Portfolio.
Matteo Deval

2021-2025

Matteo Deval

Research fellow / Inventor

Research fellow specializing in the integration of robotics and artificial intelligence in wood construction. Focused on computational design, digital fabrication, and augmented reality. Developed and patented the "LokAlp" wood construction system based on generative design and robotic arm manufacturing.

PERSONAL DETAILS

Date and place of birth: 29/08/1999, Aosta, Italy
Phone number: +39 3348954119
Website: www.devalmatteo.com
E-mail: matteo.deval99@gmail.com
LinkedIn: linkedin.com/in/matteodeval
Languages: Italian: Native / English: Professional / French: B2

RESEARCH ACTIVITY / TEACHING

15/05/2024 - Ongoing — **Research Fellow - Indexlab**
Indexlab - Politecnico di Milano

- Research fellow at Indexlab research lab, supervised by Professor P. Ruttico, specializing in the integration of robotics and artificial intelligence in wood construction.

2020 - 2024 — **Teaching Assistant**
Politecnico di Torino

03/03/2022 - 03/04/2022 — **Scholarship for research activity "Phygital Exhibition"**
Politecnico di Torino

PROFESSIONAL EXPERIENCE

17/02/2023 - 17/08/2023 — **Computational Design Assistant - Rotterdam**
Studio RAP - Innovation Dock // Rotterdam, Netherlands

29/03/2021 - 30/06/2021 — **Design Assistant - Bruxelles**
UNAA - Urban Nation Architects & Associates // Bruxelles, Belgium

01/09/2019 - 05/10/2020 — **App Developer ArchViz / Virtual Reality**

PATENT / PUBLICATIONS

30/06/2025 — **Deval, M., & Ruttico, P. (2025)**. LokAlp: A Reconfigurable Massive Wood Construction System Based on Off-Cuts from the CLT and GLT Industry. Sustainability, 17(13), 6002. https://doi.org/10.3390/su17136002

17/07/2025 — **Ruttico, P., Bordoni, F., & Deval, M. (2025)**. Woodot: An AI-Driven Mobile Robotic System for Sustainable Defect Repair in Custom Glulam Beams. Sustainability, 17(12), 5574. https://doi.org/10.3390/su17125574

07/11/2023 — **Patent – Modular wood-based building system**
Politecnico di Milano

- Inventor of wooden modular construction system "LokAlp" registered with EUIPO - European Union Intellectual Property Office. ID Code: 015040194 (001-009), class 25 "Building and construction elements" subclass 02 "Prefabricated or pre-assembled building elements".

EDUCATION

20/08/2021 - 01/03/2024 — **Master's Degree in "Architecture for Sustainability"**
Politecnico di Torino

- Final grade: 110/110 cum laude with Honorable Mention

14/12/2021 - 01/03/2024 — **Honour Program ASP Alta Scuola Politecnica**
Politecnico di Torino - Politecnico di Milano

17/02/2023 - 17/08/2023 — **Master's thesis abroad - Innovation Dock Rotterdam**
Politecnico di Torino - Studio RAP // Rotterdam, Netherlands

02/10/2018 - 19/07/2021 — **Bachelor's Degree in "Architecture"**
Politecnico di Torino

- Final grade: 107/110

26/09/2019 - 19/07/2021 — **Young Talents Program**
Politecnico di Torino

19/02/2021 - 25/06/2021 — **Young Talents Erasmus+ - Bruxelles**
ULB - Université Libre de Bruxelles // Bruxelles, Belgium

AWARDS / CERTIFICATIONS

07/04/2025 — **Nominee EUmies Awards** - Young Talents 2025

13/11/2024 - 14/11/2024 — **Doosan Robotics** - Advanced Course for collaborative robots

24/10/2024 — **First Prize ArchDaily** - Best Master's Thesis

26/03/2024 — **Honorable Mention** - Non-Architecture Competition

22/06/2022 — **First Prize** - Courmayeur Mont Blanc Foundation

19/05/2021 — **Critics' Award** - BAC2021 Best Architecture Competition

02/06/2020 — **Second Prize** - BAC2020 Best Architecture Competition

WORKSHOPS AND STUDENT TEAMS

26/09/2022 - 13/12/2023 — **Student Team SHELTER**
Politecnico di Torino

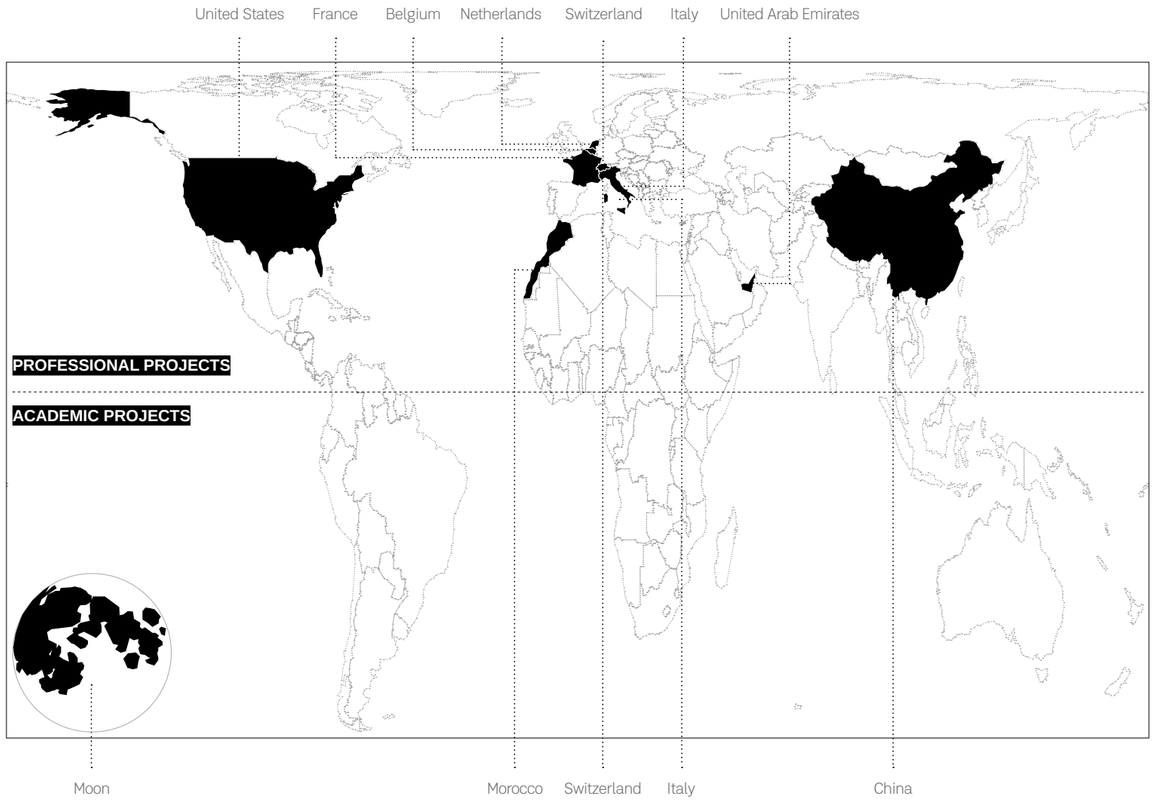
26/04/2022 - 04/06/2022 — **International Workshop "Interpréter la Ville" // Paris, Turin**
École Pratiques des Hautes Études - Politecnico di Torino

