

P5

Master of Science Architecture.

# The story lives on

Optimizing Narrative driven Design for a  
Zero-Waste conversion of churches

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22-06-2023



# Introduction

- 1500 to 4500 churches will have to close in the next ten years, to save these buildings from demolition they need a new role in present day society.

Transforming and reviving them creates possibilities for:

- Characteristic buildings with rich history.
- Living and well used monuments.
- Opportunities for improved circularity in the building sector.

The research is conducted in the context of the graduation studio revitalizing heritage: zero-waste church, where the focus is to give new life to heritage under threat of disuse or demolition a new function, reusing what is already there and minimizing waste.



# Research questions

How to make the stories that are integrated in religious built heritage legible in a redesign?

- What is the symbolic value of the Dutch neogothic church architecture of the 19th century?
- What elements tell stories and carry symbolic value in Catholic religious heritage?
- How are the intangible stories and symbolism connected to the tangible building and its elements?
- What are the effects of the narrative design approach to the circularity potential of the tangible and intangible building elements?

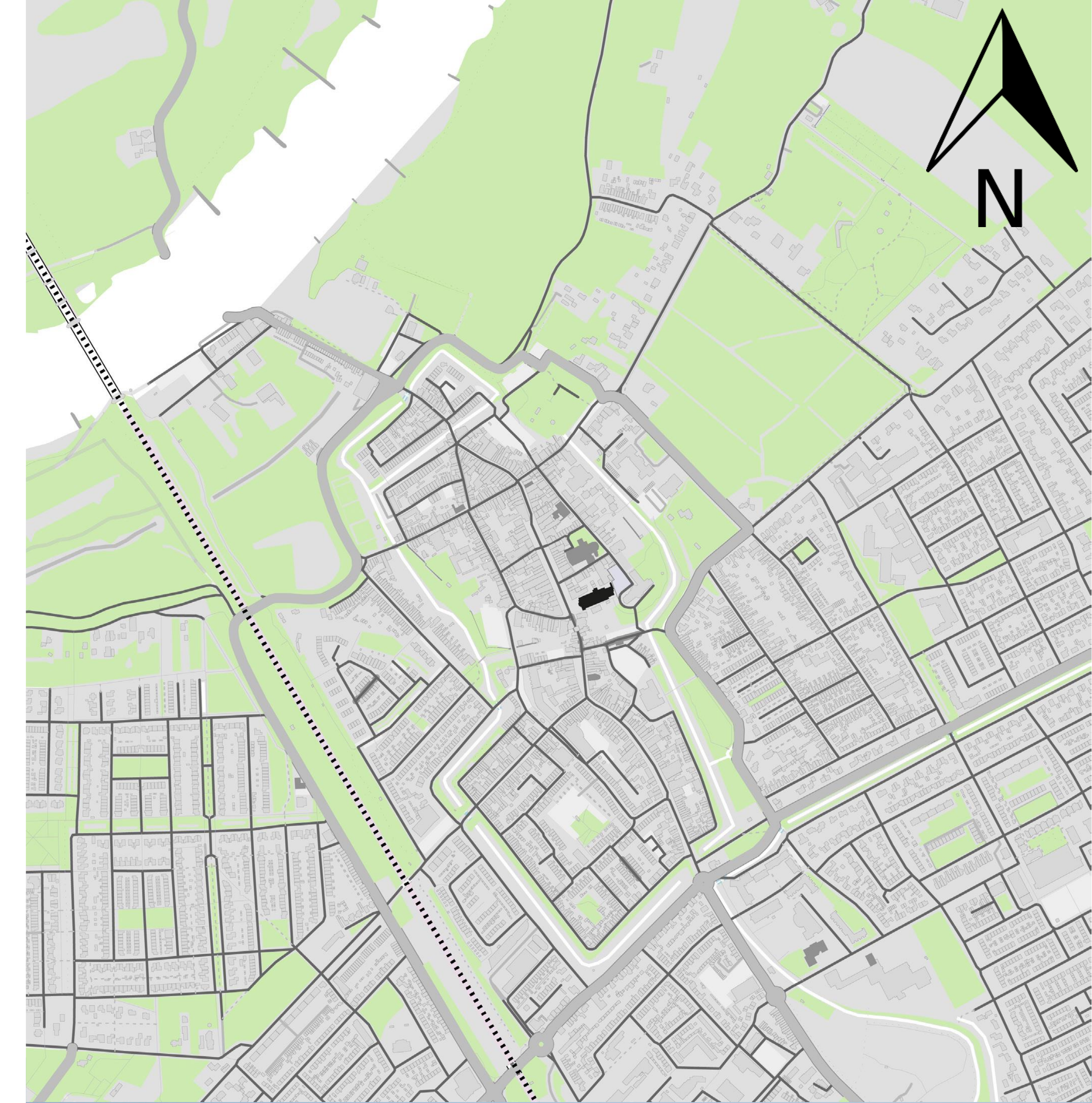
*(All these questions will be tested in reference to the case study of the R.K. Barbarakerk in order to limit the scope of the research)*



# Heilige Barbarakerk Culemborg

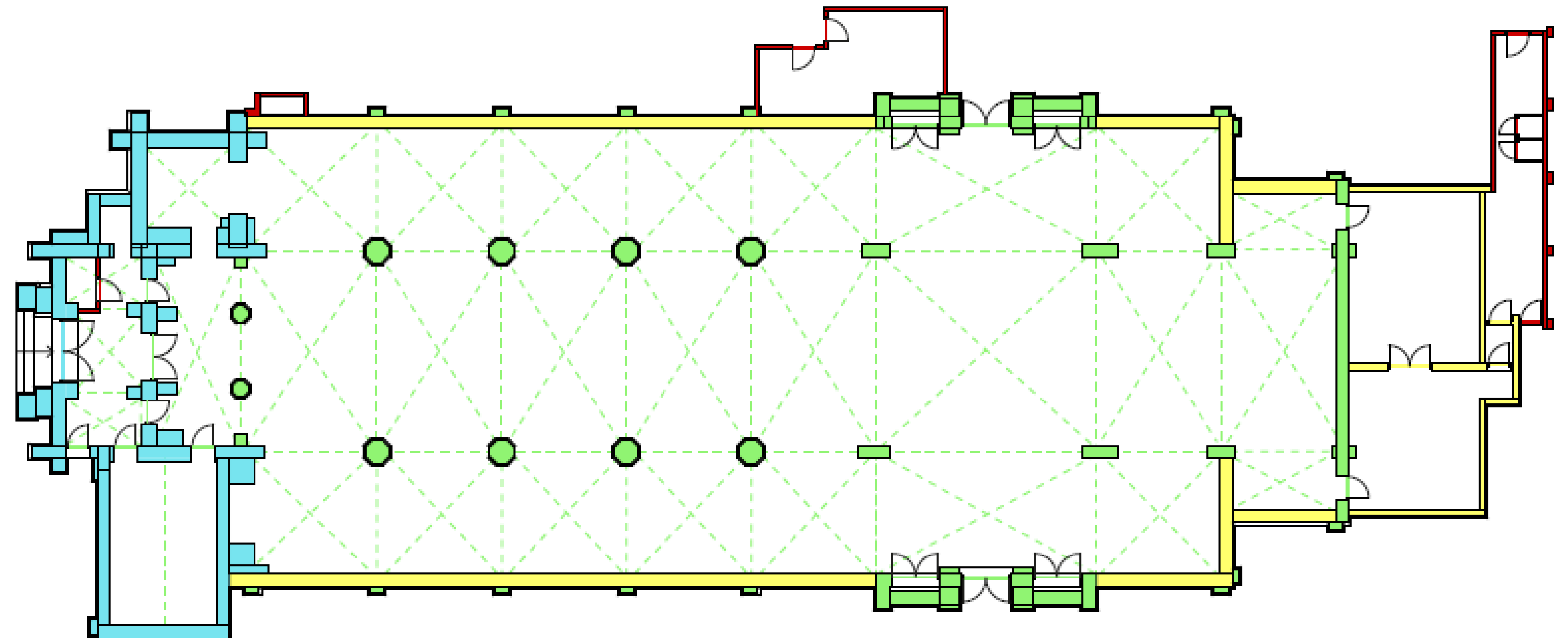
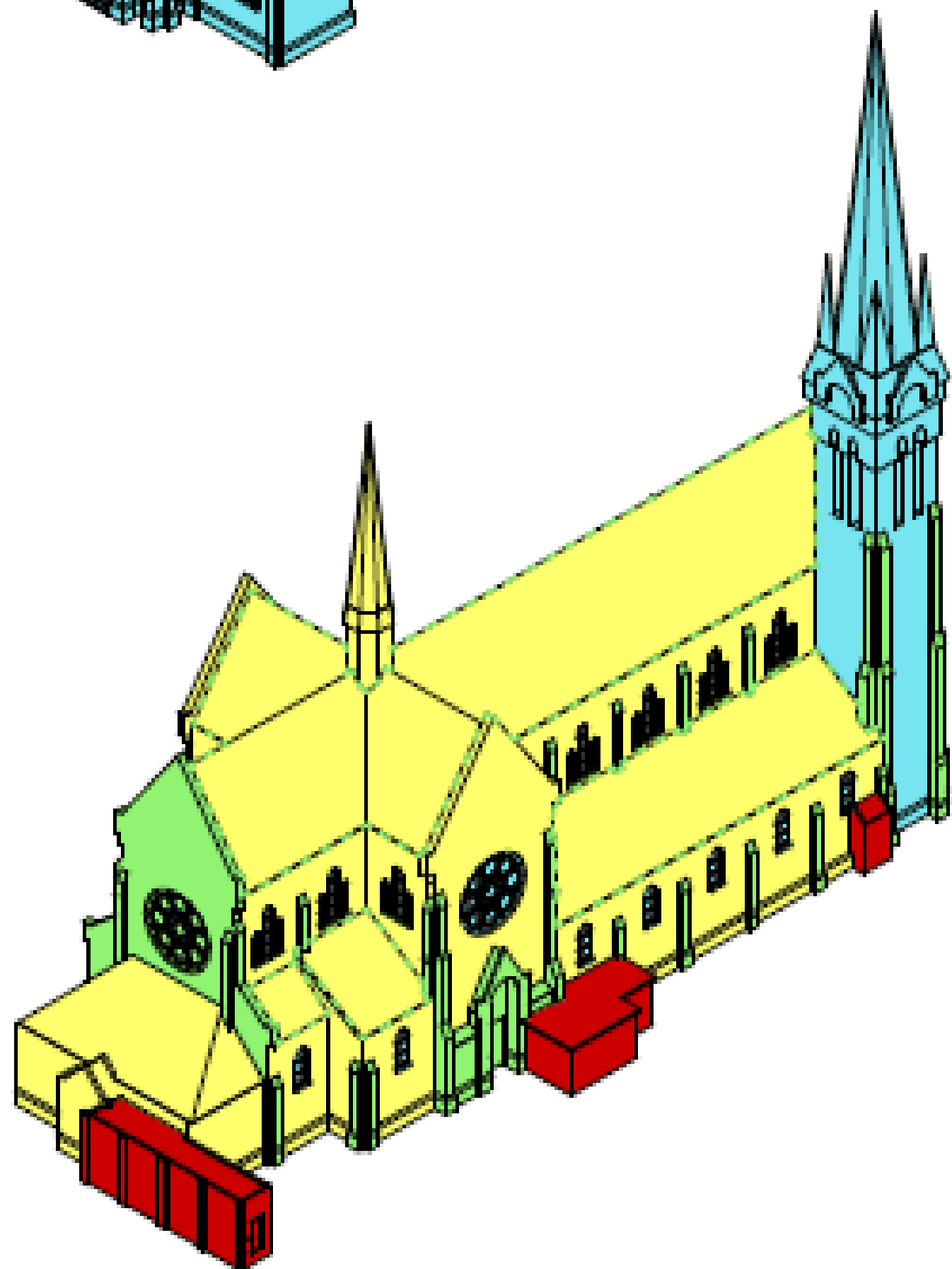
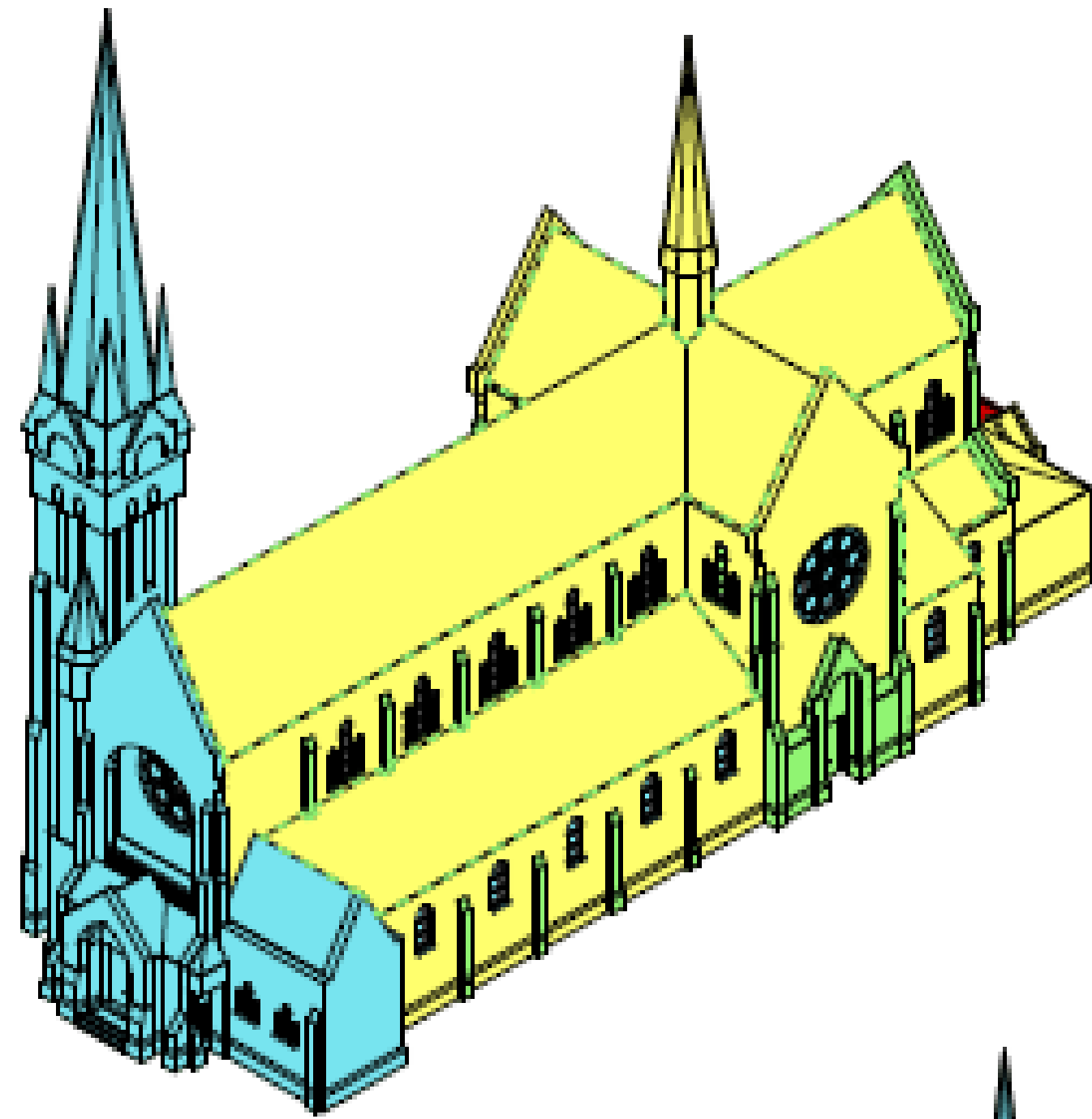
A Neo-Gothic (1886) catholic church in the city center of Culemborg that will become vacant.

- Designed by Piet van Genk, main church architect for the region Breda (Frijters, 2011).
- Grand Neo-Gothic architecture symbolizes the reestablishment of Catholicism in the city (Genootschap A.W.K. Voet van Oudheusden, 2004).
- Using narrative architecture visualizing faith, the bible and the presence of the Catholic community (Tkac, 2019).

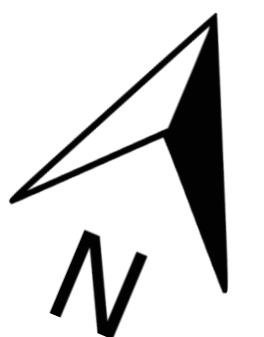




# Valuation of the current situation



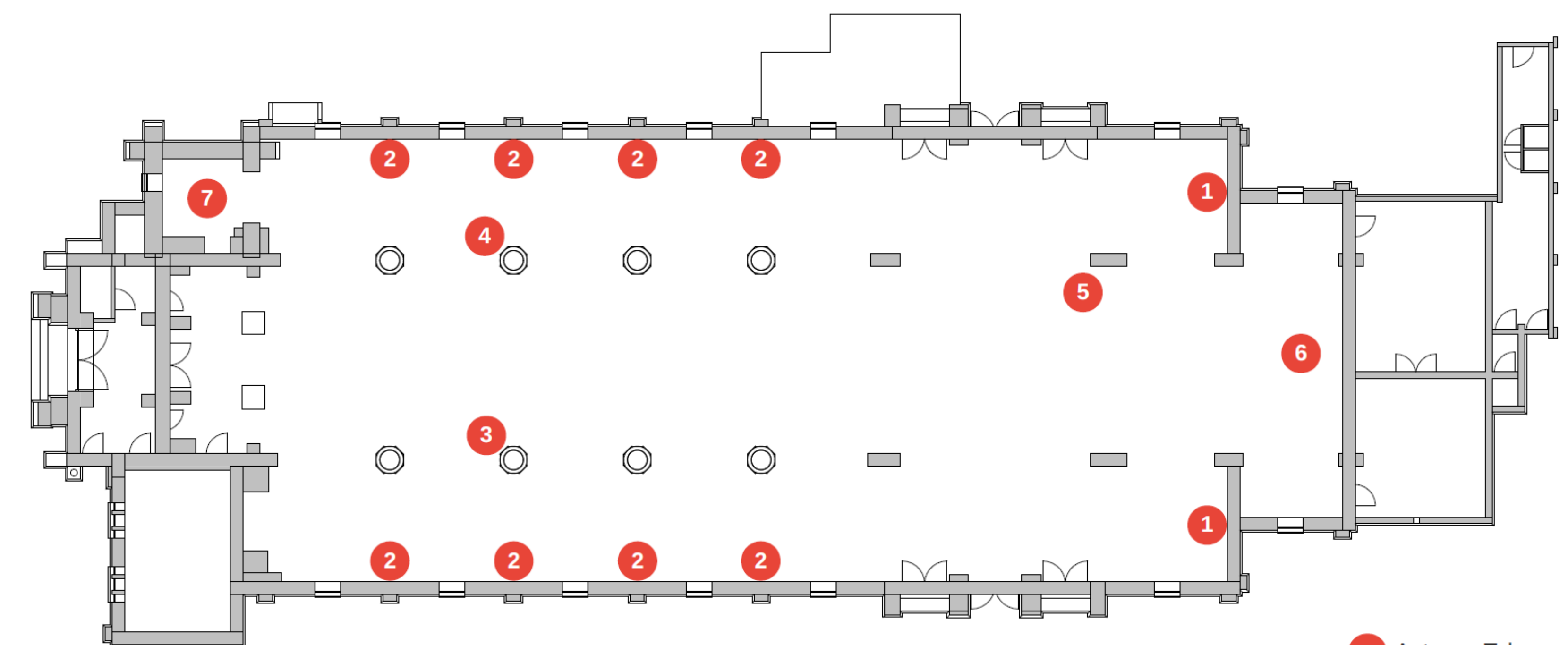
- High importance
- Medium high importance
- Medium importance
- Low importance





# Icons

- Displays of acts of charity.
  - Most of the saints represented gained their sainthood through dedicating their life to help those in need, to help educate the vulnerable and for standing up for their beliefs in adverse conditions.
- Representations of biblical virtues and stories.
  - Saints are often displayed with symbols or attributes relating to their backstory (McNamara, 2011).



- 1 Side Altars
- 2 Stations of the Cross
- 3 Pulpit
- 4 Antwerp Tabernacle
- 5 Augustinus Sculpture
- 6 Organ
- 7 Elisabeth Bell



# Symbolism

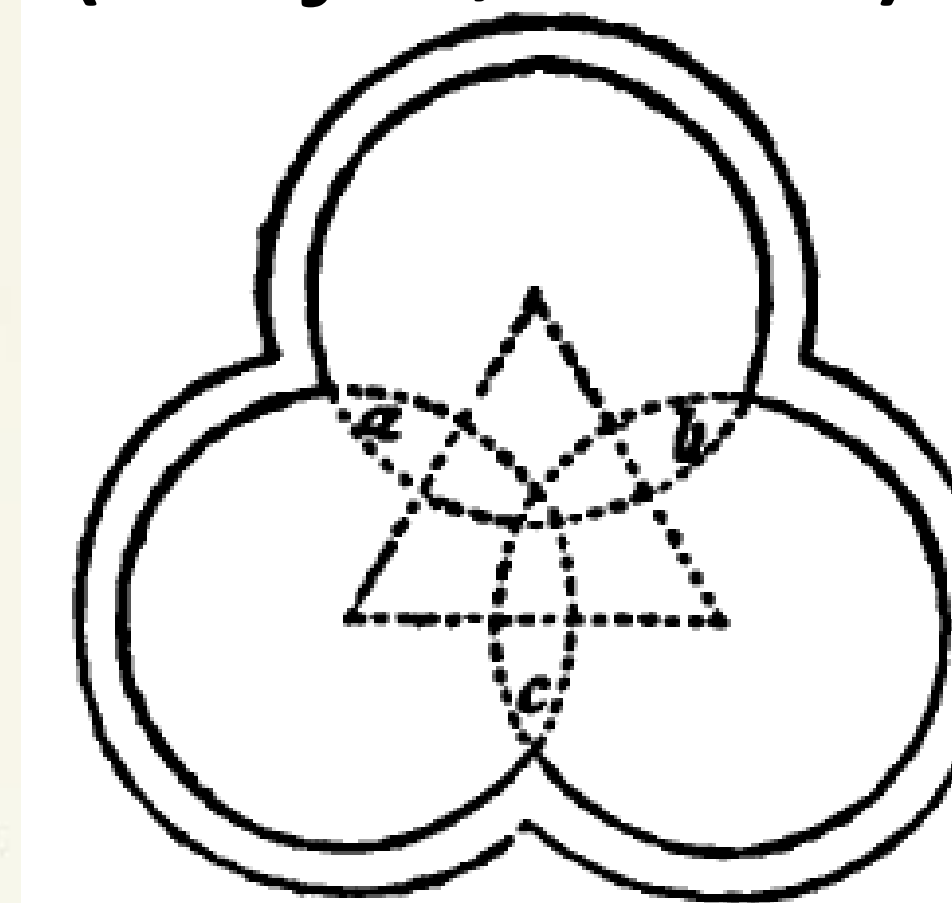
Construction of Figures on the Principle of the Cross

Construction of Figures on the Principle of the Cross

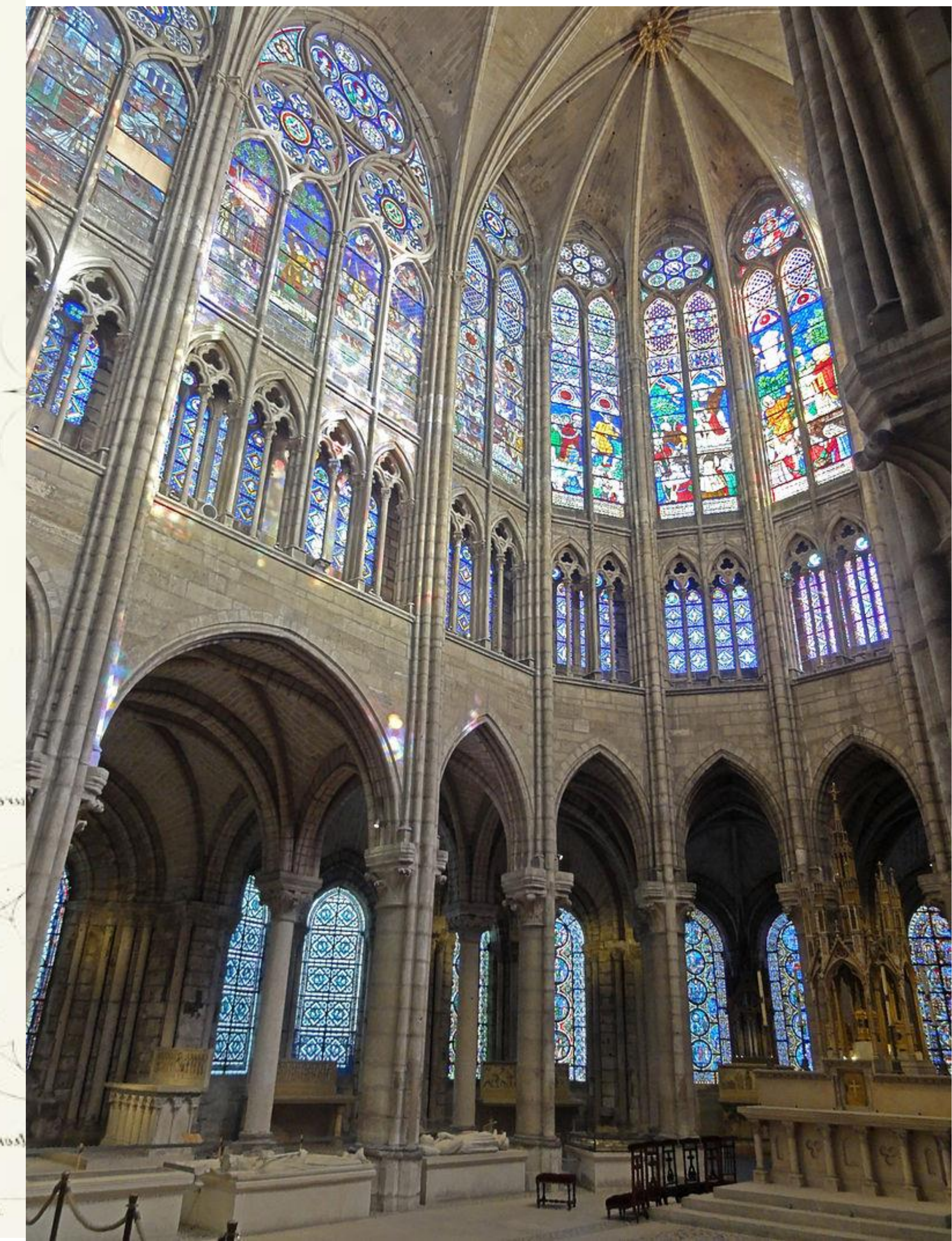
- Orientation and light (Thijm, 1858).
- Number symbolism (Translated in geometric forms).
  - Both present in structure and ornamentation.
  - Main symbolic numbers: 3, 4, 7, 8, (A. W. N. Pugin, 2019)
- Main shapes consist of the square (earthly) and the triangle (celestial) (Thijm, 1858).
- Honesty of construction (Lewis, 2021).
- True ecclesiastical architecture.
  - Invented by the church instead of adapted for the church (A. W. N. Pugin, 2015).

Construction of Figures on the Circle  
(Pugin, 1844)

(Thijm, 1858)

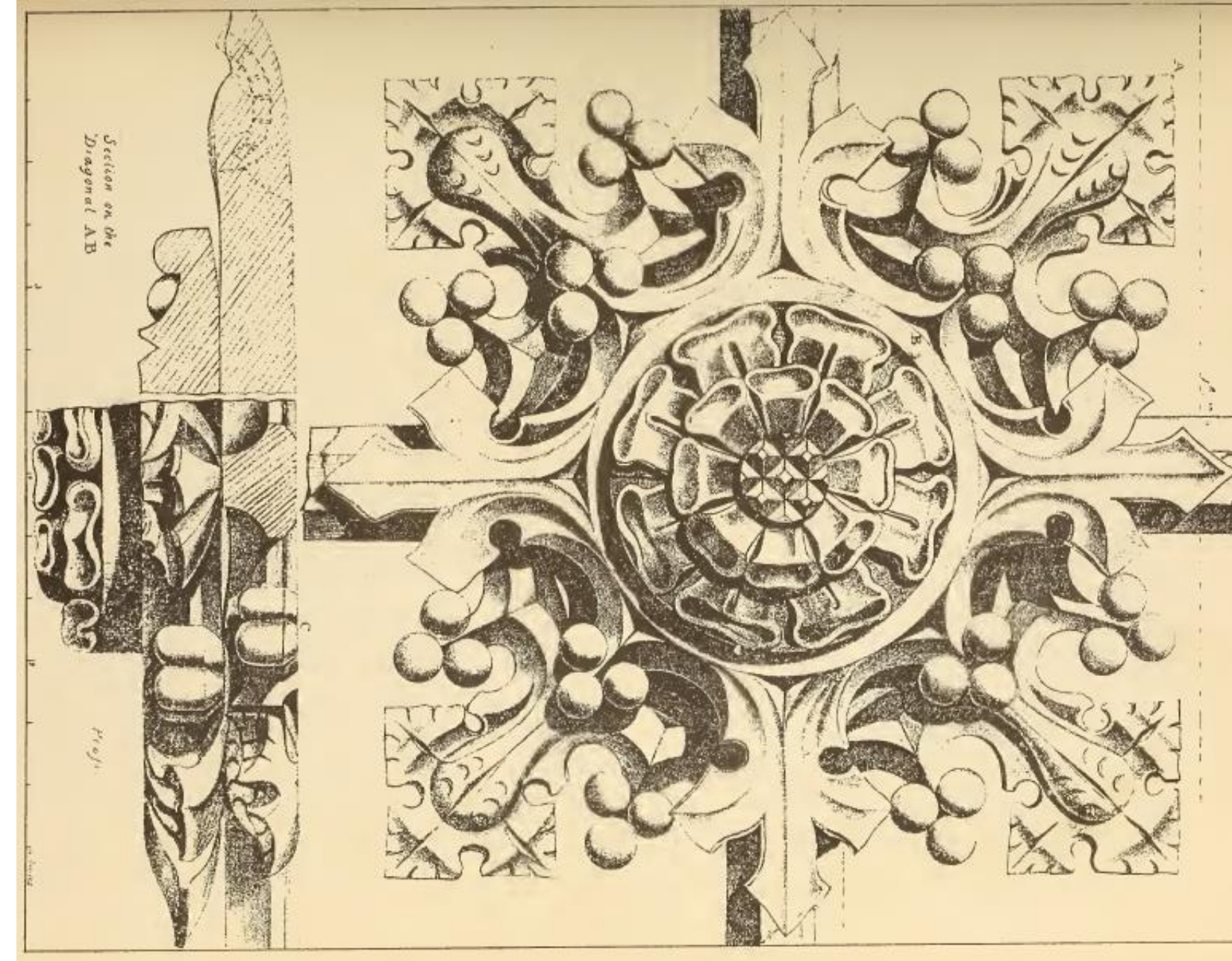


Original Gothic architecture  
Invented by Catholics  
(Cathedral de Saint-Denis)





# (Hidden) Stories



- Return to craftsmanship.
  - The family business of the van Genk Art-clan building, furnishing and decorating the entire building (Frijters, 2011).
  - Architects of the time had close relations with craftsmen or had their own studio's for church furnishings, however still making use of modern production methods (Lewis, 2021).
- Lifecycle of the catholic faith in the Netherlands.
  - Symbolising their return in the city and visualizing their ideas and how they changed over time (Frijters, 2011).
- The church provides for itself.
  - Being built on donations, the church represents the community and what they have provided, leaving traces to its patrons (Genootschap A.W.K. Voet van Oudheusden, 2004).





# Circularity

History repeats itself.



Iconoclasm



Wreckovation





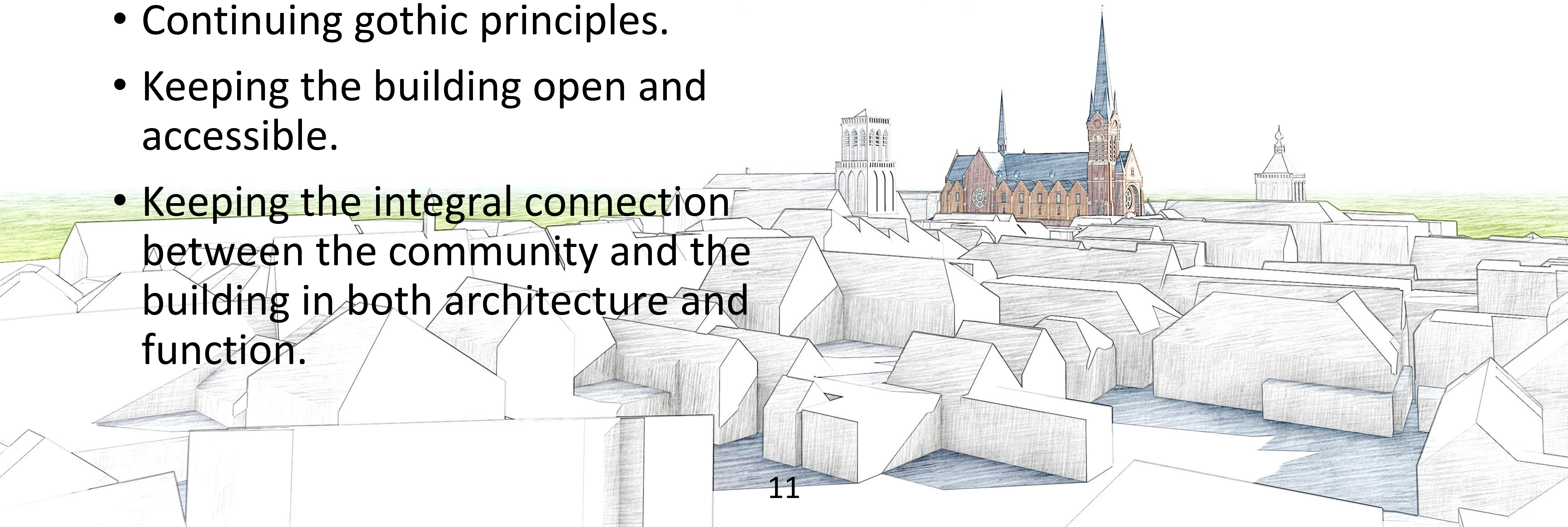
# Research findings

- The RK Barbarakerk is not a strict interpretation of the Gothic principles but rather a more visually inspired 'Romantic' Gothic building
- The church and its symbols, icons and furnishing are created as an integral unit by either the architecture studio itself or closely related art studios.
- The creation of a new church in the late 19<sup>th</sup> century was an integral community undertaking, funded and furnished by donations, representing the community itself as well as being the main community gathering place.
- Gothic principles valued honesty of construction, material and craftsmanship, this gave an important role to the ornament as a highlighting feature for key functional or structural points as well as giving craftsmen the opportunity to embellish and show their artisanal abilities.
- As a church, a neogothic represents very clear and linear stories where presence, charity and community are central. For a sensible narrative architecture that is in line with the original building, it is important that these features are maintained and safeguarded.



# Redesign

- Fostering community and craftsmanship.
- Continuing gothic principles.
- Keeping the building open and accessible.
- Keeping the integral connection between the community and the building in both architecture and function.





