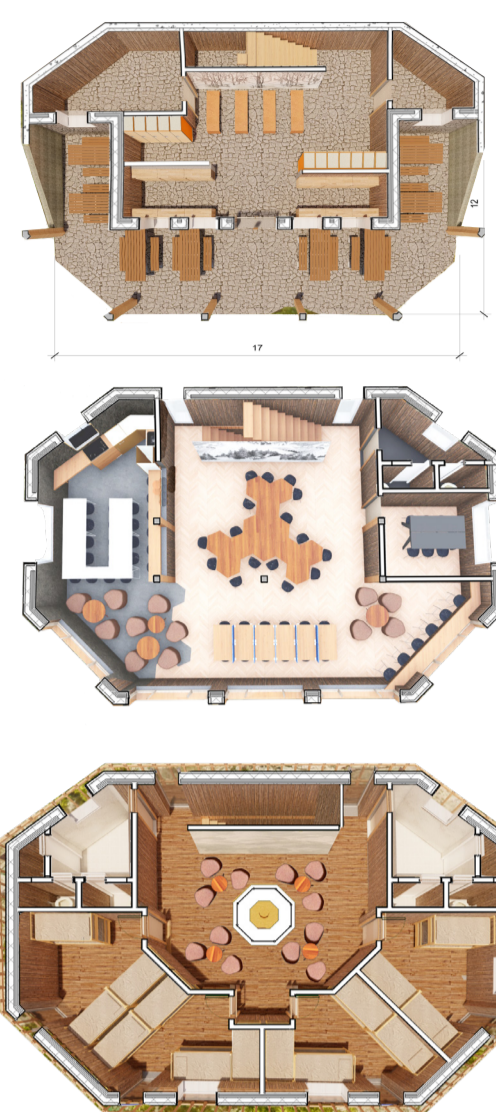
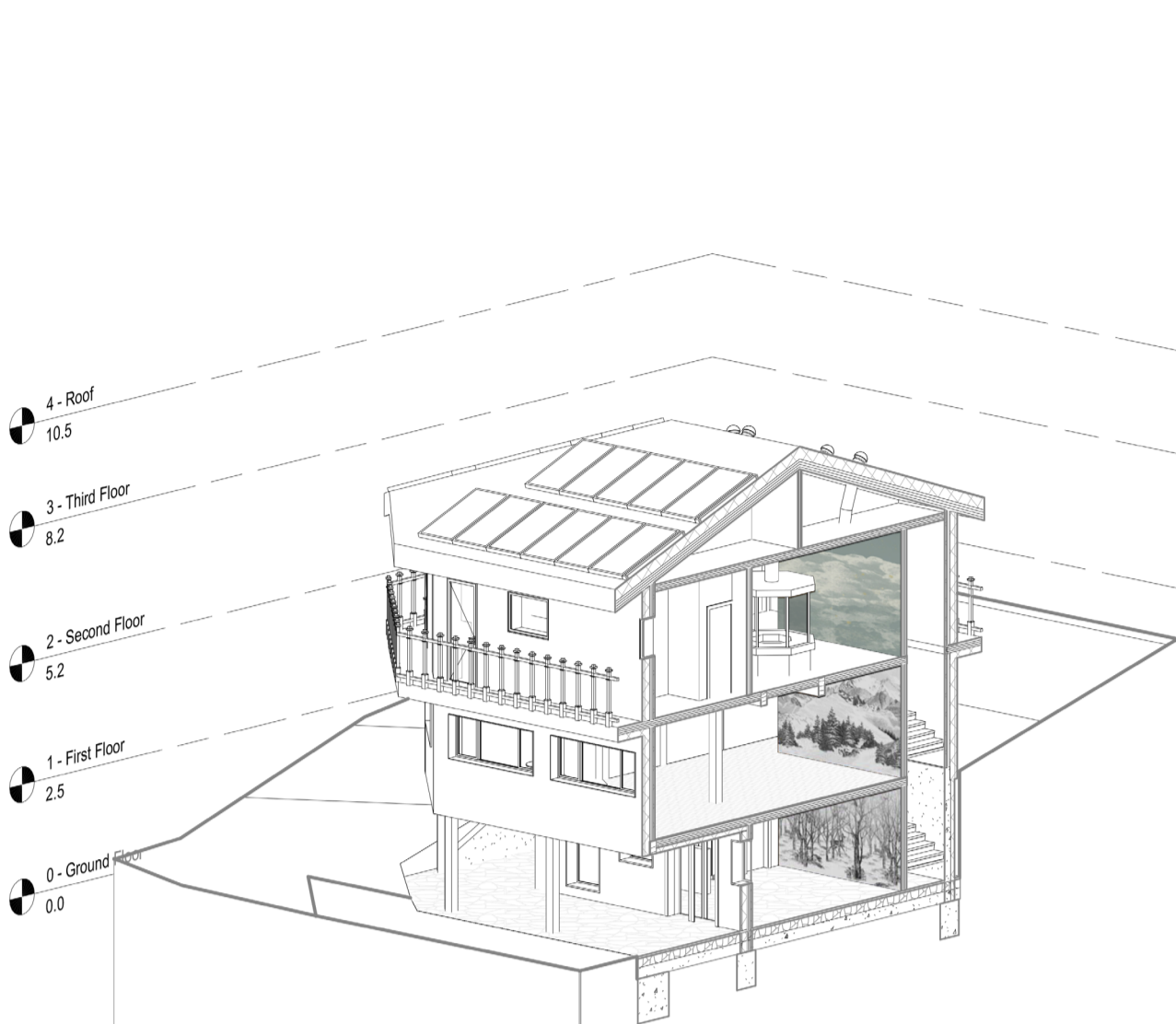


