Harbour City Amsterdam

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Delegate of the Board of Examiners | **René van der Velde** |

Contents

Introduction

Problem Statement

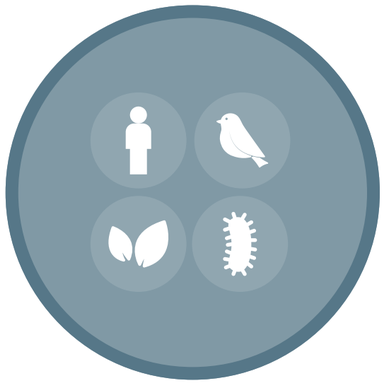
Not enough attention for water usage and nature within the Open Building concept.

INEFFICIENT USE WATER RESOURCES

Increased (extreme) precipitation
Increased floodrisk
Impaired water quality
Subsidence

URBAN HEAT ISLAND EFFECT

Increased temperatures
Heat stress
Increased energy usage
Increased air-pollution



BIODIVERSITY LOSS

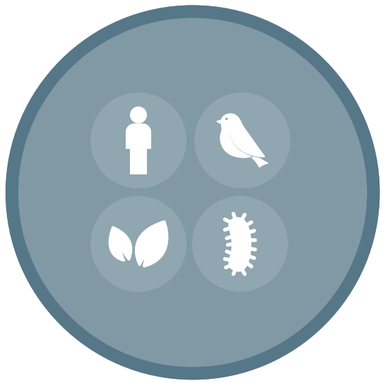
Poor ecological quality
Human habitat disconnected from nature

UNBALANCED HOUSING STOCK

Housing shortage
Wrong target group
(mostly) Not built for adaptation
(New) Construction disconnected from nature
Slow process

Opportunities

Combining nature-based solutions with open building



ENVIRONMENTAL

SOCIAL

ECONOMIC

Objective

The objective is to create a **high-density, mixed-use** (circular) neighbourhood based around the principles of **nature-based solutions** combined with the **‘Open Building’** concept to transform the Western Harbour Area into a publicly oriented **nature inclusive environment.**

An attempt to incorporate the water cycle to create qualitative nature inclusive public spaces within the ‘Open Building’ concept to change and renew the relationship of residential neighbourhoods with their environment. This project will strive to bring back the balance between liveability and socio-political, environmental and economic behavioural patterns within the city.

Thematic Research Question

“How can nature-based solutions be integrated within the ‘Open Building’ concept to create/ contribute to a ‘net positive (circular) water cycle’ which simultaneously achieves nature inclusive public space in a mixed-use, high-density neighbourhood?”

Sub questions

- What are the constituents of the **Open Building** concept and how are they related to the constituents of the water cycle when aiming for a '**net positive water cycle**'?

- How can the Open Building concept contribute to a **high-density** neighbourhood and **nature-inclusive** public space?

- What are **Nature-Based Solutions** and how can they be integrated within the 'Open Building' concept?

- What is the impact of densification on a 'net positive watercycle' and how can nature-inclusive public space (Nature-Based Solutions) mitigate these effects?

- How can Nature-Based Solutions contribute to nature-inclusive public space in a **mixed-use**, high-density neighbourhood?

Methods

CONTEXTUAL ANALYSIS

Morphology
Material culture
Ecology
Historic research
Administrative maps
Landcover map
Current context
Future plans

LITERATURE

Epistemes
Foundations
Justification
Facts & figures
Input

DATA

Numbers
Water system analysis
Water cycle analysis
Water properties analysis
Open building

CASE STUDIES

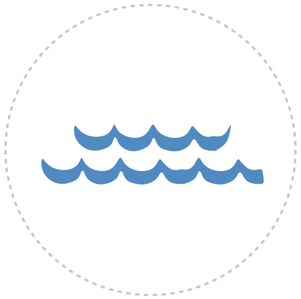
Greenblue
Open building
System options
Comparative
Completed
On going

