BELVEDERE FOR KOBLENZ

DETHIER ARCHITECTURES

A CLOSE IN CUBIC METER STRUCTURAL ANALYSIS

FRA UAS - MATERIAL DESIGN 21/22 - AYMAN ALWAN

Introduction

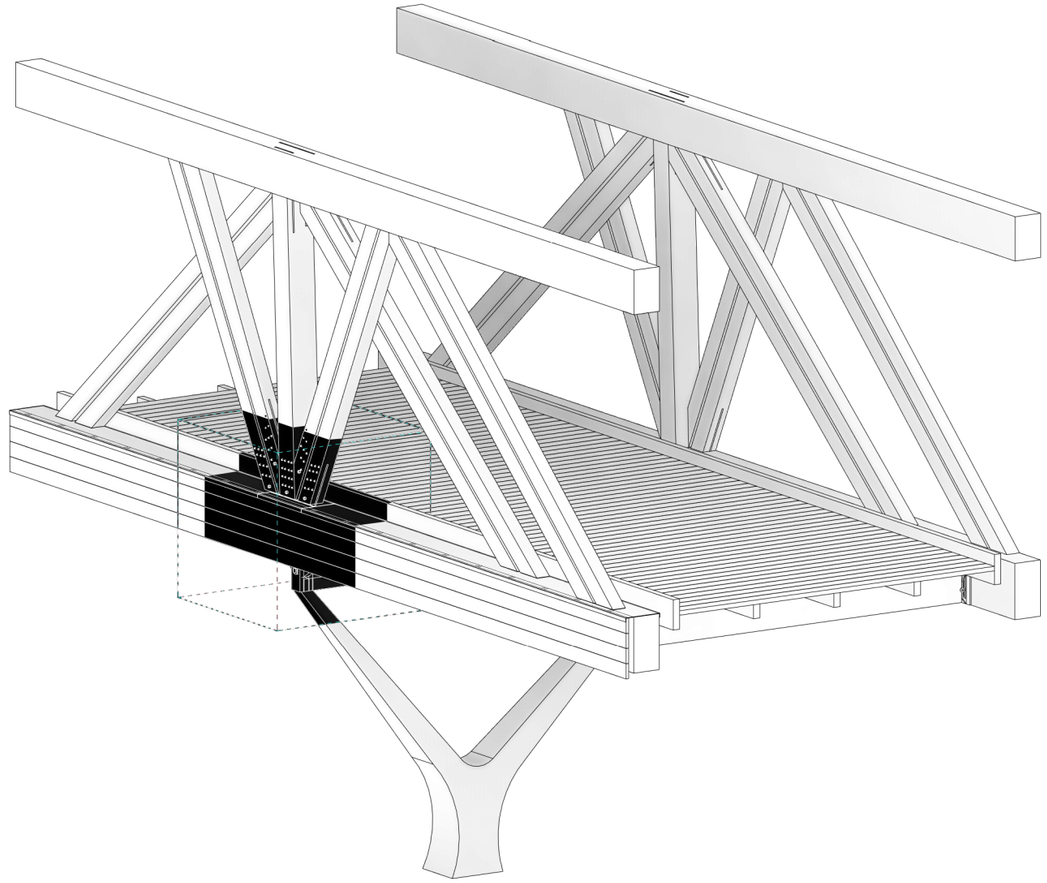
The belvedere is in the shape of a hollow triangle positioned on the plateau overlooking Koblenz. A walkway, accessible to visitors with limited mobility, leads from a gallery – a potential exhibition space – to the roof, along a pathway offering, by turns, views of the park, the city and the belvedere itself. The cantilever symbolises the project: it extends more than 15 metres out over the valley, and rises 10 metres above the ground.

The choice of materials (native wood species for the structure and walkway, and Cor-Ten steel for the structural elements), meant that the entire construction could be pre-fabricated. The marriage of architectural research, and engineering to ensure stability, have resulted in a lightweight structure with dynamic visitor circulation. The lateral trusses create a mosaic of the surrounding countryside and allow the structure to be relatively free-standing.

