



让我们共同打造气候中和的未来
Building a climate-neutral future together



中华人民共和国
住房和城乡建设部



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skat Swiss Resource Centre and
Consultancies for Development

Sino-Swiss ZEB Project - Capacity Building at Nanjing University

中瑞零碳建筑项目 – 南京大学能力建设活动

Circular Construction – Swiss Experience

循环建造——瑞士经验

April 10th 2025, 2025年4月10日

Prof. Dr. Andri Gerber, IKE, ZHAW

Andri Gerber教授，苏黎世应用科技大学建筑构造设计研究所联合负责人

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Why and when destroy building stock?
为何以及何时拆除既有存量建筑？

The first Re-use building in Switzerland
瑞士首个再利用建筑实例

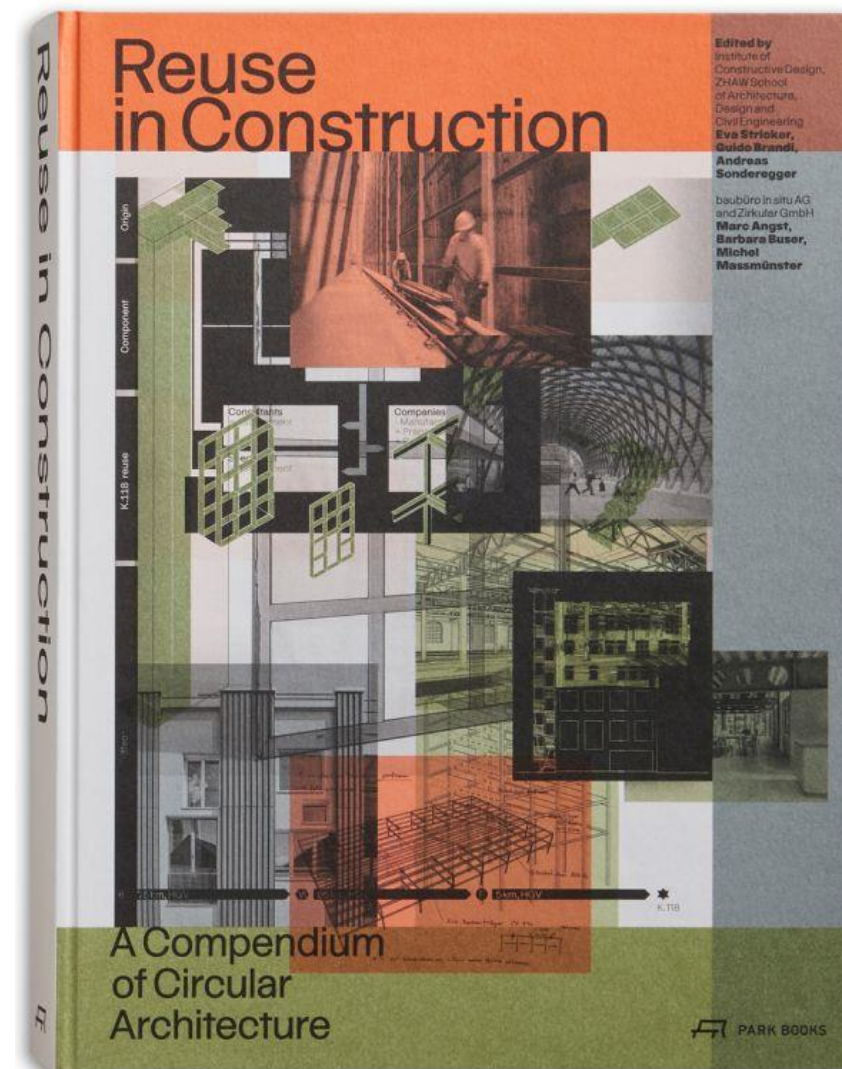
Build to unbuild
为了未建成的建造

Why and when destroy building stock?
为何以及何时拆除既有存量建筑？

00 Institute constructive Design

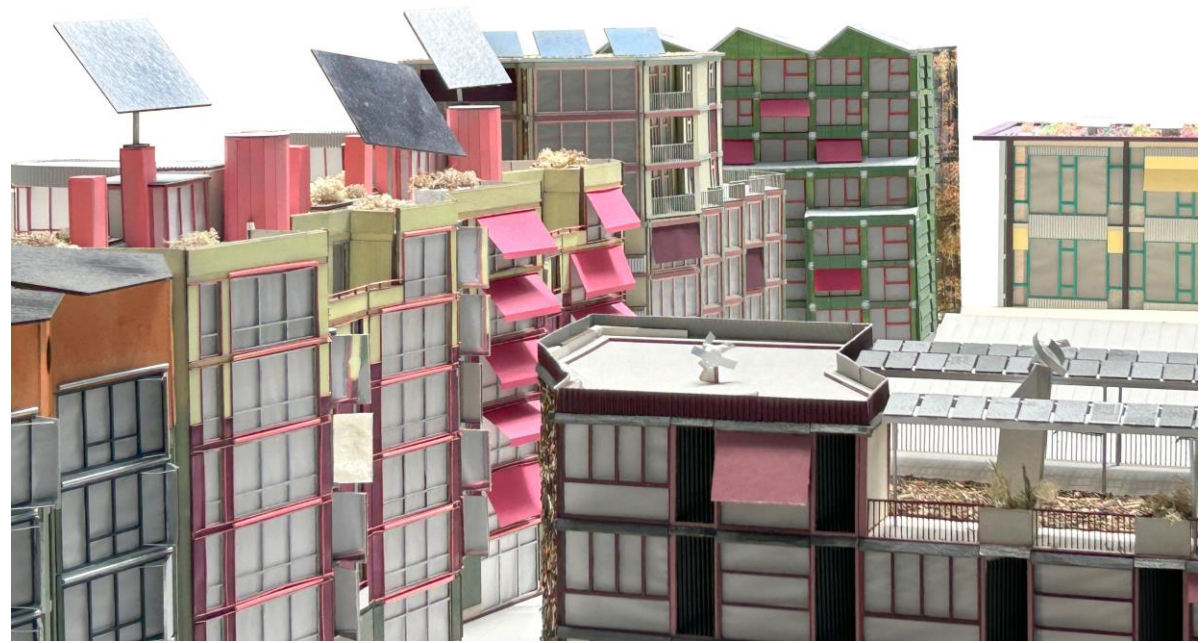


© IKE ZHAW 2024, 2021 《以气候意识进行设计：历史、研究与实践》



Institute Constructive Design (IKE), ZHAW
构造设计研究所（IKE），瑞士苏黎世应用科技大学（ZHAW）

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House without heating, Summersemester 2024
无供暖设施的建筑设计，2024年夏季学期

00 Institute constructive Design



„Werkstückhalle“ with Mockups, IKE, ZHAW
建筑工作坊的1:1打样模型, IKE, ZHAW



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Re-use of cast concrete, IKE, ZHAW
浇筑混凝土部件再利用, IKE, ZHAW



01 Re-use: paradox of destruction. Building stock as mine

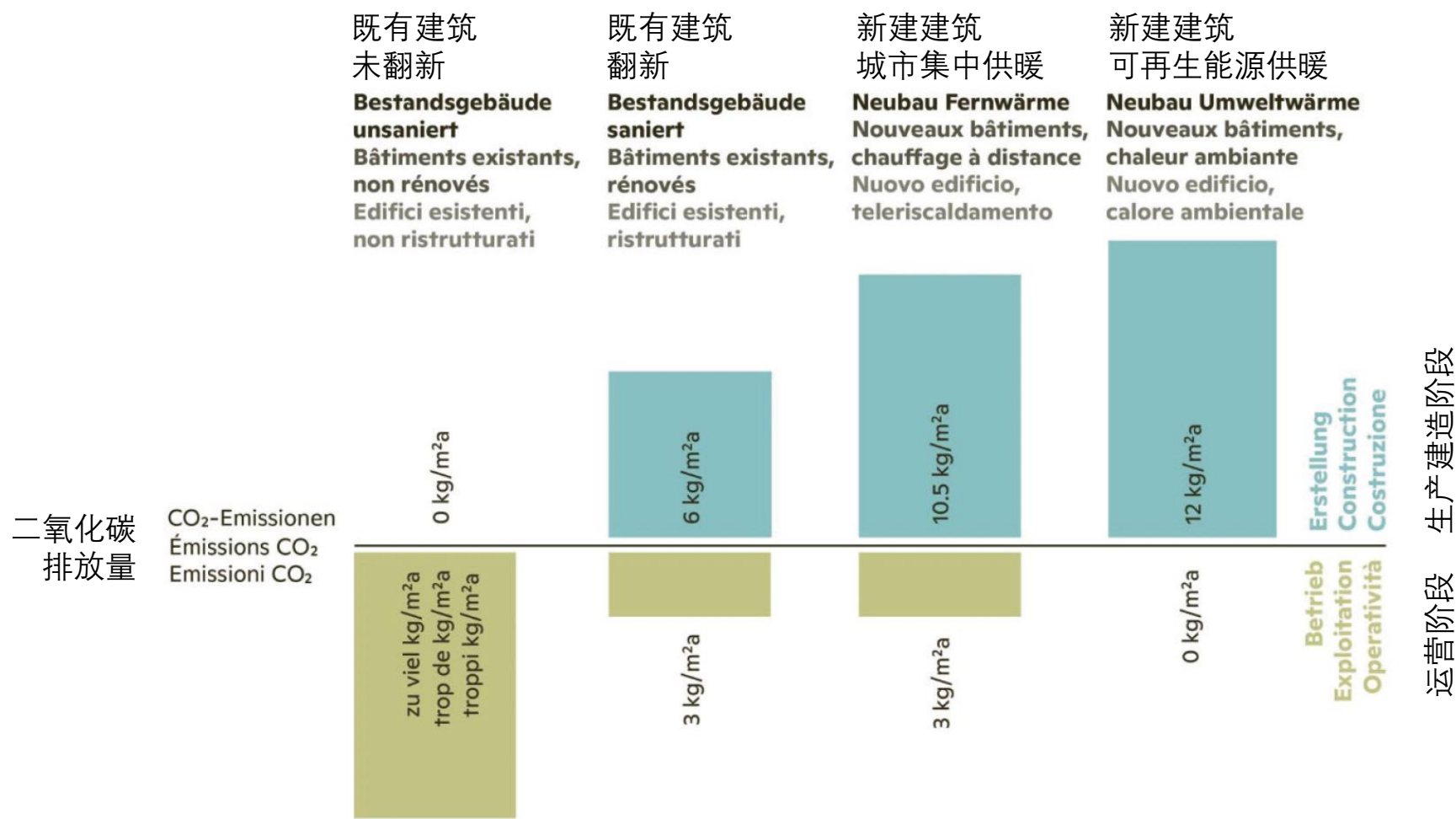


© IKE ZHAW



Esch und Sintzel, Weinlager Basel, 2023
Esch Sintzel建筑事务所, 巴塞尔酒窖改建, 2023

01 Re-use: paradox of destruction. Building stock as mine



New building vs. Old building refurbished, source: Jürg Lamster, Durable
新建与改建策略的碳排放比较, 来源: Jürg Lamster, 《耐久性》



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Genealogie des Hauses

建筑谱系图

30 A.D.



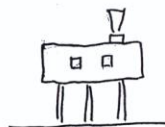
1030 A.D.



1830 A.D.



1930 A.D.



2030 A.D.

LK 88



MODERNISMUS = VORÜBERGEHENDE
ABLEHNUNG des ARCHETYPUS

现代主义建筑 = 过客
拒绝原型样式化的设计



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skat

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Genealogie des Hauses

30 A.D.



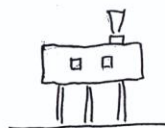
1030 A.D.



1830 A.D.



1930 A.D.



2030 A.D.

LK 88

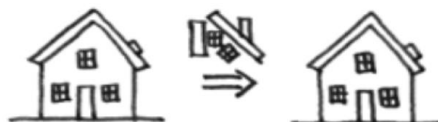


MODERNISMUS = VORÜBERGEHEND
ABLEHNUNG des ARCHETYPUS

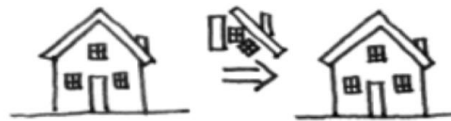
Source: Leon Krier, 1995

A BRIEF HISTORY OF CONSUMPTION

> 50 A.D.



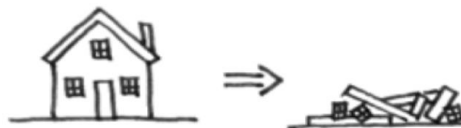
> 1050 A.D.



> 1850 A.D.



> 1950 A.D.



> 2050 A.D.



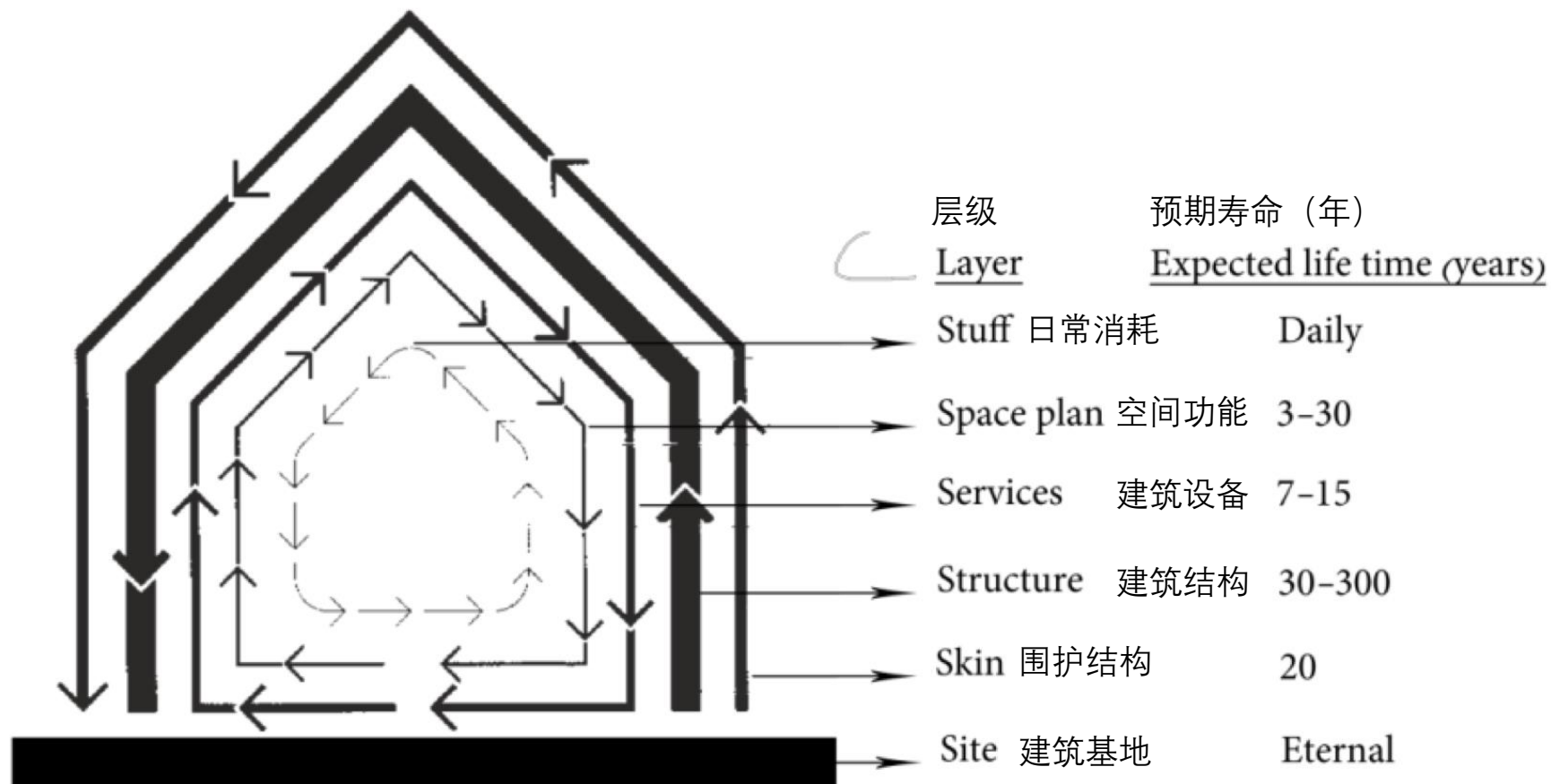
THE HISTORY OF ARCHITECTURE AS A HISTORY OF REUSE

Daniel Stockhammer, 2020

建筑作为消费品的简史

建筑历史作为再利用的历史

01 Re-use: paradox of destruction. Building stock as mine



Source: Stewart Brand, 1994

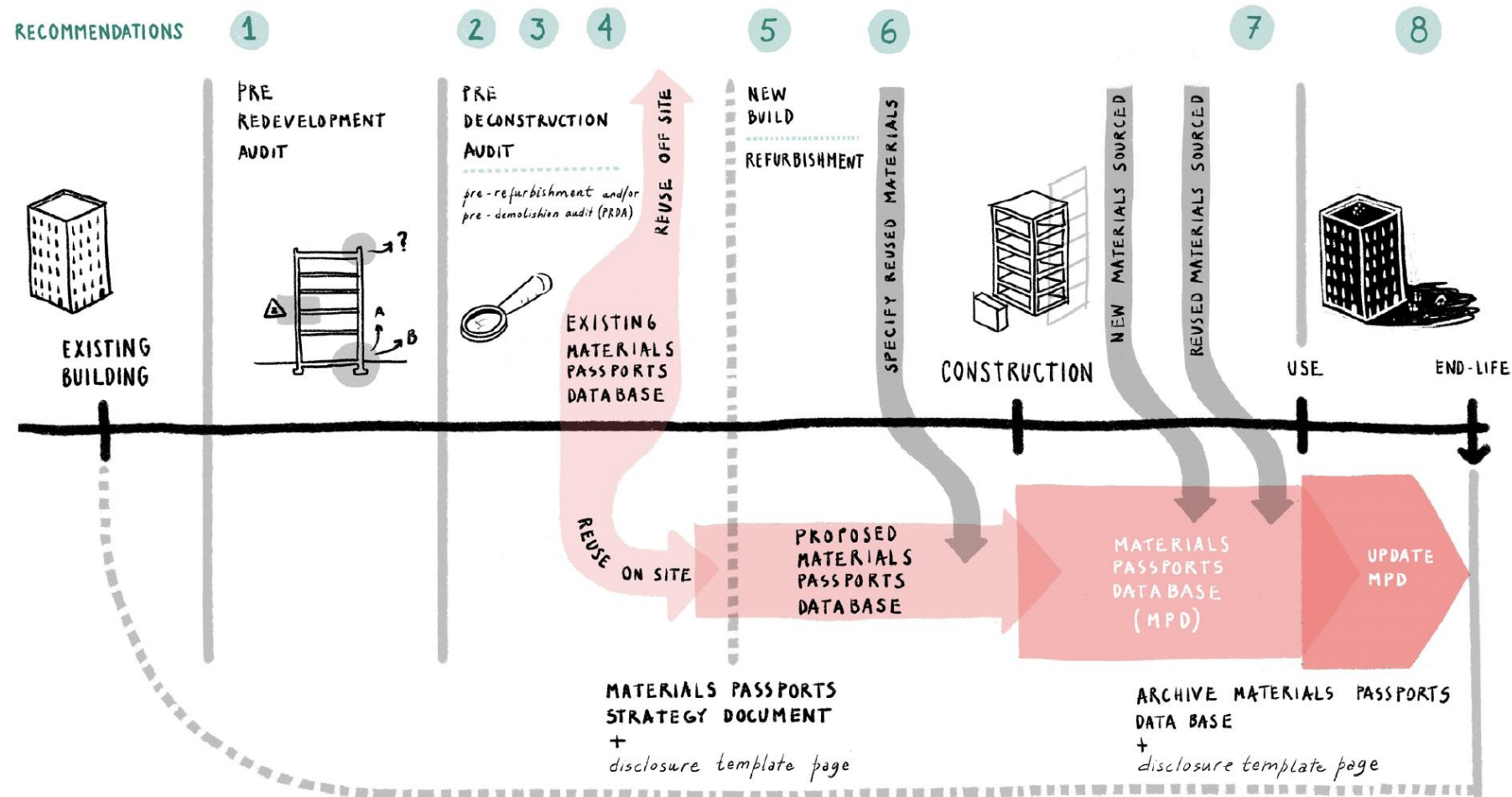
来源: 斯图尔特·布兰德, 1994

01 Re-use: paradox of destruction. Building stock as mine



SLIK Architects, Zürich, Officebuilding YOND, 2019 Specific vs. Generic
SLIK建筑事务所，苏黎世，YOND办公楼，2019 定制设计与普适设计

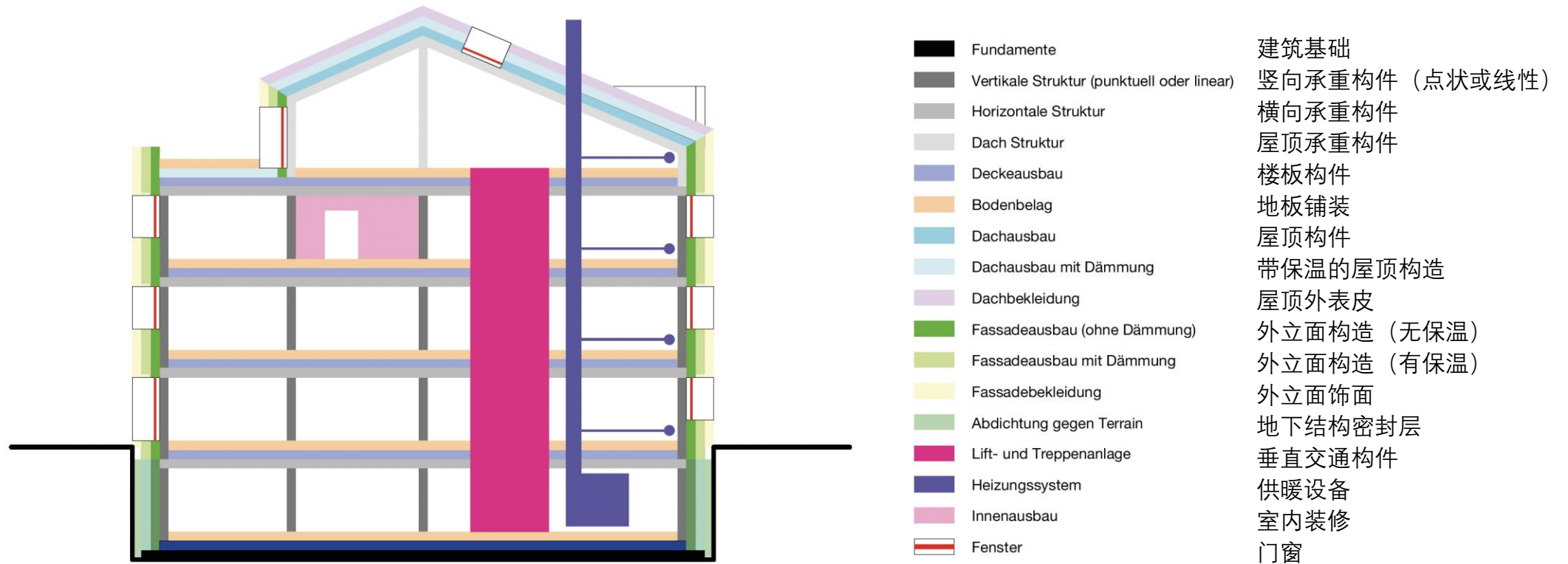
01 Re-use: paradox of destruction. Building stock as mine



