

20
BETON
30

CreaTower I – RFS Decken


7. Juni 2023

Philippe Block & Mike Guyer



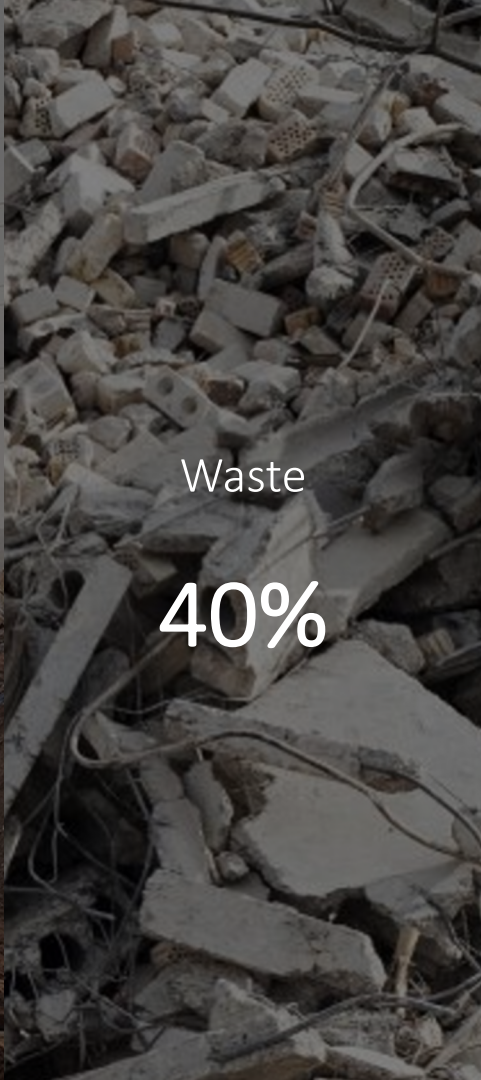
Emissions

40%



Resources

40%



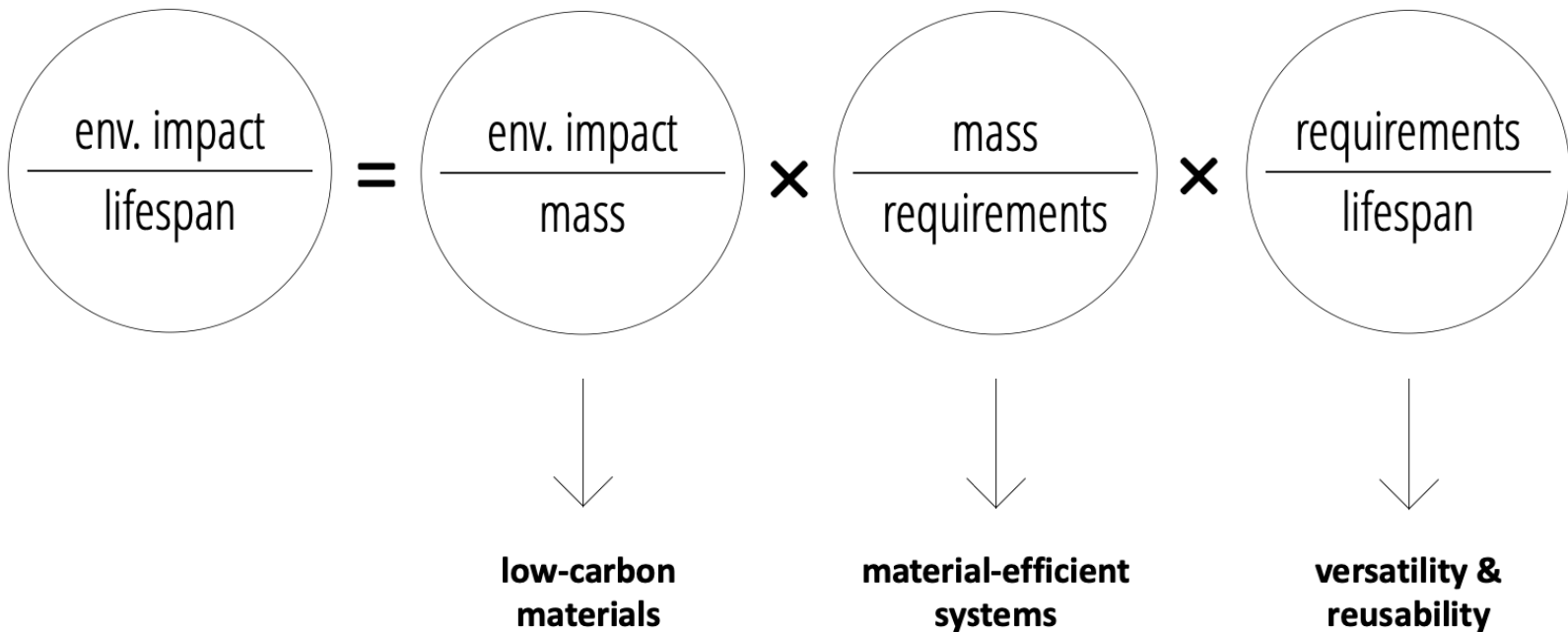
Waste

40%



Energy

40%



The image is a composite of two scenes. The left side shows a demolition site with a worker in a yellow jacket sitting on a pile of rubble. The right side shows a modern building under construction with several cranes against a cloudy sky. The text is overlaid in the center.

Strength through Geometry

Material Effectiveness

Circular Construction


Strength through Geometry



Photo: J. Kurt Schmidt





A close-up photograph of a textured, light-colored concrete wall. Below the wall, a brick pillar is visible, and an archway leads to another part of the structure. The lighting is bright, suggesting an outdoor setting.

**Reduce
mass**

A photograph of construction workers on a roof or elevated platform. In the foreground, a worker in a bright orange high-visibility suit and a white head covering looks towards the right. In the background, two other workers in purple uniforms and orange hard hats are working on a large, cylindrical brick structure. Scaffolding is visible in the distance under a clear blue sky.

**Reduce
stresses**



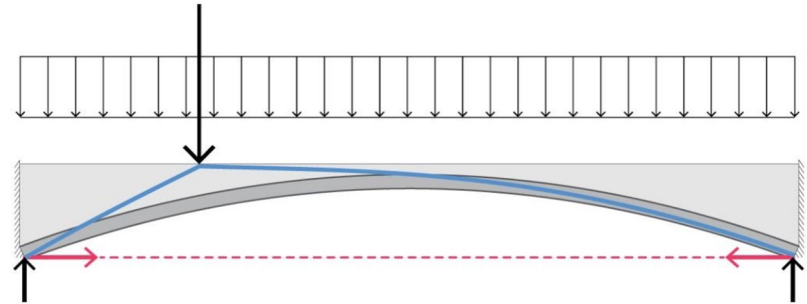
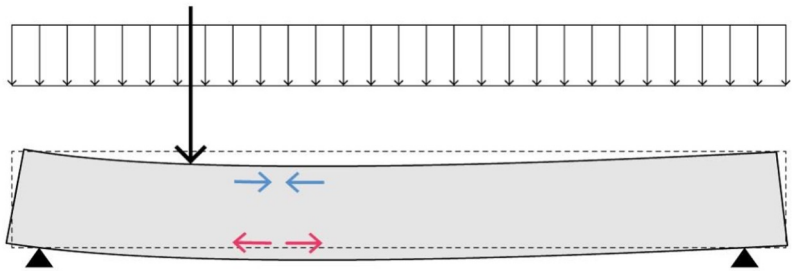
**Reduce
mass**



