Architectural Technology and Construction Management
2019 - 2022

Portfolio

Pauline Carstens

Pauline **Carstens**



I am a 24-year-old Construction Architect from Germany who thrives on challenges and in collaboration with others. I am curious, detail oriented, and a critical thinker. My passions are sustainable, circular, and energy-efficient building design and workflow optimization within BIM or project management.

I love to learn and am never afraid of a challenge.

for more drawings, videos & construction management material visit my website at

pauline-carstens.webnode.com

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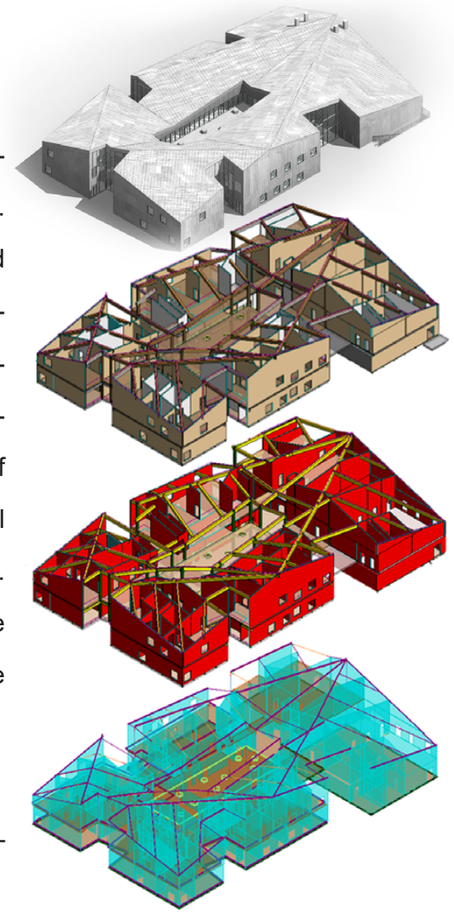
Børnehus i Skovlunde

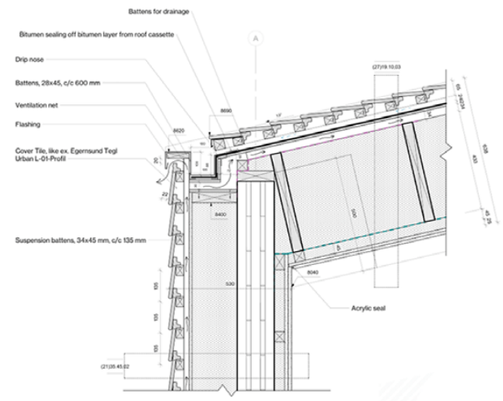
6th semester technical bachelor project

Based on a design proposal by Cobe for a 3500 m² daycare institution for nursery and kindergarten in Skovlunde, Ballerup Kommune. The concept is about flexibility: Th building is organized around seven “home rooms” with connected depots, wardrobes and bathrooms. They are flexible to be used either as a nursery or kindergarten room. My changes from the concept were to change the material for the superstructure to timber with concrete cores instead of 100% concrete; I added a basement for bike parking and technical rooms and made floorplan changes to align with fire safety needs. As the concept design had cover tiles on both facades and roofs, the roof’s slope had to be changed, and two different pitches had to be added for drainage. A water-tight under roof is still needed.

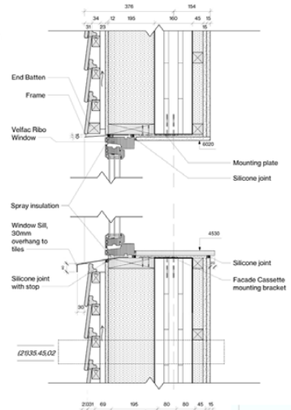


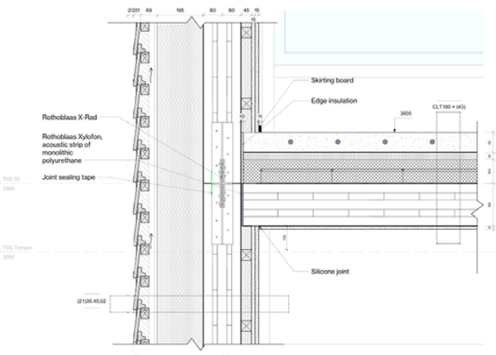
3D architectural, structural and analytical model———

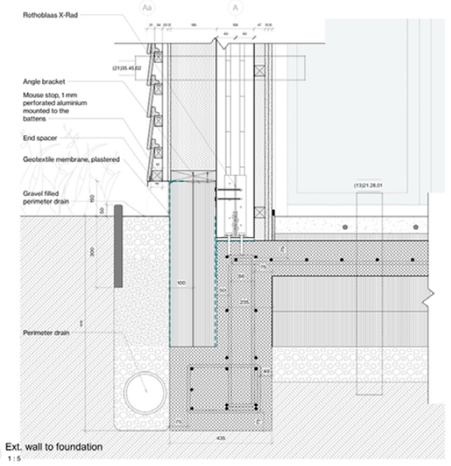




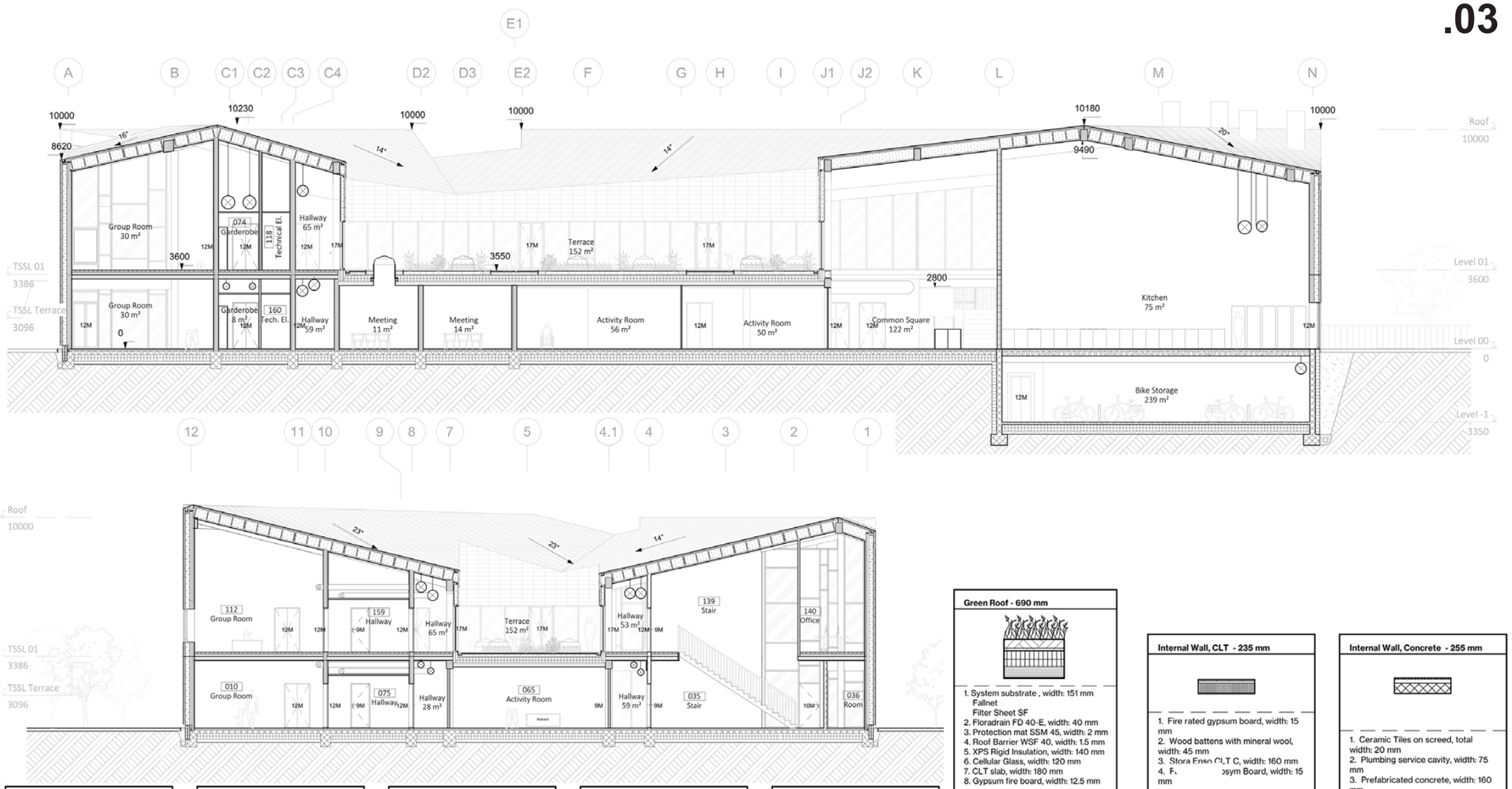
1 Roof to Ext. W
1 : 5







1 Ext. wall to foundation
1 : 5



External Wall, CLT and Tiles - 530 mm

1. Ceramic Cover Tile (fx. Egernsund Tegl Urban) fire class A1, on 34x45 mm battens, total width: 65 mm
2. Wooden batten, width: 23 mm
3. Wind barrier, fiber cement orasphalt impregnated wood fiber board, width: 12 mm
4. Wood studs with mineral wool, width: 195 mm
6. Stora Enso CLT C or pre-fab, reinforced concrete, width: 160 mm
7. Wooden batten with mineral wool filling, width: 45 mm
8. Fire-rated Gypsym Board, 2 x 15 mm, total width: 30 mm

External Wall, Stud and Tiles - 165 mm

1. Ceramic Cover Tile (fx. Egernsund Tegl Urban) fire class A1, on 34x45 mm battens, total width: 65 mm
2. Wood studs, width: 100 mm

External Wall, Sleeping Room - 429 mm

1. Fibercement board, width: 12 mm
2. Wooden batten, width: 35 mm
3. Wind barrier, fiber cement orasphalt impregnated wood fiber board, width: 12 mm
4. Wood studs with mineral wool, width: 195 mm
6. Stora Enso CLT C, width: 160 mm
7. Fire-rated Gypsym Board, total width: 15 mm

External Curtain Wall

Stabalux AL, system width 80 mm
Equipped with safety glass

Insulated Panels
1. Ceramic Cover Tile (fx. Egernsund Tegl Urban) fire class A1, on 34x45 mm battens, total width: 65 mm
2. Aluminium, width: 3 mm
4. Insulation, width: 160 mm
5. Aluminium, width: 3 mm
6. Gypsum board, width: 12.5 mm

External Wall Basement Wall - 487 mm

1. Drainage mat, width: 12 mm
2. XPS insulation, width: 200 mm
3. Concrete cast in situ, width: 275 mm
4. Paint

Green Roof - 690 mm

1. System substrate , width: 151 mm
   Fallnet
   Filter Sheet SF
2. Floradrain FD 40-E, width: 40 mm
3. Protection mat SSM 45, width: 2 mm
4. Roof Barrier WSF 40, width: 1.5 mm
5. XPS Rigid Insulation, width: 140 mm
6. Cellular Glass, width: 120 mm
7. CLT slab, width: 180 mm
8. Gypsum fire board, width: 12.5 mm

Roof - 614 mm

1. Tiles on battens, 34 mm, width: 65 mm
2. Bitumen (PF3500)
3. Plywood, width: 12 mm
4. Battens for Ventilation, width: 34 mm
5. Mineral wool λ34 between rafters, max. 600 mm c/c: 300mm, width: 433 mm
6. Fire-rated Gypsym Board, 2 layers á 12.5mm, width: 25 mm

Internal Decks - 397mm

1. Gerfloor Mural Ultra Design Color Skyline, width: 1.5 mm
2. Screed, width: 80 mm
   Floor heating c/c 300 mm
3. PE membrane
4. Soft impact sound insulation, width: 30 mm
5. Concrete backfill, width: 100 mm
6. CLT, width: 180 mm
7. Fire-rated Gypsym Board, width: 12.5 mm

Internal Wall, CLT - 235 mm

1. Fire rated gypsum board, width: 15 mm
2. Wood battens with mineral wool, width: 45 mm
3. Stora Enso CLT C, width: 160 mm
4. Fi… …gsym Board, width: 15 mm

Internal Wall, Concrete - 255 mm

1. Ceramic Tiles on screed, total width: 20 mm
2. Plumbing service cavity, width: 75 mm
3. Prefabricated concrete, width: 160 mm
4. Paint

Internal Stud Wall - 95 mm

1. Fire rated gypsum, width: 12.5 mm
2. Wooden studs with insulation, width: 70 mm
3. Fire rated gypsum, width: 12.5 mm

Internal Stud Wall - 165 mm

1. Ceramic Tiles on screed, total width: 20 mm
2. Fire rated gypsum, width: 12.5 mm
3. Plumbing service cavity, width: 50 mm
2. Wooden studs with insulation, width: 70 mm
3. Fire rated gypsum, width: 12.5 mm

Slab on Grade - 550mm

1.1 Gerfloor Mural Ultra Design Color Skyline, width 1.5
OR
1.2 Glued ceramic tiles in wetrooms, width 10 mm
2. Concrete, width: 150 mm
2. EPS Rigid Insulation, 2 layers á 150mm, width: 300 mm
3. Capilarry Break Layer, leca pellets, width: 150mm

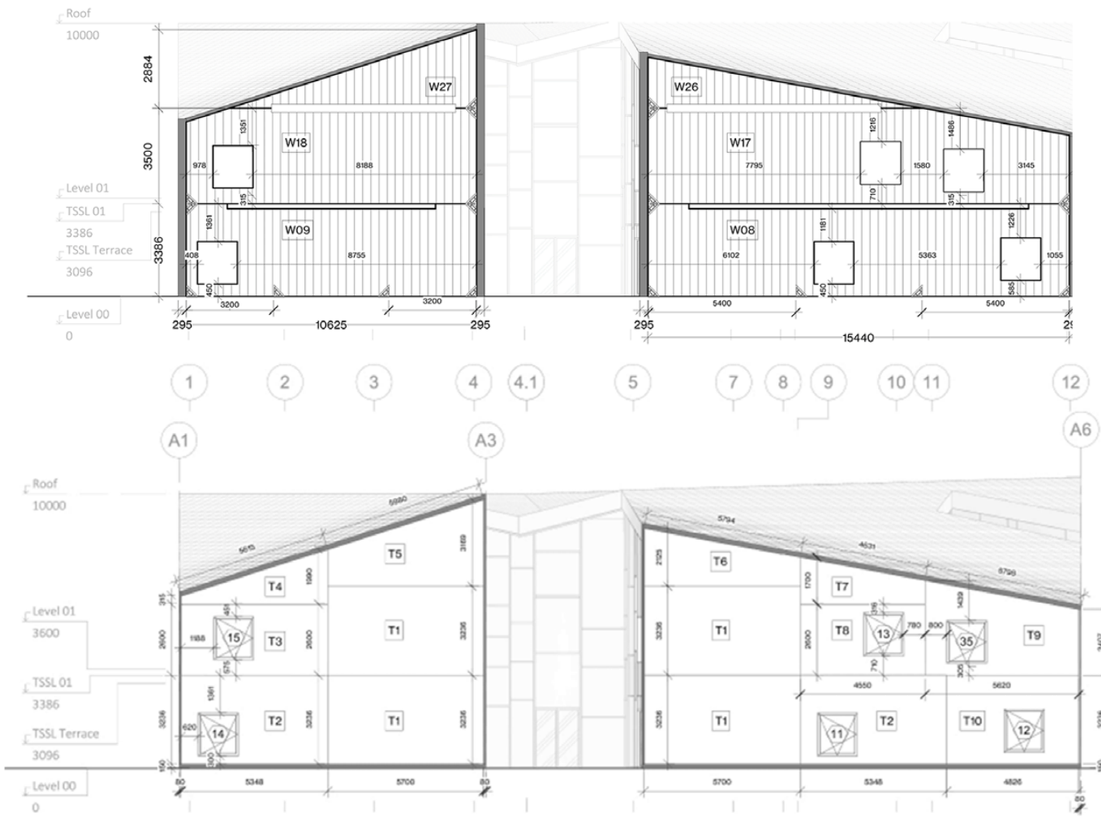
Hollow Cores

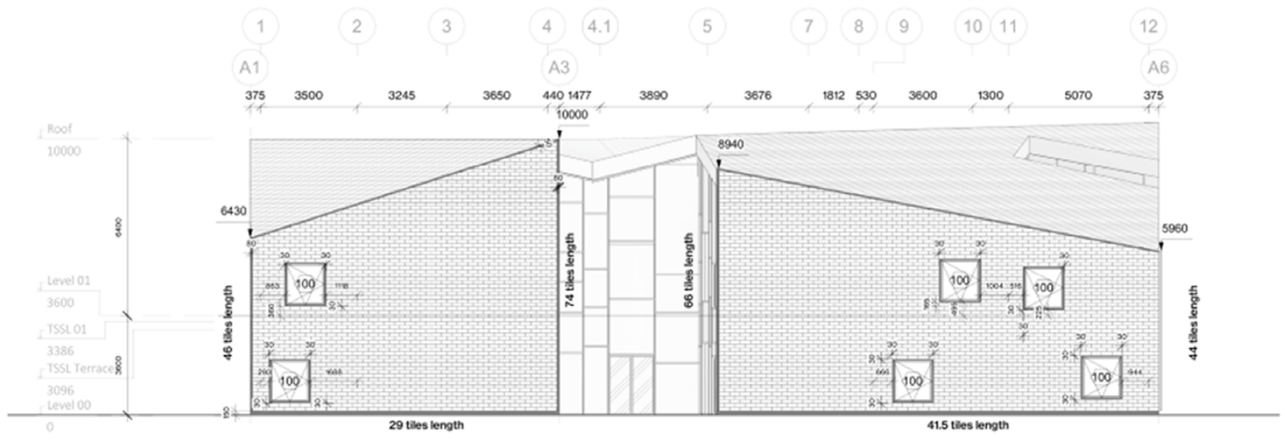
1. Gerfloor Mural Ultra Design Color Skyline, width: 1.5 mm
OR
1.2 Glued ceramic tiles in wetrooms, width 10 mm
2. Screed, width: 80 mm
   Floor heating c/c 300 mm
3. Pre-cast hollow core decks, width: 220mm

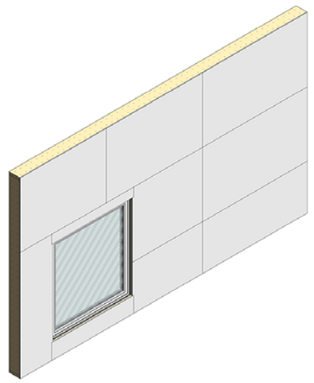
Focus

The focus area of this project was the facade, consiting of a CLT backleaf, prefabricated casettes for the insulation and tightness of the wall and cover tiles extending onto the roof. Some of the challenges I encountered were acoustics, as the kindergarten is wedged between main streets and the rail way, fire flass, heat loss and moisture.