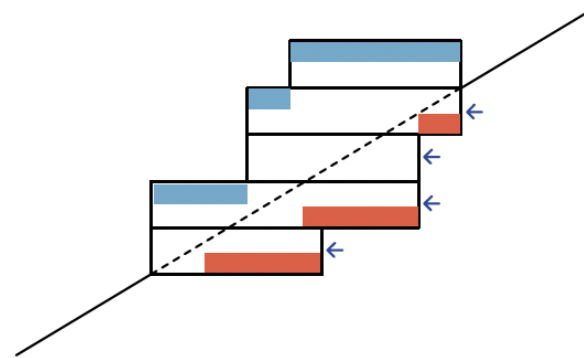
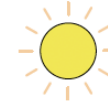
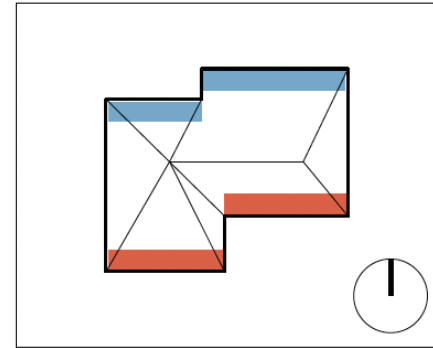
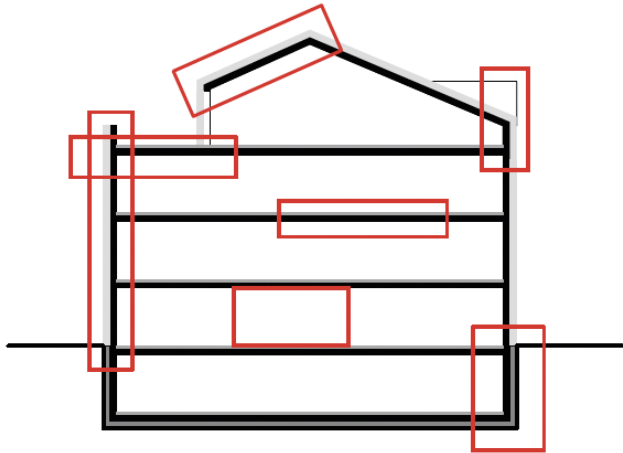
Source: Dr Ana Costa, Rachel Hoolahan, Material Passports, Accelerating Material Reuse in Construction, 2024

来源：安娜·科斯塔博士，瑞切尔·霍拉汉，《建材护照：加速建筑材料再利用》，2024

01 Re-use: paradox of destruction. Building stock as mine



01 Re-use: paradox of destruction. Building stock as mine

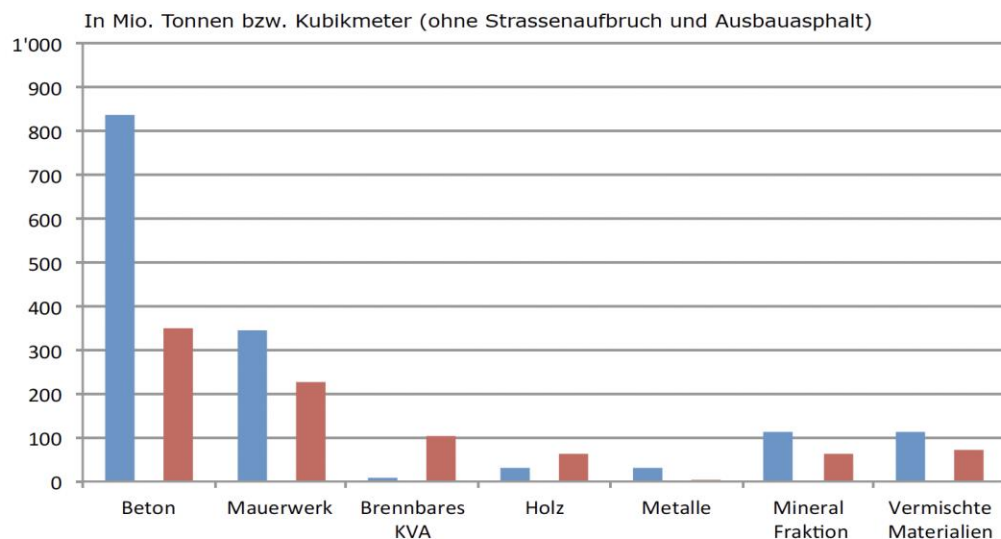
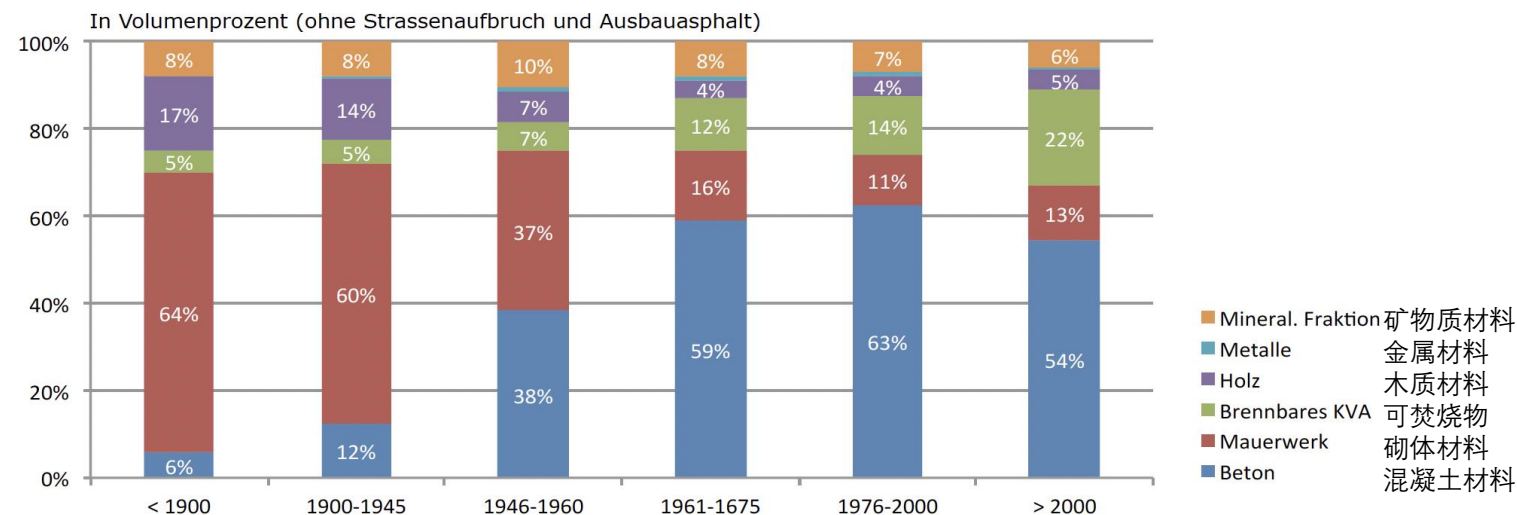


01 Re-use: paradox of destruction. Building stock as mine

建筑材料按年代分类

Building materials by age

Quelle: Gebäudemodell Wüest & Partner 2015



既有的现存建筑材料量

Building materials in stock

Quelle: Gebäudemodell Wüest & Partner 2015

01 Re-use: paradox of destruction. Building stock as mine

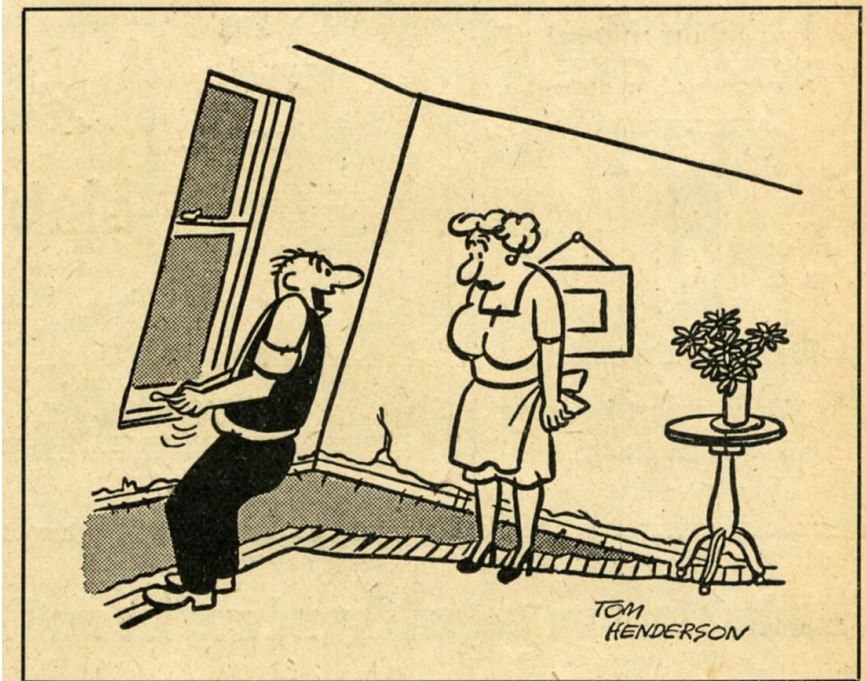
重质构造



1930

轻质构造

Der Leichtbau

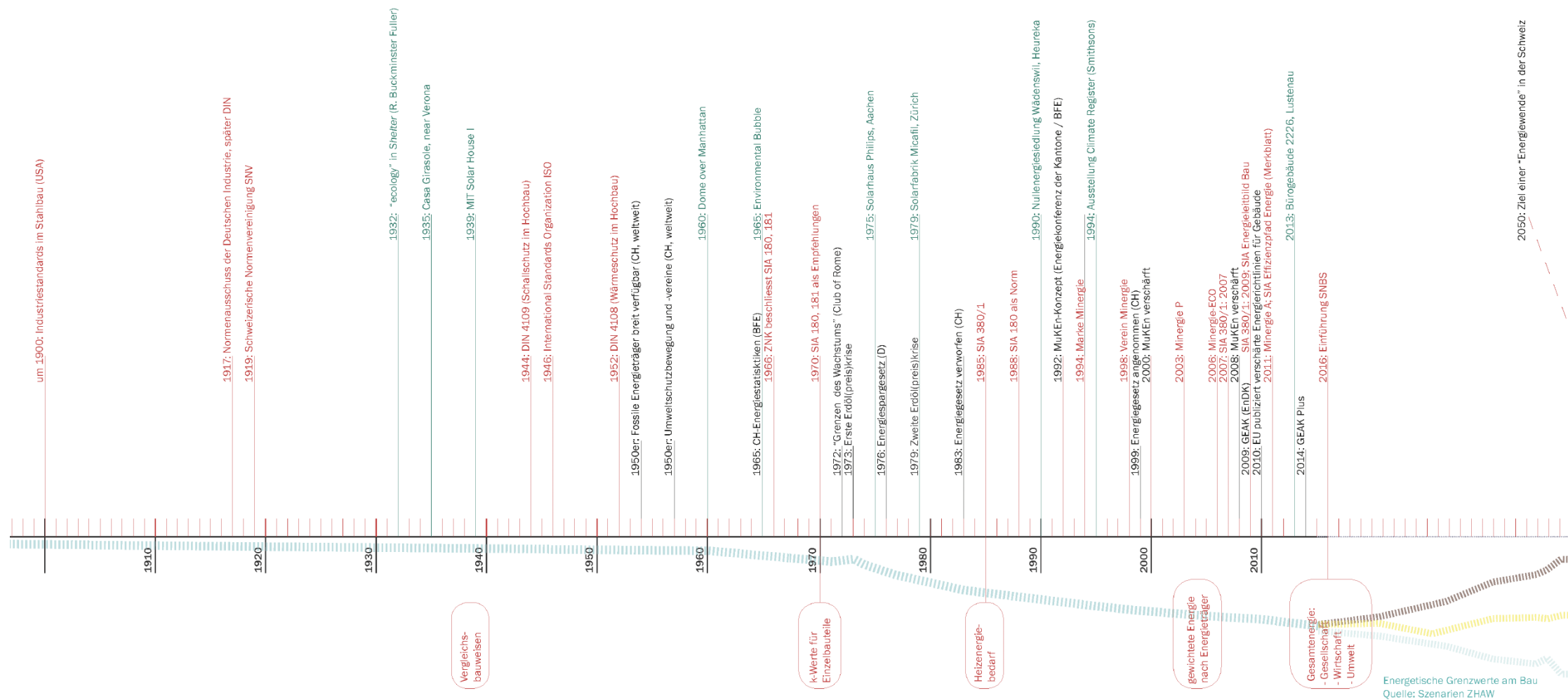


. . . . es gibt schon nach!

„Heute“, Berlin, Nr. 25/1946

1946

01 Re-use: paradox of destruction. Building stock as mine



02 Re-use: Case Study K.118

From a linear to a circular construction 从线性建造方式转向循环建造方式

Linear phases:

Manufacturing - Construction - Operational - Disposal

线性建造方式的历程阶段:

建材生产 - 现场建造 - 建筑运营 - 废弃处理

A circular process has different circle: **循环建造**区分不同的循环方式:

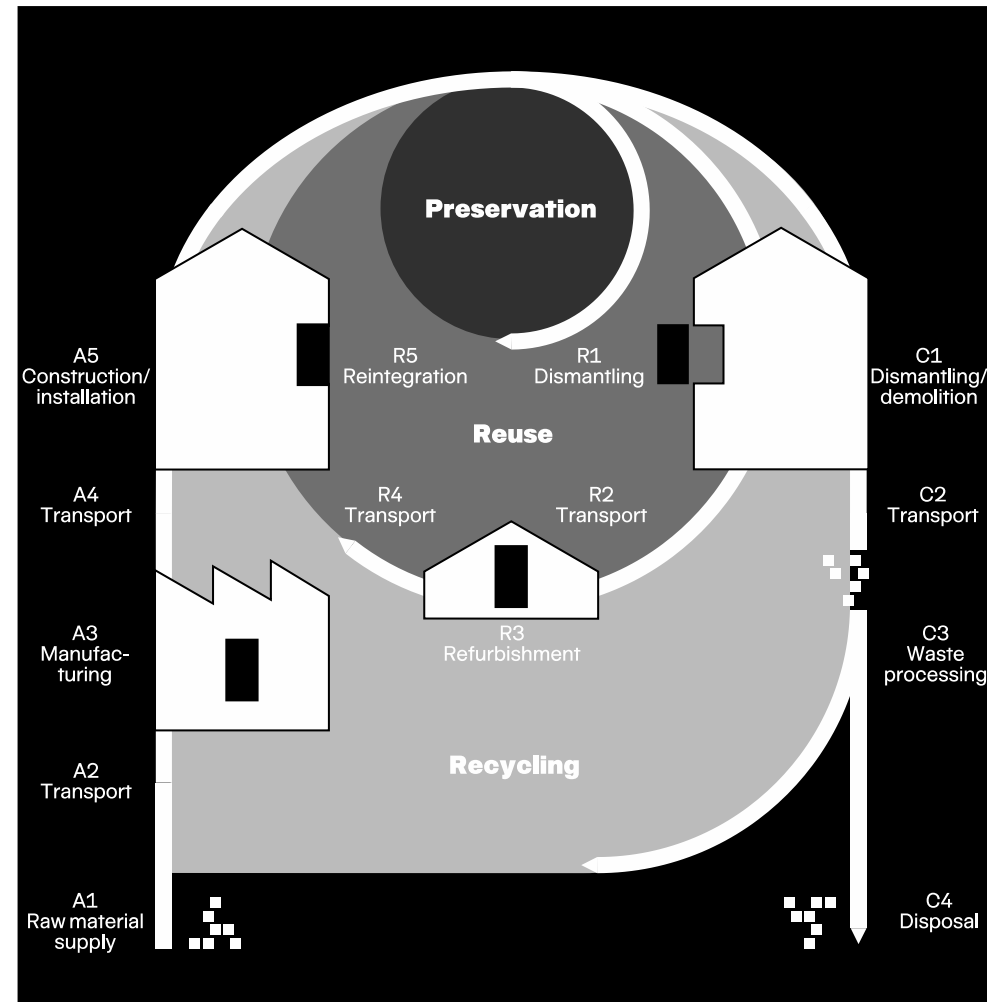
> **Recycling** of building fabric with loss of form to new building materials
回收利用，建筑材料将遗失其原有的物料形式，转化为新建筑材料

> **Reuse** of whole building components without loss of shape, with the same function or with another function

直接再利用，针对整个建筑部件，不损失原有的物料形式，可以保持相同功能或用于其他功能

> **Preservation** of existing building fabric by repair, reconstruction, extension

保护修缮：通过修复、重建、扩展来保持现有建筑材料



Cycle diagram based on the life cycle model according to
SN EN 15804+A1 / SIA 490.052+A1

基于全生命周期模型的循环示意图，依据SN EN 15804+A1 / SIA 490.052+A1

02 Re-use: Case Study K.118

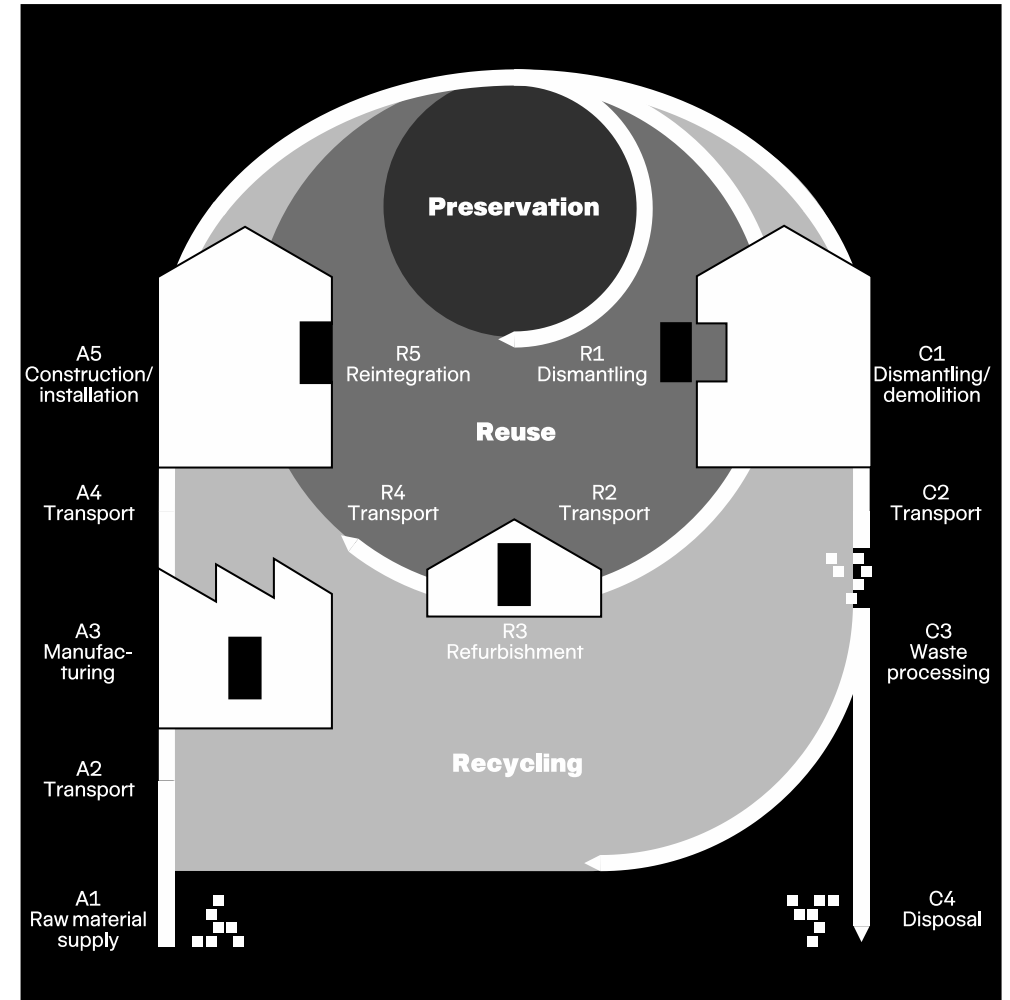
From a linear to a circular construction 从线性建造方式转向循环建造方式

Ideally, all three strategies start already in the design of new buildings as future reparability and deconstructability

理想情况下，所有这三种策略在新建筑设计时就应考虑未来的可修复性和可拆卸性。

= "Design for Disassembly" 可拆卸设计

- **Preservation** and **Recycling** are already established in practice
保护修葺和回收再利用已经在现有的建筑实践中得以应用
- **Reuse** and **Reusability** are still market niches
直接再利用和可再利用性仍然是既有设计市场上未开拓的处女地



Cycle diagram based on the life cycle model according to
SN EN 15804+A1 / SIA 490.052+A1

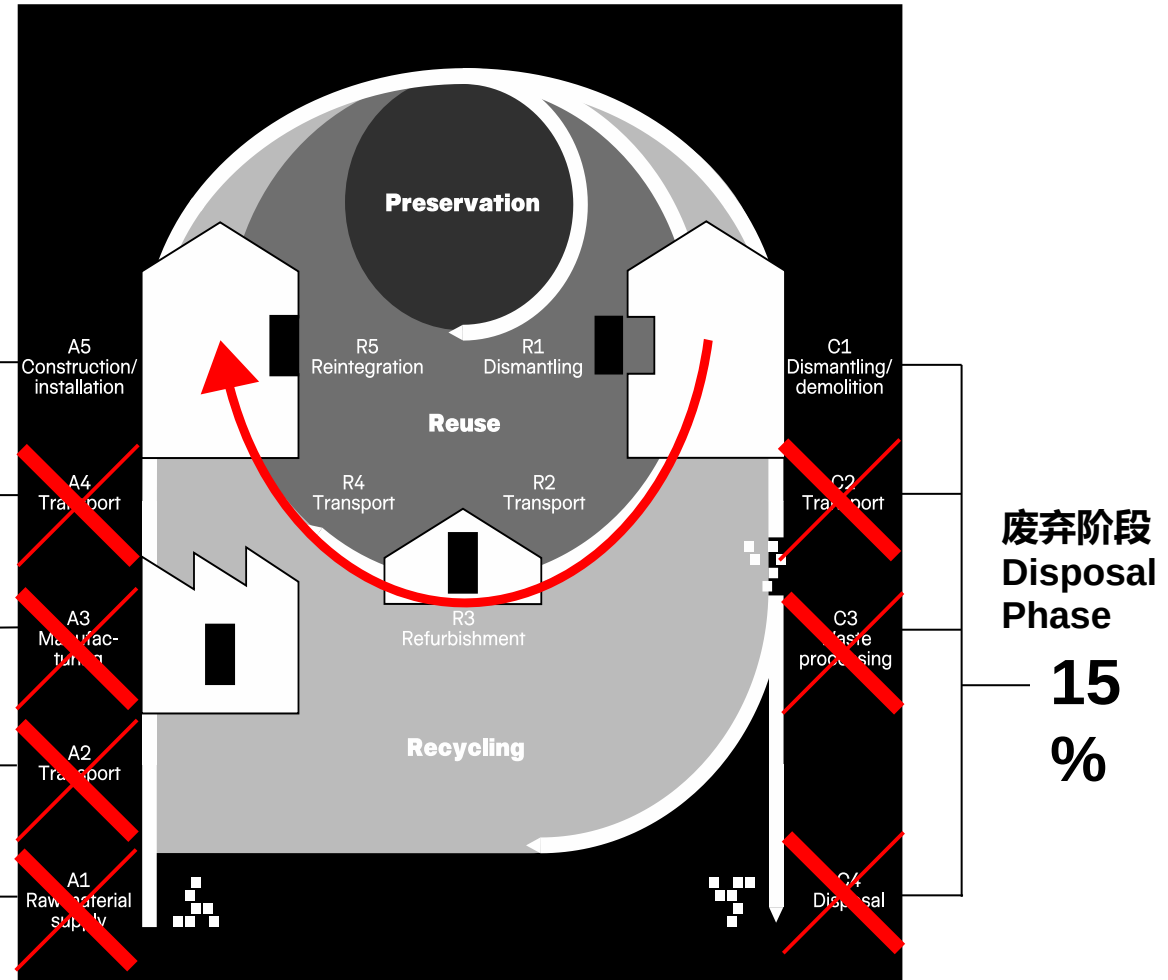
02 Re-use: Case Study K.118

From a linear to a circular construction
从线性建造方式转向循环建造方式

建设阶段
Construction
Phase **10**
%

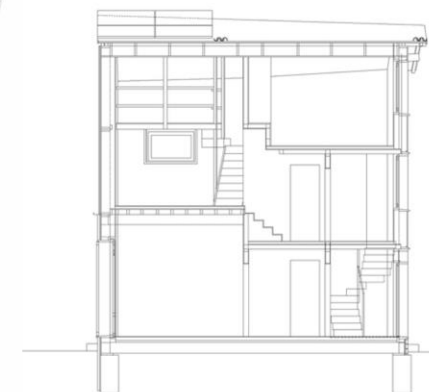
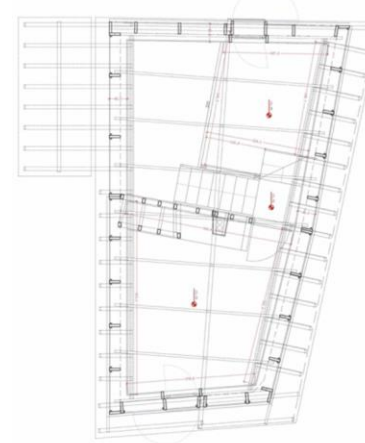
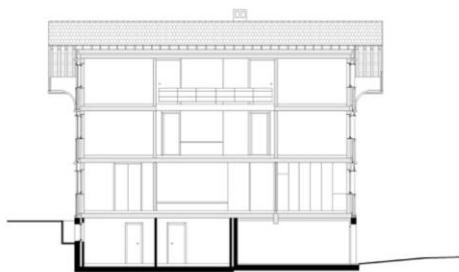
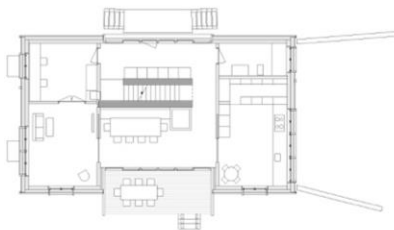
生产阶段
Manufacturing
Phase **75**
%