Research Recap

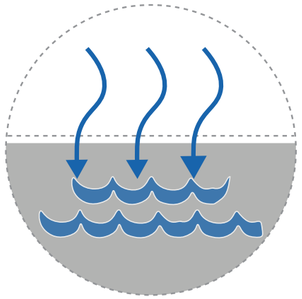
Water system

RAINWATER

SURFACEWATER

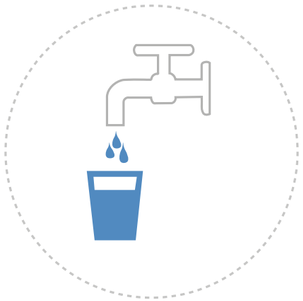


GROUNDWATER



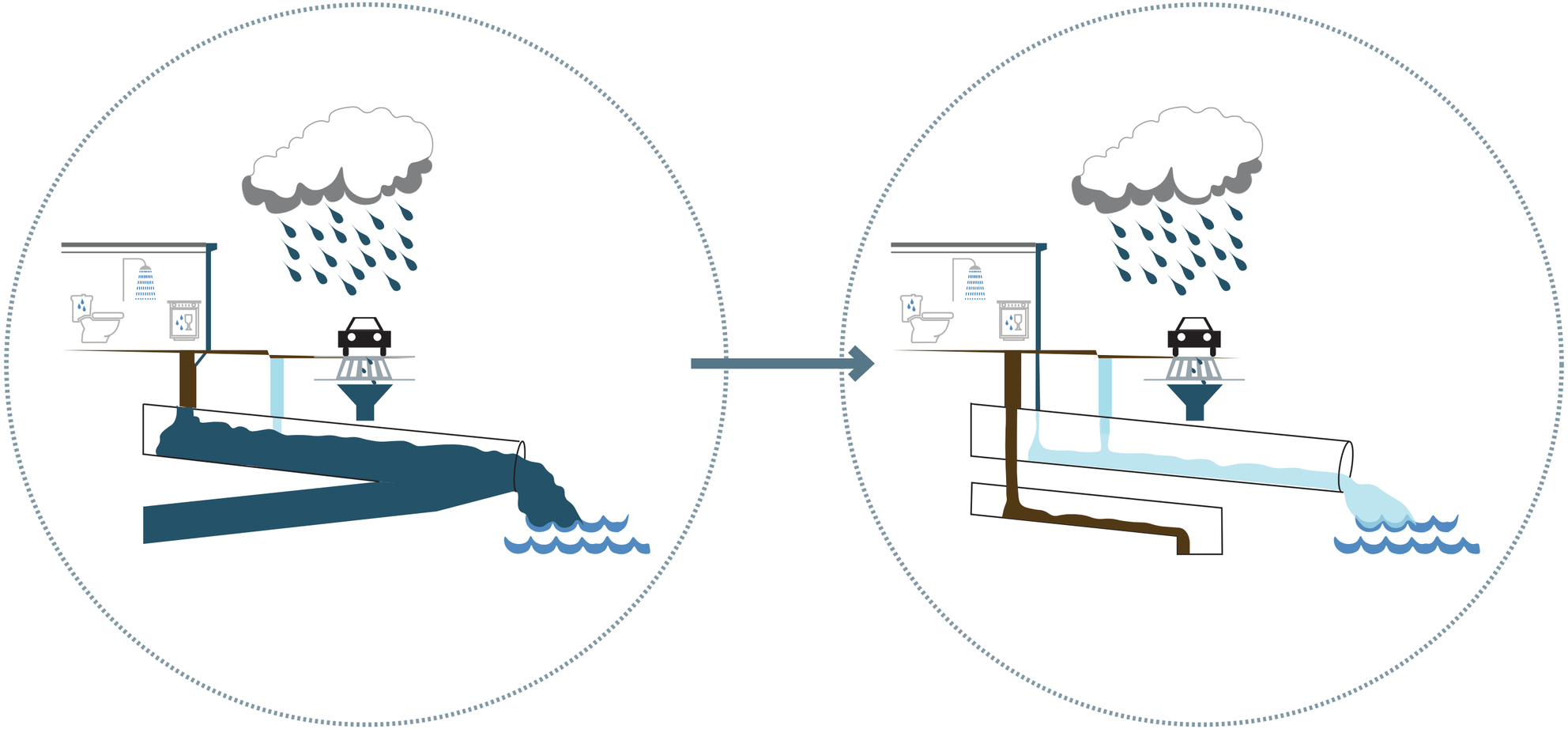
Water chain

DRINKWATER



GREYWATER

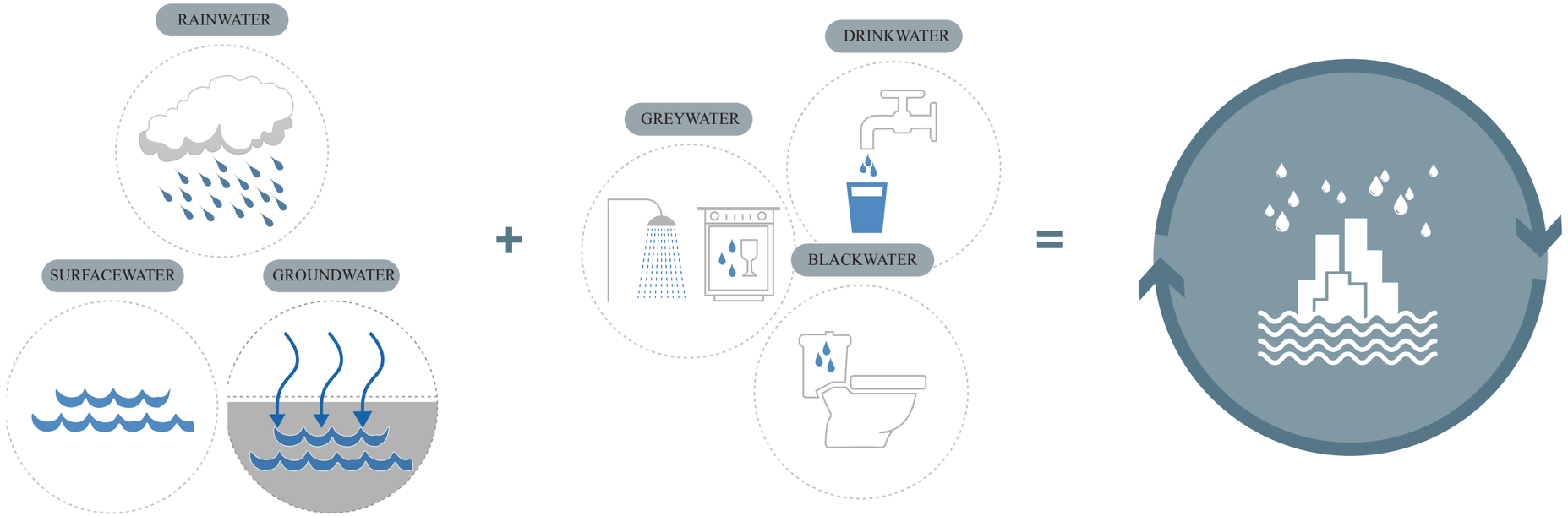
BLACKWATER



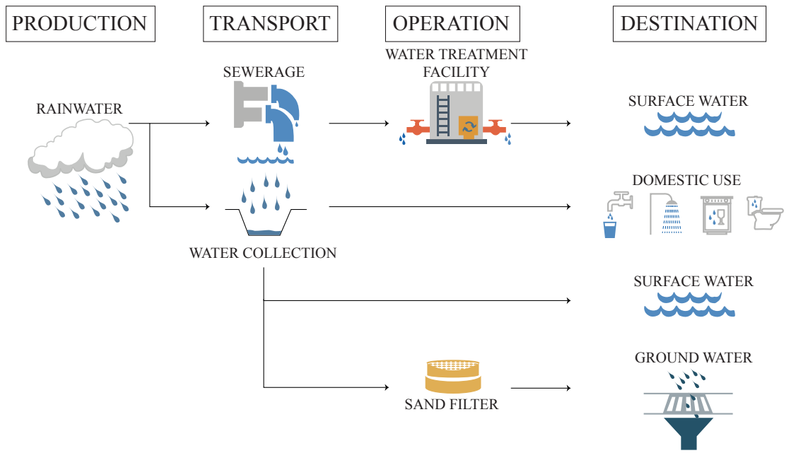
COMBINED SEWER SYSTEM

SEPARATED SEWER SYSTEM

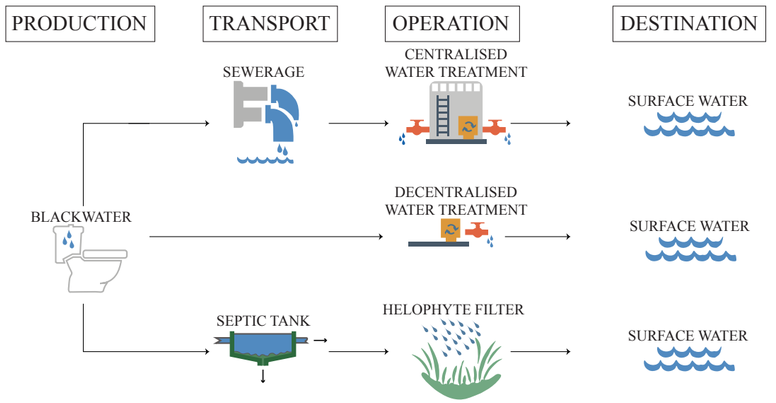
To bridge circularity gap



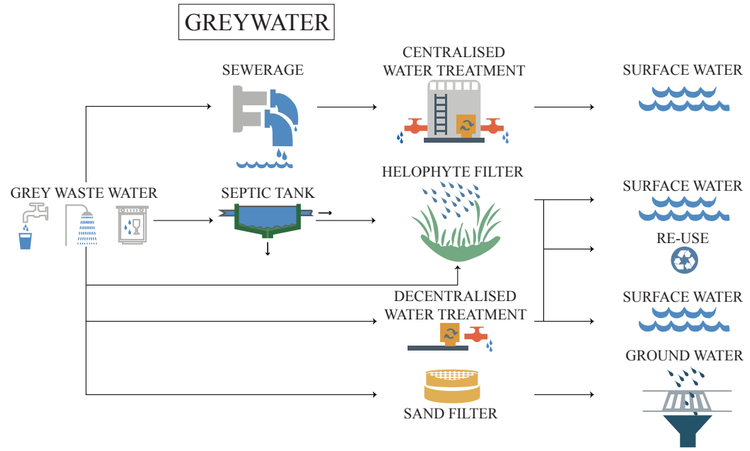
RAINWATER



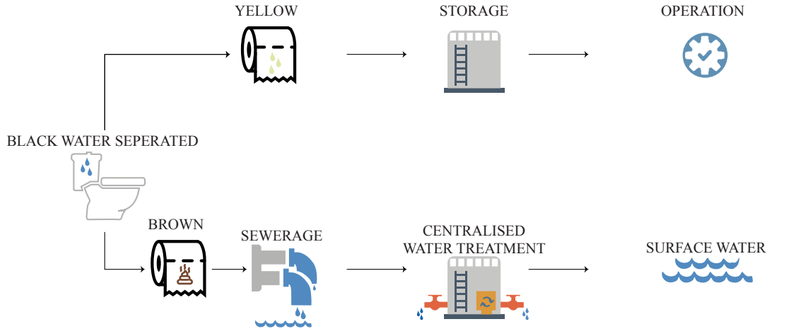
BLACK WATER



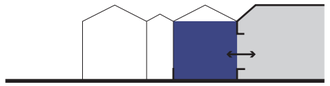
GREYWATER

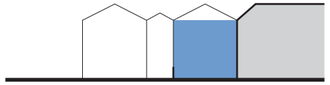


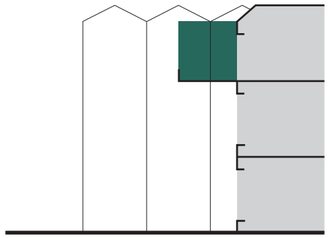
BLACK WATER SEPERATED

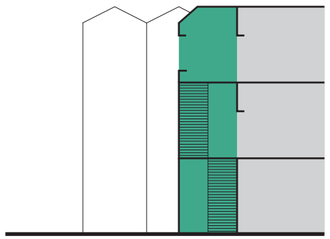


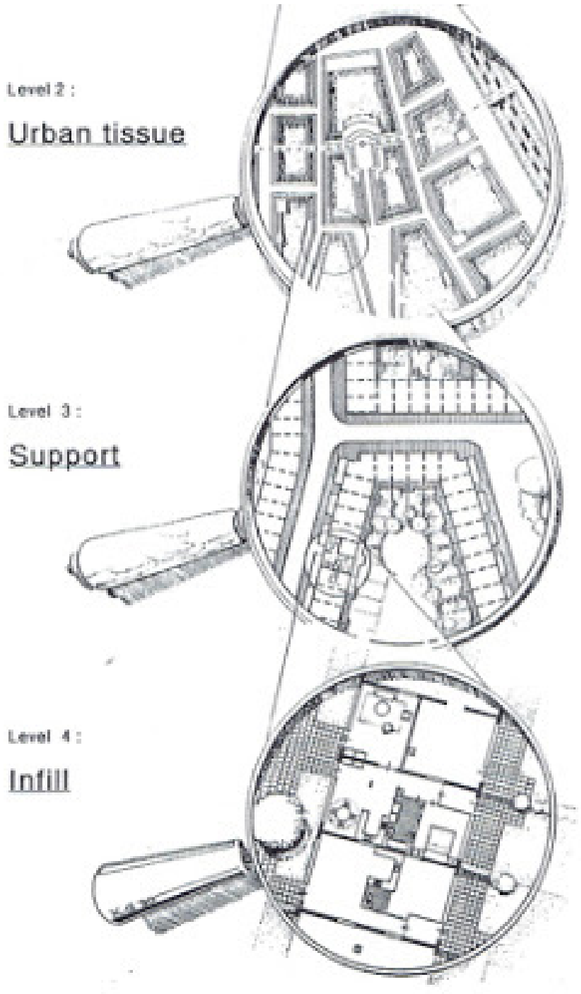
Open Building

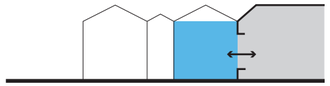


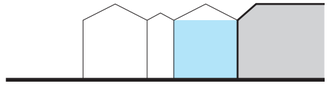


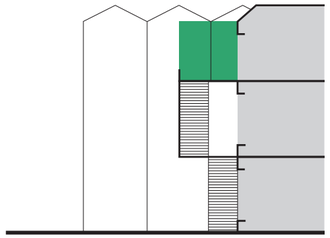


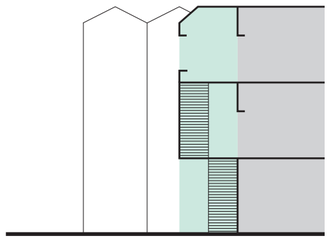




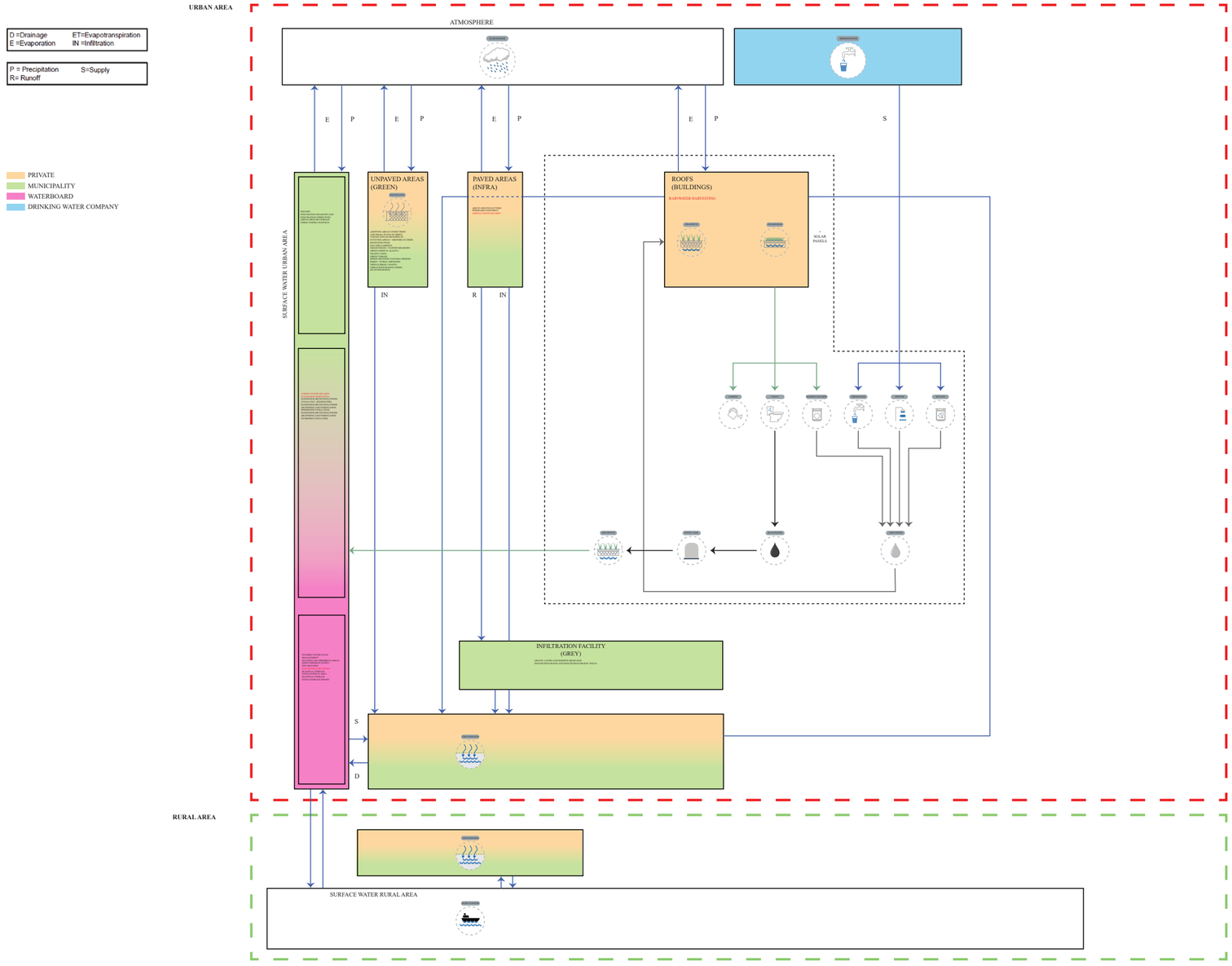


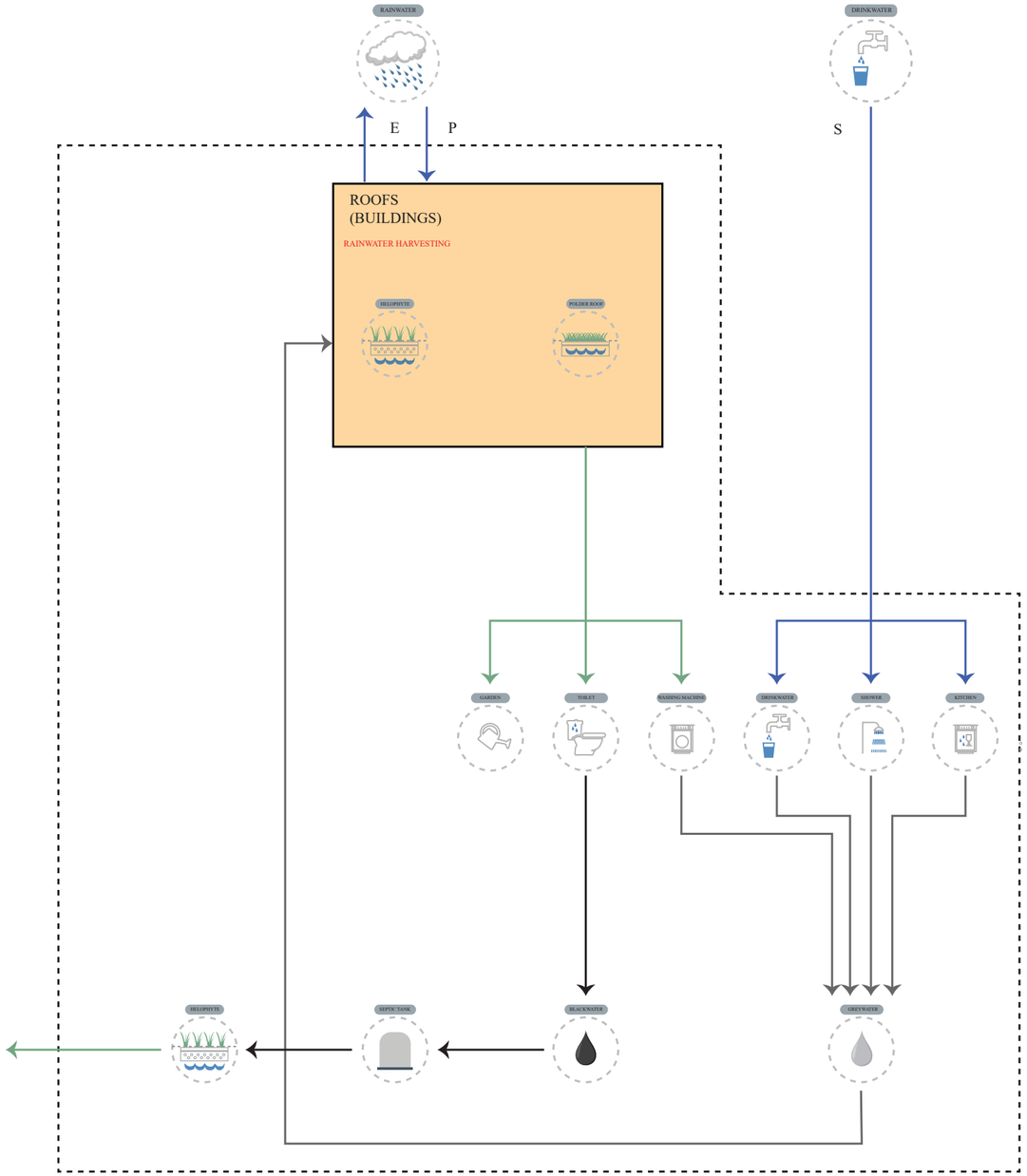






	MEASURES	INTERRELATION WATERCHAIN				WATERSYSTEM							SPATIAL IMPACT		URBAN TISSUE PUBLIC					PRIVATE	SUPPORT PUBLIC				INFILL PRIVATE	
		drinking water	Waste water	Greywater	Blackwater	Rainwater	Stormwater	Surfacewater	Groundwater	Soil	TECHNICAL	BIODIVERSITY	m2/IE	SUBSURFACE	O	βO	αO	βP	αP	P	γO	δO	γP	δP	α	β
✓	Above ground Drainage (gutters)					✓	✓	✓			✓															
✗	Adopting areas under trees and small plots of green											✓														
–	Bidet																									
✓	Bioswale/ bioretention cell					✓	✓	✓	✓	✓	✓	✓														
✓	Connection of biotopes to the outlying areas + green-blue grids					✓	✓	✓	✓	✓	✓	✓														
✓	Cooling extraction		✓	✓	✓	✓	✓	✓	✓		✓															
✓	Decentralised treatment	✓	✓	✓	✓			✓			✓															
✓	Ditches					✓	✓	✓	✓	✓		✓														
✓	Diver							✓		✓	✓															
✓	Downspout Disconnection					✓	✓		✓	✓	✓															
✗	Dry stone walls					✓					✓	✓														
–	Facilities for birds and other fauna on and around buildings										✓	✓														
–	Flexible water level management					✓	✓	✓	✓	✓																
✓	Floating or amphibious areas					✓	✓	✓			✓															
✓	(facade) Gardens					✓			✓	✓		✓														
✓	Grass fields + flower meadows					✓			✓	✓		✓														
–	Gravel layers and reserve drainage					✓	✓		✓	✓	✓															
✓	Green Riparian zones + wet biotopes							✓				✓														
✓	Green Roofs					✓			✓		✓	✓														
✗	Green Streets, Alleys + traffic lines					✓	✓		✓	✓		✓														
✓	Green Verges					✓	✓		✓	✓		✓														
✗	Green water squares					✓		✓	✓	✓	✓	✓														
✓	Heat extraction	✓	✓	✓	✓	✓		✓	✓		✓															
✓	Hedge biotopes/ natural hedges					✓			✓	✓		✓														
✓	Helophyte filter		✓	✓		✓		✓	✓	✓		✓														
✗	Helophyte filter (horizontal)		✓	✓		✓		✓	✓	✓		✓														
✗	Helophyte filter (vertical)		✓	✓		✓		✓	✓	✓		✓	2,5-5													
✗	Helophyte filter (vertical aerated)		✓	✓		✓		✓	✓	✓		✓	0,5-1													
✗	Infiltration boxes and infiltration drains/ wells					✓	✓		✓	✓	✓															
✗	Infiltration meadows and infiltration strips with above ground storage					✓		✓	✓	✓		✓														
–	Membrane filtration	✓	✓	✓	✓						✓															
✓	Parks + public greenery					✓			✓	✓		✓														
✓	Participation + Education	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓														
✓	Permeable Pavements (scoria semi)					✓	✓		✓	✓	✓															
✓	Pipes	✓	✓	✓	✓	✓	✓	✓			✓															
✓	Pump station (distribution household water)	✓				✓		✓	✓		✓															
✓	Rainwater harvesting	✓				✓		✓	✓		✓															
✓	Rainwater ponds (clean incl. rinsewater)					✓		✓	✓	✓		✓														
✗	Rainwater ponds (buffering and purification moderately polluted)					✓		✓	✓	✓		✓														
✓	Rainwater ponds (buffering and purification extremely polluted)					✓	✓	✓	✓	✓	✓	✓														
✓	Rainwater storage below buildings					✓				✓	✓															
✗	Rainwater tanks (regenton)					✓					✓															
✓	Sand filter		✓	✓		✓		✓	✓	✓		✓														
✓	Seasonal storage extra surface area					✓		✓	✓	✓																
✓	Seasonal storage extra storage height					✓		✓	✓	✓																
✓	Separate sewer	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓															
–	Toilet compost/ dry	✓	✓		✓						✓															
✓	Toilet urine diverting	✓	✓		✓						✓															
✓	Toilet vacuum	✓	✓		✓						✓															
✓	Trees (Urban Tree Canopy)					✓			✓	✓		✓														
✗	Urban infiltration strips (planter boxes)					✓	✓		✓	✓	✓	✓														
✓	Urban water channels					✓	✓	✓			✓															
✓	Water roofs					✓		✓			✓															
✗	Water squares					✓		✓	✓	✓	✓															

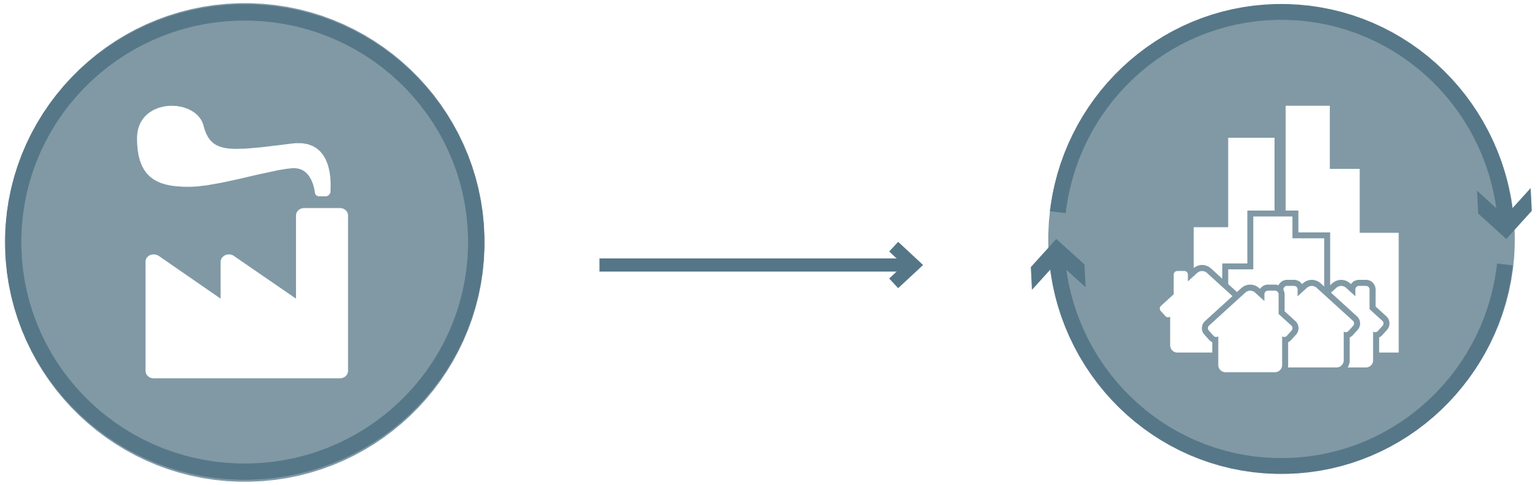

D =Drainage
E =Evaporation
ET=Evapotranspiration
IN =Infiltration
P = Precipitation
R= Runoff
S=Supply
PRIVATE
MUNICIPALITY
WATERBOARD
DRINKING WATER COMPANY
URBAN AREA
ATMOSPHERE
E
P
S
UNPAVED AREAS (GREEN)
PAVED AREAS (INFRA)
ROOFS (BUILDINGS)
RAINWATER HARVESTING
SOLAR PANELS
IN
R
SURFACE WATER URBAN AREA
INFILTRATION FACILITY (GREY)
D
RURAL AREA
SURFACE WATER RURAL AREA


RAINWATER
DRINKWATER
E
P
S
ROOFS
(BUILDINGS)
RAINWATER HARVESTING
HELOPHYTE
POLDER ROOF
GARDEN
TOILET
WASHING MACHINE
DRINKWATER
SHOWER
KITCHEN
HELOPHYTE
SEPTIC TANK
BLACKWATER
GREYWATER

Design

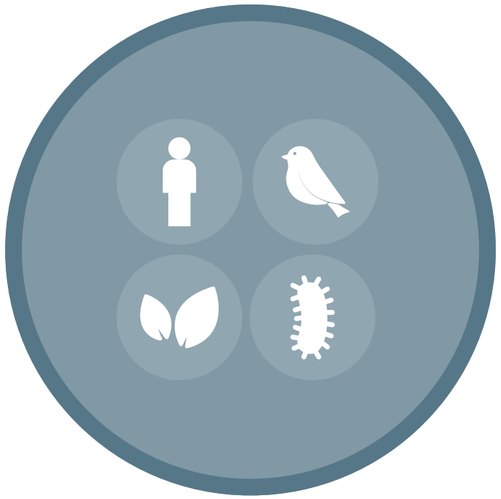
Overall Design Question

“How can nature-based solutions be combined with the Open Building concept to create a mixed-use, high-density neighbourhood in order to transform the Western Harbour area of Amsterdam into a publicly oriented nature inclusive live work environment?”

