ENVISIONING FUTURE FOOD PRODUCTION IN SLOTERDIJK:

an urban farm and vocational school in a repurposed „de Knip” office building.

Michał Siupik - 4709454 - P5 presentation

CONTENT:

LOCAL FOOD PRODUCTION

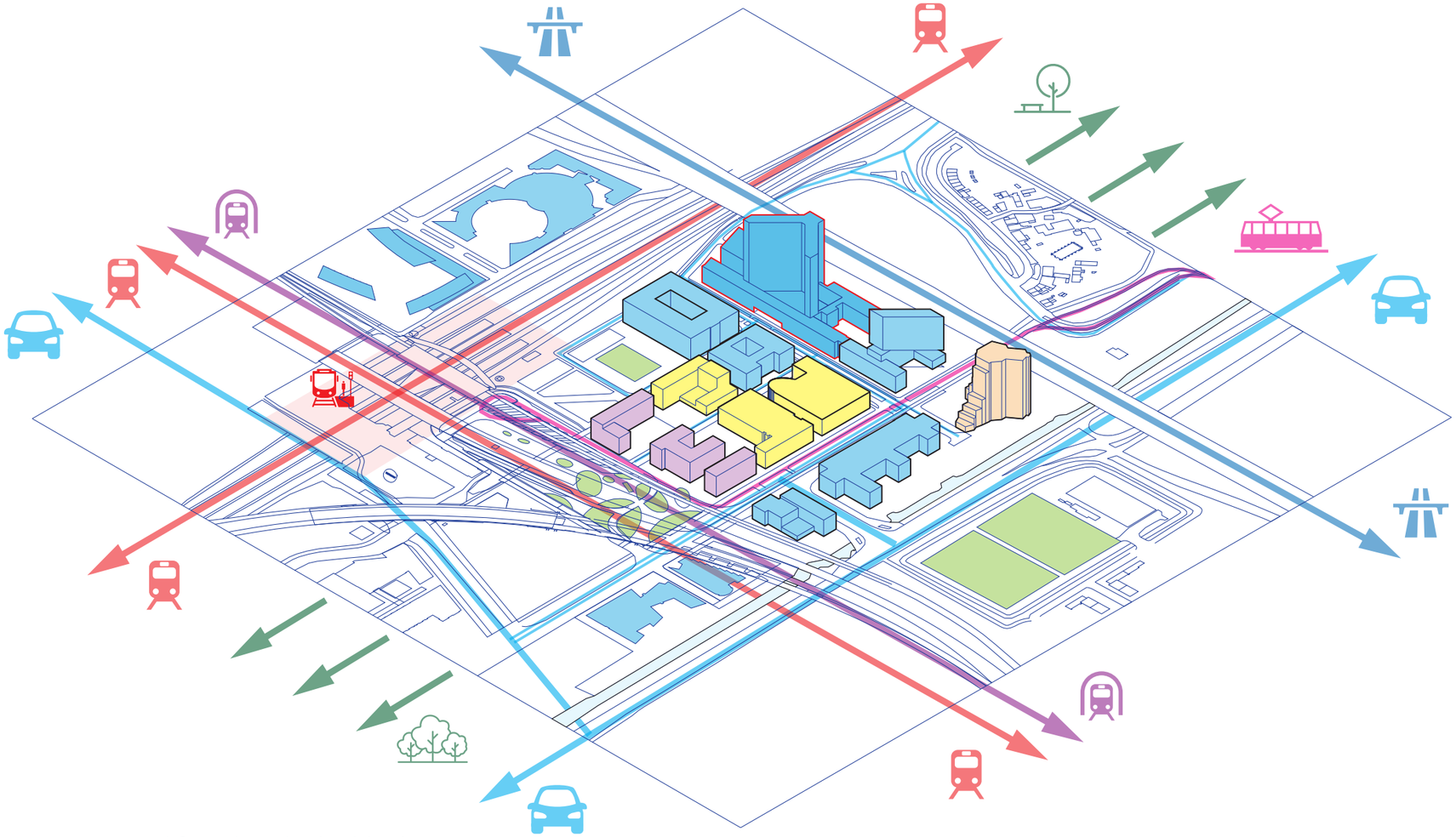
SLOTERDIJK AS MY CASE STUDY

Busy transportation hub

Obsolete buildings

Neglected public space, lack of community function

SLOTERDIJK AS MY CASE STUDY



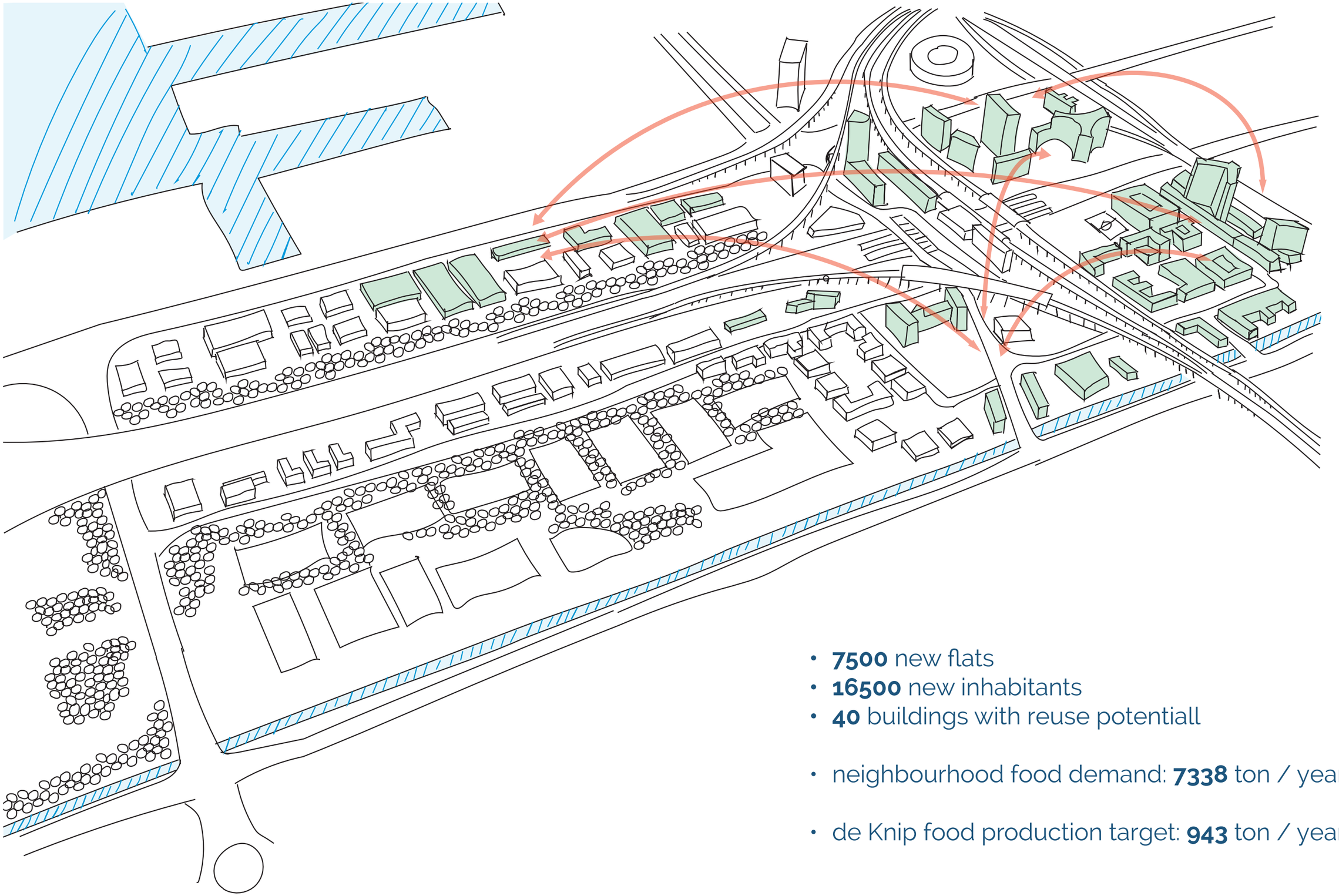
Transports and functions in the block.

Busy transportation hub

Obsolete buildings

Neglected public space, lack of community function

THEMATIC RESEARCH: FOOD PRODUCTION STRATEGY

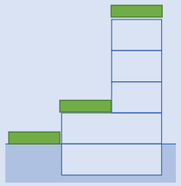
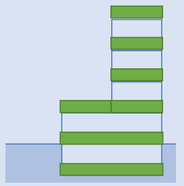
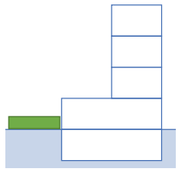
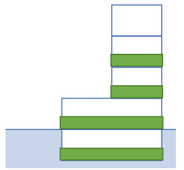
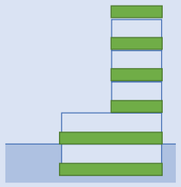
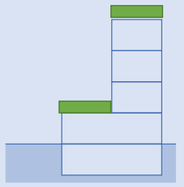
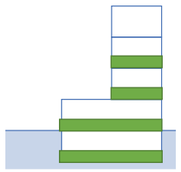
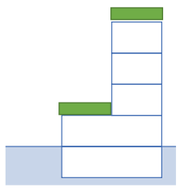
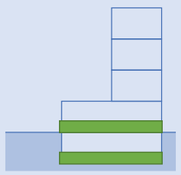
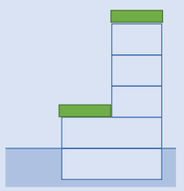
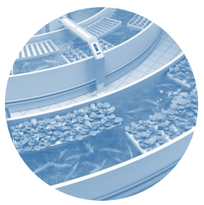
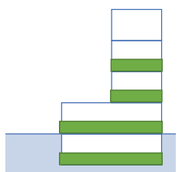
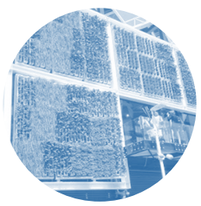
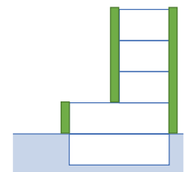


- **7500** new flats
- **16500** new inhabitants
- **40** buildings with reuse potentiall

- neighbourhood food demand: **7338** ton / year

- de Knip food production target: **943** ton / year

THEMATIC RESEARCH: PROGRAMMATIC CONCLUSIONS & CHOICE OF METHODS

method	positive	negative	education	positioning	method	positive	negative	education	positioning
 Open-field farming	- Low maintenance - Low knowledge entry threshold - Suitable educational tool in vocational training	-Low yield - Dependent on weather conditions - Can be heavy	+		 Aeroponics	- Lightweight - Low energy requirements	-Complex structure -Complex equipment - Requires trained staff and monitoring - Yields higher than traditional, yet low for complex method	+/-	
 Greenhouse farming (Soil)	- Higher yield -All year round -Can be used in education	-Requires maintenance -Extra energy use -Extra water use	+		 Plant factory	- Very high-density production - Highest yields - Easily handled - Easily cleaned - No chemicals	- Weight dependent on: artificial light, air handling units, environmental control - Largest energy consumption of noted techniques - Requires trained staff and monitoring	-	
 Hydroponics NFT	-Very lightweight -Low maintenance. -Low-tech version can be used in education	-Periodic interventions -Reliant on external nutrients -Requires at least some trained staff	+/-		 Rooftop greenhouse (CEA)	- Higher yield -All year round -Can be used in education -Can host water and soil-based methods	-Requires maintenance -Extra weight -Depend on method utilised inside	+	
 Hydroponics DFT	-Can be heated -Can be cooled -Easily constructed	-Medium weight -Reliant on external nutrients -Requires trained staff and monitoring	-/+		 Rooftop gardens	- Low maintenance - Low entry threshold - Easily accessible for elderly and disabled people	-Low yield - Dependent on weather conditions - Can be heavy - Have to be created when the building is first designed	+	
 Hydroponics DWC	-Can be heated -Can be cooled -Conveyor-belt like production	- Heavy - Requires more nutrients due to size - Low-crops only - Uses substantial amounts of water - Requires trained staff and monitoring	-/+		 Soil-based raised beds	- Low maintenance - Low entry threshold - Easily accessible for elderly and disabled people	-Low yield - Dependent on weather conditions - Can be heavy	+	
 Aquaponics	-Creates ecosystem - Self-regulating - Fish food is the main input - Fish harvest as a by-product - Highest yields	-Heavy (fish tank, filters) - Requires deep cleaning periodically - Requires trained staff and monitoring	+/-		 Facade farming	- high-density - Uses usually unused space - Introduces more biodiversity	-Requires façade redesign -Can be heavy -Pumping water to higher levels -Requires trained staff	-	

THEMATIC RESEARCH: WATER DEMAND

[For 942 ton / yr. food demand]

Soil-based raised beds

2 540 m³

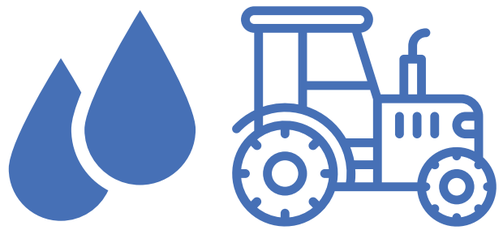
Rooftop greenhouse (CEA)

18 968 m³

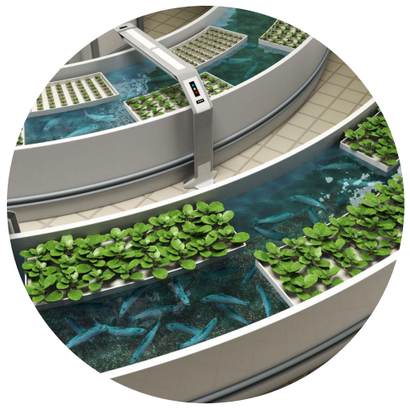
Facade farming

298 m³

Traditional Farming (m³/yr.)



106 809 m³



Aquaponics

7 196 m³

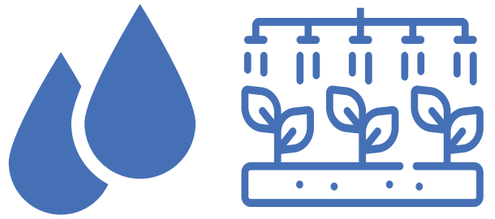
Hydroponics NFT

1 819 m³

Aeroponics

416 m³

Urban Farming (m³/yr.)



31 238 m³

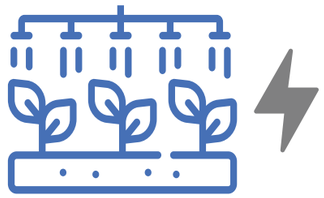
THEMATIC RESEARCH: ELECTRICITY DEMAND & CARBON ACCOUNTING

= 4.8 GWh

[For 942 ton / yr. food demanc

TRADITIONAL FARMING
+
IMPORT

5613 ton CO_2eq.



LOCAL URBAN FARMING
+
GREY ELECTRICITY

3853 ton CO_2eq.

LOCAL URBAN FARMING
+
GREEN ELECTRICITY

1316 ton CO_2eq.

THEMATIC RESEARCH: CONCLUSIONS

Spatial programme, & best positioning

m2, acommpaning utilities
best floors to locate it

Best for education

combined industrial-scale
methods & traditional ones

Possibility of environmental impact reduction

depending on balance between
green and grey electricity

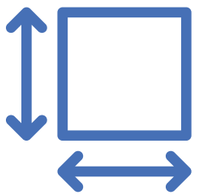
implement

Further investigate by design:

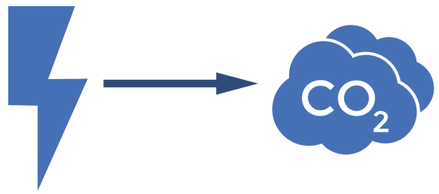
renewable energy sources,
water collection, treatment,
energy efficient ventilation

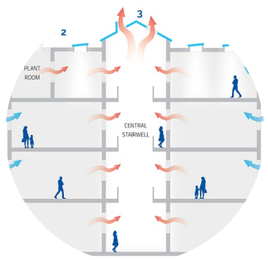
impact on facade and roof design

Research conclusions



Façade and roof PV's / wind turbines





Energy efficient ventilation / heating, cooling

Roof and façade water collection

Impact on design

Implementation on the roof

Implementation on the façade

DE KNIP: OPPORUNITIES AND GOAL

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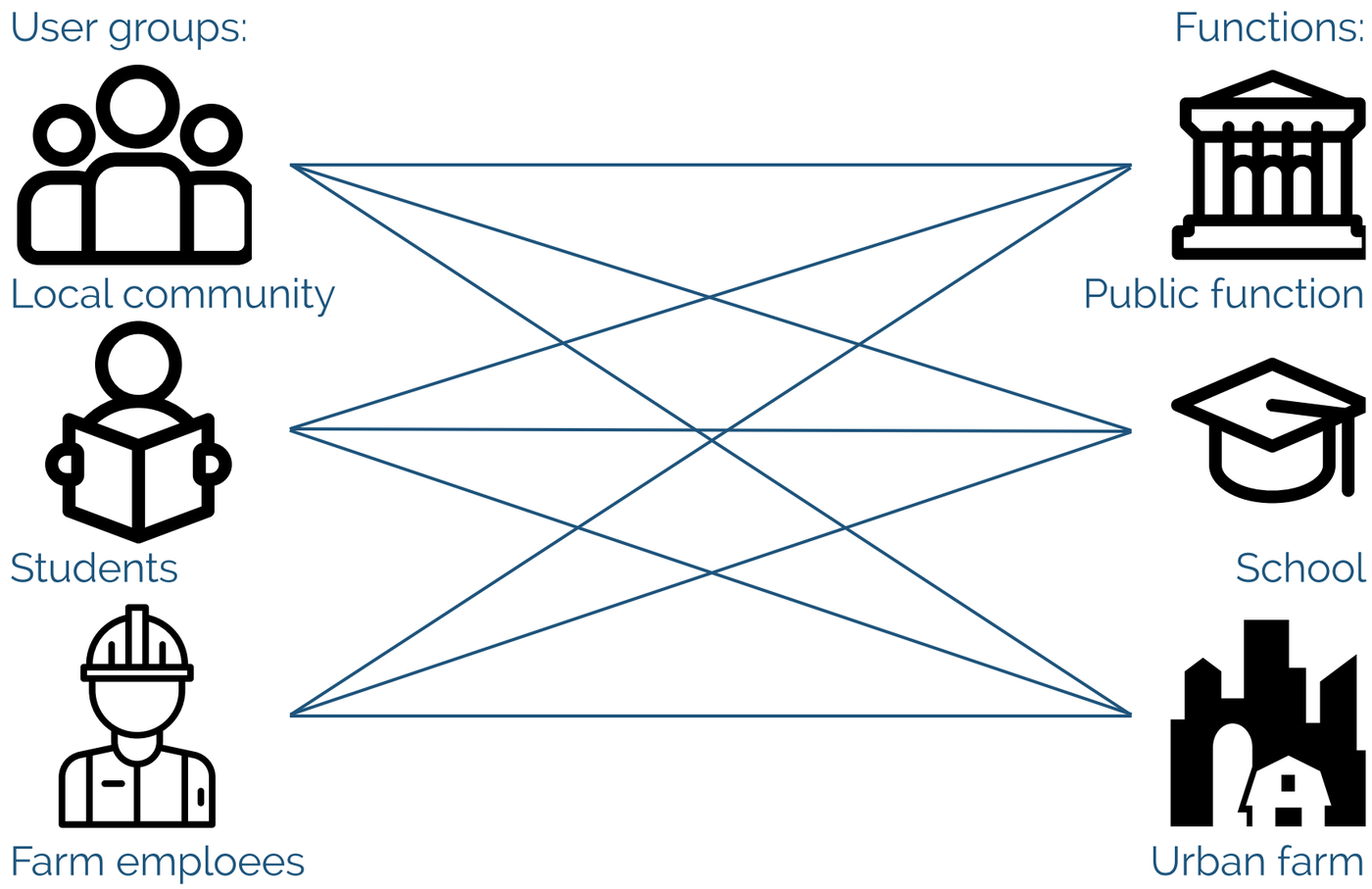
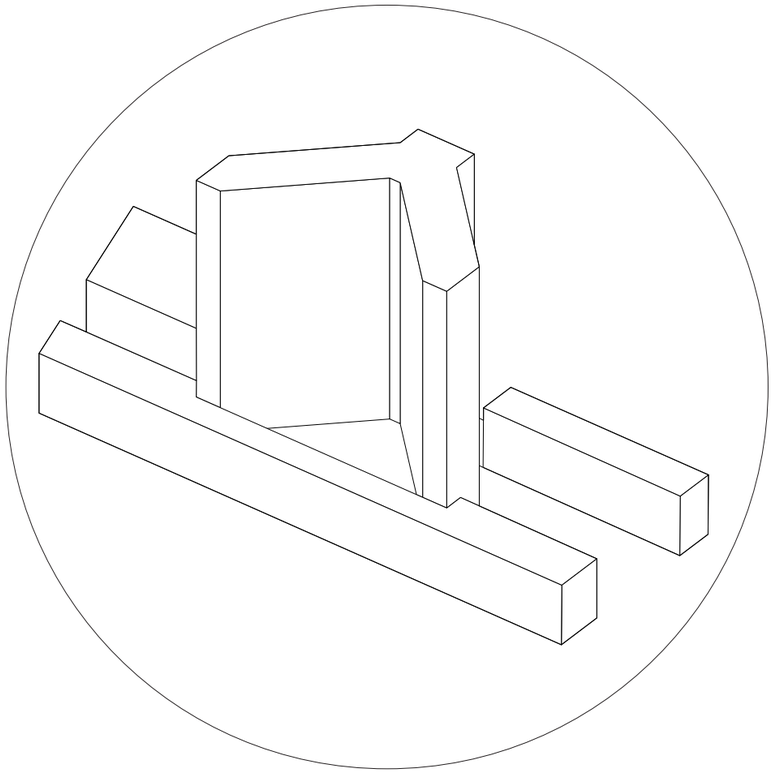
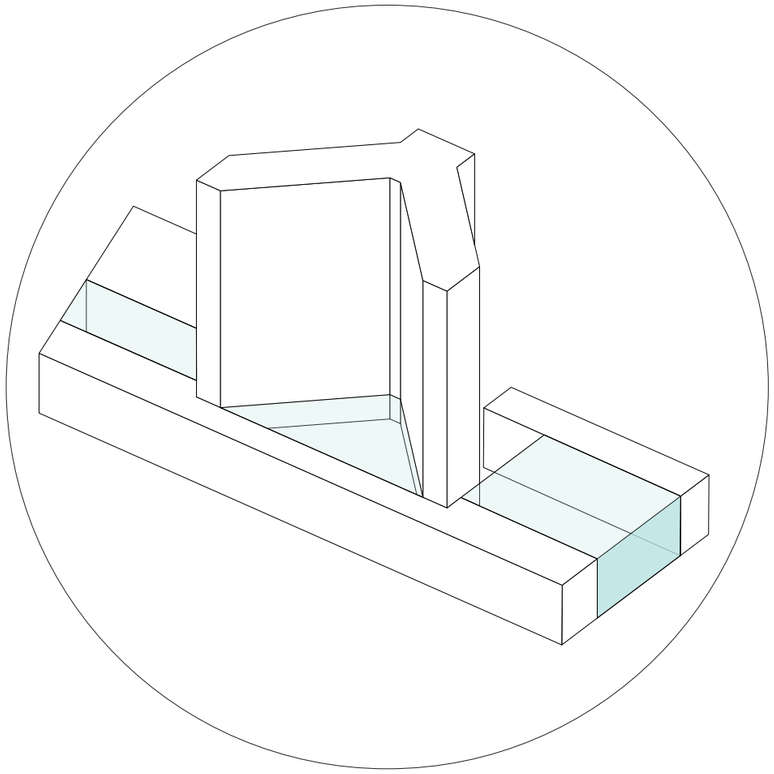


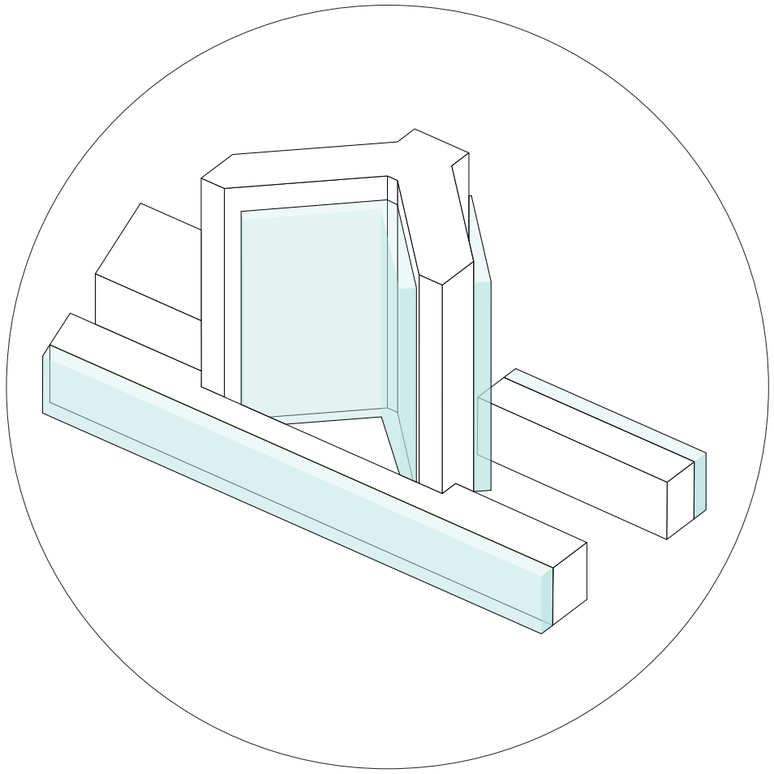
DE KNIP: AREAS OF INTERVENTION



Existing volume



Common areas (atriums infill + roof)

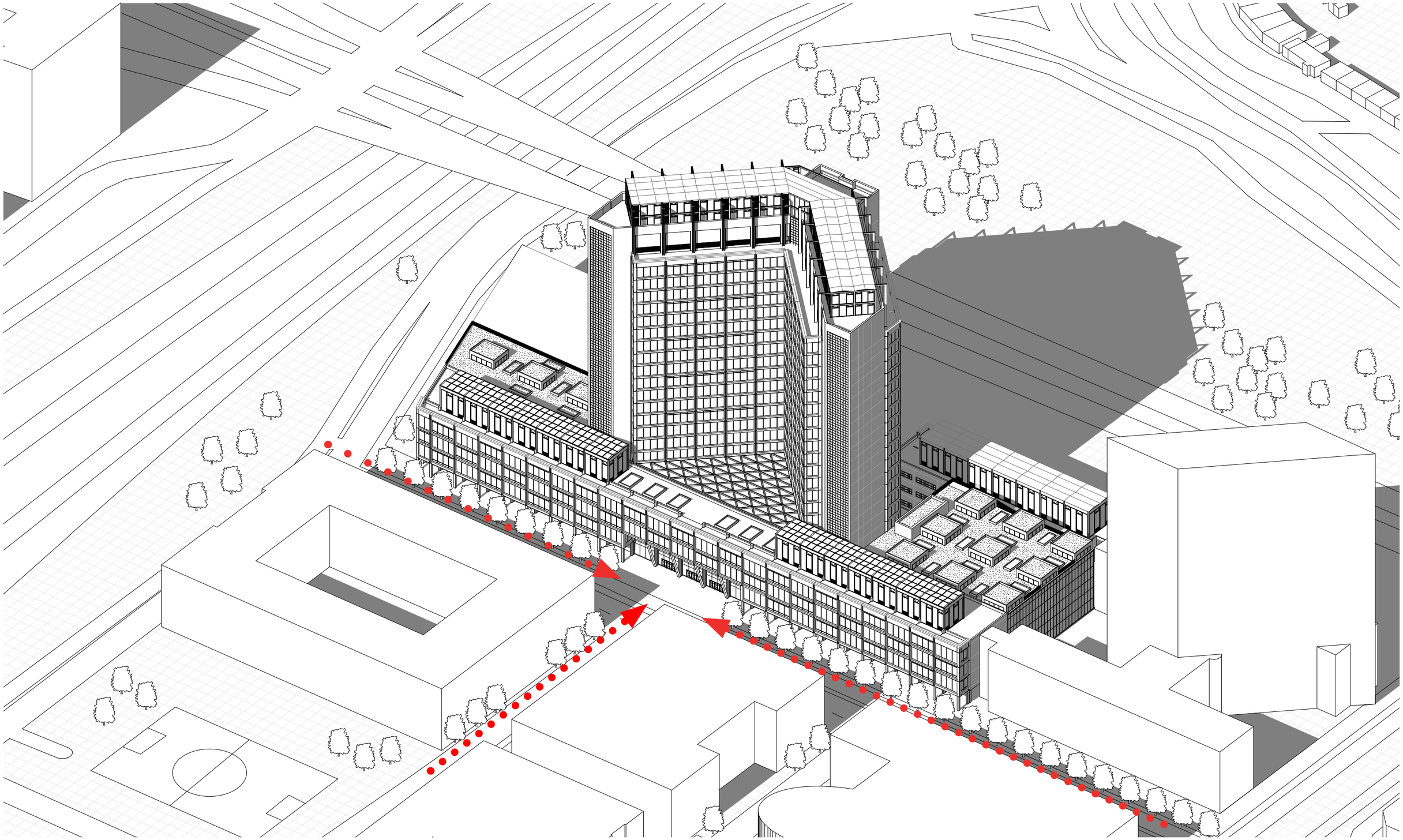


Facade

Rules of intervention:

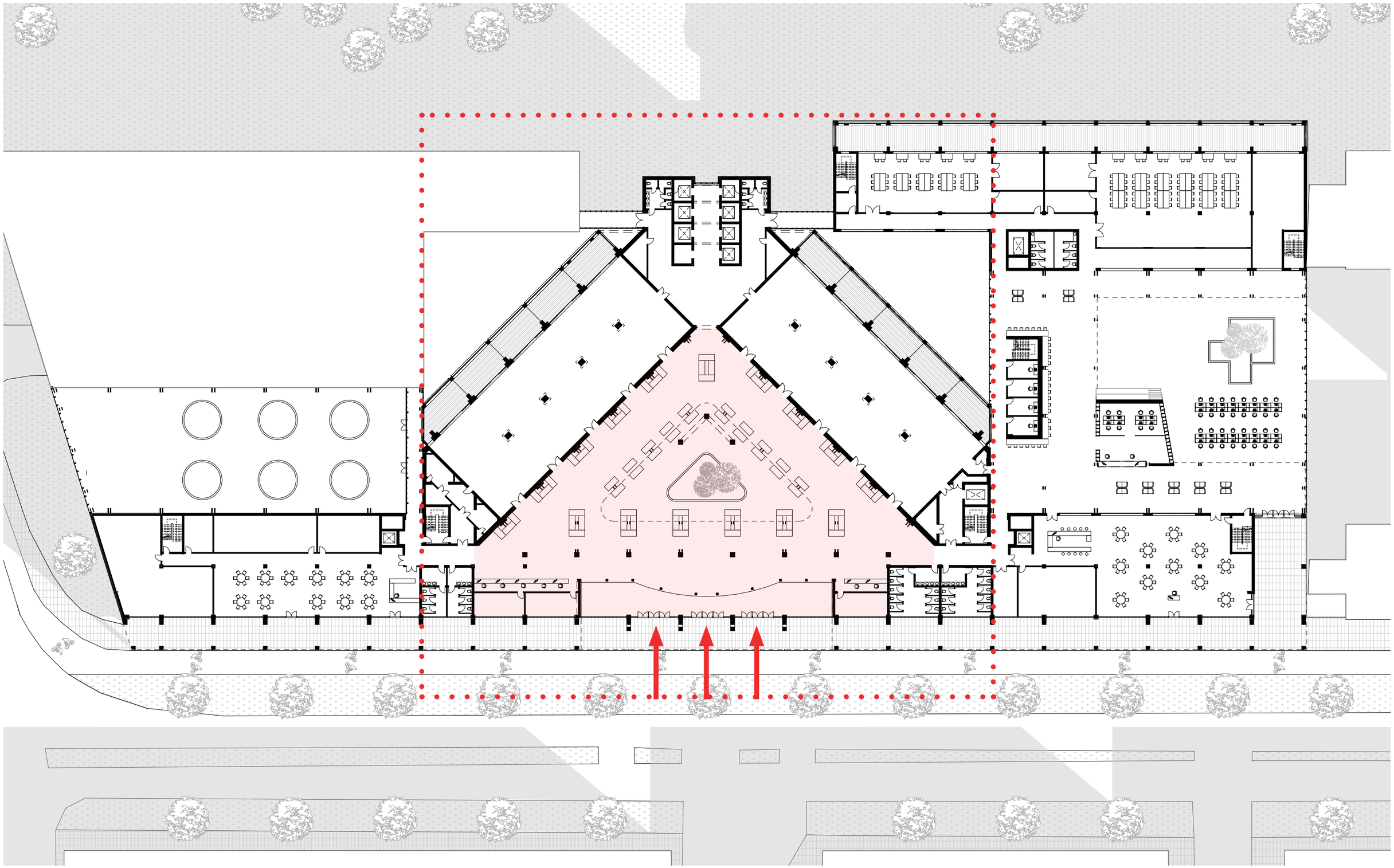
1) adding new volume
2) demolishing as little as possible
3) working with the existing building tissue (layout)

DE KNIP



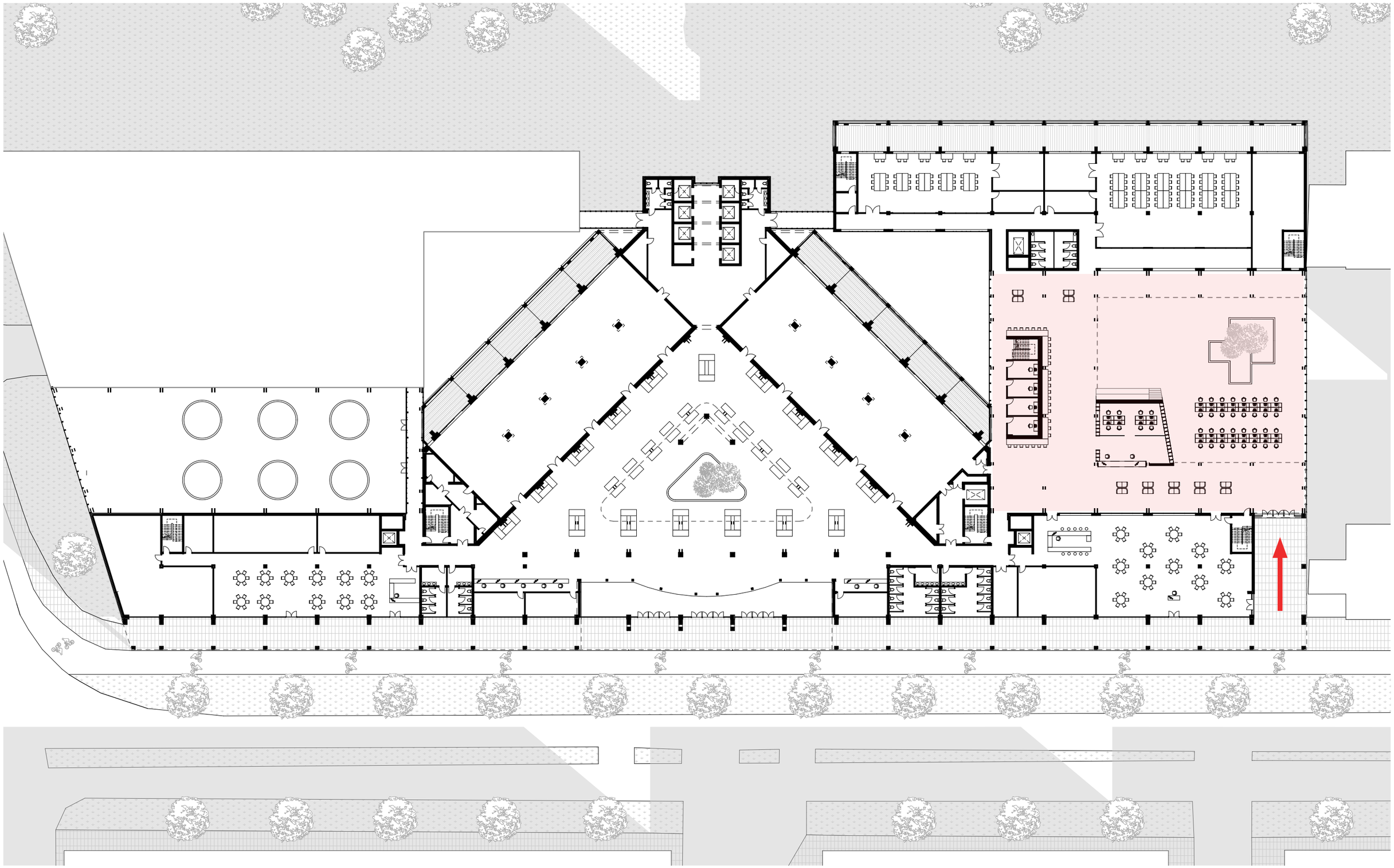
TOWARDS THE ENTRANCE

ENTRANCE ATRIUM



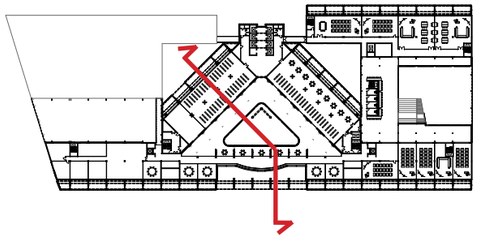
ENTRANCE ATRIUM - THE MARKETPLACE

SOUTHERN ATRIUM



SOUTHERN ATRIUM - NEW HEART OF THE SCHOOL

FUNCTIONAL LAYOUT



greenhouse & restaurant

machine room & utilities
(water tratement and pumps, air control, mechanical ventilation, elevator engines)

service deck for the new facade

farm floors (level +10 to +19)

public atrium and market
(main circulation, buy fresh food, meet the neighbours, students, access the knowledge)

created by elevating existing roof two floors up

roof garden
(group study, education, relaxation)

sky garden (level +8 to +9)

maintenance floor
(storage, fertalizer, utilities)

farm offices & quality control

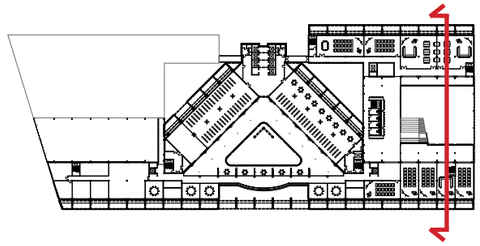
school, practical education
(labs, workshops, kitchens)

