Terra Habita

Project MA | WS 2025/26

Professorship of Digital Fabrication
Prof. Dr. Kathrin Dörfler | Janna Vollrath, M. Sc.

Chair of Architectural Design and Construction
Prof. Florian Nagler | Dr.-Ing. Tilmann Jarmer

Chair of Timber Structures and Building Construction
Prof. Dr.-Ing. Stefan Winter | Prof. Dr. Gerhard Fink
Dominik Merk, M. Sc. | Christoph Kurzer, M. Eng.

Introduction

Wood and earth are two of the oldest building materials in human history and are also considered to be forward-looking renewable resources in modern construction. Their use can be traced back to the earliest civilisations and is documented archaeologically on almost every continent. For several thousands of years, both materials have been used worldwide in residential construction as well as in public, religious and agricultural buildings. Archaeological finds from Asia indicate the use of unfired clay bricks more than 9,000 years ago. At the same time, timber construction played a central role for centuries in the densely forested regions of Europe, Asia and North America, significantly shaping local building traditions (cf. Minke 2012).

The use of wood and clay over many years is based on their good construction properties, their regional availability and their relatively simple processing. Historical construction methods such as half-timbered construction still demonstrate the load-bearing capacity and durability of these materials today. Experience gathered over generations shows that wood and clay are high-performance building materials that can meet modern technical requirements (cf. Kollmann/Côté 2016).

Regenerative building materials are becoming increasingly important in the modern world. The construction sector is responsible for a significant percentage of global CO^2 emissions and resource consumption. Against the background of climate change and shrinking natural resources, sustainable construction is increasingly becoming the focus of politics, industry and society (cf. DGNB 2023). In this context, wood and earth have considerable potential as they are regionally available, durable and environmentally friendly.

References

German Sustainable Building Council (DGNB) : Sustainable Construction. Stuttgart.
Principles of Wood Science and Technology. Vol. 1, Solid wood/ Kolmann; Côté, Springer, Berlin.
Building with Earth: Design and Technology of a Sustainable Architecture, Minke; Birkhäuser, Basel.

Project MA | WS 2025/26 | Technical University of Munich

Teaching
Professorship of Digital Fabrication
Prof. Dr. Kathrin Dörfler | Janna Vollrath, M. Sc.

In collaboration with
Chair of Architectural Design and Construction
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Gartenhaus Theodor-Storm-Straße
Florian Nagler Architekten
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Schedule

Tuesdays | 09:00 - 16:00 | 0501.04.1401

Date	Program	Presentation
15/10/2025	Kick-off	
22/10/2025	Exkursion	
28/10/2025	Research presentation	Tasks 1
04/11/2025	Desk crit	
11/11/2025	Desk crit	
18/11/2025	Desk crit	
25/11/2025	1. Midterm presentation	Task 2
02/12/2025	Desk crit	
19/12/2025	Desk crit	
16/12/2025	2. Midterm presentation	Task 3
23/12/2025	Desk crit	
30/12/2025	Desk crit	
06/01/2026	Desk crit	
13/01/2026	Final presentation	Task 4

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Bettina Baggenstos
Co-Founder Lehmit GmbH, VDC | Sustainability at Blumer Lehmann
© Avishek Das

Tobias Schwinn
Head of Research and Research Infrastructure at Institute for Computational Design and Construction
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Guest critics and guest lecturers

Blumer Lehmann
Lehmit
Bettina Baggenstos, M.A.

Institute for Computational Design and Construction | University Stuttgart
Dr.-Ing. Tobias Schwinn

Institute for Advanced Architecture of Catalonia (IAAC) Barcelona
Alexandre Dubor, M.Arch.

Institute for Construction | Technical University of Braunschweig
HELGA BLOCKSDORF / ARCHITEKTUR
Prof. Dr.-Ing. Helga Blocksdorf

Alexandre Dubor
Director of the Robotics Lab at Institute for Advanced Architecture of Catalonia
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Midterm 1
Concept and Design Idea
© Avishek Das

Midterm 1
Concept and Design Idea
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Midterm 2
Construction and Fabrication
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Midterm 2
Construction and Fabrication
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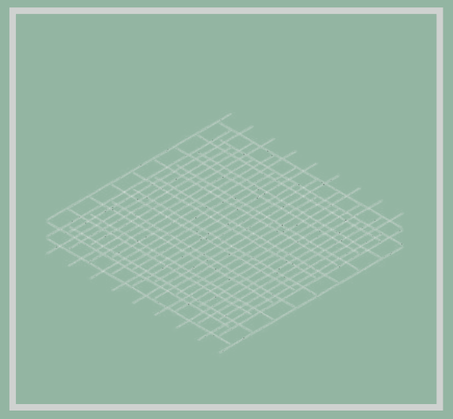
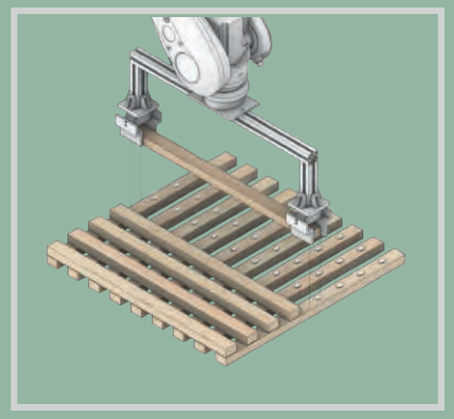
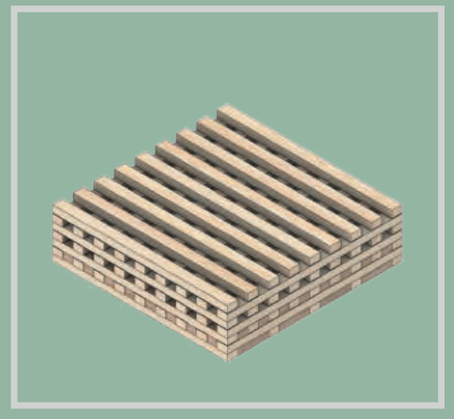
Timber Earth Slab

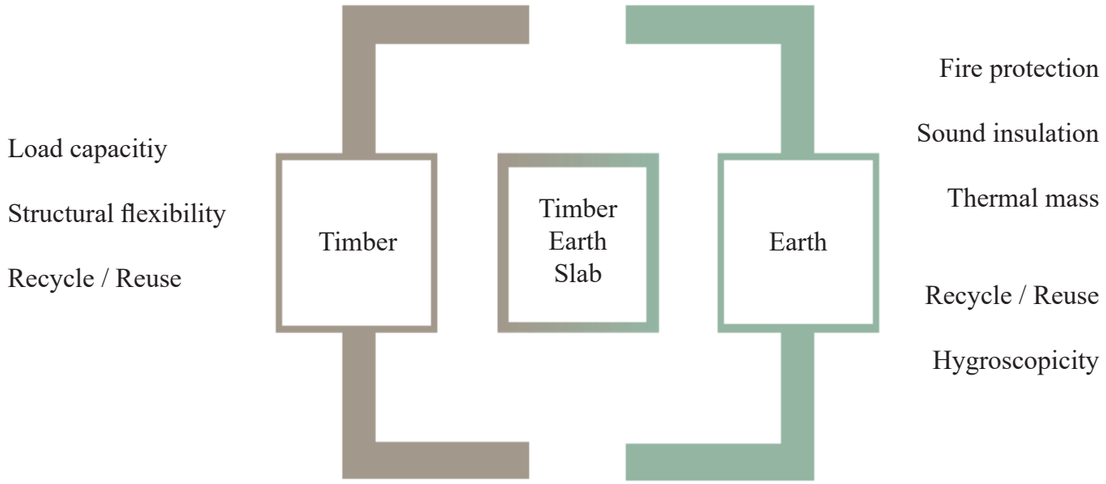






The Timber-Earth Slab (TES) is is an innovative construction system that combines the two natural materials wood and earth to leverage their complementary properties. Wood provides the structural strength and load-bearing capacity necessary for multistory buildings, while earth offers additional benefits such as thermal regulation, sound insulation, and fire resistance. The interaction of these two regenerative materials results in a unified, resource-efficient building system that not only enhances the indoor climate but also reduces energy consumption and improves the comfort of the built environment.

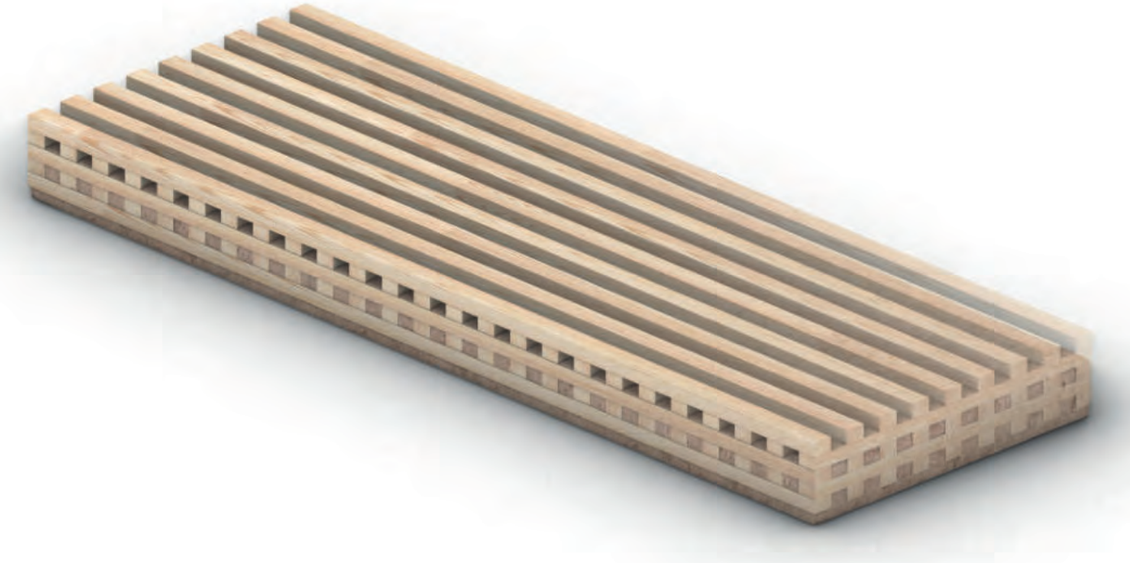
The core idea behind TES is to create a modular, adaptable system that can be applied to a variety of building components, starting with ceiling elements.



The structural concept of TES is based on an innovative lightweight system derived from crosslaminated timber (CLT). Unlike traditional CLT, in which timber layers are fully surface-glued, the TES system forms a spaced grid by selectively bonding the layers only at the connection points. In TES, this timber grid fulfils a dual role. It serves as the primary load-bearing component by providing high tensile strength and structural adaptability. The use of small cross-sections promotes resource efficiency, minimises production waste and enables the production of dif ferent panel layouts, including nonstandard geometries or slabs with openings. This approach supports scalable, flexible production and enables fully robotic prefabrication of the timber structure.

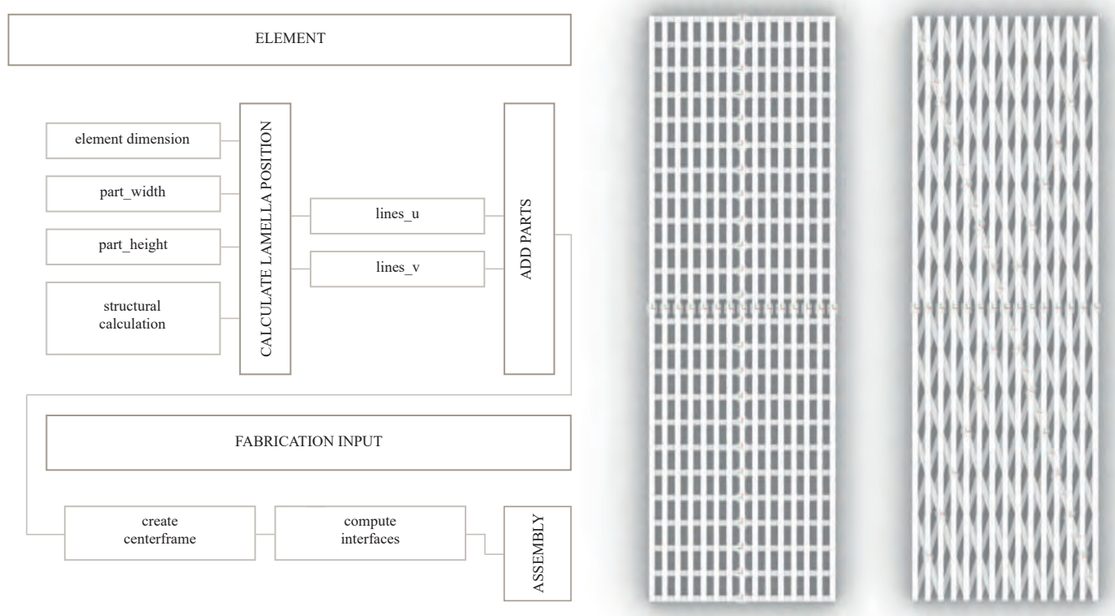
Once the timber grid is complete, its cavities are filled with a specially developed earth-based mixture. Formulated by ETH spin-off Oxara, the mix incorporates Oxacrete® Care, an additive that enhances flowability with minimal water content. This allows the earth material to be poured into the wooden structure. During the pouring process, the structure is continuously vibrated to ensure even distribution, avoid air pockets and ensure sufficient compaction. Depending on the ambient conditions, the drying phase takes around two to four weeks until the structural strength required for transportation and installation is achieved.

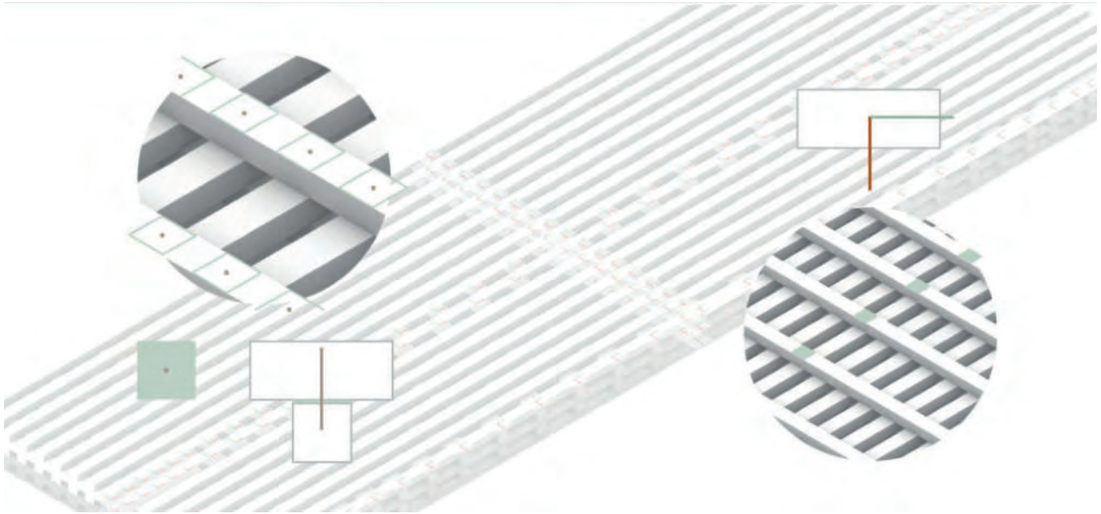
In contrast to traditional timber-concrete composite slabs, where concrete is poured onto the timber, TES integrates the earth within the timber grid. This produces a monolithic, composite system where the earth remains exposed on the soffit, allowing it to unfold its full functional potential. The visible earth surface enhances passive thermal regulation, contributes to fire resistance, and improves acoustic insulation. Moreover, the slab can be thermally activated, forming a foundation for integrating passive heating and cooling technologies.



The configuration of the horizontally layered timber structure is achieved using a parametric design methodology developed as part of the research. This method integrates the architectural design, the structural analysis and the parameters for robotic manufacturing into an automated design workflow. As a central component in the chain from design to production, the configurator determines the optimal arrangement of timber layers based on the overall geometry.

Based on the input parameters for the dimensions of the lamellas, the number and orientation of the layers, and, if required, the positioning of openings, the configurator creates a flexible system adapted to varied geometric layouts and structural requirements. In addition, it is possible to condense or expand individual areas to precisely adapt to the load-bearing structure and at the same time reduce the amount of material. This differentiated design methodology prioritises material efficiency by arranging the lamellas specifically in accordance with the requirements of the earth infill. In addition, all the necessary parameters for robot production are calculated automatically by the configurator.





The timber grid is assembled robotically, using a digital model to guide the customised placement and joining. The robot positions each lamella with high precision, bonding them at defined contact points to form a structurally effective lattice. This method combines the material efficiency and reduced adhesive demand of traditional beam slab systems with the load-bearing capability, high dimensional accuracy, and prefabrication advantages of modern CLT construction.

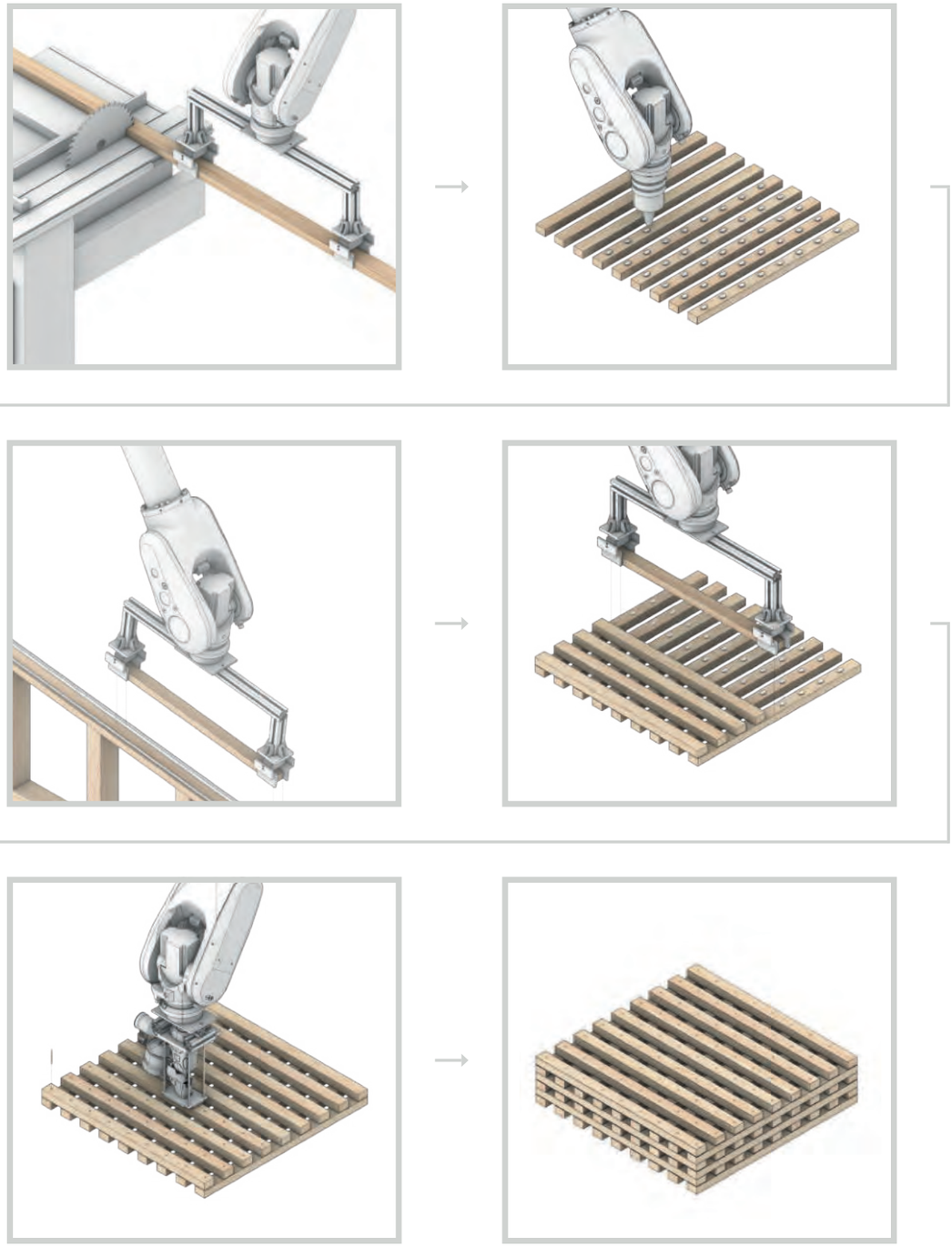
Currently, the fabrication workflow is partially automated and comprises four main steps, carried out at or in conjunction with a single robotic workstation.

Preparation and cutting of the lamellas
At present, timber lamellas are cut, ground, and prepared separately according to the geometric layout specified in the digital model. These preprocessed lamellas are then supplied to the robotic station. In future iterations of the workflow, this preparatory phase is intended to be integrated into the robotic system, enabling fully automated shaping and feeding of the lamellas directly from raw stock.

Positioning of the lamellas
Guided by the digital model, the robot grips and places each lamella with high accuracy. At this stage, the process operates in a feed-forward manner, relying solely on predefinedpositions and geometries. However, natural variability and deformation in the timber elements (e.g., bowing or twisting) can compromise alignment and bonding quality. To address this, future implementations will incorporate real-time sensor feedback, such as vision or tactile systems, to detect deviations and enable adaptive correctionduring assembly, ensuring robust structural performance despite material inconsistencies.

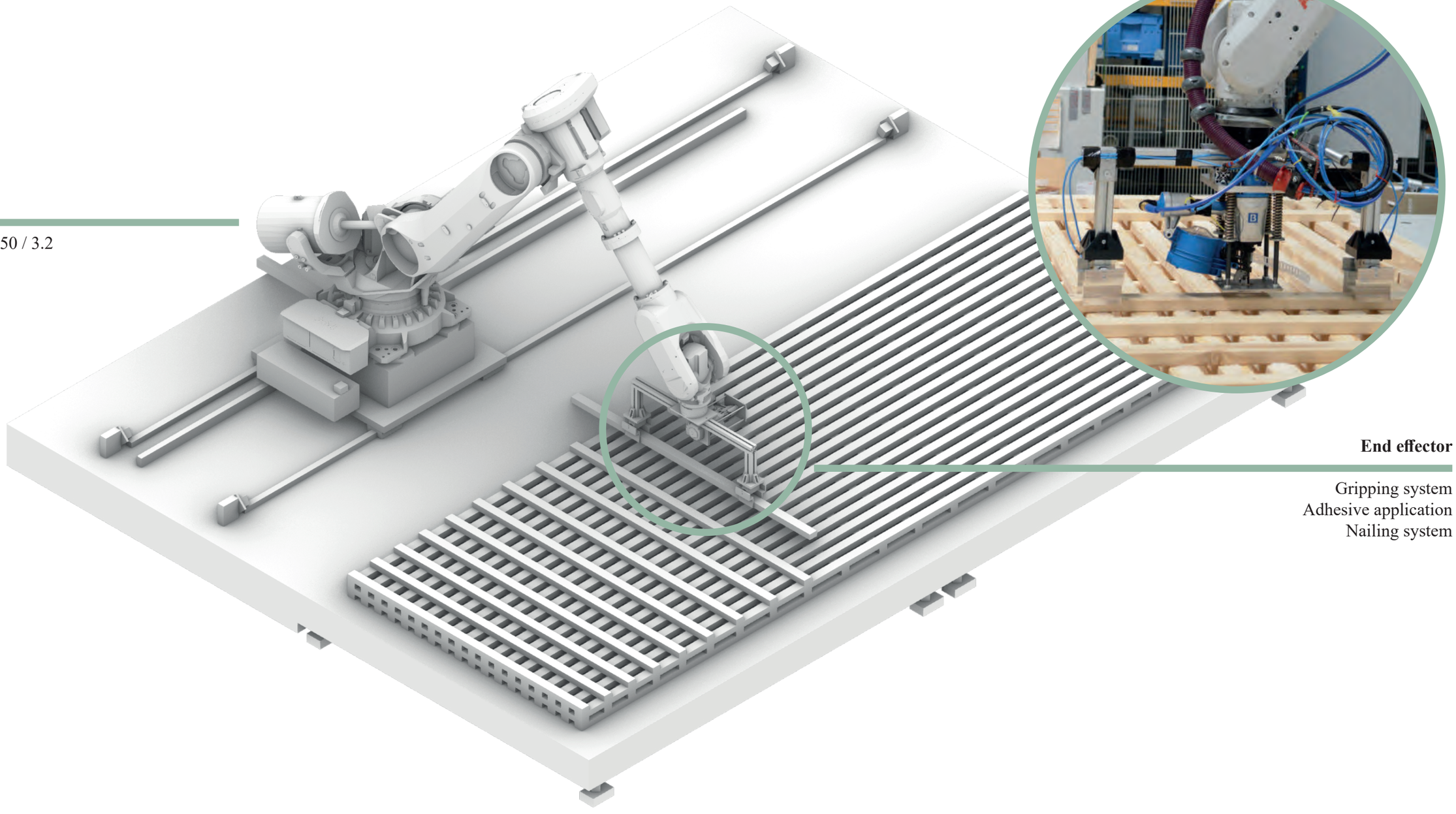
Applying the adhesive
Currently, adhesive is applied manually at specific bonding points before robotic layer placement. While functional, this manual intervention limits process speed and continuity. Future developments aim to integrate robotic adhesive dispensing, synchronised with lamella positioning, to enable precise, on-demand application within the adhesive’s open time and reduce waste.

Insertion of wood nails
After adhesive placement, the robot positions the next lamella layer and inserts nails under controlled pressure to locally secure the joint during adhesive curing. This strategy circumvents the need for large-surface pressing methods, such as vacuum pressing, making the process well-suited for complex or perforated slab geometries.



Robot

ABB IRB 6700 - 150 / 3.2

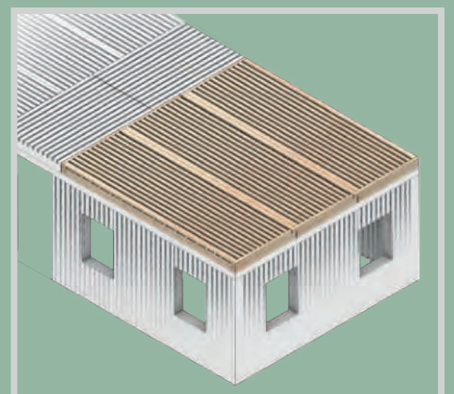


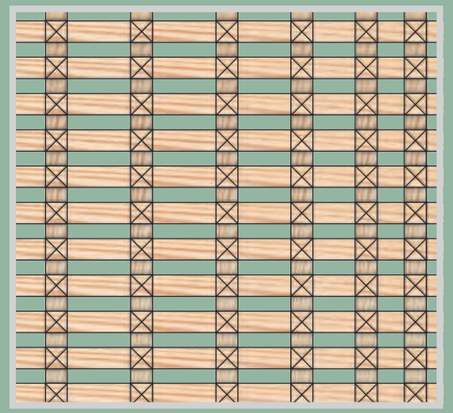
End effector

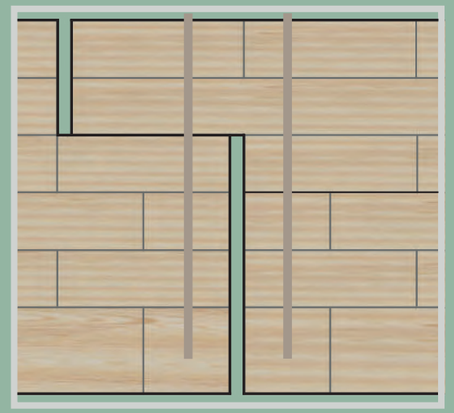
Gripping system
Adhesive application
Nailing system

Timber Earth Slab
Research Project
Technical University of Munich | © Janna Vollrath

Design Task





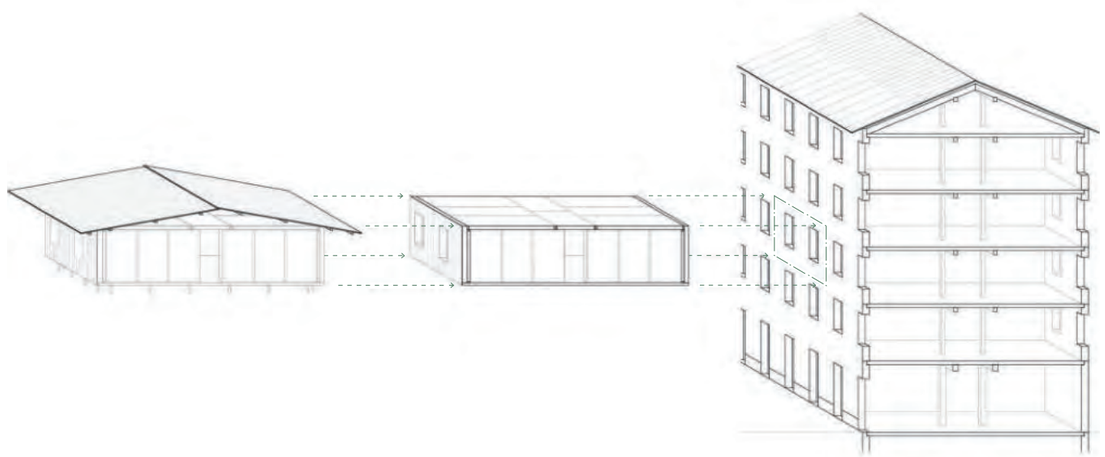


The task of the interdisciplinary design studio is to design a pavilion as a gathering place that functions as an open, public space for exchange and interaction, providing an inclusive setting for informal encounters, shared activities andspontaneous use. The pavilion should be designed as a building that does not require electricity or water supplies.

The specific use of the pavilion will not be determined in advance, but will result from an in-depth analysis of the location, taking into account its spatial configuration, social dynamics and environmental conditions. Based on this study, the spatial, social and functional qualities that are currently lacking at the location will be identified and ways in which the pavilion can specifically address these issues will be explored.

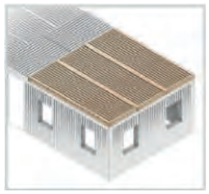
The design should not be understood as a singular, individual structure, but rather as a prototypical segment with a transferable system logic. The pavilion should be designed in such a way that it functions both as an independent structure and, in terms of its spatial and structural logic, can be applied to residential or office construction. Its structure, materiality and structural principles should thus serve as the basis for later expansion or further development.

The focus is on developing a holistic architectural concept that combines space, use and atmosphere and is to be worked out in detail, right down to the structural details. The pavilion will be constructed entirely from wood and clay and is based on the Timber Earth System from the underlying research project. Particular attention is paid to the structural design of the wall and ceiling structures and the precise design of the joints. The connections between wall and wall, ceiling and ceiling, and wall and ceiling are developed in detail and understood as an essential part of the architectural expression.

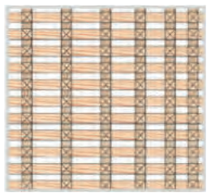


Semester Structure

Task 1
Research
In the first phase of the semester, students engage intensively with the overarching research context. The focus is on the renewable materials wood and earth, as well as their potential, properties and possible applications in architecture. In addition, digital design methods and robotic manufacturing techniques in the construction process are examined. Each working group works on a specific research topic based on the literature provided. In addition, students research and analyse other relevant sources such as specialist books, scientific articles and completed architectural projects in order to develop a comprehensive and critical understanding of the respective topics.



Task 2
Concept and Design Idea
The findings derived from the research subsequently serve as the foundation for developing the overall design concept for the pavilion. Building on this basis, the students formulate a utilisation concept that is informed by the results of a comprehensive analysis of the site. This analysis includes an examination of the spatial, climatic, functional, and contextual conditions and constraints of the location. Digital design methods support the process of form-finding and the continued development of the design, enabling design decisions to be systematically reviewed, adjusted, and further refined.



Task 3
Construction and Fabrication
The third section focuses on the detailed design of the building and its supporting structure. Students develop the structural system, define the components used and explain how they interact within the overall structure. In this context, the manufacturing and production process is also planned in detail, with a focus on digital and robotic fabrication technologies and how their specific potential can be used in a specific way for the individual design. The structural and manufacturing decisions should be sustainable and realistic to implement, and should also take into account the deconstruction process in terms of durability.

Task 4
Construction and Fabrication
In the final stage of the process, the design and construction of the pavilion are comprehensively developed and refined. All elements of the project are worked out in depth and recorded in detailed drawings, plans and structural representations. Particular emphasis is placed on working out structural details, the choice of materials and connections, and clearly defined strategies for practical implementation. The aim of this phase is to develop a consistent, coherent and easily comprehensible overall concept. This should convincingly communicate the architectural idea, the structural logic and the sustainable qualities of the design, and demonstrate the potential realisation of the pavilion in a clear, realistic and understandable way.

3dPA Forest Campus
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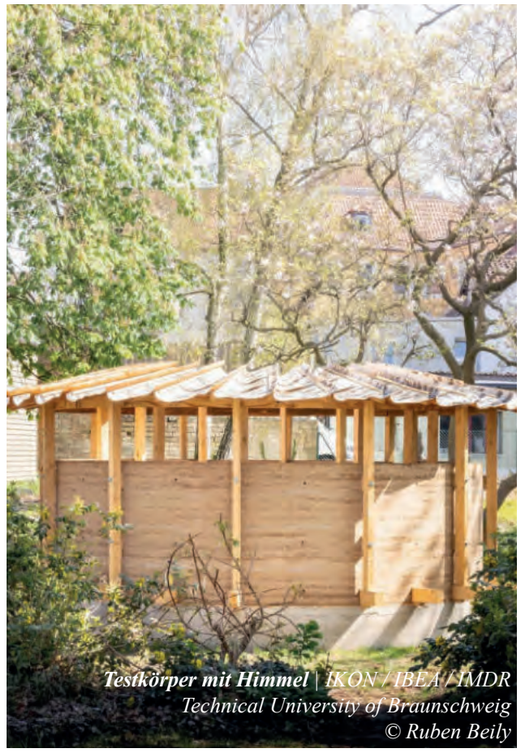

Testkörper mit Himmel | IKON / IBEA / IMDR
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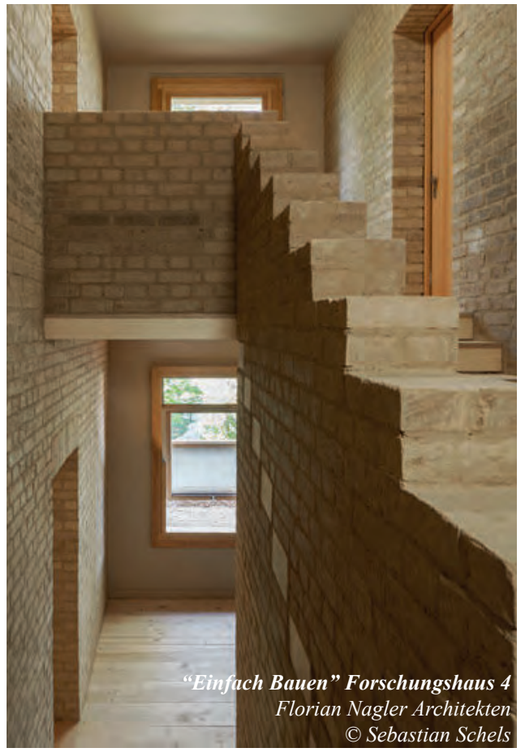
543 Hortus
Herzog & de Meuron Ltd, ZPF Ingenieure AG,
SENN Construction AG, Blumer-Lehmann AG



“Einfach Bauen” Forschungshaus 4
Florian Nagler Architekten,
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Research

The Research topics revolving around the two main themes of Digital Fabrication and Regenerative Materials. The literature provided is a starting point for the research task. Each group is expected to find and analyze their own references for each chosen topic: these could include books, papers, architectural projects, and research projects.

Digital Materiality
Digital Materiality in Architecture | Fabio Gramazio and Matthias Kohler

Monomaterial Construction
Monomaterial Construction: Method - Material - Construction | Dirk Hebel and Ludwig Wappner

Post-Carbon Built Environment
Material Reform: Building for a Post-Carbon Future / Material Cultures, Amica Dall, Charlotte Malterre-Barthes, Jess Gough

TerraFibra
TerraFibra Architectures | Dominique Gauzin-Müller and Aurélie Vissac

Earth Construction
Handbook on Earth Construction: Building Materials, Techniques, Earth | Gernot Minke

Historical Wood-Earth Constructions
Hybrid Wall and Slab Systems

Building with Earth
Poured Earth, Clay Bricks, Rammed Earth

Digital Manufacturing with Clay
Impact Printing, Sprayed Earth Additive Manufacturing (SEAM), Intrusion Earth Additive Manufacturing (IEAM), Robotic Rammed Earth

Digital Manufacturing with Wood
CNC machining, additive manufacturing, assembly, connections

Element and Module Manufacturing in Timber Construction
combination of individual parts and elements, prefabrication of load-bearing elements, prefabrication of room modules

Concept and Design Idea

Site Plan 1:3000

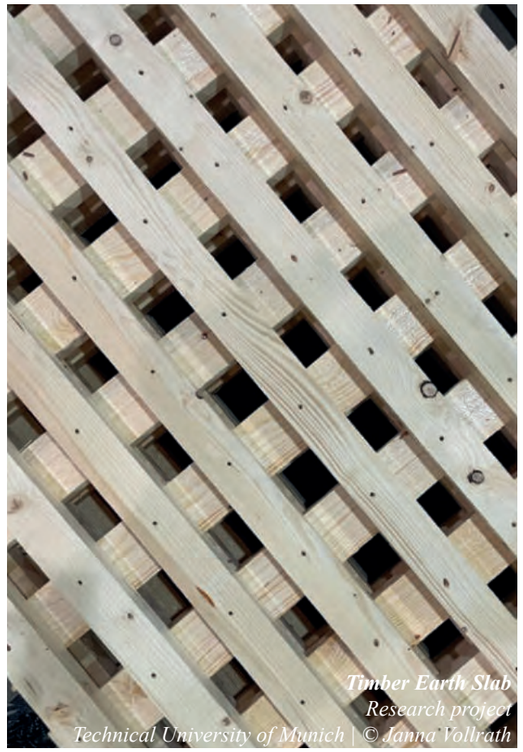
Building Site

The site for the project is located on the Garching campus of the Technical University of Munich. It is situated in the northern part of the campus on a currently undeveloped green meadow area directly next to the “Wiesäckerbach”. The site is nestled between various university facilities, including the Chemistry Branch Library, the TUM School of Natural Sciences Student Council, the Faculty of Chemistry with several institutes, the Munich Institute of Integrated Materials, Energy and Process Engineering (MEP) and UnternehmerTUM MakerSpace.

