

HEMBRUG

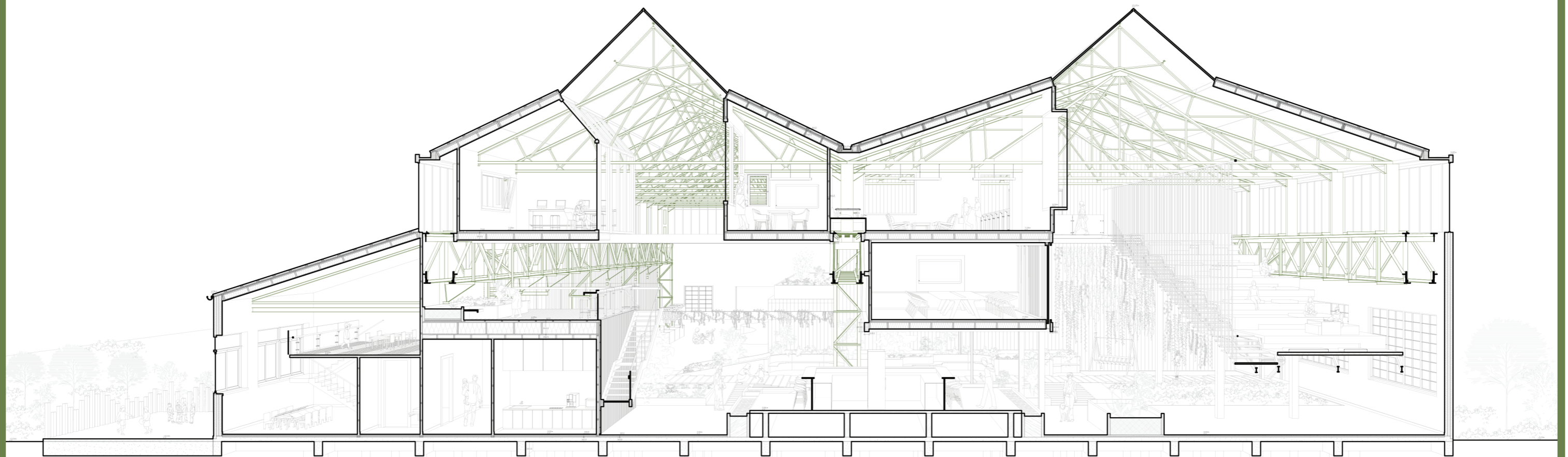
InBetween Context | A lobby for Hembrug

SUSTAINABLE REPURPOSE OF INDUSTRIAL HERITAGE BUILDINGS

Final Presentation
Jiahui Yan, 5045479
June, 28th, 2022

AR3AE100 Architectural Engineering Graduation Studio (2021-2022)
Second life
Faculty of Architecture and the Built Environment, TU Delft

Mentors:
Roel van de Pas
Ger Warries
Jos de Krieger



Content

- RESEARCH FOCUS -

Background/Methodology/Research Findings/Site Research

- DESIGN PROPOSAL -

Design Research/Design Principle/Materplan Design/Program Design/Floorplan Design

- RENOVATION STRATEGY -

Structure Resue/ Facade Restore, Renovate and Redesign/Circular Material/Atrium/Climate Design

- CONCLUSION & REFLECTION -

Research To Design

CHAPTER 01

- RESEARCH FOCUS -

Background/Methodology/Research Findings/Site Research

BACKGROUND



What is the future for the industrial heritage ?



RESEARCH QUESTION

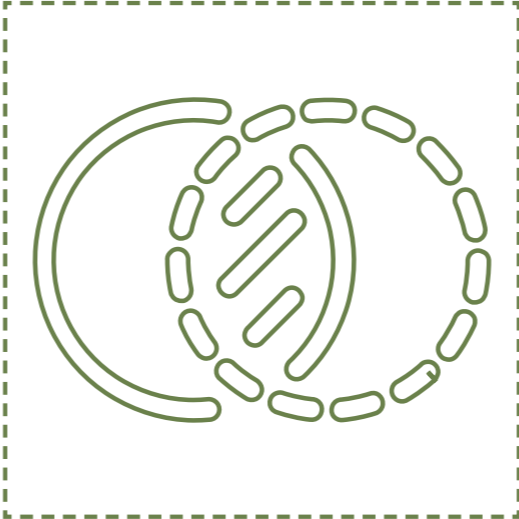
How to choose a suitable strategy for renovating an industrial heritage building?

1. What potential reconstruction strategies can be used during the renovation process?
2. What are the possibilities of the spatial order between new intervention and existing building?
3. How to achieve the balance between renovation and preservation?

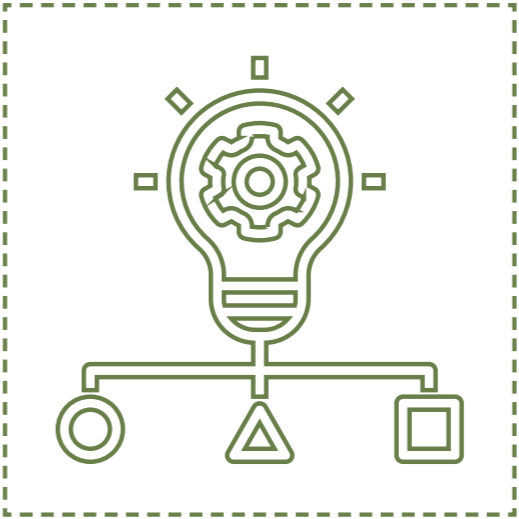
METHODOLOGY



Case Study Research



Comparative Analysis



Descriptive Research



METHODOLOGY
Case study research



Alsdorf Culture and Education Centre
Alsdorf, Germany
Power Station of Anna coal mine
Refectory, Auditorium, Youth Art School



The Forge Offices and Exhibition Space
London, UK
Millwall Ironworks
A new headquarters and exhibition space for Craft central



Valby Machinery Halls
Copenhagen, Denmark
a former industrial hall
Apartments, Office, Event space



Smederij NDSM
Amsterdam, Netherlands
a main forge-shipbuilding industry
Office, Hotel, Restaurant



CaixaForum Madrid
Madrid, Spain
the Central Eléctrica Power Station
Gallery, Auditorium, Restaurant, Offices, Event room, Workshop



Transformation House
Wirdum, Netherlands
Transformer house
Contemporary Hiker's Cabin



Social Housing Complex
Barcelona, Spain
Warehouse building
Social housing



Art Zaanstad
Zaandam, Netherlands
Weapon Factory Hall
Museum with its own large collection



Werkspoor Factory
Utrecht, Netherlands
Industrial warehouse
Business, Multifunctional space, Cafe, Office





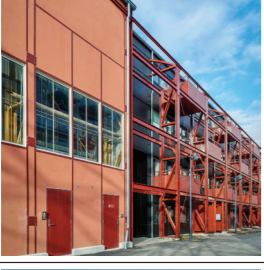



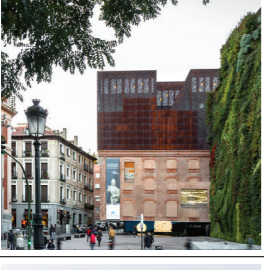
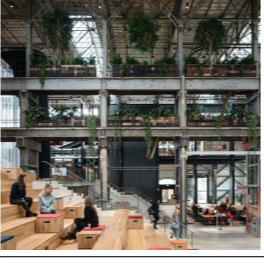



Gjuteriet
Malmö, Sweden
Shipbuilding factory
Workplace, Restaurant, Cafe



LocHal Library
Tilburg, Netherlands
Rail depot
Library, Labs, Cafe, Exhibition

METHODOLOGY
Comparative Analysis

	FACADE	STRUCTURE	MATERIAL	INSULATION		FACADE	STRUCTURE	MATERIAL	INSULATION
	Restore and Renovate	Restore	Emphasize the contrast	Self-contained and generate climate buffer		Restore and Renovate	Reuse	Introduce new materials	Create climate buffer
	Restore and Renovate	Restore	Emphasize the contrast	Self-contained and generate climate buffer		Restore and Renovate	Restore	Reuse	
	Redesign and echo the original expression	Add new system	Echo previous material	Create climate buffer Totally new		Redesign (functional leading and retain characteristics)	Add new system	Introduce new materials	
	Restore and Renovate Redesign and echo the original expression	Restore	Emphasize the contrast Echo previous function	Totally new		Redesign (retain characteristics)	Reuse	Recycle	Detail design of facade
	Restore	Demolish	Echo previous function Emphasize the contrast	Totally new		Restore and Renovate	Restore	Introduce new materials	Introduce new system
	Redesign (functional leading)		Emphasize the contrast	Detail design of facade					

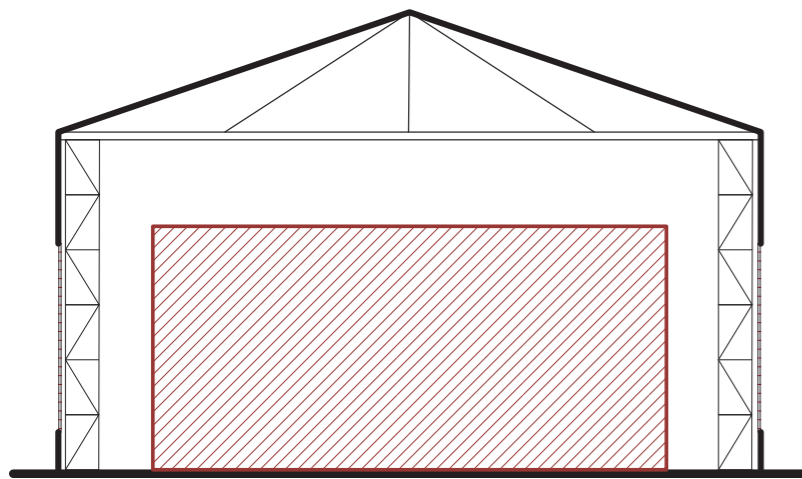
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INBETWEEN CONTEXT | A LOBBY FOR HEMBRUG

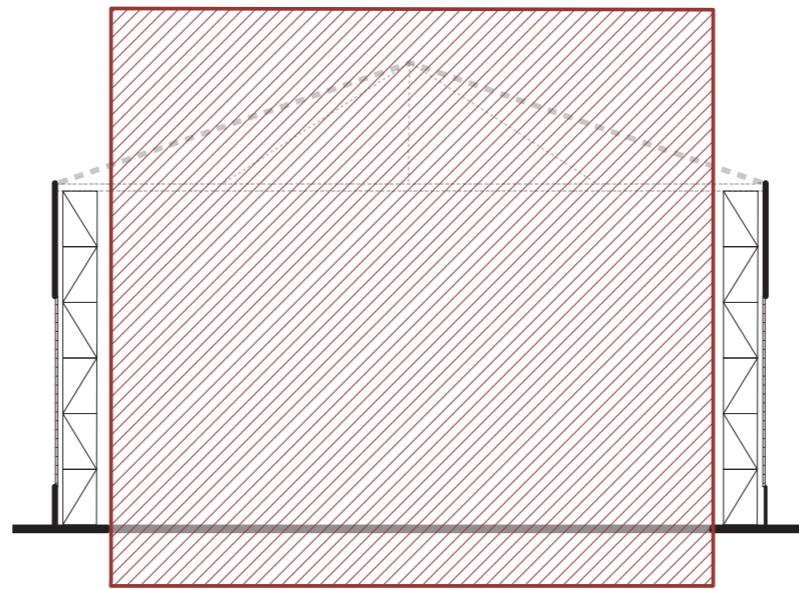


METHODOLOGY
Descriptive research

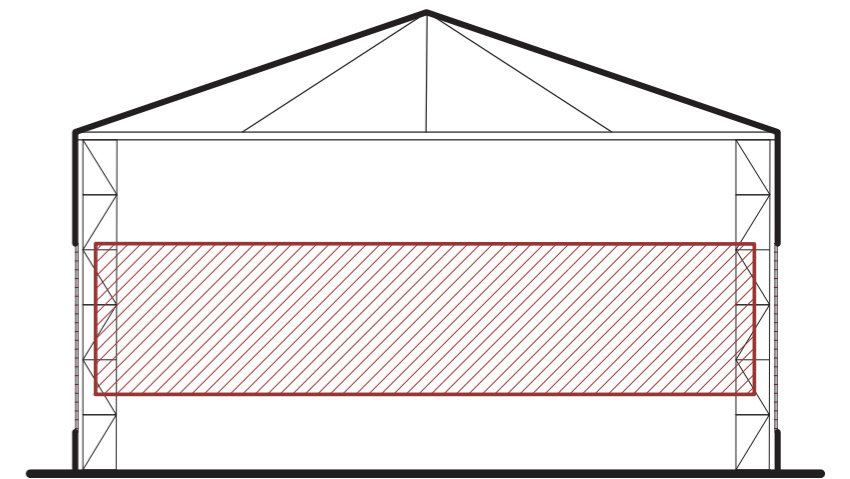
Building-within-a-building



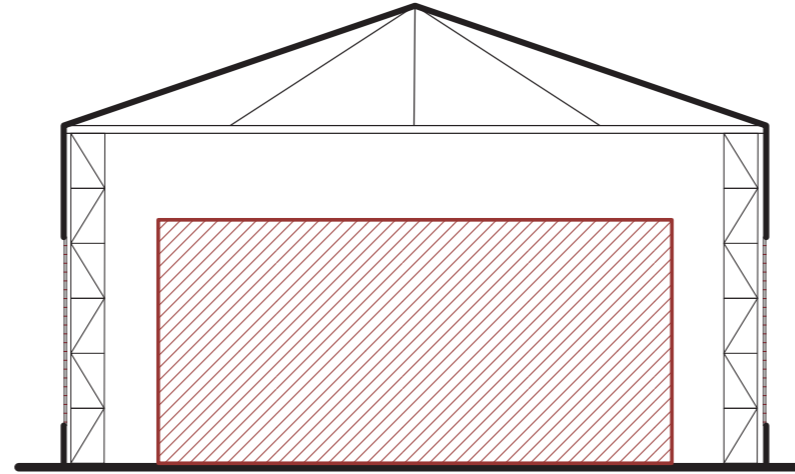
Building-beyond-a-building



Building-on-a-building



BUILDING-WITHIN-A-BUILDING



The new component is fully isolated from the original building's structure and facade, and it appears inside the original building in a self-contained state.

- **Facade** -

Restore and Renovate

- **Structure** -

Restore

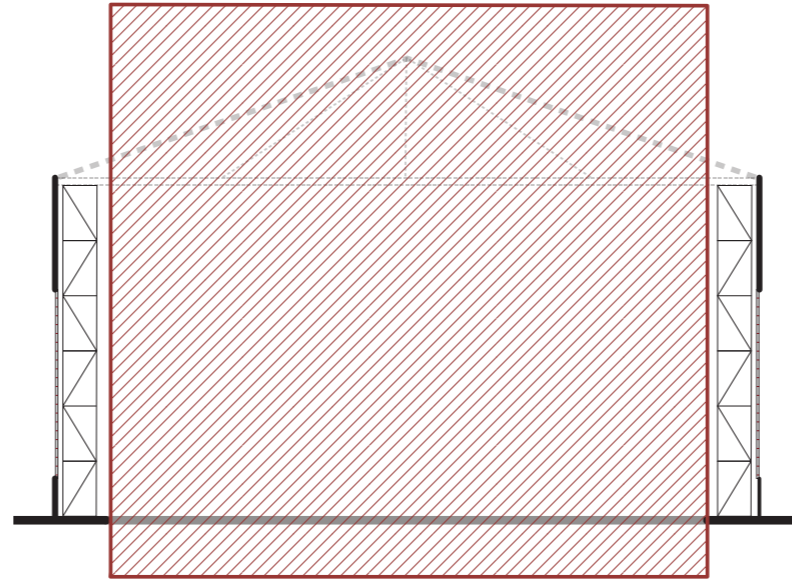
- **Material** -

Emphasize the contrast

- **Insulation (climate)** -

Self-contained and generate climate buffer

BUILDING-BEYOND-A-BUILDING



Architectural elements of the heritage building are split up into different fragments in the renovation process, where only some of these elements are remained and melt into the new design of the project.

- Facade -

Restore / Redesign and echo the original expression

- Structure -

Demolish

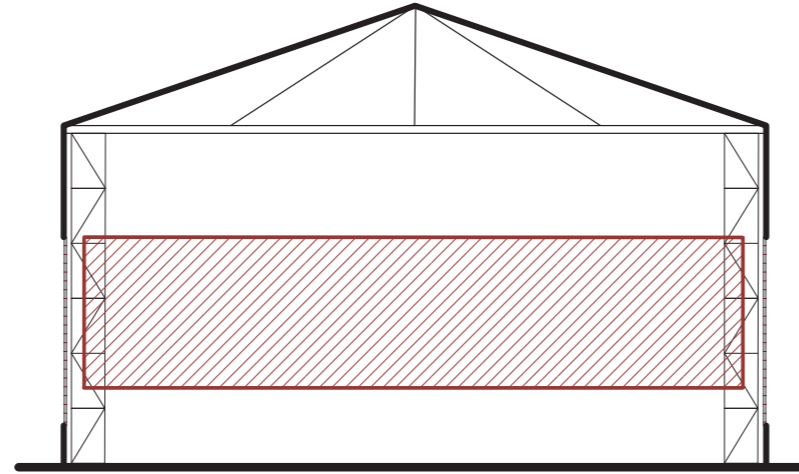
- Material -

Emphasize the contrast / Echo previous function or material

- Insulation (climate) -

Totally new

BUILDING-ON-A-BUILDING



The new construction has a tectonic connection with at least one part of the original building, the elements of the original building will be reused, redesigned or restored during the renovation process, and the proportion, scale will be remained.

- Facade -

Restore and Renovate / Redesign (functional leading and retain characteristics)

- Structure -

Reuse / Restore / Add new system

- Material -

Reuse / Recycle / Introduce new materials

- Insulation (climate) -

Create climate buffer / Introduce new system / Detail design of facade

THE HEMBRUG SITE

HEMBRUG



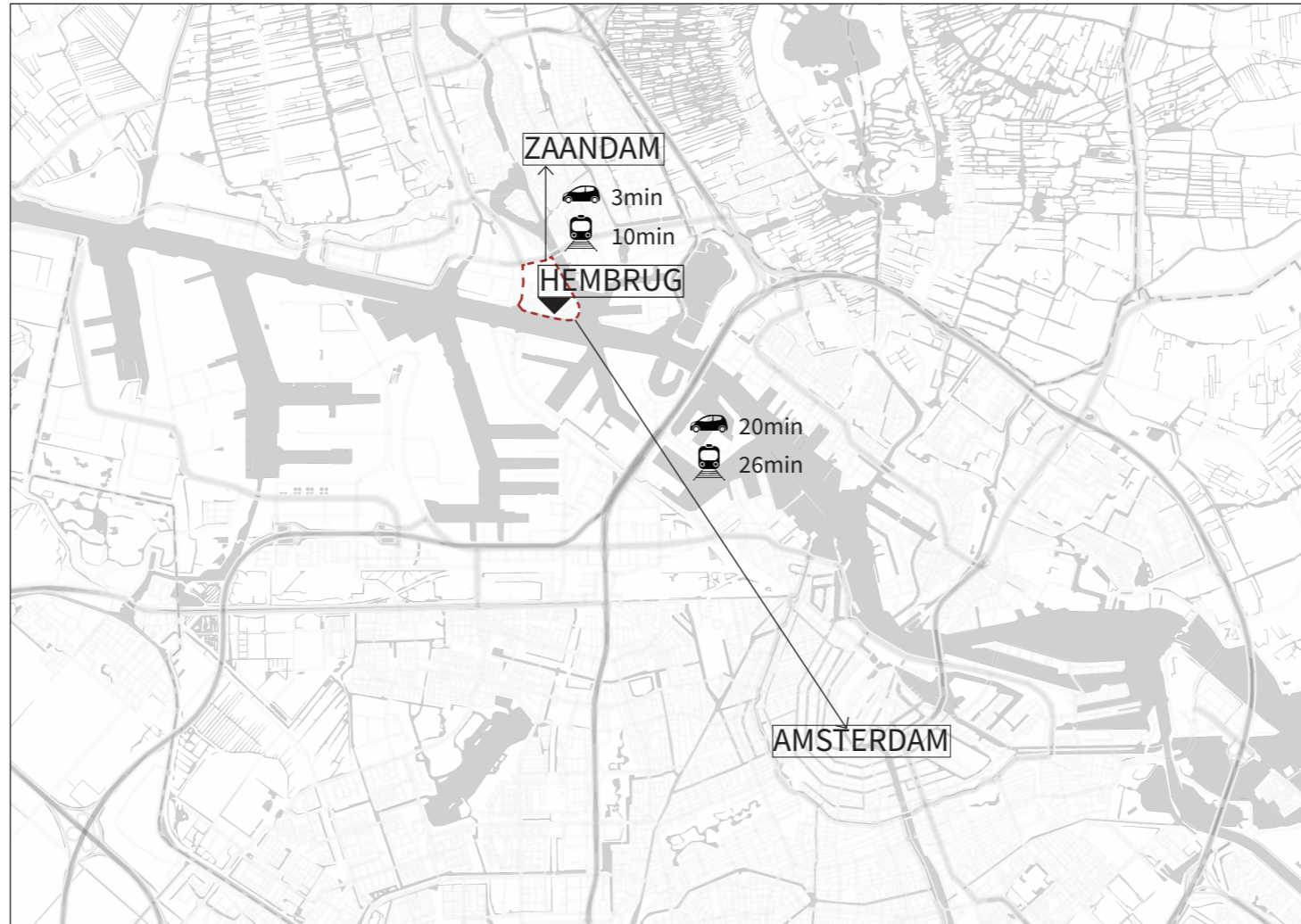
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INBETWEEN CONTEXT | A LOBBY FOR HEMBRUG

SITE RESEARCH

Urban Context

Where is Hembrug Site?



SITE RESEARCH

Urban Context

How is Hembrug Site?



SITE RESEARCH

Before



<https://artillerieinrichtingenhembrug.wordpress.com/>



<https://lutgerink.com/?p=1173#foobox-1/5/31-08-2014-007.jpg>

Present



<https://magazines.rijksvastgoedbedrijf.nl/kei/2016/02/uitgelicht-hembrug>



<https://www.flickr.com/photos/44666563@N04/5931756314/in/album-72157627056514317/>

SITE RESEARCH



Plant Trees to camouflage the area



Division AI to reorganize



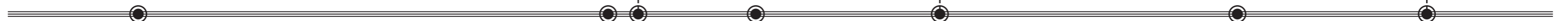
35 National Monument
22 Municipal Monument



+ 60% Forest Area

Start opening again

2014



1895

Start Point

During the World War II

1939

Mobilization

1950

Western part

1973

2003

Abandoned Site



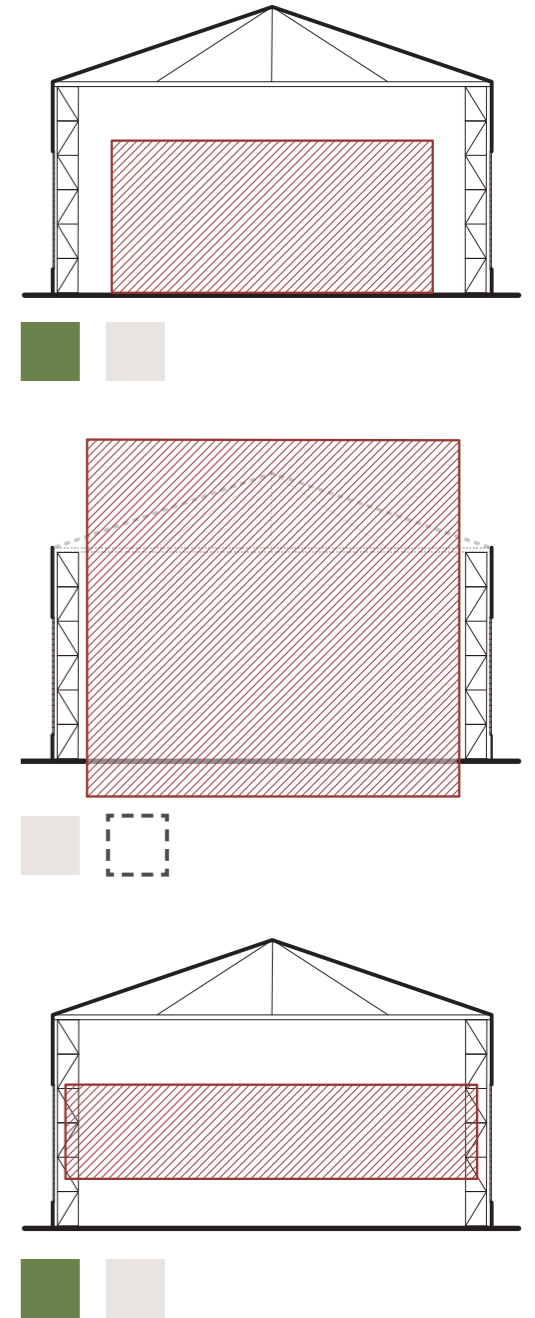
Shelters built for fear of bombing



RESEARCH APPLICATION

Top-down application to Hembrug Site

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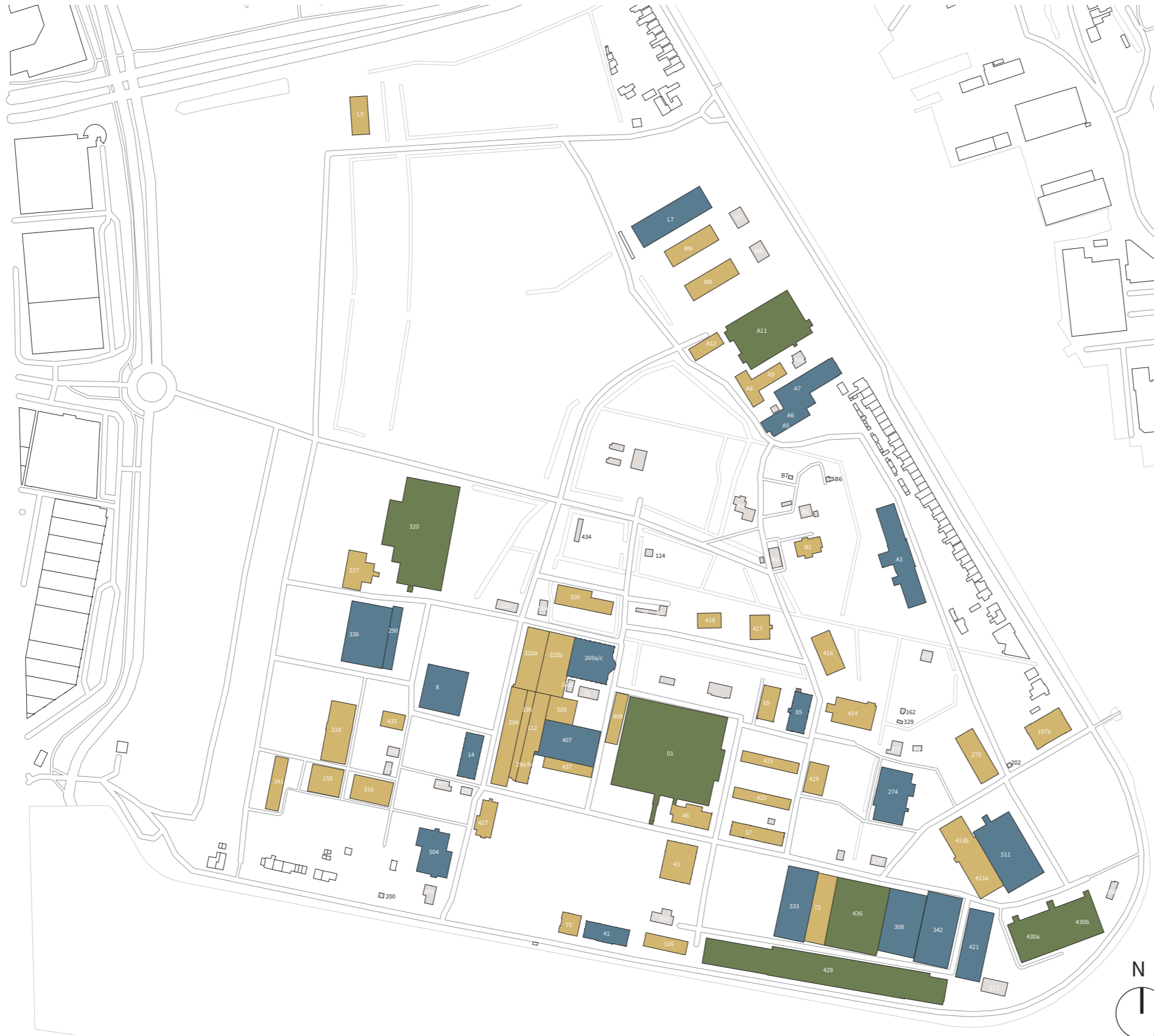