27/09/2021 - 02/10/2021 — **Workshop "Atelier 2000" // High-altitude Architecture Design**
Politecnico di Torino // Valle d'Aosta

SOFTWARES / CODING

Computational Design: Grasshopper, WASP
Deep Learning: PyTorch, ComfyUI (Flux/SD)
Robotics: ABB / Doosan / Fanuc
App development: Unreal Engine 4|5
3D Printing: Ultimaker S3, Bambu Lab
3D Modeling: Rhino, Sketchup, Revit, AutoCAD
Rendering: V-Ray, Enscape, Lumion, Twinmotion
Post-production: Adobe Suite

INDEX

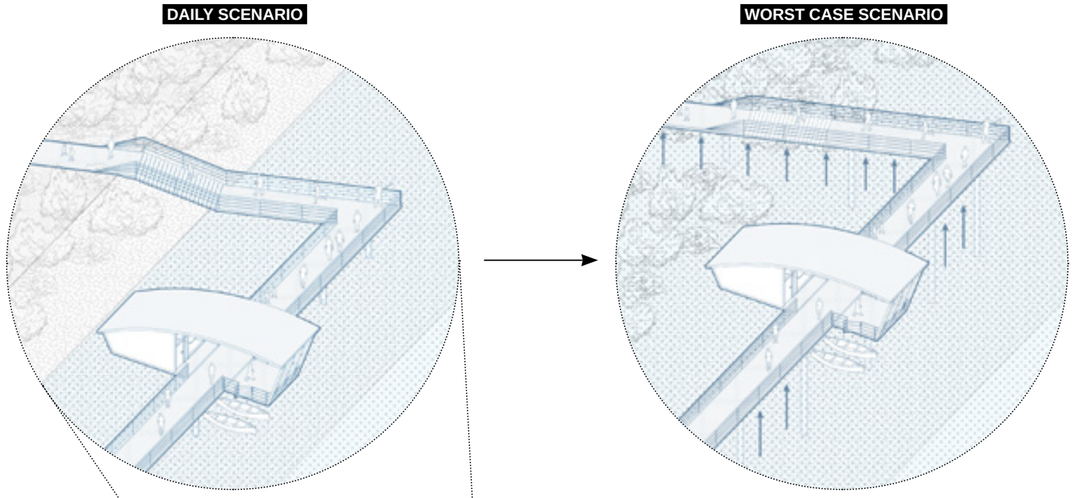



LEAF.

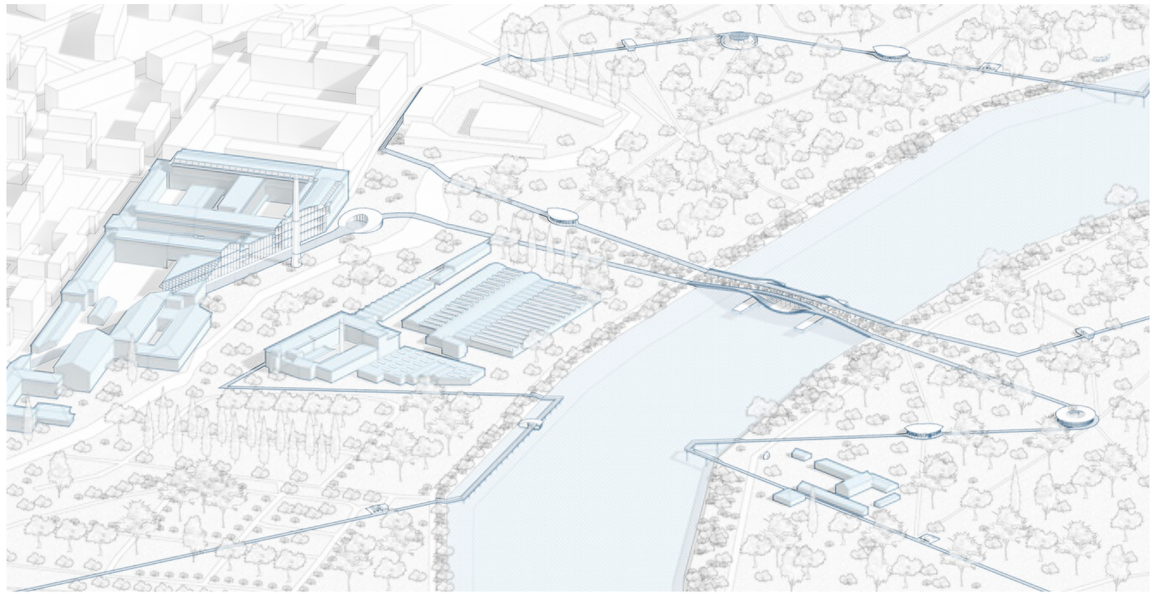
CONCEPT

“The water rises, the park replies.”

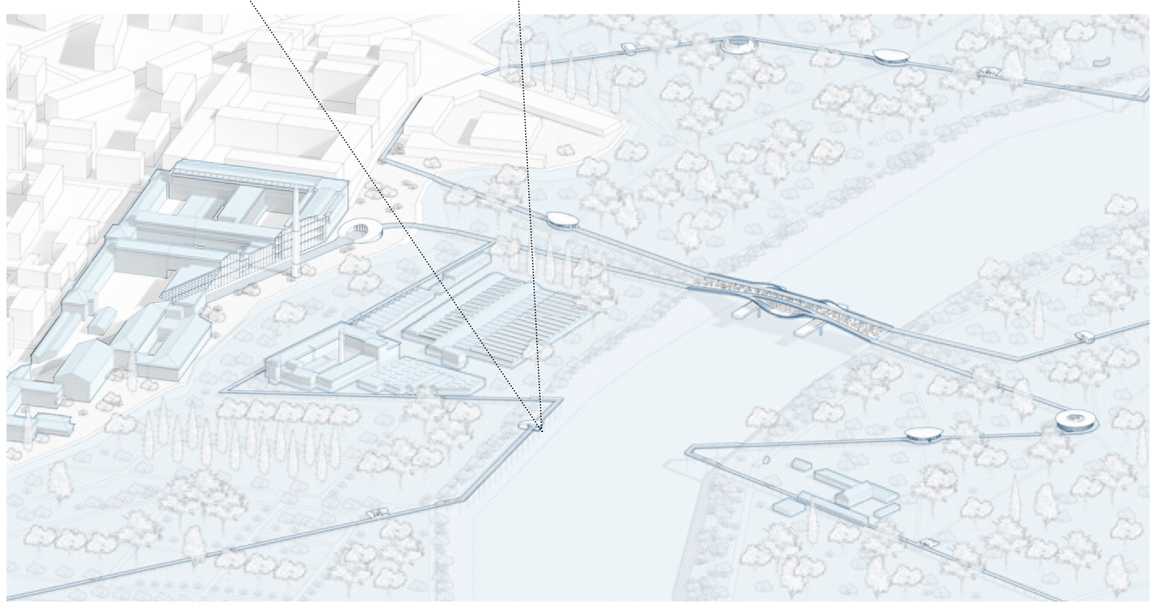
Due to climate change throughout Europe there is an increasing trend of increasing hydrogeological risks, both in intensity and frequency.
Turin’s public park is in the area with the highest risk of flooding and in the future its use by citizens will be increasingly intermittent and uncertain. For this reason, the LEAF (Live Ecological: Adapt Floods) project aims to make this place experienced by citizens adaptive, which in the future will present increasingly changing scenarios.
By means of a system of floating dynamic platforms, it will be possible to enjoy the park even during periods of rising water levels, thus being able to visit the Green Park and the Blue Park.
The route created starts with a strong linearity with the Royal Palace in the historic centre, and continues in the park, creating a promenade with a continuous succession of stimuli, passing by theatre squares, carpentry workshops, and even standing on the surface of the water in the centre of the river.

