

MIT
LEH



Blumer
Lehmann

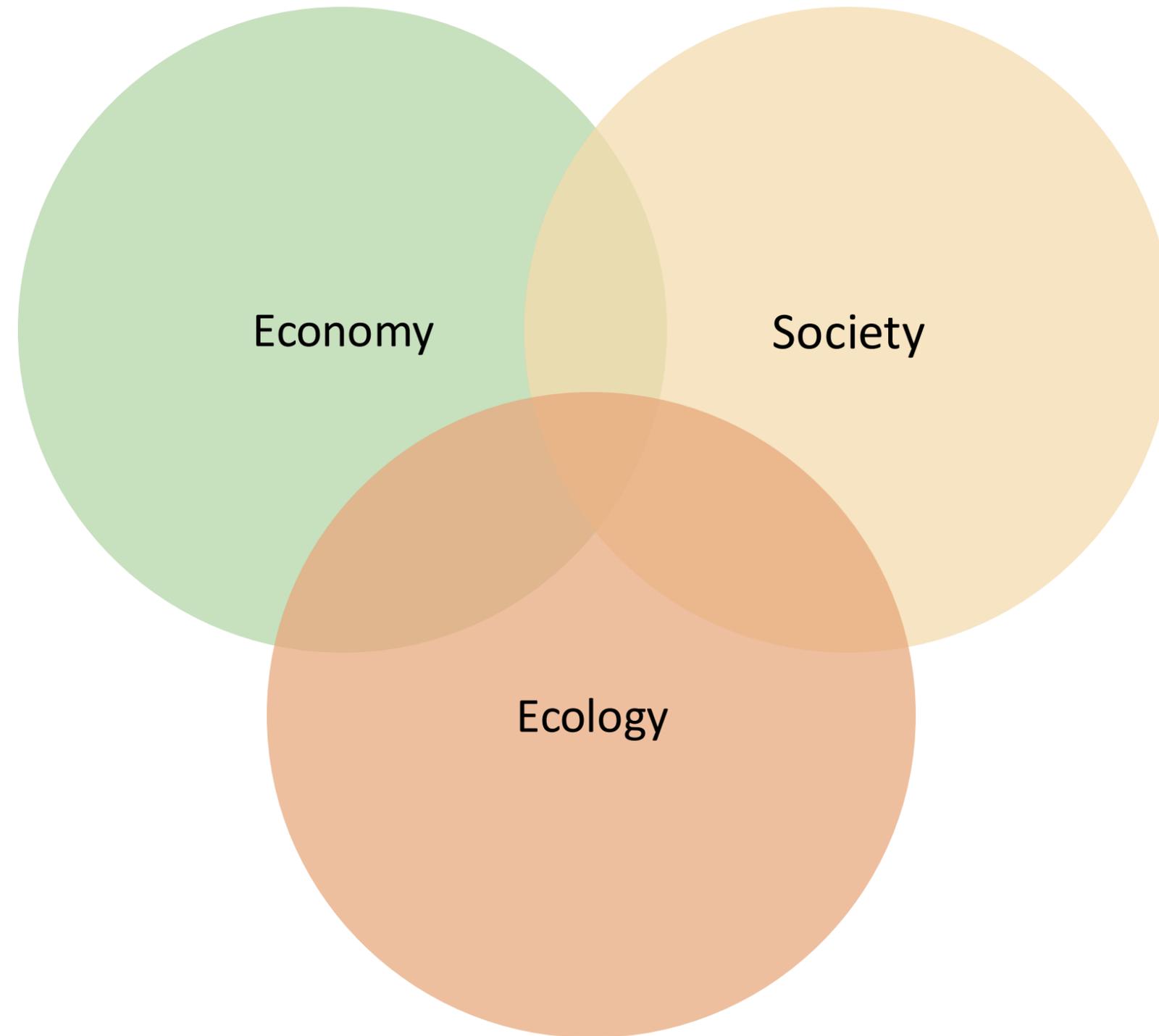
Hortus
Sustainable
Building in Earth
and Timber

Bettina Baggenstos



The Most Ecological Building

The Most Ecological Building







Bettina Baggenstos

Architect ETH | BFH
Sustainability | Earth

Blumer Lehmann AG
Cofounder Lehmit GmbH

Agenda

- Short Introduction Lehmit GmbH
- Why Combine Earth and Timber?
- Putting Theory into Practice: Hortus
- Continuing Innovation with Lehmit

gbw

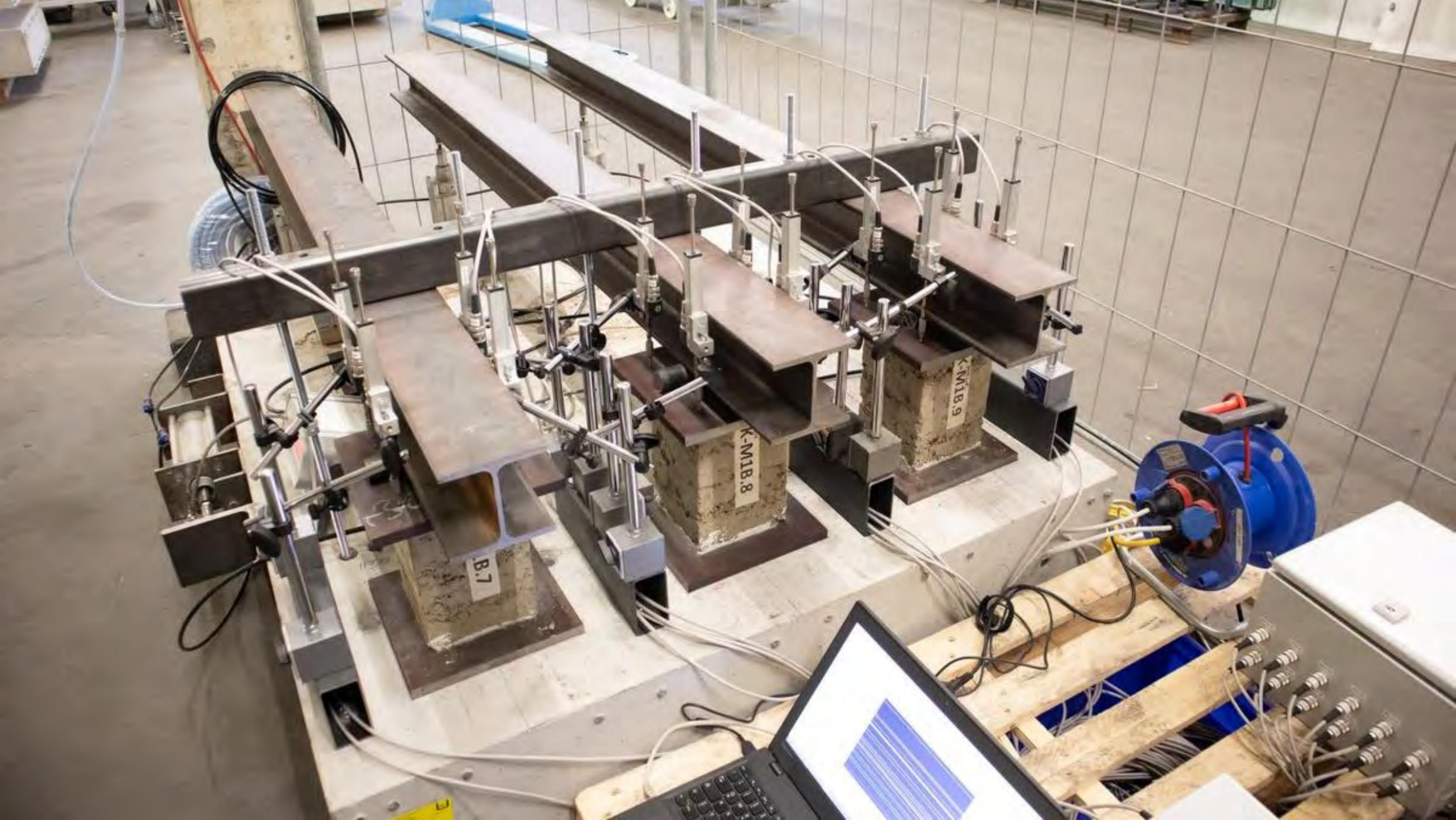
L E H M
T O N
E R D E



Blumer
Lehmann

LEHMIT

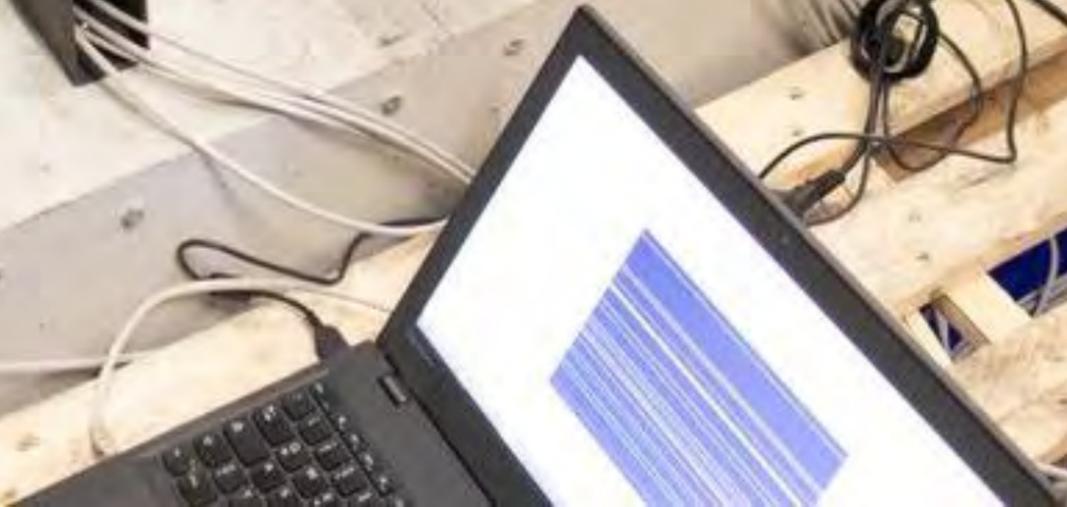
www.lehmit.com



B.7

K-M1B.8

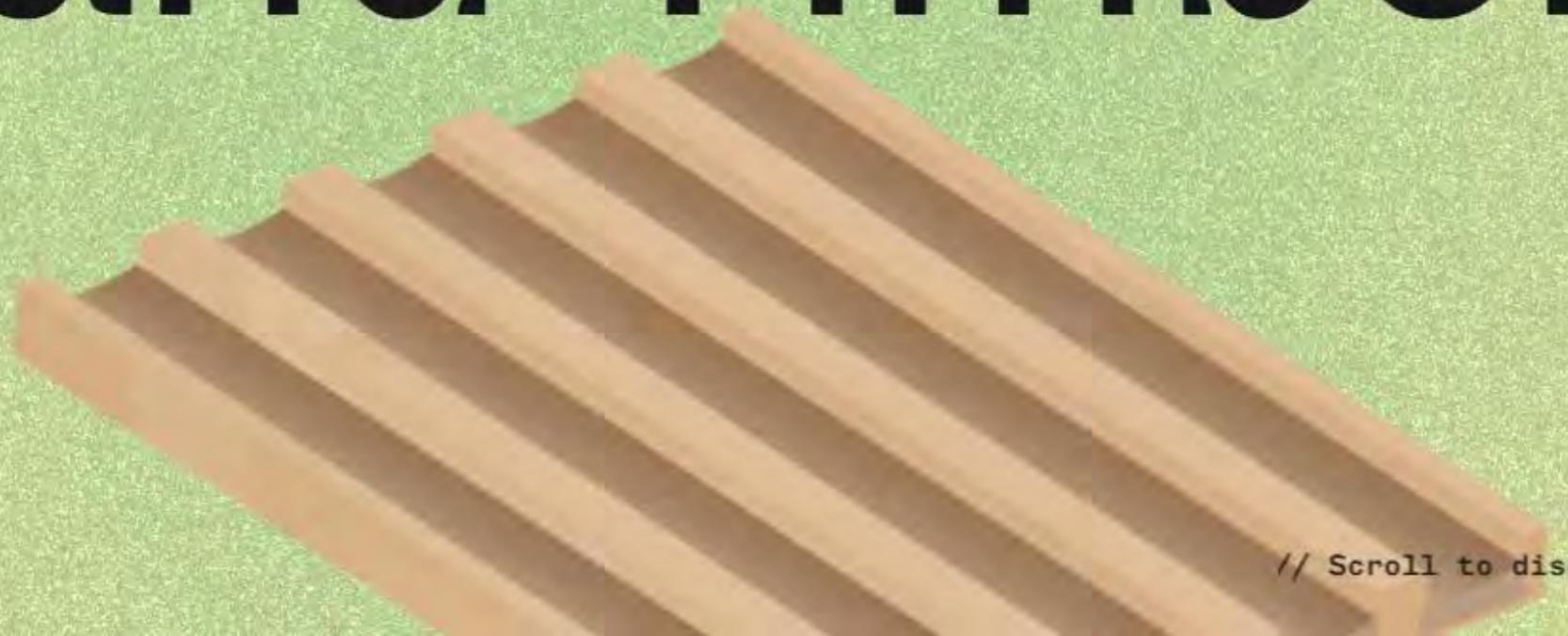
K-M1B.9





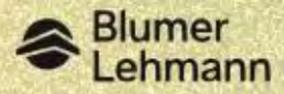
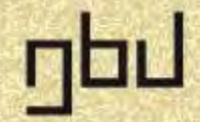


Innovating Building Systems in Earth and Timber



A joint venture of:

LEHM
TON
ERDE

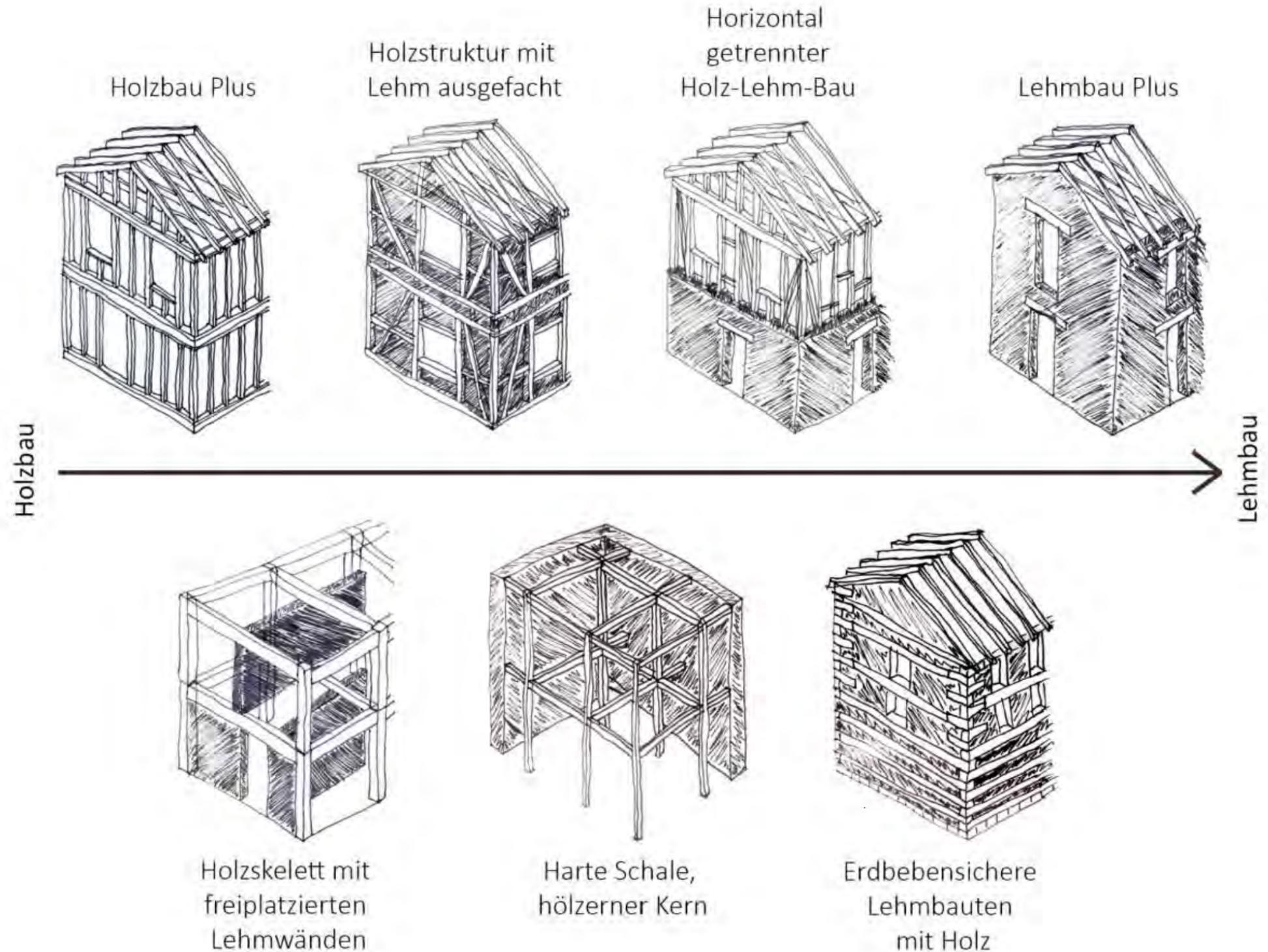


// Scroll to discover our

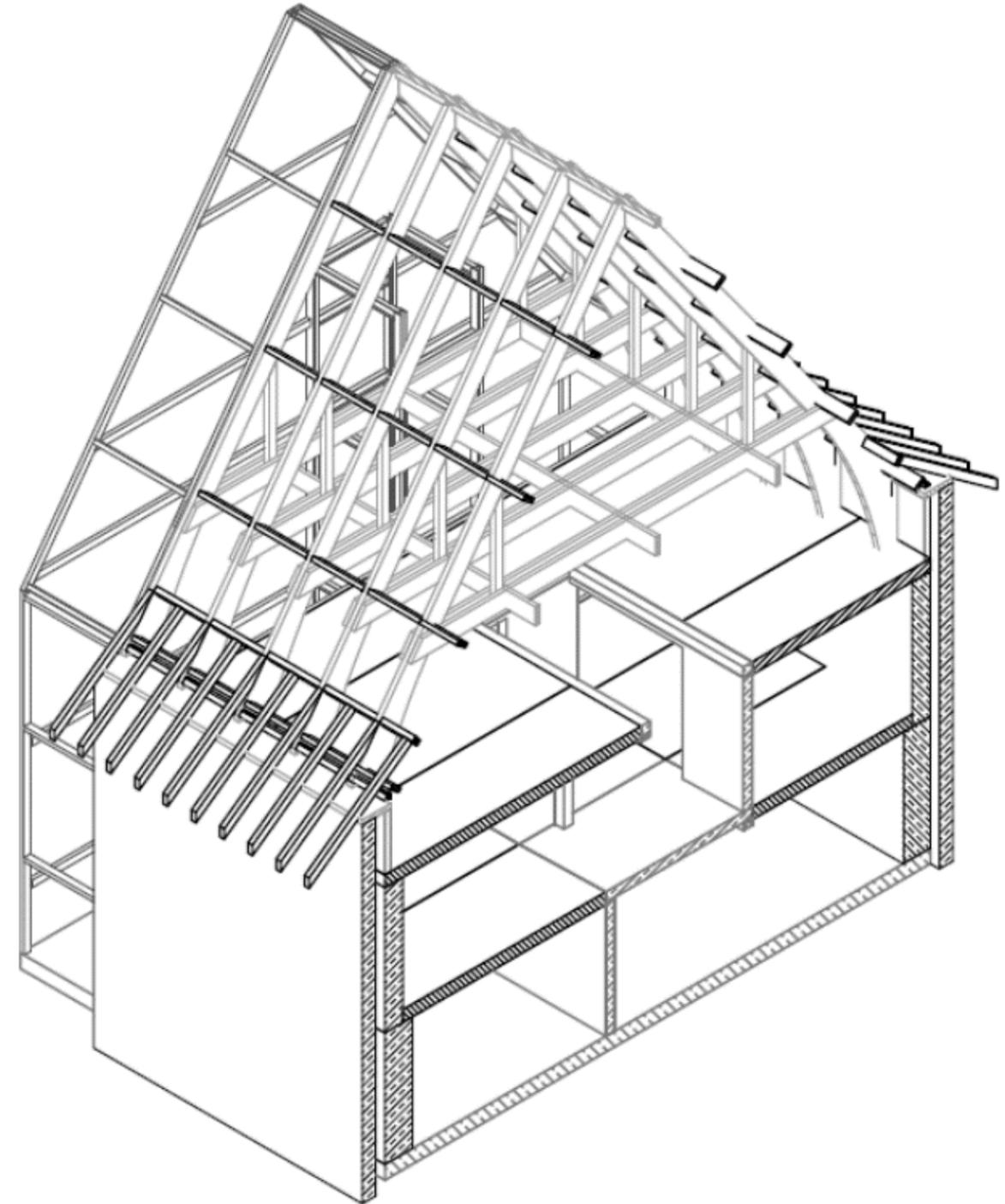
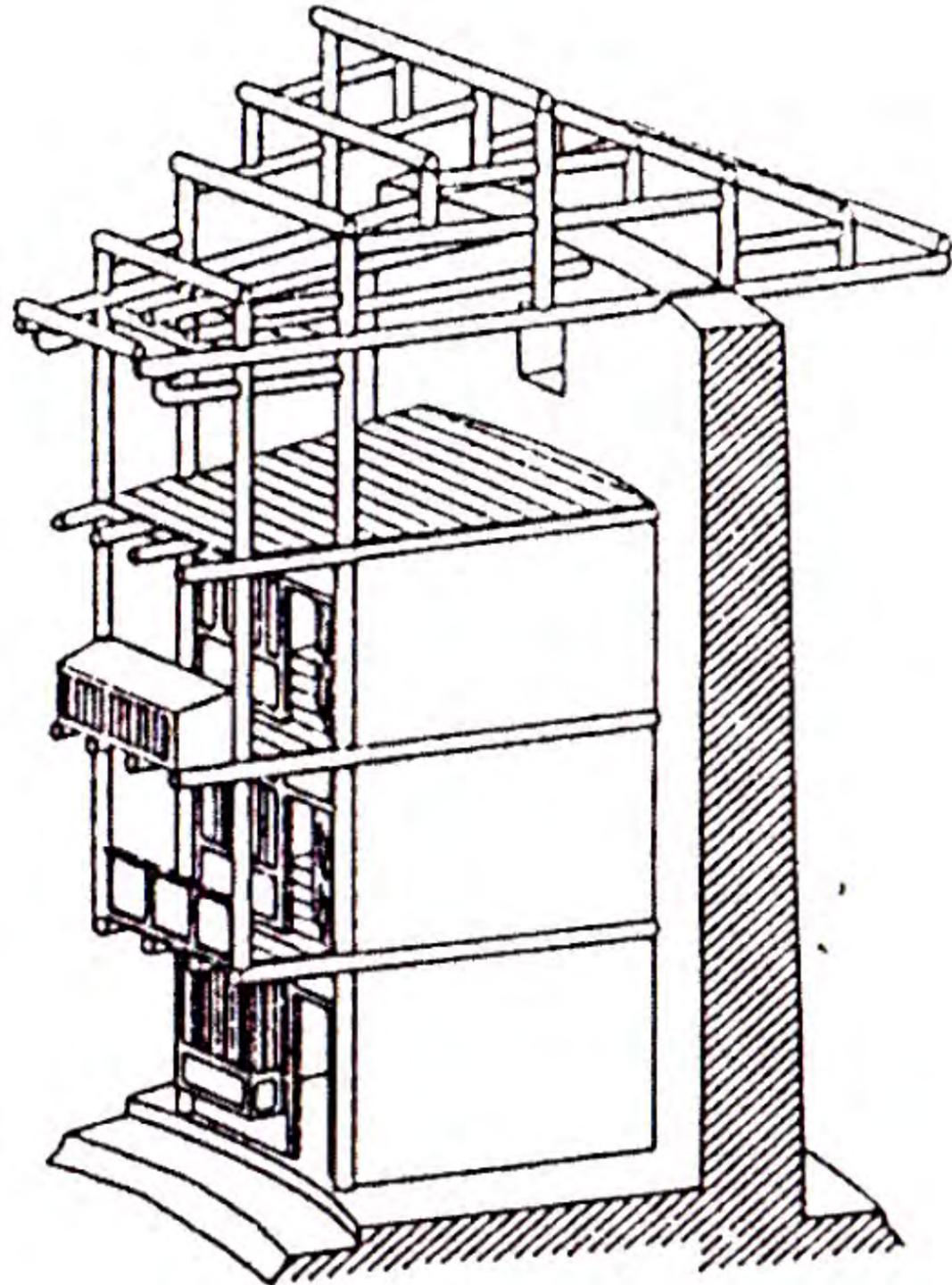


Why combine
Earth and
Timber?

Master Thesis: Earth and Timber Construction



Vernacular Practice and Contemporary Construction



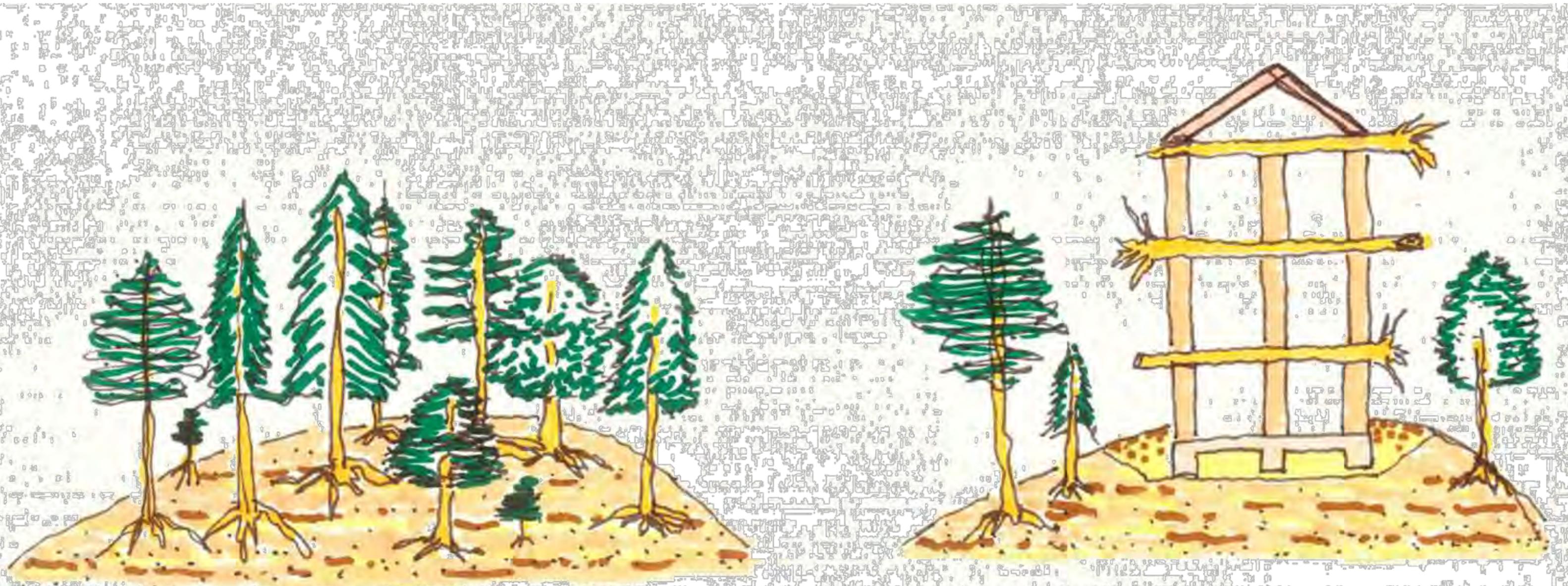


Learning
from...

Vernacular
Building
Practice:

Material
Sourcing

Use the Local, Easily Accessible Materials



Effective Use of Forests by Efficient Use of Timber



Construction Material Instead of Waste Material





Learning
from...

Material
Sciences

Smart
Combination
of Material
Properties

Ideal Combination for Tension and Compression



Fire Resistance of Earth Protects Timber



Earth Adds Mass to Lightweight Timber Structures



Porous Surfaces Equilibrate Indoor Climate





Learning
from...

Contemporary
Industrialized
Timber
Construction:

Optimized
Prefabrication
and Assembly

Advanced Prefabrication for Efficiency and Quality

LEHMANN
IT



Quick and Precise Assembly On-Site

LEHM
MIT



Reliability in Cost and Timing





HORTUS

Client:

Senn Construction

Architecture:

Herzog & de Meuron

Engineers:

zpf

Facadeplanner:

Christoph Etter

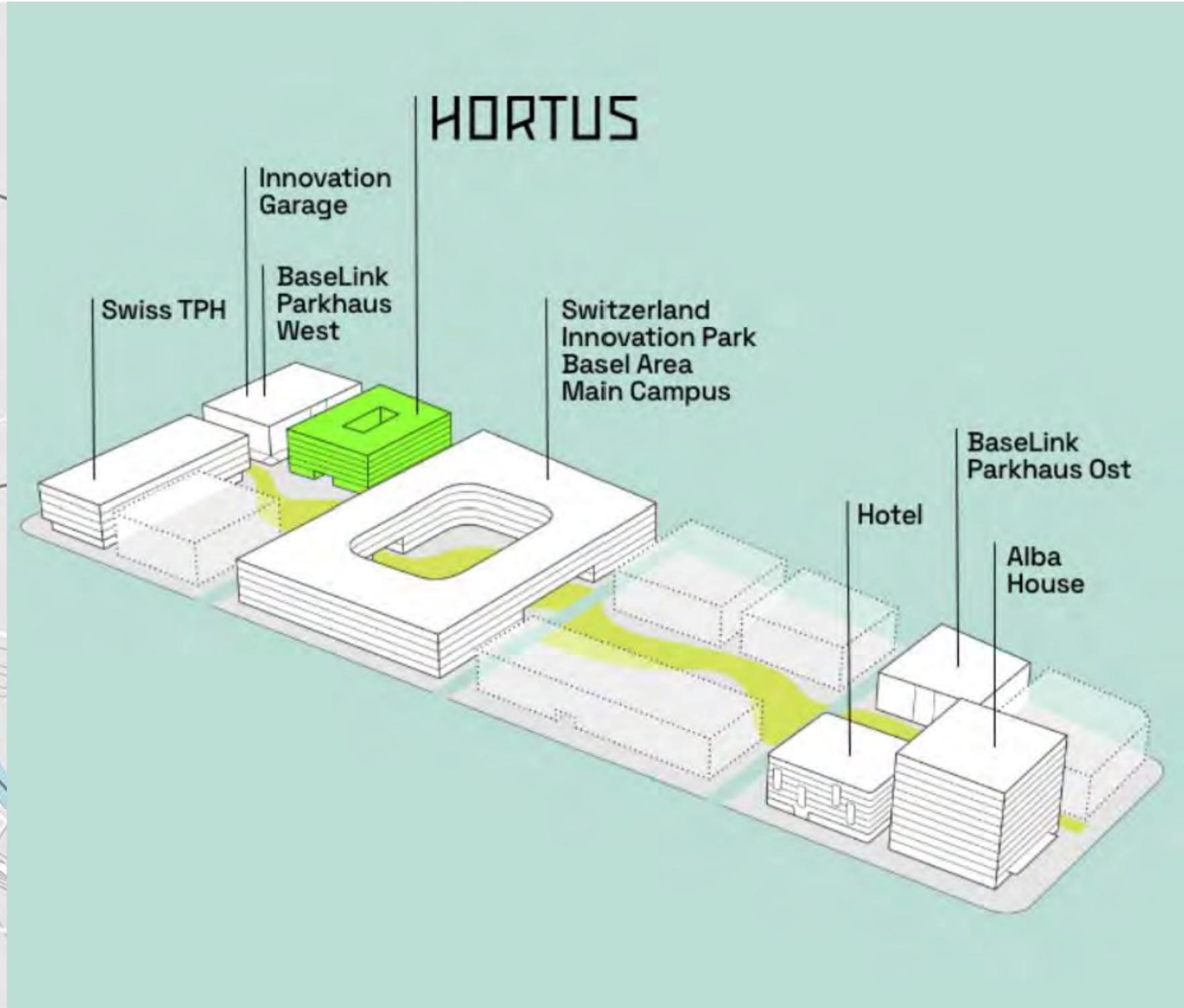
Timber Construction:

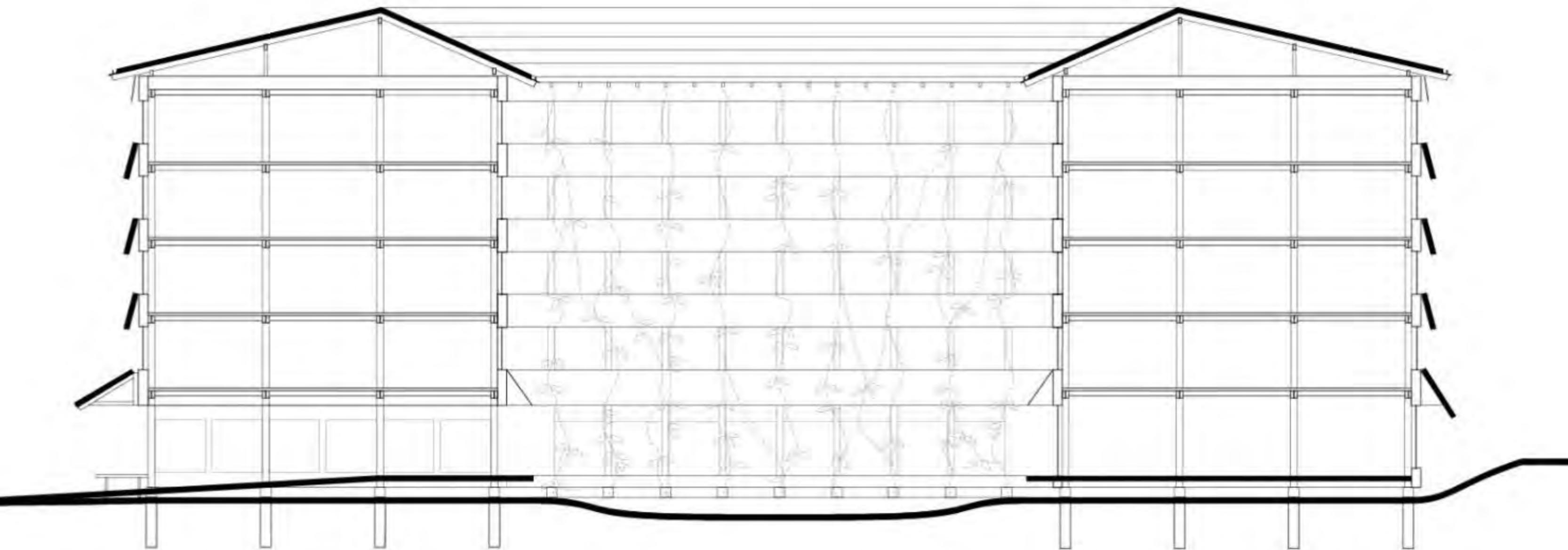
Blumer Lehmann

Earth Construction:

Blumer Lehmann and
Lehm Ton Erde

Officebuilding in Allschwil, close to Basel, Switzerland





Different Planning Process for the Team

STANDARD

PROGRAM



ANALYSIS
& CONCEPT



STRUCTURAL SYSTEM
AND MATERIALS



BUILDING ELEMENT

HORTUS

SUSTAINABILITY GOALS



BUILDING ELEMENT



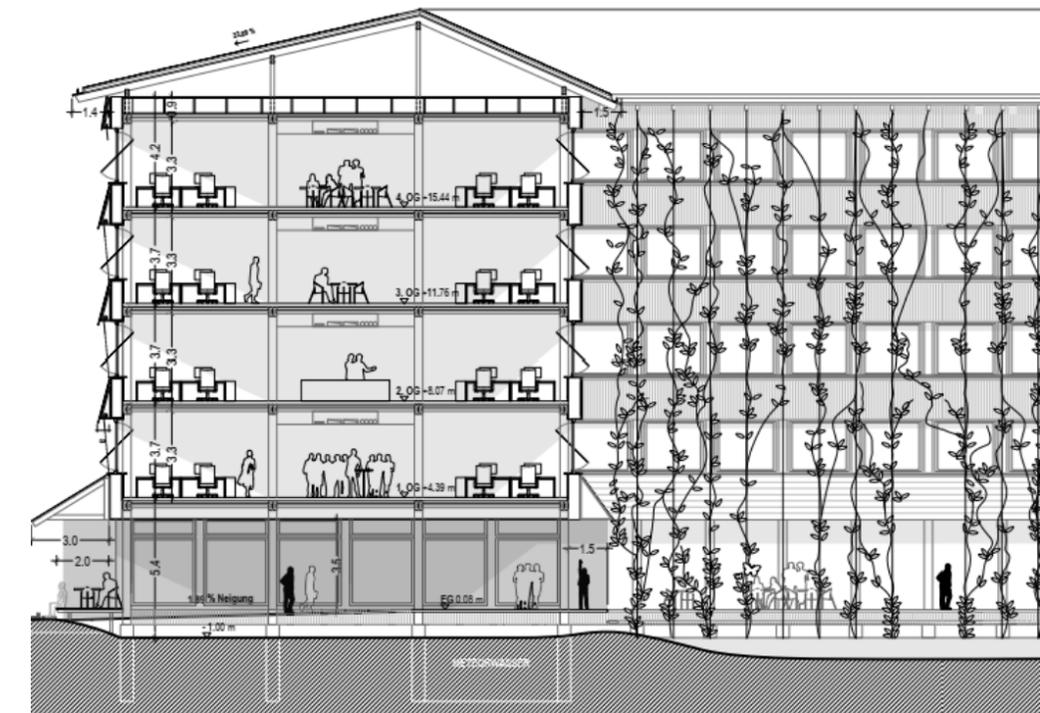
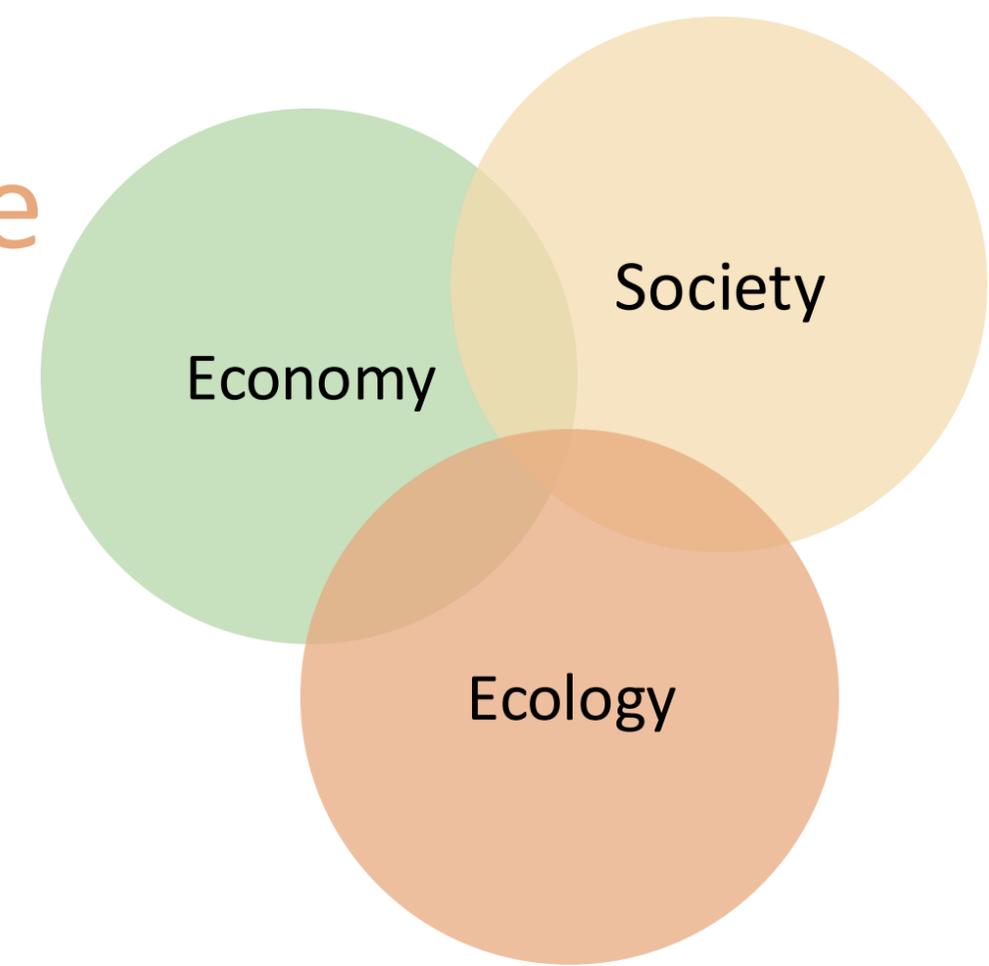
FULL
CONCEPT



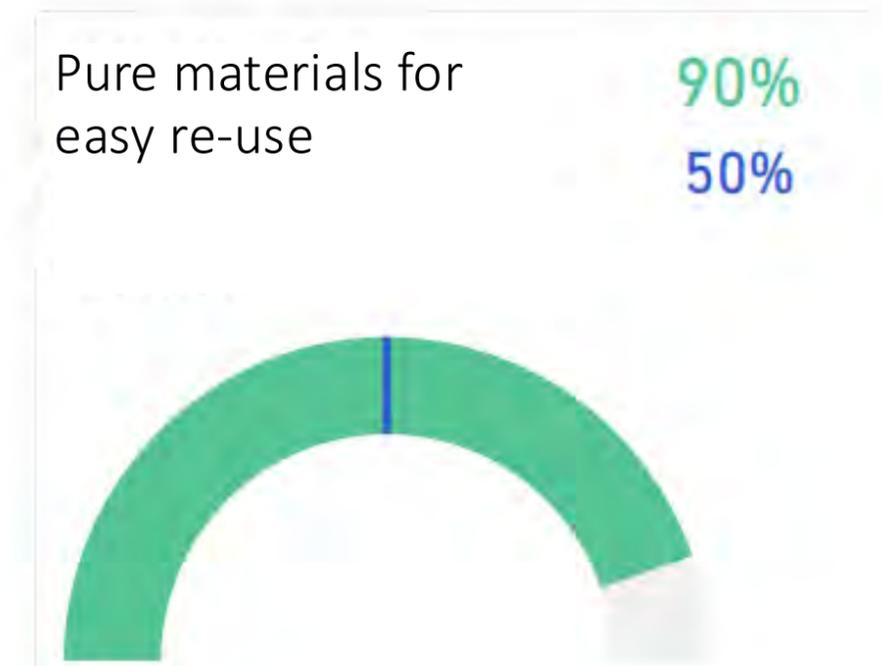
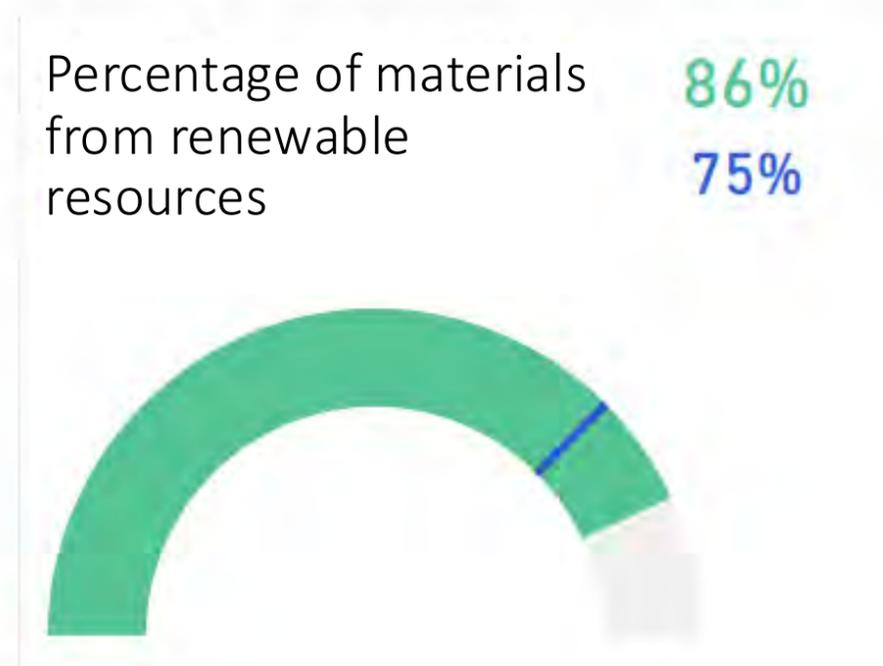
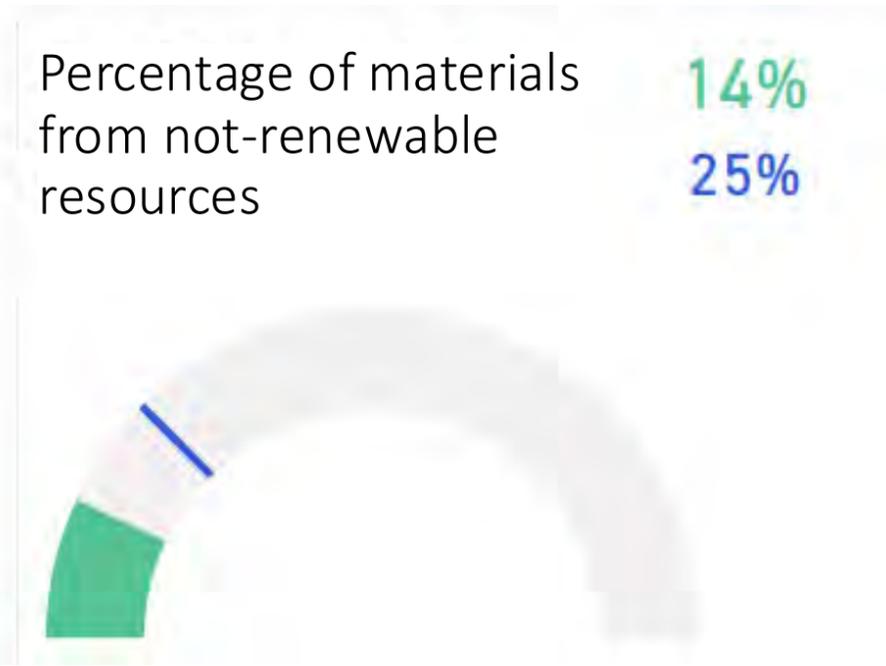
PROJECT

Sustainabilitygoals – Radically Sustainable

- Circularity as Key part of the Concept
 - Building circular from the beginning, instead of recycling at the end
- Efficient Use of Resources
 - Mixed-use to optimize land-use
 - Circular flow of materials instead of waste
- Ecologic Energy and Certification
 - Energetic amortization within one generation
 - SNBS platin certified



