



HERITAGE AND ARCHITECTURE GRADUATION STUDIO  
HEMBRUG TERRAIN

# PAVILIONS IN THE WOODS

THE UNINTENDED BEAUTY OF DEALING WITH EXPLOSIVES





01

HEMBRUG

2374.









**Zaandam**

2,5km

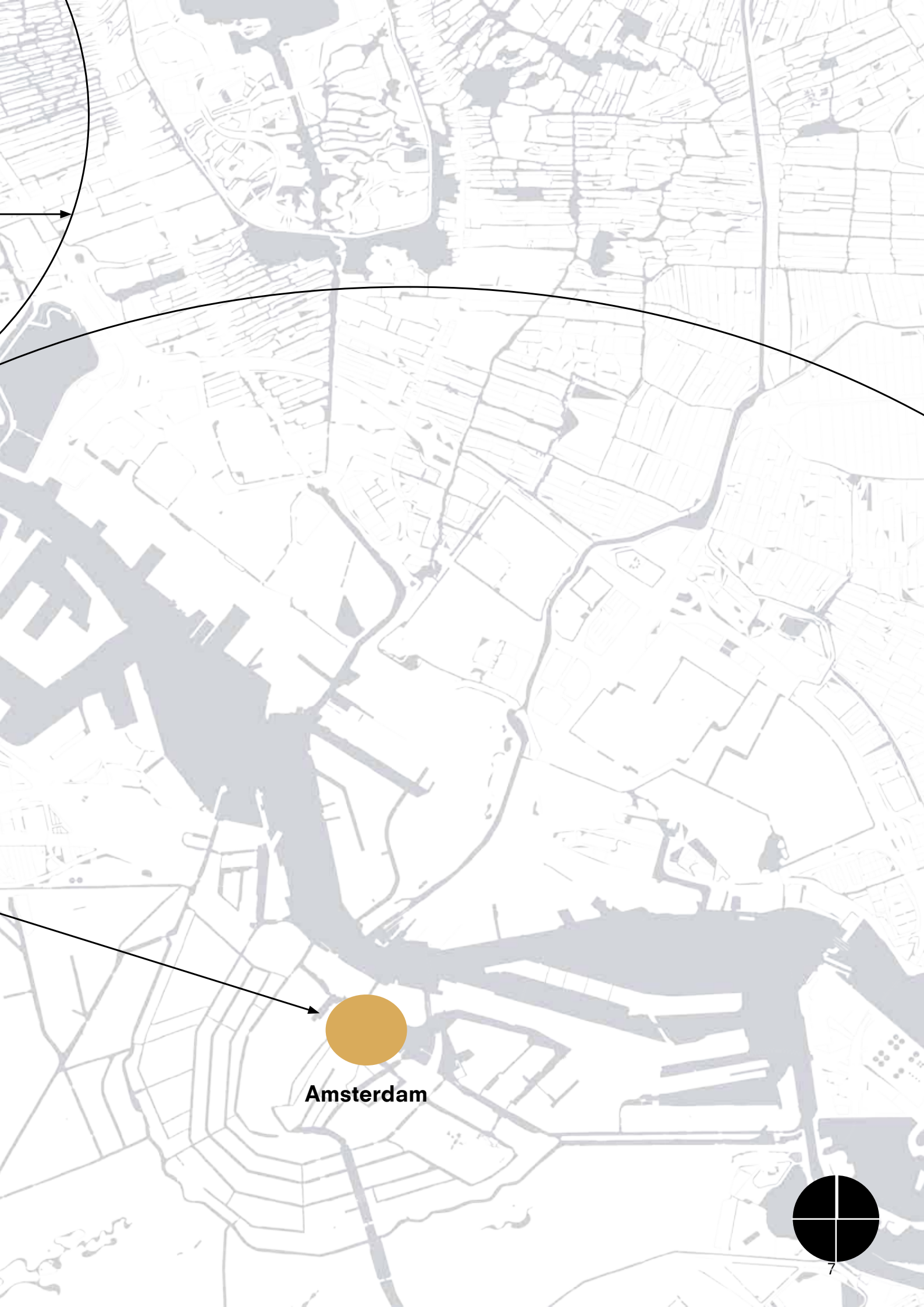
**Hembrug**

**'Stelling van Amsterdam'**

6km

**Amsterdam**





**Amsterdam**







**IMPRESSIONS**



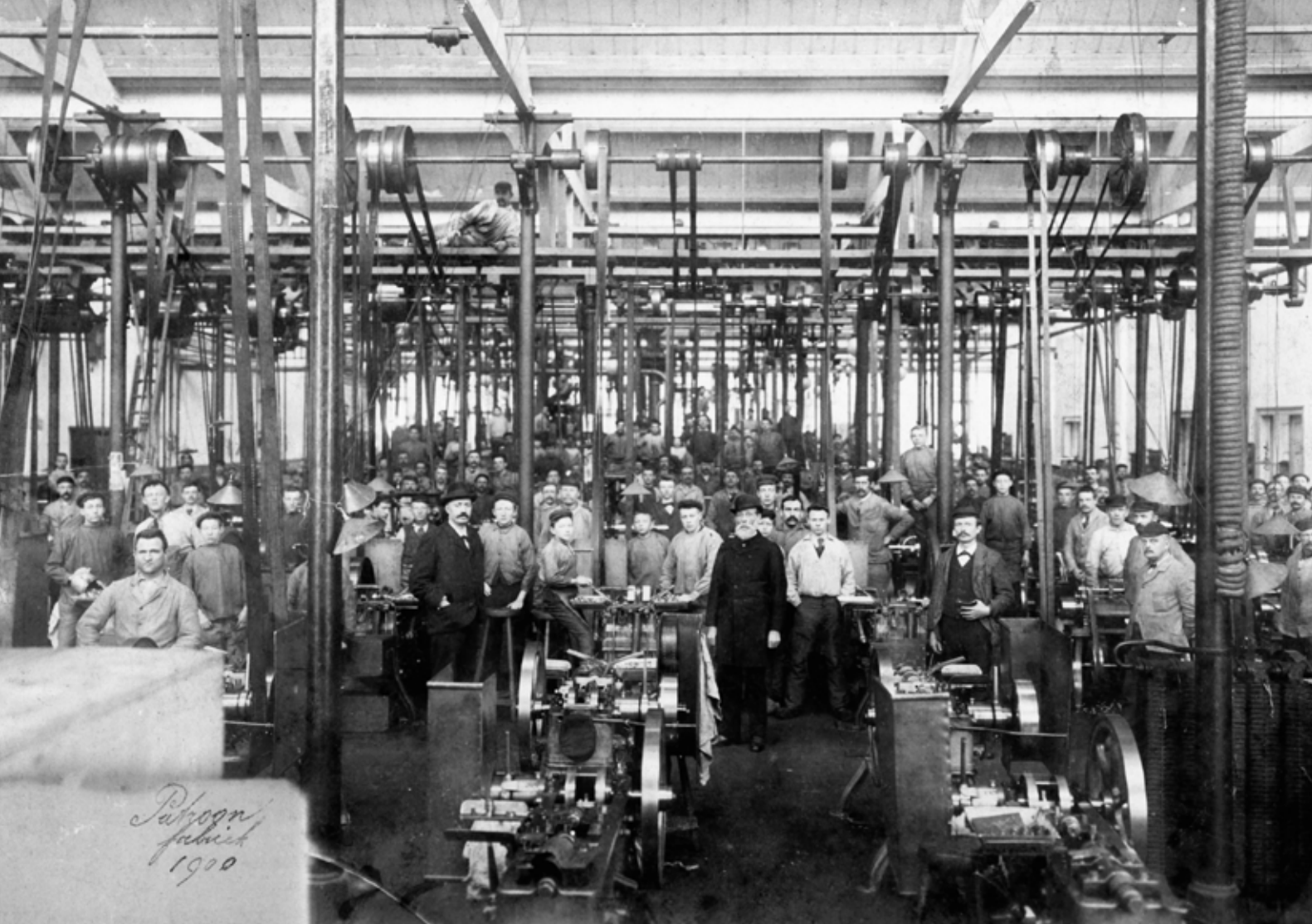
**FORMAL - PRESTIGIOUS - INNOVATIVE - SEC**





RECY - EXPLORATION - UNEXPECTED



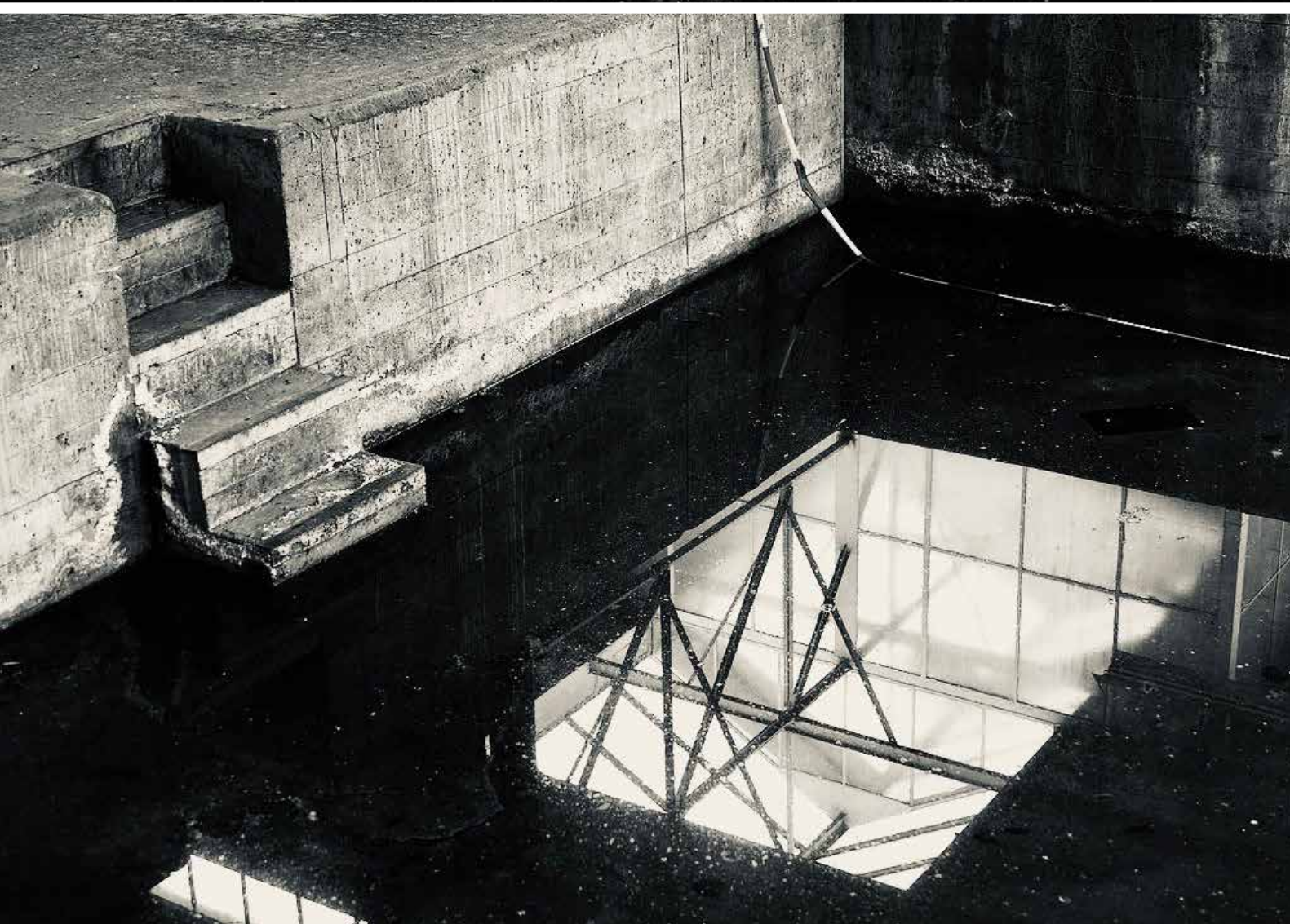


**MILITARY FACTORY CA. 1900**













**AFTER WWII...**









**...TIMELESS**





**DECAY - RUINS**





- WILD NATURE



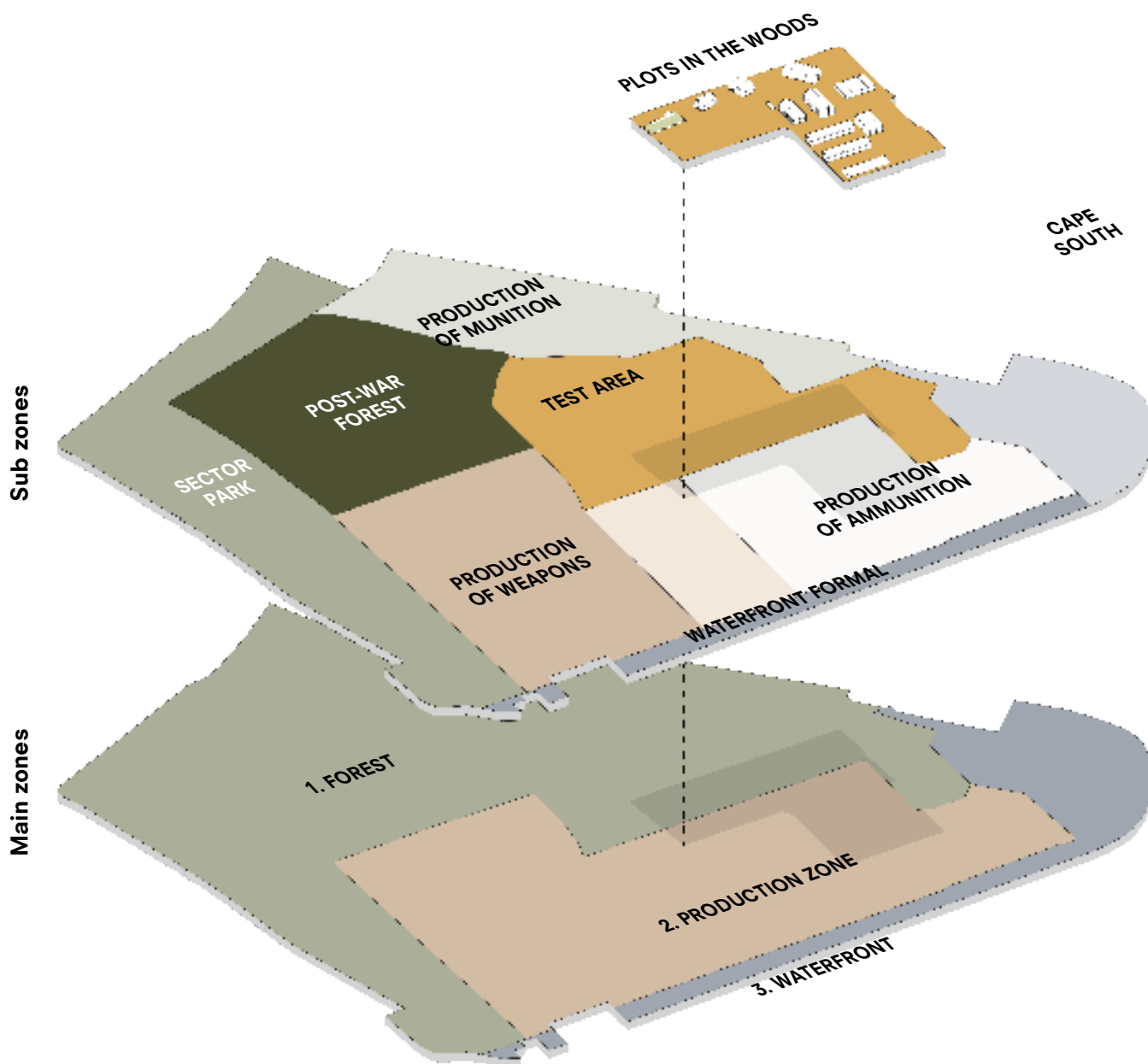


Fig. 1.1 Zones of Hembrug





Fig. 1.4 Hembrug terrain



## Hembrug area



Unique area and military heritage



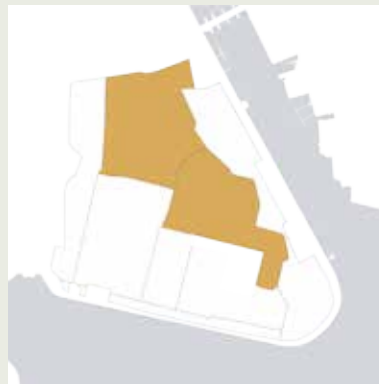
Made public in 2003



Situated between Zaandam and Amsterdam



Fig. 1.5 Plofbos



## 1. Forest Zone



Natural environment / spacious



Contrast/transition



Small scale



Fig. 1.2 Production zone



## 2. Production Zone



High diversity



Clustering of buildings



Presence of the main structures/sight lines



Fig. 1.3 Waterfront



## 3. Waterfront



- Monumental / iconic



Greenery along quay

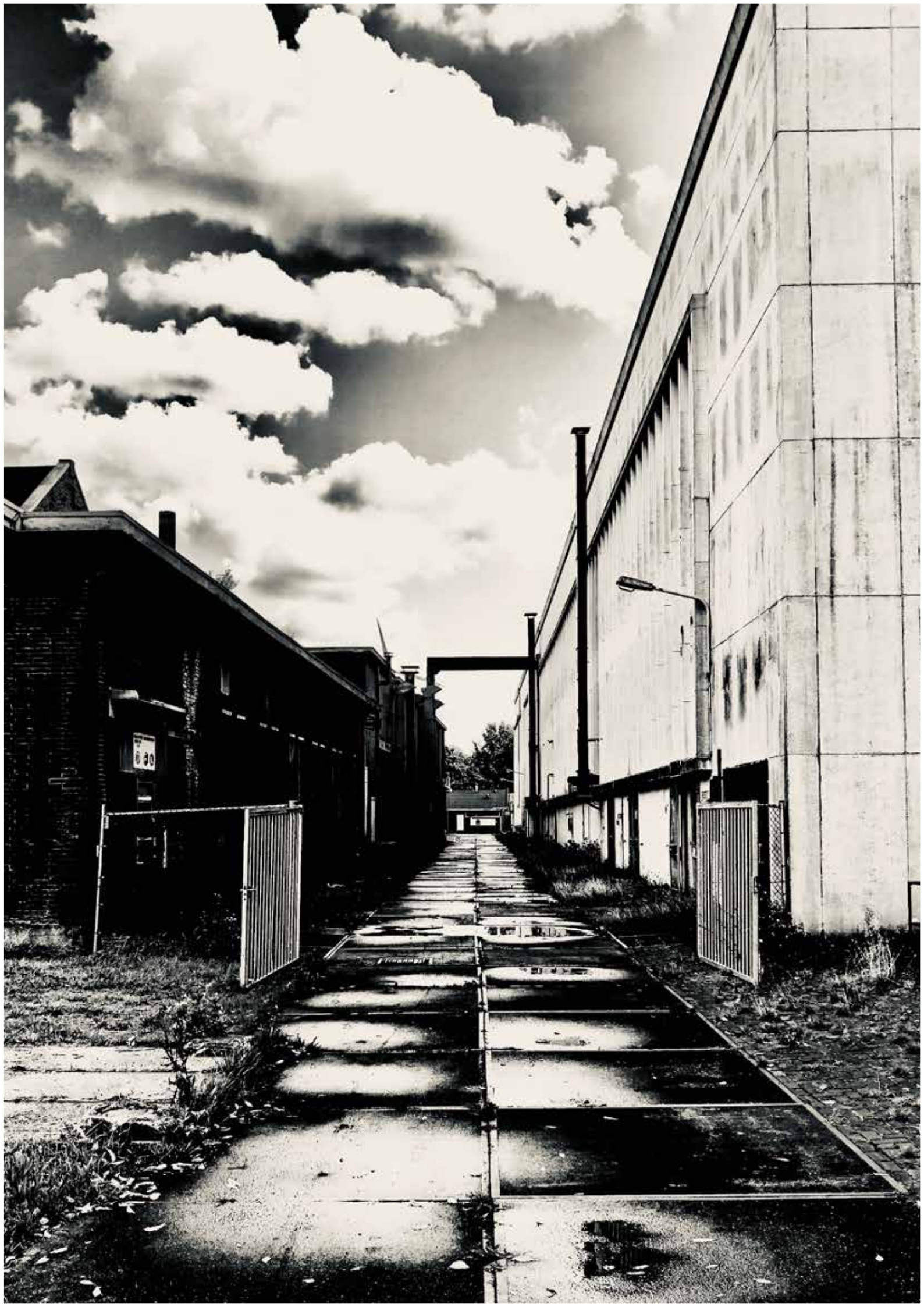


Parallel to the Noordzee Kanaal



















# THE PAVILIONS





# IN THE WOODS























































02

ANALYSIS /CULTURAL VAL





LUES



## 02 ANALYSIS

*“How did practical military design  
of a forest-villa*

*What was the design approach b*

*What are the characteristic traits of Plofb*



# ANALYSIS

*design yield unintended qualities  
age in Plofbos?”*

*behind the planning of Hembrug?*

*os and how did they come into existence?*



# THE FUNCTION

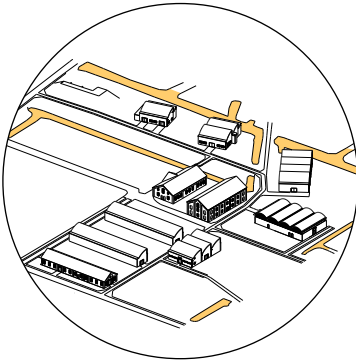


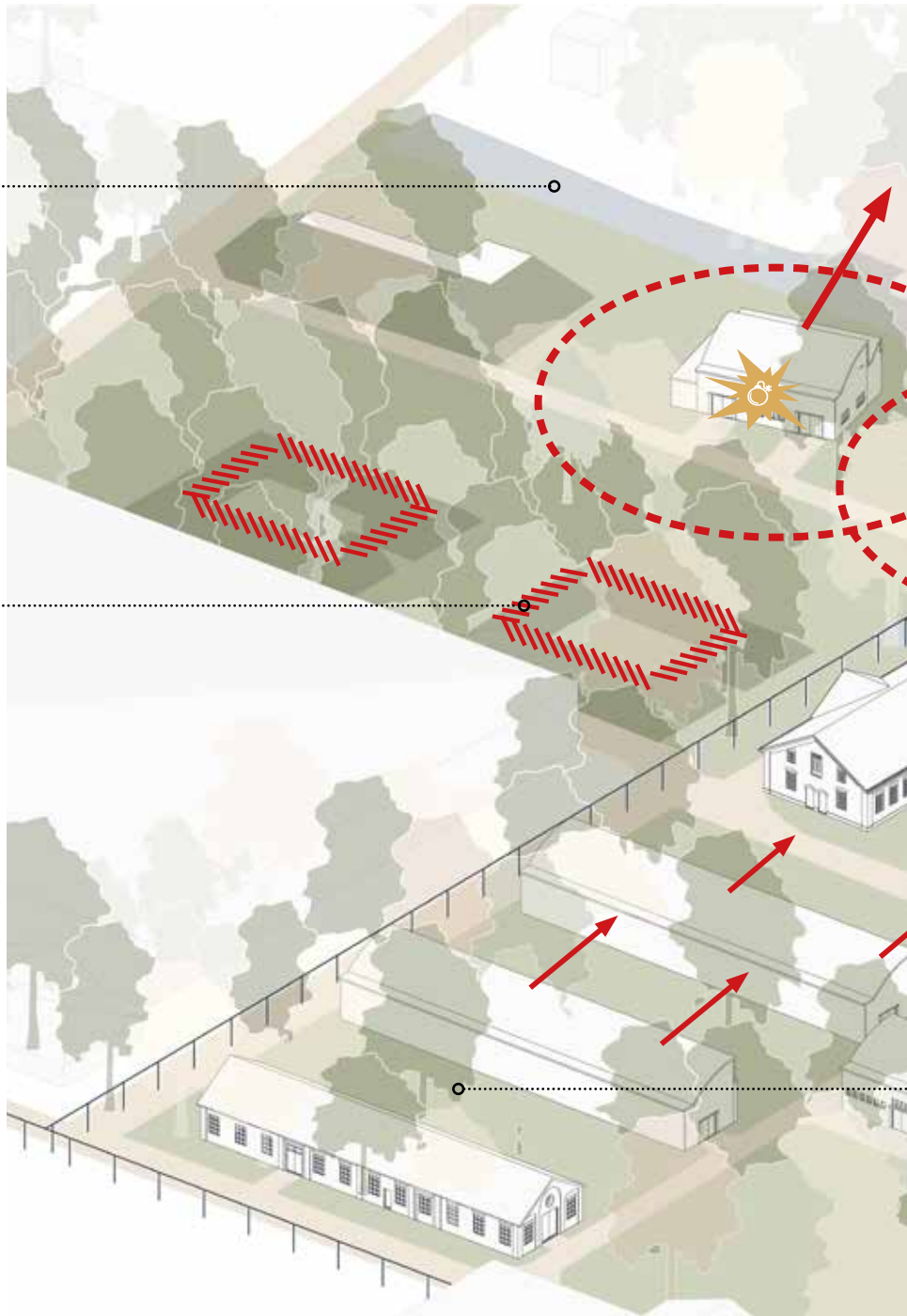
Fig. 2.1 Canal system as fire compartments



Fig. 2.2 Earth walls to sustain blast impact



Fig. 2.3 Pipelines providing steam to heat the buildings, instead of flammable gas





# NAL ASSESTS

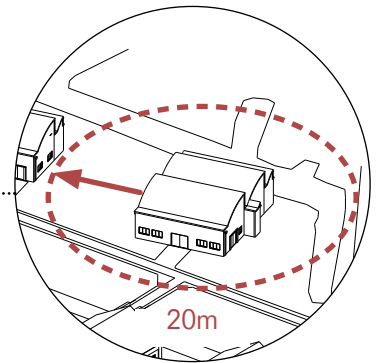
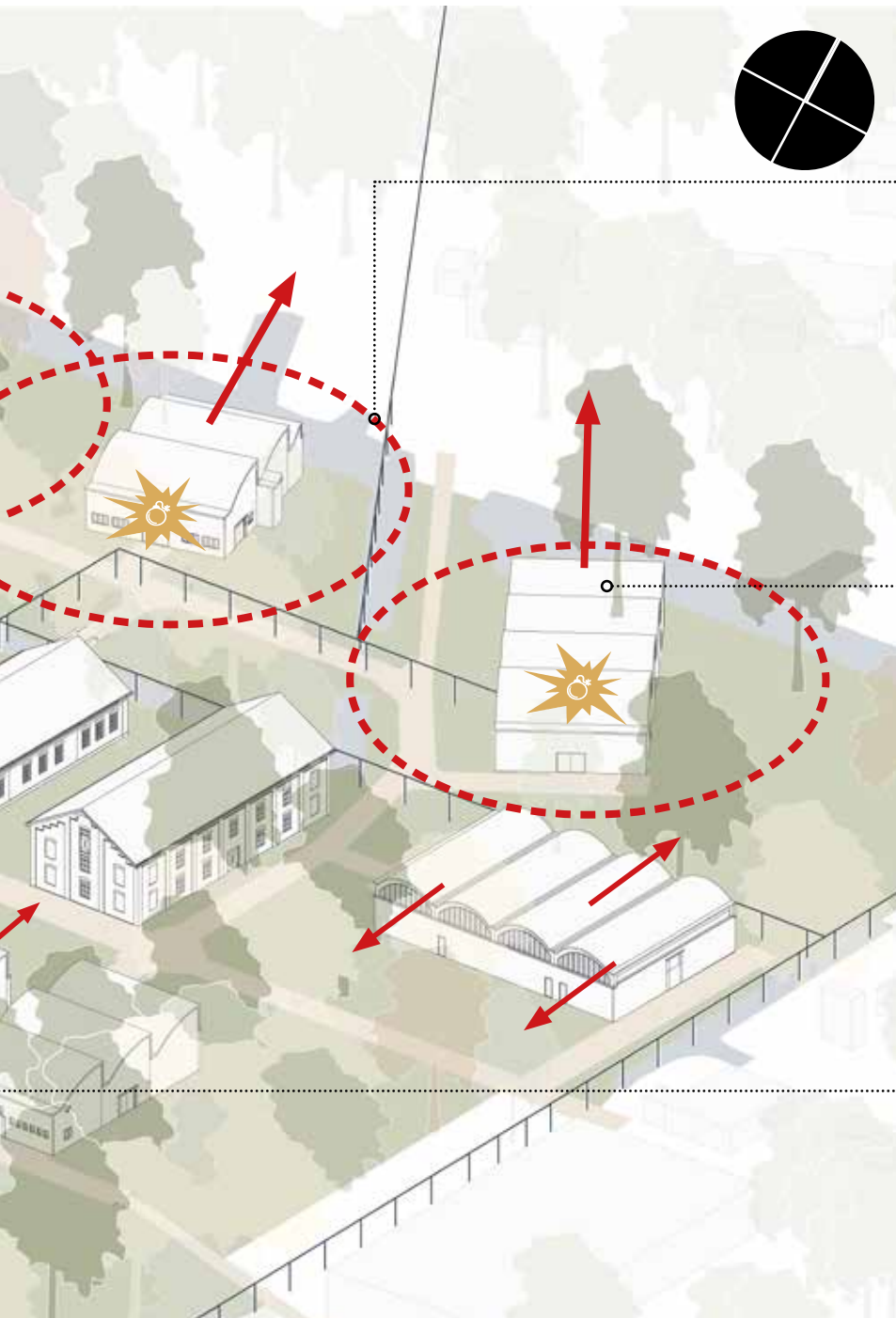


Fig. 1.8 Blast radius

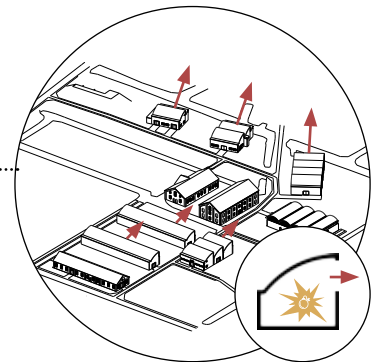


Fig. 1.6 Directing potential

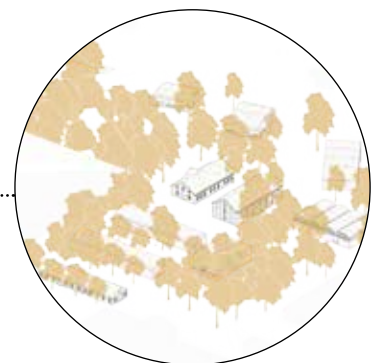


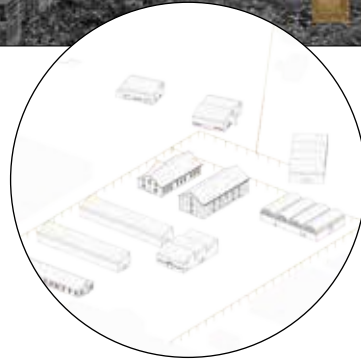
Fig. 1.7 Tree lanes for camouflage



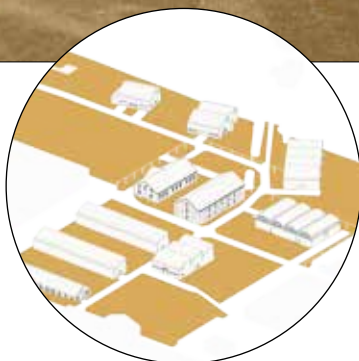
## Lightning catchers



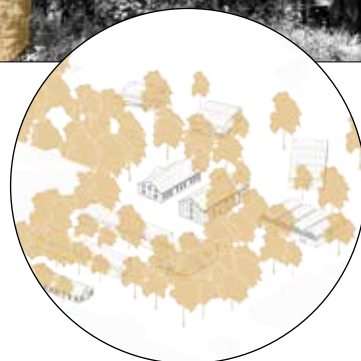
## Pipelines



## Open Space



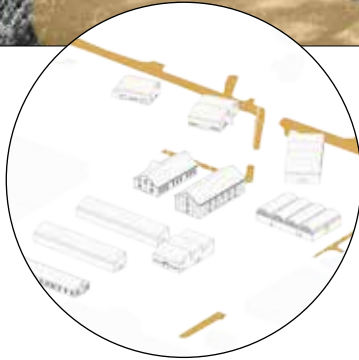
## Trees



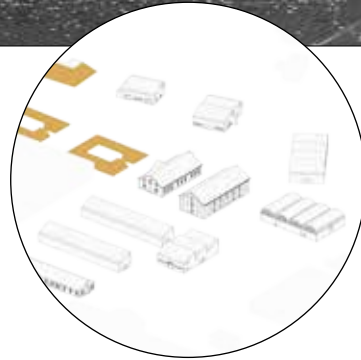


# ENTS

**Creeks**



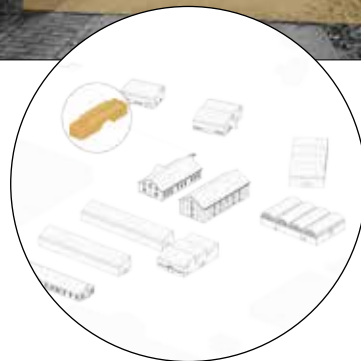
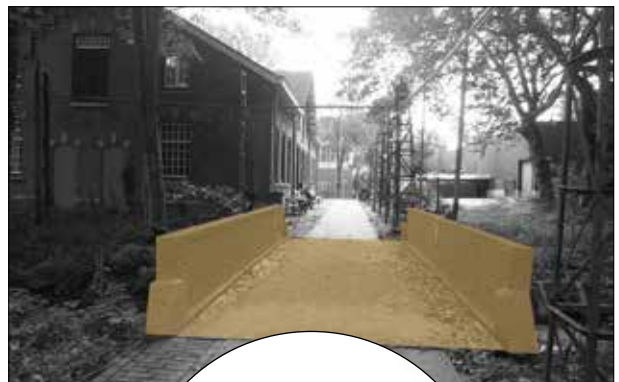
**Earthen walls**



**Path / Sequences / Sight lines**



**Bridge**







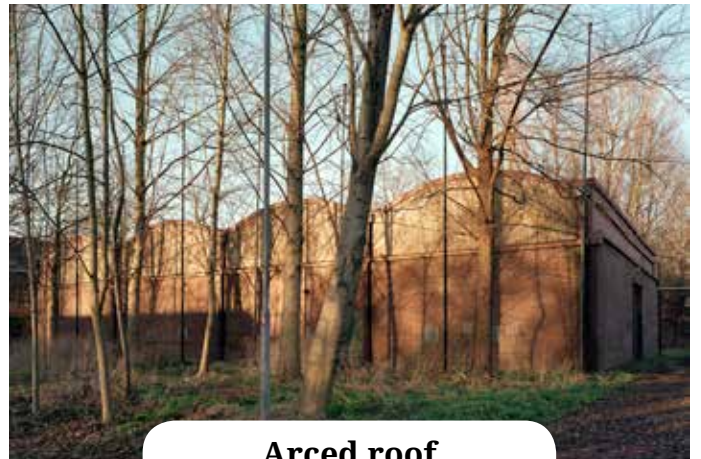
**Monuments  
Anno 1900**



**Hidden behind  
greenery**



**Open space in  
between buildings**



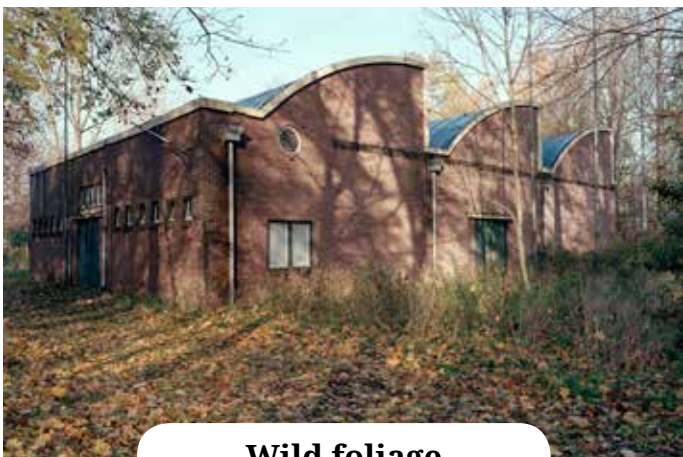
**Arched roof**



**Shell roofs  
Anno 1950**



**Paths through forest**



**Wild foliage**



**De Grote Boerderij**





**Secluded**



**Wild**



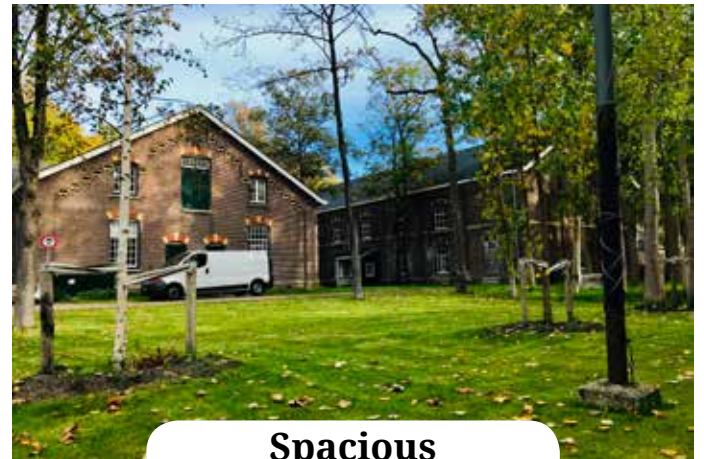
**Idyllic heart**



**Transition zones**



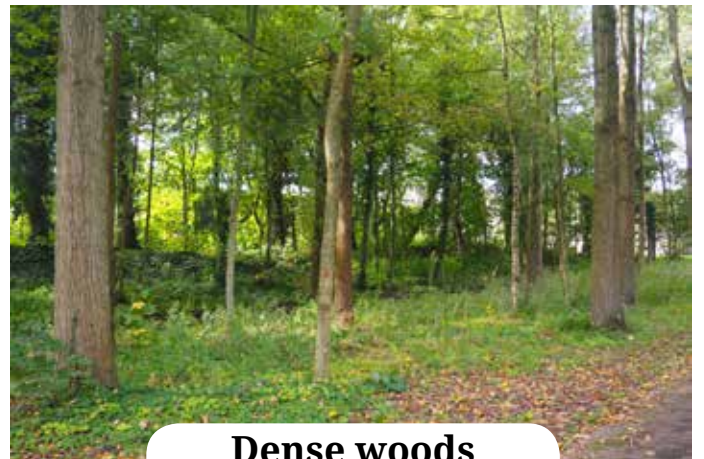
**Compactness**



**Spacious**



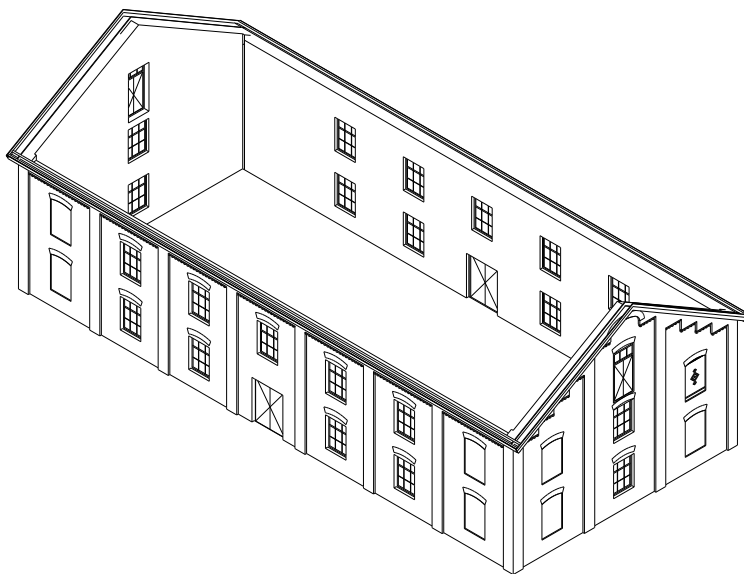
**Lane of trees**



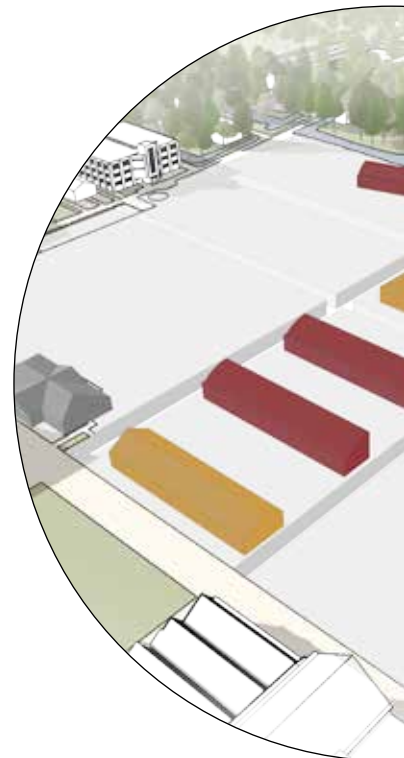
**Dense woods**



# FARM'S AND S

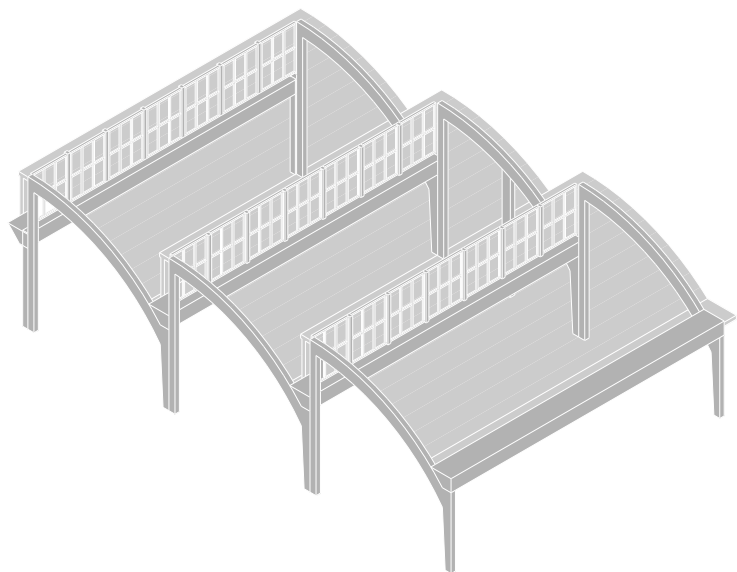


1900's series





# SHELL-ROOFS



1950's series





**03**

## **GRADUATION PLAN**







## 1.3 Target group

With better health care, advanced medicine, and increased technology, we as a population can become much older. On top of that has come the strong influx of baby boomers now in their elderly stage. Many of them require assistance and care. Care in such an amount we as a society can't cope with. Fewer people need to take care of more. This requires intelligent interventions of which architecture can be of assistance with. It should help to make it possible for elderly people to live on their own for a longer period of time, so they require less assistance. However, another aspect especially elderly people deal with is loneliness and therefore their mental well-being.

The Pavilions in the woods, with its natural atmosphere offers an ideal environment for the aging elder. Living in a natural environment could improve the overall well-being of the individual, opposed to living in an urban environment. Yet, especially elderly, suffer from loneliness, fear or depression. These problems demand another solution from the transformation on a bigger scale of program that deal with the mental well-being of the individual. It can be contested by hosting communal activities for the elderly, as well as to stimulate them to exercise and to do communal activities such as gardening, bike rides or hikes through the forest. However, all these activities need to be organized and taken care of, so who is going to put in the effort? Another growing problem in the Netherlands is the huge housing shortage, especially in the Randstad. Mostly young starters are not able to afford an acceptable house. Within the two major cities Zaanstad and Amsterdam, Hembrug could offer an interesting alternative for those seeking a house. With the former mentioned elderly target group in mind, it is the idea to mix these young starters, families, and individuals together with the elderly. Together they will form a community, where people will focus on participation, hosting communal activities and help their elder neighbours. Whether it be small chores such as

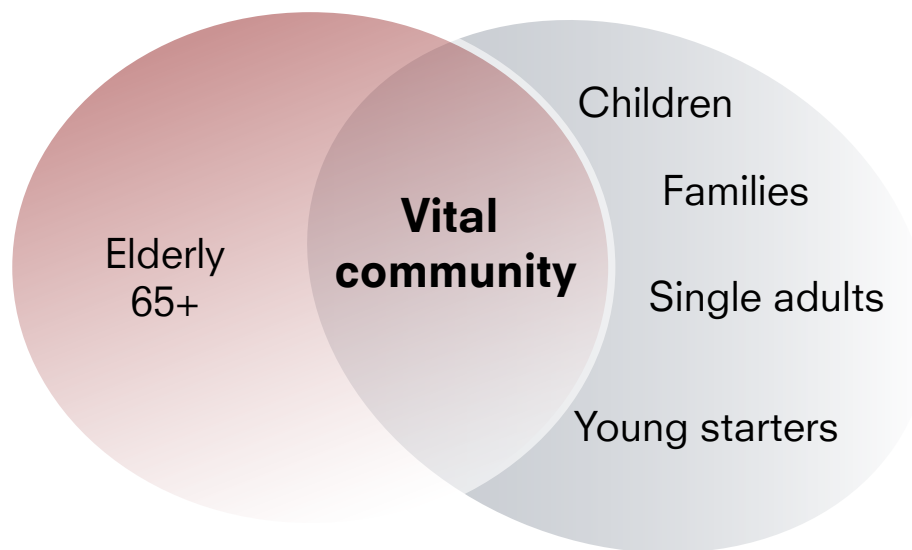


Fig. 3.1 Target group

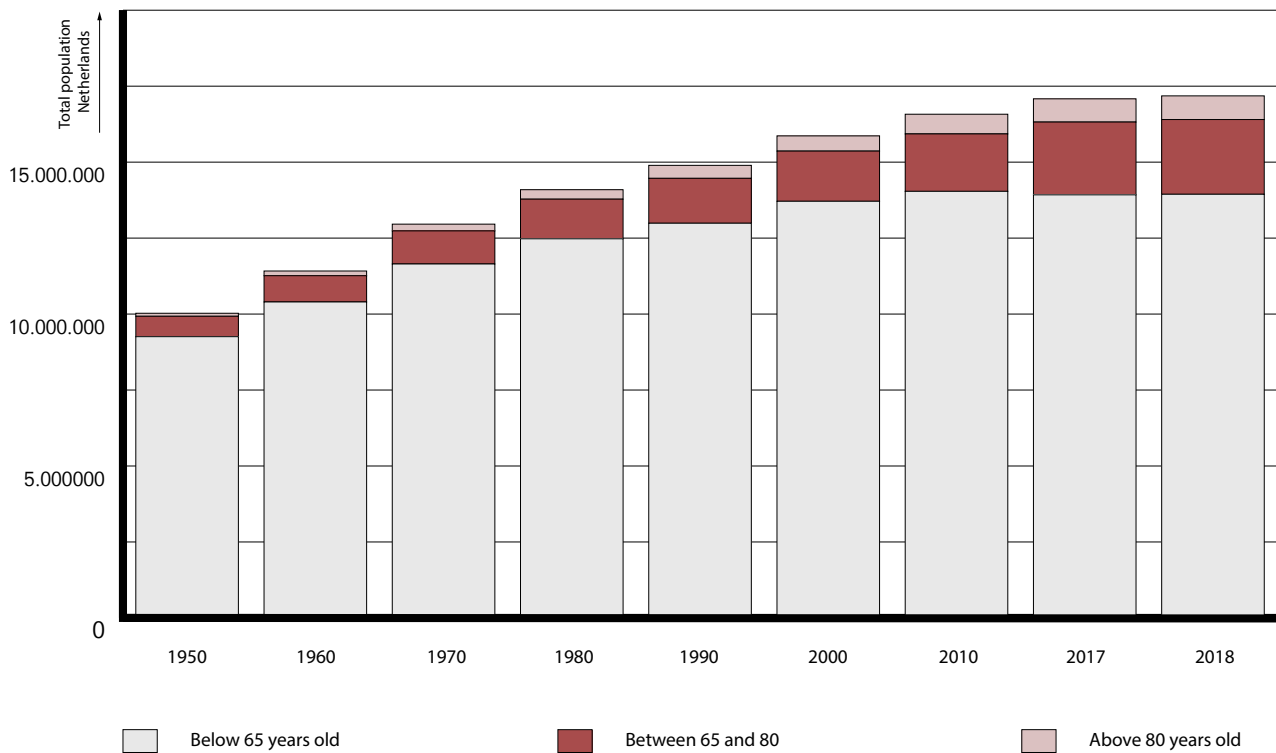
**“Expected growth towards 2.6million elderly above 75 in the Netherlands by 2040 (double as of today).”**

NU.NL - Article post: 9th of January 2019

<sup>1</sup> <https://www.nu.nl/binnenland/5672549/aantal-mantelzorgers-ouderen-loopt-in-hoog-tempo-terug.html>



## Demographic growth in the Netherlands



<sup>2</sup>Centraal Bureau Statistiek, accessed on dec. 6th, 2018

## Self-reliance

Self-reliance is the ability of the elder to function independently and is in control of his/her daily life.



