

PRODUCTION & PARTS

PART 2: THE DESIGN OF AN EXTENSION TO THE MODEL WORKSHOP IN VERTIGO

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Preface

This is the report regarding the master course Architectural Engineering: Production & Parts, part of the master Architecture, Building and Planning from the Eindhoven University of Technology. It regards the second part of the course, designing an extension to the model workshop in Vertigo, the first part being an investigation of an architectural detail.

During the design process and the editing of this booklet, with fellow students around me working on the same assignment, this project was a pleasure to work on. This assignment was done in Eindhoven.

Introduction

The brief of this assignment was to design an extension to the model workshop in Vertigo. This design will focus on a small extension of 100 m² just for making full scale details for Production & Parts. This can be interpreted in various ways. To find the right way to develop this extension, it is important to understand the essence of the detail of part 1. In this part of the course Jorg de Bie and I analyzed and reproduce a detail from the research institute NIOO-KNAW.

The first aspect of this report is the investigation of the original building (NIOO KNAW) and its detailing. This will lead to a position which can be used to create a concept of the design. This part of the report also gives argumentation for the choice of materials and structure. In the third part the process of designing the building and the details will be discussed. Also the situation and its relation to its surrounding buildings are explained.

Detail

Before designing the extension to the model workshop, it is important to understand the concept of the research institute NIOO-KNAW. This concept is visible on all scales in the building; even in the detailing it can be observed.

- 01. Model part 1
- 02. Netherlands Institute of Ecology (NIOO-KNAW) in Wageningen
- 03. Chosen detail for part 1
- 04. Drawing detail



01.



02.



03.

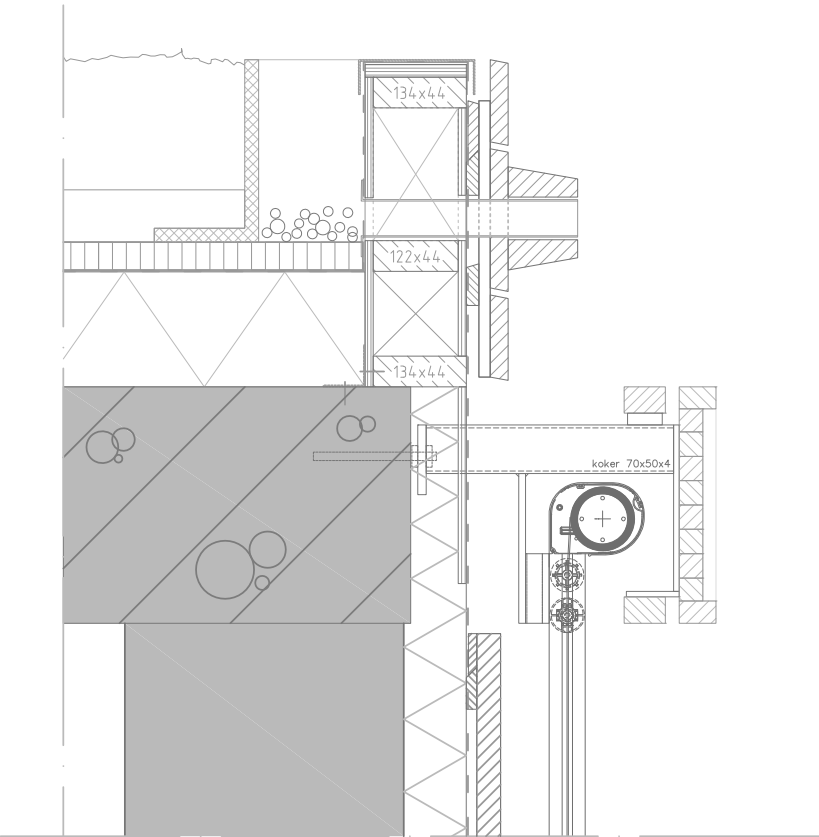
“Demountable - minimalistic detailing”

In the detail a large amount of Plato wood is used. The consoles on the top of the facade and the cantilever to hide the covers of the screens are all made out of this material. The top console is not fixed by screws or glued, it hangs on a mitred slat. In that way no means of connection is seen on the outside of the facade. The slat below is meant for fixing the console at a certain point, but they are not connected.

Concept
NIOO director, Professor Louise Vet, was inspired by the Cradle to Cradle (C2C) principles and wanted to take the design and construction of their building one step further than the most sustainable buildings built to date in the Netherlands. Sustainability is generally measured by energy efficiency; the C2C concept, however, poses new criteria. The question is not what can we do to limit environmental damage, but rather how can we make a valuable contribution to the surrounding environment? The C2C guiding principle is that production should be waste free. In the cradle to cradle model, everything we make and leave behind is regenerated as raw materials for use in the natural environment or in new products. This can be interpreted by way of detailing; everything is demountable so it wouldn't be waste.

Material
Claus and Kaan Architects had to meet a number of stringent material specifications. The building had to be people and environmentally friendly, made from renewable raw materials and economically produced without any harmful emissions. The hull is made of durable concrete without any artificial additives and no sealant, solvents or such like were used in the process. They also took into consideration products that carry quality marks such as FSC and PVC-free certified materials. Using materials such as wood, glass, steel, ground limestone and granular debris creates a streamlined building with an open and natural appearance.

Originally, the NIOO wanted to have a steel frame structure, because steel can be recycled without quality loss. This was prevented by the recent steep rise in steel prices as well as the strict requirements that the building structure is vibration-free. Therefore a concrete structure with thick floor slabs was realized. However, those requirements didn't play a part in choosing the construction materials for my design as it will become a workshop. Jorg de Bie and I do have the same concept obviously, but we discussed different construction materials. Jorg chose to use a timber framed construction and I chose to use steel as construction material.

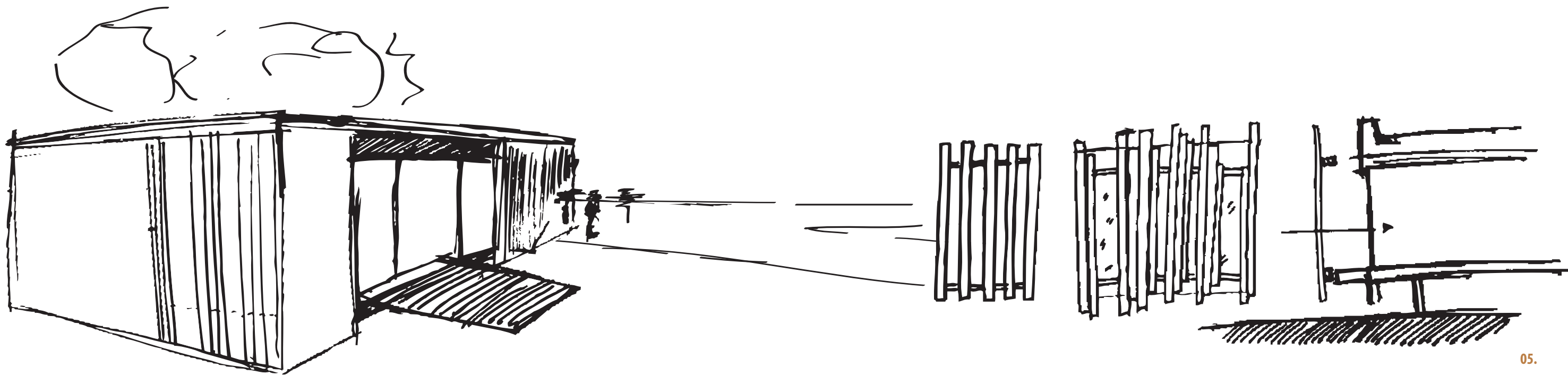


04.