TUM Mountain Office

Group N
Daniel Dlubal
Gbenga John Ogunjinmi
Alessandro Valentini



ARCHITECTURE

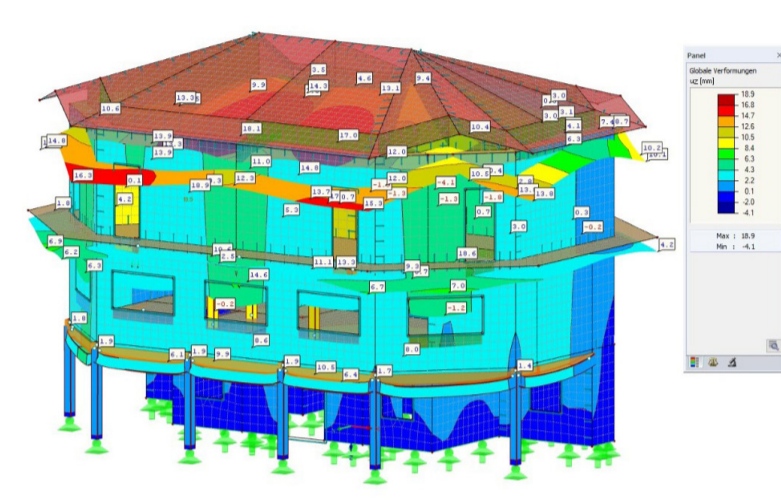
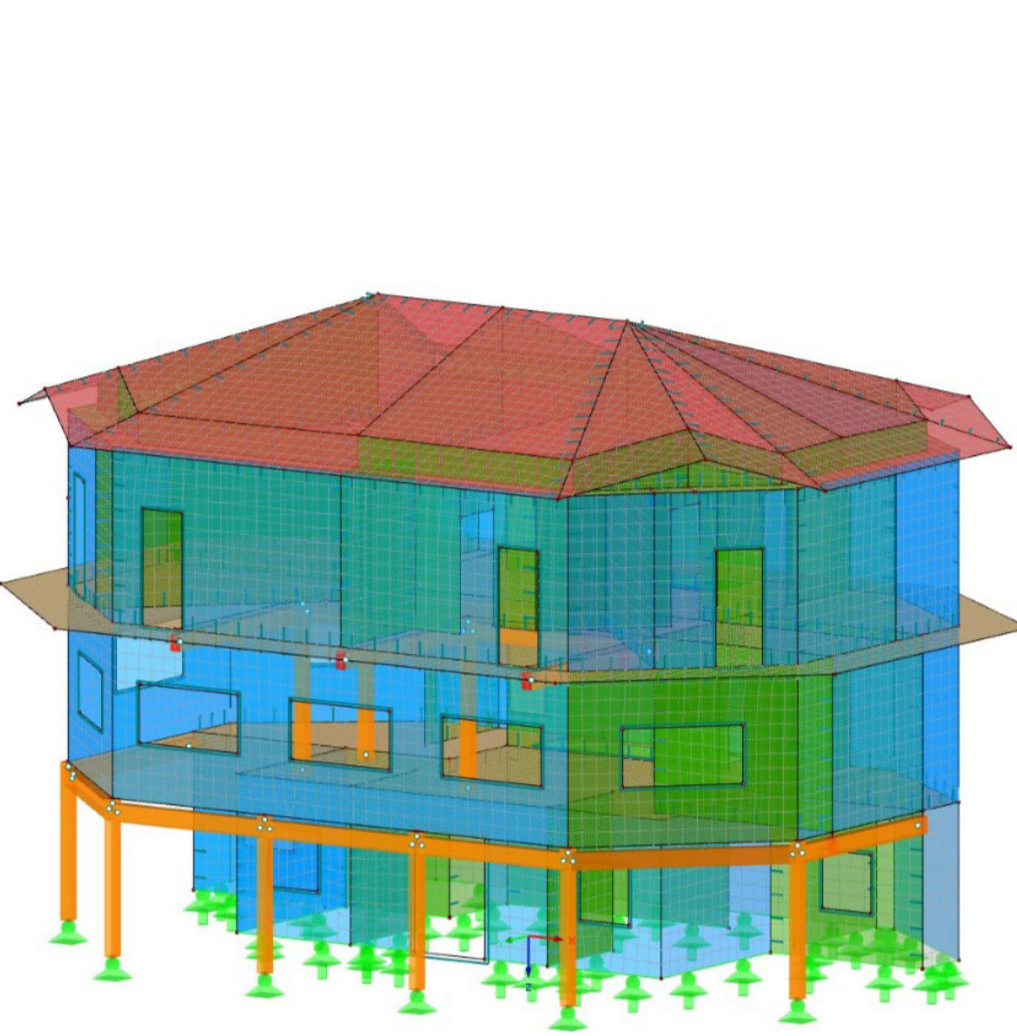
The site in Wendelstein is unique. You have 360 view, spacing from a deep valley on the south to the Wendelstein top to the north Doesn't matter if you are coming there for a meeting, passing by during a trekking or just arrived for your skiing weekend. Our Mountain Office will provide you everything you need.

The outer space of the refuge, delimited by columns, will offer shelter to trekkers, also when it is closed. Some dining tables will give people rest. As you enter, locker and shelves will allow you to relieve yourself from your heavy equipment, boots and skis.

The first floor is where refuge and office lives merge together. The space is open, allowing people to freely move around from the kitchen to the meeting room. Just let creativity flows as you move along. Optatist, et doloribus.

On the second floor, the central fireplace, which serve also as a heating system, will help us achieving a sense of intimate space. There are just two types of room, for six and for eight people. What actually makes the difference is their position. Ranging from east to west they will be completely different from one another thanks to the exposure.

Obviously, talking about feeling means talking about light, colours and materials. Building in such a context would require a special attention to transportation. Wood resulted to be the best solution, both for structure and for cladding.

