

**PRODUCTION & PARTS**  
PART 2: THE DESIGN OF AN EXTENSION TO THE  
MODEL WORKSHOP IN VERTIGO

## CONTENTS

Preface	4
Introduction	5
Detail	6
Design	8
Reflection	20
Bibliography	21

## 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 m<sup>2</sup> 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



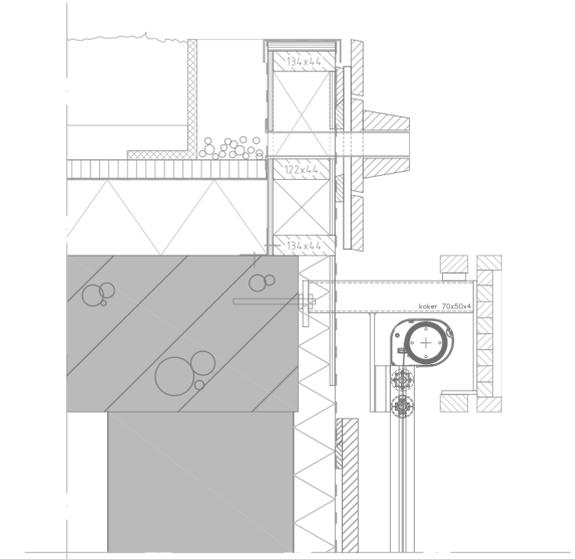
01.



02.



03.



04.

The first part of the course Production & Parts consisted of the investigation of an architectural detail from an architectural project of personal choice. For this, my partner and I chose the research institute NIOO-KNAW, situated in Wageningen in the eastern part of The Netherlands. The institute's building process was finished in January of 2011 and is designed by the Amsterdam department of Claus & Kaan architecten. We chose this detail because of the minimalistic approach of the architects to the detailing of this building and because of the high degree of sustainability the building, and therefore the detail, carries with it.

The particular detail we chose is a part of the east façade with its connection to the roof as shown in picture 1. The reason this façade and detail was chosen is because of the great simplicity of them. Out of own experience we know that, to achieve simplicity, great time and effort have to be put in this kind of detailing. The eastern façade is a rhythmic game of repetitive elements, an architectural language Claus & Kaan are known by. At first glance, not that many elements are visible, but when you dive into the details a large amount of parts is discovered. These parts are largely made invisible by different consoles and cantilevers by the architects.

It is very hard to make a detail that is minimalistic and detachable at the same time, because the use of permanent connections is prohibited. Of course some compromises had to be made, but in general the most parts of the detail are separable from one another.

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.

### “Demountable - minimalistic detailing”

### Material

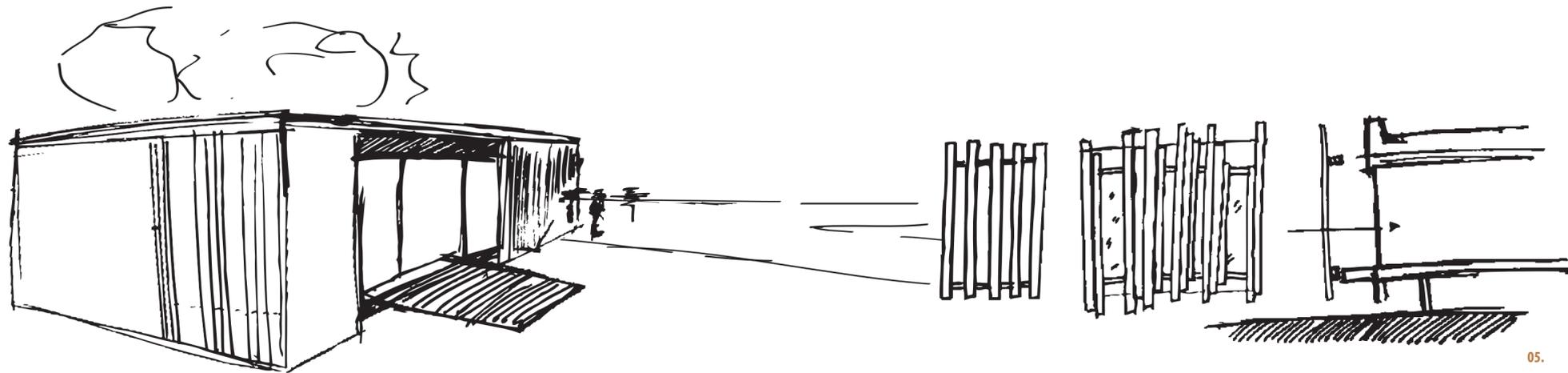
Claus and Kaan Architects had to meet a number of stringent material specifications. The building had to be people and environmentally friendly, made from renewable raw materials and economically produced without any harmful emissions. The hull is made of durable concrete without any artificial additives 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.

