

TU Delft

Delta Intervention Studio

P5-Presentation

Yi Chien Liao 4326202

Design Mentor: Esther Gramsbergen

Building technology mentor: Koen Mulder

External Examiner: Gerard van Bortel

Water Resilient Living in Houston

The Porch of Kashmere Gardens neighborhood



Houston,
The 4th Biggest
City in U.S.

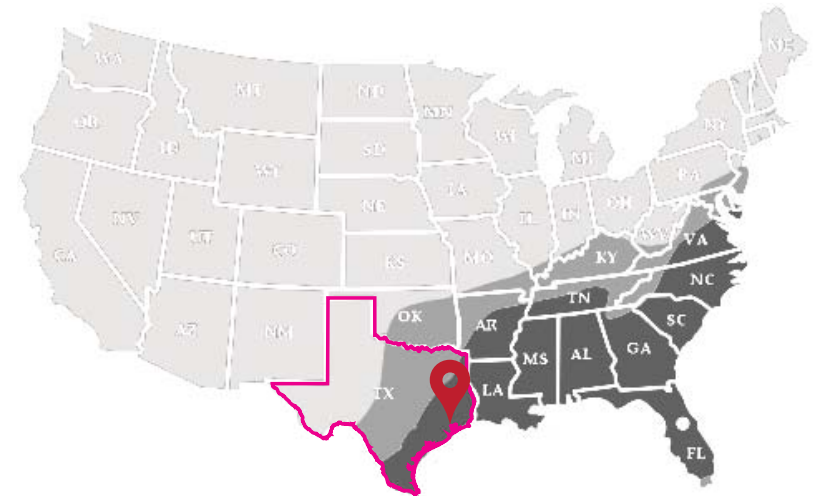


Houston
May 2015



Used to be called **Bayou City**

Houston
1891

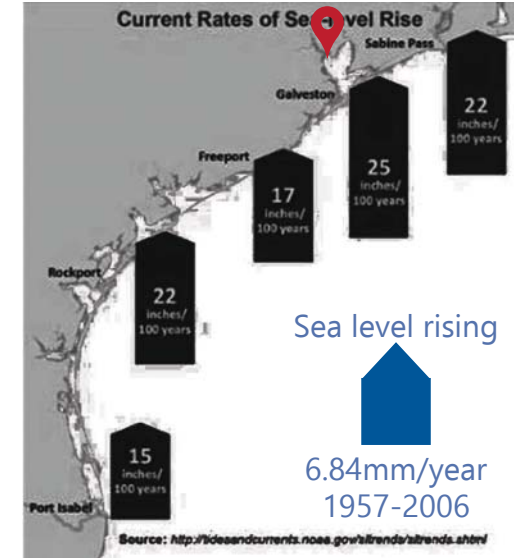


Source: <http://www.guide-to-disney.com>
 Author edited

Humid subtropical zone
 Transitional Humid subtropical zone

 Project site

Located at subtropical climate zone



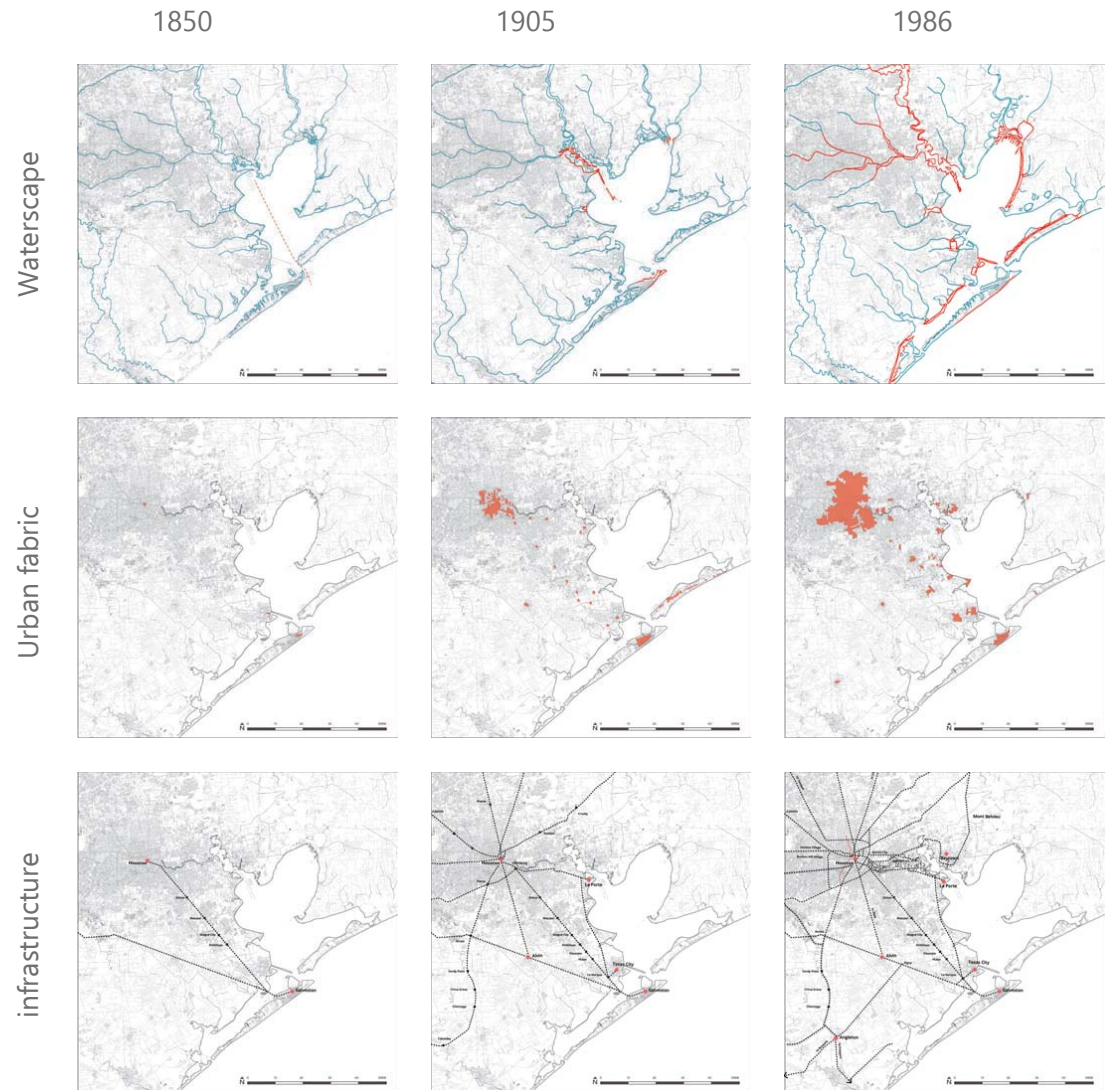
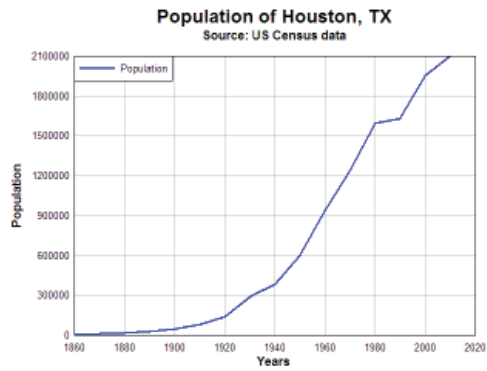
Trend of sea level rising

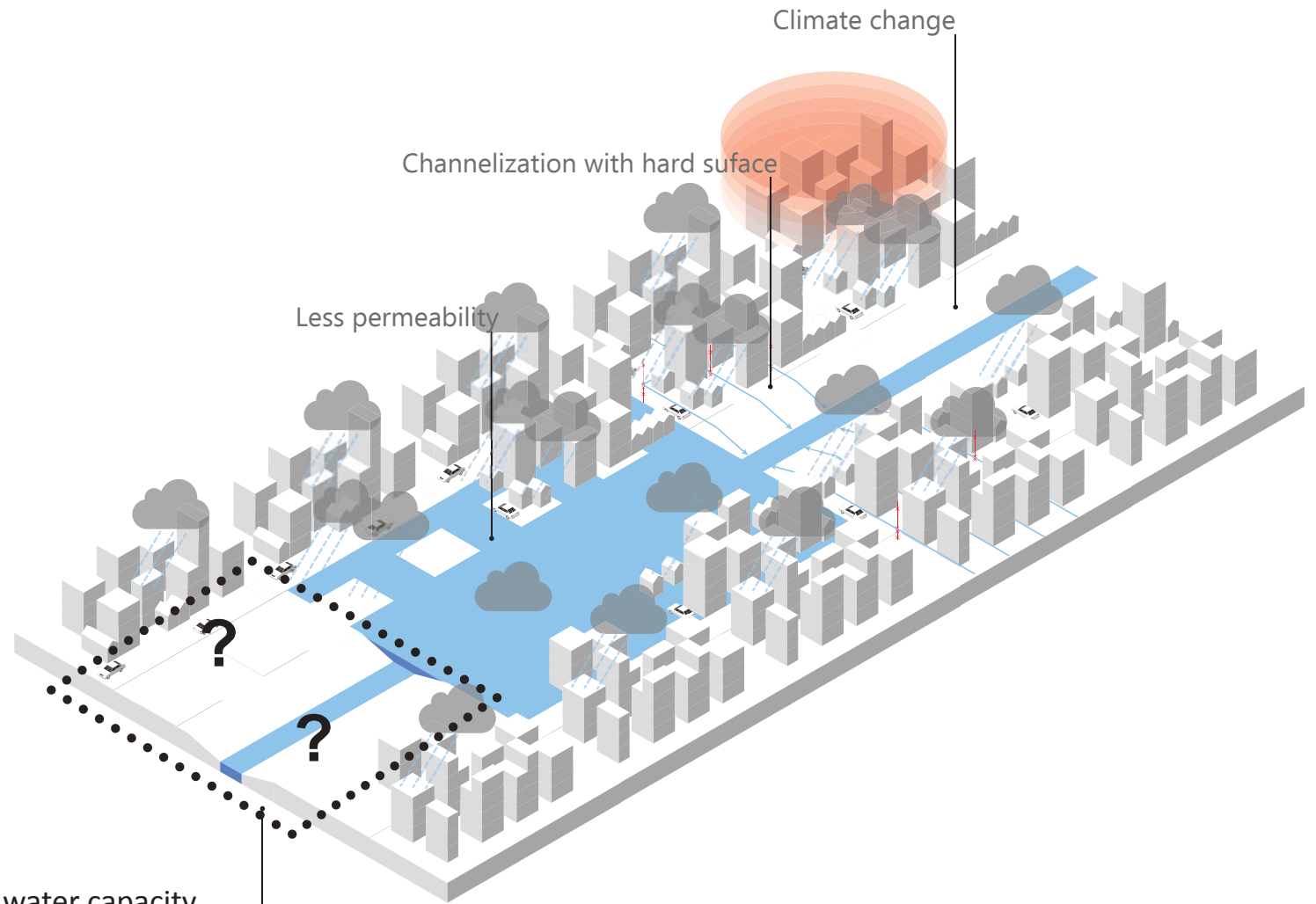
Delta studio Group work
Author edited

Framework of Delta interventions studio

History of Houston development

- Chanalization in Galveston Bay and Houston City
- Population and urban fabric is still growing rapidly





Problem statement

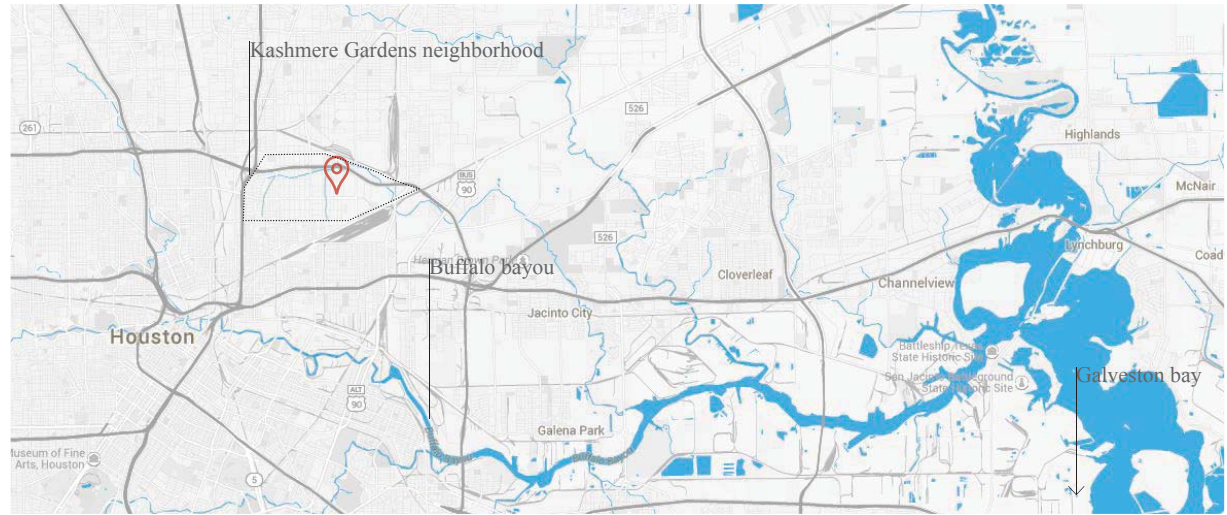
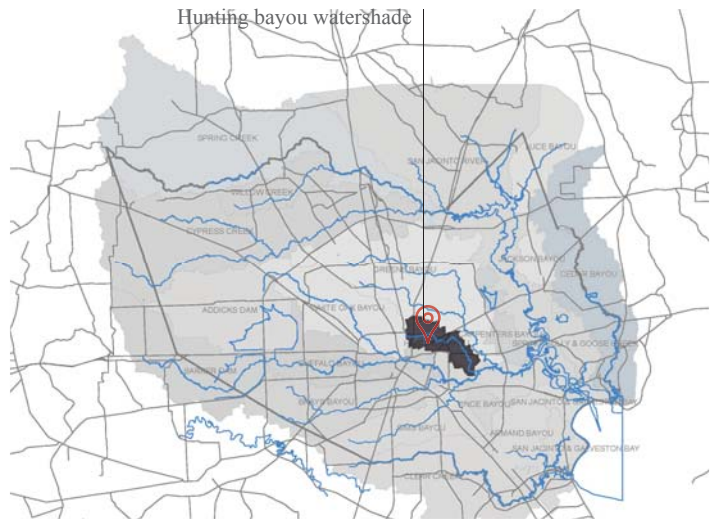
Chanalized bayou with concrete is lack of water capacity

Problematic flood prone area



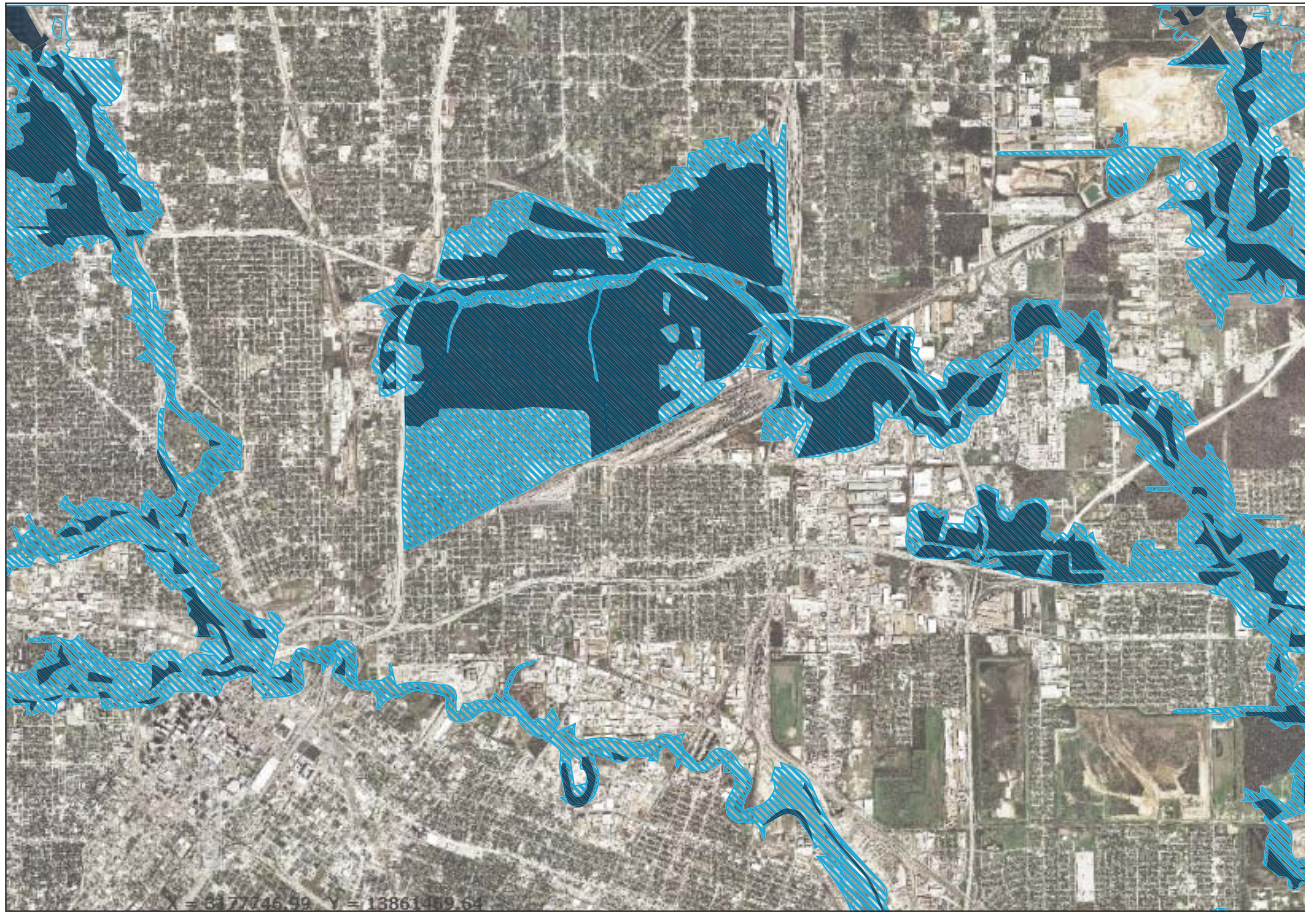
How to integrate the restoration of urban stream corridor with water resilient living?

Photo credit: Brett Coomer/Houston Chronicle
People board a canoe from a parking lot before floating off into floodwaters near Bear Creek Park on Saturday, May 30, 2015, in Houston.