<sup>3</sup> <https://www.ouderenfonds.nl/activiteiten/eenzaamheid>



# RESEARCH

*How did practical military design  
of a forest-village*

*“How can the existing buildings of the PL  
elderly can live more independently and with  
porting com*



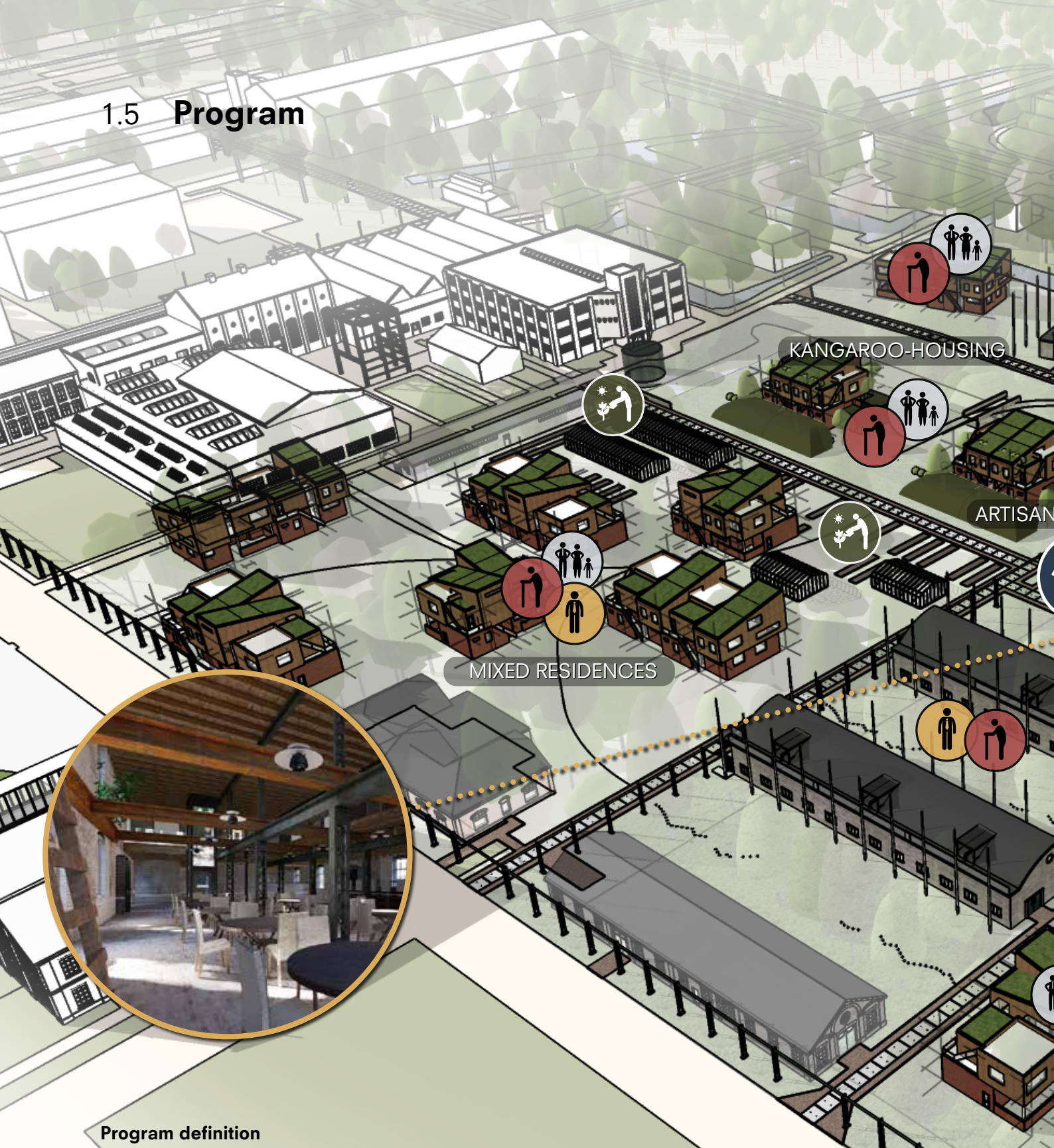
# QUESTION

*sign yield unintended qualities  
age in Plofbos?*

*ofbos be transformed sustainably, where  
which stimulates the settlement of a self-sup-  
community?”*



## 1.5 Program



KANGAROO-HOUSING

ARTISAN

MIXED RESIDENCES

### Program definition



ELDER, 65+



FAMILY



SINLE ADULTS

ARTISANS' WORKSHOP



- DRAWING,
- PAINTING,
- TAILORING,
- KNITTING,
- POTTERY,
- WOODWORK,
- FABLAB

CONTEMPLATION HALL



- CO
- ME
- LE
- WE
- ME
- AR





GIARTRIC DOCTOR

CONTEMPLATION HALL

READING

S' WORKSHOP

CAFE/RESTAURANT

GARDENING

KANGAROO-HOUSING

FAMILY RESIDENCES

CAFE/RESTAURANT

COMMUNAL GATHERING  
MENTAL REFLECTIONING

PICTURES  
WEDDINGS  
MEMORIAL SERVICES  
ART EXHIBITIONS

- HORECA
- MUSIC
- YOGA/TAI-CHI
- READING
- ORGANISING EVENTS



Reading room, 90m<sup>2</sup>  
Added mass that combines the two individual structures.

Giarttric doctor,  
150m<sup>2</sup>

Improves balance, flexibility and overall fitness.

Music, 85m<sup>2</sup>  
Playing an instrument improves cognitive functioning and coordina  
Also positive for the ability to hear/speech.

Office, 100m<sup>2</sup>  
Place where communal activities are organised by the community.

Cafe, 220m<sup>2</sup>  
Receiving the public in the heart of the ensemble.

## GIARTTRIC DOCTOR



## READING



## ARTISANS' WORKSHOP



- DRAWING,
- PAINTING,
- TAILORING,
- KNITTING,
- POTTERY,
- WOODWORK,
- FABLAB



PHYSIQUE



MUSIC



CAFE/RESTAURANT



- HORECA
- MUSIC
- YOGA/TAI-CHI

- READING
- ORGANISING EVENTS













04

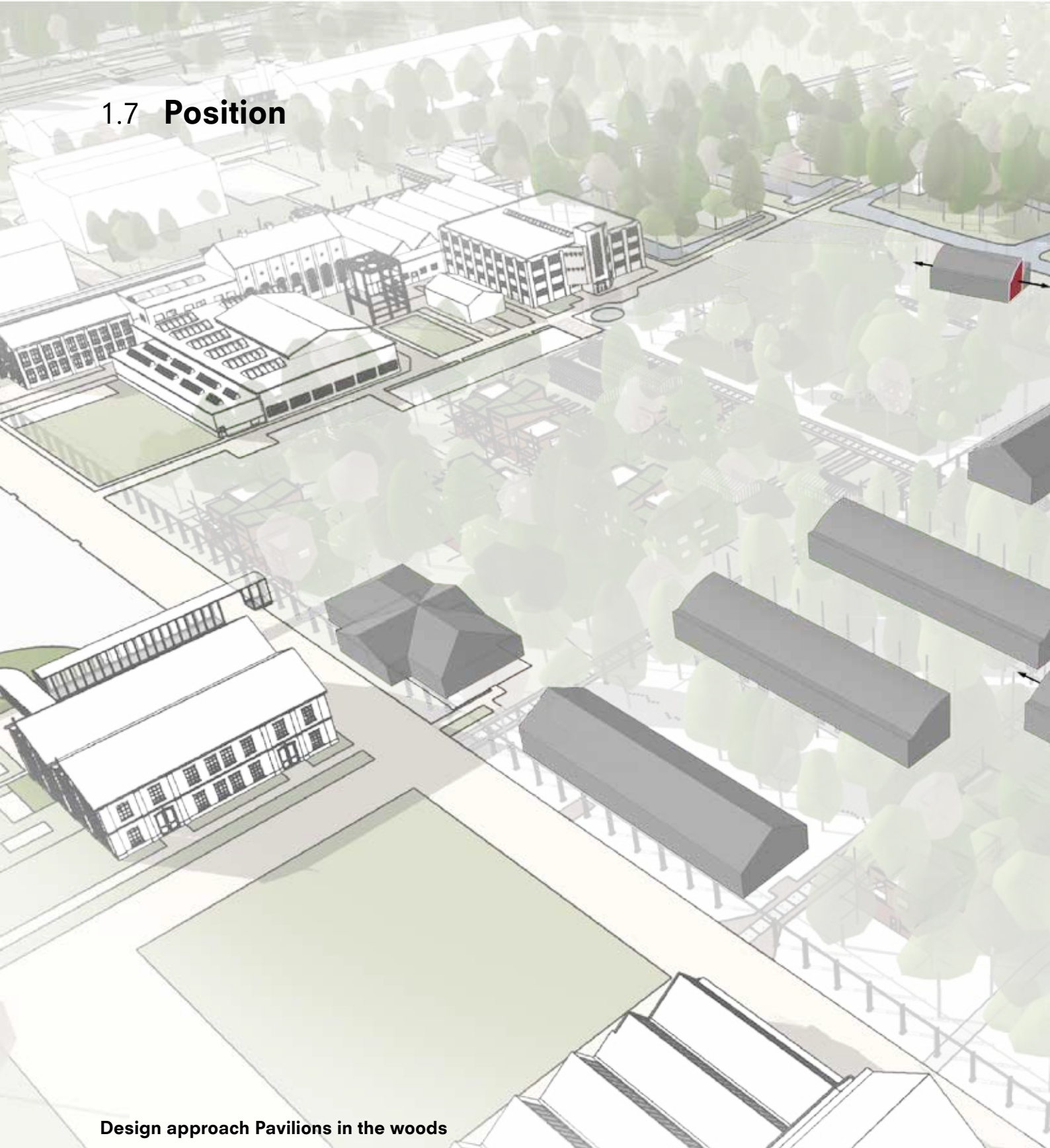
MASTERPLAN







## 1.7 Position



Design approach Pavilions in the woods

Taets  
Demolish

Preserve

Repair

S  
Int





Strategy for the Plofbos between

fill

Intervention

Re-interpretation

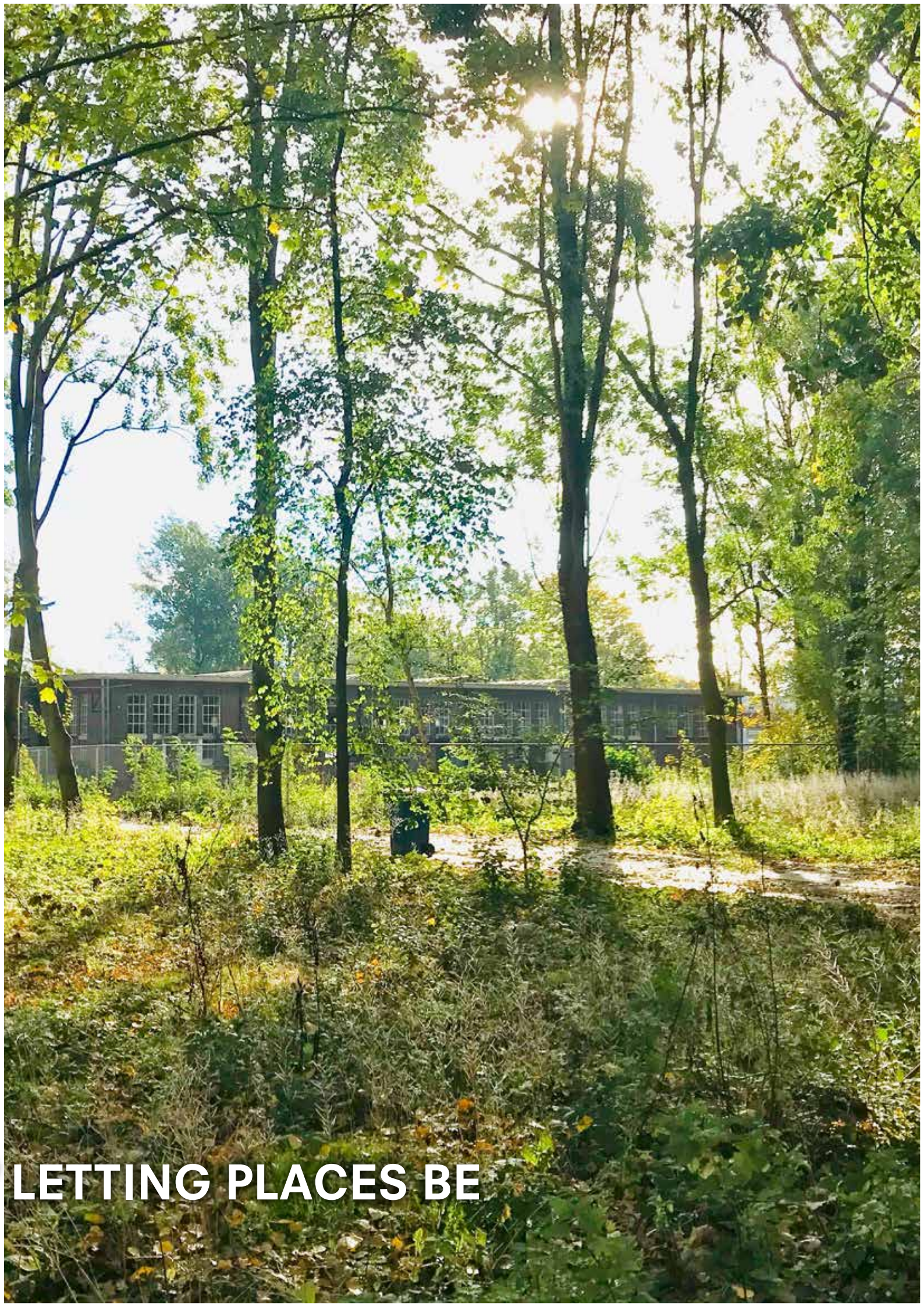
Level of transformation →





**CREATING PLACES /**

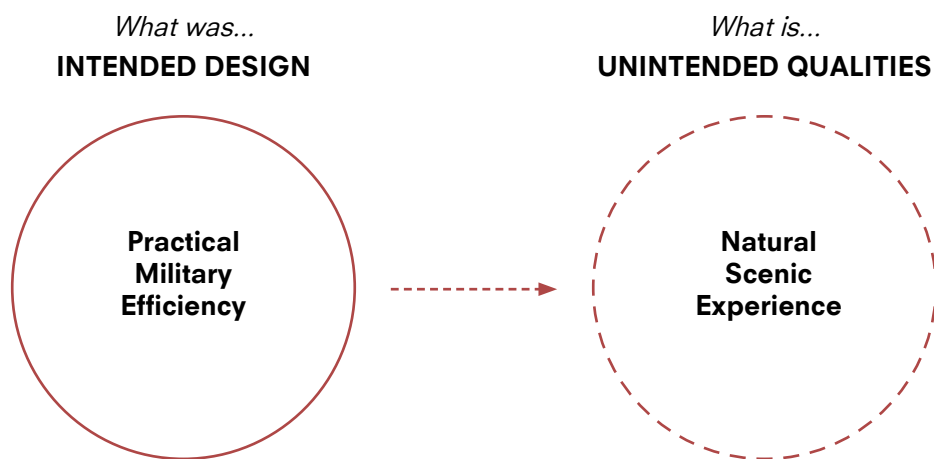
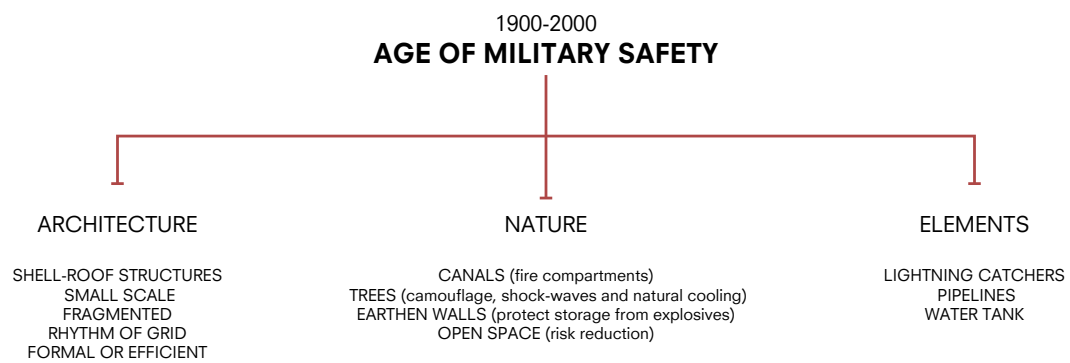




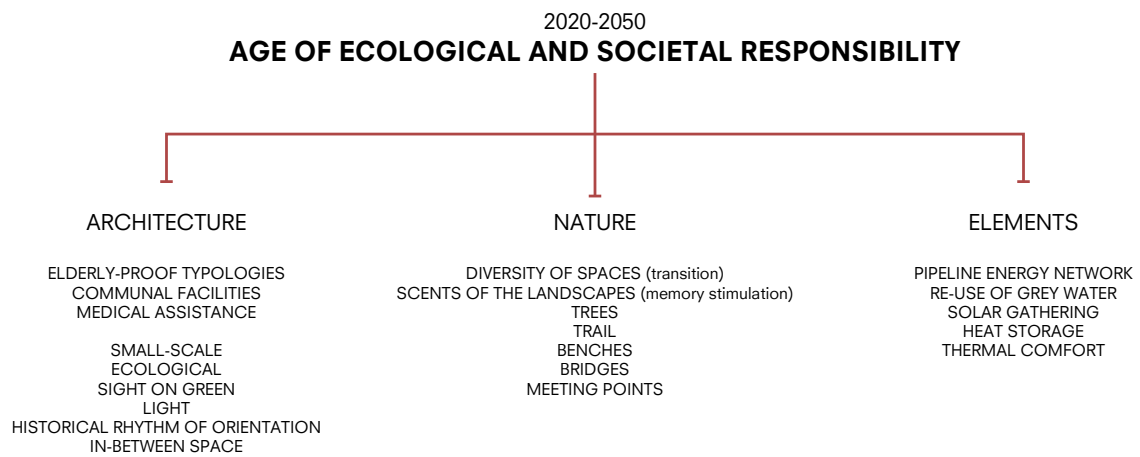
**LETTING PLACES BE**



## 1.9 The course of Hembrug







*What will be...*

## SUSTAINABLE INTERVENTIONS

**Elderly proof  
Self-supportive  
Community  
Ecological**



1900



1950



2040





05

THE KANGAROO RESIDENCE





CE



## 4.1 Kangaroo housing

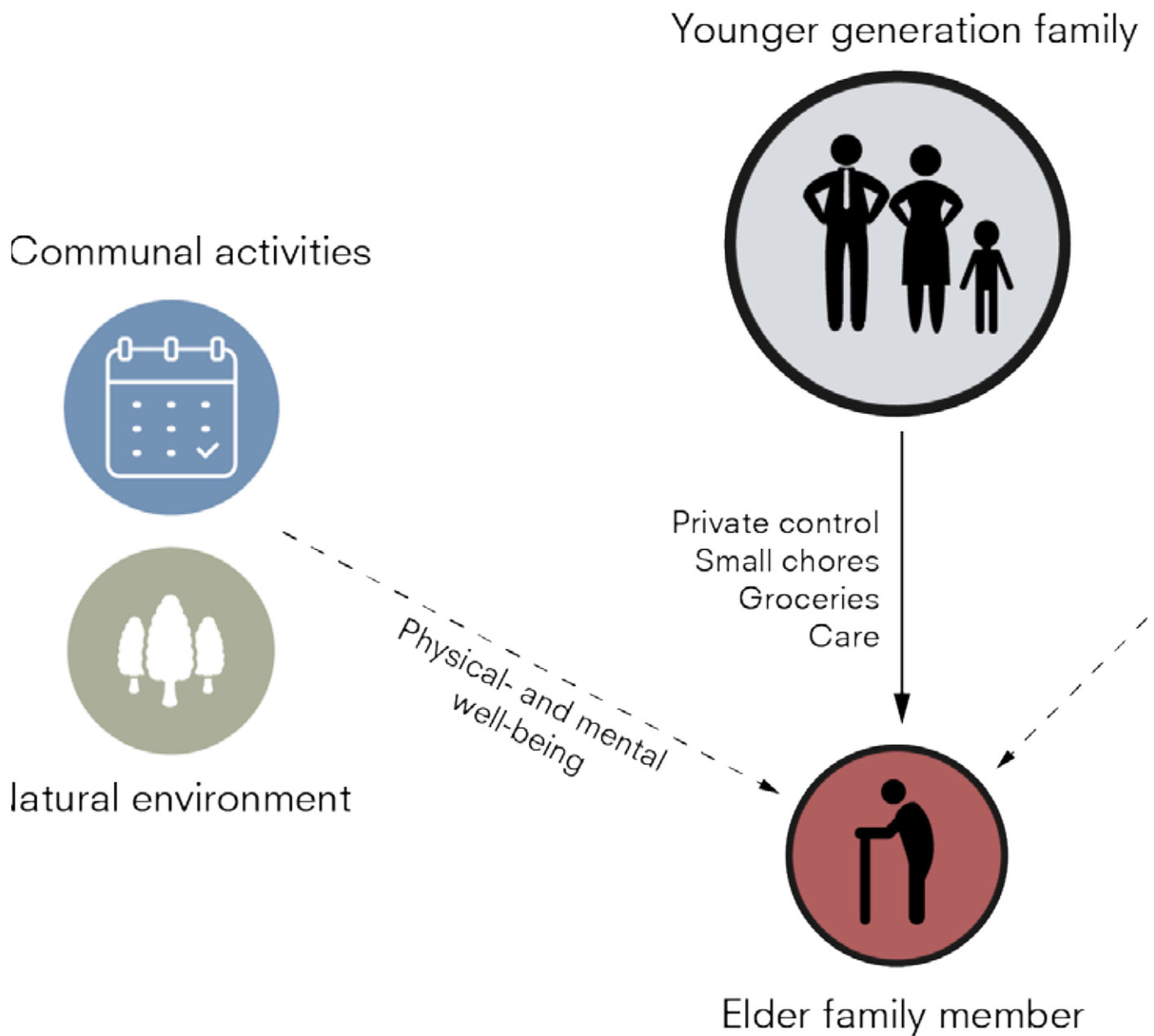


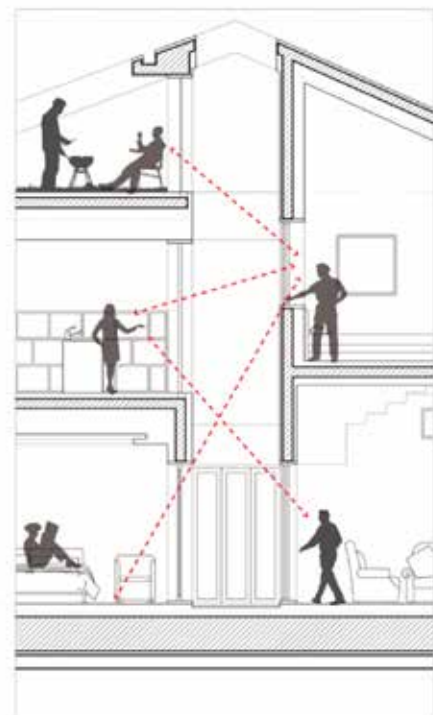
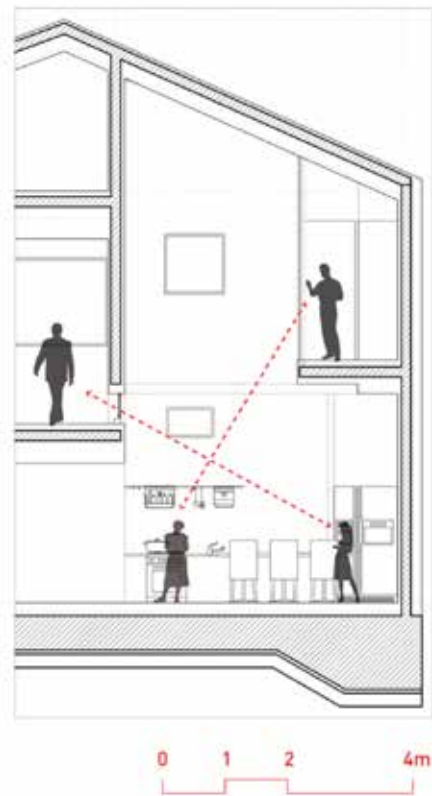
Fig. 3.3 Schematic “care” according to the Kangaroo housing principle



Giartric doctor



Prevention  
Diagnosis  
Treatment



Public & Private control



# BUILDING TECHNOLOGY

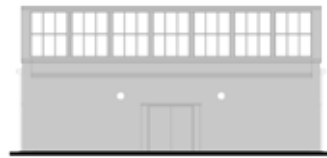
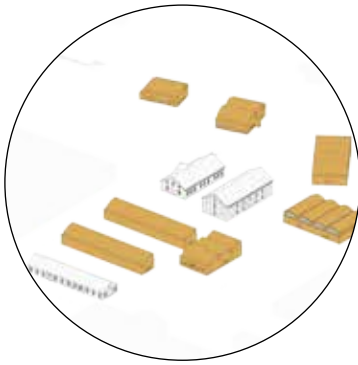


Fig. 6.23 "Hollow" roof shells for drainage

Fig. 6.22 Hollow drainage

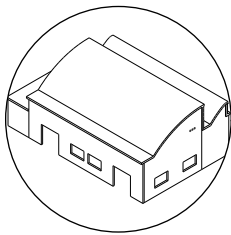


Fig. 6.20 Concrete formwork

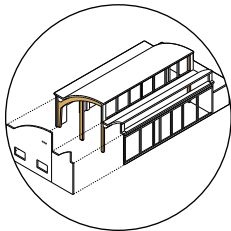
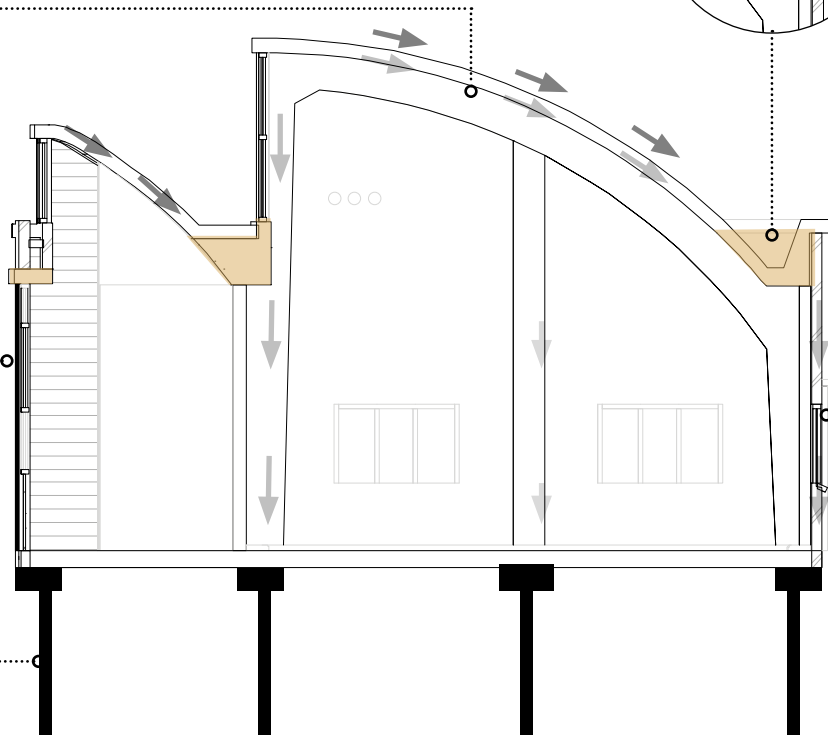
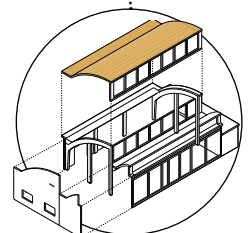
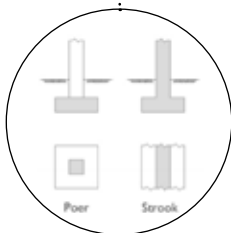
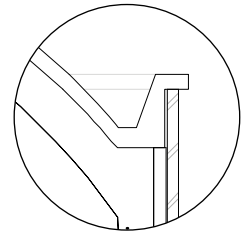
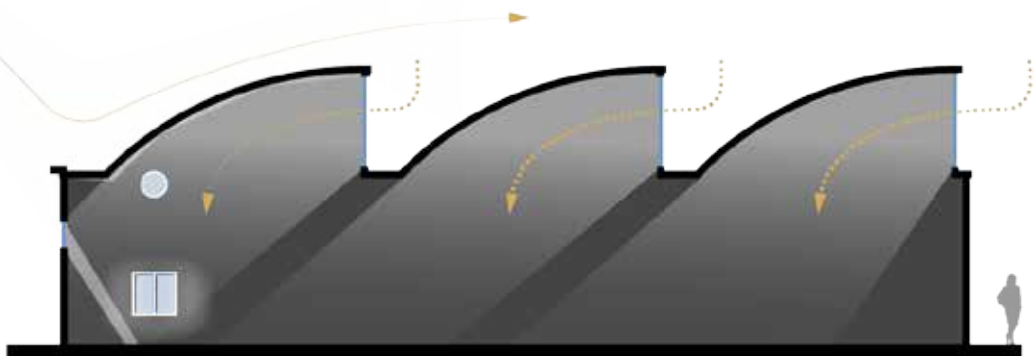


Fig. 6.21 Brick curtain wall



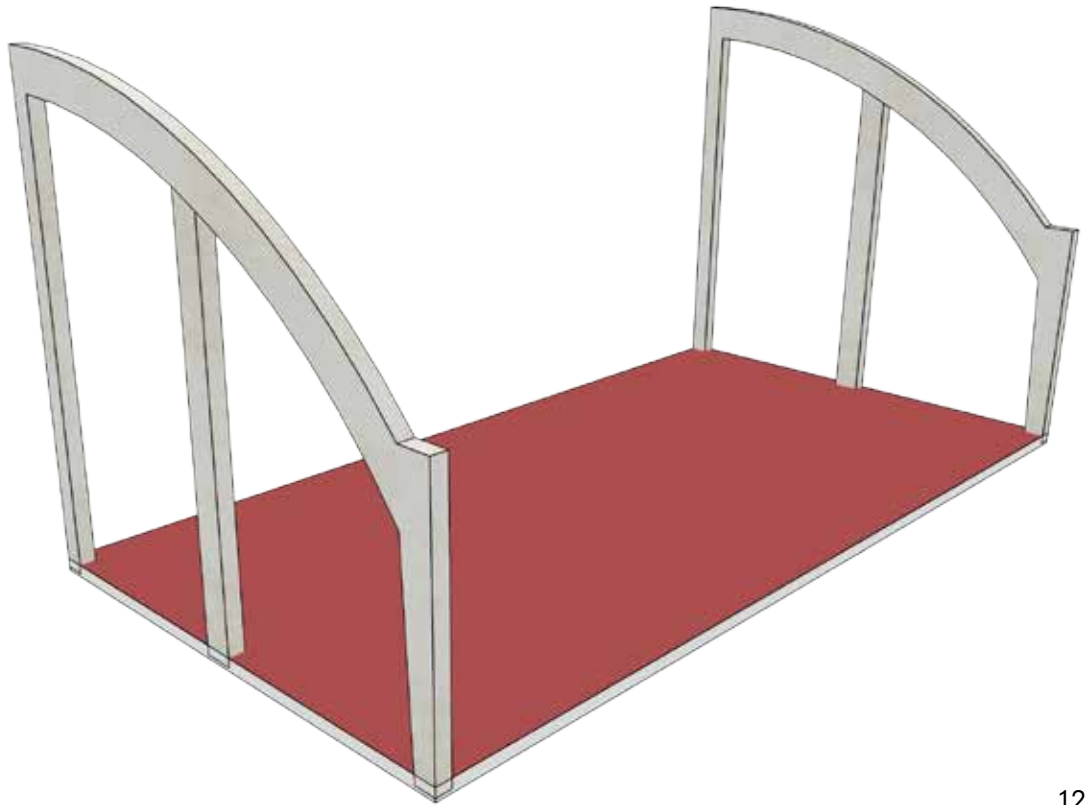


# LOGY 'SHELL ROOF'



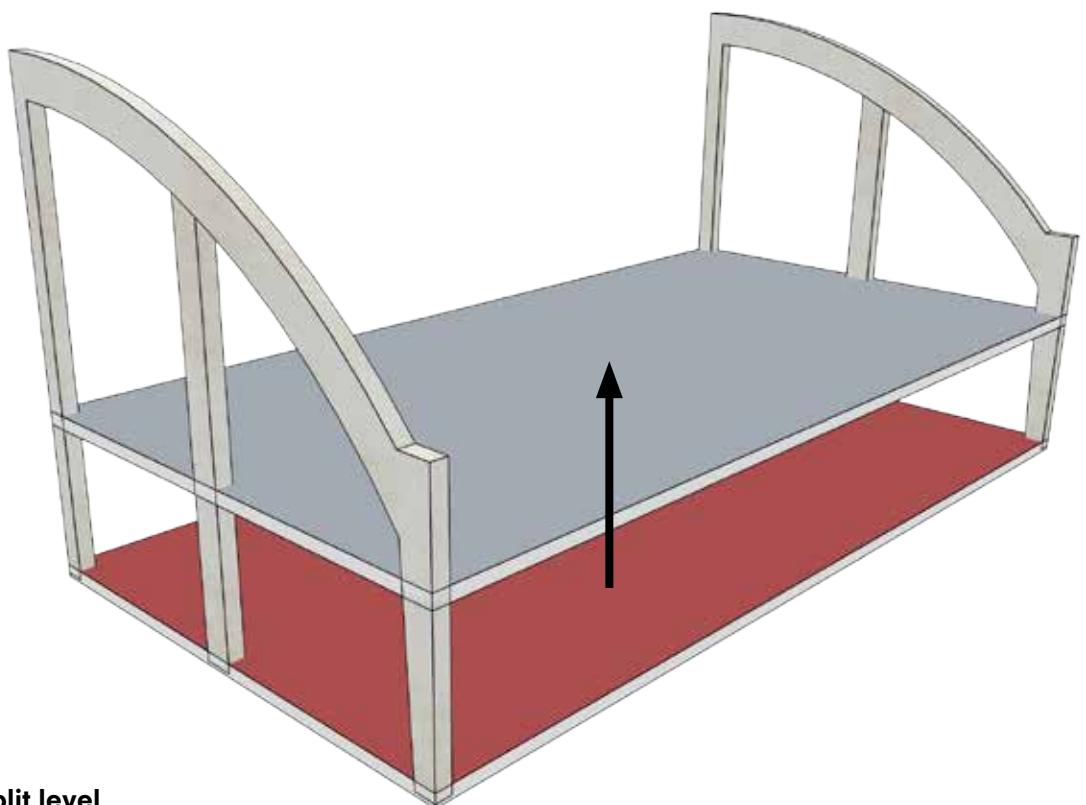


## 4.1 Kangaroo housing



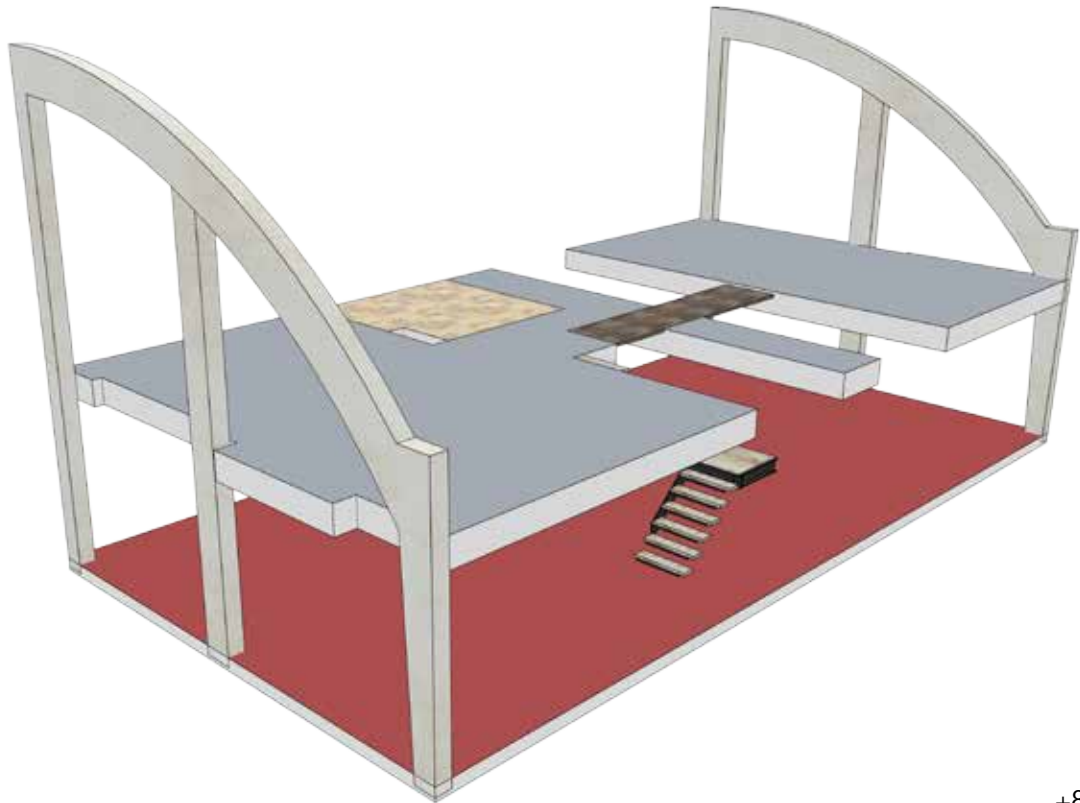
120m<sup>2</sup>

**Base foundation of the existing situation**



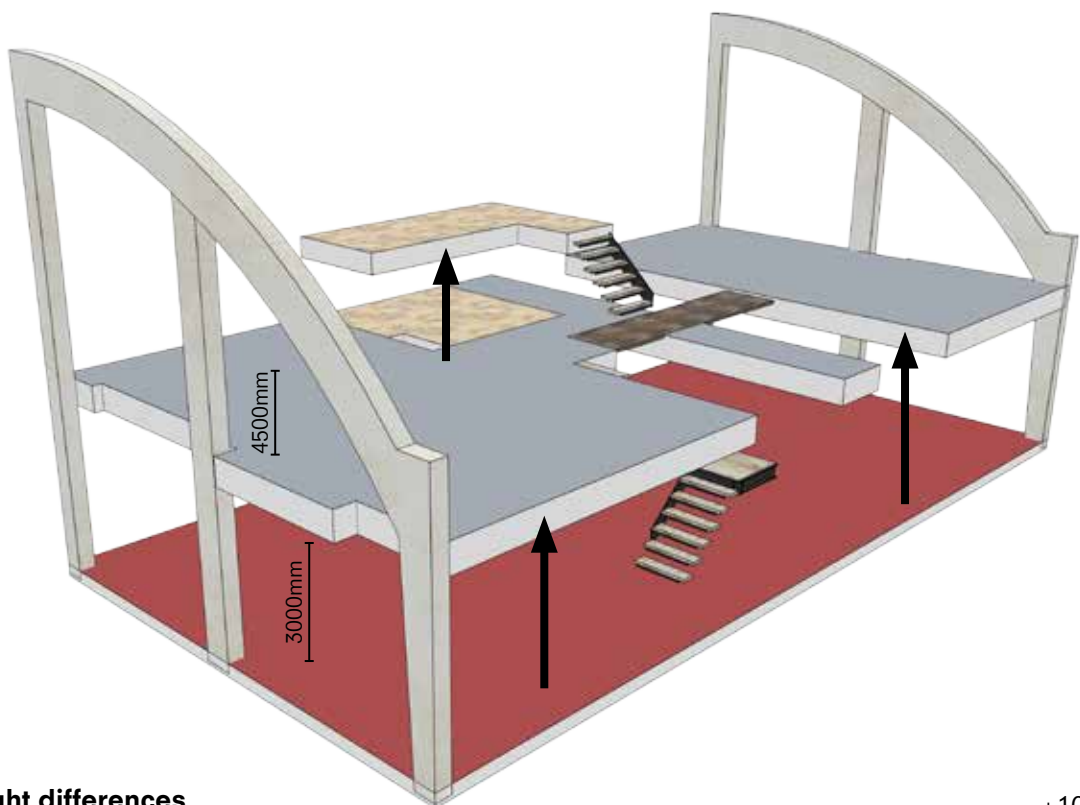
**Adding a split level**





+85m<sup>2</sup>

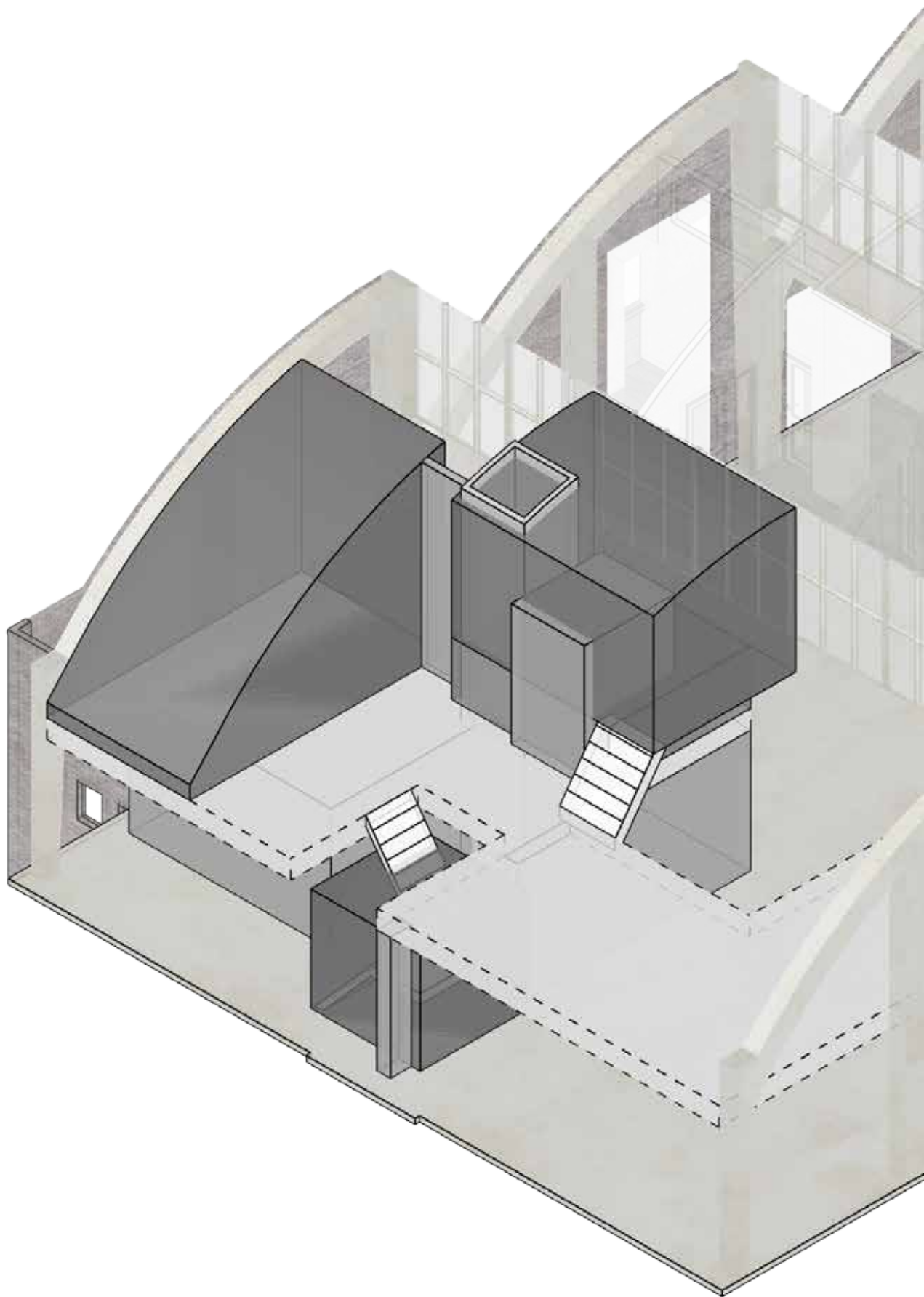
**Voids to pass on light to the lower levels**