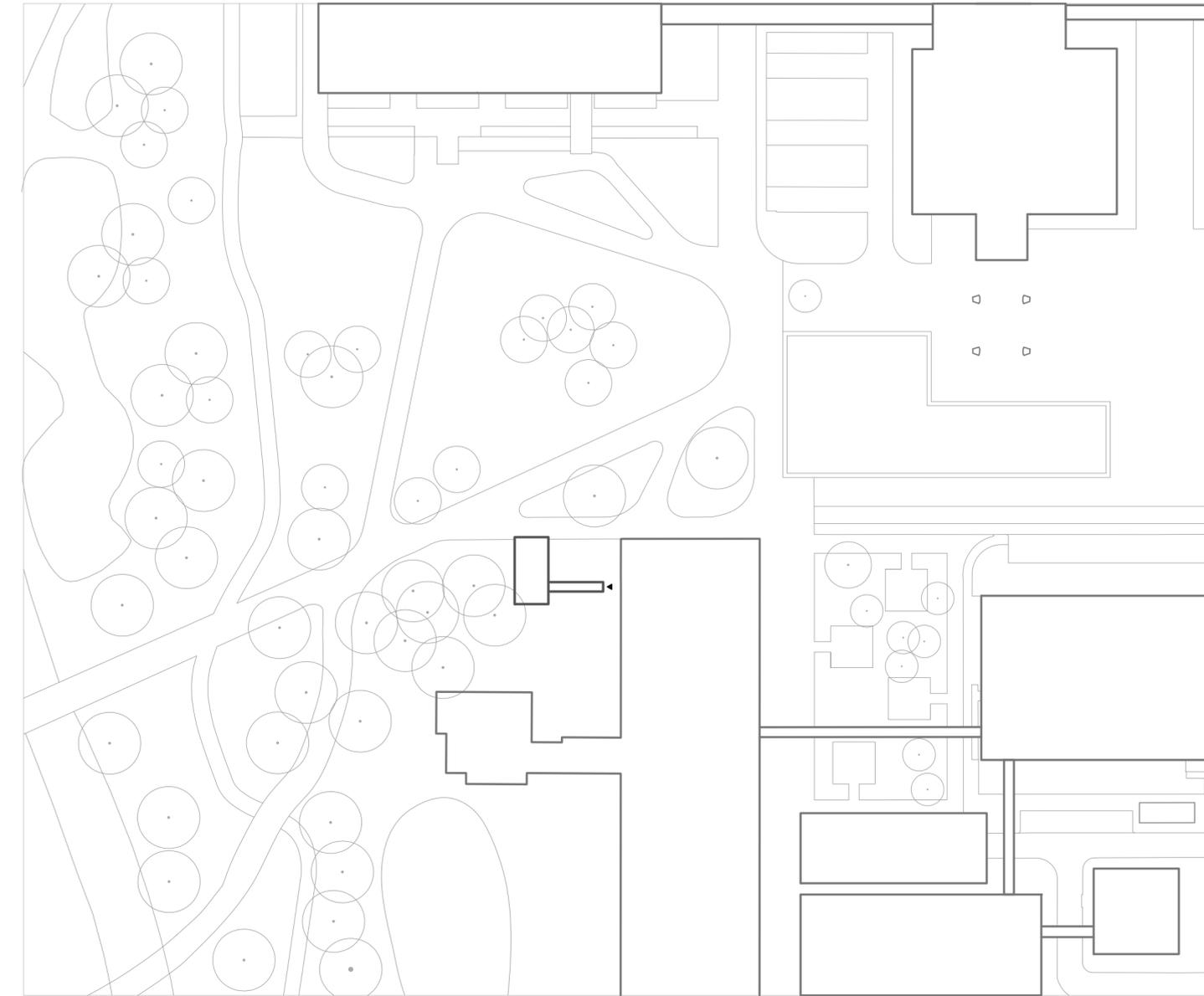
## Design

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

