

1-07-2025

REBIRTH OF THE CHURCH

Wooden infills as a
solution to vacancy

Brent Burm 5286670

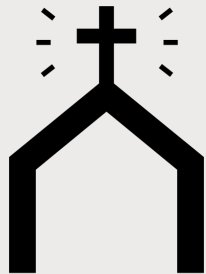




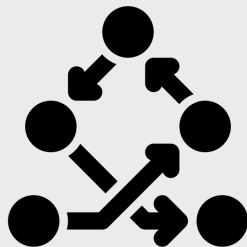
R E S E A R C H

- Problem Statement
- Thematic Research Questions
- Findings
- Conclusion

PROBLEM STATEMENT



1700 vacant churches by 2030



Long and complex procedures



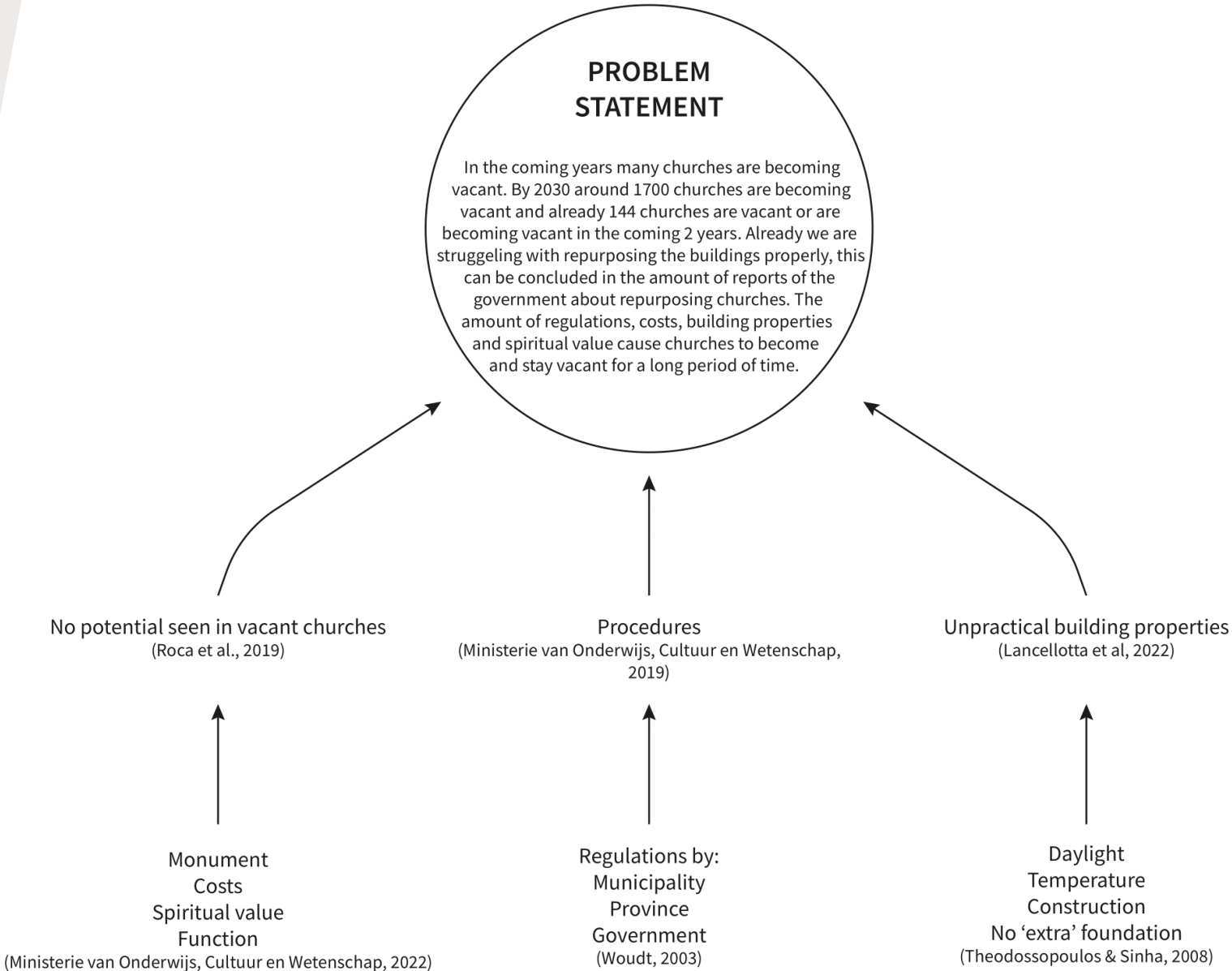
Unpractical Building properties



Costs

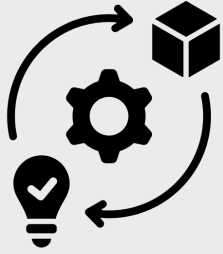


Spiritual value



THEMATIC RESEARCH QUESTIONS

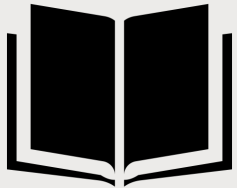
METHODOLOGIES:



Research by
design



Case study
analysis



Literature
study



Content
analysis

THEMATIC RESEARCH QUESTION

“How can a modular wooden building system be developed with adaptable elements to create customizable, remountable, multistory spaces within vacant churches?”

SUBQUESTIONS

“What are the criteria for a modular building system that could be used as an infill within vacant churches?”

“Which of the existing modular building systems could be a potential solution as an infill to fit within vacant churches?”

“How modular is the most potential modular building system as an infill within vacant churches?”

“What are the technical requirements of the system concerning the various functions it is designed to accommodate?”

CRITERIA

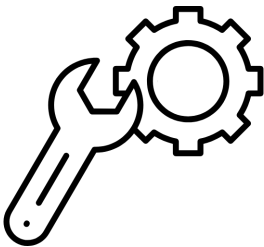
Requirements



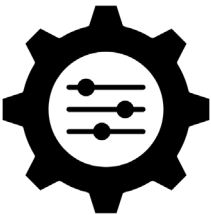
Completely made out of wood



Demountable



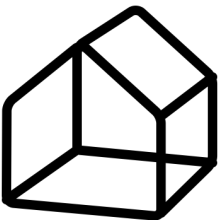
Made for other functions



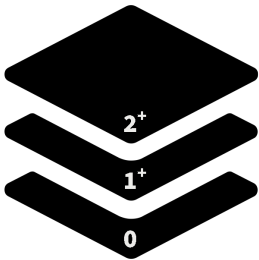
Can be made in specific measurements



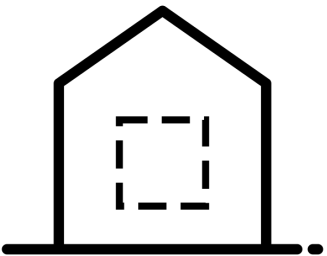
Lightweight



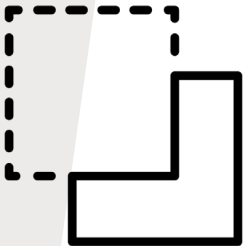
Stable without inner walls



Multistory possible



Inside module



Adaptable in size



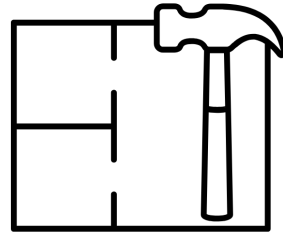
Can the elements be carried by 2



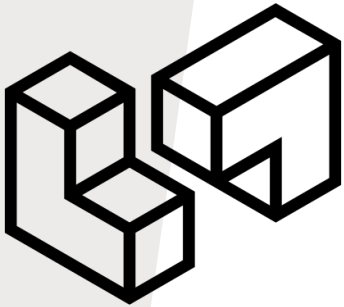
Housing

CRITERIA

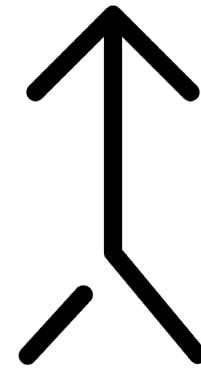
Design Principles



Construction method

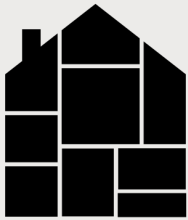


Easily remountable



Possible to merge installations in
the construction

MODULAR BUILDING SYSTEMS



Respace
system most
potential

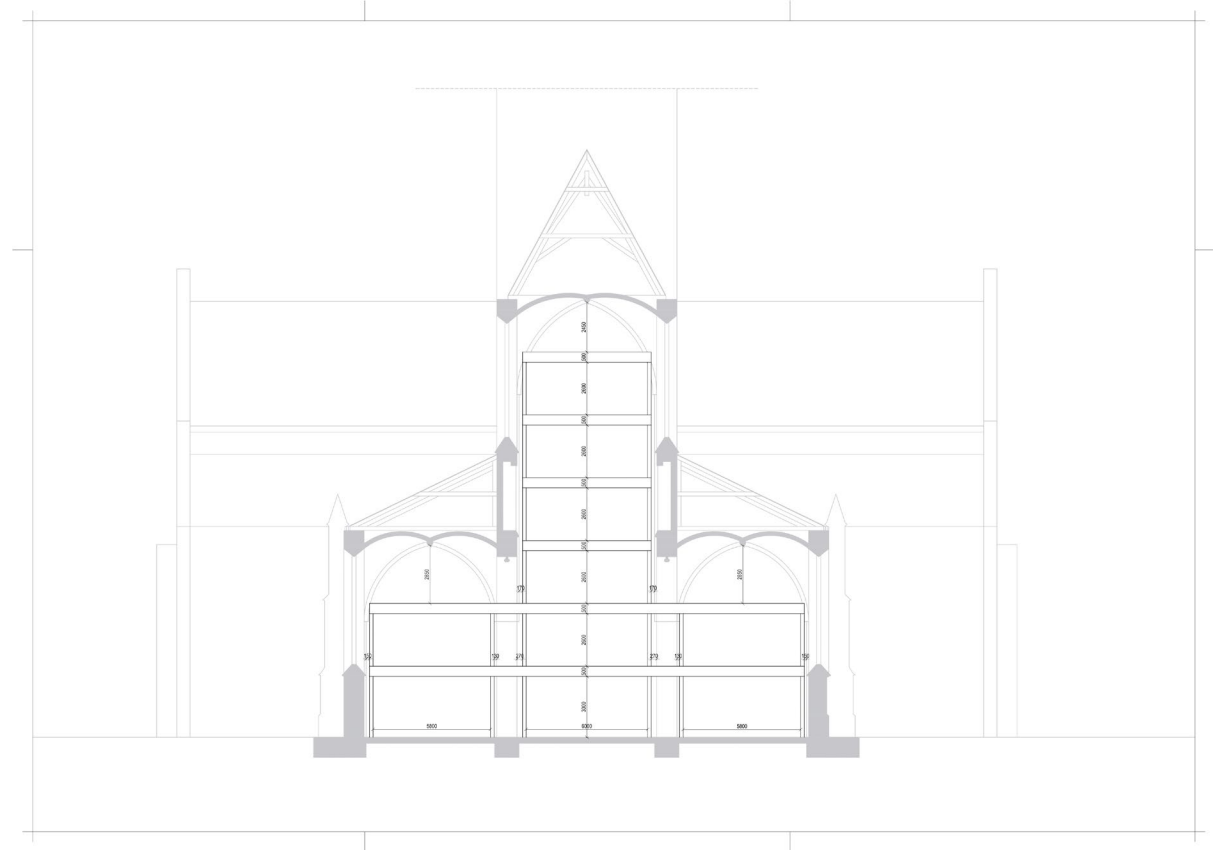
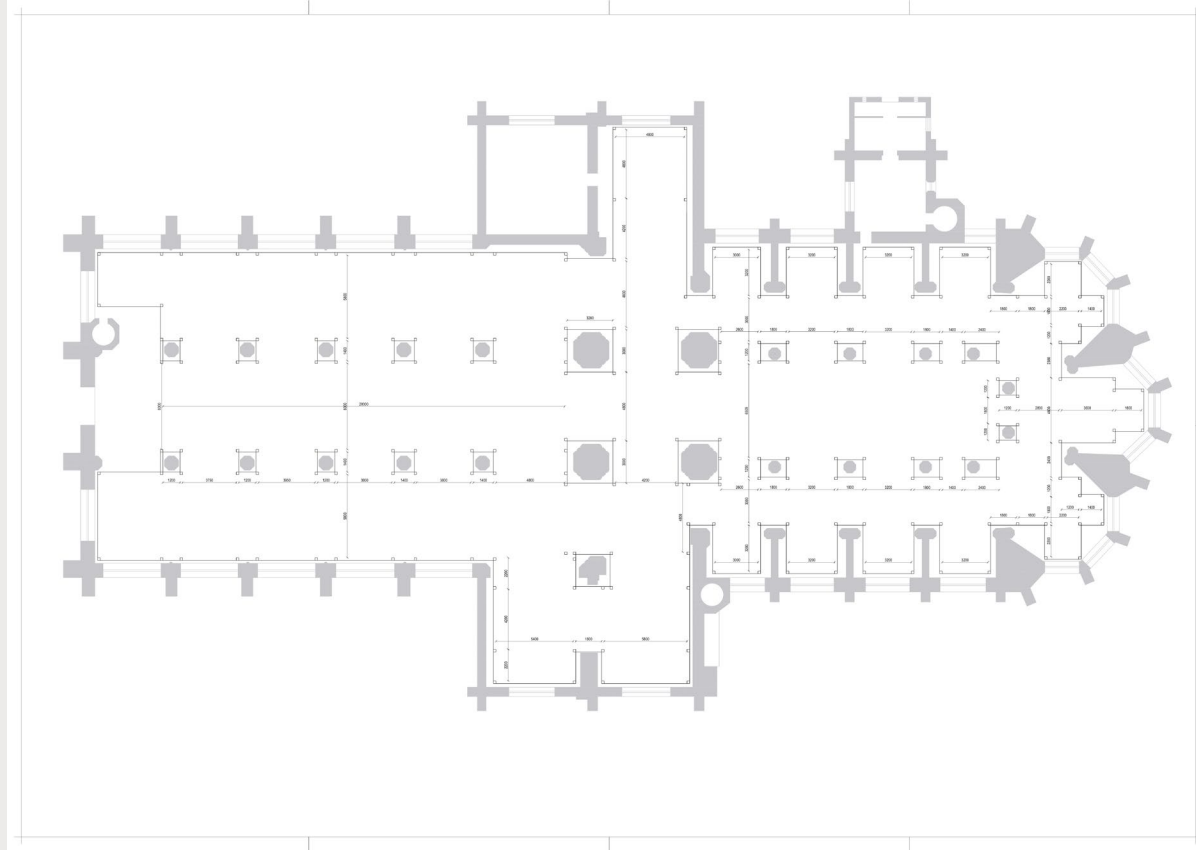
Company	Modular system	Completely made out of wood?	Construction method	Lightweight?	Can the elements be carried by 2?	Multistory possible?	Demountable?
Barli		Yes	HSB	Yes	No	Yes	Yes
Circlewood	CircleWood	Yes	HKB	Yes	No	Yes	Yes
Cube Homes	Cube Homes	Yes	HSB	Yes	No	Yes	Yes
Daiwa House Modular	Daiwa House Modular	No	Steel	No	No	Yes	Yes
De Groot Vroomshoop	Modulinn	Yes	HSB	Yes	No	Yes	Yes
De Groot Vroomshoop	Houtmodulebouw	Yes	CLT	Yes	No	Yes	Yes
De Groot Vroomshoop	Festing bouwsysteem	No	Steel	No	No	Yes	Yes
VDL De Meeuw		No	HSB	No	No	Yes	Yes
DMT-Modular		No	Steel	No	No	Yes	Yes
Finch Buildings	Finch Modules	Yes	CLT	Yes	No	Yes	Yes
geWOONhout		Yes	LVL	Yes	Yes	Yes	Yes
HDO	Woonmodules	Yes	HSB	Yes	No	Yes	Yes
Heijmans	ONE	Yes	CLT	Yes	No	Yes	Yes
Hodes Huisvesting		No	HSB	No	No	Yes	Yes
Homesfactory		No	Steel	No	No	Yes	Yes
TBI	Houtbaar	Yes	LVL	Yes	No	Yes	Yes
Plegt-Vos		Yes	CLT	Yes	No	Yes	Yes
Respace		Yes	LVL	Yes	Yes	Yes	Yes
Skilpod		Yes	HSB	Yes	No	Yes	No
Startblock		Yes	CLT	Yes	No	Yes	Yes
Tala		Yes	CLT	Yes	No	Yes	Yes
The Boxsystem		No	Steel	No	No	Yes	Yes
The New Makers		Yes	CNC Wood	Yes	No	Yes	Yes
Ursem	Ursem CLT system	No	CLT	No	No	Yes	Yes

MODULAR BUILDING SYSTEMS

Stable without inner walls?	Housing?	Made for other functions?	Adaptable in size?	Can be made in specific measurements	Inside module?	Possible to merge installations in construction?	Easily remountable?	Potential system
No	Yes	No	Yes	No	No	Yes	No	No
Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Maybe
No	Yes	Yes	No	No	No	Yes	No	No
No	Yes	No	No	No	No	Yes	No	No
Yes	Yes	Yes	Yes	No	No	Yes	No	No
Yes	Yes	No	Yes	No	No	Yes	No	No
Yes	Yes	Yes	Yes	No	No	Yes	No	No
No	Yes	Yes	Yes	No	No	Yes	No	No
No	Yes	Yes	Yes	No	No	Yes	No	No
Yes	Yes	No	Yes	No	No	Yes	No	No
Yes	Yes	No	Yes	No	No	Yes	No	No
No	Yes	No	No	No	No	Yes	No	No
No	Yes	Yes	No	No	No	Yes	No	No
No	Yes	Yes	Yes	No	No	Yes	No	No
Yes	Yes	No	Yes	No	No	Yes	No	No
Yes	Yes	No	Yes	No	No	Yes	Yes	No
No	Yes	No	Yes	Yes	No	Yes	No	No
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No	Yes	No	No	No	No	Yes	No	No
No	Yes	No	No	No	No	No	No	No
No	Yes	No	No	No	No	Yes	No	No
Yes	Yes	Yes	Yes	No	No	Yes	No	No
No	Yes	No	Yes	Yes	No	Yes	No	No
No	Yes	No	Yes	No	No	Yes	No	No

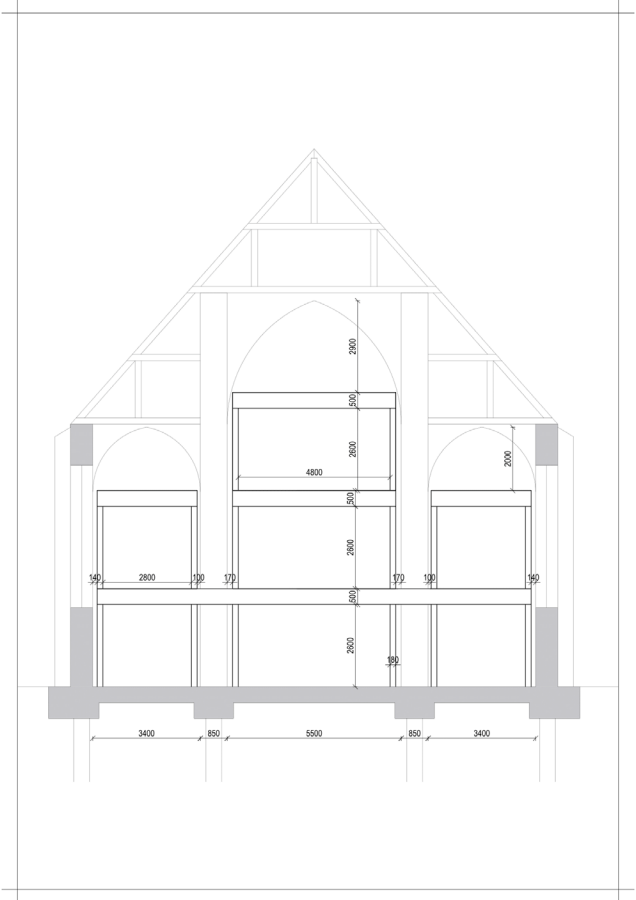
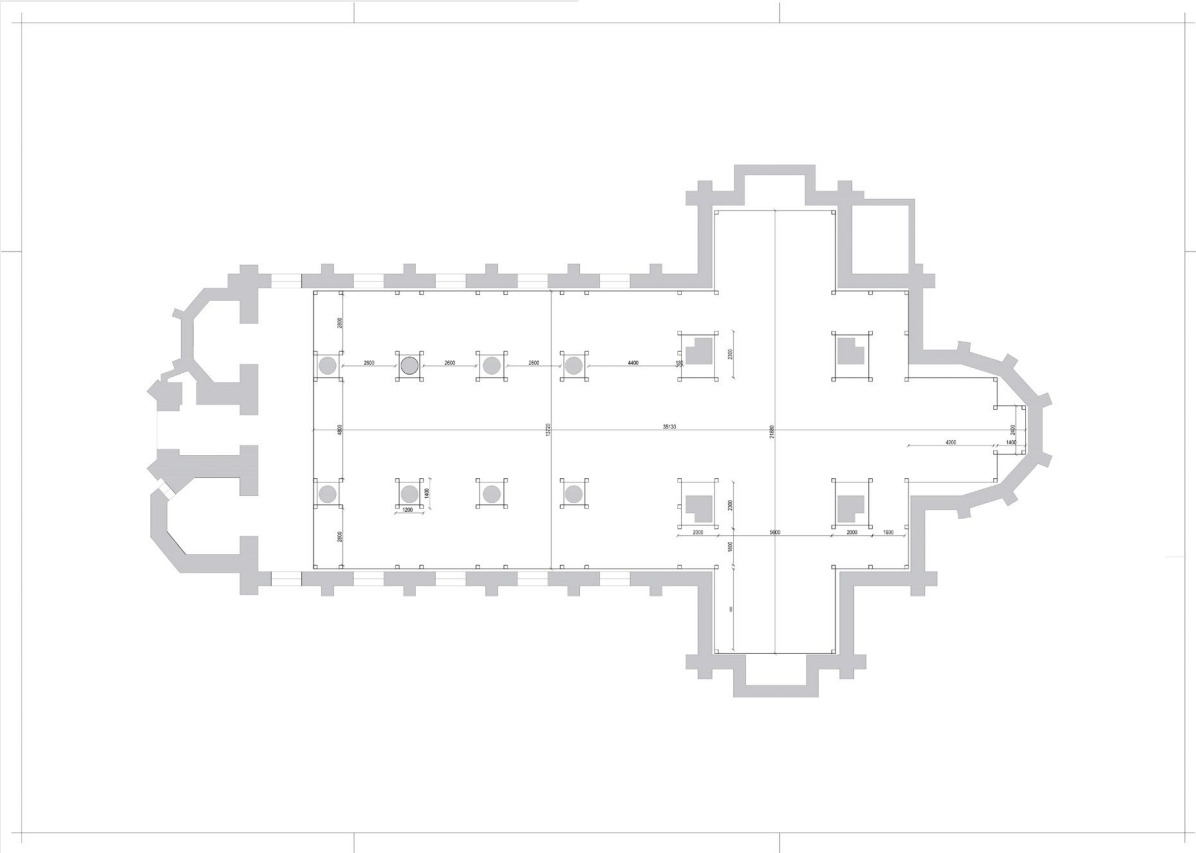
THE RESPACE SYSTEM

Hulst

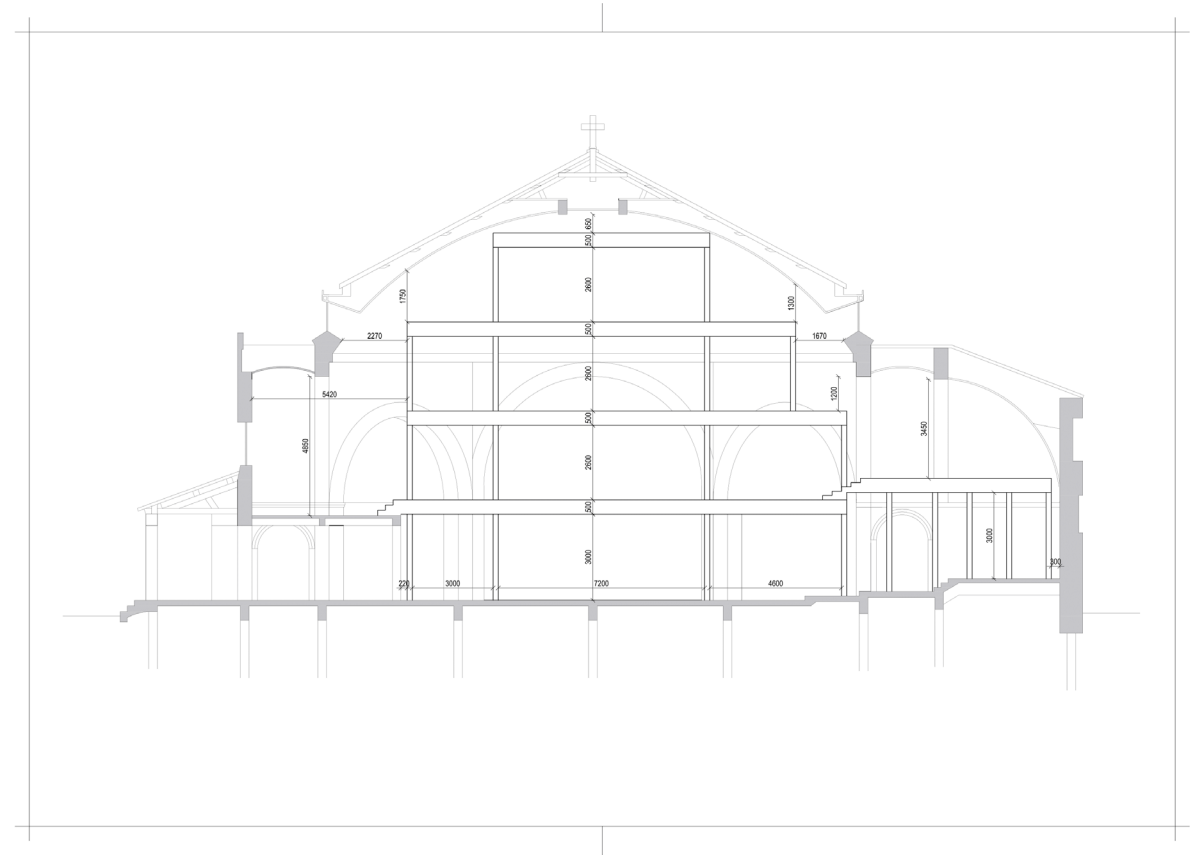


THE RESPACE SYSTEM

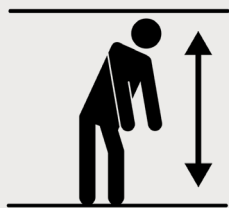
Graauw



Philippine



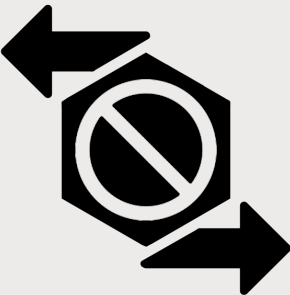
THE RESPACE SYSTEM



Unusable space



Inefficient material use



Not completely interchangeable



Hidden architecture

Church	Element	size	amount	Derived from Respace ratio
Graauw	Column	3000 mm	0	
	Column	2600 mm	204	
	Beams	1200 mm	4	2x 600
	Beams	1400 mm	56	2x 600 + 200
	Beams	1800 mm	20	3x 600
	Beams	2000 mm	24	3x 600 + 200
	Beams	2400 mm	2	4x600
	Beams	2600 mm	42	4x600 + 200
	Beams	2800 mm	32	4x600 + 400
	Beams	4000 mm	8	6x600 + 400
	Beams	4400 mm	18	7x600 + 200
	Beams	4800 mm	44	8x600
	Beams	5600 mm	24	9x600 + 200
	Total Columns		204	
	Total Beams		274	

Church	Element	size	amount	Derived from Respace Ratio
Hulst	Column	3000 mm	210	
	Column	2600 mm	386	
	Beams	1200 mm	164	2x600
	Beams	1400 mm	24	2x600 + 200
	Beams	1800 mm	68	3x600
	Beams	2000 mm	8	3x600 + 200
	Beams	2200 mm	24	3x600 + 400
	Beams	2400 mm	6	4x600
	Beams	2600 mm	6	4x600 + 200
	Beams	3000 mm	102	5x600
	Beams	3200 mm	50	5x600 + 2
	Beams	3600 mm	8	6x600
	Beams	4200 mm	104	7x600
	Beams	4600 mm	4	7x600 + 400
	Beams	4800 mm	16	8x600
	Beams	5200 mm	4	8x600 + 400
	Beams	5400 mm	8	9x600
	Beams	5800 mm	50	9x600 + 400
	Beams	6000 mm	64	10x600
	Beams	6600 mm	2	11x600
	Beams	7000 mm	54	11x600 + 400
	Total Columns		596	
	Total Beams		766	

Church	Element	size	amount	Derived from Respace ratio
Philipinne	Column	3000 mm	50	
	Column	2600 mm	32	
	Beams	1000 mm	6	600 + 400
	Beams	1200 mm	18	2x 600
	Beams	1400 mm	6	2x 600 + 200
	Beams	2400 mm	1	4x600
	Beams	3000 mm	10	5x600
	Beams	3200 mm	2	5x600 + 200
	Beams	3400 mm	2	5x600 + 400
	Beams	4600 mm	12	7x600 + 400
	Beams	5800 mm	1	9x600 + 400
	Beams	7000 mm	19	11x600 + 400
	Beams	7200 mm	24	12x600
	Total Columns		82	
	Total Beams		101	

Columns	Graauw	Philipinne	Hulst
Graauw		637,50%	52,85%
Philipinne	15,69%		32,10%
Hulst	189,22%	1626,25%	

Beams	Graauw	Philipinne	Hulst
Graauw		876,61%	1555,30%
Philipinne	474,87%		393,37%
Hulst	4288,79%	9773,65%	

CONCLUSION

MAIN CONCLUSION

“Ultimately, it is concluded that no infill is explicitly made for the purpose described in the current analysis. It can be said that a modular wooden system for customizable, remountable, and multistory spaces can be developed, provided that the identified criteria, adaptability, material efficiency, modularity, and integration with existing building requirements, are prioritized while ensuring the preservation of the church architecture.”



CHURCH

- Current situation
- Properties
- Values
- Changes

CURRENT SITUATION

Hulst

St. Willibrordusbasiliek



1535



Basilica



Ledian stone



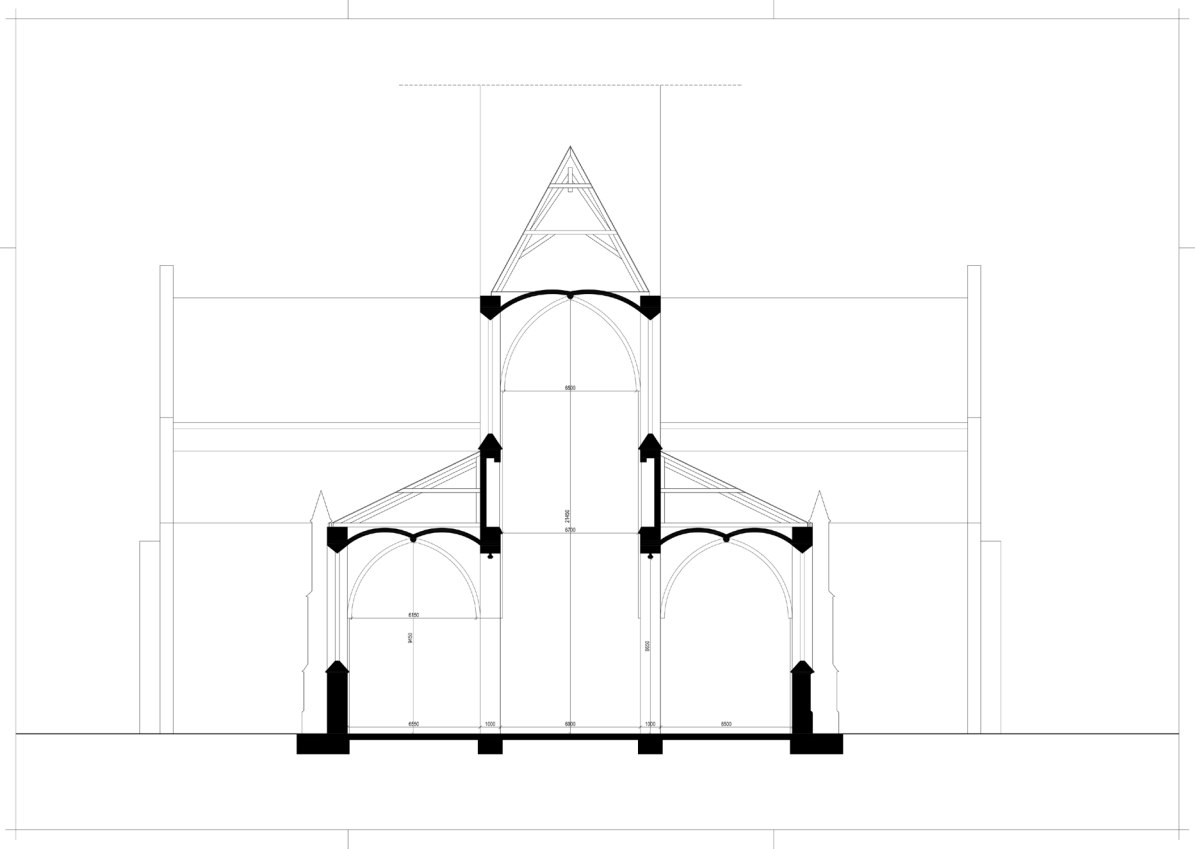
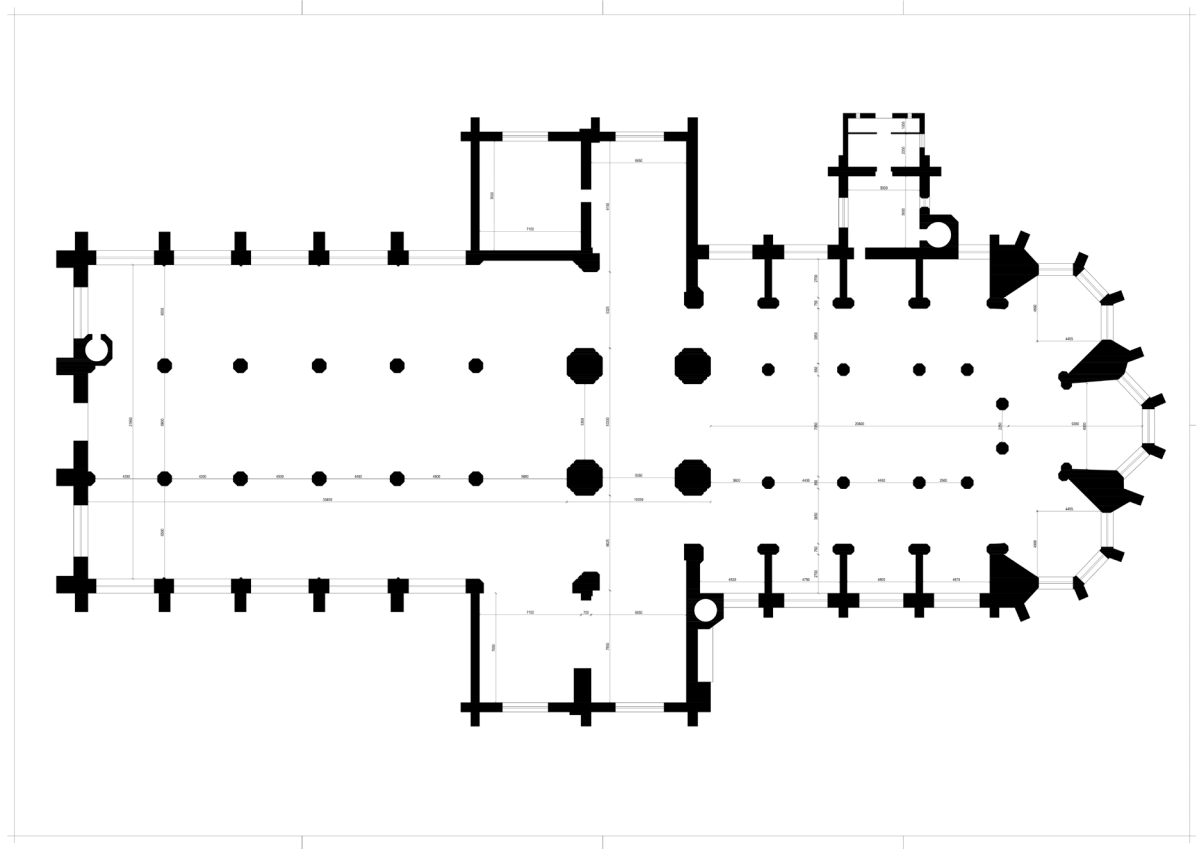
National monument
(Rijksmonument)



Brabantine Gothic

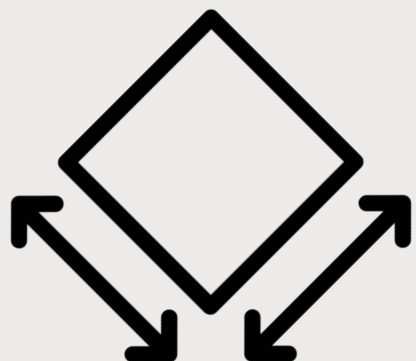


CURRENT SITUATION





CURRENT SITUATION



Floor space:

3500 m²

Total length:

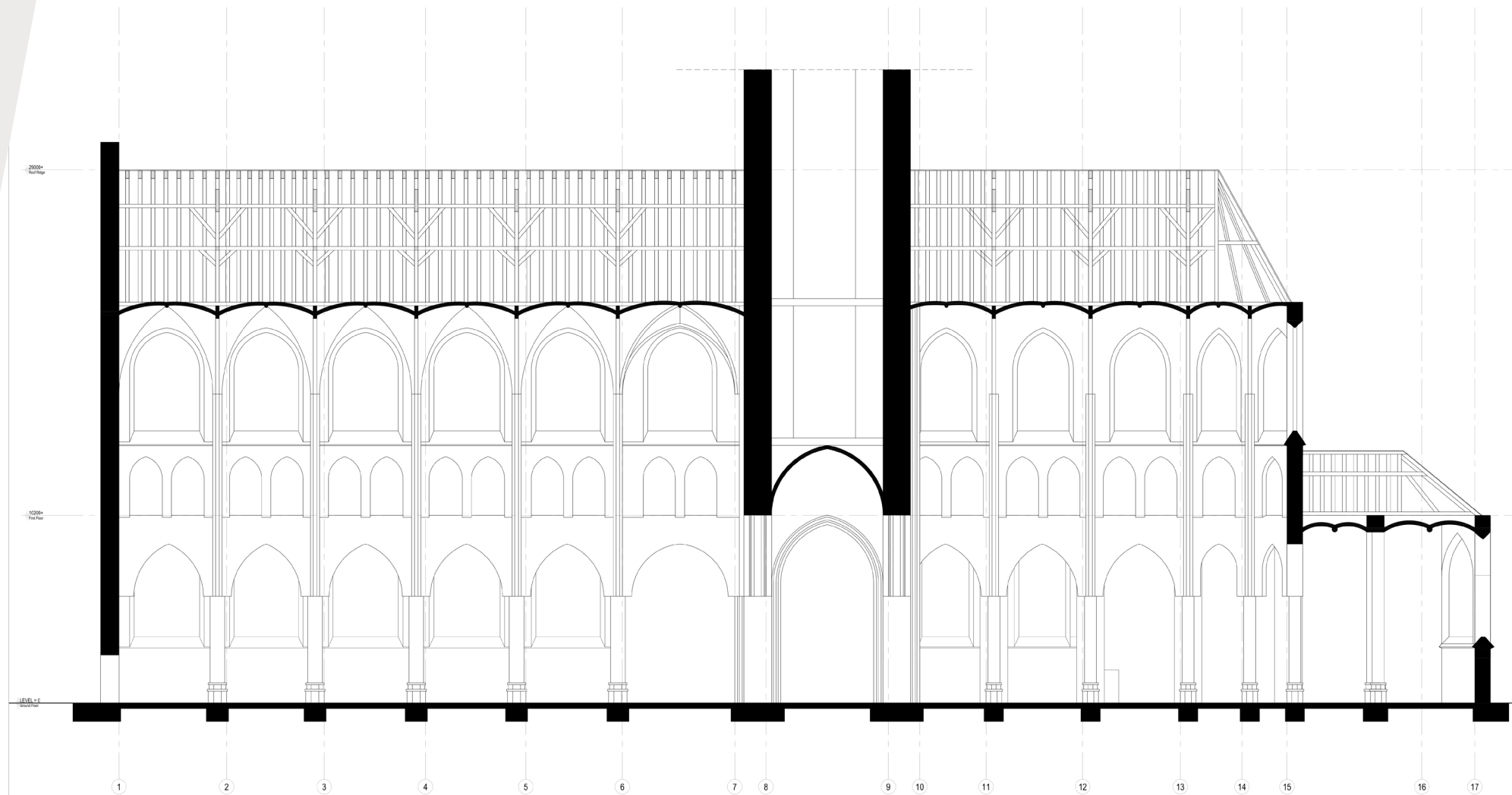
73,65 m

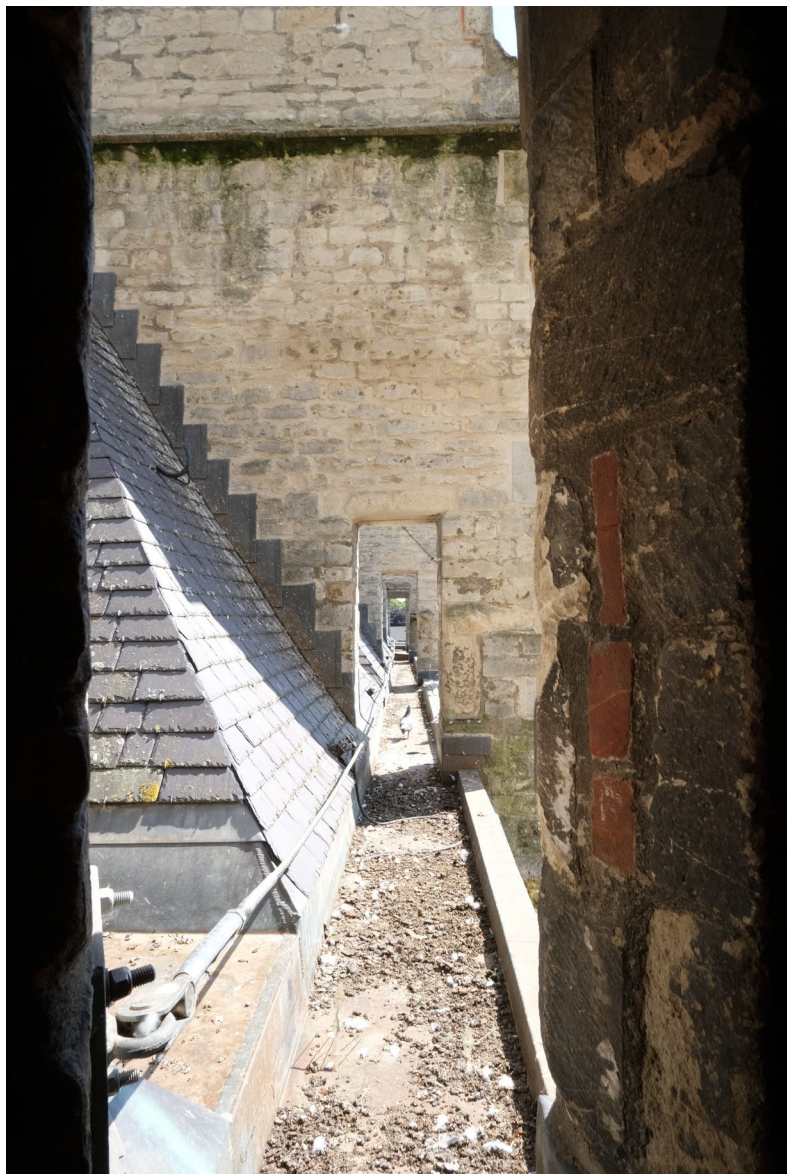
Max. width:

39,25 m

Max. indoor
height:

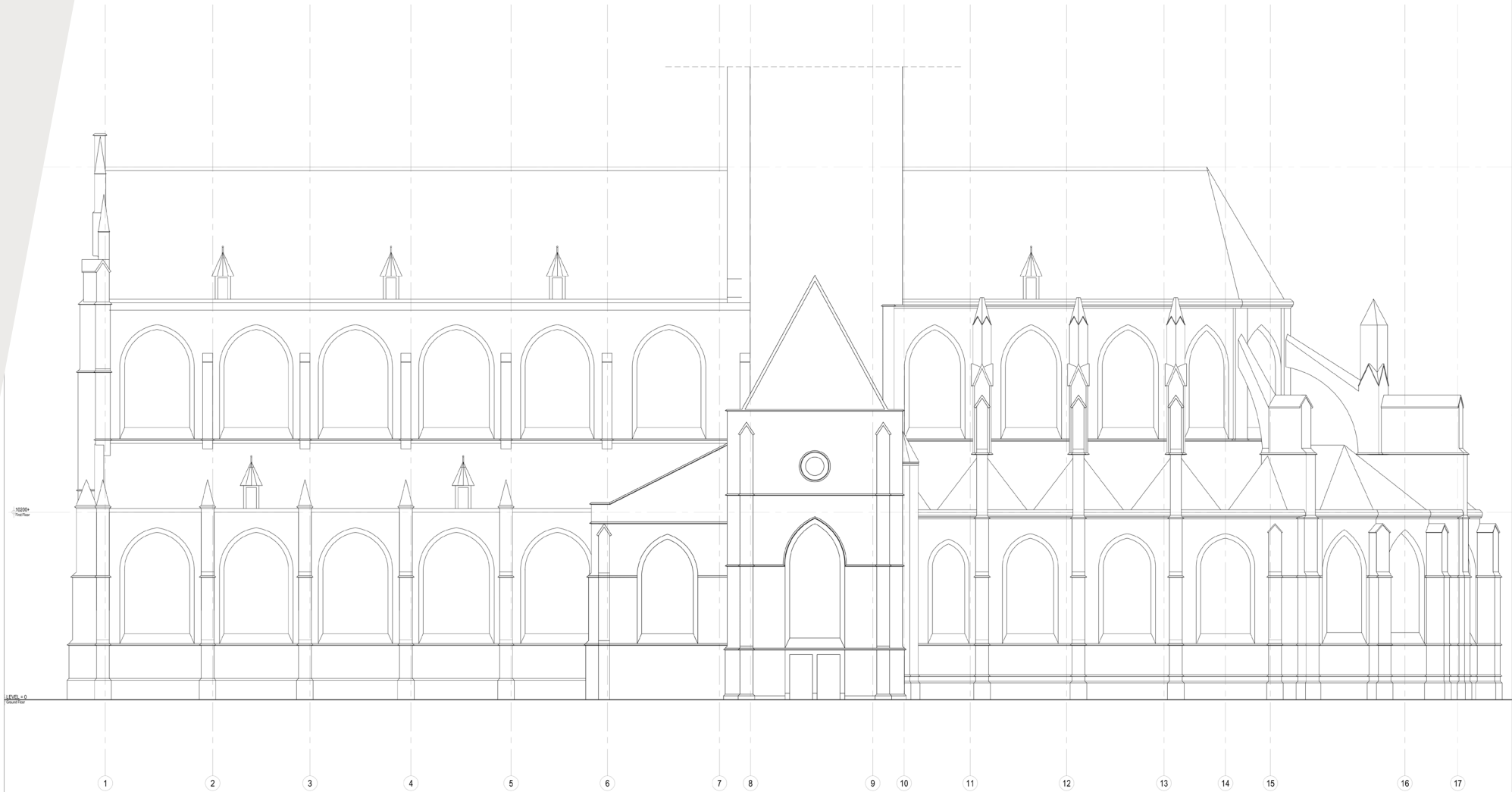
21,4 m





CURRENT SITUATION

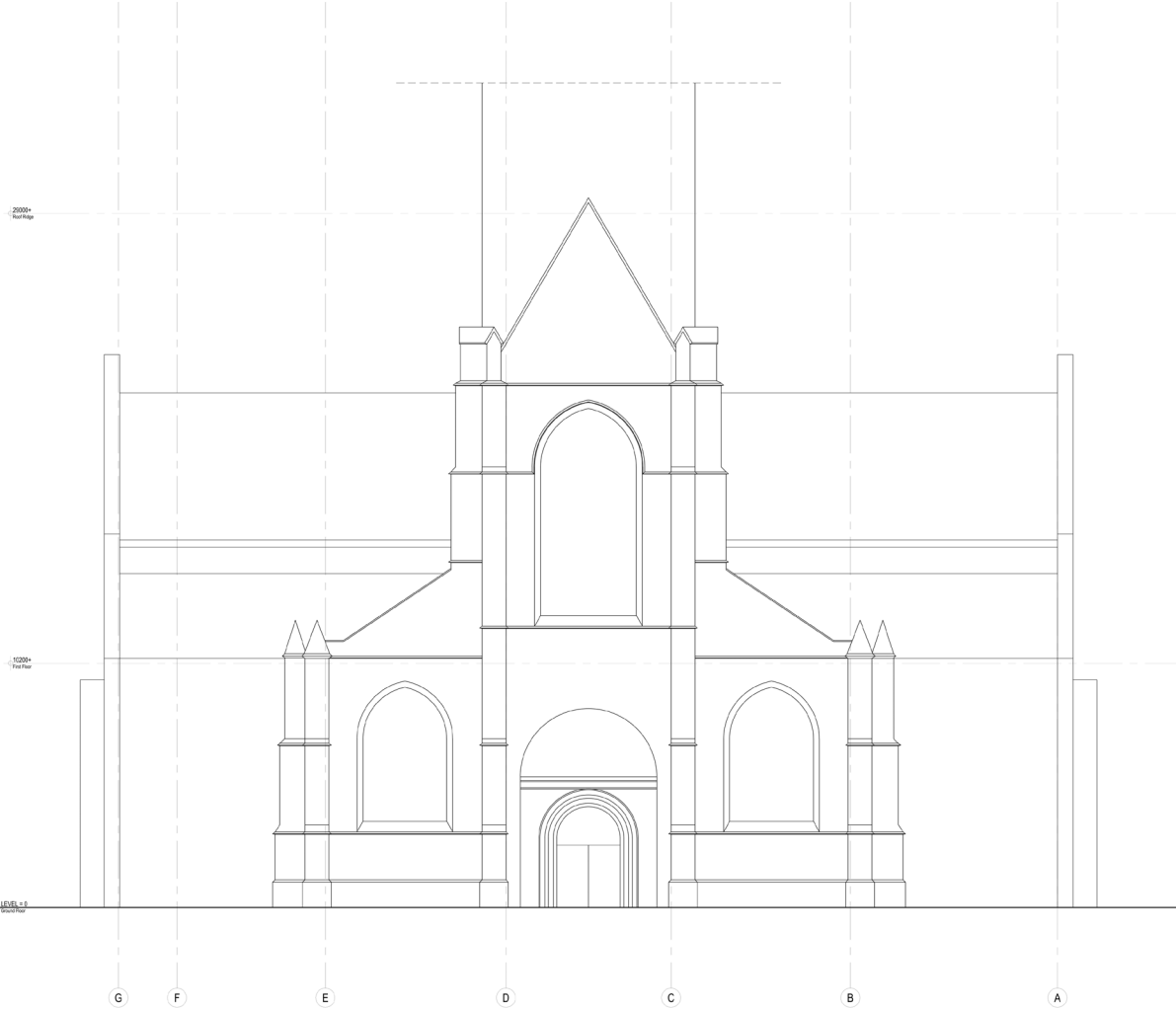
South facade
1:100





CURRENT SITUATION

West facade
1:100





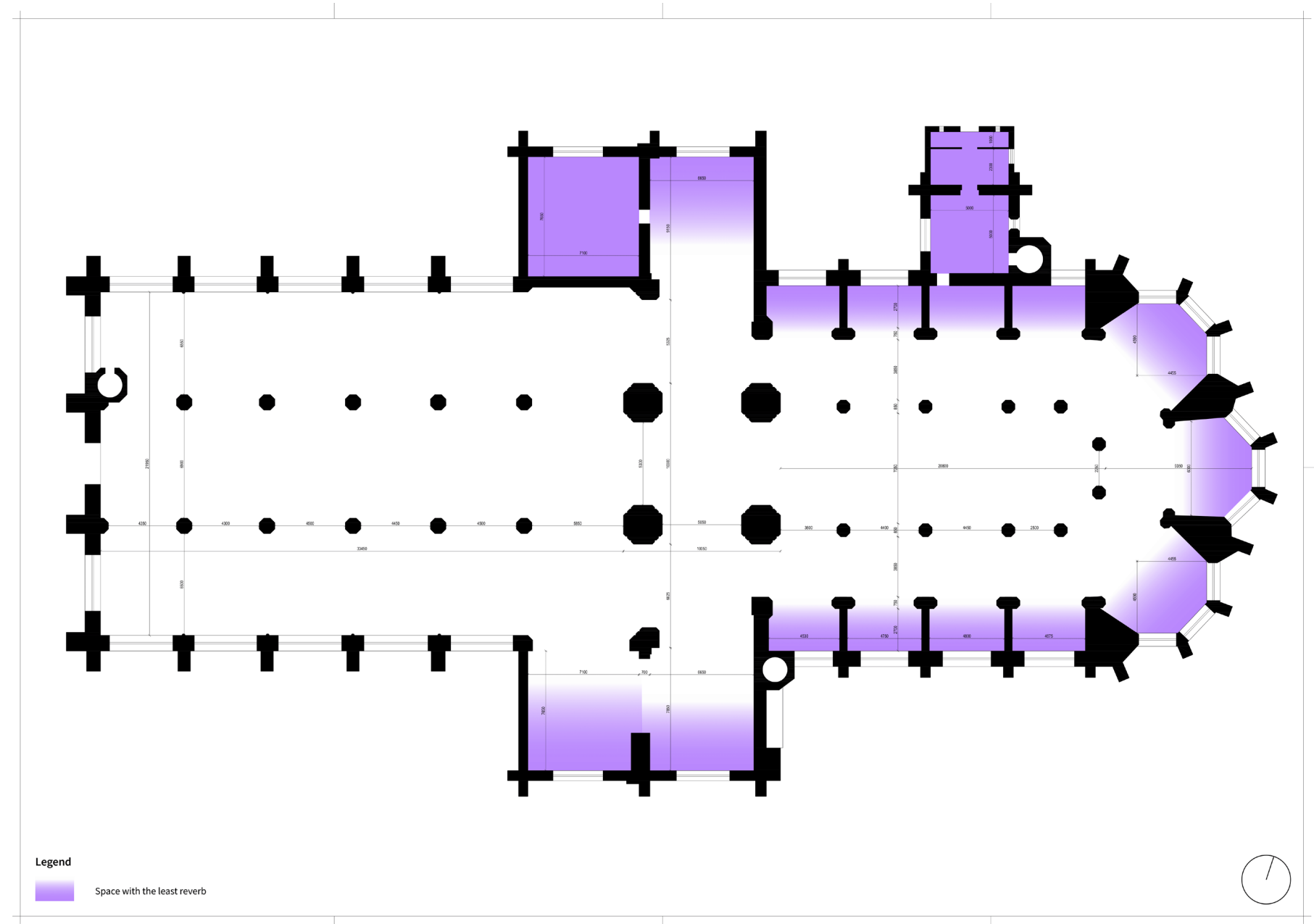
CURRENT SITUATION

North facade
1:100



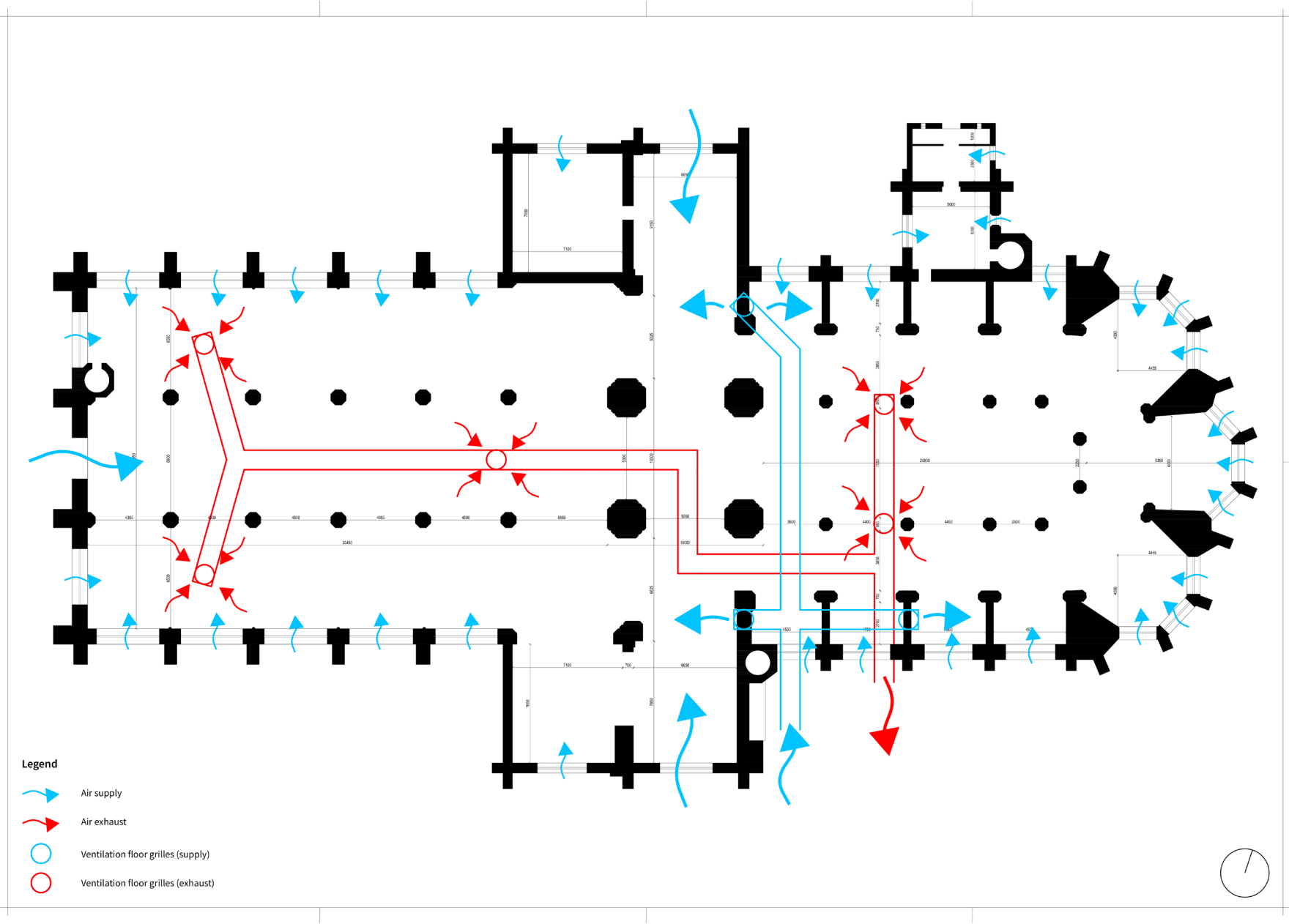


Acoustics



PROPERTIES

Ventilation

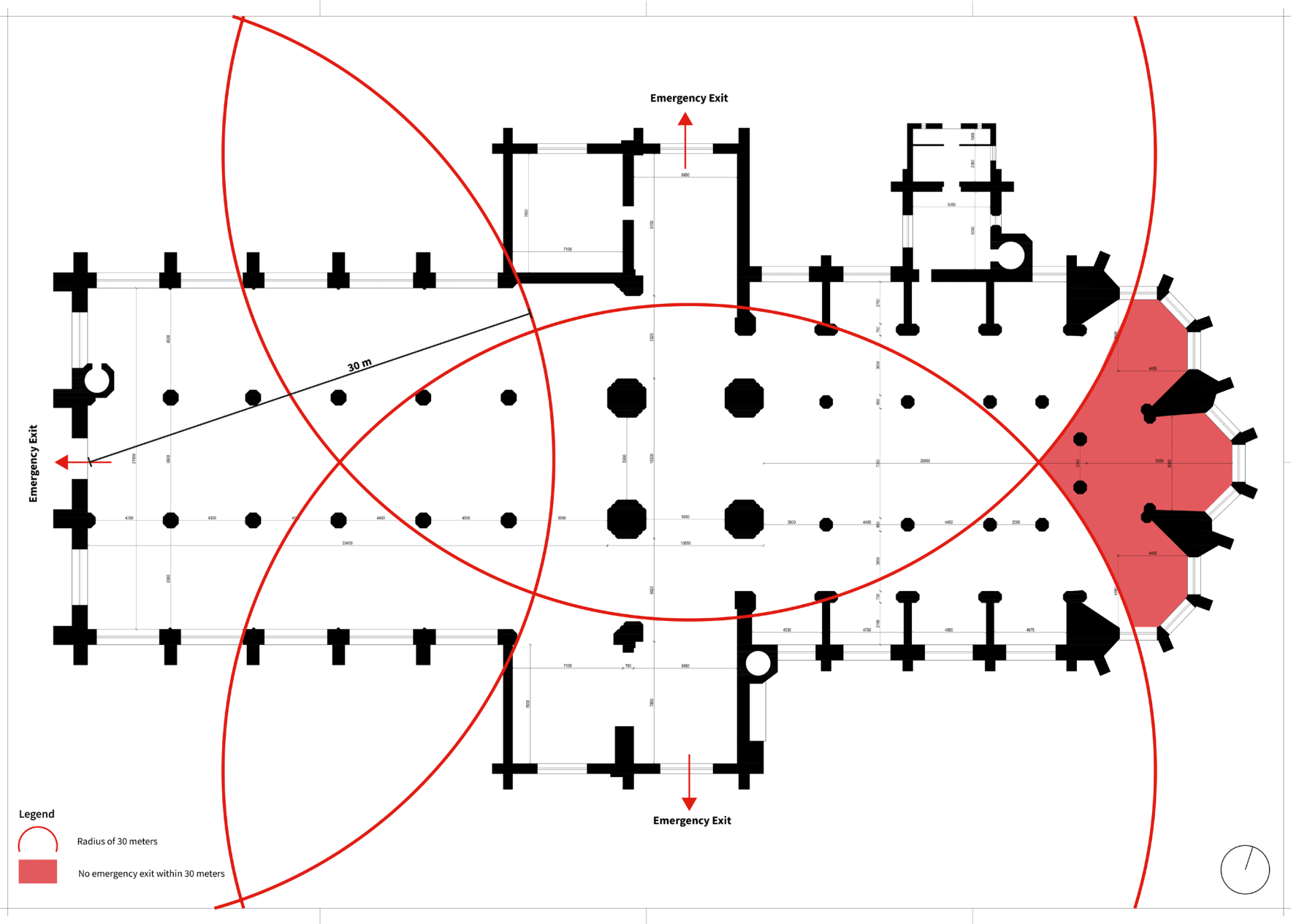


PROPERTIES

Fire safety

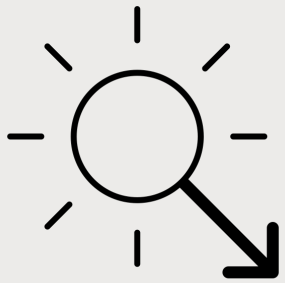


Extra fire
escape required
to accomodate
functions on
the east side

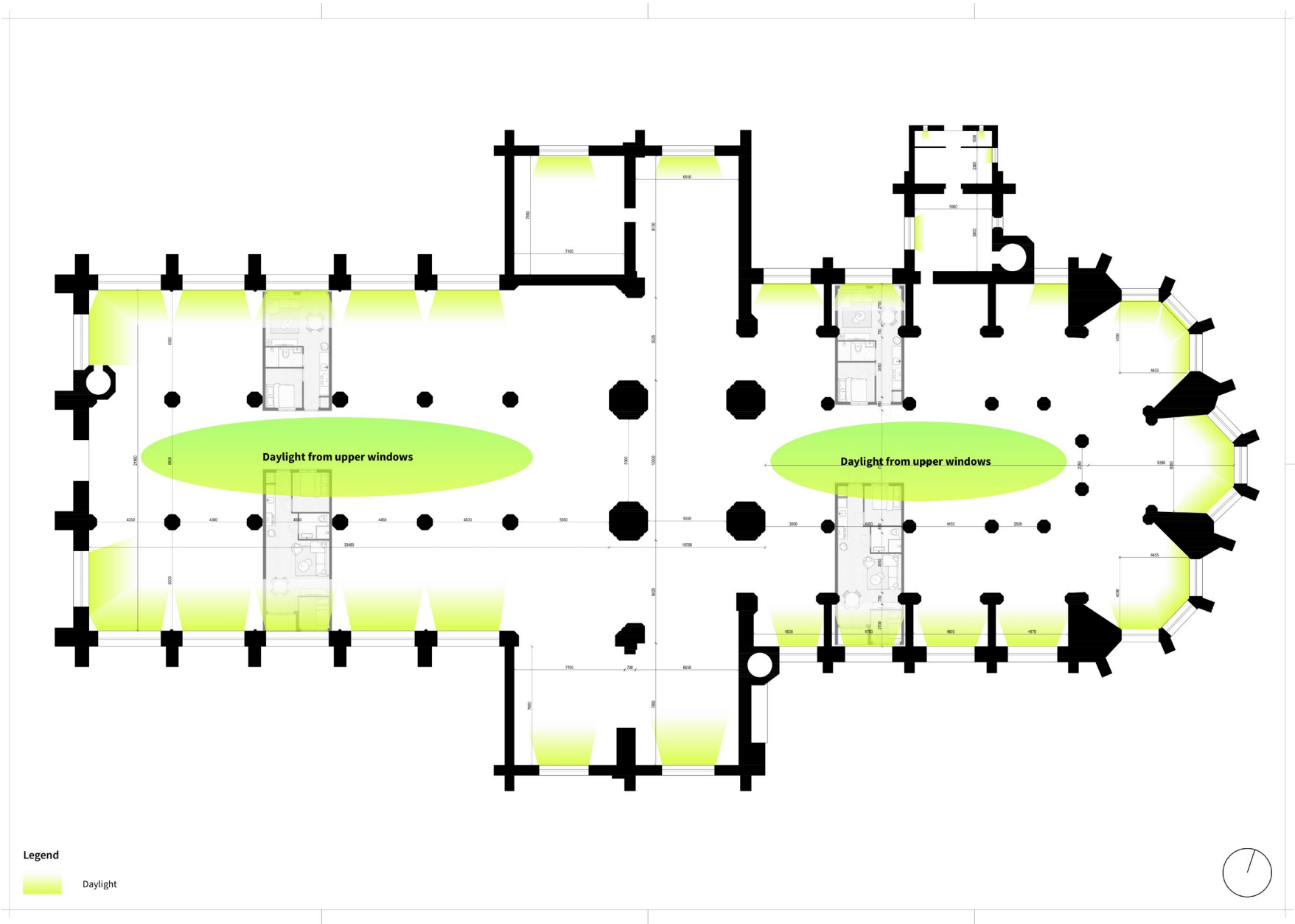


PROPERTIES

Daylight access



Functions such as offices and housing can be placed from 3000 mm and above

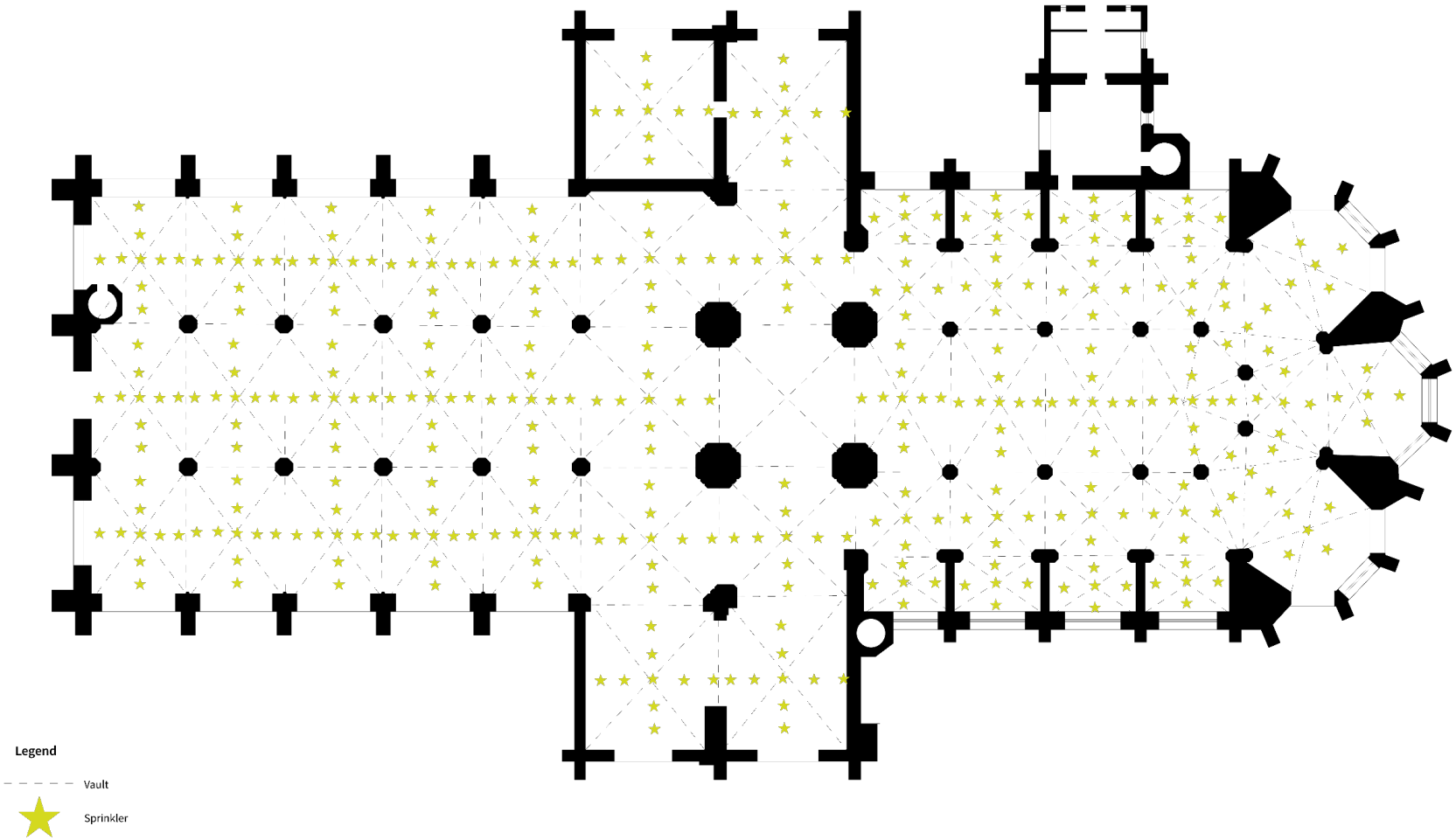


PROPERTIES

Sprinklers

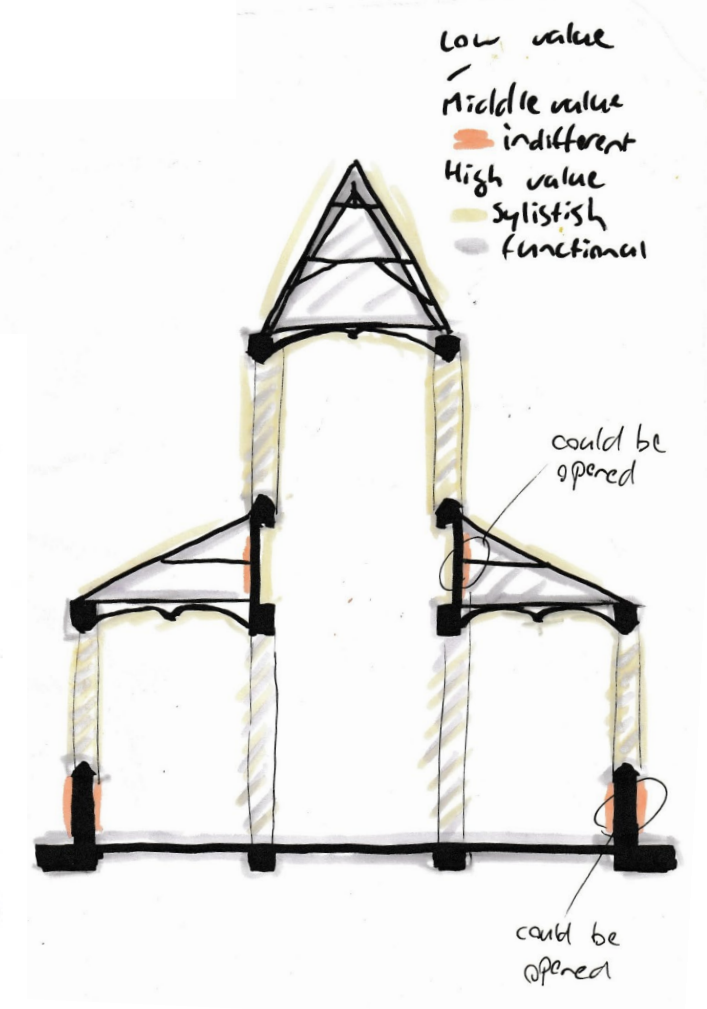
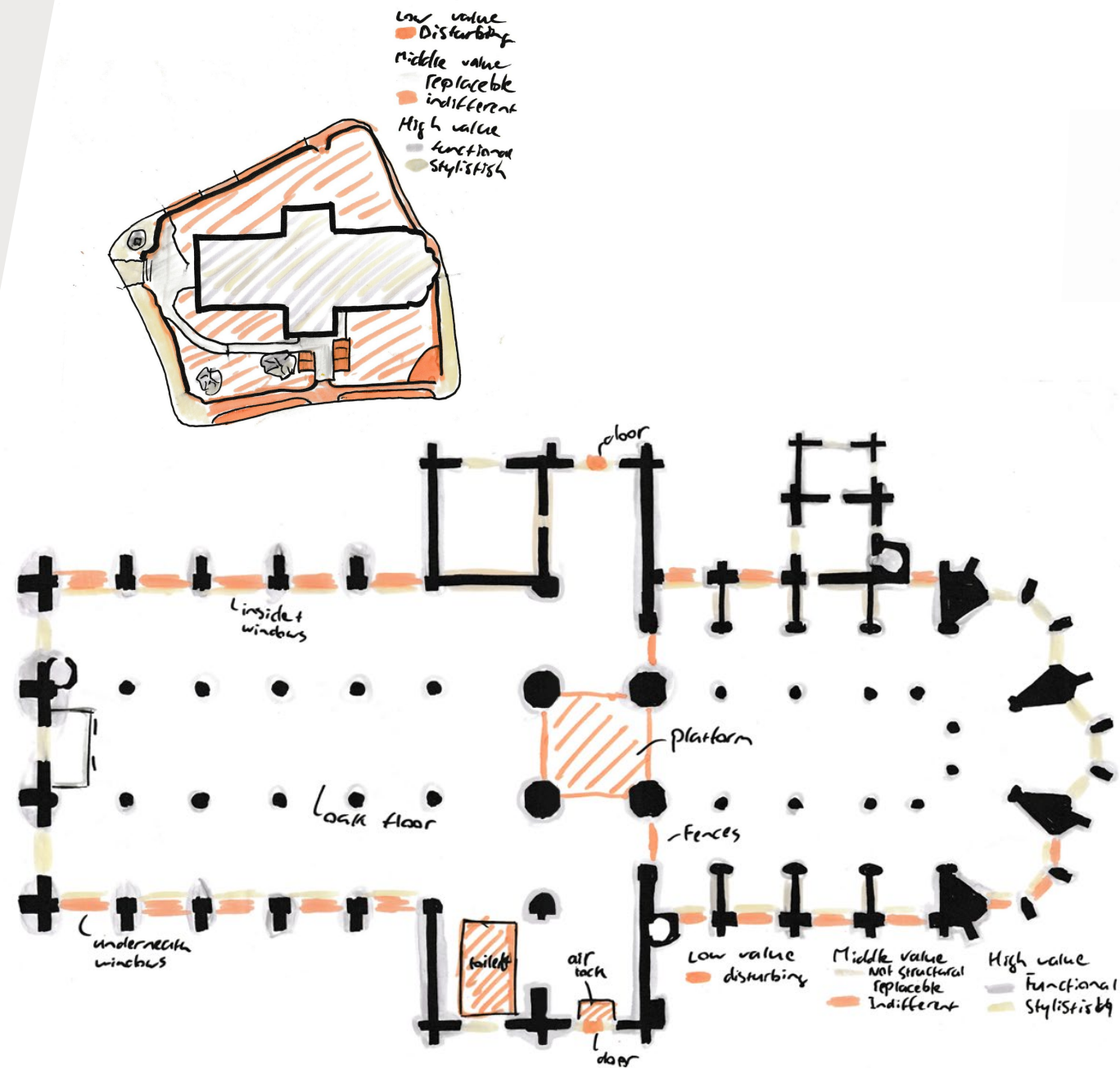


