EEN GAT IN DE MARKT

TOWARDS CIRCULAR HERITAGE V&D BUILDINGS

P5 BT booklet
Niek Buchner

29.06.21

PART I Architecture

Urban connections

Context 1:500

Floorplans

Floorplan V0

Mandenmakerssteeg

Breestraat 78-80

De Waag

Breestraat

Aalmarkt

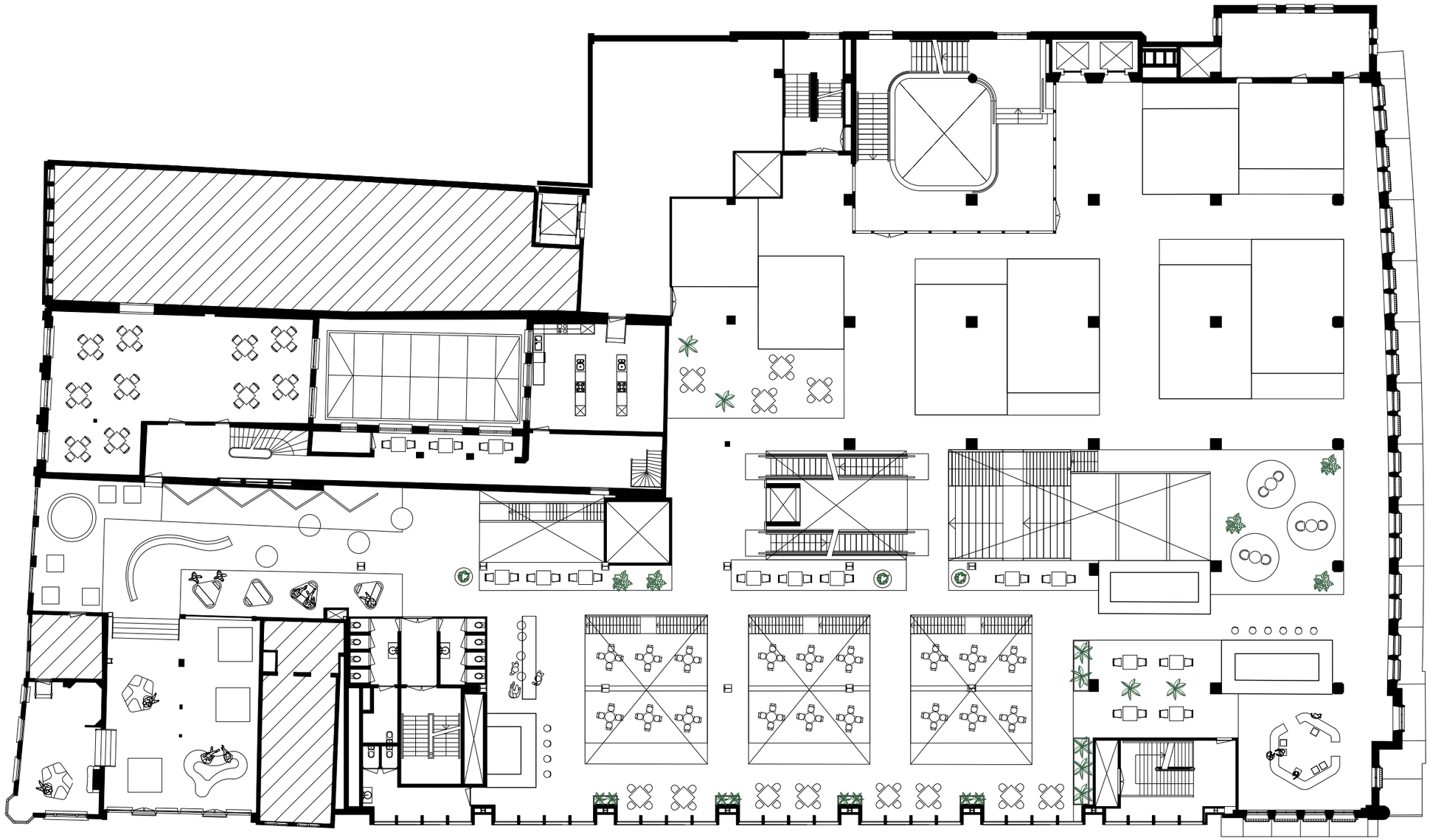
Visbrug

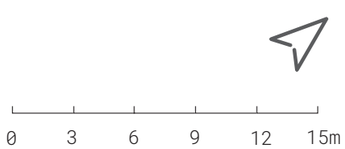
Maarsmansteeg

Kapelstraat

Floorplans

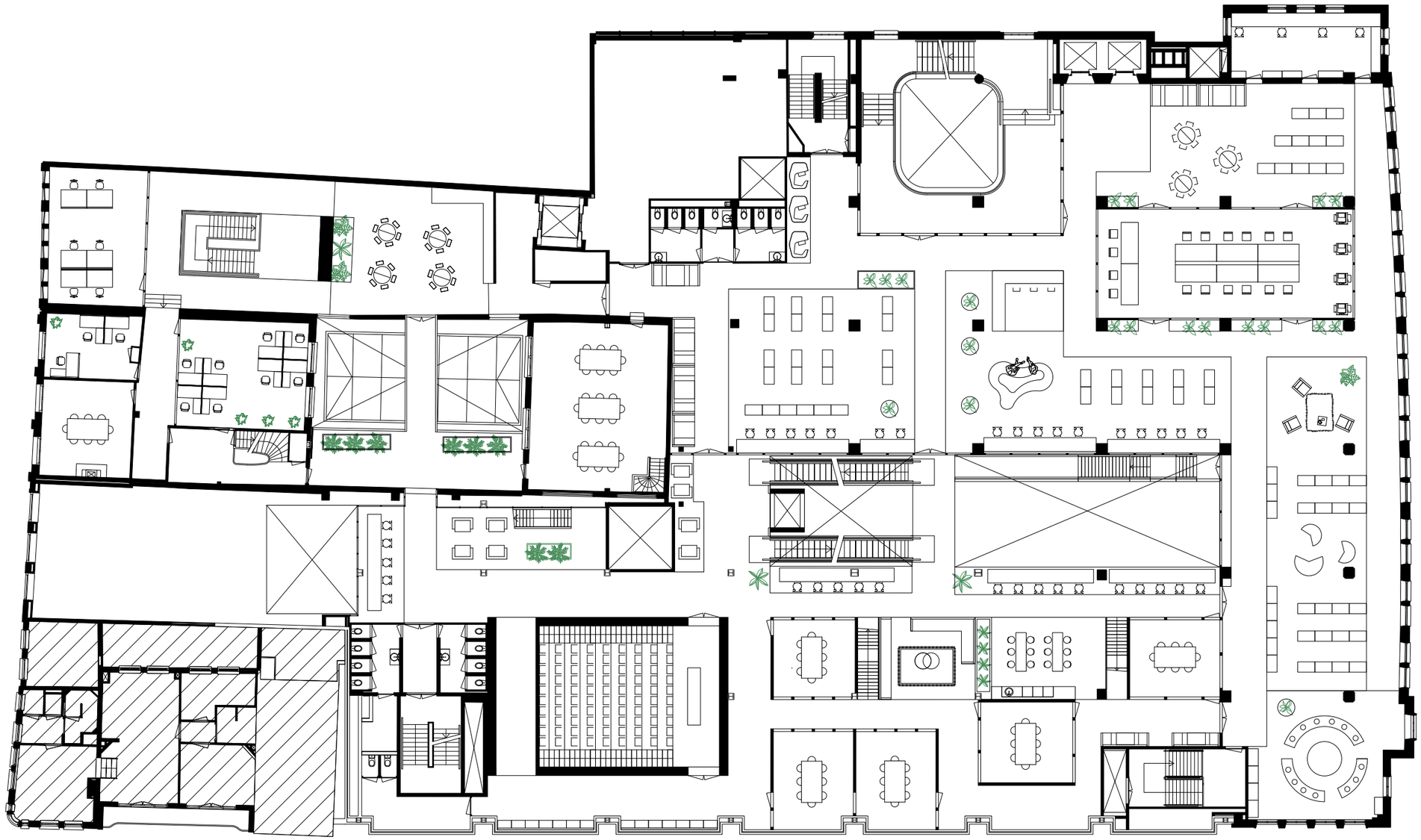
Floorplan V1





Floorplans

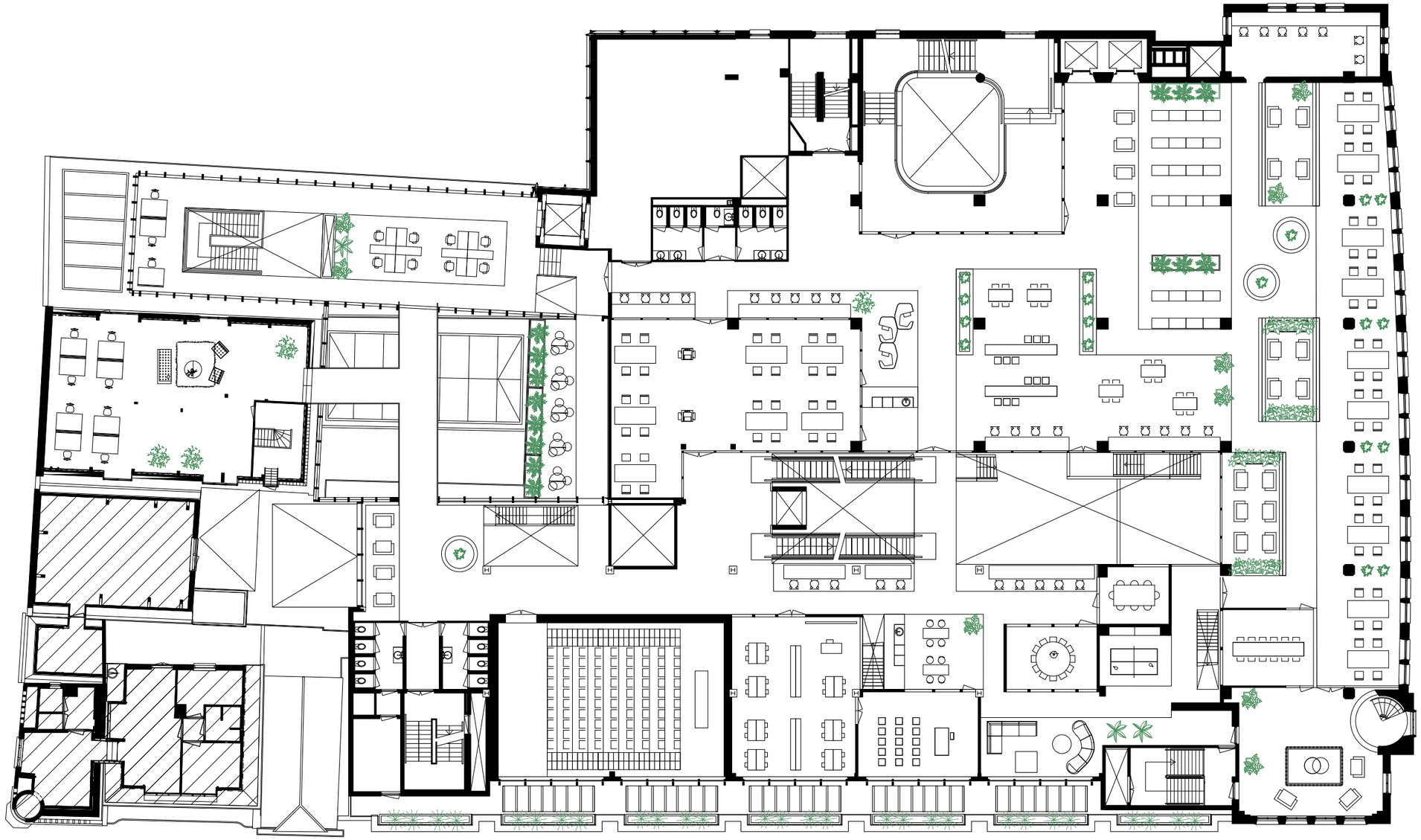
Floorplan V2

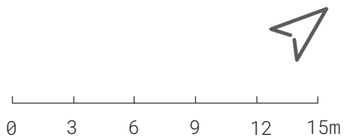


0 3 6 9 12 15m

Floorplans

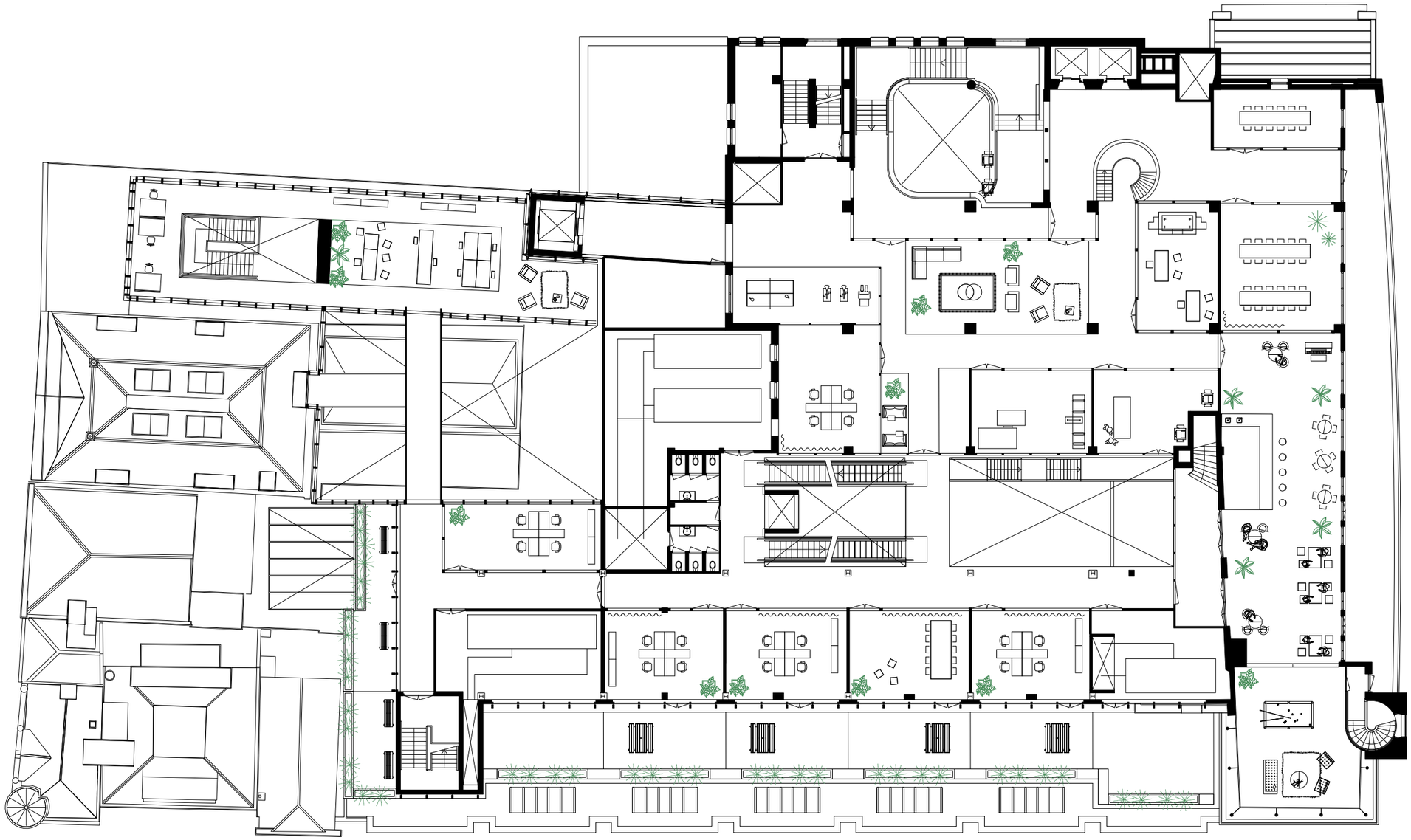
Floorplan V3

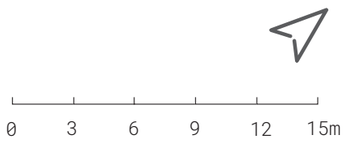




Floorplans

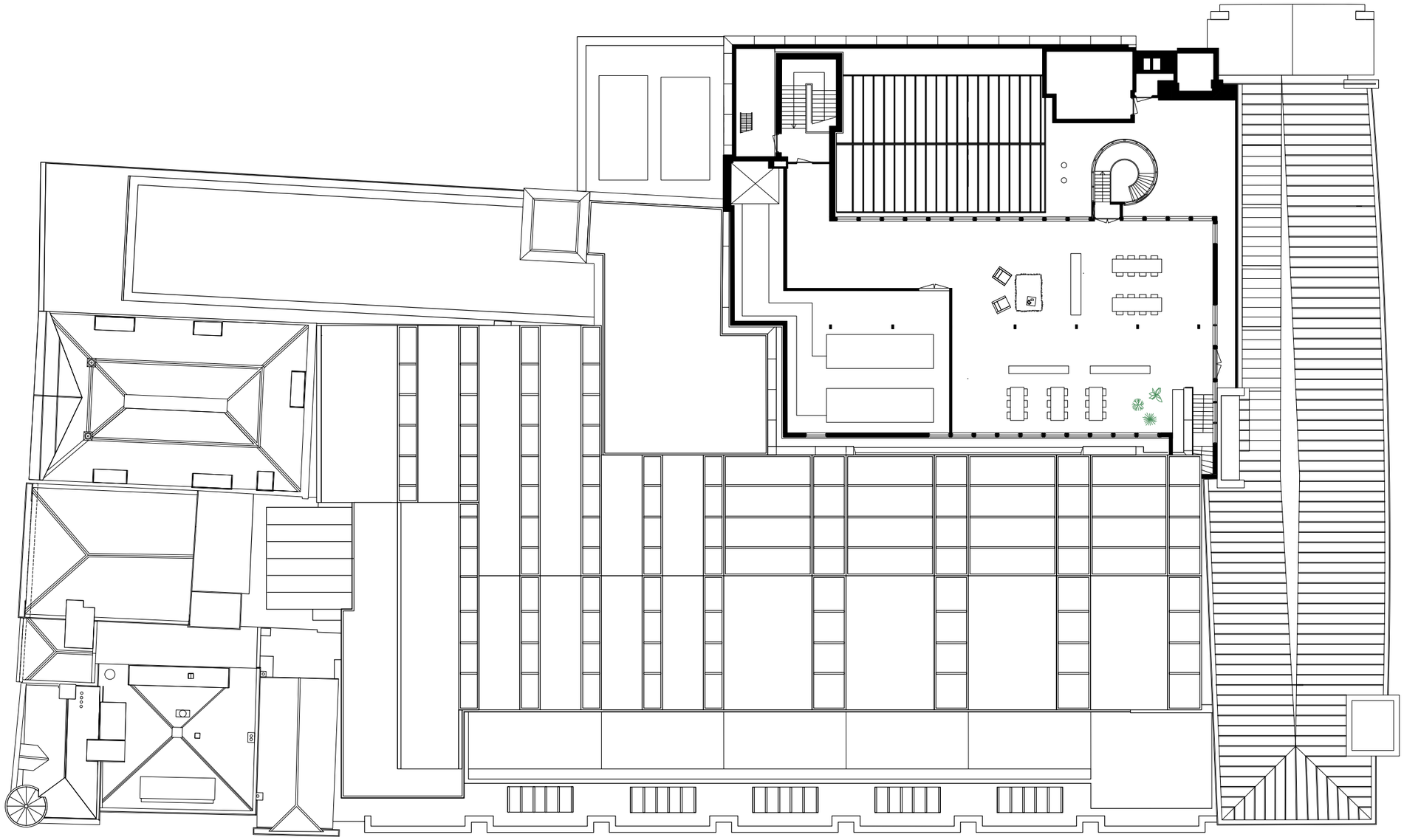
Floorplan V4

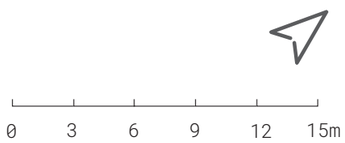




Floorplans

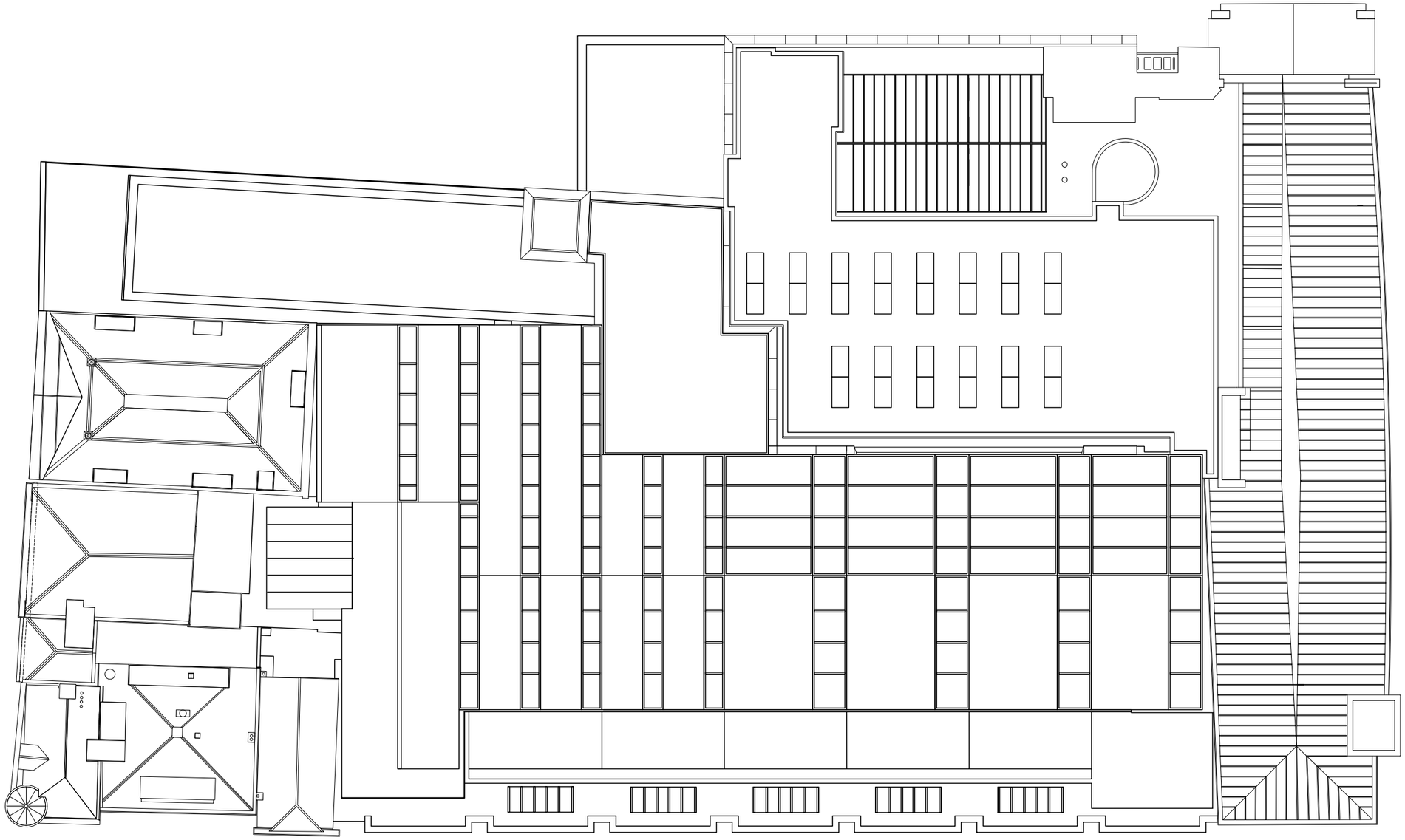
Floorplan V5





Roofplan

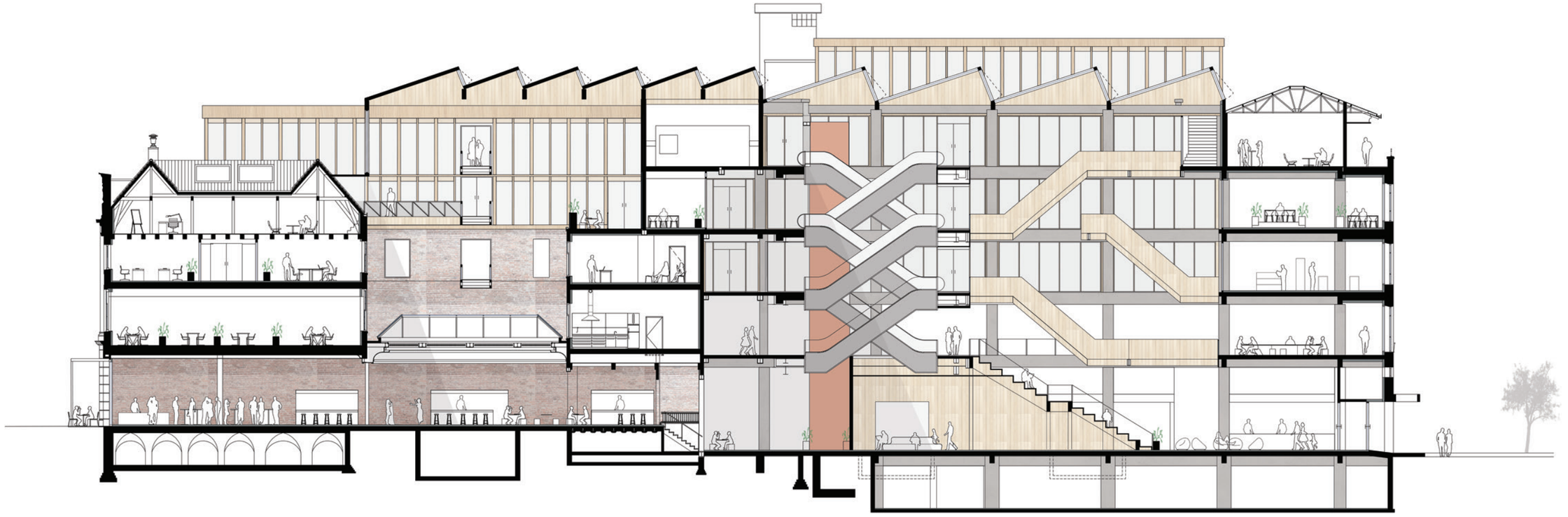
Roofplan 1:300



0 3 6 9 12 15m

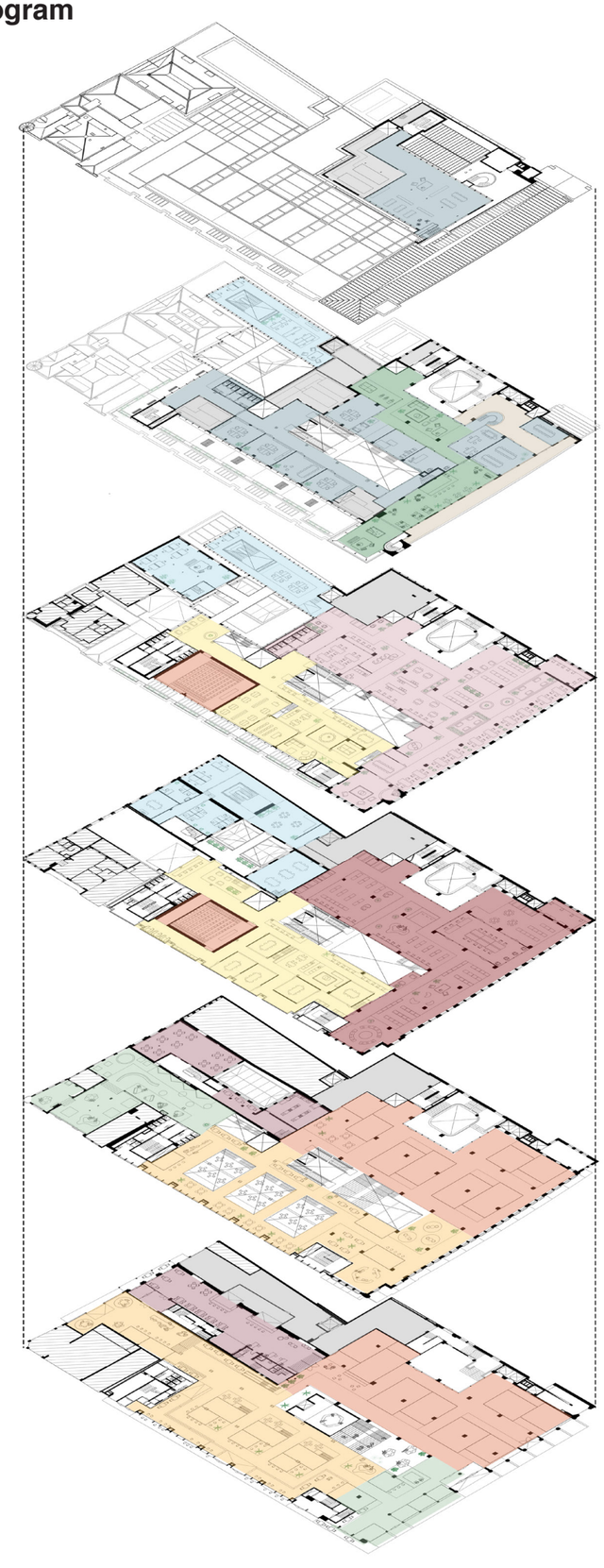
Section

Long section



0 3 6 9 12 15m

Program



V5

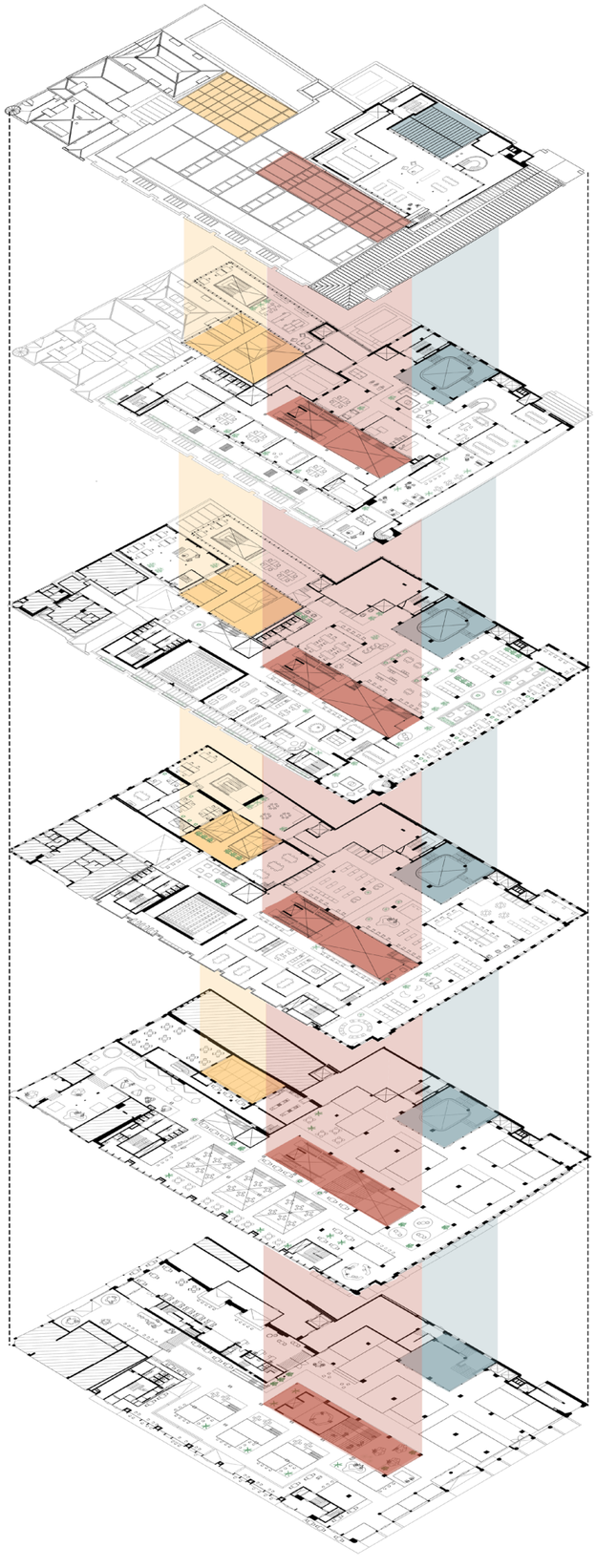
V4

V3

V2

V1

V0



Innovative functions V4 & V5

start-up offices & creative labs	650 m2
flex offices	170 m2
logistic space	340 m2
lounge space with bar	400 m2
public terrace	

Educational functions V2 & V3

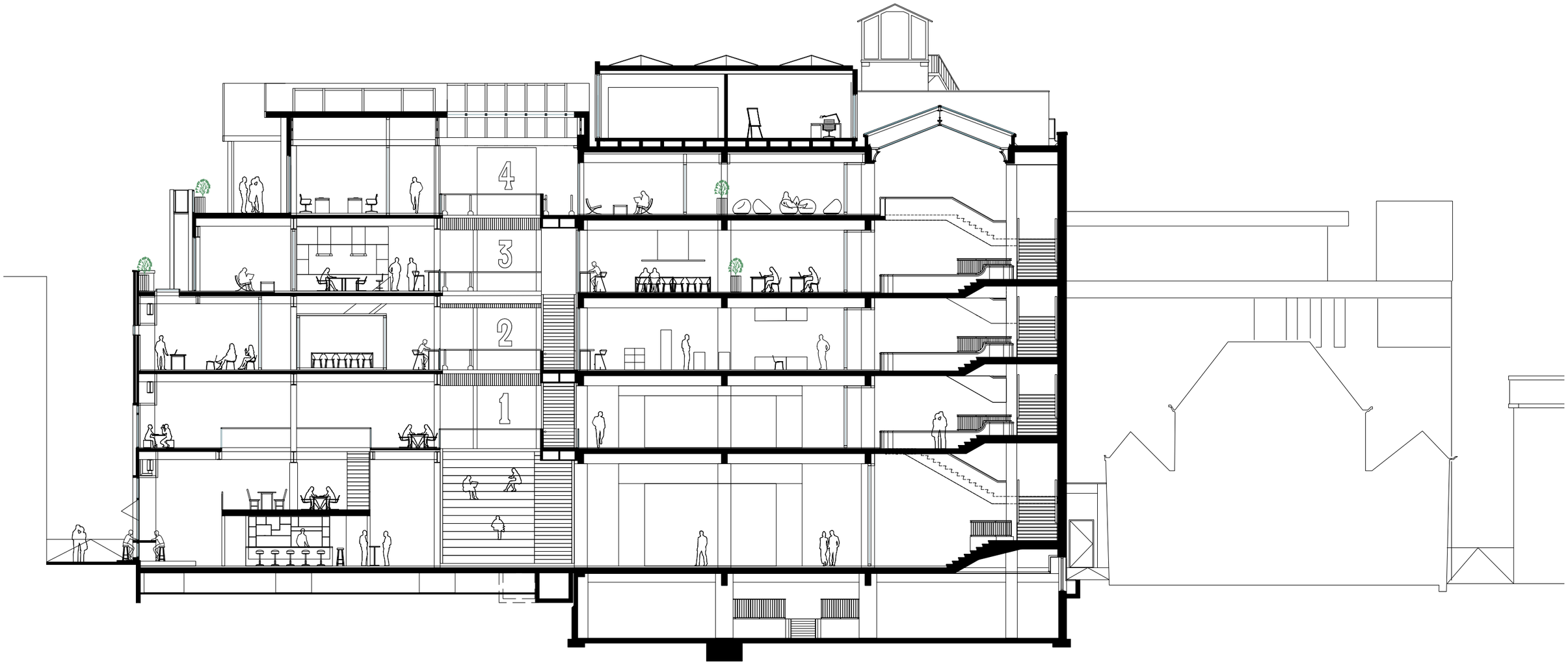
library	935 m2
study landscape	935 m2
lecture hall	260 m2
meeting rooms & lounges	1040 m2
educational flex offices	440 + 300 m2
logistic space	140 + 125 m2

Recreational functions V0 & V1

shop-in-shop retail	750 + 730 m2
foodcourt	865 + 800 m2
restaurant/bar	290 + 175 m2
innovation galleries	210 + 340 m2
logistic space	330 + m2

Section

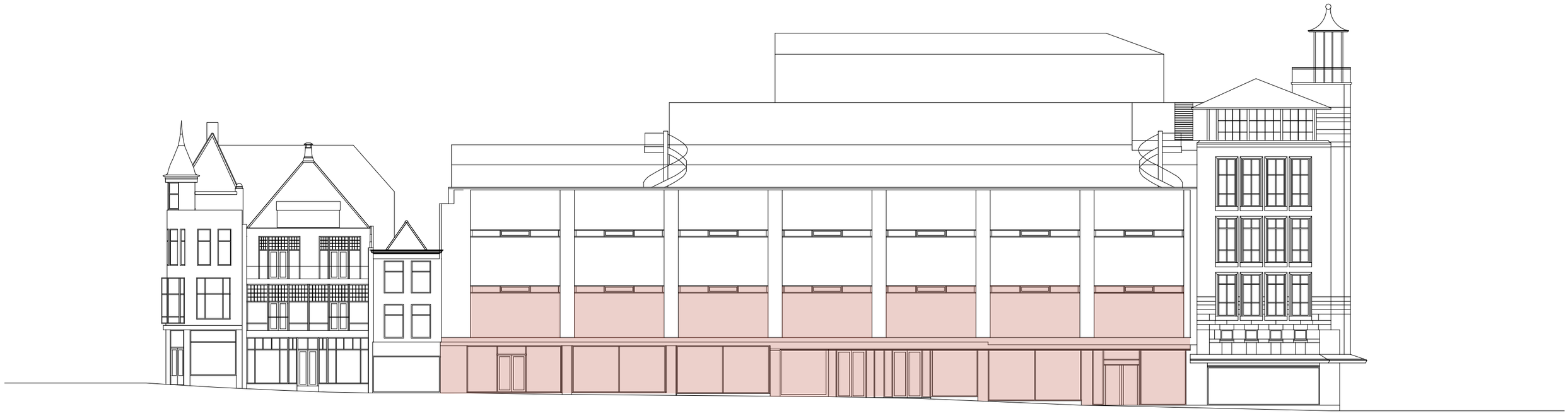
Cross section



0 2 4 6 8 10m

Demolition drawing

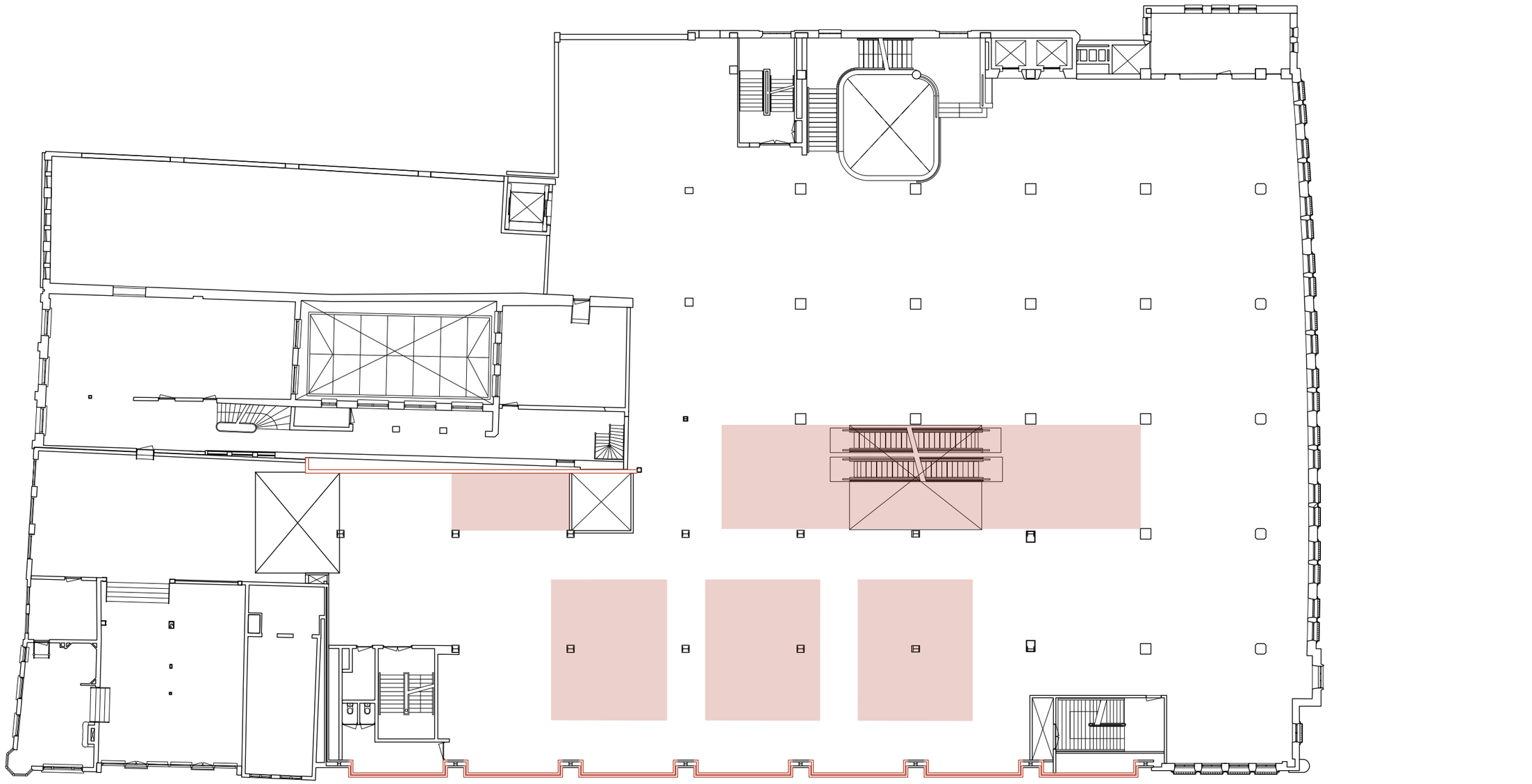
Facade Maarsmansteeg



0 3 6 9 12 15m

Demolition drawing

Representative floorplan - V1



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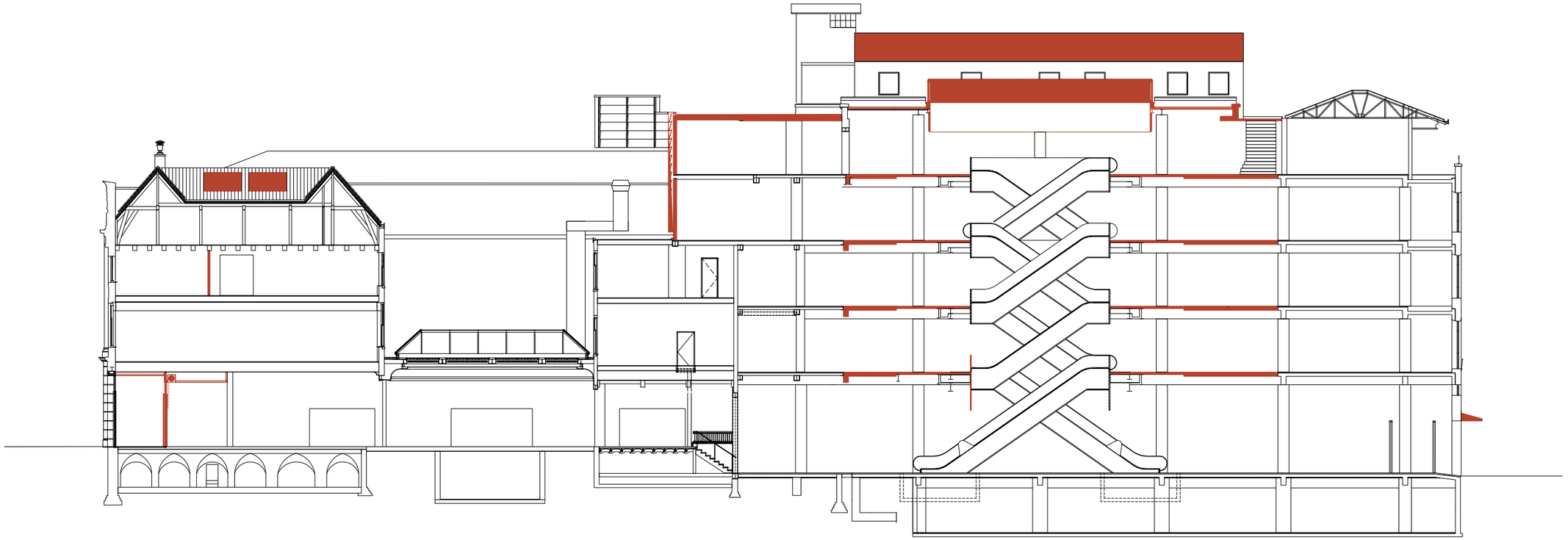
Demolition drawing