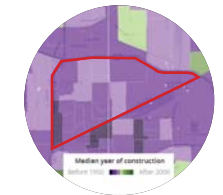
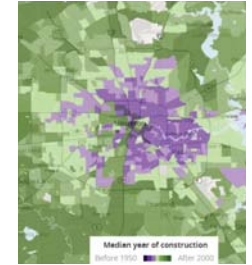
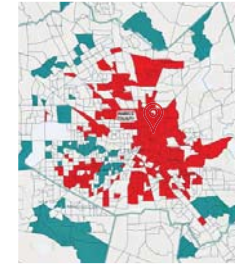
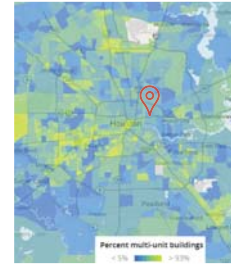
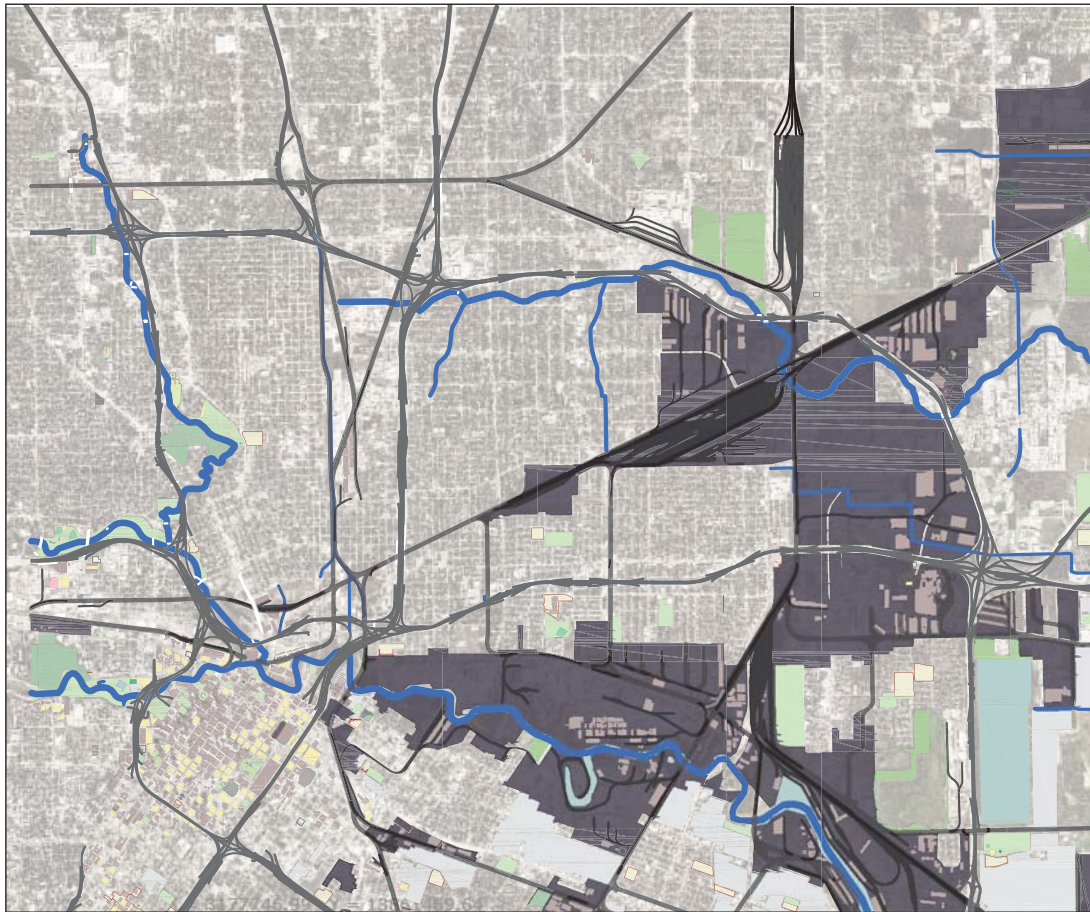


Site selection

Hunting Bayou & Kashmere Gardens region



Located in flooding risk plain



8%
16%
34%

Low income
High income

< \$66,000
\$66,000 - \$90,000
> \$90,000

1949
1951
1966

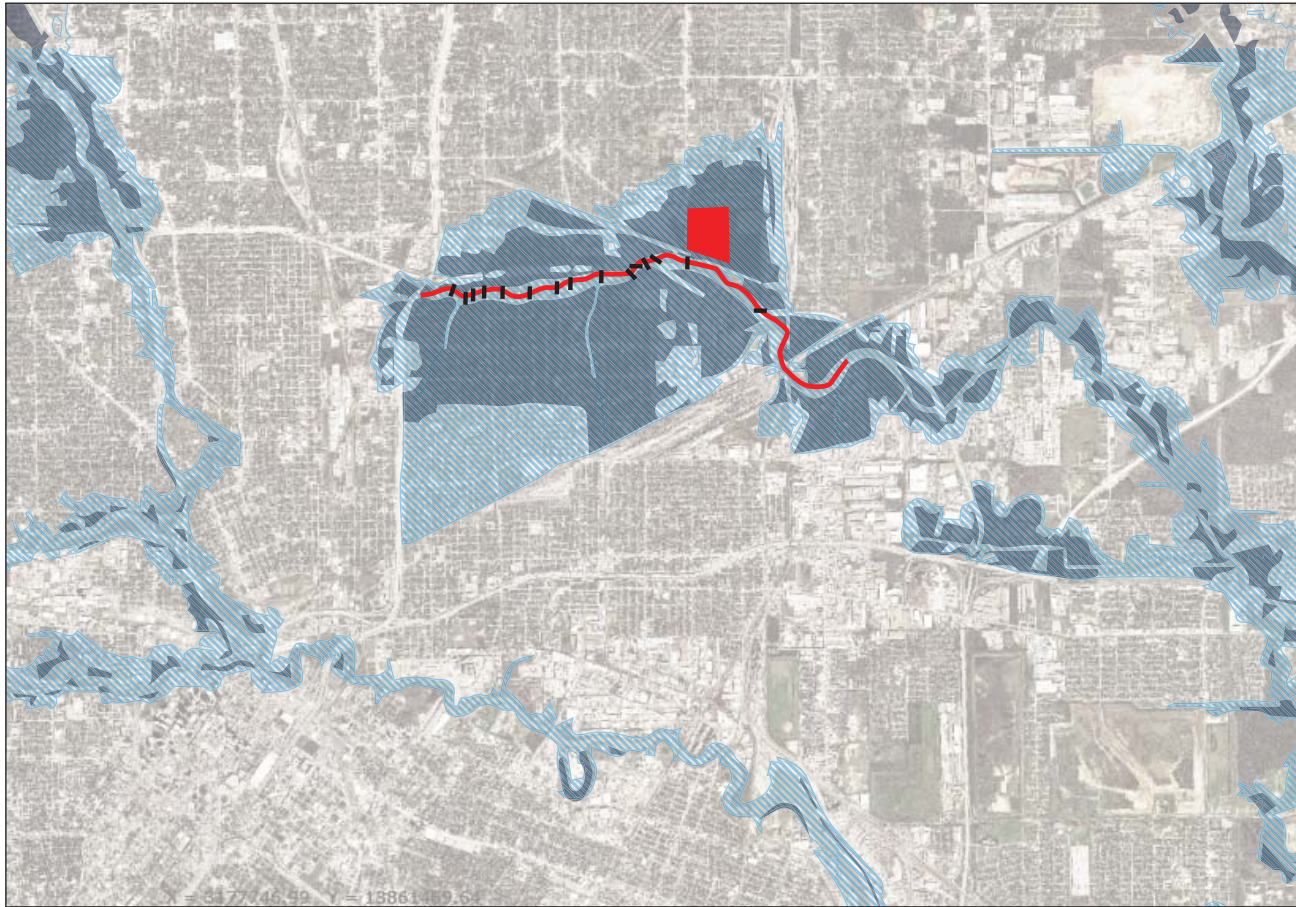
Less desiccation

Lower income

Lower land value

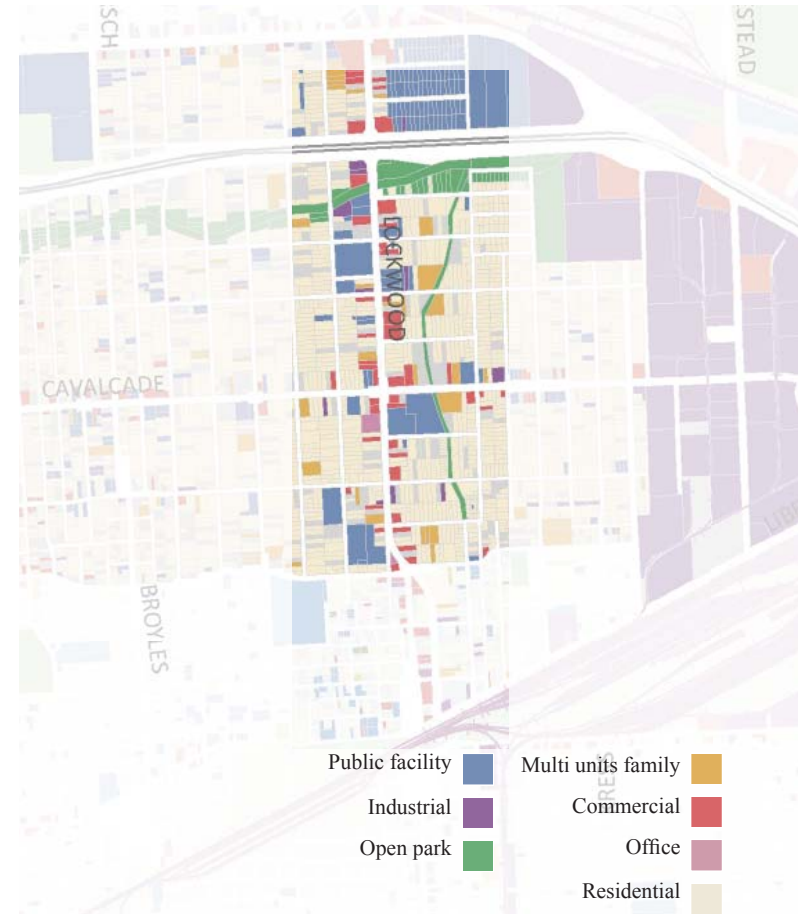
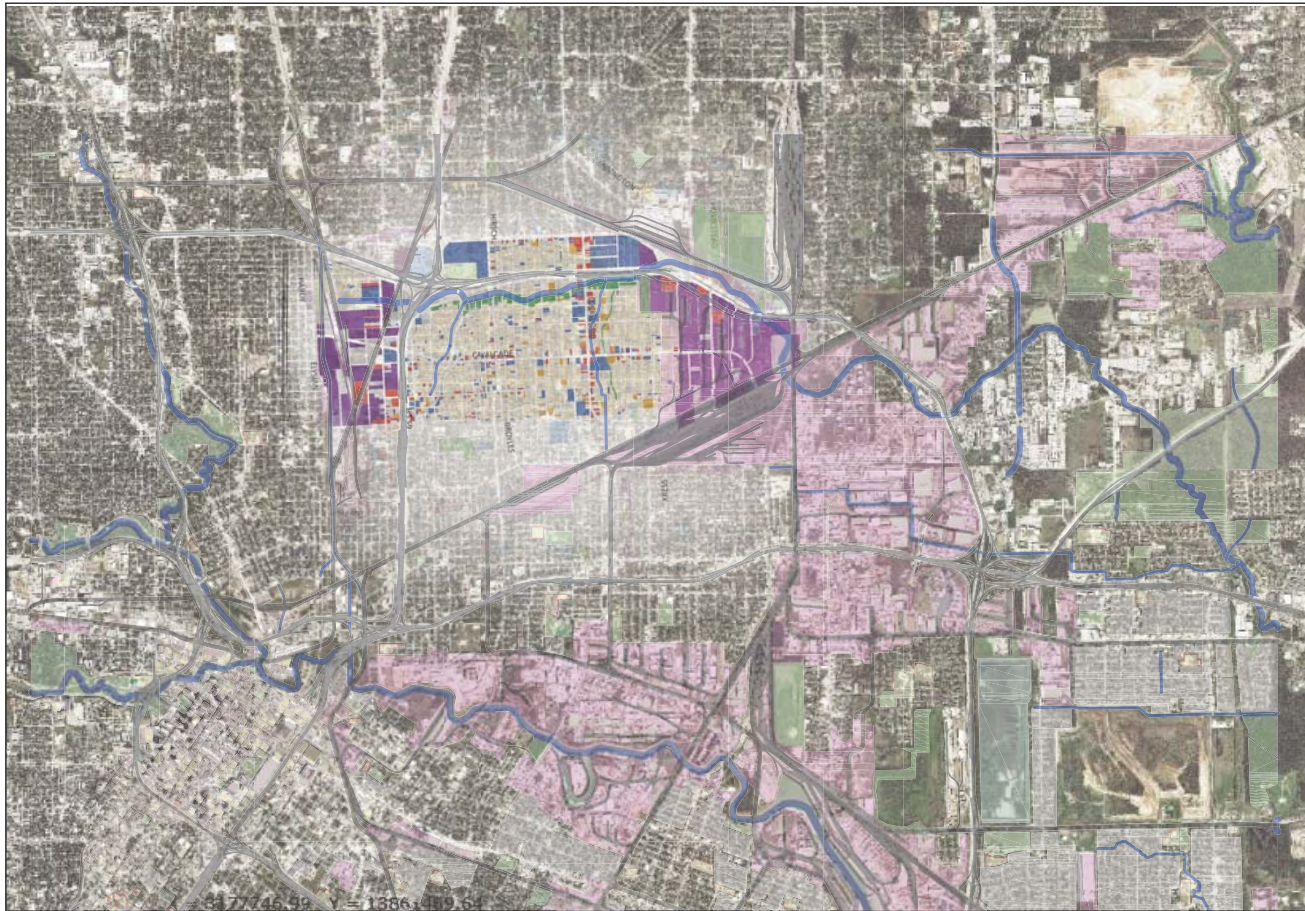
Earlier developed, but less maintained houses

One of most vulnerable social structure in Houston



Ongoing water management: Project Hunting

- Widen & deepen the main stream
- Create a detention basin in the north-east side of Kashmere Gardens neighborhood



2014 Master plan from government

Greenery park along bayou

The land in between main street & creek would be investigated in this project

Street views

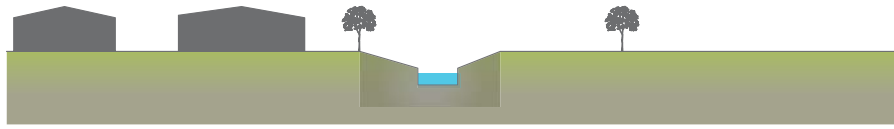


Housing condition

Hard surface

Creek & neglected lands

Urban Strategies



Current creek section

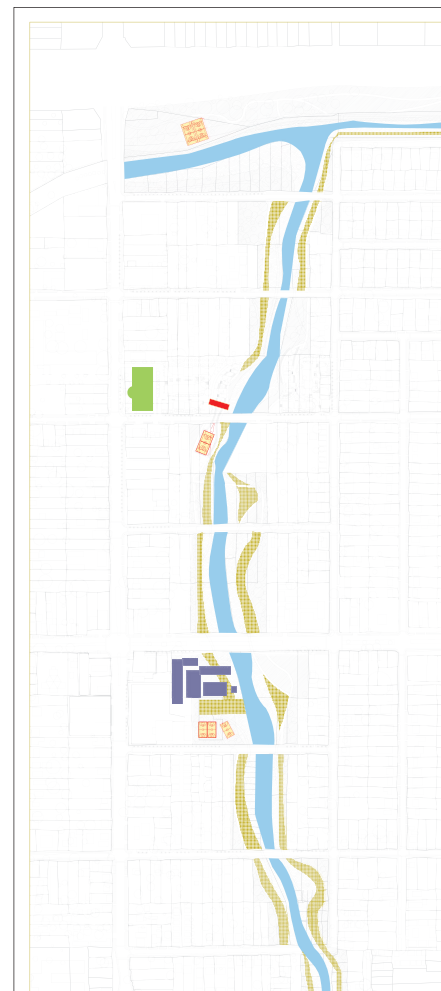


Project creek section



1. Reduce flood risk
by increasing water capacity of creek

- Sidewalk improvement
- Cafe in community center
- Farming
- Ecological school
- Sport court
- Resteraunt & market
- Lawn
- Farming
- Wetland
- New Trees
- Existing trees
- Creek water

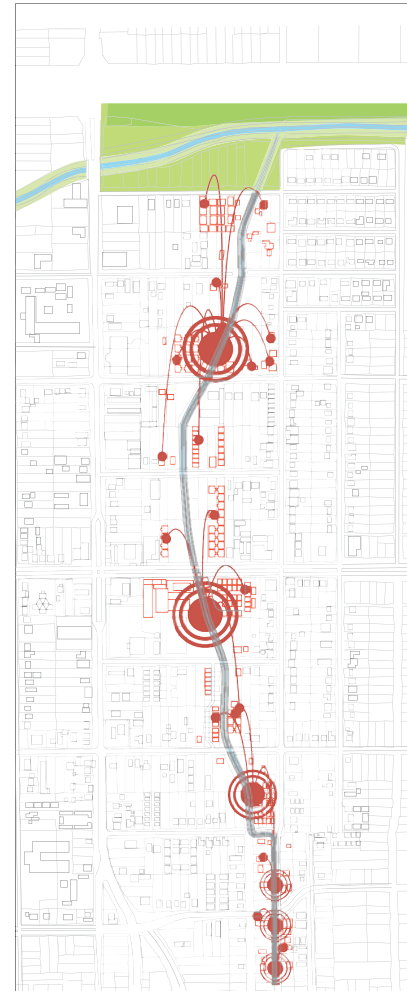


2. Bring public amenities

to provide an alternative communal space in this area

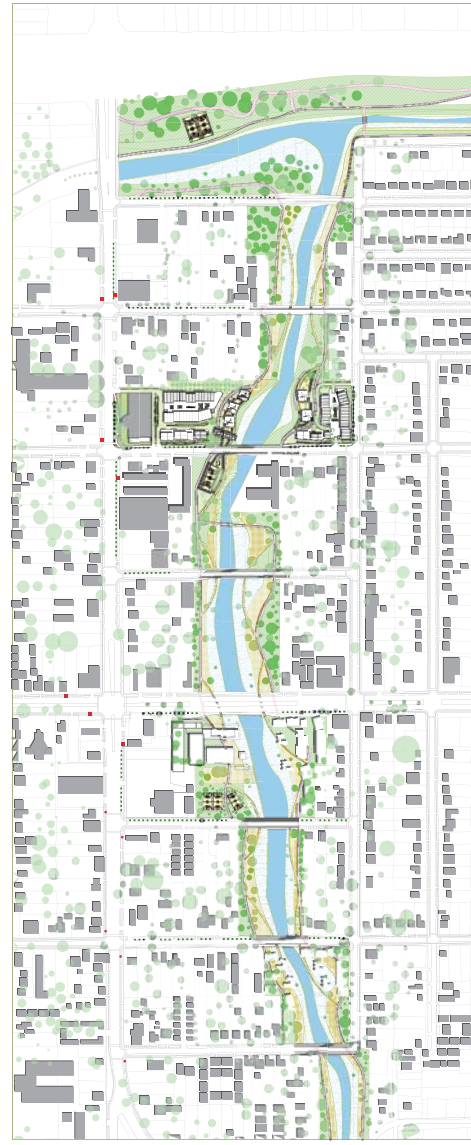
- Projected to be demolished
- Projected to be built

3. Remove problematic housing plots and desify along the creek





Before

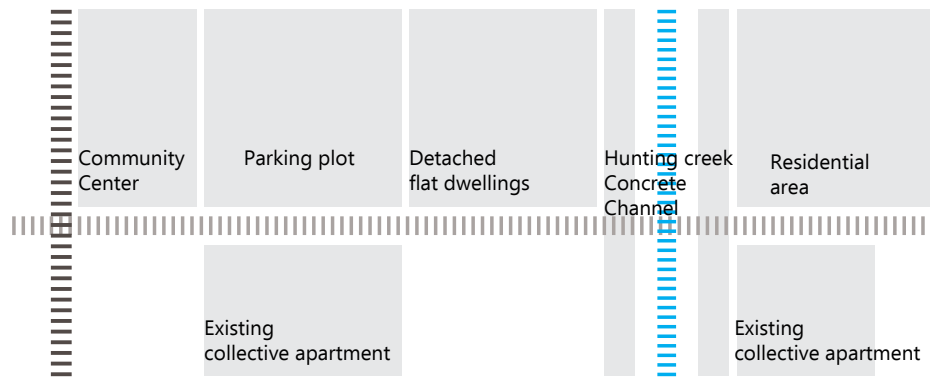


After

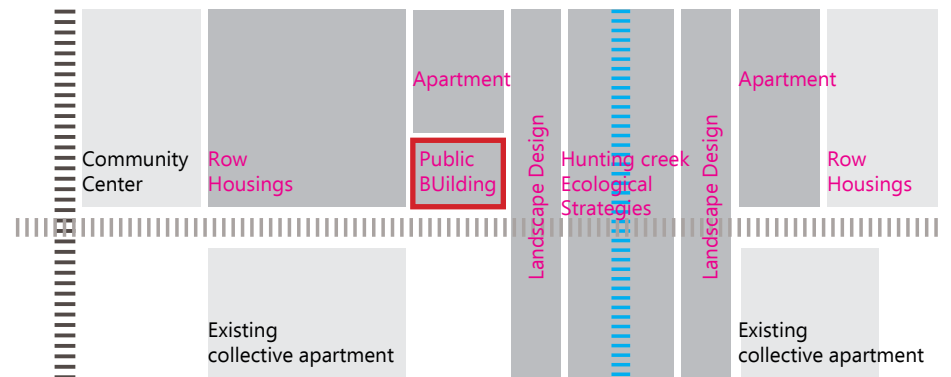
Community Masterplan



Site for Landscape & Architectural design



Existing zoning plan

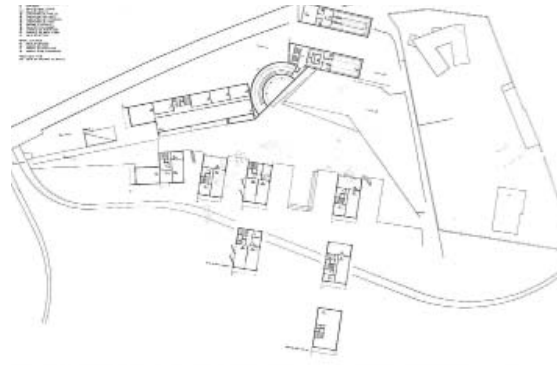
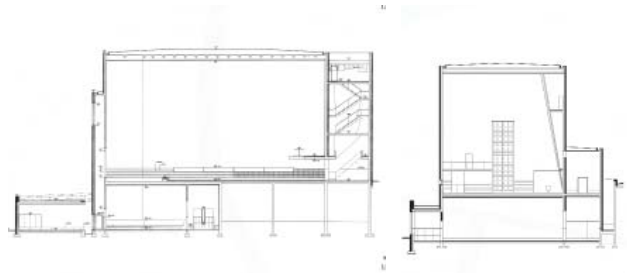


Project zoning plan

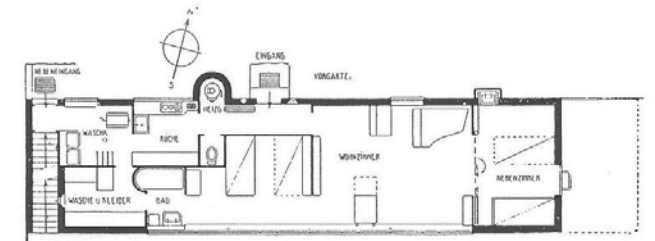
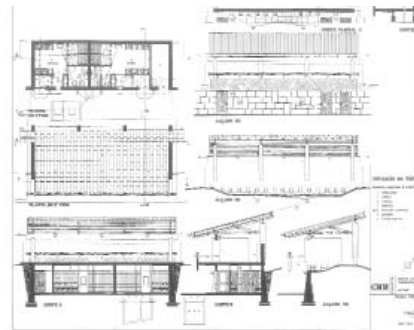
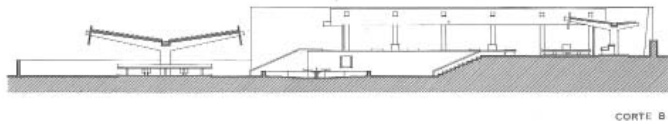
Zoning plan