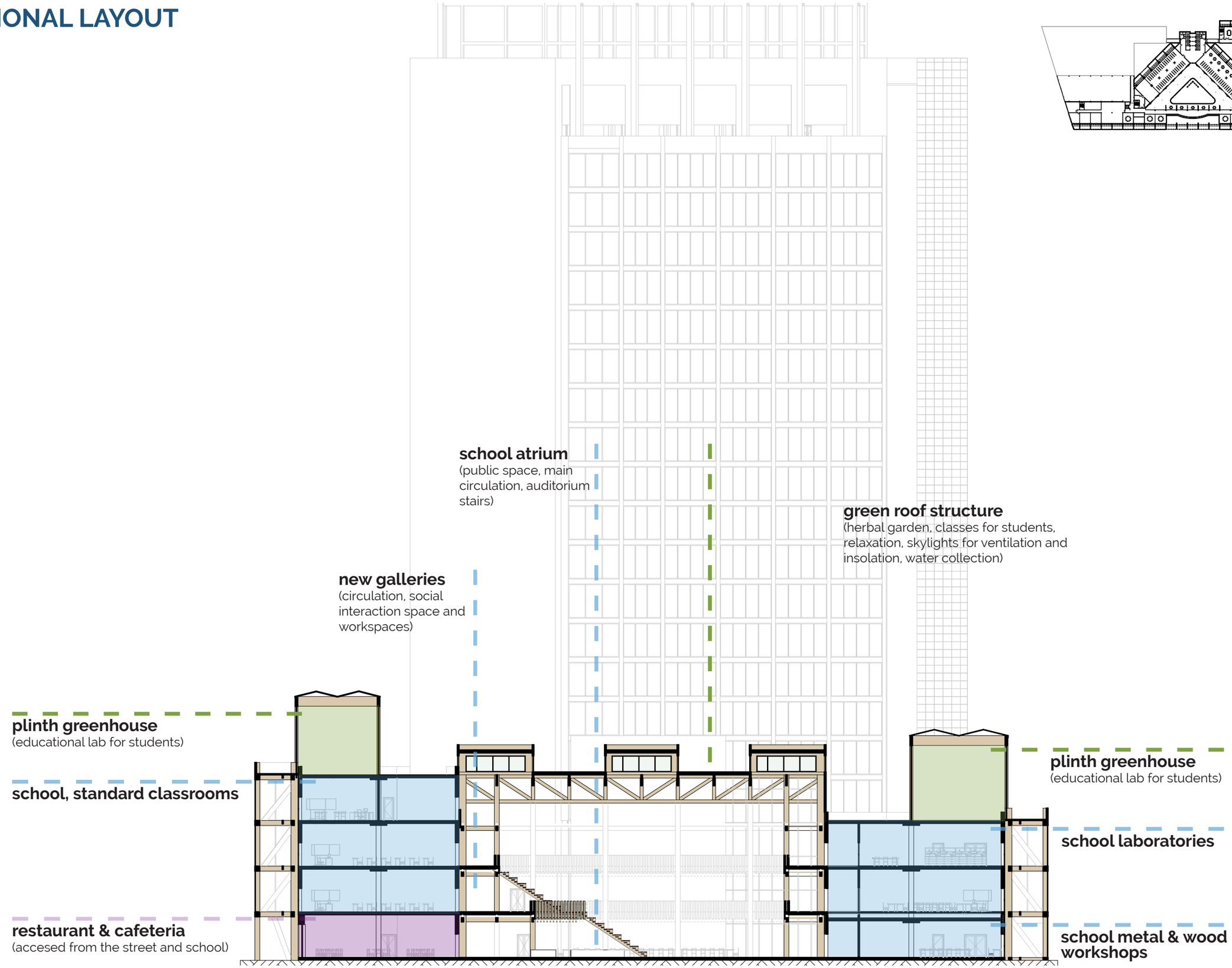
school, theoretical education
(classrooms, group study, self study compartments)

school & public library
(reading rooms, workspaces)

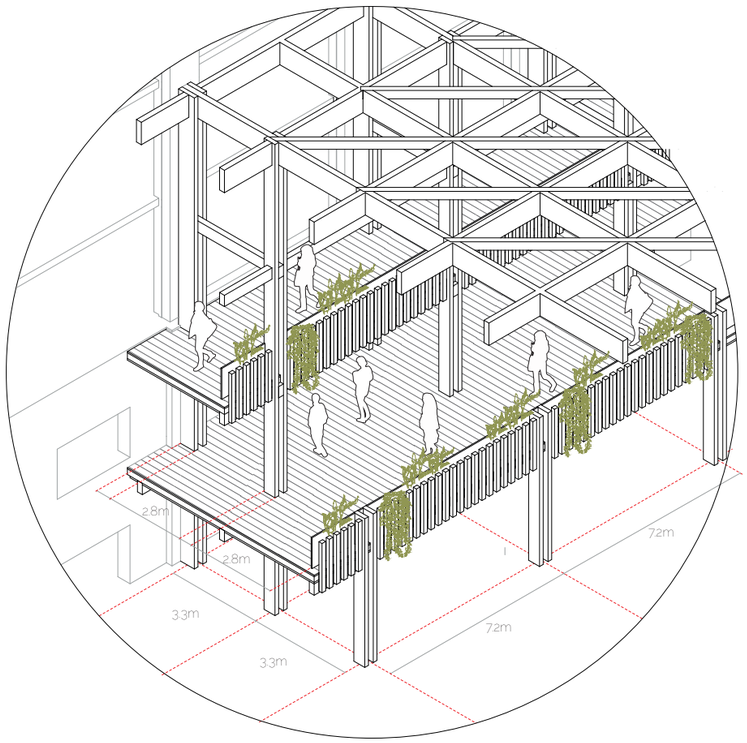
farm products storage
(accessed through facade lift)

FUNCTIONAL LAYOUT

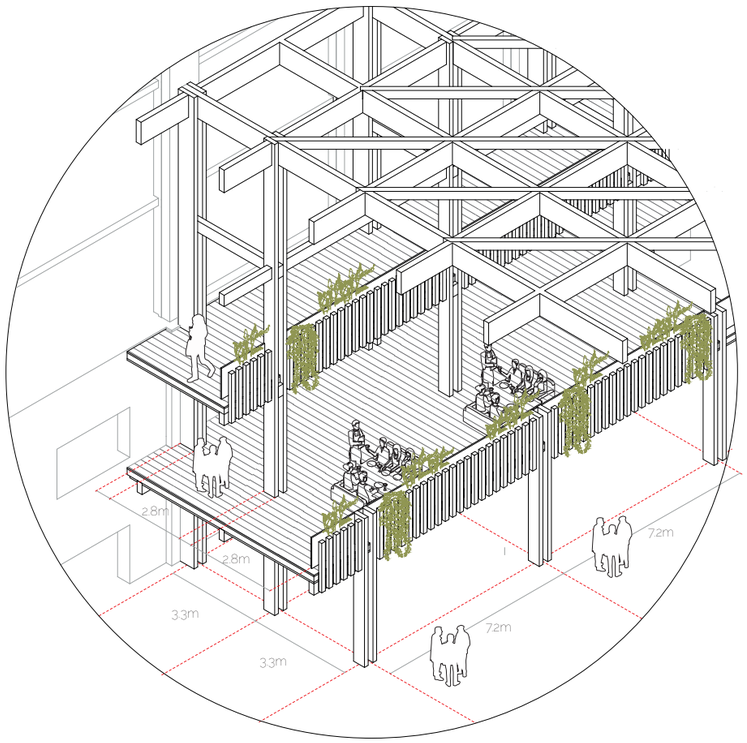




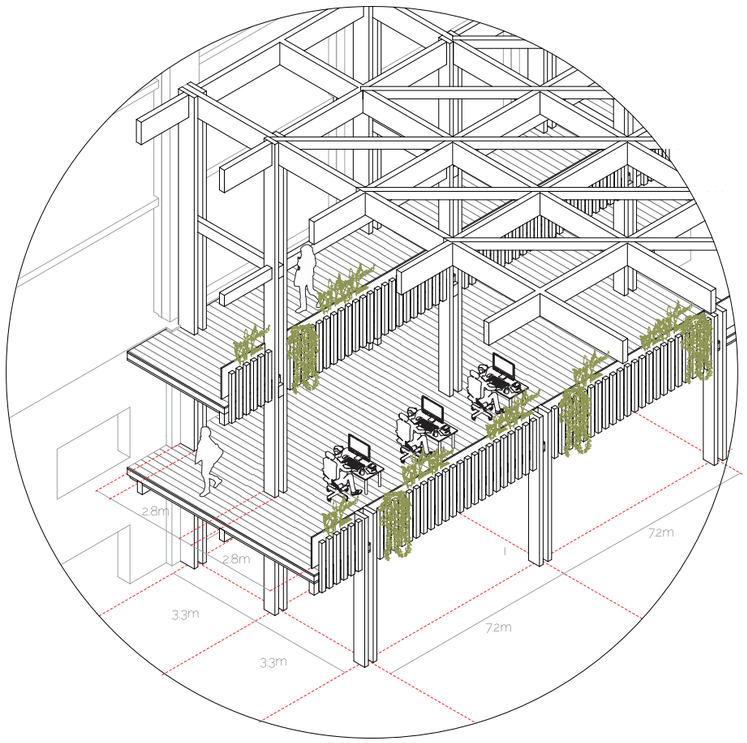
MULTIFUNCTIONAL STRUCTURE



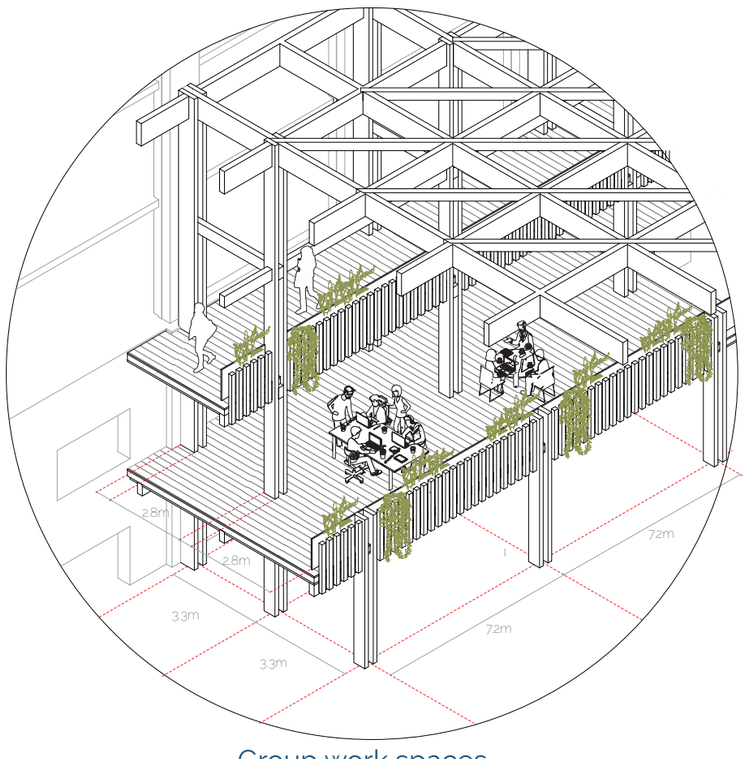
New circulation



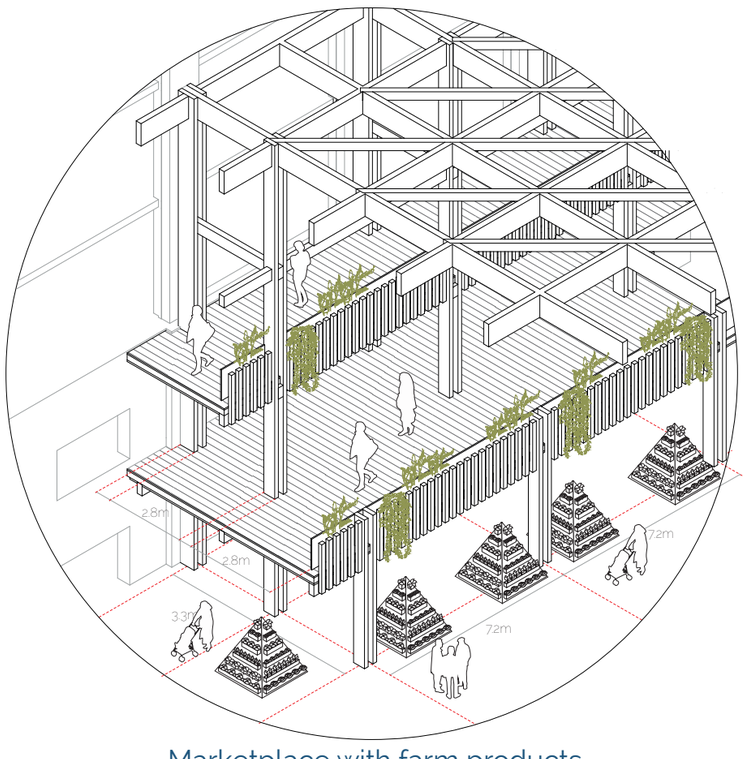
Socialising space



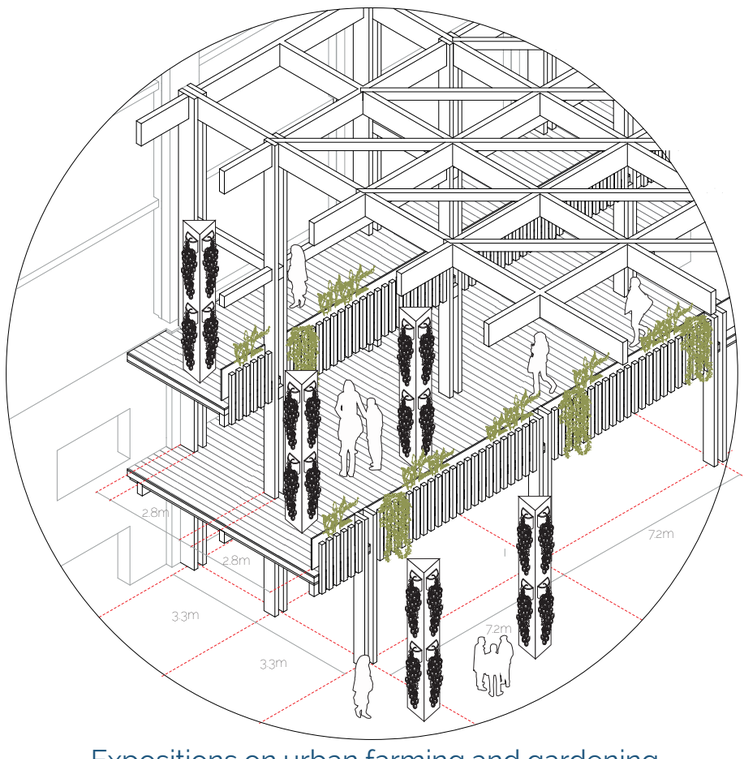
Workspaces for students



Group work spaces



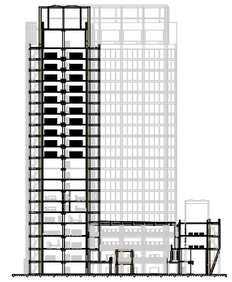
Marketplace with farm products

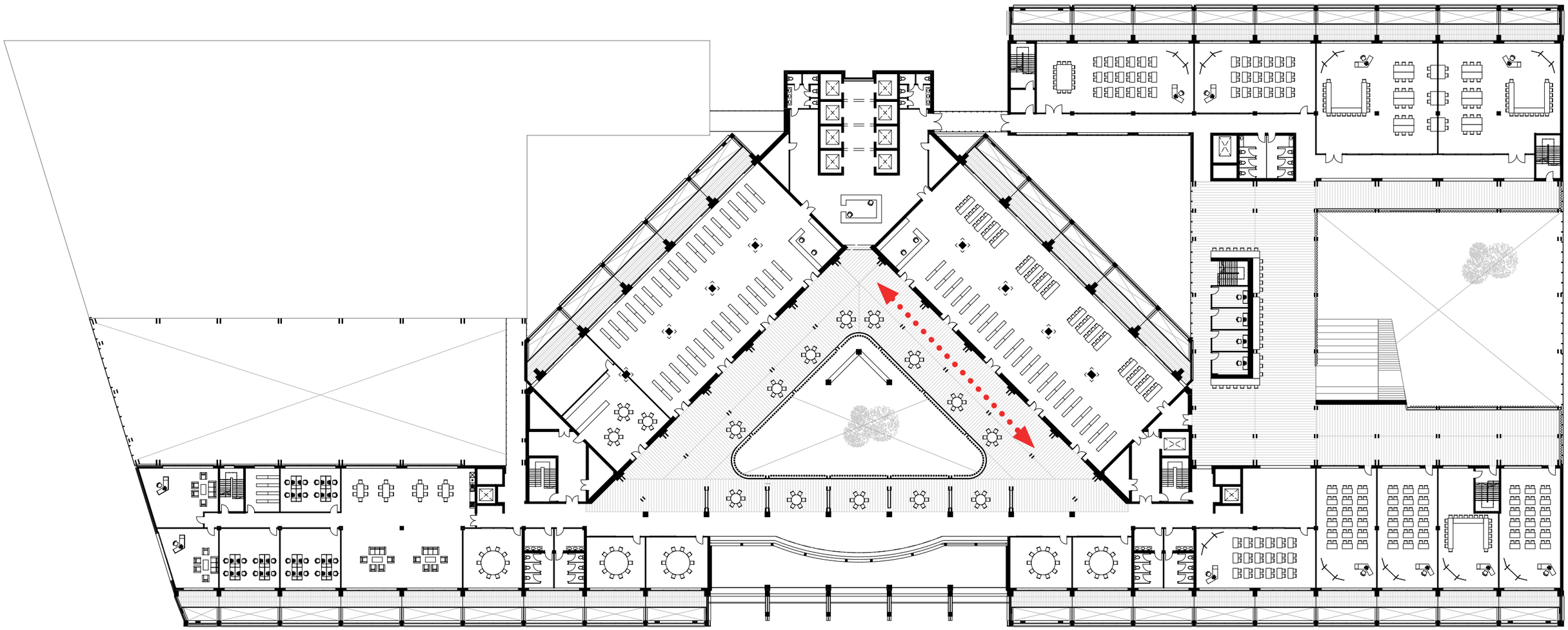


Expositions on urban farming and gardening

TERRACING GALLERIES: CIRCULATION AND FARM ACTIVITIES

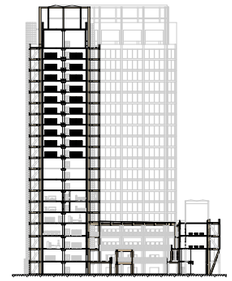
SPACE OF COMMUNICATION AND INTERACTION

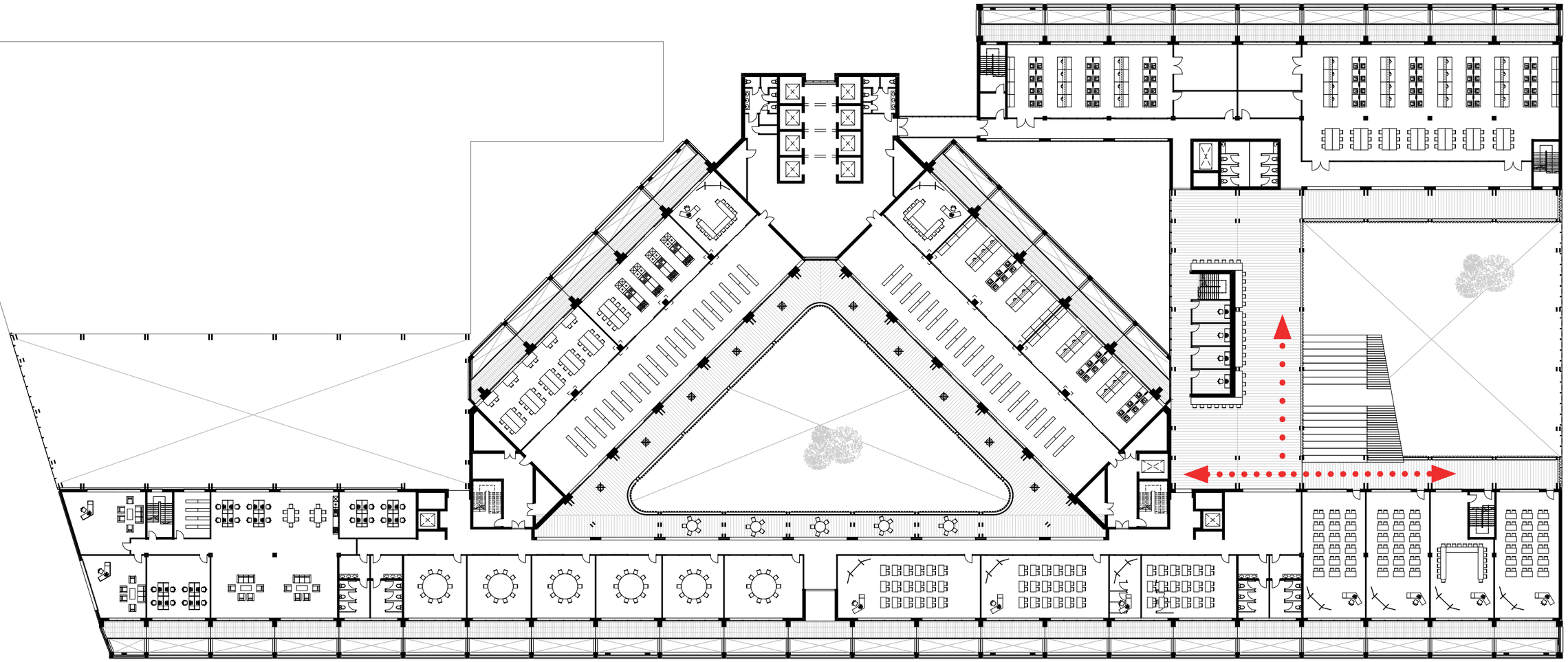




TERRACING GALLERIES: COMMUNICATION AND INTERACTION

CIRCULATION & STUDENT SERVICES





CORRIDOR: STUDENT SERVICES

ATRIUM INFILL: ASSEMBLY PROCESS & JOINTS

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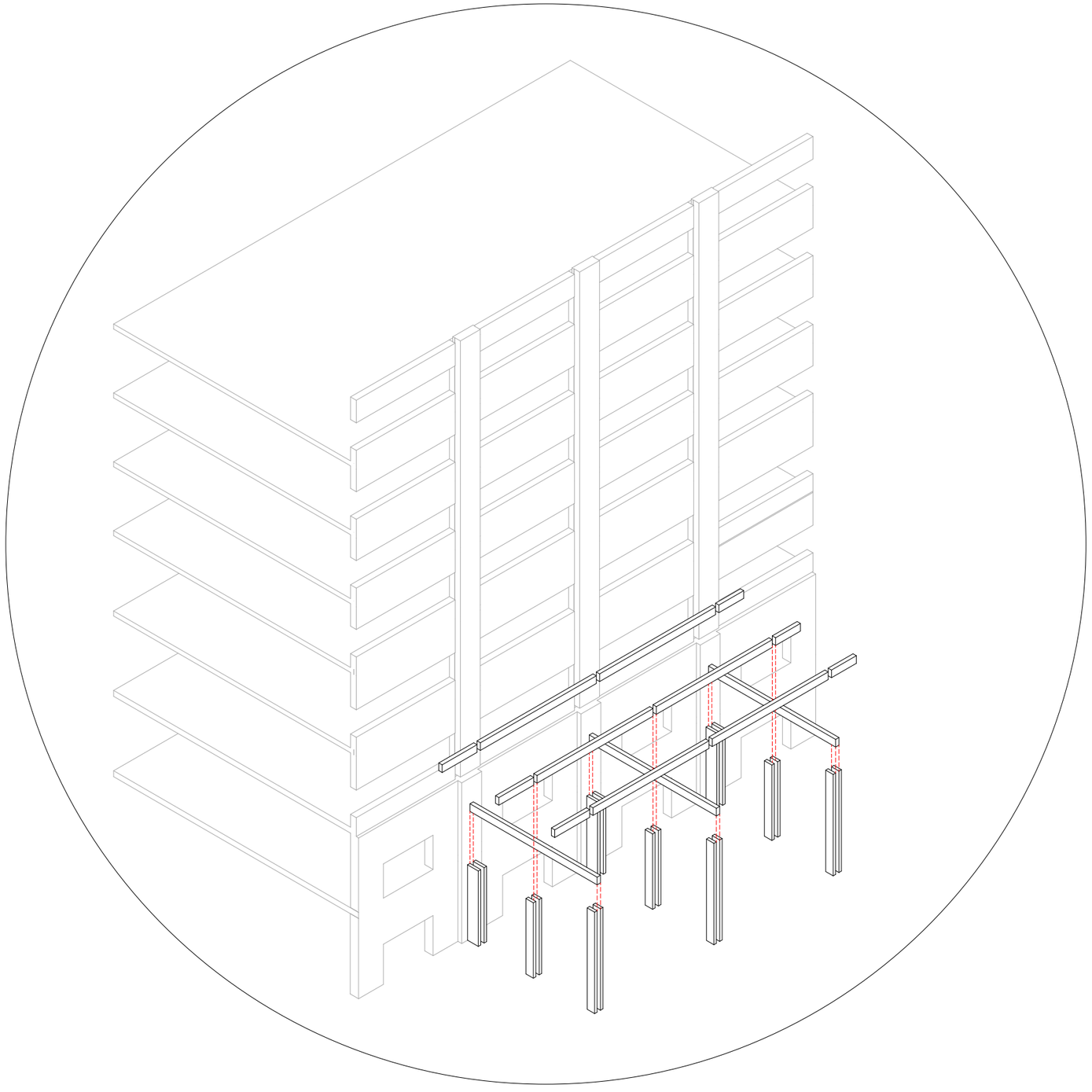
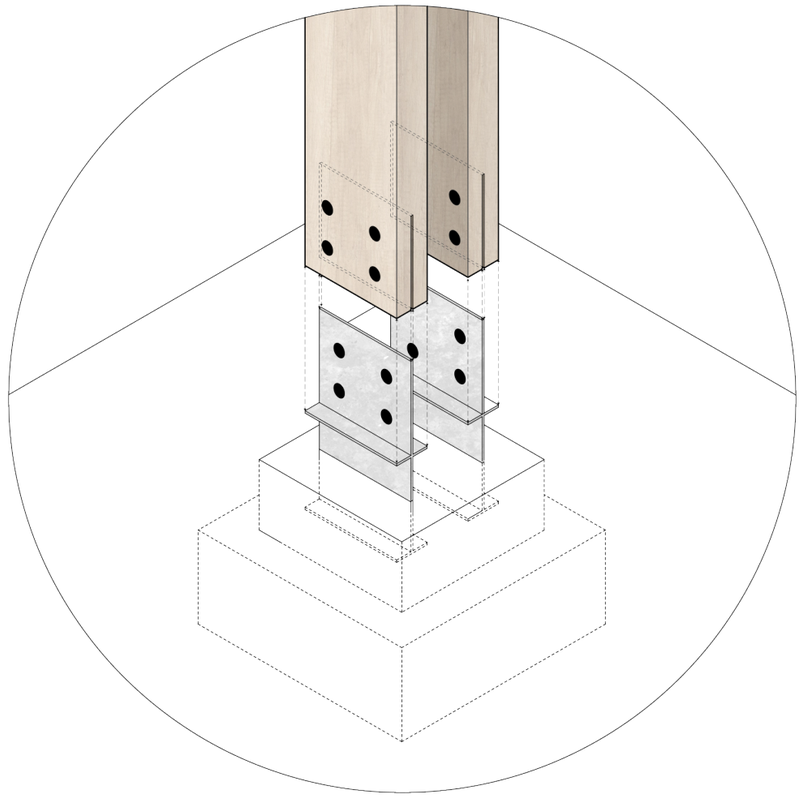
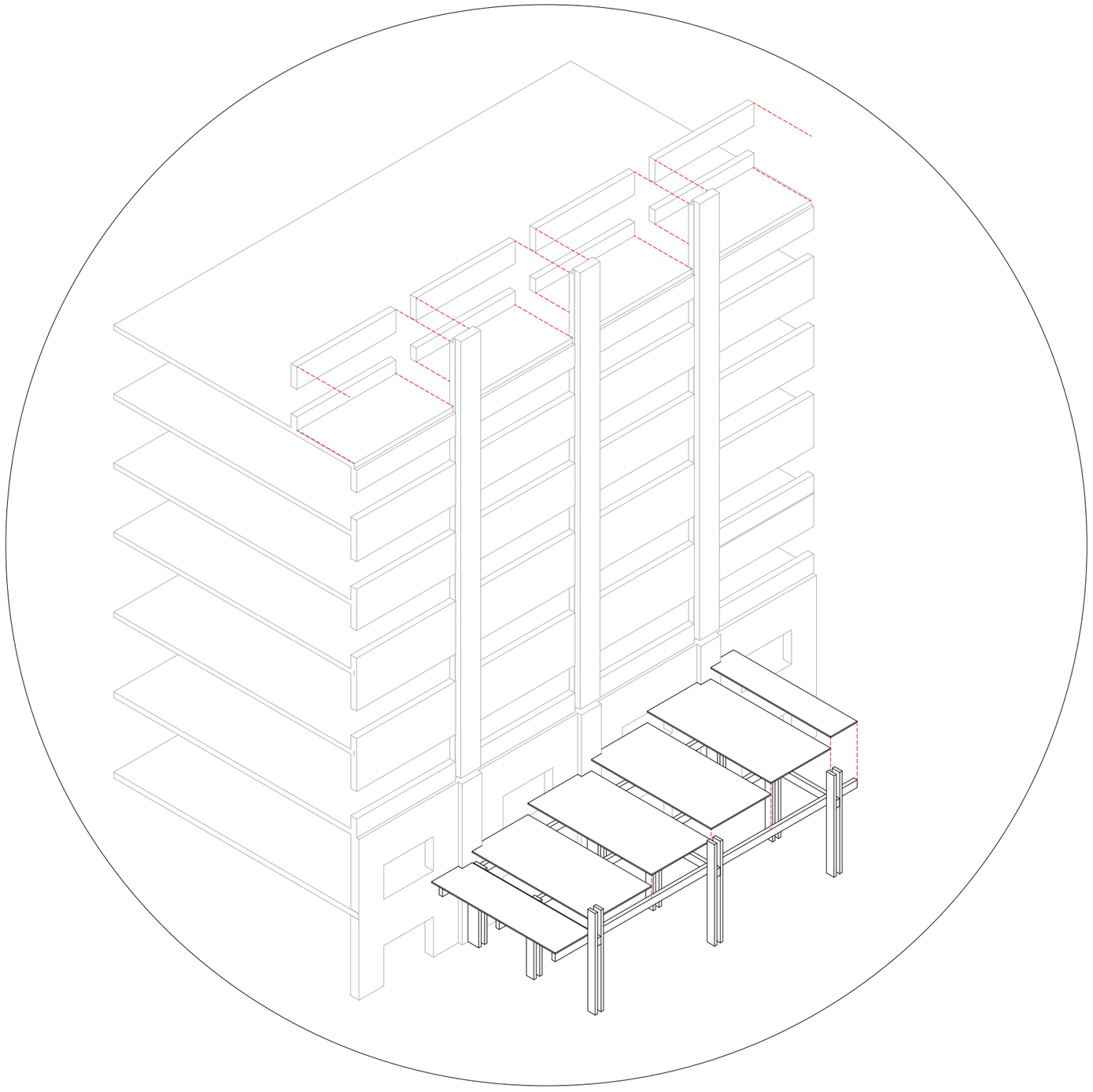


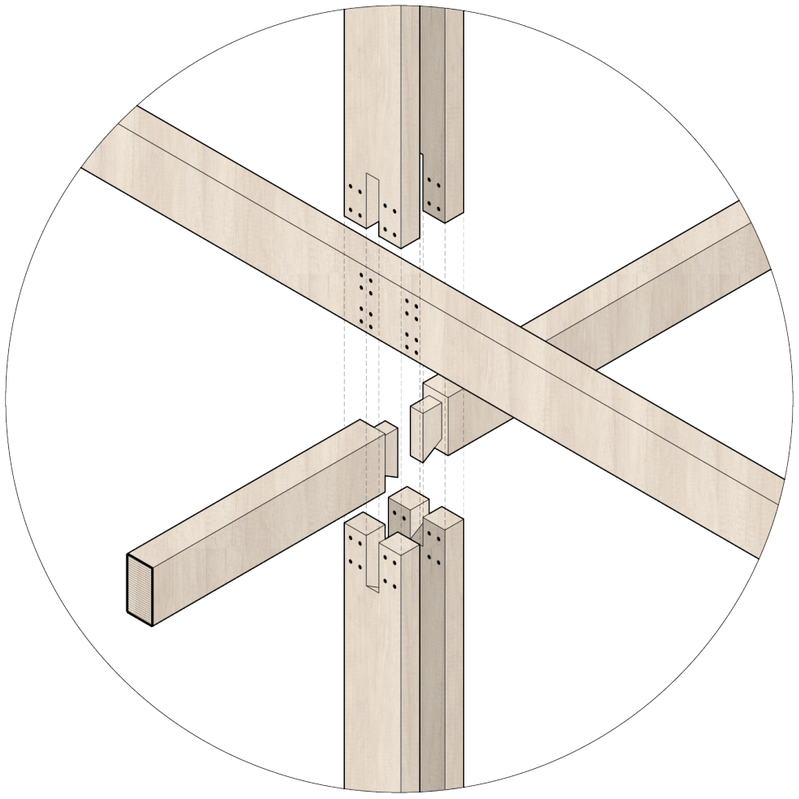
New foundation, posts, primary and secondary beams



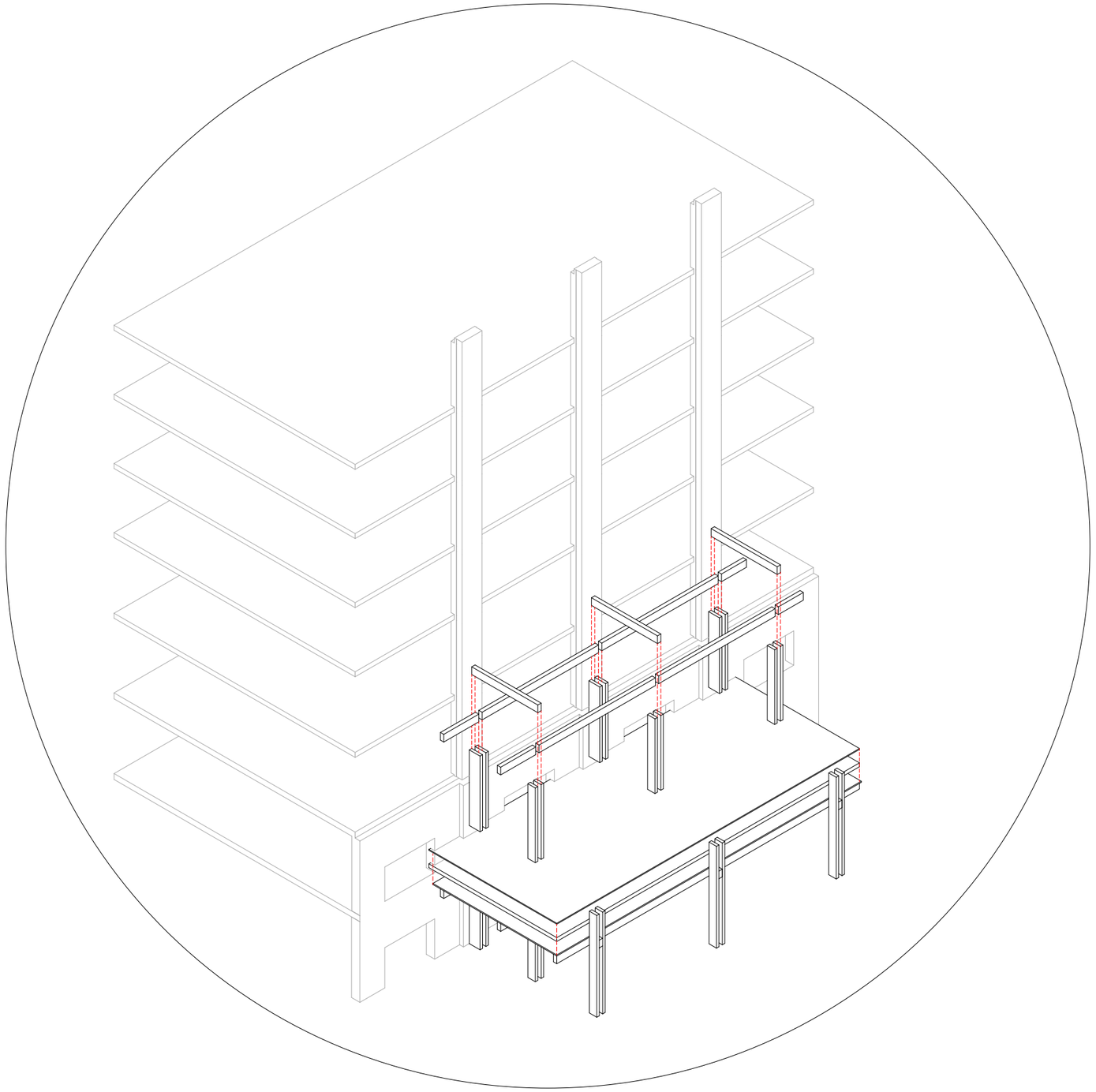
ATRIUM INFILL: ASSEMBLY PROCESS & JOINTS