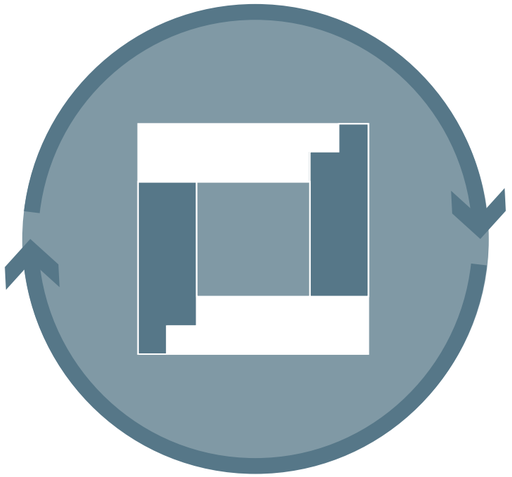


Industrial

Post-industrial

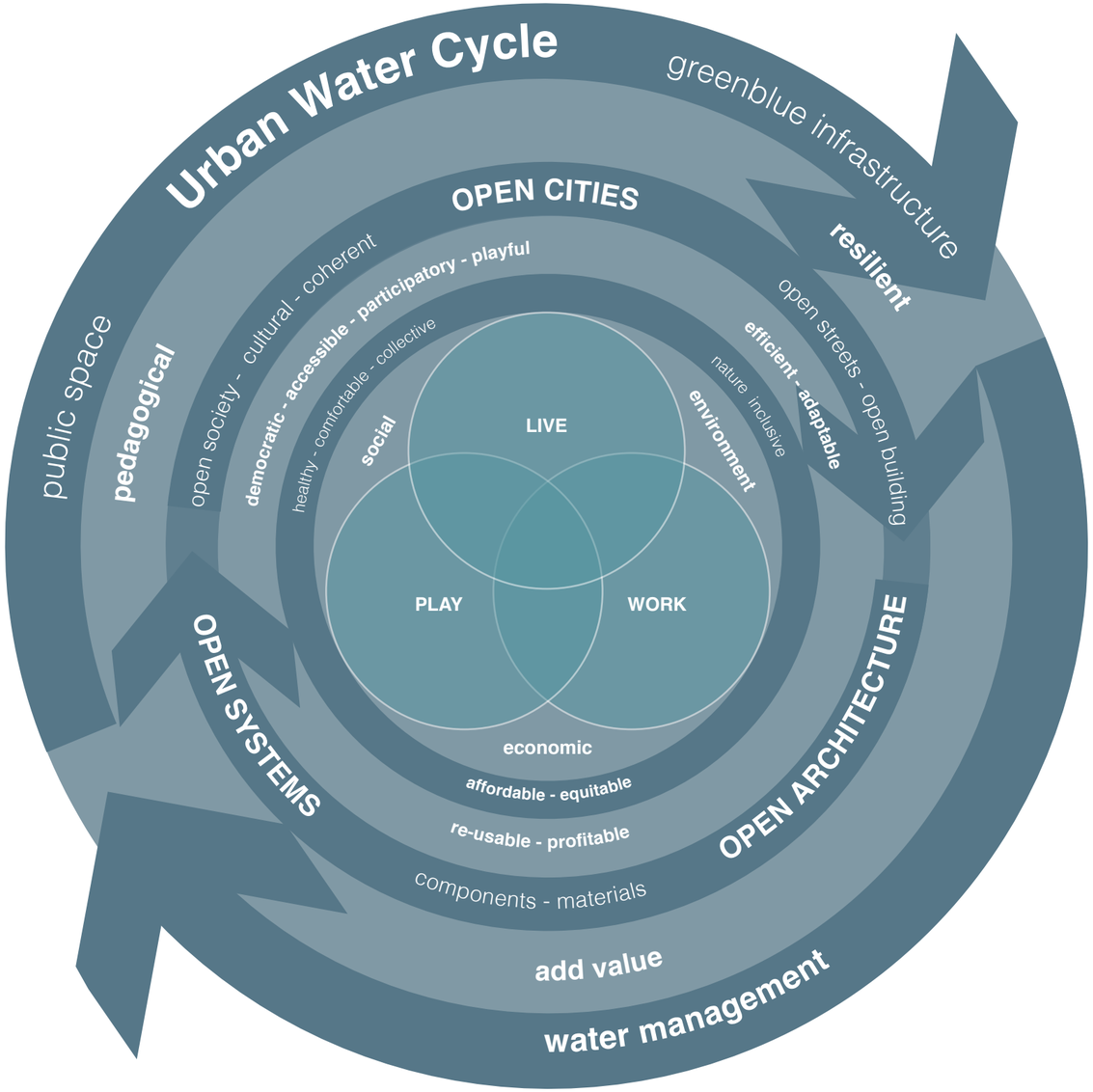


Nature-Based Solutions

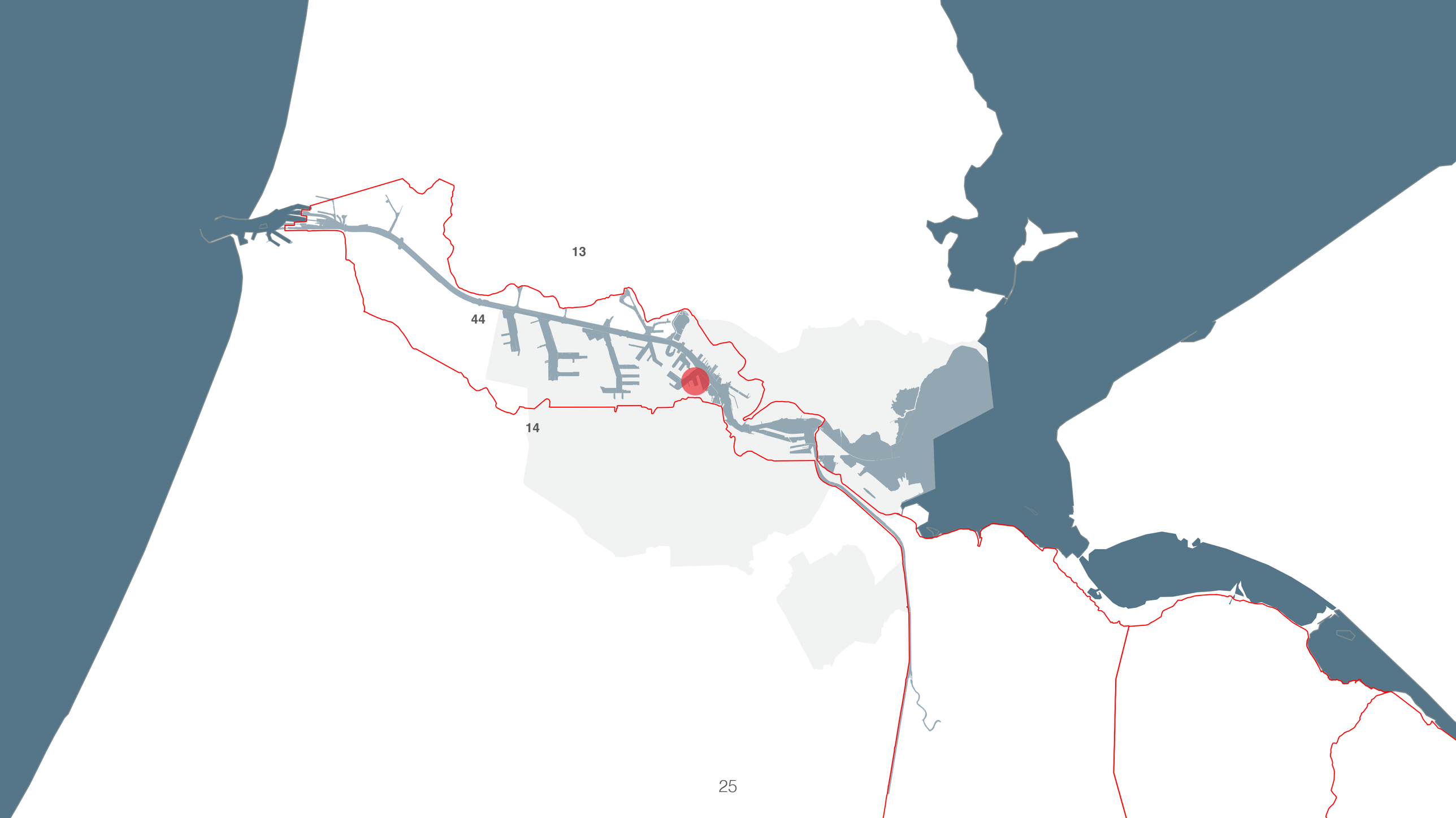


Open Building

MIXED-USE NEIGHBOURHOOD



Context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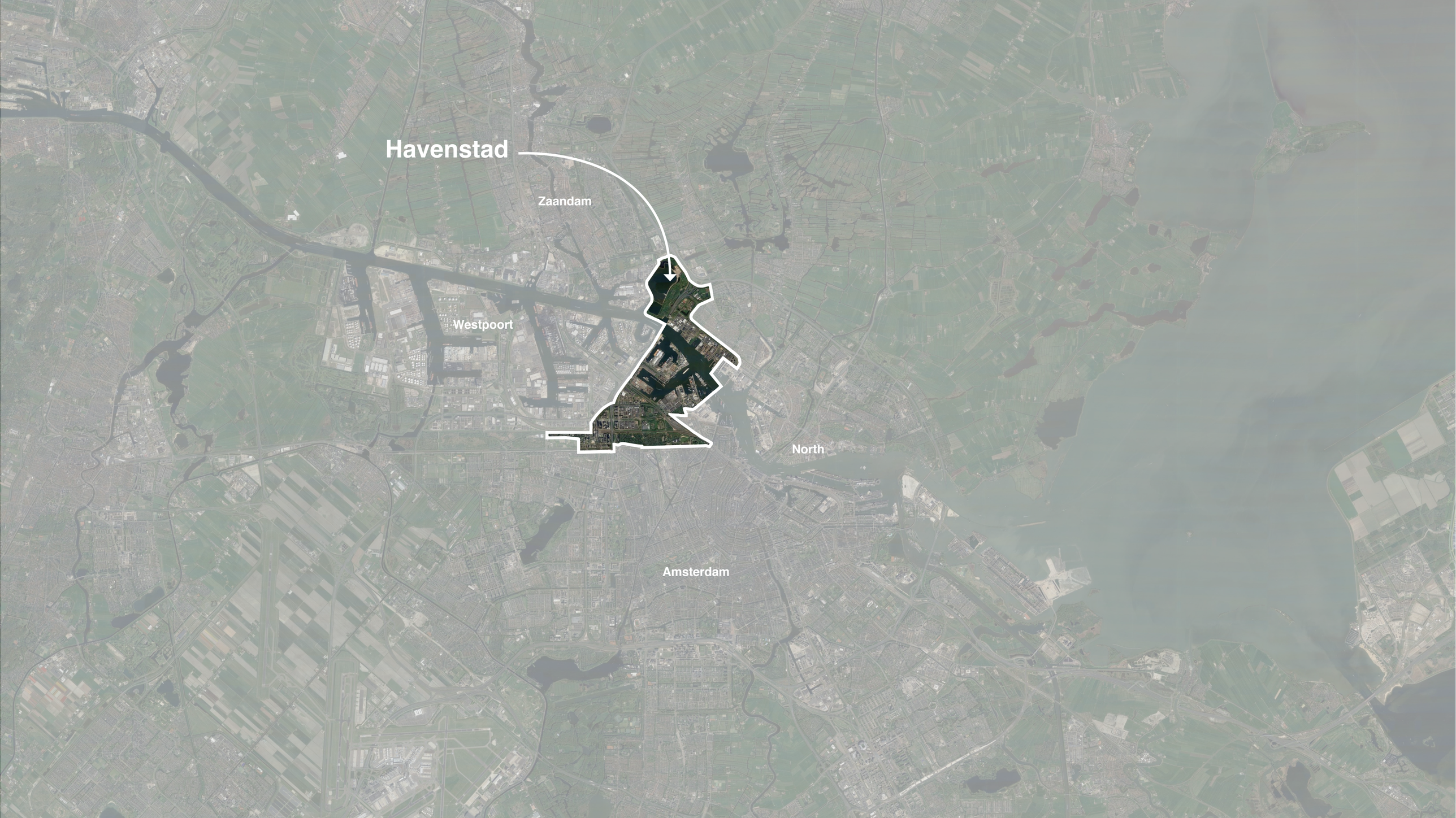
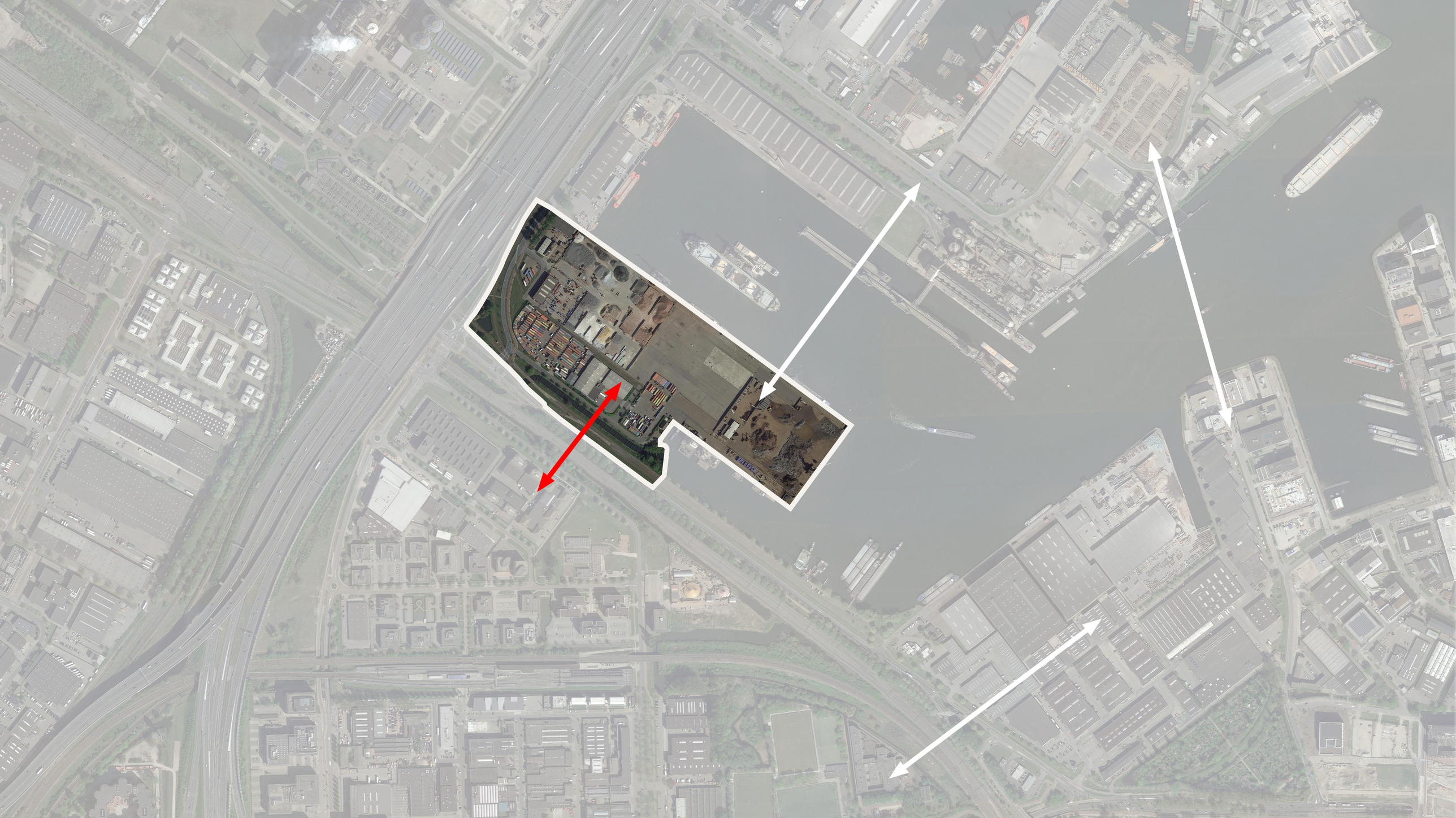
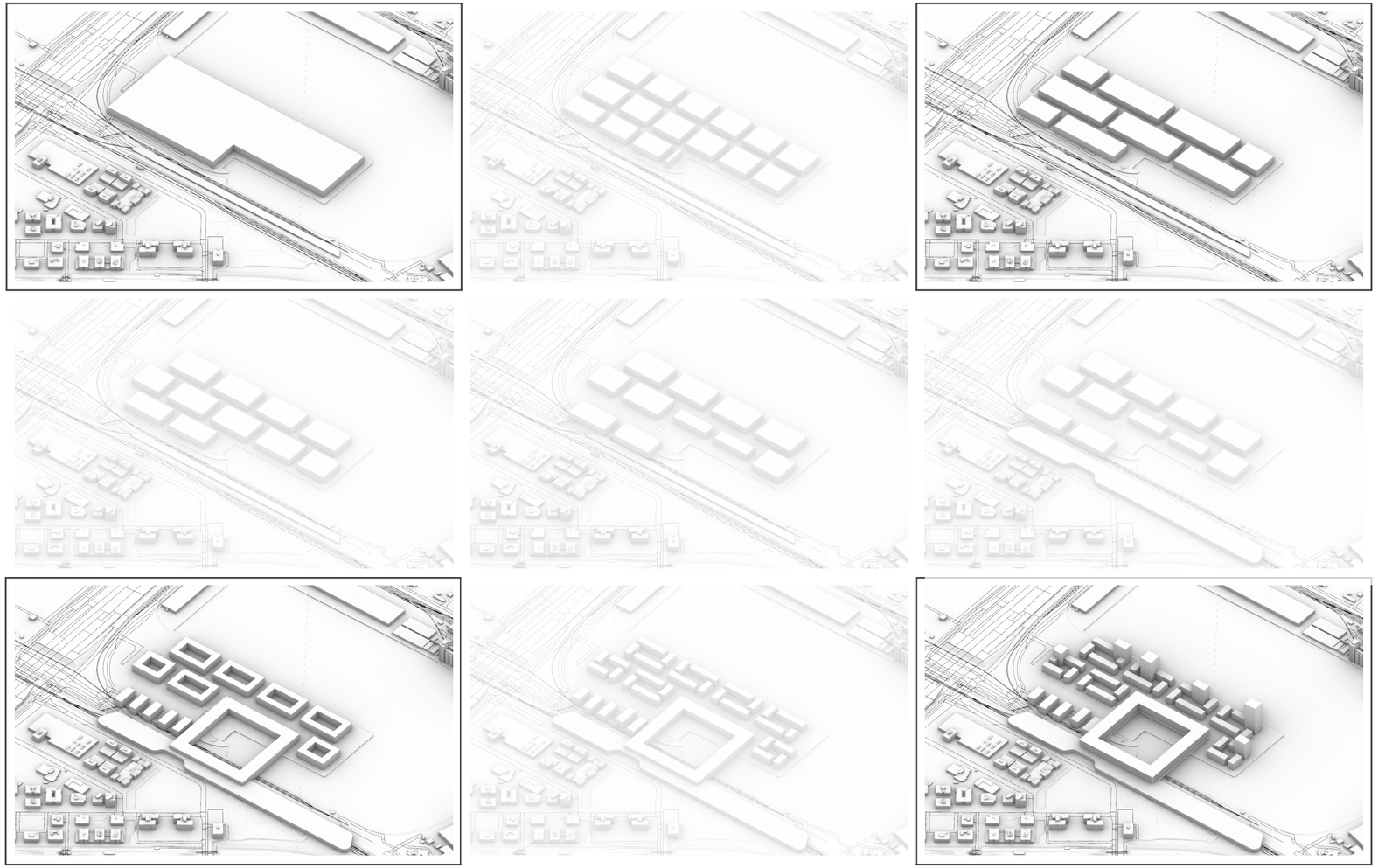
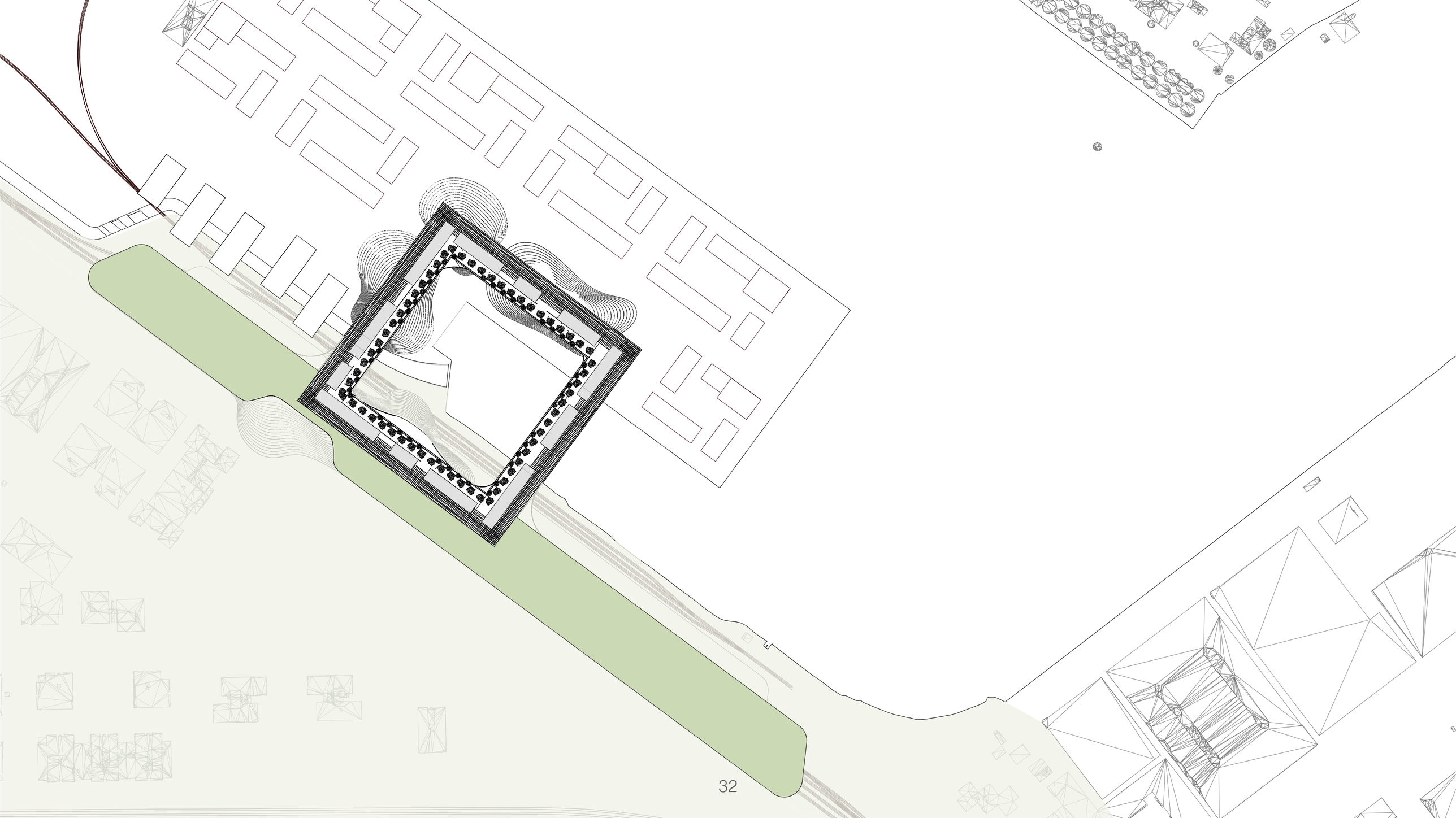
44
14


Havenstad
Zaandam
Westpoort
North
Amsterdam


Zaandam
A10
Nieuwe Hemweg
M
Transformatorweg



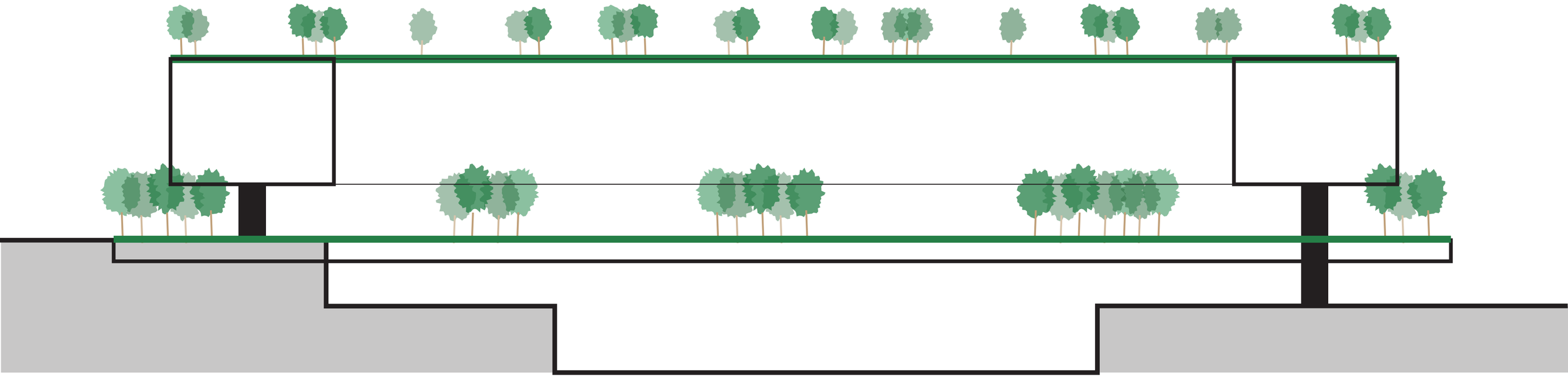


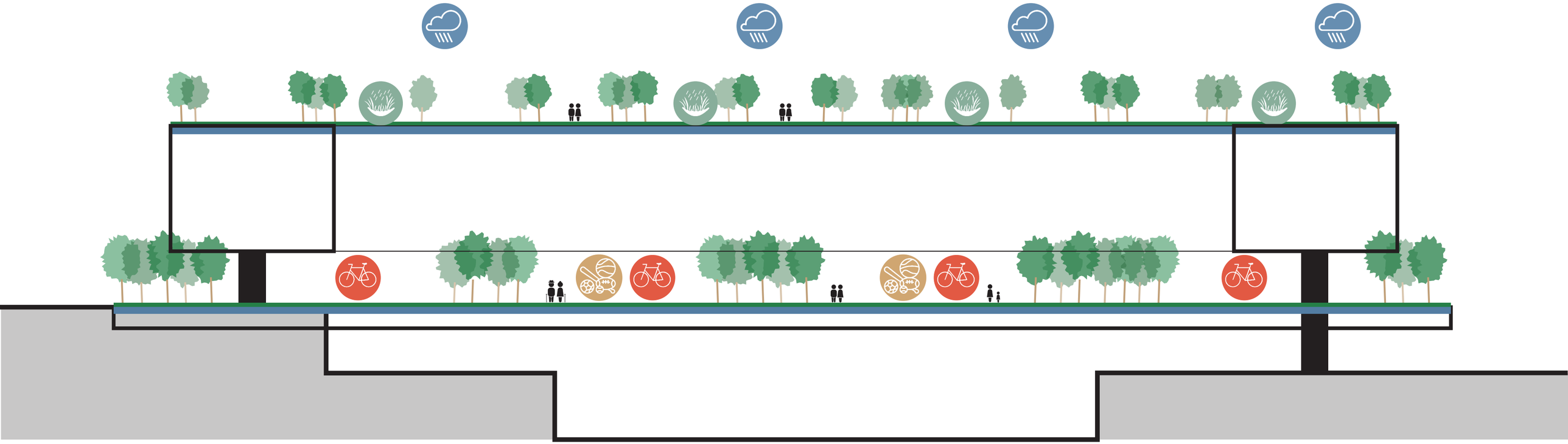


swimming in Vlothaven, 1954

source: Municipality Amsterdam_Bureau Monumenten & Archeologie


NEW GROUND LEVEL





Design

Program

- **Housing**
- live work spaces
- lofts
- apartments
- **Communal spaces**
- **Commercial plinth**
- cafe
- restaurant
- **Sports facilities**
- **Gardens & terraces**
- public, semi-public, semi-private, private
- **Natural (floating) swimming pool**
- **Water treatment systems**
- **Building services**