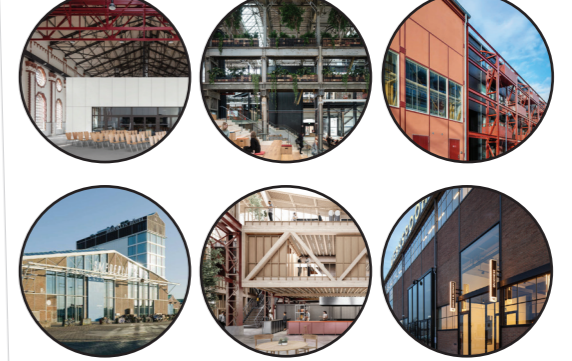
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RESEARCH APPLICATION

Bottom-up application to Hembrug Site

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-  Small $<200m^2$
- 
-  Medium 200-1000m²
- 
-  Large 1000-2000m²
- 
-  Xlarge $>2000m^2$
- 

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RESEARCH APPLICATION

Bottom-up application to Hembrug Site



Art & Culture



Living / Hotel



Working



Facilities / Events



Resource: Hembrug Masterplan (2021)

CHAPTER 02

- DESIGN PROPOSAL -

Design Research/Design Principle/Materplan Design/Program Design/Floorplan Design

DESIGN RESEARCH

National Monument Position

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Building 320_Machine Hall_1936

National Monuments

Height: 13m

Floor Plan: Around 3580m²

Roof Material : wood and mental

Primary Construction: loadbearing facade

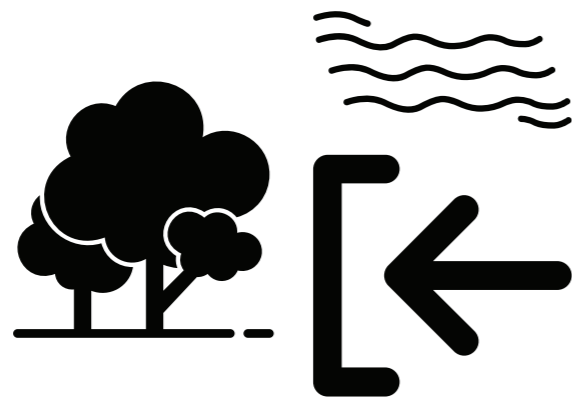
Secondary Construction: steel columns

Facade Material: Brick & Wood

Previous Functions: storage facility, factory

VALUE ASSESSMENT

surroundings



- waterways and trees next to the building
 - near the entrance to the site
 - connect to the main road

structure



- crane tracks
 - assembly of the trusses
- extruded crane as visual landmark

facade



- national monument
 - roof skylights
- windows with steel frame



Design Principle 01
As a national monument, keep the original building recognizable

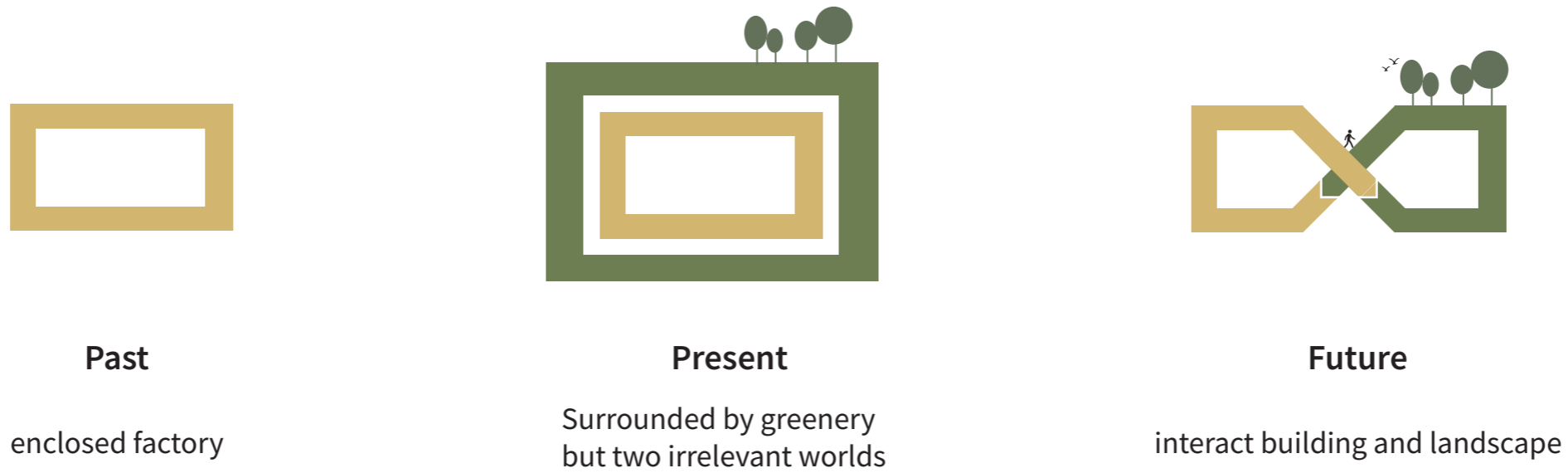
DESIGN PRINCIPLE

02. Spatial Quality



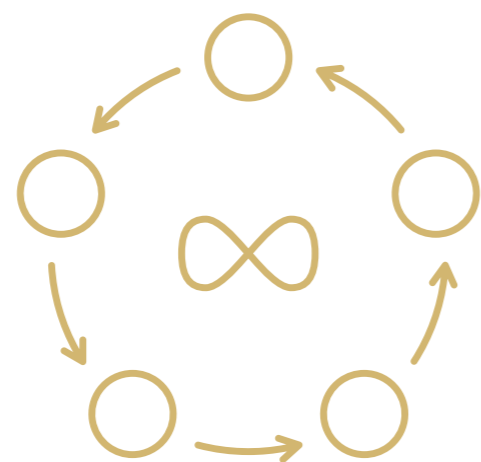
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DESIGN PRINCIPLE

03. Sustainability



Social sustainability

program diversity
social cohesion
promote well-being lifestyle



Environmental sustainability

reuse of the original building
circular material
green atrium
climate design

CURRENT SITUATION



MASTERPLAN DESIGN



FUTURE PLAN FOR THE HEMBRUG SITE

A place for everyone



Hembrug site: From a closed former military industrial site to an accessible and attractive **mixed area** for living, culture, nature and business

Target Groups



Public

Semi-public

Private

CAFE

INDOOR ACTIVITY

WORKING SPACE

RESTAURANT

MEETING SPACE

GYM

RETAIL

PLATFORM

CHILDCARE


PUBLIC STAIR

PROGRAM DESIGN

RESTAURANT
 Independent Relax
 Lounge Kitchen



CHILDCARE
 Daycare
 Residents' children
 Learning space
 Resting Space
 Exterior playground



PLATFORM
 Green Pocket
 Relaxation



GYM
 Private for community
 Gymnasium Service Room
 Sports Court Equipment

WORKING SPACE
 24/7 ACCESS
 Shared, semi-private, private
 Hot desking Group work
 Breakout area Individual work
 Positive environment Comfort
 Informal working



INTERNAL ATRIUM GARDEN
 Social gathering
 Green Space
 continuous connection
 relaxation



CAFE
 Heart
 Relax



RETAIL
 Open Market
 Flexibility
 Grocery Gift Shop



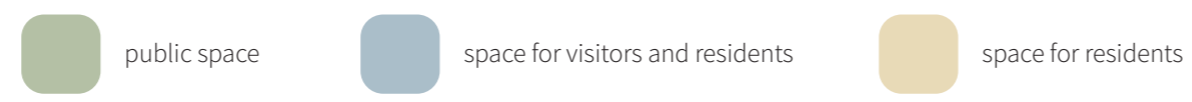
PLATFORM
 Relaxation
 Green Pocket

INDOOR ACTIVITY
 Social melting pot
 Multipurpose
 Sports court
 Healthy atmosphere
 Studio
 Rehearsal
 Flexible



PLATFORM
 Green Pocket
 Relaxation

MEETING SPACE
 occupation by reservation
 Shared
 semi-private
 private
 Restroom
 Pantry room
 Lounge
 Digital
 Infrastructure

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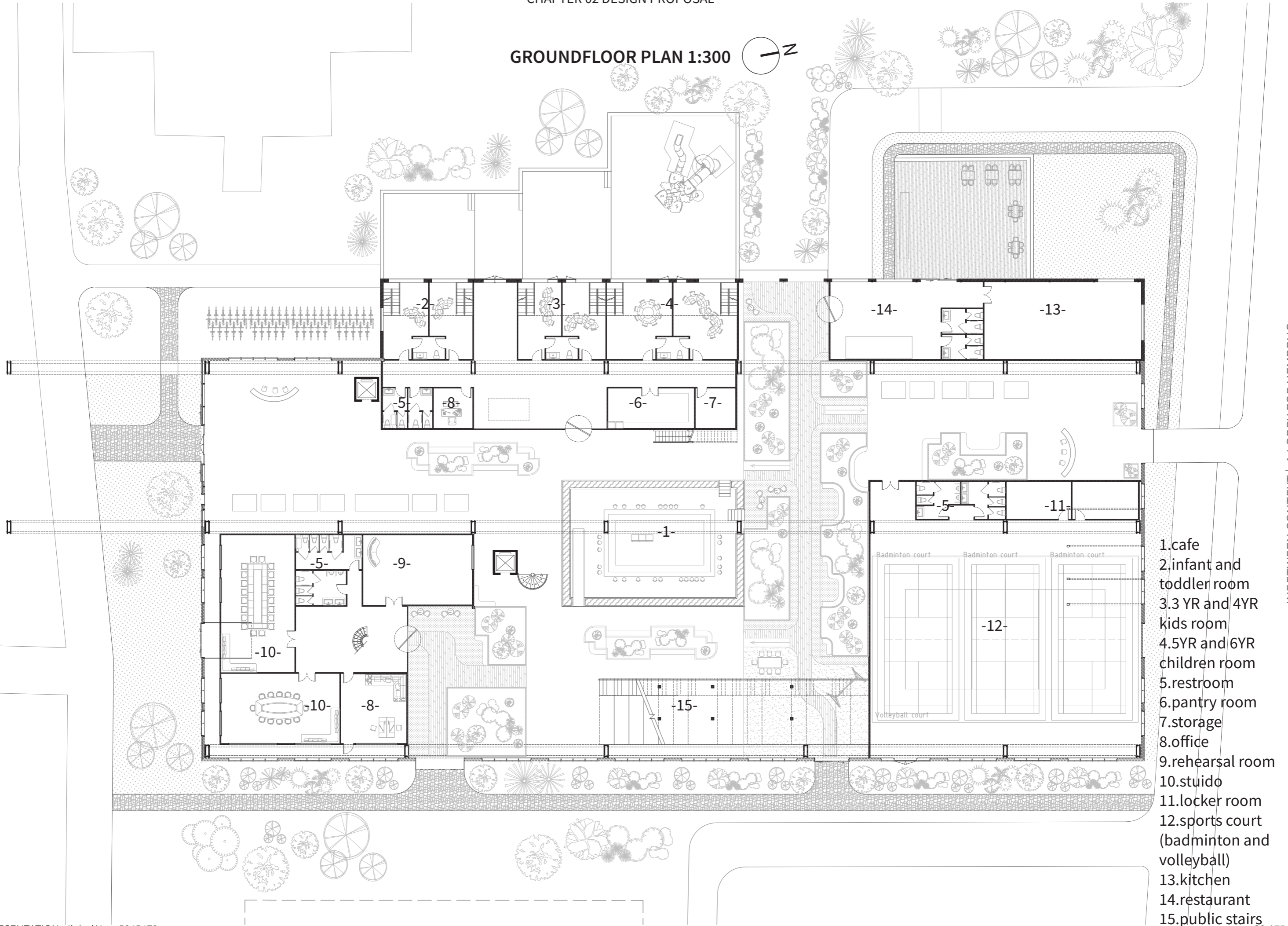
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GROUND FLOOR PLAN 1:300



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IN BETWEEN CONTEXT | A LOBBY FOR HEMBRUG

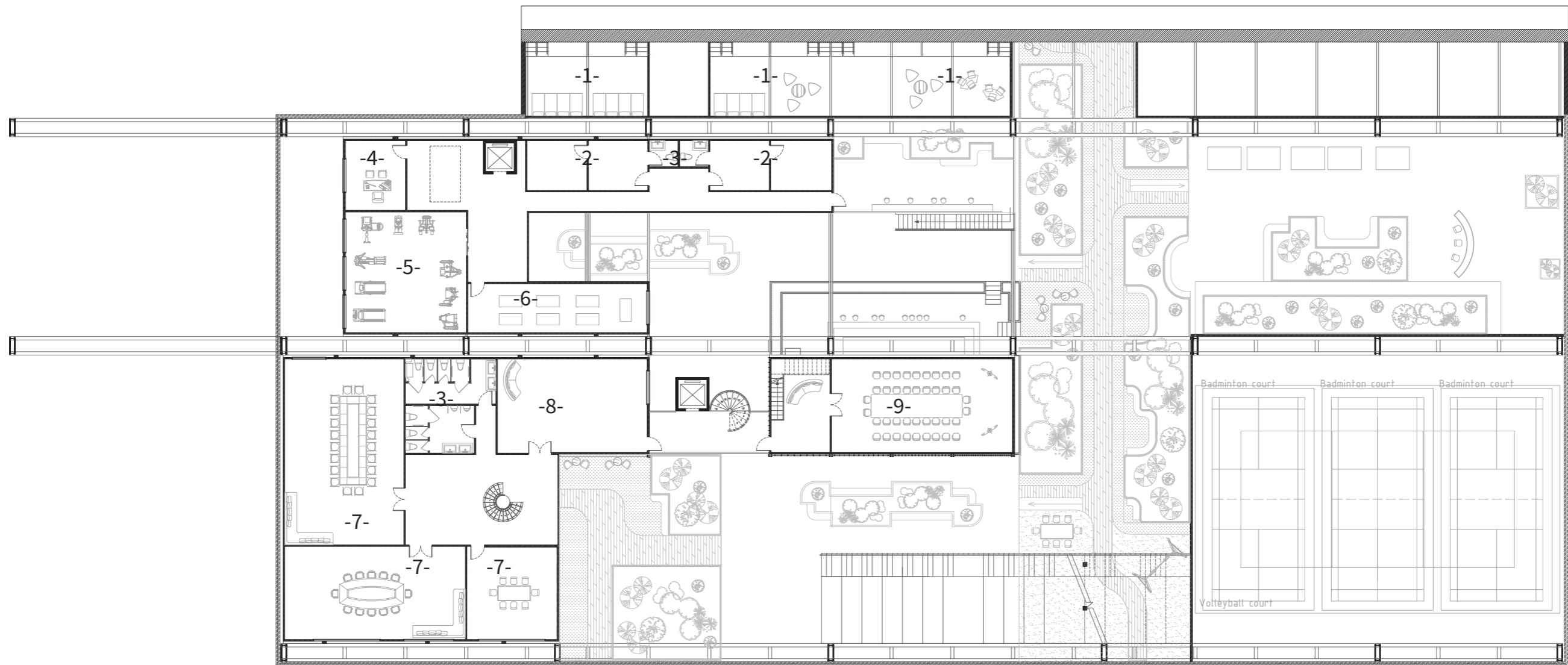


- 1.cafe
- 2.infant and toddler room
- 3.3 YR and 4YR kids room
- 4.5YR and 6YR children room
- 5.restroom
- 6.pantry room
- 7.storage
- 8.office
- 9.rehearsal room
- 10.stuido
- 11.locker room
- 12.sports court (badminton and volleyball)
- 13.kitchen
- 14.restaurant
- 15.public stairs

FIRST FLOOR PLAN 1:300

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INBETWEEN CONTEXT | A LOBBY FOR HEMBRUG

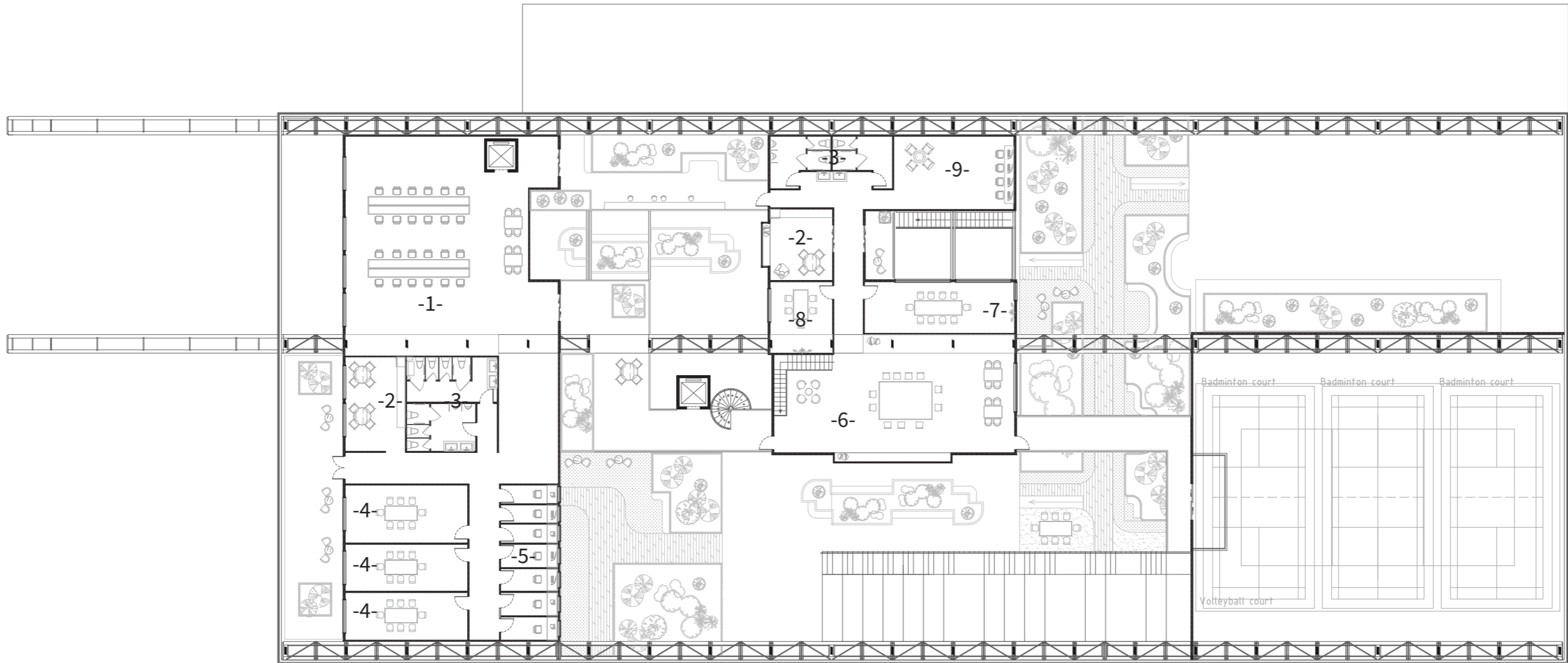


- 1.children activity platform
- 2.locker room
- 3.restroom
- 4.office
- 5.gymnasium
- 6.yoga
- 7.stuido
- 8.rehearsal room
- 9.large meeting room

SECOND FLOOR PLAN 1:300

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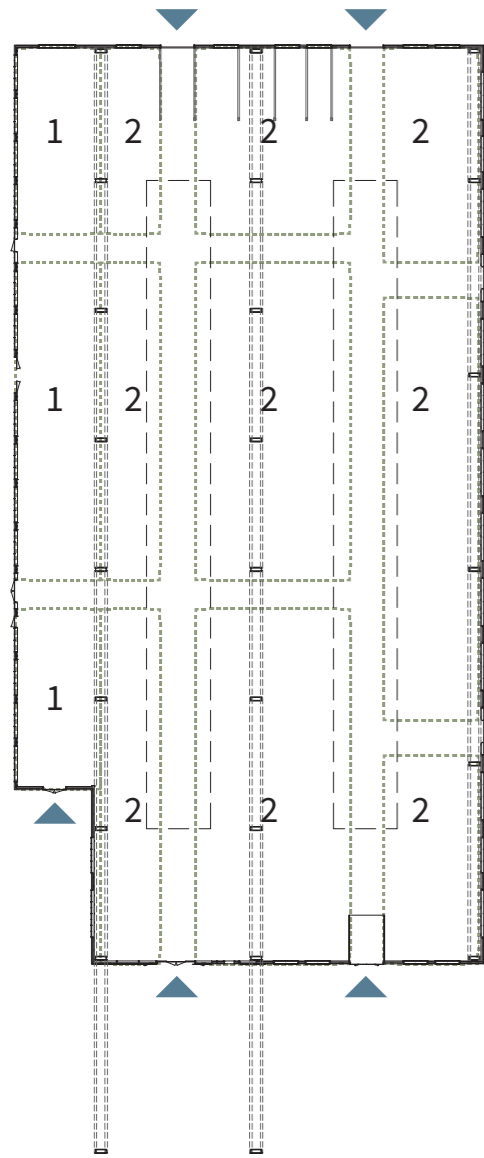
INBETWEEN CONTEXT | A LOBBY FOR HEMBRUG



- 1.group work and hot desking
- 2.pantry
- 3.restroom
- 4.breakout room
- 5.individual working room
- 6.shared space
- 7.medium meeting room
- 8.small meeting room
- 9.lounge

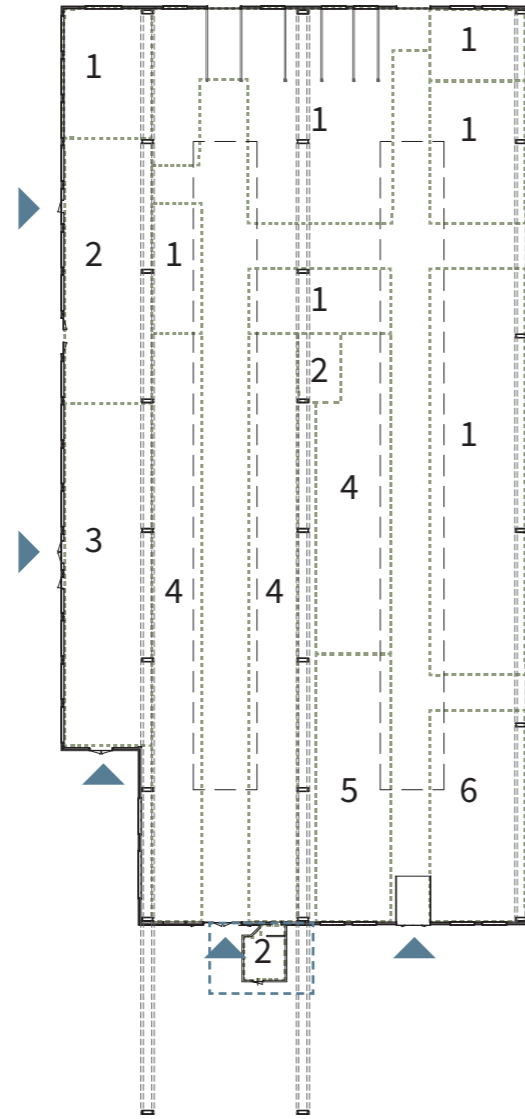
PREVIOUS LAYOUT

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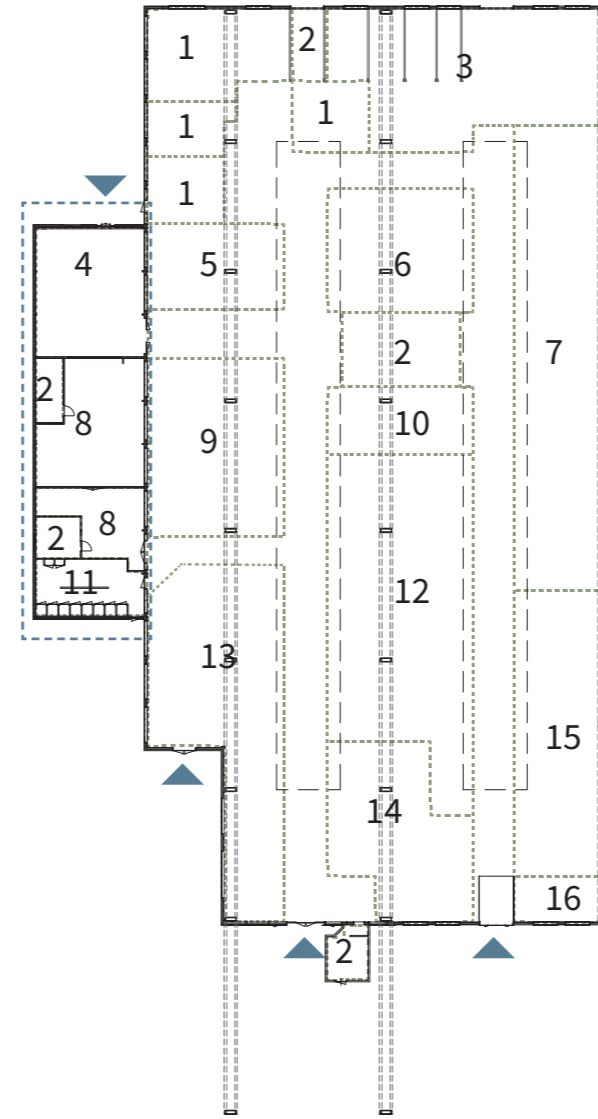
Origin