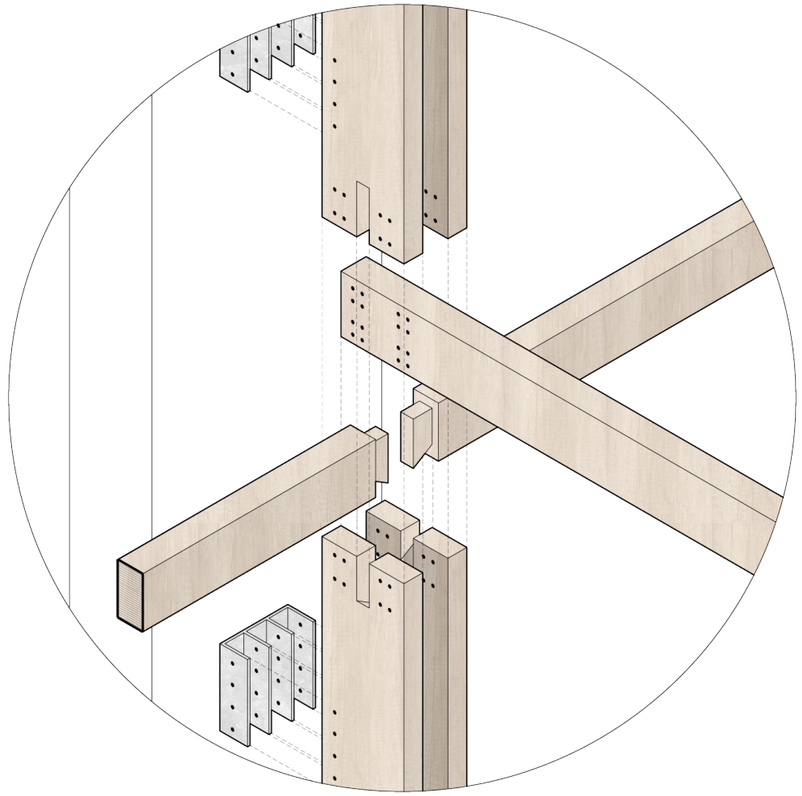
Facade removal, Baubuche Q slab



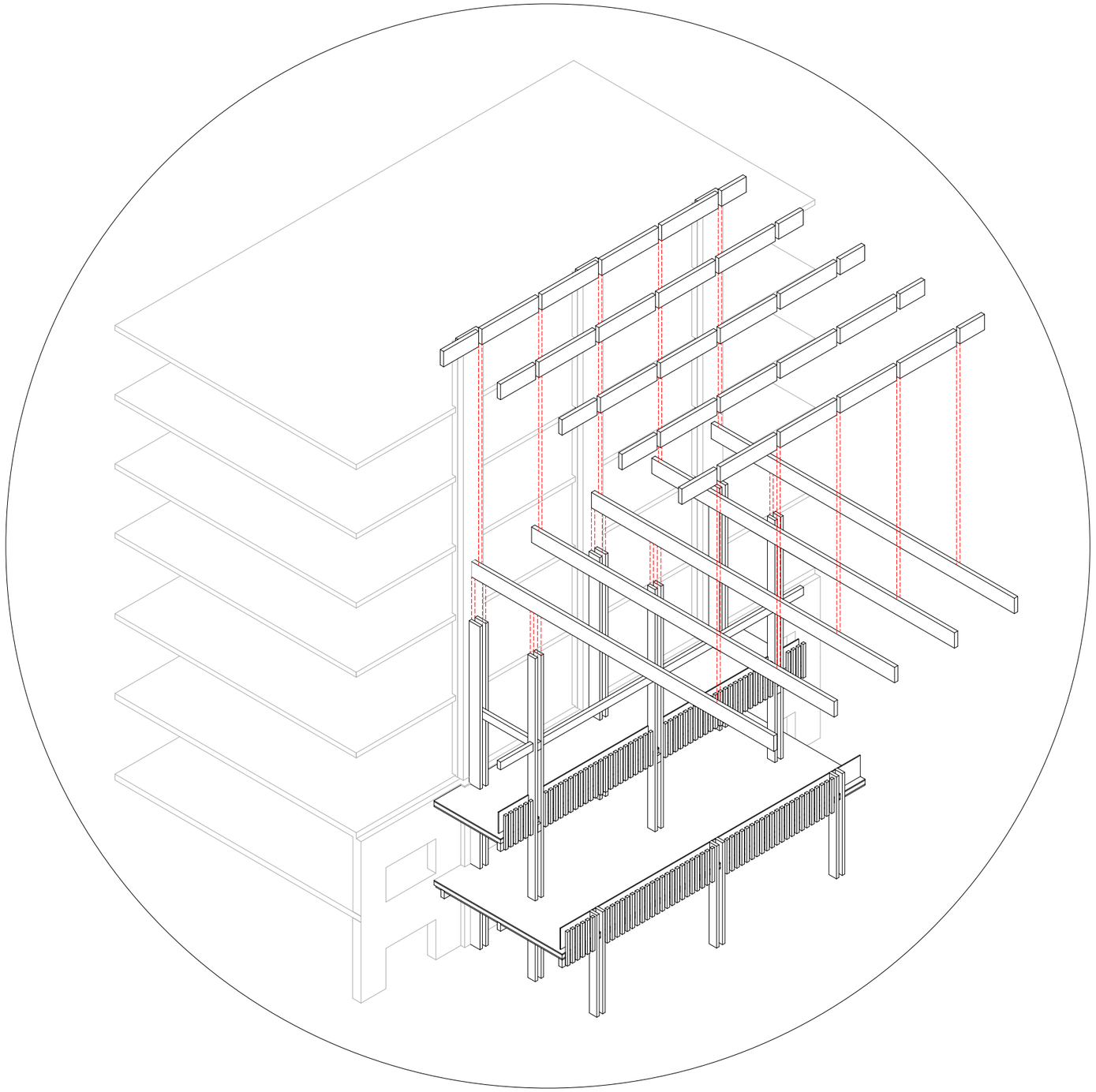
ATRIUM INFILL: ASSEMBLY PROCESS & JOINTS



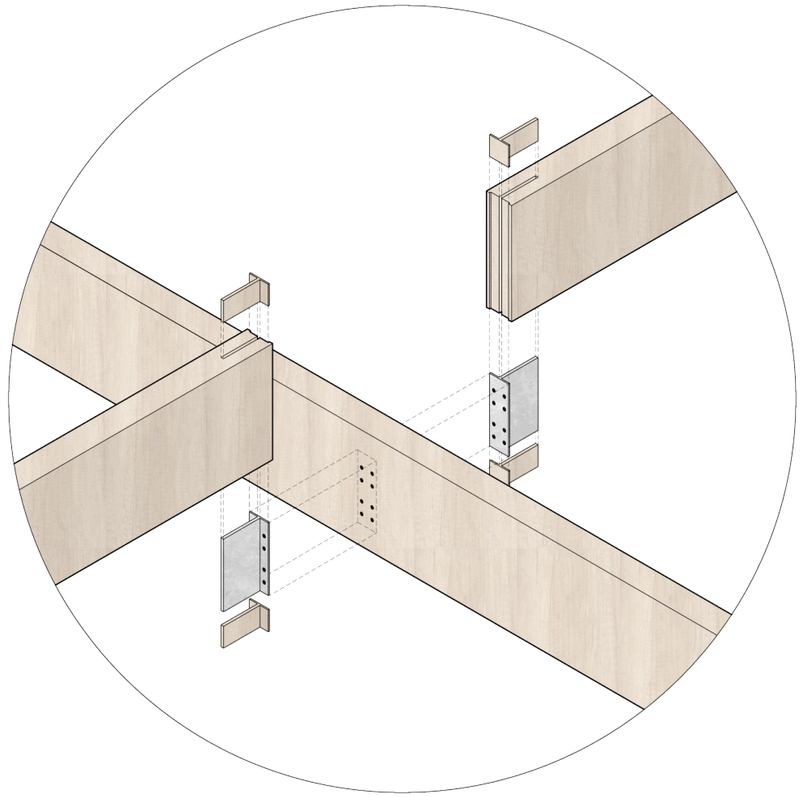
Next level of posts and beams, floor finishing layers



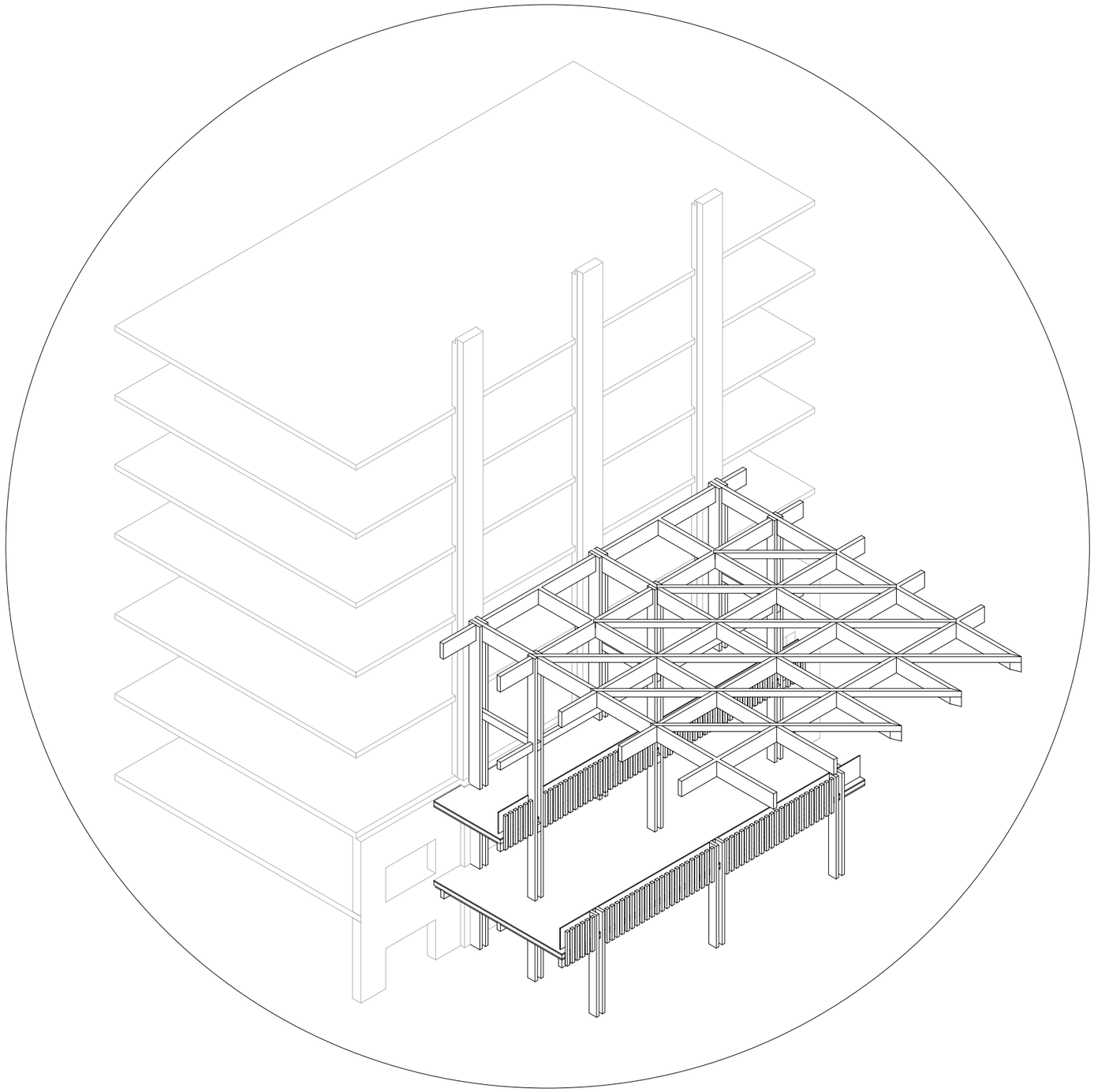
ATRIUM INFILL: ASSEMBLY PROCESS & JOINTS



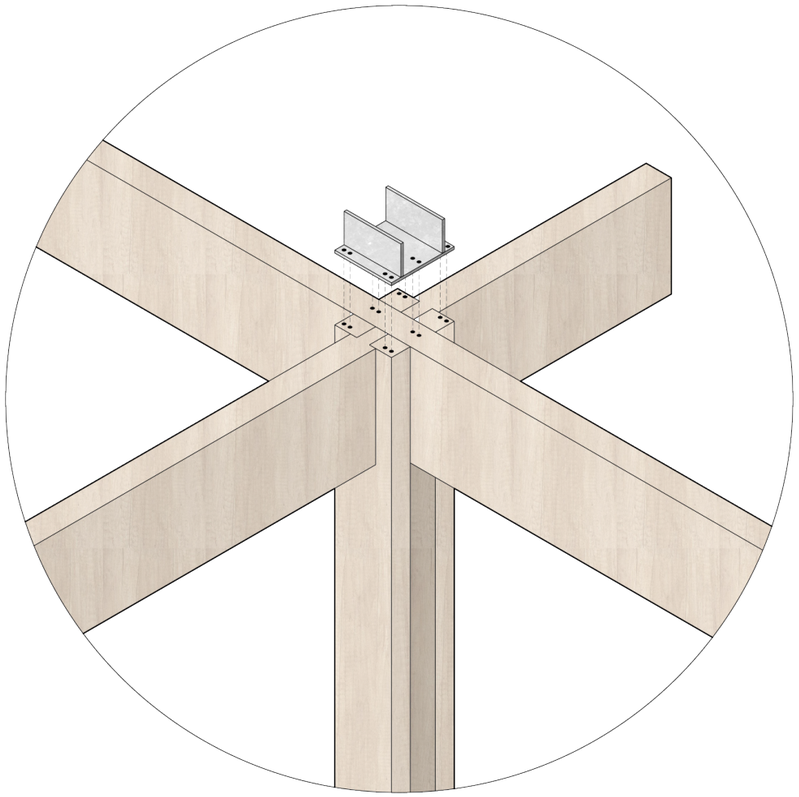
Roof structure secondary and primary beams



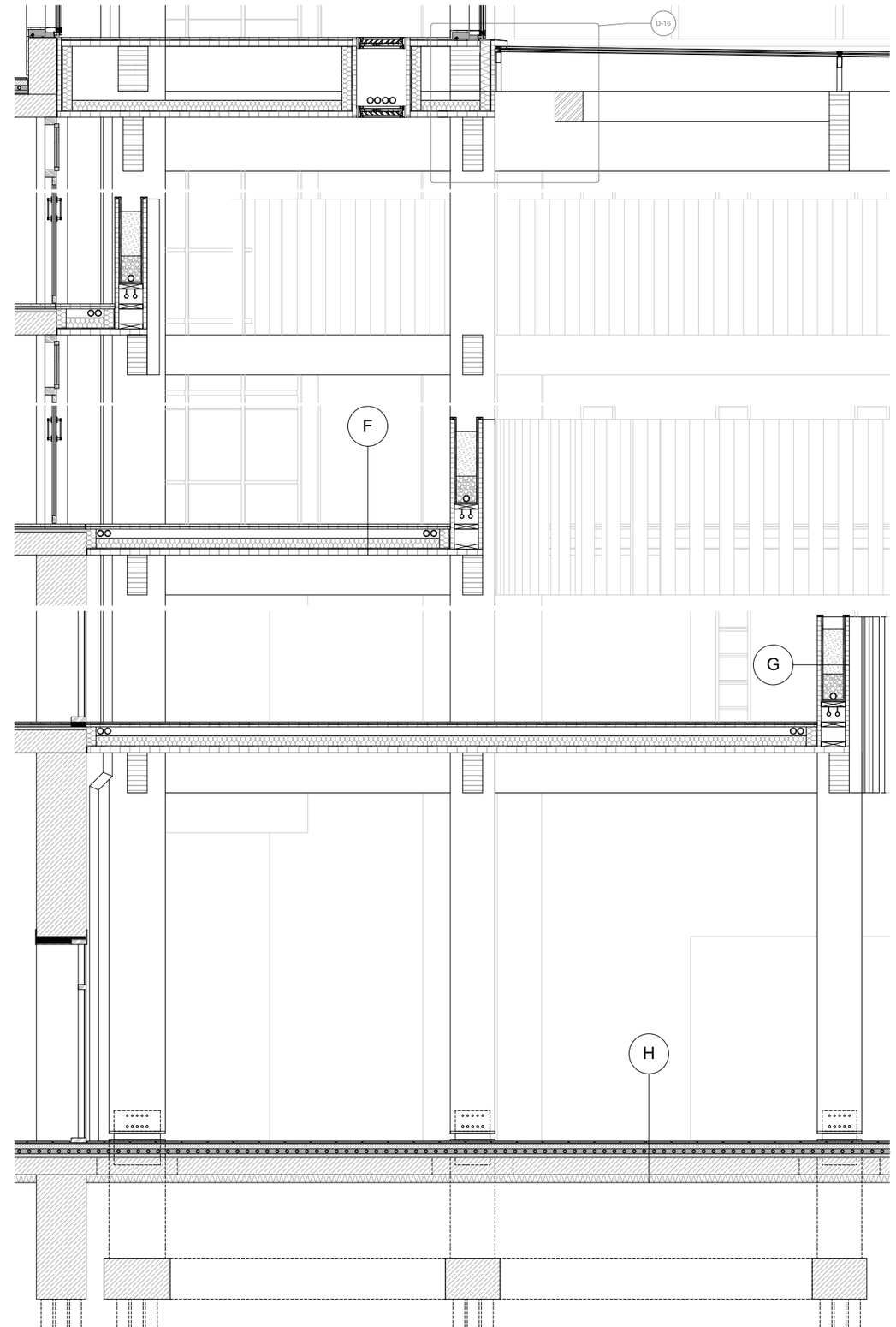
ATRIUM INFILL: ASSEMBLY PROCESS & JOINTS

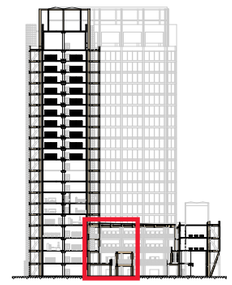


New enclosed atrium

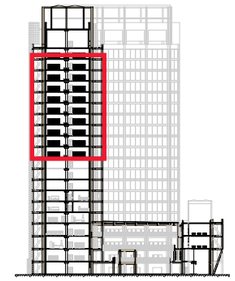


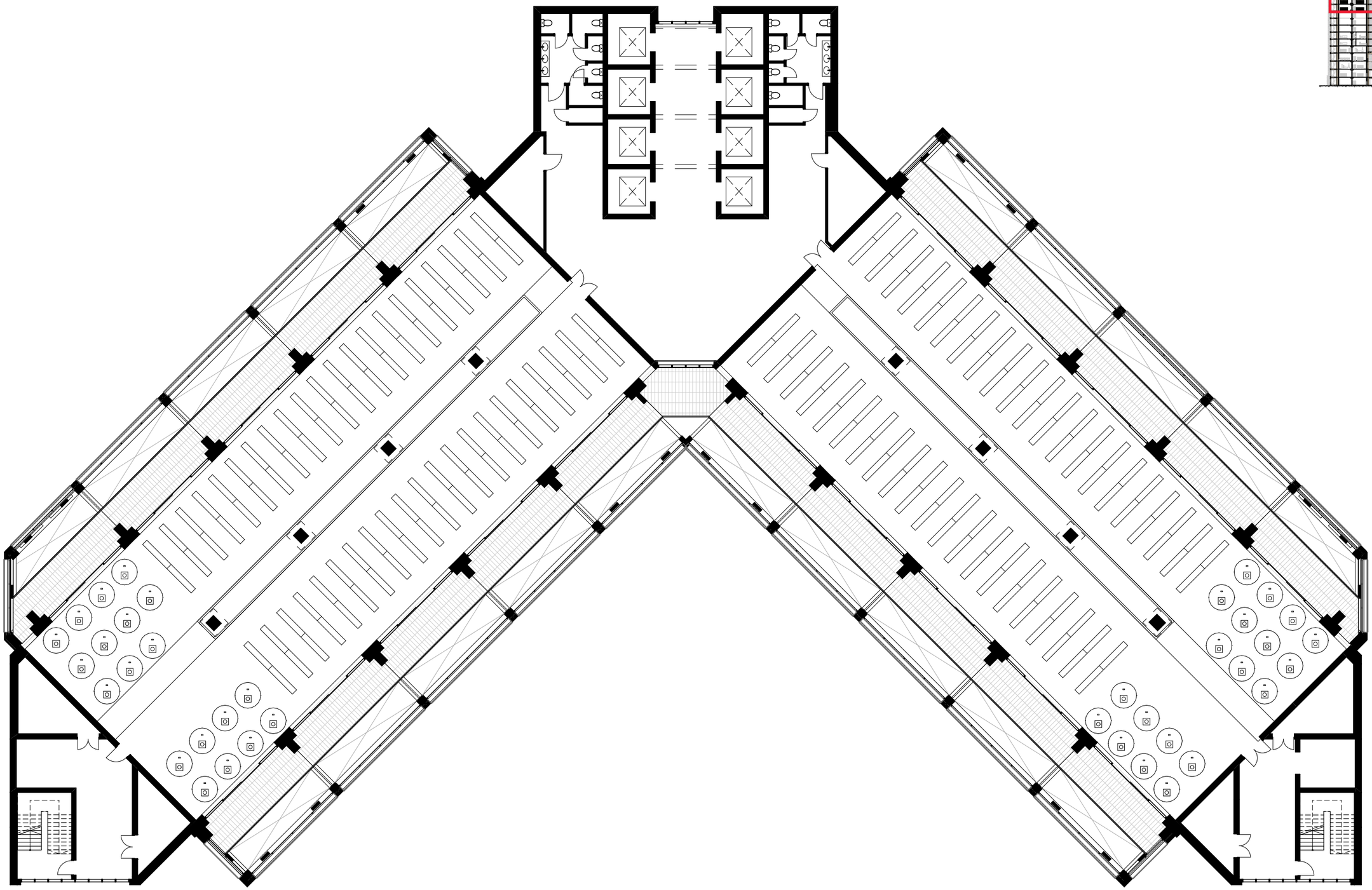
ATRIUM INFILL: SECTION





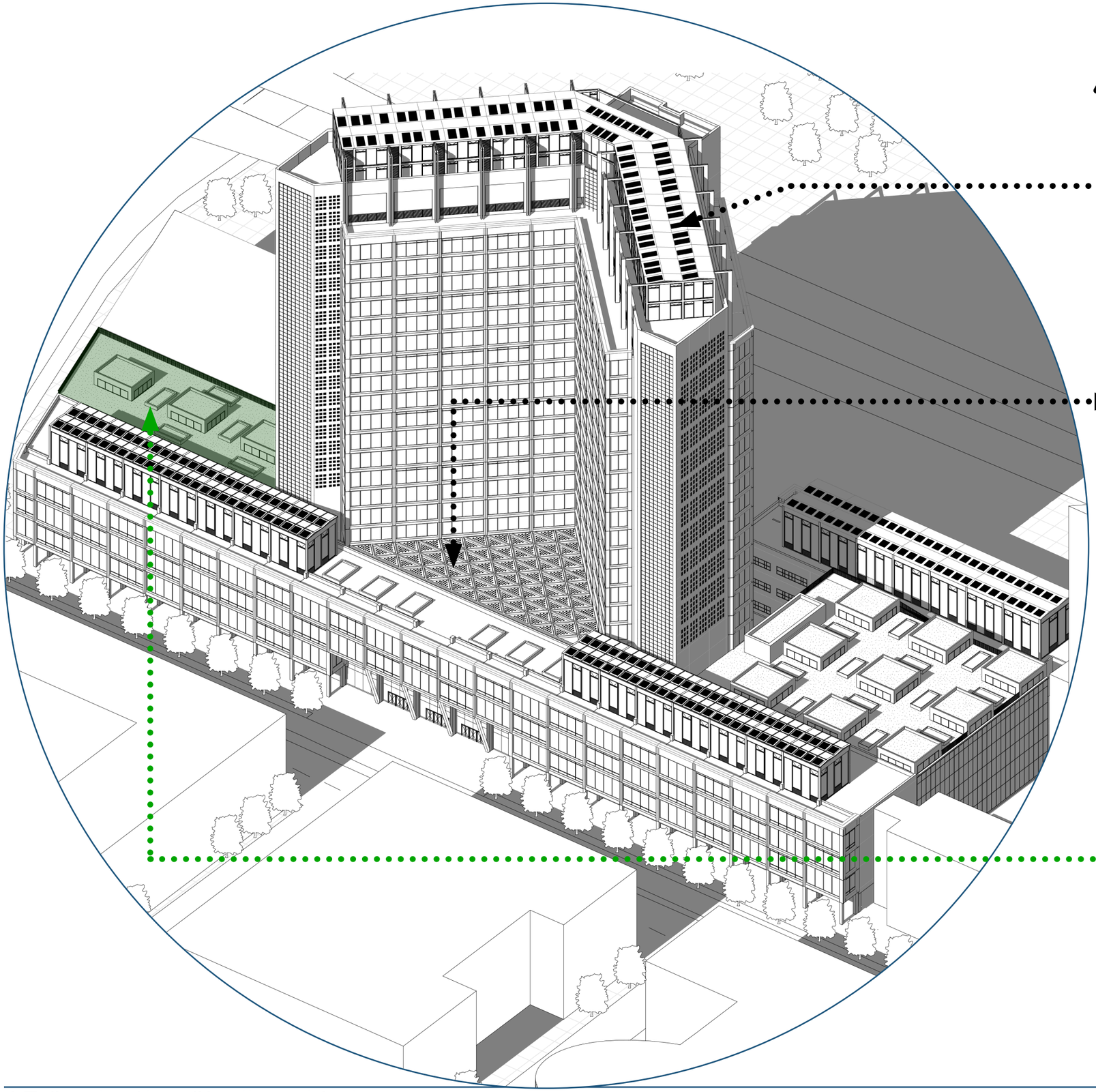
THE FARM FLOORS





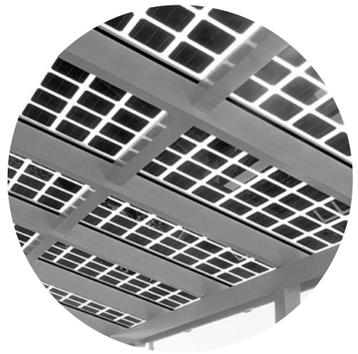
FARM ACCESIBLE FOR STUDENTS

ENERGY SOURCES



Farm energy demand: **4.8 GWh / yr**

Solar roof cells



Solar panels

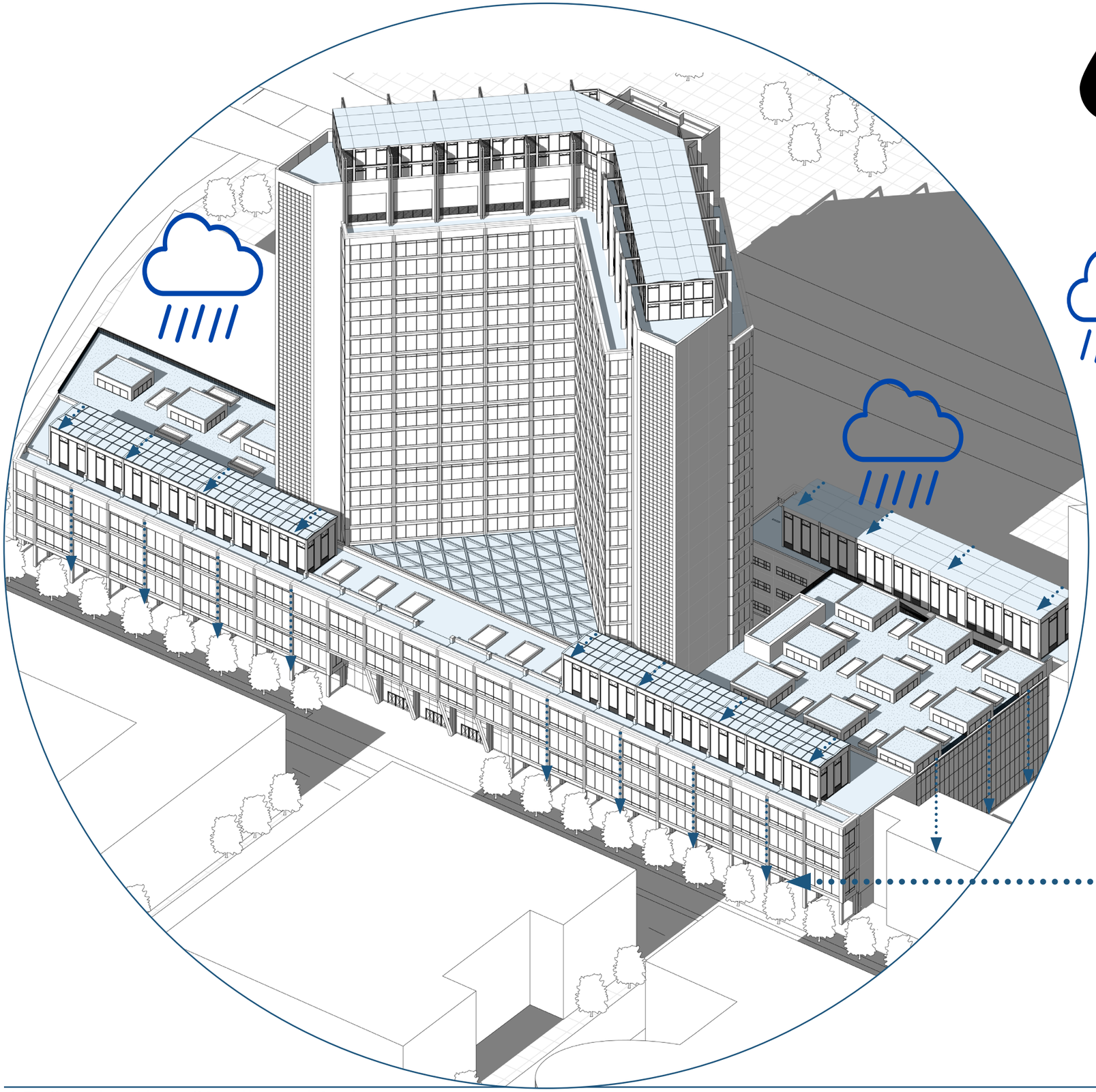
Possible PV's electricity: 4.92GWh / yr
(if every suitable surface is to be covered with panels)

Possible PV's electricity: 1.09GWh /yr
(if 20% surface is to be covered with panels)

Anaerobic biodigester facility:
264 tons of biowaste from the farm
2055 tons of biowaste from the food system

Energy from organic waste:
De Knip urban farm: **0.4 GWh/yr**
Waste from food system: **1.07 GWh/yr**
TOTAL: 2.56 GWh / yr

WATER COLLECTION



Farm demand: **31 238m³**[1]
The school: 94.63 l/user[2] x 500[3] x 365[4] = **17 220³**

Total water demand: 48 457m³

[1] according to previous research
[2] according to EIA for educational buildings
[3] estimated max number of users at one time
[4] days

Water possible to collect from roof:

Roof surface: **11090m²**
Avarage rainfall: **838mm (l/m²)**

Rainwater: 838 l/m² x 11090m² = **9293.42m³**

Water from roof stored underground:

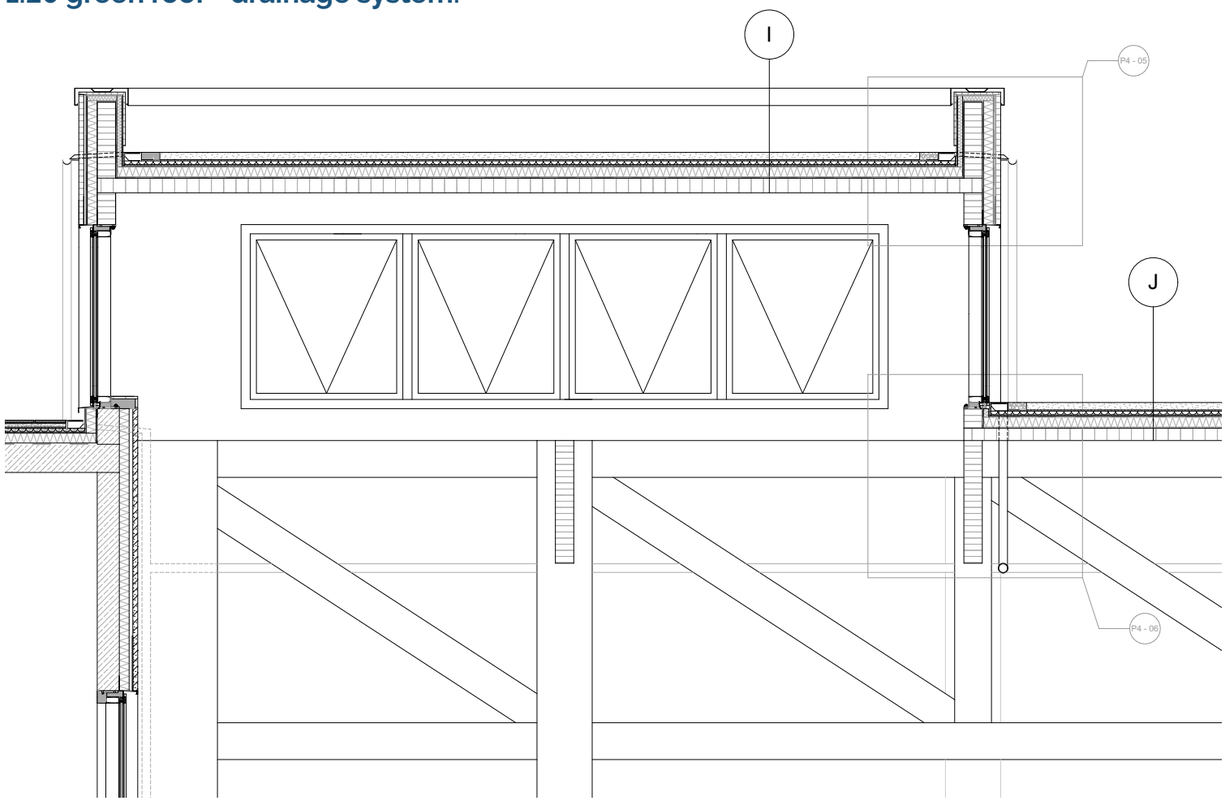
Farm | Toilets | Heating

Anaerobic biodigester water recovery:

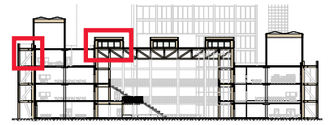
Water in digester: **285m³**
Water in digester: **1628m³**
TOTAL: 9600m³ / yr

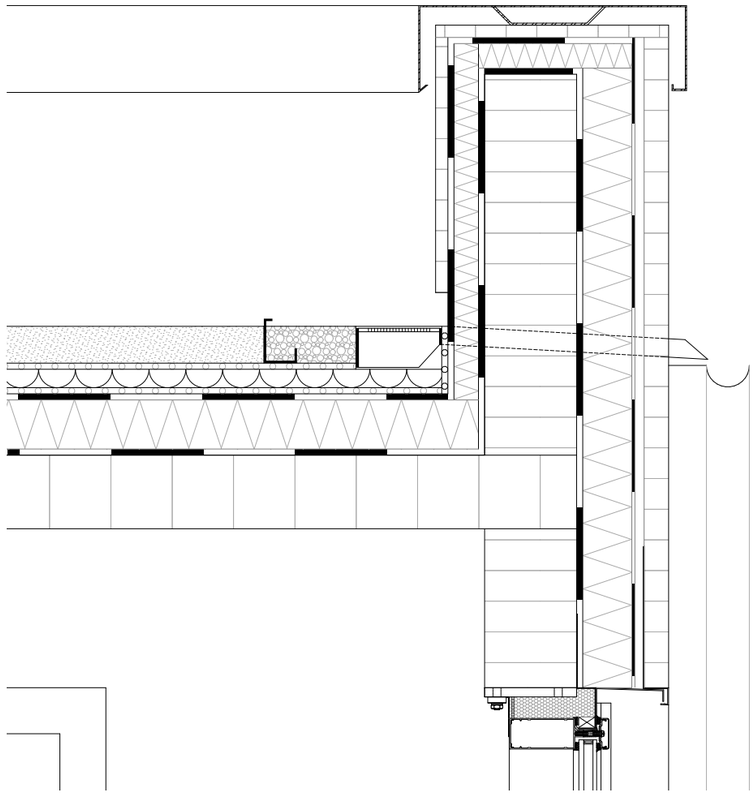
WATER COLLECTION: DETAILS

1:20 green roof - drainage system:

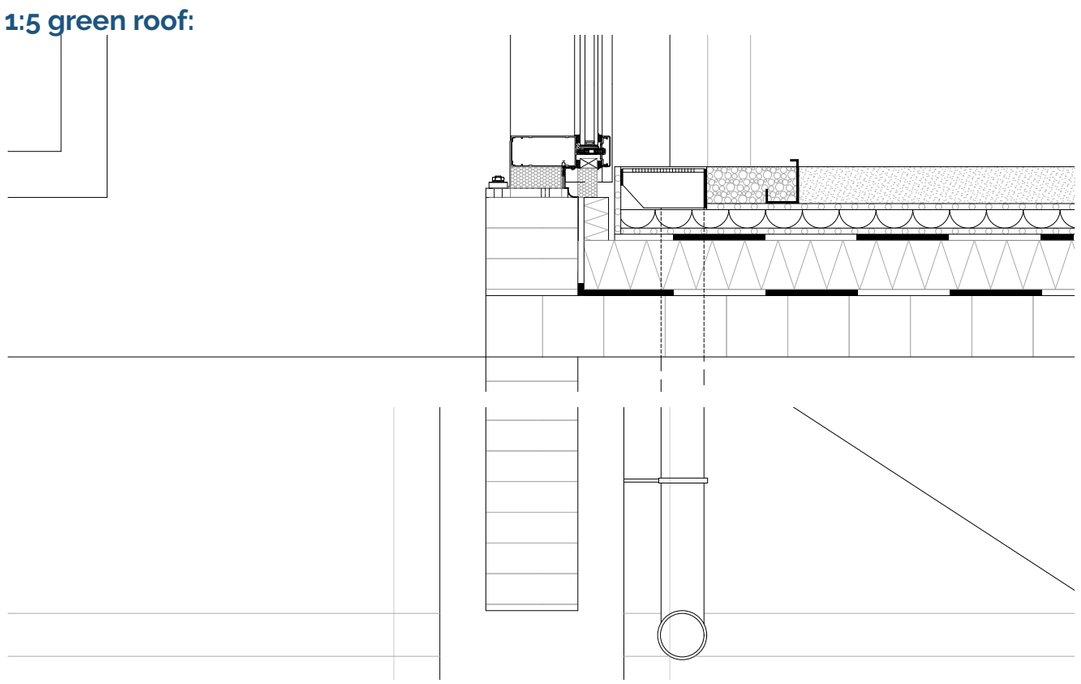


1:5 green roof:

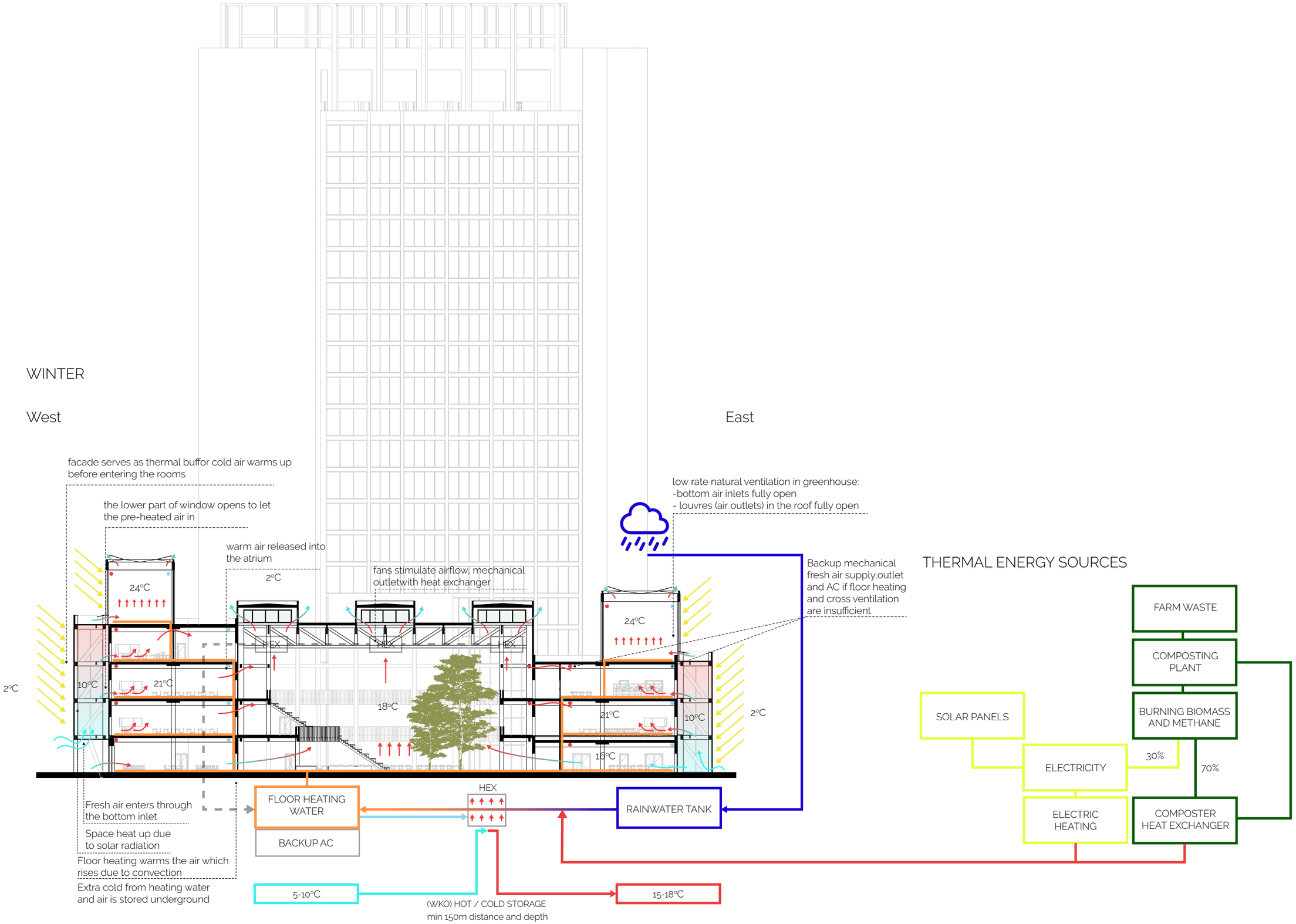




1:5 green roof:

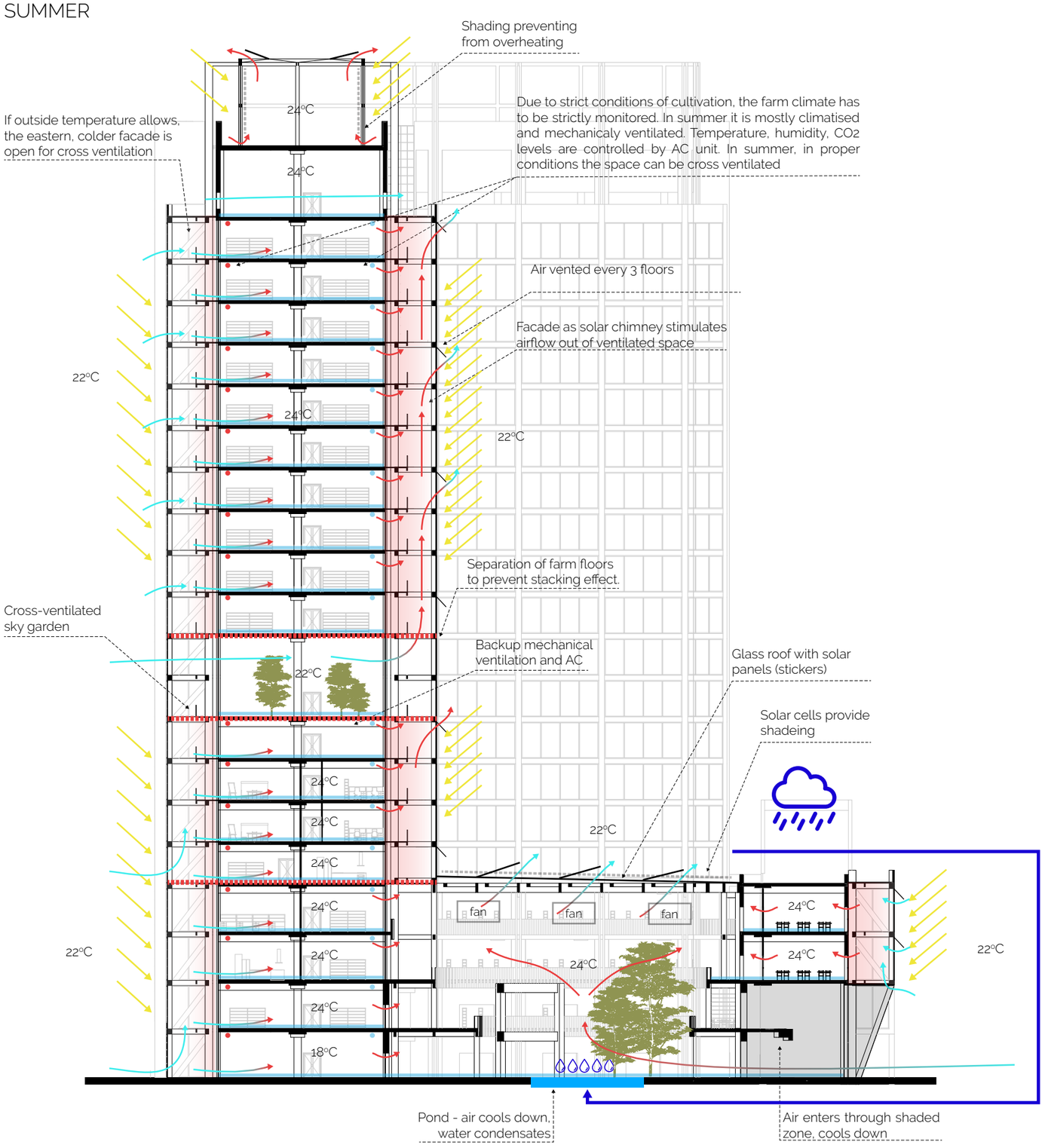


CLIMATE STRATEGY

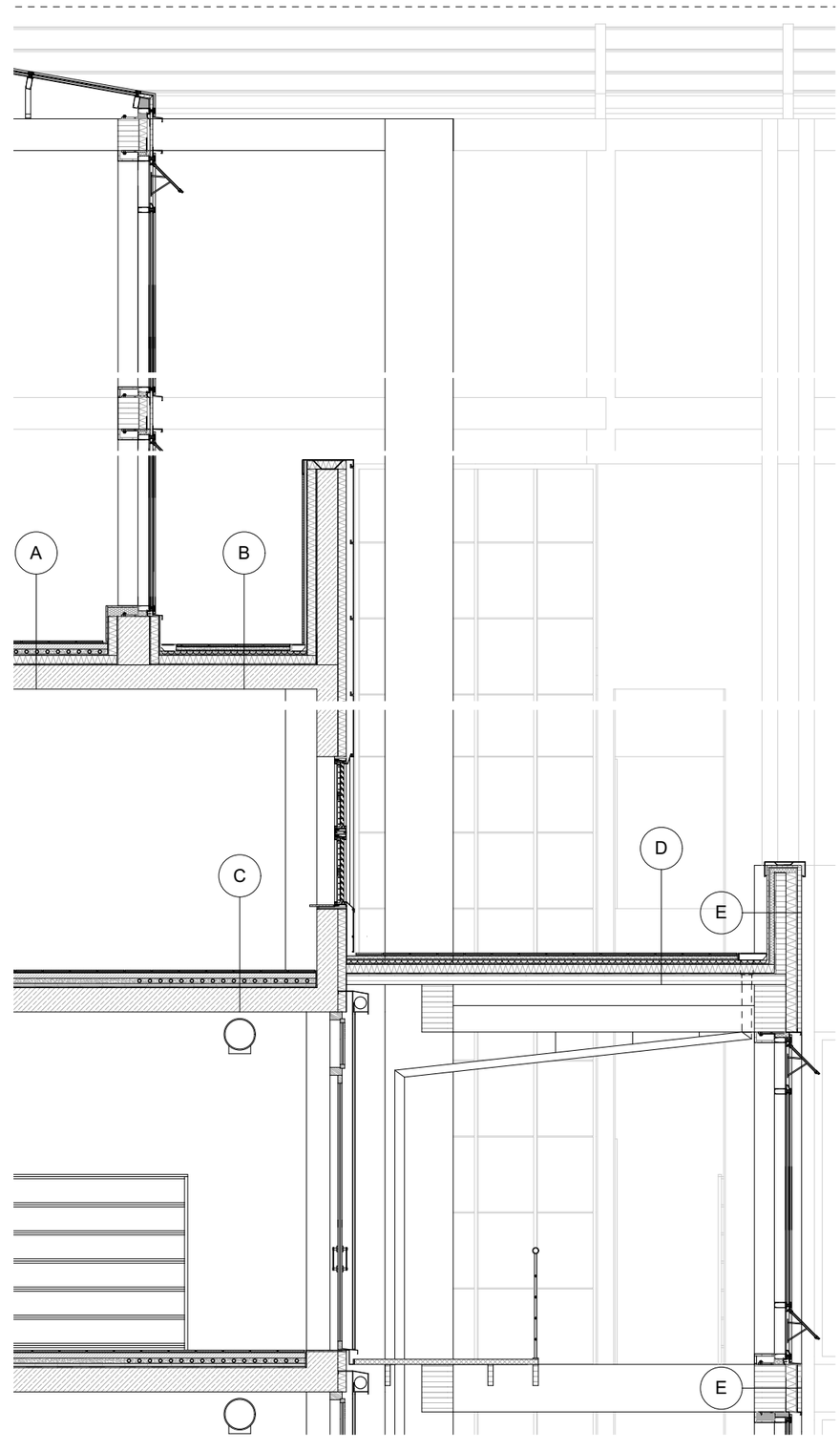


CLIMATE STRATEGY

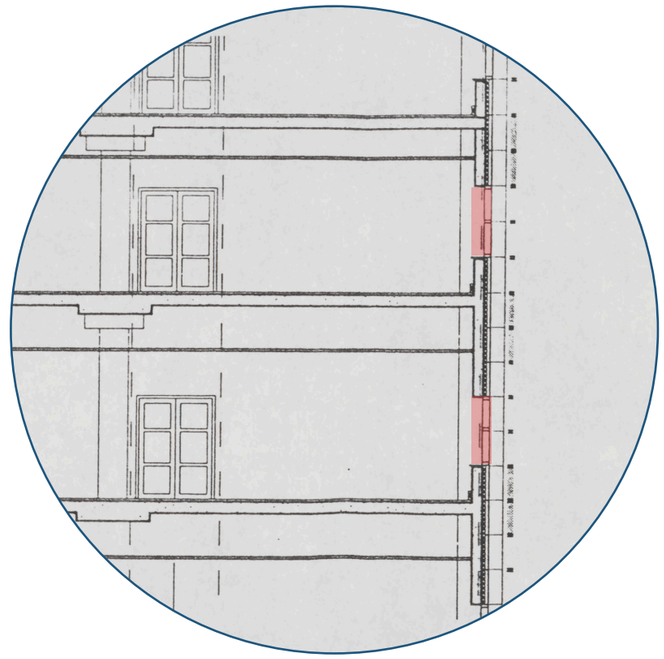
SUMMER

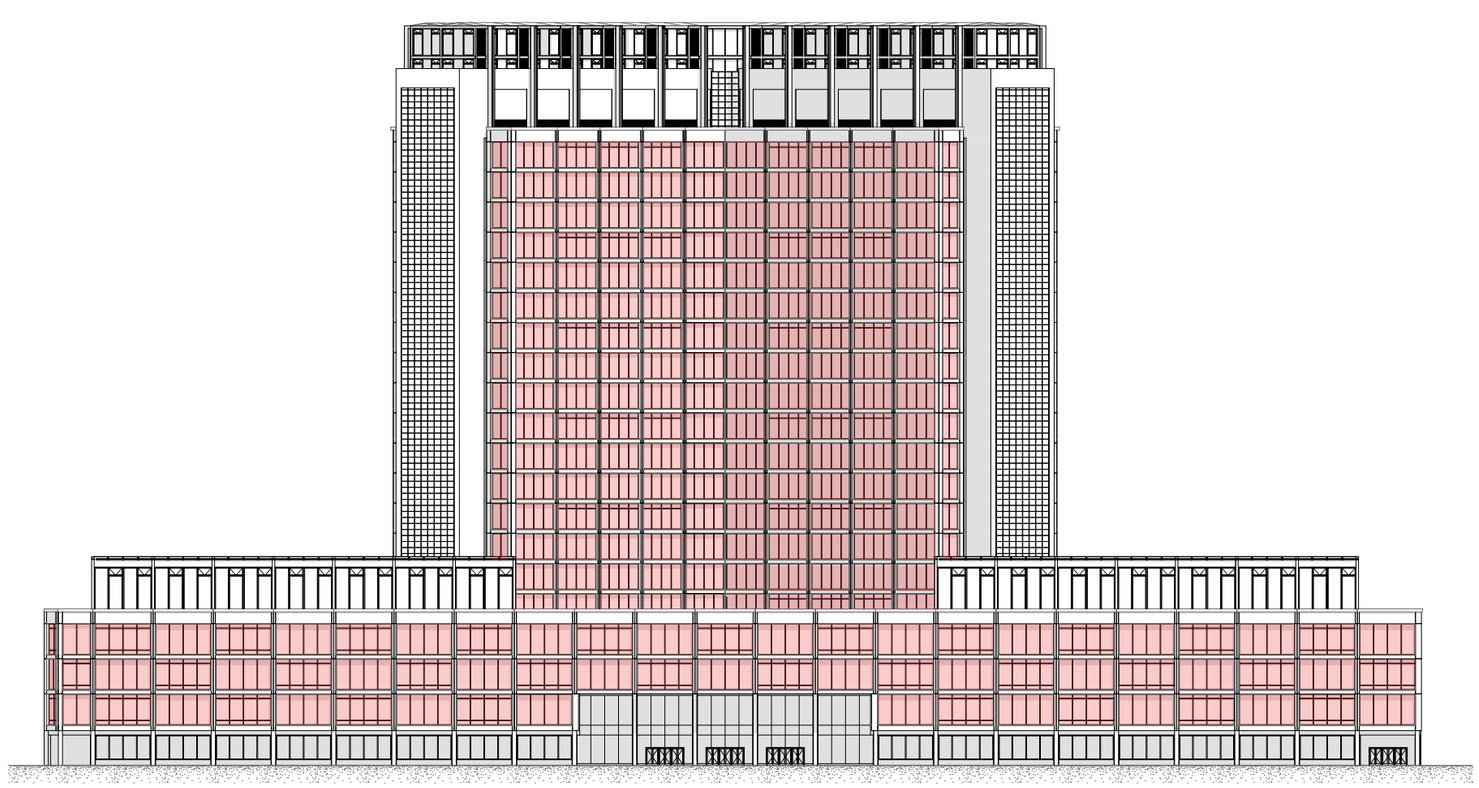


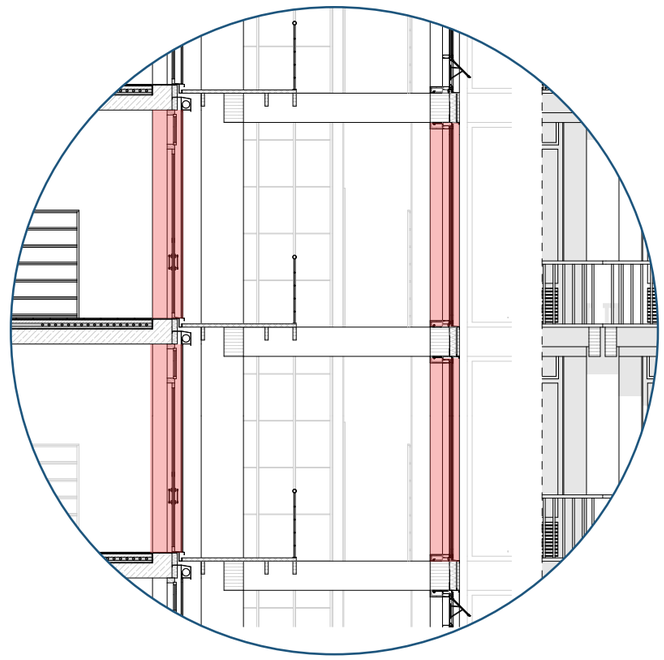
1:20 tower section:



FACADE: OLD vs. NEW

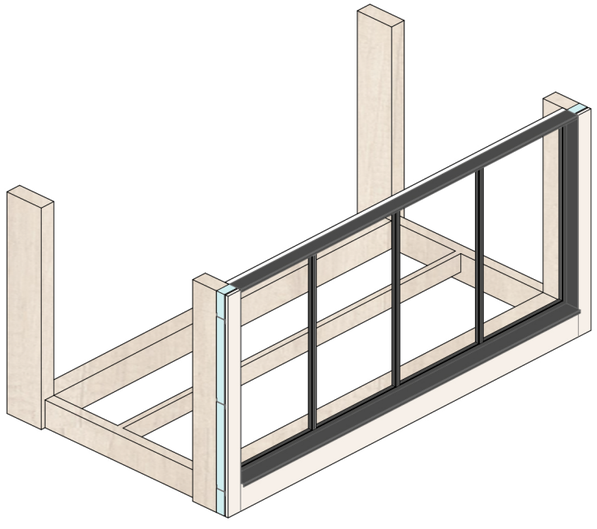




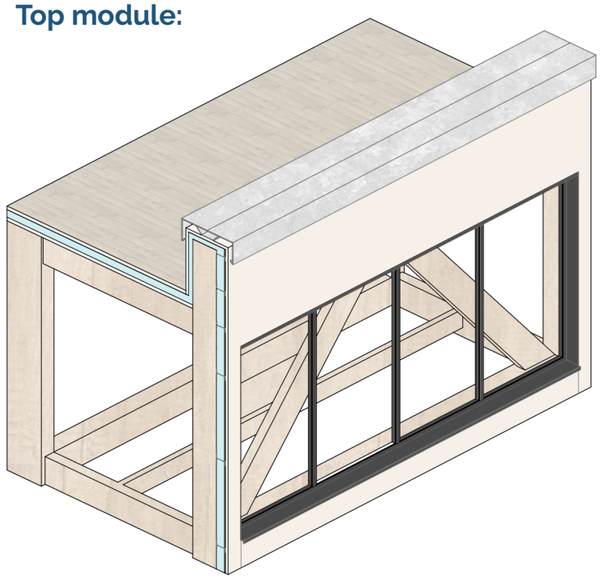


MODULAR FACADE: TYPES AND INFILLS

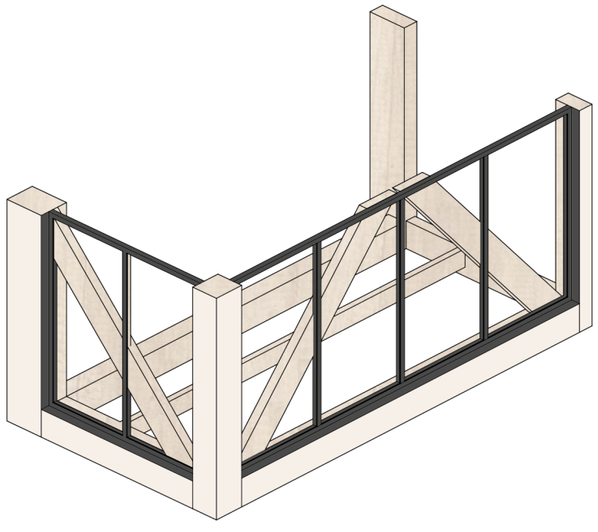
Basic module:



Top module:

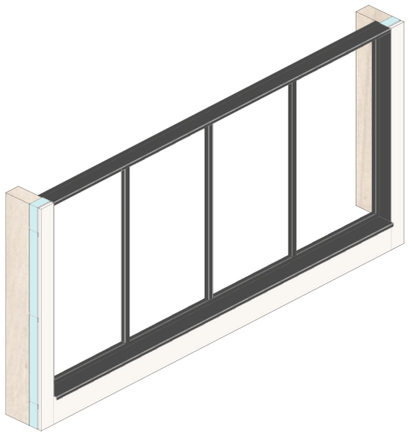


Corner module:

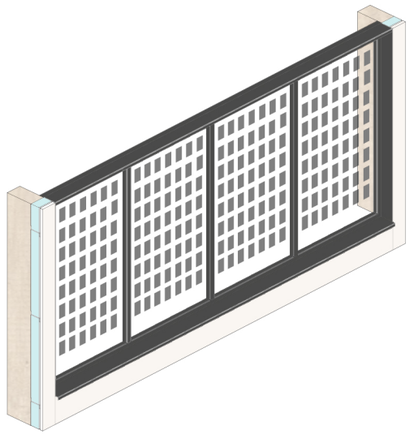


Infills:

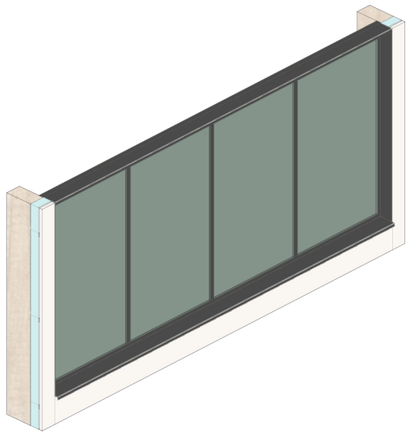
Clear glass



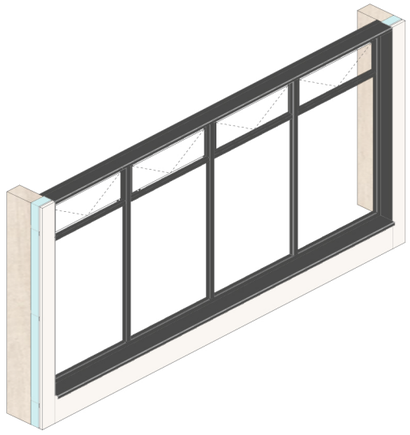
Solar cells



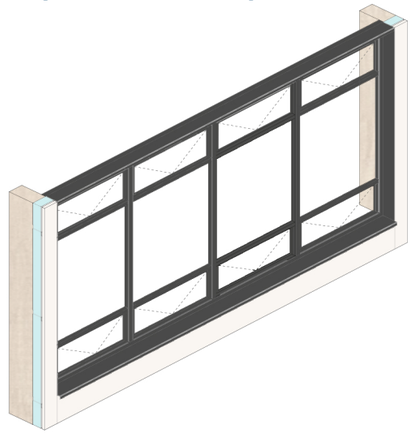
Acoustic panel



Top opanable

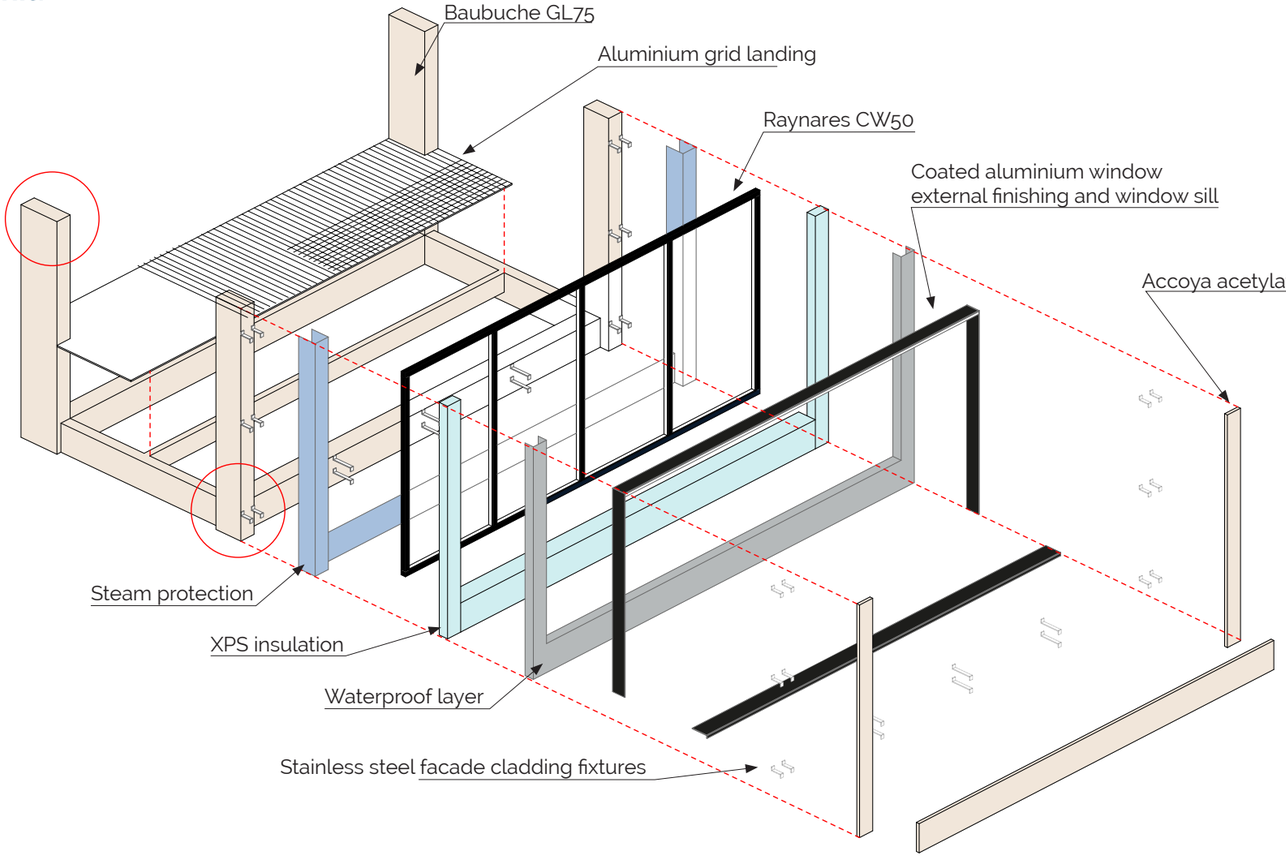


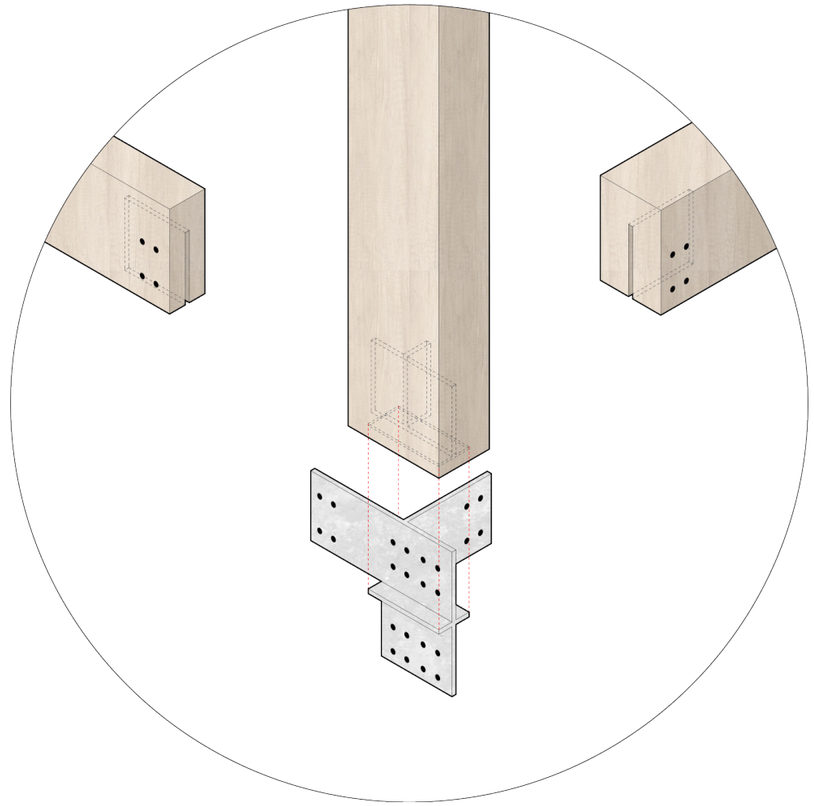
Top and bottom opanable



MODULAR FACADE: ASSEMBLY AND DETAILING

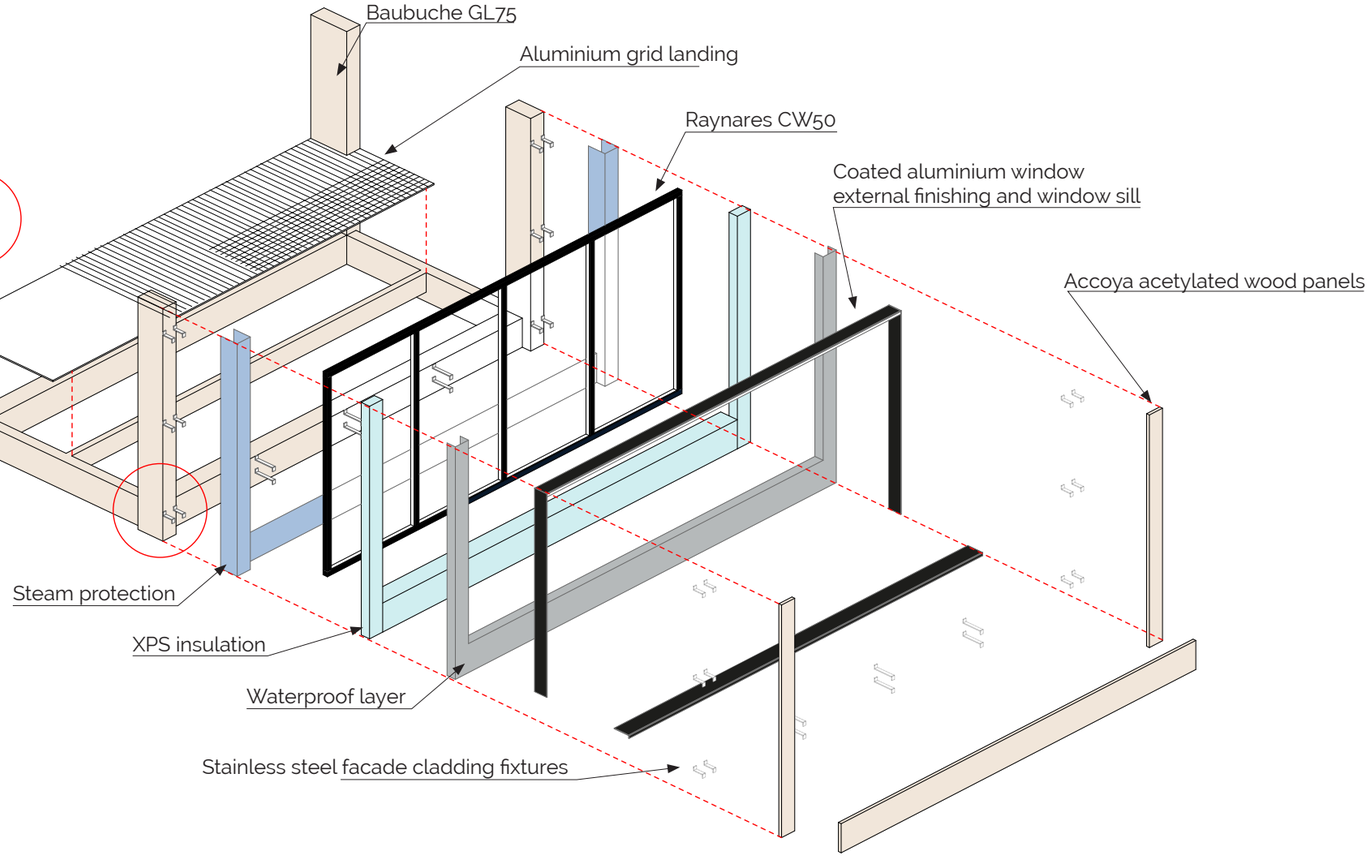
Unit:

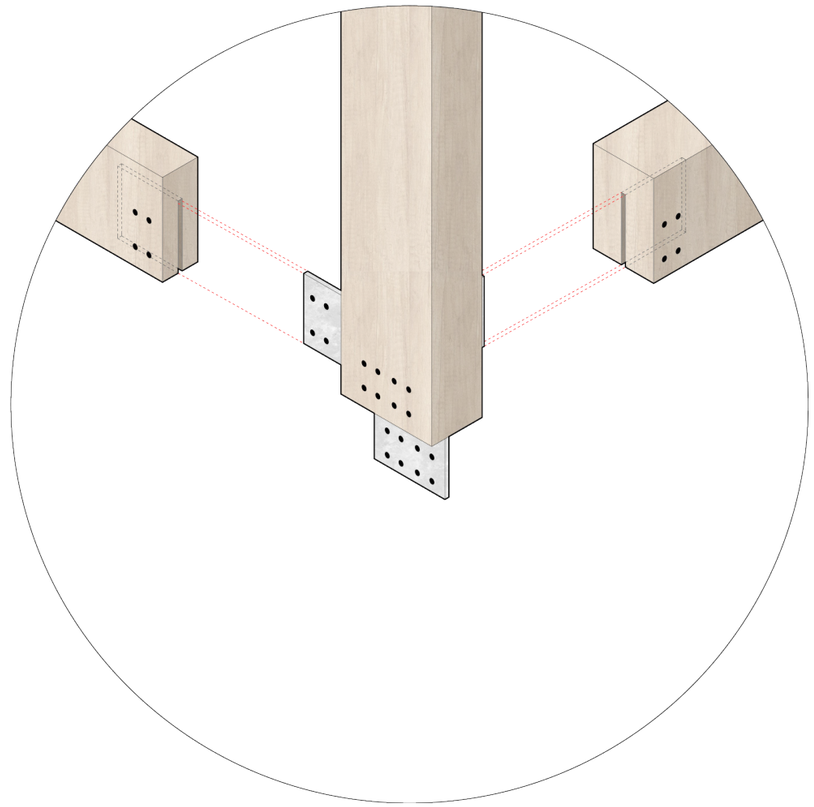




MODULAR FACADE: ASSEMBLY AND DETAILING

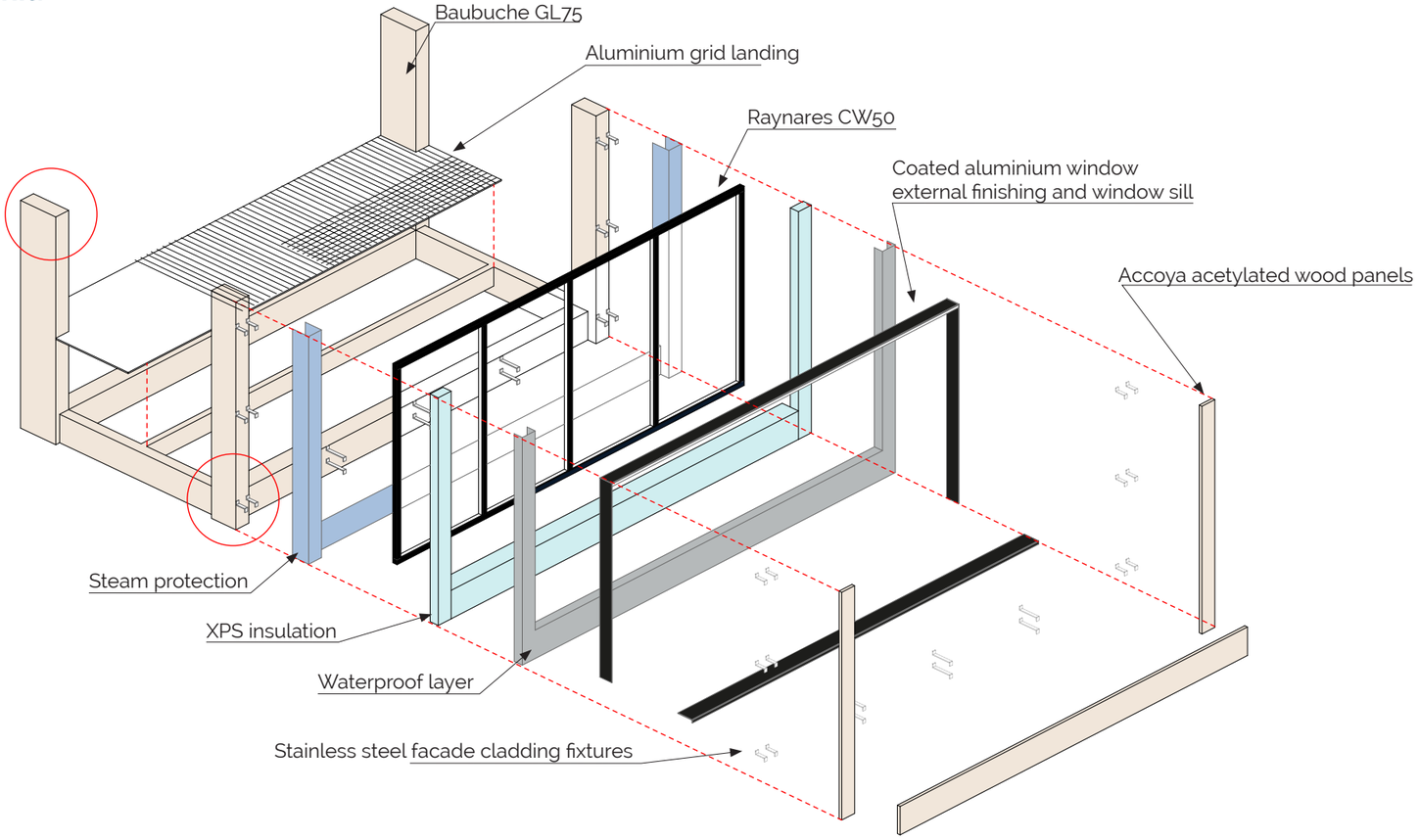
Unit:

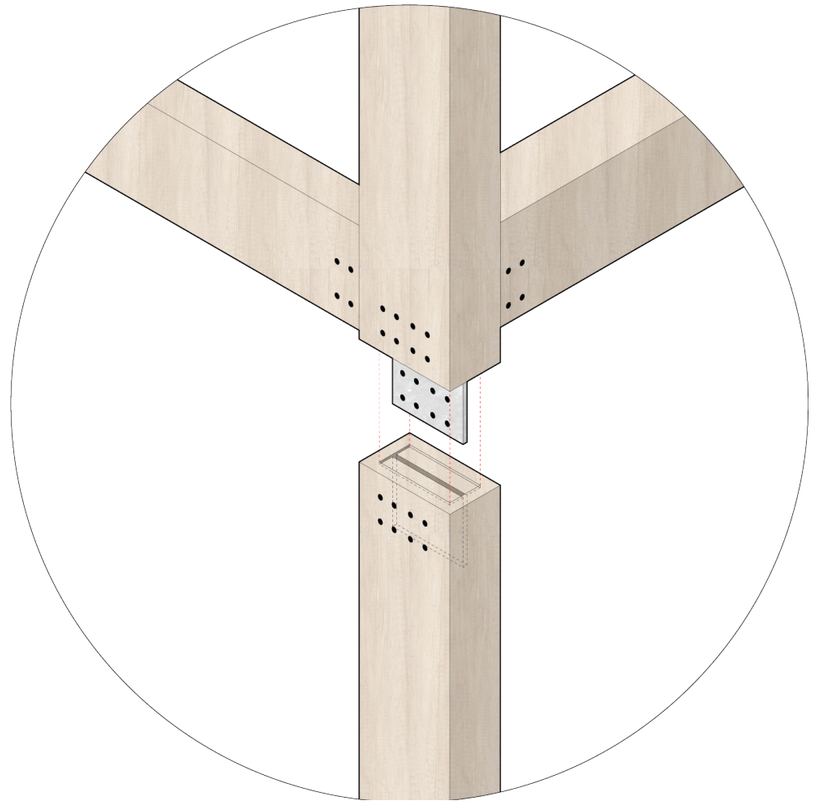




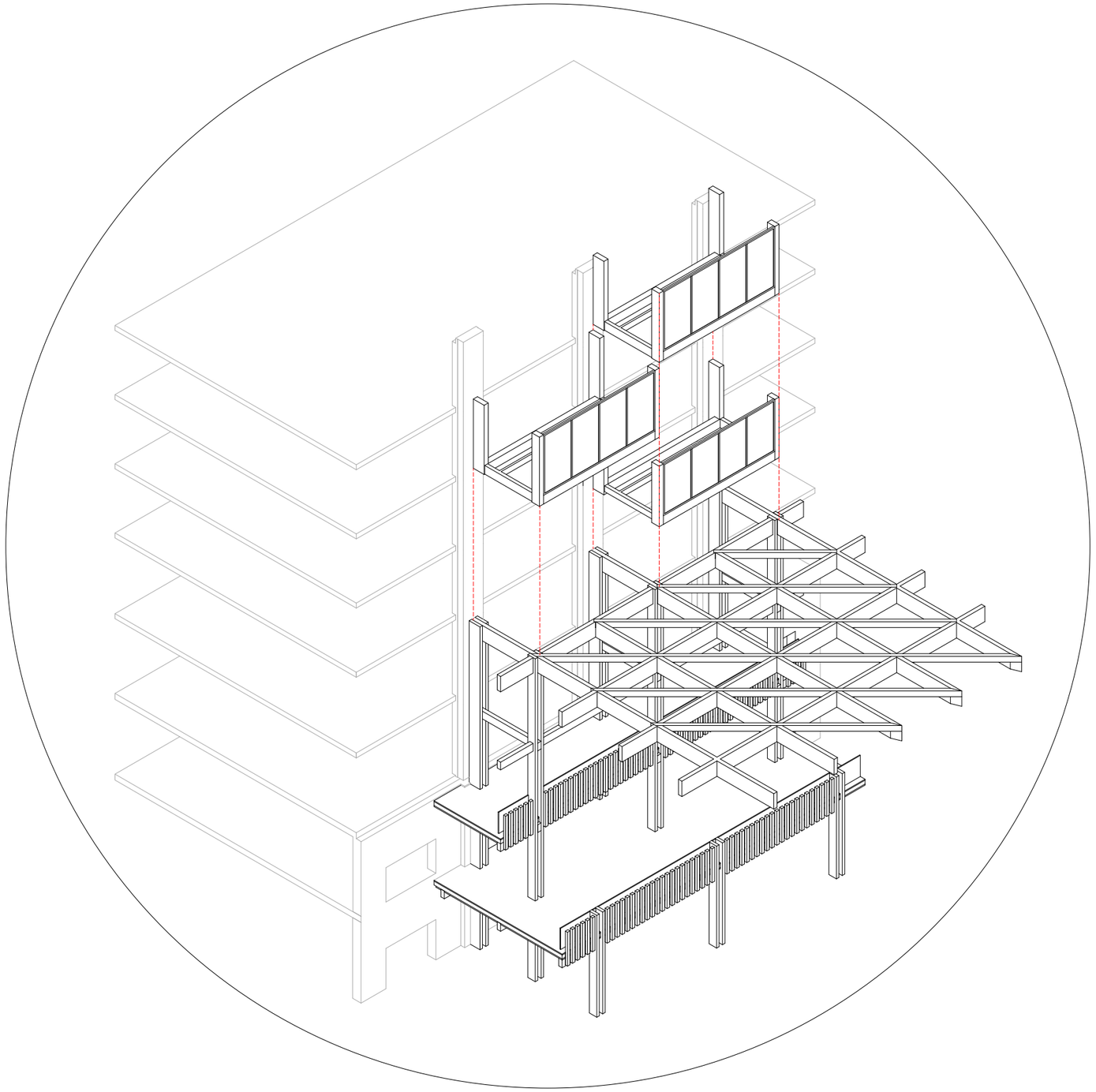
MODULAR FACADE: ASSEMBLY AND DETAILING

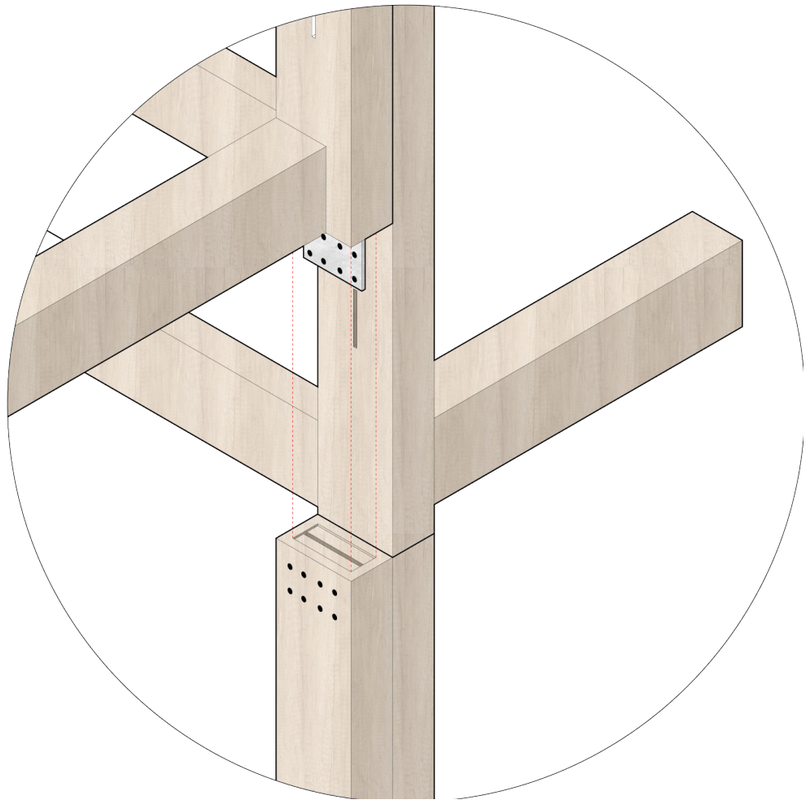
Unit:



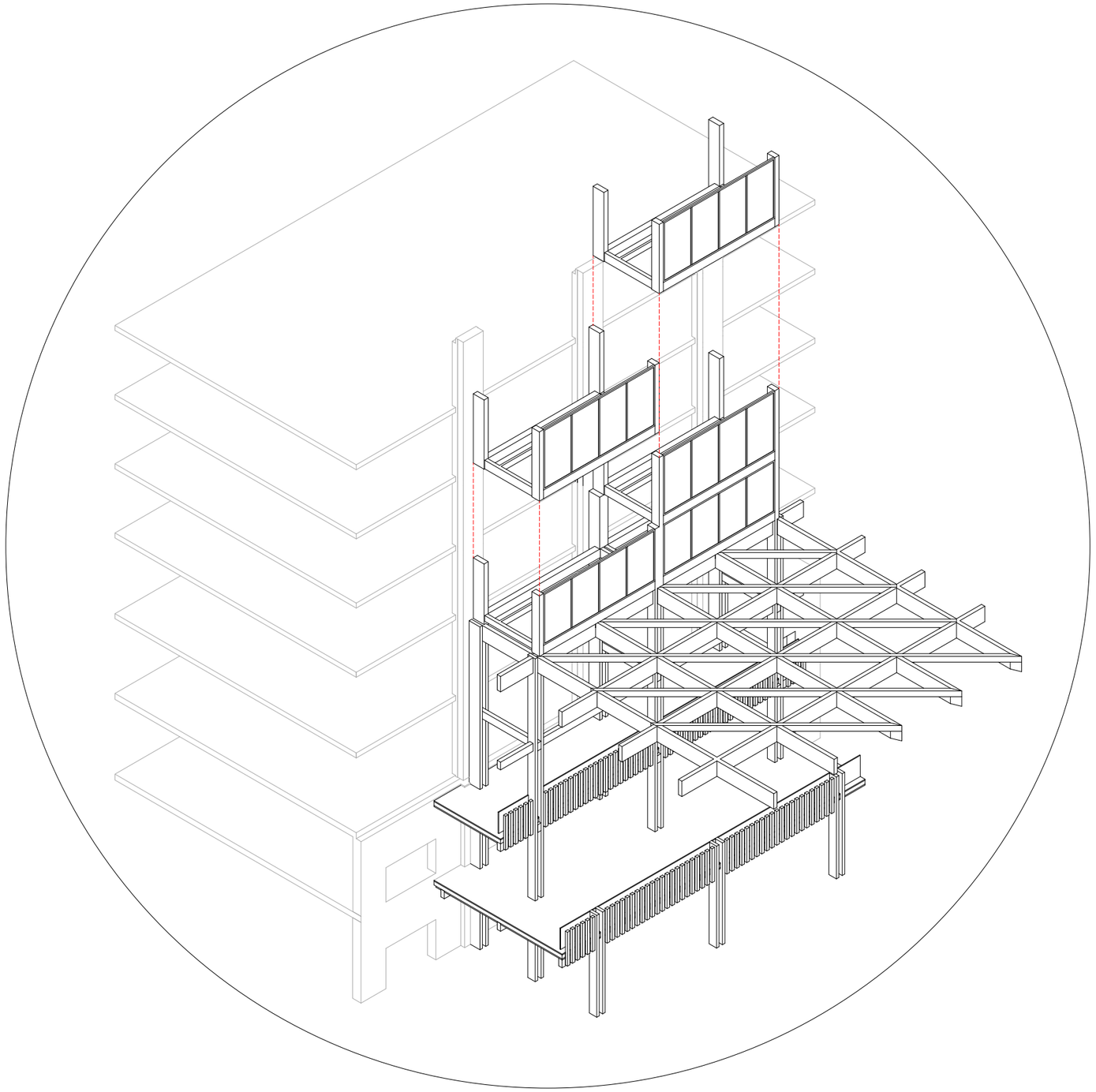


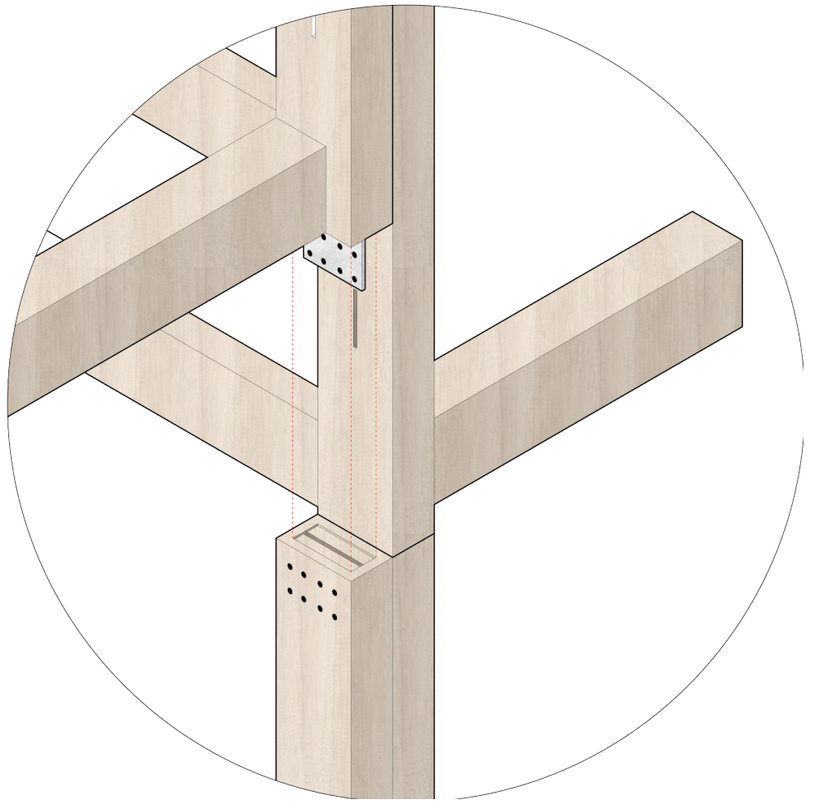
MODULAR FACADE: ASSEMBLY PROCESS



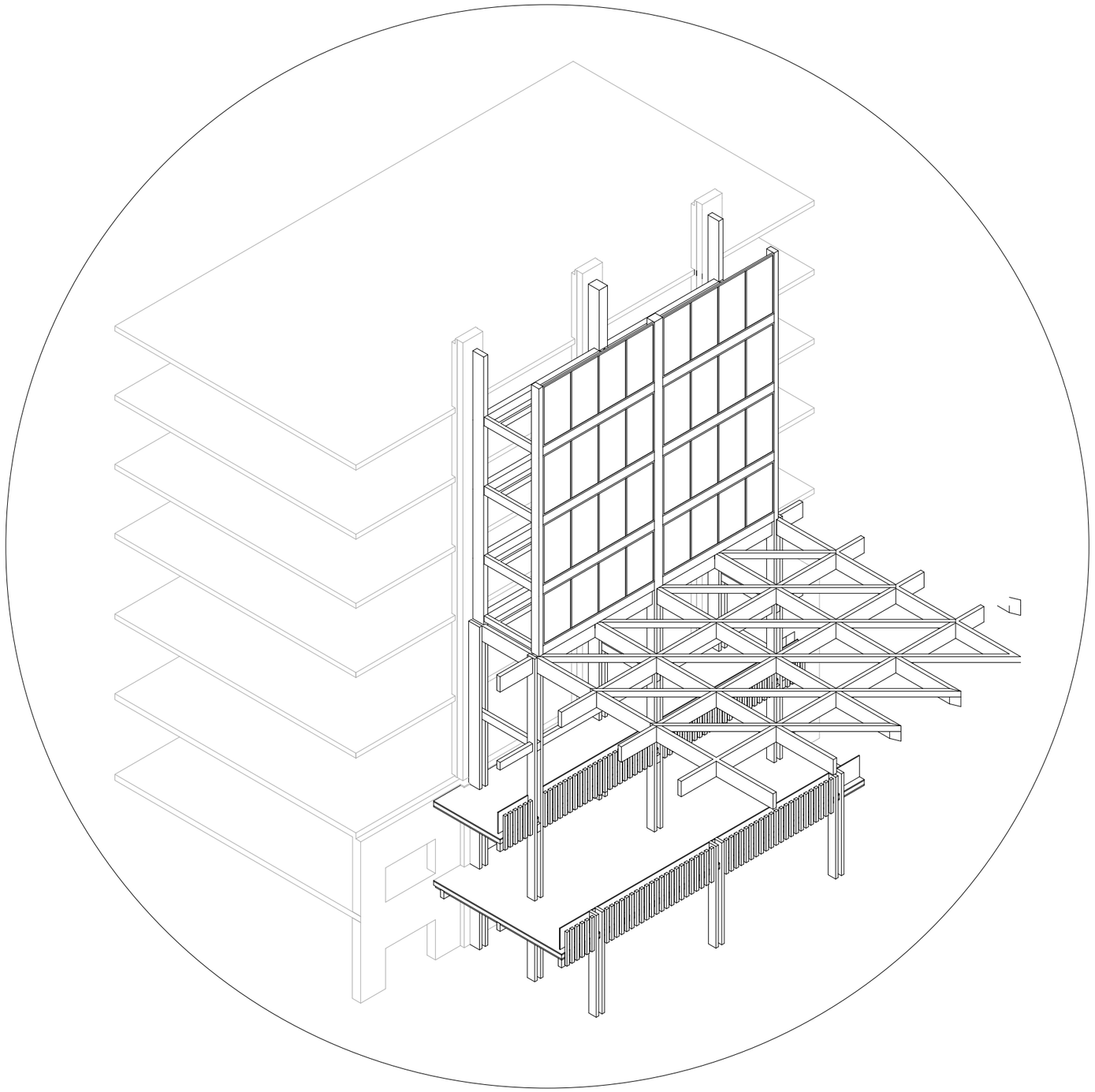


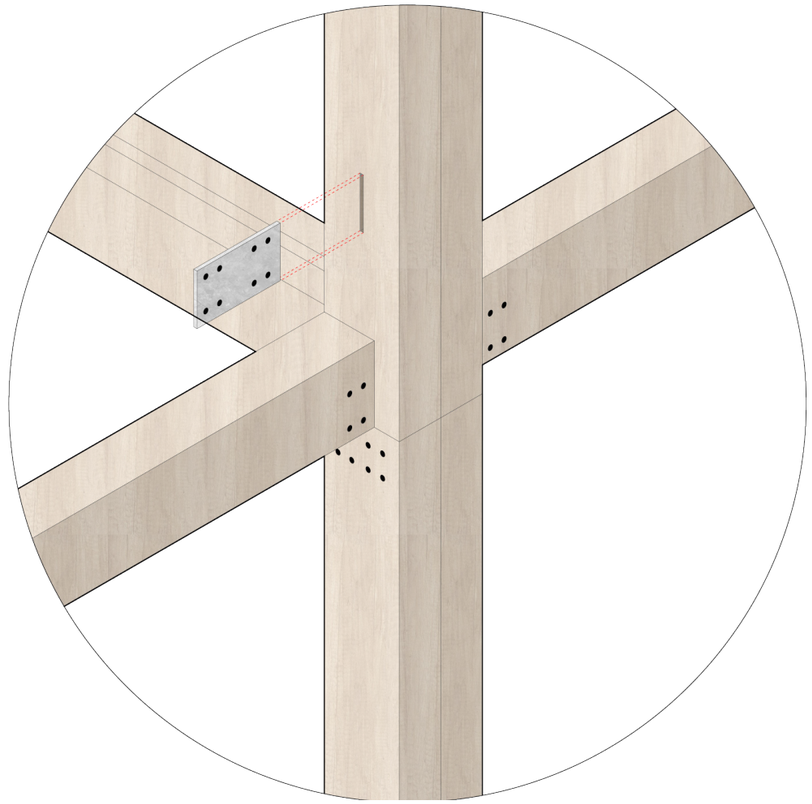
MODULAR FACADE: ASSEMBLY PROCESS



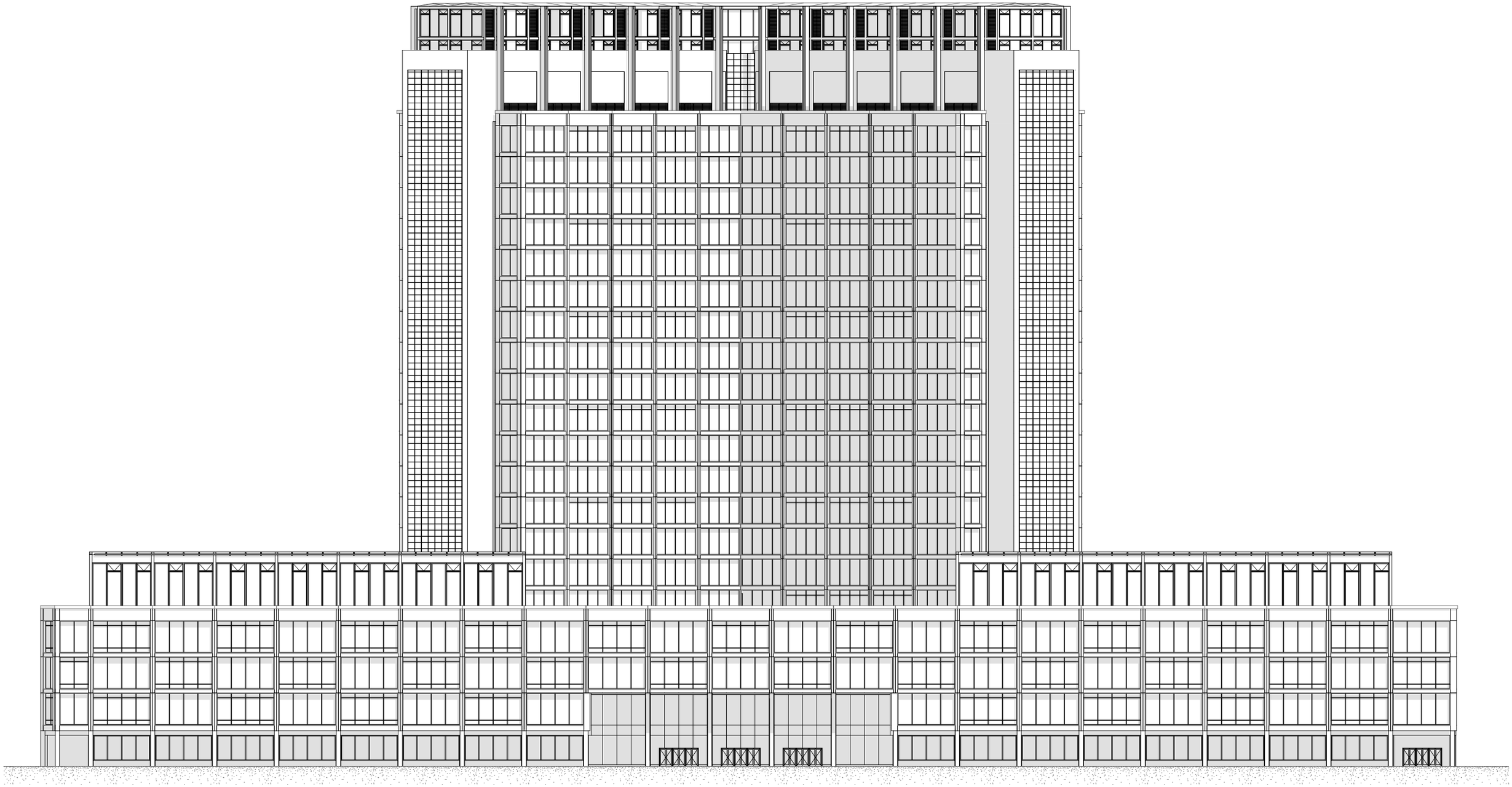


MODULAR FACADE: ASSEMBLY PROCESS

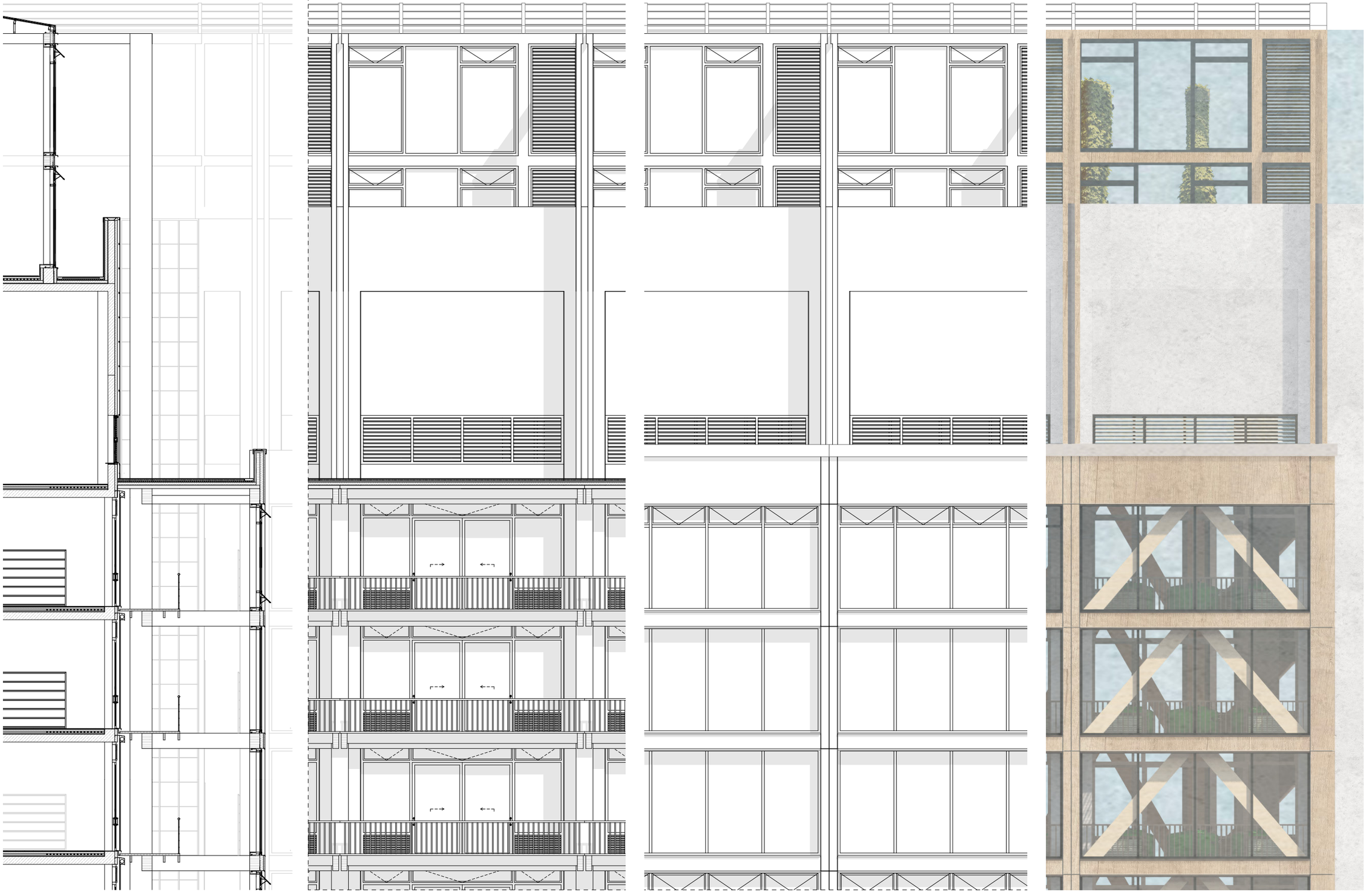




WESTERN FACADE

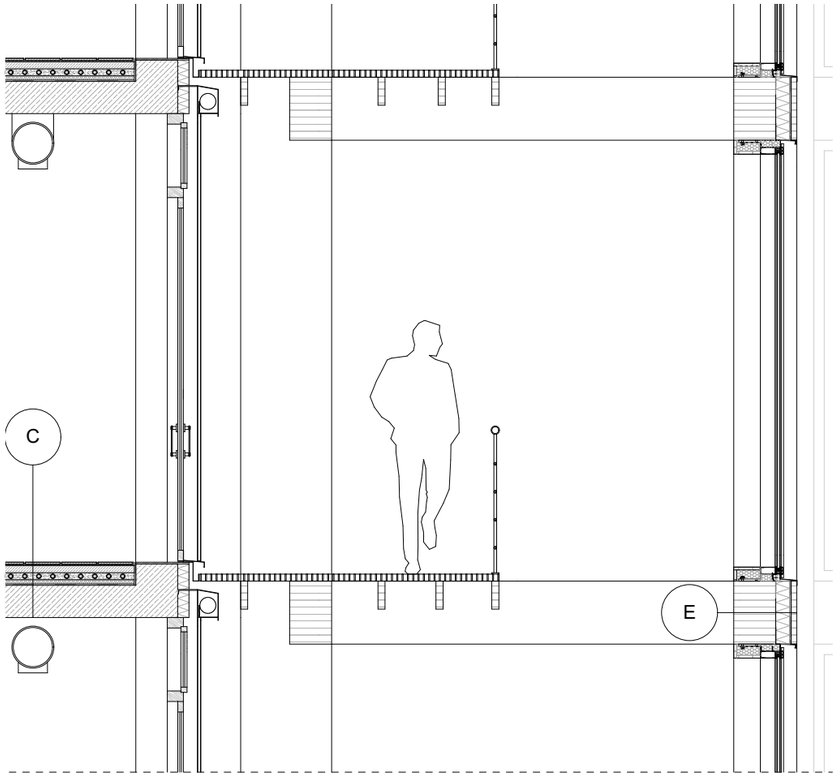


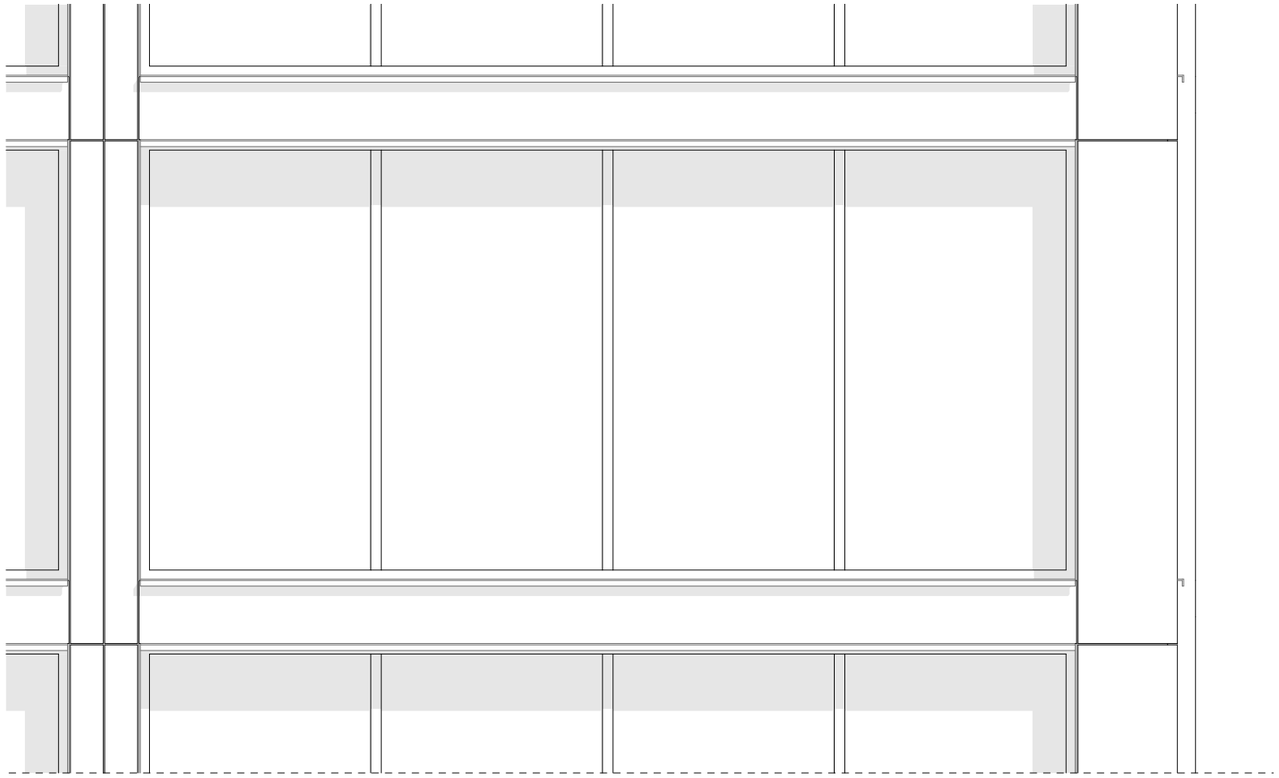
MODULAR FACADE: COMPOSITION



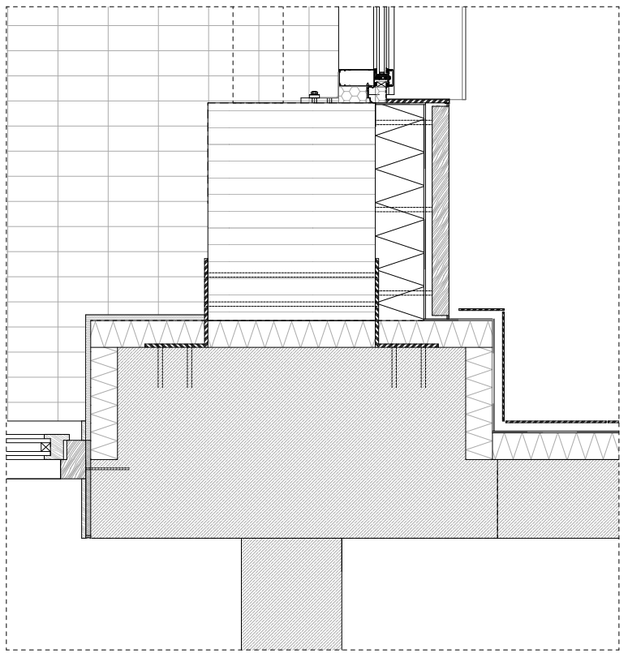
FACADE MATERIALITY

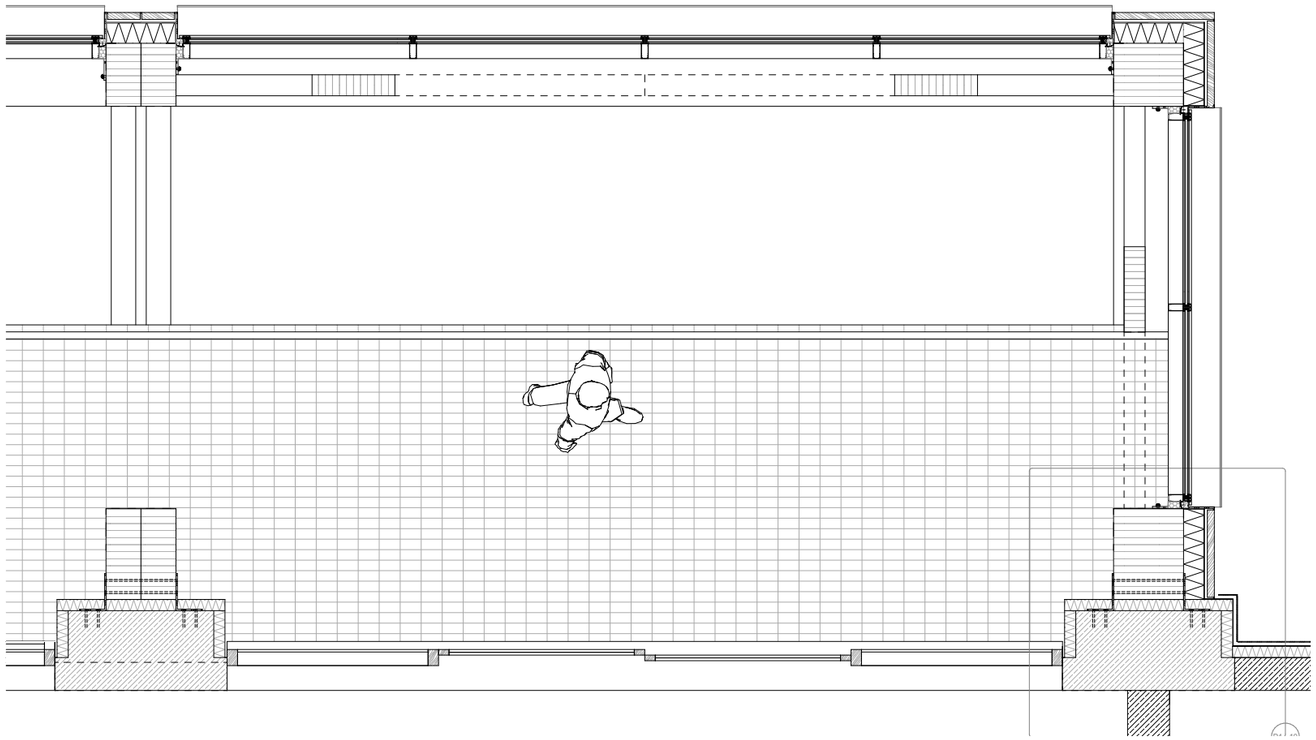
MODULAR FACADE: UNIT IN DETAIL





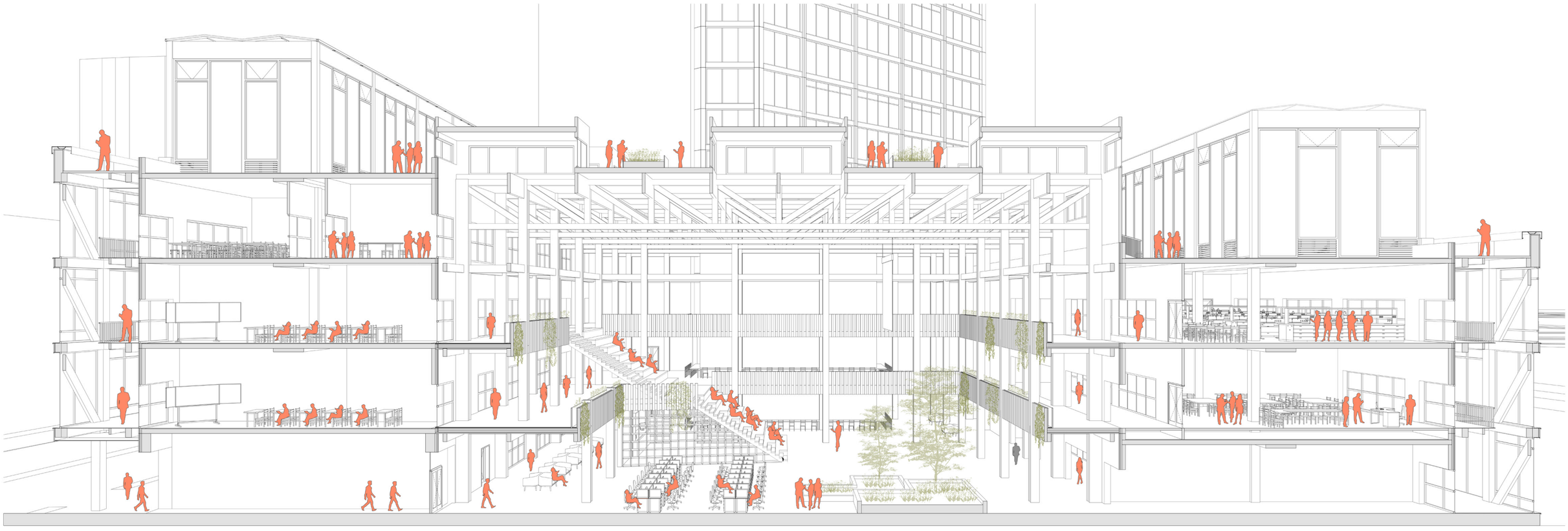
Module to building tower, detail 1:5





FACADE AS A SPACE OF CULTIVATION

REFLECTION



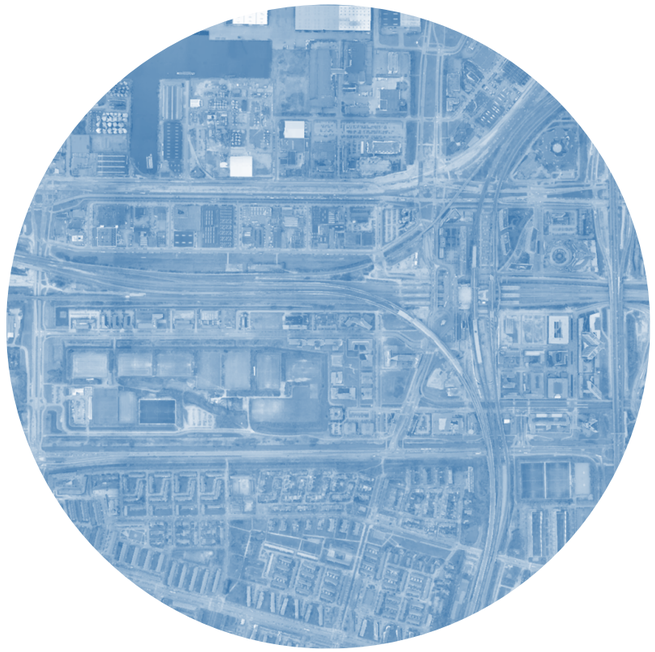
THANK YOU FOR YOUR ATTENTION!