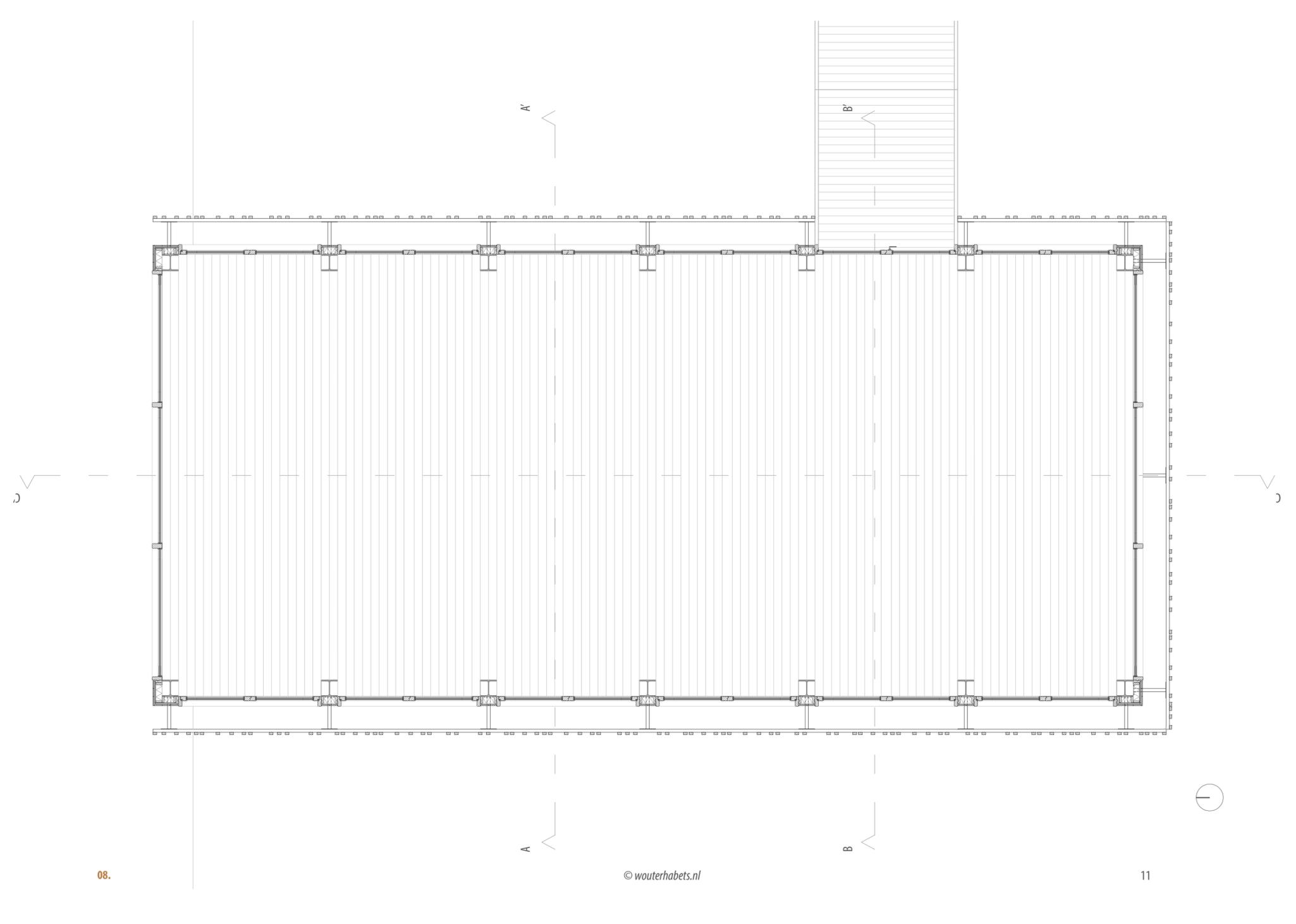
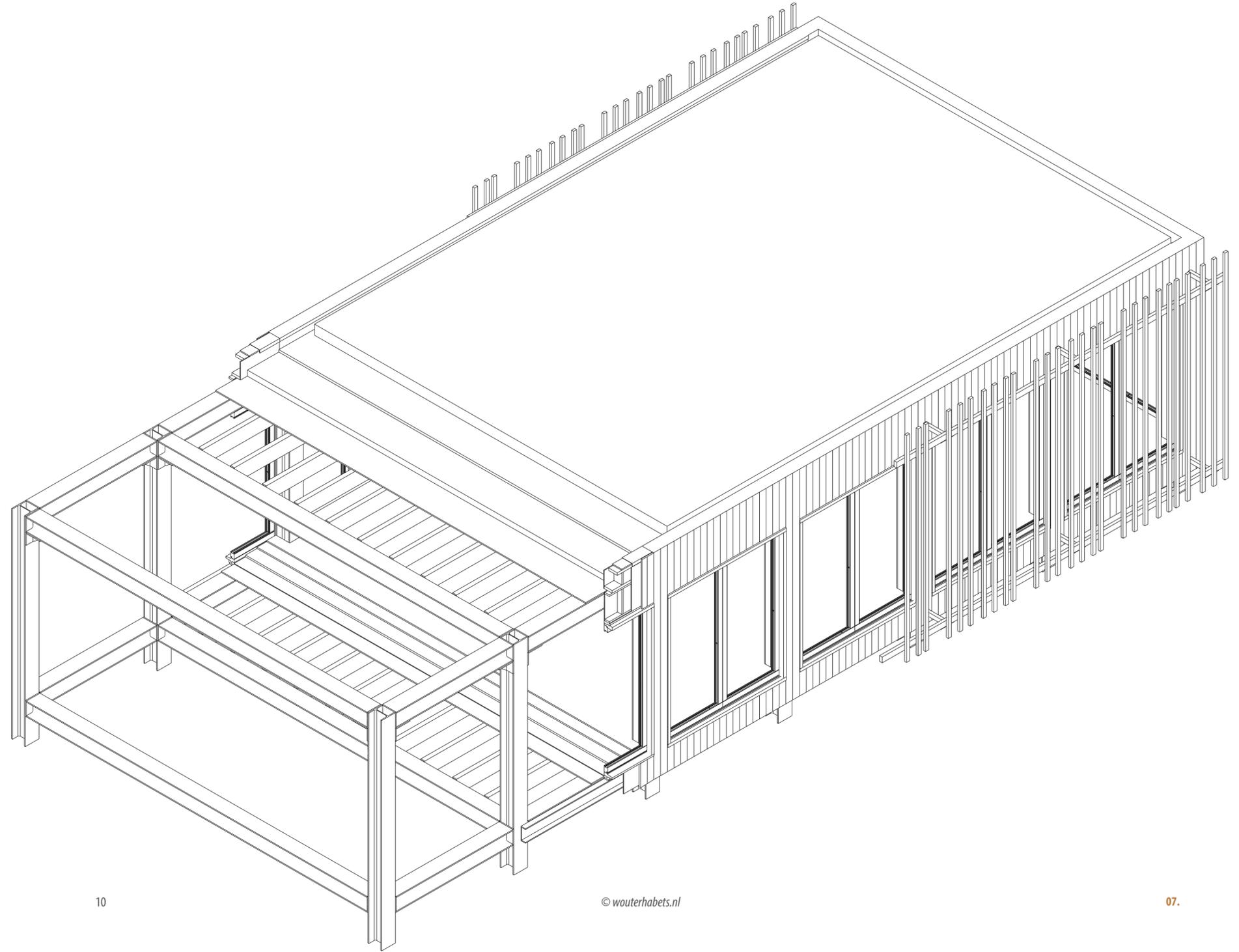