Creek -> Bridge -> Landscape -> Architectural programs

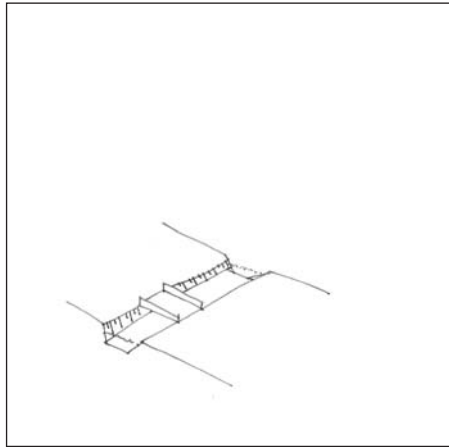
Junctional area can be public spaces



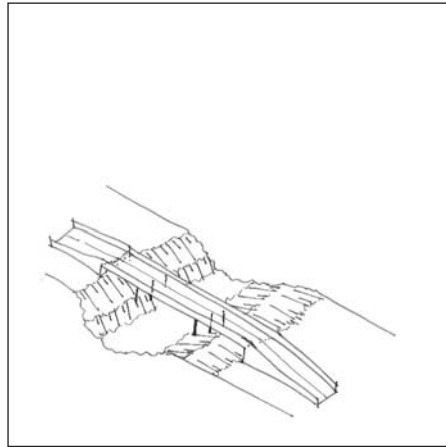
Inspiration:
Relationship between landscape + architecture



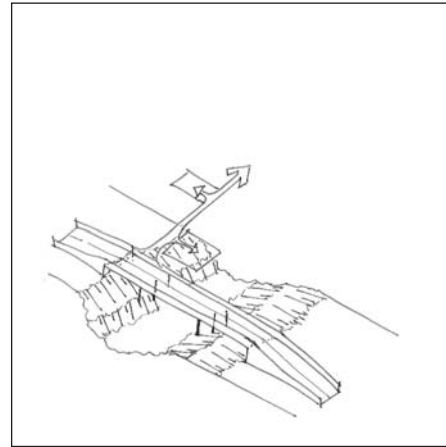
Inspiration:
Relationship between landscape + architecture



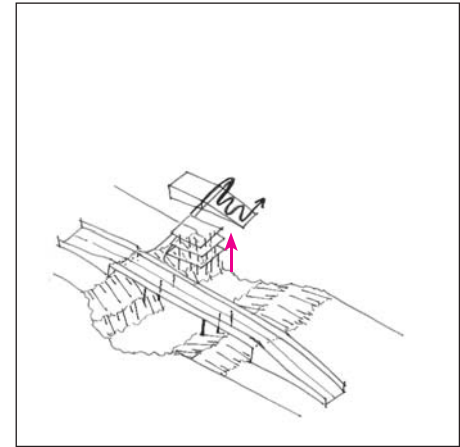
Current creek



Bridging



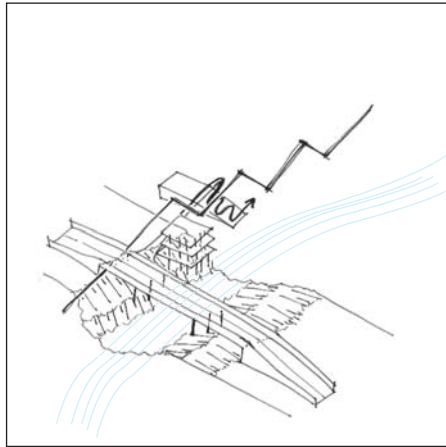
Routing



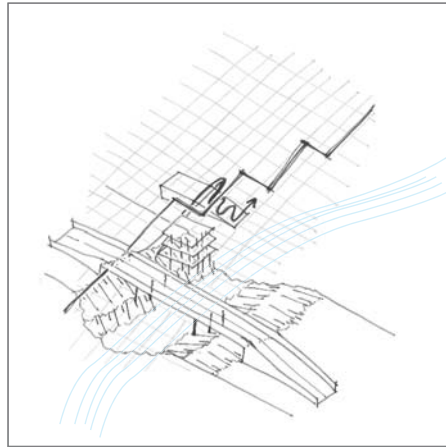
Public volumes growing

Spatial strategies

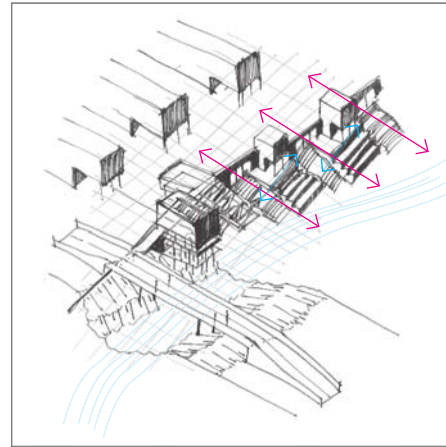
Widening / Bridging / Routing



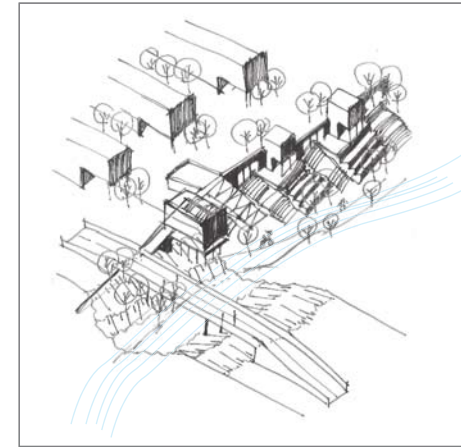
Zigzag



Orthogonal grid



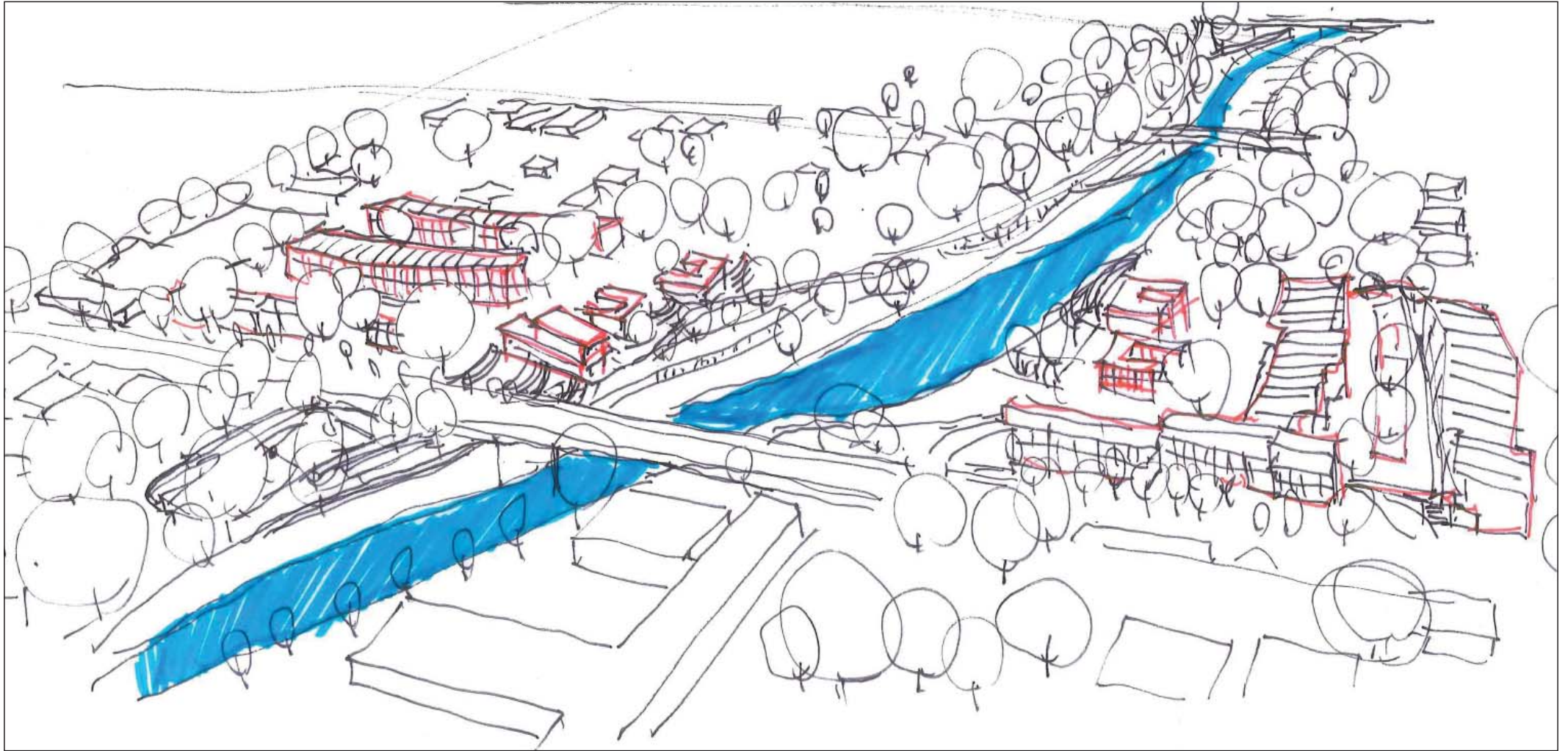
Accessibility to the water



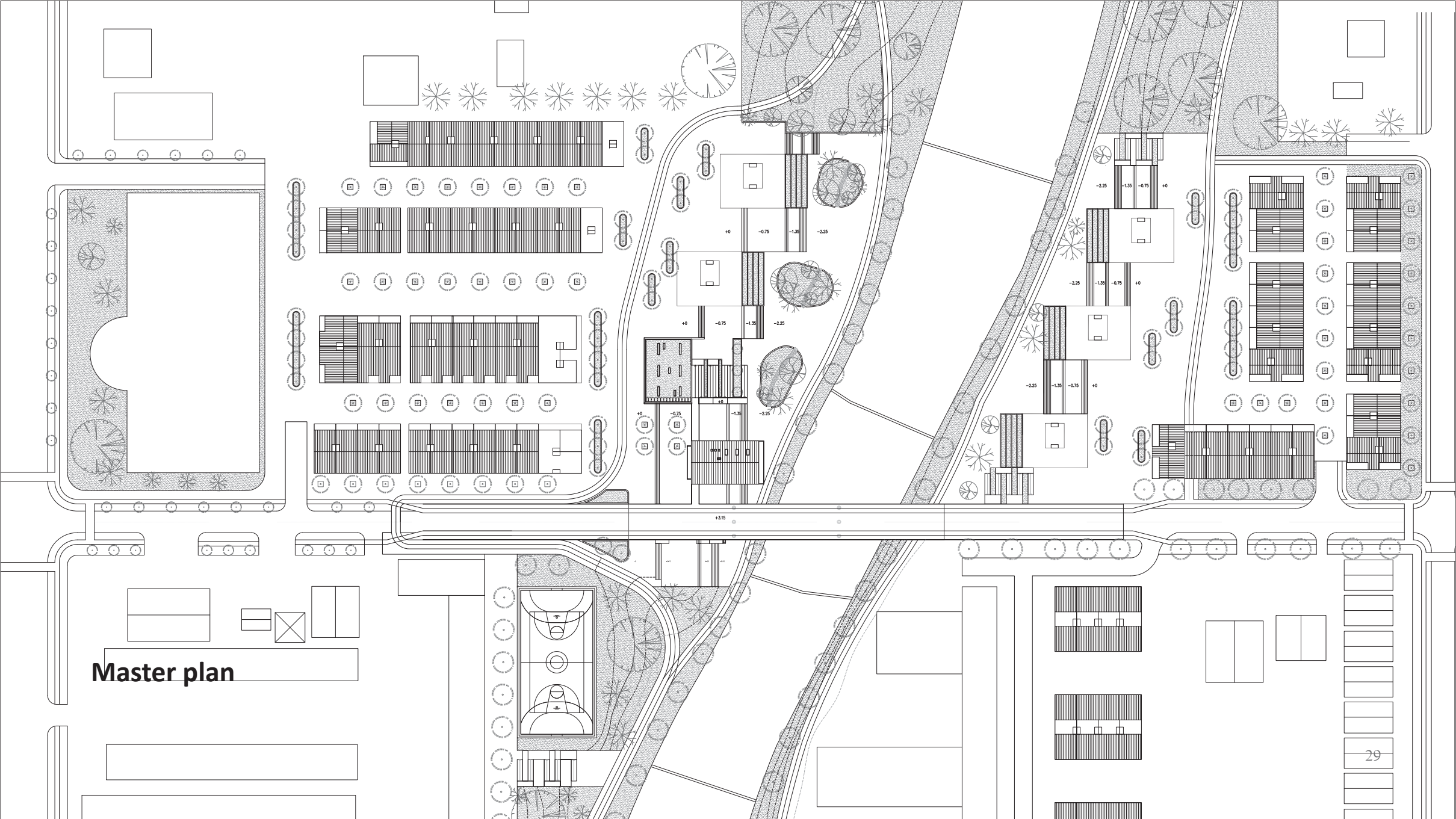
Greenery and permeability

Spatial strategies

Zigzag landscaping / Orthogonal / Accessibility / Permeability

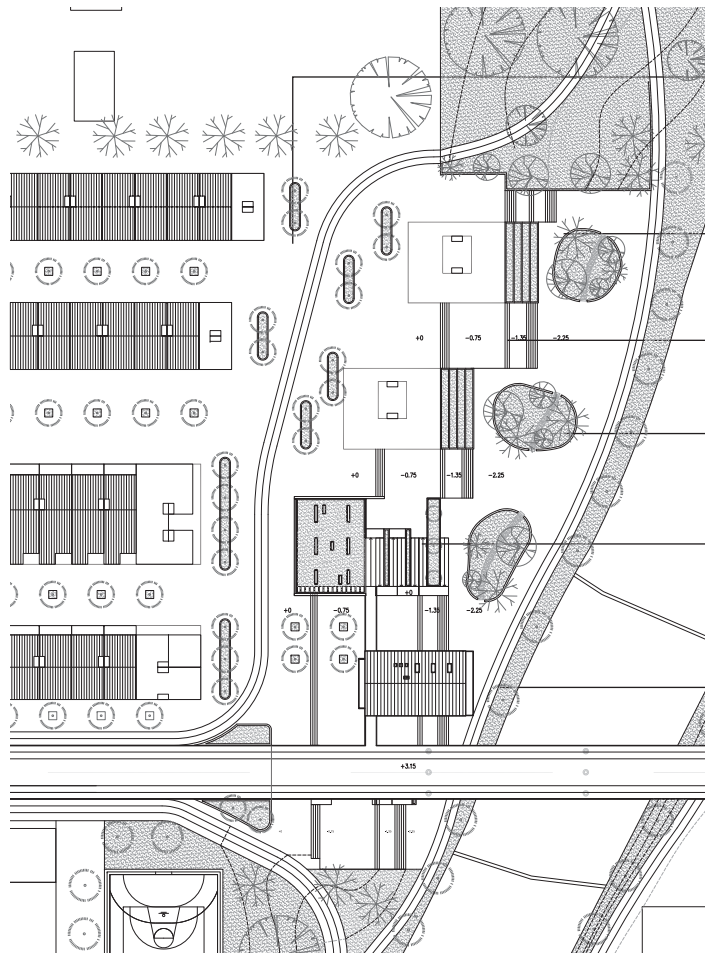


Conceptual bird's eye view



Master plan

Landscape+Architecture Design



Row Housing

- Interface between
- Public and private

Apartment B

- GF: Communal using
- 1~3F: 3 Housing units

Apartment A

- GF: Communal using
- 1~3F: 3 Housing units

Landscape

- Greenery
- Bike path

Public Building

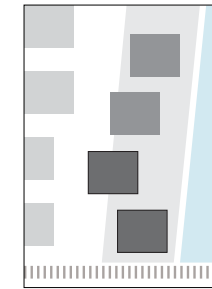
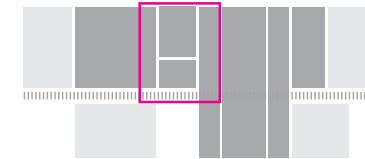
- Market
- Roof platform
- Toilet

Public Building

- Kiosk
- Restaurant
- Multi functional hall
- Toilet
- Public Elevator (water proof)

Design part

- Waterfront landscape
- Public spaces
- Public architecture

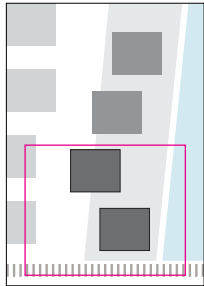


Design Items

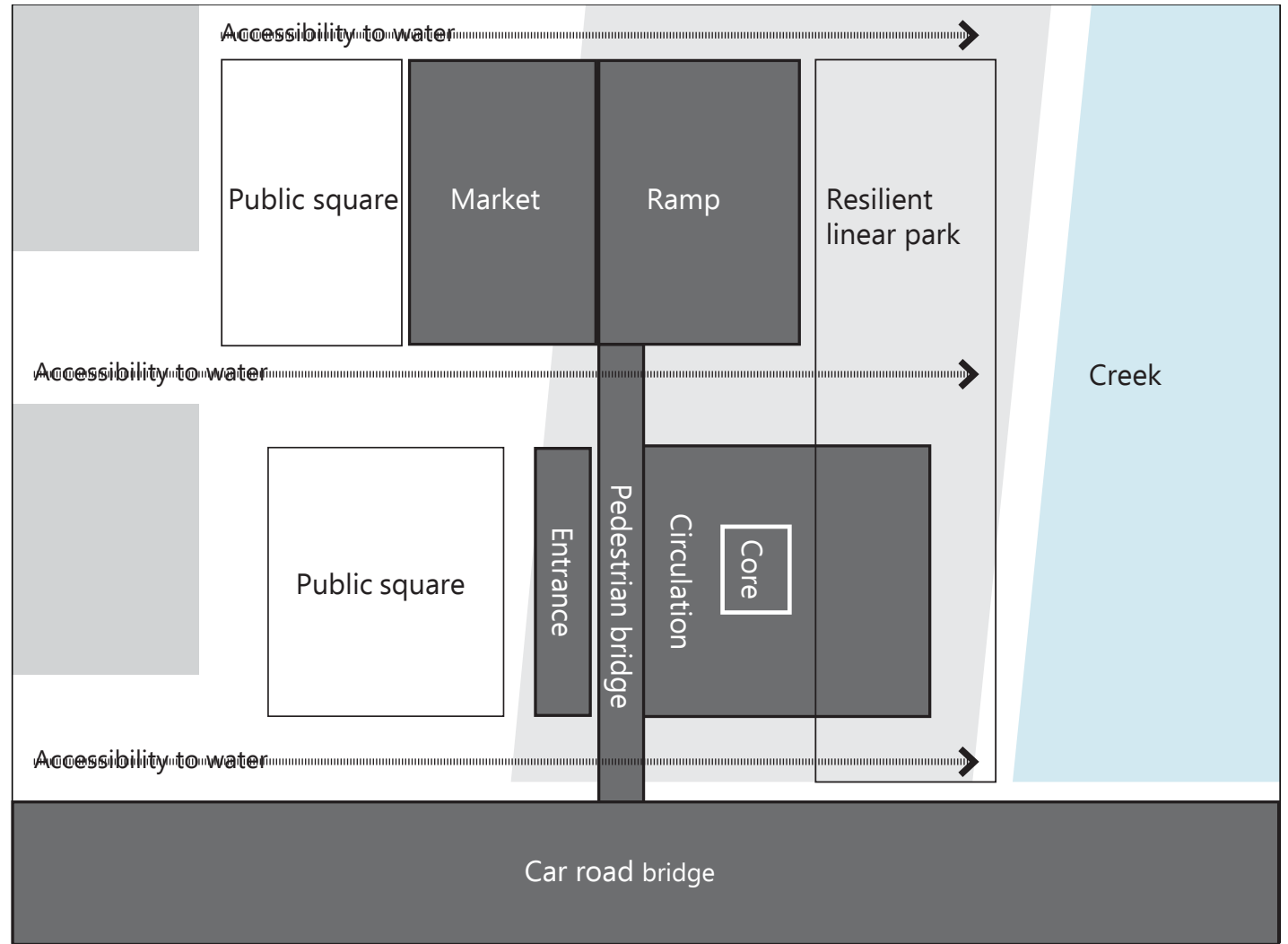
Design level

	Landscape	lv. 1
	Row Housing	lv. 2
	Apartment	lv. 2
	Architecture Design	lv. 1

Program



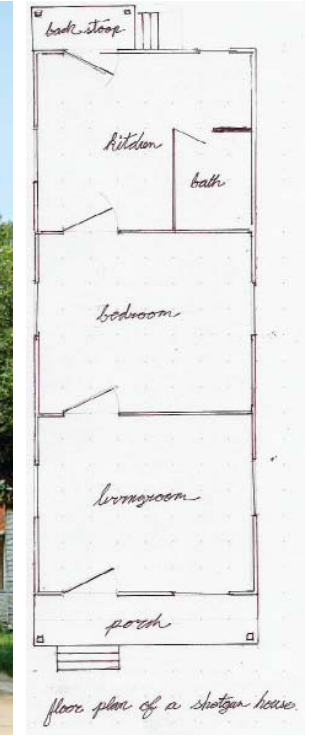
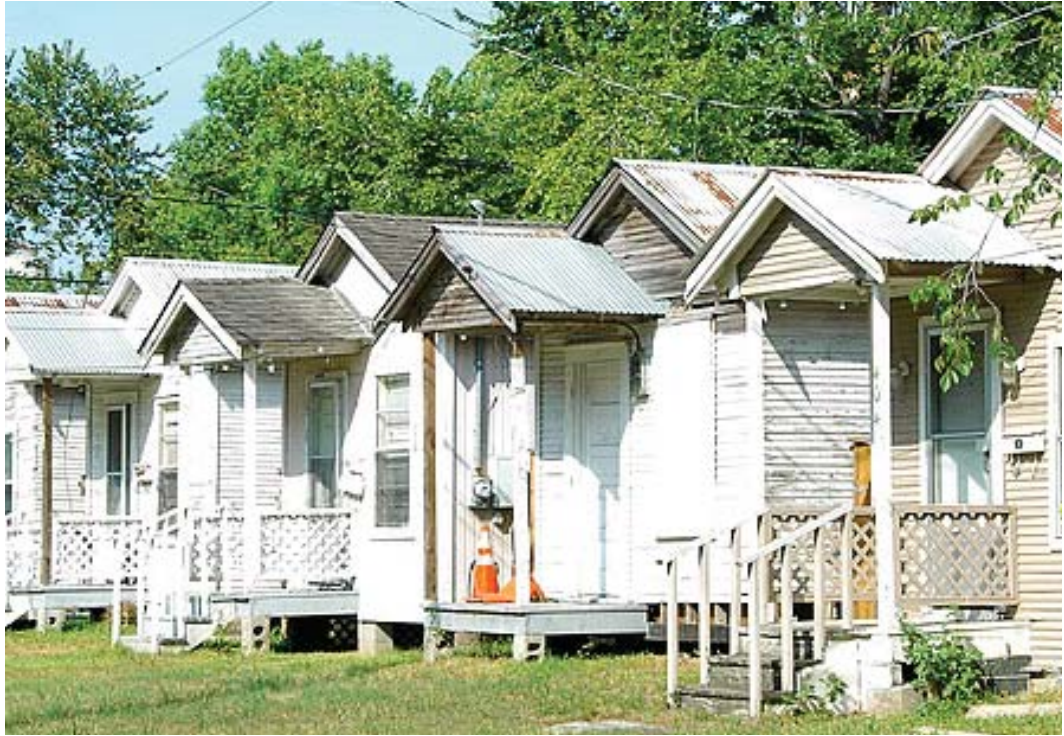
Architectual zoning





