

Architectenburea Drexhage, Sterkenburg, Boden&Venstra; Bezuidenhout, the Hague ; 1959-1962

But thanks be to God, who makes us triumph in Christ all times. 2Corinthians 2:14

Revitalising Heritage
Christus Triumfatorkerk



postwar reconstruction area in the Hague
1959-1962
D.S.B.V. an Rotterdam competition firm
postwar modern architecture movement

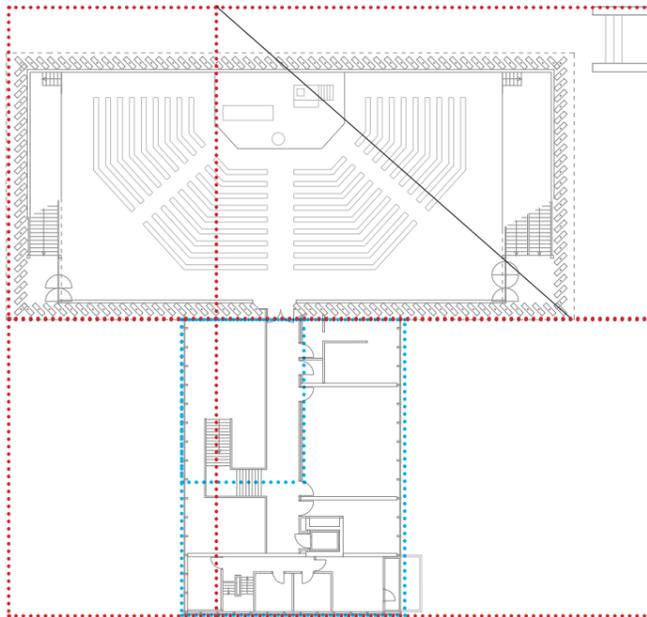
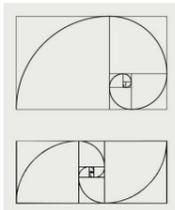


Reformed Protestant community
capitalization and globalizing after war rebuildment
church community as the thriving neighborhood center

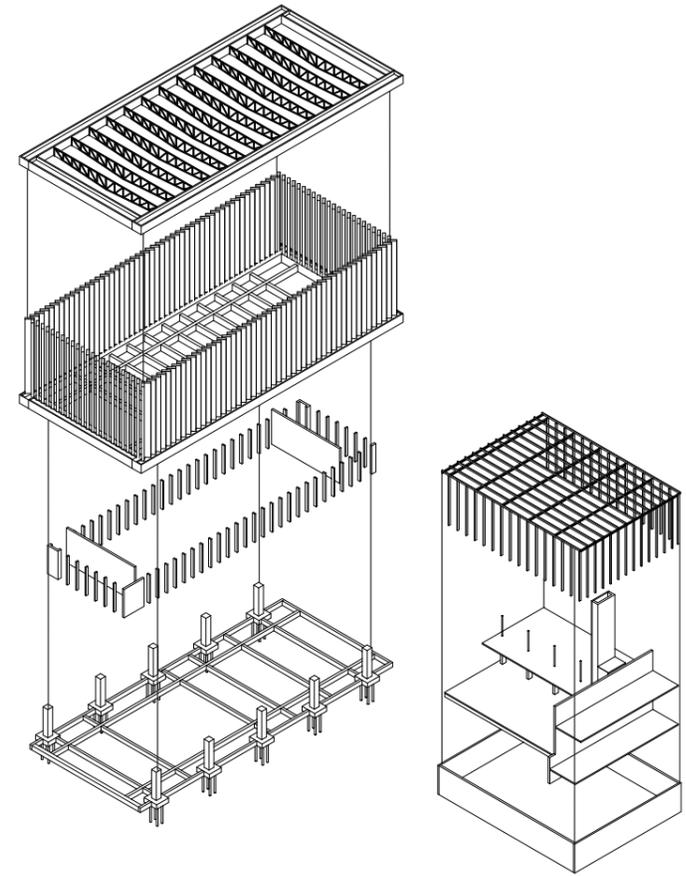
Case study choice:
Christus Triumfator Church



urban expression
 temple v.s. home/factory
 open figure-ground



structured plan
 use pattern in space frame
 silver ratio generative plan (ortho-)
 bombard memorial (diagno-)



two volumes, two systems
 brick grid, pile grid, steel -135 grid
 multi materials
 heavy---lightweight

INTANGIBLE

ASSET

CONCEPT
RELATION
CHARACTER

SOCIETAL

USE
KNOWLEDGE
ASSOCIATION
COMMUNITY

PROCESS

PLANNED
UNPLANNED

ASSET

BUILDING ELEMENT
BUILDING
URBAN ELEMENT
NATURAL ELEMENT

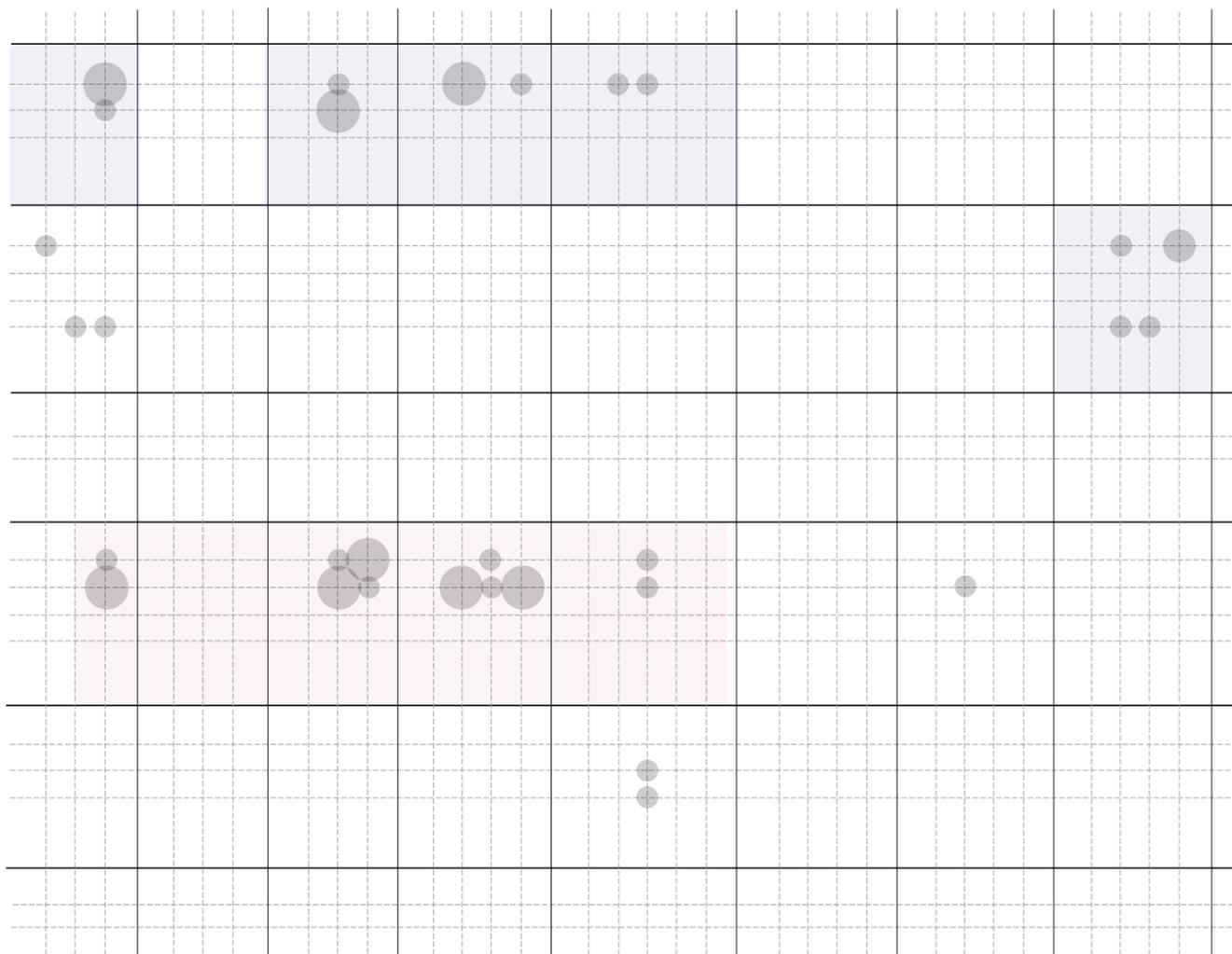
AREA

ENSEMBLE
CONTEXT
AREA

LANDSCAPE

LAYERING
LANDSCAPE

TANGIBLE



SOCIAL
SPIRITUAL
EMOTIONAL(IND.)
EMOTIONAL(COL.)
ALLEGORICAL

ECONOMIC
USE
NON-USE
ENTERTAINMENT
ALLEGORICAL

POLITICAL
EDUCATIONAL
MANAGEMENT
ENTERTAINMENT
SYMBOLIC

HISTORIC
EDUCATIONAL
HISTORIC-ARTISTIC
HISTORIC-CONCEPTUA
SYMBOLIC
ARCHAEOLOGICAL

AESTHETICAL
ARTISTIC
NOTABLE
CONCEPTUAL
EVIDENTIAL

SCIENTIFIC
WORKMANSHIP
TECHNOLOGICAL
CONCEPTUAL

AGE
WORKMANSHIP
EXISTENTIAL
MATURITY

ECOLOGICAL
SPIRITUAL
ESSENTIAL
EXISTENTIAL



the chapel



the atrium

Christus Triumphator Church:

building asset, conceptual asset, lively community

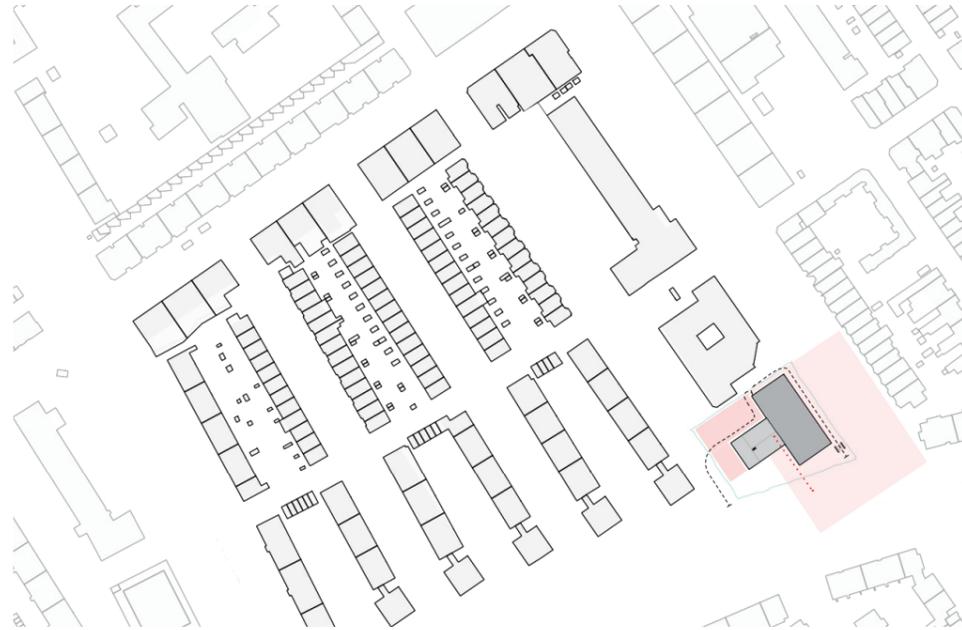
How to develop a renewal guideline for Christus Triumphator Church according to its innate architectural concept and value?

1) How to find and describe the inner relationship between materiality, space, and urban form of Christus Triumphator Church that points out the possible future alternation visions for the building innated by the architect?

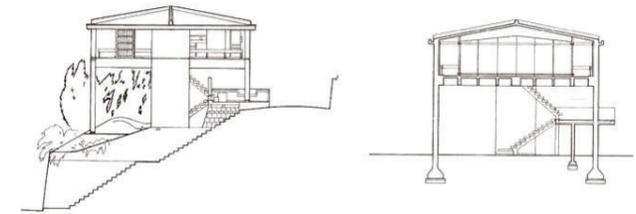
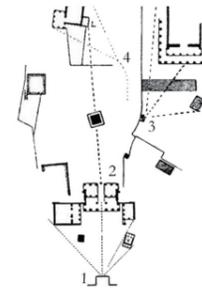
Four Scales of Facts and observation ----->

Time background and meanings

- a. Urban and sequence -----> Mass production, postwar era, business model
- b. Ratio order -----> Silver ratio, CIAM background, mass production
- c. Space elements and use -----> Prostestant origin, dialectic relationship
- d. Materiality -----> The artichect to group design, architects and engineers



postwar mass production era



dramatic, ancient, and exotic patterns



serial arts for the people



1962

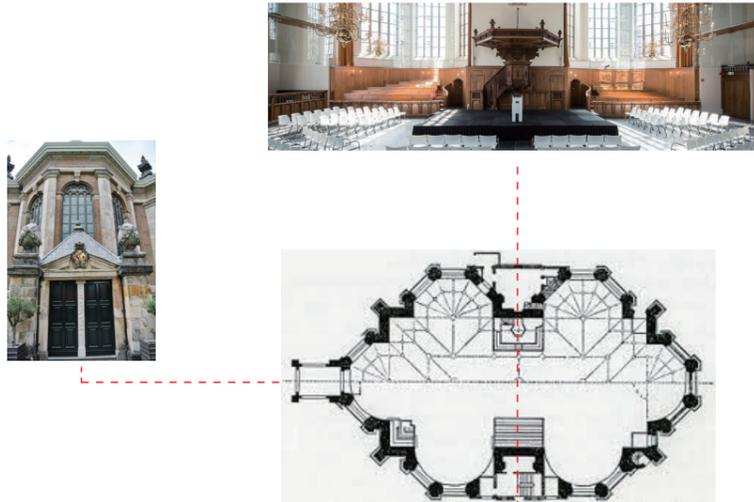


1965

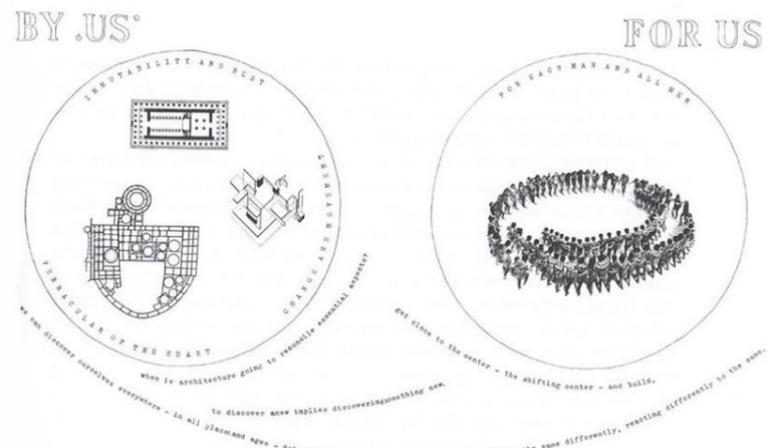
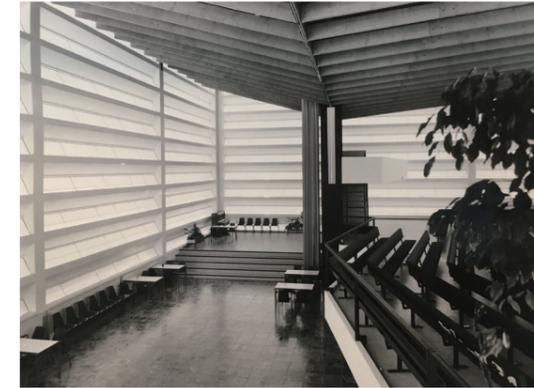


1969

business model:
 many houses of the Lord. "The fish symbol in it symbolized the tower of Christus Triumphator church"



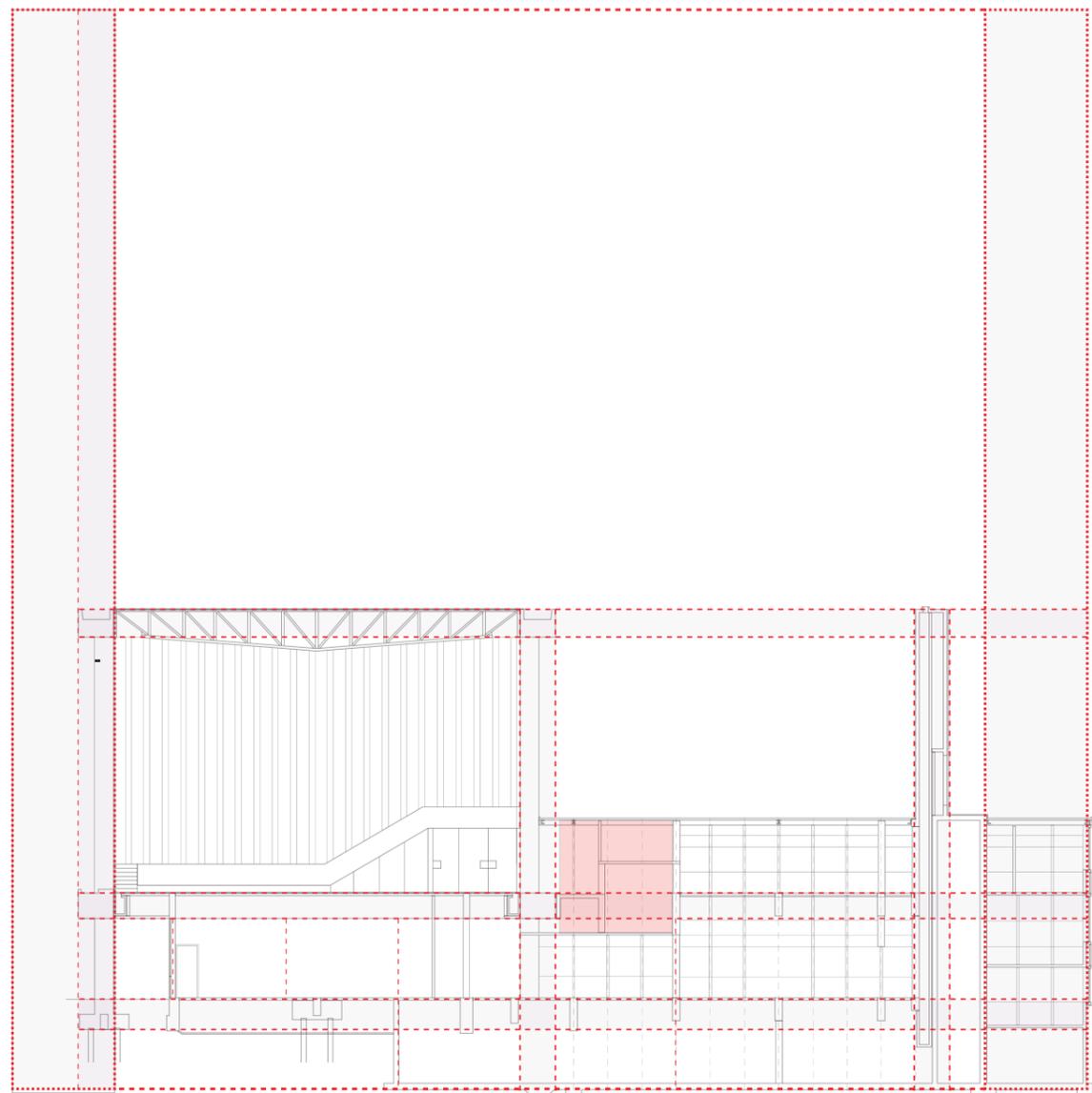
Protestant dialectic tradition
equality, dual space, spiritual and abstract space elements



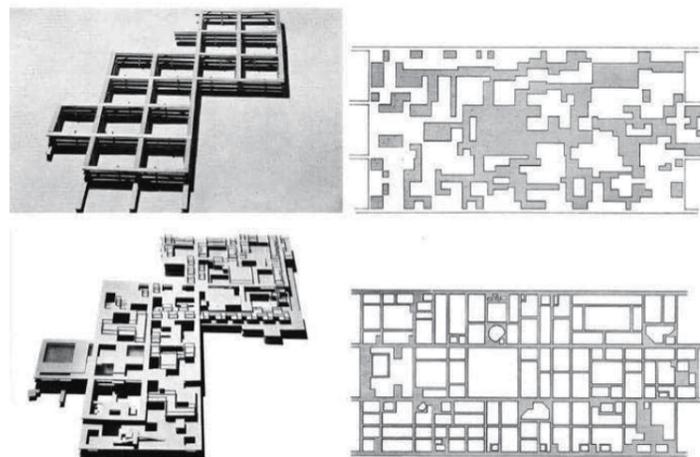
Waterloo cycle (CIAM 1959, van Eyck)
dualism, mutuality, productivity loop
Team X matured in 1954-1959



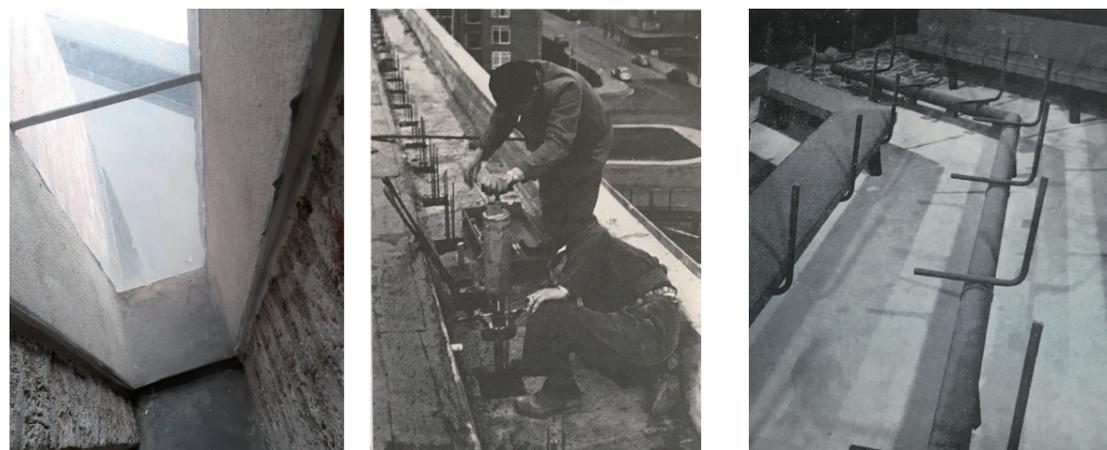
structure - fabric
non-fixed pattern and lively, spiritual space elements
people as subjects of the space



tartan grid (postwar architectural trend)
 from parts to whole (a brick of 5cm*10cm*20cm, 1cm mortar)
 zones generated that define solid interfaces



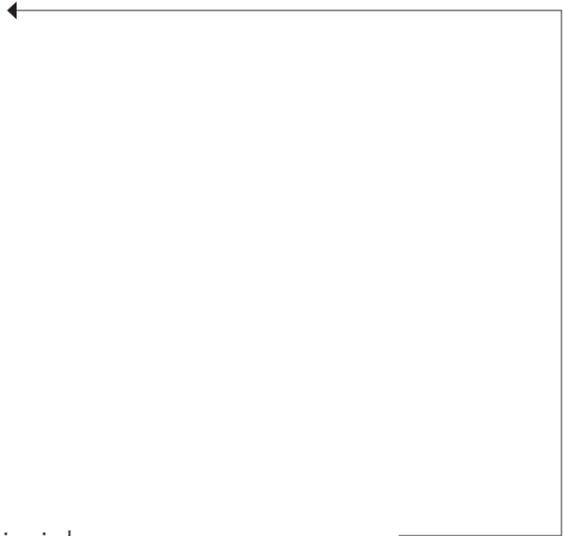
metrics and mat-building of postwar
 deal with complexity (i.e. Berlin Free University)
 use pattern: structure--fabric



D.S.B.V. : architects and engineers
 integrated structural and climate design

How to develop a renewal guideline for Christus Triumphator Church according to its innate architectural concept and value?

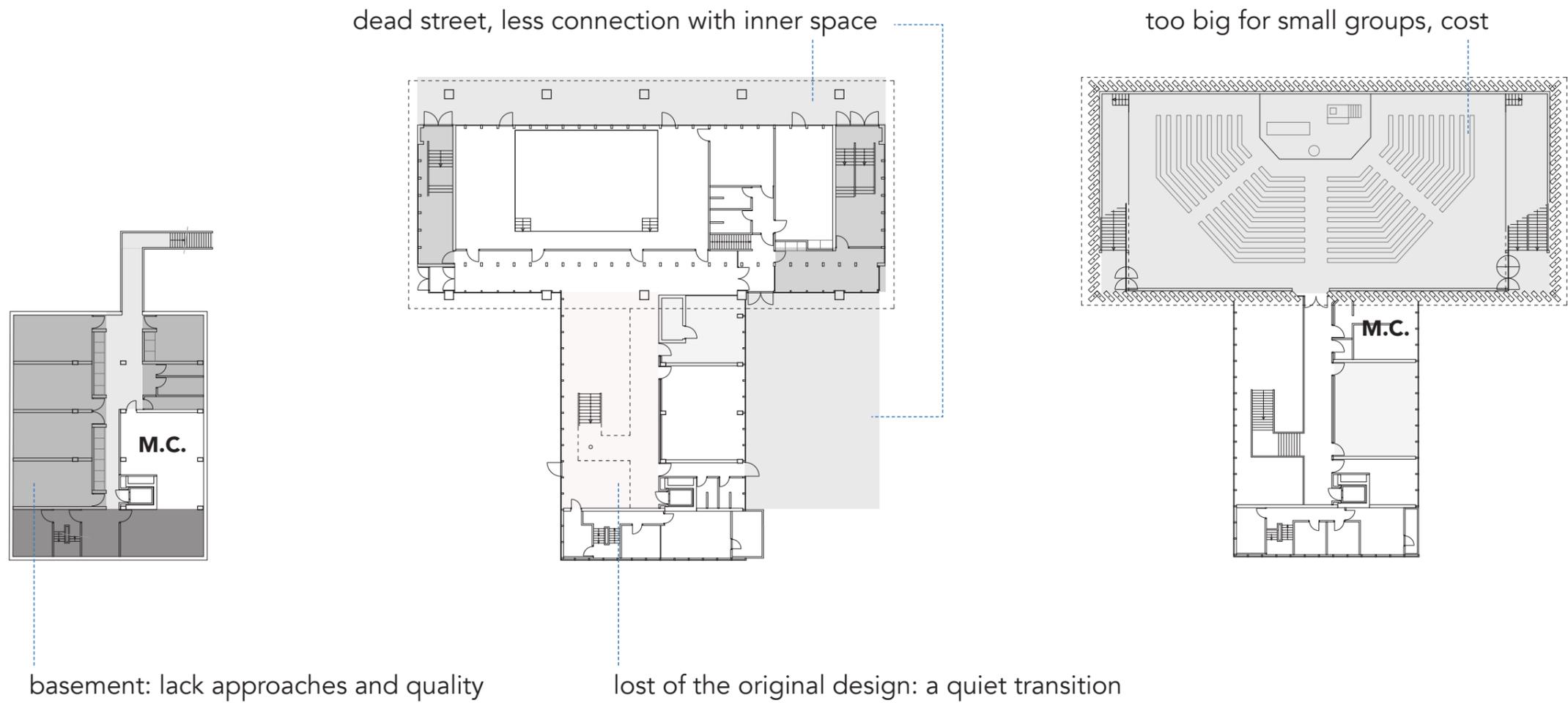
2) How to test and magnify these possible relationships for future sustainable changes in materiality, space, and urban form?