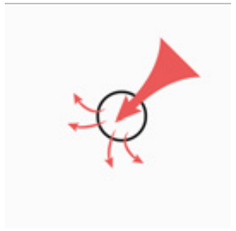


DAILY SCENARIO



WORST CASE SCENARIO





INFO POINT MODULE

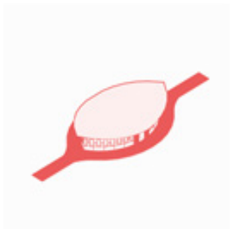
It is the first module that receives the citizen at the two entrances to the park. It embraces and welcomes park users with its architecture, providing a privileged elevated view of the park and a 180-degree view.

SQUARE MODULE

It is the most extensive module and can be produced in various conformations (Theatre Square, Market Square, Concert Square). As it is the only module exclusively for public events, it is the only module that bends its own path, almost having its own gravitational force.

LAB MODULE

Located in the middle of the path, it deflects the flow of the walk like a rock in a river, so that visitors can see what goes on inside: during the cycle of the year, one might first observe a carpentry workshop and then a study room.



MOBILITY MODULE

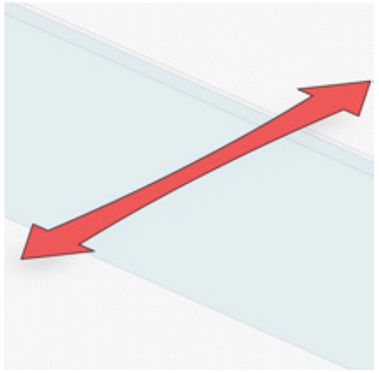
It is cut from the path, indicating the dynamism of its role. It can be of two types: land mobility (E-Bike hire) or water mobility (canoe hire).

BREAK MODULE

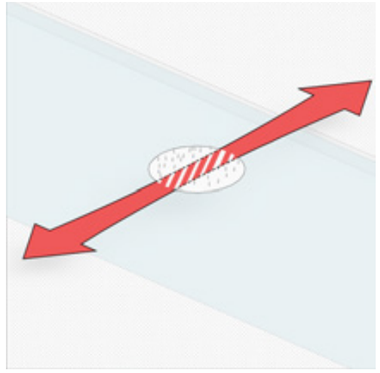
It is placed next to the path, as a resting place. its stepped morpholgy allows for increased seating space, allowing for interaction between park users during a lunch break.

BRIDGE CONCEPT

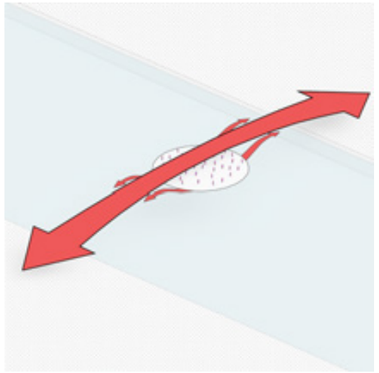
Turin's public park is divided in two by the river Po: slow mobility (on foot, by bicycle) is made extremely difficult by the lack of a direct connection between the two banks. For this reason it was necessary to create a path that was both a link for people and vegetation, and a centraliser of public events, being able to host open-air cinemas and exhibition spaces within it.



Linking two sides of the park.



Public meeting place in the middle of the river.

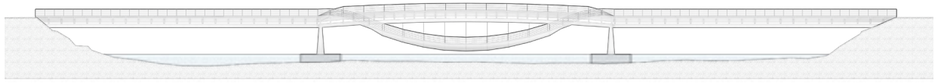


A double path allows the stationarity of encounters and at the same time the flow of the path.

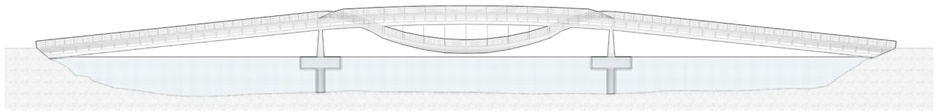
Floating supporting structure that allows the bridge to adapt to the water level.

STRUCTURE

The structure of the bridge allows it to adapt to the water level in a totally dynamic way without requiring forecasting. Thanks to the two load-bearing telescopic pillars - supported by floats parallel to the river, thus minimising obstruction to the flow of water - the bridge allows the perfect outflow of water, and in the case of flooding also of sediment. The 'belly' of the bridge, on the other hand, supported by the cable-stayed structure, does not require any additional support points.