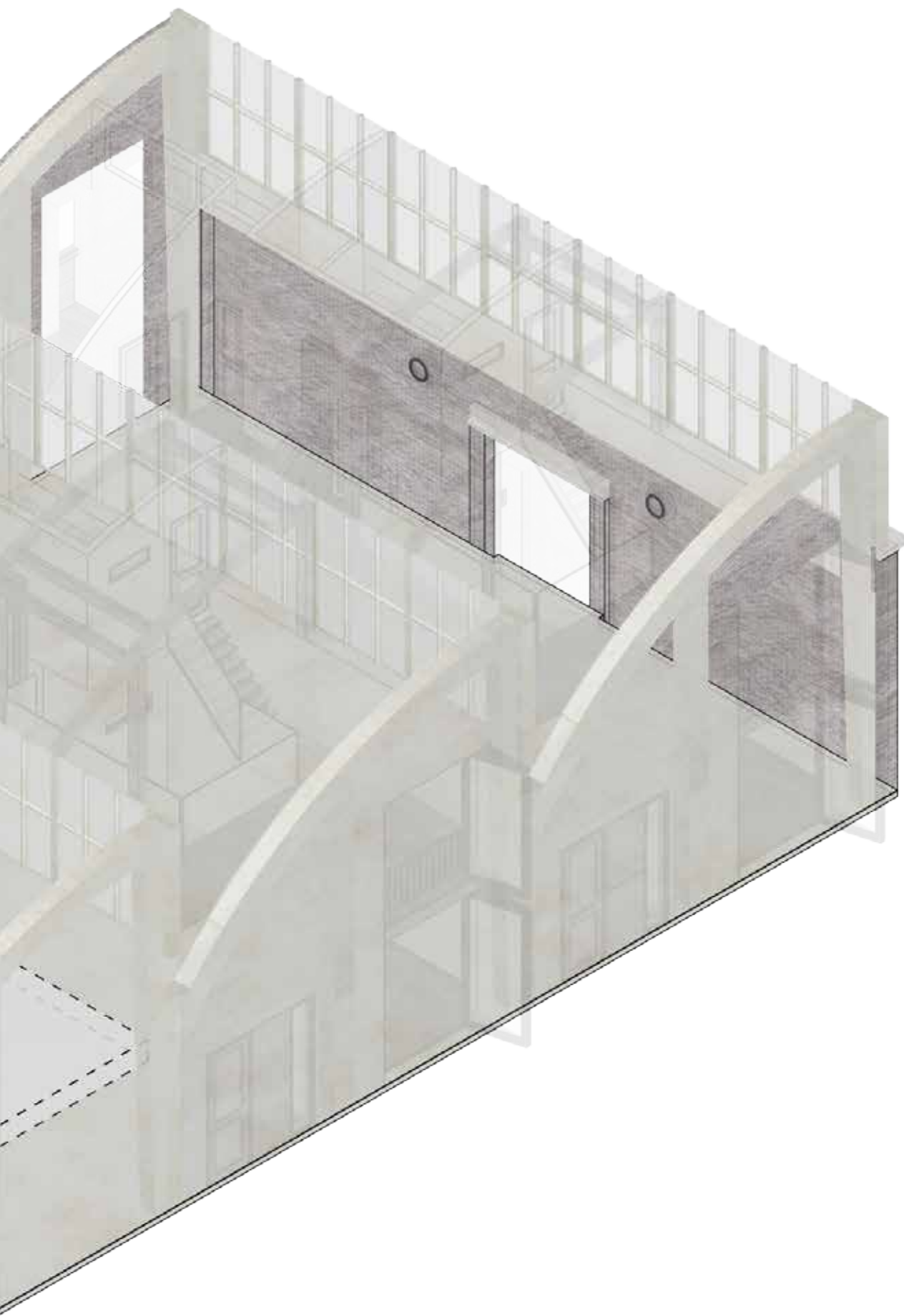
**Further height differences  
for visual relations between the residences and pass on more light**

+100m<sup>2</sup>









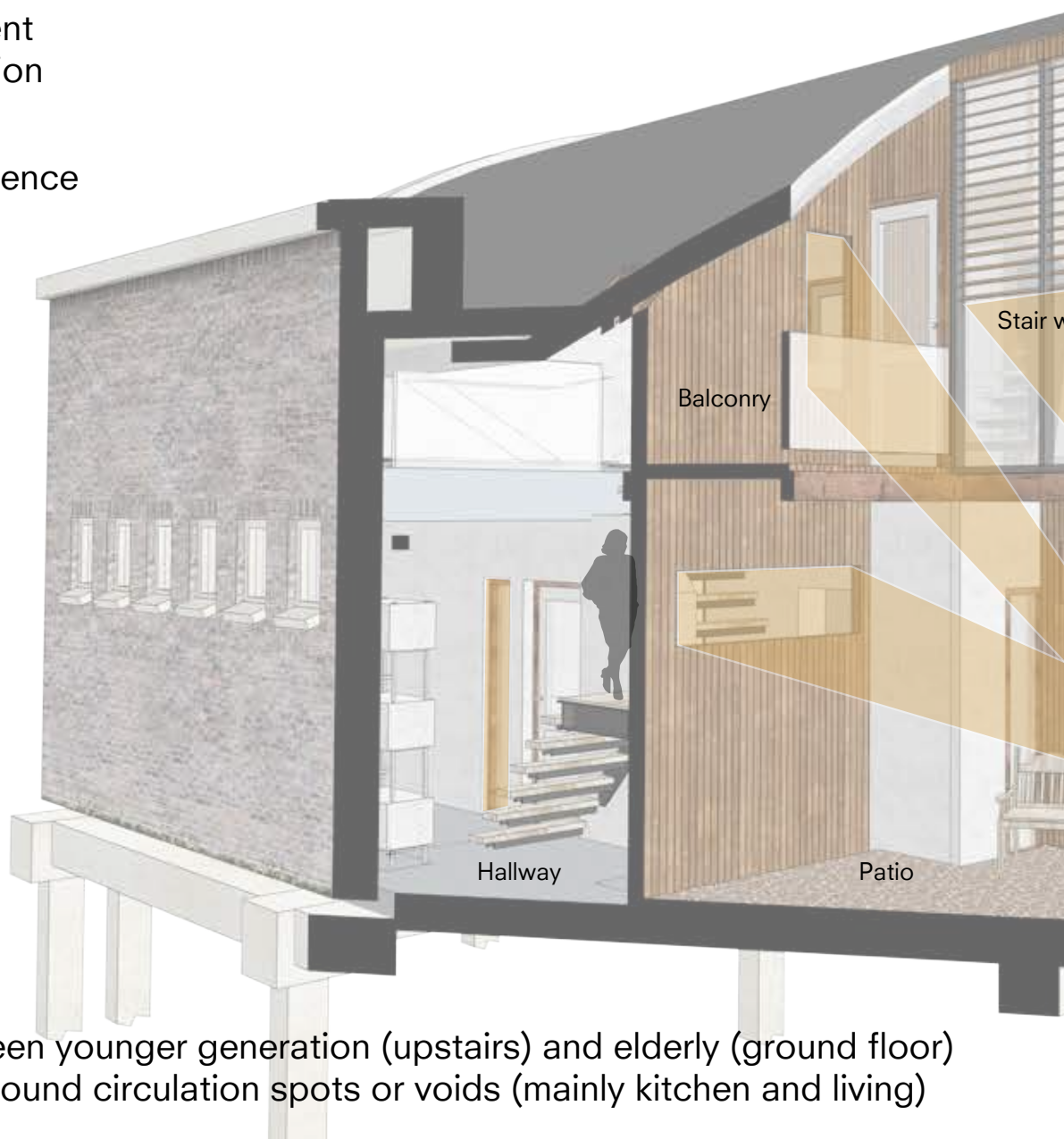


## 4.1 Kangaroo housing

### Two houses under one roof

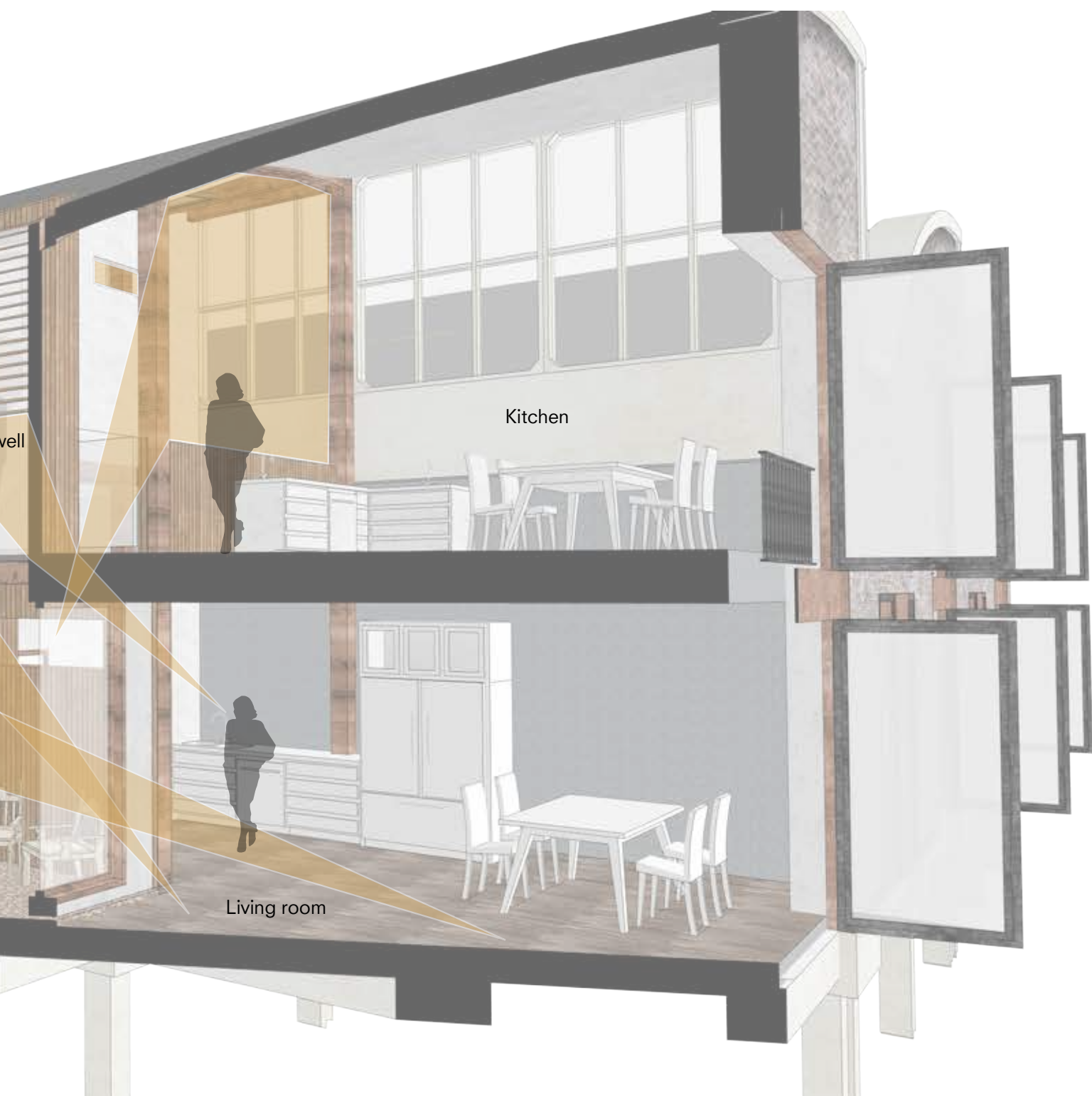
Upper floor apartment  
for younger generation  
110m<sup>2</sup>

Ground bound residence  
for elder occupant  
100m<sup>2</sup>



Public control between younger generation (upstairs) and elderly (ground floor) through openings around circulation spots or voids (mainly kitchen and living)

































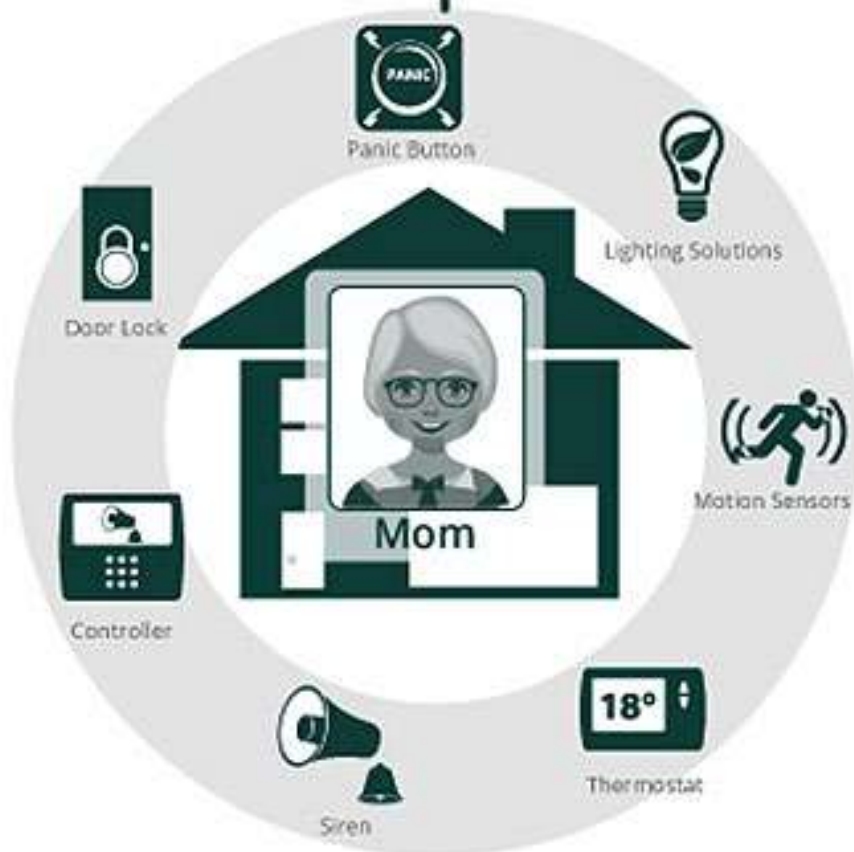






## LACK OF SOCIAL INTERACTION

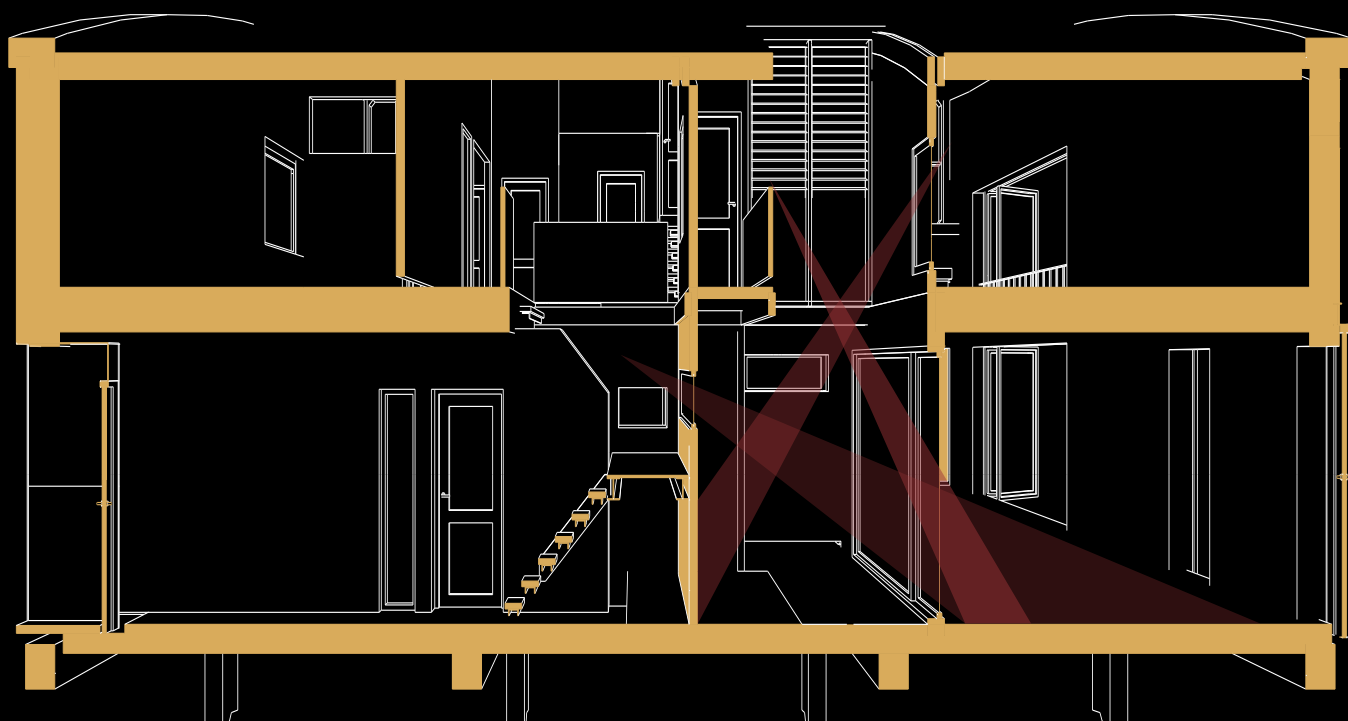
PRIVATE  
INFORMATION



# DIGITAL CARE

# V





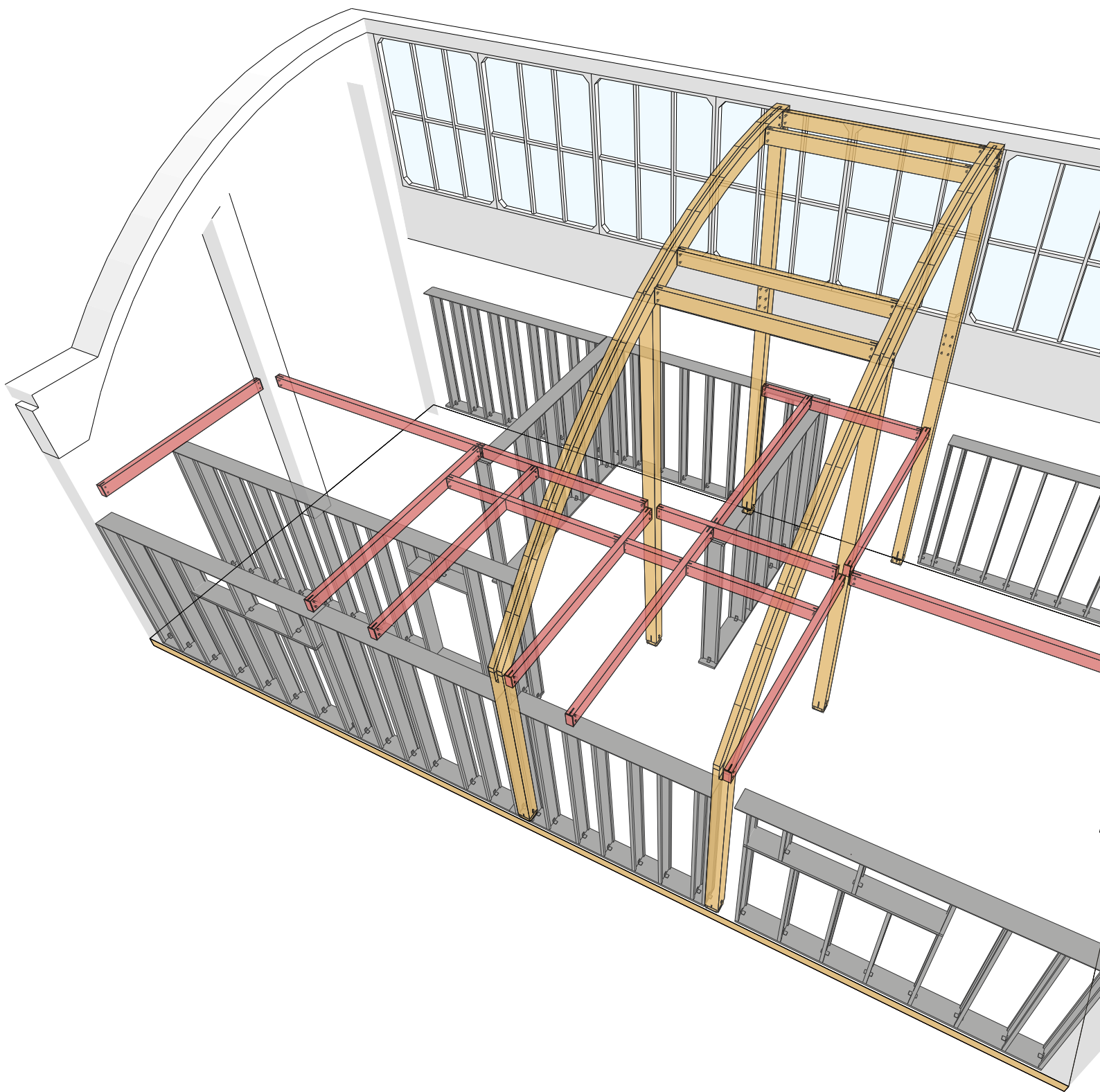
ACOUSTIC BARRIERS  
VISUAL RELATIONSHIPS (MOVEMENT/LIGHT)  
PROVOCATION OF INTERACTION

S

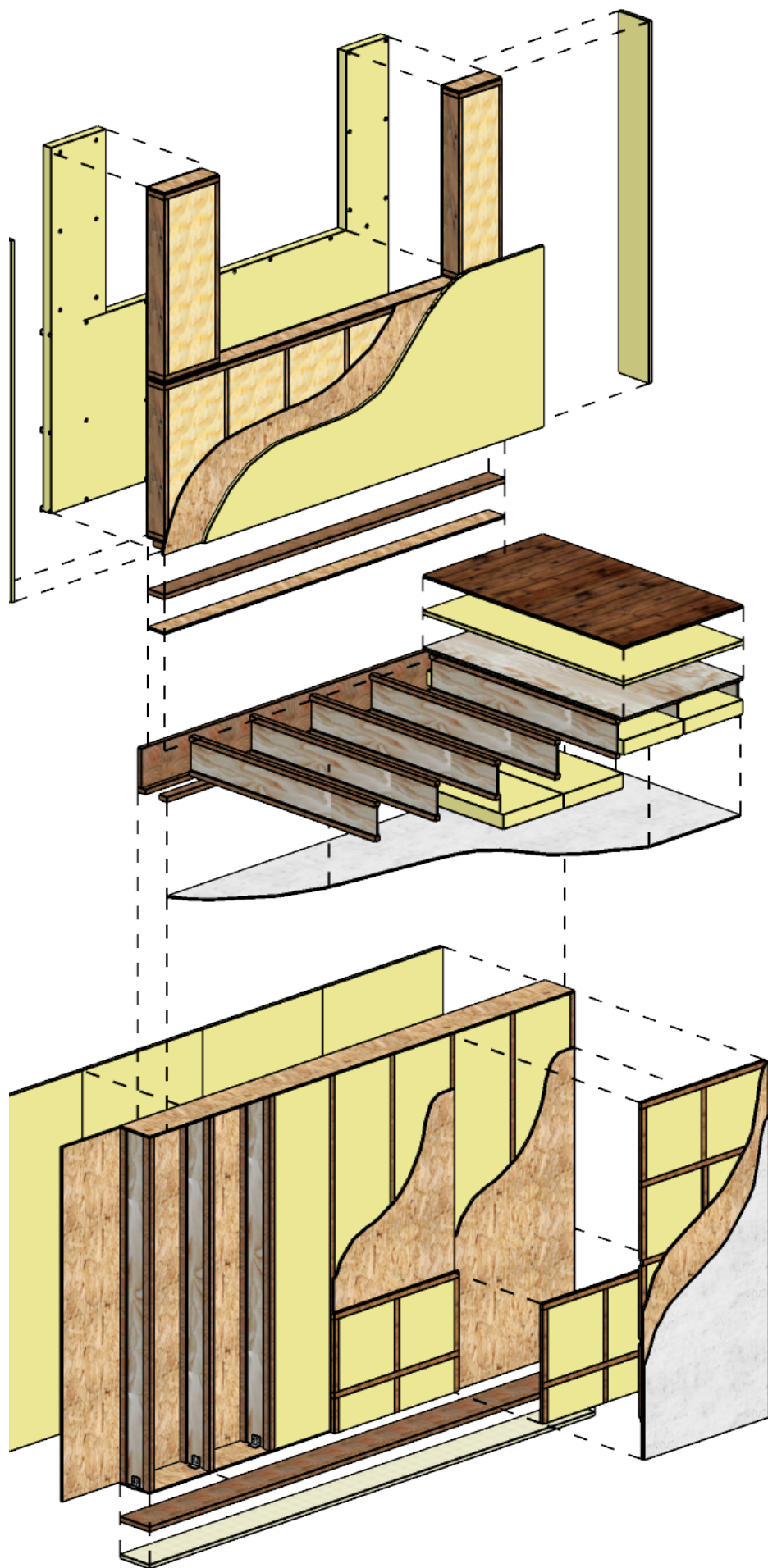
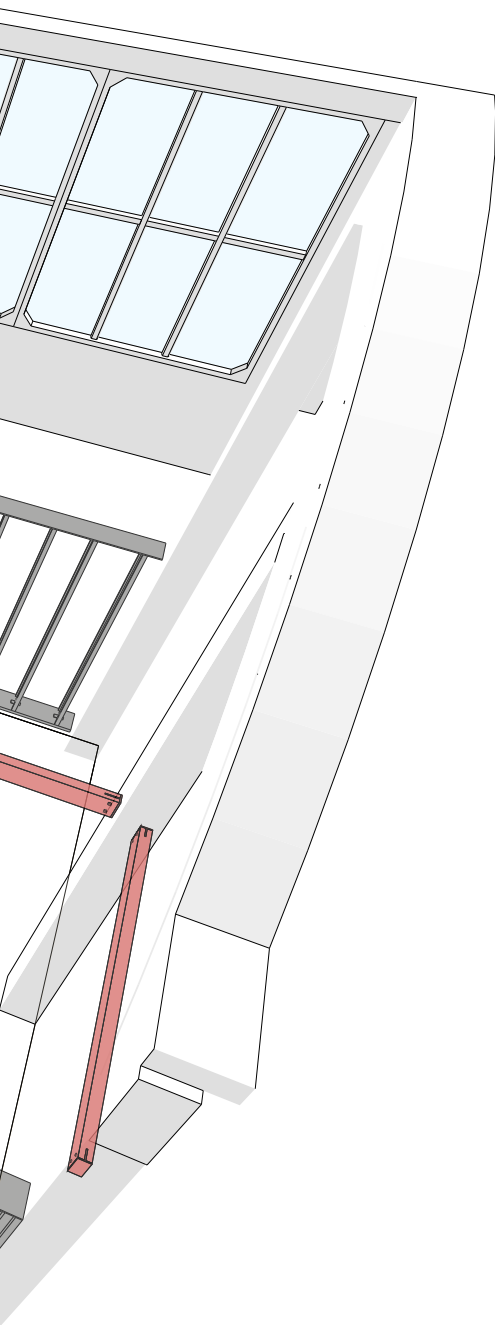
# ANALOGUE CONTROL



# STRUCTURE

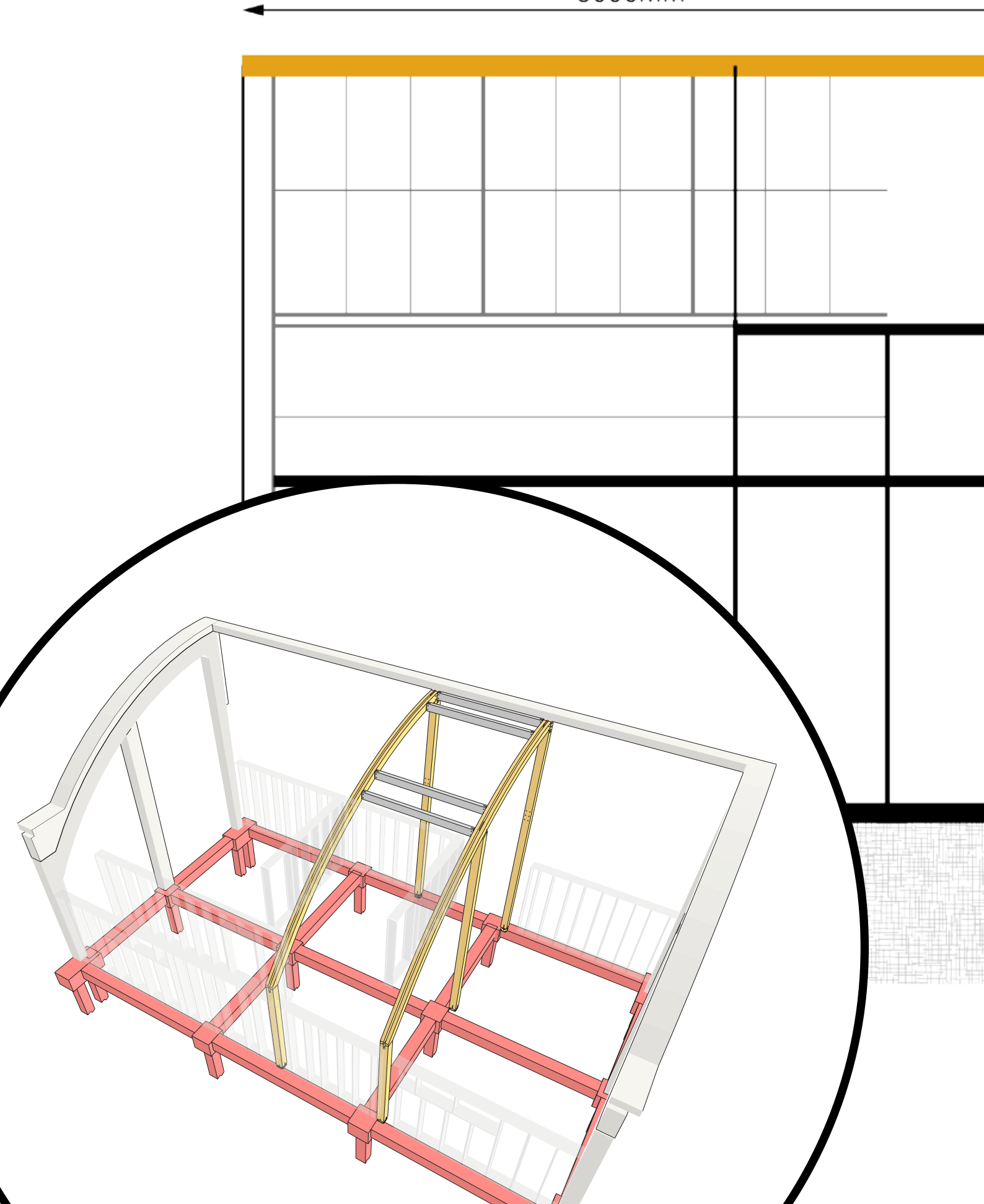






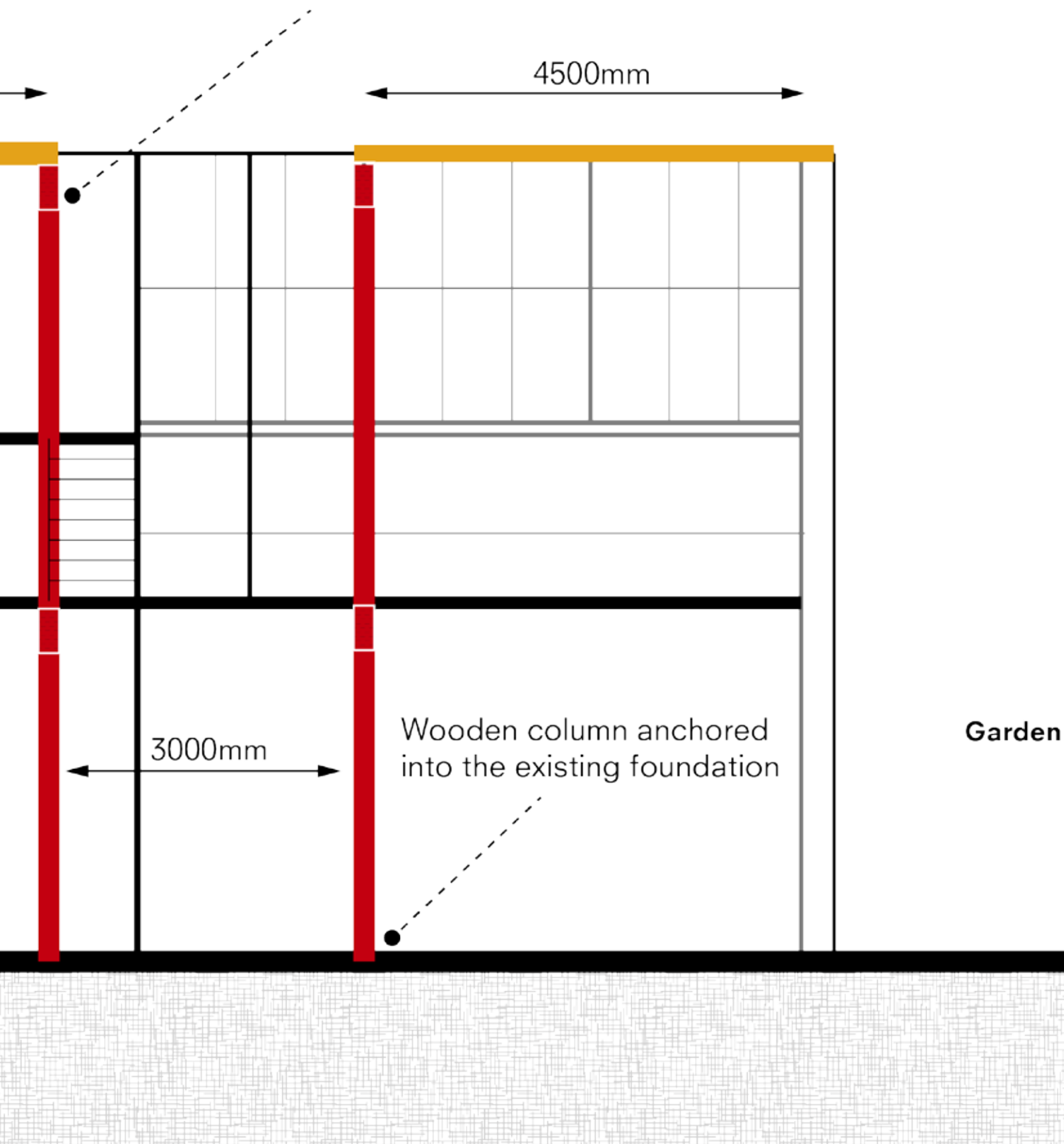


8000mm





Laminated timber beam bears the new load









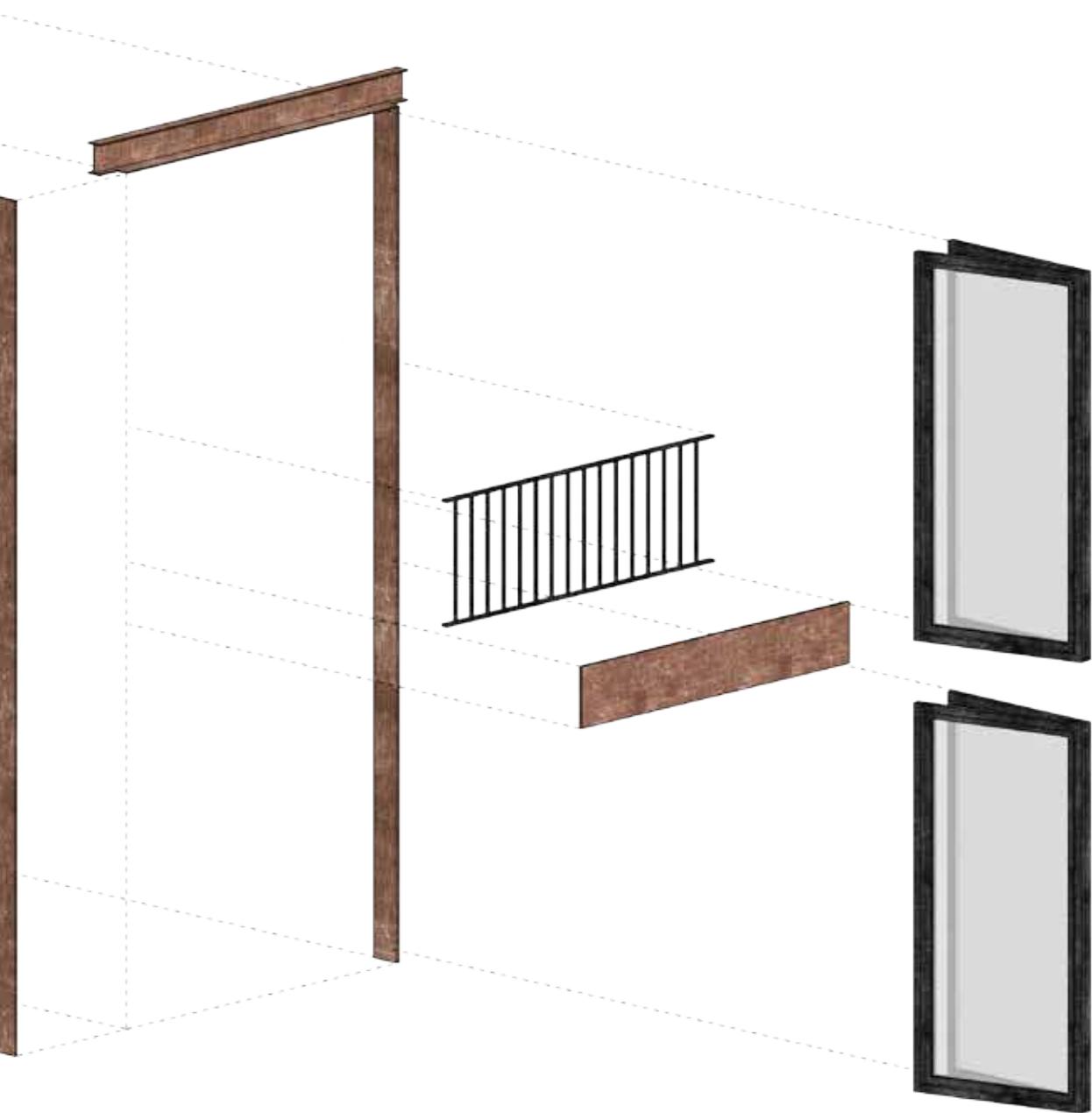




**CUTTING OPEN EXISTING WALL**

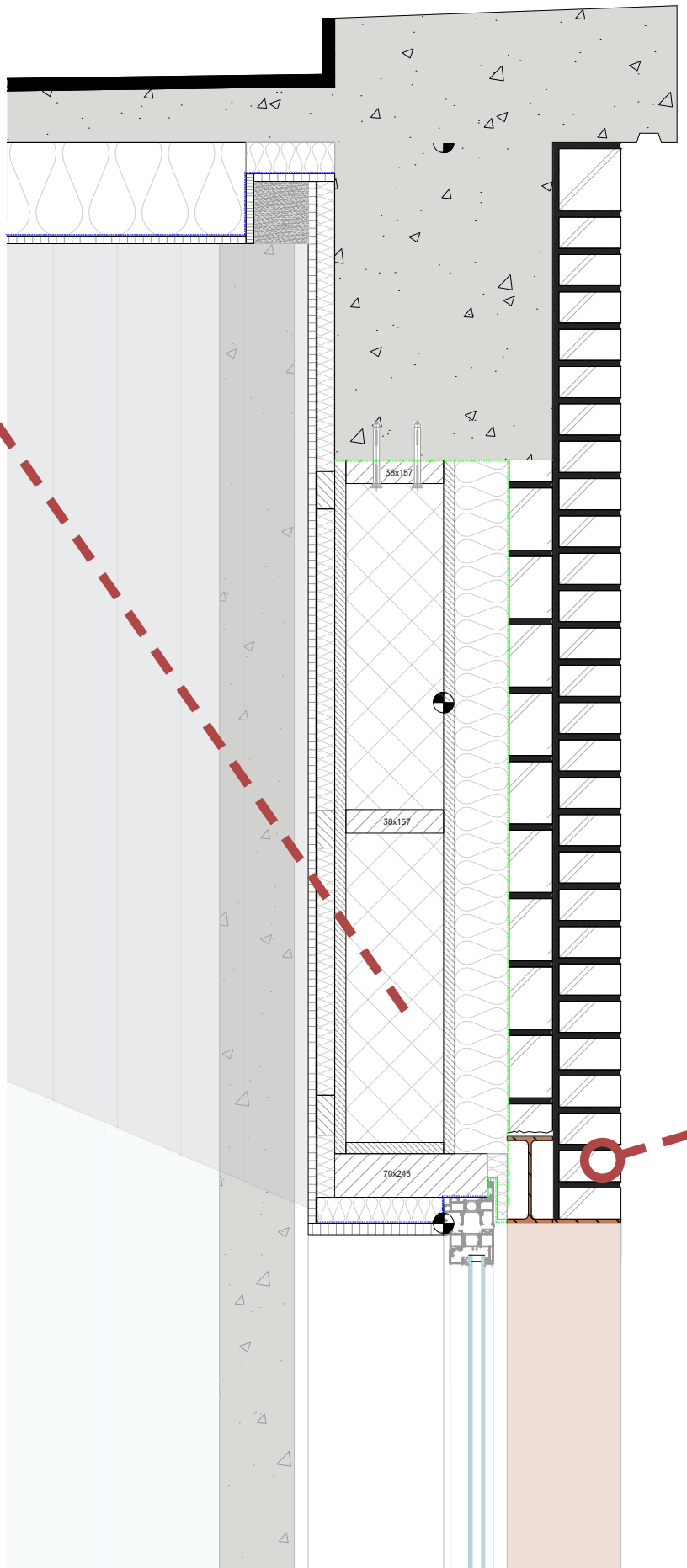
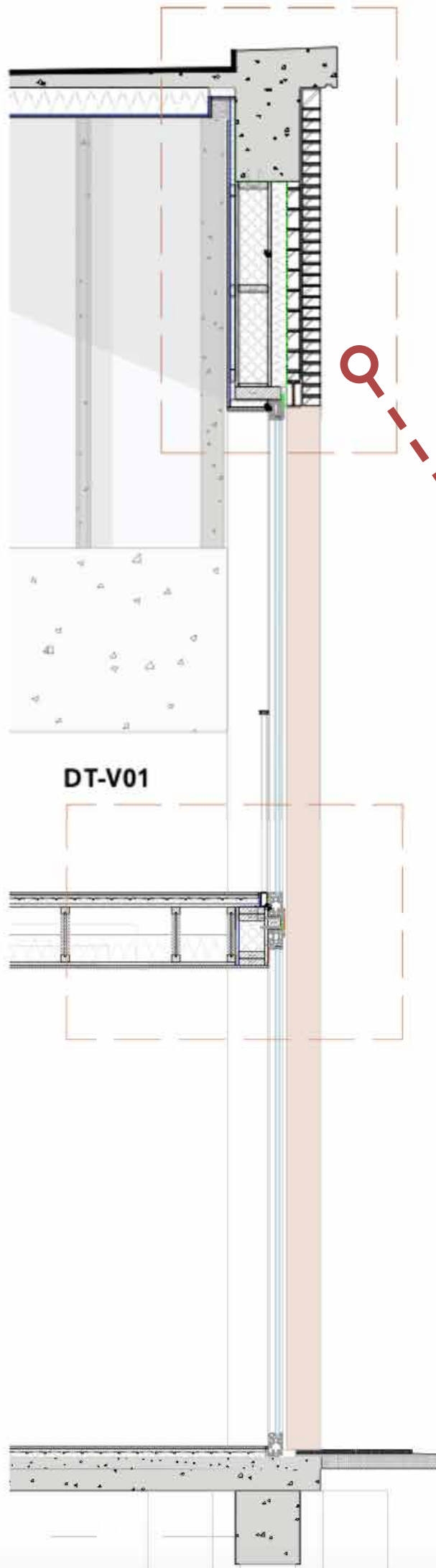