- 1. Office/ Storage (assumption)
- 2. Manufacturing (assumption)



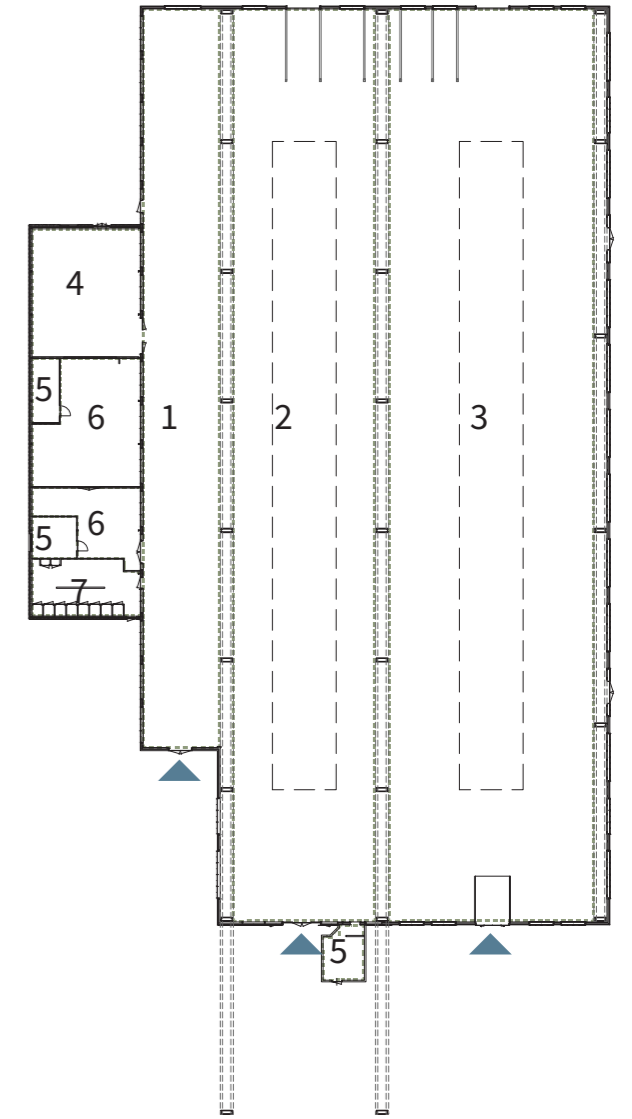
1954

- 1. Manufacturing (several machines)
- 2. Office (assumption)
- 3. Welding space
- 4. Storage (assumption)
- 5. Lathes
- 6. Drilling machines



1975

- 1. Manufacturing (assumption)
- 2. Office
- 3. Grinding machines
- 4. Circular grinding machines
- 5. Sharp grinding machines
- 6. Planing mill machines
- 7. Milling machines
- 8. Measuring space
- 9. Tool magazine and counter
- 10. Control post
- 11. Toilet and bathroom
- 12. Lathes
- 13. Heavy rod material and progression storage
- 14. Storage space
- 15. Drilling machines
- 16. Changing room



Present

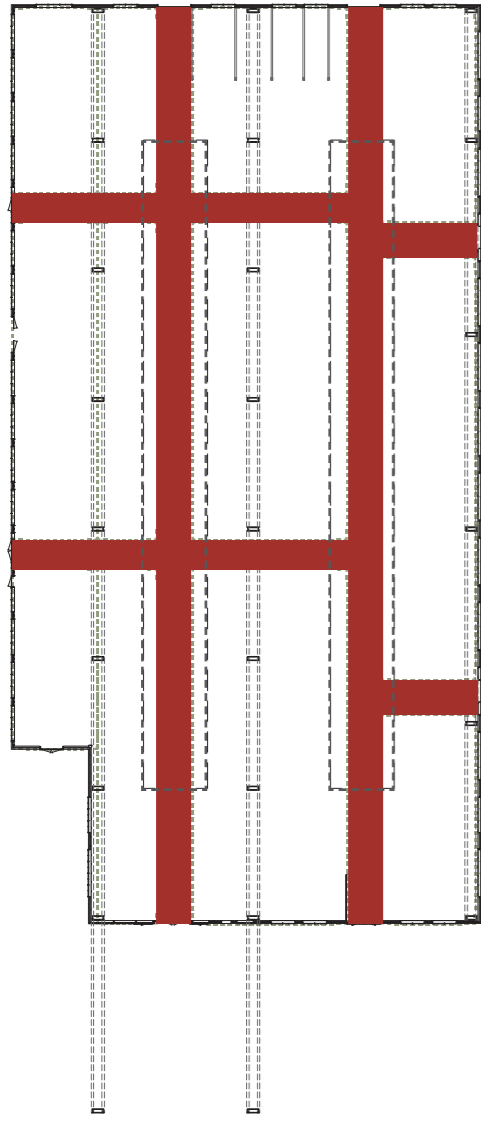
- 1. Former storage space
- 2. Narrow manufacturing hall
- 3. Wide manufacturing hall
- 4. Former grinding space
- 5. Former office space
- 6. Former measuring space
- 7. Toilet and bathroom

IN BETWEEN CONTEXT | A LOBBY FOR HEMBRUG

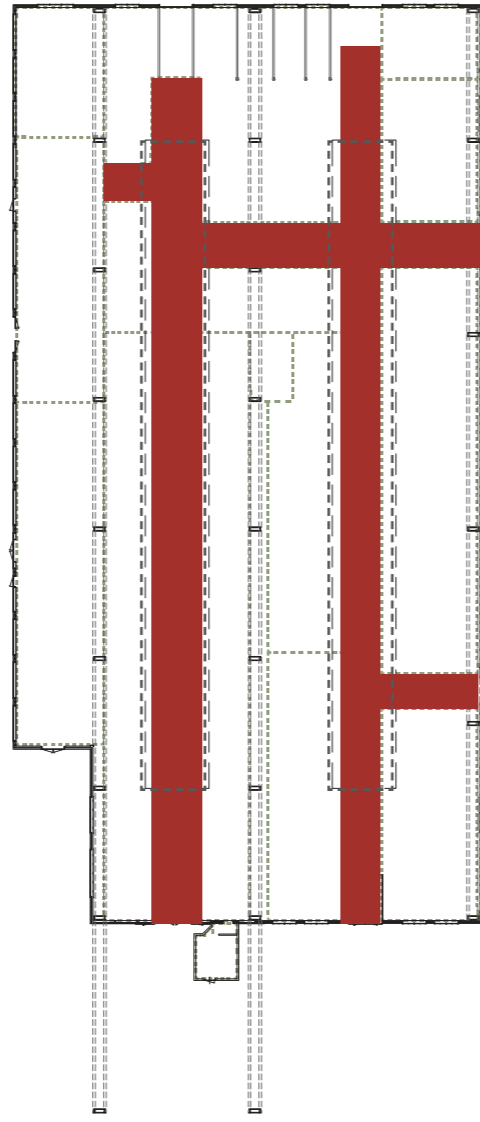
PREVIOUS LAYOUT

Circulation correspond to roof skylight

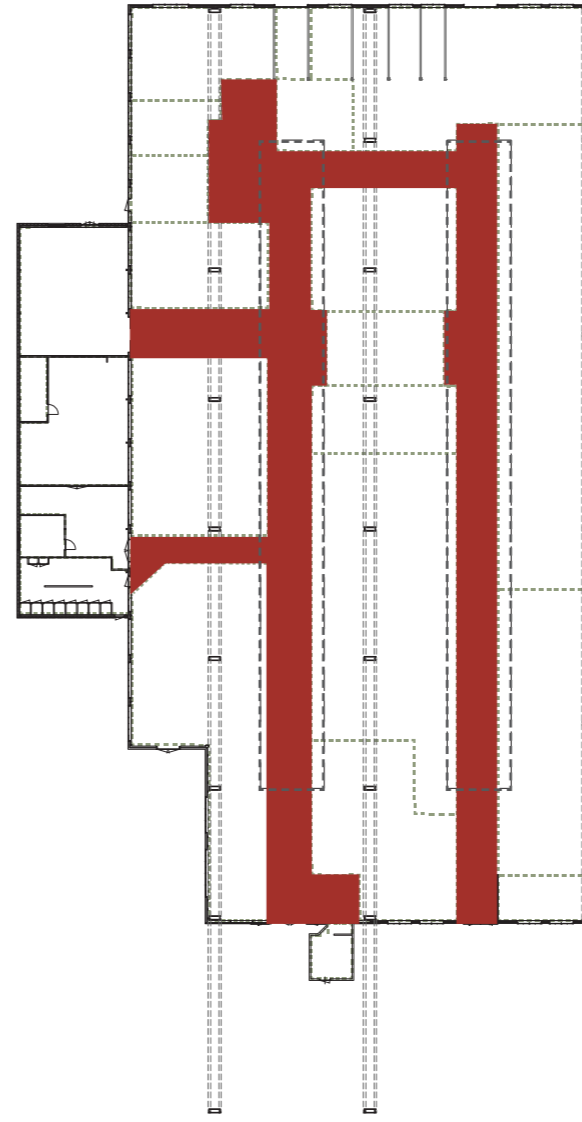
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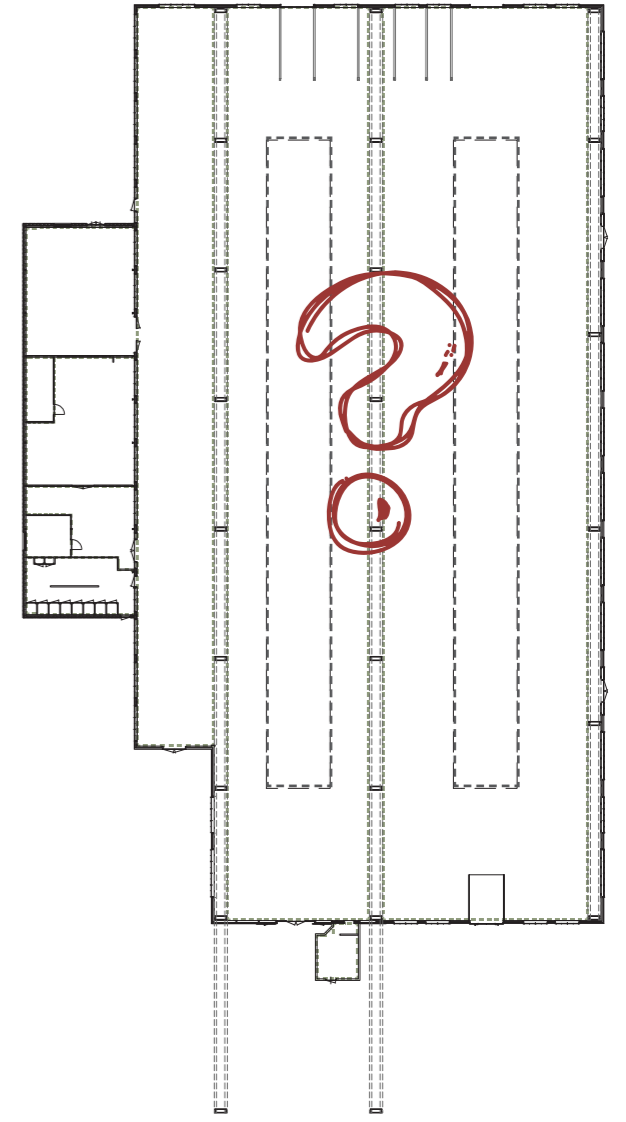
Origin



1954



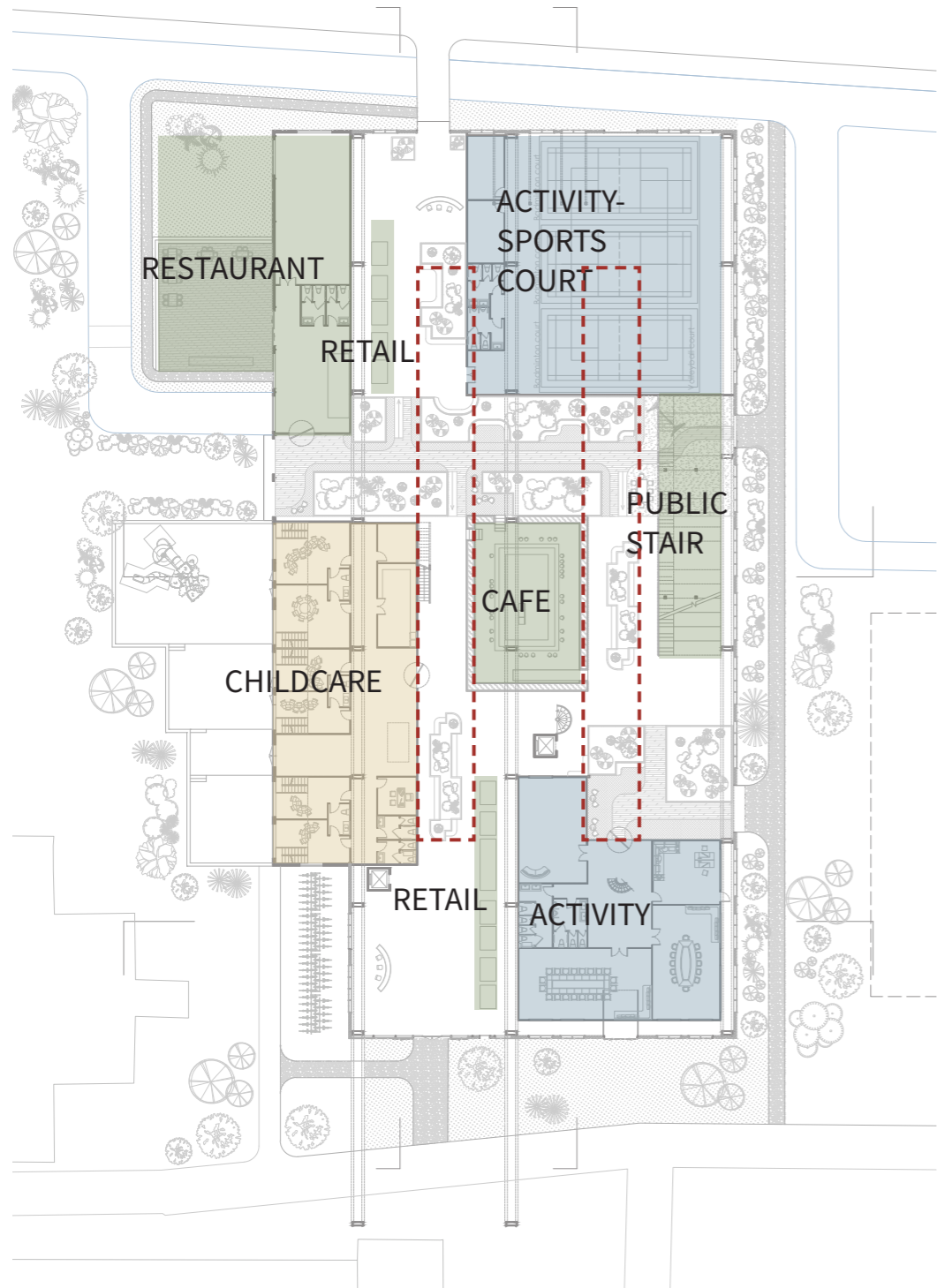
1975



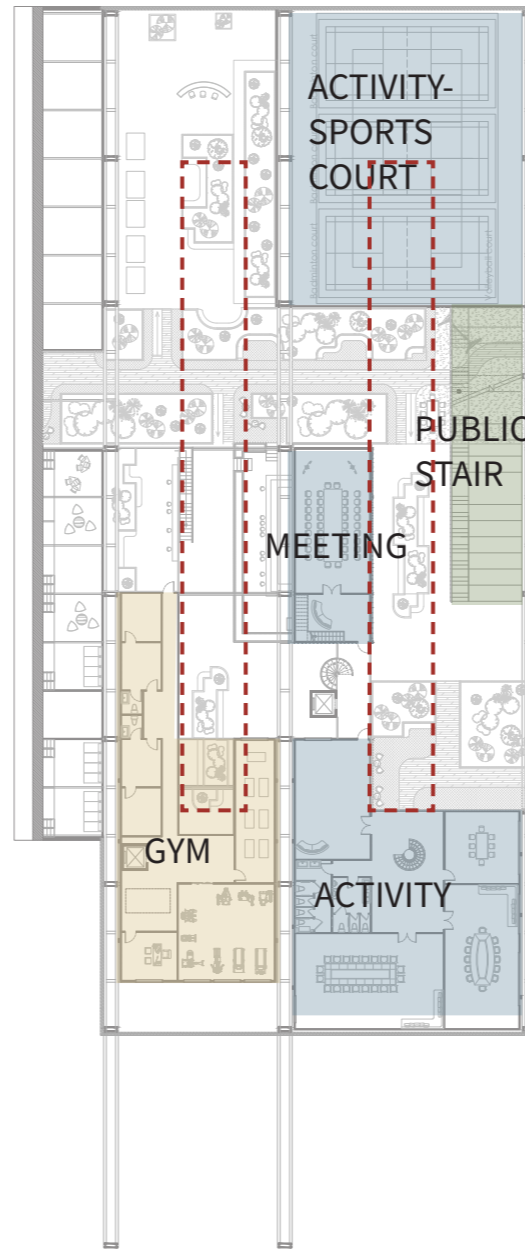
Present

INBETWEEN CONTEXT | A LOBBY FOR HEMBRUG

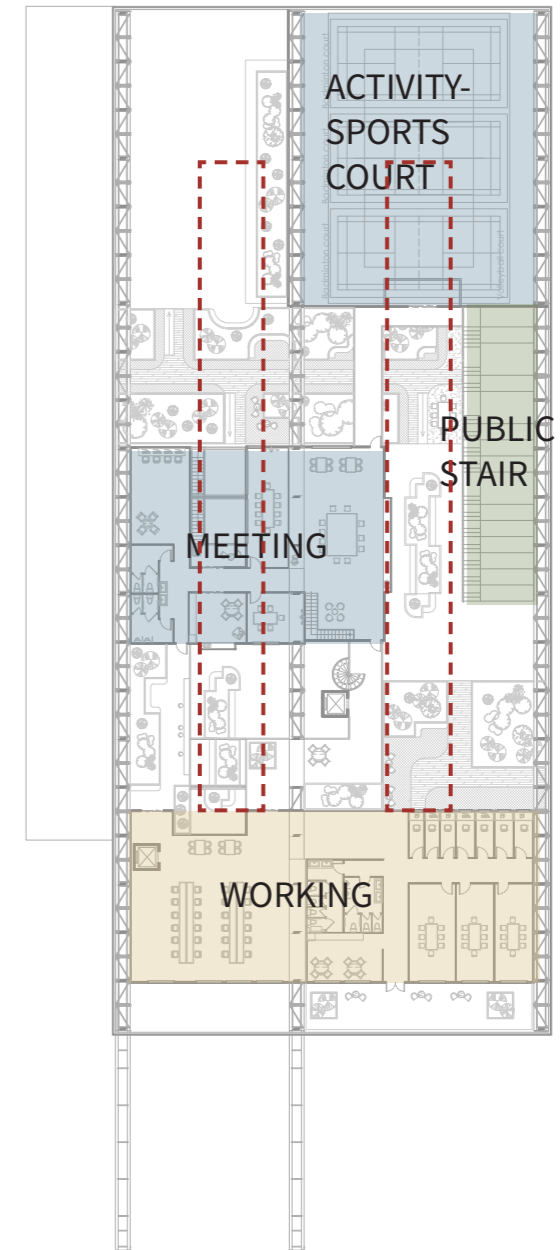
PRESENT LAYOUT



Groundfloor



First floor

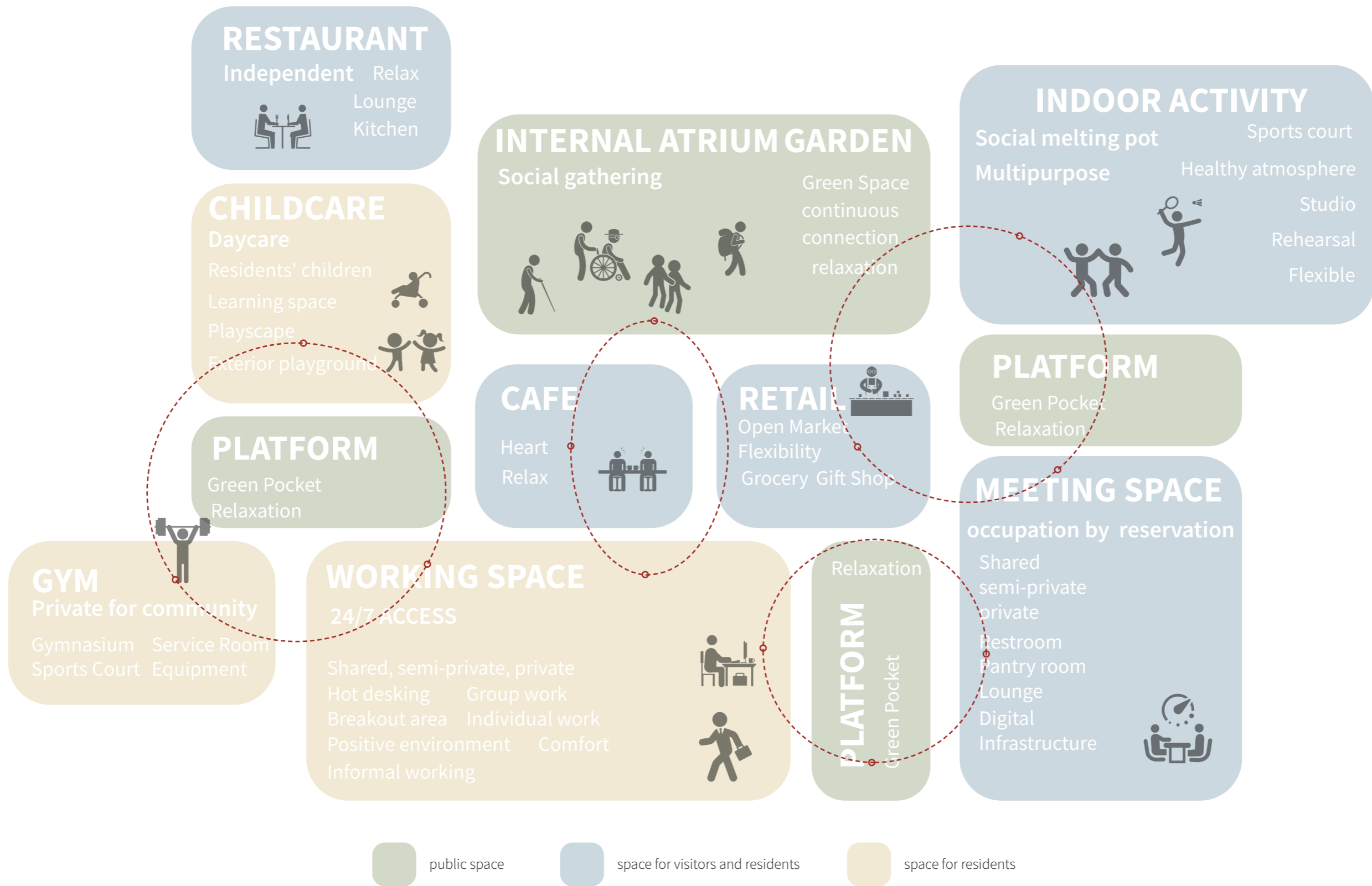


Second floor

PROGRAM DESIGN
Cohesion

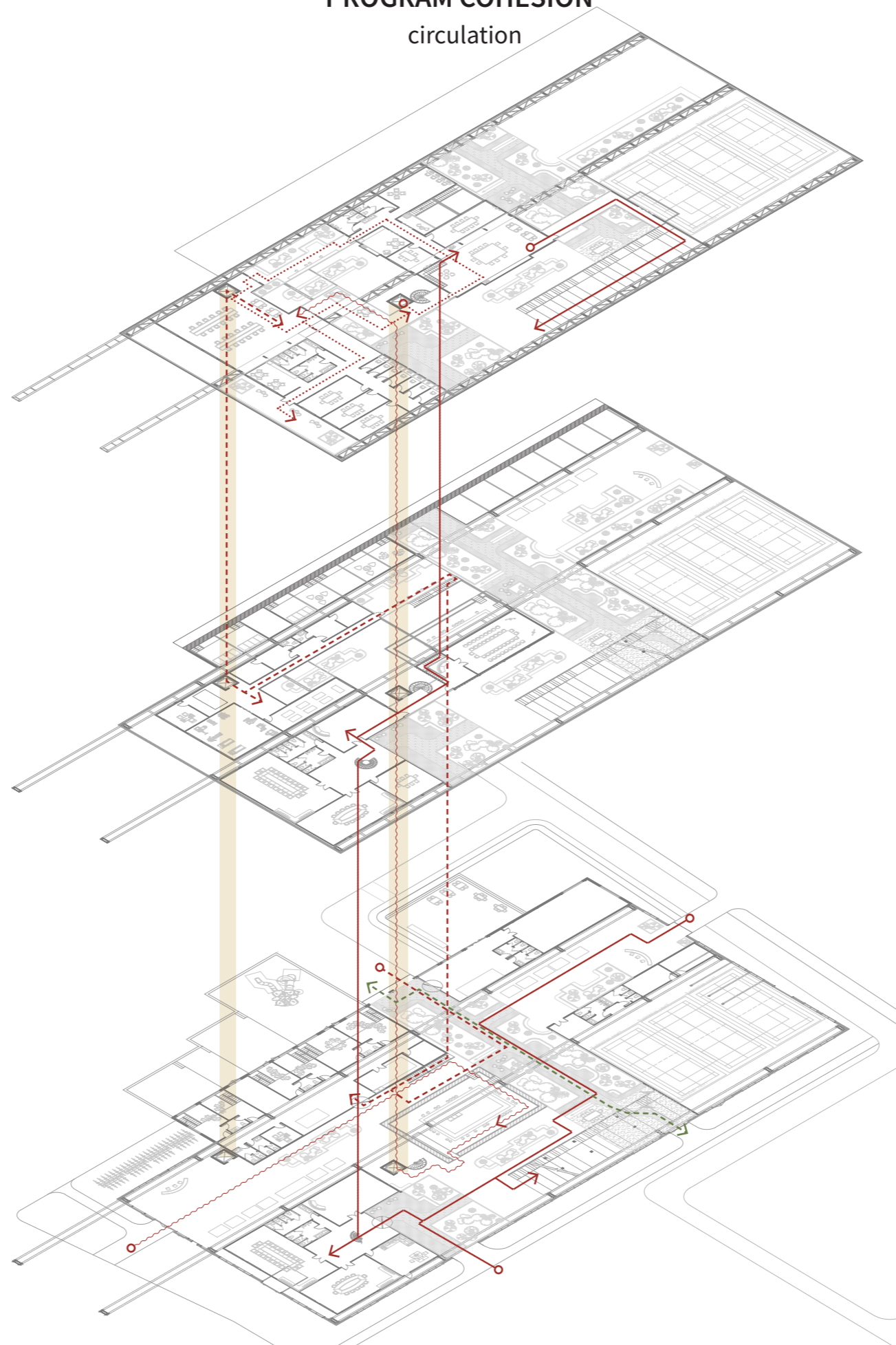
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PROGRAM COHESION

