Project Documentation
Gebäude-Dokumentation

Abstract | Zusammenfassung

SMARTWARE (CREATOPY) OFFICE BUILDING - ROMANIA

Data of building | Gebäudedaten

Year of construction Baujahr	2020	**Space heating** **Heizwärmebedarf**	**27** **kWh/(m²a)**
U-value external wall U-Wert Außenwand	0,160 W/(m²K)		
U-value slab on grade U-Wert Kellerdecke	0,198 W/(m²K)	Primary Energy Renewable (PER) Erneuerbare Primärenergie (PER)	161 kWh/(m²a)
U-value roof U-Wert Dach	0,096 W/(m²K)	Generation of renewable Energy Erzeugung erneuerb. Energie	0 kWh/(m²a)
U-value window U-Wert Fenster	1,20 / 0,61 W/(m²K)	Non-renewable Primary Energy (PE) Nicht erneuerbare Primärenergie (PE)	0 kWh/(m²a)
Heat recovery Wärmerückgewinnung	67 %	Pressurization test n_{50} Drucktest n_{50}	0,3 h^{-1}
Special features Besonderheiten	The largest CLT structure office building made in Low Energy standard from Romania. Due to the server room and high data processing equipement requiered, the primary energy was much higher that PH criteria		

Brief Description

SMARTWARE (CREATOPY) LOW ENERGY OFFICE BUILDING

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 acomodate 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 confort 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.

Responsible project participants
Verantwortliche Projektbeteiligte

Architect Entwurfsverfasser	Vertical Studio Oradea – arch. Mădălina Mihăilcean, arch. Chiș Gabriel-Bulea, arch. Nan Florin Moisa
Implementation planning Ausführungsplanung	Eng. Marius Șoflete, ec. Micloș George
Building systems Haustechnik	Terax Engineering – eng. Gabriel Dincuță, Eurocad Instal – eng. Raul Birstan
Structural engineering Baustatik	Inginerie Creativă / Creative Engineering Eng. Marius Șoflete, Eng. Timu Octavian, Eng. Caraza Cătălin www.ingineriecreativa.ro
Building physics Bauphysik	Eng. Marius Șoflete
Passive House project planning Passivhaus-Projektierung	Eng. Marius Șoflete
Construction management Bauleitung	Eng. Marius Șoflete, ec. Gerge Micloș, Kabai Ervin