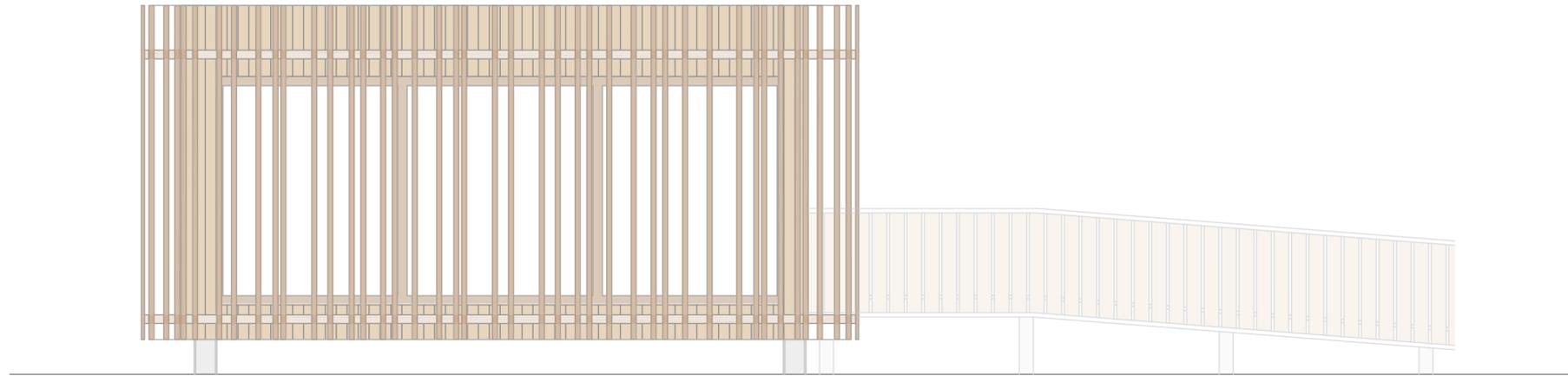
05.



06.







09.

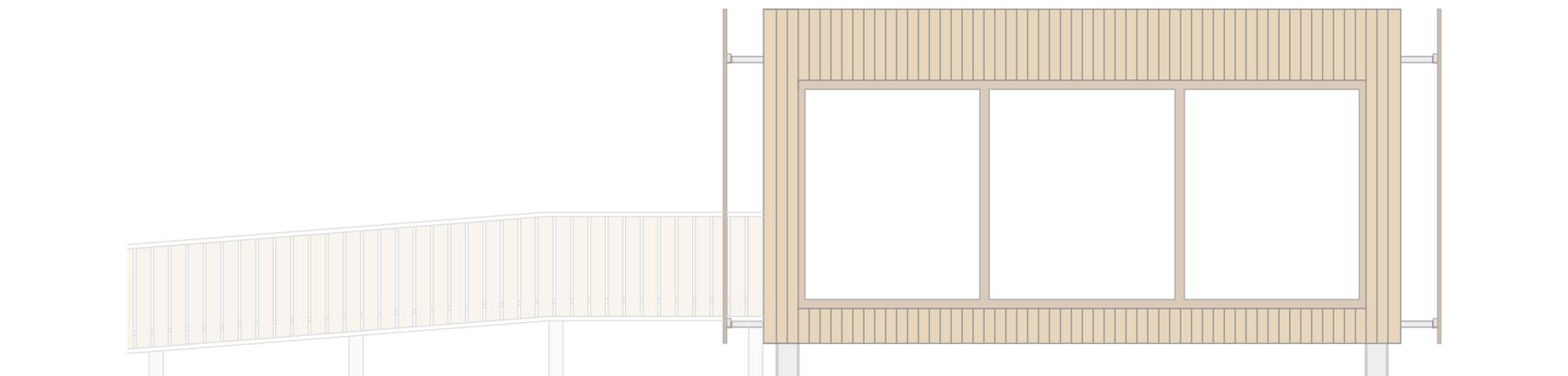


11.

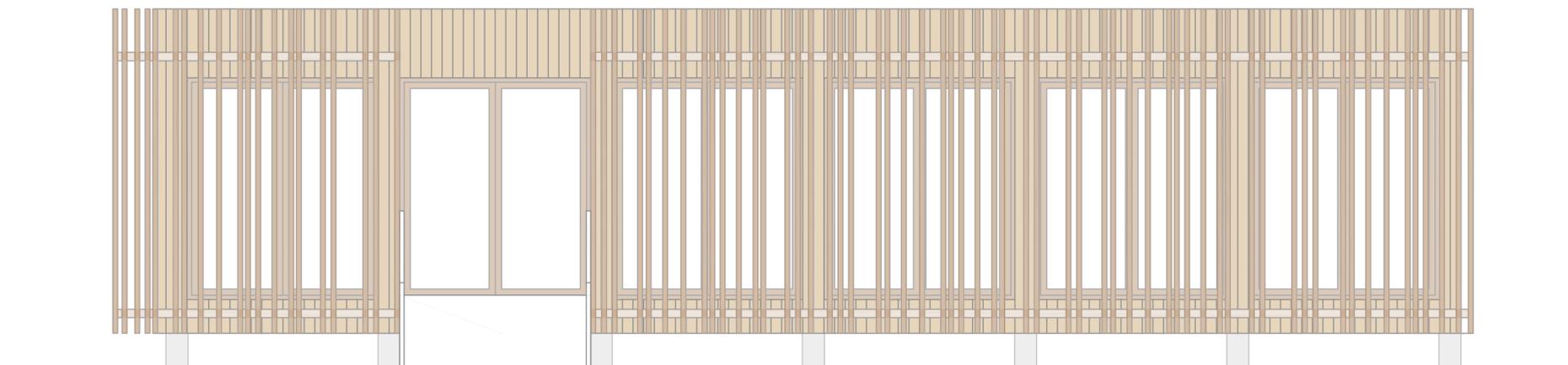
07. Isometric construction parts  
08. Ground floor plan 1:50