530 sprinklers
installed in the
church's vaults
with 2000 m piping



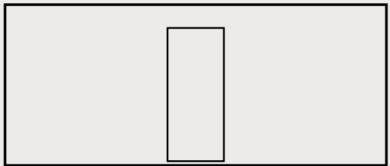
VALUES

Heritage values

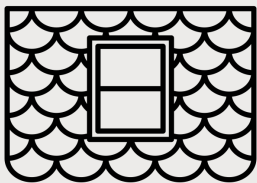


CHANGES

South façade
1:100



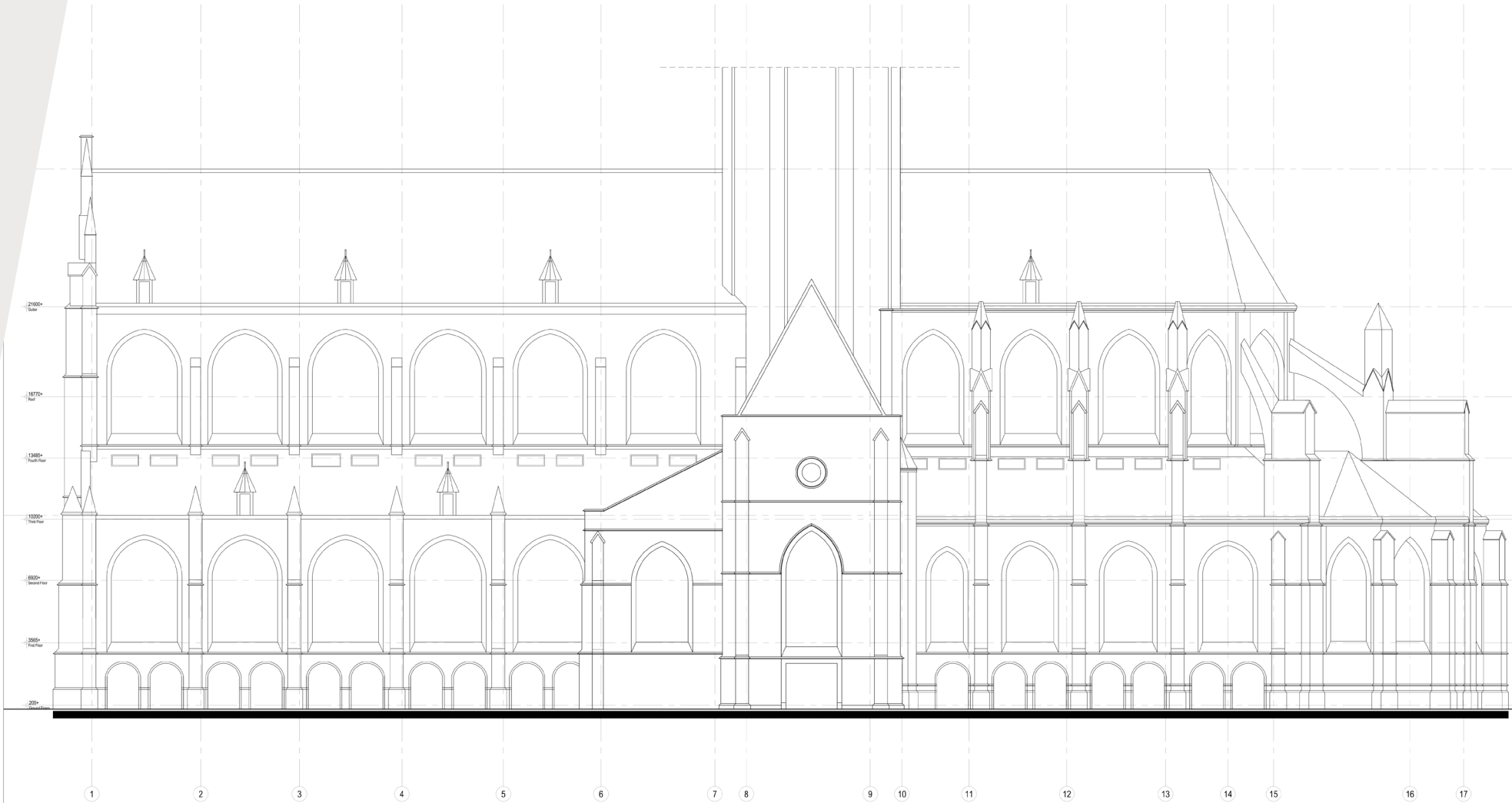
Openings ground floor



Roof windows

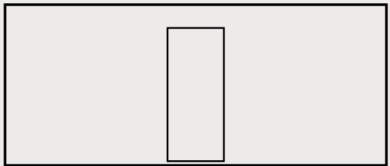


Simplified roof
East-side

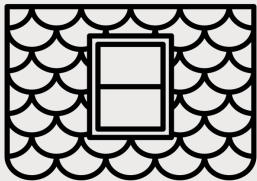


CHANGES

North façade
1:100



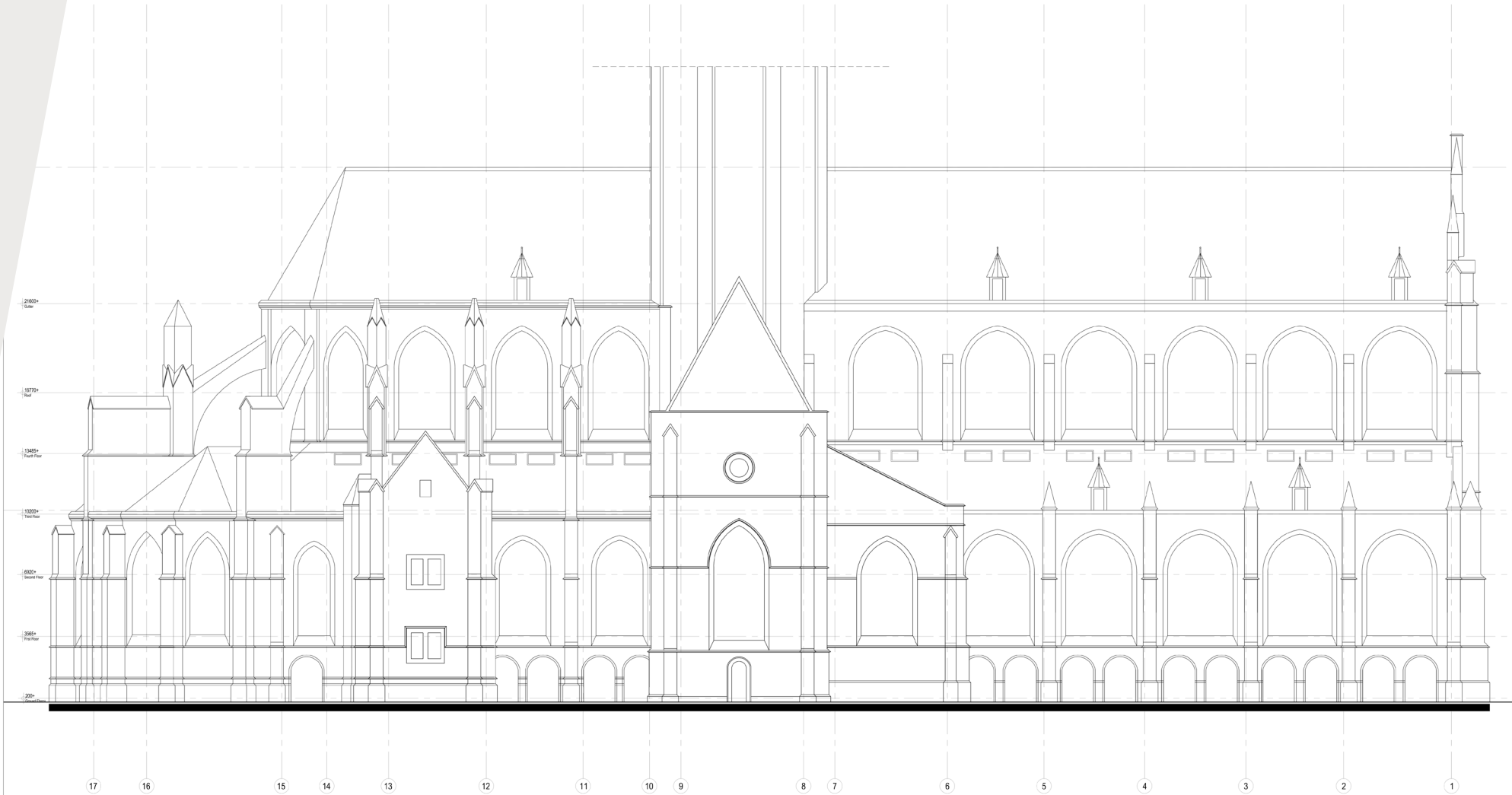
Openings ground floor



Roof windows



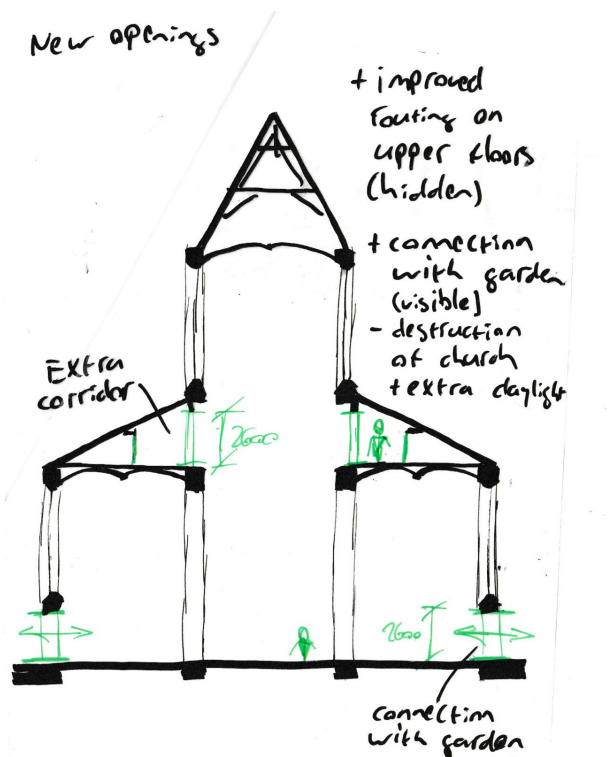
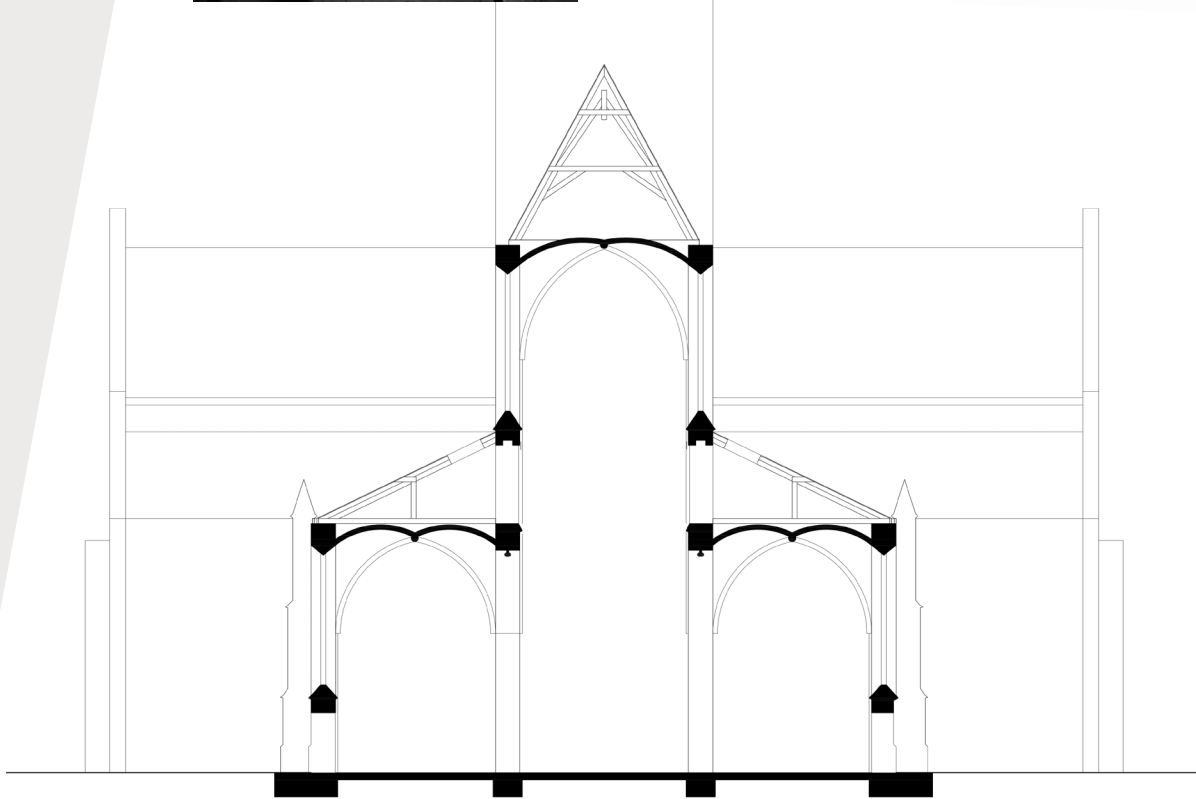
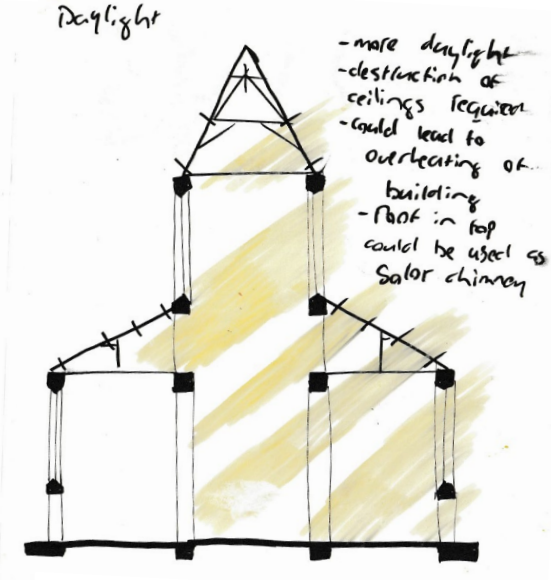
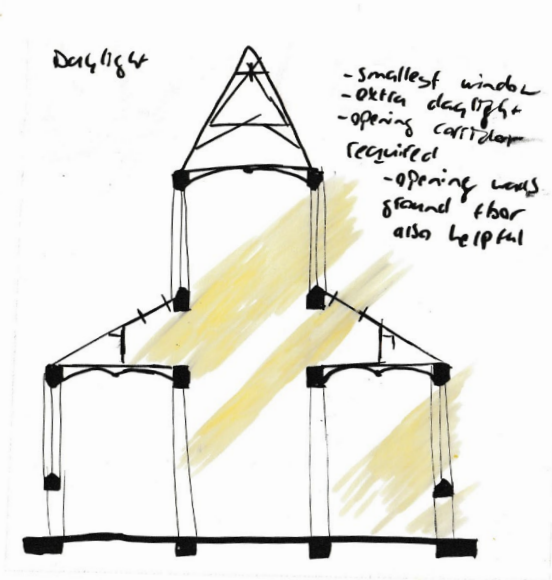
Simplified roof
East-side



CHANGES

Openings

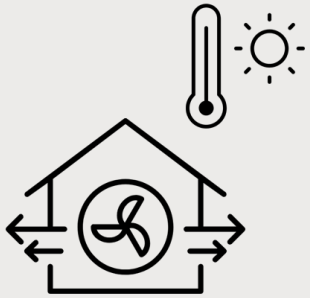
To improve accessibility, connection with the surrounding area and daylight access, additional openings are made to the church.





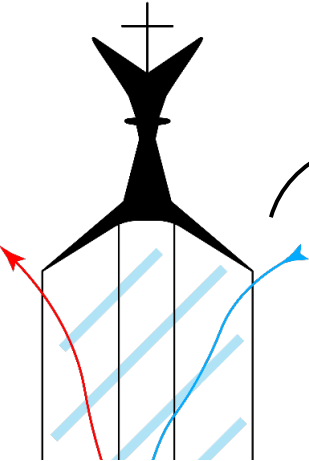
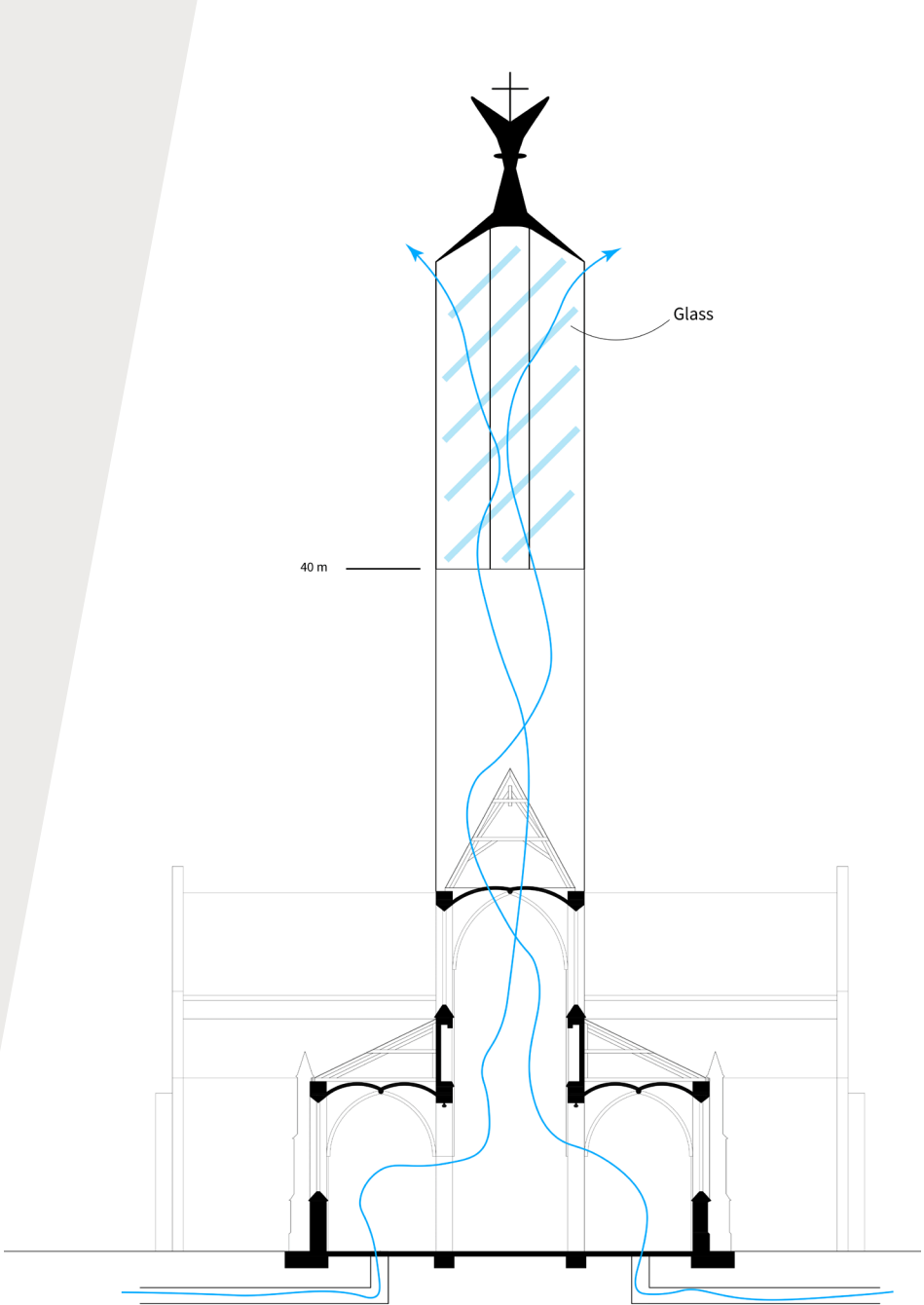
CHANGES

Solar chimney



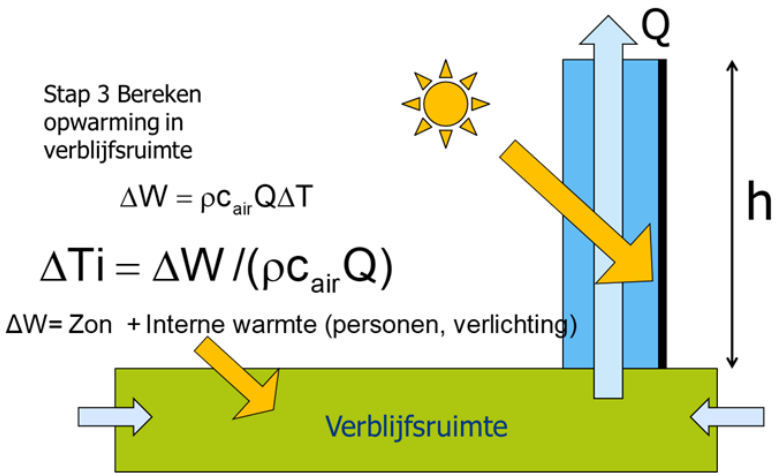
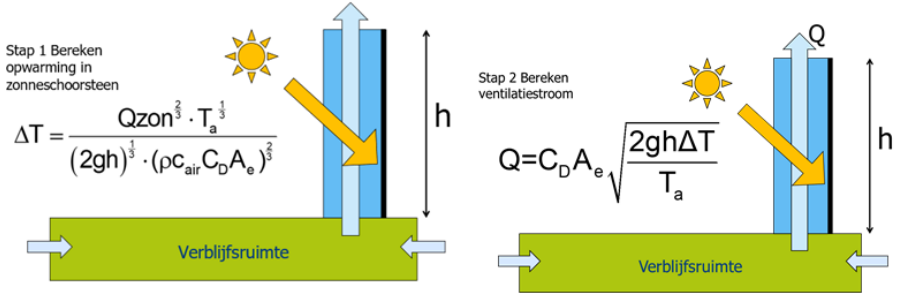
Chimney will be used as a summer ventilation system to cool down the building. Total opening of airducts should be 2,44 m²

Total height:
68,7 m



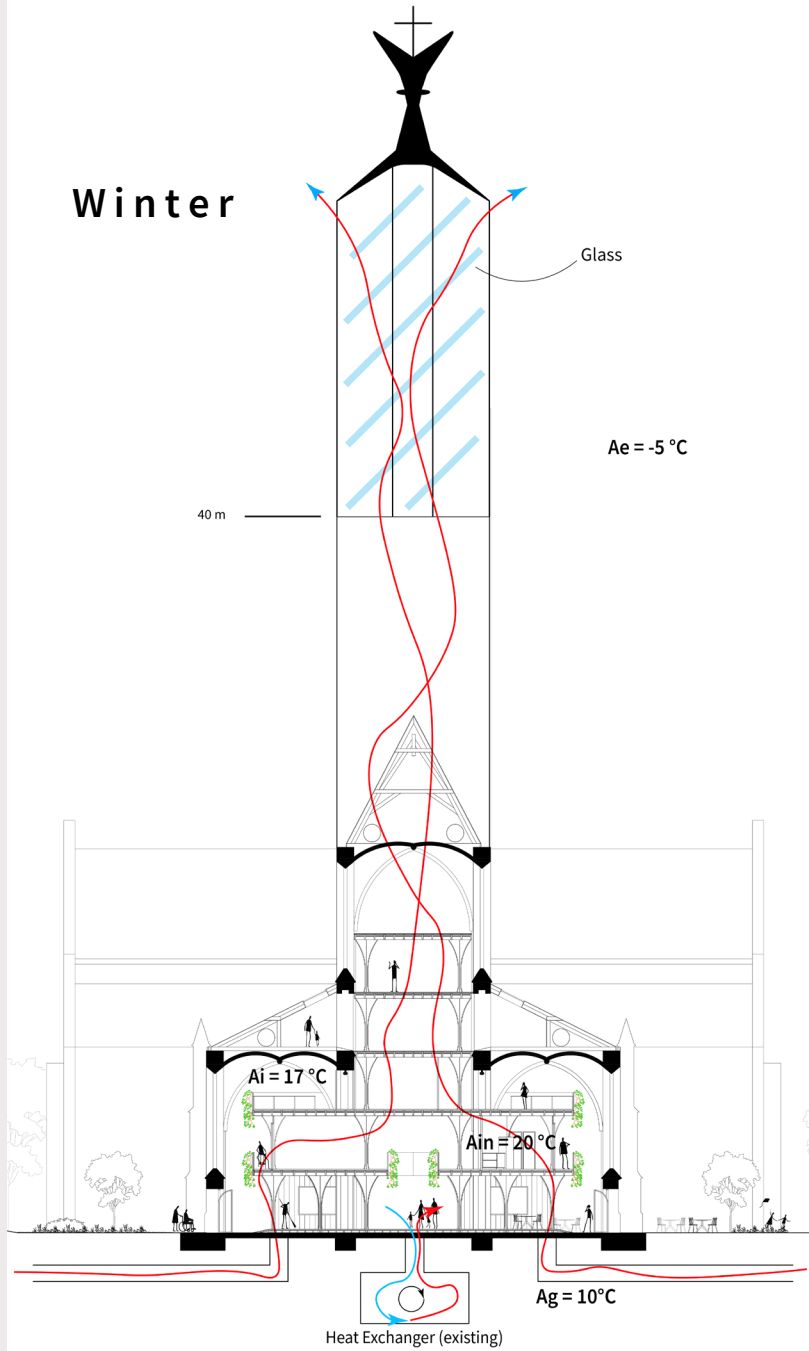
Windcatcher as alternative (Not practical in this situation)

Principe ventilatie d.m.v. zonneschoorsteen

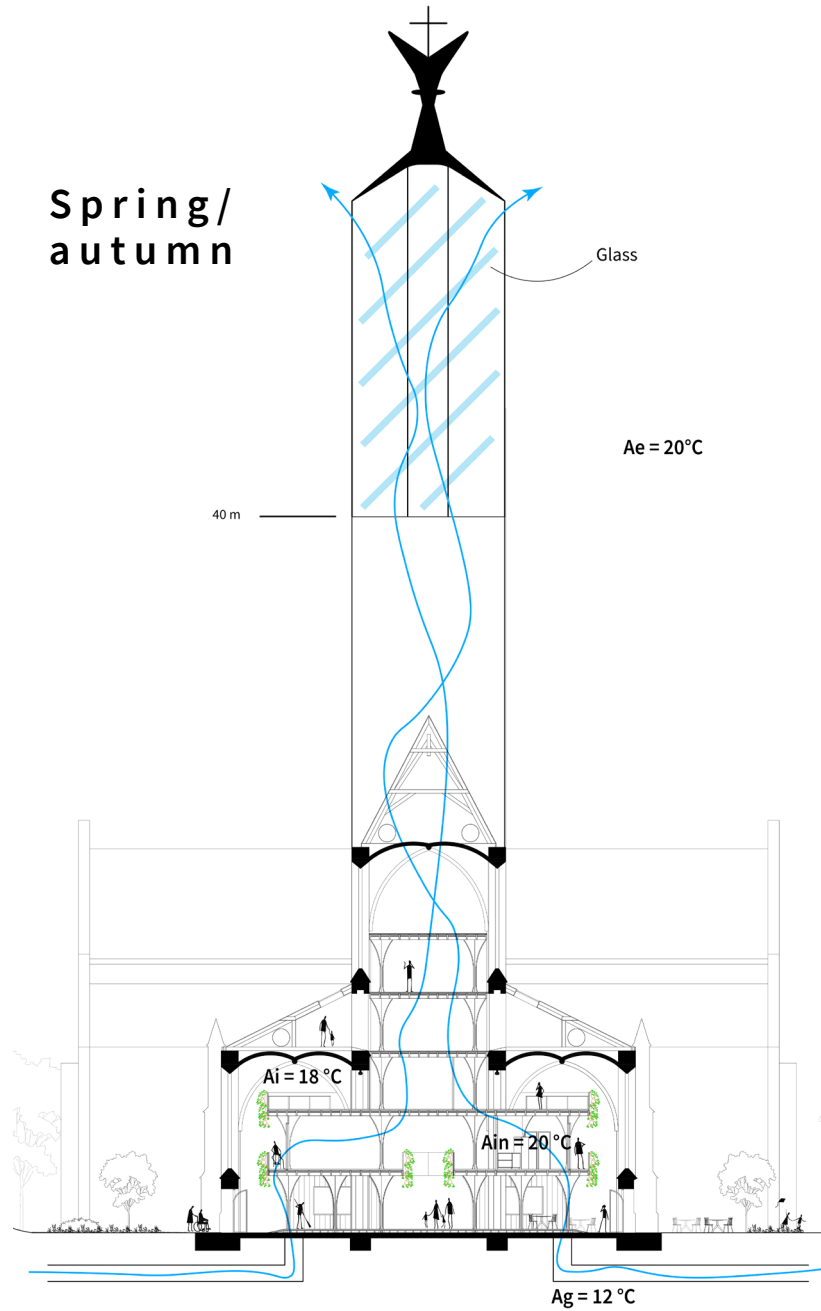




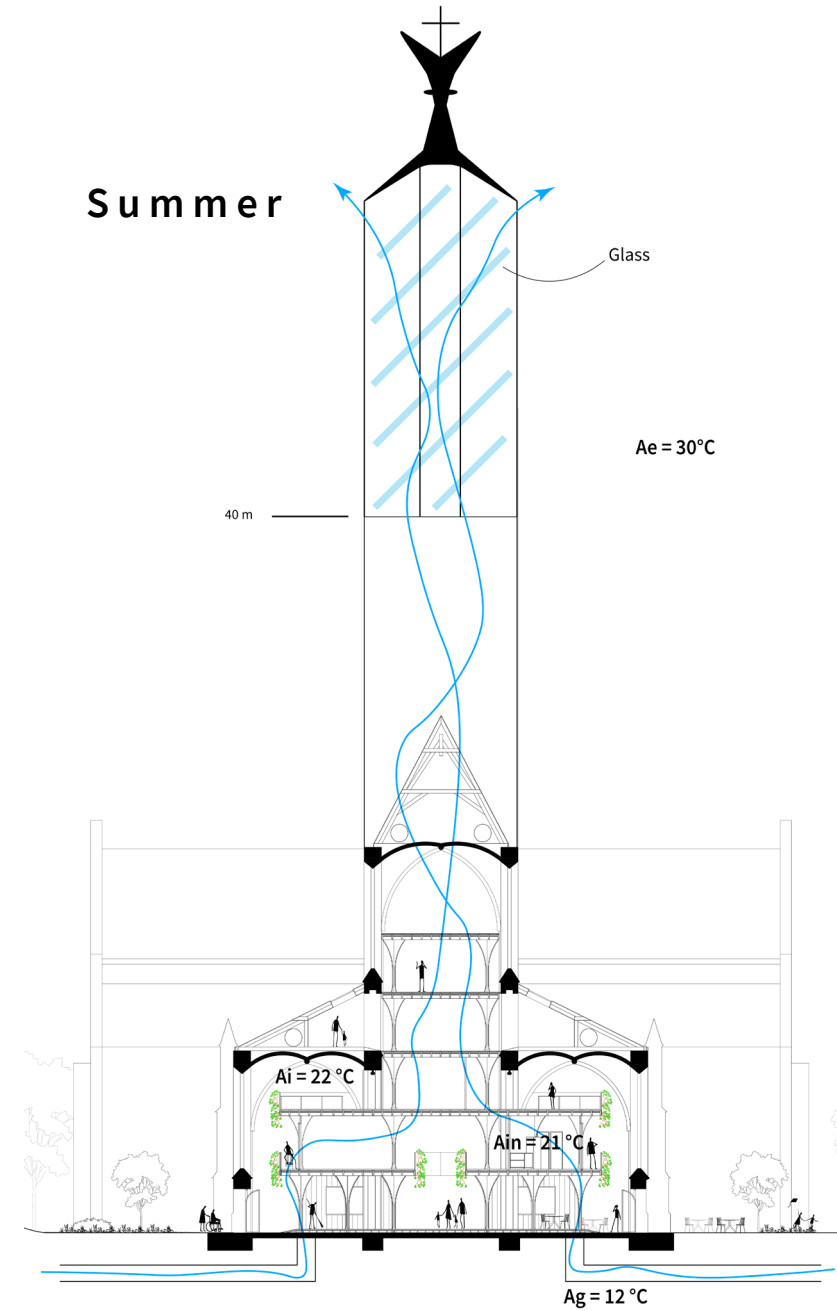
Winter



Spring/
autumn

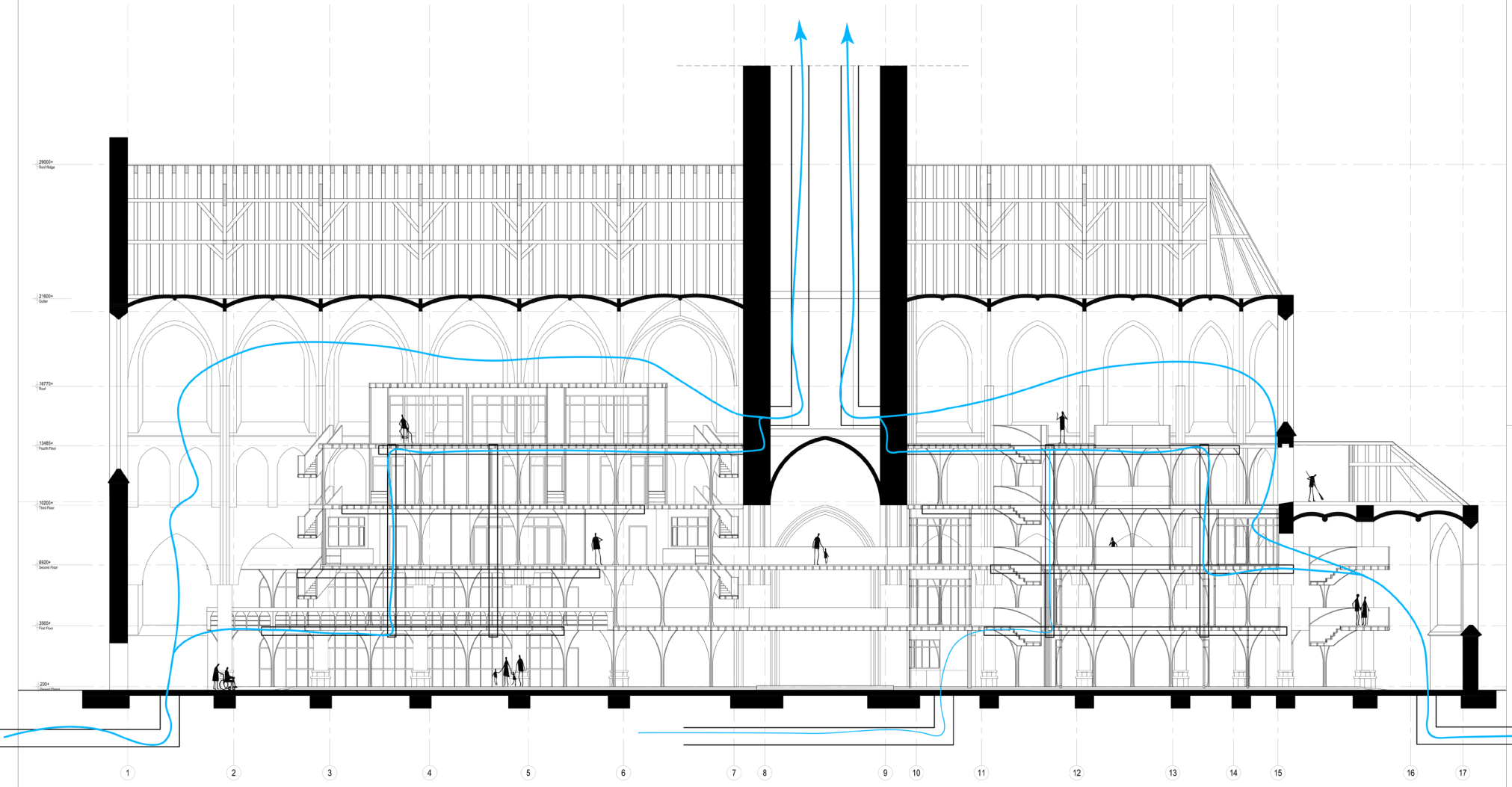


Summer



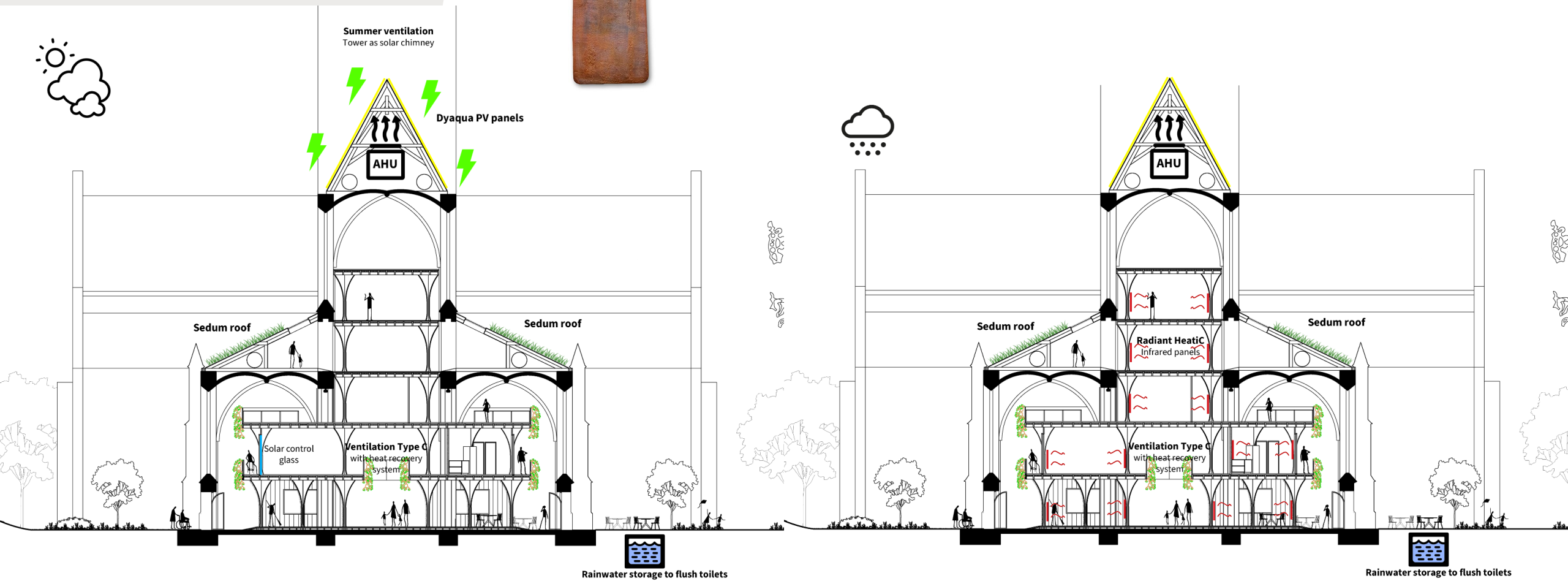
CHANGES

Ventilation system



CHANGES

Climate Design



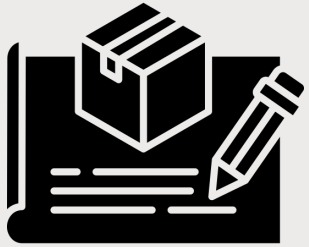


I N F I L L

- Strategy
- Construction
- Details
- Change of infill
- Other churches

STRATEGY

Building process



Configure to order

P - Production

T - Transport

S - Sorting

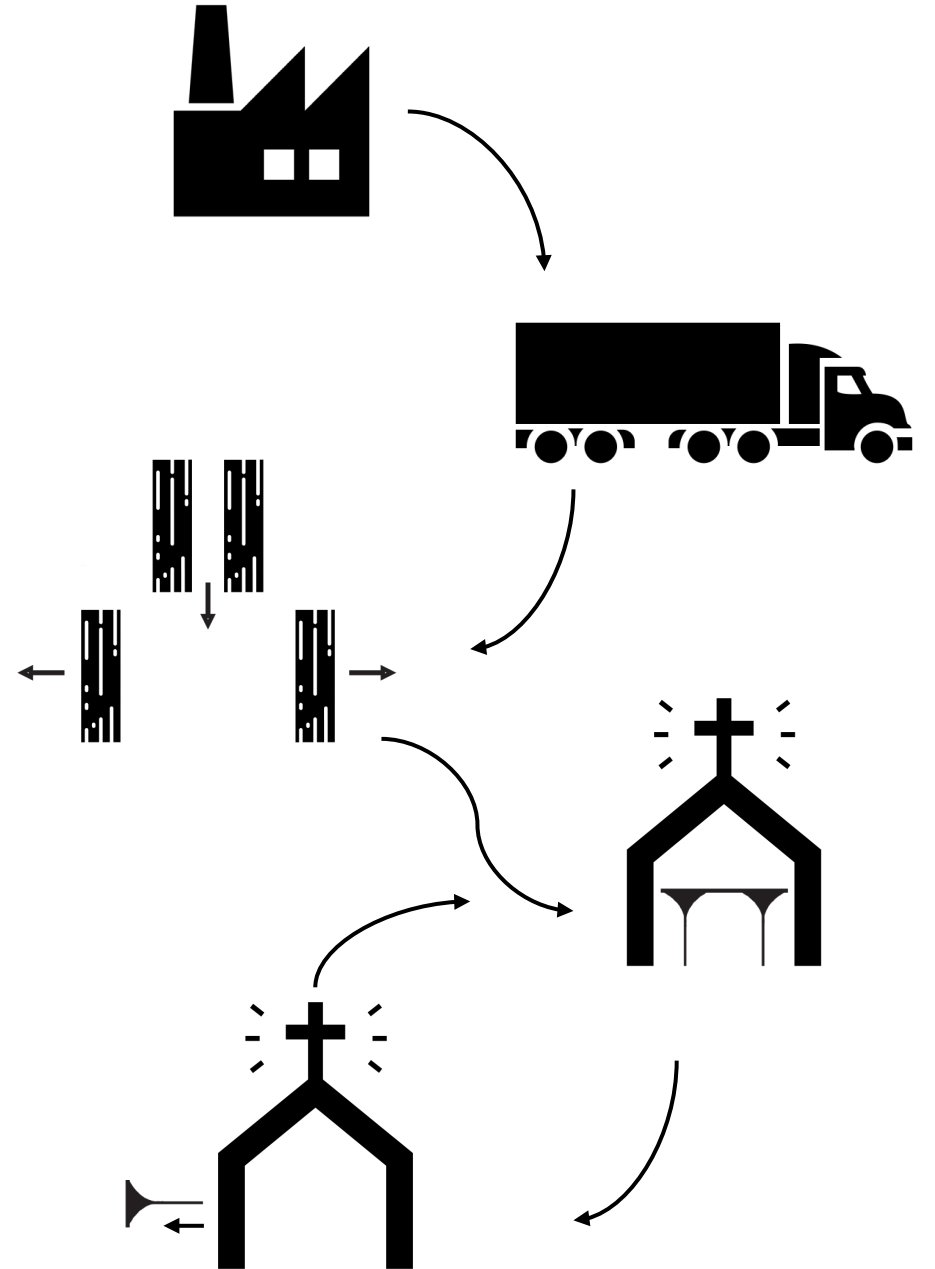
A - Assembly

D - Disassembly

(A - Assembly)