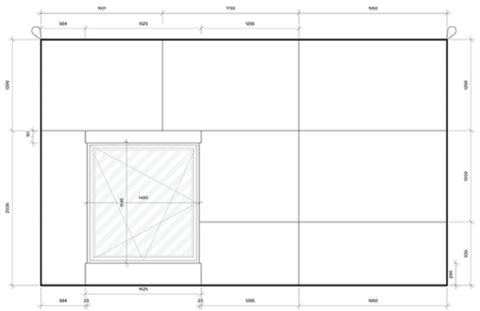




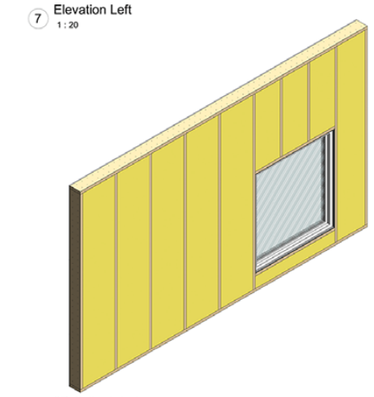


1 3D Ortho Interior

2 3D Ortho Exterior



7 Elevation Left
1 : 20



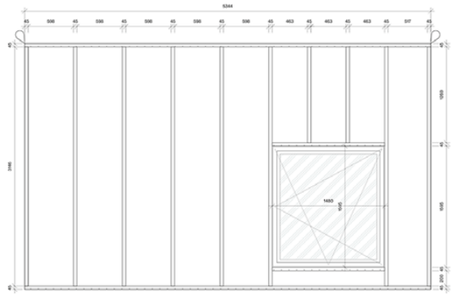
6 Elevation Front
1 : 20



4 Elevation Back
1 : 20



10 Plan Detail
1 : 20



8 Elevation Right
1 : 20

Focus

For the layout of the facade elements, I focused on buildability and unity amongst the pieces so that they could be pre-fabricated and the same in different parts of the building, thus minimizing cost and building time on site.

Wall Cassette T2 - (21)35.45,02

Part List

8 Studs, timber C24
h: 3146 mm | w: 195 mm | t: 45 mm
Tolerances: distances +/- 5 mm, timber all measurements +/- 2 mm

2 top and bottom plate, timber C24
h: 5344 mm | w: 195 mm | t: 45 mm
Tolerances: distances +/- 5 mm, timber all measurements +/- 2 mm

The studs are fixed to the top and bottom plate with coutnersunk wood screws (ø6 mm, l: 100mm)

13 m² Insulation, mineral wool, Isover Rulle λ34
Cut tolerance: oversize 5-8 mm

Insulation strips are placed between the studs, they must be pushed together tightly and must adhere close to the restraining studs so that effictive inuslation is achieved.

15 m² fiber cement board, wind board
Tolerances: thickness +/- 0.7 mm, width and length +/- 3 mm,

1 cm edge insulation around window







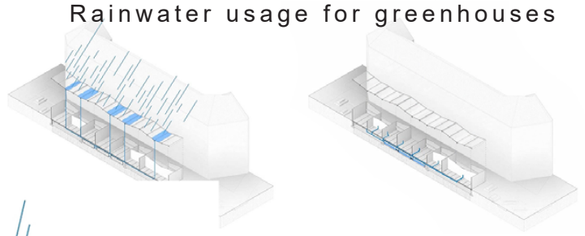
Rainwater usage for greenhouses

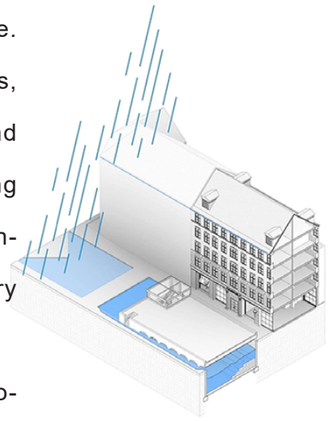
Kulturgaderne Urban Spaces

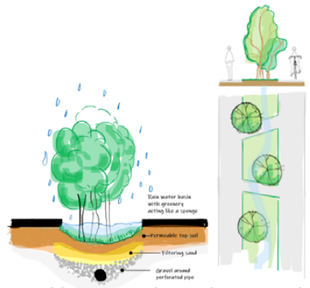
5th semester concept design

The project aimed to transform an old fire station on Adelgade in Copenhagen K and its surroundings into a more liveable and vibrant space. To work out a concept in the preliminary and project proposal stages, we focused mainly on the stretch of Adelgade between Klerkegade and Fredericiagade and the ground floor of the fire station. The surrounding areas between Klerkegade and St. Pauls Gade, as well as Kronprincessegade and Borgergade, were conceptually developed. Our primary focus points for the new development were:

- Car-free Copenhagen: Barcelona‘s superblocks theory and micro-grids for more silent and liveable streets
- Rain and stormwater management: We thus incorporated overflow areas and a sponge city;
- Urban farming and selling in market stalls
- Urban resilience by designing for multiple purposes.







Cloudburst basin and sponge city concept



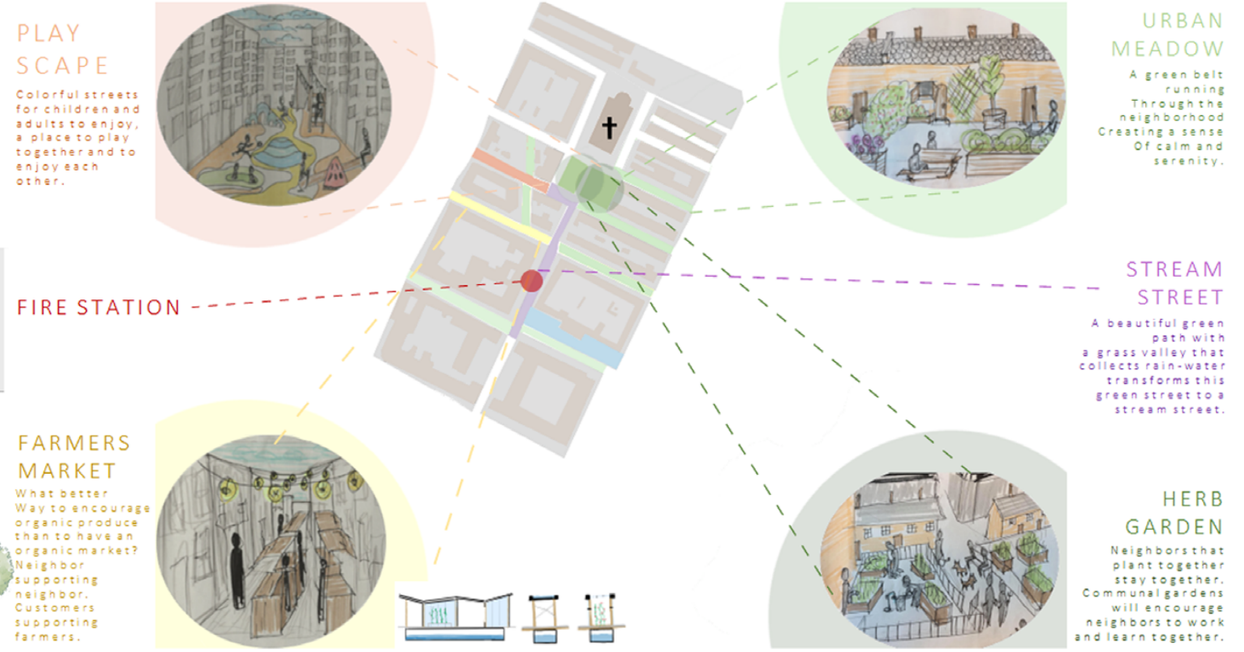
site plan and concept

firestation concept









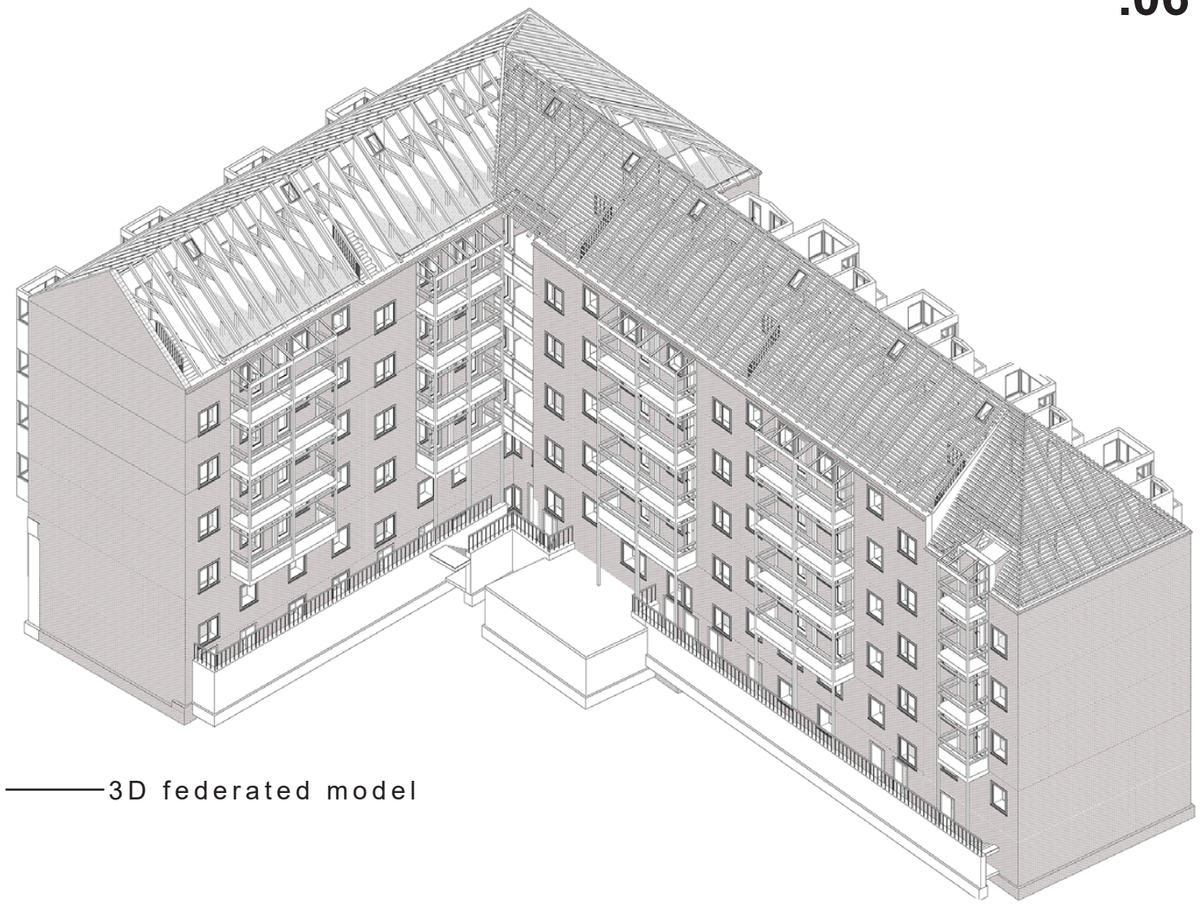


BIM Coordination

5th semester start-up

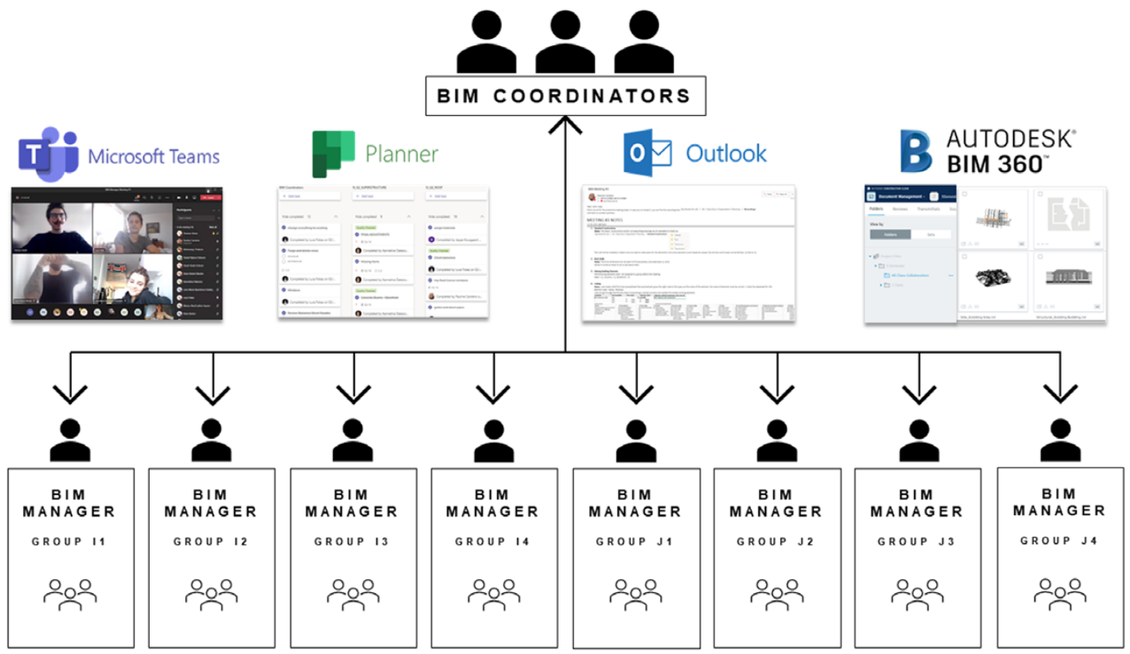
For the first two weeks of my 5th semester, we were challenged to collaborate with all 45 students from our year. The task was to collectively model an existing building to the highest level of development, using the 84-year-old original drawings. Two fellow students and I took the challenge further and served as BIM coordinators. Our job was to coordinate and organize all work. We started the first week by setting up a BIM collaboration agreement, project standards and a project time frame. We then divided the modelling, parameter and family management work among eight groups with one BIM manager. Not only that, but we mainly used only the second week for modelling the existing phase and quality checking each other's work. We created three separate models, an architectural model, a structural one and one hosting the site and location topography. For the next stage and the rest of the semester assignment, we detached all the models and provided each group with a copy.