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

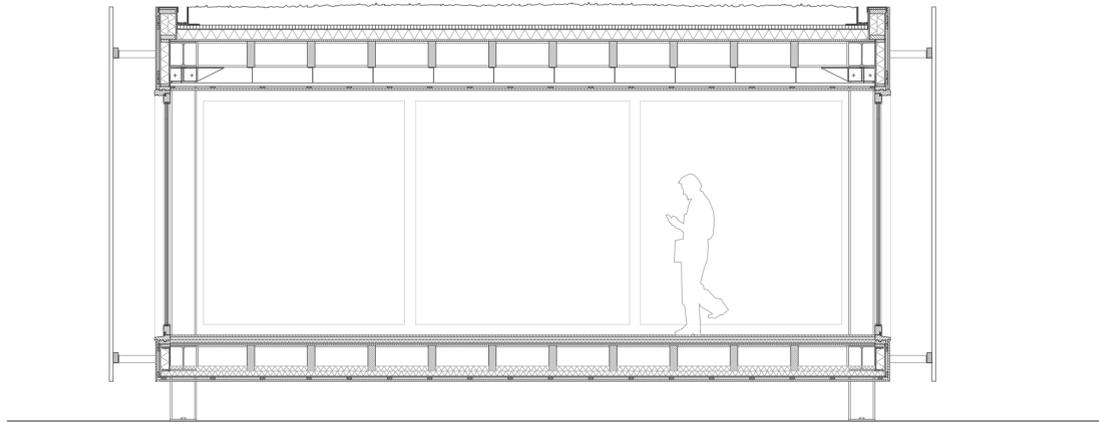
11. West elevation 1:50  
12. East elevation 1:50



10.



12.



13.



14.

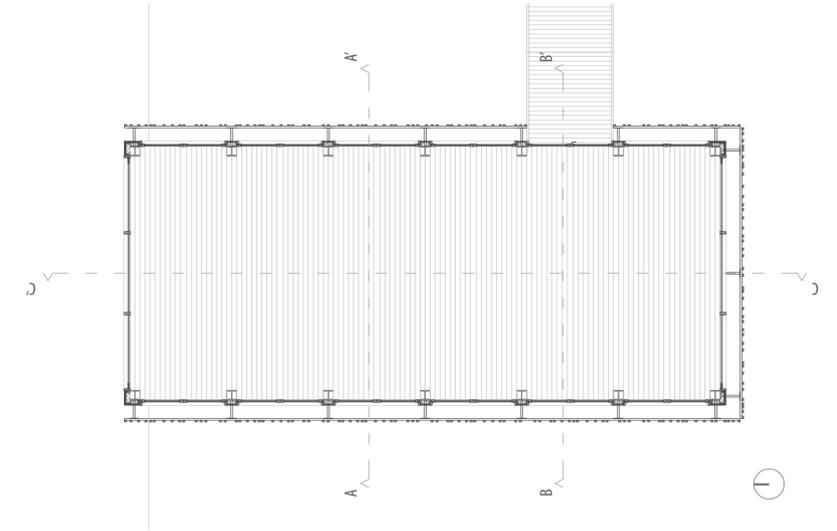


15.

**Demountable and minimalism**

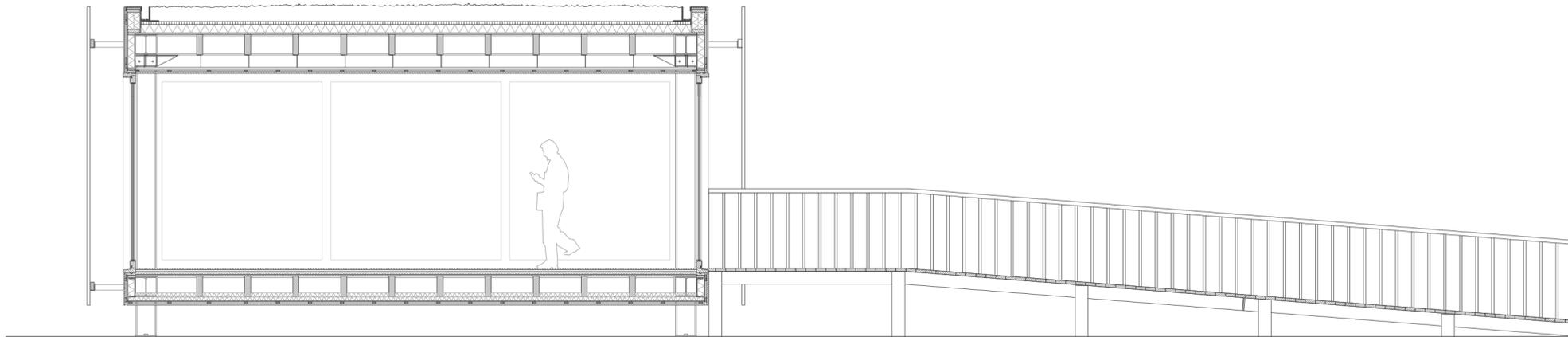
Starting with the structure, this is made out of steel HEB 260 profiles. These are fixed together by the use of bolts, because it has to be demountable. To get a stable structure, the HEB 260 at the roof has to be moment fixed. This has been solved by the addition of profiles in the corners of the columns. 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.