Conclusion	----->	Design respond
Mass production, Postwar roots		Zero waste redesign, design principles
a. Urban and sequence	----->	adjust space character with landscape interventions (4)
b. Ratio order	----->	follow carefully and find design oppurtunities (2)
c. Space elements and use	----->	grow new program from existing use meanings (1)
d. Materiality	----->	reduce to revitalize, add lightweight and reversable (3)

I. space and use

grow new program from existing use meanings



I. space and use

current needs, energy and vacancy , evolving new uses



faith
3 smaller groups



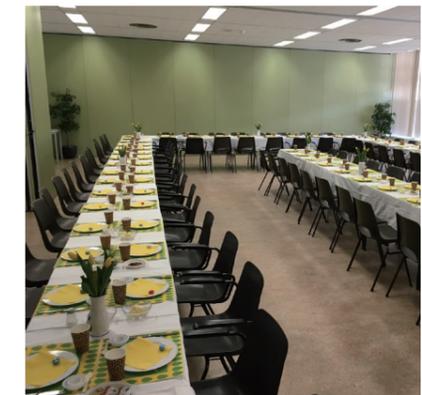
public
performance/ art/ conferences
rental



community
shrinking but alive

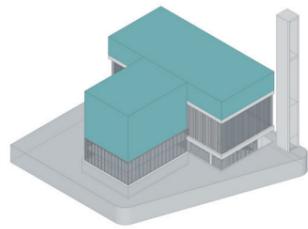


business/ meetings
rental income

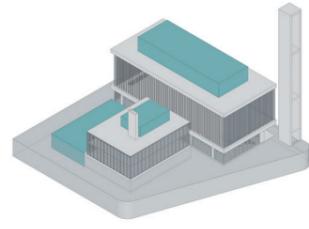


I. space and use

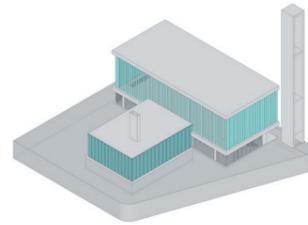
current needs, energy and vacancy , evolving new uses



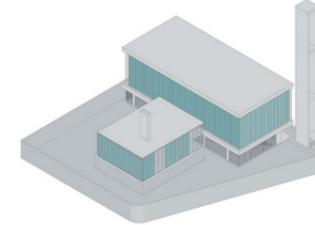
Add
strategy 01-1:
add with figure-ground



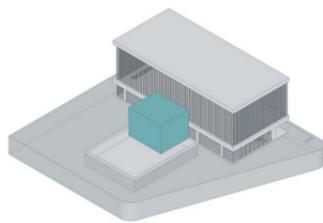
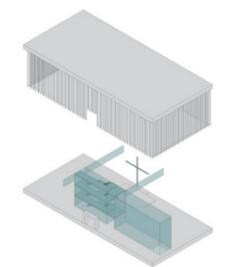
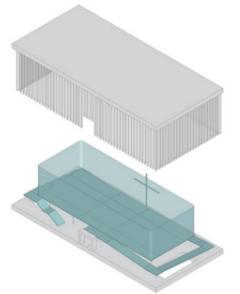
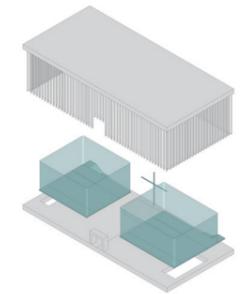
strategy 01-2:
add with space perception



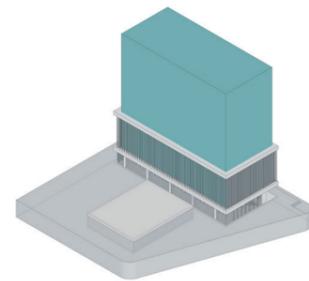
Alter
strategy02-1:
alter the boundary- energy



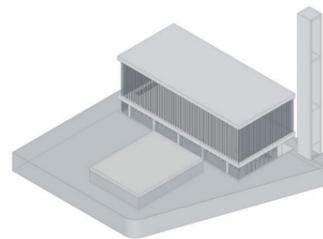
strategy 02-2:
alter the inner part- program



Reduce & Add
strategy 03-1:
redo the service volume



strategy 03-2:
urban space and high density use



Reduce
strategy 04-1:
reduce; material cycle



strategy 04-2:
reduce to the most; material cycle

overall space schemes

chapel schemes

I. space and use

test in volumes, keep the quality, find intersections

designed use now/

owner: Protestant parish the Hague
 status: national monument
 user groups: Protestant parish, other denominations, organizations, firms, schools

1f. main volume

staircase foyers		occasionally
chapel	group A (50 protestant)	Sun. morning
	group B (60 other church)	Sun. noon
	special rituals	occasionally
	concerts	monthly
	art exhibitions	scheduled

notes:

connections with city, religious/art events can be highlighted
 flexibility: multiple uses, shrink of church attendants
 climate issue should be solved with design

1f. service volume

atrium and corridor		daily
church council	religious meetings/ baby-sit	Sun.
	religious discussions	Sun.
pastor room		
	ventilation room	for chapel
restroom		

notes:

the church council and pastor room require specific qualities
 the ventilation room is at a carefully designed spot

1f. sexton house

master bedroom	in use	daily
bedroom	in use	daily
bedroom	in use	daily

notes:

the sexton house is in good use by the family of the paster
 the climate aspect can be improved

gf. main volume

foyers and portico		occasionally	
community center	group C (10 other church)	Sun. noon	
	group A+B (winter)	seasonally	
	religious classes	weekly	
	room 01	church events	occasionally
	room 02	church events	occasionally
	room 03	rooms rentals	Mon. - Sat.
	restrooms		

notes:

connections with the front street can be strengthened
 in need of spaces with high controls and changeability

gf. service volume

entrance foyers		daily
wardrobe corridor		daily
main atrium	events and rentals	daily
	office use	occasionally
church office		vacant
coffer room		
mission room	room rentals	Mon. - Sat.
cafeteria	events and rentals	daily
restrooms		
yards	parkings	daily

notes:

the main atrium+cafeteria become a busy secular, social center of the complex
 the atrium lost its designed simplicity and sobber of the protestant tradition
 the church office+mission room are not regularly used, becoming a block

gf. sexton house

living room	in use	daily
kitchen	in use	daily
garden	bad condition	

bf. main volume

staircase and corridor	vacant
------------------------	--------

bf. service volume

youth center	vacant	
room01	vacant	
room02	vacant	
room03	vacant	
room04	vacant	
room05	used as kitchen	occasionally
mechanical rooms	daily	
restrooms		

notes:

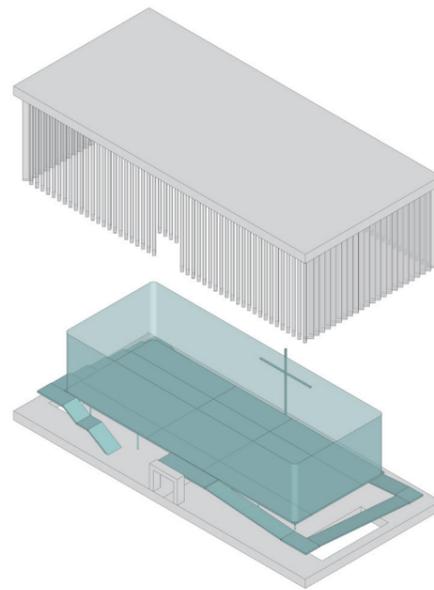
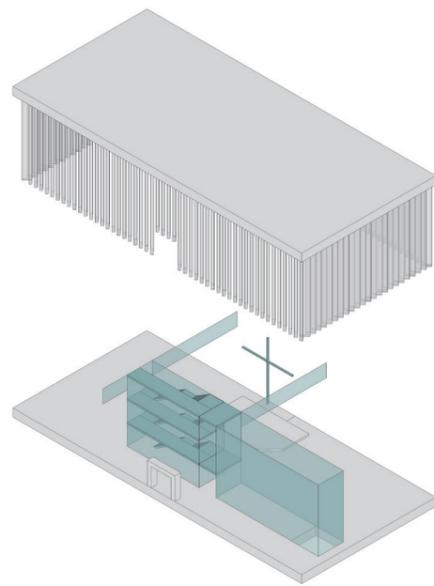
the quality of the basement is low that offers no events and rentals
 the complex requires a better equipped kitchen

bf. sexton house

storage1	vacant
storage2	vacant
storage3	vacant

I. space and use

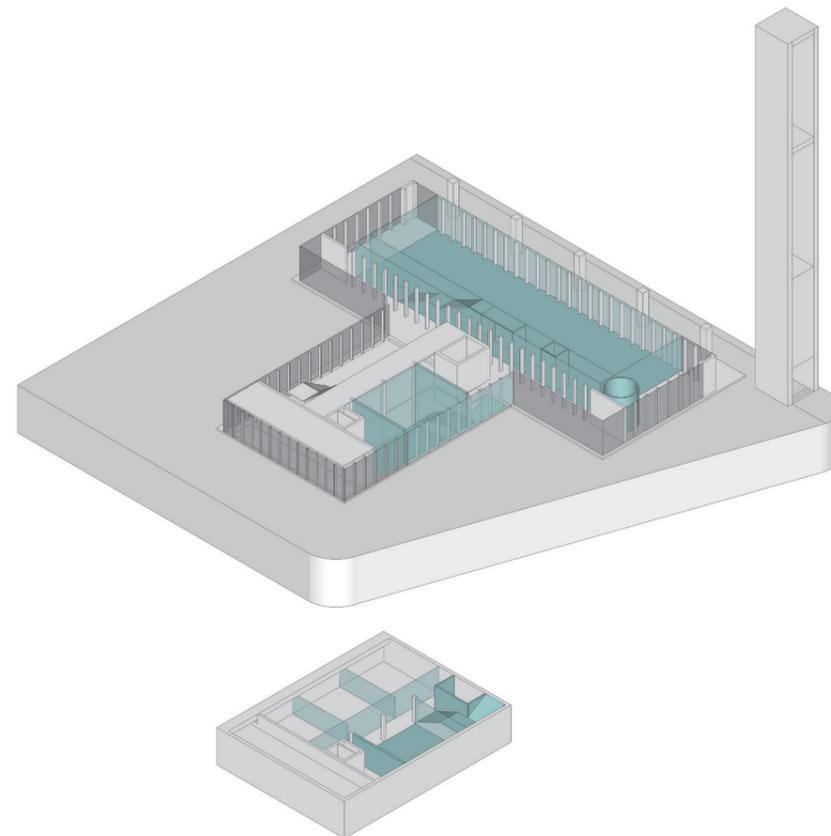
current needs, vacancy and evolving uses



add a box in the chapel for different groups

on the box:
main chapel hall

in the box:
rooms/ small hall/ exhibits route
can be combined together



open the ground to the city

co-working open space for rental

restrooms
kitchen

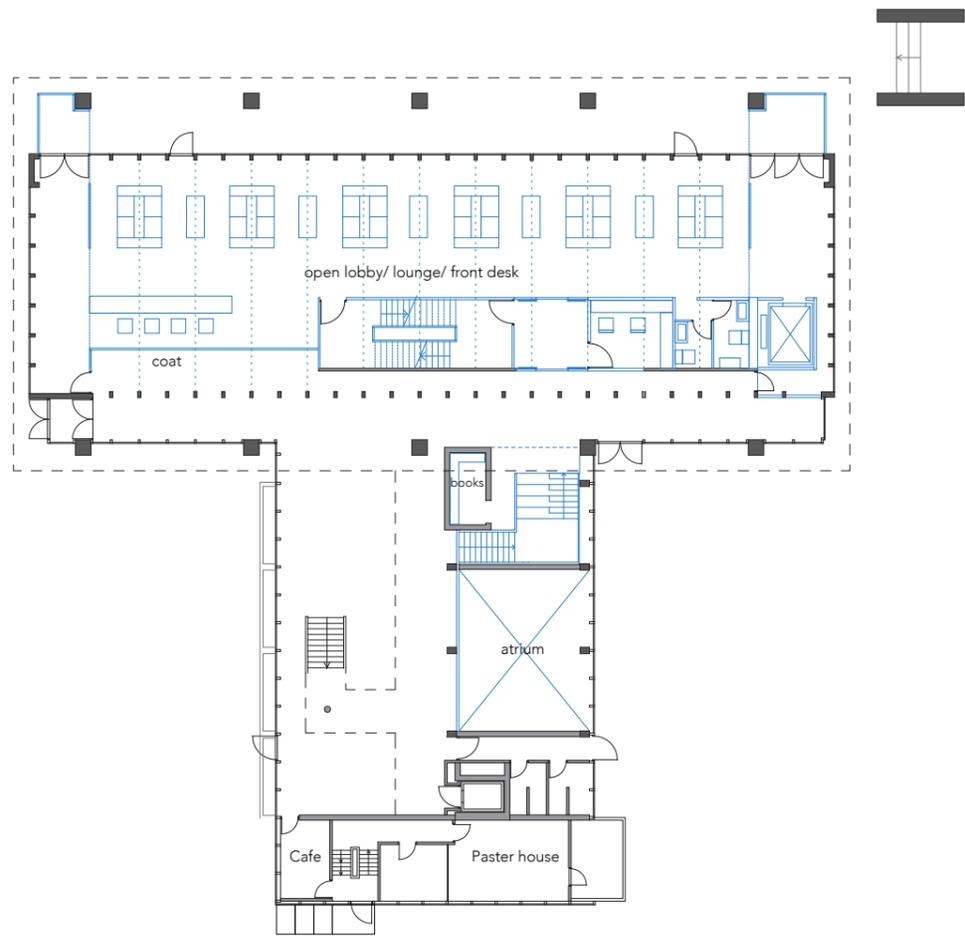
reduce (create void) the service building to revive

new atrium for events

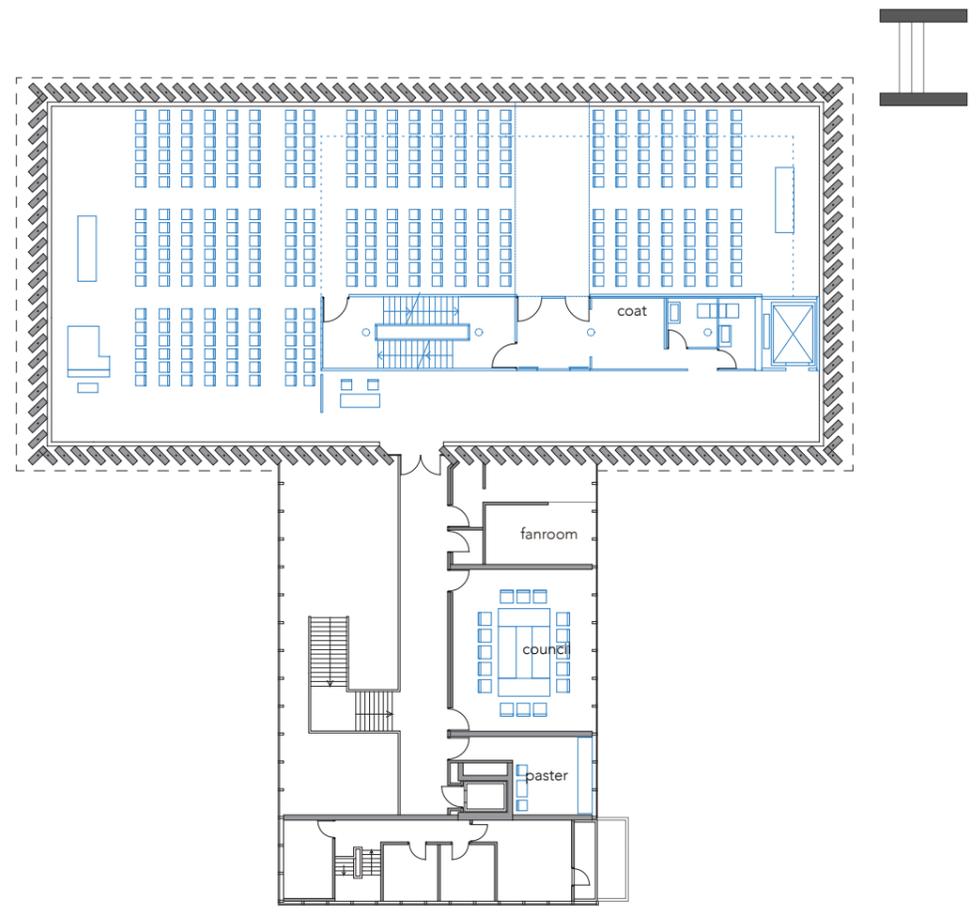
new kitchen (30m²)
4 rooms with flexible division

I. space and use

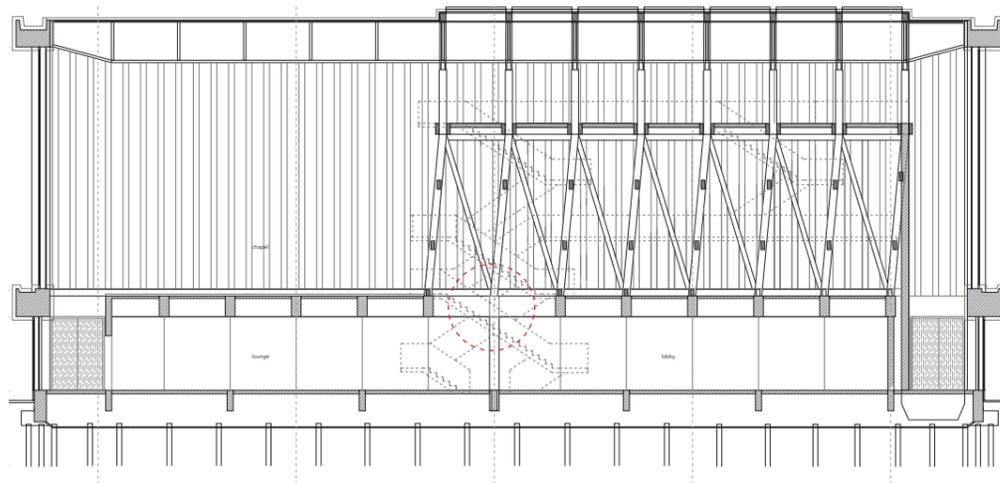
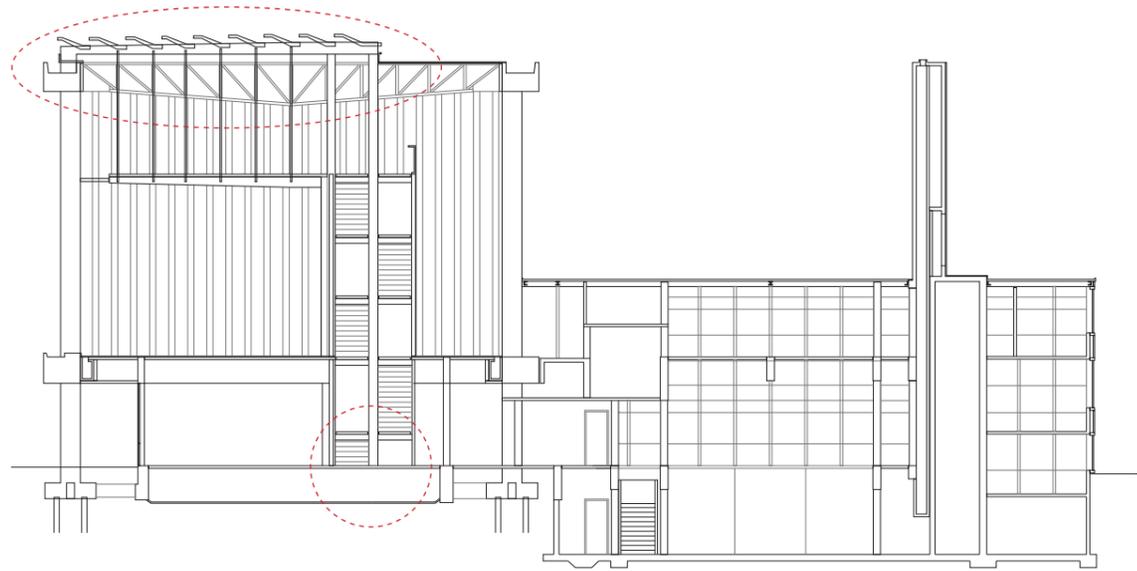
current needs, vacancy and evolving uses



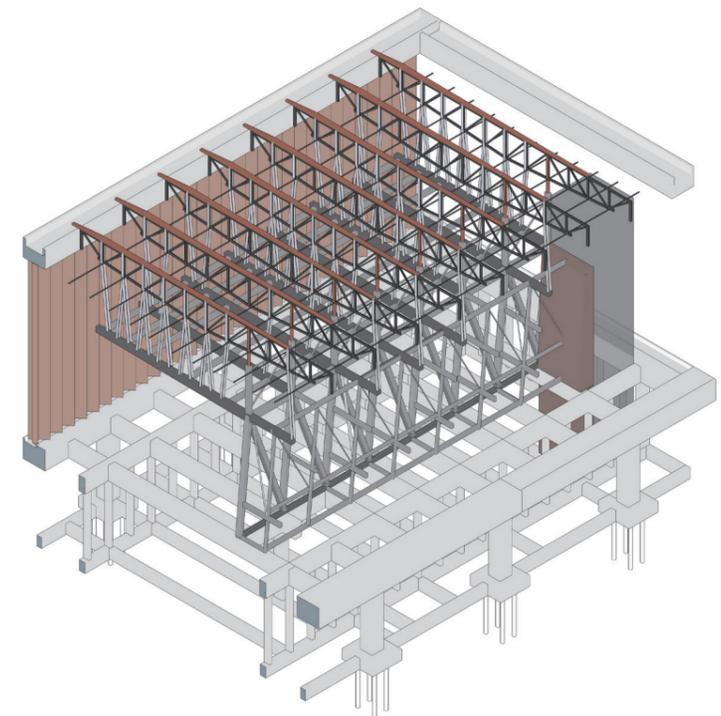
ground floor plan
scale 1/300



first floor plan
scale 1/300



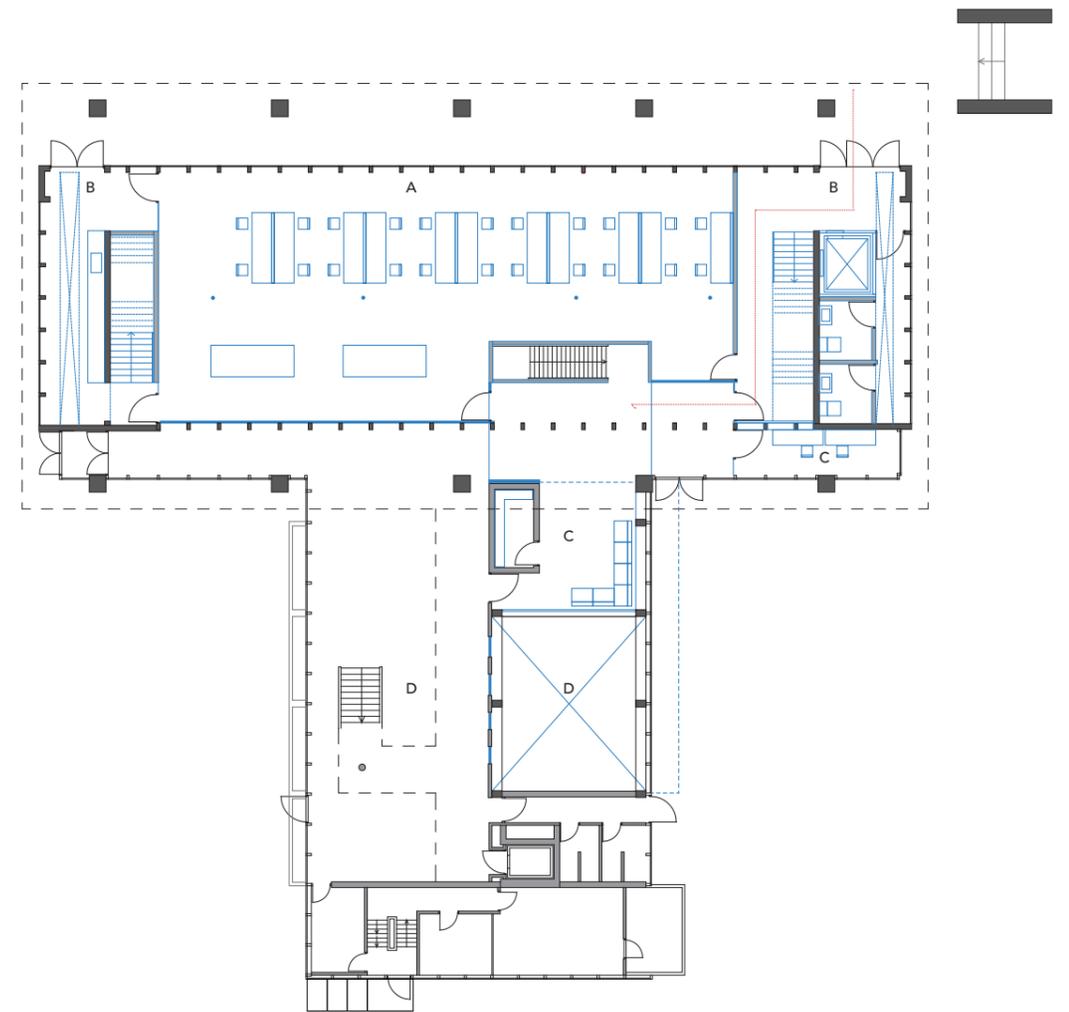
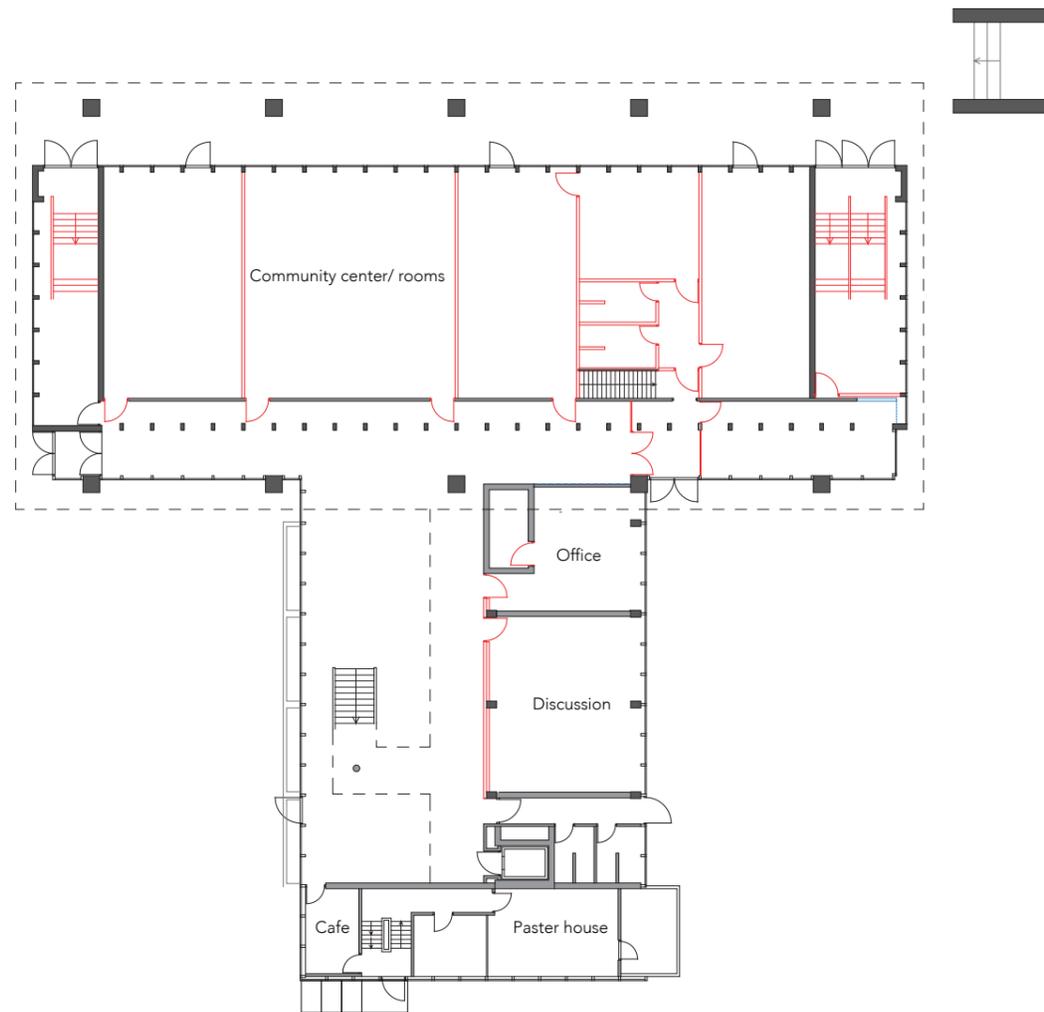
sections



building elements

II. plans and sections

follow carefully the structured order and ratio to find design oppurtunities



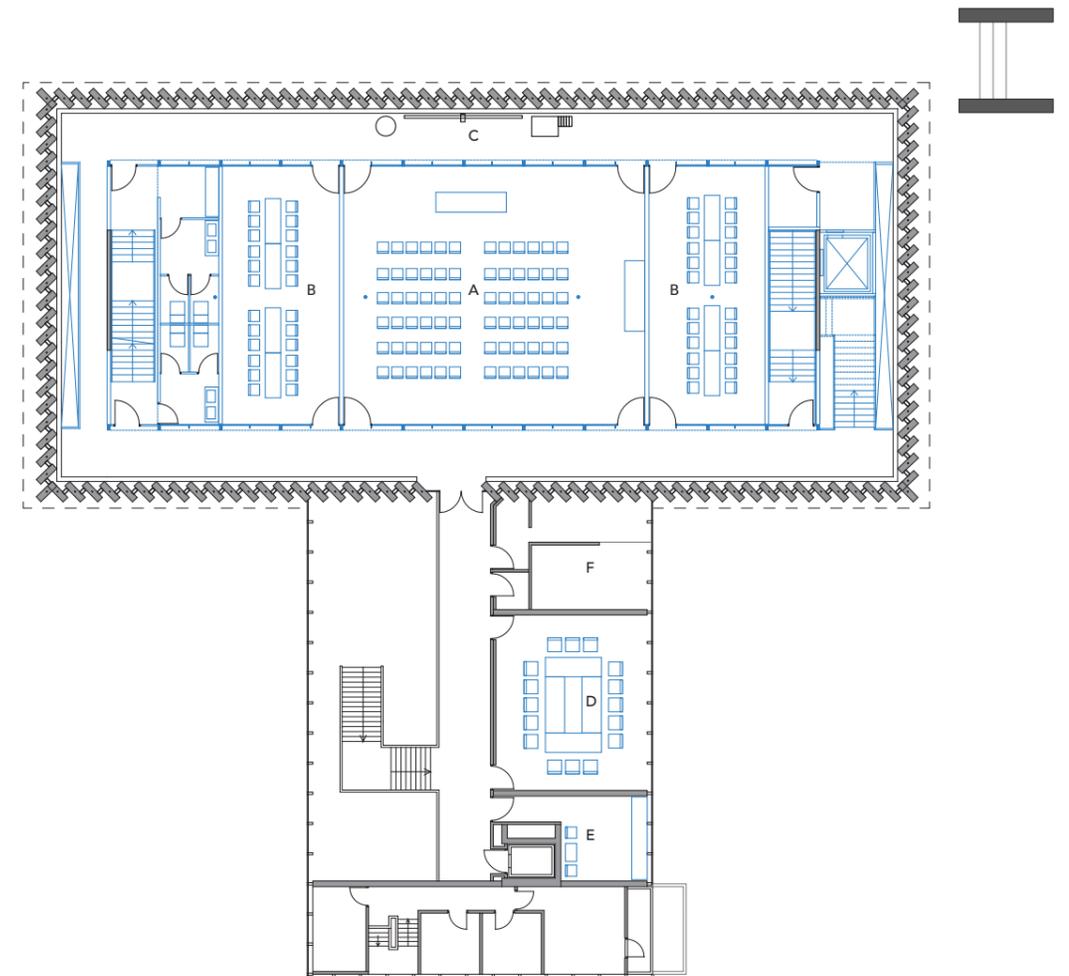
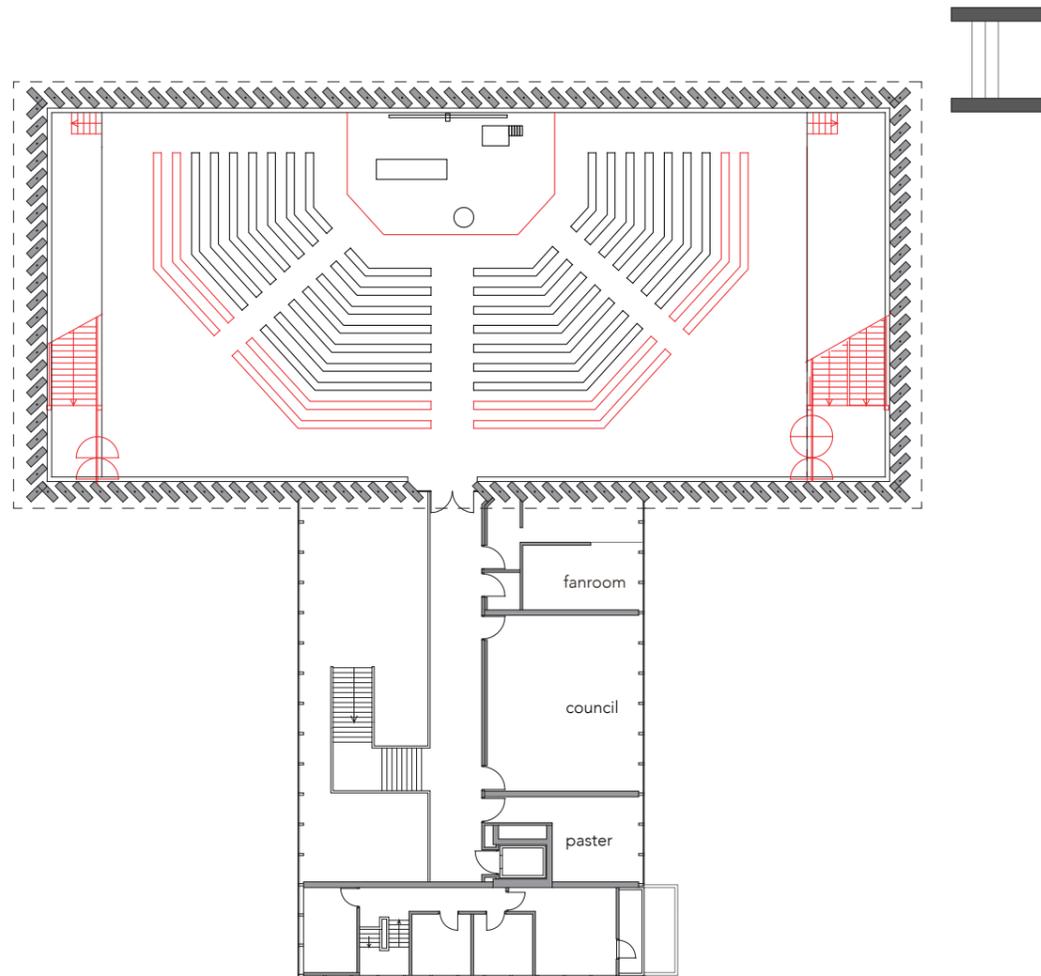
G floor:

- A. co-working space
- B. flipped in circulations, open corners
- C. reception space and church office
- D. atriums



II. plans and sections

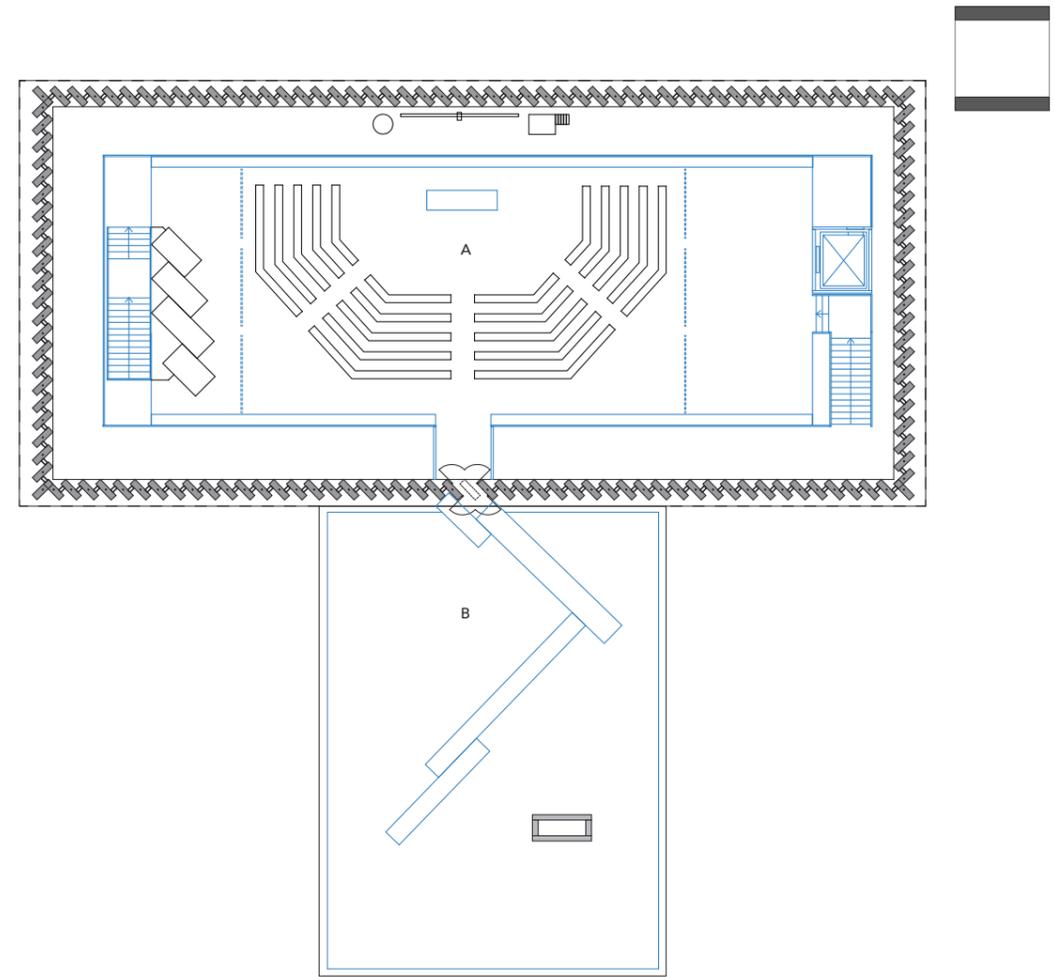
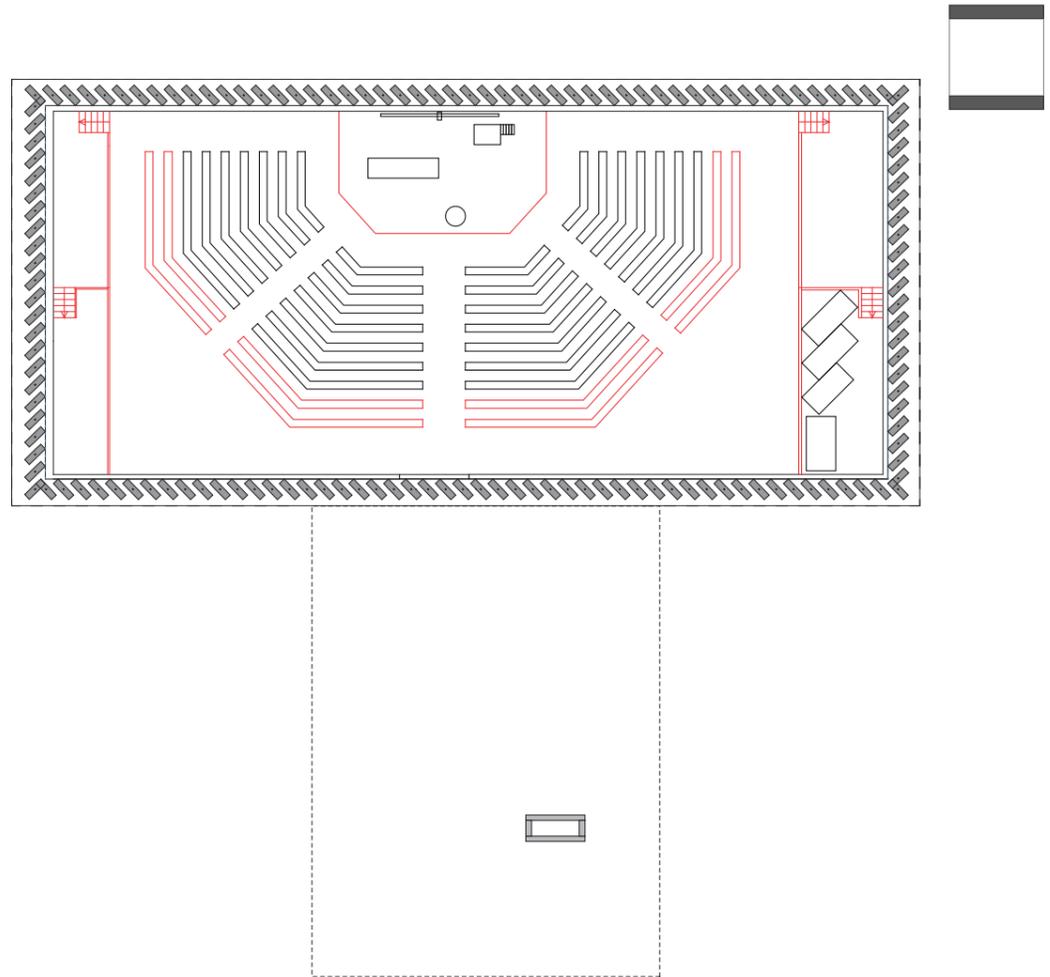
Ground floor plan



- 1st floor:**
- A. small hall
 - B. rental rooms
 - C. gallery walks
 - D. church council
 - E. pastor office
 - F. fanroom

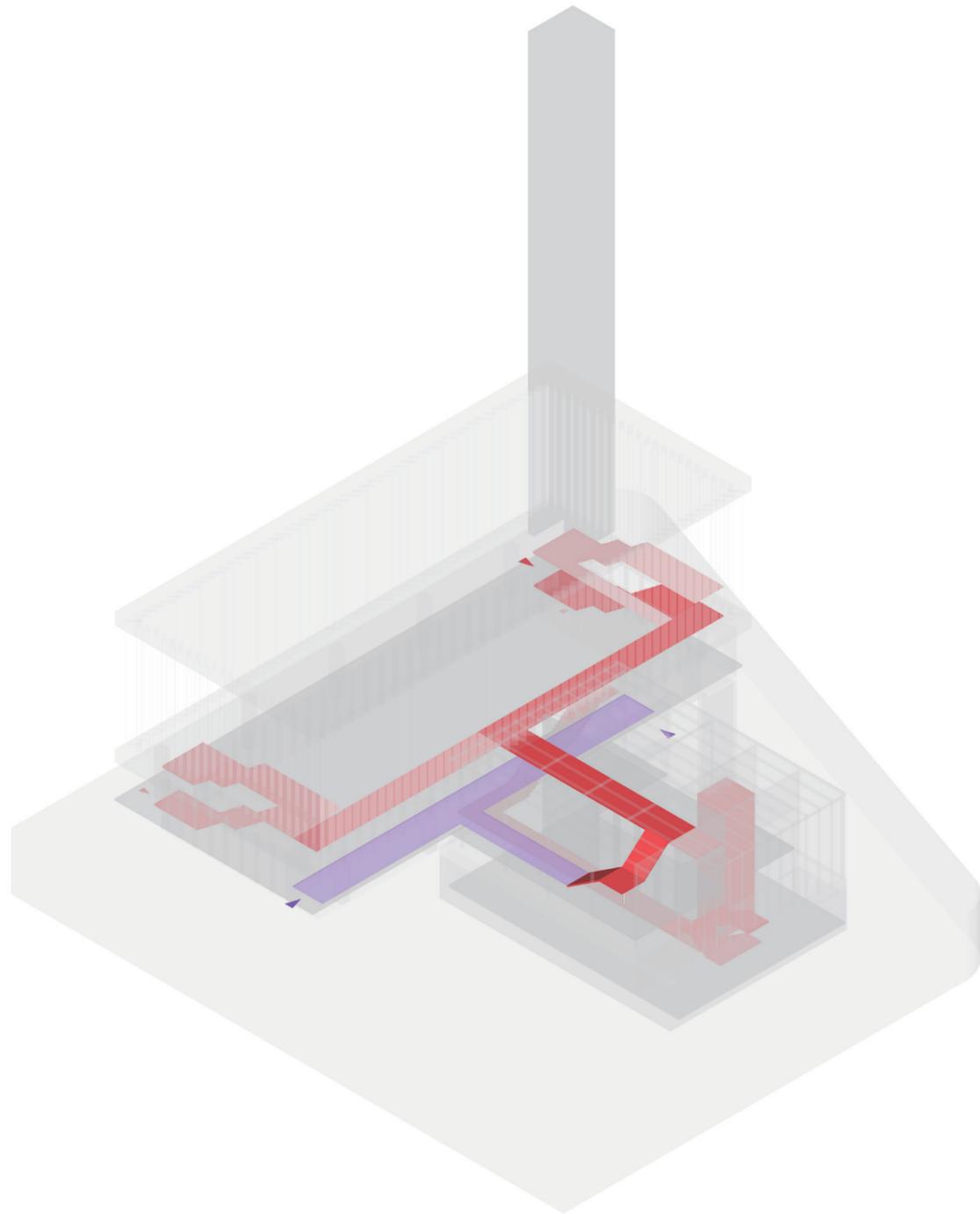


II. plans and sections
First floor plan

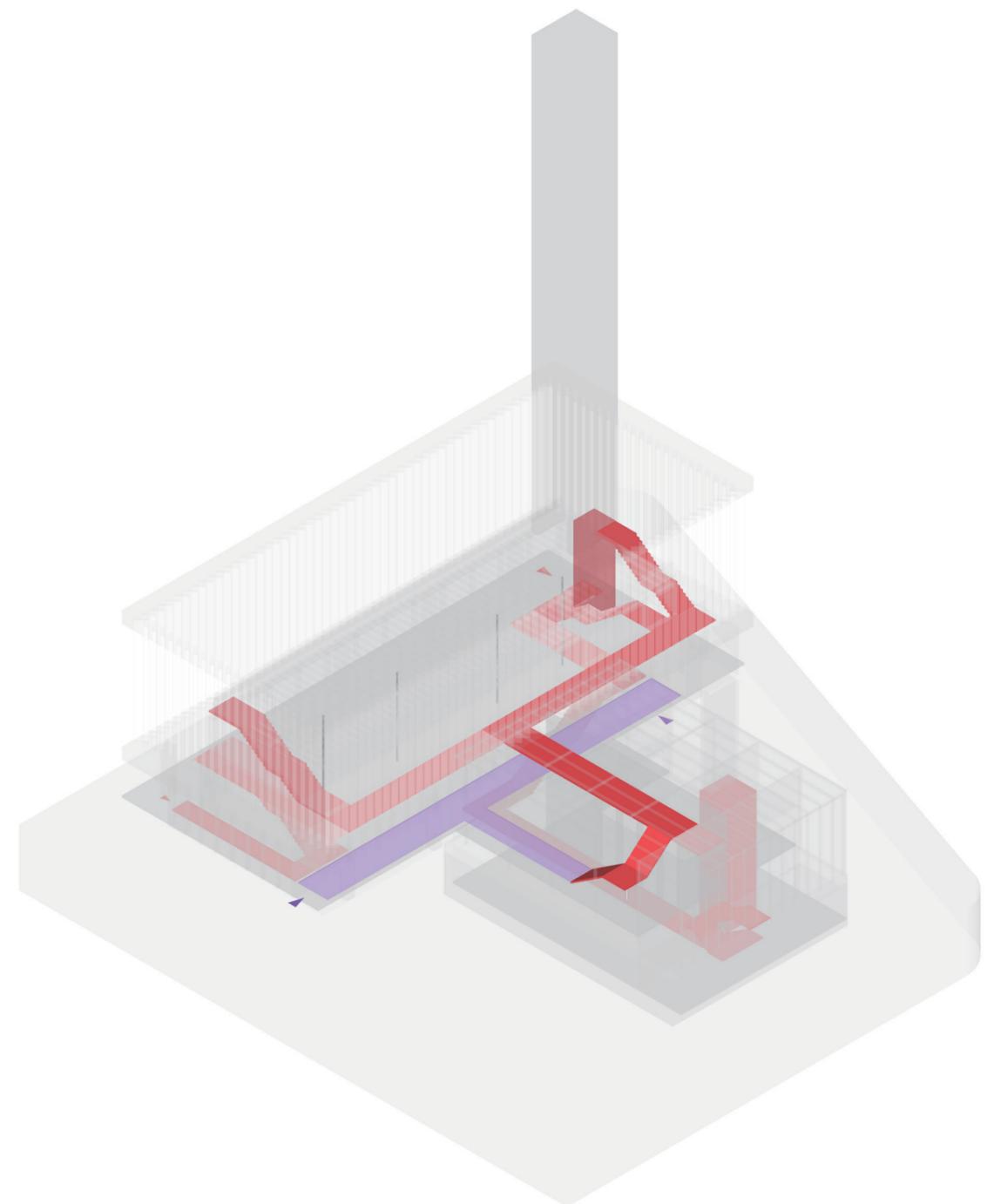


2nd floor:
 A. main chapel hall
 B. roof garden

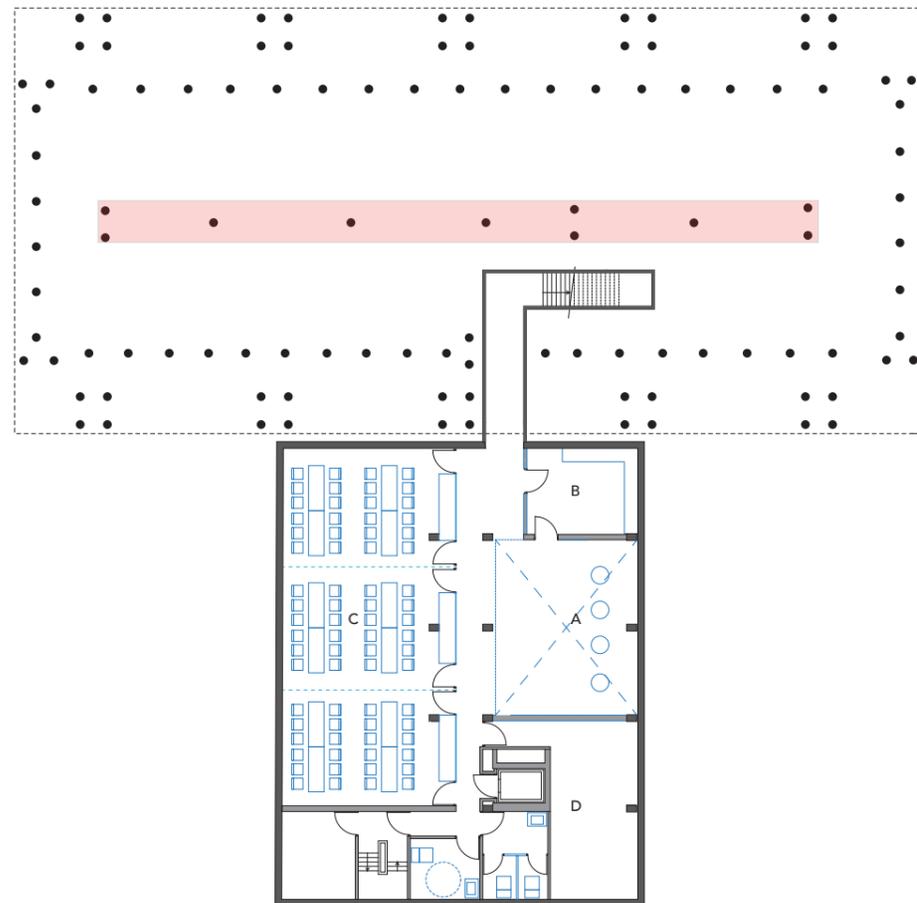
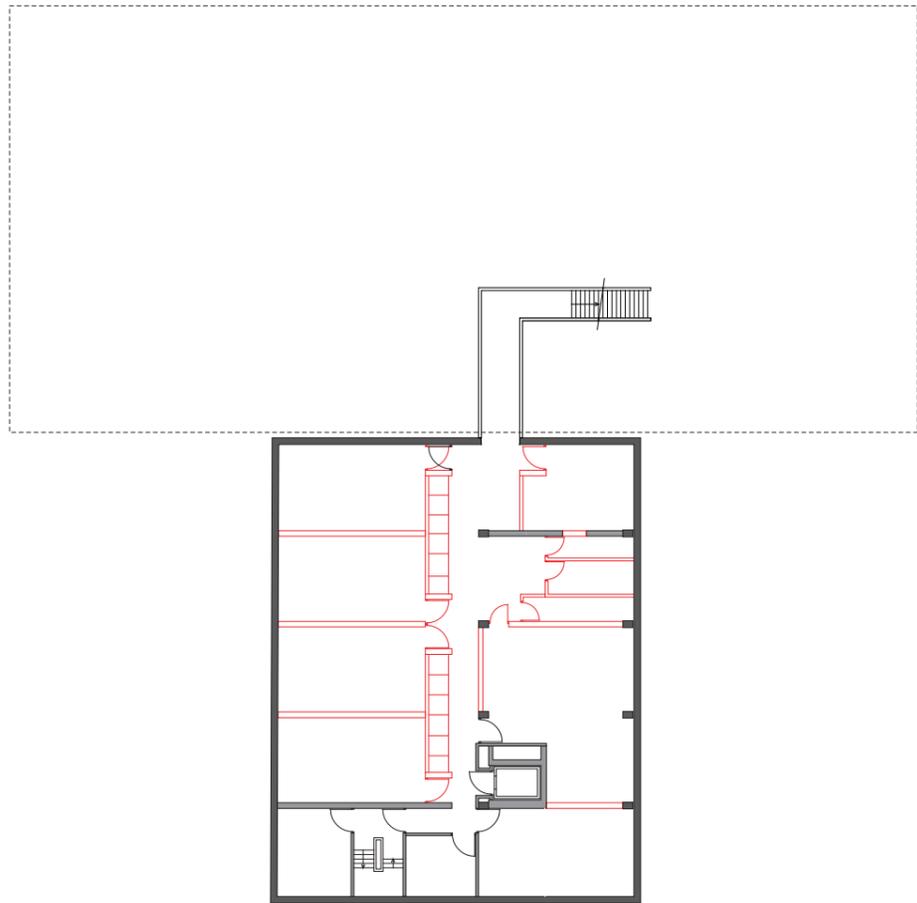




original sequence:
 hard to find entrances (with religious meanings)
 front street saperated with back community



adjusted sequence:
 slightly link front corner entrance with back volume circulations
 front entrance clarified
 flipped in staircase to keep the original layout the most



- B floor:**
- A. atrium
 - B. kitchen
 - C. class rooms
 - D. mechanical room

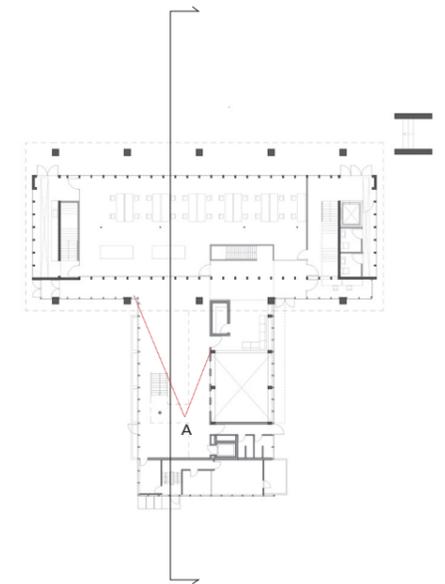
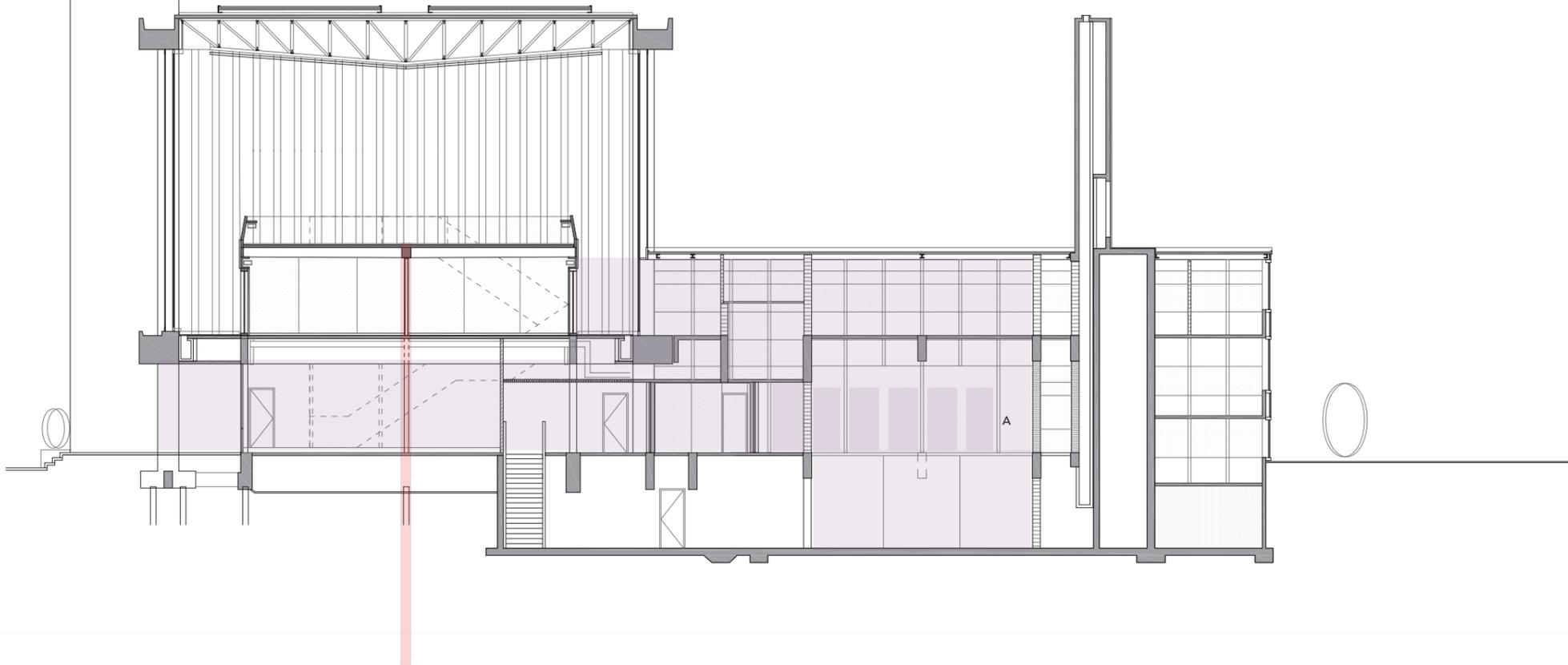


