Project Documentation
Gebäude-Dokumentation

1 Abstract / Zusammenfassung

Detached single family house in Budapest, Hungary

1.1 Data of building / Gebäudedaten

Year of construction/ Baujahr	2017	**Space heating /** **Heizwärmebedarf**	**12** **kWh/(m^2a)**
U-value external wall/ U-Wert Außenwand	0.138 - 0,097 W/(m^2K)		
U-value basement ceiling/ U-Wert Kellerdecke	0,109 W/(m^2K)	**Specific Primary Energy Demand** DWH, heating, Cooling, Auxiliary and Hh Electricity.	80 kWh/(m^2a)
U-value roof/ U-Wert Dach	0.094 W/(m^2K)	**Generation of renewable energy /** **Erzeugung erneuerb. Energie**	0 kWh/(m^2a)
U-value window/ U-Wert Fenster	0.69 W/(m^2K)	**Specific Primary Energy Demand** DWH, heating, Auxiliary Electricity	49 kWh/(m^2a)
Heat recovery/ Wärmerückgewinnung	76,6 %	Pressure test n_{50} / Drucktest n_{50}	0.2 h-1
Special features/ Besonderheiten	-		

1.1 Brief Description ..Passive House Budapest, Hungary

The building is situated in the garden suburb of Budapest. The orientation of the site is ideal for constructing a passive house, as the rear wall could be oriented almost entirely towards the south. The building is intended to accommodate a 4-member family. Requirements of the customers included: a large unified living and dining room including the kitchen, an individual study and 3 bedrooms with their own walk-in closet. Furthermore, an unheated car garage for 2 vehicles. Construction began in 2013, but due to issues independent of the architectural work, handover of the building had to wait until 2017.

1.2 Responsible project participants / Verantwortliche Projektbeteiligte

Architect/ Entwurfsverfasser	Valter Szandbauer http://www.v2epitesz.hu
Implementation planning/ Ausführungsplanung	Valter Szandbauer http://www.v2epitesz.hu
Building systems/ Haustechnik	Légkomfort Kft. Papp Szilárd http://www.legkomfort.hu
Structural engineering/ Baustatik	Péter Takács
Building physics/ Bauphysik	Valter Szandbauer http://www.v2epitesz.hu
Passive House project planning/ Passivhaus-Projektierung	Róbert Juhász, http://www.juroplan.hu Valter Szandbauer http://www.v2epitesz.hu
Construction management/ Bauleitung	Valter Szandbauer http://www.v2epitesz.hu

Certifying body/ Zertifizierungsstelle	Passive House Institute Darmstadt www.passiv.de	
Certification ID/ Zertifizierungs ID	Project-ID (www.passivehouse-database.org) Projekt-ID (www.passivehouse-database .org)	5635

Author of project documentation / Verfasser der Gebäude-Dokumentation	PIBiEO Łukasz Smól http://www.pibp.pl/
Date, Signature/ Datum, Unterschrift	22.09.2018.