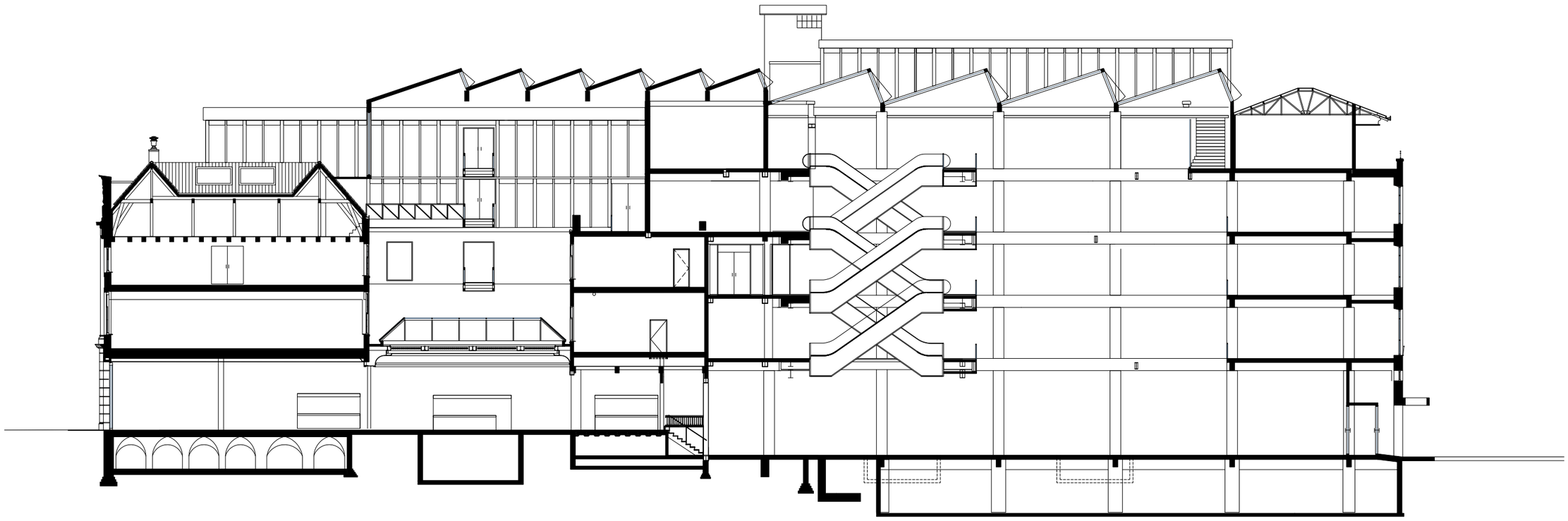
Representative section



0 3 6 9 12 15m

Future scenario

Section with removed interventions

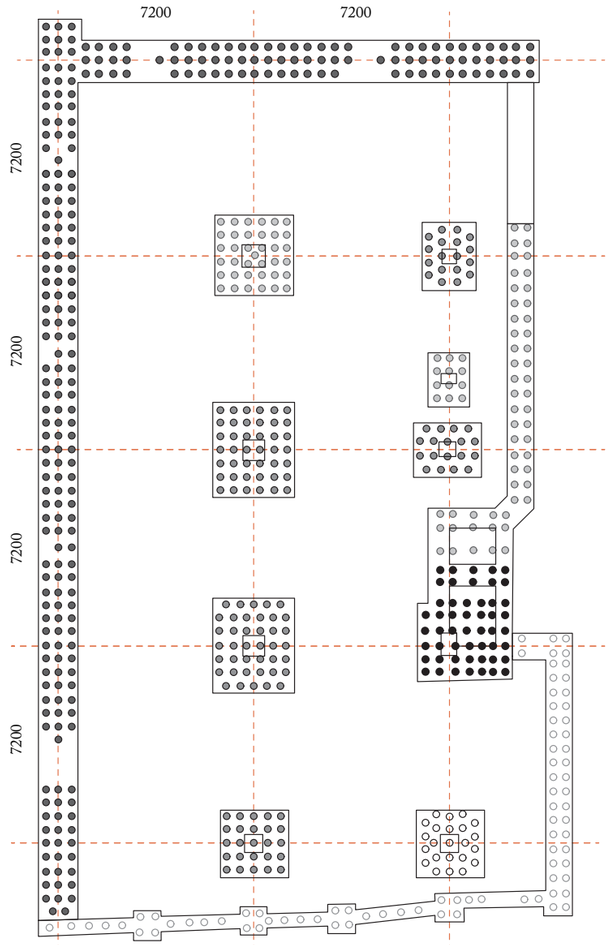


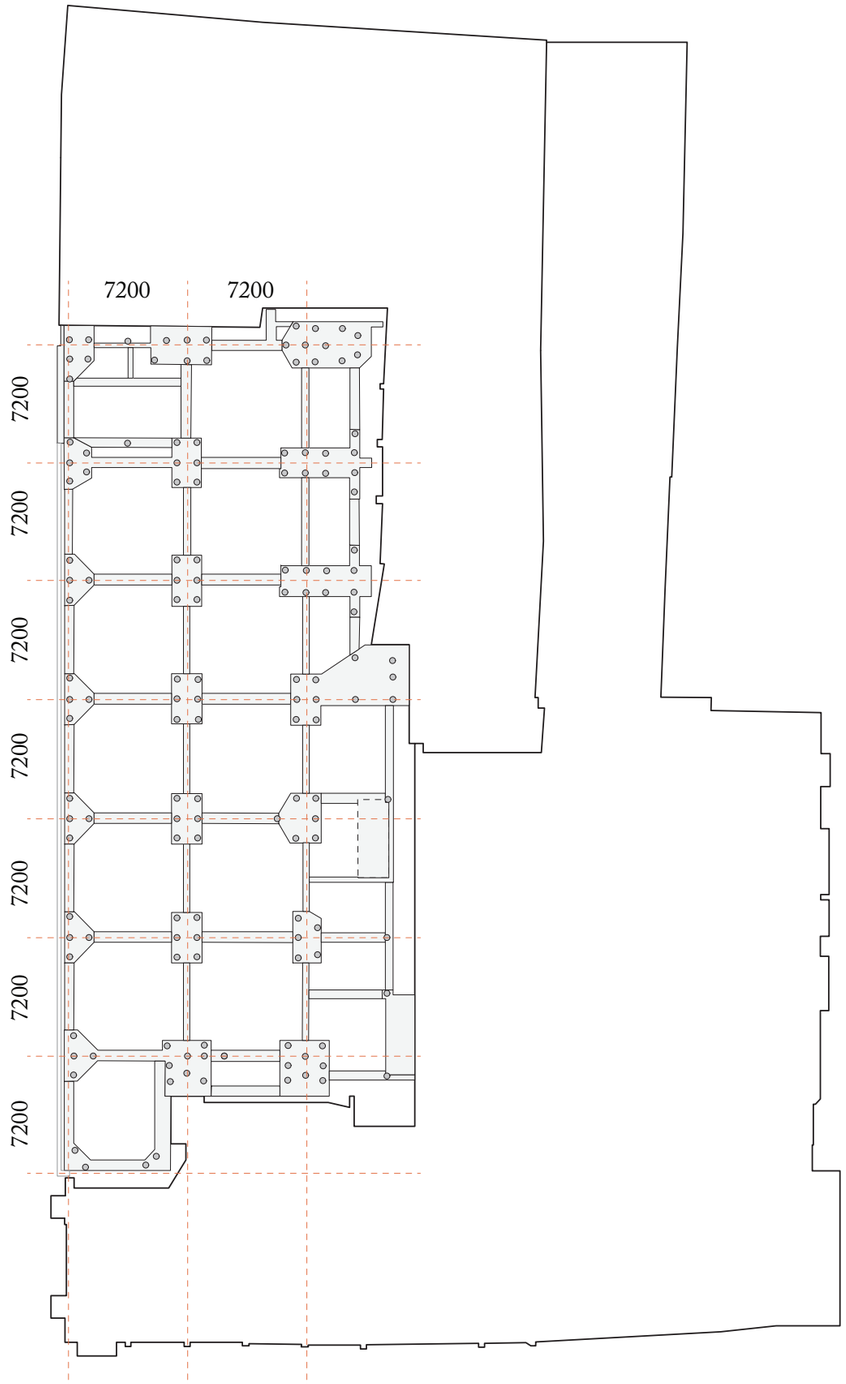
0 3 6 9 12 15m

PART II Structure

Analysis

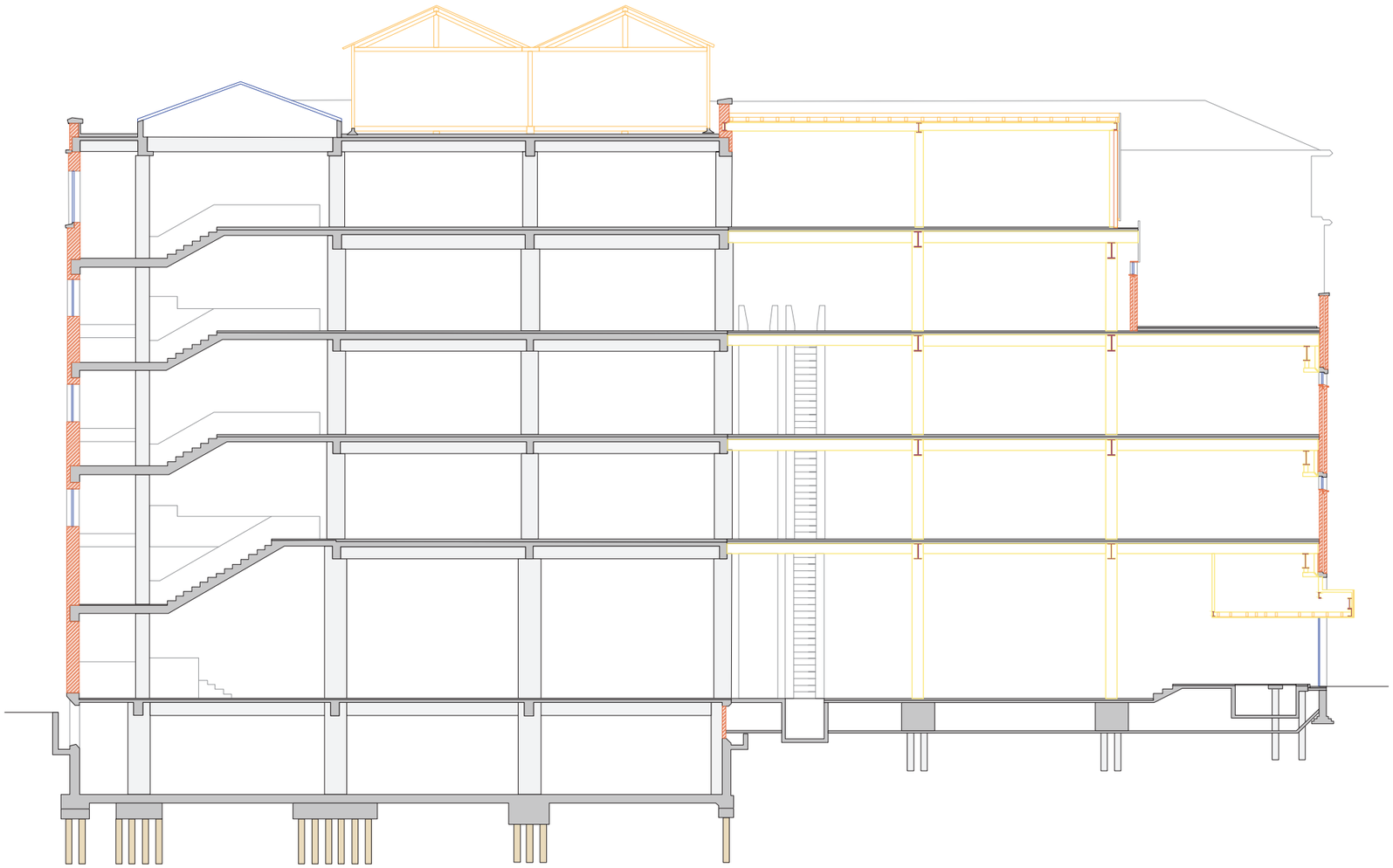
Foundation drawings





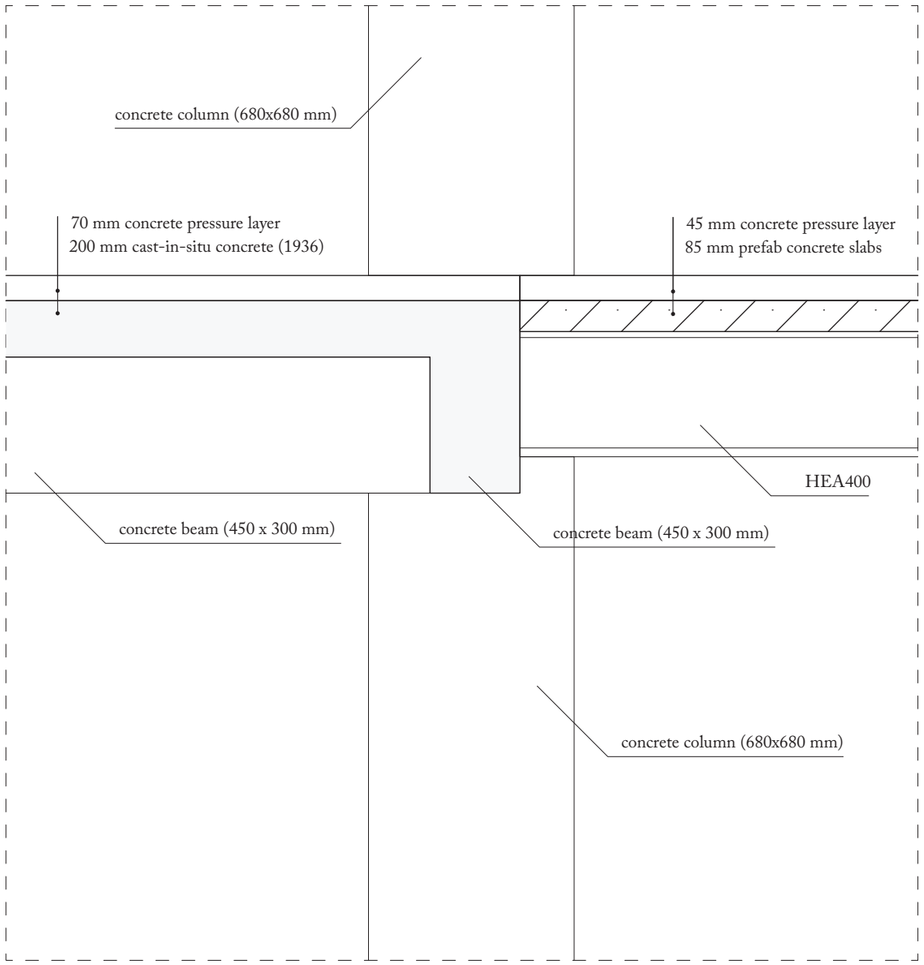
Analysis

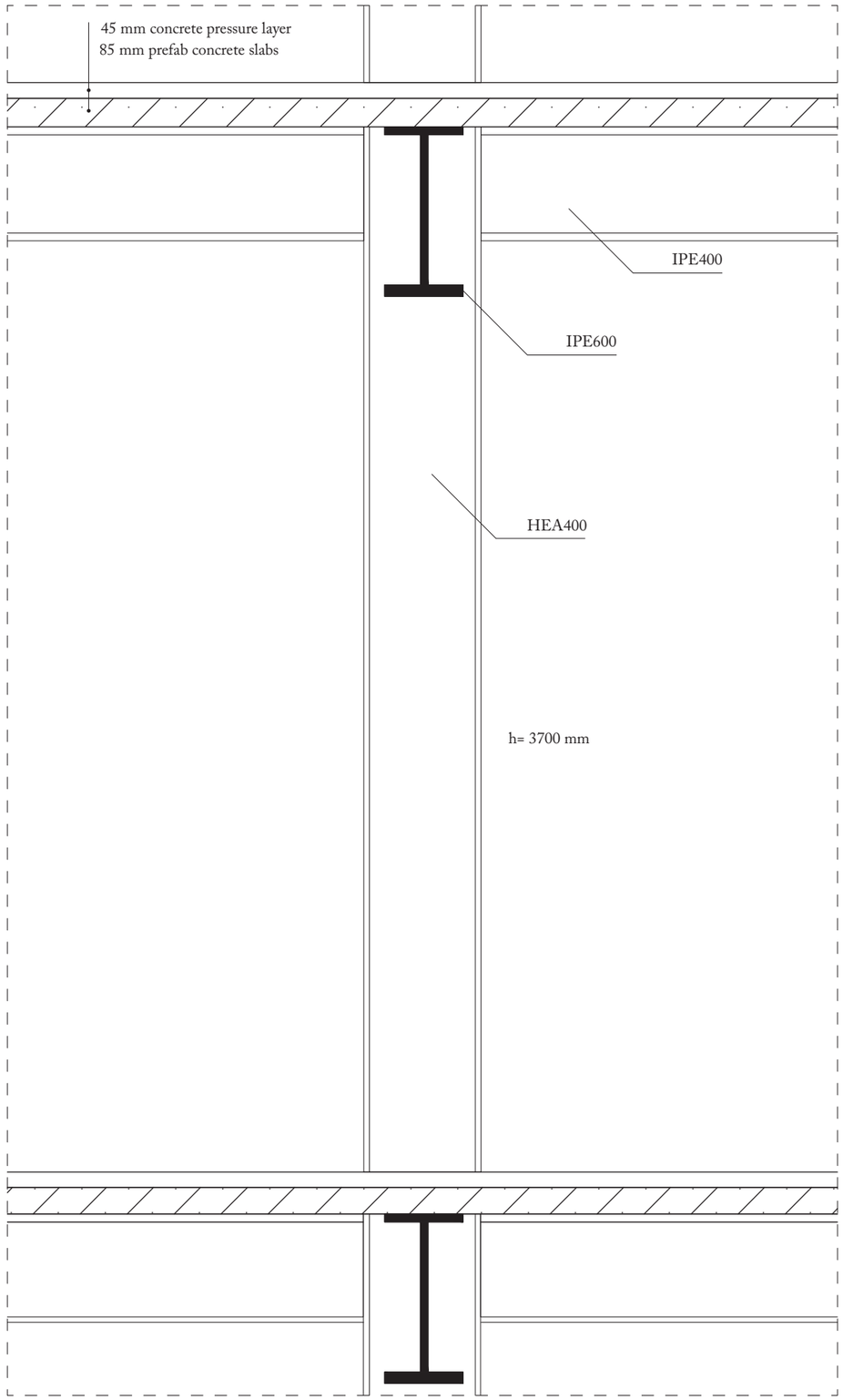
Structure drawings of typical floorplans