During this process I learned lots about communication and processes in large collaborations. As everyone had different skill sets, we



3D federated model

collaboration organization



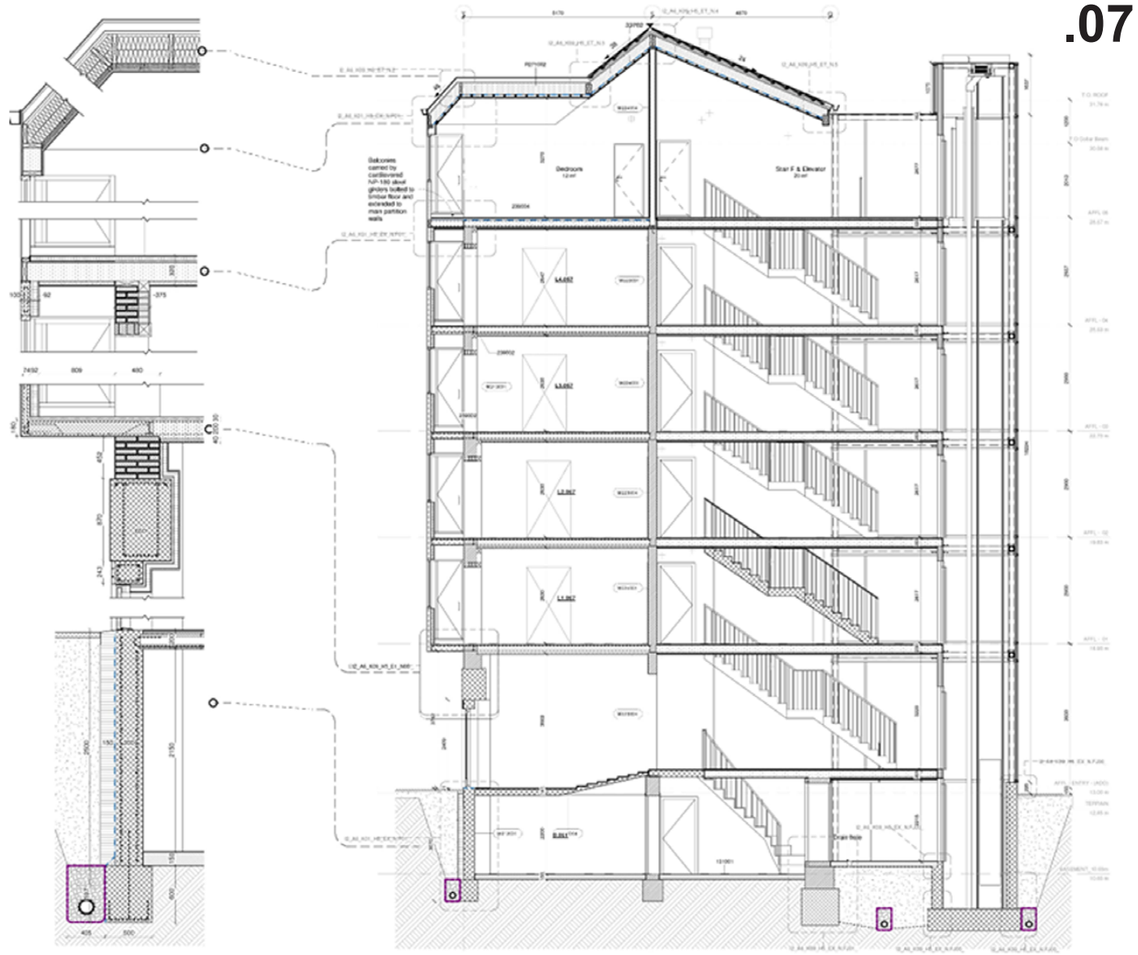




Residential Renovation Valby

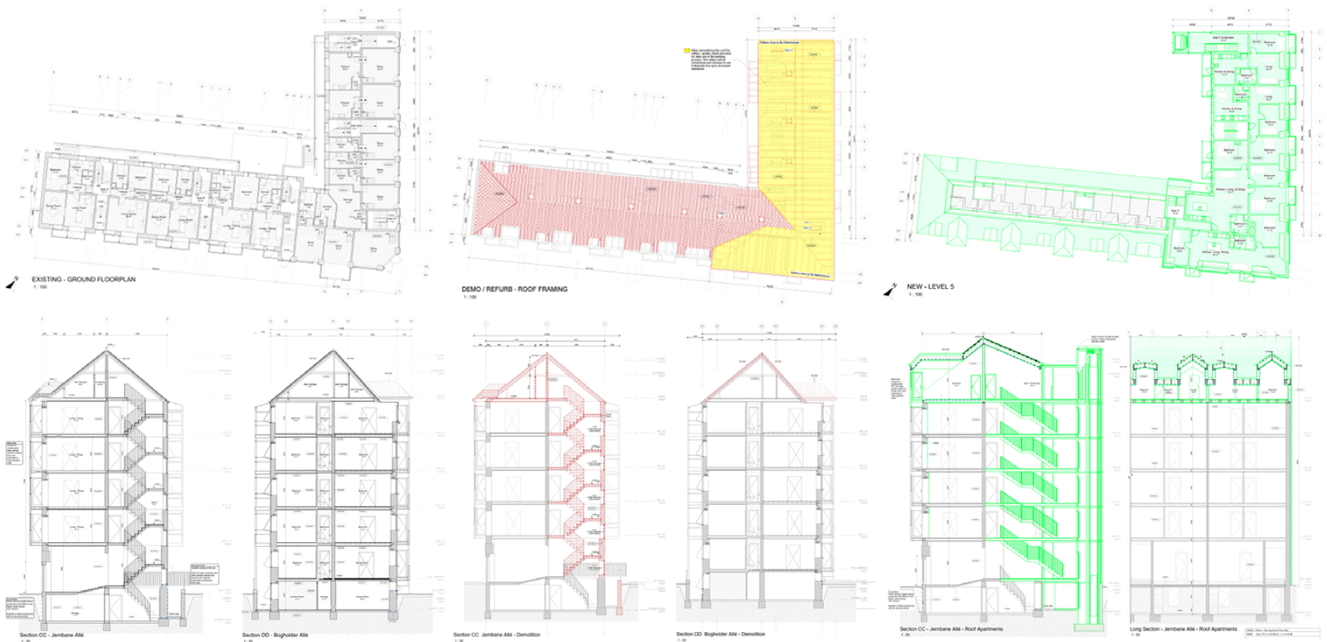
5th semester technical design

After collaborating on the work on the existing building, we worked through demolition and new construction phases of the building. The task was underpinning of the foundations, energy renovation, new roof apartments along Jernbane Allé, roof refurbishment along Bogholder Allé and the installation of mechanical ventilation and elevators.

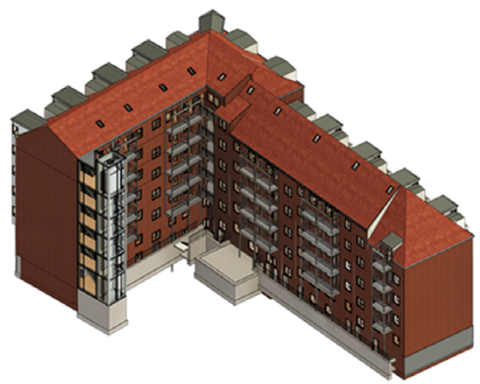


new part section

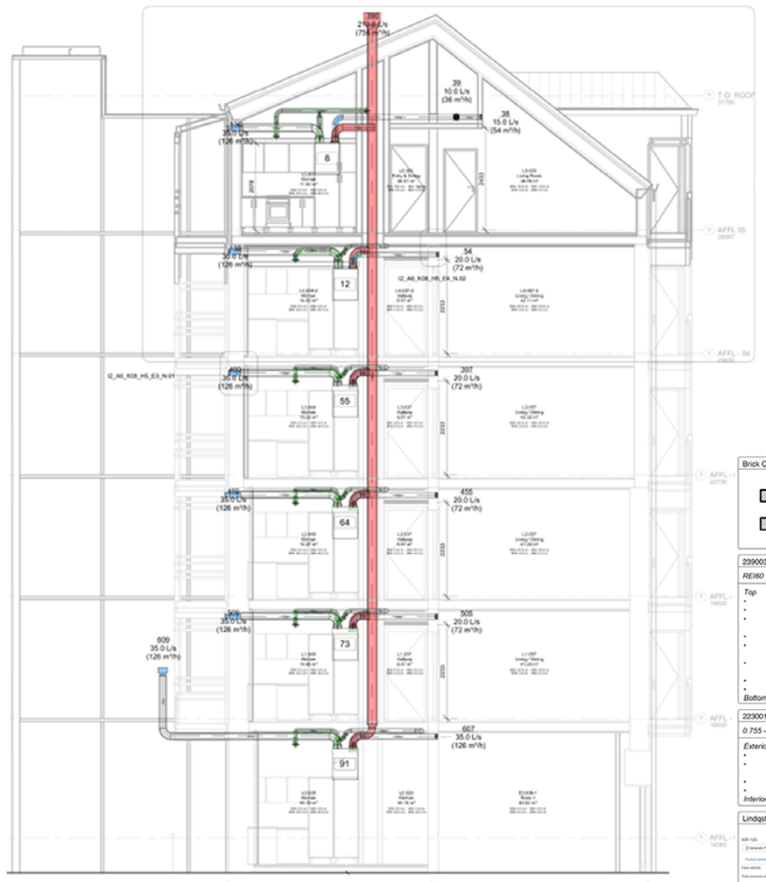
plans & sections for the existing, demolition and new construction phase

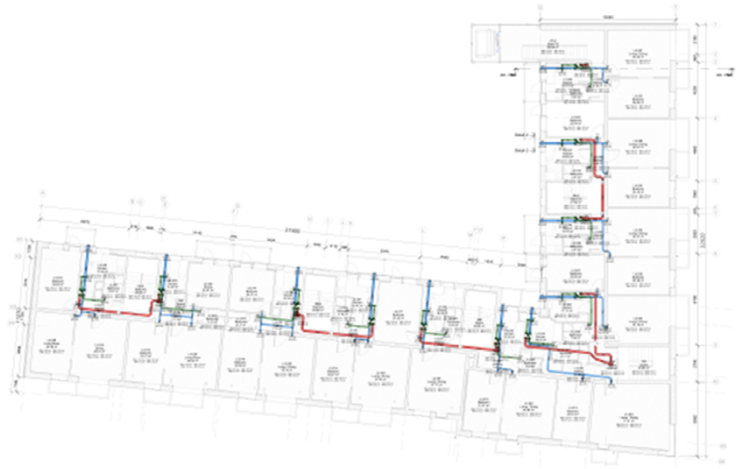


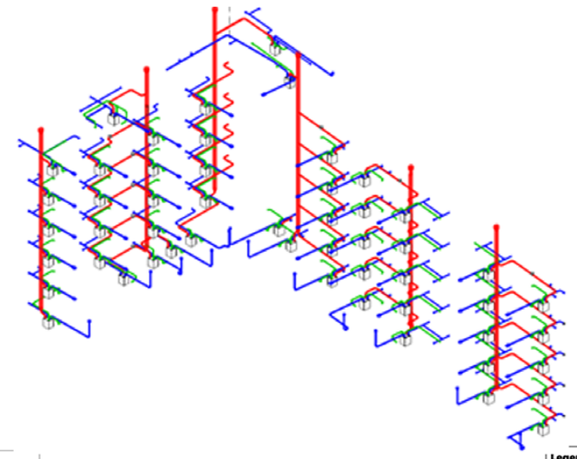




3D structural and architectural model

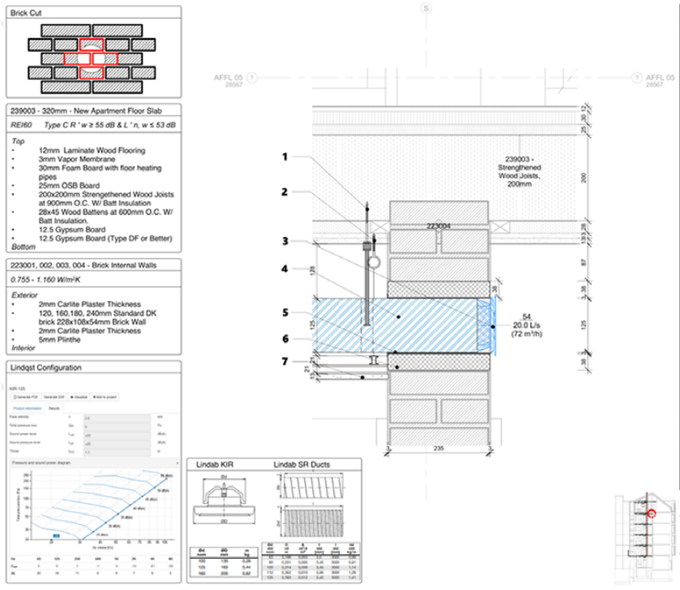


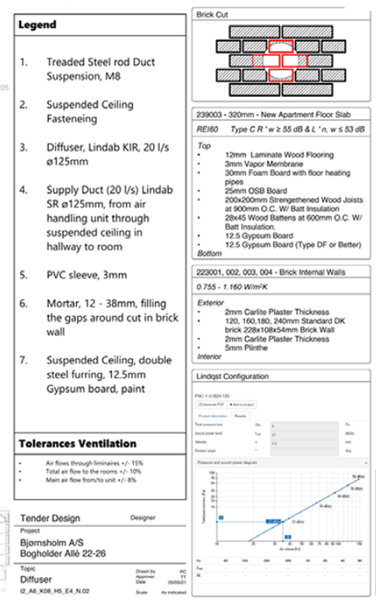


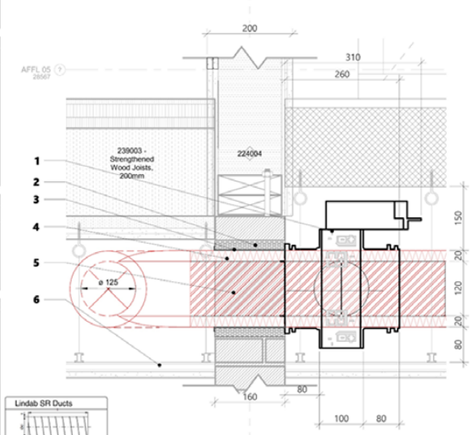


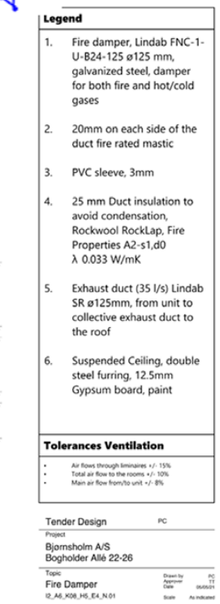
Focus

I decided to work with mechanical ventilation for the individual focus part. The installation posed a challenge, as the existing old building did not fit in ceiling heights or installation shaft sizes. Therefore, I decided to install a decentralized system with a separate air handling unit in each apartment. For that reason, only exhaust air was collectively led up in one duct to roof level. Old trash shoots were used as those shafts. By doing this, the changes to the existing structures were kept minimal, and the short duct work had low-pressure drops. Focused BE18 models for the different building changes showed, that the mechanical ventilation alone would save up to 20 kWH/m² per year - thus futureproofing the building.