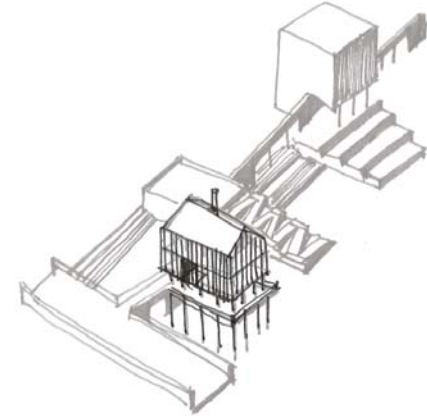
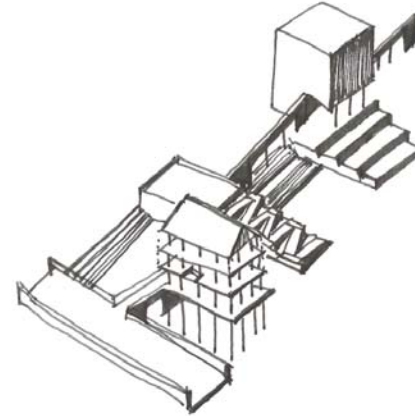
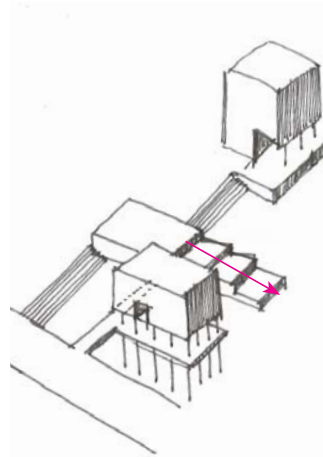
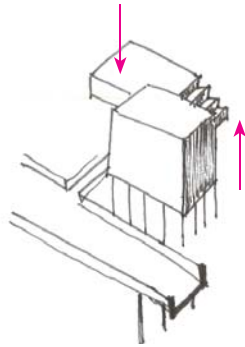
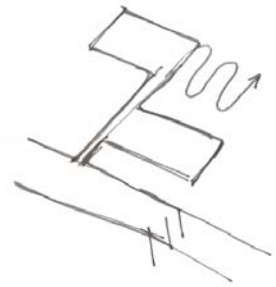
Inspiration

by local architectural characteristic: "Porch"



Inspiration

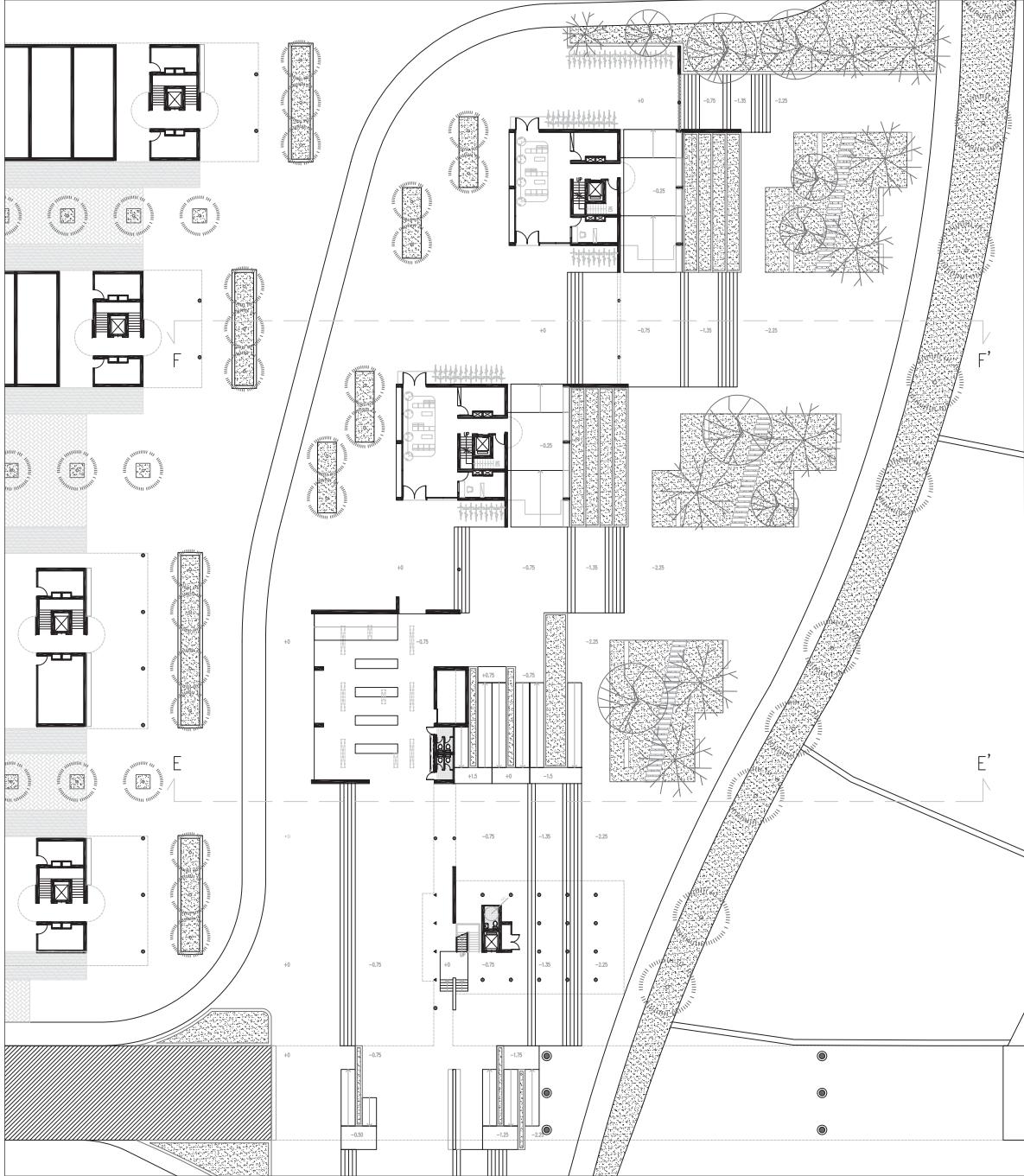
by local architectural typology: "shotgun house"



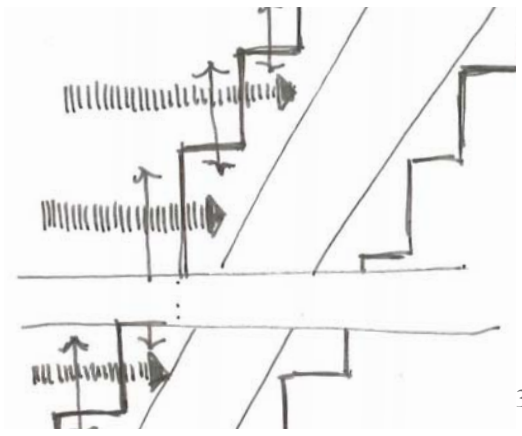
Mass Development

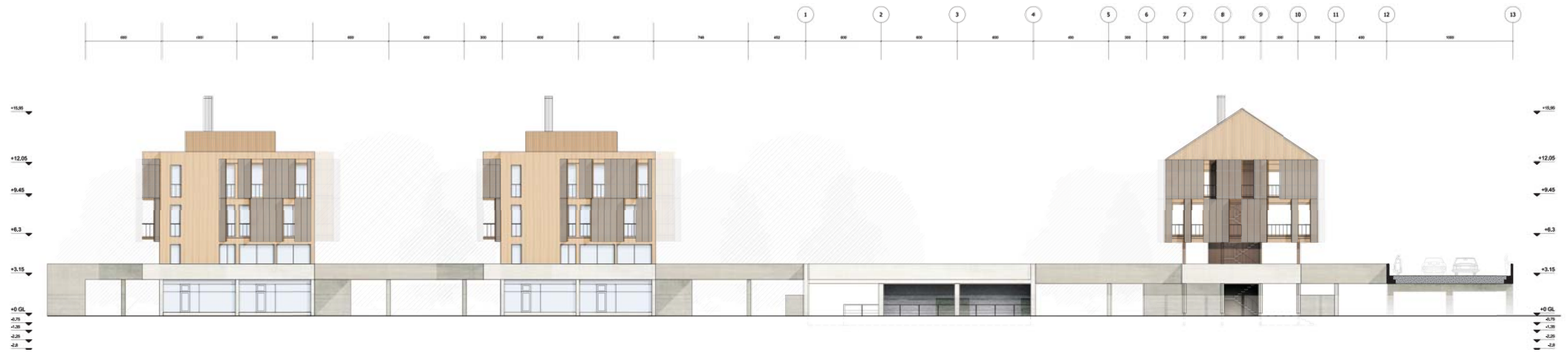
Tower / Slope

The Porch of Kashmere Gardens neighborhood



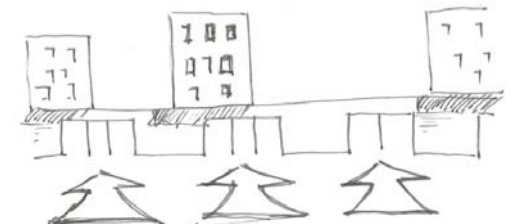
Site plan

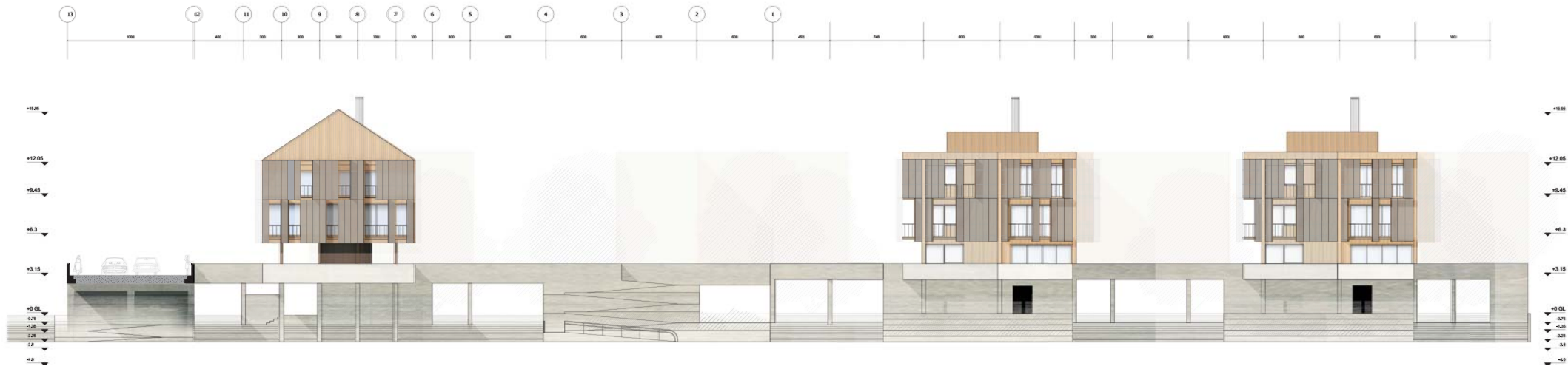




West Elevation

Entrance for water resilient landscape

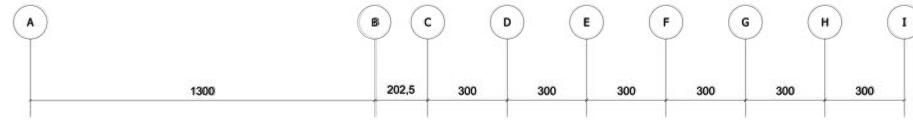




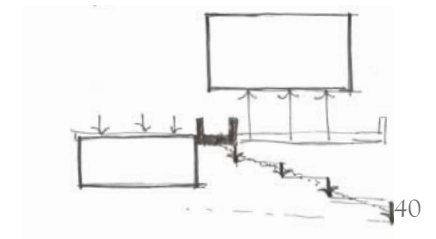
East Elevation

Various opportunities to approach the water





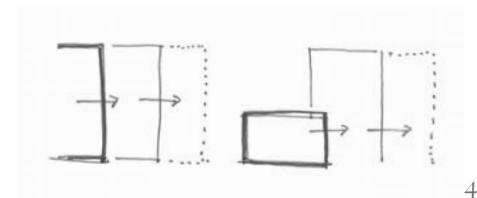
South Elevation
Route as an intersection





South section

The effect of zigzag strategy





North section

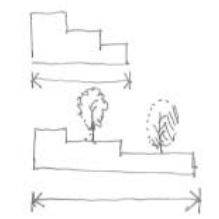
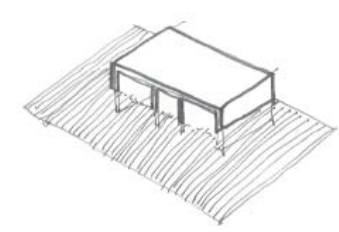
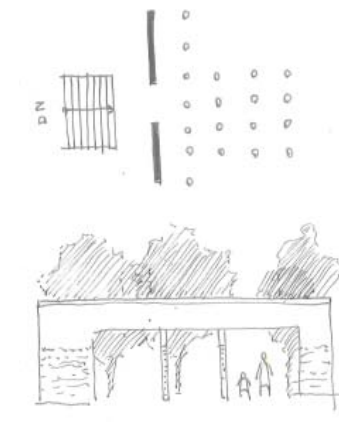
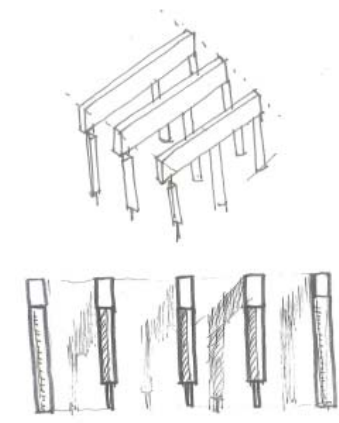
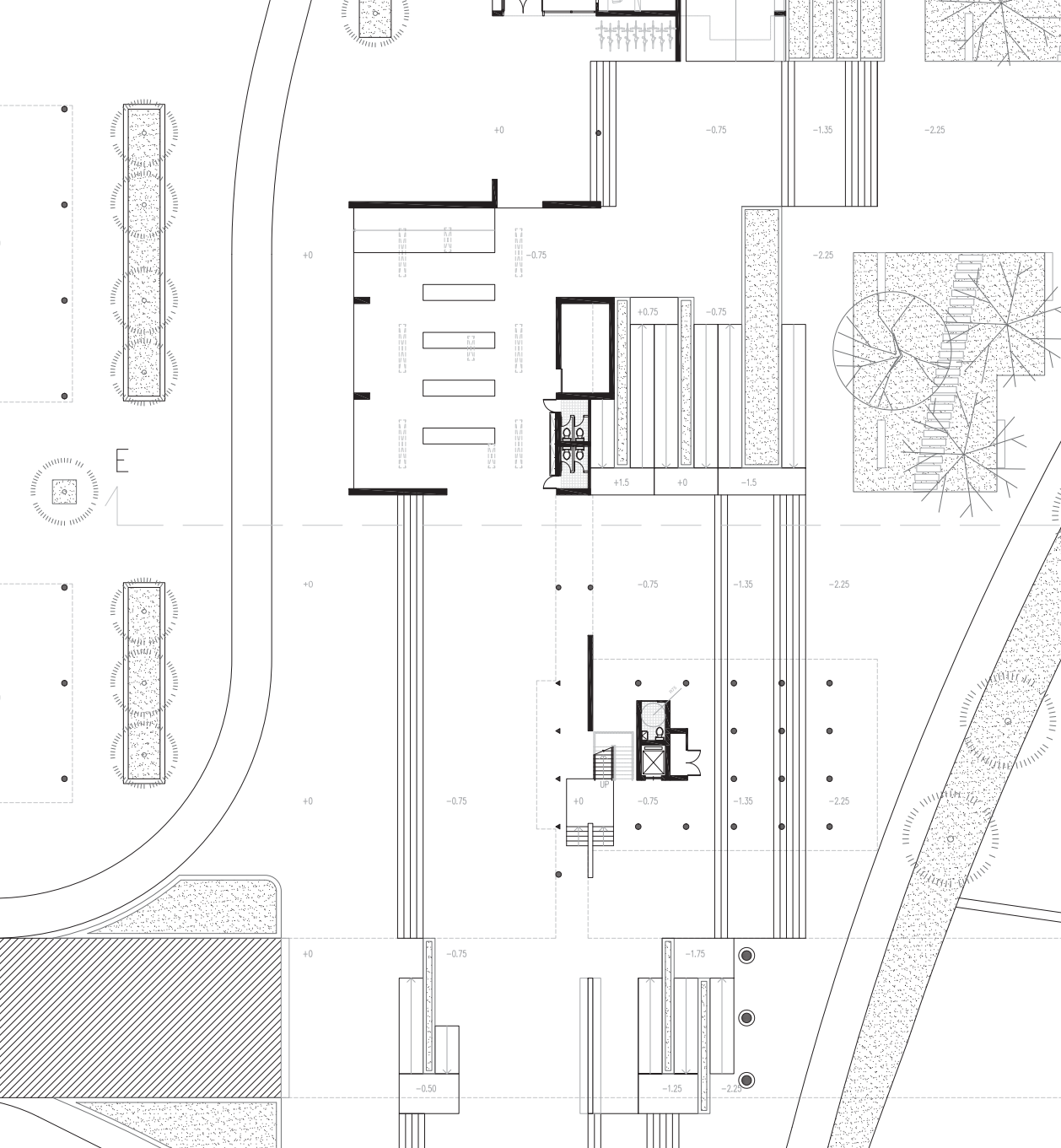
The outstanding Porch Building