Analysis

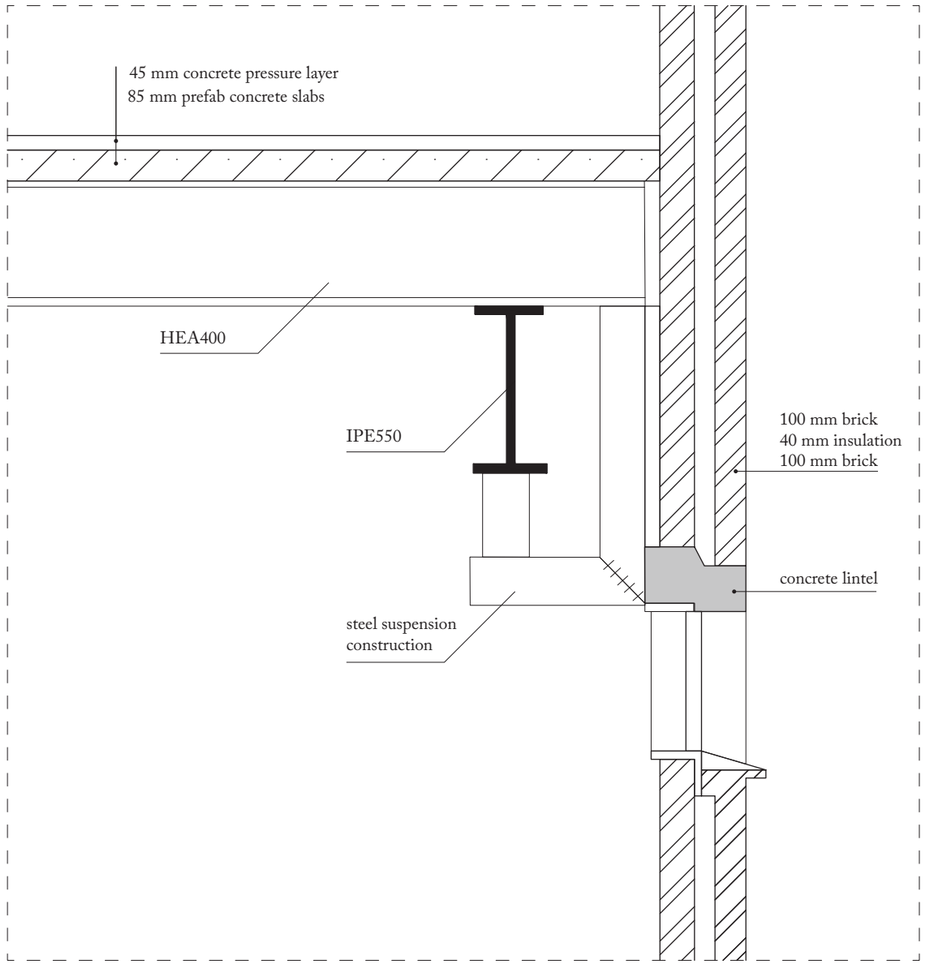
Structure drawings of typical details

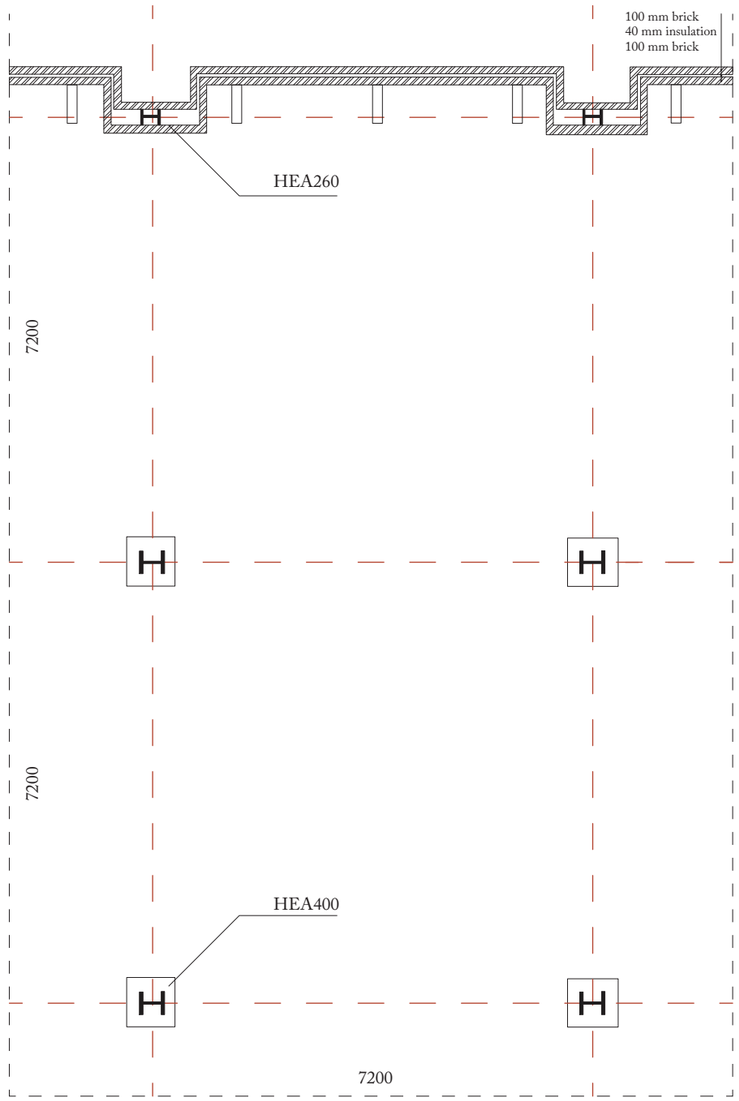




Analysis

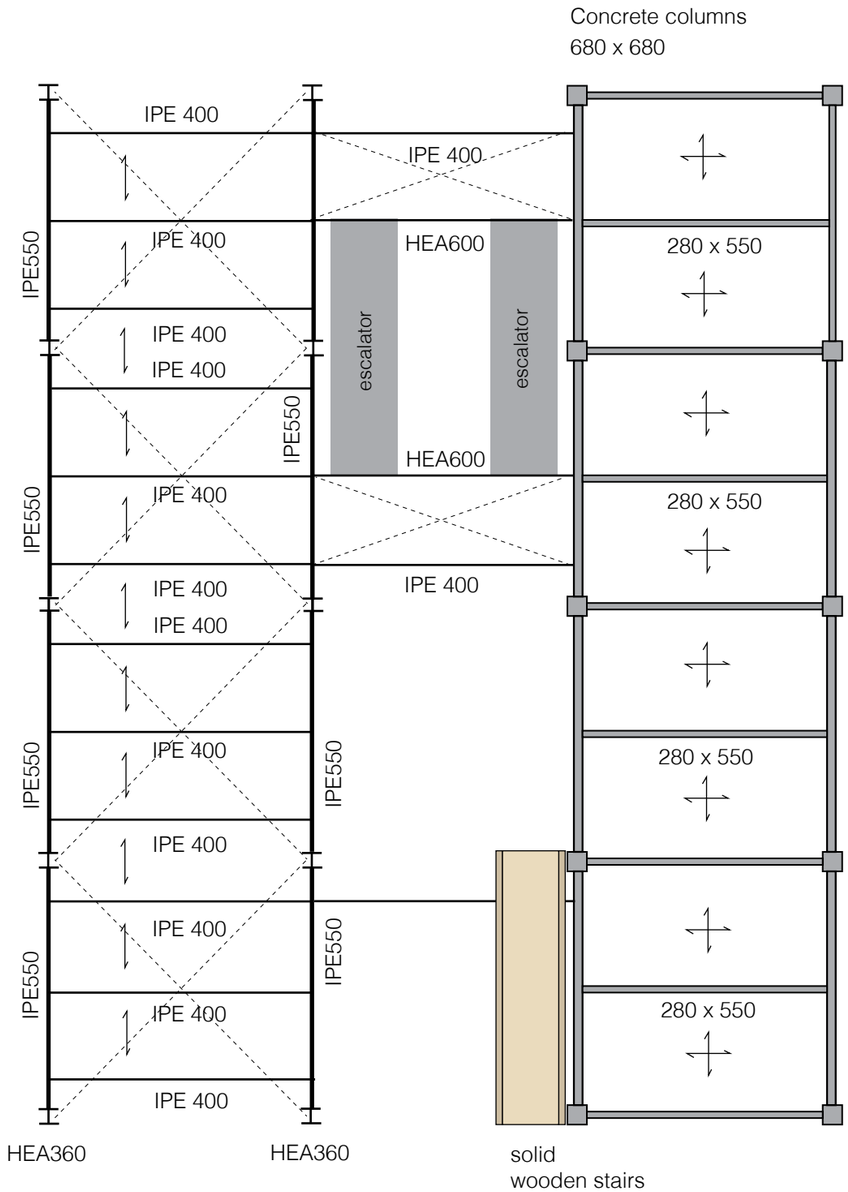
Structure drawings of typical details

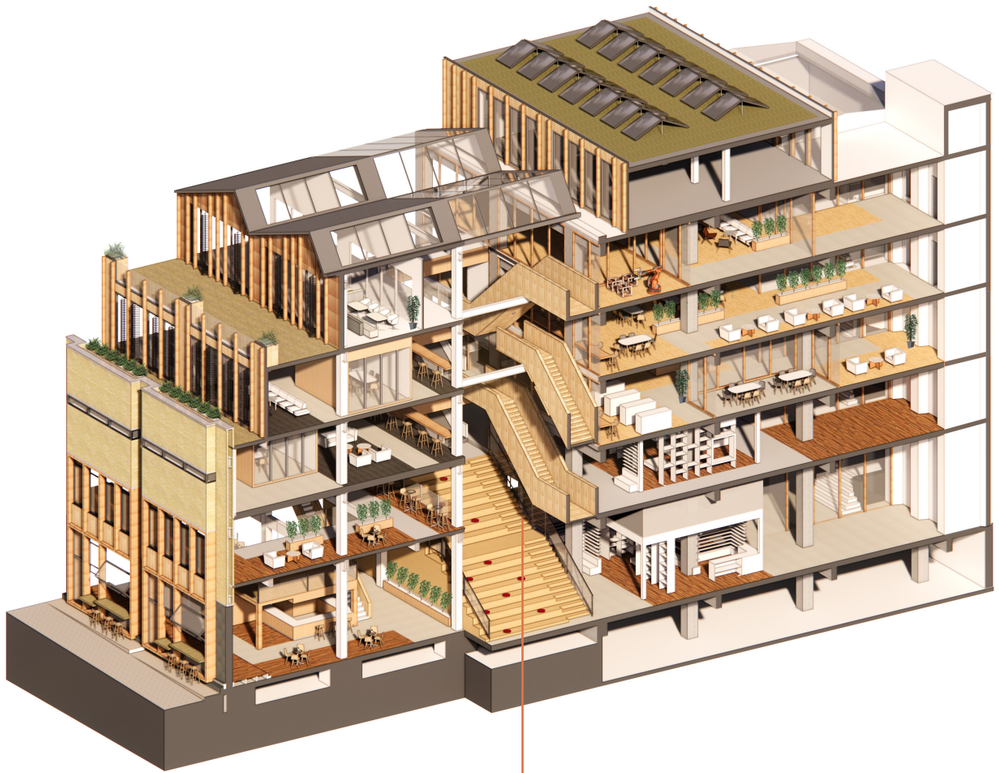




Construction principles

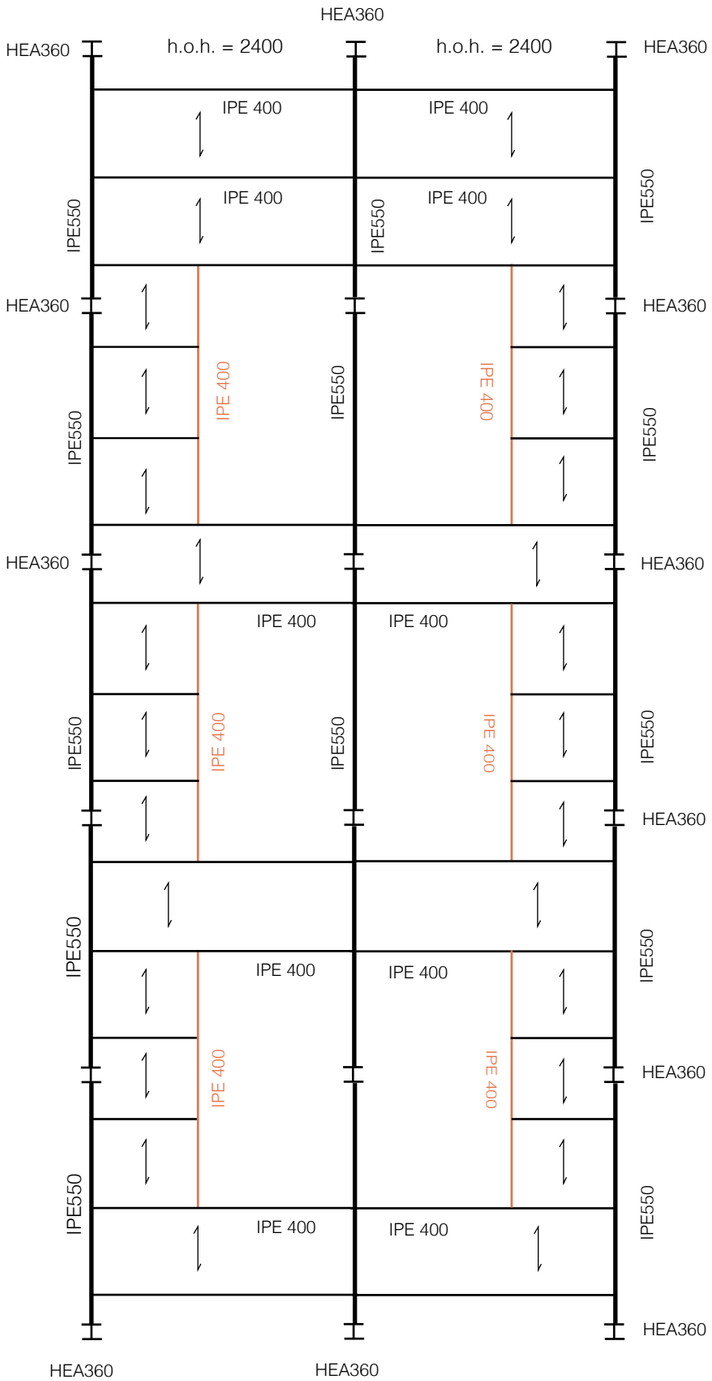
V1 - Vispoort atrium construction

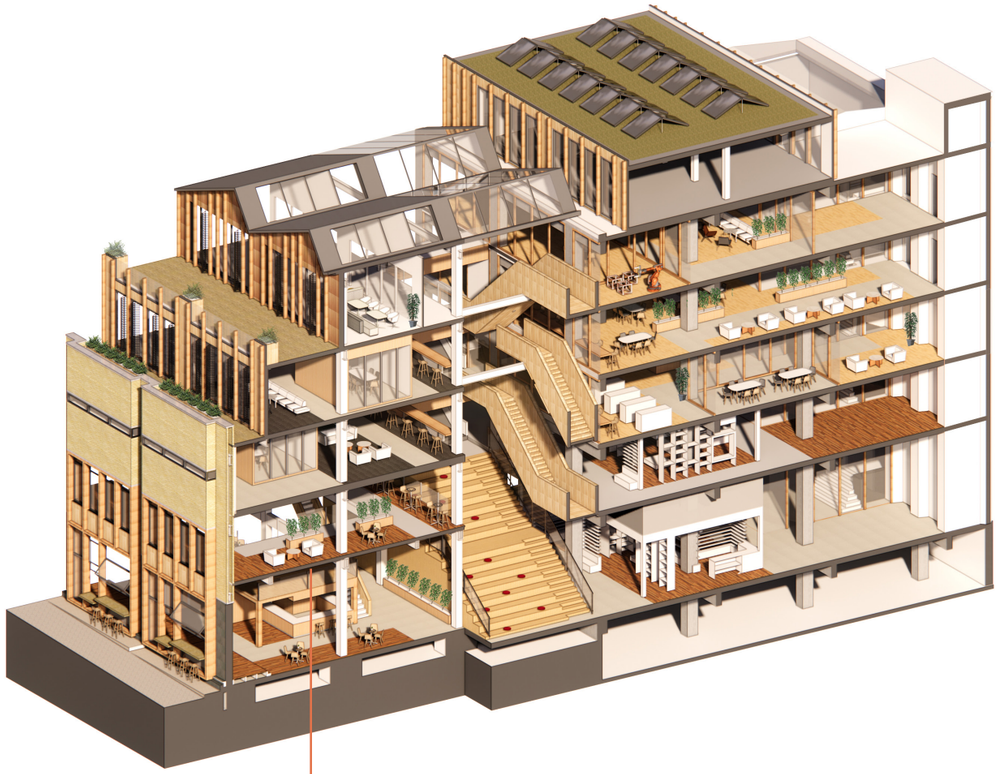




Construction principles

V1 - Foodcourt construction



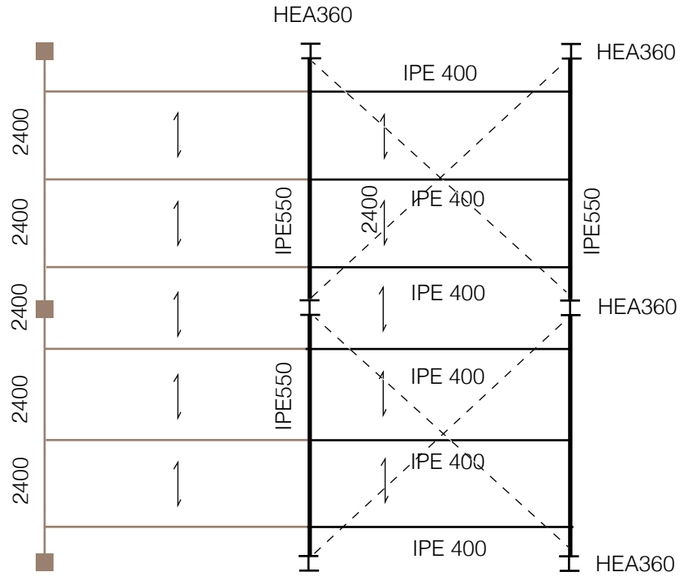


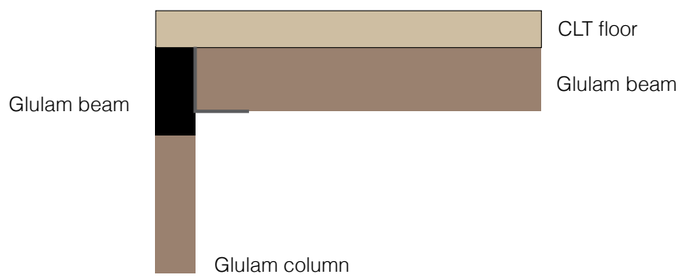
Construction principles

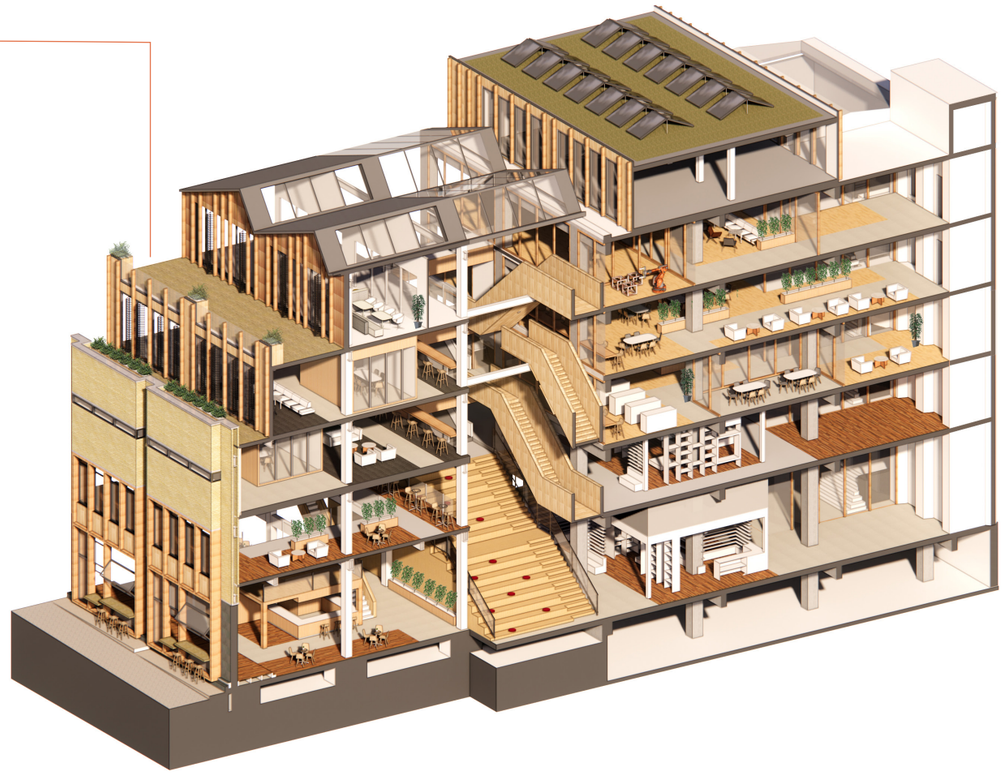
V3 - CLT additional construction

Constructie schema V3

h.o.h. = 2400







PART III Climate

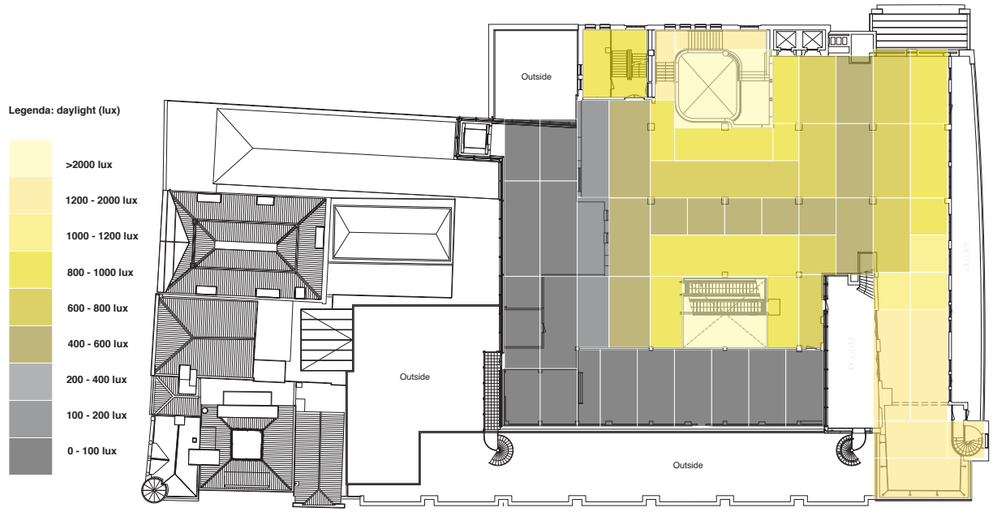
Daylight

Analysis of daylight typical floors

V1

V2

V3



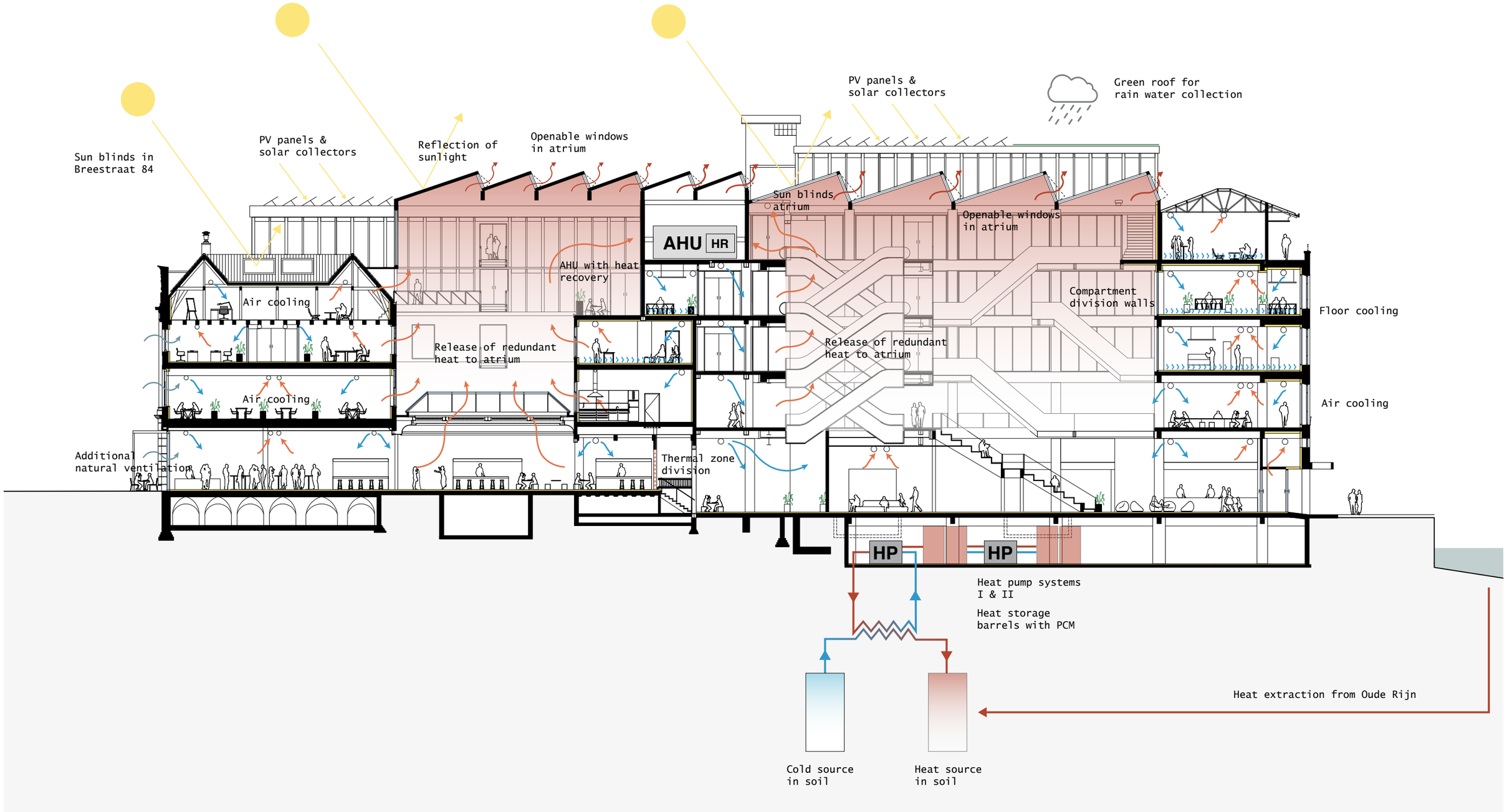
V4

Schaal 1:800

0 4 8 20m

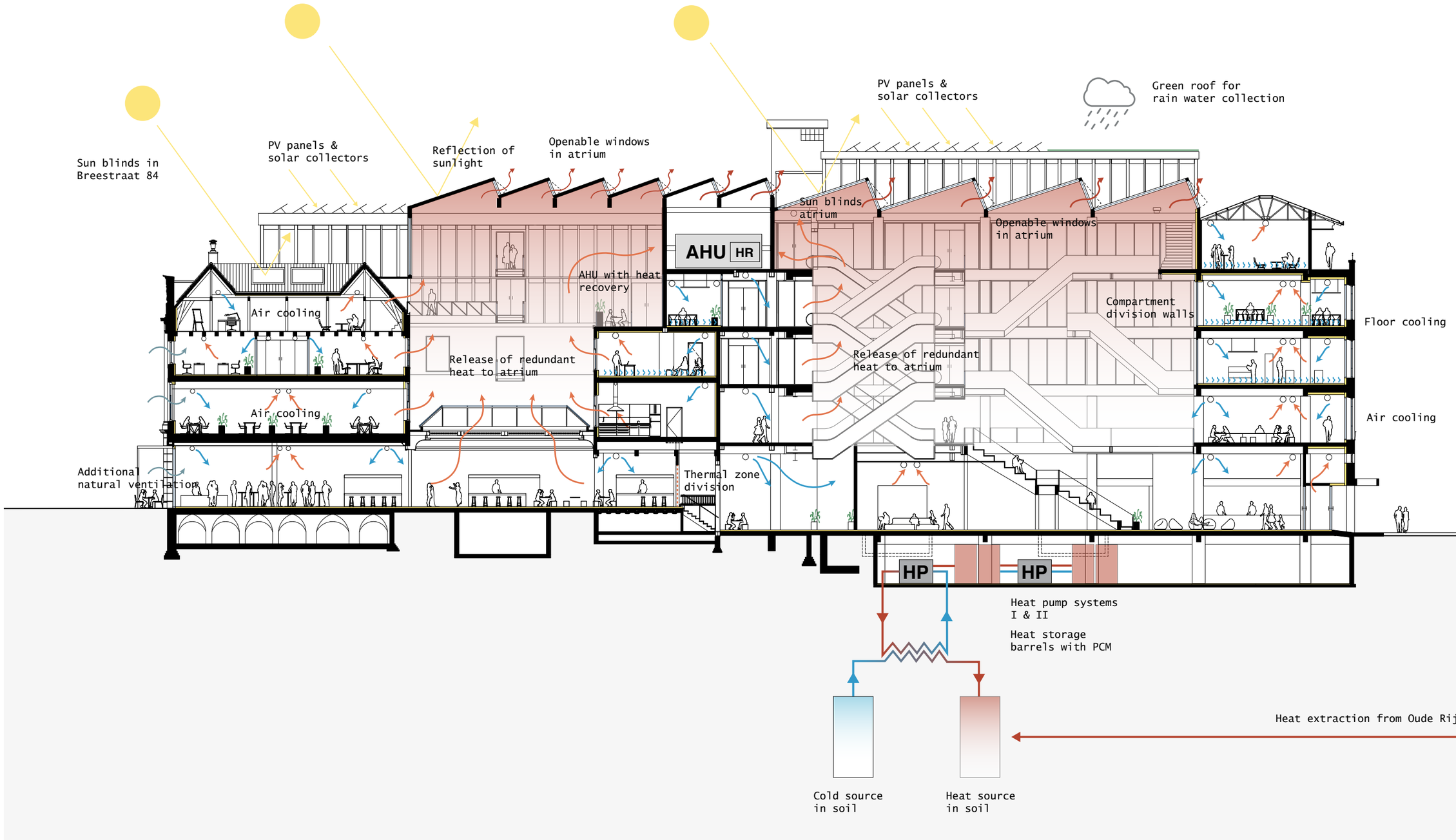
Climate

Climate section in summer



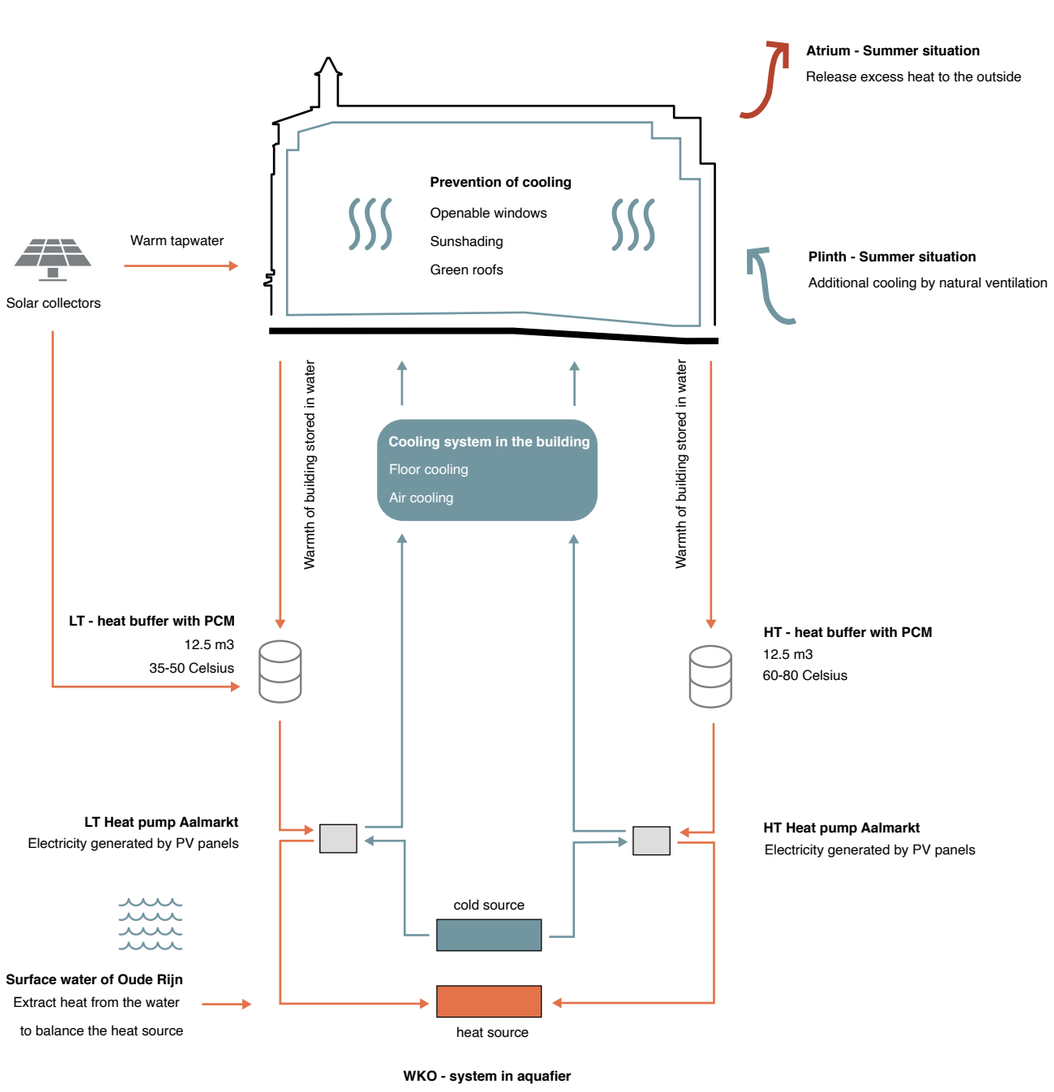
Climate

Climate section in winter

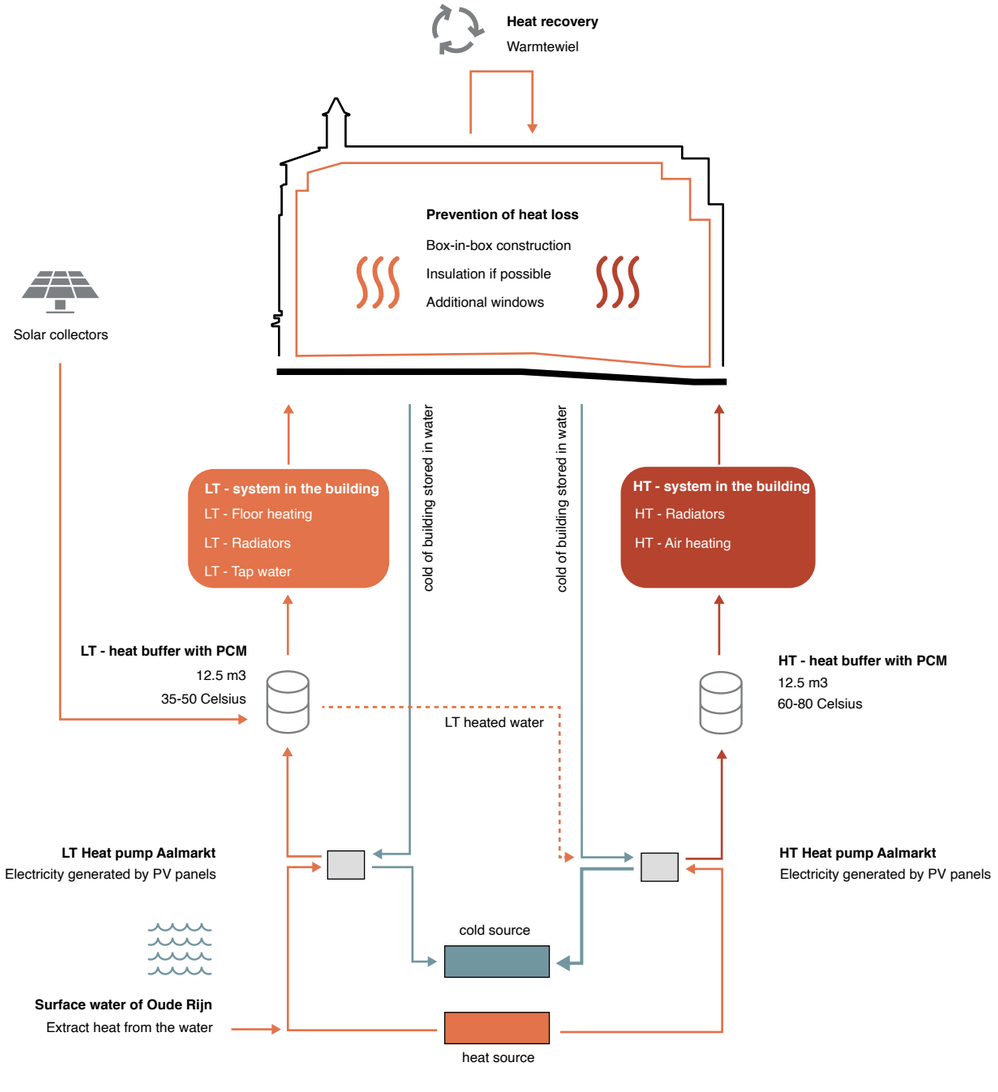


Heating & cooling

Concept scheme of heating/cooling in summer & winter



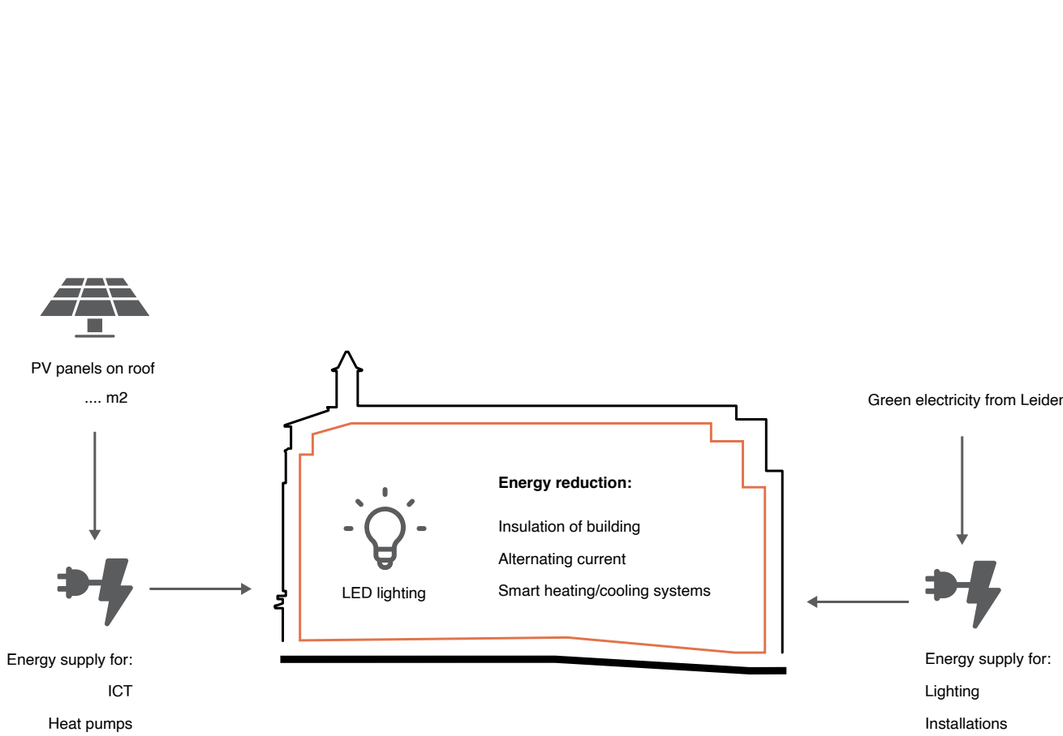
WKO - system in aquafier

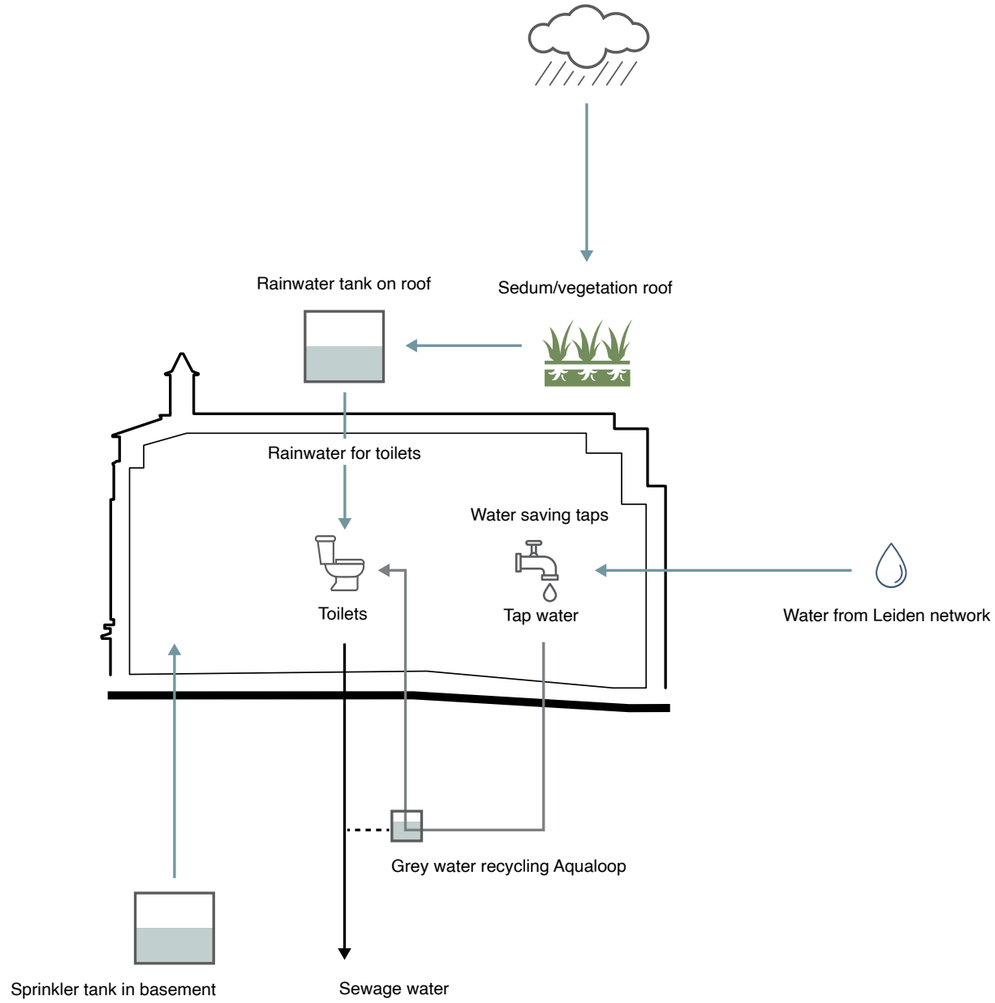


WKO - system in aquafier

Water & energy

Concept scheme of water & energy





Thermal zones

Thermal zones in winter situation

-10 to 15 Celsius
Varying outside temperature

21 Celsius - Closed spaces with constant use (library, studyplaces)
(floor heating & LT radiators)

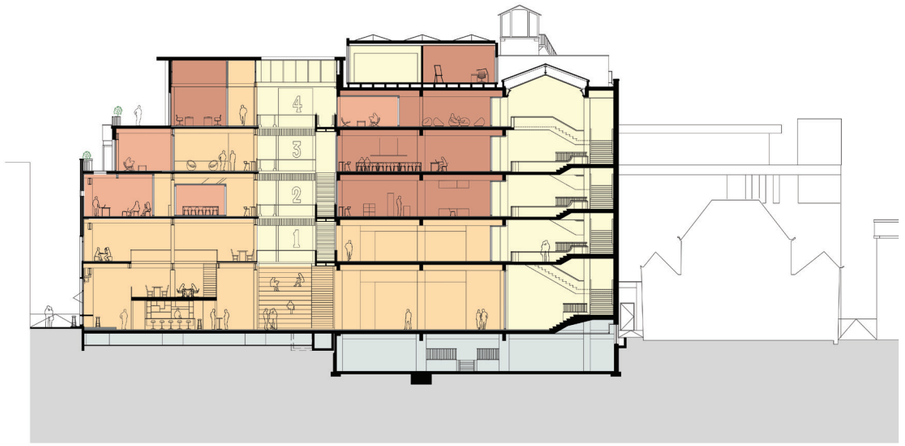
20 Celsius - Closed spaces with partly use (meeting rooms, workshoprooms)
(floor heating,HT radiators & PCM ceiling)

18-20 Celsius - Open spaces with constant use, but lower temperature possible (air heating)

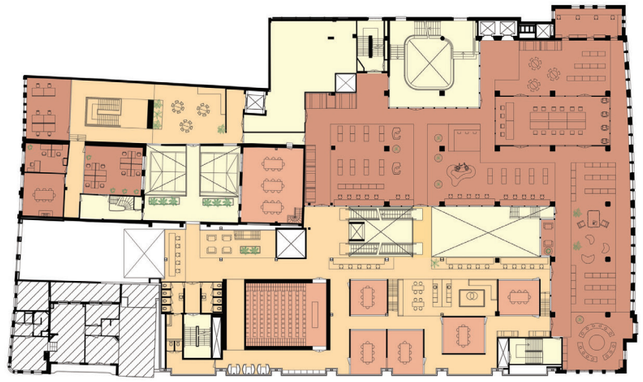
16-18 Celsius - No heating necessary due to function as atrium/void/ storage or circulation space. Heated by residual heated air.