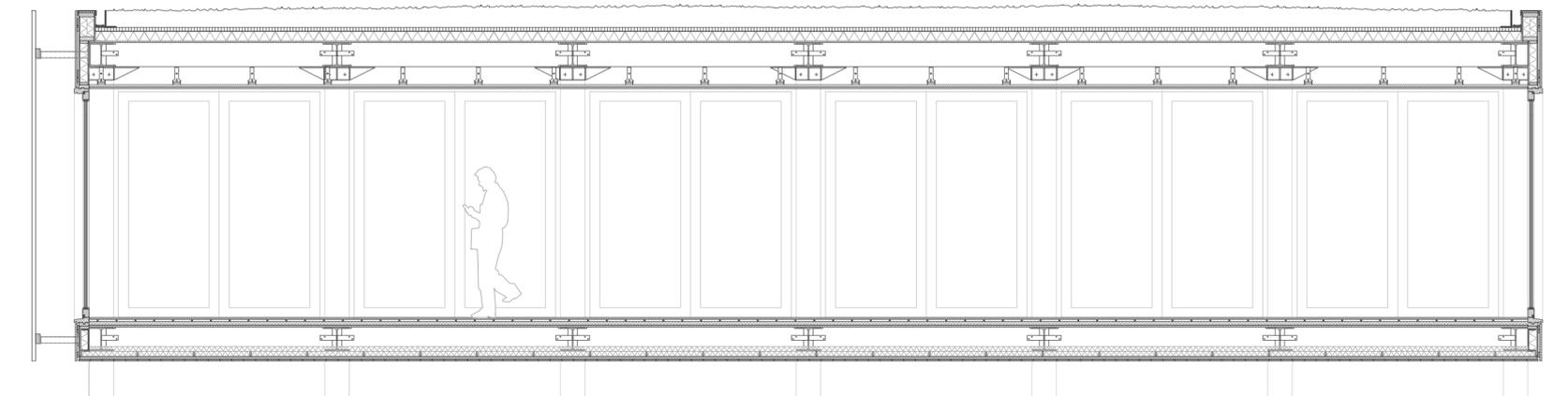
13. Section AA' 1:50  
 14. Kaap Skil - Mecanoo Architecten  
 15. Golden Workshop - Modulorbeat Ambitious Urbanists & Planners

