This project has received funding from
the European Union's Horizon 2020
research and innovation programme
under grant agreement No 862820

BUILD IN
WOOD

Trento - Wooden Bike Tower

work package 3 / pilot project

October 2022

CF MØLLER
ARCHITECTS

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Torre Vanga

Santa Maria Maggiore

Chiesa dei Santi Cosma e Damiano

Torre Campanaria

Torre Verde

Gardolo church

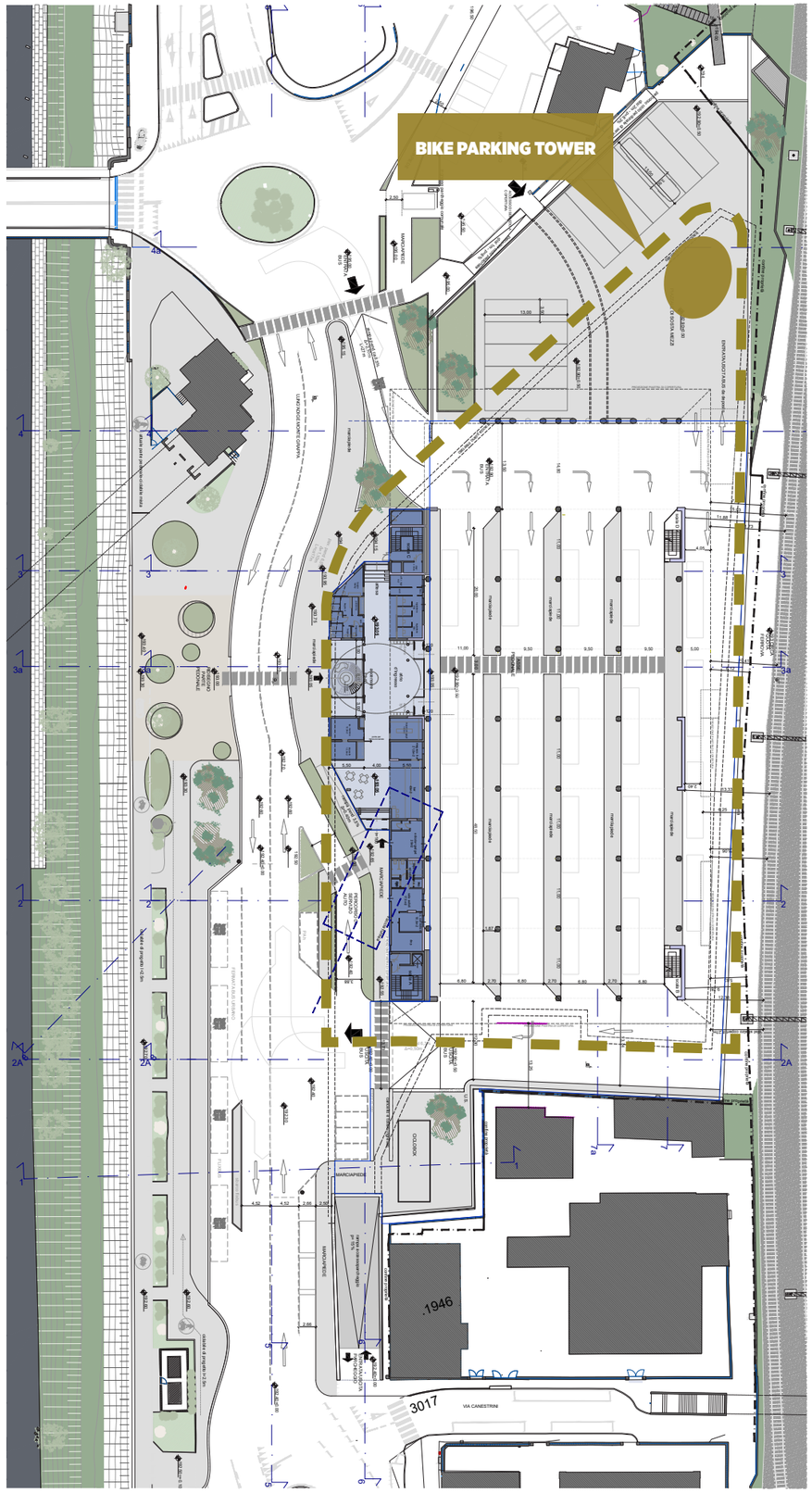
MUSE (Museum of Science)

Piazza del Duomo and Neptune Fountain

Le Albere Area

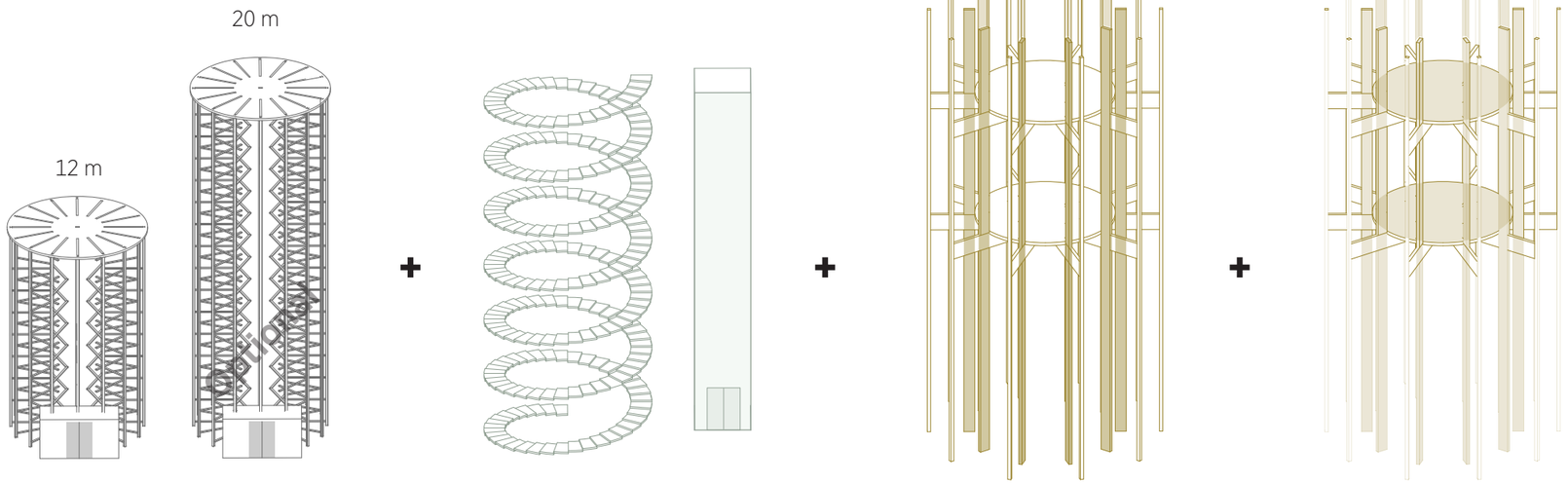
Castello del Buonconsigli


Basilica
Paleocristiana
Doss Trento
Train station
Piazza
Dante
Torre
Verde
Castello del
Buonconsiglio
Torre
Vanga
SITE
Adige river
Piazza
del Duomo
Torre
Grande
via sardagna (cable car)
MUSE
Le Albere
Area


BIKE PARKING TOWER
1946
3017
VIA CANESTRINI

View of the site from Lungadige Monte Grappa

Design principles



122 bikes / staircase

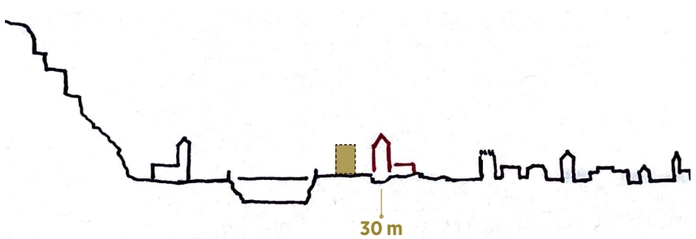
203 bikes

Circulation

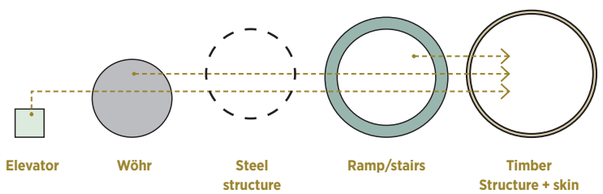
Elevator 3 x 3m

Timber structure

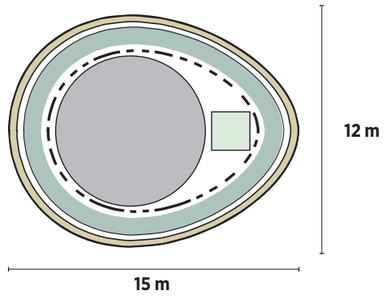
Viewing platforms



The height of the tower must be between 20-30 m. To respect the historical towers of Trento, the tower should be closer to 20 m than 30 m. This puts an extra focus on the shape and the proportions of the tower to accondate the restrictions while creating an elegant tower landmark.



