SMARTWARE (CREATOPY) OFFICE BUILDING - ROMANIA

<table>
<thead>
<tr>
<th>Data of building</th>
<th>Gebäudedaten</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Year of construction</strong>&lt;br&gt;Baujahr</td>
<td>2020</td>
</tr>
<tr>
<td><strong>U-value external wall</strong>&lt;br&gt;U-Wert Außenwand</td>
<td>0,160&lt;br&gt;W/(m²K)</td>
</tr>
<tr>
<td><strong>U-value slab on grade</strong>&lt;br&gt;U-Wert Kellerdecke</td>
<td>0,198&lt;br&gt;W/(m²K)</td>
</tr>
<tr>
<td><strong>U-value roof</strong>&lt;br&gt;U-Wert Dach</td>
<td>0,096&lt;br&gt;W/(m²K)</td>
</tr>
<tr>
<td><strong>U-value window</strong>&lt;br&gt;U-Wert Fenster</td>
<td>1,20 / 0,61&lt;br&gt;W/(m²K)</td>
</tr>
<tr>
<td><strong>Heat recovery</strong>&lt;br&gt;Wärmerückgewinnung</td>
<td>67 %</td>
</tr>
<tr>
<td><strong>Special features</strong>&lt;br&gt;Besonderheiten</td>
<td>The largest CLT structure office building made in Low Energy standard from Romania. Due to the server room and high data processing equipment required, the primary energy was much higher than PH criteria</td>
</tr>
</tbody>
</table>
This project started at the end of 2018 when Gabriel Ciordaș, the CEO of an IT company from Oradea, Romania, contracted us along with the architecture team - Vertical Studio from Oradea, to design the building that will accommodate all the new employees. The main design theme was an office building for 250 new users, who should work in a comfortable environment and all of that had to be done within 1 year because they were in an exponential growth. They had already occupied all the office buildings that could be rented in Oradea and all of the rented spaces had major comfort problems, which affected their quality of life, furthermore, their performance at work. When all of this started, nobody had in mind that this new building had to be a passive one. Everything that was needed was a construction that kept up with the technology of the year we are in and a building that can be later upgraded to run on its own energy resources. The main emphasis was to ensure that all the occupants will have a high quality of comfort and working.

With a total surface of 2400 sqm and 250 working places, the building is developed on four platforms, the level differences are a natural response to the slope of the land. This justifies the non-invasive approach that helps animate the building both inside and outside.

The main entrance is located on the southern façade and it leads to a spacious atrium and central lobby. There are eight open office zones located on the building’s Northern Eastern and Western perimeter. The conference rooms together with the common areas and toilets are organized around a central interior garden in order to receive natural light. The reinforced concrete slab is sitting on a 400mm foamed glass insulation layer, made from recycled glass waste. The walls and roof slabs are made of prefabricated CLT panels. They are insulated with 200mm of mineral wool applied on the exterior. Additionally to the above mentioned insulation, the roof has an extra 100 mm XPS layer under the green roof structure.

In February 2019 the team started to work on the preliminary design. A few months later, in April, the architecture team had its final design chosen and based on that we started working on the structural concept made from CLT panels. We chose this material because it is an complete prefabricated constructive system and has a high assembly speed.

In May the construction of the foundation started and in August, the assembly of the CLT structure began and in order to save time, on the inside, the entire structure remained visible and this makes this building the largest one in Europe that has the biggest surface of CLT panels visible. The high execution speed and the short time we had to finish the construction, put great pressure on workers and contractors. To be able to keep such a demanding project with an even more demanding deadline required the teams to be in sync with each other. Everybody had to have clarity in their task, and a verification system in order to avoid mistakes that could cause delays. Because of that, I stepped in as technical coordinator of the project and made integrated details, clear and easy to understand, both in a graphic format as well as in video and pdf manuals that helped the workers be more efficient.

Even though from the beginning it was not planned for the building to be a certified passive building, I used the passive house principles when designing it. During the construction process, I noticed that things were going very well and everybody was paying attention to all the little details. So, because of that, I re-discussed with the owner the option of certification and the related benefits of it. The biggest one was the fact that they will now have a guarantee that all of the comfort requirements of the building are met, something that all the employees asked in the first place. So this is how we managed to finally certificate this building as a PHI Low Energy Building.
<table>
<thead>
<tr>
<th>Role</th>
<th>Responsible Party</th>
</tr>
</thead>
<tbody>
<tr>
<td>Implementation planning</td>
<td>Eng. Marius Șoflete, ec. Micloș George</td>
</tr>
<tr>
<td>Building physics</td>
<td>Eng. Marius Șoflete</td>
</tr>
<tr>
<td>Passive House project planning</td>
<td>Eng. Marius Șoflete</td>
</tr>
<tr>
<td>Construction management</td>
<td>Eng. Marius Șoflete, ec. Gerge Micloș, Kabai Ervin</td>
</tr>
</tbody>
</table>