16. Section BB' 1:50  
 17. Section CC' 1:50



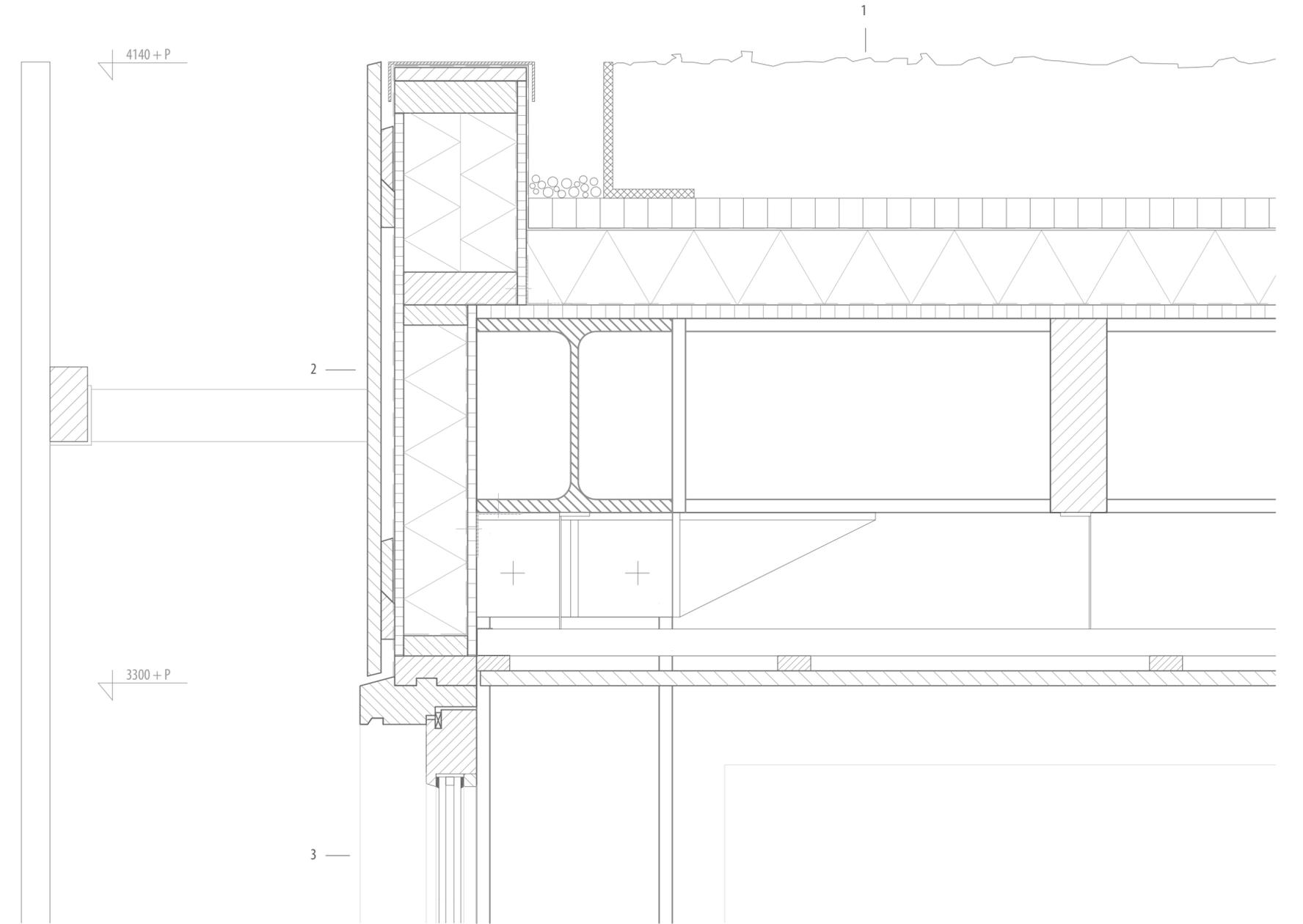
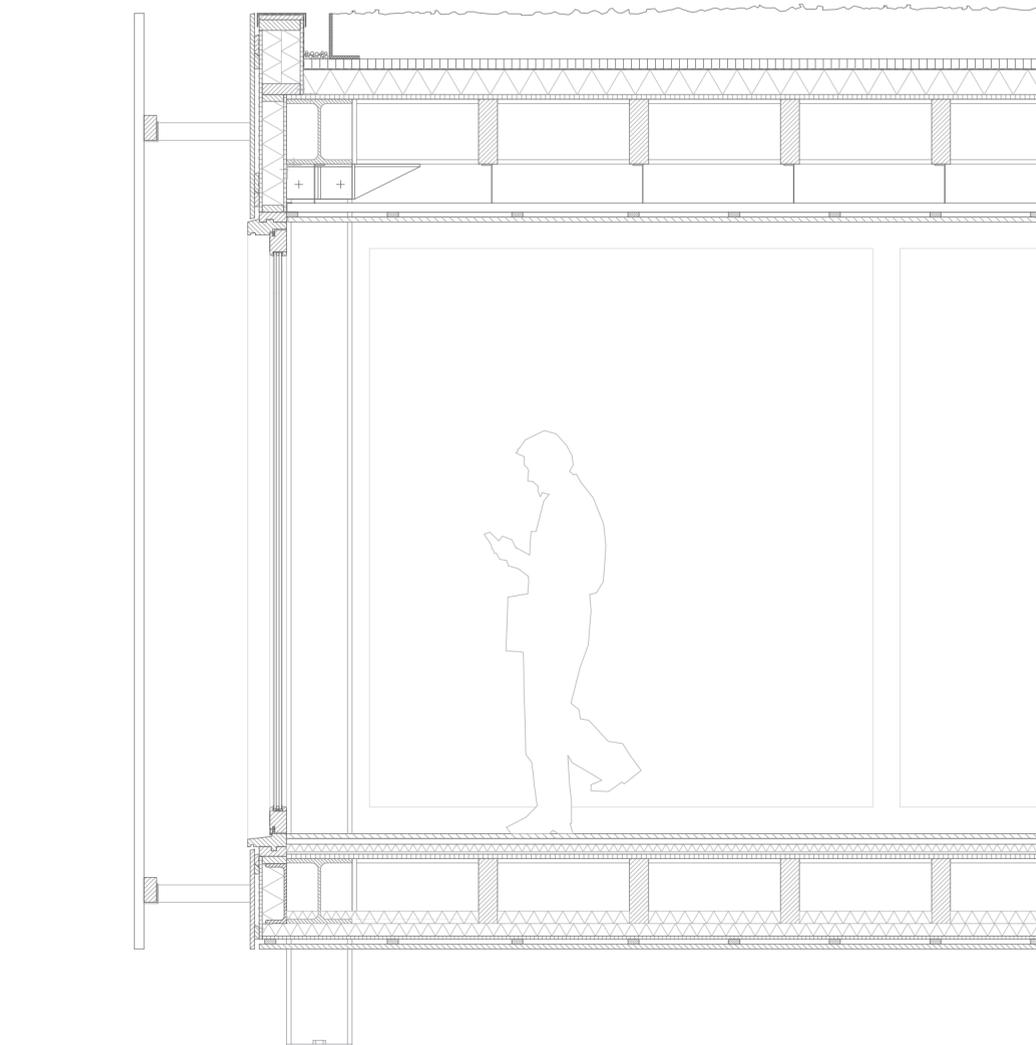
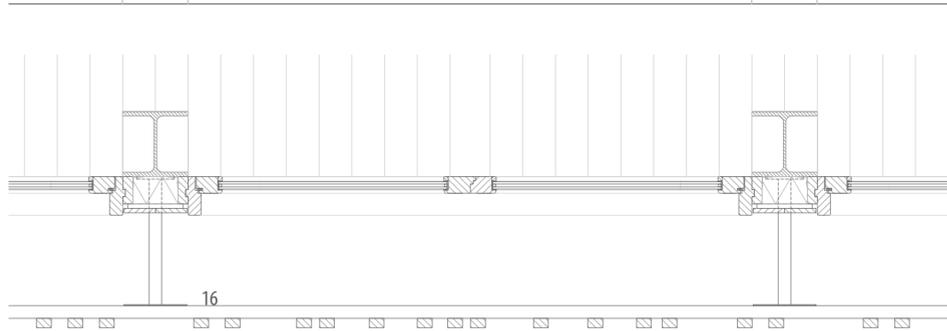
14