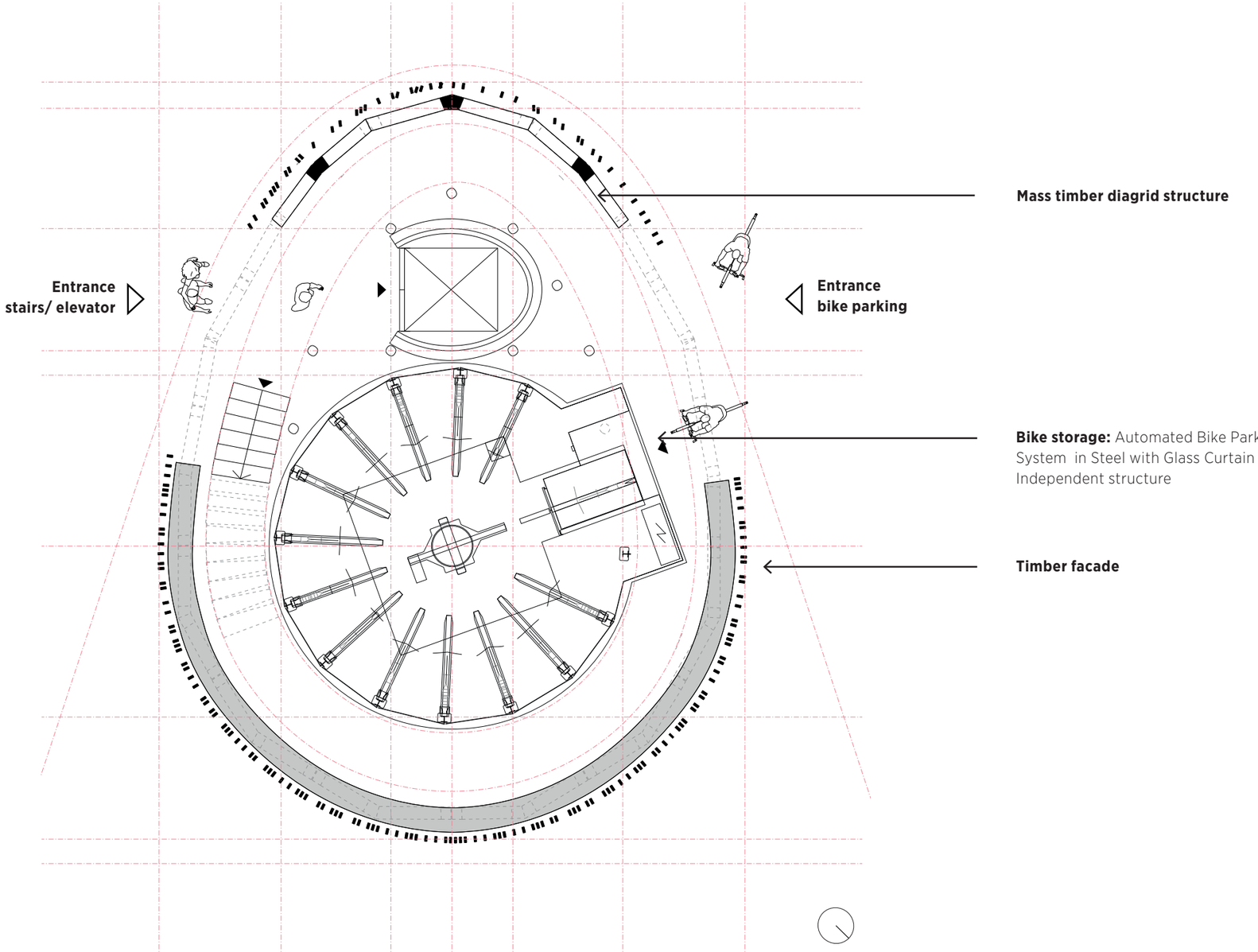
The footprint dimensions of the tower comes from fitting in the Wöhr bike parking system with its fixed dimensions, together with an elevator for the viewpoint at the top of the tower and the construction of the tower - this with a focus on creating the right balance between width and height.



The stretched shape (egg/ellipse) gives space to integrate elevator, Wöhr system, and staircase spiral while creating a slimmer tower construction from specific angles. The elliptical shape create a simple yet dynamic tower without a backside but with different expressions depending of the viewing point.