Design

From the information of the previous chapter there are two important subjects: demountable and minimalism. These two concepts are leading in the design for the extension to the model workshop.

- 05. Sketches of design
- 06. Situation - campus TU/e 1:1000



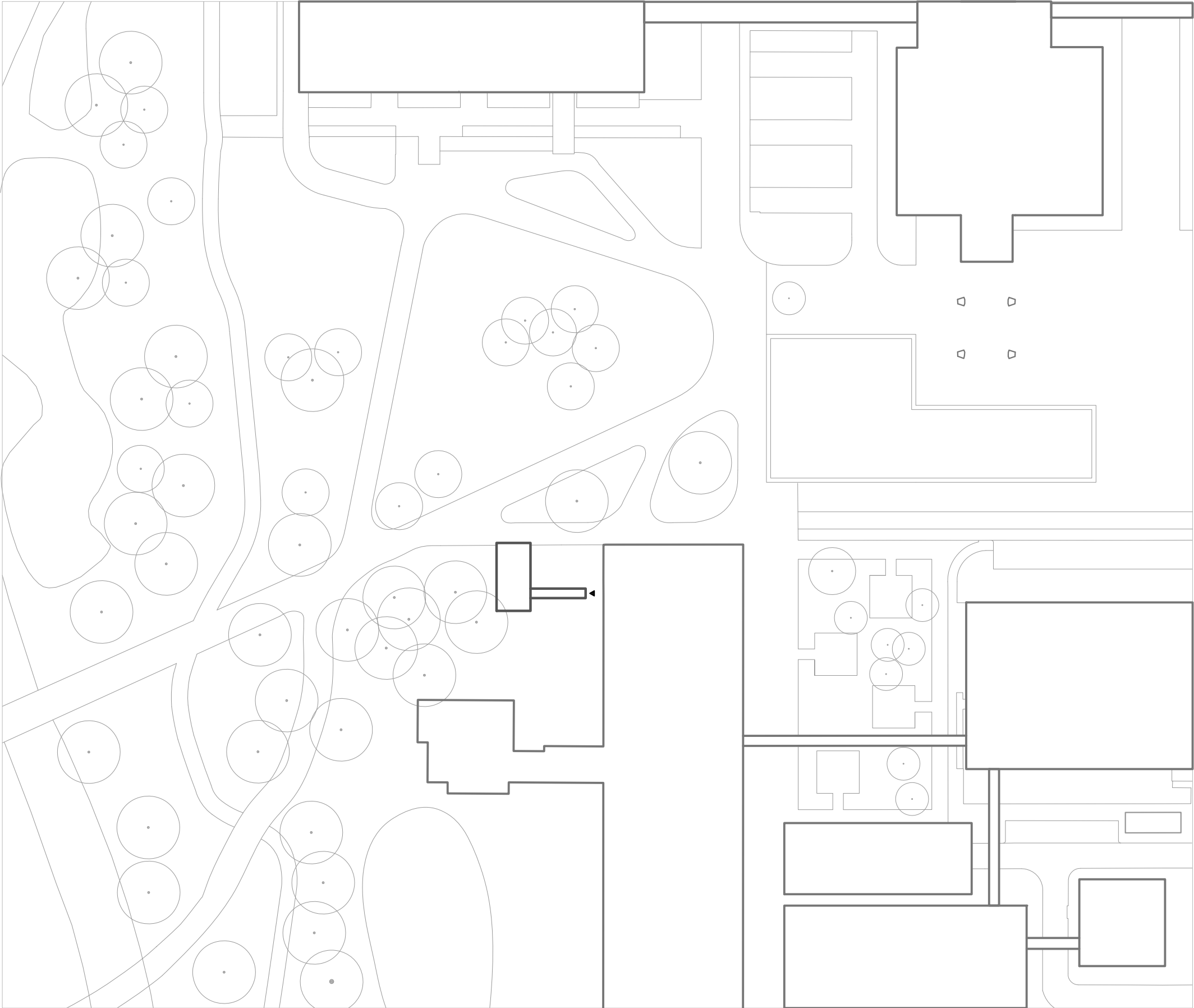
05.

What is a workshop? A workshop is a space which can be used for a lot of ways. For instance, you can go to a workshop to create a little model, scale 1:100, or on the other hand, to create a model for the course Production & Parts, scale 1:1. Therefore this space is created as an open, flexible space. The rectangle form is inspired by the NIOO-KNAW building.