# Redesign

Starting point:





# Redesign Concept:



(Wijkpaleis Rotterdam)

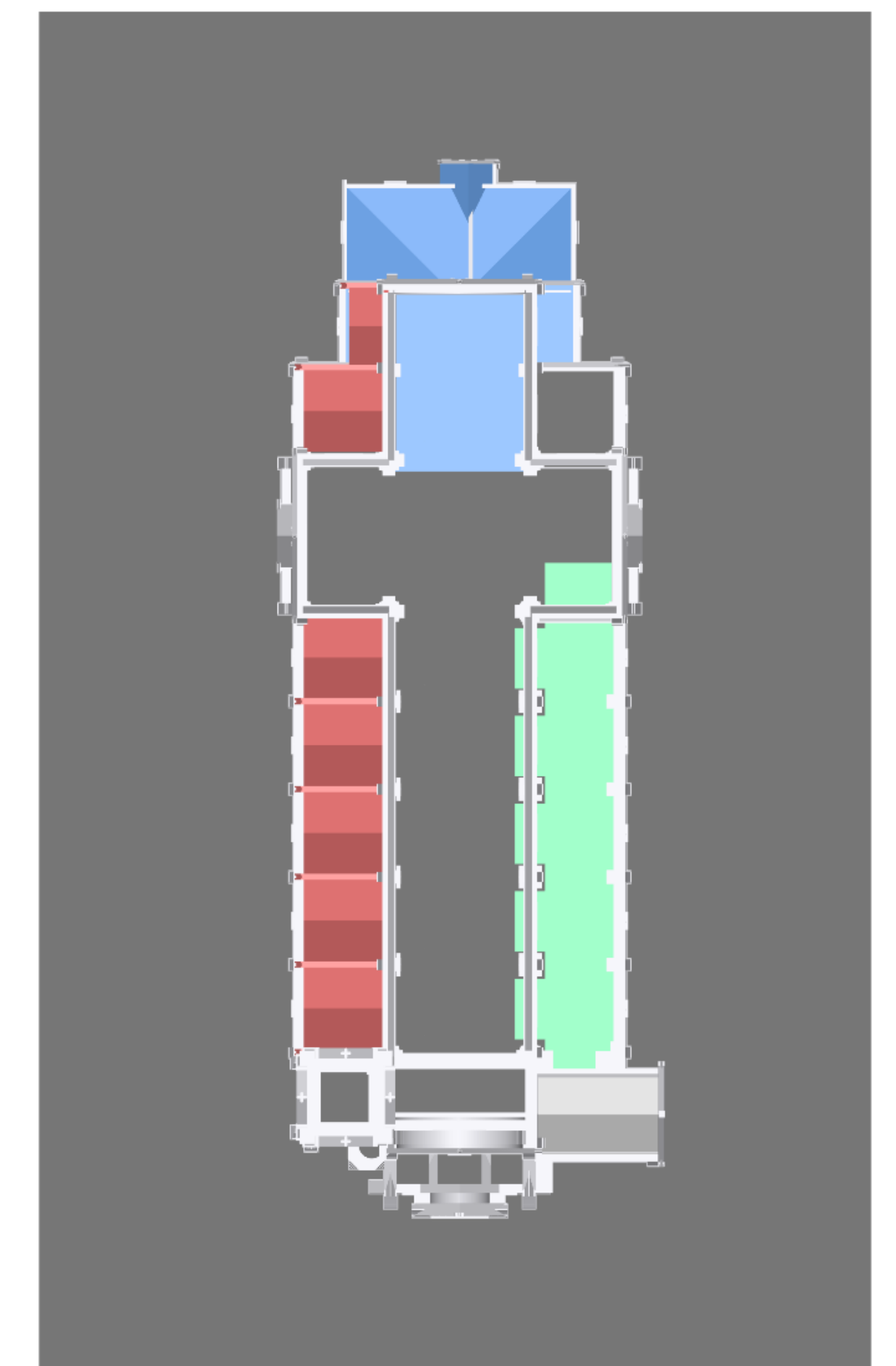
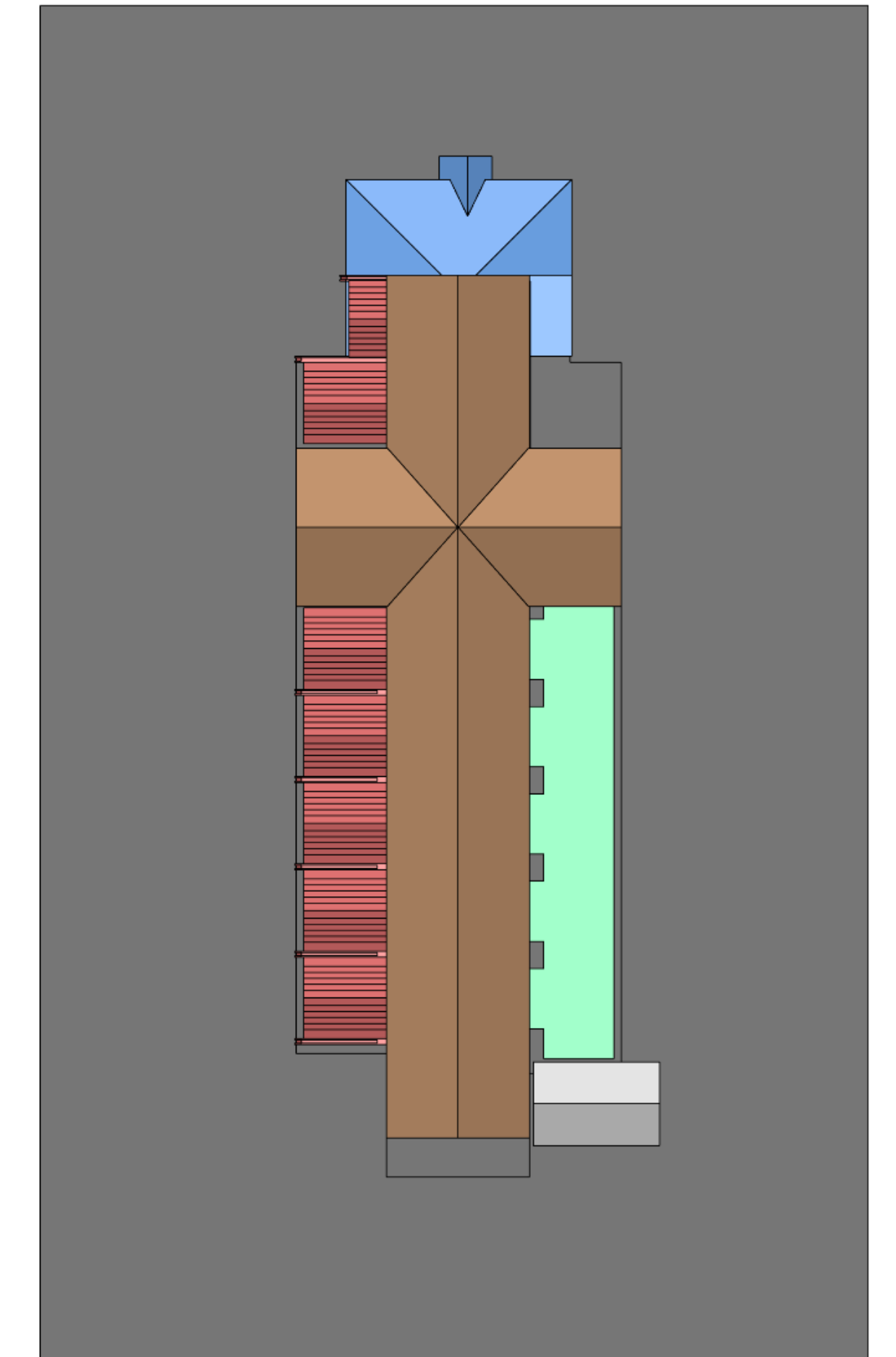
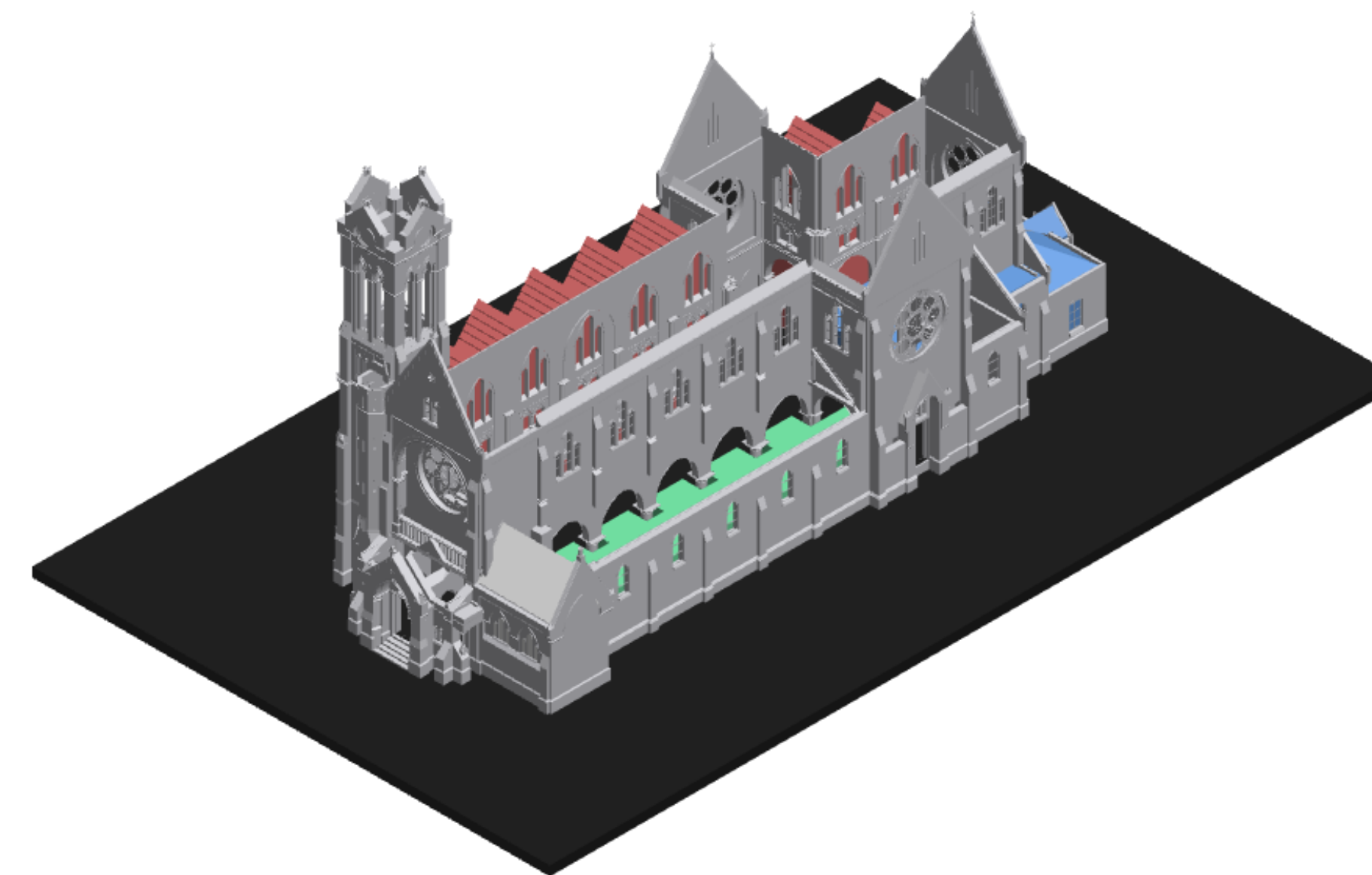
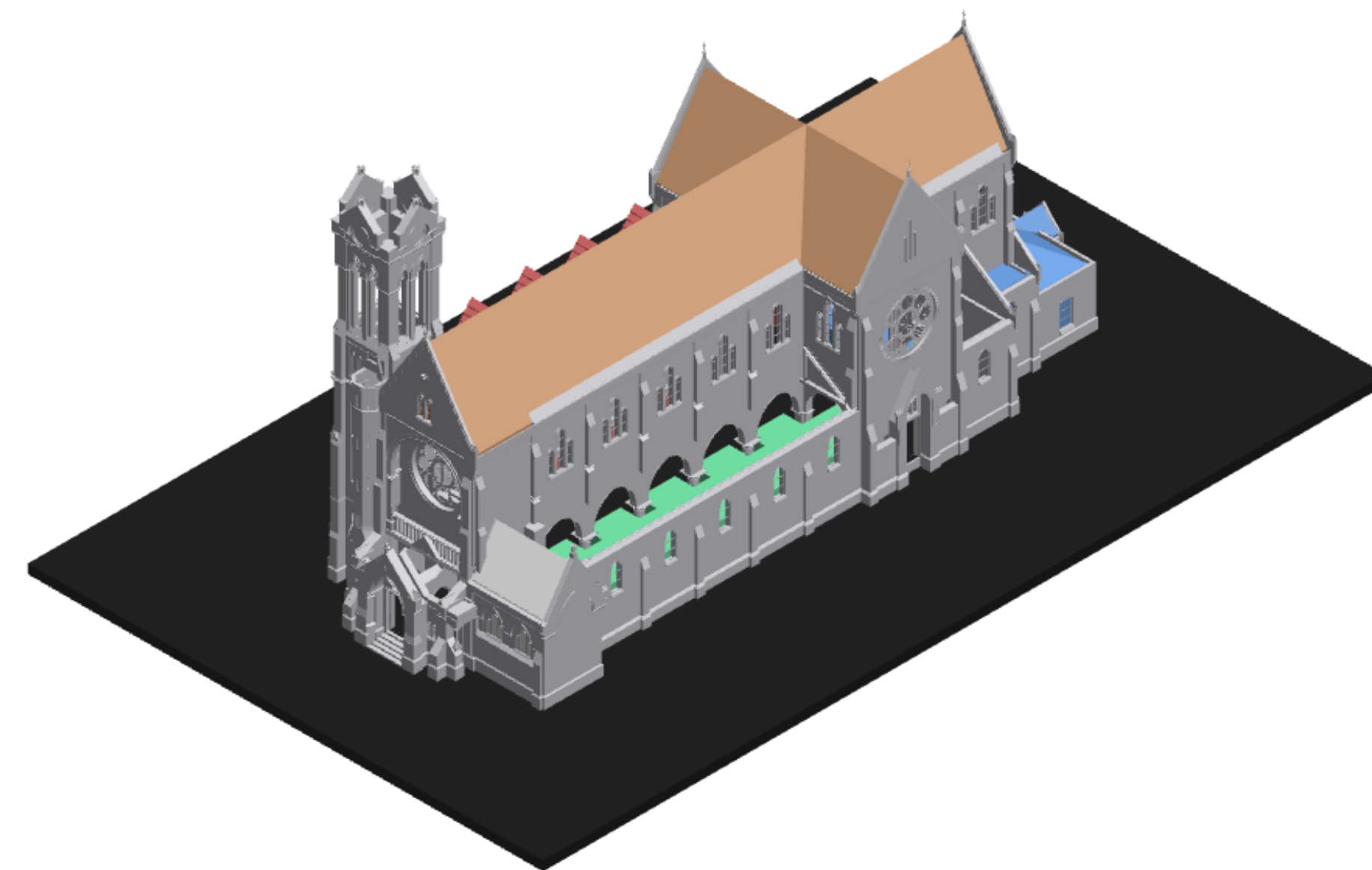
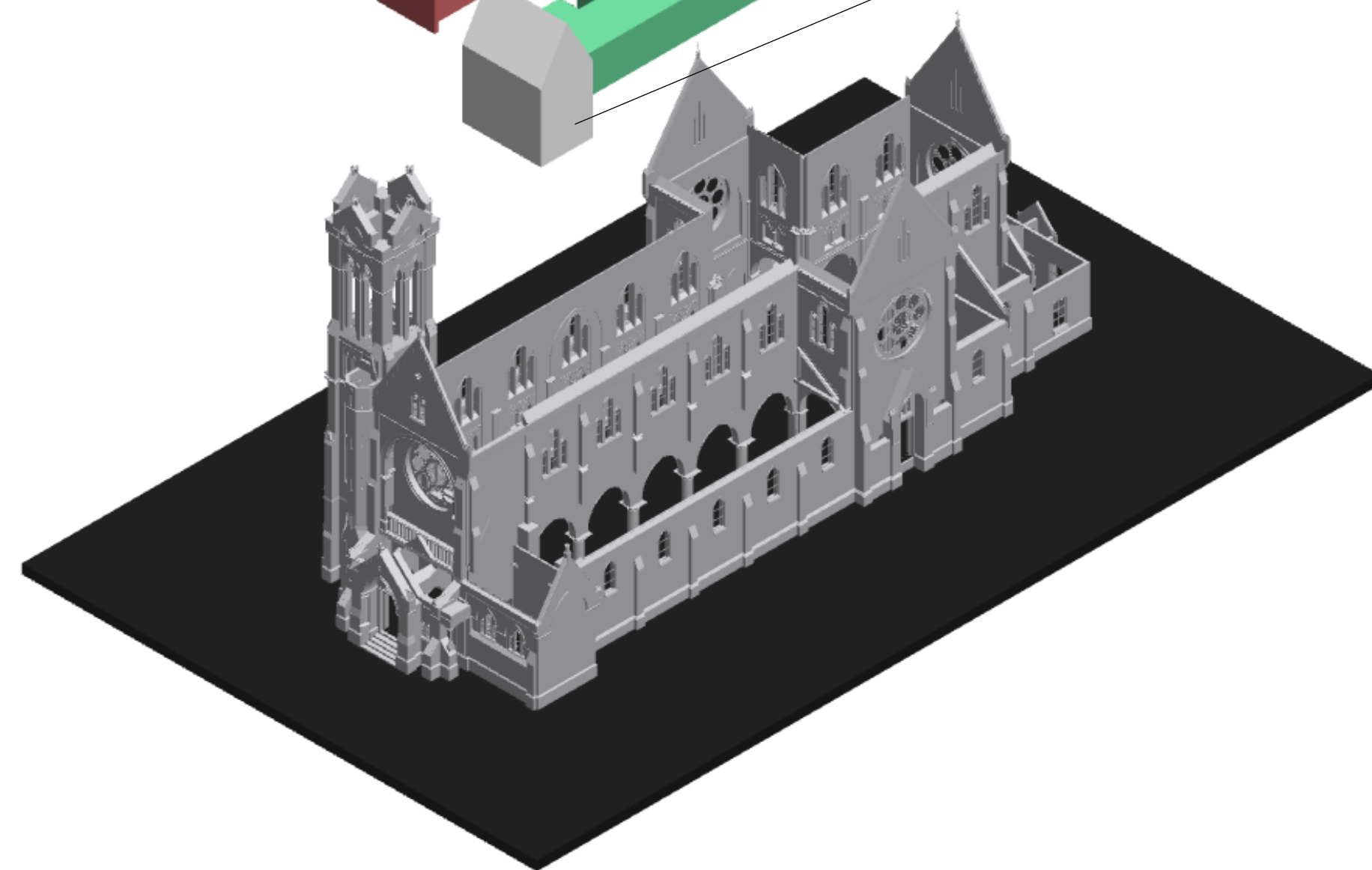


# Redesign

## Functions:

- Exhibition space (1)
- Offices (2)
- Cafeteria & Kitchen (3)
- Wood workshop (4)
- Day chapel (5)

1. A space for the relics and icons that no longer have a place in the main church, showing the history and lifecycle of the church
2. Well climatized and characteristic offices catering to creative businesses.
3. Lunchroom for offices, place for community cooking workshops and pop-up restaurants.
4. A workshop the creative businesses can use as well as where the community can create and get educated by the professionals working in the offices.
5. An artifact of the church that remains for the catholic community.
6. The remaining interior is a community enclosed square where the businesses can exhibit their craft and events can take place, this space can also be rented for festivities or events.

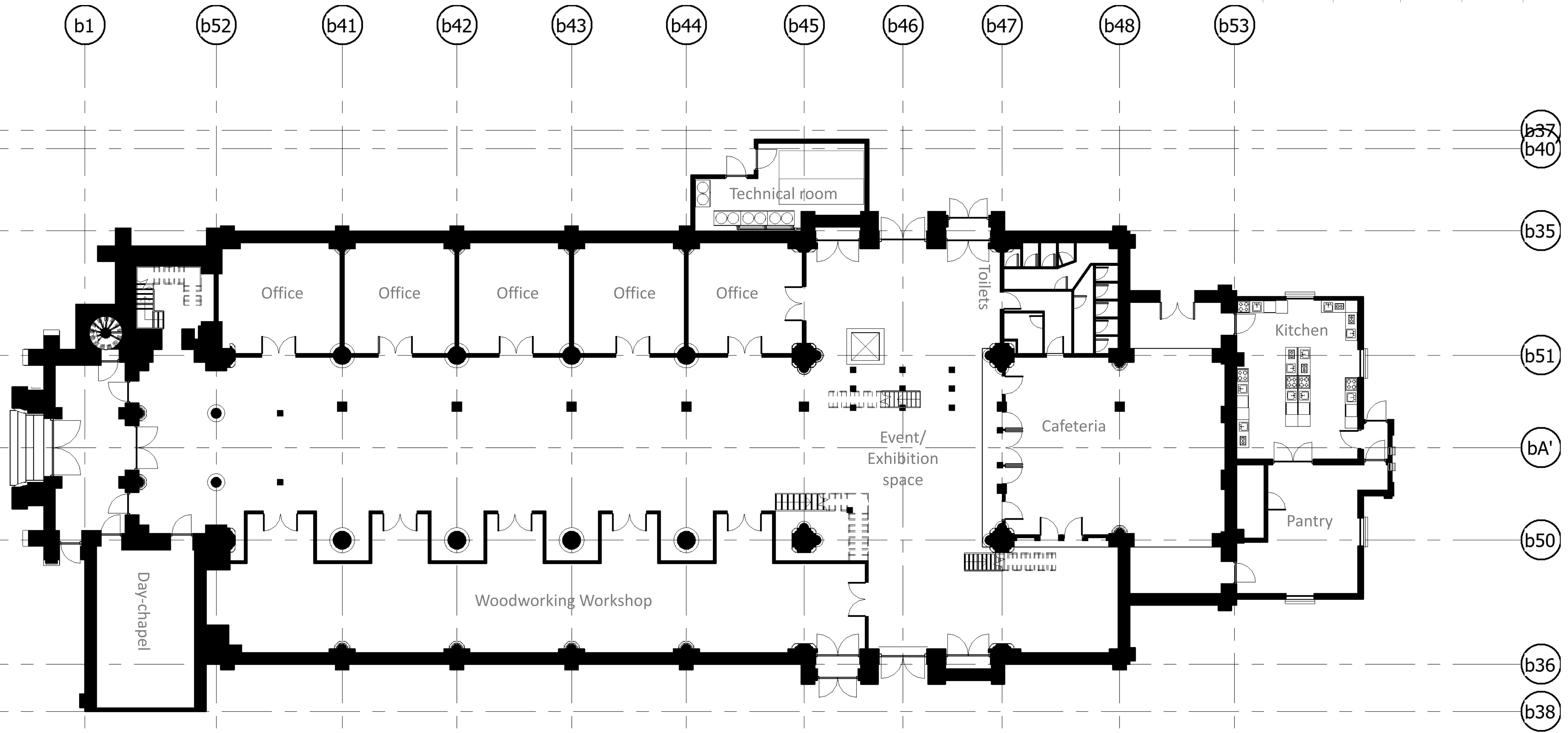
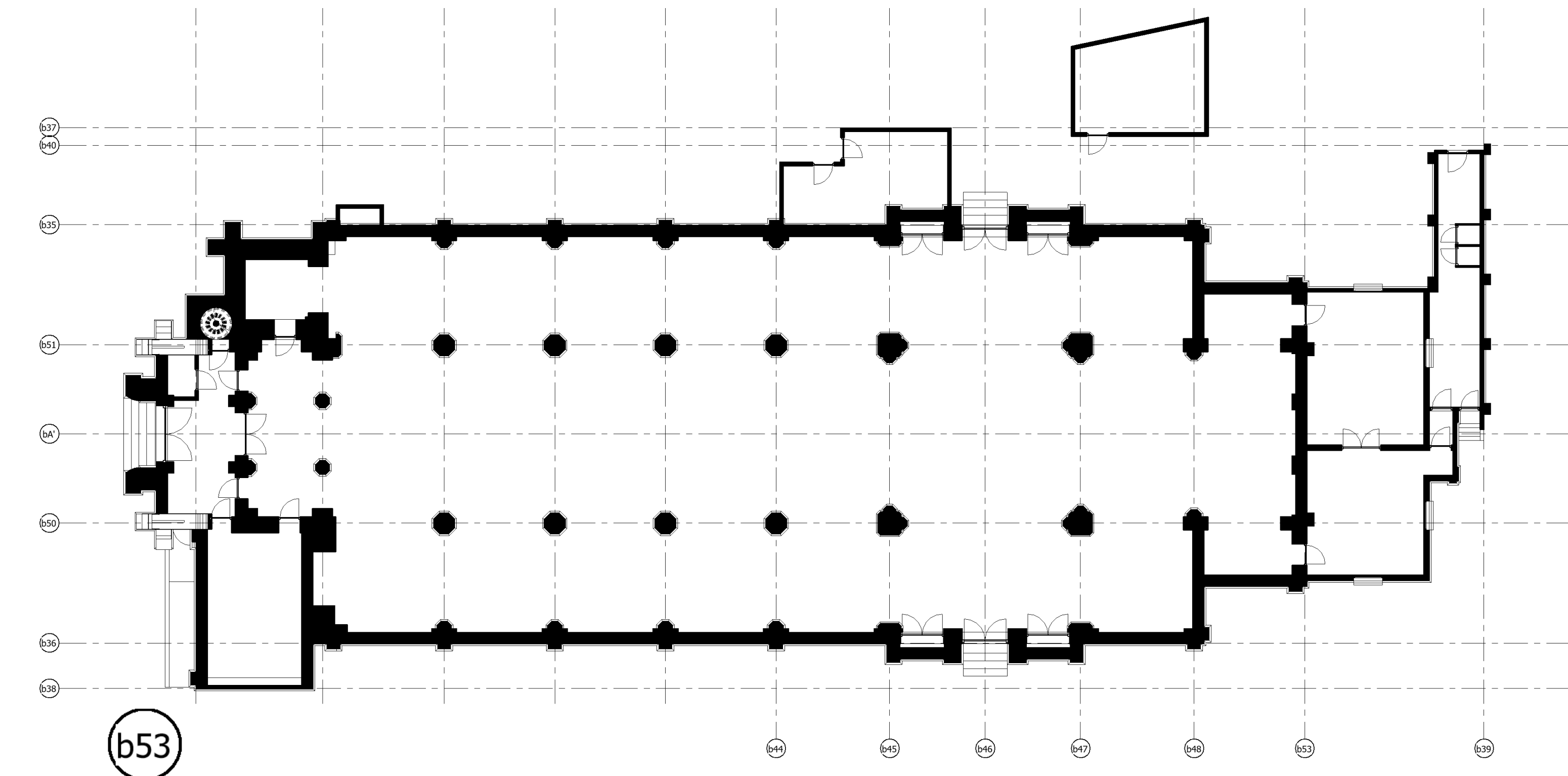
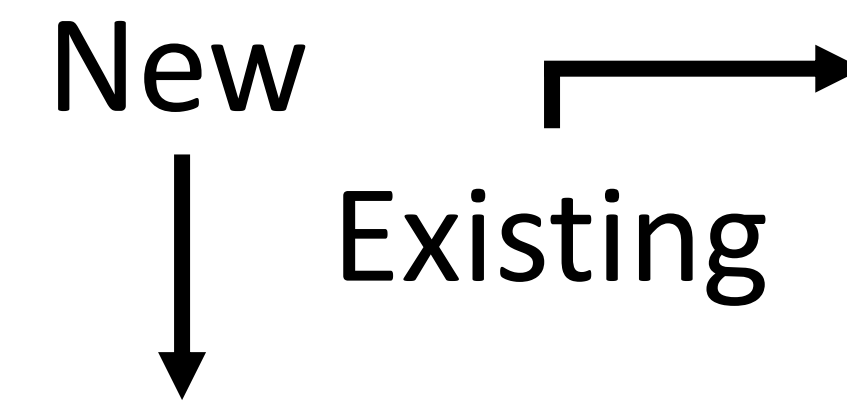




# Redesign

Floor plans:

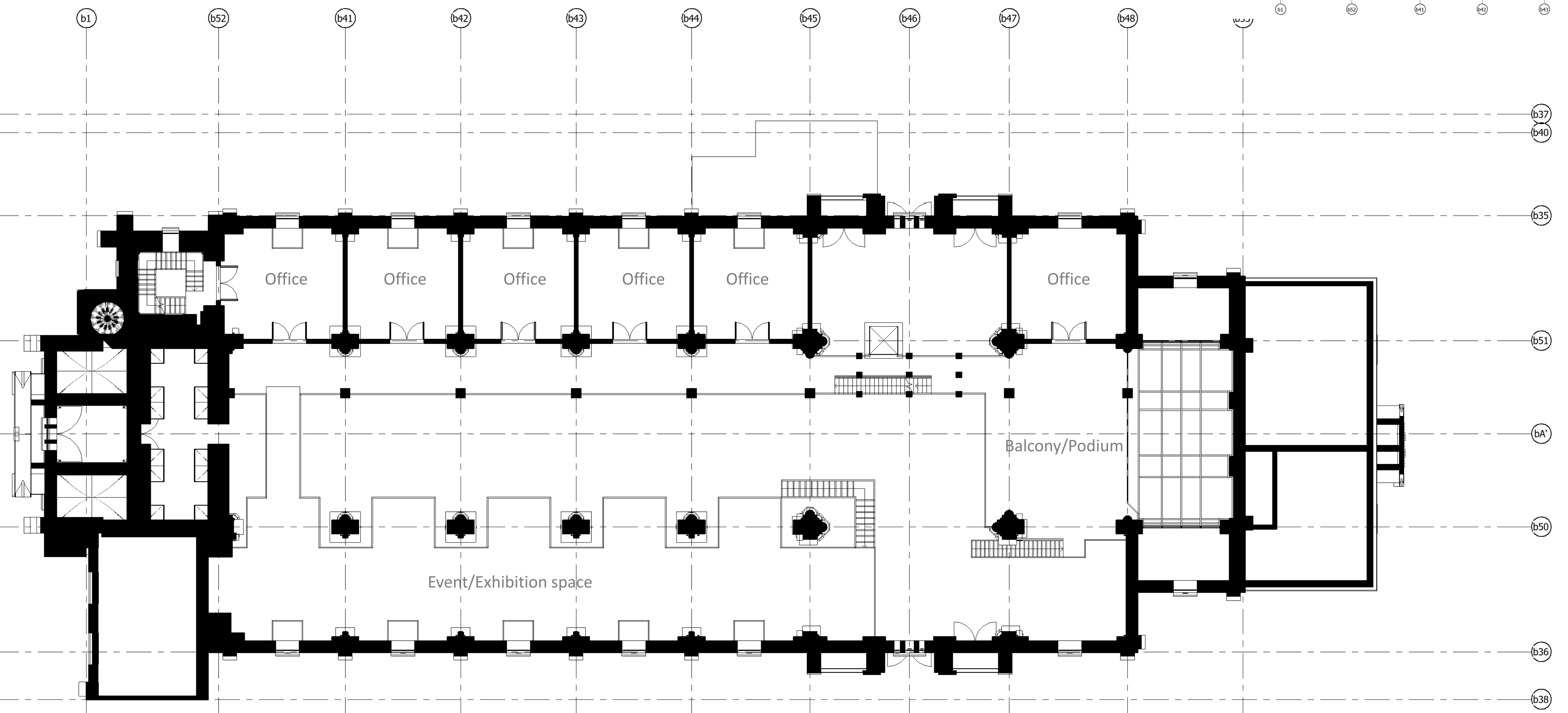
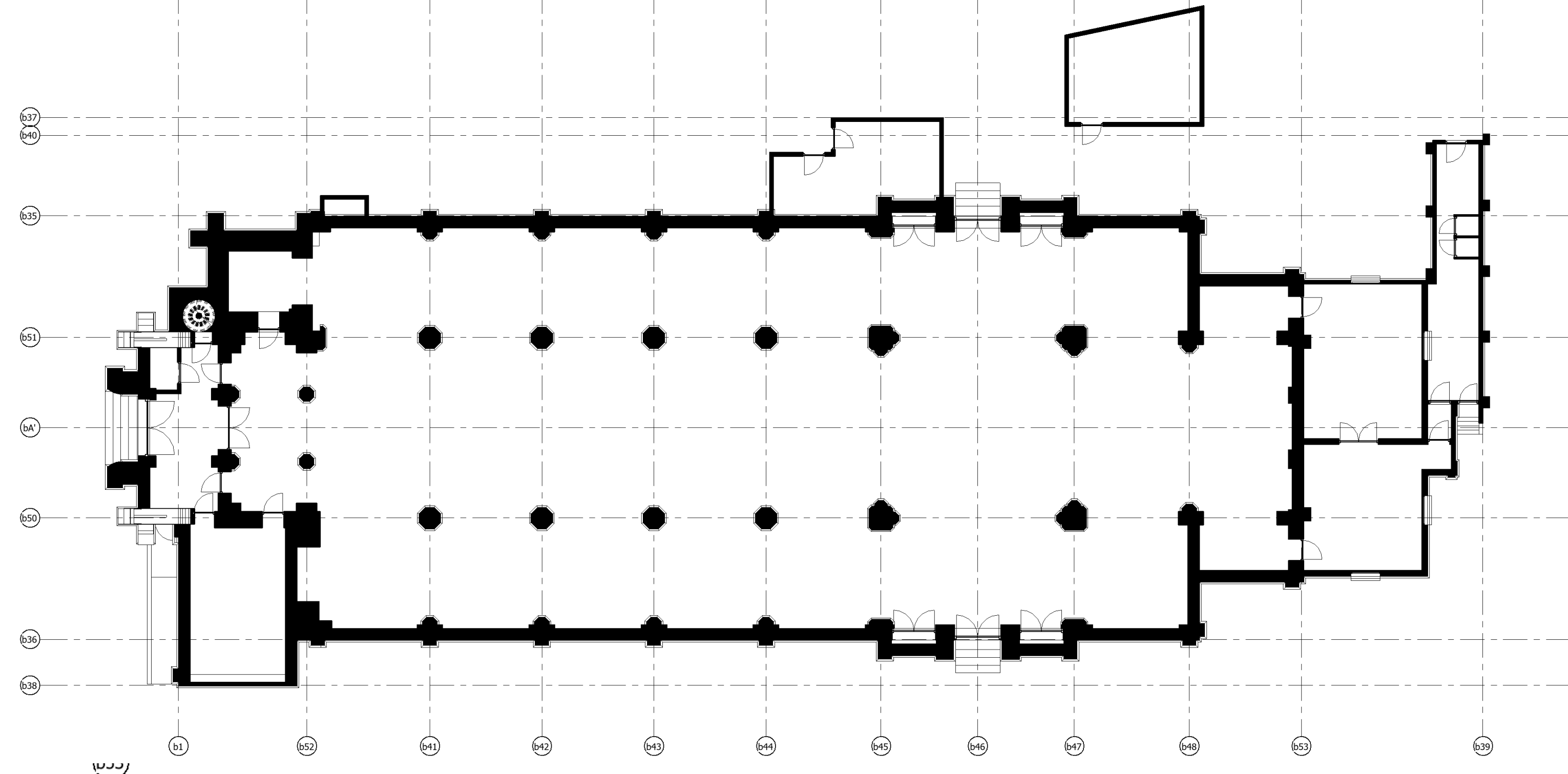
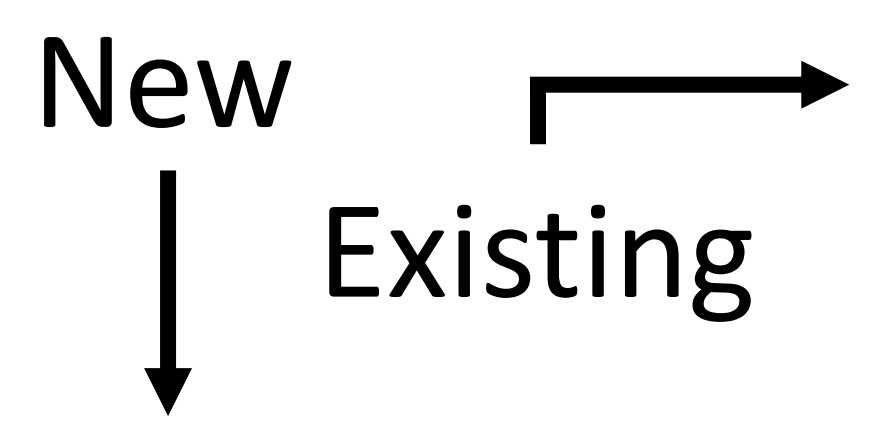
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# Redesign