16 Celsius - No heating
Basement

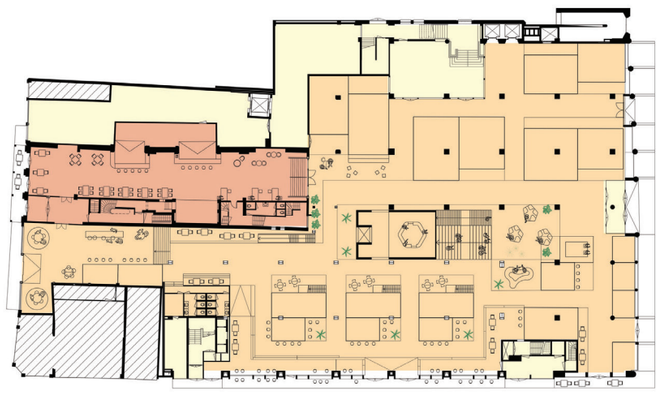
Exterior climate



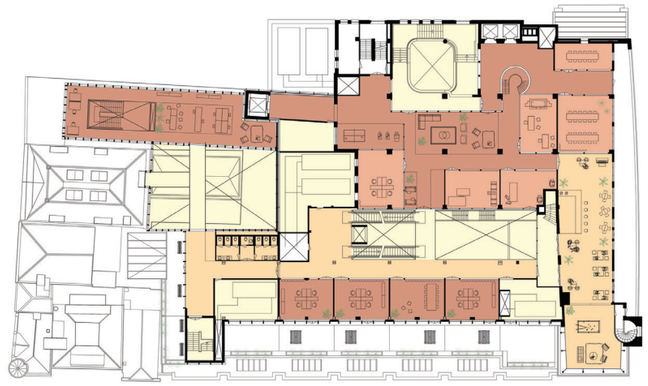
Cross section



Floorplan V2



Floorplan V0



Floorplan V4

Thermal zones

Thermal zones in summer situation

15 to 30 Celsius
Varying outside temperature

28-30 Celsius - Open circulation space/atrium. Cooling by openable windows

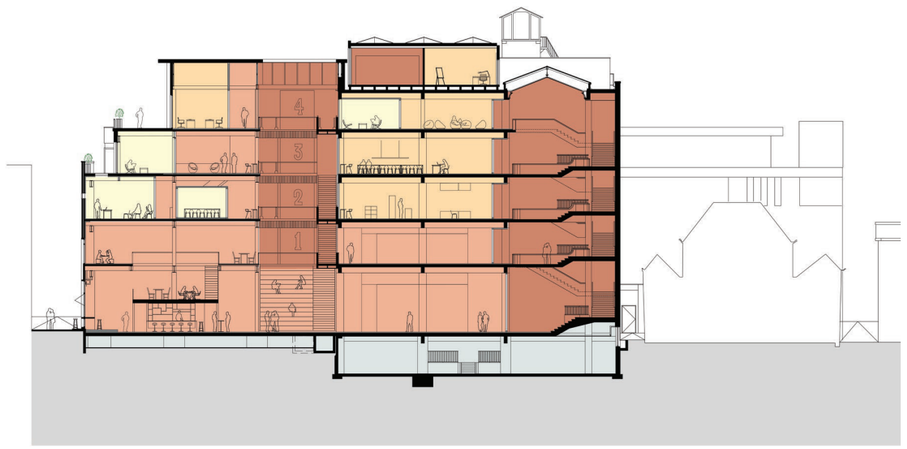
23-26 Celsius - Open spaces with constant use, but higher temperature possible (air cooling & openable windows)

22-25 Celsius - Closed spaces with constant use (library, studyplaces) (floor cooling + air cooling)

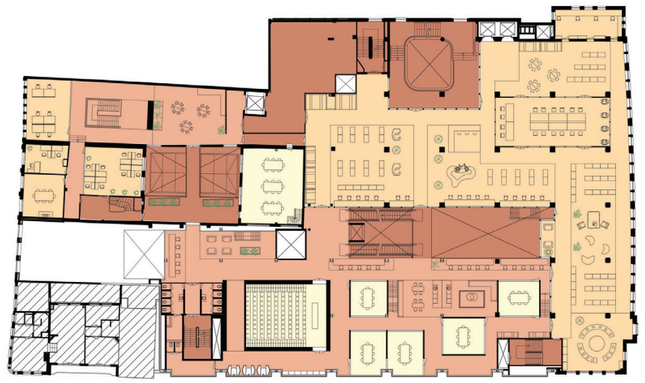
21-23 Celsius - Closed spaces with partly use (meeting rooms,lecture hall) (floor cooling, air cooling, PCM ceiling)

Exterior climate

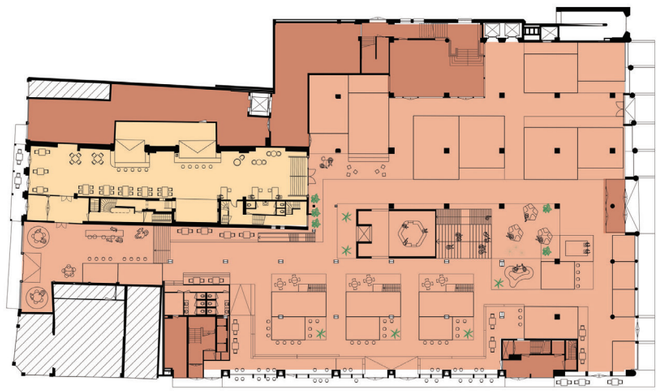
Cross section



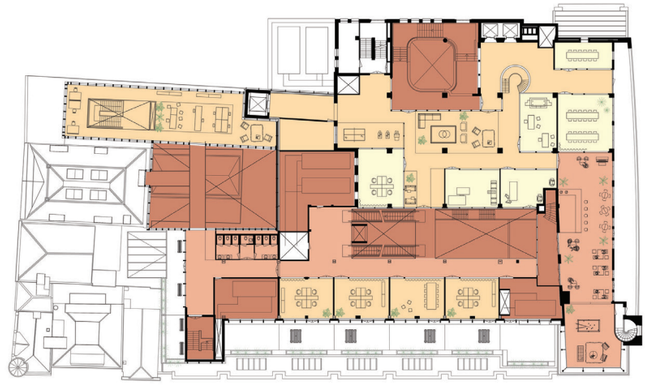
Floorplan V2



Floorplan V0

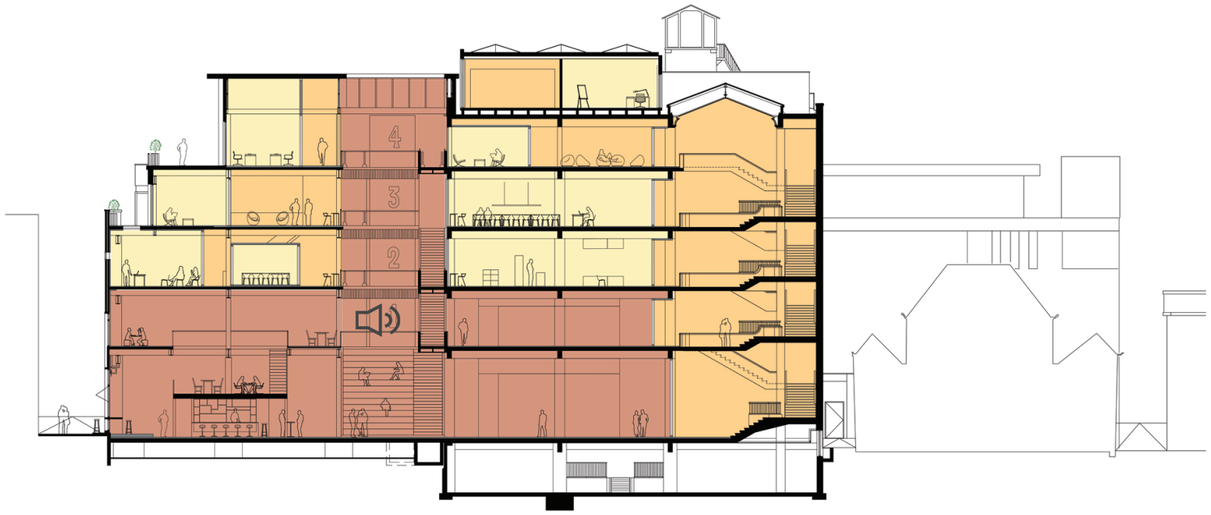


Floorplan V4

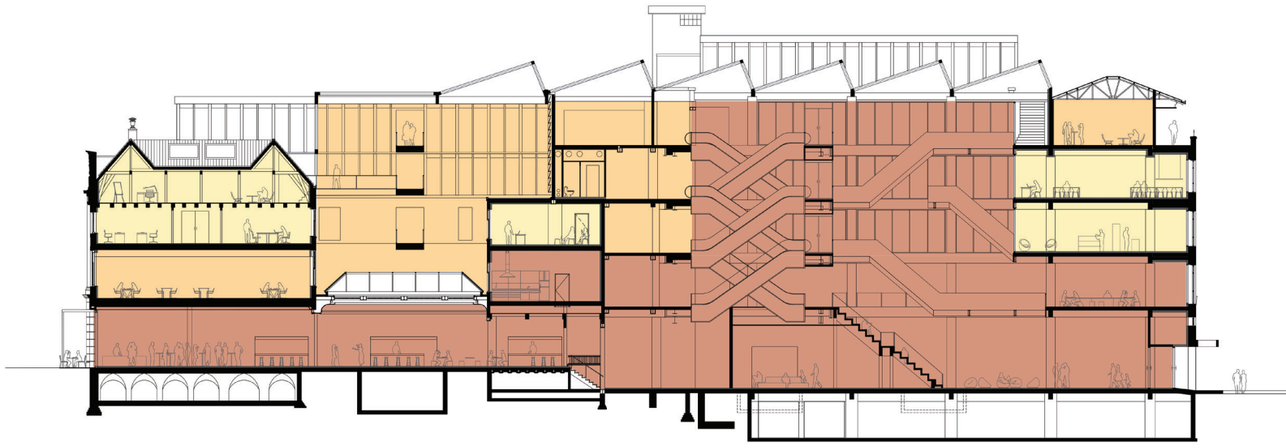


Acoustic zones

Acoustic zones in section



Cross section



Long section

Noisy zone

Mix of noisy- and more quiet zones

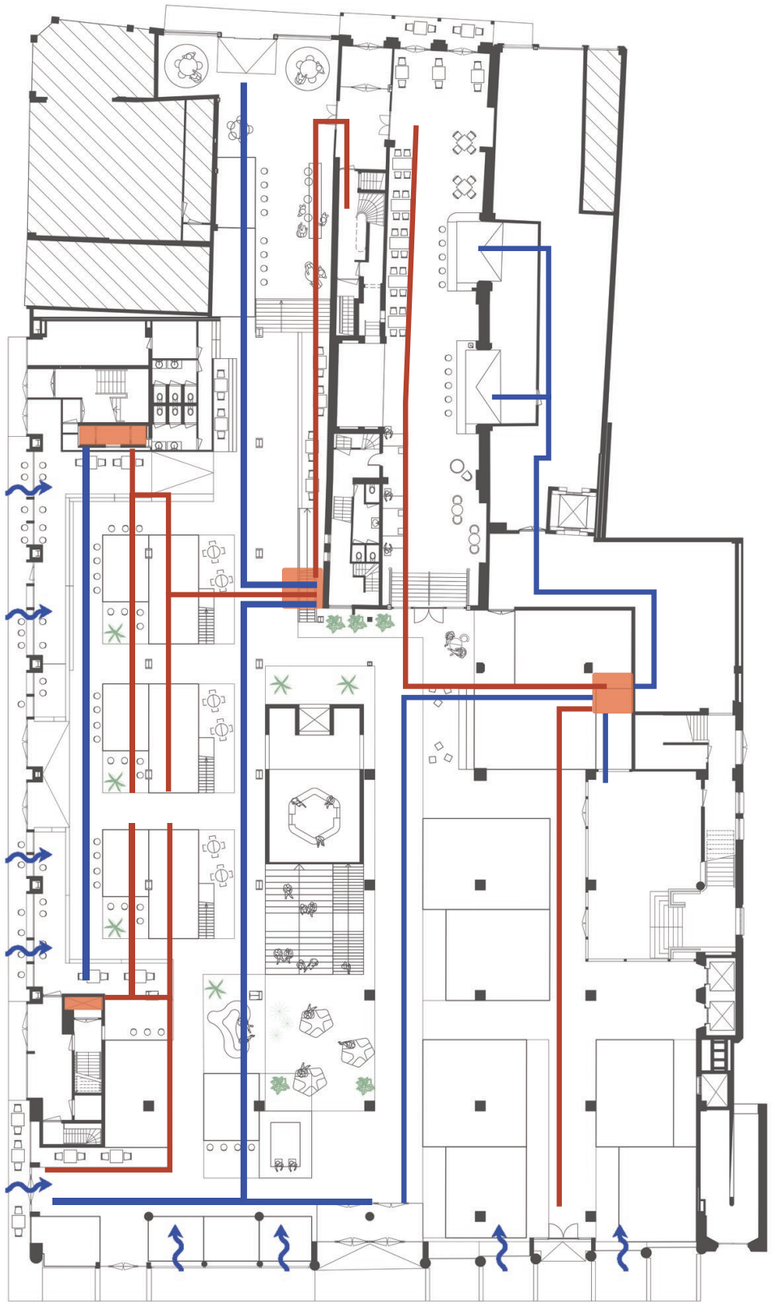
Quiet zone

Schaal 1:400

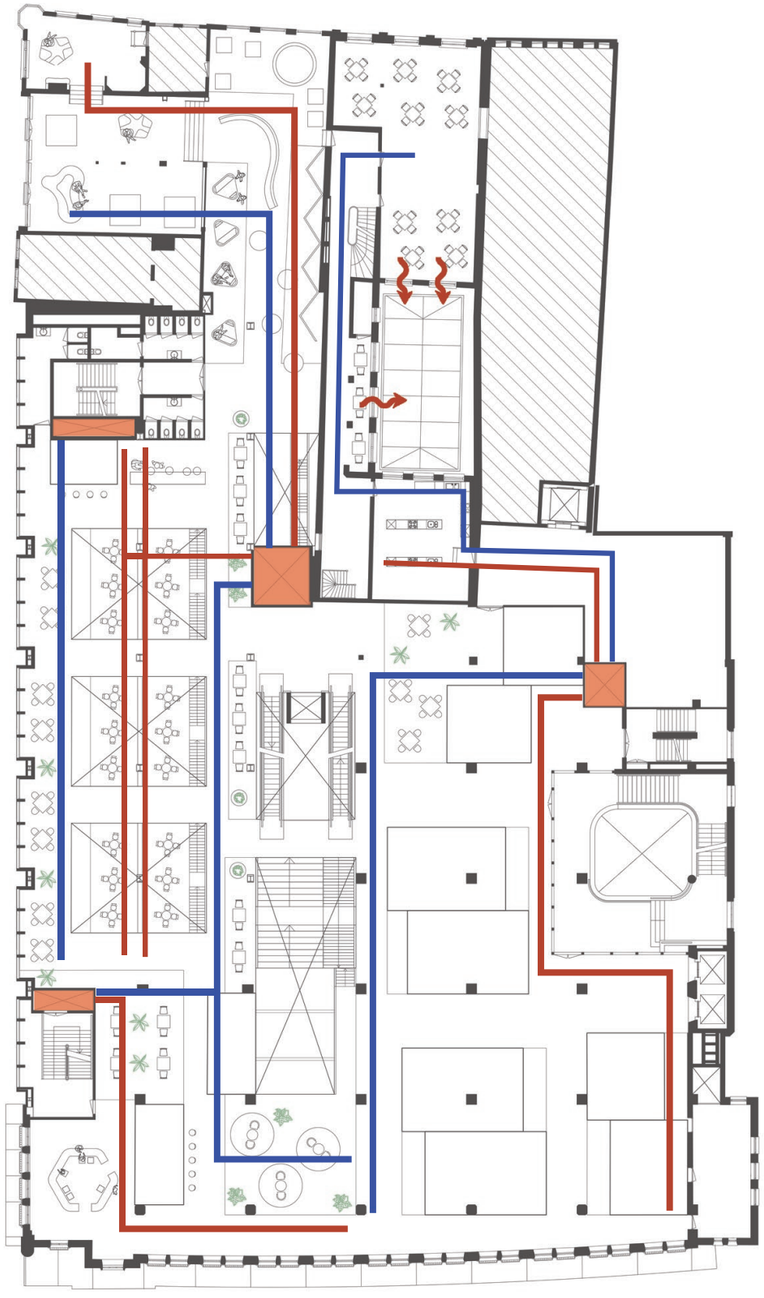
0 4 8 12 14 20m

Ventilation

V0 & V1 - Canals



Floorplan
V0



Floorplan
V1

Additional natural ventilation

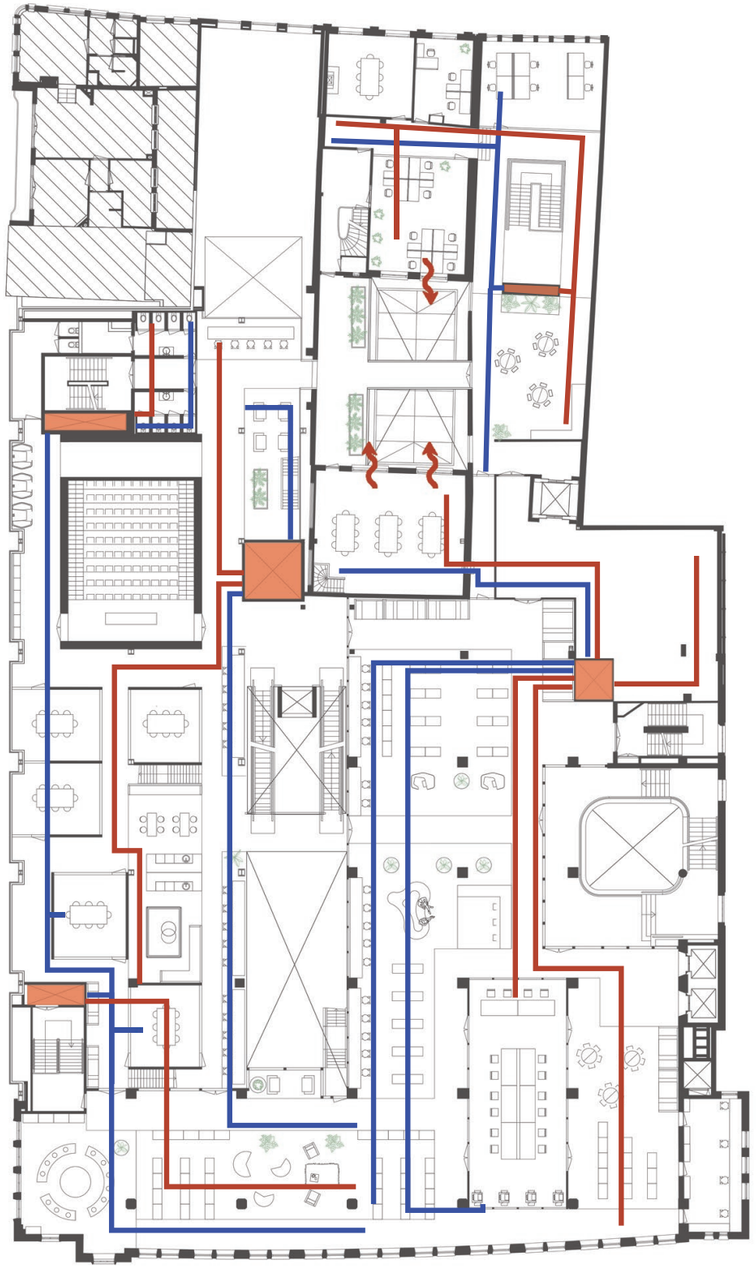
Vertical installation shaft

Ventilation tube fresh air

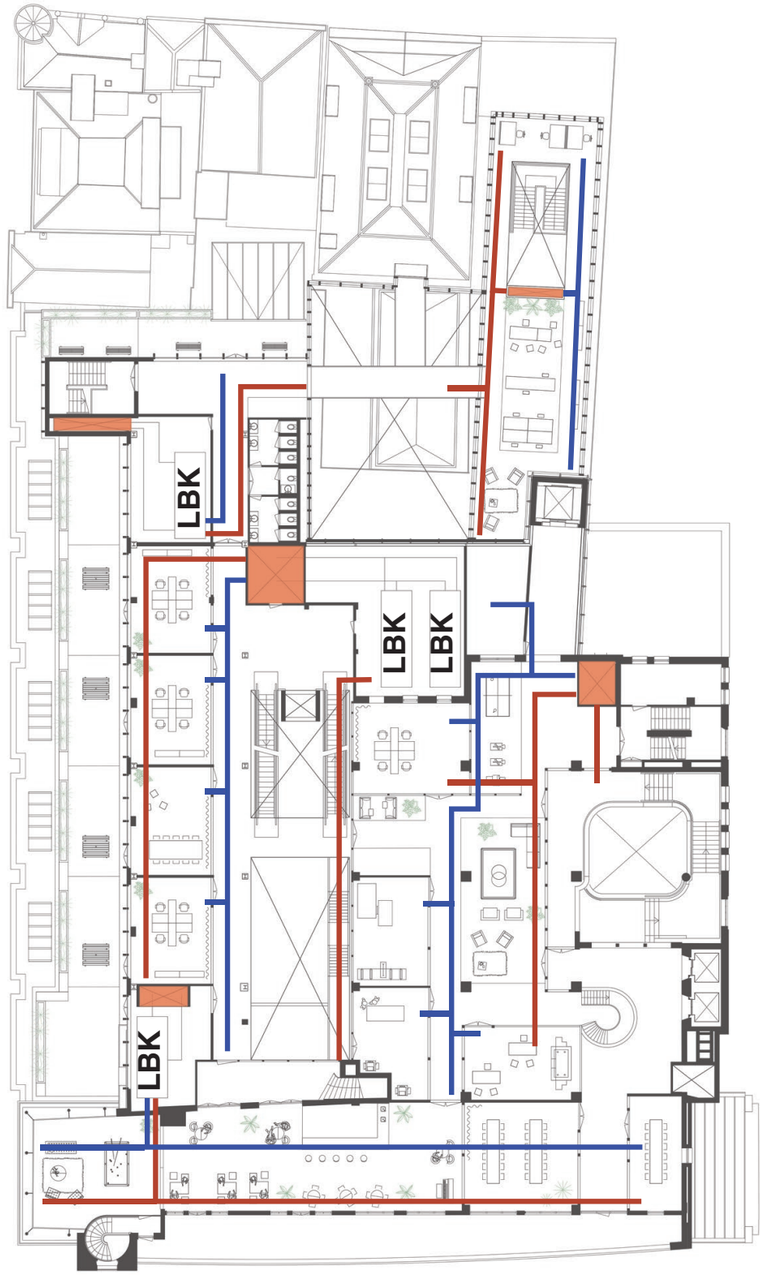
Ventilation tube old air

Ventilation

V2 & V4 - Canals



Floorplan
V2



Floorplan
V4

Additional natural ventilation

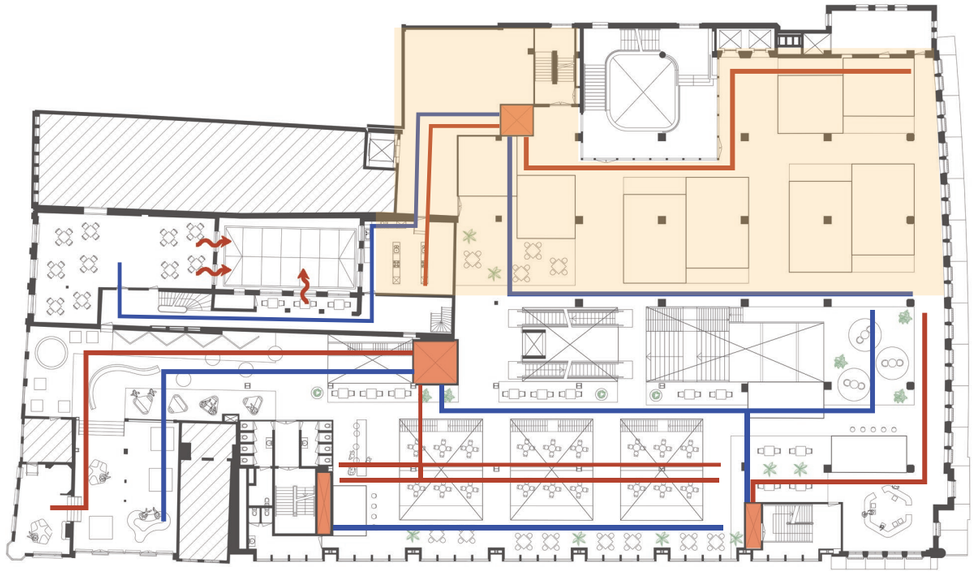
Vertical installation shaft

Ventilation tube fresh air

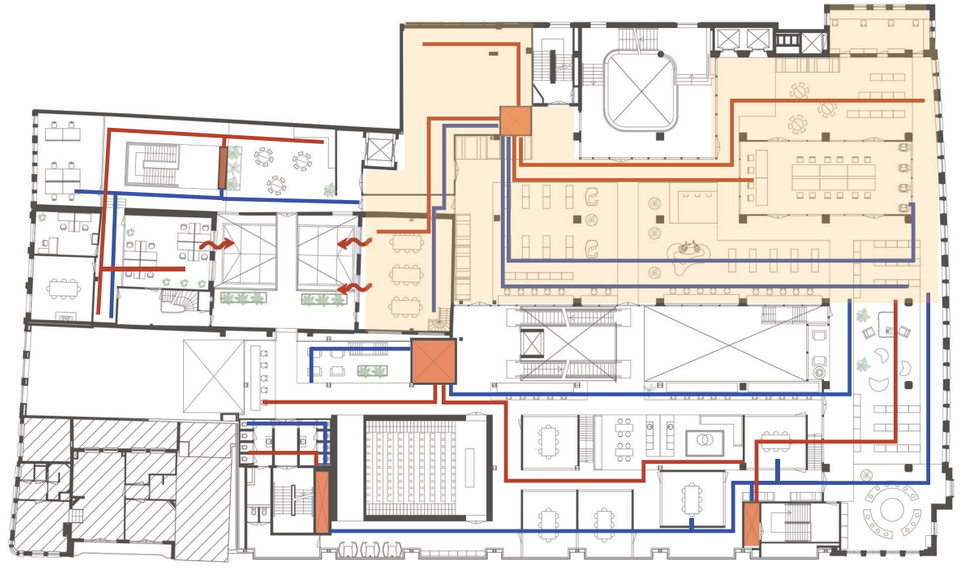
Ventilation tube old air

Ventilation

Calculation ventilation needs Aalmarkt



Floorplan
V1

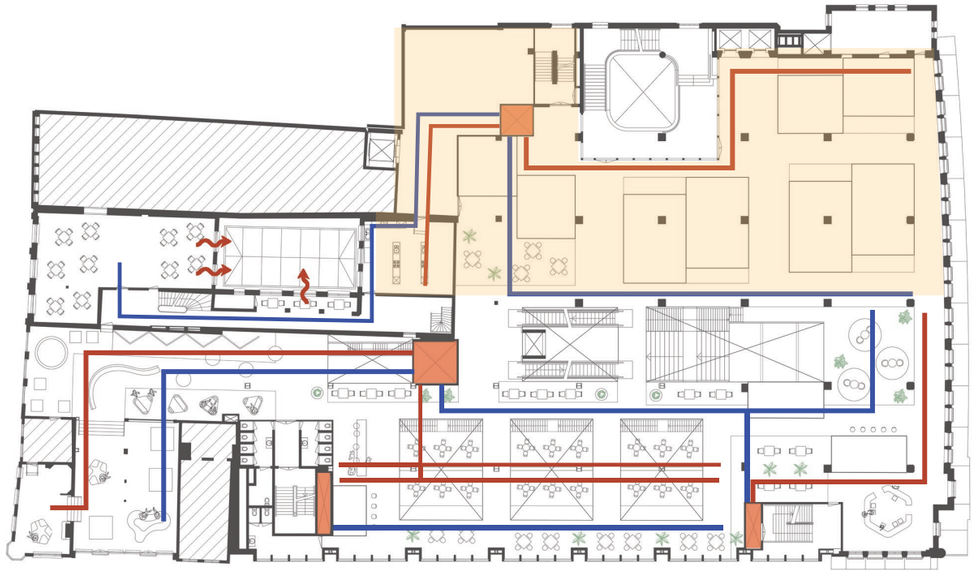


Floorplan
V3

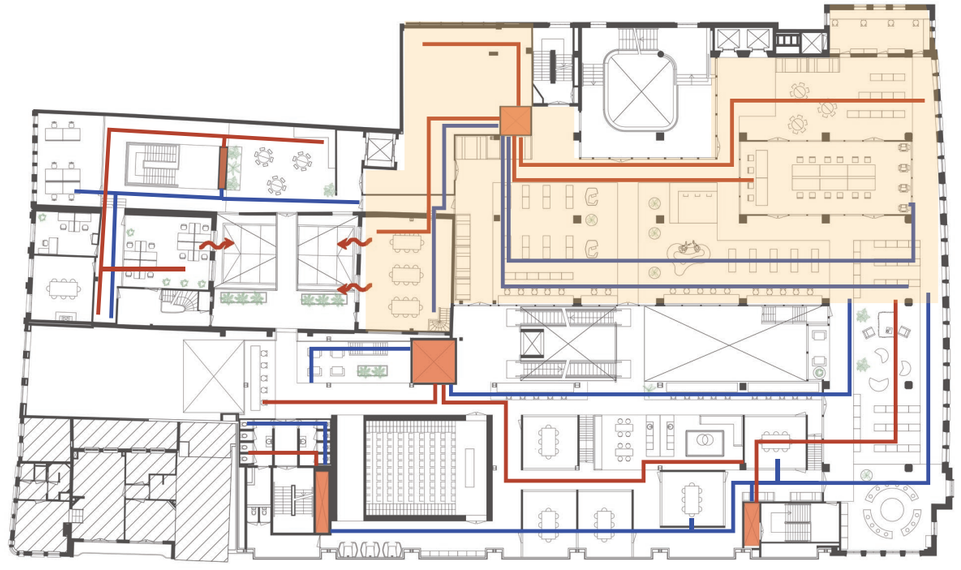
Ruimte (Verdieping)	Afmetingen	Oppervlakte (m2)	Hoogte (m)	Volume (m3)	Ventilatievoud (/h)	Benodigde ventilatie (m3/h)	Oppervlakte ventilatiekanaal (m2)	Afmeting kanaal (cm)
V0 - Retail	650 m2	650	5.5	3575	6	21450	1.19	109
V1 - Retail	650 m2	650	3.5	2625	6	13650	0.76	87
V2 - Library deel I	525 m2	525	3.5	1838	4	7352	0.41	64
V2 - Library deel II	205 m2	205	3.5	718	4	2872	0.16	40
V2 - Library deel III	205 m2	205	3.5	718	4	2872	0.16	40
V3 - Studyspace deel I	525 m2	525	3.5	1838	4	7352	0.4	63
V3 - Studyspace deel II	205 m2	205	3.5	718	4	2872	0.16	40
V3 - Studyspace deel III	205 m2	205	3.5	718	4	2872	0.16	40