Nature-based solutions

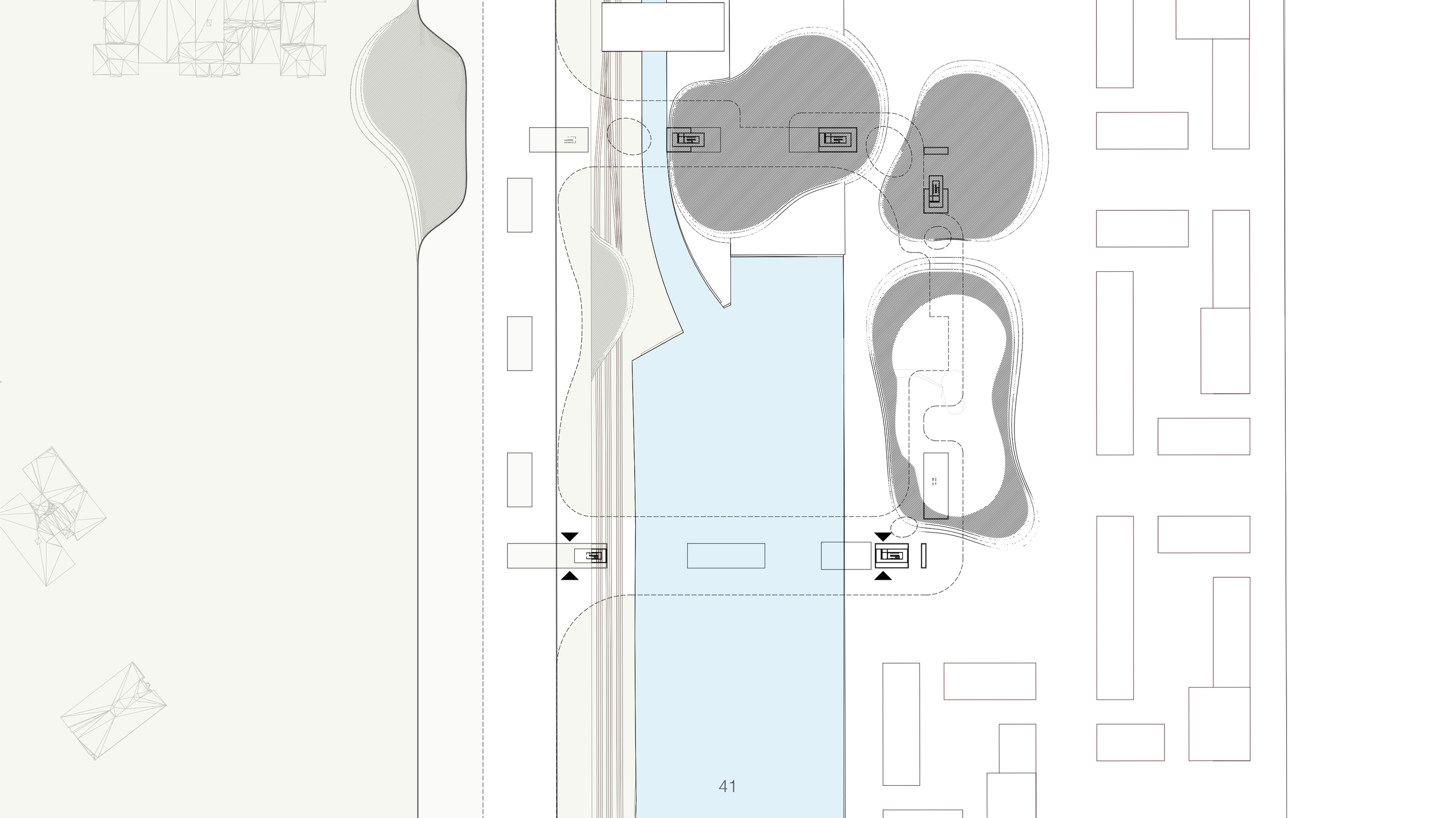
Urban tissue level

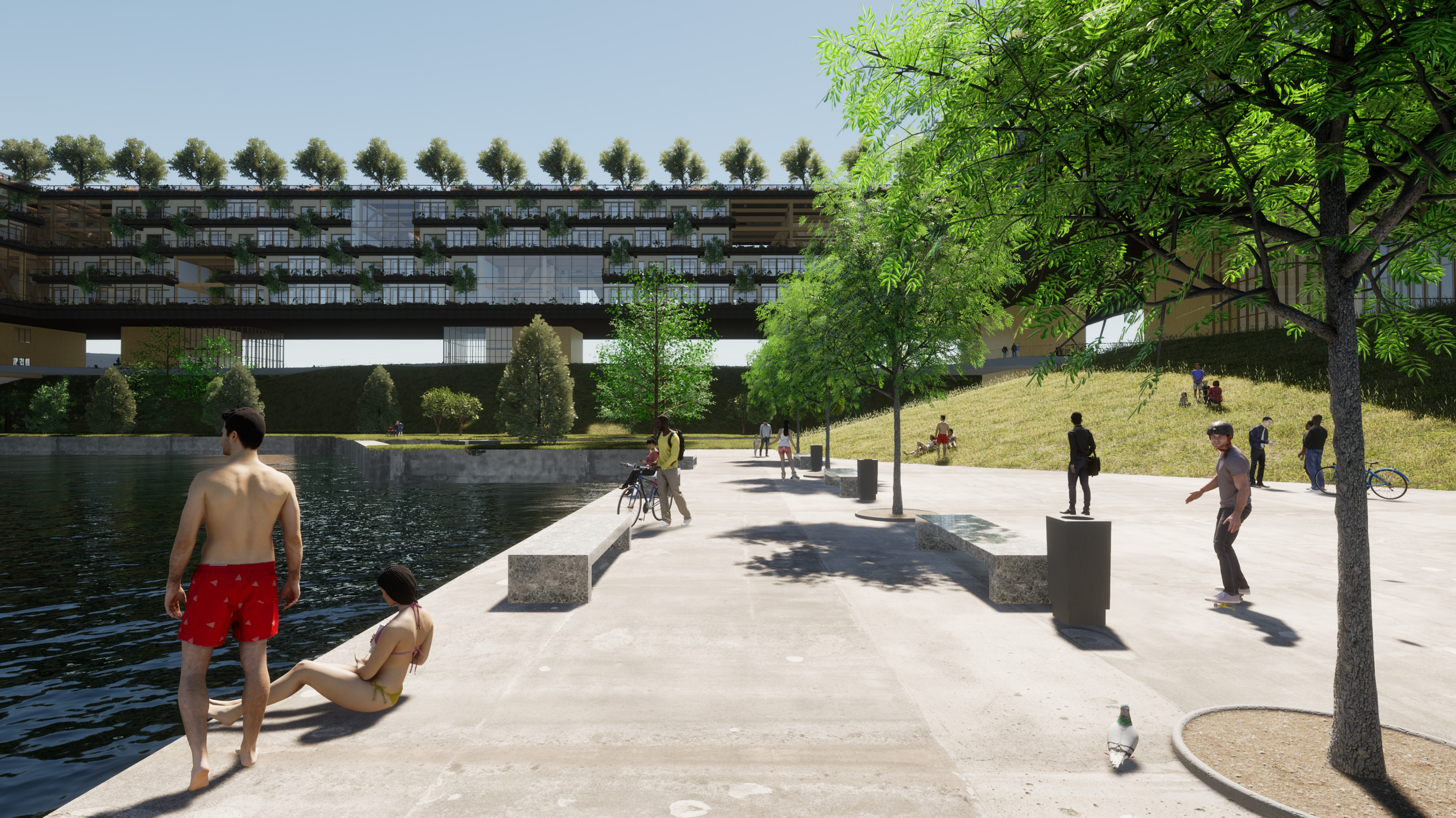
Support Level

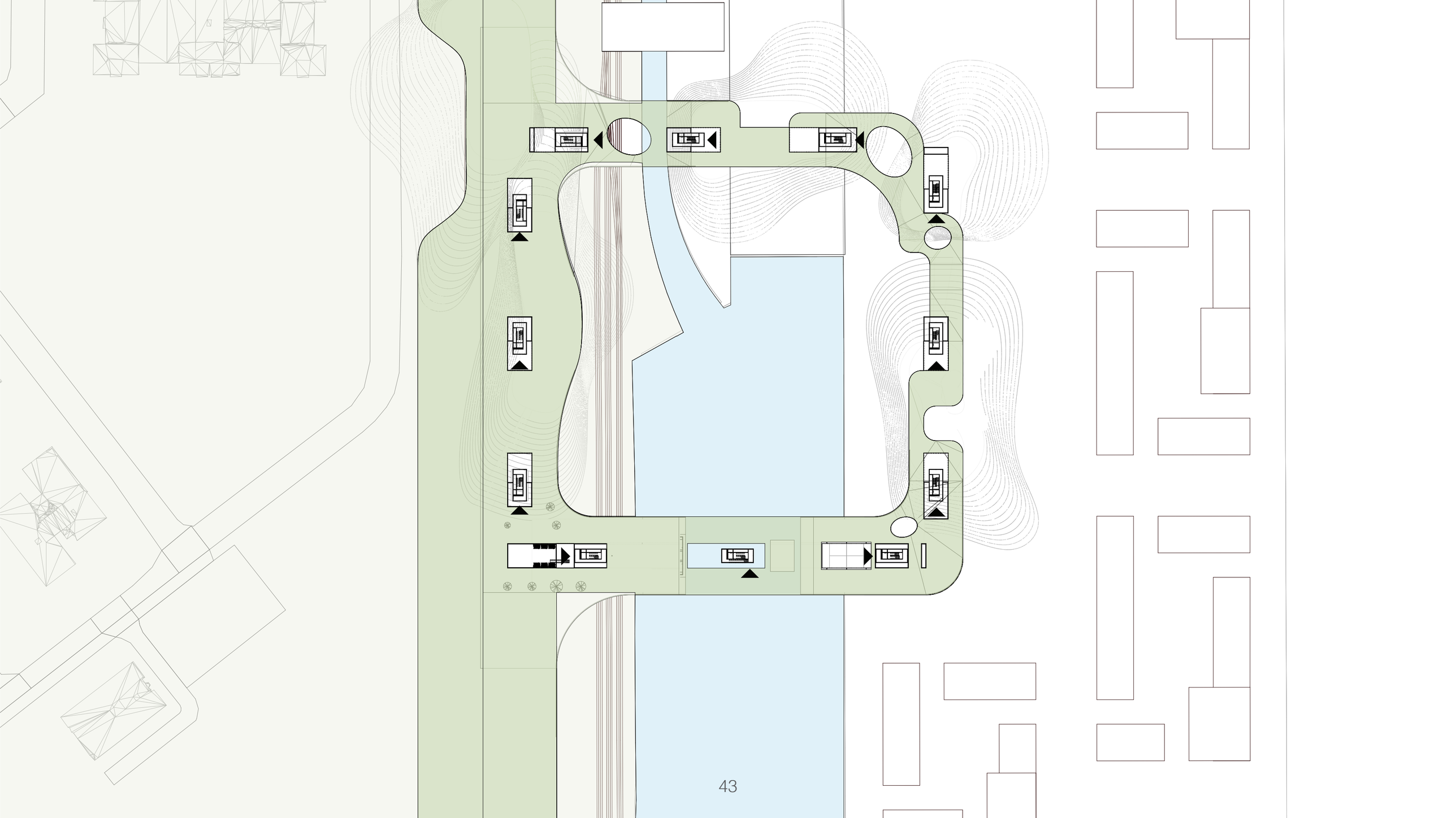
Infill level

Target Group

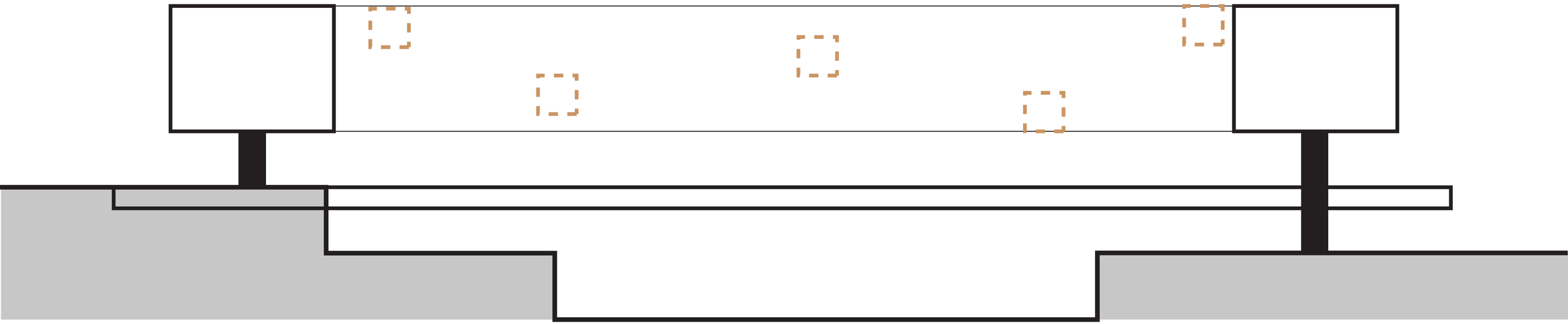
All incomes

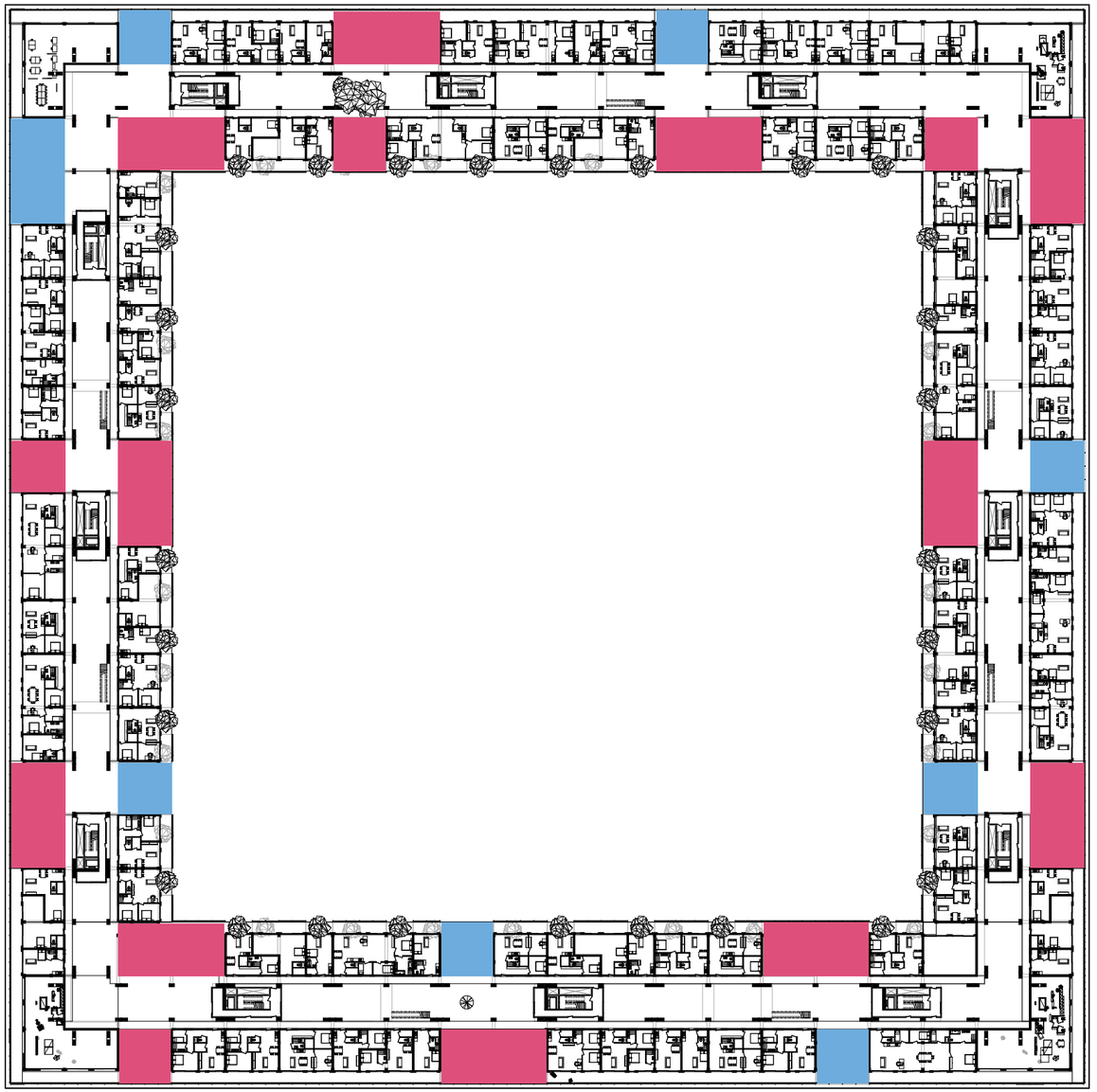


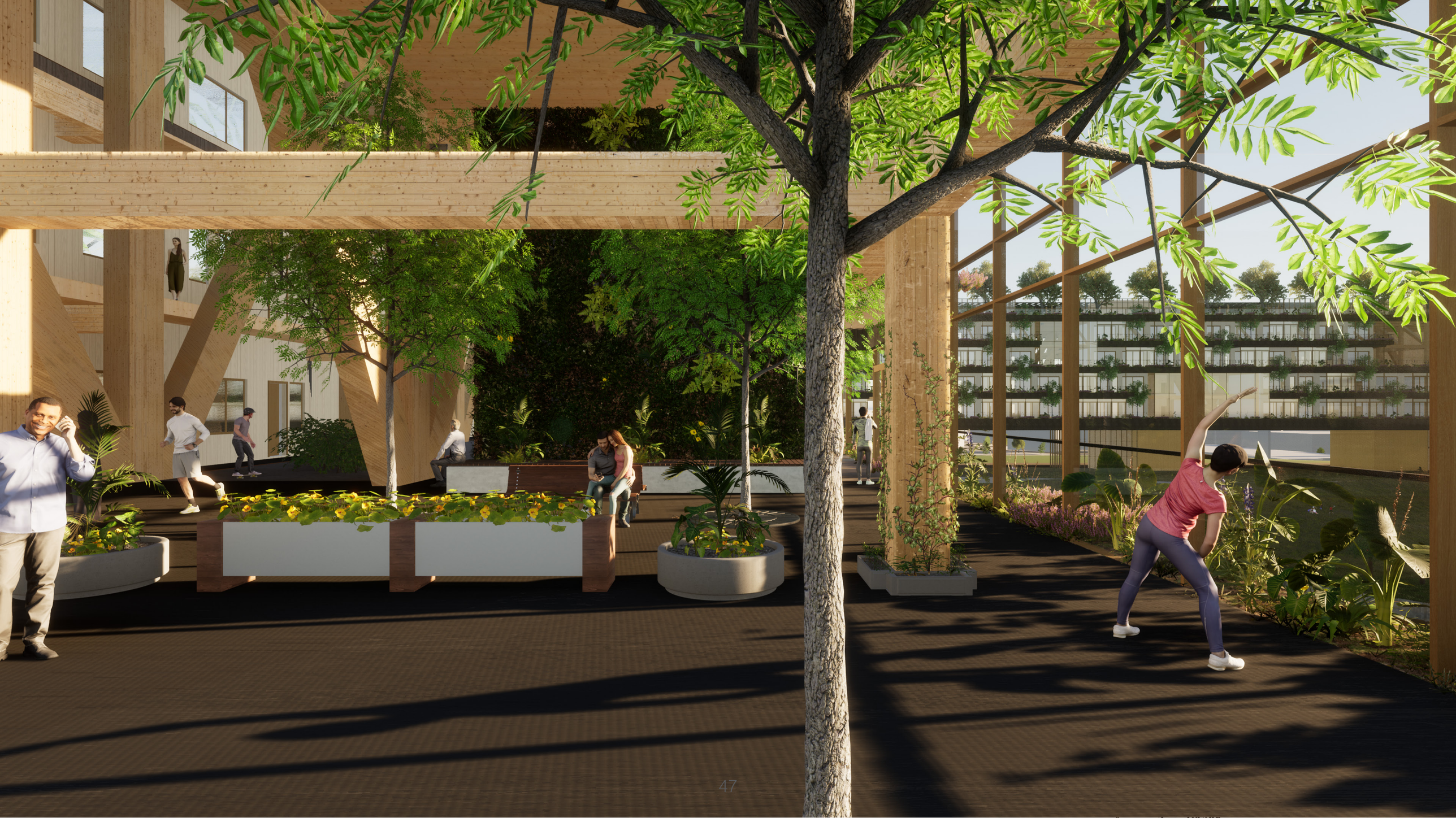


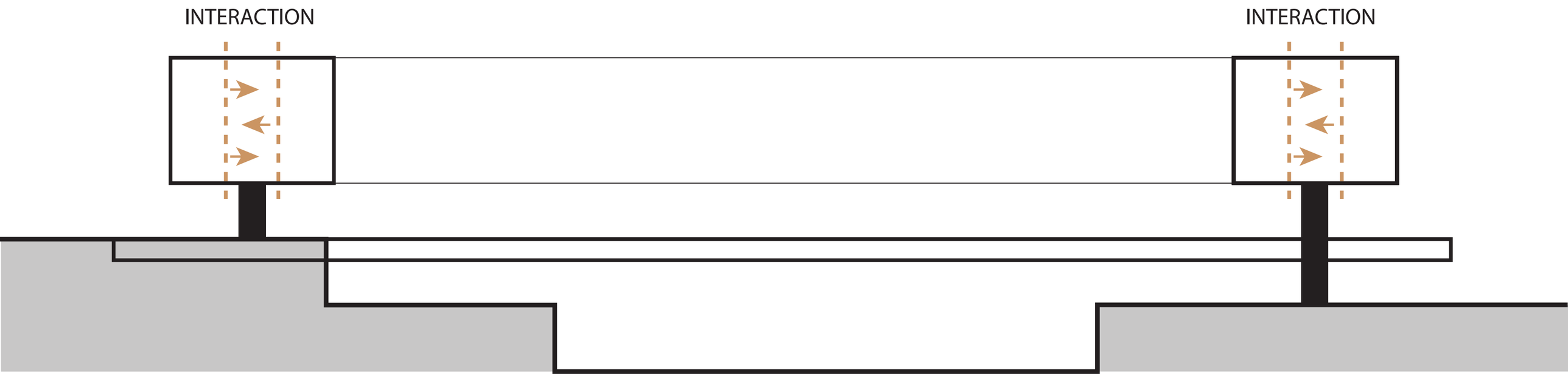