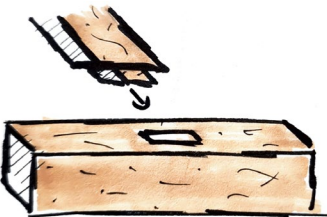
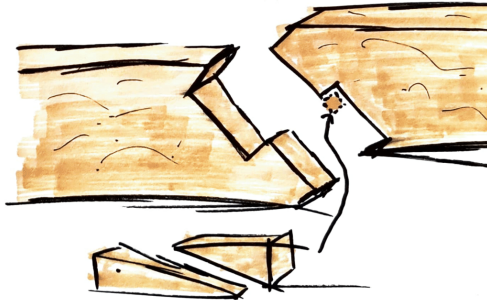
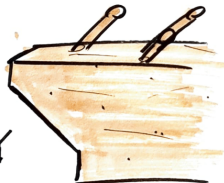
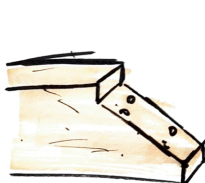
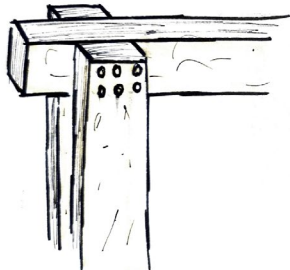
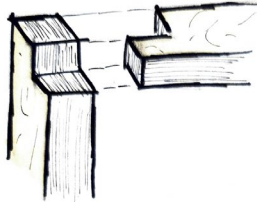
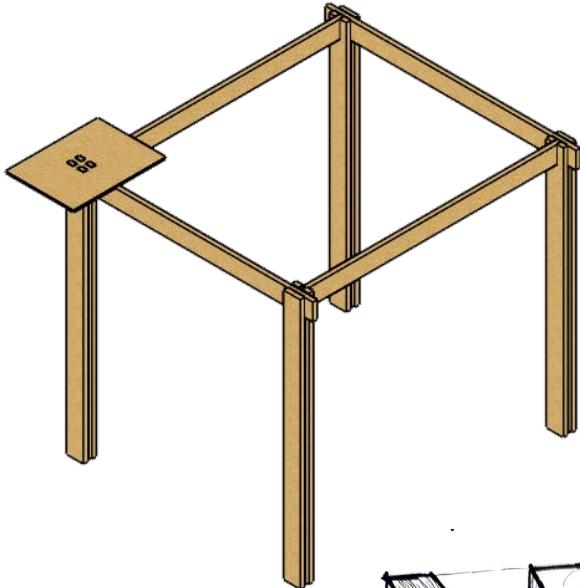
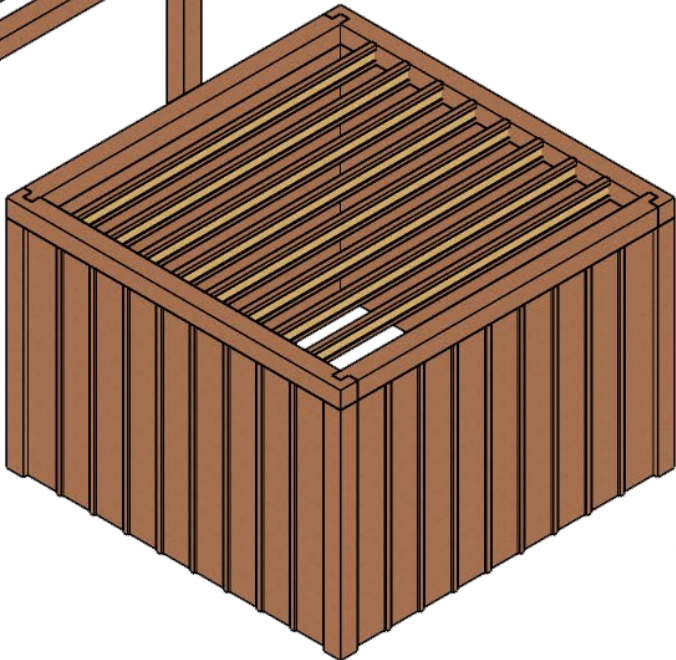
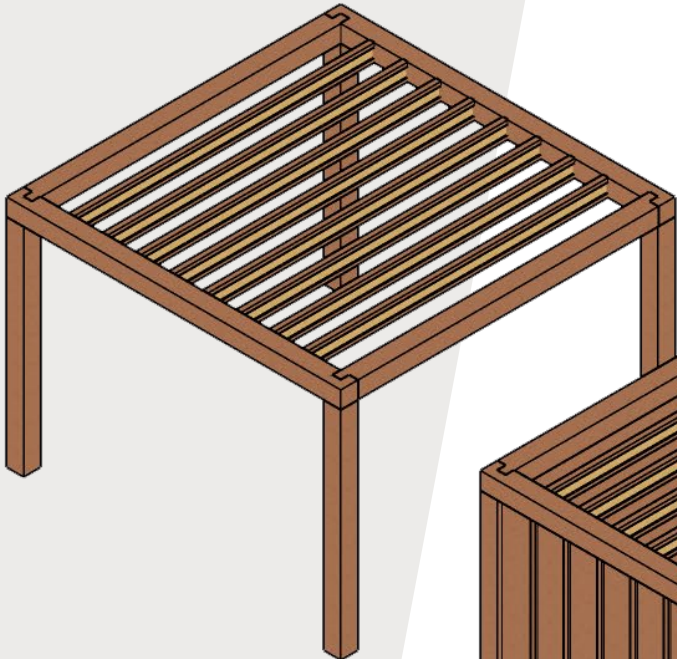
(D - Disassembly)

.....



CONSTRUCTION

Initial ideas /
Starting points



wood on wood
connections?

requires screws

requires dowels

Dowels reusable?

Dowels
required!

Massive
elements!

(complex)

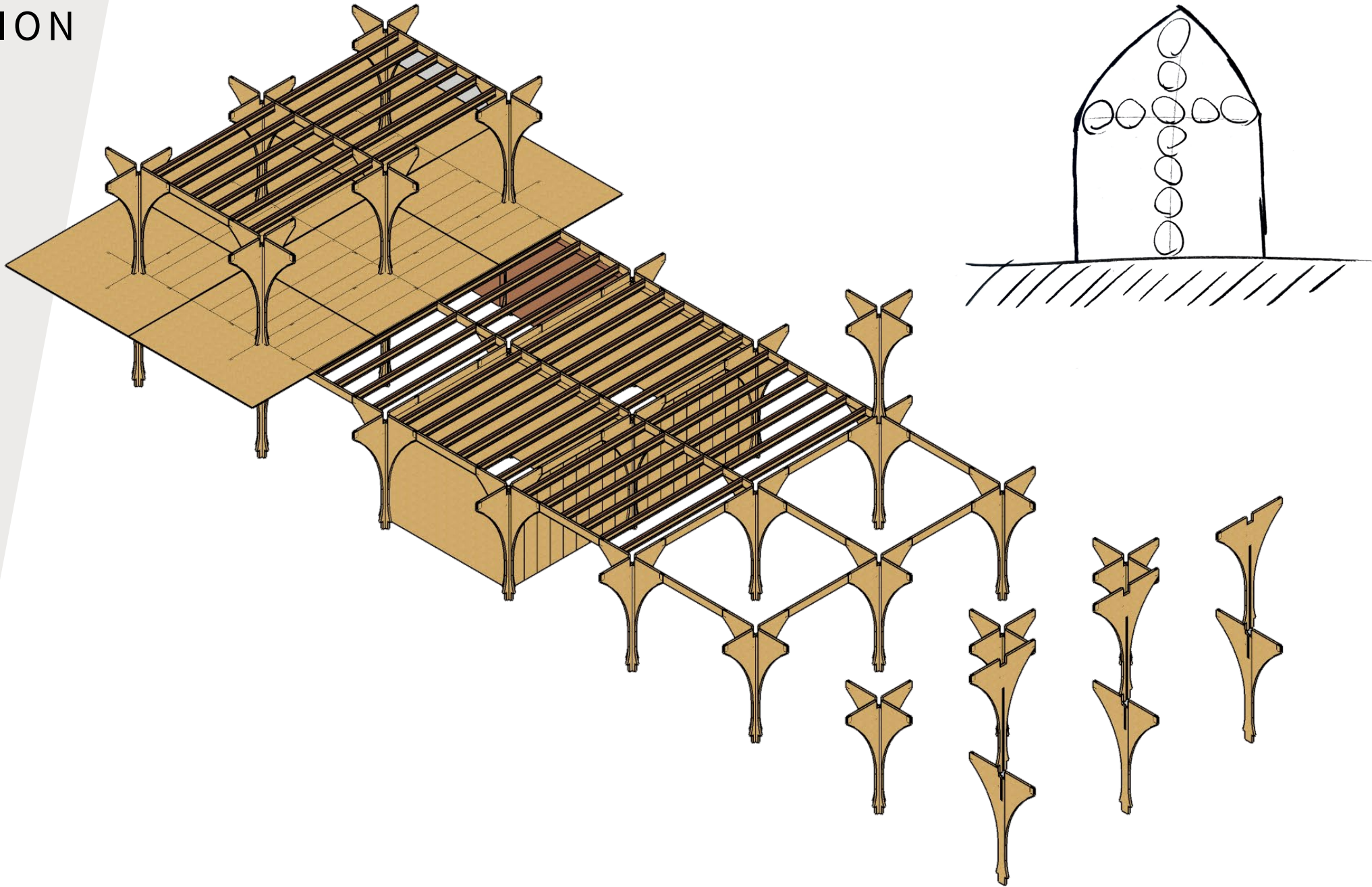
Japanese technique
on wooden joinery?

or

How was it
done in churches

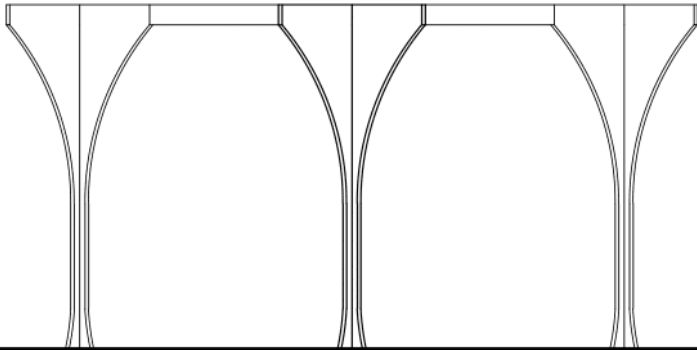
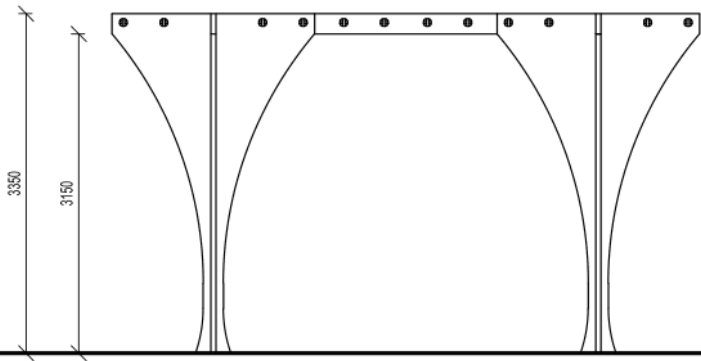
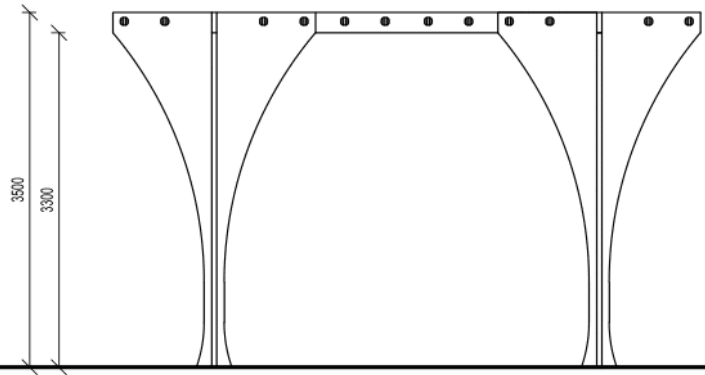
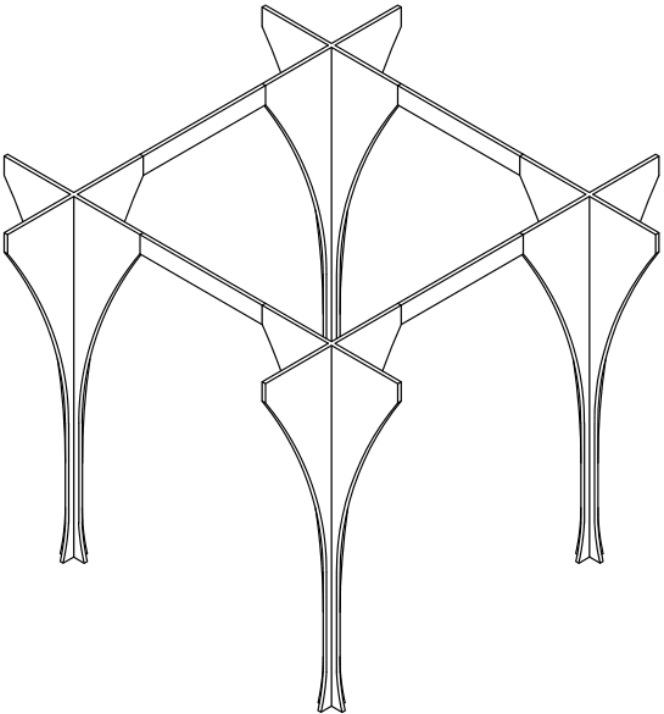
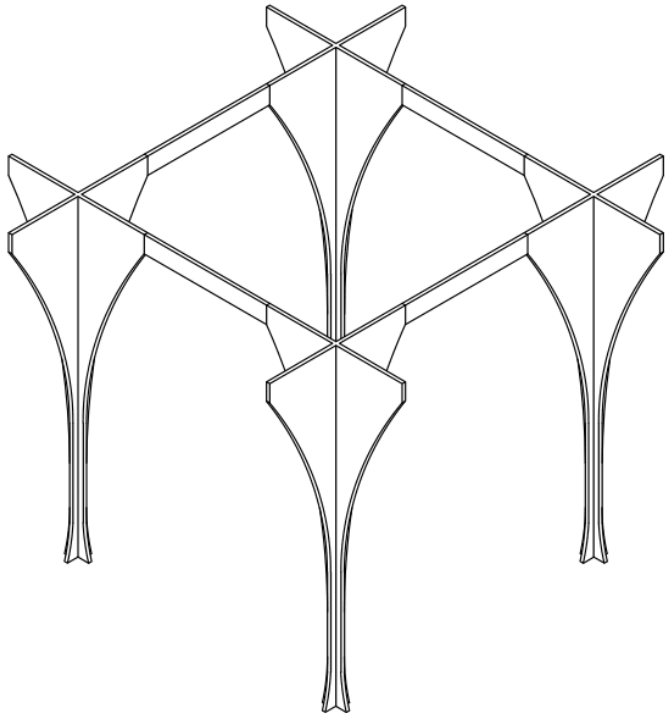
CONSTRUCTION

Initial ideas /
Starting points



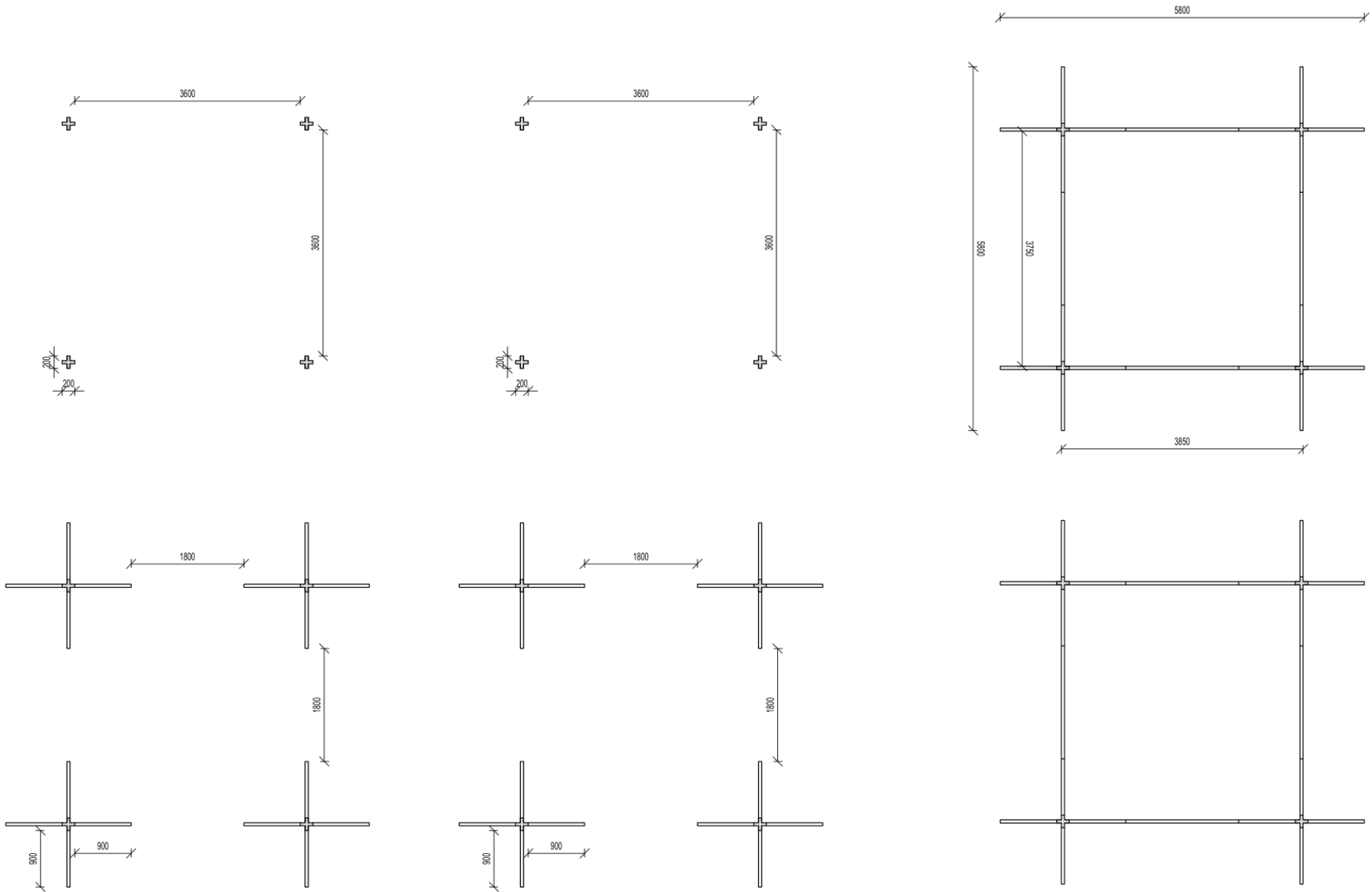
CONSTRUCTION

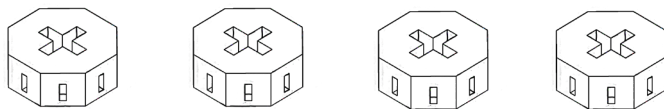
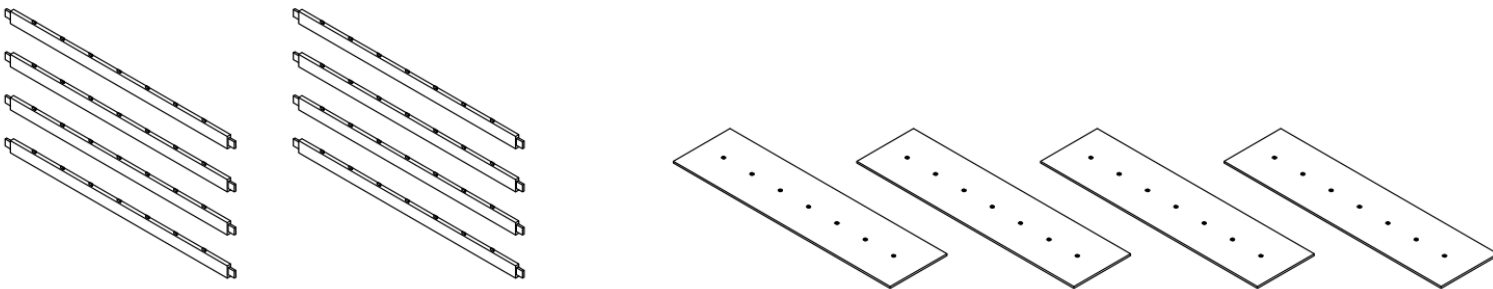
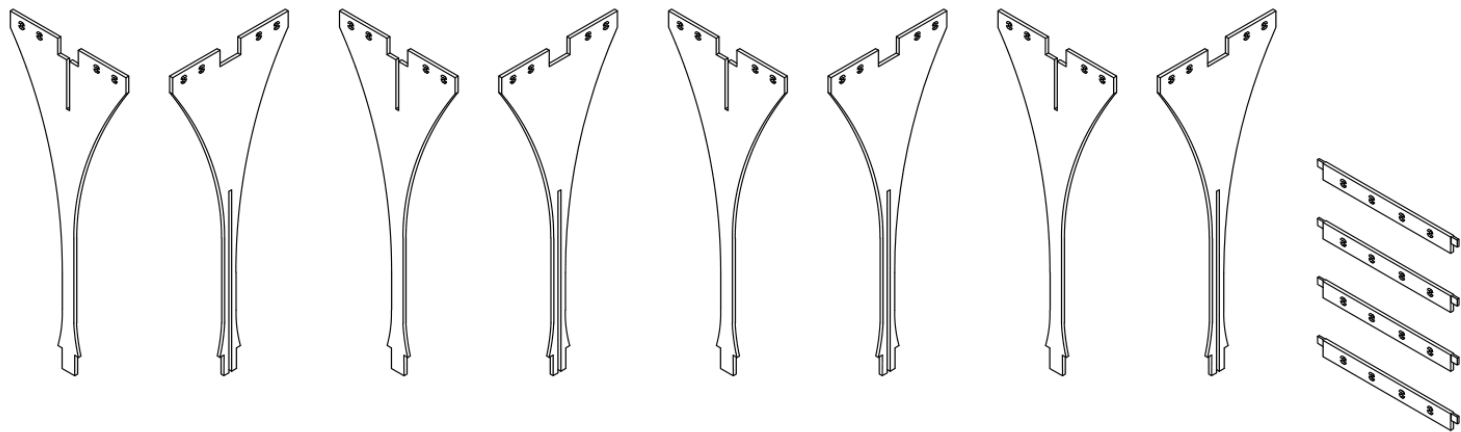
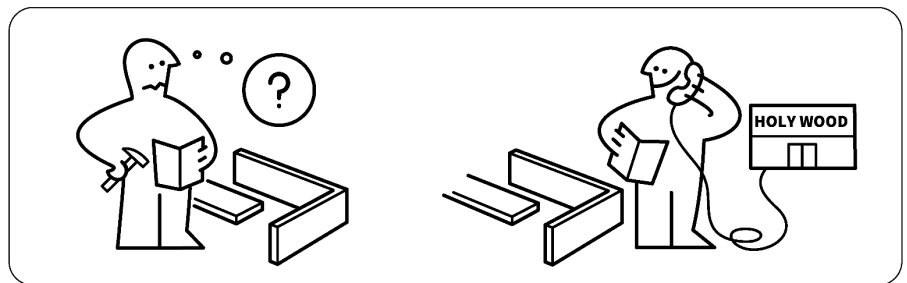
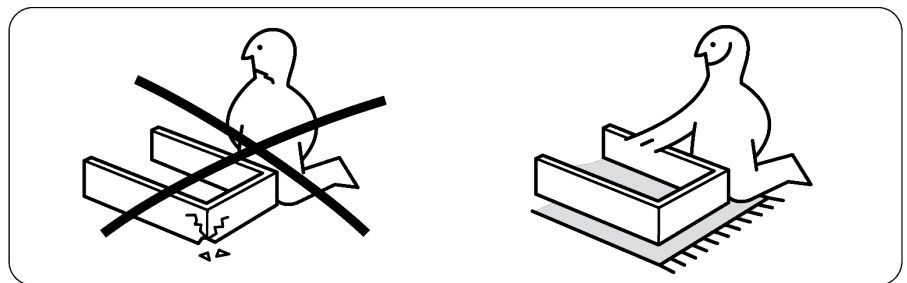
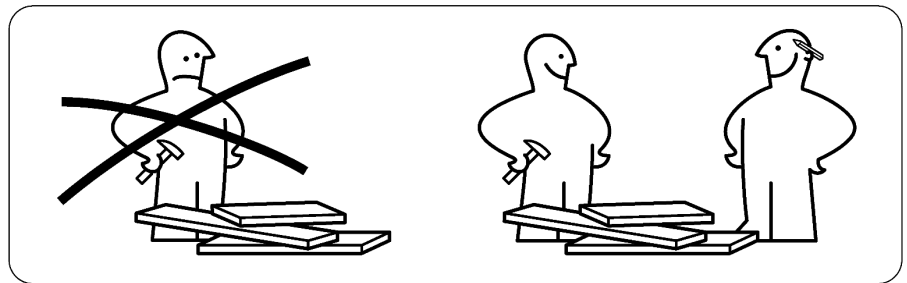
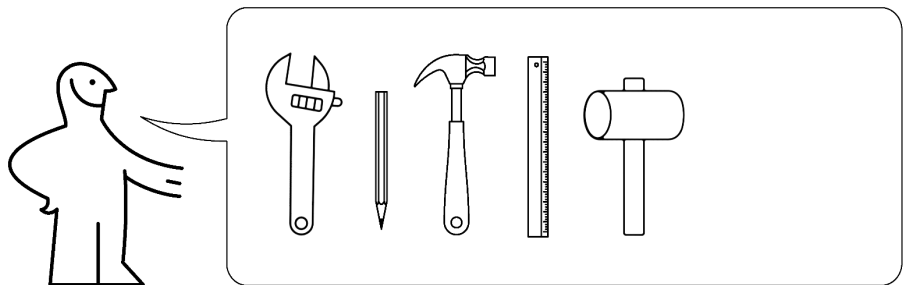
Basics of
structure