Certifying body
Zertifizierungsstelle

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

Certification ID
Zertifizierungs ID

6605	Project-ID (https://passivehouse-database.org/index.php?lang=en#d_6605)

Author of project documentation
Verfasser der Gebäude-Dokumentation

Passivhaus Institut Darmstadt
www.passiv.de

Date Datum	Signature Unterschrift
05.02.2021	

1. Facade photos / Ansichtsfotos

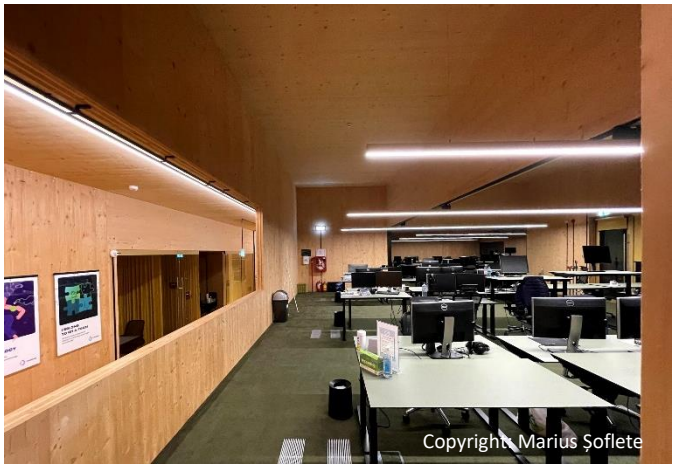
South east

Copyright: Marius Șoflete

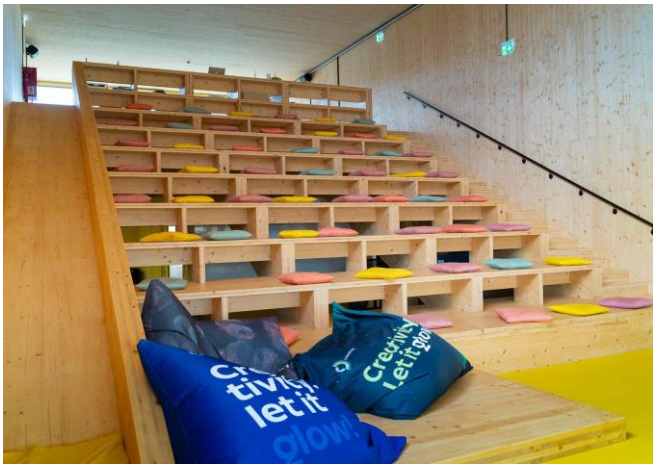
South west

Copyright: Marius Șoflete

2. Interior foto / Innenfoto exemplarisch

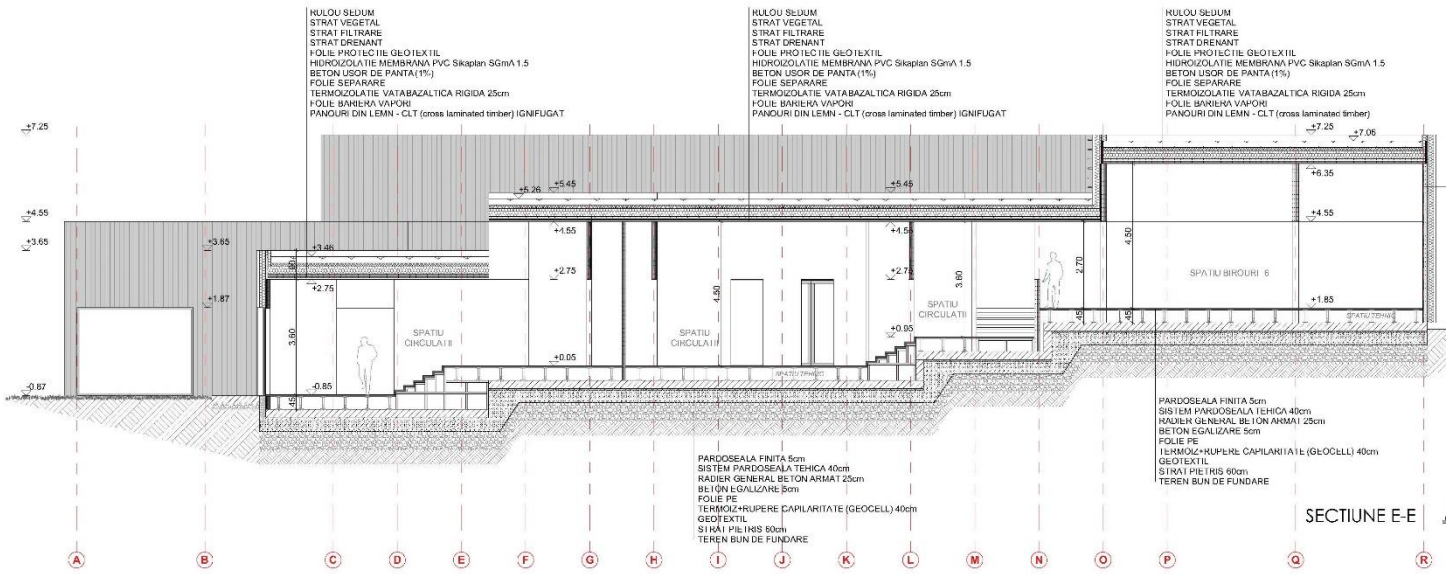