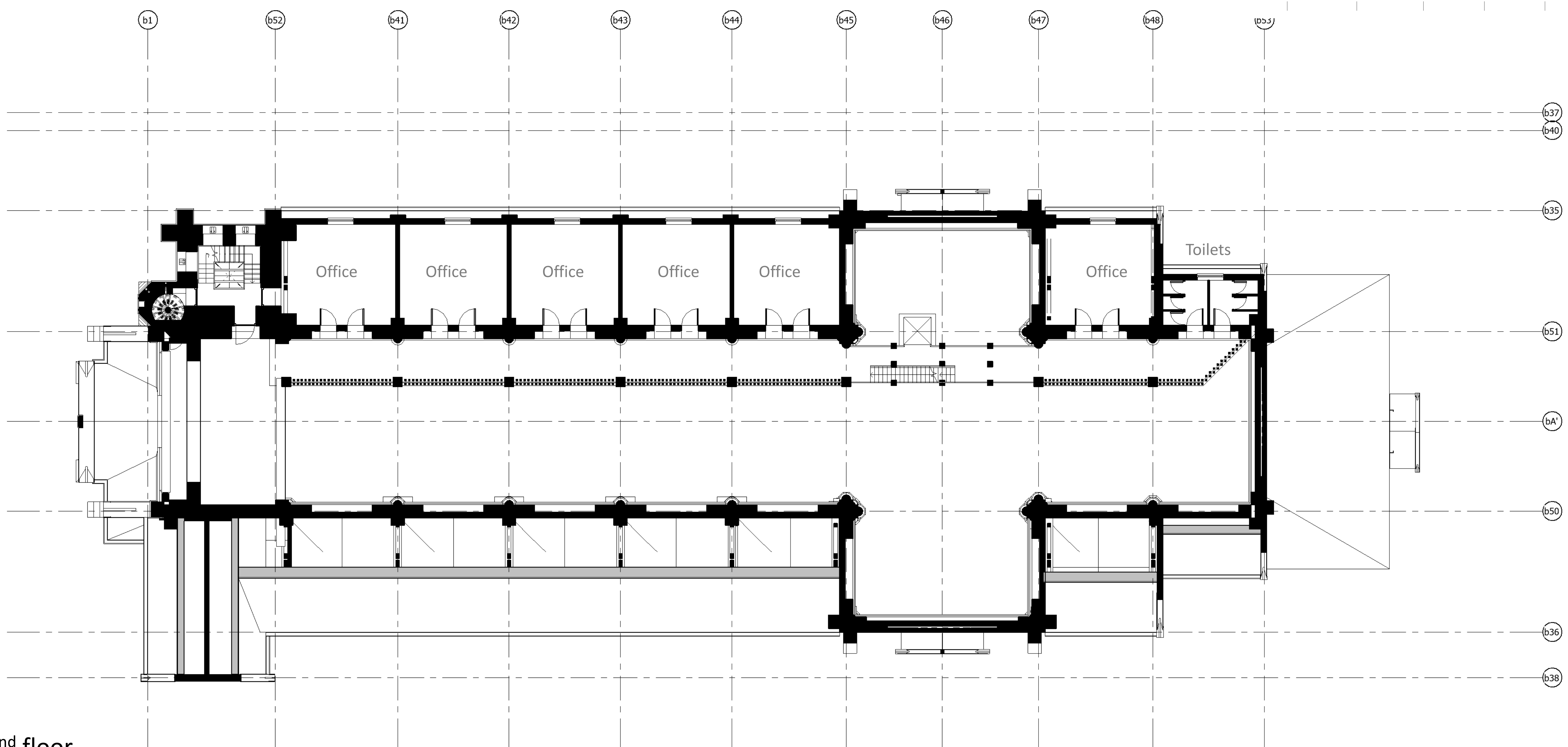
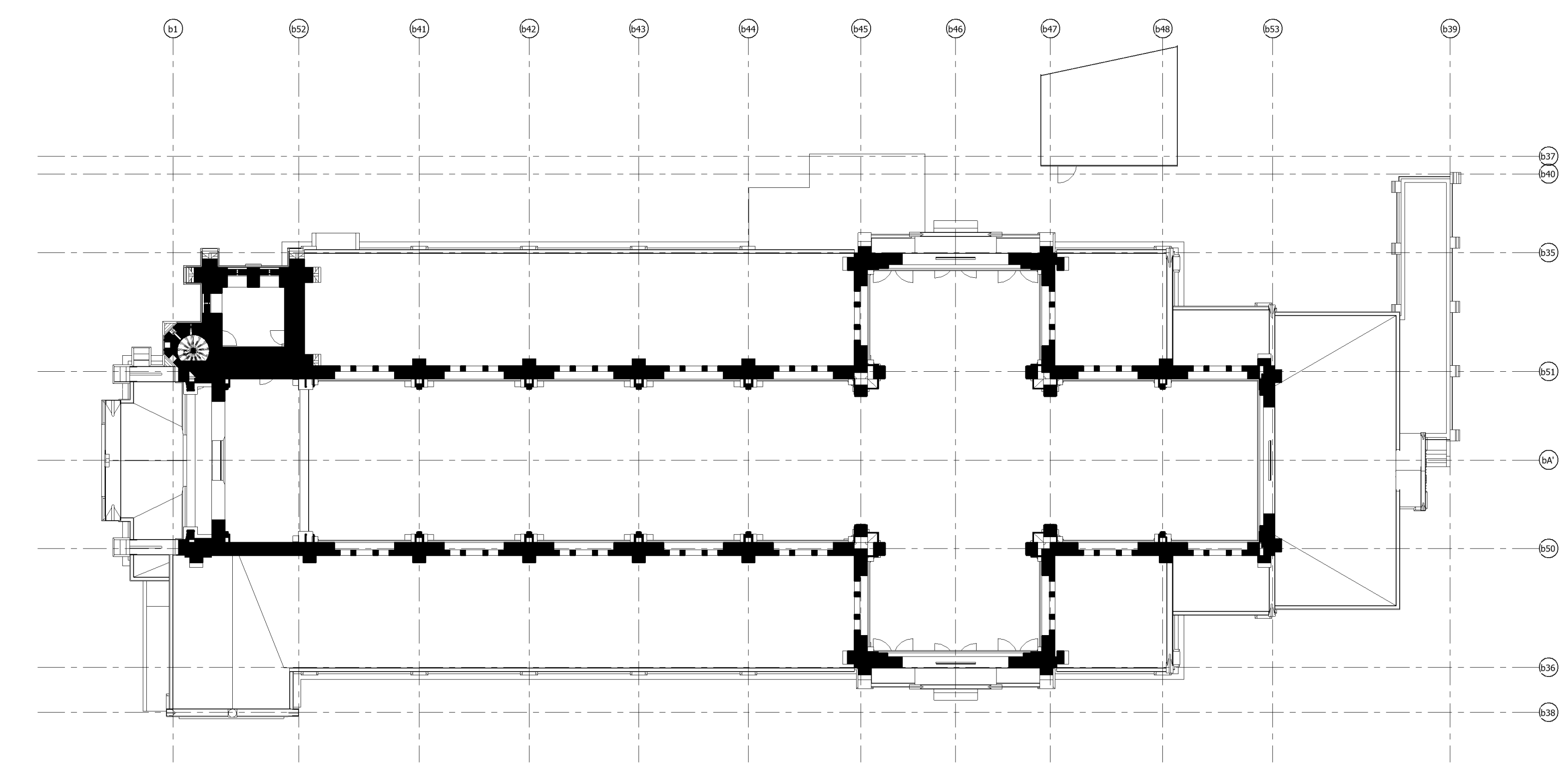
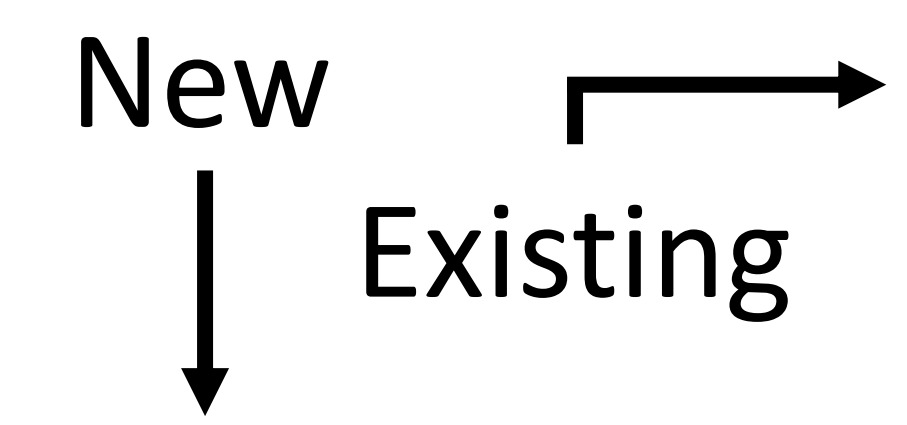
Floor plans:





# Redesign

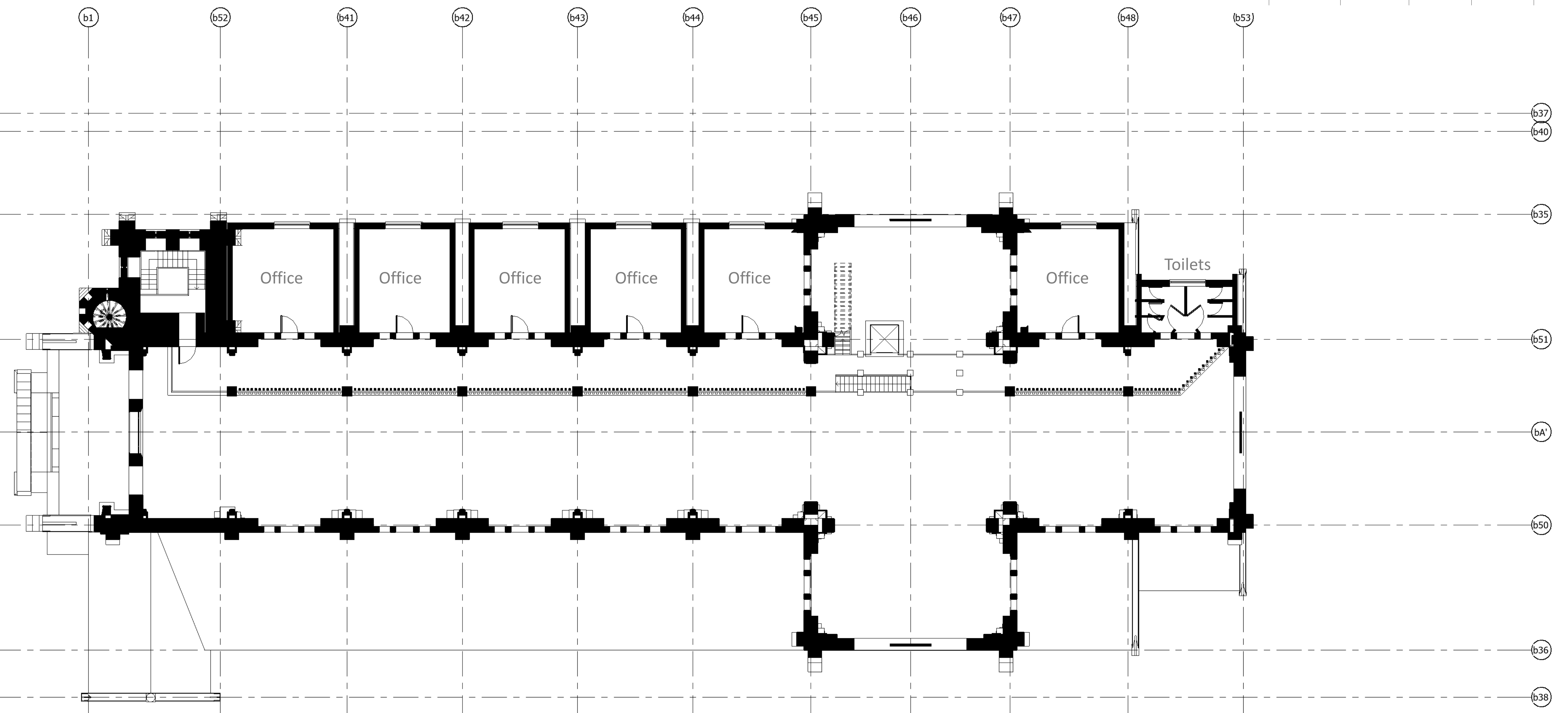
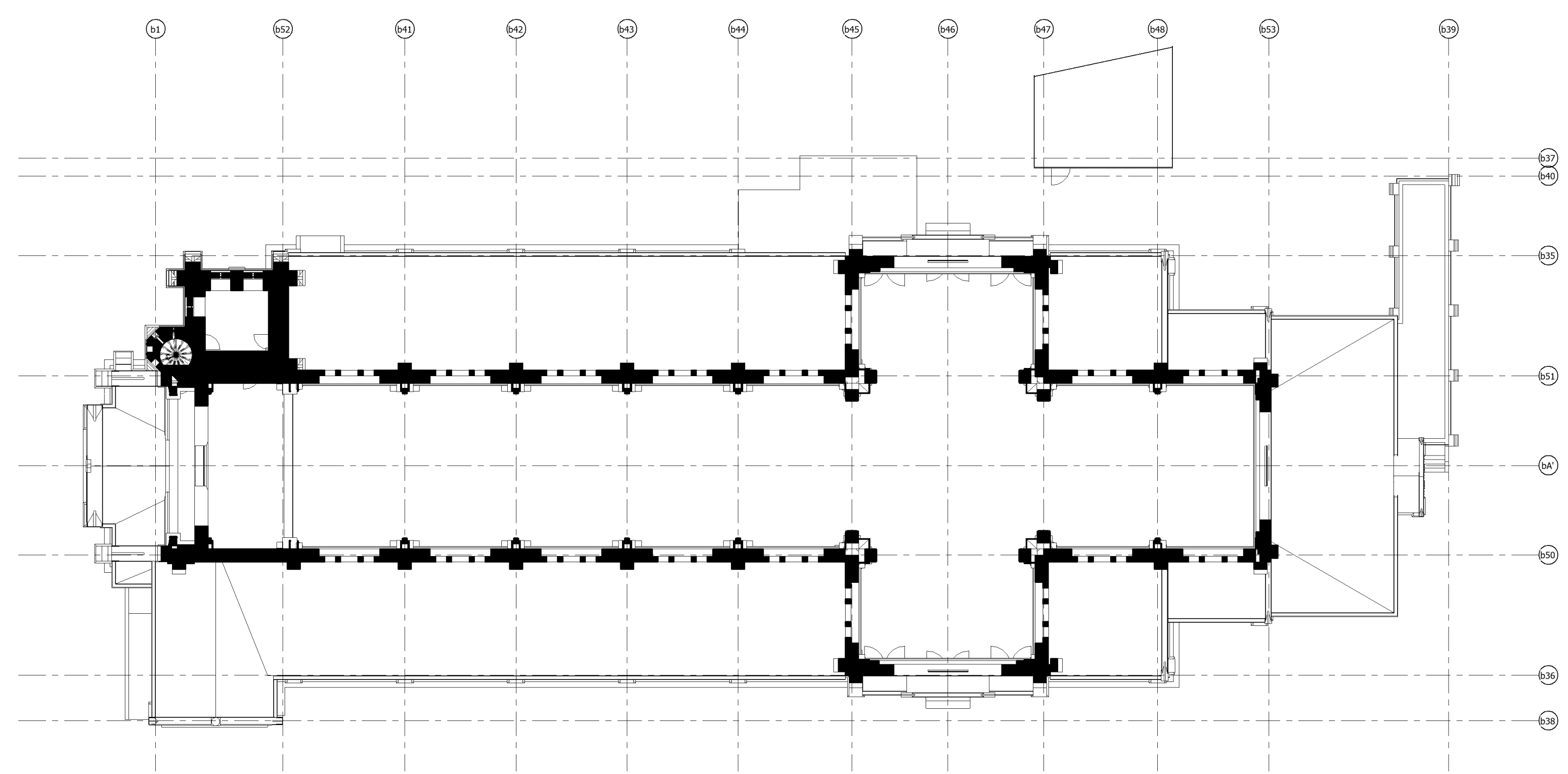
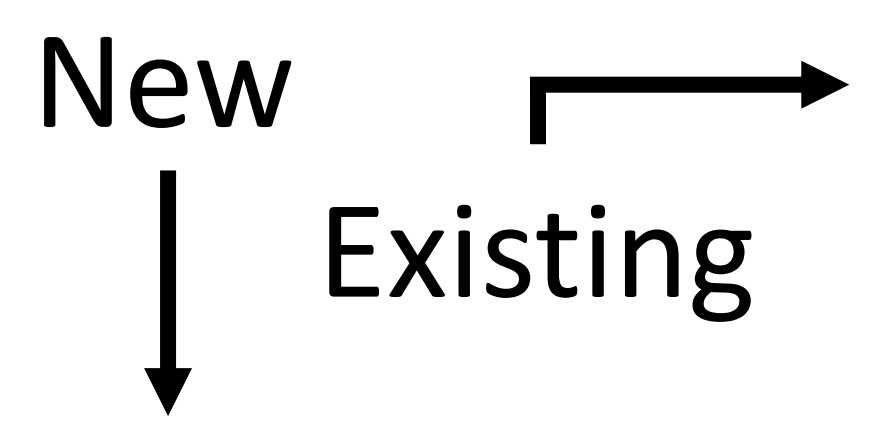
Floor plans:





# Redesign

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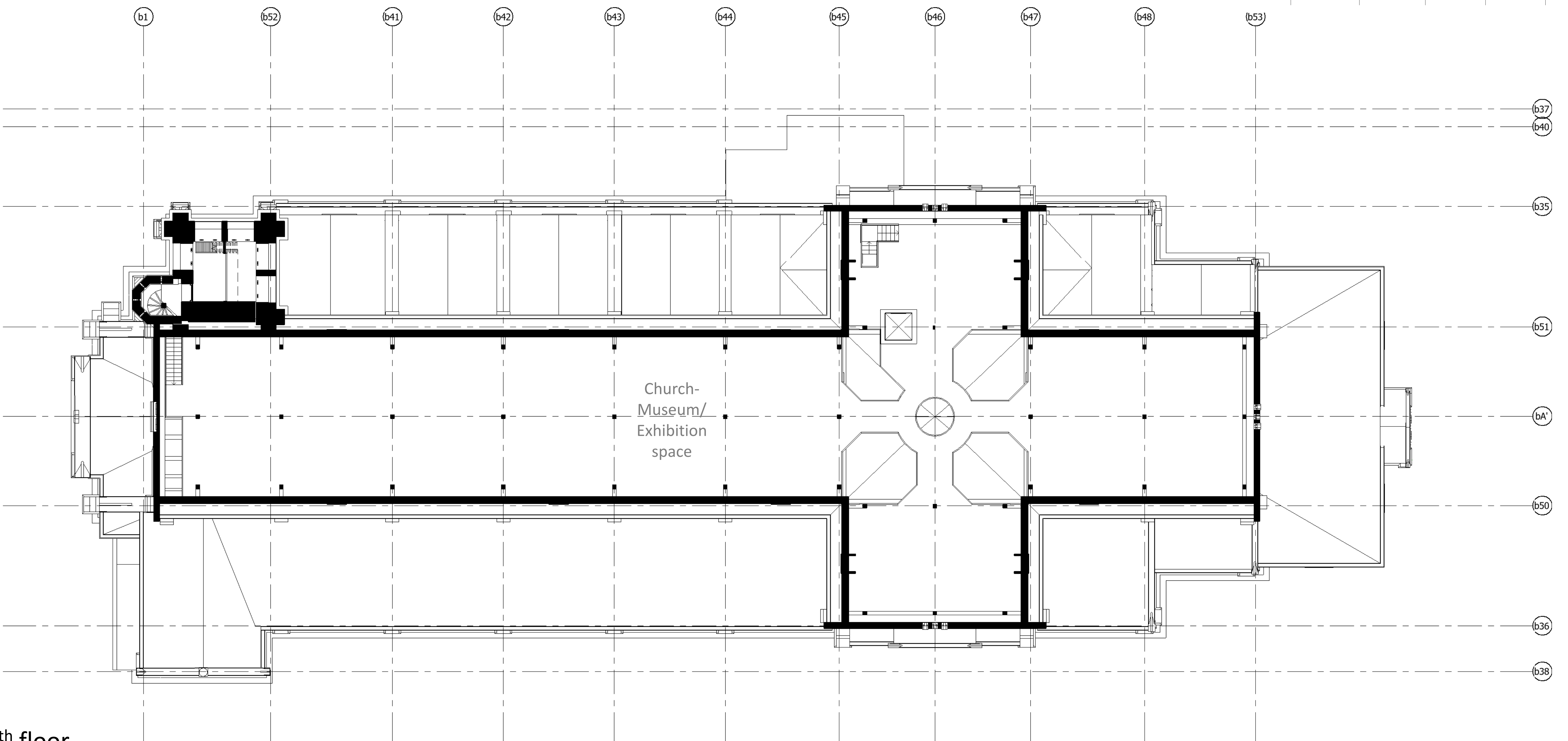
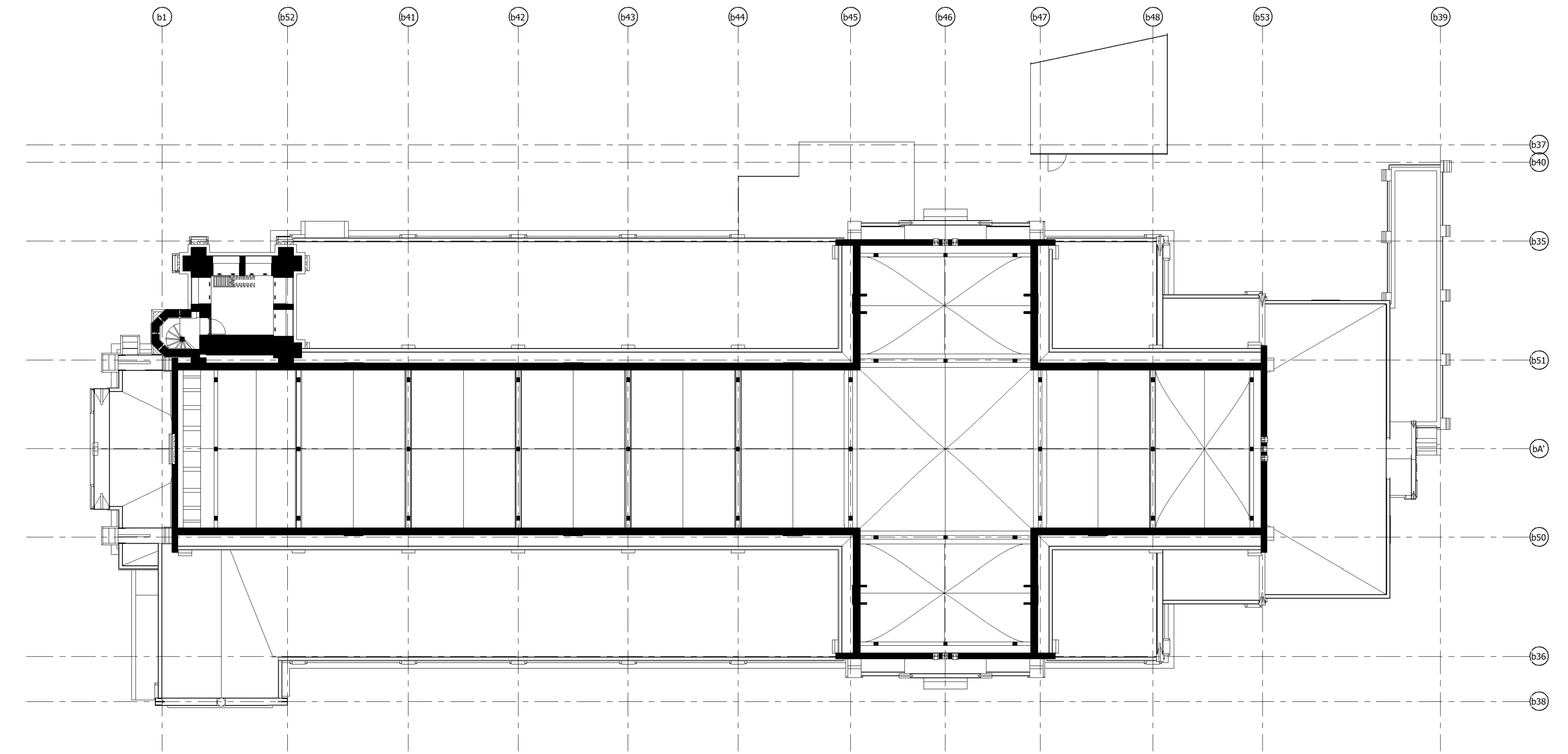




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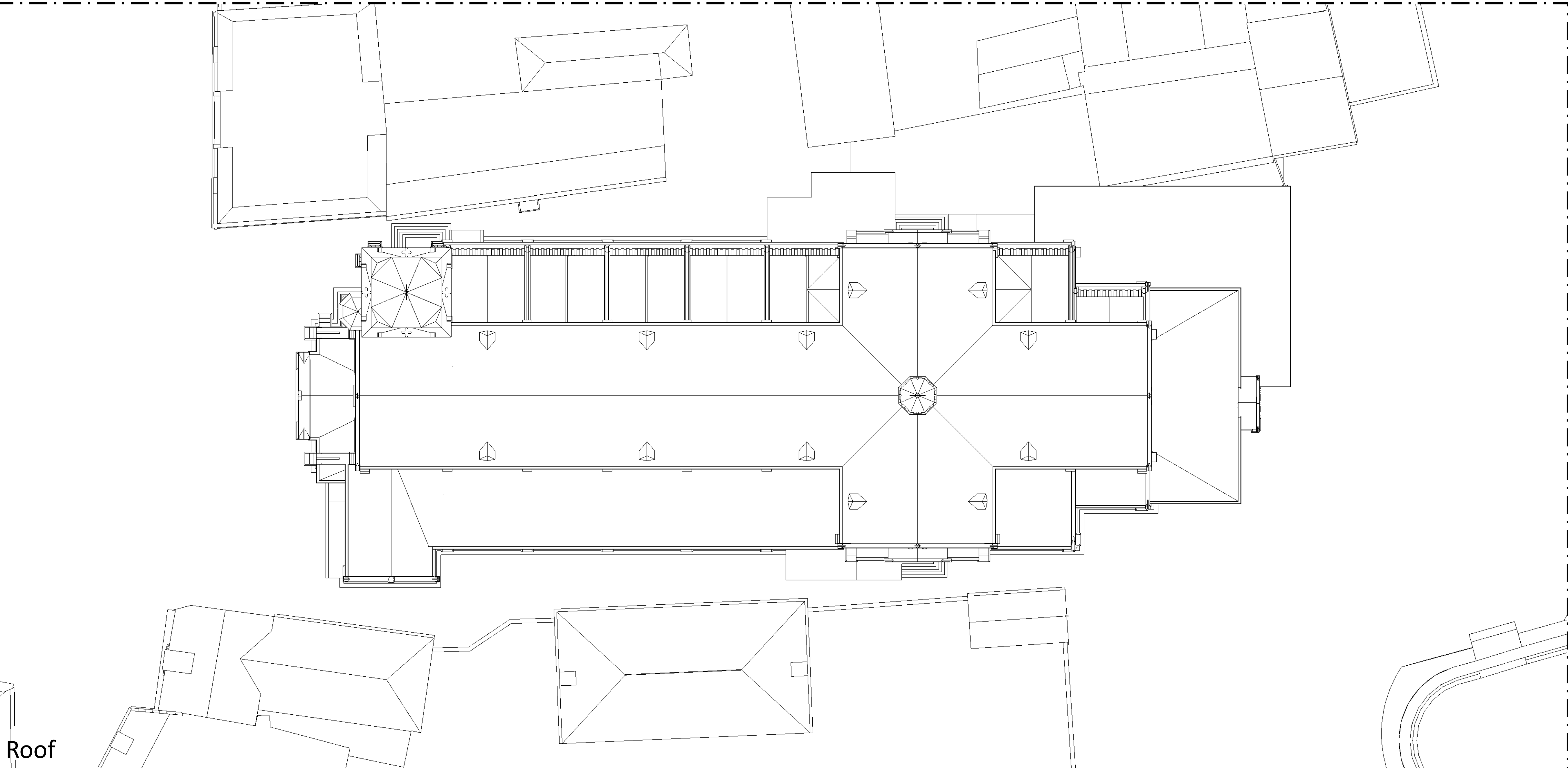
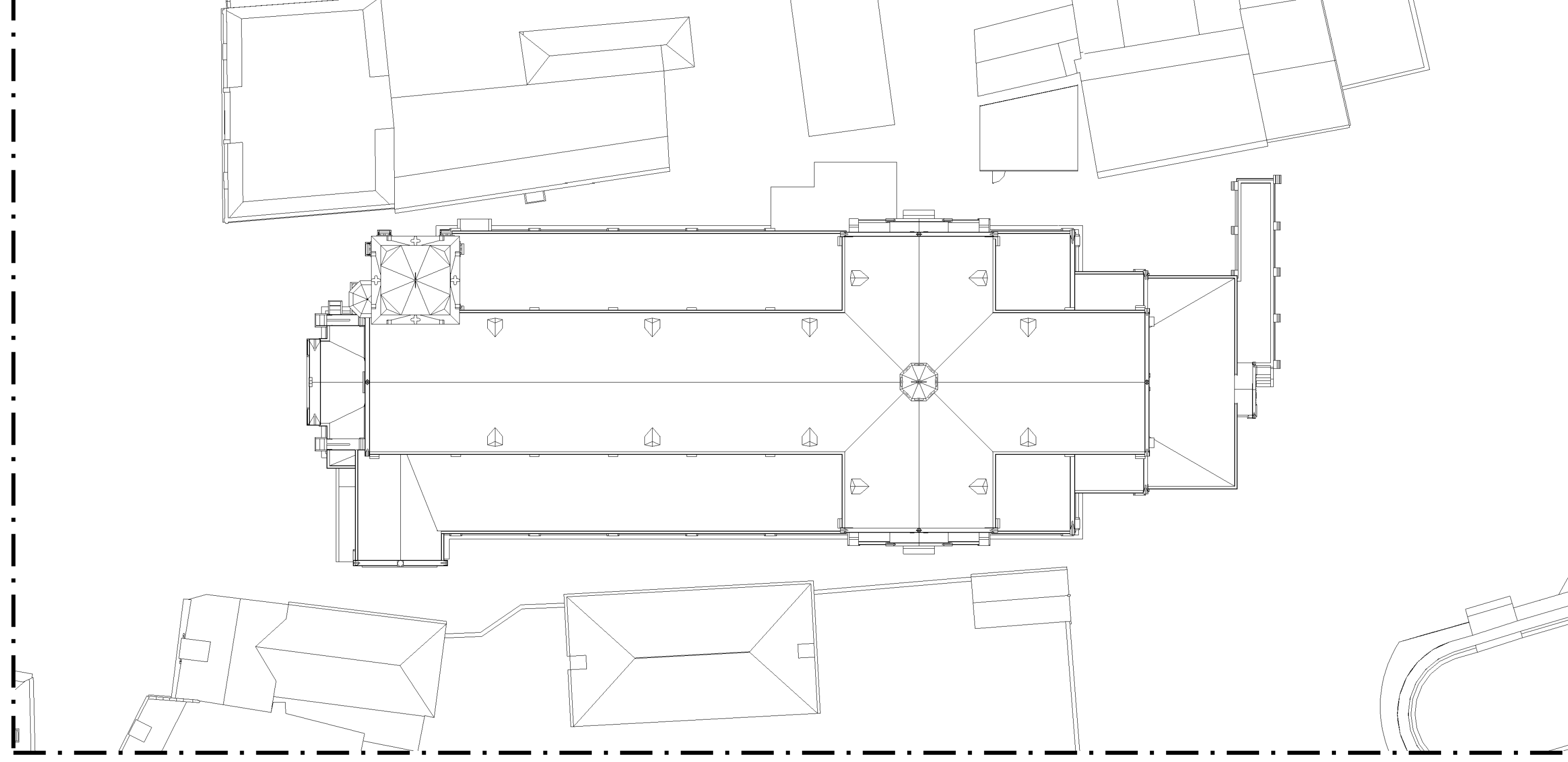
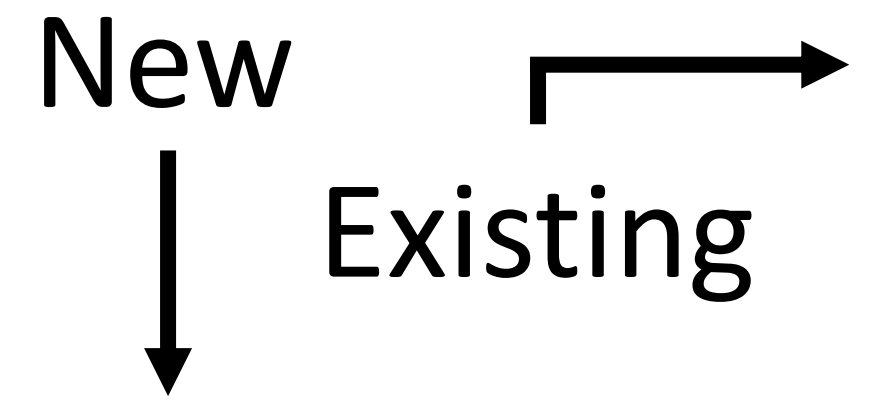
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 Existing





# Redesign

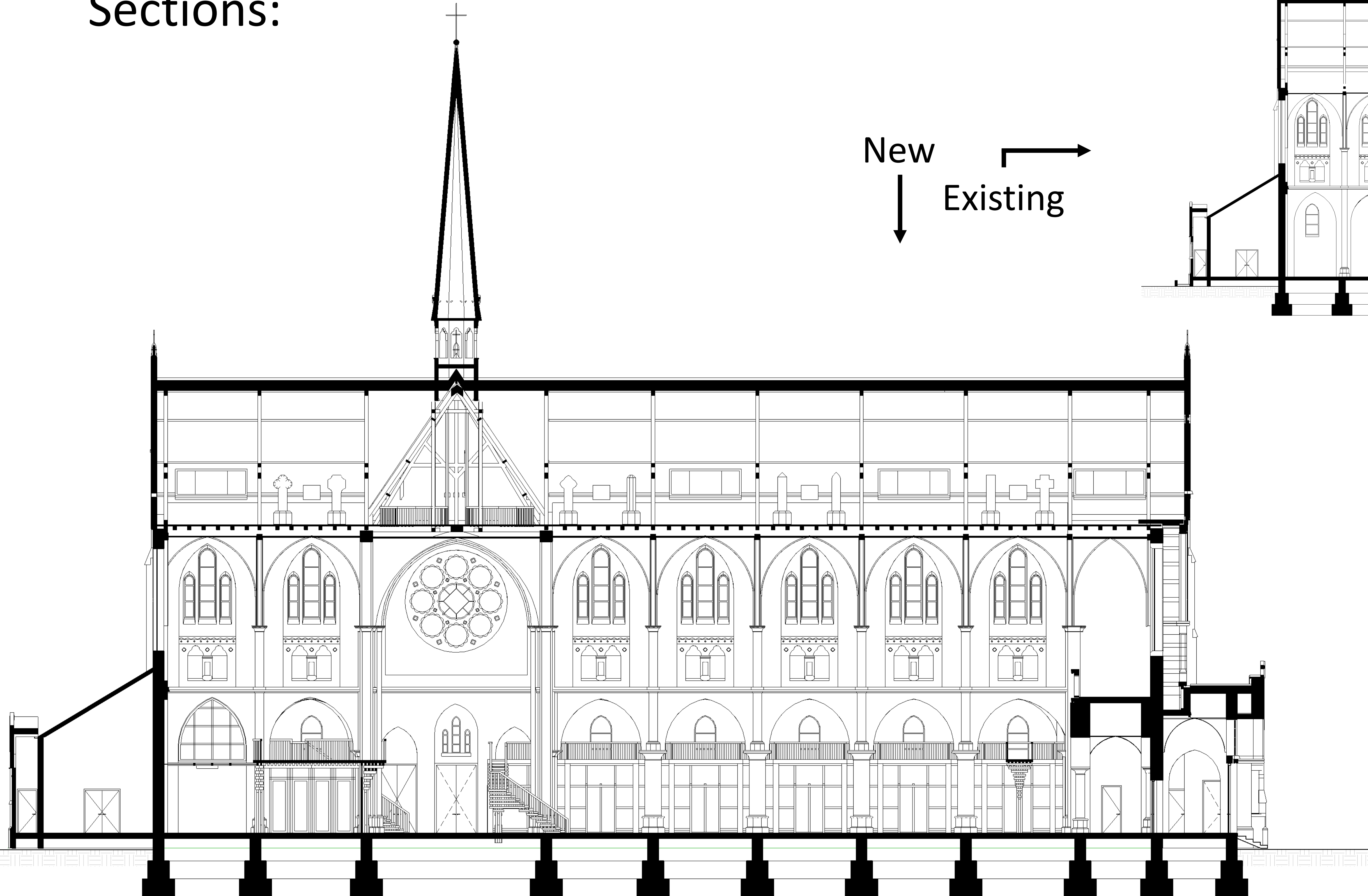
Floor plans:





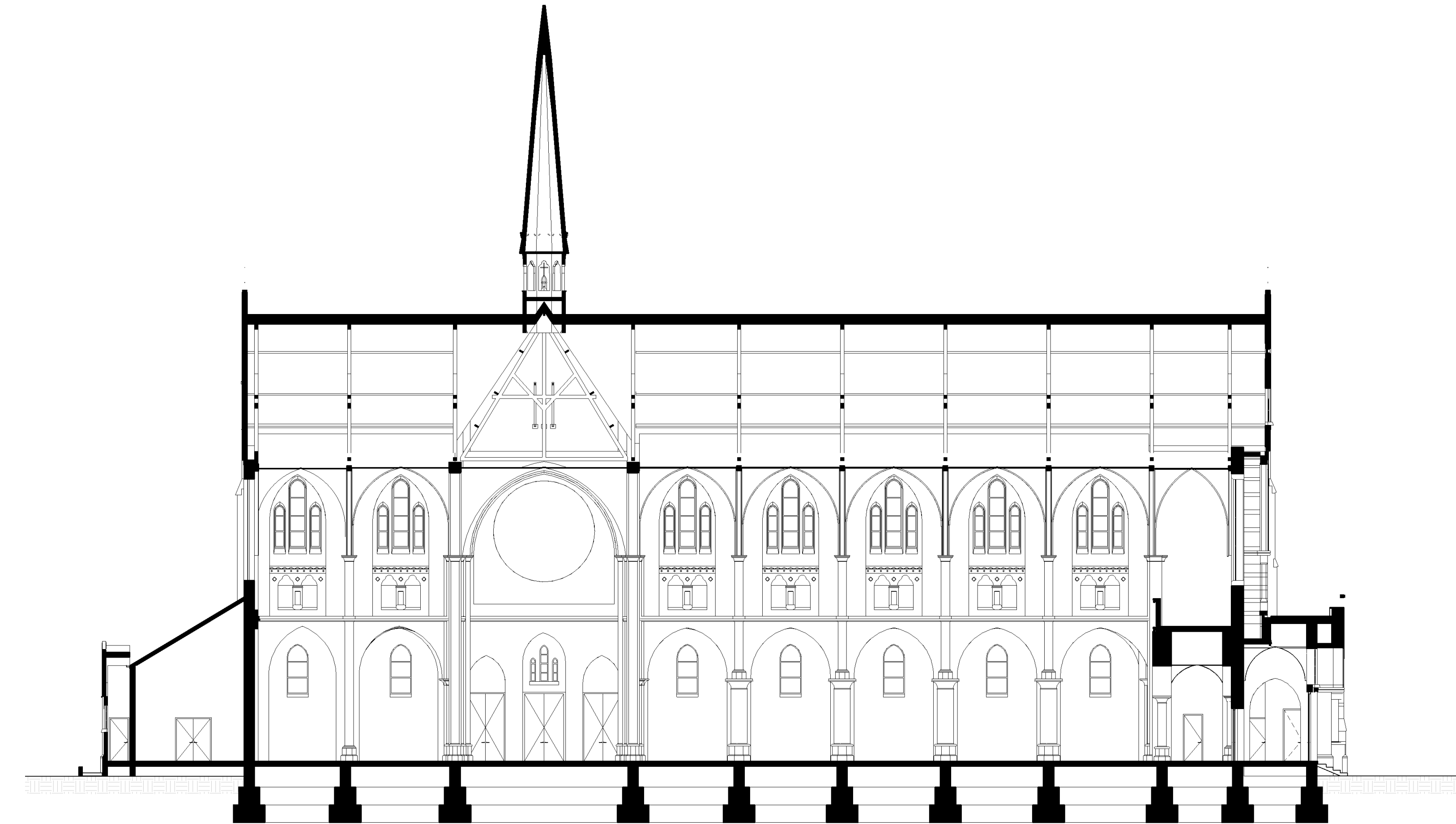
# Redesign

Sections:



Section toward South

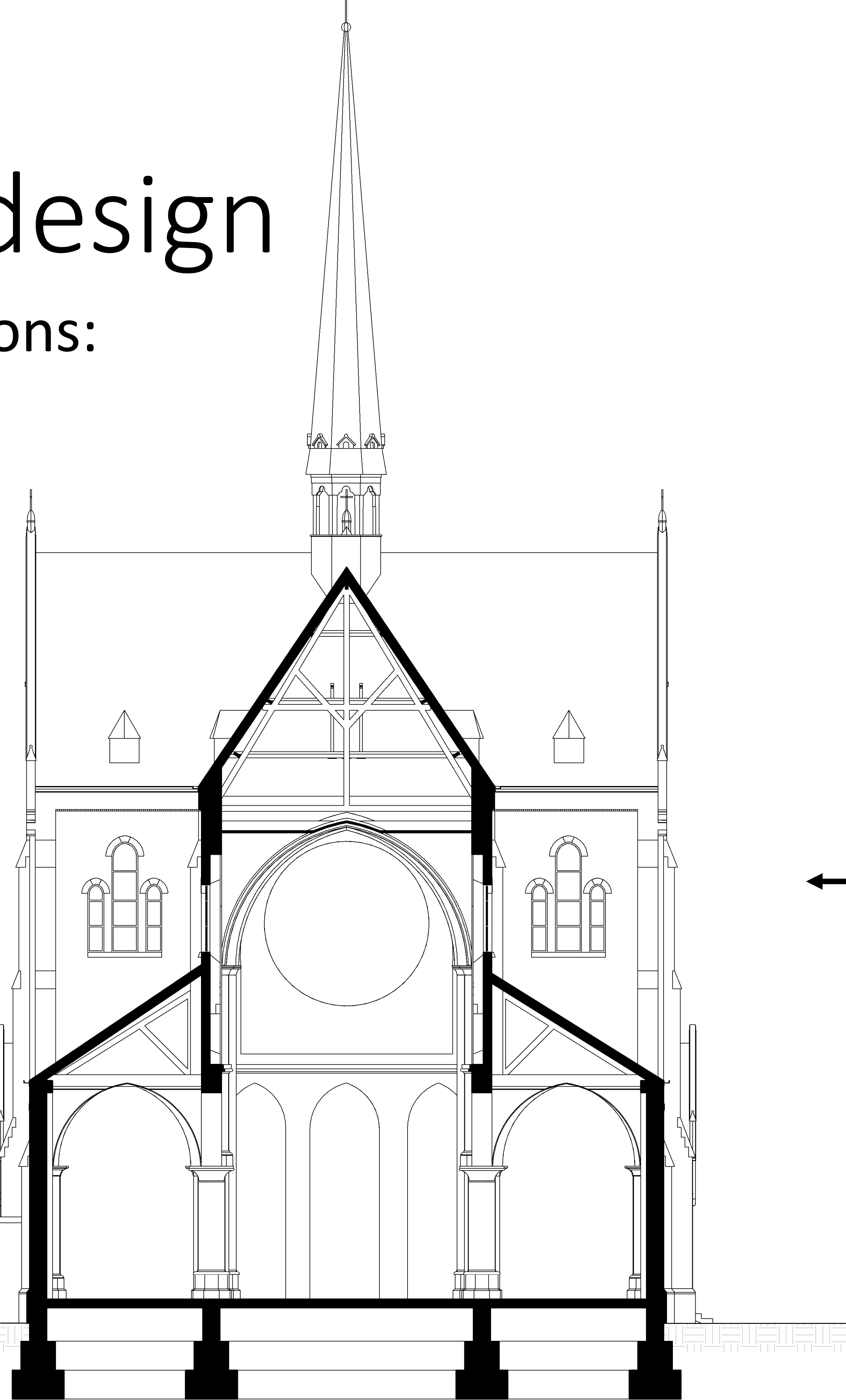
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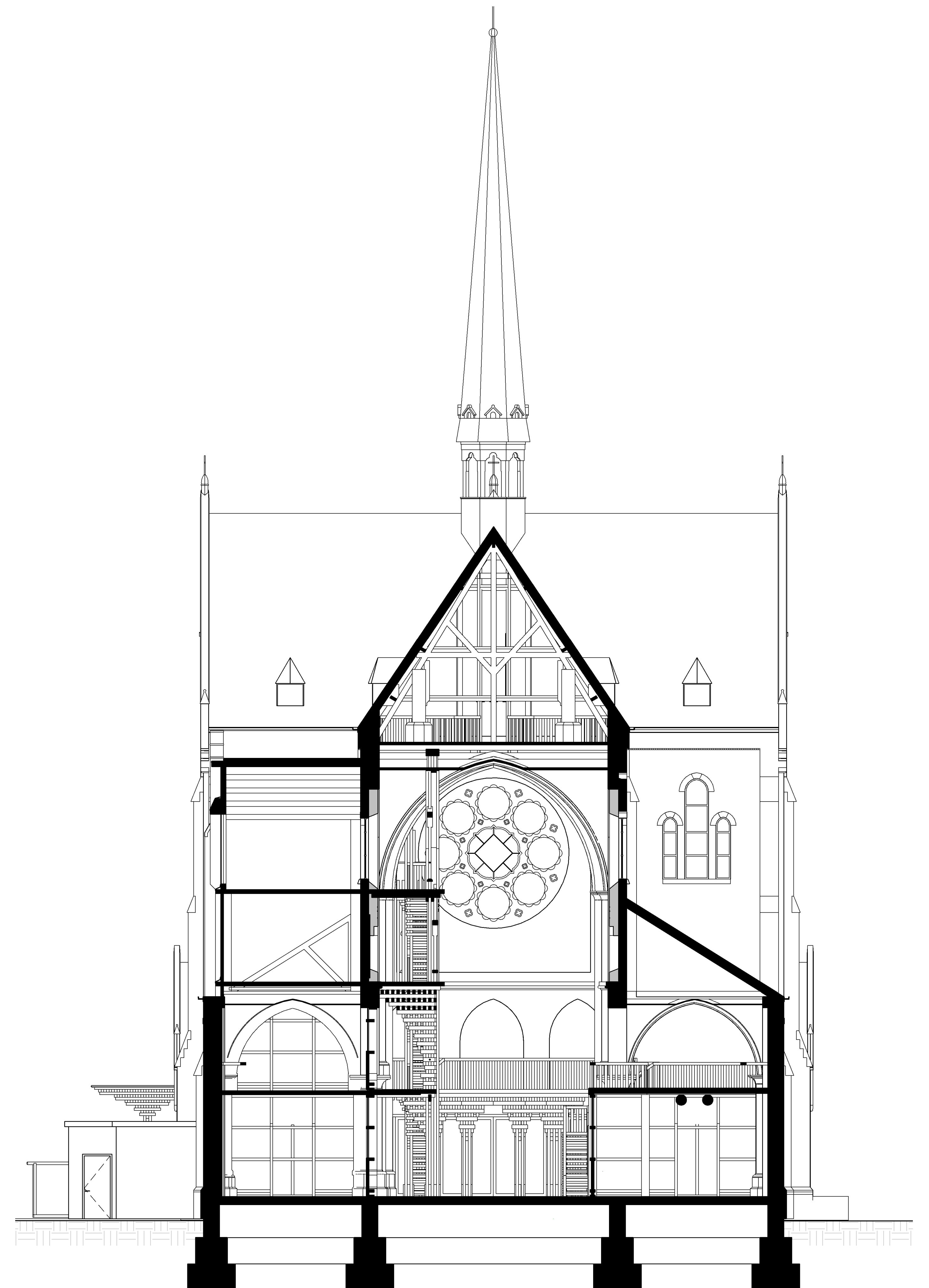


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Sections:



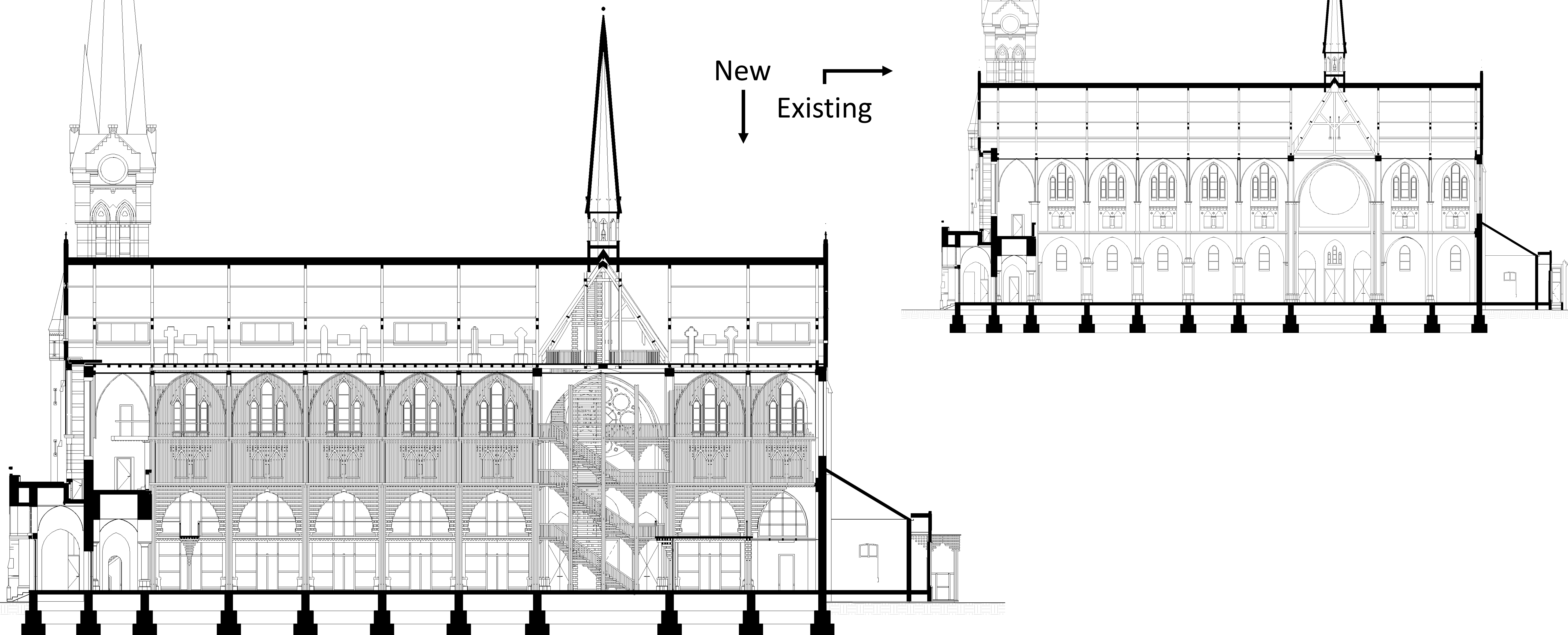
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# Redesign

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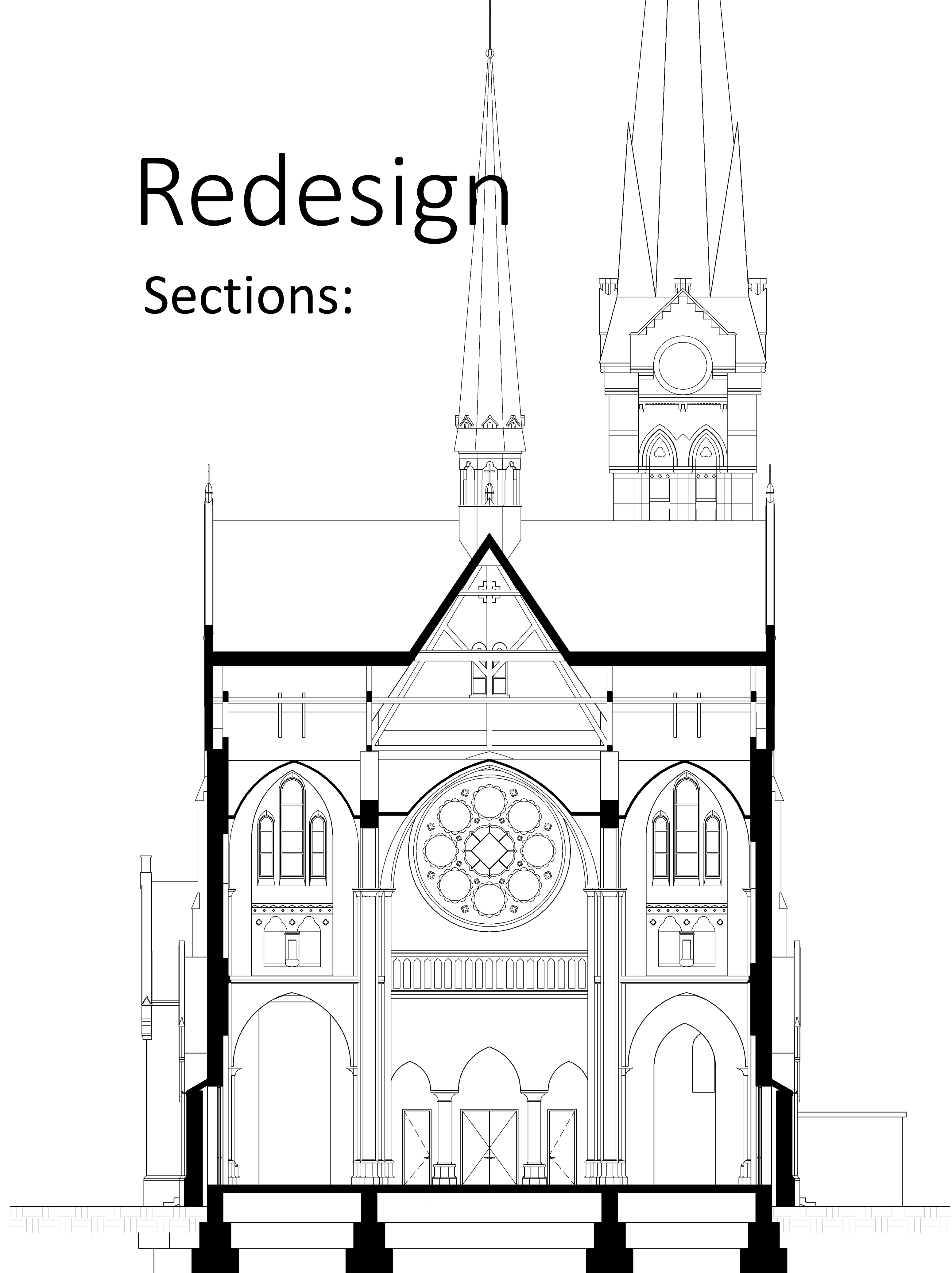


Section toward North

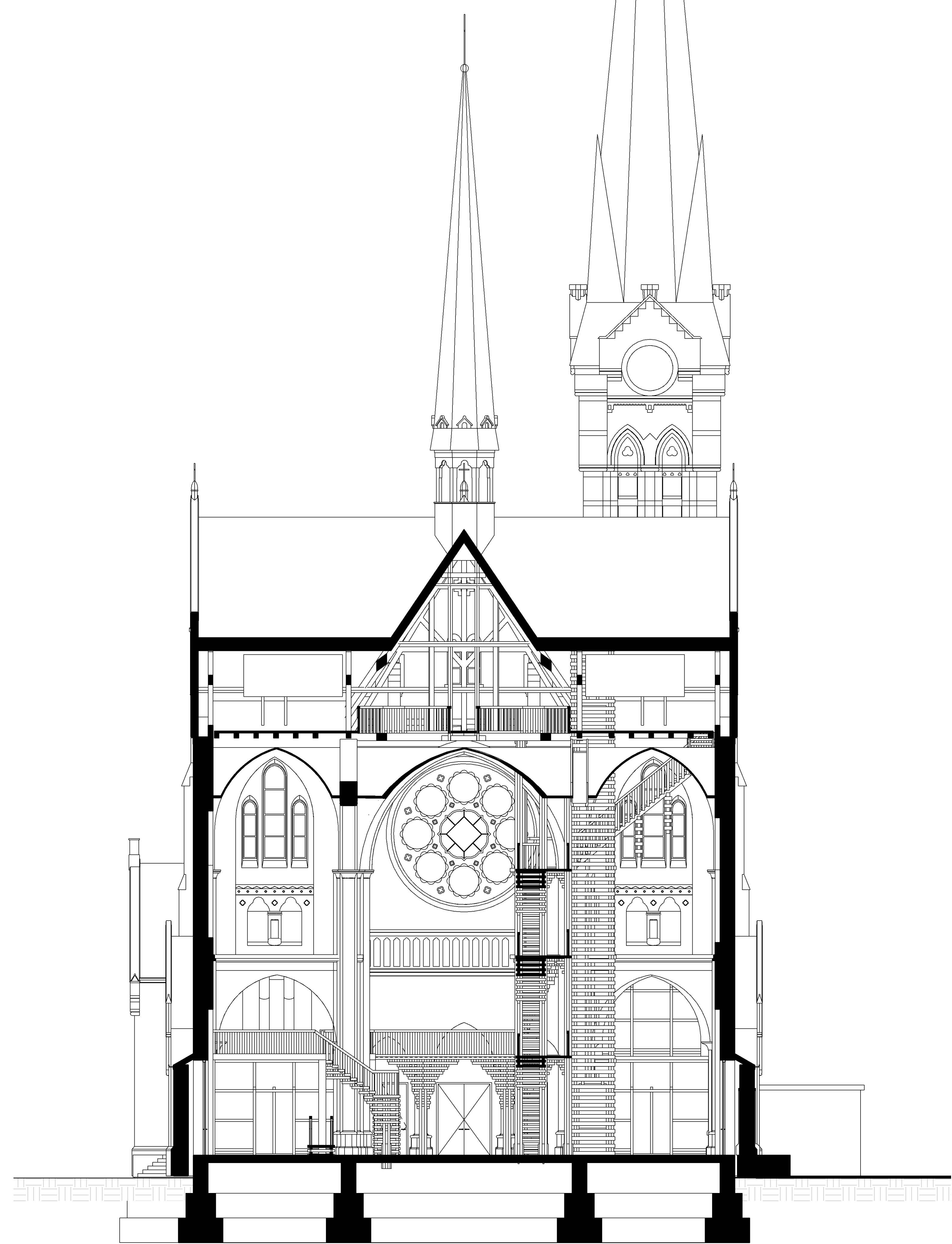


# Redesign

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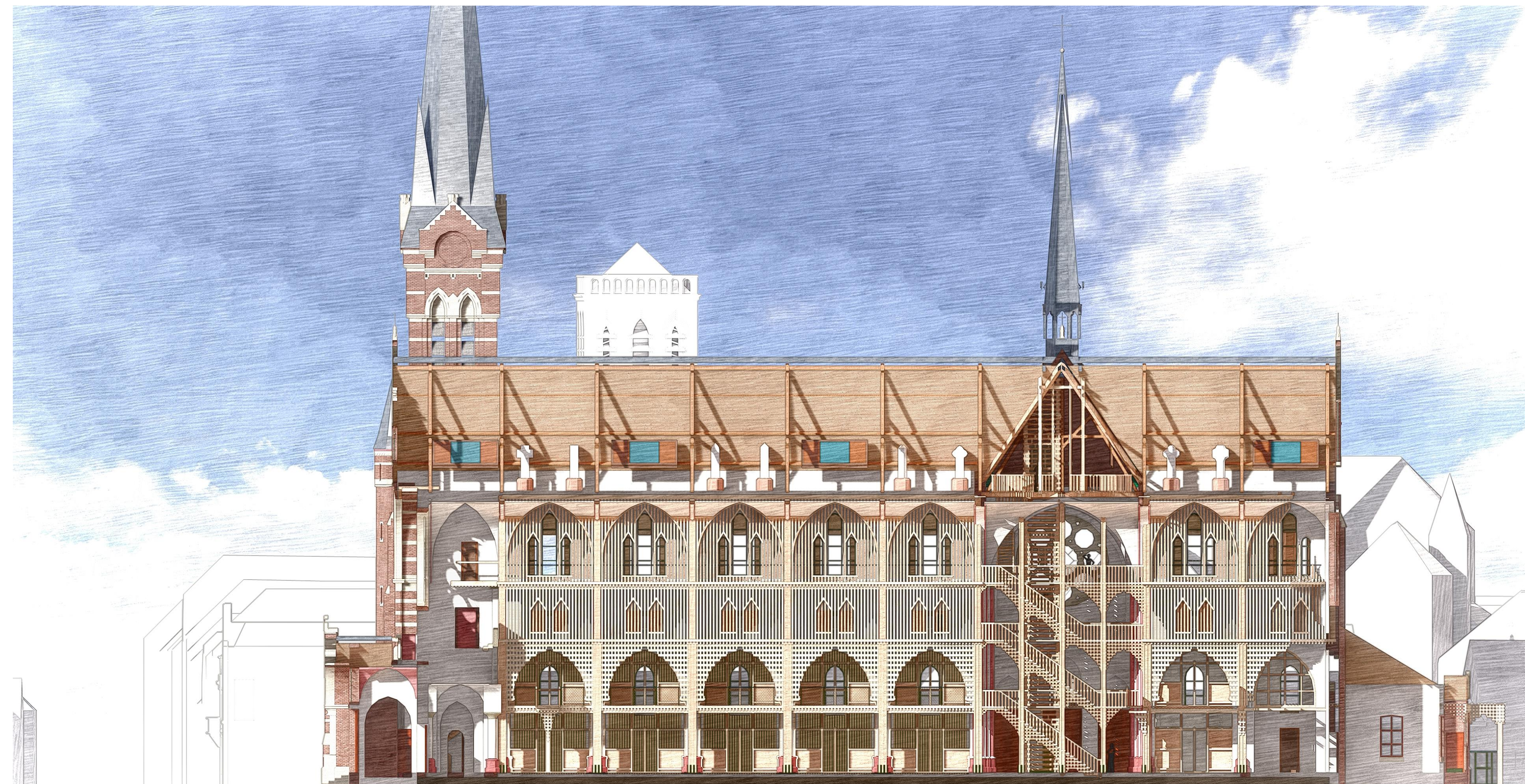
New →  
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Section toward West