Situation

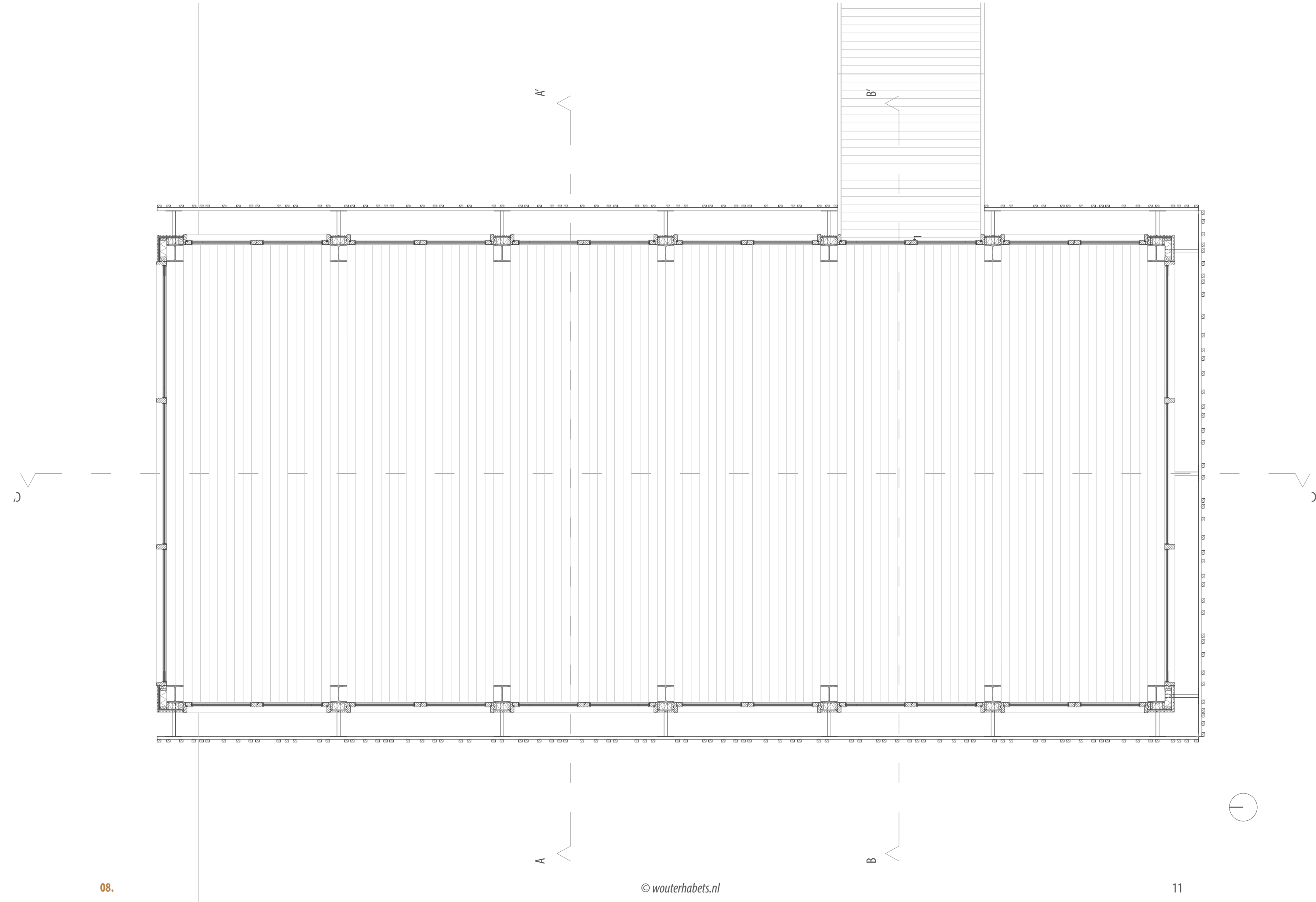
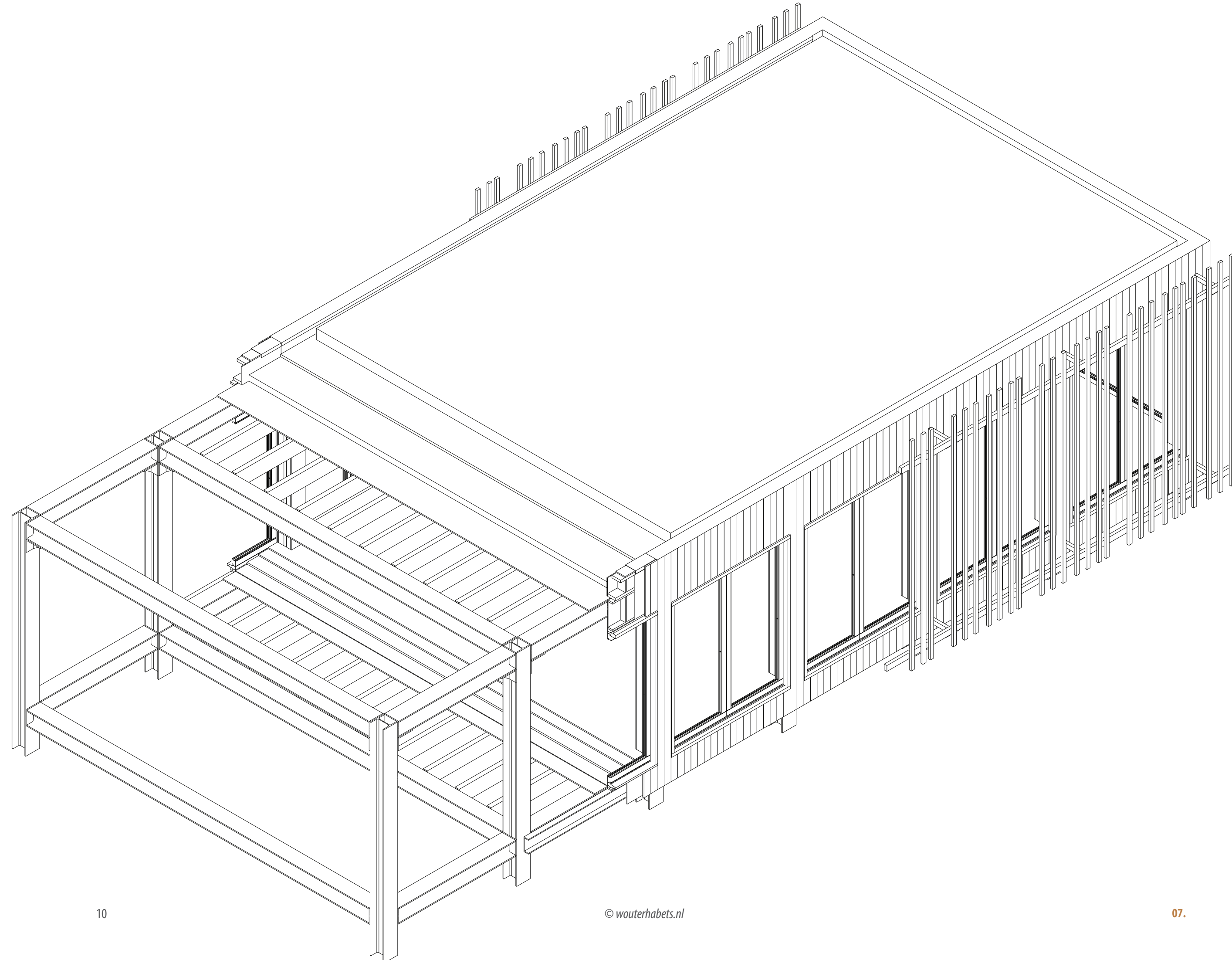
The design is situated at the west of Vertigo (picture 6). It is located there because of the possibility to exhibit not only the models itself, but also to display the work that it costs to make a full scale model. There's an entrance on the east side, so models can easily be transported from Vertigo to the extension. By using the bridge (ramp) - refers to the walking bridge between buildings on the campus – people can enter the extension.

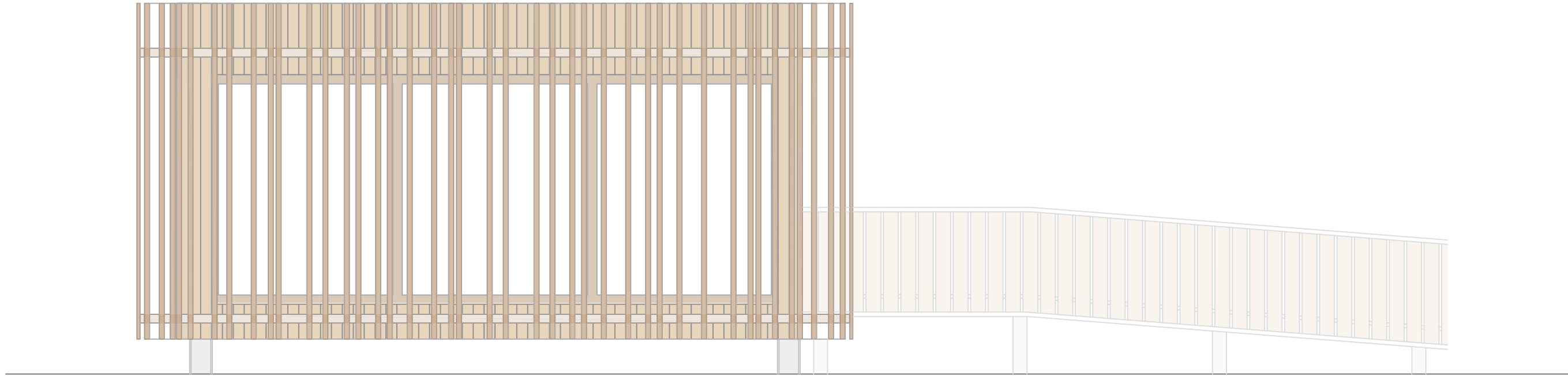
The extension is a 15 x 7 meters rectangle, stretched in the North – South direction. Because of the sunlight the design need some kind of shading. This is created with the wooden panels in the front of the building (variants shown in sketches). These vertical wooden beams are applied on the East – South – West side; on the North side is a perfect open view for the exposition of models.