II. plans and sections

Basement plan: the Hague, soft ground



A atrium

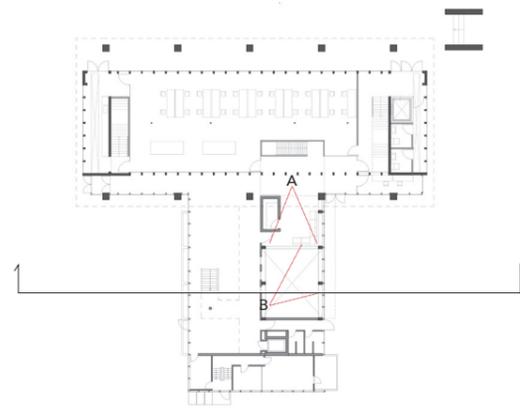


II. plans and sections
central column, continuous space



II. plans and sections

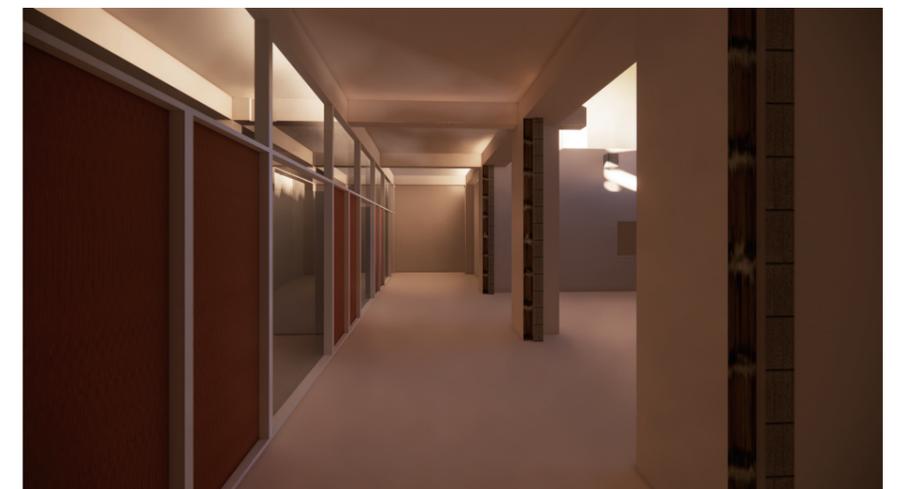
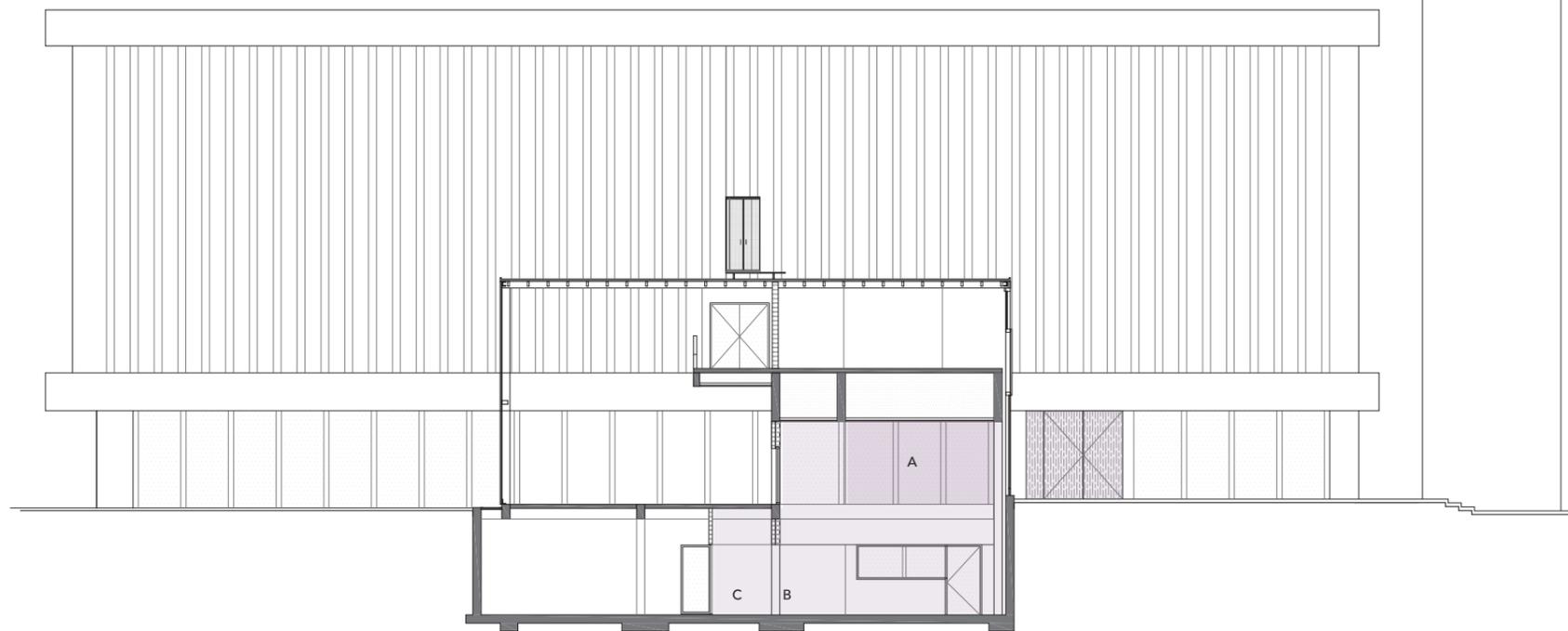
atriums, continuous space, heart of the church



A reception corner, can see through the atrium



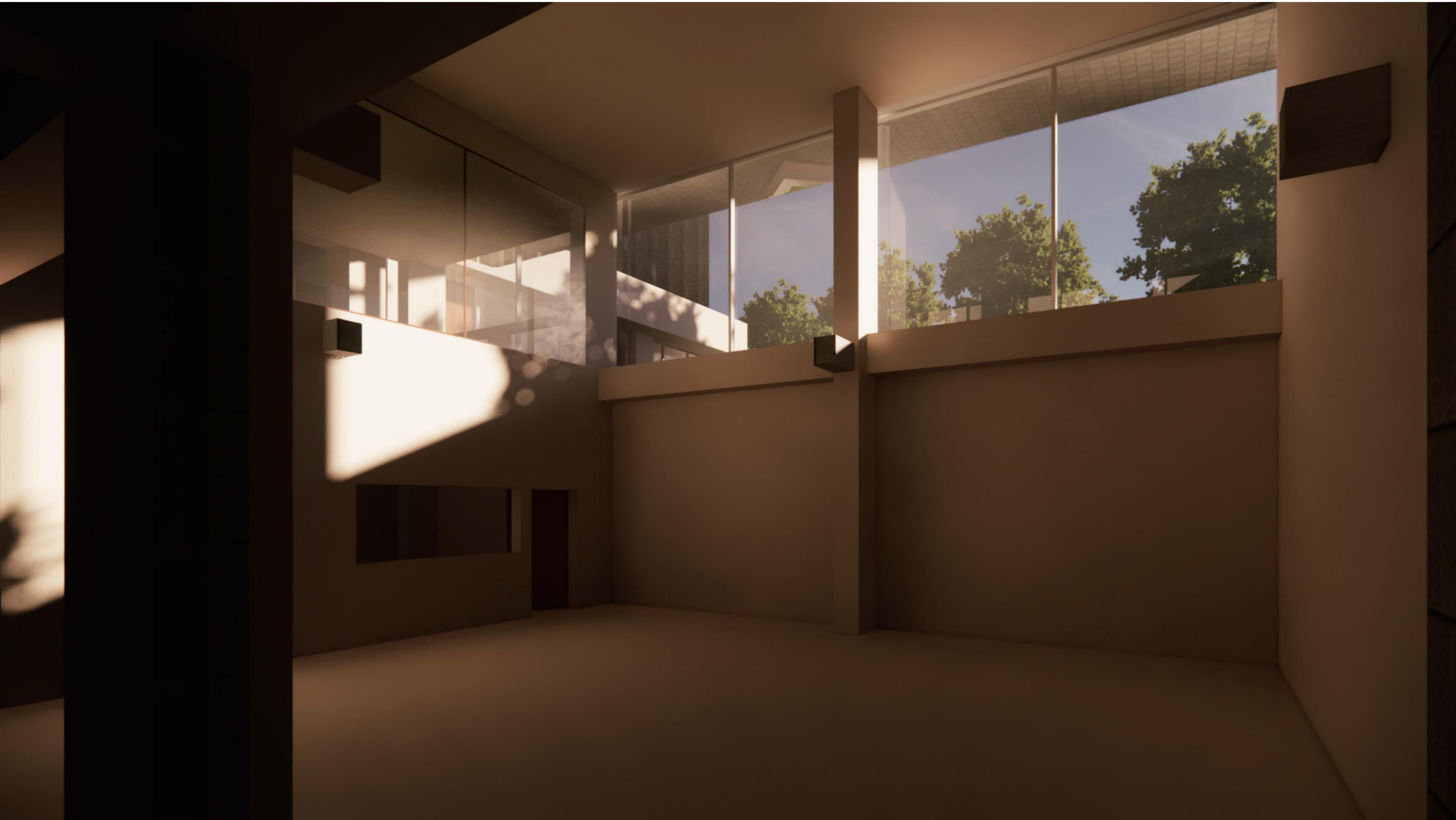
B basement atrium, for gatherings and children



C basement corridor and classrooms

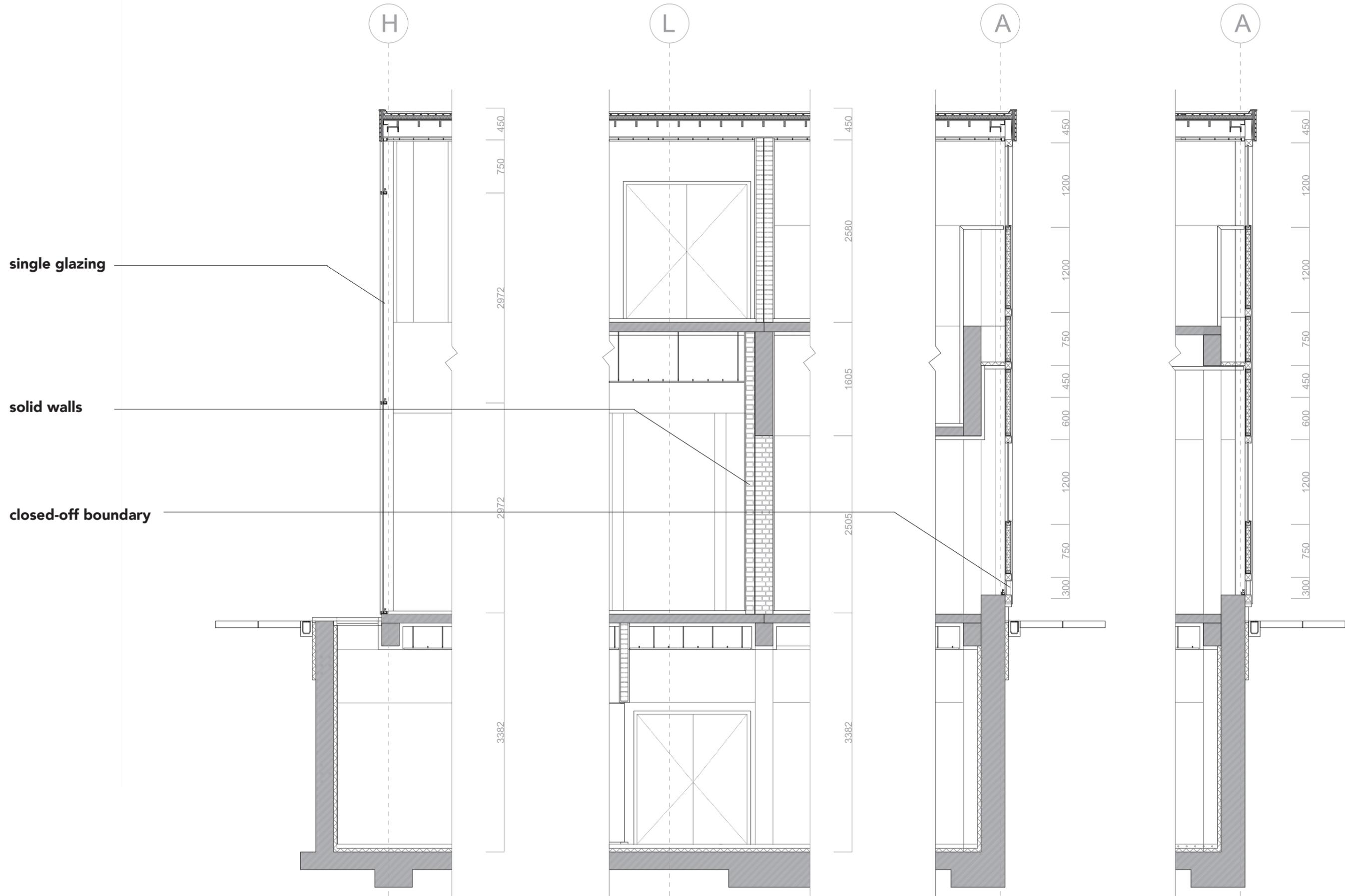
II. plans and sections

new atrium



II. plans and sections

new atrium, an event center with kitchen, playing space; linked to upper floor reception space

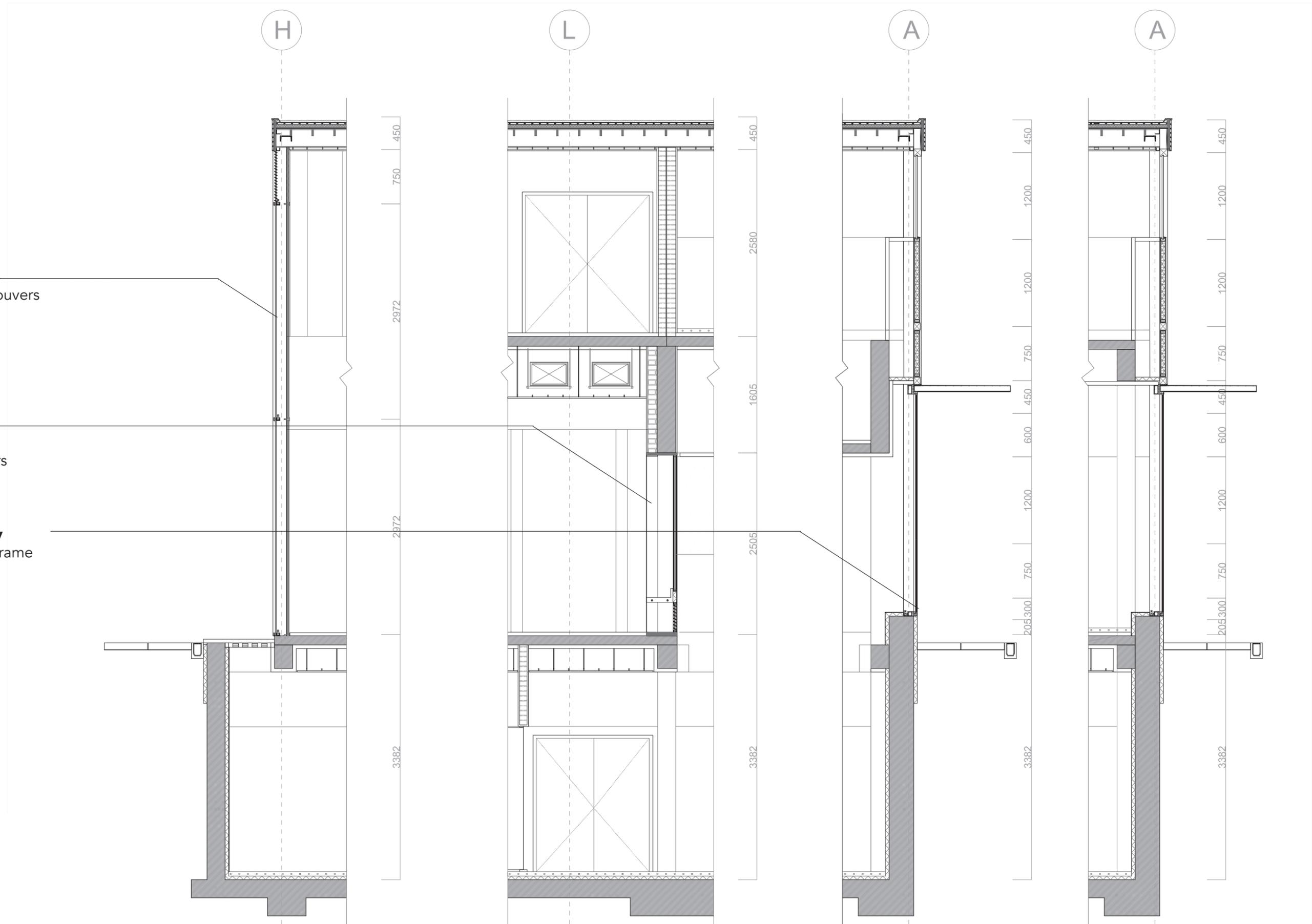


II. plans and sections
the service building renovation

double curtain
with operable louvers

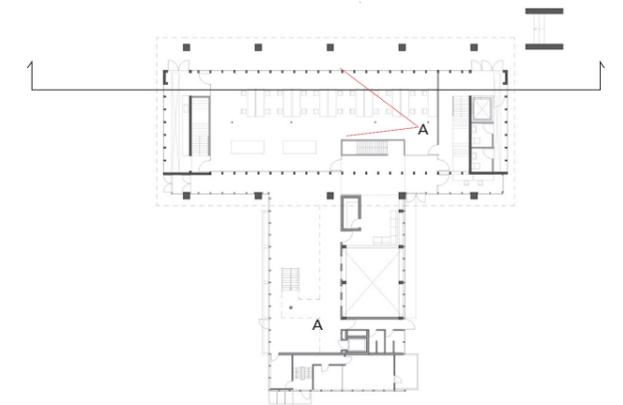
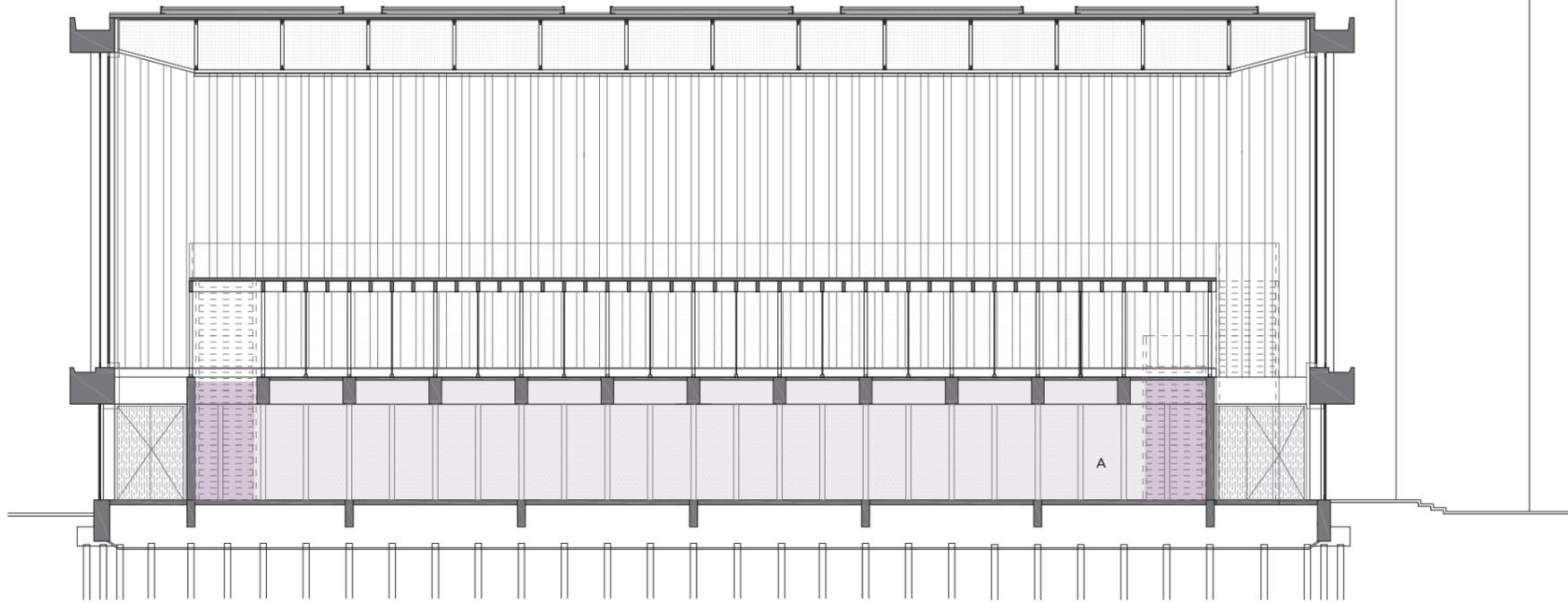
opened walls
with seats
operable louvers

open boundary
with new steel frame
over-hang roof





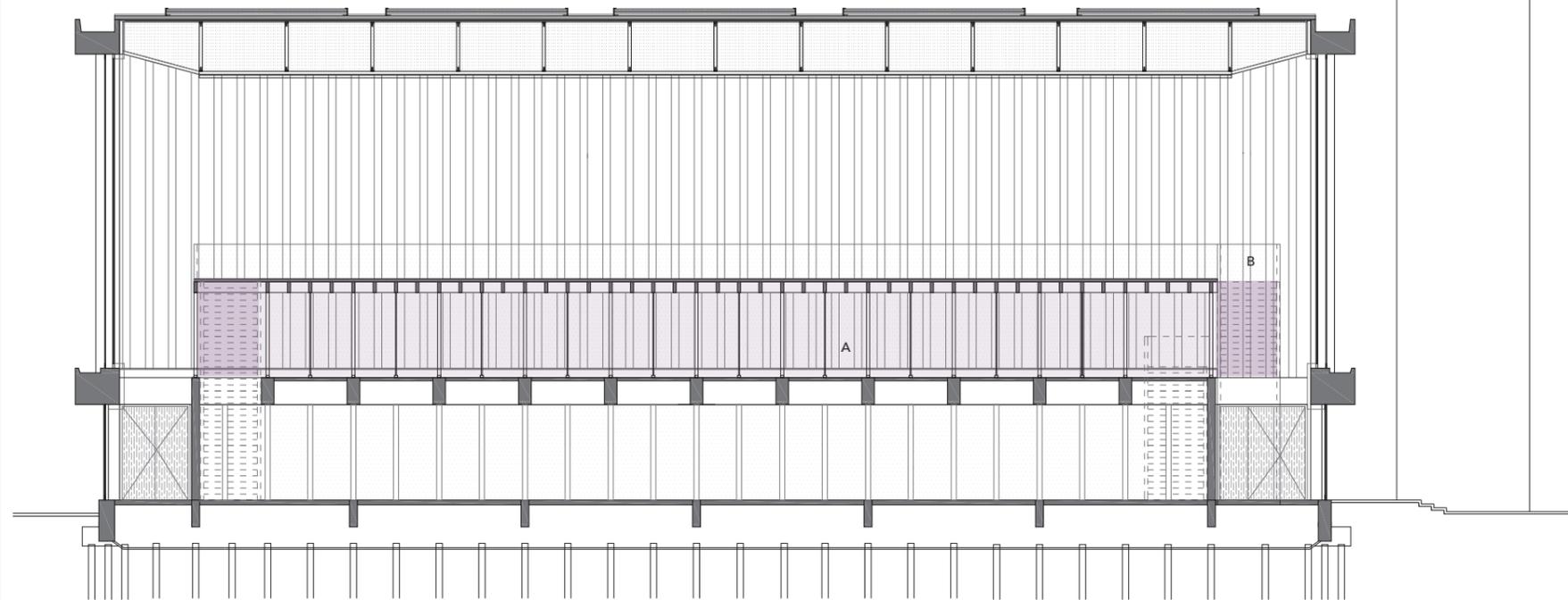
A co-working space



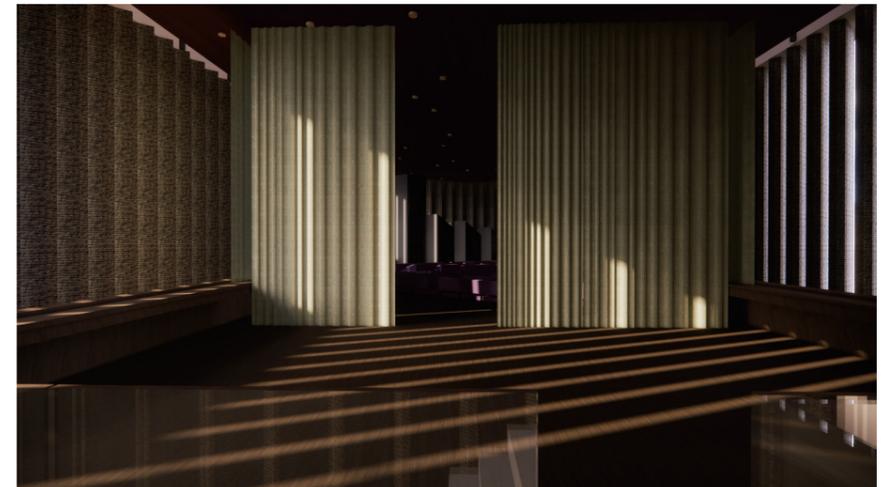


II. plans and sections

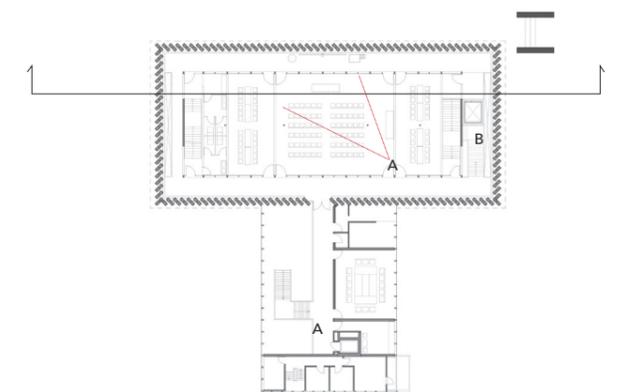
co-working space as a 24 hr light-spot at street corner



A rental rooms for conferences, discussions, lectures



B staircase to the main chapel hall



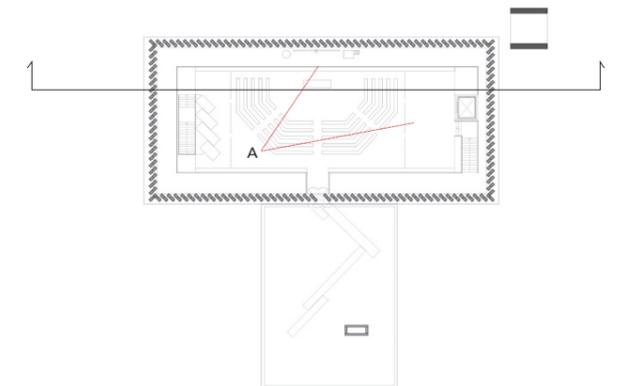
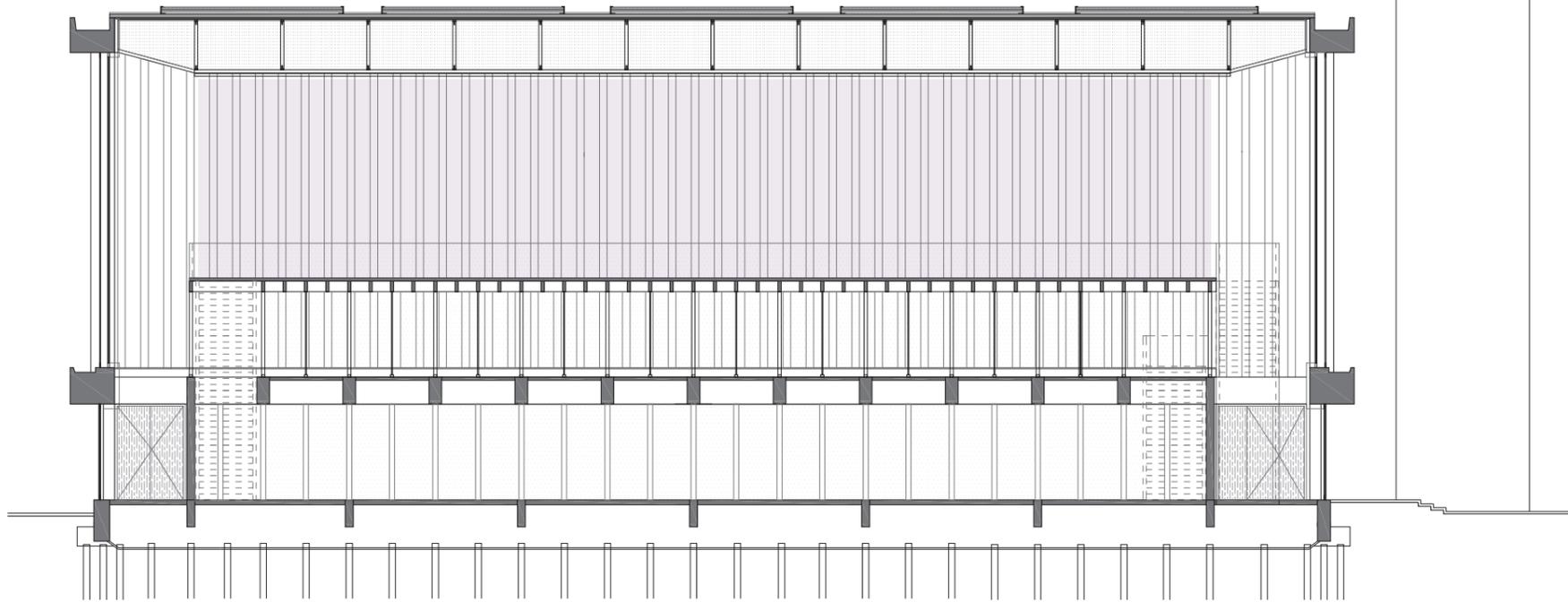
II. plans and sections
rental multi-function rooms