APPENDIX

INTRODUCTION

Ongoing trend:

Urban farming / Adaptive reuse



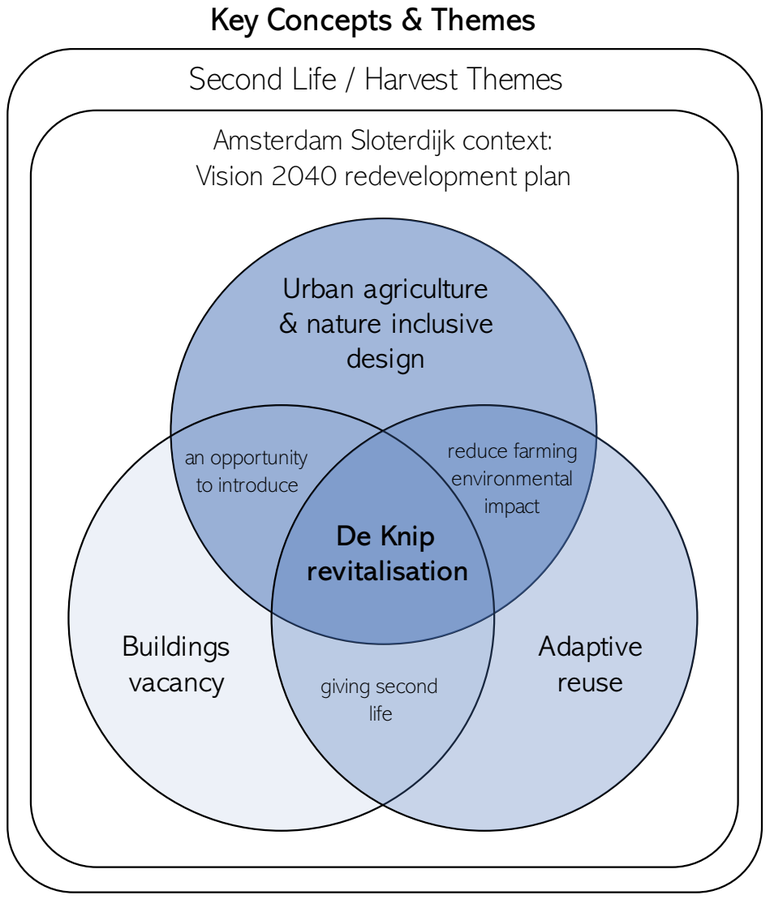
Location:

Sloterdijk,
a neighbourhood in transformation

Building:

Tax authority office,
“de Knip”

OBJECTIVES, DESIGN QUESTION & RESEARCH QUESTION



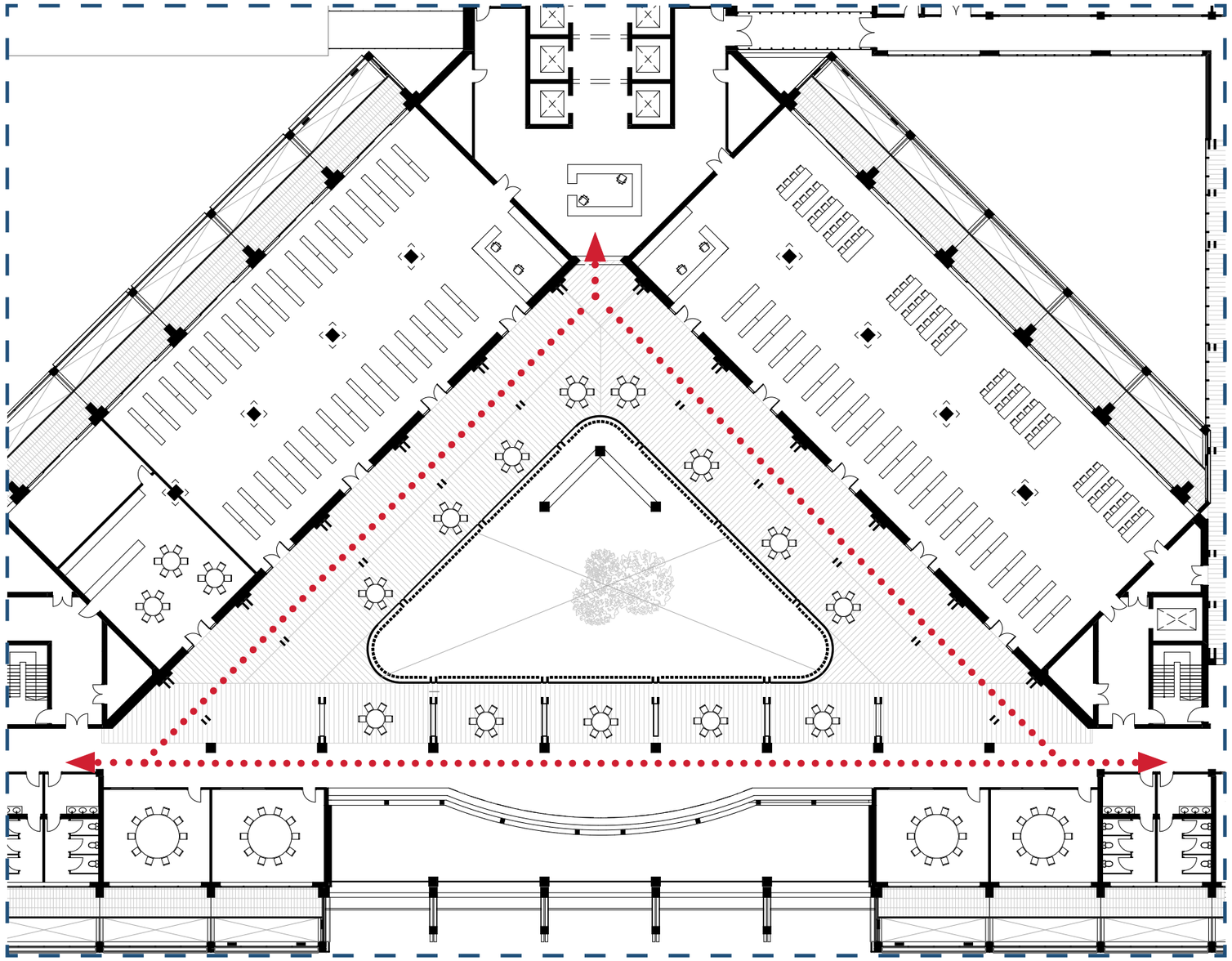
Design Question

How to repurpose an existing office building (de Knip) in Sloterdijk into a vocational school and sustainable urban farm that effectively produces a selection of healthy foods for the local community?

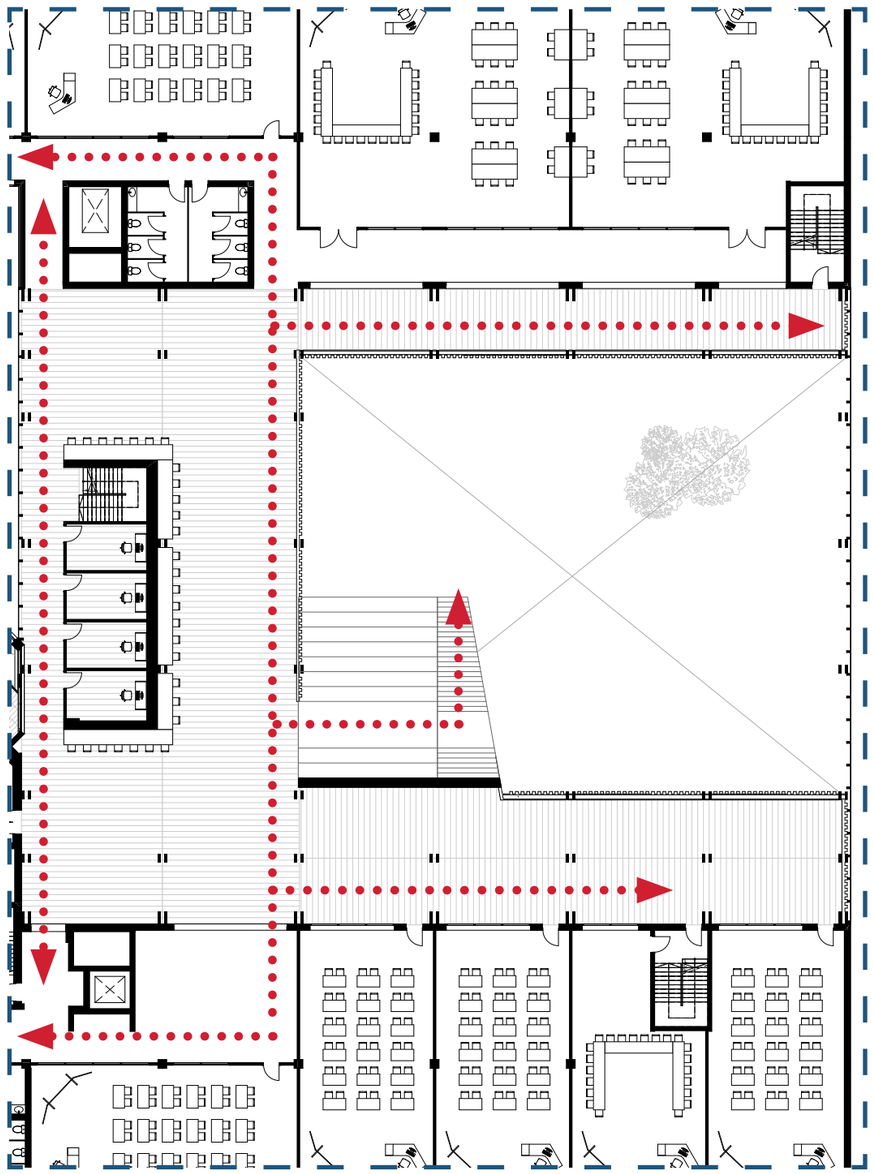
Thematic Research Question:

What are the most suitable urban farming techniques for de Knip, which would satisfy the neighbourhood future food demand for selected products?

NEW CIRCULATION IN ATRIA - CONNECTING SPACE

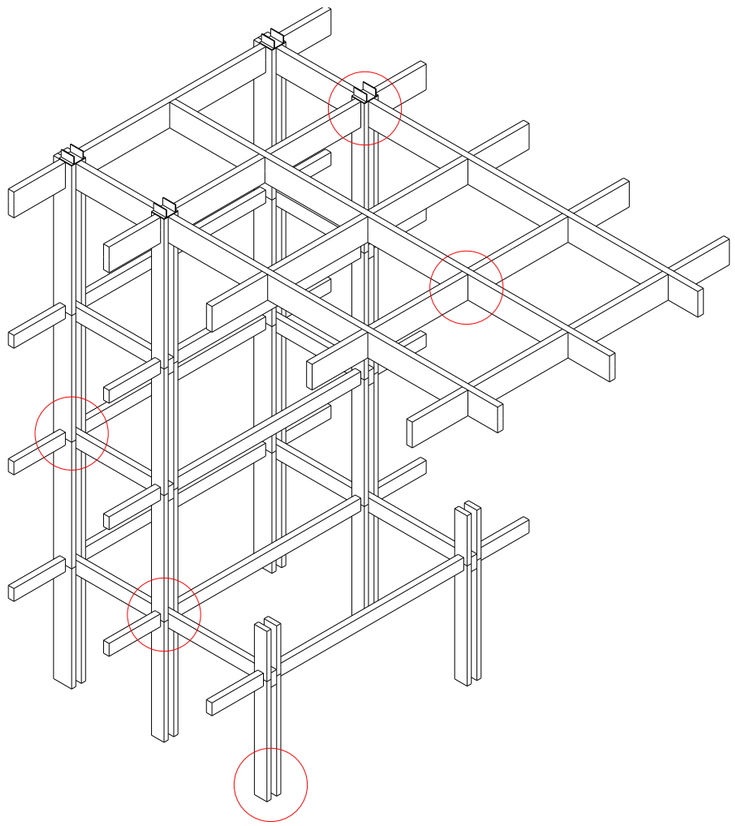


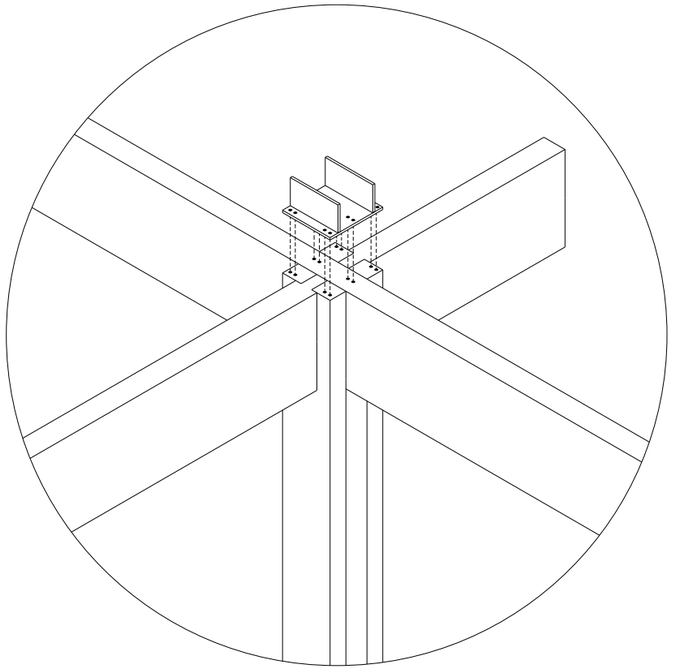
Main atria 1:100



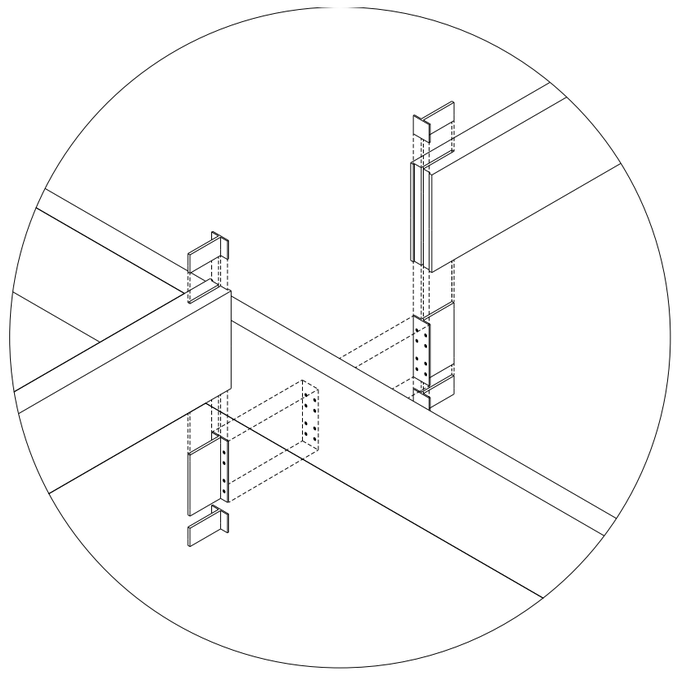
School 1:100

ATRIUM INFILL: STRUCTURE AND JOINTS

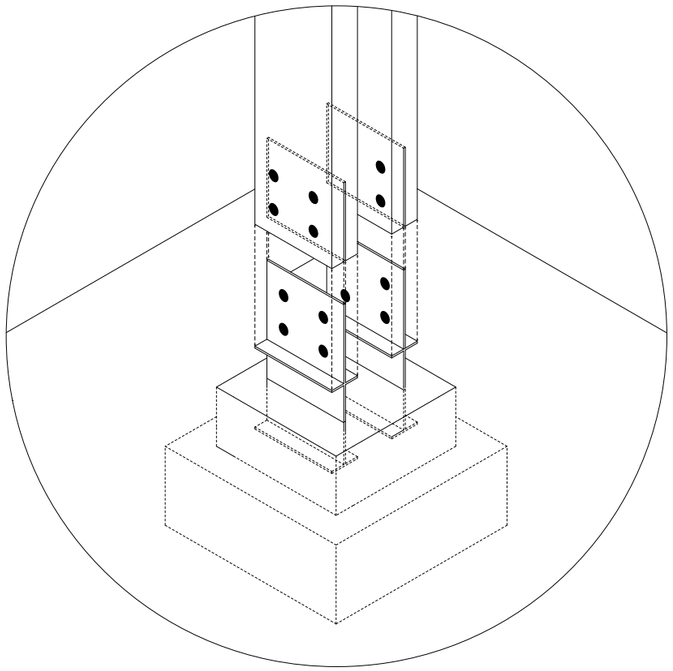




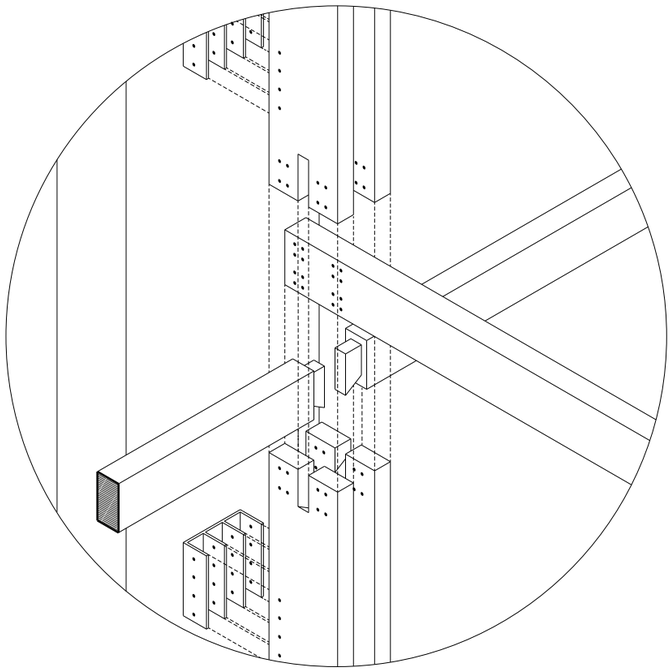
Roof to new facade module



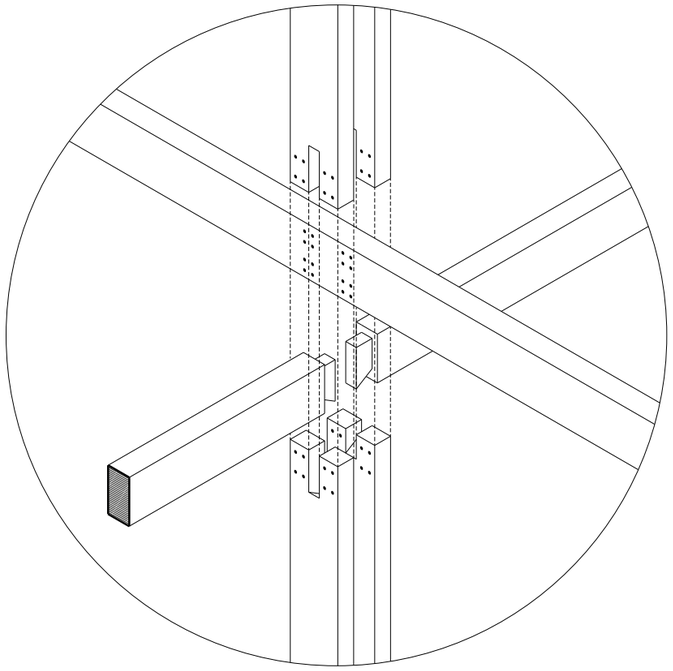
Secondary and primary roof beam connection by steel plates



Foundation to wood post connection by steel plates



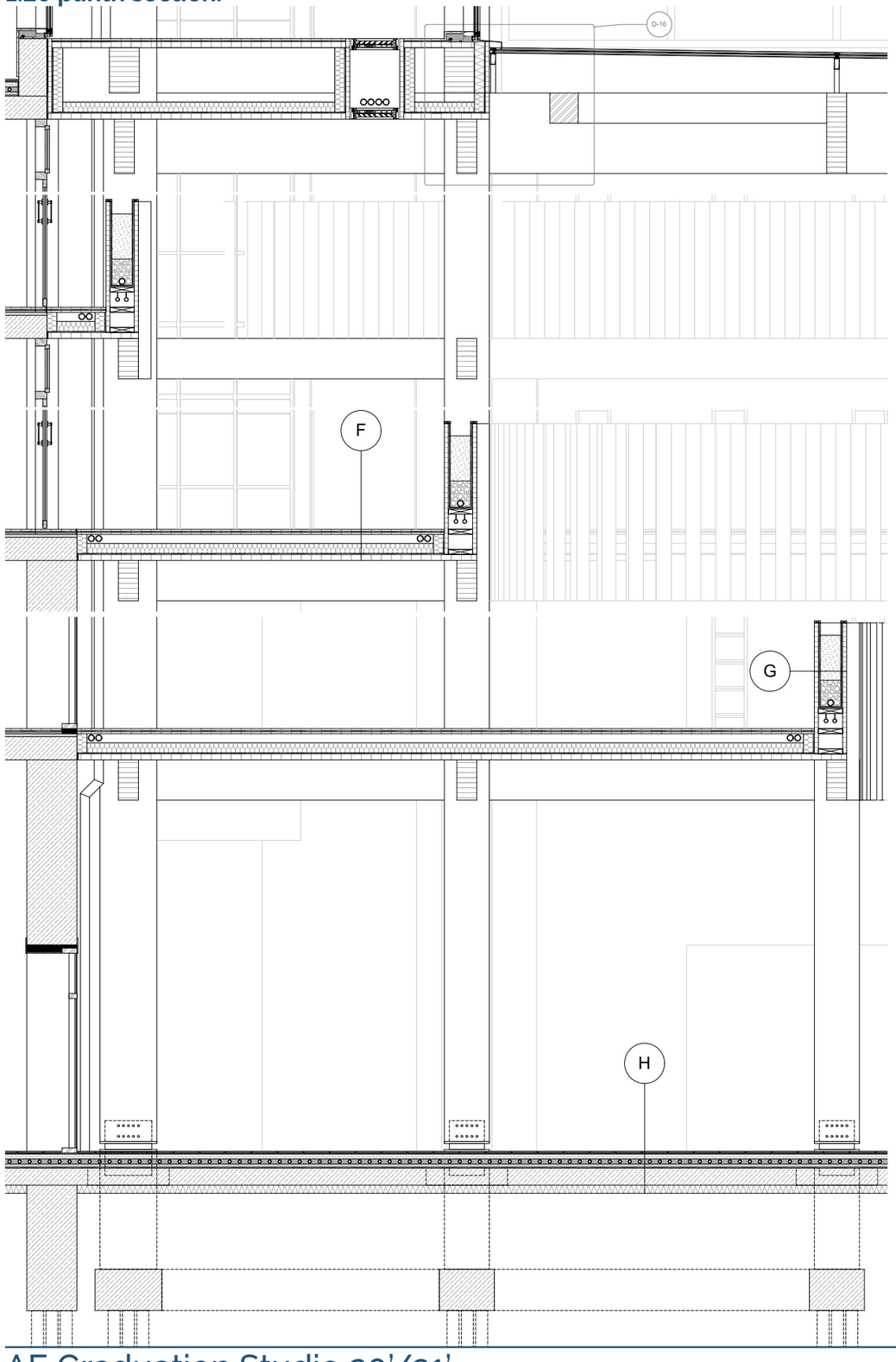
Steel saddles to attach the columns to existing structure



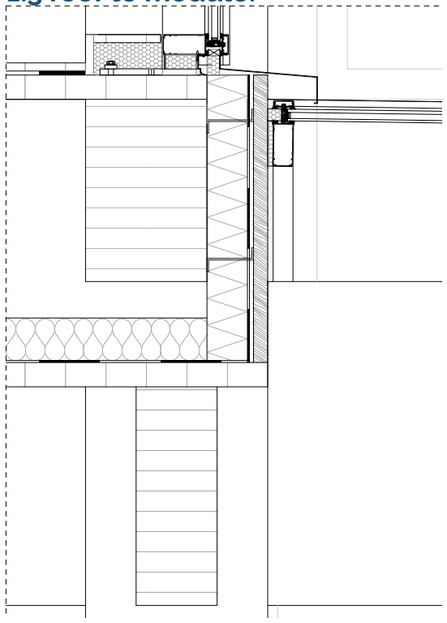
Posts, primary beams: connected with steel bolts
Secondary beams: wood to wood connection (cnc)

INFILL DETAIL & MATERIAL

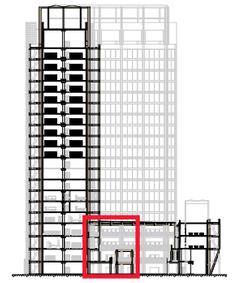
1:20 plinth section:



1:5 roof to module:



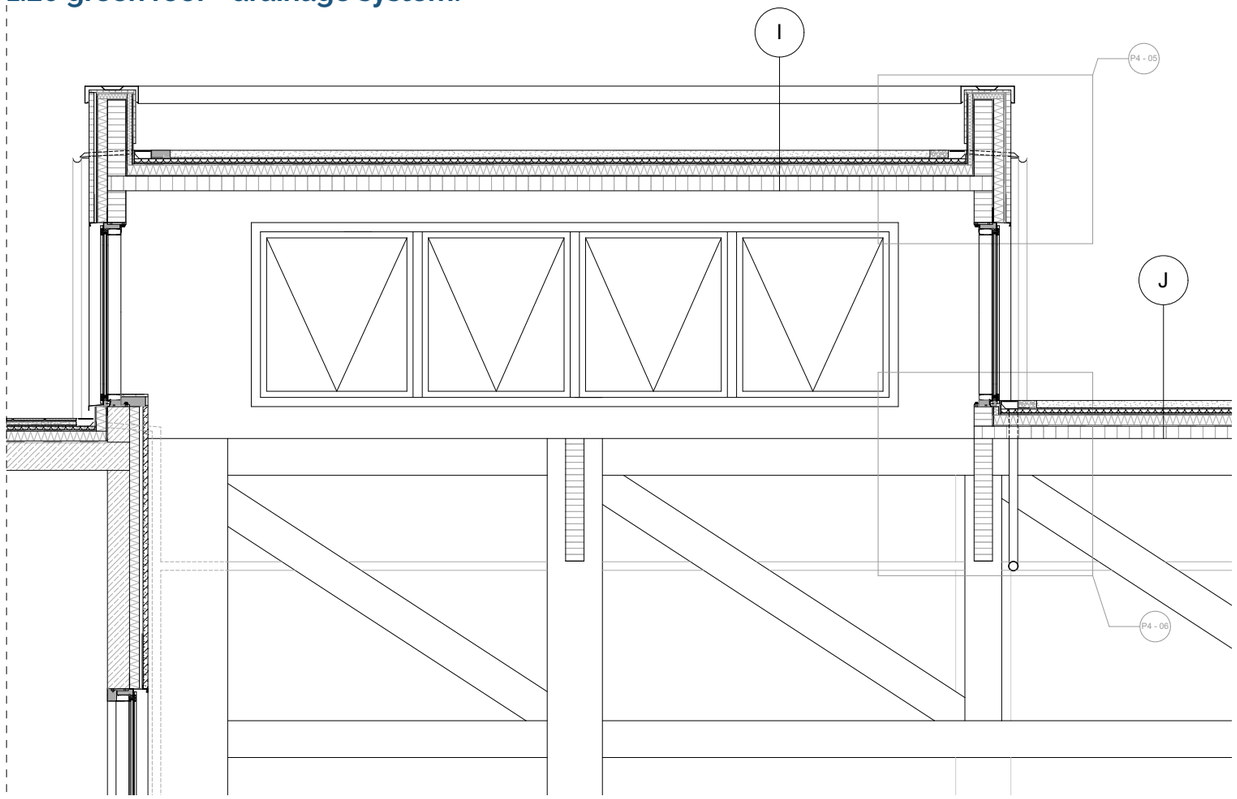
- elements beams, posts, slabs: BauBuche GL75 structural laminated beech venneer
- structural posts of 50 x 65 cm, 45 x 50cm, beams of 20 x 40 cm
- build up conventionally, not prefabricated
- the wood is of fire class R60 which complies with regulation for renovated buildings
- overhanging galleries as prevention from fire spreading
- smoke discharge - openable panels in the roof



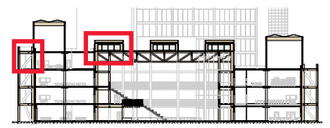
Baubuche GL75

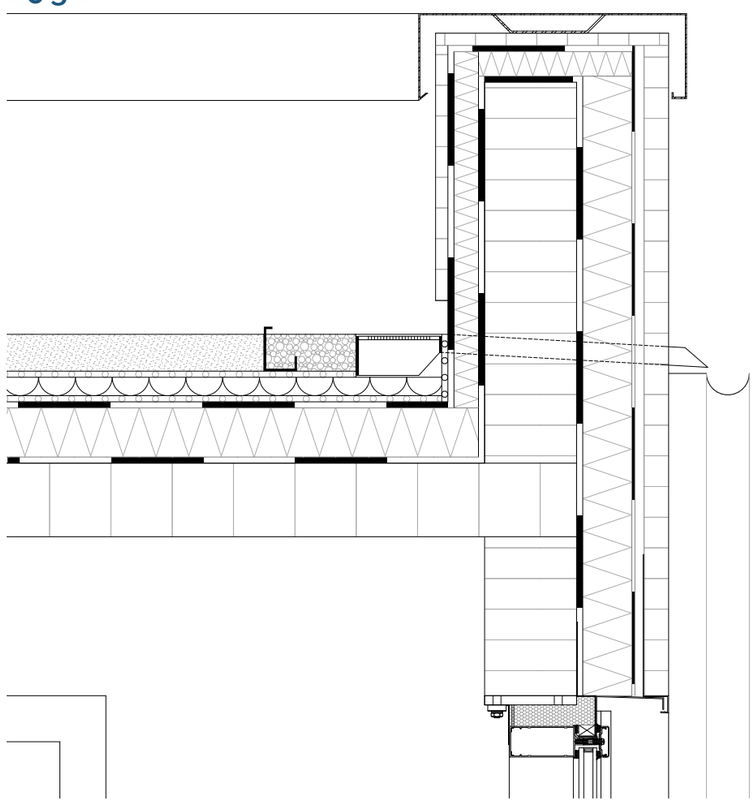
WATER COLLECTION: DETAILS

1:20 green roof - drainage system:

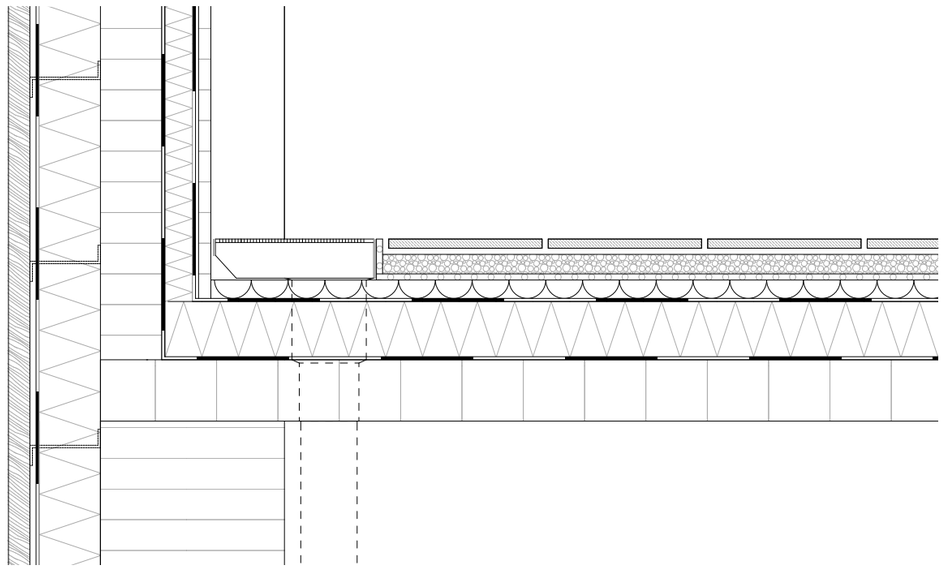


1:5 green roof:

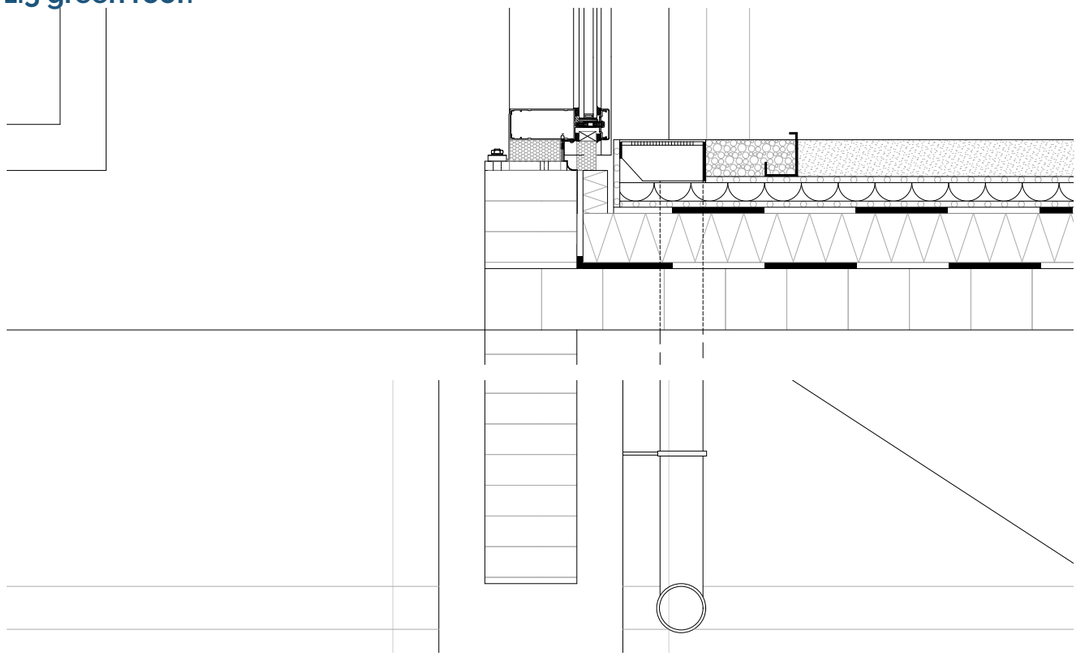




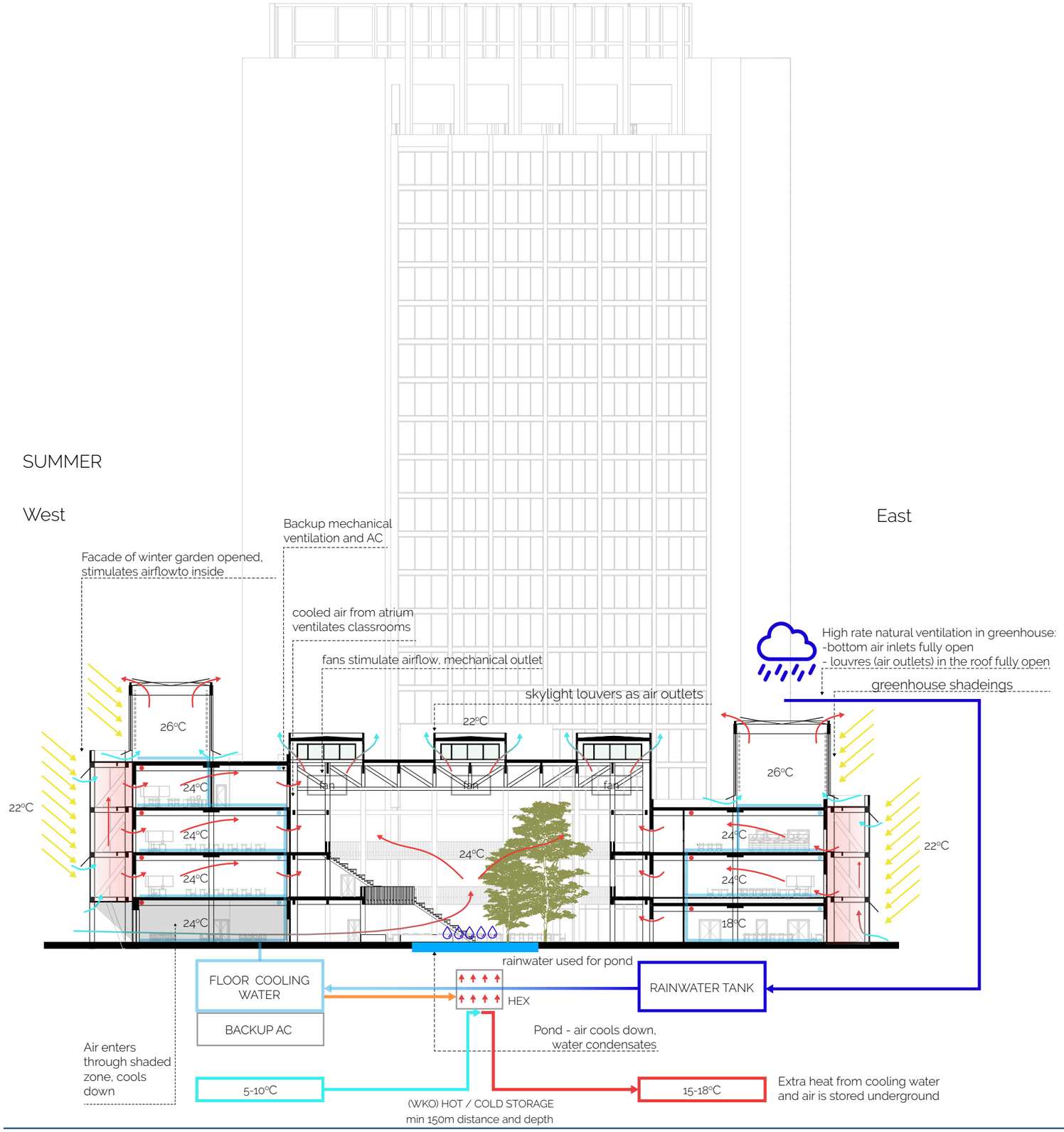
1:5 facade drainage:



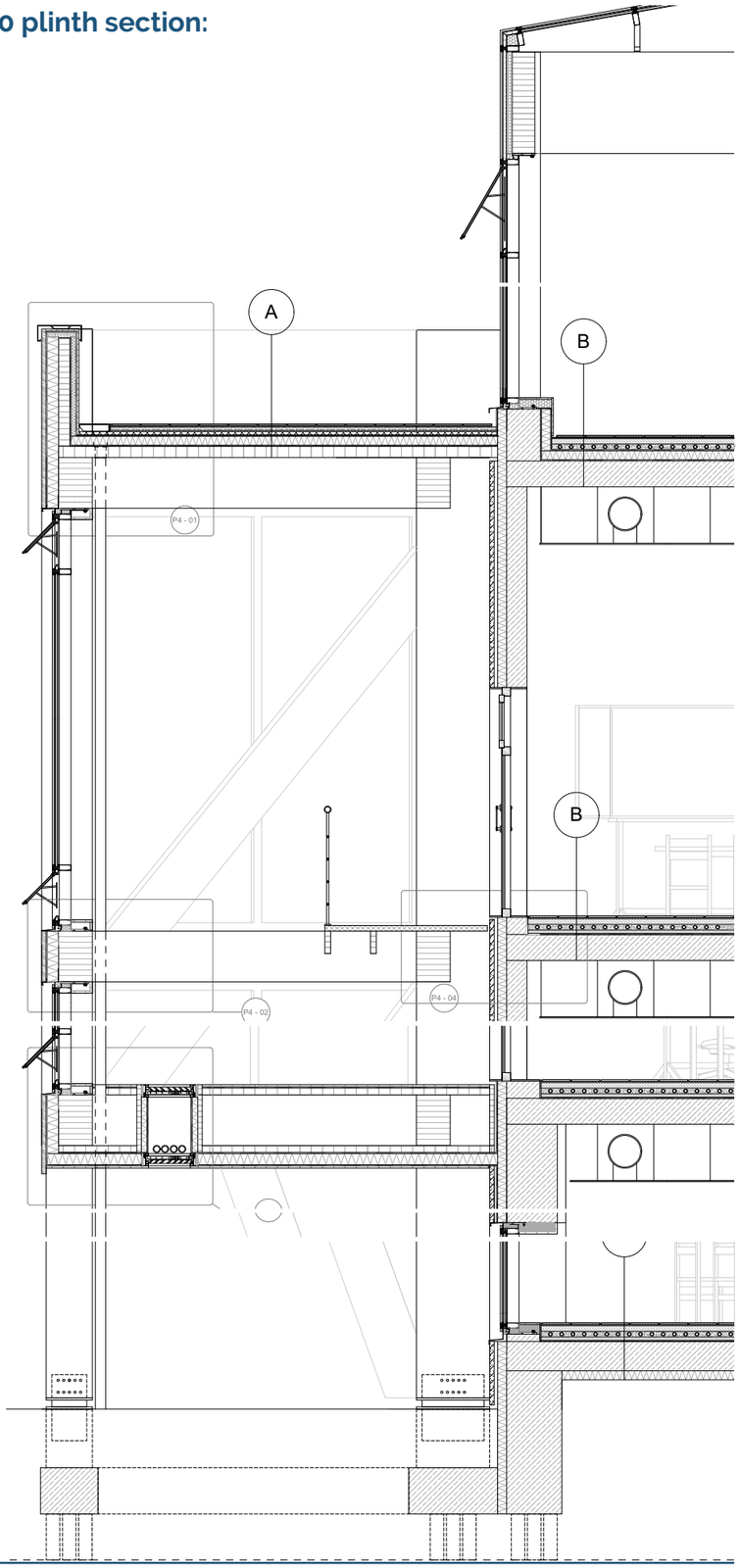
1:5 green roof:



CLIMATE STRATEGY

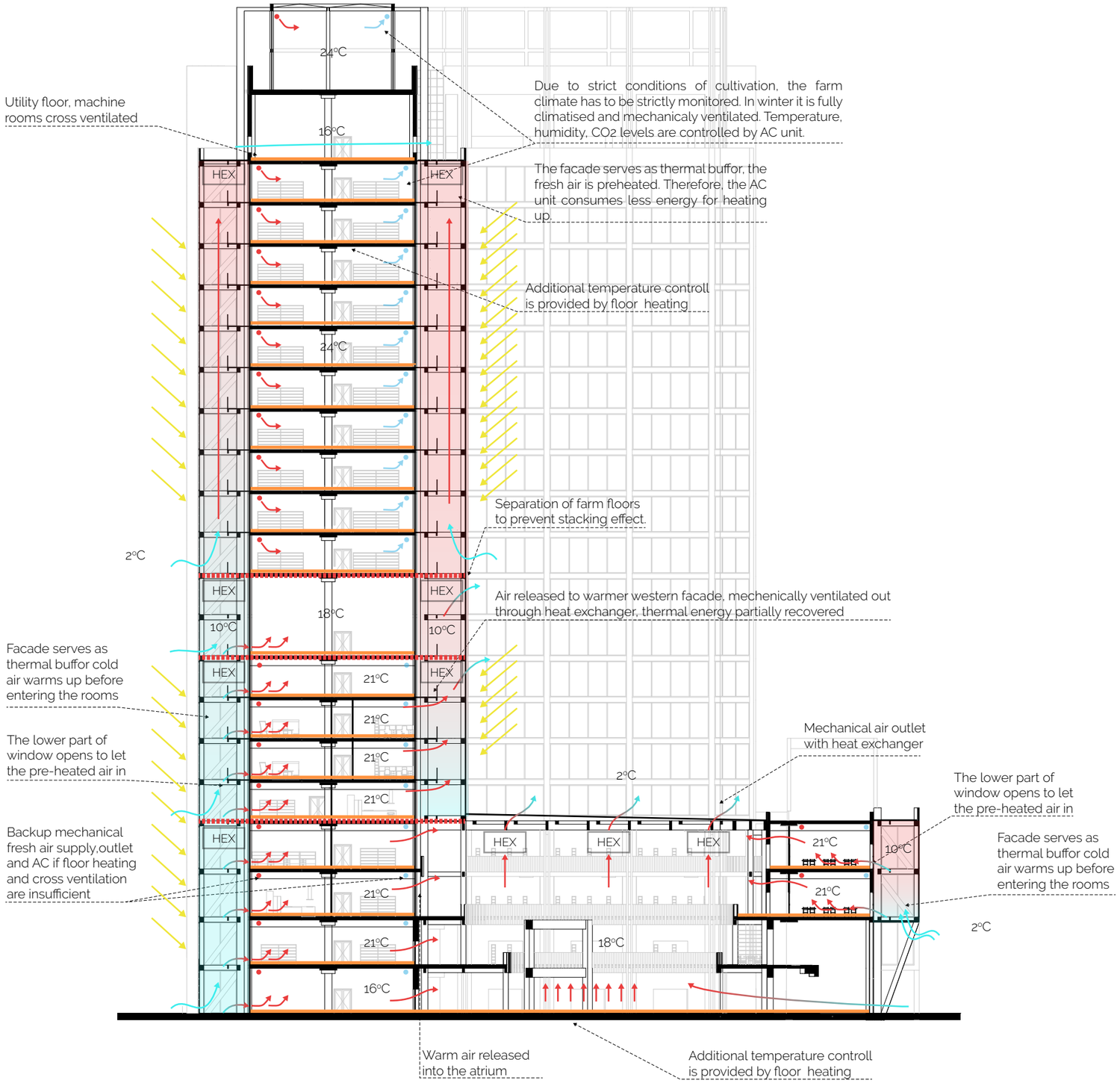


1:20 plinth section:



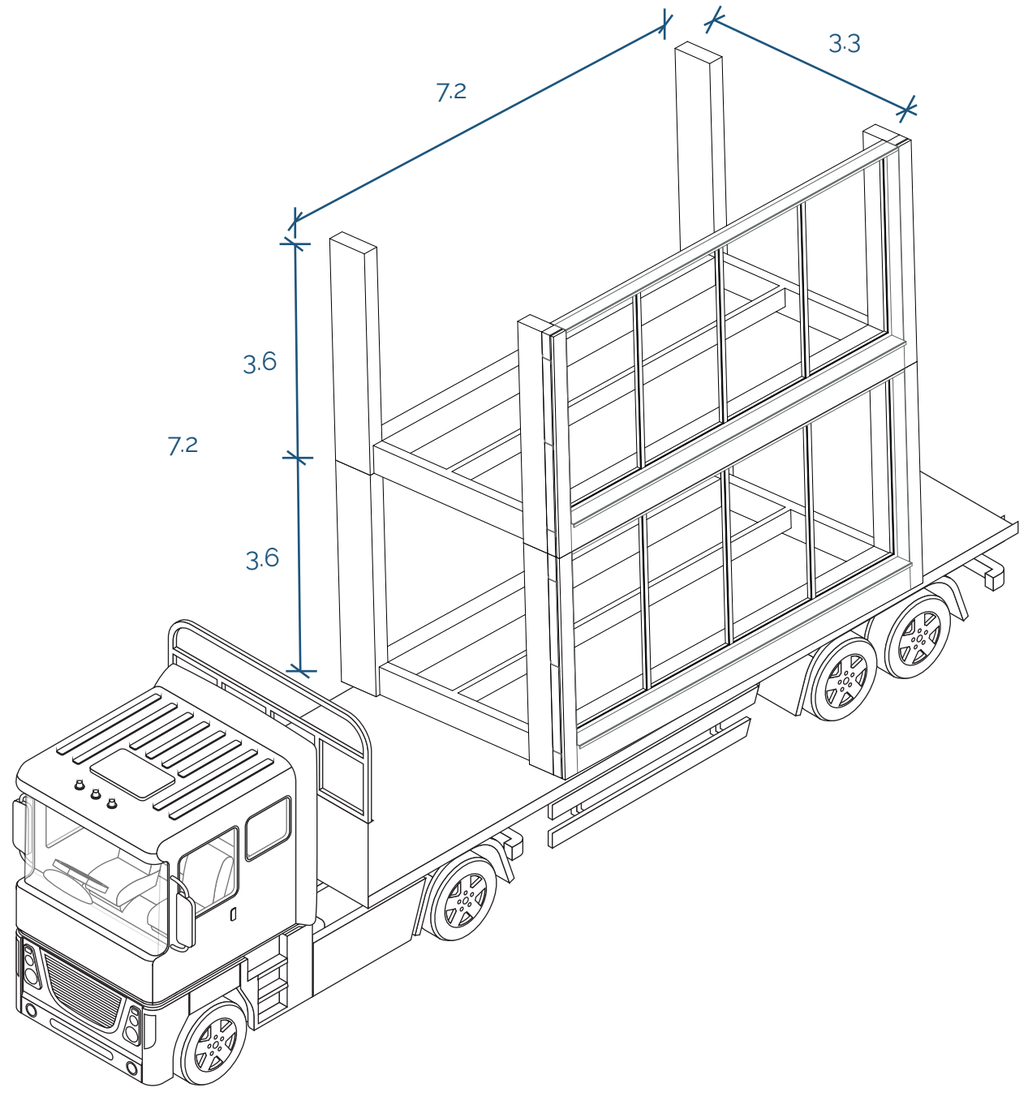
CLIMATE STRATEGY

WINTER



MODULAR FACADE: SHIPPING TO SITE

Modules transported to site by trucks, size require special transportation

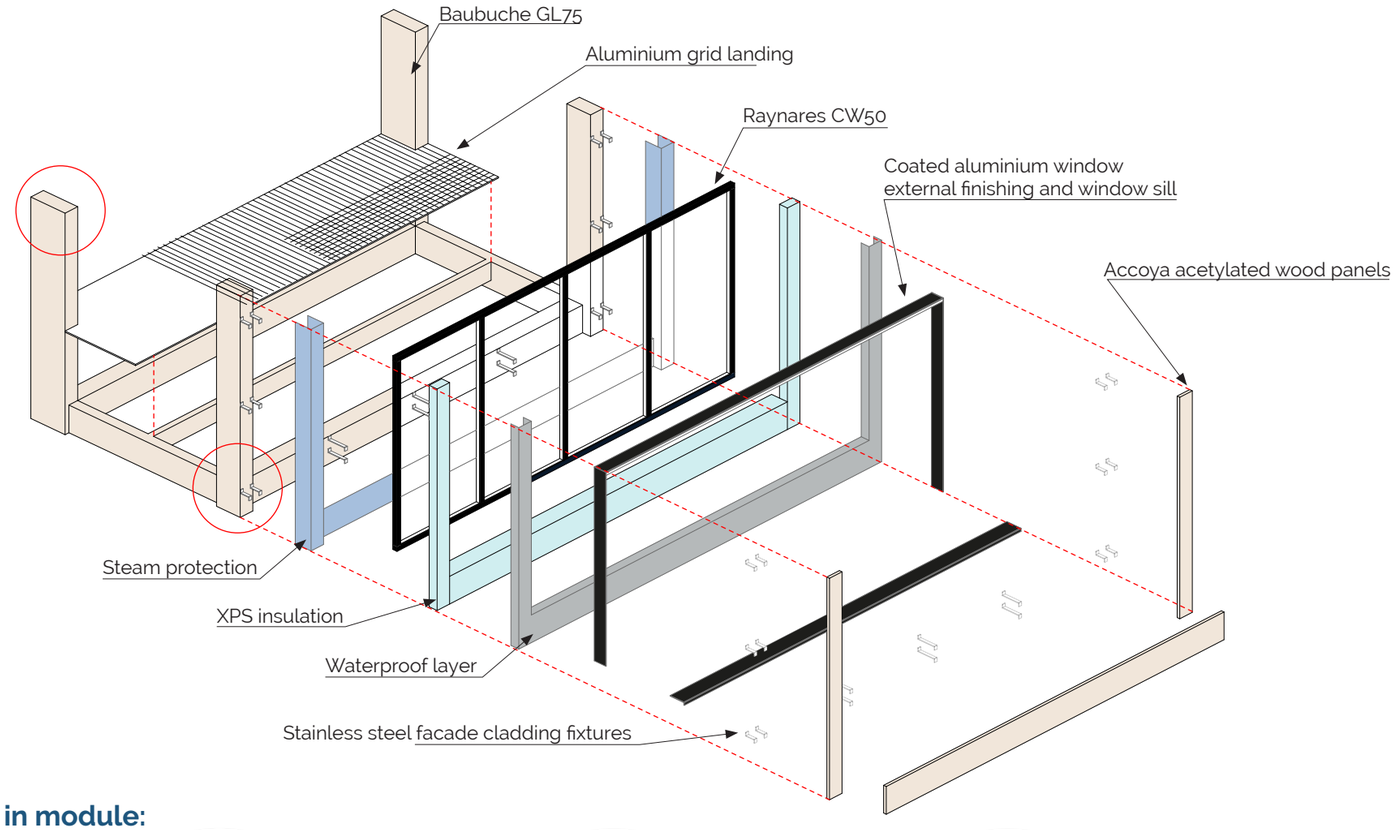


Modules shipped with barge to docks of Amsterdam, and then with special size transportation to de Knip

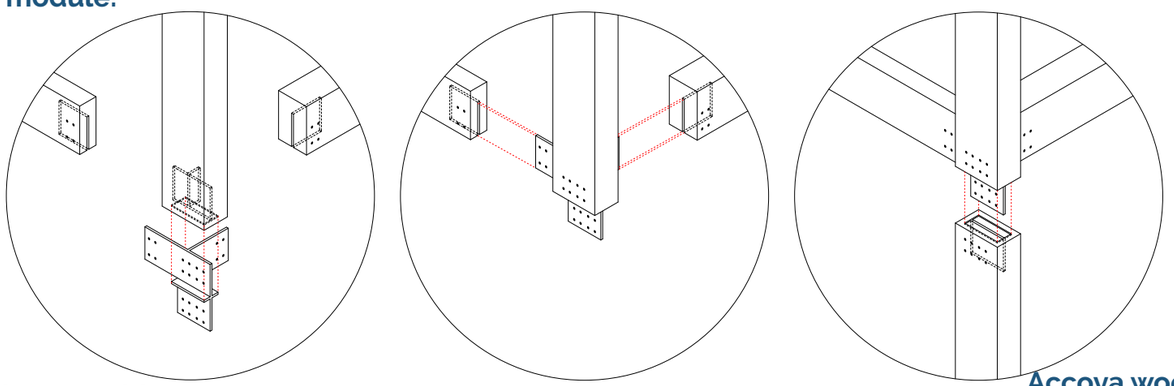
Transportation plan 1:5000

MODULAR FACADE: ASSEMBLY AND DETAILING

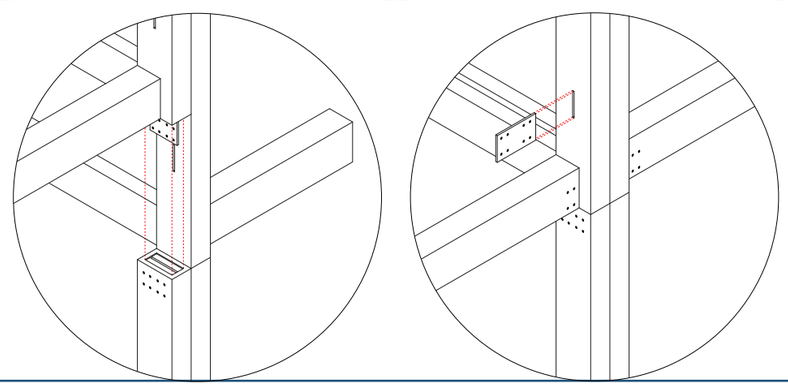
Module:



Joints assebly in module:

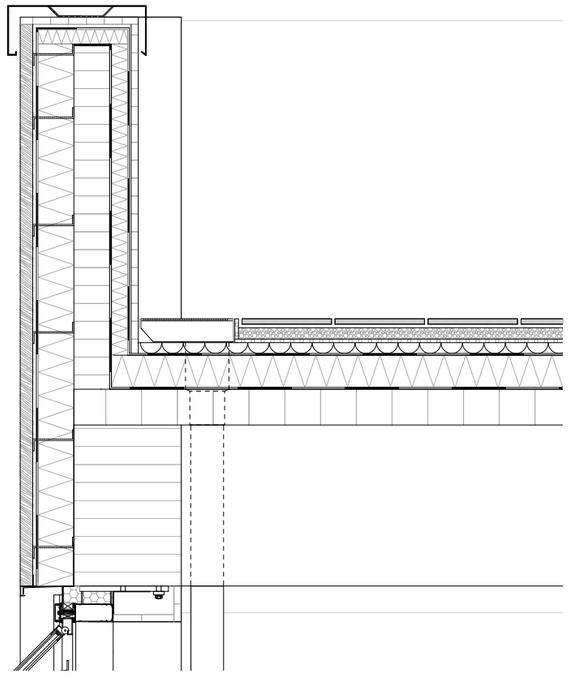


Module to module assembly:

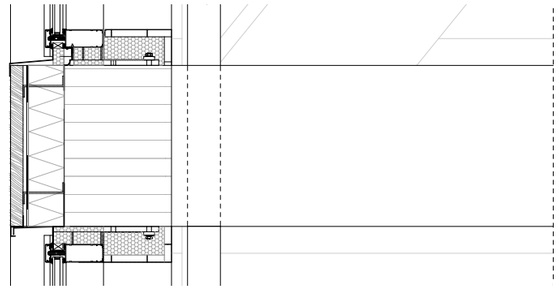


Accoya wood panel:

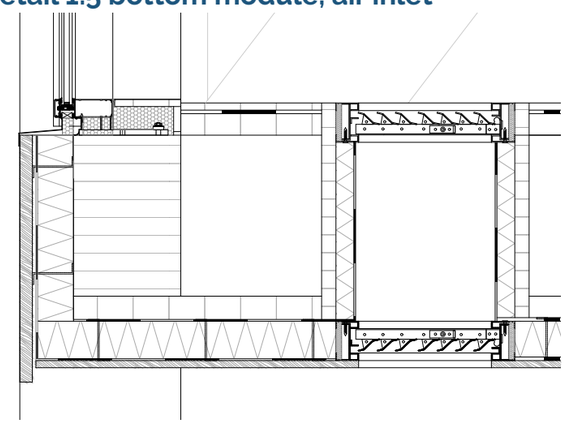
Detail 1:5, modular facade roof



Detail 1:5, module to module

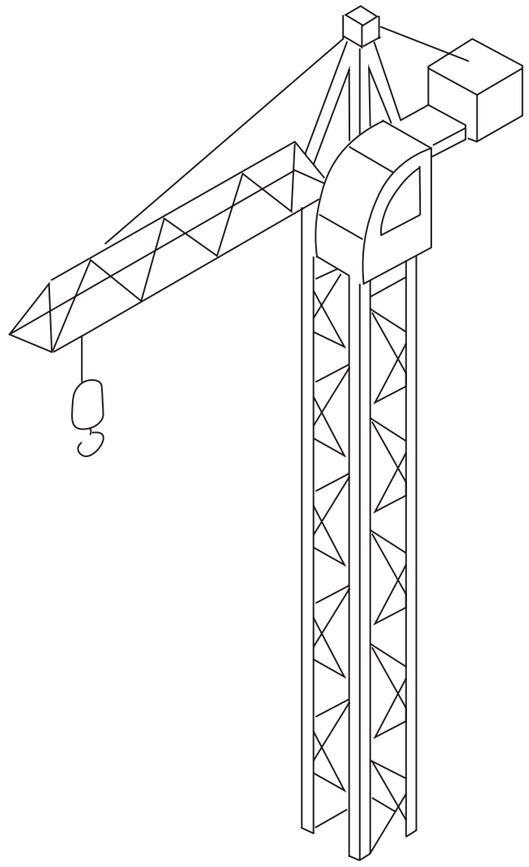


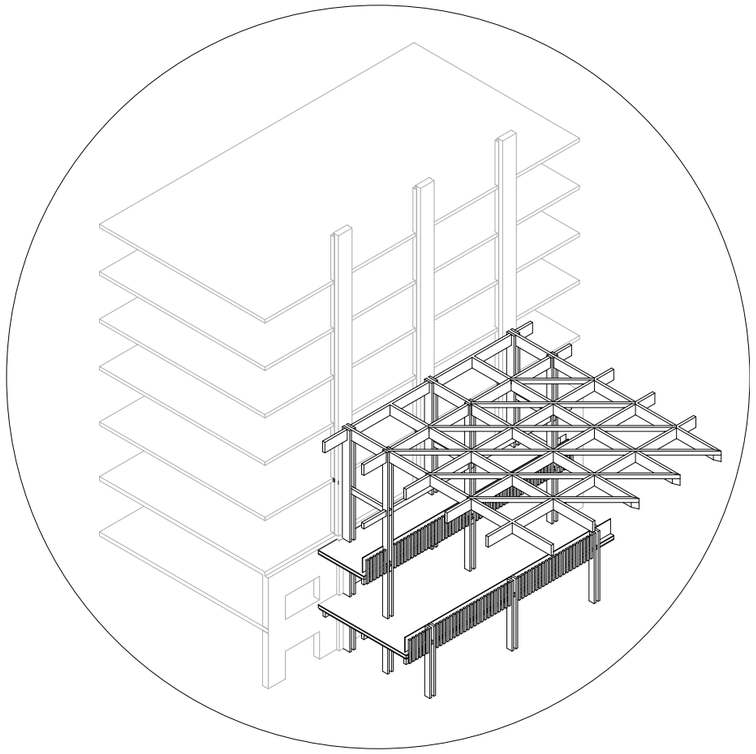
Detail 1:5 bottom module, air inlet

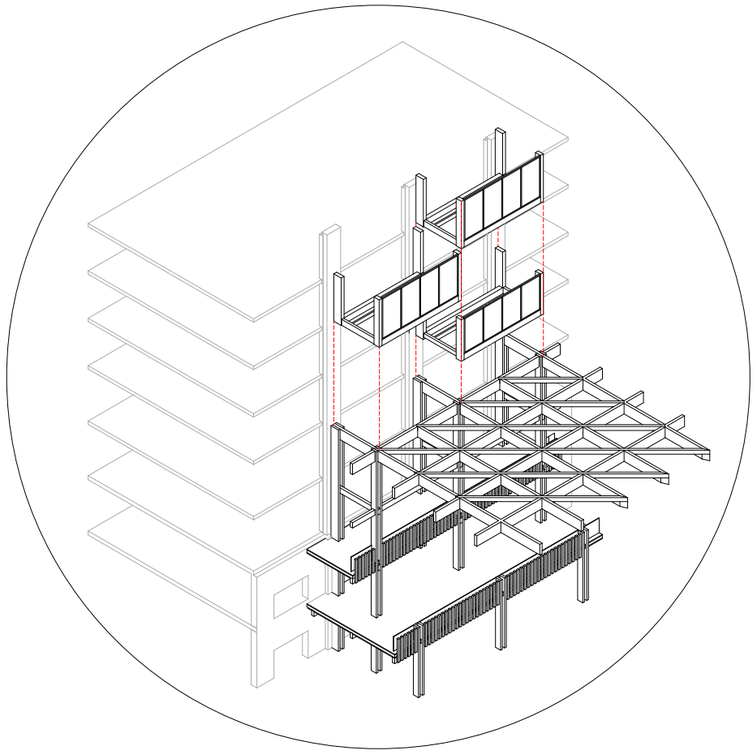


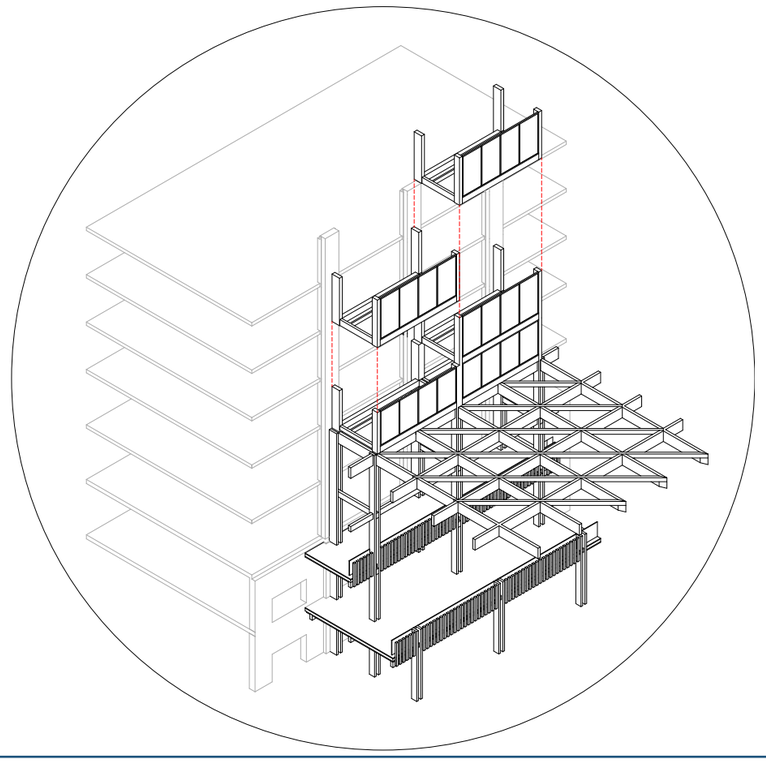
MODULAR FACADE: ASSEMBLY PROCESS

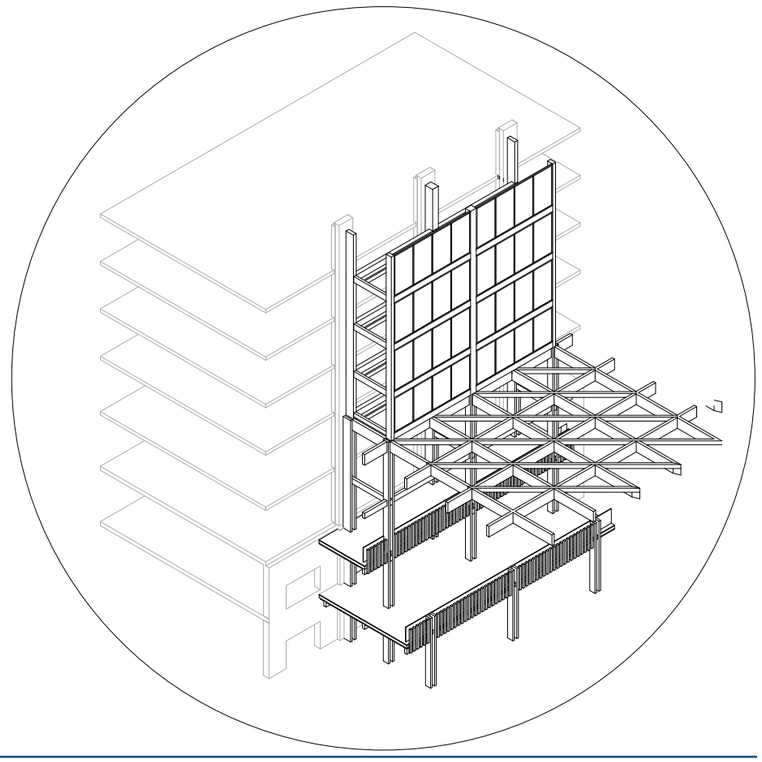
Modules assembled with crane on site:



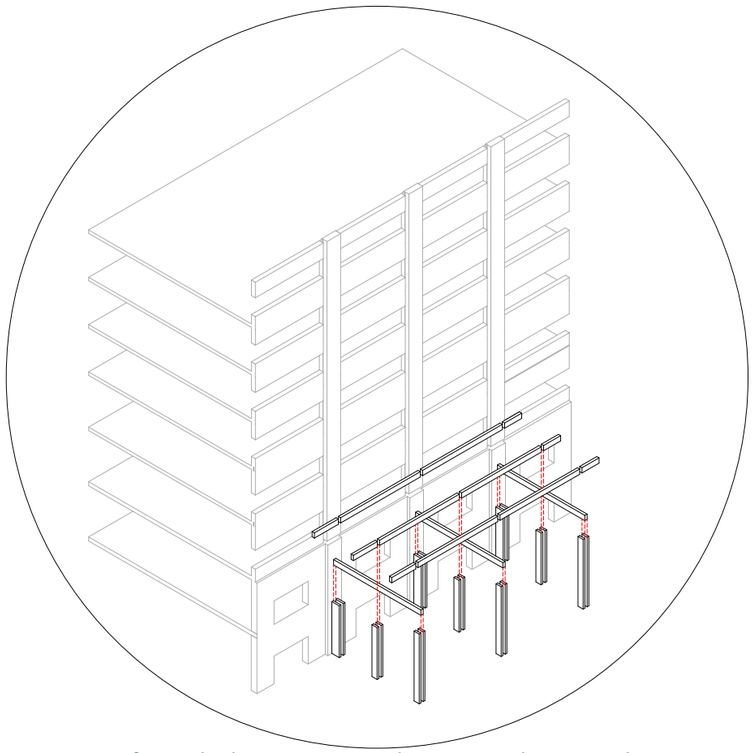




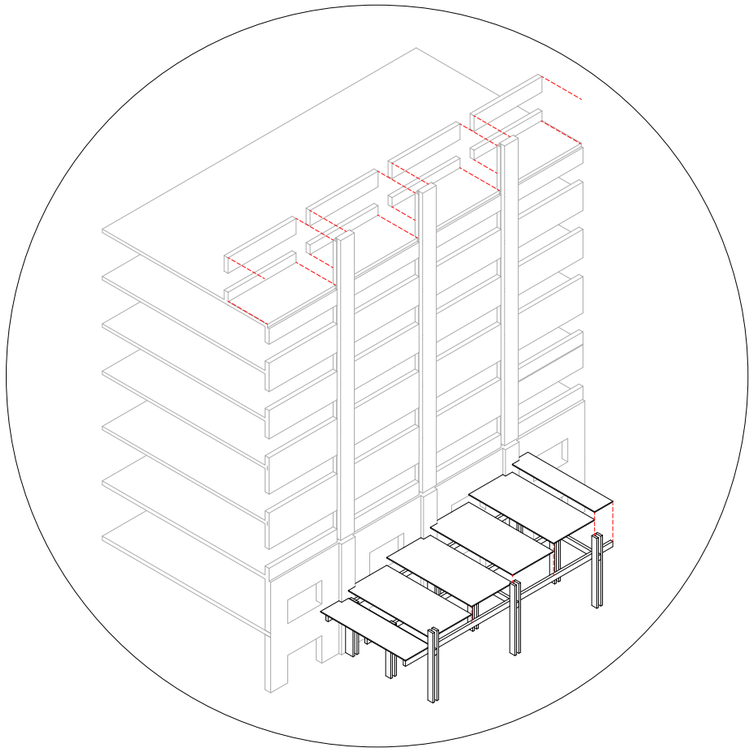




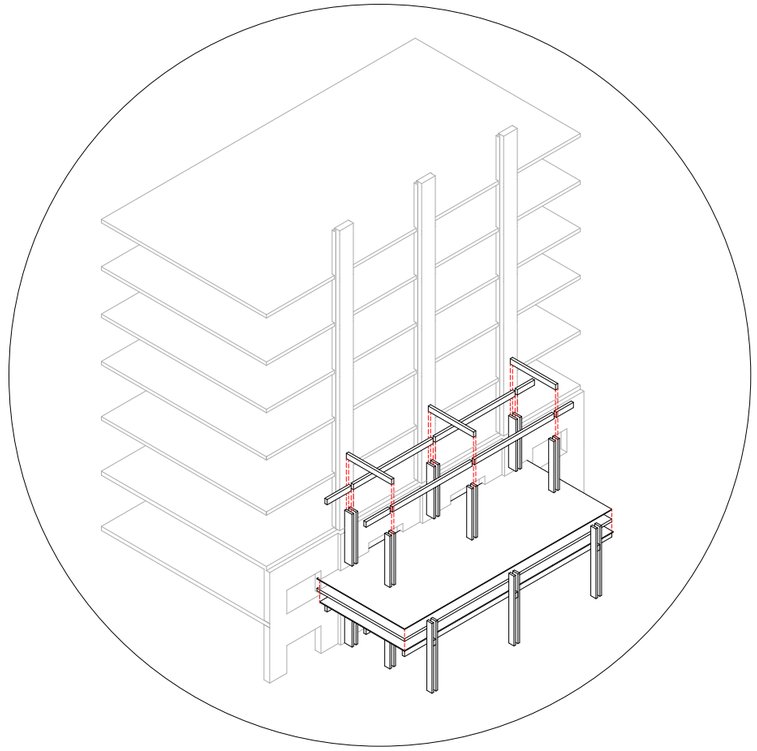
ATRIUM INFILL: ASSEMBLY PROCESS



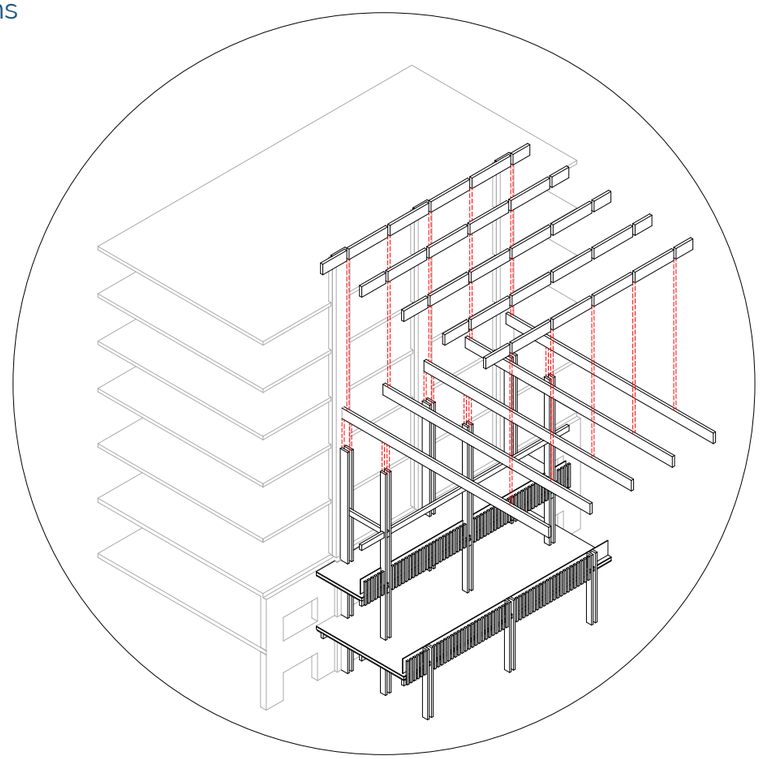
New foundation, posts, primary and secondary beams



