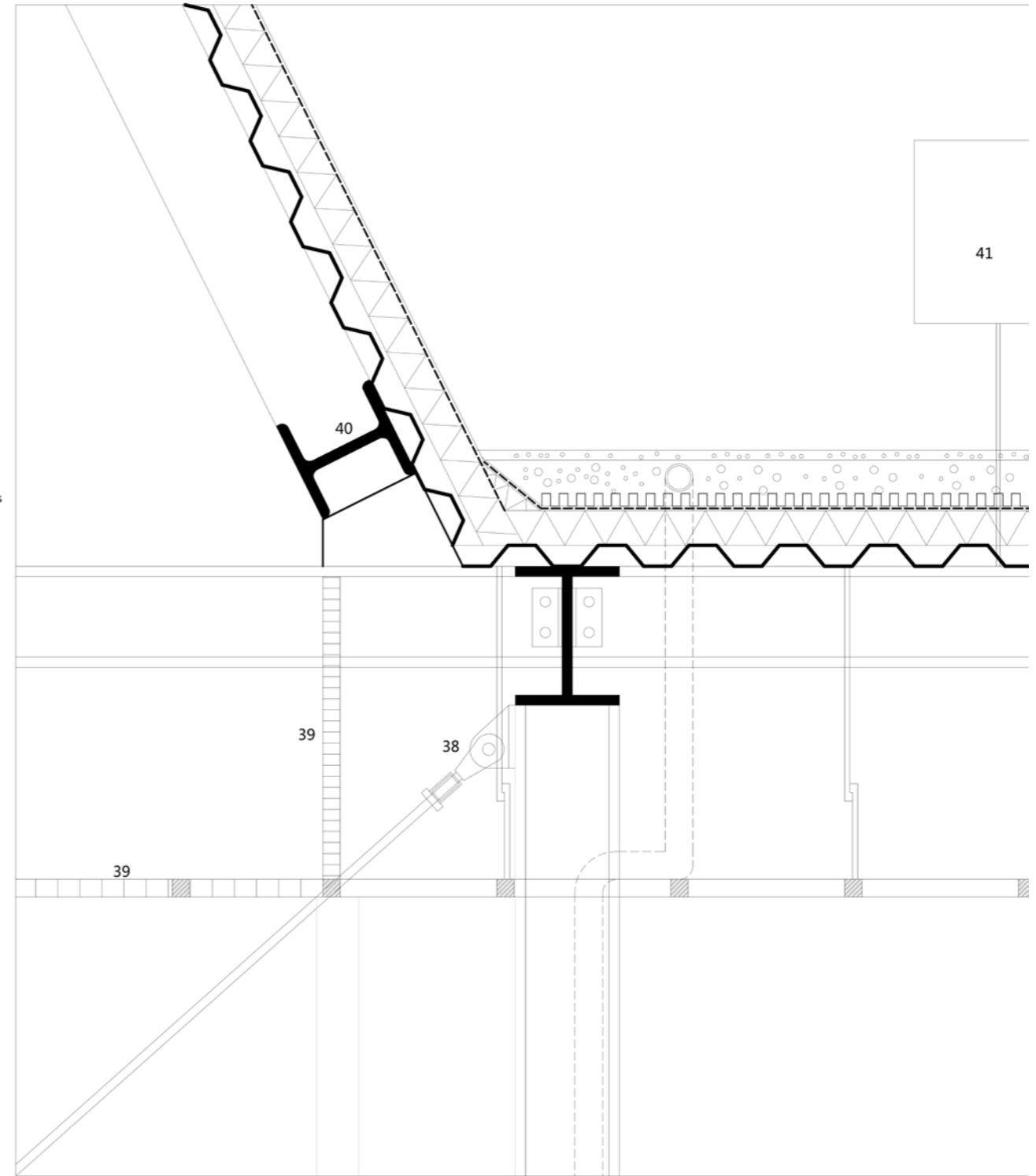
Details



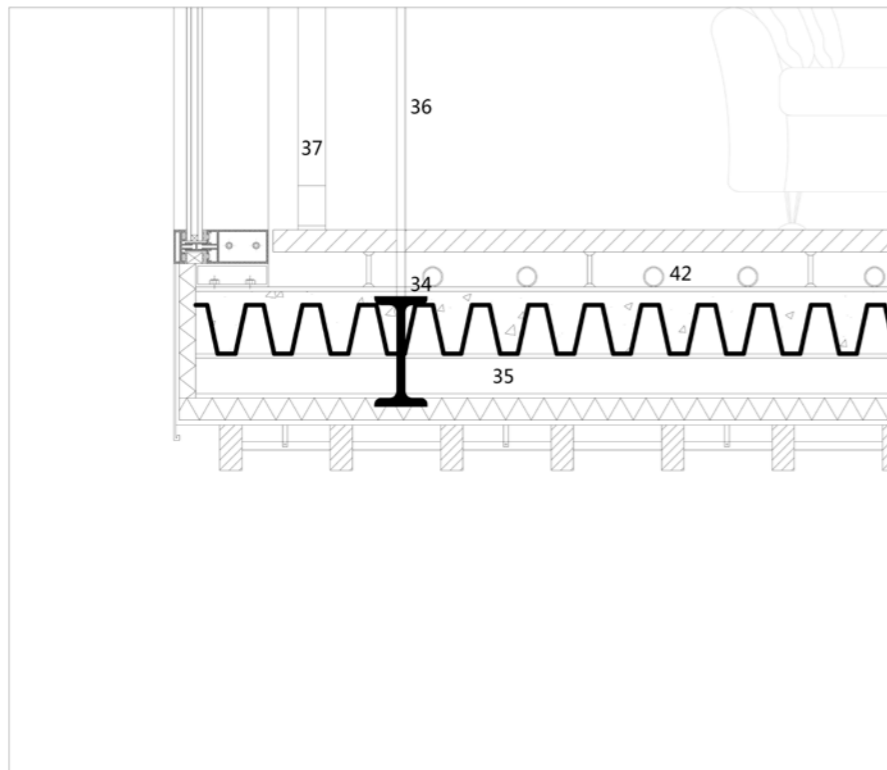


Detail 4 1:5

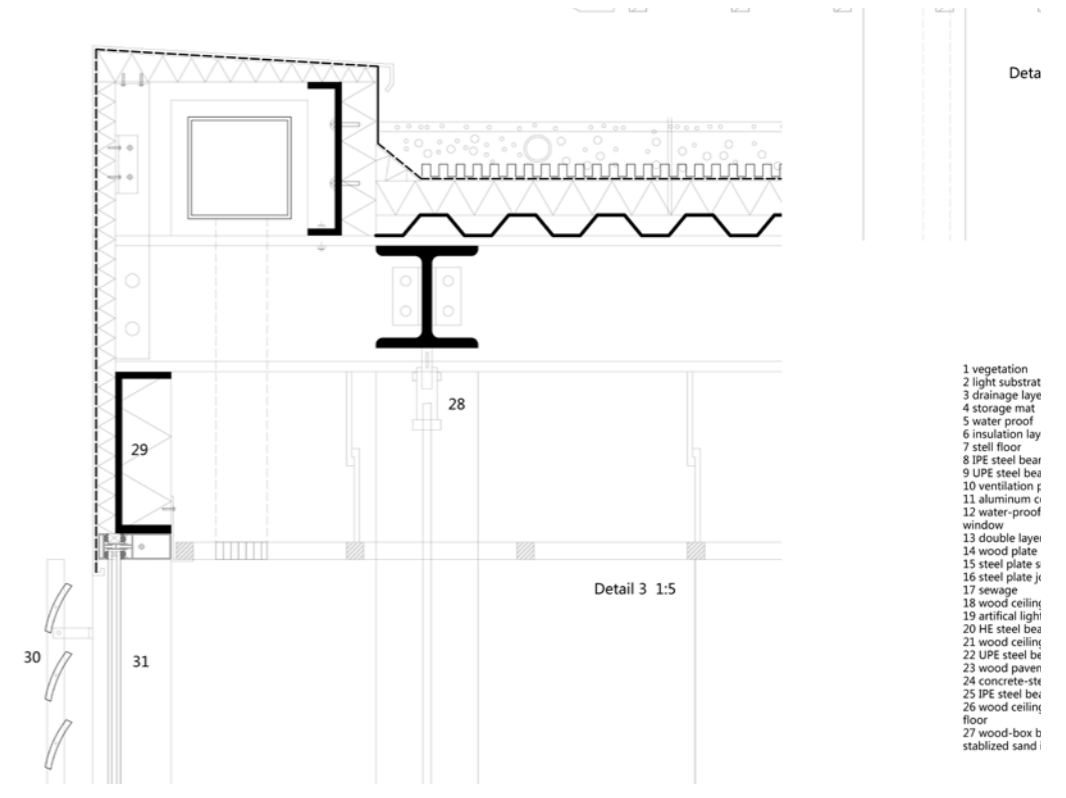
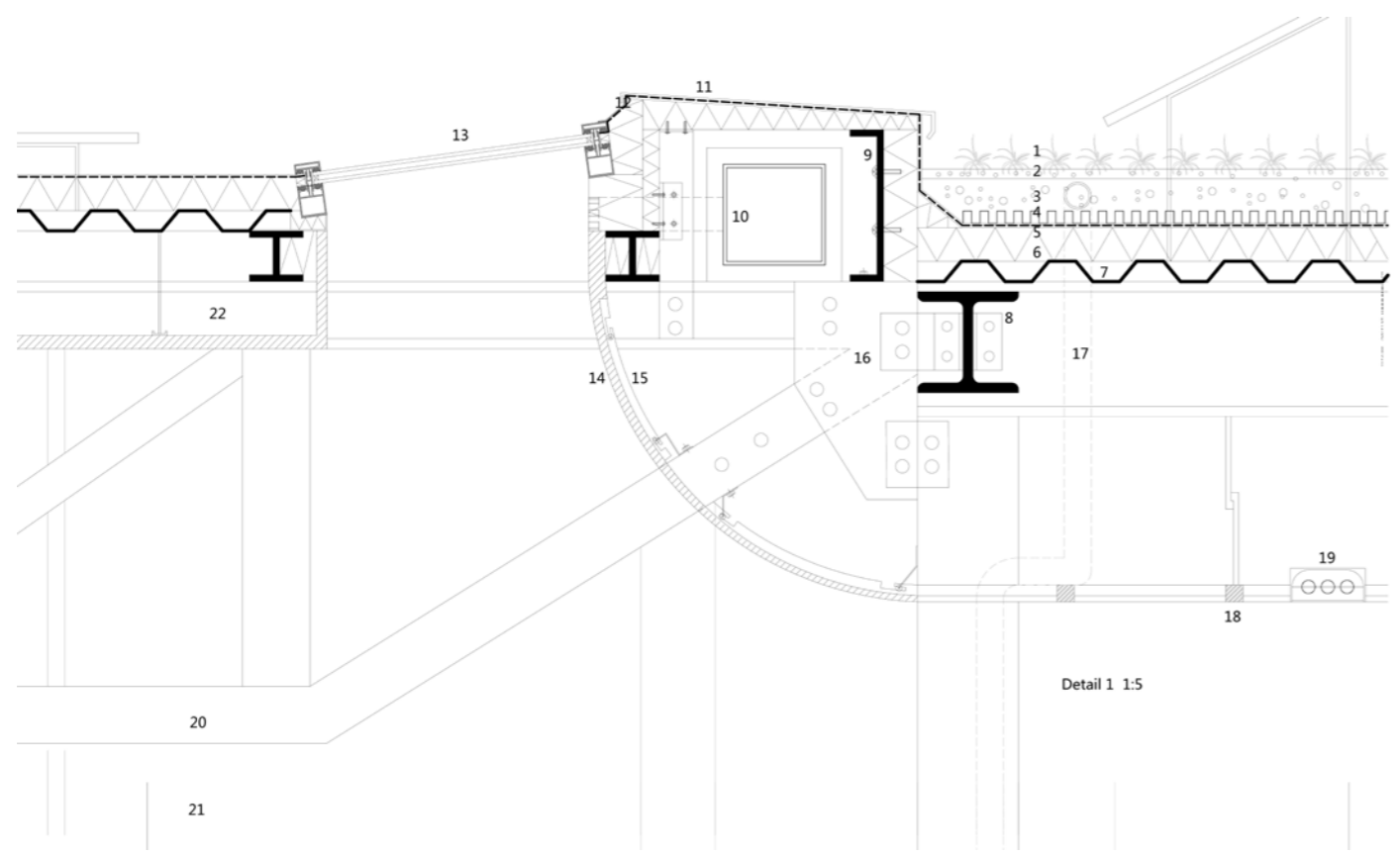
- 1 vegetation
- 2 light substrate
- 3 drainage layer
- 4 storage mat
- 5 water proof
- 6 insulation layer
- 7 stell floor
- 8 IPE steel beam 50x 30mm
- 9 UPE steel beam
- 10 ventilation pipe
- 11 aluminum cover
- 12 water-proof cover for sky-window
- 13 double layer glass
- 14 wood plate
- 15 steel plate supportings
- 16 steel plate joint
- 17 sewage
- 18 wood ceiling
- 19 artifical light
- 20 HE steel beam 20X20mm
- 21 wood ceiling
- 22 UPE steel beam
- 23 wood pavement
- 24 concrete-stell floor
- 25 IPE steel beam 100X150mm
- 26 wood ceiling for ground-floor
- 27 wood-box beam
- 28 steel cable joint
- 29 UPE steel beam
- 30 out wooden shadings
- 31 aluminum window frame
- 32 steel plate
- 33 open window
- 34 IPE steel beam
- 36 concrete-heart steel columns
- 37 steel plate o
- 38 steel cable joints
- 39 louvers
- 41 solar panels
- 42 heat pump water tubes