2 Photograps

North-west view with first floor terrace from master bedrom

North-eastt view with main entrance door

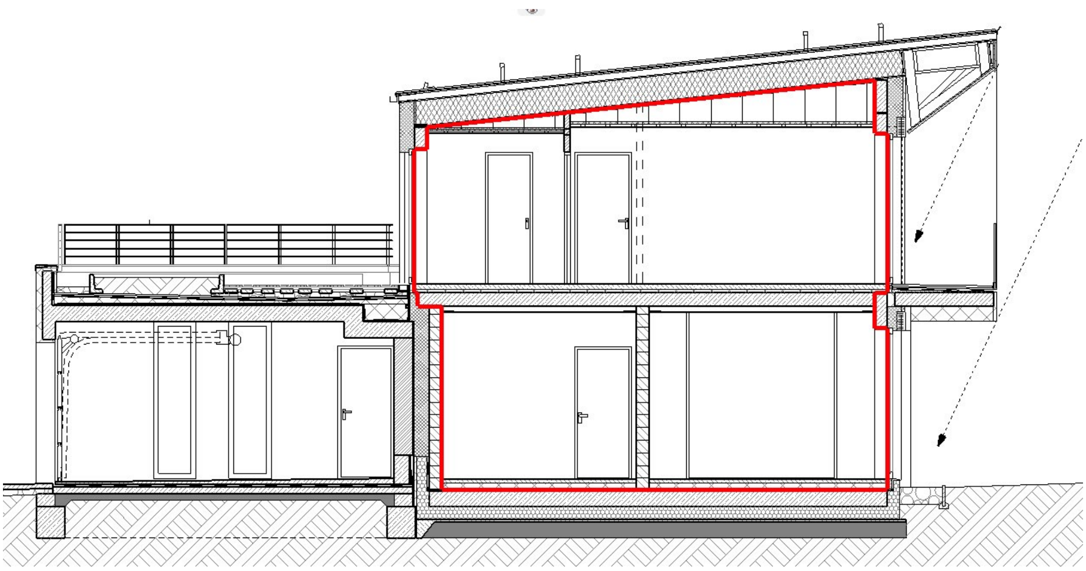
Entrance

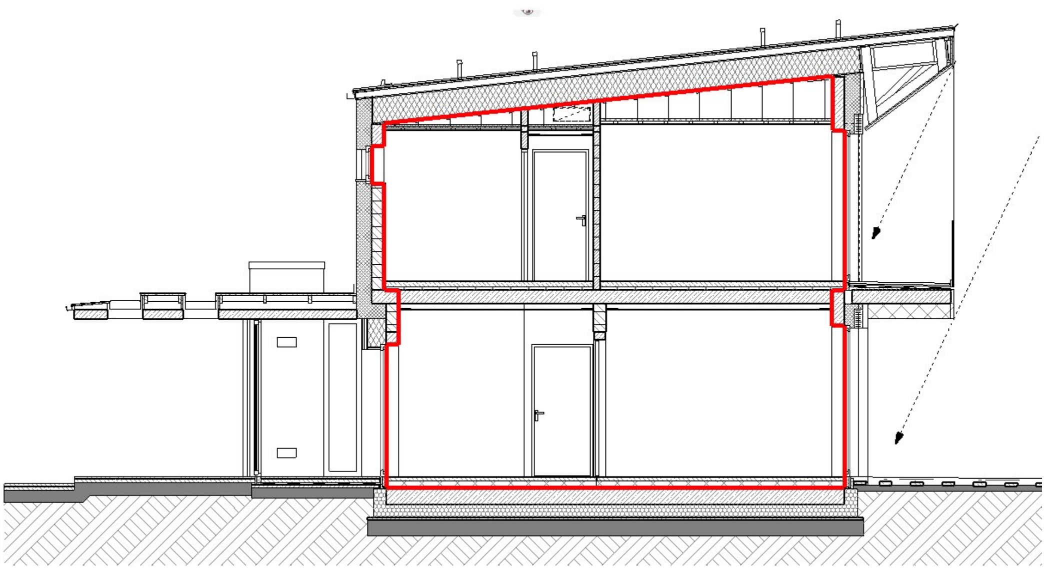
South facade

Interior views of the kitchen and dining area.