CONSTRUCTION

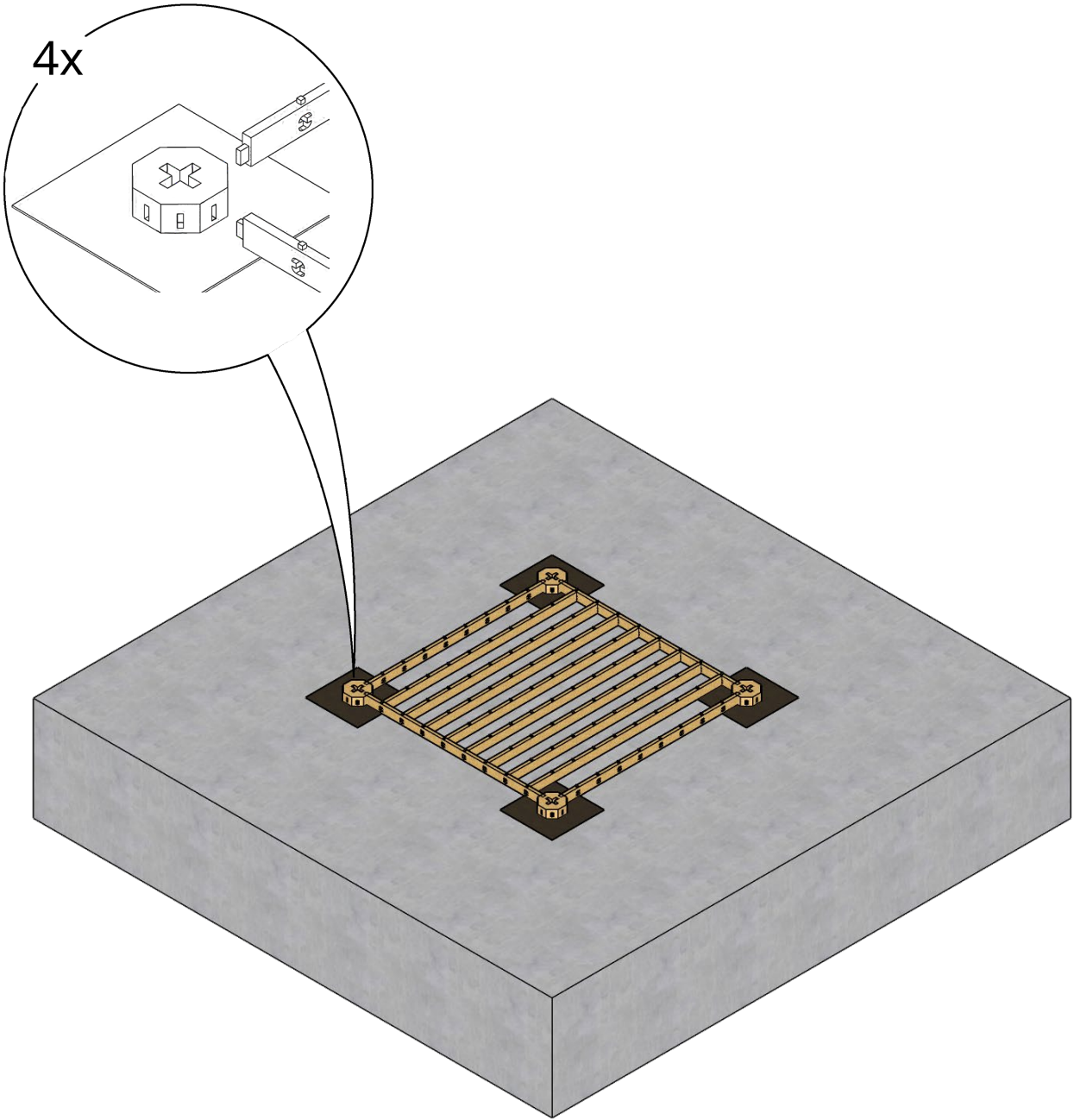
Basics of
structure
1:100





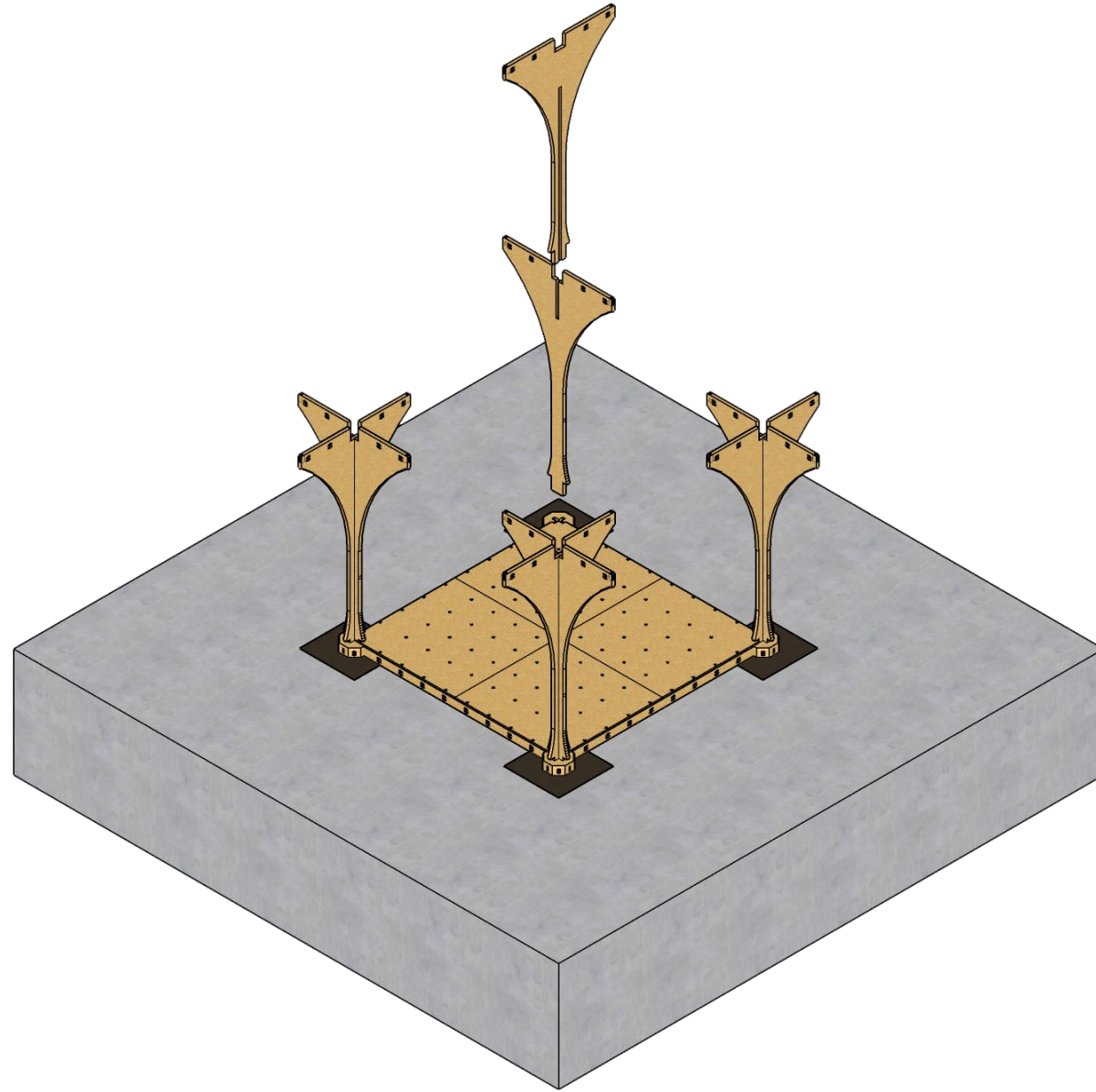
CONSTRUCTION

Basics of
structure



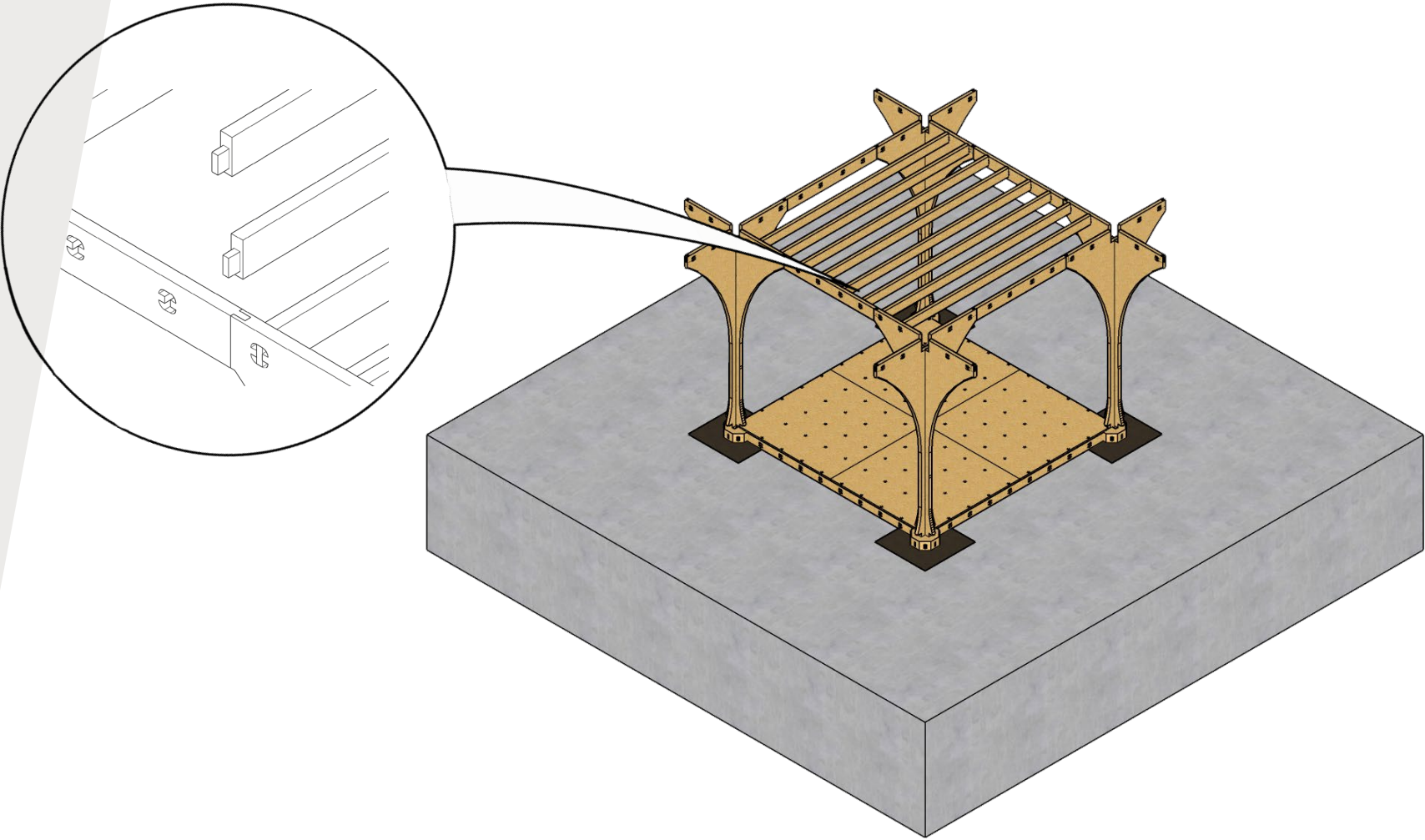
CONSTRUCTION

Basics of
structure



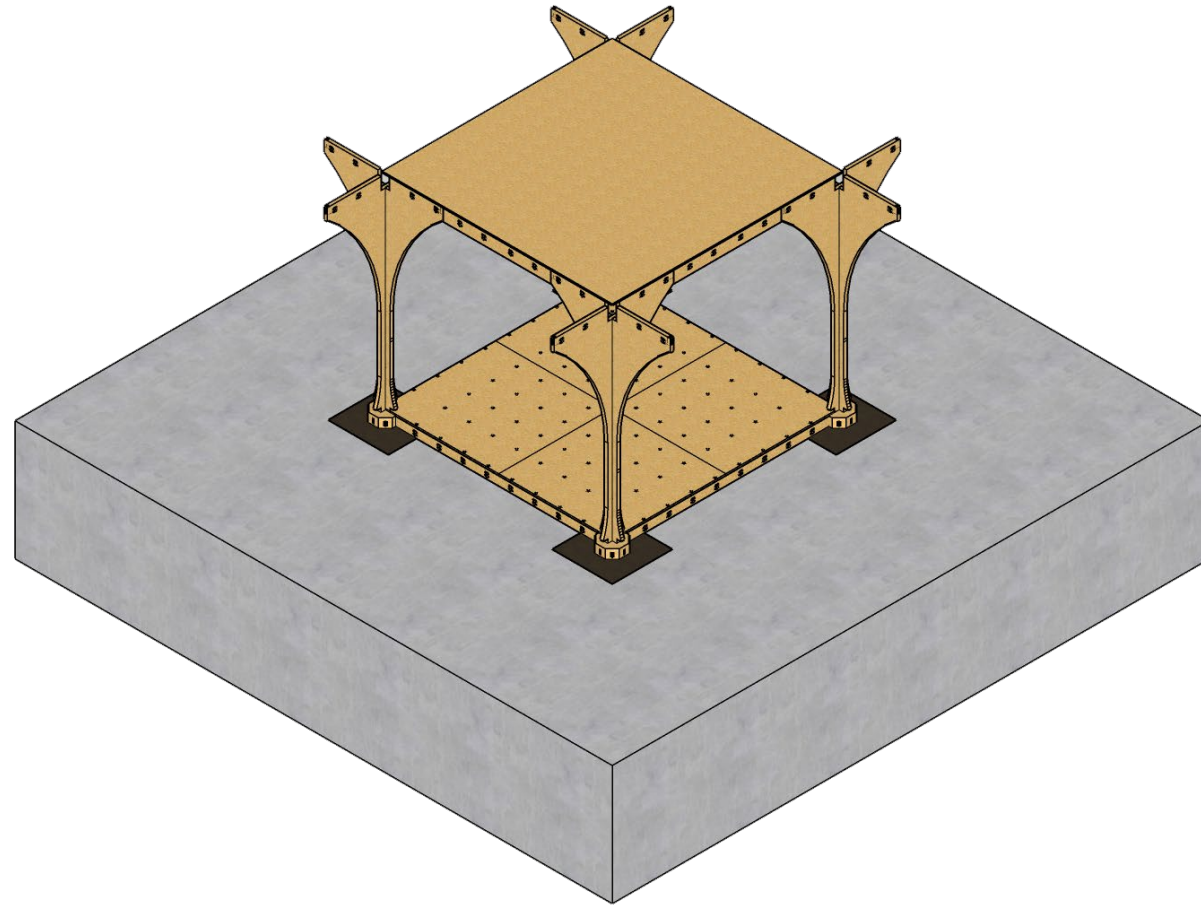
CONSTRUCTION

Basics of
structure



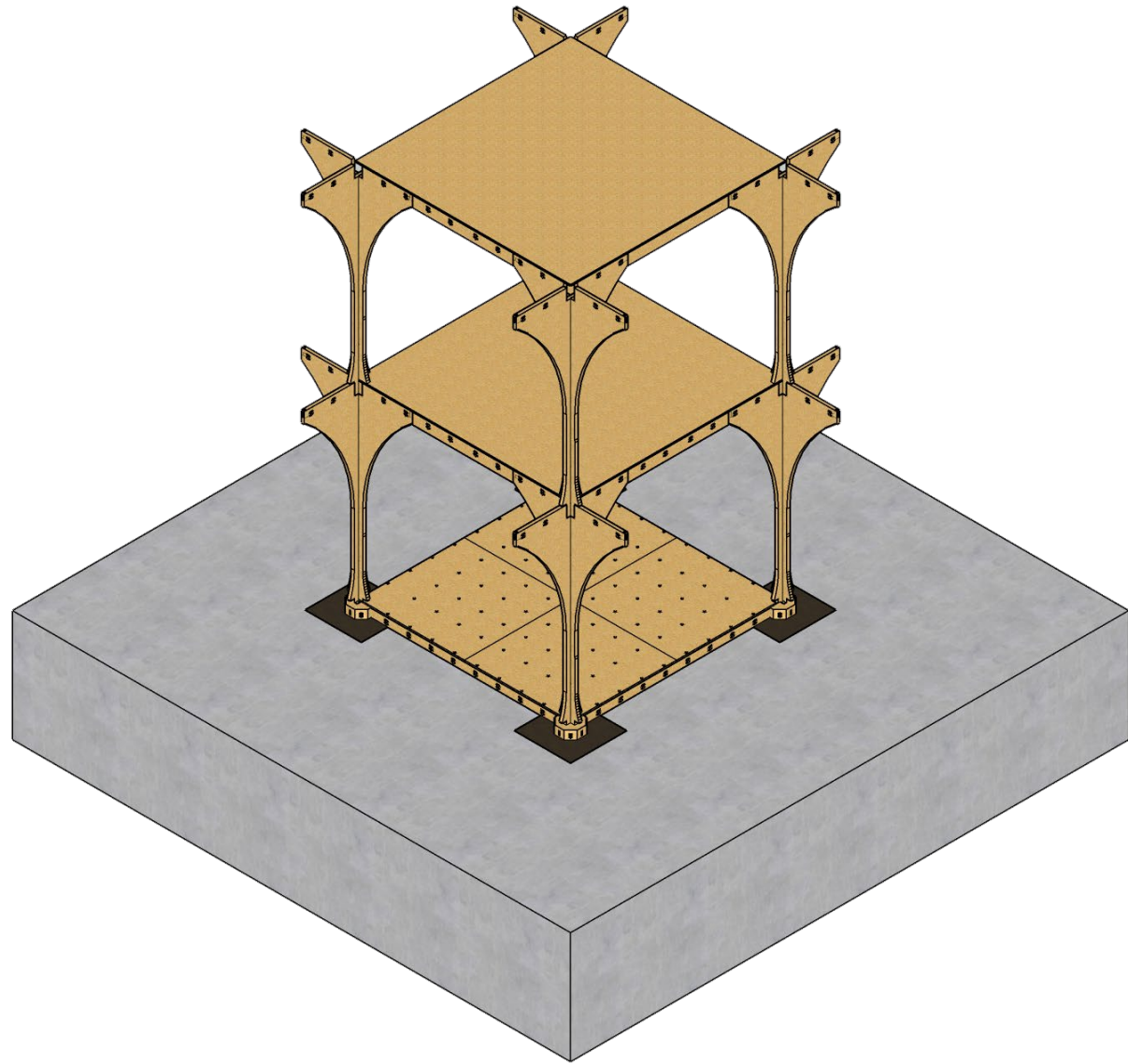
CONSTRUCTION

Basics of structure



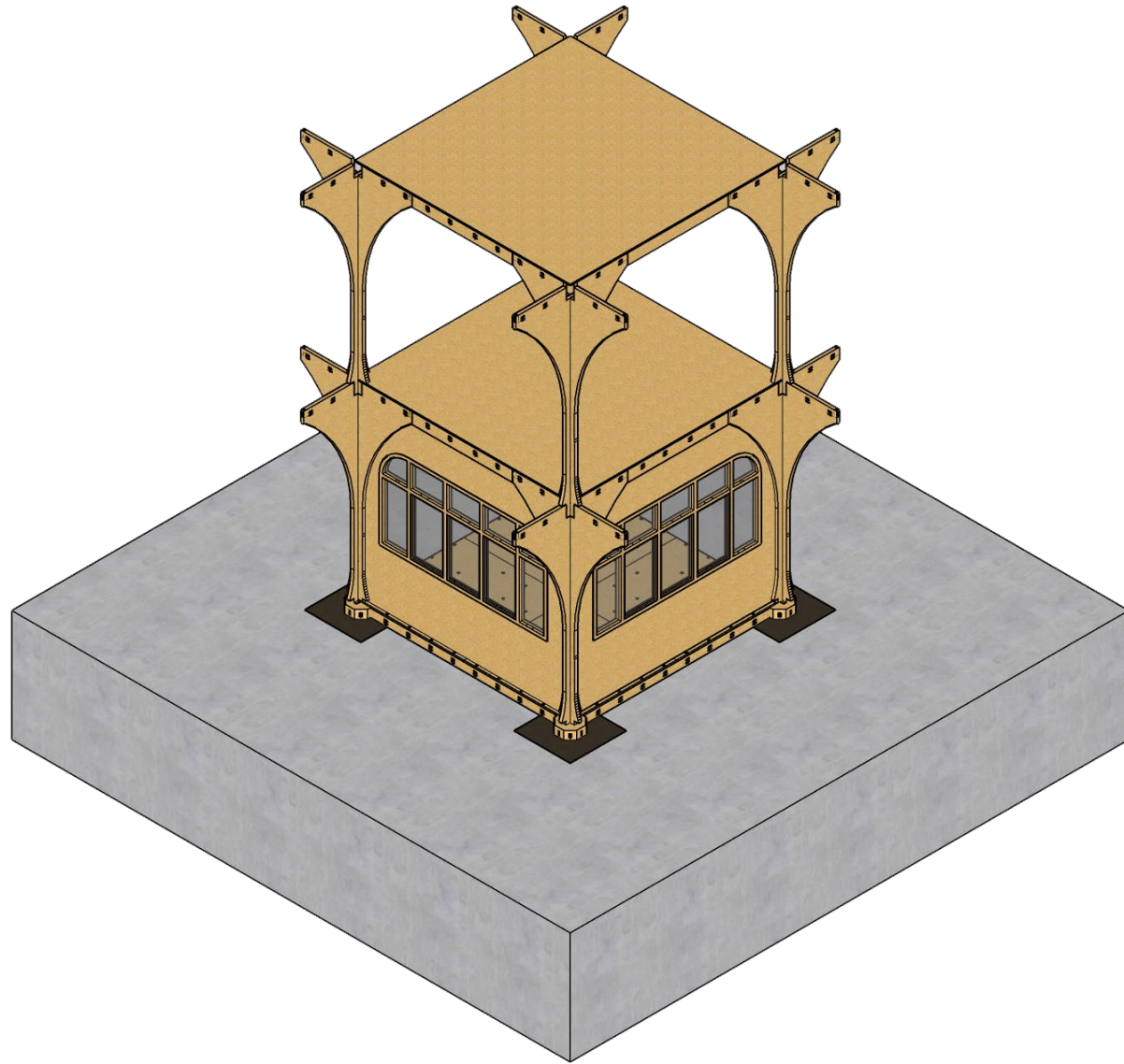
CONSTRUCTION

Basics of
structure

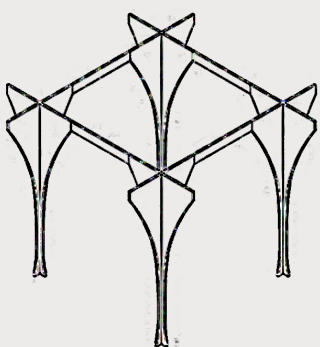


CONSTRUCTION

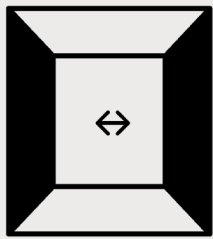
Basics of structure



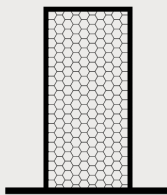
MATERIALS



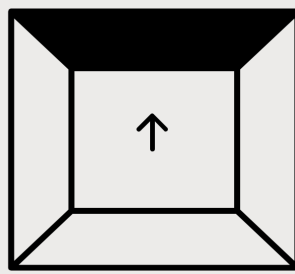
LVL



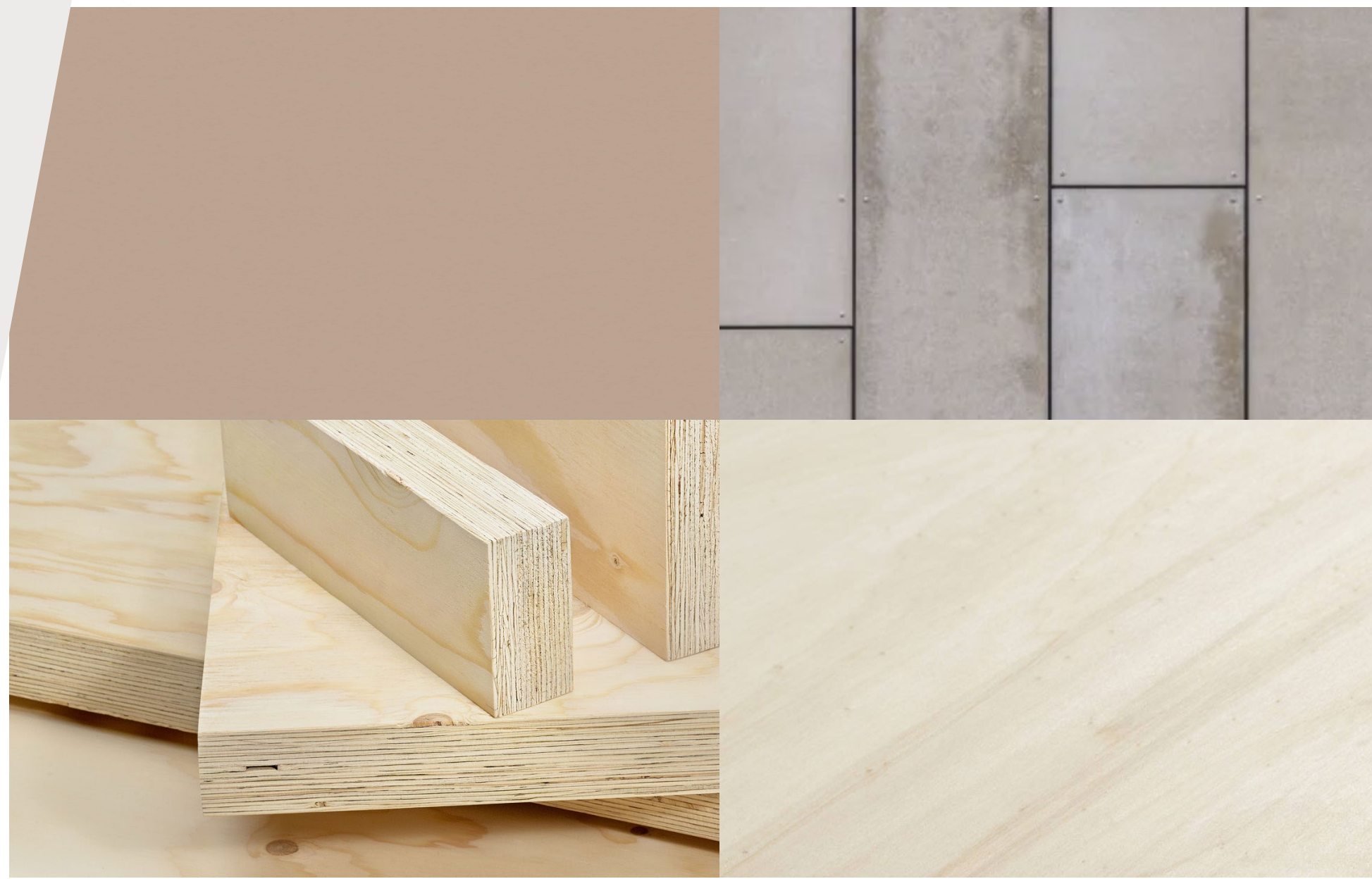
Vinyl



Kerloc

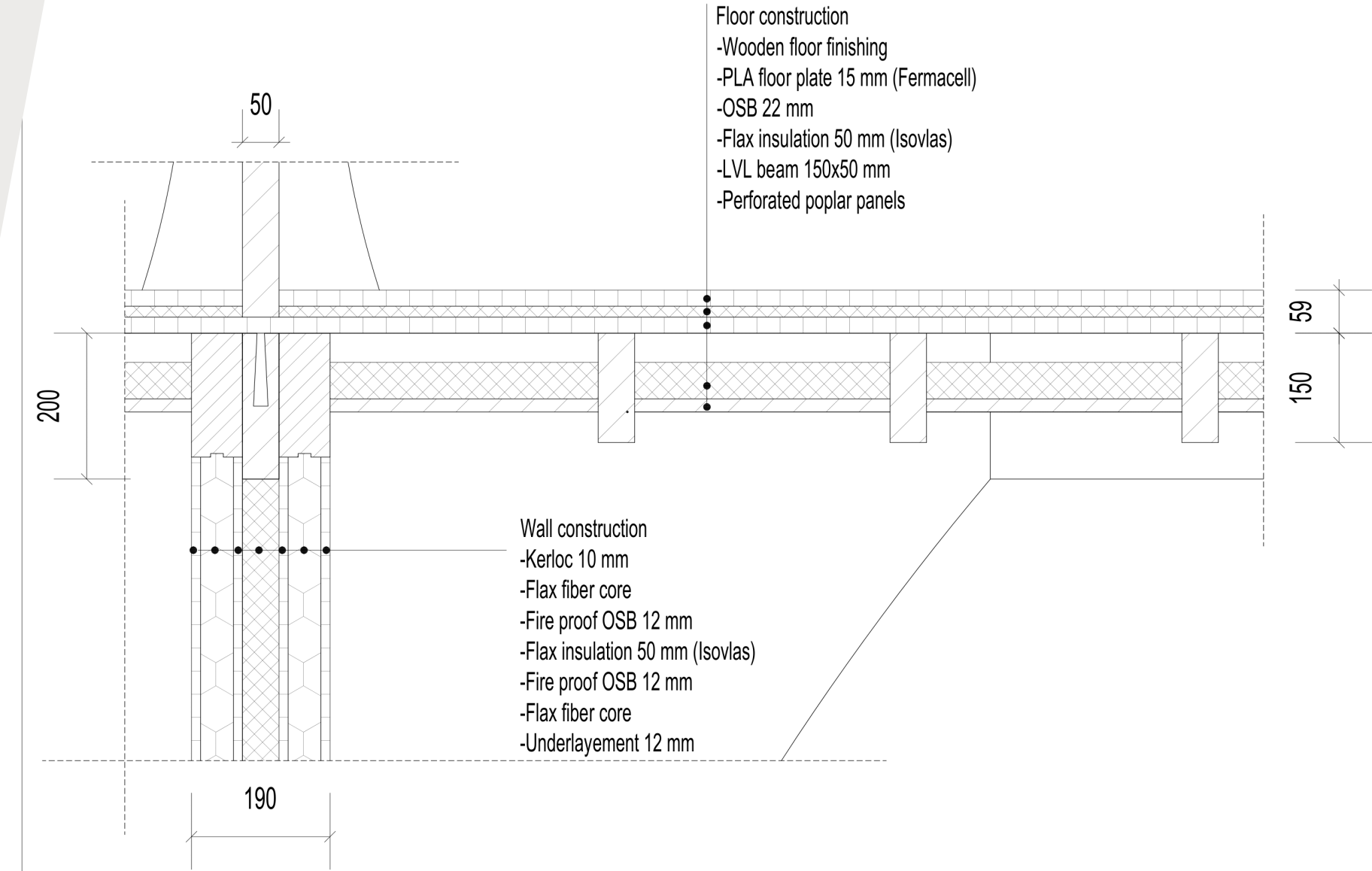


Poplar



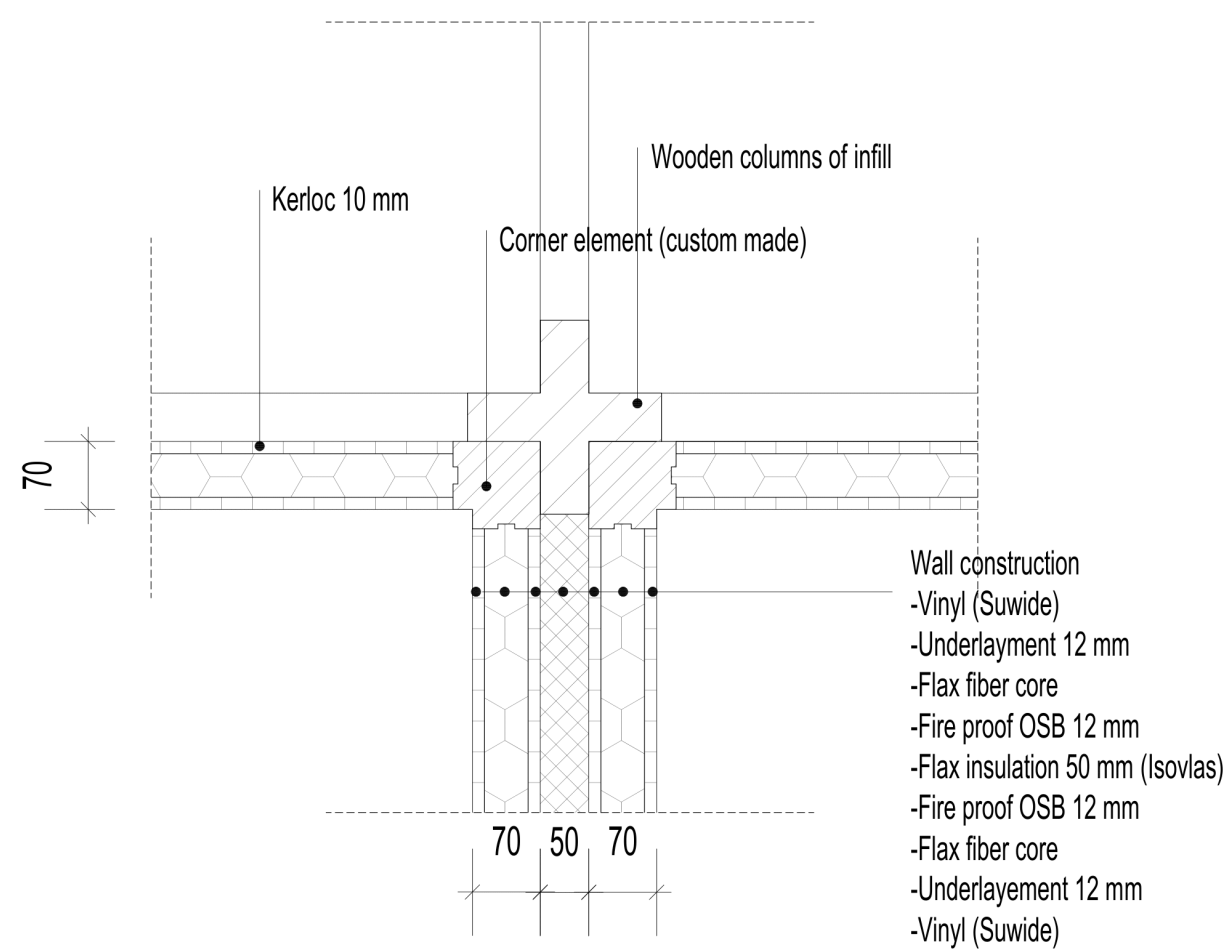
DETAILS

Detail wooden
structure
1:5



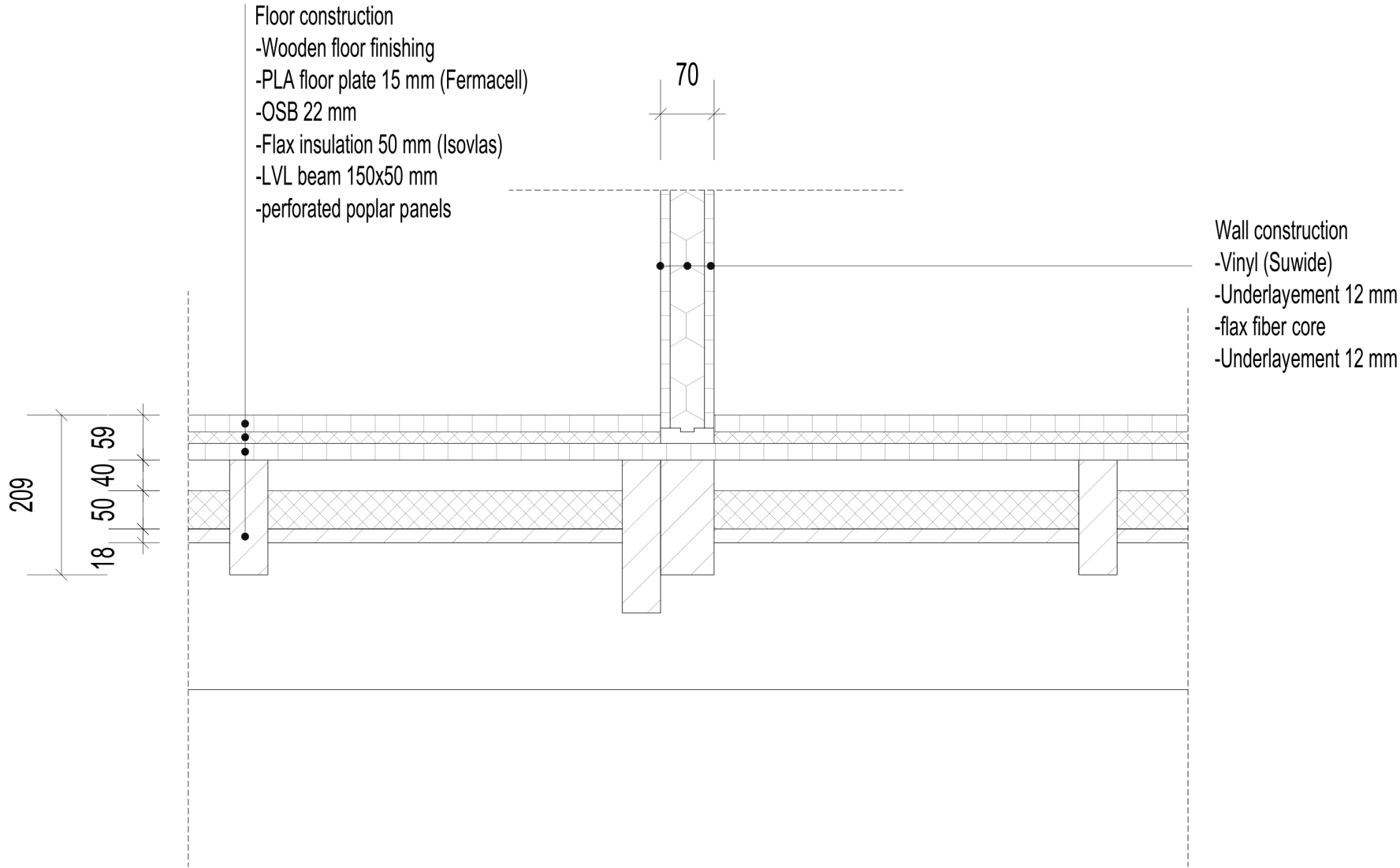
DETAILS

Detail wooden