Ventilation

Calculation new shaft Aalmarkt



Floorplan
V1



Floorplan
V3

Berekening nieuwe schacht Aalmarkt	Oppervlakte (m2)	Hoogte (m)	Volume (m3)	Ventilatievoud (/h)	Benodigde ventilatie (m3/h)	
V0 - Retail	650	5.5	3375	6	21450	
V1 - Retail	650	3.5	2275	6	13650	
V2 - Library	730	3.5	2555	4	10220	
V3 - Study places	730	3.5	2555	4	10220	
V4 - Offices	385	3.5	1350	4	5400	
Totaal					60940	m3/h

60940 m3/h = 16.92 m3/s

Luchtsnelheid in schacht = 10 m/s

(16,92 m3/s)/(10 m/s) = 1,692 m2 oppervlakte

16920 cm2 oppervlakte

Afmetingen van toevoerkanaal = wortel (16920) = 130 cm

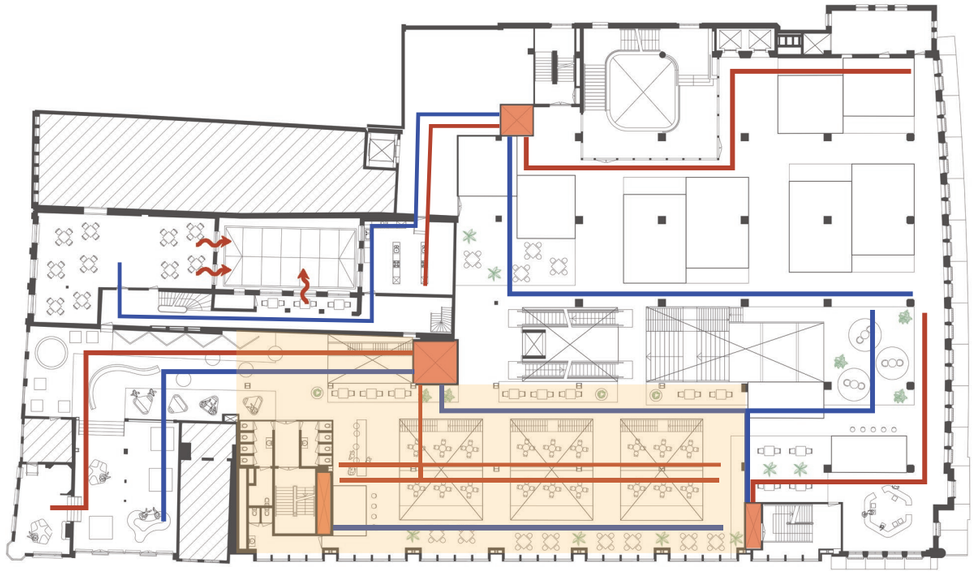
Twee kanalen naast elkaar = 260 cm

Conclusie - Minimale breedte van nieuwe schacht = 270 cm

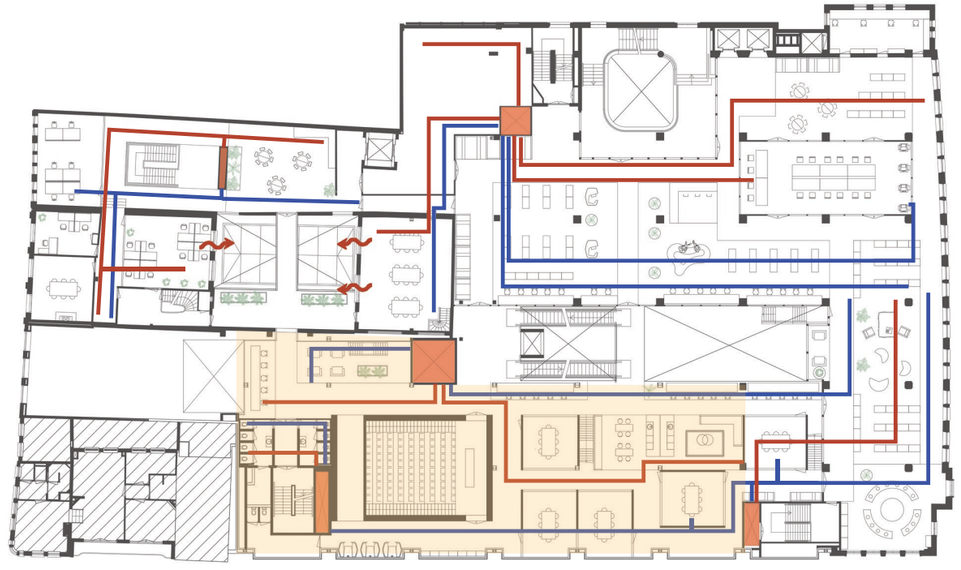
Conclusie - 2 LBK's nodig van 30.000 m3/h

Ventilation

Calculation ventilation needs Maarsmansteeg



Floorplan
V1

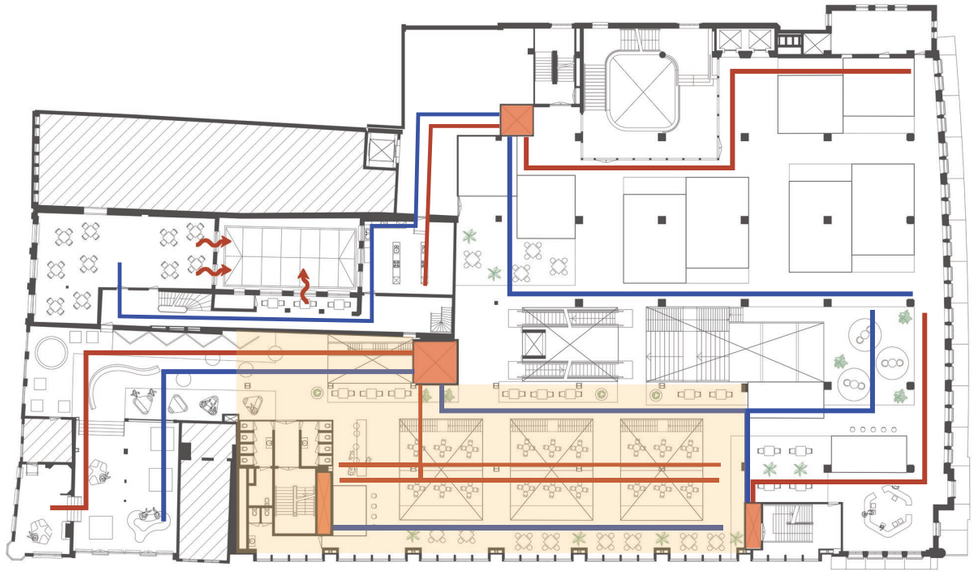


Floorplan
V3

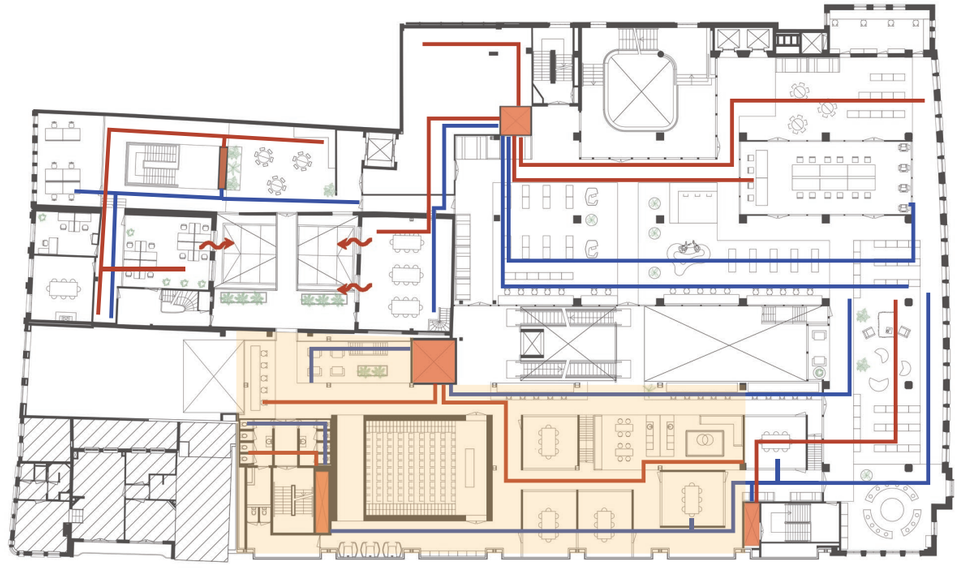
Ruimte (Verdieping)	Afmetingen	Oppervlakte (m2)	Hoogte (m)	Volume (m3)	Ventilatievoud (/h)	Benodigde ventilatie (m3/h)	Afmeting kanaal (cm)
V0 - Foodcourt	14 x 36 m	504	5.5	2772	5	13850	87.8
V1 - Foodcourt	14 x 36 m	504	3.6	1815	5	9075	71
V2 - Vergaderruimten 4x	5 x 6 m	120	3	360	5	1800	31
V2 & V3 - Collegezaal	13 x 8 m	104	6	624	8	4992	52
V2 - Lounge & verkeersruimte	504 - 224 = 280 m2	280	3.5	980	3	2940	40
V3 - Vergaderruimten 3x	5 x 6 m	90	3	90	5	450	16
V3 - Instructielokaal 1x	9 x 7 m	63	3	189	5	945	24.9
V3 - Lounge & verkeersruimte	504 - 326 = 188 m2	188	3.5	658	3	1974	33.1
V4 - Kantoorruimten 5x	7 x 5 m	175	3.5	123	4	492	16.7
V4 - Lounge & verkeersruimte	gang = 2 x 36 = 72 m	72	3.5	252	2	504	16.8
Totaal						37022	m3/h

Ventilation

Calculation shaft Maarsmansteeg



Floorplan
V1

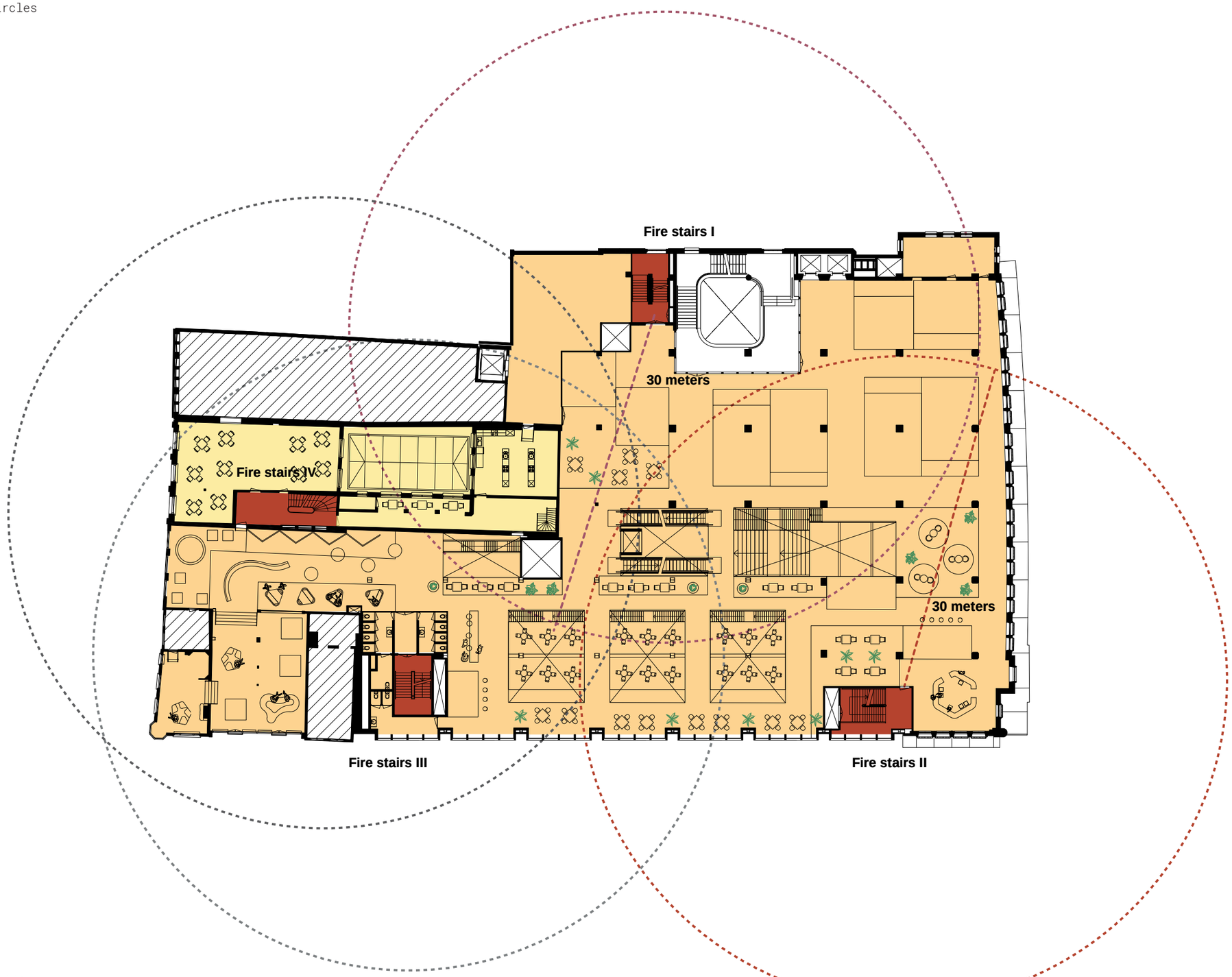


Floorplan
V3

Berekening schacht Maarsmansteeg	Oppervlakte (m2)	Hoogte (m)	Volume (m3)	Ventilatievoud (/h)	Benodigde ventilatie (m3/h)	Afmeting kanaal (cm)
V0 - Foodcourt (helft)	252	5.5	1386	7	9702	
V1 - Foodcourt (helft)	252	3.5	882	7	6174	
V2 - Vergaderruimten (totaal)	120	3	360	5	1800	
V2 - Lounge & verkeersruimte	280	3.5	980	3	2940	
V3 - Workshopruimten (totaal)	153	3	459	4	1836	
V3 - Lounge & verkeersruimte	188	3.5	658	3	1974	
V4 - Offices (totaal)	385	3.5	1350	4	5400	
V4 - Lounge & verkeersruimte	72	3.5	252	2	504	
Totaal					29826	m3/h
29826 m3/h = 8.28 m3/s						
Luchtsnelheid in schacht = 10 m/s						
(8.28 m3/s)/(10 m/s) = 0.828 m2 oppervlakte						
8280 cm2 oppervlakte						
Afmetingen van toevoerkanaal = wortel (8280) = 90 cm						
Afvoer- en toevoer naast elkaar = 180 cm						
Conclusie - Huidige schacht voldoet ruim = 360 cm						
Conclusie - Atrium & Breestraat 86 ook aansluiten op deze schacht						
Conclusie - 1 LBK nodig van 30.000 m3/h						

Fire safety

V1 - Compartments & fleeing circles

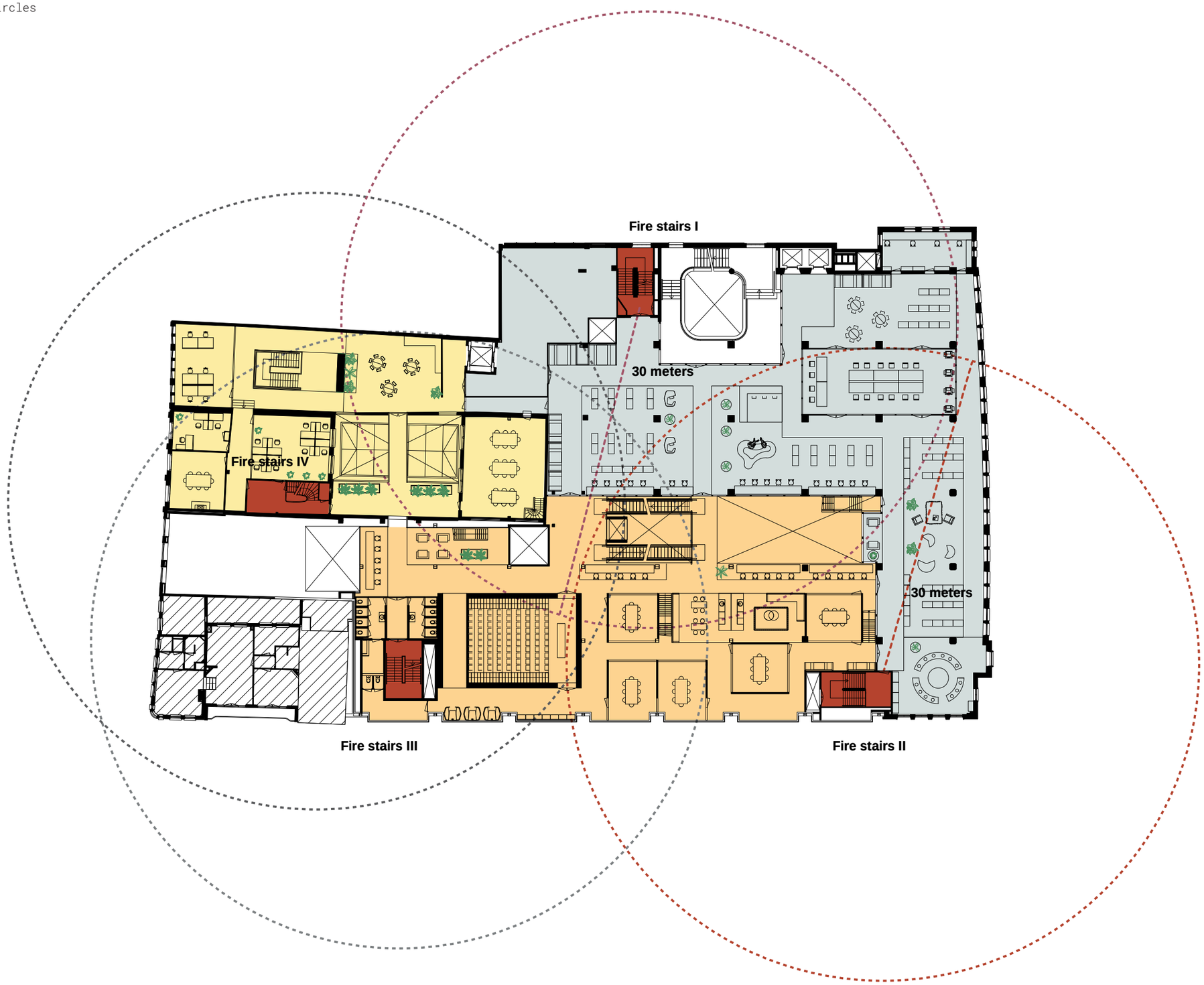


Conclusions fire safety V0 & V1:

Division into three compartments with their own escape routes. No intersection between those routes.
Re-use of sprinkler system on these floors because of the size of fire compartments
Sufficient amount of fire stairs

Fire safety

V2 - Compartments & fleeing circles

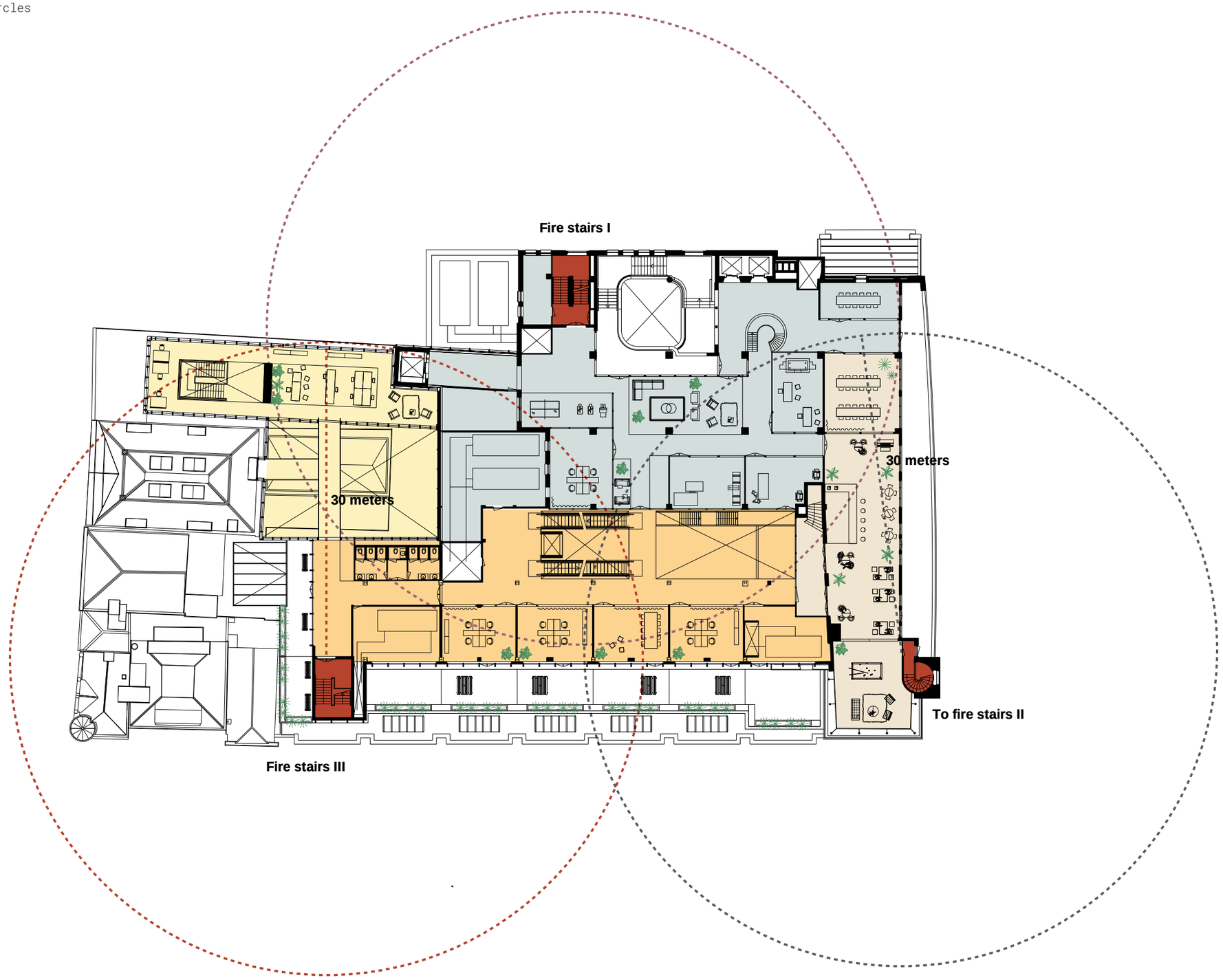


Fire safety V2 & V3

Same principle

Fire safety

V4 - Compartments & fleeing circles



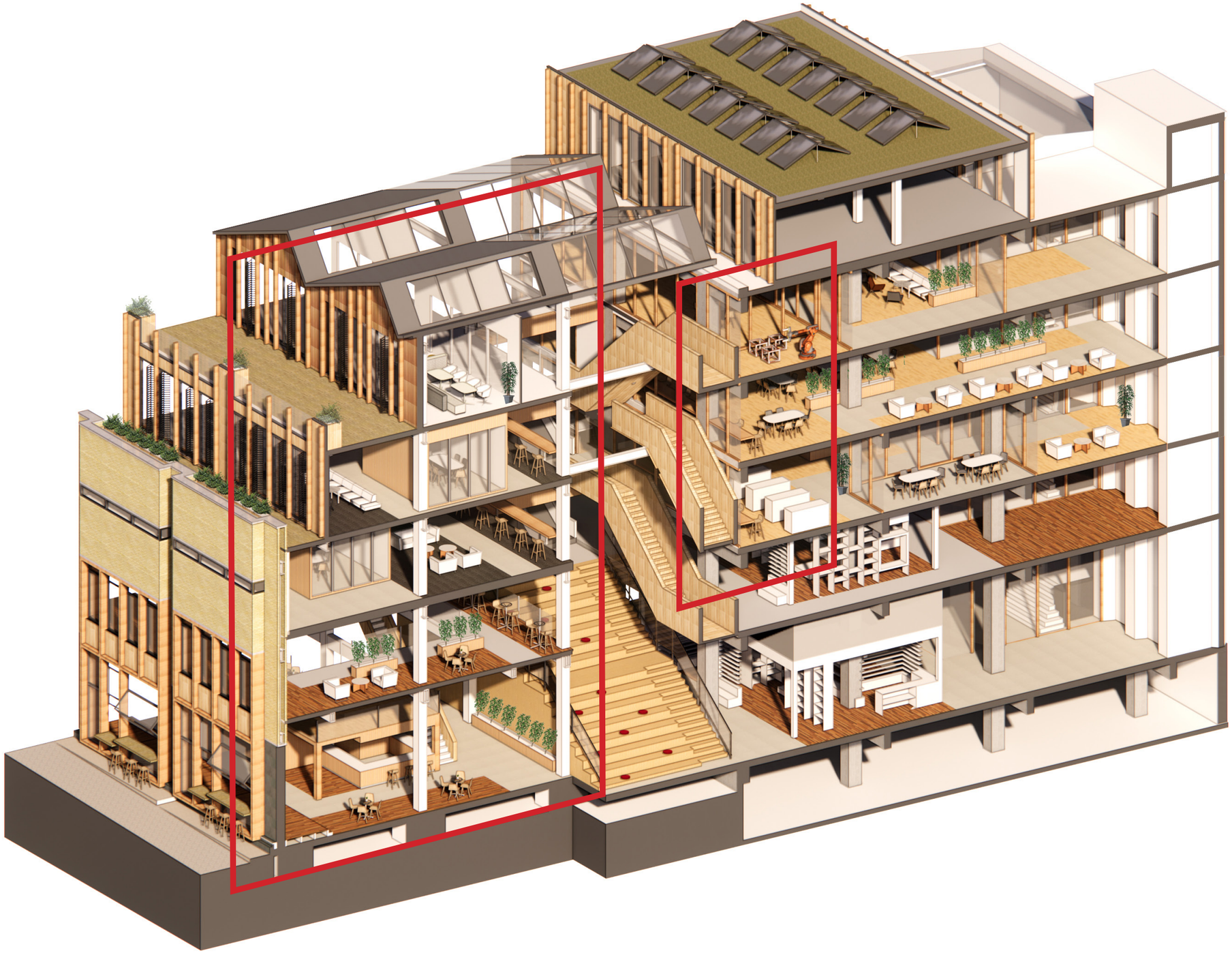
Fire safety V4 & V5

Same principle

PART IV Details

Details

Proposed positions of details



Relation with architecture

Architecture of different compartments

Maarsmansteeg facade

- Connection between old and new
- Wooden addition on top of existing
- Reference to former houses on the site