The site is connected by two existing paths, between which the area stretches out in an almost triangular shape together with the stream. The topography of the site is largely flat and level, meaning that there are no significant differences in height or topographical restrictions for the design. The area is not overly frequented at present and is mainly used as a thoroughfare and green space.

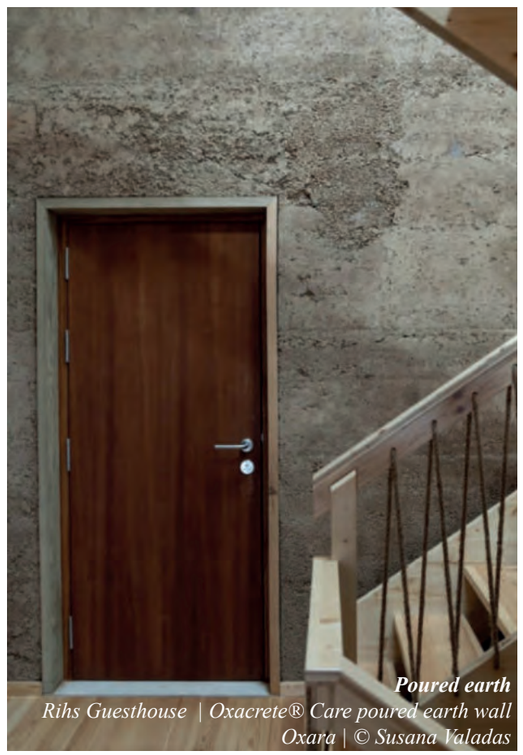
Centrally located campus facilities are within walking distance of the property. The Garching campus cafeteria, for example, is about a five-minute walk away, as are most of the university’s other teaching facilities. This means that the area is well integrated into the existing campus structure and benefits from its proximity to academic buildings and shared facilities, while at the same time not being located directly on busy main roads, which contributes to a quieter, more pedestrian-friendly environment.

Various structural and landscaping regulations must be taken into account when positioning the design. In particular, a minimum distance of 20 metres from the “Wiesäckerbach” must be maintained, which clearly defines the possible development of the property and must be taken into account in the design planning.



Timber Earth Slab
Research project
Technical University of Munich | © Janna Vollrath

Clay bricks
"Einfach Bauen" Forschungshaus 4
Florian Nagler Architekten | © Sebastian Schels



Poured earth
Rihs Guesthouse | Oxacrete® Care poured earth wall
Oxara | © Susana Valadas

Rammed earth
Levita Lehm

Construction and System

Materiality
The pavilion is to be designed as a consistent timber and earth construction. This selection of materials is directly related to the existing Timber Earth Slab (TES) research project, to which the MA project is directly linked. The findings obtained in the context of this research project provide an essential basis for the development of the pavilion and are to be specifically incorporated into its design, construction and implementation. The aim is not only to investigate the potential of hybrid construction with wood and earth in theory, but also to apply it in practice in an architectural prototype and develop it further.

The slab elements of the pavilion can be used in their current form, as developed in the research. At the same time, there are opportunities to further develop these elements and adapt them to the respective architectural design ideas. Depending on the spatial concept, spans or design requirements, the TES elements can be modified, varied or reinterpreted. This creates a direct exchange between research and design, in which the component is not understood as a rigid system, but as an adaptable basis.

The structural approach to the walls is intentionally more flexible. This provides an opportunity to examine the applicability of the timber earth slab principle to other components and whether it can be developed into a comprehensive building system. Applying the TES logic to vertical components opens up new structural and spatial questions and enables a more in-depth examination of the interaction between material, supporting structure and construction process.

Alternatively or in addition, a combination with other timber and earth construction methods is also feasible. Construction methods such as rammed earth, earth bricks or timber frame constructions can be combined with the TES system and allow for different structural, ecological and design approaches. Students are encouraged to engage intensively with the various systems, compare their properties and critically evaluate which system or combination seems most appropriate for the respective pavilion. The creative use of materials and construction is explicitly in the focus.

Digital planning methods
A central component of the project is the use of digital design and planning methods as well as robotic fabrication processes. These should not only be understood as technical tools, but as an integral part of the architectural process. Digital design strategies make it possible to integrate complex geometries, material behaviour and manufacturing logic into the design at an early stage, thus consistently translating the architectural idea into construction and production.

The advantages of robotic fabrication should be specifically utilised and reflected. This includes both the design process, for example through parametric models or simulation-based decisions, and concrete production planning. Students should clearly explain how and why robotic processes are used and what added value they offer over conventional methods. At the same time, a hybrid construction method combining machine and manual work is also expressly possible. This hybrid approach encourages critical reflection on the role of automation in architecture and highlights the interaction between digital precision and human intuition. In addition, limitations resulting from robot-assisted manufacturing, such as tool restrictions, tolerances or processes, should be actively incorporated into the design. In this way, digital and robot-assisted methods become a driver of architectural quality and not just a purely technical optimisation.

Details and Implementation Planning

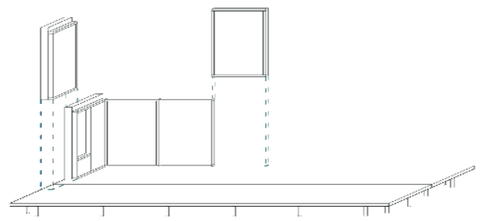
To ensure that the pavilion can be built on a 1:1 scale, a comprehensive detailed planning is required. In this phase, the focus is on developing the architectural, structural and material aspects of the project to ensure its feasibility. All design components are fully developed and documented in detailed plans, which serve as the technical basis for implementation.

A central element of this phase is the detailed elaboration of the construction. All connection points between the individual elements (foundation, floor, walls, ceiling and roof) are examined and designed. At the same time, all materials and fasteners are specified in detail, with particular attention paid to their structural performance, environmental compatibility, availability and suitability for the proposed construction methods.

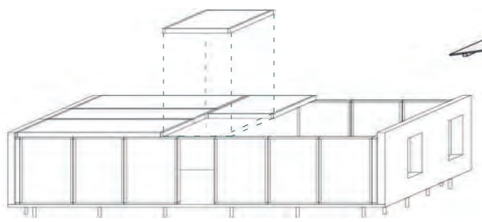
In addition, an implementation plan will be drawn up that specifies the sequence in which the individual components are to be produced. For this purpose, the respective boundary conditions must be taken into account when considering which components are to be prefabricated and what the consequences of this will be. Furthermore, a plan for the assembly process of all elements into a pavilion on the construction site must be developed.

A detailed list of materials and a preliminary budget plan will also be prepared, providing an overview of the quantities required and the expected costs. Ultimately, these preparations will provide a solid basis for the possibility of realising the pavilion.

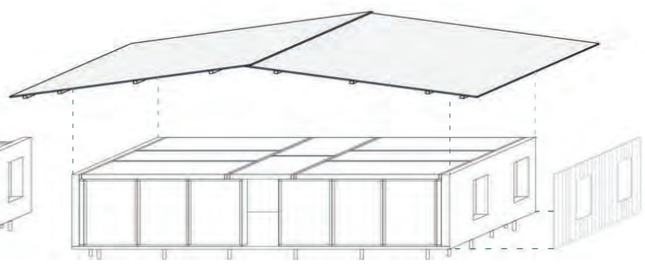
1 - Foundation and Platform



2 - Wall elements



3 - Ceiling elements



4 - Roof and Façade

Student Design Projects

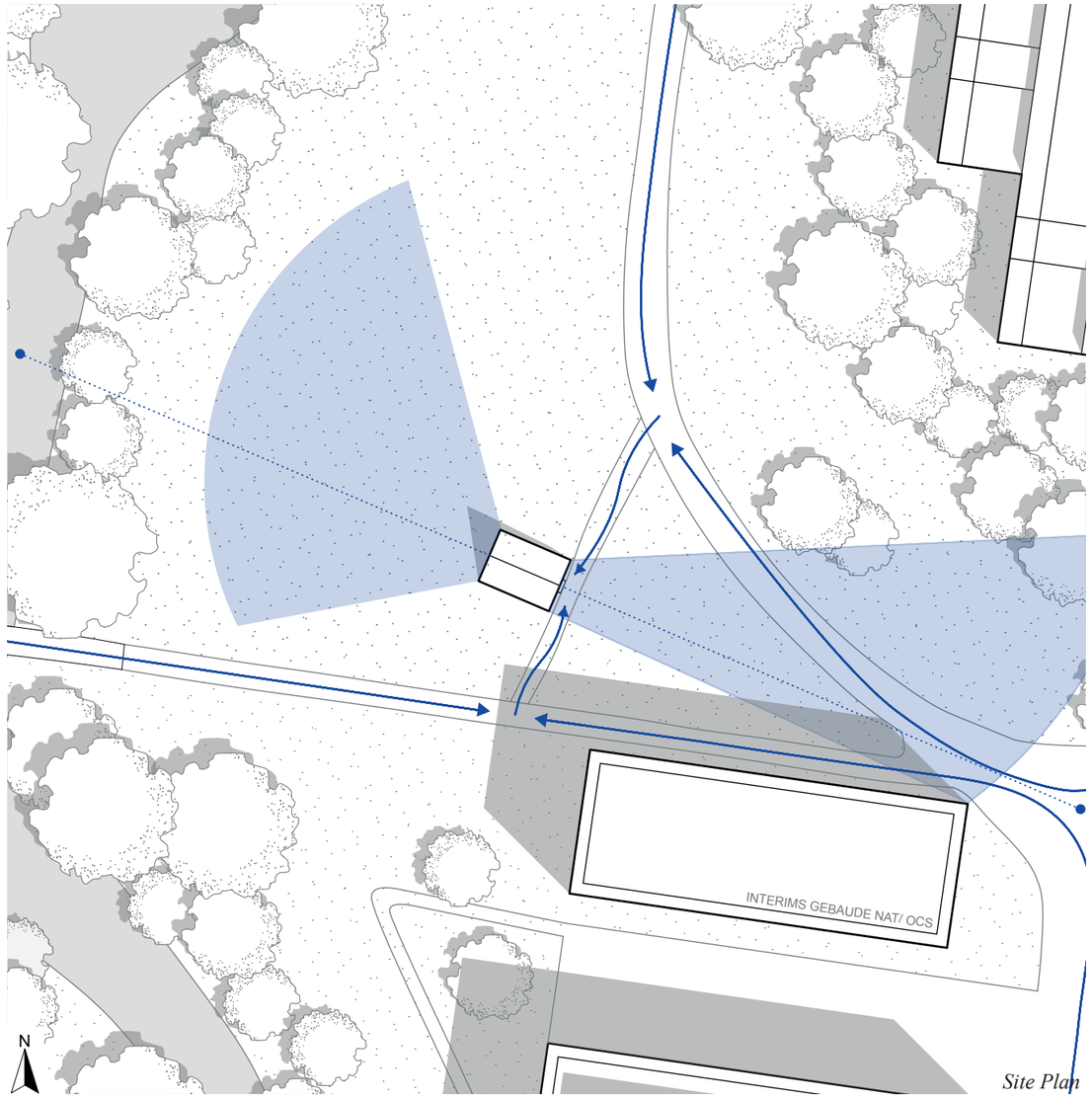
01 | roof TESting

Introduction

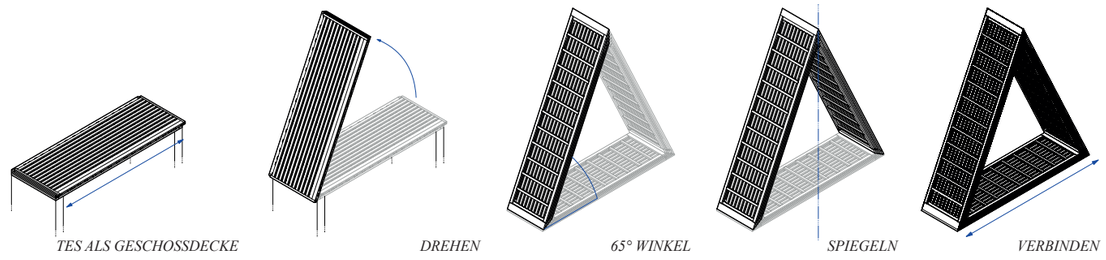
Dominik Nehring, Jaap Wegner, Mayra Bruncken

Roof TESting explores the structural potential of the TES element beyond its conventional use as a horizontal floor slab. The project examines how the element's material logic, load-bearing capacity and modular fabrication can be translated into a self-supporting roof structure. By rotating the TES element to a steep inclination of 65 degrees and combining it into a force-closed A-frame system, the pavilion is formed entirely from TES components. Two inclined elements and one horizontal connecting element create a structurally stable triangle that functions simultaneously as roof, wall and spatial enclosure. Designed as a temporary structure for campus use, the pavilion features a deliberately reduced construction that keeps the structural system fully visible. By minimizing additional layers, the project demonstrates how structural clarity directly generates space, atmosphere and architectural expression.

Outdoor Perspective

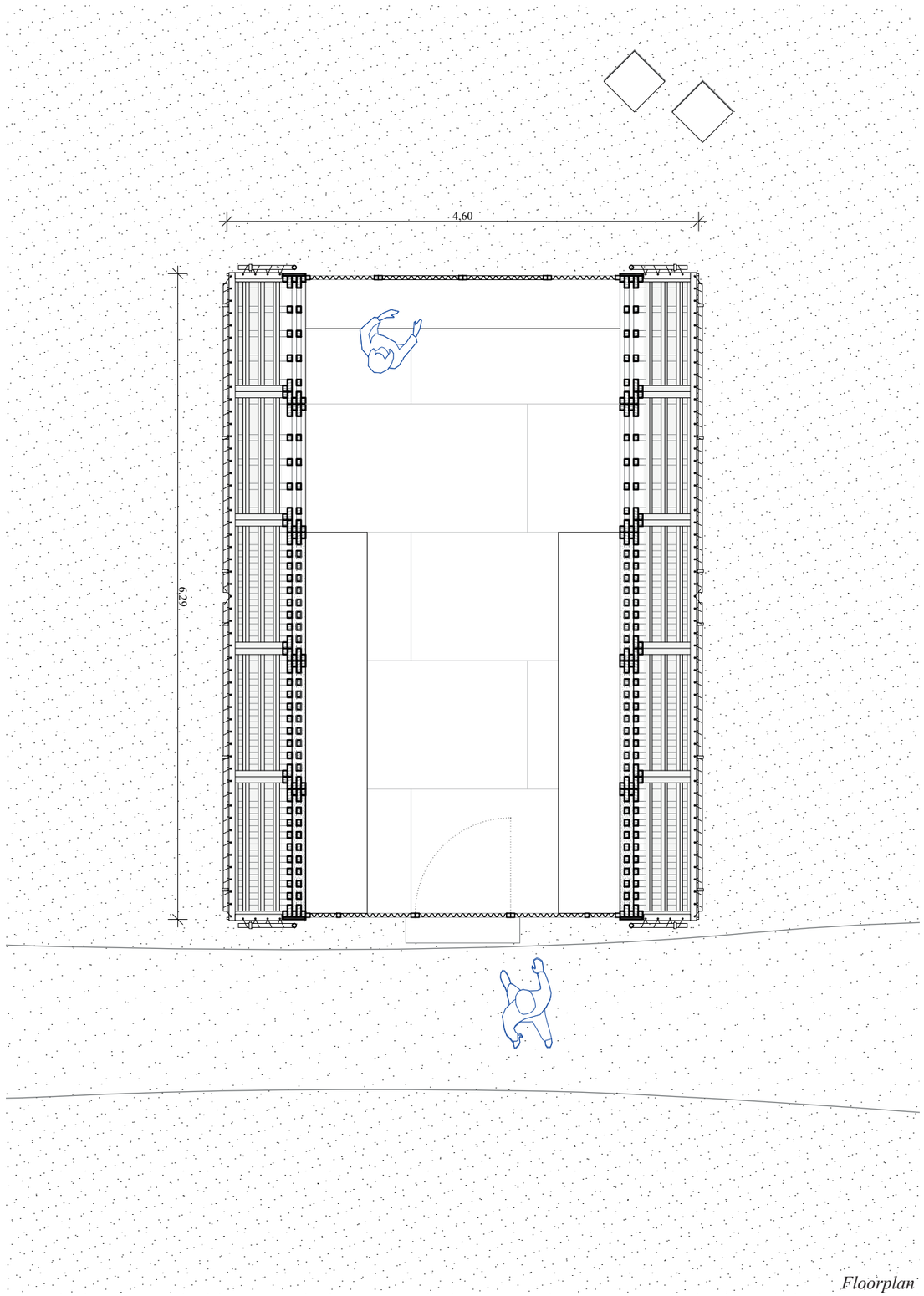


Site Plan

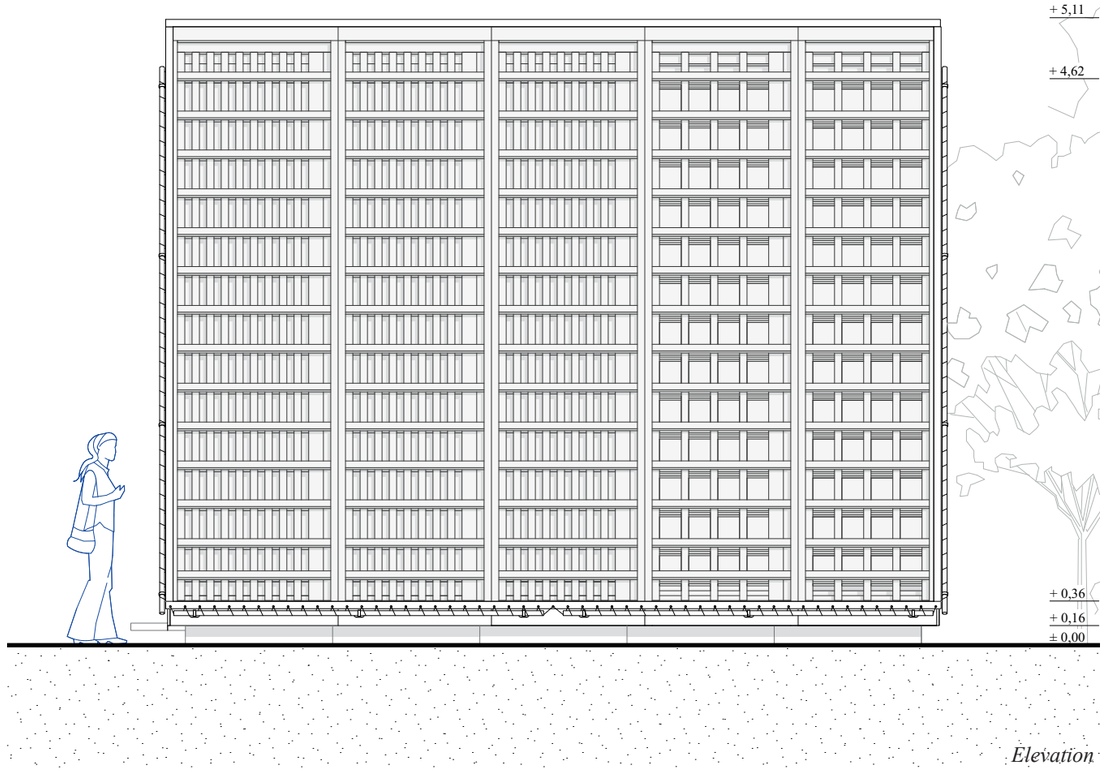


Concept Pictogram

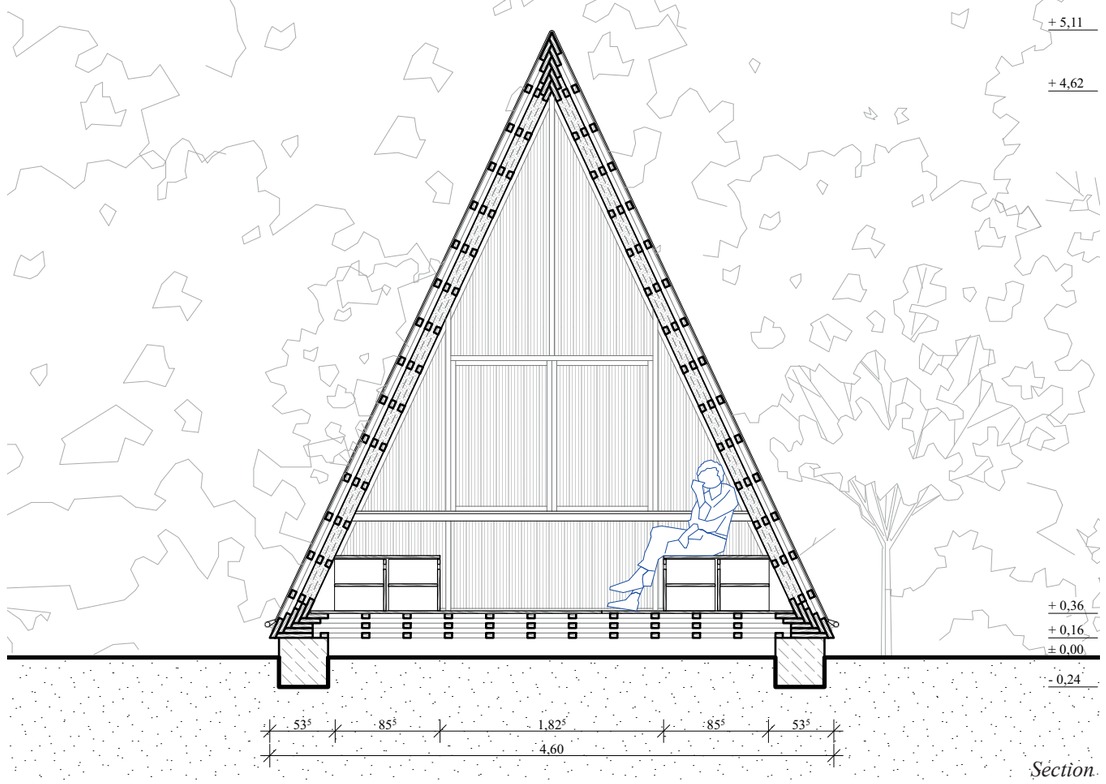
Design Concept



Floorplan



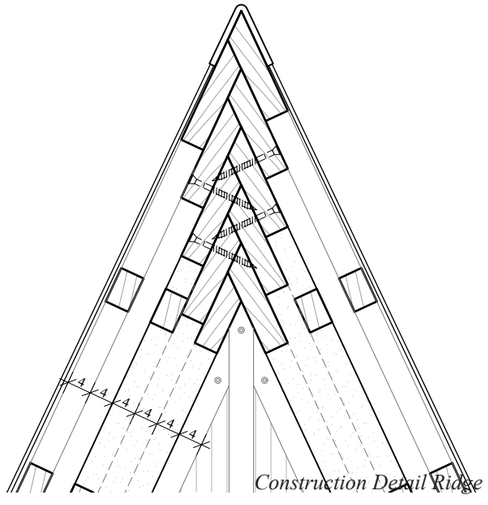
Elevation



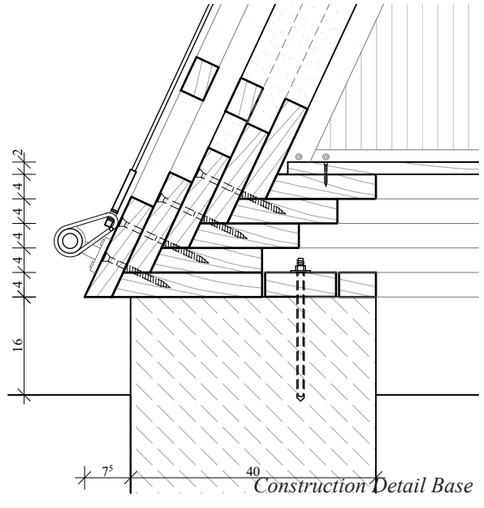
Section

01

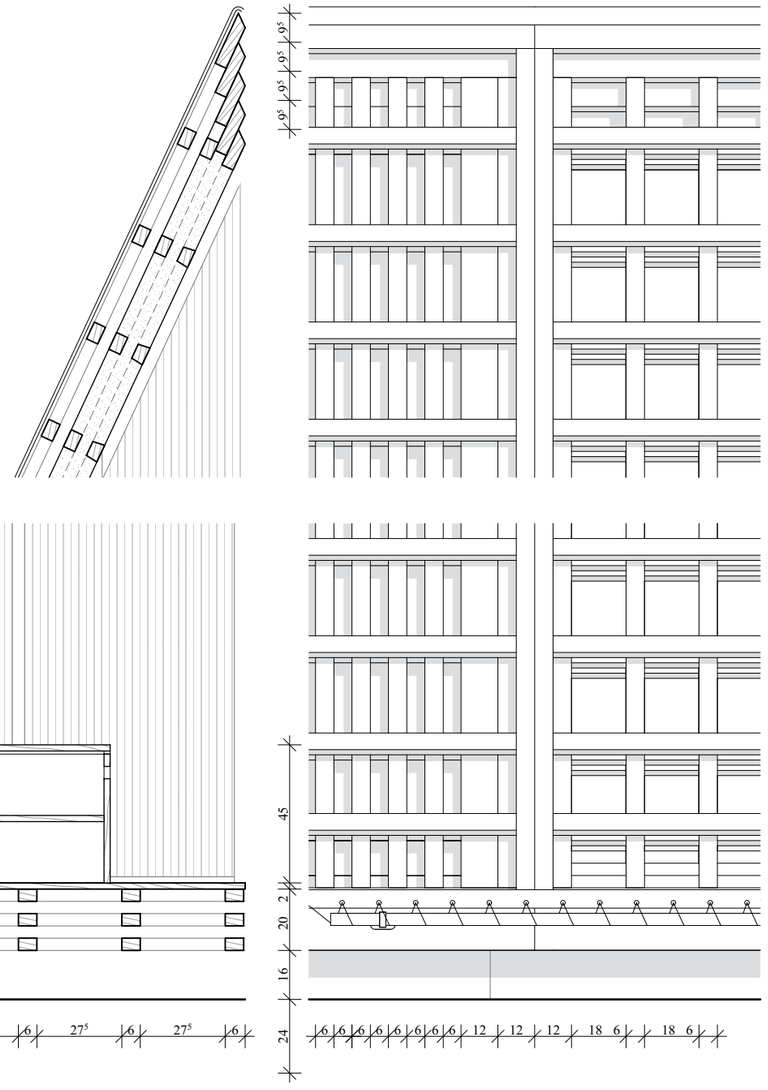
Indoor Perspective

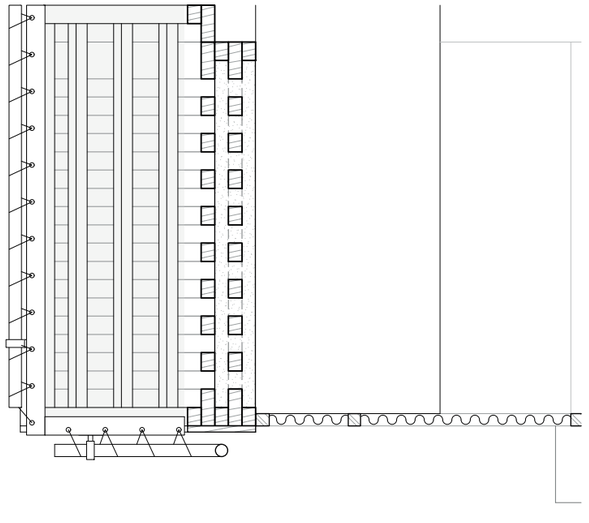


Construction Detail Ridge



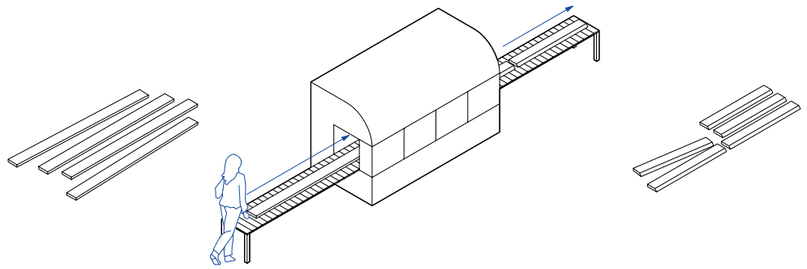
Construction Detail Base



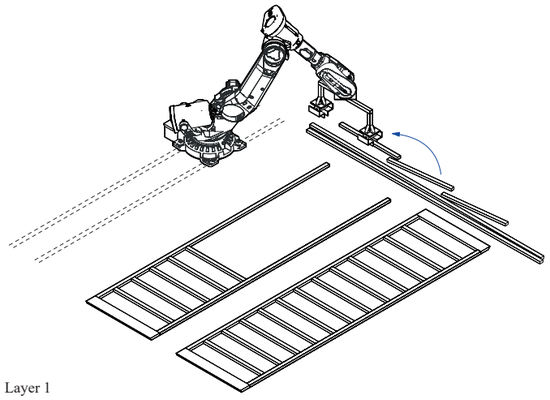


1. Concrete block
2. TES element (unfilled)
3. Bench with stool
4. TES element (filled)
5. Polycarbonate facade
6. Roof membrane

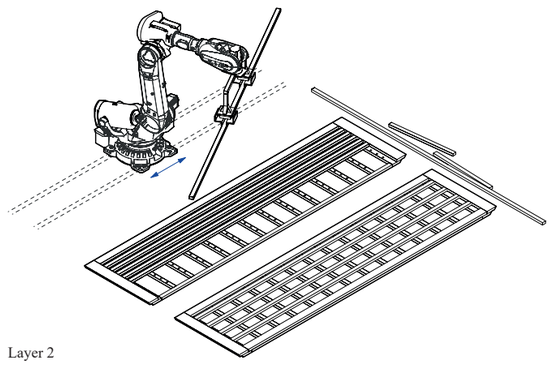
Three View Projection



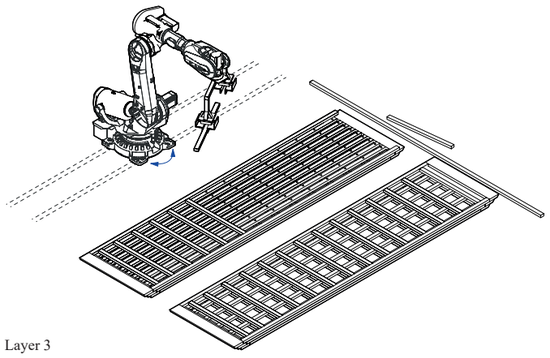
Miter cut



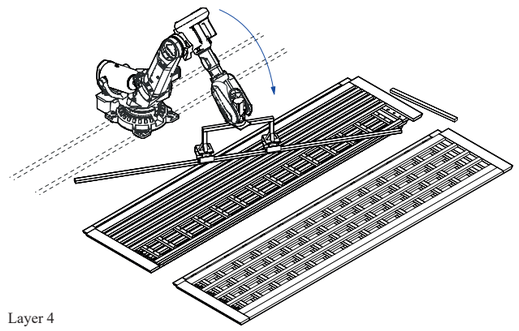
Layer 1



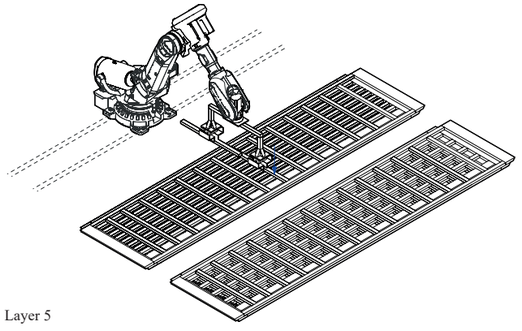
Layer 2



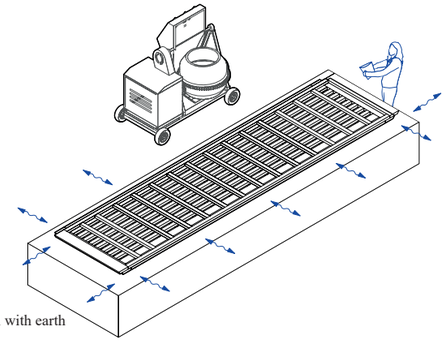
Layer 3



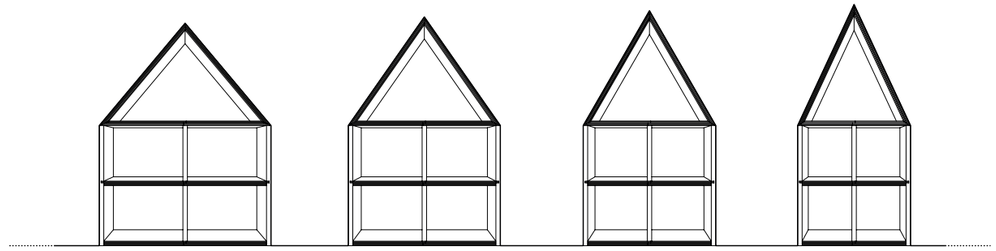
Layer 4



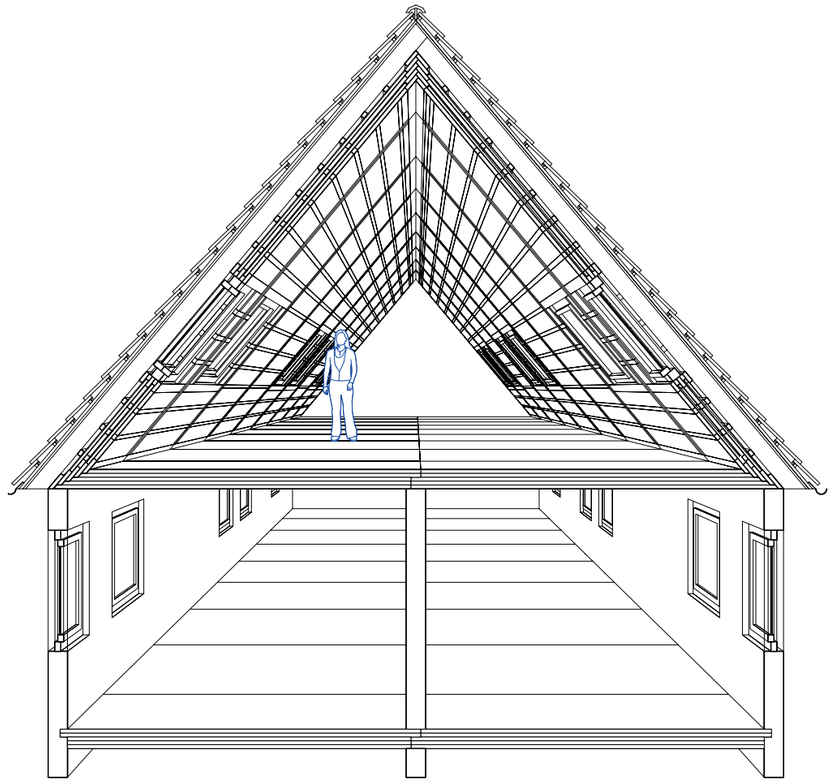
Layer 5



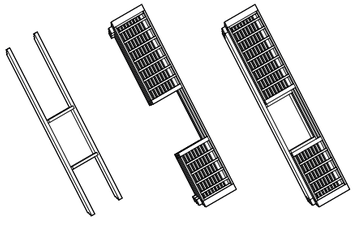
Fill with earth



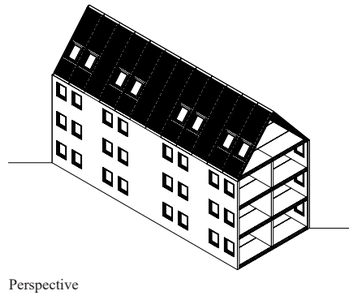
Possible Angles 50° 55° 60° 65°



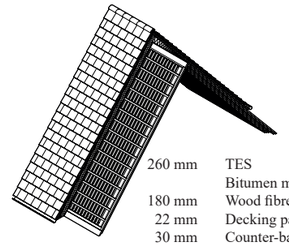
Sectional view



Window



Perspective



260 mm TES
180 mm Bitumen membrane
22 mm Wood fibre board
30 mm Decking panel
30 mm Counter-battening
Battens
Roof tile

Roof build-up

01 Models

Model with Surrounding

Design Model

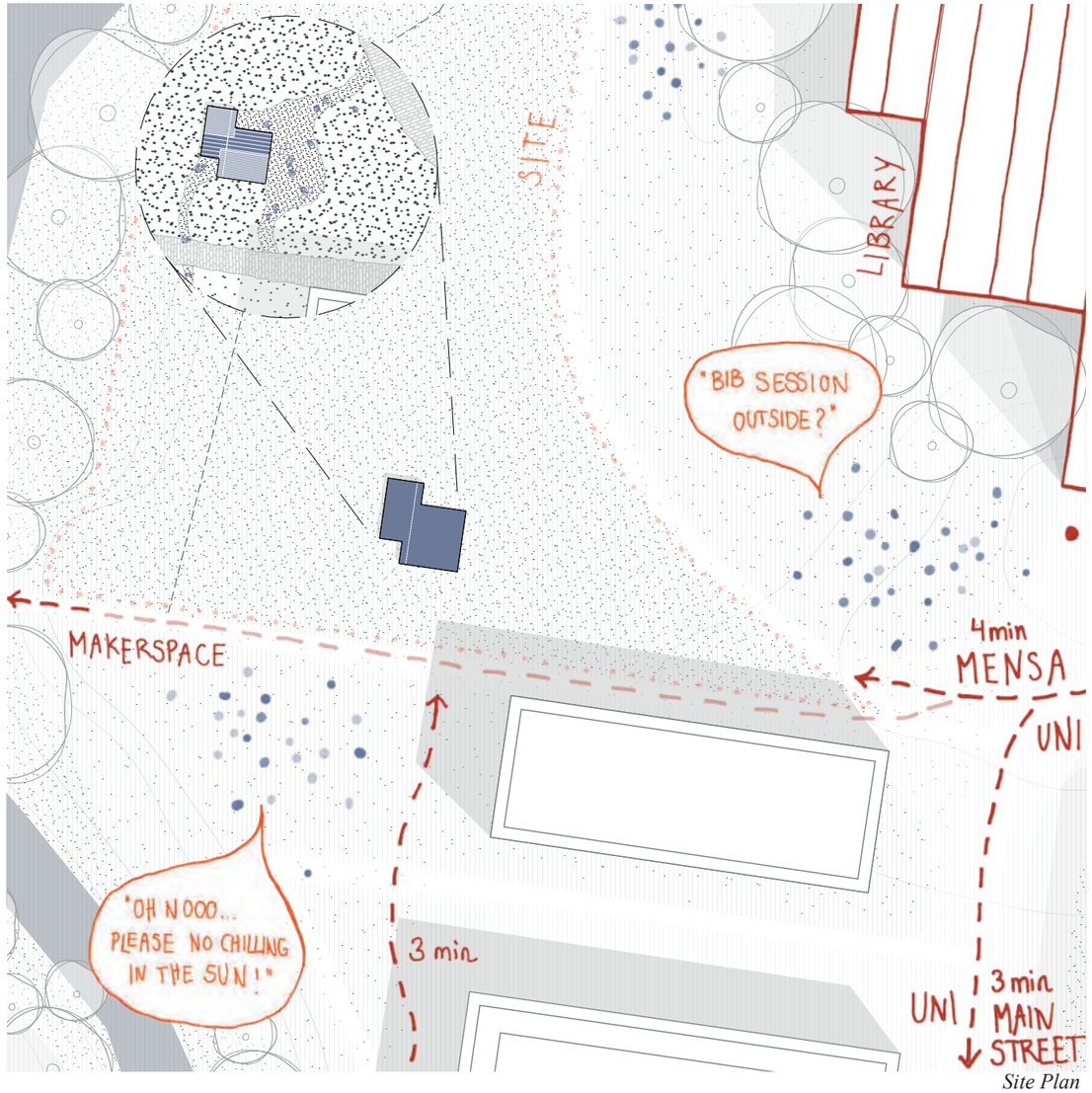
Detail Model

02 | **Commons in shade**
where shadow becomes space

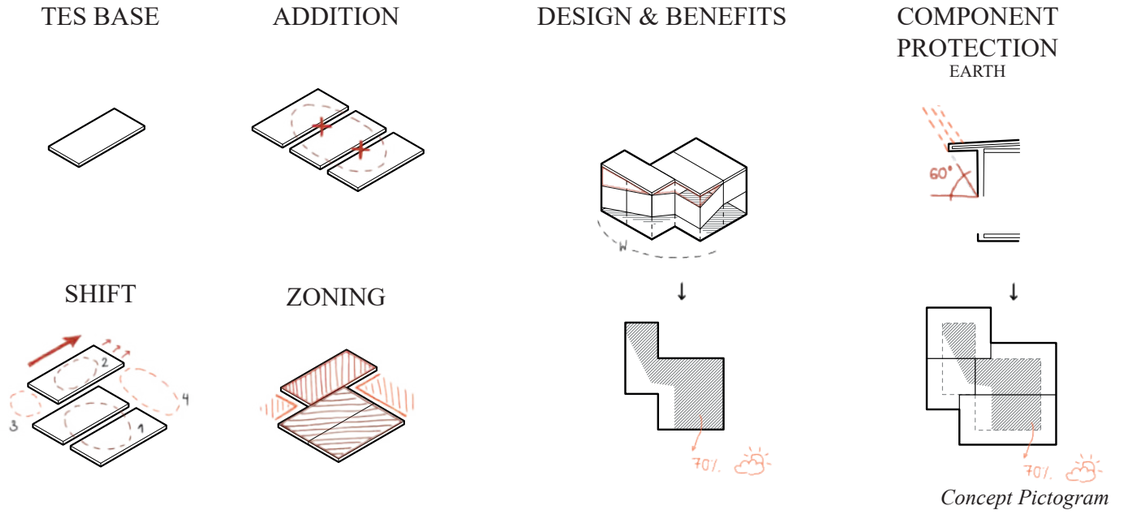
Apalie Burkhardt, Ermes Costa, Daliah Gartenmeier

The pavilion is designed as a wooden and clay structure that serves as a social meeting point and a place for exchange. It creates shaded outdoor workspaces for students, supporting both individual study and collective activities in an open environment.
The central design concept is the principle of using as little material as possible, placing material only where it is structurally or functionally required. Through the addition and subtle displacement of modular elements, the pavilion forms a variety of spatial zones and outdoor areas.
This strategy allows flexible use while maintaining a lightweight, climate-responsive, and resource-efficient architectural expression.