**Reduce
embodied
carbon**

Material Effectiveness





-70% concrete
-90% steel

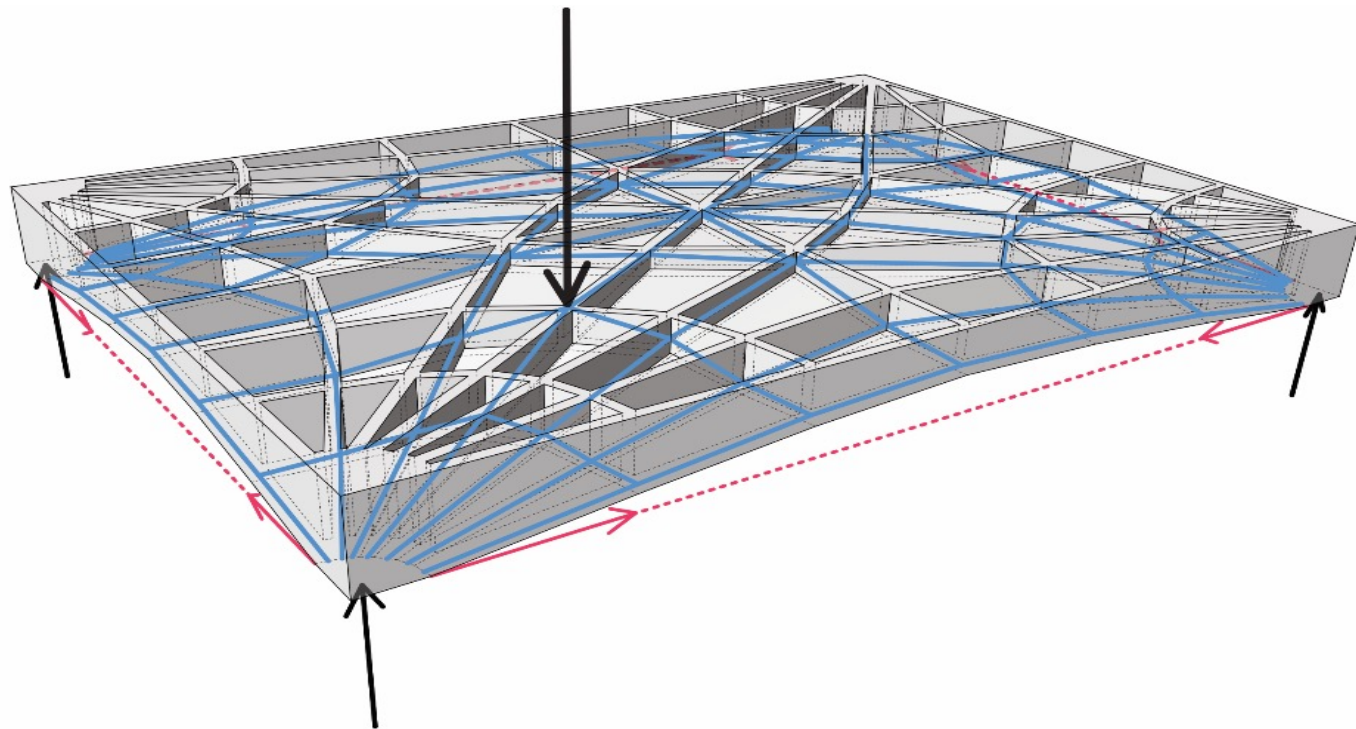
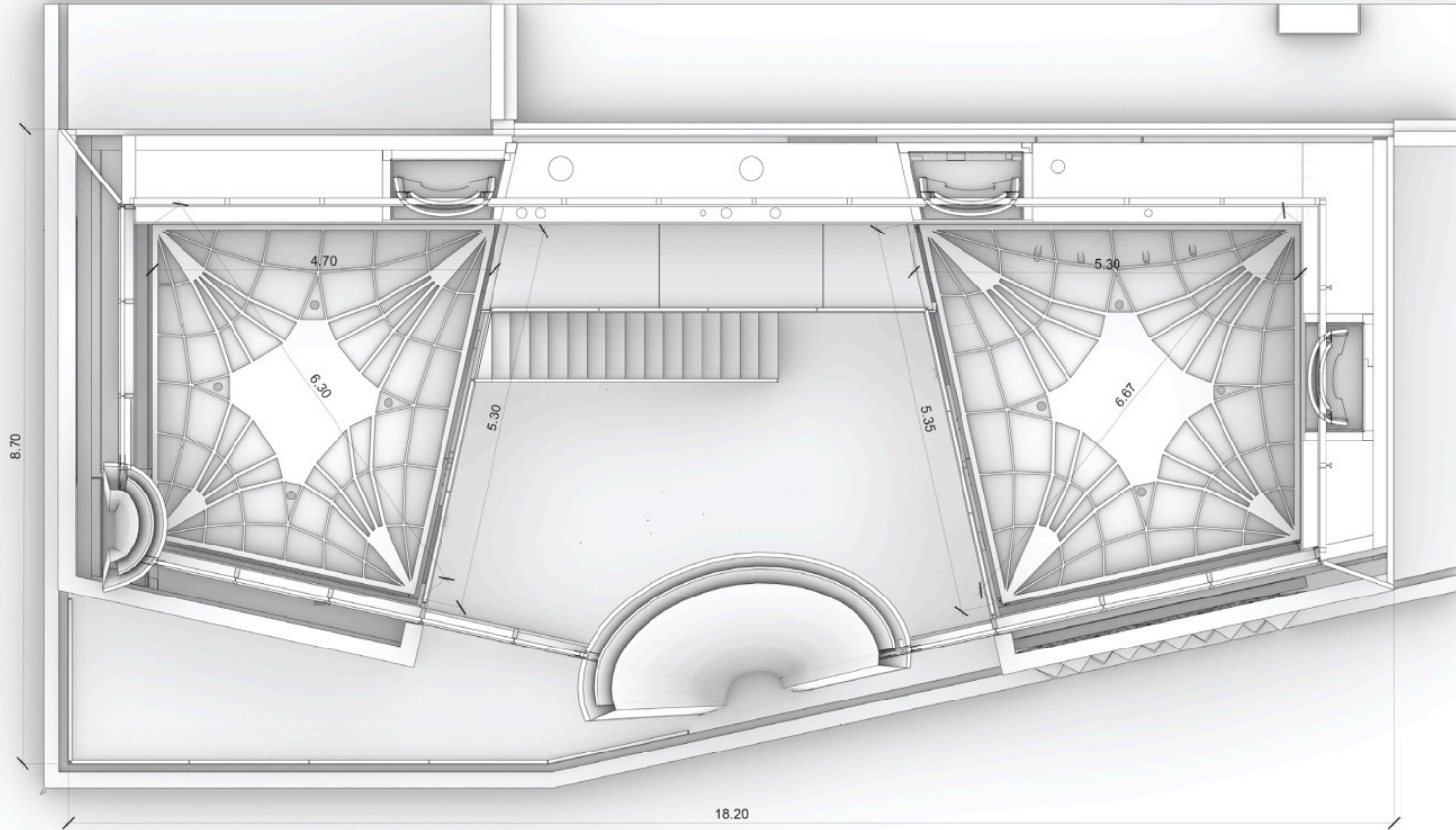
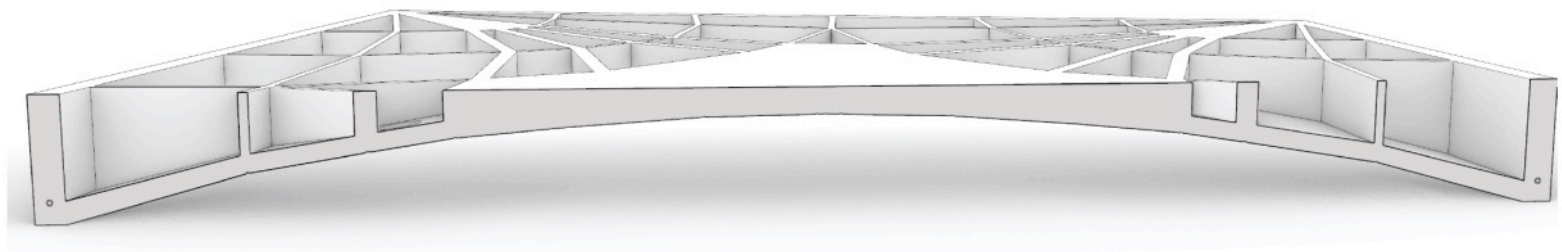