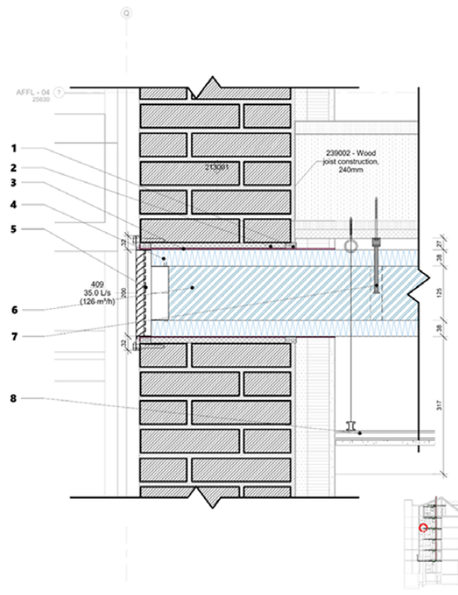


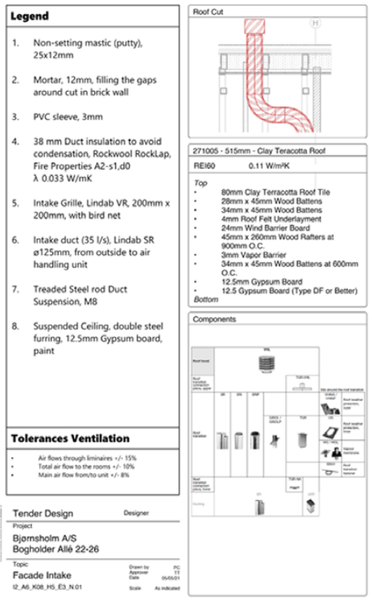


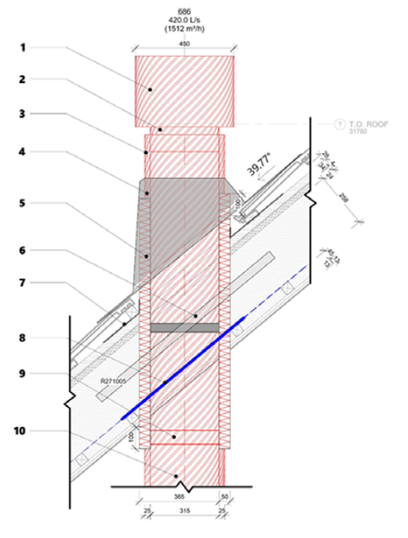


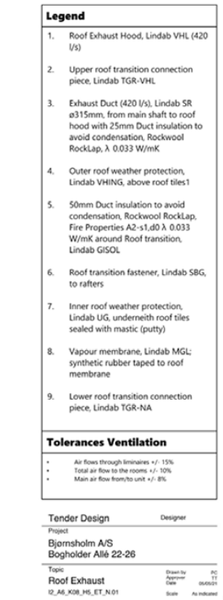


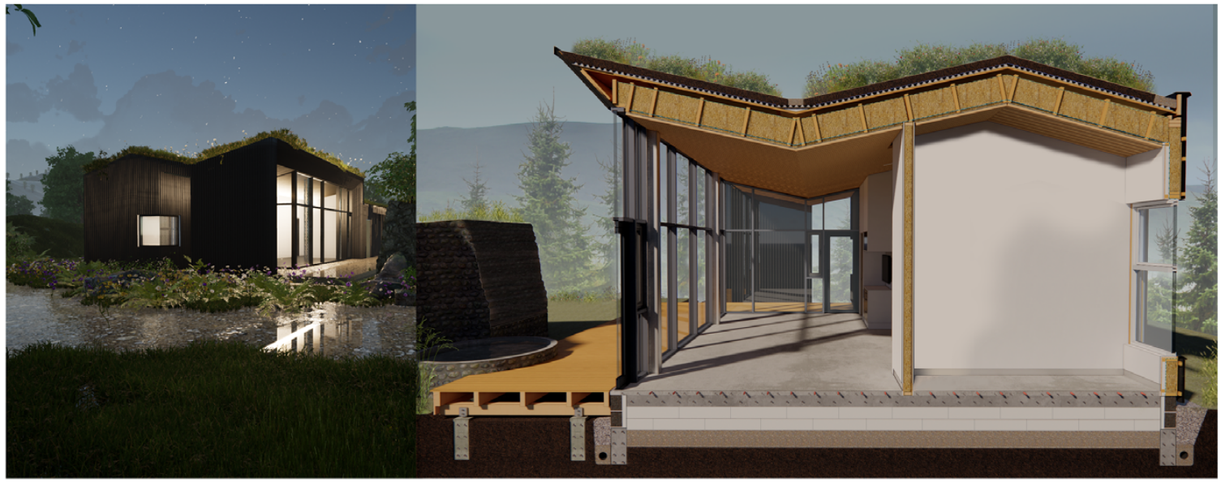








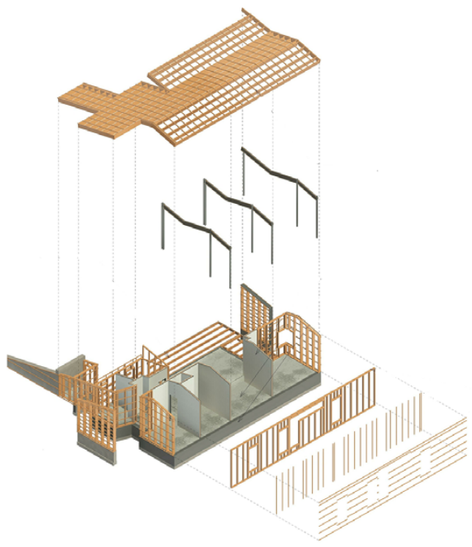




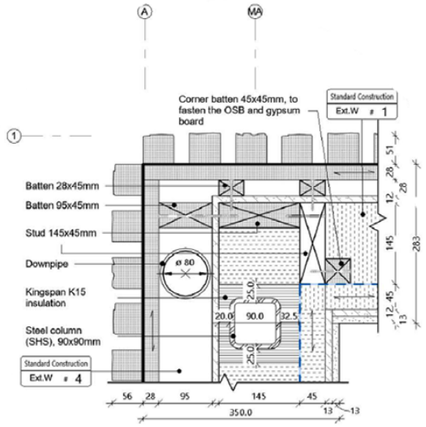
THE HILL HOUSE

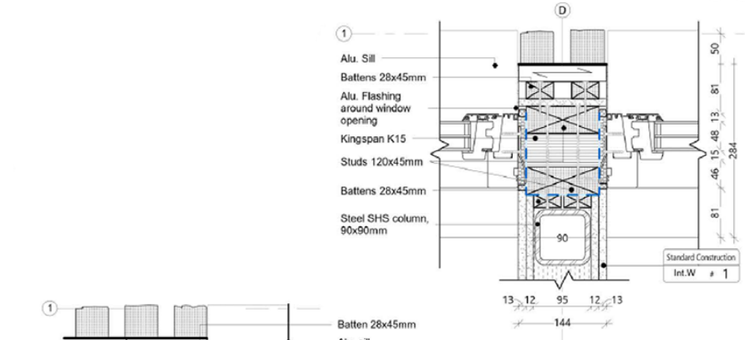
4th semester technical design

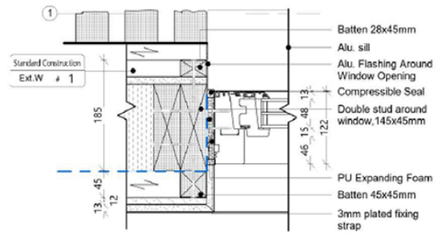
In our elective, we developed a selective design brief. The design we chose is a 100 m² single-family house. We chose a lightweight building system consisting of wooden studs and rafters with a separate load-carrying steel column and beam system. The architect's design concept was to blend the house with the landscape. The idea embodies a simple and minimalistic design. The wooden cladding refers both to modern architecture and to traditional Scandinavian houses. One of the main features of the house is a small hill behind the building; thanks to that, the building refers to the landscape in a literal way; the hillcovered with flowers and herbs becomes a bridge between the wild meadow and the building – it is a perfect way to respect the context of the location.

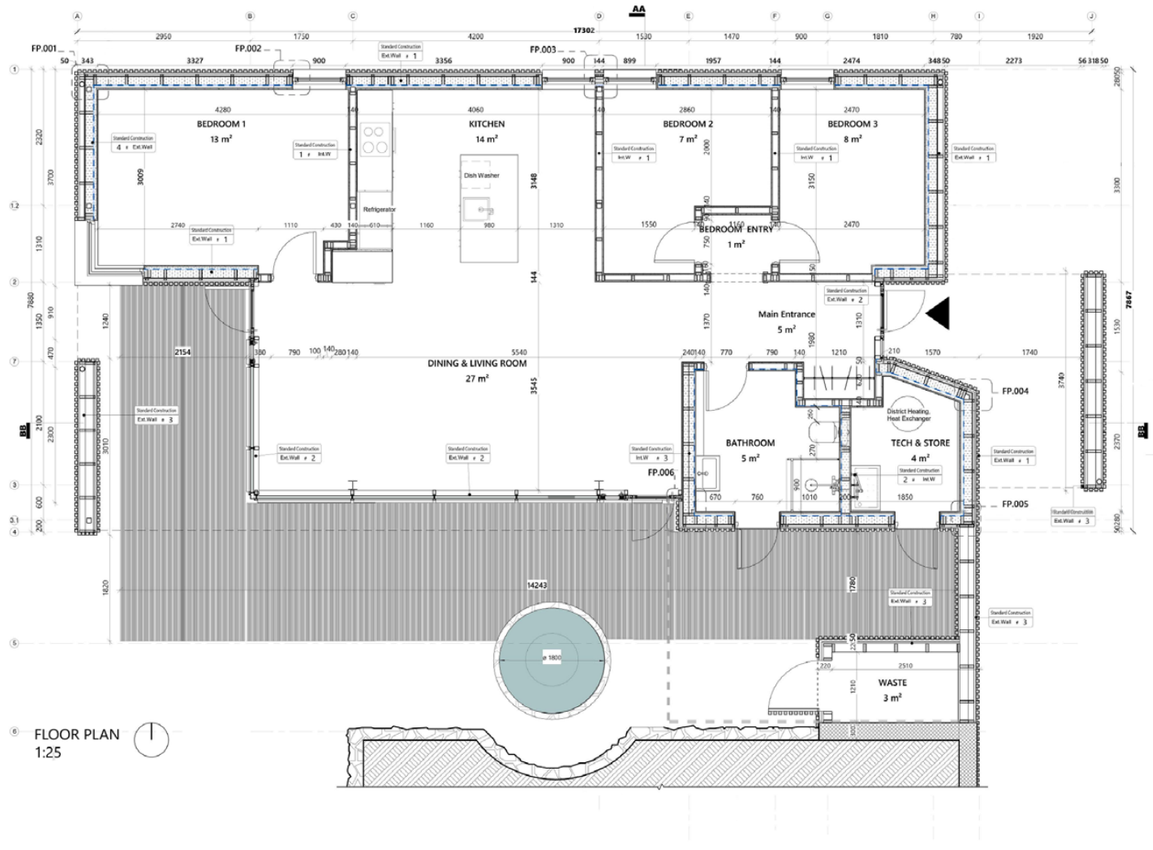


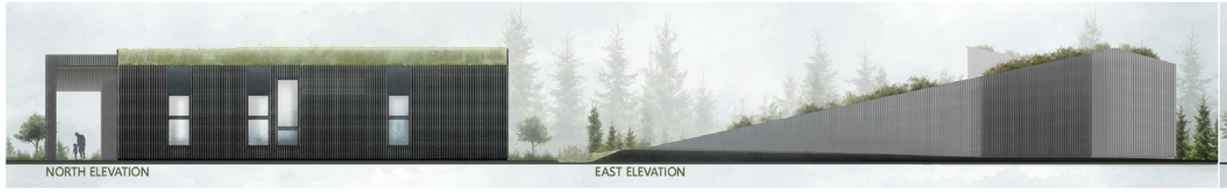
build-up diagram



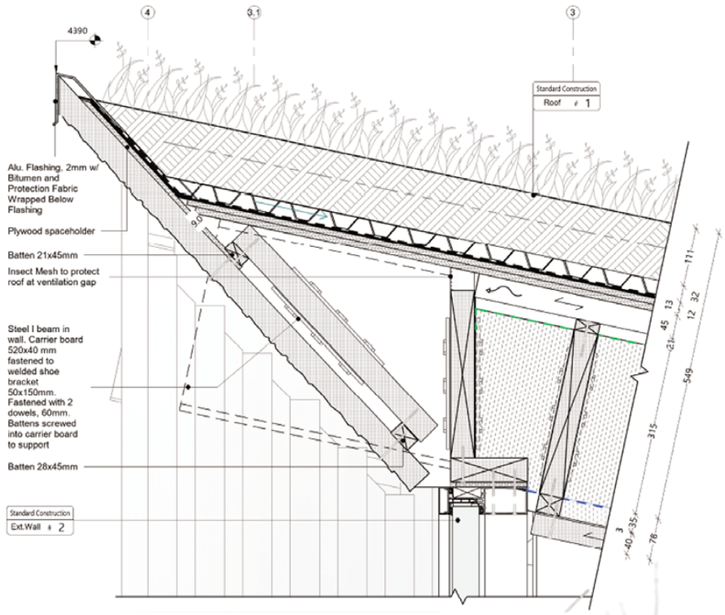












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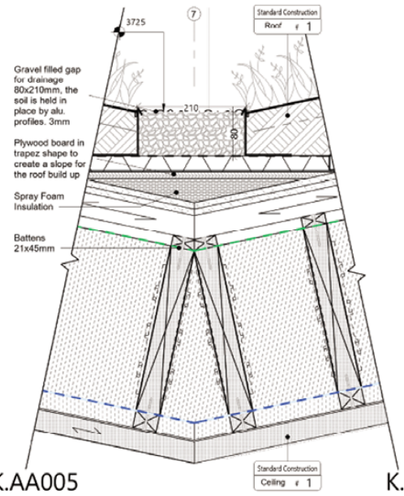

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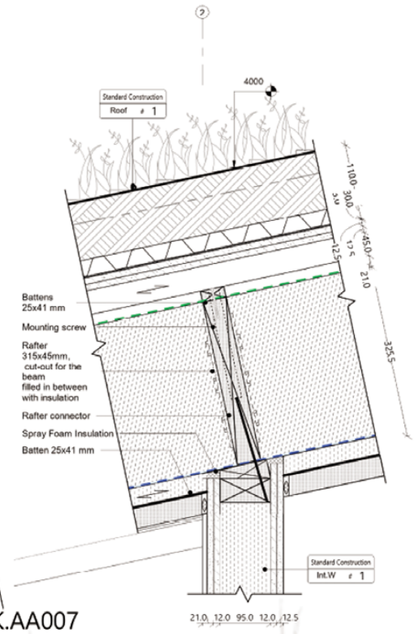

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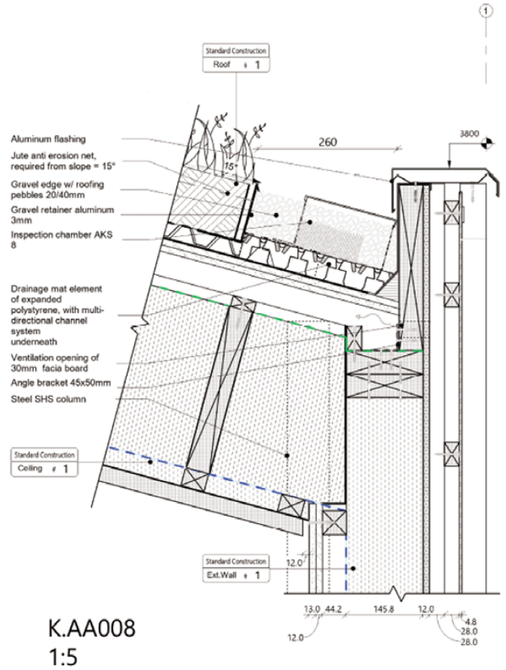

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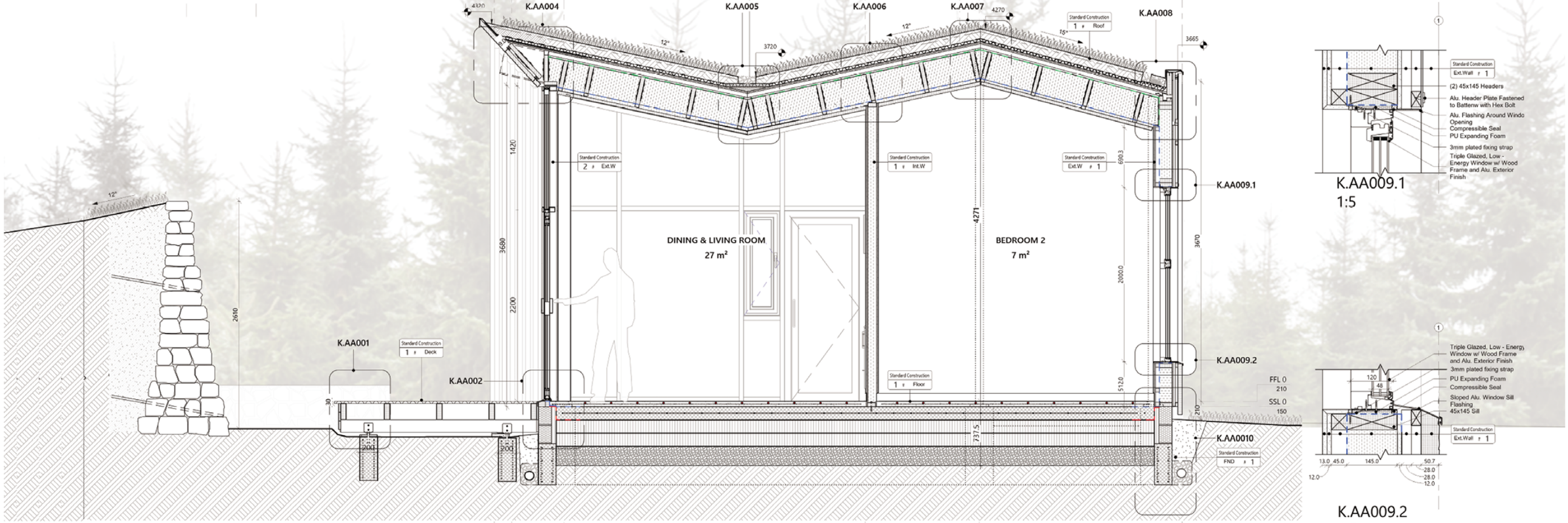