Outdoor Perspective

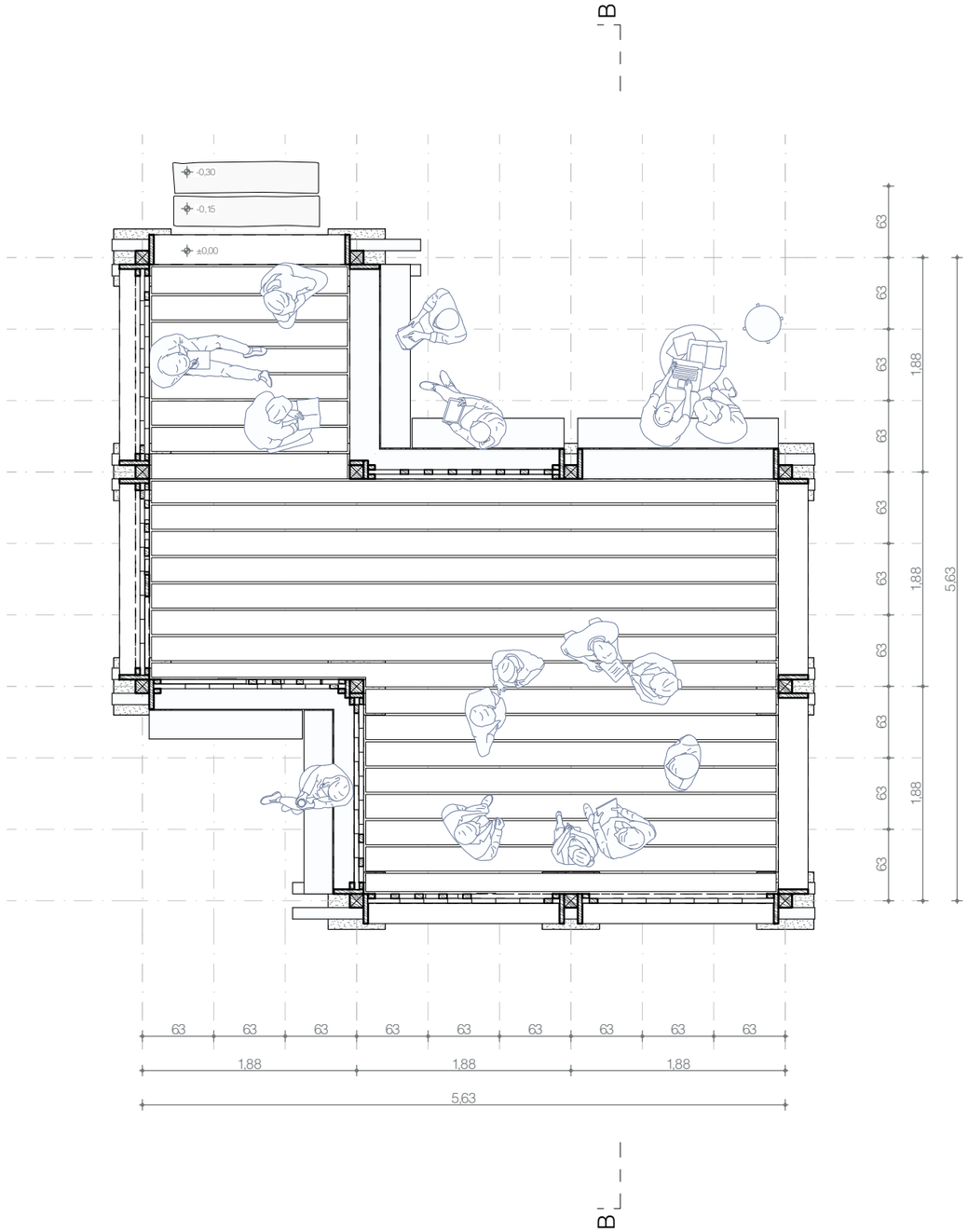


Site Plan

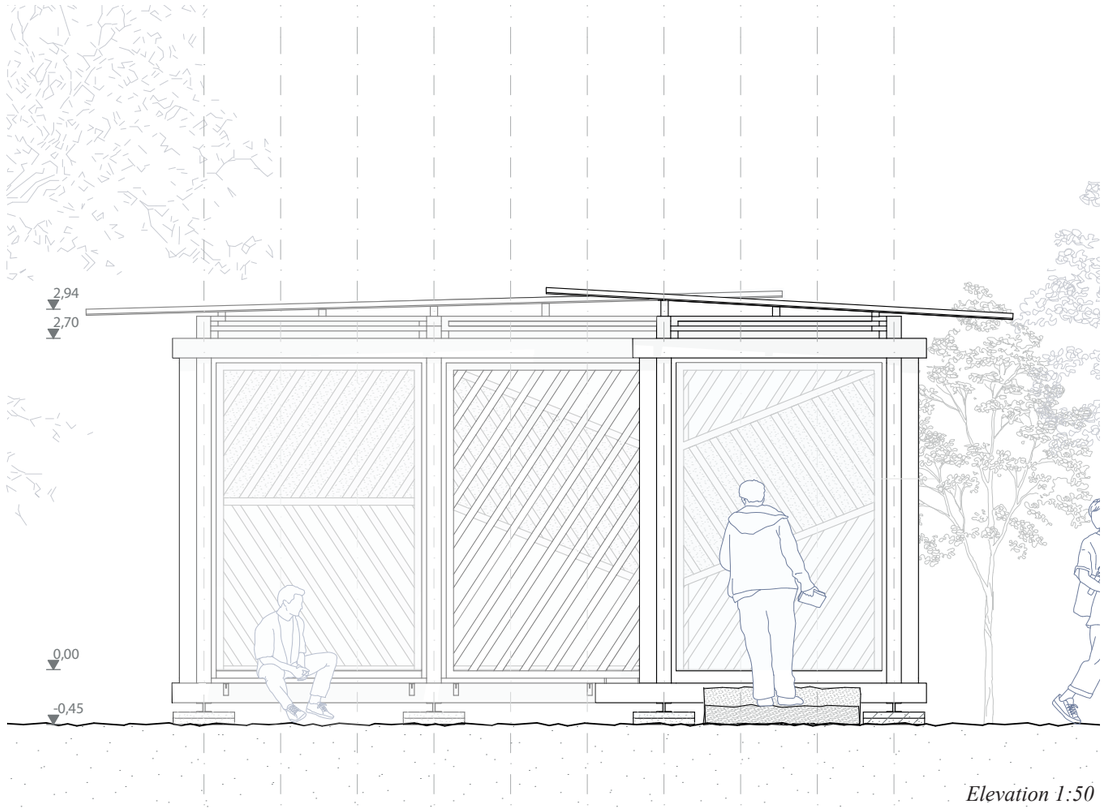


Concept Pictogram

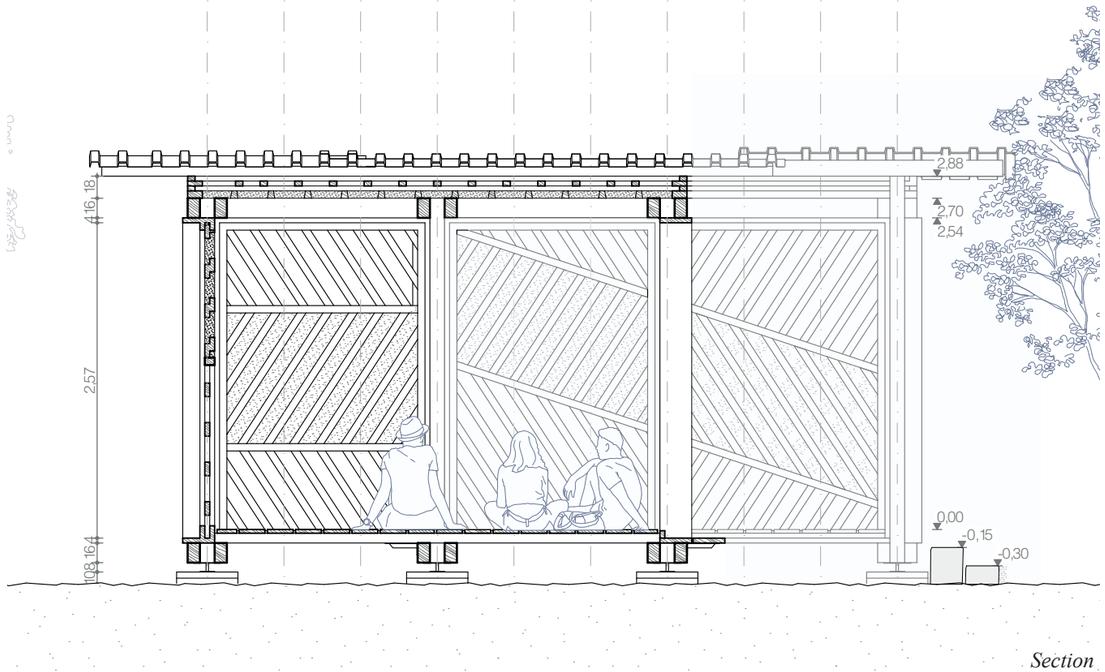
Design Concept



Floorplan

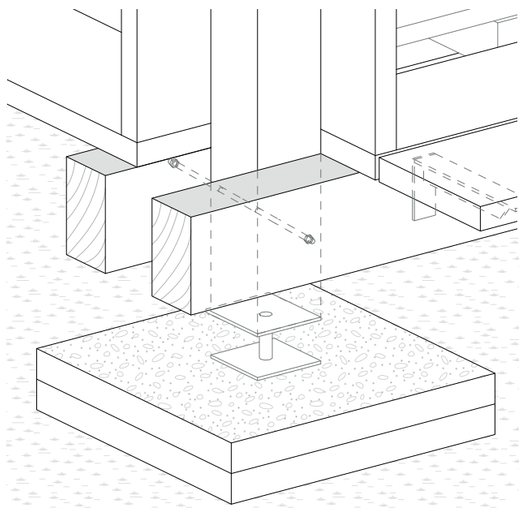


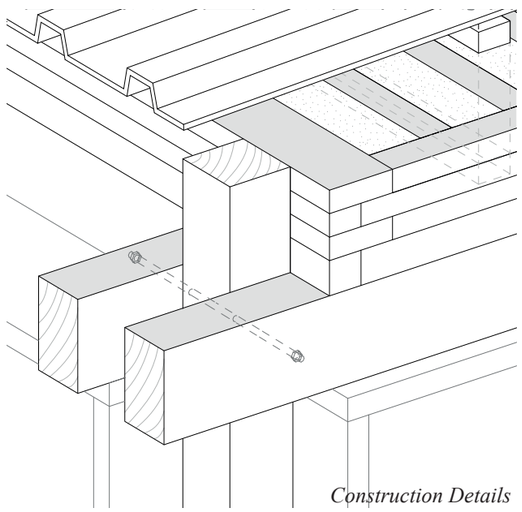
Elevation 1:50



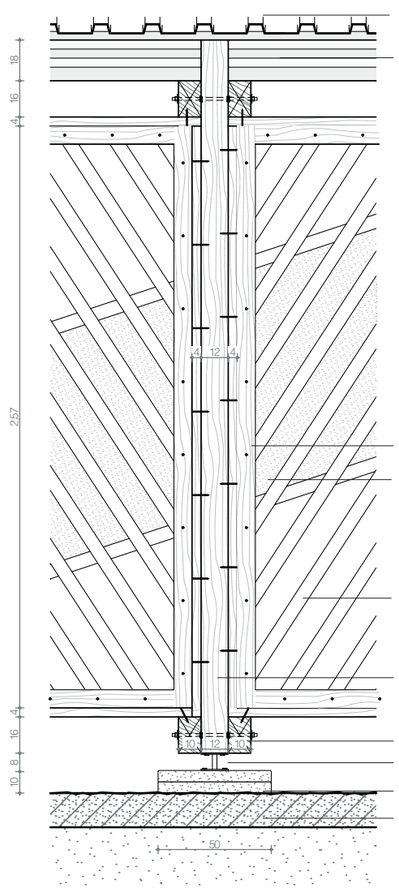
Section

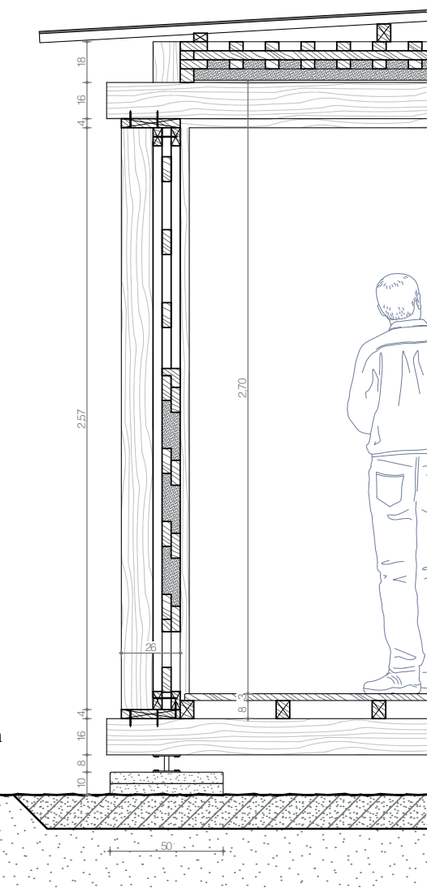
Indoor Perspective

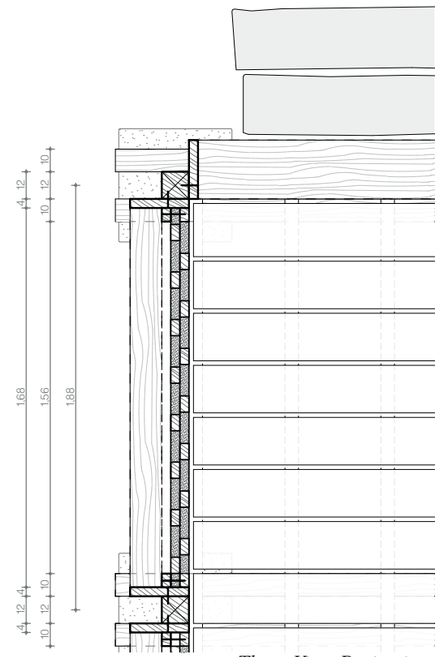




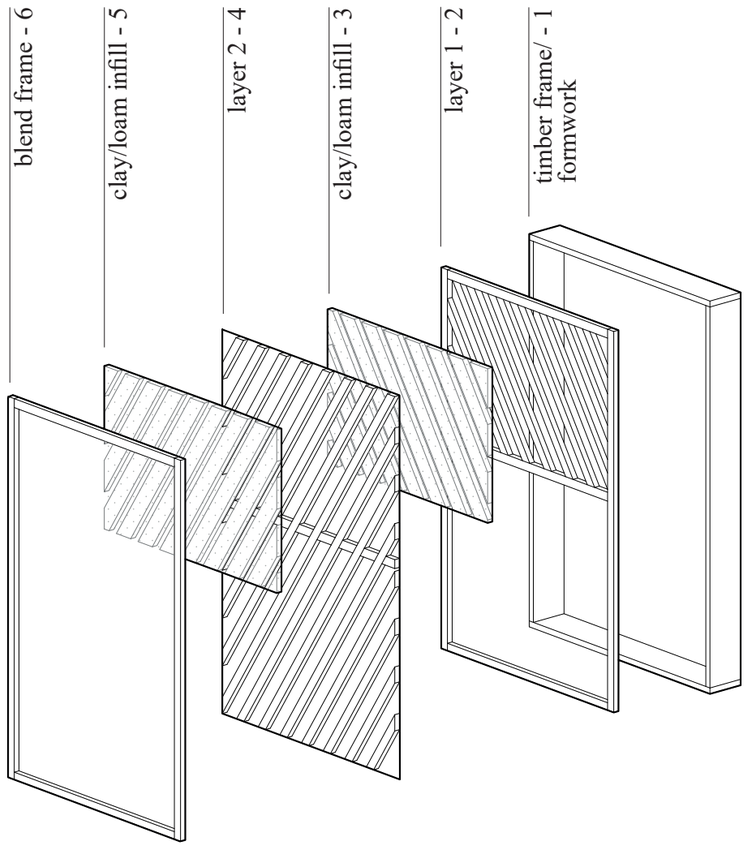
Construction Details

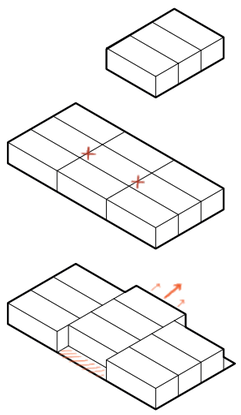


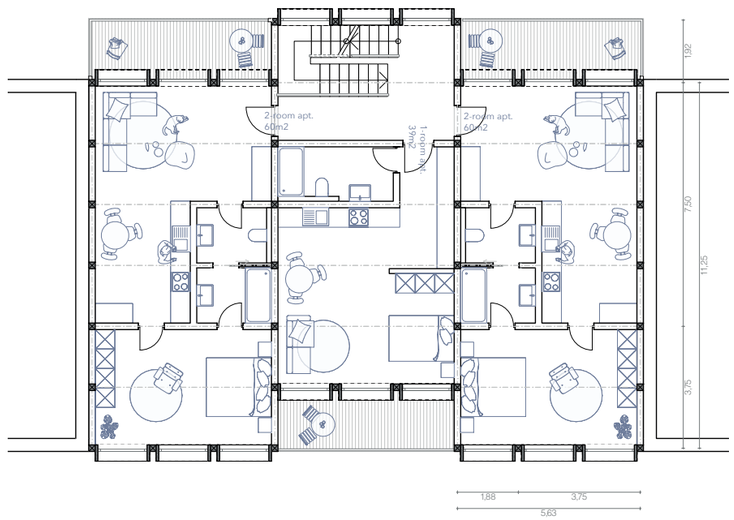


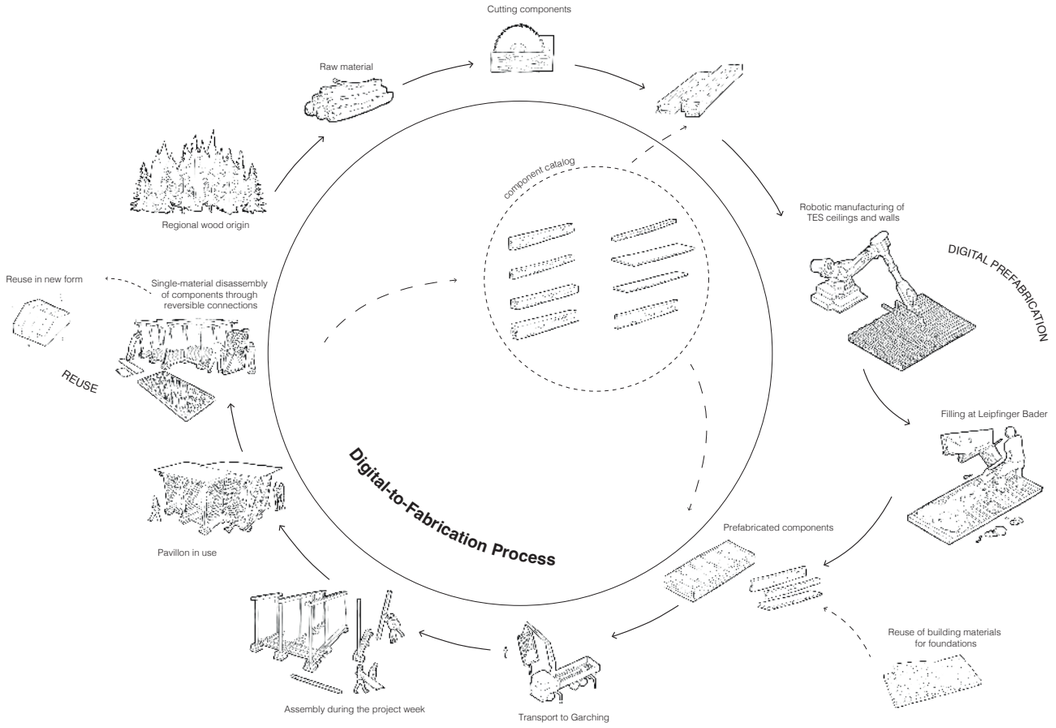


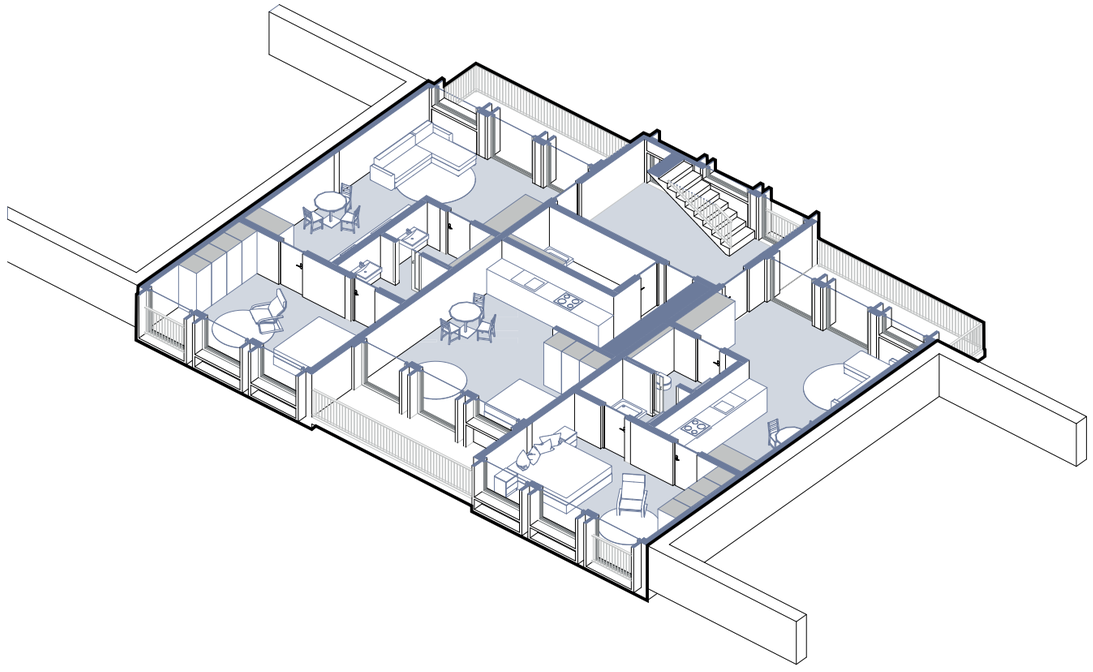
Three View Projection


blend frame - 6
clay/loam infill - 5
layer 2 - 4
clay/loam infill - 3
layer 1 - 2
timber frame/ - 1
formwork




2-room apt.
60m2
2-room apt.
60m2
1.92
7.50
11.25
3.75
1.88
3.75
5.63


Cutting components
Raw material
Regional wood origin
component catalog
Robotic manufacturing of
TES ceilings and walls
DIGITAL PREFABRICATION
Filling at Leipfinger Bader
Prefabricated components
Reuse of building materials
for foundations
Transport to Garching
Assembly during the project week
Pavillon in use
Reuse in new form
REUSE
Single-material disassembly
of components through
reversible connections
Digital-to-Fabrication Process



Model with Surrounding

Design Model

Detail Model

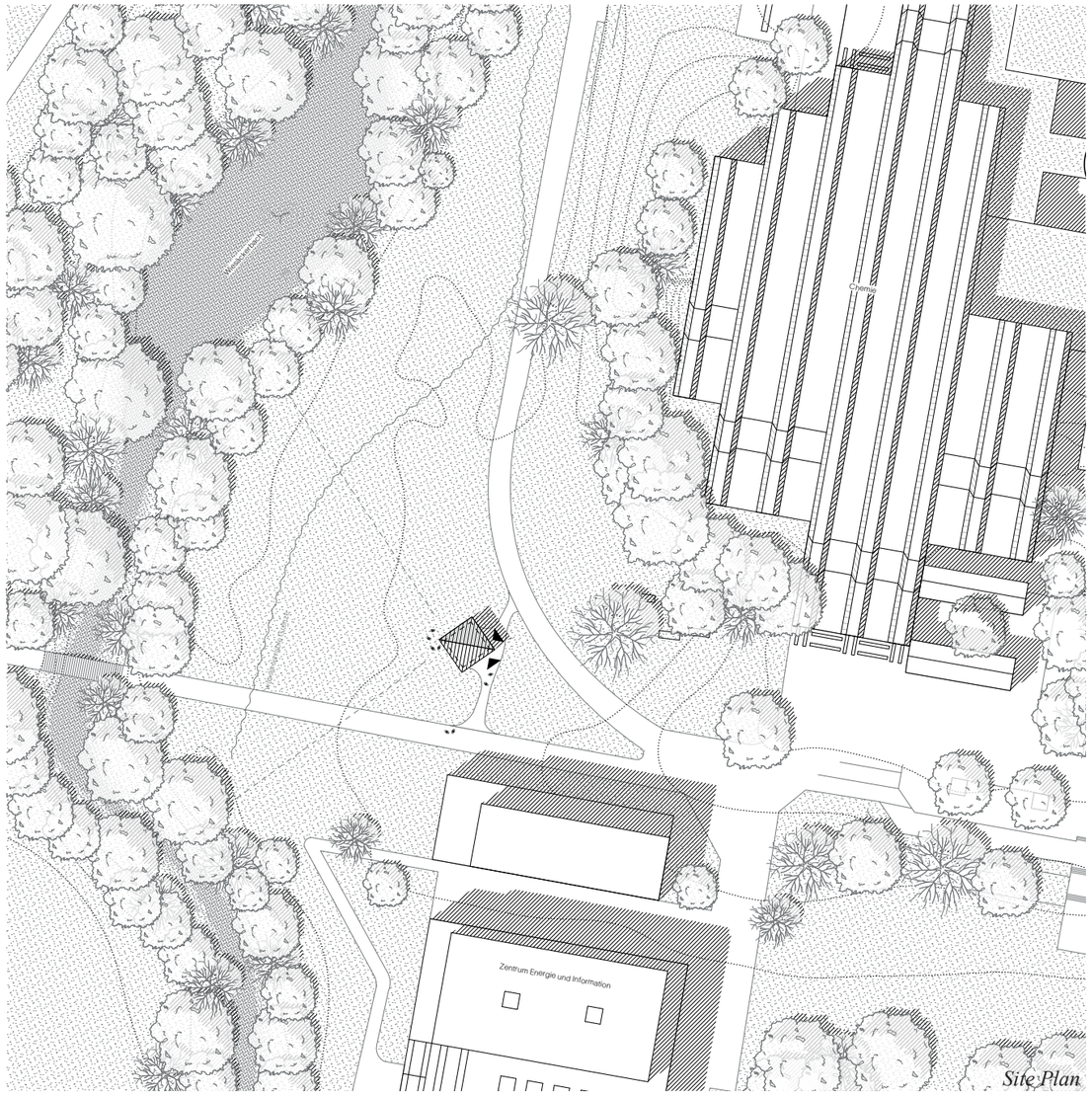
03 | **Blickwinkel**

Introduction

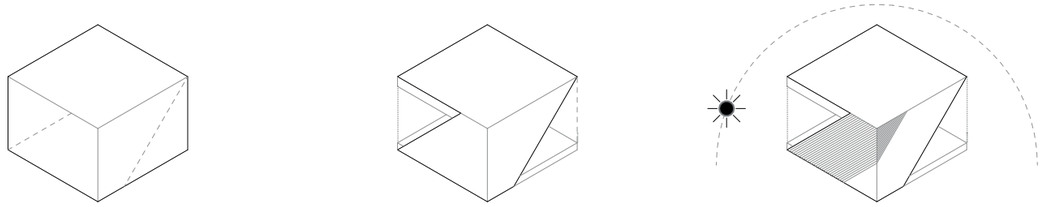
Micha Eßinger, Paul Tienes, Timo Sawitzky

Our design extends the Garching campus with a summer workspace. The pavilion is positioned along a desire path used by students as a shortcut. Based on the concept of the TES slab, a three-layer wall element was developed, in which the two outer diagonal layers act exclusively as bracing, allowing for a very shallow overall depth. The wall element is infilled with poured earth and opens towards the west to admit the low evening sun into the interior. Inside, a communal table provides space for collaborative work and is oriented towards views of the surrounding landscape. Flexibility is ensured by the TES stools, which can be arranged into small tables or seating groups. The thermal mass of the earth contributes to a cooler microclimate during the summer months. Particularly in the facade, the use of earth and wood is consciously celebrated.