II. plans and sections
staircase to the main chapel hall



A main chapel



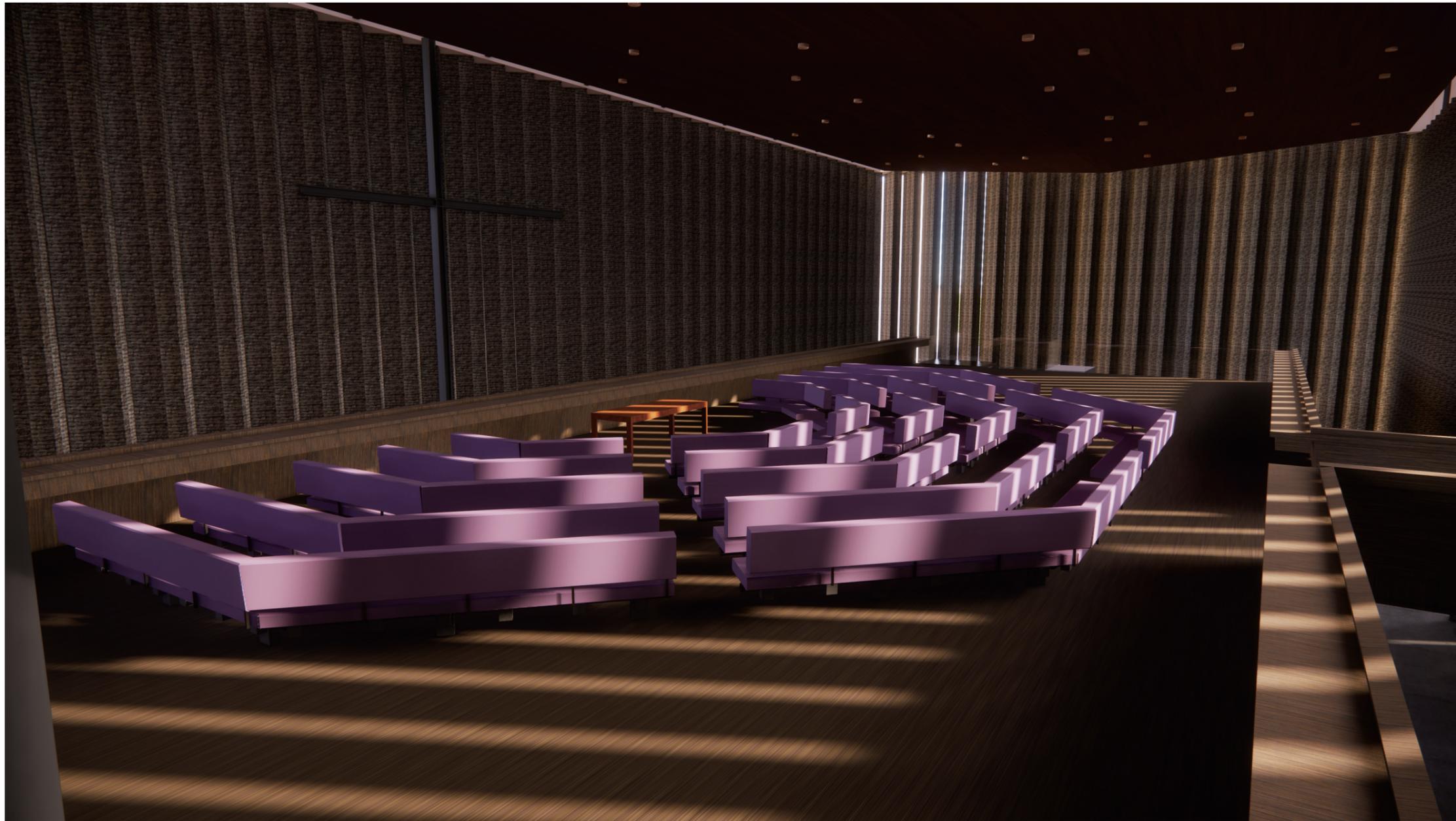
II. plans and sections

the main chapel hall: less used, higher floor, reduced size



II. plans and sections

the main chapel hall: seasonal curtain, reused pews

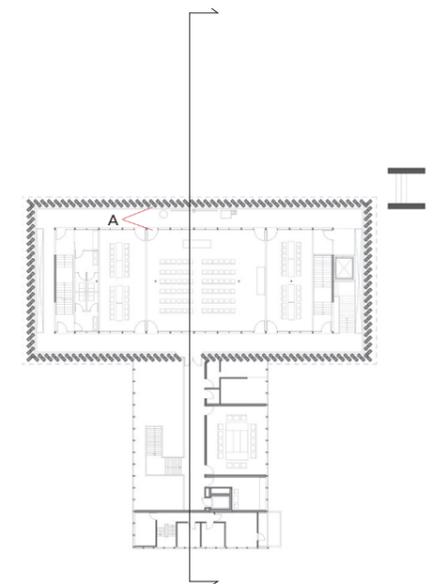
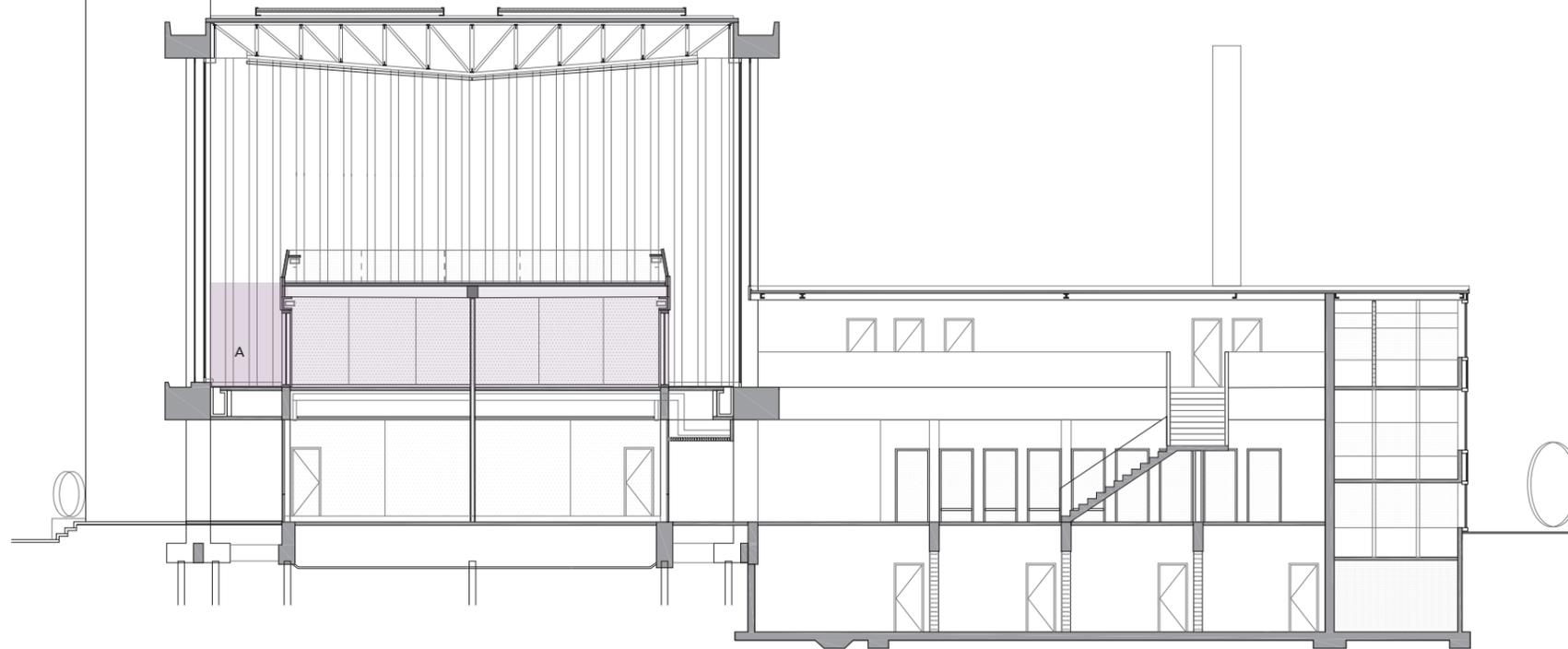


II. plans and sections

the main chapel hall comparison: untouchable distance to the cleared facade



A side gallery walk



II. plans and sections
side gallery walk



II. plans and sections

side gallery walks: rythm of the frame, religious objects

outer envelope: insulate from inside

Goal: $U = 0.13 \text{ W/(m}^2\text{K)}$

concrete slab 100mm + insulation 300mm

$$7.69 = 0.1\text{m}/2.3 + 0.3\text{m}/R_i, \quad R_i = 0.039$$

hemp/ wool/ wood fibre

concrete 200mm + insulation 200mm

$$7.69 = 0.2\text{m}/2.3 + 0.2\text{m}/R_i, \quad R_i = 0.026$$

phenolic/ P.I.R.

single glazing 3mm + air 200mm + double glazing

$$7.69 = 0.003\text{m}/0.7 + 0.2\text{m}/0.027 + 1/R_i, \\ 0.028/R_i = 0.026, \quad R_i = 1.07$$

4+20+4 double glazing with low-e coating, make airtight

brick 450mm (section)

no insulation, value the aesthetic texture

$$\text{total surface: } 45\text{m} \times 140 \text{ pillars} = 6300\text{m}^2$$

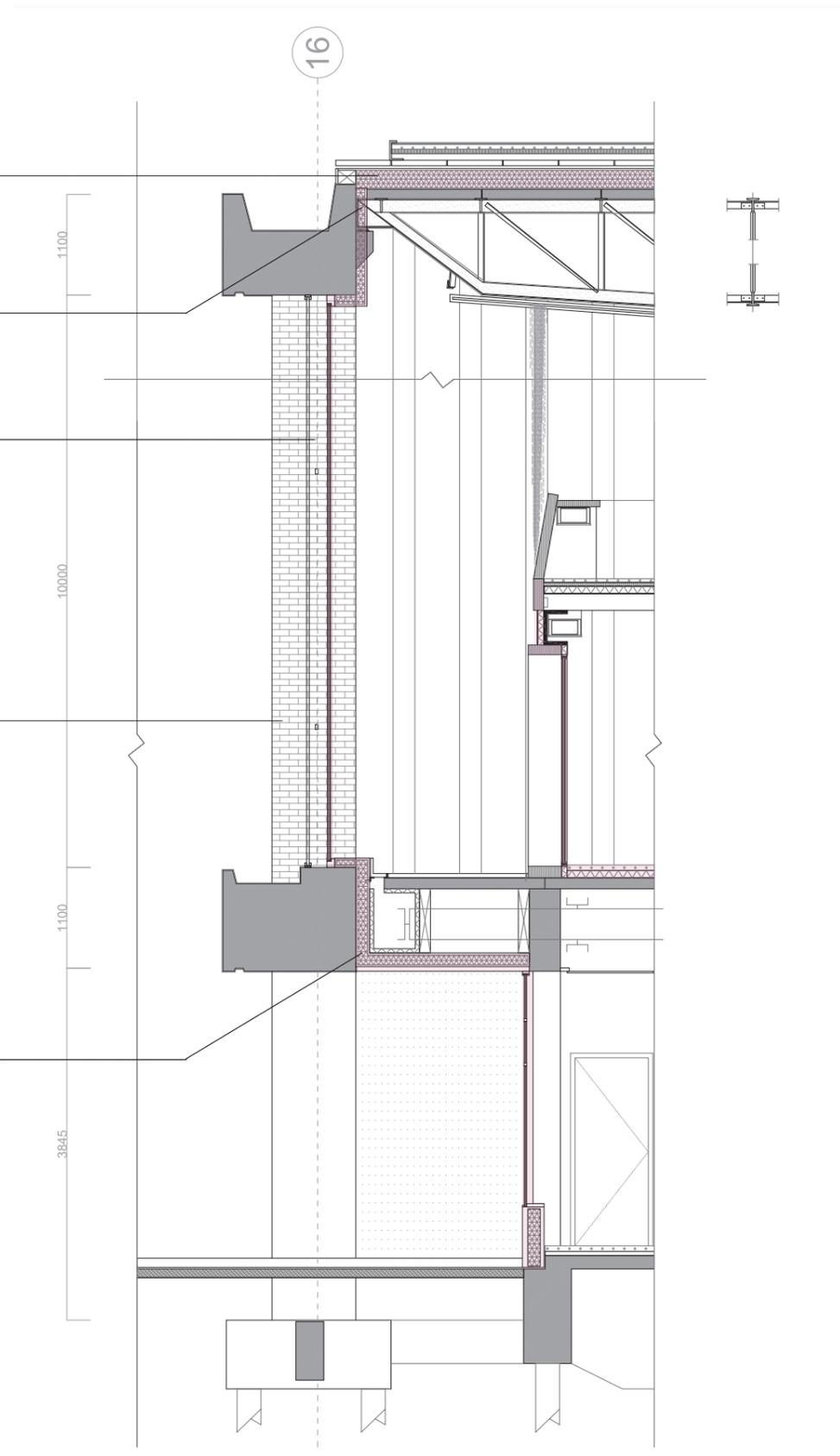
$$R = 4.5\text{m}/0.5\text{W/(m/K)} = 9, \quad U = 1/9 = 0.11$$

winter heat-loss Q: $0.11 \text{ W/m}^2 \times 6300\text{m}^2 \times 25 = 17325\text{W}$
compensate with roof solar panel

concrete 1500mm+insulation 150mm

$$7.69 = 1.5\text{m}/2.3 + 0.20\text{m}/R_i, \quad R_i = 0.028$$

phenolic/ P.I.R.



II. plans and sections

renovation of the chapel volume- insulate from inside

outer envelope: insulate from inside

Goal: $U = 0.13 \text{ W/(m}^2\text{K)}$

concrete slab 100mm + insulation 300mm

$7.69 = 0.1\text{m}/2.3 + 0.3\text{m}/R_i$, $R_i = 0.039$

hamp/ wool/ wood fibre

concrete 200mm + insulation 200mm

$7.69 = 0.2\text{m}/2.3 + 0.2\text{m}/R_i$, $R_i = 0.026$

phenolic/ P.I.R.

single glazing 3mm + air 200mm + double glazing

$7.69 = 0.003\text{m}/0.7 + 0.2\text{m}/0.027 + 1/R_i$,
 $0.028/R_i = 0.026$, $R_i = 1.07$

4+20+4 double glazing with low-e coating

brick 450mm (section)

no insulation, value the aesthetic texture

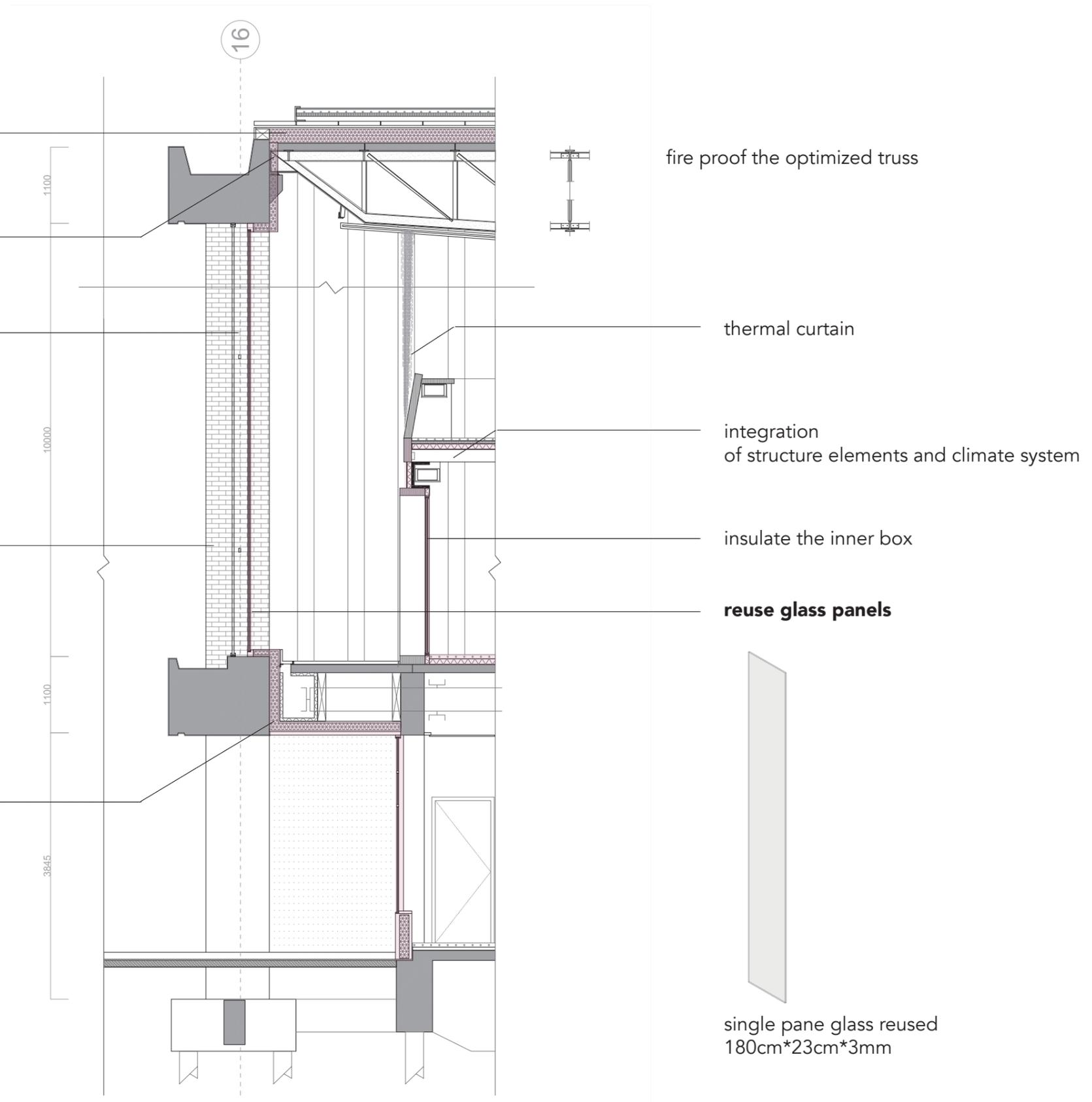
total surface: $45\text{m} \times 140\text{pillars} = 6300\text{m}^2$
 $R = 4.5\text{m}/0.5\text{W/(m}^2\text{K)} = 9$, $U = 1/9 = 0.11$

winter heat-loss Q: $0.11 \text{ W/m}^2 \times 6300\text{m}^2 \times 25 = 17325\text{W}$
compensate with roof solar panel

concrete 1500mm+insulation 150mm

$7.69 = 1.5\text{m}/2.3 + 0.20\text{m}/R_i$, $R_i = 0.028$

phenolic/ P.I.R.



II. plans and sections

renovation of the chapel volume- insulate from inside



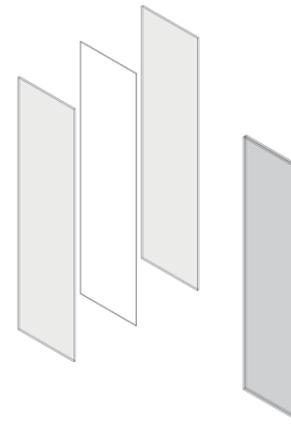
single pane glass reused

180cm*23cm*3mm

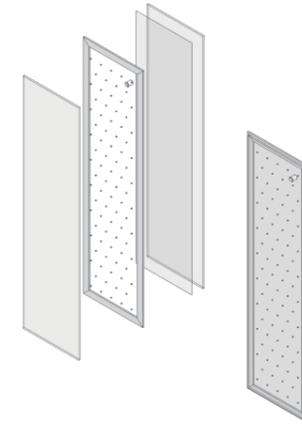
cut into half



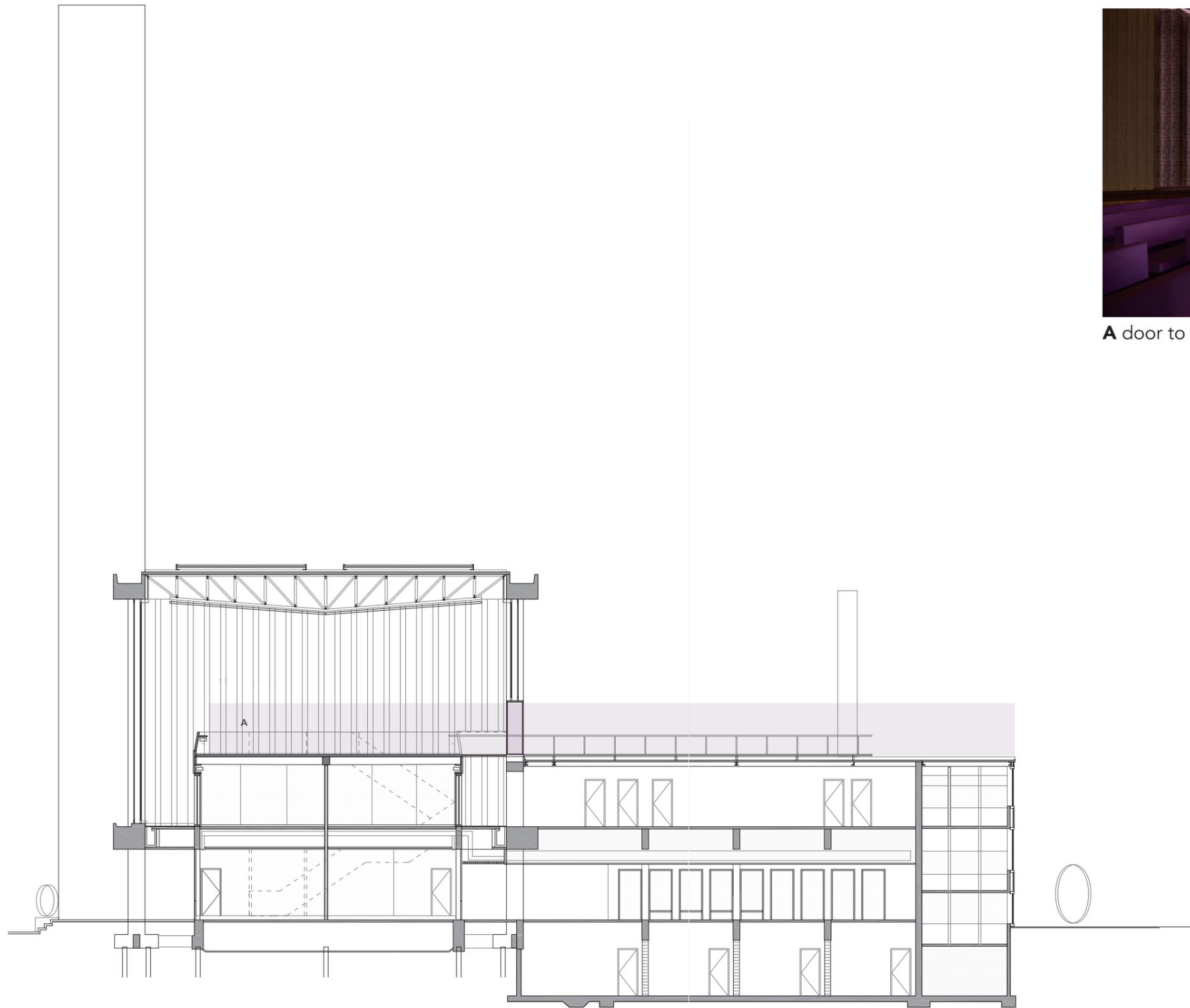
single glass panel



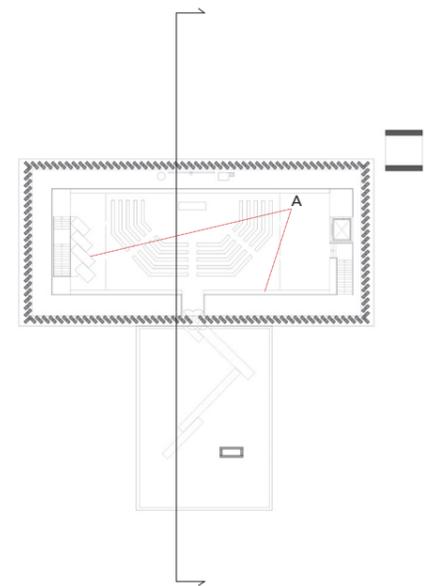
double layers glass panel



vacuumed insulated glass



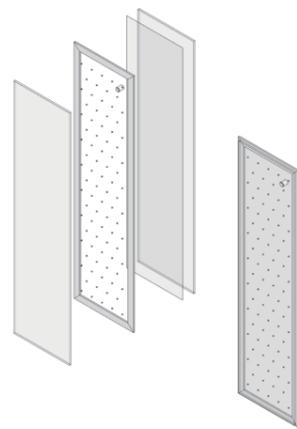
A door to the outside roof



II. plans and sections
break through the volume: paradox



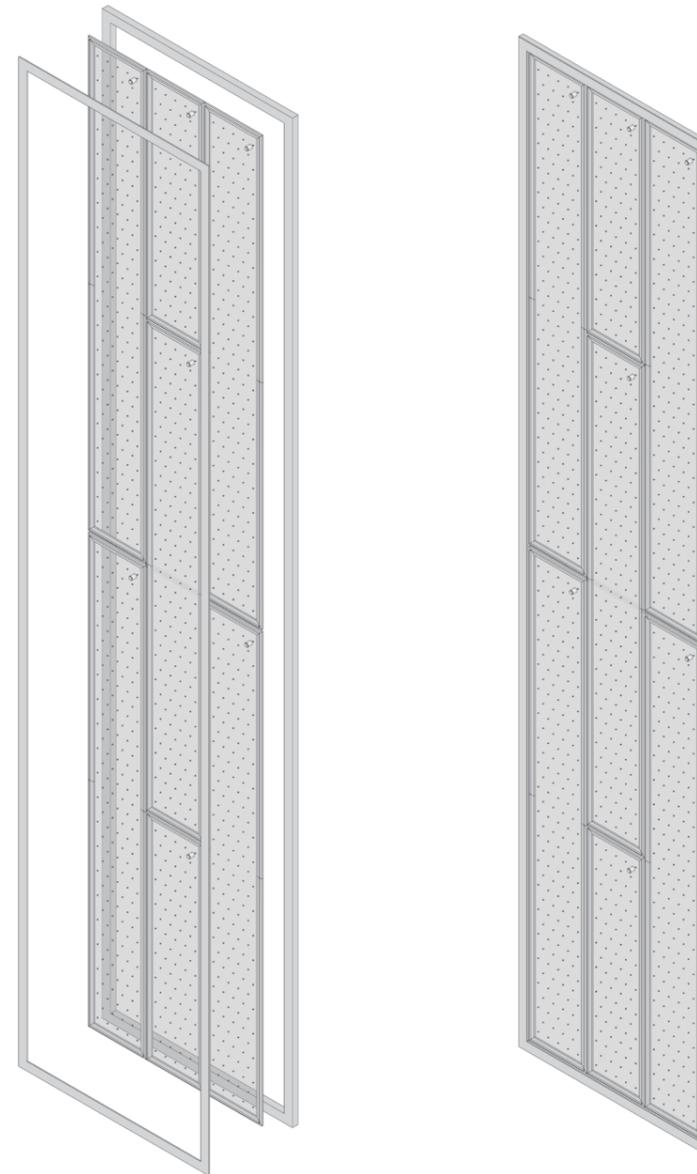
II. plans and sections
light leading through the volume



vacuumed insulated glass

180cm*23cm*3mm
90cm*23cm*3mm

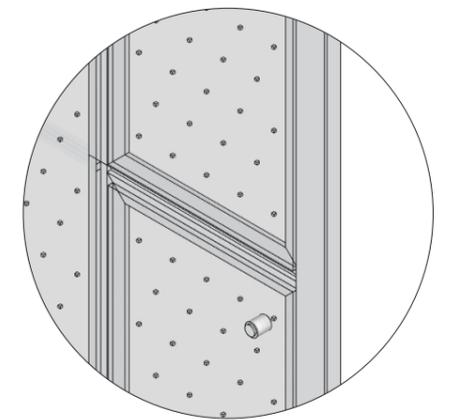
double layers with 2.5mm gap
welded frame, spacing, vacuum point
colored coating in between



door-set glass panel

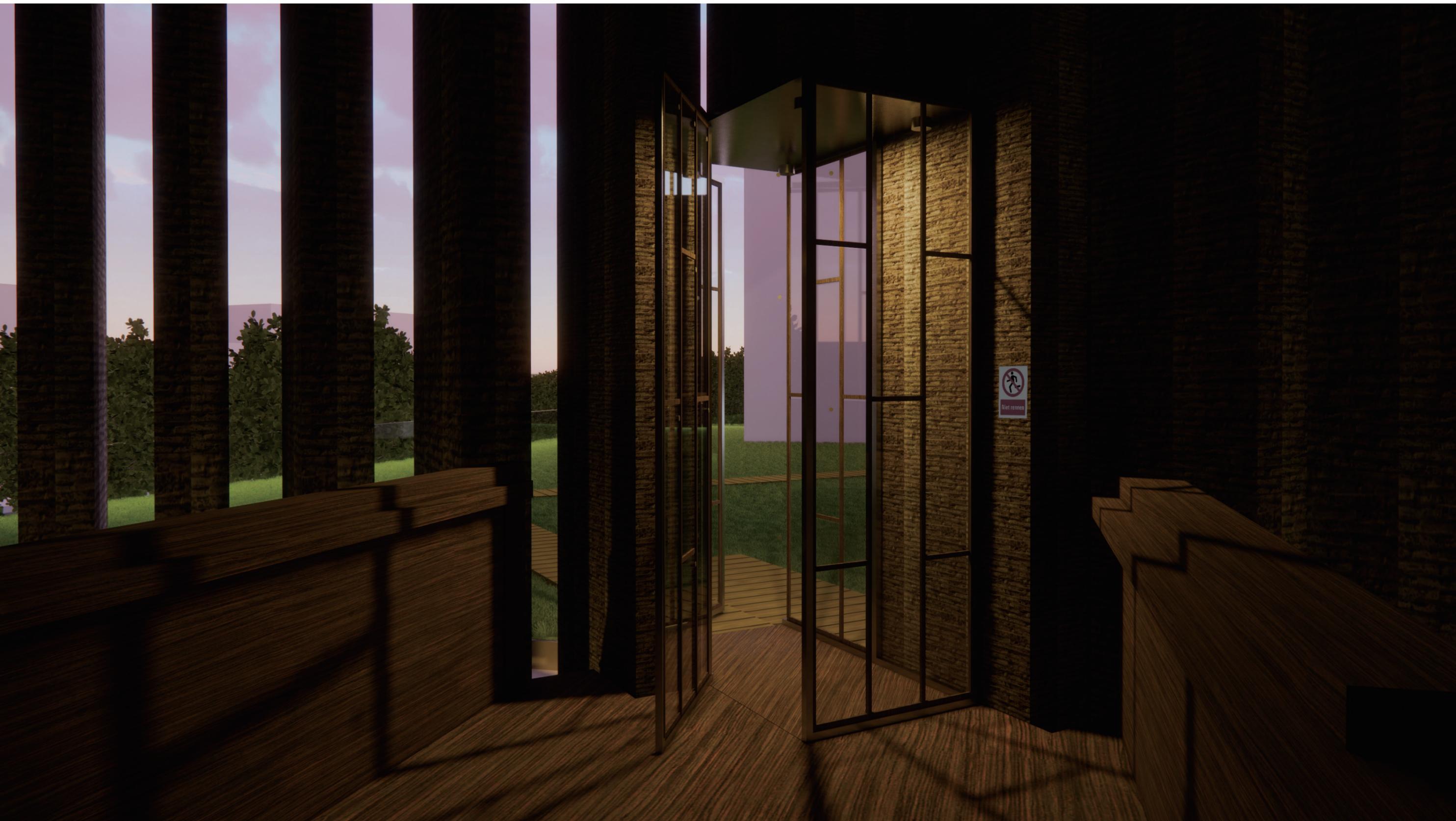
180cm*23cm*9mm panel
90cm*23cm*9mm panel

combination of 2 dimension panels
timber supporting frame (in)
aluminium finishing (out)