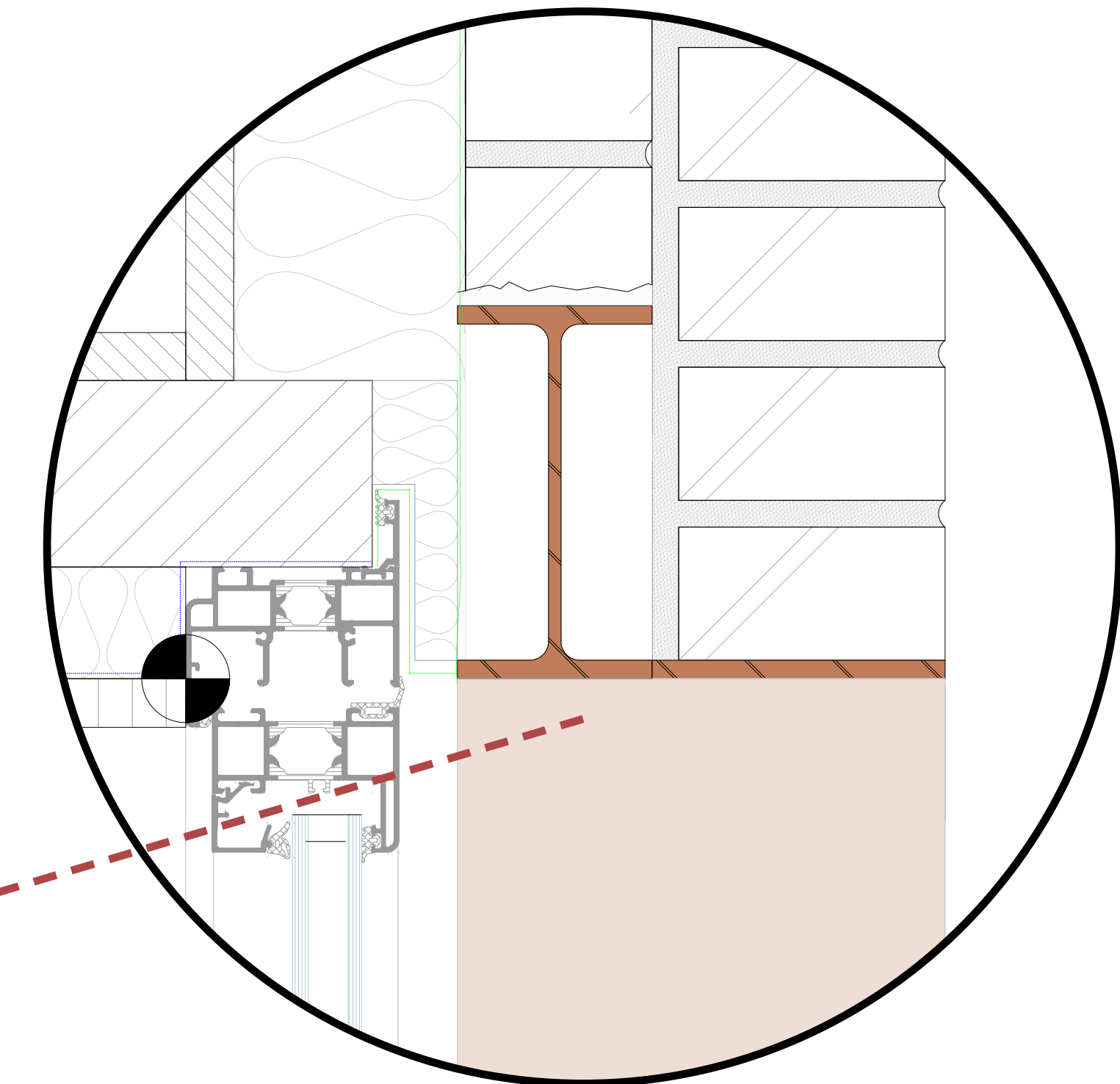




DT-V03

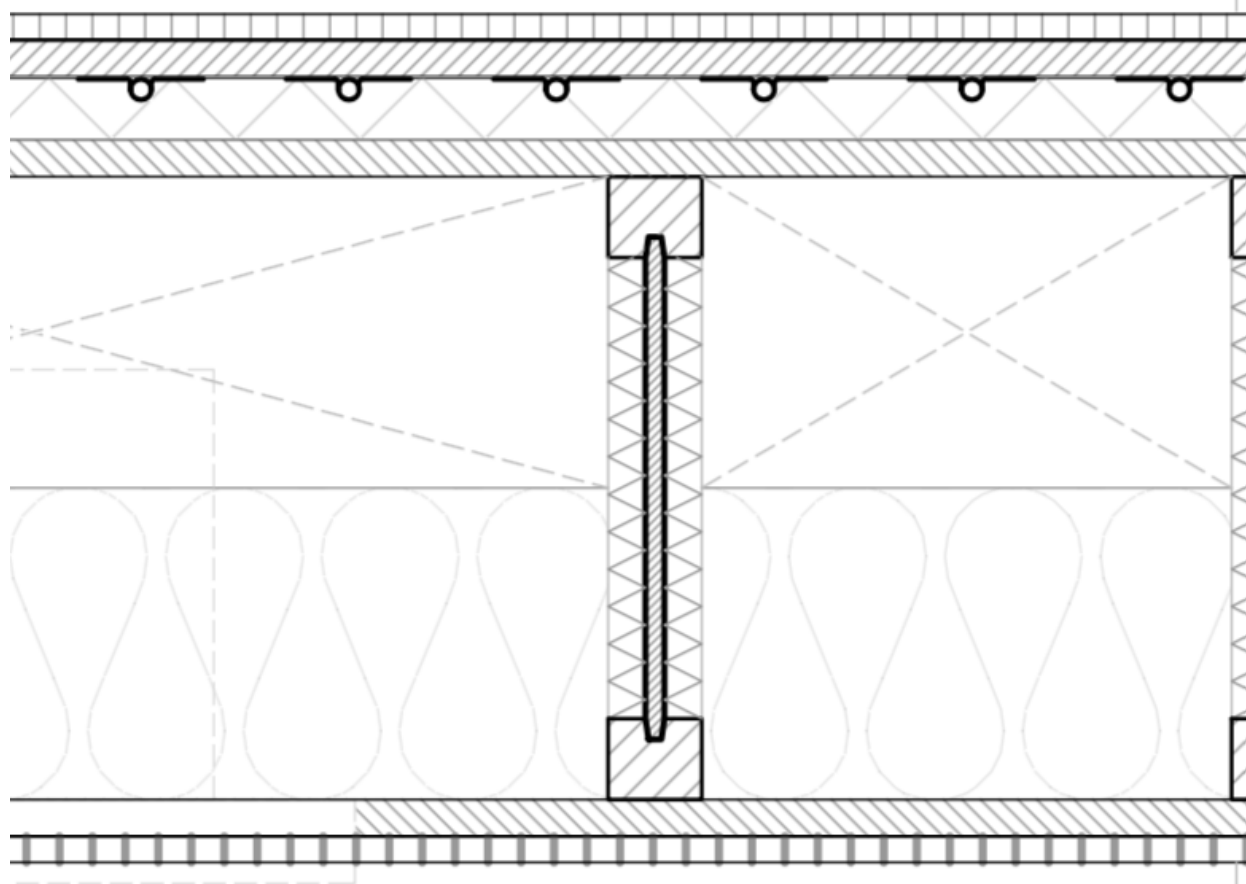




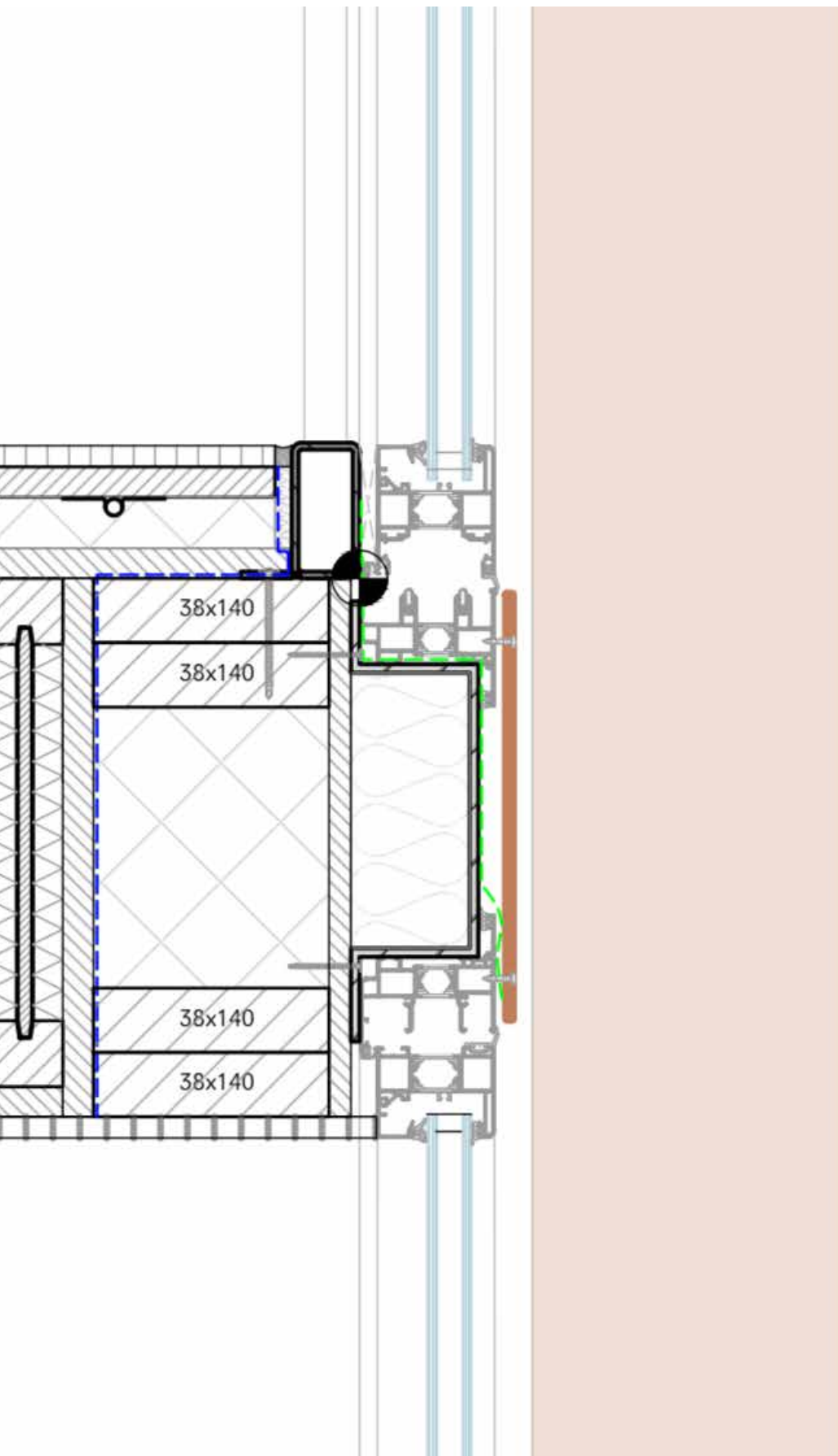


**Welded flange attached to an IPE180**

















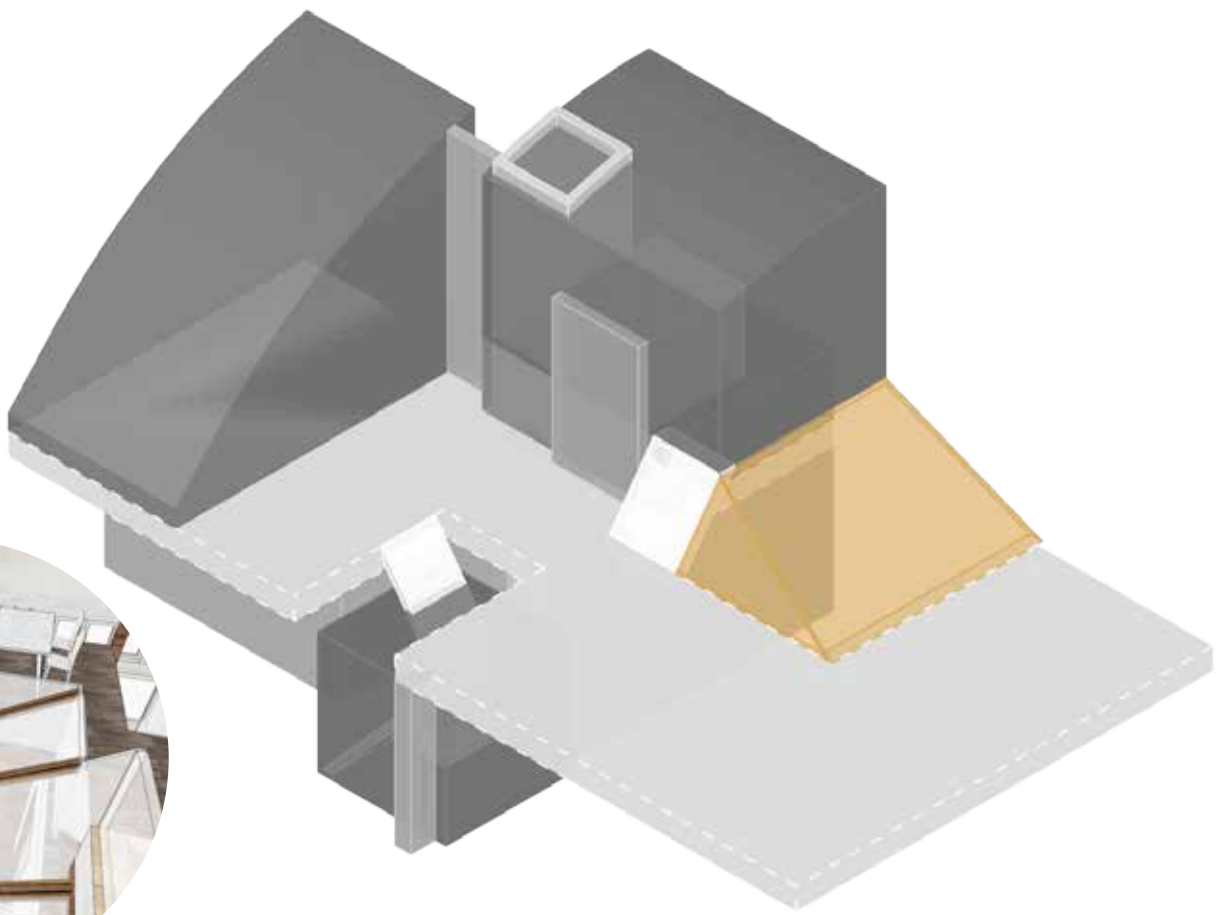




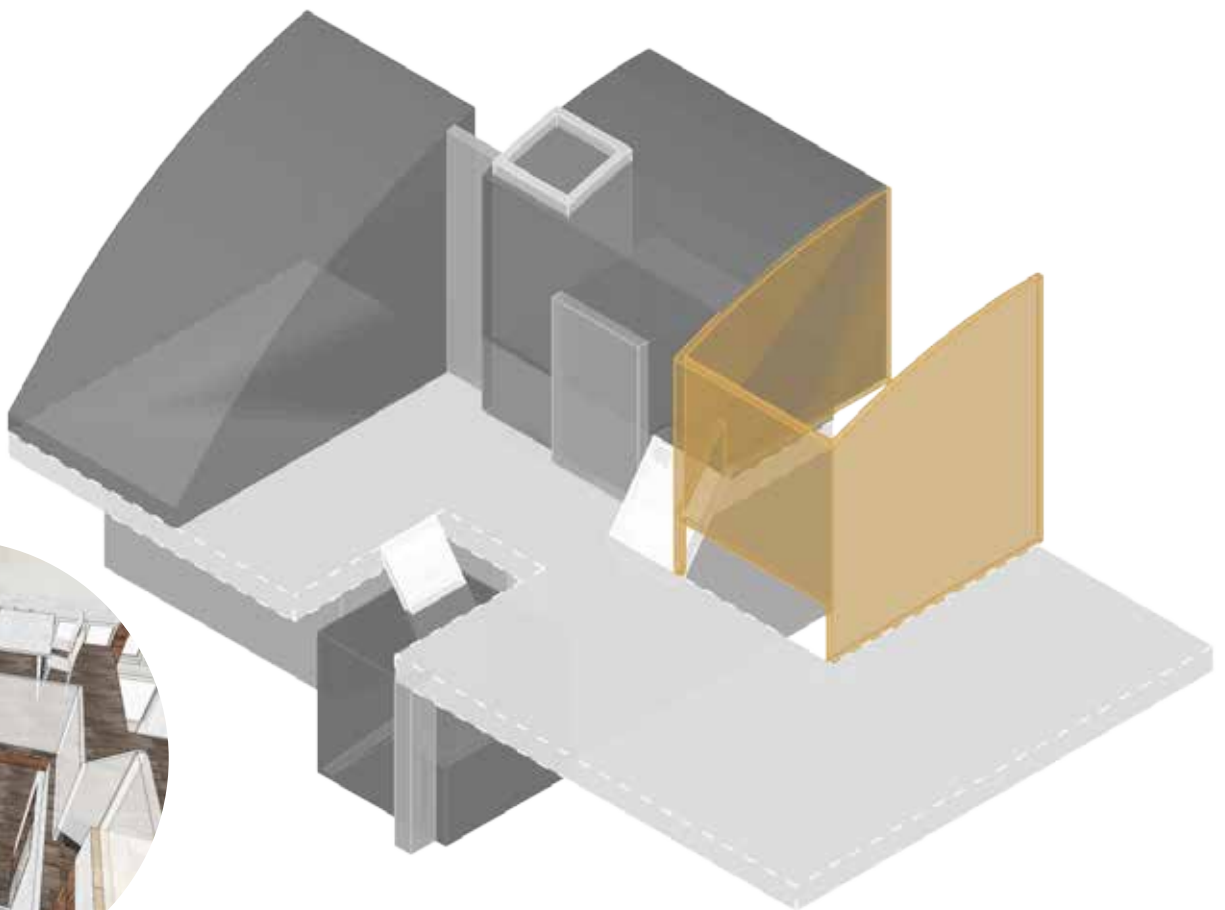






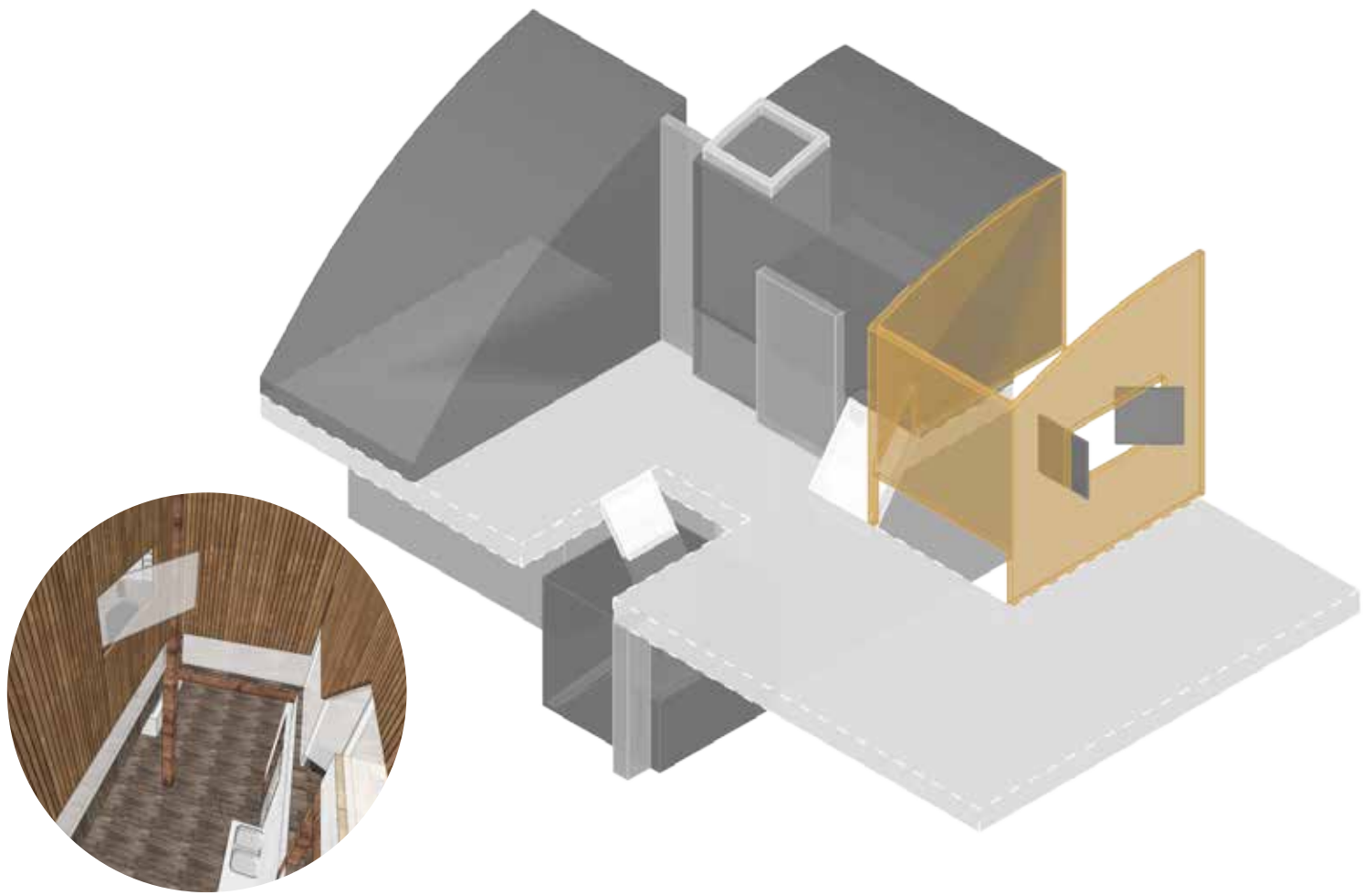


**1 - FULLY CLOSED**

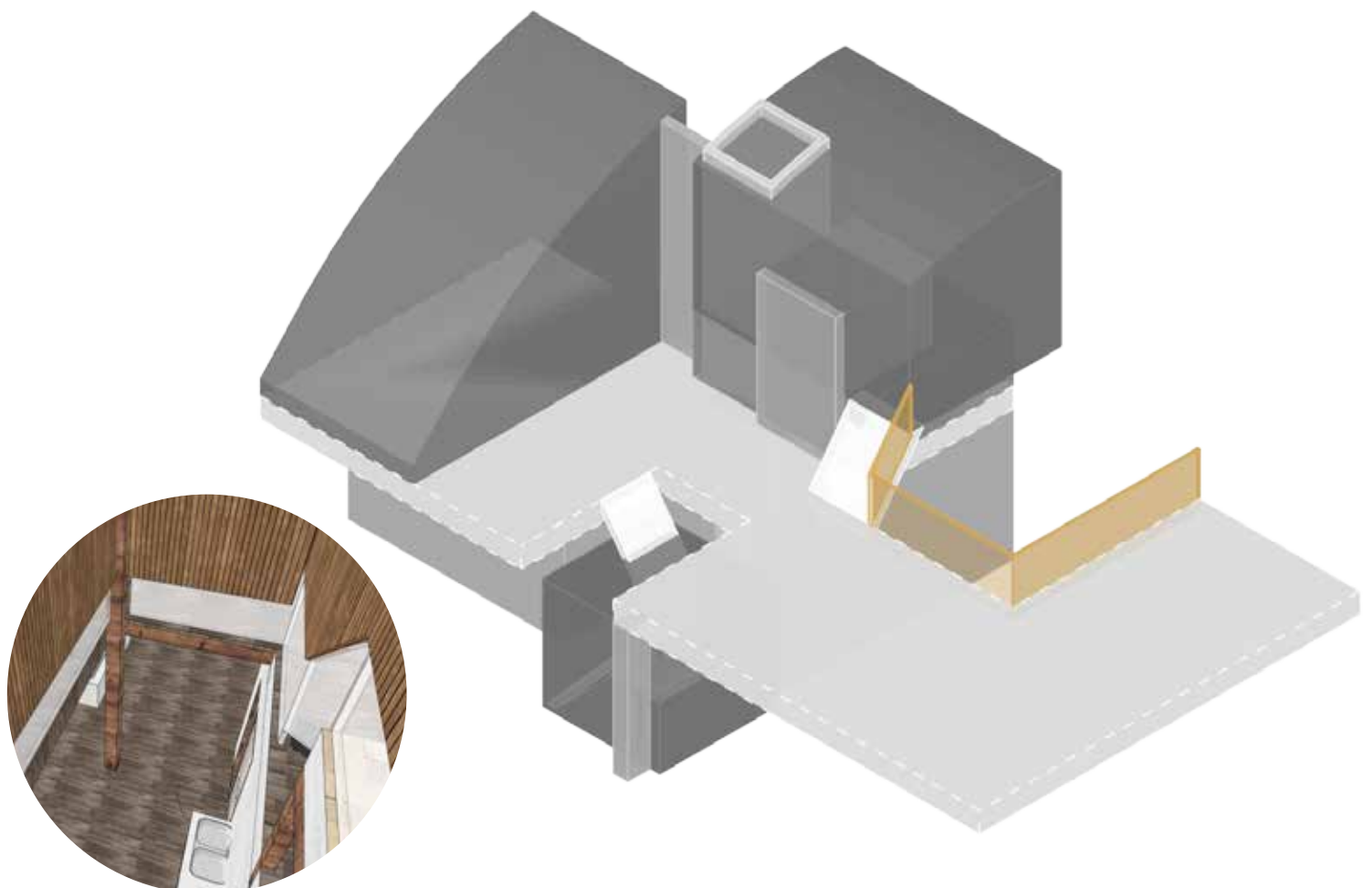


**1 - ALTERNATIVE FULLY CLOSED**





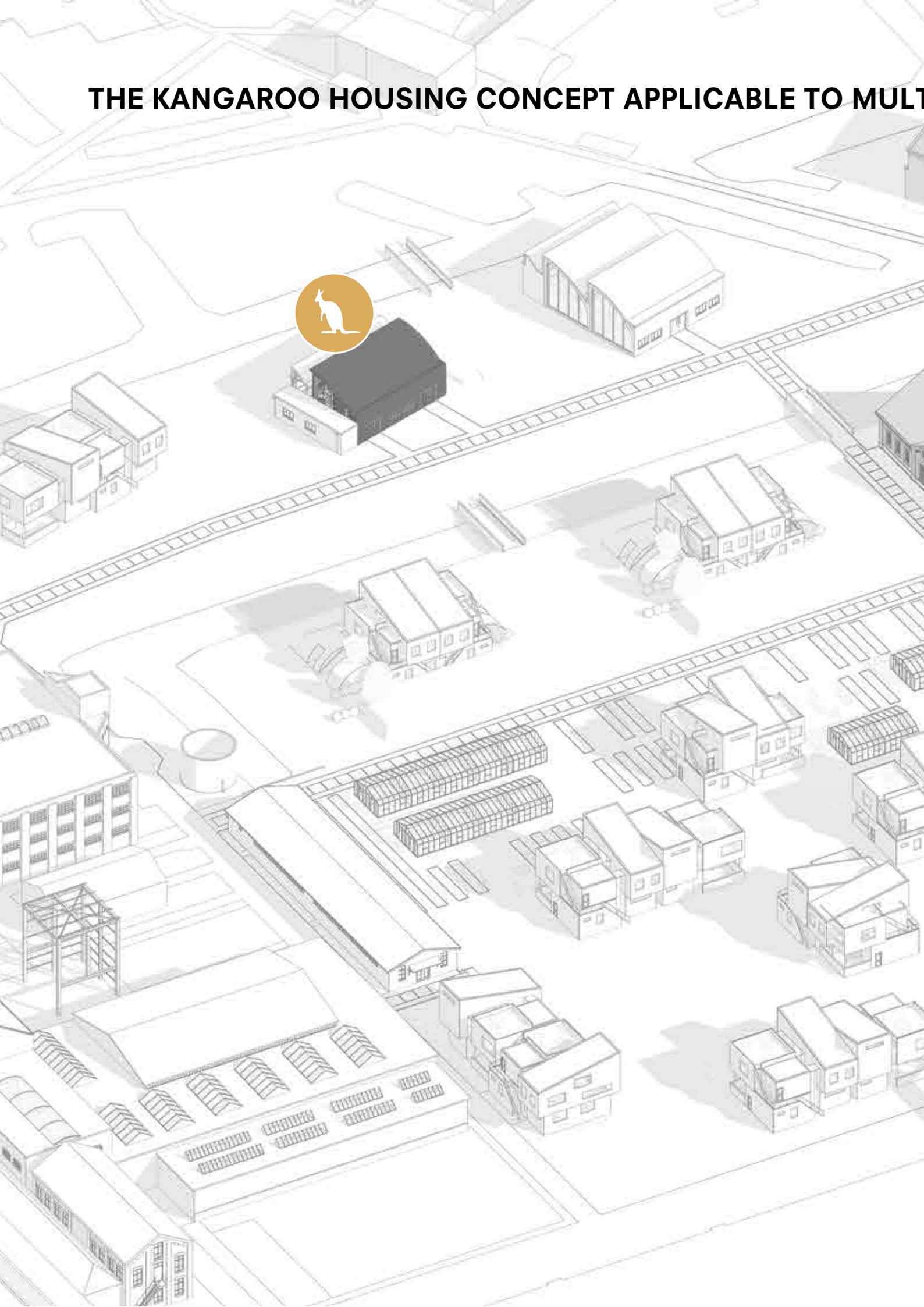
**2 - OPENABLE WHEN APPLICABLE**



**3 - FULLY OPEN; NO BORDER BETWEEN ZONING**



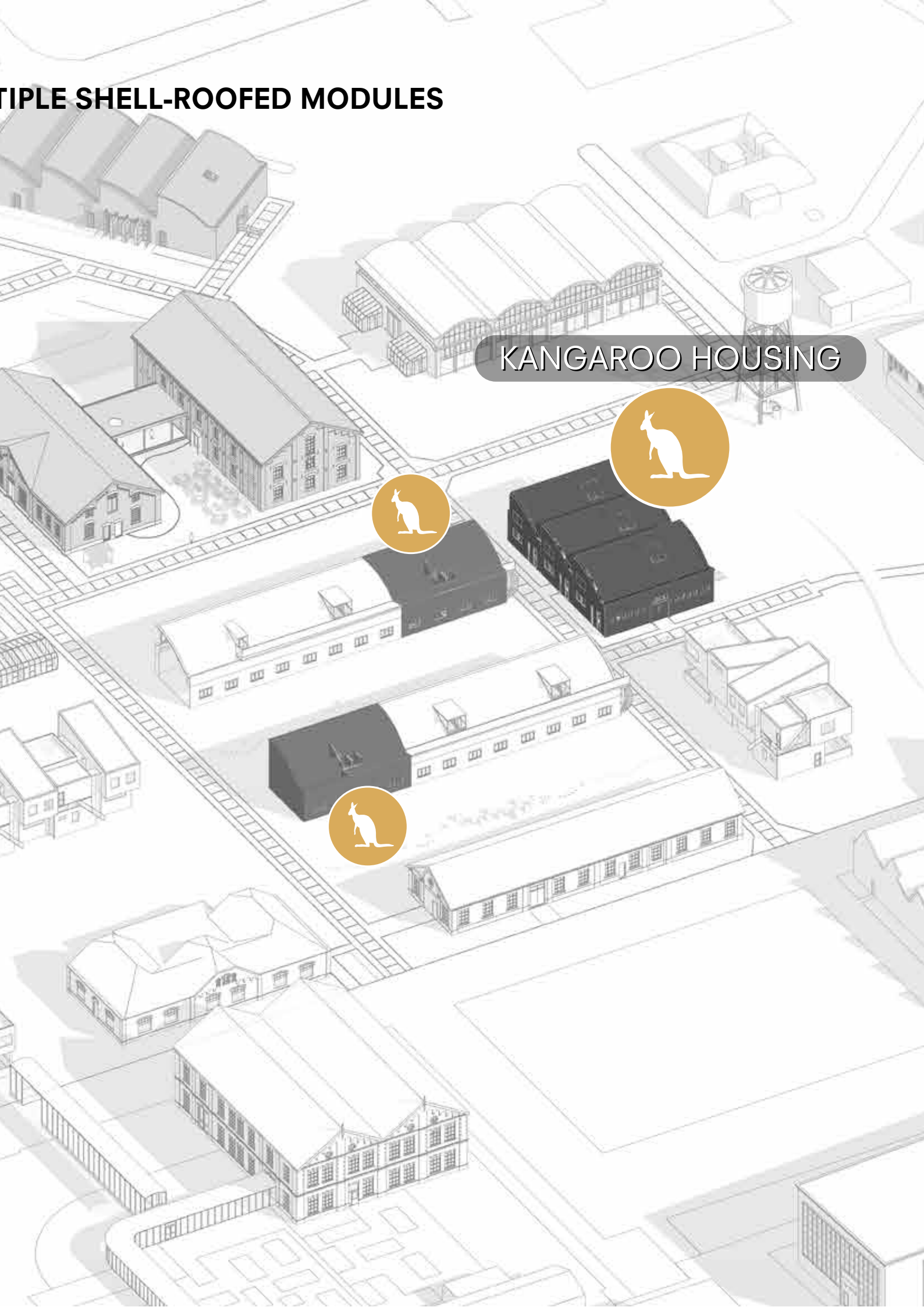
# THE KANGAROO HOUSING CONCEPT APPLICABLE TO MULT





# MULTIPLE SHELL-ROOFED MODULES

## KANGAROO HOUSING







**05**

**THE CONTEMPLATION HALL**





LL





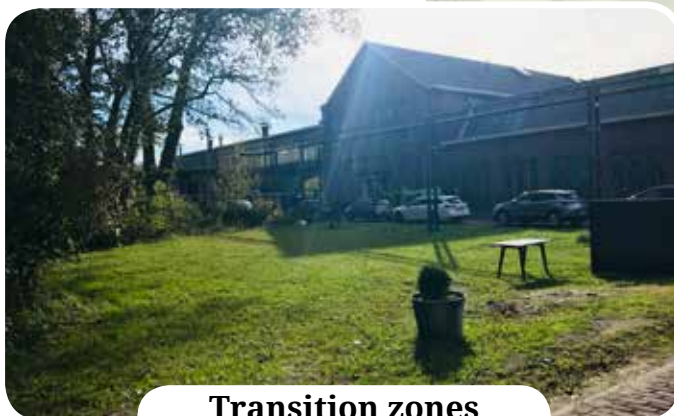
**Contemplation Hall  
along the Draaibank**



**Lane of trees**



**Compactness**



**Transition zones  
“Border of trees”**





# ANCES



**Light; Scents/colour**



**Touch; tall grasses**



**Tall, wild, spacious  
woods. Undefined trail**



**“Lifted”;  
Umfassungsweg**



















































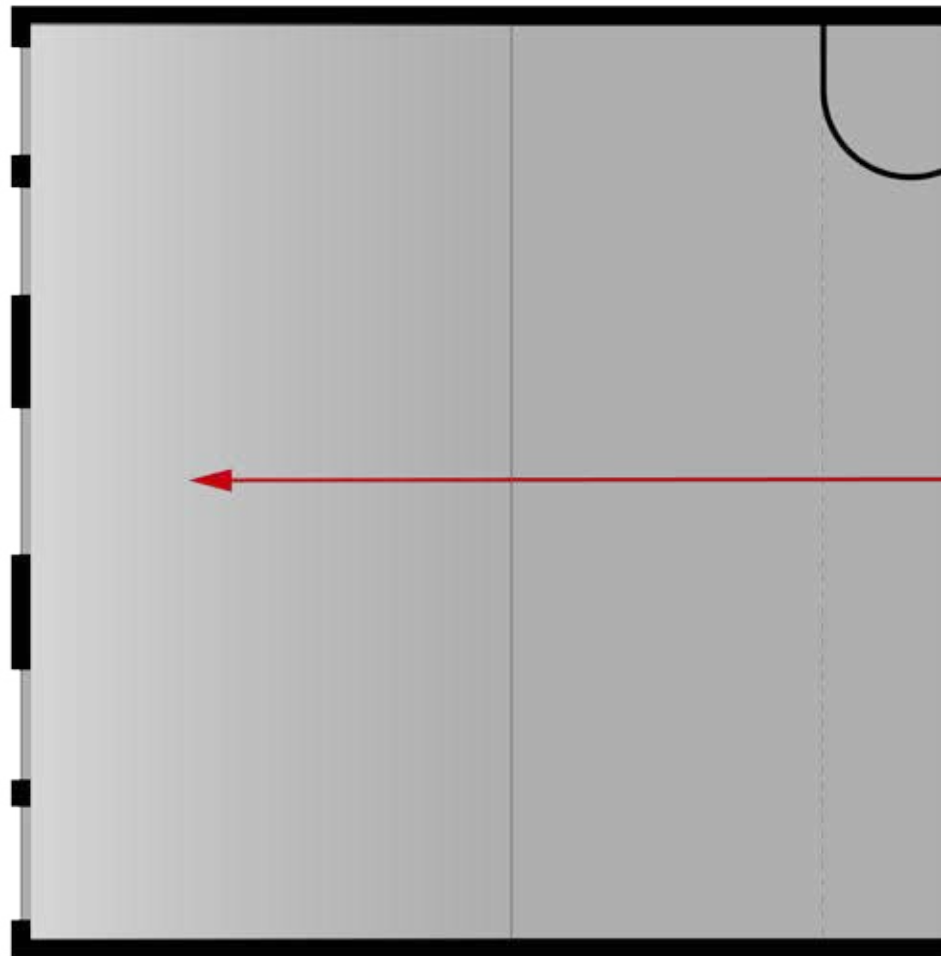
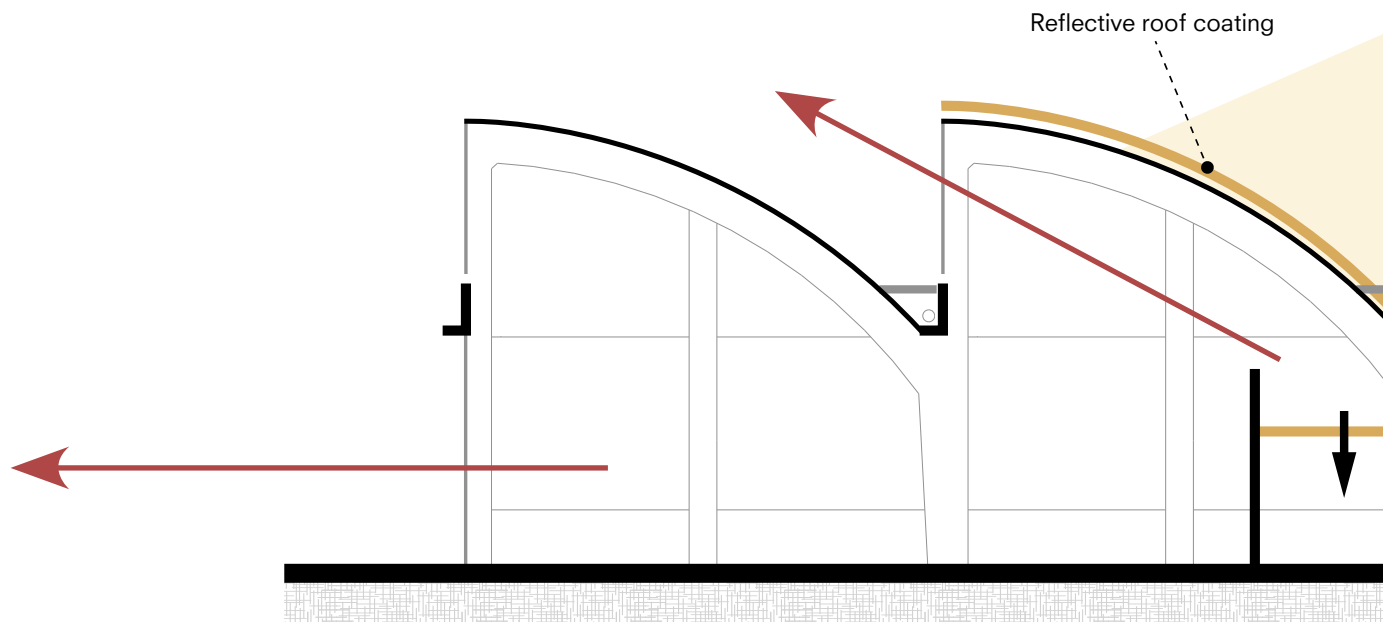




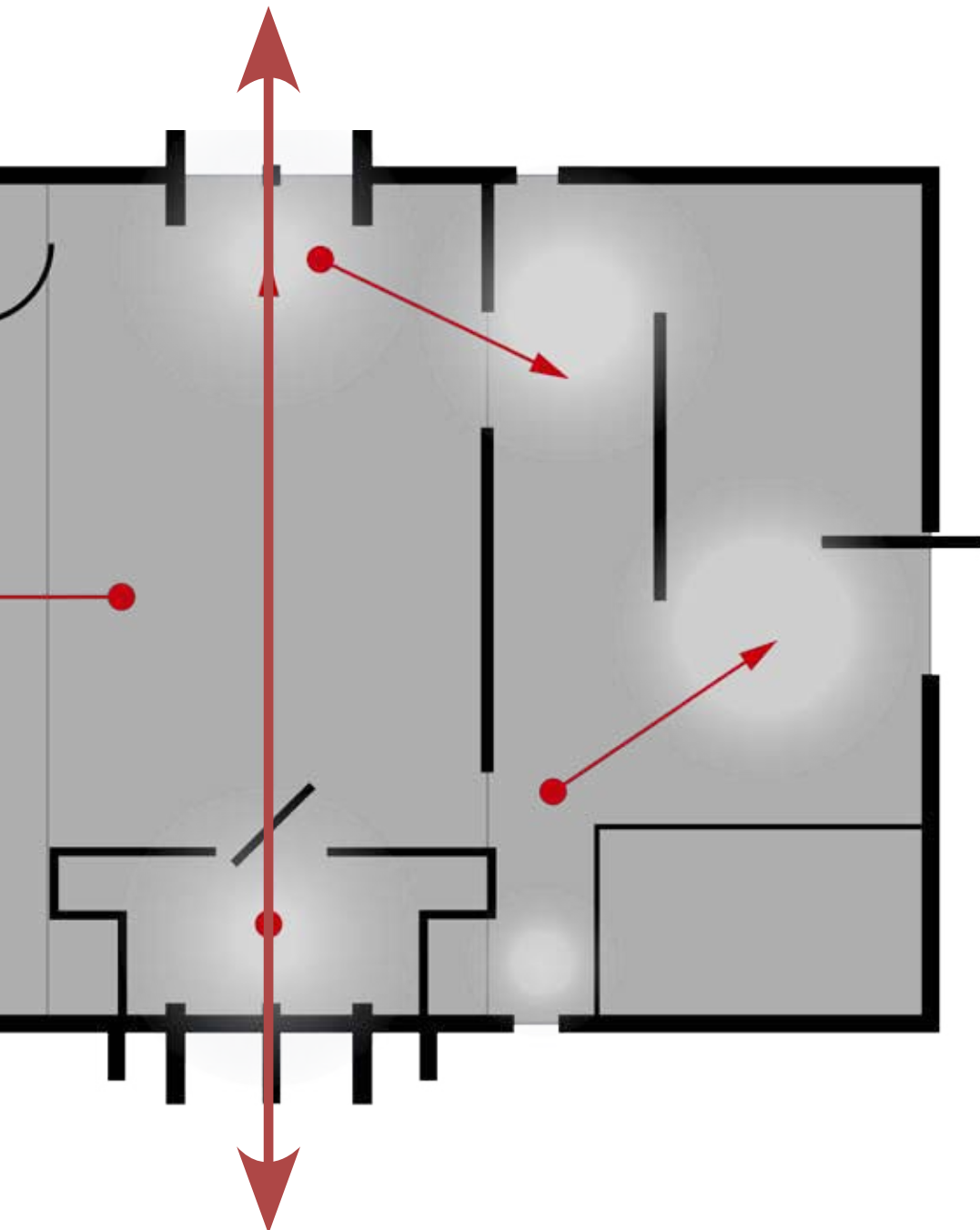
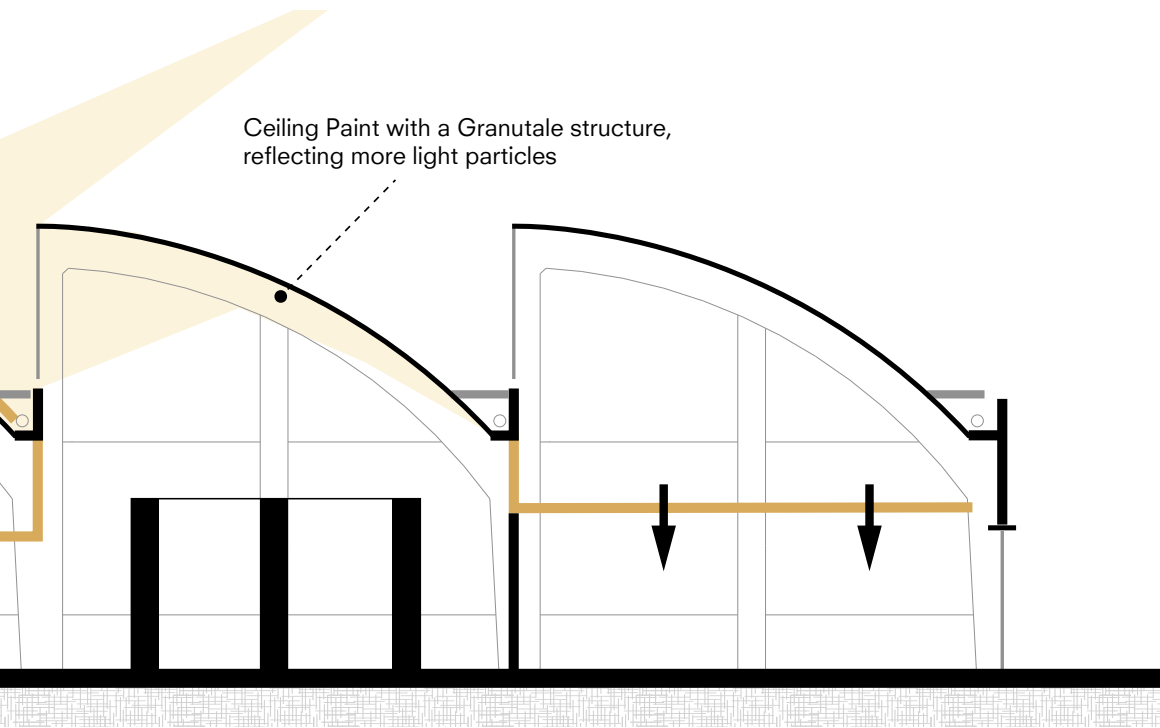