Clearly Set Goals and Monitoring



Amortization time

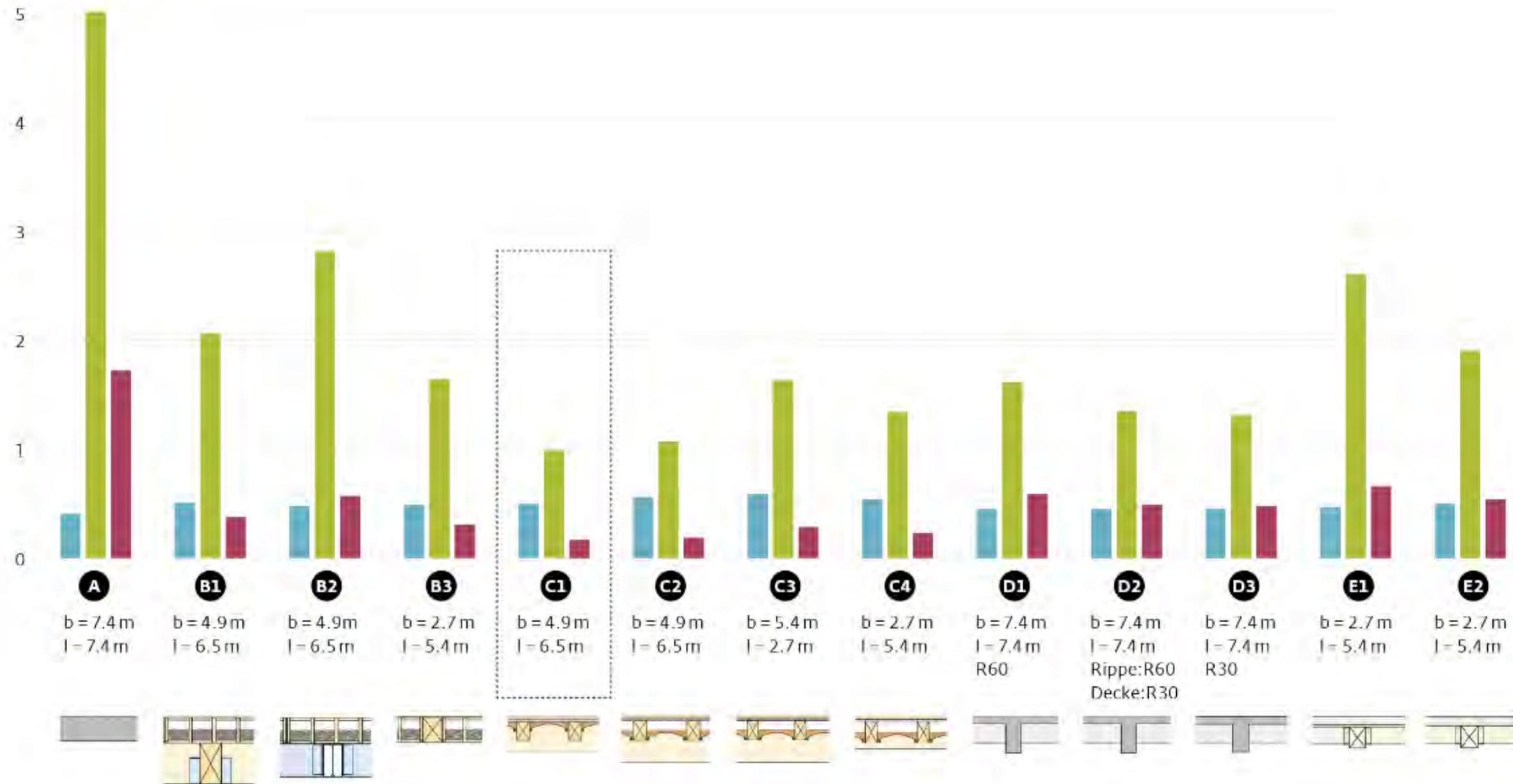
31.30
(Leer)



Wert



Grey Energy Calculations for Slab Systems



Deckensysteme im Vergleich (© ZPF Ingenieure)

A Flachdecke Stahlbeton B Hohlkastendecke C Holzbalkendecke mit Lehmgewölbe D Rippendecke Stahlbeton E Holz-Beton-Verbunddecke

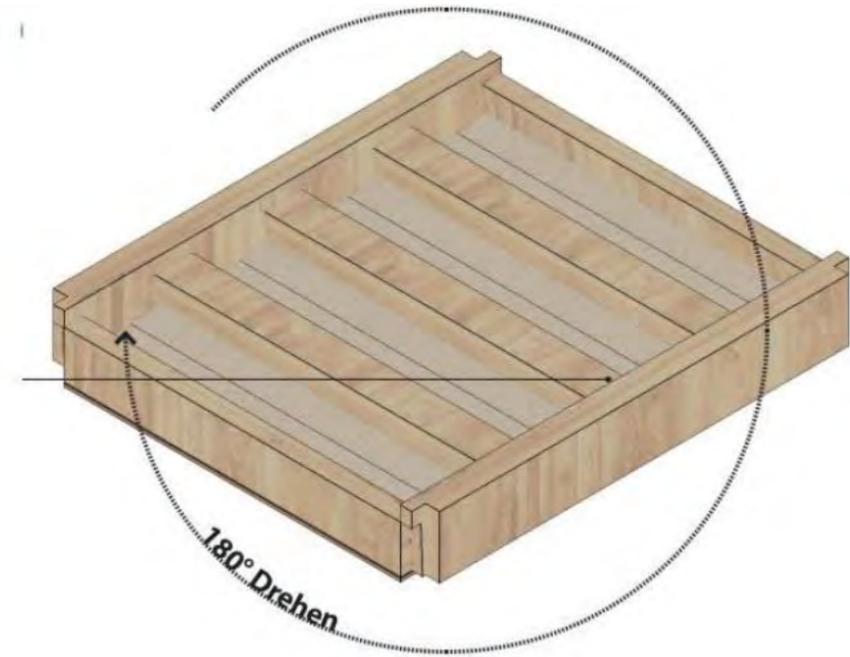
■ Kosten [kCHF/m²] ■ nicht erneuerbare Primärenergie [kWh/m^{2a}] ■ Treibhausgase [kgCO₂eq/m^{2a}]

Timber-Earth Slabelements



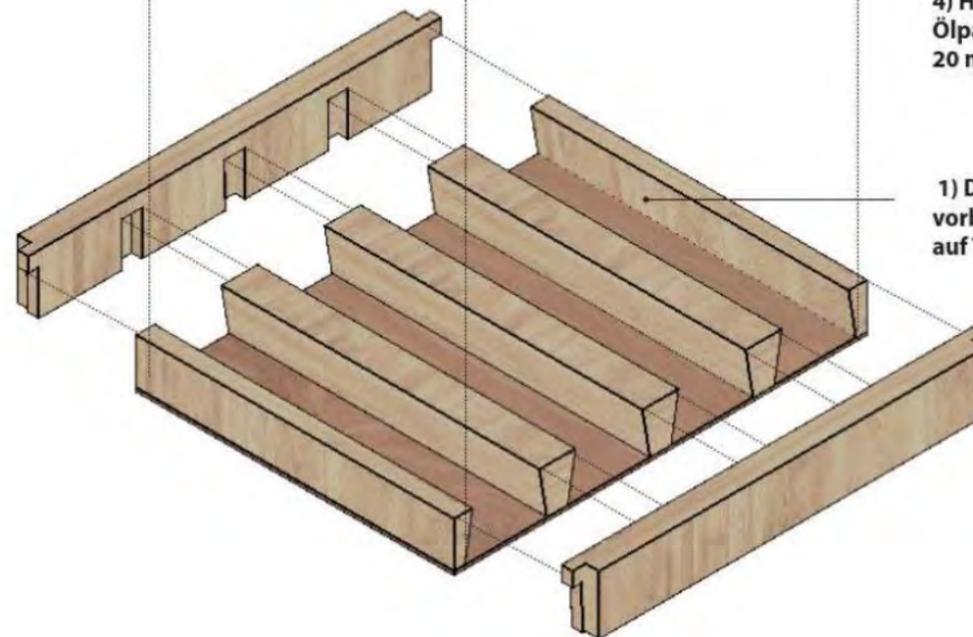
2) Lehm in Decken - Rahmen
"Schalung" schütten und
stampfen.

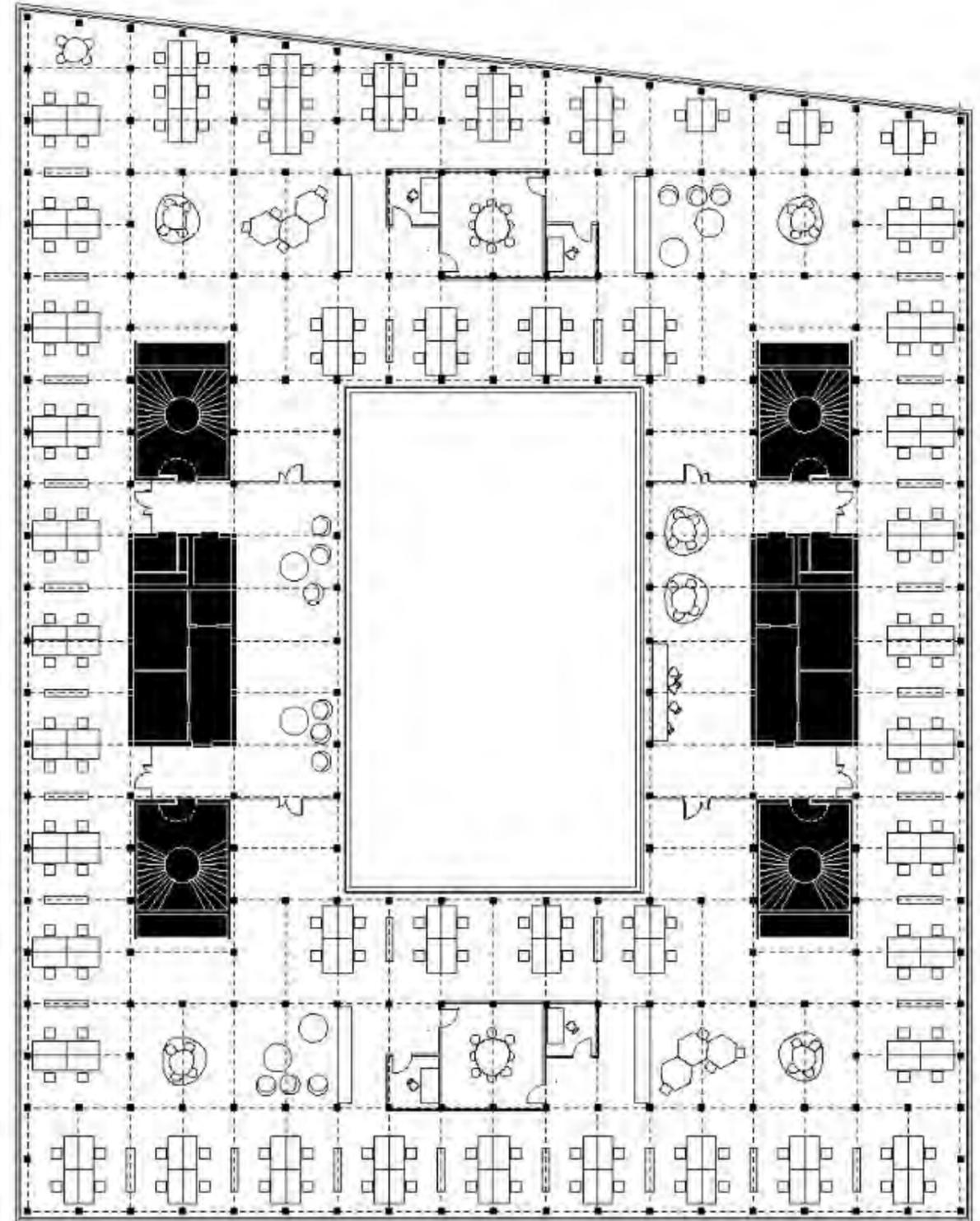
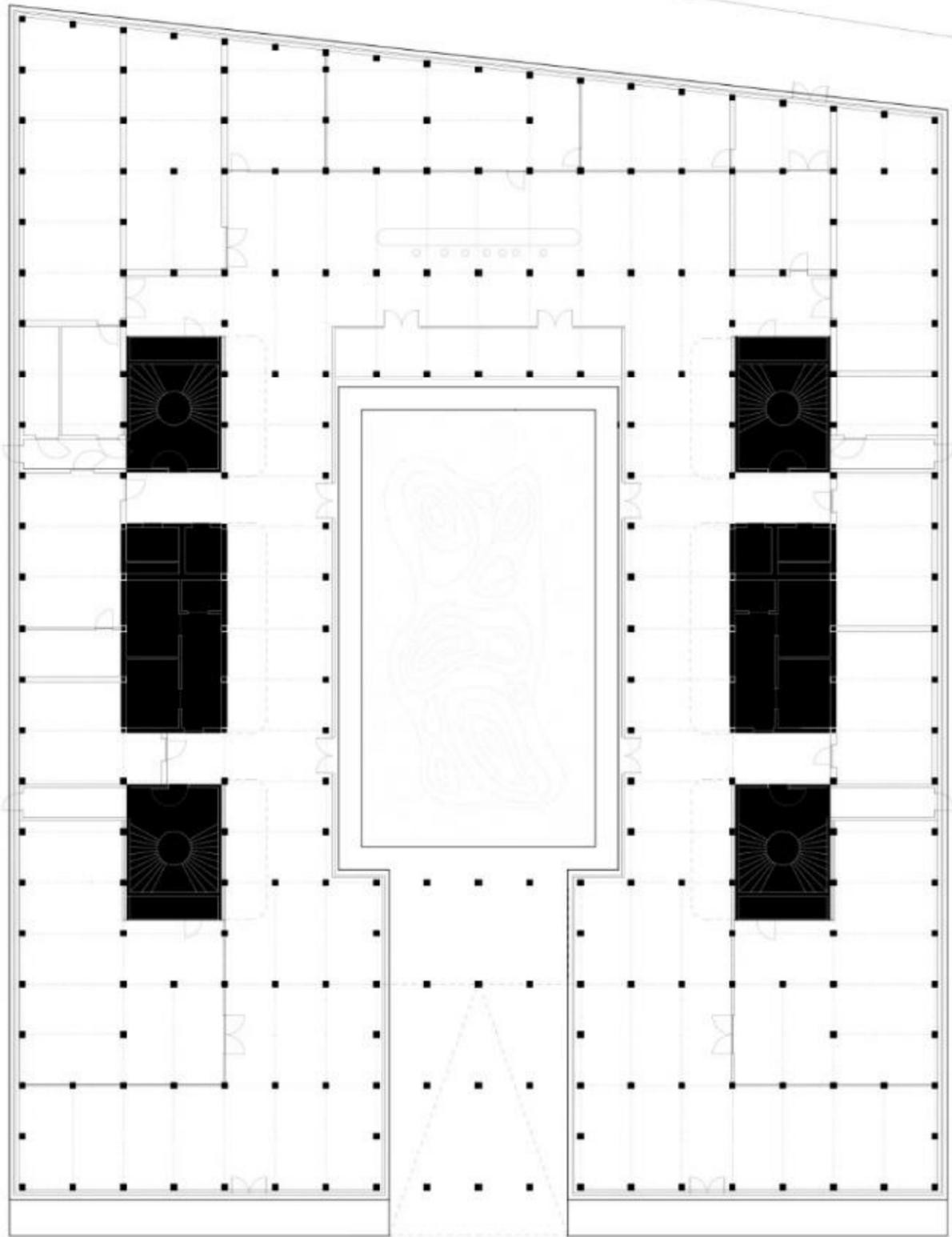
3) Decken-Rahmenelement
180° drehen.



4) Holzfaserplatte 40 mm +
Ölpapier+ Sandschüttung 30 mm +
20 mm Eichendielen

1) Decken-Rahmenelement
vorbereiten. 3 - Schichtplatten
auf Träger vernagelt.