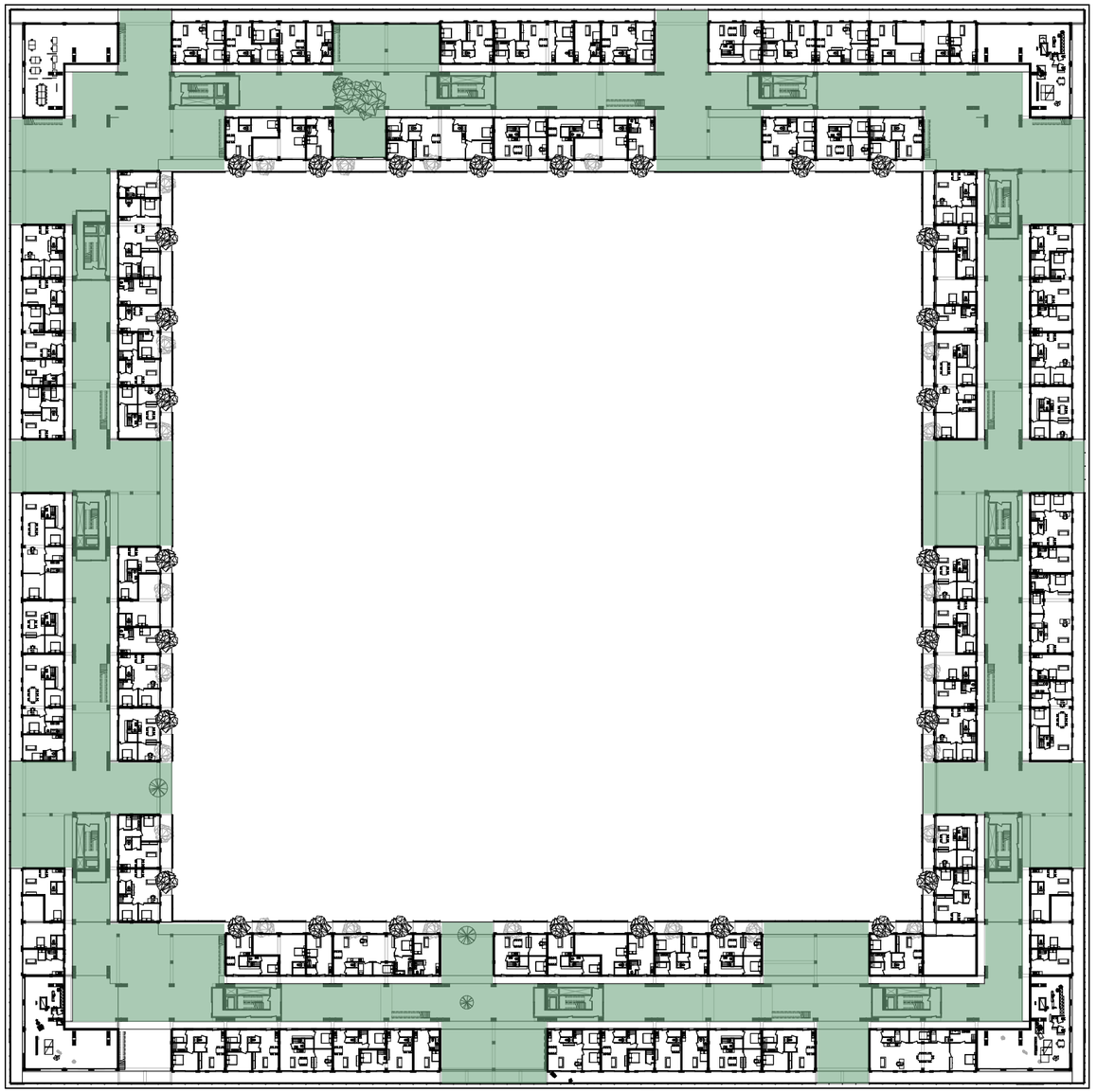
ATRIA

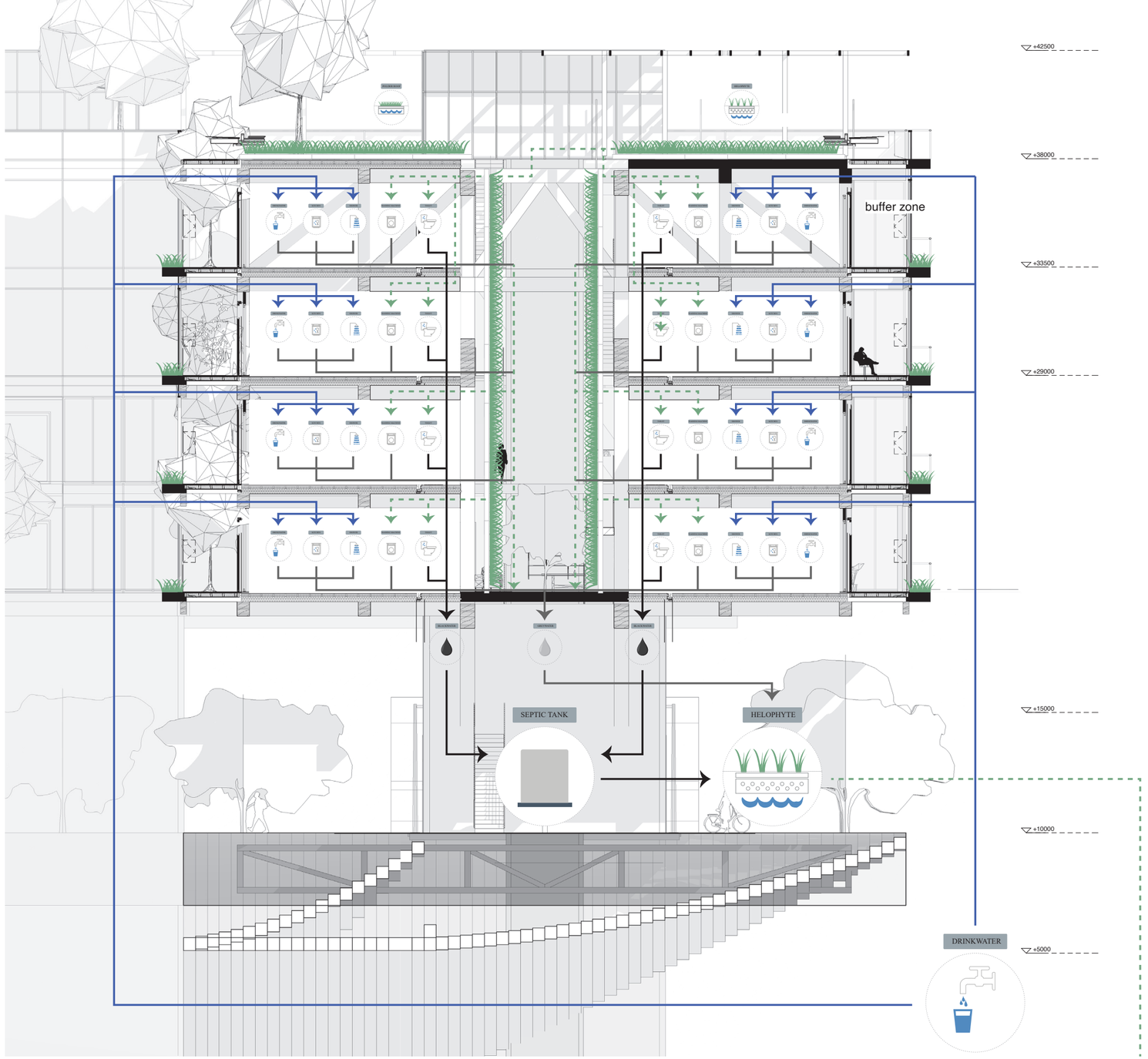


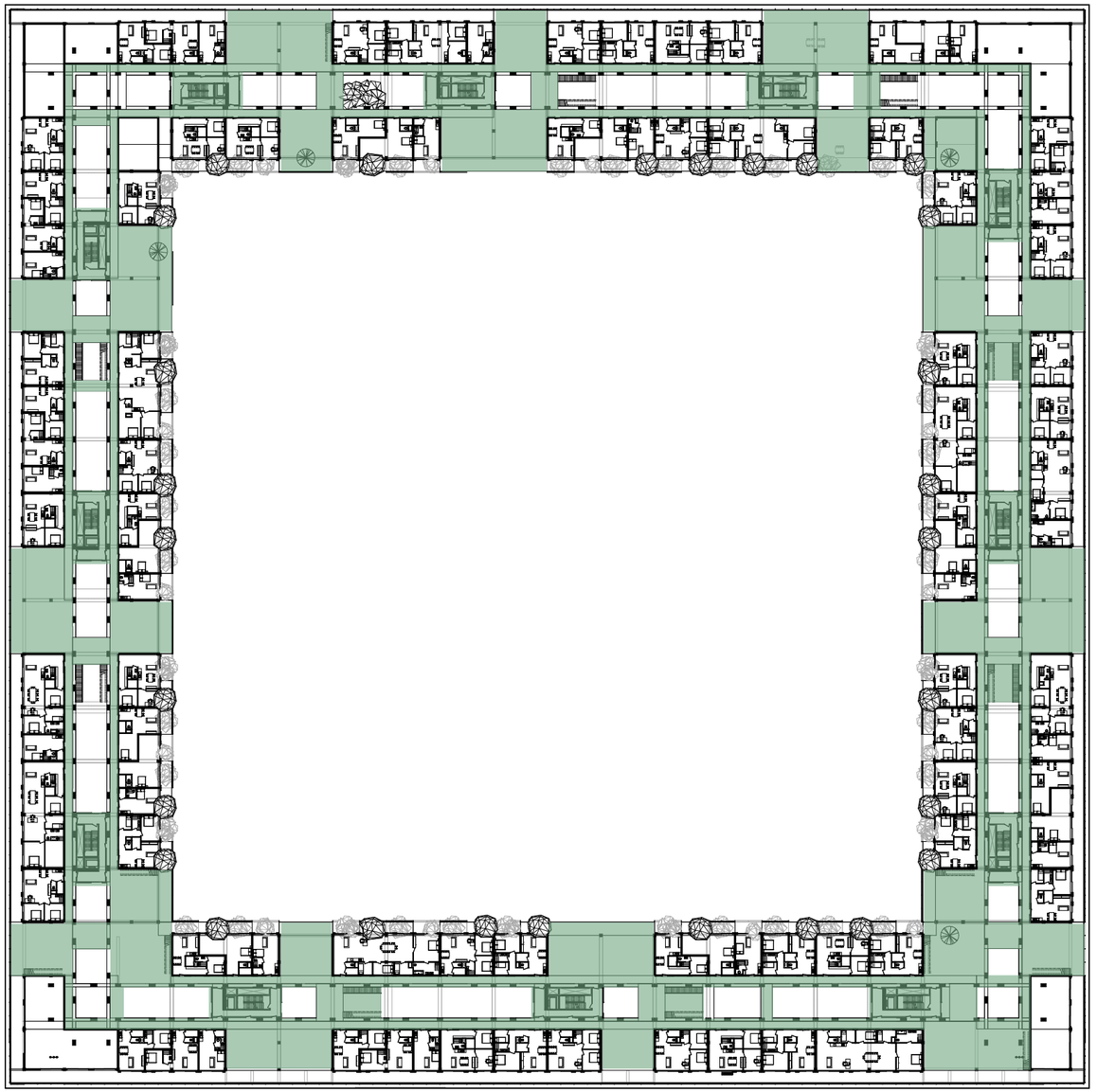


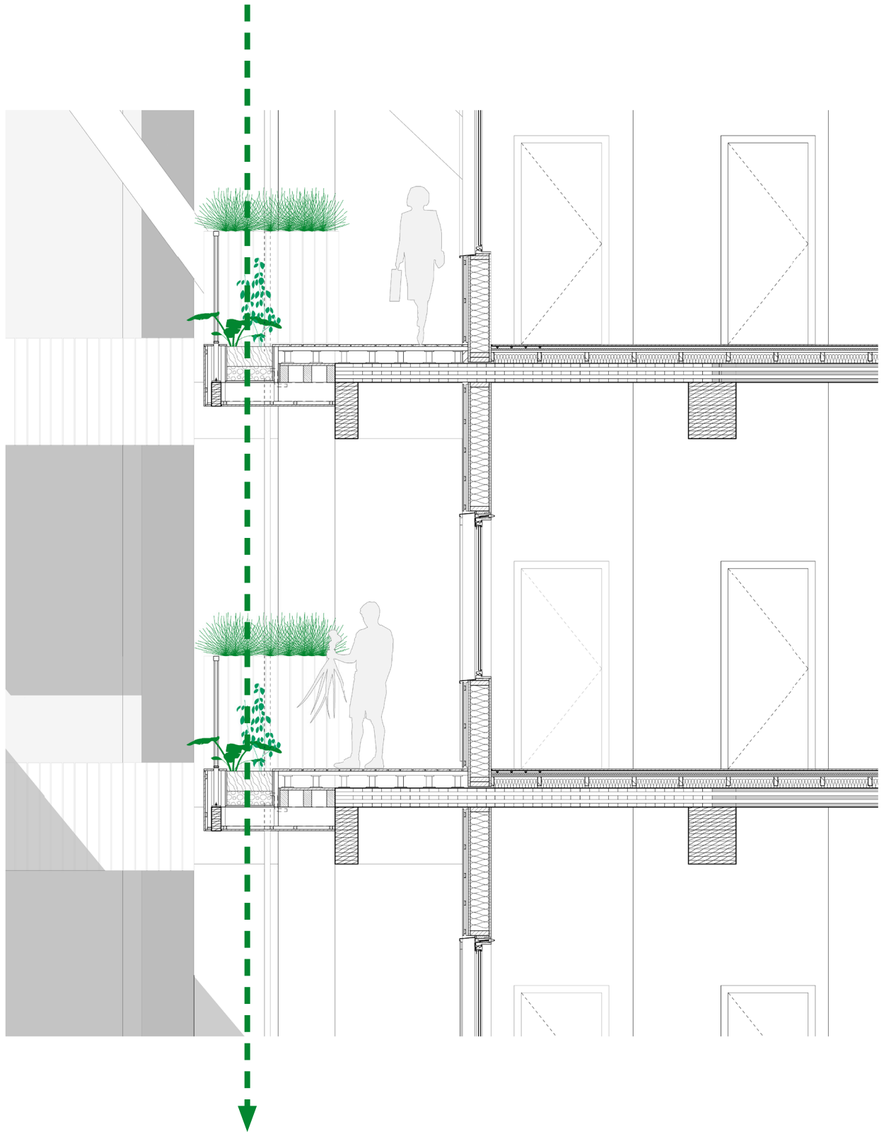


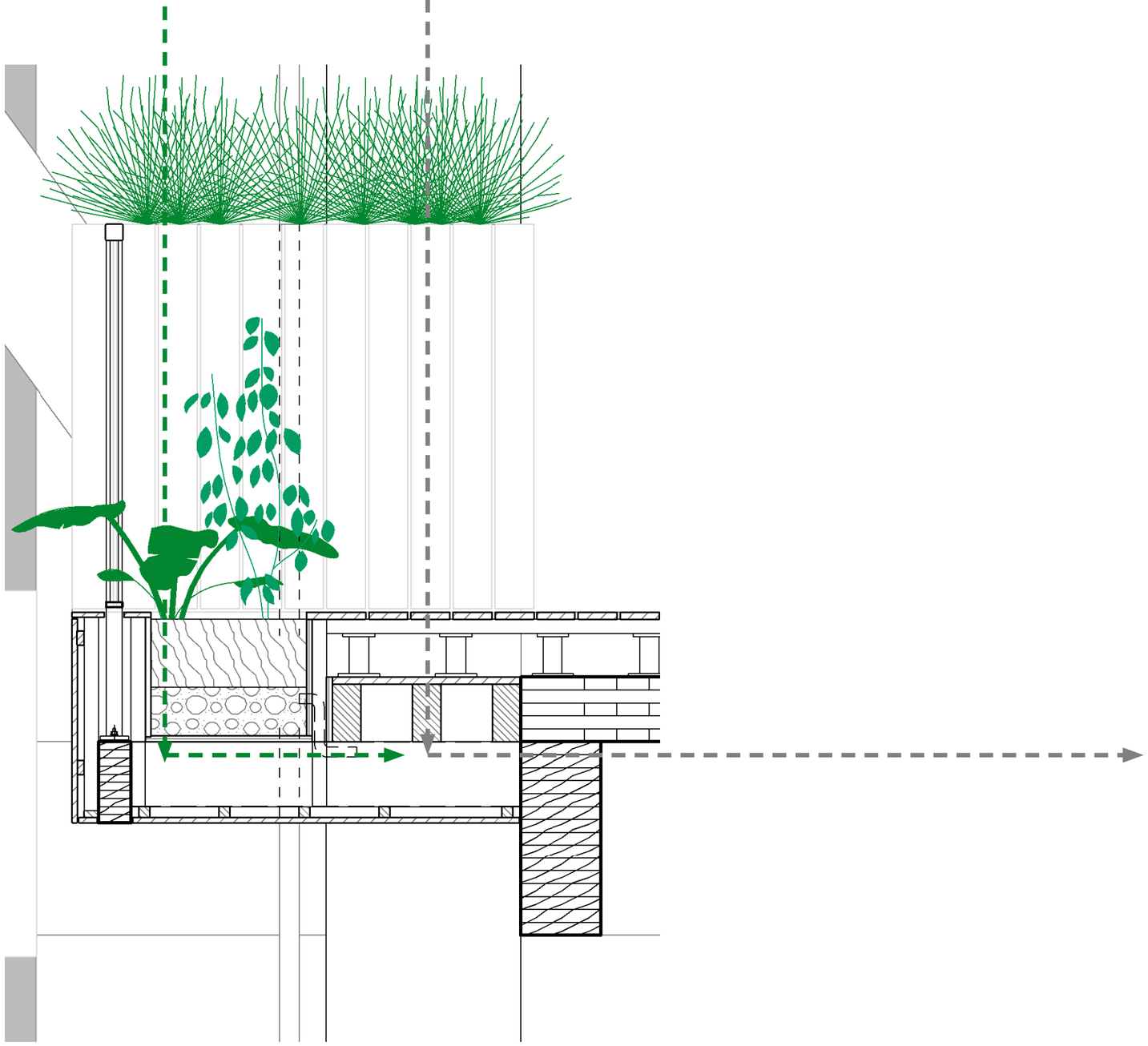

INTERACTION
INTERACTION

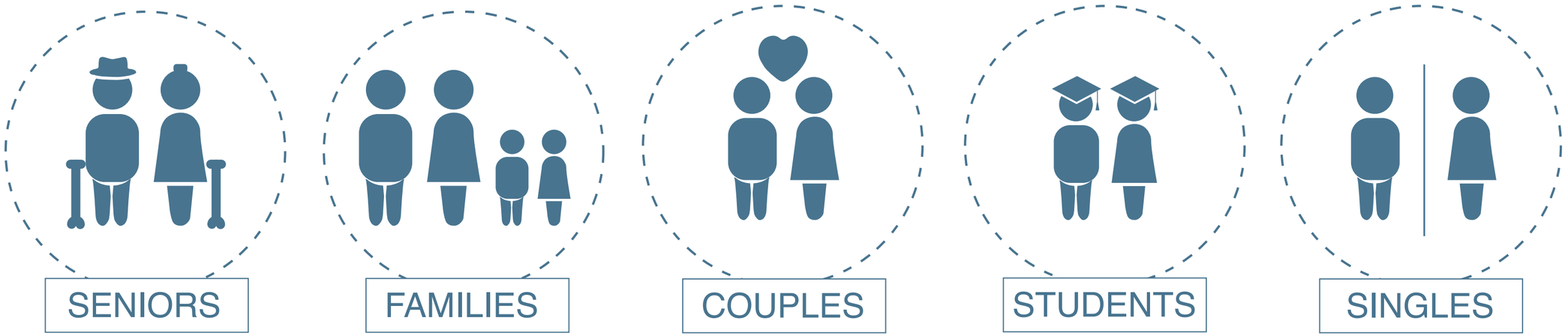



+42500
+38000
+33500
+29000
+15000
+10000
+5000
buffer zone
SEPTIC TANK
HELOPHYTE
DRINKWATER