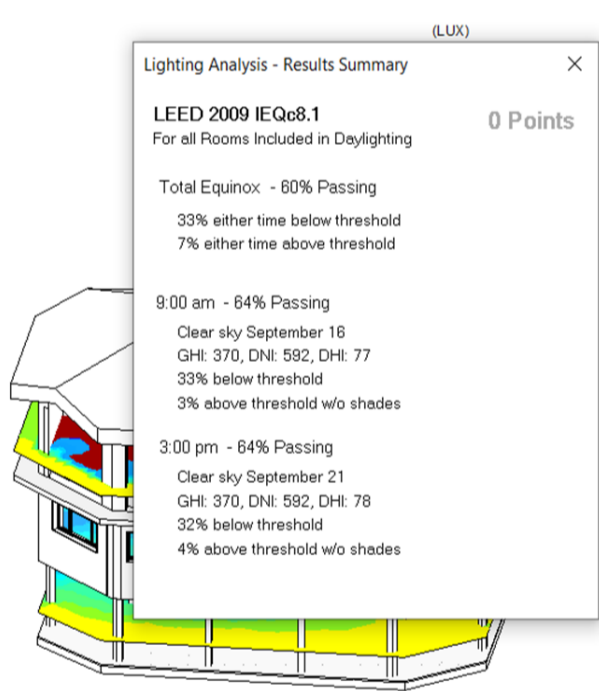
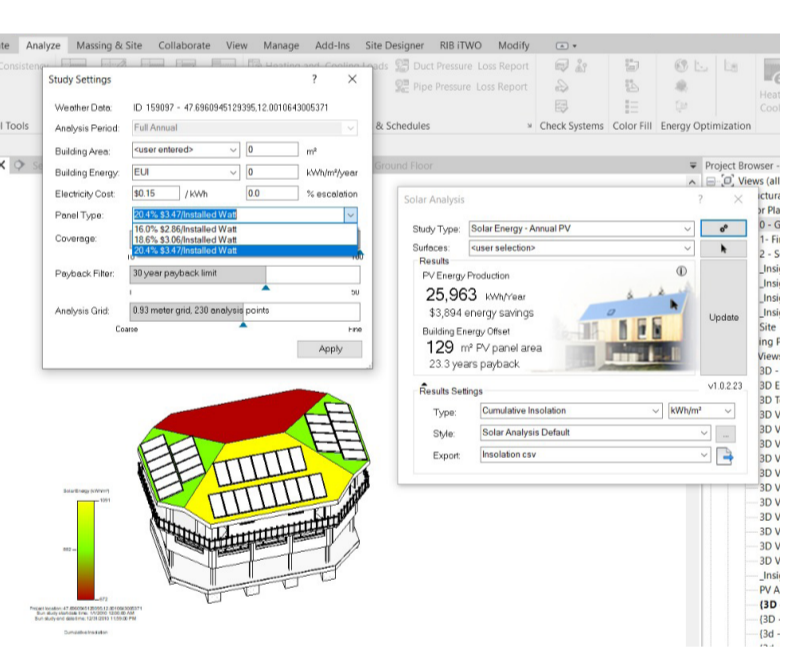


STRUCTURE

For the structural analysis the software RFEM by Dlubal was used. RFEM is a finite element analysis program for numerical simulations and design of 2D and 3D models consisting of member, plate, wall, folded plate, shell, solid, and contact elements. Thank to the direct interaction between RFEM and Revit it is possible to create new models and adjust modifications in both directions.

The loads on the solid roof are transferred by walls into the ceiling and the underlying walls by means of very rigid cross-laminated timber elements. All load-bearing interior and exterior walls and slabs are also made of cross-laminated timber. The load transfer on the upper floors is carried out on walls and beams whose material is glulam timber. Thus, the largest possible column-free space is realized. The cantilevered external walls are supported by a beam system with columns that carry the loads down to the ground. The walls on the ground floor also transfer the loads from the upper floors into the ground. On the north side, the building projects into the mountain so that the outer walls are made of reinforced concrete.