Copyright: Marius Șoflete



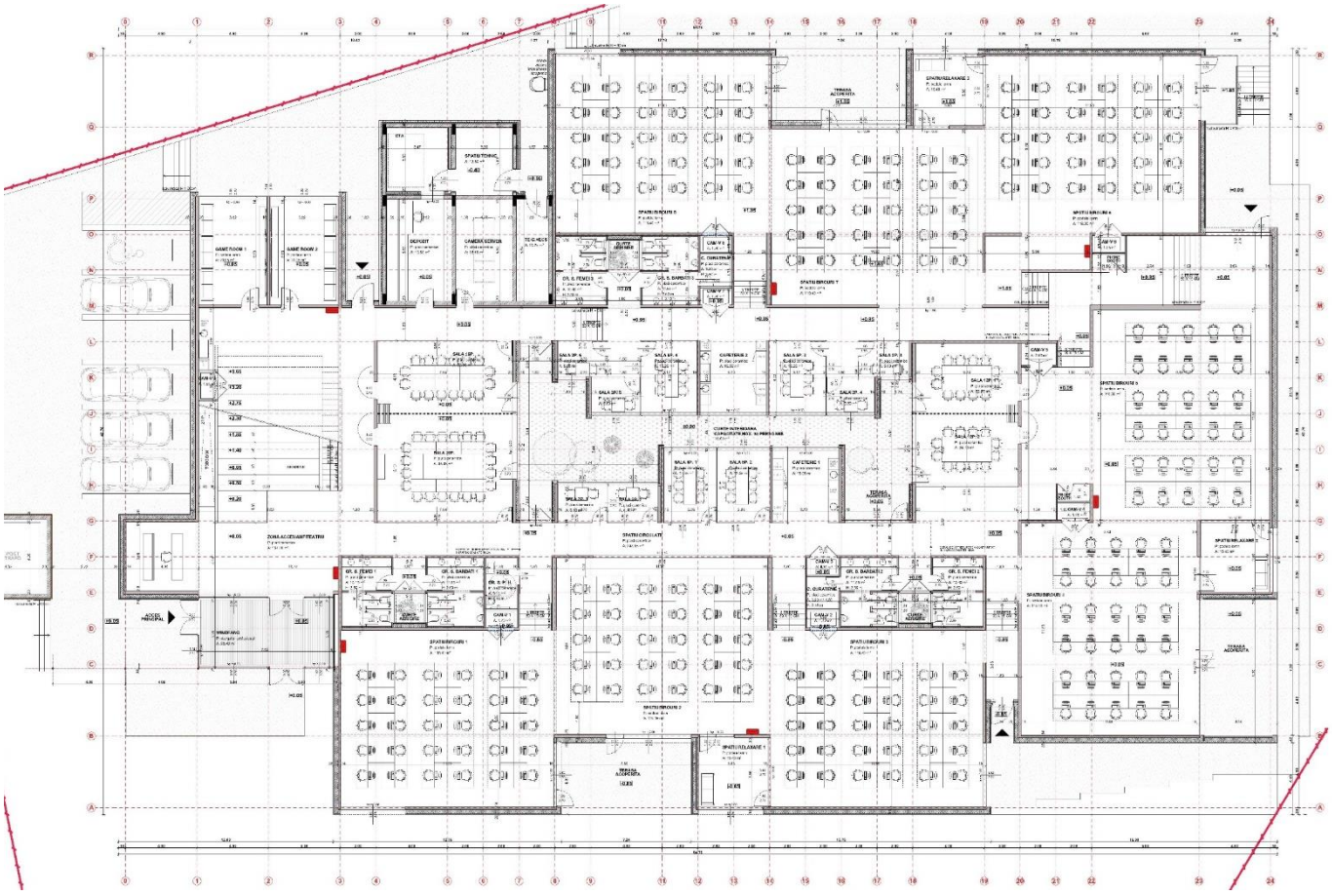
© Peter Cook

3. Section / Schnittzeichnung



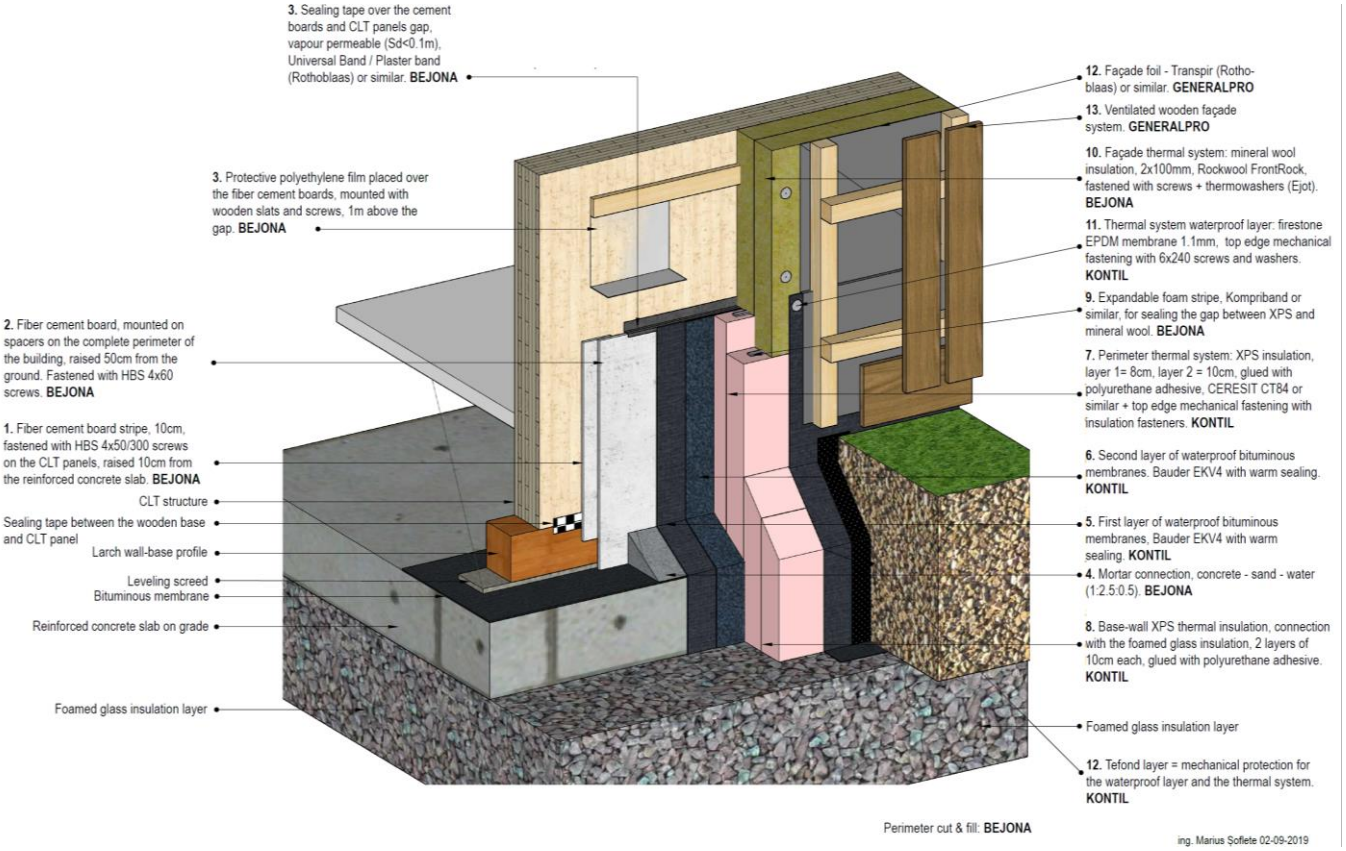
Copyright: Vertical Studio

4. Floor plan / Grundrisse



Copyright: Vertical Studio

5. Construction Details / Konstruktion der Bodenplatte



Assembly no.						Interior insulation?
05ud	Placa pe sol					

Heat transmission resistance [m²K/W]

Orientation of building element	0,17	interior R_{si}	0,17
Adjacent to	0	exterior R_{se}	0,00

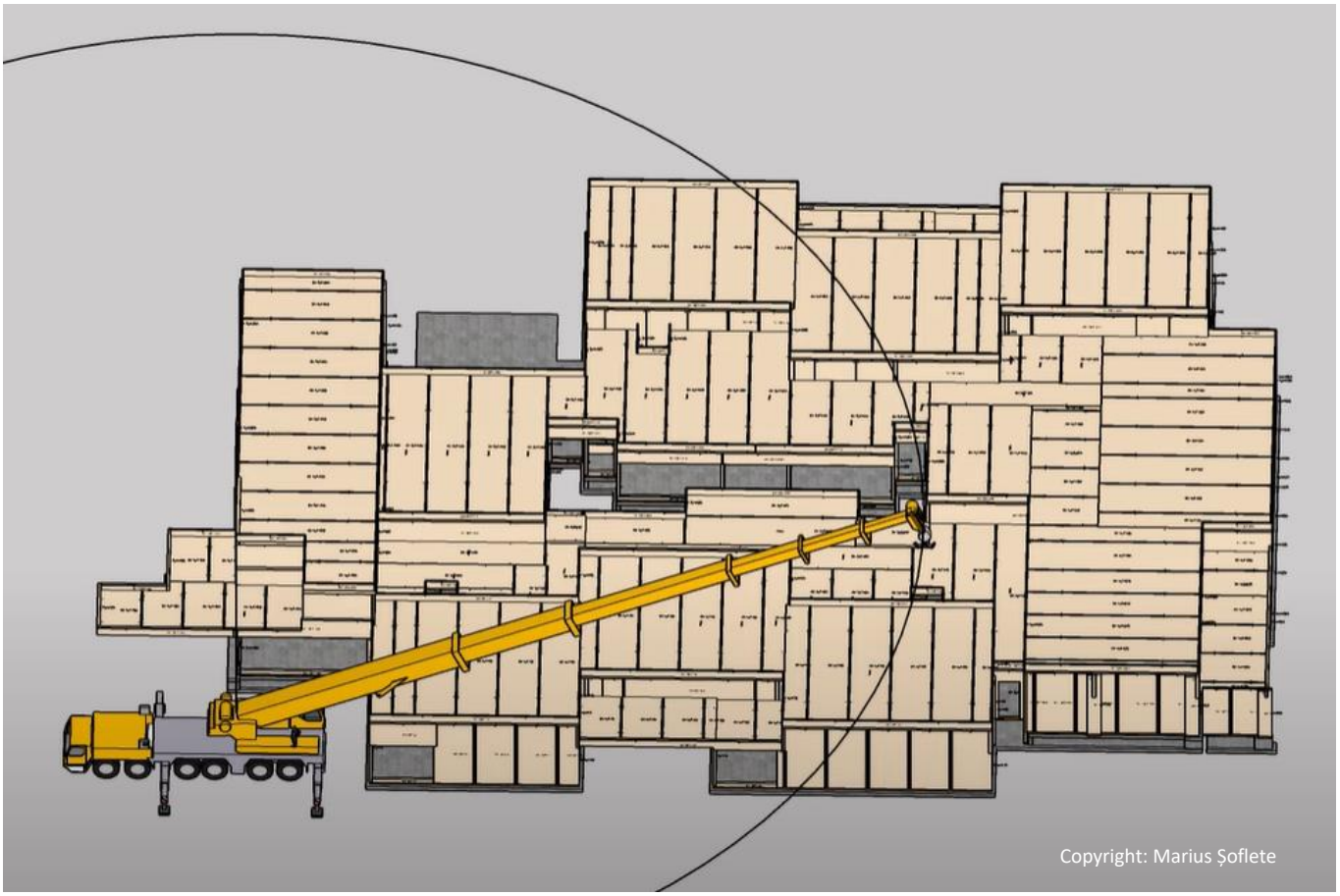
Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
Radier BA	2,300					300
Geocell	0,084					400