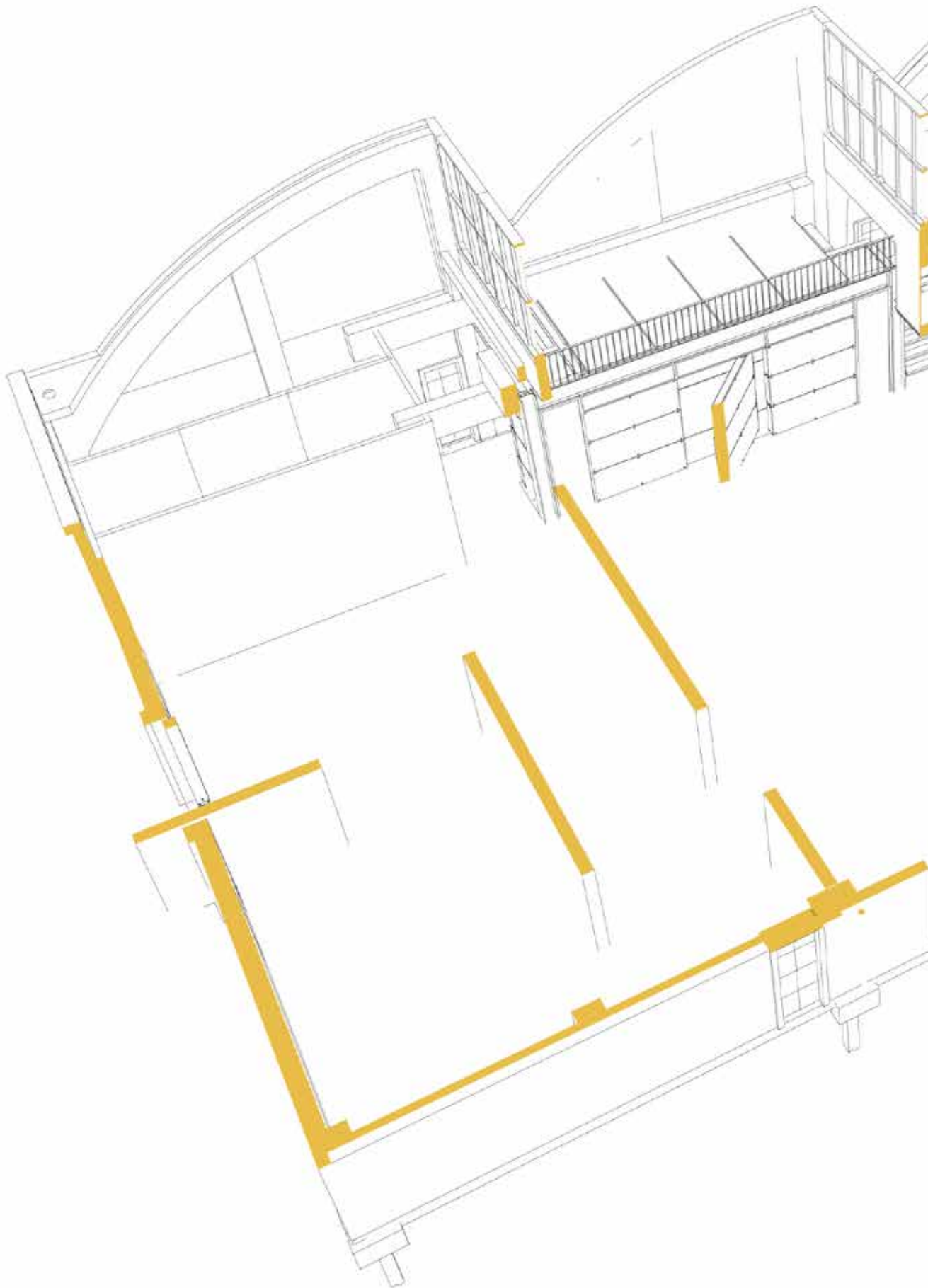
## 1.15 Contemplation Hall



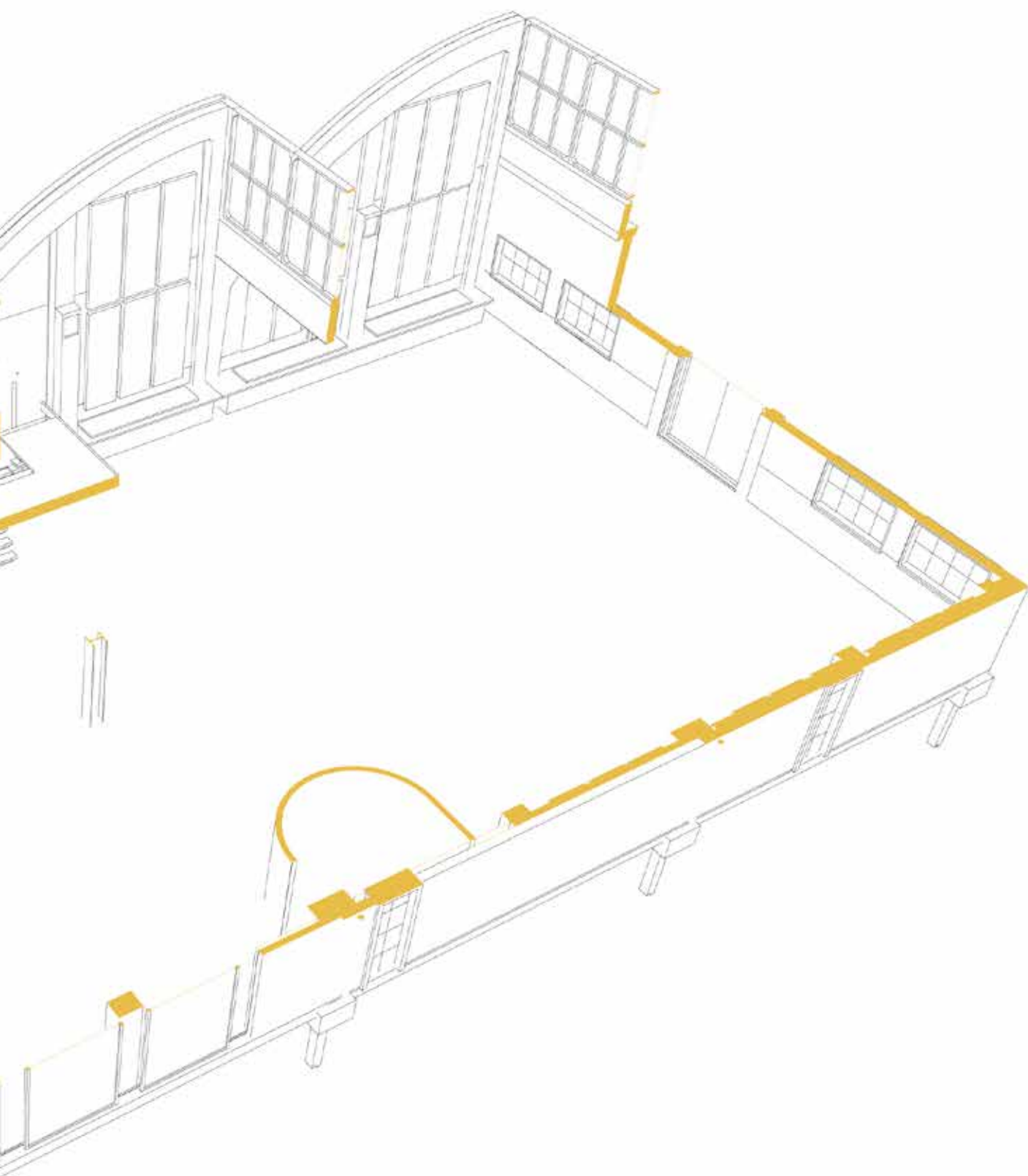








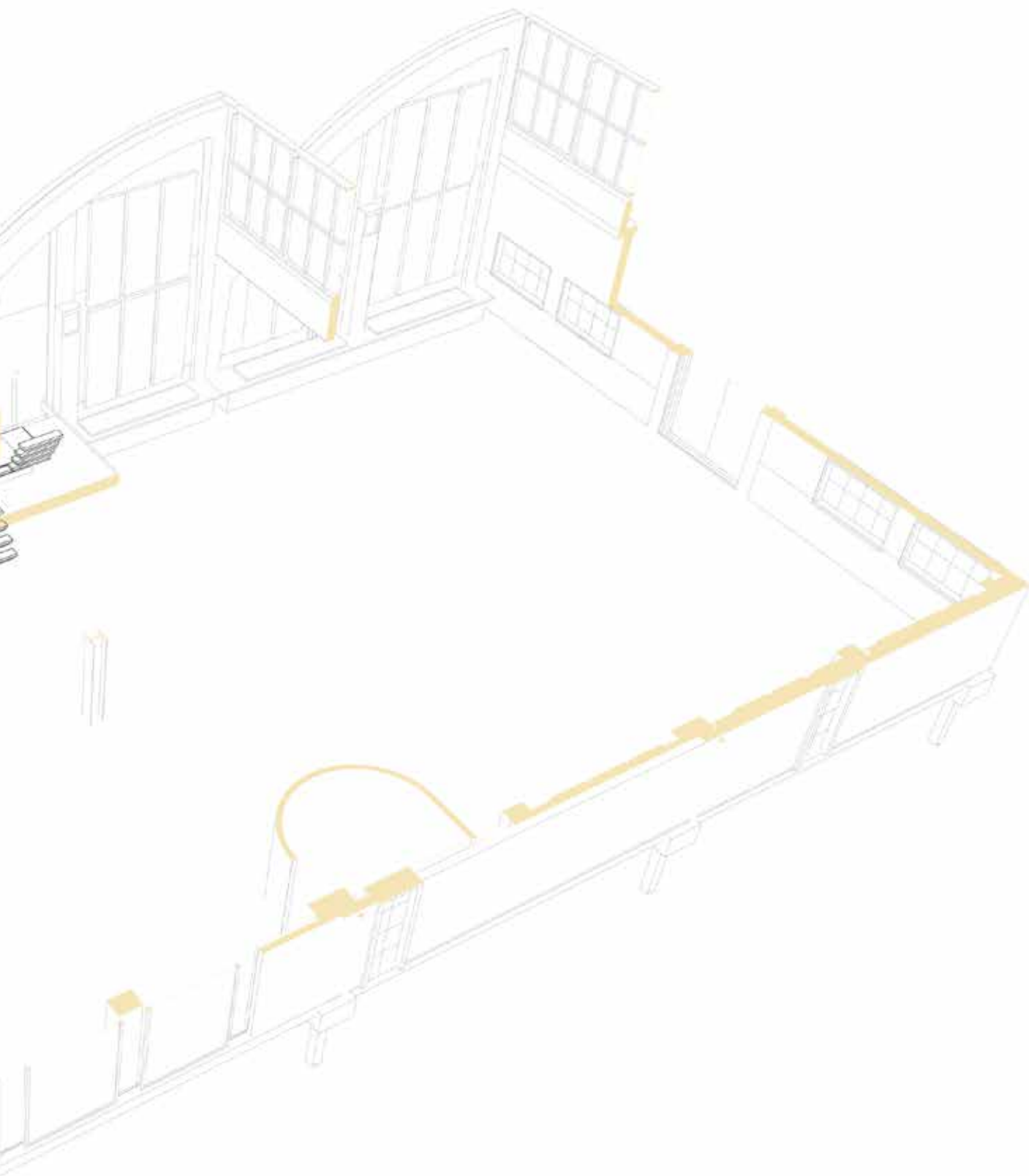






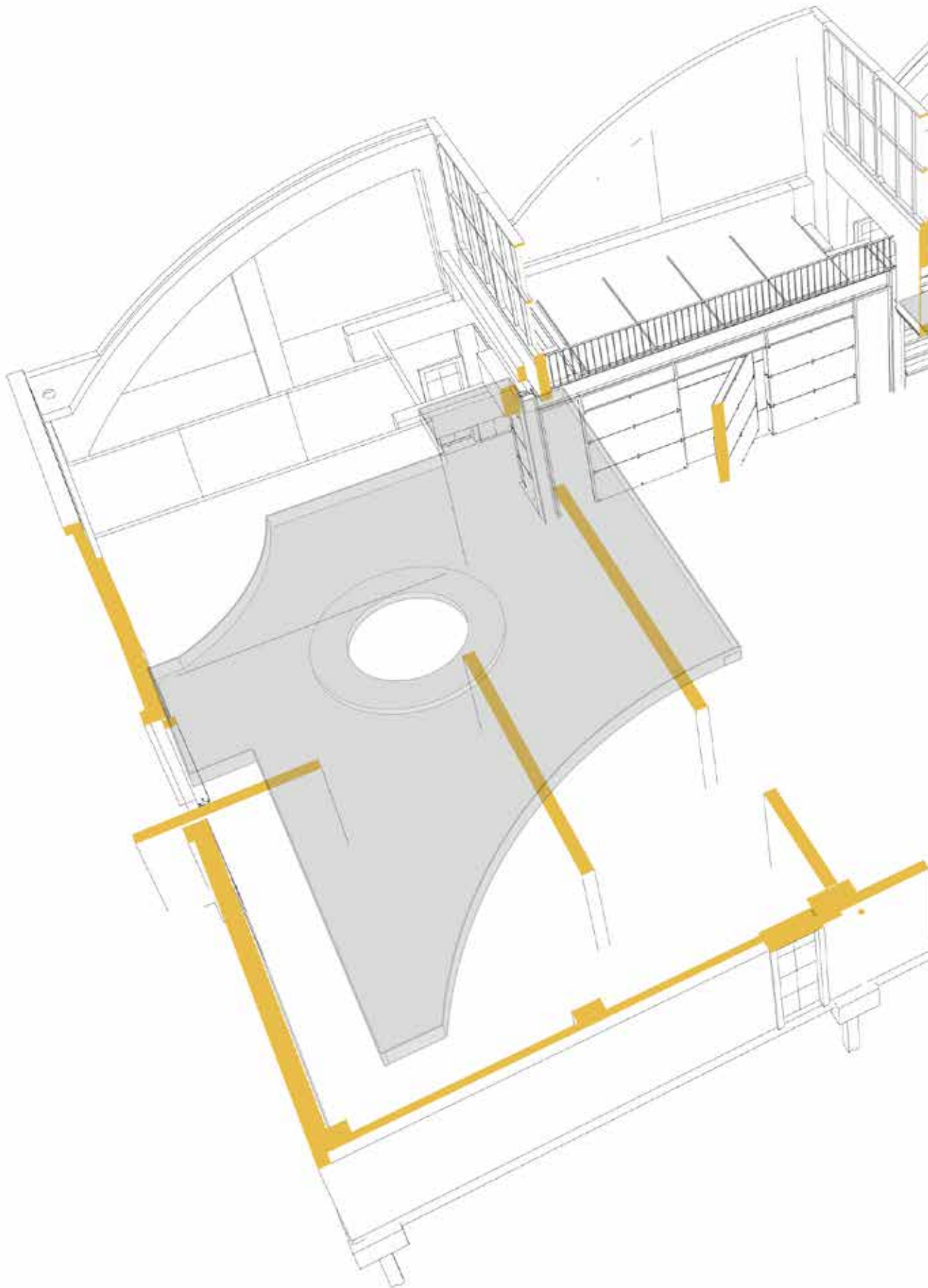




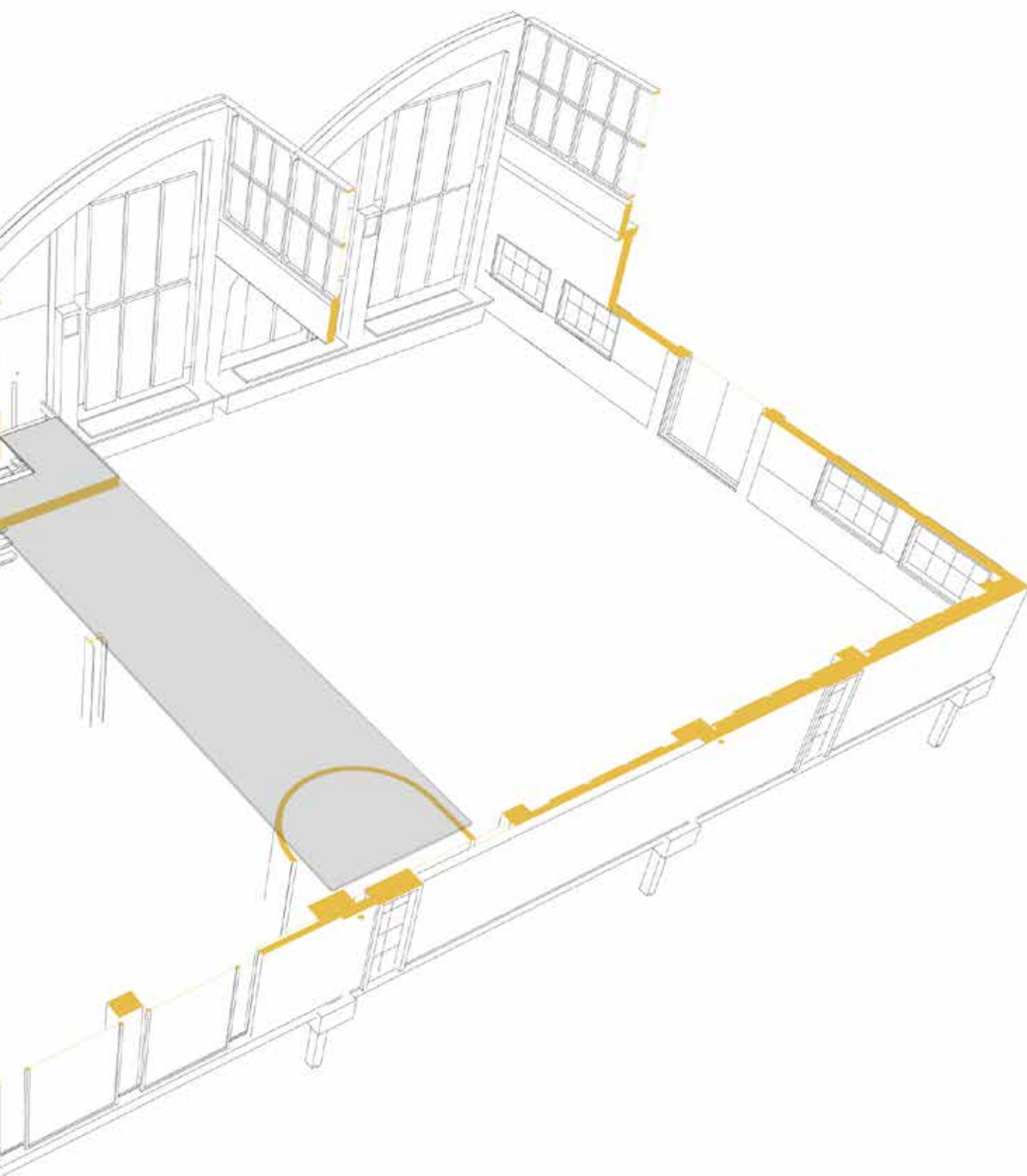


**ENTRANCE**









**DESCENDED CEILINGS**









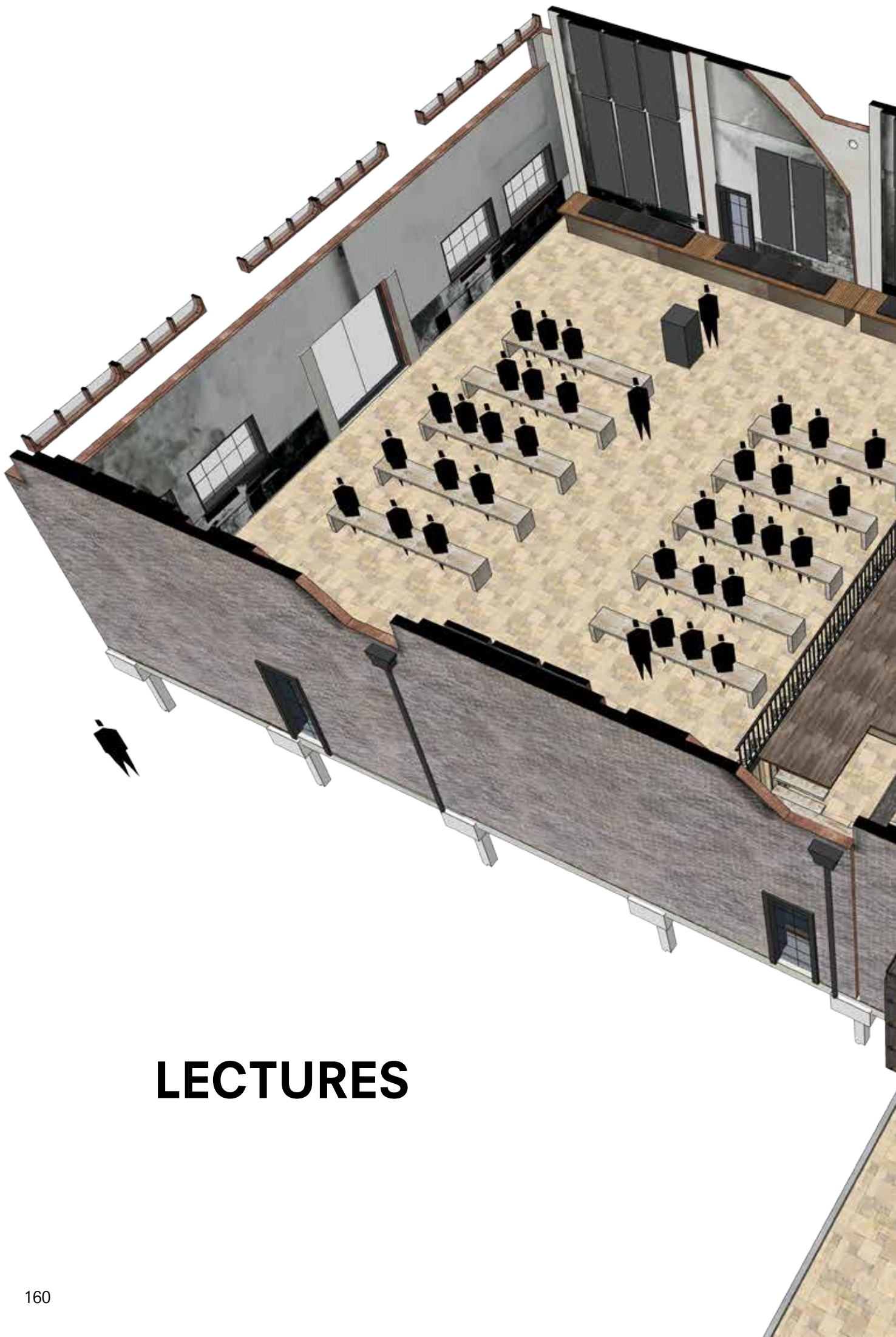










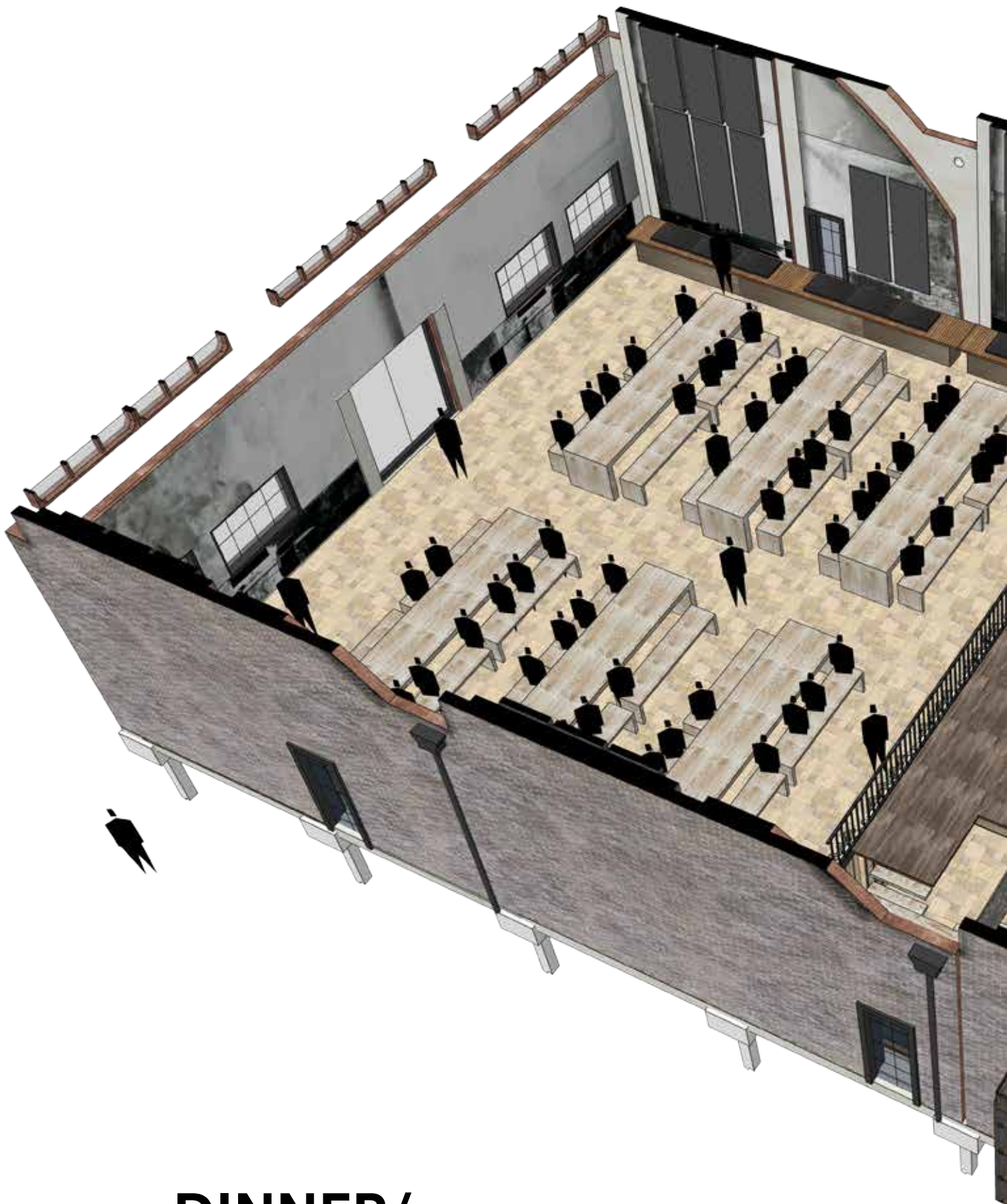


# LECTURES







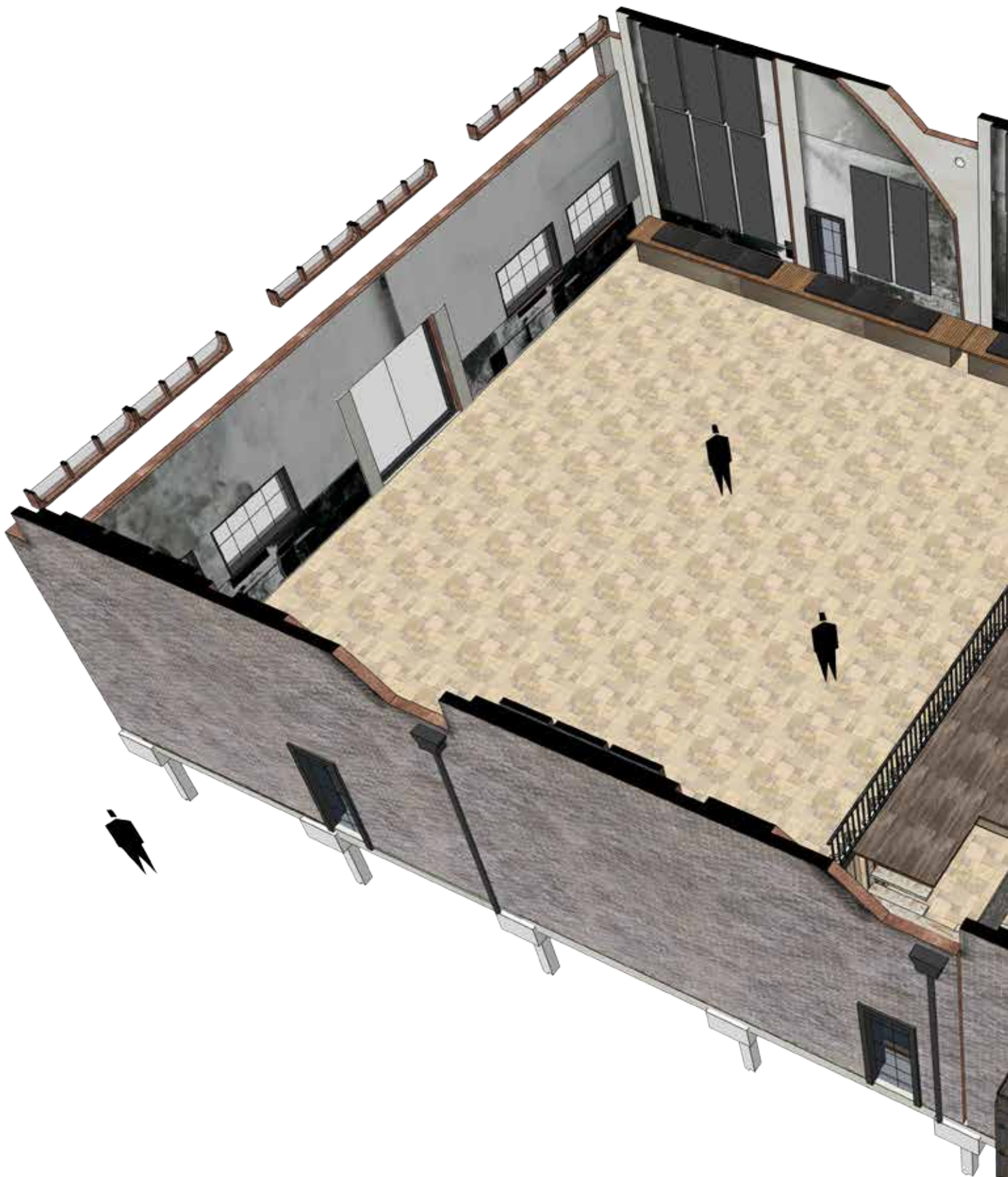


## **DINNER/ COMMUNAL GATHERING**







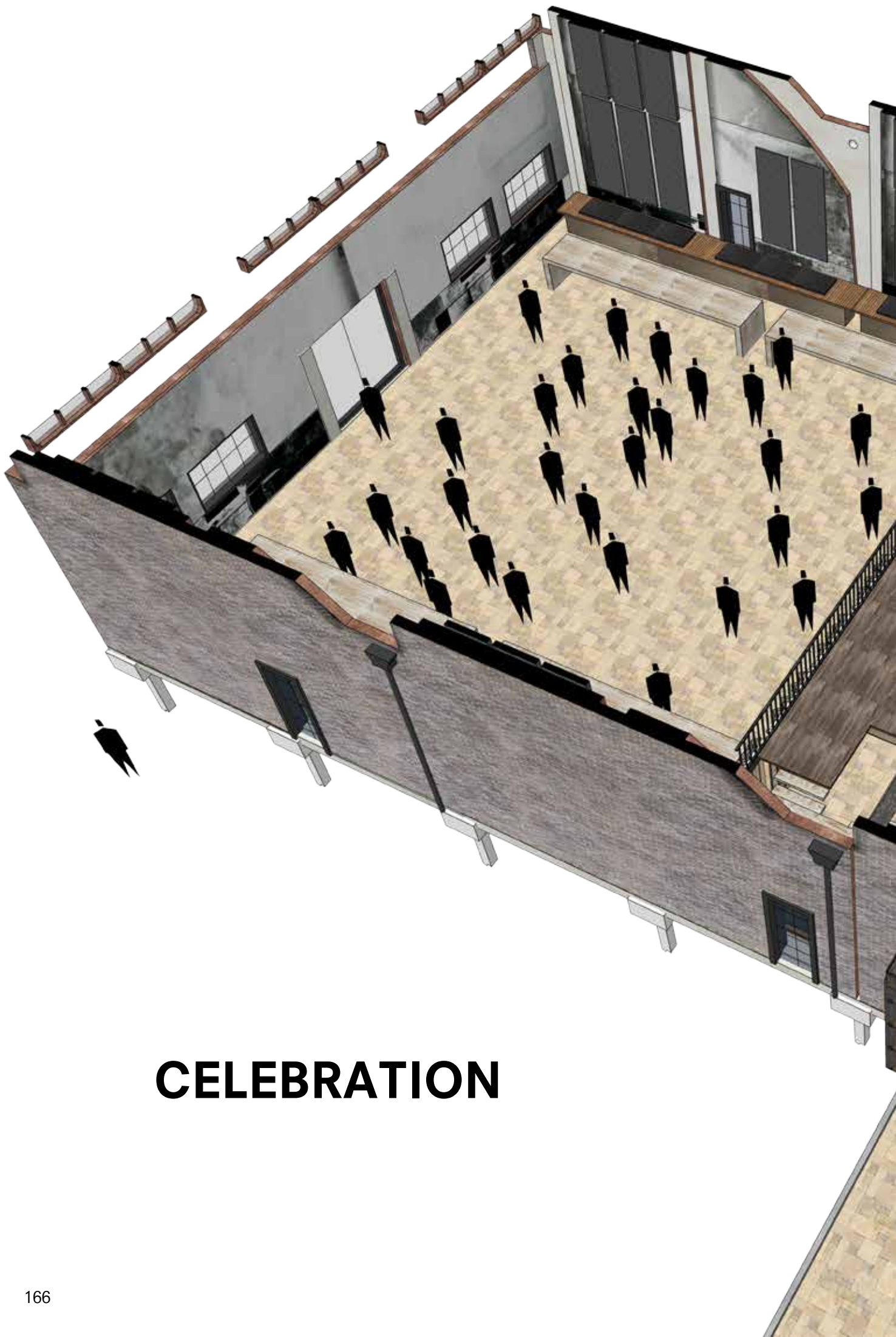


## FEAST/ORCHESTRY







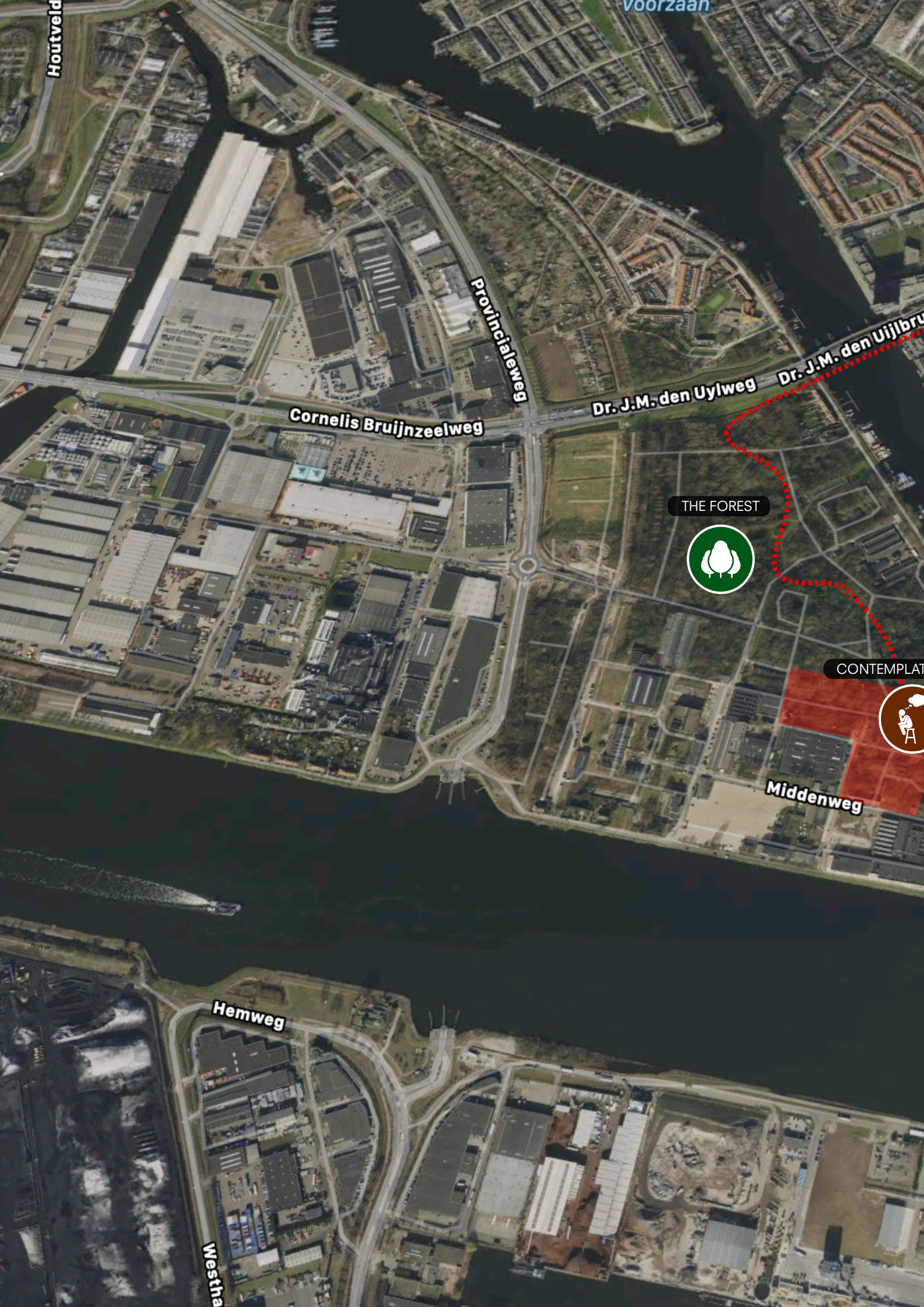


# CELEBRATION









Houtveld

voorzaan

Provincialeweg

Cornelis Bruijnzeelweg

Dr. J.M. den Uylweg

Dr. J.M. den Uijlbrug

THE FOREST



CONTEMPLAT



Middenweg

Hemweg

Westha





Zuidervaart

Zuidervaart

CREMATORIUM AND FUNERAL CENTER ZAA NSTAD

Vijfhoekpark

Zuidelijk

CEMETRY

Wijkstraat

Zijkanaal G

Isaïc Baarthaven

Dirk  
Metselaarhaven

HEM BRUG

ION HALL











## 1.16 Rain water principle/ shadow vegetation



**FARGESIA ROBUSTA  
'PINGWU'**



**ACORUS GRAMINEUS  
'OGON'**



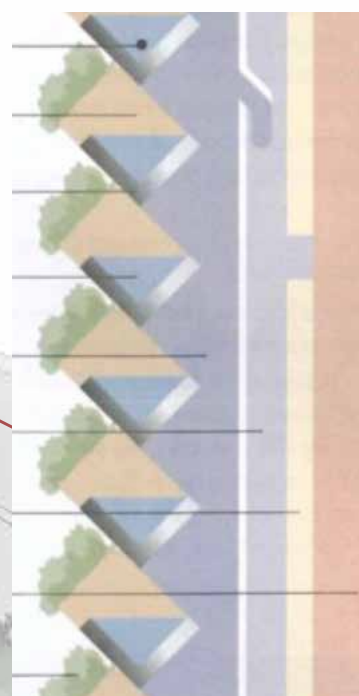


Collecting accumulated rainwater  
within existing gutter



Rain water distributes equally  
over the mounted green facade

Monnikskap (Aconitum)  
Longkruid (Pulmonaria)  
Elfenbloem (Epimedium)  
Kruipend zenegroen (Ajuga  
reptans)  
Gebroken hartje (Dicentra)  
Kerstroos (Helleborus orientalis)  
Varen (Polystichum)  
Hartlelie (Hosta)  
Kaukasisch vergeet-me-nietje  
(Brunnera)  
Salomonszegel (Polygonatum)