Outdoor Perspective

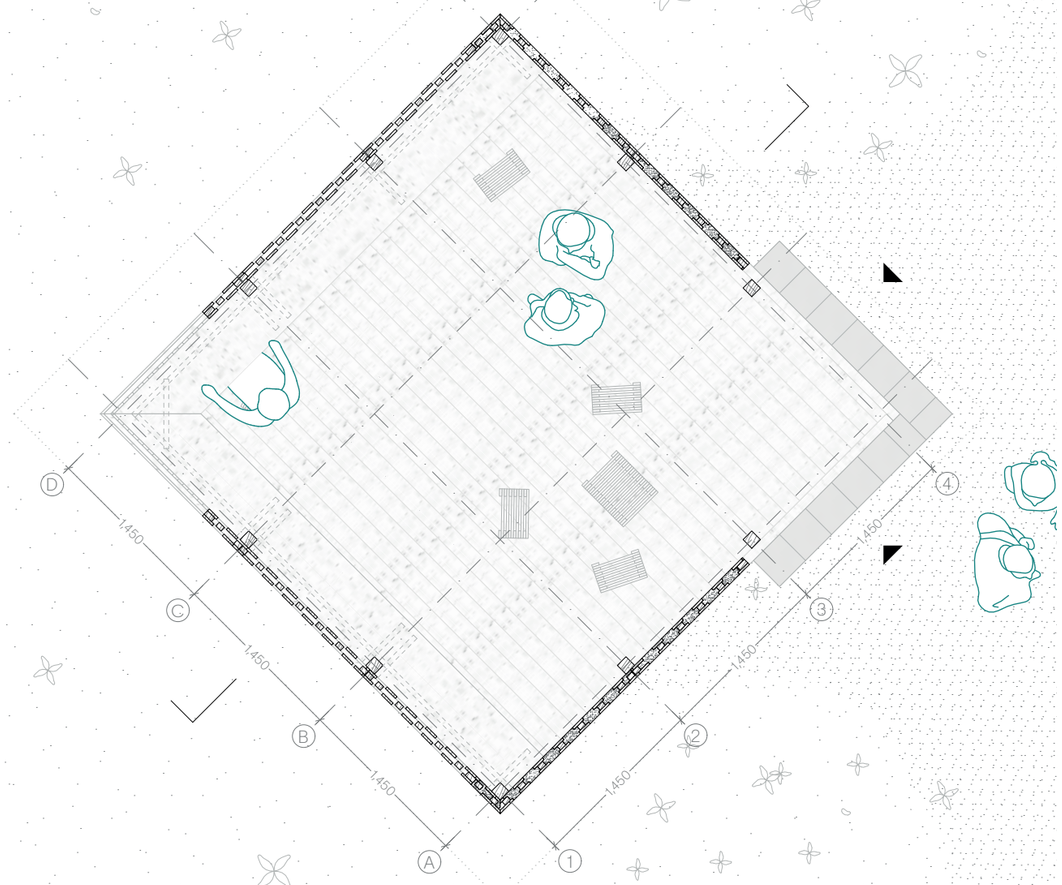


Site Plan

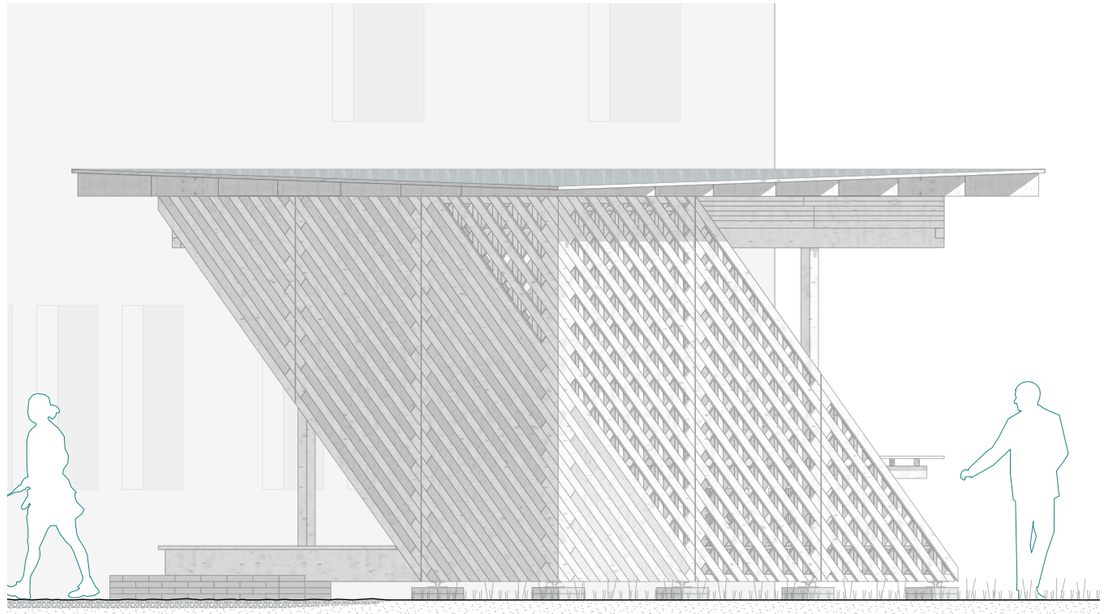


Concept Pictogram

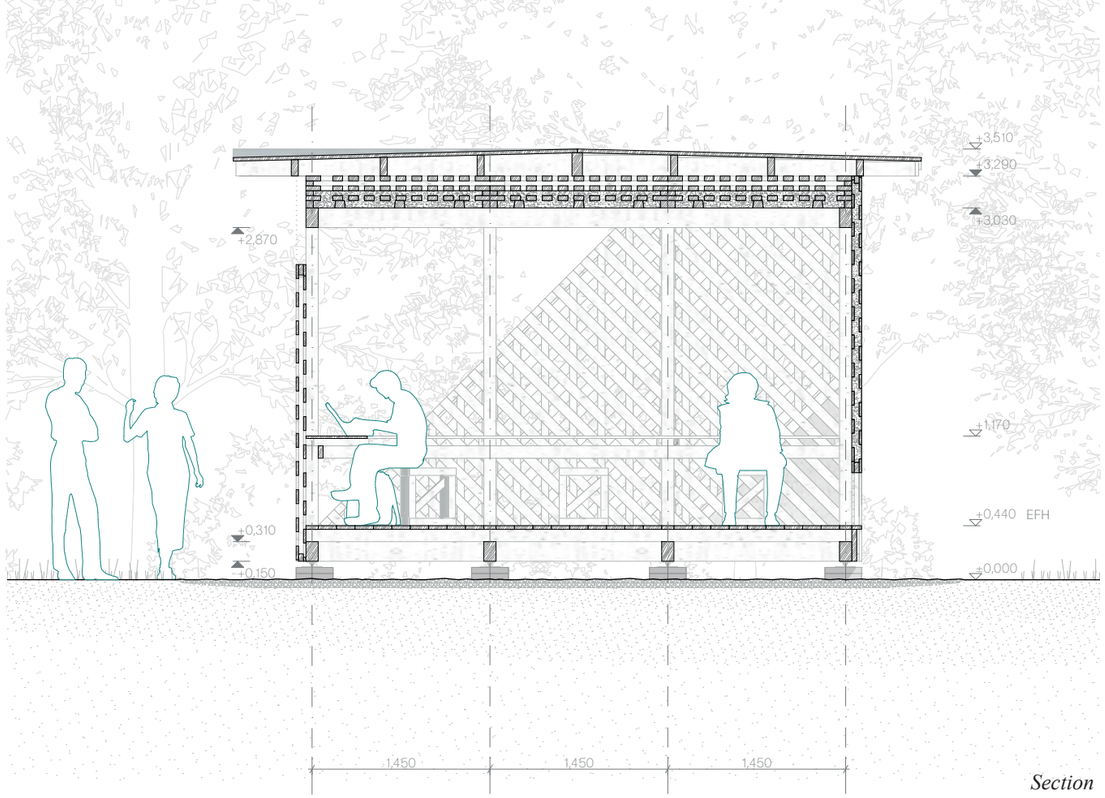
Design Concept



Floorplan

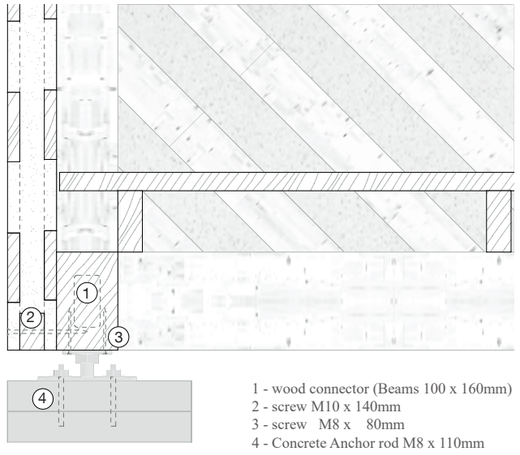


Elevation



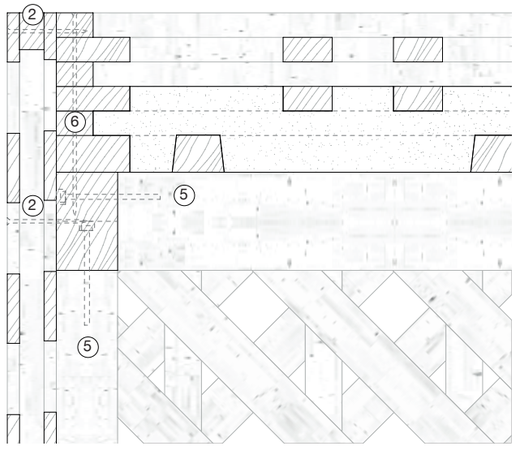
Section

Indoor Perspective



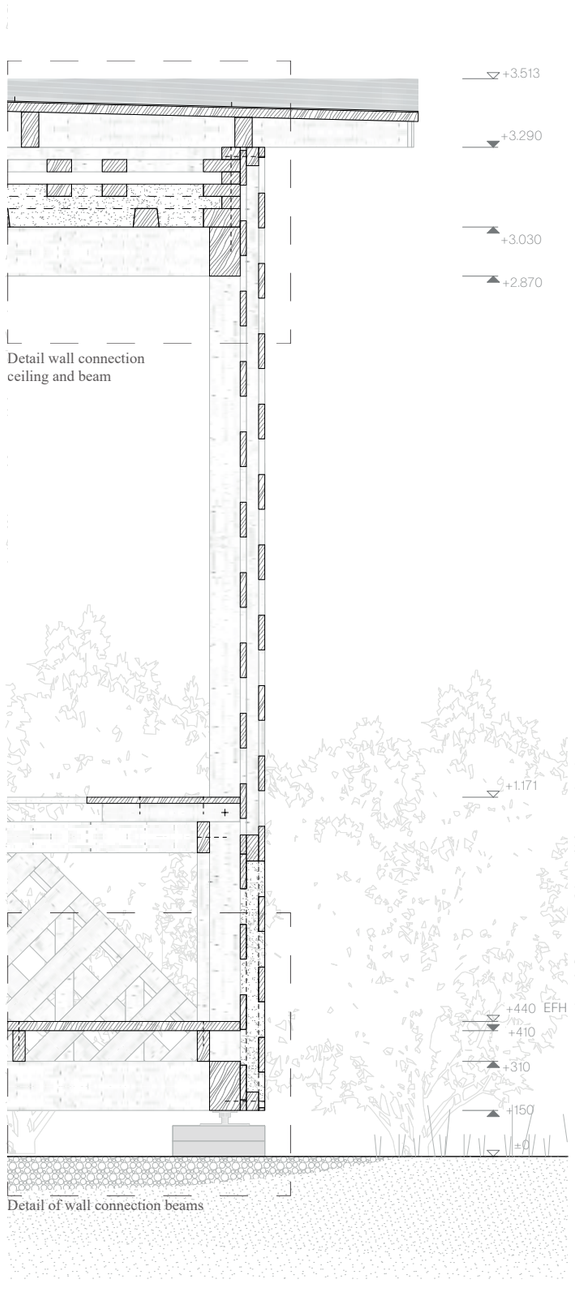
Detail of wall connection beams

1 - wood connector (Beams 100 x 160mm)
2 - screw M10 x 140mm
3 - screw M8 x 80mm
4 - Concrete Anchor rod M8 x 110mm
5 - Bolt anchor M10 x 160 mm
6 - Screw M10 x 325mm



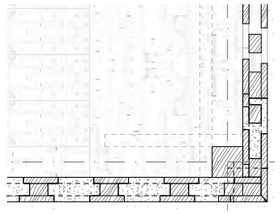
Detail wall connection ceiling and beam

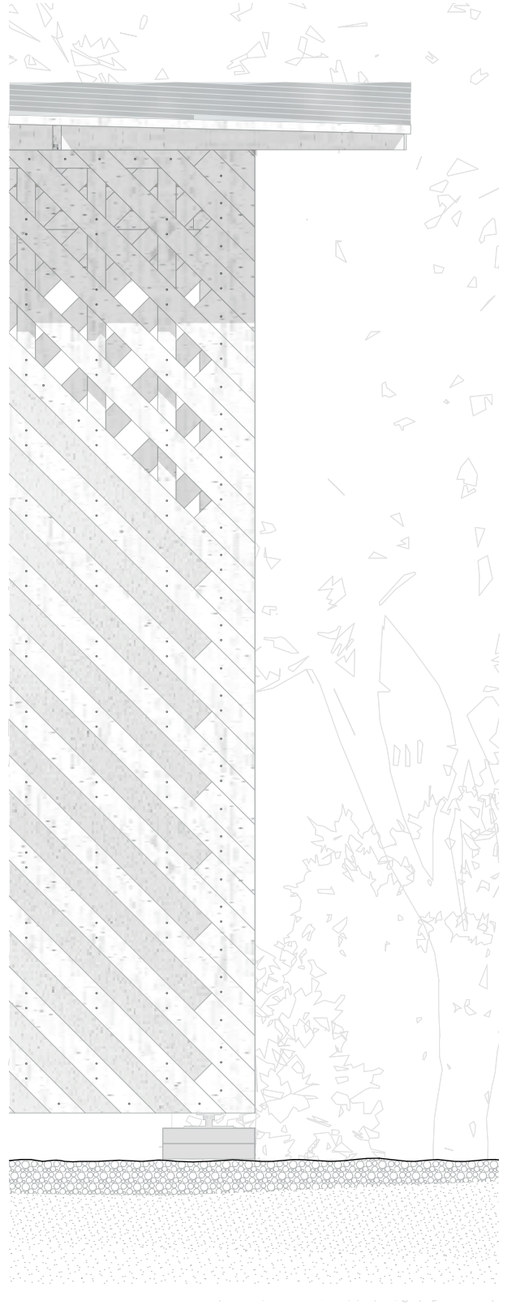
Construction Details



Detail wall connection ceiling and beam

Detail of wall connection beams

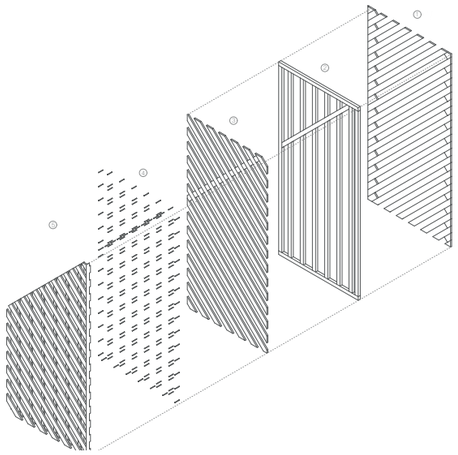


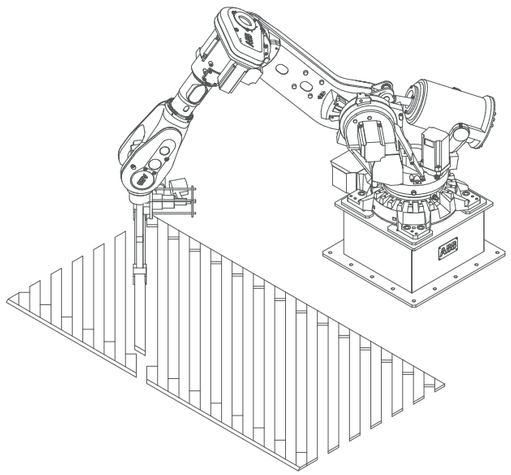


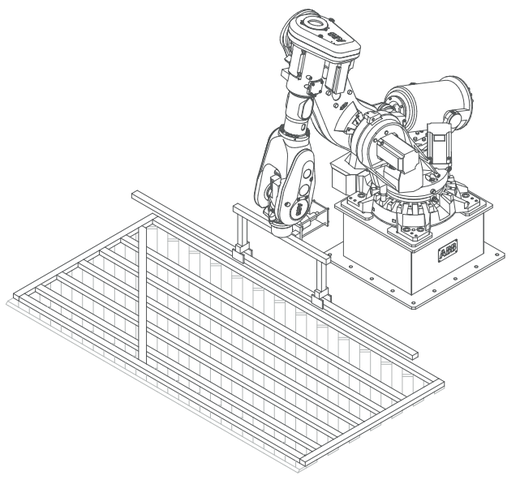
TEWS Bracing Wall Elements (80 mm thickness)

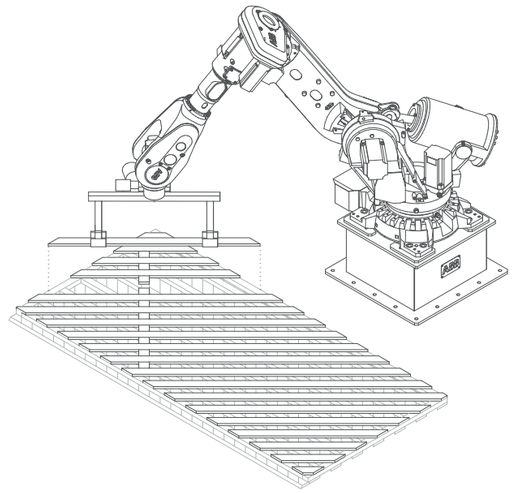
Three-layer timber lath assembly
One vertical inner layer of timber laths, 40 × 60 mm
Two diagonal outer layers of timber boarding, 20 × 80 mm
Connections executed analogously to the slab element,
using robotically placed wooden dowels
Fixed to columns, beams, and the slab element

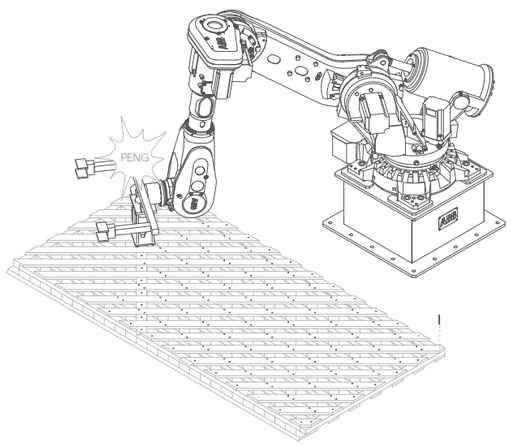
Three View Projection

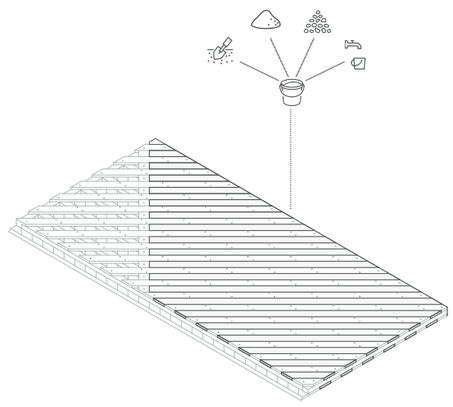


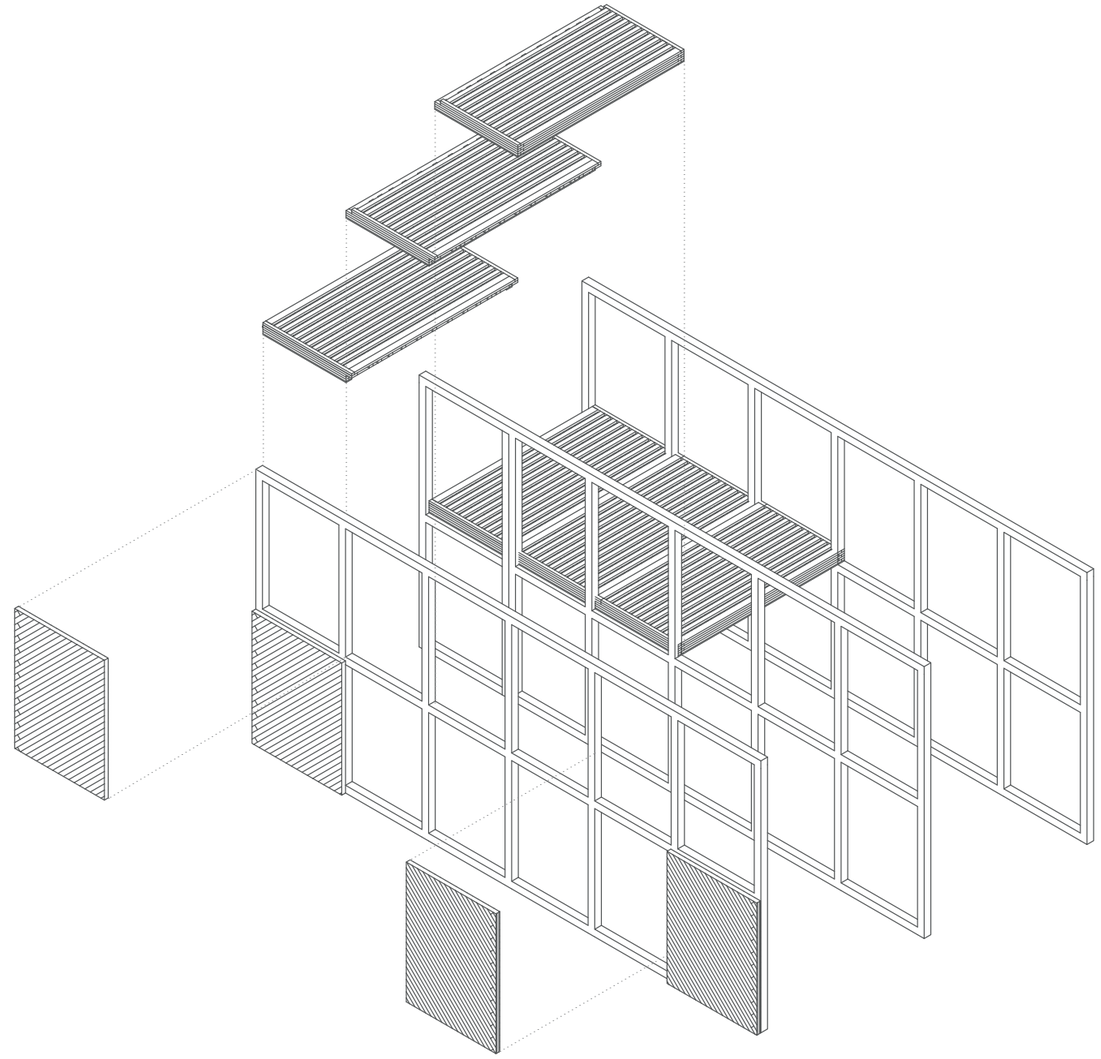







PENG





Model with Surrounding

Design Model

Detail Model

04 | **TON-ik**

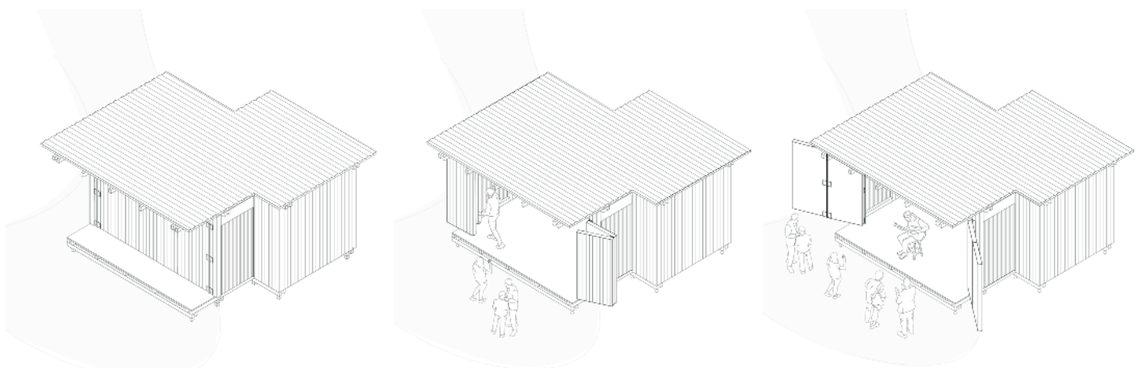
Introduction

Chloé Cartier, Joana Apostoli, Judith Leonhard

The TON-ik Pavilion on the Garching campus is designed as a flexible music pavilion. A key architectural feature is the large opening on one façade, which allows the space to adapt to different uses. Two bi-fold doors can be fully opened, transforming the enclosed rehearsal room into an open performance stage. The construction is adapted to acoustic requirements. The walls consist of a prefabricated timber frame structure filled with straw insulation and finished with clay plaster, supporting balanced sound quality. The ceiling is made of TES elements, providing effective acoustic and thermal insulation. The sustainable choice of materials also emphasizes the experimental and ecological character of the pavilion within the campus environment.

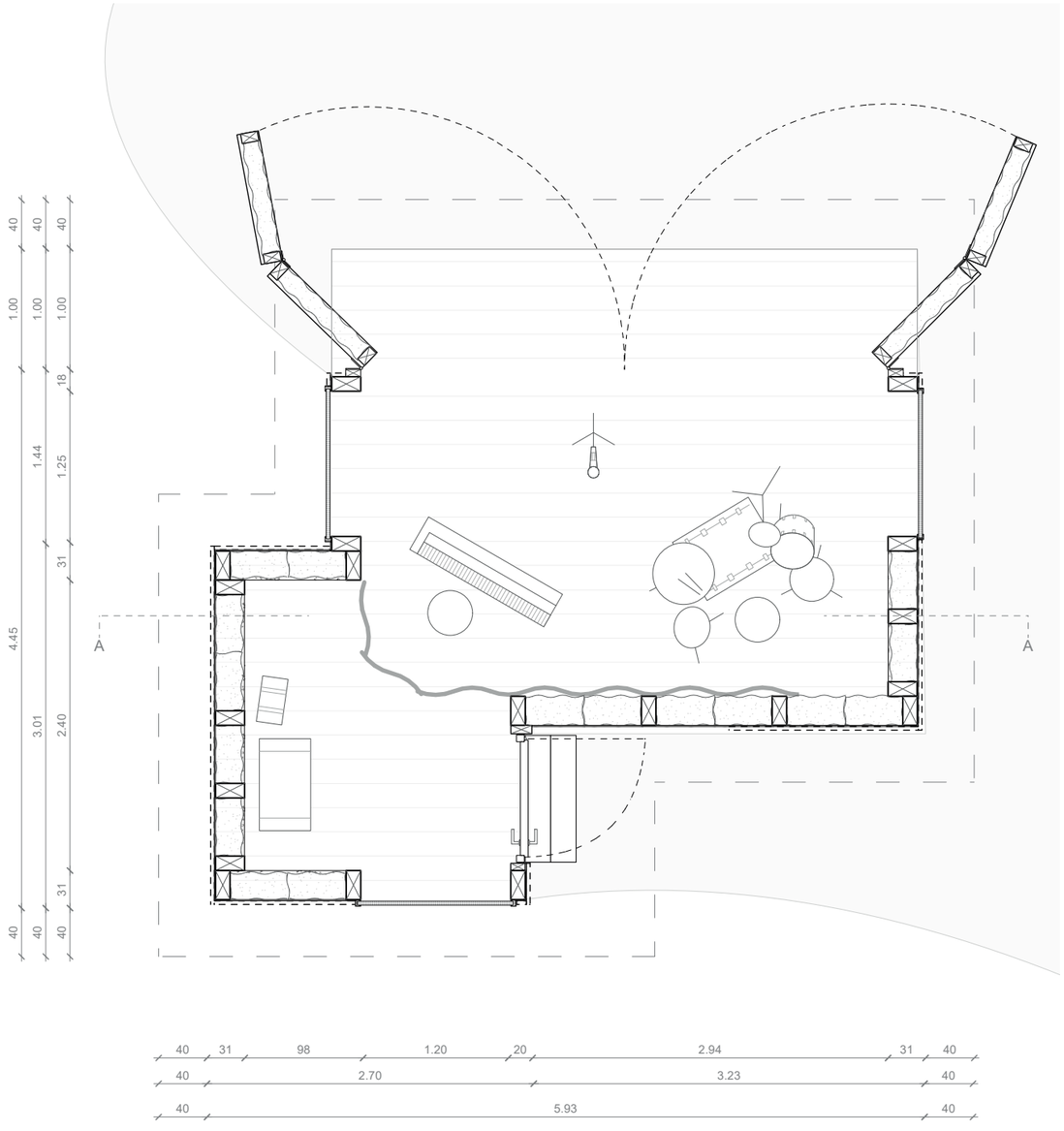
Outdoor Perspective

Site Plan



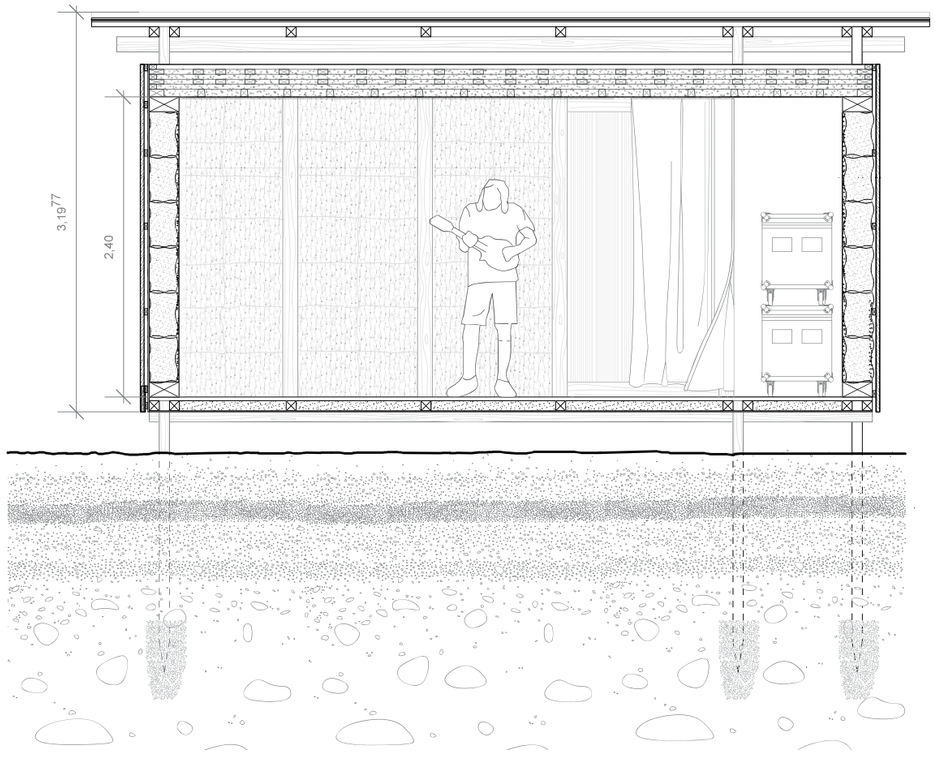
Concept Pictogram

Design Concept



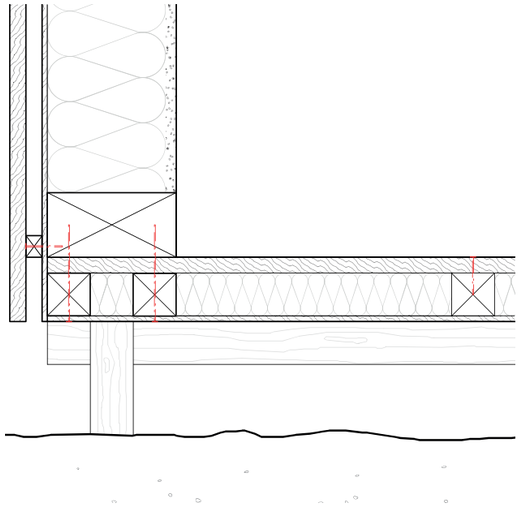
Floorplan

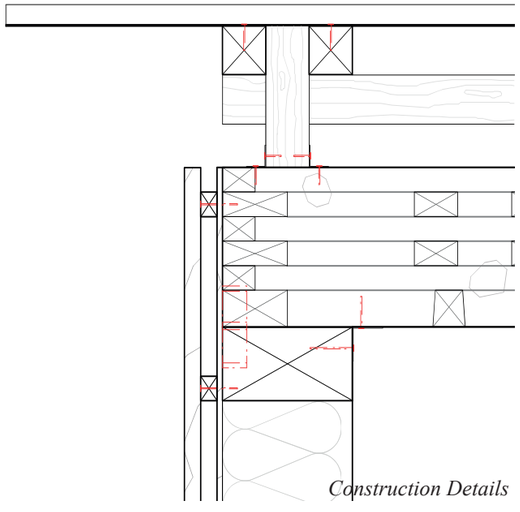
Elevation



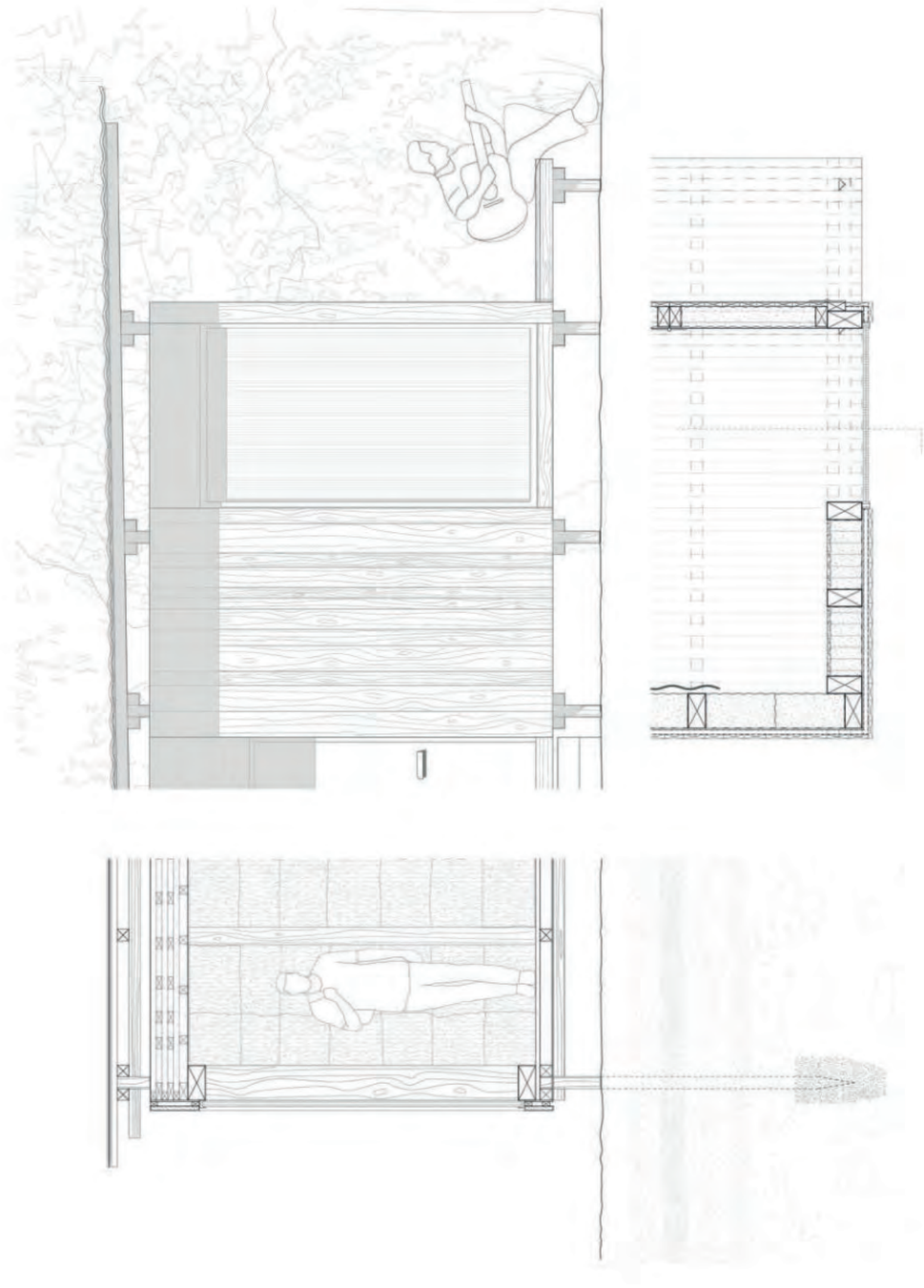
Section

Indoor Perspective

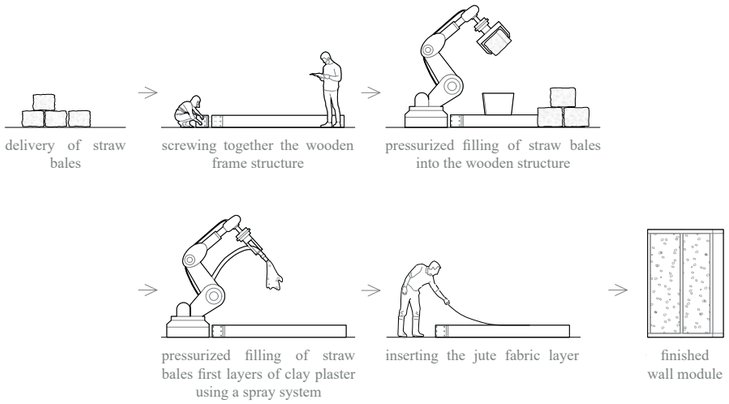


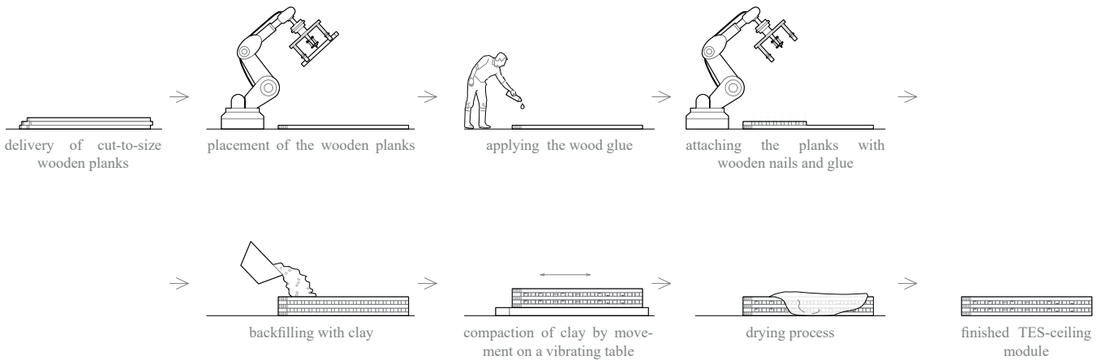


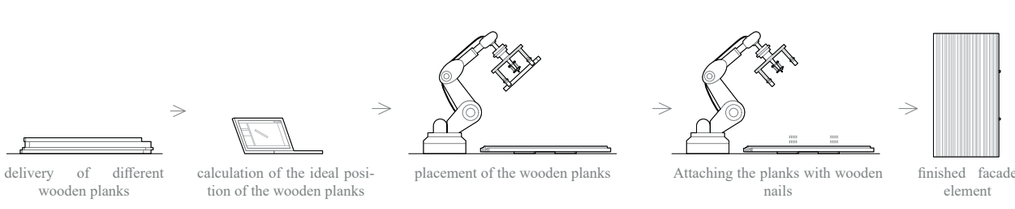
Construction Details

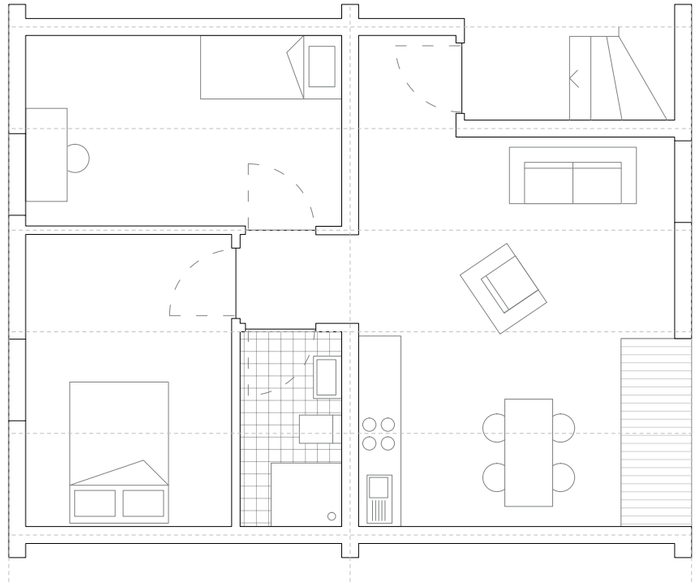


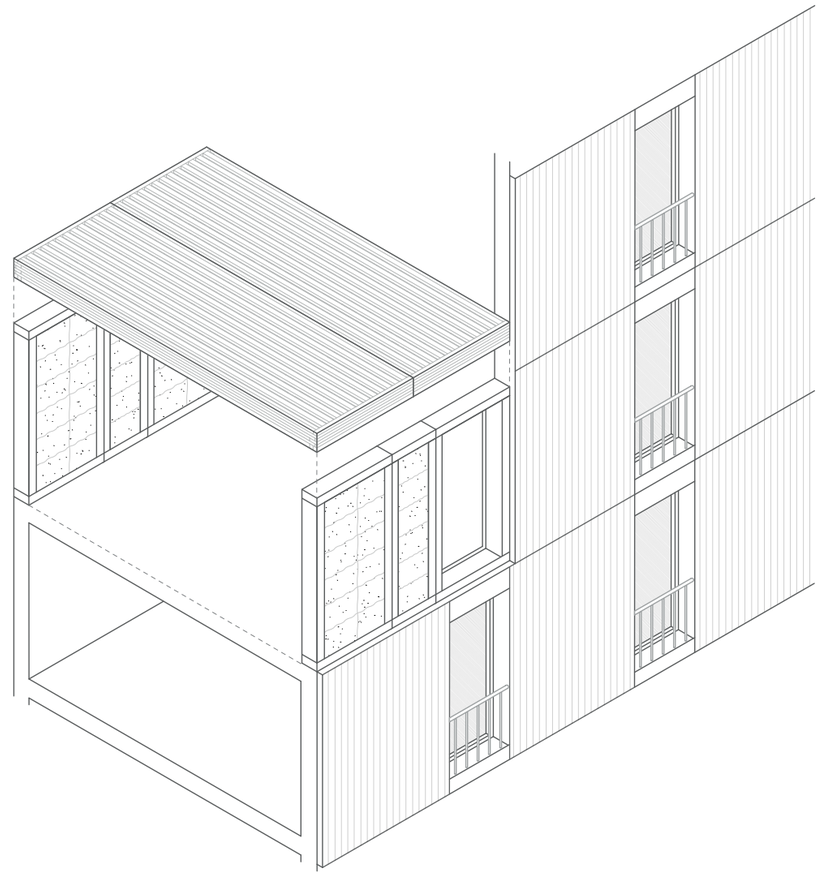
Three View Projection


delivery of straw bales
screwing together the wooden frame structure
pressurized filling of straw bales into the wooden structure
pressurized filling of straw bales first layers of clay plaster using a spray system
inserting the jute fabric layer
finished wall module


delivery of cut-to-size wooden planks
placement of the wooden planks
applying the wood glue
attaching the planks with wooden nails and glue
backfilling with clay
compaction of clay by movement on a vibrating table
drying process
finished TES-ceiling module


delivery of different wooden planks
calculation of the ideal position of the wooden planks
placement of the wooden planks
Attaching the planks with wooden nails
finished facade element