ZERO WASTE MATERIAL

door glass panels



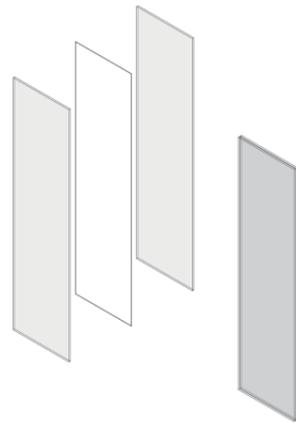
II. plans and sections

passing through to the roof (feel the contrast: light and weight. be reverant, no running)



II. plans and sections

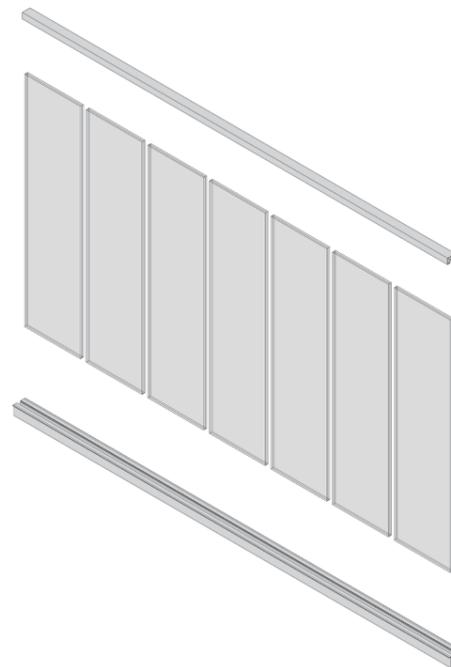
open and quiet dialectic space



double layers glass panel

90cm*23cm*3mm

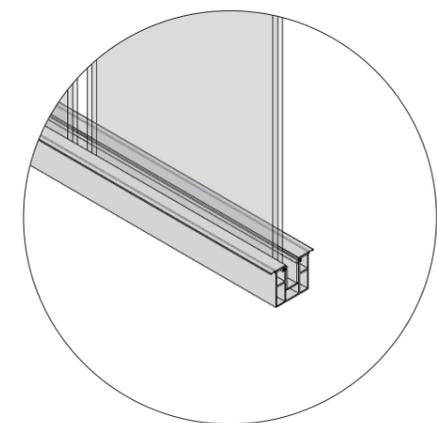
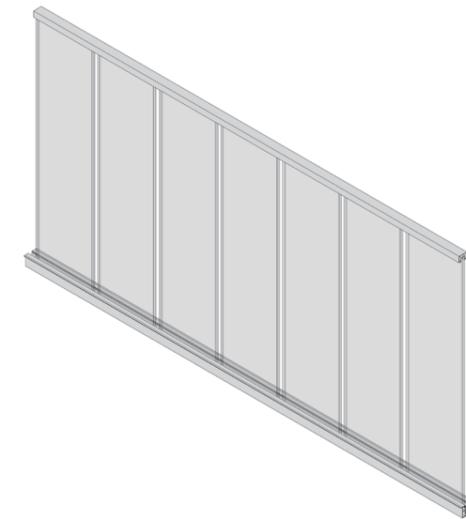
double layered glasses
jointed and laminated
with PVB layer



roof balustrade

180cm width, 90cm height

extruded aluminium foundation
extruded aluminium railing finishing



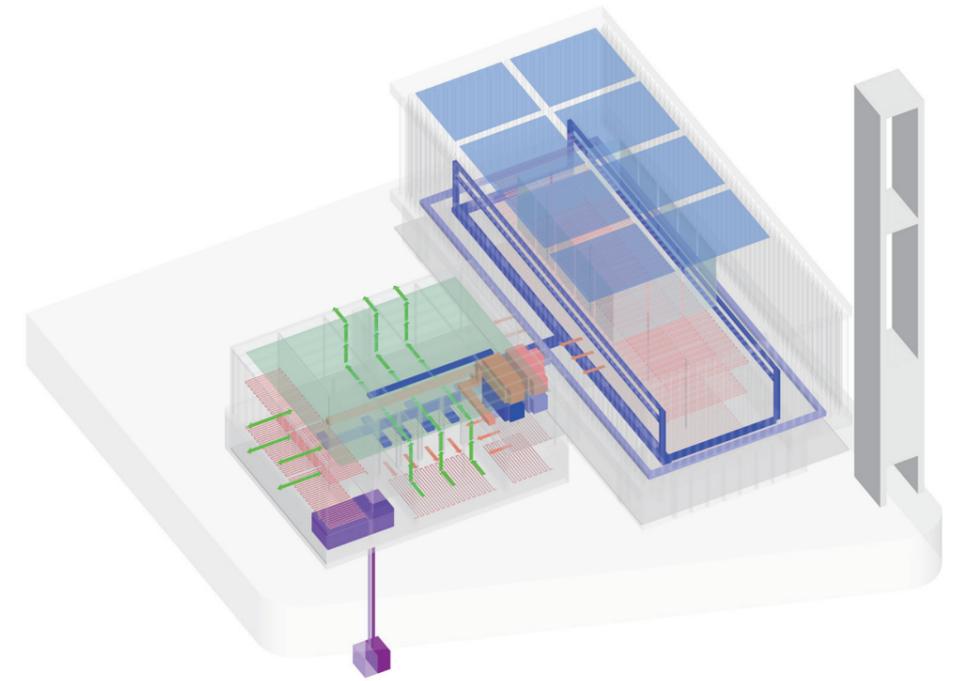


II. plans and sections

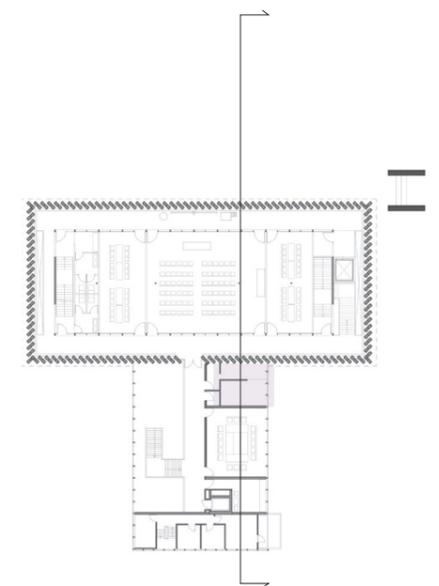
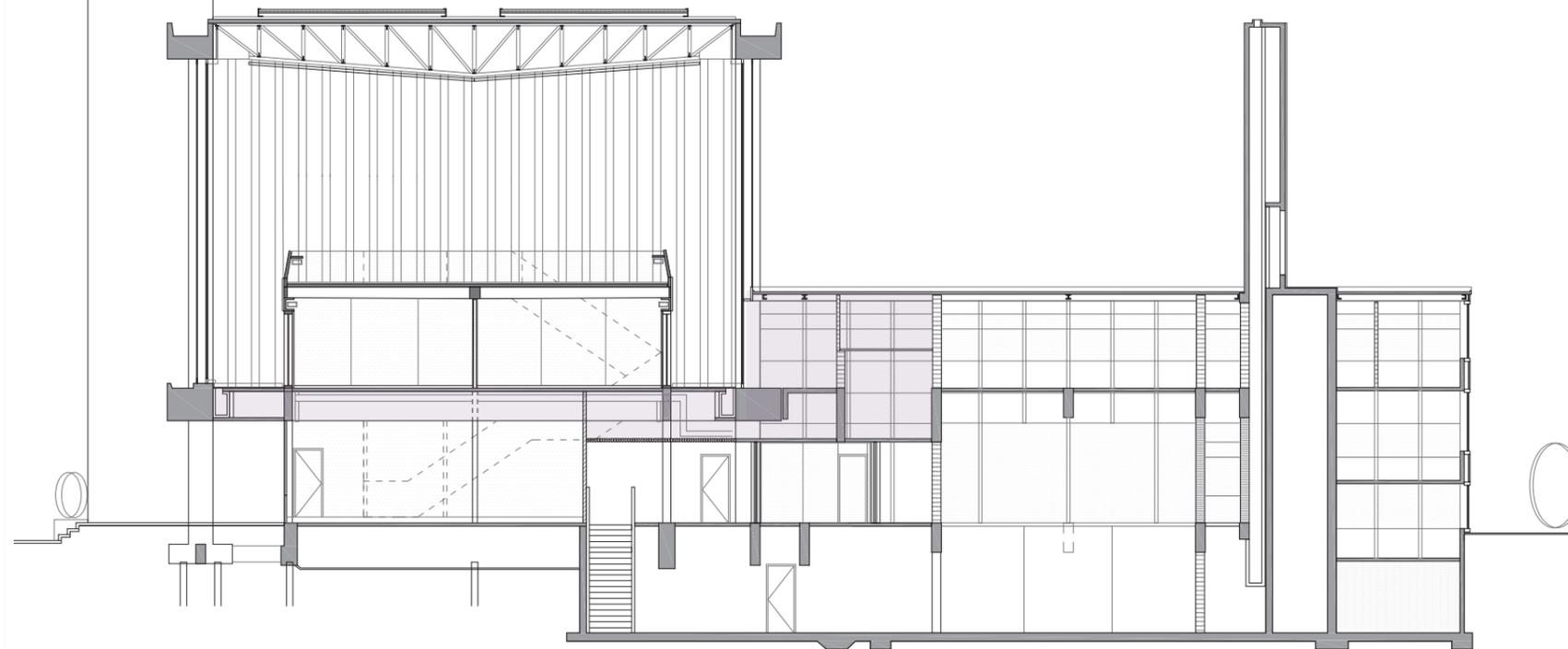
roof deck lands into sadum roof, open and quiet dialectic space

III. construction and materiality

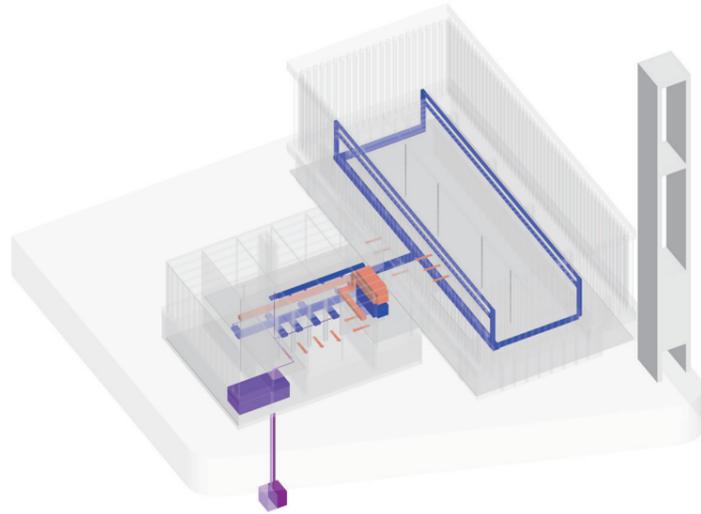
reduce to revitalize, add lightweight and reversable



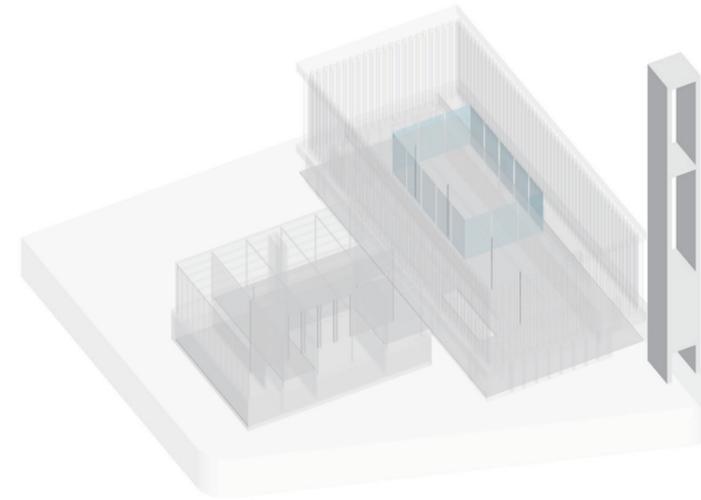
climate scheme



III. construction and materiality
climate system integration

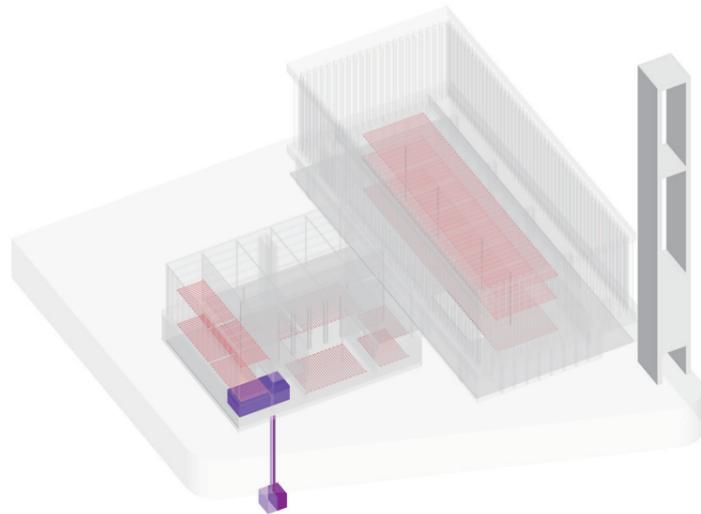
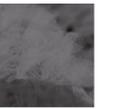


AHU 1:
for daily basis use
natural out to atriums, back to fanroom
preheated by heat pump water

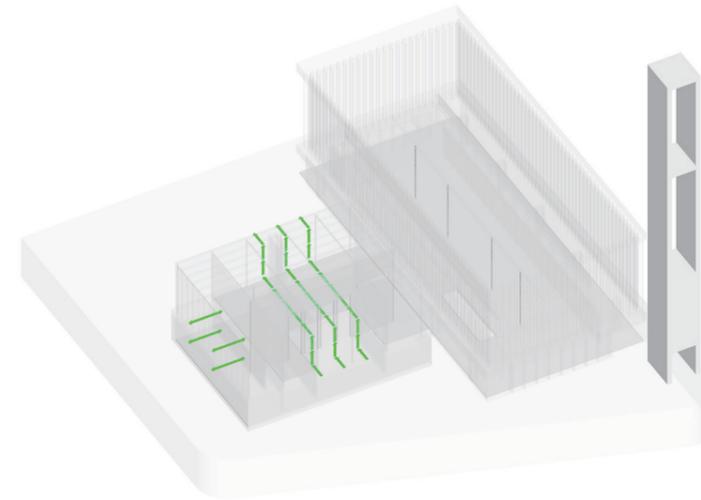


curtains:
break air flow (but not totally hinder)
reduce radiation heat lost

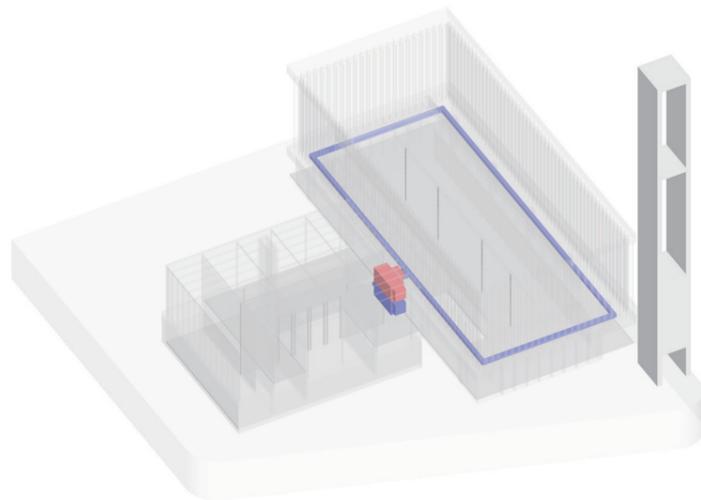
mesh core
glass fiber infilled
fabric finish



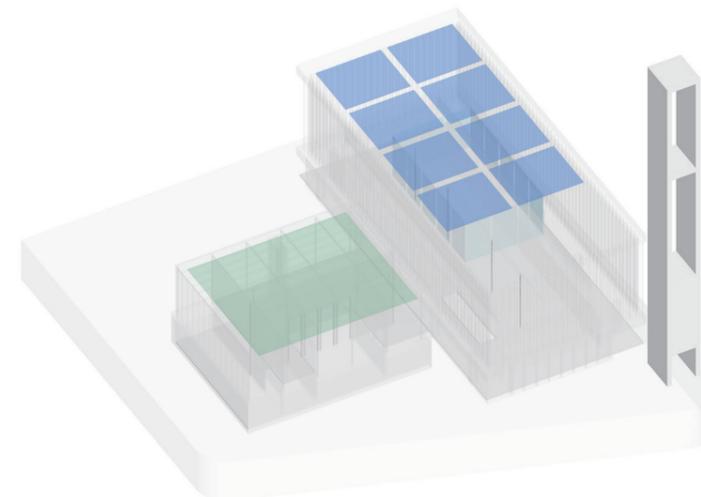
floor heating:
most of the ventilated space
water heat pum combined



cross ventilation:
mid seasons, drive by temperature
operable facade elements



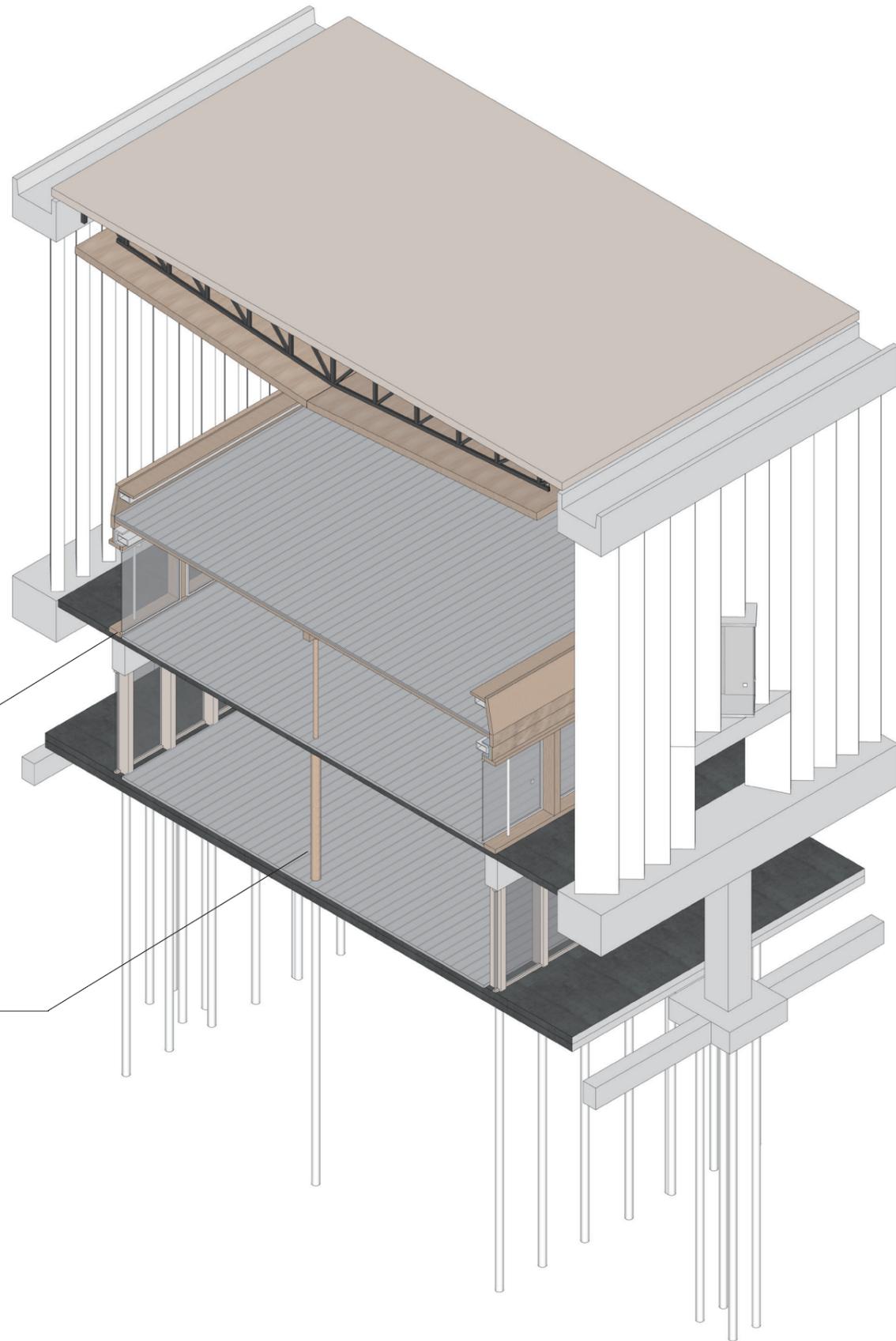
AHU 2 :
extra ventilation in mass gatherings
air flow to break cold air from facade



roof:
pv flat panels
sedum roof for lowering temperature

III. construction and materiality

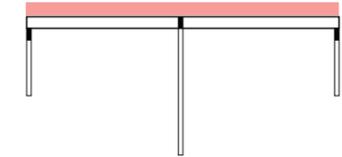
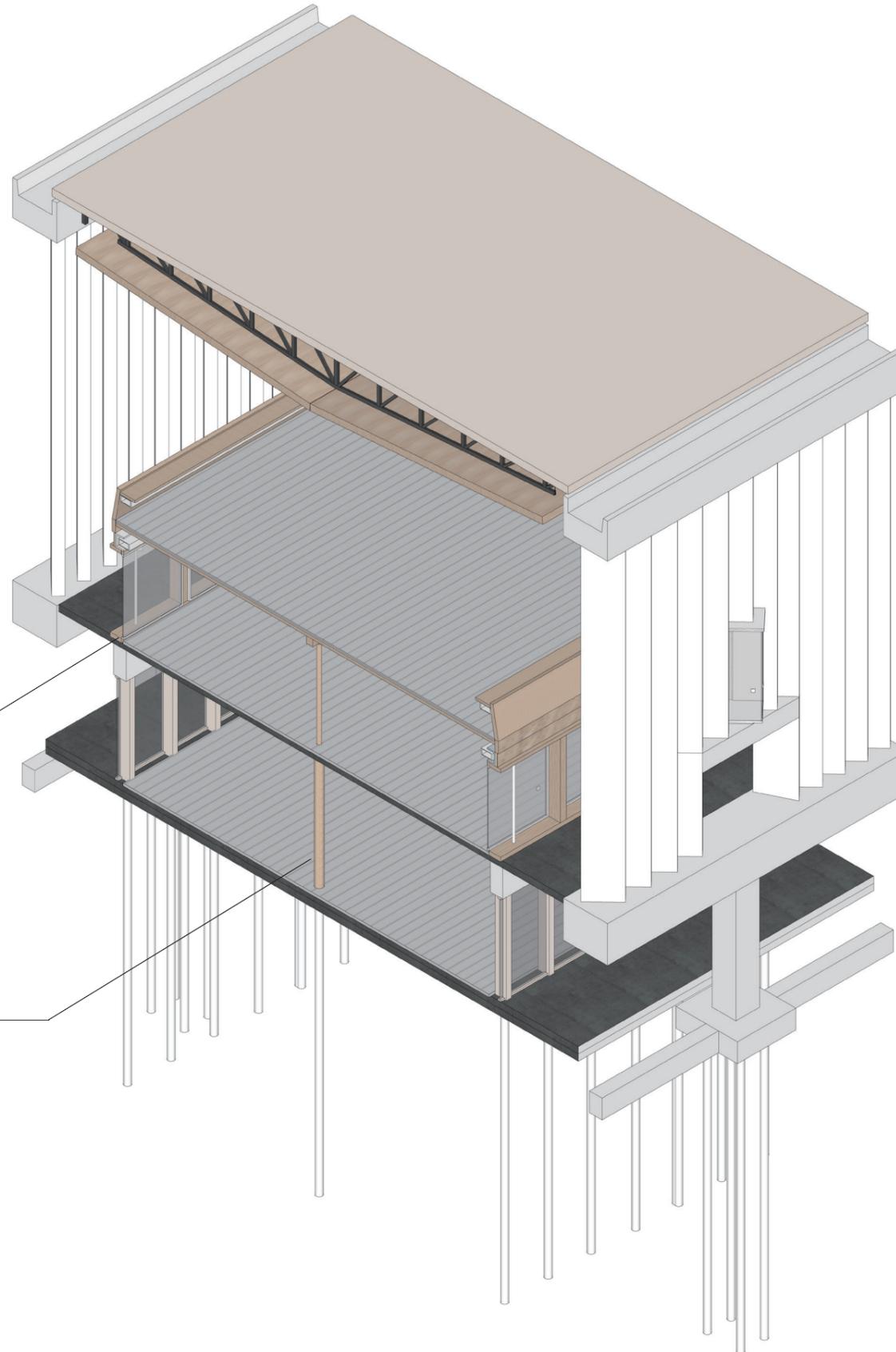
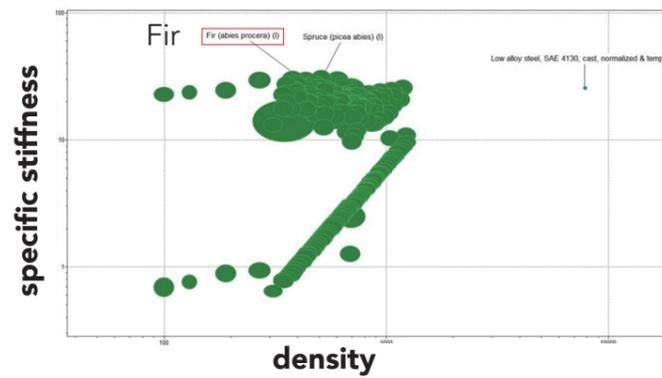
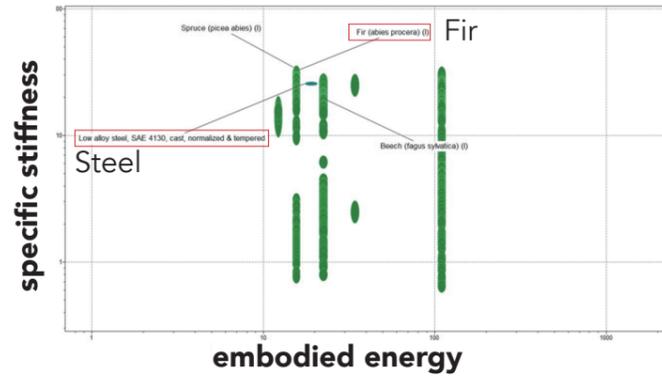
climate system



frame
lightweight, high stiffness,
low embodied energy
goal:
optimized profiles
prefabricated elements
construction sequence

central column
reduce the section
of top floor beams

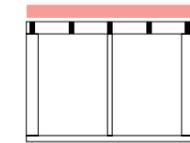
III. construction and materiality
chapel volume fragment



30m*10m
 Load: 3000N/m²
 900000N in total
 central frame: 300000N
 side frames*2: 300000N

central frame: 300000N
 central beam profile dimension: fir
 15cm*24cm

each column carries 60000N
 central beam profile dimension: fir
 580cm*15cm*15cm



side frames*2: 300000N*2
 divide into 12 parts, each part carry
 25000N

in subframe, each column carries 8333N
 steel column profile dimension: steel
 230cm*6cm*6cm
 wood column profile dimension: fir
 230cm*9cm*30cm

on subframe, each beam carries 6250N
 wood beam profile dimension: fir
 580cm*6cm*12cm

on subframe, each floor panel carries
 6250N
 wood panel profile dimension: fir
 580cm*70cm*2cm