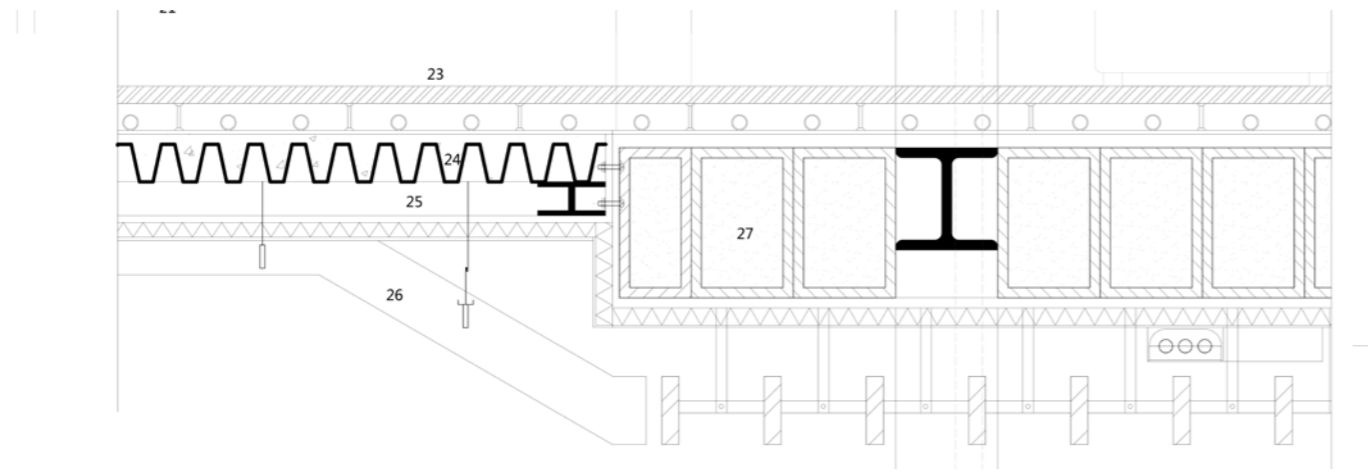
Detail 6 1:5



Detail 5 1:5



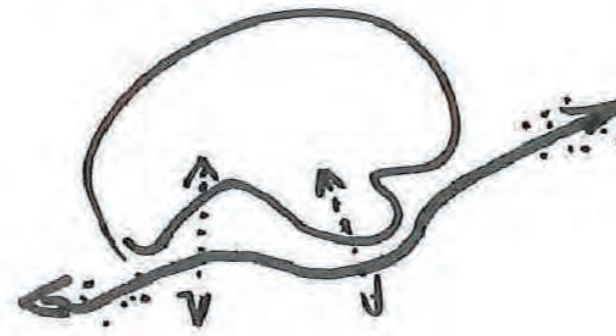
- Deta
- 1 vegetation
 - 2 light substrat
 - 3 drainage laye
 - 4 storage mat
 - 5 water proof
 - 6 insulation lay
 - 7 steel floor
 - 8 IPE steel bear
 - 9 UPE steel bea
 - 10 ventilation p
 - 11 aluminum c
 - 12 water-proof window
 - 13 double layer
 - 14 wood plate
 - 15 steel plate s
 - 16 steel plate j
 - 17 sewage
 - 18 wood ceiling
 - 19 artificial light
 - 20 HE steel bea
 - 21 wood ceiling
 - 22 UPE steel be
 - 23 wood paver
 - 24 concrete-slab
 - 25 IPE steel be
 - 26 wood ceiling
 - 27 floor
 - 28 wood-box b
 - 29 stabilized sand



Detail 2

Part 4 Reflection

Research Question



Answer

Concept



Strategy

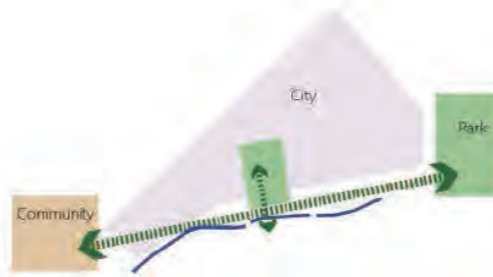


Project



Create sustainable safe waterfront and new building to show people the value of green bayou.

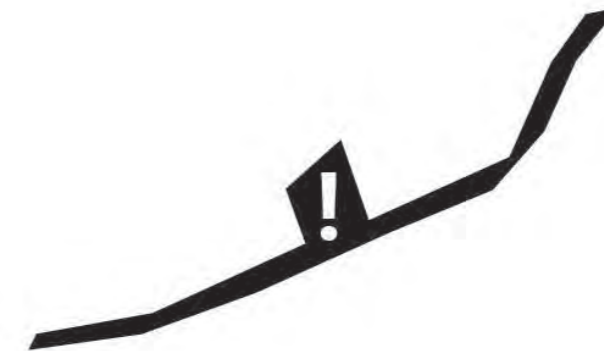
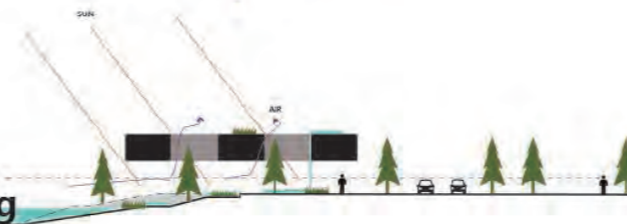
Urban