Maarsmansteeg compartment

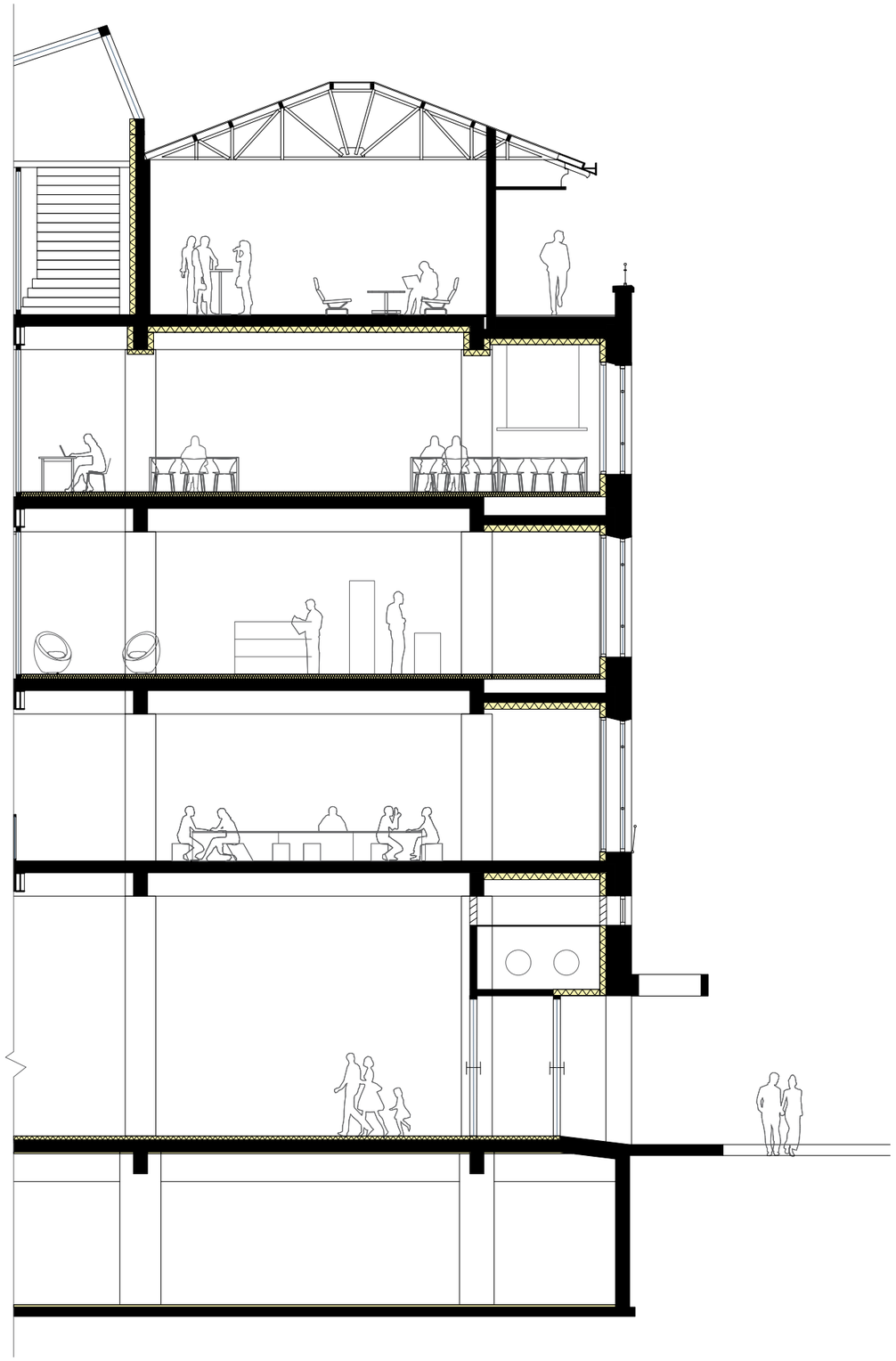
- Playfulness
- Main color on each floor
- Neutral colors/materials for construction
- Accoya wood cladding as connecting element
- Visible installations on ceiling

Aalmarkt compartment

- Concrete structure attracts attention
- Wooden stairs and window frames dominate the architecture
- Accoya wood cladding as connecting element
- V0 & V1 - Colors are determined by shop-in-shops
- Installations are visible on ceiling

Detail I Aalmarkt

Aalmarkt compartment 1:100



Proposed situation Aalmarkt

Detail II Aalmarkt

Detail Vispoort atrium Aalmarkt 1:50

100 mm transparant partition wall
with oak wood window frames

10 mm Petac wooden acoustic panels
20 mm Wooden slats construction
100 mm Glulam wood railing

Existing constructional beam

Solid wooden stair construction
1500 x 150 mm, span = 7.2 m

V0 & V1 sprinkler system

Floor package - Fermacell

10 mm Herso laminate floor
20 mm Fermacell floor element with floor heating tubes
10 mm felt for insulation
10 mm woodfiber
20 mm eligalizing granules
50 mm concrete pressure layer
200 mm concrete floor construction

Petac acoustic baffles system

Philips LED Lighting (light as service)

Floor package - Fermacell floor heating

10 mm Herso laminate floor
20 mm Fermacell floor element with floor heating tubes
10 mm felt for insulation
10 mm woodfiber
20 mm eligalizing granules
50 mm concrete pressure layer
200 mm concrete floor construction

Floor package - Zwevende dekvloer

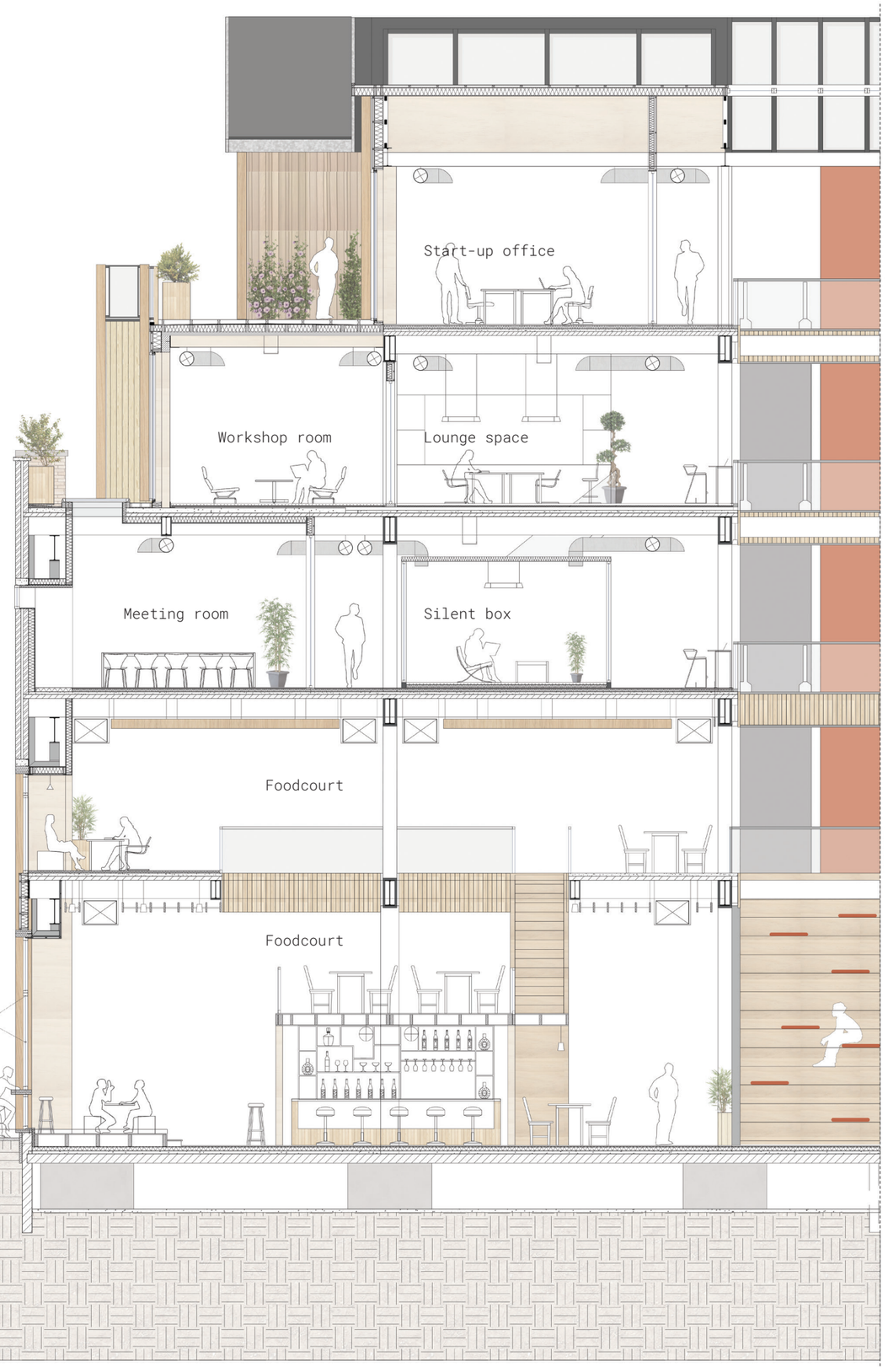
10 mm Herso laminate floor
45 mm XPS insulation
10 mm woodfiber
50 mm concrete pressure layer
200 mm concrete floor construction

Floor package - Zwevende dekvloer

10 mm Herso laminate floor
85 mm XPS insulation
10 mm woodfiber
50 mm concrete pressure layer
200 mm concrete floor construction