3D renders

3 Sectional drawings

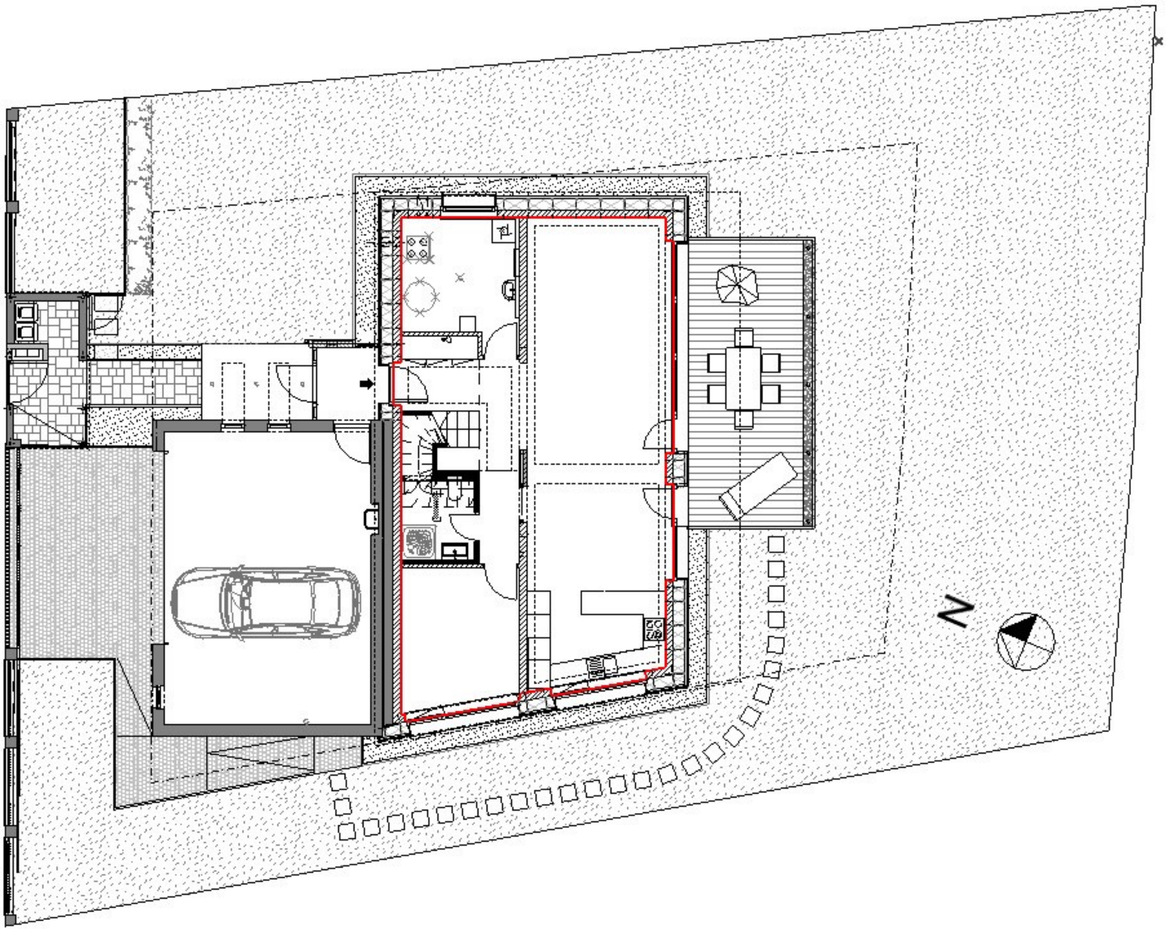




The living space of the building includes a ground floor and a first floor. The base is a monolithic reinforced concrete slab base. The load bearing walls are 20 cm thick lime sand brick walls. The floor structure of the first floor is monolithic reinforced concrete. The roof structure is made of wooden I beams tilted in 7 degrees, which lean only on the external walls. Apart from providing connection to the garden, the balcony running along the bedrooms on the first floor also has a significant role in providing shade in the summer period. At the balcony, we applied a certified heat bridge interruption. The unheated garage is outside the thermal shell.