**Certifying body**

Passivhaus Institut Darmstadt
www.passiv.de
arch. Dragoș Arnăutu

**Certification ID**


**Author of project documentation**

Passivhaus Institut Darmstadt
www.passiv.de

<table>
<thead>
<tr>
<th>Date</th>
<th>Signature</th>
</tr>
</thead>
<tbody>
<tr>
<td>05.02.2021</td>
<td>Sofletez</td>
</tr>
</tbody>
</table>
1. Facade photos / Ansichtsfotos

South east

South west

2. Interior foto / Innenfoto exemplarisch

Copyright: Marius Soflete
3. Section / Schnittzeichnung

4. Floor plan / Grundrisse
5. Construction Details / Konstruktion der Bodenplatte

Assembly no.

Out

Placa per sol

Heat transmission resistance $R_{\text{th}}$ [m²K/W]

Interior $R_{\text{i}}$

 Adjacent to

Area section 1 $R_{\text{a}}$ [m²K/W]
Area section 2 (optional) $R_{\text{o}}$ [m²K/W]
Area section 3 (optional) $R_{\text{b}}$ [m²K/W]

Radier BA 2.390
Geocell 0.084

Percentage of sec. 1

100%

Percentage of sec. 2


Percentage of sec. 3


Total 70.0

U-value supplement $U_{\text{value}}$ [W/(m²K)]

U-value: 0.198

Page | Seite

6
6. Wall construction details / Konstruktion der Außenwände
7. Roof construction / Konstruktion des Daches
### 8. Fenster und Fenster-Einbau

<table>
<thead>
<tr>
<th>Beschreibung der Fenster (rahmen)-Konstruktion, Hersteller</th>
<th>Aluprof Alumil aluminum frame MB86 aero and MB 104 aero</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fabrikat Fenster (rahmen; Produktname)</td>
<td>Aluminium frame with aerogel insulation on middle chamber</td>
</tr>
<tr>
<td>Rahmen-U-Wert Uf</td>
<td>From 0.71 to 1.50 W/(m²K)</td>
</tr>
<tr>
<td>Bauart der Verglasung</td>
<td>Argon filling 10</td>
</tr>
<tr>
<td>Glas-U-Wert Ug</td>
<td>07,0 W/(m²K)</td>
</tr>
<tr>
<td>g-Wert der Verglasung</td>
<td>0,50</td>
</tr>
</tbody>
</table>

**Category:** Window Frame  
**Manufacturer:** Aluprof S.A., Bielsko-Biala, Poland  
**Product name:** MB-104 Passive Aero

This certificate was awarded based on the following criteria for the cool, temperate climate zone:

- **Comfort** $U_g = 0.76 \leq 0.08 W/(m²K)$  
- $U_{\text{Raum}} = 0.08 W/(m²K)$  
- $U_g = 0.76 W/(m²K)$  
- **Hygiene** $\varphi_{\text{min},25} \geq 0.70$

---

[Image: window installation details and diagrams]
9. Blower door test / Beschreibung der luftdichten Hülle

Raport testare 
Etansare prin blower door

Beneficiar: SmartWare
Locatie: ORADEA
11-13.06.2020

Airthight layer:
Floor ceiling – reinforced concrete slab – 400mm
Walls – 140 – 160 mm 5 layer CLT
Roof – aluminium bitum vapour barrier
Windows – interior and exterior foil
Building services perforation sealed with fireproof Sika Foam

Copyright: ZECAPH CONSULT

Copyright: ZECAPH CONSULT
10. Ventilation with heat recovery / Lüftungsgerät

The fresh air is transmitted by the 8500 m³/h ERV (effective HRE =67%, Humidity recovery =40%), to the 8 zonal units (marked above in purple) which in turn provide it to the dedicated zones (marked in yellow) through underfloor air chambers via local units (marked in light blue).