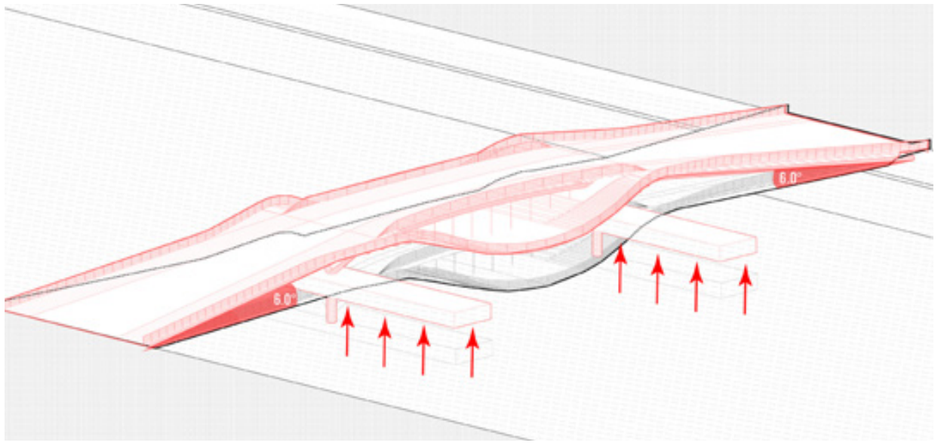
DRIED-UP RIVER

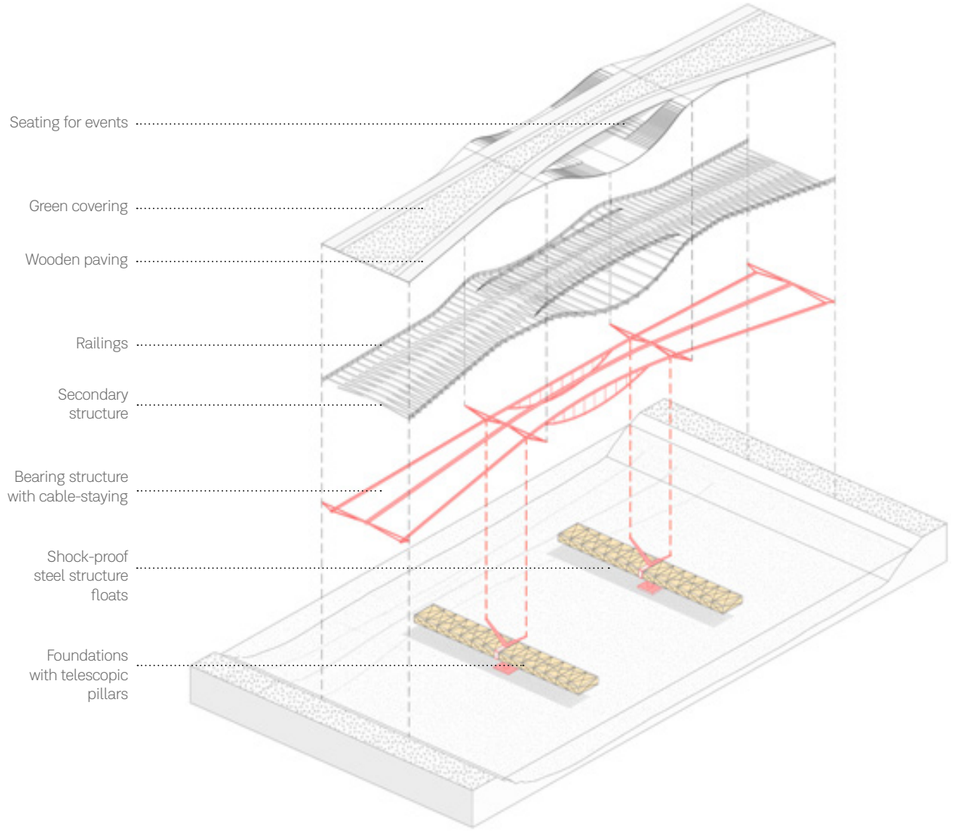


FLOODING RIVER

DYNAMISM

The structure allows it to rise up to an angle of 6 degrees. Once this level is reached, it means that the river water has left the riverbed, and for this reason the walkways located on the ground will also begin to rise with the same foundation system. The pressure from the water - thus allowing flotation - is exerted exclusively on the floats.



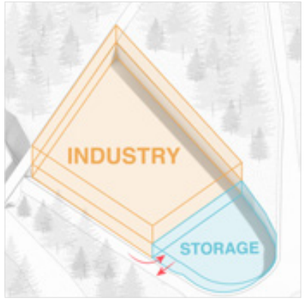


HYPER WOOD

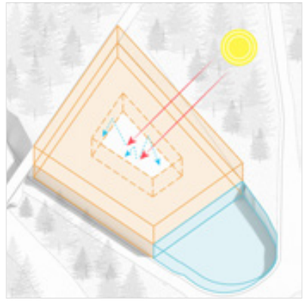
CONCEPT

The site is located in the heart of the Alps near Mont Blanc, in an abandoned industrial area once used for mining. The site's potential is expressed by the surrounding nature: the massive presence of coniferous forests presents easily accessible raw material of great value for a circular and sustainable economy. Hyper Wood aims at decarbonisation targets for 2050, promoting a 4.0 wood industry that can bring together land protection authorities and local sawmills for proper management of forest resources.

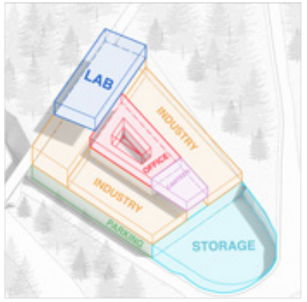
Abandoned industrial area with underground garage.



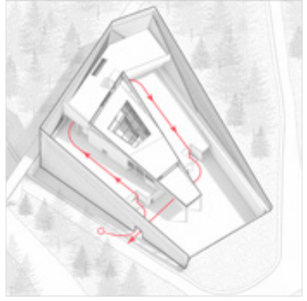
Loading and unloading of materials facilitated by proximity to the road, taking advantage of the slope of the terrain.



Need for an internal courtyard to maximise the entry of natural light.



Subdivision of the volume defining the main functional areas.

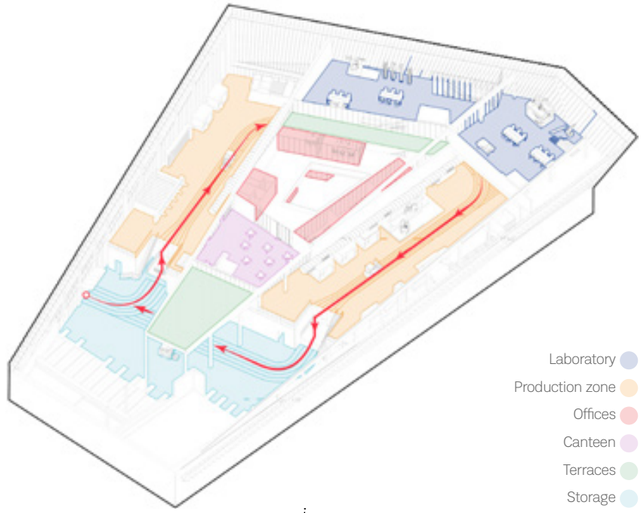


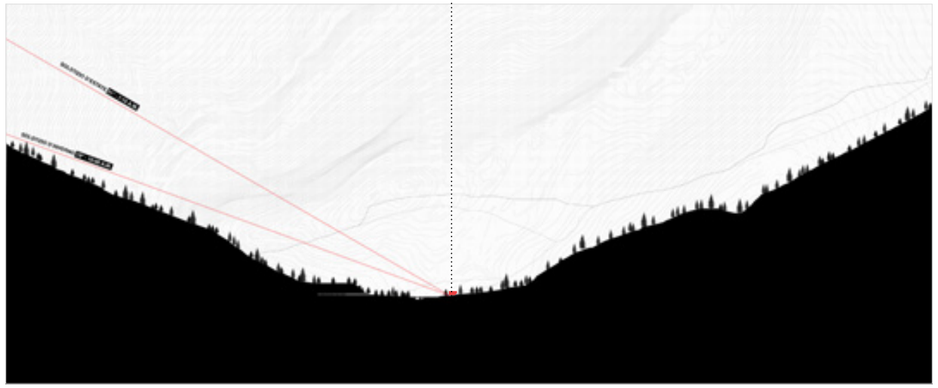
Material cycle as a loop: through the same door the wood enters and the end product exits.

Green roof connected to the terraces that can be used as a panoramic viewpoint.

WOOD PRODUCTION FLOW

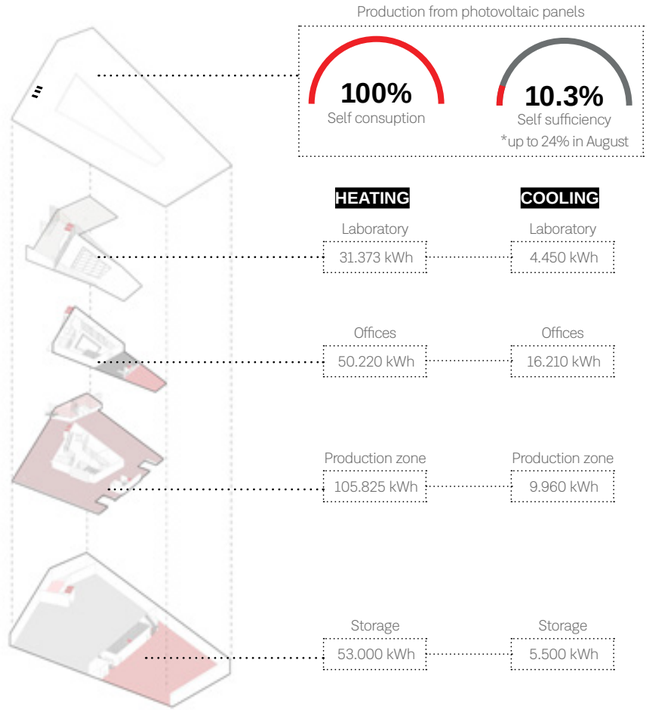
The internal layout, born from the morphology of the terrain, was developed starting from the wood production flow: the raw material is lifted by means of elevators to the upper floor following the various production and waste recycling phases; finally, the final product is returned to the storage area ready to be shipped. The production cycle pivots around the offices and research laboratory, which are acoustically isolated in a single area directly in contact with the outside. The coffee break is more pleasant to take on the terrace if it is not winter.