Facade fragment

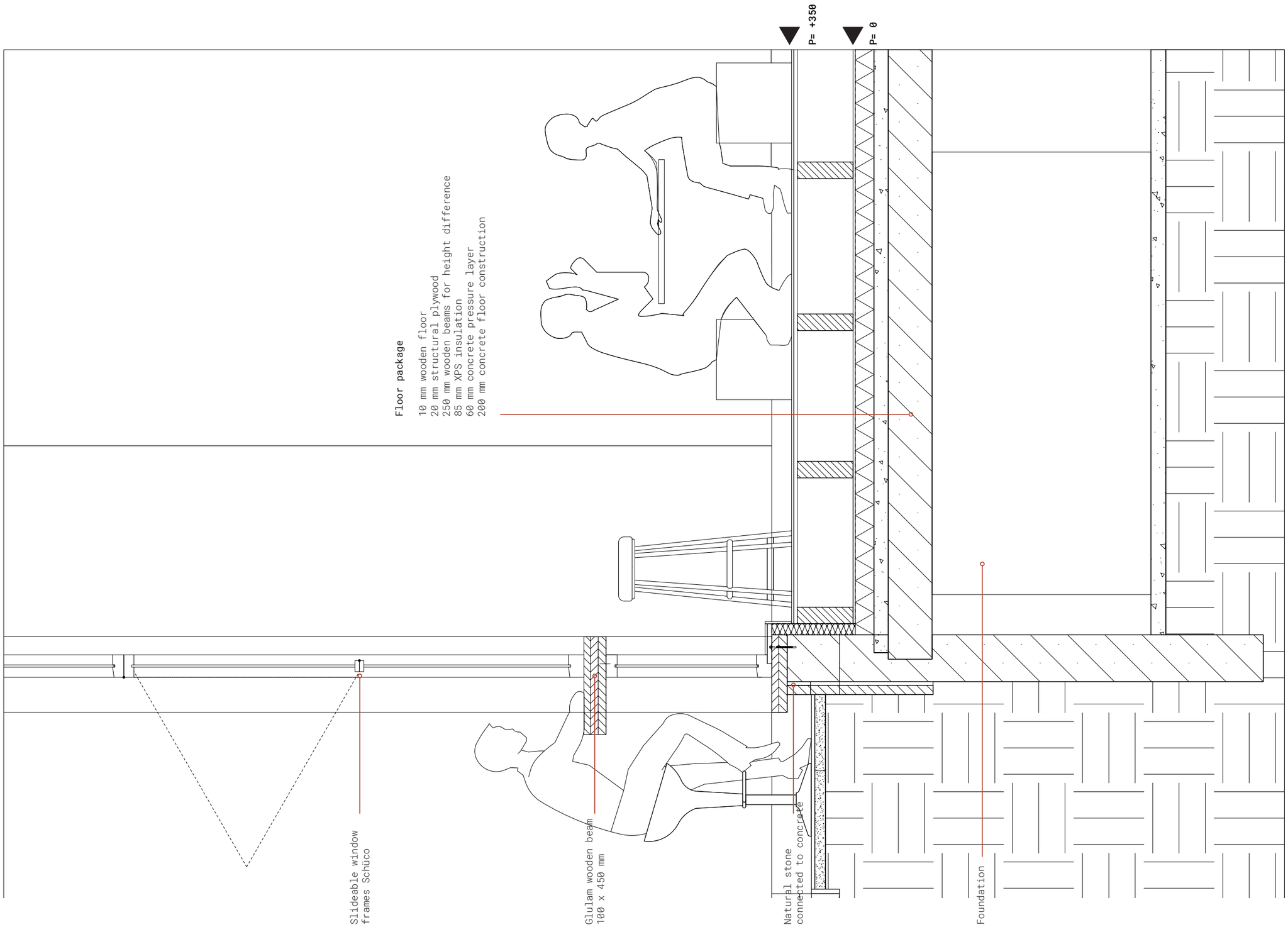
Maarsmansteeg



0 1 2 3 4 5m

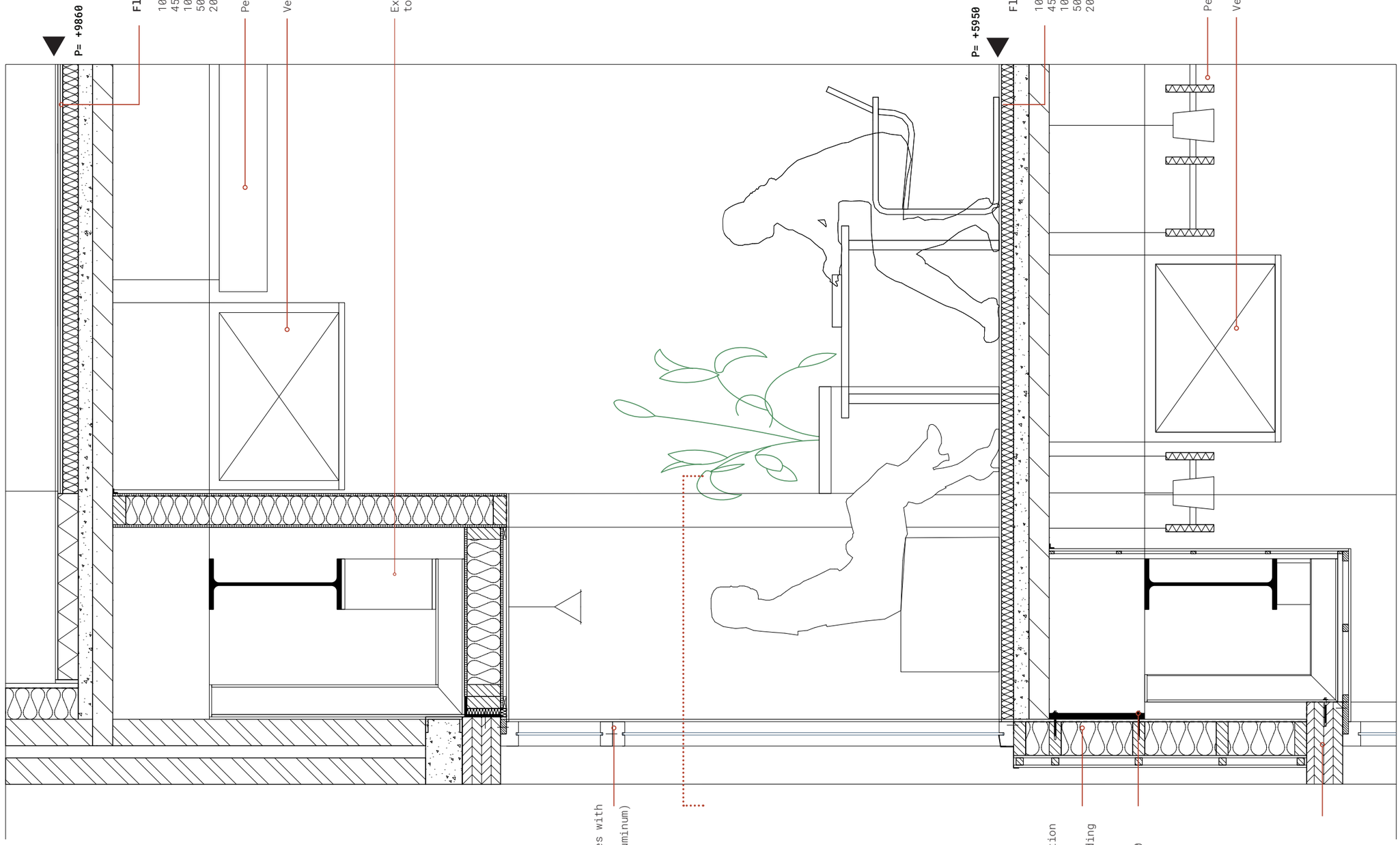
Detail I - Maarsmansteeg

Vertical detail V0 - 1:20



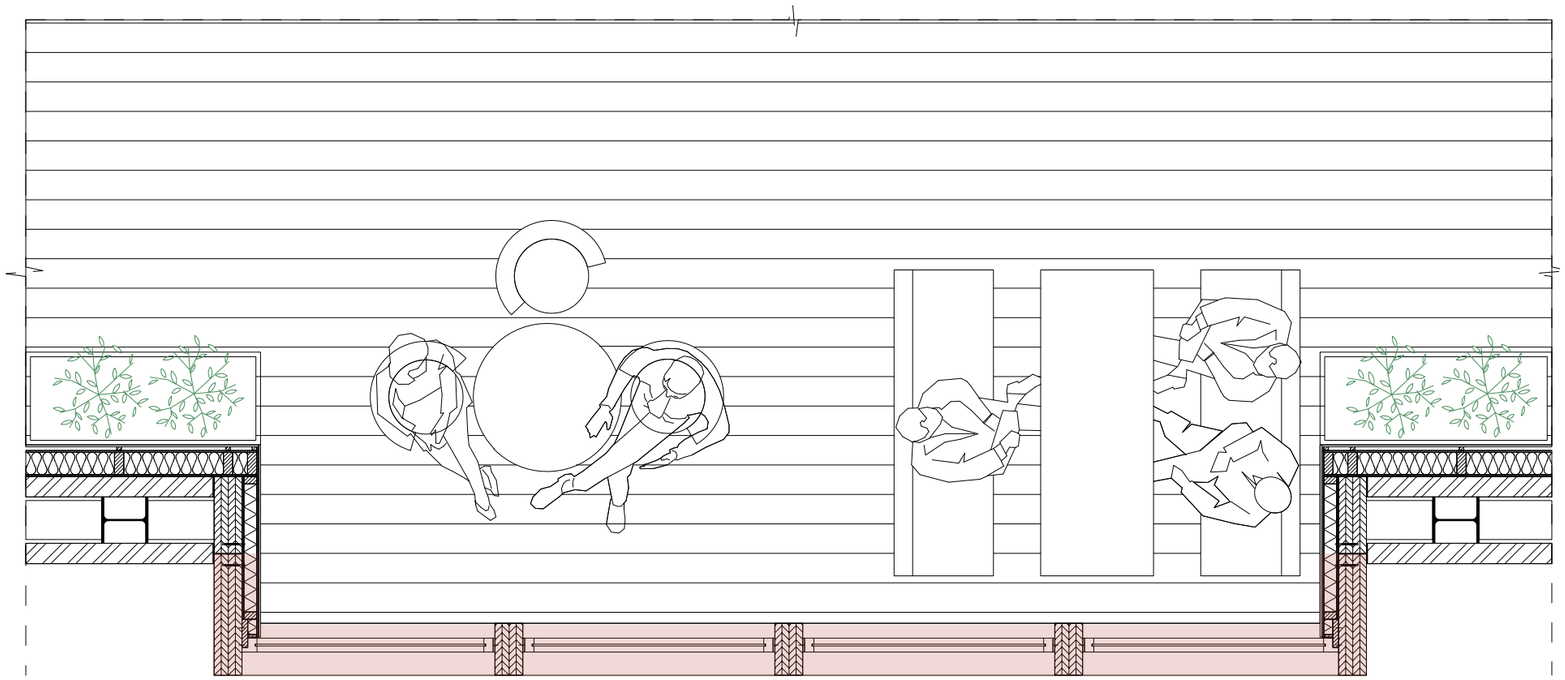
Detail II - Maarsmansteeg

Vertical detail V1- 1:20



Detail III - Maarsmansteeg

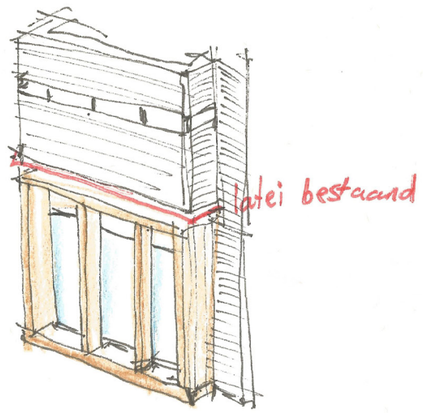
Horizontal detail V1- 1:20



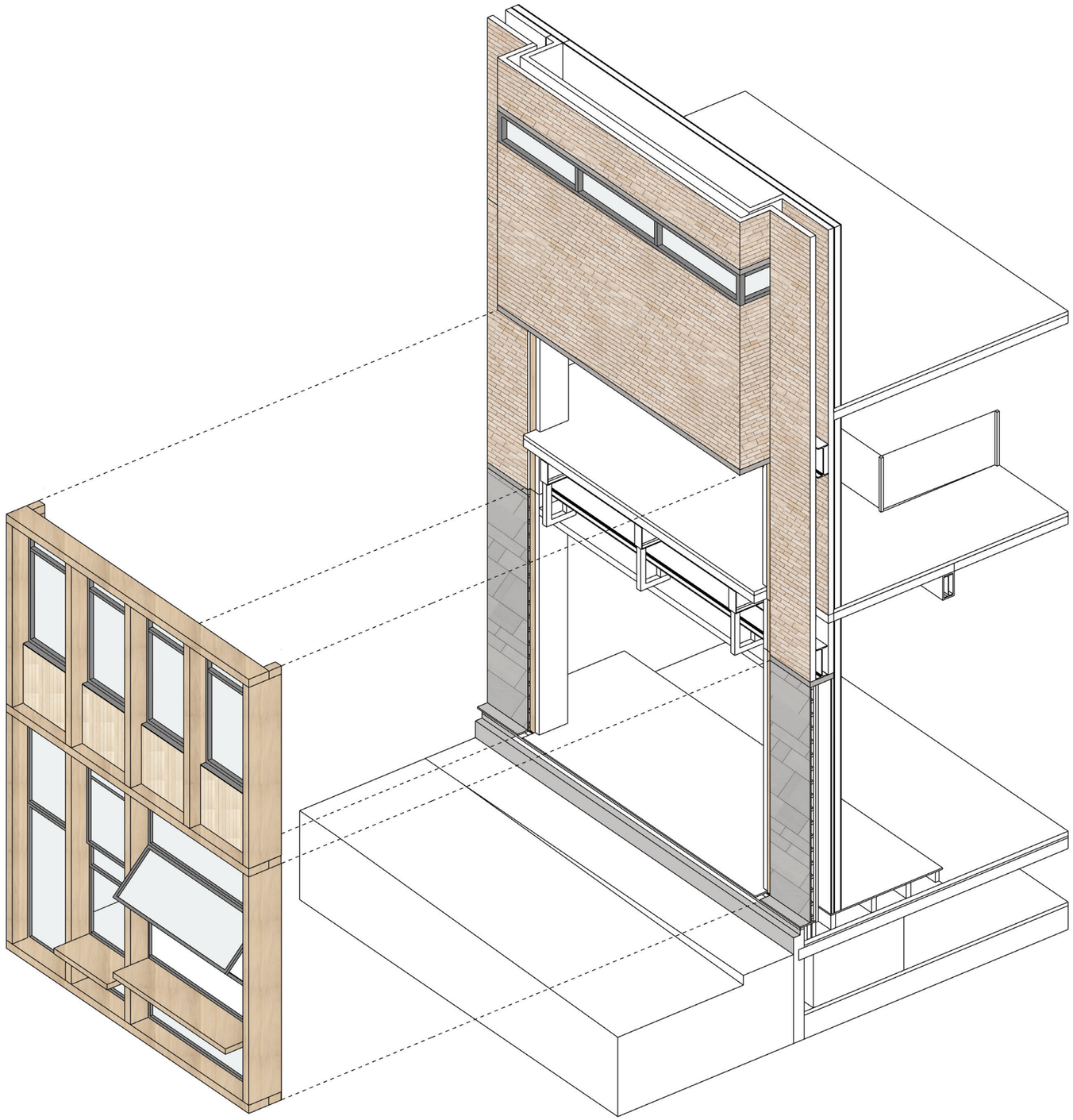
0 0.3 0.6 0.9 1.2 1.5m

Maarsmansteeg facade

Building method

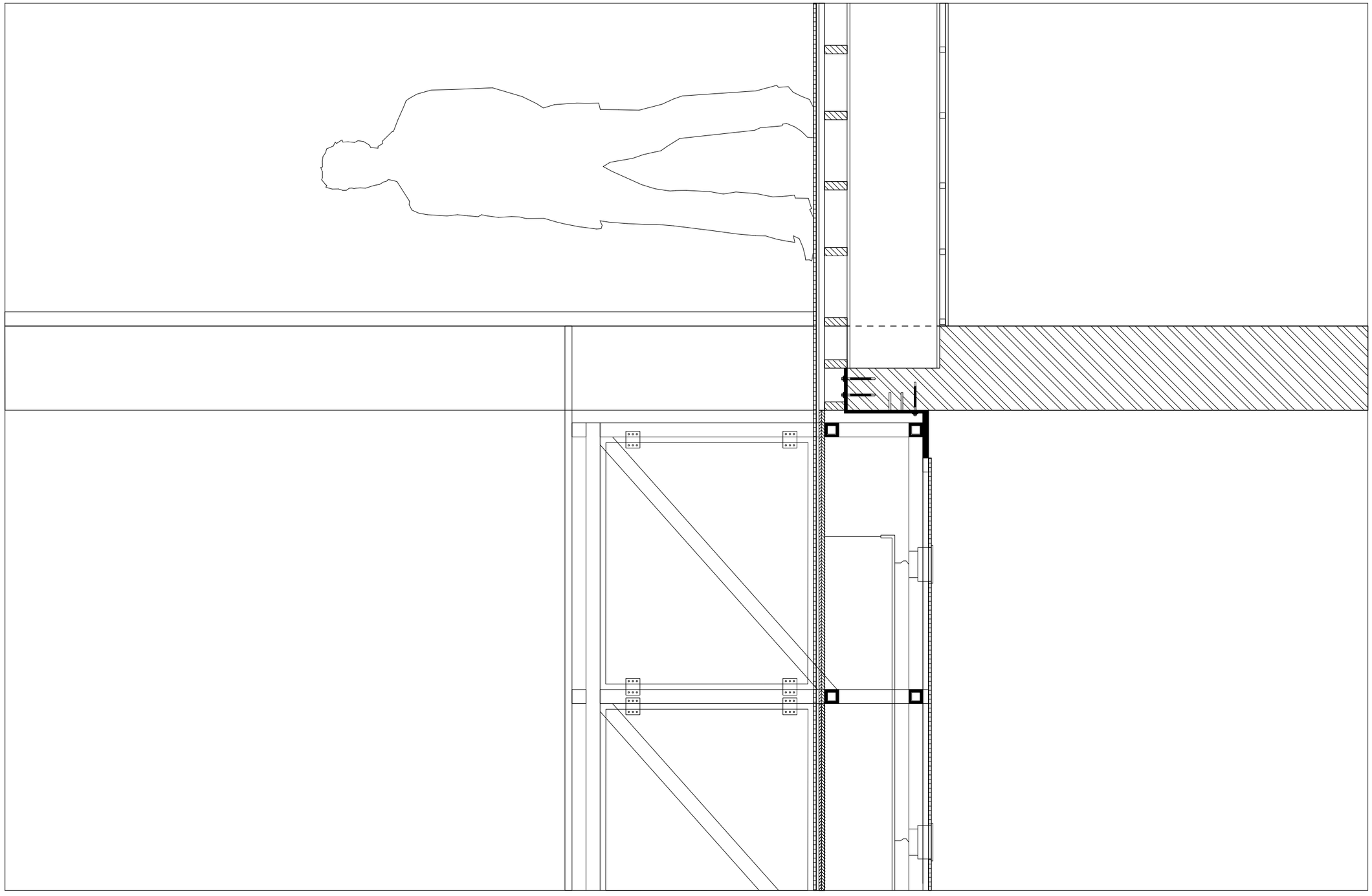


principal sketch of intervention



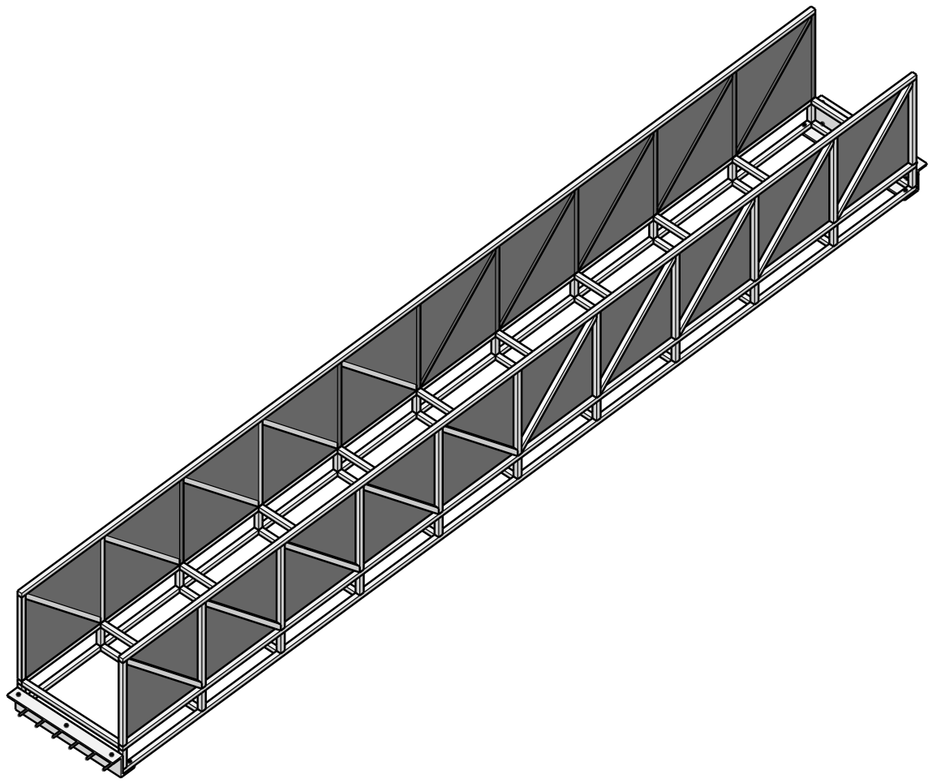
Detail IV - Breestraat atrium

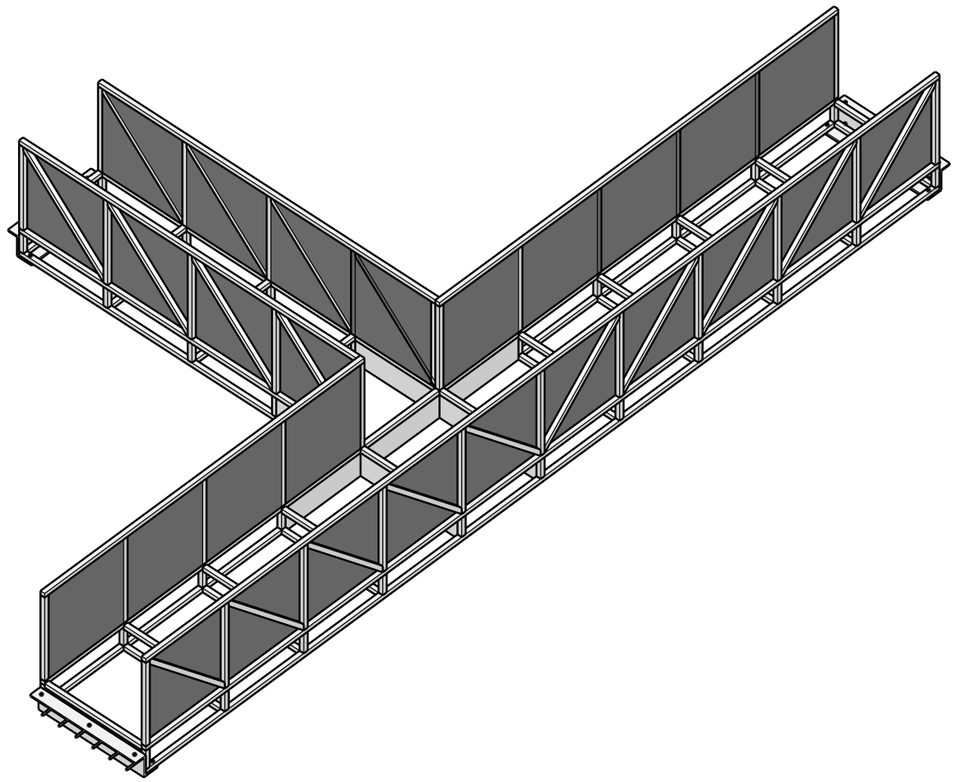
Connection of skybridges - 1:20



Breestraat atrium

Skybridge construction

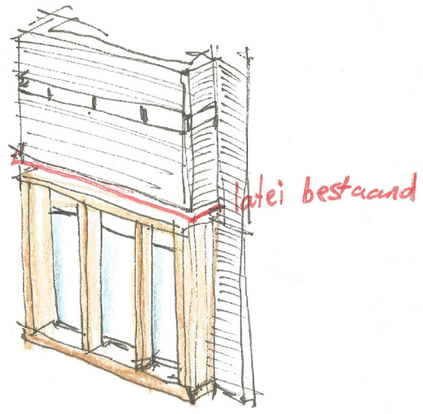




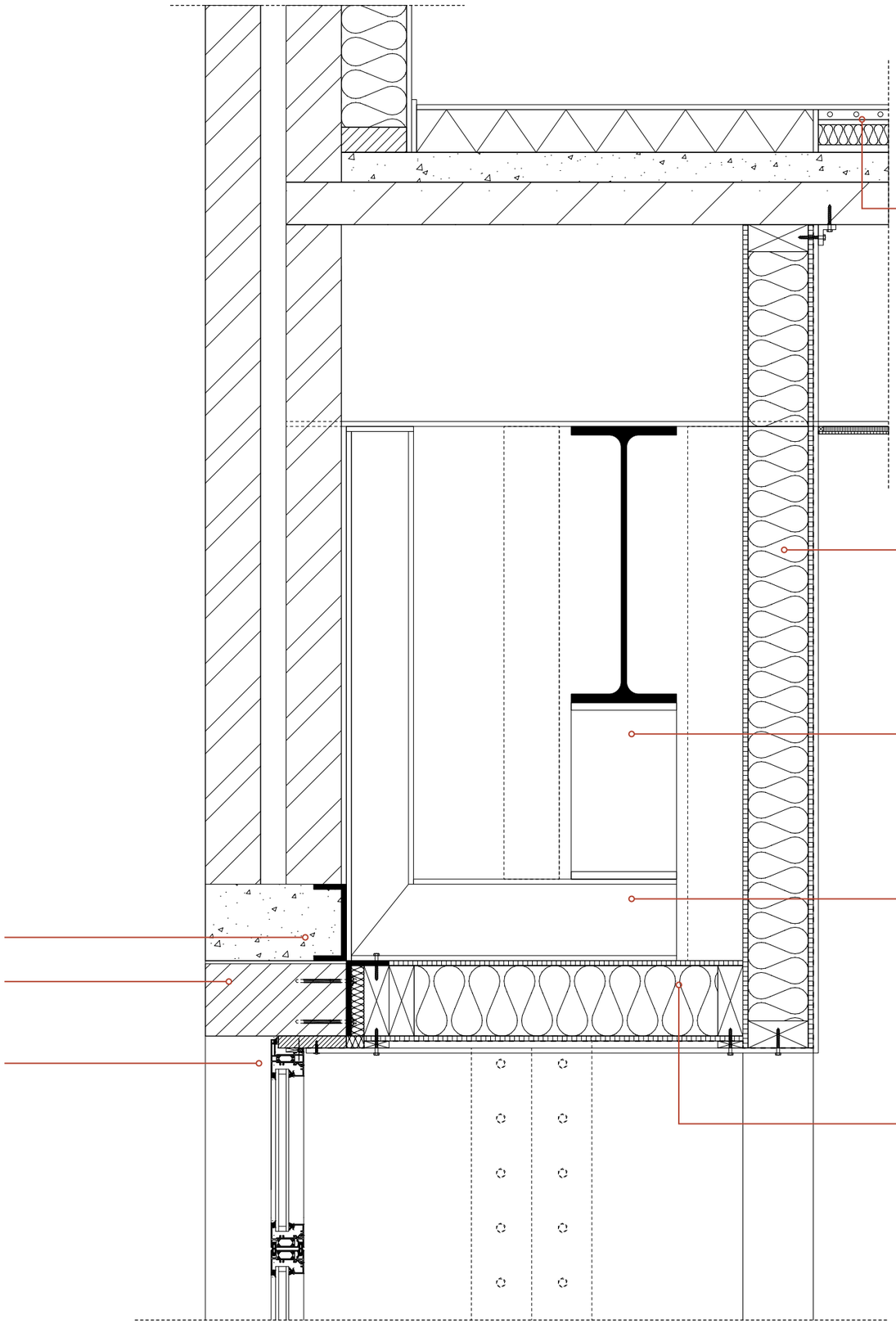
Skybridge construction

Detail I - Maarsmansteeg

Vertical connection - 1:10



principal sketch of intervention



10 mm Herso laminate floor
20 mm Fermacell floor element with floor heating tubes
10 mm woodfiber
65 mm insulation for floorheating & acoustics
60 mm concrete pressure layer
85 mm prefab concrete

10 mm plywood
120 mm woodfiber insulation with wooden slats
damp-proof layer (λ = 0.038 W/mK)
10 mm plywood
10 mm painted gipsum board

INP profile connected to IPE550

HEA120 steel construction

10 mm plywood
120 mm woodfiber insulation with wooden slats
(λ = 0.038 W/mK)
10 mm plywood
10 mm wooden slats
10 mm wooden cladding

in-situ latei, connected with UNP200

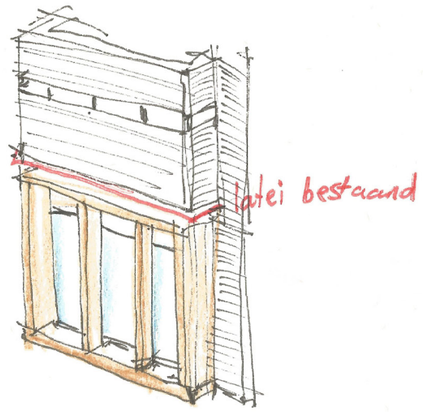
oak wooden beam 150 x 280 mm

Schüco AWS65 window frames with HR++ glass
U=1,6 W/m²K (recycled aluminum)

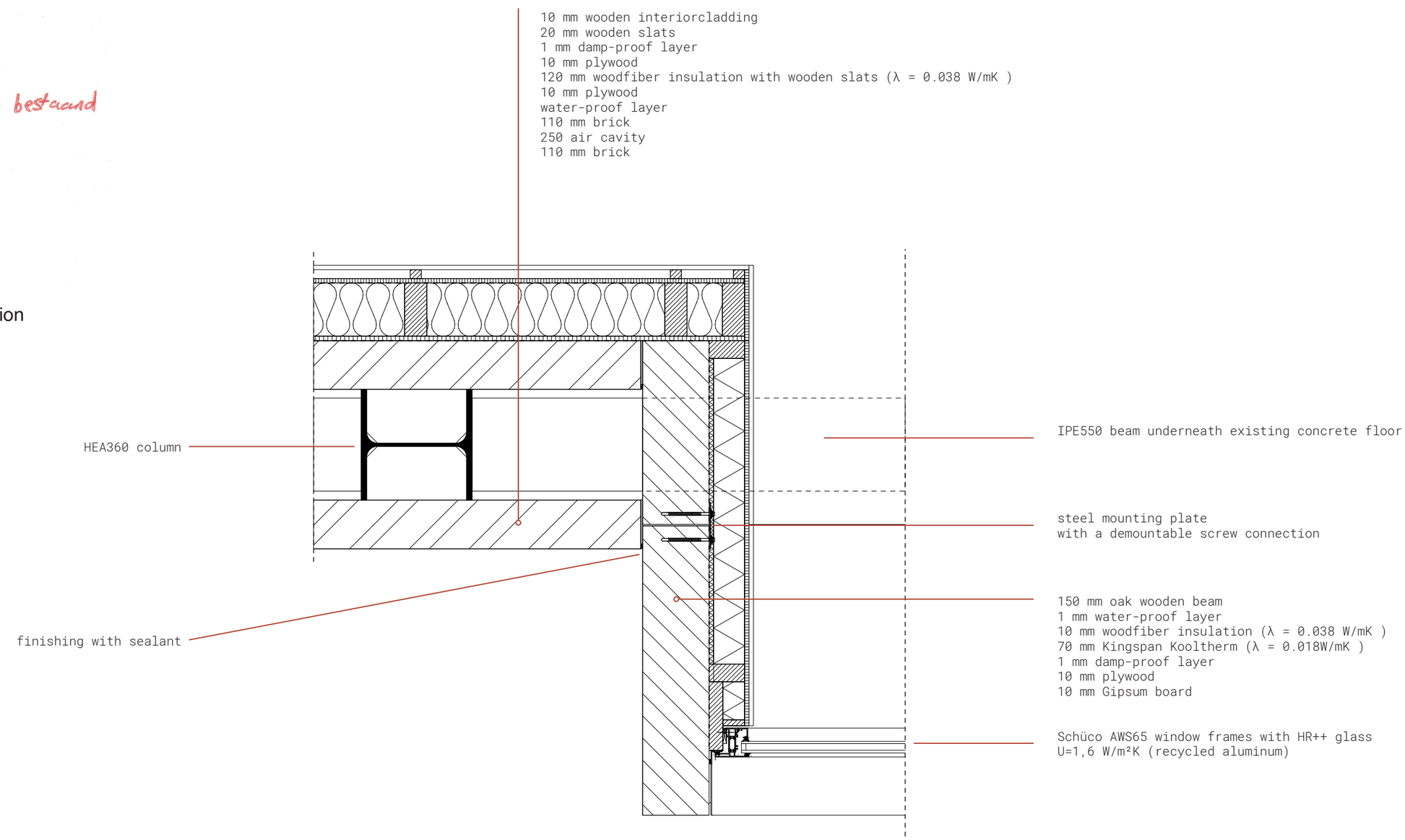
0 0.1 0.2 0.3 0.4 0.5m

Detail II - Maarsmansteeg

Horizontal connection - 1:10

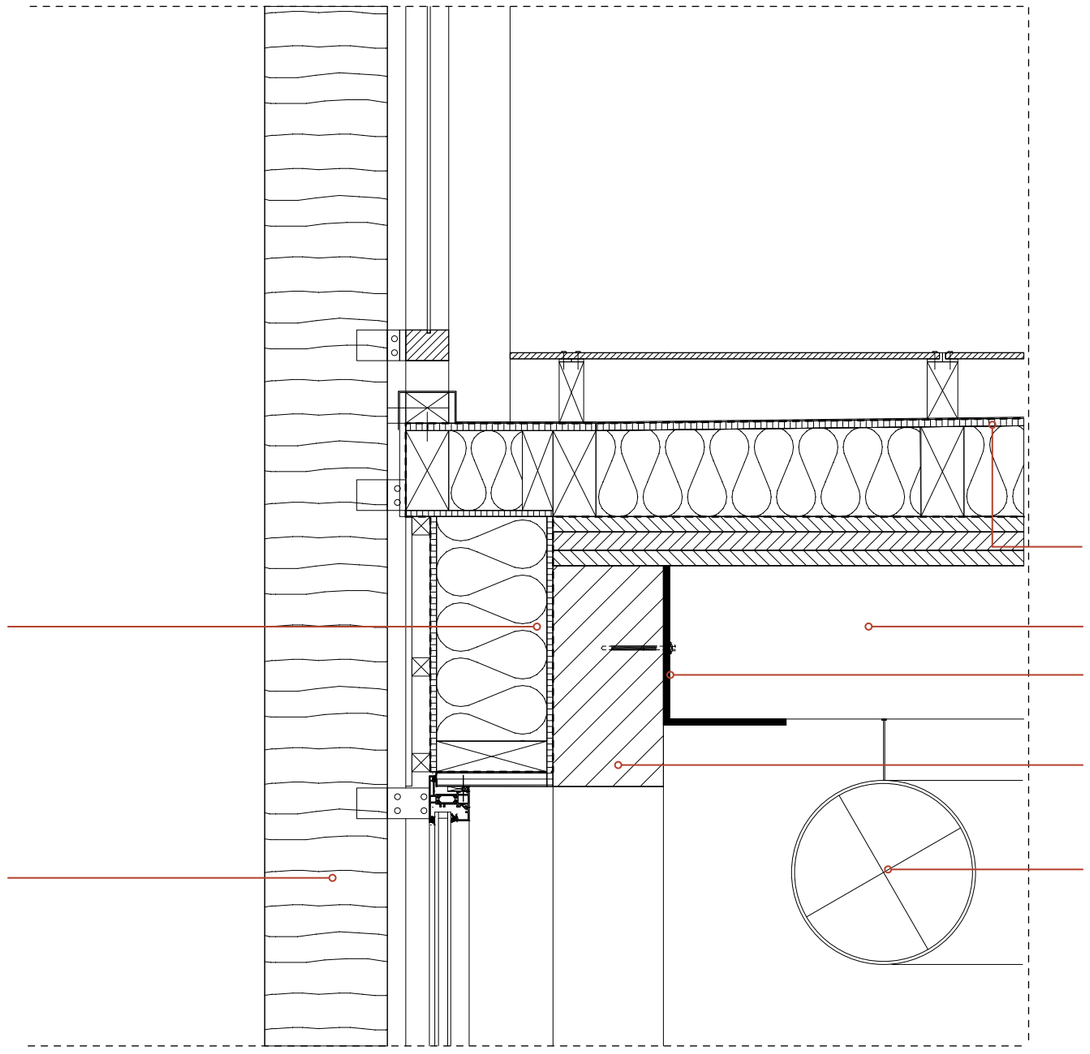


principal sketch of intervention



Detail III - Maarsmansteeg

CLT roof connection 1:10



Wall package

10 mm wooden facade cladding
25 mm wooden slats
10 mm MDF wood
140 woodfibre insulation
10 mm MDF wood

Wooden facade beam

Roof package

1 mm eco-proof bitumen
10 mm MDF wood
140 woodfibre insulation
1 mm damp proof layer
10 mm MDF wood
80 mm CLT floor

Glulam wooden beam 250 x 80 mm

Steel profile 250 x 200 mm with demountable screw connection

Glulam wooden beam 360 x 150 mm

Ventilation canal with 400 mm diameter

0 0.1 0.2 0.3 0.4 0.5m

PART IV Circular design

Appendix I - Circular design solutions

Categories of design solutions

Integration to context

- Gebruik van materialen, resources, afvalstromen uit de nabije omgeving
- Oude materialen leveren een bijdrage aan lokale projecten van de stad
- Samenwerking met verschillende organisaties uit de stad (universiteit etc.)
- Verhogen van verbondenheid van het publiek met het gebouw
- Relevantie functies aanbieden voor diverse doelgroepen uit de stad
- Stimuleren van fiets & openbaar vervoer voor gebruiker

Sustainable energy consumption

- Aansluiting op stedelijke warmtenet
- Slimme oriëntatie en verhogen aantal gevelopeningen t.b.v. daglicht
- Slimme zonwering, om koeling te voorkomen
- Smart - lighting systemen (lichtsensoren, gelijkstroom, licht als een service)
- PV – panelen met hoog rendement
- Koel/warmte plafonds als warmtebuffer: phase changing ceiling (pcm)
- Warmteterugwinning systemen, zoals warmtewiel
- Natuurlijke ventilatie in atrium tijdens de zomer, te openen atrium
- Zonneboiler systemen voor opwarmen van tapwater
- Box- in – box systemen voor plaatselijke verwarming & koeling
- Voorzetten van nieuwe beglazing/vacuumglas
- Gebruik maken van warmte/koude uit water Oude Rijn Leiden?
- Mogelijkheid tot WKO-systeem in Leiden?

Sustainable water consumption

- Water besparende kranen & toiletten
- Grijswater opvangsysteem
- Water- efficiënt dak landschap door groene daken te gebruiken als buffer
- Regenwater berging op het dak voor toiletten, verwarmingswater

Sharing program, with new products & services

- Reparatie service voor bestaande producten
- Verkoop van tweedehandsproducten & circulaire producten
- Verlichting als een service
- Lift als een dienst
- Inrichting en meubilair als een pay- for- use systeem
- Flexibel verhuren van kantoorruimten/vergaderruimten
- Interieur ontwerpen voor activity-based working i.p.v. vaste bureauplekken
- Gedeelde ruimten voor meerdere functies en gebruikers
- Ontmoetingen stimuleren door visuele connecties met ontmoetingsplekken
- Kennis delen ten bate van circulaire innovatie

Well-being of users

- Oriëntatie en circulatie in het gebouw zijn overzichtelijk
