Revitalising Heritage:

Christus Triumfatorkerk

Site:
The Hague, The Netherlands

Built year:
1959

Architect:
Geert Drexhage, D.S.B.V.

State:
National monument

Zerowaste
Church
Postwar modern

HERITAGE
ARCHITECTURE
GRADUATION
THESIS

Christus Triumfator church

The design of Christus Triumfator church reflects a time of Dutch postwar modern architectural profession shifting into a capitalized environment, confrontation between new theories and old tradition, group standardized design for mass clients, and cooperations of professional engineering consultants. Despite the complexity of the background, the church was given with an order that harmonized materials, space, and meanings into the postwar urban environment and society as well reclaimed a Dutch building and religious tradition. As a result, rather than posing personal declarations of an architect, it shows a composited picture of the time and the group of people. In such a way, they together did 'get close to the meanings and build'.

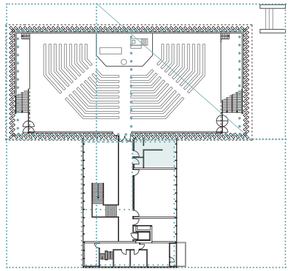
Zero-waste heritage

For a contemporary redesign and intervention to respond to that from the 1960s, one of the subjects is to treat carefully in the sequence, space order, and materiality in the Christus Triumfator church by understanding the facts and meanings behind, and another one is to react to the mass production pattern matured in the era. A new zero-waste design challenge might be to set away from the producing loop, reduce and revital the form to that meet the need, and reclaim from the past production in a tangible or intangible way that triggers reflections of the past and the future. In the design proposal, I tried to grow and generate the most from the church itself, from urban relationship, programming, space and structure, to materiality.

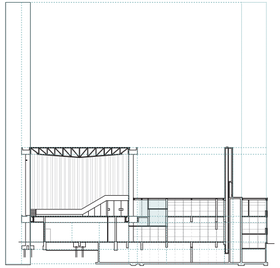
the chapel

the atrium

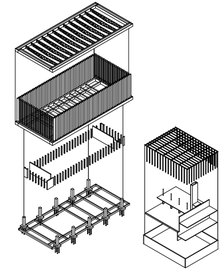
Archive and literature research:
value assessment to understand the assets



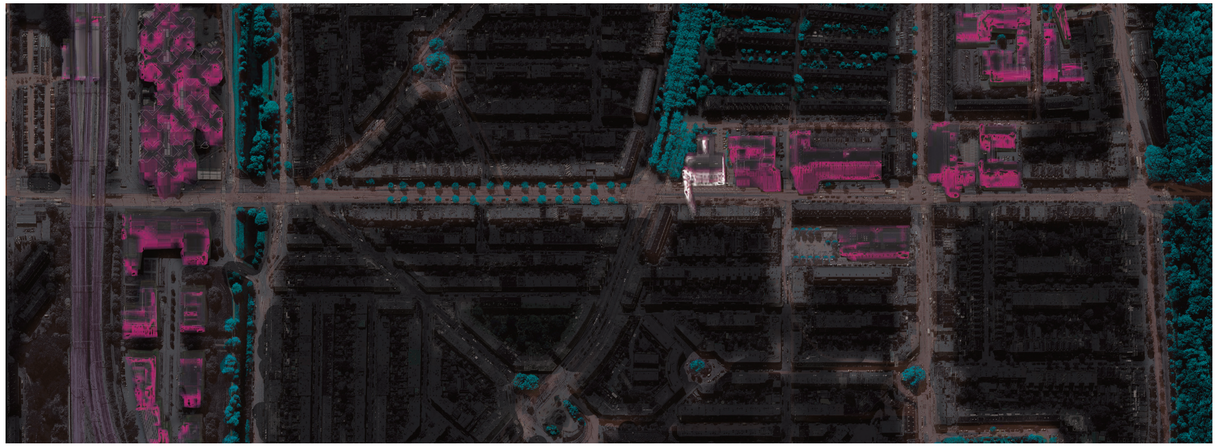
Silver ration, dualism, shifts in plaid grid:
mass production era, post-war theories