circulation



- > Childcare-Gym-Working
- > Retail-Activity-Meeting-Public stairs
-> Meeting-Working
- ~~~~~> Cafe-Working
- > Atrium

SHARED MEETING SPACE PERSPECTIVE VIEW



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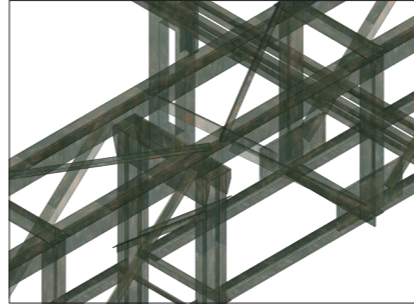
INBETWEEN CONTEXT | A LOBBY FOR HEMBRUG

CHAPTER 03

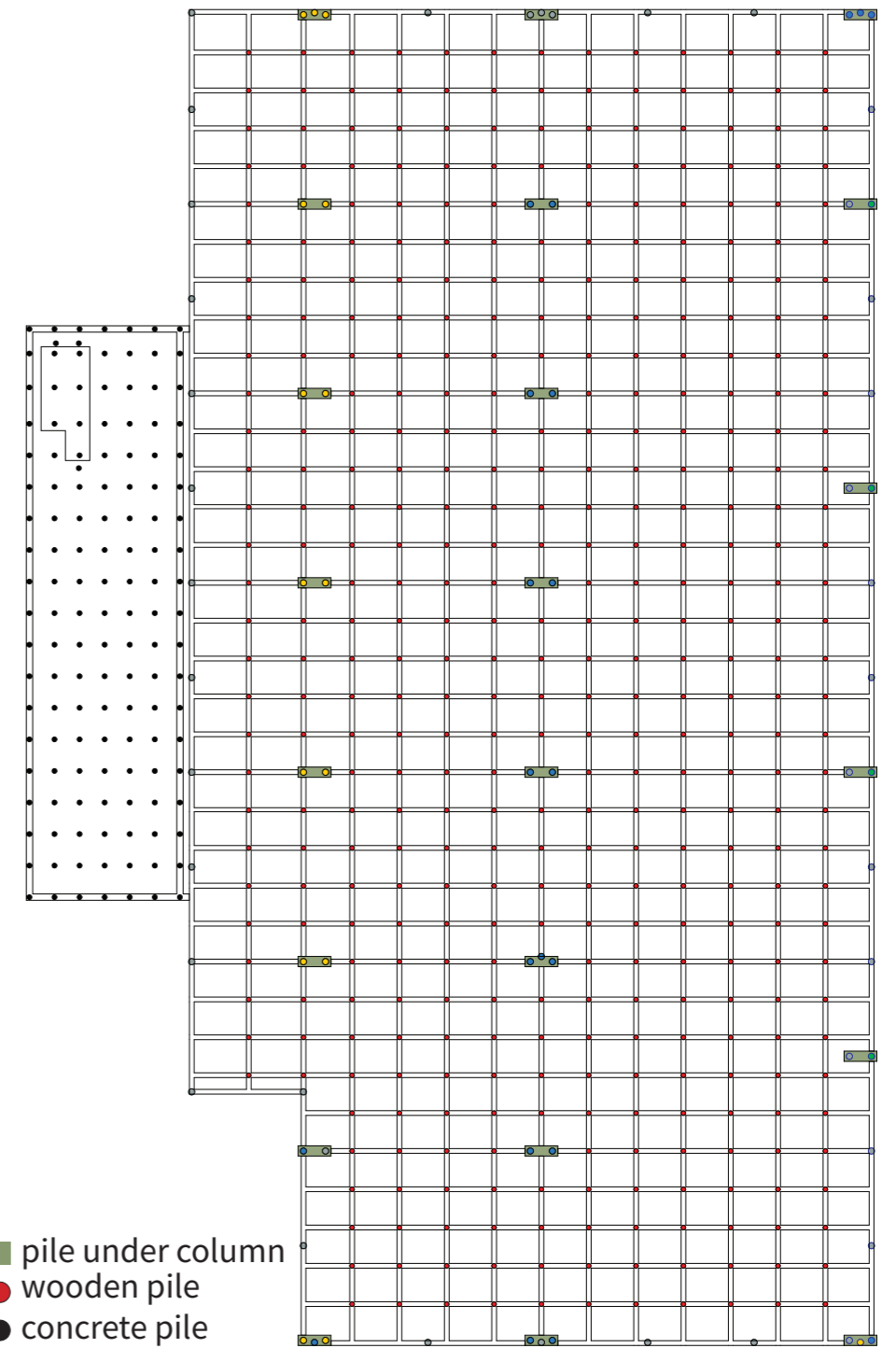
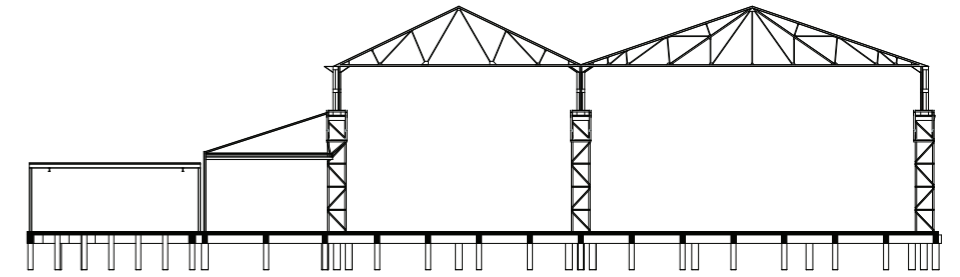
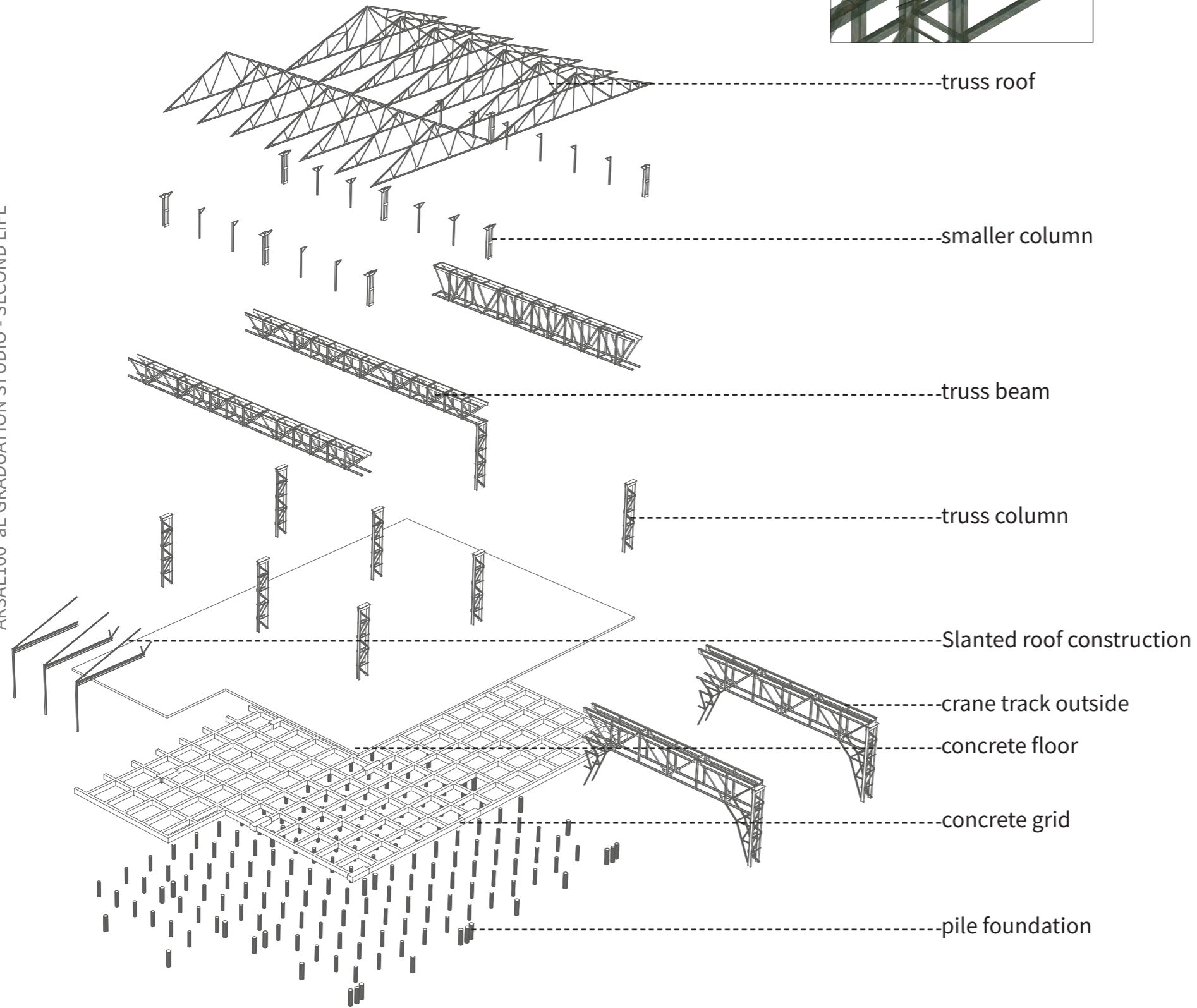
- RENOVATION STRATEGY -

Structure Resue/ Facade Restore, Renovate and Redesign/Circular Material/Atrium/Climate Design

ORIGINAL STRUCTURE SYSTEM



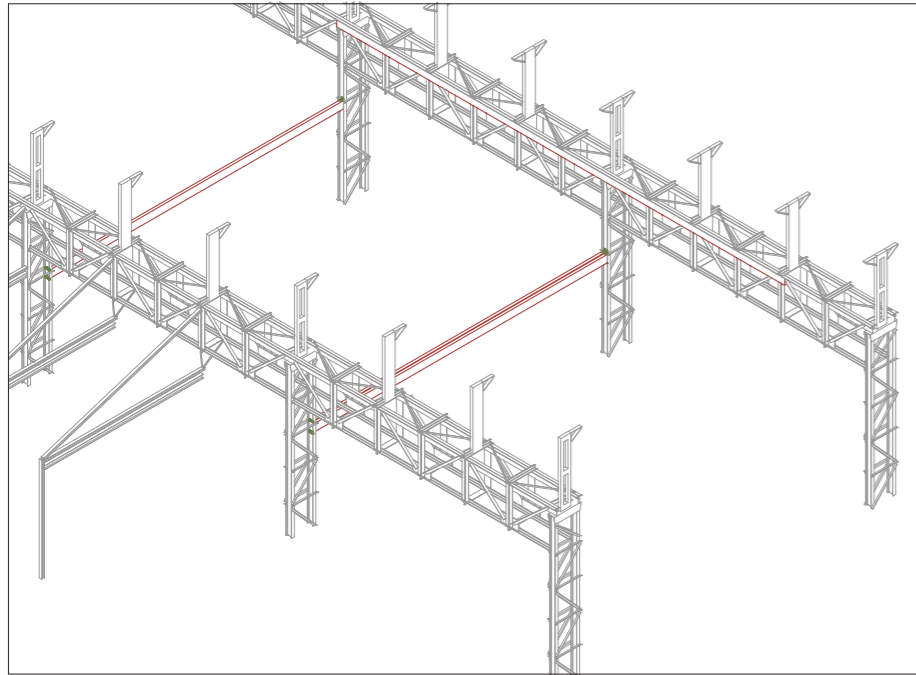
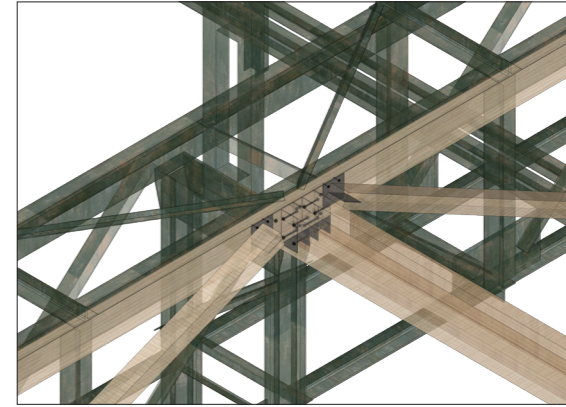
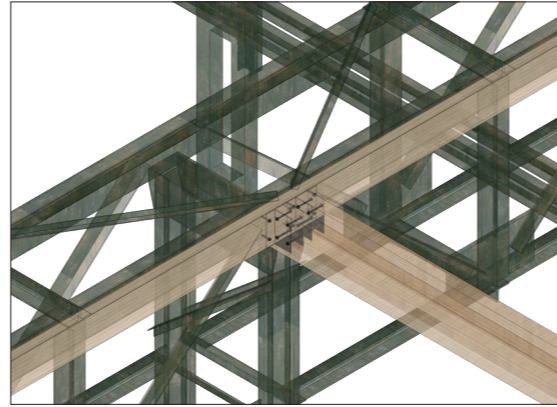
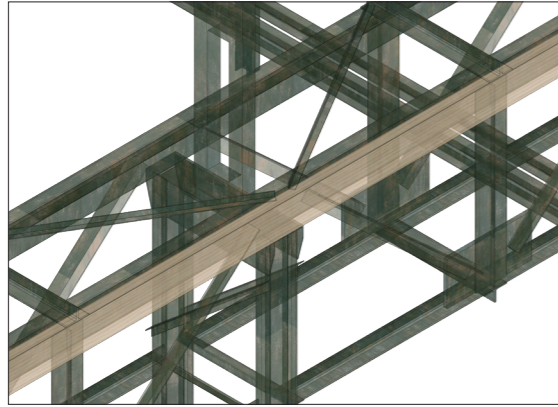
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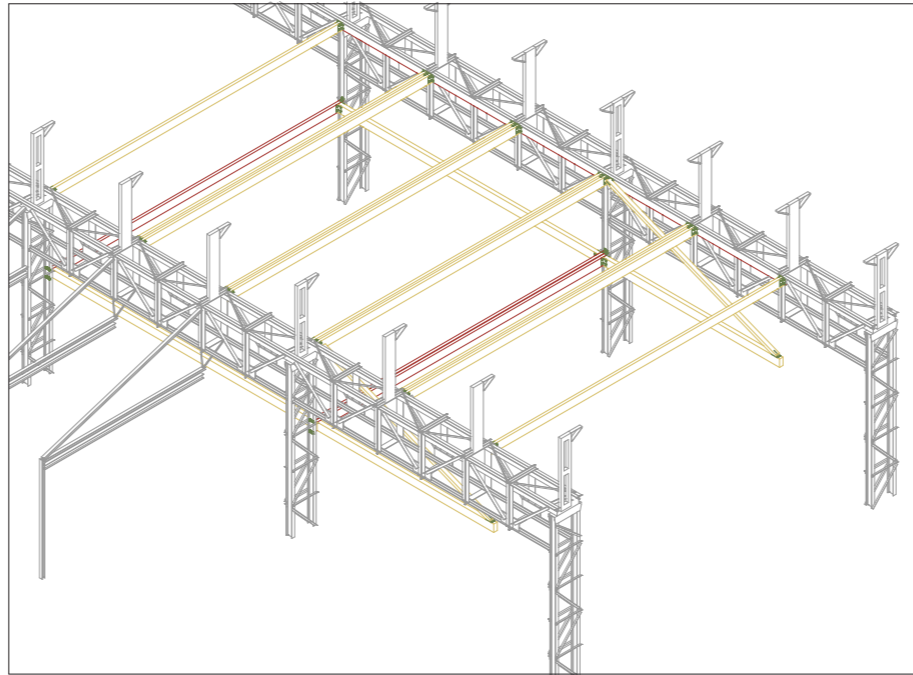
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NEW STRUCTURE SYSTEM

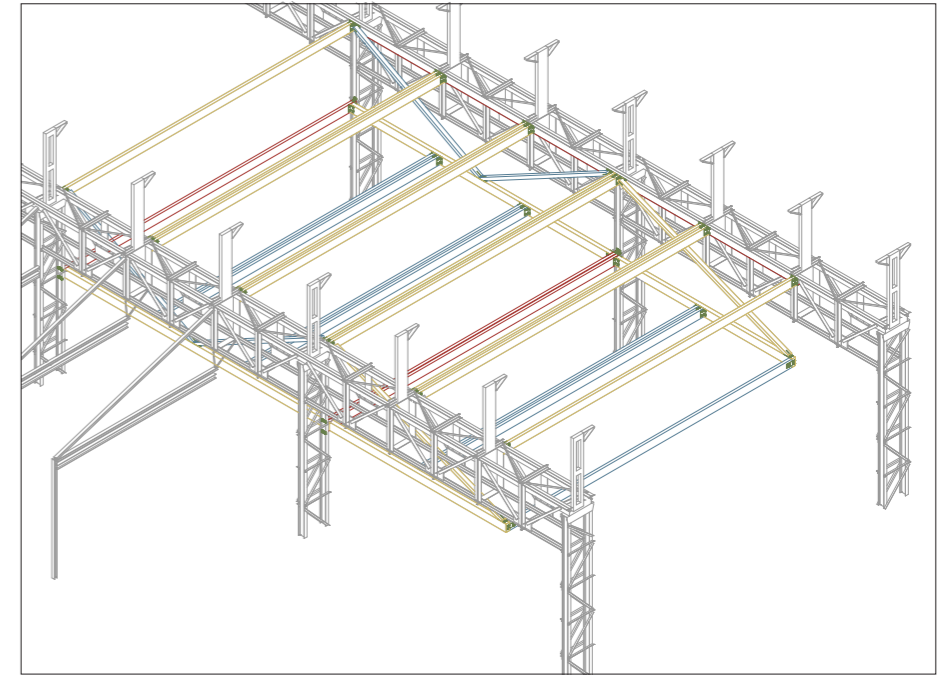
Reuse the original structure strategy



Sequence 01 Glulam beam bolt to steel truss

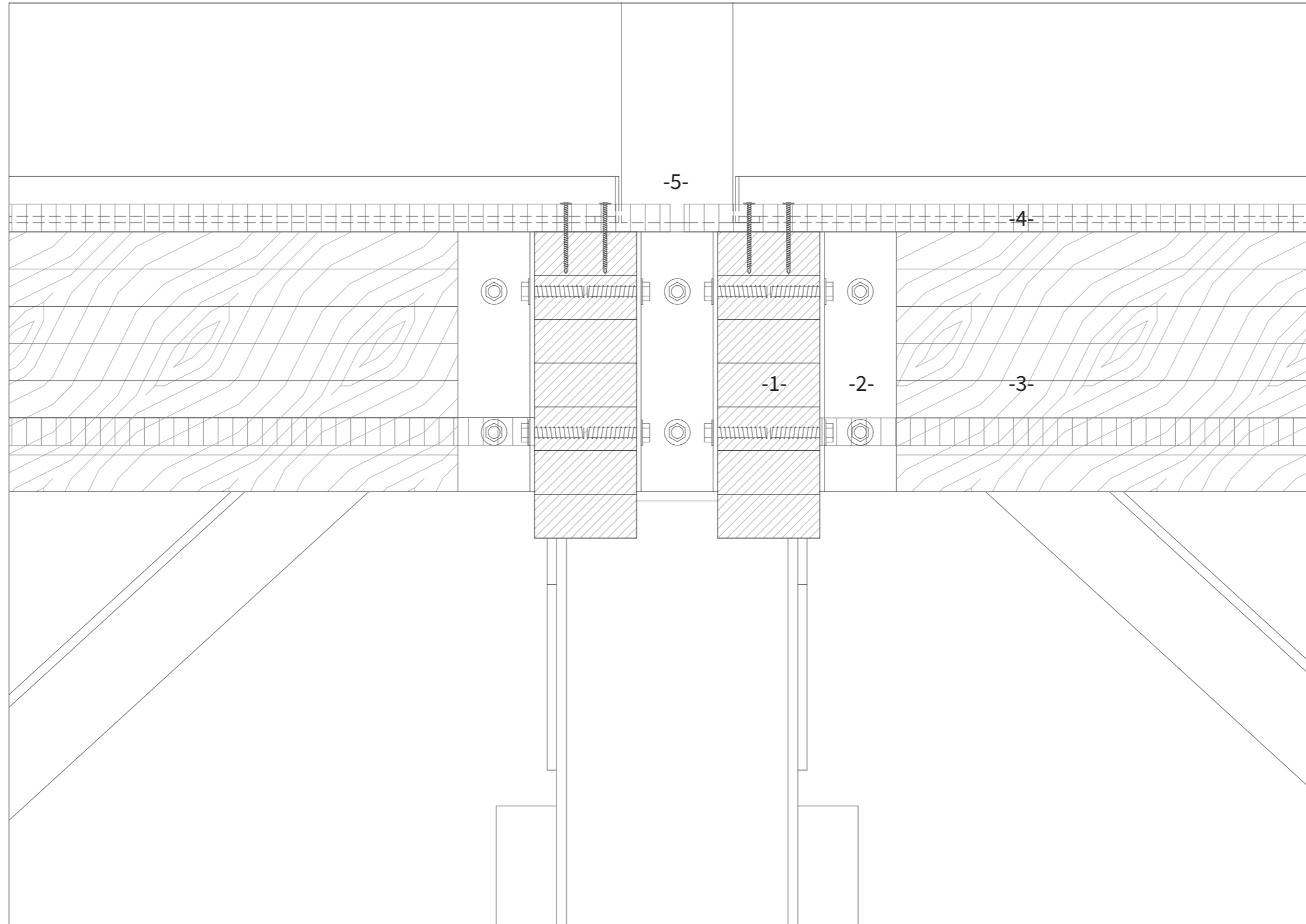


Sequence 02 Main girder bolt to glulam beam



Sequence 03 Structural reinforcement

NEW STRUCTURE SYSTEM

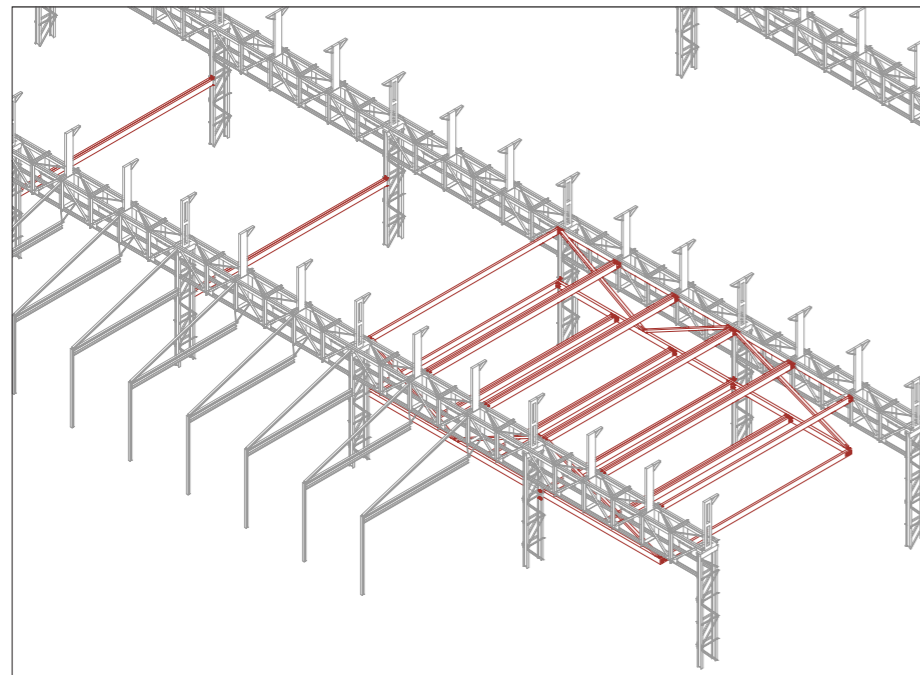


Structure Connection Detail 1:5

- 1. Glulam Girders
- 2. Steel connectors
- 3. Glulam Beam
- 4. Kerto-Ripa floor elemnts
- 5. Steel structure

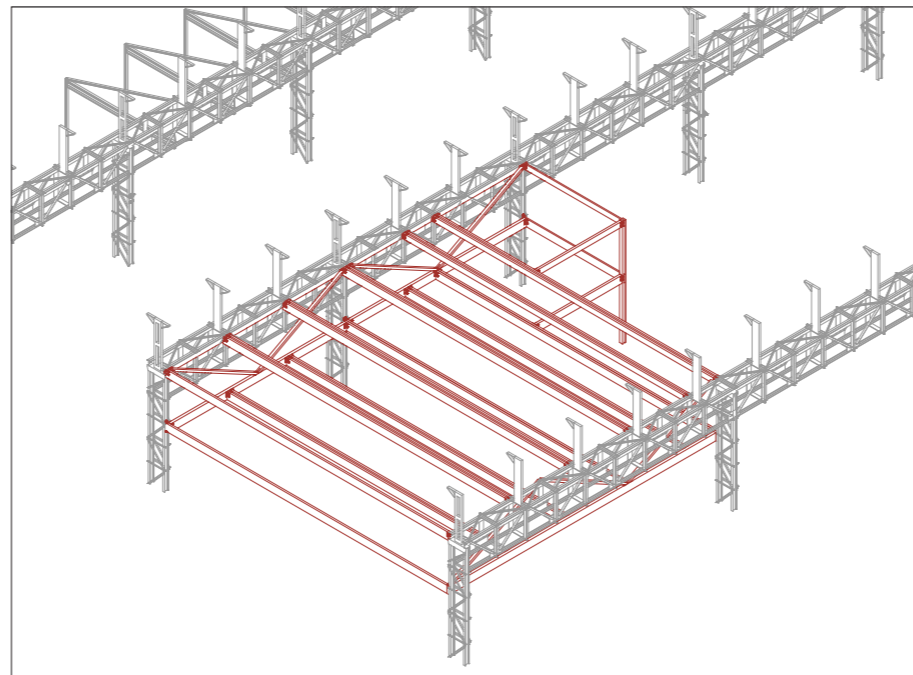
NEW STRUCTURE SYSTEM

Narrow Hall Structure Design



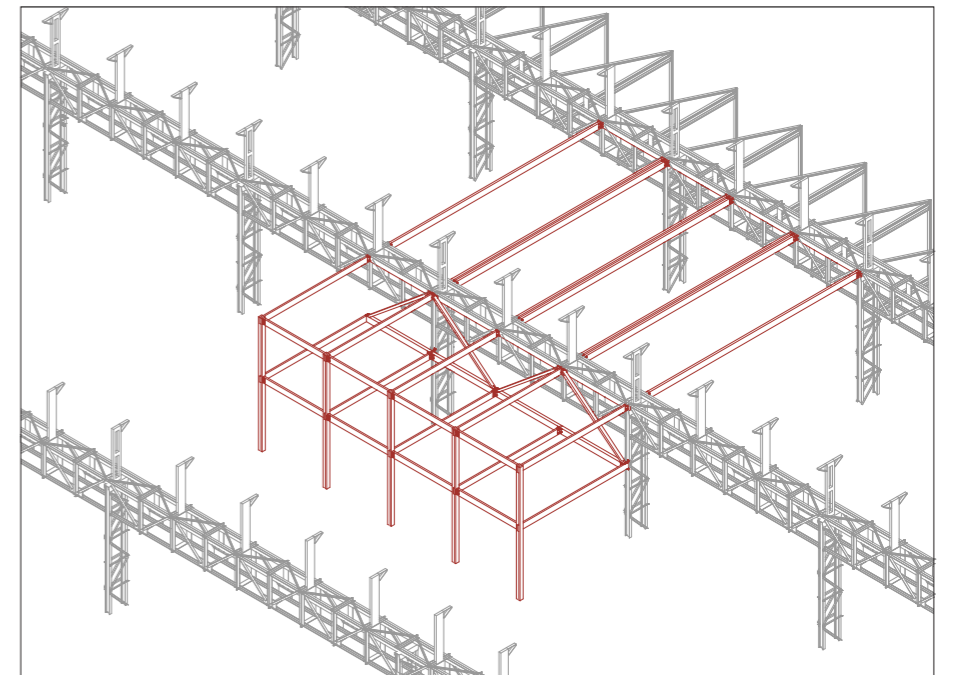
Span: 13.16m
size of Glulam beam: 110*330mm

Wide Hall Structure Design_activity



Span: 19m
size of Glulam beam: 160*475mm

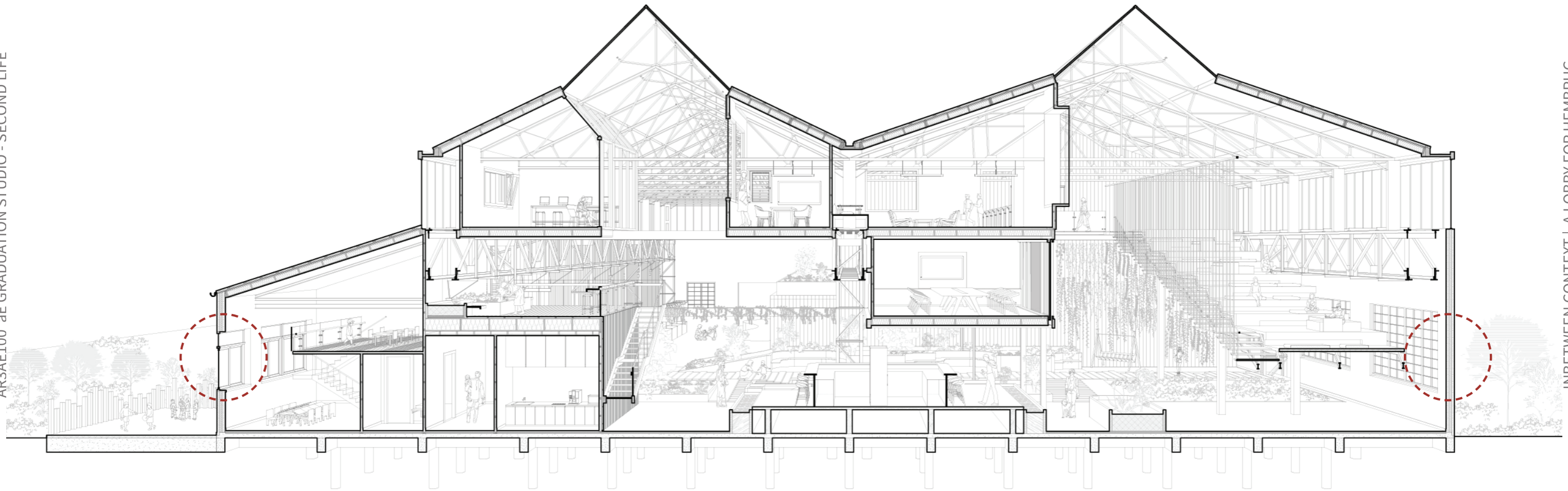
Wide Hall Structure Design_meeting



Span: 6.5 m
size of Glulam beam: 75*320mm
size of column: 75*200mm *2

FACADE RESTORE, RENOVATE AND REDESIGN

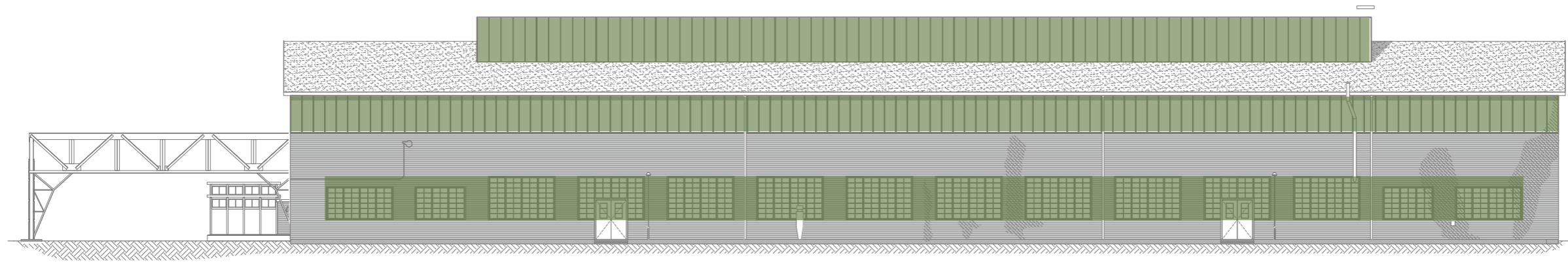
AR3AE100 aE GRADUATION STUDIO - SECOND LIFE



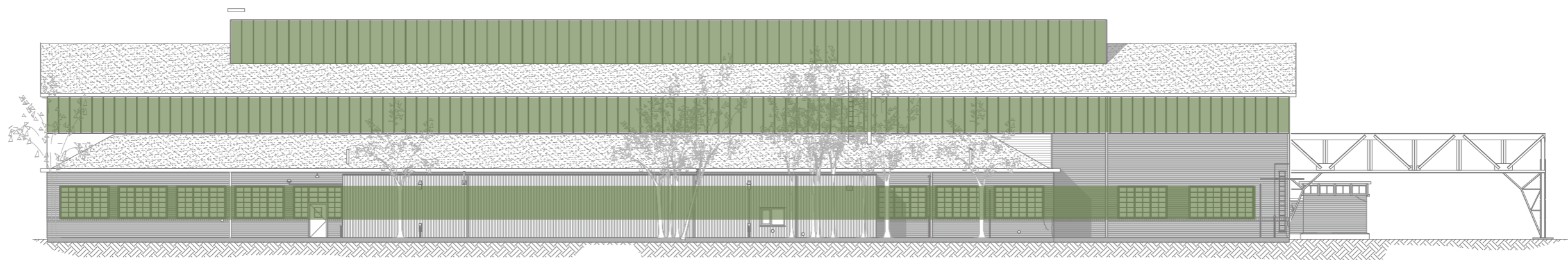
INBETWEEN CONTEXT | A LOBBY FOR HEMBRUG

ORIGINAL FACADE

- skylights, upper windows, brick wall, openings on the ground floor
 - lengthwise space



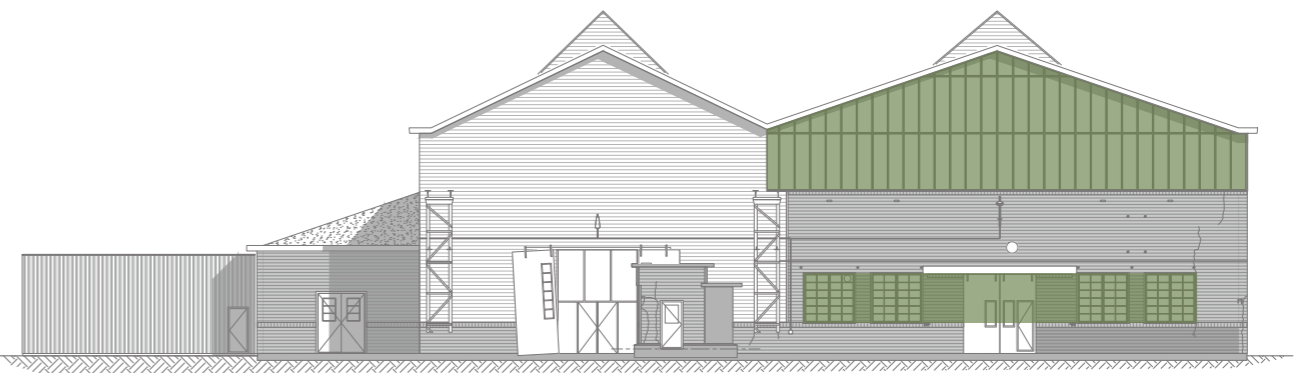
East Elevation



West Elevation



North Elevation



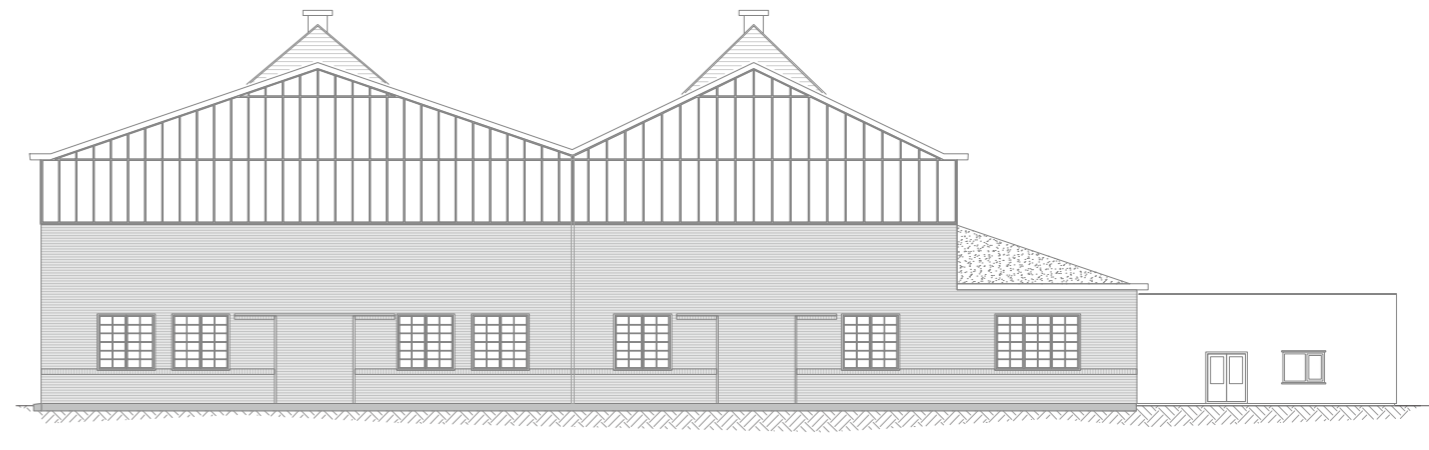
South Elevation

FACADE RESTORE AND RENOVATE

- Southern elevation narrow part regain original expression