Model with Surrounding

Design Model

Detail Model

05 | **Bier und Beichtstuhl**

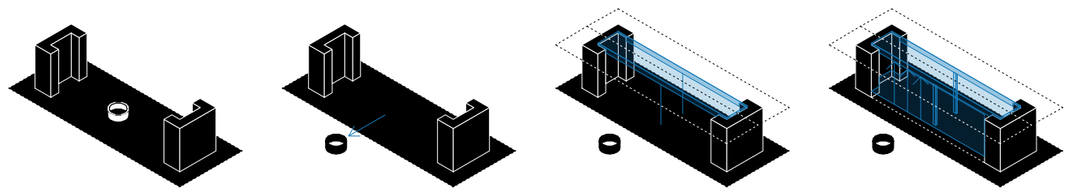
Introduction

Malte Anselment, Antonio Arduini, Maximilian Boeck

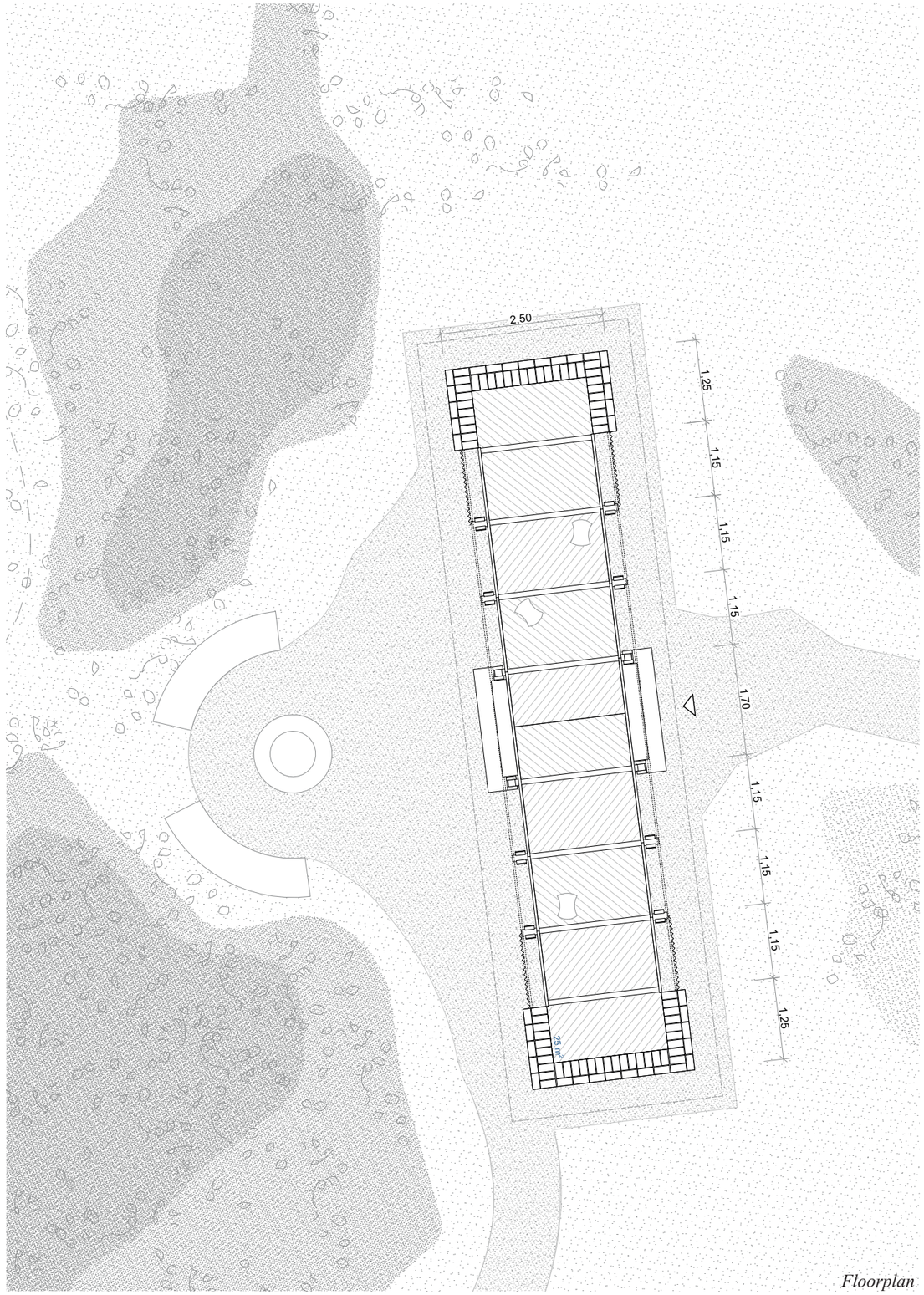
The pavilion in Garching, Munich, is designed as an open, communal space. Since there is currently no central place for informal gatherings or barbecues, the pavilion offers an open area with flexible use a gateway between nature and the campus. The elongated building is framed by two clay brick pillers, between which a lightweight wooden structure spans. The suspended floor elements are hung from two TES elements, demonstrating their structural performance. Movable curtains in front of the façade provide airy shading and a flexibly sheltered atmosphere. The pavilion deliberately plays with contrasts such as retreat and social interaction, light and heavy, as well as nature and the university buildings.

Outdoor Perspective

Site Plan

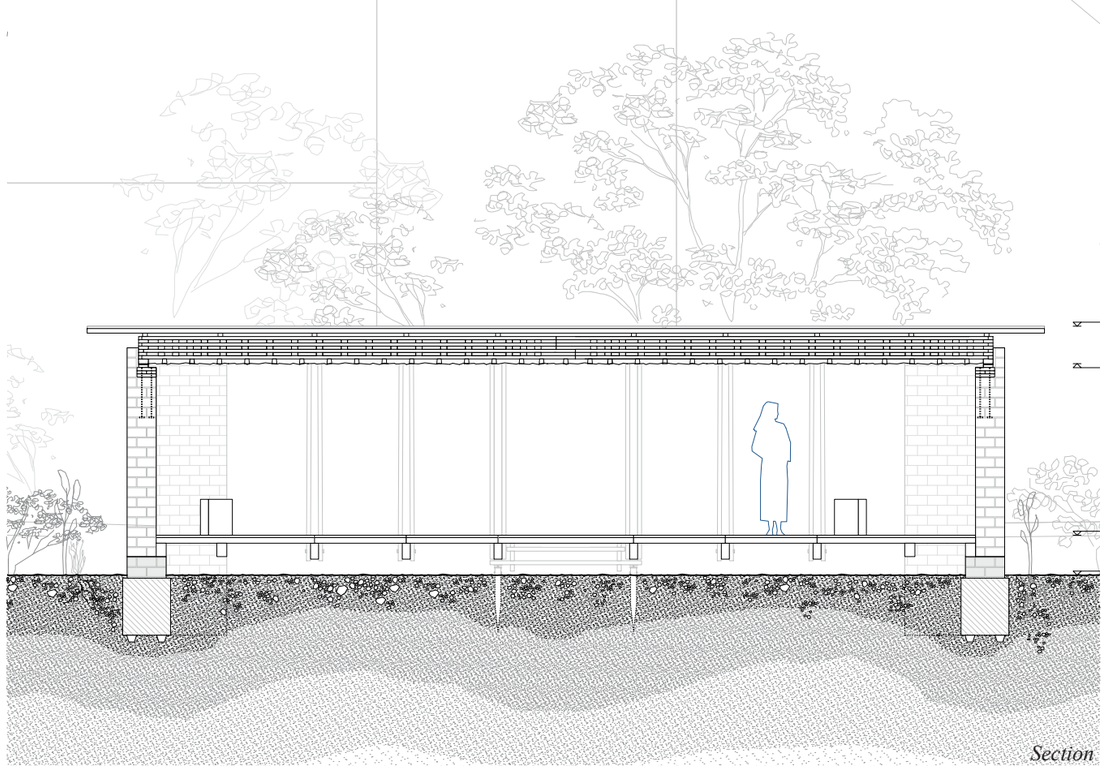


Concept Pictogram



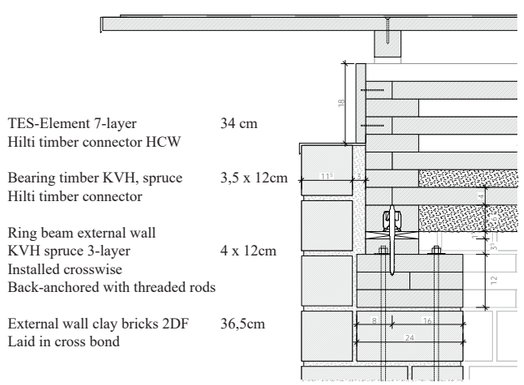
Floorplan

Elevation



Section

Indoor Perspective

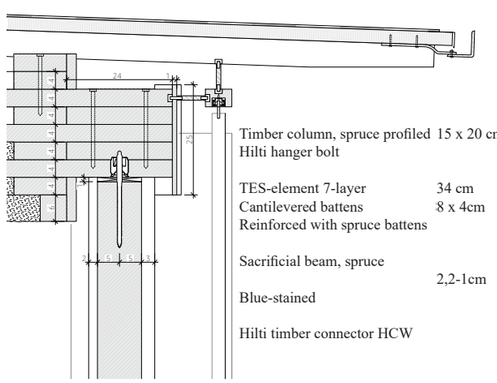


TES-Element 7-layer 34 cm
Hilti timber connector HCW

Bearing timber KVH, spruce 3,5 x 12cm
Hilti timber connector

Ring beam external wall
KVH spruce 3-layer 4 x 12cm
Installed crosswise
Back-anchored with threaded rods

External wall clay bricks 2DF 36,5cm
Laid in cross bond



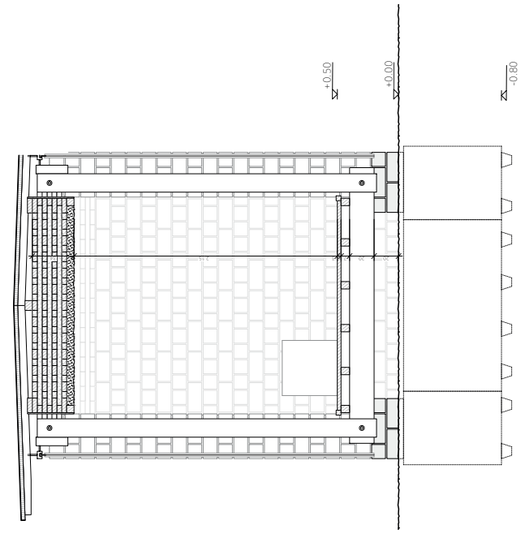
Timber column, spruce profiled 15 x 20 cm
Hilti hanger bolt

TES-element 7-layer 34 cm
Cantilevered battens 8 x 4cm
Reinforced with spruce battens

Sacrificial beam, spruce 2,2-1cm
Blue-stained

Hilti timber connector HCW

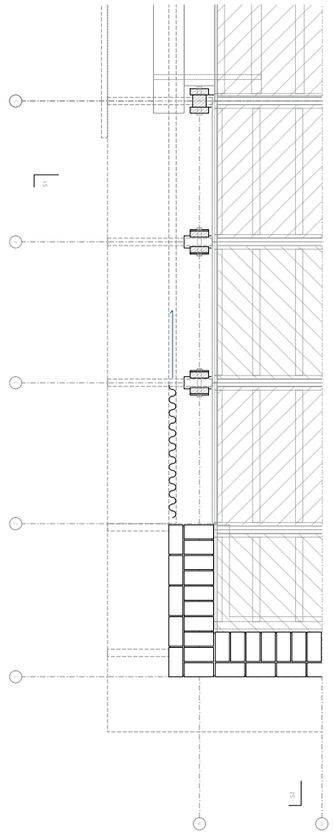
Construction Details



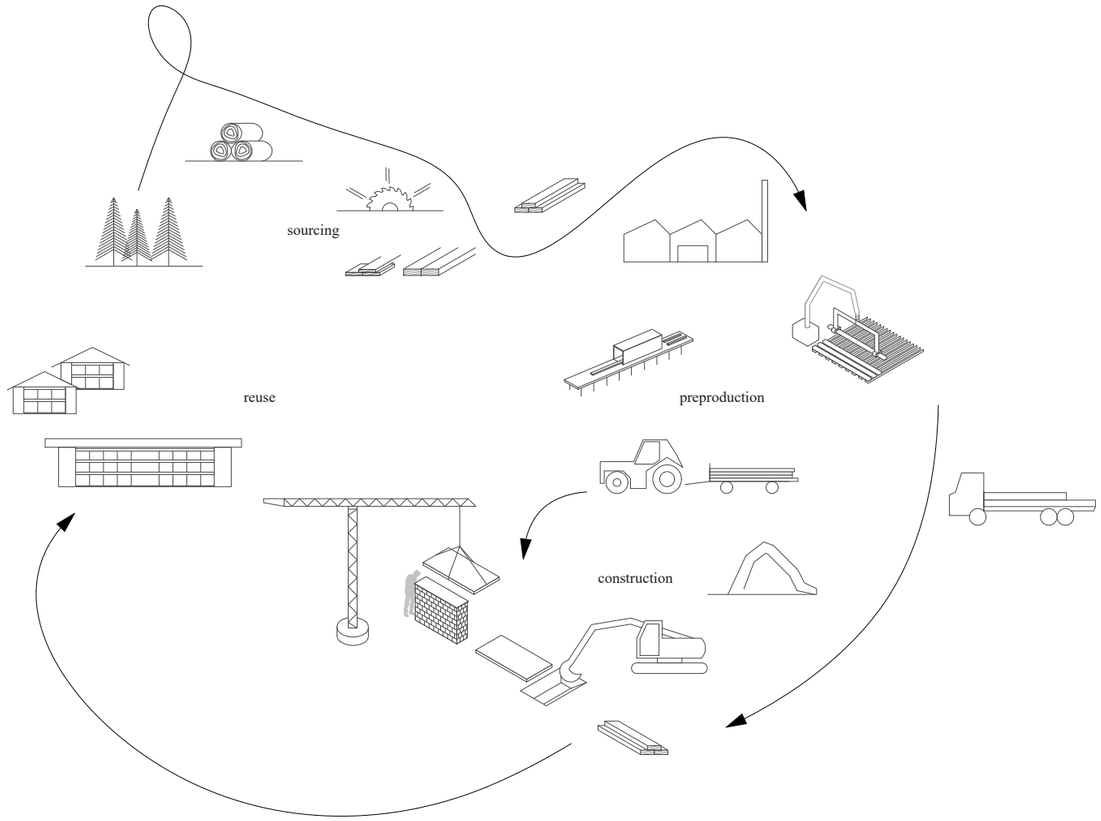
Roof
Bituminous roofing membrane, sanded 3cm
Three-layer timber panel 6 x 6cm
Roof battens, spruce 34cm
TES-elements 7-layer

External Wall
clay bricks 2DF 36,5 cm
Laid in cross bond

Foundation
Fired clinker bricks 2DF 50cm
Reused concrete block units 60 x 80 cm
Sand blinding layer 10 cm

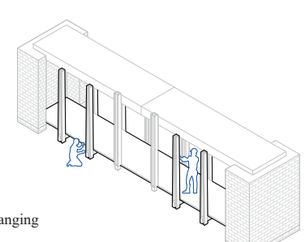


Three View Projection

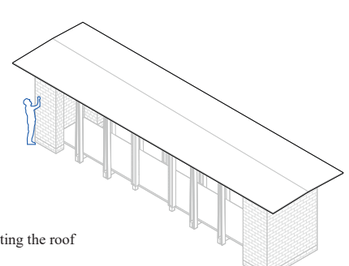


1. Erecting load-bearing structures

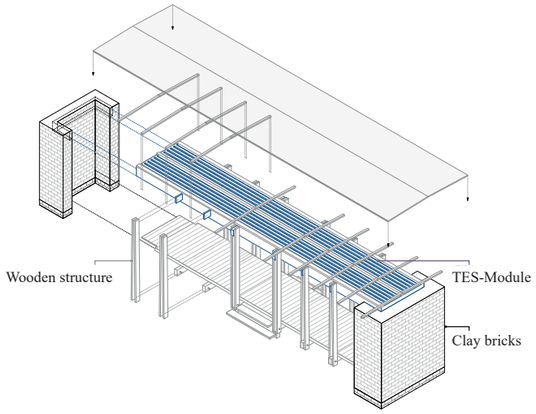
3. Placing TES modules and connecting hanging structures

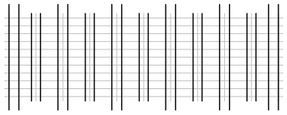


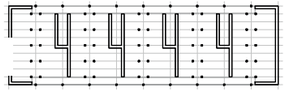
2. Placing floor tiles and hanging structures

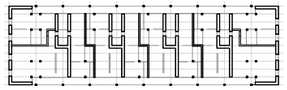


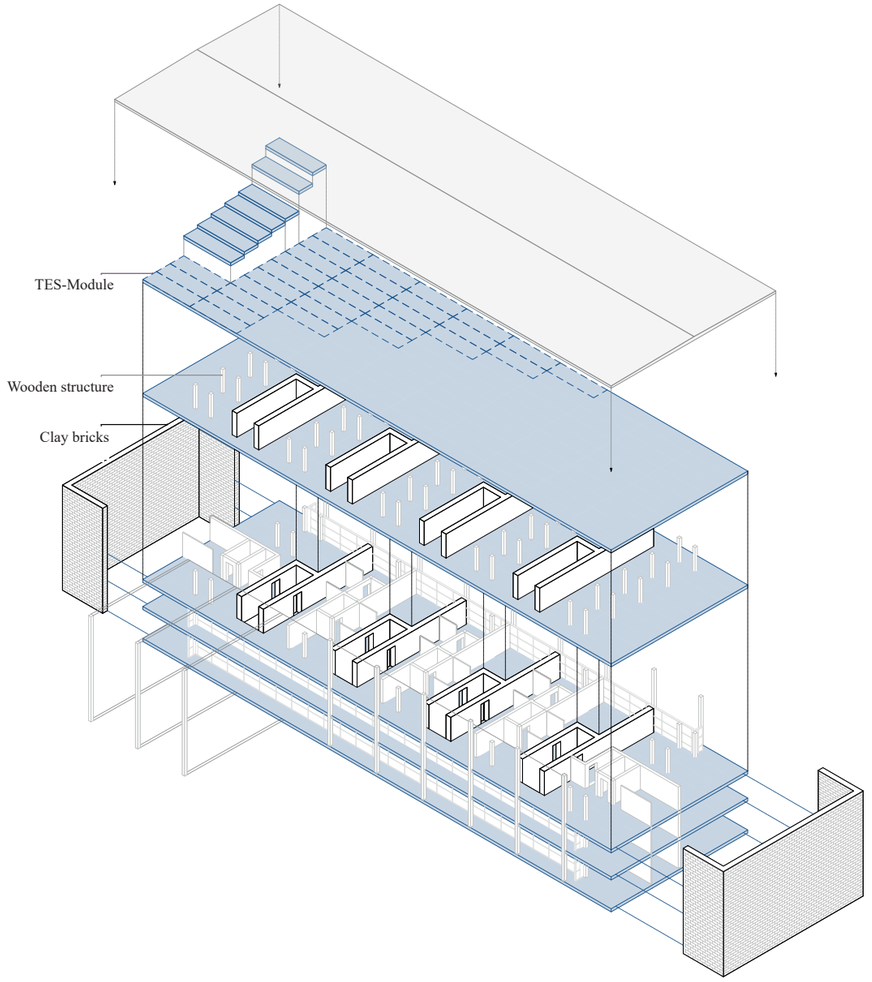
4. Constructing the roof

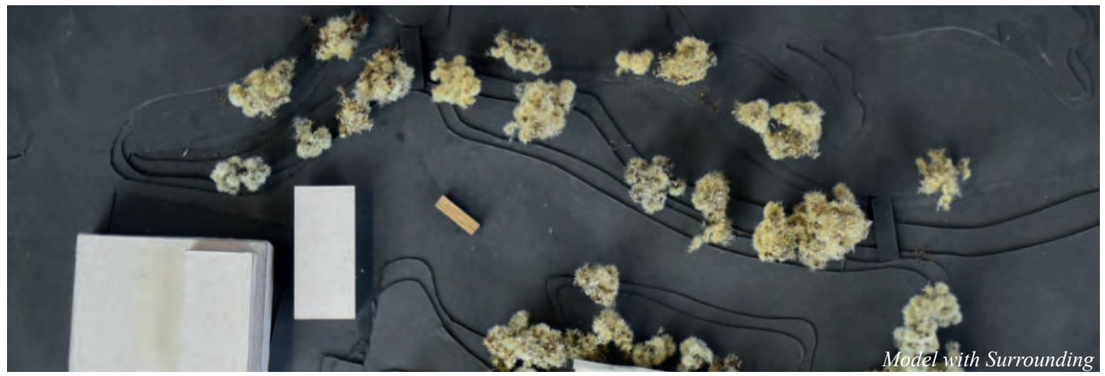












Model with Surrounding

Design Model

Detail Model

06 | **Chidori Terra System**

Introduction

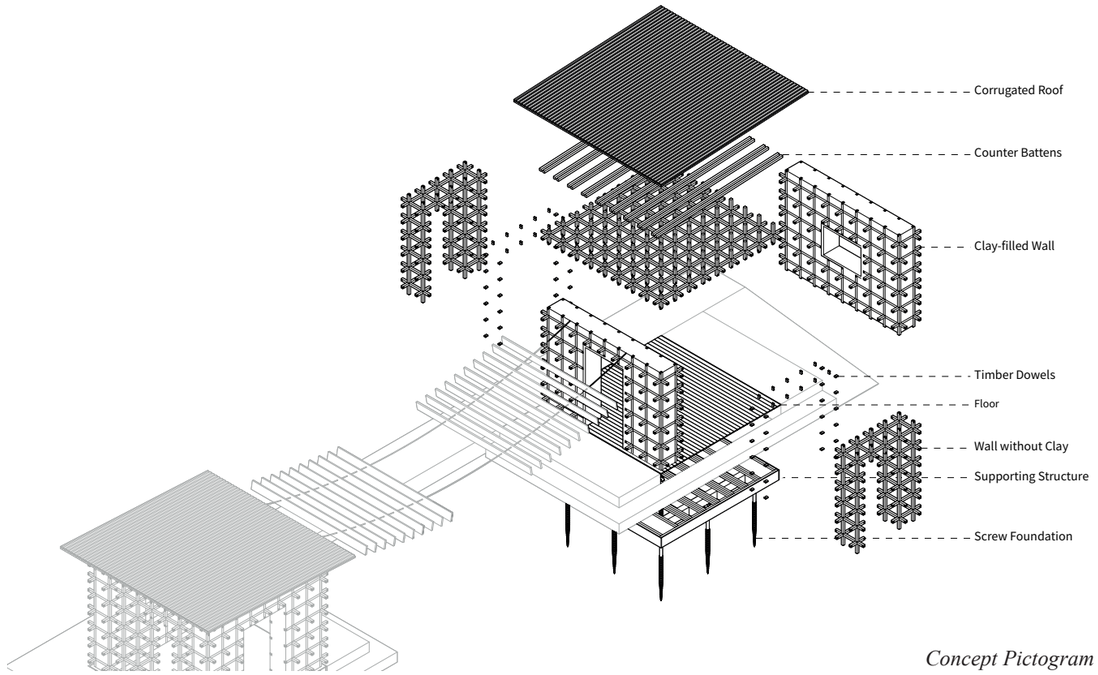
Zeyu Deng, Marius Eichhöfer, Lennart Kremerskothen

The Chidori Terra System explores a modular wood-earth construction system developed from the serial repetition of a simple wooden grid. The grid forms the supporting structure, formwork, and spatial order, and determines the architectural logic of the building. Within the system, earth is used as a solid, storage-capable building material and remains structurally and spatially visible.

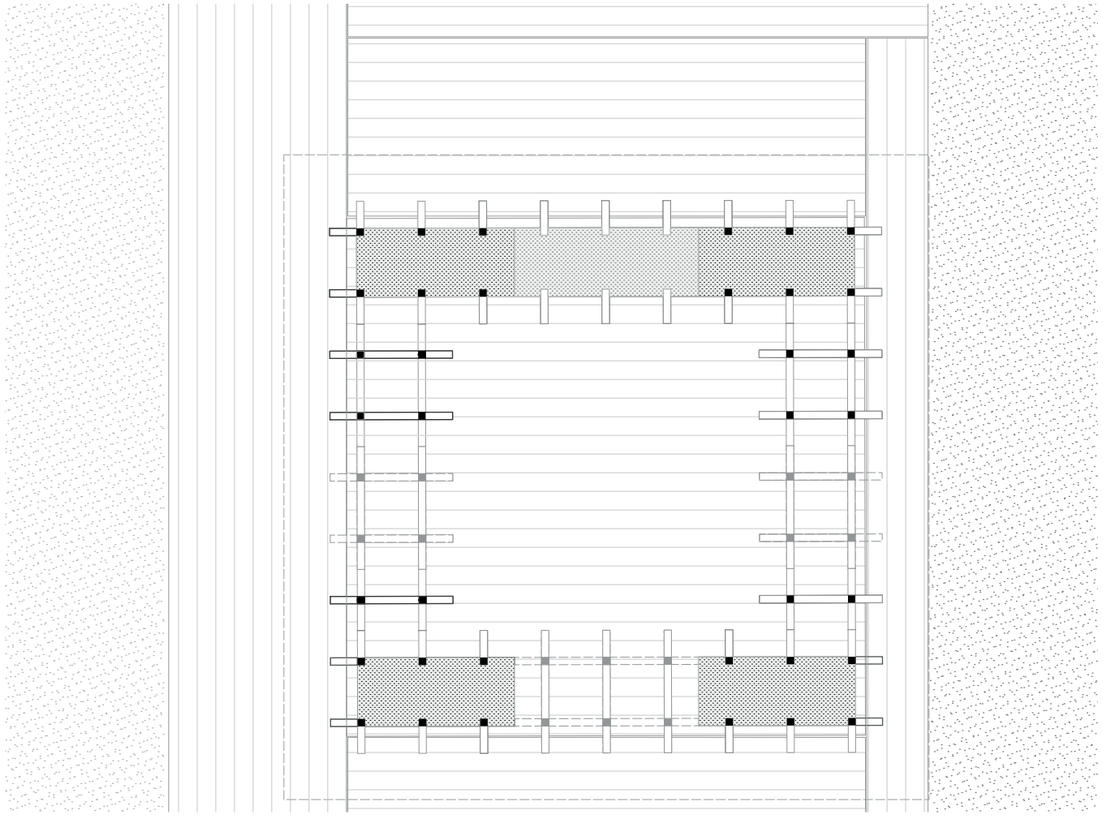
Architecture arises from the precise alignment and repetition af a structural principle, not from formal setting or hierarchical component arrangement. The project sees itself as a prototypical structure that is scalable, repairable, and further developable, testing a robust, material-appropriate construction method at the interface of craftmanship, systems thinking, resource-efficient building.

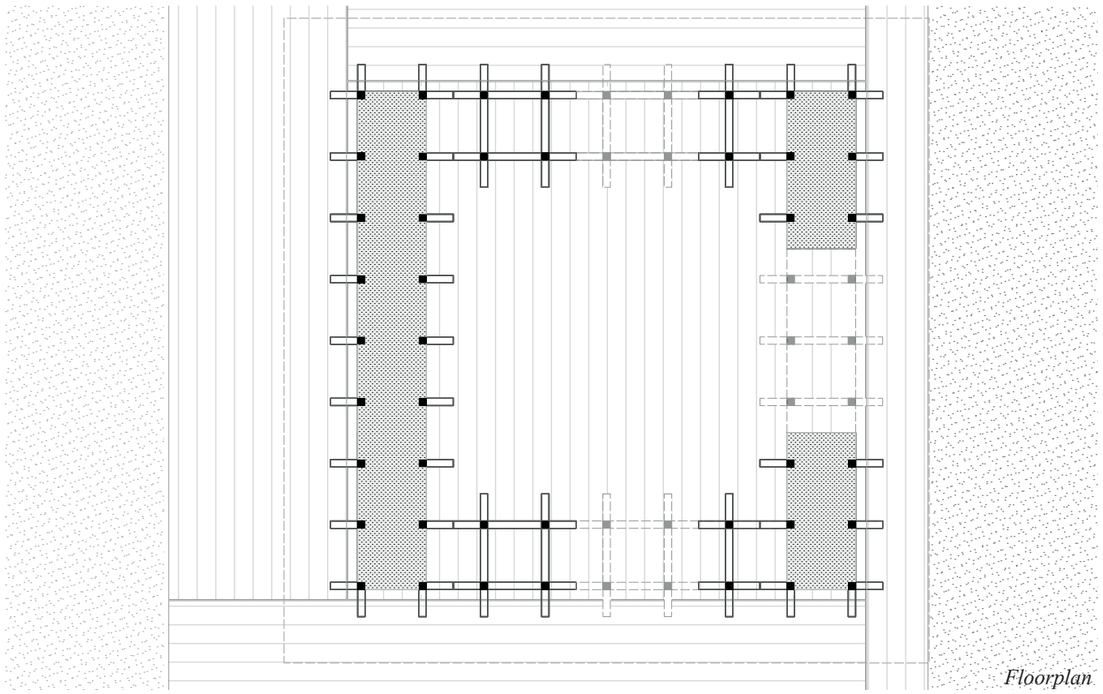
Outdoor Perspective

Site Plan

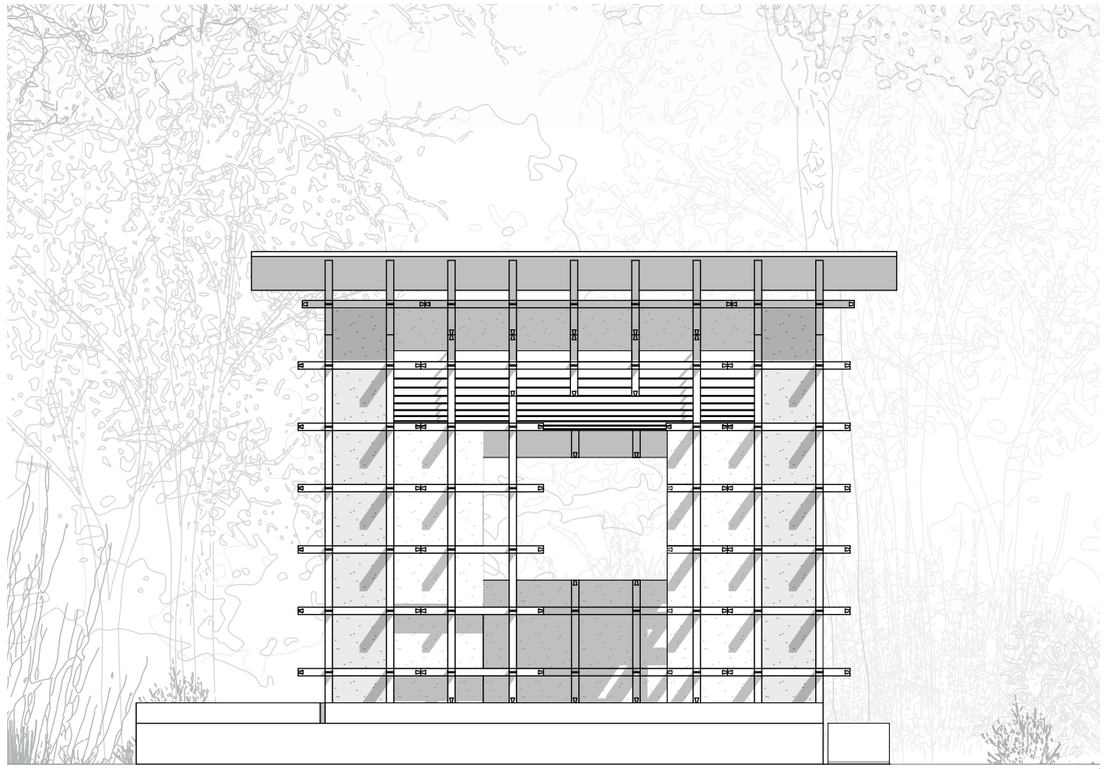


Concept Pictogram

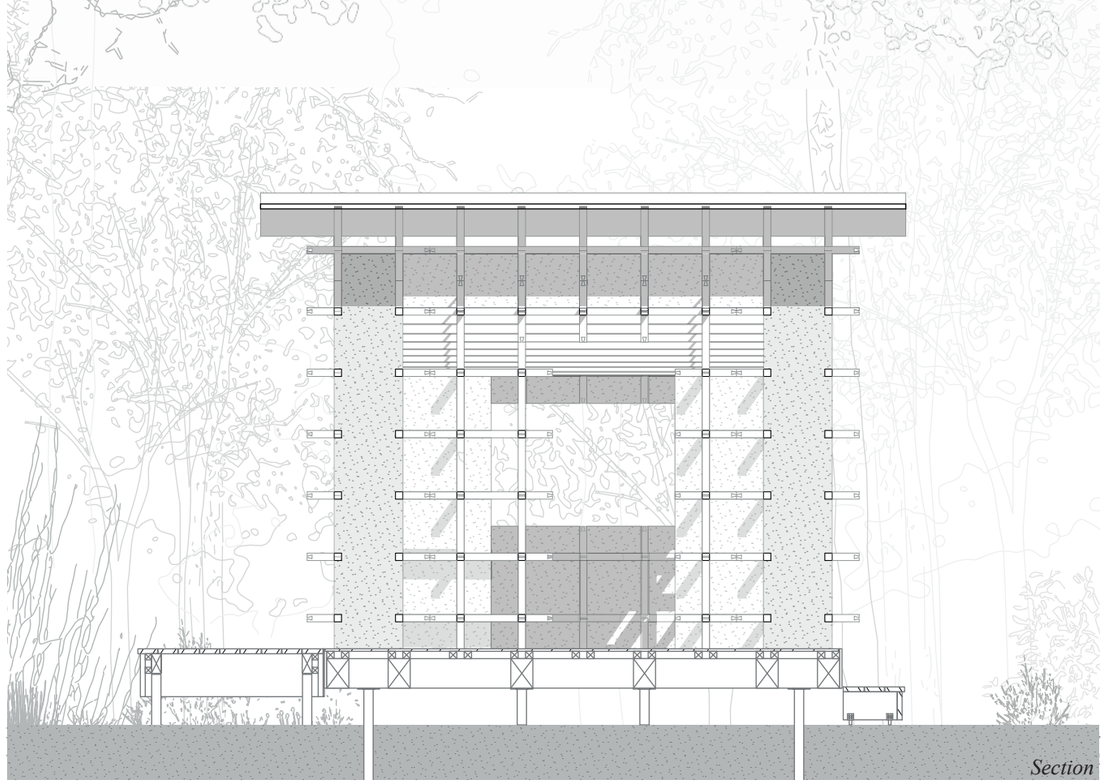




Floorplan

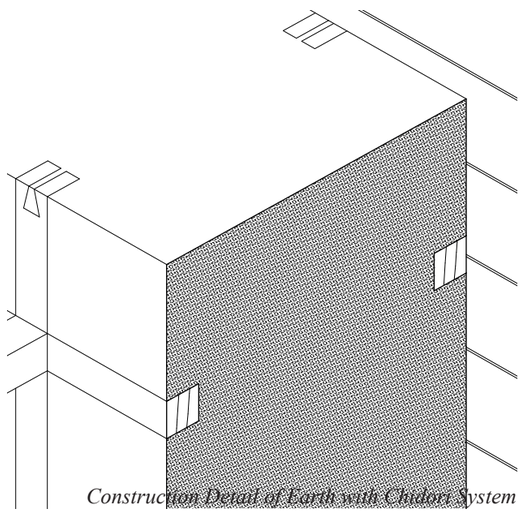


Elevation

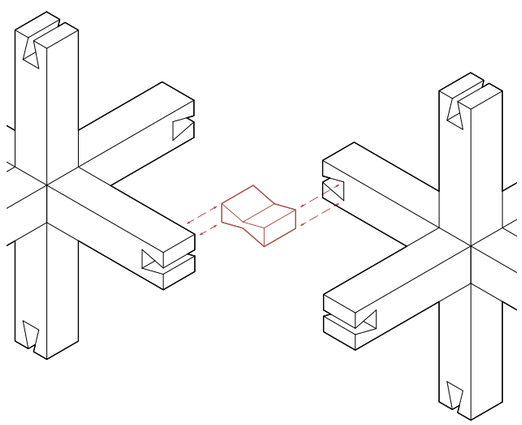


Section

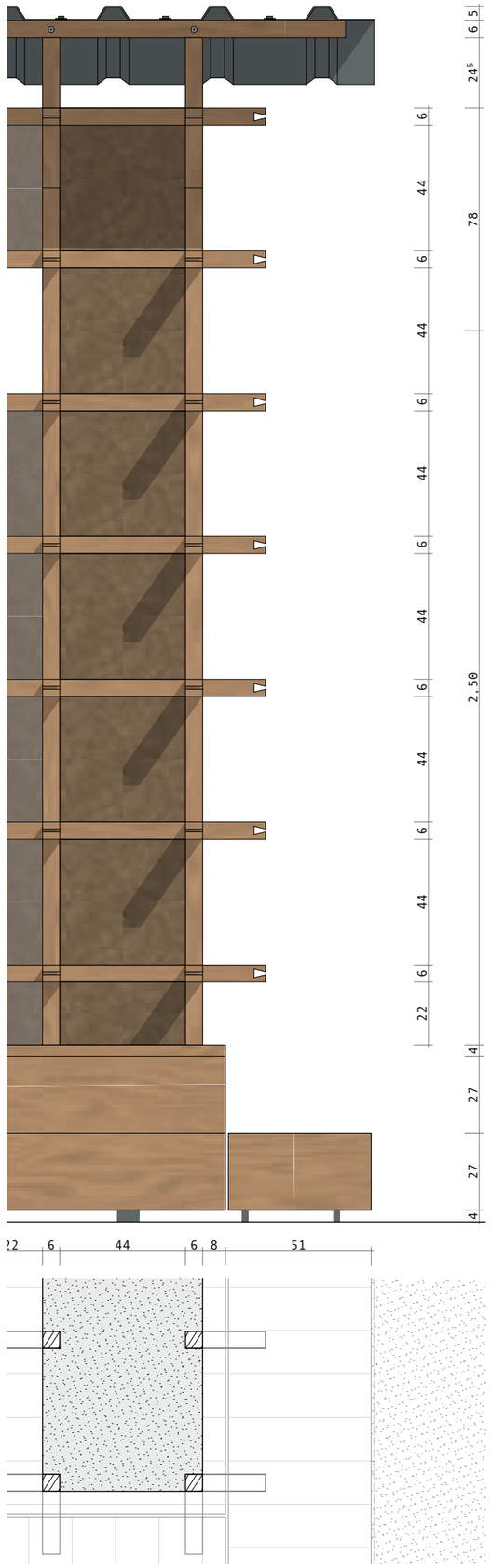
Indoor Perspective

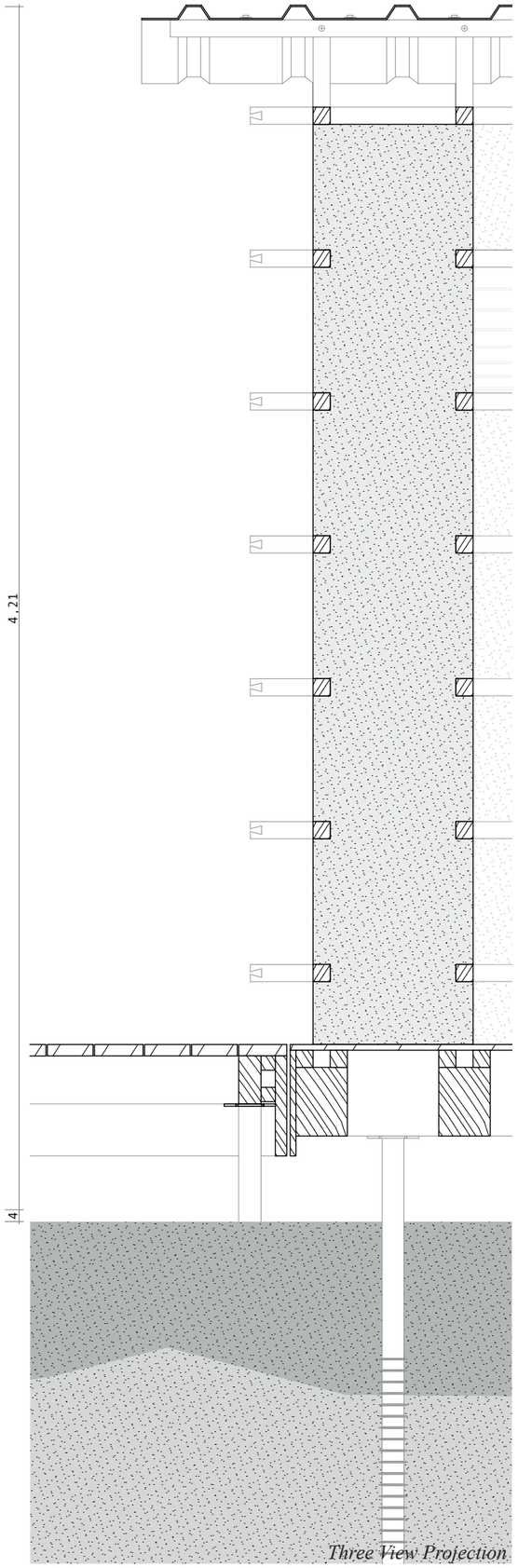


Construction Detail of Earth with Chidori System



Construction Detail of Connecting Chidori System

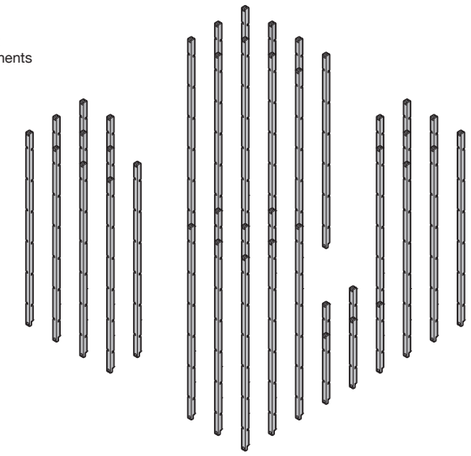




Three View Projection

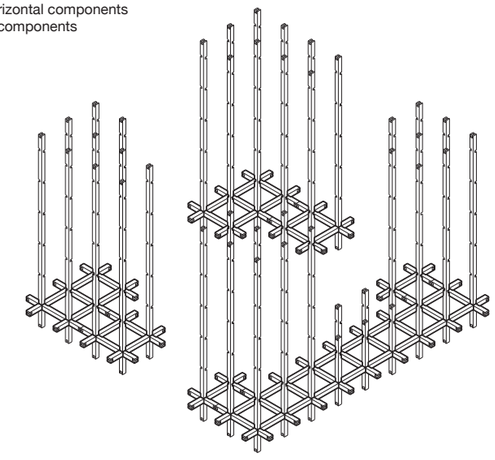
STEP I.