Photo: Roman Keller

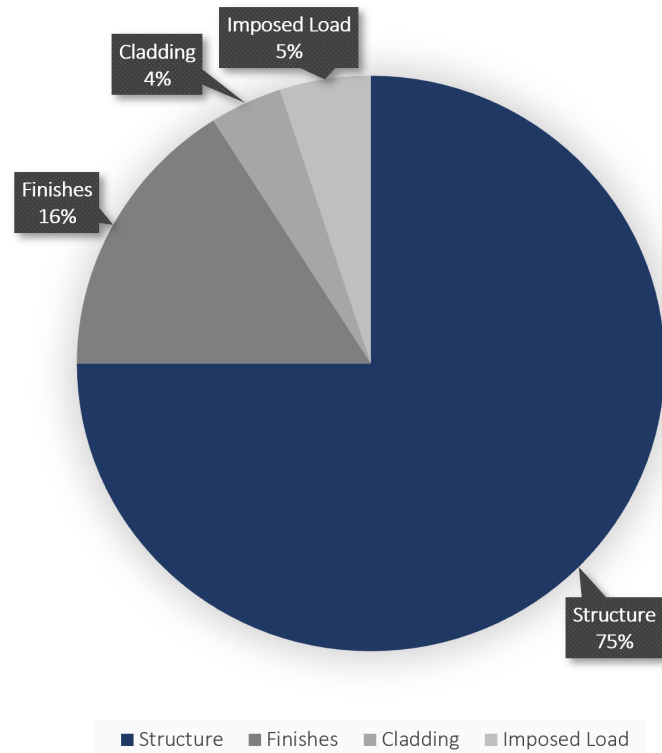


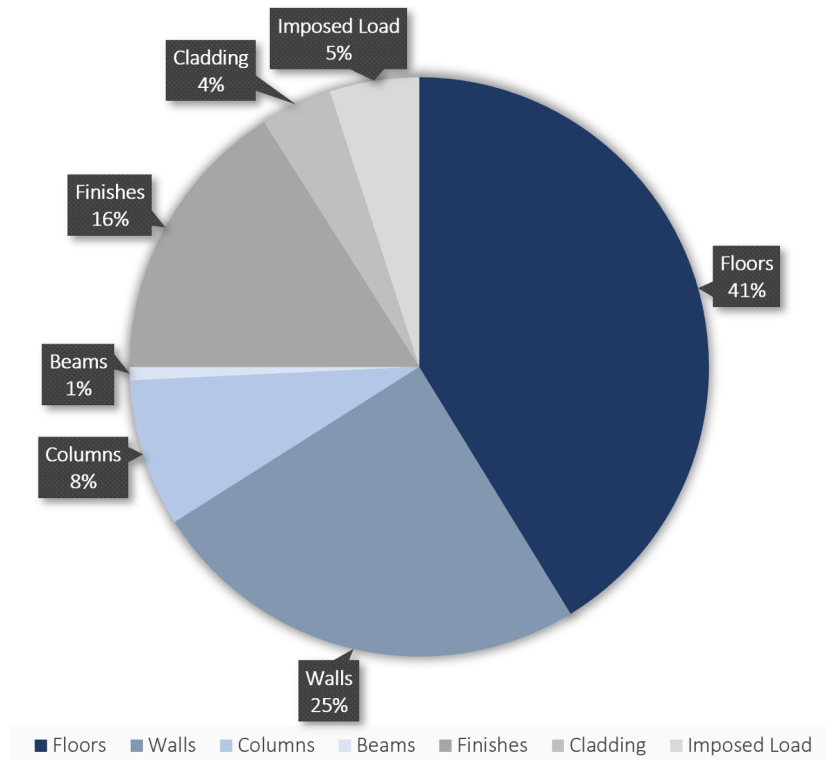


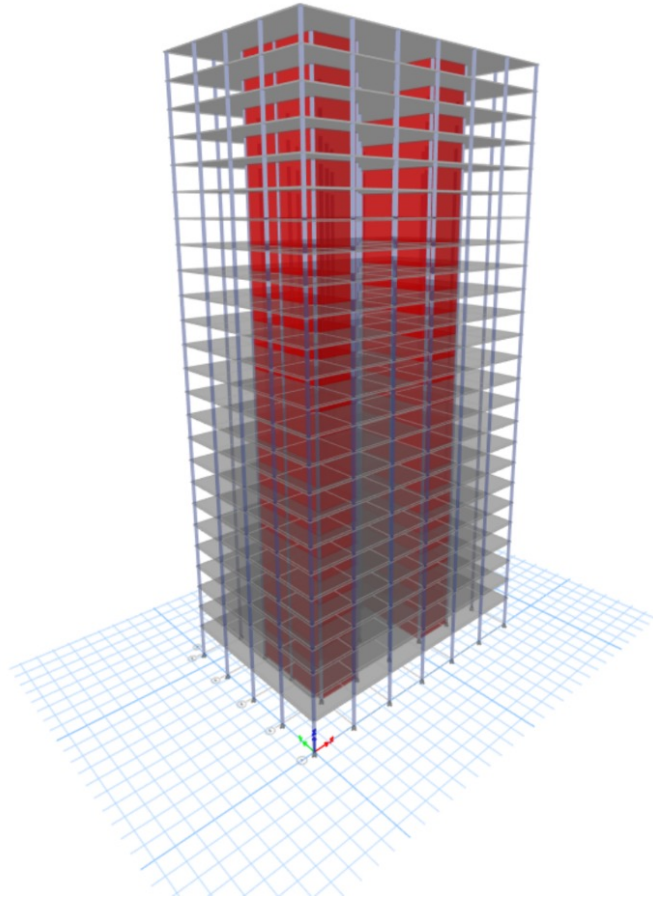
3cm



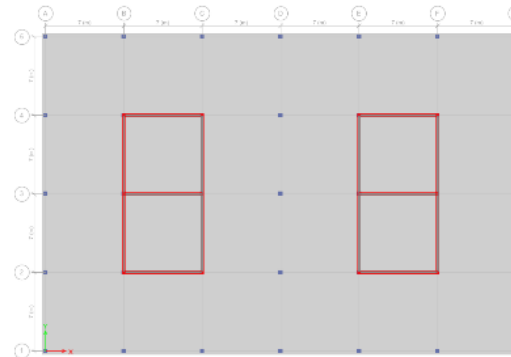


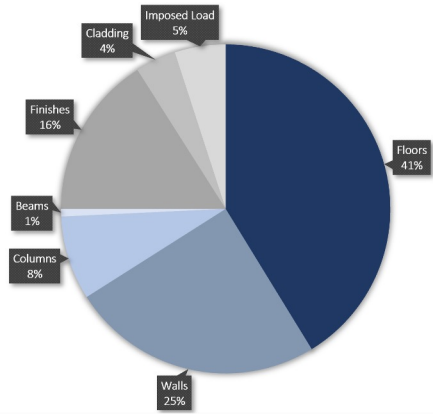




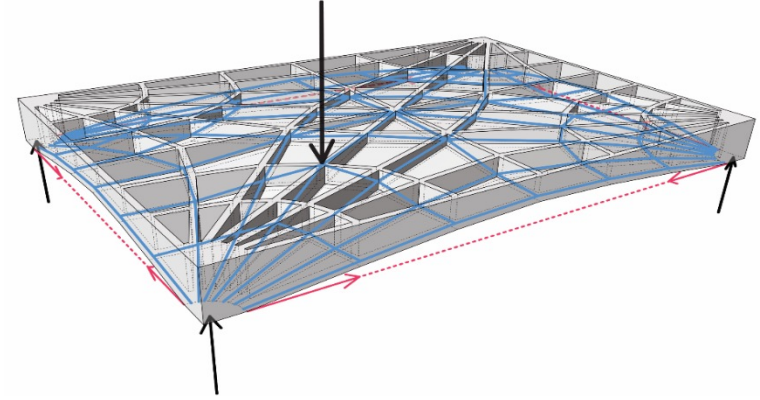


- Number of stories: 25
- Typical span: 7.5m
- Floor plate: 35m X 50m





> 40%



-67% concrete
-80% steel



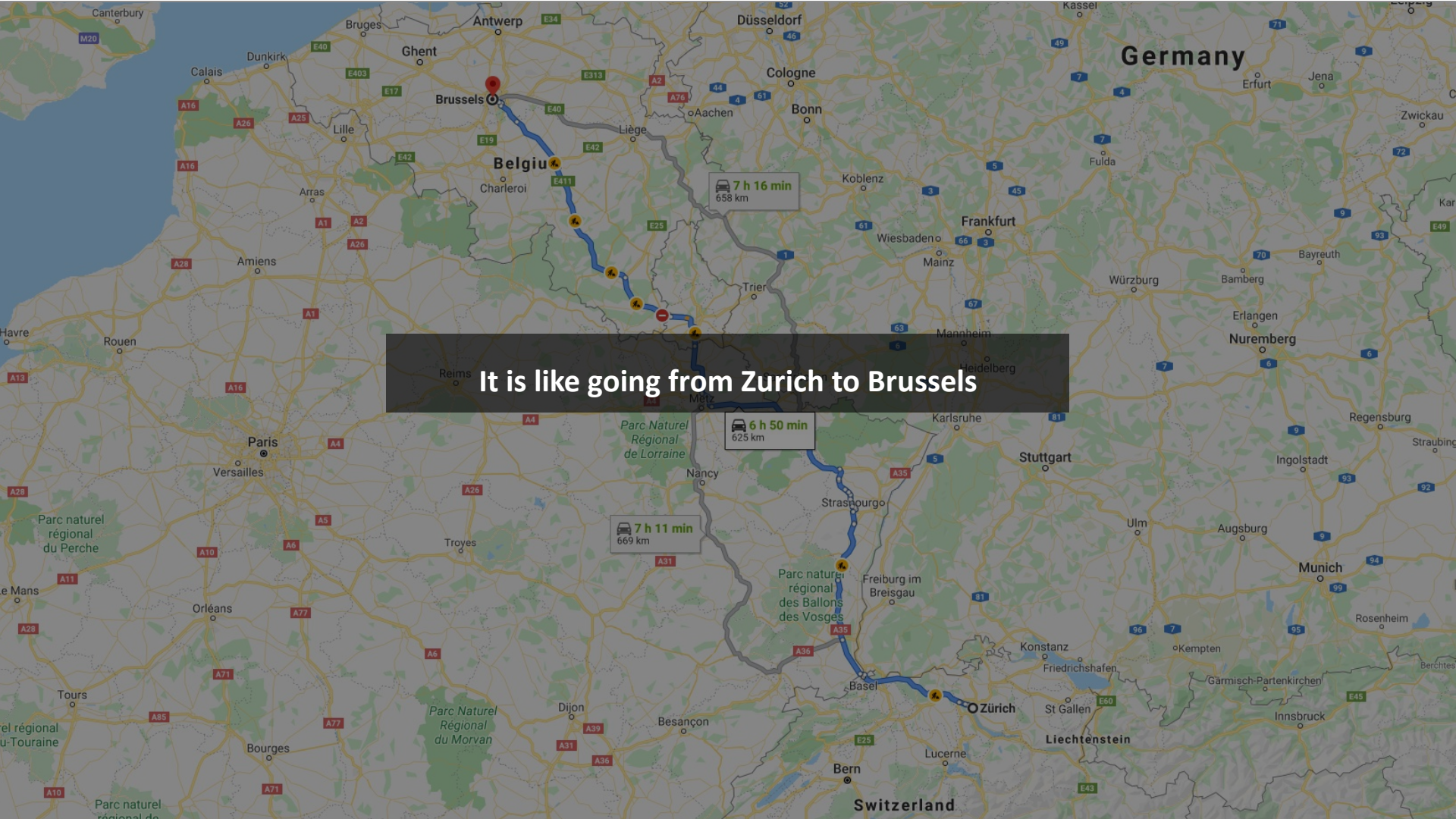
7500 cubic metres of concrete less



1208



20 km of \varnothing 12mm steel bars per story less



It is like going from Zurich to Brussels

7 h 16 min
658 km

6 h 50 min
625 km

7 h 11 min
669 km

STRUCTURAL GEOMETRY

LOW CARBON CONCRETE

$$GWP = \sum_i (M_i \times ECC_i)$$