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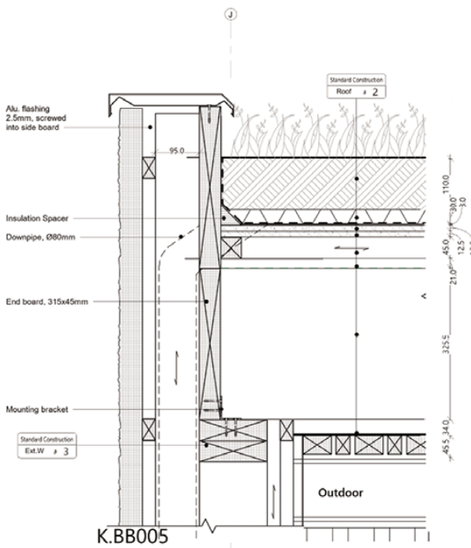
K.AA009.1
1:5

K.AA009.2
1:5



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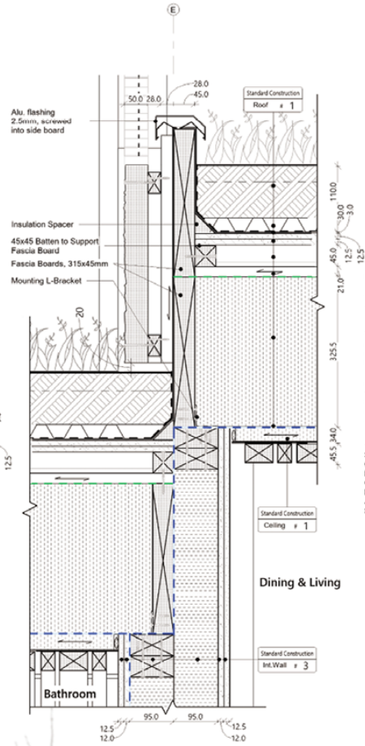

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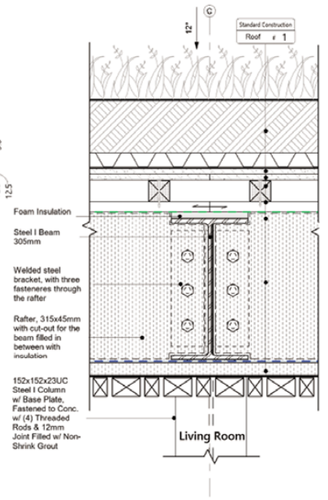

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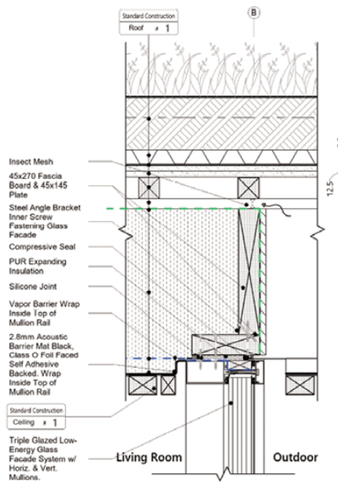

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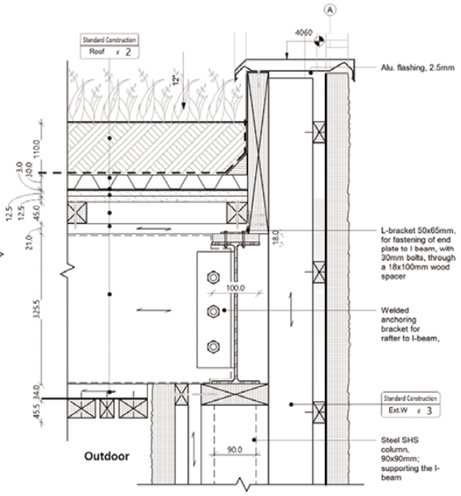

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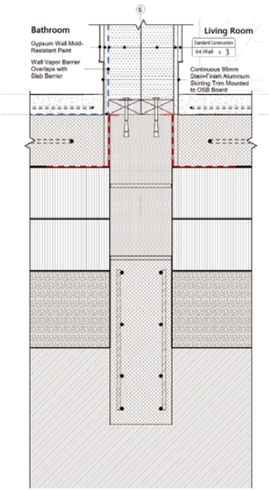

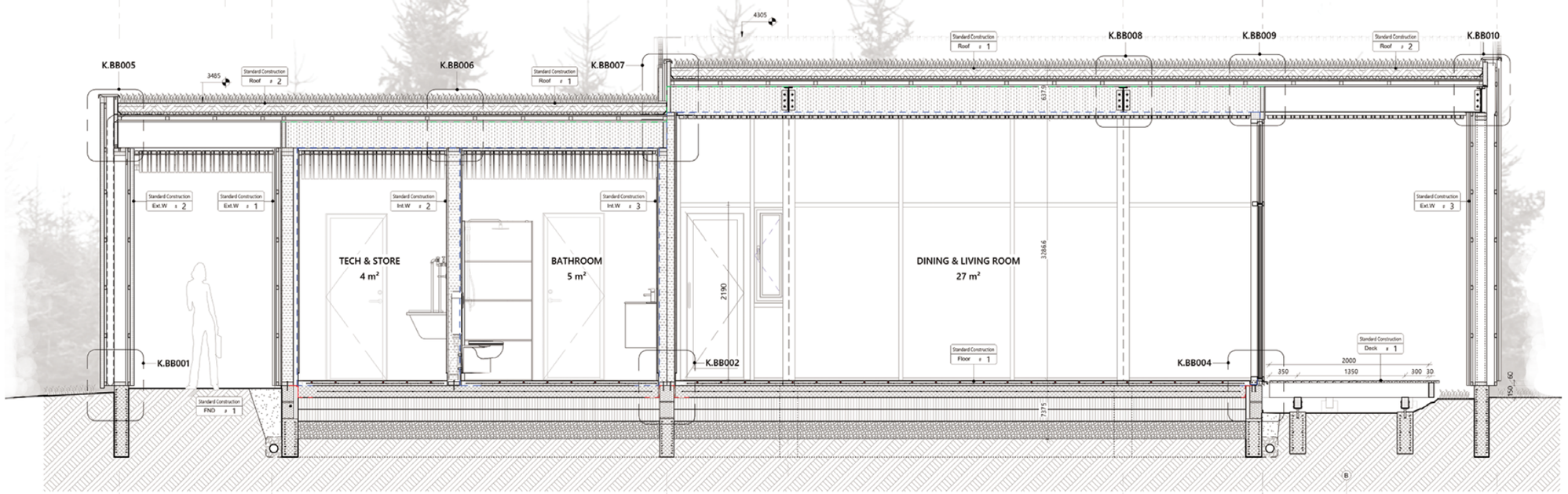

BB - LONG SECTION
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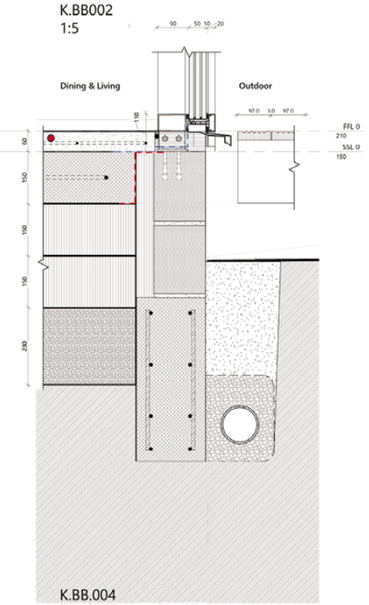

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K.BB.004
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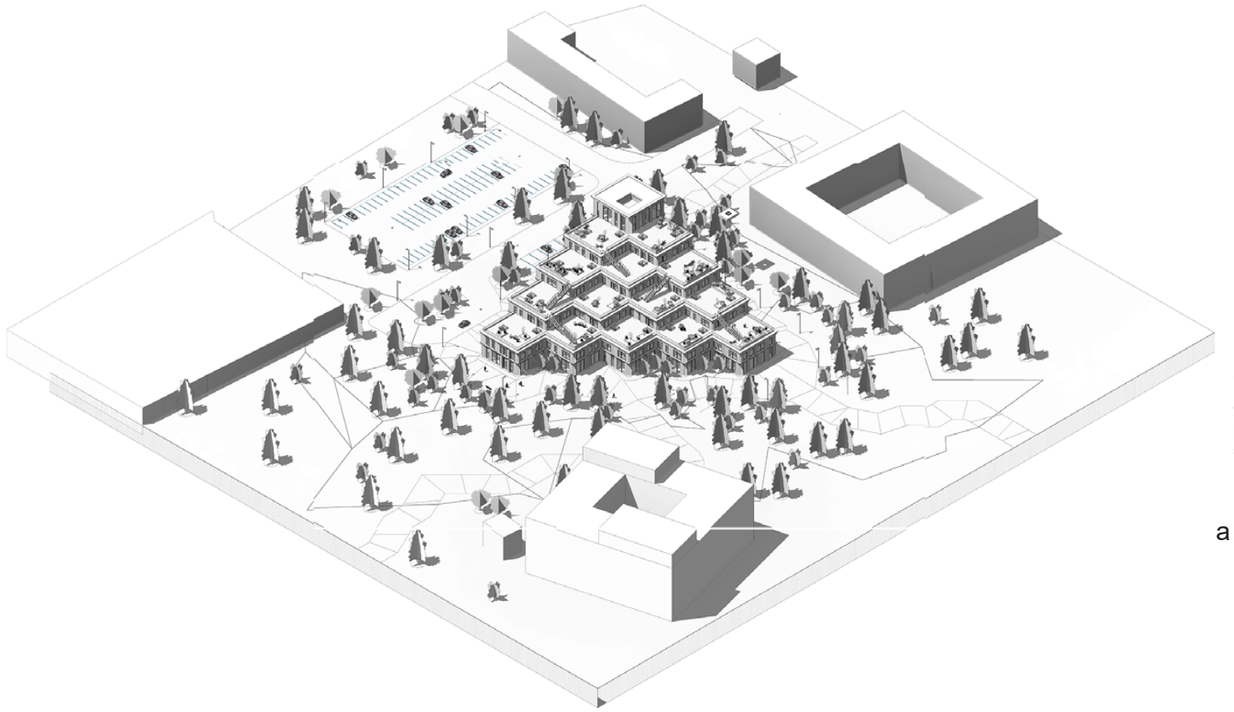


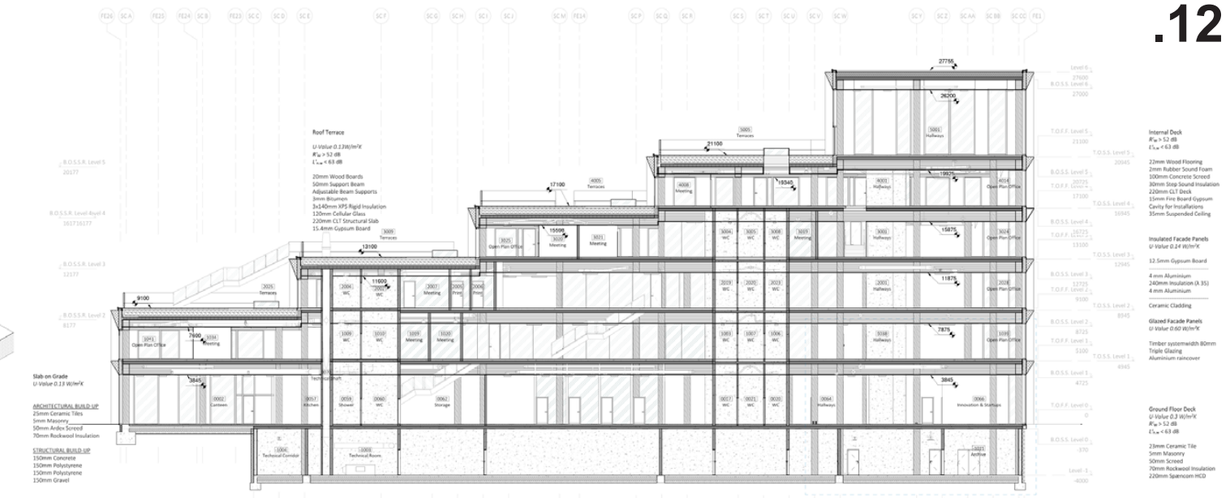
City Hall in Høje Taastrup

4th semester technical design

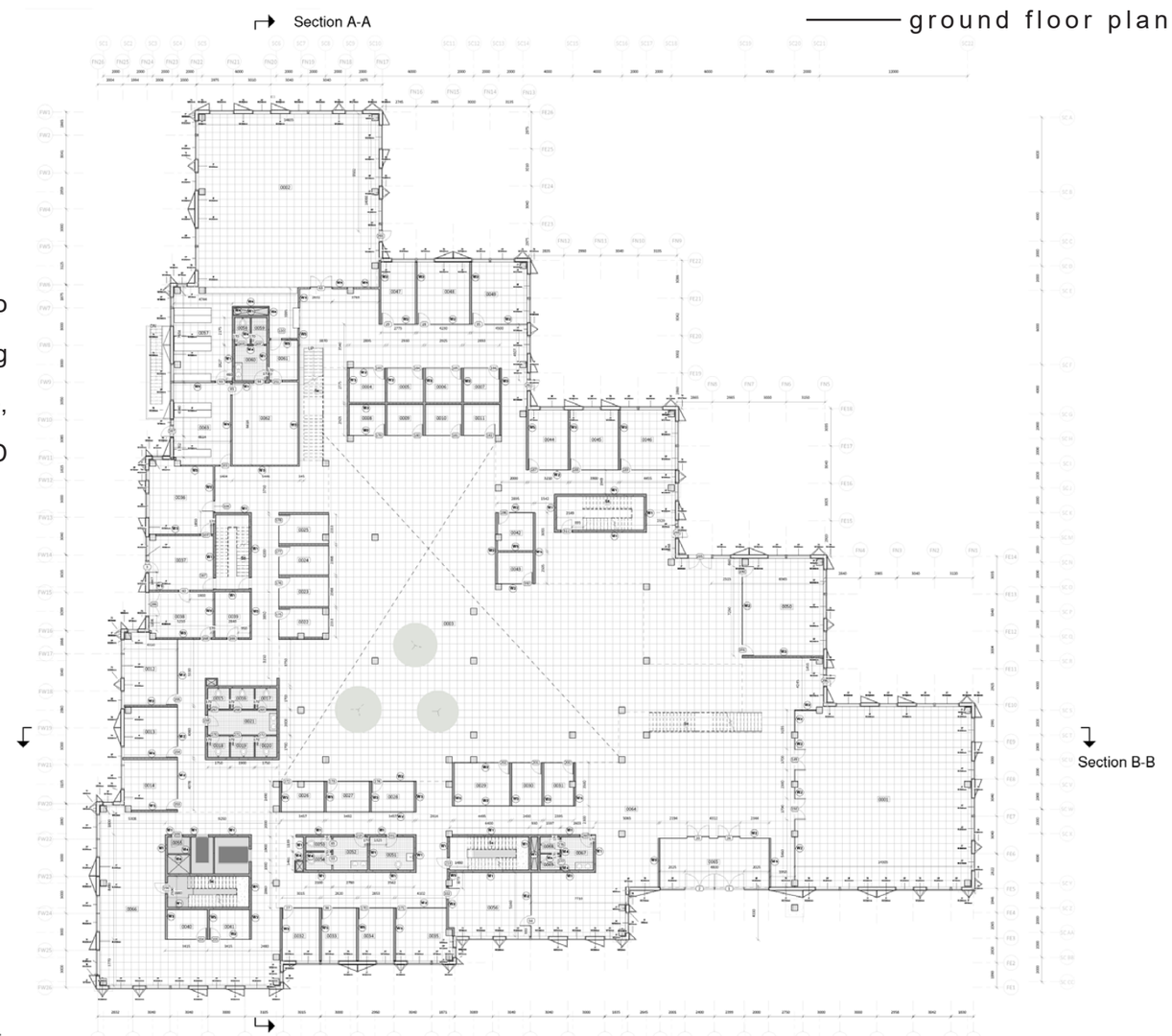
We developed a competition proposal by Cobe and MOE for all the project stages according to the Dark&Fri. This semester's main focus was timber design; thus, we developed the building as a timber column and beam system. Using timber, we had to pay extra attention to the fire, moisture and structural analysis. The second focus of the semester was a fully developed 3D ventilation system using Revit MEP.