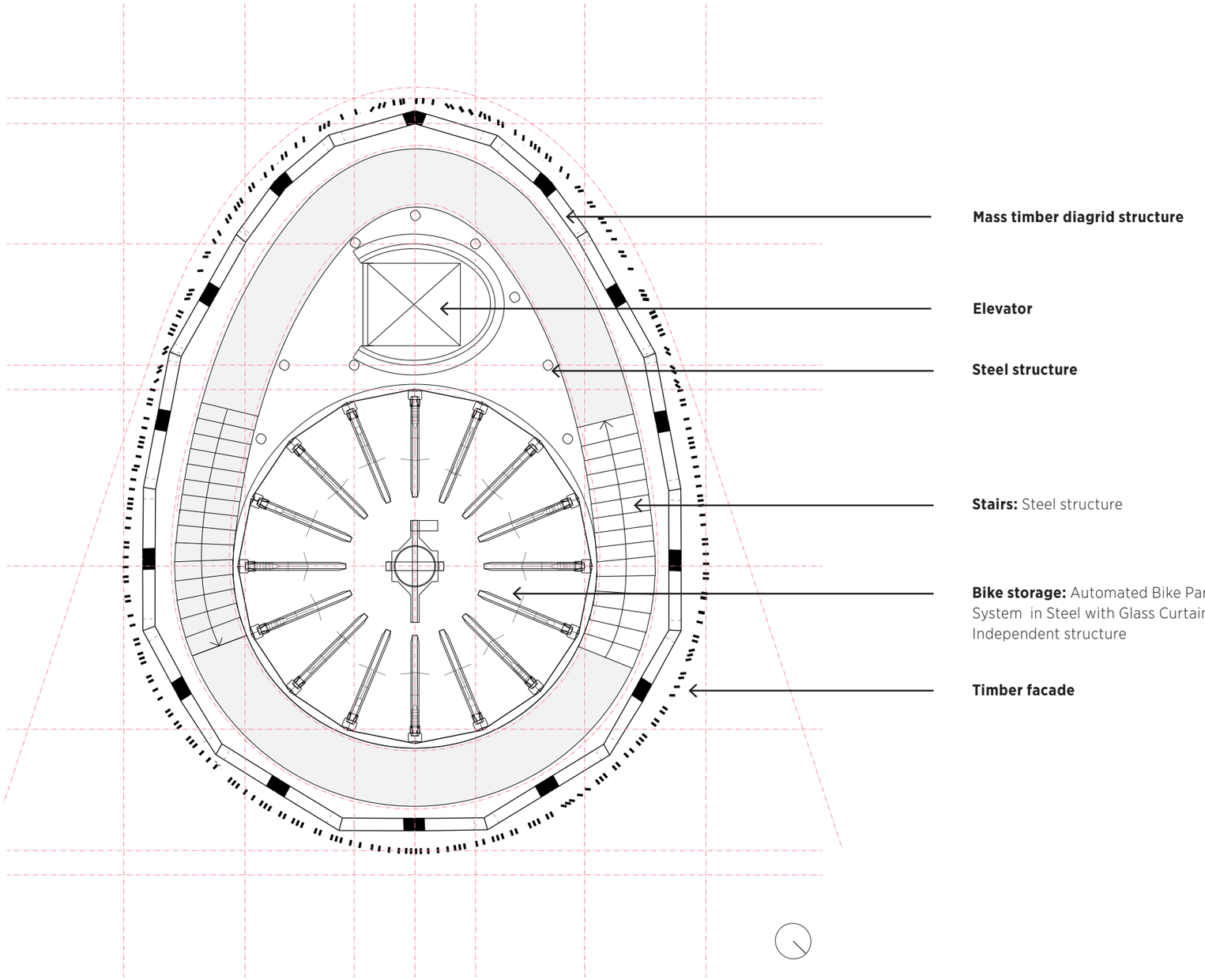
Massing principles

Groundfloor: +/- 0m



Massing principles

Regular Floor: +6-21m



Mass timber diagrid structure

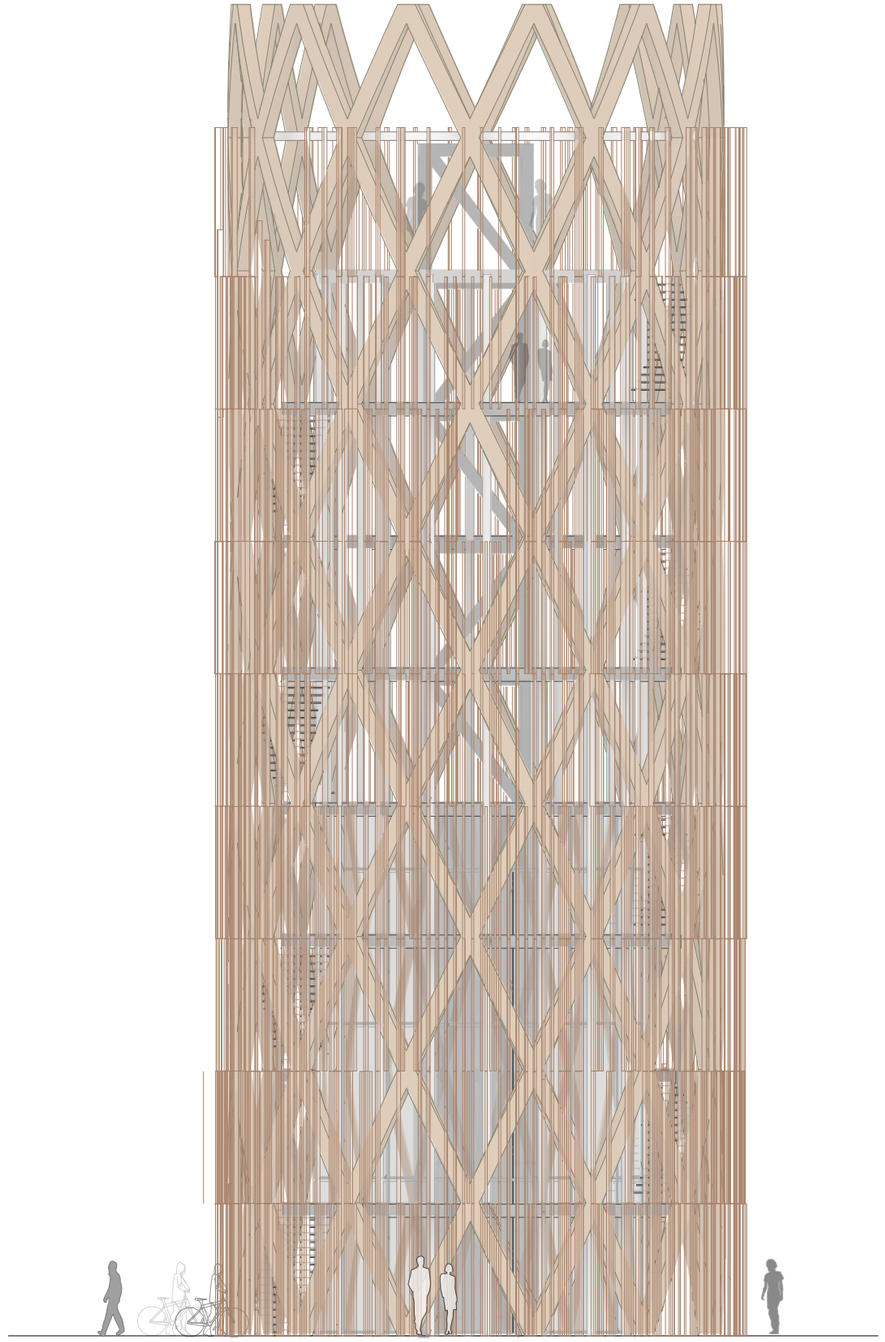
Elevator

Steel structure

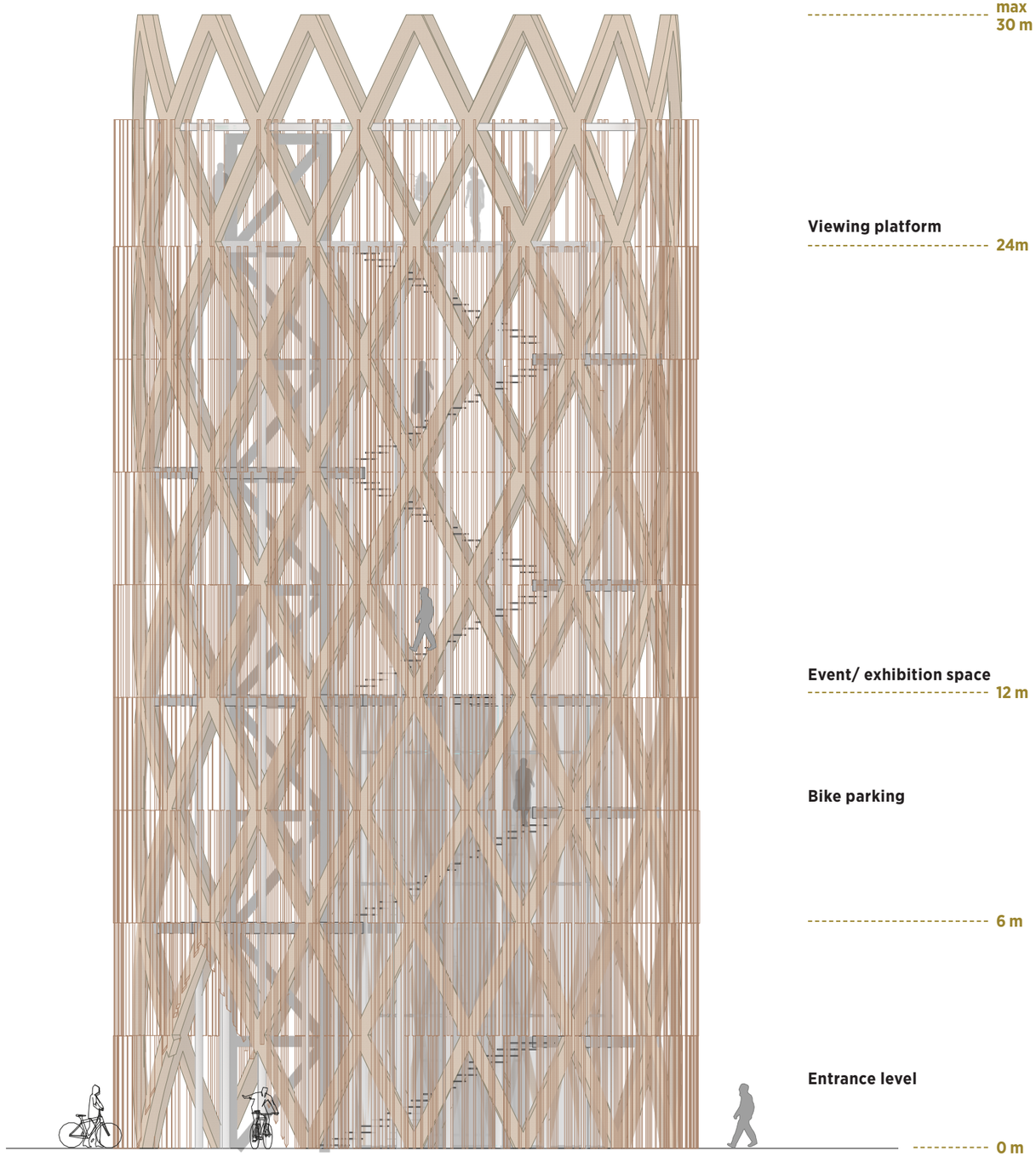
Stairs: Steel structure

Bike storage: Automated Bike Parking System in Steel with Glass Curtain Wall, Independent structure