The diagram illustrates the components of the Global Warming Potential (GWP) equation. The equation is $GWP = \sum_i (M_i \times ECC_i)$. The term M_i is enclosed in a blue box and is pointed to by a solid blue arrow from the text 'STRUCTURAL GEOMETRY'. The term ECC_i is also enclosed in a blue box and is pointed to by a solid blue arrow from the text 'LOW CARBON CONCRETE'. Additionally, a dashed blue arrow points from 'STRUCTURAL GEOMETRY' to ECC_i , indicating that structural geometry also influences the embodied carbon coefficient.

GWP = global warming potential (kgCO₂e/m²)

M = mass (kg/m²)

ECC = embodied carbon coefficient (kgCO₂e/kg)

STRENGTH THROUGH GEOMETRY



Less mass ¹

- 67%



Lower stresses ²

- 21%

X

MATERIAL INNOVATION



Less clinker ³

- 67%



- 91%

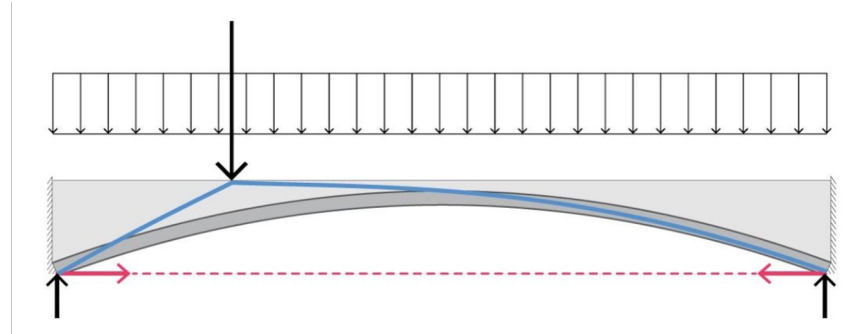
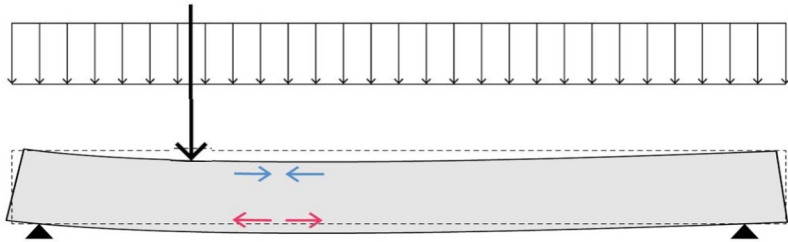