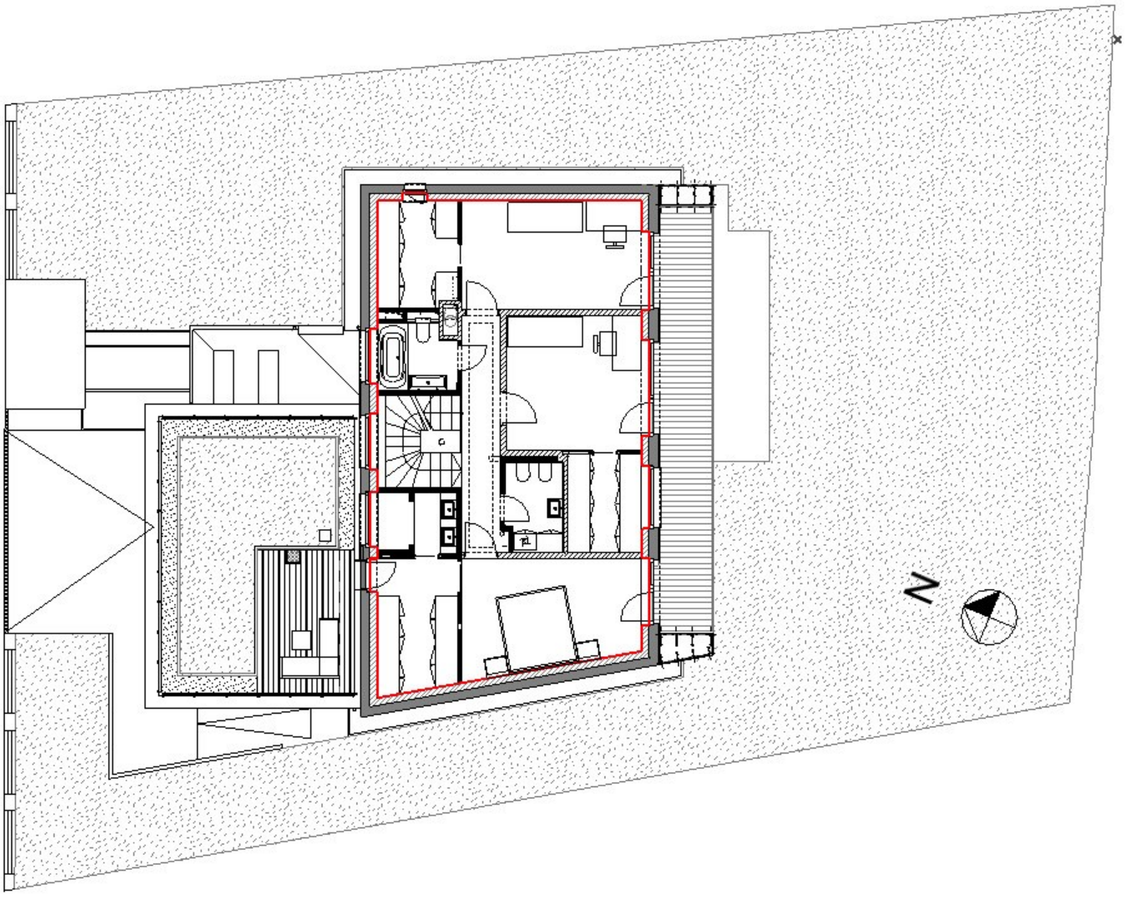
4 Floor Plans

Ground Floor Plan



The building and the unheated garage outside the thermal shell are connected via an unheated windshield. Apart from the living-dining-kitchen space, the ground floor accommodates a study and a room for the building services.