Contents

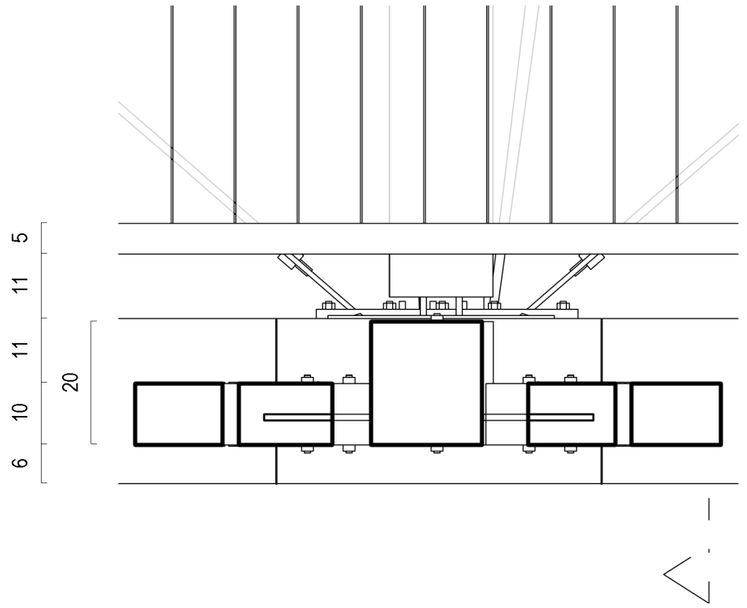
General structure

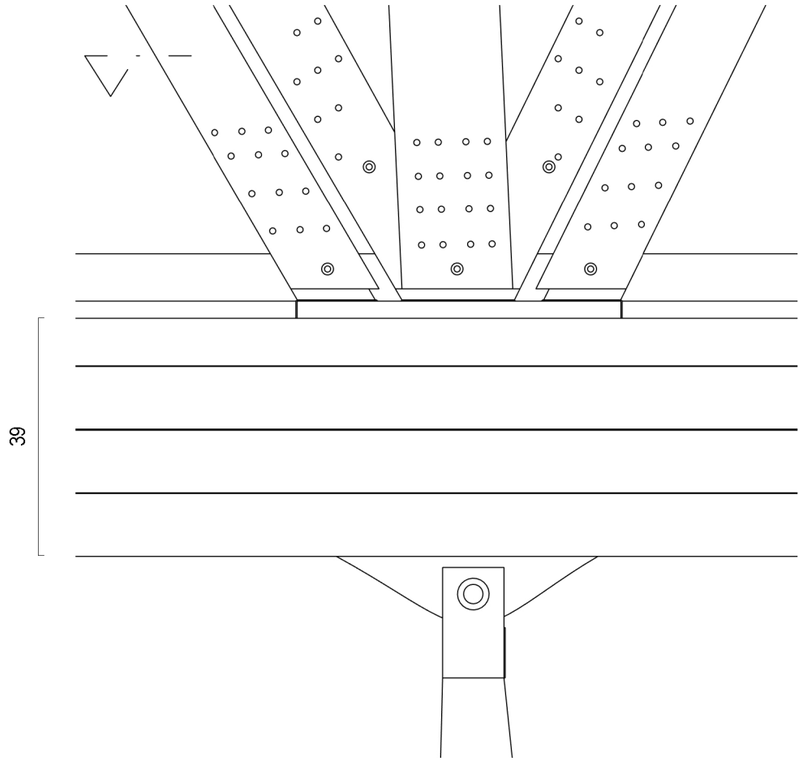
The Main structure of the building can be perceived as 2 load bearing sides that are held together through secondary beams and horizontal cable bracing, the load bearing sides are comprised of horizontal main beams at the top and bottom with columns and braces in between creating a stiff composite, this structural layout allowed for a very lightweight structure that seems to be almost floating while being held only by a few columns which therefore resolves the usual challenge of the meeting point between timber and the ground and the rising issues that comes with it.
The structure may look very simple on the first glance with only a few components but in reality it contains more than what meets the eye, with some elements being within others, or simply hidden by other layers. Therefore, the most interesting part of this structure is the point where all the different structural elements meet and connect in a single place.



Structure analysis

The Structure at first glance seems to be all from timber, but the main connecting elements that are connecting all the elements together are in fact steel plates that are inserted within the timber elements and are then fixed through precise prefabricated wholes within the different elements with bolts, these steel elements are placed within the timber in a smart solution to keep the aesthetics of the timber and protect the steel from possible damage due to environmental factors, in this particular point the metal plates hold all the different structural elements at once as it connects the timber columns and bracings to the main beam from the top, and on the bottom it connects to the main steel plate that holds the main beam and connects to steel column, this main plate is also connected to other steel plates that are connected to the cable bracings and the secondary beams that hold the two main load bearing sides together, the floor structure is then placed on these secondary beams.