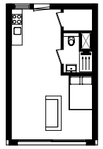


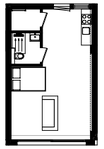


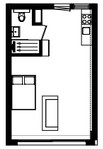



SENIORS
FAMILIES
COUPLES
STUDENTS
SINGLES

82 x 35m²

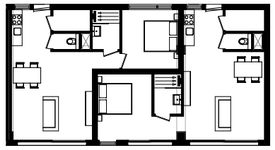


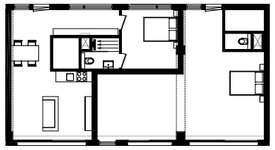


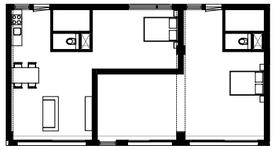


10% = 592 m²

124 x 45m²

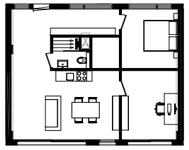






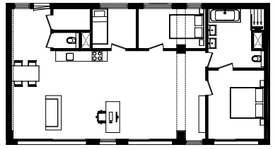
25% = 1480 m²

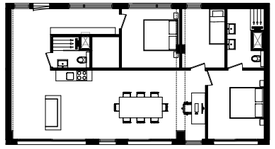
148 x 70m²

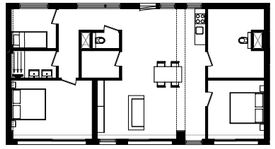


45% = 2664 m²

20 x 105m²

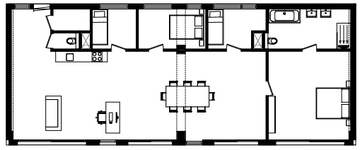


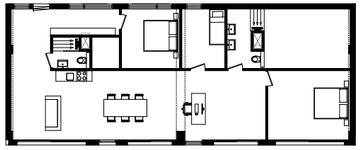


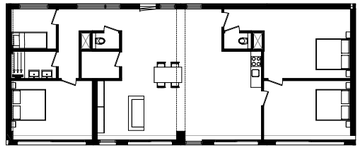


10% = 592 m²

20 x 140m²

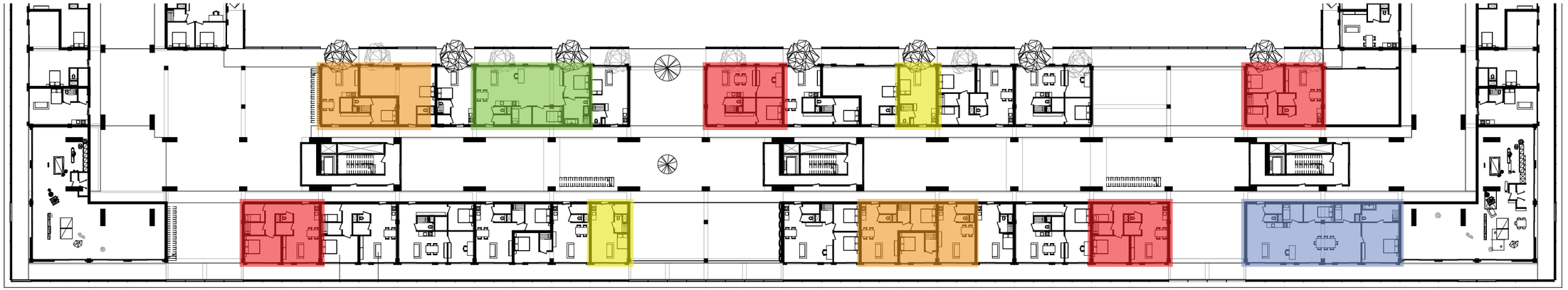


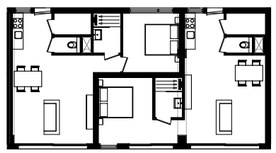


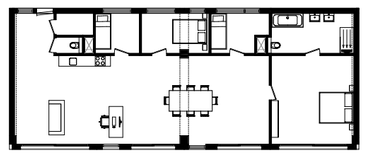