温室气体在: Greenhouse gas emissions in:



Cycle diagram based on the life cycle model according to
SN EN 15804+A1 / SIA 490.052+A1

02 Re-use: Case Study K.118



Haus K Alpnach, 2018 • Client: private • Architects: Seiler Linhart, Lucerne / Sarnen
阿尔普纳赫K房，2018年 • 业主：私人 • 建筑师：塞勒·林哈特，卢塞恩 / 萨尔嫩

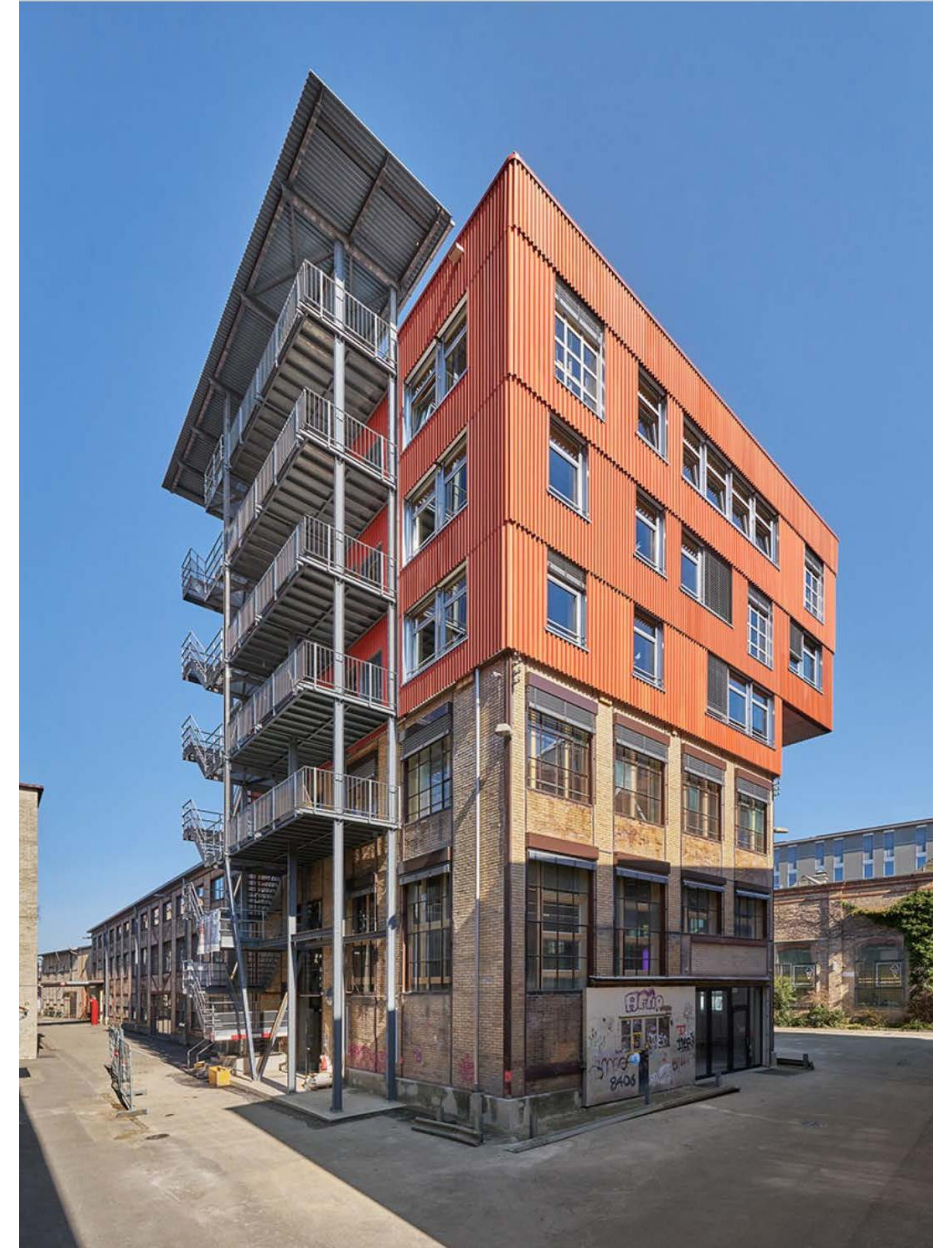
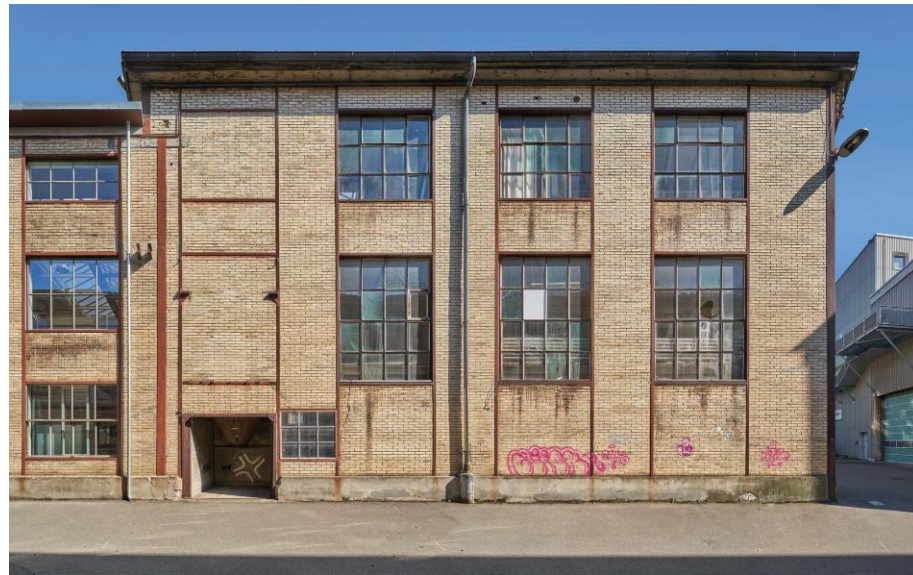
Casa a Laveno, Laveno, Varese, 2021 • Client: private • Architects: Studio Albori, Milan
拉韦诺住宅，拉韦诺，瓦雷泽，2021年 • 业主：私人 • 建筑师：阿尔博里工作室，米兰

02 Re-use: Case Study K.118

K.118 Office Building,
Winterthur, Switzerland,
Architect: Baubüro in situ
K.118办公楼,
瑞士温特图尔,
建筑师: Baubüro in situ

Building addition 扩建

Everything you see is reused
您所看到的一切皆为直接再利用的建材和构件



02 Re-use: Case Study K.118

K.118 Office Building,
Winterthur, Switzerland,
Architect: Baubüro in situ

The completed interior in one
of the office spaces
建成后的办公空间室内效果

The structure and trapezoidal
sheet metal, windows, parquet
flooring and even radiators
are reused

在该空间中，钢结构、梯形金属
压型板、窗户、地板铺装，甚至
采暖散热片均为直接再利用的建
筑材料。

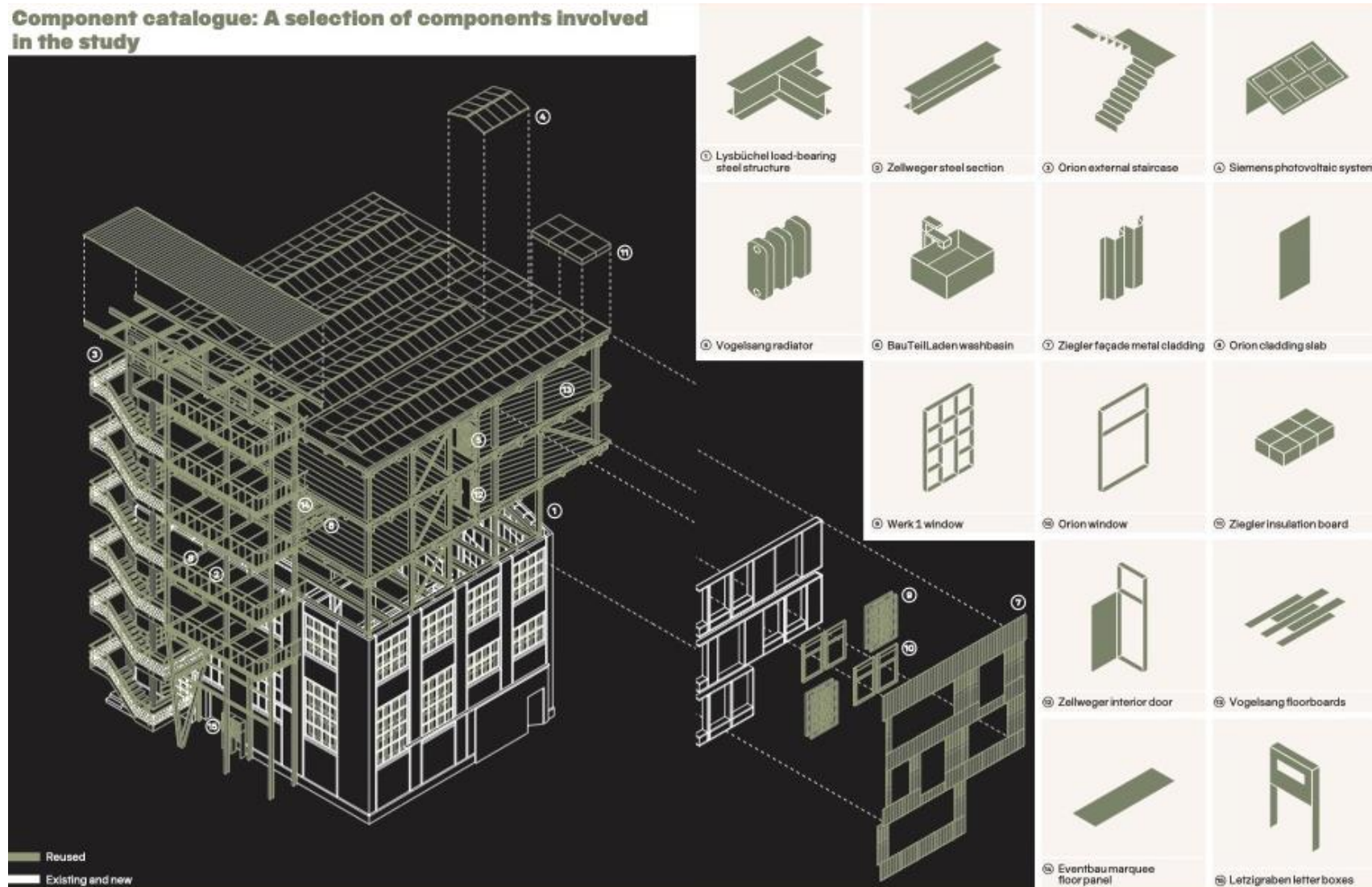
Everything you see is reused
您所看到的一切皆为直接再
利用的建材和构件



02 Re-use: Case Study K.118

K.118 Office Building,
Winterthur, Switzerland,
Architect: Baubüro in situ
K.118办公楼,
瑞士温特图尔,
建筑师: Baubüro in situ

Everything in green is reused
绿色部分皆为直接再利用



02 Re-use: Case Study K.118

K.118 Office Building,
Winterthur, Switzerland,
Architect: Baubüro in situ

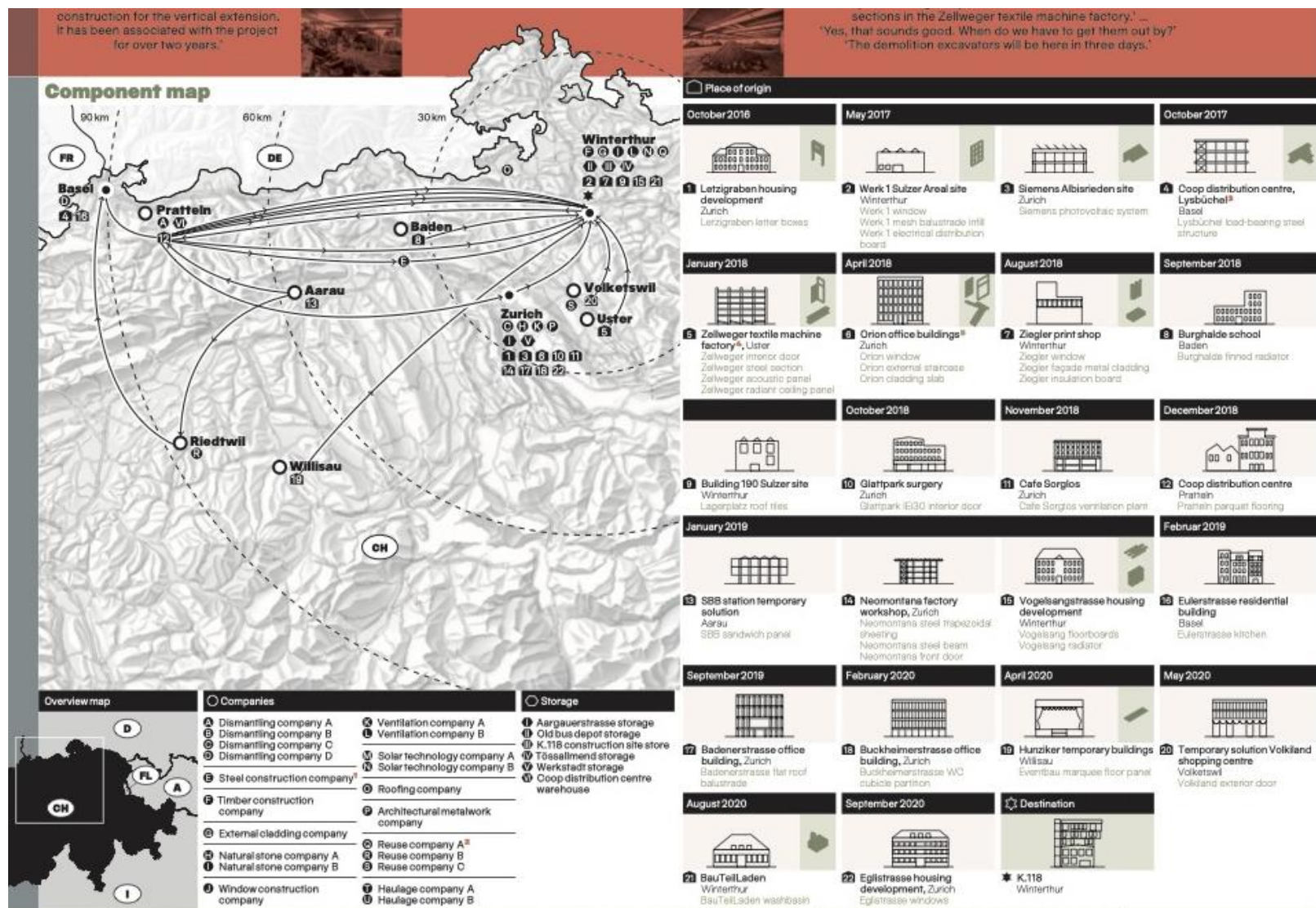
K.118办公楼,
瑞士温特图尔,
建筑师: Baubüro in situ

To have a Re-use construction site means
to follow in parallel more demolition sites.

For K118 were 23.

拥有一个再利用建筑工地意味着同时跟进
多个拆除工地。在K118项目中，意味着同
时有23个拆除工地。

And arrives from max. 90 km away
而拆除材料来自于最多90公里外的工地。

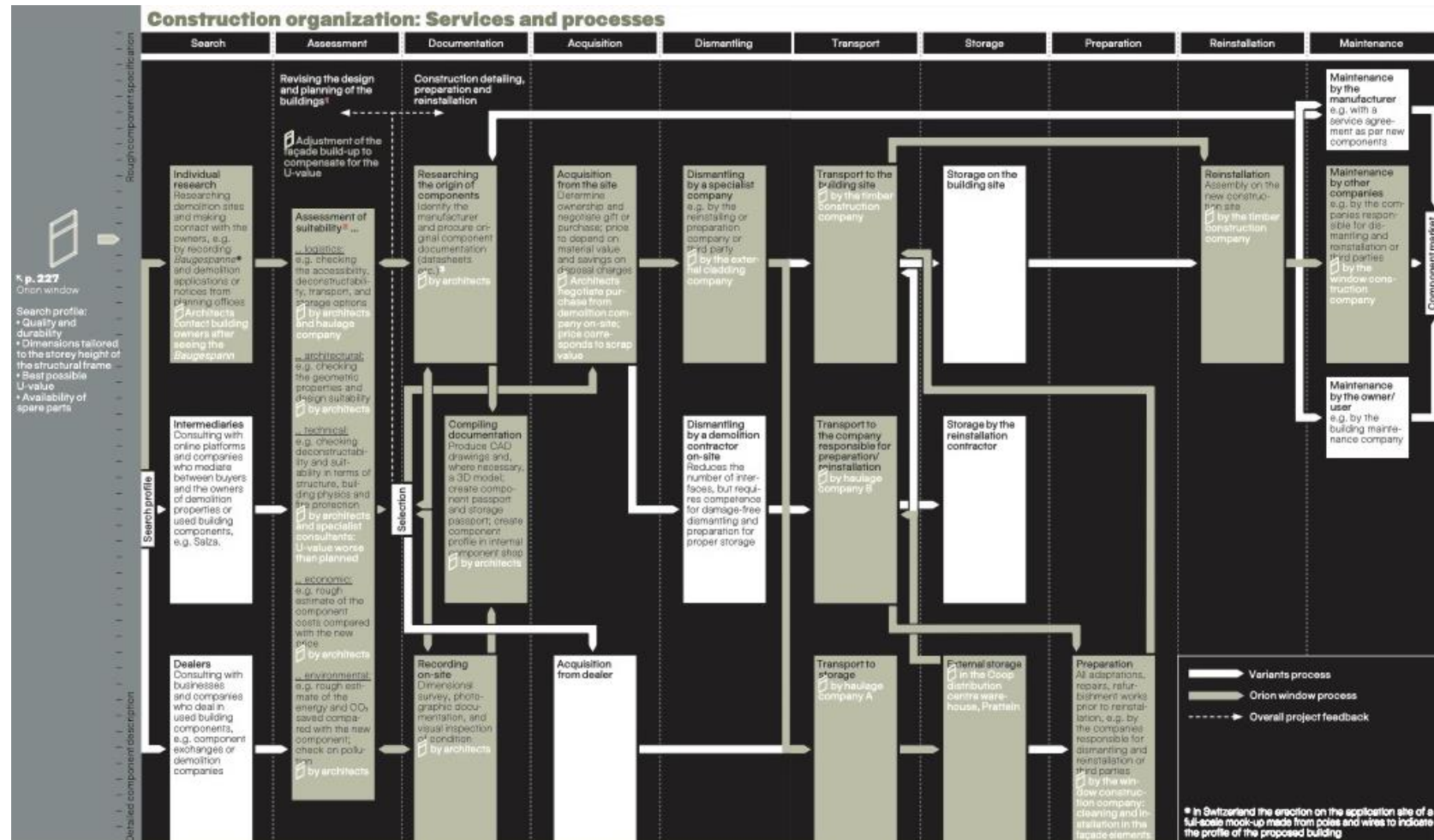


02 Re-use: Case Study K.118

K.118 Office Building, Winterthur, Switzerland,
Architect: Baubüro in situ

Every reused component should pass a 10-Phase Process
每个再利用组件应经过10个阶段的流程。

Each phase can be executed by different companies. This increases the coordination and contracts to be executed, but also allows new business models to be created.
每个阶段可以由不同的公司执行。这虽然增加了协调工作和签订合同的复杂性，但也提供了机会创建全新的商业模式。



02 Re-use: Case Study K.118

K.118 Office Building, Winterthur, Switzerland,
Architect: Baubüro in situ

Four possible Business Model with Re-use:
直接再利用的四种可能的商业模式:

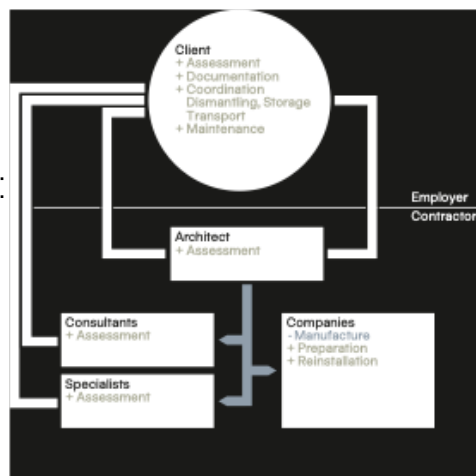
A circular real estate client that has enough buildings and component that can reuse all the materials from their own properties.

循环建造型房地产商: 拥有足够多的既有物业和既有构件的客户，可以从自有物业中再利用所有的建筑材料。

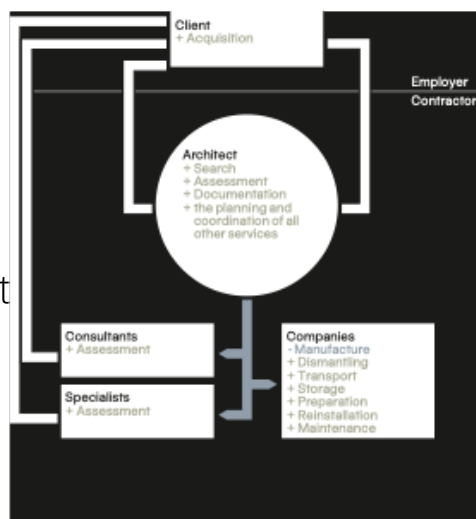
A circular planner, like Baubüro in situ, that start to collect and stock the components and plan them in their future projects

循环建造设计师: 如Baubüro in situ, 开始收集和储存建筑构件，并在未来项目中进行规划设计。

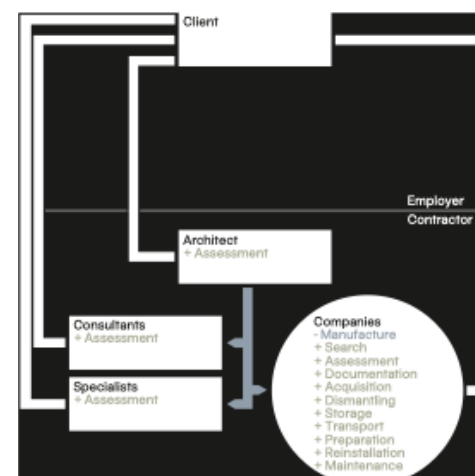
Construction organization: Circular models



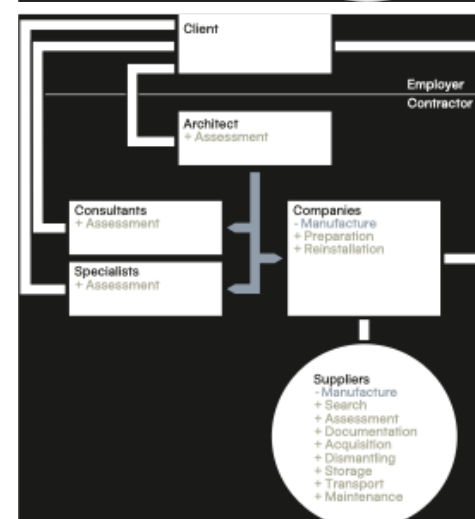
Circular client
SBB



Circular planners
Baubüro in situ
Rotor DC



Circular business
Philips lights



Circular suppliers
Platform Opalis (EU)

02 Re-use: Case Study K.118

K.118 Office Building, Winterthur,
Switzerland,
Architect: Baubüro in situ

Four possible Business Model with Re-use:
直接再利用的四种可能的商业模式:

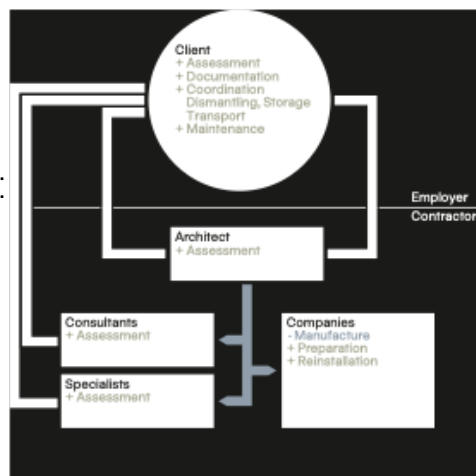
A circular business that owns the installed components: after the end of the life, the product is repaired, collected, refurbish and reinstalled.