Part to whole, servant-served space, equality:
a brick as the foundamental dimension



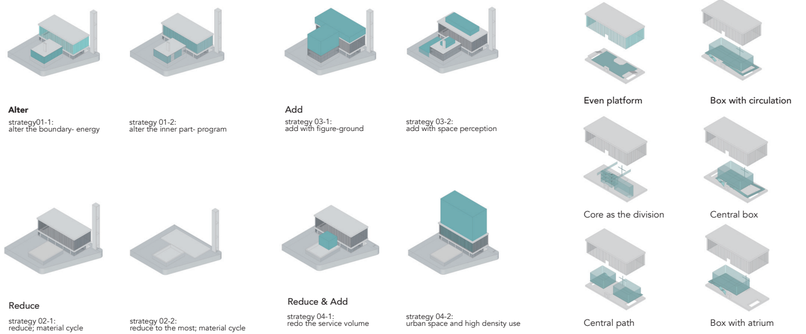
Engineered optimized design
two volumes, two material systems



Bezuidenhout, the Hague:
postwar bombard community rebuildment, a dynamic mixed-use street corner

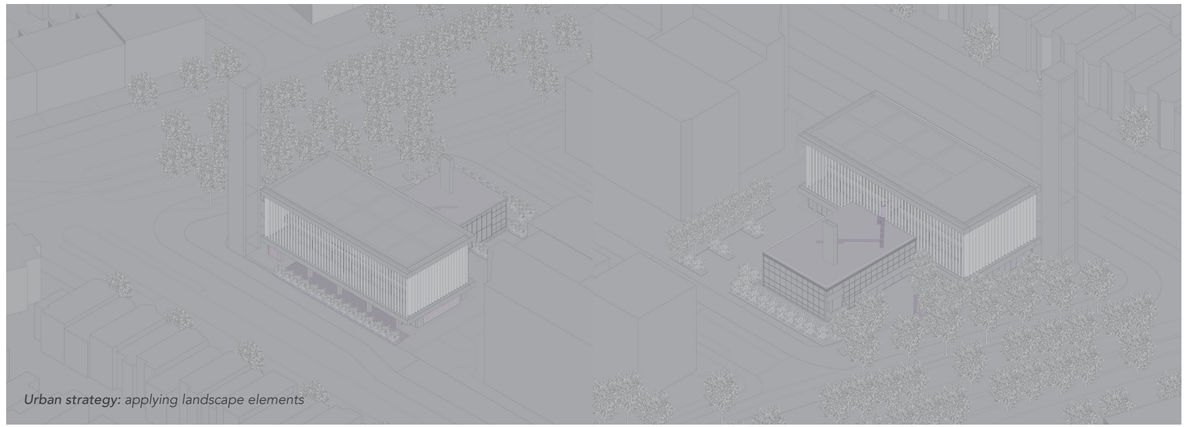
Revitalize strategy

As the church was carefully structured and planned in the urban environment, each volume and element is ordered with rule. Schemes were tested so that the intervention strategies could be compared with the values from the analysis and research. The selected strategy was to keep the overall volumes the same in exterior and do the renovation with the shell and within. The chapel became the most important space for several schemes, as the original quality of the space and textured facade should be kept or mingled with the new design. A platform in the volume strategy was chosen.