Timber facade



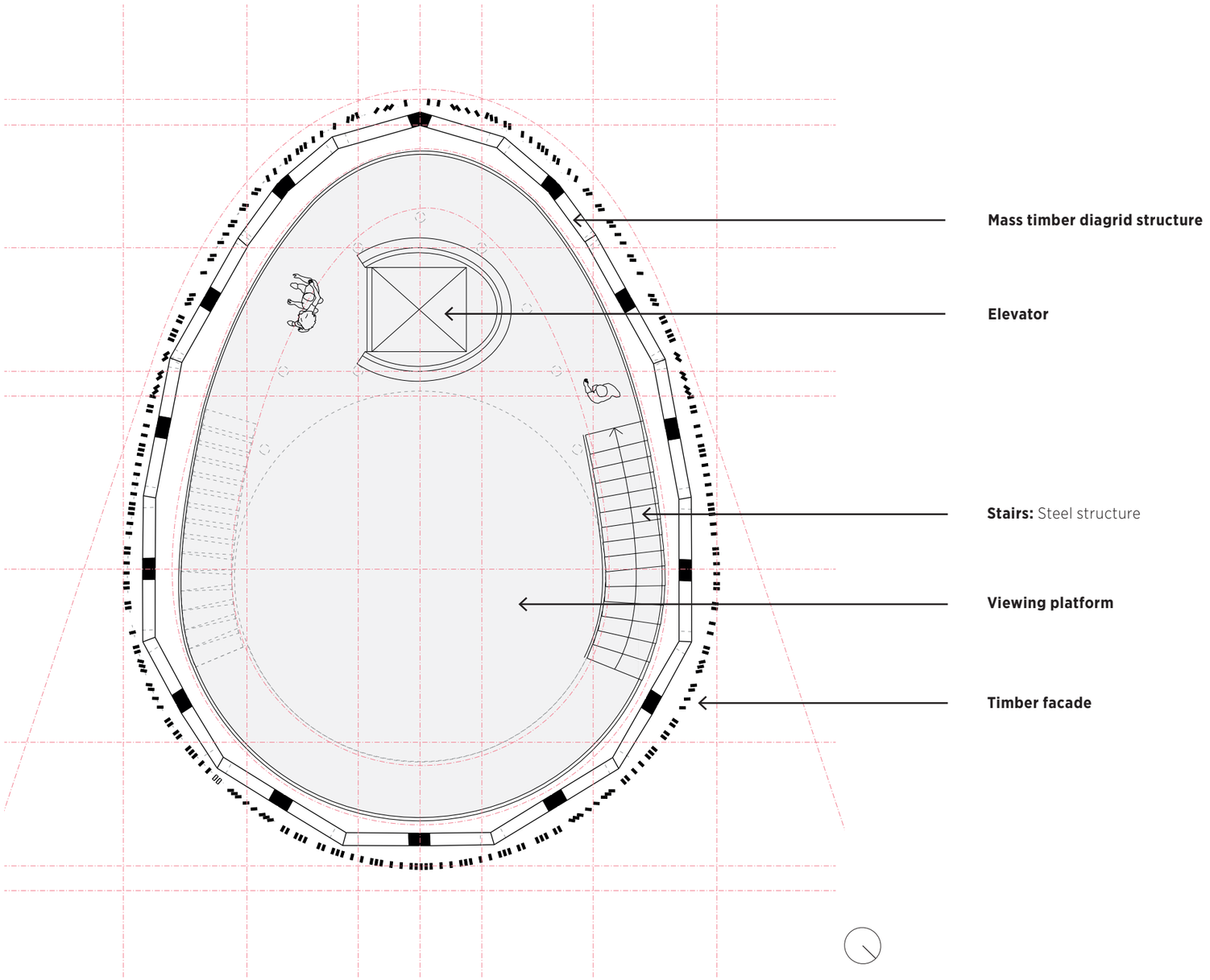
Elevation/East

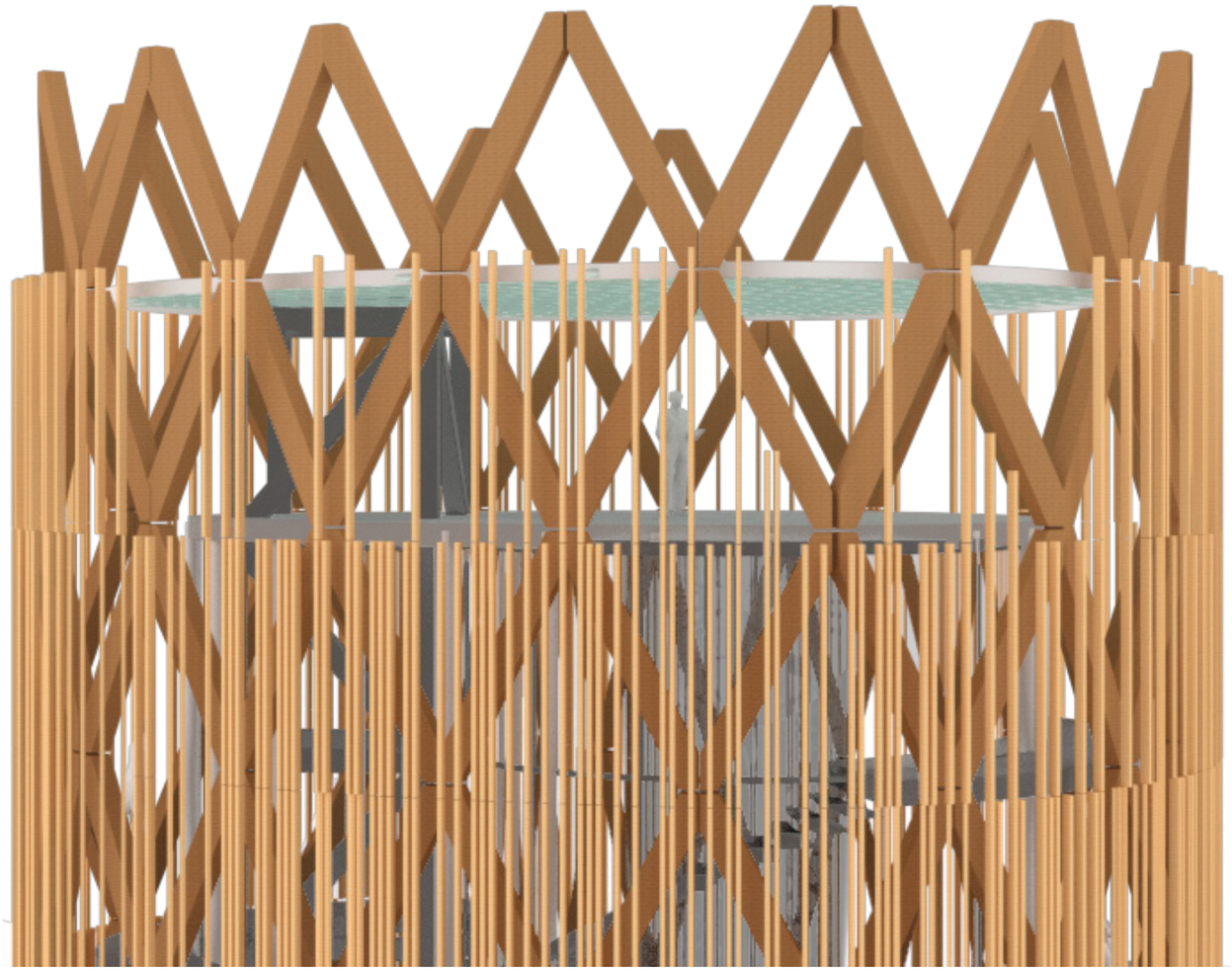


Elevation/North

Massing principles

Viewing platform: +24m





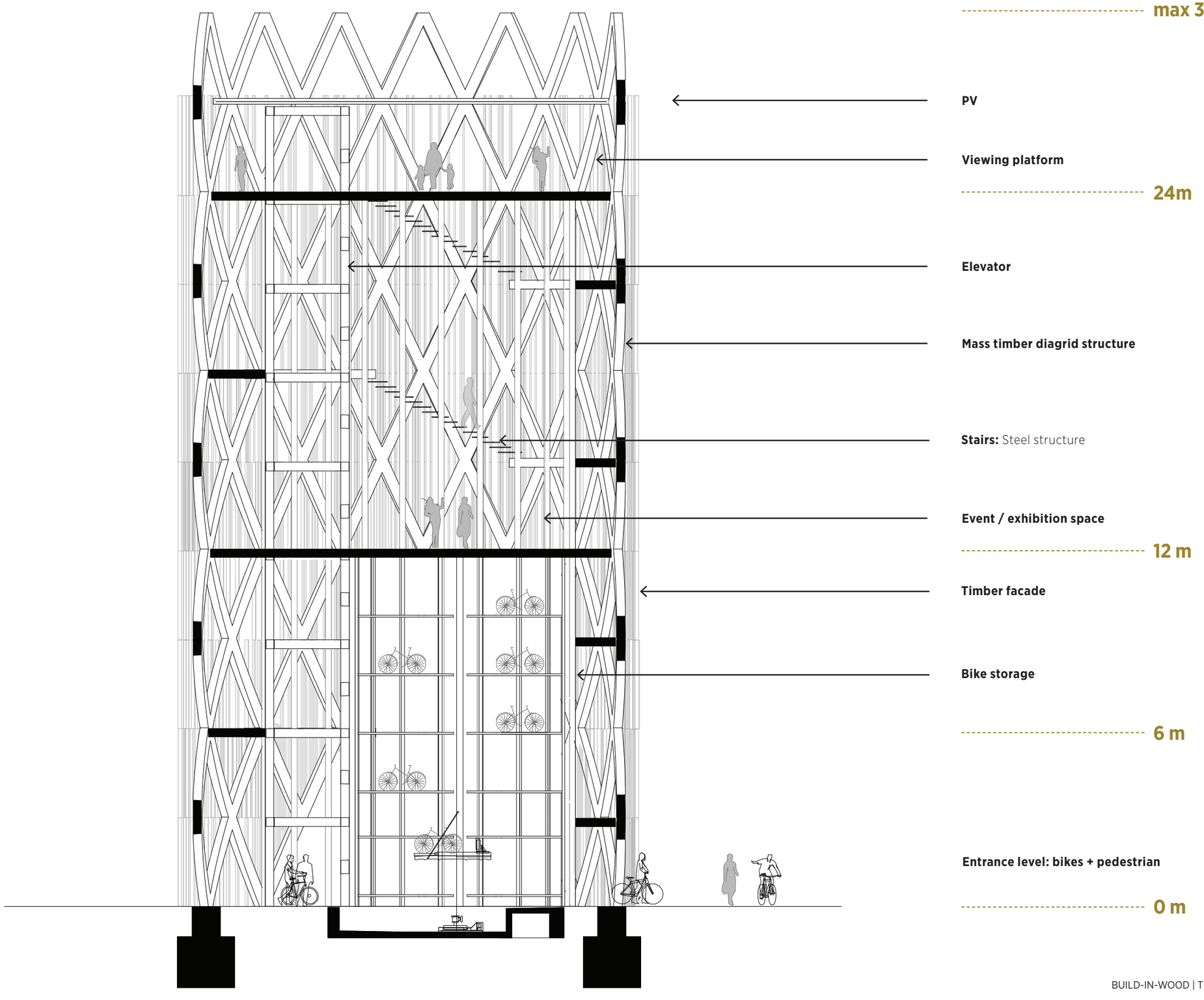
ROOF: PV-Panels attached onto steel substructure fixed to mass timber frame