循环建造租赁商: 拥有可供租赁安装的建筑构件的企业。在使用寿命结束后, 产品会被修理、收集、翻新并重新安装至其他项目。

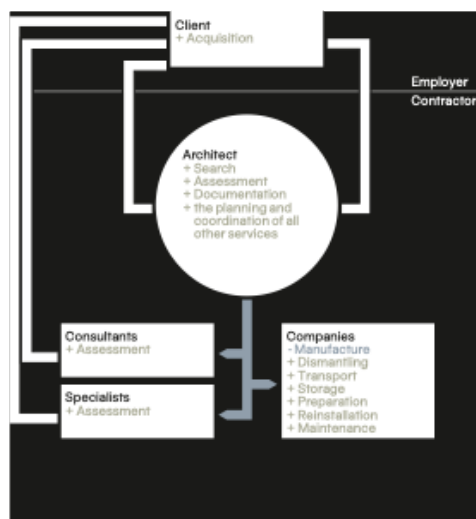
A circular suppliers, like the one in the Opalis Platform (opalis.eu) that specialized in the reuse of a specific component.

循环建造供应商: 例如Opalis平台 (opalis.eu) 中的供应商, 专注于特定构件的再利用。

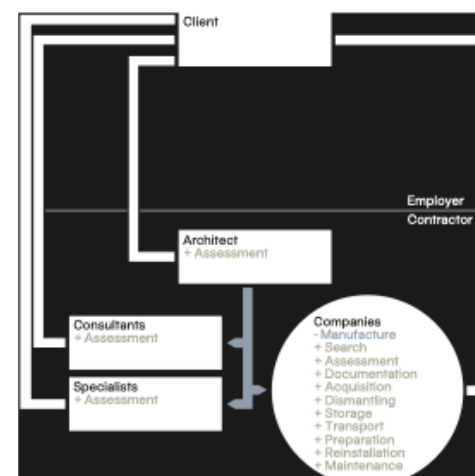
Construction organization: Circular models



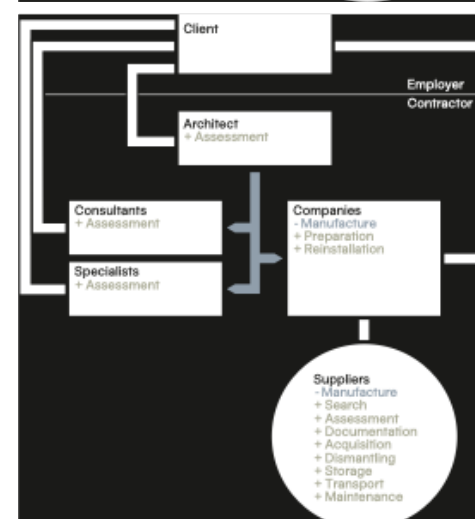
Circular client
SBB



Circular planners
Baubüro in situ
Rotor DC



Circular business
Philips lights



Circular suppliers
Platform Opalis (EU)

02 Re-use: Case Study K.118

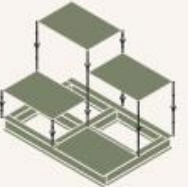
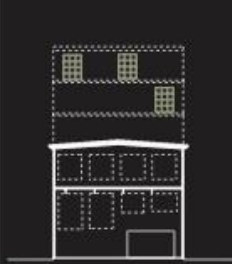
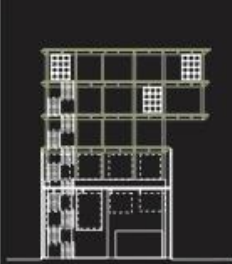
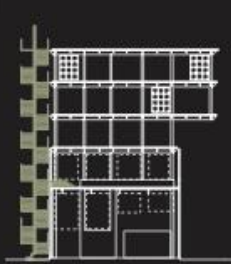
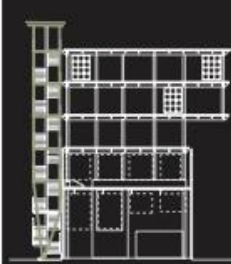
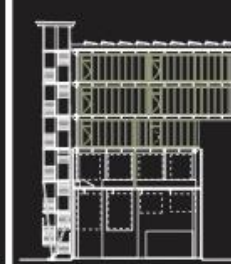
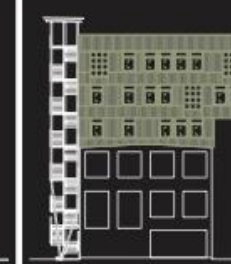
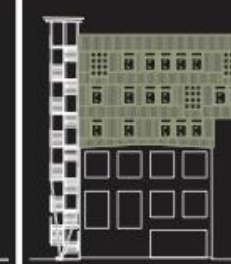
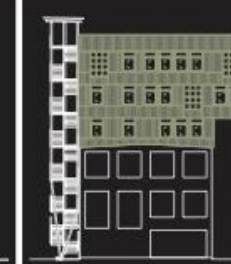
K.118 Office Building,
Winterthur, Switzerland,
Architect: Baubüro in situ

The design process is different
设计过程截然不同

Forms follows availability
建筑形式根据可用的材料和构件确定

Example of the steel structure: the
cantilever volume is a spontaneous
result coming from the geometry of
the existing steel structure
以钢结构为例：悬挑体量是回收既有
钢结构本身的几何形状自发导致形成
的结果。

Design and construction: Process

Origin	 Werk 1, Sulzer Areal site	 Coop distribution centre, Lysbüchel	 Orion office buildings	 Orion office buildings	 Zellweger textile machine factory	 Huntziker temporary buildings	 Ziegler print shop	 Orion office buildings	
Component	 Werk 1 window ↖ p. 226	 Lysbüchel load-bearing steel structure ↖ p. 218	 Orion external staircase ↖ p. 220	 Orion cladding slab ↖ p. 225	 Zellweger steel section ↖ p. 219	 Zellweger interior door ↖ p. 229	 Eventbau marquee floor panel ↖ p. 231	 Ziegler façade metal cladding ↖ p. 224	 Orion window ↖ p. 227
K.118 reuse									
Effect									

02 Re-use: Case Study K.118

K.118 Office Building,
Winterthur, Switzerland,
Architect: Baubüro in situ

The steel structure reused from a
demolishing site in Basel
来自巴塞尔拆除工地的钢结构

63 t of steel profiles reused
再利用63吨重的钢制型材

The existing structural raster fitted
perfect the geometry of the “new”
K118
现有的结构网格完美契合“新”K118
的几何形状。



02 Re-use: Case Study K.118

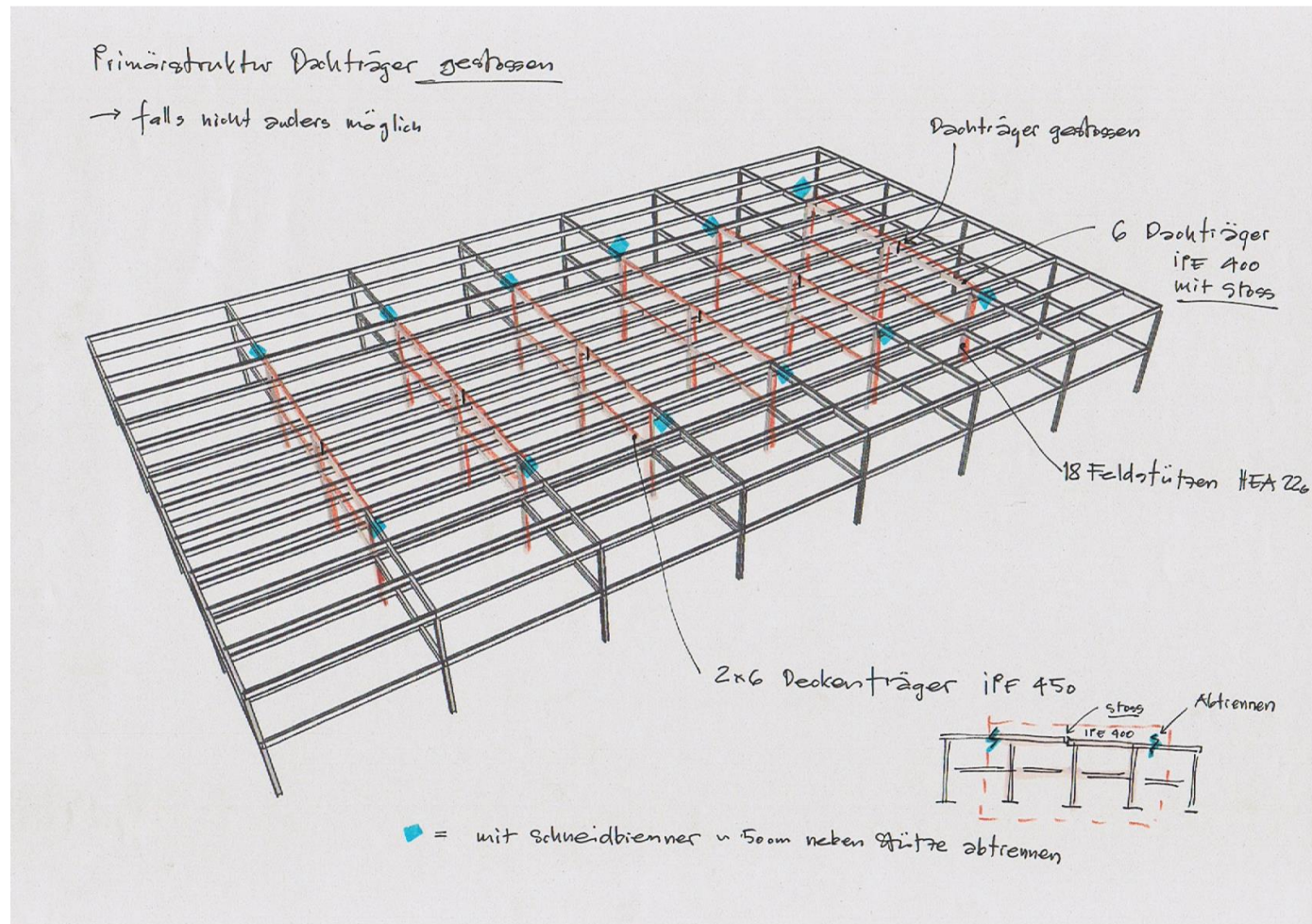
K.118 Office Building,
Winterthur, Switzerland,
Architect: Baubüro in situ

The Structural Engineer (who will sign the structural calculation of the building) approves the reuse of the steel structure because he knows the original function of the building and slabs and has in his possession the original plans of the engineer who designed the building.

结构工程师（将签署建筑结构计算书并承担结构责任）验证批准了钢结构的再利用，因为他了解原建筑及其楼板的原始功能，并且拥有原建筑结构工程师的原始设计图纸。

He decides to use the central structure on two floors. This will be used double, one on top of the other, to create the 4 floors of K118.

他决定重新利用原有二层建筑中间部分的钢结构，叠加在一起成为K118新建部分的四层建筑楼板。



02 Re-use: Case Study K.118

K.118 Office Building,
Winterthur, Switzerland,
Architect: Baubüro in situ

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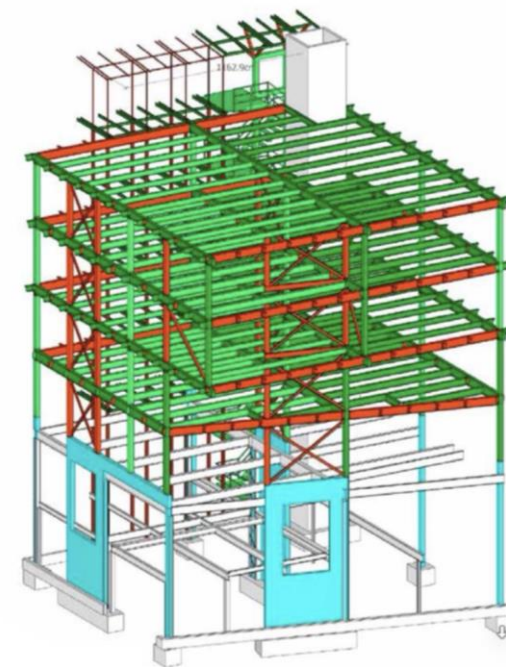
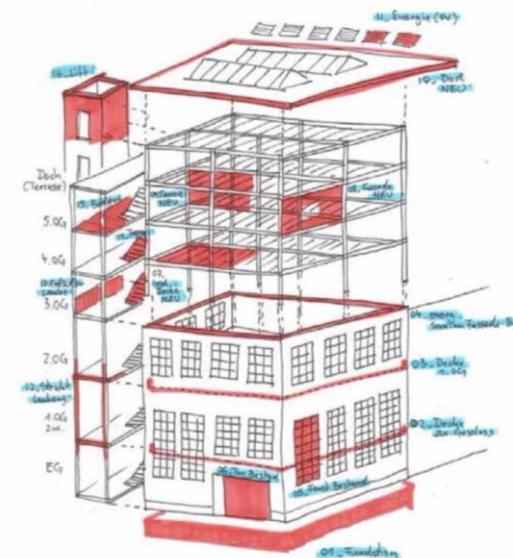
02 Re-use: Case Study K.118

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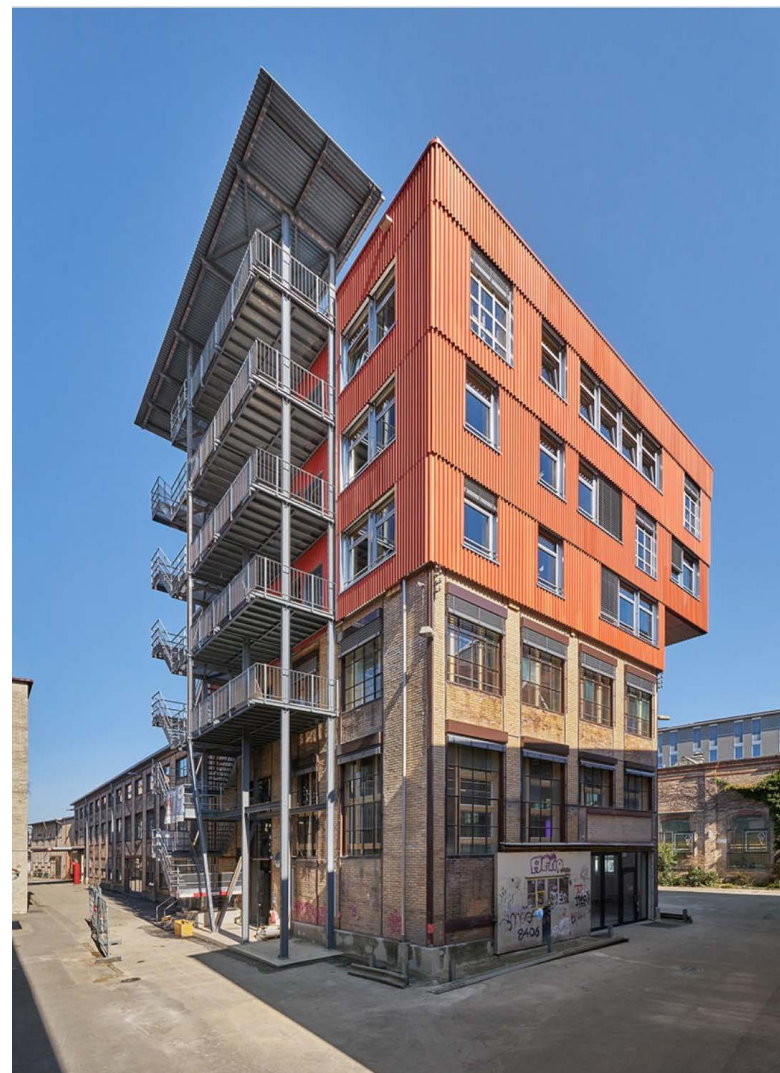
02 Re-use: Case Study K.118

K.118 Office Building,
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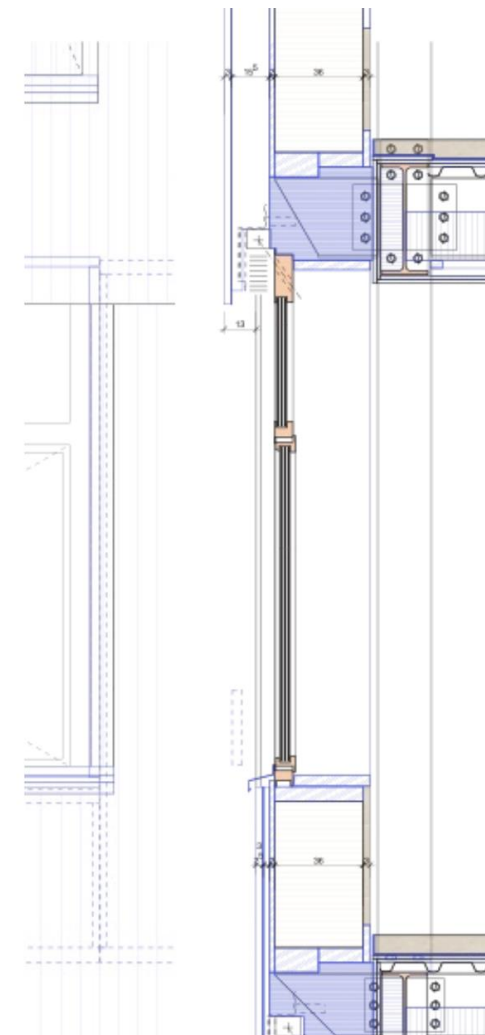
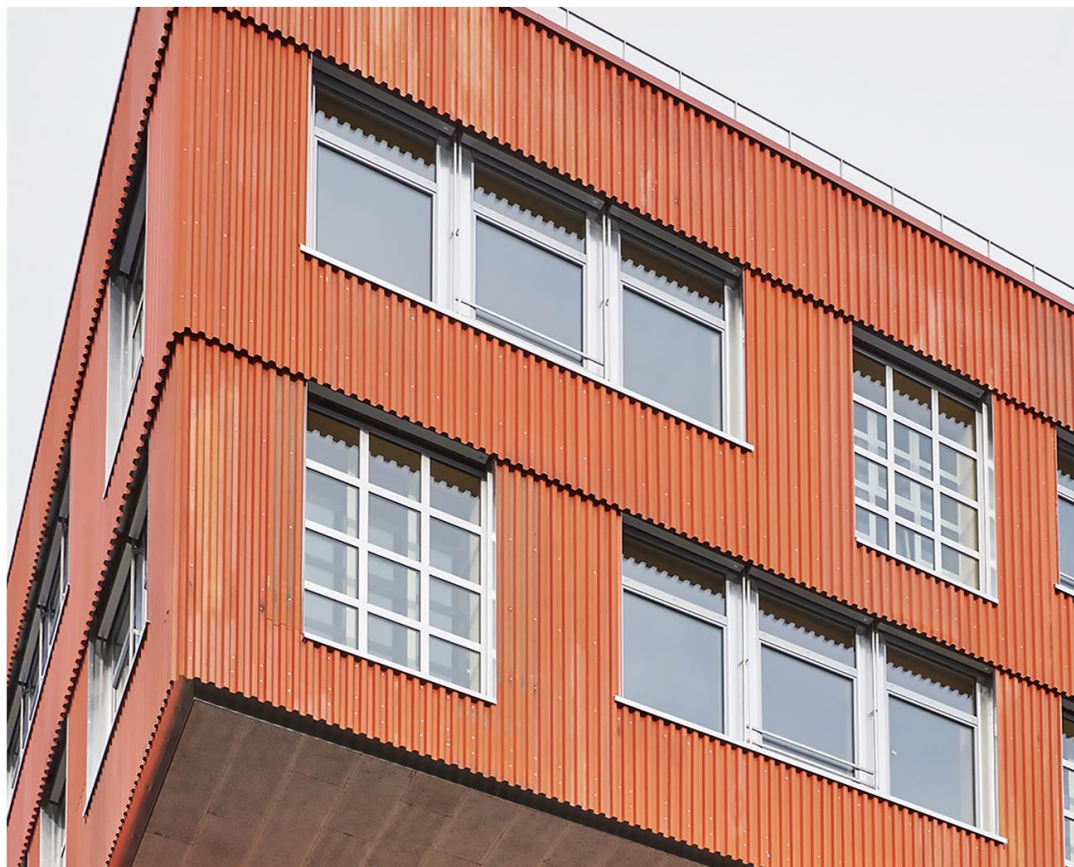


02 Re-use: Case Study K.118

K.118 Office Building,
Winterthur, Switzerland,
Architect: Baubüro in situ

The windows are reused from 3 different building mines.
窗户来自三个不同建筑拆除下来的建筑材料。

The façade built in this way allows great flexibility in the design and the possibility of deciding on the position and size of the windows right up to the last moment.
这种方式建造的外立面为设计提供了极大的灵活性，并允许在最后时刻决定窗户的位置和大小。