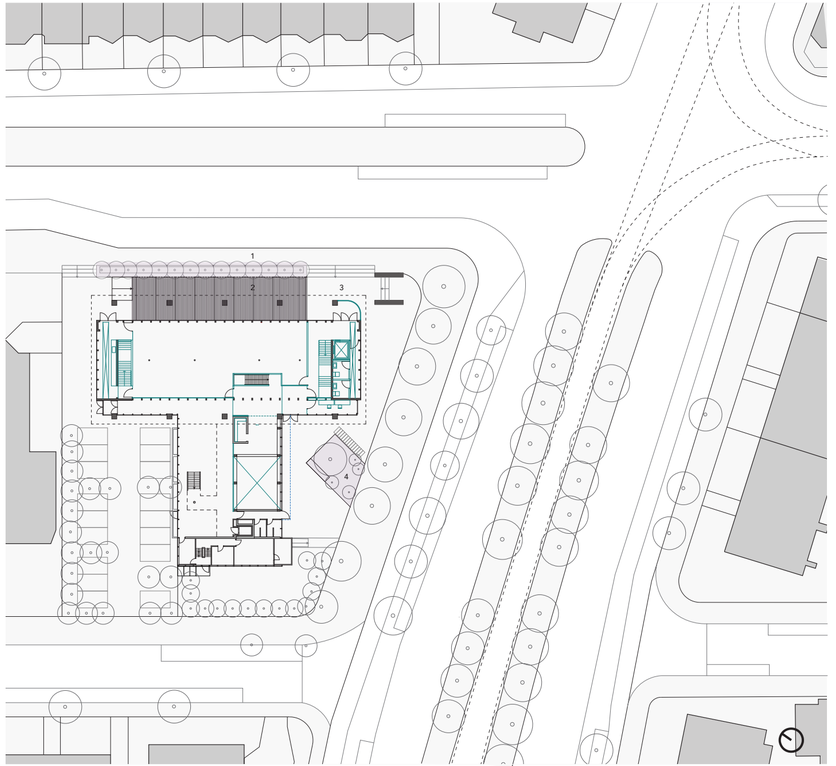


Revitalize strategies

Chapel renewal strategies



Urban strategy: applying landscape elements



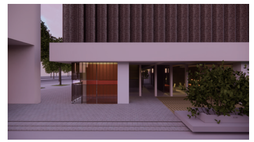
Site plan: define the open space

Redefine the open space

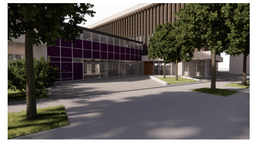
As the urban relationship og the church was well-structured, landscape elements were added in to define the open space. The church with its dual entrances and hidden courtyard were designed with religious meaning. In new intervention, new elements meant to guide visitors through the design.

1. bushes and seats
make in between space
hinder the bustle road
hide the second entrance

2. wood deck
stress the main entrance
defined courtyard for working space



3. curved glass gate entrance
stress and hide the main entrance



4. tree and landscape bushes
bicycle parkings
orientation and entrance square

Re-program function and use

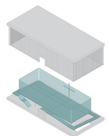
The program was intended to meet the requirements of new smaller religious groups, rental rooms and halls for the citizen, and better quality of activity space for the church community. At the same time, it also deals with reducing the vacancy in the basement, and high energy use of the chapel hall.

The new program and space was planned at the same time to make sure they didn't deminish each other. In such a way, the structural elements can also logically put in. The new structure in the intervention grew from the pile plan upwards.

add a box in the chapel for different groups

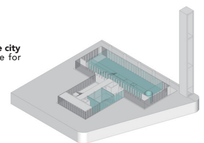
on the box:
main chapel hall

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



open the ground to the city
co-working open space for rental

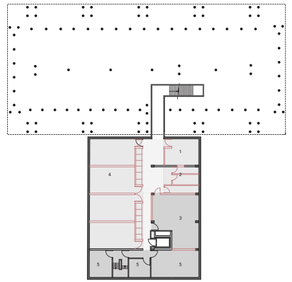
restrooms
kitchen



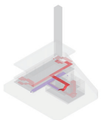
reduce (create void) the service building to revive
new atrium for events

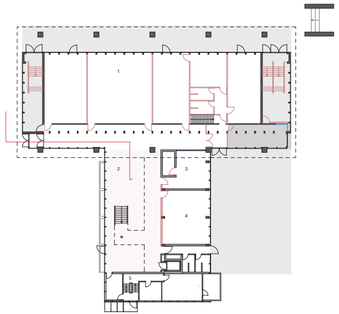
new kitchen (30m2)
4 rooms with flexible division