construction (top
view)
1:5



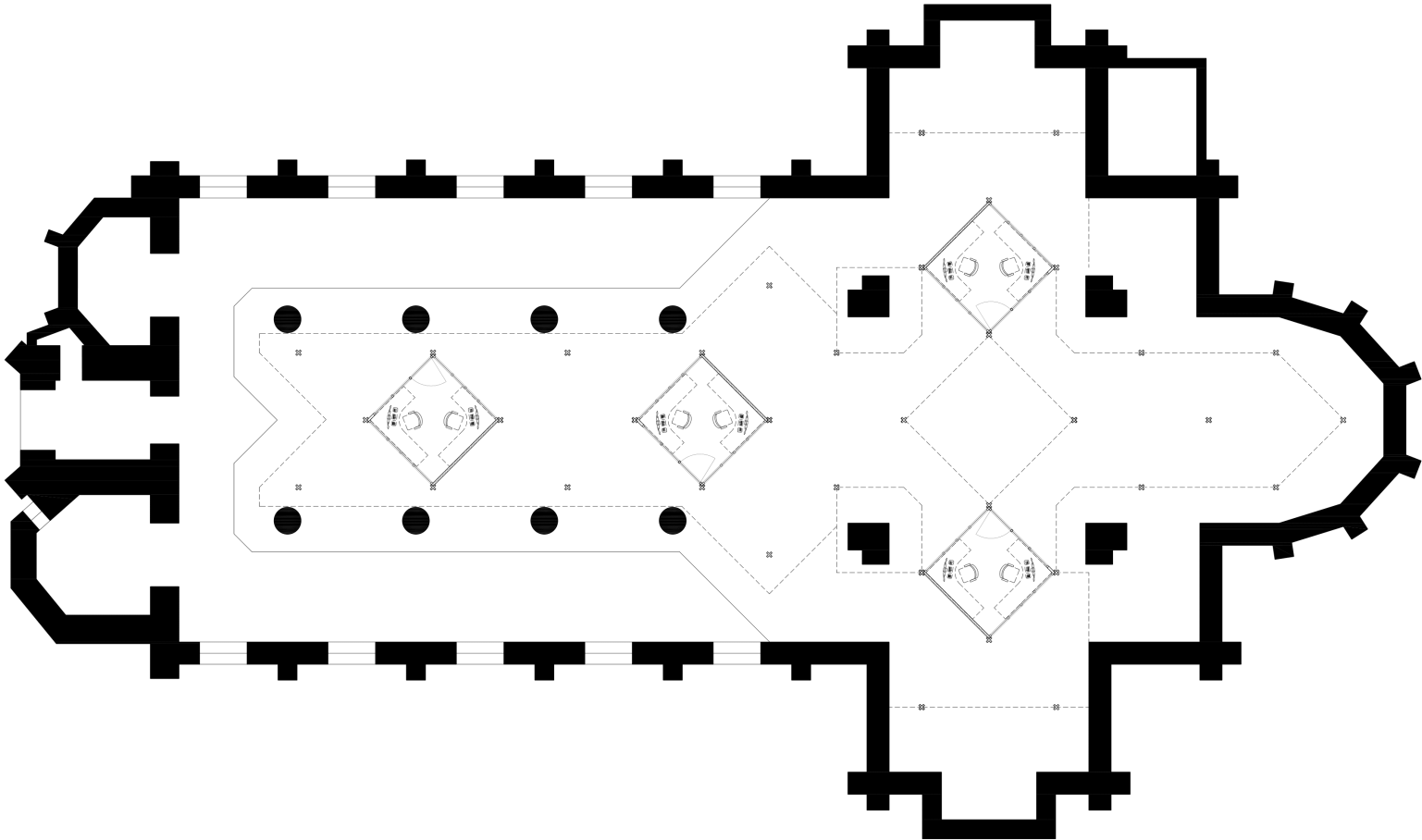
DETAIL

Detail upper floor
1:5



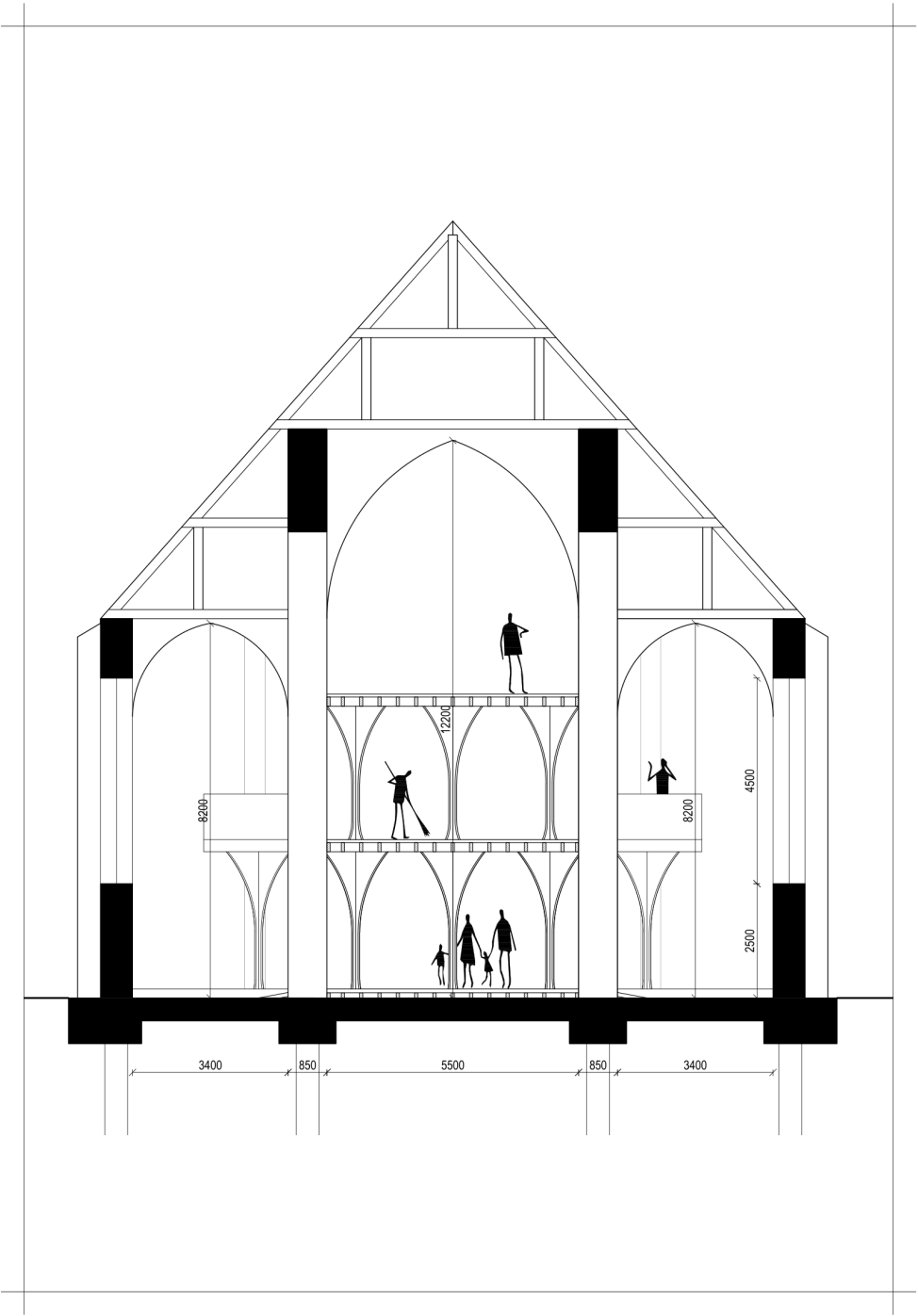
OTHER CHURCHES

Maria
Hemelvaartkerk
Graauw Spaceplan



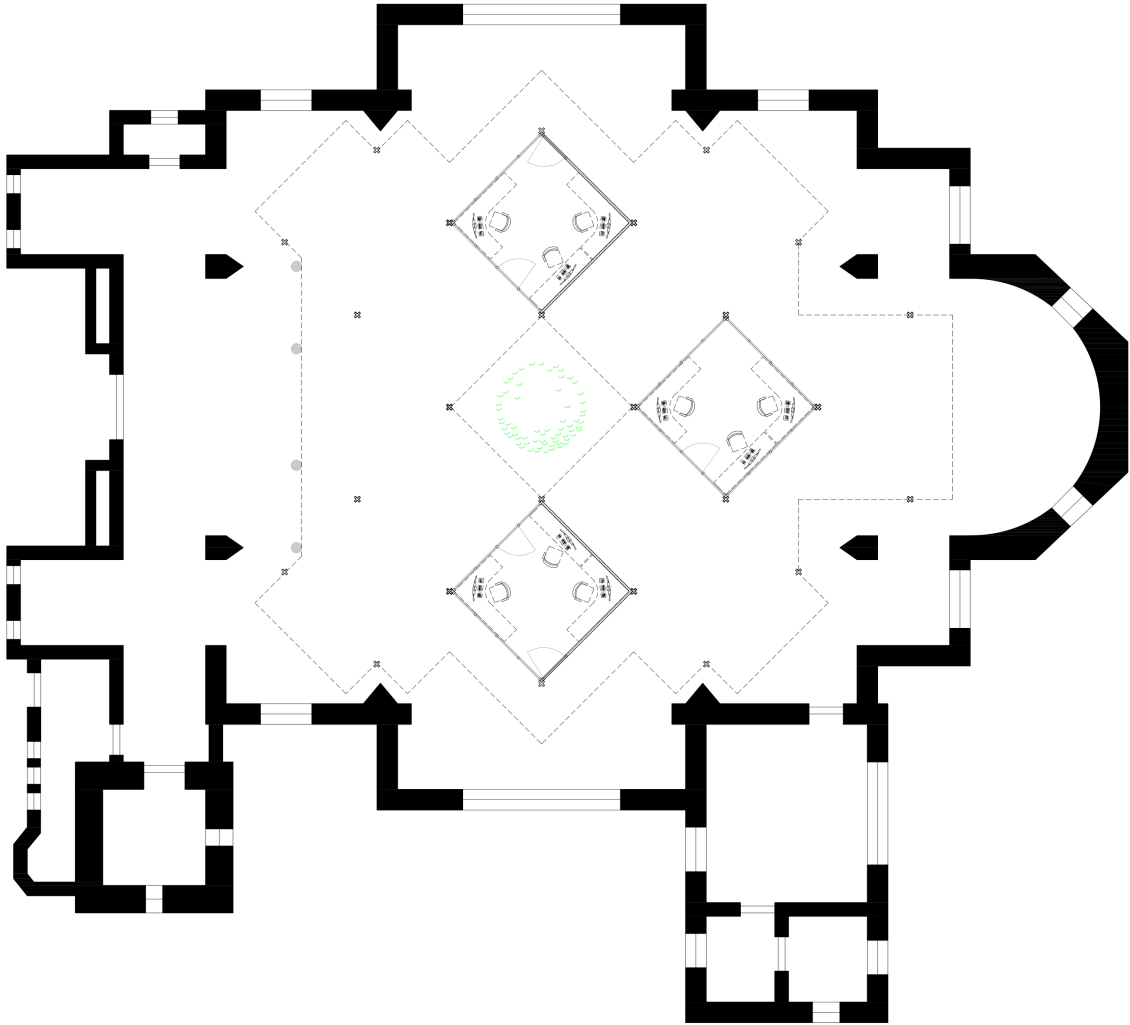
OTHER CHURCHES

Maria
Hemelvaartkerk
Graauw Section



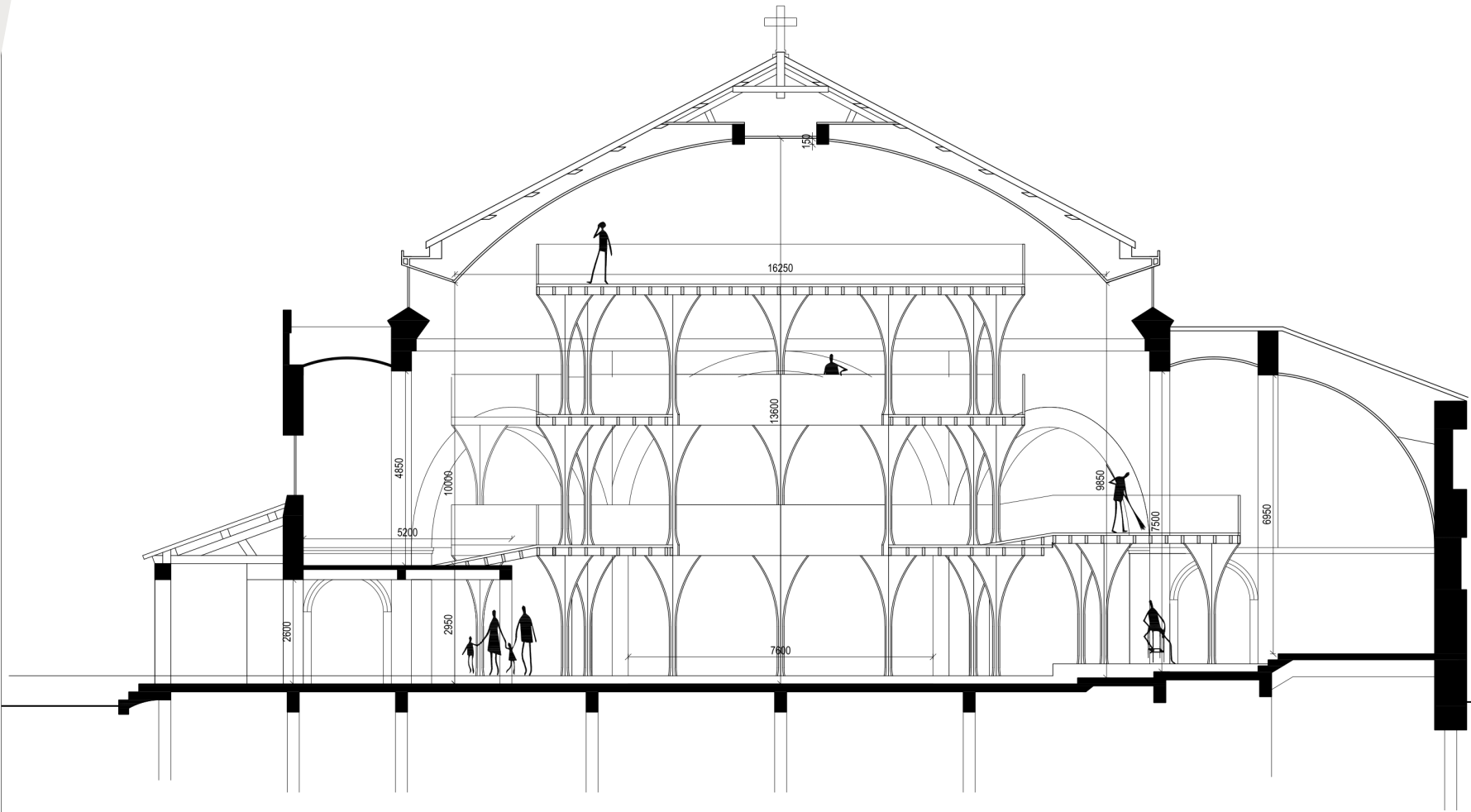
OTHER CHURCHES

Onze-Lieve-Vrouw-
Hemelvaartkerk
Philippine
Spaceplan



OTHER CHURCHES

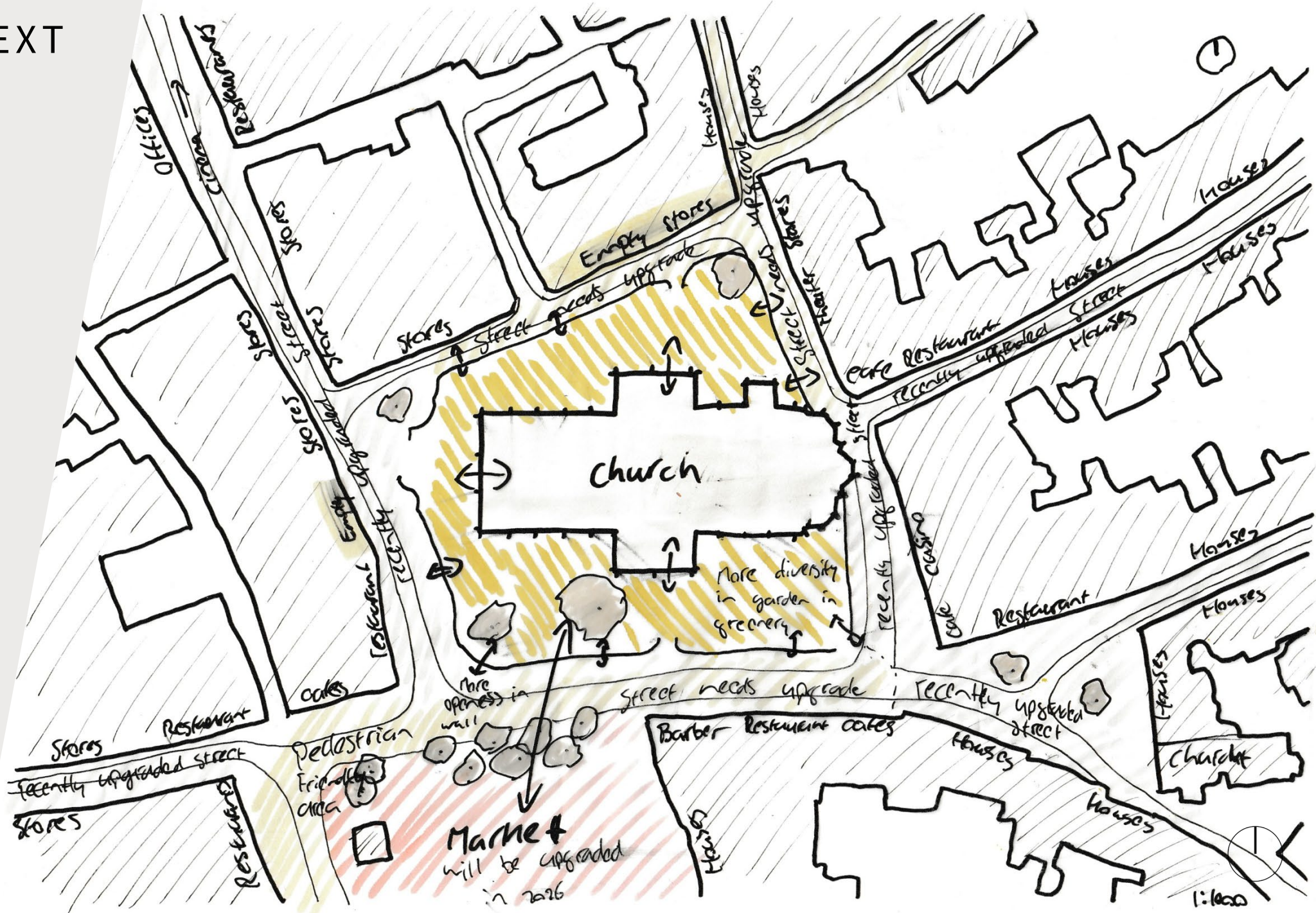
Onze-Lieve-Vrouw-
Hemelvaartkerk
Philippine Section





D E S I G N

- Urban context
- Spaceplans
- Sections
- Close-ups
- Fragment
- Details
- Visuals



URBAN CONTEXT

Difficulties:

- No outdoor space for storage
- Narrow streets
- Complex (un)loading area
- Heart of the city center
- 2 possible routes for trucks
- 1 entry into the city

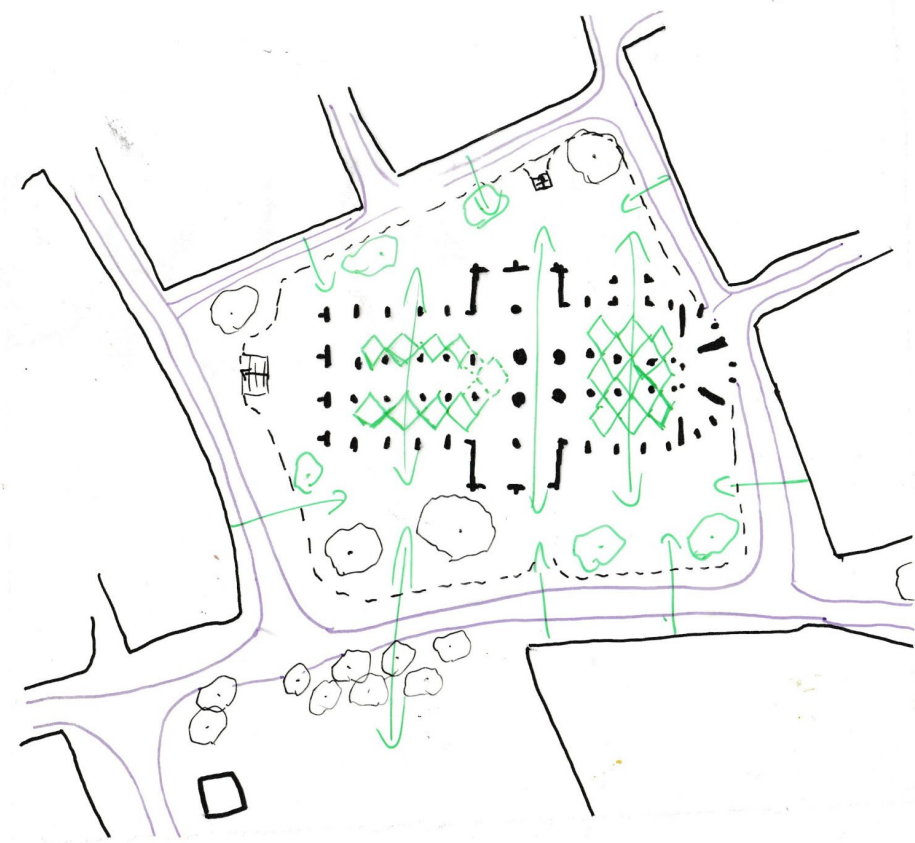
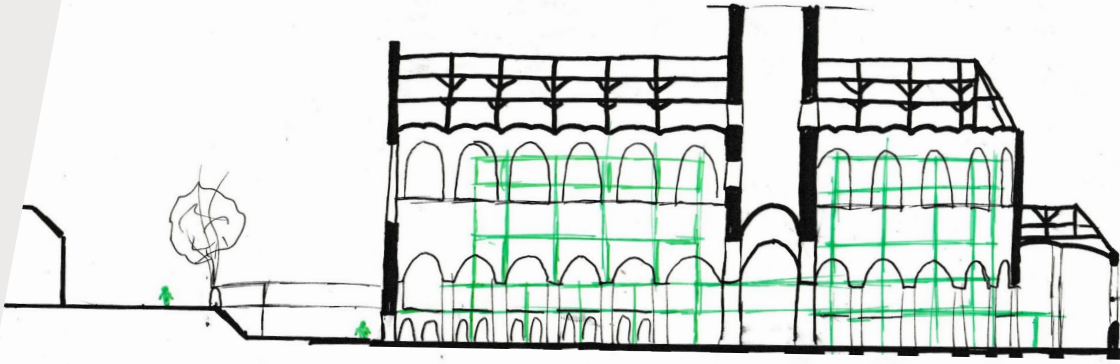
A temporary sorting area on site as a solution