- 80%

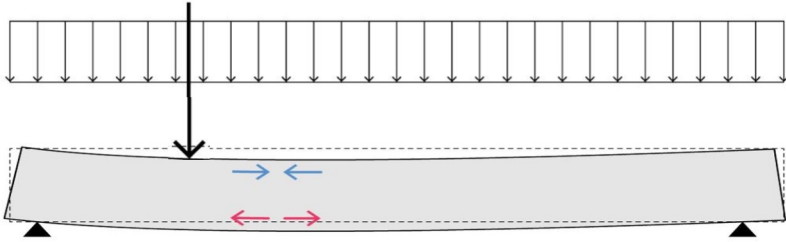
¹ Compared to RC floor slab

² C30/37 → C16/20

³ CEM I /OPC → CEM III+

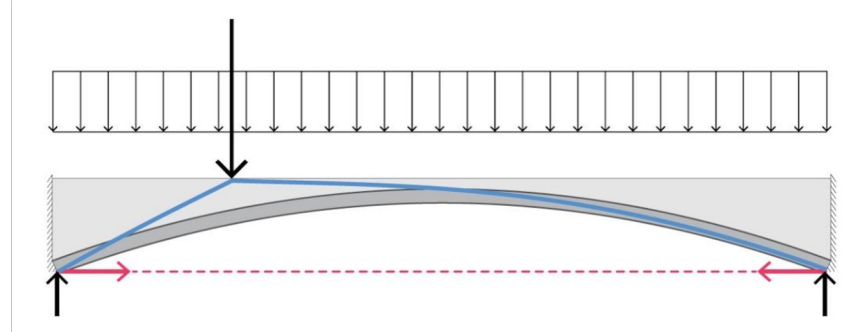


-85% GWP



50% GWP

100% M



20

~~**15% GWP**~~

33% M

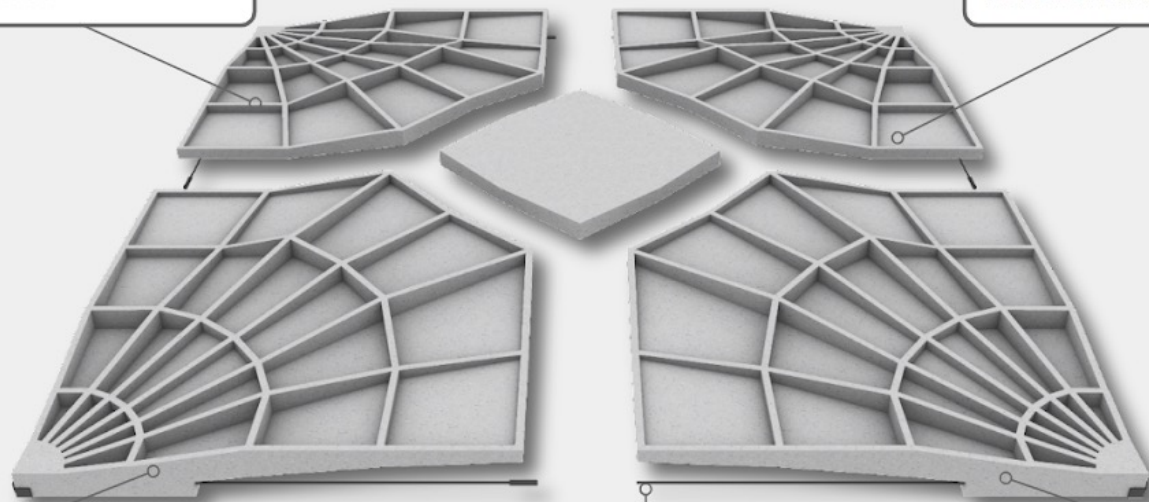
Circular Construction

Prefabricated = fast & safe

The floor planks are produced offsite with a zero-waste strategy, assuring consistent quality, tight tolerances and the highest quality standards.

Dry assembled = easily deconstructed

Contact interfaces rely on proprietary details, ensuring fast and reversible connections. The building site is freed of noise and dust pollution and the workers' Health and Safety is guaranteed.



Low-strength = low-carbon concrete

The low compressive stresses allow the replacement of large percentages of clinker cement with byproducts of other industries.

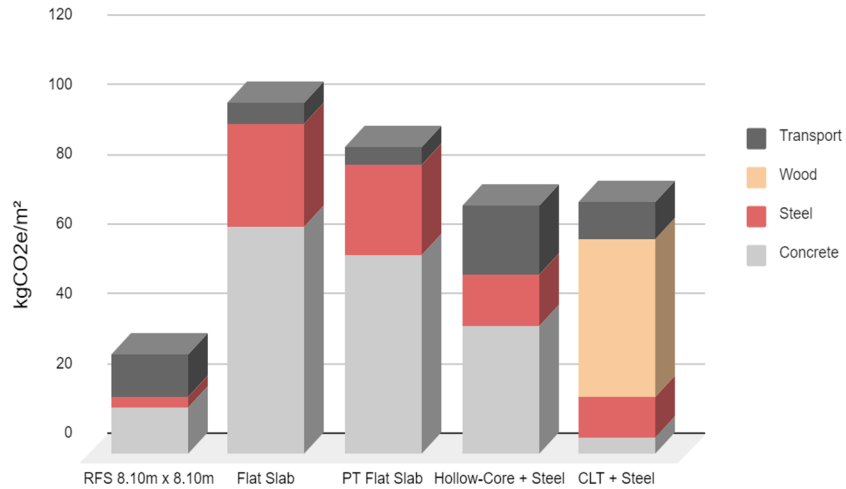
Materials separation = recyclability

The clear separation between concrete and steel ensures complete and low-energy recycling at the end of the building lifecycle.

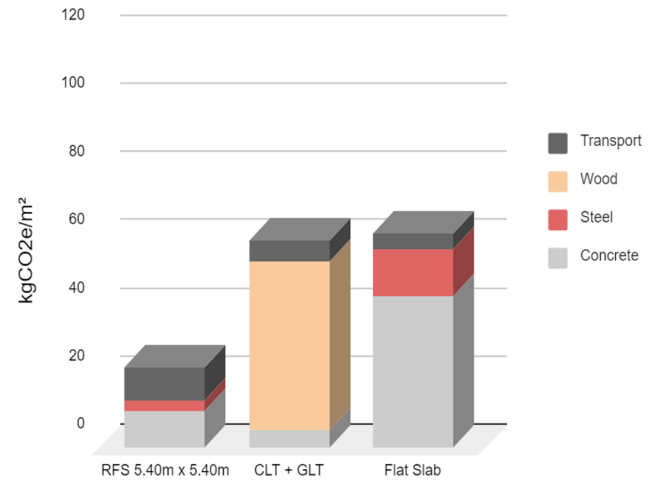
Fully unreinforced = durability

The lack of conventional reinforcement means the floor is unaffected by phenomena like corrosion due to carbonation.