Program scheme with plans

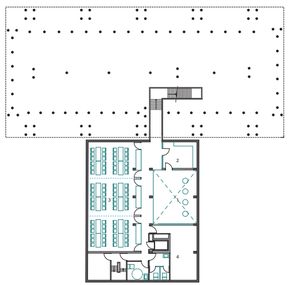


Basement: lack of linkages and quality
1. classroom
2. restroom
3. mechanical room
4. youth centre
5. storage

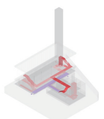


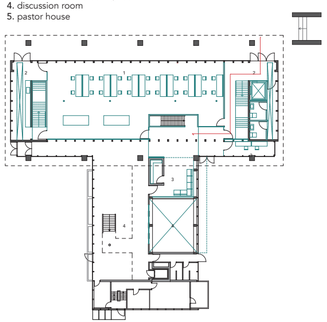


G floor: closed up boundaries, not clear entrances
1. community centre and rental rooms
2. main atrium
3. church office and tithing room
4. discussion room
5. pastor house

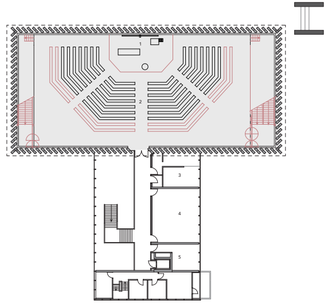


Basement: new atrium enhances quaility and linkages
1. atrium
2. kitchen
3. class rooms
4. mechanical room

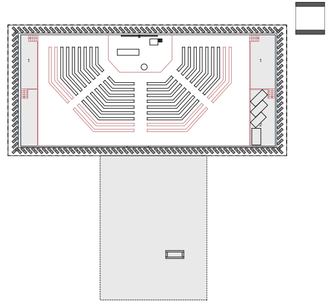




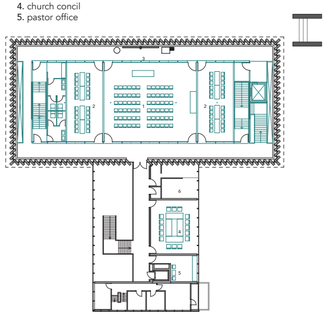
G floor: open boundaries, adjusted circulation
1. co-working space
2. flipped in circulations, open corners
3. reception space and church office
4. atriums



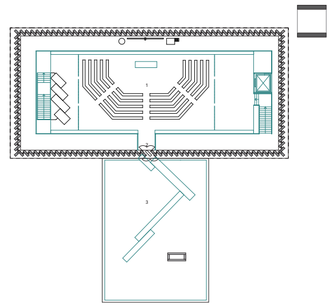
1st floor: the 600 people hall is huge for maintenance and use
1. liturgy centre
2. chapel hall
3. fanroom
4. church concil
5. pastor office



2nd floor: theadding side balconies blocked the brick facade
1. balconies for the choir and storage
2. organ



1st floor: divided hall for efficient use and rentals
1. small hall
2. rental rooms
3. gallery walks
4. church council
5. pastor office
6. fanroom