Plot



Building



Bayou Renovation

+

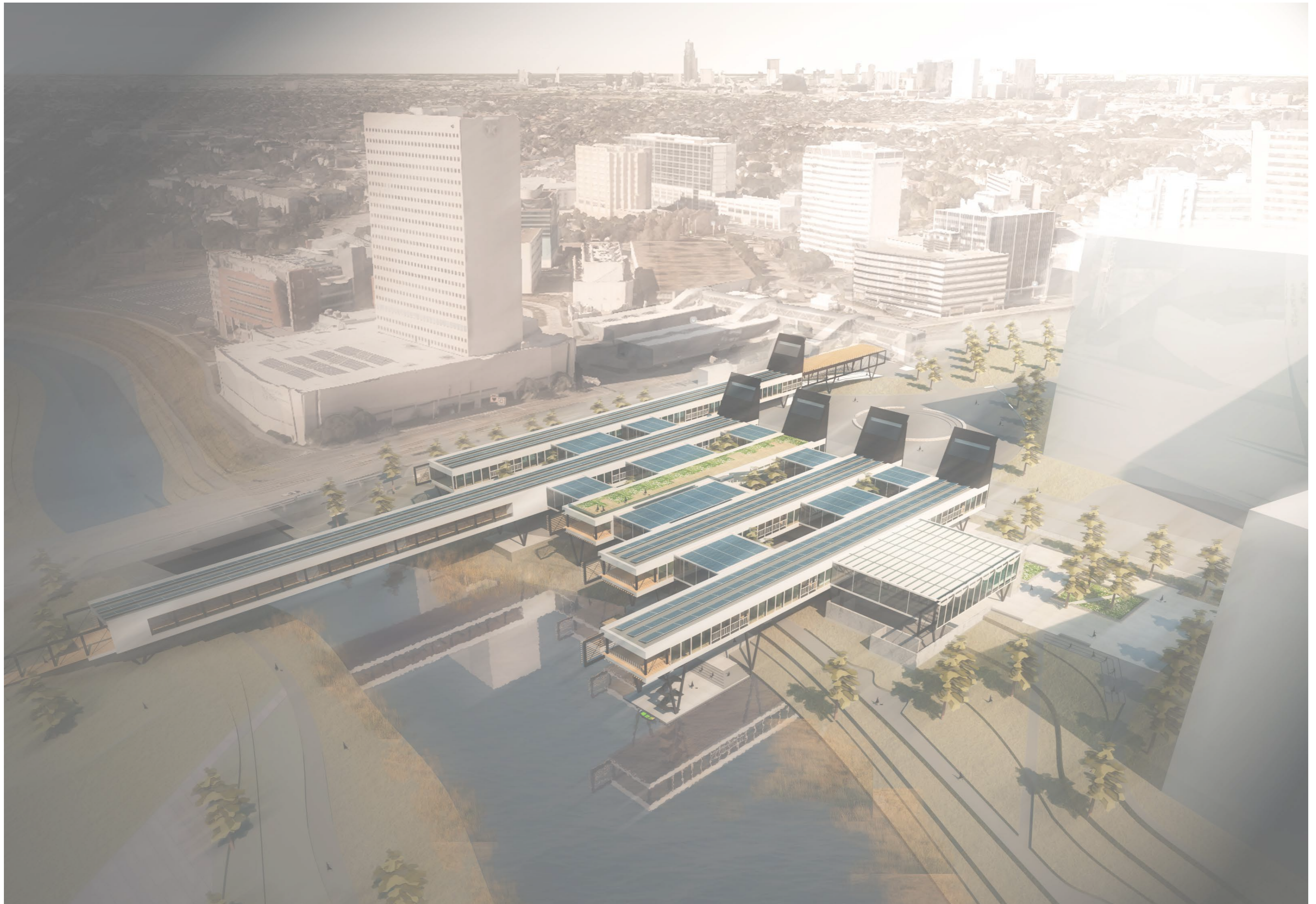
Education Center

Part 4 Reflection

The project tries to answer the question that public water-related building can contribute to the circulation between the inner city and the waterfront as well as promoting flood risk management. The project also shows the concept that ecological aspect is significant for the water-related design. It is a good continue of the group research of the Delta Intervention subject.

As an architecture students, I mainly focus on the building, including the structure, material, interior, climate strategy. In order to answer the research question, and to make a continue logic for this whole design part. The urban planning and landscape for a larger area is also been developed. But the urban design will not go into a lot of detail or too large. It will mainly help to define the architecture project and to show the whole concept of the research.

At last, when I look back, the Delta Intervention Studio really give a nice and wide topic to me. The research method helps me to get my interest and develop it into a project. The lecture courses improve my skills and knowledge to deal with the water-related topics. The final project is a good practical exercise for me to learn it.



A photograph showing a perspective view through a series of wooden beams and railings, creating a sense of depth. The structure appears to be a walkway or a staircase. In the background, a red rectangular object is visible. The lighting is warm and soft.

Thank you for listening.