8.10 x 8.10 m Slab



5.40m x 5.40m Slab





VAULTED

Bürohochhaus CreaTower I, Zug

Studienauftrag 2022, 1. Preis

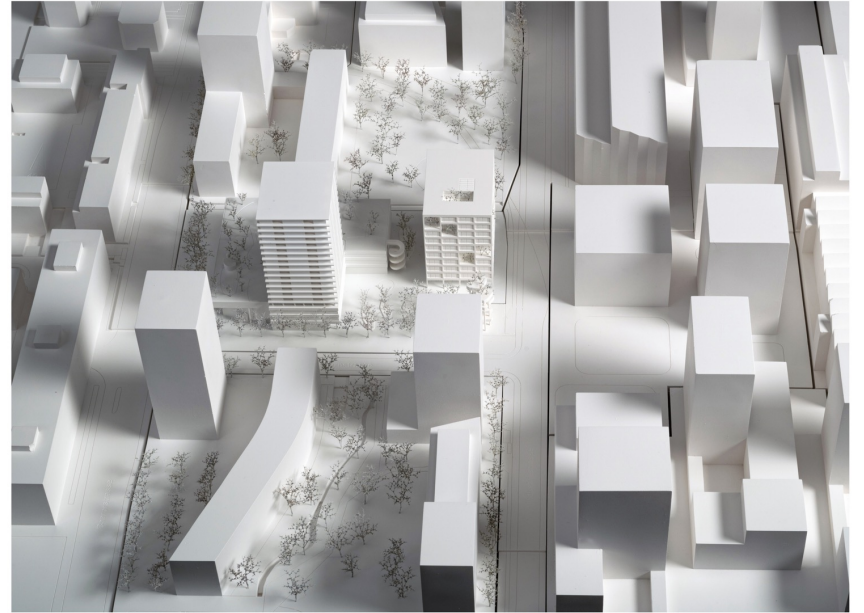
Gigon / Guyer Architekten



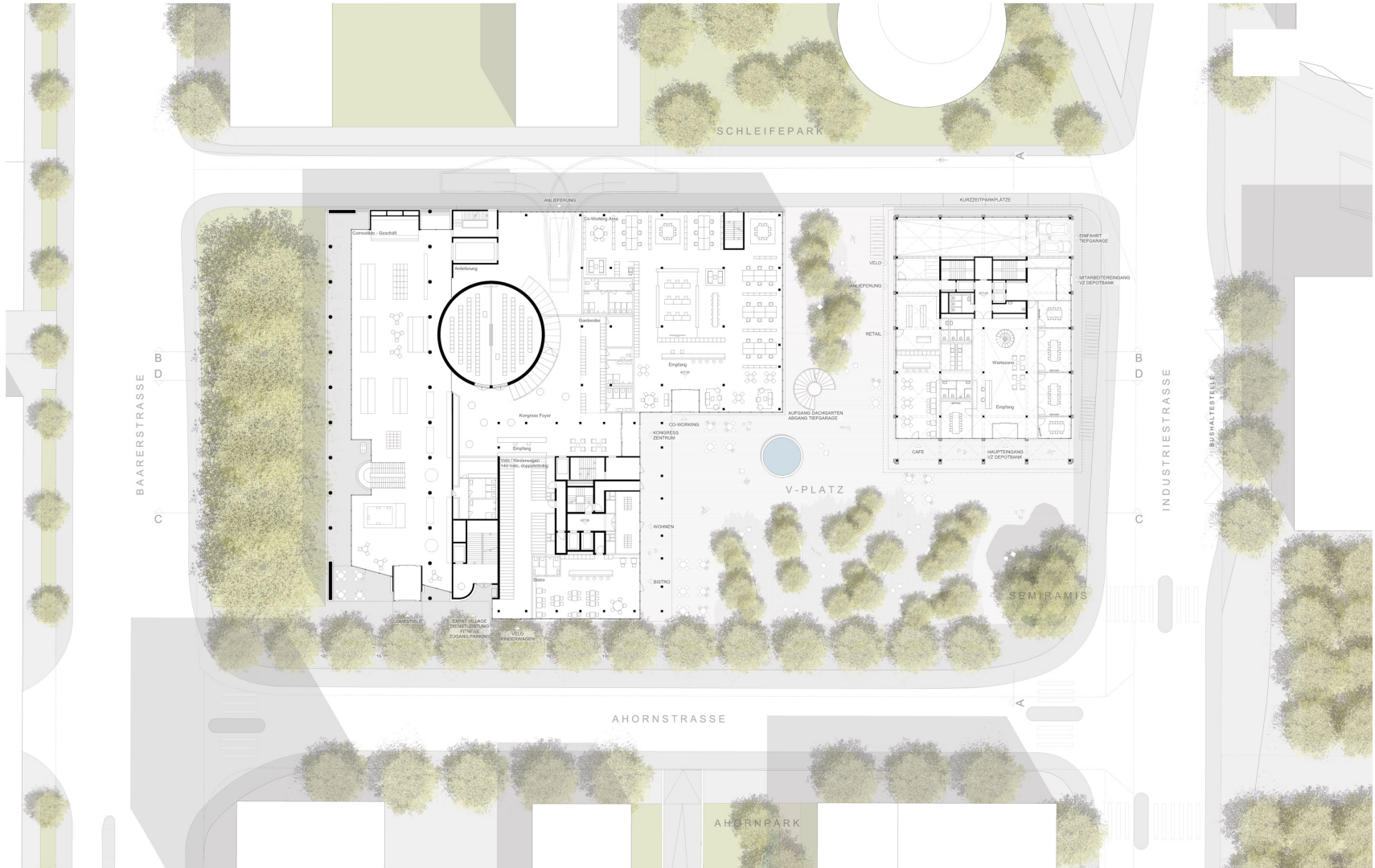




Etappe 1



Endzustand



BAARERSTRASSE

D
C

SCHLEIFEPARK

AHORNSTRASSE

AHORNPARK

INDUSTRIESTRASSE

D
C

BUSHALTESTELLE

SEMIRAMIS

V-PLATZ

KURZZEITPARKPLATZE

ANLEFERUNG

ANLEFERUNG

ANLEFERUNG

NETZ

EINFART
REFUGIAGE

MITARBEITERGANG
VZ DEPOTBANK

Eingang

HAUPTGANG
VZ DEPOTBANK

Eingang

Eingang

WOHNE

BISTRO

CO-WORKING

KONGRESS
ZENTRUM

Kongress Foyer

SEMI-KONGRESS

SEMI-KONGRESS

SEMI-KONGRESS

SEMI-KONGRESS

SEMI-KONGRESS

SEMI-KONGRESS

SEMI-KONGRESS

SEMI-KONGRESS

SEMI-KONGRESS

SEMI-KONGRESS

SEMI-KONGRESS

Commissariat - Geschäft

Verwaltung

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

Service

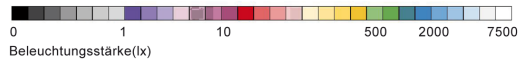
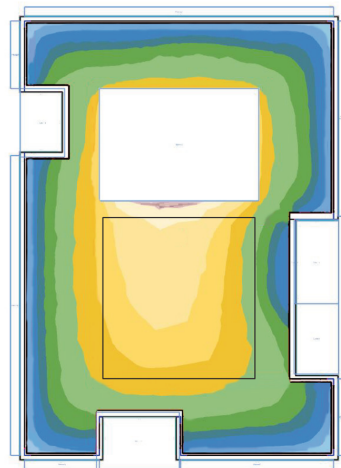
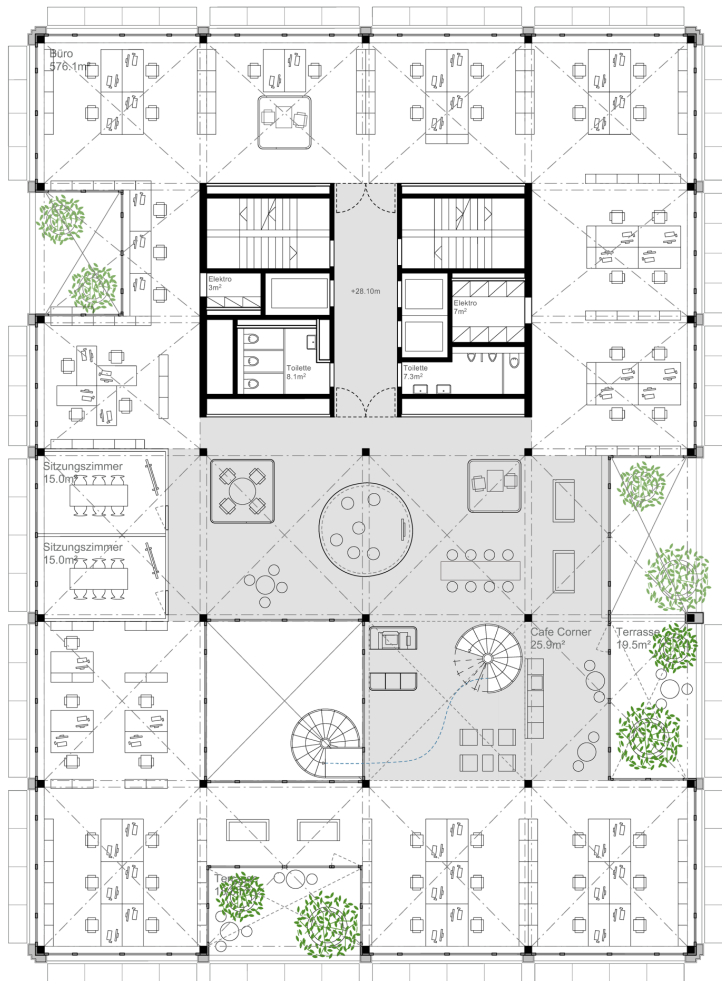
Service