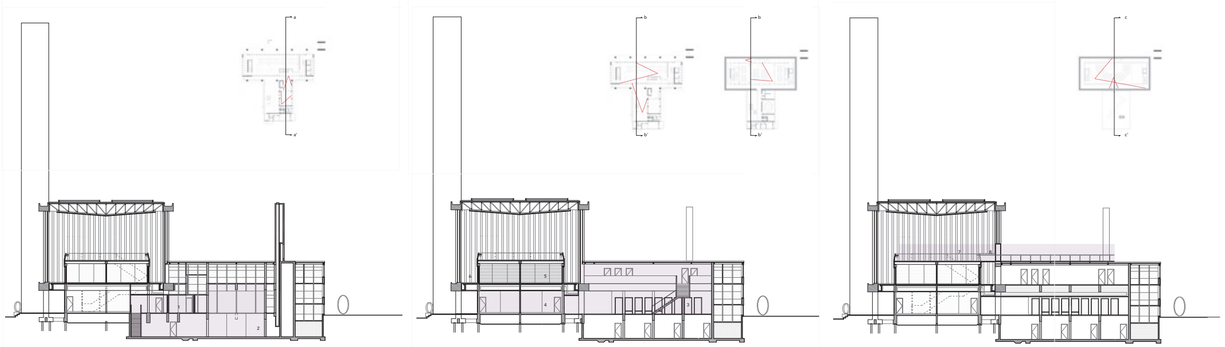


2nd floor: open platform linked with outdoor space
1. main chapel hall
2. new bridge and door cell
3. roof garden

designed use now/ redesign proposal

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

1f. main volume			
staircase foyers		occationaly	
chapel	*group A (50 protestant)*	*Sun. morning*	chapels/halls/exhibits units
	group B (60 other church)	*Sun. noon*	hall A 10m*15m
	special rituals	*occationaly*	hall B 10m*12m
	concerts	*monthly*	hall C 10m*12m
	art exhibitions	*scheduled*	can be combined together
			2bathrooms 3m*6m
1f. service volume			
atrium and corridor		*daily*	
church council	*religious meetings/ baby-sit*	*Sun.*	
pastor room	*religious discussions*	*Sun.*	
ventilation room	*for chapel*	occationaly	renew the system
restroom			
1f. sexton house			
master bedroom	*in use*	*daily*	
bedroom	*in use*	*daily*	
bedroom	*in use*	*daily*	
gf. main volume			
foyers and portico		occationaly	
community center	*group C (10 other church)*	*Sun. noon*	lobby for communities
aula	*group A+B (winter)*	*seasonly*	church office desk 7.5m*3m
room 01	*religious classes*	*weekly*	open space 7.5m*30m
room 02	*church events*	*occationaly*	2bathrooms 2m*4.5m
room 03	*rooms rentals*	*Mon. - Sat.*	kitchen 1.5m*8m
restrooms			
gf. service volume			
entrance foyers		daily	
wardrobe corridor		daily	
main atrium	*events and rentals*	daily	link atriums to B floor
church office	*office use*	occationaly	reception space
coffer room		vacant	book shelf room 1.5m*3m
mission room	*room rentals*	*Mon. - Sat.*	new atrium 6m*7m
cafeteria	*events and rentals*	daily	
restrooms			
yards	*parkings*	daily	enhance relationship w/ atrium
bf. service volume			
youth center		vacant	church activities
room01		vacant	3 rooms 6m*7m
room02		vacant	flexible divisions
room03		vacant	
room04		vacant	
room05	*used as kitchen*	occationaly	
			kitchen 4m*3m
mechanical rooms		daily	new atrium 6m*7m



Lontitude section a-a'

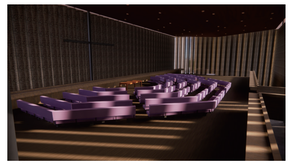
Lontitude section b-b'

Lontitude section c-c'

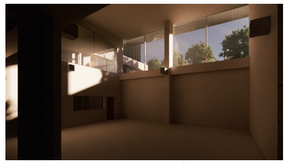
1. **Reception corner:** the original office is changed into a reception space that sees through the new atrium for the community.

3. **Main atrium:** the boundaries of the old atrium is opened to the co-working space and the new atrium.

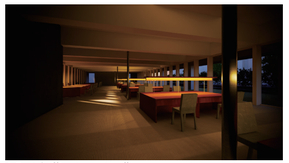
5. **Reception corner:** the new inner box of the chapel provides rental space for religious and rental use.



7. **Reception corner:** the new chapel hall platform is distanced from the brick facade, floating in the space.