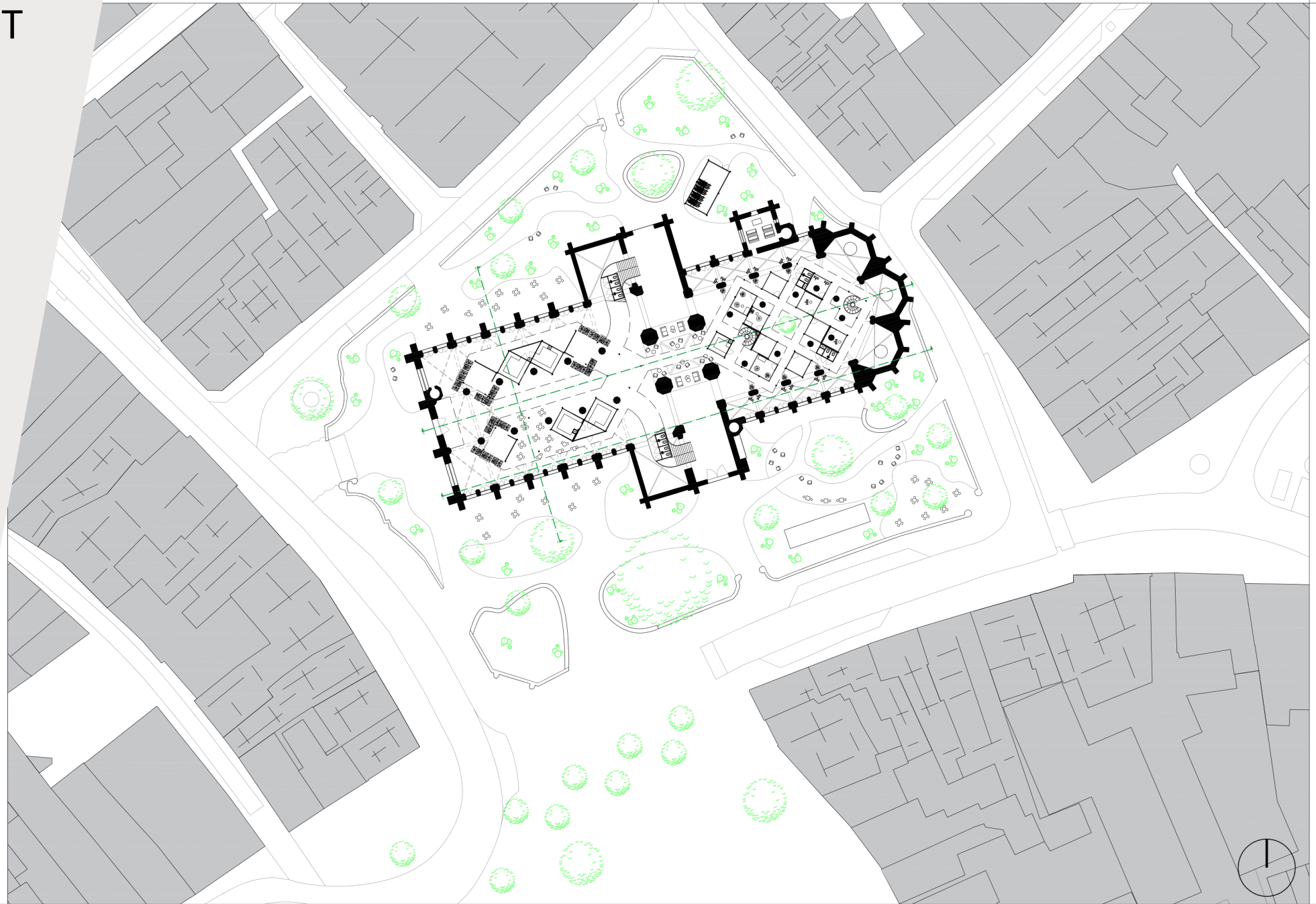
URBAN CONTEXT

Starting points



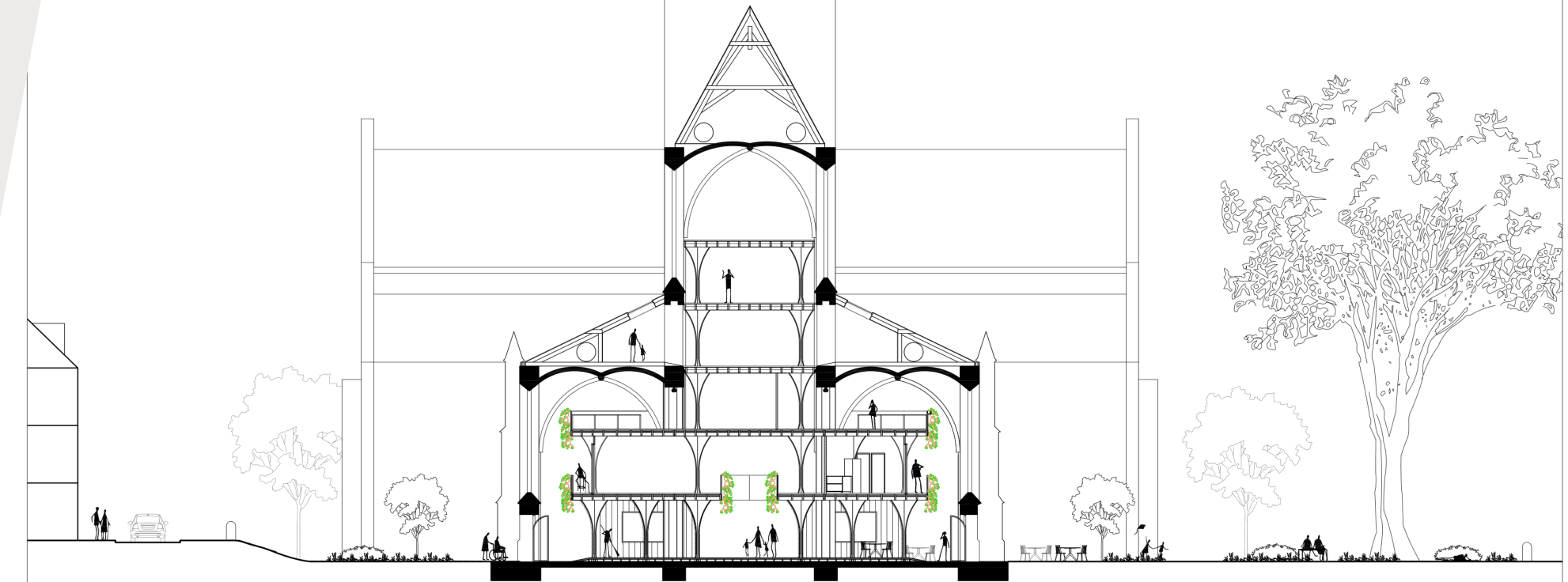
URBAN CONTEXT

Ground floor and
surrounding area
1:500



URBAN CONTEXT

Section A-A'
1:200



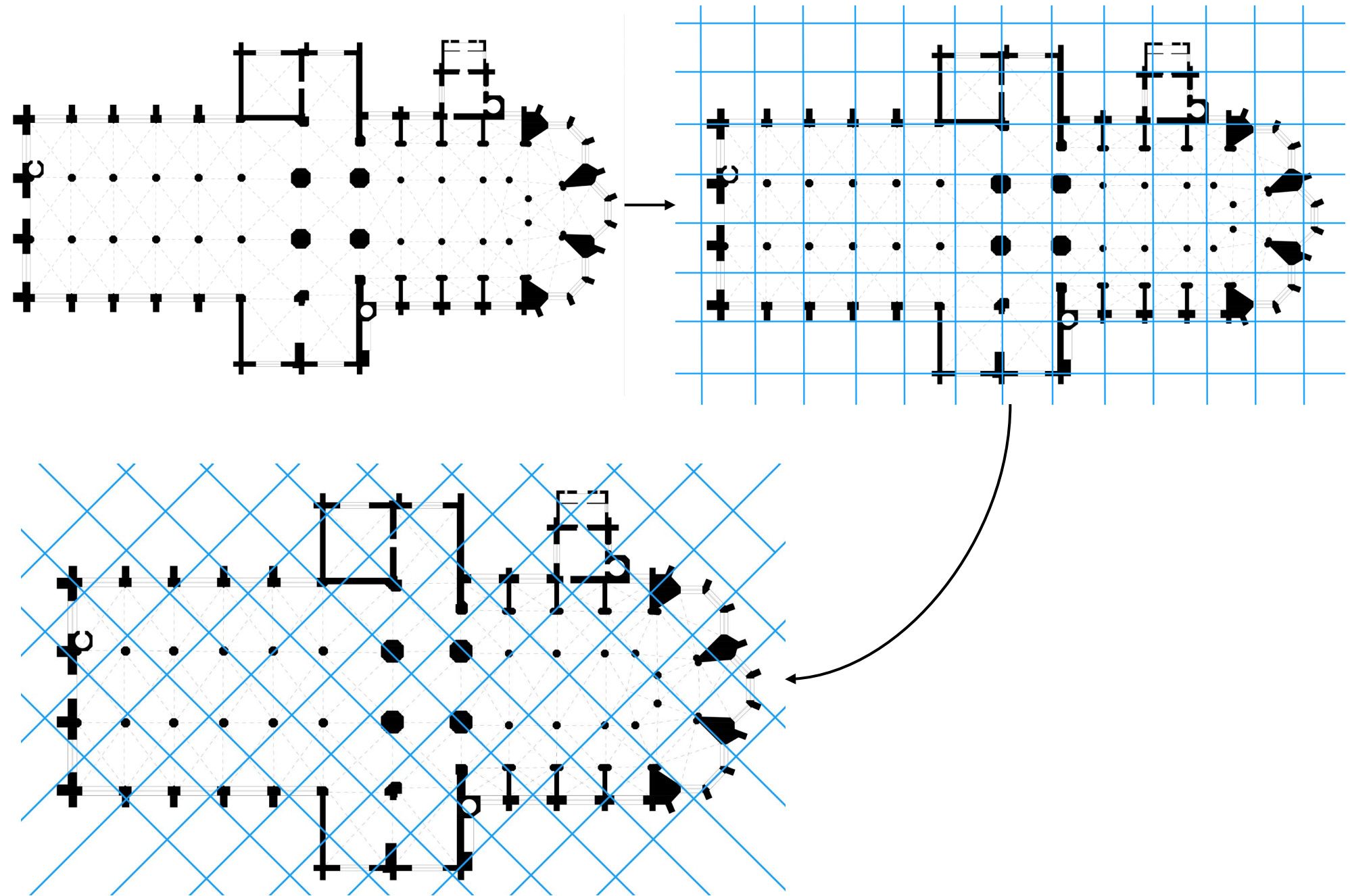


SPACEPLANS

Concept



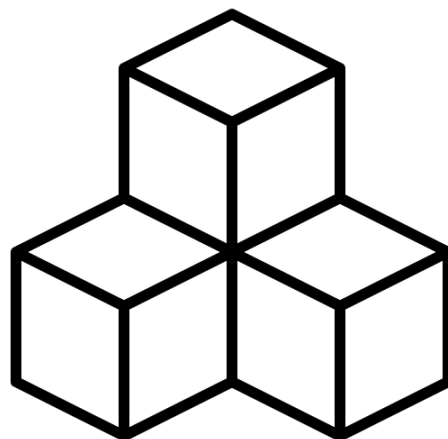
Position benefits
acoustics





2 designs

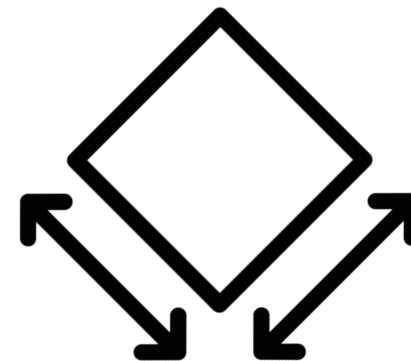
Public or Private



85 units

Type I: 14,6 m²

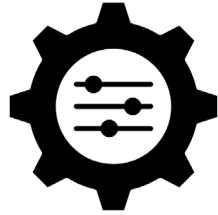
Type II: 8,7 m²



1750 m² added

1700 m² Church floor

CHURCH AS A PUBLIC BUILDING

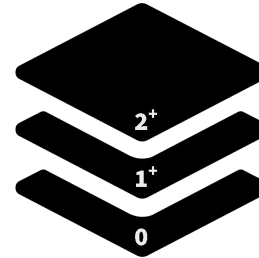


6 different functions



Multiple Workshops/
commercial spaces

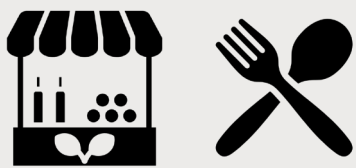
*Painter, Sculptor,
Potter, etc.*



Most public functions on
the ground floor

SPACEPLANS

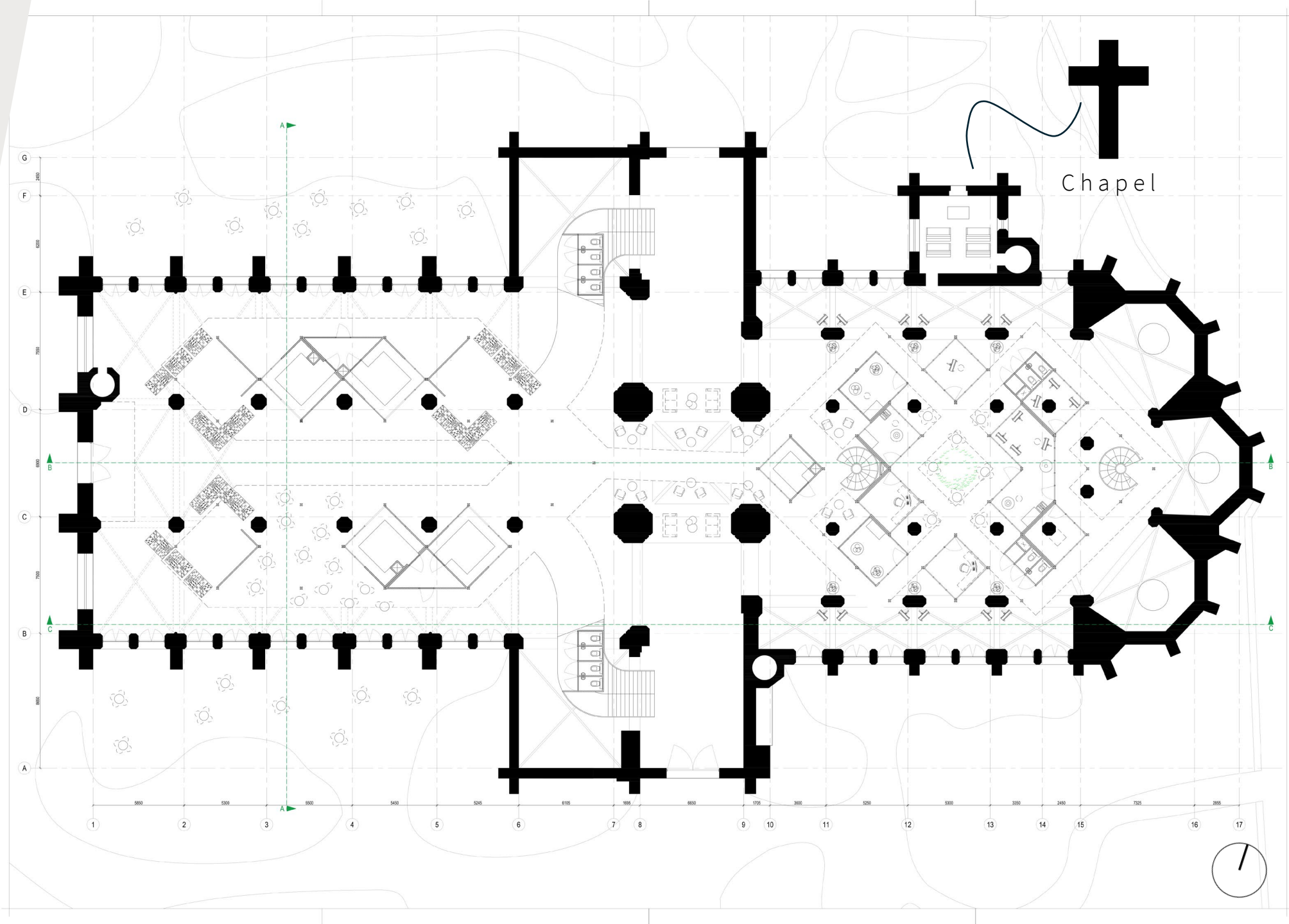
Ground Floor Public
1:100



Food Market /
Food Hall



Workshops



SPACEPLANS

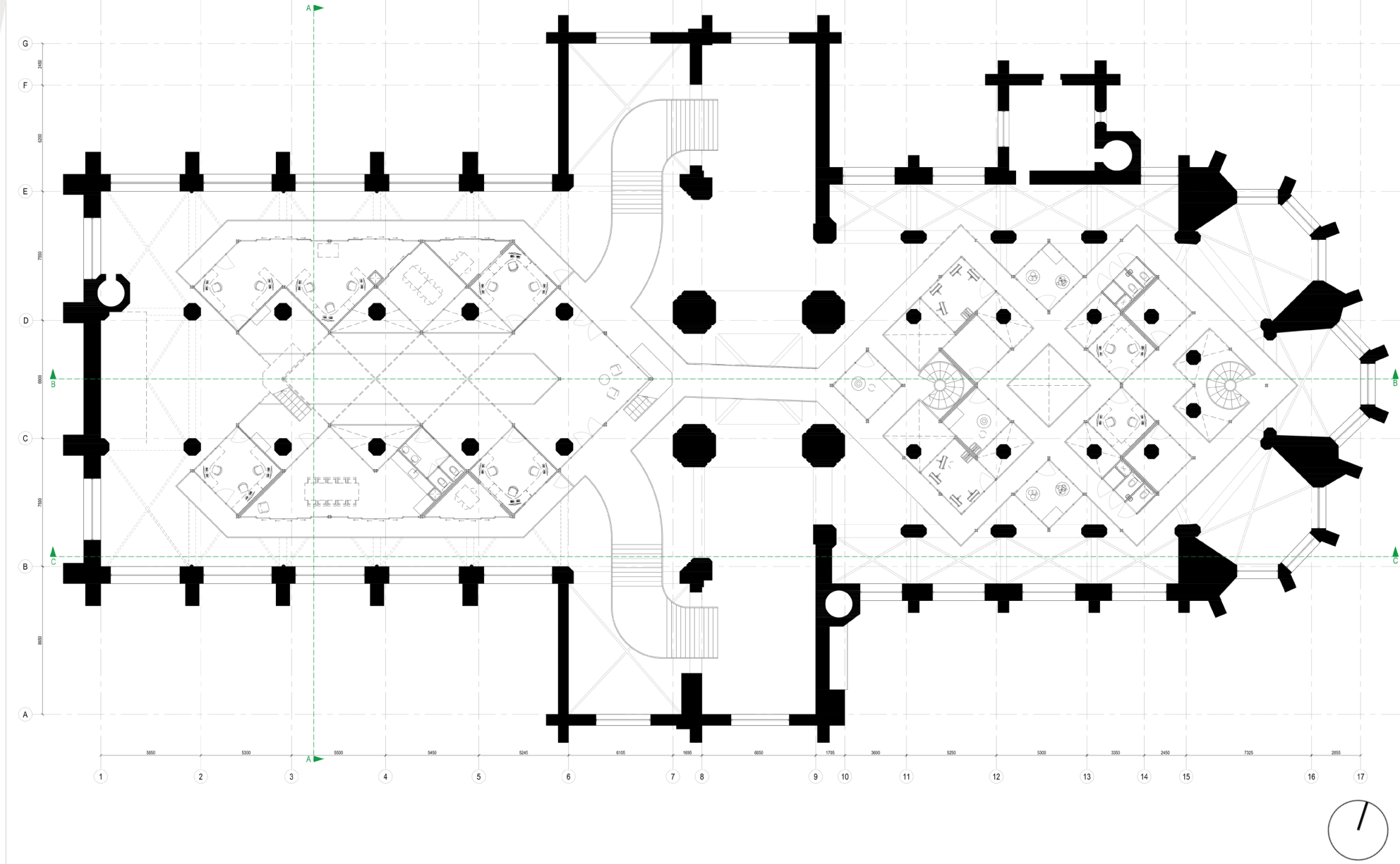
First Floor Public
1:100



Office



Workshops

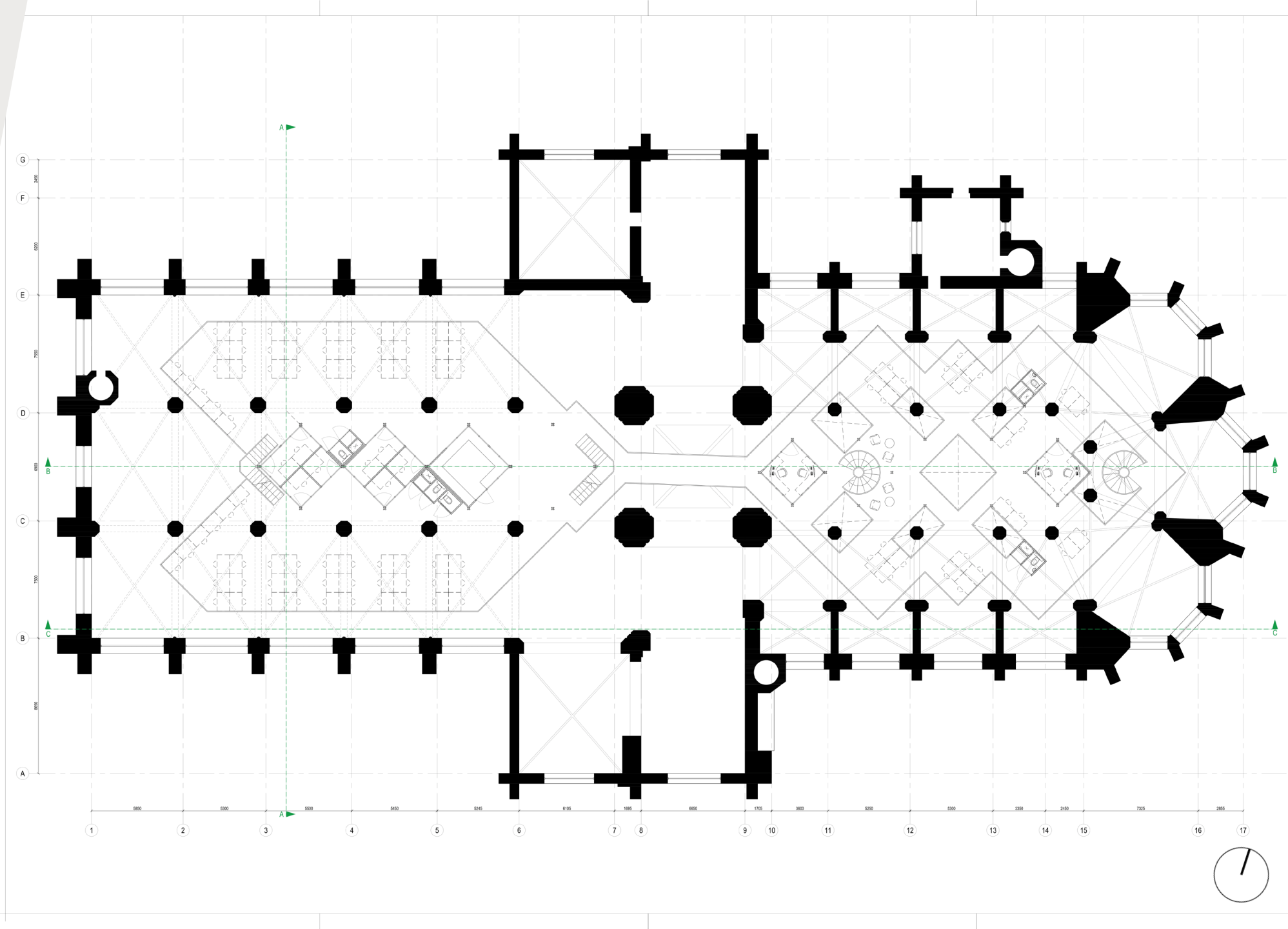


SPACEPLANS

Second Floor Public
1:100



(Co-)workspace

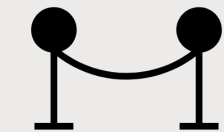


SPACEPLANS

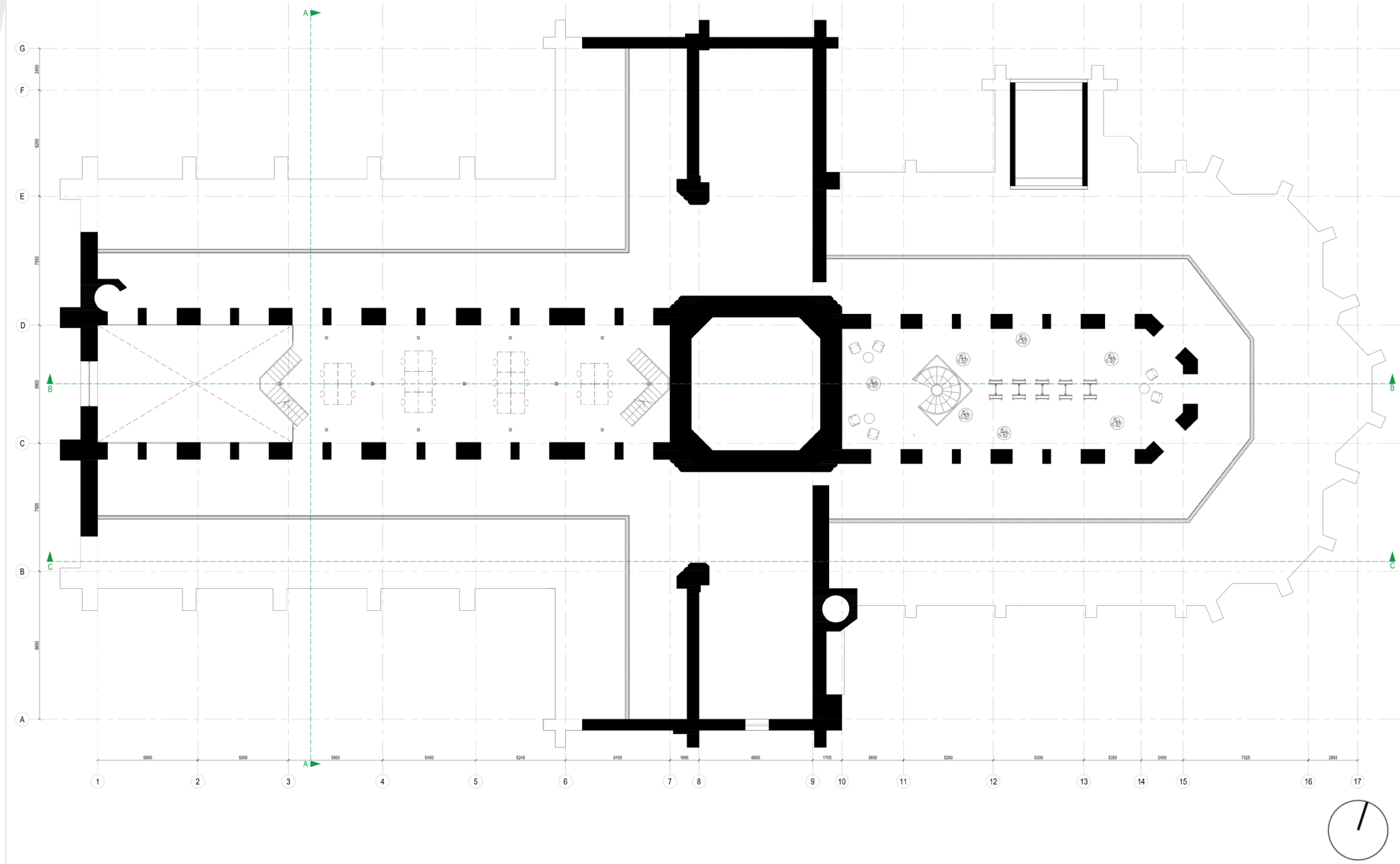
Third Floor Public
1:100



(Co-)workspace



Art Gallery

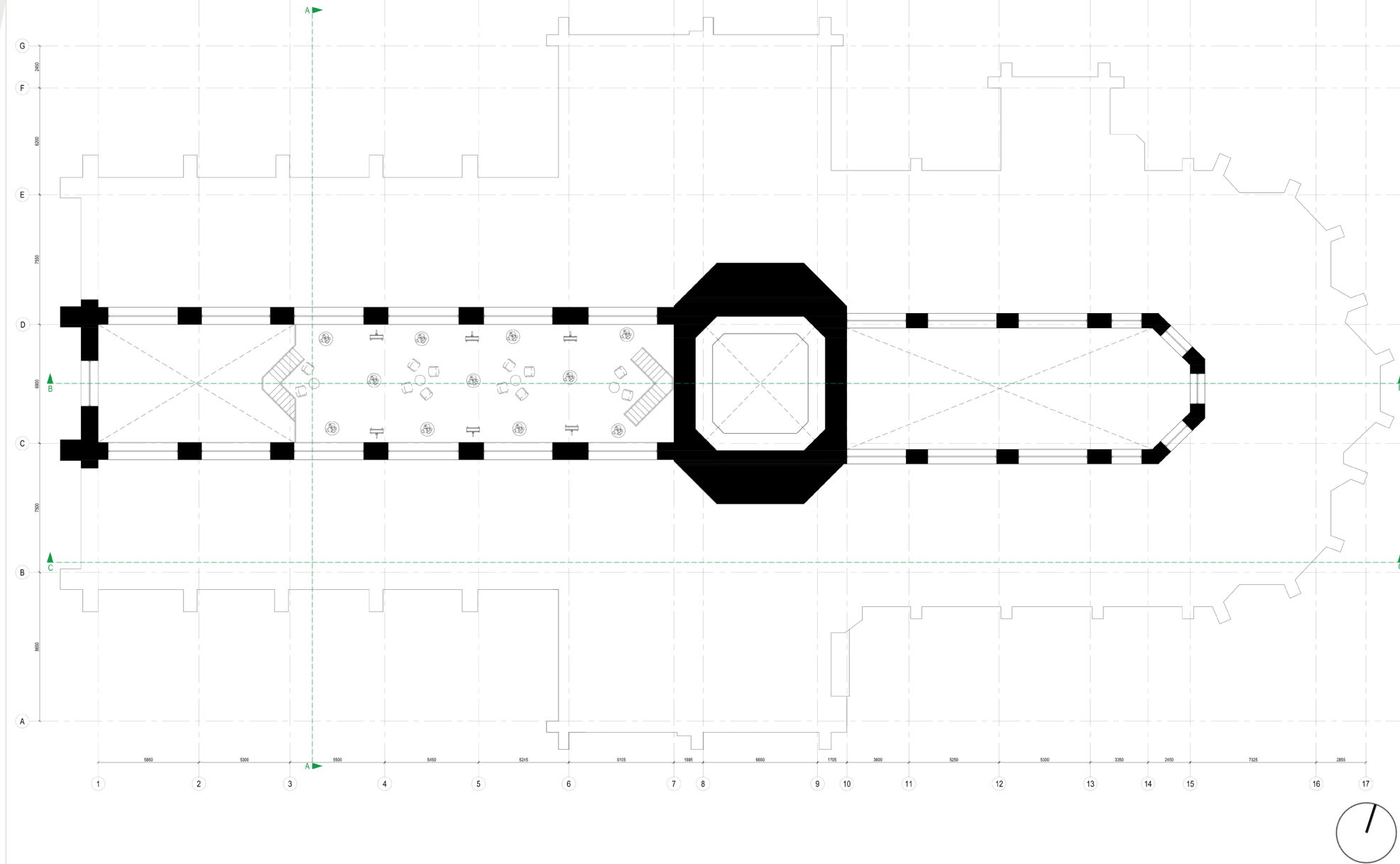


SPACEPLANS

Fourth Floor Public
1:100



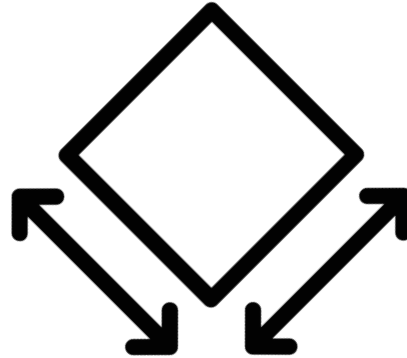
Art Gallery



CHURCH AS A SHELTER



2 types of housing
*Apartment and
Maisonette*

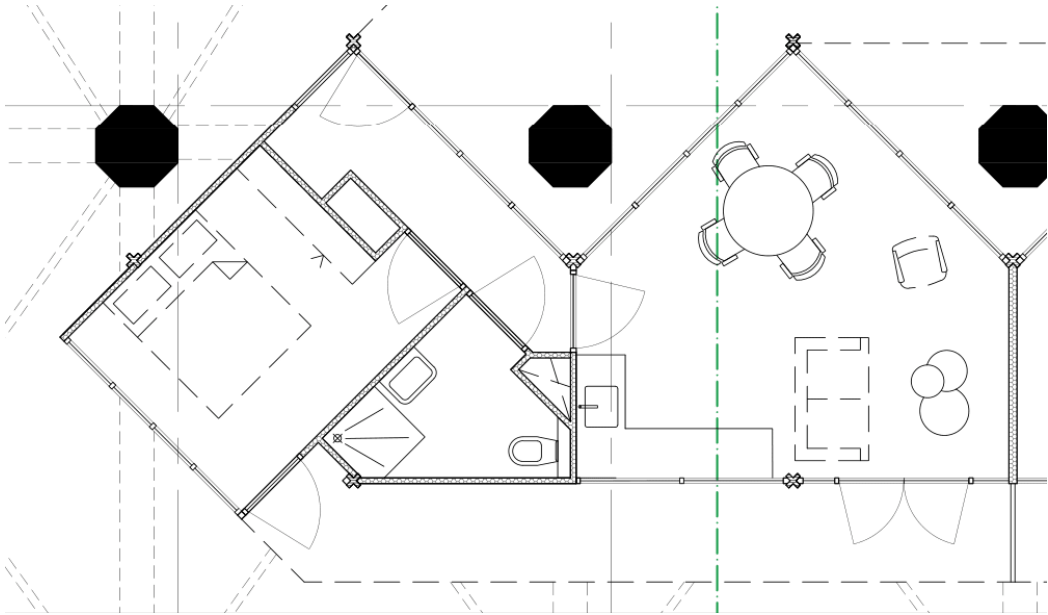


3 different surfaces
Type I: 40 m²
Type II: 47 m²
Type III: 54 m²

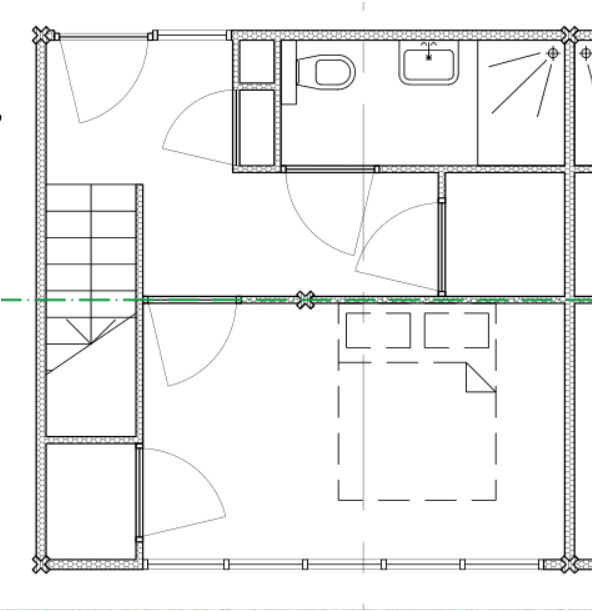


Office of 1000 m²
*3 levels with 45
workspaces and 28
flexspaces*

TYPES OF HOUSING

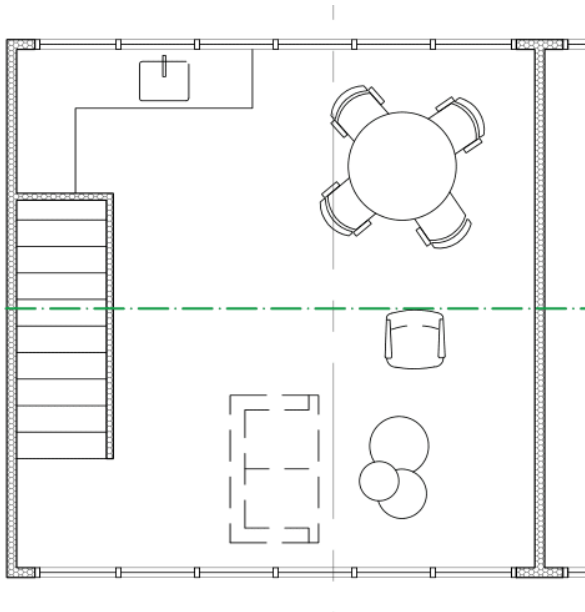
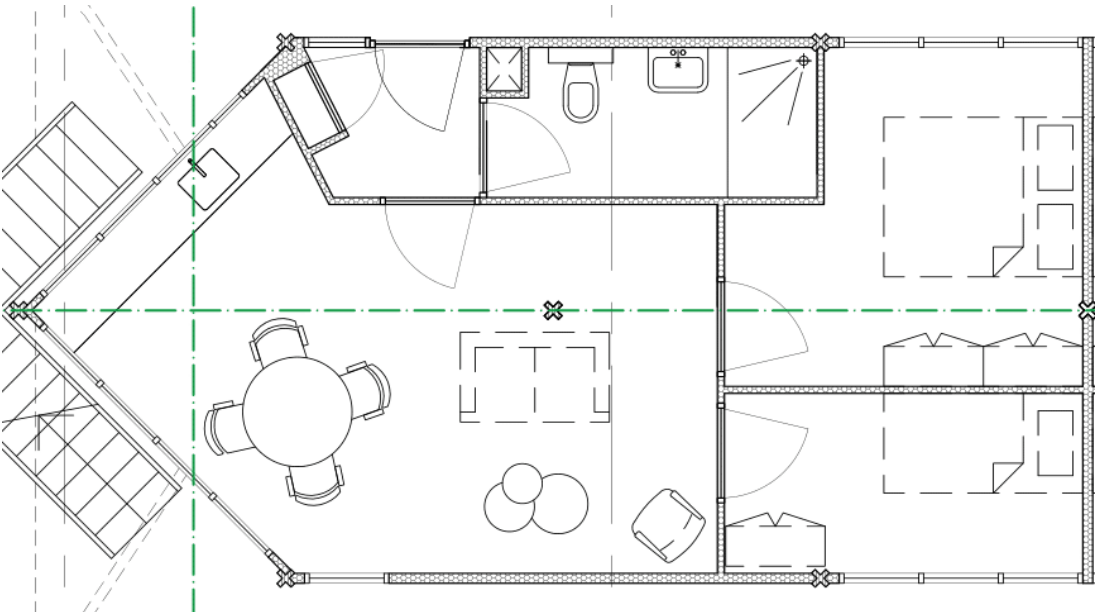


Type I
40 m²



Type III
54 m²

Type II
47 m²



SPACEPLANS

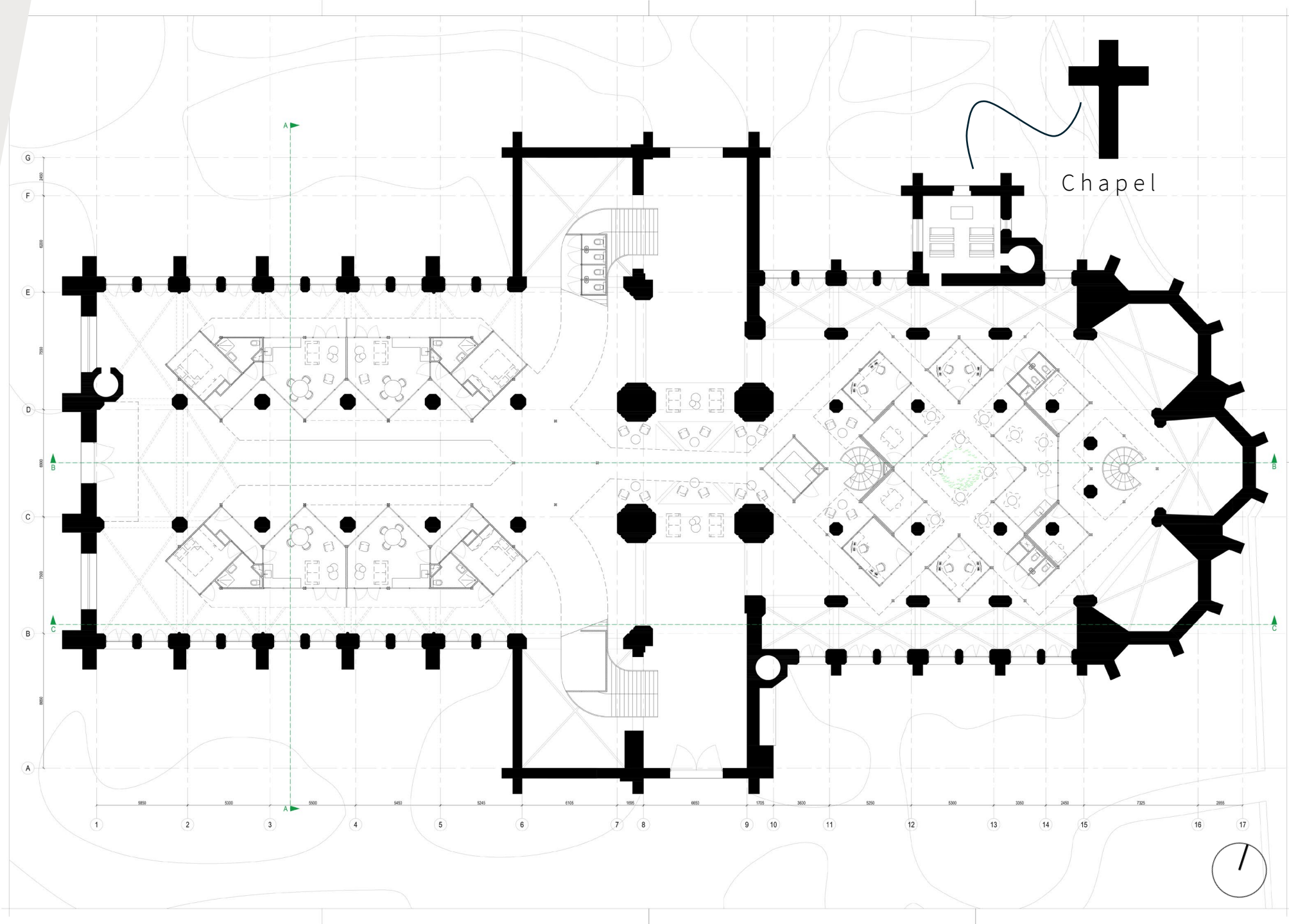
Ground Floor Private
1:100



Housing



Office



SPACEPLANS

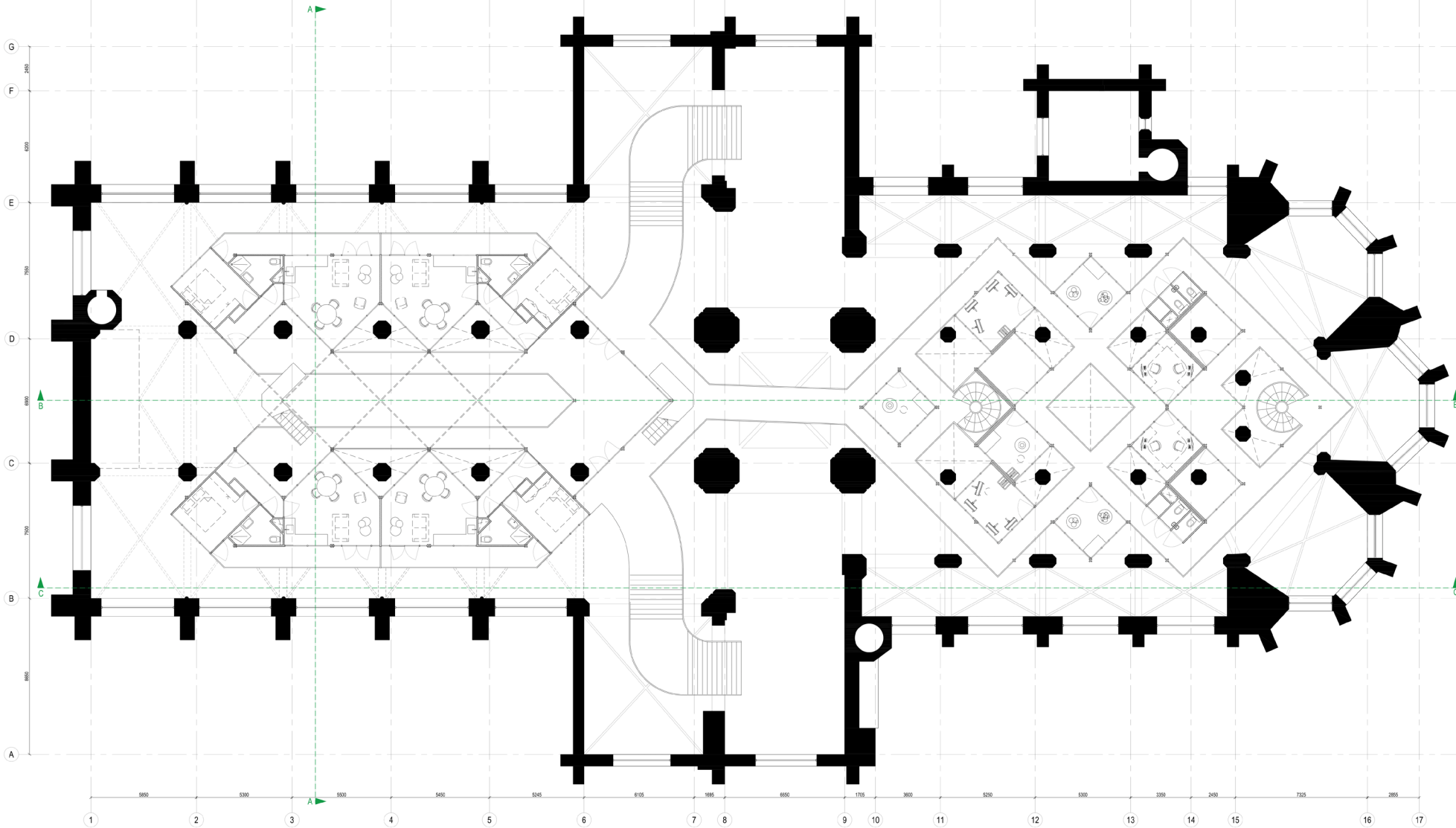
First Floor Private
1:100



Housing



Office



SPACEPLANS

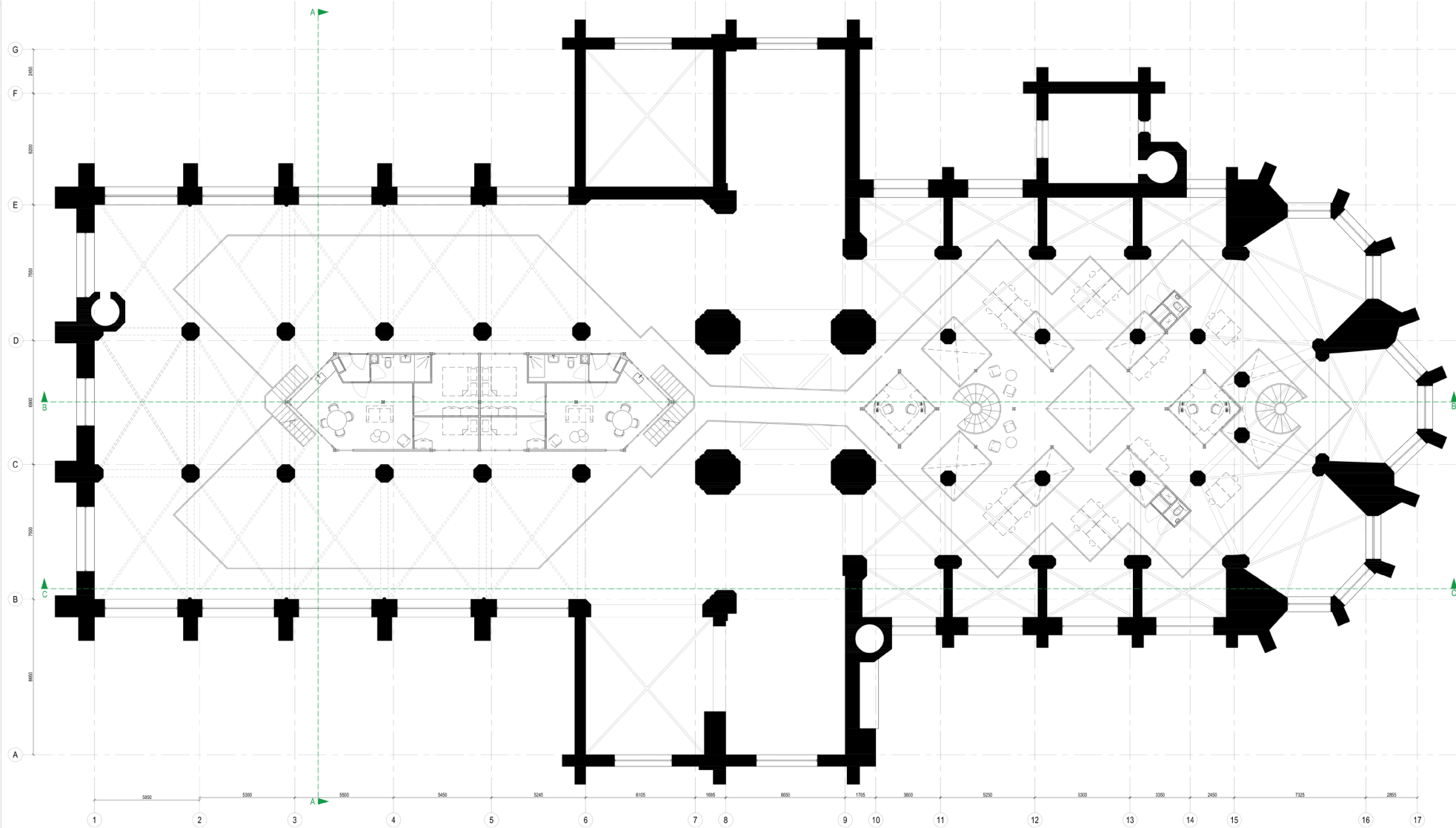
Second Floor Private
1:100



Housing



Office



SPACEPLANS

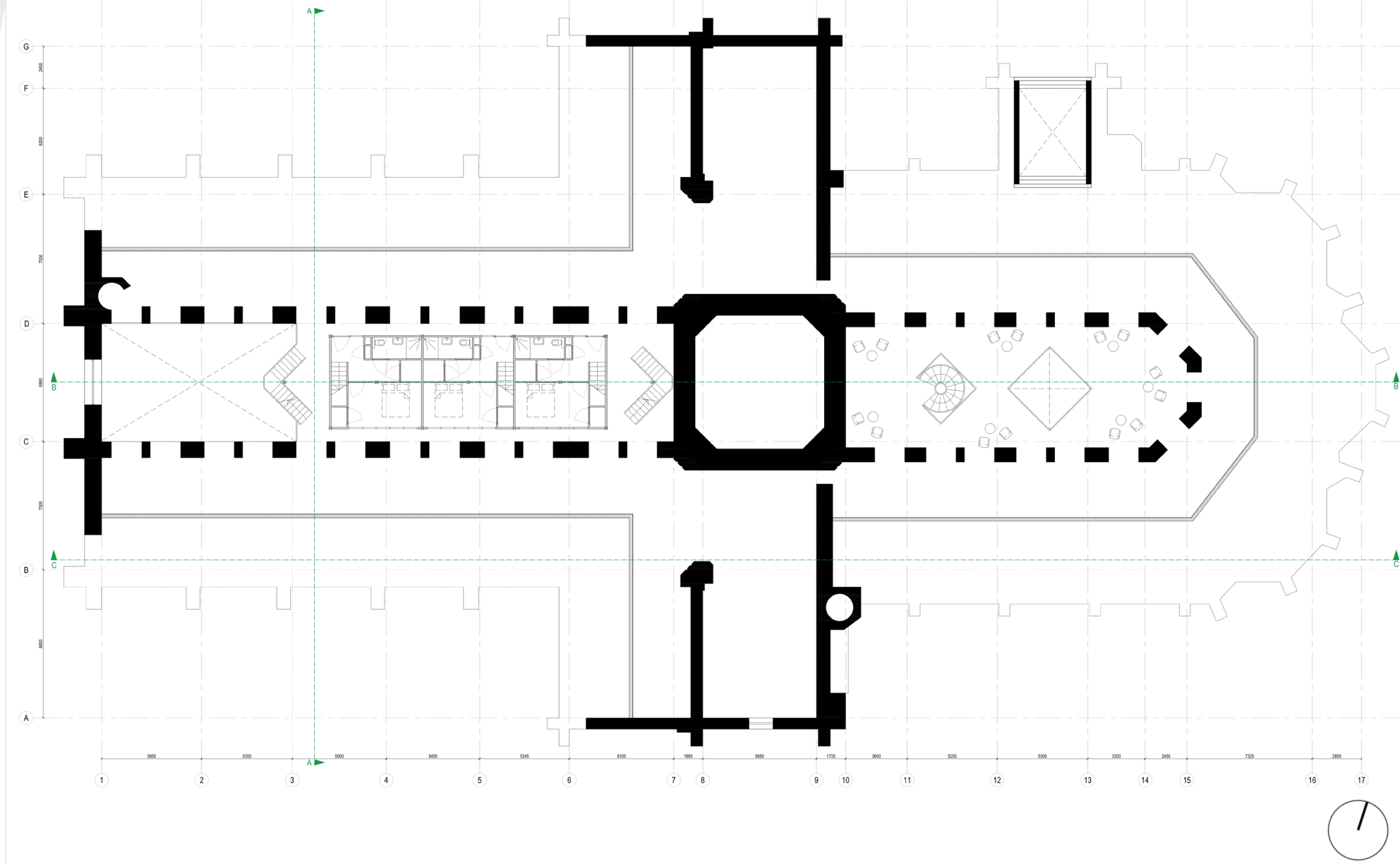
Third Floor Private
1:100



Housing



Office (lounge)