east elevation



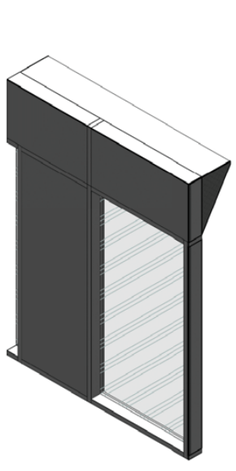
aa section

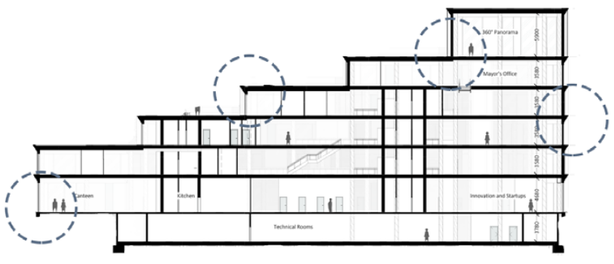


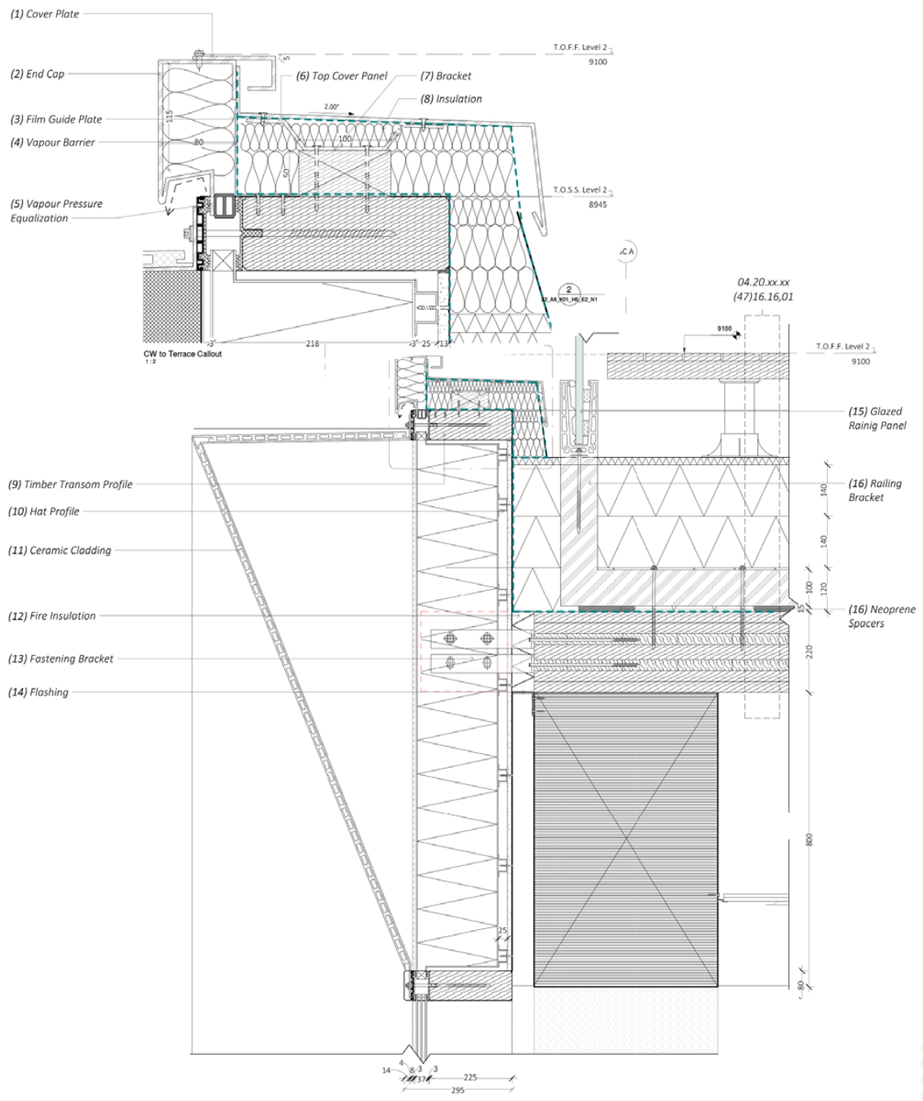
ground floor plan

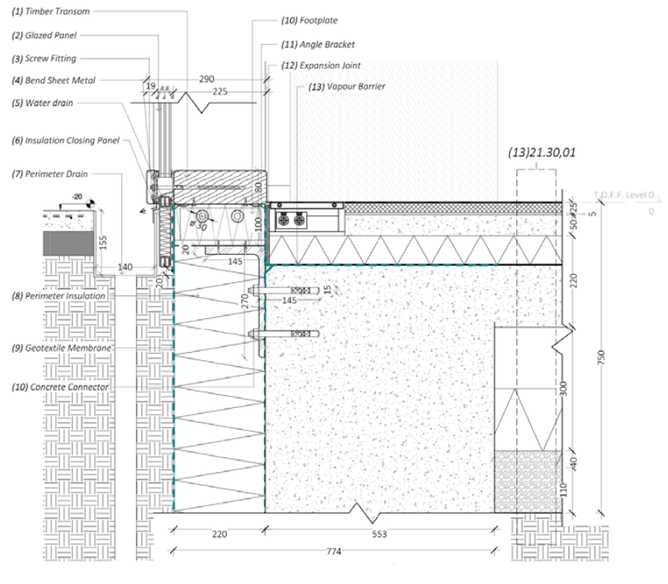
Focus

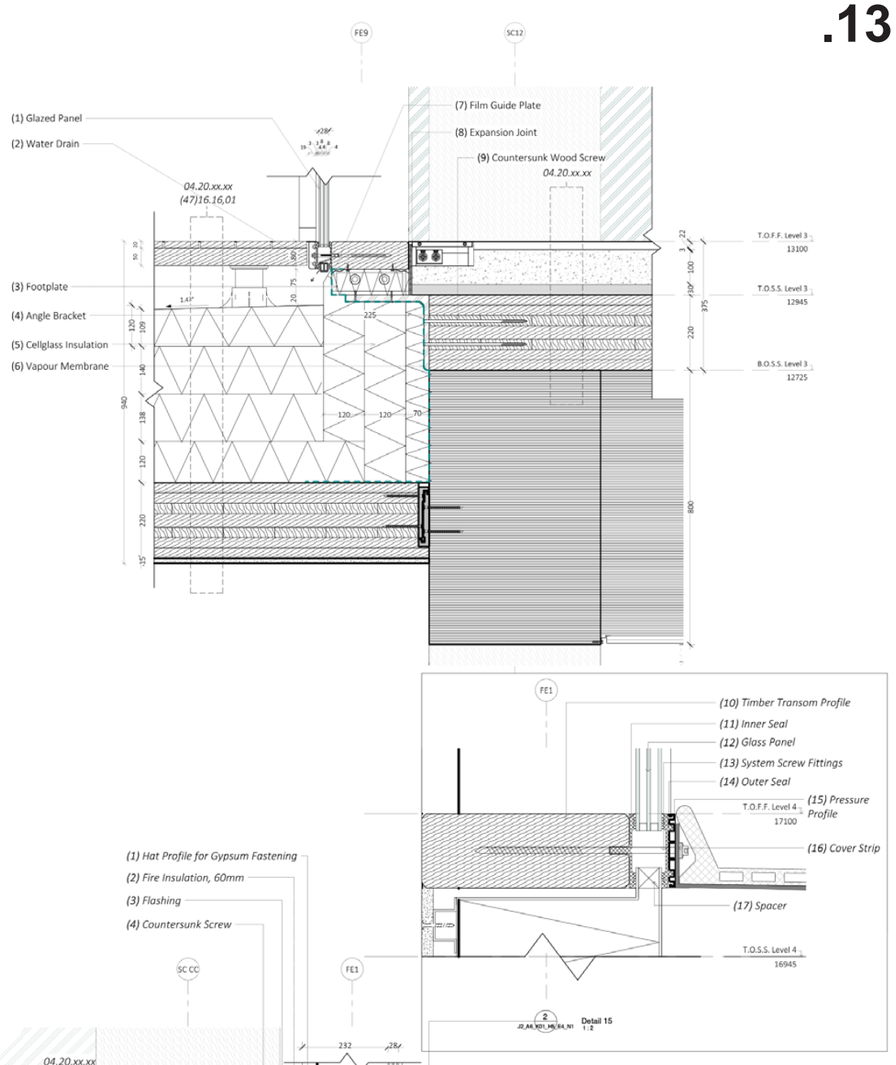
I decided to focus on the curtain wall facade for the individual performance. After comparing several different systems, I developed the facade as a mullion transom stick system (80 x 295mm) made of softwood. The primary mullions are fastened to the internal decks with steel brackets. The panels alter between glazed panels (triple glazing) and insulated panels (3mm aluminium, 218mm mineral wool, 3mm aluminium; finished on-site with gypsum boards fastened with hat profiles, U=0.15 W/m²K). The insulated panels are clad with 18mm terracotta plates attached with steel backbones to achieve the facade's triangular look.

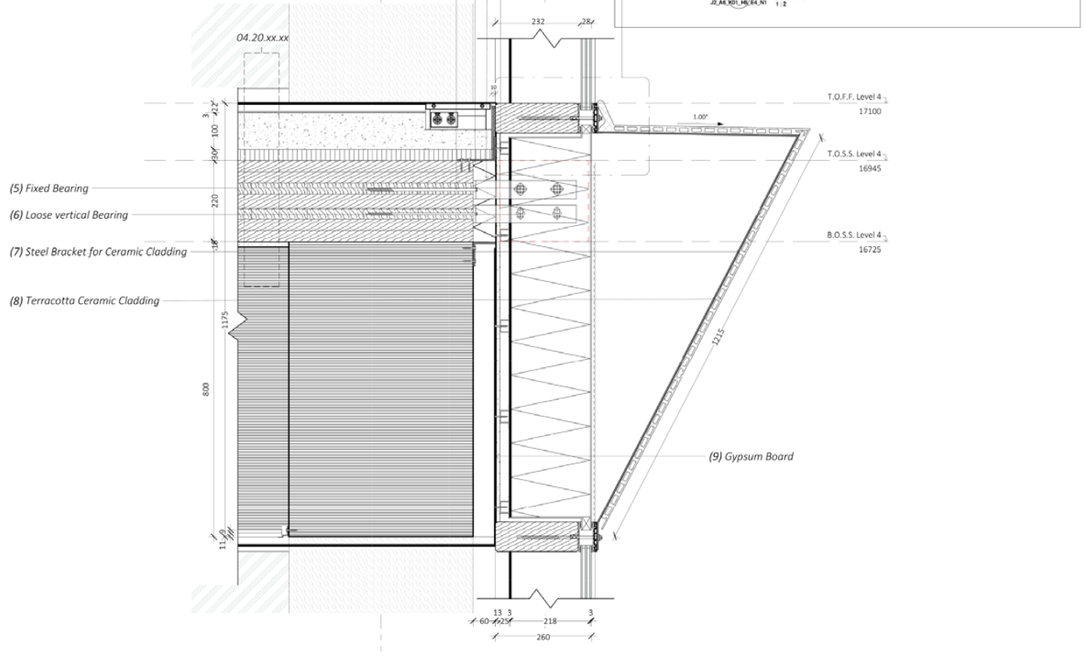








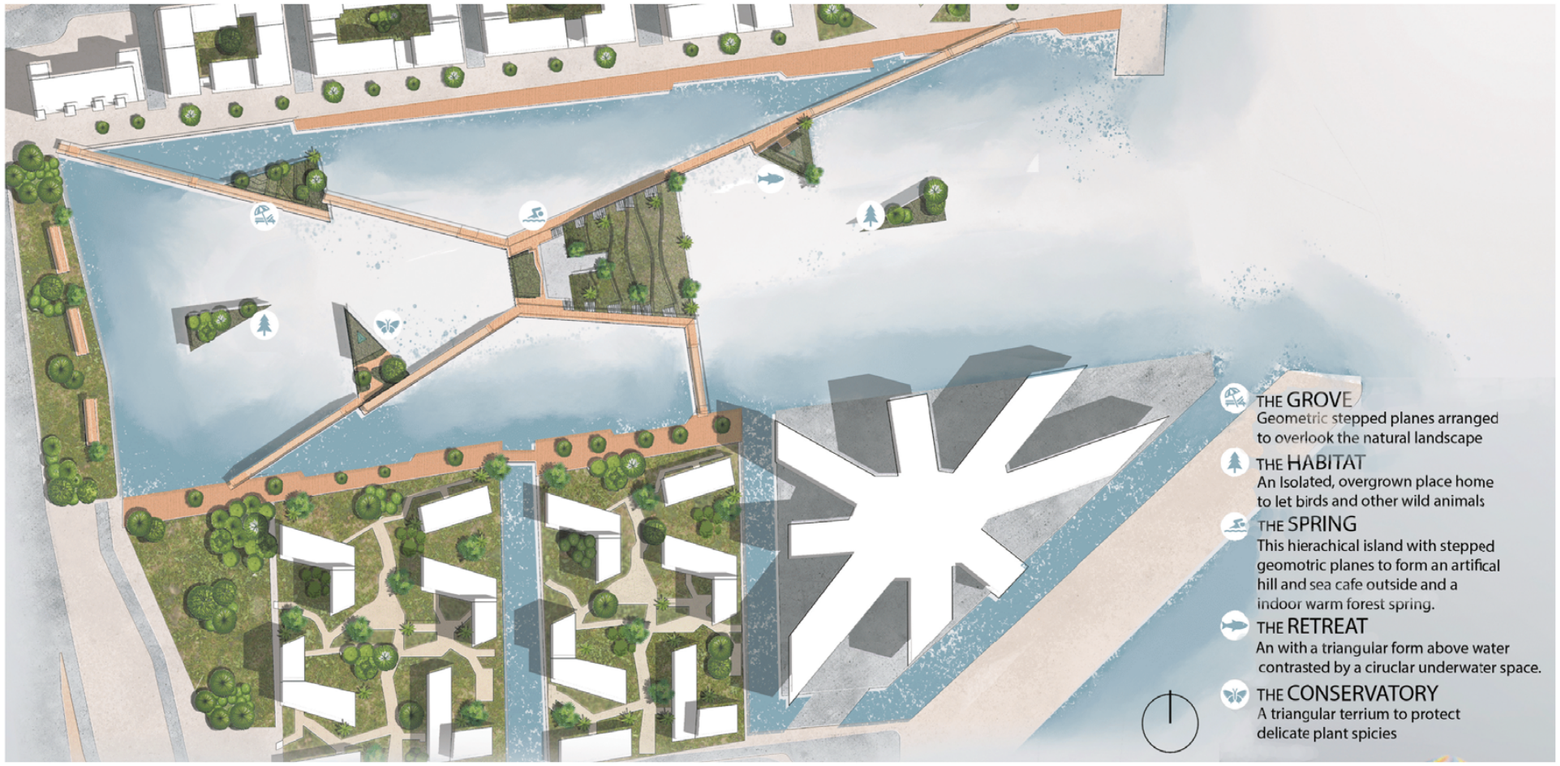




Nøhavn Archipelago in Nordhaven

3rd semester conceptual design

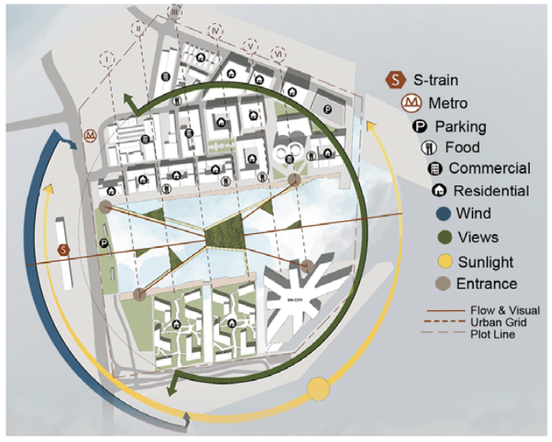
A landscape architecture project. The vision for Nøhavn was to create a new urban fabric to connect the community in Nordhaven, a newly developed area of Copenhagen. The design aims to address two of the 17 UN sustainable development goals by creating urban islands in the Nordhaven Bassin. The first goal is life on land: The proposal features two islands, inaccessible to humans, as bird protection areas. The second goal focuses on life below water; the concept of Nøhavn is restoring a working underwater biotope for indigenous species. The idea is to introduce blue mussels and seaweed to filter the water and provide a stable food source for aquatic life. The Archipelago organization is based on urban grids and existing streets and uses data and hierarchy ordering principles. This way, the design connects the community and keeps flow, líght, sound and views in mind.