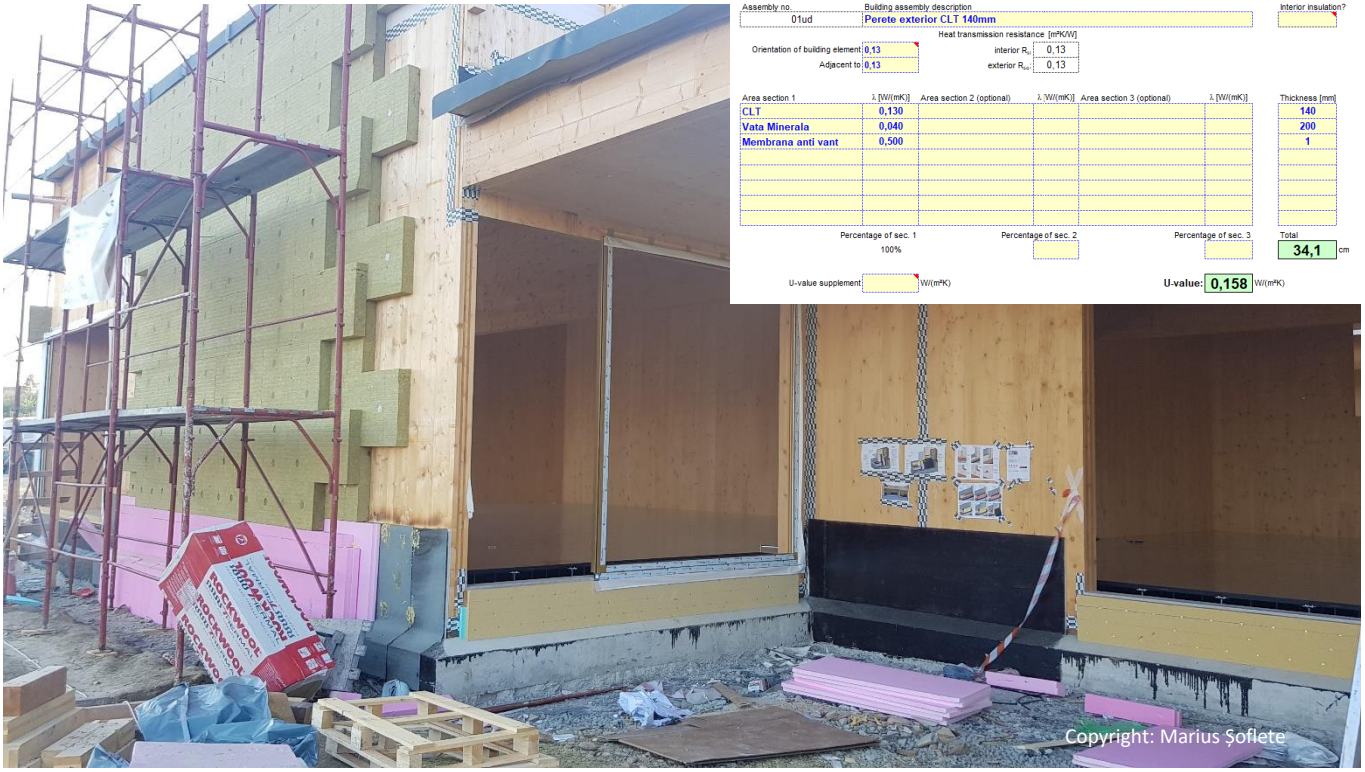
Percentage of sec. 1	Percentage of sec. 2	Percentage of sec. 3	Total
100%			70,0 cm

U-value supplement: W/(m²K)

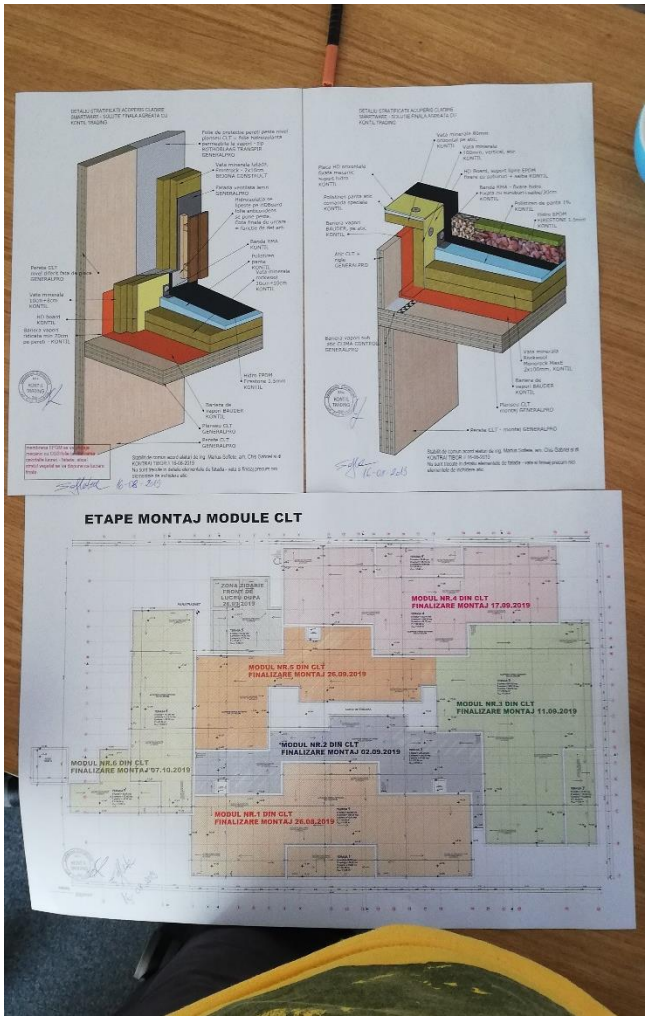
U-value: 0,198 W/(m²K)

6. Wall construction details / Konstruktion der Außenwände





7. Roof construction / Konstruktion des Daches



Assembly no.	Acoperis CLT 160mm				Interior insulation?
04ud					

Heat transmission resistance [m²K/W]

Orientation of building element: 0,1 — interior R_{si}: 0,10

Adjacent to: 0,04 — exterior R_{se}: 0,04

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
CLT	0,130					160
Vata minerala	0,040					200
XPS	0,035					100
Pamant vegetal	0,170					200

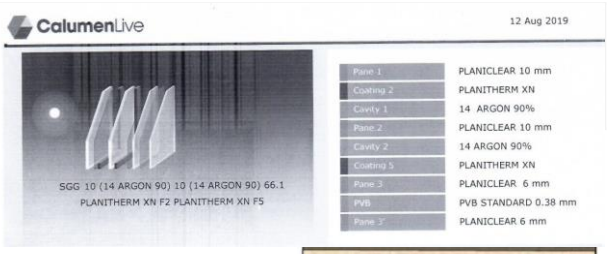
Percentage of sec. 1: 100% — Percentage of sec. 2: — Percentage of sec. 3: — Total: 66,0 cm