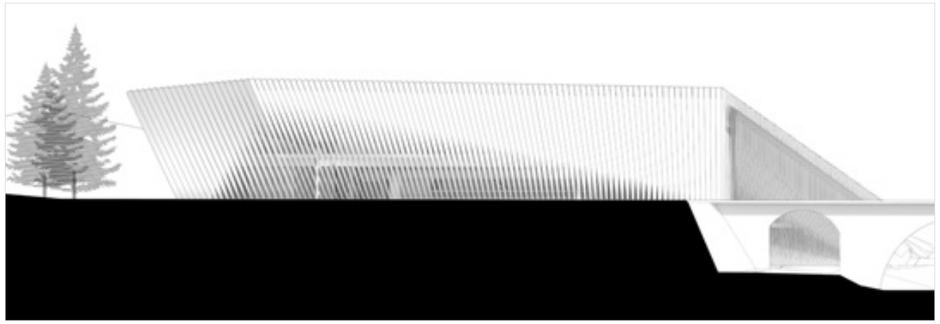


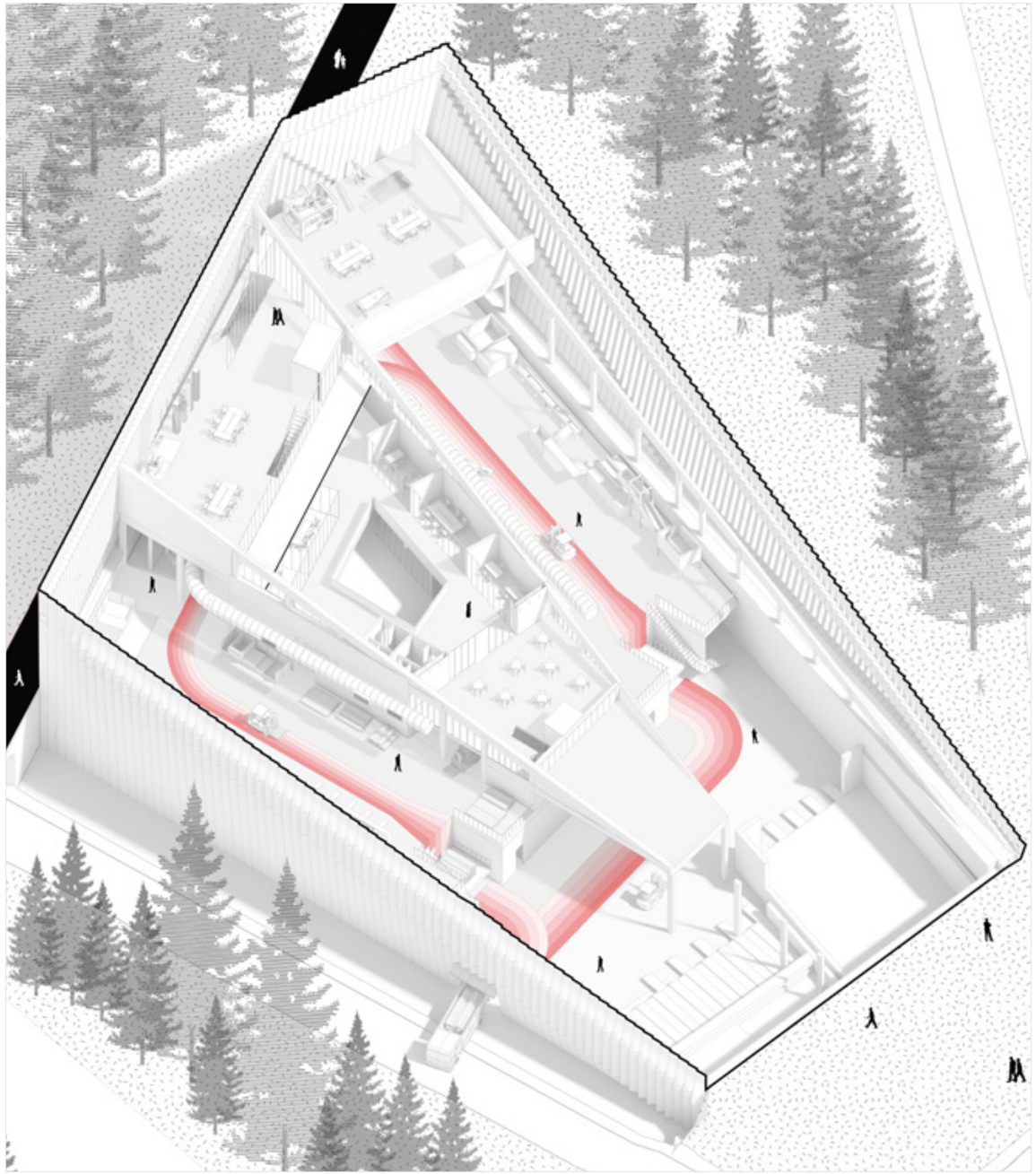


ENERGY CONSUMPTION

The calculation of energy consumption in a wood-processing industry is essential for understanding the solutions to be adopted. By dividing the industry into 4 climate zones with different specific demands, it was possible to calculate the corresponding consumption that each one required. Starting from the total energy consumption required, it was possible to dimension a 60 kW photovoltaic system that would cover part of the electrical demand needed for heating and cooling of the geothermal heat pump.