← **VIEWING PLATFORM**

← **TIMBER FACADE**

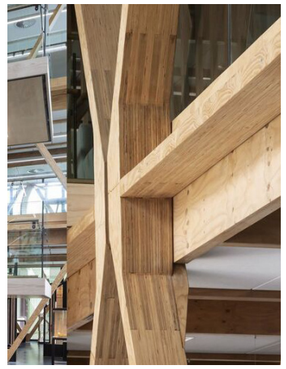
Massing principles

Section



Structural system

Mass timber diagrid structure

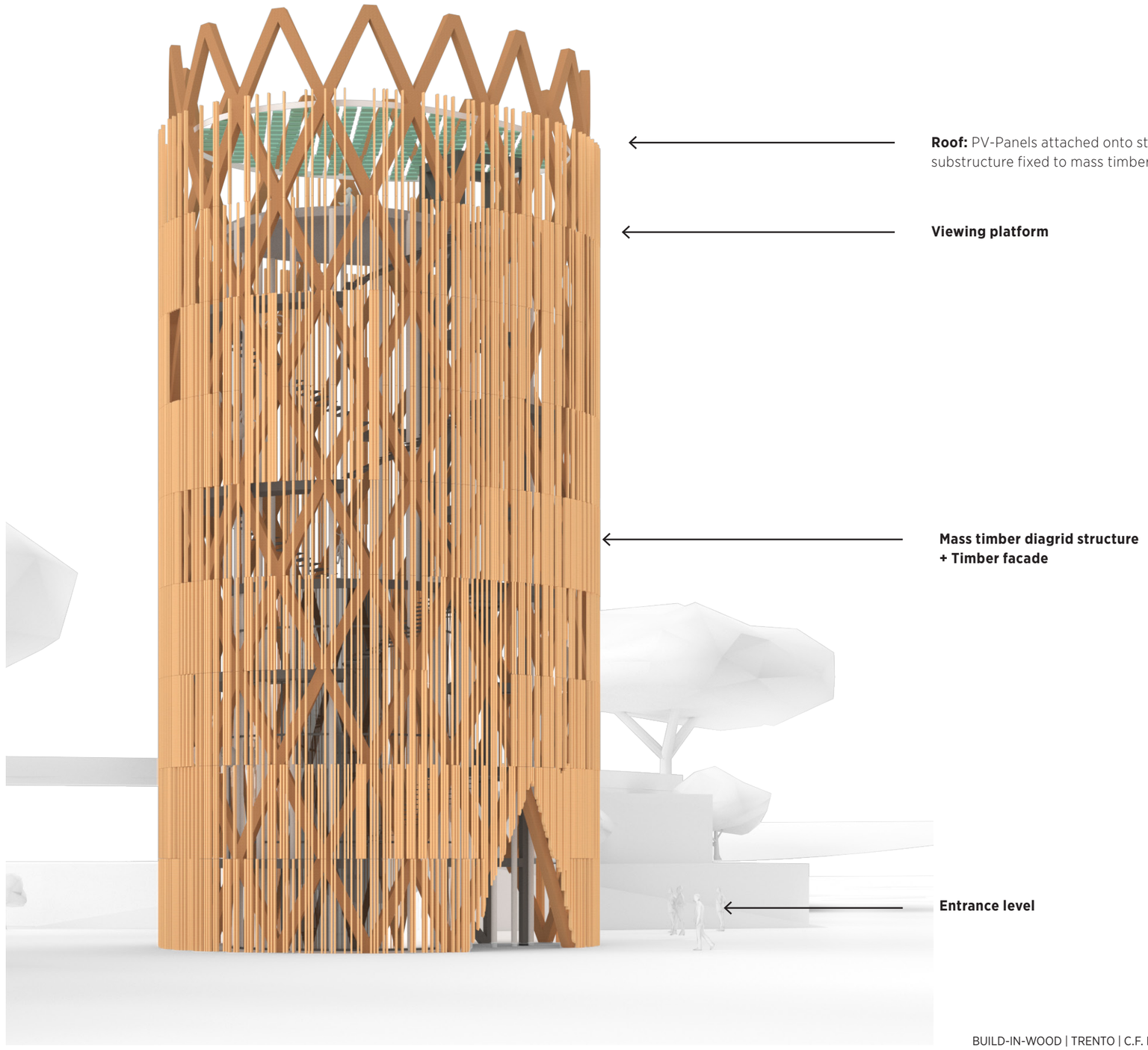


Structure as ornament

The foremost intentions of illustration sustainability and innovation through the use renewable materials, a state of the art bike storage system and energy producing PV-Panels is expressed very clearly to the outside. No further cladding or facade is necessary. The exposed mass timber elements are forming a rigid, simple and elegant diagrid structure. Repetitive joint in wood to wood or wood to steel.
The elements which are within this structure are reduced in their appearance and are mainly articulated in black powder coated steel.

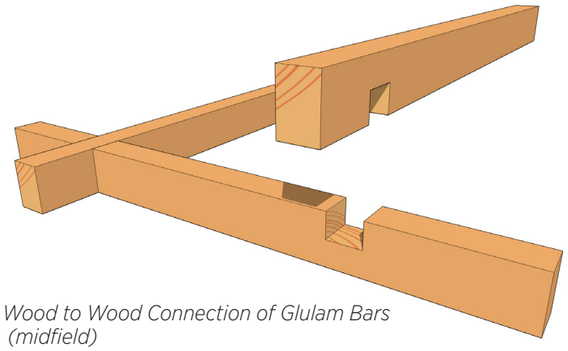
The bike parking system is a self-supported and free standing element. The elevator core is providing additional lateral stability and anchors the whole system safely to the ground. The core can be build in steel or concrete and will be evaluated in later phase.

The stairs are attached to the mass timber diagrid structure by steel components. The two viewing platforms are embedded into the primary timber structure and can be constructed out of steel or timber. The PV-Panels which form the so called “Crown” are attached onto a steel substructure holding onto the timber diagrid. Therefore the PV-Panels are ventilated and oriented towards the sun for an optimal performance.

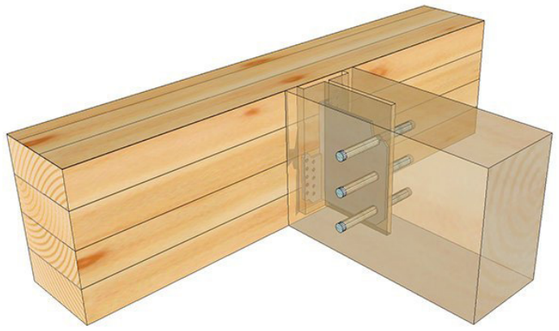


Technical design

Joints and assembly



Wood to Wood Connection of Glulam Bars (midfield)



Wood to Steel Joint with Steel Dowels (Joining four member together)