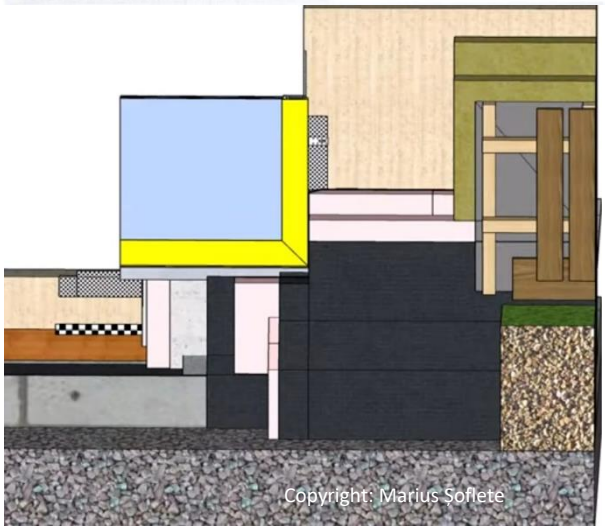
U-value supplement: — W/(m²K)

U-value: 0,096 W/(m²K)

8. Fenster und Fenster-Einbau

Beschreibung der Fenster (rahmen)-Konstruktion, Hersteller	**Aluprof Alumil aluminum frame MB86 aero and MB 104 aero**
Fabrikat Fenster (rahmen; Produktname)	Aluminium frame with aerogel insulation on middle chamber
Rahmen-U-Wert Uf	From 0.71 to 1.50 W/(m²K)
Bauart der Verglasung	Argon filling 10 | 14 | 10 | 14 | 12
Glas-U-Wert Ug	07,0 W/(m²K)
g-Wert der Verglasung	0,50



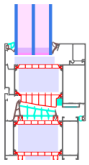


Category: Window Frame
Manufacturer: Aluprof S.A., Bielsko-Biala, Poland
Product name: MB-104 Passive Aero

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

Comfort $U_W = 0.76 \leq 0.80\,W/(m^2K)$
$U_{W,installed} \leq 0.85\,W/(m^2K)$
with $U_g = 0.70\,W/(m^2K)$

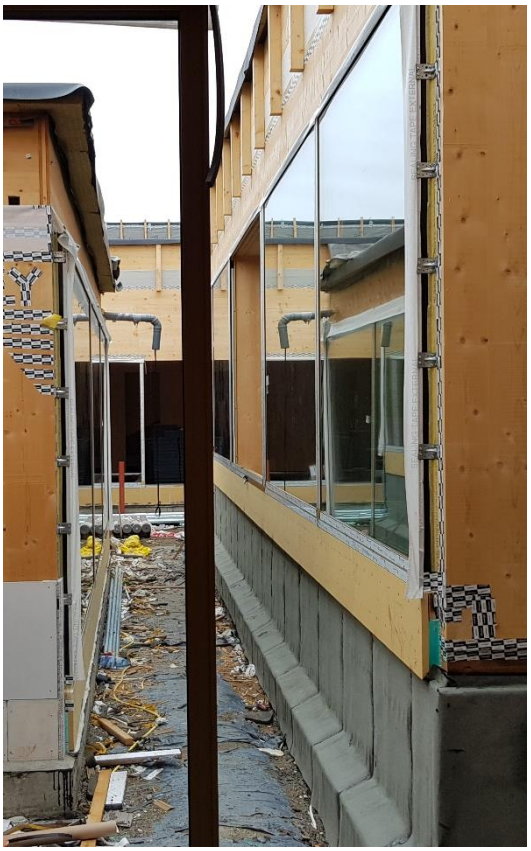
Hygiene $f_{Rsi=0.25} \geq 0.70$



Passive House efficiency class: phE | phD | phC | phB | phA

cool, temperate climate
phB
CERTIFIED COMPONENT
Passive House Institute

www.passivehouse.com



9. Blower door test / Beschreibung der luftdichten Hülle

Raport testare Etansare prin blower door

Beneficiar: SmartWare

Locatie: ORADEA

11-13.06.2020

ZECAPH CONSULT SRL
constructii responsabile

Str IOAN SOCEC nr 12V1 ap 19 – Brasov -Ro
Birou proiectare:Str 1Decembrie 1918 nr38
J8/370/11.03.2015 , CUI 34217889
0729292731
c.vlad@zecaph.com
office@zecaph.com
www.zecaph.com
www.zecaph.ro

Ing. Ciobanu Vlad
Ing. Simpetru Gabriela

Pagina 1. Raport centralizator al rezultatelor obtinute in urma testarii pentru identificarea neetans

Airthigth 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

Summary

FanTestic	version: 5.11.73	licensed to: Zecaph Consult srl
Test date: 2020-06-13	By: Vlad Ciobanu	
Customer:	Smartware	
Building Lot Number:		
Building address:	Saldabagiu de munte Petofi Sandor 345 Oradea, Bihor Romania	

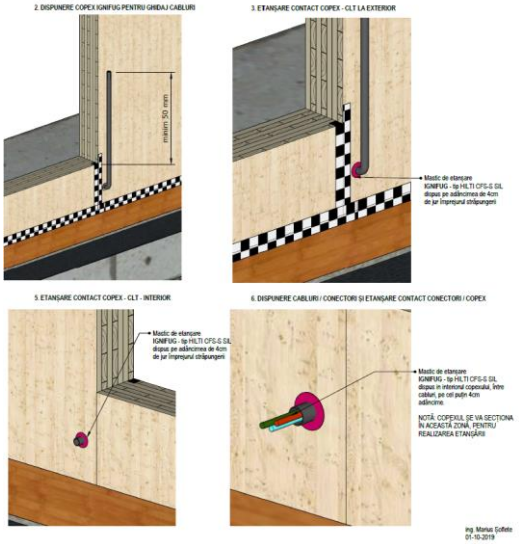
Building and Test Information	
Test file name:	EN13829-DE 2020-06-13 0924 test 3
Building volume [m³]:	8,048
Envelope Area [m²]:	6,411
Floor Area [m²]:	2,089
Building Height (from ground to top) [m]:	6.4
Building Exposure to wind:	Partially protected building
Accuracy of measurements:	5%

Results	
Air flow at 50 Pa, V_{50} [L/s]	627.25
Air changes at 50 Pa, n_{50} [/h]	0.28
Permeability at 50 Pa, q_{50} [L/s/m²]	0.098
Specific leakage at 50 Pa, w_{50} [L/s/m²]	0.308
Effective leakage area at 50 Pa, A_L [cm²]	688.5
Equivalent leakage area at 50 Pa, A_L [cm²]	1130
Normalized Leakage Area [cm²/m²]	0.10736