Prepare and define
the vertical components



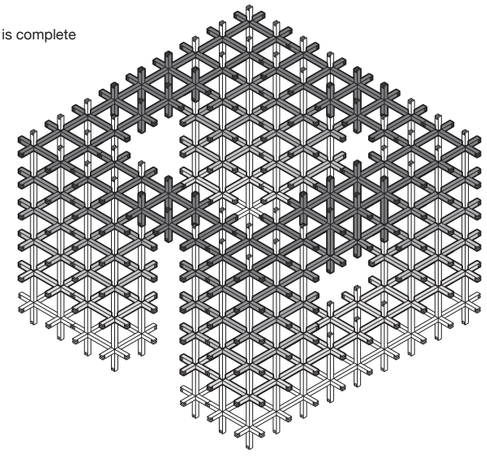
STEP II.

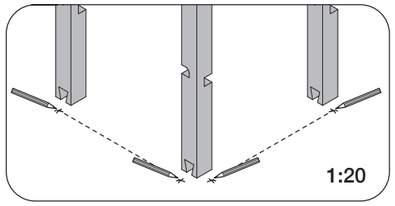
Assemble the horizontal components
onto the vertical components

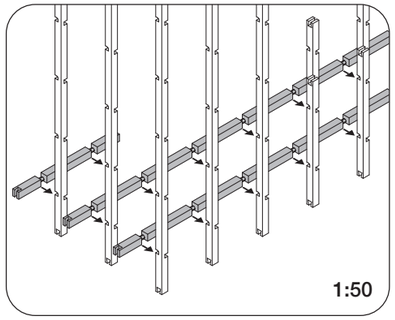


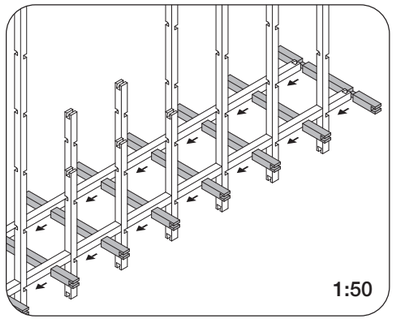
STEP III.

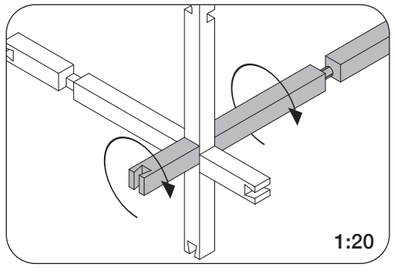
Repeat Step II.
until the assembly is complete

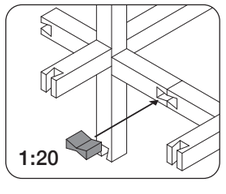




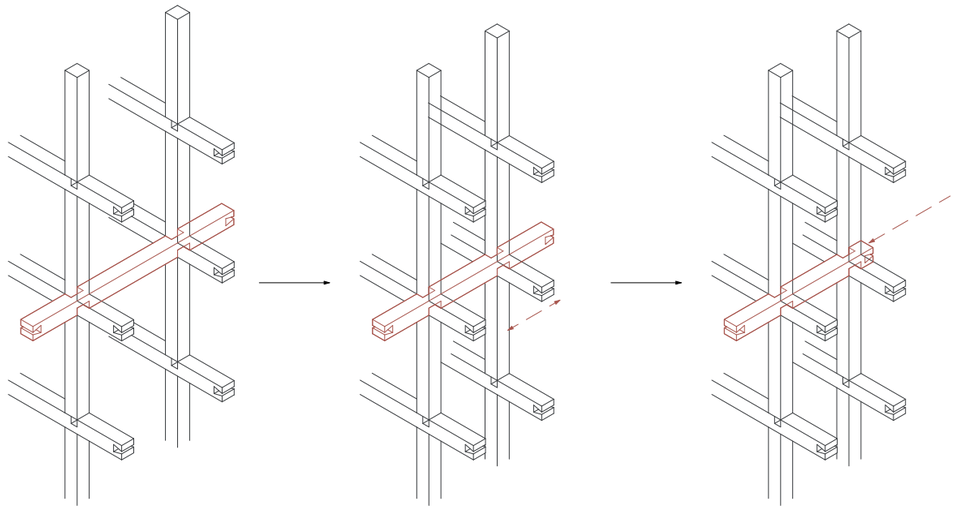




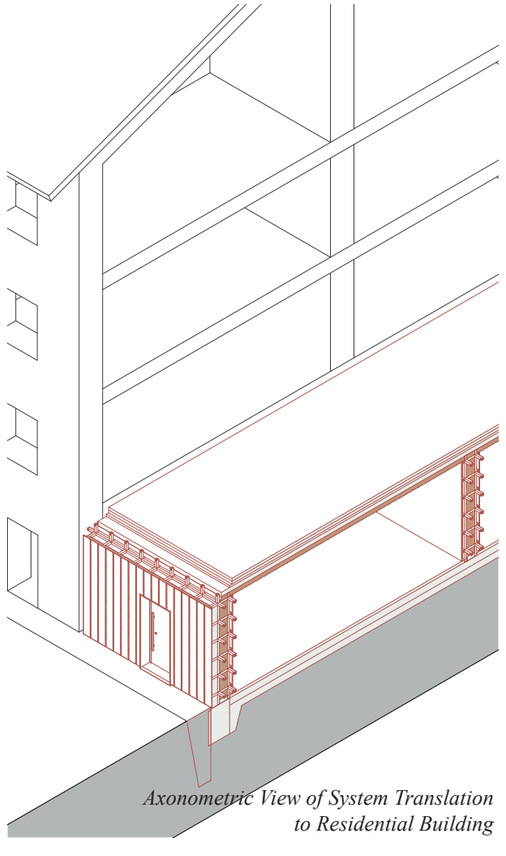




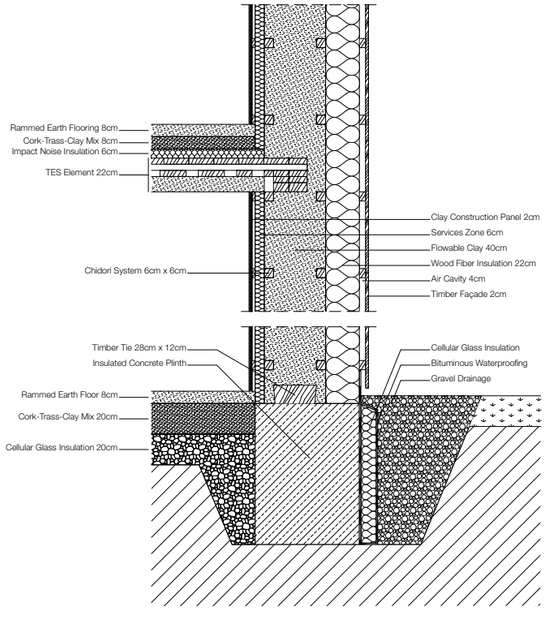
Manufacturing



System Adaption to Residential Wall Dimensions



*Axonometric View of System Translation
to Residential Building*



Façade Section

Model with Surrounding

Design Model

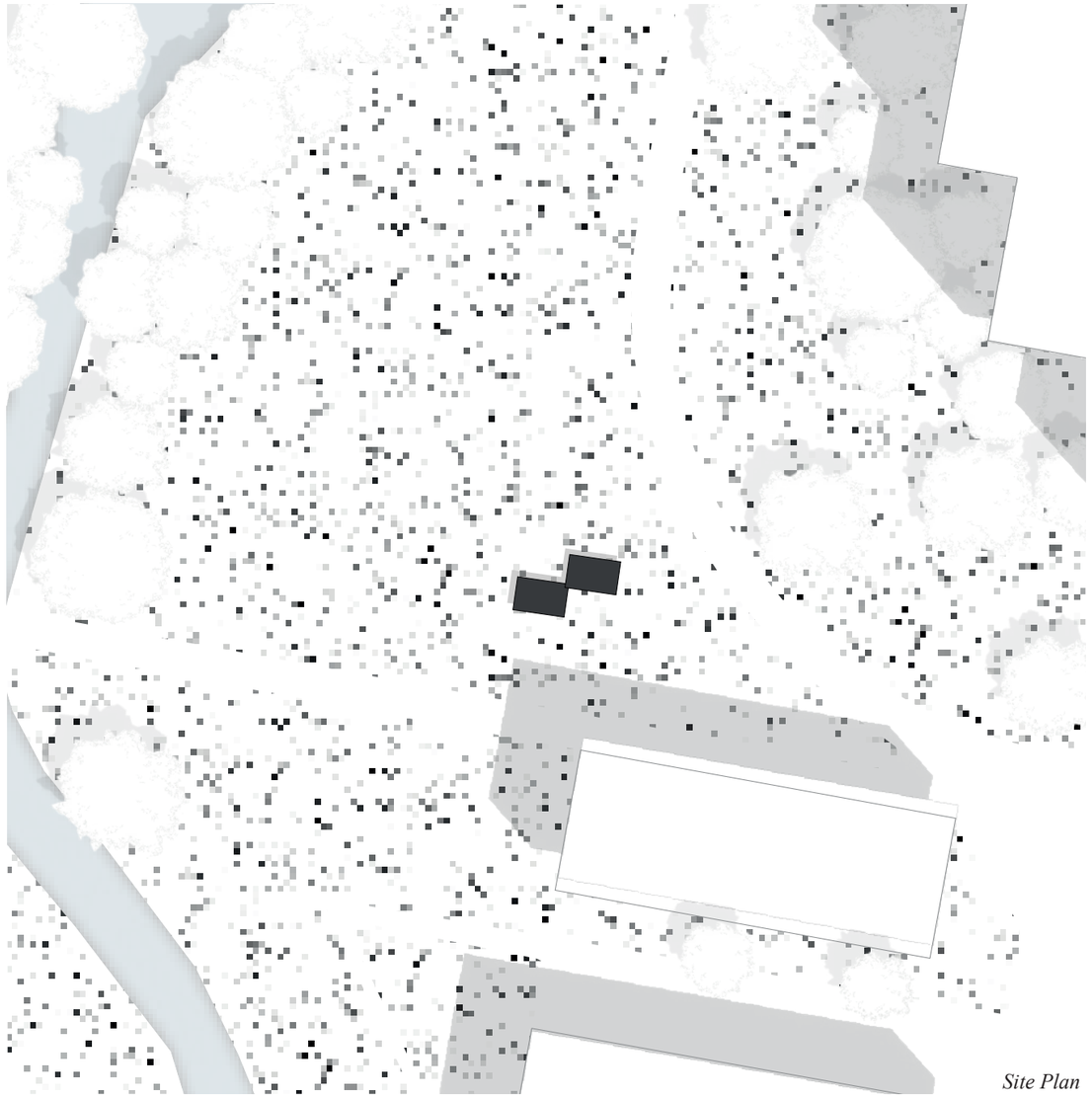
Detail Model

07 | **Parea Pavillon**

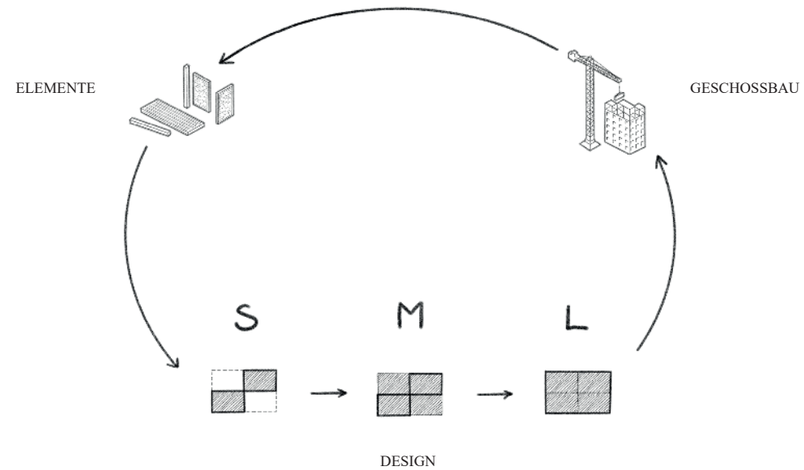
Lars Kolberg, Merle Geimer, Karim Yacoub

The aim of our concept is to design a pavilion made of a sustainable timber-clay construction for the campus in Garching. This is intended to serve as a prototype for a multi-story building. For this, we use a stacked clay wall as the wall type, which is easily and one-to-one reusable due to the omission of mortar. As a ceiling element, we use the Timber Earth Slab (TES), which perfectly combines the positive properties of wood and clay. Due to the limitation of the BRI to 75m³, we plan intermediate spaces that expand our usable area. Two shifted cubes form uncovered terraces, which do not increase the BRI. The chosen orientation results in an inviting visual axis from the lively campus to the quiet nature. Due to the stringent form and the flexible furniture, a variety of uses arises, which can be utilized depending on needs or time of day and light conditions.

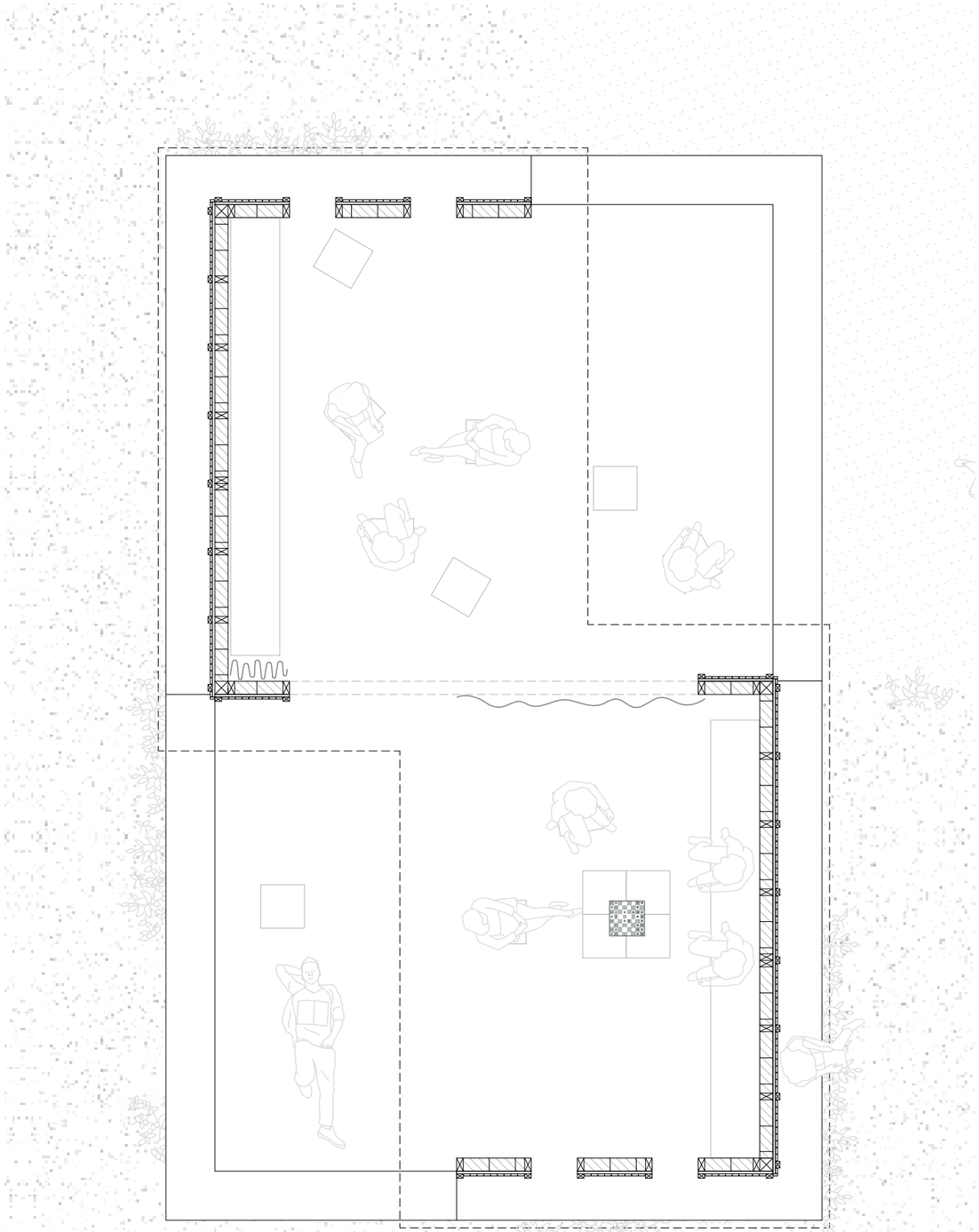
Outdoor Perspective



Site Plan

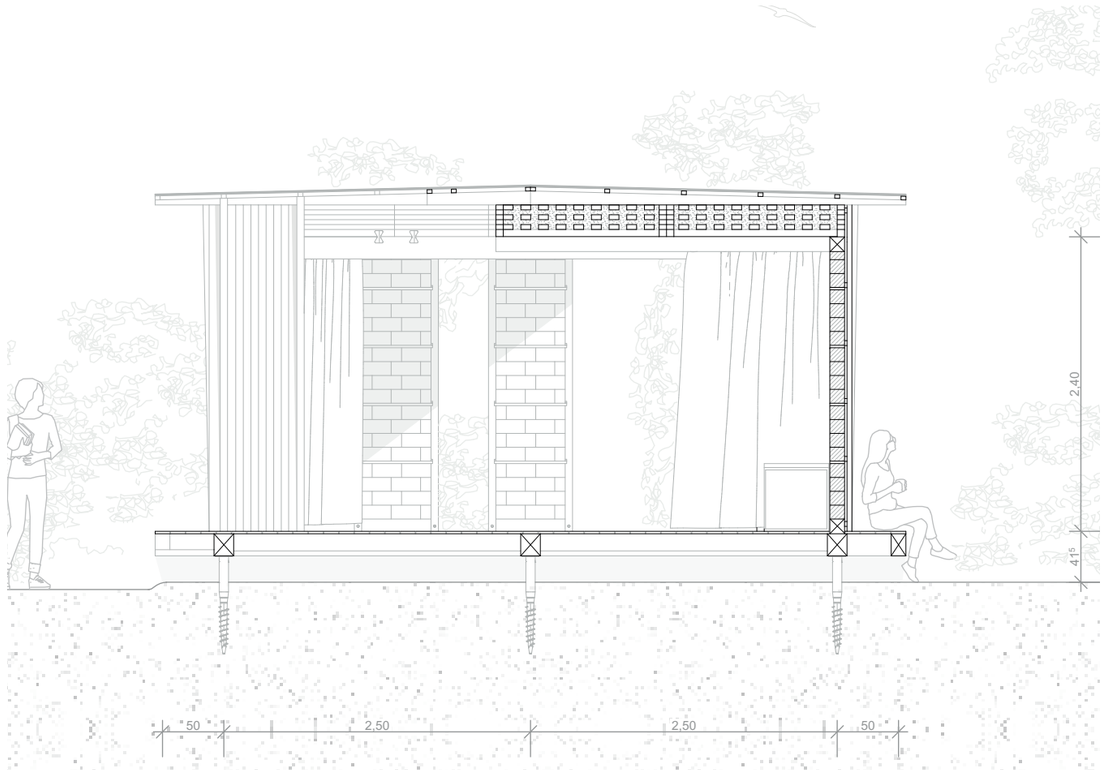


Concept Pictogram



Floorplan

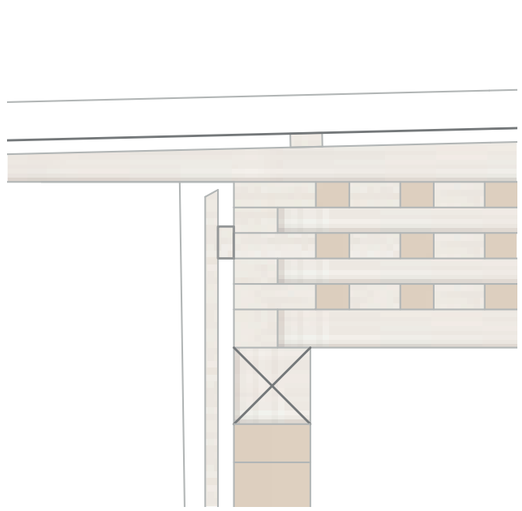
Elevation

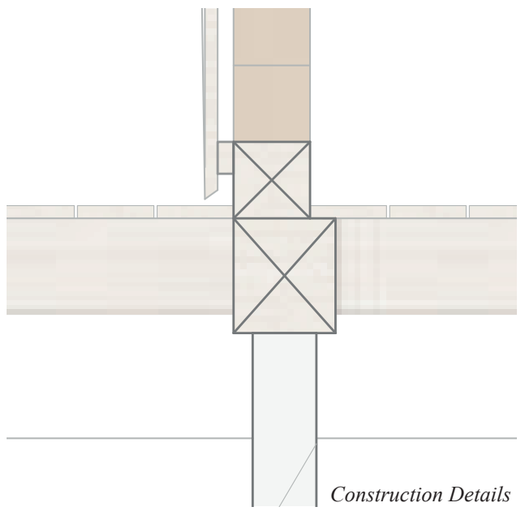


Section

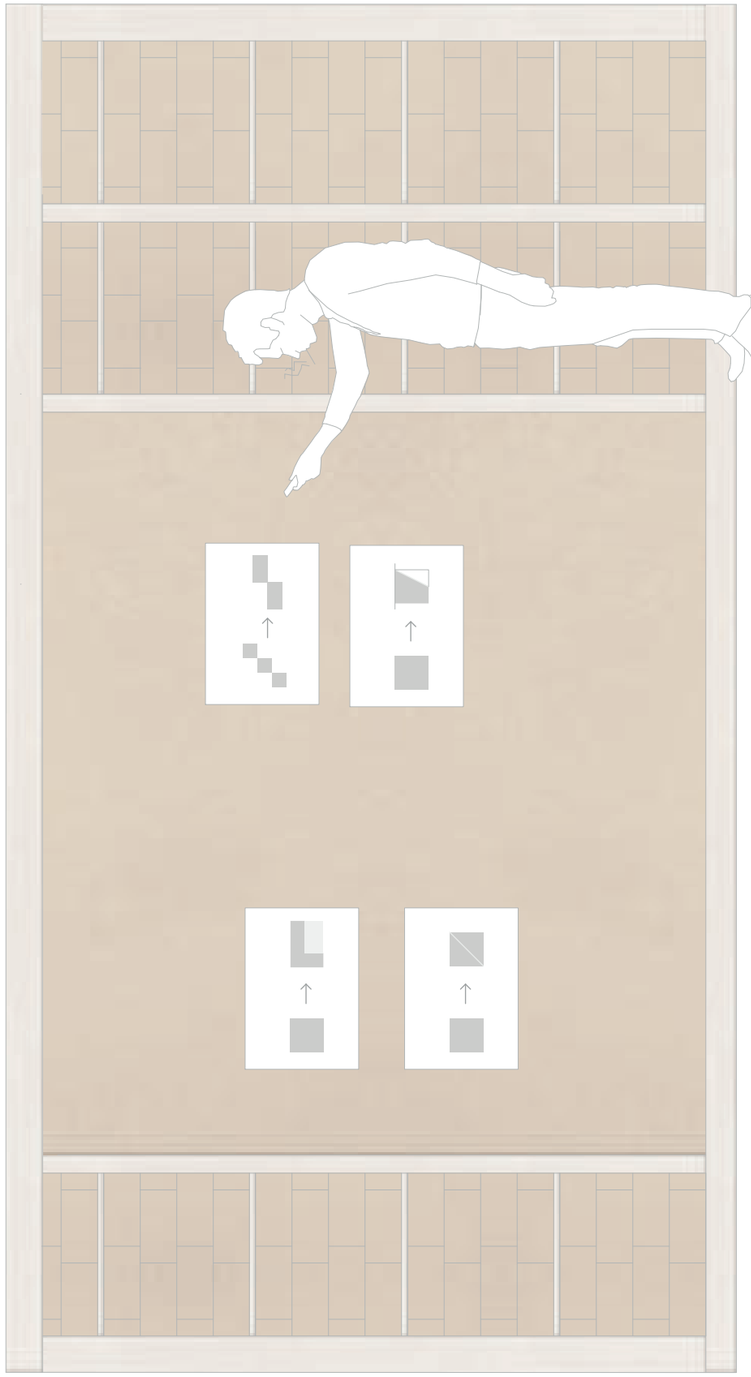
07

Indoor Perspective

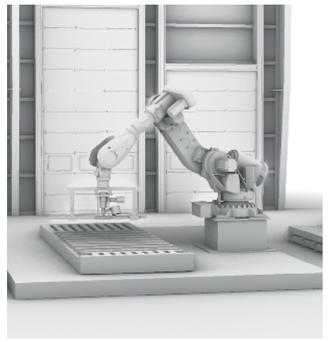


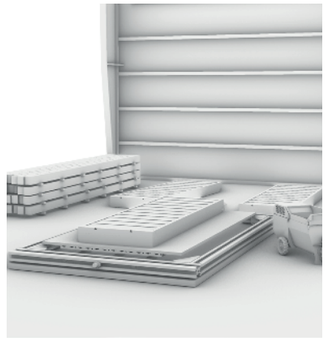


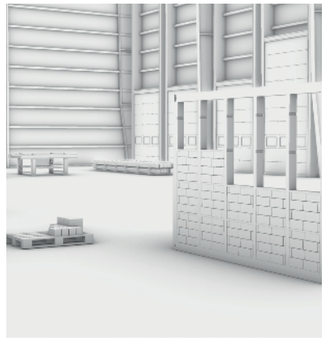
Construction Details

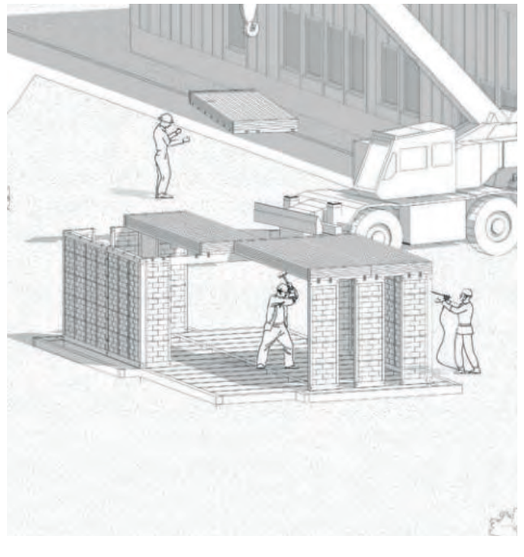


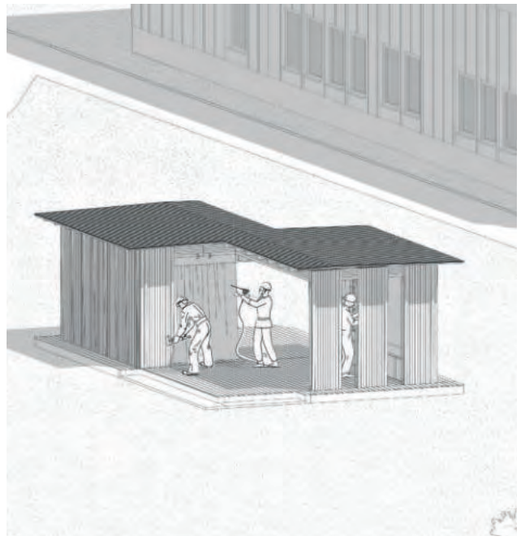
Three View Projection

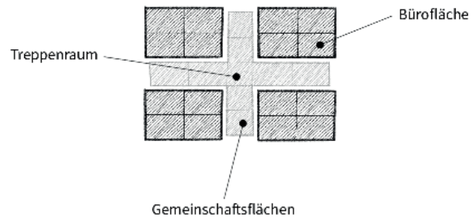


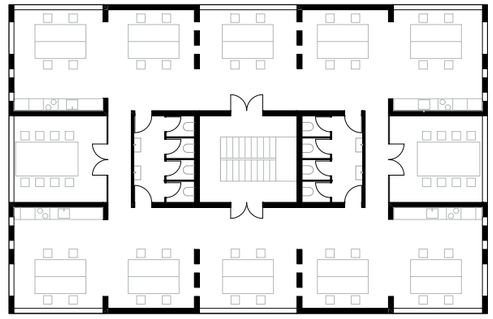


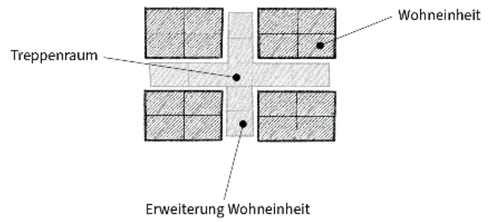


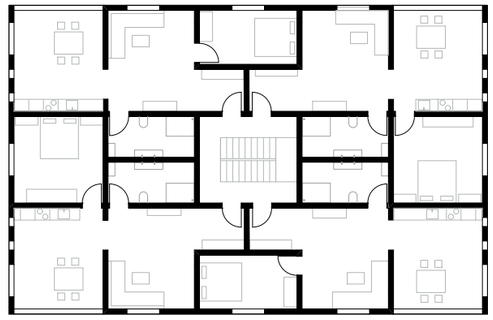


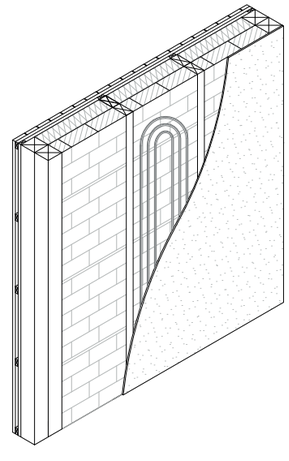


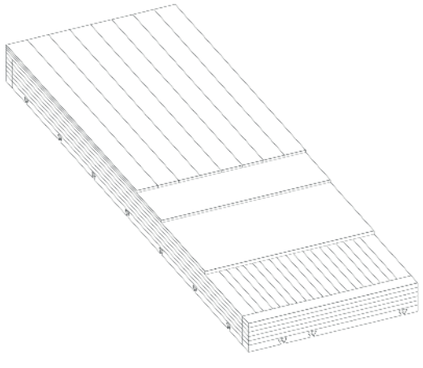

Bürofläche
Treppenraum
Gemeinschaftsflächen




Wohneinheit
Treppenraum
Erweiterung Wohneinheit







Model with Surrounding

Design Model

Detail Model

08 | **Garten_Haus**

Introduction

Chantal Wanda Lenart, Christian Rauch

Garten_Haus aims to provide a calm place for study and rest, set apart from the busy campus and instead intimately connected to the surrounding nature. The thermal capabilities of the TES-element's clay infill are utilized in conjunction with the Trombe-wall effect to provide a comfortable interior space that remains warm well into the late autumn months without any artificial heating, compensating for the lack of accommodation during colder months, as expressed by the students attending the adjacent chemistry faculty. Moreover, the high adaptability inherent in robotic fabrication allows precise tailoring of all wall and slab elements to create a sun-heated winter garden, a skylight, and deliberately set views towards the trees around the small stream to the east.

Outdoor Perspective

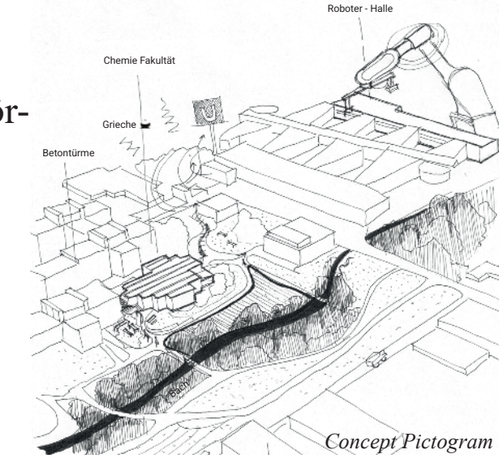
Site Plan

_Wo hältst du dich auf dem Campus am liebsten auf?