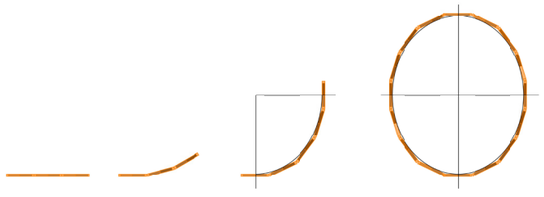
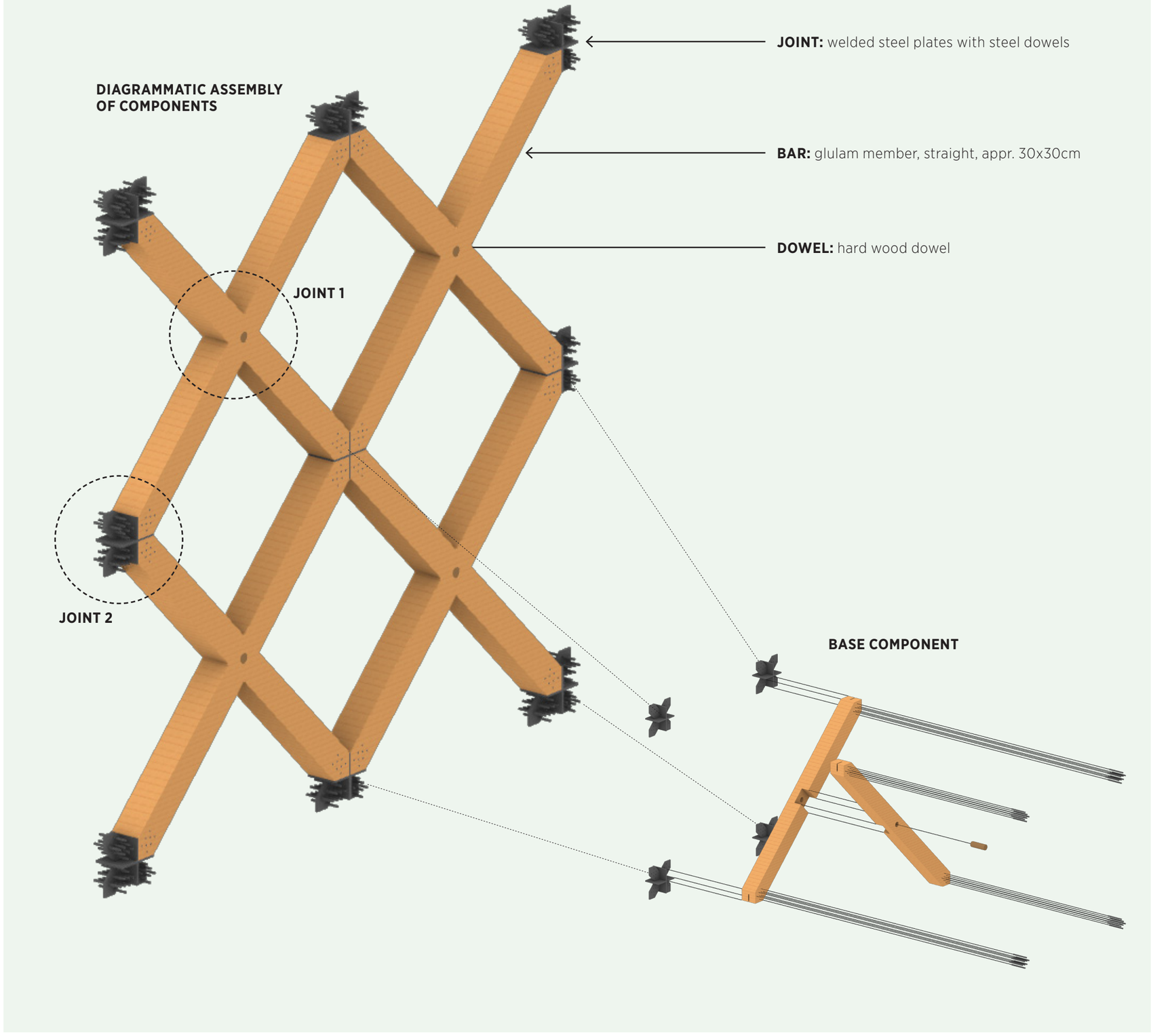


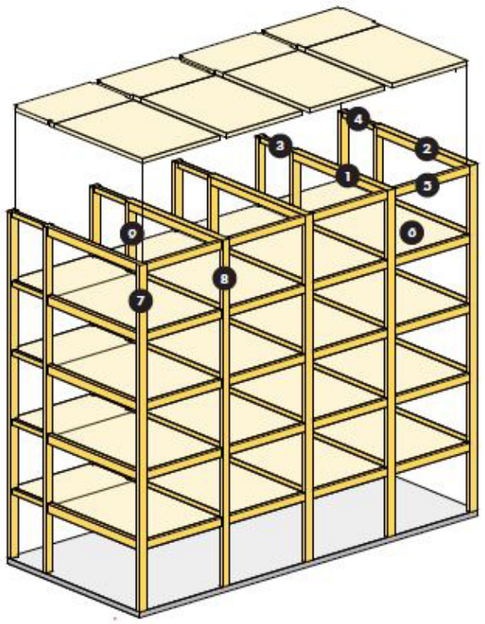
Diagram of the folded glulam bars

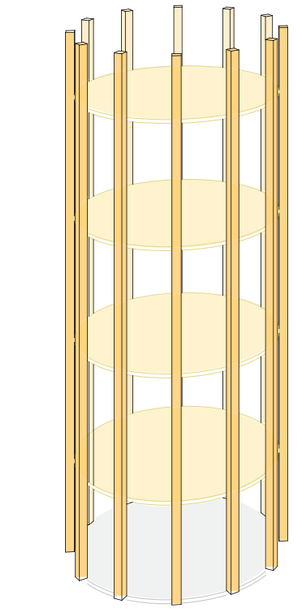
The Structural system is using two basic joints:
1. Wood-to-wood Joint
2. Wood-to-steel Joint

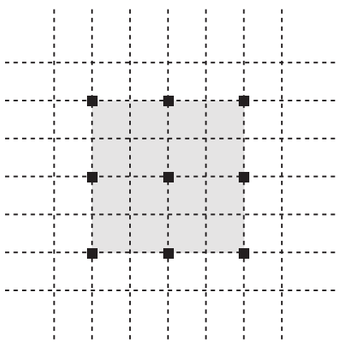
This allows for a simple and repetitive assembly.
The glulam bars are straight and have a square profile of appr. 30x30cm. In order to bend this lattice work of straight members, only the joints need to incorporate the angle, the bars remain straight.



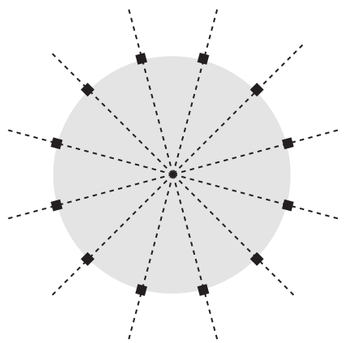
Technical design





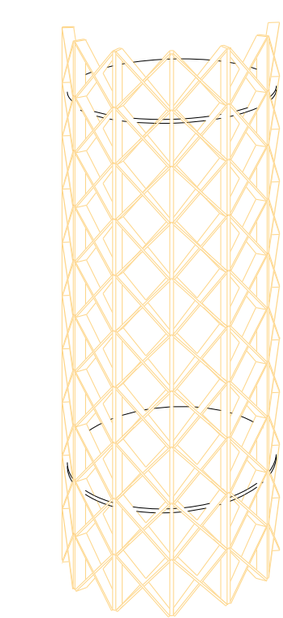


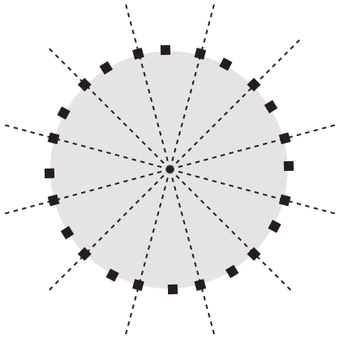
ORTHOGONAL POST AND BEAM STRUCTURE (PLATFORM BASED)



CONTINOUS VERTICAL STRUCTURE (SIMILAR TO BALOON FRAMING)