# Impressions





# Impressions



South



East



West



North



# Impressions



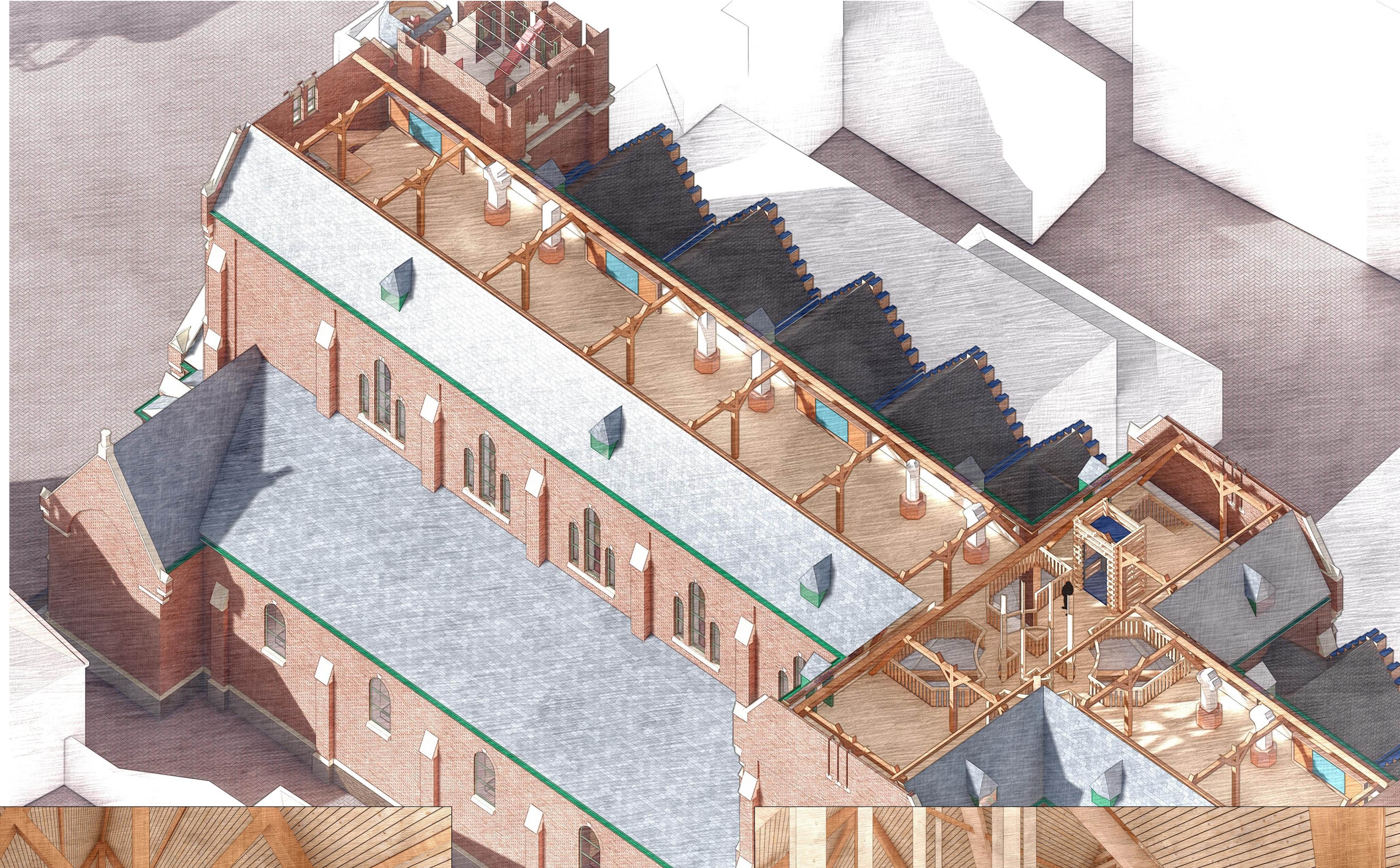


# Impressions





# Impressions

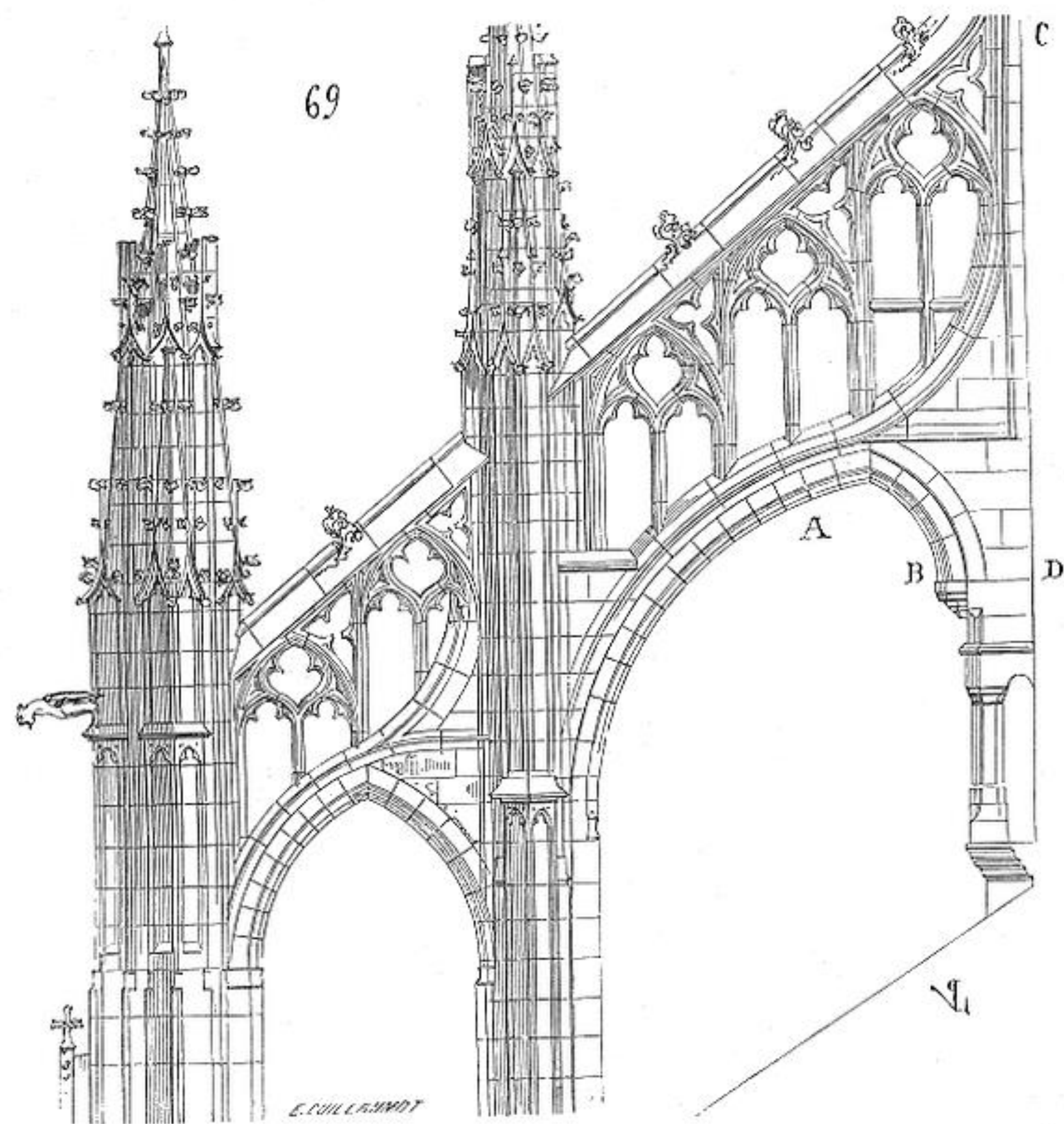


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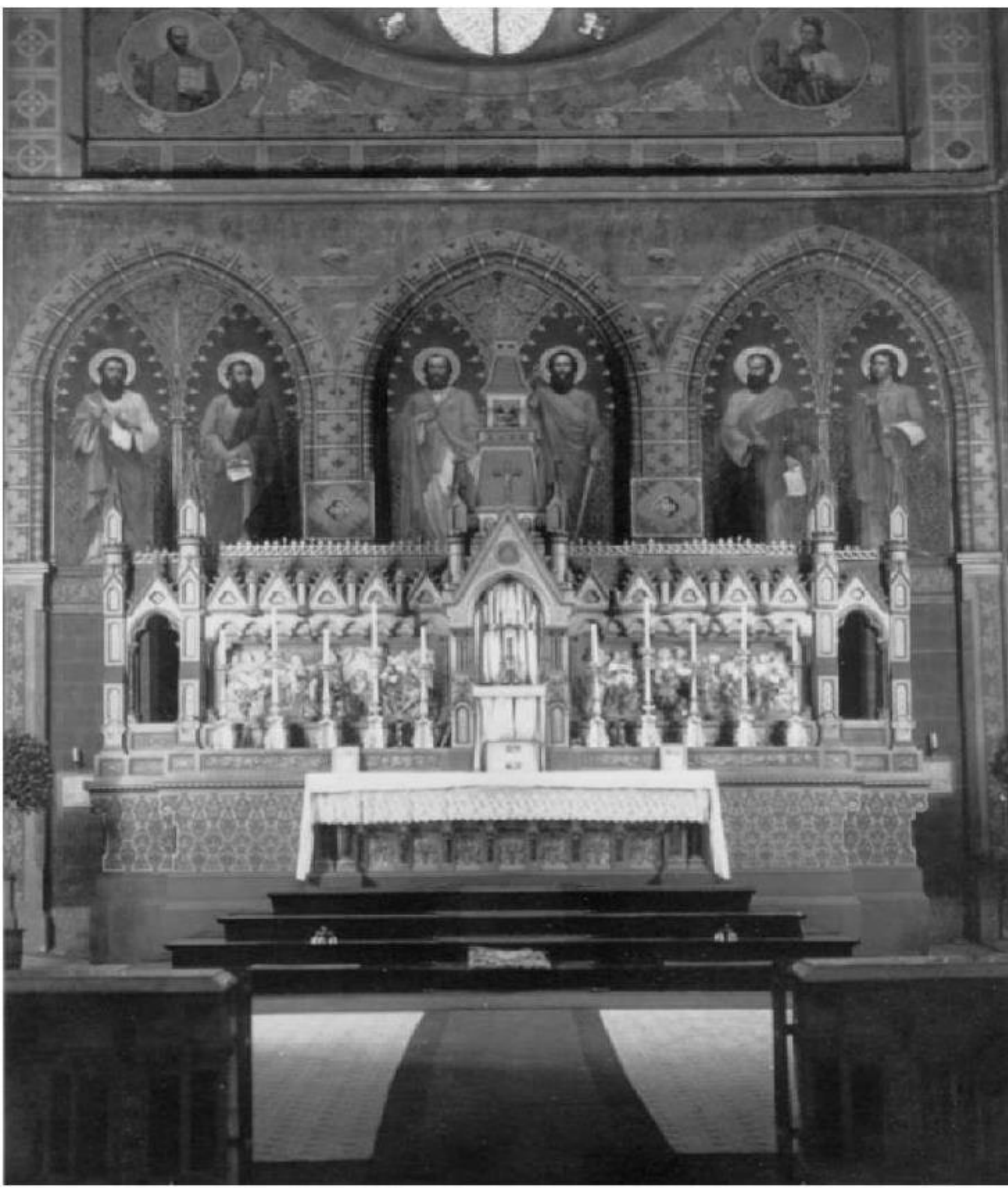
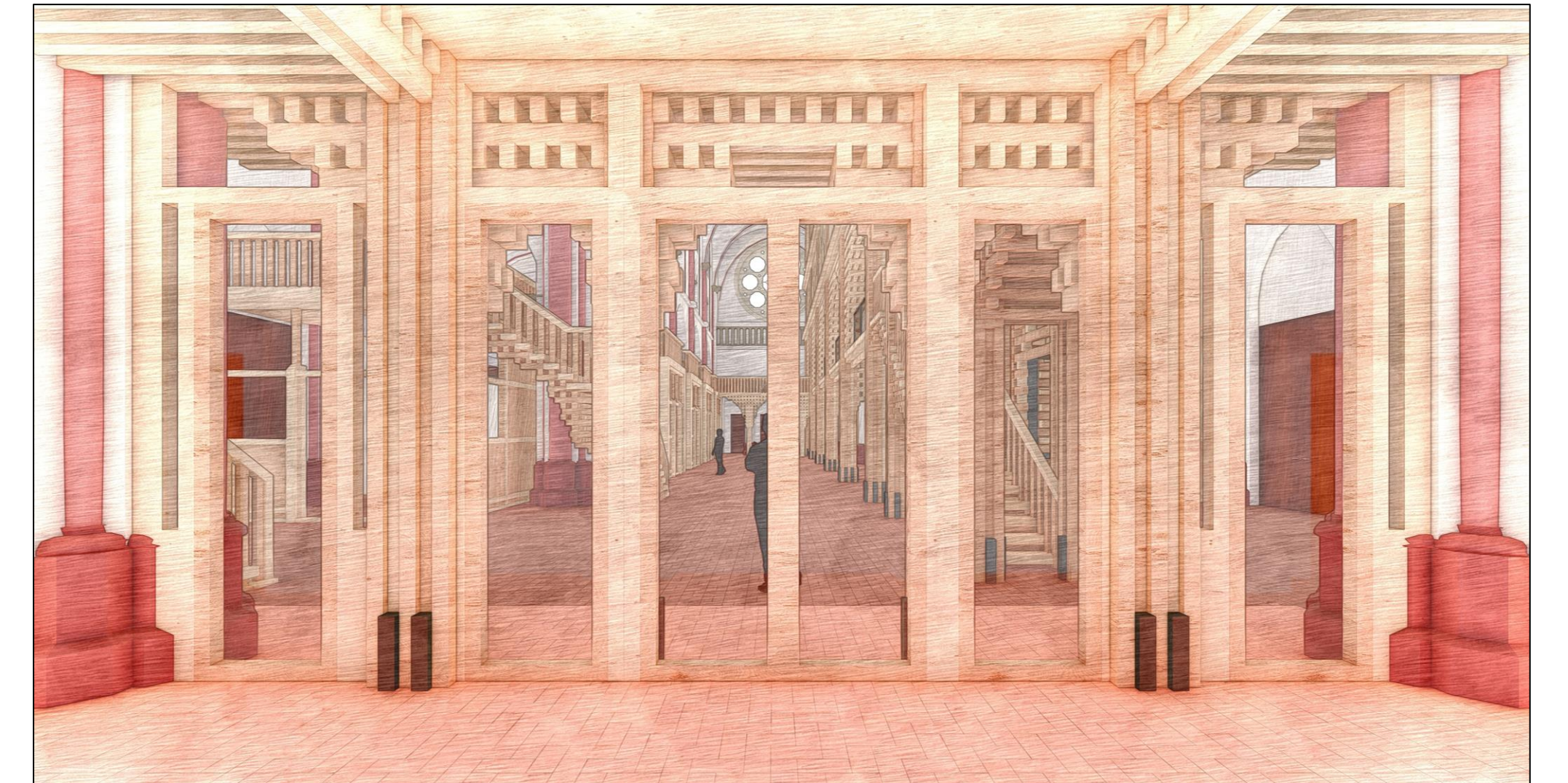


# Impressions





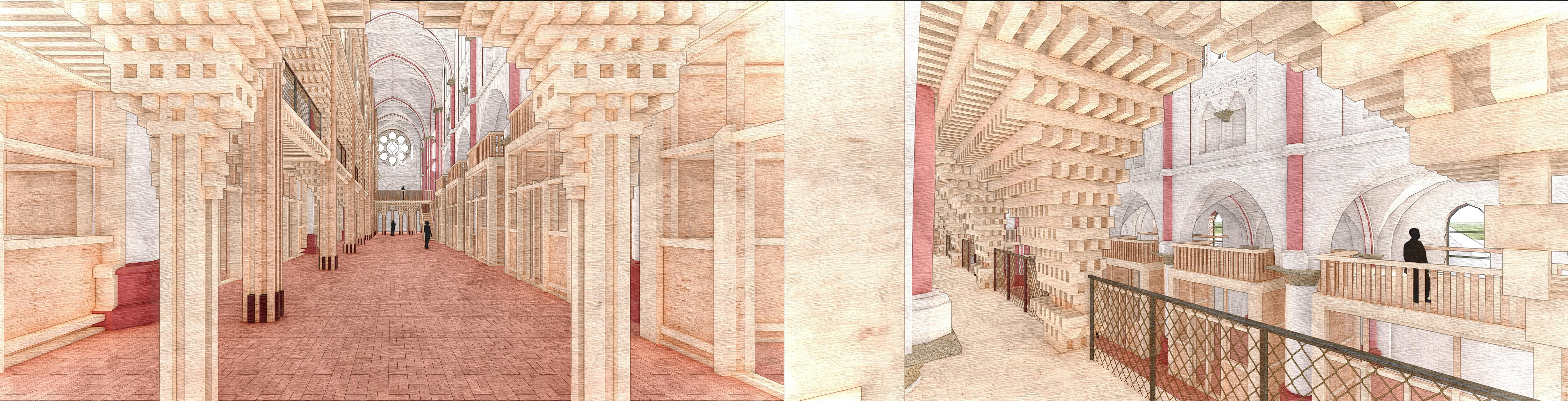
# Impressions





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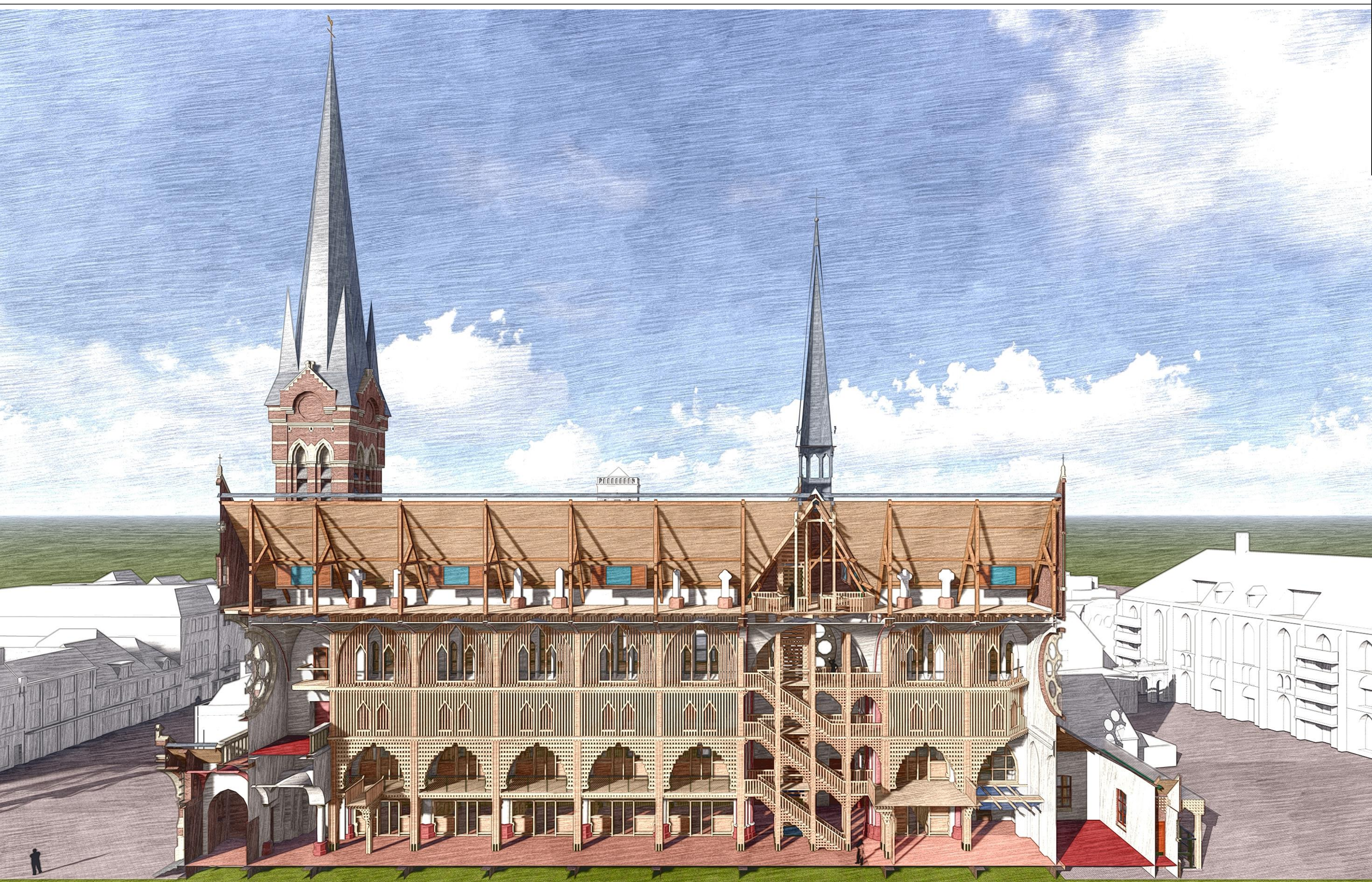
Interior:





# Redesign

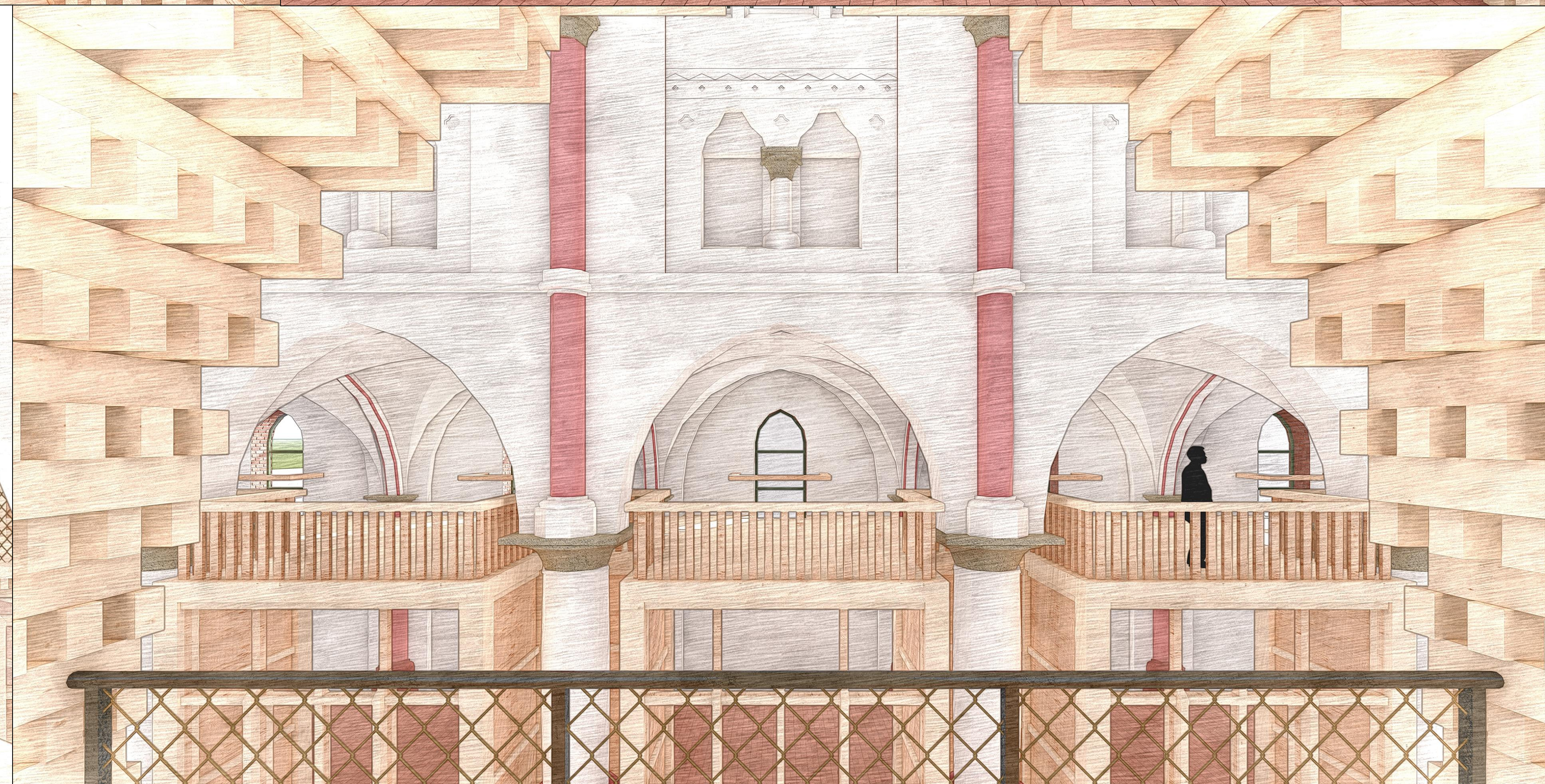
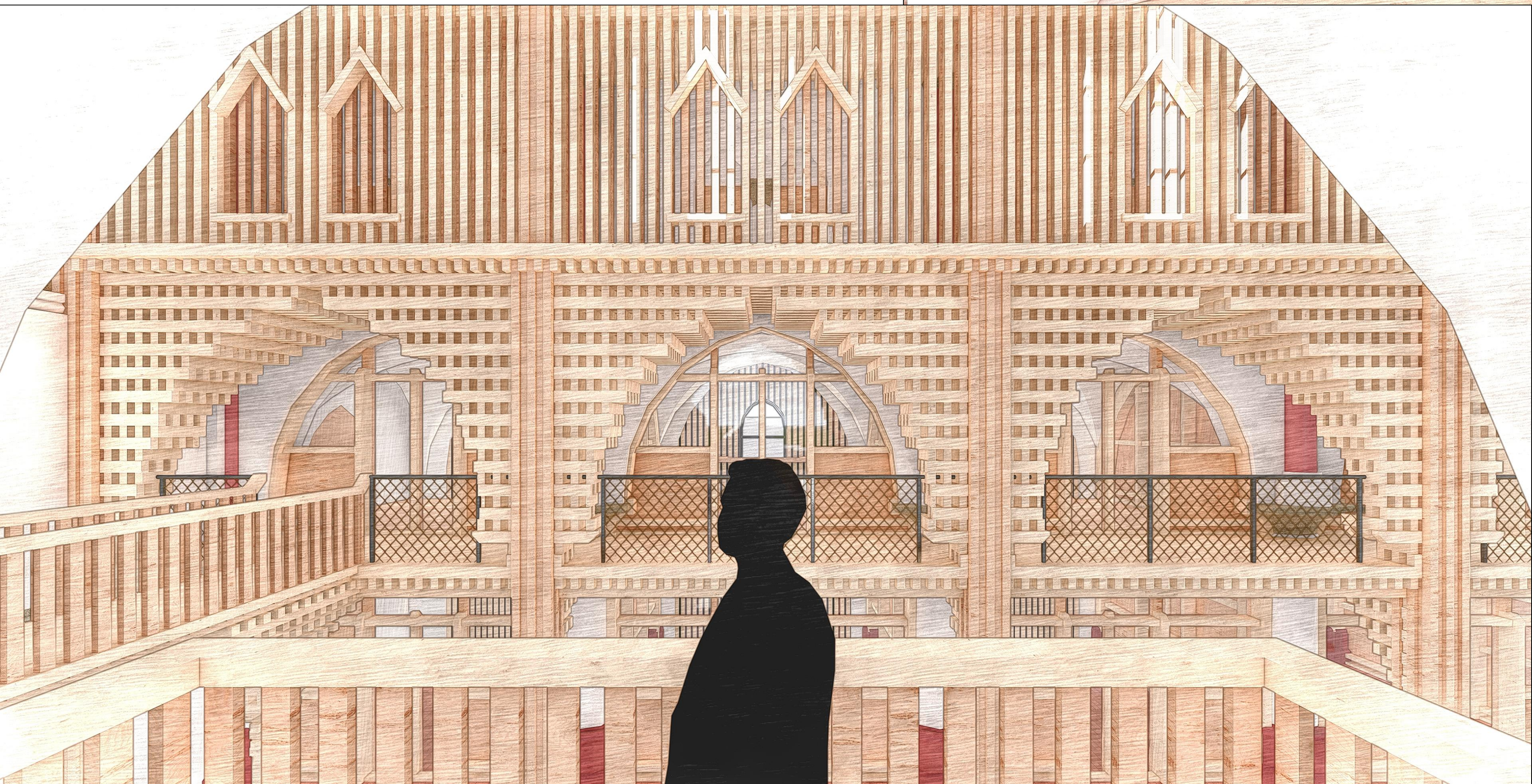
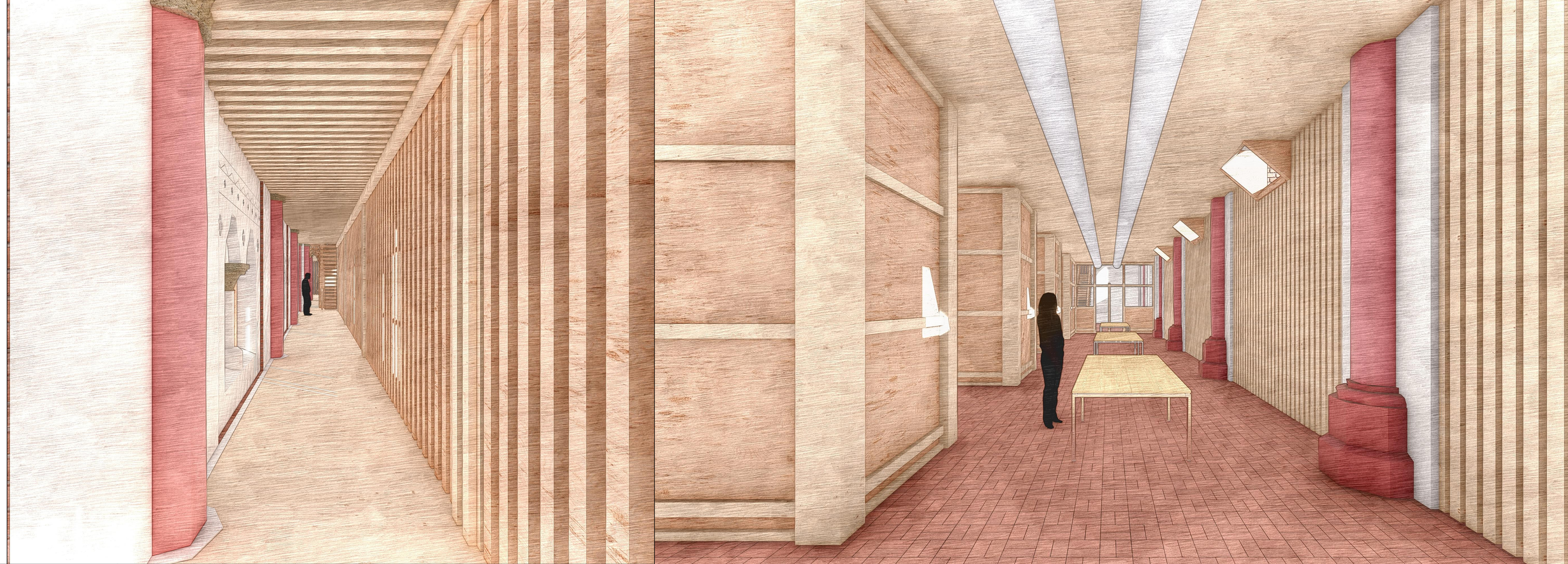
Interior:





# Redesign

Offices:





# Redesign

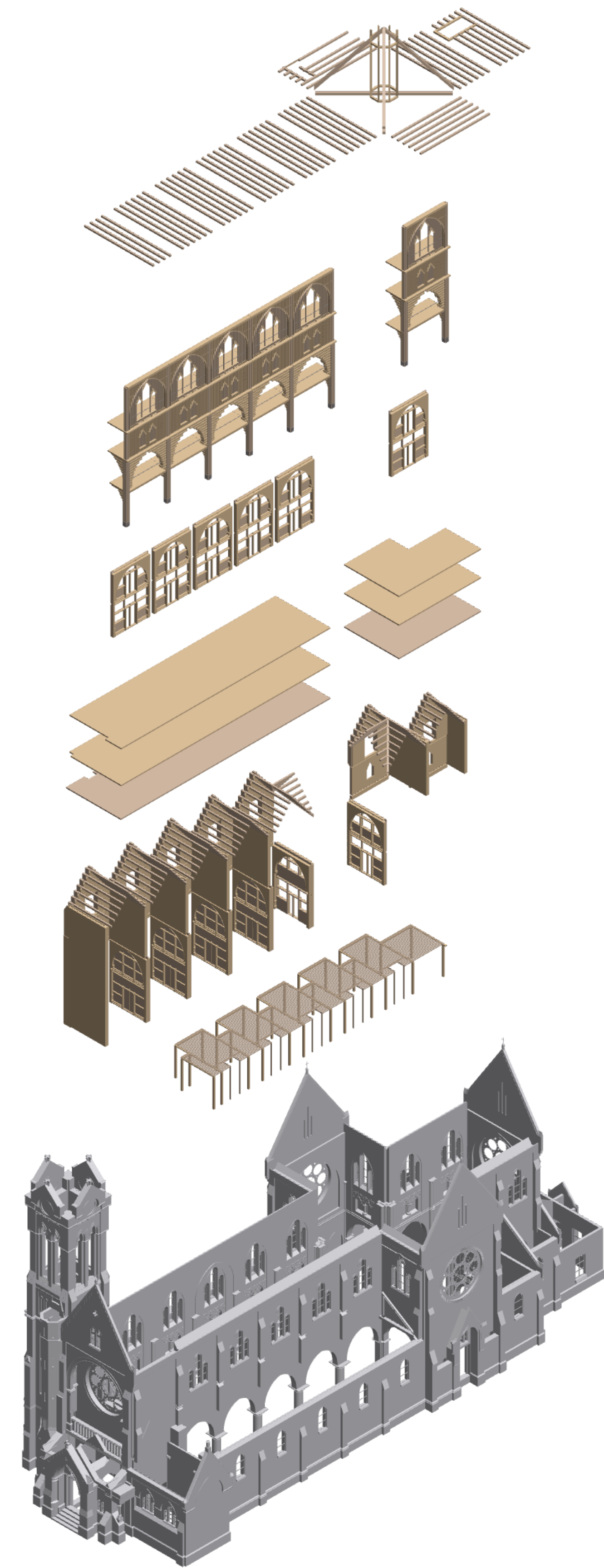
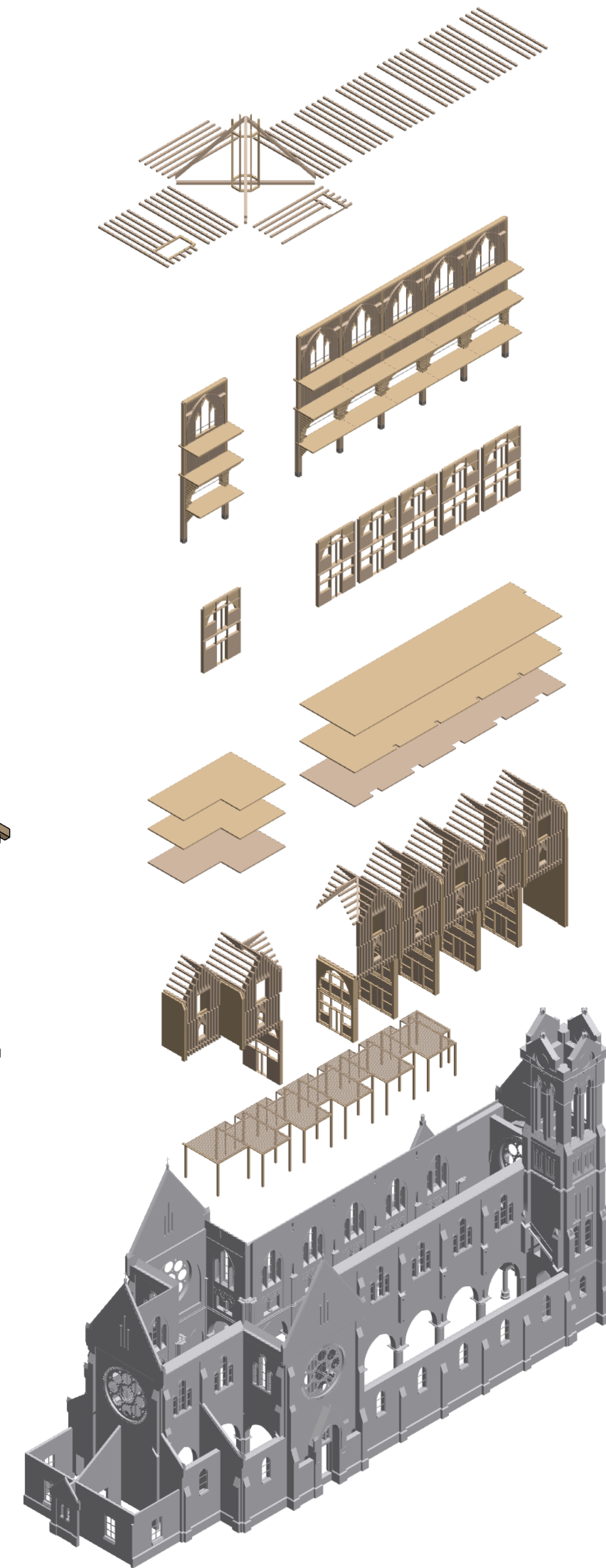
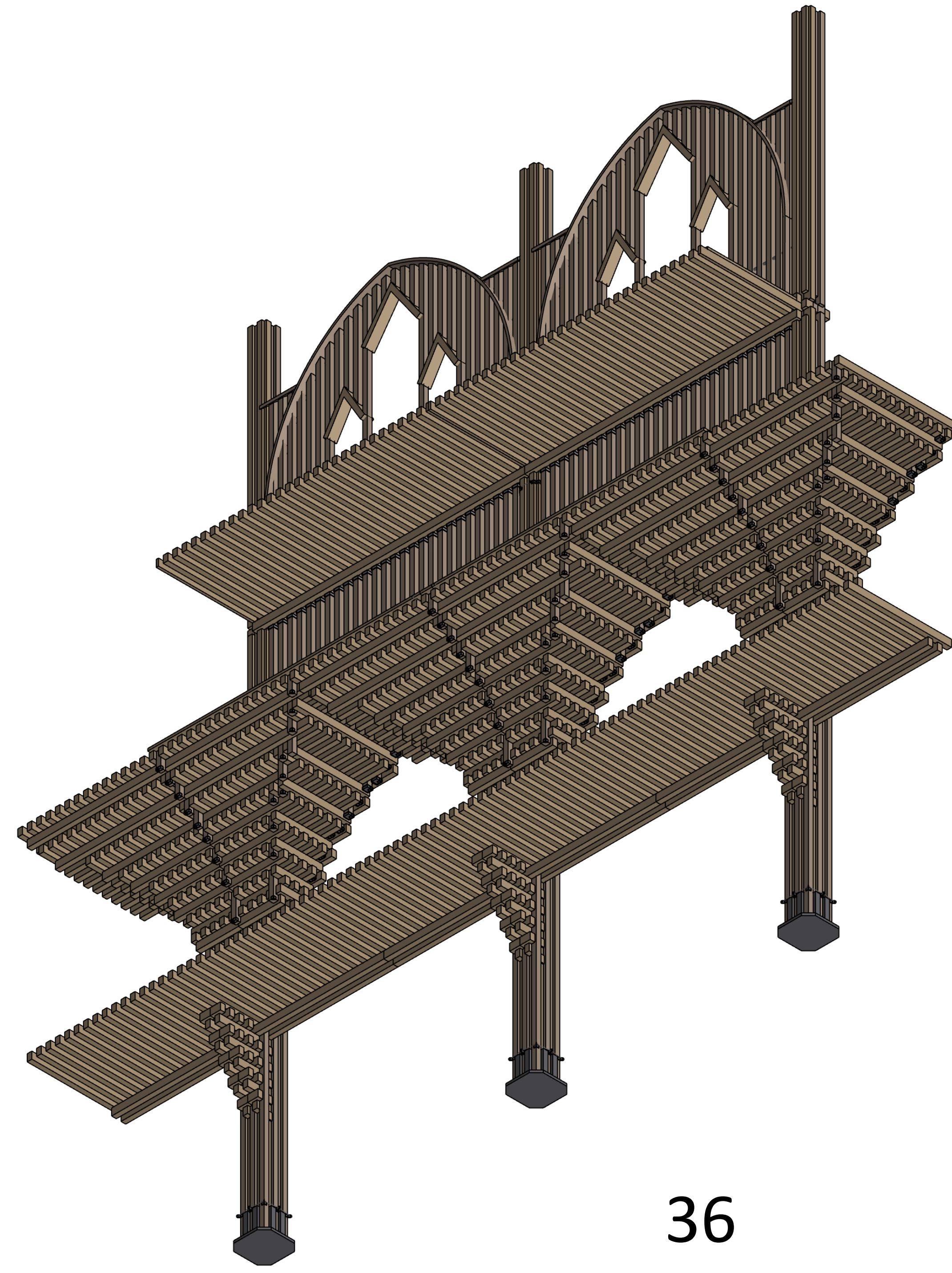
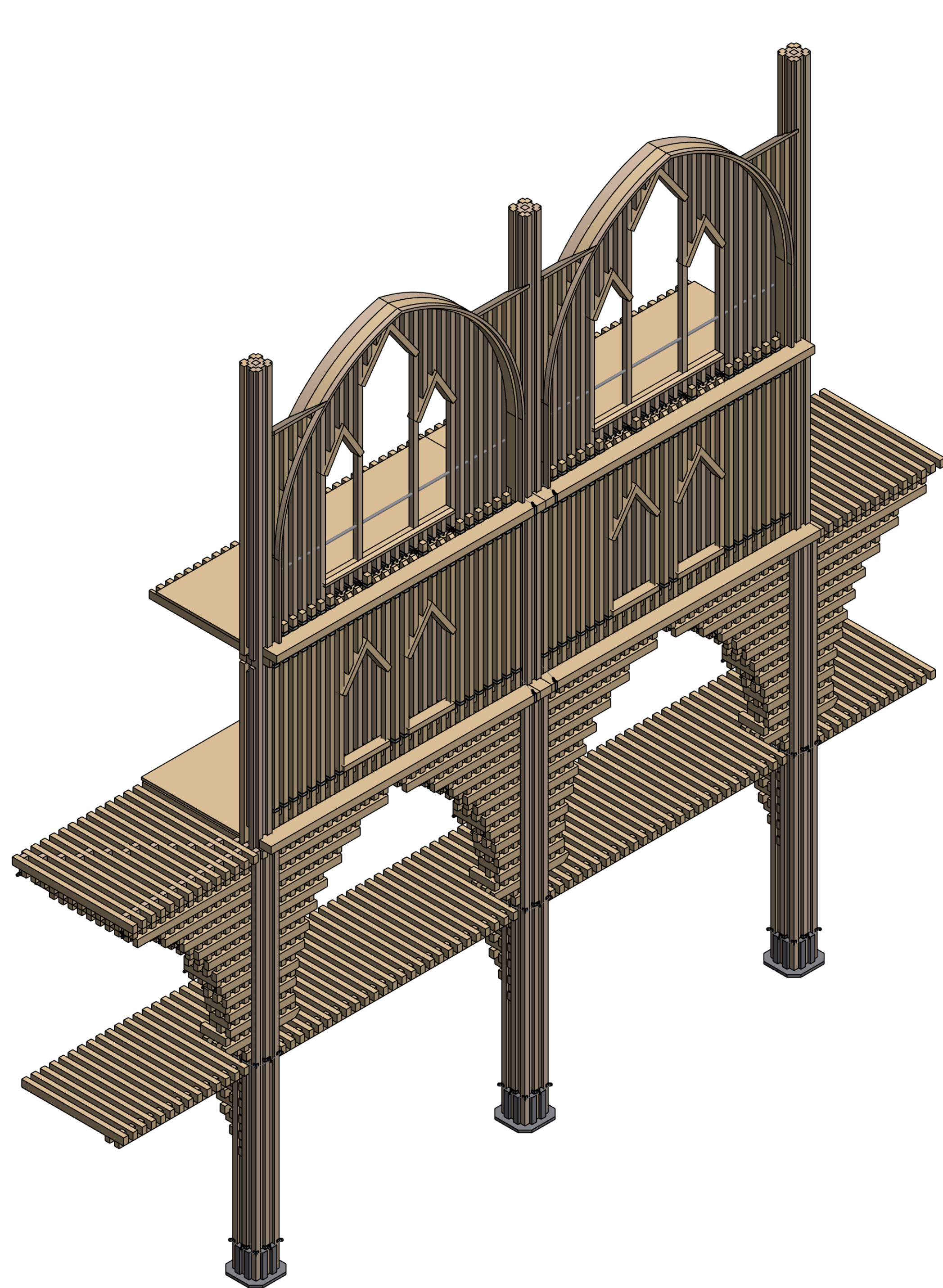
Exterior:





# Construction

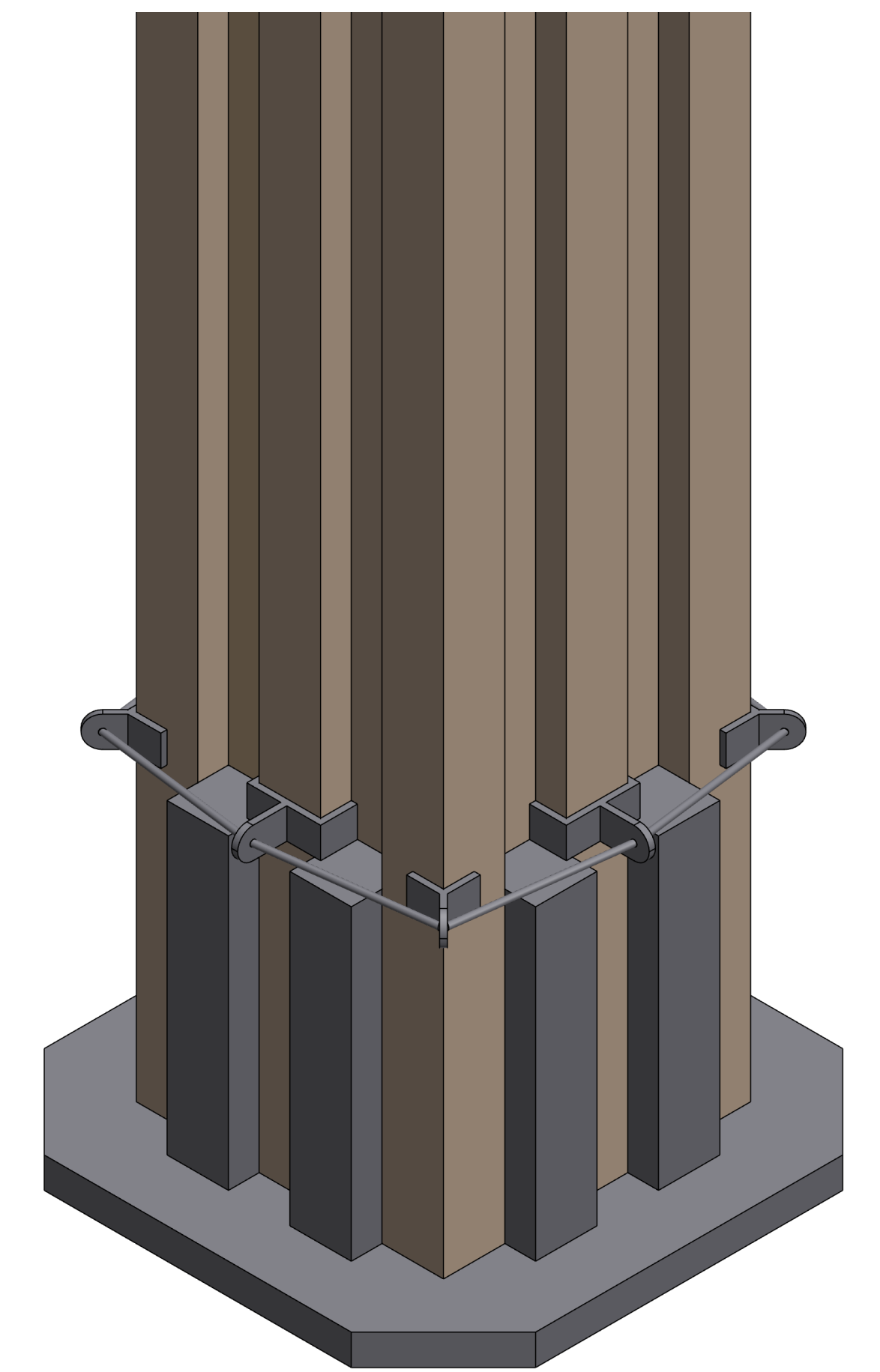
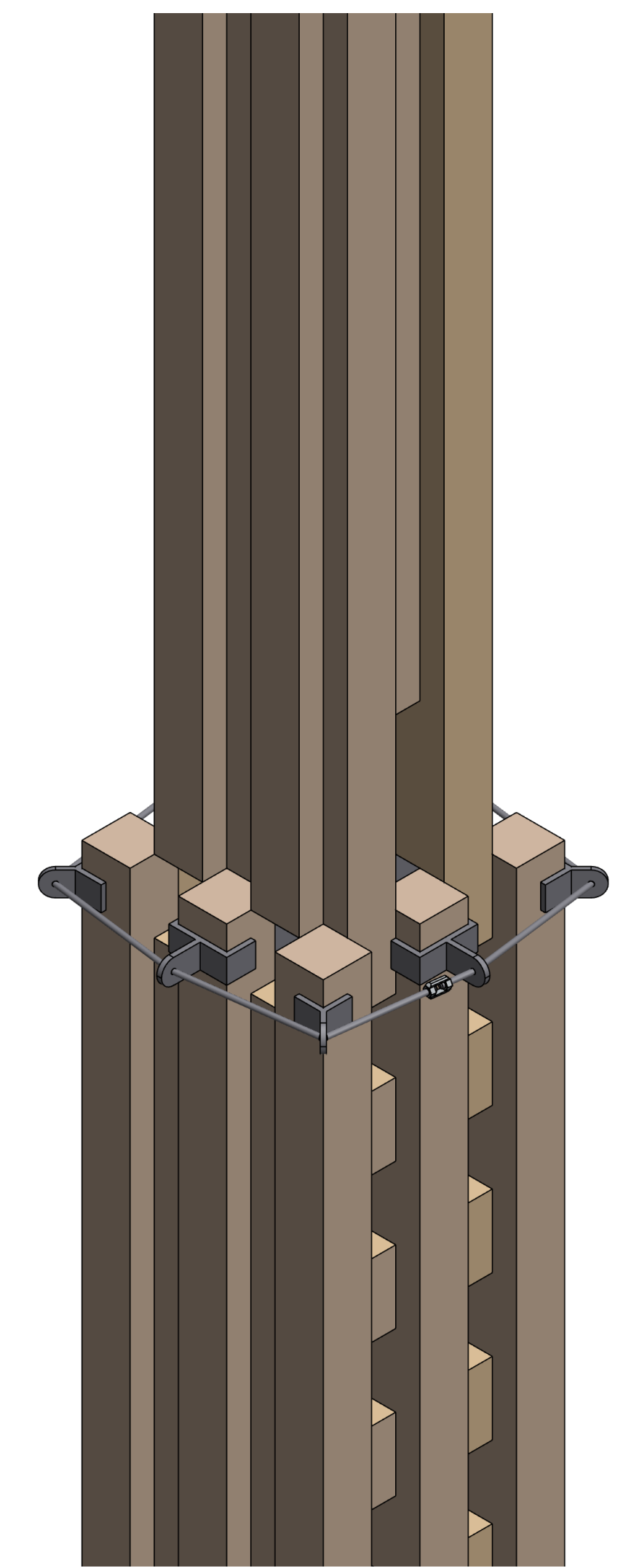
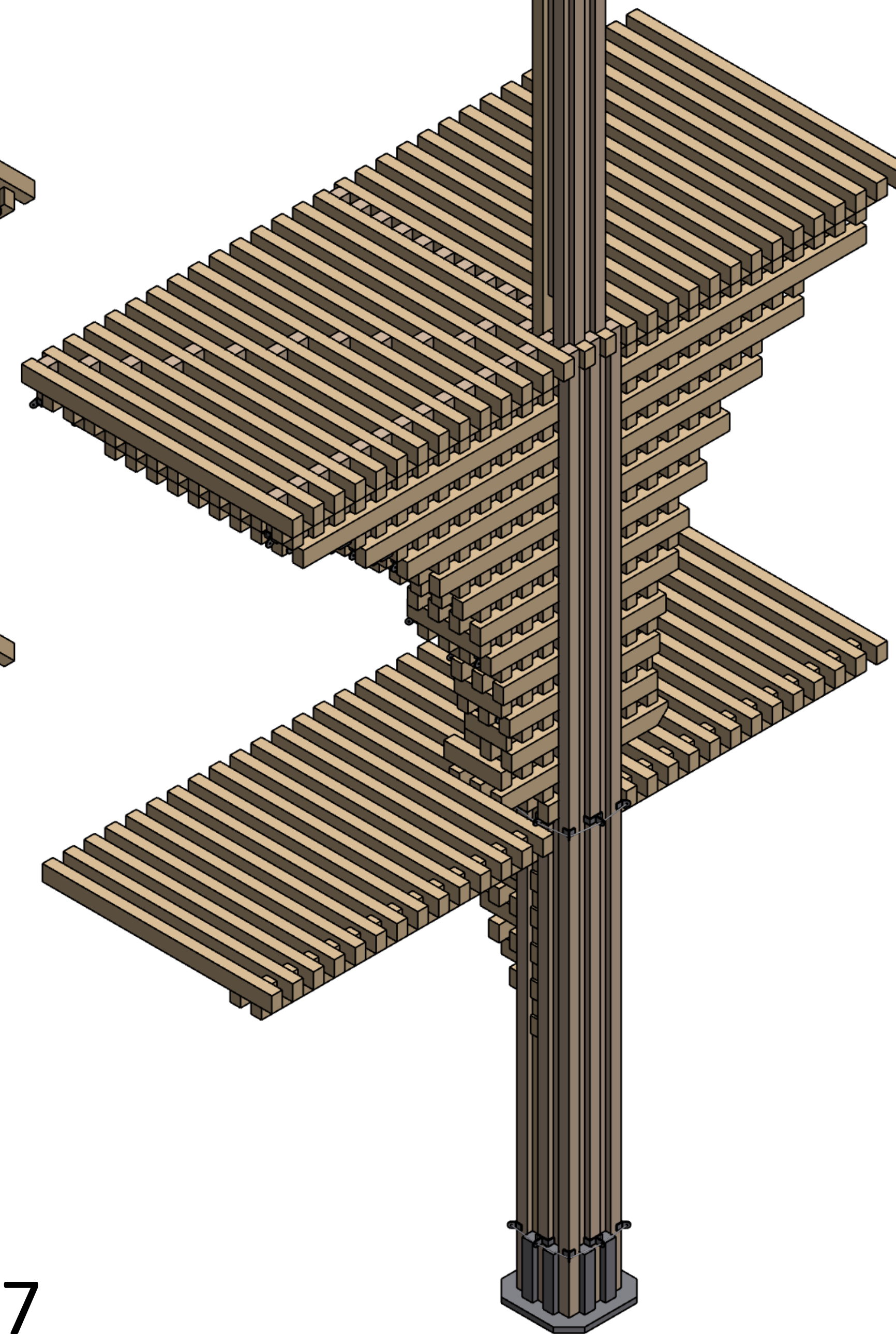
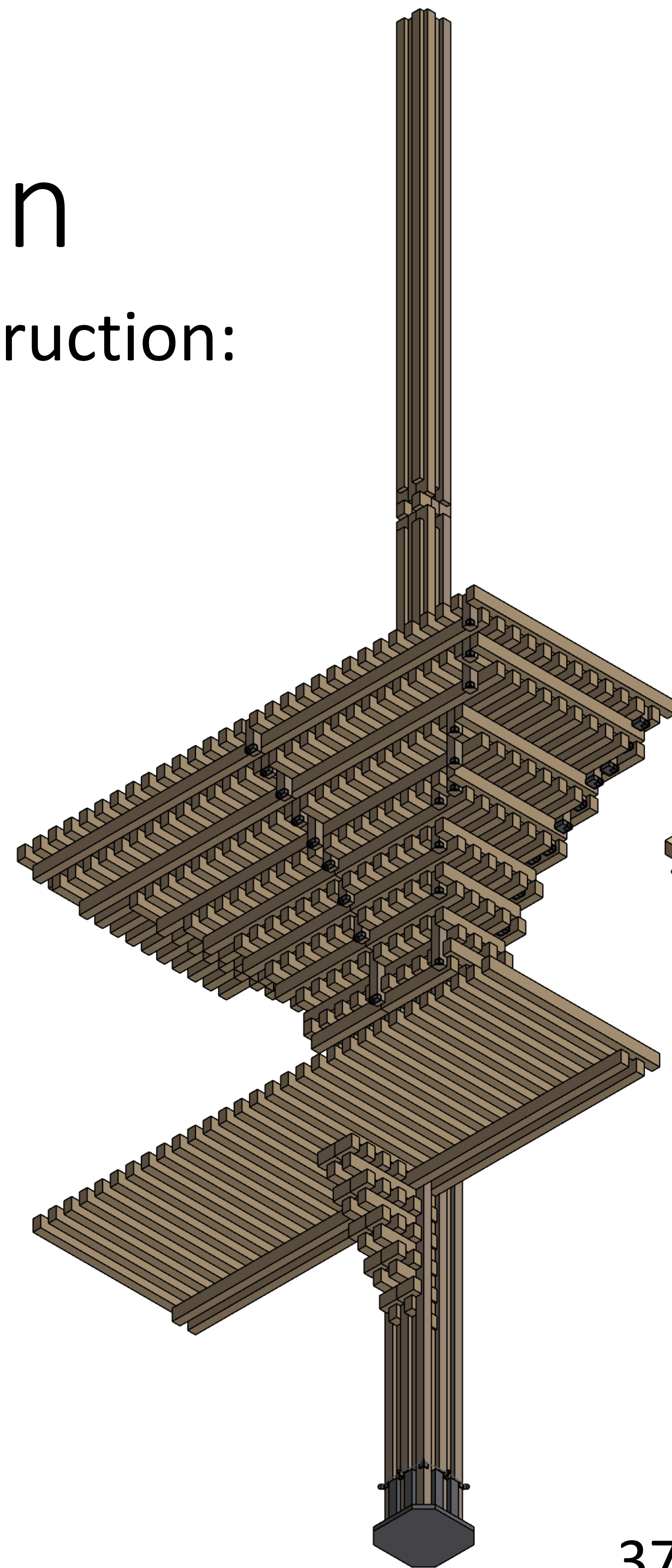
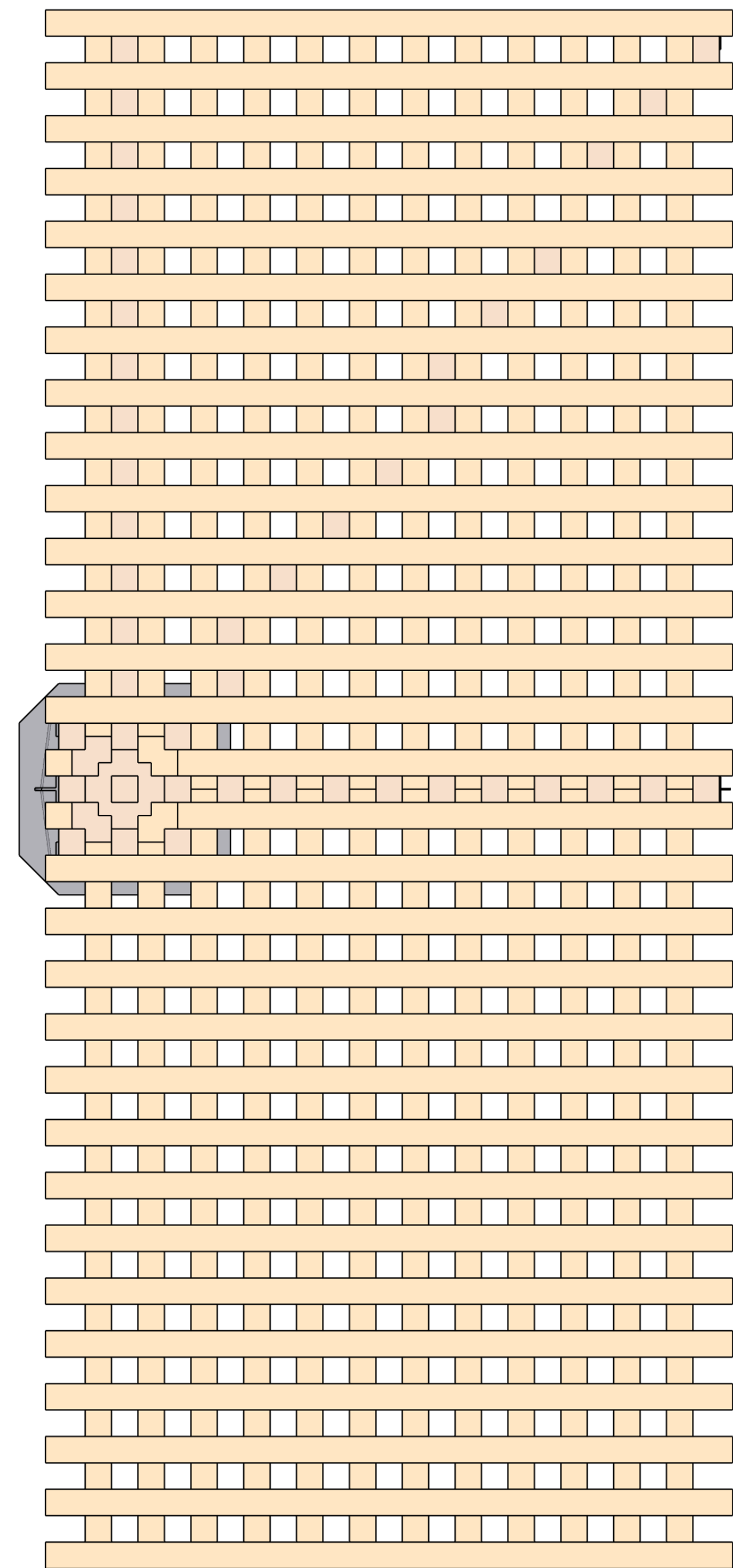
Wooden structure:





# Construction

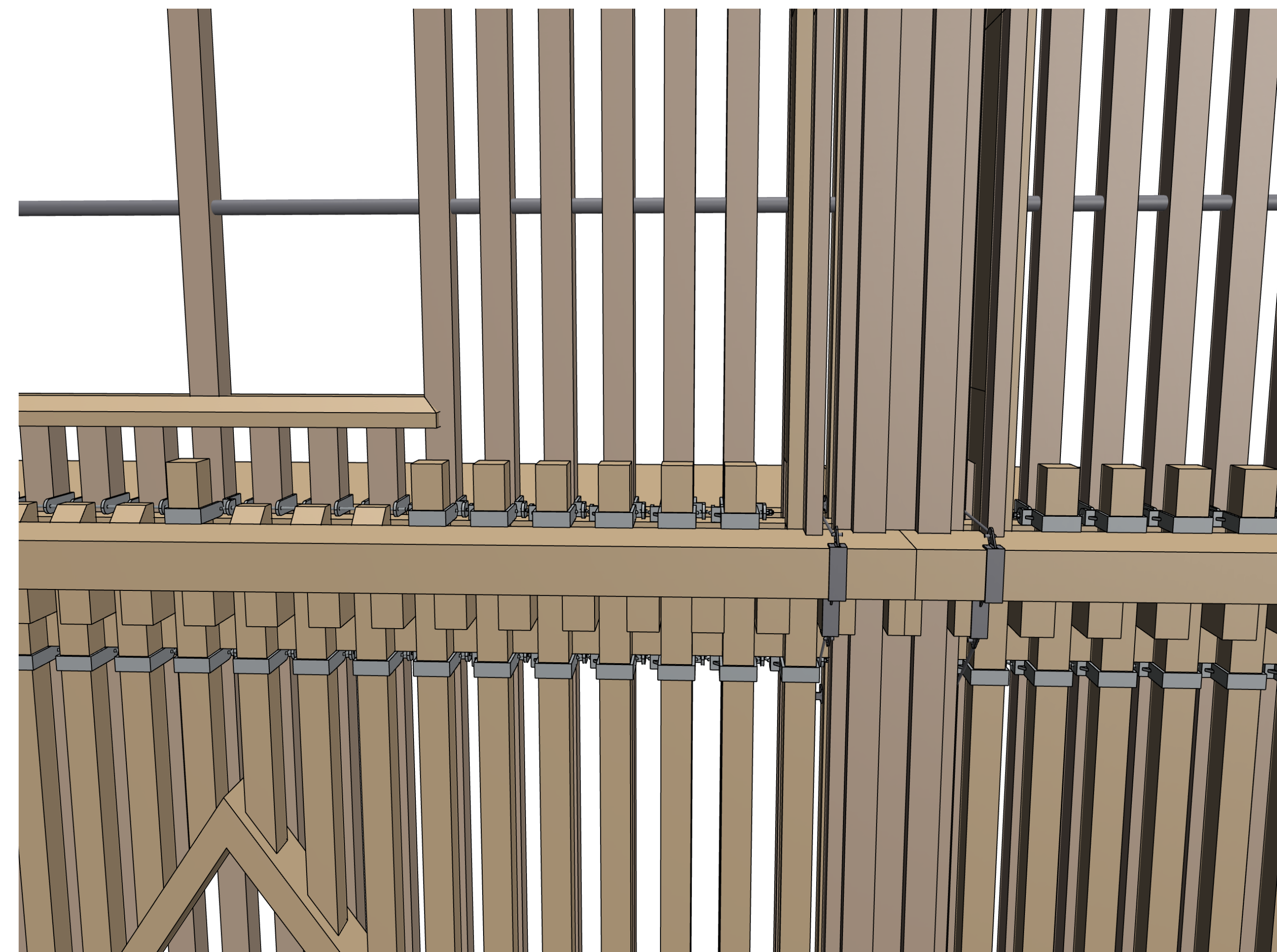
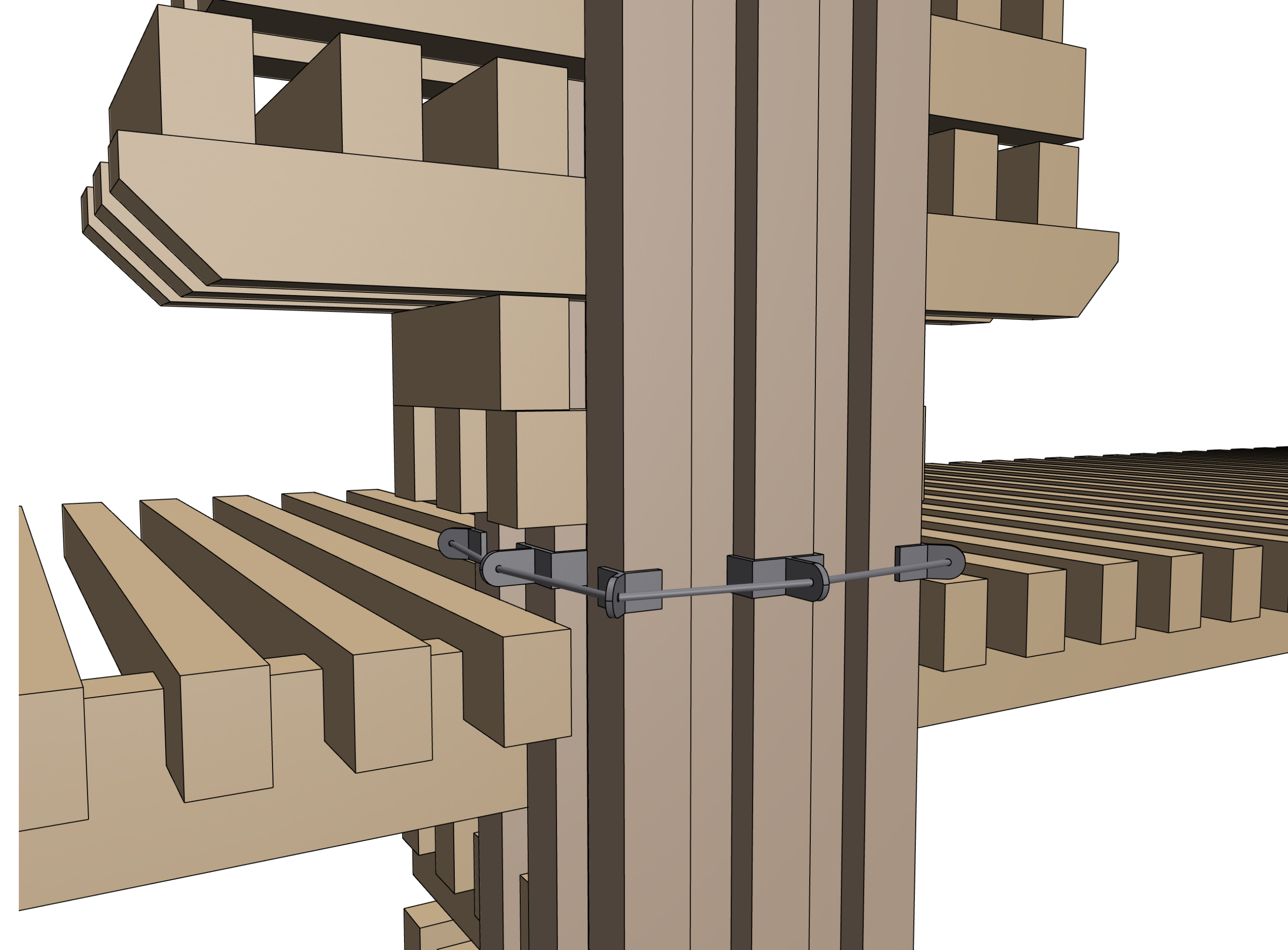
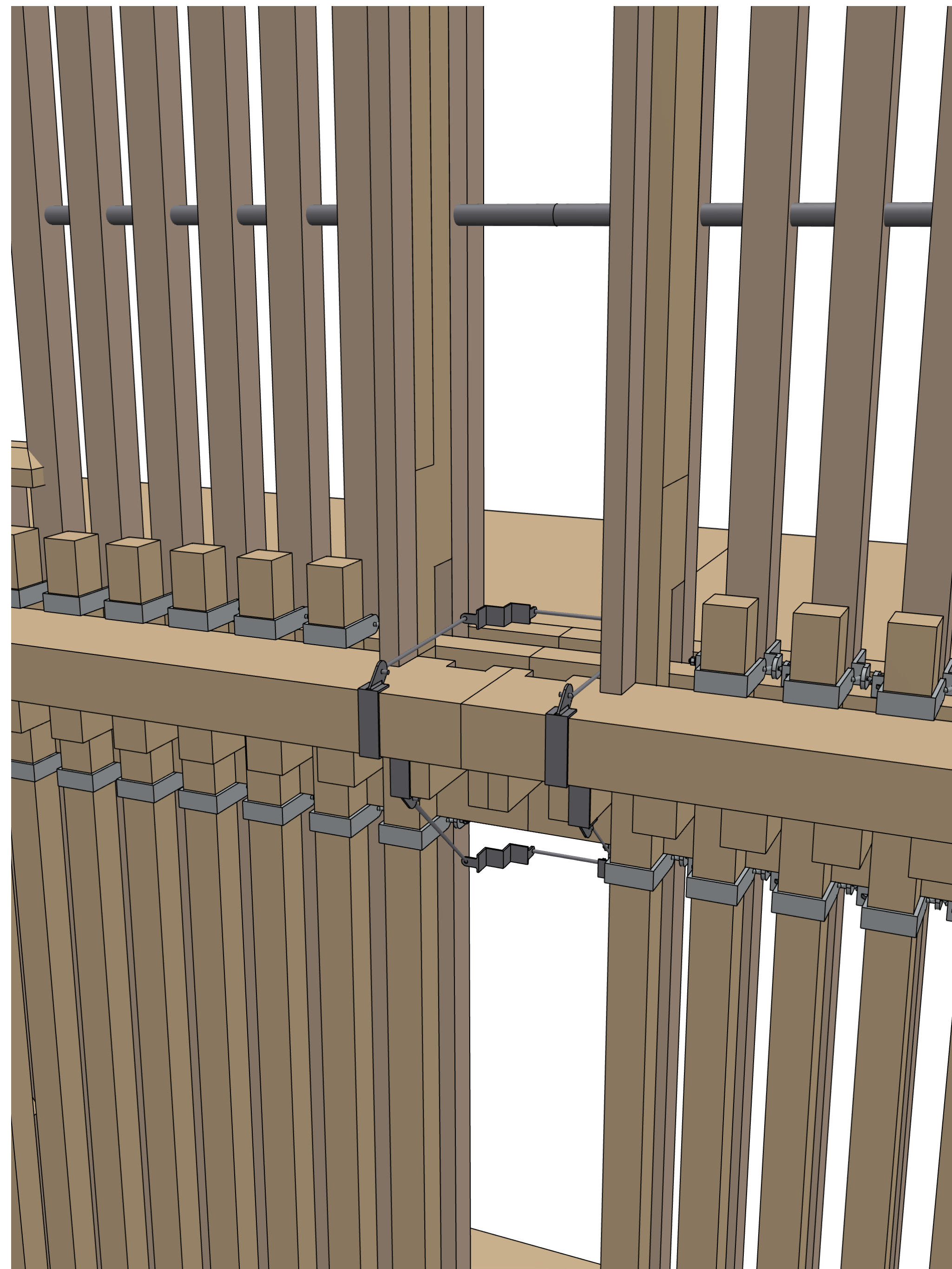
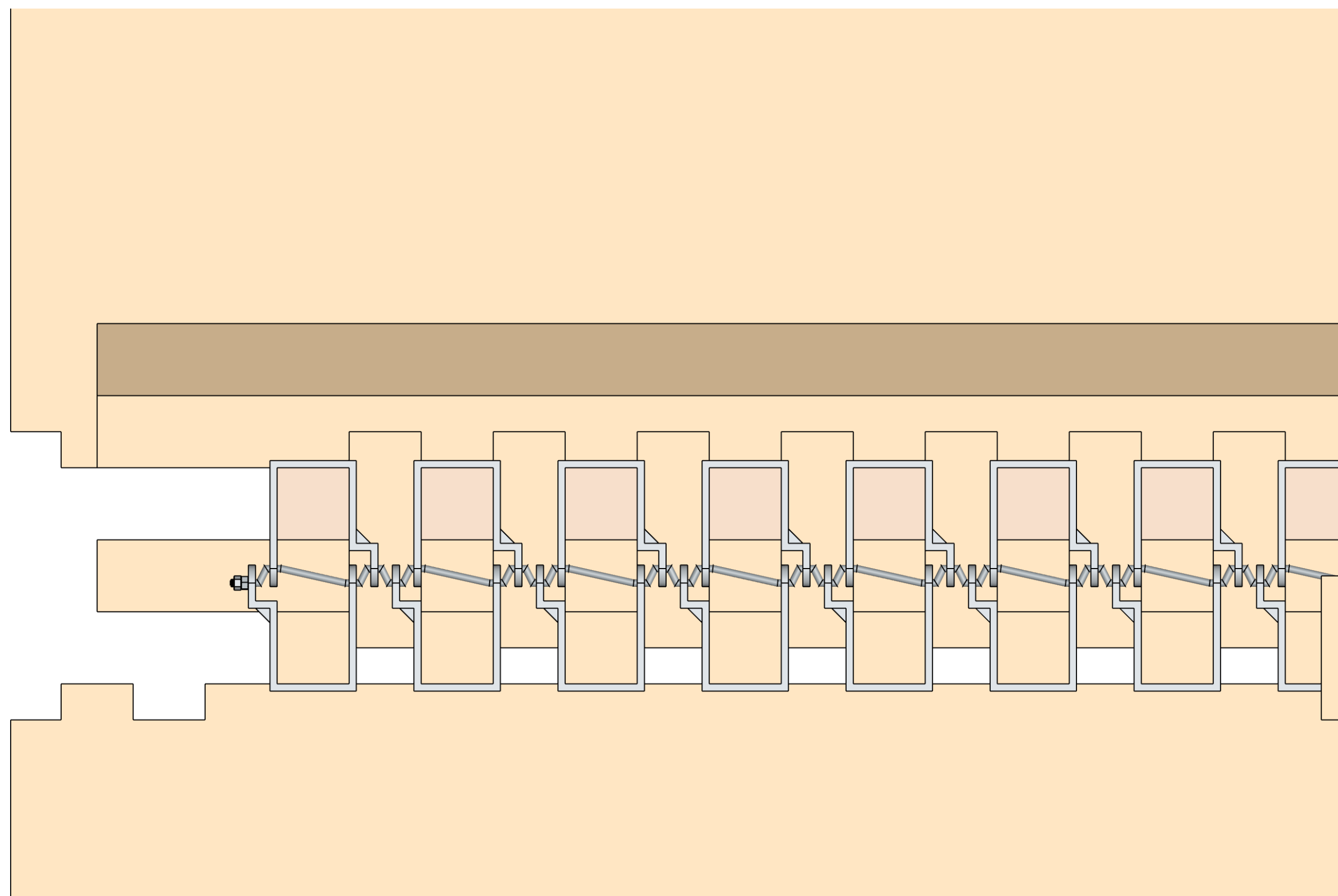
Stacked & tied construction:





# Construction

Compression cables:

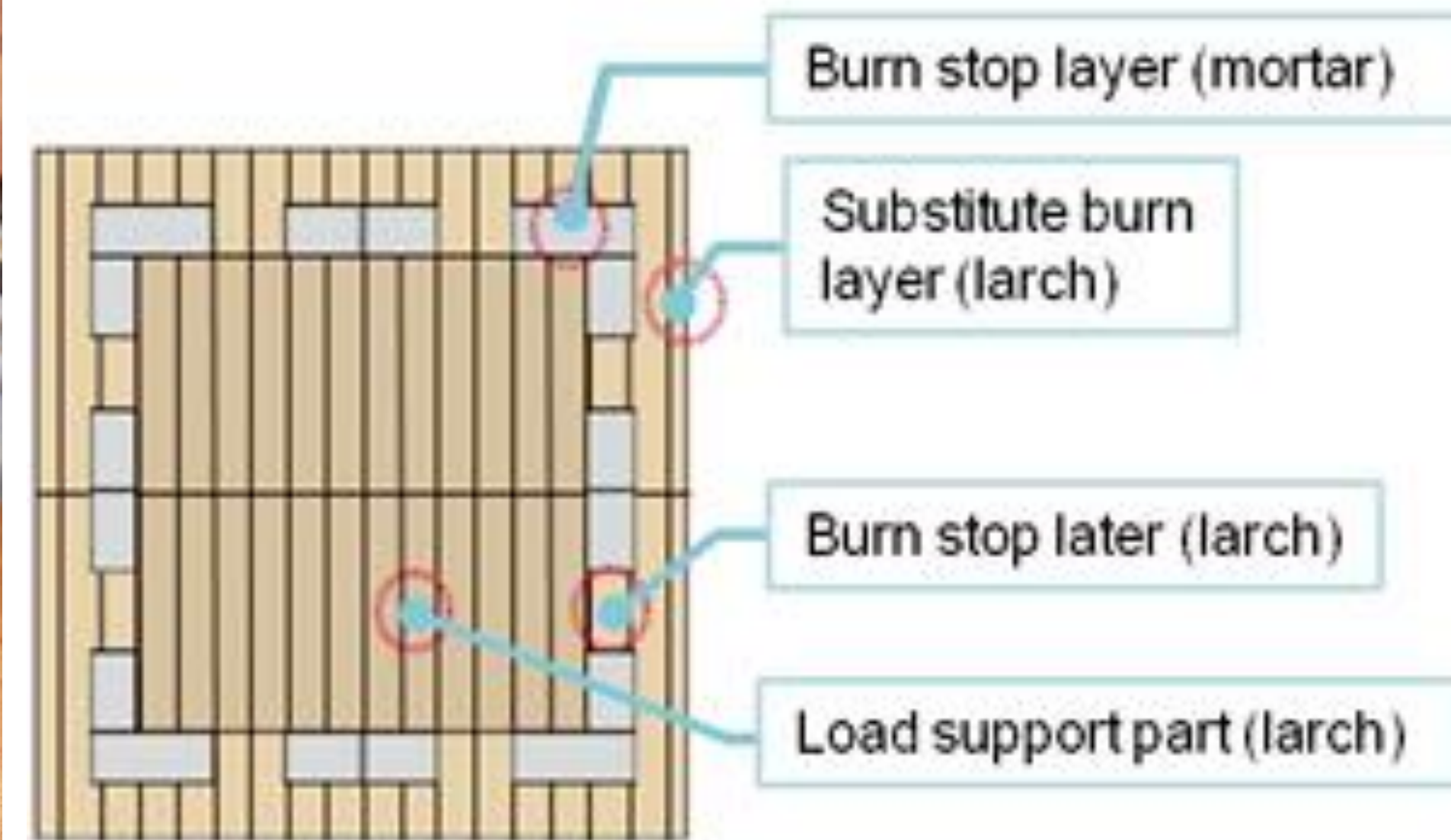
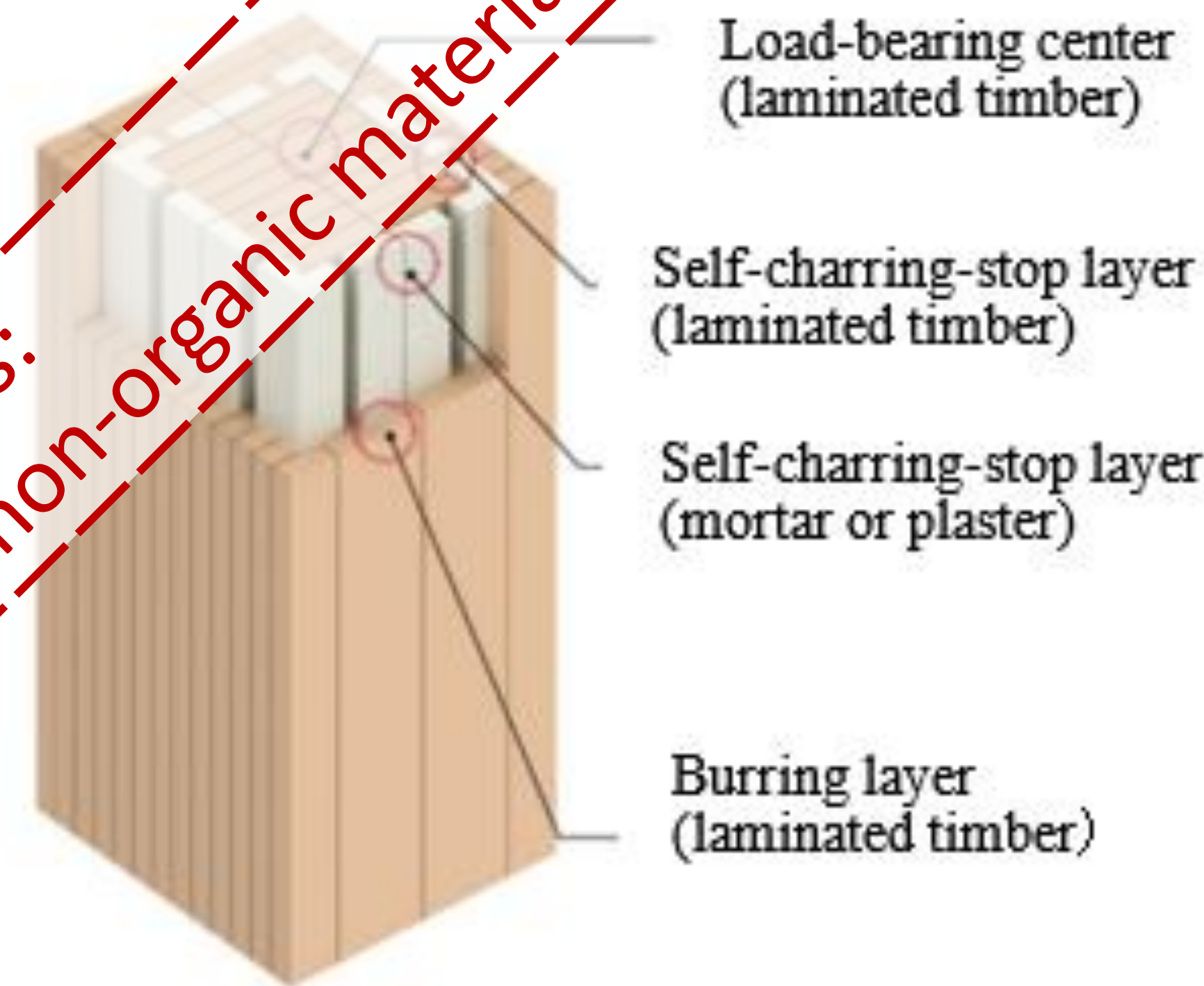
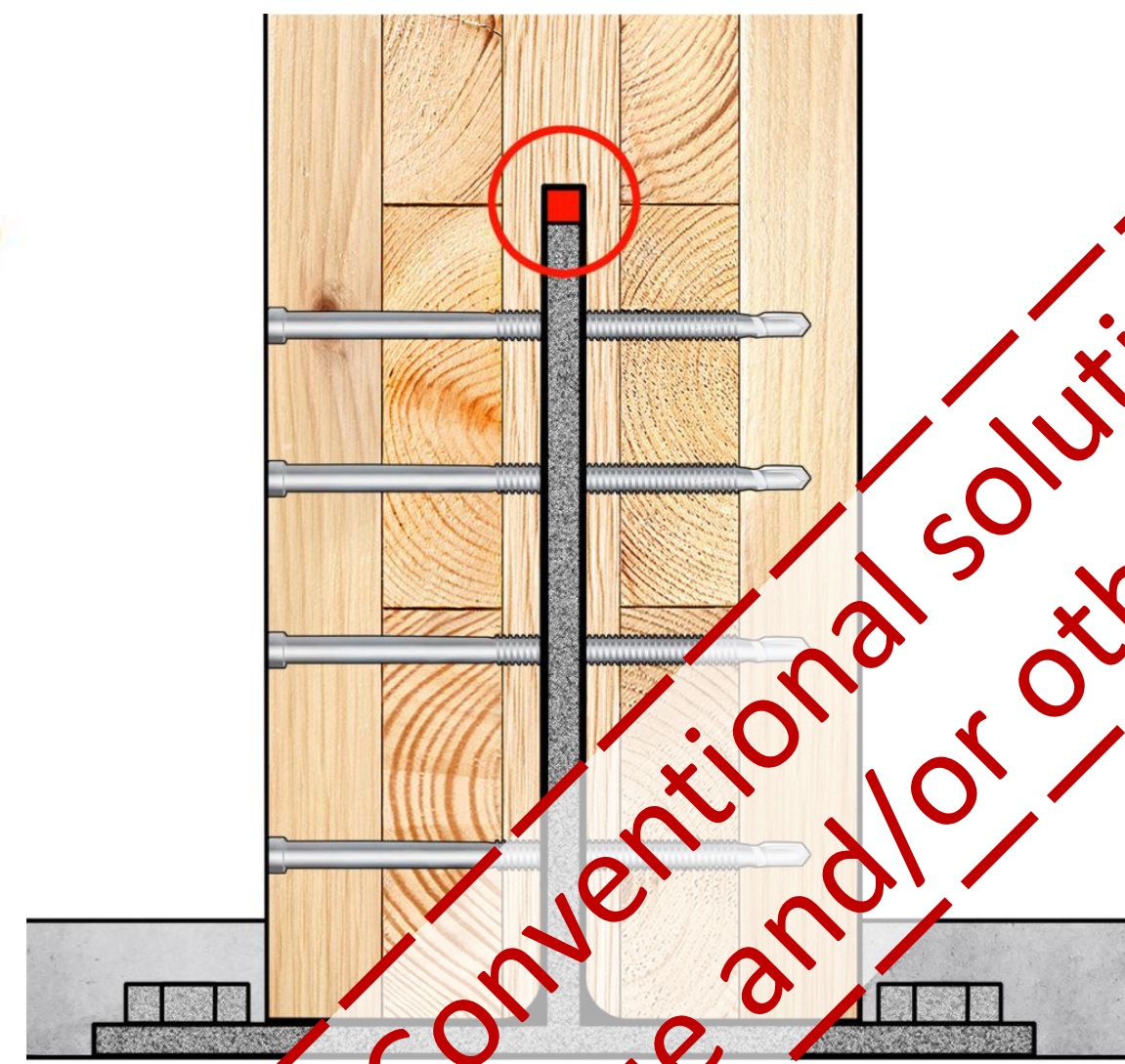




# Construction

## Wood columns: (Fire) safety

(Recommendation for further study on structural performance of tied wood)



Conventional solutions:  
 Heavy reliance on glue and/or other non-organic materials

**Table 2.1** Matrix of fire damage scenarios for combinations of active and passive fire protection

Active fire intervention: →	Sprinklers work	Sprinklers don't work		
		Rapid response	Slow response	No response
Fire size: →	No flashover	Flashover, one room.	Flashover and decay, one floor.	Full burnout, one floor.
Passive fire protection: ↓		Extinguished by fire service	Cooled by fire service	Severe charring continues.
Walls and ceilings exposed	No charring	Minor charring. Stopped by fire service.	Moderate charring. Stopped by fire service.	<b>Very Severe charring.</b> (large areas)
Walls exposed	No charring	Minor charring. Stopped by fire service.	Moderate charring. Stopped by fire service.	<b>Severe charring</b> (smaller areas)
Beams and columns exposed	No charring	Minor charring. Stopped by fire service.	Limited charring. Stopped by fire service.	<b>Severe charring</b> (limited areas)
Wood protected with one layer of gypsum	No charring	No charring	Some gypsum falls off. Minor charring.	Gypsum falls off <b>Severe charring later</b>
Full encapsulation.	No charring	No charring	No charring	No charring

**Table 2.2** Suggestions for passive fire protection depending on sprinkler protection and height of the building

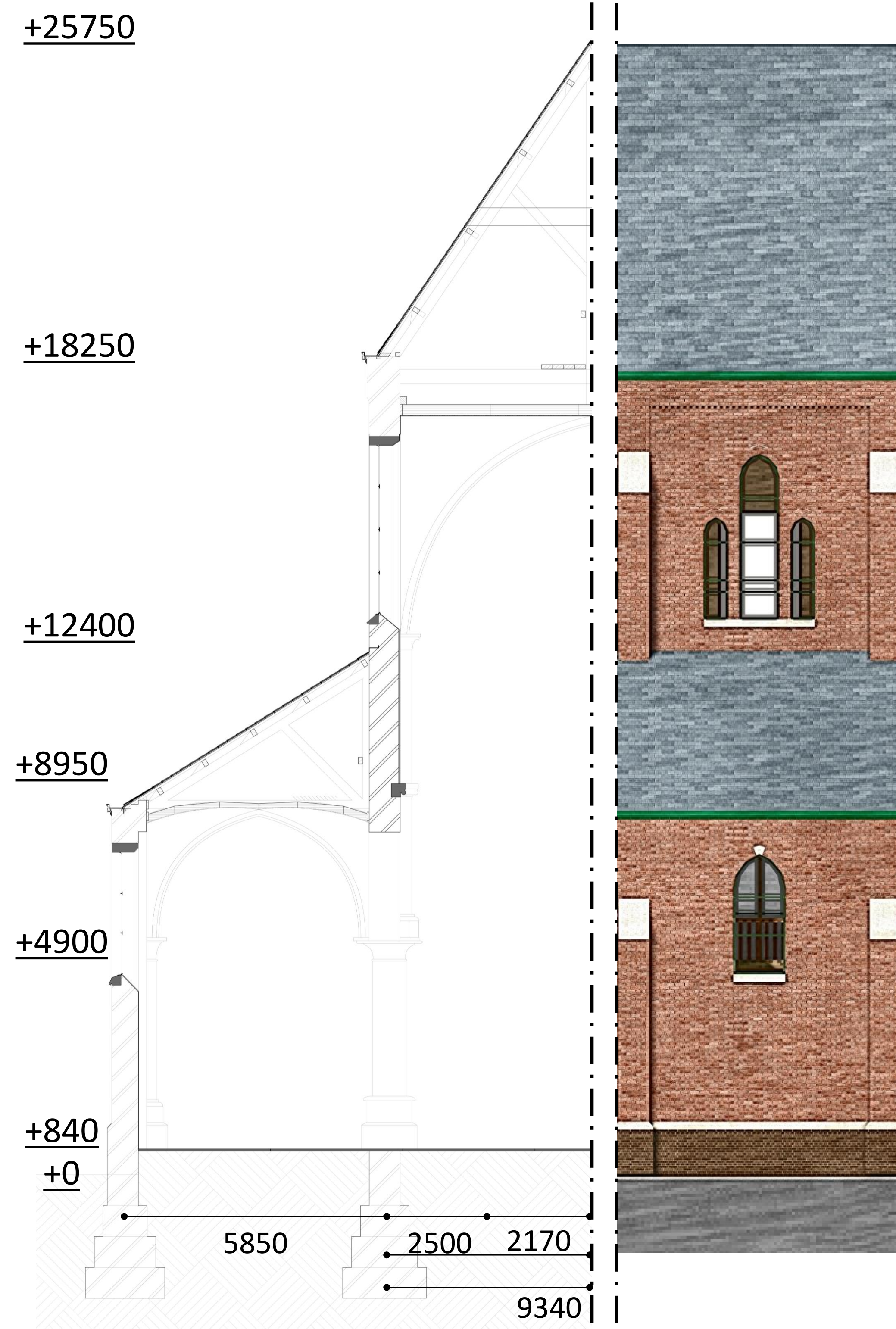
Height	Low-rise	Mid-rise	Tall	Very tall	Hi-rise
Storeys	1-2	3-5	6-8	9-15	>15
Likely escape	Quick escape	Slow escape	Assisted escape	Assisted escape	Difficult escape
No sprinklers	Local areas exposed	No exposed wood	<b>Not allowed</b>	<b>Not allowed</b>	<b>Not allowed</b>
Normal sprinklers	Large areas exposed	Local areas exposed	No exposed wood	<b>Full encapsulation</b>	<b>Full encapsulation</b>
Special sprinklers	Large areas exposed	Large areas exposed	Local areas exposed	No exposed wood	<b>Full encapsulation</b>

(Harada, Matsuyama, Himoto, Nakamura, & Wakatsuki, 2017)

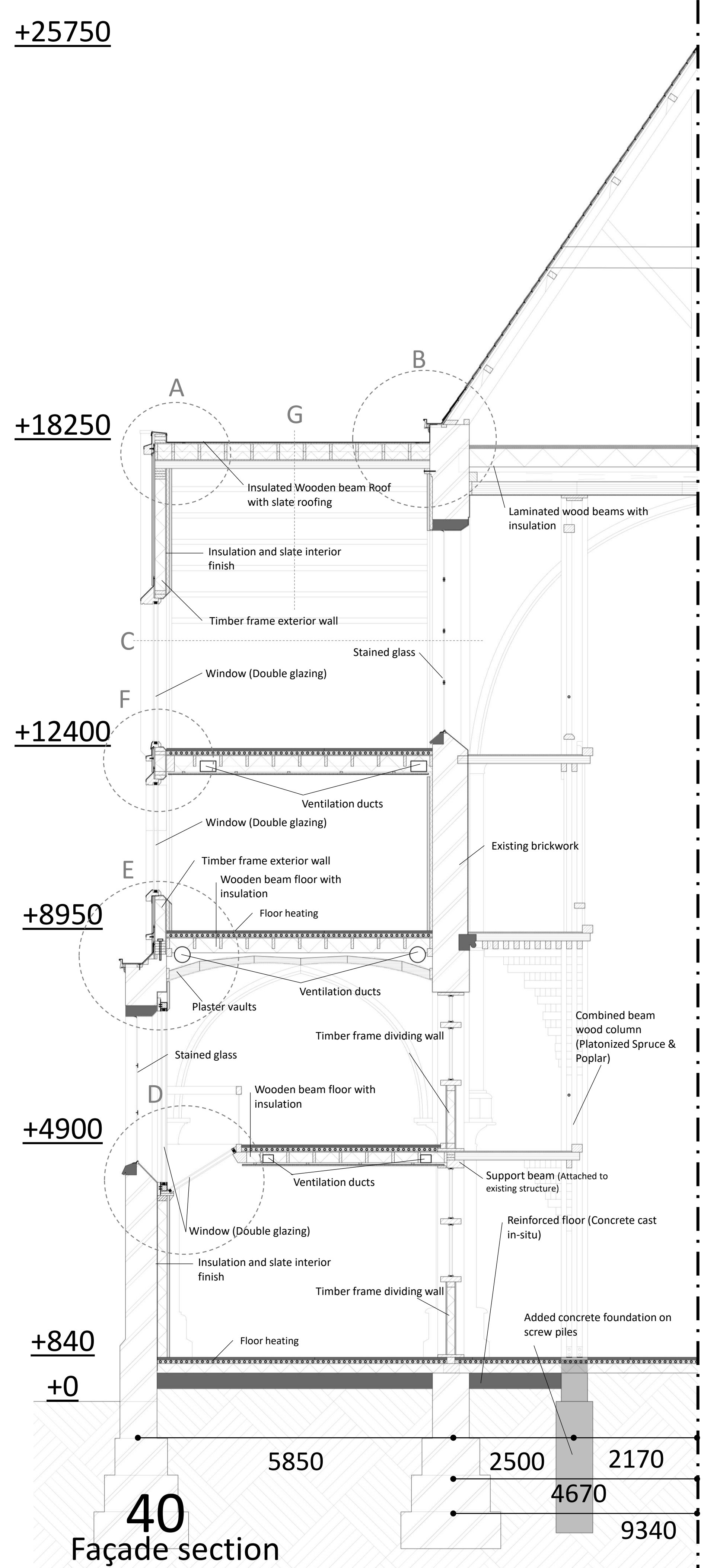


# Construction

## Details:



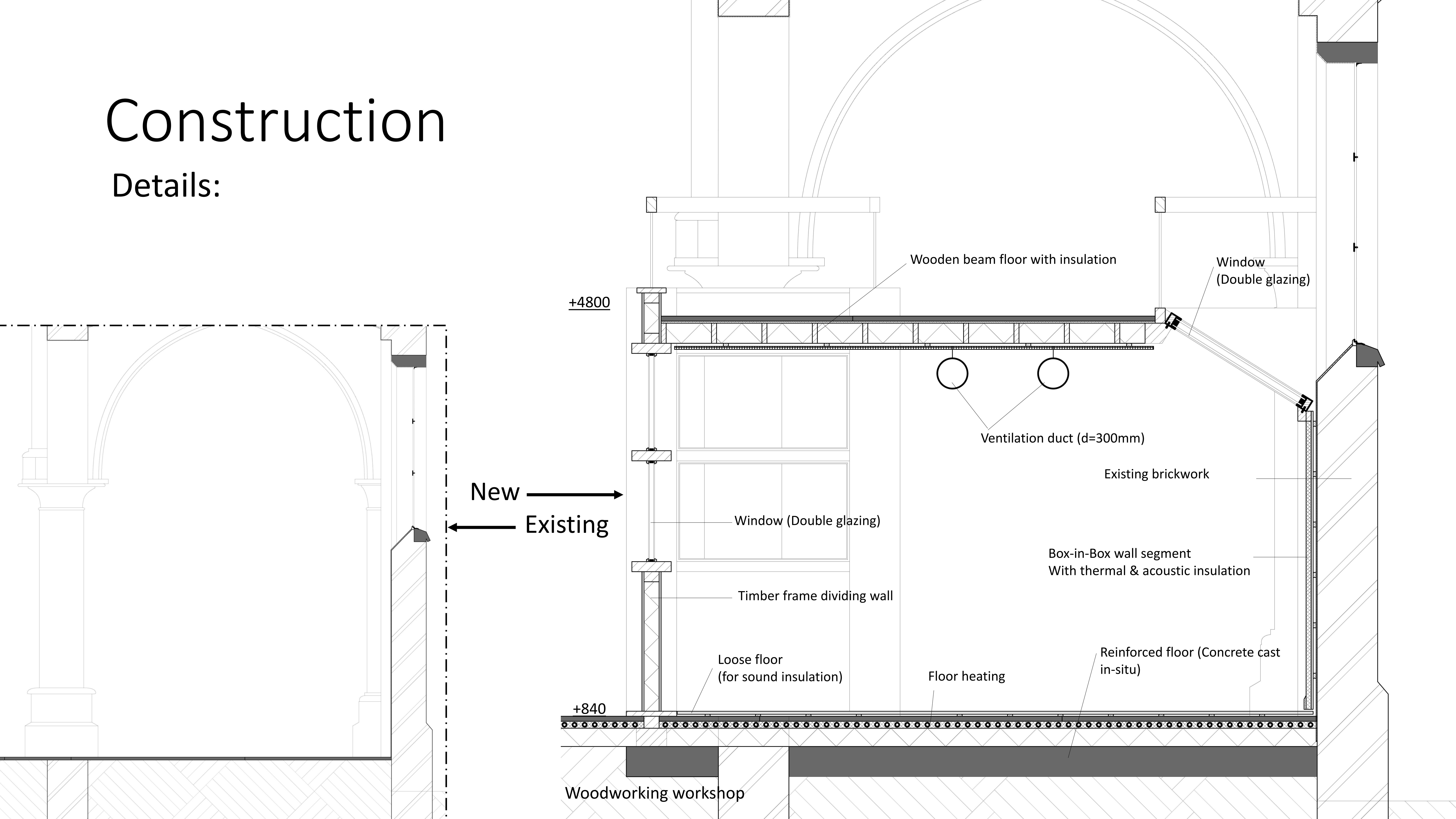
← Existing  
New →





# Construction

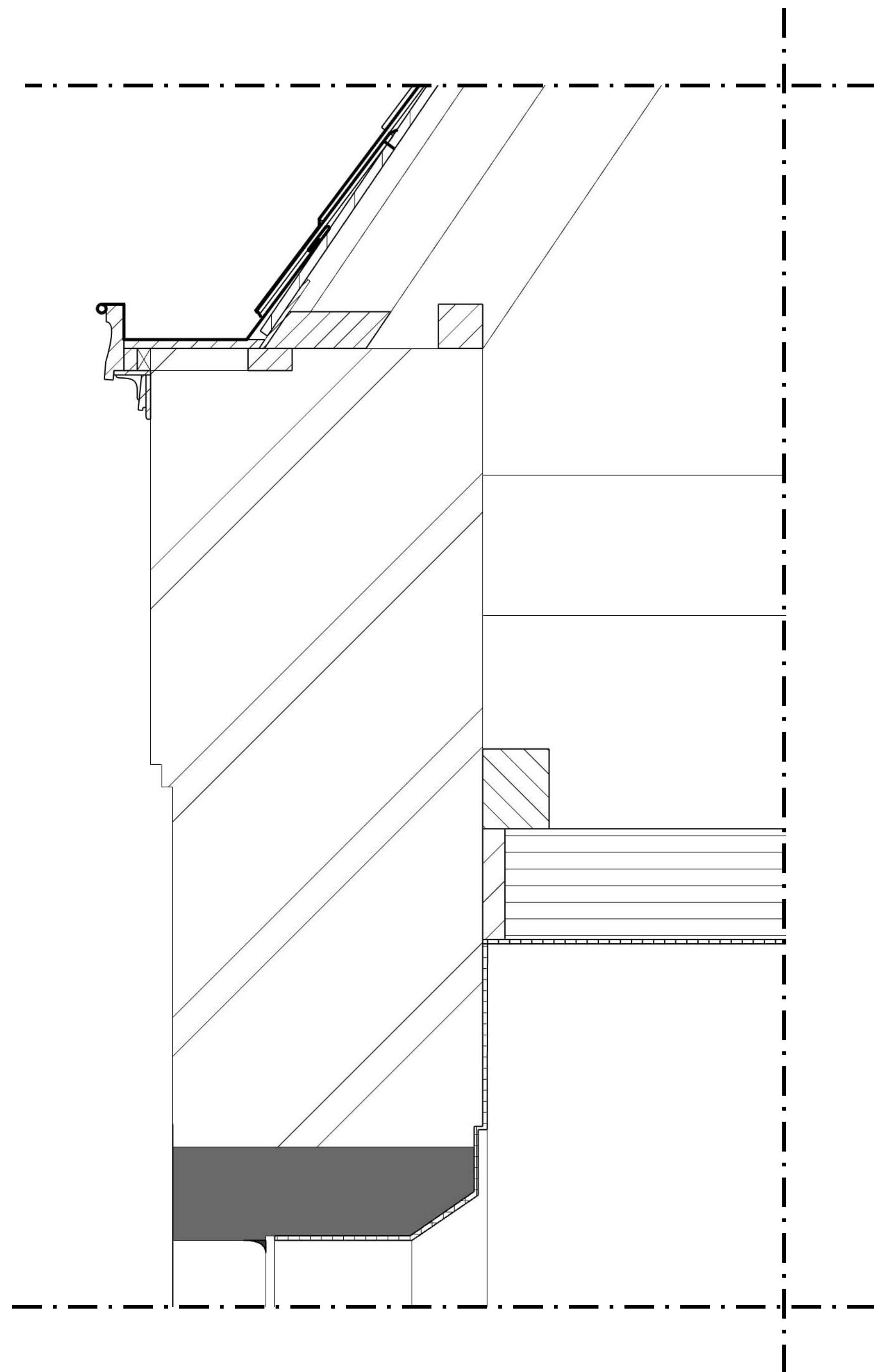
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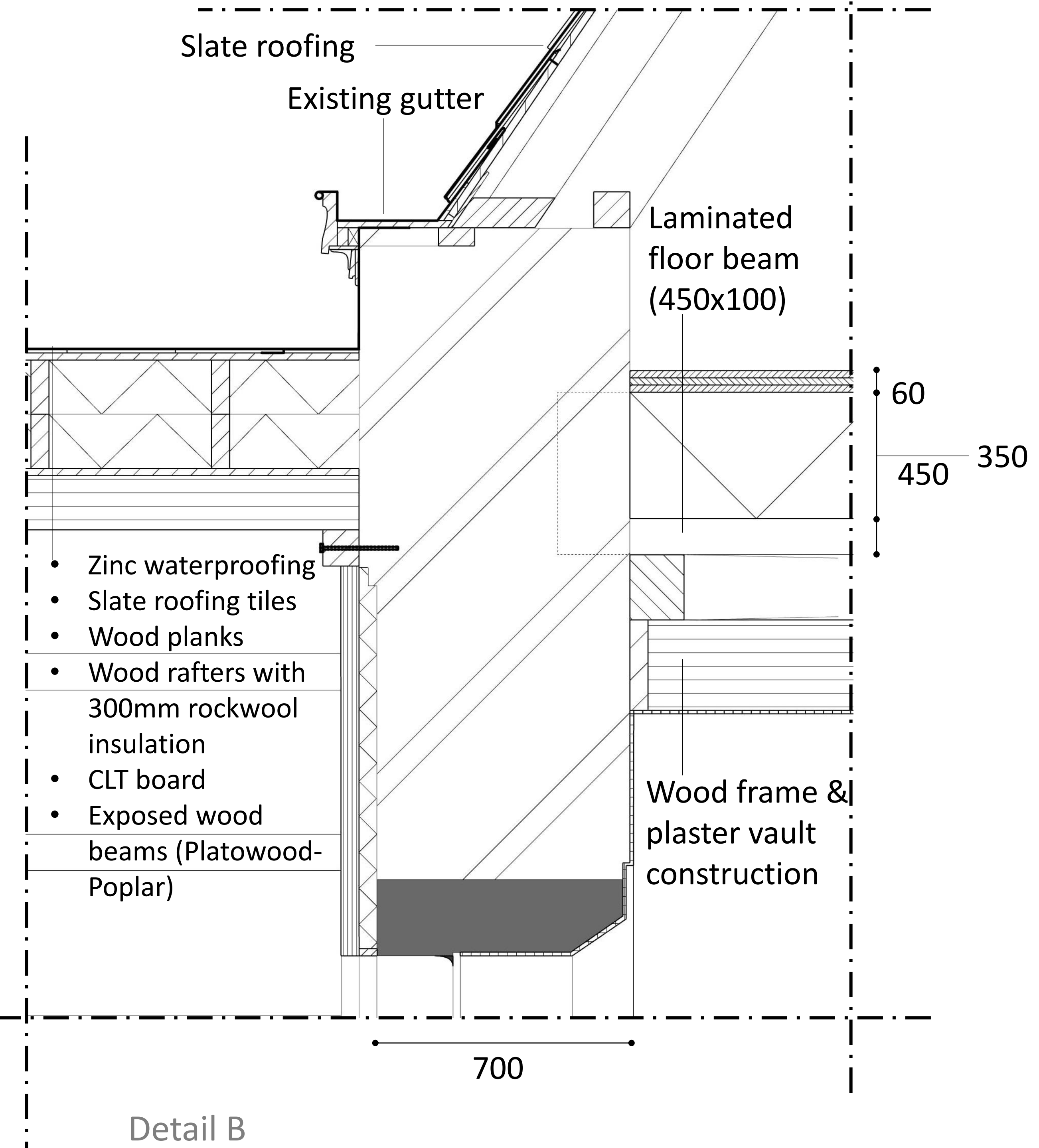
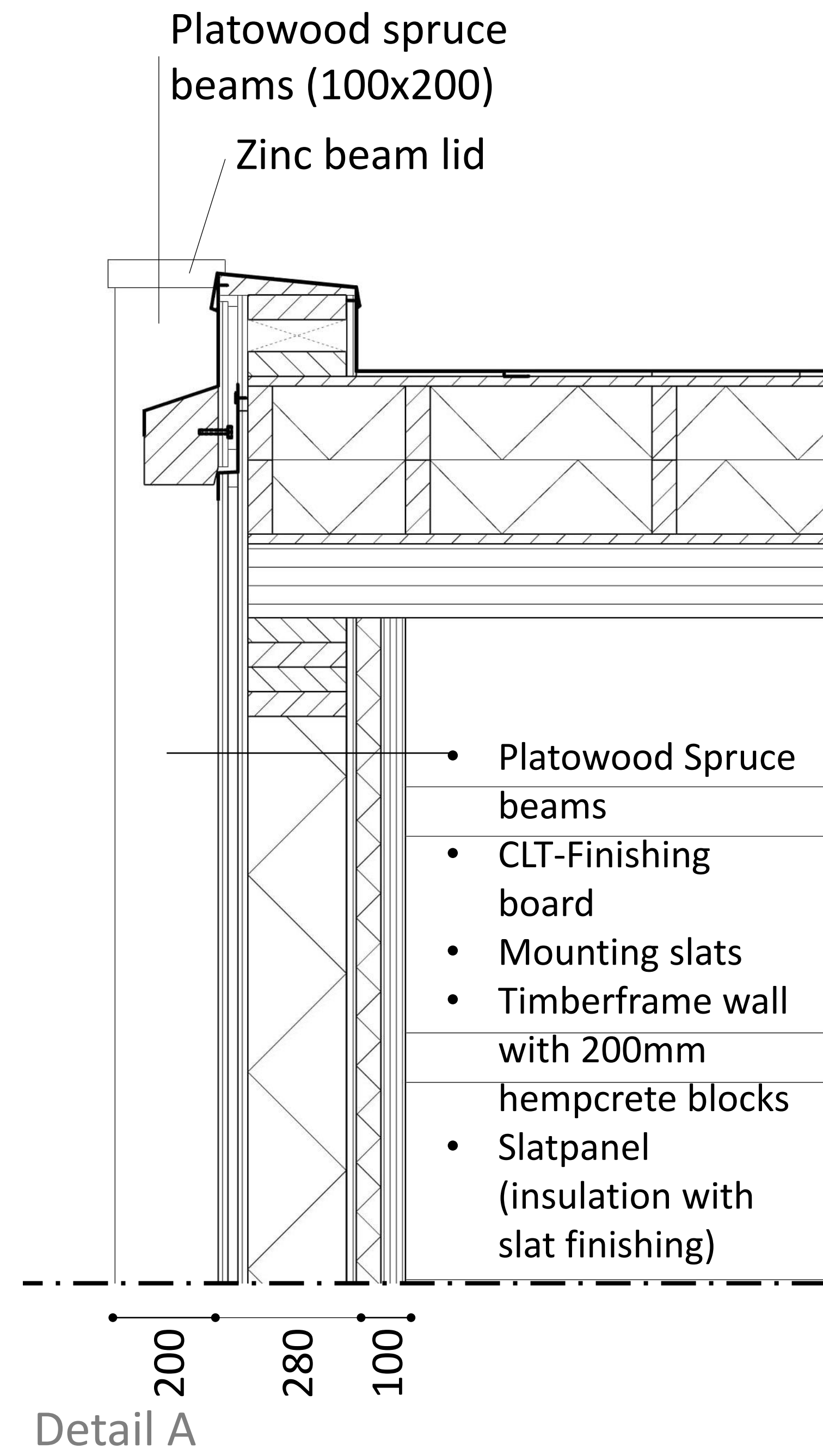