North Elevation

Bridge as the boundary of concrete

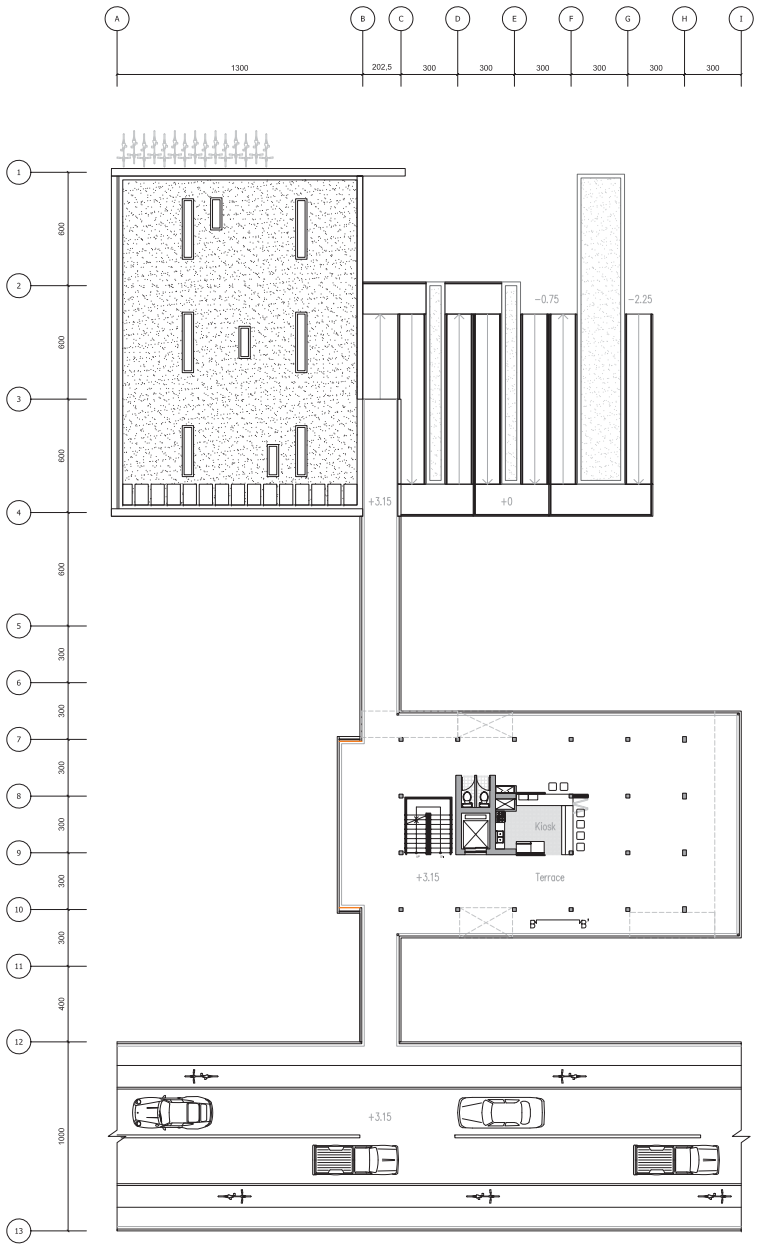




Ground Floor
Entrance, Structure, Walls



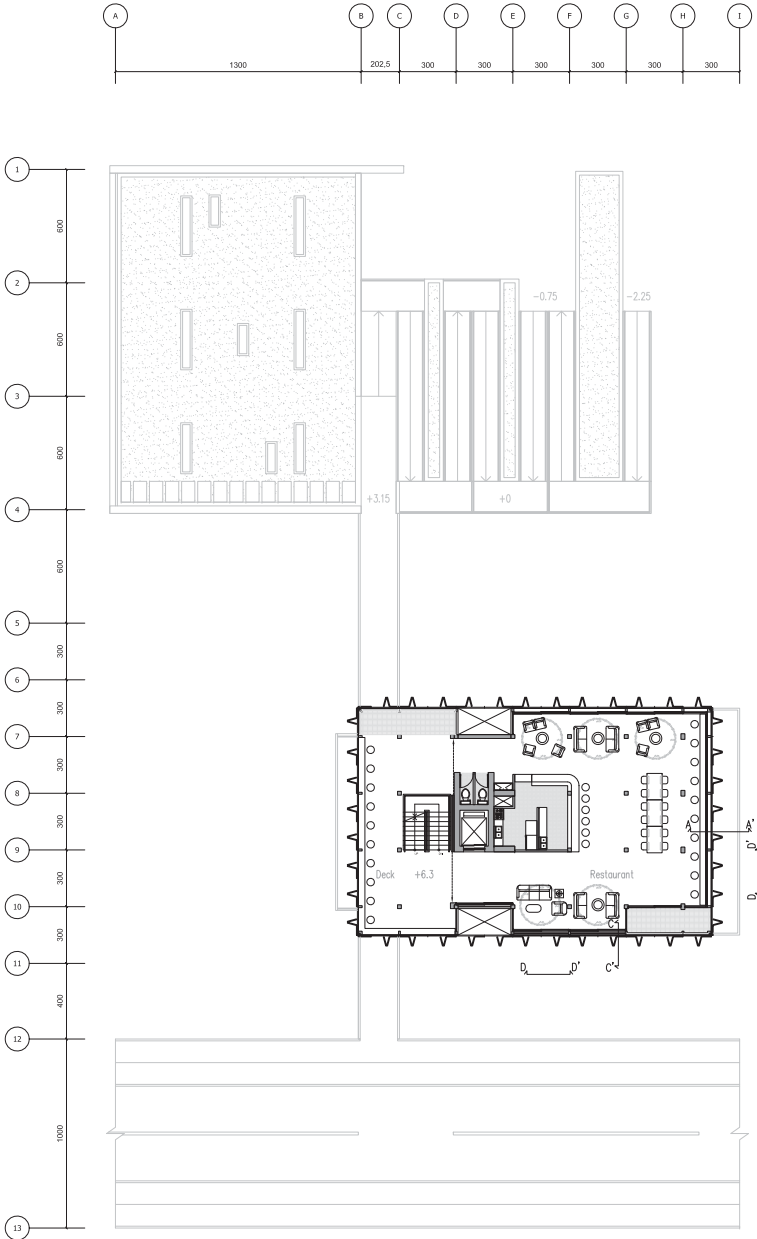




First Floor

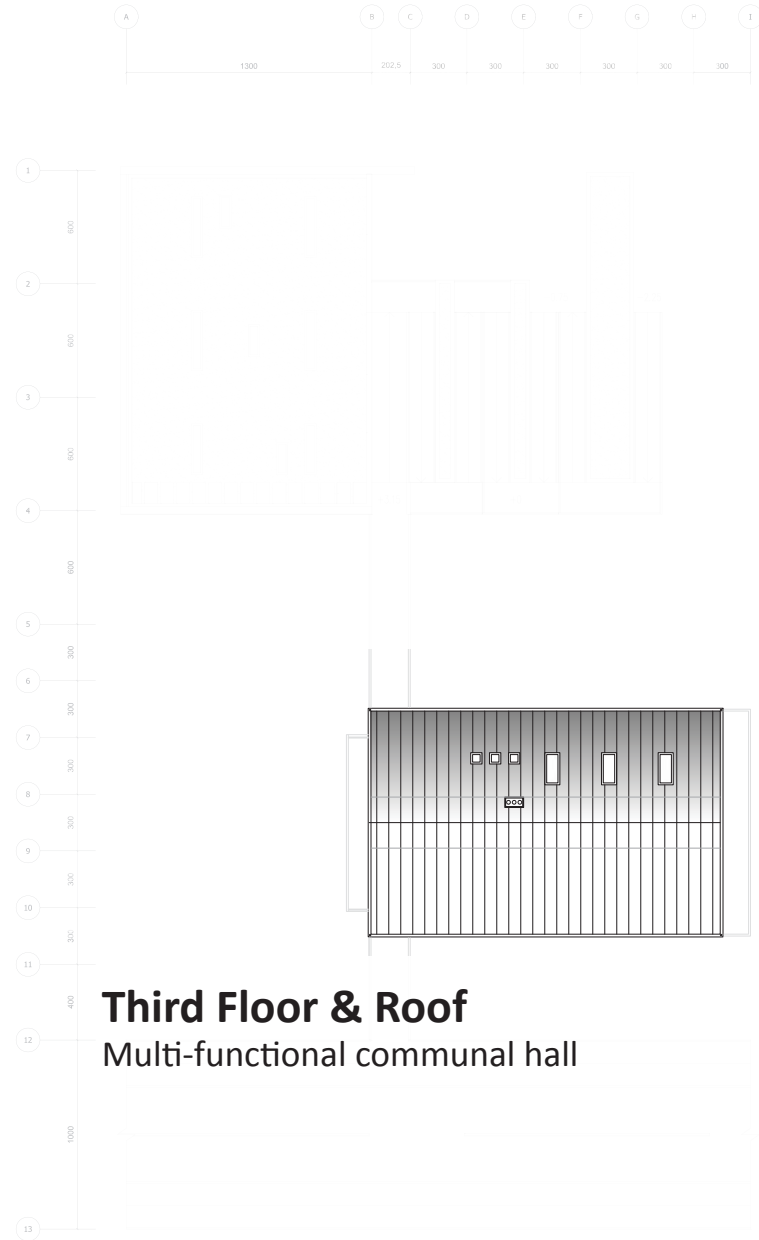
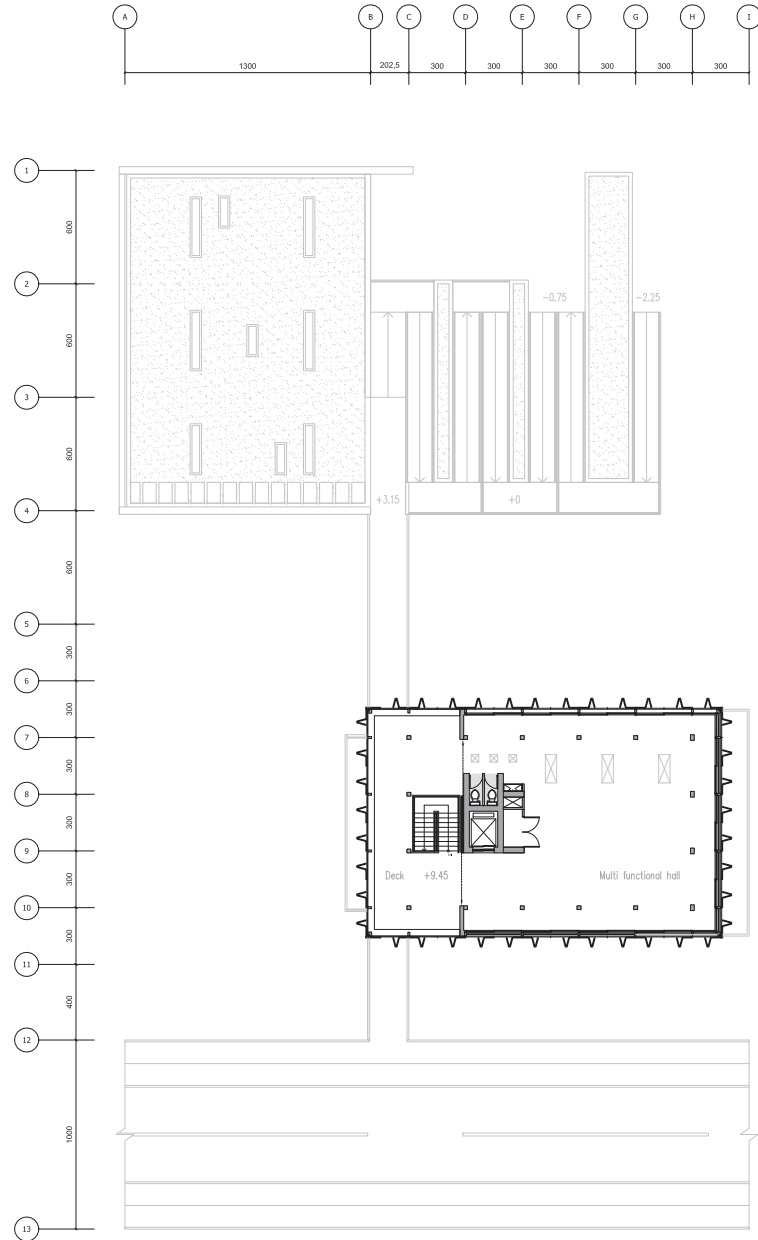
Bridge, Kiosk, Green roof platform, Ramp
 Void from second Floor: Connection with view and light





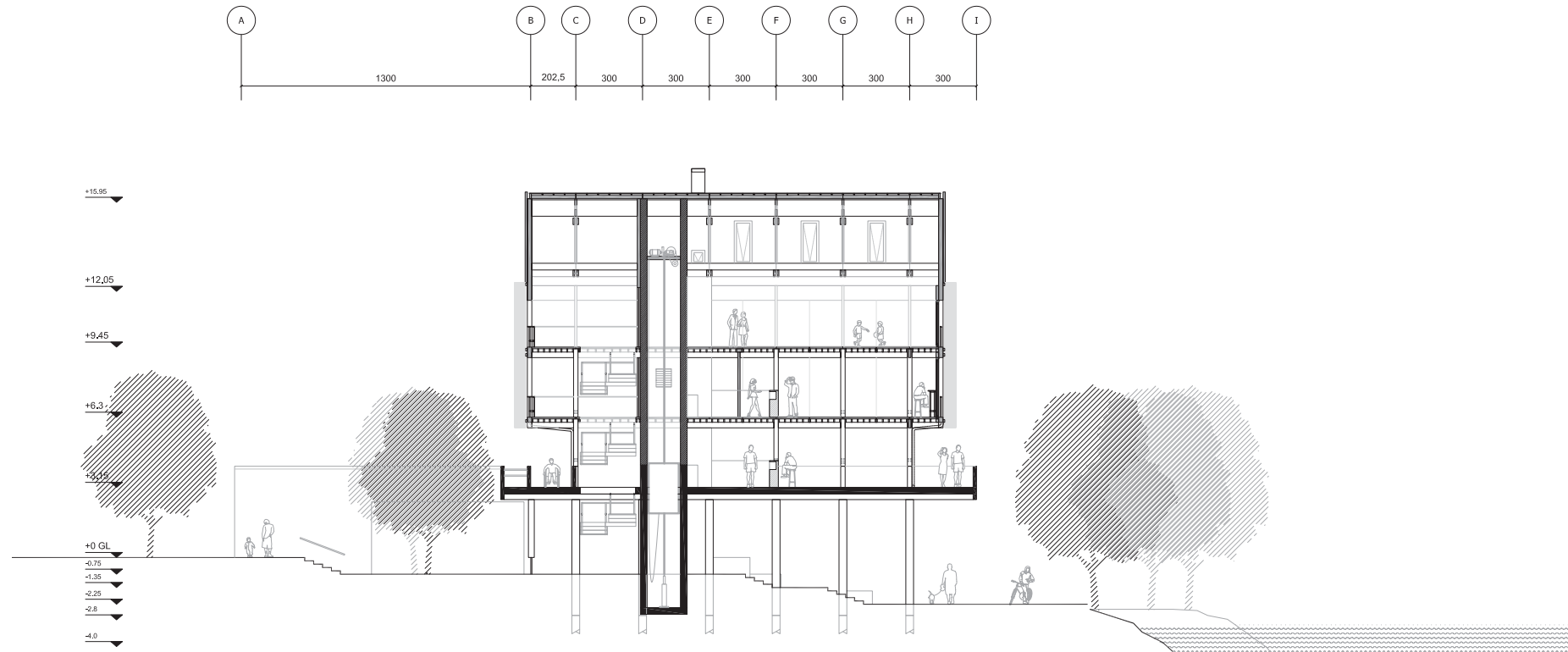
Second Floor
 Restaurant with adjustable panorama view





Third Floor & Roof
Multi-functional communal hall

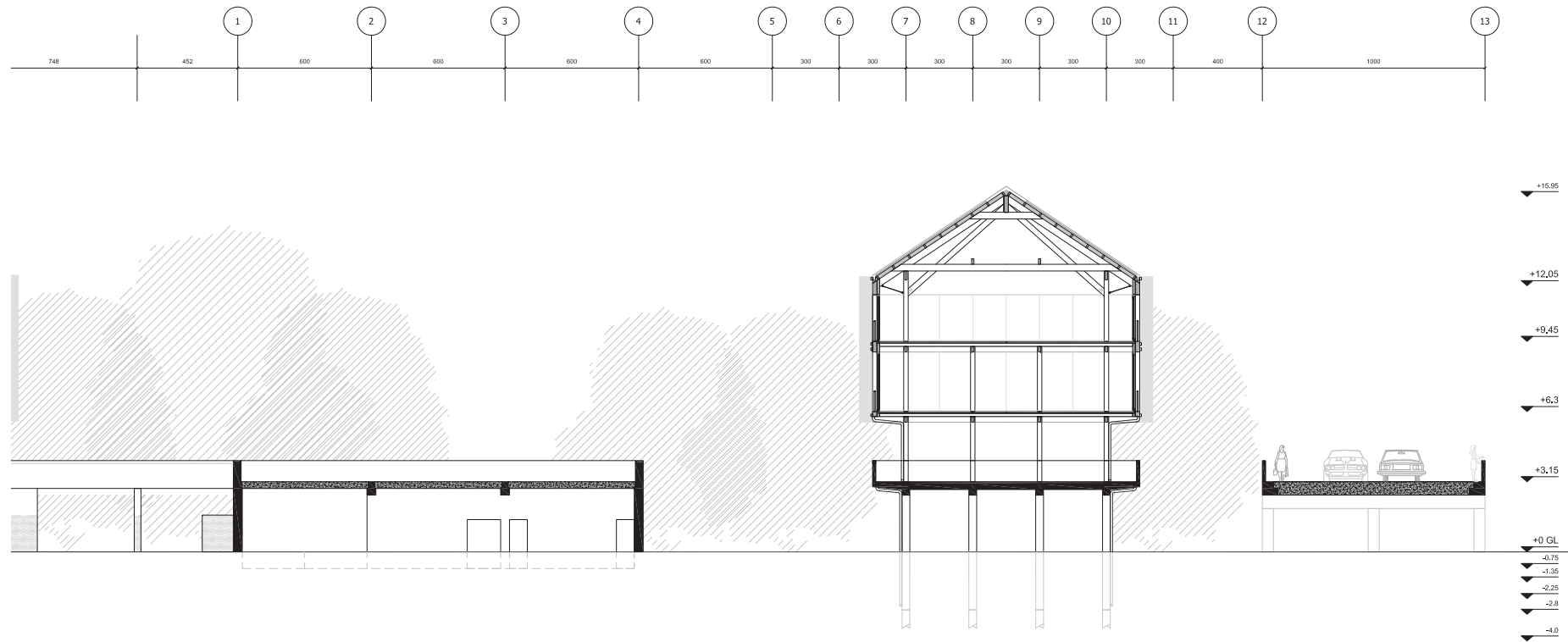




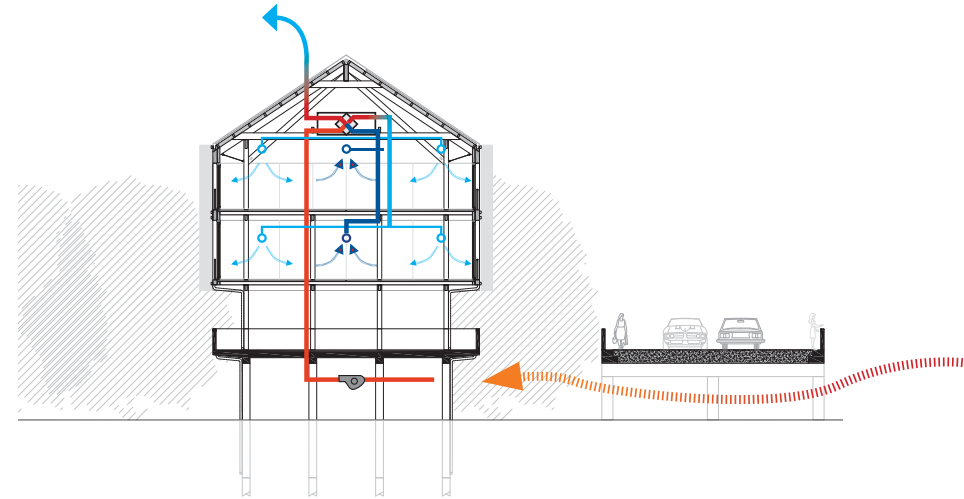
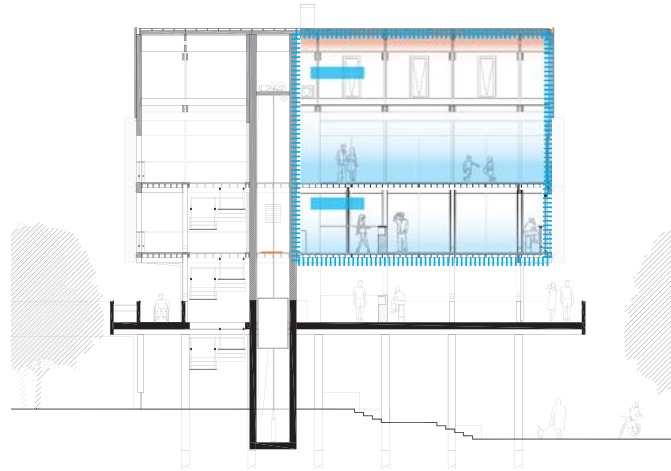
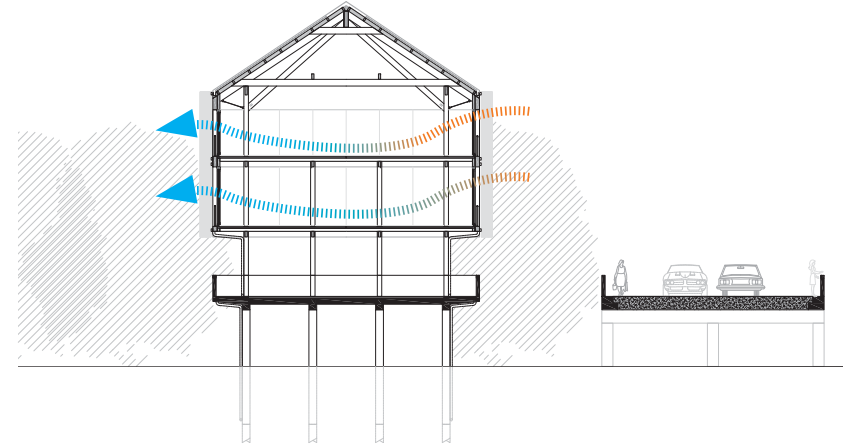
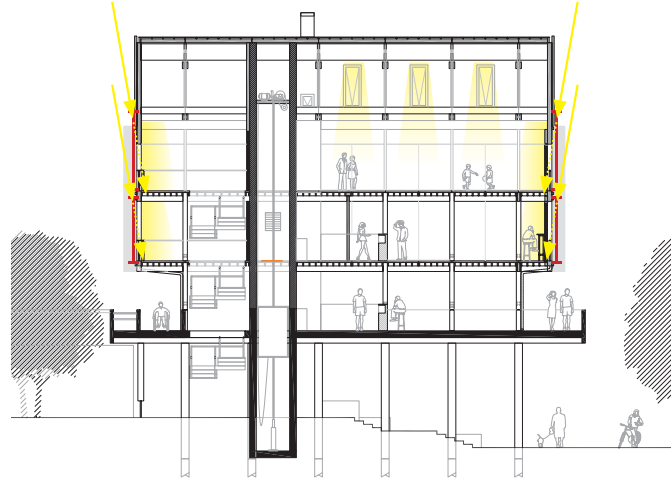
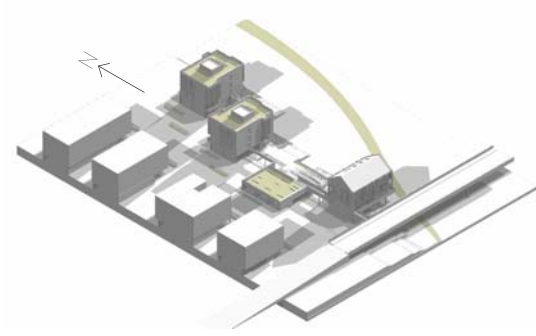
Long Section of Porch Building