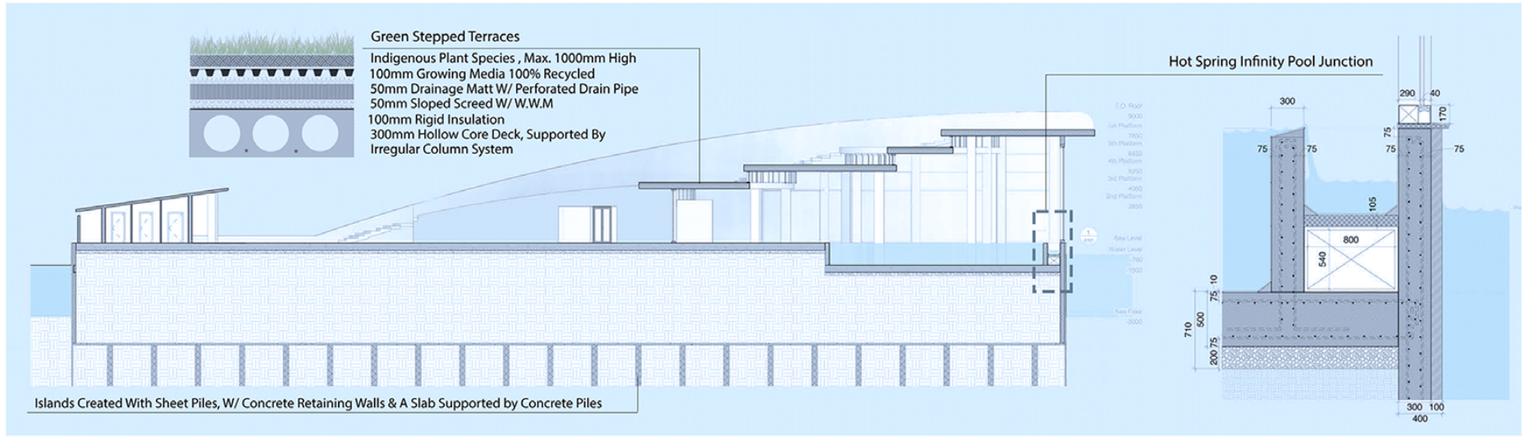


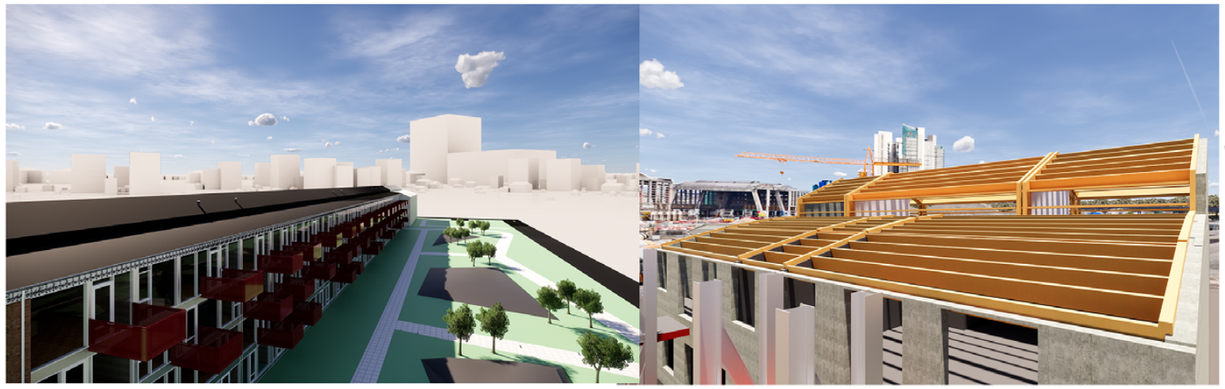


THE SPRING THE RETREAT





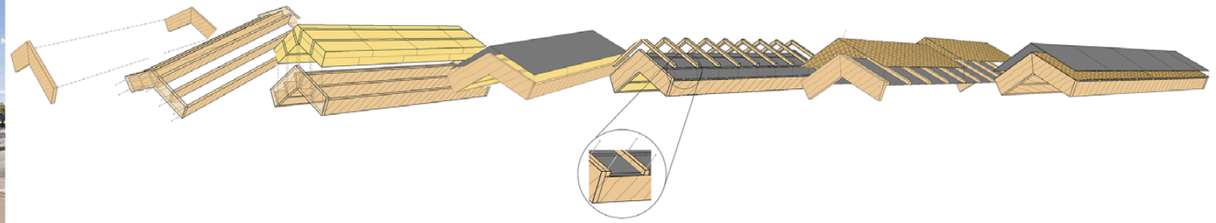




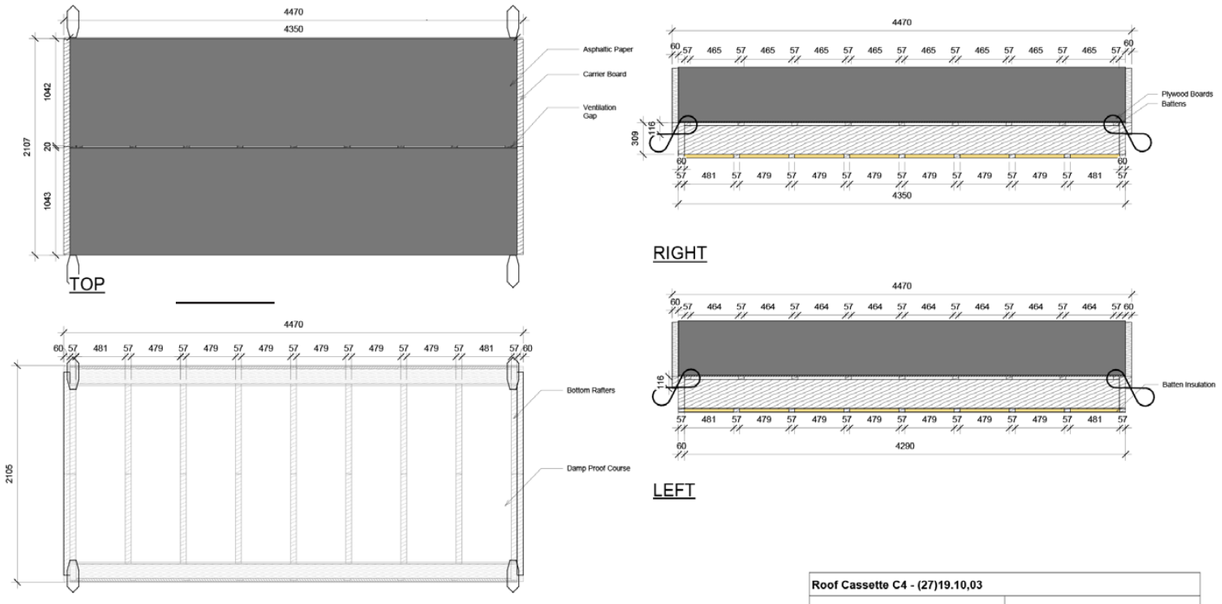
Valby Maskinfabrik

3rd semester technical design

In the 3rd semester, we got the task to rebuild Valby Maskinfabrik P2 using a design by CF Møller Architects and make it match the existing historical ends of the building. We used bricks, glazed curtain walls, and a steel truss balcony system as the building materials. In addition, we added six different apartment types and a basement. The focus was on prefabrication and lean construction. For the individual performance, I decided to focus on the curved roof. Since one of the semester foci was prefabrication, I decided to work off Taasinge Elementer. I made a detailed structural model of the roof cassettes and their rafters to solve the technical connections. Further, I also produced element and production drawings for every layer of a ridge roof cassette.



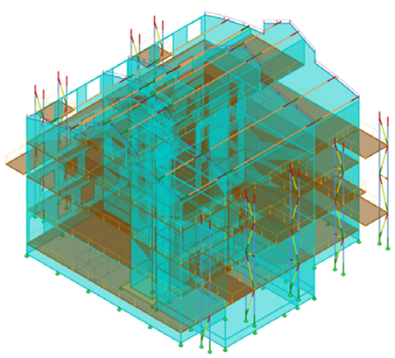
production sequence of a roof casette

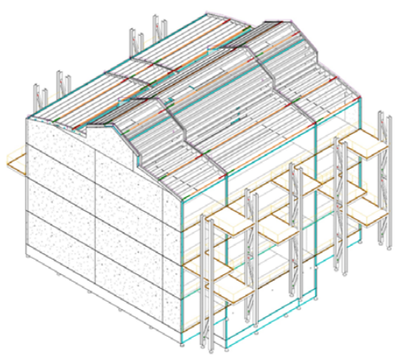


Roof Cassette C4 - (27)19.10,03	
Layers *Asphaltic paper*, 4.3mm *Plywood*, 12mm *Battens (Airgap)*, w=38mm, h=57m *Wind Membrane*, 0.3mm *Isover Insulation* (0.0034 W/mK) 120mm, 195mm *Rafters (Insulated)*, w=60mm, h=315mm *Damp Proof Membrane*, 0.3mm *Battens (Insulated)*, w=38mm, h=57m *Fiberglass Board*, 12.5mm	**Production Tolerances** *Cassette* Lenght: ± 6 mm Width: ± 3 mm Angularity: ± 5mm *Openings in Cassette* Dimensions: ± 6 mm Location: ± 8 mm Angularity: ± 5 mm

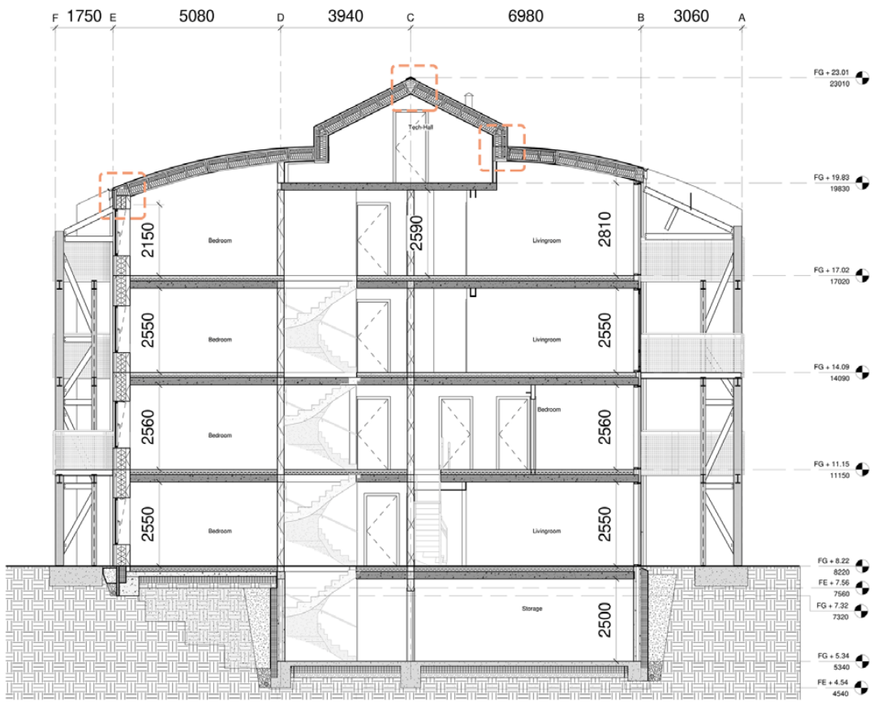
element drawing

structural model









roof key junctions

Roof Cassette - (27)19.10,03

On-Site

4.3mm	Asphaltic paper

4.3mm	Asphaltic paper
2x 6mm	Plywood (on C9, 1x 12mm)
38mm	Battens (38x57mm)
0.3mm	Wind Membrane
120mm	Isover Insulation (λ = 0.0034 W/mK)
195mm	Isover Insulation (λ = 0.0034 W/mK)
315mm	Rafters (60x315x8875mm)
2mm	Damp Proof Membrane
38mm	Battens (38x57)
12.5mm	Fiberglass Board

On-Site

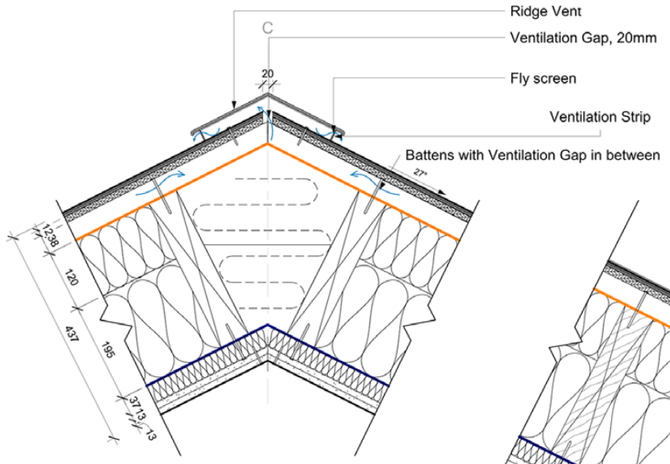
12.5mm	Fiberglass Board
0.3mm	White paint finish

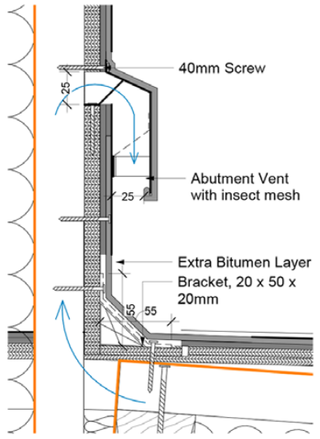
Properties
U-Value: 0.13 W/m²K

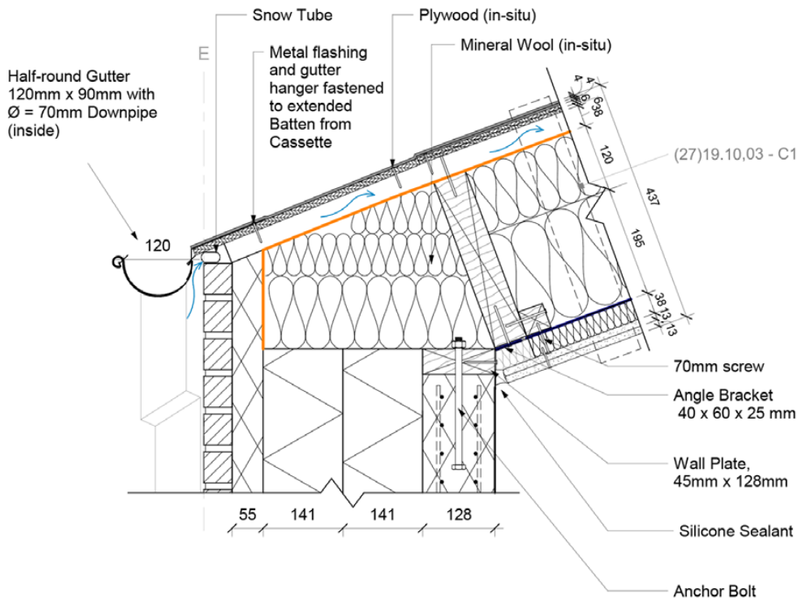
Fire: Cassette REI 60 for the first m next to the dimising wall, REI30 for the rest; Ceiling (EI30): $K_1$10 D-s2,d2

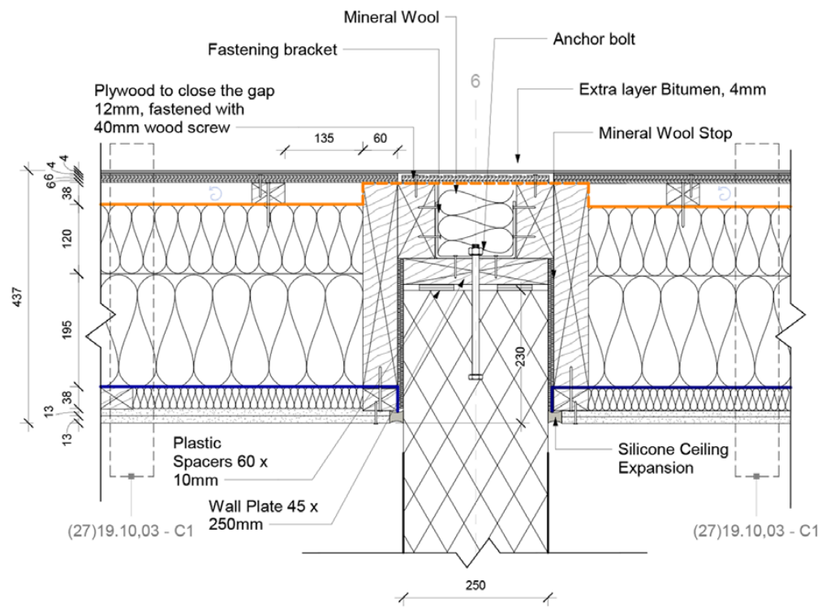
On-Site Tolerances
Position in Plan: +- 5mm
Height of Element on Site: +- 5mm

For Element Tolerances see Production Drawings and Material List.