Loads from dead load, usage, wind and snow act on the building. In particular, the high snow loads had to be considered by rigid support elements in the construction. The wind loads were determined using RWIND Simulation. This software is used for numerical simulations of wind flow. All the other loads were added manually. After the calculation all structural elements were designed in the ultimate limit state.



ENERGY ANALYSIS

Unlike the initial planning process that focuses mainly on the economical aspect of the building (choosing less-costly materials), structural integrity and aesthetics before the energy efficiency and environmental impact of building is considered. To attain energy efficiency and sustainability in the building sector, 'Energy analysis' has been incorporated into the early stages of building construction planning.

With the aid of BIM tools (such as Autodesk Revit, Autodesk insight360, Green Building Studio etc.) it is easier to incorporate energy analysis from the conceptual phase of a building project. This gives a better understanding of the type of environment we are building for and help to make decision such as choosing the right orientation for rooms based on their purpose and their need for daylight and ventilation, choosing the right fenestration ratio etc

Also, the use of BIM tools helps us make the right choice of materials based properties such as its thermal properties and its environmental effect.

ion Heroes Benchmark

lits

leteness (-) and plausibility checker (grade: G)

t contributing materials (Global warming)

resource	Cradle to gate impacts (A1-A3)	Of cradle to gate (A1-A3)	Sustainable alternatives
Aluminum extrusions, anodized finish	22 tons CO ₂ e	29.2 %	show sustainable alternatives
reconstituted wood cladding, generic	12 tons CO ₂ e	16.1 %	show sustainable alternatives
thermal wood (flat roof insulation)	9.8 tons CO ₂ e	13.1 %	show sustainable alternatives
ready-mix concrete	8 tons CO ₂ e	10.7 %	show sustainable alternatives
roofline insulation board	7.5 tons CO ₂ e	10.0 %	show sustainable alternatives
thermal wood (facade insulation)	6.7 tons CO ₂ e	7.7 %	show sustainable alternatives
flat laminated wood, oak	4.4 tons CO ₂ e	5.9 %	show sustainable alternatives
coated flat glass	1.7 tons CO ₂ e	2.2 %	show sustainable alternatives
thermal wood (floor insulation)	0.75 tons CO ₂ e	1.0 %	show sustainable alternatives
cross laminated timber	0.66 tons CO ₂ e	0.9 %	show sustainable alternatives

Struktur	Schlüssel	Bezeichnung	Menge	ME
1.10		GLULAM Beams	1.838	m ³
1.20		GLULAM Columns	0.720	m ³
1.30		GLULAM Columns	0.780	m ³
1.40		ConcreteSlab	7.235	m ³
1.50		ExternalWall	116.912	m ²
1.60		ConcreteFoundation	26.921	m ³
1.70		ConcreteWalls	2.177	m ³
1.80		ConcreteWallWithInsulation	17.429	m ²
1.90		ExternalWall	46.475	m ²
1.100		Roof	192.221	m ²
1.110		ExternalWall	112.544	m ²
1.120		StairsRiser	34.000	St.
1.130		InteriorWalls	224.390	m ²
1.140		Windows_700x2000	2.000	St.
1.150		SlidingWindows	6.000	St.
1.160		SmallWindows	8.000	St.
1.170		WindowsChairs	6.000	St.
1.180		WindowsNorth	2.000	St.
1.190		WoodenSlabs	288.795	m ²
1.200		EntranceDoor	2.000	St.
1.210		SolarPanels	36.000	St.
1.230		InteriorDoors	8.000	St.

QUANTITY TAKEOFF

The use of BIM tools for quantity and cost estimation is believed to be one of the most effective way for making building construction Bill of Quantities. Since one of the main aims of BIM is to eliminate errors in the construction process, the use of BIM-based cost estimation tools help achieve this aim. The use of BIM-based software makes it easier to carry out project quantity take-off and costing. The building model is imported using a CPIXML file exchange format which makes it difficult to miss out any of the building components. This also helps to achieve transparency and makes it easy to update in case of in material cost, retrofitting or replacement of building material.