Public square, Sunken market, Waterfront, creek





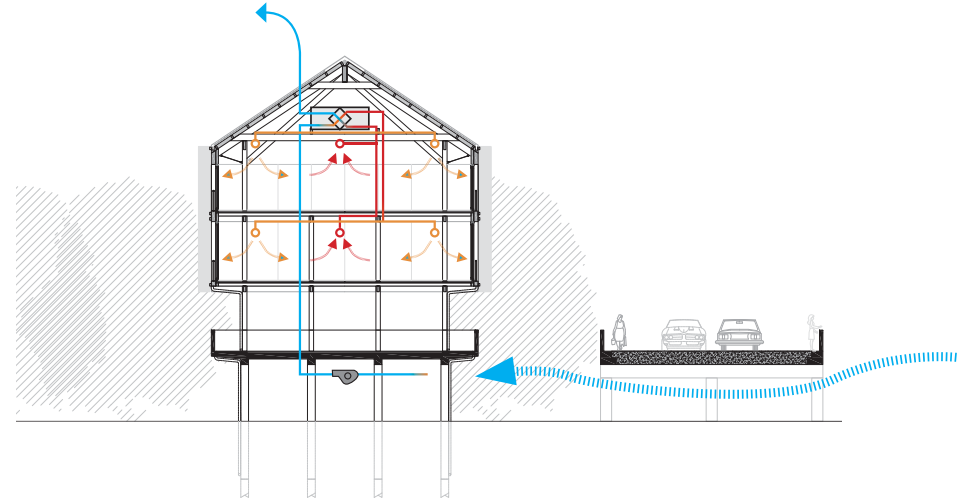
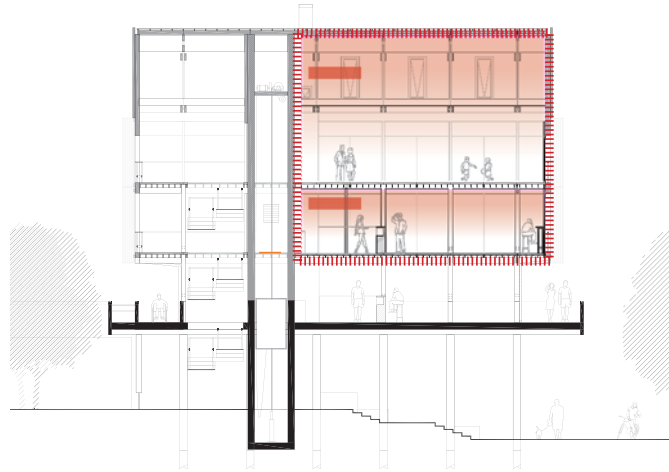
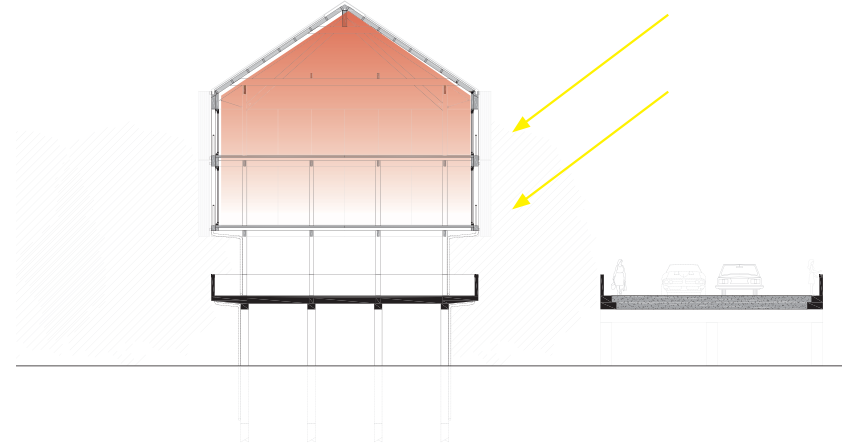
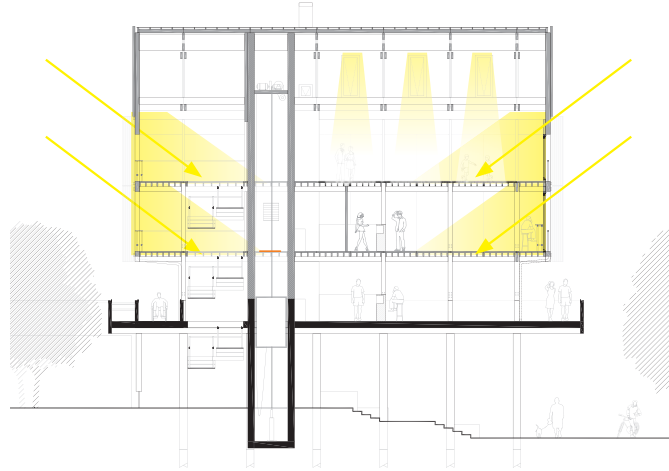
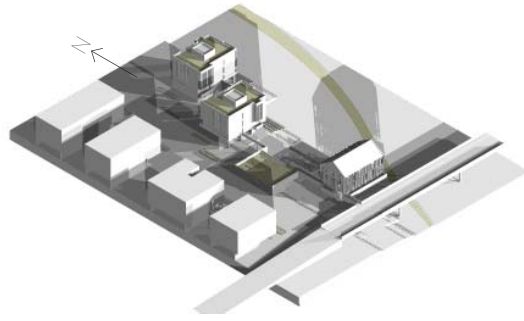
Short Section of Porch Building & Market
 Sunken market, Porch building, Bridge



Summer

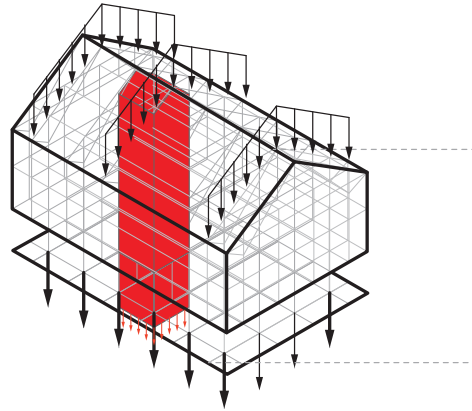
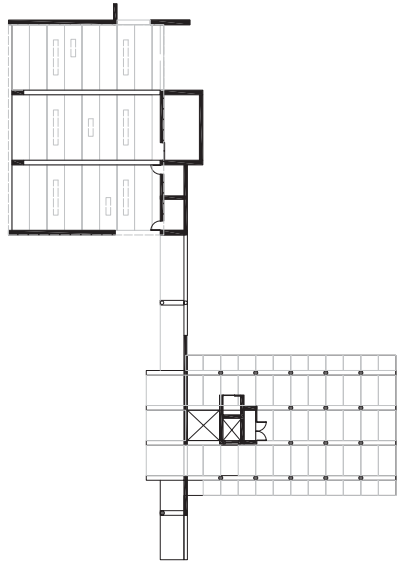
Natural daylight 83° in June / Natural cross ventilation

Insulated envelope / Mechanical cooling ventilation ERV+VRV

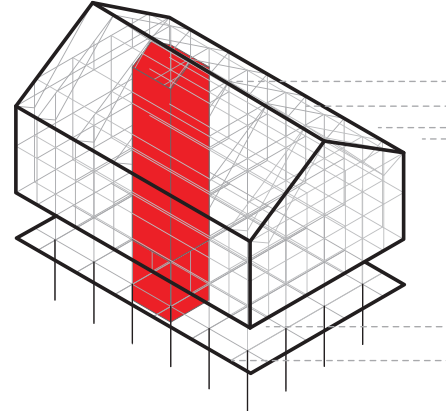


Winter

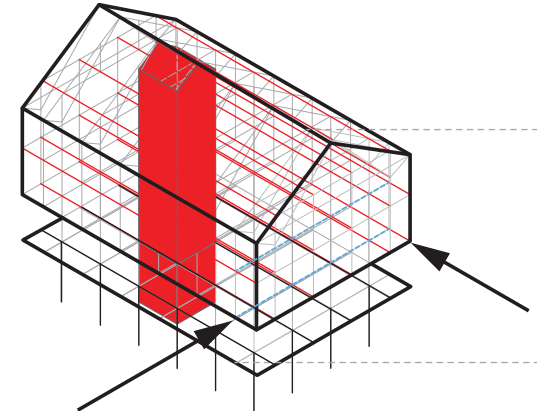
Natural daylight 34° in December / Natural green house effect
Insulated envelope / Mechanical heating ventilation ERV+VRV



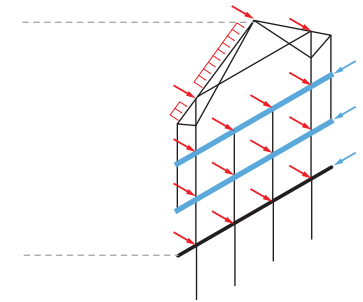
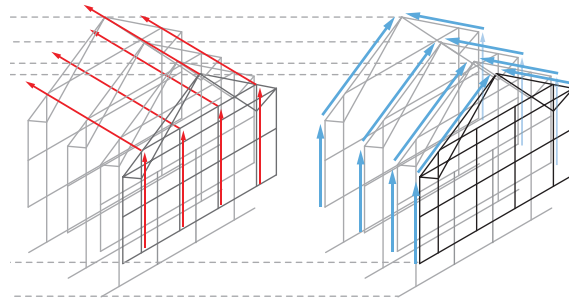
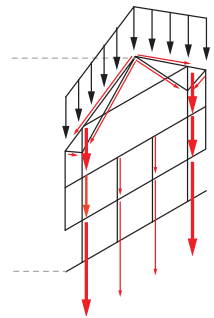
Load bearing



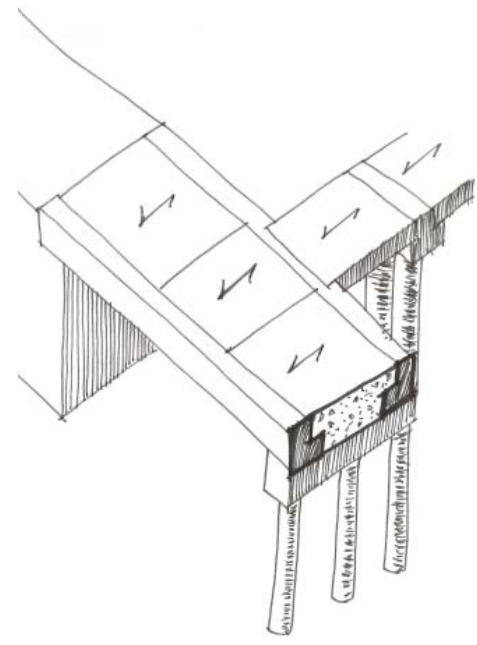
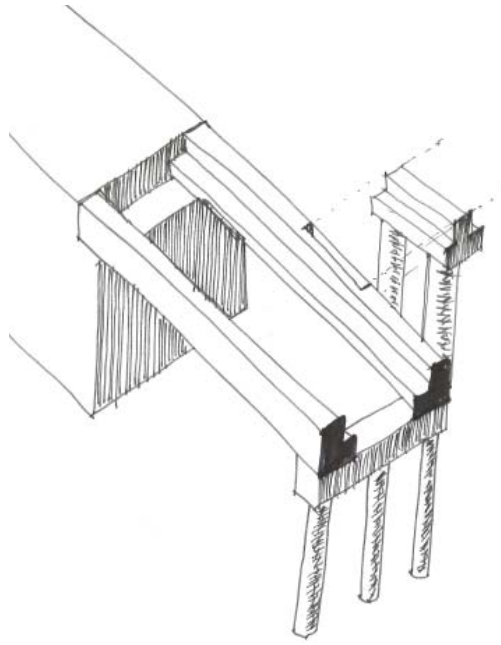
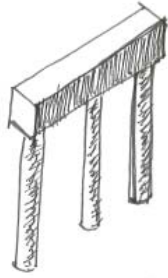
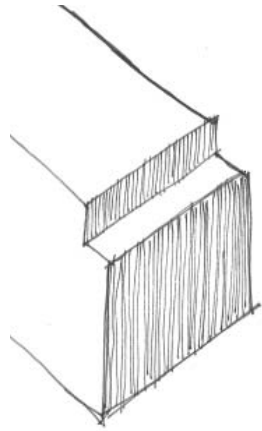
Cantilever



Rotation

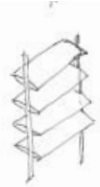
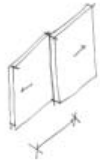
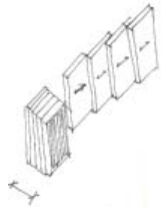
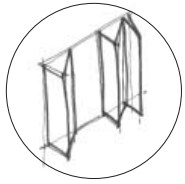