**ACORUS GRAMINEUS  
'VARIEGATUM'**

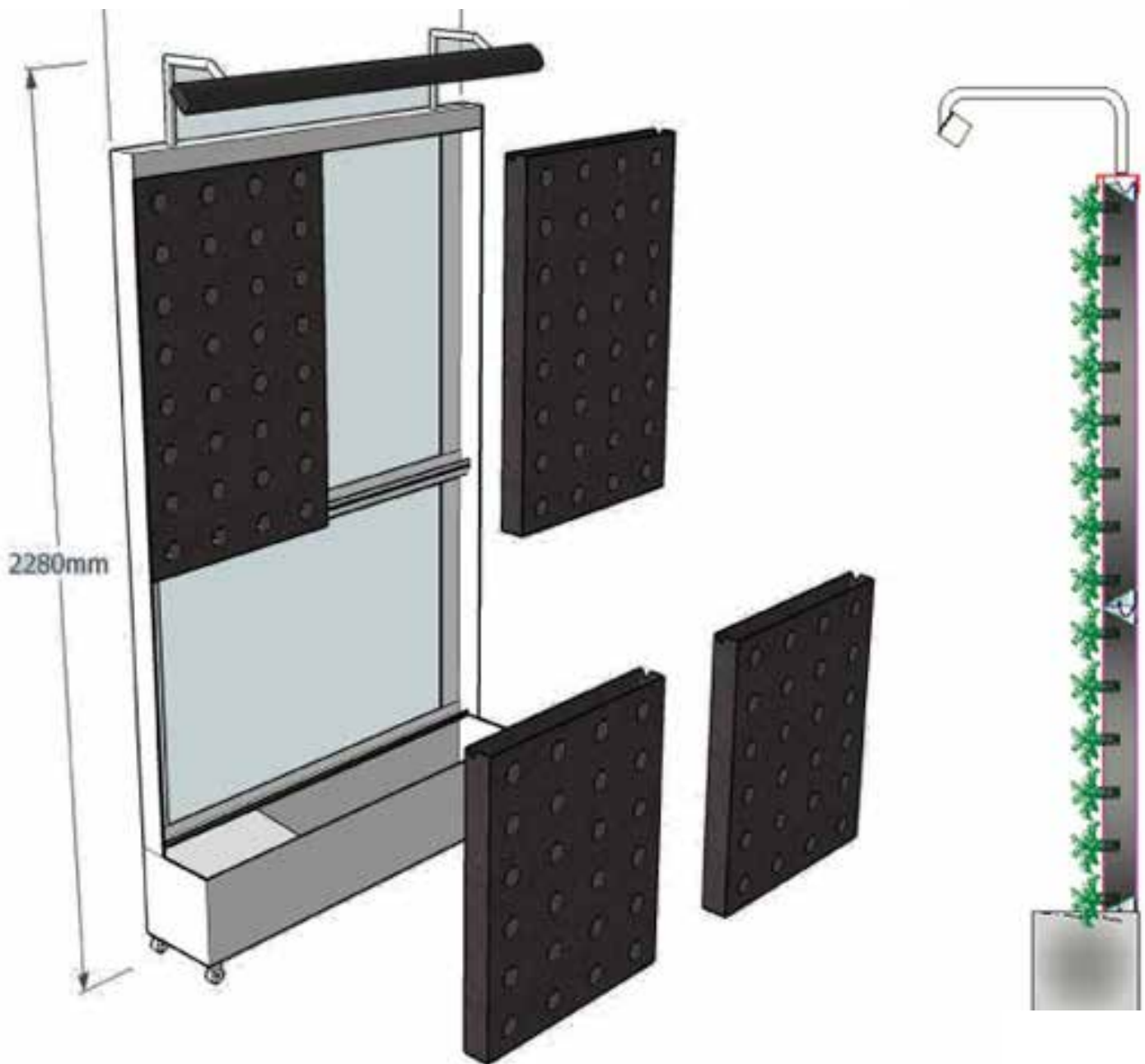


**FERN  
'POLYSTICHUM'**



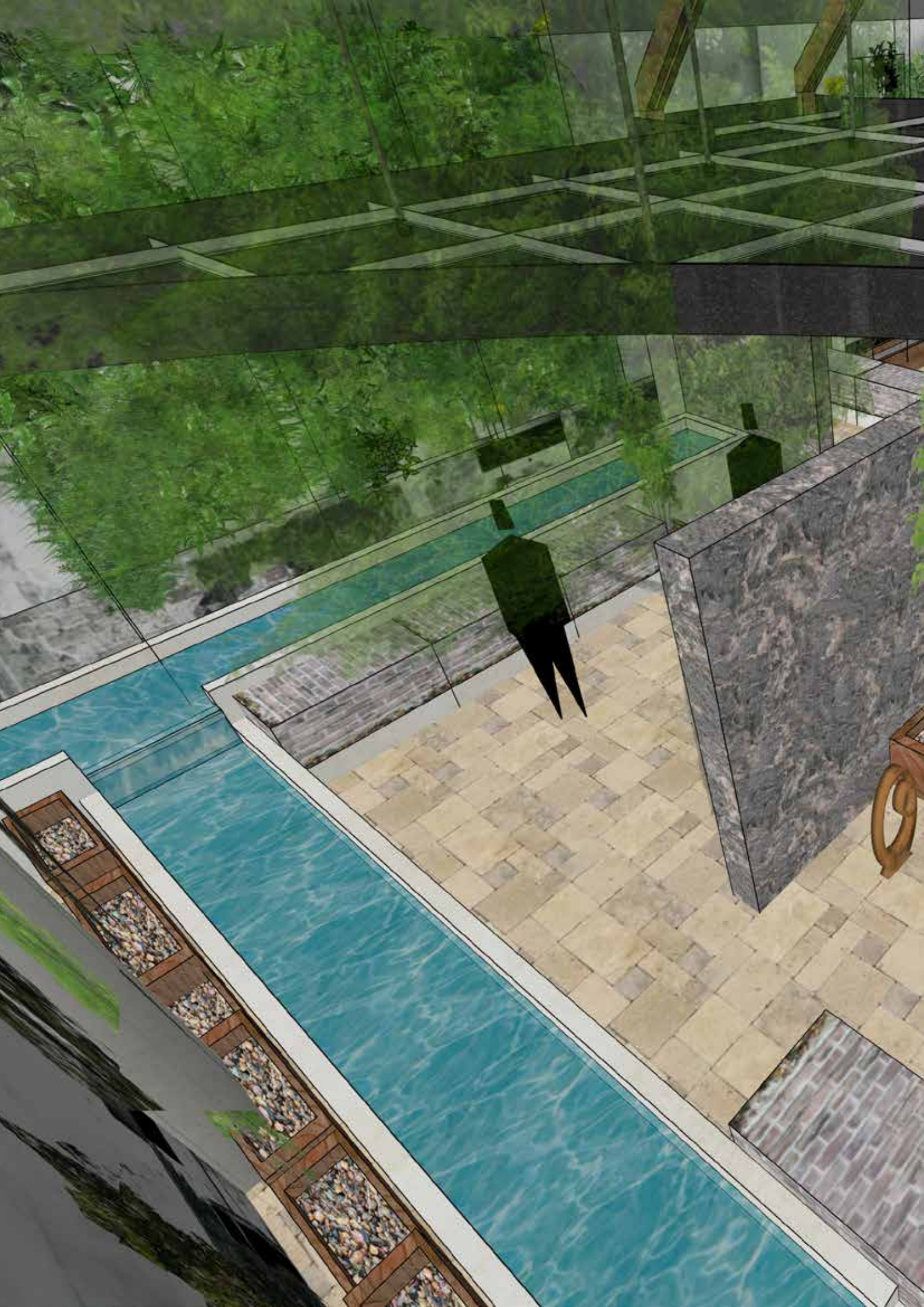






**WALLFLORE FLEX**











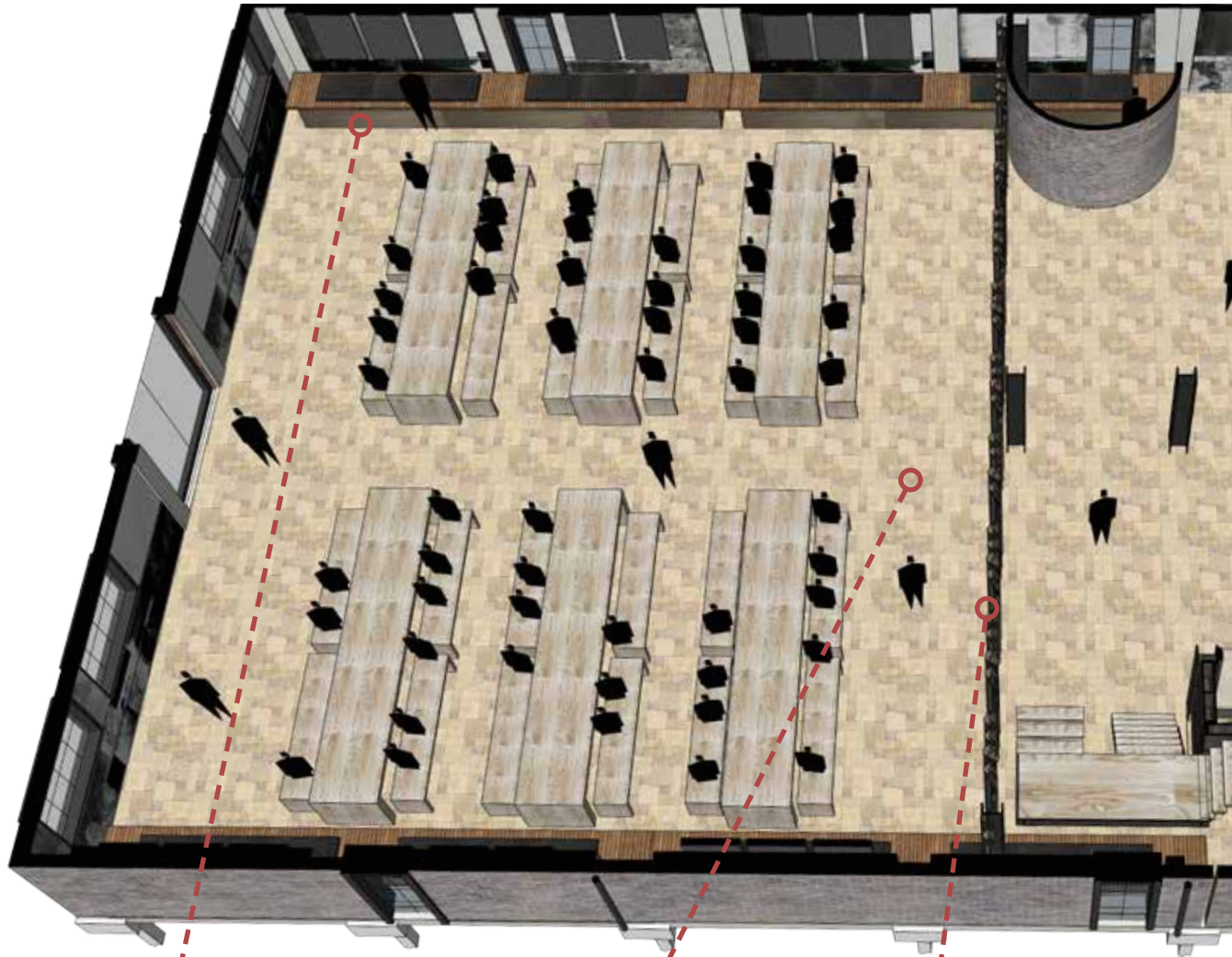




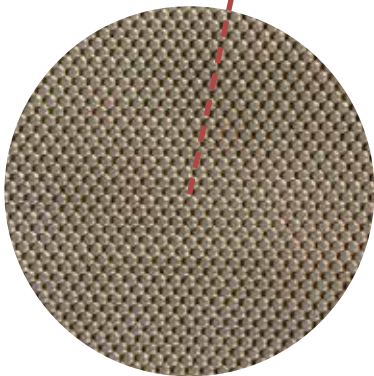




## REDUCED ACOUSTIC REVERBERATION



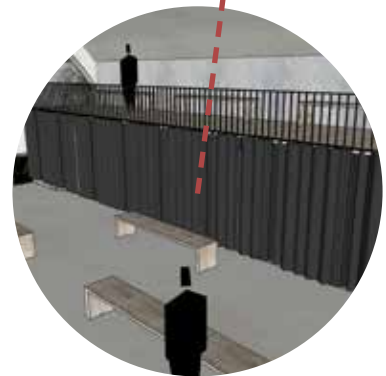
## FLOOR HEATING



Stretch metal finishing



Floor heating/Stone tile finish

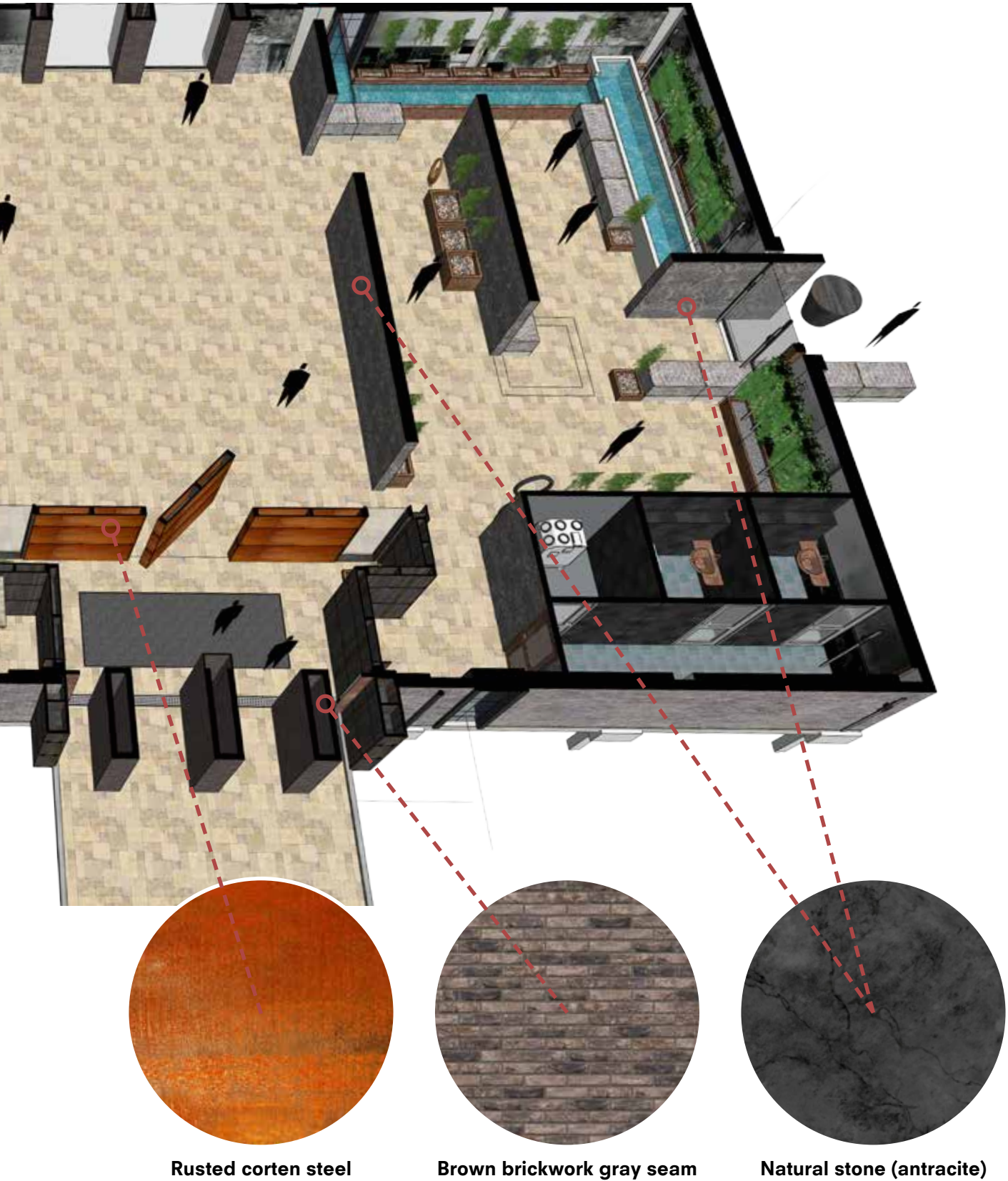


Room-dividing curtain



# LISATION

INCREASED ACOUSTIC REVERB













# RESEARCH

*How did practical military design  
of a forest-village*

*“How can the existing buildings of the PL  
elderly can live more independently and with  
porting com*



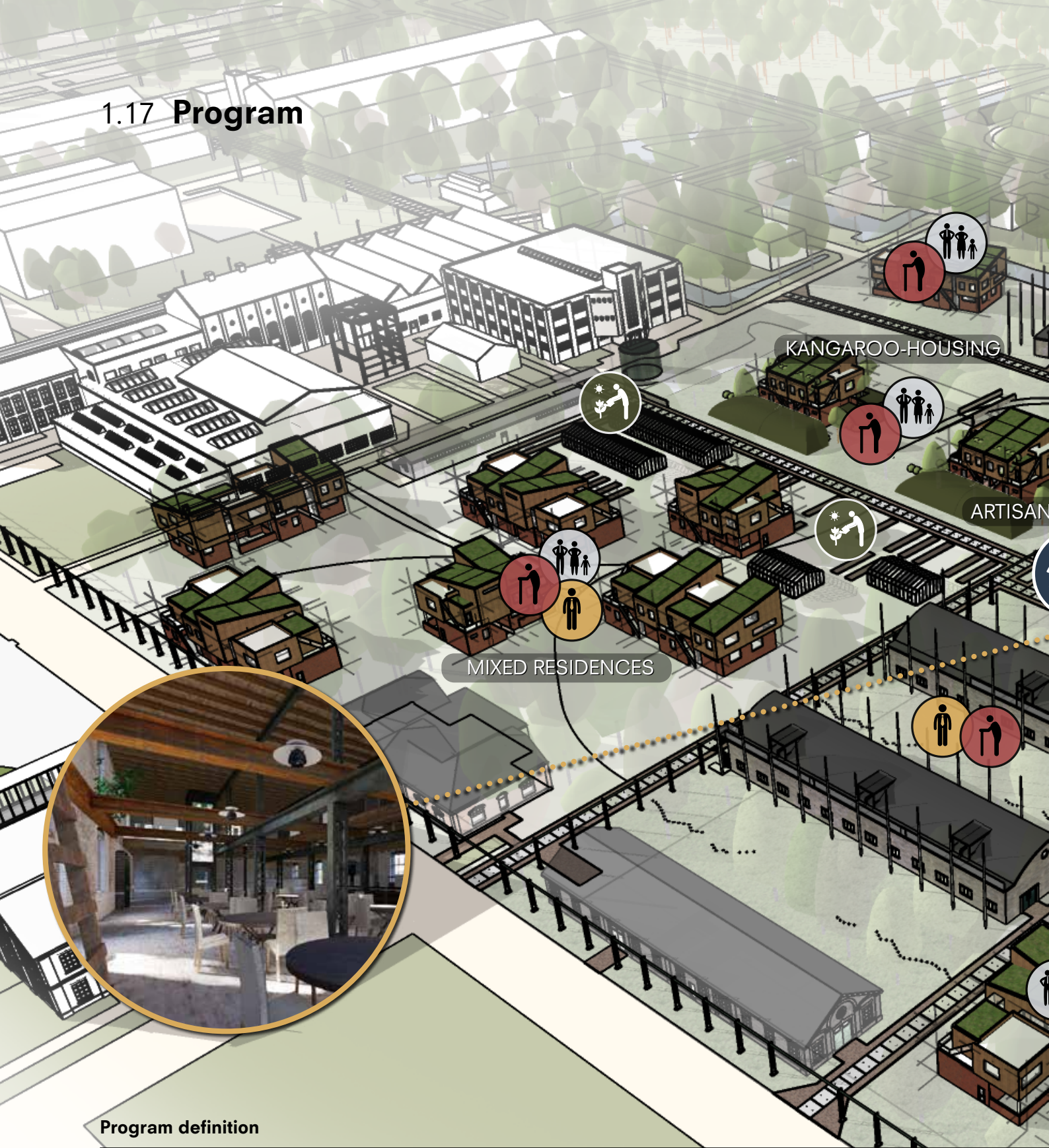
# QUESTION

*sign yield unintended qualities  
age in Plofbos?*

*ofbos be transformed sustainably, where  
which stimulates the settlement of a self-sup-  
community?”*



## 1.17 Program



### Program definition



ELDER, 65+



FAMILY



SINGLE ADULTS

### ARTISANS' WORKSHOP



- DRAWING,
- PAINTING,
- TAILORING,
- KNITTING,
- POTTERY,
- WOODWORK,
- FABLAB

### CONTEMPLATION HALL



- CO-
- ME
- LE
- WE
- ME
- AR





GIARTRIC DOCTOR

CONTEMPLATION HALL

READING

S' WORKSHOP

CAFE/RESTAURANT

GARDENING

KANGAROO-HOUSING

FAMILY RESIDENCES

CAFE/RESTAURANT

COMMUNAL GATHERING  
MENTAL REFLECTIONING

PICTURES  
WEDDINGS  
MEMORIAL SERVICES  
ART EXHIBITIONS

- HORECA
- MUSIC
- YOGA/TAI-CHI
- READING
- ORGANISING EVENTS









**QUESTIONS?**



8-5-2008

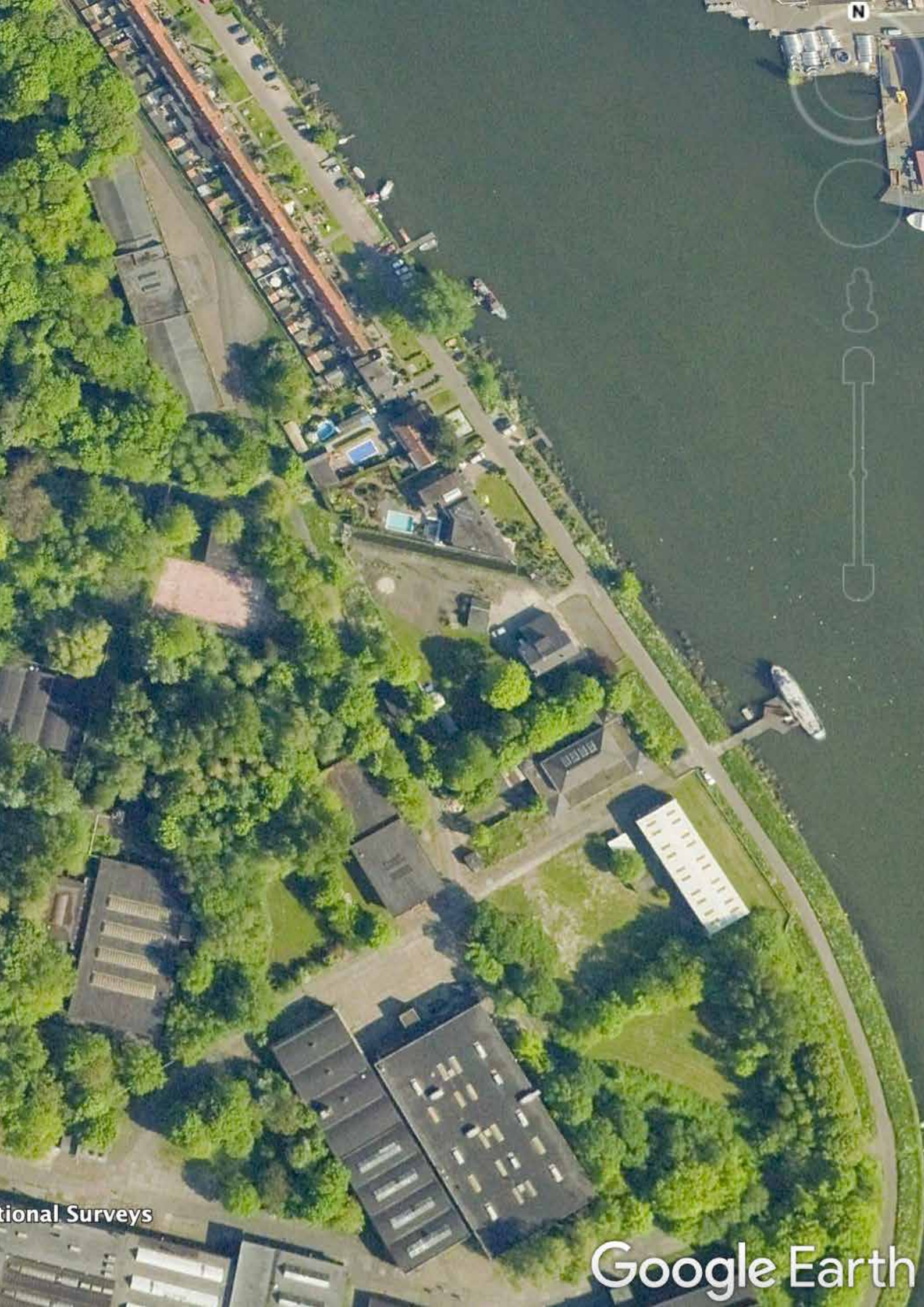


05

CLIMATE

Image © 2019 Aerodata International



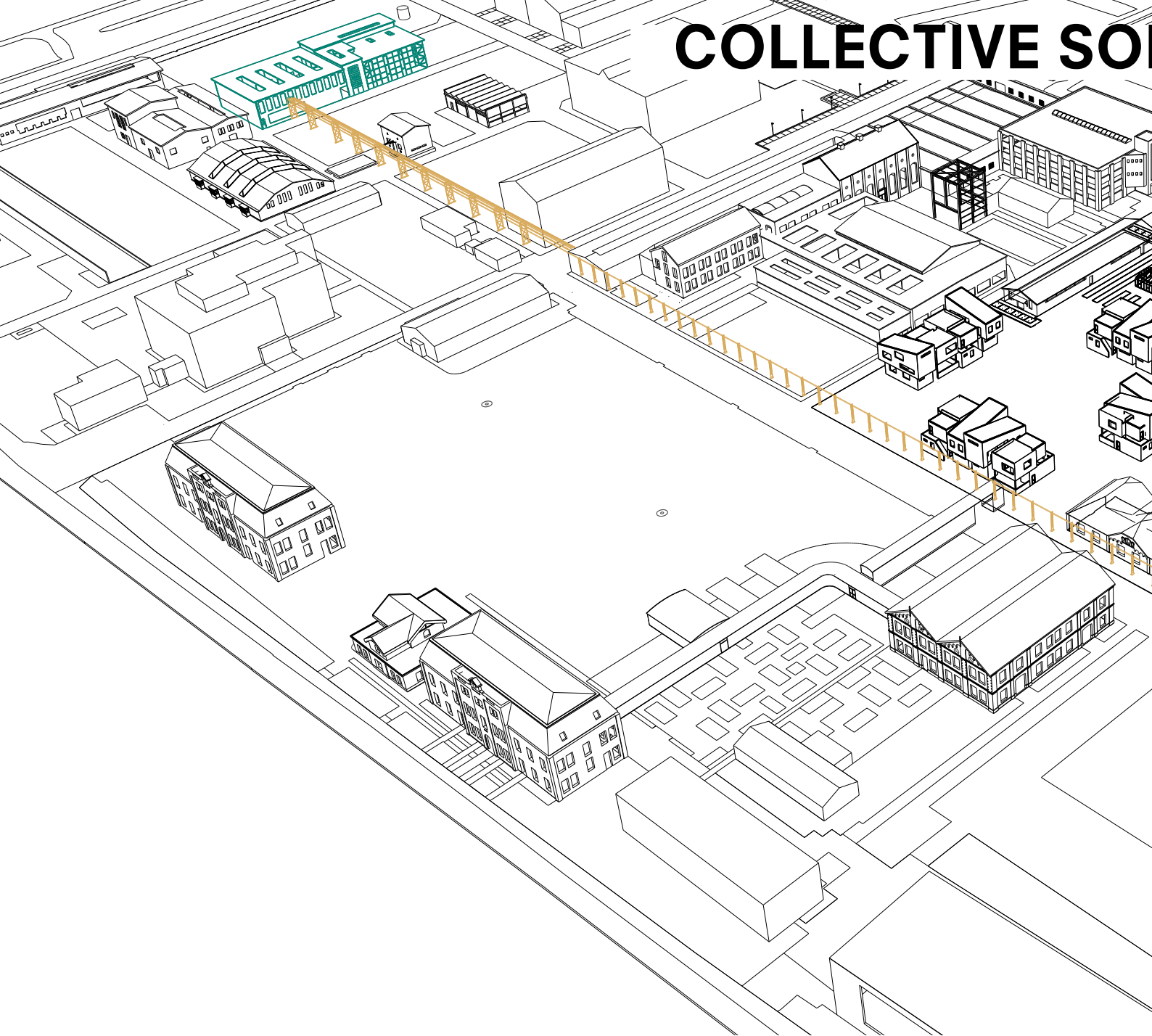


Additional Surveys

Google Earth

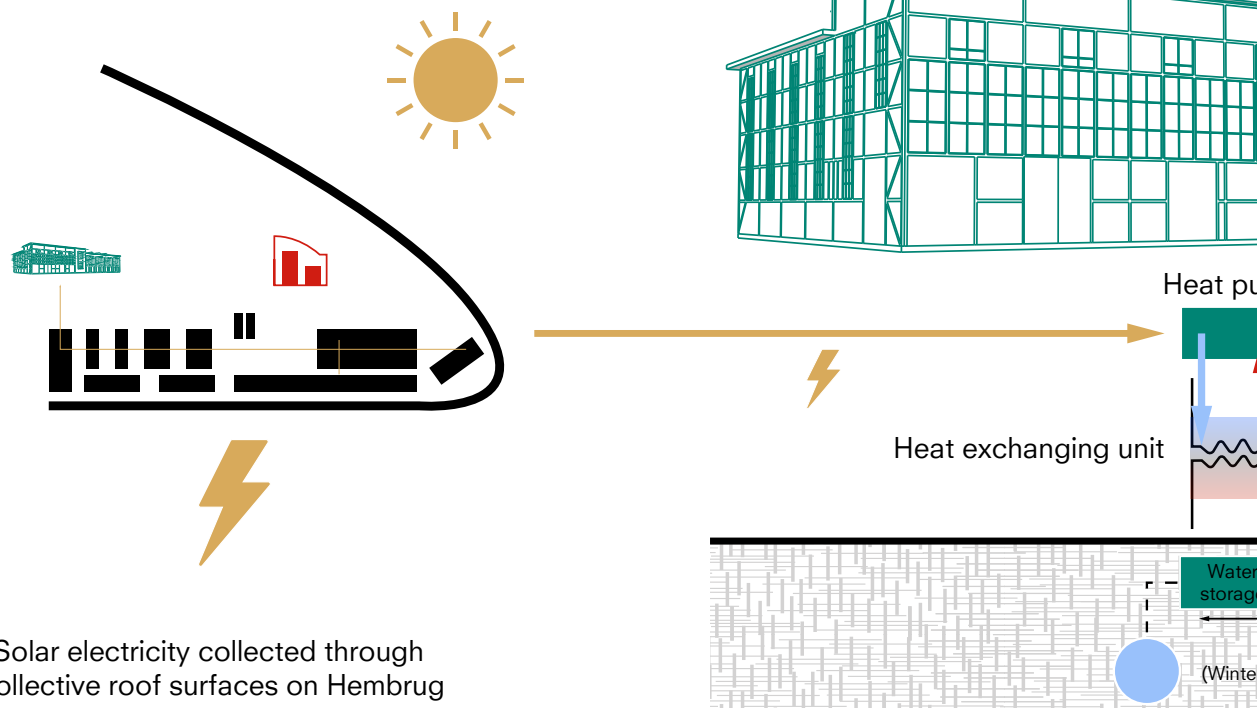


# COLLECTIVE SOL



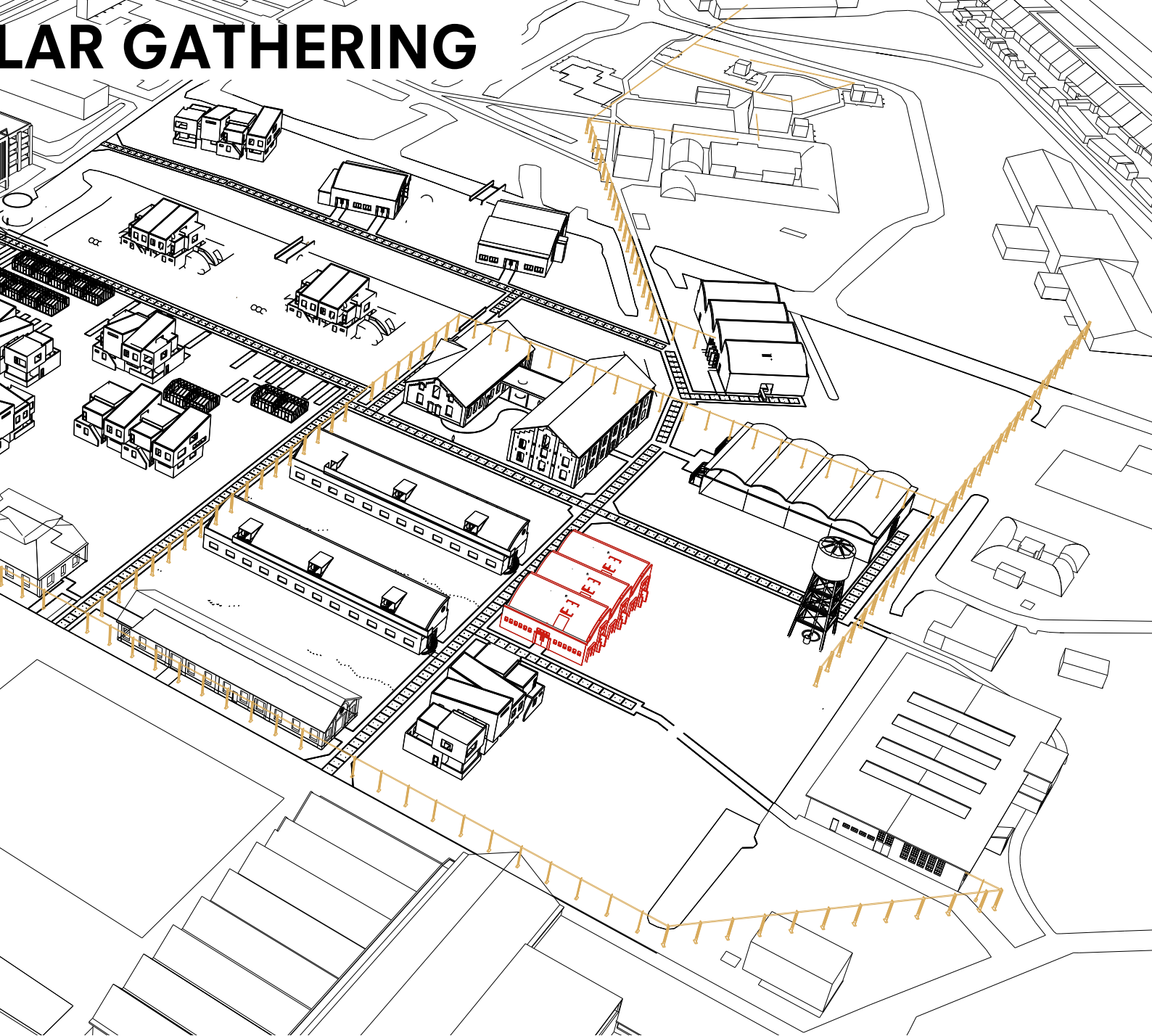
Collective solar gathering

Central Heat pump installation (K





# LAR GATHERING



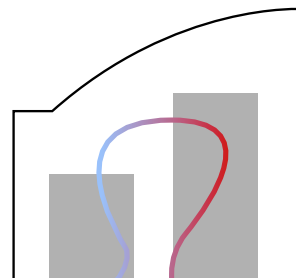
etelcentrale Hembrug)

Kangaroo residence



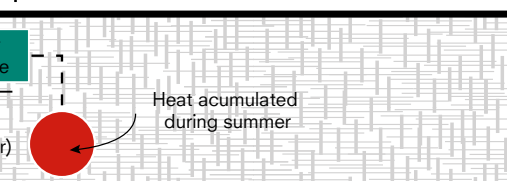
ump

Insulated  
water network  
trough Hembrug  
Ø200mm



Heat  
exchanger

Electrical  
heating boiler



Heat accumulated  
during summer

Hot water used by  
Floor heating + radiators

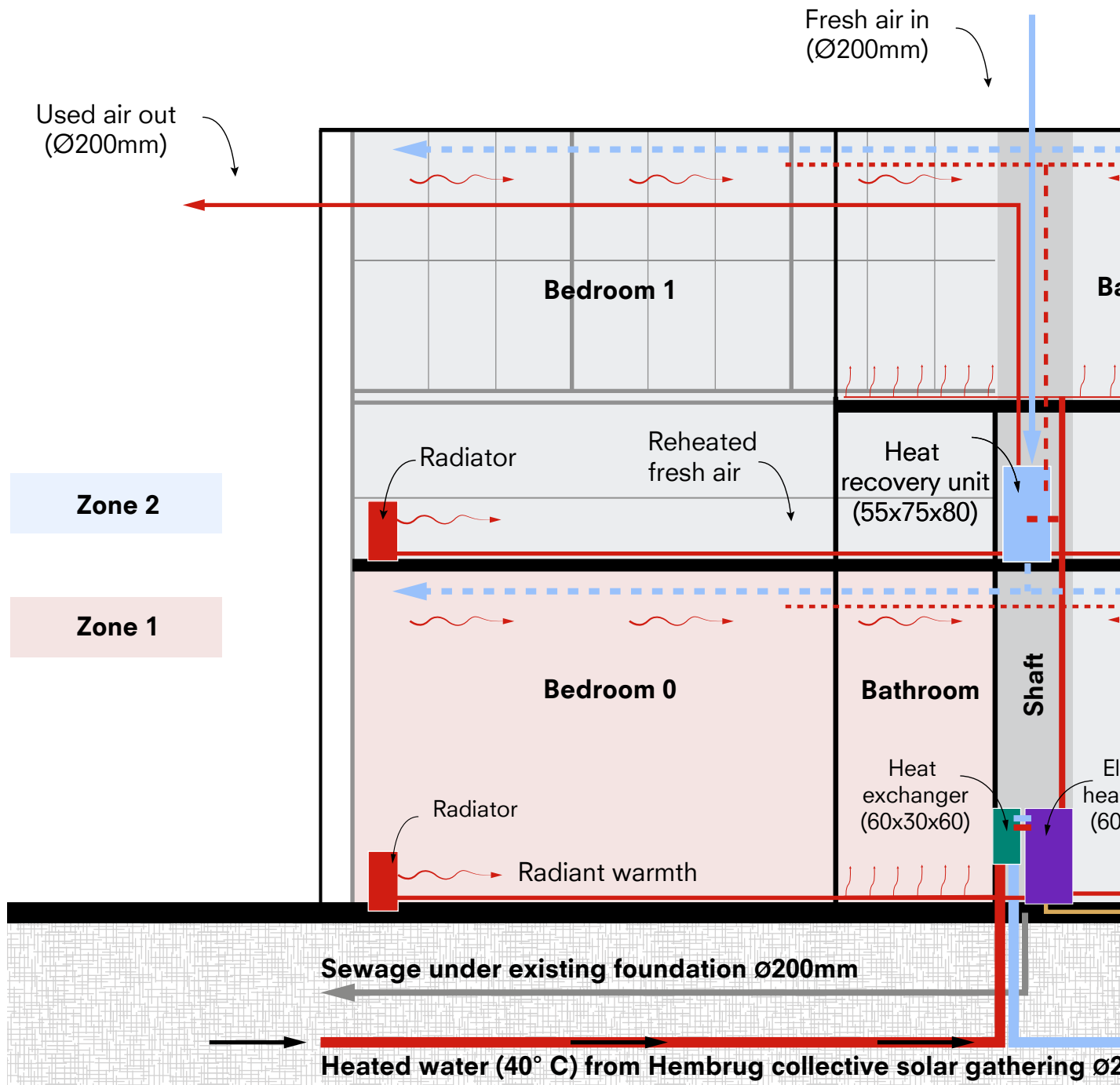










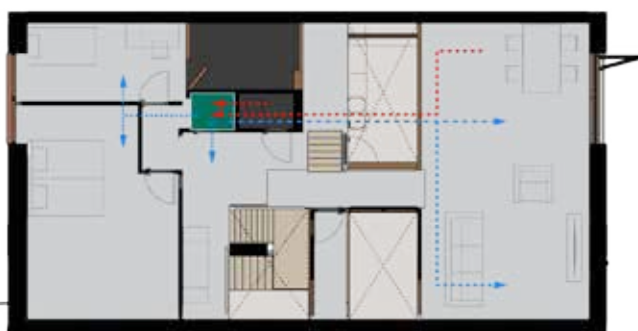
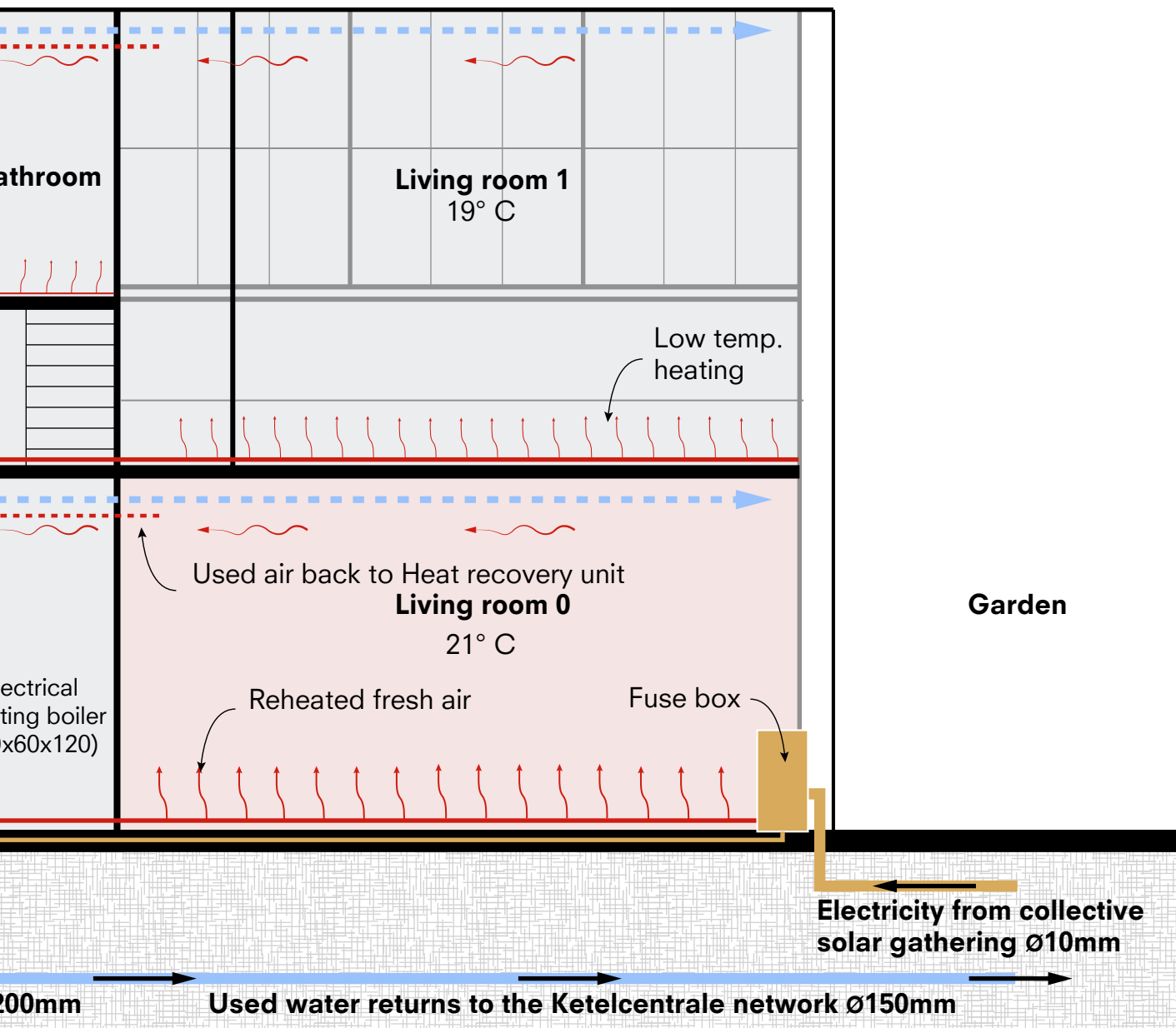


Insulation from the inside. Target:  $R_c$  between  $4/5 \text{ m}^2 \text{ K/W}$



Ground floor



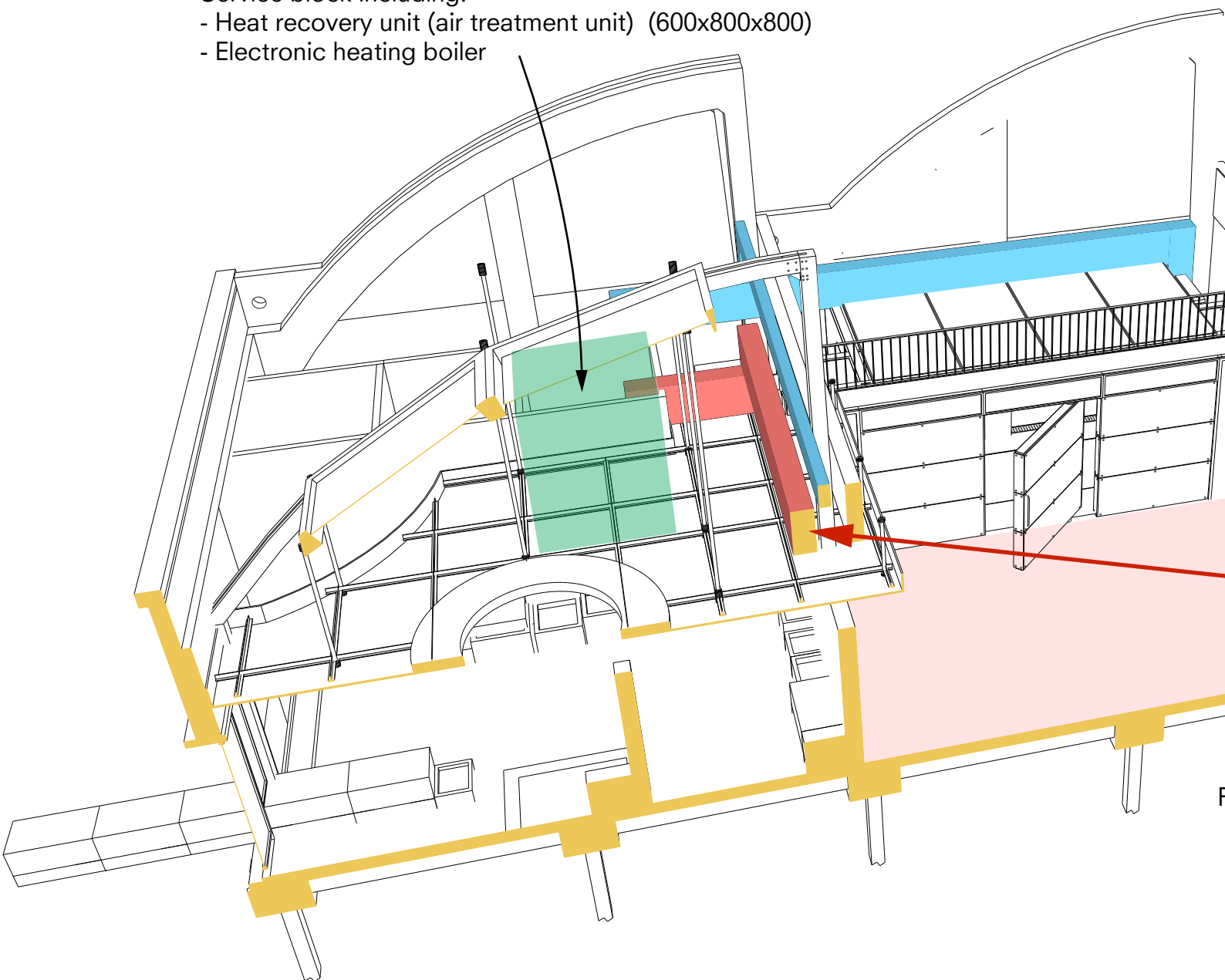


First floor

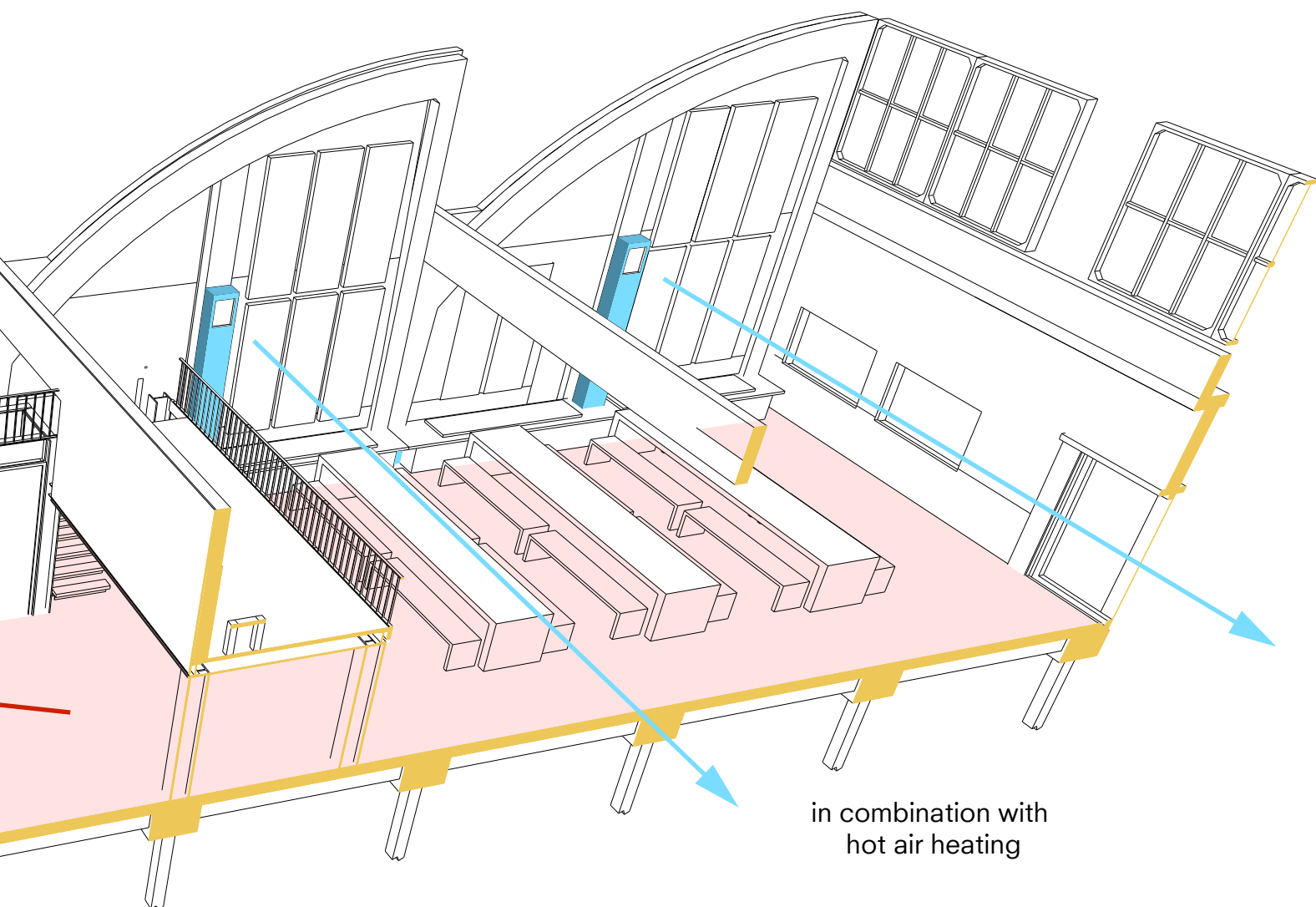


Service block including:

- Heat recovery unit (air treatment unit) (600x800x800)
- Electronic heating boiler