First Floor Plan

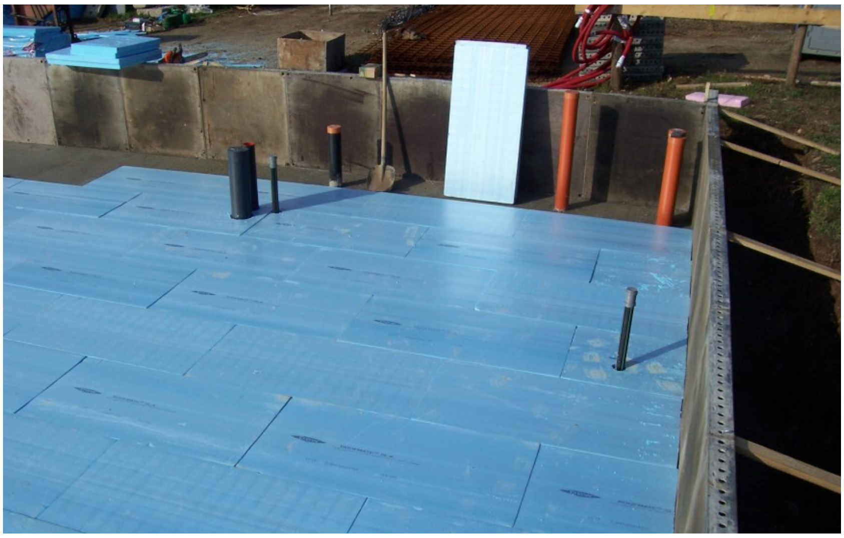


The first floor accommodates the bedroom of the parents with its own walk-in closet and bathroom, and the two additional bedrooms with their own walk-in closets. Another bathroom and a toilet for common use have also been placed on this floor.

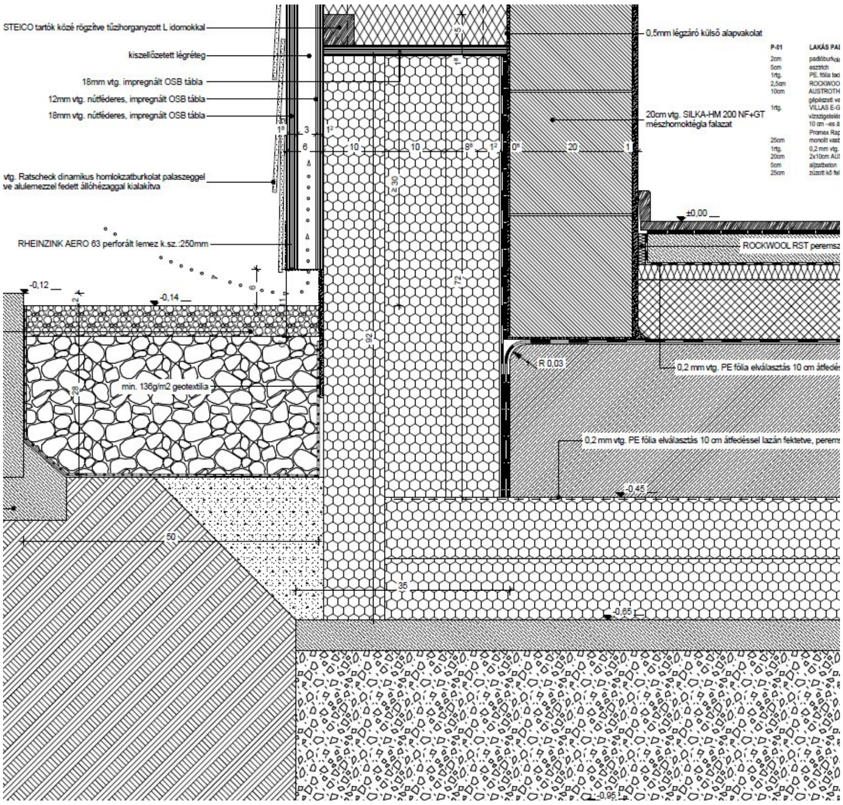
5 Description of the construction

5.1 Floor slab

The base has been constructed as a monolithic reinforced concrete slab placed on high compressive strength XPS thermal insulation. A bituminous water sealant was placed over the slab base, which also provides the demanded airlock.



200mm XPS insulation under the floor slab



Detail drawing – the connection between floor slab and basement wall solution.

5.2 Description of external walls

The external walls are made of lime sand brick. Behind the Steico Joist wooden front panels there is a 300 mm thick blown rock-wool insulation on the ground floor and 240 mm thick PIR thermal insulation on the first floor. The ground floor has been given a natural slate finish.