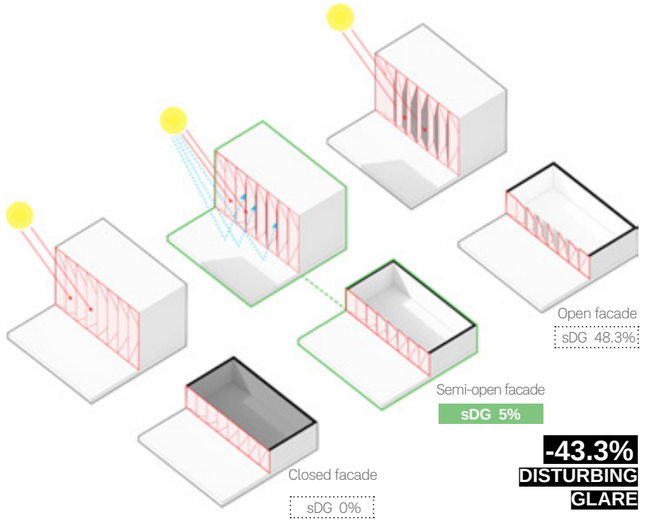


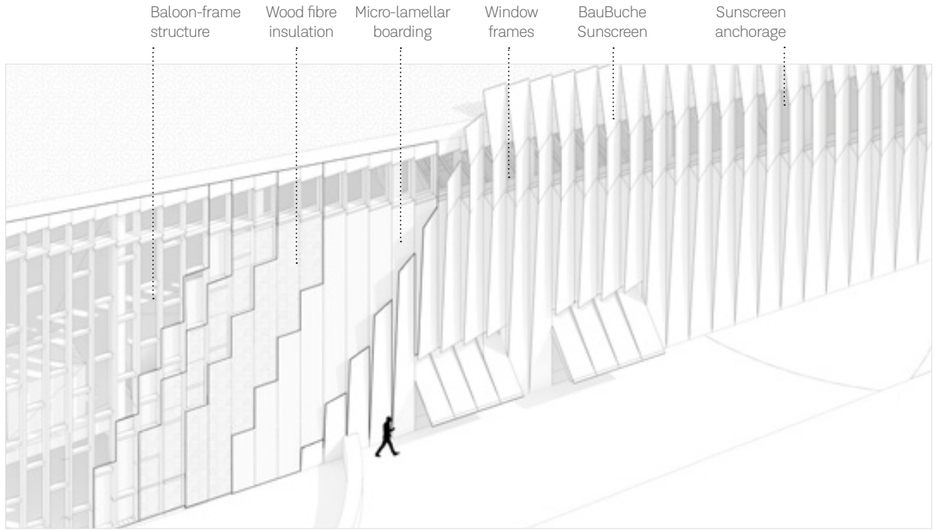


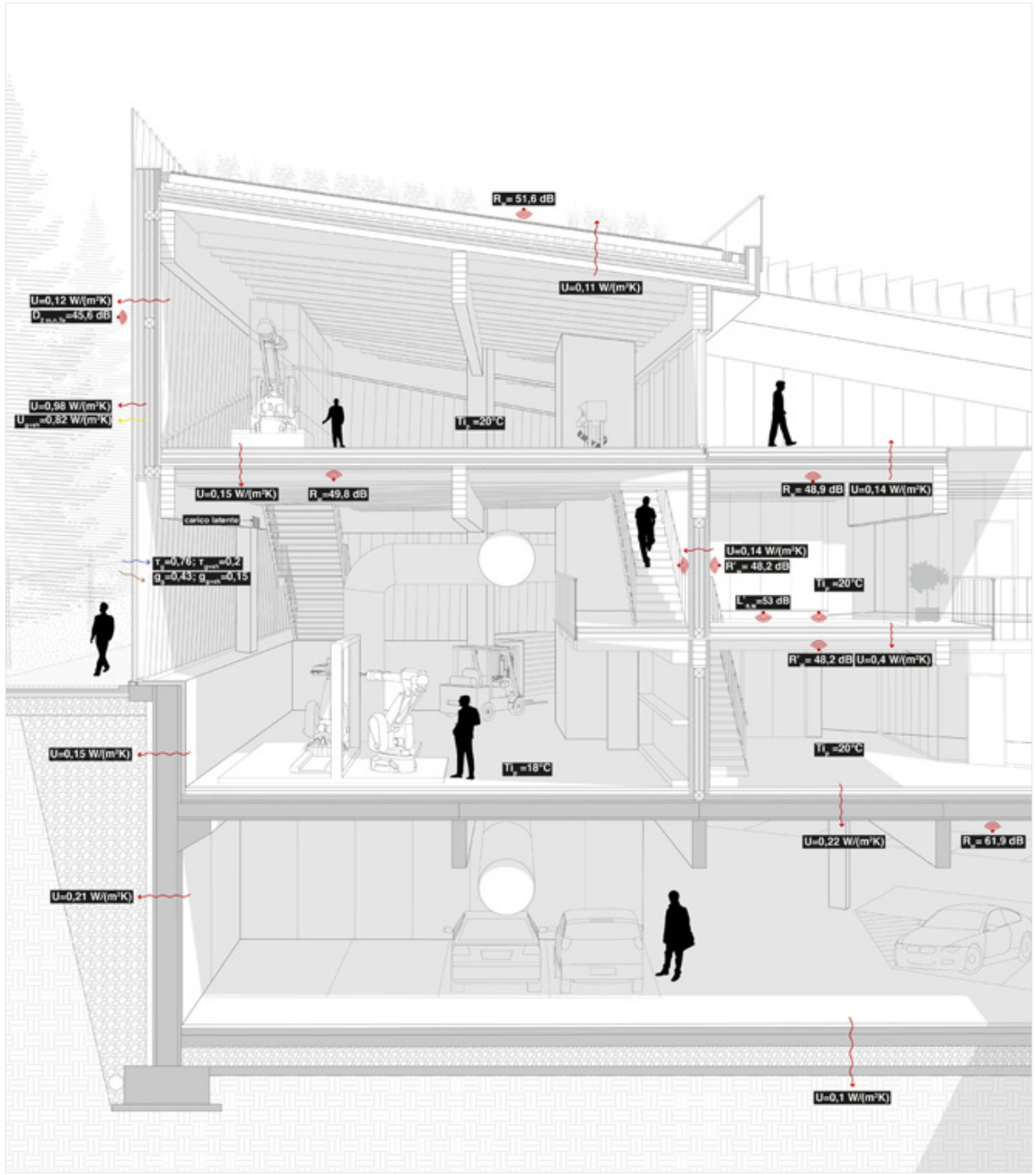


DOUBLE SKIN FACADE

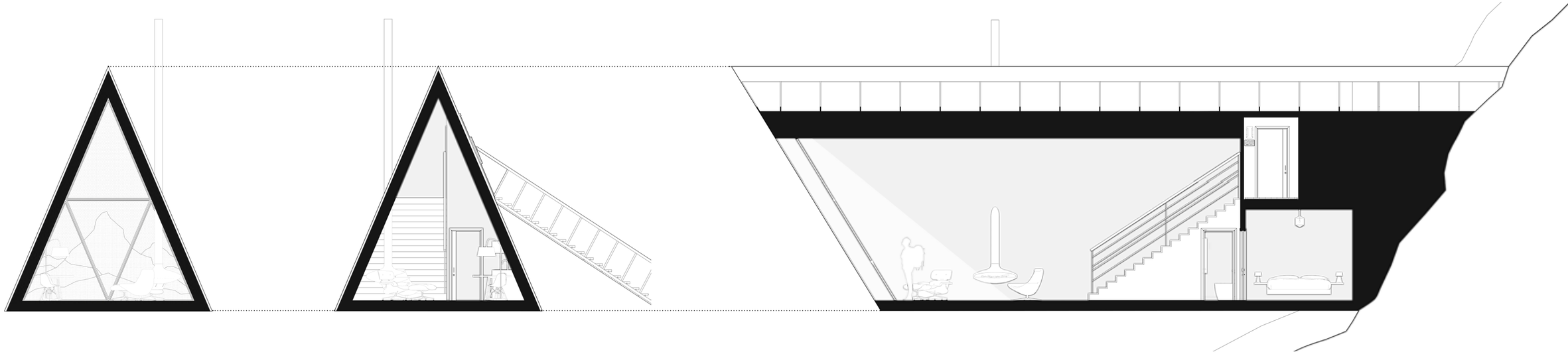
From the lighting point of view, the industry needed large windows and light wells to maximise natural light. At the same time, however, the natural light required had to be indirect, to minimise glare during work processes: the Spatial Disturbing Glare index in fact affected 48.3% of the production area. By inserting a static wooden shading system parameterised on Grasshopper, it was possible to almost eliminate glare phenomena and at the same time have a correct amount of indirect natural light.