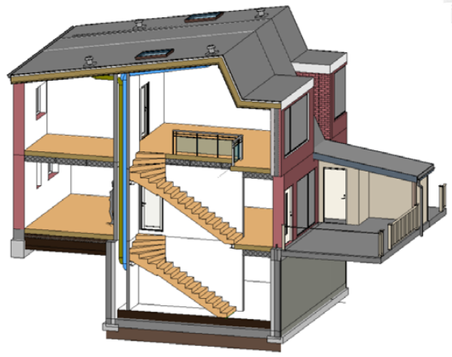


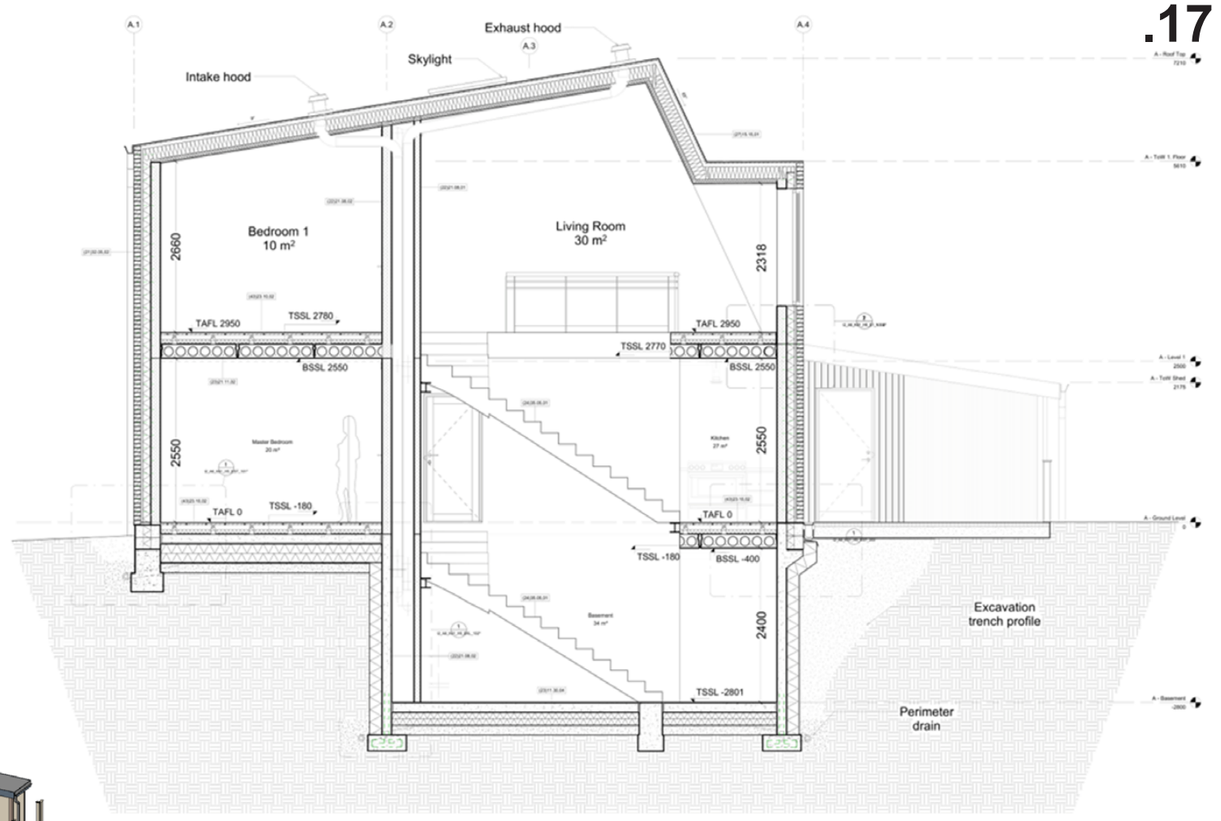


Lisbjerg Bakkehuse

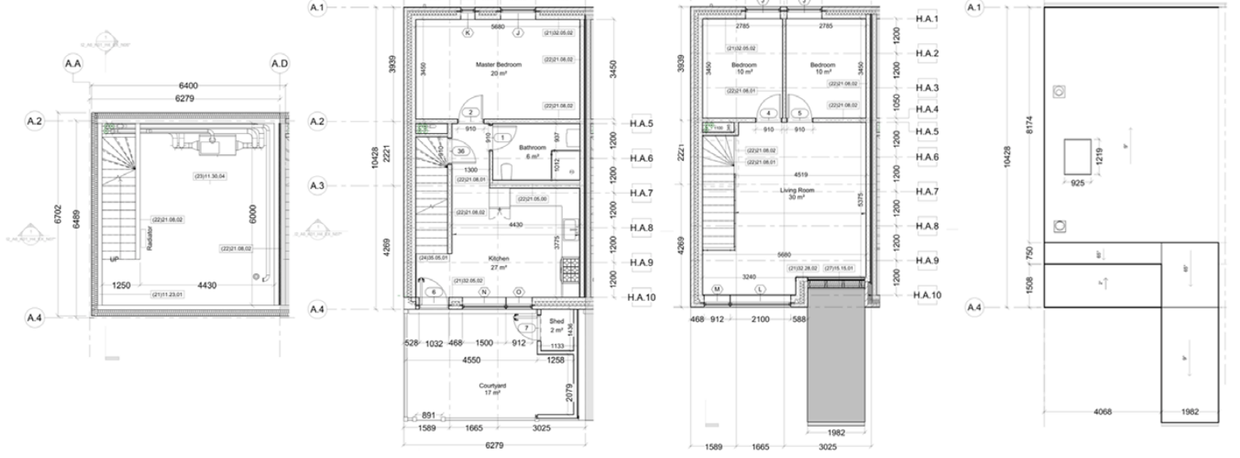
2nd semester technical design

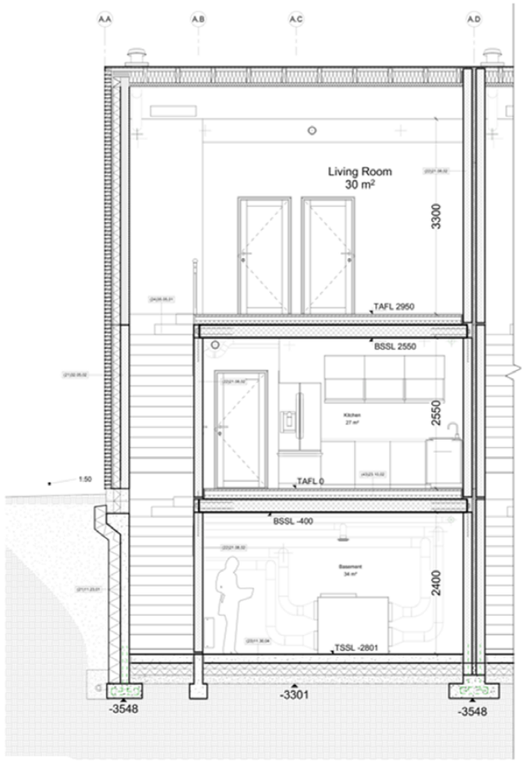
We were given outline proposal drawings of the Lisbjerg Bakkehuse rowhouses by RUBOW architects and challenged to recreate those. We added a basement and built five rows of five houses. We tried to be process-effective and sustainable. The design featured a wooden clad façade, and we added two rows with a brick façade and wooden bike sheds. Next to architectural drawings, we also performed structural analysis and made layout plans for heating and an MEP model for the ventilation.

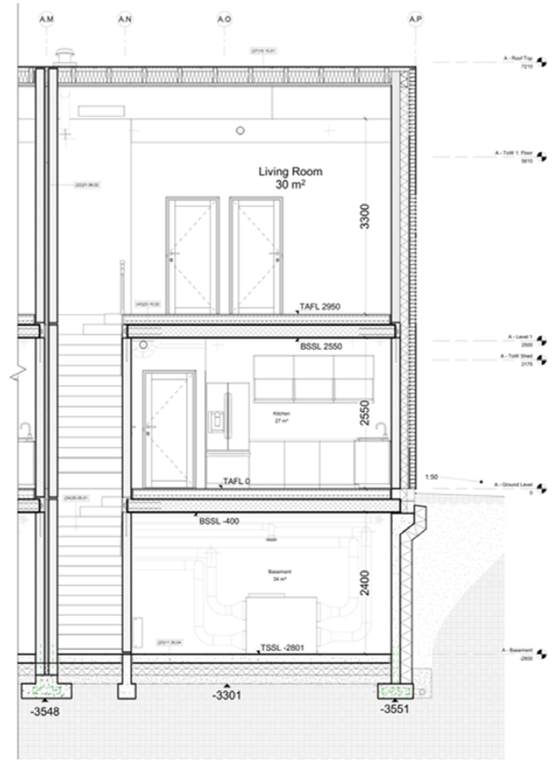




cross and long section

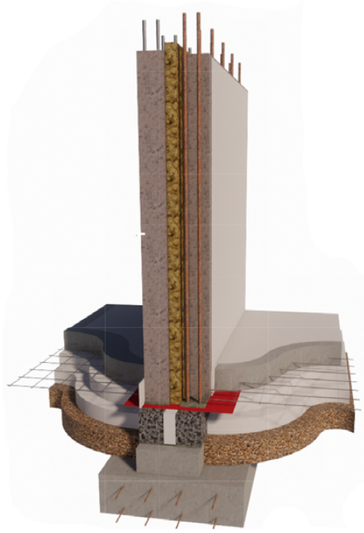




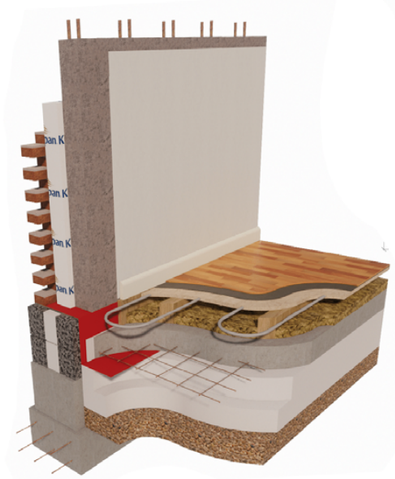


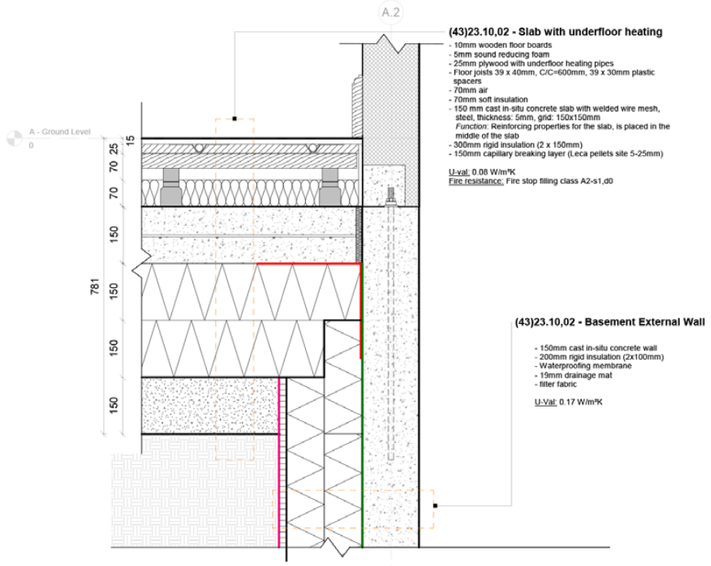
Focus

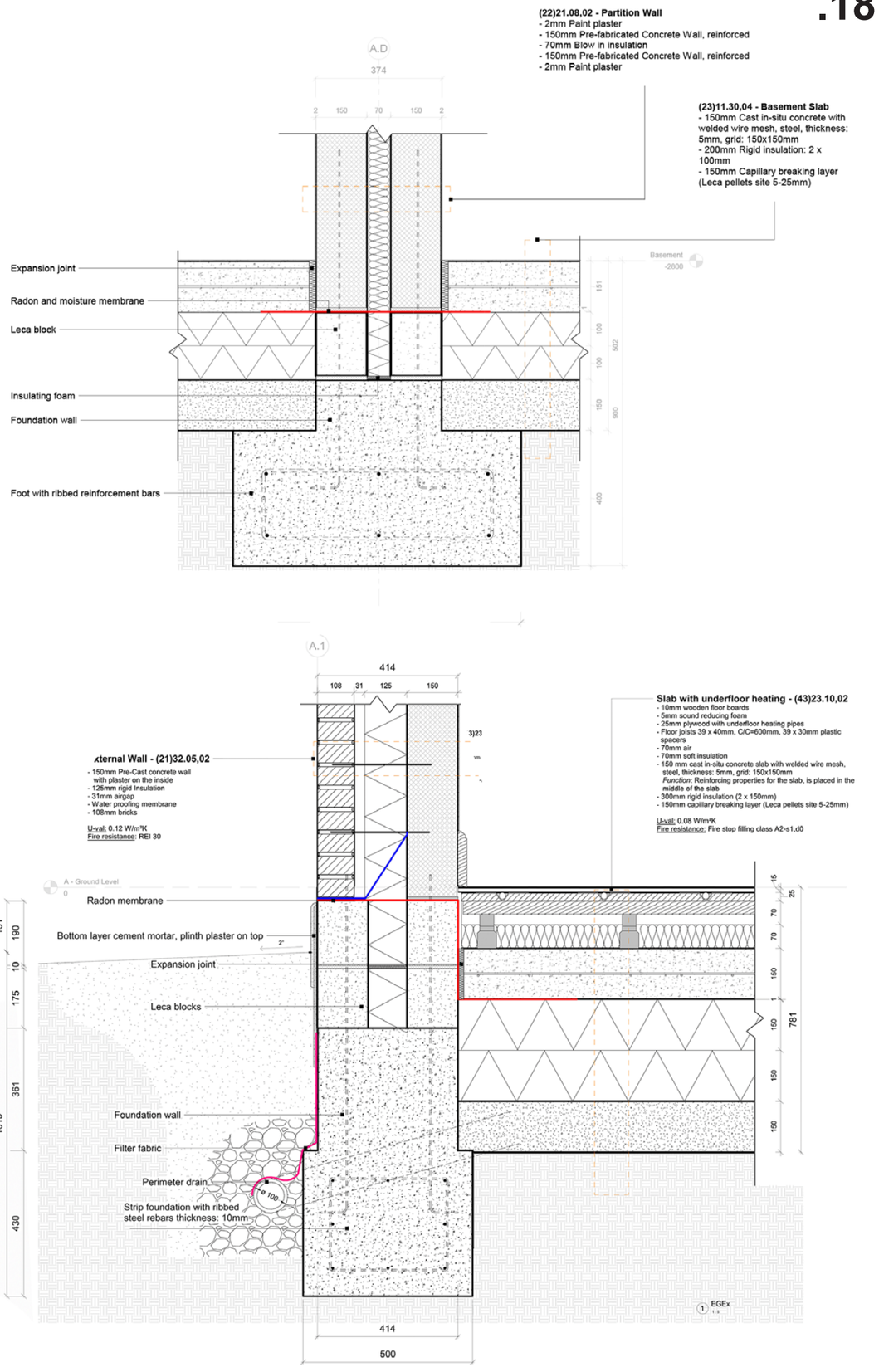
For my individual, I focused on the foundation and substructure of the building. The second semester was mainly about research. Thus, I did a manual footing calculation taking all the loads into account and investigated the challenges of building a basement like radon, moisture and heat loss. Finally, I decided to develop a traditional strip foundation below the external walls and partition walls for the foundation.











By Pauline Carstens