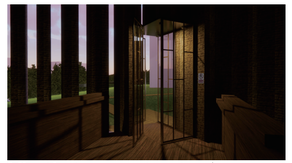


2. **New atrium:** the mechanical room is shifted to open a new atrium which links outwards. A cross of beam is removed.



4. **Rental office:** the rental office becomes a transparent and friendly interface between the road and the church community.

6. **New atrium:** the religious objects on the gallery walk, the dimensions of brick pillar, timber and steel frame create rhythm.



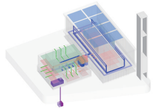
8. **New atrium:** the new doorcell towards the roof garden breaks through the brick facade and shows the contrast in between.

Climate integration

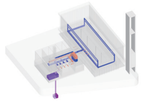
A new climate system is coordinated with the new uses to solve the original heavy cost of a centralized ventilation and heating system. Two ventilation system will work according to time and people, heating will be supported by heatpump.

Material choice and construction

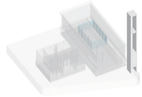
The new added in structure should be lightweight and high stiffness for least burden to the original structure. And the elements should be prefabricated into small fragments in a highly used busy site of central the Hague neighborhood.



Climate integration scheme

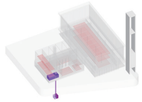


AHU 1:
for daily basis use
natural out to atriums, back to fanroom
preheated by heat pump water

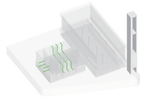


curtains:
break air flow (but not totally hinder)
reduce radiation heat lost

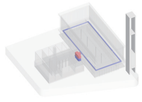
mesh core
glass fiber infilled
fabric finish



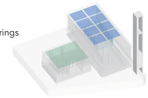
floor heating:
most of the ventilated space
water heat pum combined



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

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

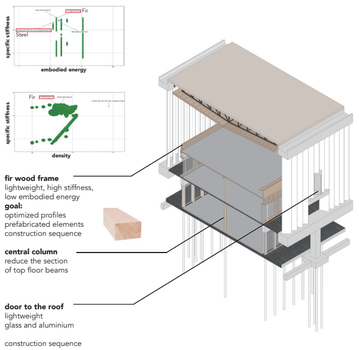
on subframe, each floor panel carries 6250N
wood panel profile dimension: fir 580cm*70cm*2cm

a layer of brick and cement:
brick 0.1m*0.2m*0.04m*12=0.0096m3
0.0096*(1500~1800)=(14.4~17.28)kg
cement:
(0.3136-0.24)*0.04+
0.24*0.01=0.005344m3
0.005344*1440=7.69kg
7.69+17.28=24.97kg
91layers of remaining hanging pillar:
91*24.97=2272.75kg

steel rod*5
5*3.14*0.01m*0.01m
=5*0.000314*4.54m
=0.007127m3
0.00712*7700=54.88kg

total weight a remained pillar
=54.88+2272.75=2327.63kg=232.76N
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)



Structure calculation and material choice (through ANSYS Granta)

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

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

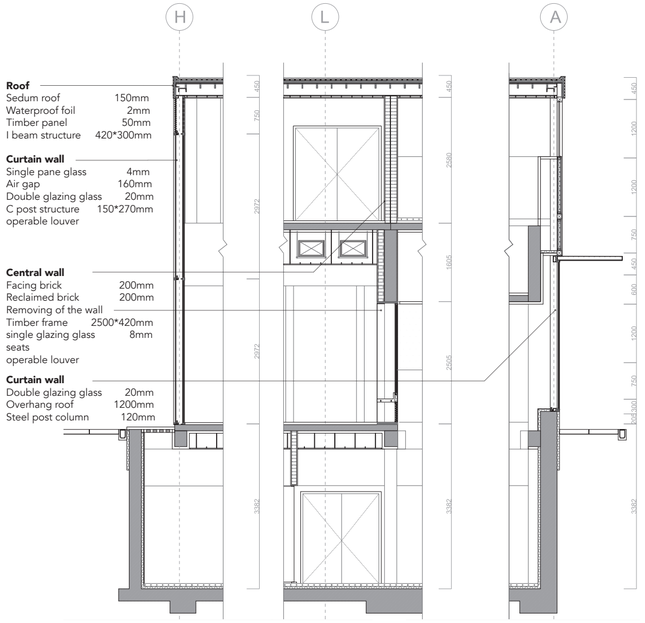
units 2:
upper column unit
frame unit (fasten in-between)