SCHNITT 4478



CONCEPT

Personal project of a radical study of an alpine refuge. The sharp cut of the architecture dialogues with the surrounding peaks, placing the user and the landscape in the focus of the architecture. The blind morphology in the two side walls provides excellent thermal insulation, while the south-facing glazing maximises the little heat from solar radiation available in these locations. The cantilevered structure also allows for a minimal footprint on the ground, thus reducing the structure's impact on the natural landscape.

AUGMENTED REALITY EXPERIENCE

The project was designed to demonstrate the new communication potential of architecture. In fact, 3 versions were developed on 3 different platforms: desktop (Windows), smartphone (Android) and in virtual reality (Oculus technology). The advantage lies in the simplified and immediate fruition of the project, thanks to which it is possible to explore the entire refuge in first person and to get an even clearer idea of the spatiality of the architecture.

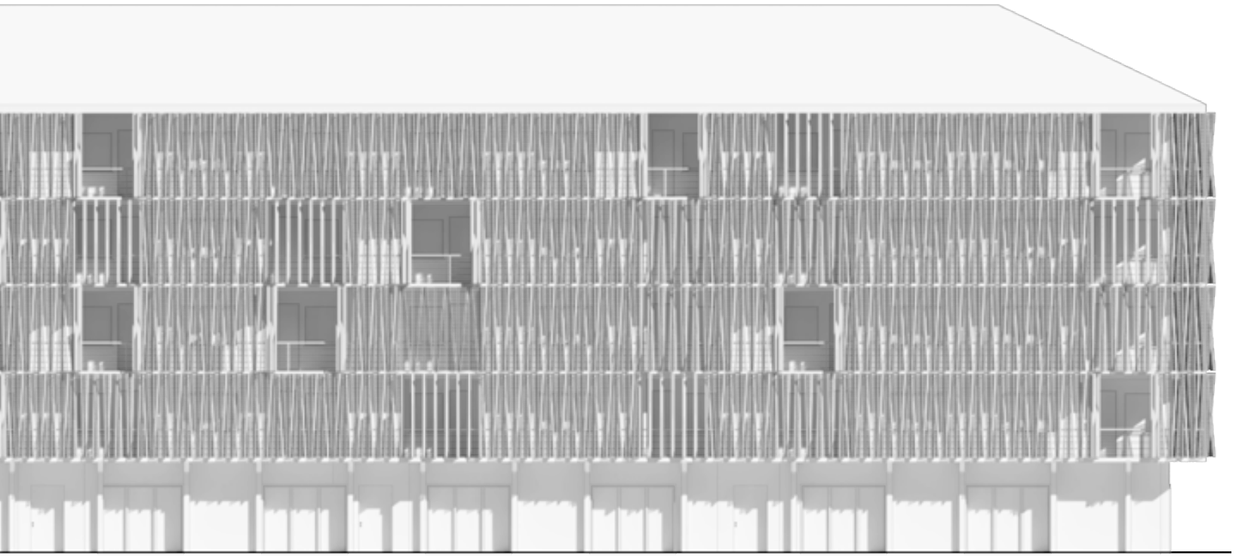
Google Play

Deval Architecture UE4 - Alpine Refuge

43 T

CONCEPT

The objective was the energy upgrading of a building in the city of Turin, which consistently exemplified the building stock in its characteristics. Through the insertion of a dynamic double skin and a new energy management of the building - based on heat pumps and solar panels - the entire building was made energetically more efficient. The choice of materials was based on EPD certifications of laminated wood and steel and their KgCO2 equivalent content, the choice of waste materials, and above all the distance of the production site from the site. This made it possible to calculate the total embodied carbon and embodied energy according to different parameters, from the fuel used for transport to the disposal of the material, facilitated by the totally prefabricated dry construction. The final result was a saving of 43 tonnes of CO2 equivalent emitted into the atmosphere for the transport, construction, maintenance and end of life of the double skin.



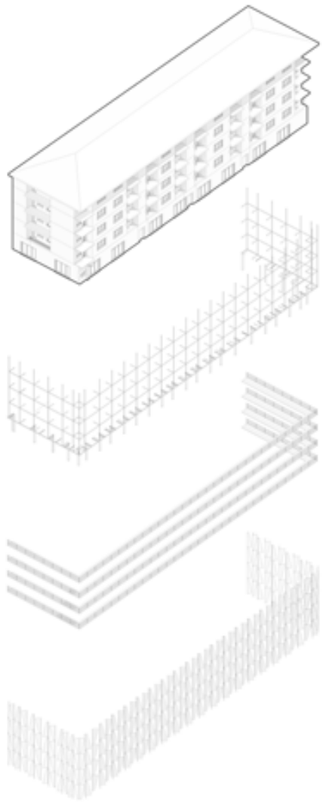
EMISSIONS:
-43.000 kgCO₂

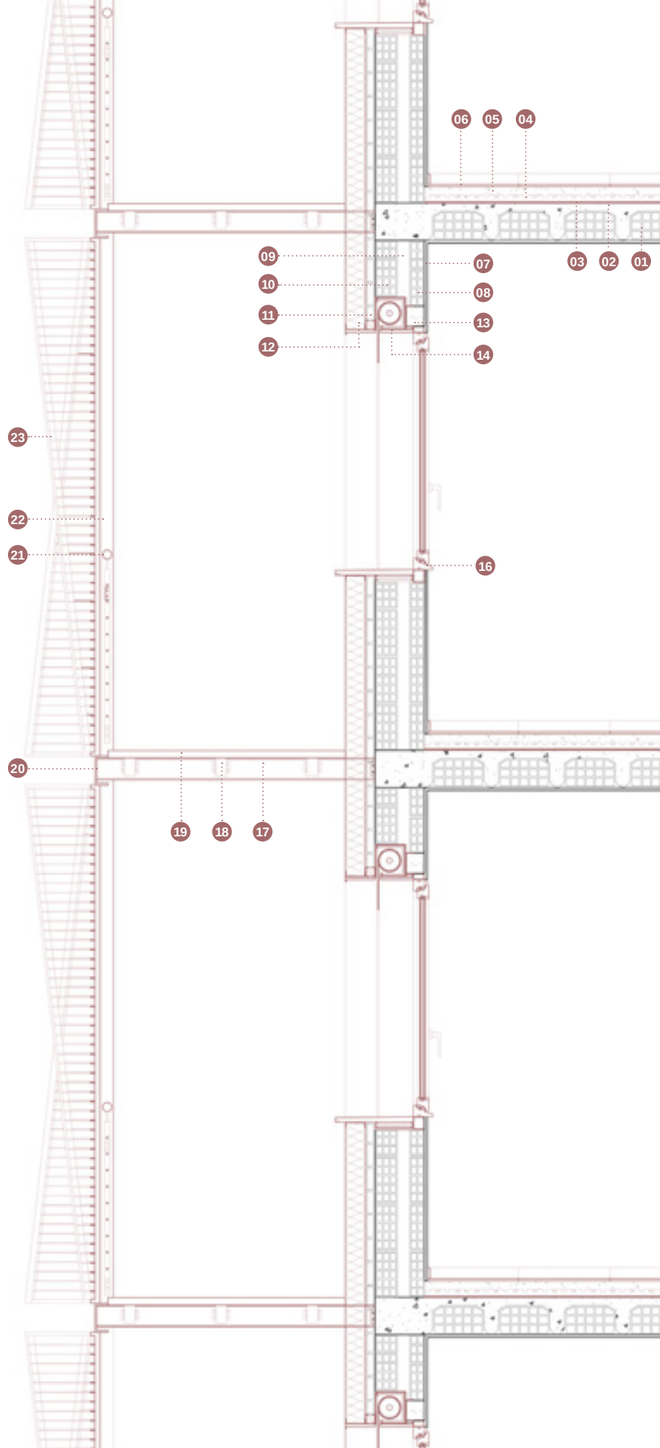
-25.071 kgCO₂
Changing window frames/ cork covering