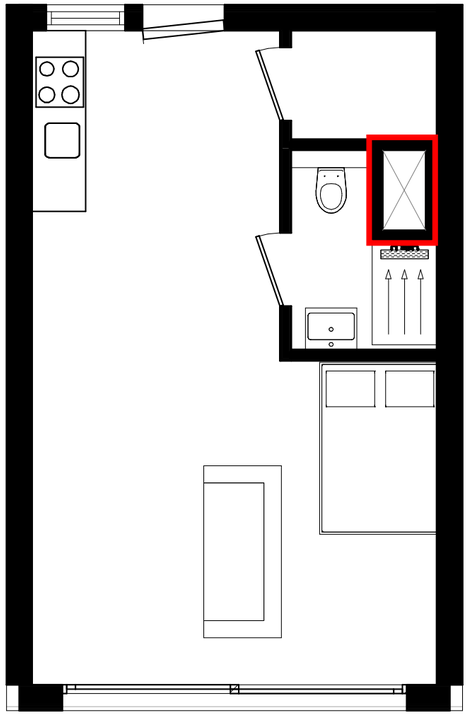
10% = 592 m²

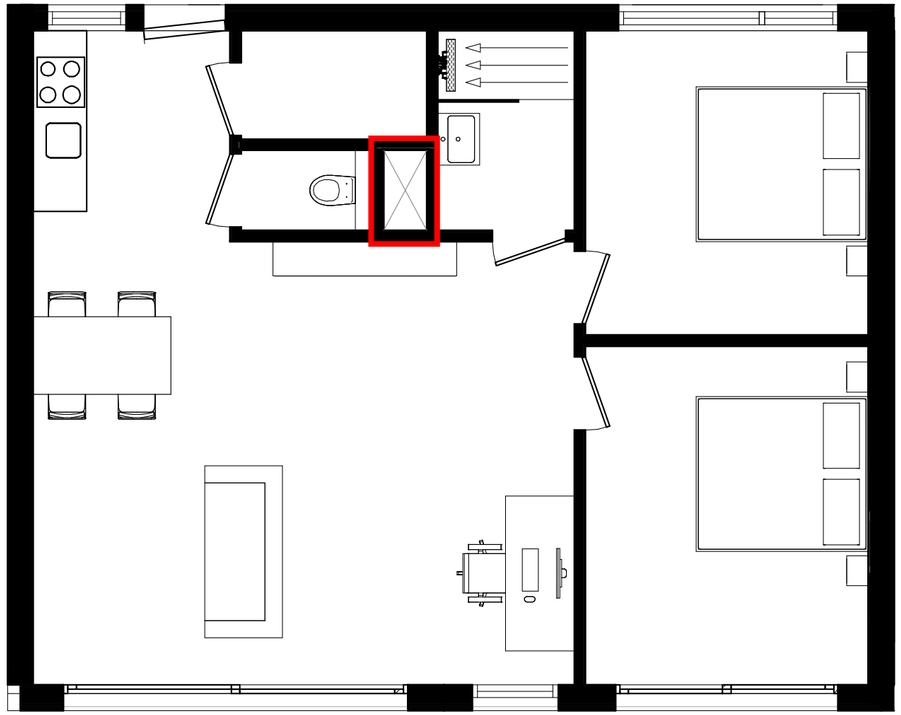
TOTAL: 23710m²

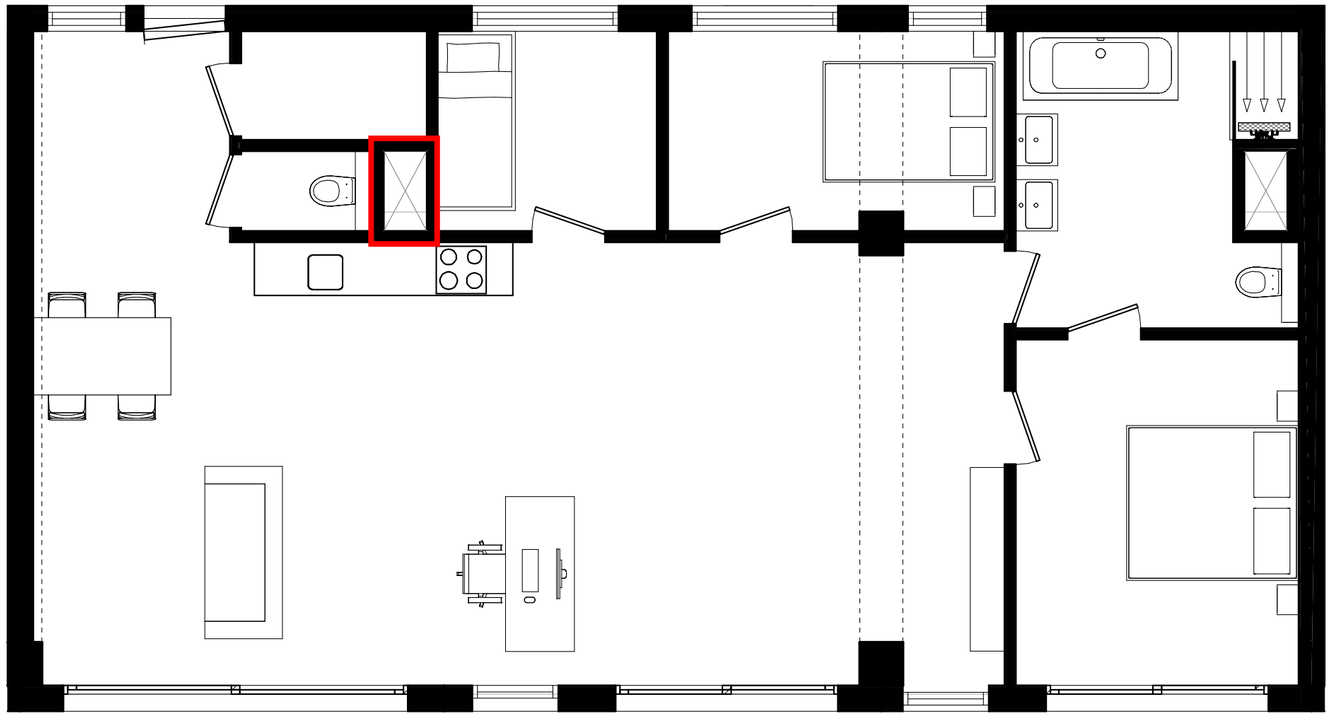


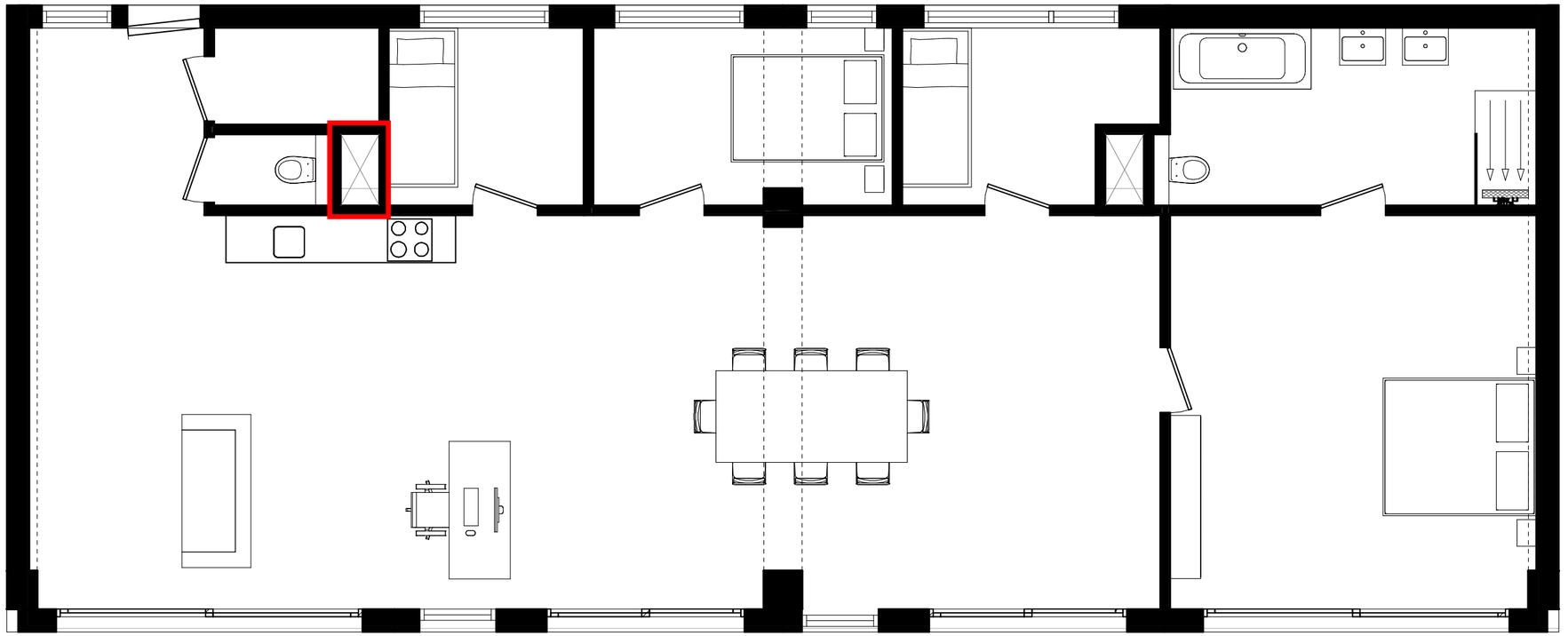


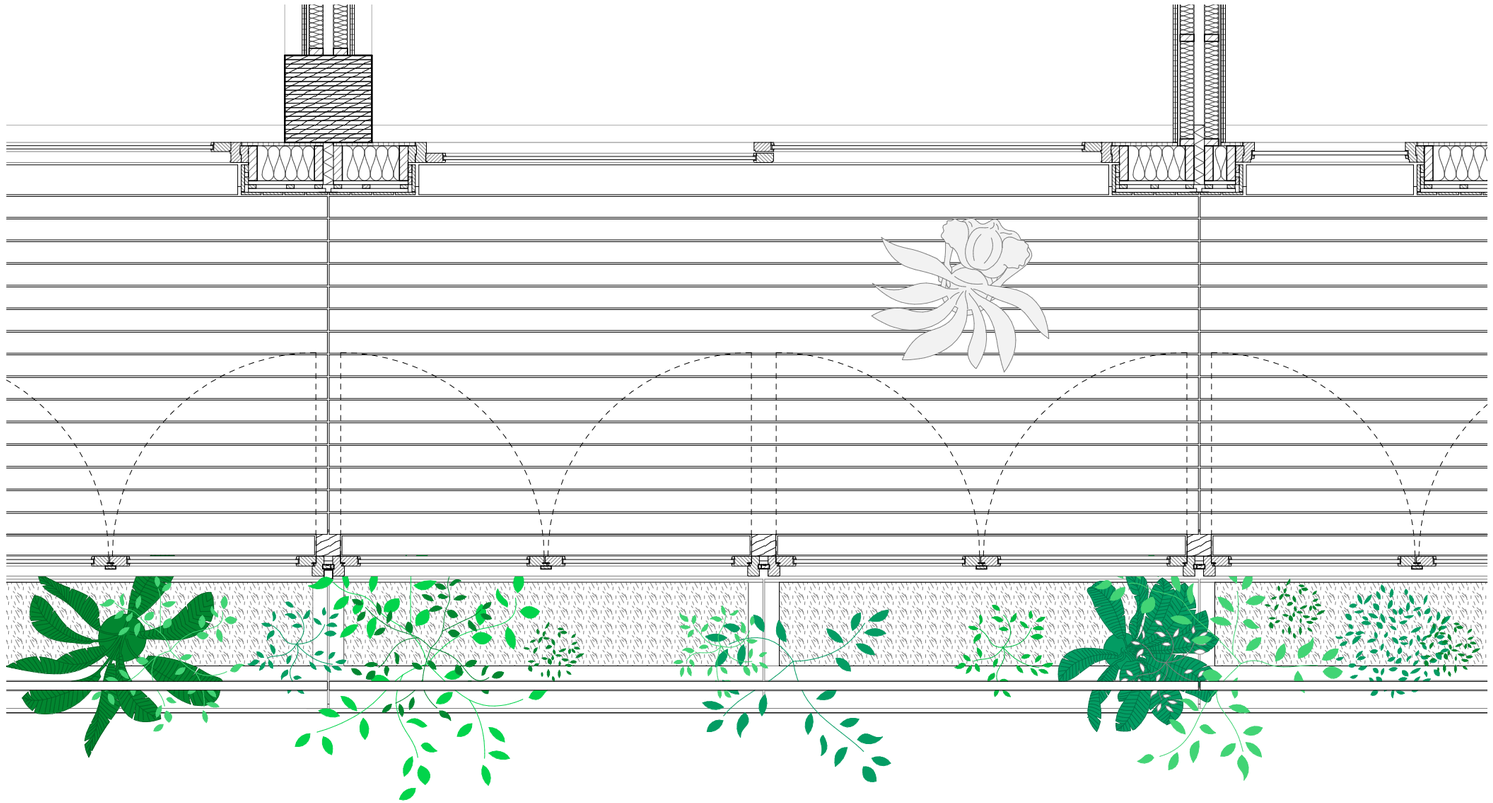


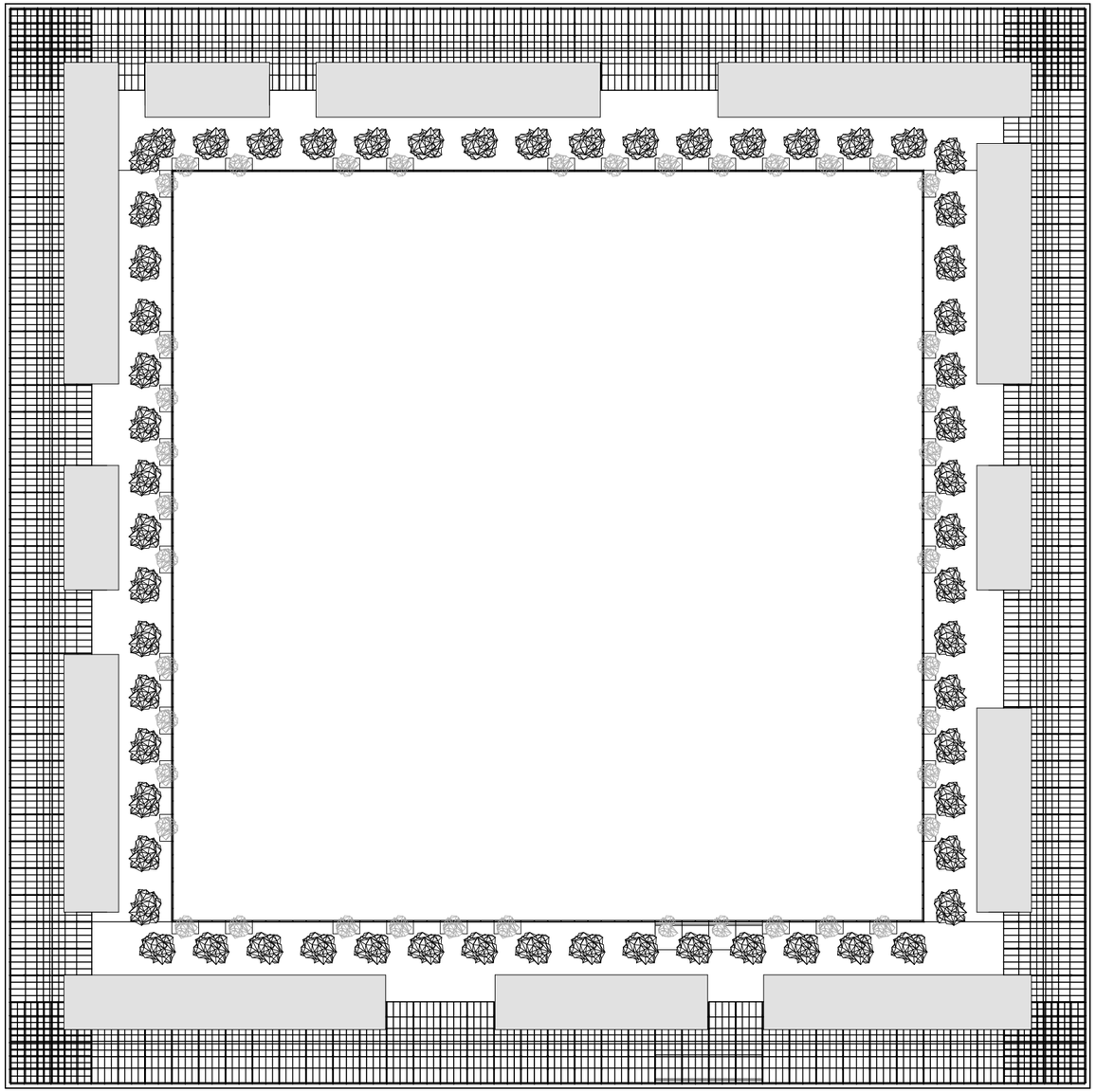


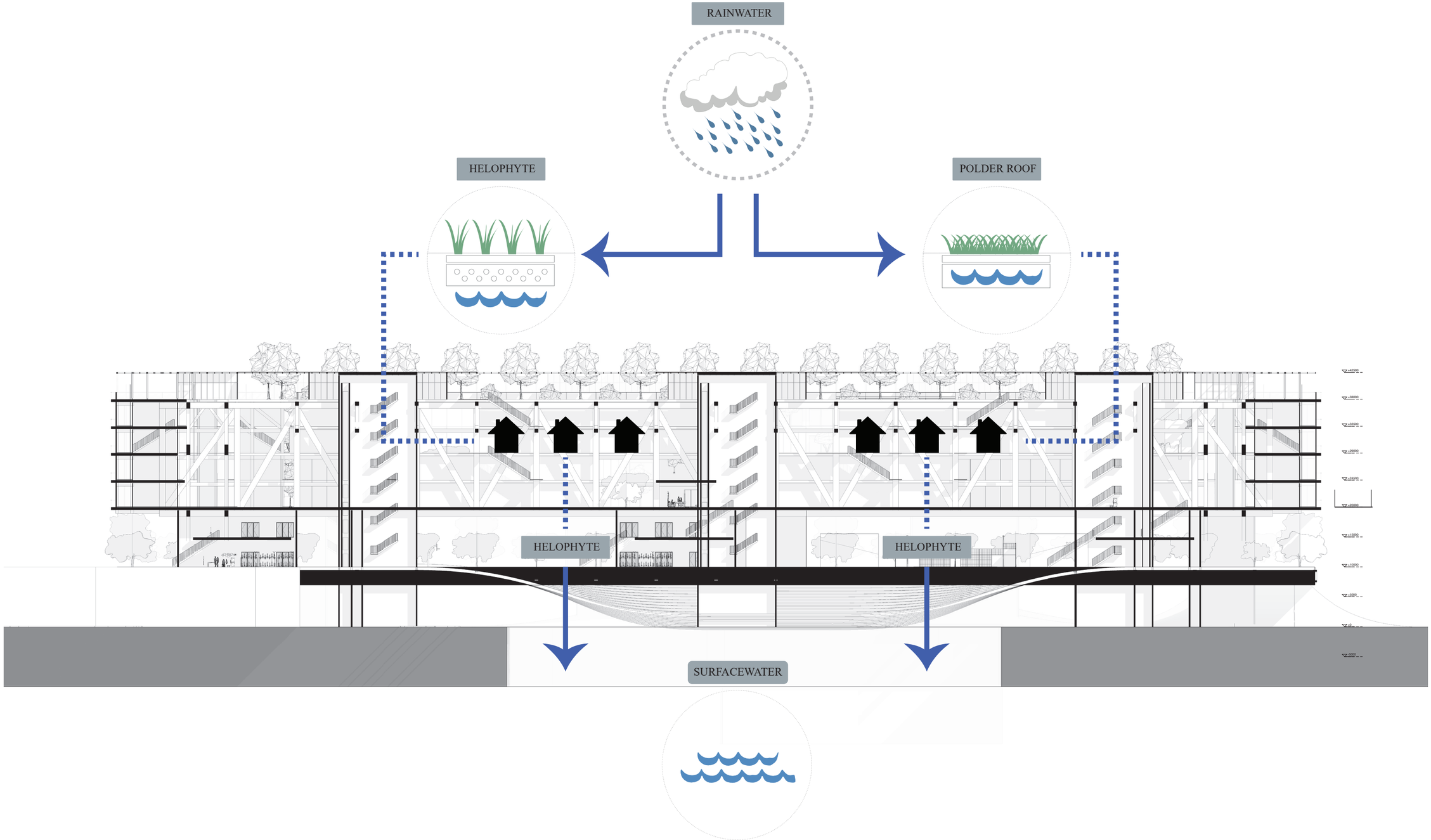


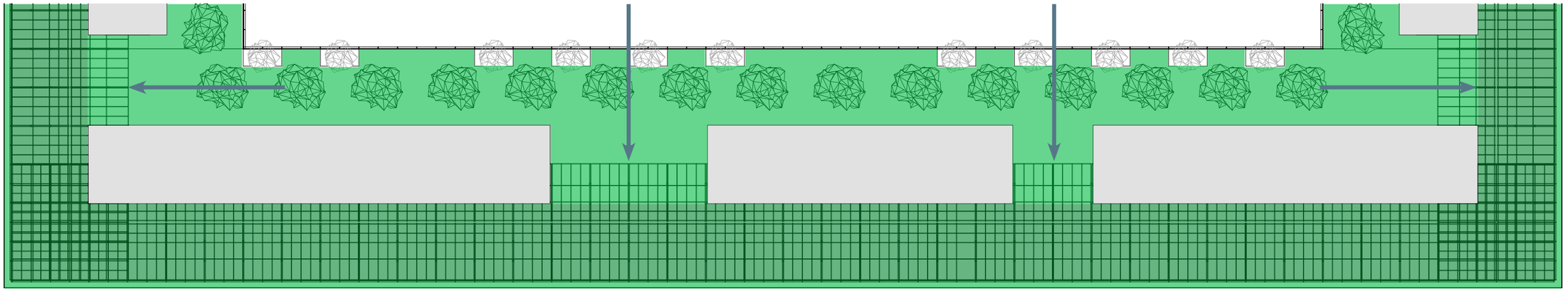


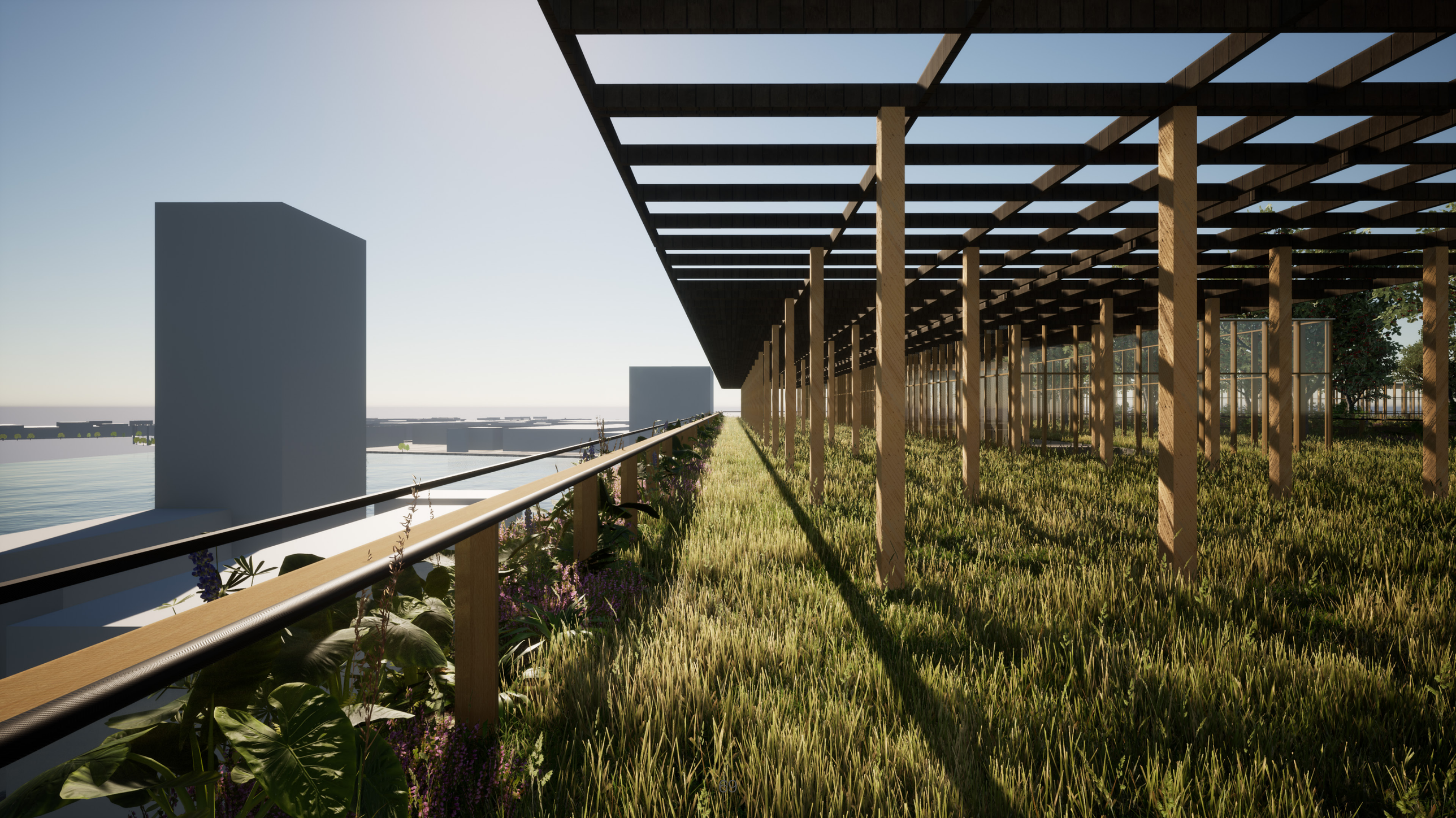


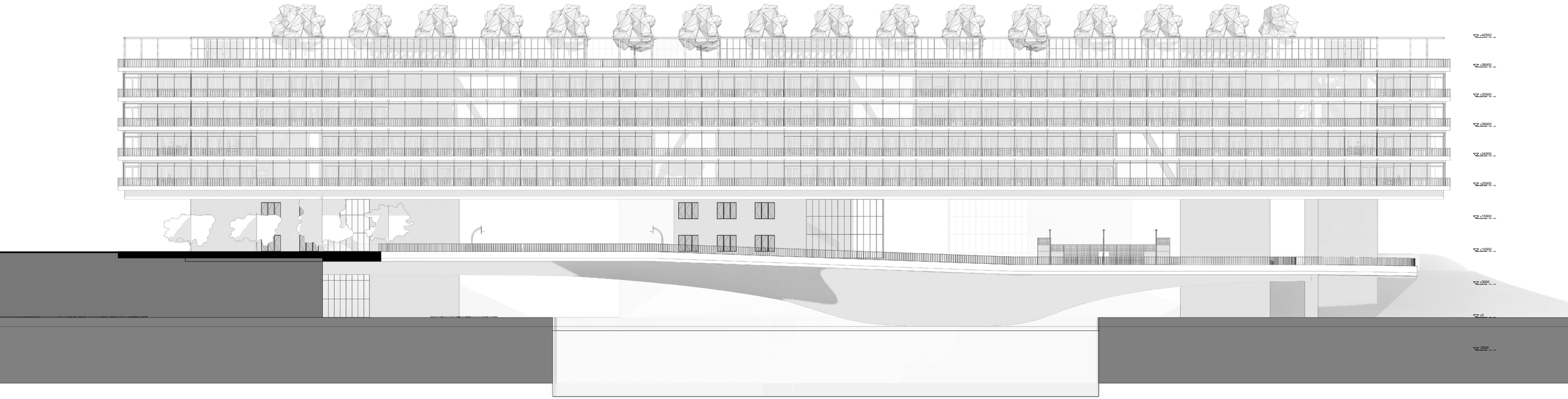





RAINWATER
HELOPHYTE
POLDER ROOF
HELOPHYTE
HELOPHYTE
SURFACEWATER



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+38000
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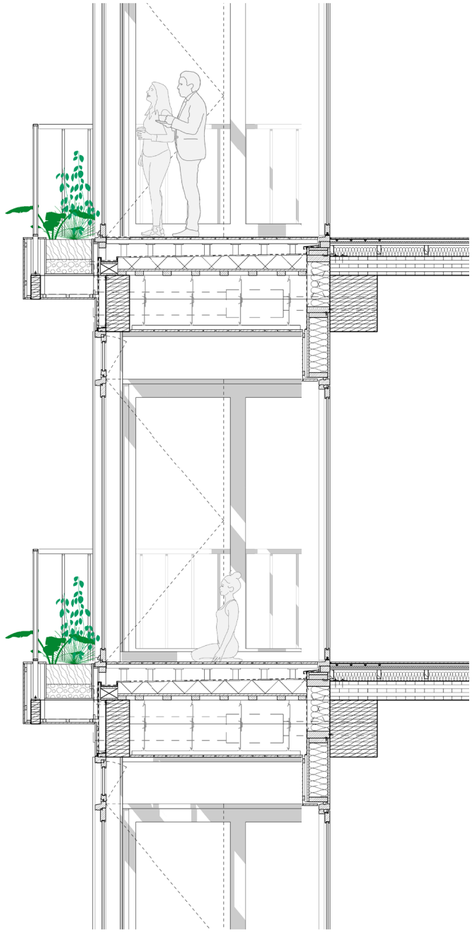
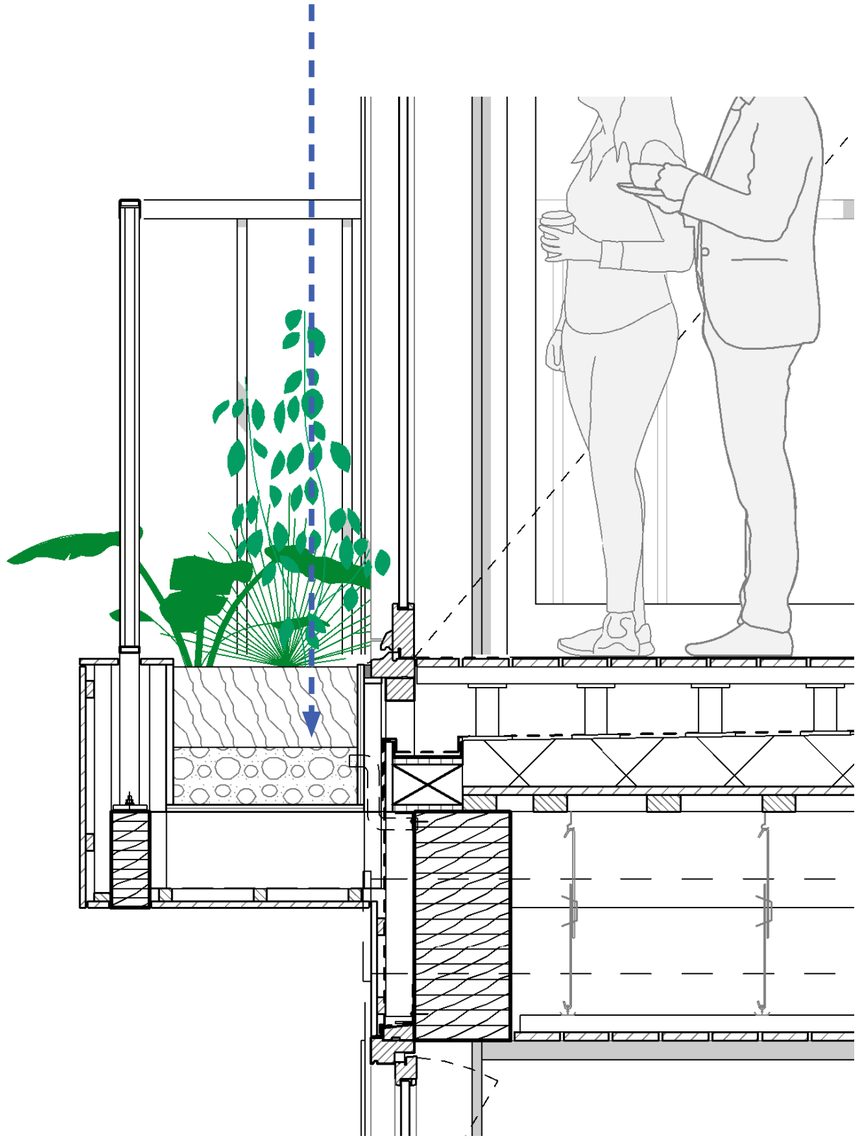
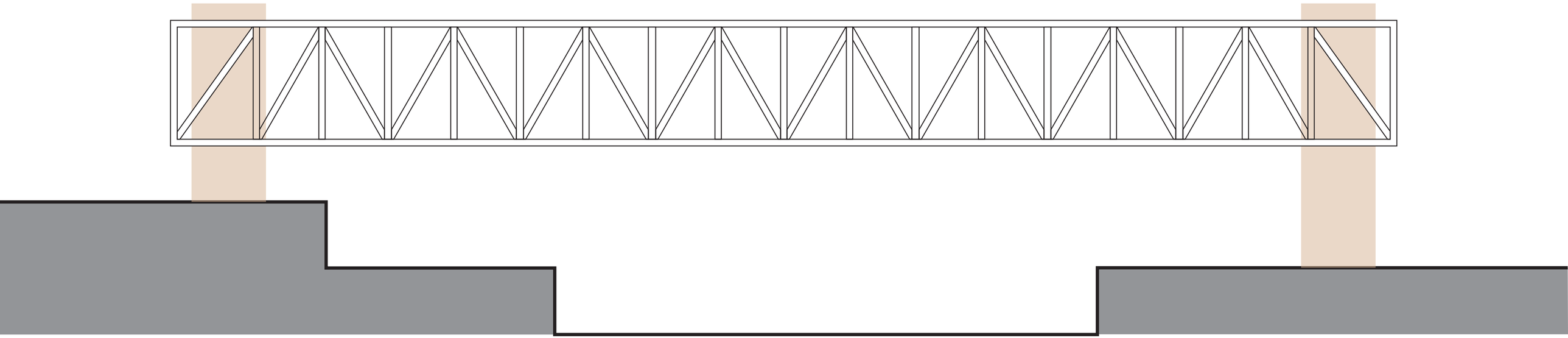
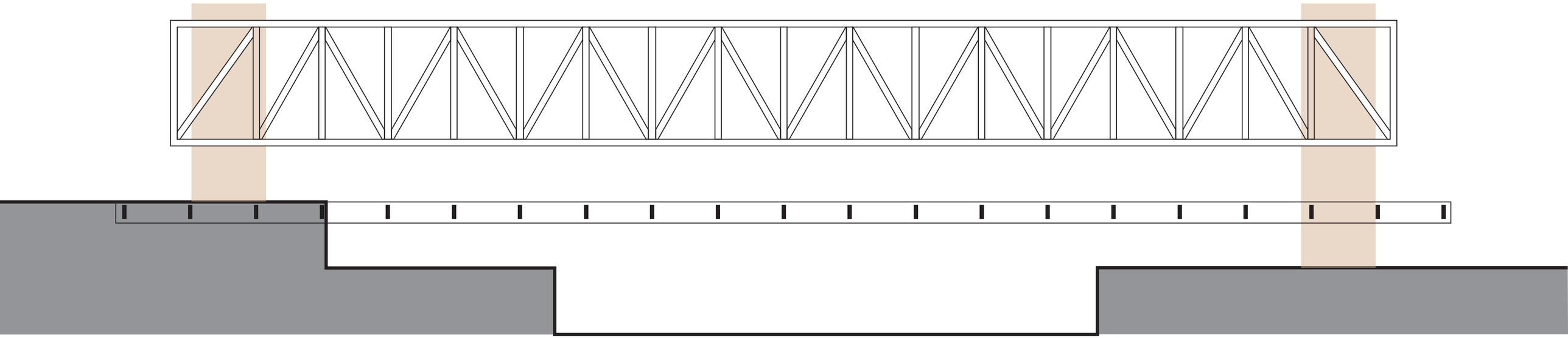
+20000
+15000
+10000
+5000
±0
-5000