Pressurize Data Set
Test Dataset Date: 2020-06-13
Start time: 08:52:35
Finish Time: 09:07:04

Environmental Conditions		
Wind speed:	0: Calm	from the
Operator Location:	Inside the building	
Initial Bias Pressure:	-1.11 Pa	
Final Bias Pressure:	0.60 Pa	
Average Bias Pressure:	-0.26 Pa	
Initial Temperature:	Indoors: 25 C	outdoors: 22 C
Final Temperature:	Indoors: 25 C	outdoors: 22 C
Barometric Pressure:	101.3 kPa	from Standard temp/pressure

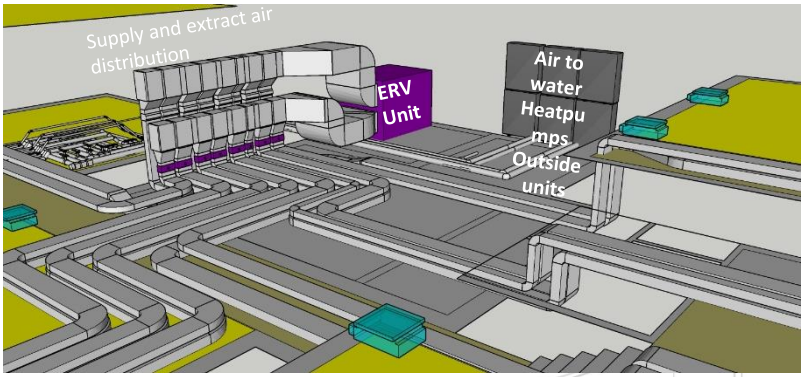
Pressurize Test Analysis				
Correlation, r [%]:	99.909			
	Mean	95% confidence limits		Uncertainty
		Lower	Upper	
Slope, n:	0.742	0.71966	0.76434	
Air leakage coefficient, C_{env} [L/s/Pa^n]:	35.904	33.08	38.97	
Air leakage coefficient, C_L [L/s/Pa^n]:	35.748	32.93	38.80	
Air flow at 50 Pa, V_{50} [L/s]	651.45	645.5	657.5	+/-0.9%
Air changes at 50 Pa, n_{50} [/h]	0.2914	0.2766	0.3062	+/-5.1%
Permeability at 50 Pa, q_{50} [L/s/m²]	0.1016	0.096	0.107	+/-5.1%
Specific leakage at 50 Pa, w_{50} [L/s/m²]	0.3195	0.3033	0.3357	+/-5.1%
Effective leakage area at 50 Pa, A_L [cm²]	714.9	708.3	721.5	+/-0.9%
Equivalent leakage area at 50 Pa, A_L [cm²]	1172	1161	1183	+/-0.9%
Normalized leakage area at 50 Pa [cm²/m²]	0.11150	0.106	0.117	+/-5.1%



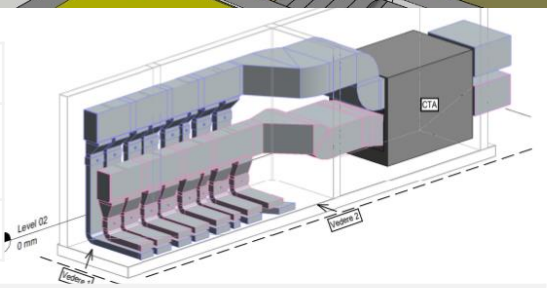
entificarea neetanseitatilor. SmartWare-ORADEA

10. Ventilation with heat recovery / Lüftungsgerät

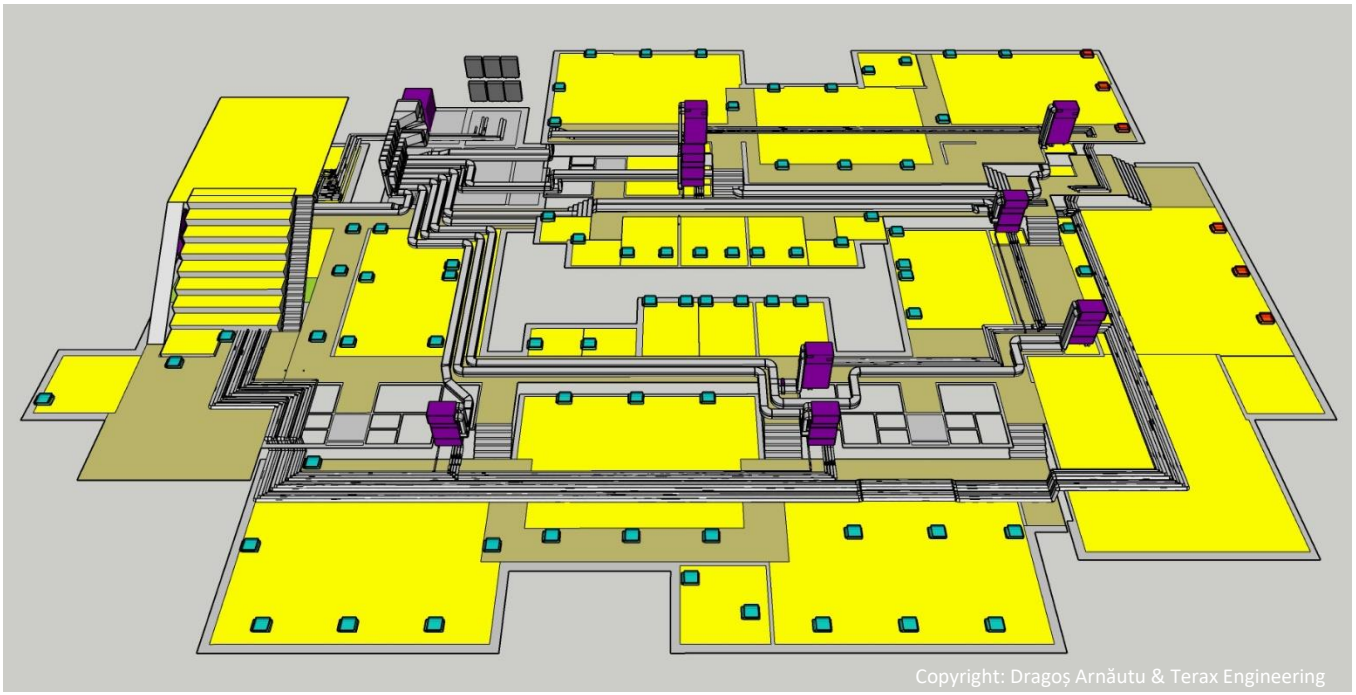
The fresh air is transmitted by the 8500 m³/h ERV (effective HRE =67%, Humidity recovery =40%), to the 8 zonal units (marked above in purple) which in turn provide it to the dedicated zones (marked in yellow) through underfloor air chambers via local units (marked in light blue).