Material efficiency: Only build what's really relevant



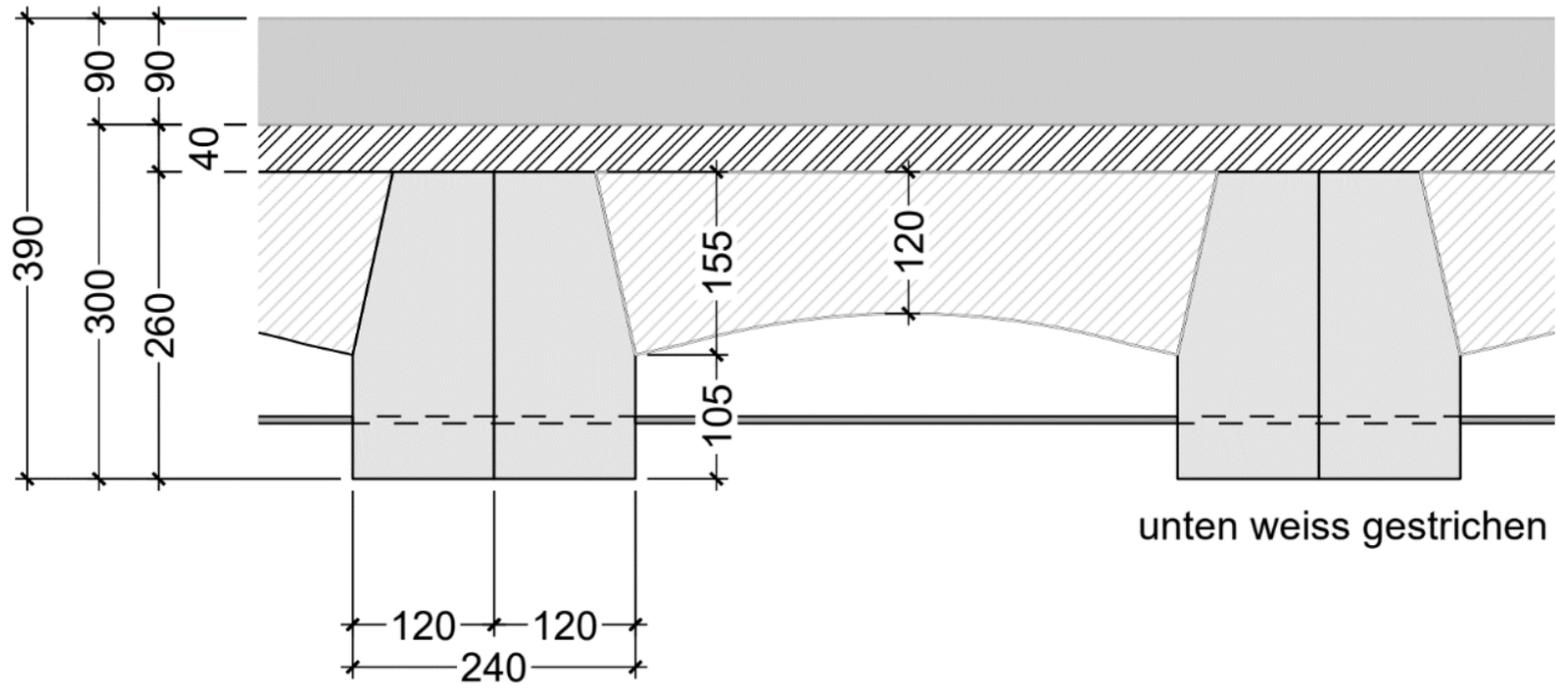
Façade and Roof with Solar Power





Putting
Theory into
Practice...

810 Slab Elements, 12'500 m²



D I.01 Deckenaufbau standard (von oben nach unten)