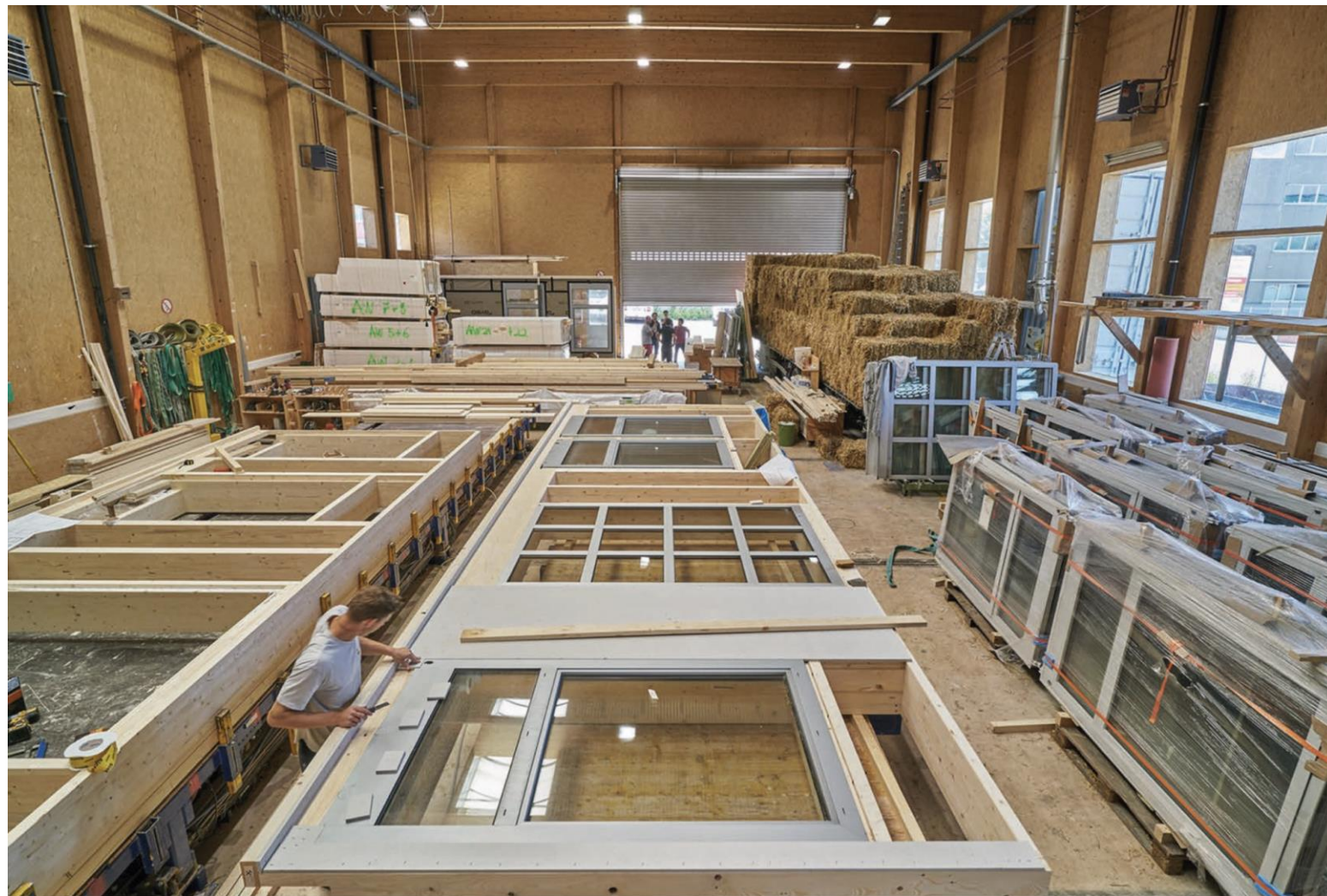


02 Re-use: Case Study K.118

K.118 Office Building,
Winterthur, Switzerland,
Architect: Baubüro in situ

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02 Re-use: Case Study K.118

K.118 Office Building,
Winterthur, Switzerland,
Architect: Baubüro in situ

Use of straw as insulation within the façade
with prefabricated timber structure.
在外立面的预制木框架中使用稻草作为保温
材料。

The elements of the timber structure are new.
预制木框架当中的木头是新材料。

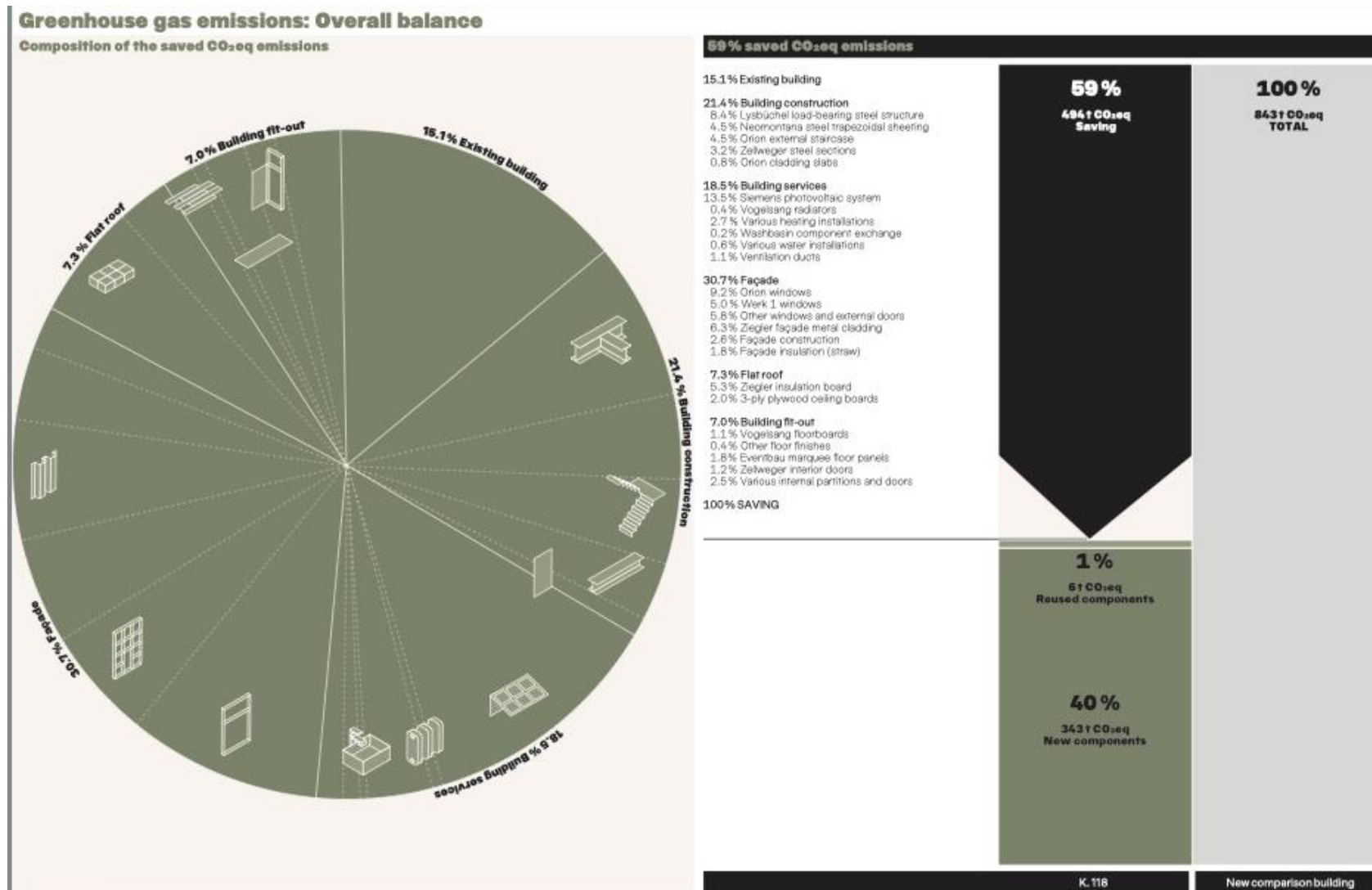


02 Re-use: Case Study K.118

K.118 Office Building,
Winterthur, Switzerland,
Architect: Baubüro in situ

K.118办公楼，
瑞士温特图尔，
建筑师：Baubüro in situ

K118 saves almost 60% of CO₂ eq
(almost 500 t) compared to a new
building
与新建筑相比，K118节省了近60%
的二氧化碳排放量（近500吨）。



02 Re-use: Case Study K.118

K.118 Office Building,
Winterthur, Switzerland,
Architect: Baubüro in situ

K118 saves almost 60% of CO₂ eq
(almost 500 t) compared to a new
building

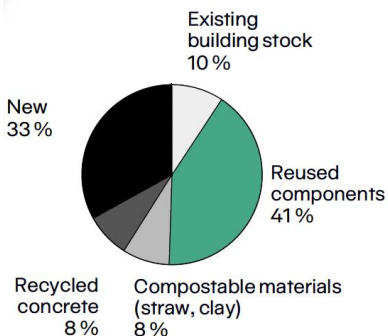
与新建筑相比，K118节省了近60%
的二氧化碳排放量（近500吨）。

The percentage changes in relation
to Volume, Weight and
CO₂ emissions

该百分比与体积、重量和二氧化
碳排放的关系变化。

建材体积
Material volume

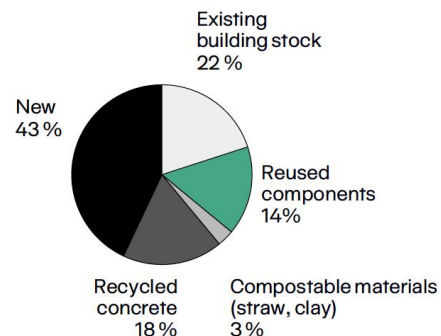
Distribution of K.118's
total volume of 1,200 m³:



Savings in
primary material:
645 m³

建材重量
Material weight

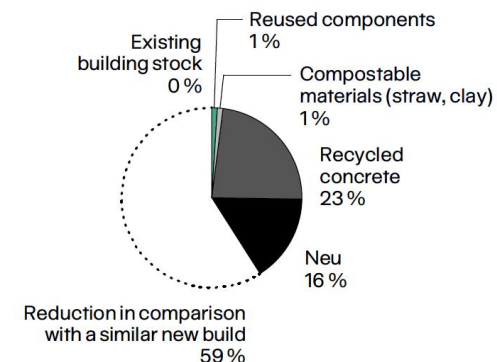
Distribution of K.118's
total weight of 1,165 t:



Savings in
primary material:
500 t

碳排放量
CO₂ emissions

Compared with a similar new build with
total emissions of CO₂ eq,³
K.118's CO₂ emissions result from:



Savings in
CO₂ emissions:
494 t

02 Re-use: Case Study K.118

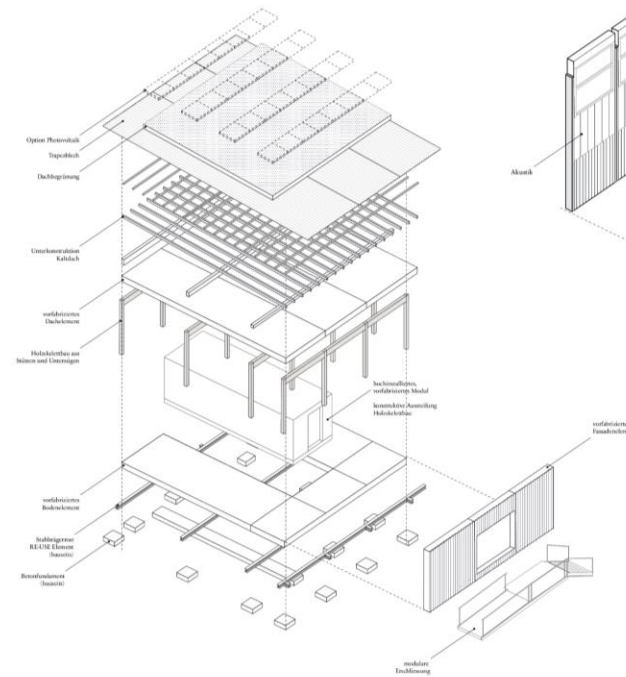
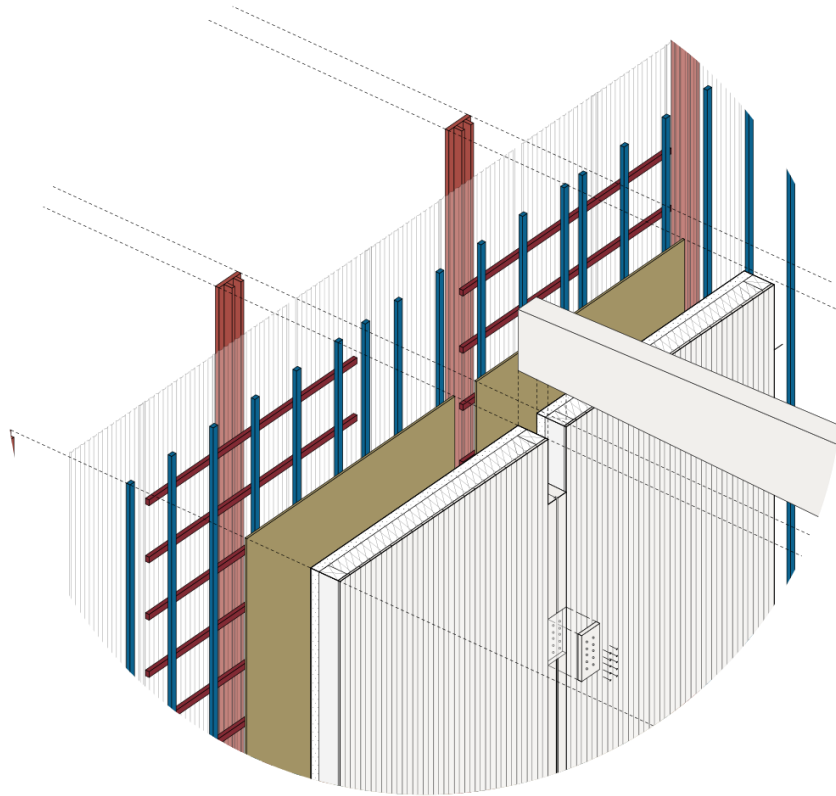
K.118 Office Building,
Winterthur, Switzerland,
Architect: Baubüro in situ

K.118办公楼,
瑞士温特图尔,
建筑师: Baubüro in situ

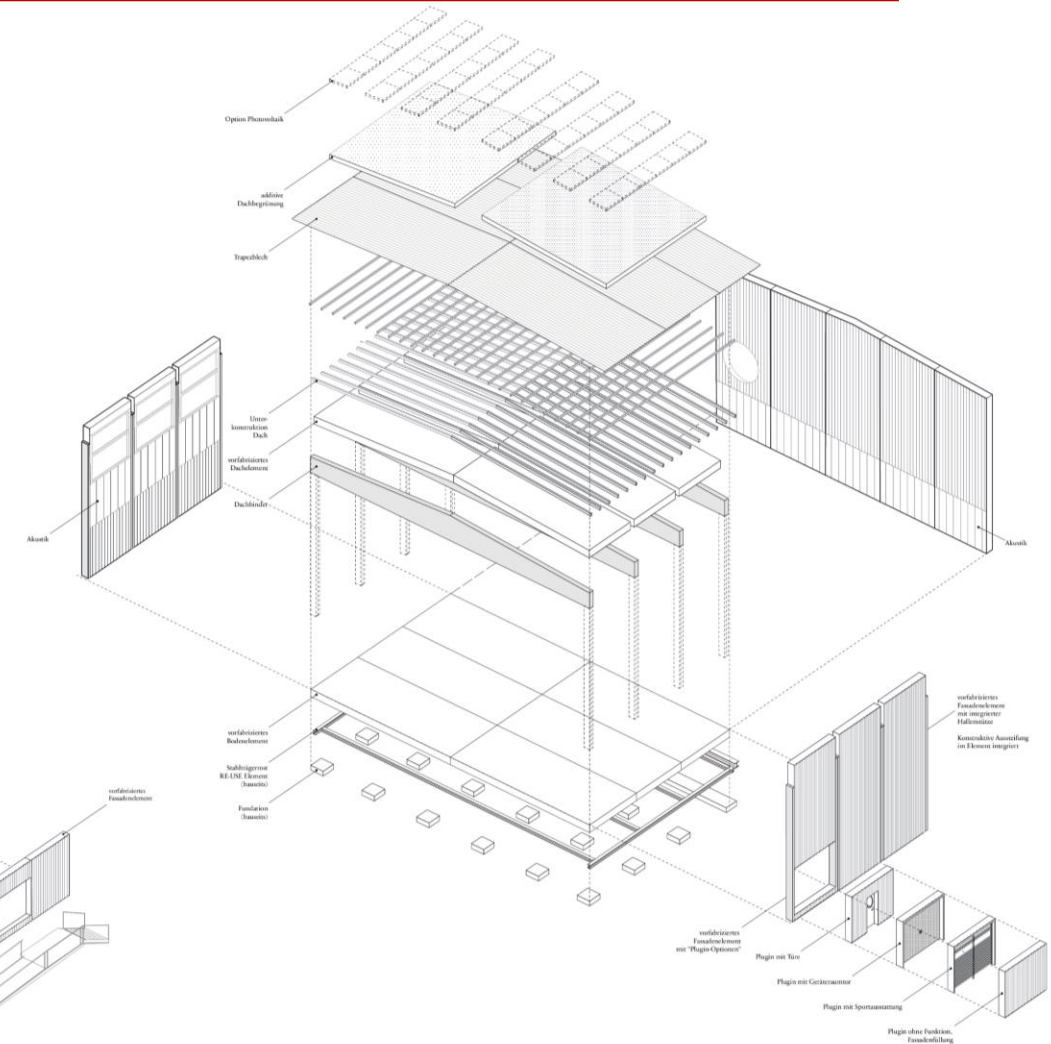
Mockup K.118
K.118模型



03 Building the future mine: Design for Disassembly



Modul Annex



Modul Sporthalle

Sports facilities for the city of Zürich, Pool Architekten, 2022 – Temporary buildings and an example of Design for Disassembly
苏黎世市的体育设施, Pool Architekten, 2022年——临时建筑与可拆卸设计的实例

03 Building the future mine: Design for Disassembly



Sports facilities for the city of Zürich, Pool architekten, 2022 – Temporary buildings and an example of Design for Disassembly
苏黎世市的体育设施，Pool architekten，2022年——临时建筑与可拆卸设计的实例

03 Building the future mine: Design for Disassembly

Element AG

Plattenbau, Bern

Flex Bau

Raumzellenbausystem

Göhner

Plattenbau, Albisrieden

Igeco

Grosstafelbausystem

Kamm 4D

Skelettbau

Peikert VPS

Schwerer Skelettbau

Schelling

Grosstafelbau

Variel

Raumelementsystem

Isler

Schalenbau

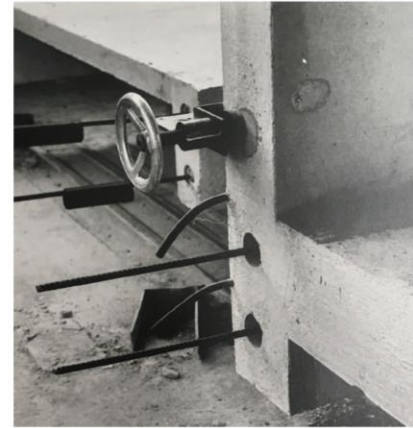


Swiss prefabricated Systems, 1950-1980
瑞士预制系统, 1950-1980

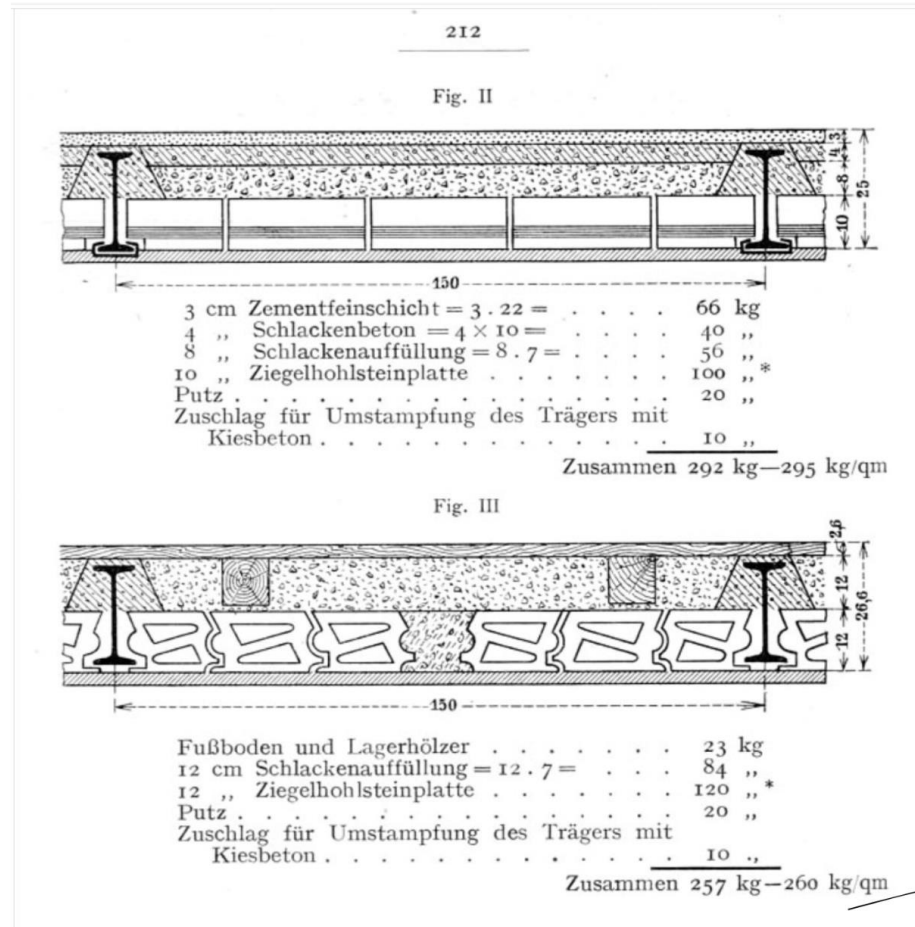
03 Building the future mine: Design for Disassembly

Variel

Konstruktion - Fügung - Element



03 Building the future mine: Design for Disassembly



Quelle: Hrsg. Stahlwerks-Verband A.-G., Taschenbuch mit Zeichnungen und Angaben über die Verwendung von Eisen im Hochbau, Düsseldorf, 1913, S. 211

Stahlwerks-Verband A.-G., Taschenbuch mit Zeichnungen und Angaben über die Verwendung von Eisen im Hochbau, 1913

钢铁厂协会 《关于在建筑中应用钢铁的图集和说明使用手册》，1913年

03 Building the future mine: Design for Disassembly

werkstückhalle
2022

klimafreundlich
konstruieren

ZHAW, Zürcher Hochschule für
Angewandte Wissenschaften
Departement Architektur, Gestaltung
und Bauingenieurwesen

zhaw

Mo – Fr
08.15
– 19.00 Uhr

Halle 180
Tössfeldstrasse 11
8401 Winterthur

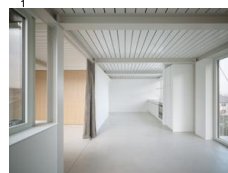
Hybrider Stahl-Leichtbau – Wohnhaus Herbstweg

Fachgespräch mit
Jürg Graser und
Beda Troxler, Graser
Troxler Architekten,
Patric Fischli-Boson,
Büeler Fischli Bau-
ingenieure, Bernhard
von Mühlenen, AM Suisse,
Simon Rutz, Wohlgen-
singer Holzbau

31.10.2022 18 Uhr

«Wie können wir materialeffizient und zirkulär bauen?» ist eine Frage die uns neuerdings täglich beschäftigt. Graser Troxler Architekten beantworten sie mit einem hybriden Leichtbau, aus den Materialien Stahl, Holz und Beton. Für den Wohnungsbau unübliche Träger und Stützen aus Stahl ermöglichen eine vorgefertigte, leichte und flexible Konstruktion, die durch ihre Dauerhaftigkeit und die lösbar geplanten Verbindungen für die Wiederverwendung prädestiniert ist. Die klassischen Baumeisterarbeiten sind auf ein Minimum reduziert. Allein Untergeschoss, Brandmauer und Überbeton der Blech-Verbunddecken sind in Ortbeton ausgeführt. Holzelemente bilden eine kompakte Fassadenkonstruktion – mittels durchdachter Ausfachungen direkt am Stahlbau befestigt. Vorhandenes anders einsetzen, führt hier zu neuen konstruktiven Lösungen und einer für das Wohnen überraschenden Atmosphäre.

www.zhaw.ch/ike/wsh



Dauerausstellung Werkstückhalle
ist ein Projekt der ZHAW,
Institut Konstruktives Entwerfen
in Kooperation mit:



MATERIAL
ARCHIV

SZS

Stahlbau Zentrum Schweiz
Centre suisse de la construction en acier
Centre suisse pour la construction en acier
Swiss Center for Steel Construction

1 Die klassischen Bau-
meisterarbeiten sind auf
ein Minimum reduziert.
Allein Untergeschoss,
Brandmauer und Über-
beton der Blech-Verbund-
decken sind in Ortbeton
ausgeführt.

2 Das Stahlskelett
kommt mit einer einzigen
Profilabmessung aus.
Der quadratische Profil-
querschnitt des HEB
160 ermöglicht einen
kubusförmigen Knoten
mit sechs geschraubten
Anschlüssen.

3 Beim Hybridbau ist
die Schnittstelle ent-
scheidend. Kämmerholz
bietet dem Holzbauer
seine gewohnten An-
schlüsse für die vorfabri-
zierten Elemente.