Structure system



Bridge Construction

Architectonic

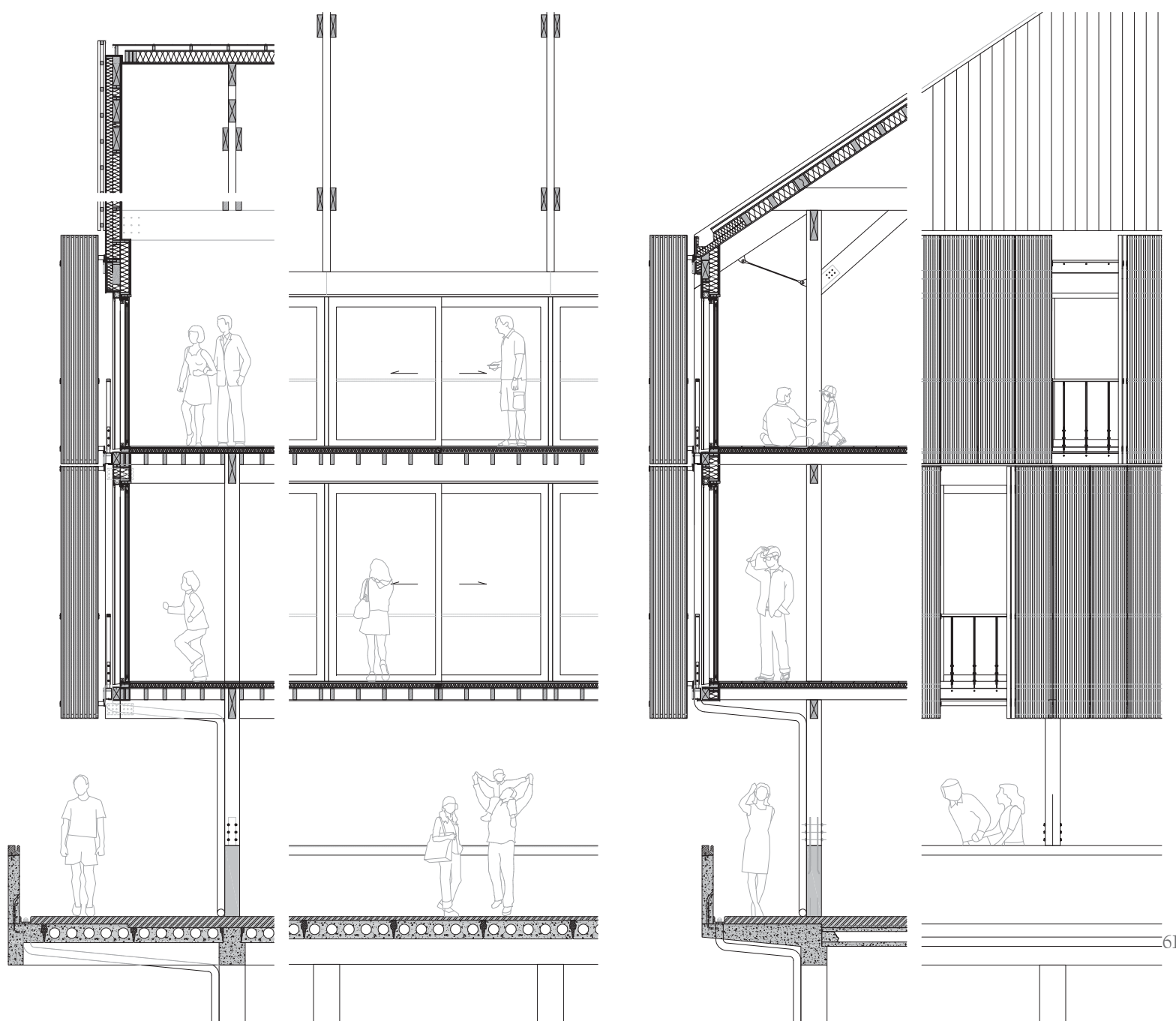


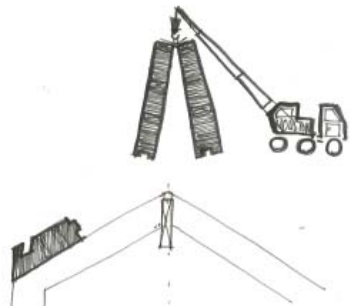
Facade

Vertical impression

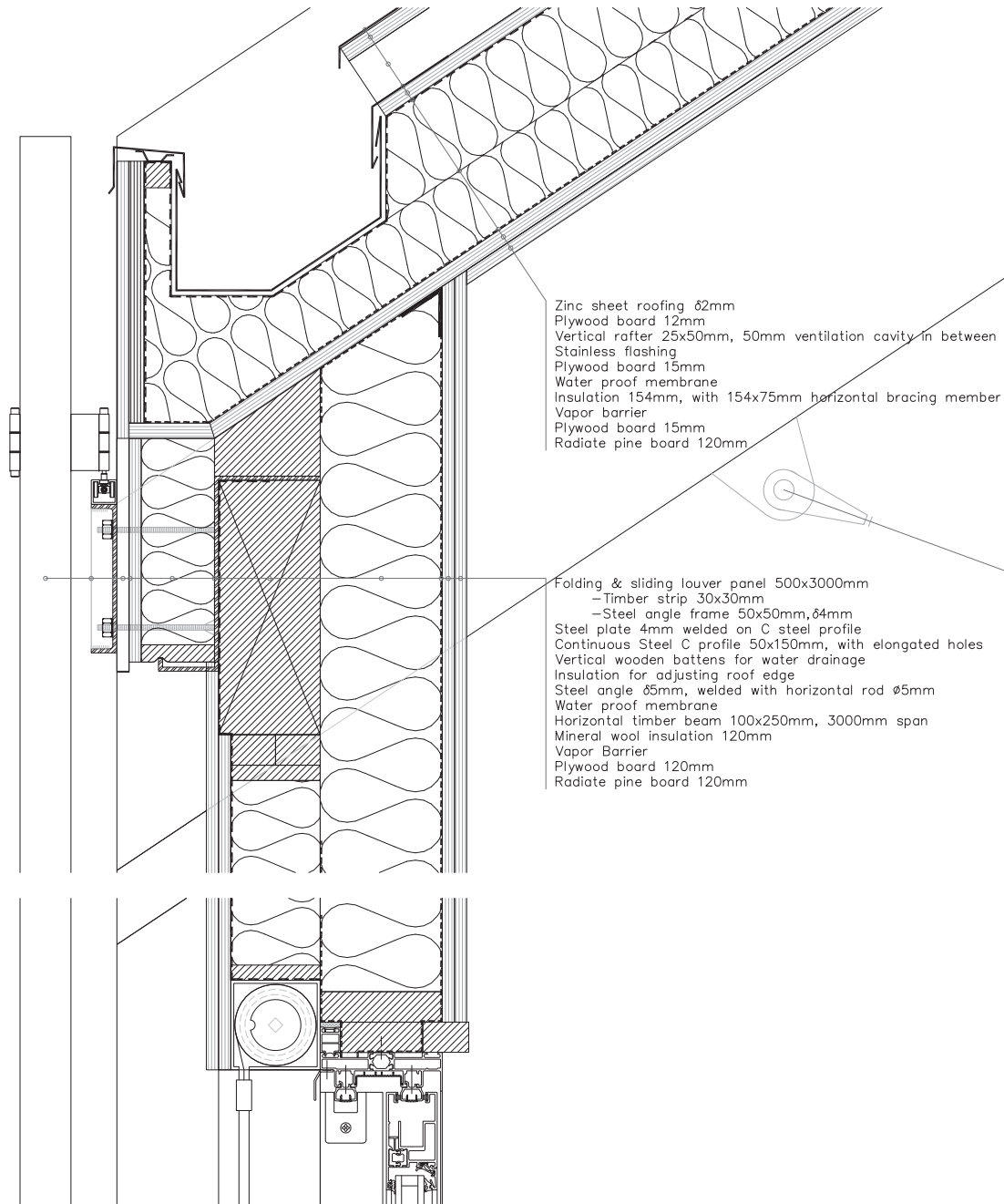
Folding & sliding louver panel

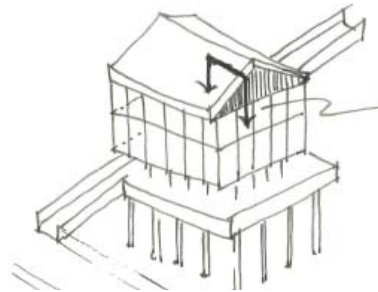
Sliding windows



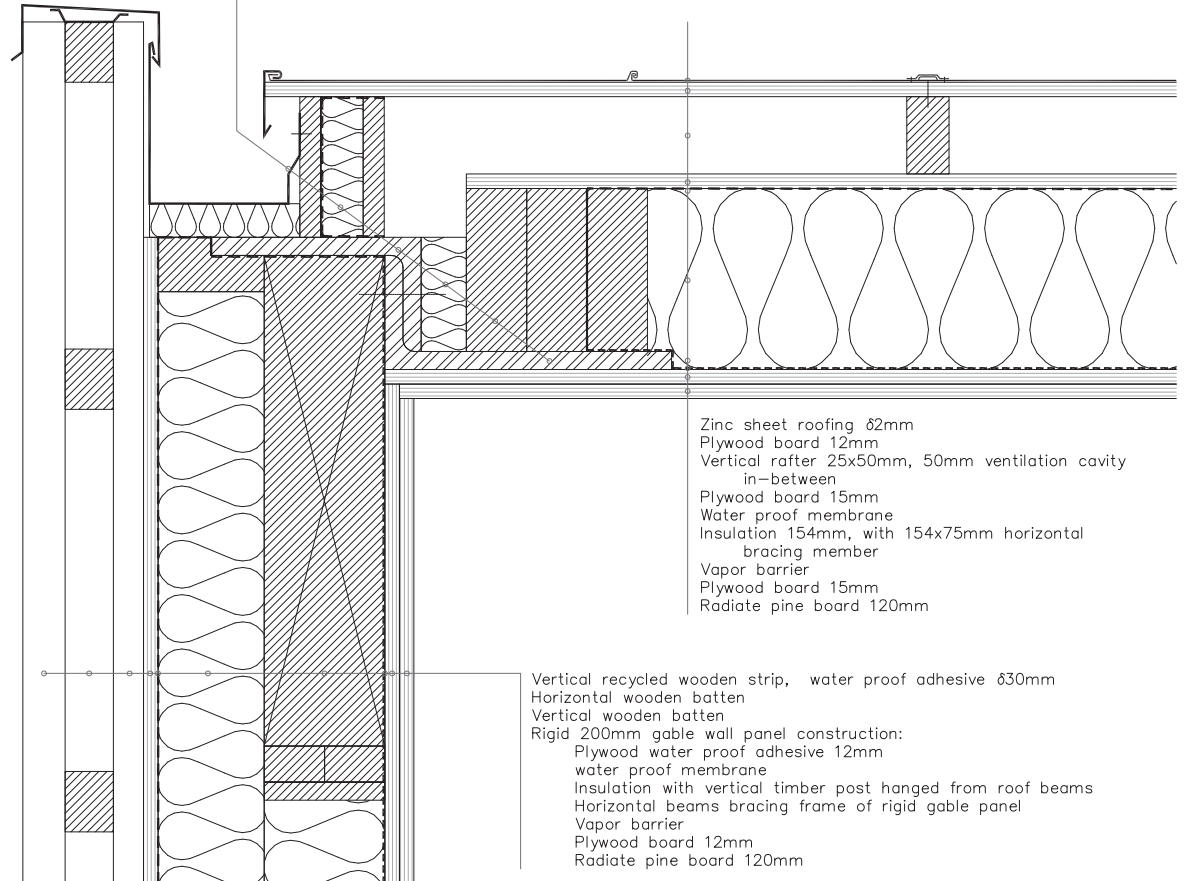


Roof construction

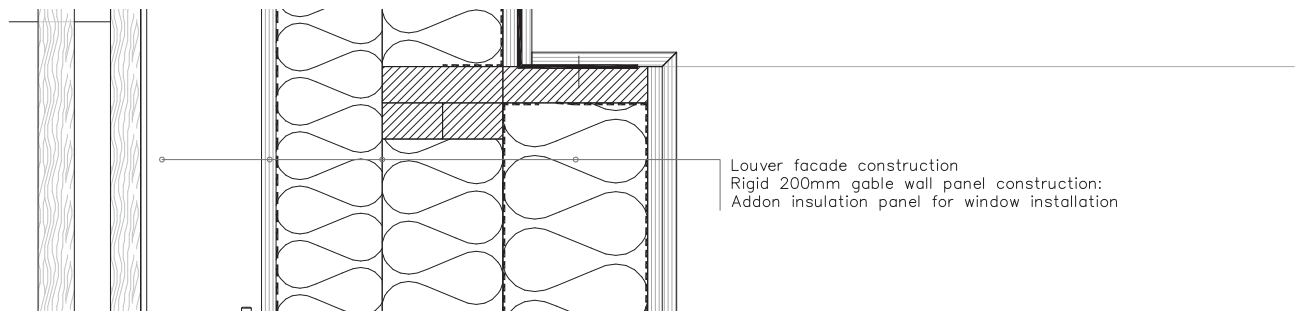


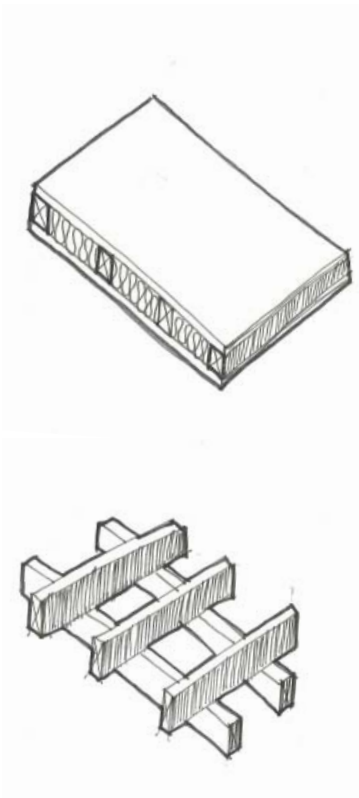


Steel angle $\delta 15$ mm, pre installed in roof pane
 Reinforced timber roof edge rafter
 Filled in on site insulation
 Filled in on site insulation with wooden boards
 Stainless flashing

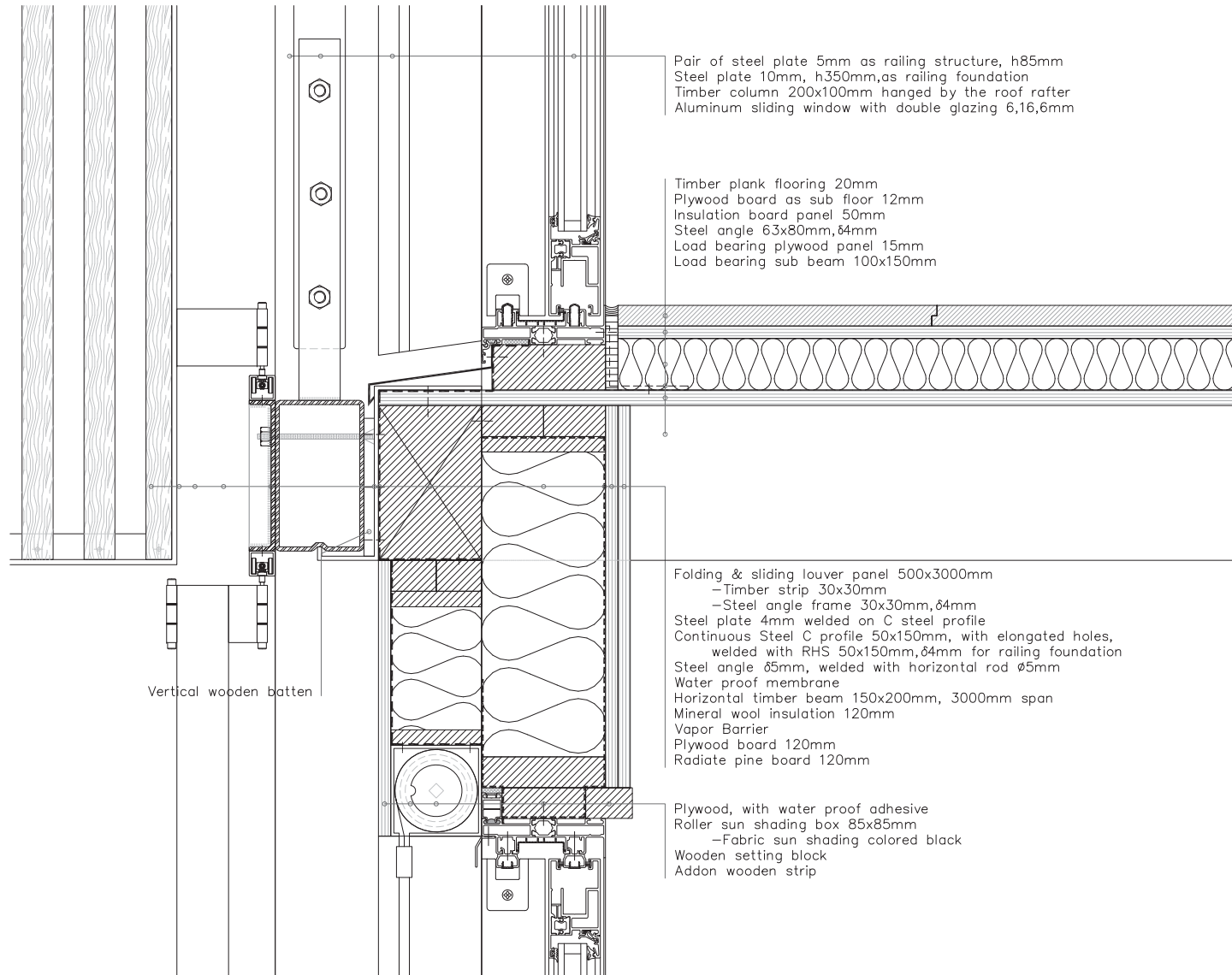


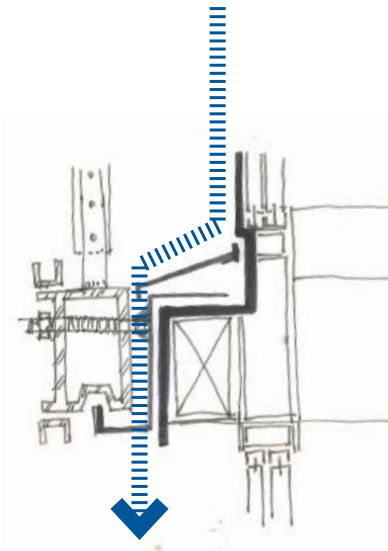
Gable wall construction



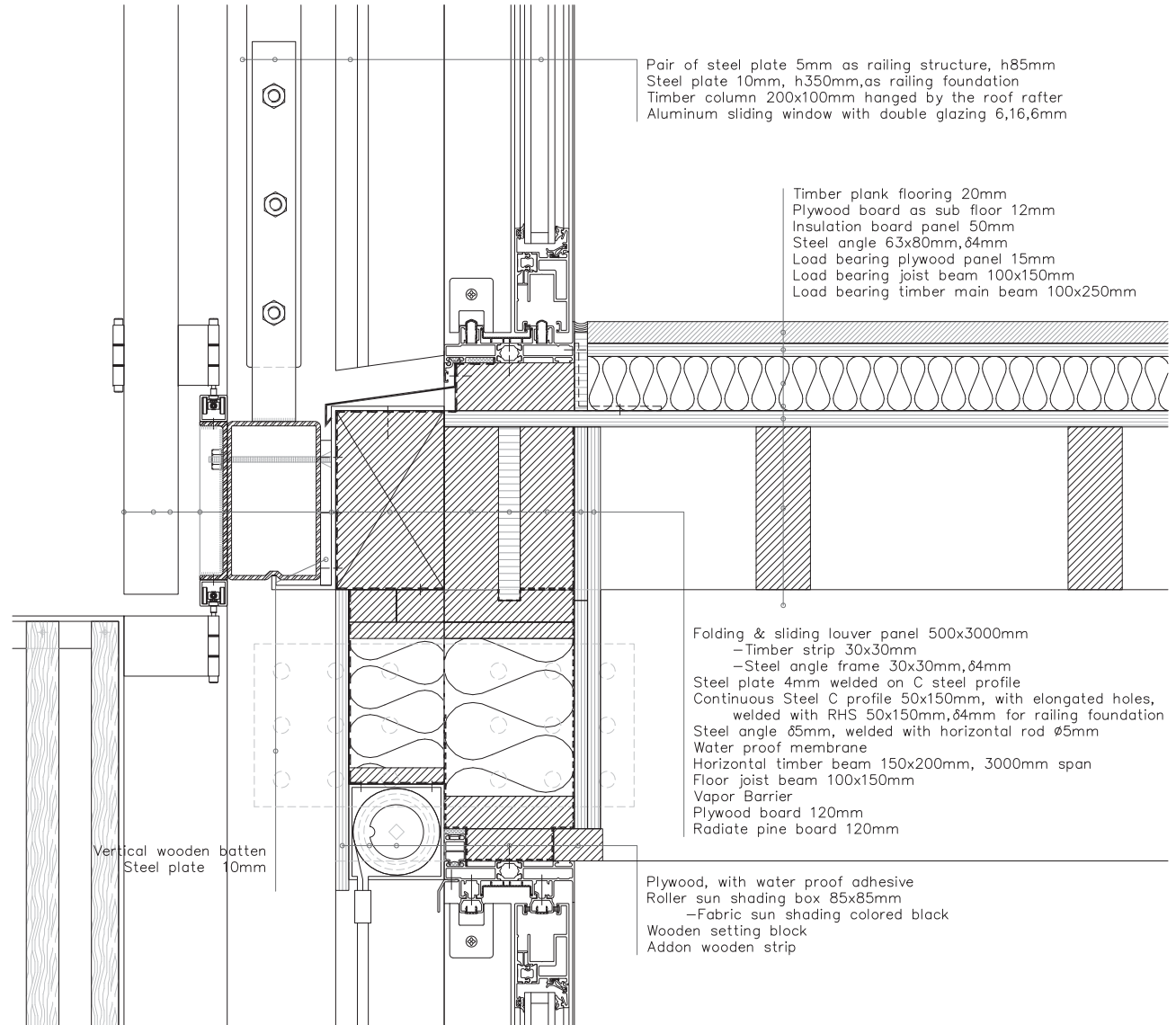


Floor & facade construction

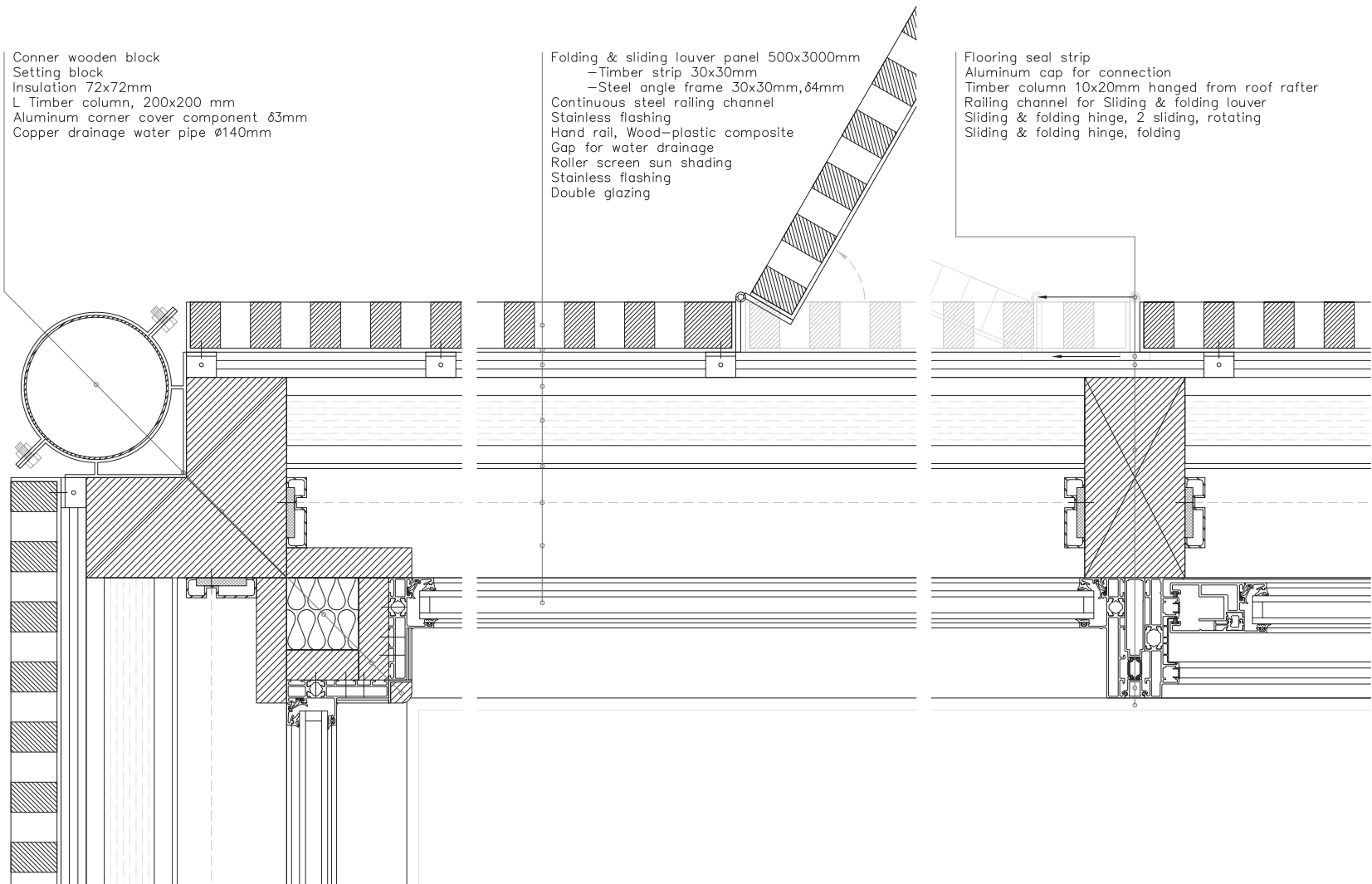


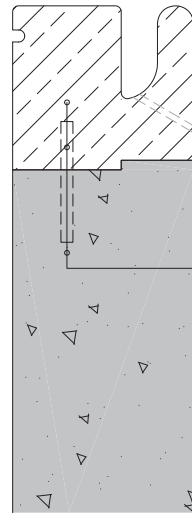


Facade as a water proof layer



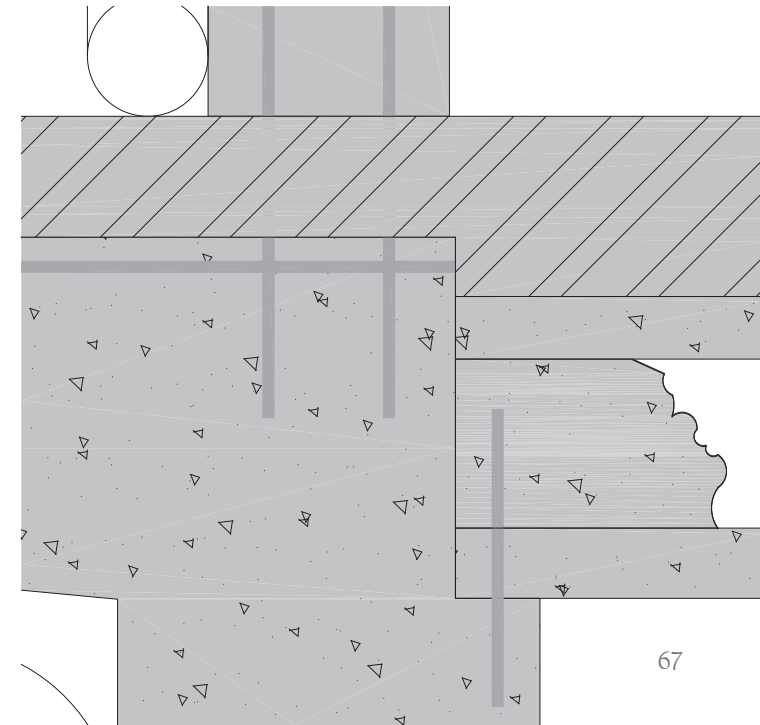
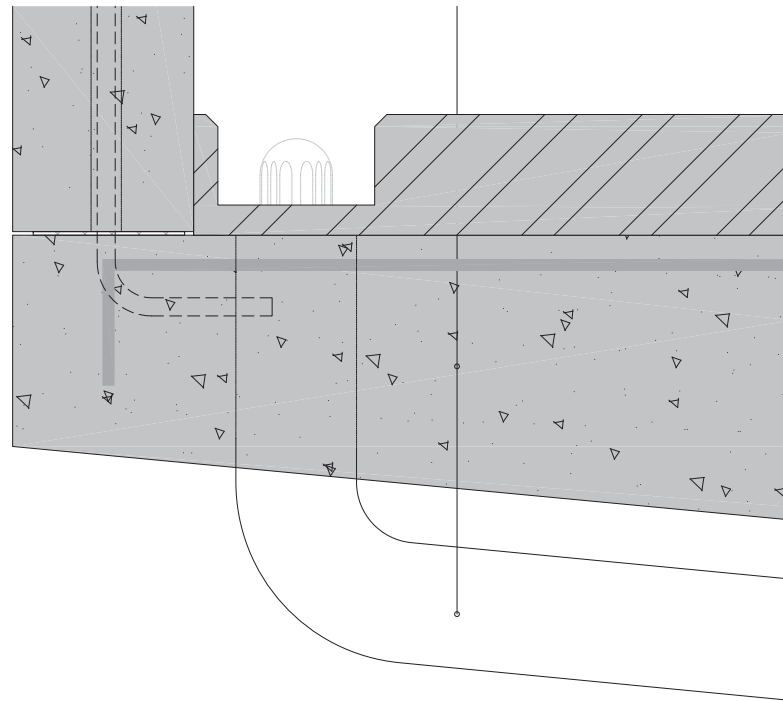
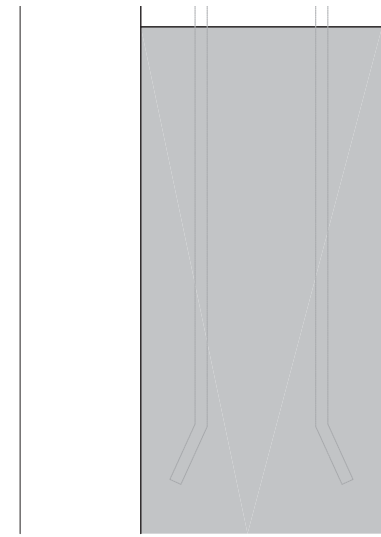
Corner construction