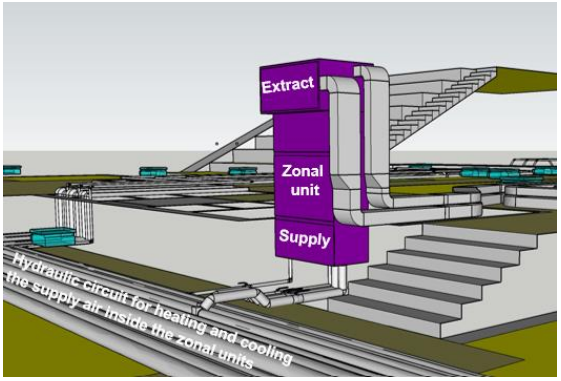
Fabrikat Lüftungsanlage	**Ruck K 7600 WKJL**
effektiver Wärmebereitstellungsgrad	67 %
Elektroeffizienz	0,43 Wh/m³



11. Ventilation scheme / Lüftungsplanung Kanalnetz

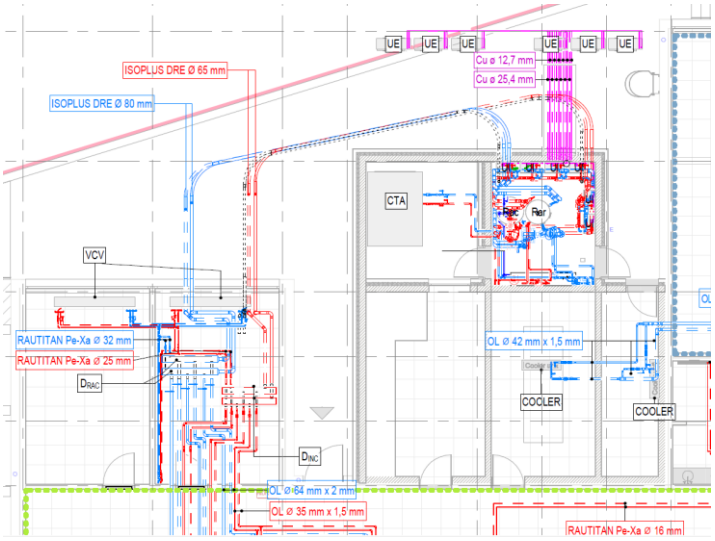


Besides post heating and cooling the supply air, the zonal units are capable of providing additional heating and cooling of the spaces through air recirculation. The post heating and cooling of the air is done inside the zonal units by water based coils connected to 4 dedicated air to water reversible 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.



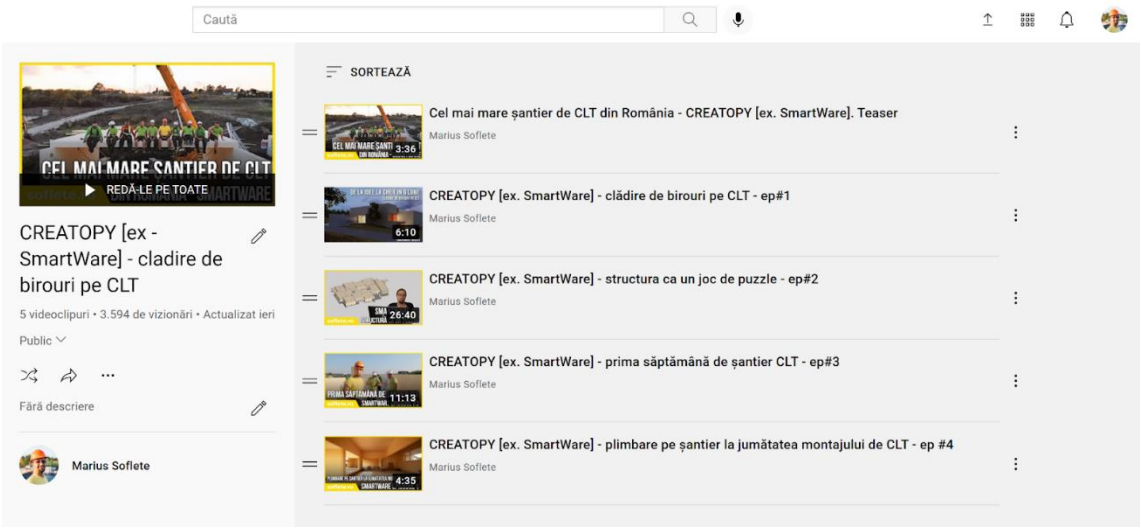
13. Construction cost - Baukosten

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

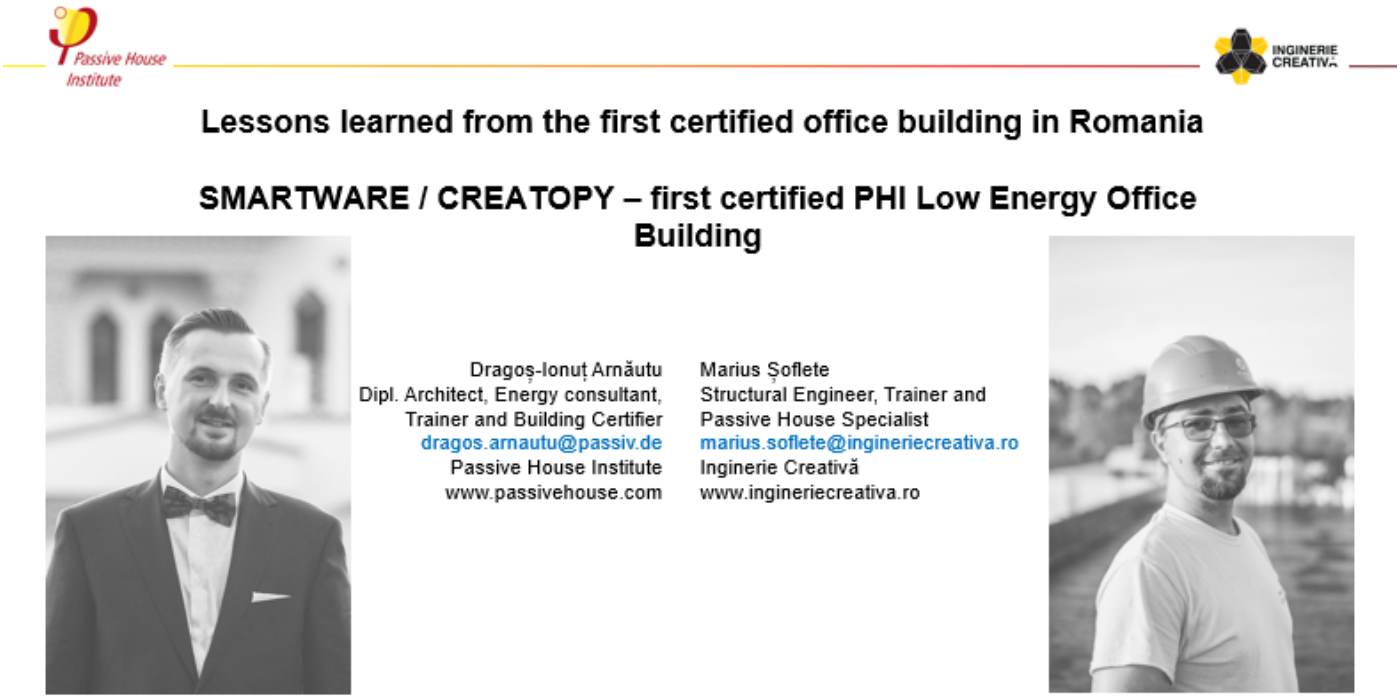
I had documented the entire proces of designing and making the building on my youtube channel, in a 5 video series (with english subtitle) that can be accessed here, at this link:
SMARTWARE OFFICE Building - how was it made