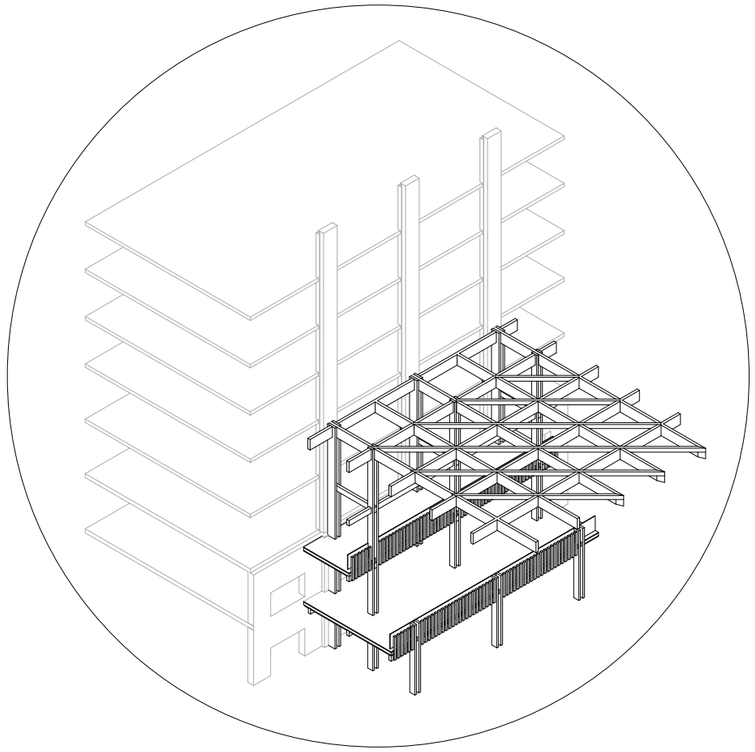
Facade removal, Baubuche Q slab



Next level of posts and beams, floor finishing layers

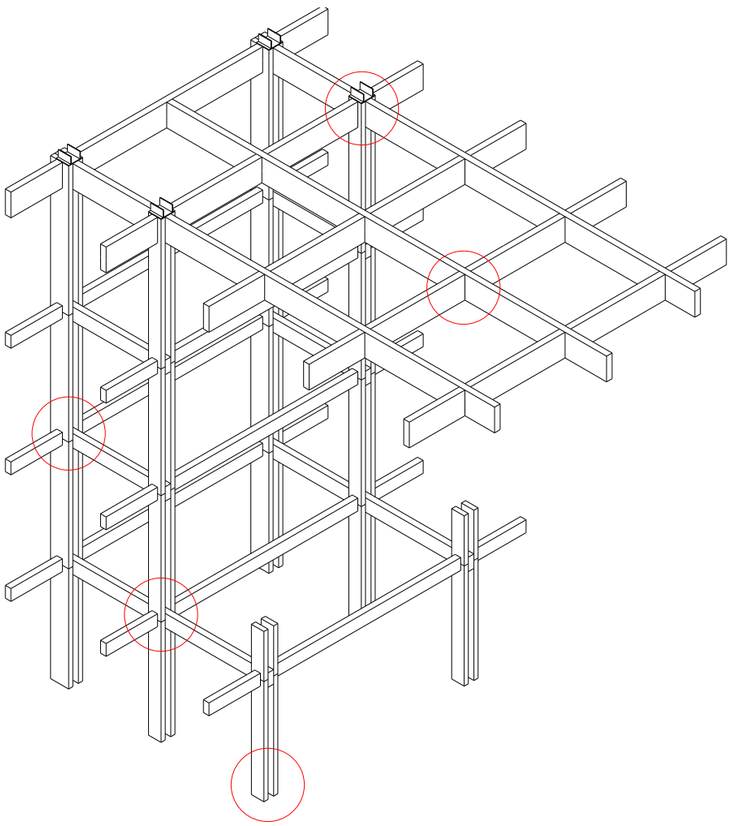


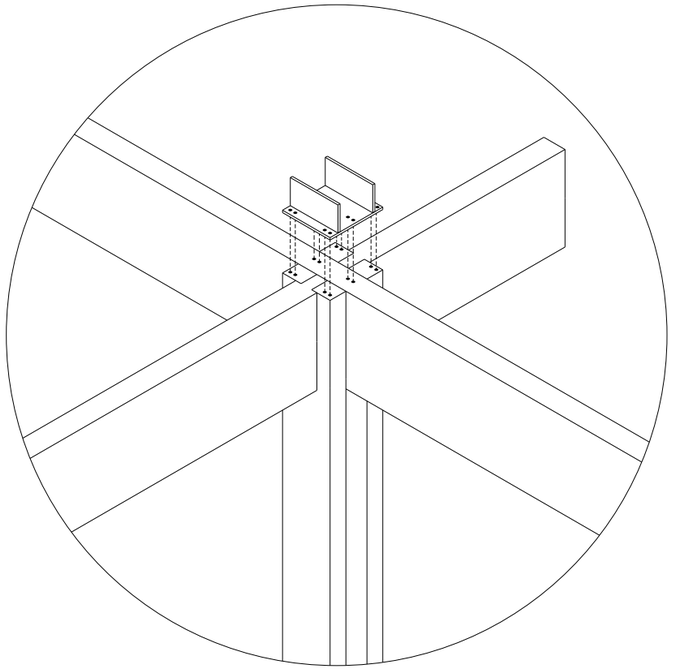
Roof structure secondary and primary beams



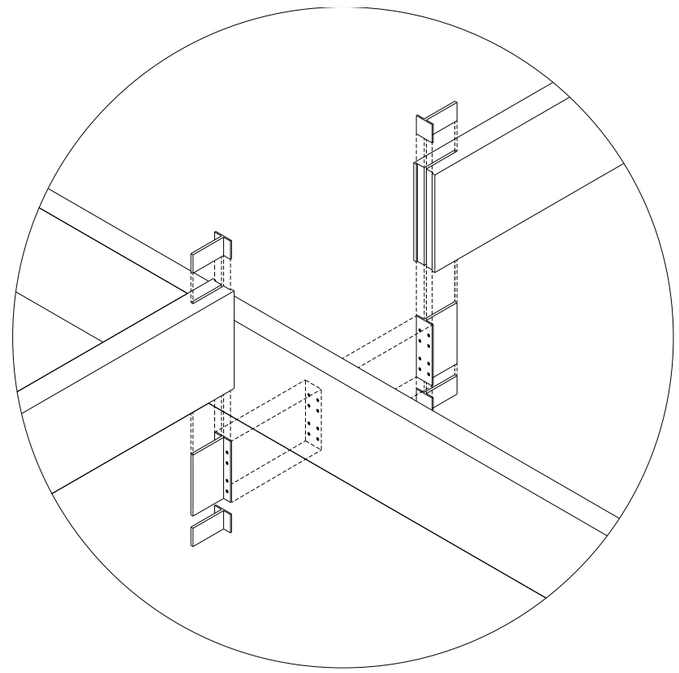
New enclosed atrium

ATRIUM INFILL: STRUCTURE AND JOINTS

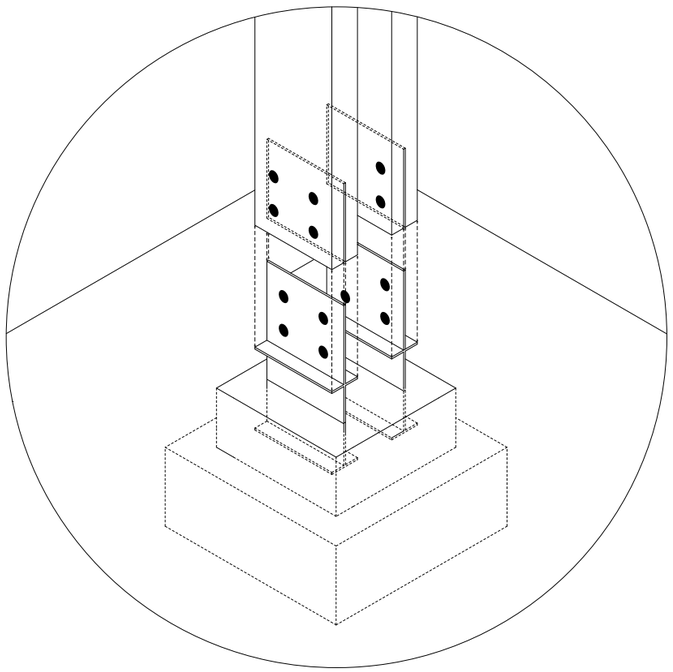




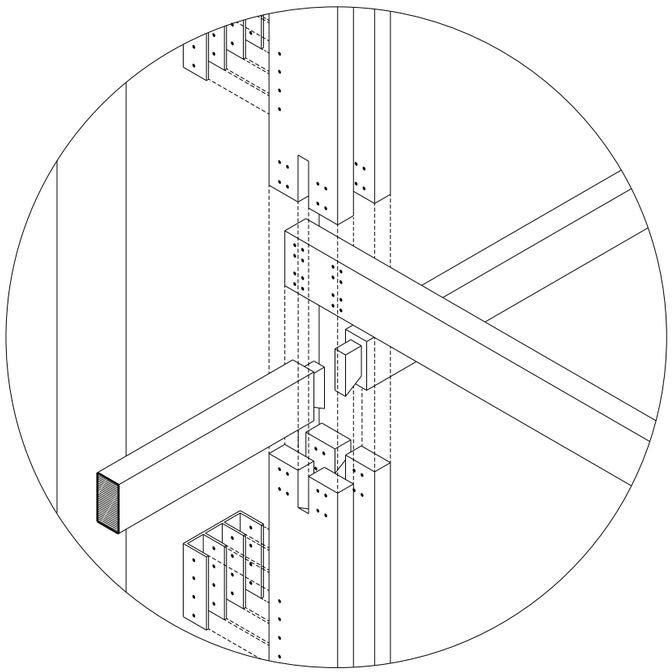
Roof to new facade module



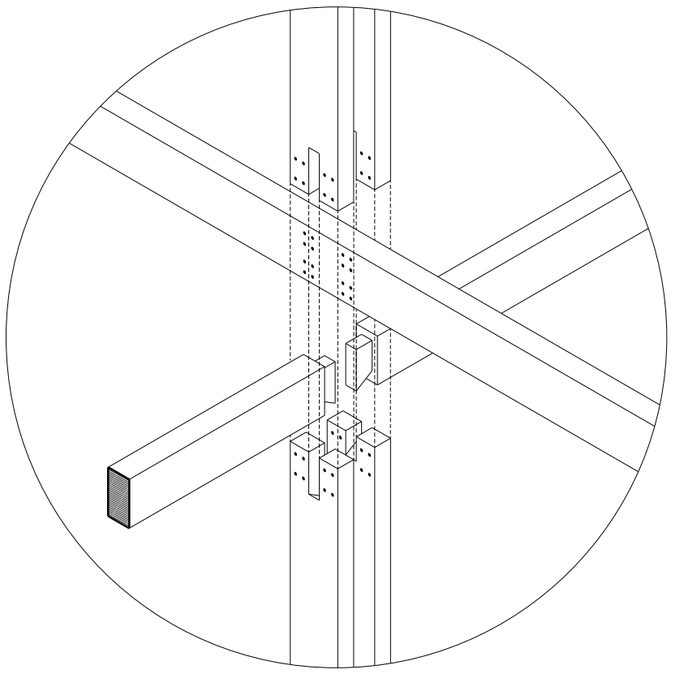
Secondary and primary roof beam connection by steel plates



Foundation to wood post connection by steel plates

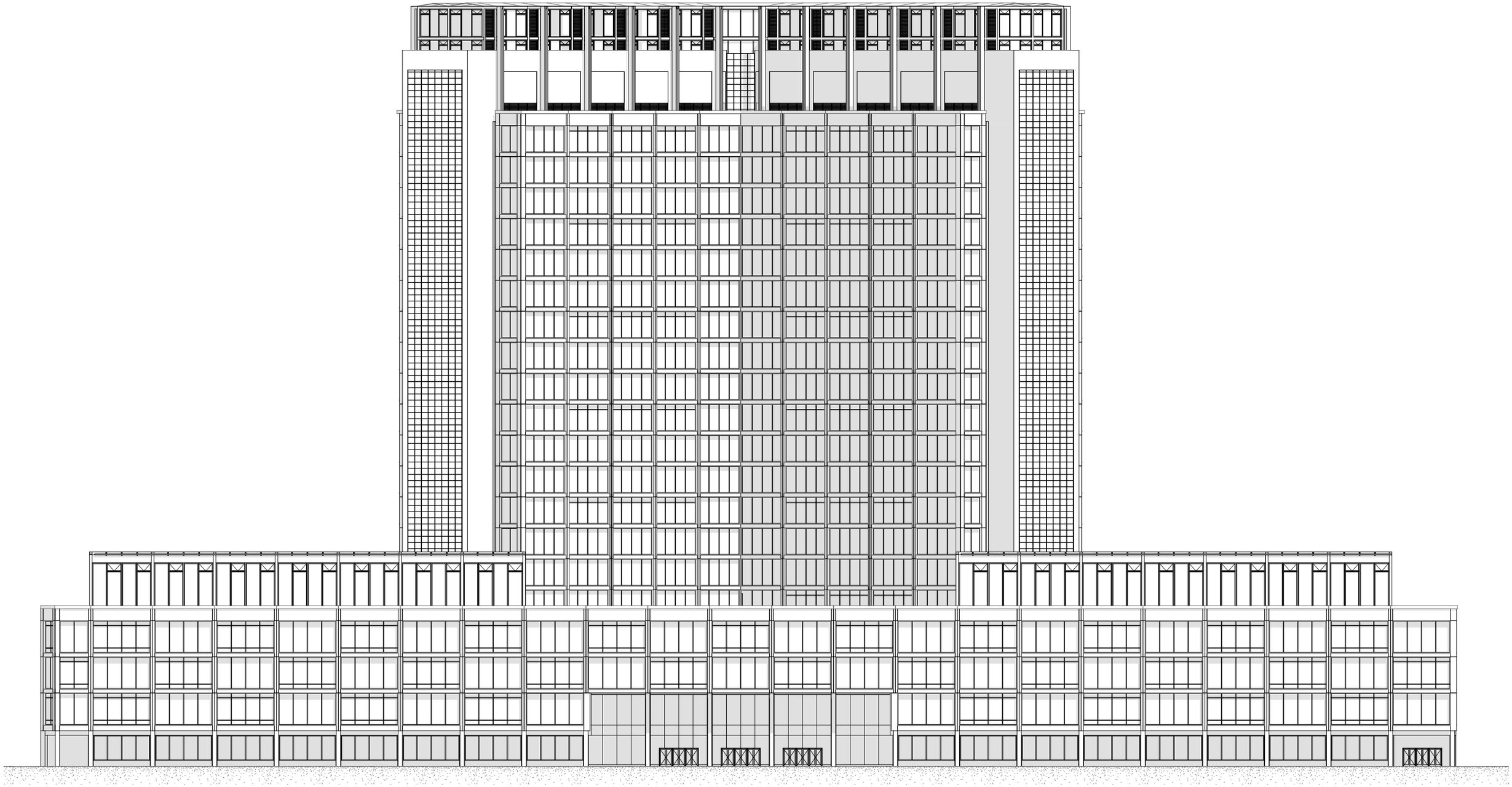


Steel saddles to attach the columns to existing structure

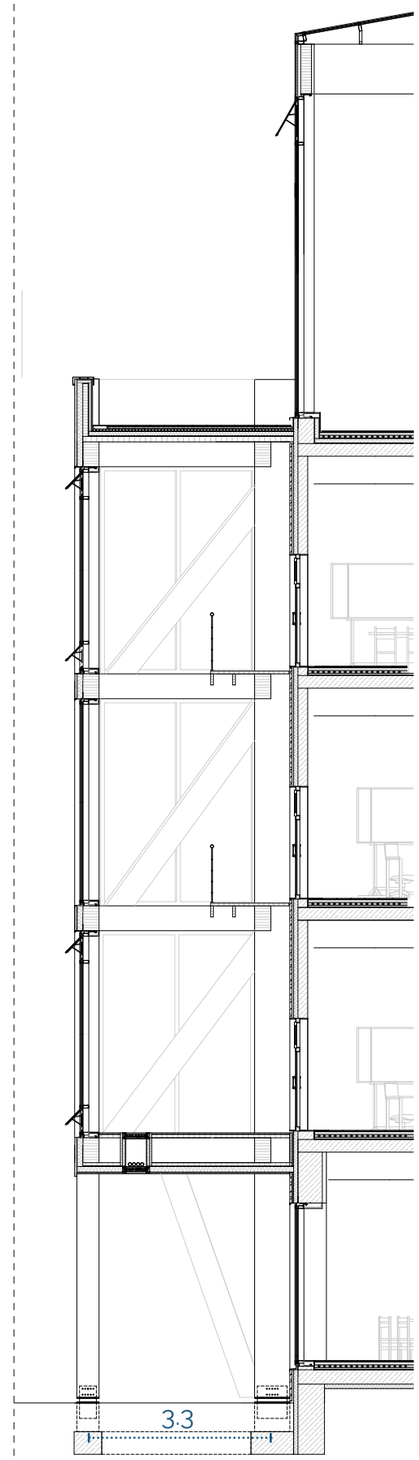


Posts, primary beams: connected with steel bolts
Secondary beams: wood to wood connection (cnc)

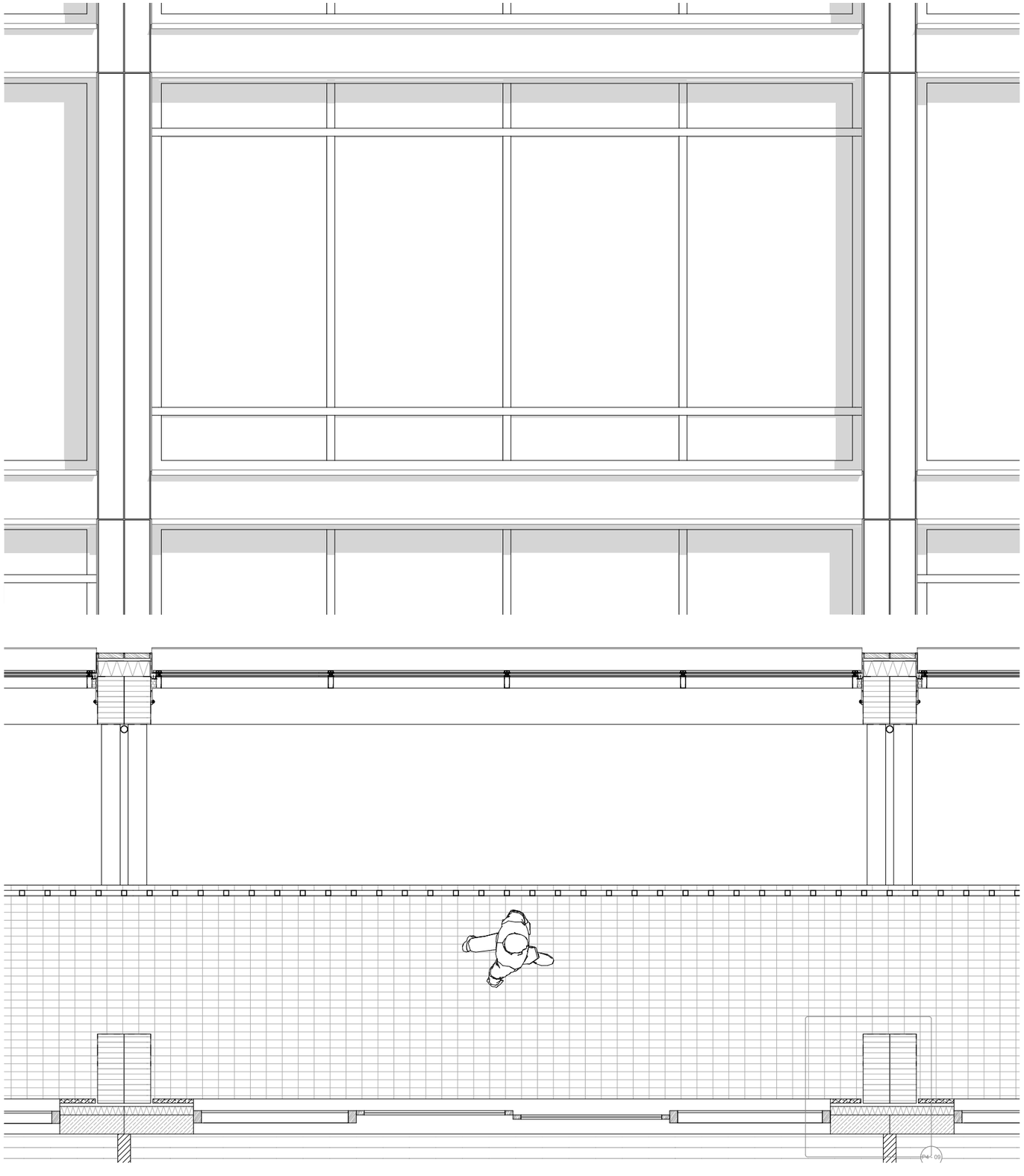
WESTERN FACADE 1:200

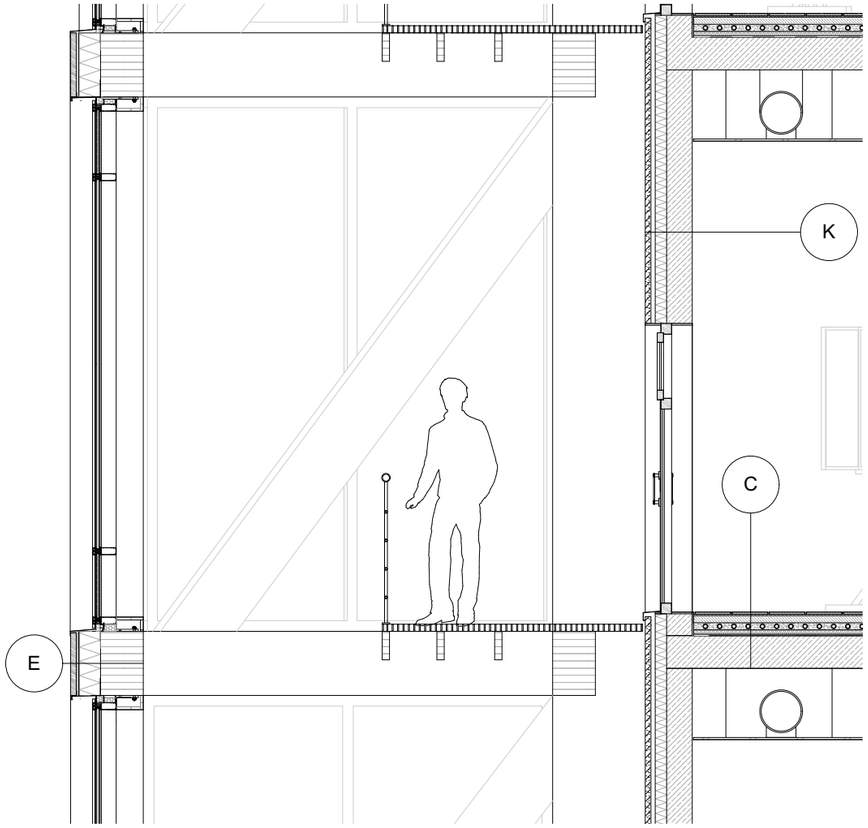


MODULAR FACADE: RYTHM PLINTH 1:50

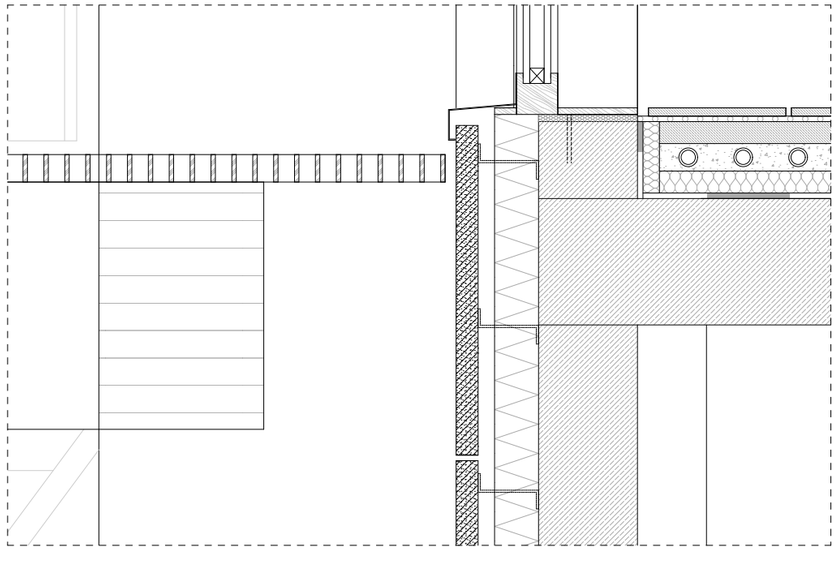


MODULAR FACADE: PLINTH REPETITIVE ELEMENT 1:20

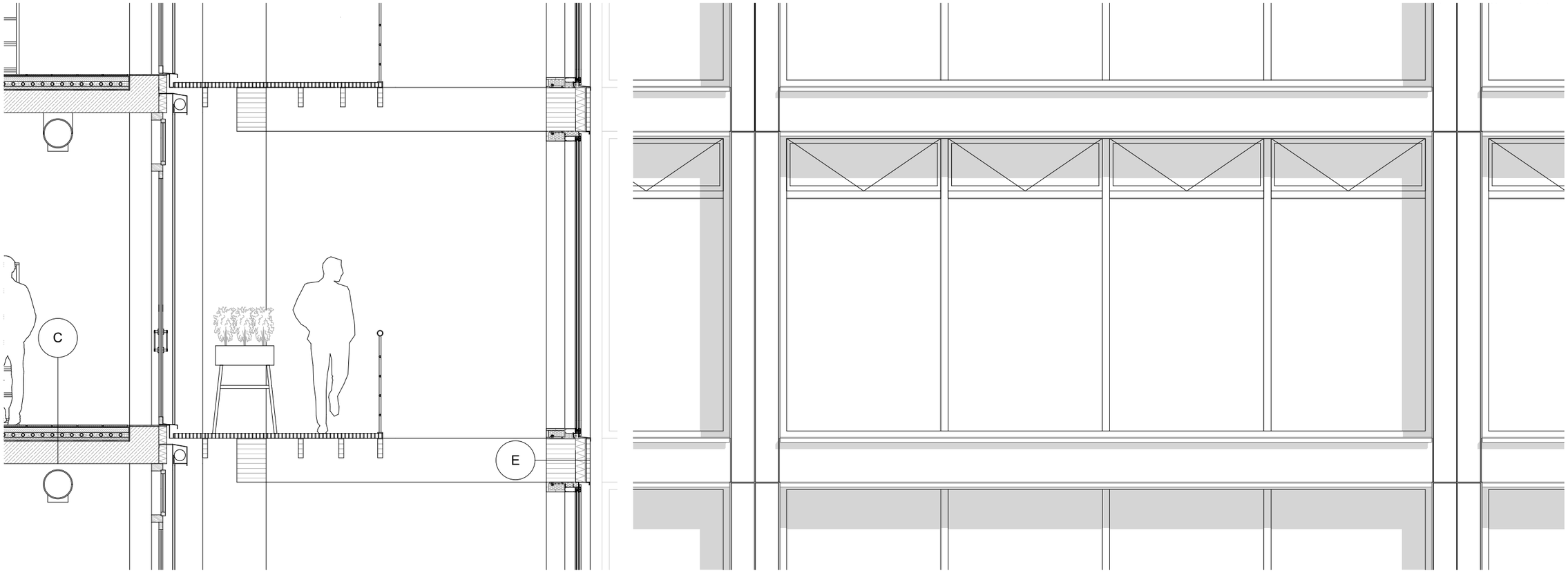




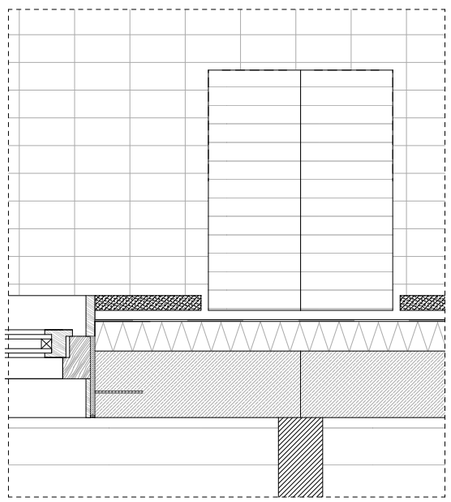
Module to building plinth detail 1:5

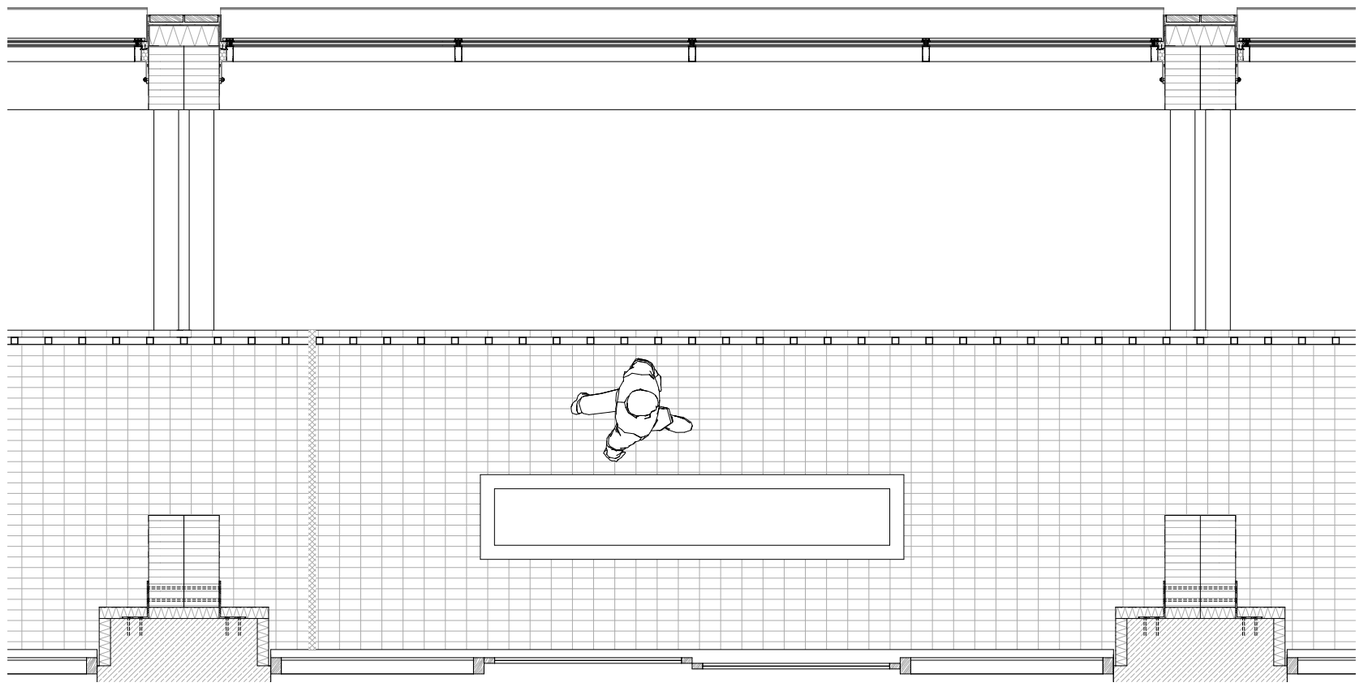


MODULAR FACADE: TOWER REPETITIVE ELEMENT 1:20

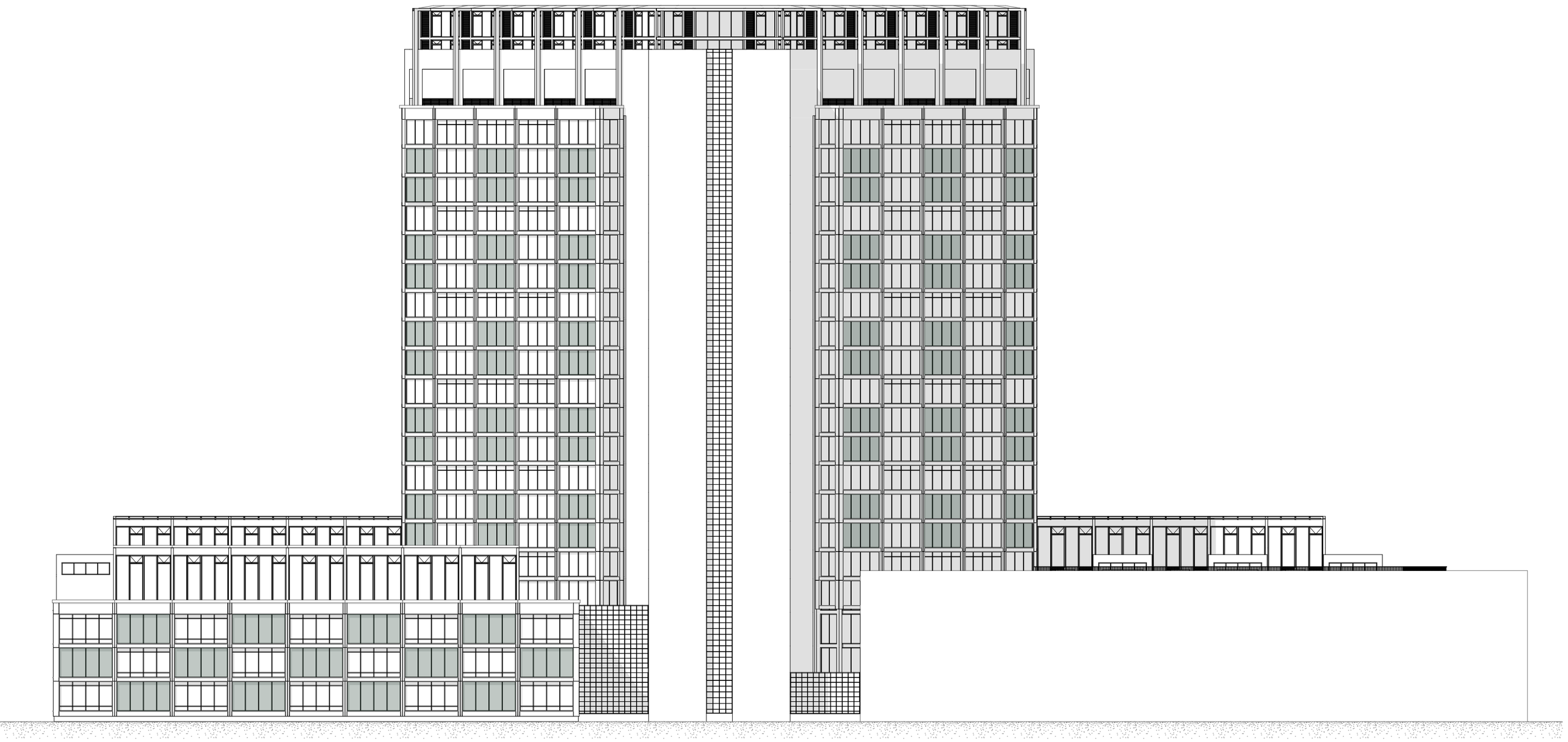


Module to building plinth, detail 1:5





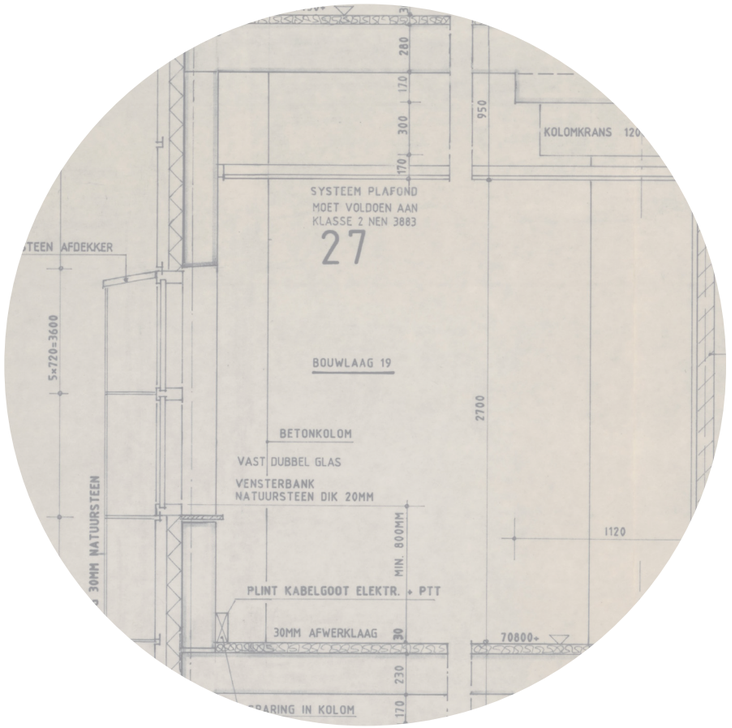
EASTERN FACADE 1:200



DE KNIP: OPPORUNITIES AND GOAL

Neighbourhood location 1:5000

Neighbourhood location 1:5000



Neighbourhood location 1:5000

DIAGRAM :

obsolete building -> opportunity

CREATING THE NETWORK OF FARMS, FEEDING POPULATION, EDUCATIONG, PROVIDING NEW PUBLIC SPACE AND