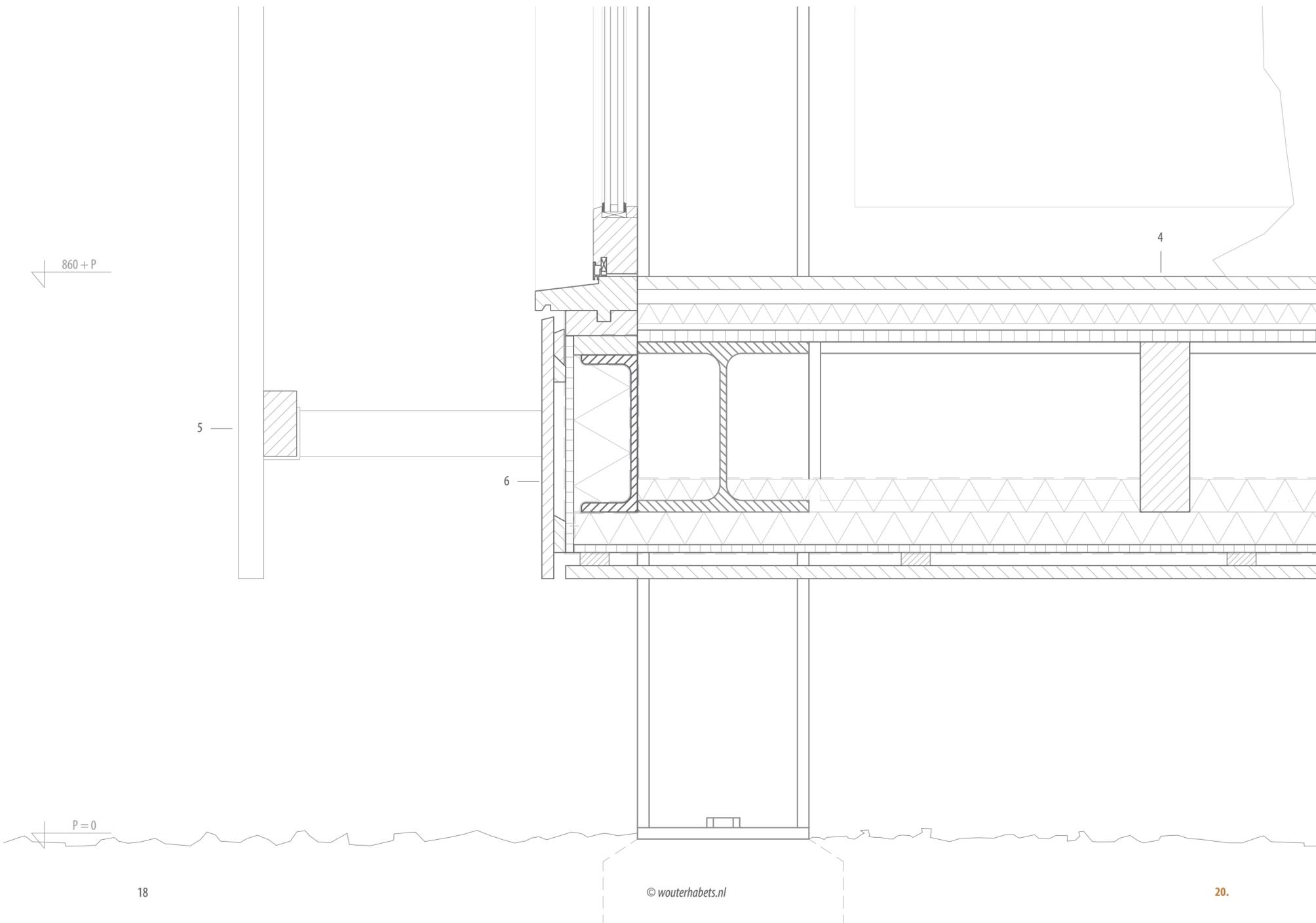
16.



17.

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
- 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
- 3. Double glazed insulating glass in timber frame (*western red cedar*)
- 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
- 5. Norwegian spruce, Plato wood 38 x 59  
Norwegian spruce, Plato wood 50 x 100  
Steel square tube 70 x 50
- 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.

## Literature

Agentschap NL (2011) *Lessons Learned*. Utrecht: Agentschap NL

Bone, A.H.L.G. (2009). *Bouwkunde Tabellenboek*. Groningen: Wolters-Noordhoff BV

Bryan, T. (2010). *Construction Technology Analysis and Choice*. United Kingdom: Blackwell Publishing LTD

Detail green (2012) (English ed.), *Research Institute in Wageningen: ecological field test*, n.2, p.22-29.

Deplazes, A. (1997). *Construction Architecture*. Basel: Birkhäuser Verlag AG

Hartman, H. (2011) GreenSource: the magazine of sustainable design, *Learning Lab*, Sept.-Oct., number 5, page 76-81

Jodidio, P. (2009). *Green Architecture now*. Cologne: Taschen GMBH

Sebestyén, G. (1977). *Lightweight building construction*. London: George Godwin Limited

## 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