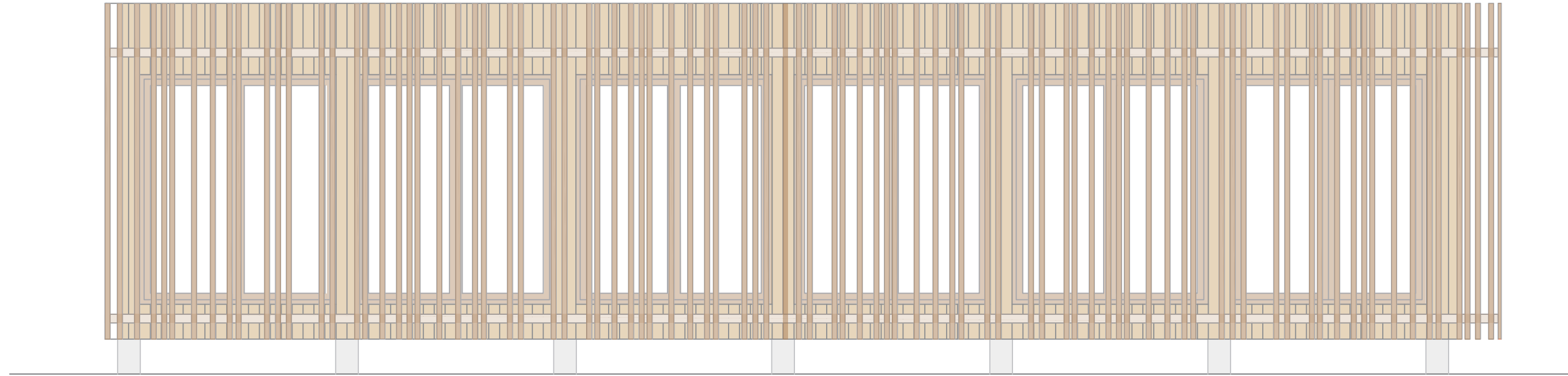
06.







09.

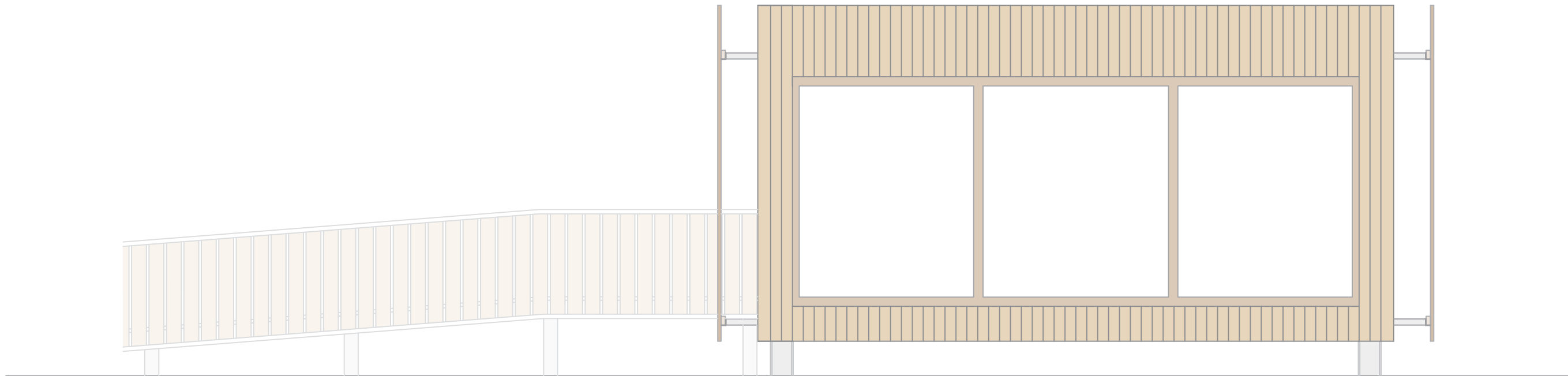


11.

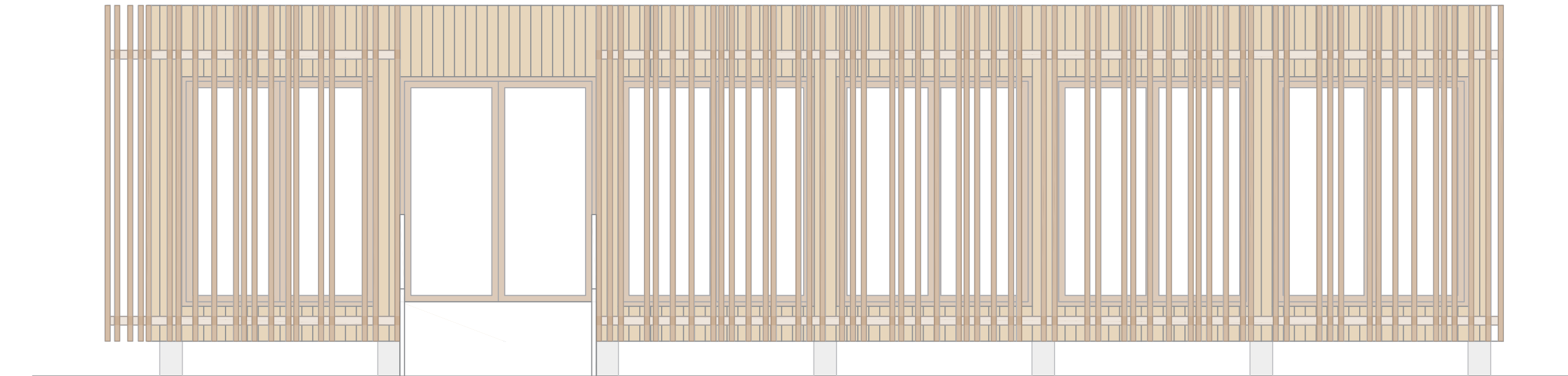
07. Isometric construction parts
08. Ground floor plan 1:50