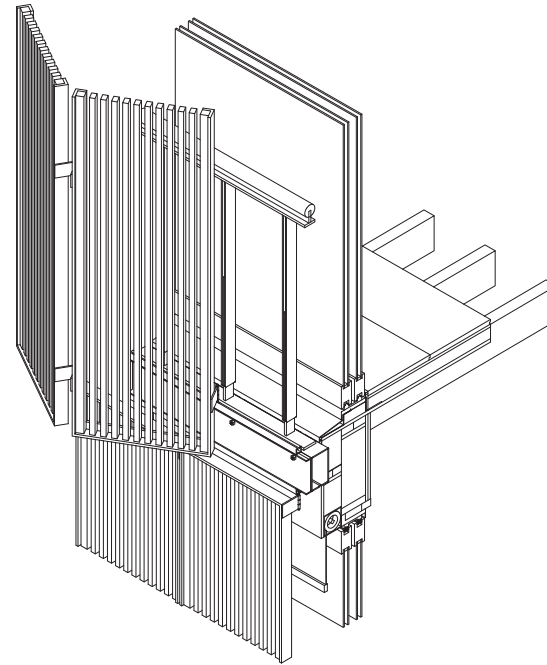
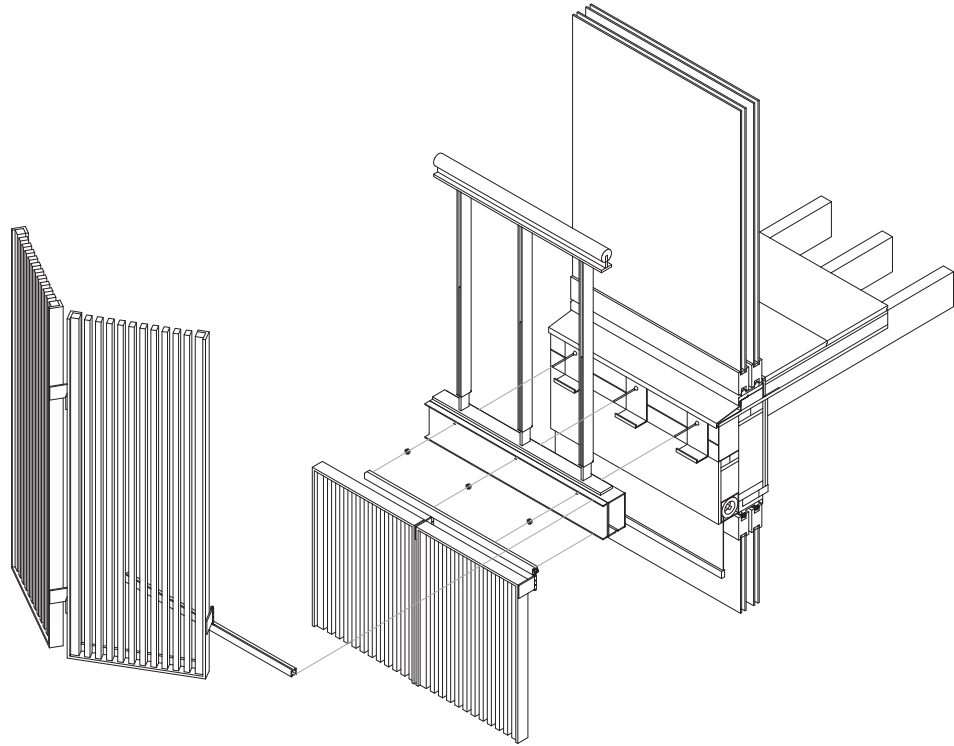


Railing construction:
Artificial stone element with water drainage hole
Reinforcement stick
Precast concrete parapet $\delta 150\text{mm}$

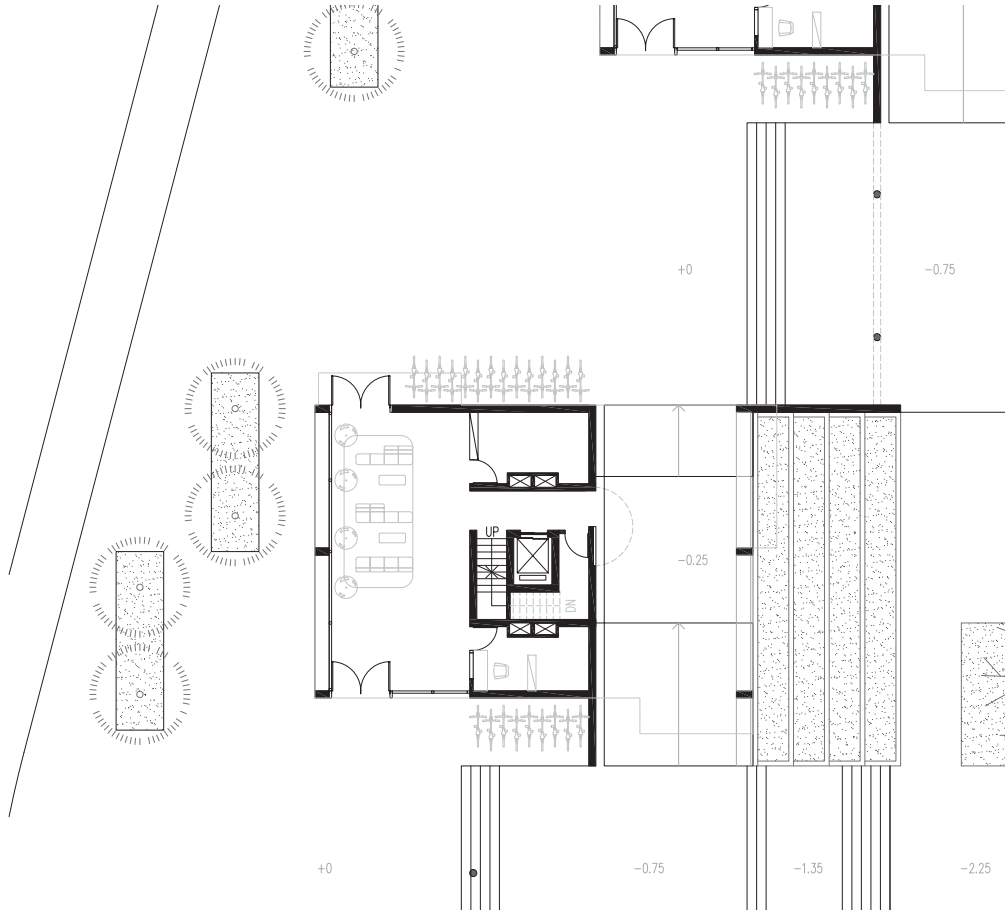
Concrete floor construction:
Precast beam with cantilever slab
Precast water drainage channel
Water proof cement screed $\delta 100\text{mm}$
for drainage slope 1%
Drainage pipe $\varnothing 80\text{mm}$



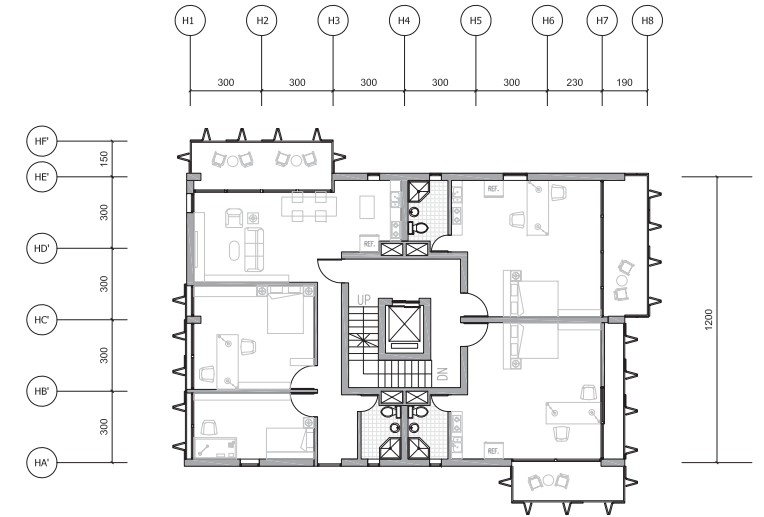
Parapet / Railing / Platform



Constrcution of facade



GL

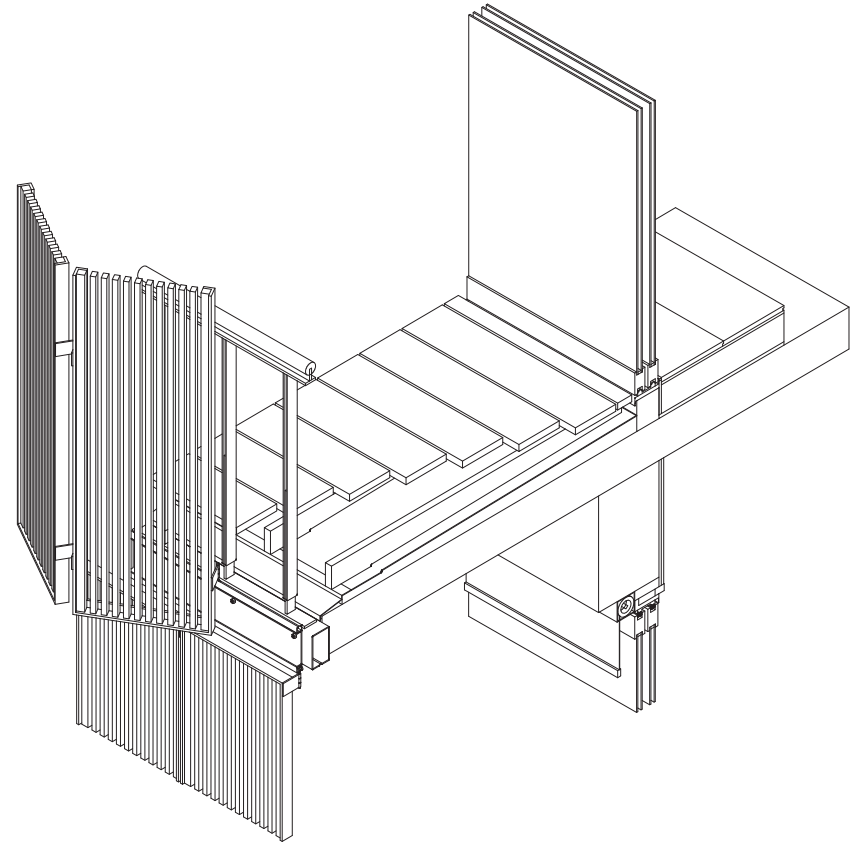
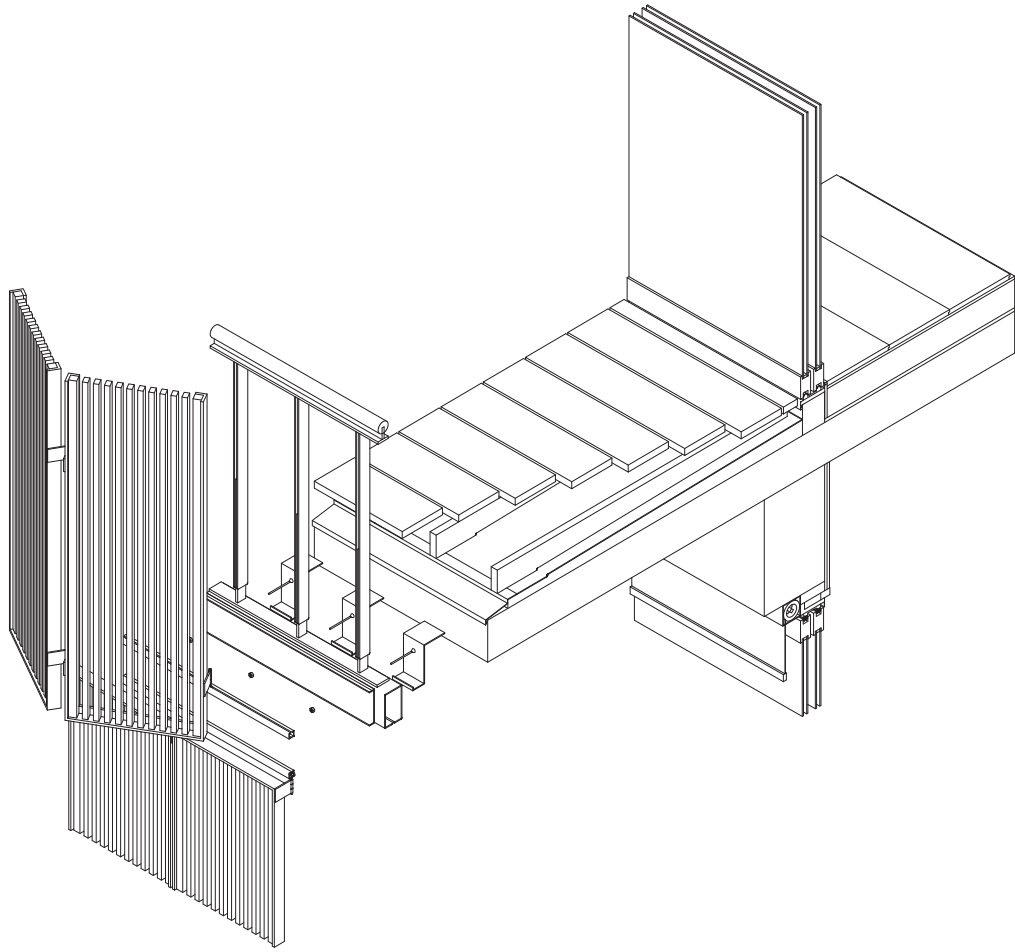


1F~3F principle plan

Principle floor plan of housing

GF-Prefab Concrete structure

1F~3F- Timber frame + timber panel structure



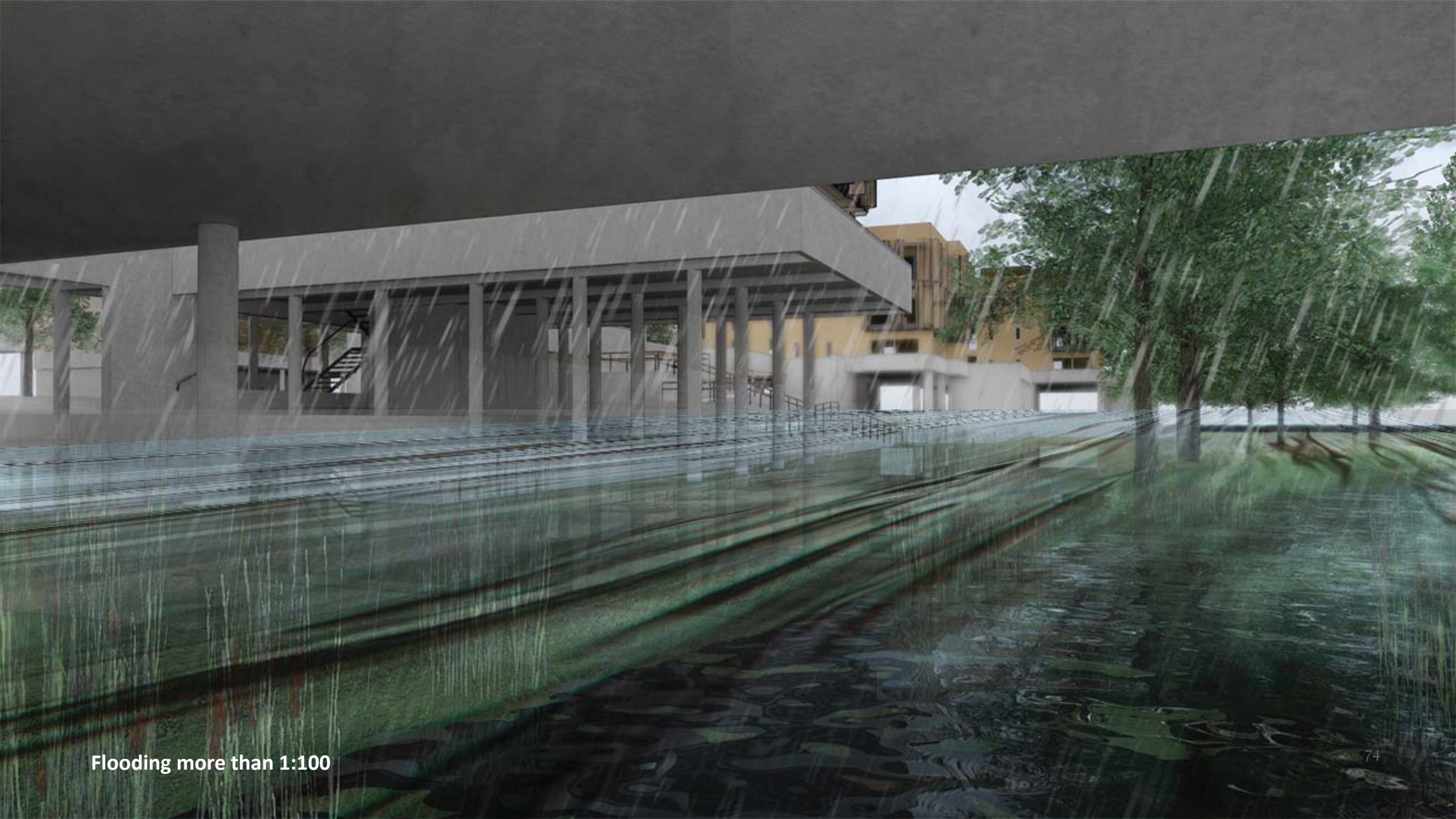
Facade application on Housing



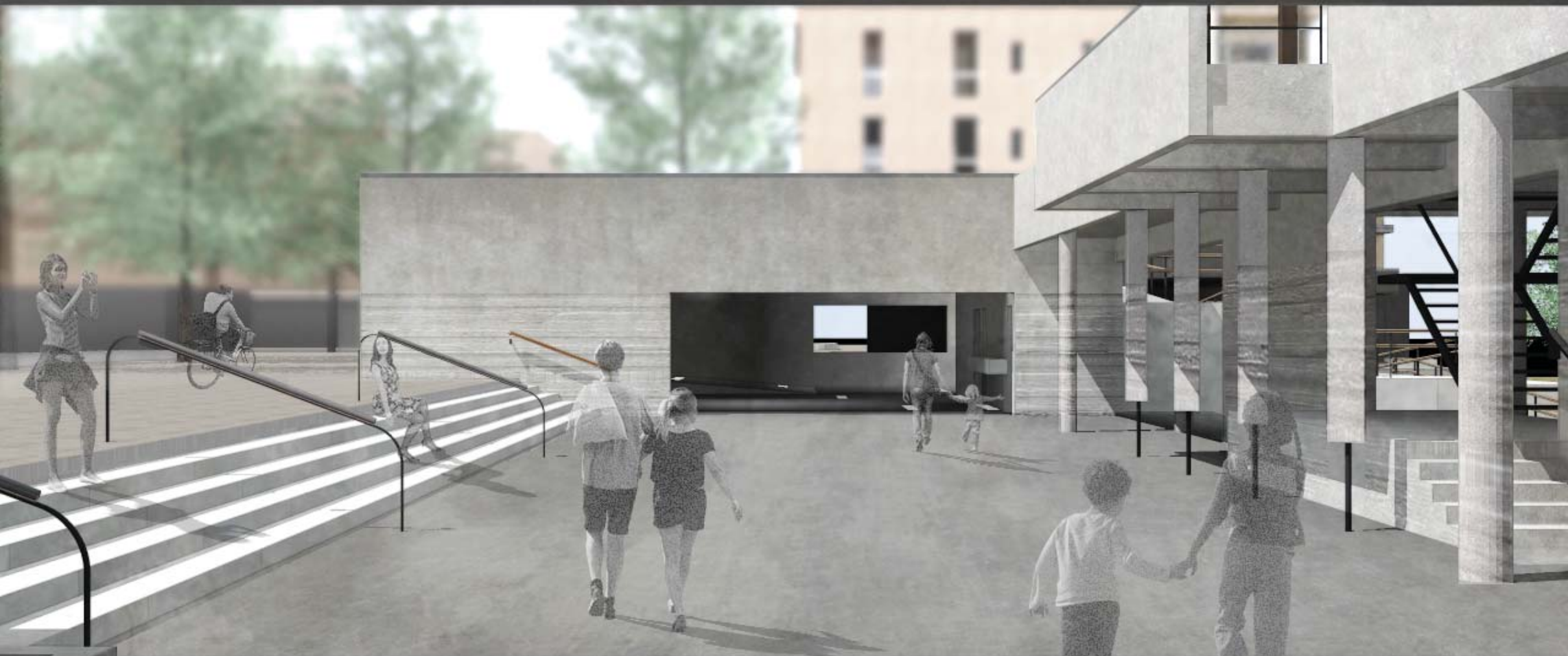
Architectural Promenade



Variety of landscape



Flooding more than 1:100



Public square



Extreme flooding (more than 1/500)



Thanks for your attention