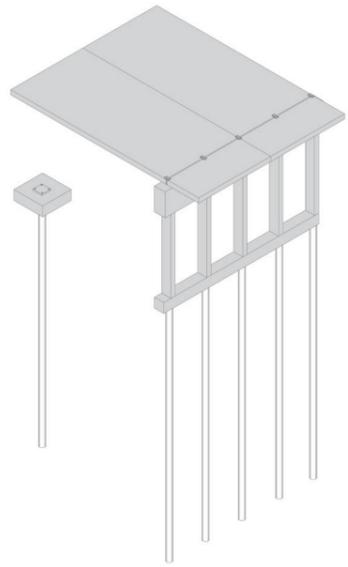
fir wood frame
 lightweight, high stiffness,
 low embodied energy
goal:
 optimized profiles
 prefabricated elements
 construction sequence

central column
 reduce the section
 of top floor beams

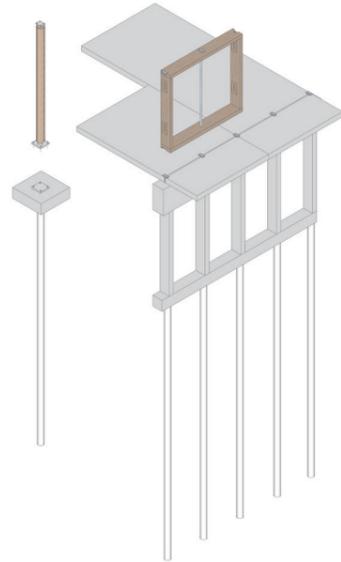


III. construction and materiality

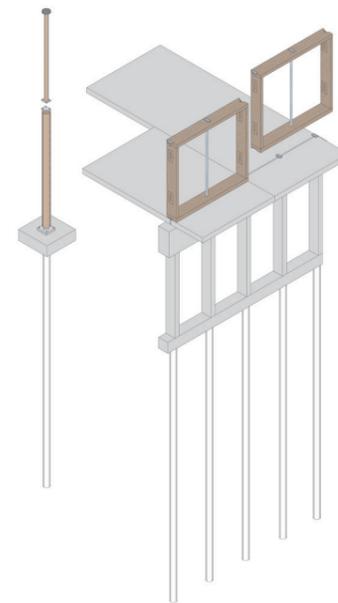
chapel volume fragment



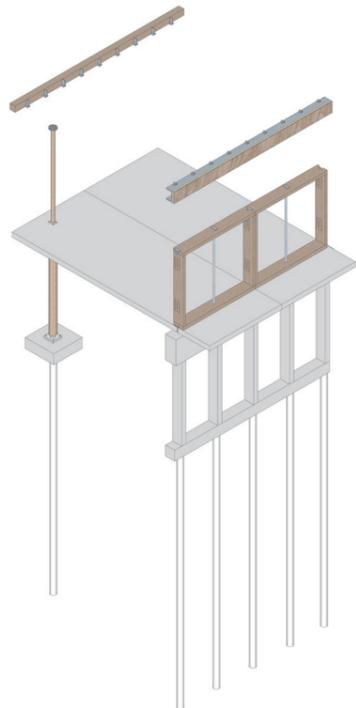
joints:
put in joints in column base
put in joints in concrete floors



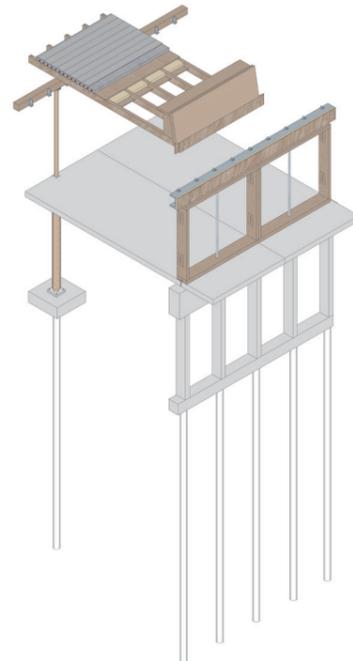
units:
base column unit (larger section)
frame unit (timber+steel composite)



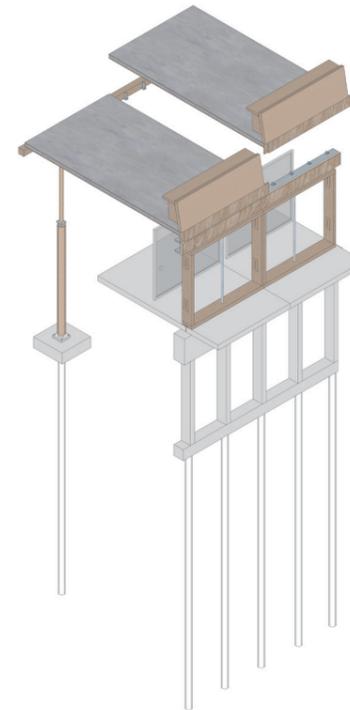
units 2:
upper column unit (smaller section)
frame unit (fasten in-between)



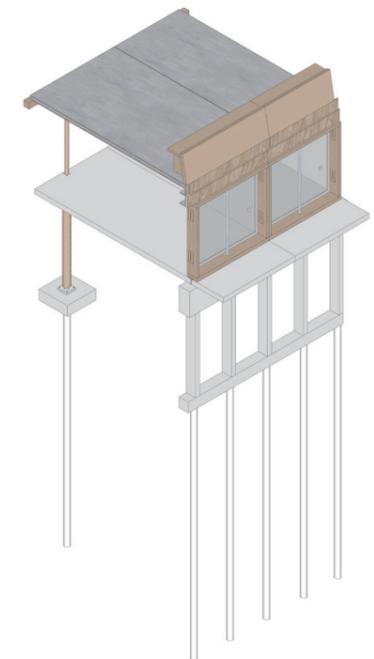
beam with joints:
wood timber central beam
steel side beam with insulation



floor with side wall:
floor units with structural frame
insulation and panel layerings



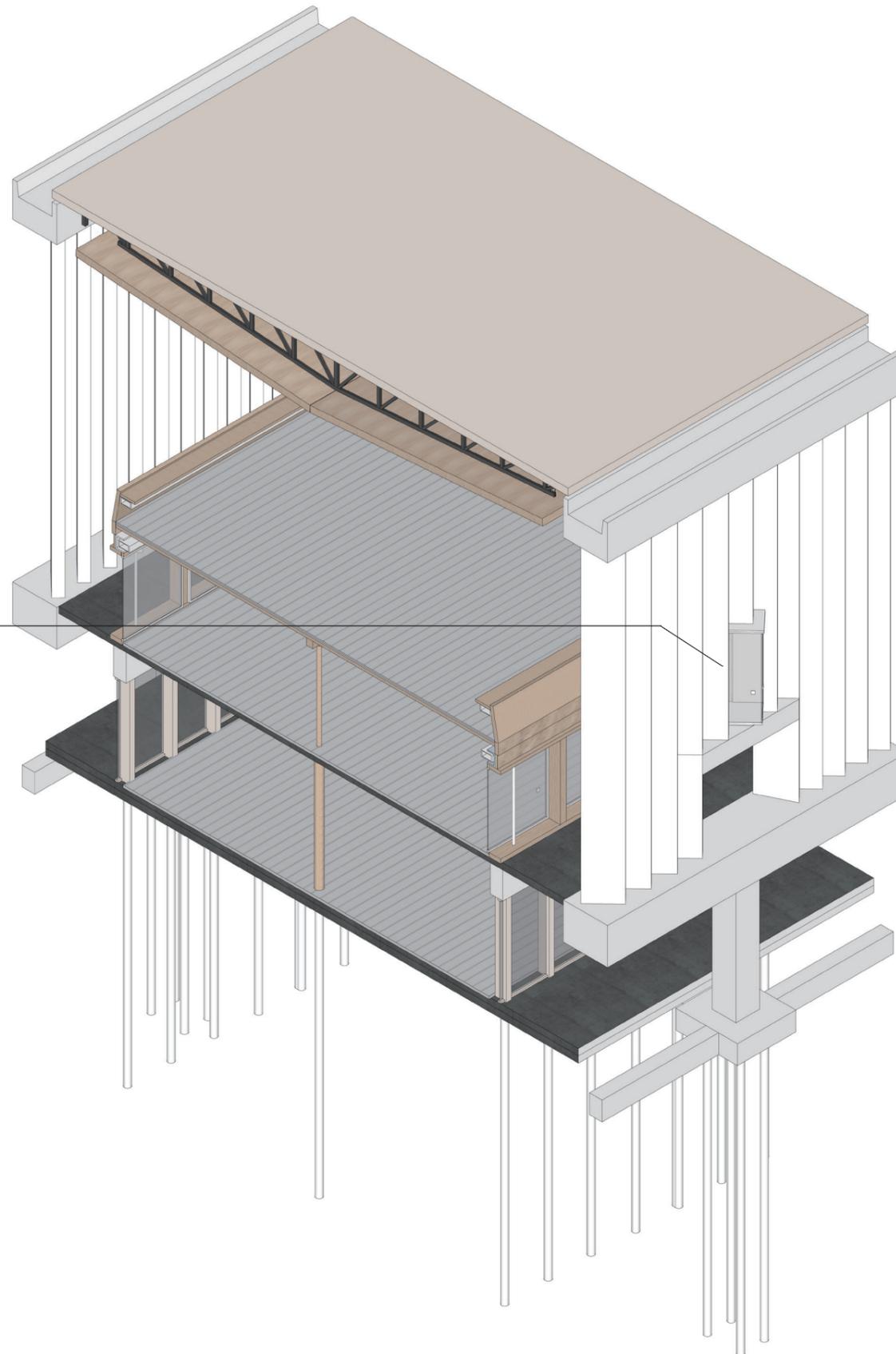
infill glass and frame:
fasten on insulated materials



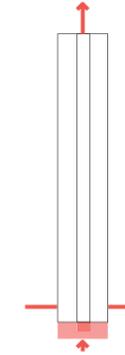
final

III. construction and materiality

construction sequence chapel box (reversible)



door to the roof
 lightweight
 glass and aluminium
 construction sequence

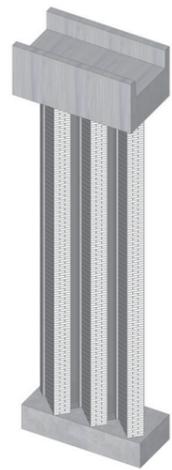


a layer of brick and cement:
 brick $0.1\text{m} \times 0.2\text{m} \times 0.04\text{m} \times 12 = 0.0096\text{m}^3$
 $0.0096 \times (1500 \sim 1800) = (14.4 \sim 17.28)\text{kg}$
 cement:
 $(0.3136 - 0.24) \times 0.04 +$
 $0.24 \times 0.01 = 0.005344\text{m}^3$
 $0.005344 \times 1440 = 7.69\text{kg}$
 $7.69 + 17.28 = 24.97\text{kg}$
91 layers of remaining hanging pillar:
 $91 \times 24.97 = 2272.75\text{kg}$

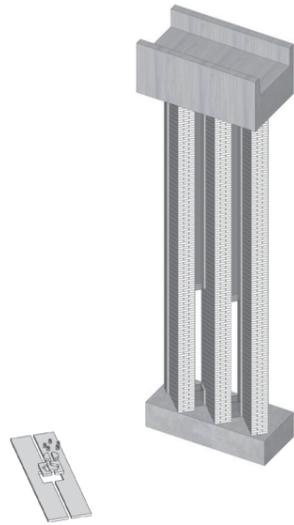
steel rod*5
 $5 \times 3.14 \times 0.01\text{m} \times 0.01\text{m}$
 $= 5 \times 0.000314 \times 4.54\text{m}$
 $= 0.007127\text{m}^3$
 $0.007127 \times 7700 = 54.88\text{kg}$

total weight a remained pillar
 $= 54.88 + 2272.75 = 2327.63\text{kg} = 232.76\text{N}$
 each rod carry 46.4N,
maximum deflection=0.003mm

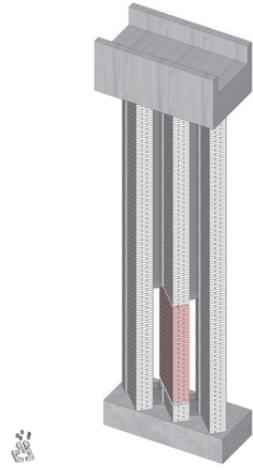
cement and the joints under a same tension will break, unless extra compression from beneath (risks in process)



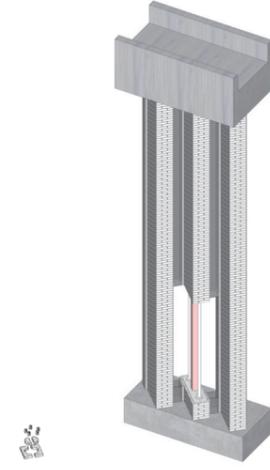
original



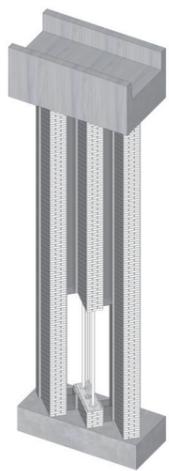
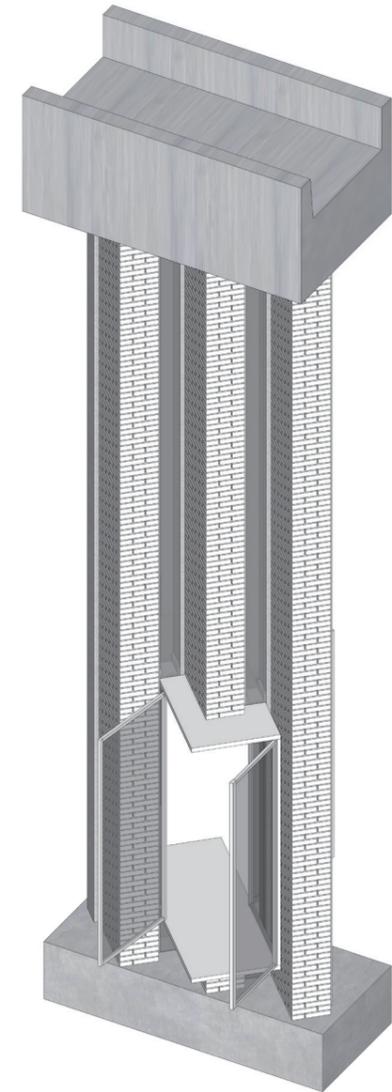
take out glass



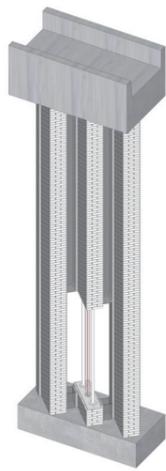
put in steel panels



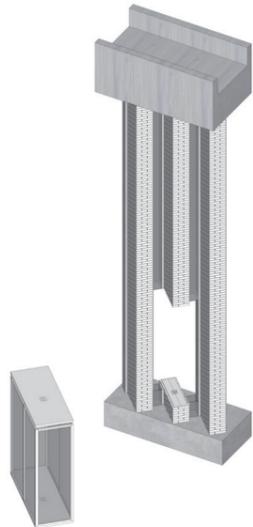
take out brick



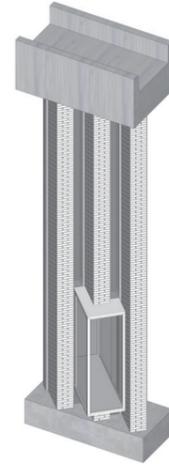
temporal structure
take out cement



take out steel
fasten bolts with pressure

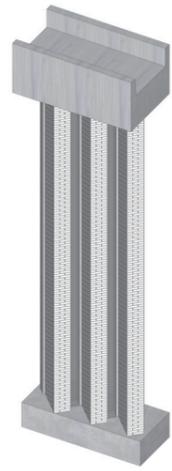


put in door cell

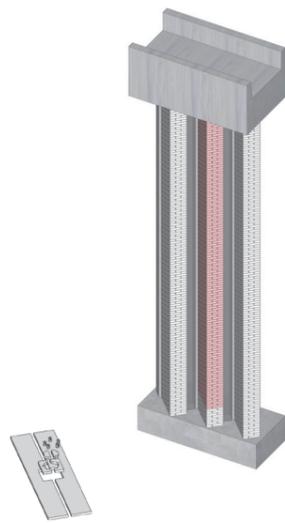


final

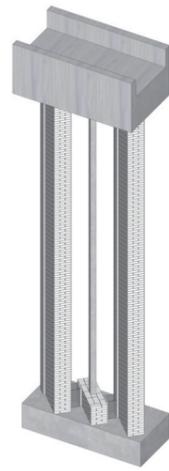
III. construction and materiality
construction sequence roof door 01



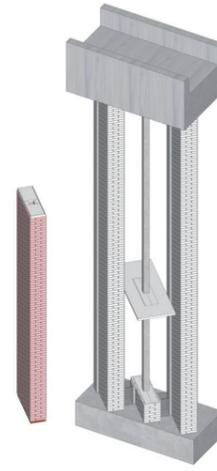
original



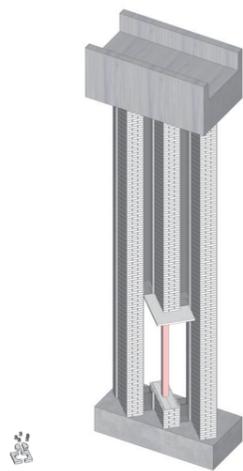
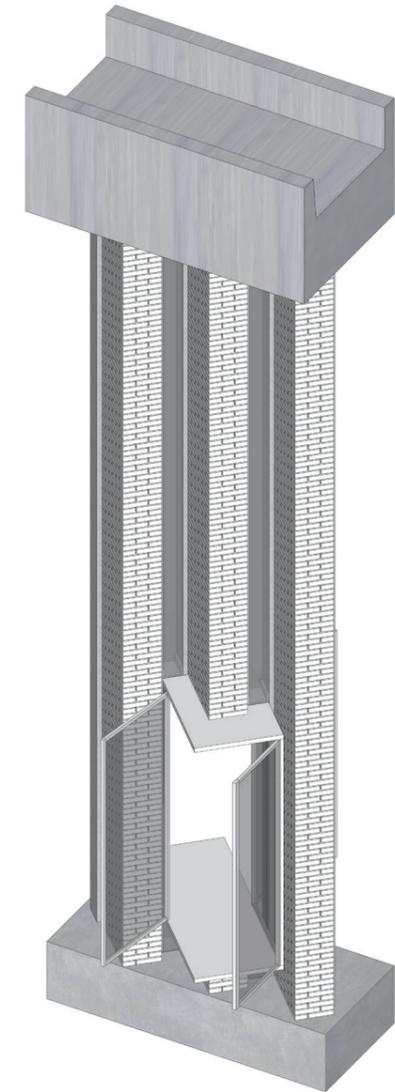
take out brick
from above



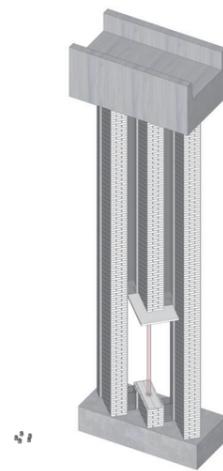
put in down panel



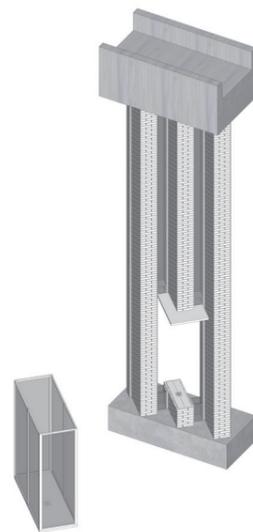
put in prefabricated
unit with claddings



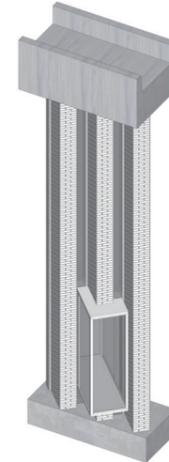
rebuild glass
take out cement



take out steel
fasten bolts with pressure



put in door cell

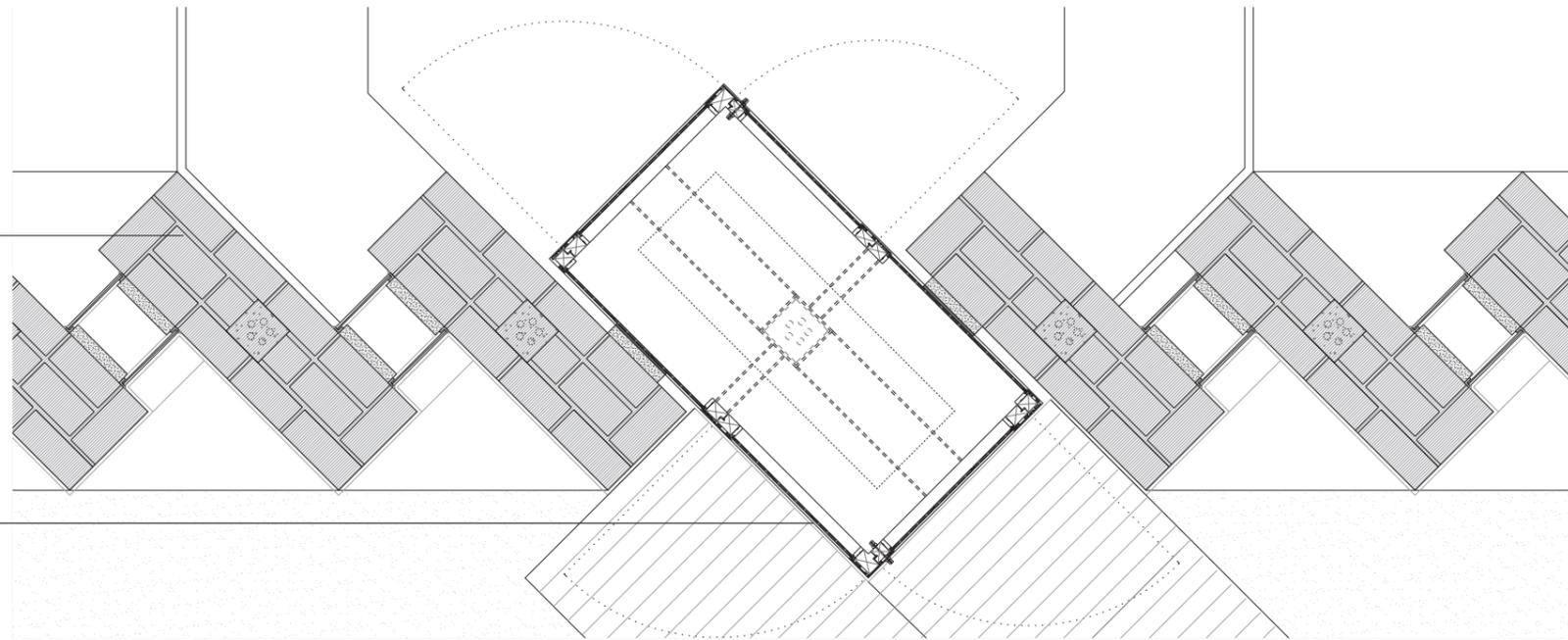


final

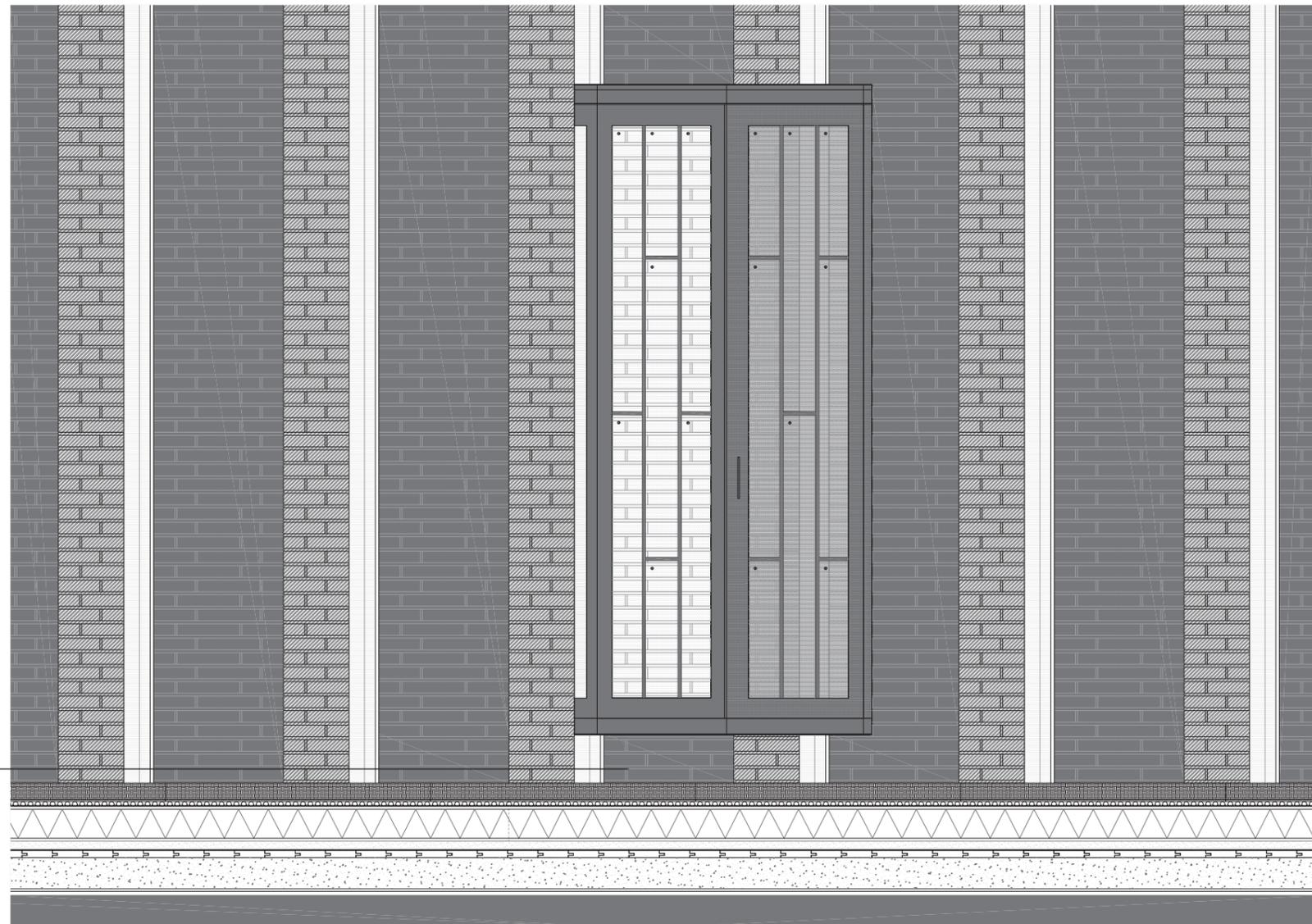
III. construction and materiality
construction sequence roof door 02

original pillars
5*10*20cm bricks
cement core
steel rods

double open doorset
timber sub frame
glass panels



30cm gap to the sedum roof
connecting to a timber ramp

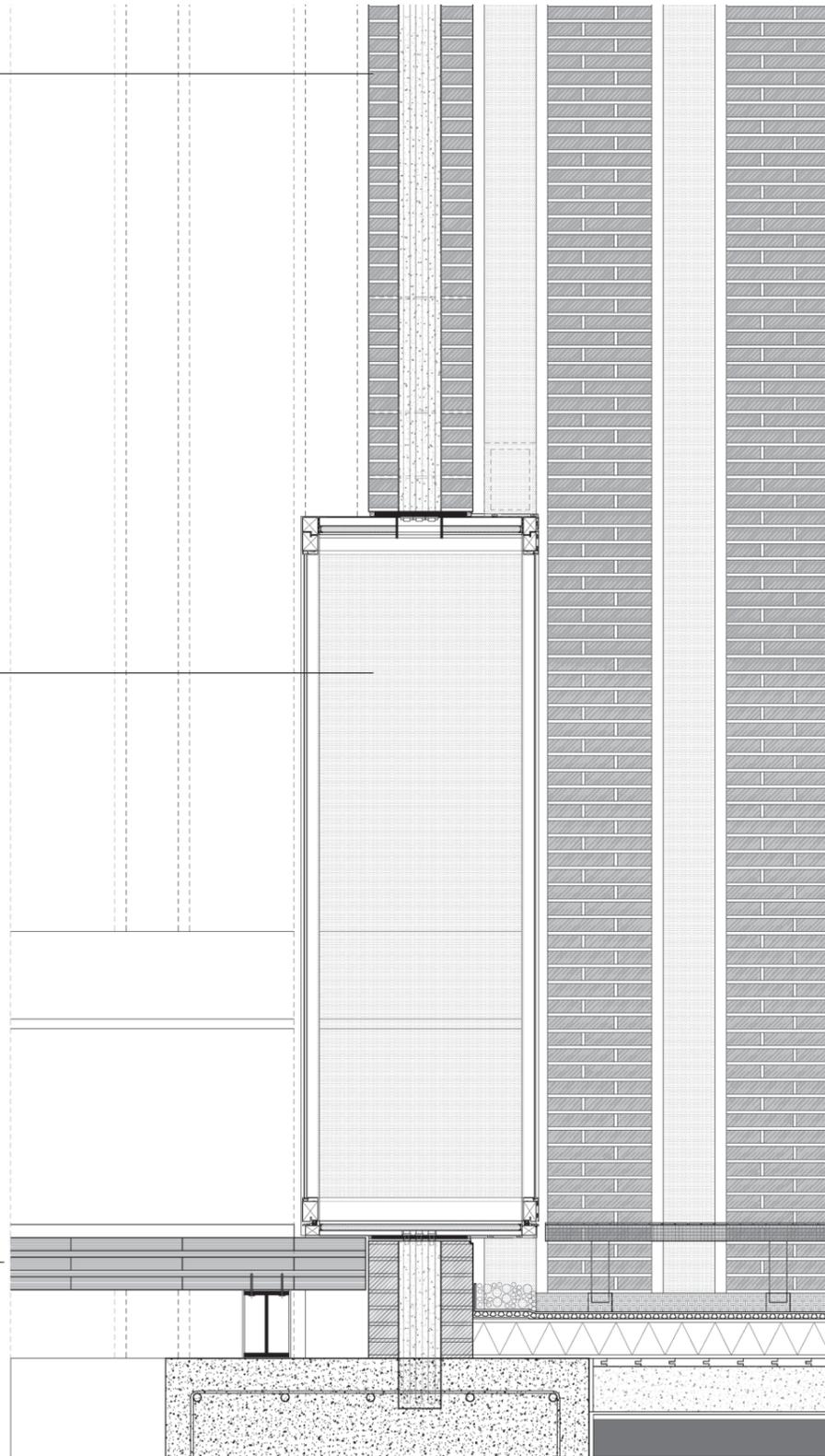


III. construction and materiality
roof door detail plan and elevation

full brick pillar

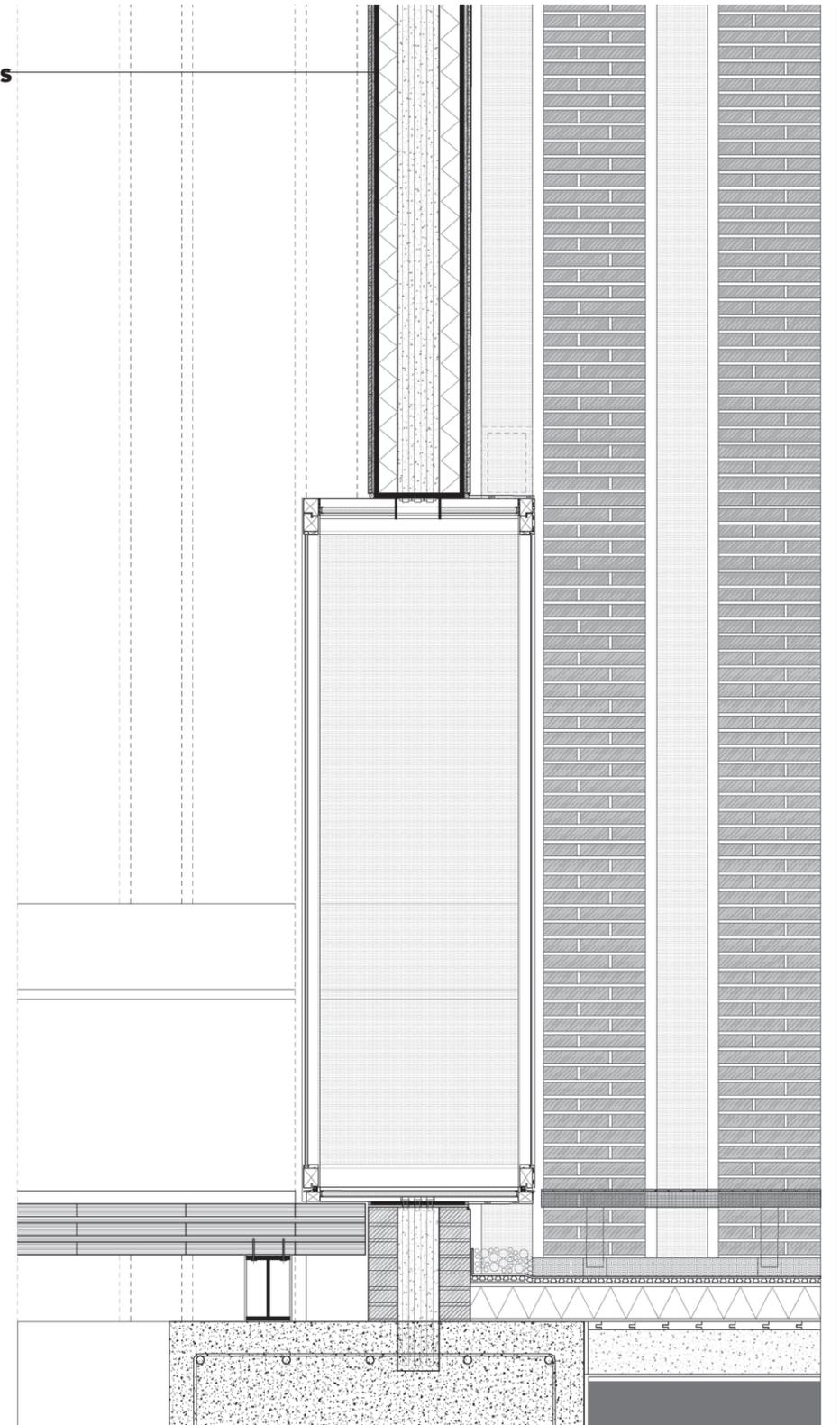
door cell

bridge
CLT wood panel
steel joints and beam



panel with claddings
and insulation

timber ramp
sedum roof



steel plate with timber frame
aluminum finishings (outside)