4 Stützen, Träger,
Schraubverbindung und
Stahlblech bleiben
sichtbar. Die Konstruk-
tion prägt den Raum.

Haus am Herbstweg, Graser Troxler, 2022 – an example of Design for Disassembly
Herbstweg大街住宅建筑, Graser Troxler, 2022年——可拆卸设计的实例

03 Building the future mine: Design for Disassembly

Haus am Herbstweg, Graser Troxler, 2022 – an example of Design for Disassembly – Video of Construction 施工视频

03 Building the future mine: Design for Disassembly

Haus am Herbstweg, Graser Troxler, 2022 – an example of Design for Disassembly – Video of Deconstruction 拆卸视频

04 Case Studies: Shanghai Demo Projects



04 Case Studies: Shanghai Demo Projects

层压木梁

A1-A2-A3阶段

二氧化碳当量：0.287公斤

来自KBOB 2022年1月的表格

元素名称（德语）：Brettschichtholz

According to KBOB Table:

Laminated timber beam

A1-A2-A3 Phases

0.287 Kg CO₂ eq

[from Table KBOB 01.2022](#)

Element name in

German: Brettschichtholz

再利用钢构件 K.118

R1-R2-R3阶段

二氧化碳当量：0.026公斤

参考：一根在巴塞尔拆除的HEA 220型钢梁，经过准备后在普拉特因运送到位于温特图尔的新工地，待组装（距离100公里）。

Reuse Steel element K.118

R1-R2-R3 Phases

0.026 Kg CO₂ eq

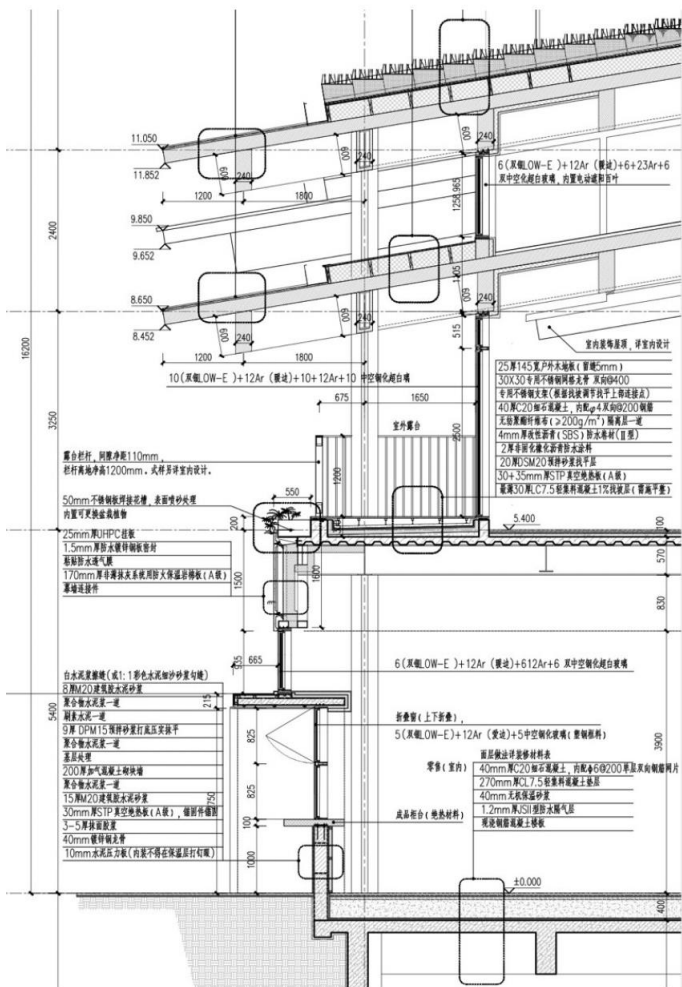
As a reference taken a kg of an HEA 220

beam disassembled in Basel, prepared in

Pratteln and brought to the new site in

Winterthur ready for assembly

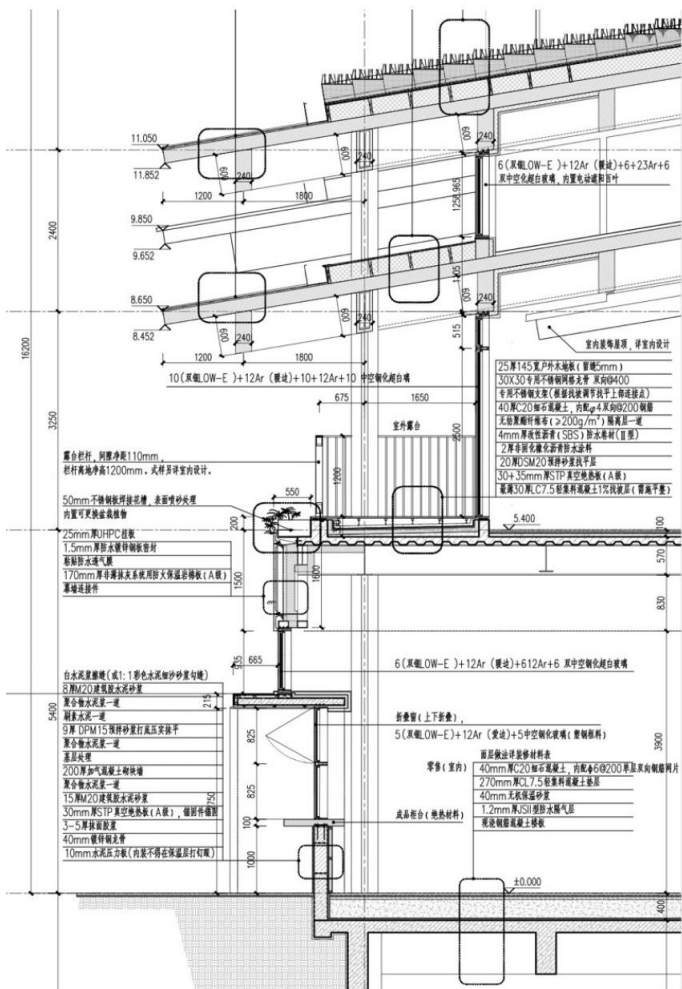
(100 km distance)



Shanghai Marketplace Space DP Project

Suggestion 1: Introducing Reuse Steel 建议一：引入再利用钢材

04



Shanghai Marketplace Space DP Project

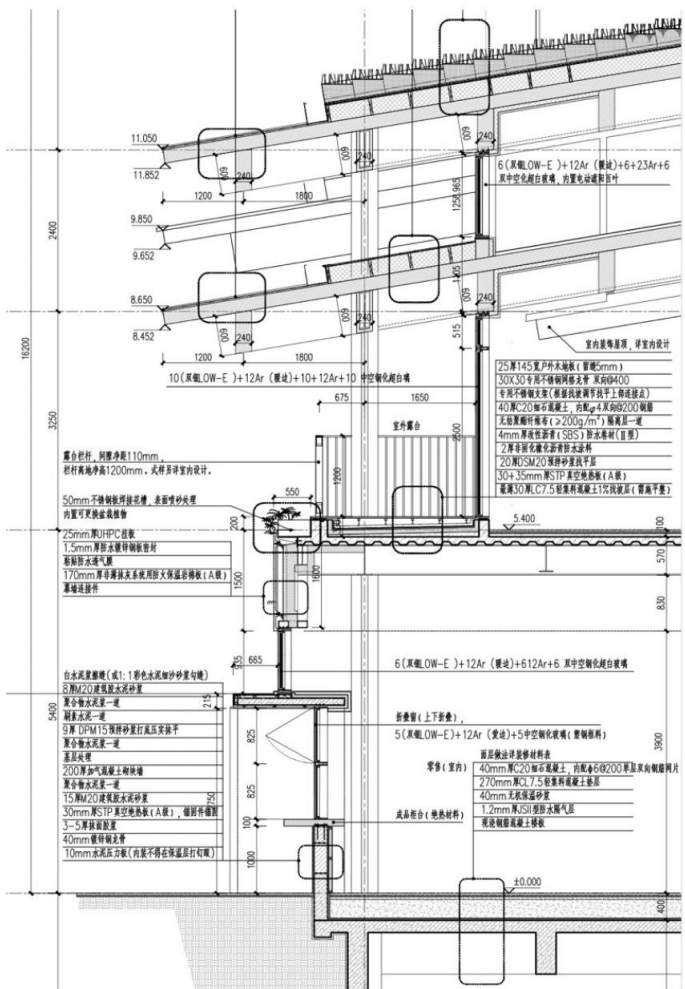


K.118, Winterthur Switzerland
Baubüro in situ, Basel/Zürich

K.118, 瑞士温特图尔
Baubüro in situ, 巴塞尔/苏黎世

Suggestion 1: Introducing Reuse Steel

04



Shanghai Marketplace Space DP Project

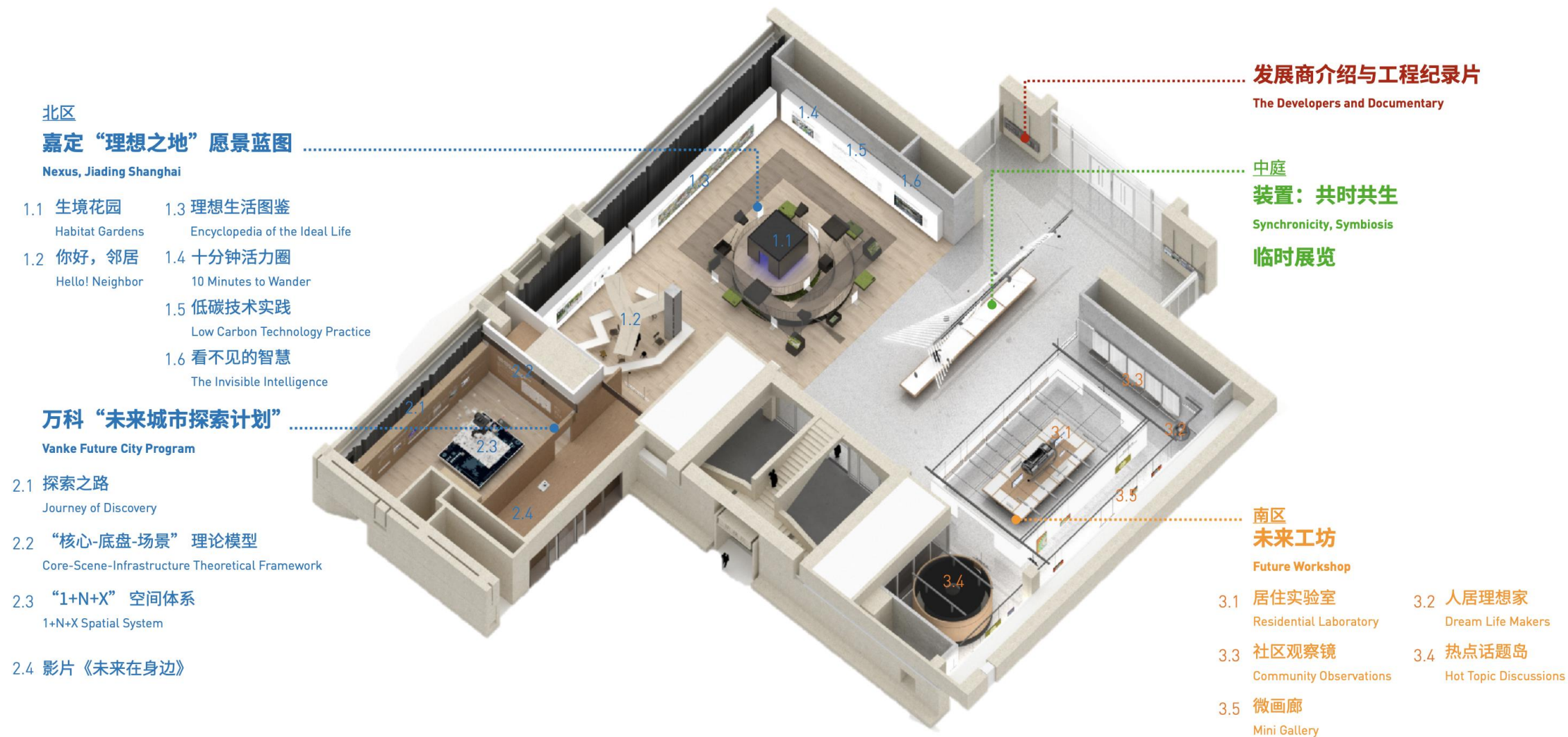


Case-Study in Alpnach with bamboo elements instead of steel elements

> 地下混凝土几乎无法避免：
在Alpnach的案例研究，使用竹子元素替代钢元素

Suggestion 2: Bamboo replacing steel rods in the underground floors
建议二：地下层混凝土结构中用竹筋替代钢筋

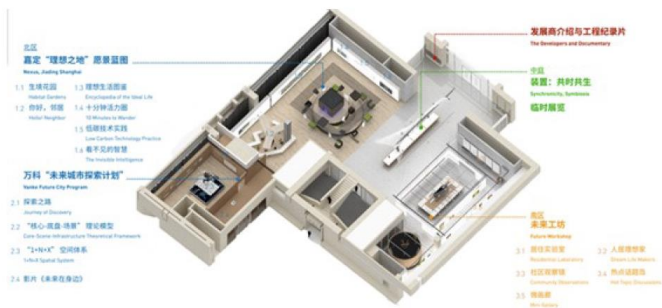
04 Case Studies: Shanghai Demo Projects



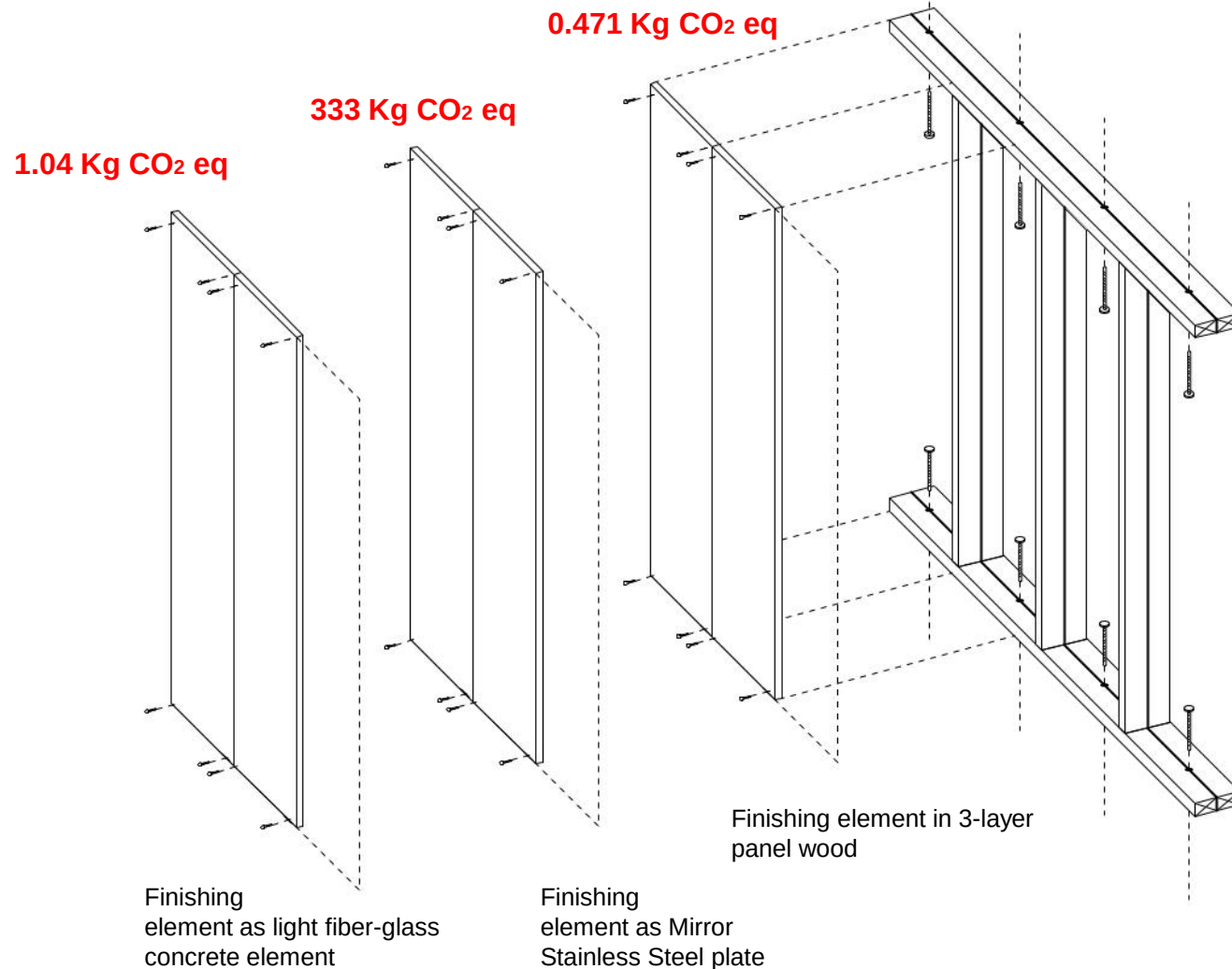
Exhibition Space 展览空间

04 Case Studies: Shanghai Demo Projects

KBOB Value
Table KBOB 01.2022

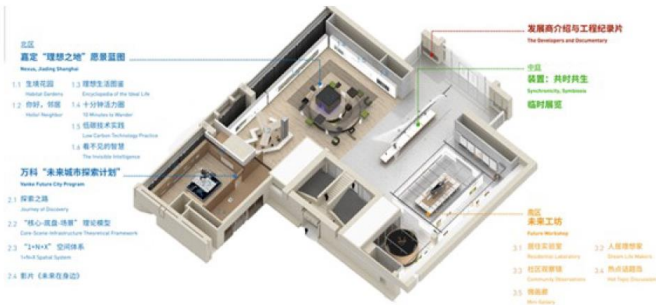


Shanghai Exhibition Space DP Project



Suggestion 1: Wooden Stud construction with coupled wooden frames
建议一：采用双联木框架的木螺栓墙体结构

04 Case Studies: Shanghai Demo Projects



Shanghai Exhibition Space DP Project



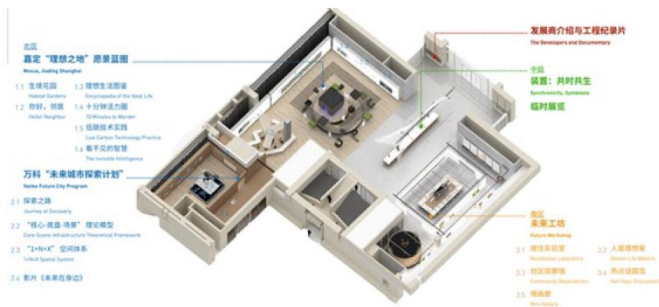
K.118, Wnterthur Baubüro in situ, Zürich

In K.118 the interior partitions are made with reused wooden frames and the reuse of rock wool insulation for the noise protection.

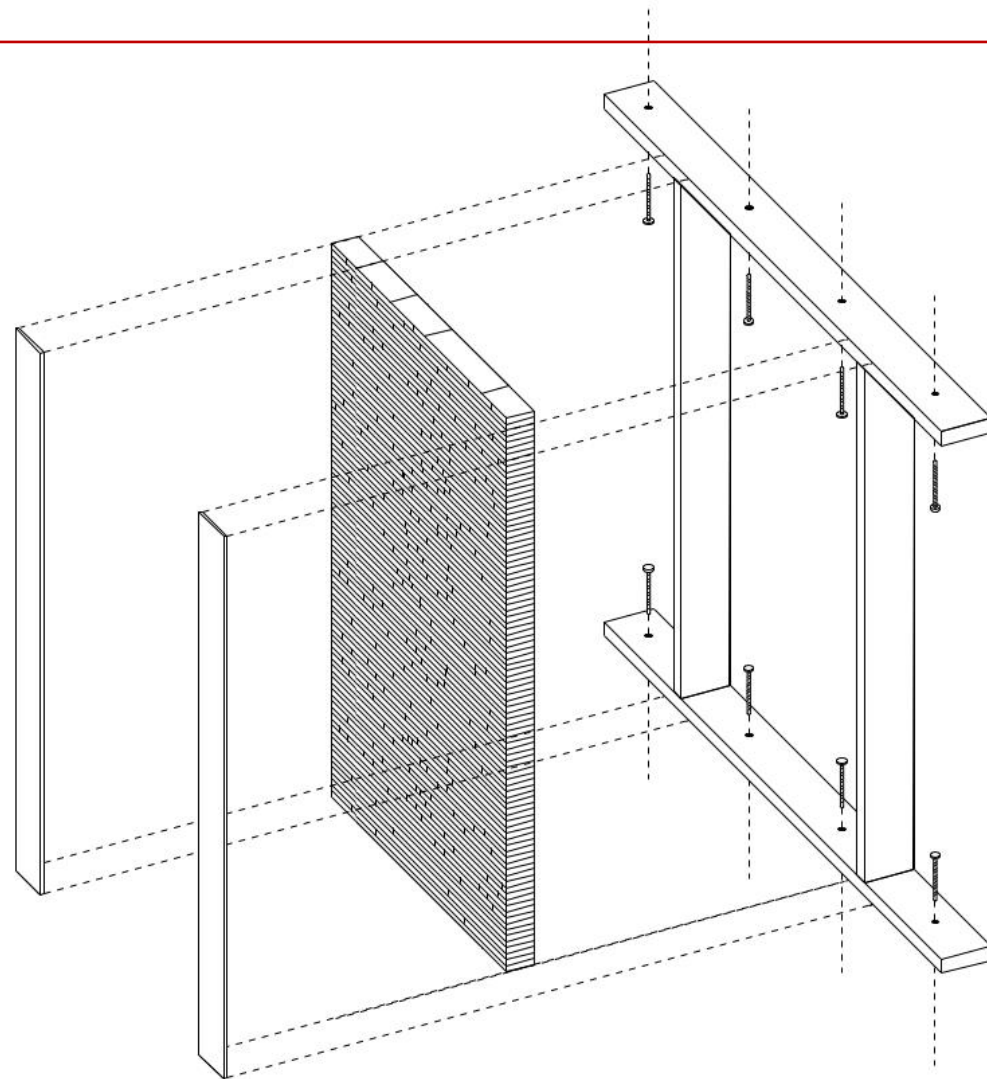


Suggestion 1: Wooden Stud construction with coupled wooden frames
建议一：采用双联木框架的木螺栓墙体结构

04 Case Studies: Shanghai Demo Projects

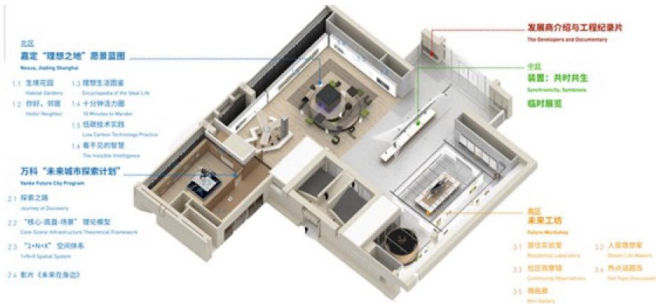


Shanghai Marketplace and Exhibition Space DP Project



Suggestion 2: Fiberboard cutted into pieces, greenhouse gases 0.001 Kg CO₂ eqSh
建议二：回收吸音天花板切割为板材，碳排放量仅为0.001kg