Floor heating

in combination with  
hot air heating

#### Communal gathering (toevoer):

Bezettingsgraad  $180\text{m}^2 / 3,3 = 54$  personen

Ventilatieluchthoeveelheid:  $216 \text{ dm}^3/\text{s}$

Toelaatbaar geluidsniveau:  $2 \text{ m/s}$

omzetten naar  $\text{m}^3/\text{s}$   $0,216 \text{ m}^3/\text{s}$

$$0,216 / 2 = 0,108 \text{ m}^2 \\ = 1080\text{cm}^2$$

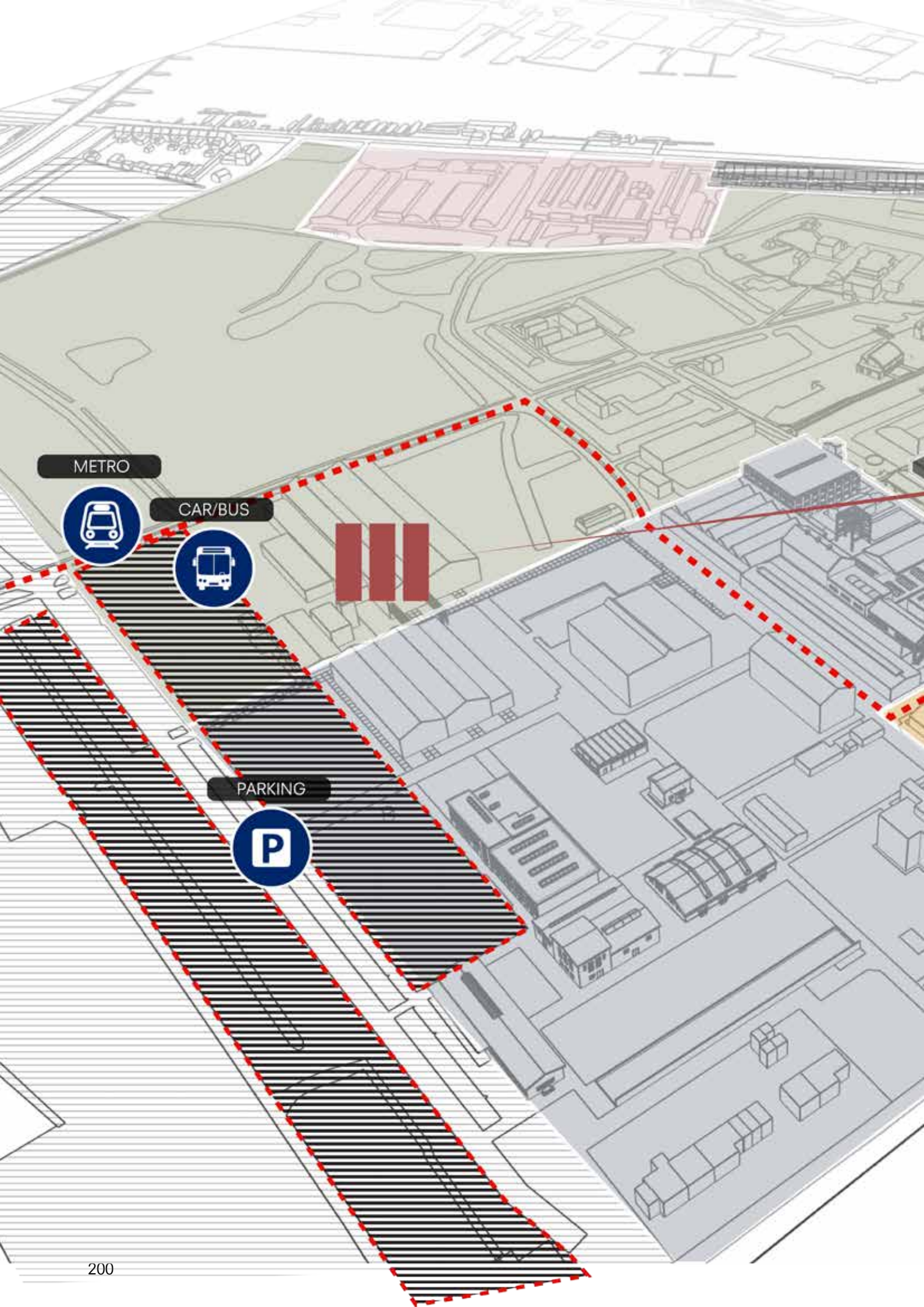
$$\pi \times \text{straal}^2 = 1080$$

$$1080 / \pi = 344$$

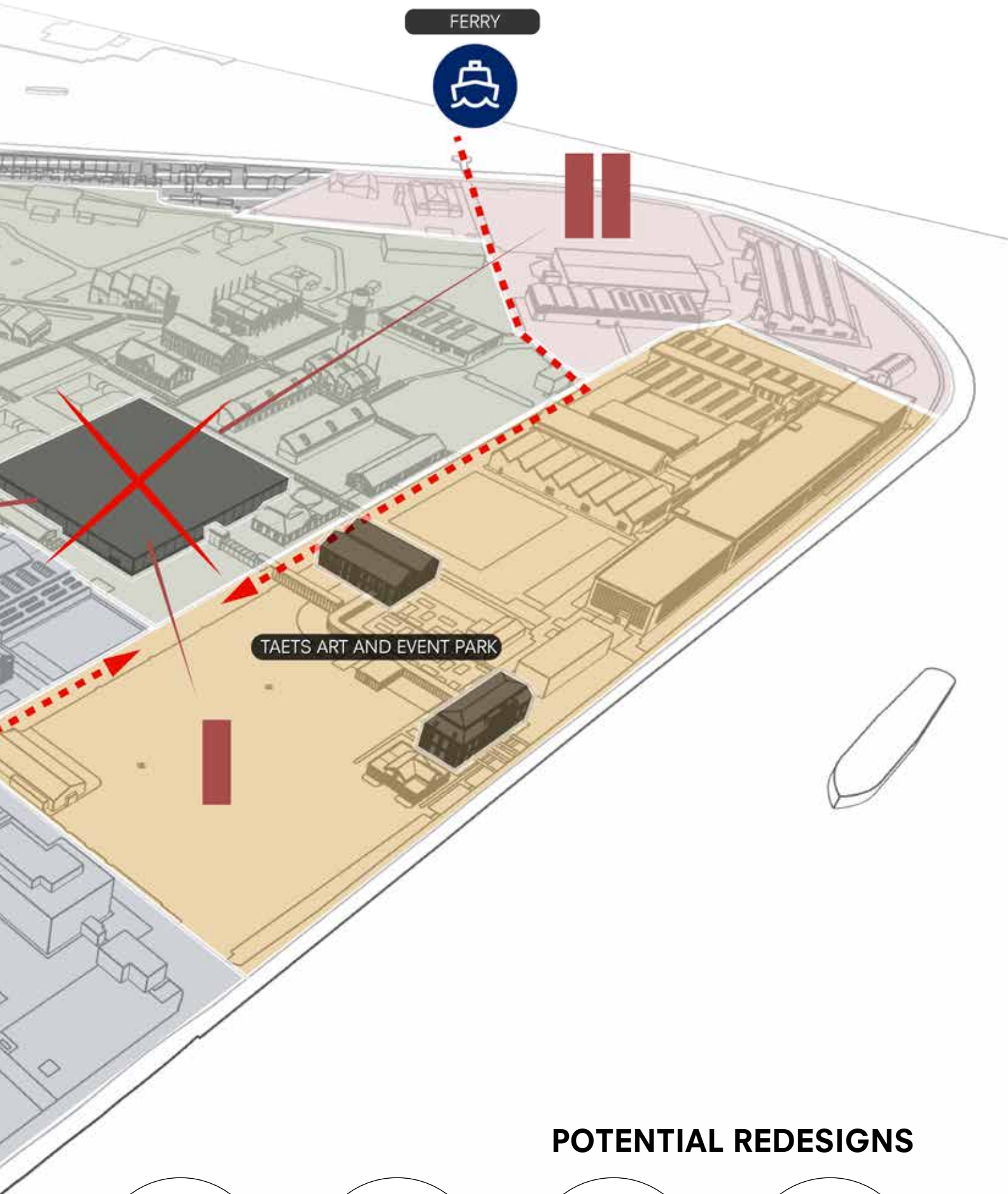
$$\text{Straal luchtkanaal: } \sqrt{344} = 18,5 \text{ cm}$$

$$\text{Diameter: } = 37 \text{ cm}$$

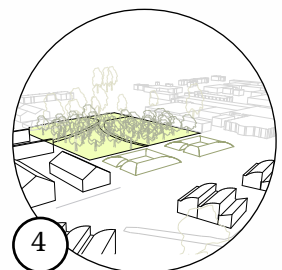
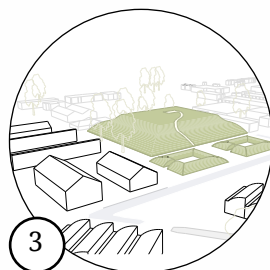
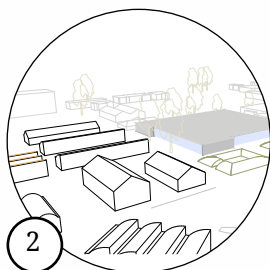
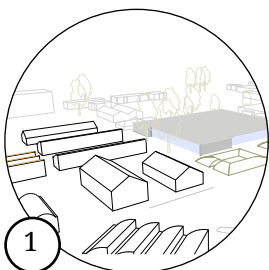








## POTENTIAL REDESIGNS





# DEMOLITION

## IMBALANCE OF SCALE, HEIGHT, PROPORTION, ARCHITECTURE AND MATERIALITY



### **Taets Art and Event Park, 6000m<sup>2</sup>.**

A site that initially acted as a production zone of explosive material and military test location, now houses a large Black box in the hearth of the Hembrug terrain. During the construction in 1991, earthen walls, canals and trees were replaced for a practical production hall. However, the activity in this building only operated until 2003, when the Hembrug terrain closed its operations. The building has not been in use until January 2014 when a variety of project developers transformed the former production hall into an Art and Event Hall. Up to today the building facilitates the most diverse events, from design fairs, multi-day company events, product presentations, car shows, conferences, fashion shows, and staff parties, to intimate get-togethers, atmospheric dinners, meetings, lunches, concerts and television recordings. Divided over three unique buildings that are connected through a glazed walkway, the Taets Art and Event park totally combine 10.000 square meters of floor space area. Combined with the open space in between the three units, Taets offers the opportunity to provide event space for up to 7.000 to 12.000 persons.



# OF BUILDING 1

## NATURE VS METAL FACADE

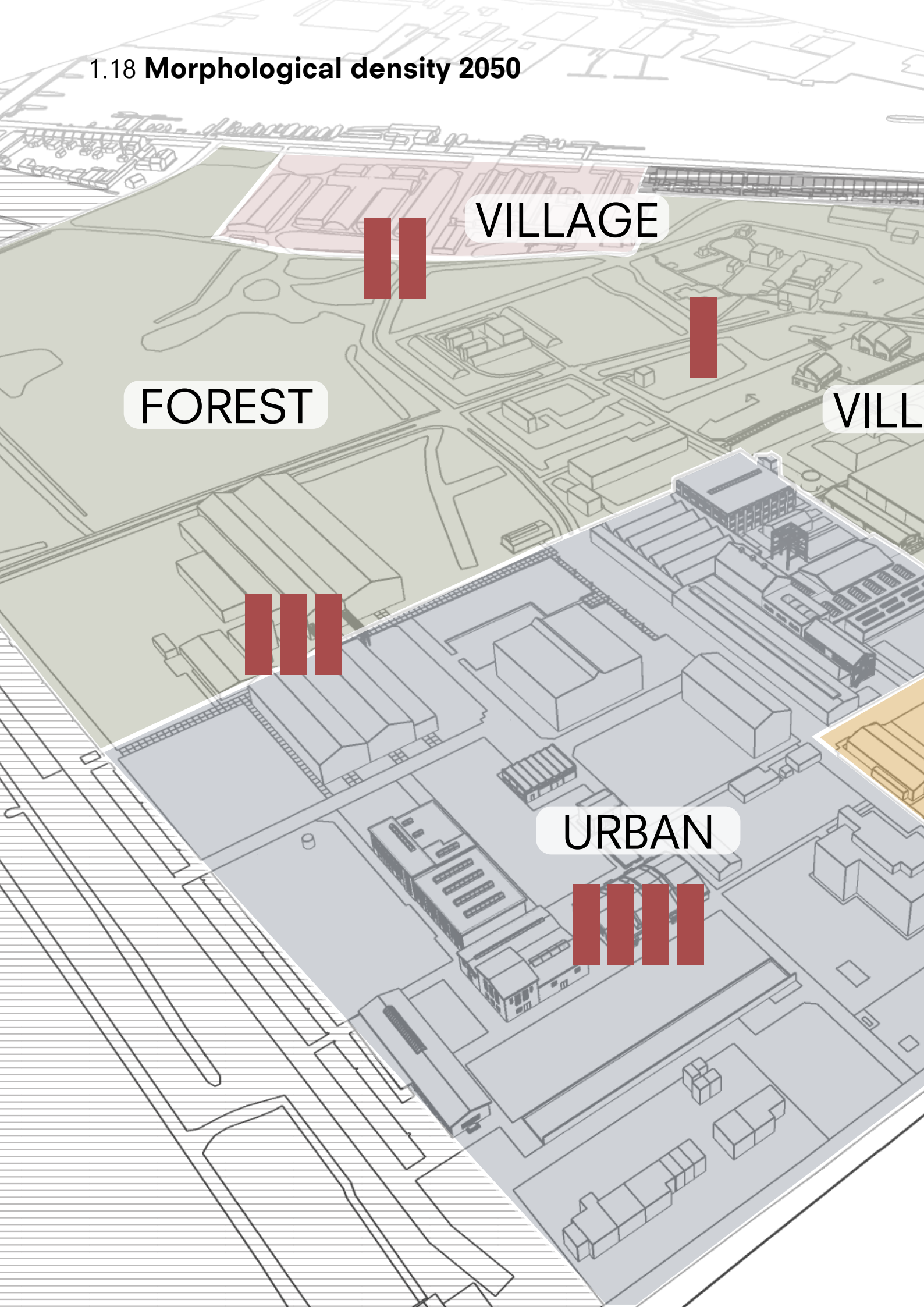


### Observations Taets Black Box (building 1).

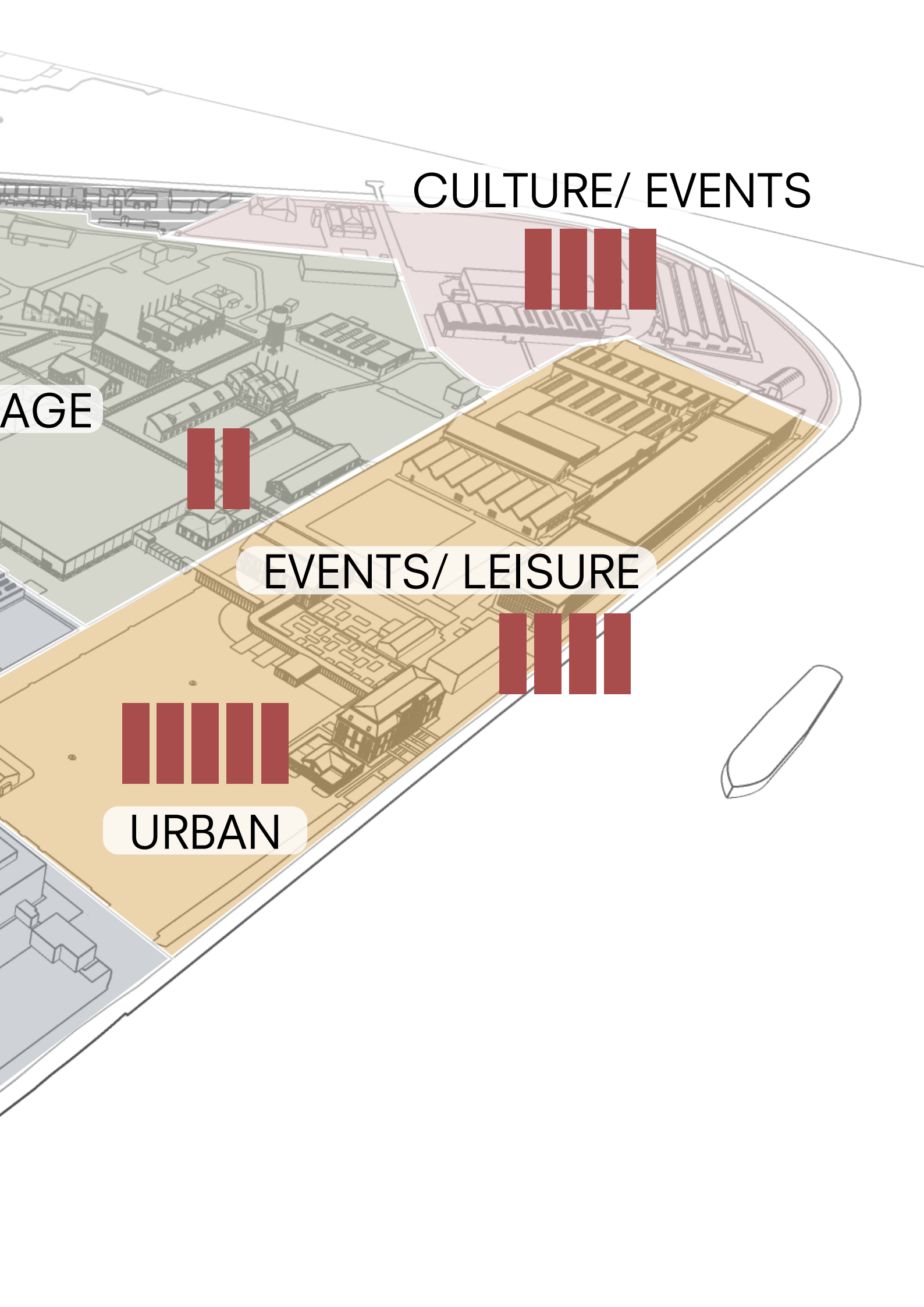
- Spacious interior, therefore highly practical for event based activities.
- Steel load bearing structure and metallic façades material potentially re-useable.
- The Black Box disturbs the structure of the northern part of Hembrug (free standing buildings at a distance from each other, surrounded by forest and sometimes earthen walls).
- Both scale and architecture do not fit in with the context.
- Architectural layering of the Black Box is incoherent with the surrounding ensembles.
- Low cultural historical significance.



## 1.18 Morphological density 2050







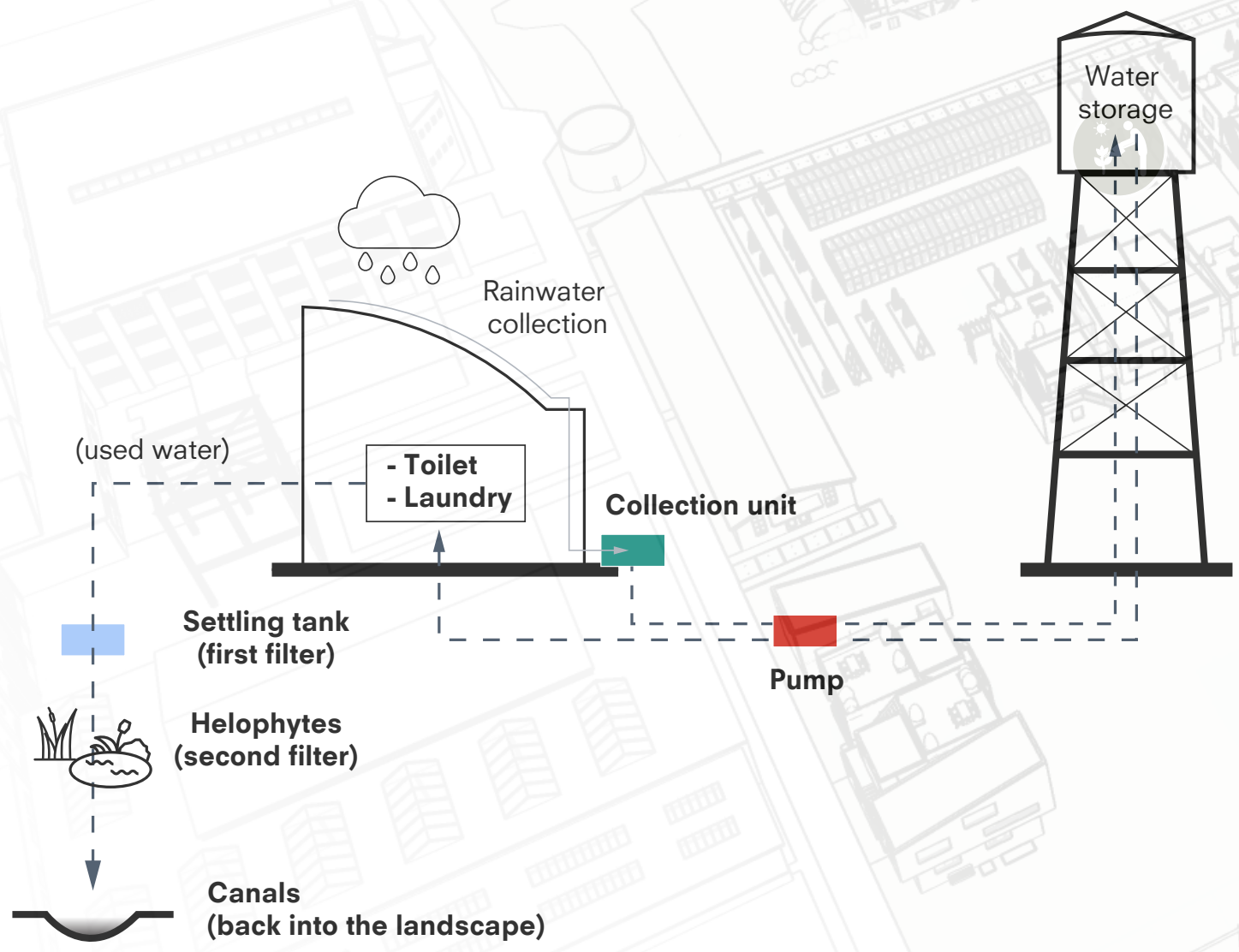
CULTURE/ EVENTS

AGE

EVENTS/ LEISURE

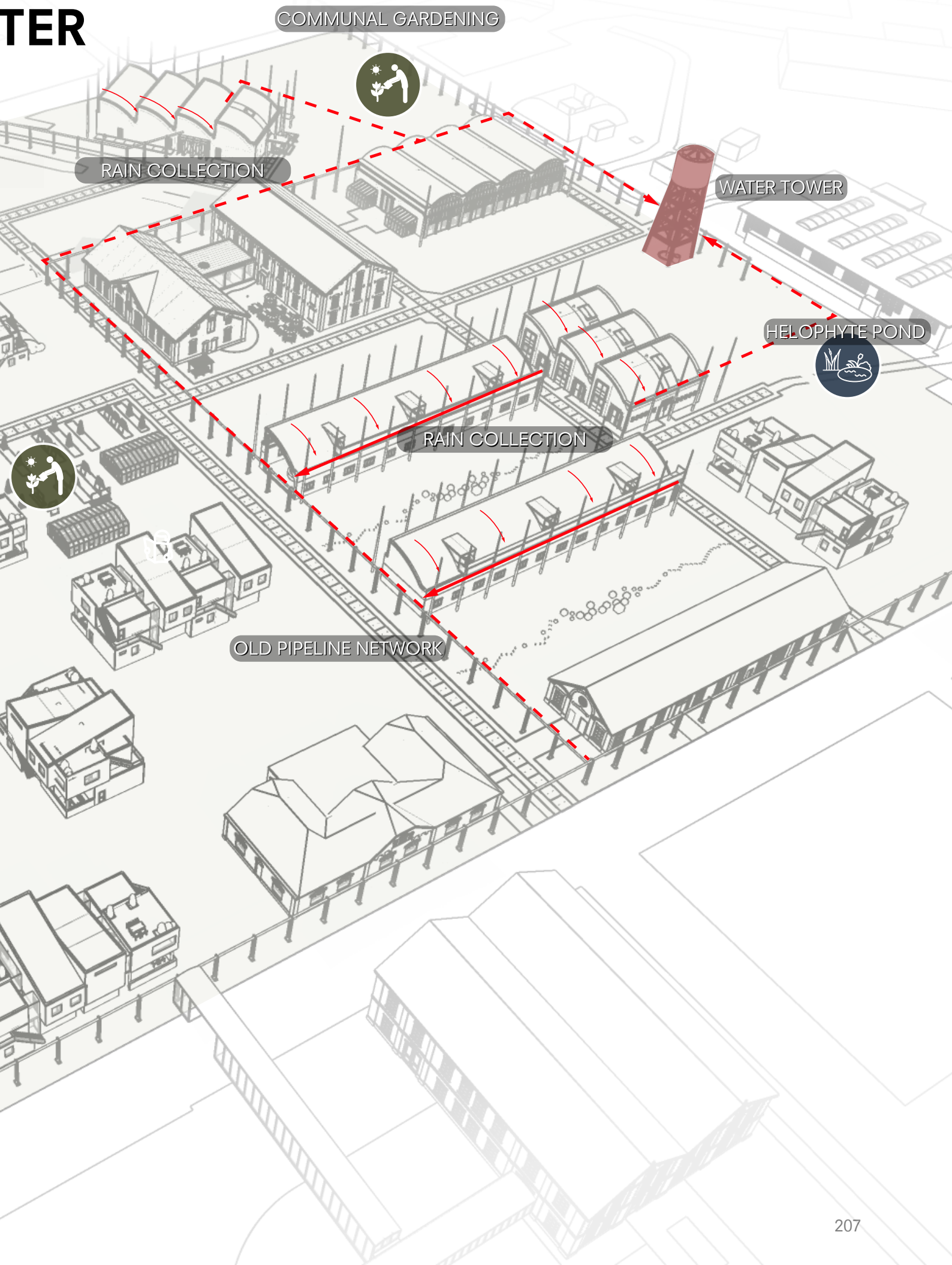
URBAN







TER



COMMUNAL GARDENING

RAIN COLLECTION

WATER TOWER

HELOPHYTE POND

RAIN COLLECTION

OLD PIPELINE NETWORK



J. Allianstraat

De Watering

A8

Zaandam

Vijfhoekpark

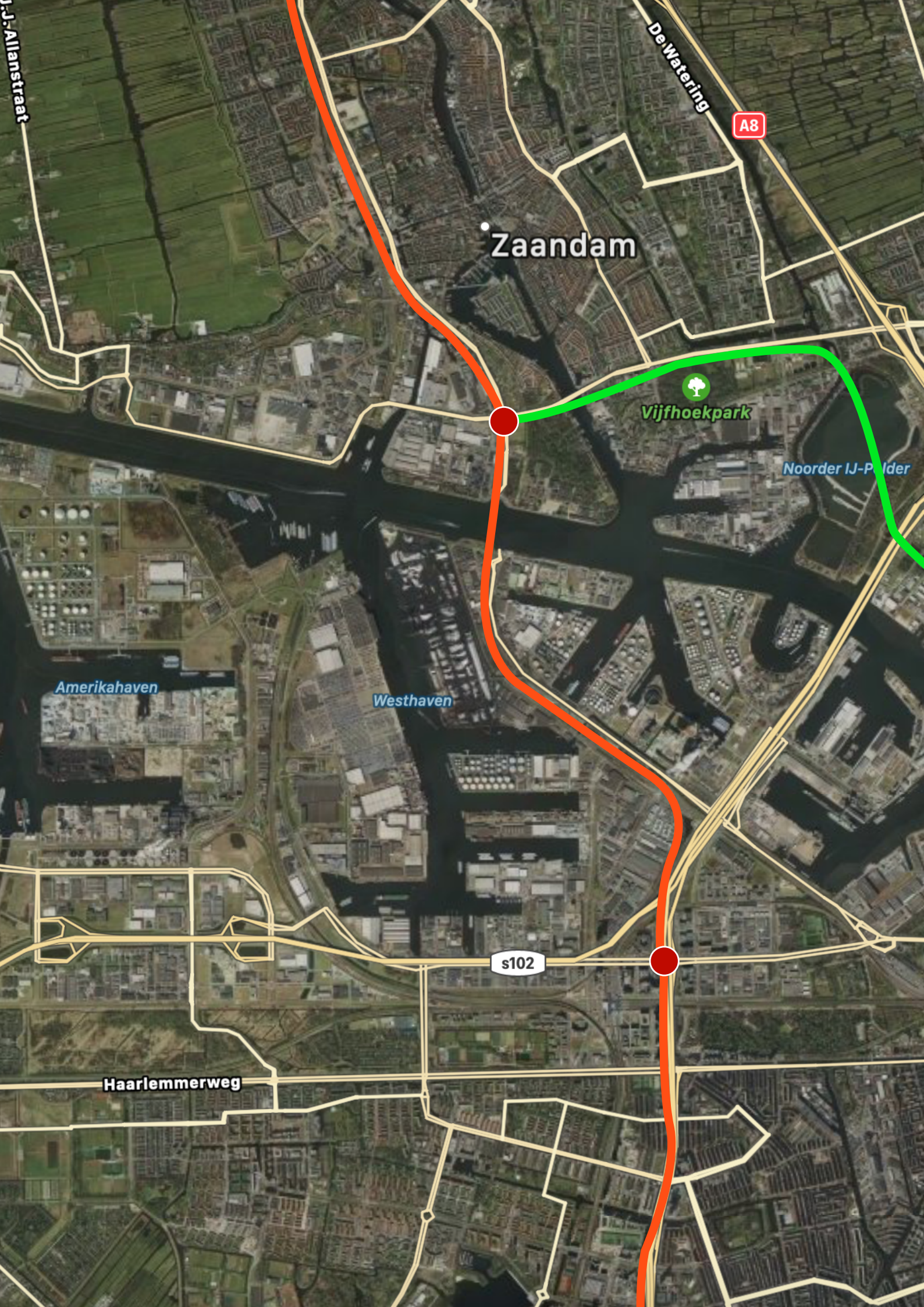
Noorder IJ-Polder

Amerikahaven

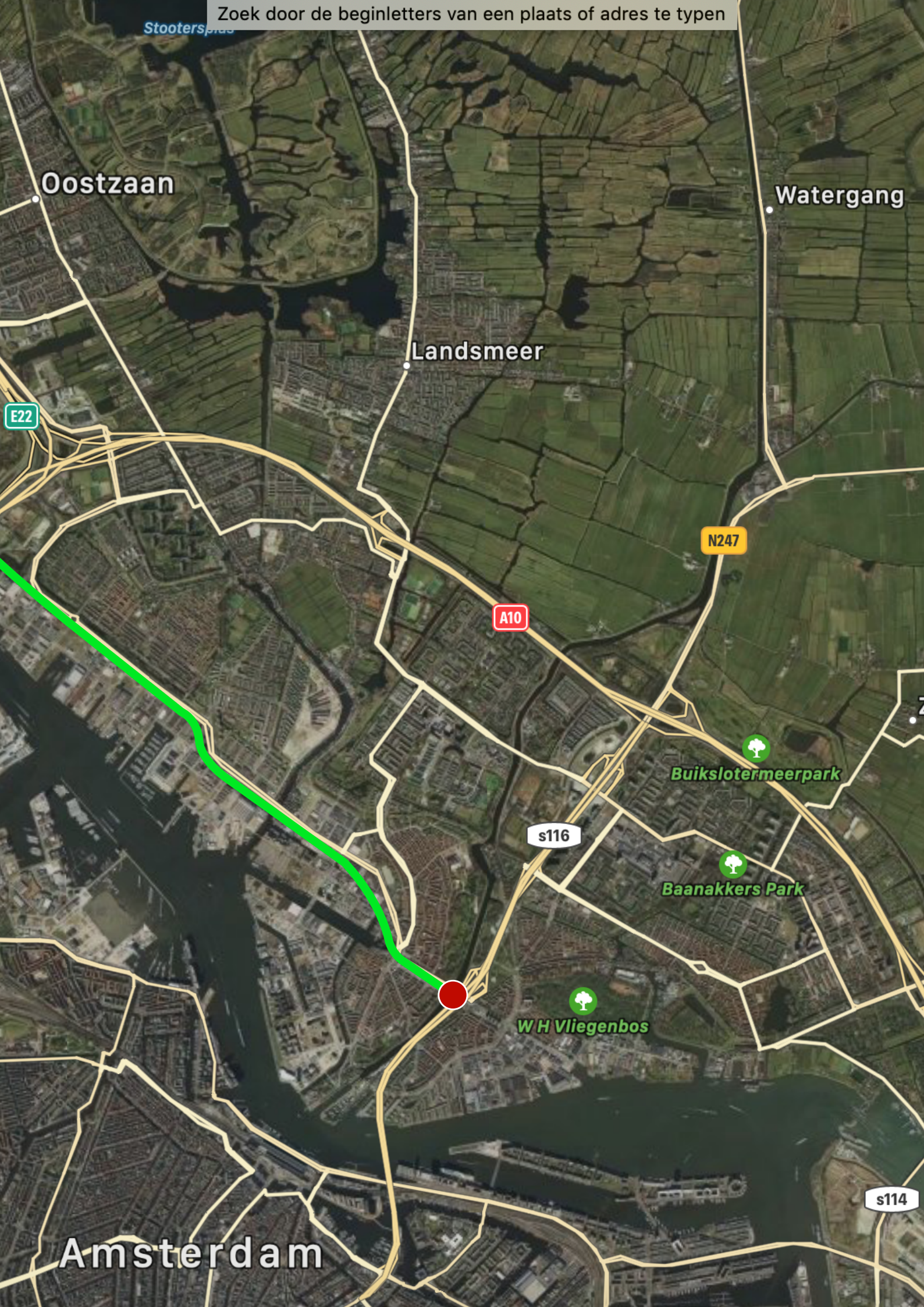
Westhaven

s102

Haarlemmerweg

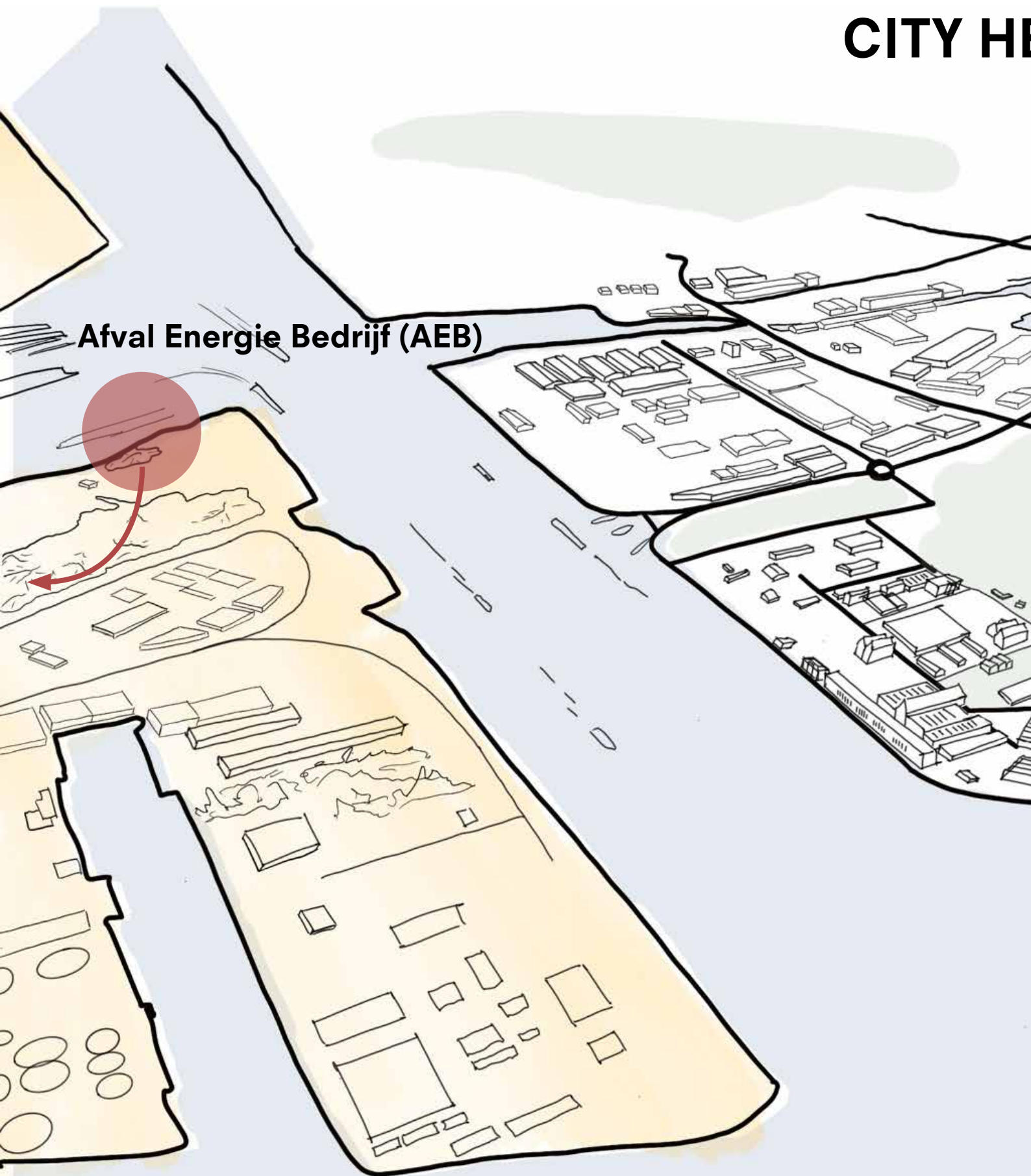






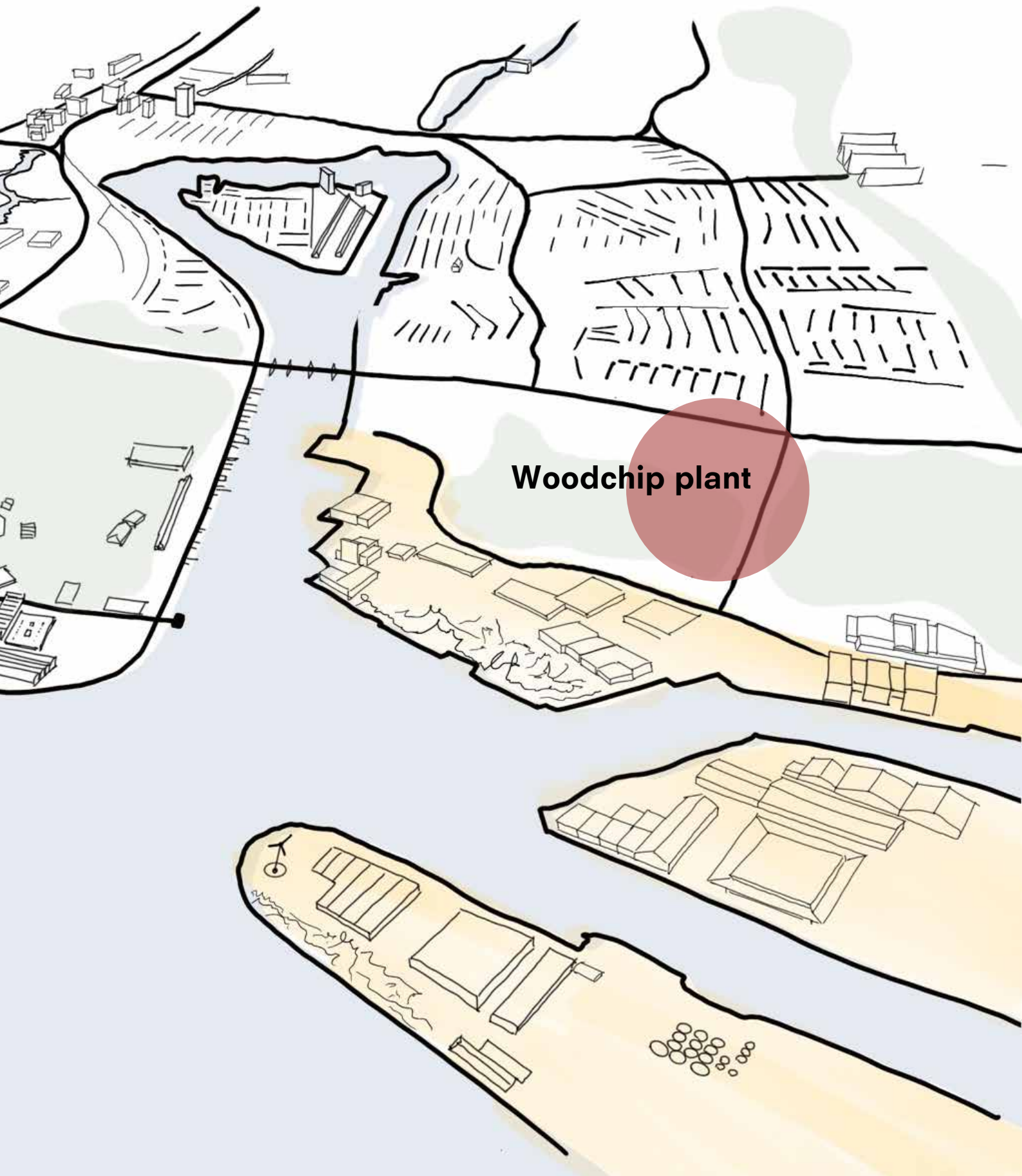


**Afval Energie Bedrijf (AEB)**

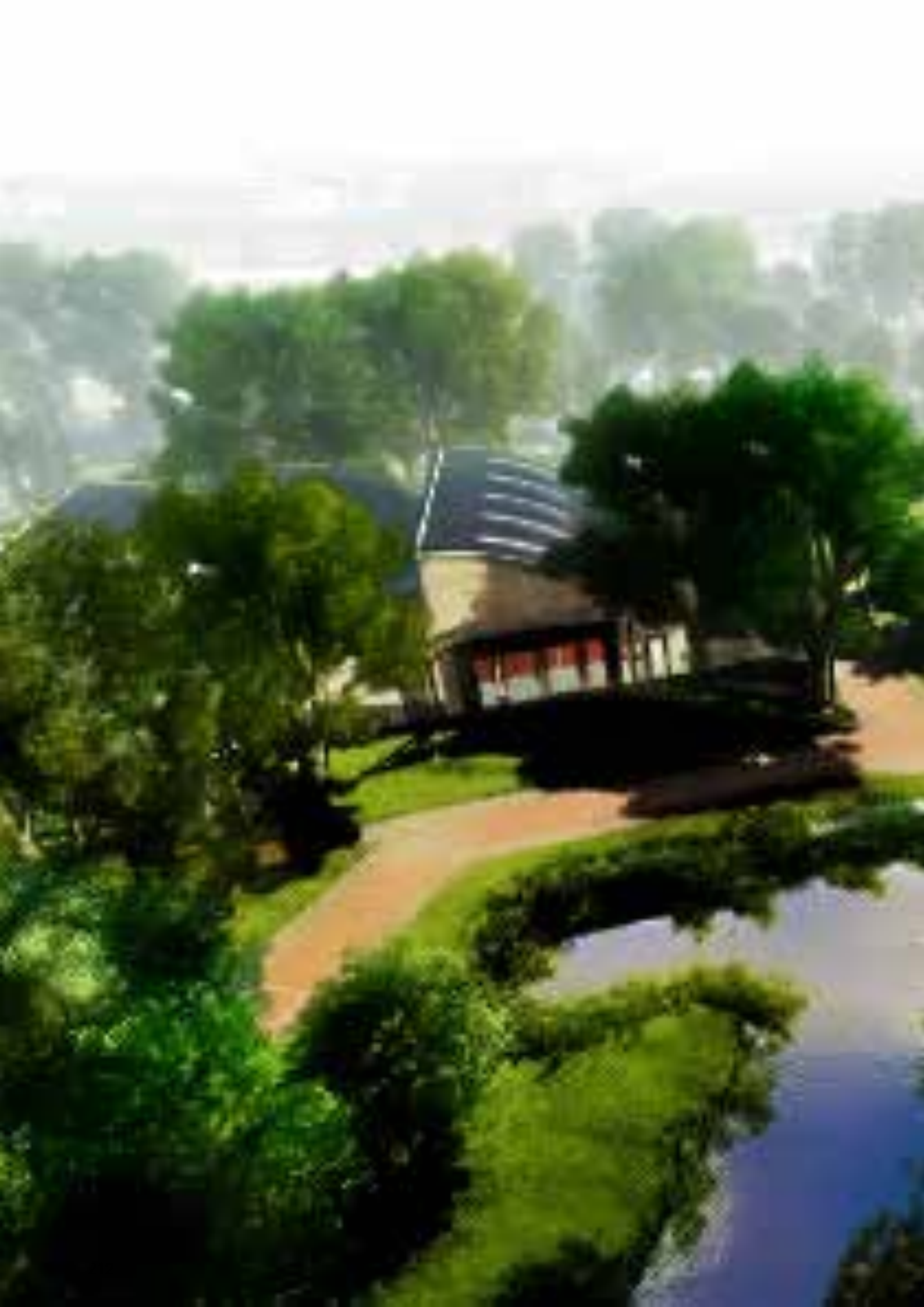




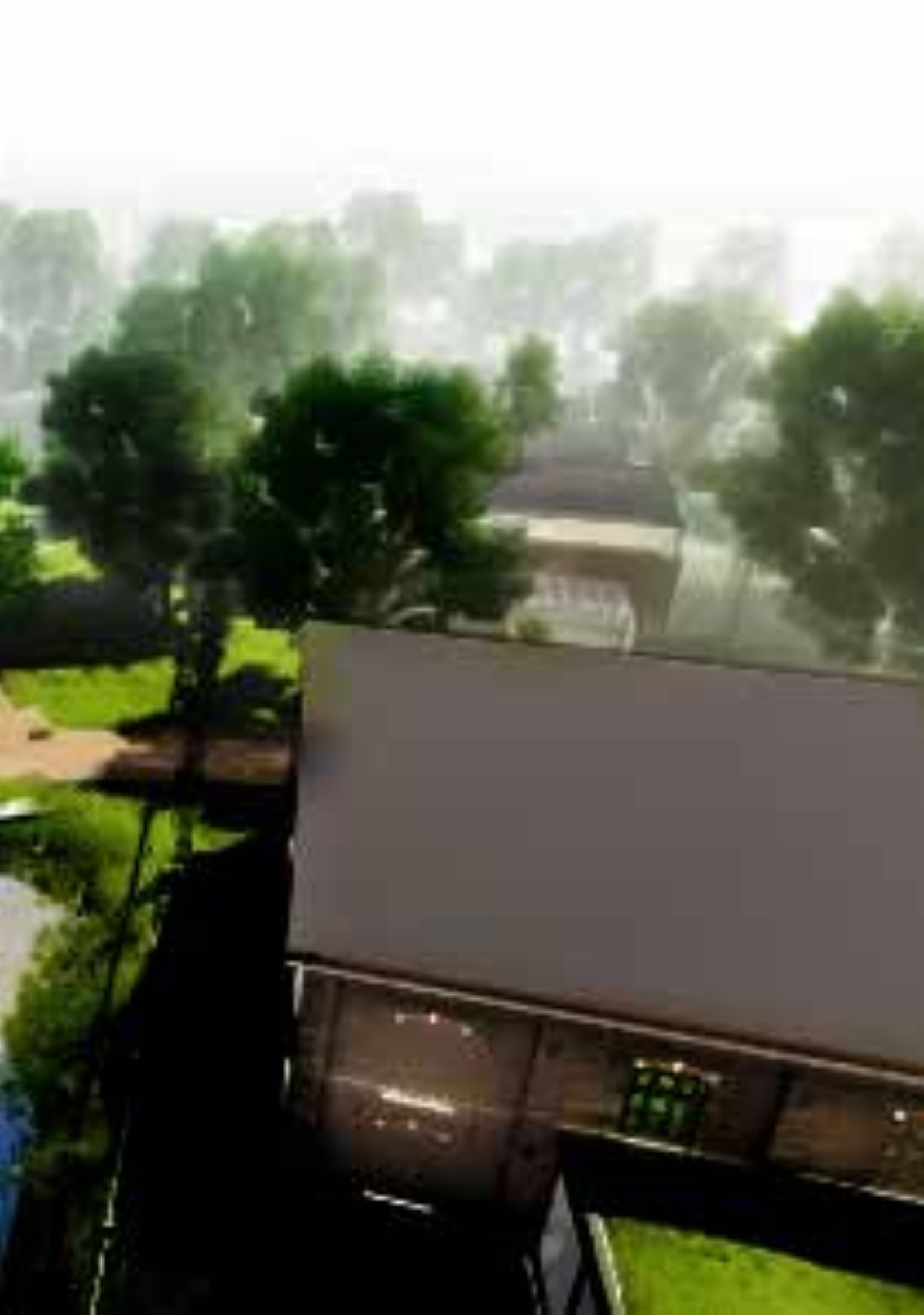
# EATING













# BUILDING TECHNOLOGY

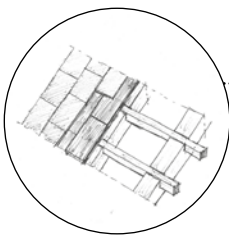
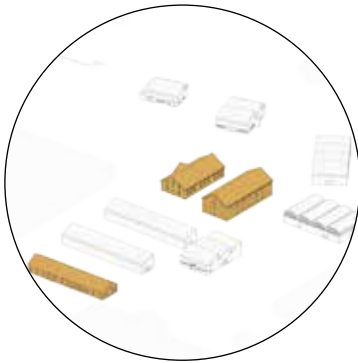


Fig. 6.24 Roof principle: slated roof (580mm h.o.h.)