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

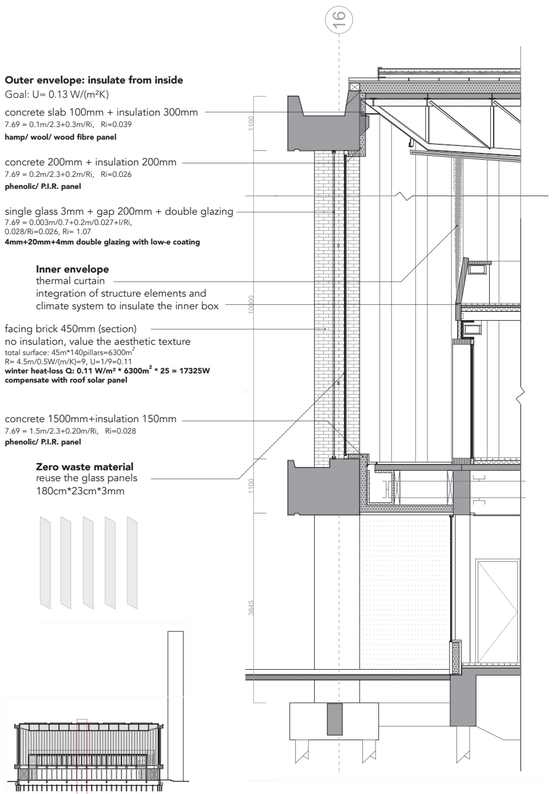
floor with side wall:
floor units with structural frame
insulation and panel layerings

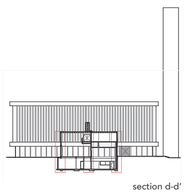
infill glass and frame:
fasten on insulated materials

Construction sequence



Service volume wall section





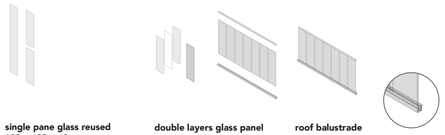
section d-d'

section e-e'

Chapel volume wall section

Envelope of the volumes

The service volume is reduced in with a atrium to give better quality of space, light, transparency, and ventilation. The chapel volume is added in a demountable lightweight structure.



single pane glass reused
180cm*23cm*3mm

cut into half

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

single glass panel
180cm*23cm*3mm

glass gate curve

timber and aluminium frame
180cm*23cm*3mm glass infill
transparency in the intersect zone
integrated with light

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)

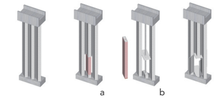
Zero waste material reuse

One layer of the frosted slated glass from the chapel brick pillar facade will be replaced by new insulated glass. Therefore, the reuse of the glass gives new zero-waste spiritual meaning in the sustainable redesign. Three prototypes of use were designed for different scenarios in the new design.

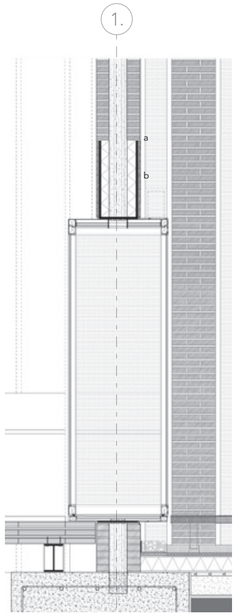
Thresholds

The glasses will be remanufactured into three main new space of the intervention in a sequence. They are: one of the main gates of the front street, the door-cell to the new roof garden, and the transparent balustrade of the roof garden. The modular size of the glass will be held by timber elements and aluminium finishings in each space that a related experience will be linked in the new zero-waste sequence.