structural sealant
between frame and panel
for movement and tolerance

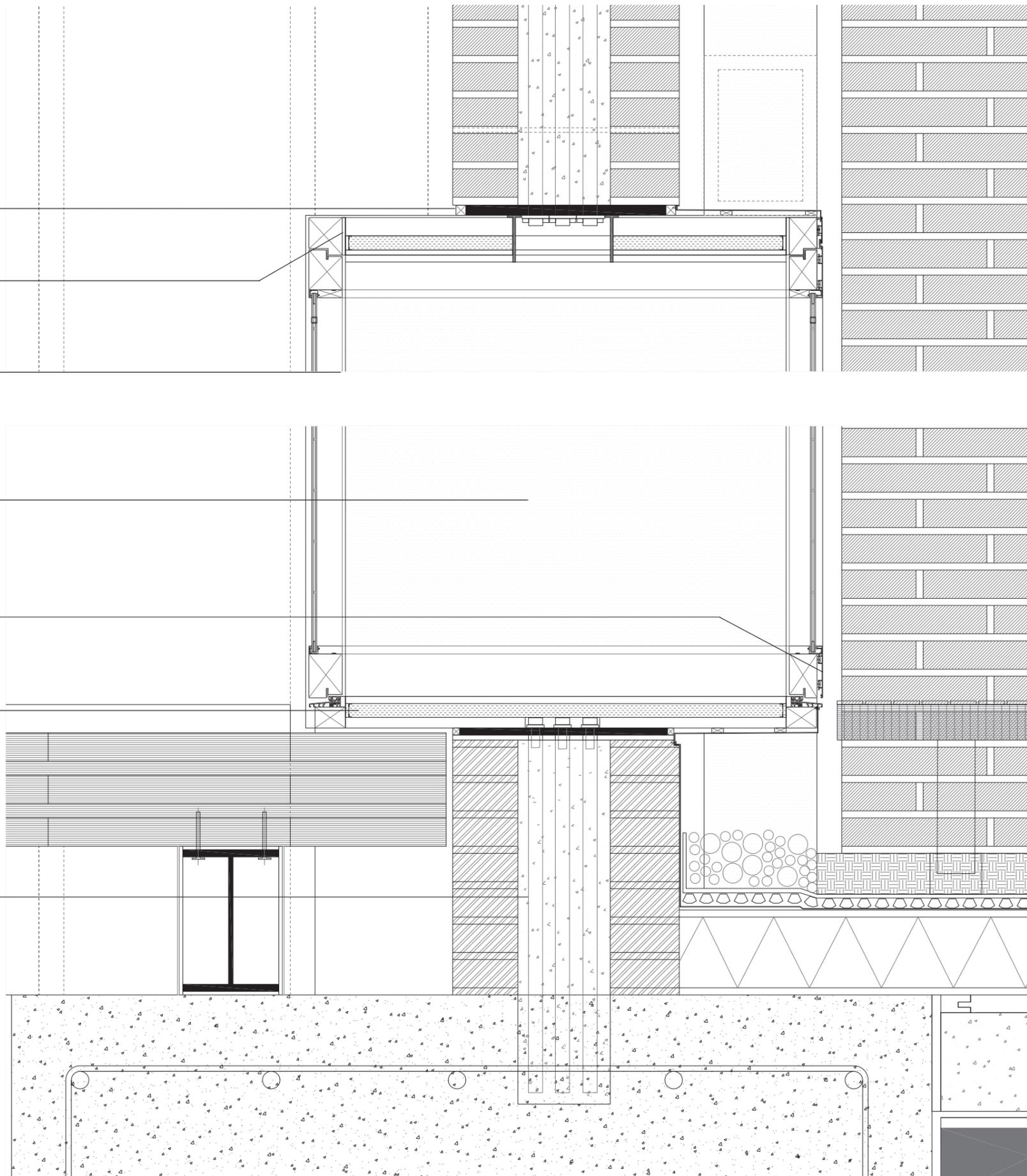
steel anchor and post
hold the frames to the plate

vacuum insulated glass
remanufactured existing glass
U value = 0.1

firwood + aluminium frame
U value = 0.16

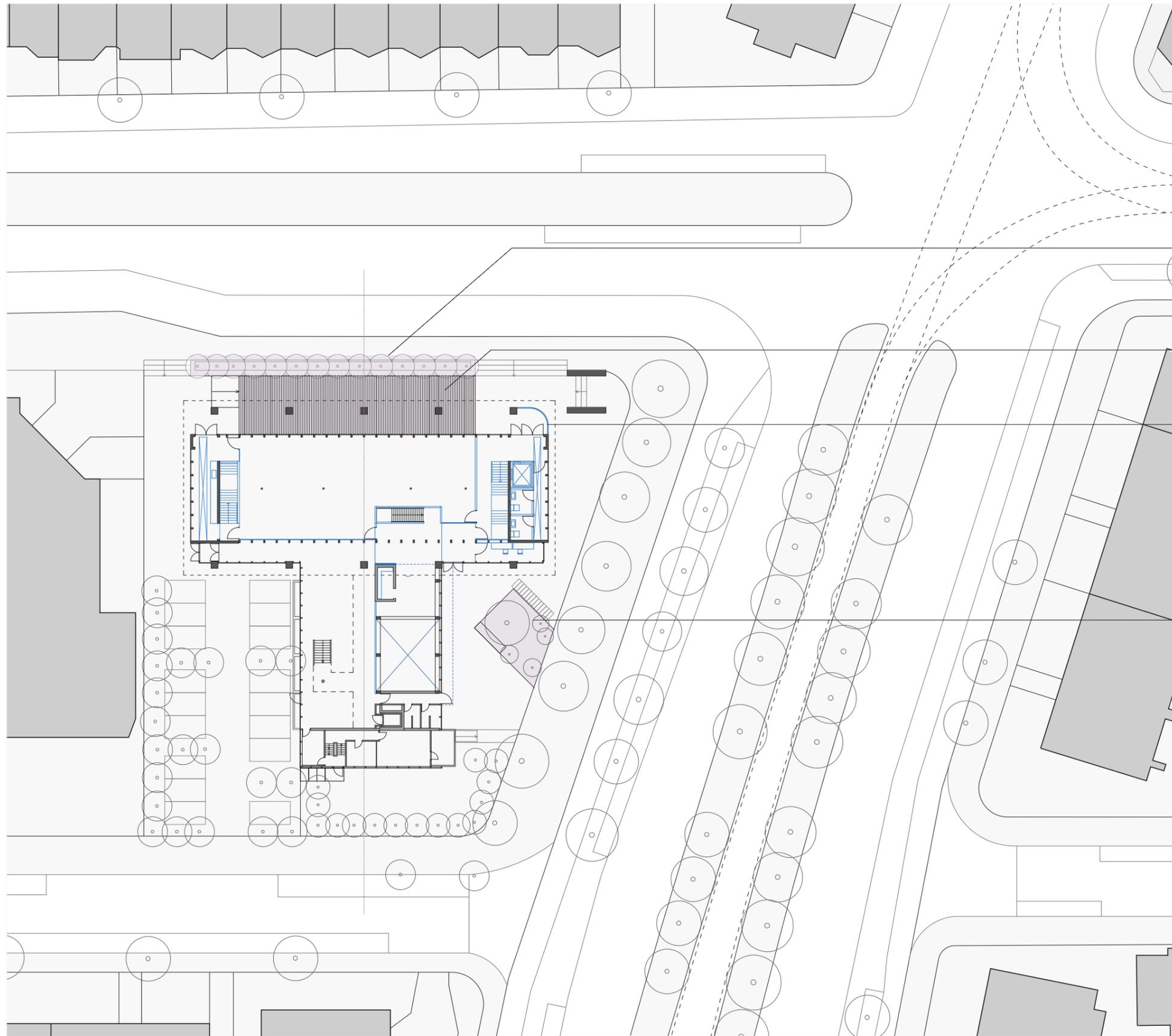
prefab panel with insulation
plywood flooring 10mm
phenolic 0.200 foam 20mm
granite panel 15mm
U value = 0.109

brick pillar foundation



IV. site

adjust space character with landscape interventions



bushed and seats
 make in between space
 block the road
 block the second entrance

wood deck
 stress the main entrance
 defined courtyard for working space

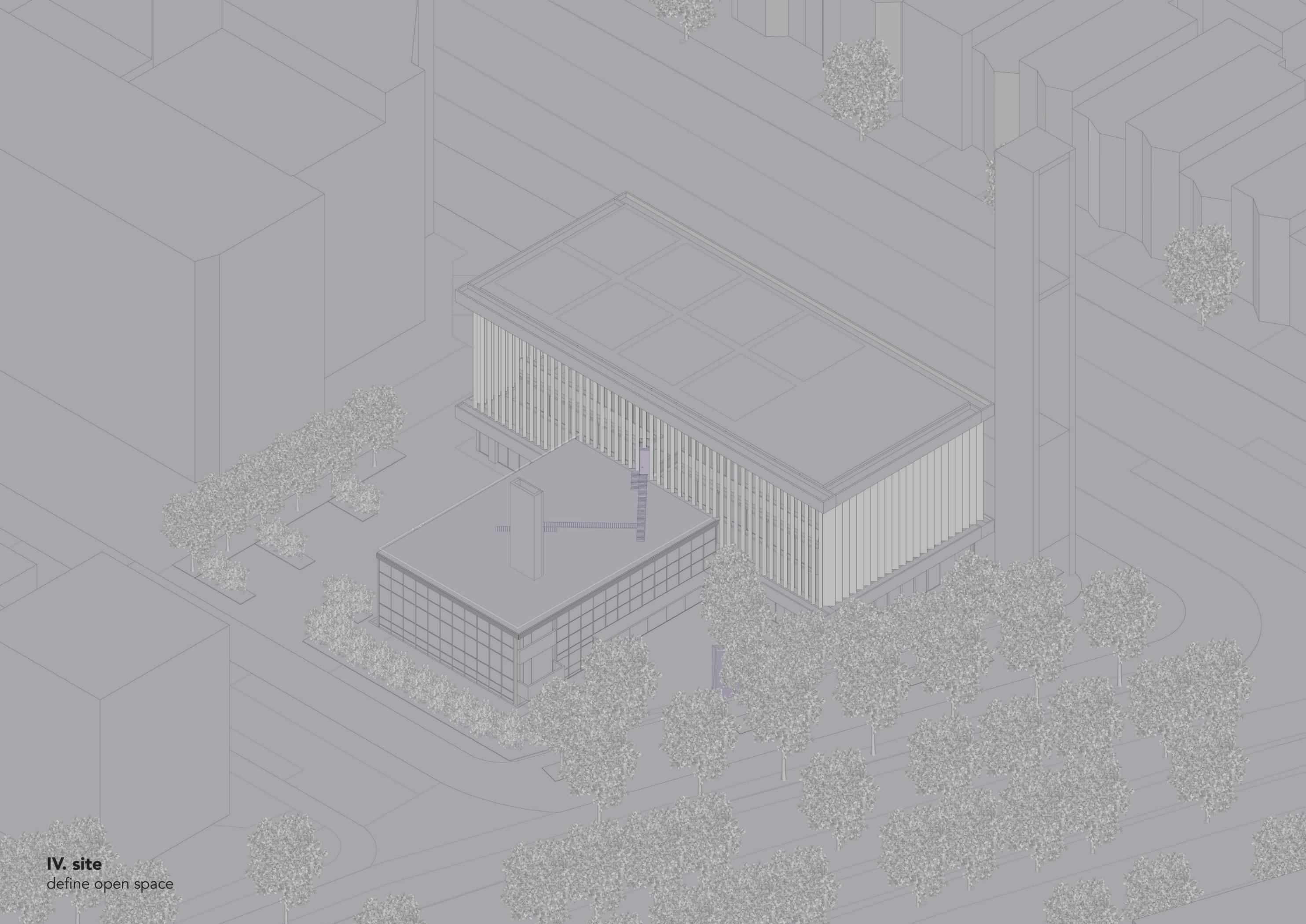
curved glass gate entrance
 stress and hide the main entrance

tree and landscape bushes
 bicycle parkings
 orientation and entrance square



IV. site

the design was very equal: interact to it by applying landscape elements and defining openspace



IV. site
define open space



IV. site

side entrance and defined open space, open boundary



IV. site
define open space



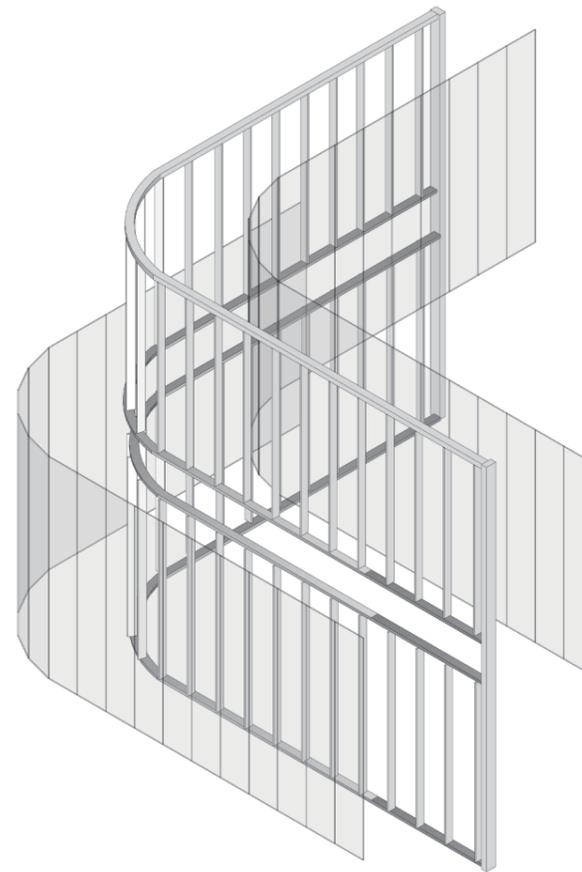
IV. site

wood deck and light in evening lead to turning kitchen corner



single glass panel

180cm*23cm*3mm

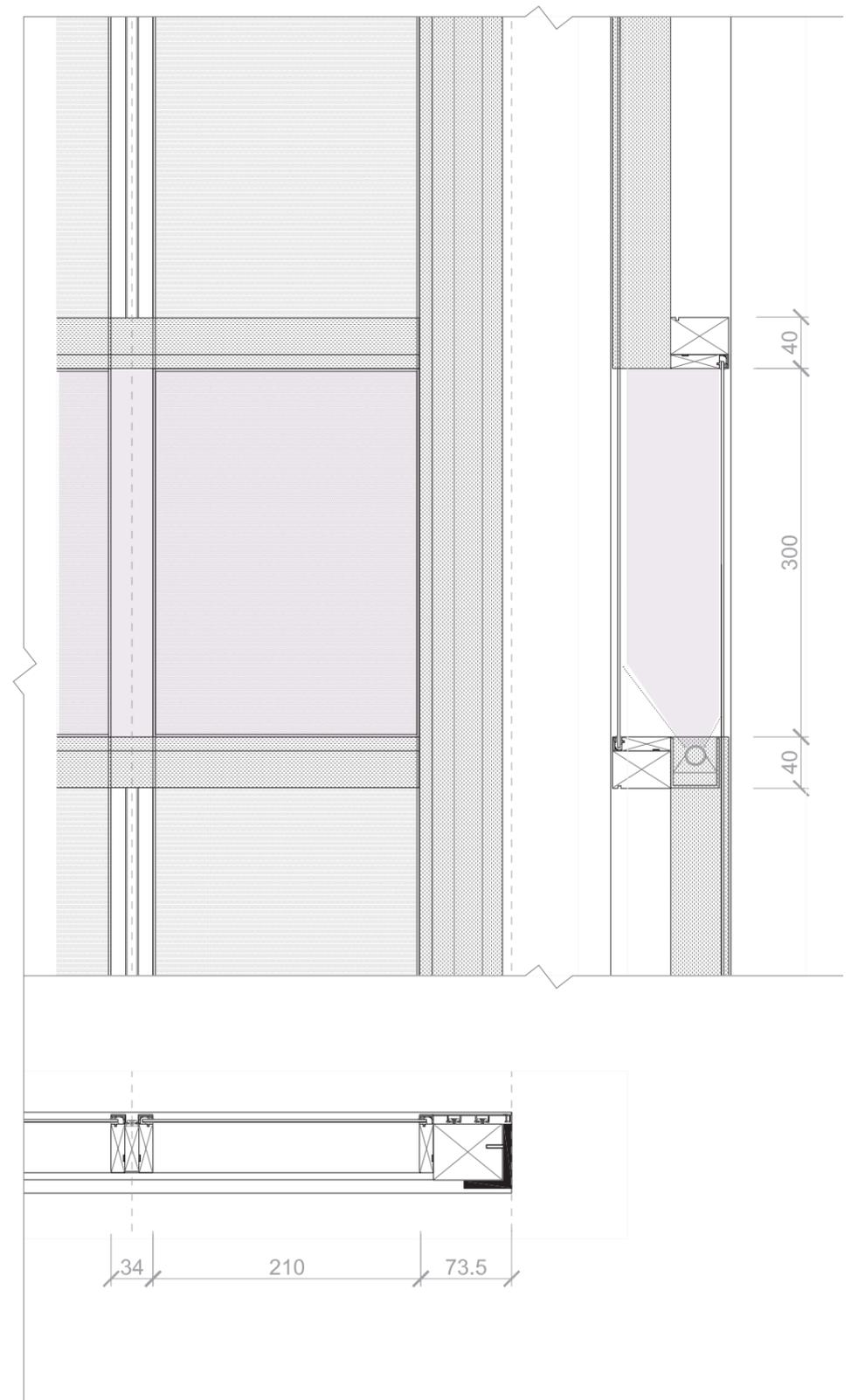
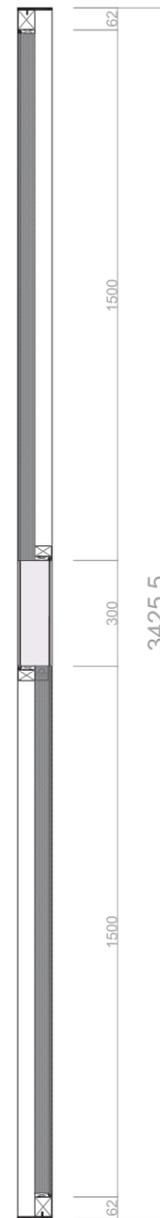
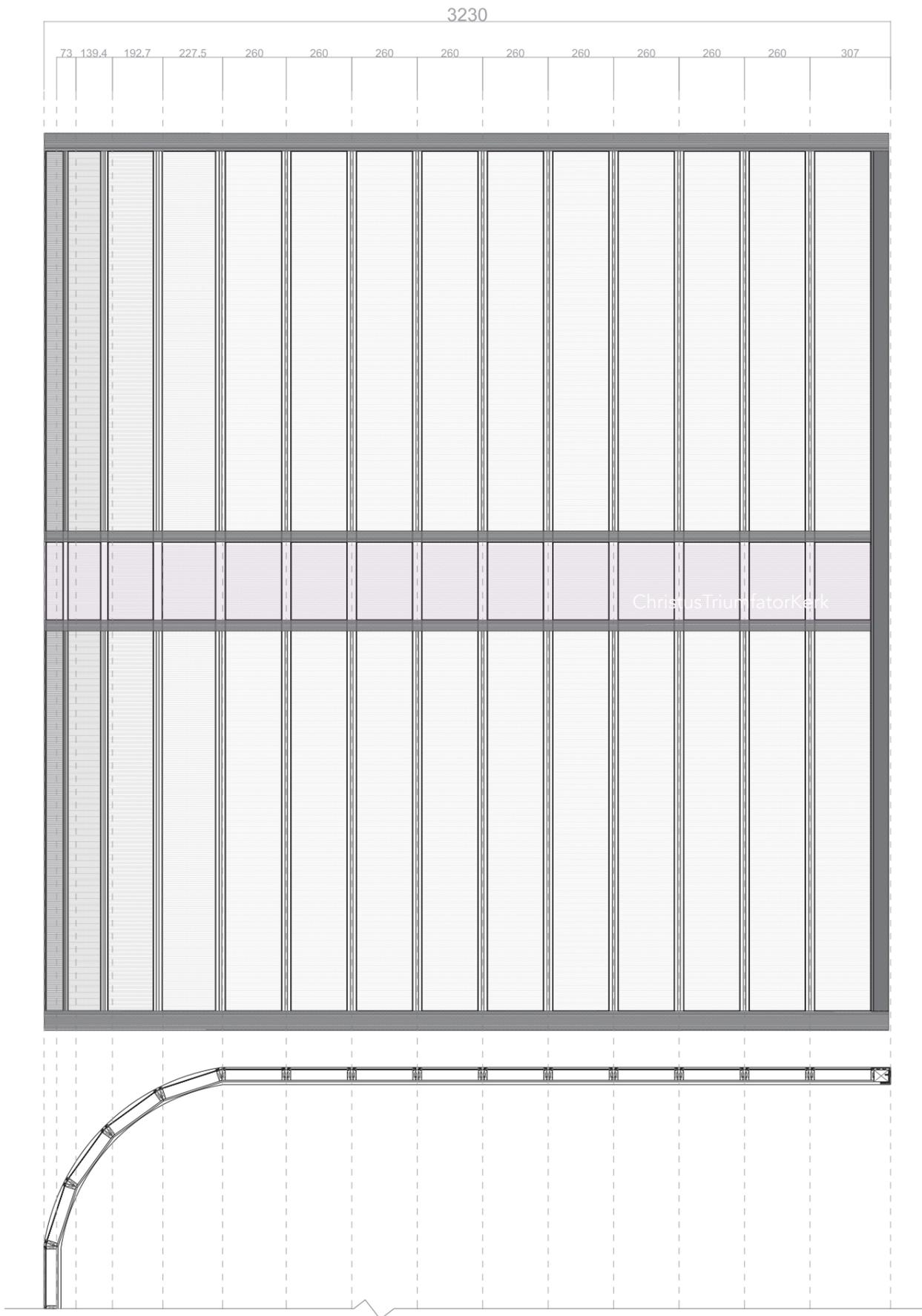


glass gate curve

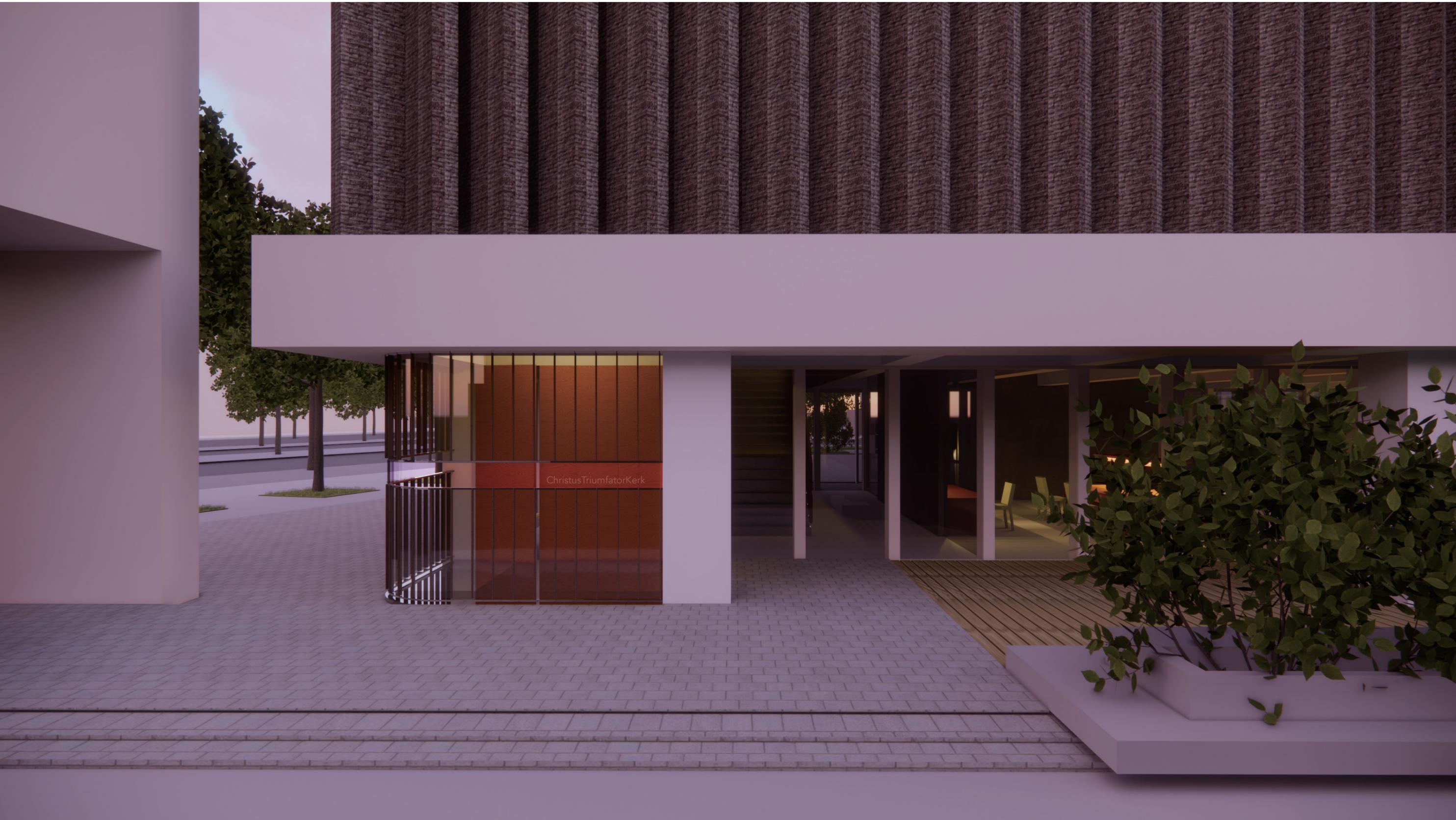
timber and aluminium frame
180cm*23cm*3mm glass infill



transparency in the intersect zone of
two glasses
integrated with light



ZERO WASTE MATERIAL
entrance glass curve



IV. site

curved glass wall entrance: highlight but also hide the entrance; beginning and end of the sequence



thank you