09. South elevation 1:50
10. North elevation 1:50

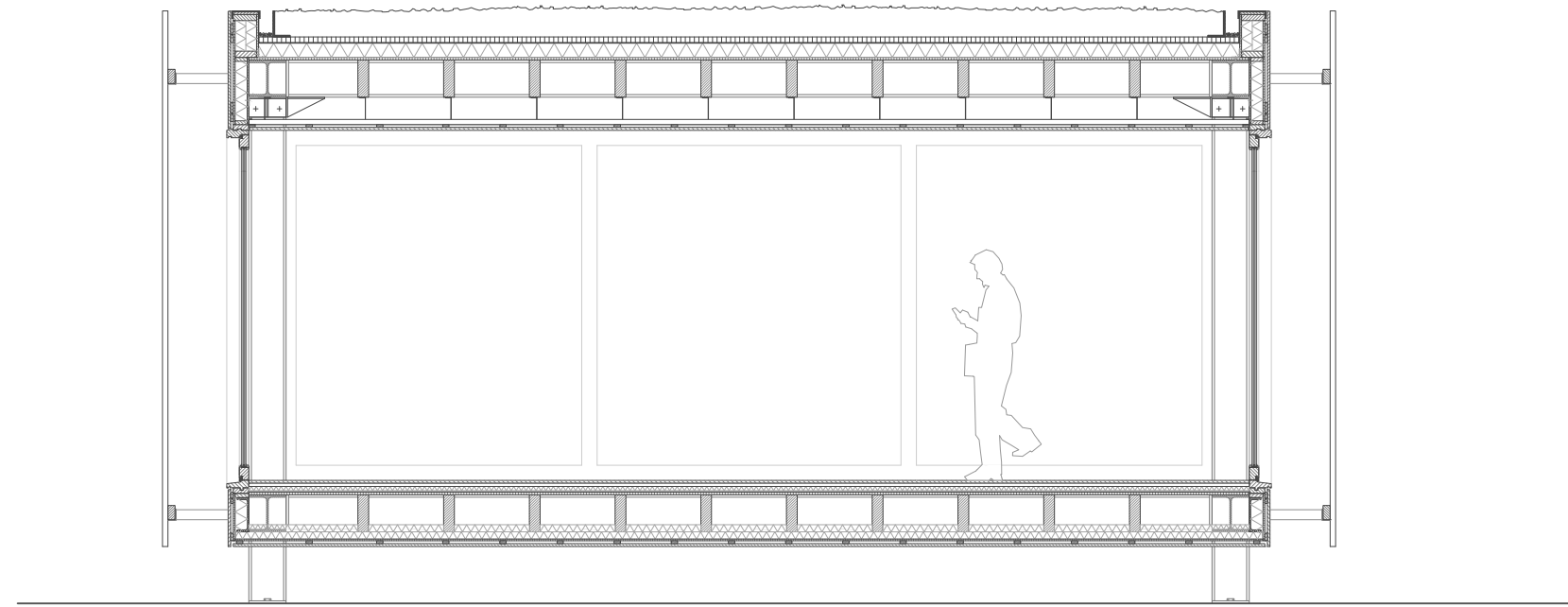
11. West elevation 1:50
12. East elevation 1:50



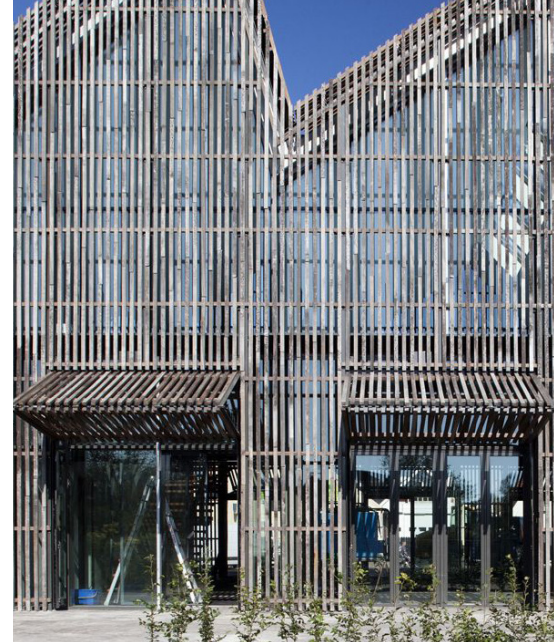
10.



12.



13.



14.

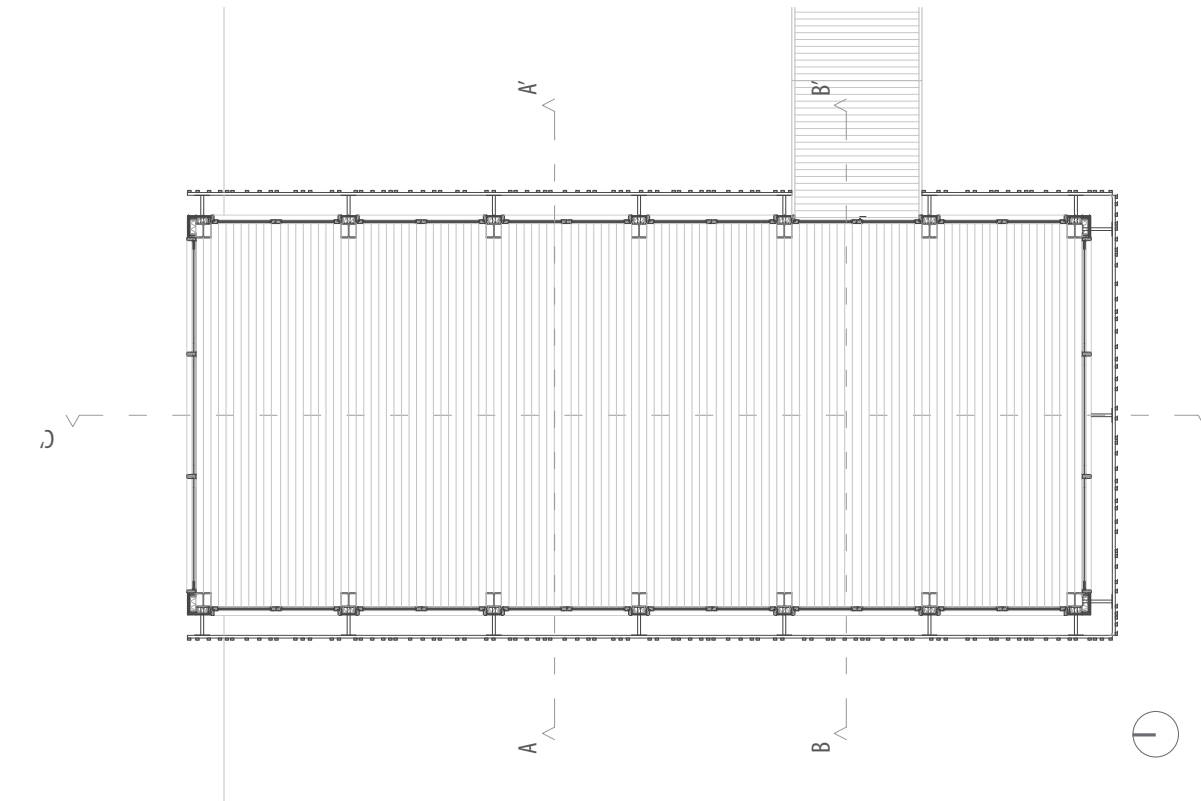


15.