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]



Also the project was presented at European Energy Efficiency Summer Study 2021 and proposed for Passive House Awards 2021

14.30–16.00 (parallel session) PANEL 8. Session III: How to accelerate the route to climate neutral building stock		
8-067-21	Accelerating the energy-efficiency renovation of single-family houses	Hanna Westling
8-051-21	The European heating system at a tipping point	Mélissa Zill
8-107-21	Energy efficient measures applied to a multi-apartment building in southern Sweden: Analysis of the cost effectiveness with respect to carbon emissions taxes implementation	Youcef Boussaa
8-209-21	SMARTWARE – certified Low Energy – Passive House office building	Marius Soflete, Dragos-Ionut Arnăutu

15. PHPP File / Ergebnisse

PHI Low Energy Building Verification

Building:	SmartWare		
Street:	Strada Petofi Sandor nr 345		
Postcode/City:	417167	Săldăbagiu de Munte	
Province/Country:	Bihor		RO-Romania
Building type:	Office Building		
Climate data set:	RO0001a-Satu-Mare		
Climate zone:	3: Cool-temperate	Altitude of location:	206 m

Home owner / Client:	SC Smartware SRL		
Street:	Strada Petofi Sandor nr 345		
Postcode/City:	417167	Săldăbagiu de Munte	
Province/Country:	Bihor		RO-Romania

Architecture:	Vertical Studio		
Street:	Republicii nr 12		
Postcode/City:	410025	Oradea	
Province/Country:	Bihor		RO-Romania

Mechanical engineer:	Terax Engineering		
Street:	Marin Sorescu nr3		
Postcode/City:	400465	Cluj Napoca	
Province/Country:	Cluj		RO-Romania

Energy consultancy:	Inginerie Creativa - Marius Şoflete		
Street:	Episcop Ioan Bob nr 4		
Postcode/City:	400015	Cluj Napoca	
Province/Country:	Cluj		RO-Romania

Certification:	Passive House Institute GmbH		
Street:	Rheinstraße 44/46		
Postcode/City:	64283	Darmstadt	
Province/Country:	Hessen		DE-Germany

Year of construction:	2019	Interior temperature winter [°C]:	20,0	Interior temp. summer [°C]:	25,0
No. of dwelling units:	1	Internal heat gains (IHG) heating case [W/m²]:	5,0	IHG cooling case [W/m²]:	5,0
No. of occupants:	240,0	Specific capacity [Wh/K per m² TFA]:	132	Mechanical cooling:	x

Specific building characteristics with reference to the treated floor area

				Criteria	Alternative criteria	Fullfilled?[2]
	Treated floor area m²	1738,9				
Space heating	Heating demand kWh/(m²a)	27	≤	30	-	yes
	Heating load W/m²	18	≤	-	-	
Space cooling	Cooling & dehum. demand kWh/(m²a)	18	≤	40	-	yes
	Cooling load W/m²	15	≤	-	-	
	Frequency of overheating (> 25 °C) %	-	≤	-		-
	Frequency of excessively high humidity (> 12 g/kg) %	0	≤	10		yes
Airtightness	Pressurization test result n_{50} 1/h	0,3	≤	1,0		yes
Non-renewable Primary Energy (PE)	PE demand kWh/(m²a)	317	≤	-		-
Primary Energy Renewable (PER)	PER demand kWh/(m²a)	161,2	≤	75	163,25	yes
	Generation of renewable energy (in relation to projected building footprint area) kWh/(m²a)	0	≥	-	13	

[2] Empty field: Data missing; '-': No requirement

I confirm that the values given herein have been determined following the PHPP methodology and based on the characteristic values of the building. The PHPP calculations are attached to this verification.

PHI Low Energy Building? yes

Task:	First name:	Surname:	Signature:
2-Certifier	Dragos	Arnautu	

Certificate ID	Issued on:	City:
		Darmstadt

Project data imported from designPH 2.0.06 BETA-3 PHPP9 display.code:

Due to large energy consuption 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

Passive House Institute
Dr. Wolfgang Feist
64283 Darmstadt
Germany

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

PHI Low Energy Building

Client	SC Smartware SRL Strada Petőfi Sándor Nr. 345 417167 Săldăbagiu de Munte, Romania
Architect	Vertical Studio Republicii Nr. 12 410025 Oradea, Romania
Building Services	Terax Engineering Marin Sorescu Nr. 3 400465 Cluj Napoca, Romania
Energy Consultant	Inginerie Creativă - Marius Șoflete Episcop Ioan Bob nr 4 400015 Cluj Napoca, 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:

Building quality		This building		Criteria	Alternative criteria
Heating					
Heating demand	[kWh/(m²a)]	27	≤	30	
Cooling					
Cooling + dehumidification demand	[kWh/(m²a)]	18	≤	40	
Airtightness					
Pressurization test result (n_{50})	[1/h]	0,3	≤	1,0	
Renewable primary energy (PER)					
PER-demand	[kWh/(m²a)]	161	≤	75	163
Generation (reference to ground area)	[kWh/(m²a)]	0	≥	-	-

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

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

www.passivehouse.com 29557-29573_PHI_LEB_20210215_DA