+8.953 kgCO₂
Steel supporting structure

-15.382 kgCO₂
Laminated timber secondary structure

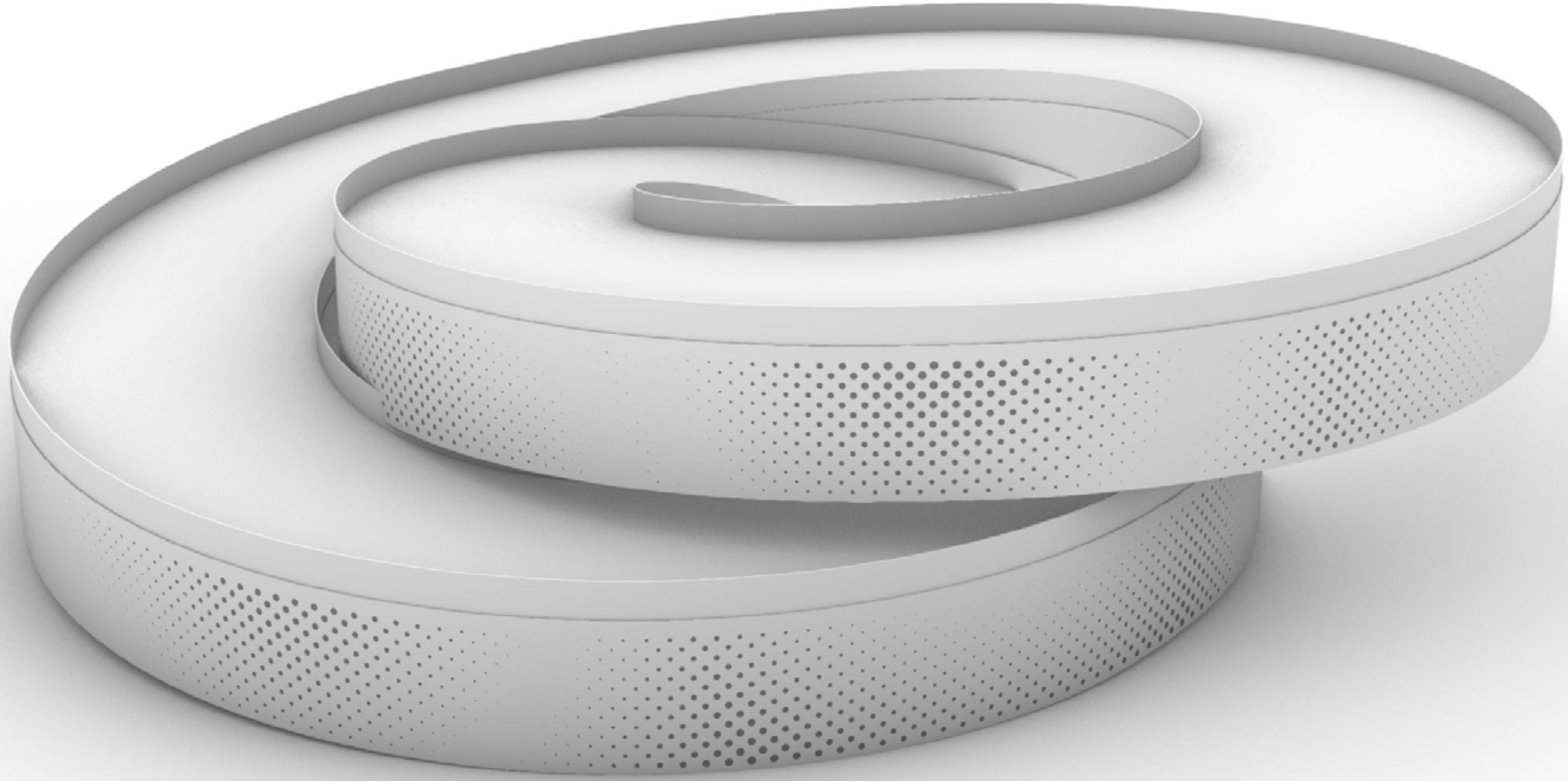
-11.372 kgCO₂
Kinetic - responsive panelling





1. Clay tile, 20x25x40 cm, structural function;
2. Reinforced concrete casting, 4.5 cm, structural function;
3. Soundproofing in expanded reticulated polyethylene, 0.5 cm, acoustic insulation;
4. Radiant panel, 3.5 cm, plant engineering component;
5. Concrete screed, 4.5 cm, support function;
6. Stoneware flooring, 1.2 cm, horizontal finish;
7. Layer of gypsum plaster, 1.5 cm, vertical finish;
8. Hollow brick block, 8x25x50 cm, infill;
9. Air gap, 7 cm, thermal insulation;
10. Perforated brick block, 12x25x50 cm, infill;
11. Hollow brick block, 12x25x3.5 cm, cladding (state ante operam)
12. Recycled cork panel, 10 cm, thermal insulation;
13. Reinforced concrete lintel, 10x11 cm, structural function;
14. Insulated roller shutter box, 18x17 cm, screening;
15. Low-emission double glazing with Argon gas, 2.5 cm;
16. Thermal break window frame in chestnut wood, 10 cm;
17. IPE 120 beam, structural function;
18. XLAM joist, 10x6 cm, structural function;
19. OSB plank flooring, 5 cm, horizontal finish;
20. UPN 160 beam, structural function;
21. Stainless steel railing;
22. Steel box, 10x10 cm, structural function;
23. OSB panel, 300x35x5 cm, shielding function.

XPO



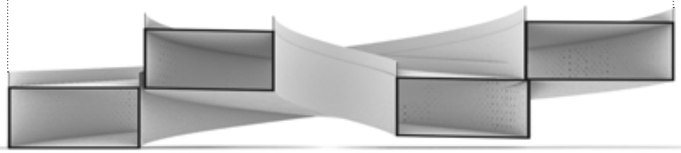
BIG
BJARKE INGELS GROUP

WORKFLOW - GRASSHOPPER

Taking as a case study the Danish pavilion at EXPO 2010 in Shanghai, developed by BIG, the aim was to investigate the interrelation between parametric modelling software (Grasshopper) and BIM modelling software (Revit). Starting from the Wolfram software - which made it possible to describe the mathematical function of the architecture's generating curve - it was possible to manage the parametric modelling of the envelope and the elevation's perforation through Grasshopper.

WORKFLOW - REVIT

Using the Rhino Inside Revit plugin, it was possible to investigate what the strengths of completing parametric modelling on BIM software might be. In the case of the steel load-bearing structure, in fact, it was possible, starting from the grid created on Grasshopper, to insert IPE beams, pillars and braces from Revit. In addition, the parametrically generated surfaces were easily converted into walls, floors and ceilings with stratigraphies and materials managed directly by Revit. This integrated workflow can be a huge advantage in the future in terms of efficiency and performance of the final product.



AUGMENTED REALITY