Demountable and minimalism

Starting with the structure, this is made out of steel HEB 260 profiles. These are fixed together by the use of bolts, because it has to be demountable. To get a stable structure, the HEB 260 at the roof has to be moment fixed. This has been solved by the addition of profiles in the corners of the columns. The forces are transferred to the columns that are founded on footings. To get the look of a full wooden minimalistic inside (*picture 15*) there is a suspended ceiling.

Contributing to the cradle-to-cradle concept and to increase the level of sustainability a green roof was introduced at the research institute NIOO-KNAW. This is also introduced in the design of the extension, to avoid a water overflow. The roof is a fifth elevation and it is in sight of the surrounding buildings. The façade consists of Plato wood that is blinded fixed to a panel that is hanged at the structure. The Plato wooden vertical beams (*picture 14*) that are used for the shading are also blinded fixed to optimize the way of minimalism at the design.



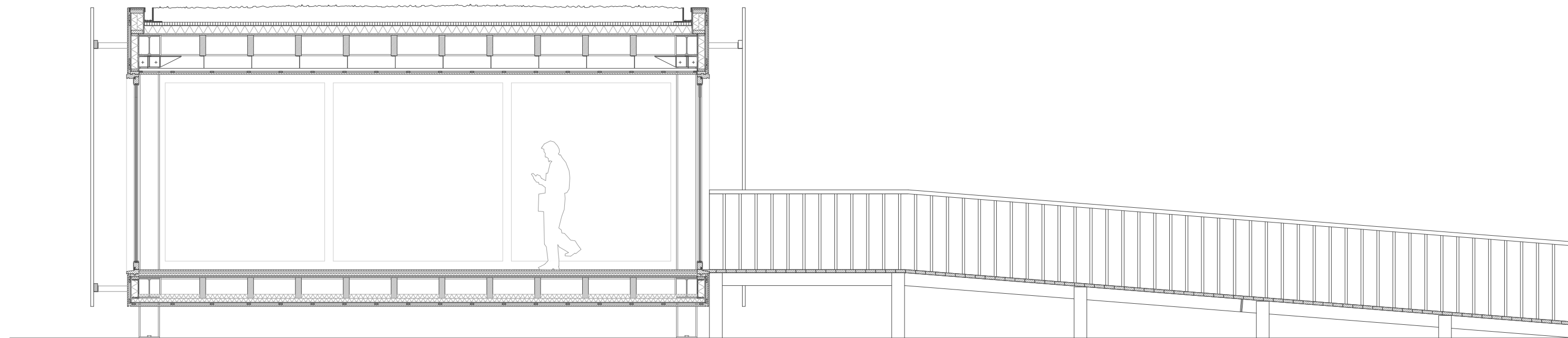
13. Section AA' 1:50

14. Kaap Skil - Mecanoo Architecten

15. Golden Workshop - Modulorbeat Ambitious Urbanists & Planners

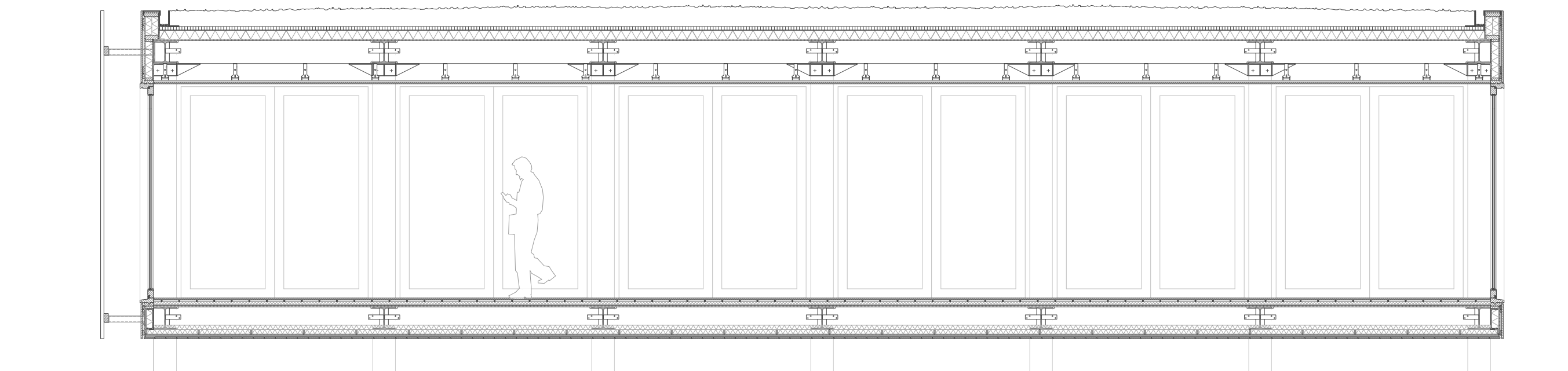
16. Section BB' 1:50

17. Section CC' 1:50



14

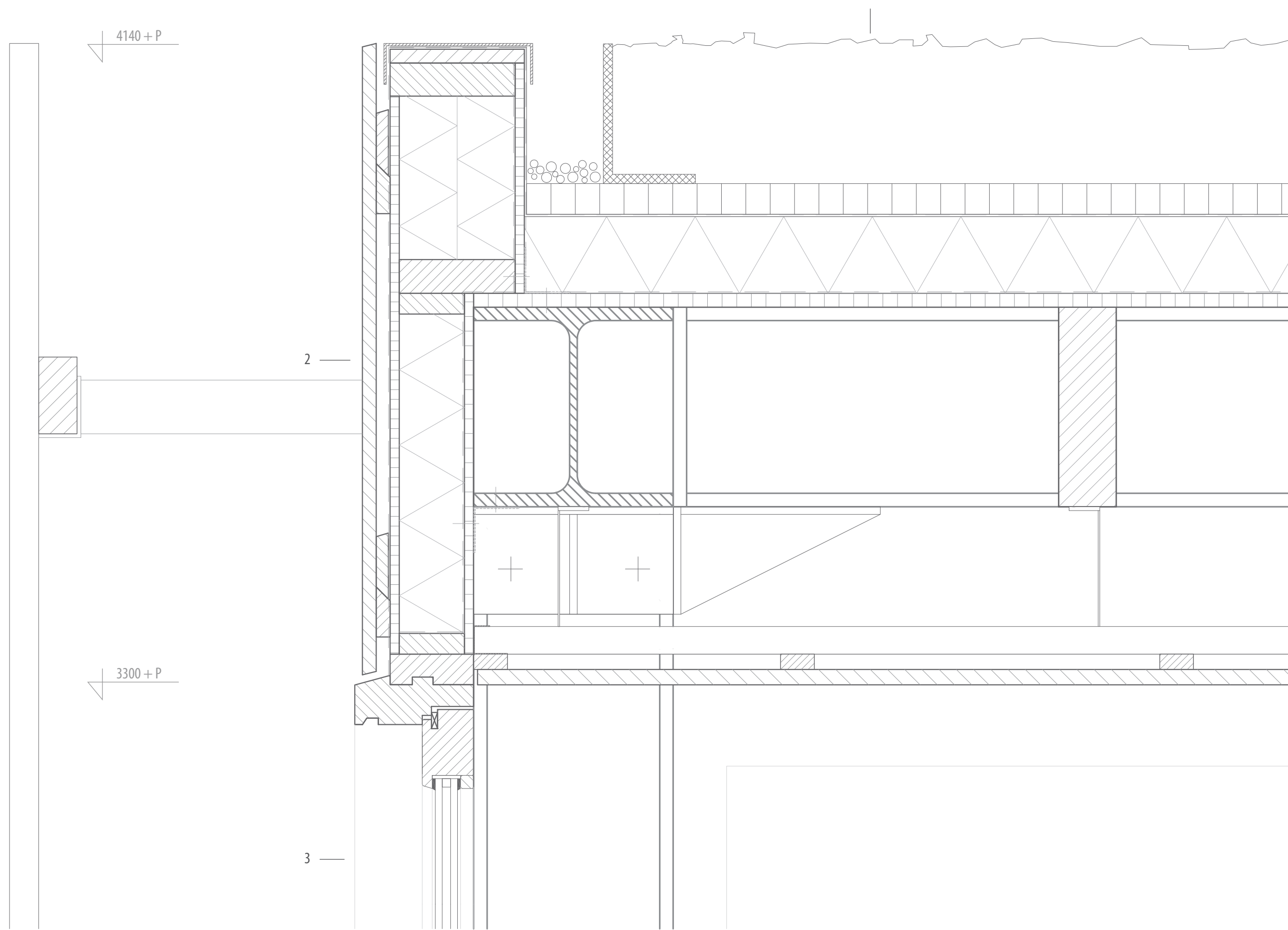
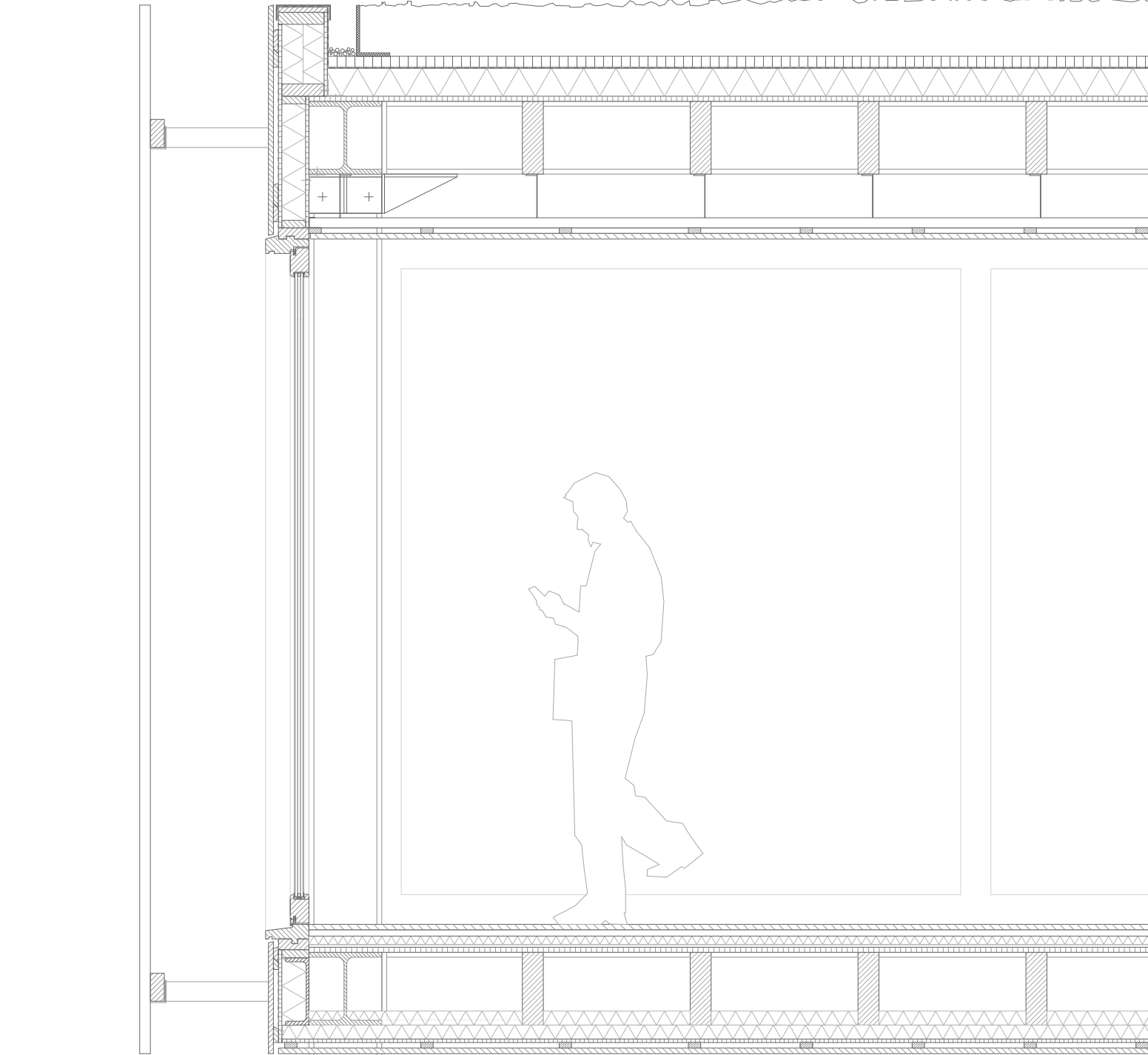
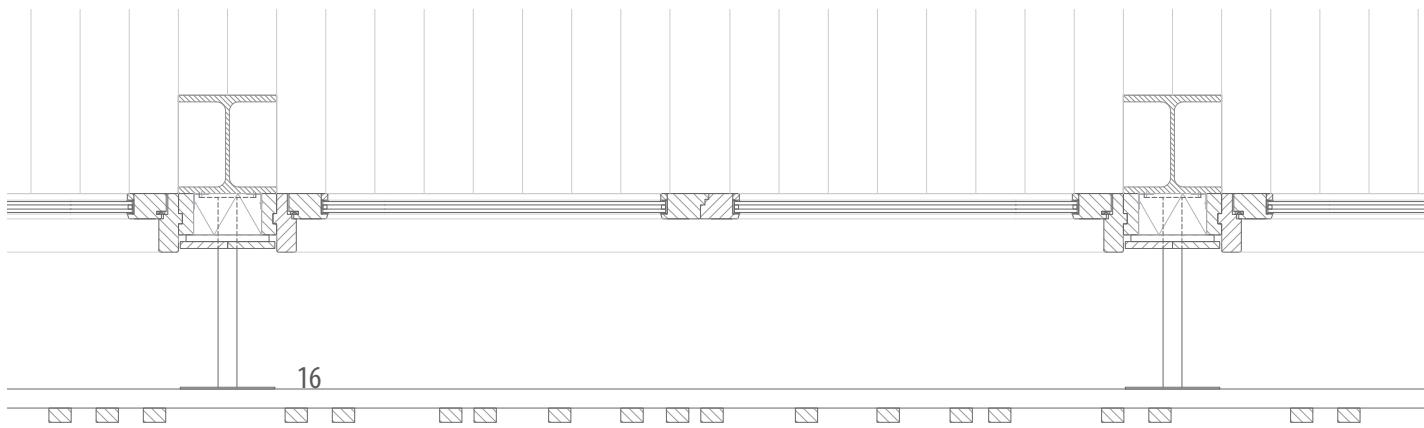
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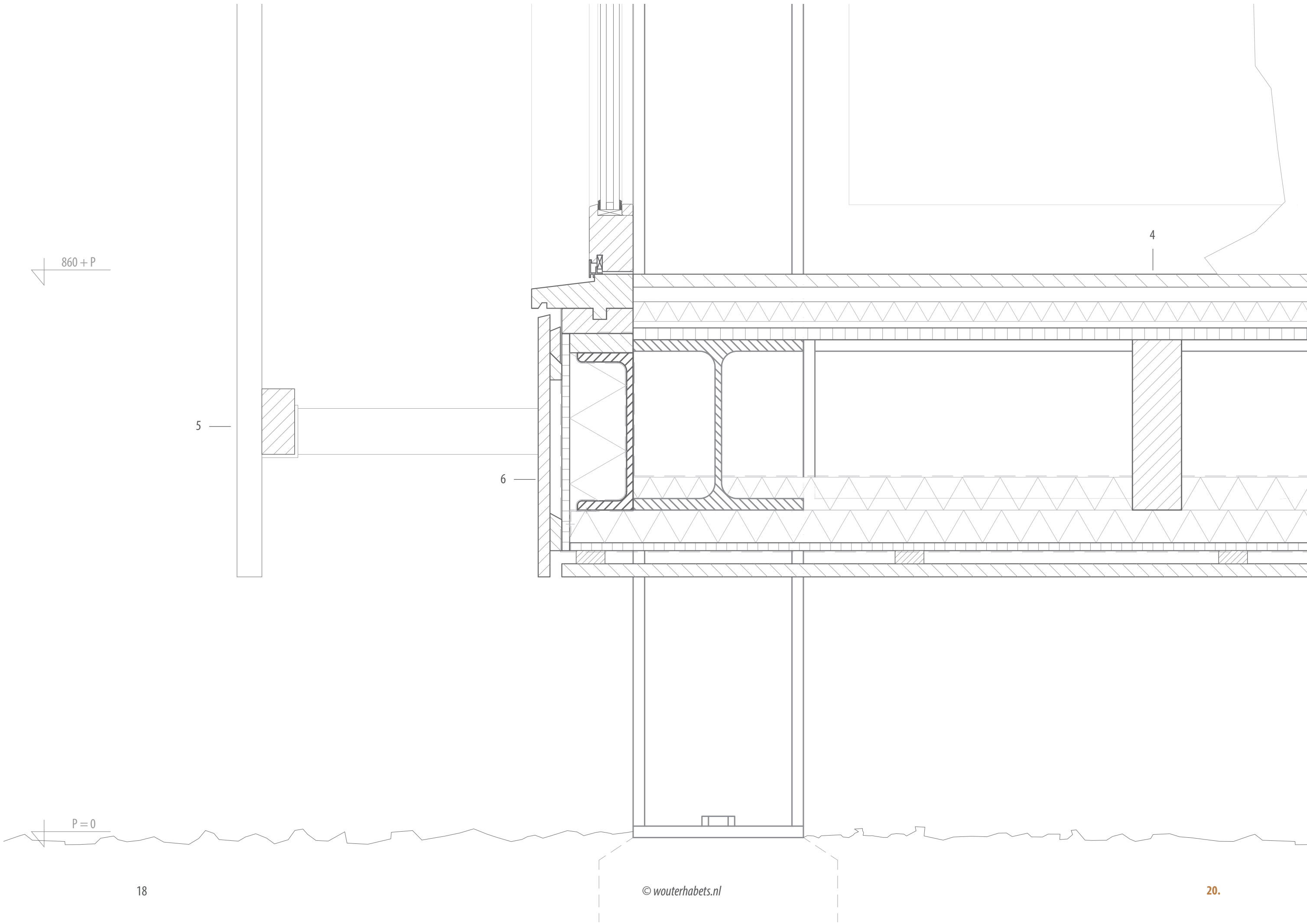