 - Emphasize new entrance

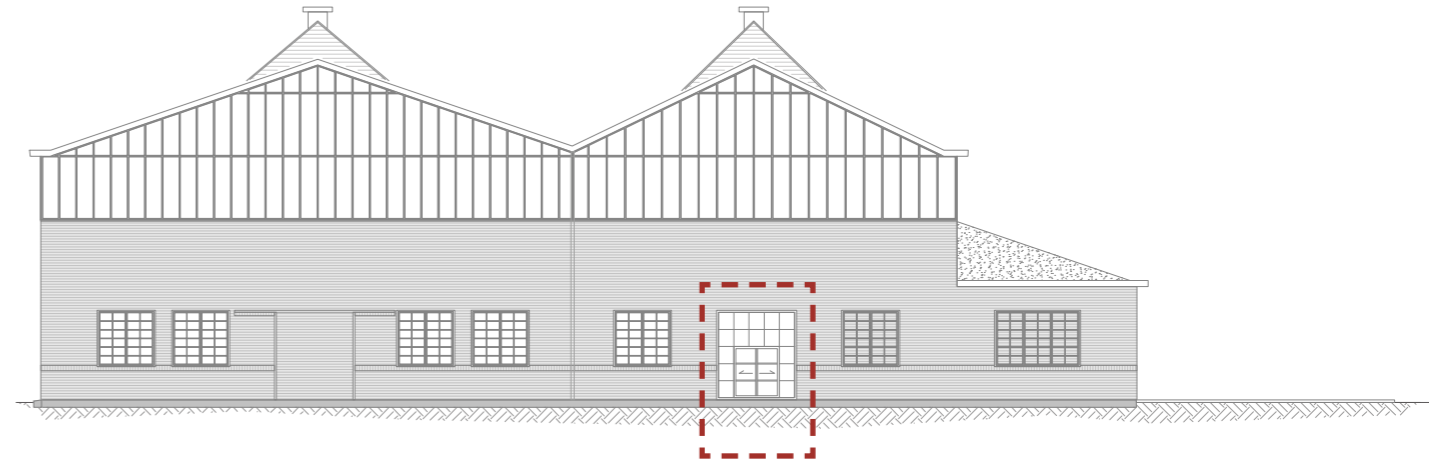
South Elevation

North Elevation



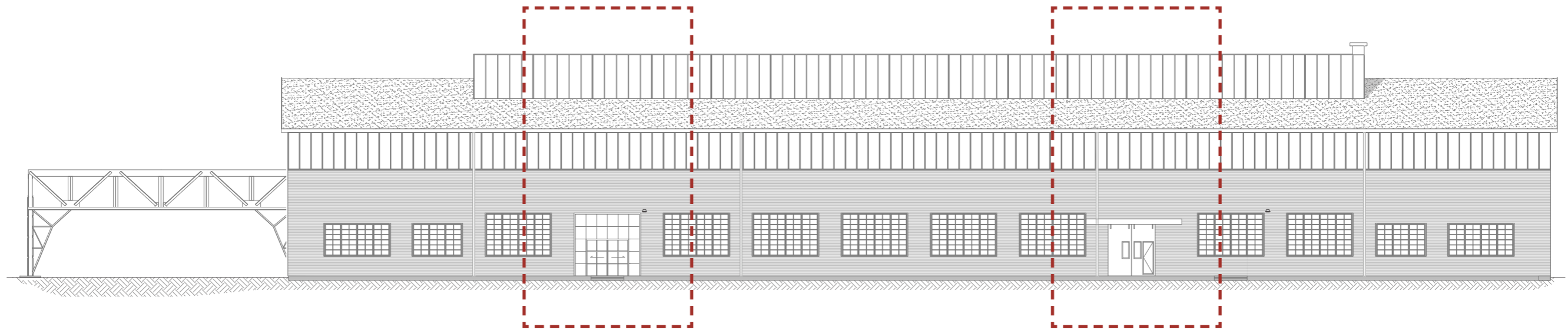
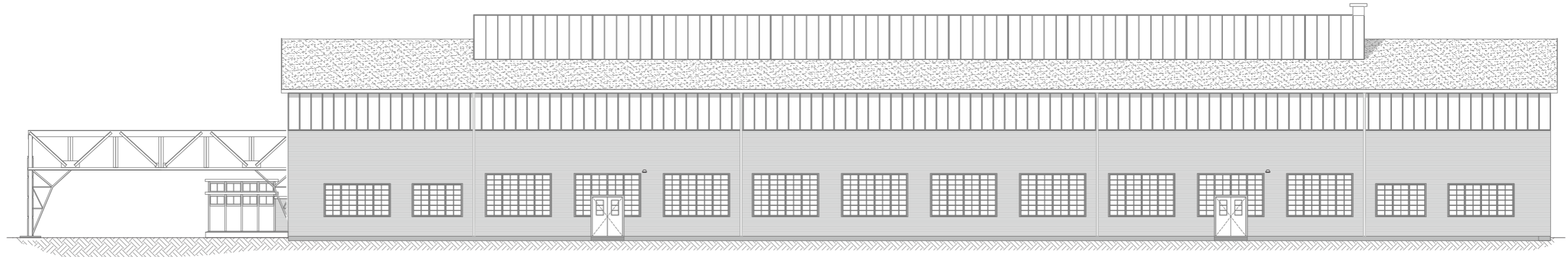
AR3AE100 aE GRADUATION STUDIO - SECOND LIFE

INBETWEEN CONTEXT | A LOBBY FOR HEMBRUG



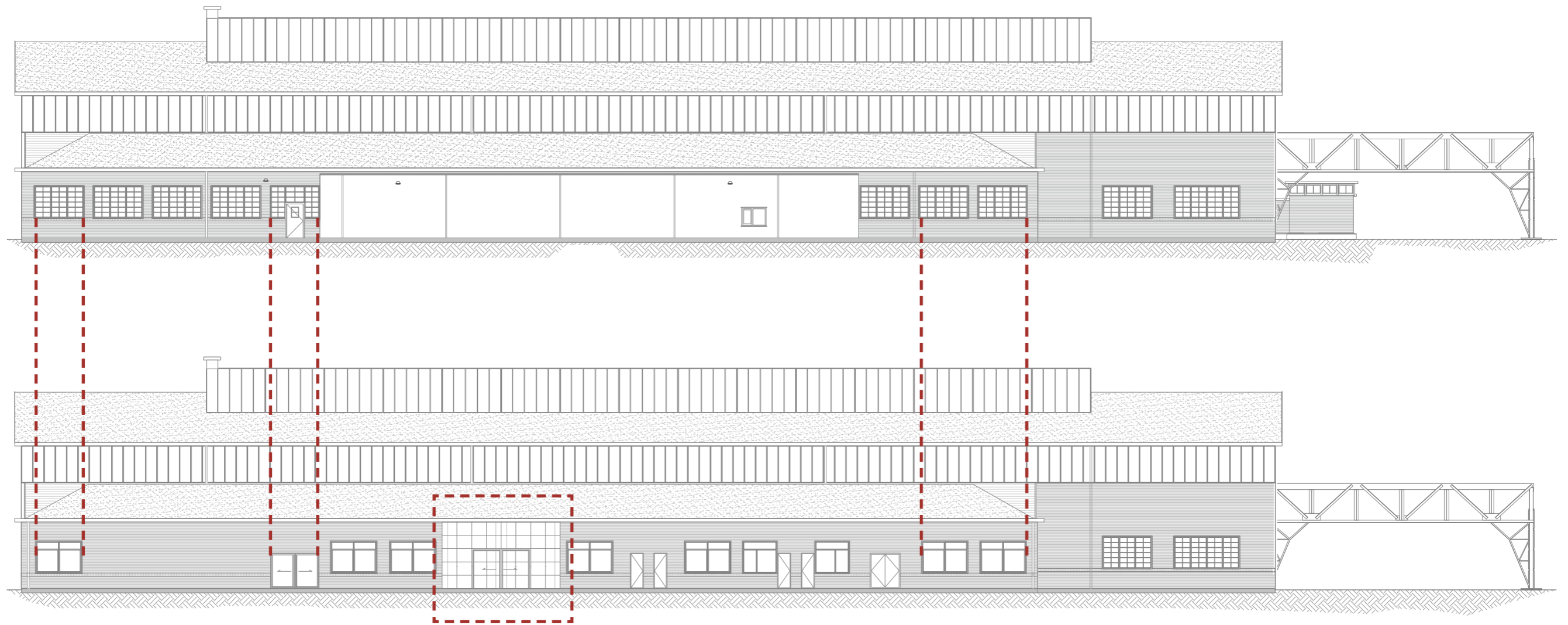
FACADE RESTORE AND RENOVATE

- Restore original facade
- Emphasize new entrance
- Introduce a new entrance with industrial sliding door



FACADE REDESIGN

- Introduce new entrance
- Redesign echo previous rhythm

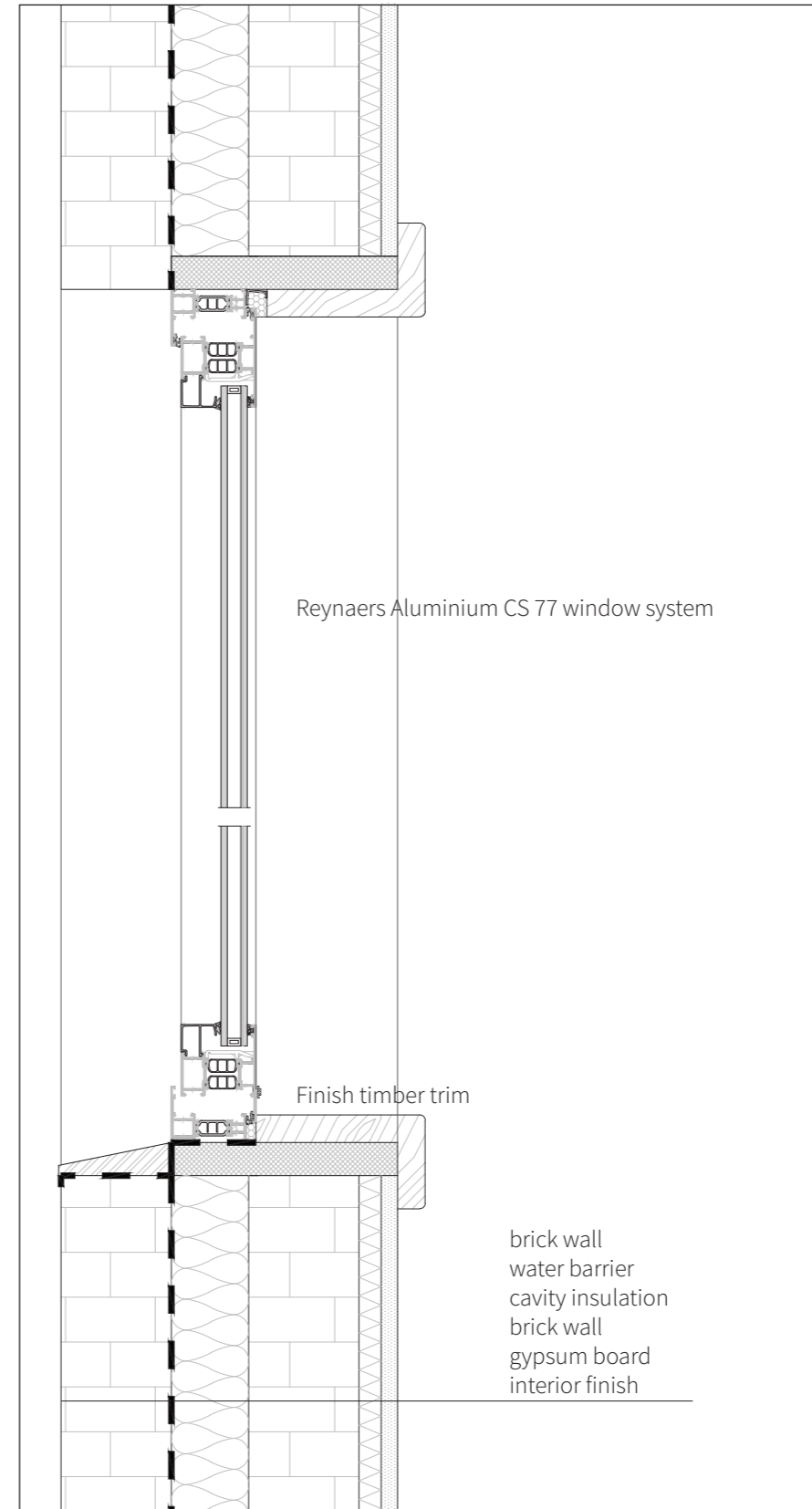
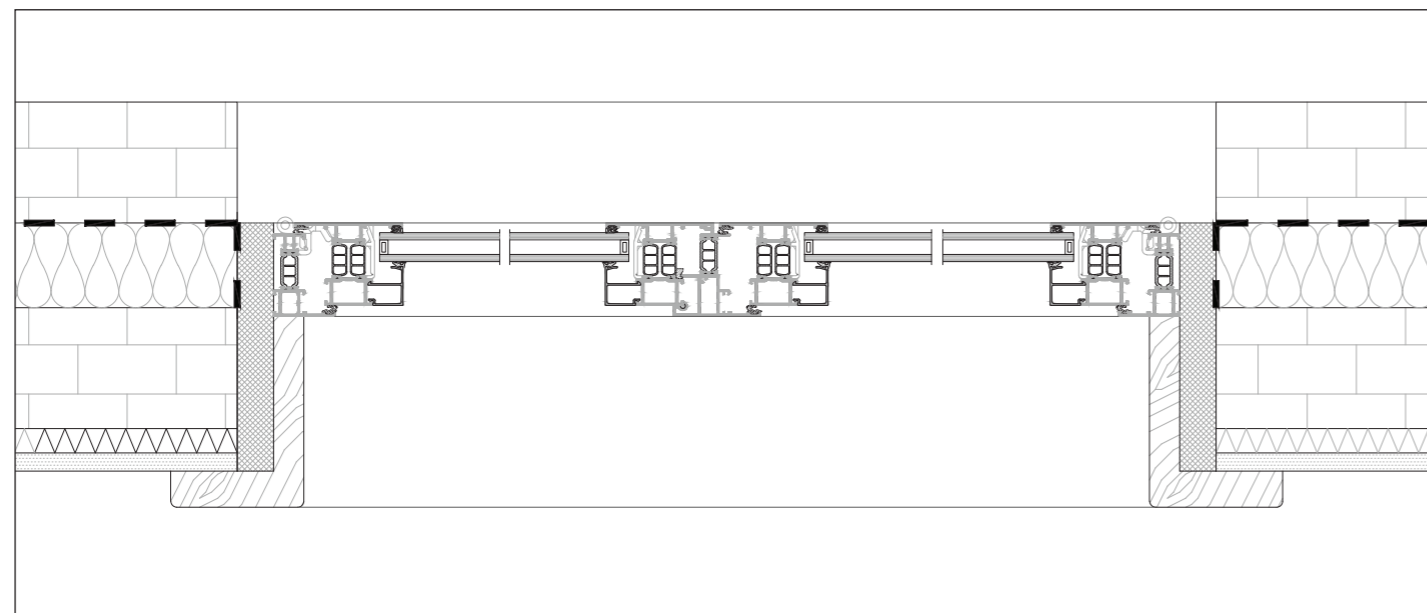
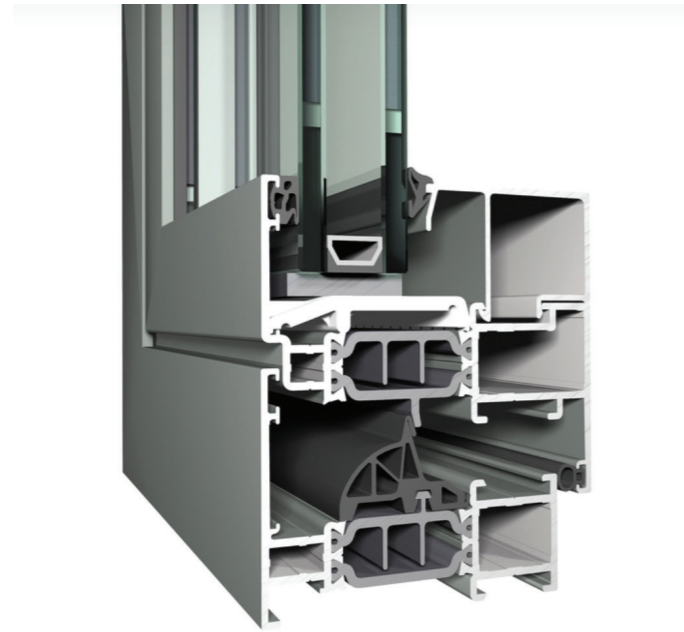


AR3AE100 aE GRADUATION STUDIO - SECOND LIFE

INBETWEEN CONTEXT | A LOBBY FOR HEMBRUG

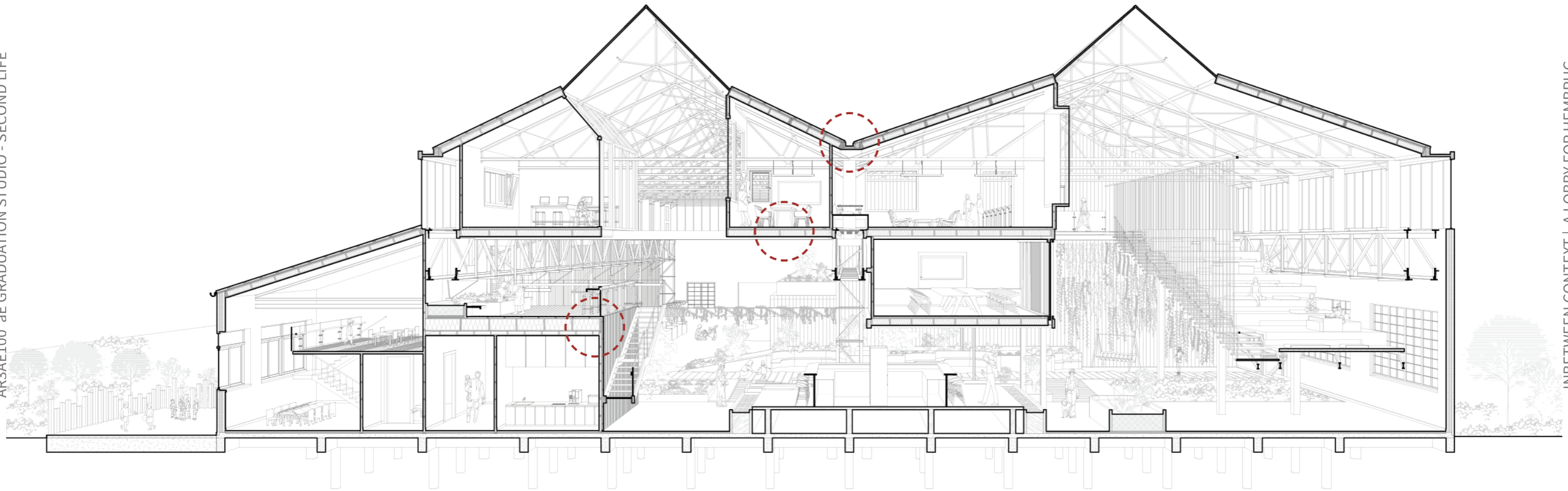
WINDOW SYSTEM

Concept System® 77 is a versatile and high insulating window system that meets elevated requirements regarding thermal insulation, stability and security.



CIRCULAR MATERIAL

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INBETWEEN CONTEXT | A LOBBY FOR HEMBRUG

TIMBER

Environmentally Friendly/ Lightweight/ Recyclable/ Easy To Handle In Manufacture, Transport And Construction/

Glulam beam



Kerto® LVL



Kerto® LVL
FAST, LIGHT, GREEN



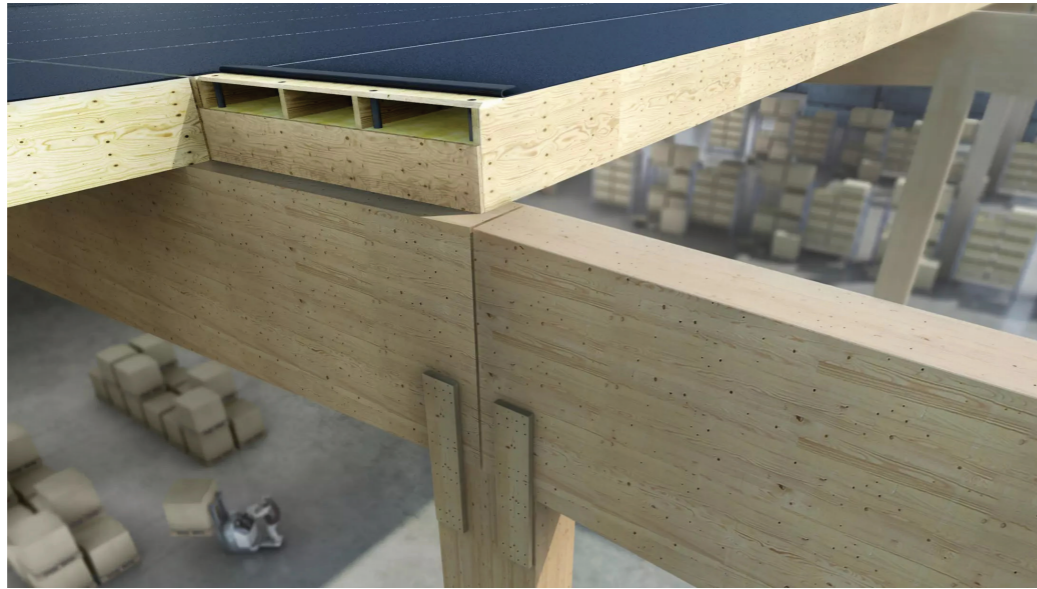
KERTO-RIPA® ROOF & FLOOR ELEMENTS



Timber cladding



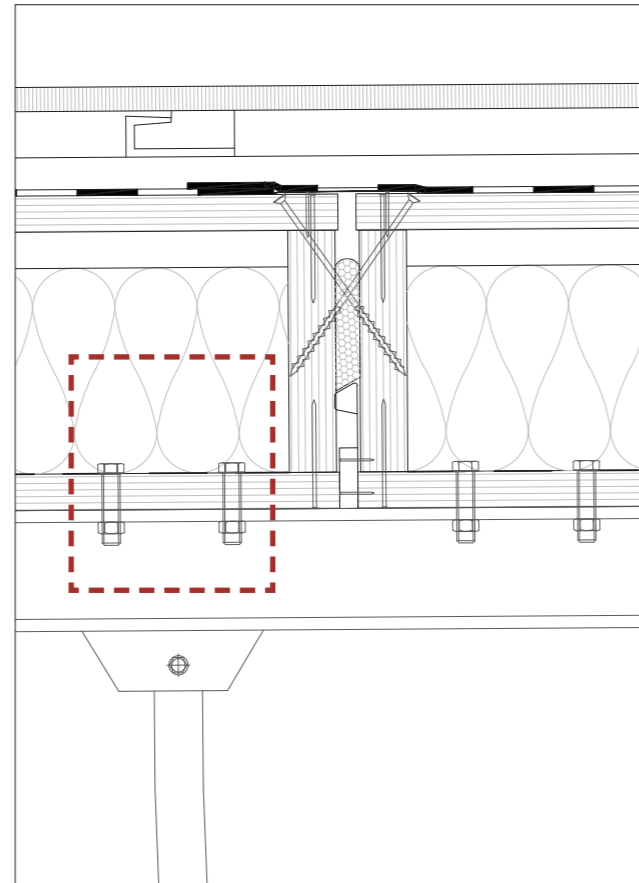
KERTO-RIPA FLOOR AND ROOF SYSTEM



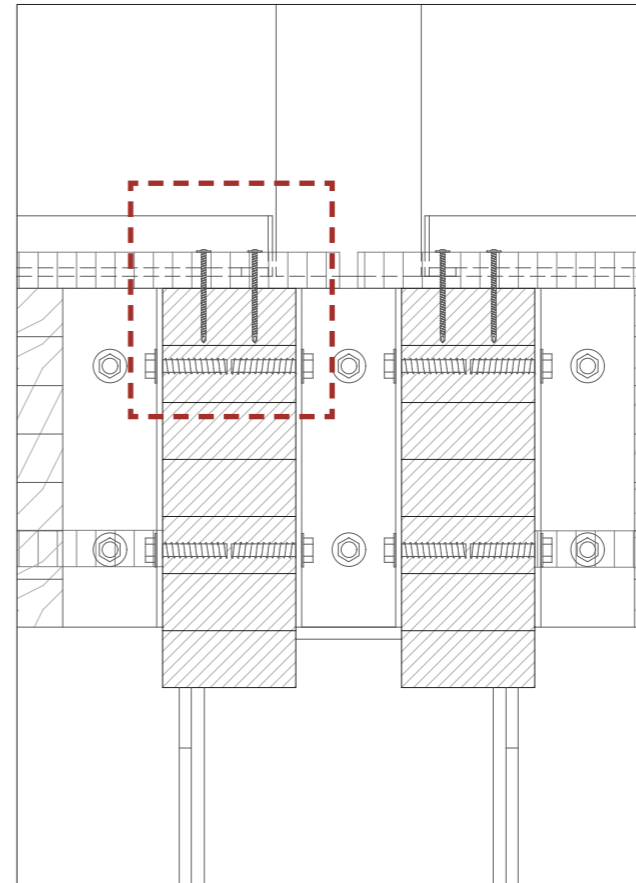
- Enables fast construction
 - Large free span with less material consumption
- More adaptability for space with less load-bearing walls or beams
 - Easy to connect from the top slab
 - Element production in controlled conditions
- As a sustainable material supports circular economy and is re-usable / recyclable

MOUNTING TYPE

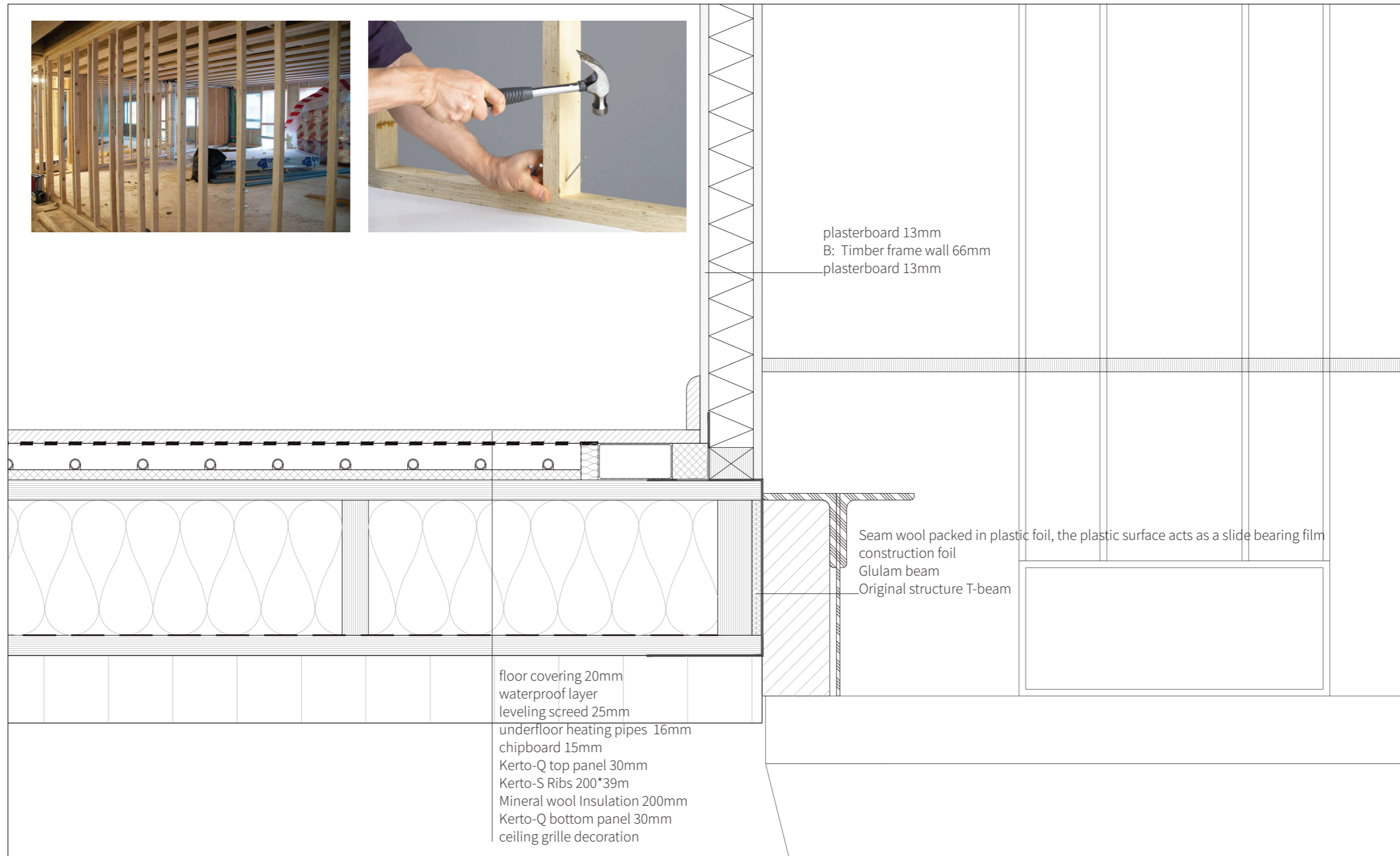
To roof steel truss
hang from the bottom panel



To glulam beams
hang from the top panel



INTERIOR WALL DETAIL 1:5



CAFE HALL PERSPECTIVE VIEW

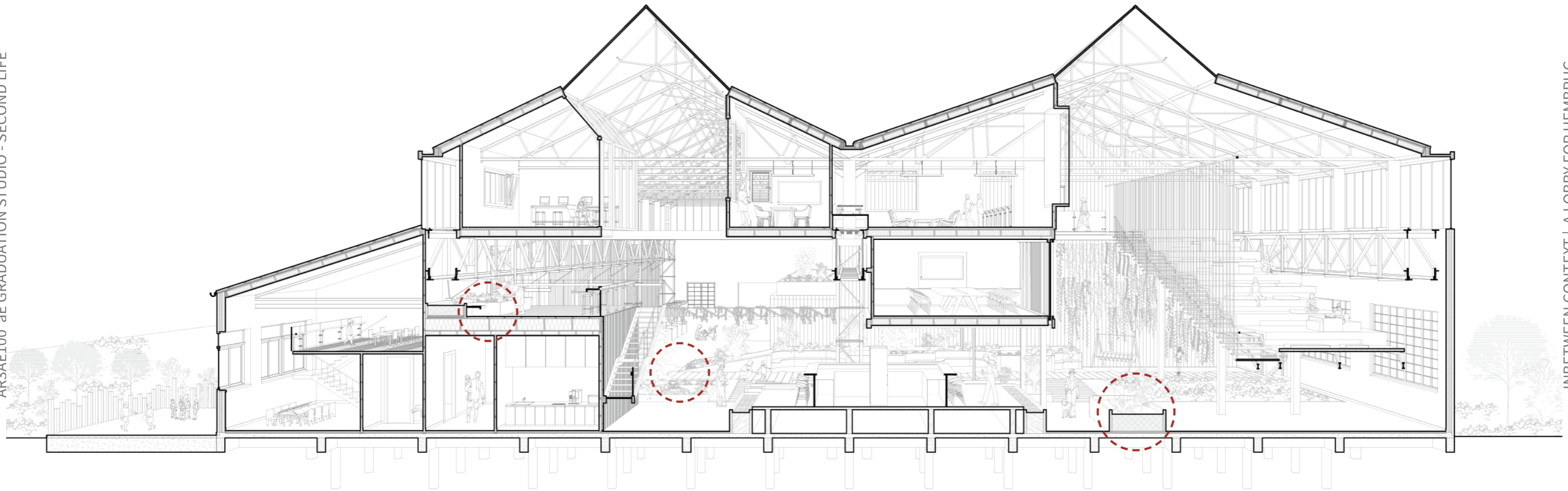


AR3AE100 aE GRADUATION STUDIO - SECOND LIFE

INBETWEEN CONTEXT | A LOBBY FOR HEMBRUG

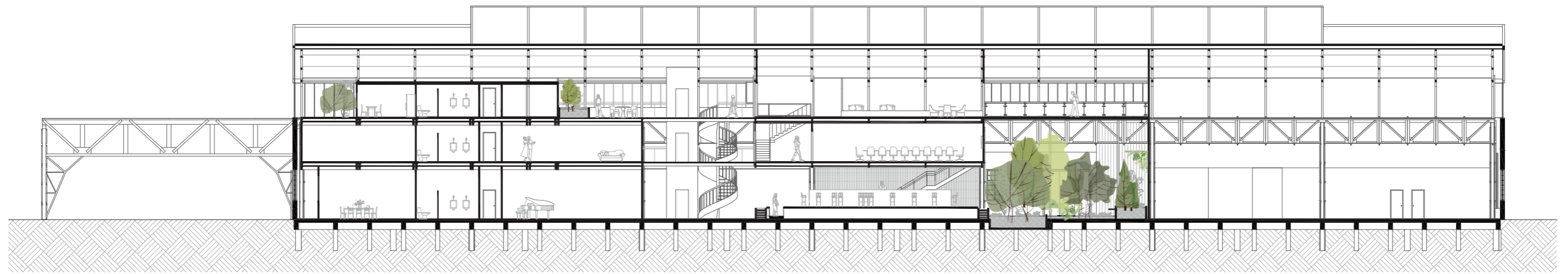
ATRIUM

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INBETWEEN CONTEXT | A LOBBY FOR HEMBRUG

ATRIUM FUNCTION



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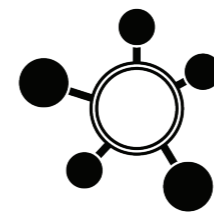