Brandschutz: REI60

Luftschall $D_i = 52$ dB

Trittschall $L' = 53$ dB

90mm Bodenaufbau in Abklärung, im EG mit verschiedenen Belägen

40mm DSP, C+/C, Fichte, Platte Pröbstl LK1.2_SWP/2 S L3

Befestigung in Abklärung

260mm Rippe, Fichte N, C24, halbiert zu 2x120mm, teilkammergetrocknet, gehobelt

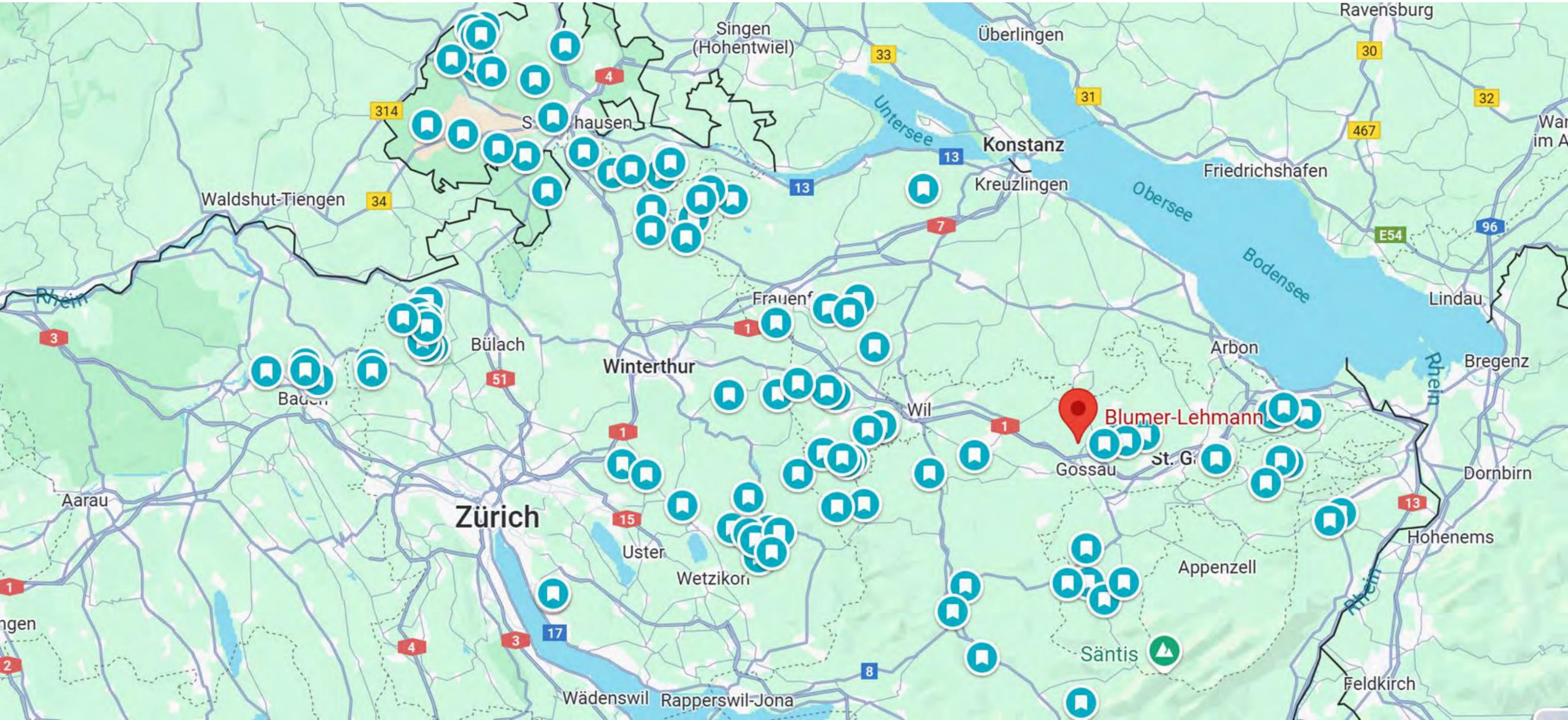
Kanten allseitig gefast ~3mm

dazwischen Stampflehm gemäss separaten Beschrieb





Tracking Where the Wood came from



5.40m Long Solid Timber Beams



Natural Drying of Swiss Timber





L E H M

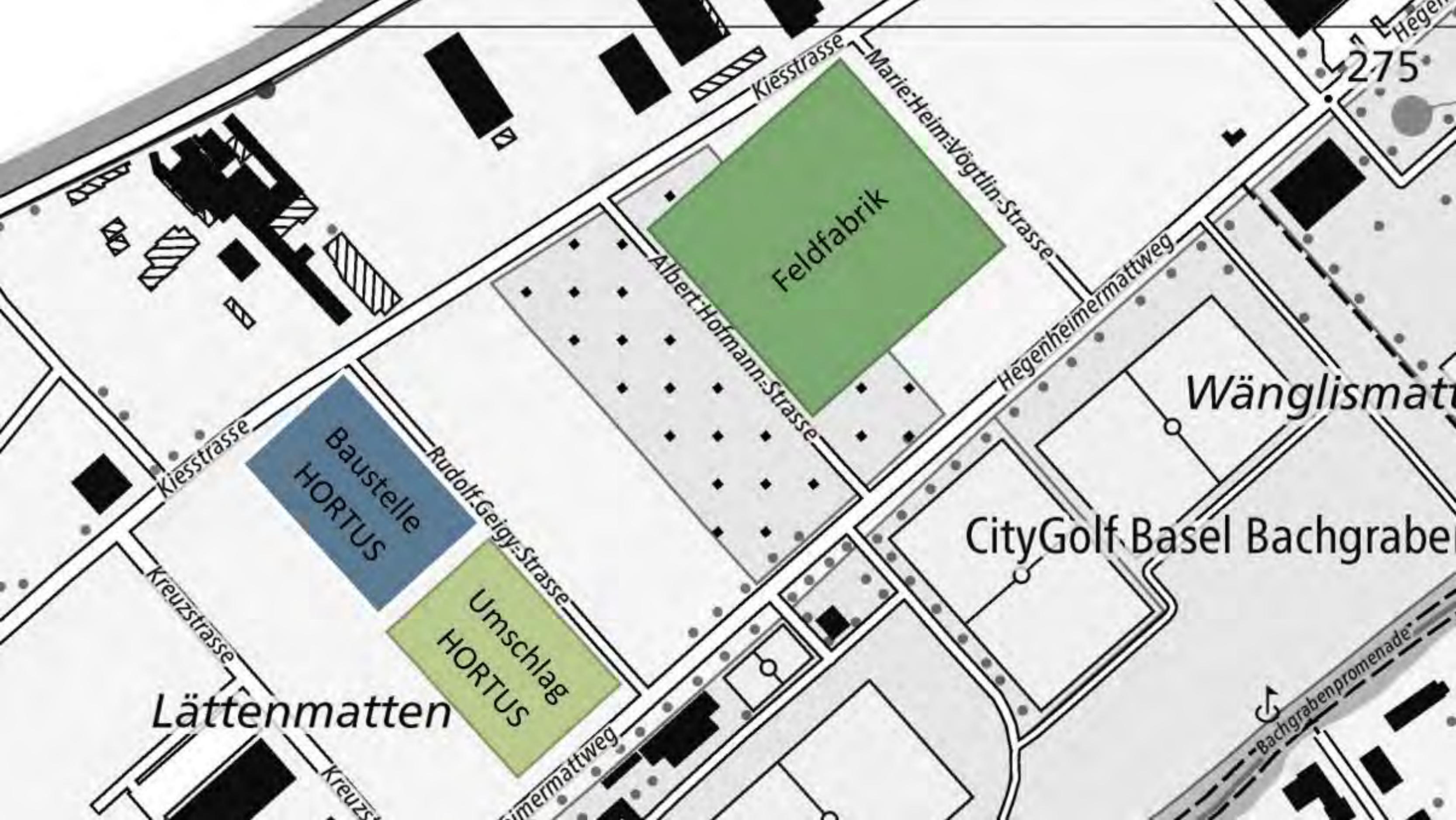
T O N

E R D E



**Blumer
Lehmann**





275

Kiesstrasse

Marie-Heim-Vögtlin-Strasse

Hegenheimermattweg

Albert-Hofmann-Strasse

Wänglismatt

Kiesstrasse

Baustelle
HORTUS

Rudolf-Geigy-Strasse

Umschlag
HORTUS

CityGolf Basel Bachgrabe

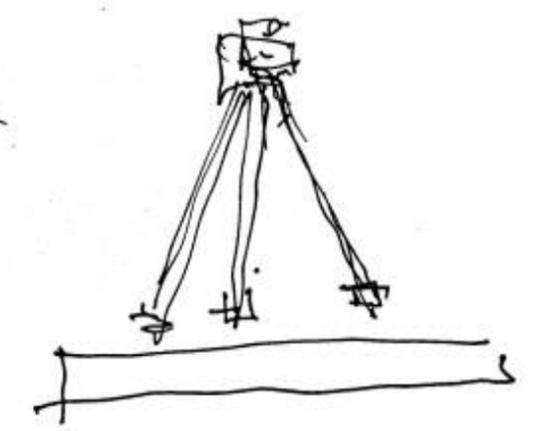
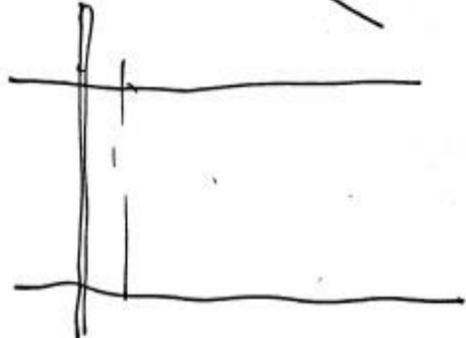
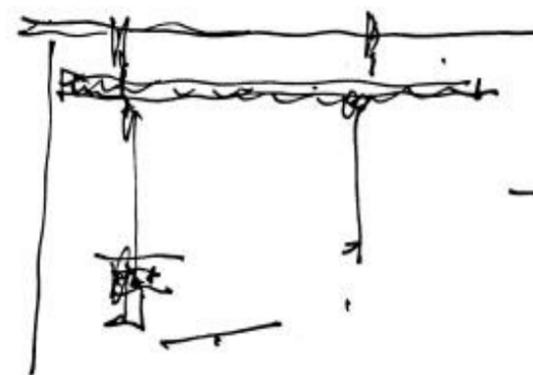
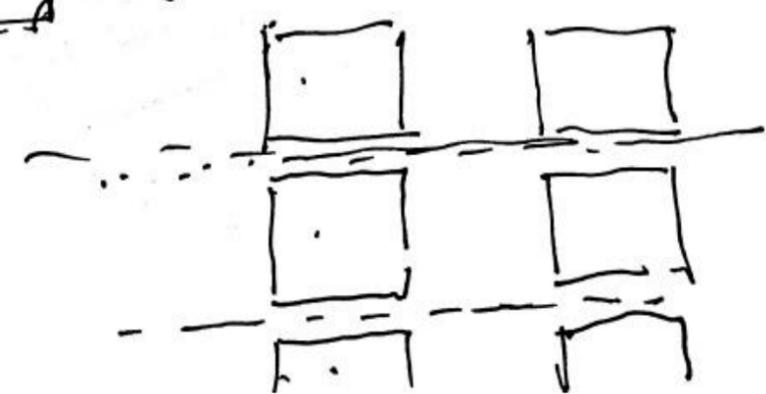
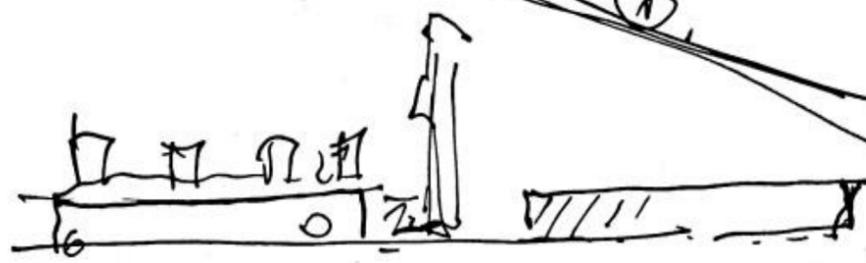
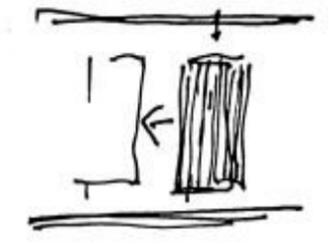
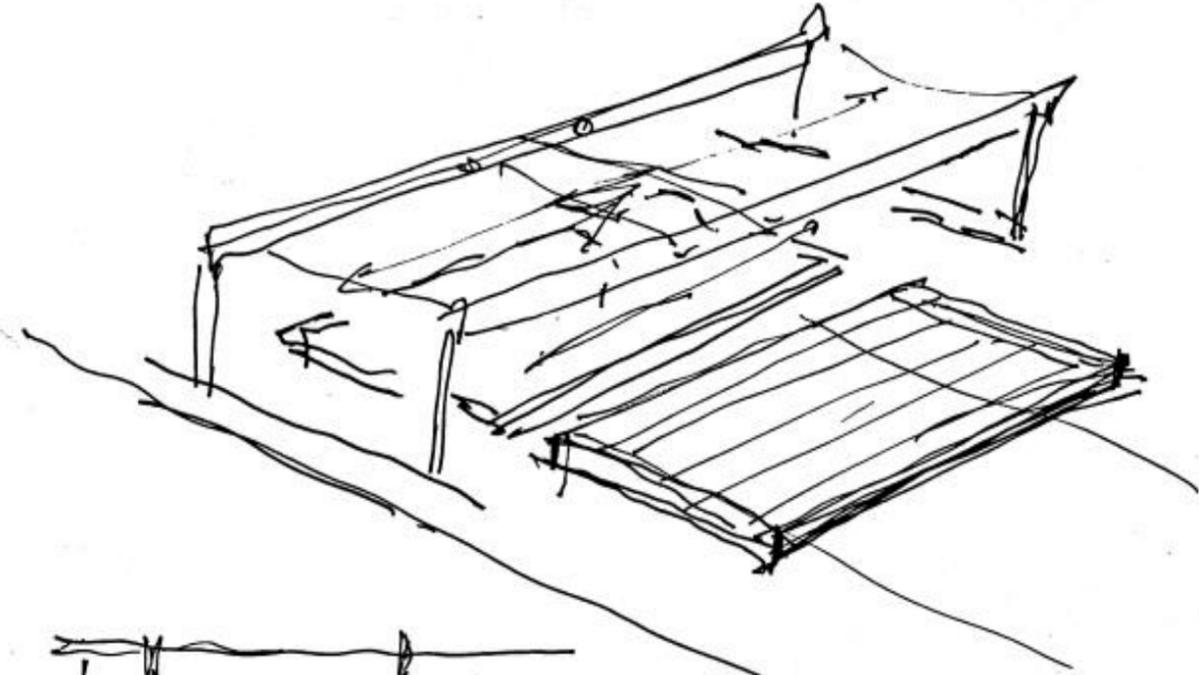
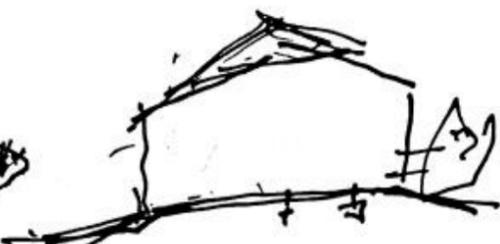
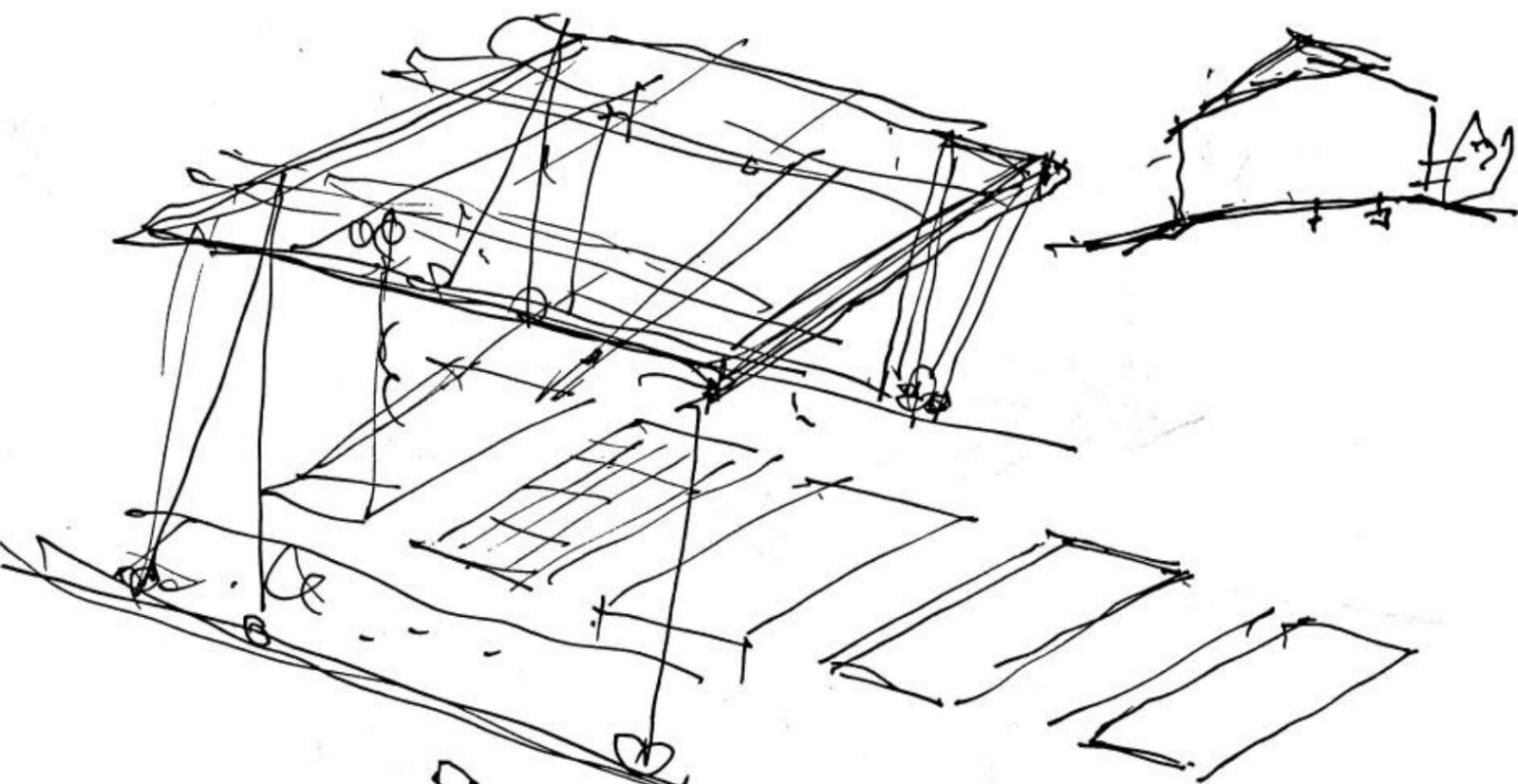
Lättenmatten

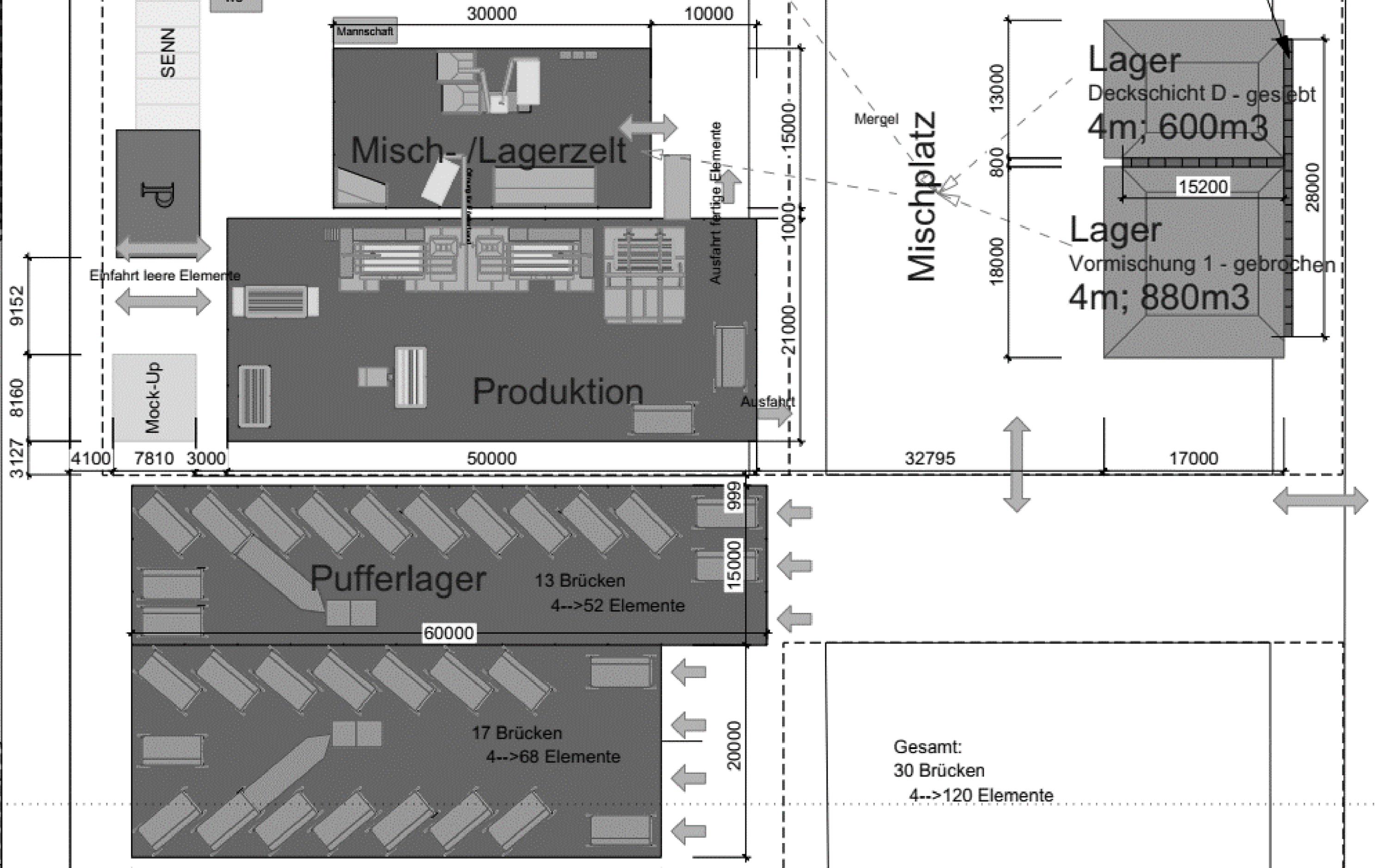
Kreuzstrasse

Kreuzstrasse

Himermattweg

Bachgrabenpromenade





Hortus Produktionseinrichtung Maschinenbau:

A. Produktionsrahmen

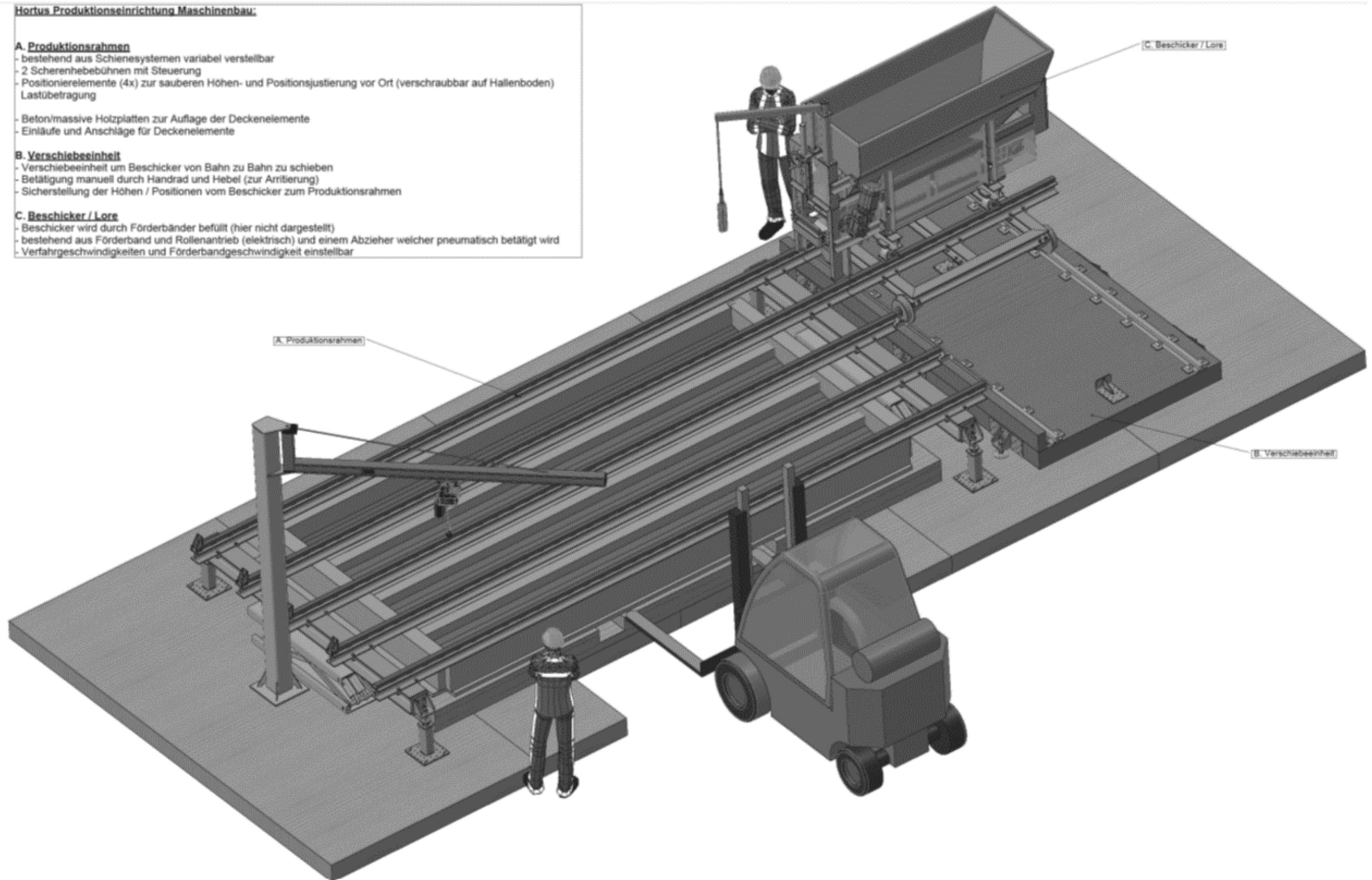
- bestehend aus Schienensystemen variabel verstellbar
- 2 Scherenhebebühnen mit Steuerung
- Positionierelemente (4x) zur sauberen Höhen- und Positionsjustierung vor Ort (verschraubbar auf Hallenboden) Lastübertragung
- Beton/massive Holzplatten zur Auflage der Deckenelemente
- Einläufe und Anschläge für Deckenelemente

B. Verschiebeeinheit

- Verschiebeeinheit um Beschicker von Bahn zu Bahn zu schieben
- Betätigung manuell durch Handrad und Hebel (zur Arritierung)
- Sicherstellung der Höhen / Positionen vom Beschicker zum Produktionsrahmen

C. Beschicker / Lore

- Beschicker wird durch Förderbänder befüllt (hier nicht dargestellt)
- bestehend aus Förderband und Rollenantrieb (elektrisch) und einem Abzieher welcher pneumatisch betätigt wird
- Verfahrensgeschwindigkeiten und Förderbandgeschwindigkeit einstellbar