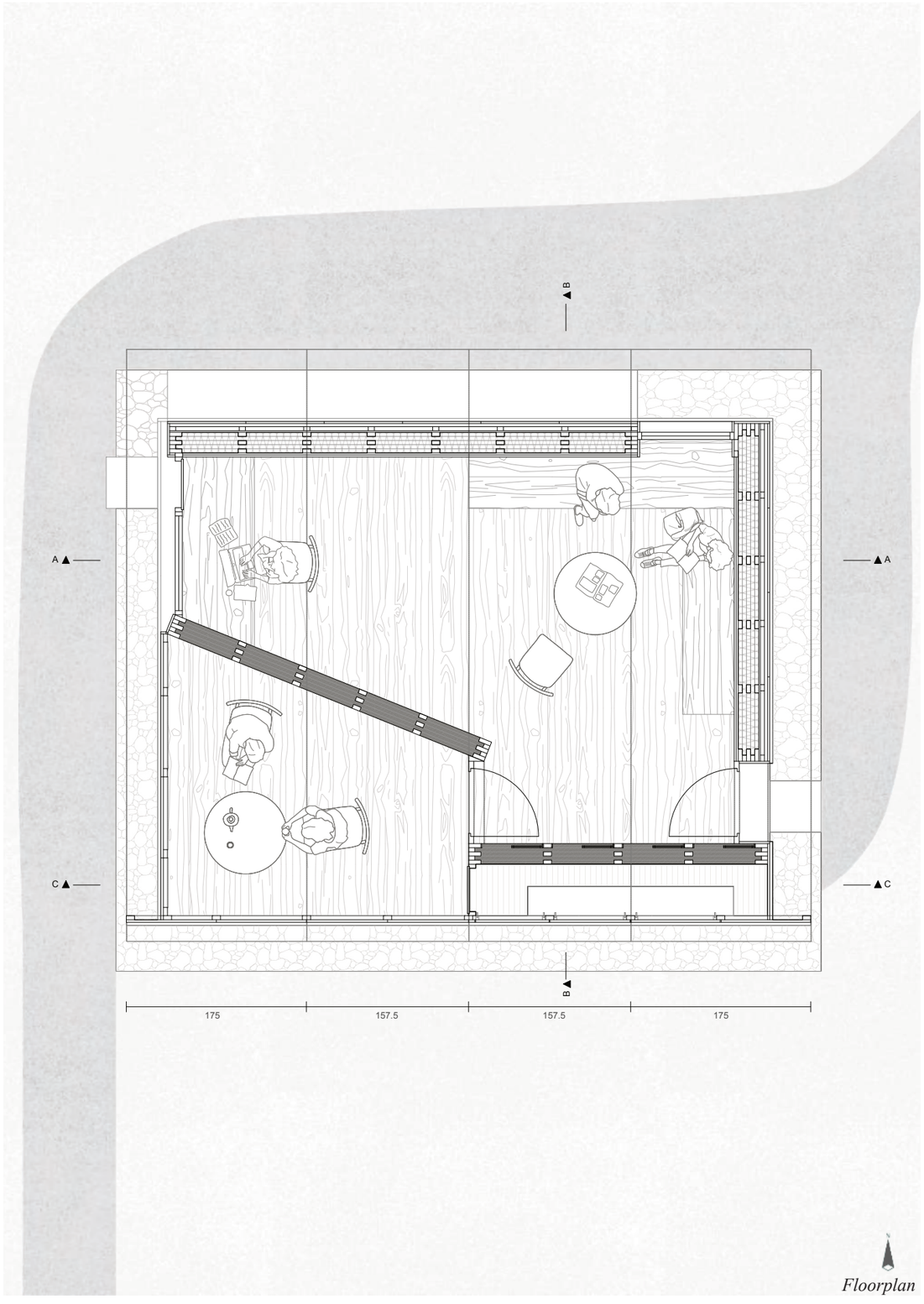
„Draußen, auf jeden Fall nicht im Hörsaal."

_Wo bist du meistens im Winter?

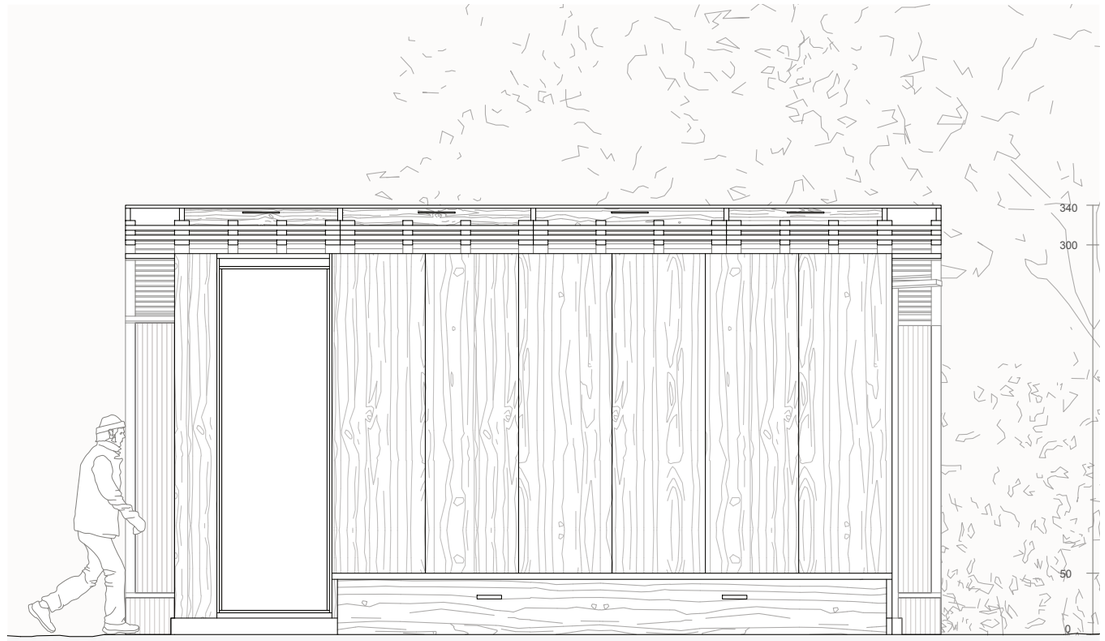
„Leider im Hörsaal."



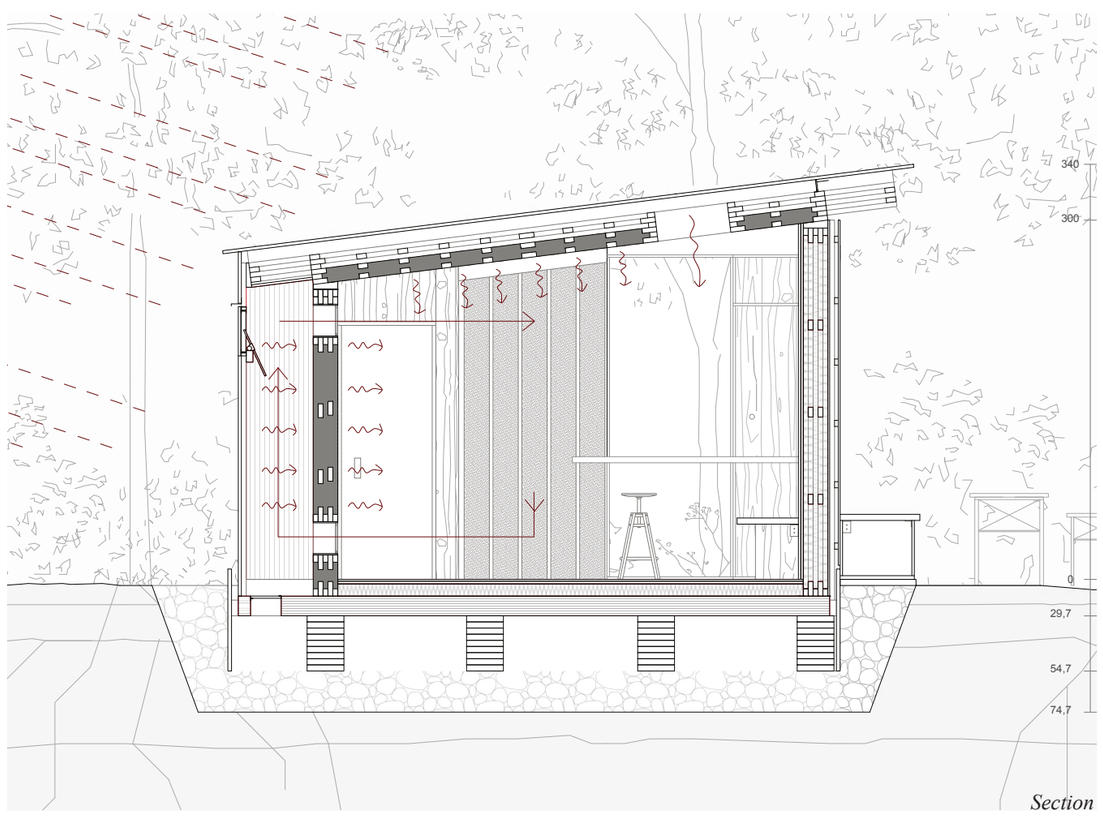
Concept Pictogram



Floorplan

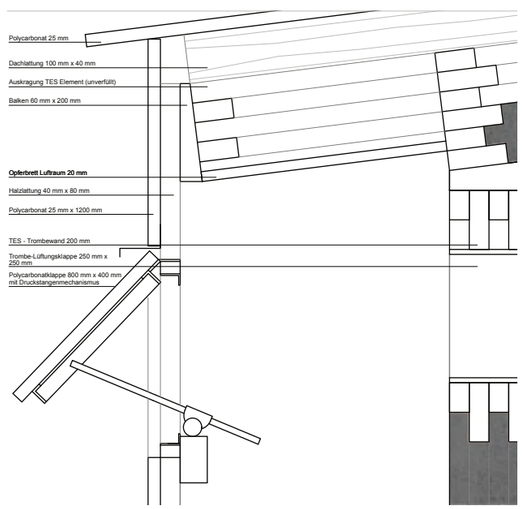


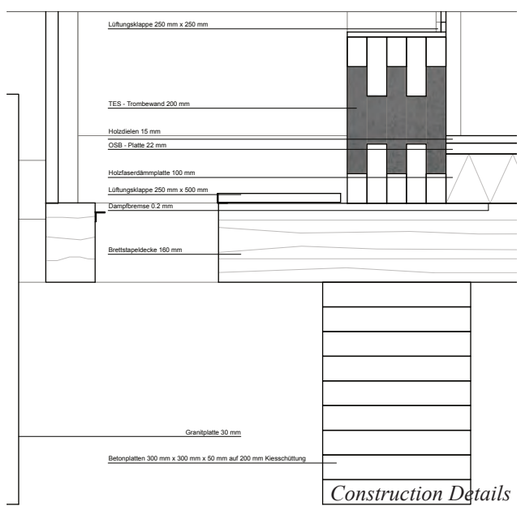
Elevation



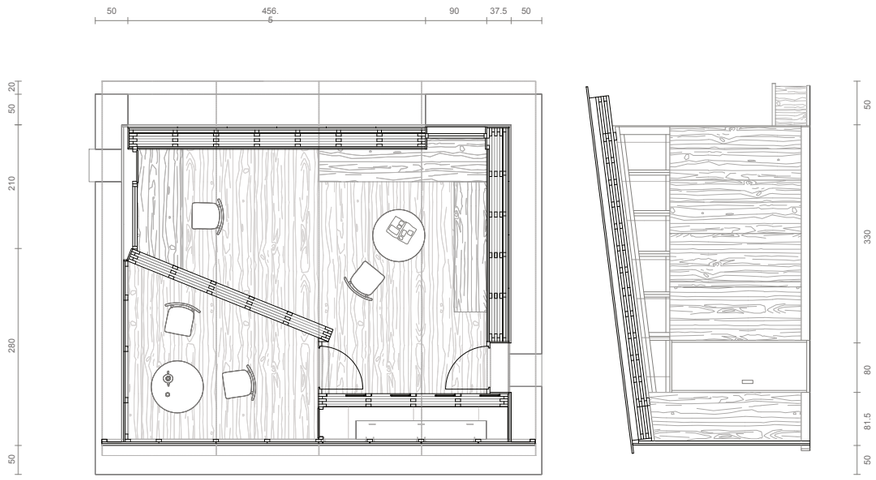
Section

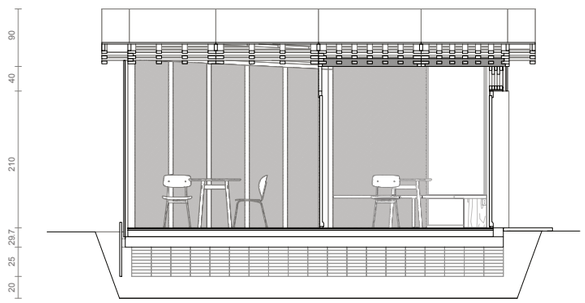
Indoor Perspective



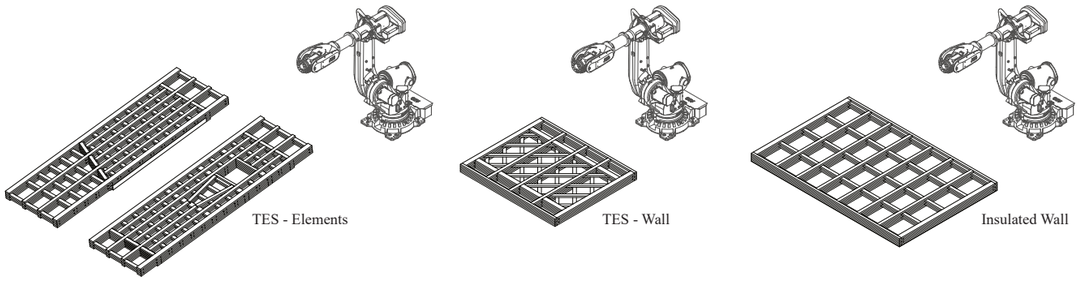


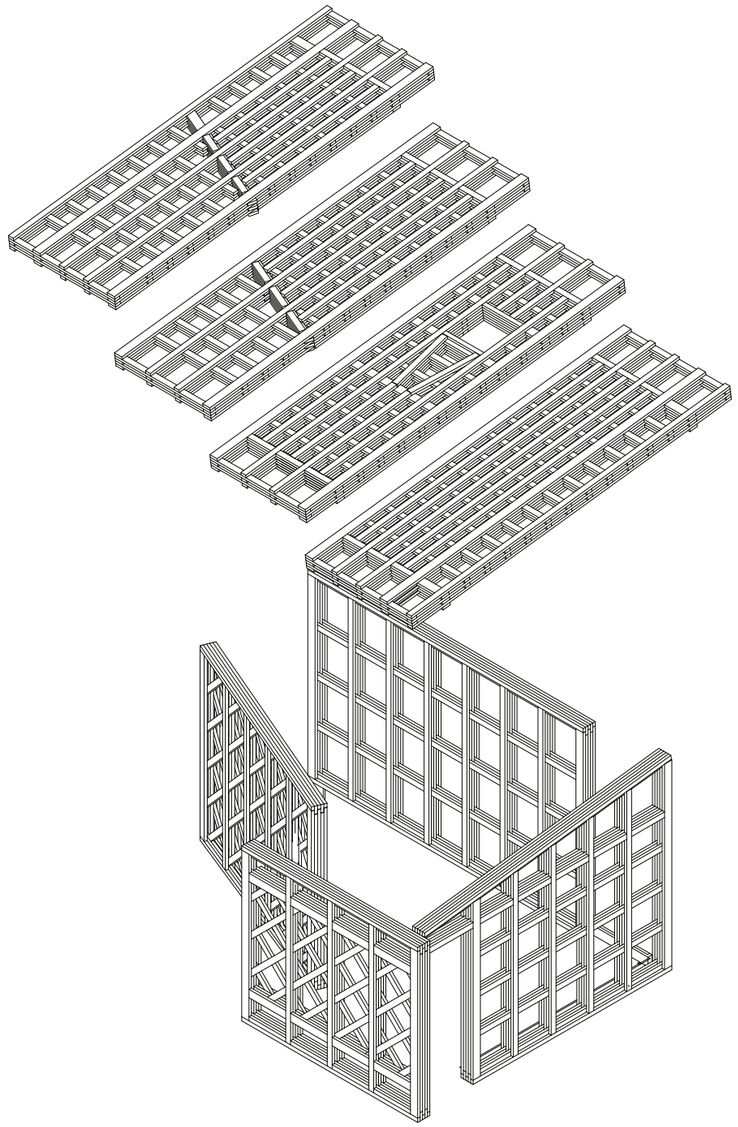
Construction Details

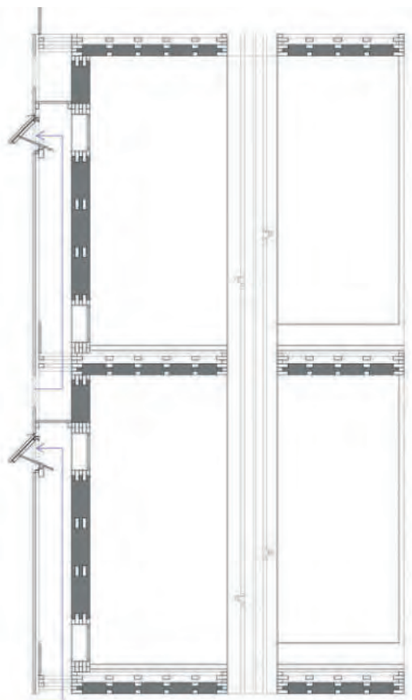


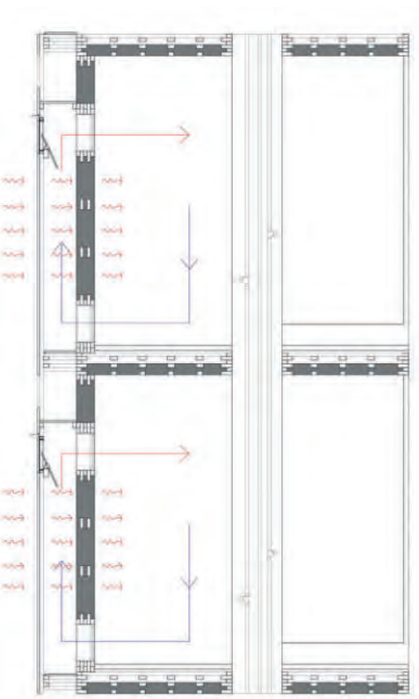


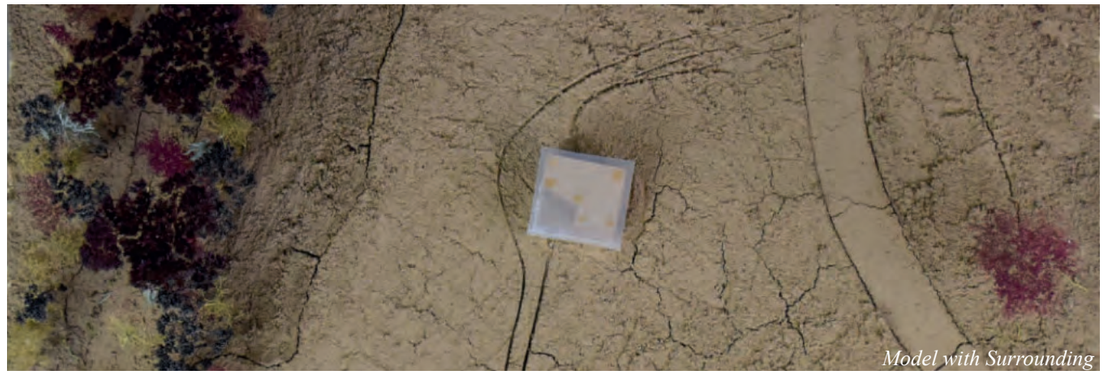
Three View Projection


TES - Elements
TES - Wall
Insulated Wall



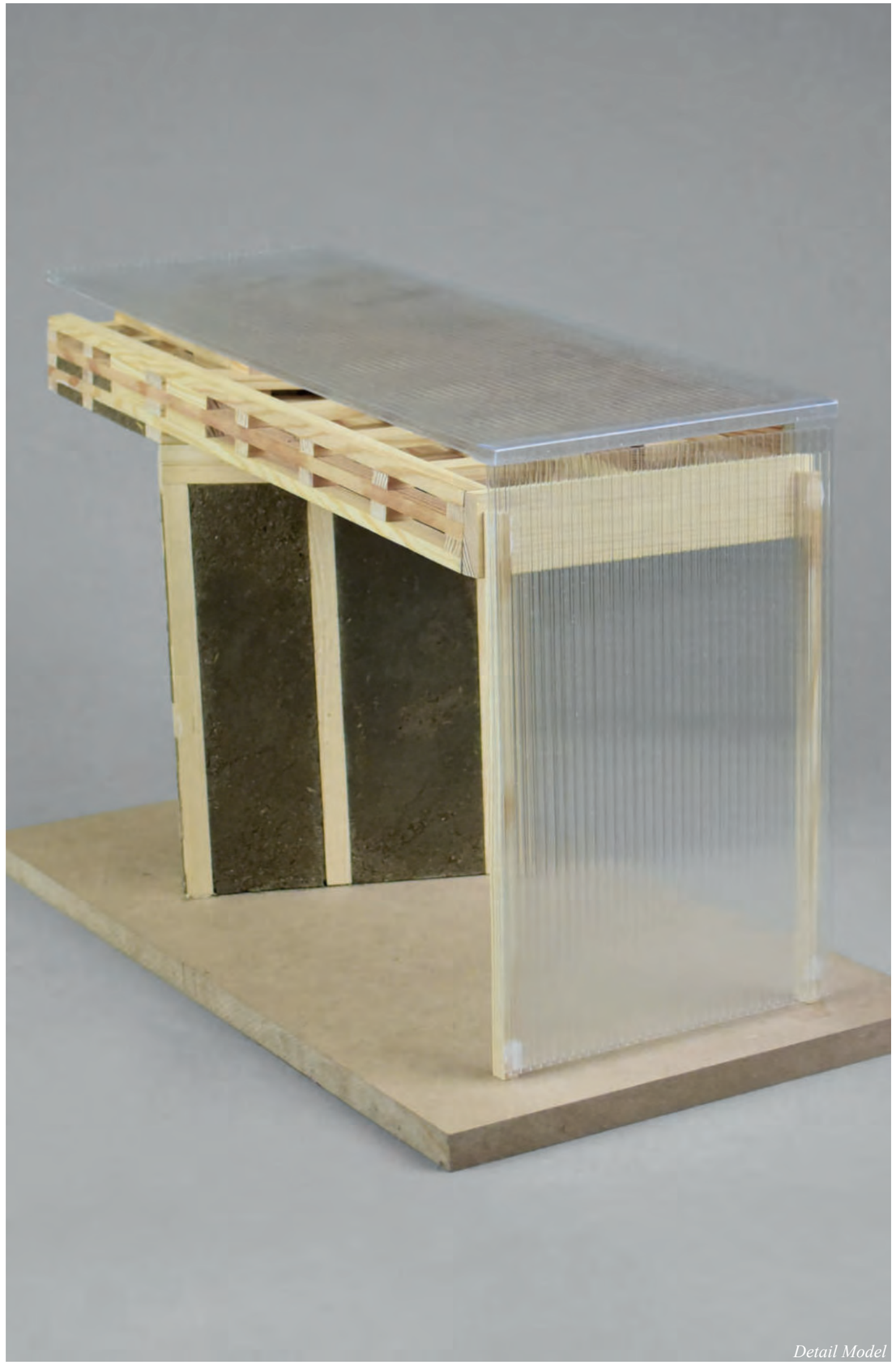






Model with Surrounding

Design Model



Detail Model

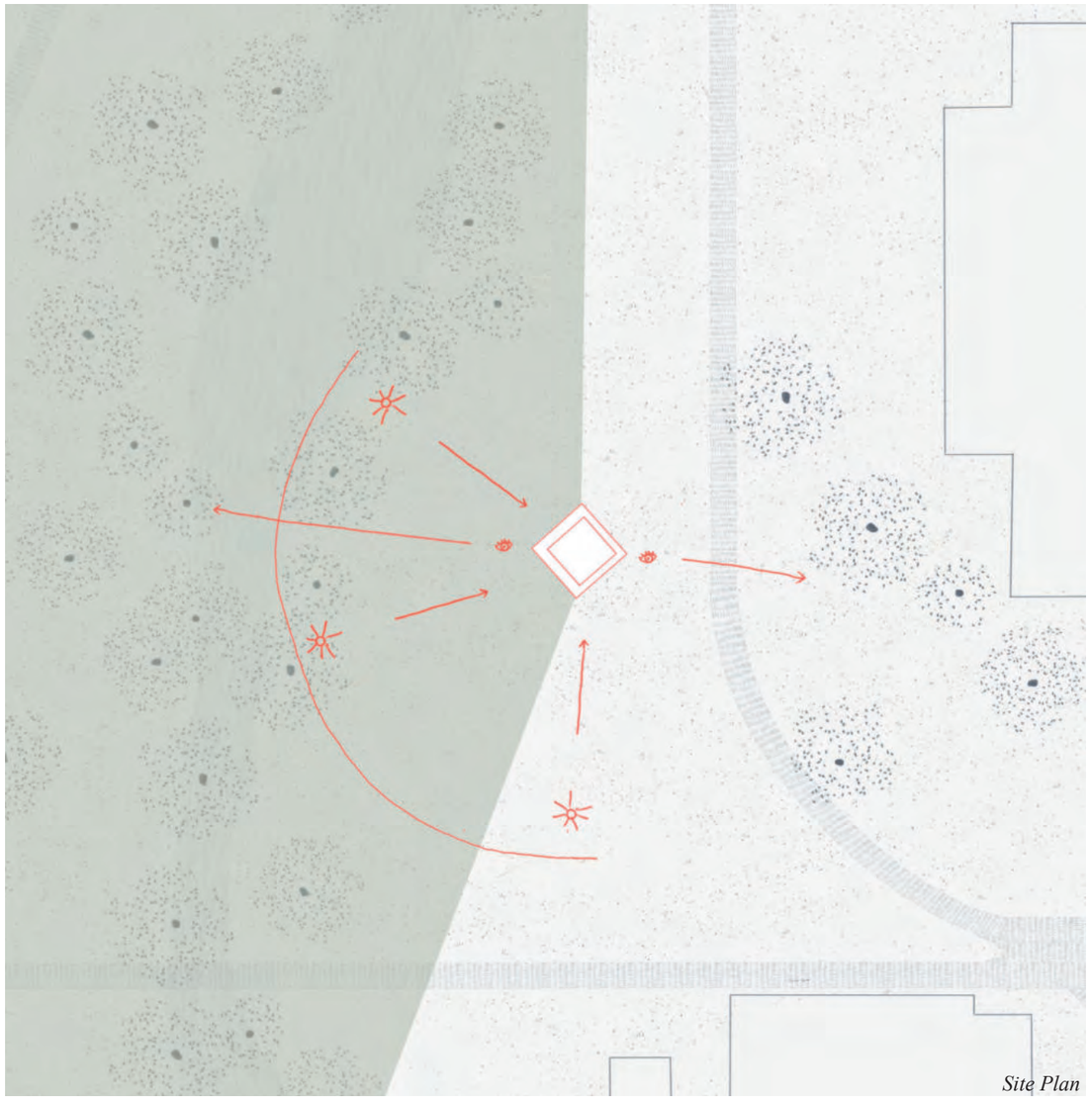
09 | RUHEPUNKT
Point of Calm

Lorenz Berger, Lukas Binder, Konstanze Habenicht

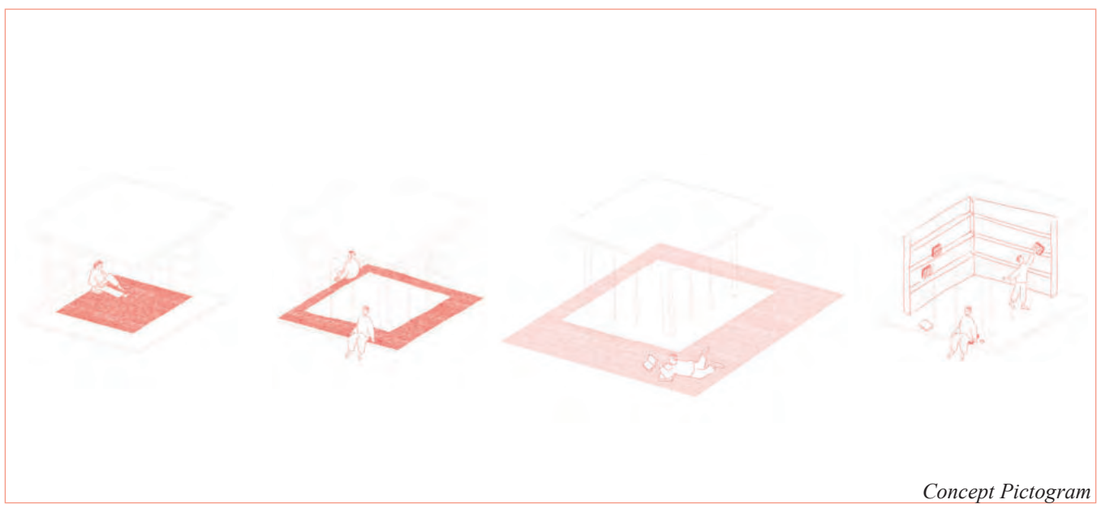
Introduction

The Ruhepunkt Pavilion responds to the predominantly functional, performance-oriented character of Campus Garching, which offers few spaces for rest and lingering in everyday academic life. Long walking distances, limited spatial quality, and few opportunities for social interaction often make the campus feel stressful. Located in the green northwestern part of the campus, Ruhepunkt mediates between landscape and buildings by dissolving the boundary between them. The pavilion is based on a square floor plan and incorporates an engawa—a threshold space from Japanese architecture that creates a covered transition between interior and exterior, offering a place for pause and calm. Conceived as a pure wood–clay structure, panels attached to the columns structure the façade, creating varying degrees of openness, while wooden shutters provide flexible sun protection. Inside, floor cushions invite visitors to sit. Ruhepunkt is open and unprogrammed—a welcoming place for rest and simply being present in a calm atmosphere.