INBETWEEN CONTEXT | A LOBBY FOR HEMBRUG



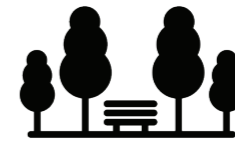
Relaxation



communication space



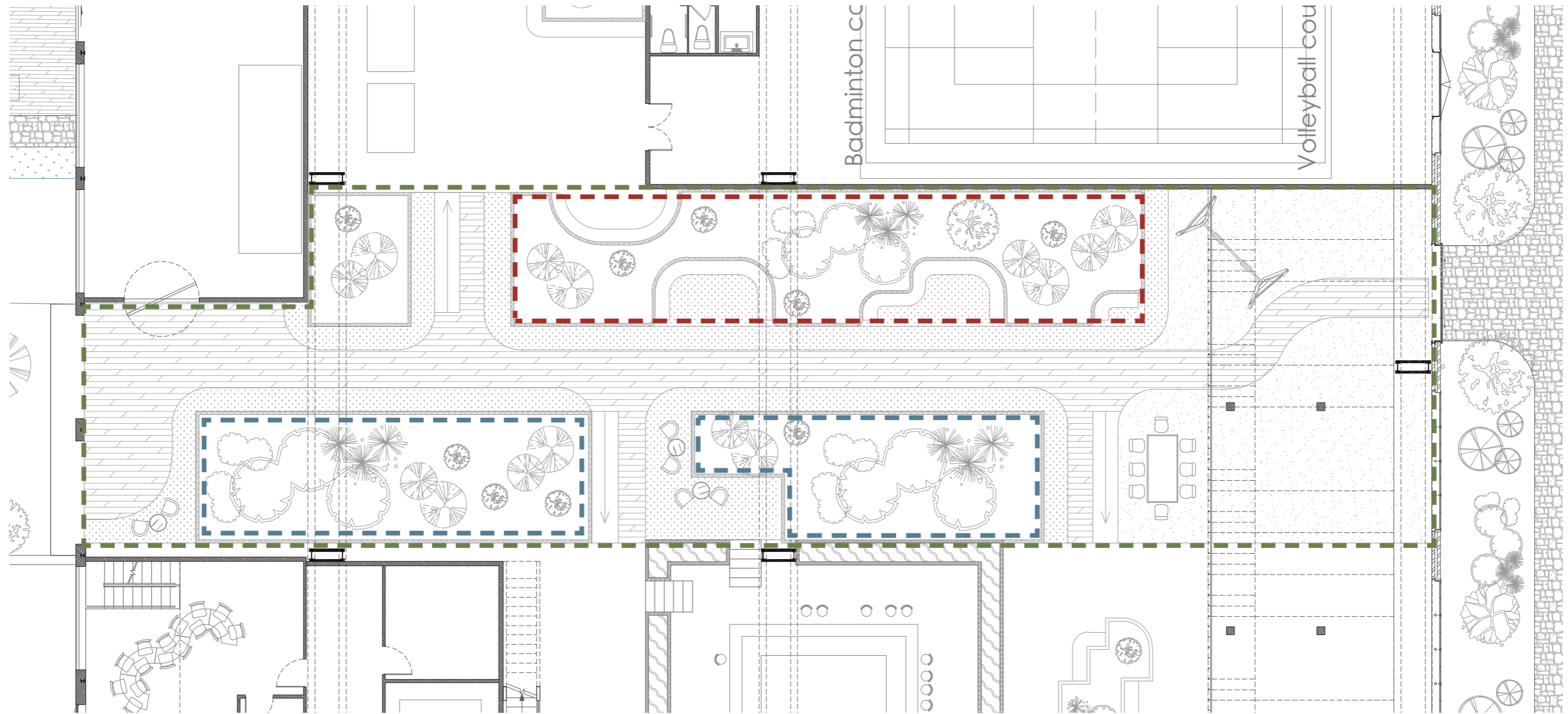
gather all functions



nature

MAIN ATRIUM CONSTRUCTION

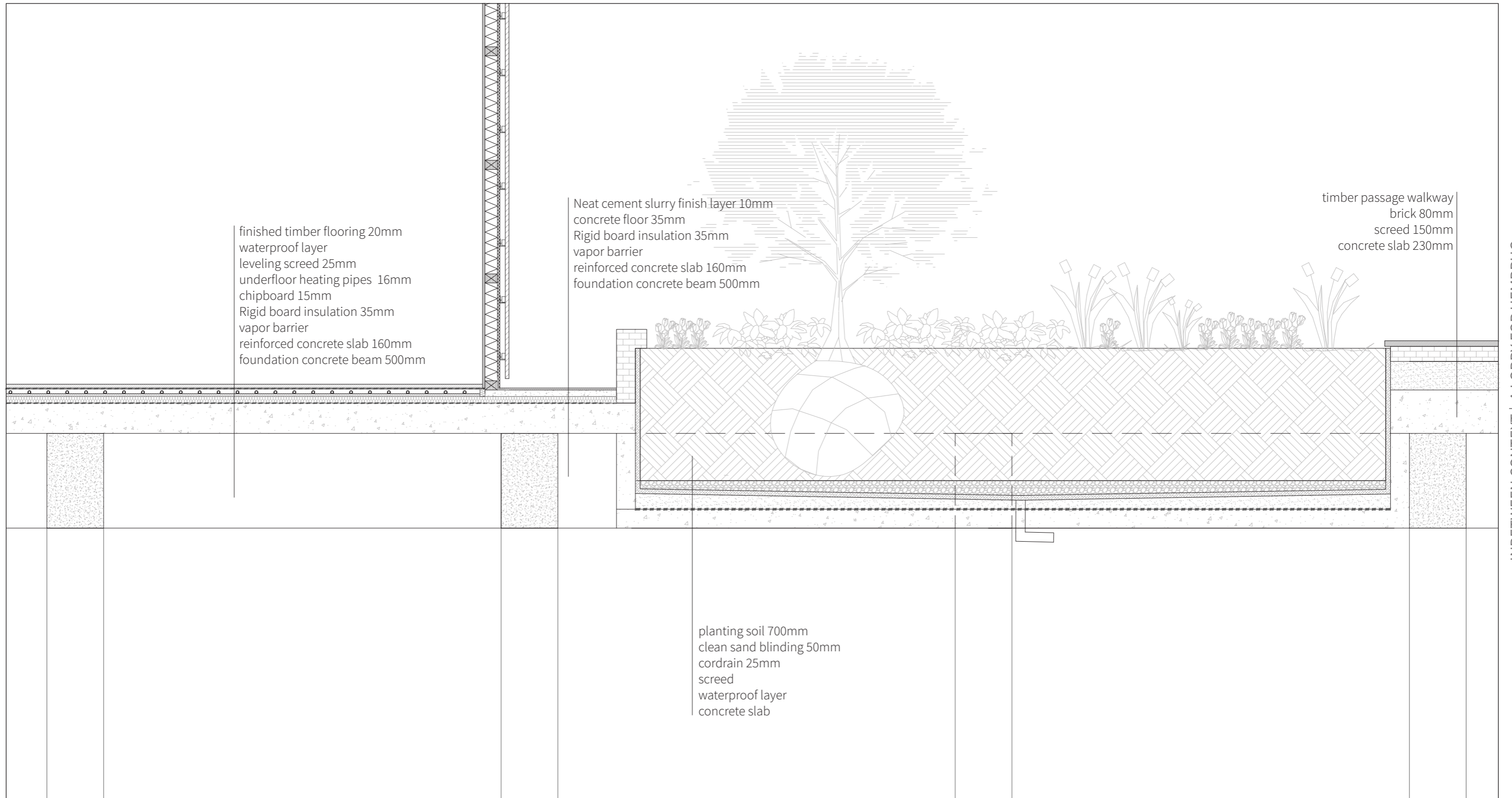
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INBETWEEN CONTEXT | A LOBBY FOR HEMBRUG

MAIN ATRIUM DETAIL 1:20

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INBETWEEN CONTEXT | A LOBBY FOR HEMBRUG

MAIN ATRIUM PERSPECTIVE VIEW

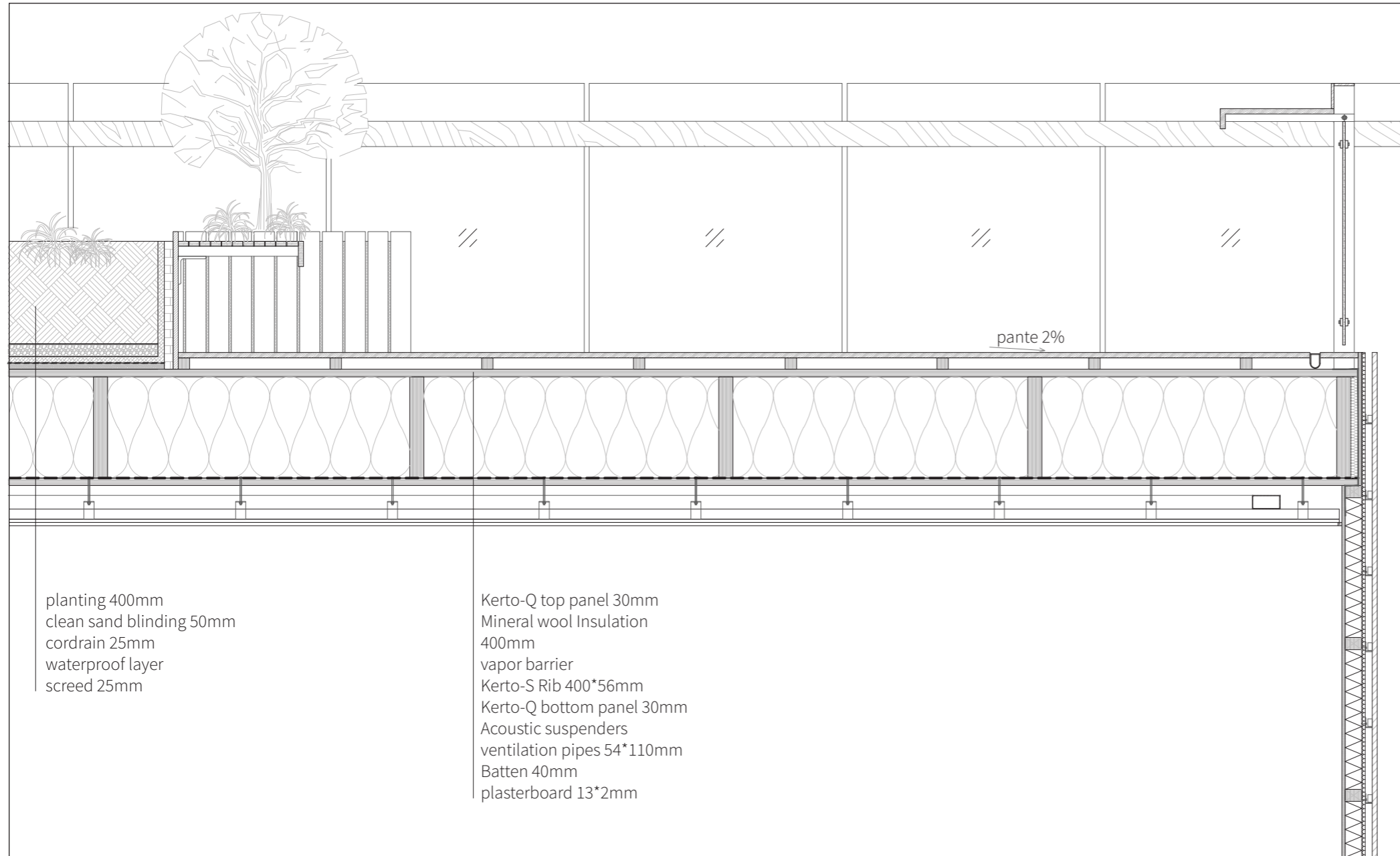


AR3AE100 aE GRADUATION STUDIO - SECOND LIFE

INBETWEEN CONTEXT | A LOBBY FOR HEMBRUG

GREENERY PLATFORM DETAIL 1:20

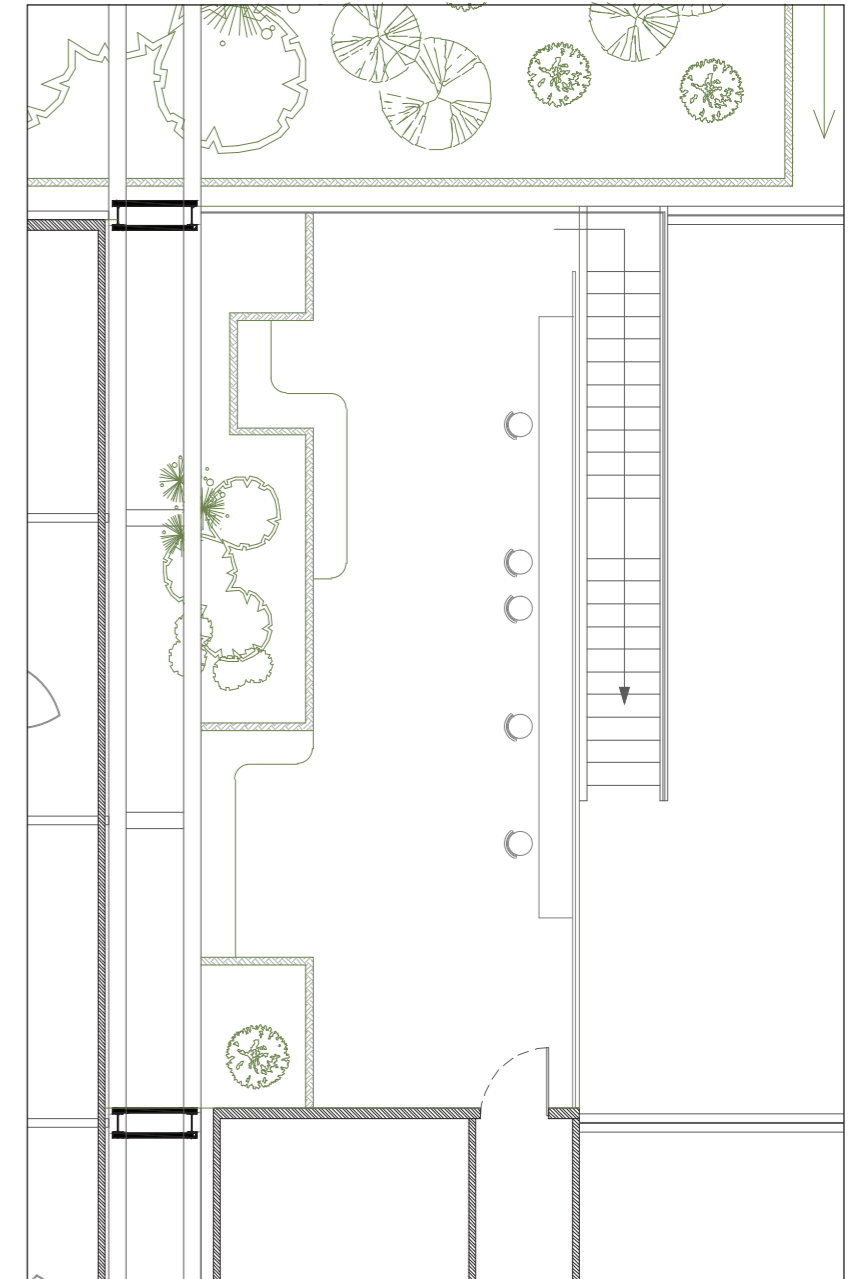
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planting 400mm
clean sand blinding 50mm
cordrain 25mm
waterproof layer
screed 25mm

Kerto-Q top panel 30mm
Mineral wool Insulation
400mm
vapor barrier
Kerto-S Rib 400*56mm
Kerto-Q bottom panel 30mm
Acoustic suspenders
ventilation pipes 54*110mm
Batten 40mm
plasterboard 13*2mm

pante 2%



INBETWEEN CONTEXT | A LOBBY FOR HEMBRUG

GREENERY PLATFORM PERSPECTIVE VIEW

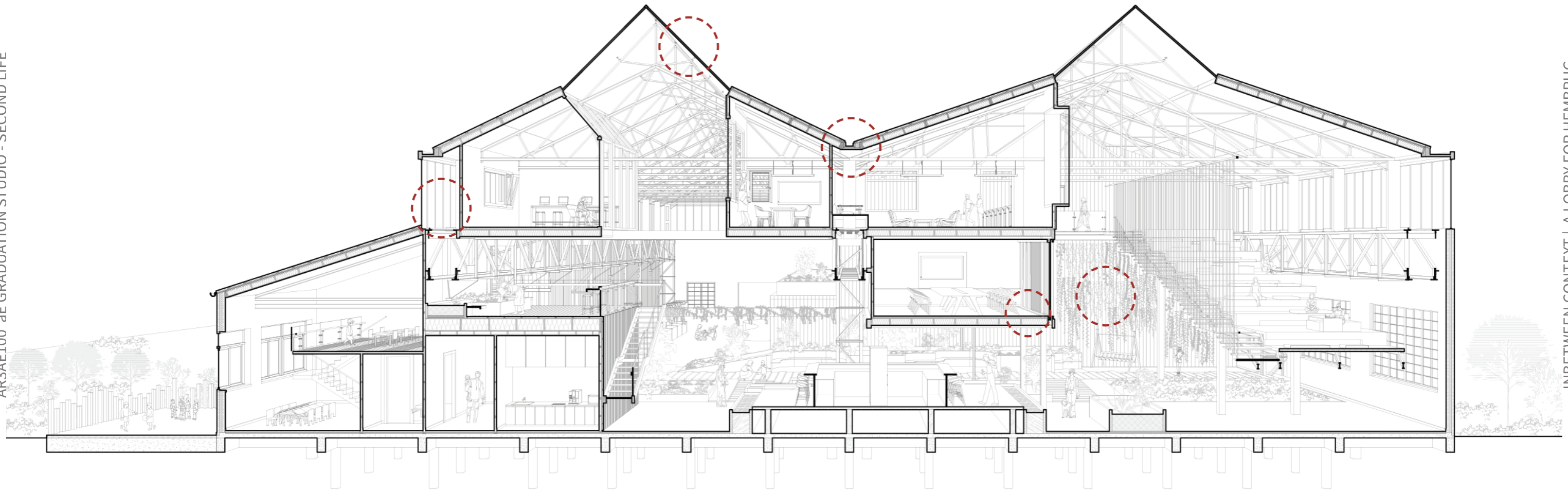


AR3AE100 aE GRADUATION STUDIO - SECOND LIFE

INBETWEEN CONTEXT | A LOBBY FOR HEMBRUG

CLIMATE DESIGN

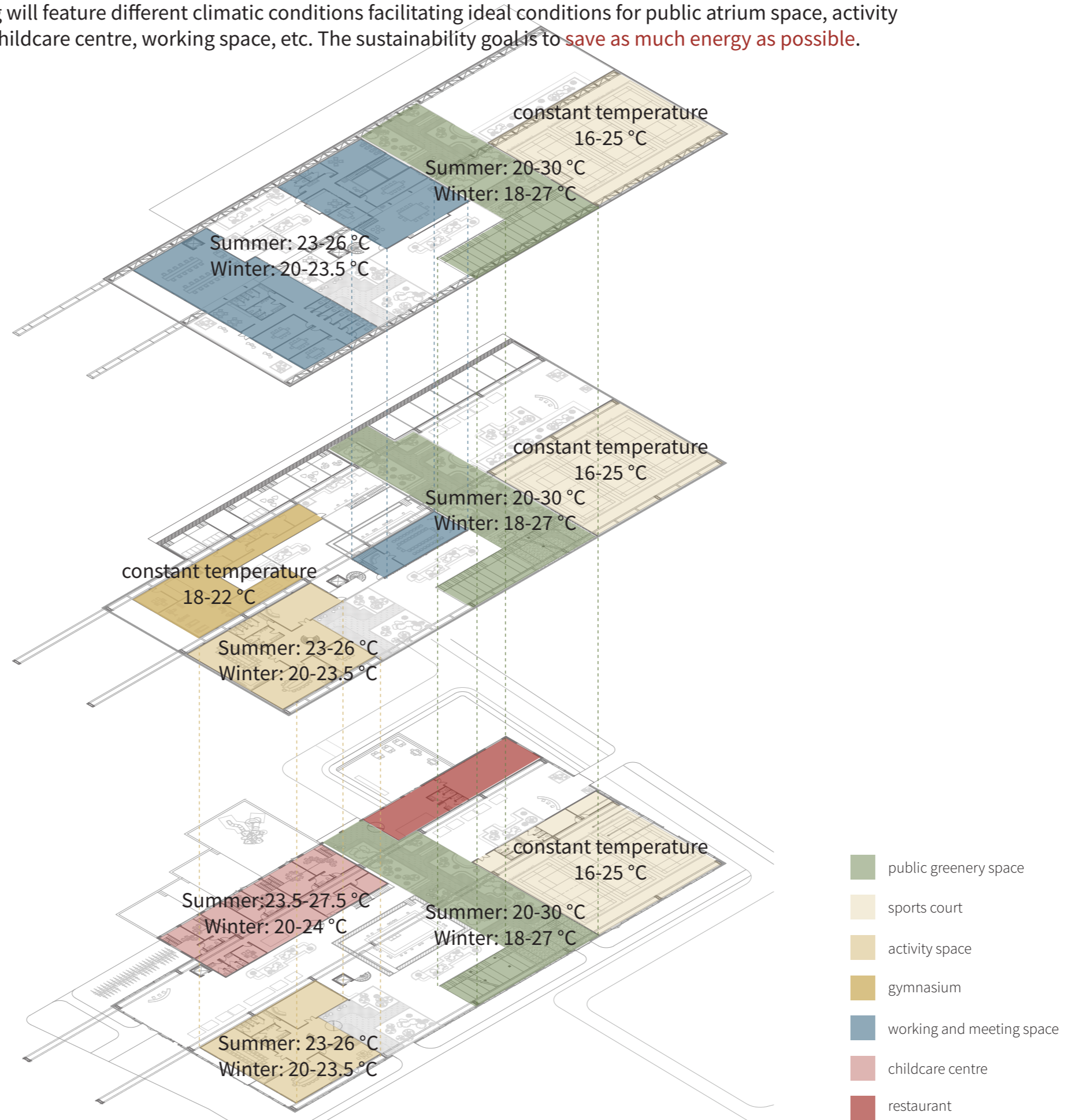
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IN BETWEEN CONTEXT | A LOBBY FOR HEMBRUG

CLIMATE ZONE

The building will feature different climatic conditions facilitating ideal conditions for public atrium space, activity space, childcare centre, working space, etc. The sustainability goal is to **save as much energy as possible**.

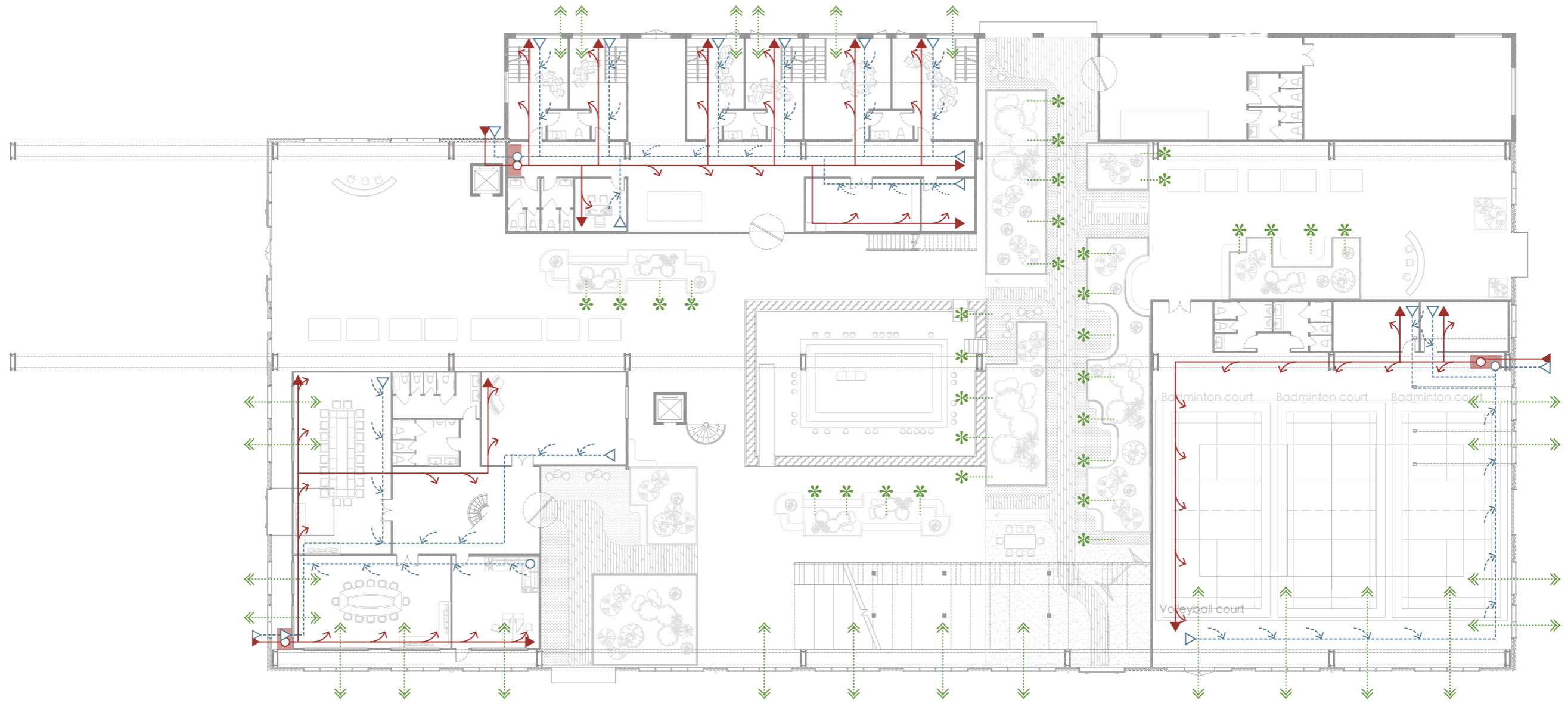


VENTILATION SYSTEM

groundfloor plan

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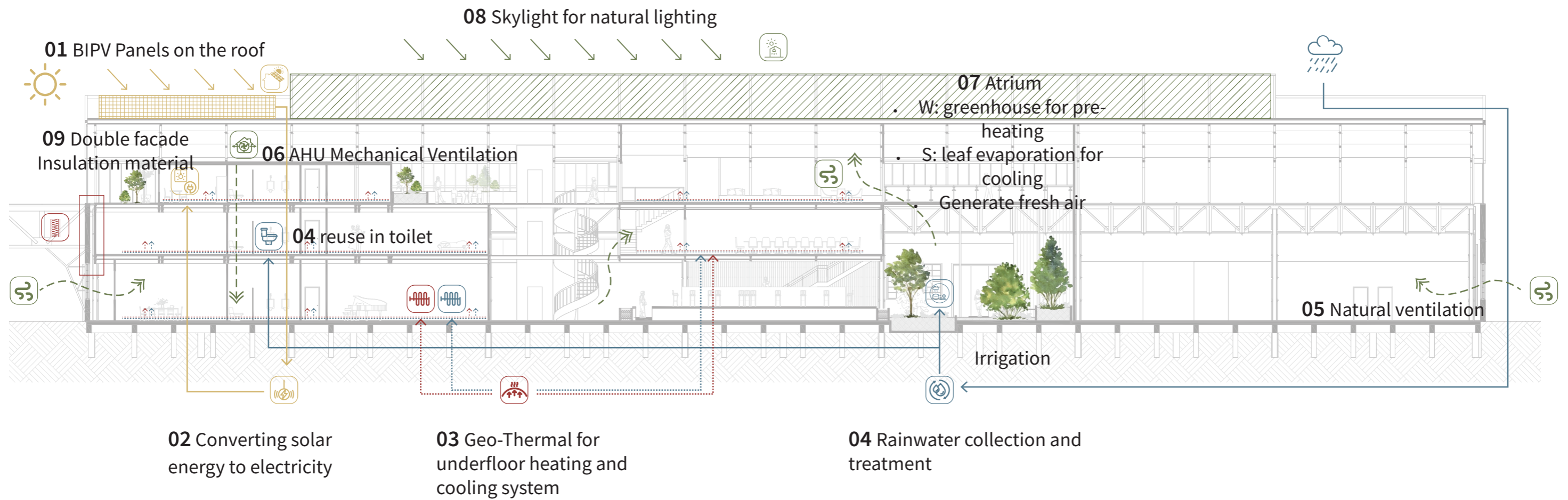
INBETWEEN CONTEXT | A LOBBY FOR HEMBRUG



- Fresh air
- Natural ventilation
- Used air exhaust
- Fresh air inlet

SUSTAINABLE STRATEGY

AR3AE100 aE GRADUATION STUDIO - SECOND LIFE



INBETWEEN CONTEXT | A LOBBY FOR HEMBRUG

CHAPTER 04

- CONCLUSION & REFLECTION -

Research To Design

RESEARCH PHASE

Problem Statement

- industrial buildings had remained the situation of vacancy since the late 1970s
- sustainable development

Main Research Question
How to choose a suitable strategy for renovating an industrial heritage building?