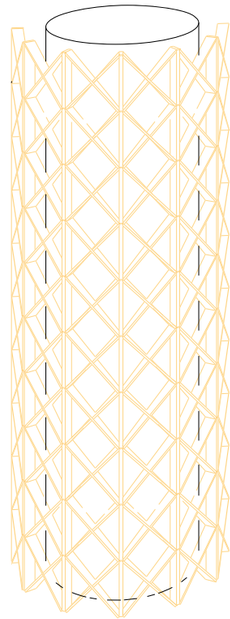
Technical design

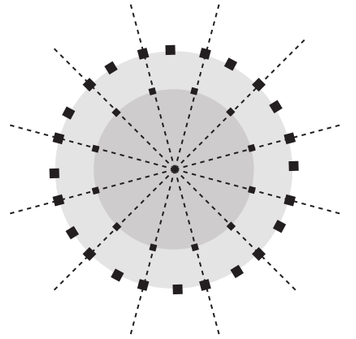




Timber structure

FRAMED TUBE



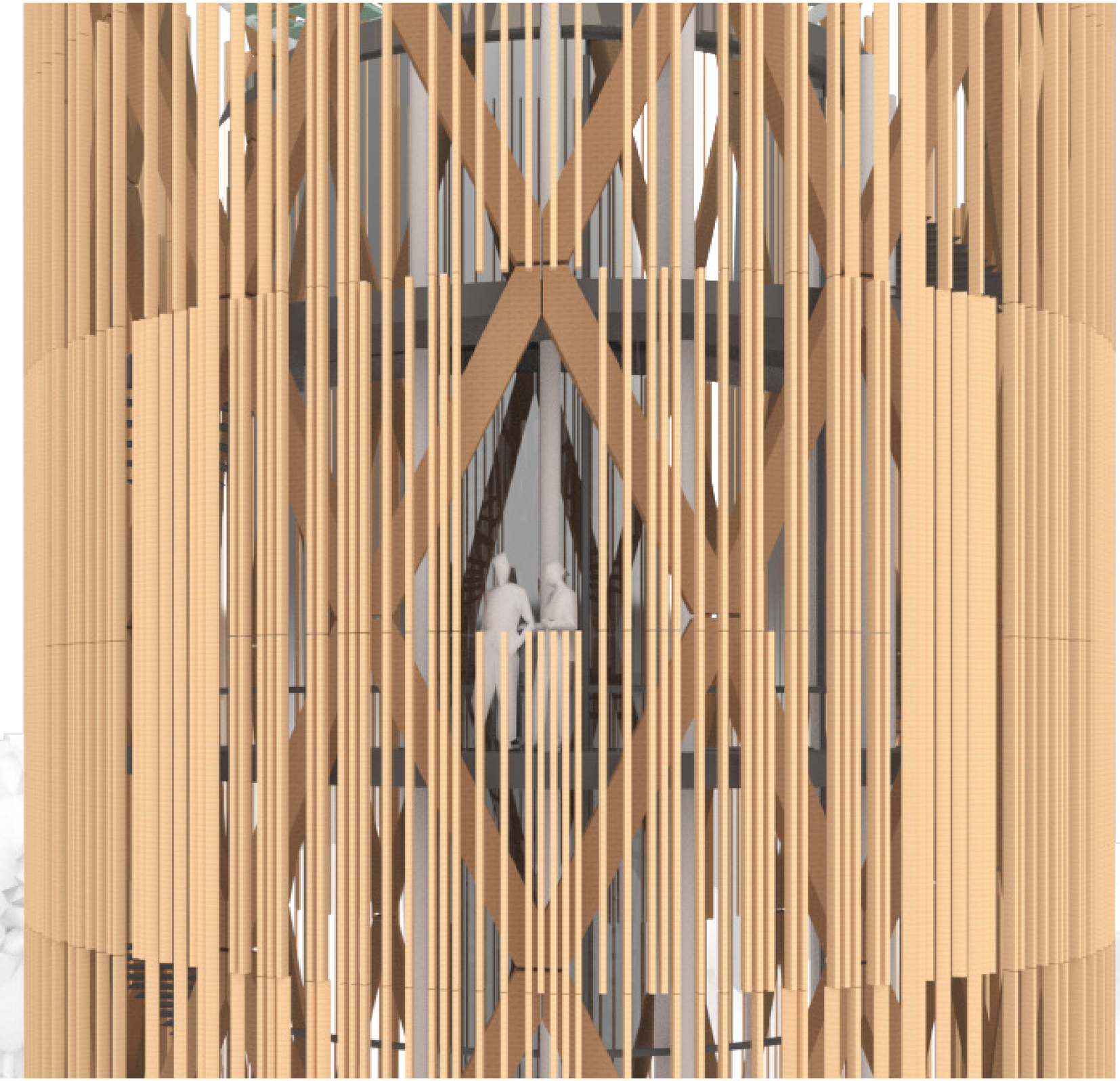


Timber structure

+

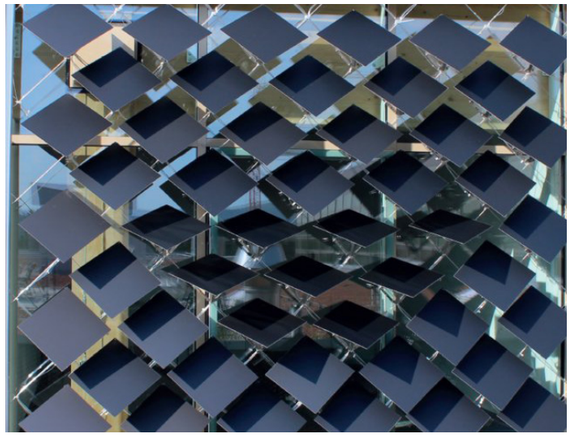
Steel structure

TUBE IN TUBE SYSTEM

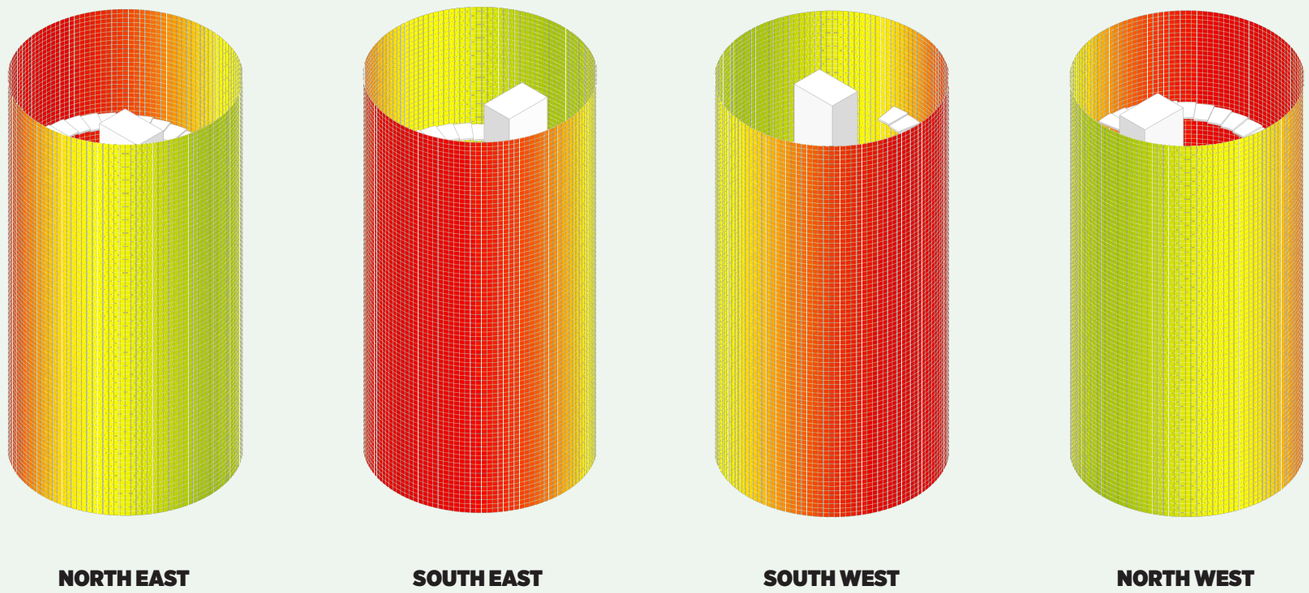


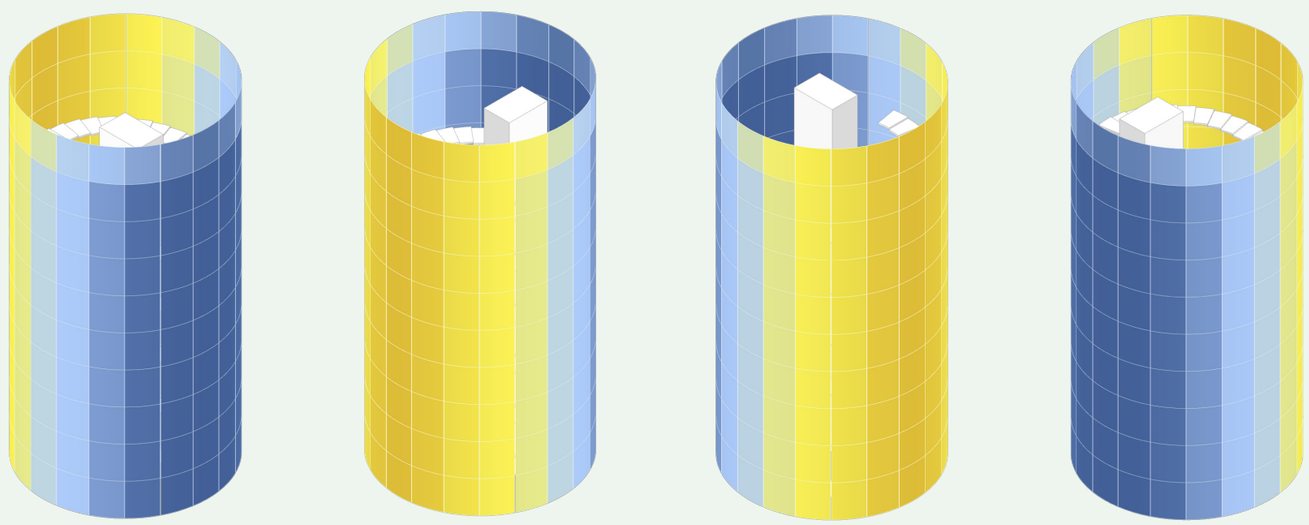
Renewable energy

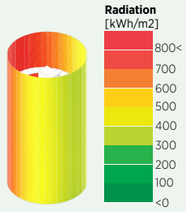
Integrated PV's



To investigate the potential of integrating PV-panels into the design, simulations in Rhino/Grasshopper have been made.
The first initial simulations are made for the full volume of the tower to simulate the solar radiation potential of the facade depending on the orientation af of the sun. This gives an idea of where the PV should be placed to perform the best.
The second simulations on the right simulates the PV production potential adjusted according to the module efficiency of PV's on the market.
After these initial simulations, design variations with PV's have been sketched and modelled to calculate the different energy production of each design solution. See next page.