Service

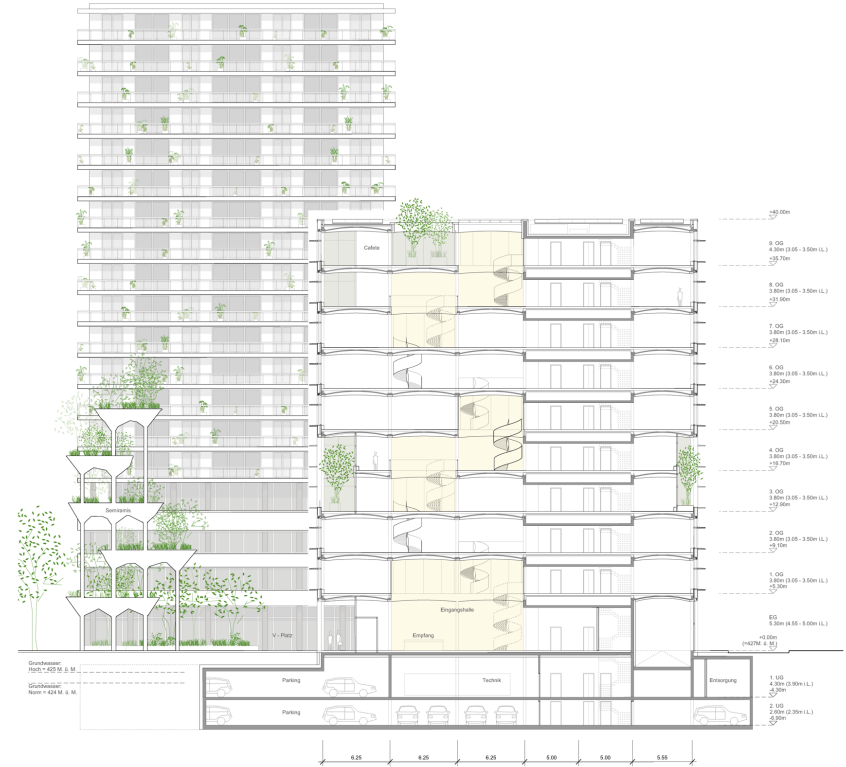
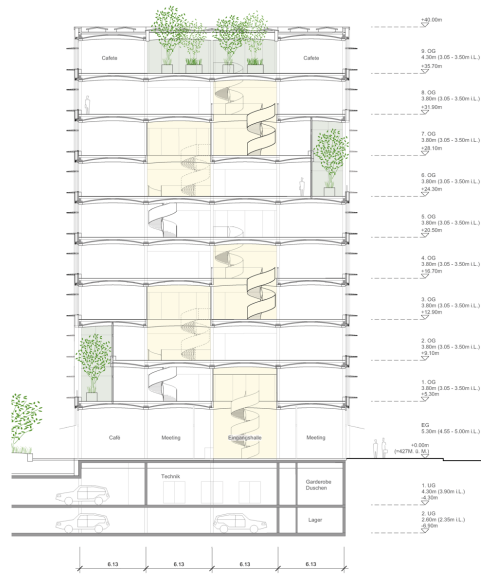
Service

Service

Service

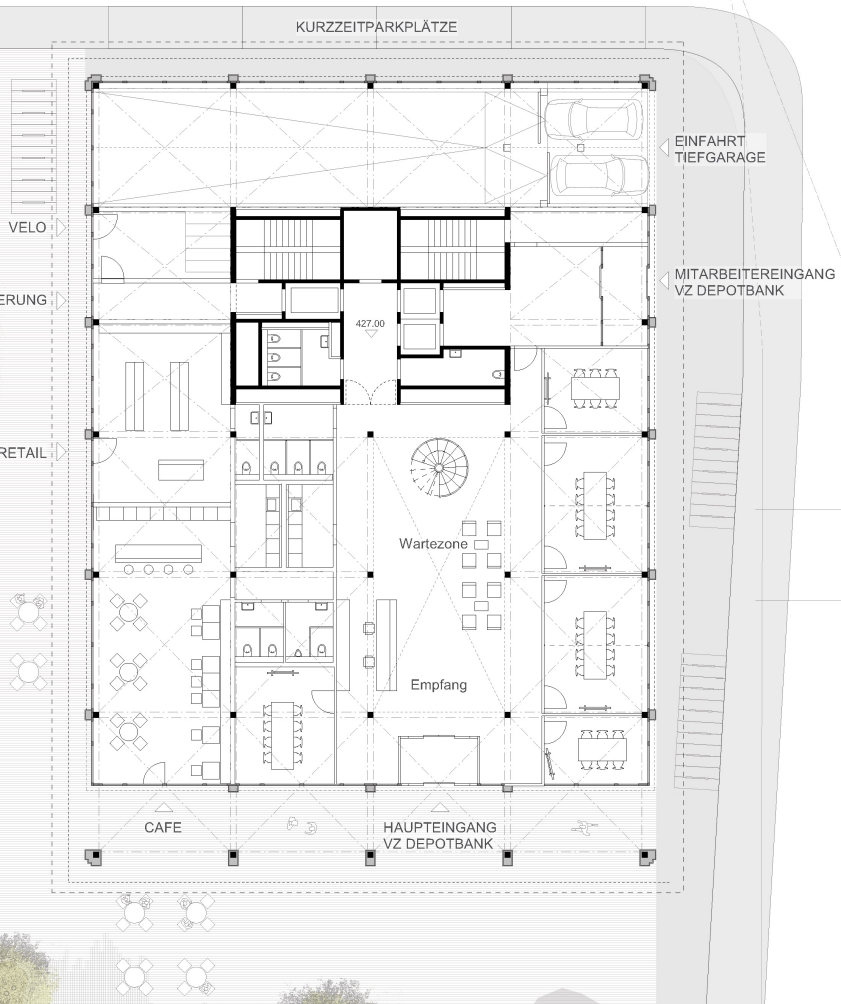


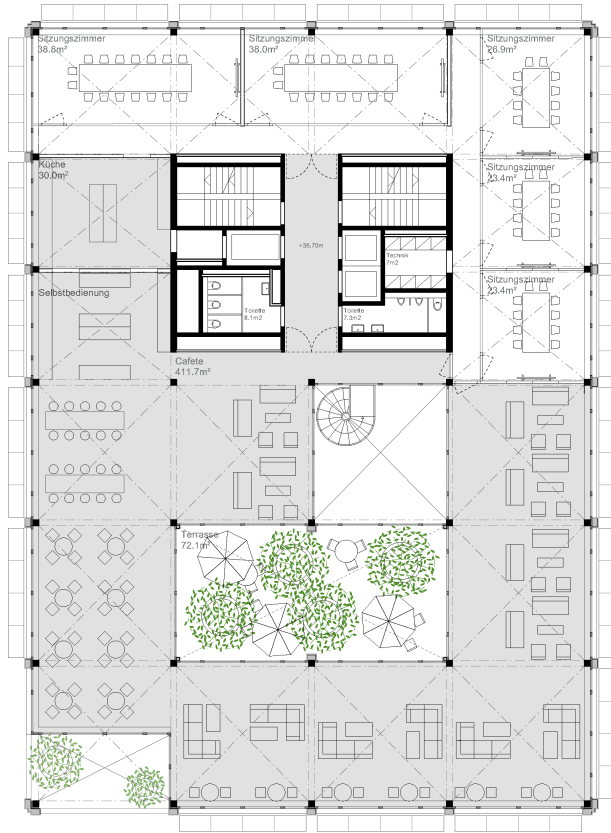












Variante 1: Flachdecke

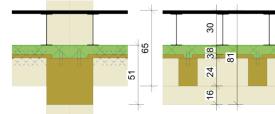


Masse:
650 kg/m²
100%

kg CO₂-eq/m² (Hochbaubeton)
82 kg
100%

Anteile:
Beton: 59kg CO₂-eq/m² (73%)
Betonstahl: 23kg CO₂-eq/m² (27%)
Baustahl: -
Holz: -