<table>
<thead>
<tr>
<th>Fabrikat Lüftungsanlage</th>
<th>Ruck K 7600 WKJL</th>
</tr>
</thead>
<tbody>
<tr>
<td>effektiver Wärmebereitstellungsgrad</td>
<td>67 %</td>
</tr>
<tr>
<td>Elektroeffizienz</td>
<td>0.43 Wh/m³</td>
</tr>
</tbody>
</table>

11. Ventilation scheme / Lüftungsplanung Kanalnetz

Besides post heating and cooling the supply air, the zonal units are capable of providing additional heating and cooling of the spaces through air recirculation. The post heating and cooling of the air is done inside the zonal units by water based coils connected to 4 dedicated air to water reversible heat pumps positioned outside the thermal envelope. The zonal units extract the air at the top (also connected with the ERV), and supply fresh (and reconditioned) air at the bottom, under the entire floor area of each specific zone towards the local units. The local units supply air to the rooms from under the raised floor, and are able to locally regulate the temperature and air flow according to the loads of each zone and user needs.
12. Heat source / Wärmeversorgung

Air-water heat pump, Mitsubishi Zubadan PUHZ SHW 230 YKA, 23 kw for heating and 20 kw for cooling, average COP 2,56, max COP 4,56.

Hotwater The hot water demand is satisfied via a decentralized system using 10L direct electric boilers for each individual water tap. The server room and additional technical spaces are conditioned by water based chillers connected to 2 dedicated reversible heat pumps. The installed servers are of the latest generation and among the most energy efficient options on the market today.

13. Construction cost - Baukosten

The entire construction cost – including landscaping and all interior / exterior finishing was at 1680 euro / usable square meter. Out of this, the functional building cost was around 1200 euro / usable square meter.

After the fist year of usage, energy cost for heating - cooling and ventilation, measured and payed on bills, was at 0.80 euro / usable square meter per one year, with a 120 people capacity

14. Extras

I had documented the entire process of designing and making the building on my youtube channel, in a 5 video series (with english subtitle) that can be accessed here, at this link: SMARTWARE OFFICE Building - how was it made
14. Extras

Smartware project was presented at Passive House Conference 2021 in online format. The video of the presentation can be accessed here –

SMARTWARE at Passive House Conference 2021

Lessons learned from the first certified office building in Romania

SMARTWARE / CREATOPY – first certified PHI Low Energy Office Building

Dragos Ionut Armanu
Dipl Architect, Energy consultant, Trainer and Building Certifier
dragos.armatu@passiv.de
 Passive House Institute
www.passivehouse.com

Marius Soflete
Structural Engineer, Trainer and Passive House Specialist
marius.soflete@ingineriecreativa.ro
Inginerie Creativă
www.ingineriecreativa.ro

Detailed building information available at www.passivehouse-database.org Building ID: 6605

Also the project was presented at European Energy Efficiency Summer Study 2021 and proposed for Passive House Awards 2021
Due to large energy consumption of installed servers, as the office is an IT company headquarter, the benchmark for PER limit was discussed with Dragos Arnăutu – PHI Certifier and with PHI.
16. PH Certificate

Certificate
Certified PHI Low Energy Building

Smartware Office Building
Strada Petőfi Sándor Nr. 345, 417167 Sălășbagiu de Munte, Romania

The characteristic energy values of buildings certified according to the PHI Low Energy Building Standard are verified as thoroughly as for Passive House certification. However, due to various reasons PHI Low Energy Buildings have a somewhat higher energy demand (criteria: see www.passivehouse.com).

The design of the above-mentioned building meets the criteria defined by the Passive House Institute for the PHI Low Energy Building Standard:

<table>
<thead>
<tr>
<th>Building quality</th>
<th>This building</th>
<th>Criteria</th>
<th>Alternative criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heating</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heating demand [kWh/(m²a)]</td>
<td>27</td>
<td>≤ 30</td>
<td></td>
</tr>
<tr>
<td>Cooling</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cooling + dehumidification demand [kWh/(m²a)]</td>
<td>18</td>
<td>≤ 40</td>
<td></td>
</tr>
<tr>
<td>Airtightness</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pressurization test result (n₅₀) [1/h]</td>
<td>0,3</td>
<td>≤ 1,0</td>
<td></td>
</tr>
<tr>
<td>Renewable primary energy (PER)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PER demand [kWh/(m²a)]</td>
<td>101</td>
<td>≤ 75</td>
<td>100</td>
</tr>
<tr>
<td>Generation (reference to ground area) [kWh/(m²a)]</td>
<td>0</td>
<td>≥ -</td>
<td>-</td>
</tr>
</tbody>
</table>

The associated certification booklet contains more characteristic values for this building.

Darmstadt, 15. February 2021
Certifier: Dragoș Amătuțu, Passive House Institute GmbH

www.passivehouse.com

29557-29573_PHI_LEB_20210215_DA