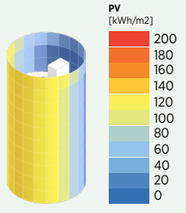




Full solar radiation potential

How much sun will reach the surface.

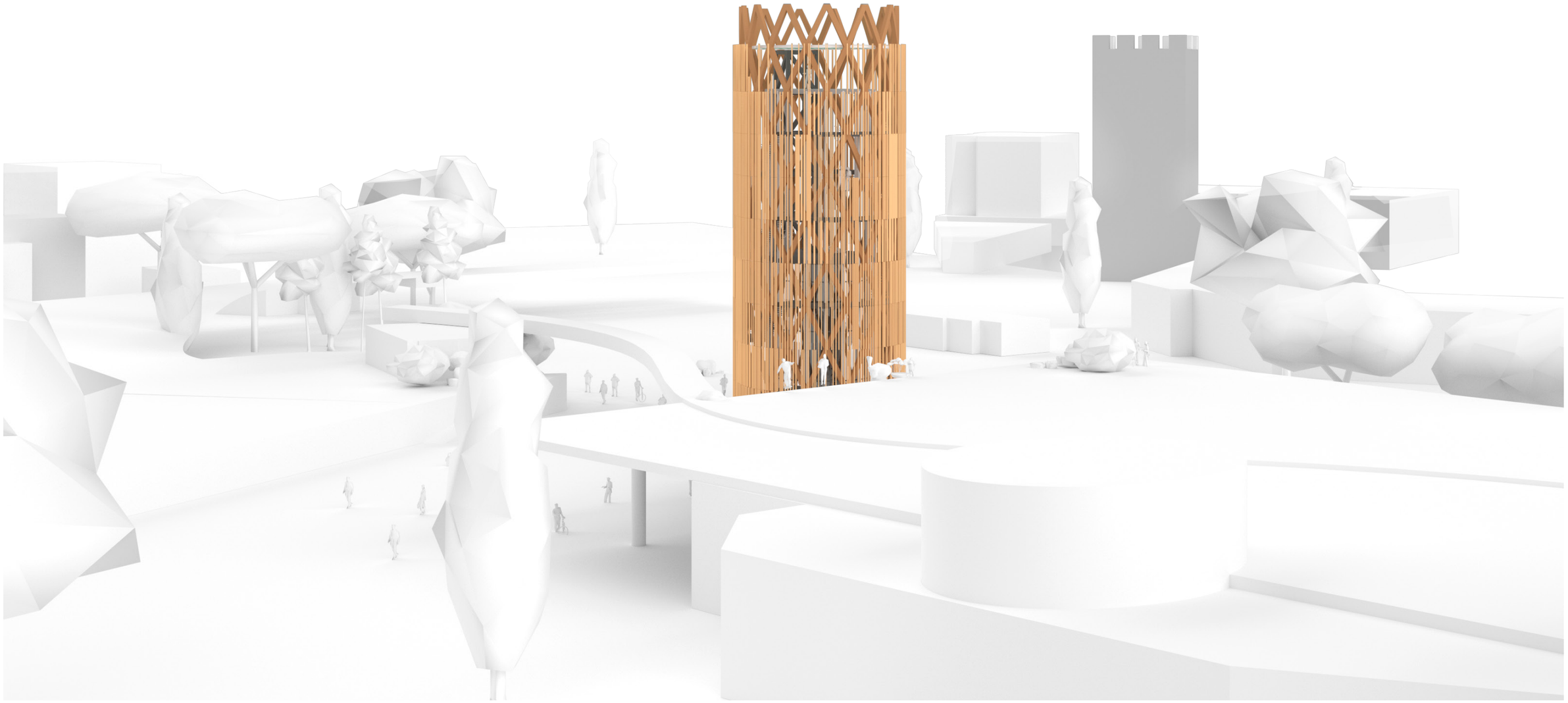
Yearly average

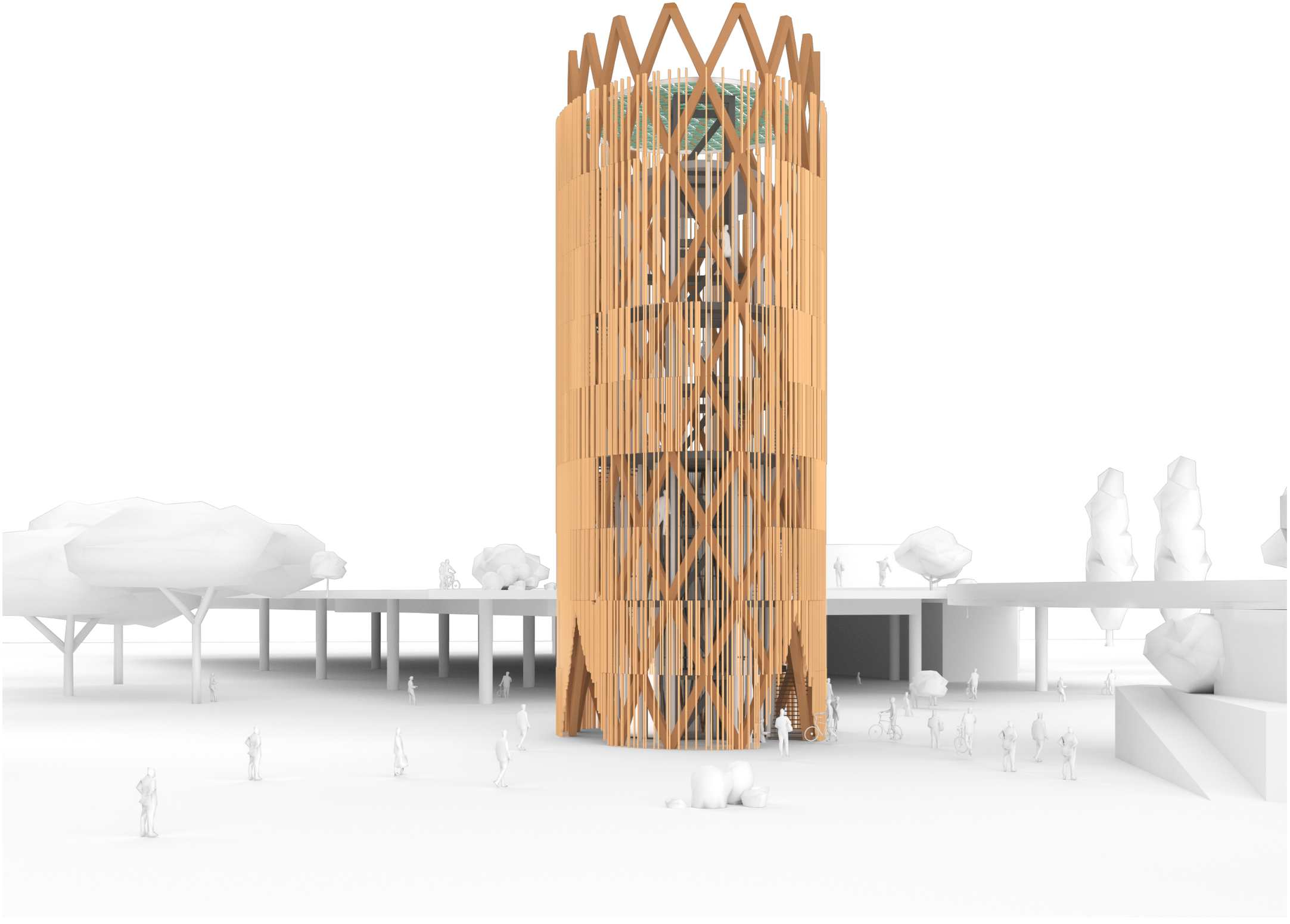


PV production potential

The simulations include the module efficiency for PVs, which for the best PVs on the market is maximum 20%.

Yearly average



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