Variante 2: HBV mit Unterzügen und Stützen in stäbverleimter Buche

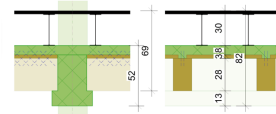


Masse:
283 kg/m²
44%

kg CO₂-eq/m² (Hochbaubeton)
56 kg
68%

Anteile:
Beton: 18kg CO₂-eq/m² (33%)
Betonstahl: 6kg CO₂-eq/m² (11%)
Baustahl: -
Holz: 31kg CO₂-eq/m² (56%)

Variante 3: Holz-Beton Verbunddecke (HBV)

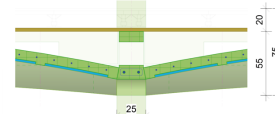


Masse:
291 kg/m²
45%

kg CO₂-eq/m² (Hochbaubeton)
53 kg
64%

Anteile:
Beton: 23kg CO₂-eq/m² (44%)
Betonstahl: 12kg CO₂-eq/m² (23%)
Baustahl: -
Holz: 18kg CO₂-eq/m² (33%)

Variante 4: Vorfabrizierte Gewölbendecke

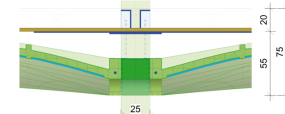


Masse:
242 kg/m²
37%

kg CO₂-eq/m² (Hochbaubeton)
30 kg
36%

Anteile:
Beton: 22kg CO₂-eq/m² (74%)
Betonstahl: 8kg CO₂-eq/m² (26%)
Baustahl: -
Holz: -

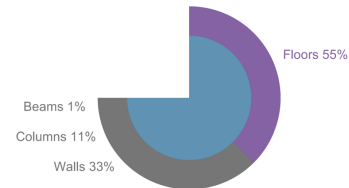
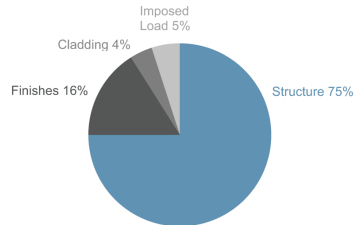
Variante 5: Vorfabrizierte Gewölbendecke RFS

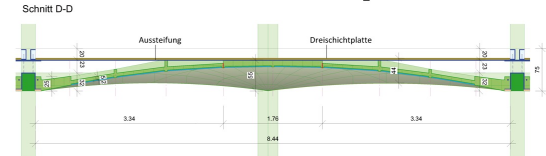
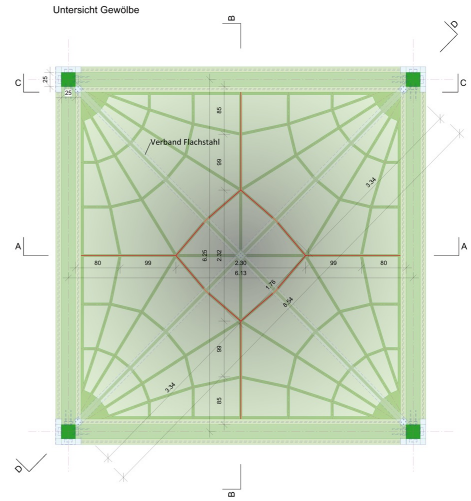
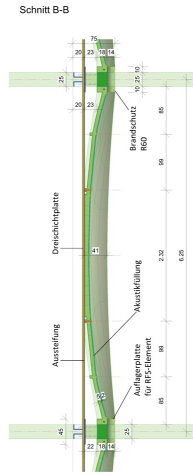
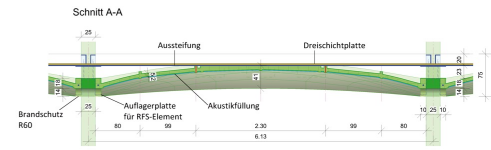
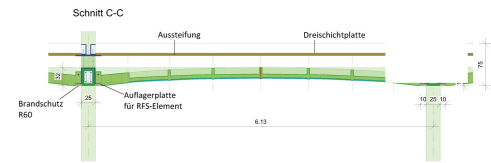
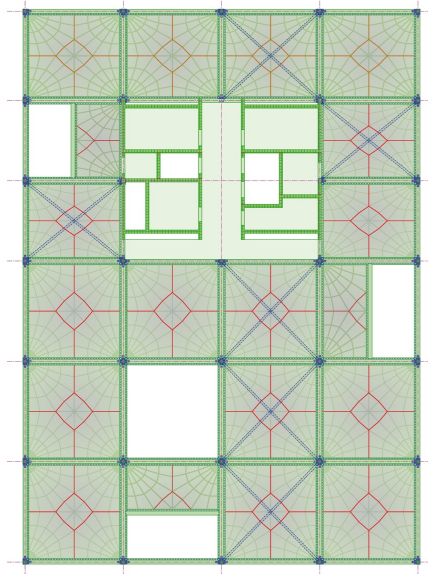
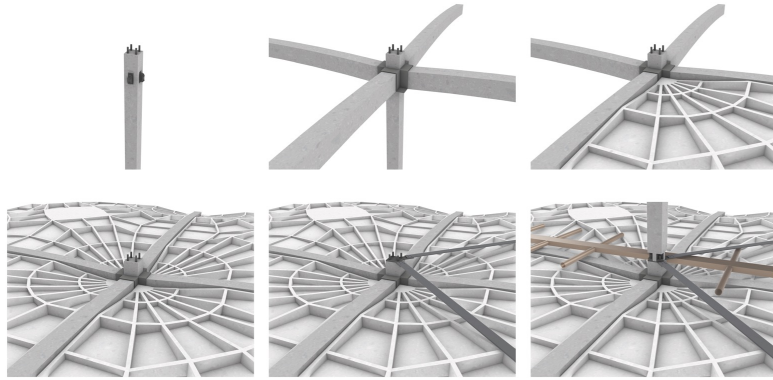


Masse:
223 kg/m²
34%

kg CO₂-eq/m² (Hochbaubeton)
26 kg
31%

Anteile:
Beton: 19kg CO₂-eq/m² (74%)
Betonstahl: 2kg CO₂-eq/m² (7%)
Baustahl: 5kg CO₂-eq/m² (19%)
Holz: -









Bauteil	Masse [Tonnen]			CO ₂ -Emissionen [kg CO ₂ -eq]		
	Konventionell	Optimiert	Reduktion	Konventionell	Optimiert	Reduktion
Decken Hochhaus	4'936	1'688	-66%	631'852	196'576	-69%
Kerne Hochhaus	2'396	1'598	-33%	391'942	243'862	-38%
Stützen	651	394	-40%	152'880	91'516	-40%
Decken Untergeschosse	4'921	4'921	0%	670'662	670'662	0%
Kerne Untergeschosse	501	438	-13%	86'739	69'916	-19%
Aussenwände Untergeschosse	768	768	0%	107'743	107'743	0%
Bodenplatte	4'251	2'125	-50%	643'046	298'331	-54%
Foundation	5'146	3'935	-24%	665'214	503'630	-24%
Total	23'620	15'867	-33%	3'350'079	2'182'237	-35%