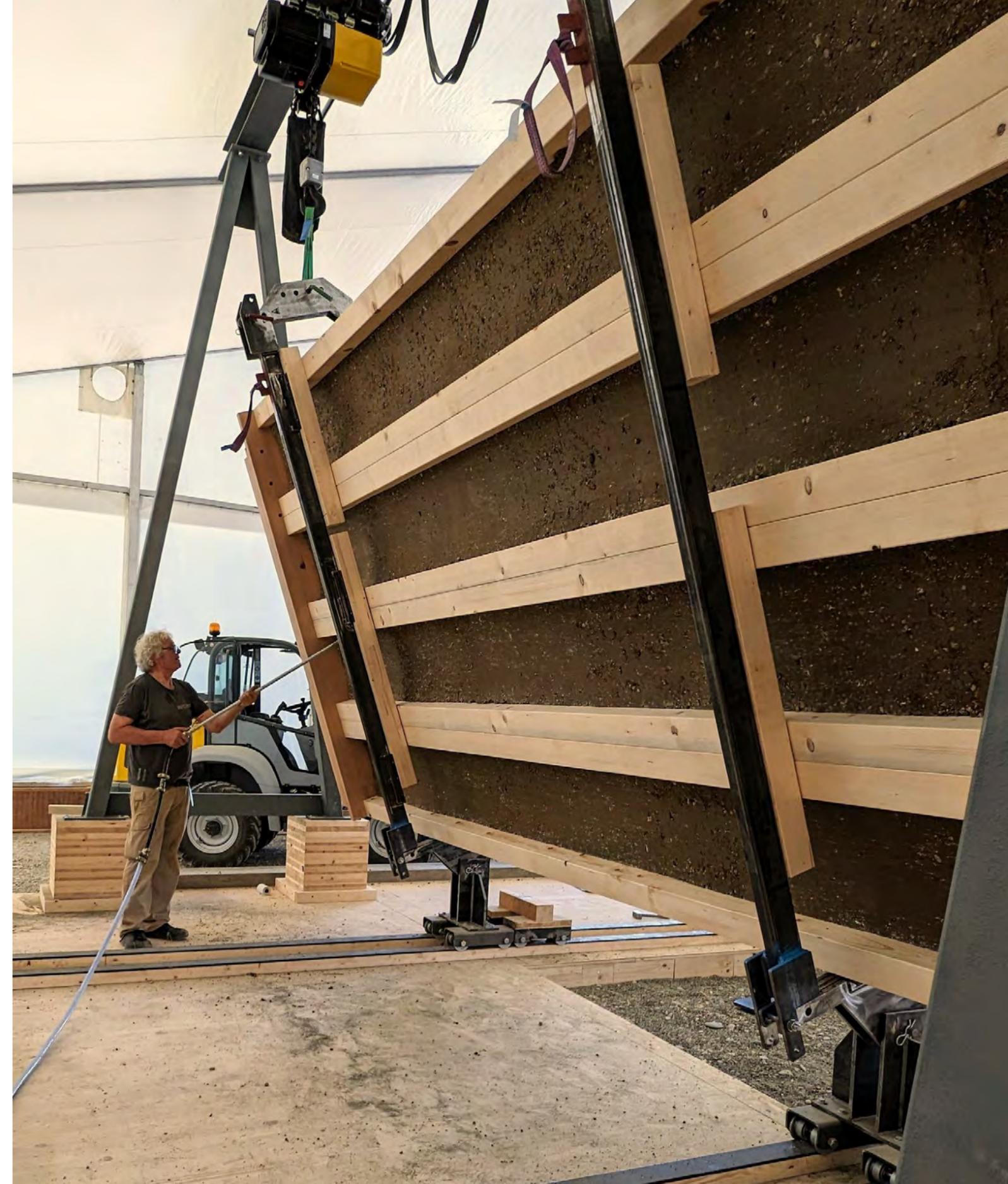




LEHM
TON
ERDE
Blumer
Lehmann

BAUMA

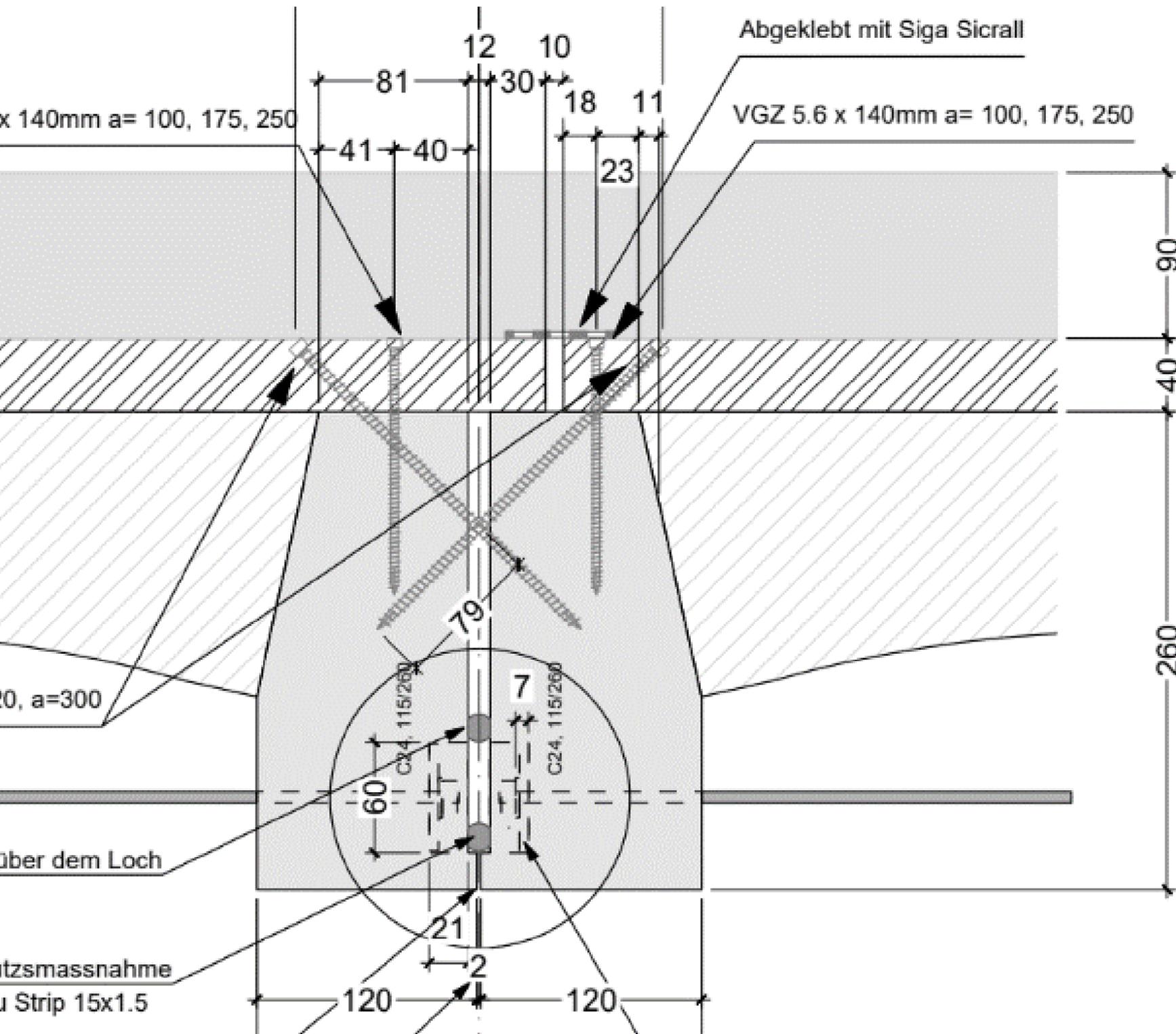








Screwed Connection of the Elements



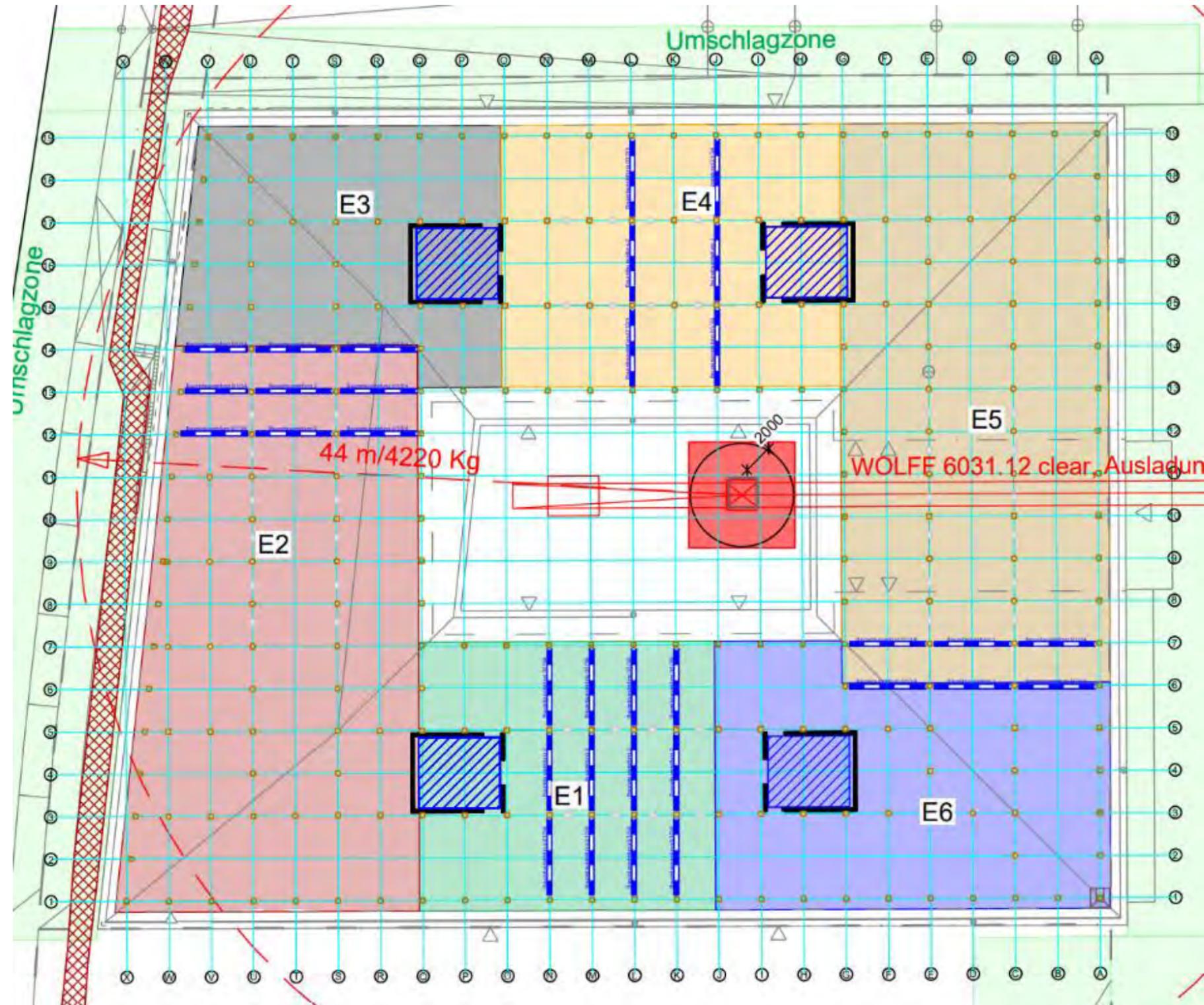
Prefabricated Staircase Fireproofed with Clay Panels





Timeline

- Excavation & Foundation
April 23 – September 23
- Production Timber
June 23 - February 24
- Production Rammed Earth
August 23 - March 24
- Erection of Structure
September 23 - April 24
- Completion
Summer 25

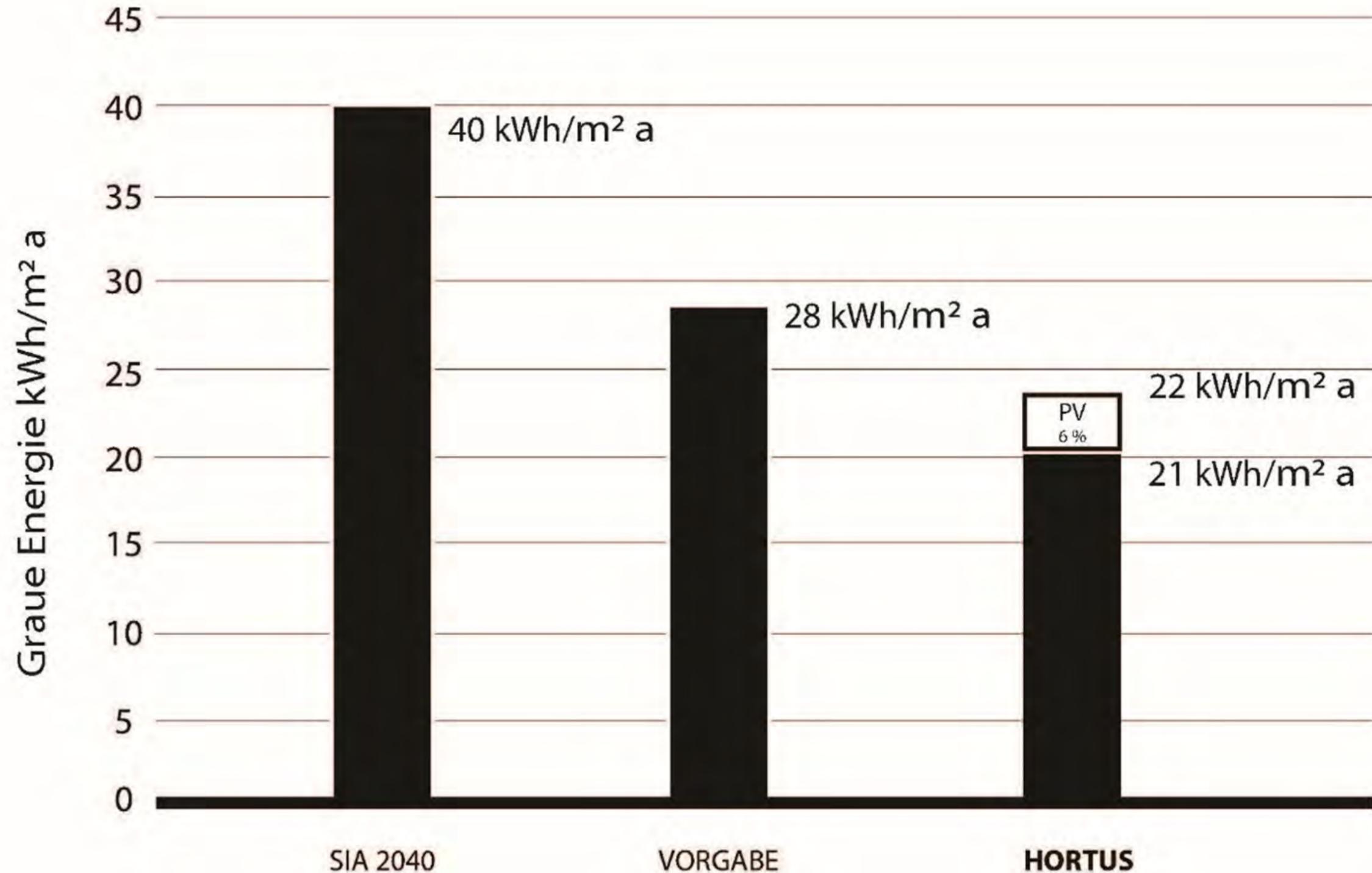




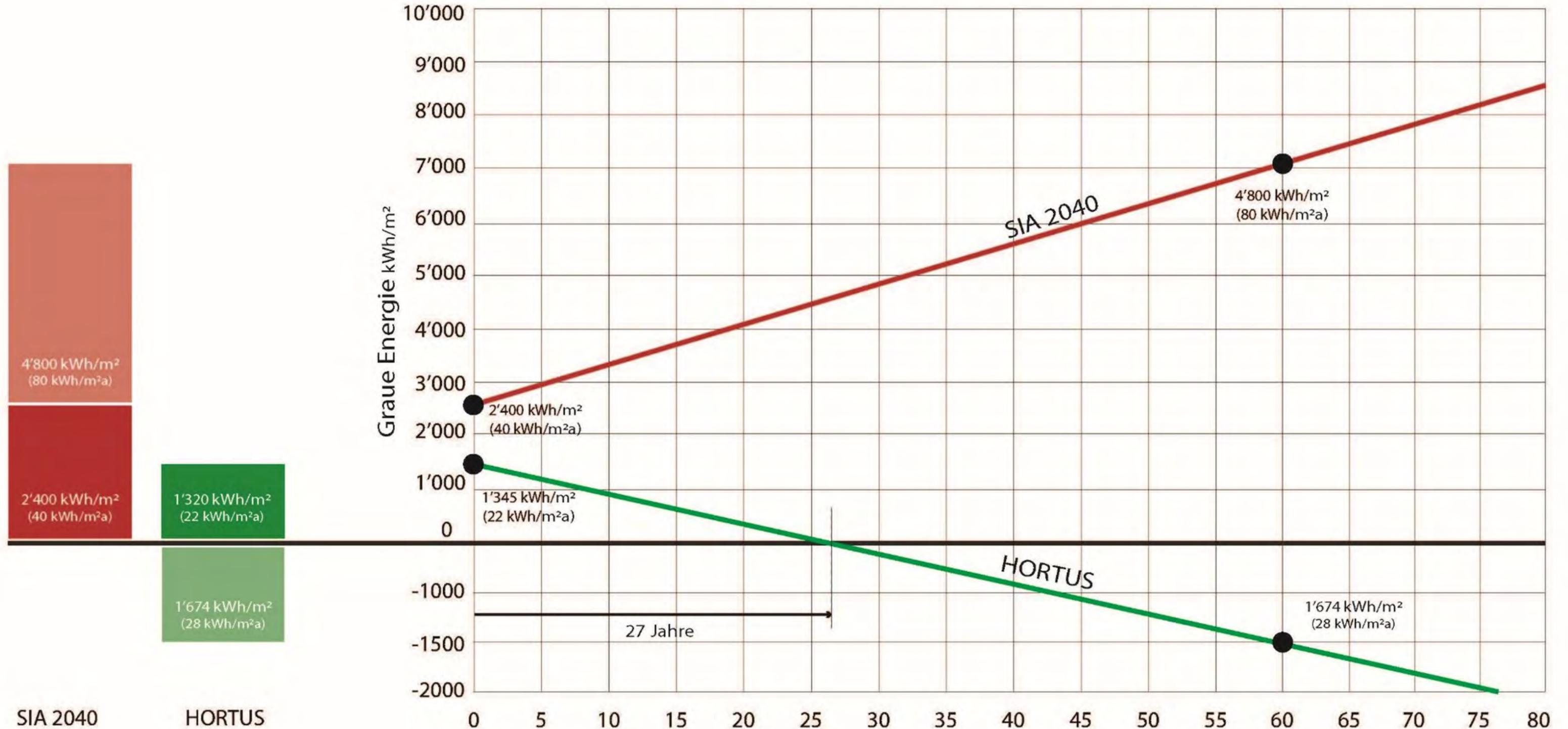
Learning
from...