Sub Question 01
What potential reconstruction strategies can be used during the renovation process?

Sub Question 02
What are the possibilities of the spatial order between new intervention and existing building?

Sub Question 03
How to achieve the balance between renovation and preservation?

Step 01
Concept Design
Climate position

Step 02
Program Design

Step 03
Strategy Selection
structure/facade/material/insulation

Step 04-1
Architecture Design

Step 04-2
Building Technology Design

-BT Research-
Girder Size/Joint Connection/
Material_kerto-Ripa /Windows
System/Climate

Elaborated Design

-Method-
Case Study

-Method-
Comparative Analysis
Descriptive Research

-Method-
Design Research
urban context/history/
situation/ position/etc.

Design principle

- Sustainability (both social and environmental)
- Spatial Quality (in-between greenery space)
- National Monument Position

Guidance & Reflection
-Original Building Situation Research-
structure research

Research Findings
Building-Within-A-Building
Building-Beyond-A-Building
Building-On-A-Building

Research Application
bottom-up/top-down
position/size/program
Page 14-16

FINAL PROJECT

RESEARCH PHASE

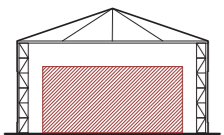

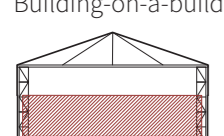
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AR3AE100 aE GRADUATION STUDIO - SECOND LIFE

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 Building-within-a-building	Maximum restoration Reversible	Restore and Renovate	Restore	Emphasize the contrast	Self-contained and generate climate buffer
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 Building-on-a-building	Make the most use of the original building Adaptive	Restore and Renovate Redesign (functional leading and retain characteristics)	Reuse Restore Add new system	Reuse Recycle Introduce new materials	Create climate buffer Introduce new system Detail design of facade

Sub Question 03

How to achieve the balance between renovation and preservation?

-Method-

Design Research

urban context/history/situation/ position/etc.

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Elaborated Design

Research Findings

Building-Within-A-Building
Building-Beyond-A-Building
Building-On-A-Building

+

Research Application

bottom-up/top-down
position/size/program
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FINAL PROJECT