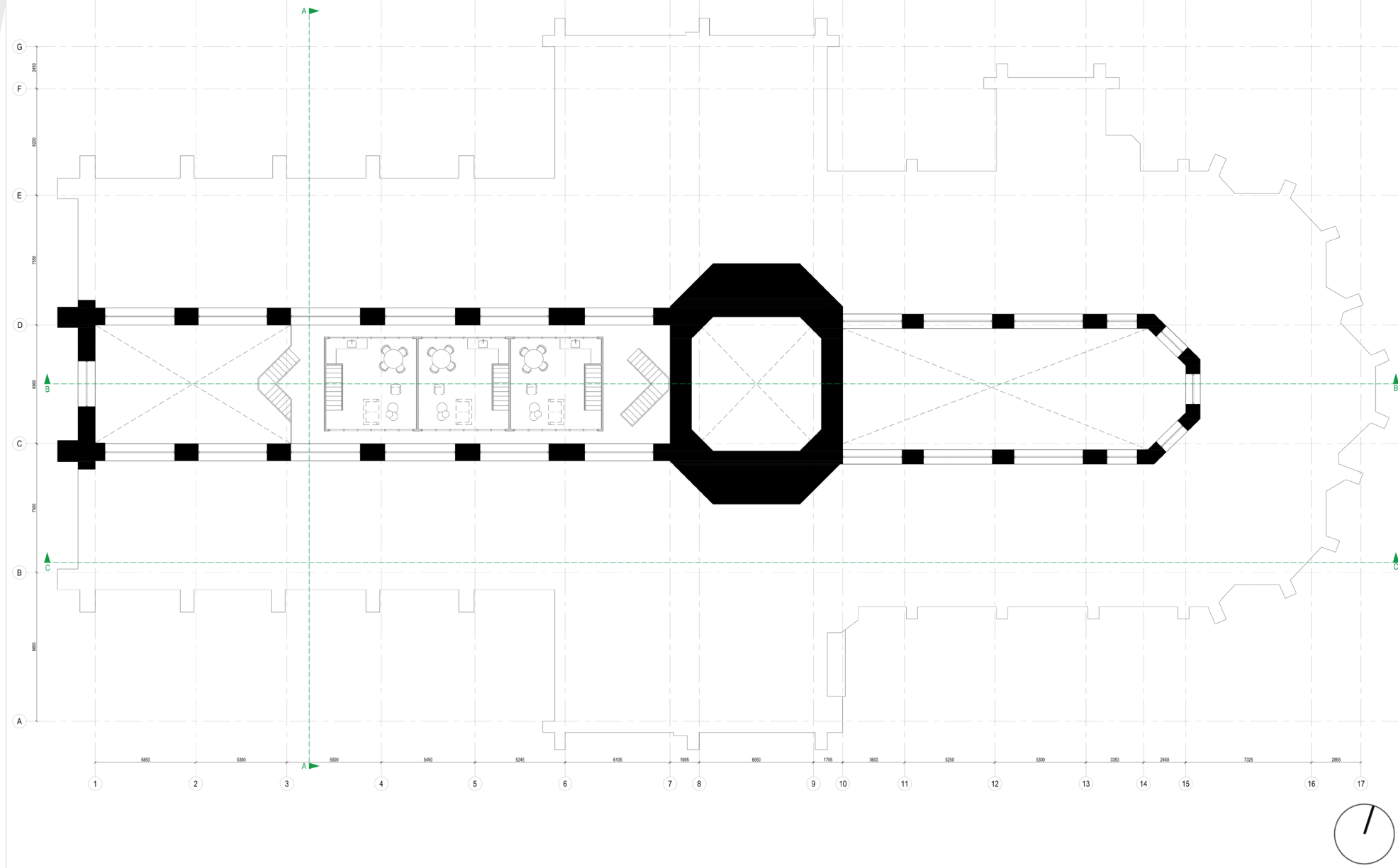


SPACEPLANS

Fourth Floor Private
1:100

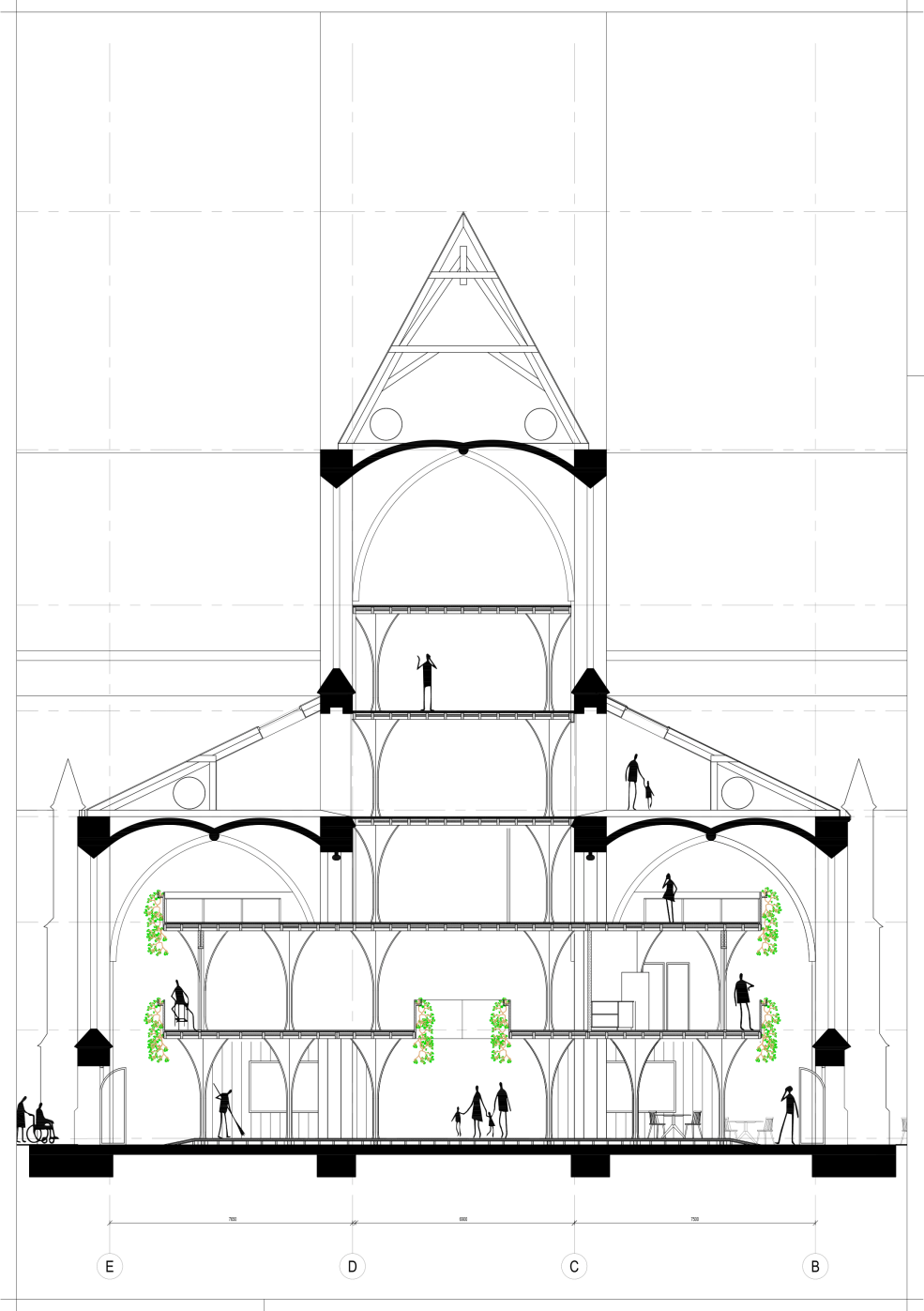


Housing



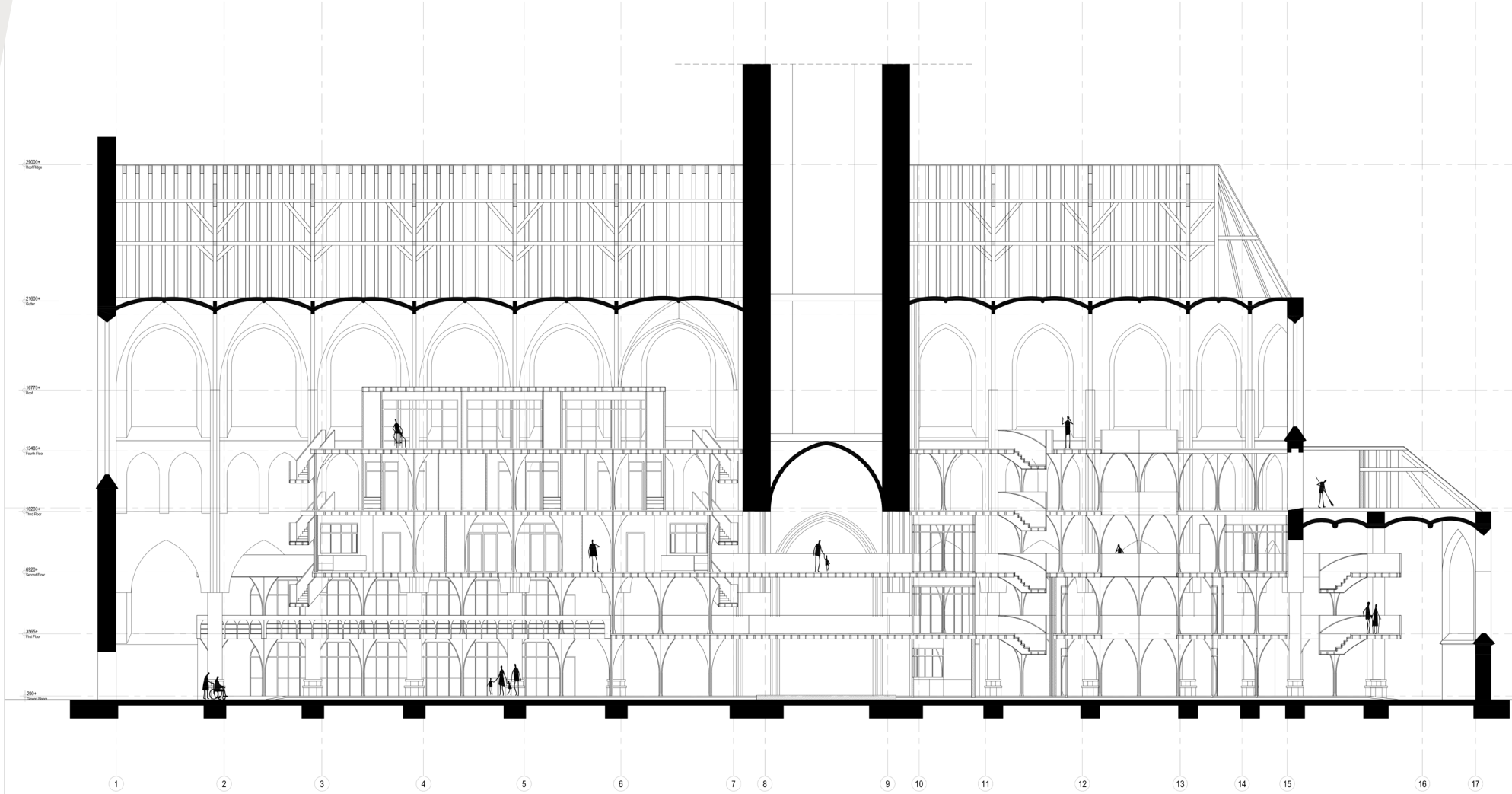
SECTIONS

Section A-A'
1:100



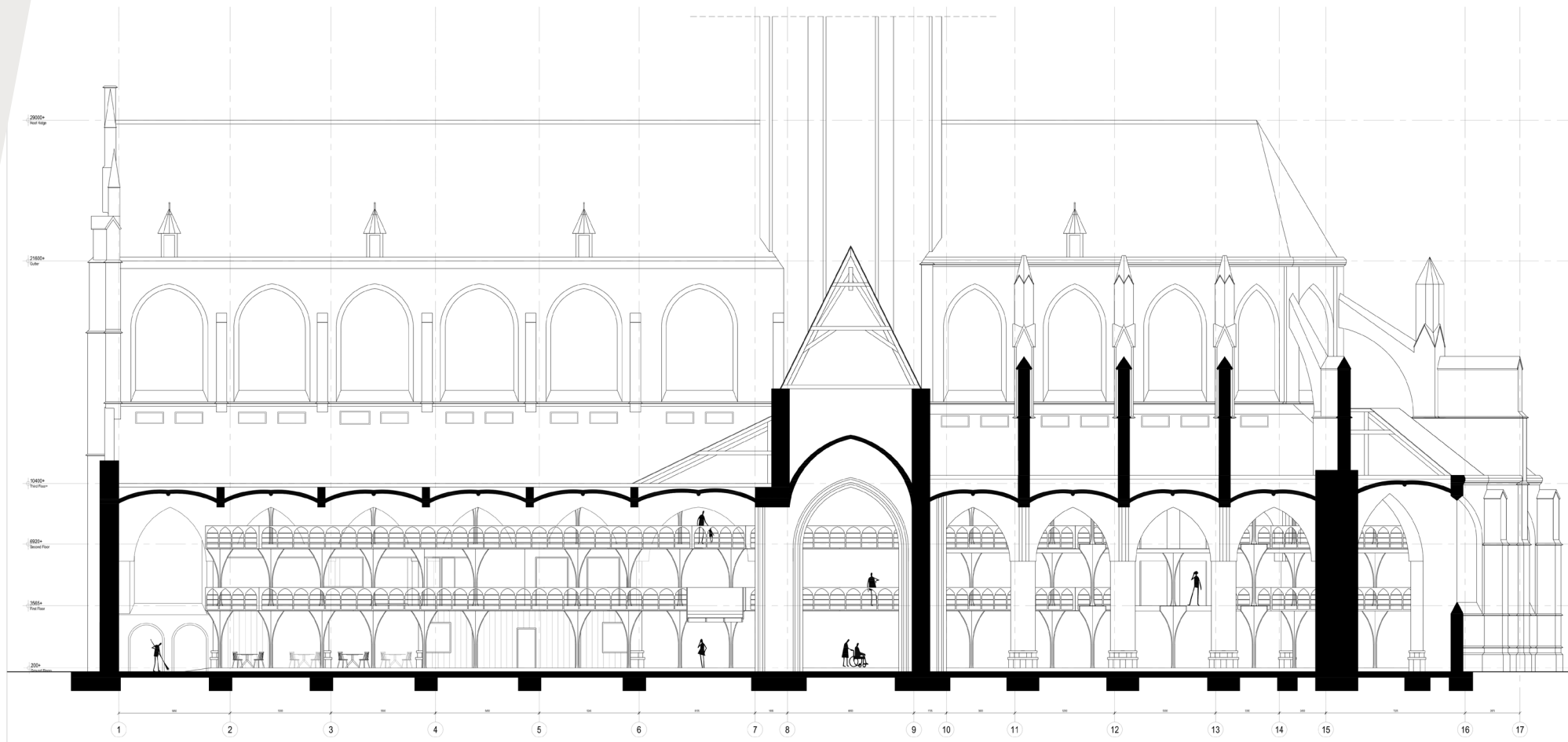
SECTIONS

Section B-B'
1:100



SECTIONS

Section C-C'
1:100



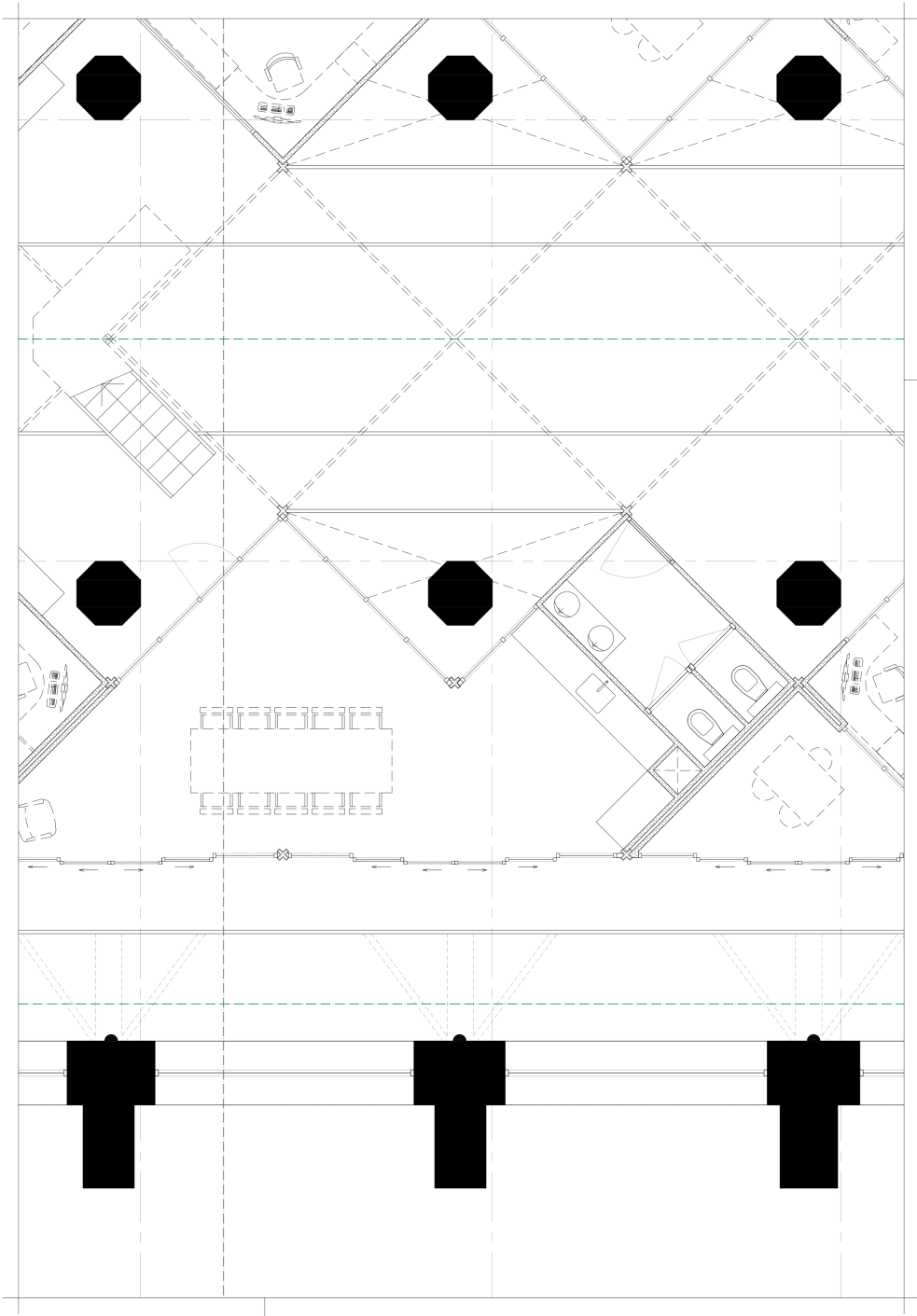
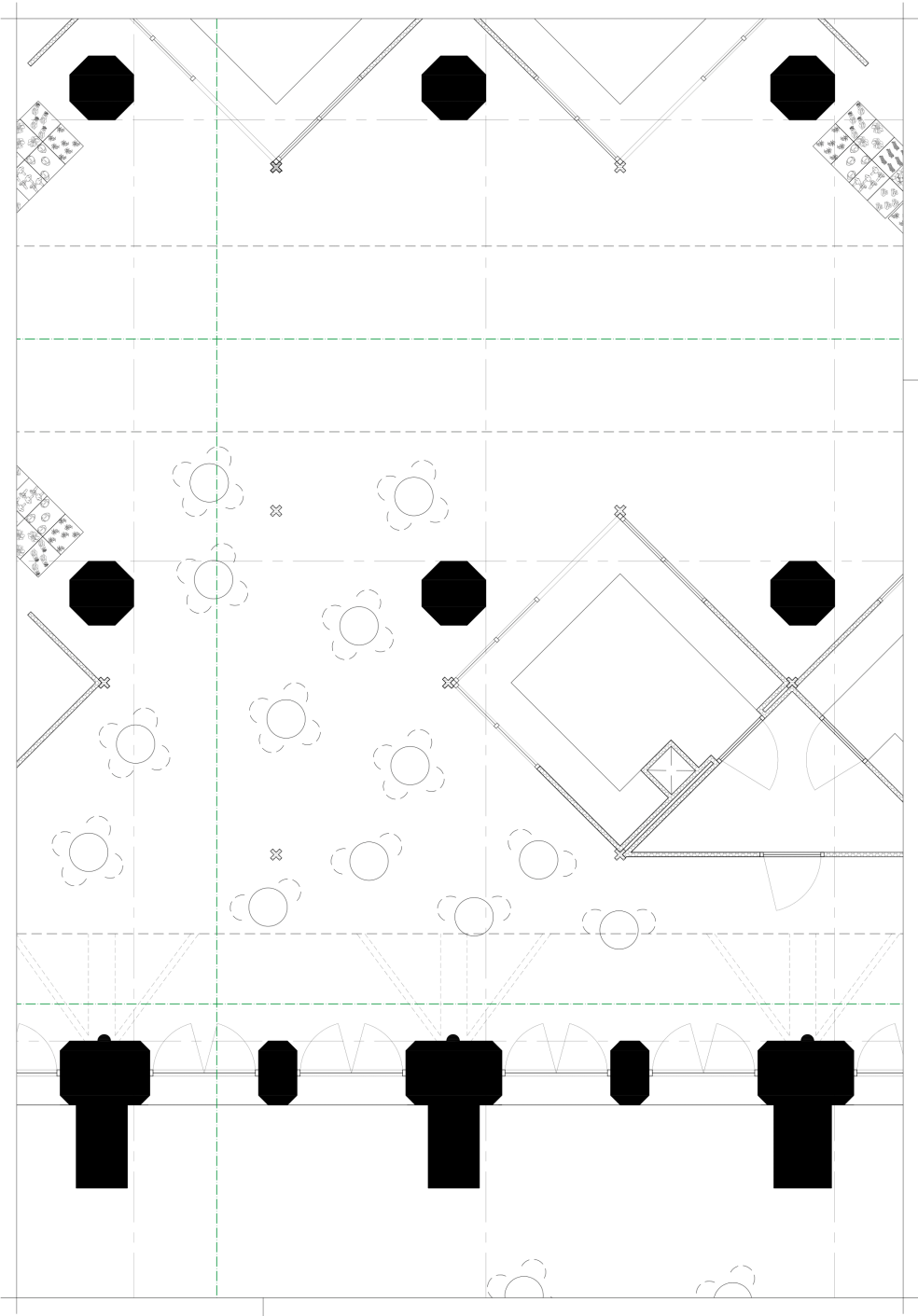
CLOSE-UPS

Section A-A'
1:50



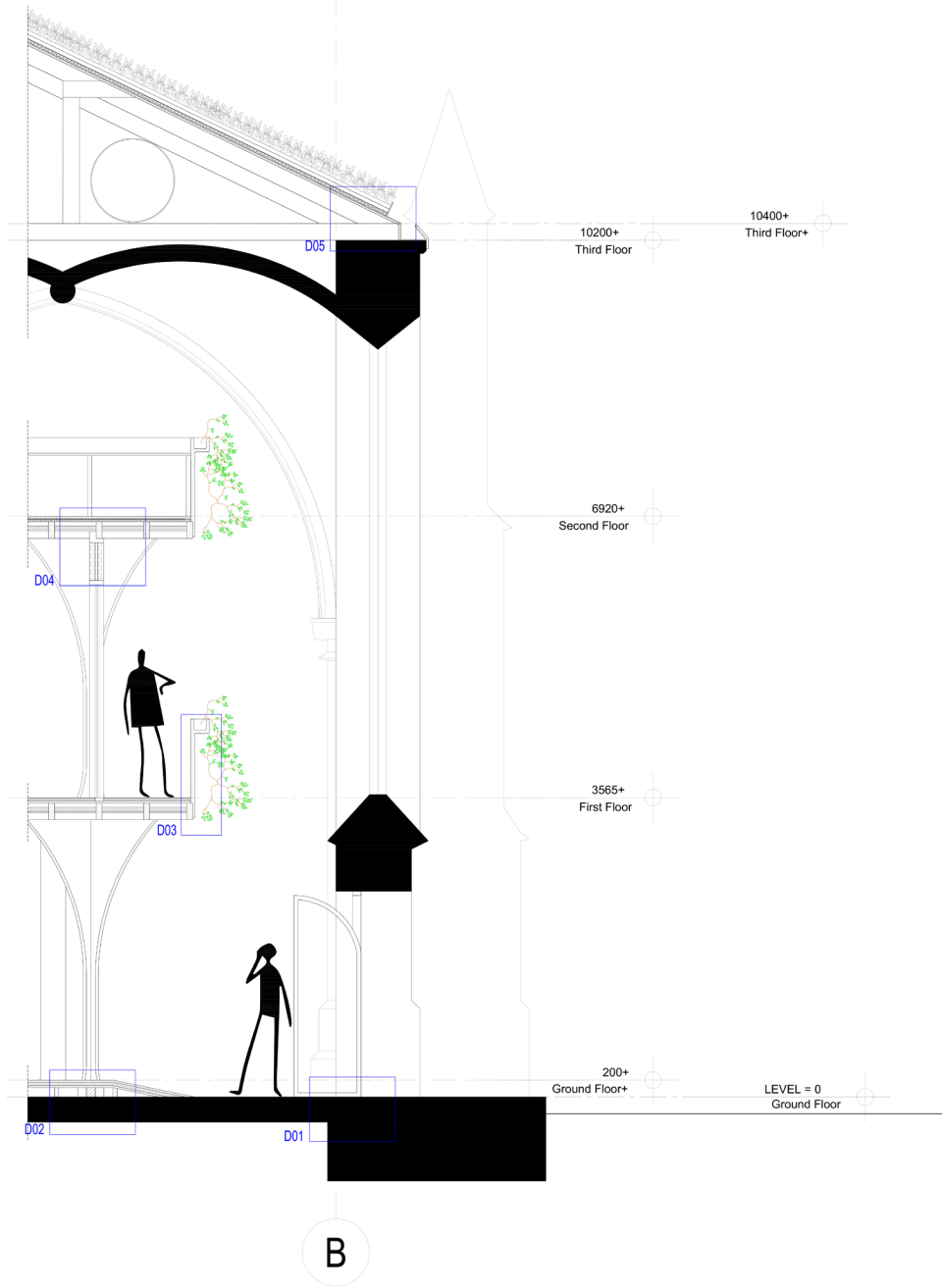
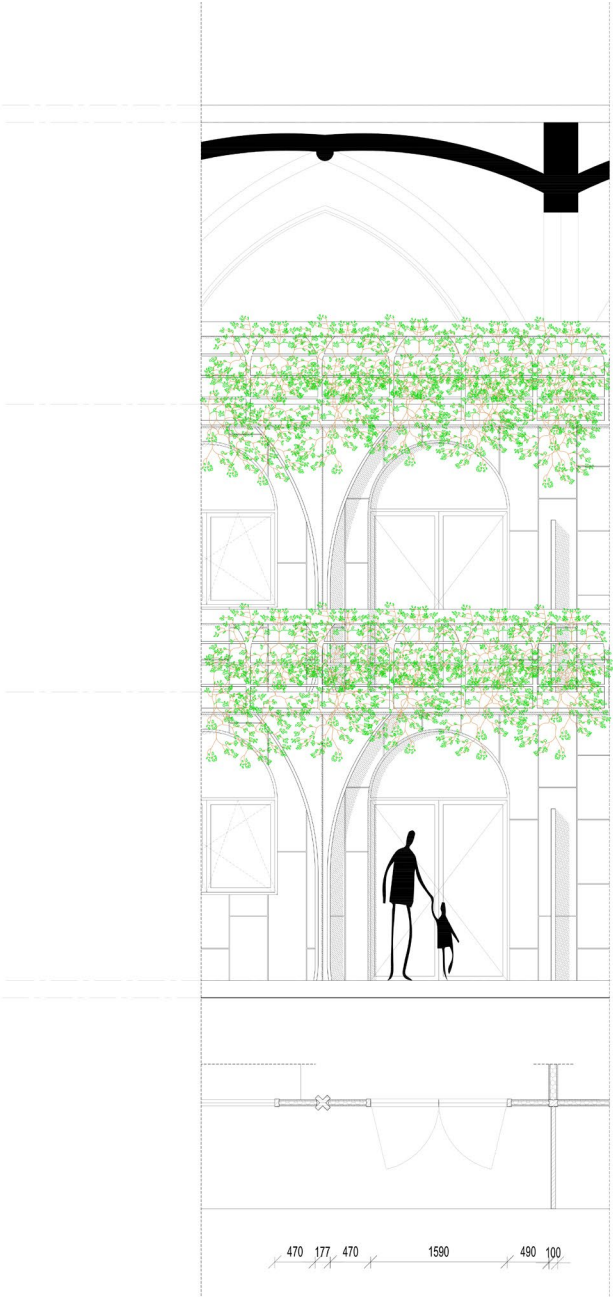
CLOSE-UPS

Spaceplan Ground
and first floor
1:50



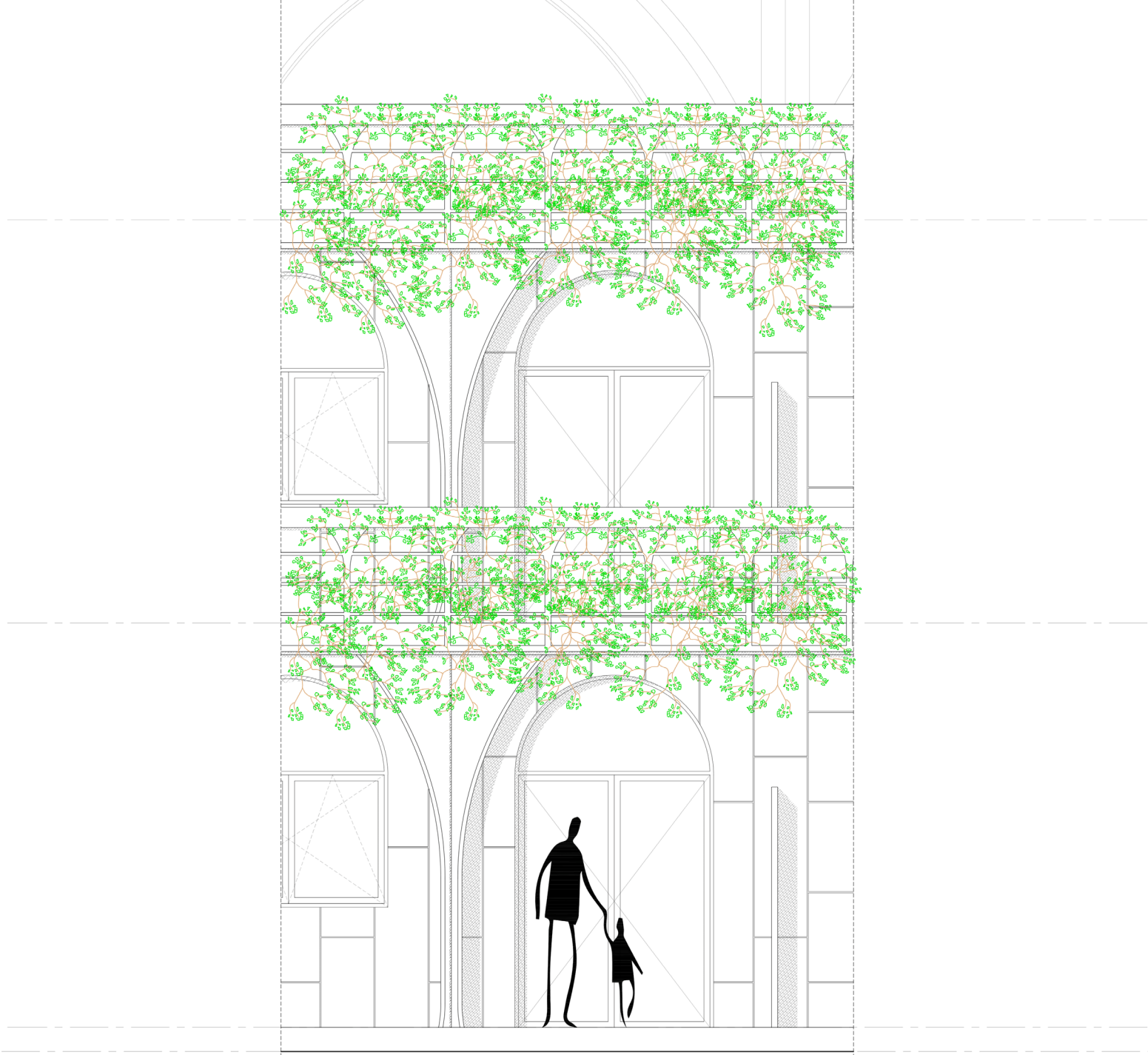
FRAGMENT

Section and
elevation
1:20



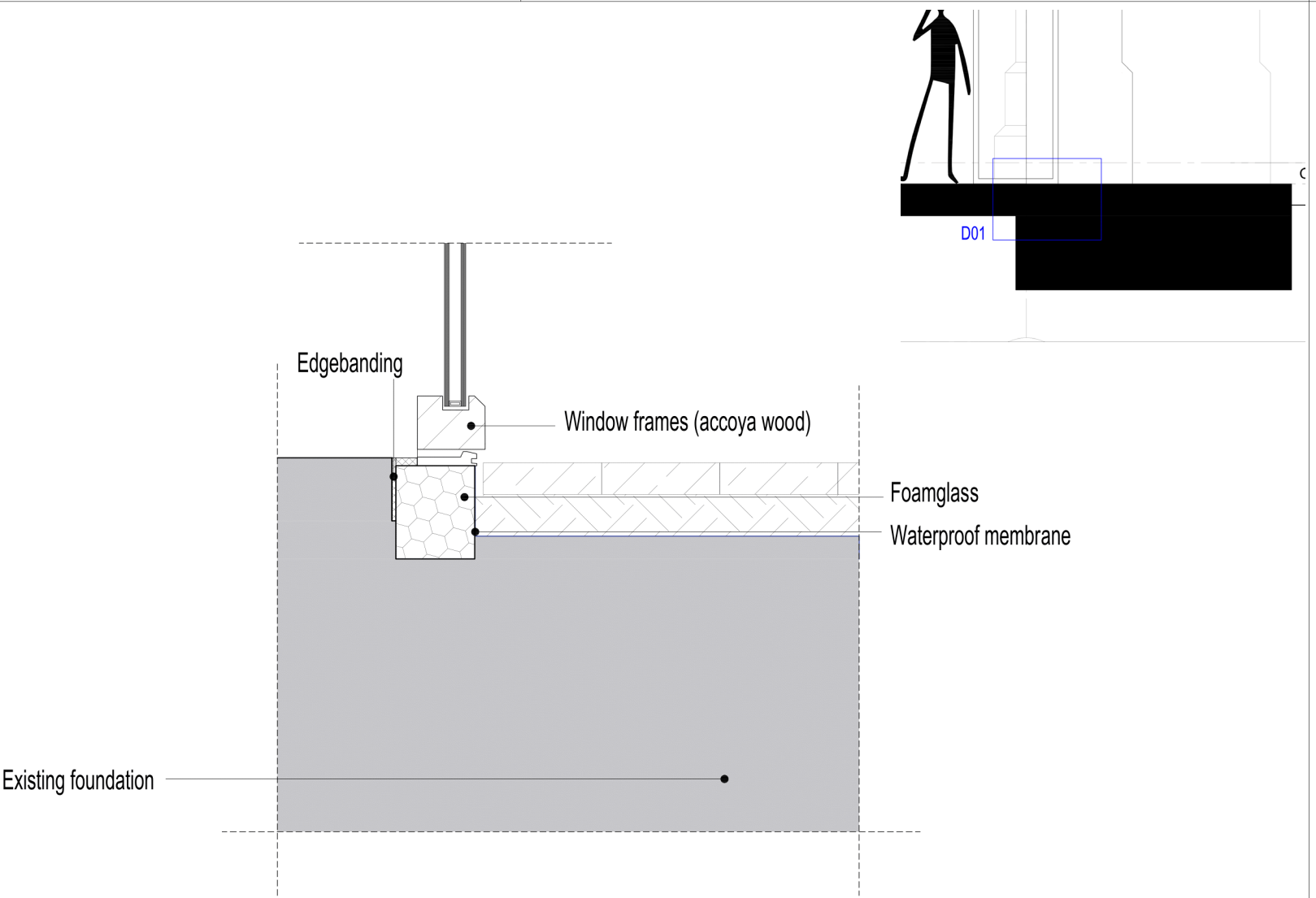
FRAGMENT

Elevation
Zoomed in



DETAIL

Detail door in
existing structure
1:5

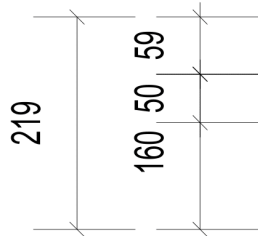


DETAIL

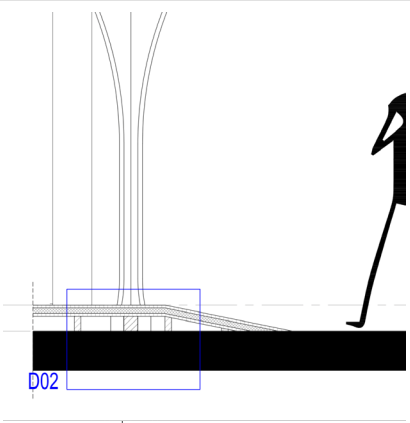
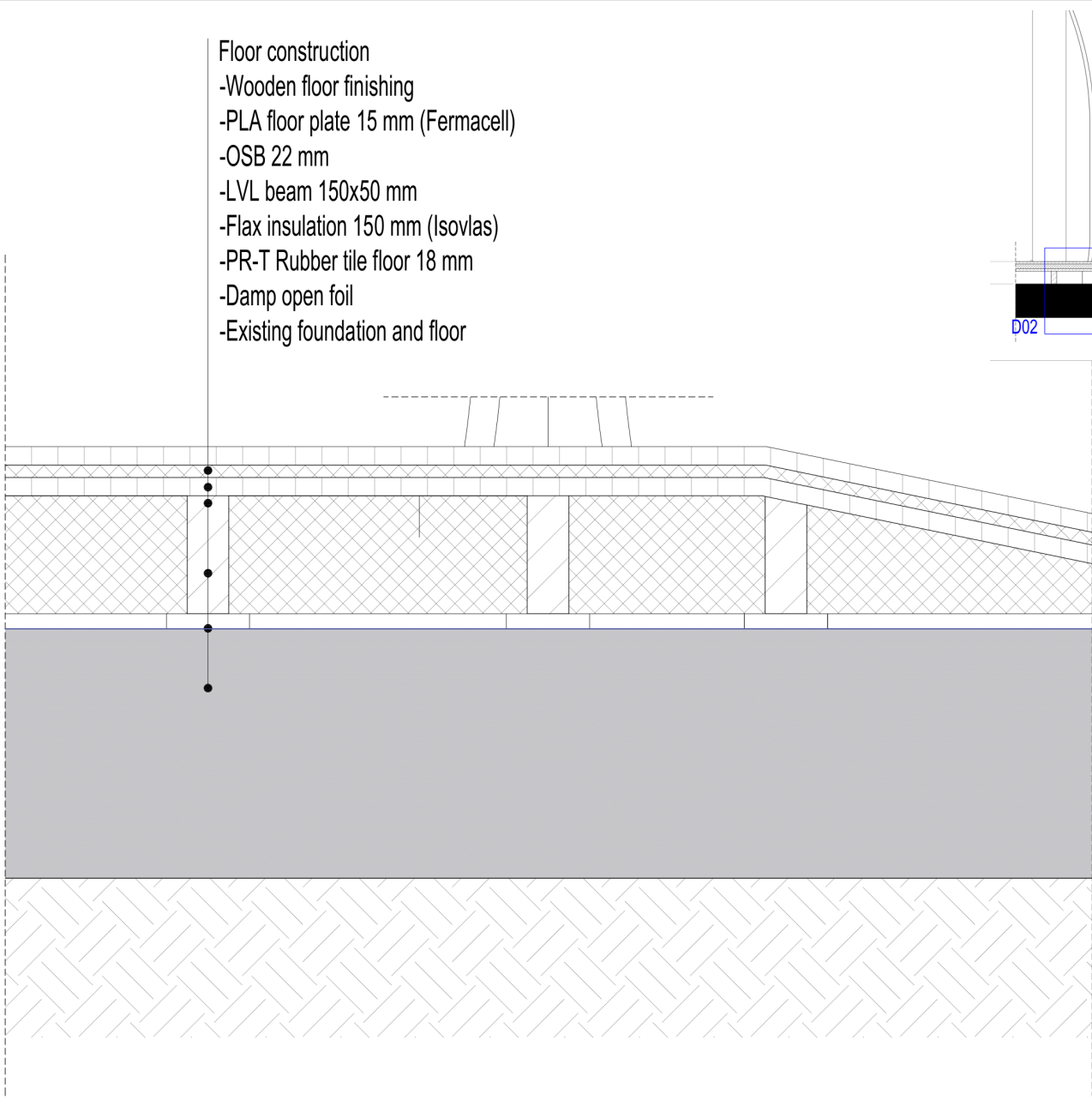
Detail structure
on existing floor
1:5



PR-T Rubber Tile

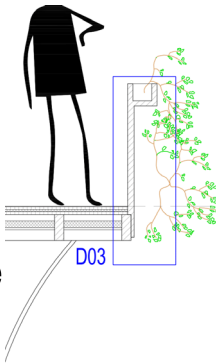
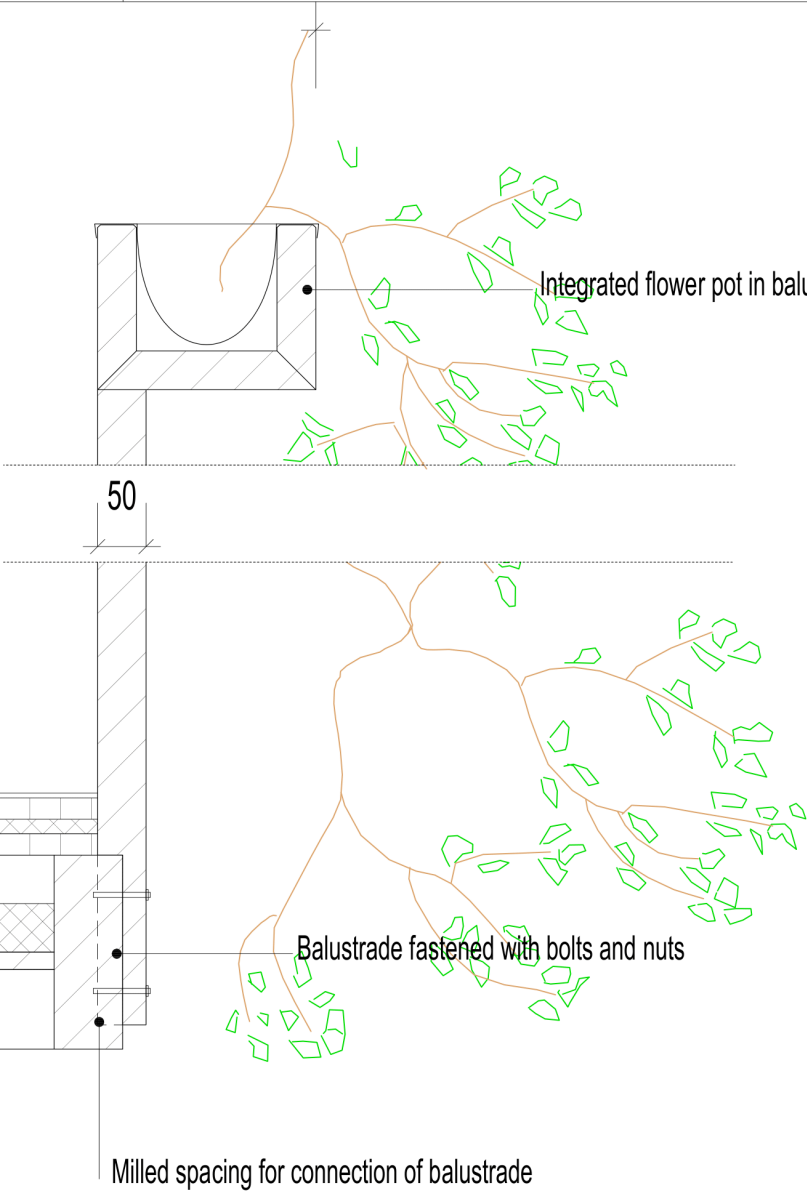
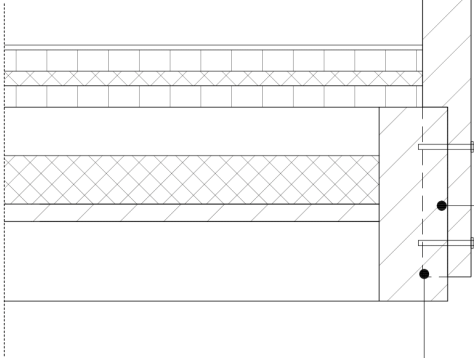
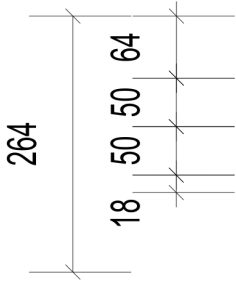


- Floor construction
- Wooden floor finishing
 - PLA floor plate 15 mm (Fermacell)
 - OSB 22 mm
 - LVL beam 150x50 mm
 - Flax insulation 150 mm (Isovlas)
 - PR-T Rubber tile floor 18 mm
 - Damp open foil
 - Existing foundation and floor



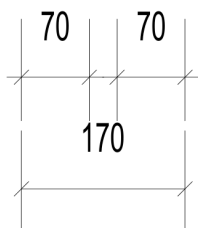
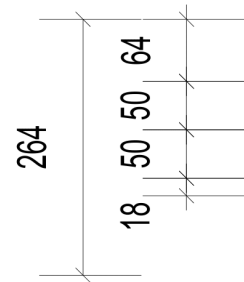
DETAIL

Detail balustrade
1:5

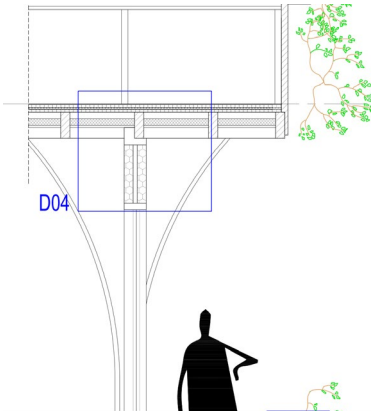


DETAIL

Detail window
under floor
1:5

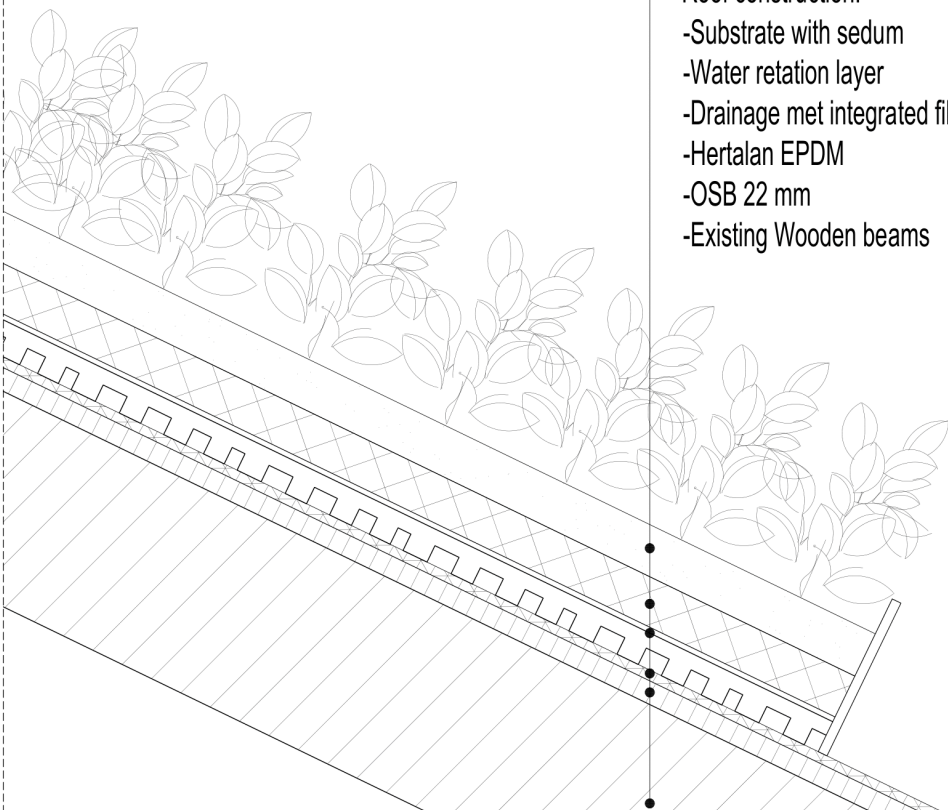
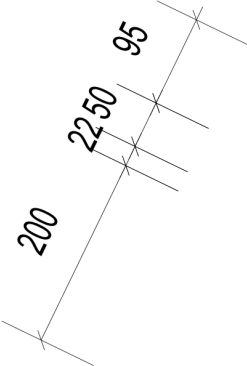


- Wall construction
- Underlayement 12 mm
 - Flax fiber core
 - Fire proof OSB 12 mm
 - Flax insulation 30 mm (Isovlas)
 - Fire proof OSB 12 mm
 - Flax fiber core
 - Kerloc 10 mm

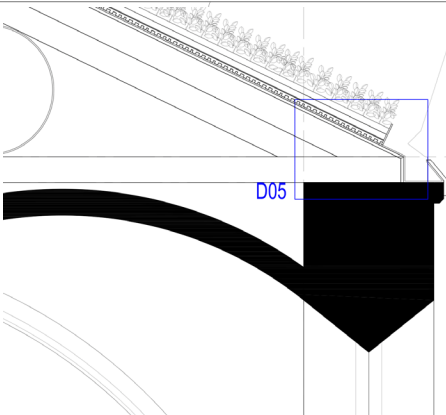


DETAIL

Detail sedum roof
1:5



- Roof construction:
- Substrate with sedum
 - Water retention layer
 - Drainage mat integrated filter layer
 - Hertalan EPDM
 - OSB 22 mm
 - Existing Wooden beams



Foamglass 10 mm

VISUALS



VISUALS





VISUALS

VISUALS