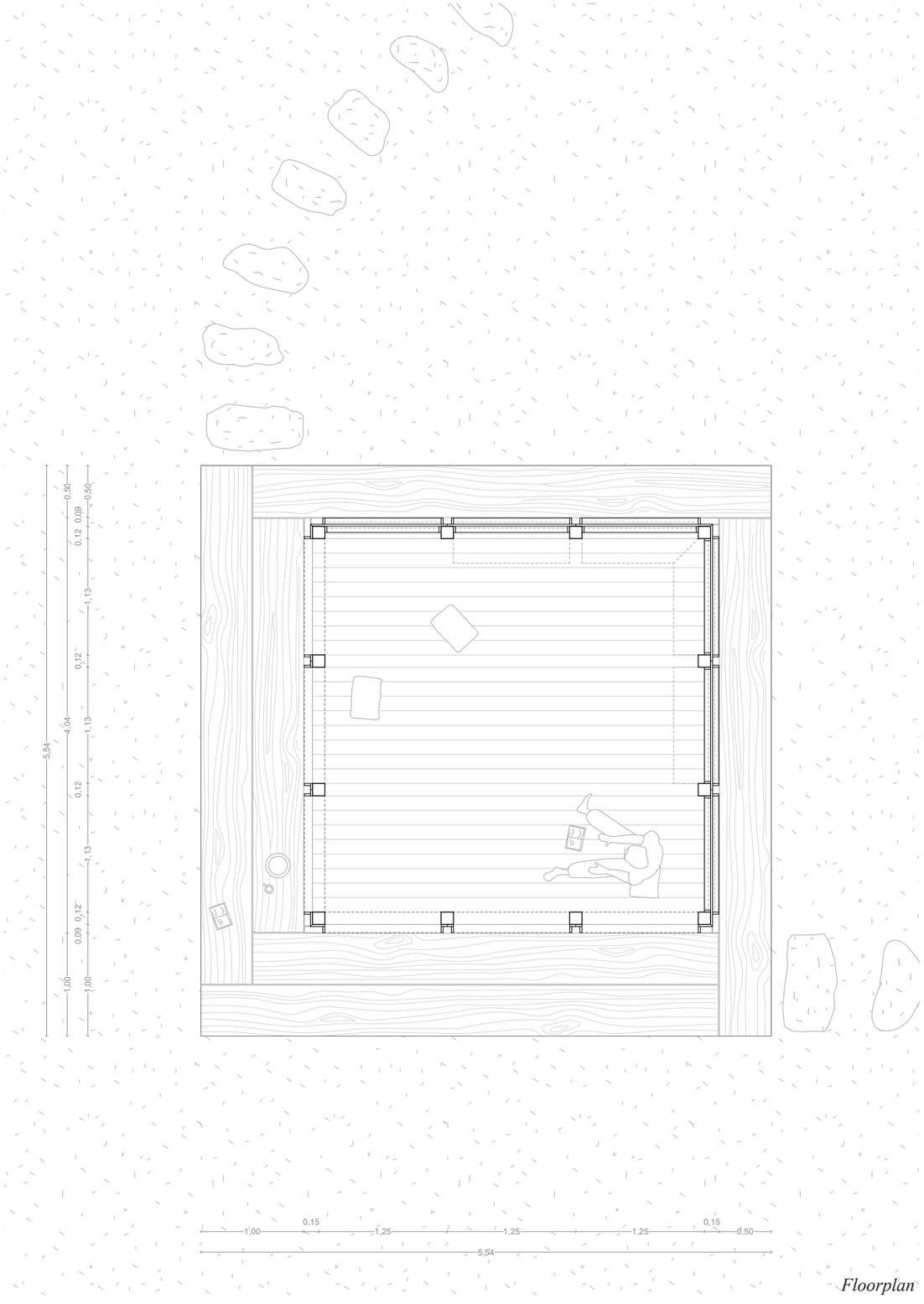
Outdoor Perspective



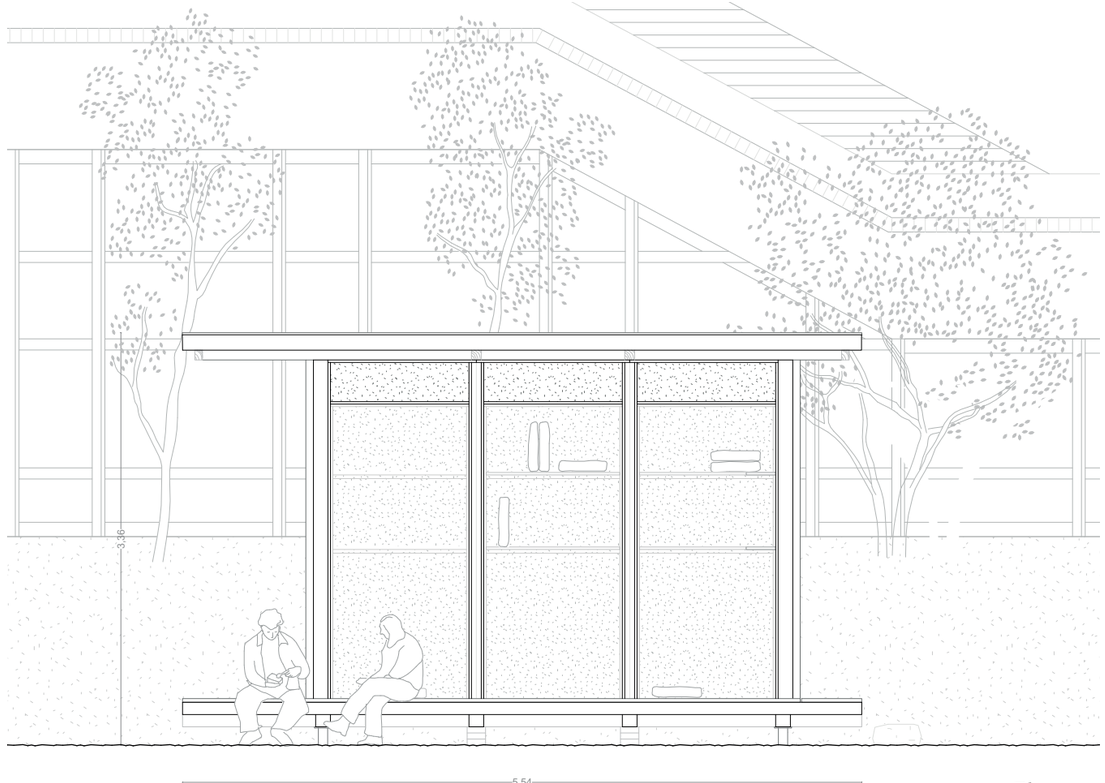
Site Plan



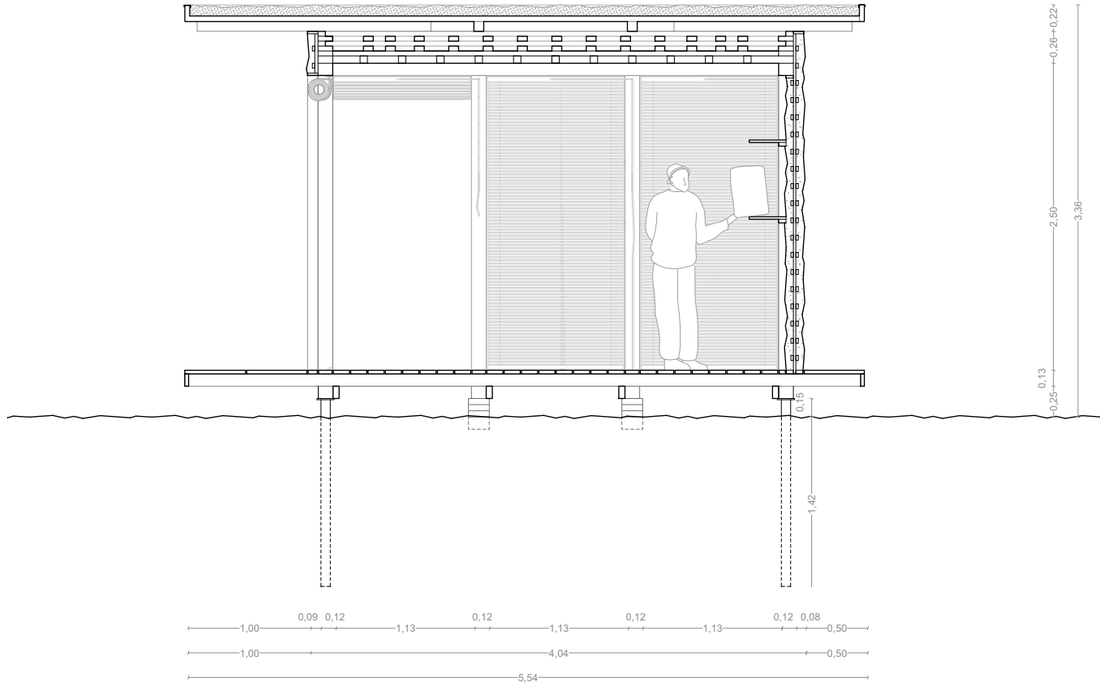
Concept Pictogram



Floorplan



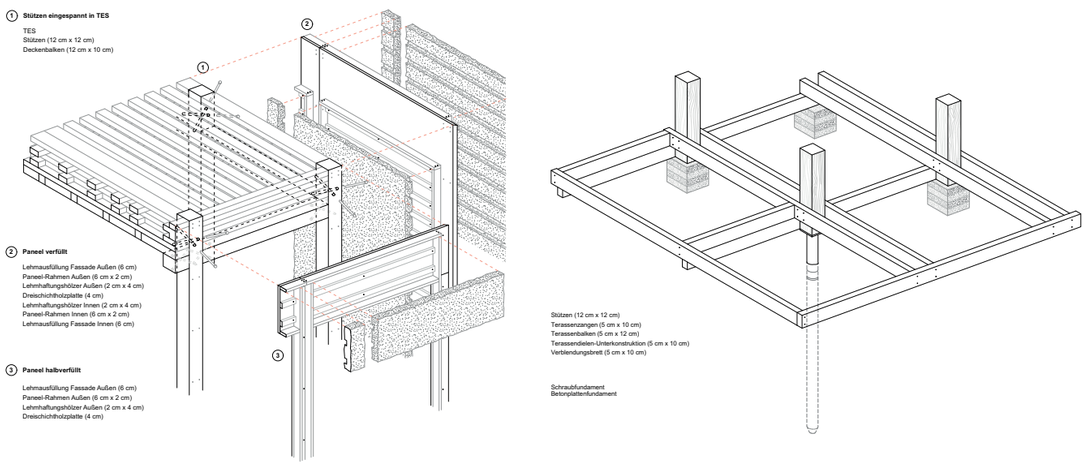
Elevation



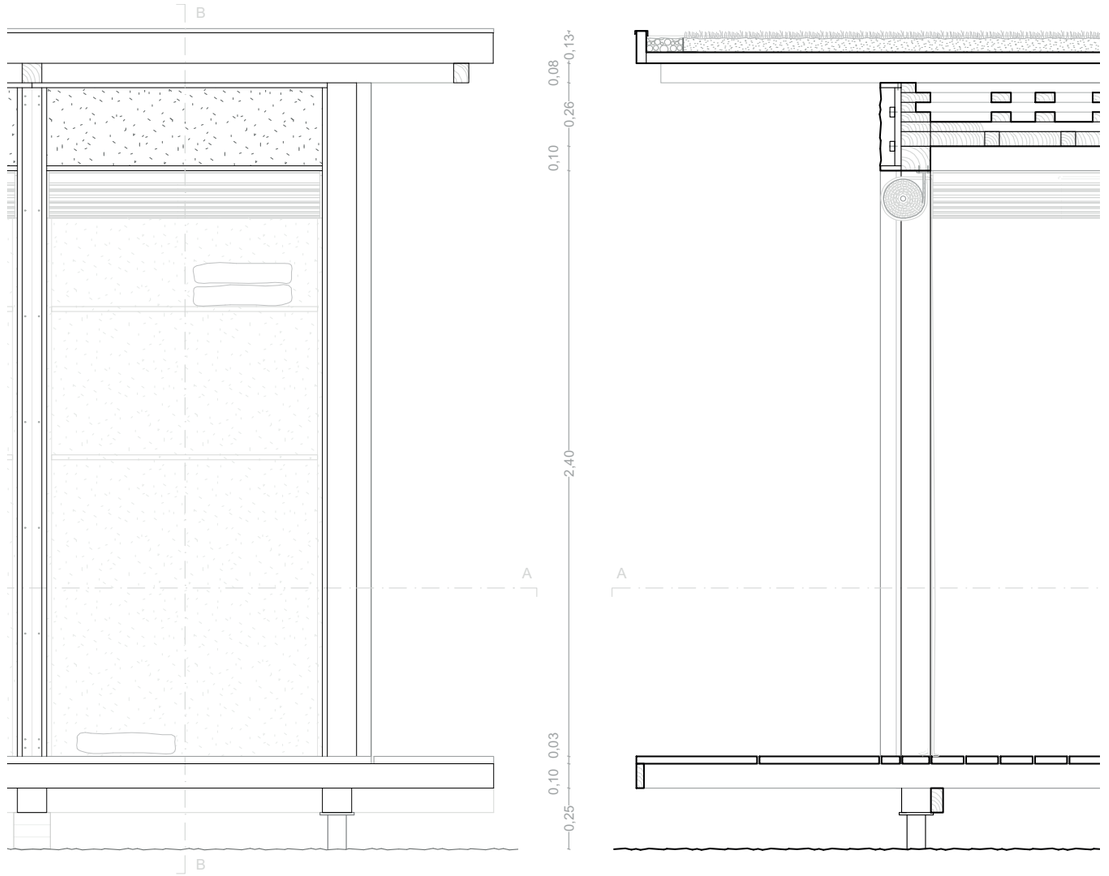
Section

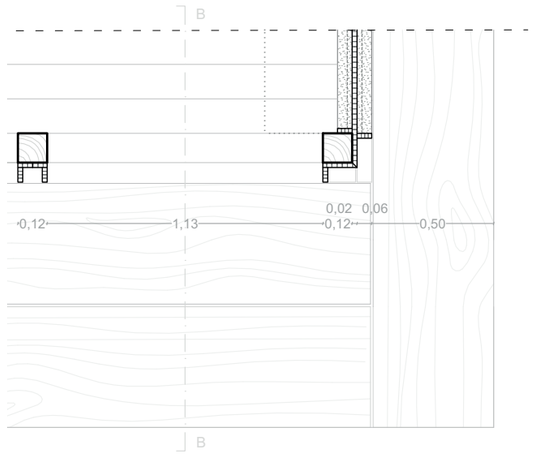
09

Indoor Perspective



Construction details





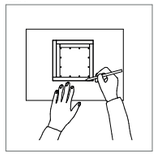
Three View Projection

15. OKTOBER
1. NOVEMBER
1. DECEMBER
1. JANUARY
13.
19.
1. FEBRUARY
5.
15.
20.
1. MARCH
16.
20.

DESIGN

TECHNICAL DESIGN

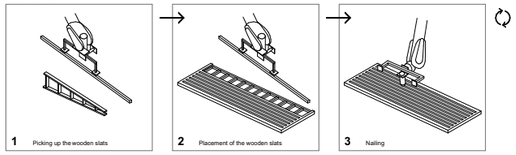
Team 1



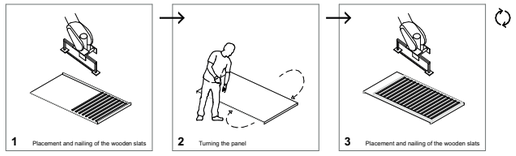
WOOD ORDERING AND TRANSPORT

MANUFACTURE OF TES (WOOD ELEMENTS)

Robot + Team 2



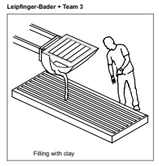
MANUFACTURE OF FACADE PANELS



FACADE PANEL INFILLING

INFILLING TES

Leipfinger-Bader + Team 3



II

Drying of the clay filling

MANUFACTURE OF SUN SHADING

Joint workshop

x 6

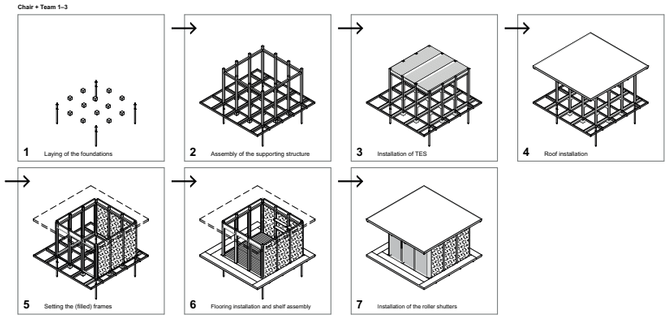
MANUFACTURE OF CUSHIONS

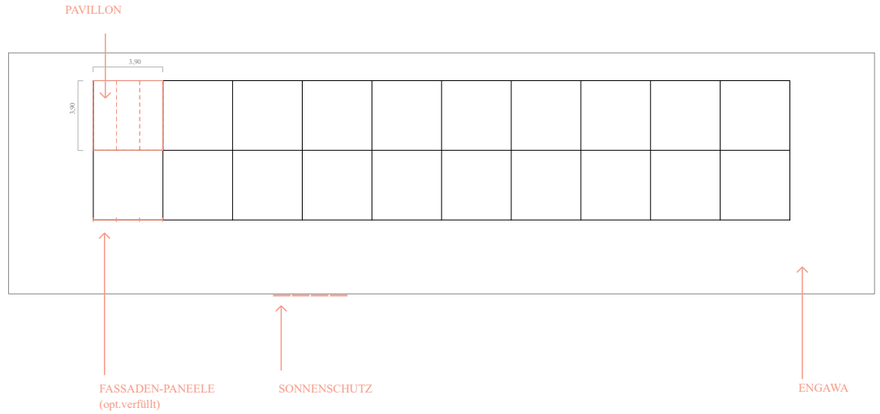
Joint workshop

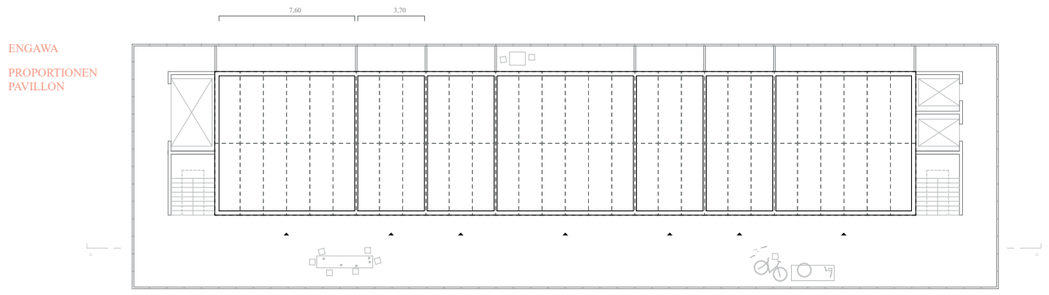
x 30

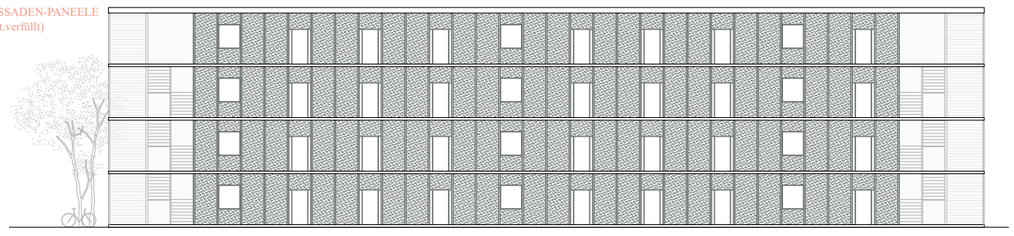
ASSEMBLY

Chair + Team 1–3









Model with Surrounding

Design Model

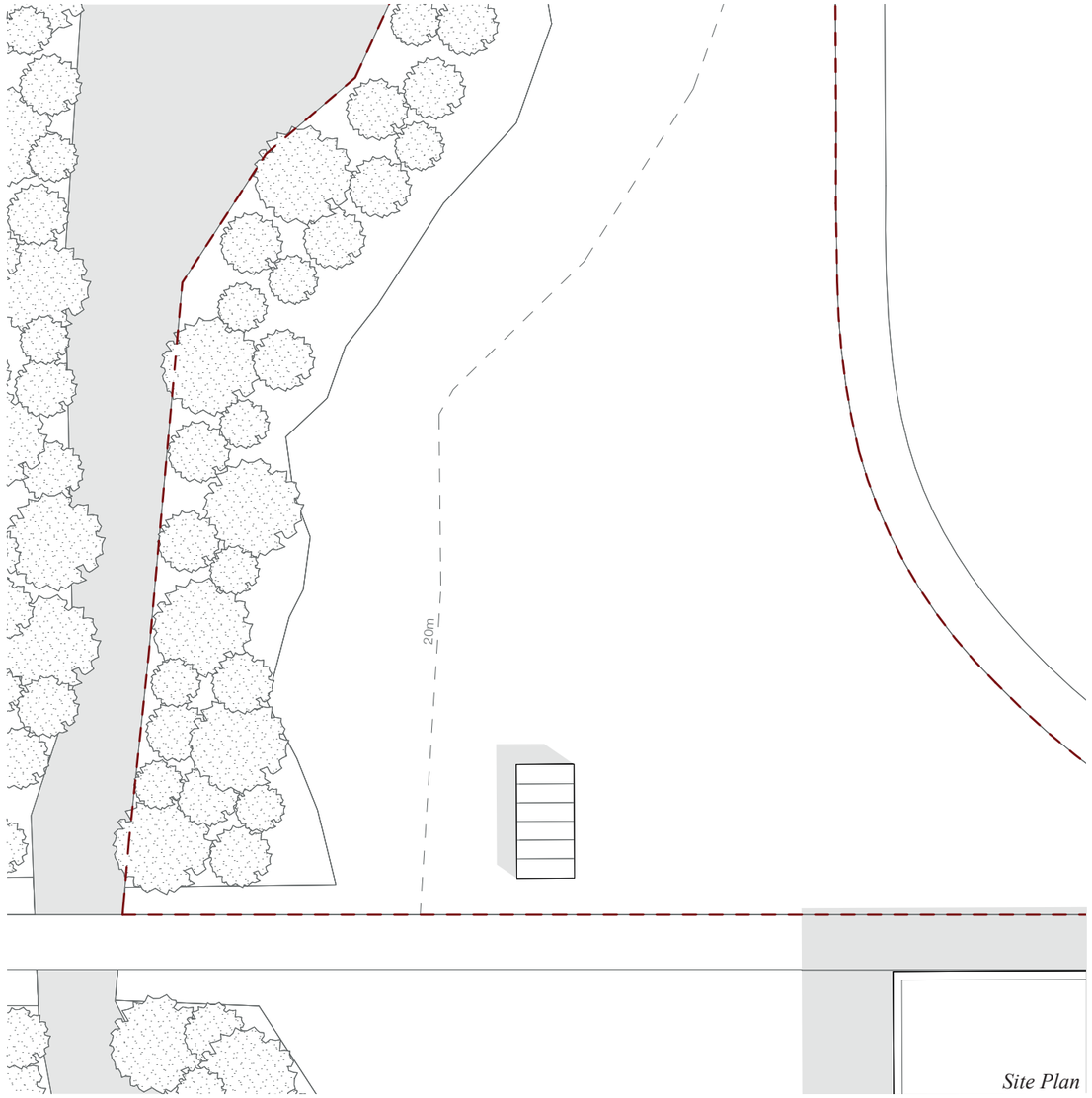
Detail Model

10 | **Meet Me Halfway**

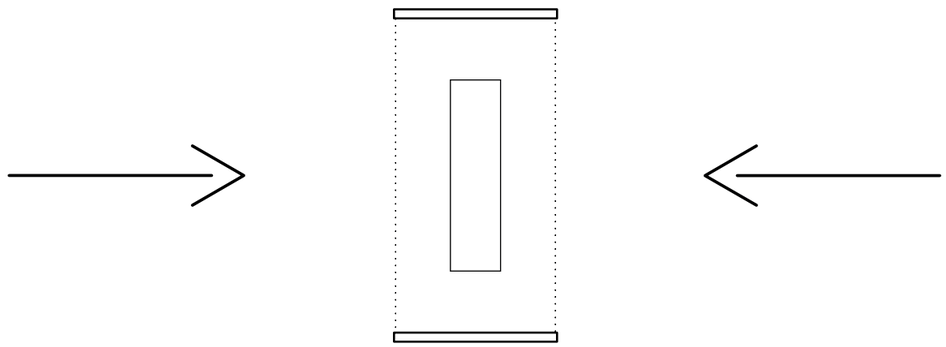
Lukas Kunze, Mika Schmale, Christoph Untch

The campus in Garching is currently divided into two areas by both the Wiesäckerbach and its different uses. On one side, there is study and research, while on the other, business and industry are represented by companies such as SAP and Siemens.
The concept of the pavilion is to bring both sides together and create a shared, informal meeting place in the middle. To this end, the pavilion opens up completely to both sides of the campus. Inside, there is a table with benches.
The supporting structure was derived from the Timber Earth Slab ceiling module and was also to consist of thin wooden cross-sections. This structural system serves not only as an expression of material efficiency but also as a prototype for future applications. The columns and ceiling elements are envisioned as a sustainable alternative for multi-story skeleton construction.

Outdoor Perspective

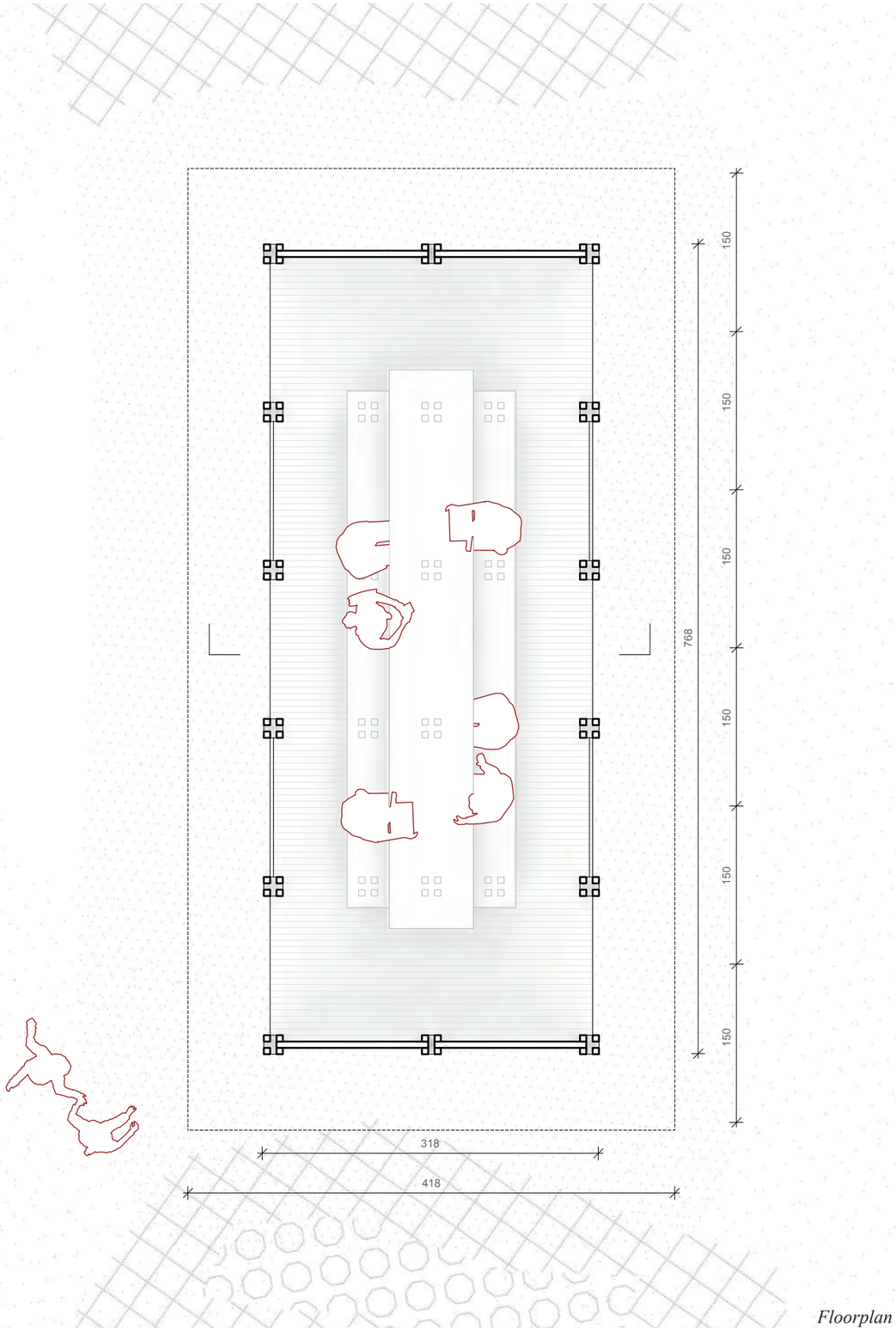


Site Plan

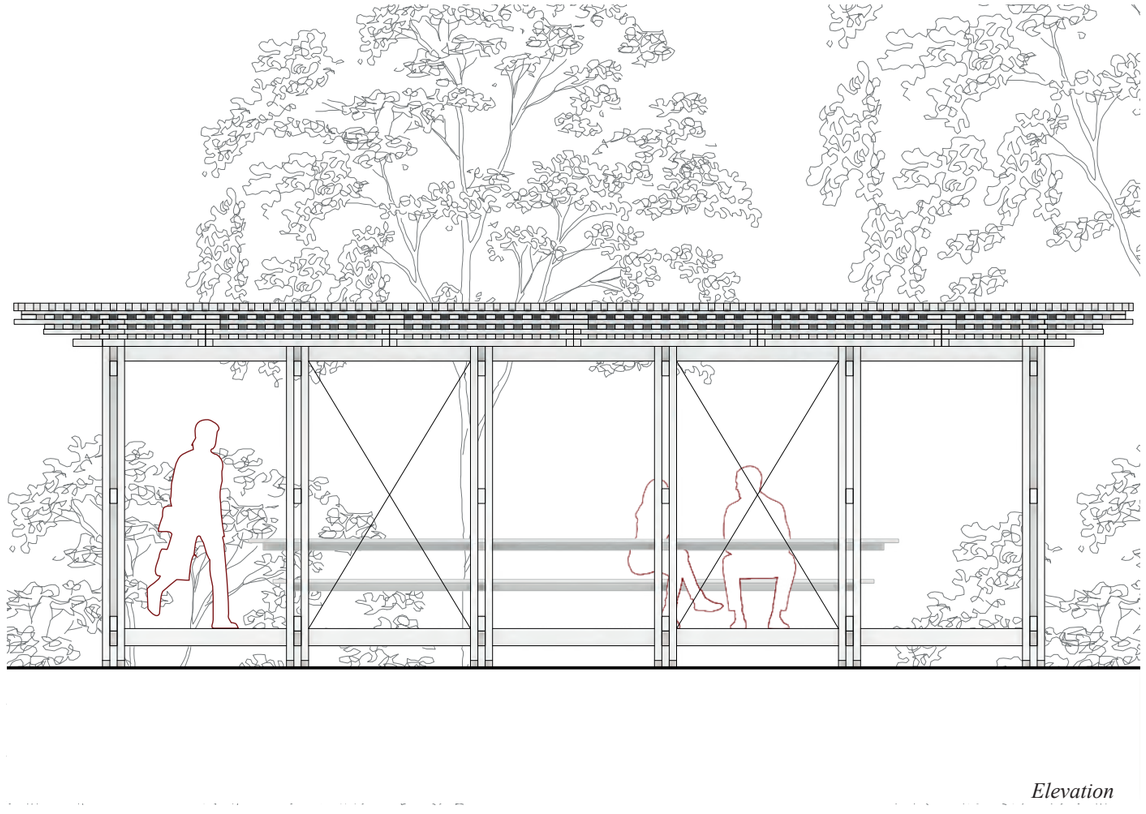


Concept Pictogram

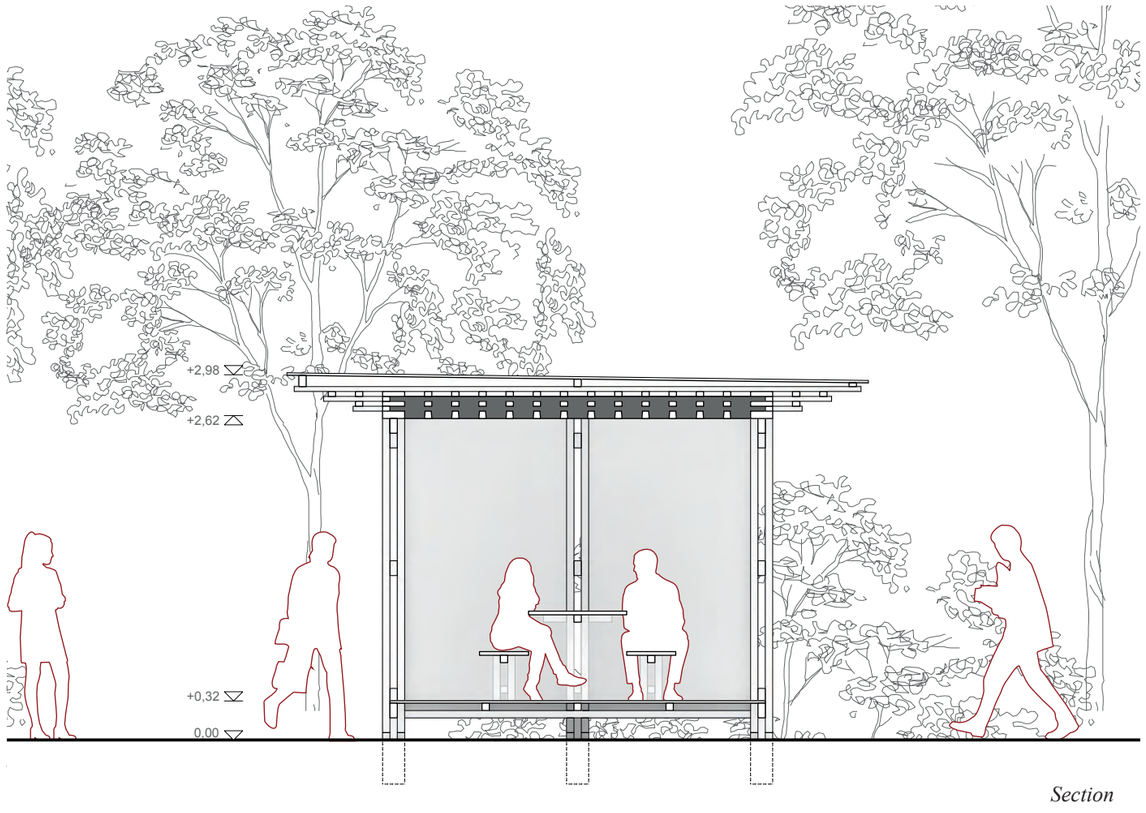
Design Concept



Floorplan

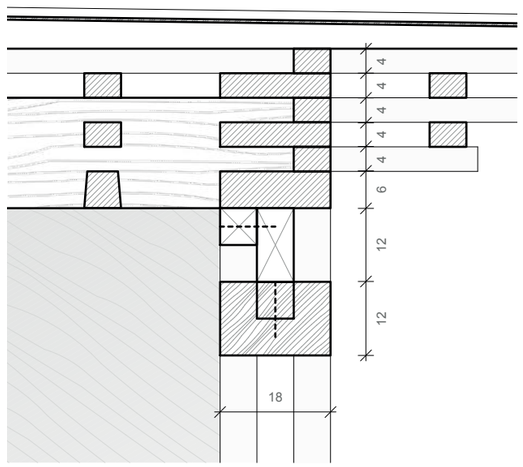


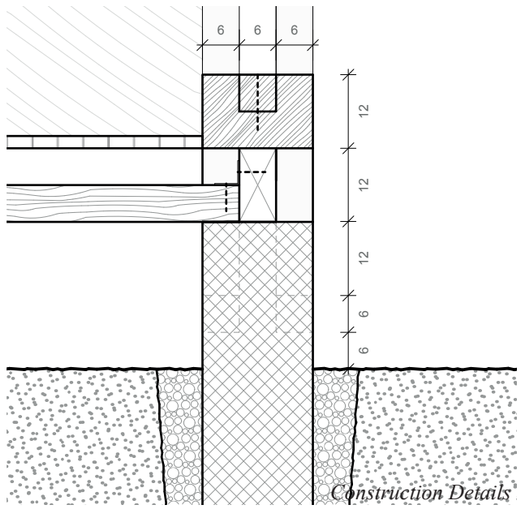
Elevation



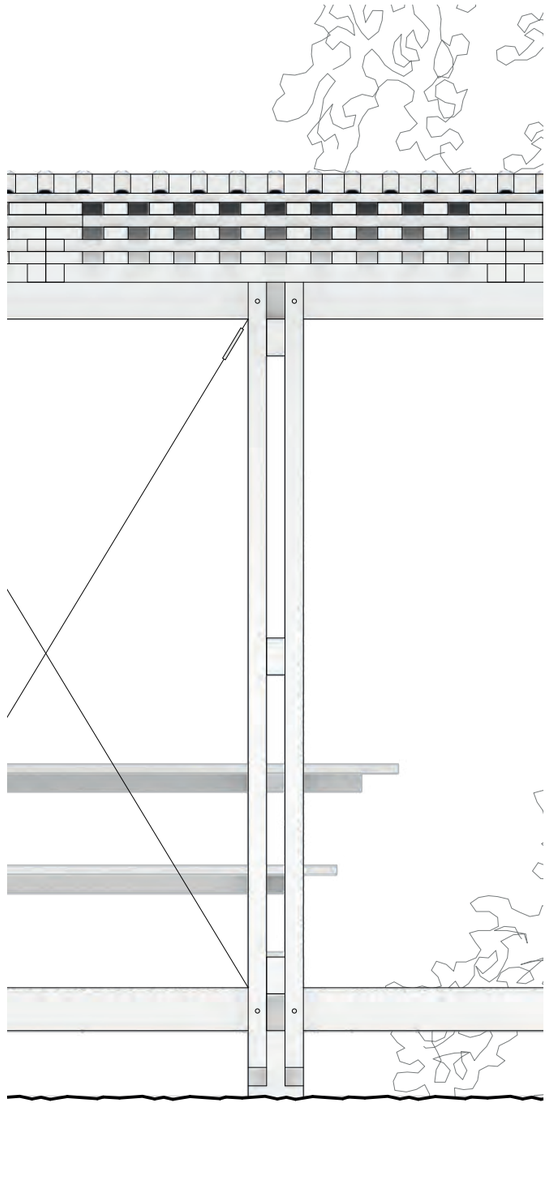
Section

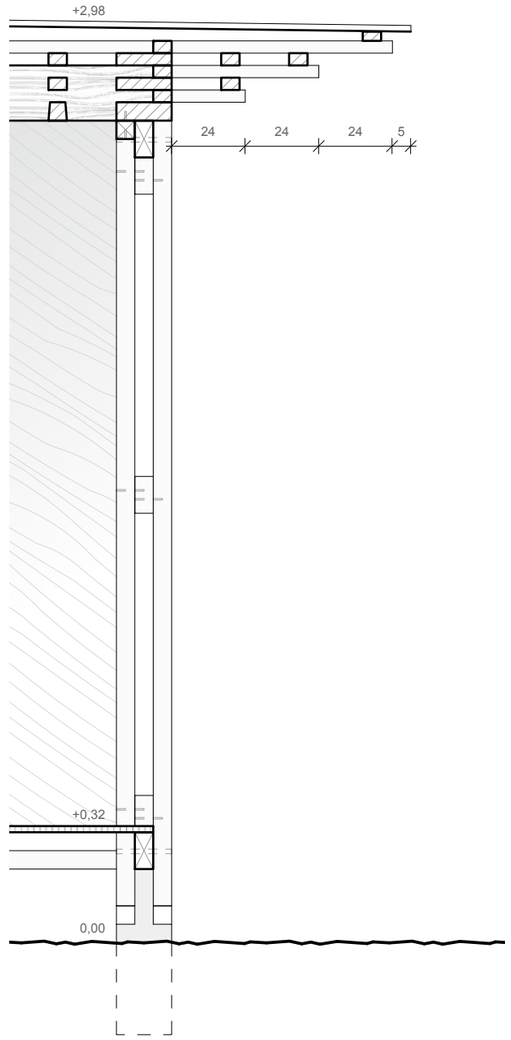
Indoor Perspective



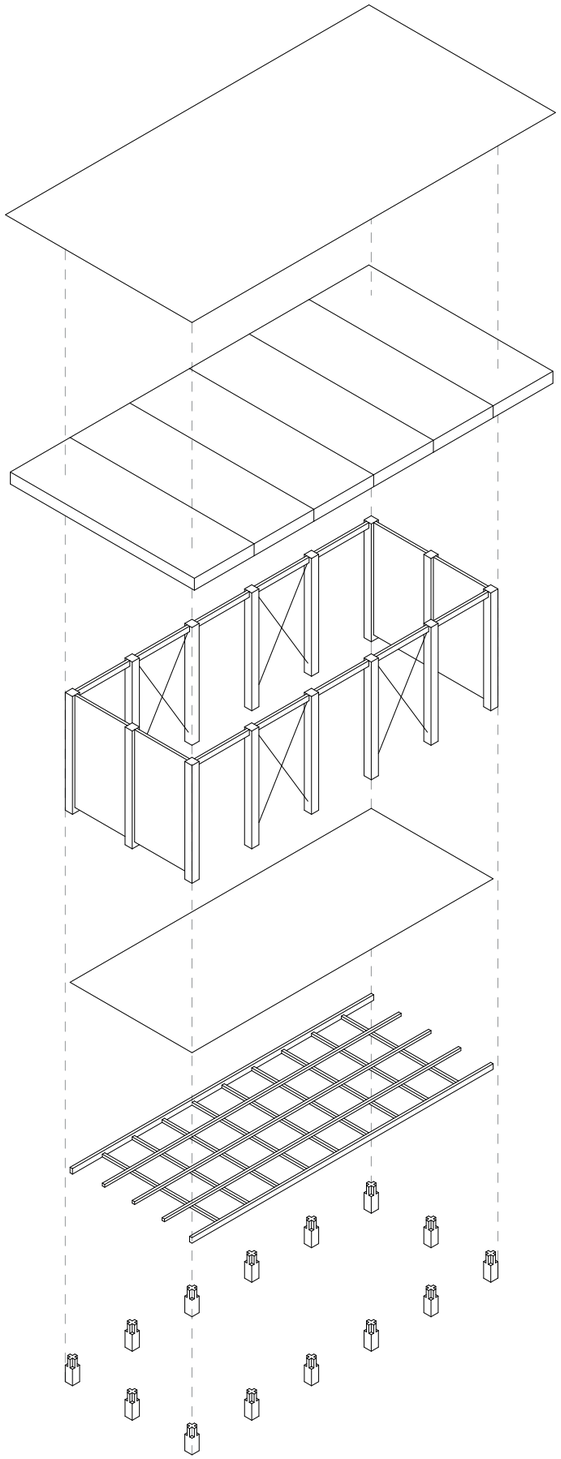


Construction Details

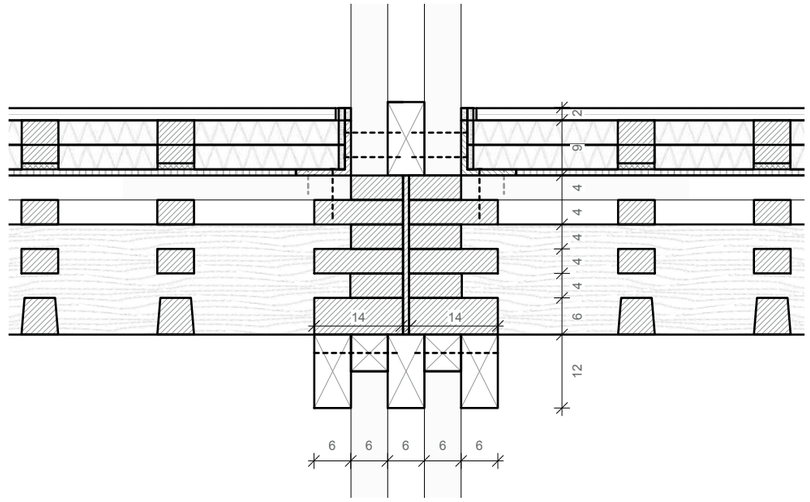




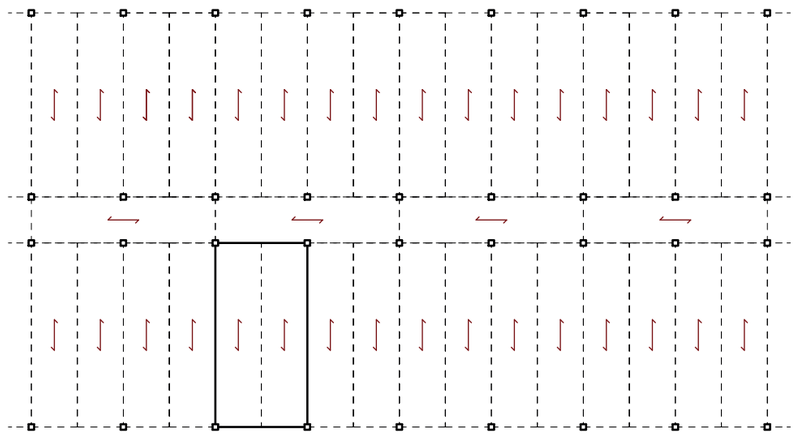
Three View Projection



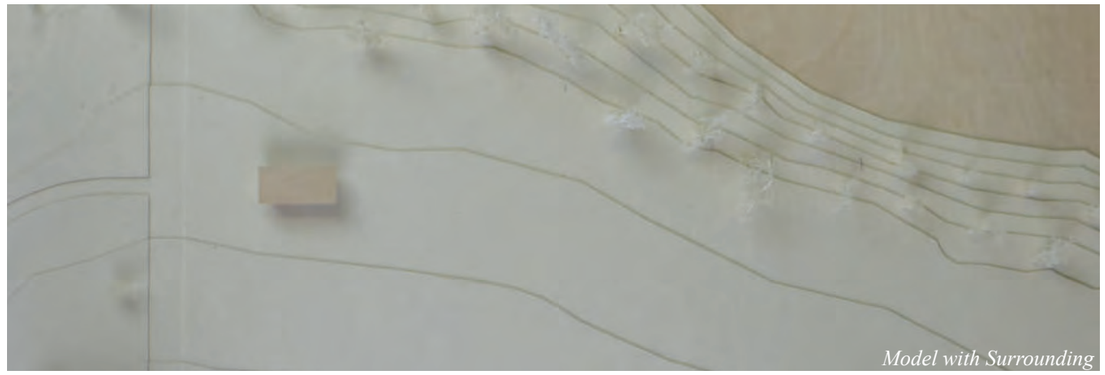
Construction Elements



Construction Detail



Sceleton Structure



Model with Surrounding

Design Model

Detail Model

Final Presentation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