INBETWEEN CONTEXT | A LOBBY FOR HEMBRUG

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FINAL PROJECT

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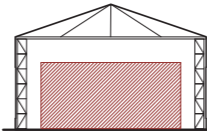
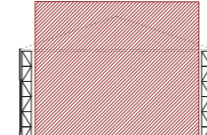
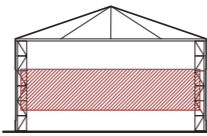
Guidance & Reflection
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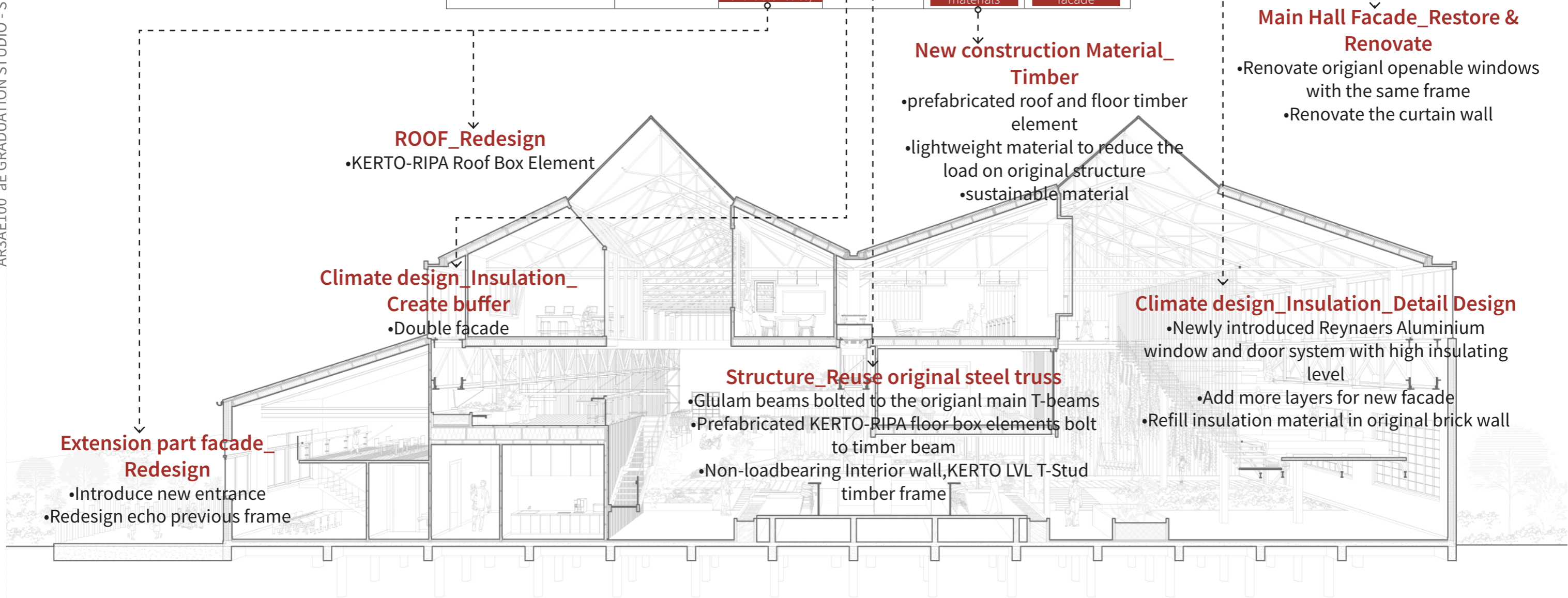
FINAL PROJECT

RESEARCH TO DESIGN

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INBETWEEN CONTEXT | A LOBBY FOR HEMBRUG



REFLECTION

Research

Develop more layers of the strategy, like moisture insulation, etc.

Design

Monument situation should not be a limitation of design. We need to find breakthroughs and discover more possibilities through continuous research

BT

The design of architectural details is not only to make the project can be built, but also to help to create space quality

••• •••

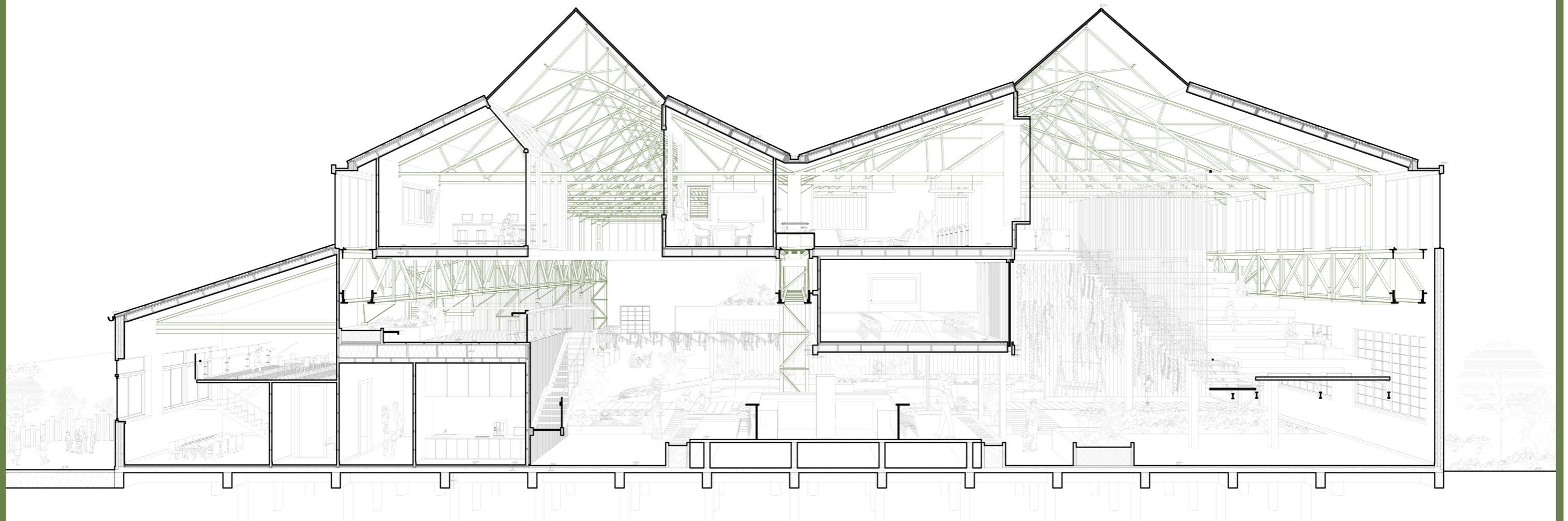
HEMBRUG

InBetween Context | A lobby for Hembrug

SUSTAINABLE REPURPOSE OF INDUSTRIAL HERITAGE BUILDINGS

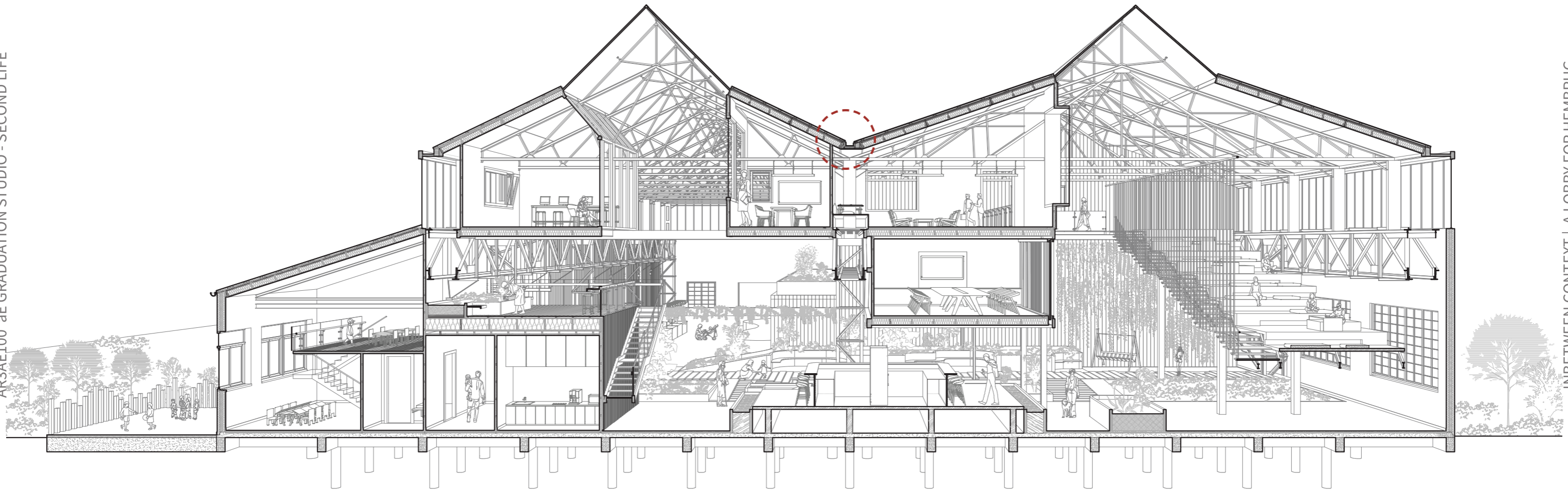
- Dank u wel! 谢谢! Thank you! -

- Jiahui Yan June, 28th, 2022 -



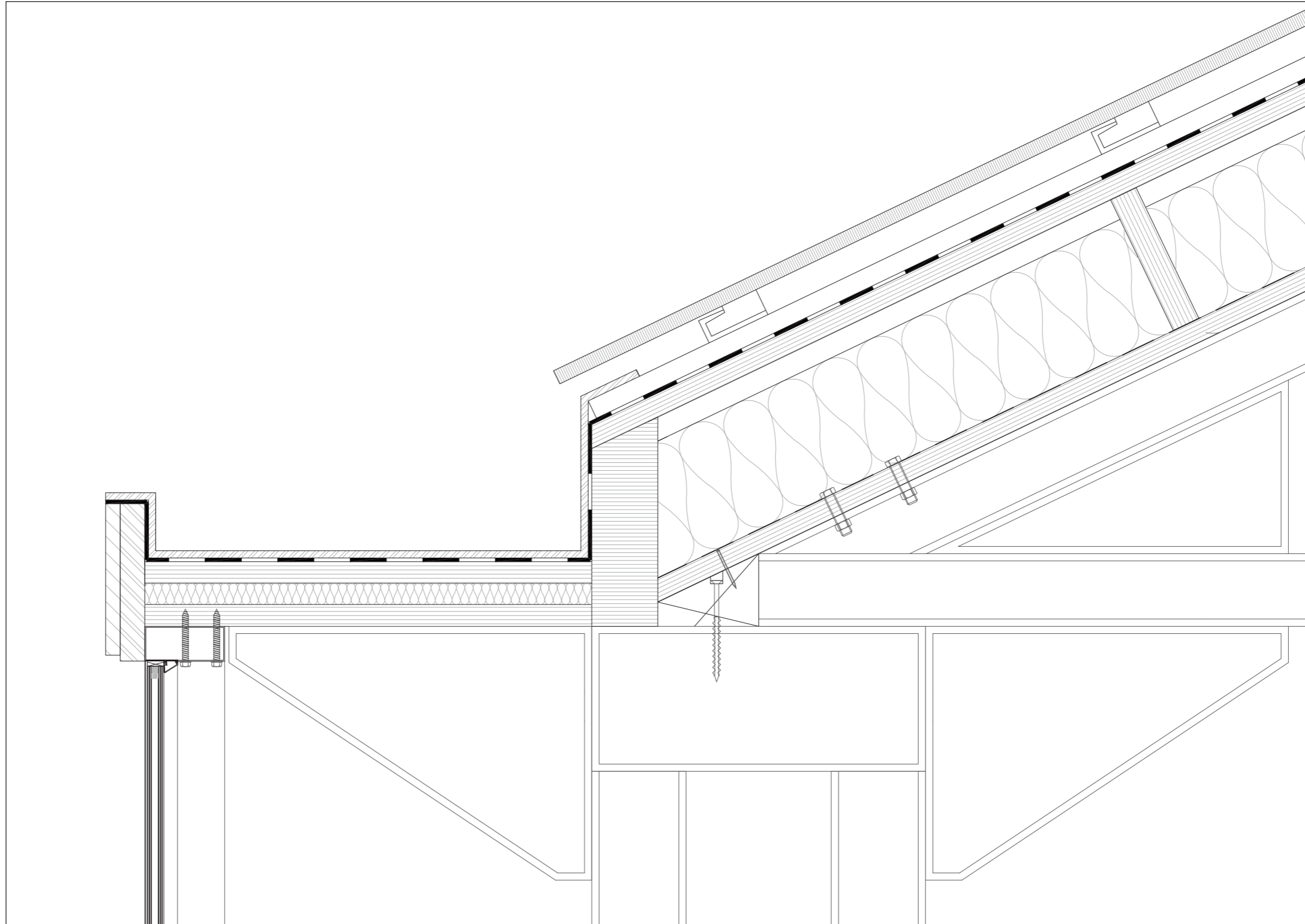
ROOF REDESIGN

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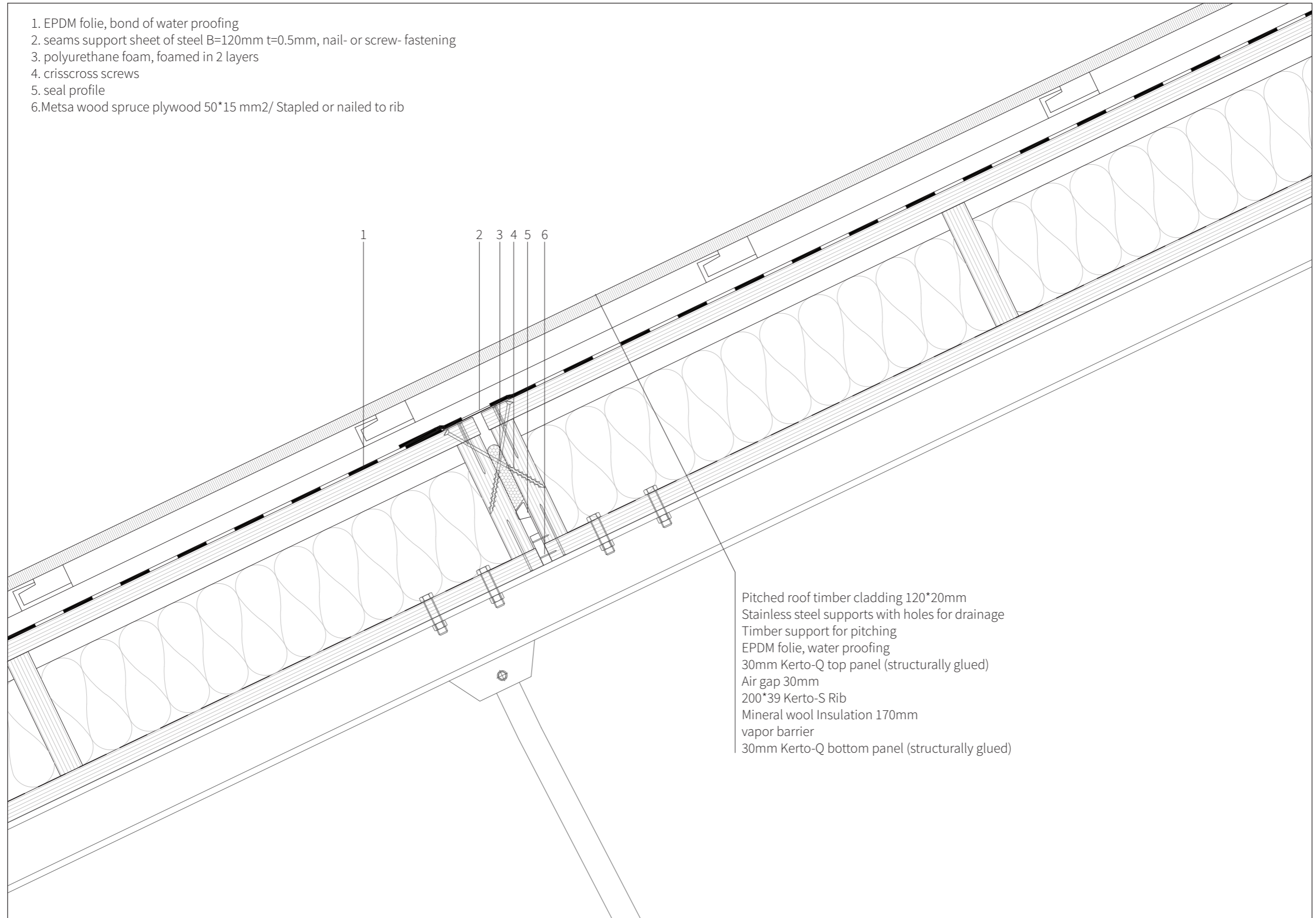
INBETWEEN CONTEXT | A LOBBY FOR HEMBRUG

GUTTER DETAIL 1:5



ROOF ELEMENT CONNECTION DETAIL 1:5

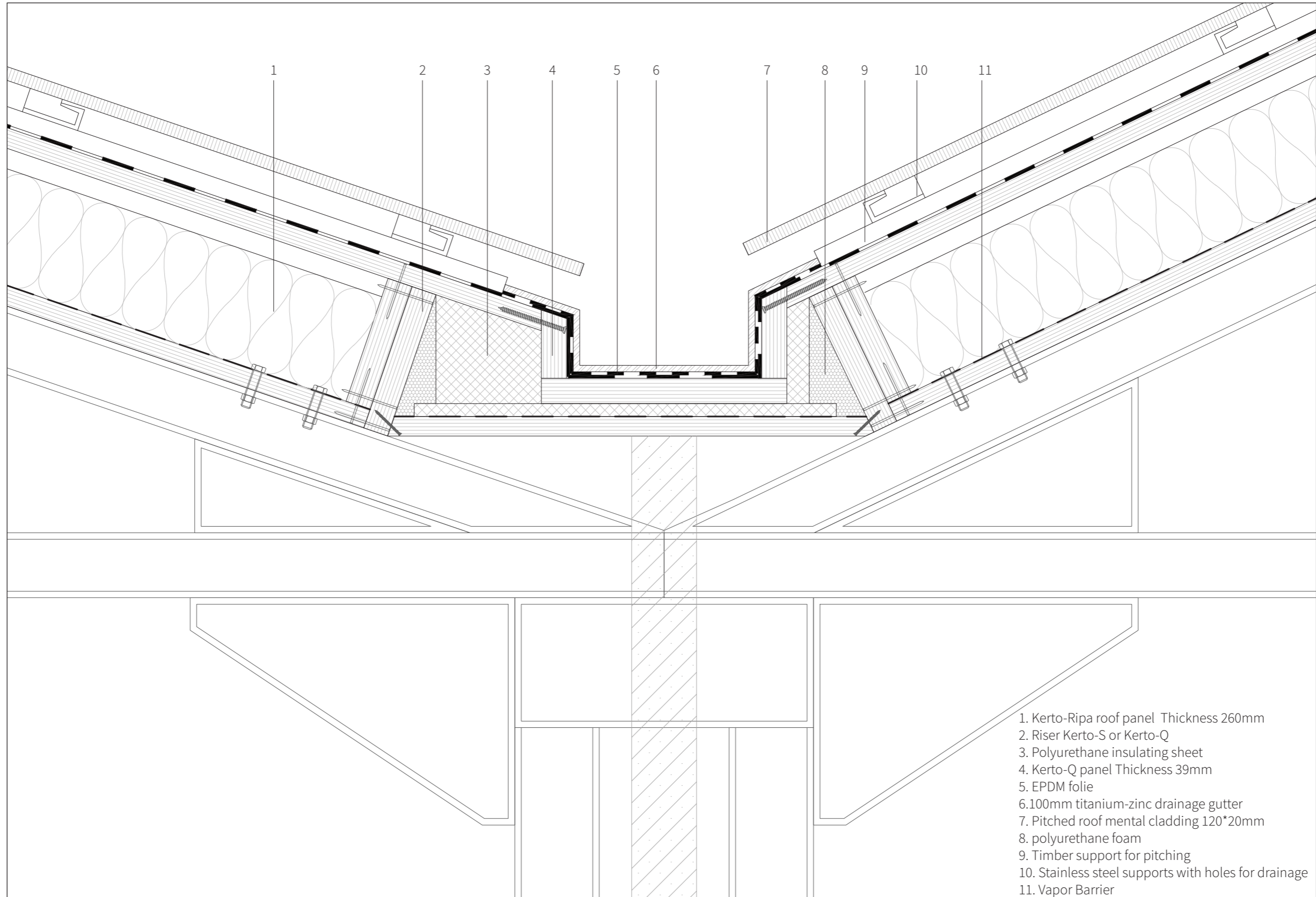
1. EPDM folie, bond of water proofing
2. seams support sheet of steel B=120mm t=0.5mm, nail- or screw- fastening
3. polyurethane foam, foamed in 2 layers
4. crisscross screws
5. seal profile
6. Metsa wood spruce plywood 50*15 mm²/ Stapled or nailed to rib



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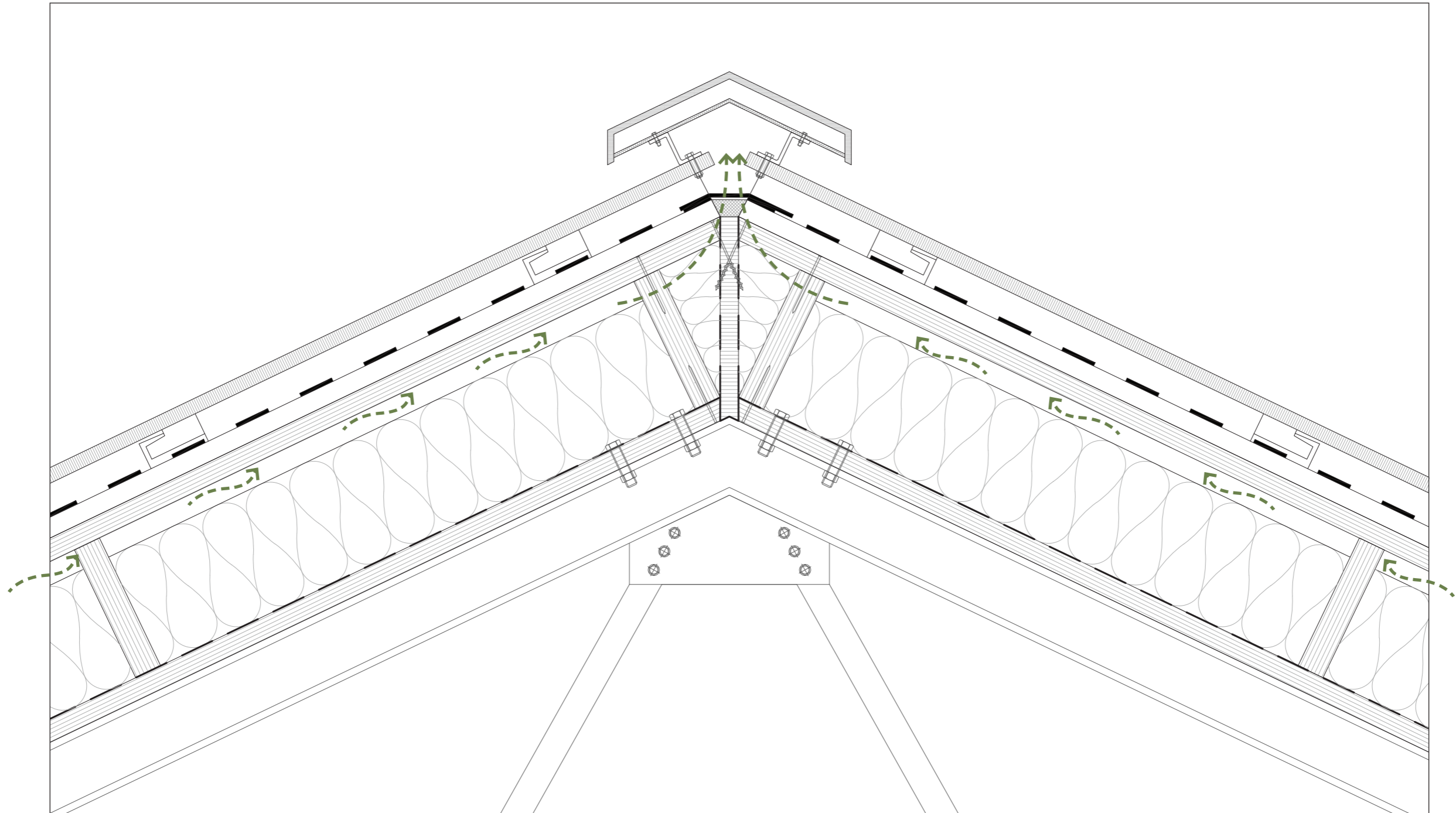
INBETWEEN CONTEXT | A LOBBY FOR HEMBRUG

GUTTER DETAIL 1:5



1. Kerto-Ripa roof panel Thickness 260mm
2. Riser Kerto-S or Kerto-Q
3. Polyurethane insulating sheet
4. Kerto-Q panel Thickness 39mm
5. EPDM folie
6. 100mm titanium-zinc drainage gutter
7. Pitched roof metal cladding 120*20mm
8. polyurethane foam
9. Timber support for pitching
10. Stainless steel supports with holes for drainage
11. Vapor Barrier

RIDGE DETAIL 1:5



AR3AE100 aE GRADUATION STUDIO - SECOND LIFE

INBETWEEN CONTEXT | A LOBBY FOR HEMBRUG