# Construction

## Details:



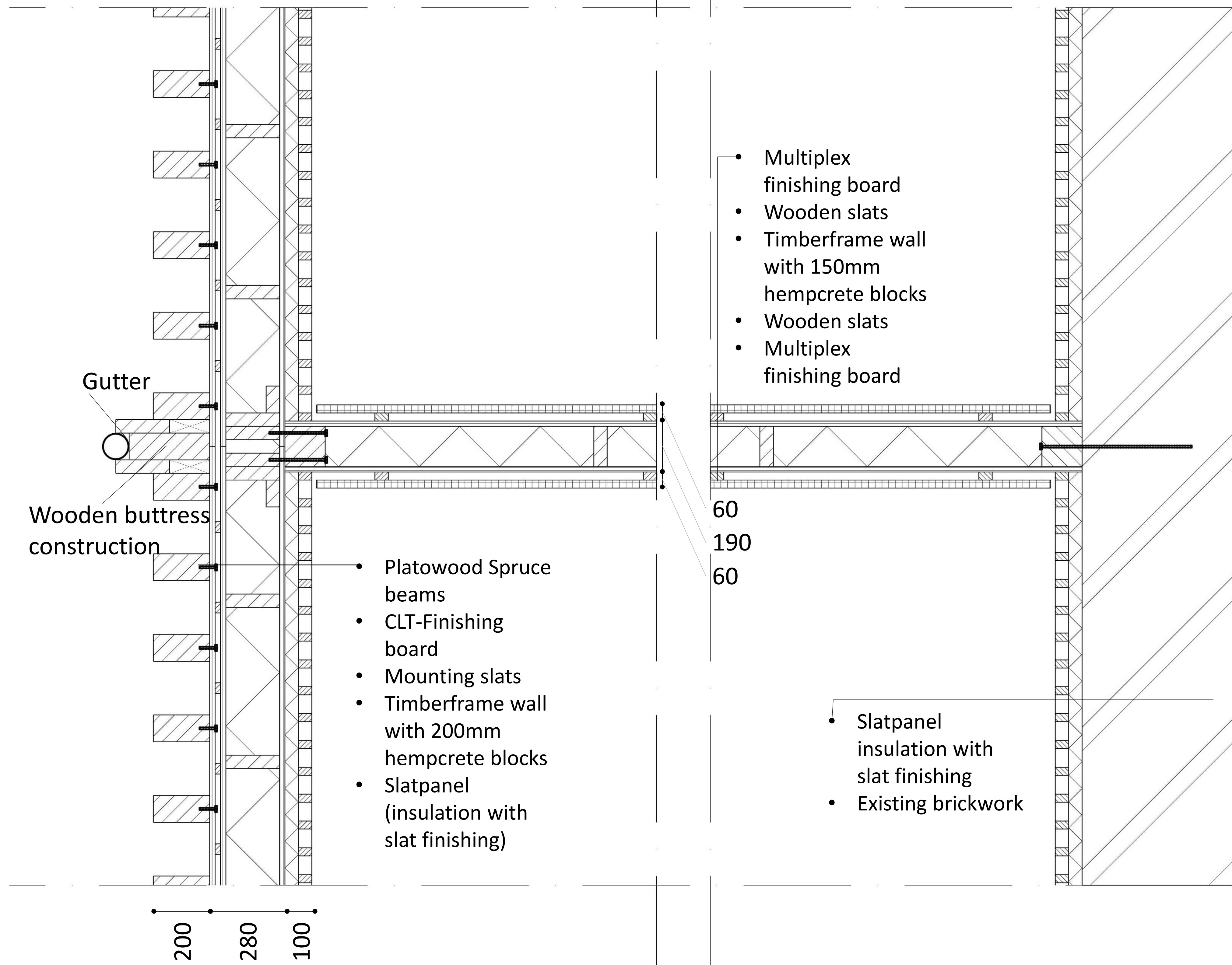
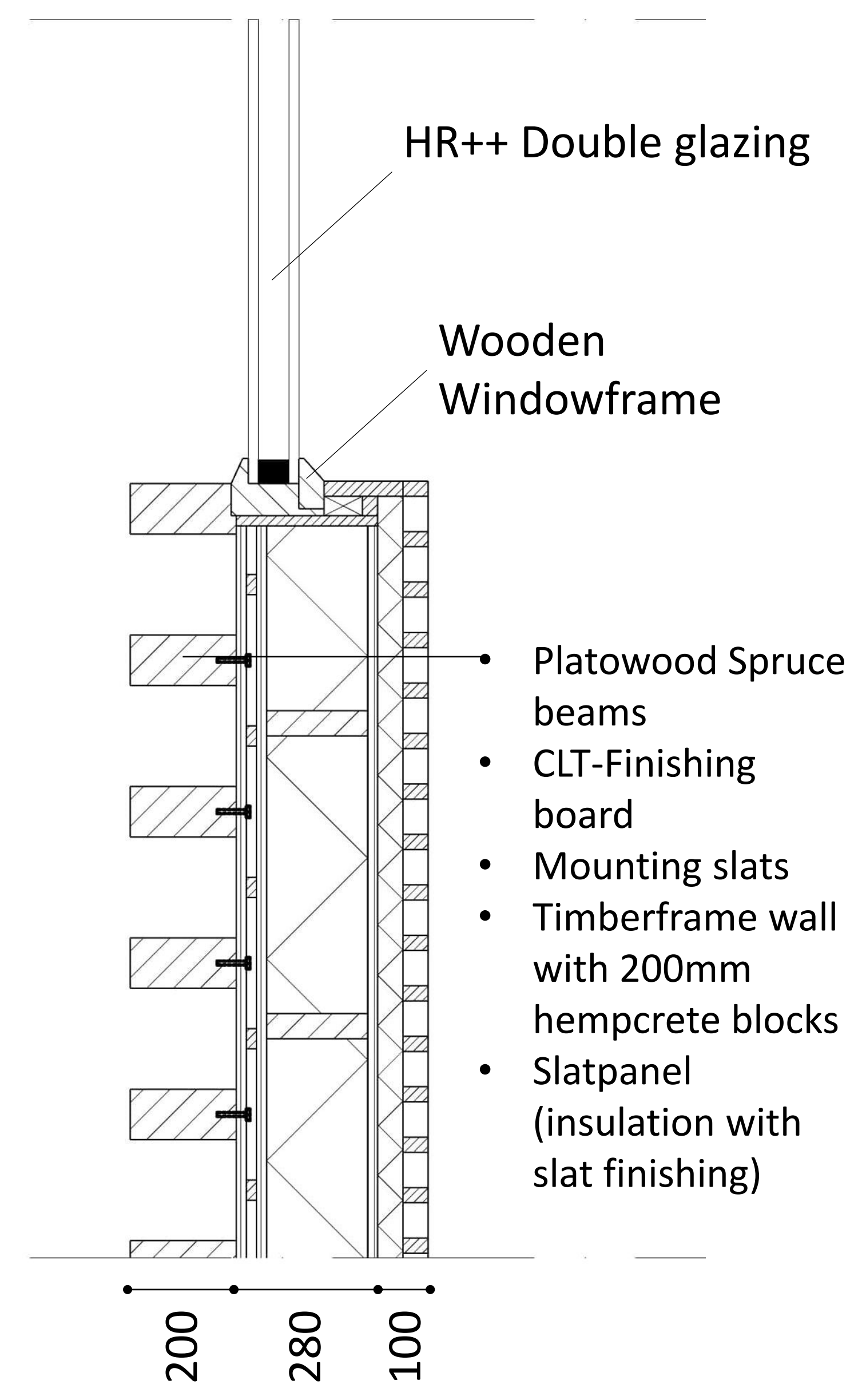
New →  
← Existing





# Construction

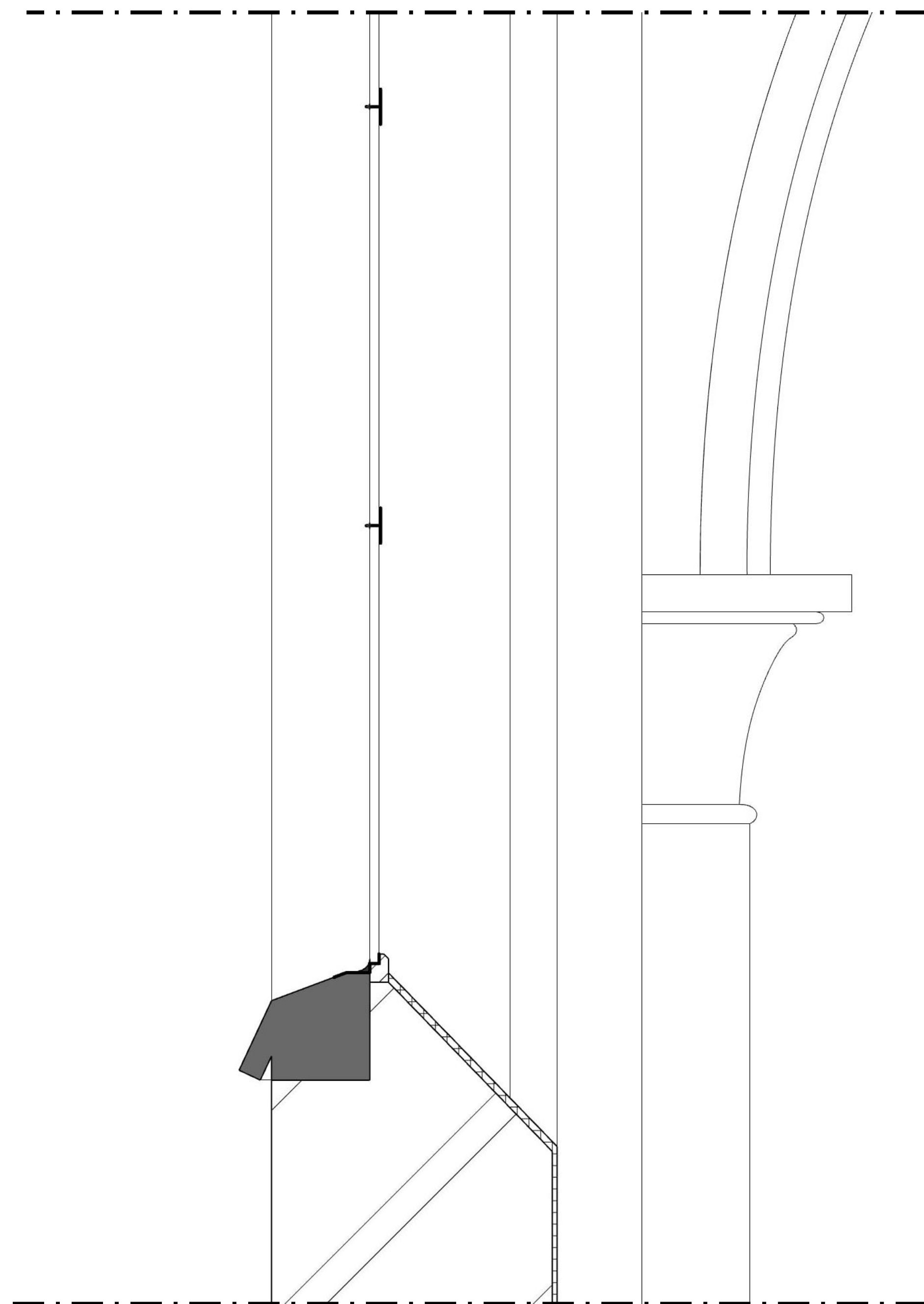
## Details:



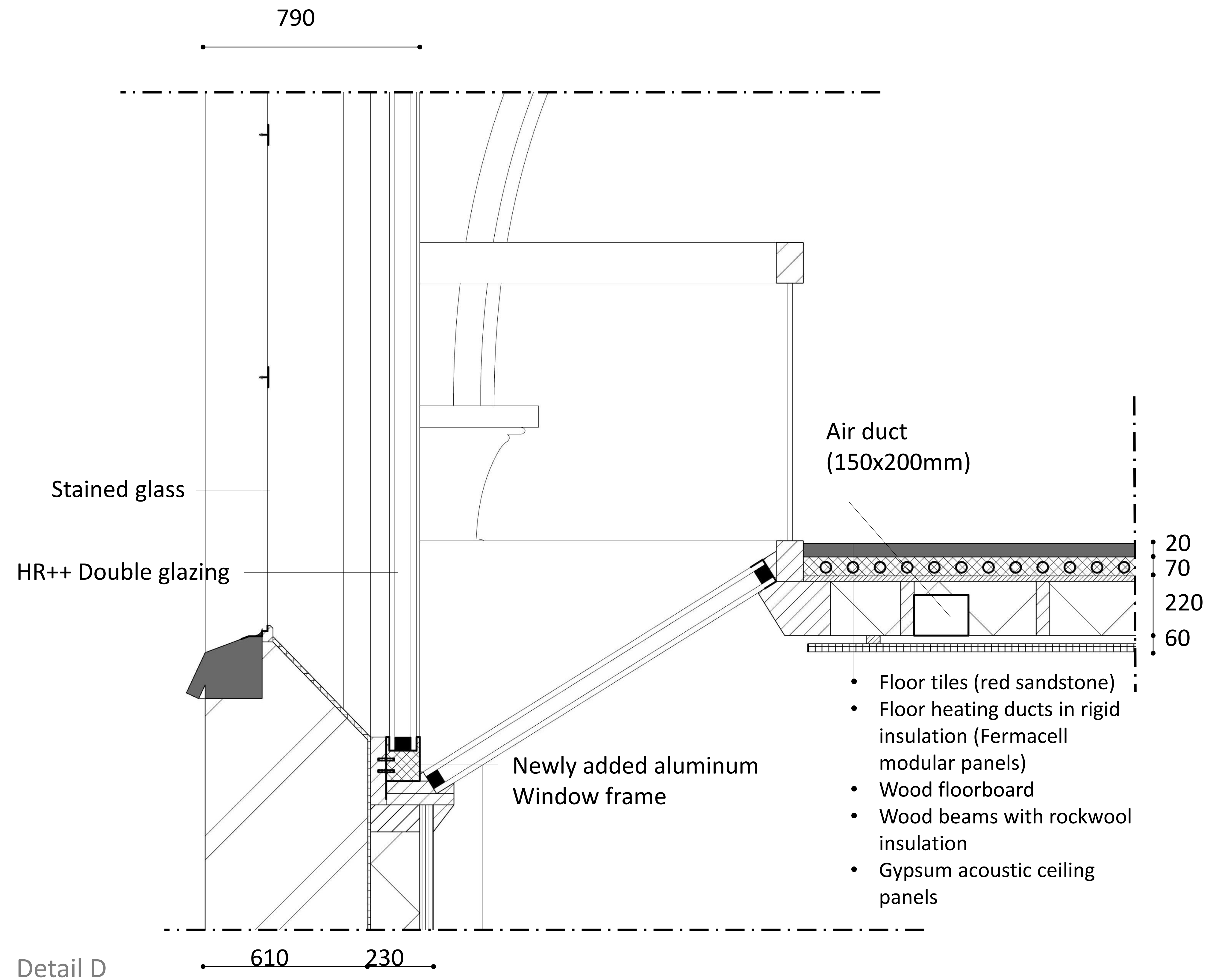


# Building

## Details:



New →  
← Existing

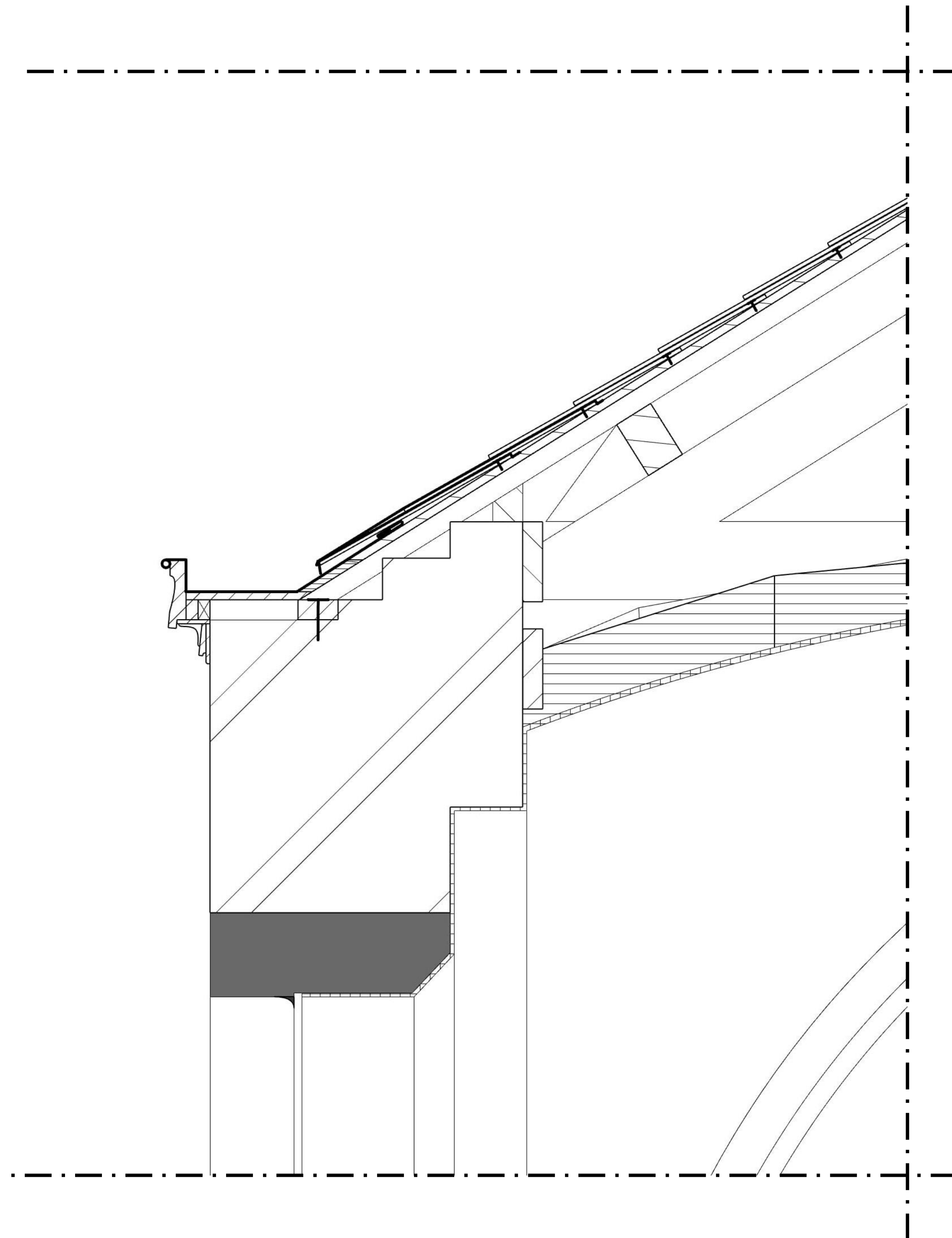


Detail D



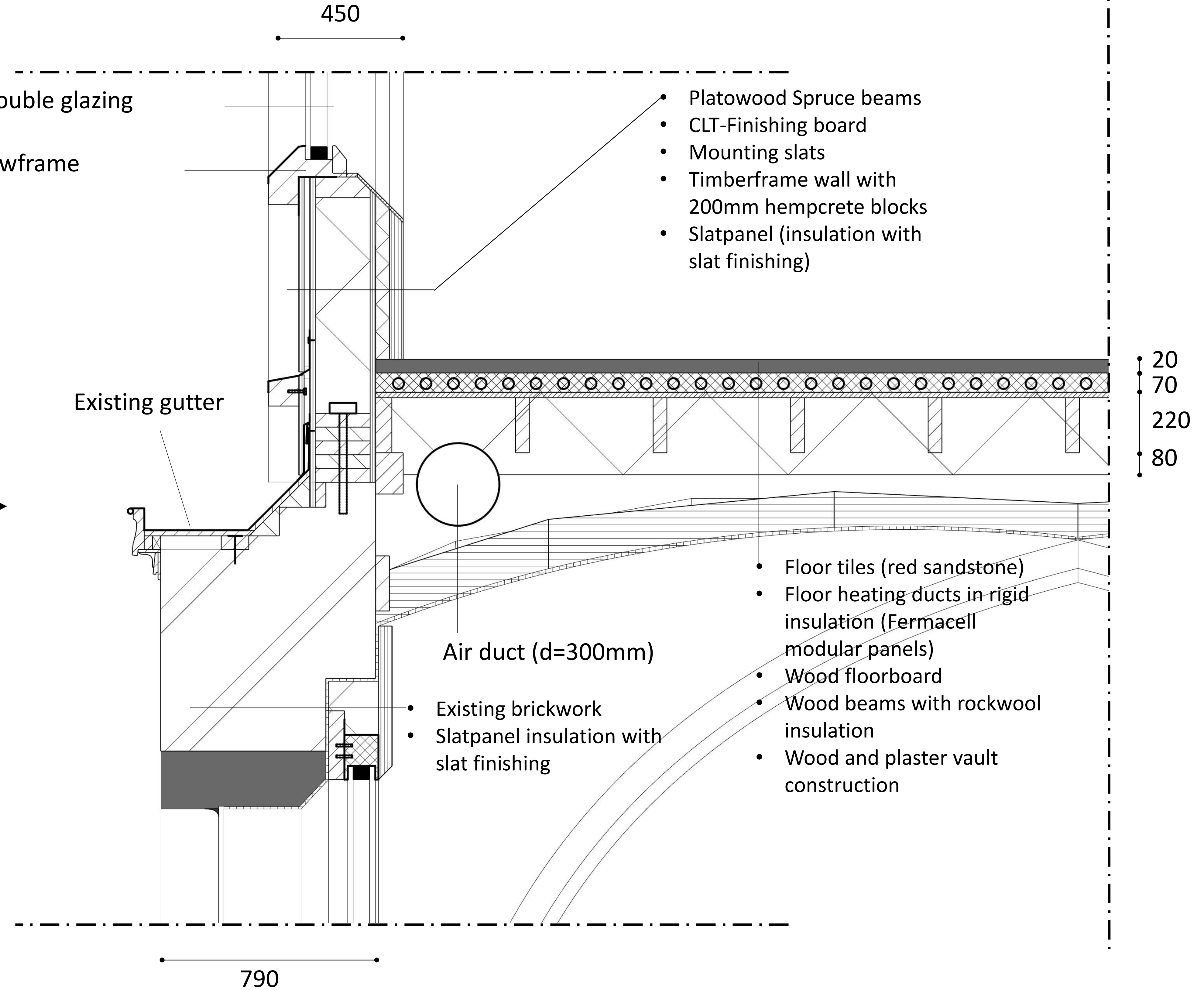
# Building

## Details:



New →  
← Existing

HR++ Double glazing  
Wooden windowframe

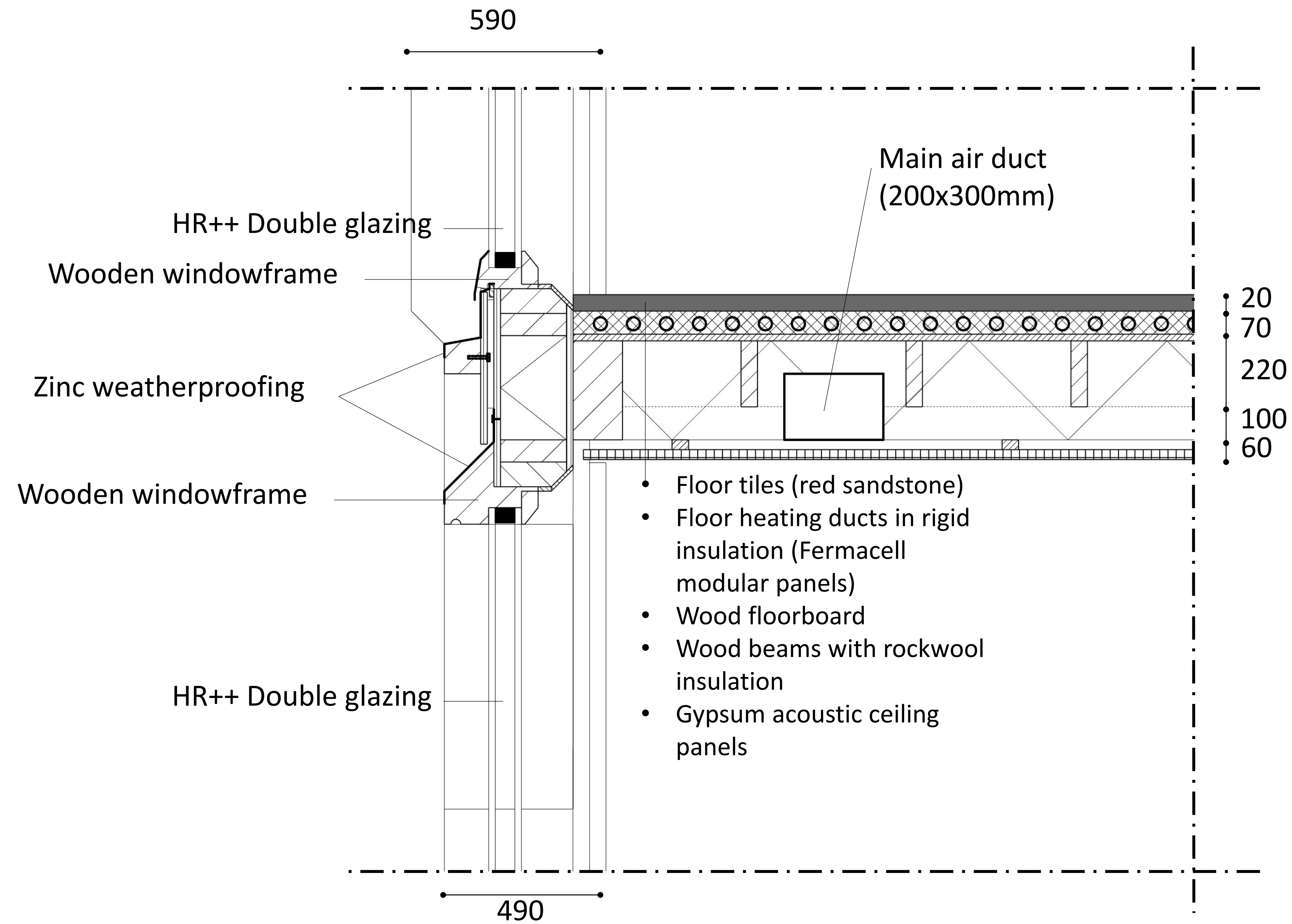


Detail E  
45

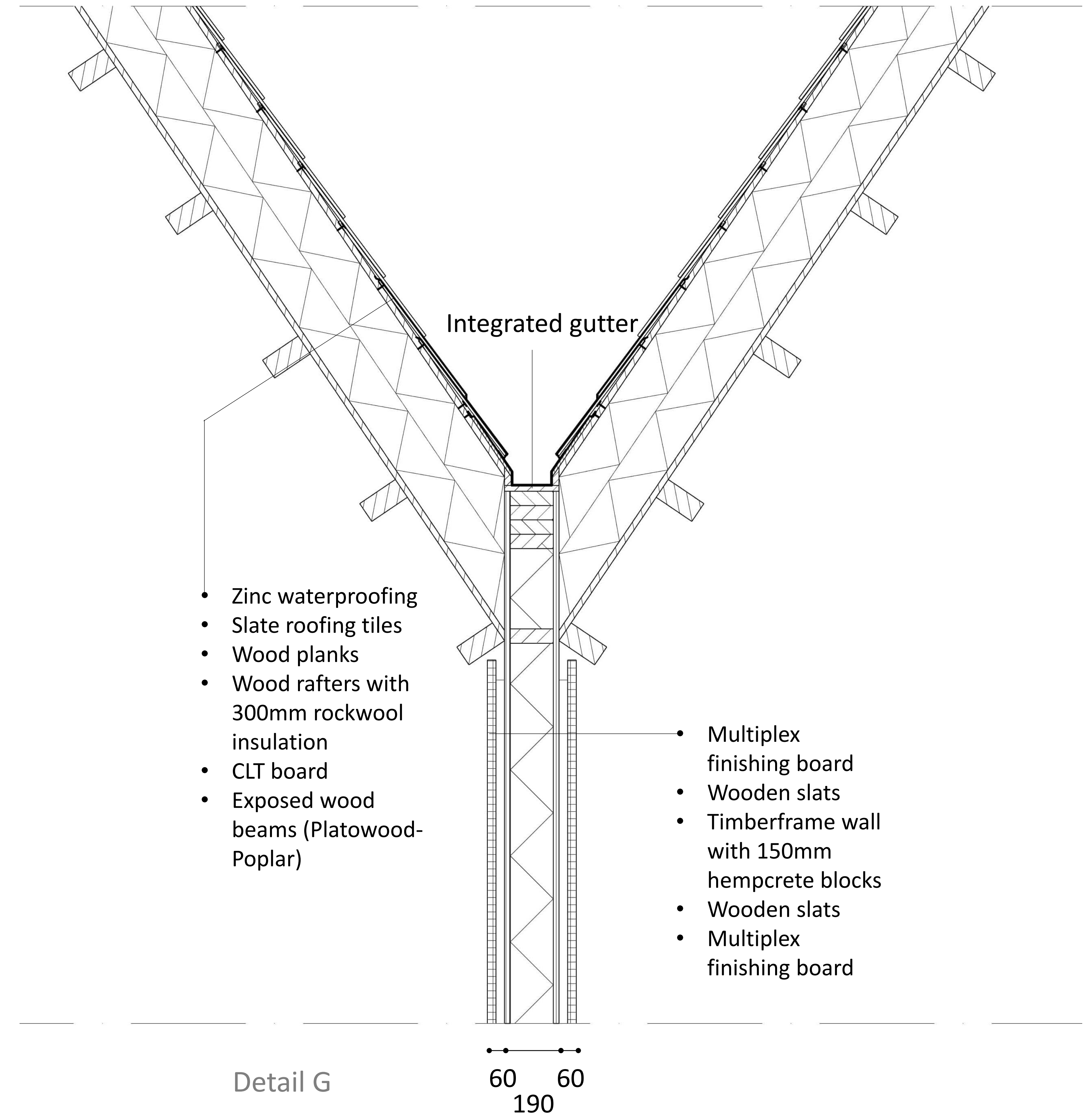


# Building

## Details:



Detail F

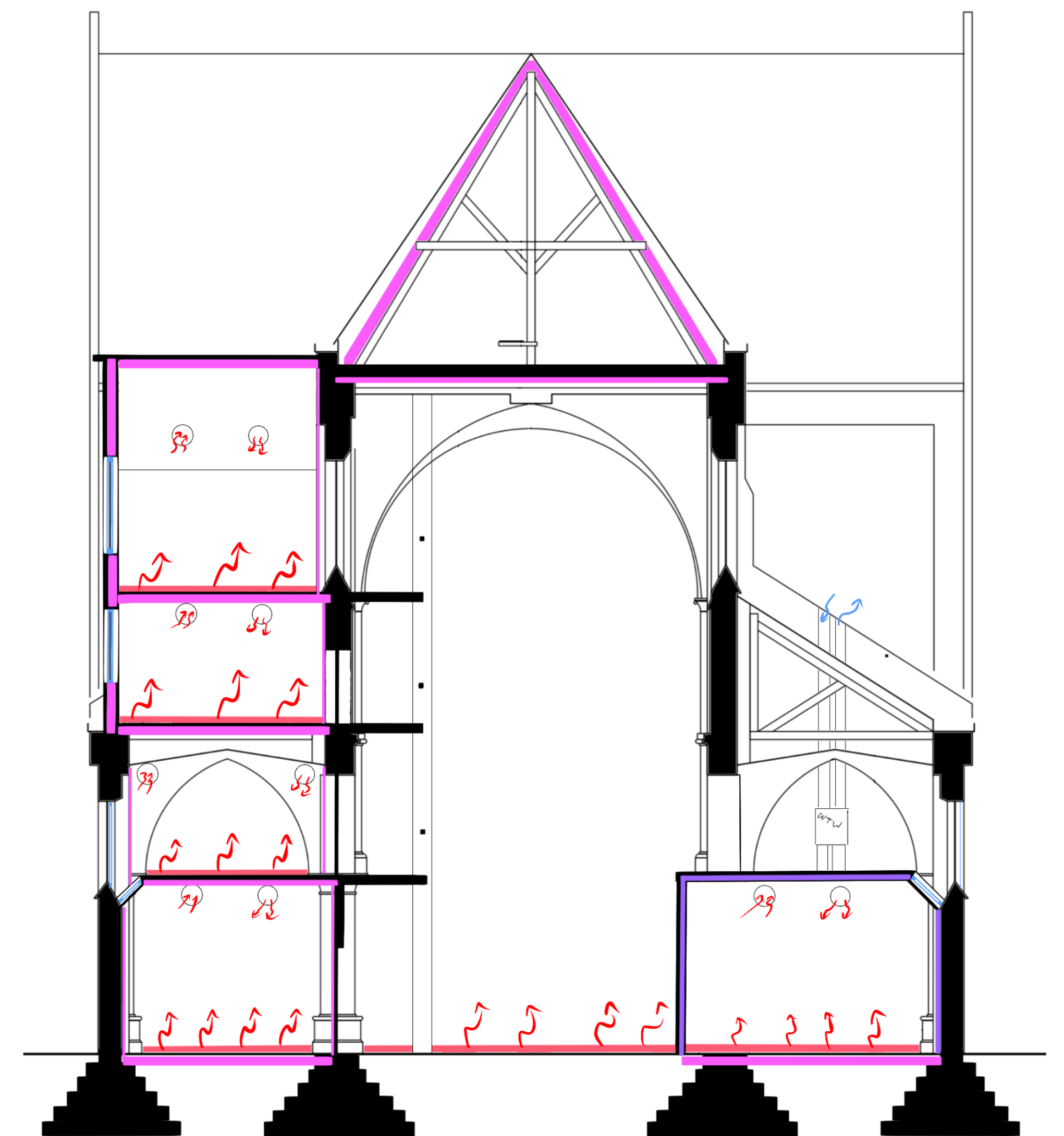
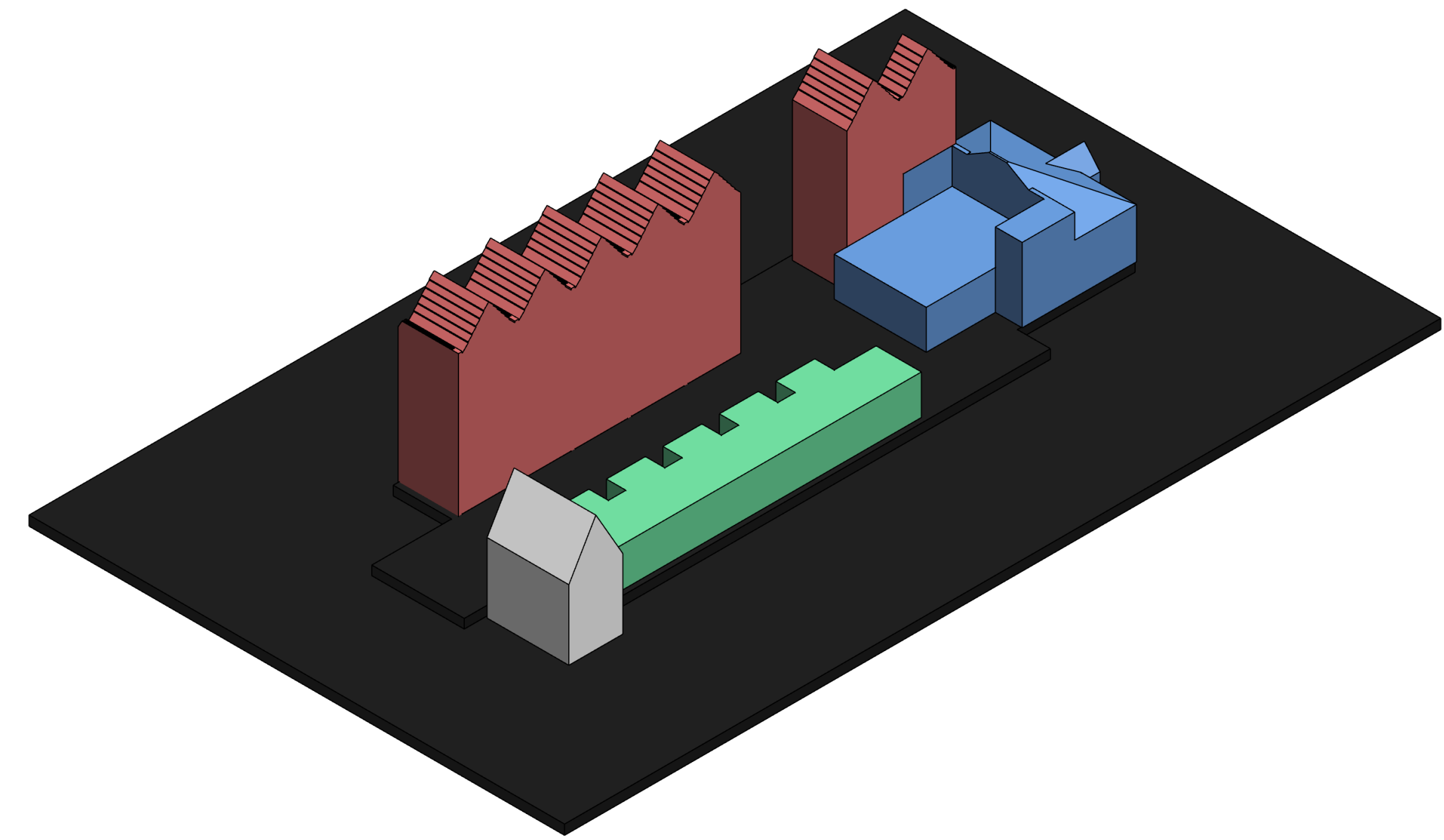


Detail G



# Sustainability principles

- Three dedicated climate regulated zones.
- Individual zones are individually regulated and insulated.
- Floor heating for comfort throughout the building.
- Fire safety regulated by use of specialized sprinklers for wood-construction (To safeguard open character of the building).
- Heat exchange units applied with mechanical ventilation (in & out).
- Groundwater source heat pump for sustainable heating and cooling.





# Recap

- The architecture employed ensures continuation of the historic architecture with modern concepts, materials and practices.
- Biobased and modular construction ensures circular building practices.
- Maintaining and enhancing public role and usefulness continues and honors the historic role of the church in the community.
- Continuing the gothic building principles creates an interesting and unified ensemble that clearly links itself to the existing structure.
- The architectural method employed dictates that use wise and spatially, the program and design make most sense in the existing narrative and structure of the R.K. Barbarakerk.
- Material choice in this project was heavily influenced by the focus on zero-waste, for projects with less focus on this aspect, other materials are also well suited to transforming a (neo)gothic building by continuing the gothic method/mindset.
- Using the gothic and narrative approach for the transformation of the R.K. Barbarakerk ensures the preservation of the historic character, symbolism and role. This results in an adaptation where the original structure is minimally altered, as well as where the architecture retains some level of meaning and relates to original artifacts, keeping them part of the ensemble and not having the icons end up in a warehouse for indefinite storage. This results in minimal Physical and immaterial waste.





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Thanks for your attention

Questions?



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22-06-2023