Experience

Less than 50% Grey Energy of a Conventional Building



Energetic Amortization within 31 Years



90% Pure Materials for Reuse or Recycling



gbu

L E H M
T O N
E R D E



LEHMIT

Continuing
Innovation
with Lehmit...

Specialist Planning

We push the boundaries of sustainable construction. Lehmit: Experts in earth and timber.



Bettina Baggenstos

Cofounder, architect, timber construction specialist



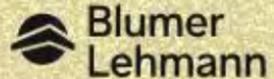
Martin Mackowitz

Cofounder, architect, earth building specialist

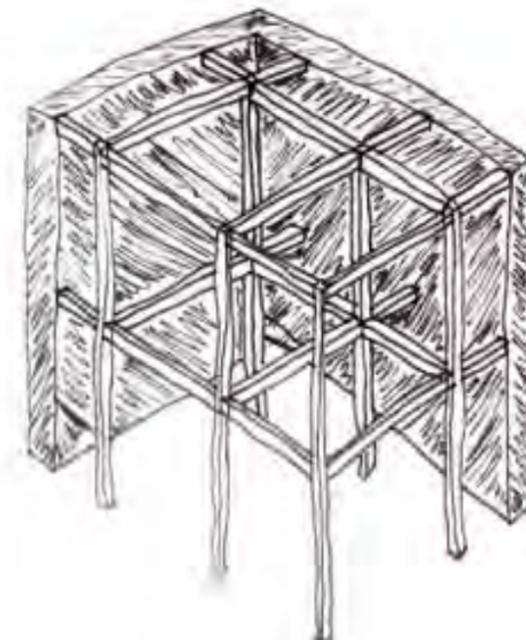
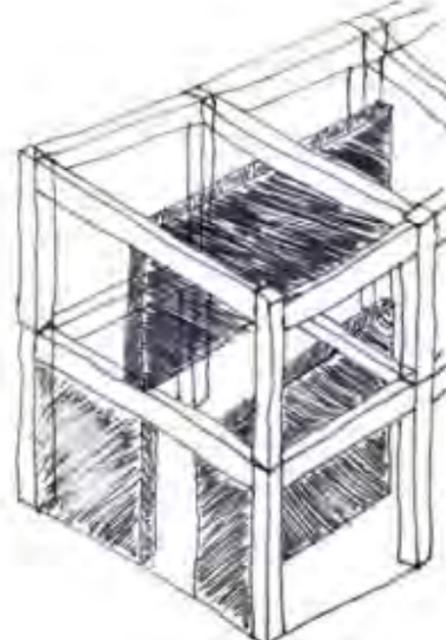
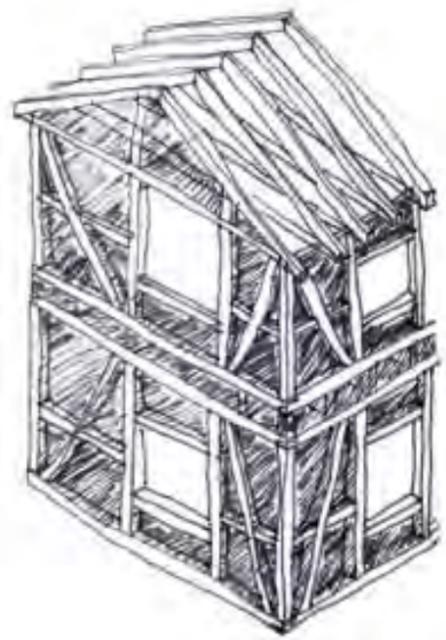


A joint venture of:

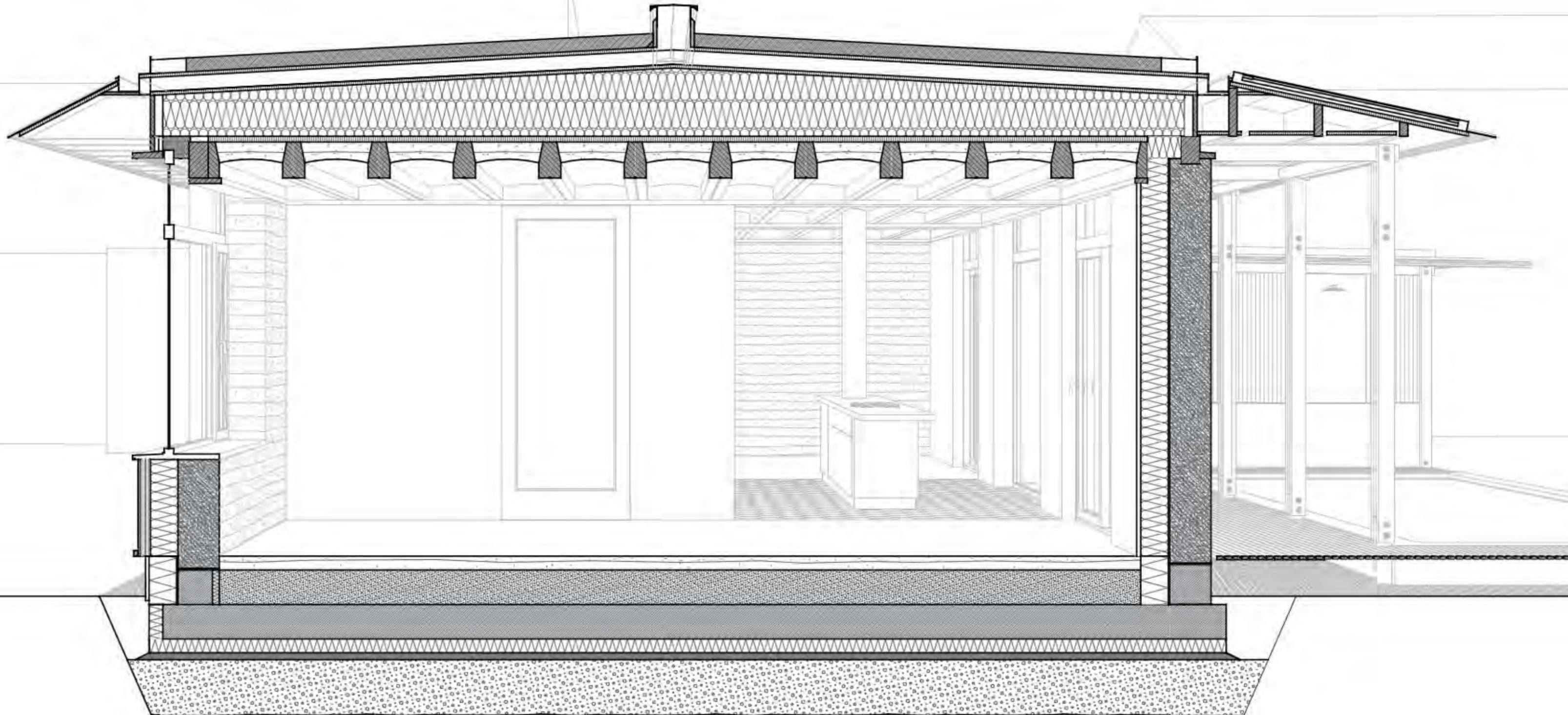
LEHM
TON
ERDE



Evaluation of Suitable Earth and Timber Application



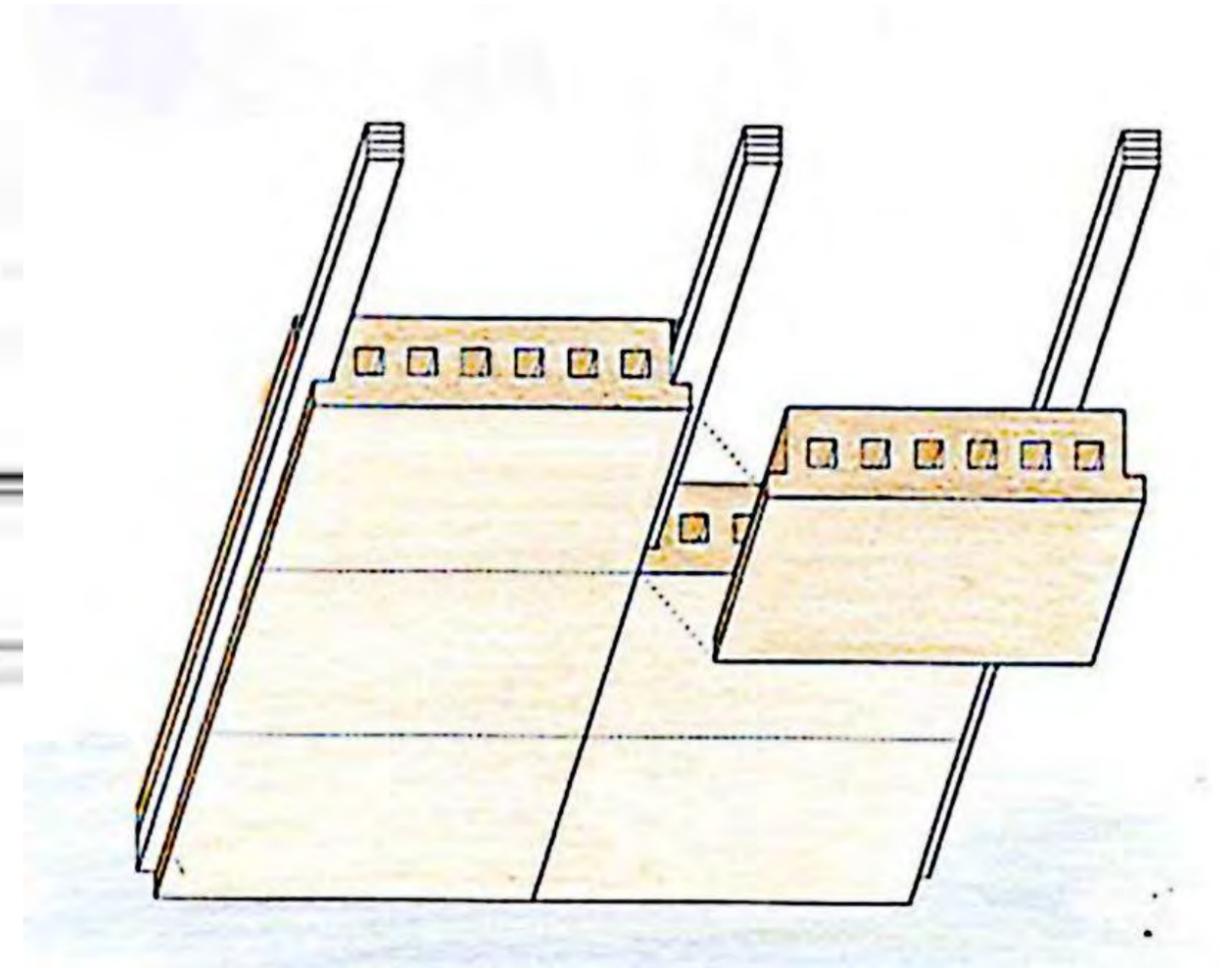
Specialist Detailing in Earth and Timber



Concepts for Sourcing, Materiallogistics and Fabrication



Panelization and Assembly Concepts



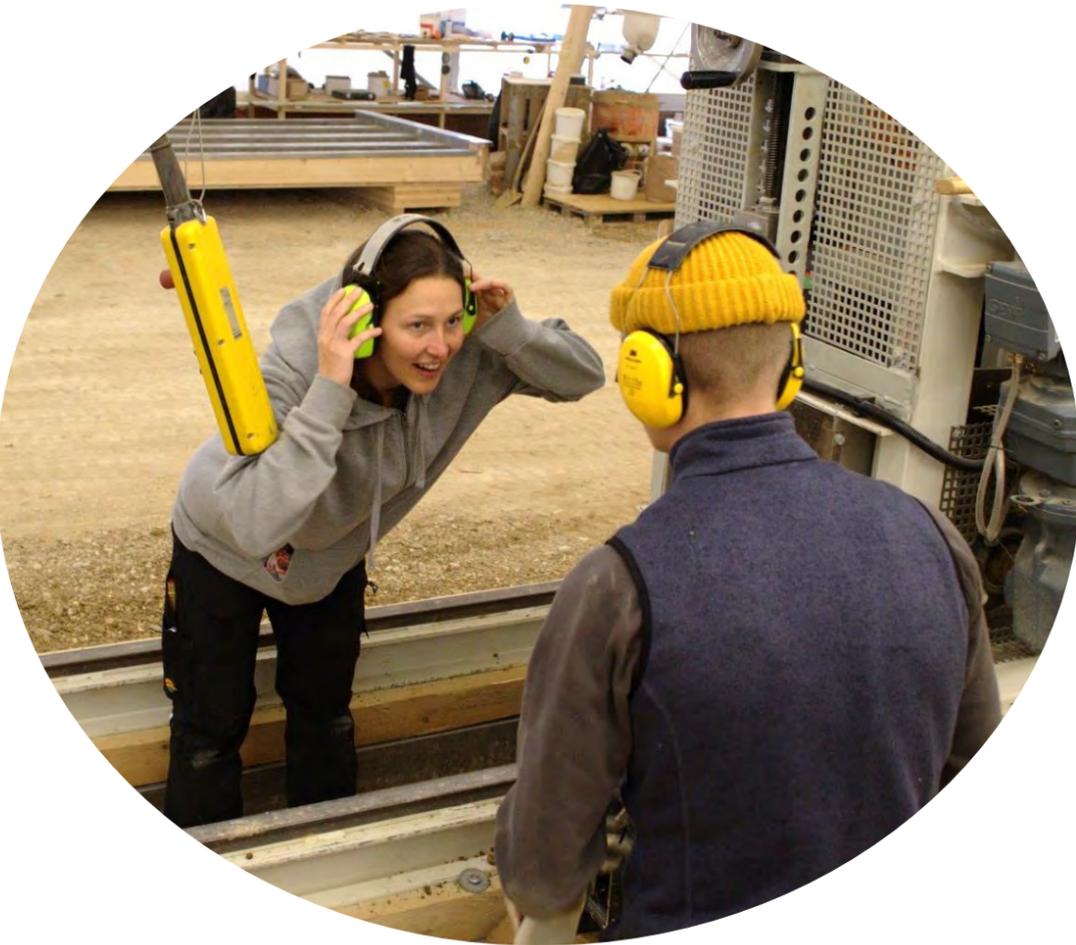
Sustainable Construction Needs Everyone

Collaboration & Communication

Sustainability & Innovation

Creativity & Flexibility

Courage & Energy



LEHMIT

Let's Plan our
Future Together
in Earth and
Timber!

www.lehmit.com