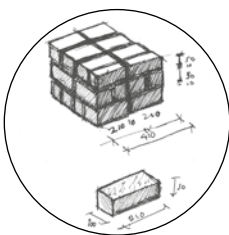


Fig. 6.25 Structural wall thickness

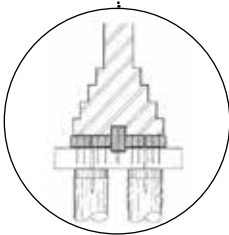
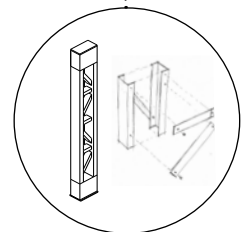
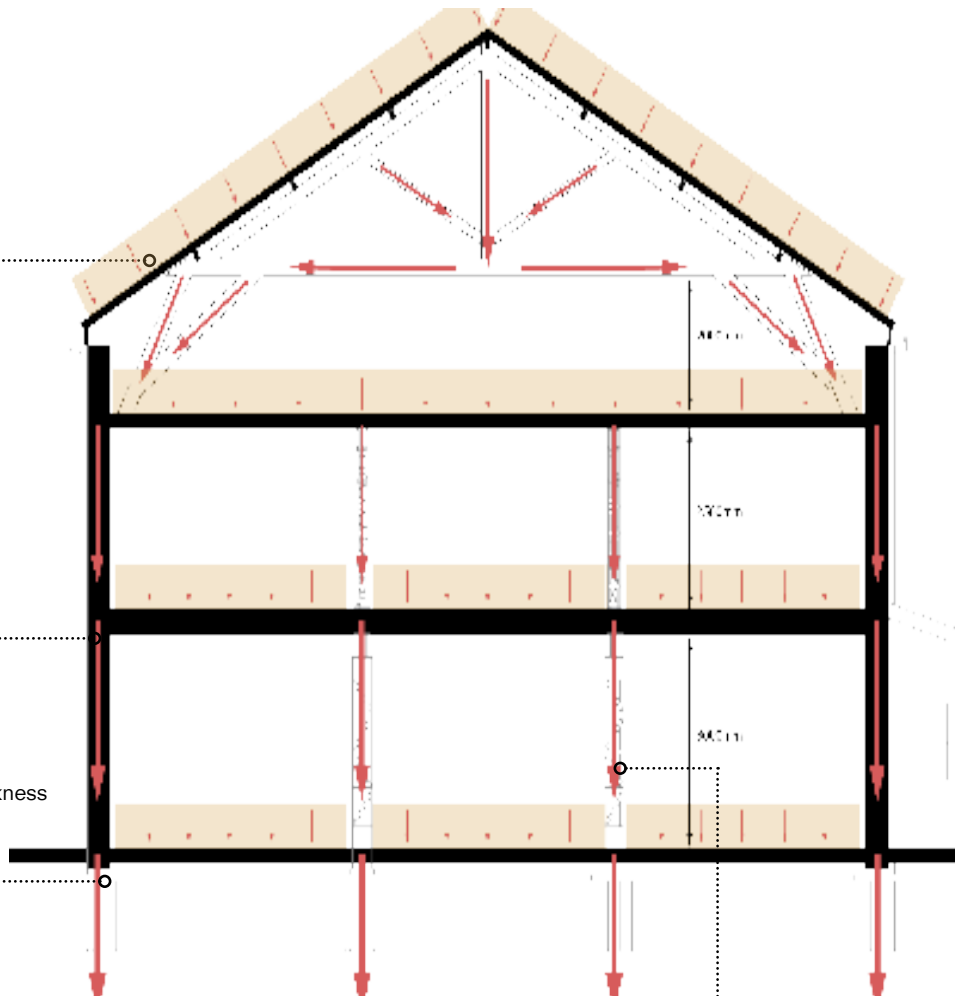
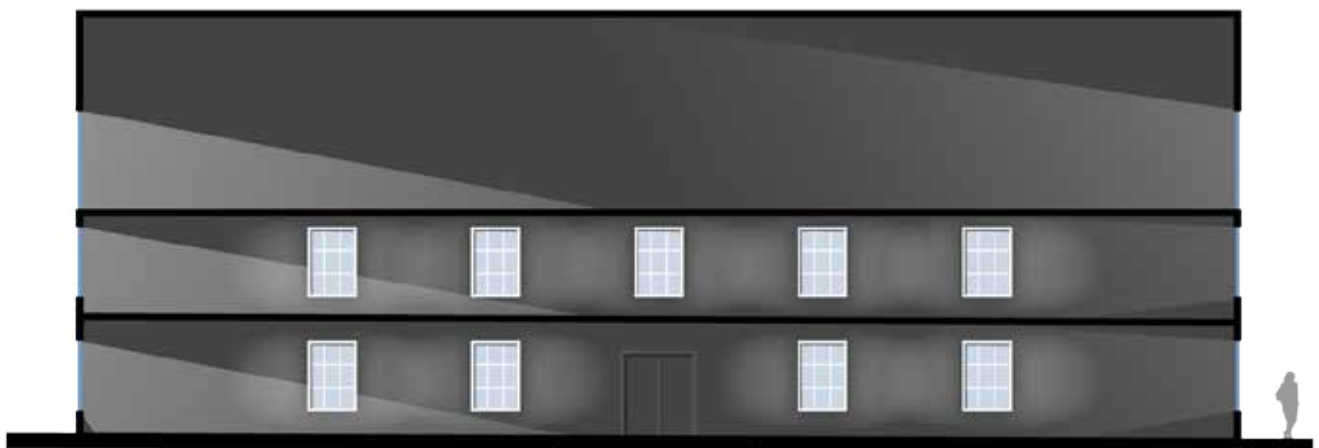


Fig. 6.26 'Amsterdamse paalfundering'



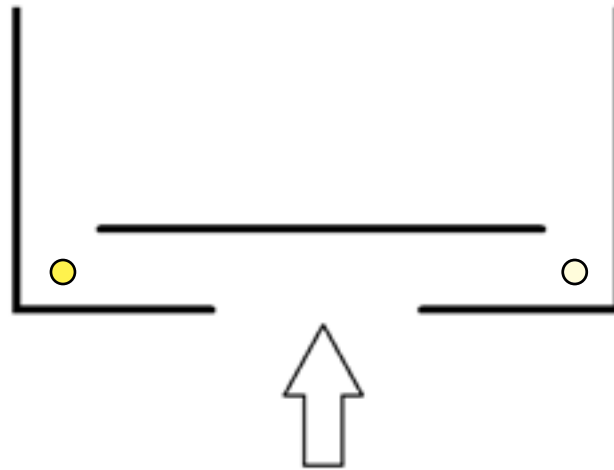


# DIALOGY 'BOERDERIJ'

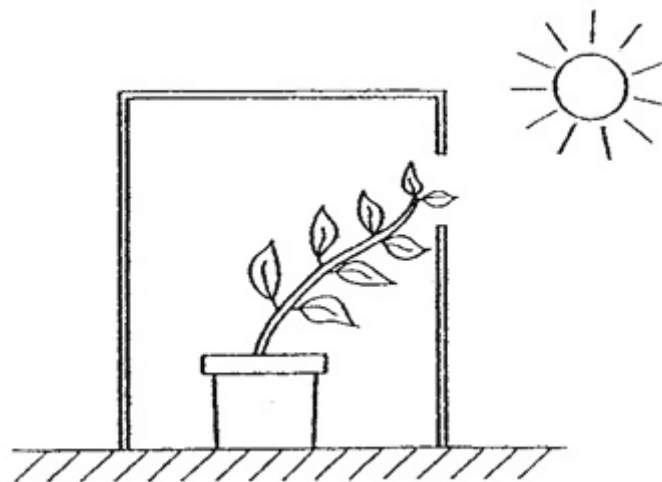




## 1.19 Reflection room



<sup>7</sup>Taylor & Sucov experiment



<sup>8</sup>Phototropism

<sup>9</sup>The growth of an organism in response to a light stimulus. (Greek; "tropos": turning)

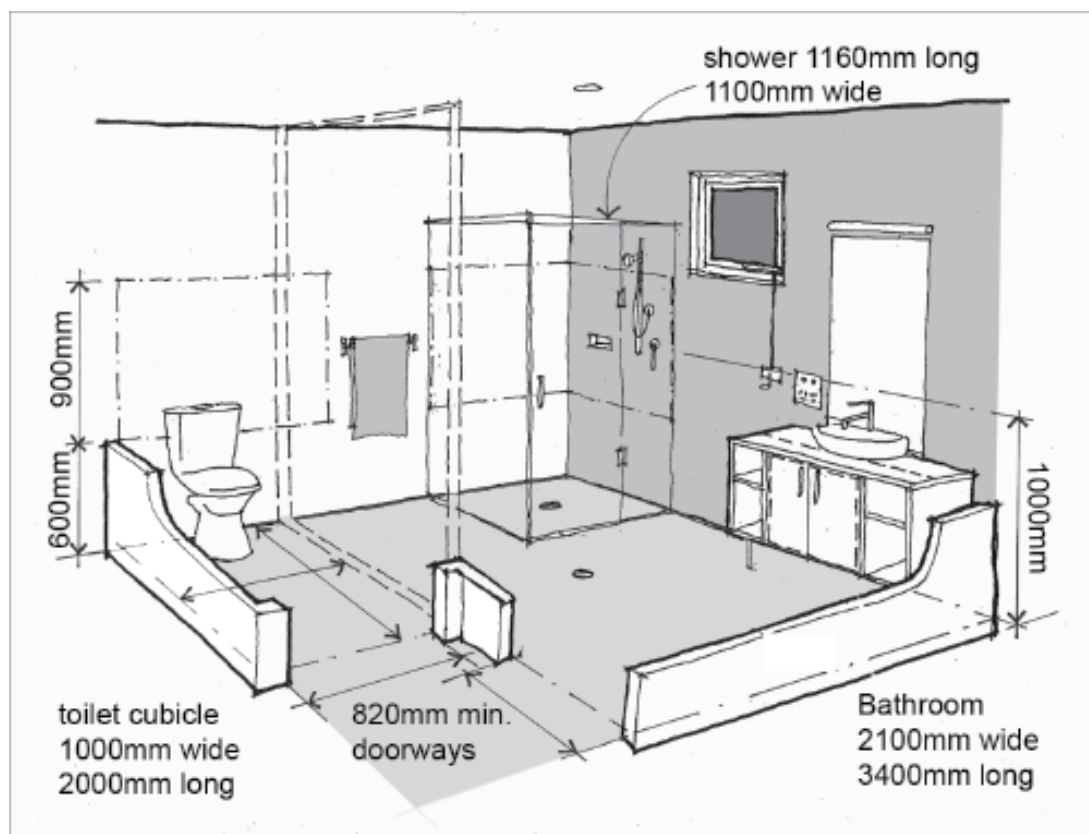
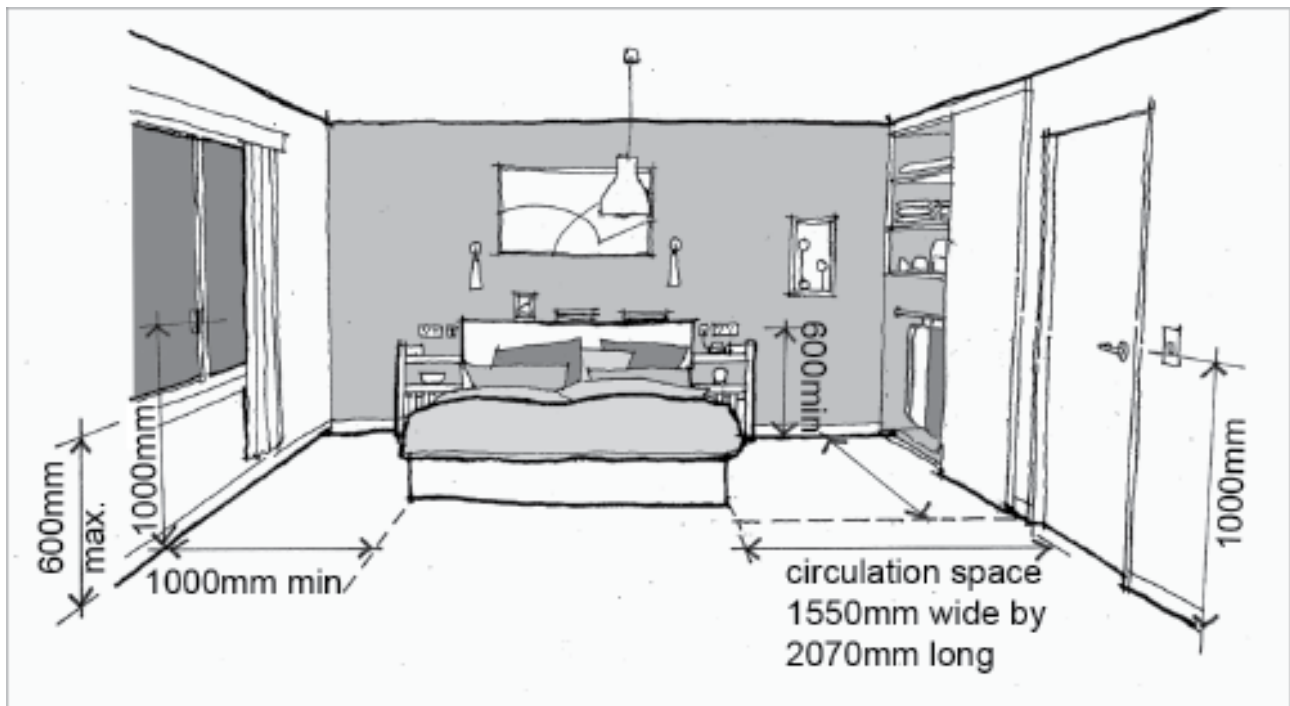
<sup>10</sup>

<sup>11</sup>Humans respond to light both physically and mentally. We orient our vision and move towards brighter spaces by nature.









<sup>12</sup><http://www.yourhome.gov.au/housing/livable-and-adaptable-house>













## **BORDER OF ROTATED STRUCTURES**

DEVIATION FROM ORTHOGONAL GRID PLANNING  
 ROTATED STRUCTURES  
 WILD FOLIAGE  
 HIDDEN, SECLUDED PLOTS



## **IDYLIC HEART**

HISTORIC MONUMENTS  
 ORNAMENTED BRICKWORK ARCHITECTURE  
 CANALS AND BRIDGES  
 HEART OF THE ENSEMBLE



## **TRANSITION ZONE**

CONTRAST FROM INDUSTRIAL ATMOSPHERE  
 STRUCTURED PATTERNS OF TREES



## **THE LADDER**

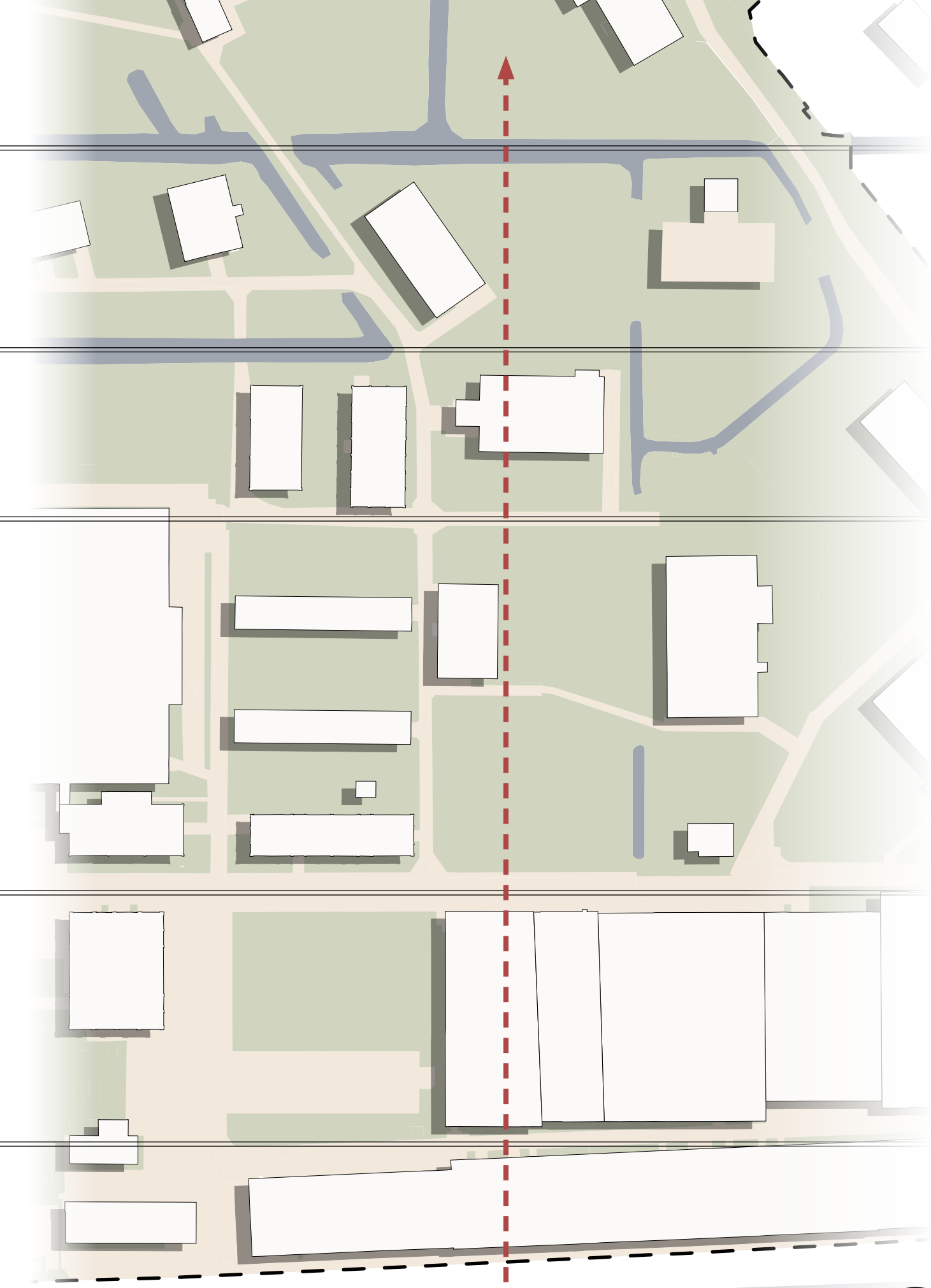
DENSE  
 COMPACT  
 LARGE SCALE STRUCTURES



## **THE WATERFRONT**

FORMAL, PRESTIGIOUS ARCHITECTURE  
 FACE OF THE NORTH-SEA CANAL





L EXPERIENCE





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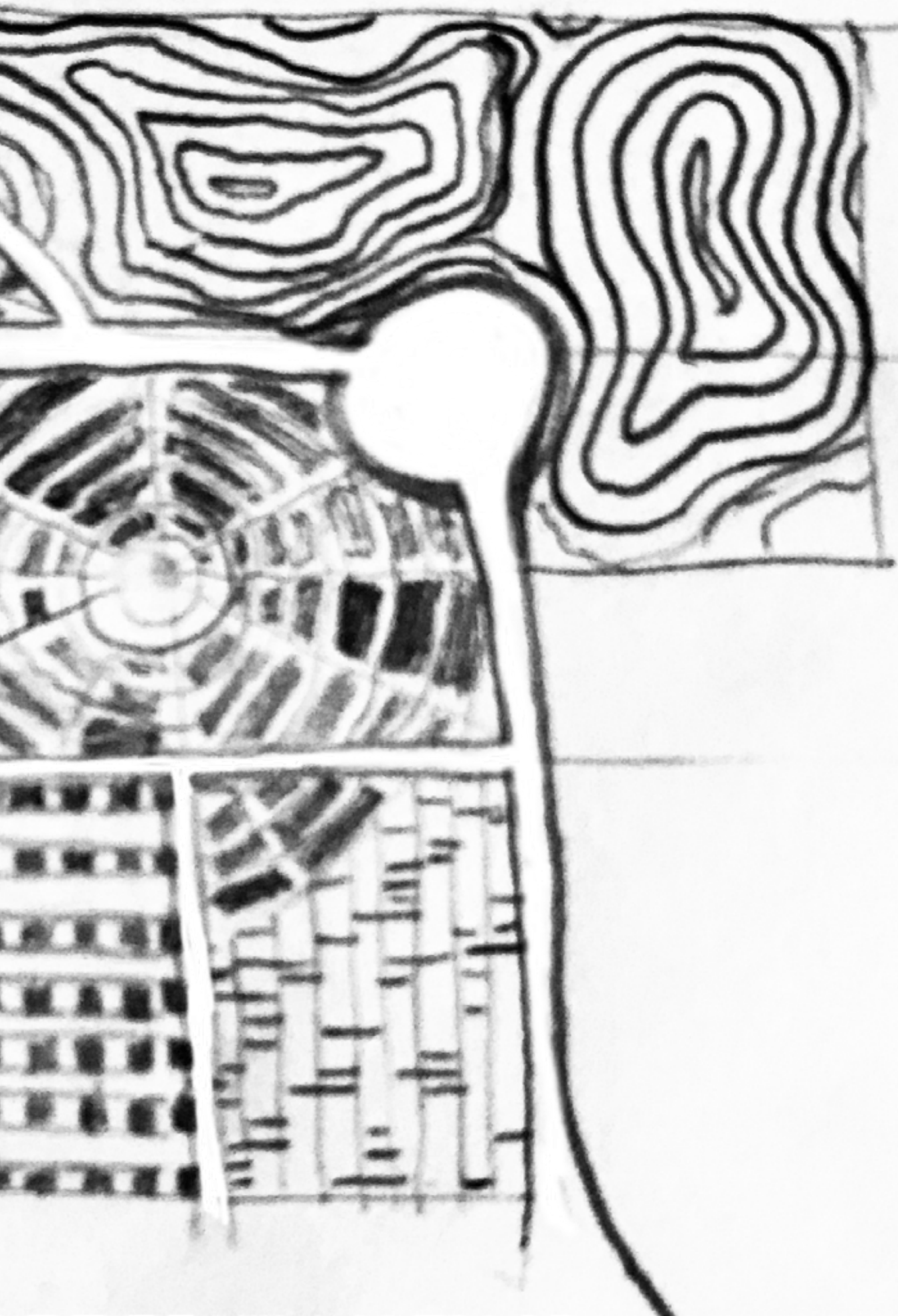
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# GENIUS' LOCI

## 1.20 Sequences

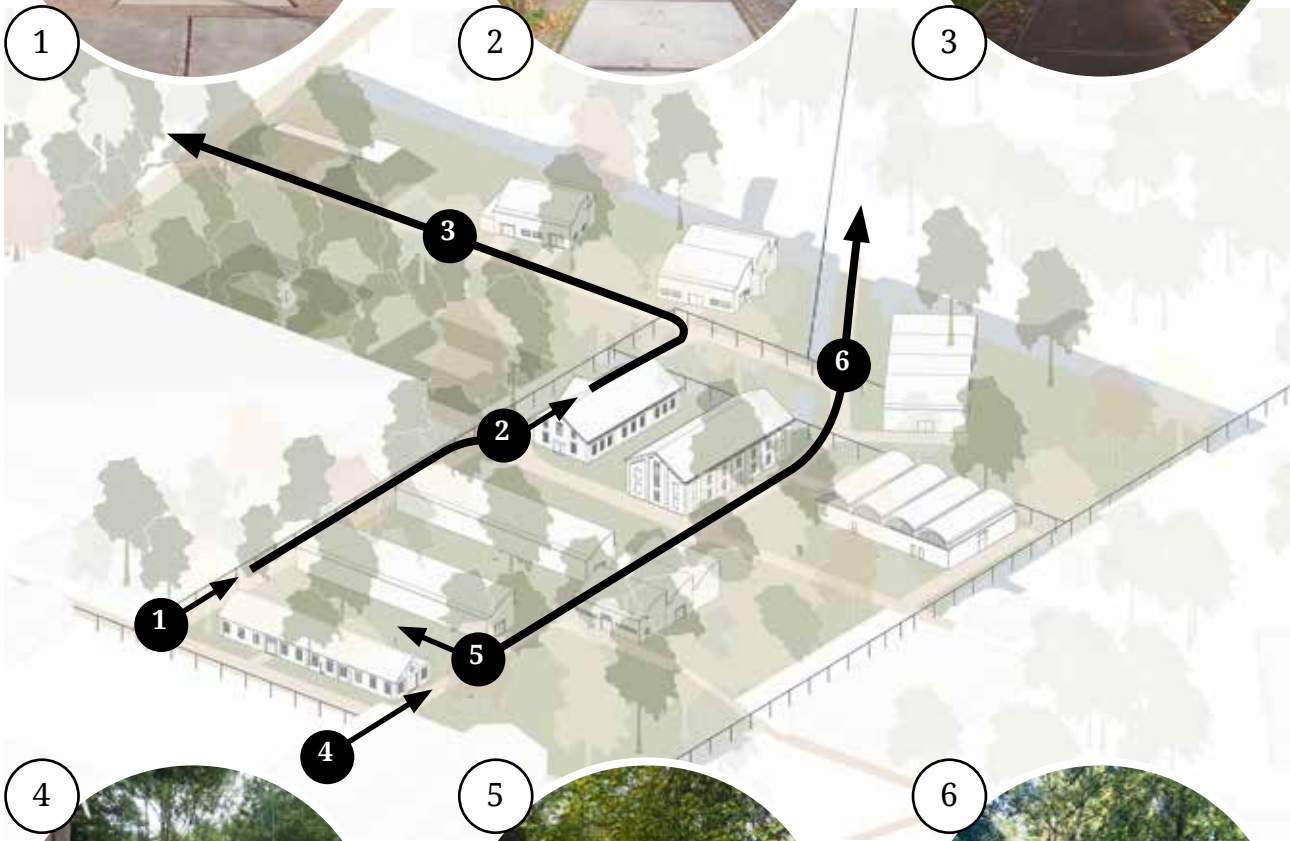
Into Plofbos



Along building 69



Towards the Exit



Structures vs nature



Lane of trees



Into the forest



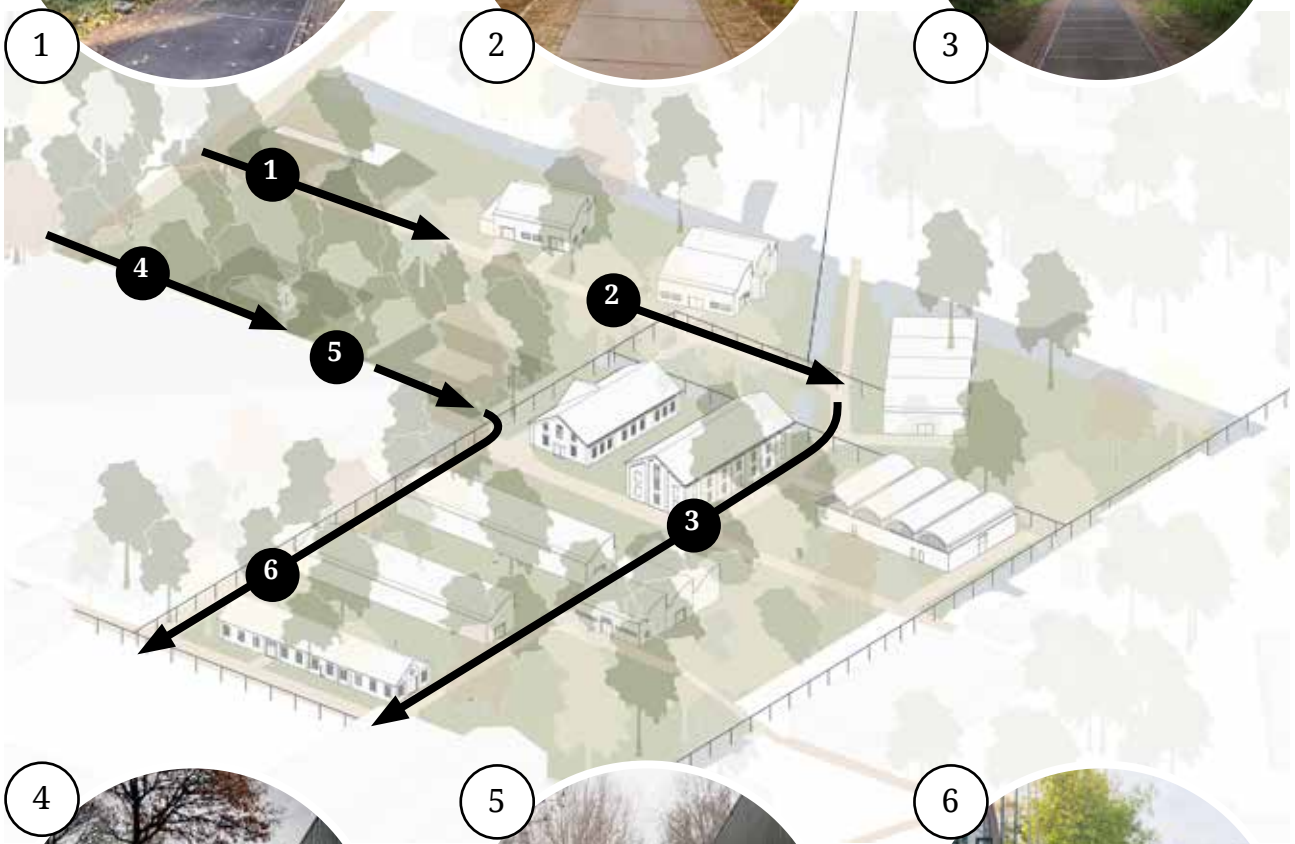
Earthen wall/shell roof



Head of the Axis



Compactness



Nature vs Taets

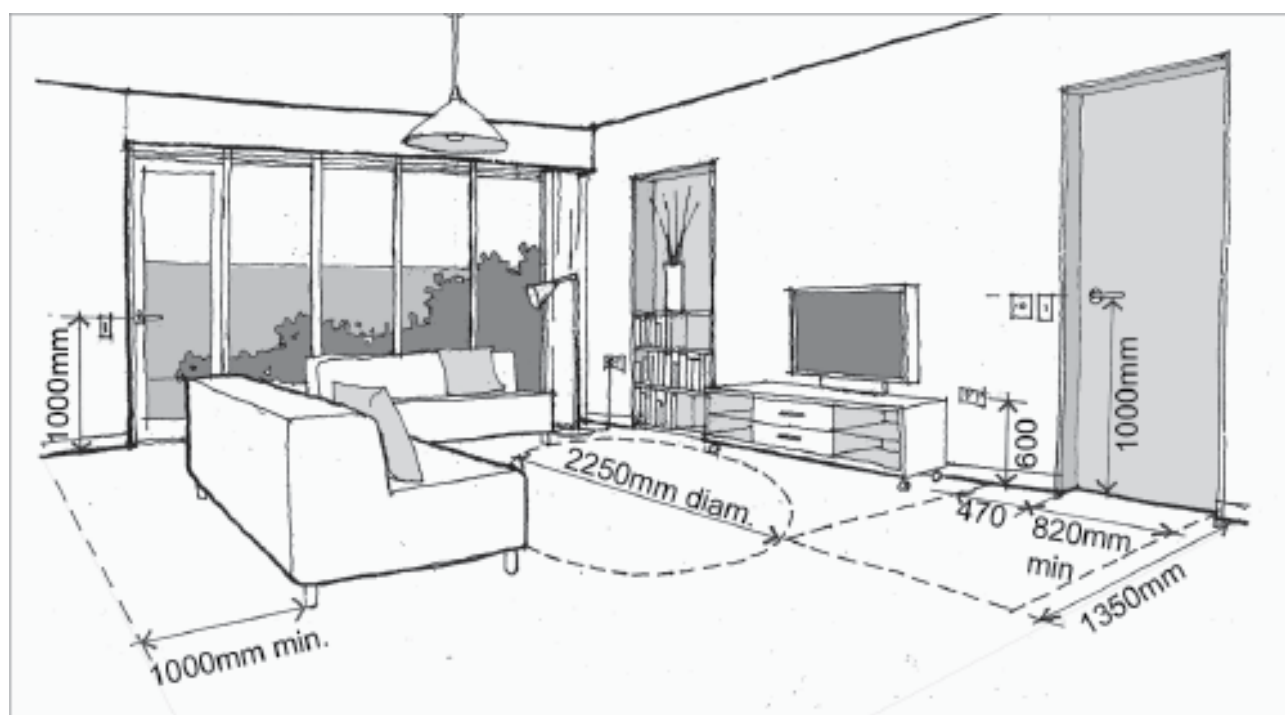


Head of the Axis

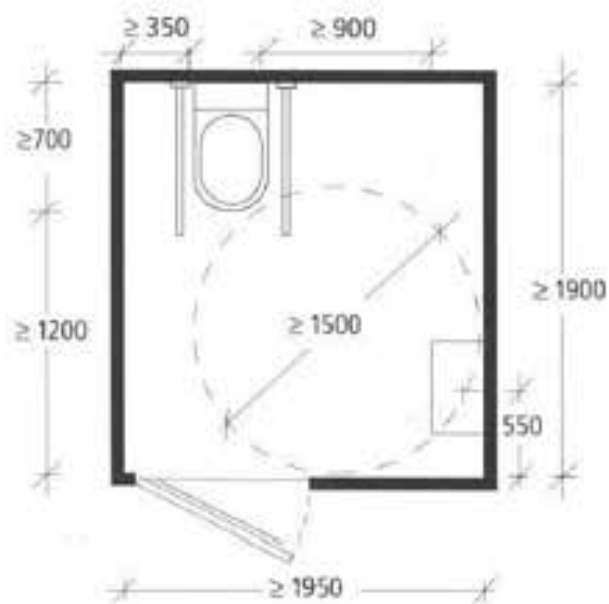
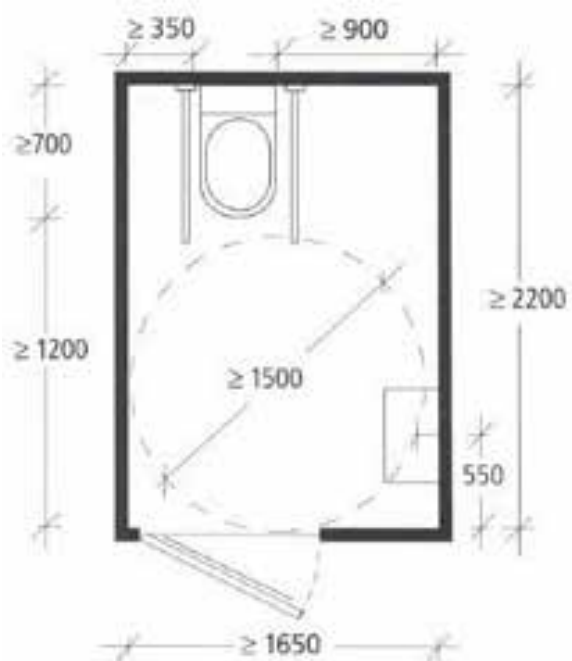
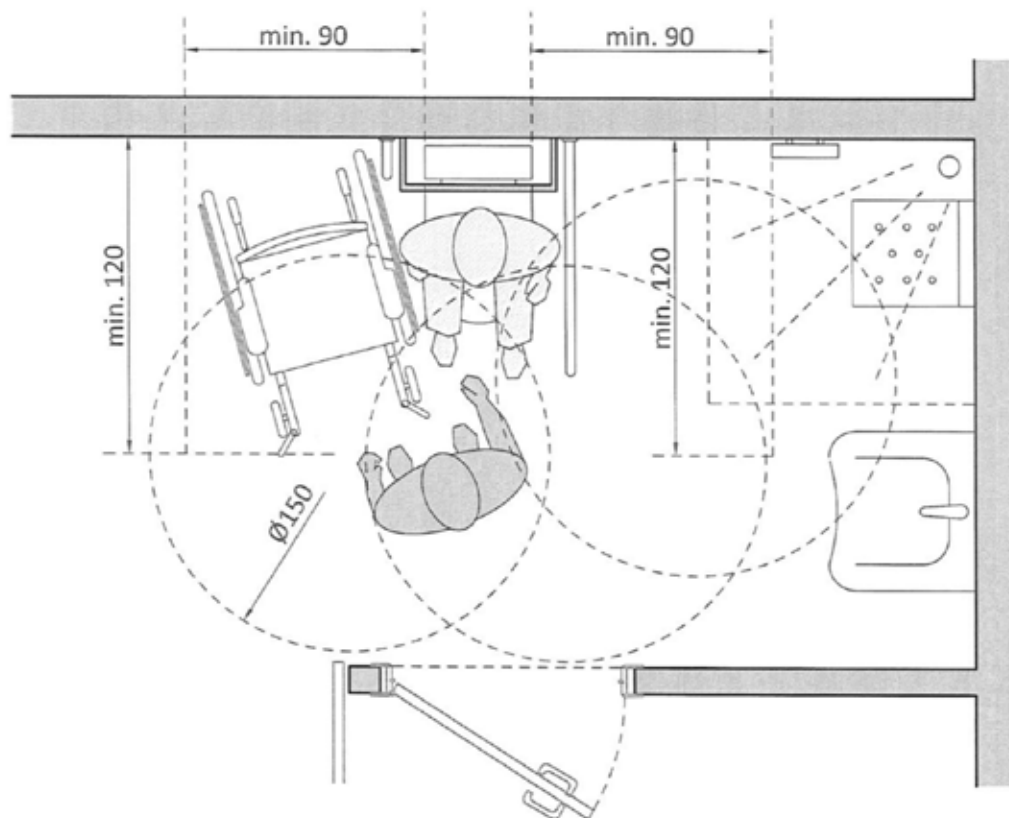


Into Noordzeekanaal





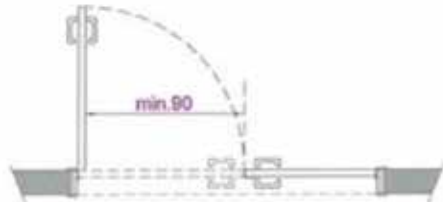




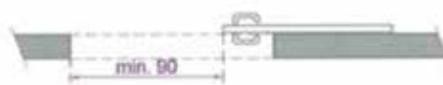
<sup>13</sup><http://toegankelijkgebouw.be/Handboek>



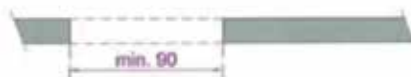
Enkel deurvleugel



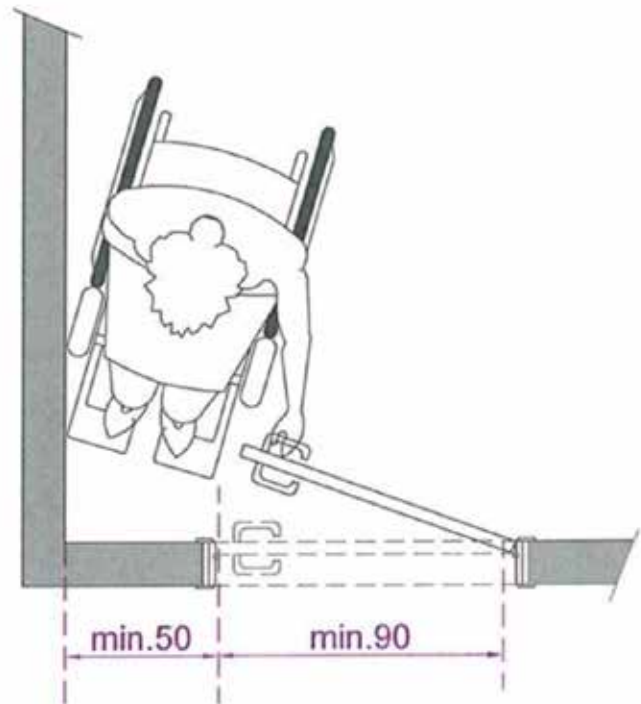
Enkel deurvleugel



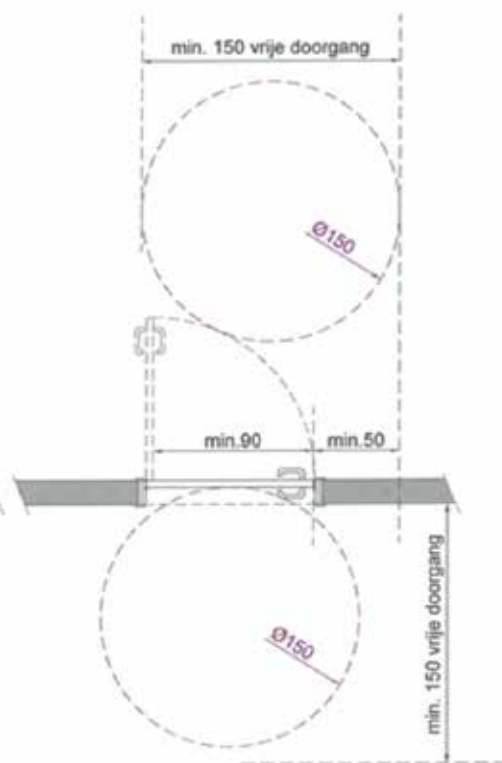
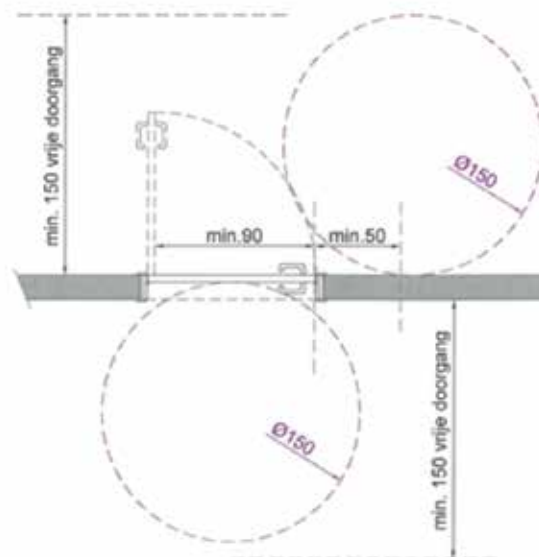
Schuifdeur



Opening in de wand

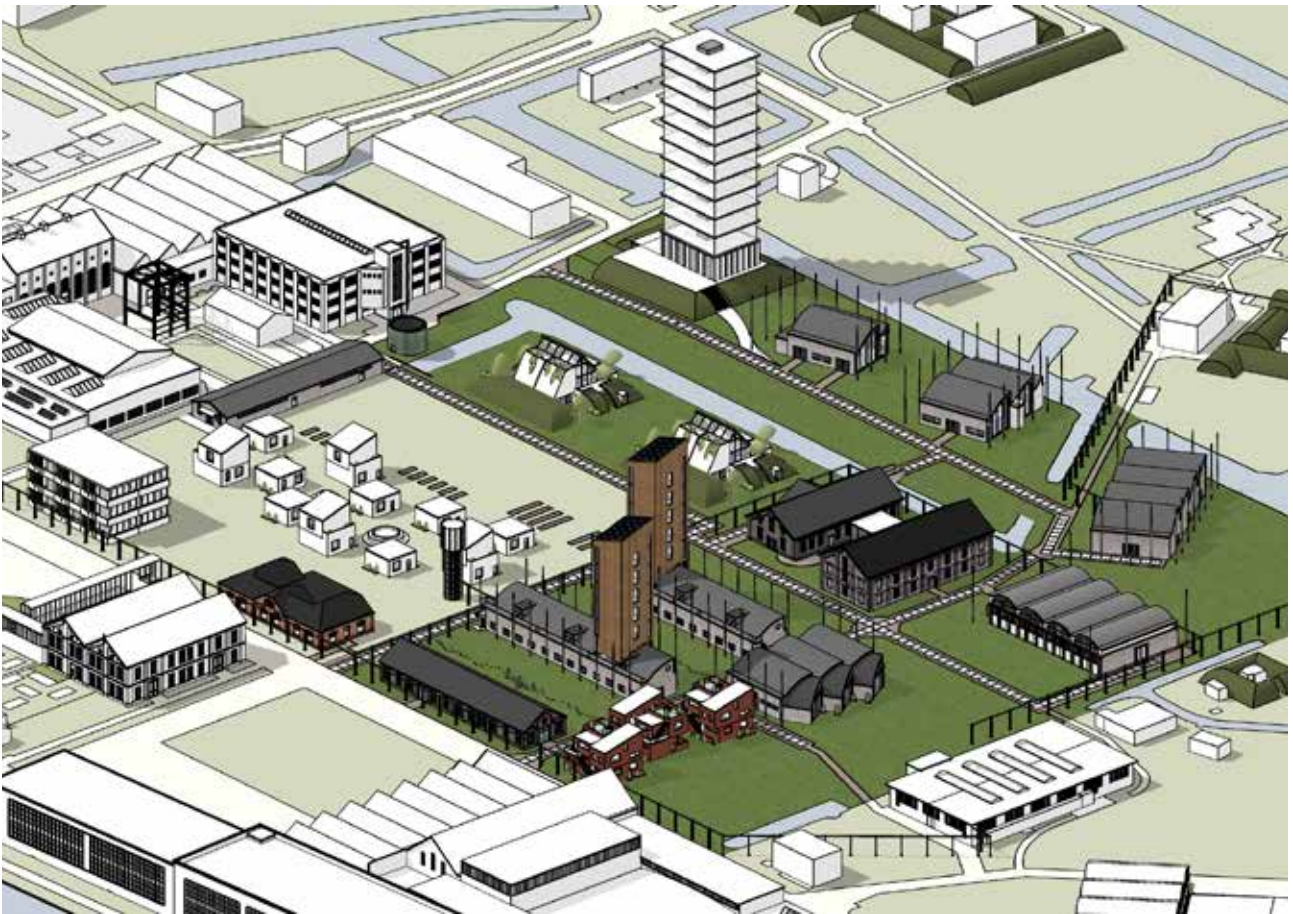


Trekzijde deur



Duwzijde deur



**Design situation old**

**Height** accent in the Plofbos  
Loss of character



# SECTION

Design situation new