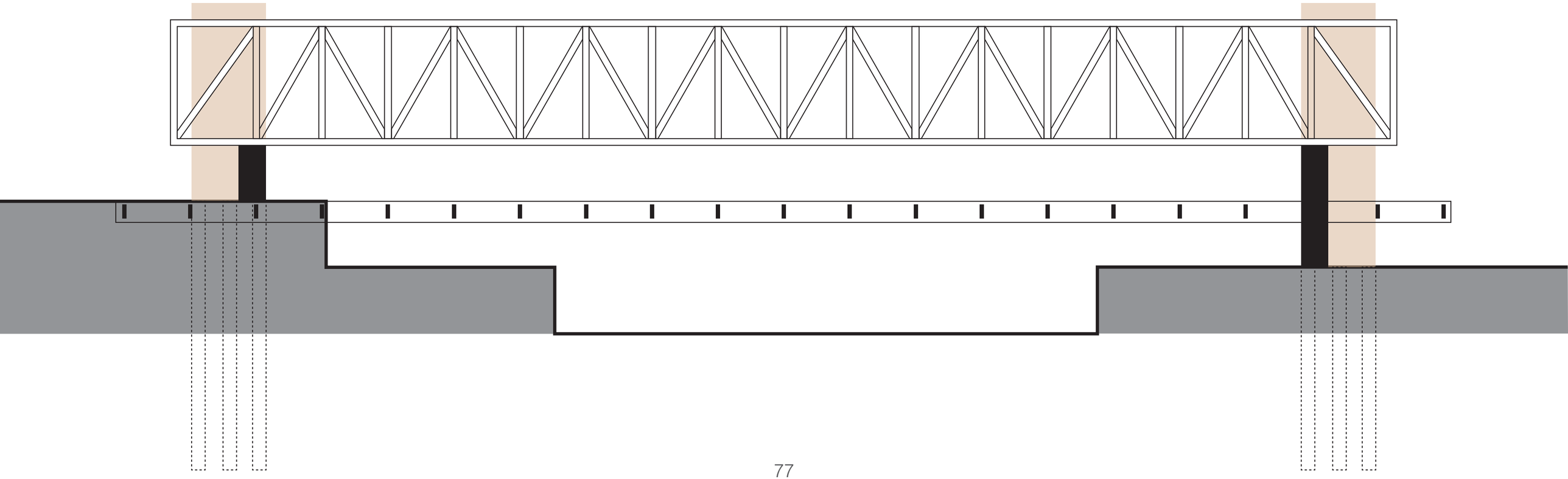


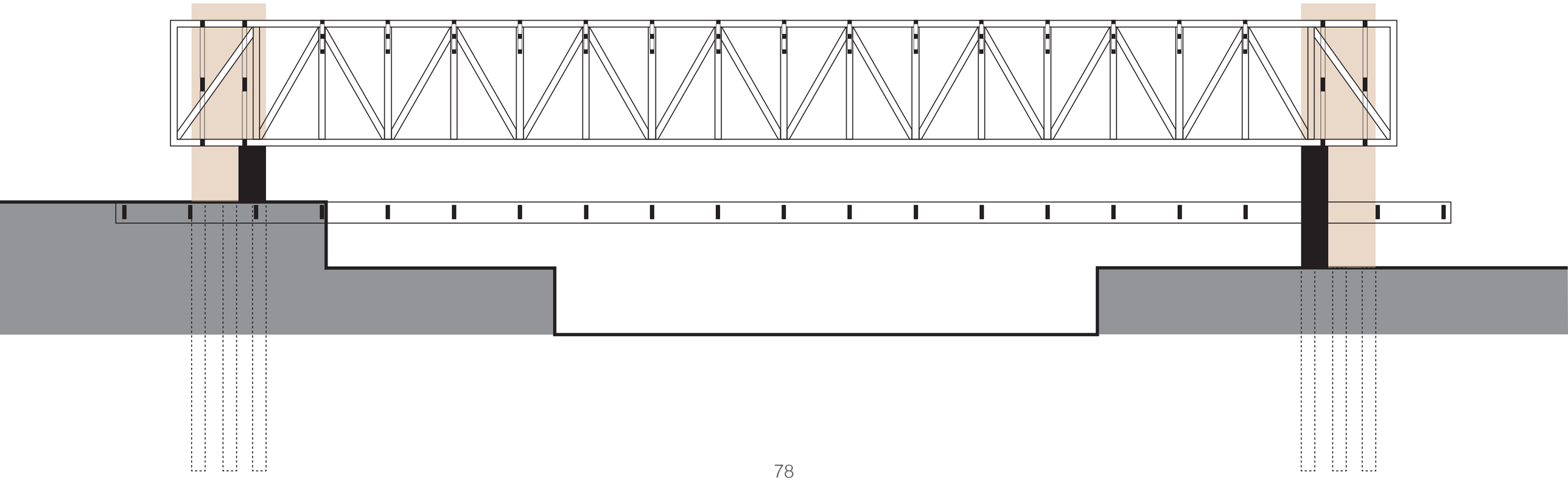


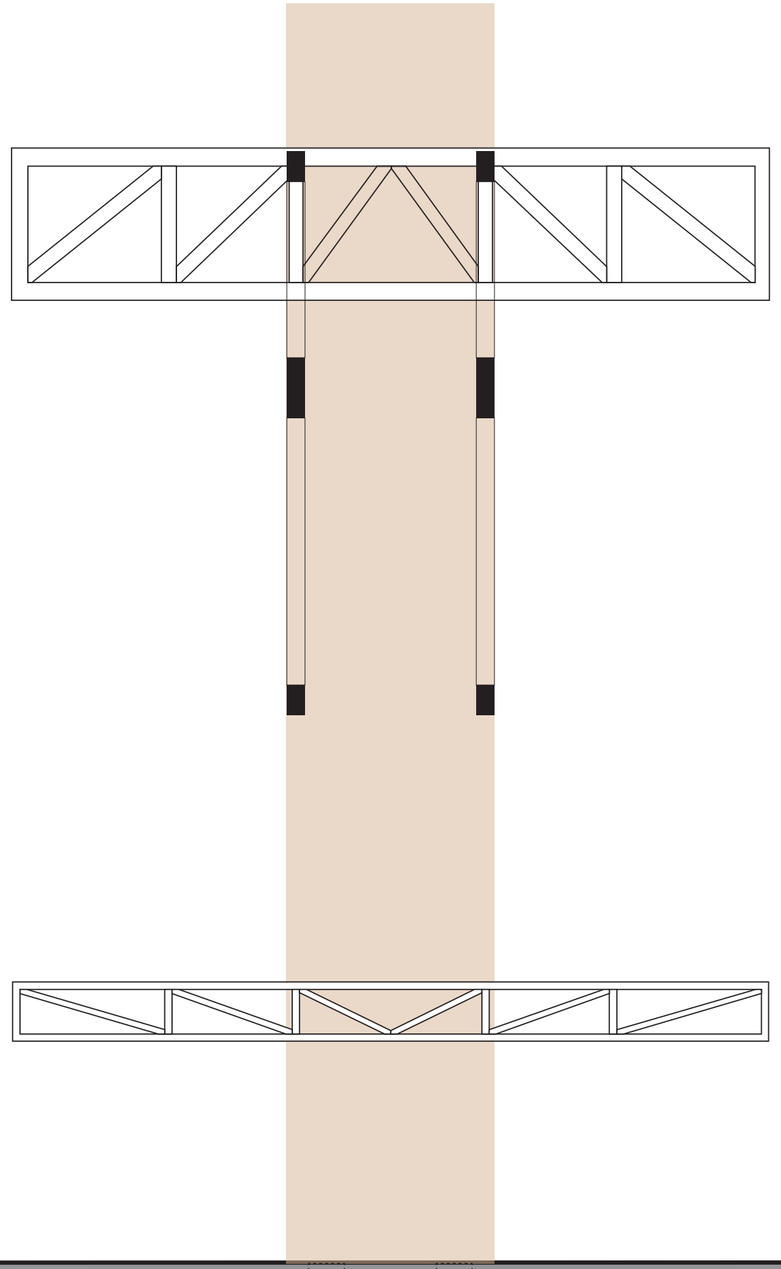
Construction

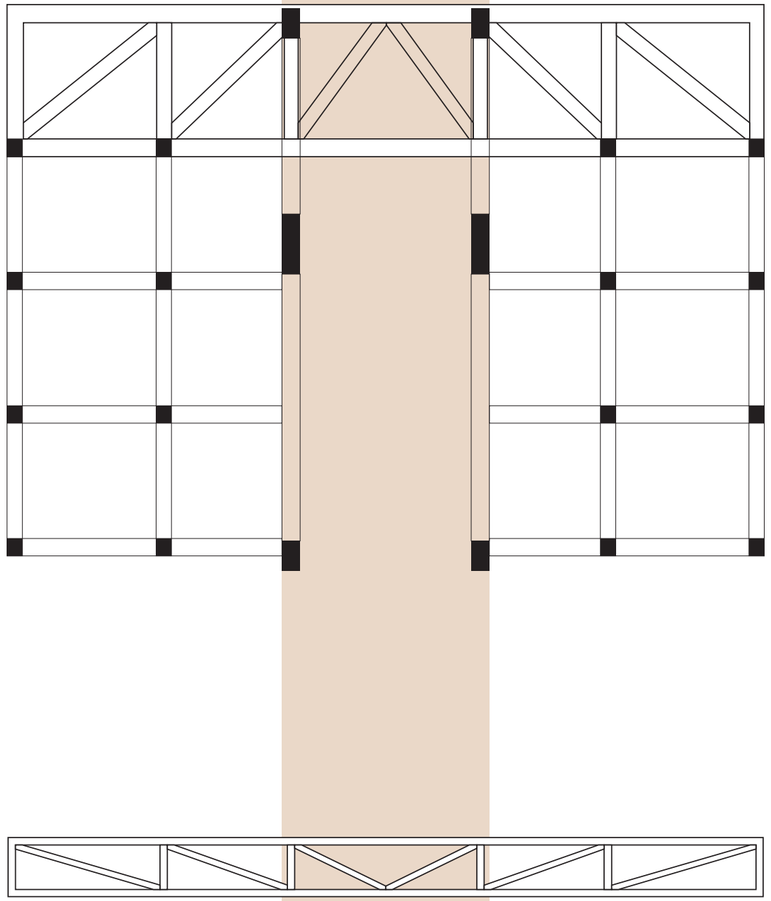


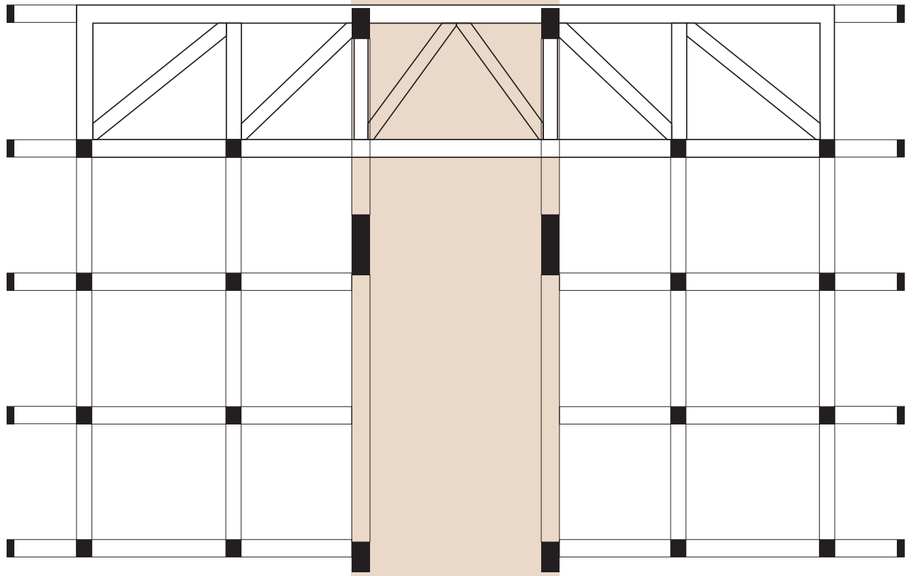


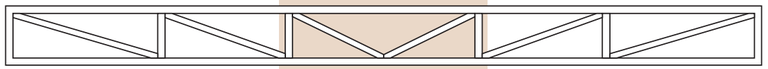


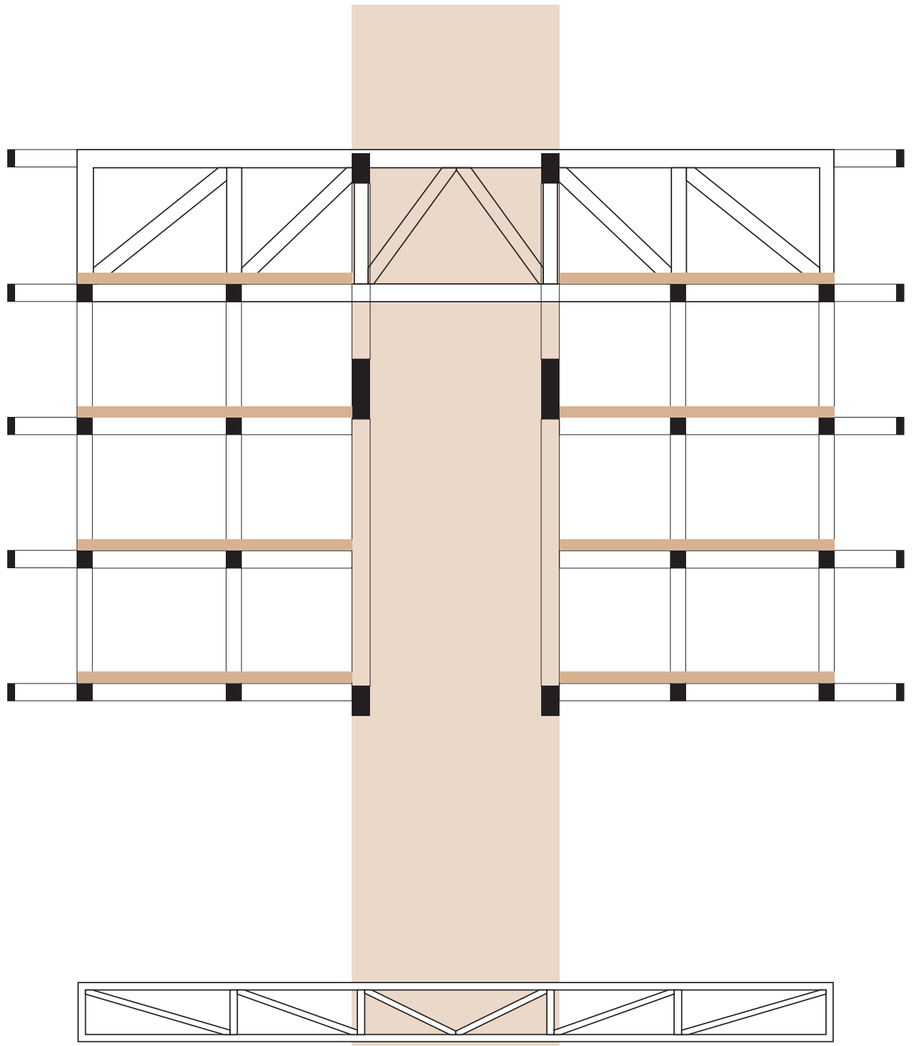




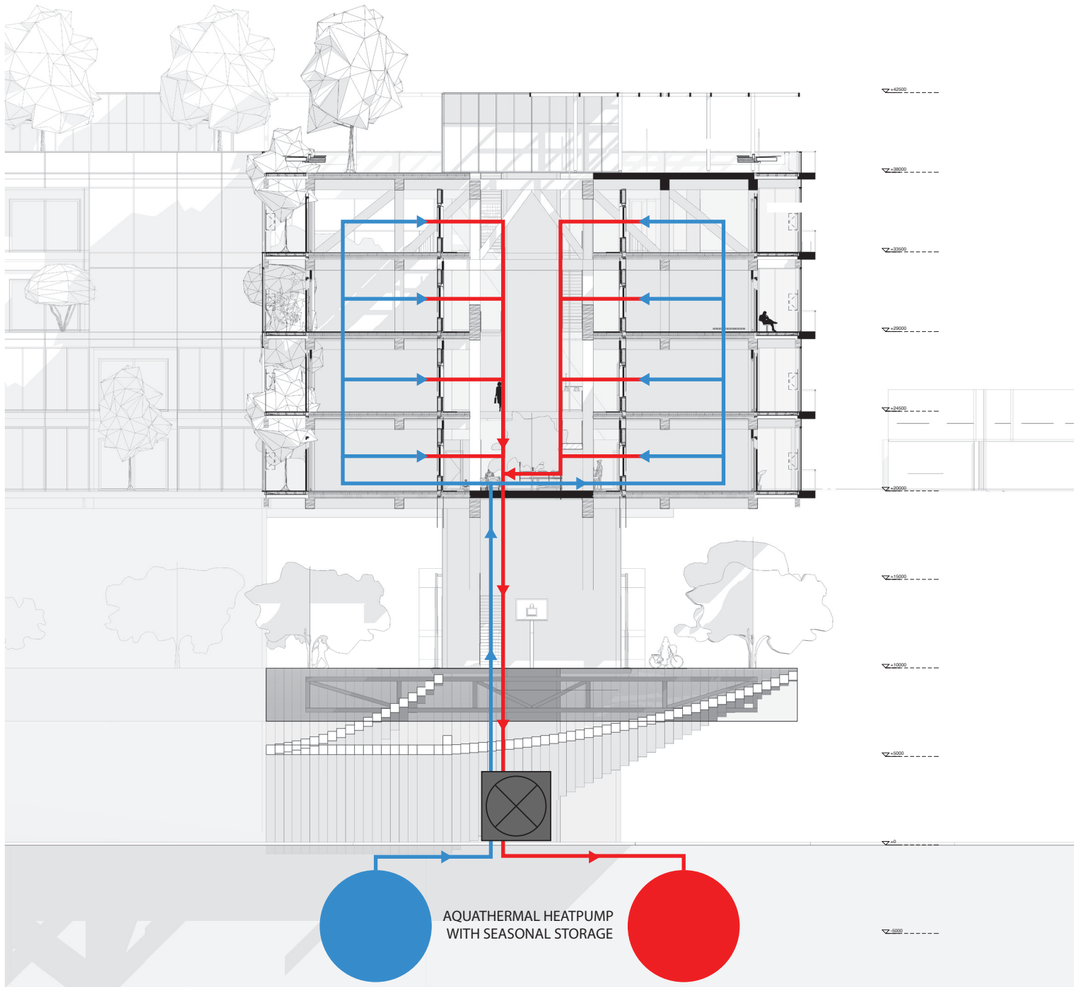




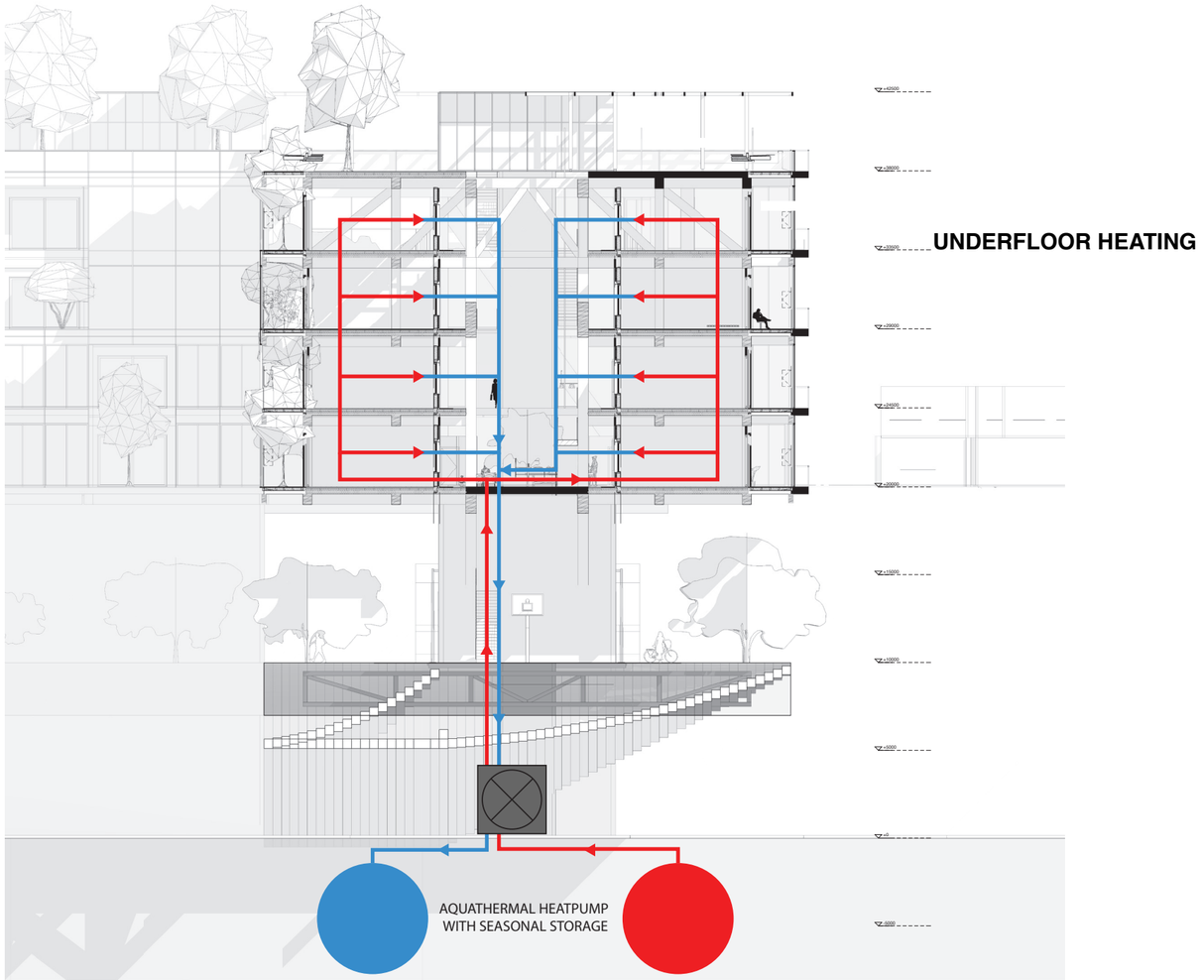




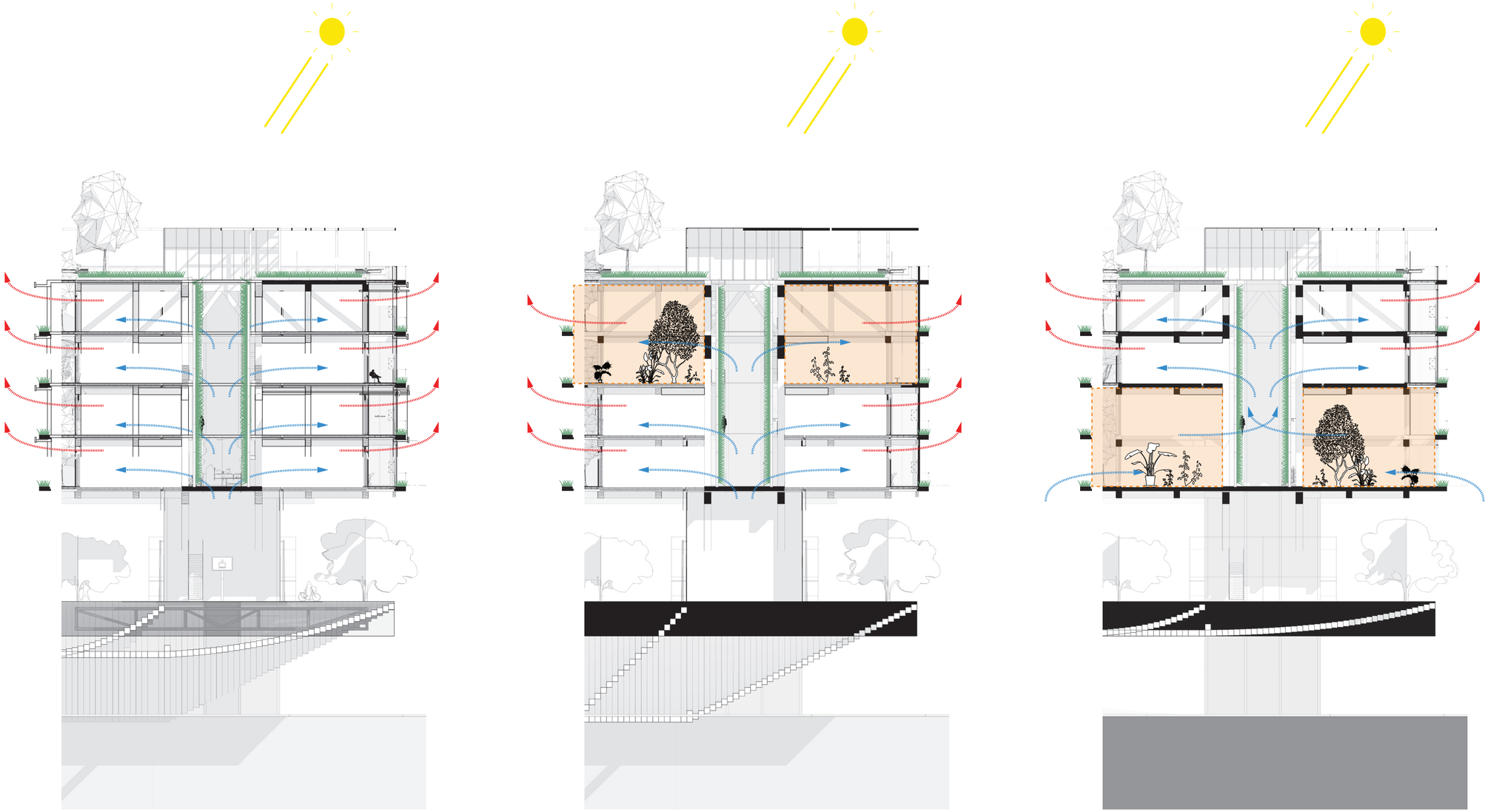
Climate



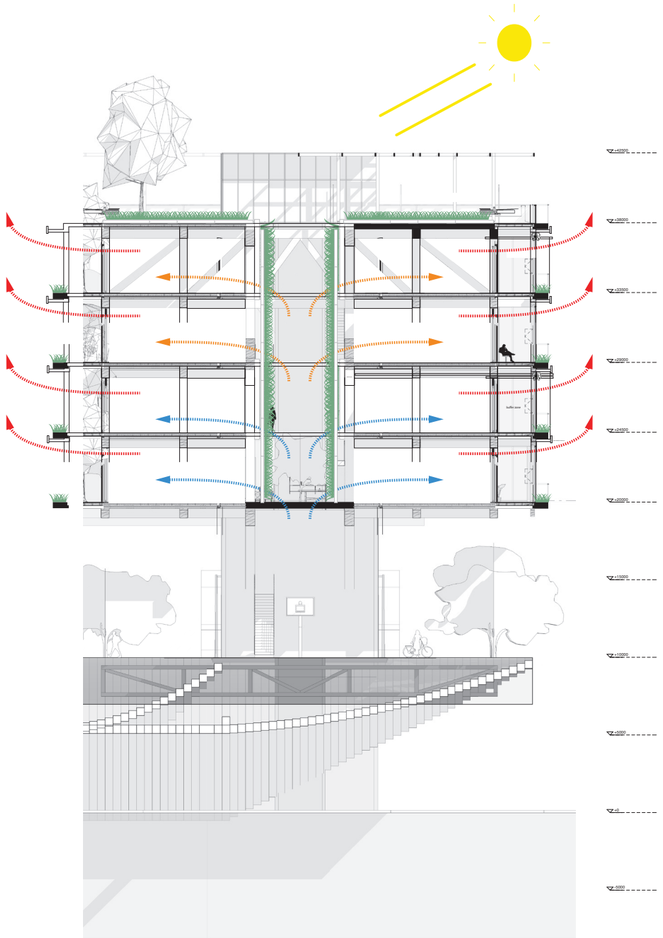
SUMMER COOLING

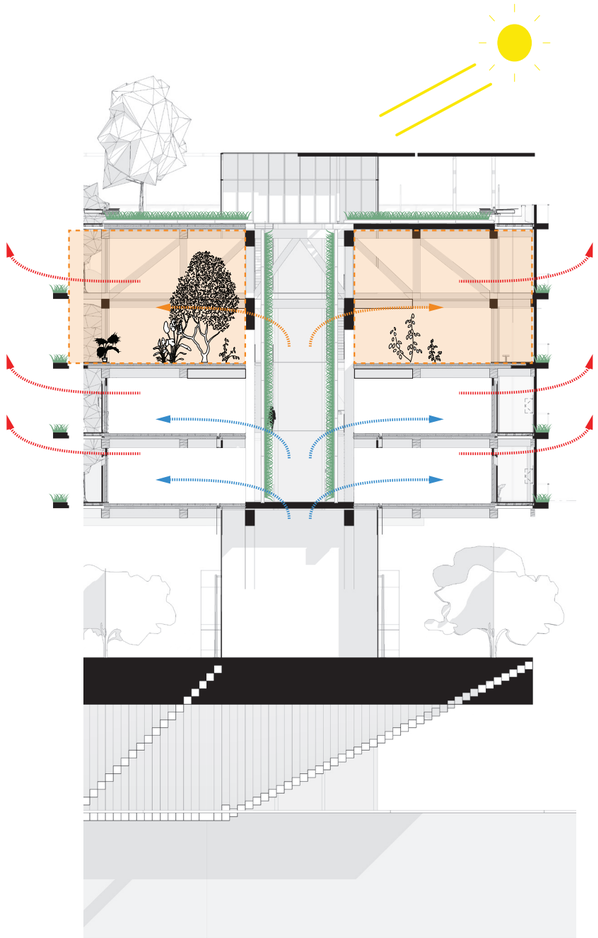


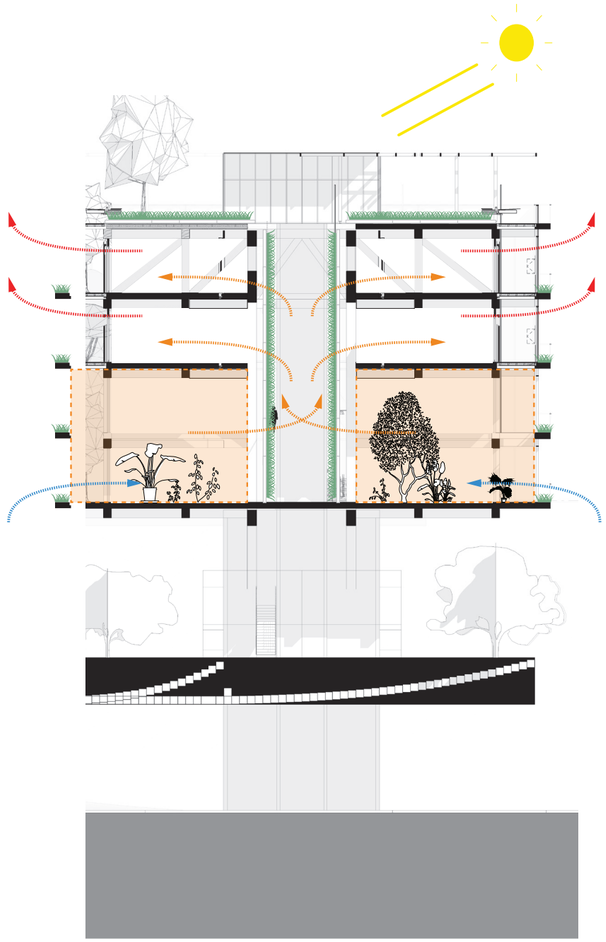
WINTER HEATING



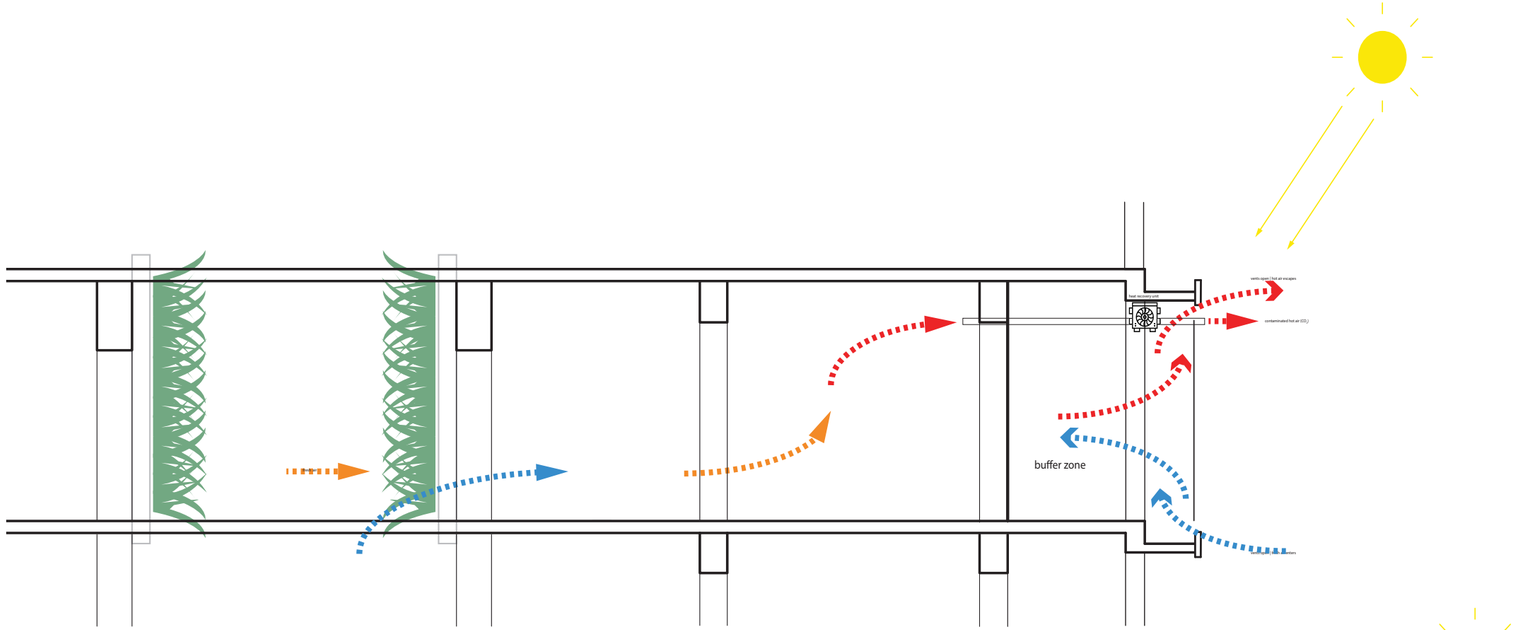
VENTILATION SUMMER



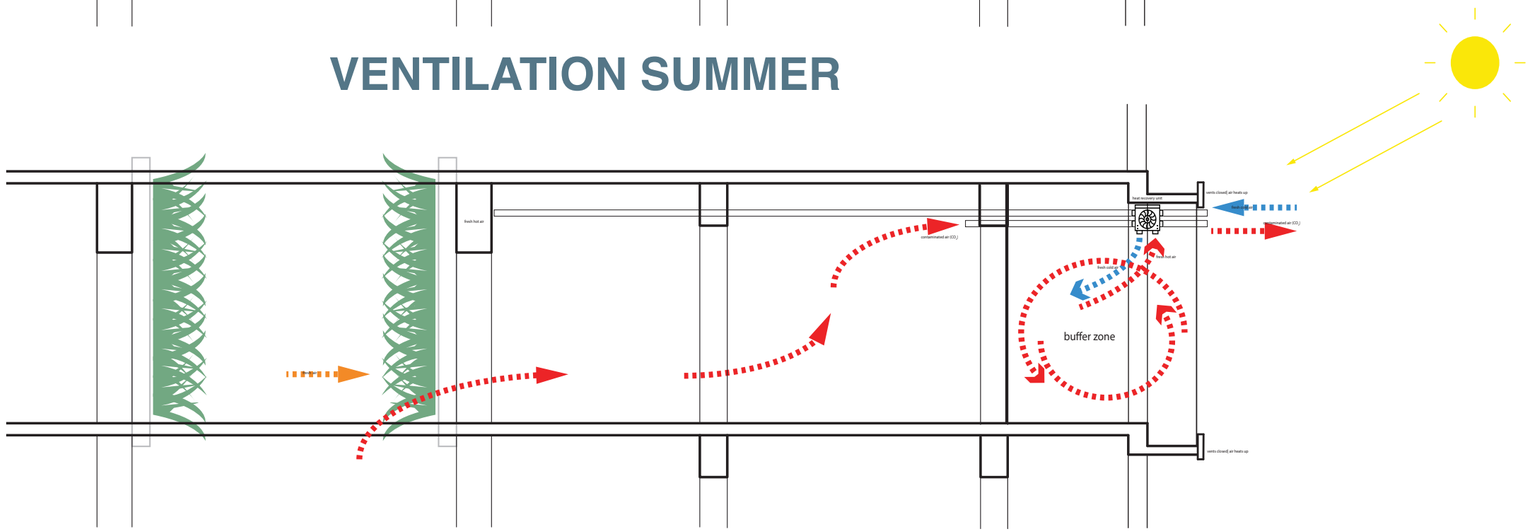




VENTILATION WINTER



VENTILATION SUMMER



VENTILATION WINTER

QUESTIONS?