17.

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15





Detail

- | | | | |
|----|--|----|--|
| 1. | Vegetation layer 180 mm
Filter mat
Breathable drainage panel 40 mm
Filtration layer
Protective membrane
EPDM membrane
EPS insulation 100 mm
Vapor barrier
OSB 18 mm
Steel HEB 260
Suspended ceiling, plywood | 4. | Plywood floor 20 mm
Floor heating 22 mm
EPS insulation 30 mm
Rubber 10 mm
OSB 18 mm
Pine beam 75 x 260 x 2400
Insulation 50 mm
OSB 12 mm
Vapor barrier
Norwegian spruce, Plato wood 20 mm |
| 2. | Norwegian spruce, thermally treated without chemical impregnation 18 mm
EPDM Membrane
Plywood 12 mm
EPS insulation 85 mm
Vapor barrier
Plywood 12 mm
Steel HEB 260 | 5. | Norwegian spruce, Plato wood 38 x 59
Norwegian spruce, Plato wood 50 x 100
Steel square tube 70 x 50 |
| 3. | Double glazed insulating glass in timber frame (<i>western red cedar</i>) | 6. | Norwegian spruce, thermally treated without chemical impregnation 18 mm
EPDM Membrane
Plywood 12 mm
EPS insulation 85 mm
Vapor barrier
Steel UNP 240 |

18. Aansnede 1:20
19. Detail 1:5
20. Detail 1:5

Reflection

Before this course I haven't had much experience with detailing in general. Since this course I learned many things about basic principles on how to attach or produce certain elements of a detail. Especially the minimalism of the detailing I appreciate more. Also to work on a full scale model was a real eye-opener. To have these large pieces of wood, cloth, cotton board and plastics in your hand and actually work with them on a full scale with different kind of tools was great.

To start with detail was an interesting way of designing. Finding the concept of the detail and it is possible to make a new building. I investigated that a concept is something you find in a plan of a building or even in a master plan. But it is also in the finest details of a building.

I want to thank Froukje Rienks from the NIOO-KNAW for her great response and help with this course.

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Images

- 01. - 03. Photos by Wouter Habets
- 04. - 13. Drawings by Wouter Habets
- 14. Photo by Courtesy of Mecanoo Architecten
- 15. Photo by Christian Richters
- 16. - 20. Drawings by Wouter Habets

Bibliography