- Connecties: fysieke en visuele connecties tussen werkplekken & functies (vides, ballustrades en transparante binnenwanden)
- Ontmoetingen: Zichtbare ontmoetingsplekken op centrale plekken in het gebouw
- Daglicht: Voldoende daglicht in ieder verblijf (skylights)
- Vegetatie & hout: stralen warmte en gezondheid uit
- Zicht: Vanuit elke verblijfsruimte is er zicht op buiten
- Natuurlijke ventilatie: Mogelijkheid op werkplekken
- Beweging: Stimuleren van beweging door trapverbindingen
- Werkplek: Activity- based working, ruimten worden ingericht naar de taken (stilteplekken etc.)

Use of materials and material choice

- Materialen met bekende herkomst, hergebruikte materialen uit omgeving mogelijk
- Minimale CO2 voetafdruk/Zero carbon/ niet- toxisch
- Hernieuwbaarheid van materiaal (vb. hout groeit terug)
- Mogelijkheid tot hoogwaardig hergebruik/recyclebaar
- Mogelijkheid tot demontabele verbindingen
- Positieve bijdrage aan de warme atmosfeer van het interieur/gebouw
- Positieve bijdrage aan de overzichtelijkheid/transparantie van het gebouw
- Positieve bijdrage aan het welzijn van de gebruiker (licht hout, groen)

Building methods aimed at lifespan

Value recovery & re-use of existing

Appendix II - Material flows

Urban mining

repurpose building parts & materials from the V&D building

re-use of existing concrete

re-use of existing aluminium

re-use of existing bricks & wood

Re-use of materials

possible implementation of re-used materials from Leiden within the building

re-used materials from Leiden

re-used building parts & furniture

re-used wooden floors & beams

New materials

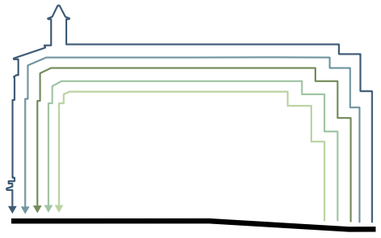
choice for producers of renewable or recycled materials

C2C wood

acoustic material from recycled PET

CLT building parts

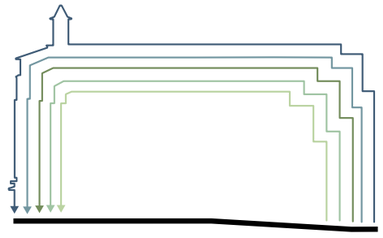
Appendix III - New materials



SITE

Energy warmtenet Leiden
Urban heat system in 2026

Biobased concrete streettiles
Biobound streettiles & concrete



FACADE

Sustainable softwood
Thermowood wood facade finish

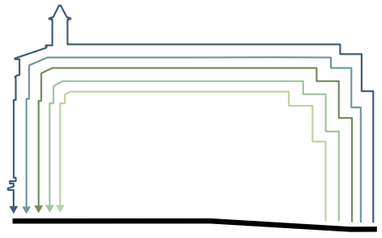
Sustainable softwood
Accoya wood facade finish

Window frames of scrap wood
Velux recycled window frames

Circular wooden window frames
Westerveld & Nederlof frames

Insulation of recycled material
Metisse insulation of old jeans

Upcycled insulation system
Everuse upcycled voorzetwand

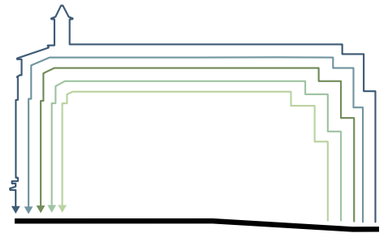


STRUCTURE

Demountable steel structure
Thermowood wood facade finish

Flexible floorsystems
Slimline demountable floor

Cross Laminated Timber (CLT)
Stora Enso facade & structure



INSTALLATIONS

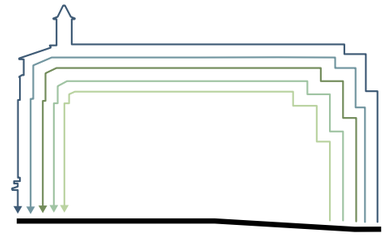
Light as a service
Philips circular lighting

Grey water recycling system
Aqualoop

Elevator as a Service
M-use life Mitshibutsi

Blue/green roof
Sedum roof for water collection

Drysystem floor heating
Fermacell JK ferma floor



SPACE PLAN

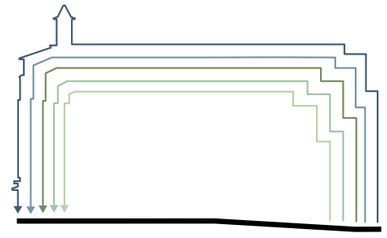
Partition walls
Ecoboard sheet material

Demountable inner wall
Quickpanell partition walls

Demountable inner wall
Knauf circular partition wall

Wooden stairs
C2C certified red oak wood

Sustainable softwood
Accoya wood finish



FURNITURE/INTERIOR

Furniture as a Service (FaaS)
Opnieuw! & Gispen furniture

Circular wooden floor
Herso floors

Biobased floor finishes
Forbo marmoleum floors

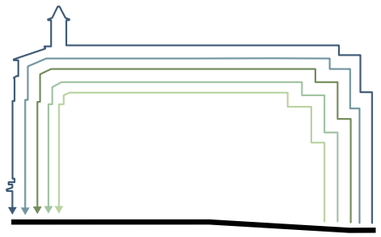
Biobased carpets
Forbo carpet tiles

C2C modular floor finishes
Tarkett recycable floor finish

Workspaces from recycled wood
Gispen REMADE workbooth

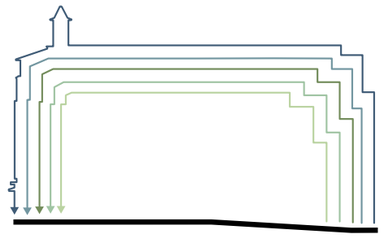
Refurbished office furniture
Desko refurbished furniture

Appendix IV - Removed/re-used materials



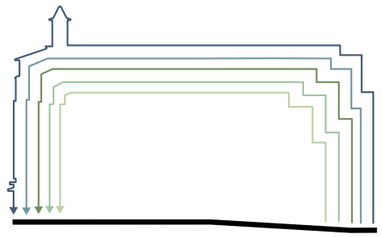
SITE

Streettiles Maarsmansteeg
New use: ?



FACADE

Brick facade elements (1970)
New use: ?

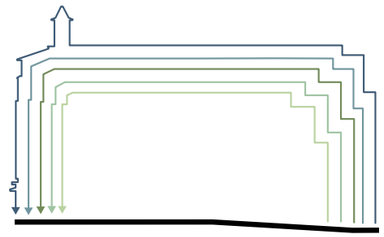


STRUCTURE

Concrete slabs (1970)
New use: pulverizing into concrete granulate for road construction

Steel beams IPE 440 (....x)
New use: construction on roof

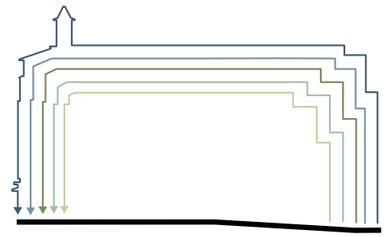
Steel beams IPE 600 (....x)
New use: construction on roof



INSTALLATIONS

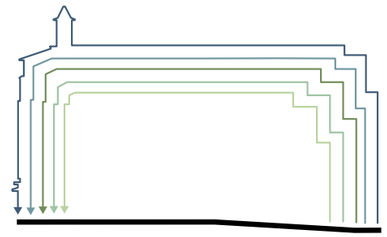
Sprinkler system
New use: Upgraded sprinkler system is used within the building

HVAC systems
New use: Re-use of former ventilation systems (5 years left)



SPACE PLAN

Escalators
New use: Re-use of escalators in new atrium



FURNITURE/INTERIOR

Old counters & shop shelves
New use: Re-use of furniture in new retail spaces

White ceiling tiles (.....m2)
New use: OWA Green circle recycling program

Light spots (1000x)
New use: ?

Changing rooms (8x)
New use: Re-use partition walls in new retail spaces