04 Case Studies: Shanghai Demo Projects

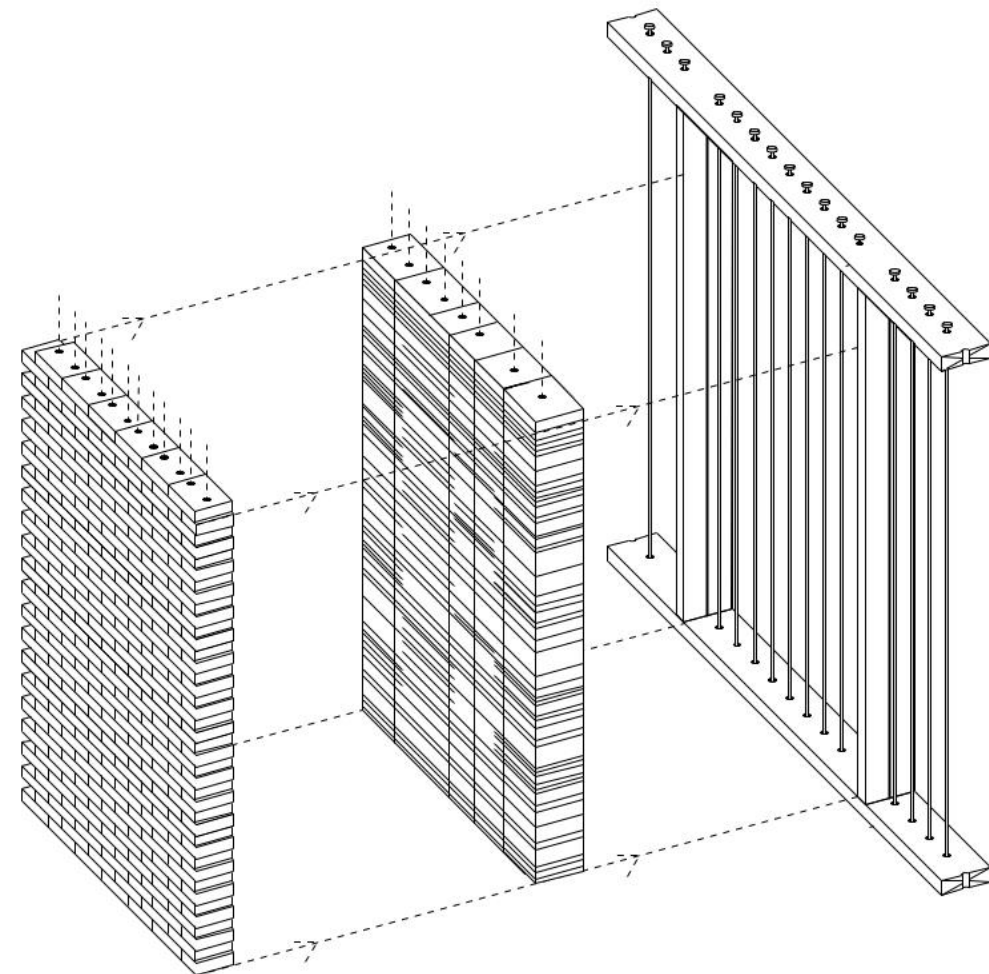
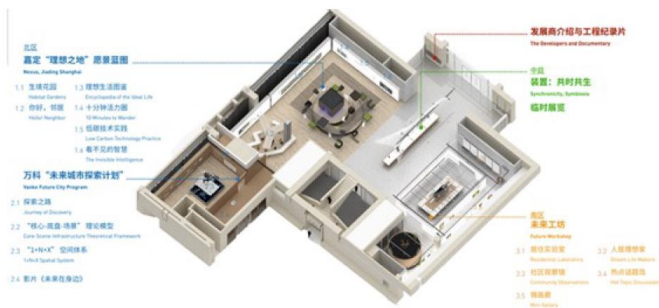


Shanghai Marketplace and Exhibition Space DP Project



Suggestion 2: Fiberboard cutted into pieces, Baubüro in Situ
建议二：回收吸音天花板切割为板材，Baubüro in Situ

04 Case Studies: Shanghai Demo Projects



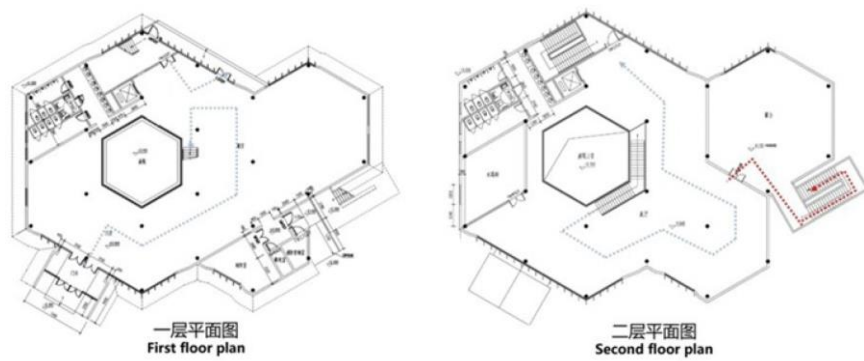
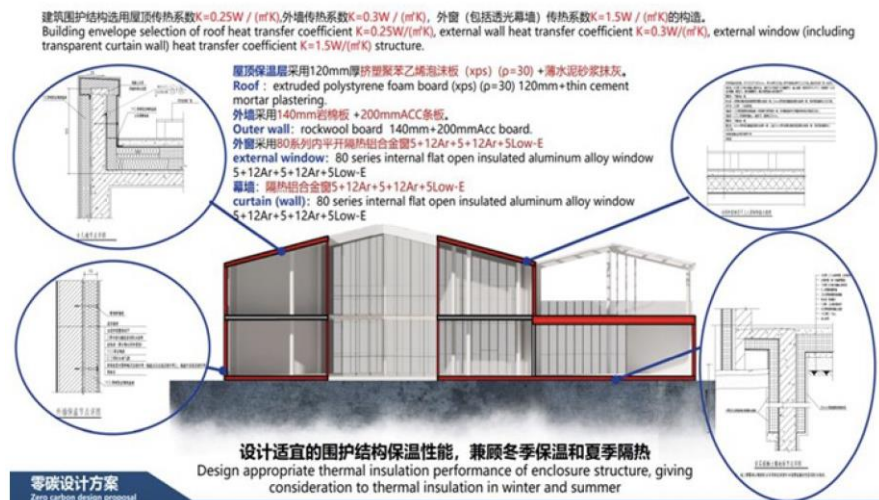
Shanghai Marketpace and Exhibition Space DP Project

Suggestion 2: Fiberboard cutted into pieces, Baubüro in Situ
建议二：回收吸音天花板切割为板材，Baubüro in Situ



Shaanxi Bee Museum 陕西蜂蜜博物馆

04 Case Studies: Shaanxi Demo Projects

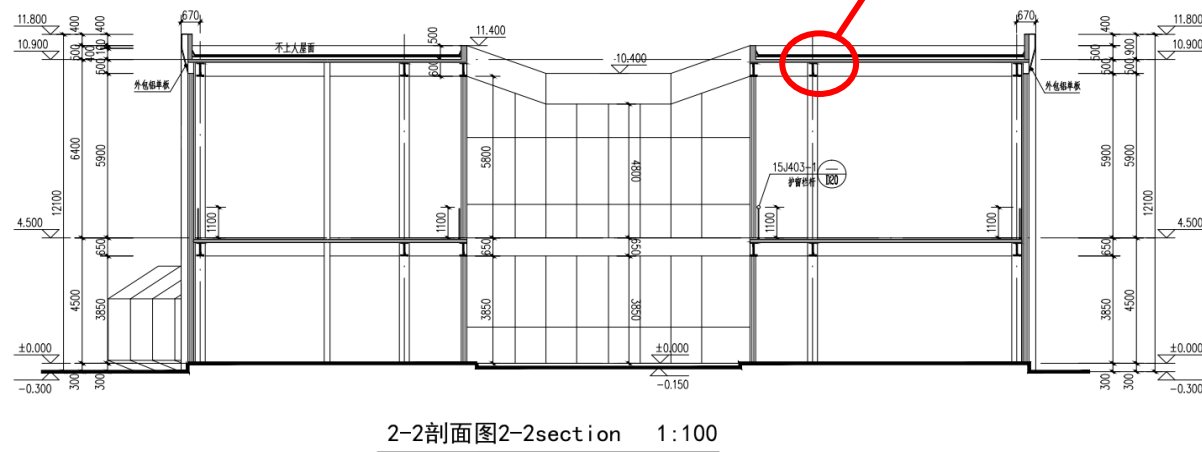
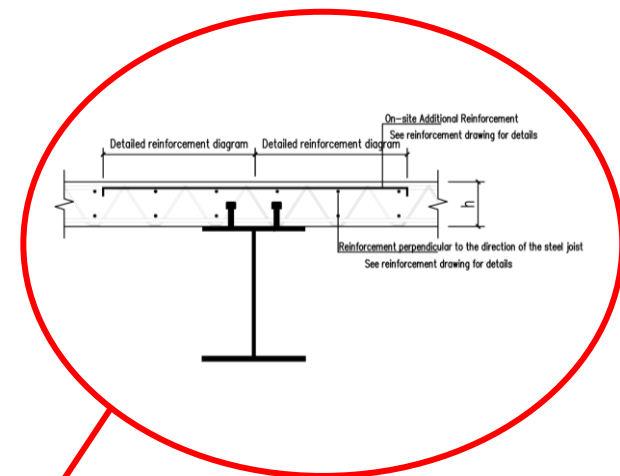


Shaanxi Bee Museum DP Project

Conventional Construction Approach 传统建筑方法

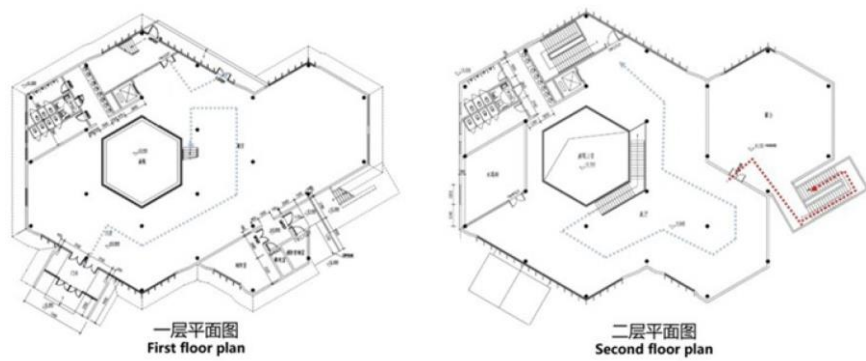
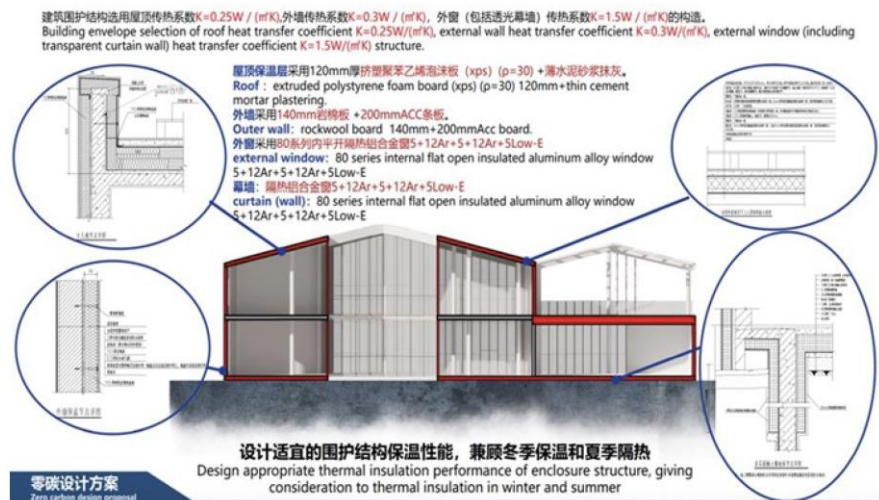
Challenges挑战:

- Not easy to disassemble 不易拆卸
- Requires fire resistance coating 需要防火涂层
--> not environmentally friendly 不环保
- Requires cold formed steel deck 需要冷弯钢板
--> its production process has high CO₂ emission
其生产过程排放高二氧化碳
---> not environmentally friendly 不环保

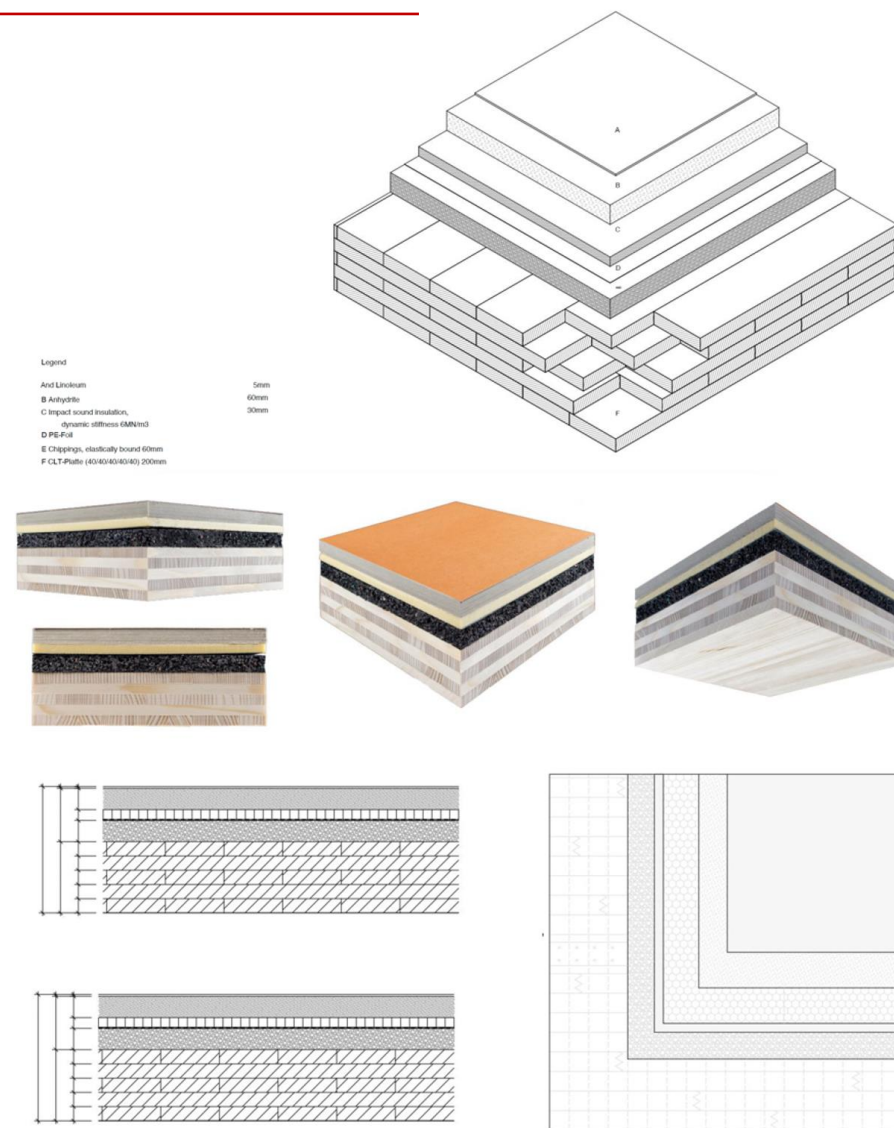


Problem: connections cannot be disassembled 问题: 连接处无法拆卸

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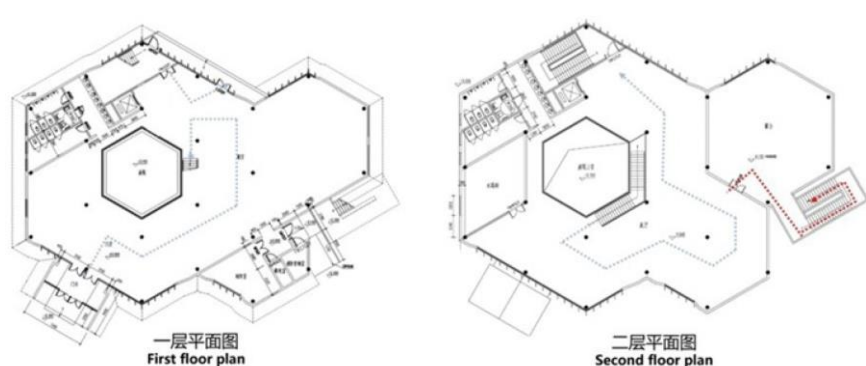
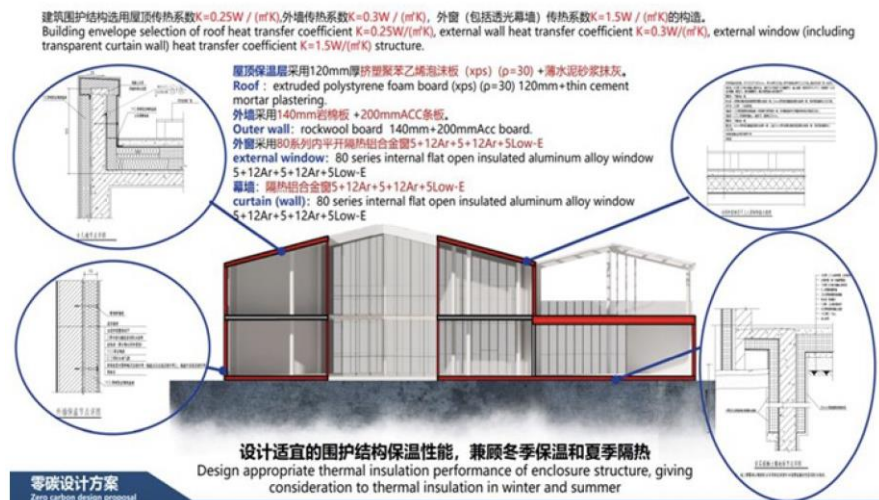


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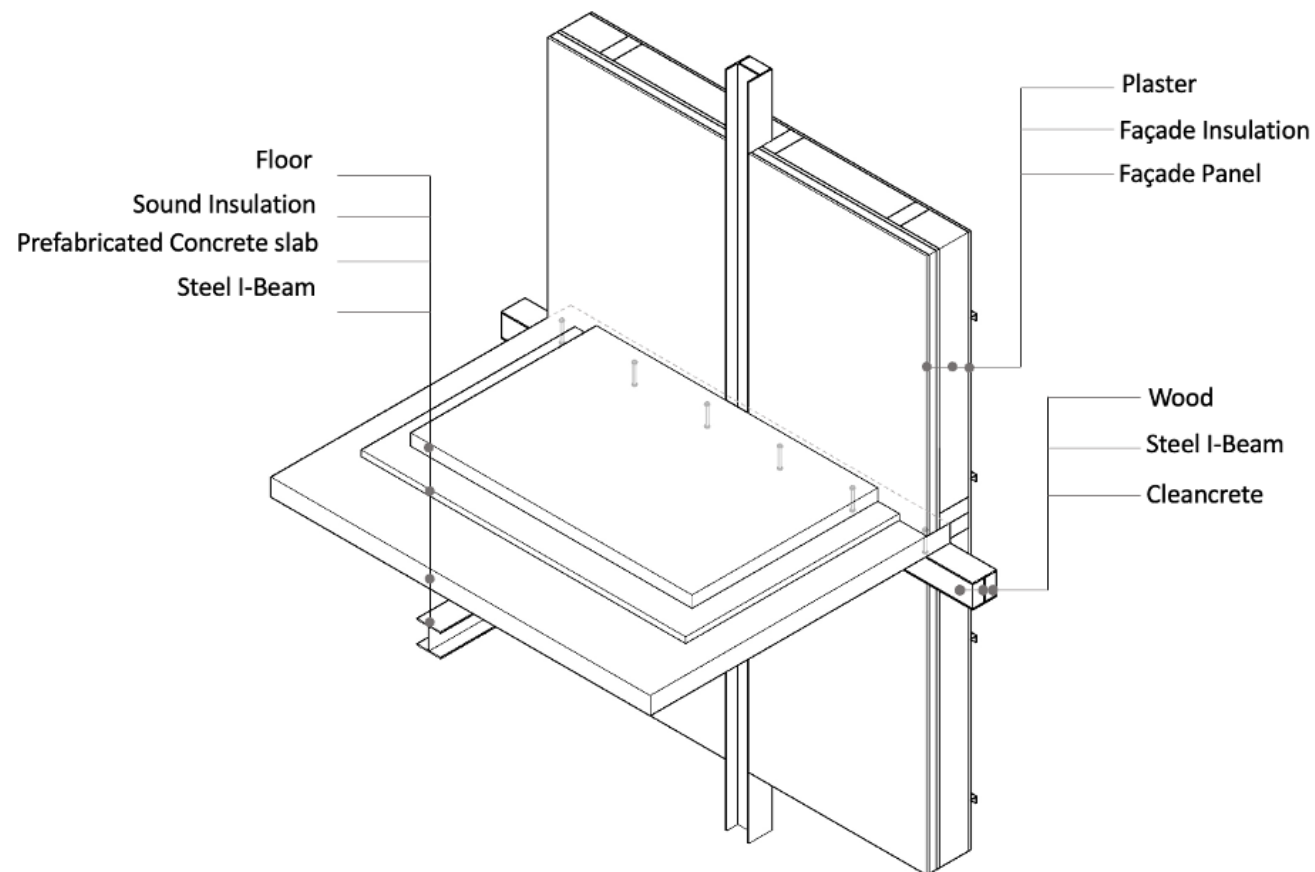


Suggestion 1: Cross laminated timber 建议一: 交叉层压木材

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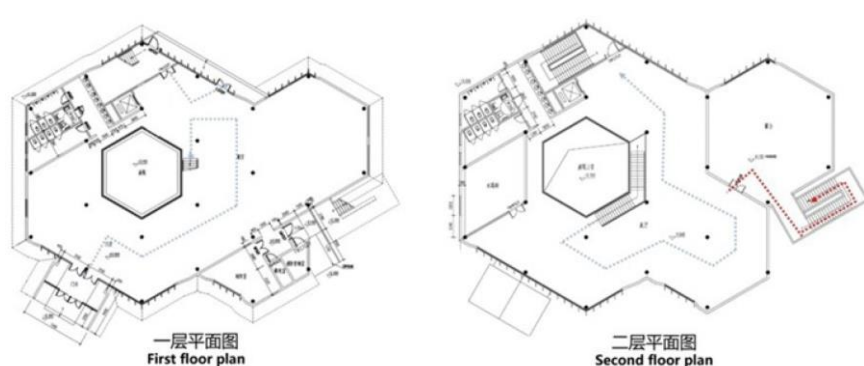
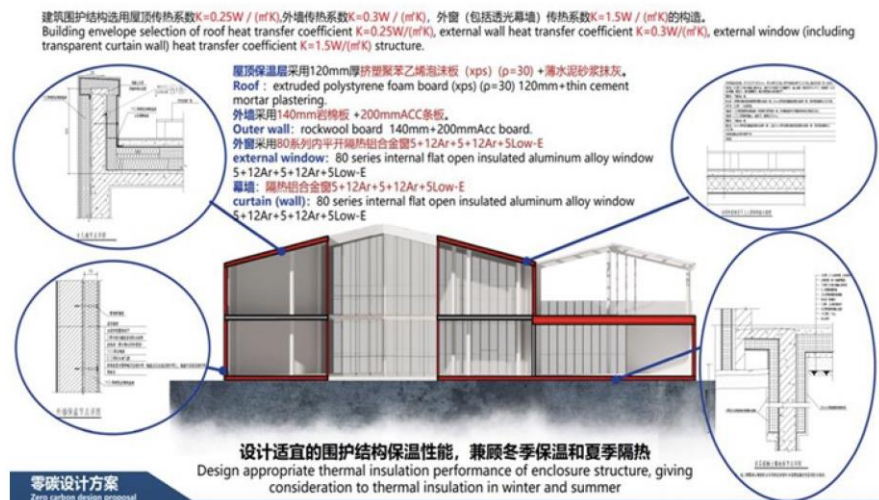
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建议二: 采用可拆卸设计 (DfD) 剪切连接系统的预制混凝土板

Suggestion 2: Prefabricated concrete slabs connected with DfD shear connector systems