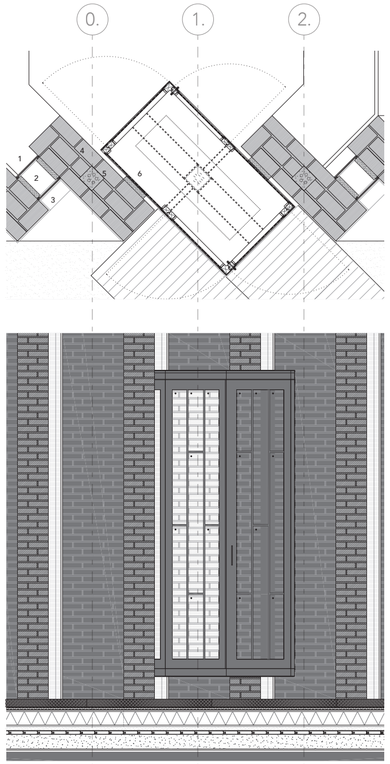
Material reuse: main gate curve wall



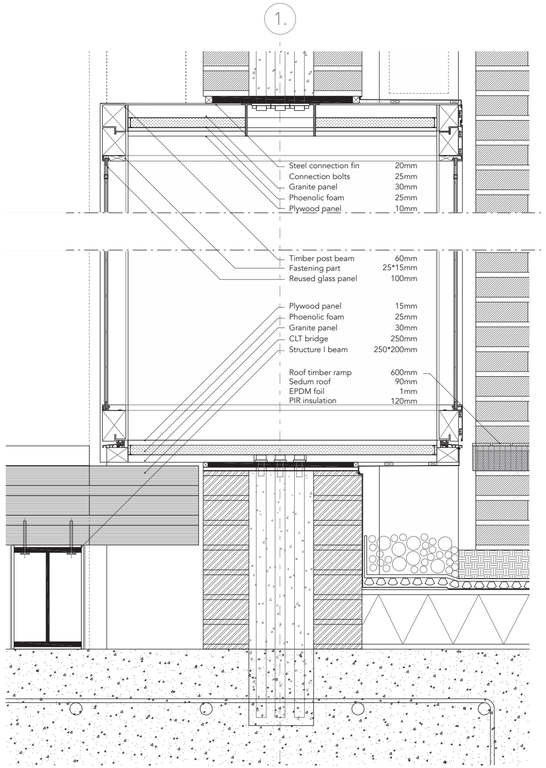
Construction sequence door-cell:
a. hanging the brick with the core
b. fixing on a new cladded light weight pillar



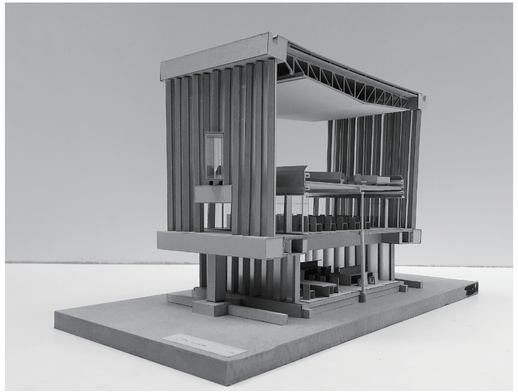
Door-cell to the roof

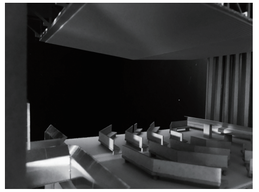


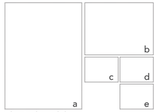
1. inner glass panel (replaced, reused in the building)
2. air gap
3. outer singal pane glass
4. facing brick 10*20*5+1cm
5. cement post-tension core
6. the new door-cell



Material reuse: door-cell to the roof detail







Physical model:
a. the door cell and brick pillars
b. section model of the chapel
c. light on the new platform
d. the chapel pews reused
e. the new central column down to the original piles