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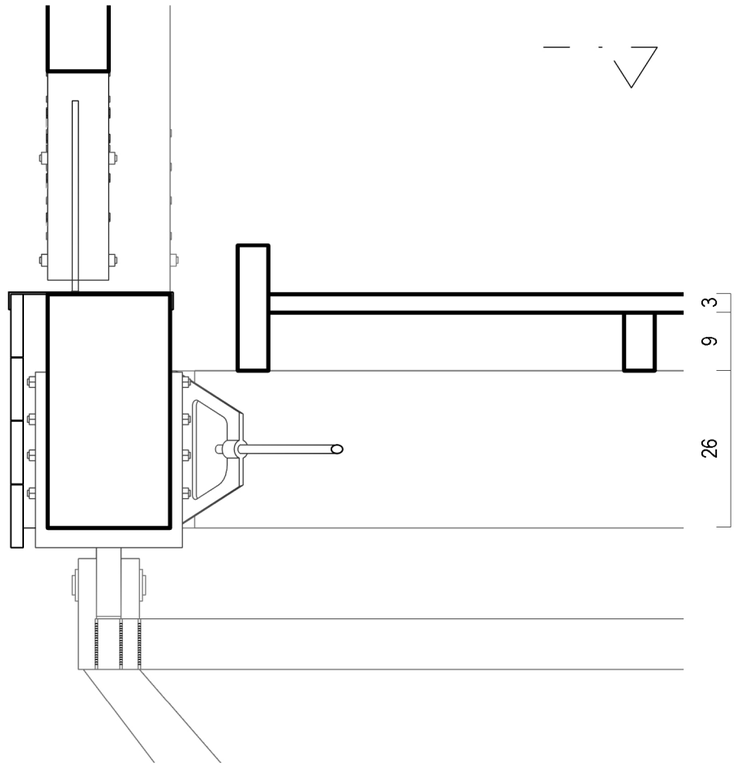
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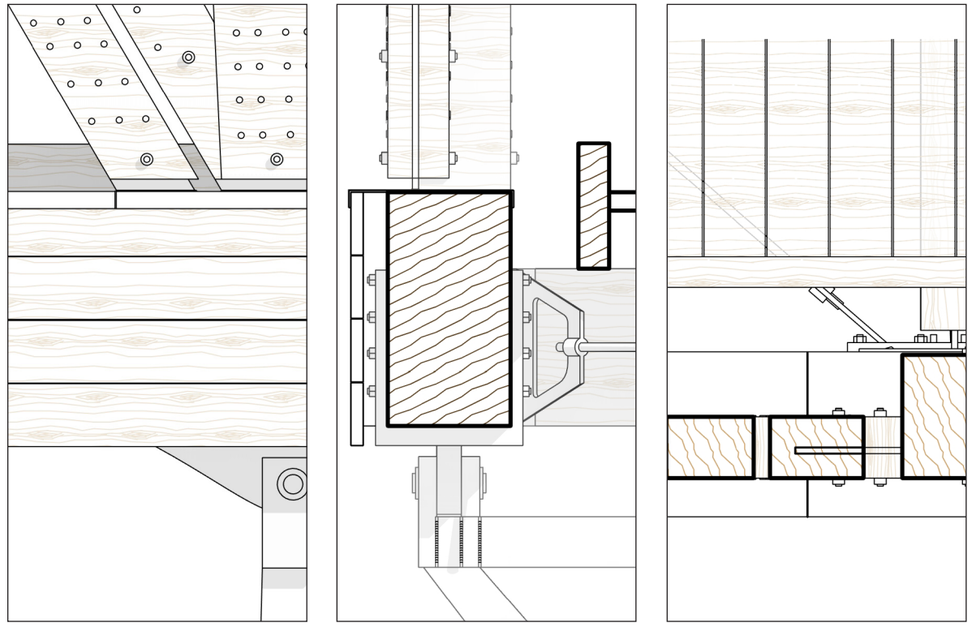
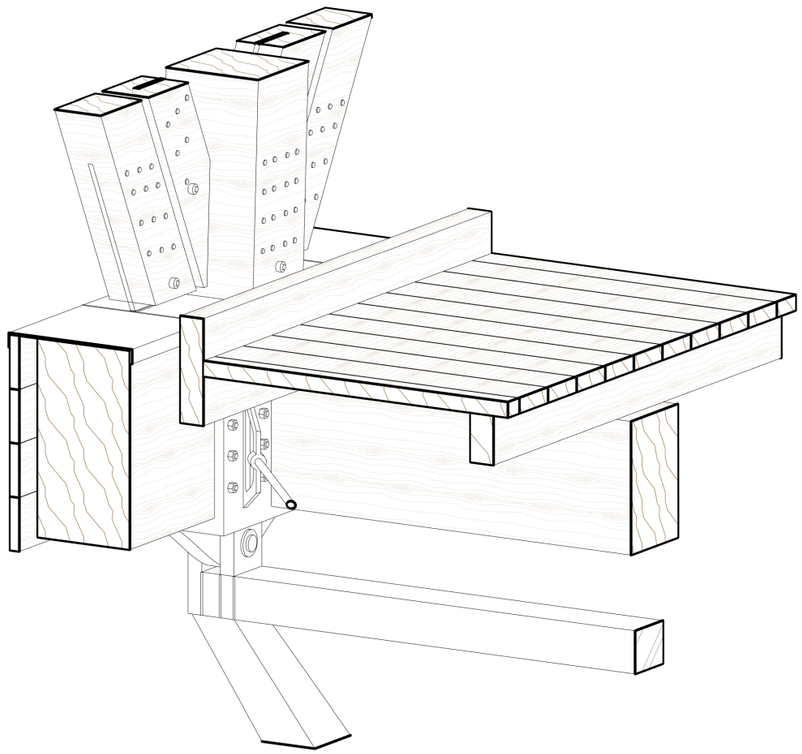
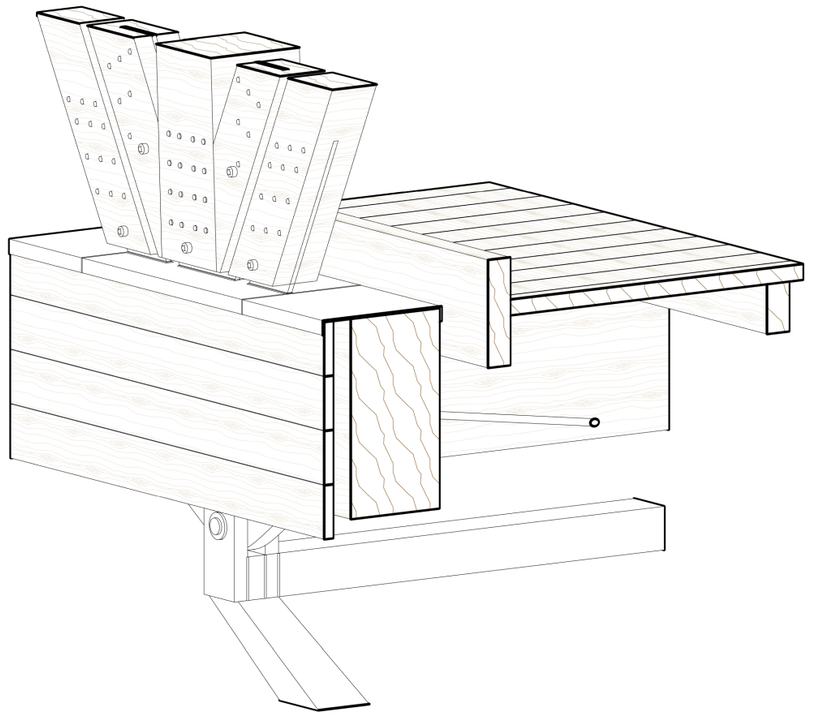
Texture analysis

The Wooden elemets used in this project are all made from native wood species, therefore they're exposed to the users as an attempt to make the pavillion look almost as it naturally belongs to the site, the visible wooden texture and grains are essential to the design conceptual idea.







Structural hierarchy

The structural hierarchy of this pavillion starts from the steel columns transferring the load of the upper structure to the ground, the upper structure consists of two main structural sides, that are inner connected through secondar beams and cable bracing which then has the flooring settled on.

- Non structural elements
- Secondary Timber structure
- Main Timber structure
- Steal structure elements
- Steel Bolts and Screws