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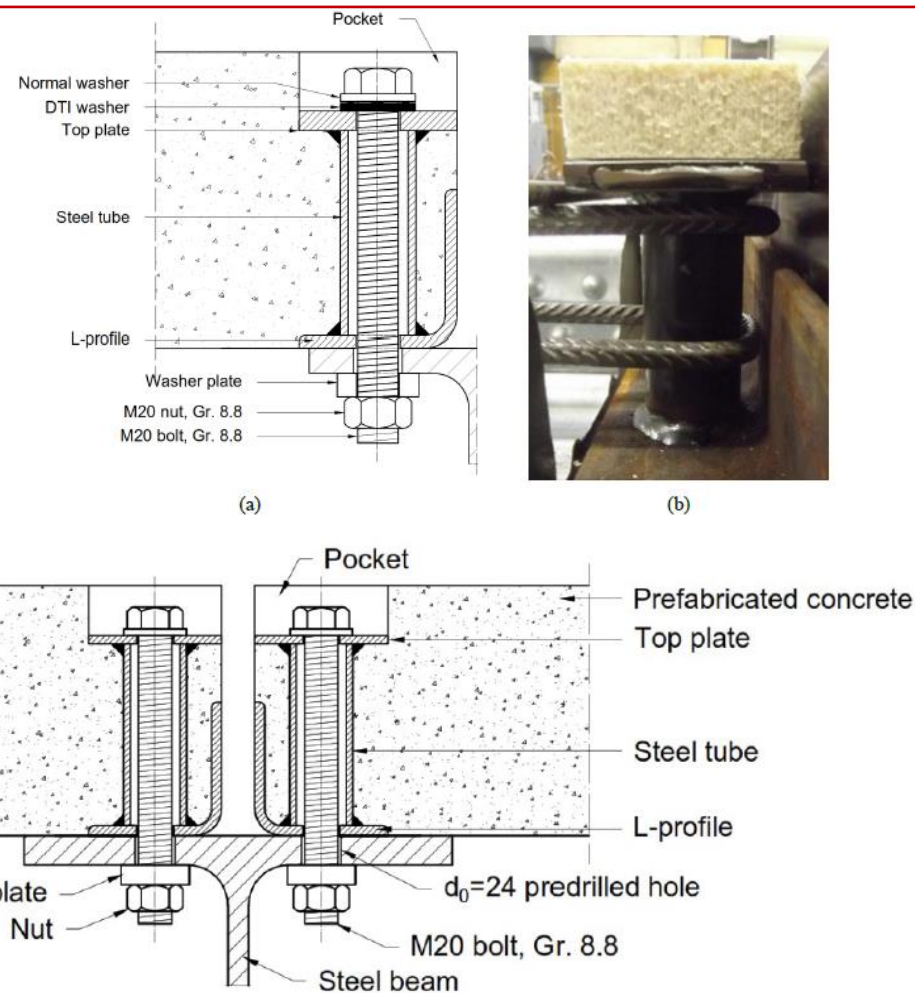
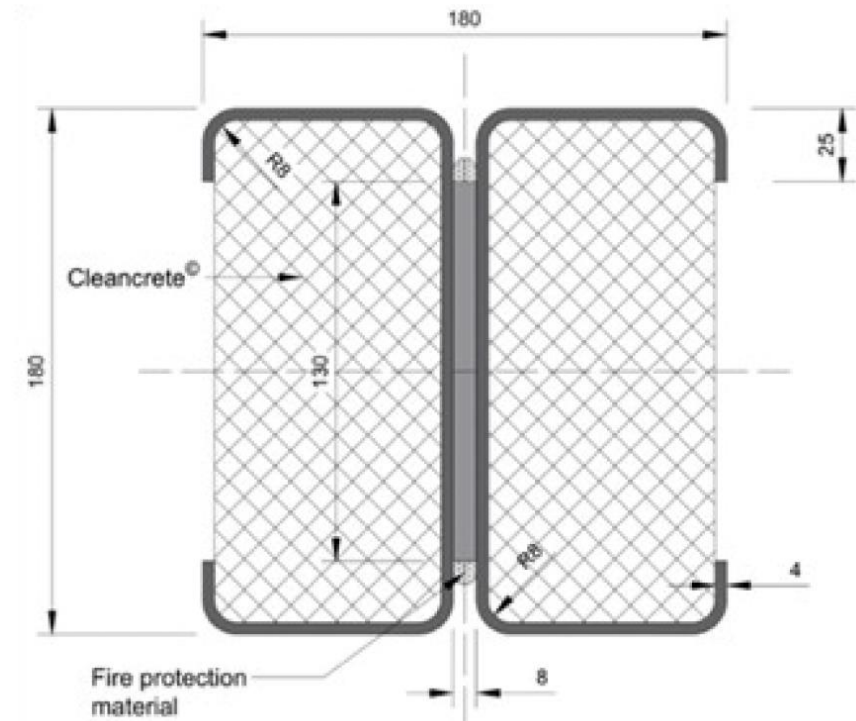
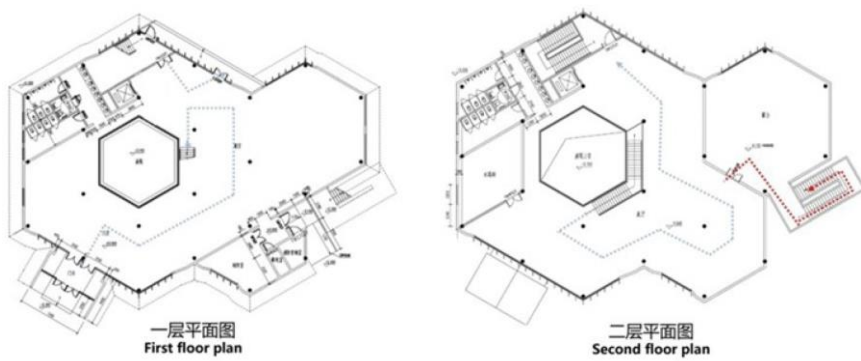
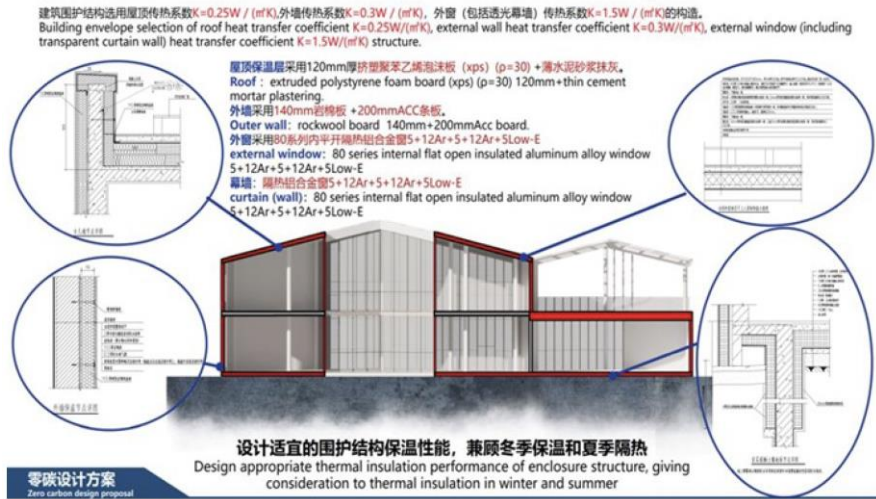


Figure 3.1 Layout of the shear connection system P3

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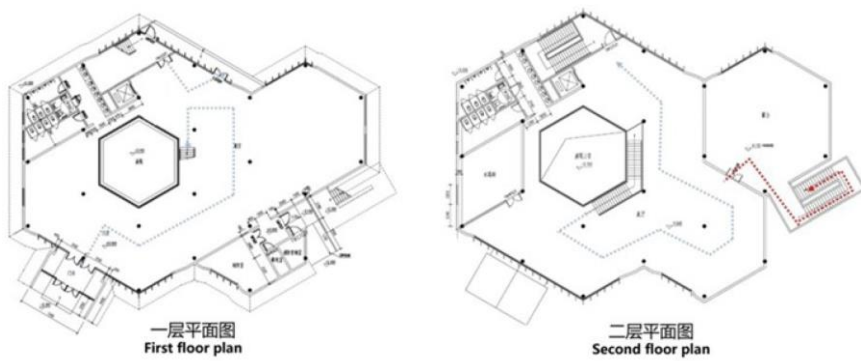
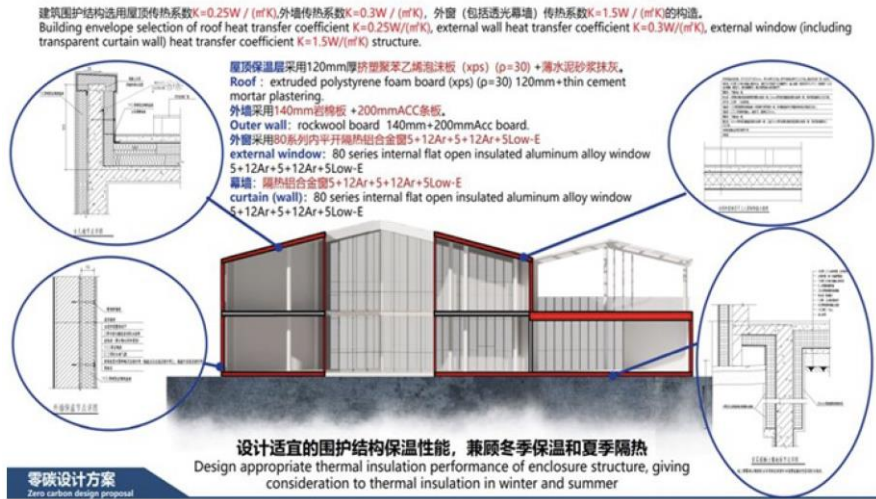


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建议三: ZHAW开发的钢壳系统 © Patric Fischli Boson

Suggestion 3: Stahlkammersystem developed at ZHAW © Patric Fischli Boson

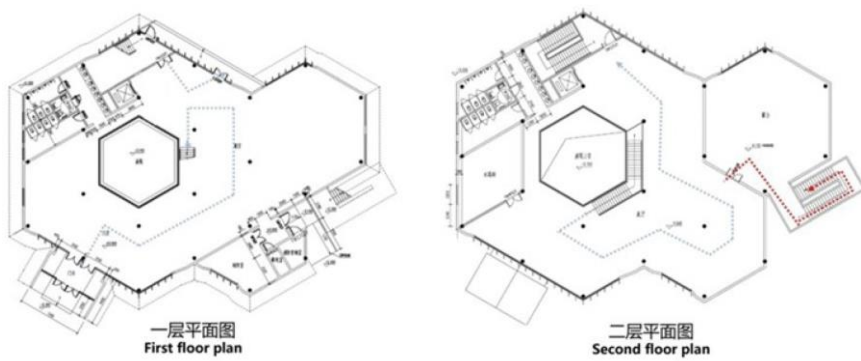
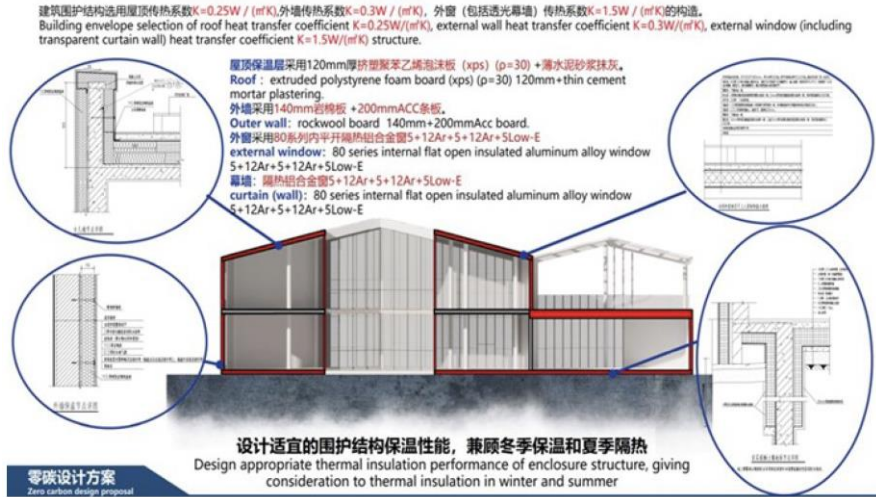
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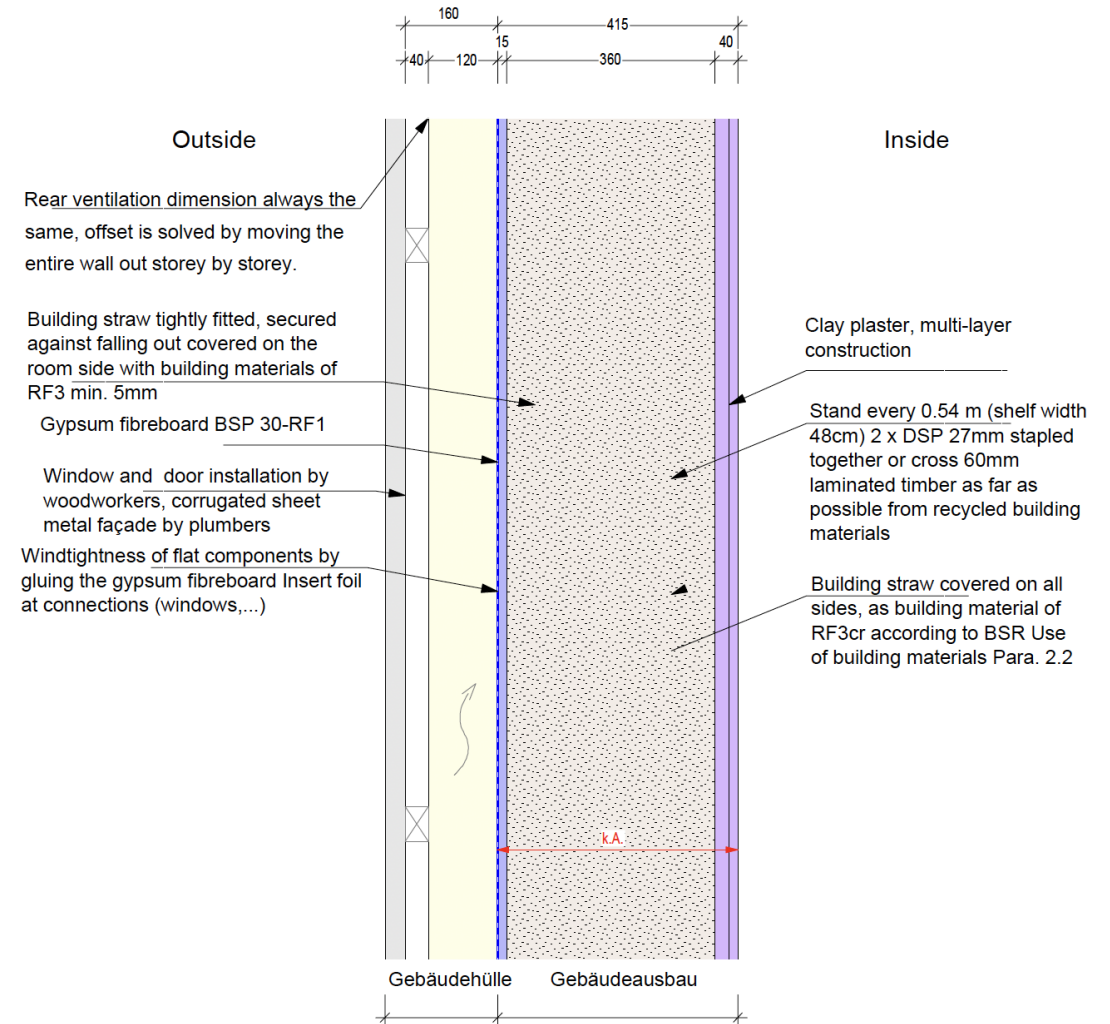
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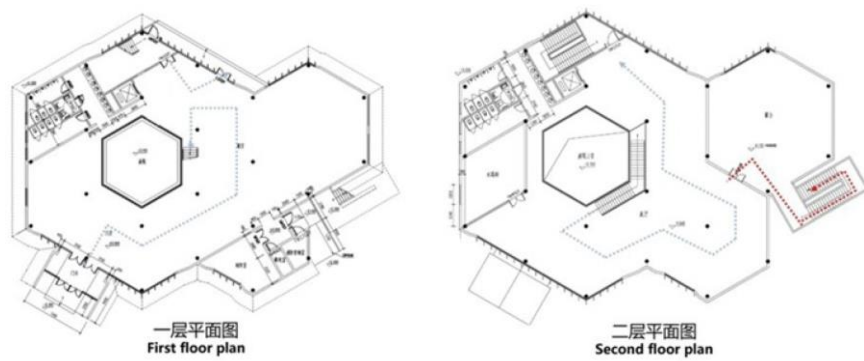
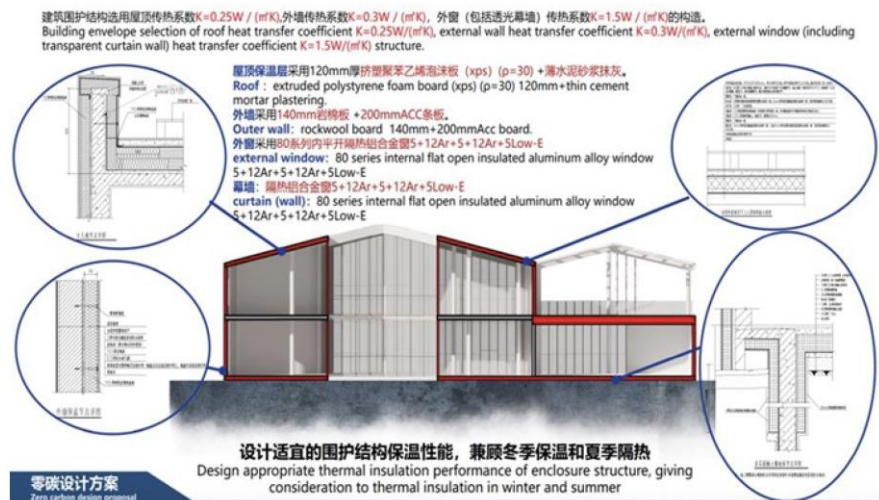
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建议四: 木质外立面填充稻草保温材料

Suggestion 4: Wooden Facade with straw insulation

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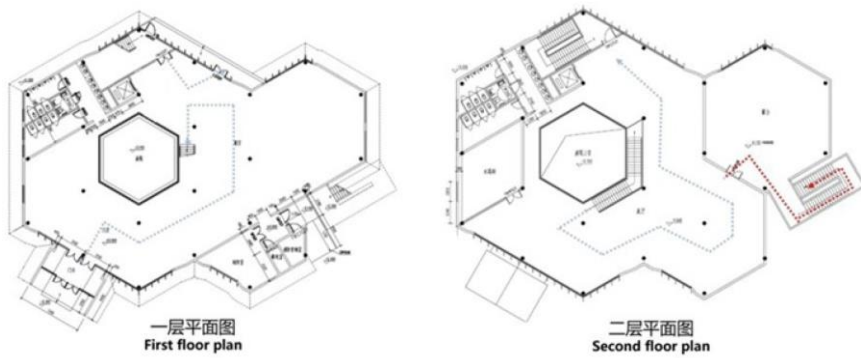
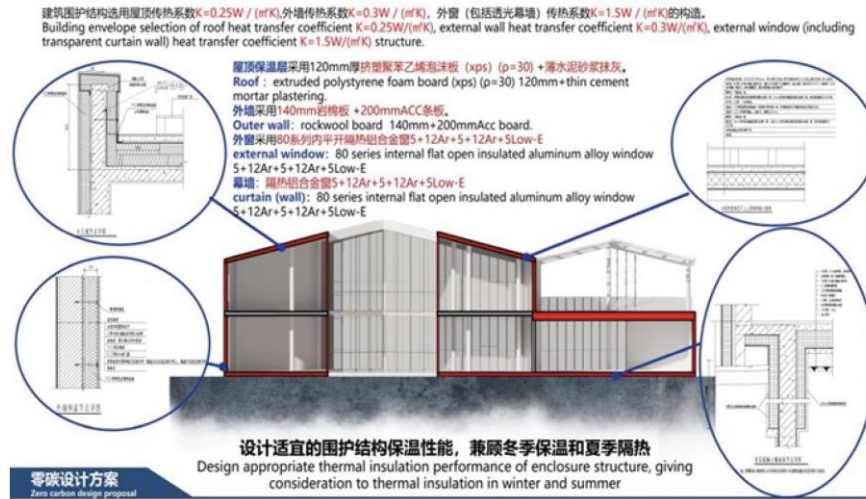
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Suggestion 4: Wooden Facade with straw insulation

建议四: 木质外立面填充稻草保温材料

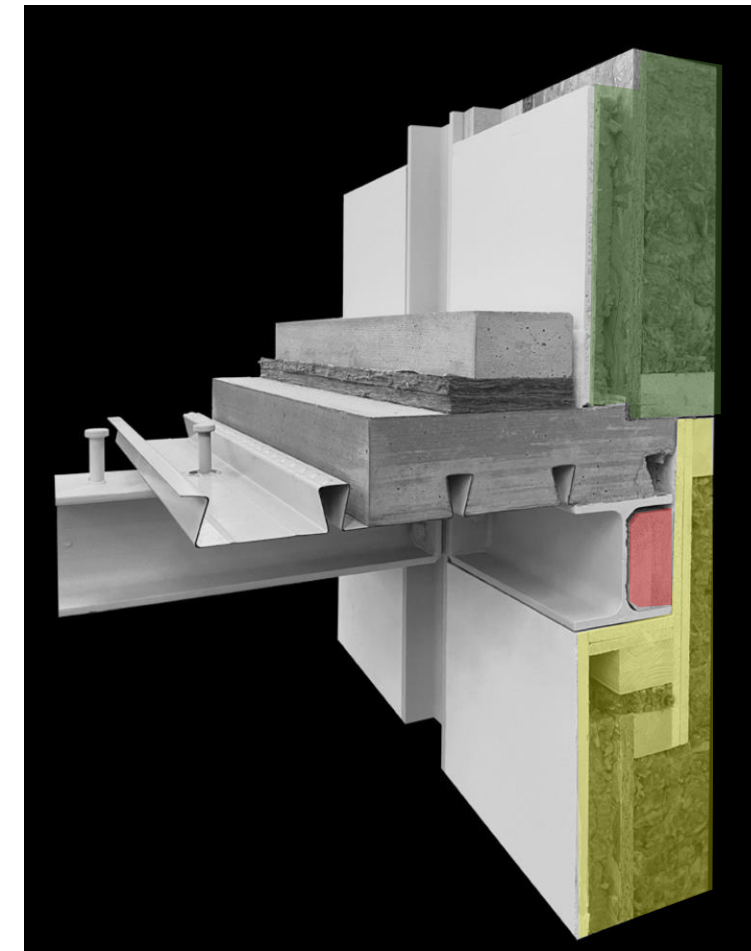
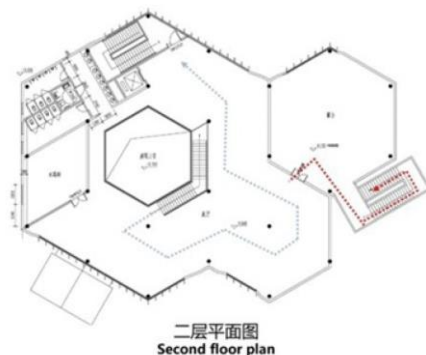
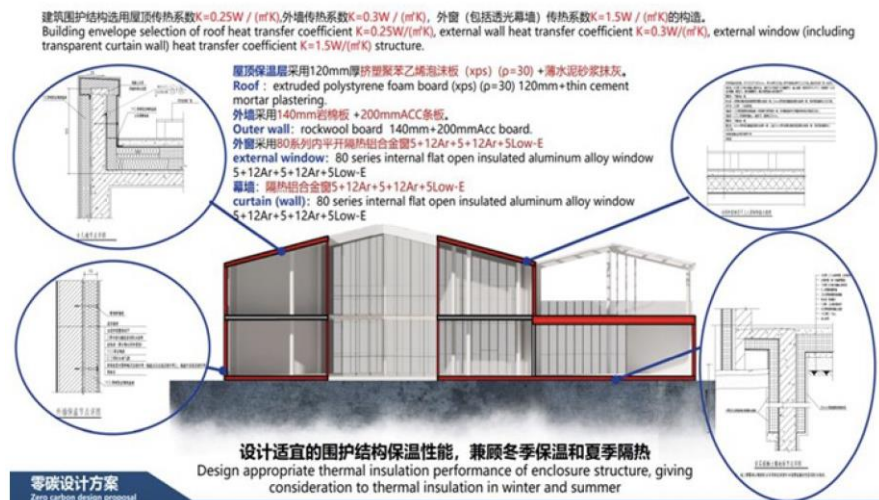
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Herbstweg: connection steel frame wooden facade. 钢框架与木质外立面的连接

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Herbstweg: connection steel frame wooden facade.钢框架与木质外立面的连接



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感谢您的关注!

THANK YOU!

提问环节

YOUR QUESTIONS?