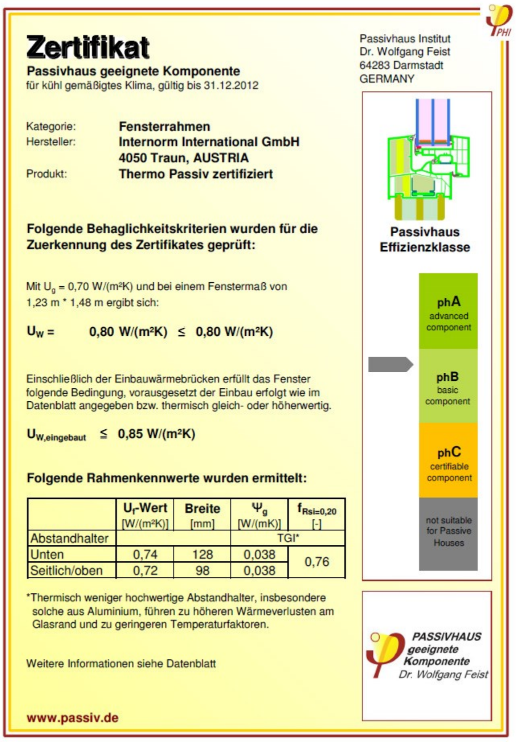
240mm PIR Insulation between the garage and the thermal envelope.

Ground floor external wall insulation

5.3 Roof

The roof structure is made of 400 mm wooden Steico Joist I beams. In the sections of the roof structure, 400 mm wide blown rock-wool insulation has been established. The roof is covered in tarnished Vm Zinc sheets. The design includes the application of an air and vapour barrier foil.

5.4 Windows



Zertifikat

Passivhaus geeignete Komponente
für kühl gemäßigtes Klima, gültig bis 31.12.2012

Passivhaus Institut
Dr. Wolfgang Feist
64283 Darmstadt
GERMANY

Kategorie: **Fensterrahmen**
Hersteller: **Internorm International GmbH**
4050 Traun, AUSTRIA
Produkt: **Thermo Passiv zertifiziert**

Folgende Behaglichkeitskriterien wurden für die Zuerkennung des Zertifikates geprüft:

Mit U_g = 0,70 W/(m²K) und bei einem Fenstermaß von 1,23 m * 1,48 m ergibt sich:

U_W = 0,80 W/(m²K) ≤ 0,80 W/(m²K)

Einschließlich der Einbauwärmebrücken erfüllt das Fenster folgende Bedingung, vorausgesetzt der Einbau erfolgt wie im Datenblatt angegeben bzw. thermisch gleich- oder höherwertig.

$U_{W,eingebaut}$ ≤ 0,85 W/(m²K)

Folgende Rahmenkennwerte wurden ermittelt:

	U_f-Wert [W/(m²K)]	Breite [mm]	Ψ_g [W/(mK)]	$f_{Rsi=0,20}$ [-]
Abstandhalter			TGI*	
Unten	0,74	128	0,038	0,76
Seitlich/oben	0,72	98	0,038	

*Thermisch weniger hochwertige Abstandhalter, insbesondere solche aus Aluminium, führen zu höheren Wärmeverlusten am Glasrand und zu geringeren Temperaturfaktoren.

Weitere Informationen siehe Datenblatt

www.passiv.de

Passivhaus Effizienzklasse

phA advanced component

phB basic component

phC certifiable component

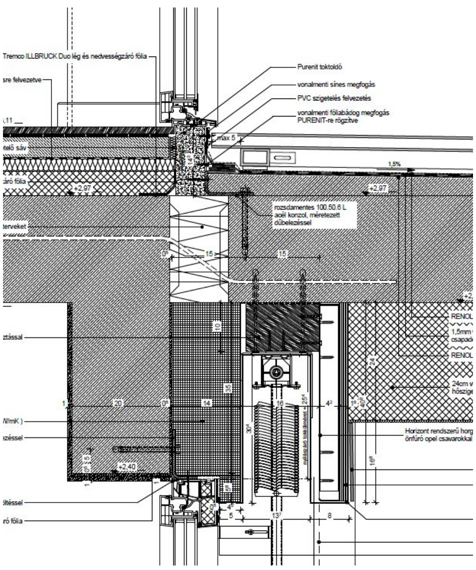
not suitable for Passive Houses

PASSIVHAUS geeignete Komponente Dr. Wolfgang Feist

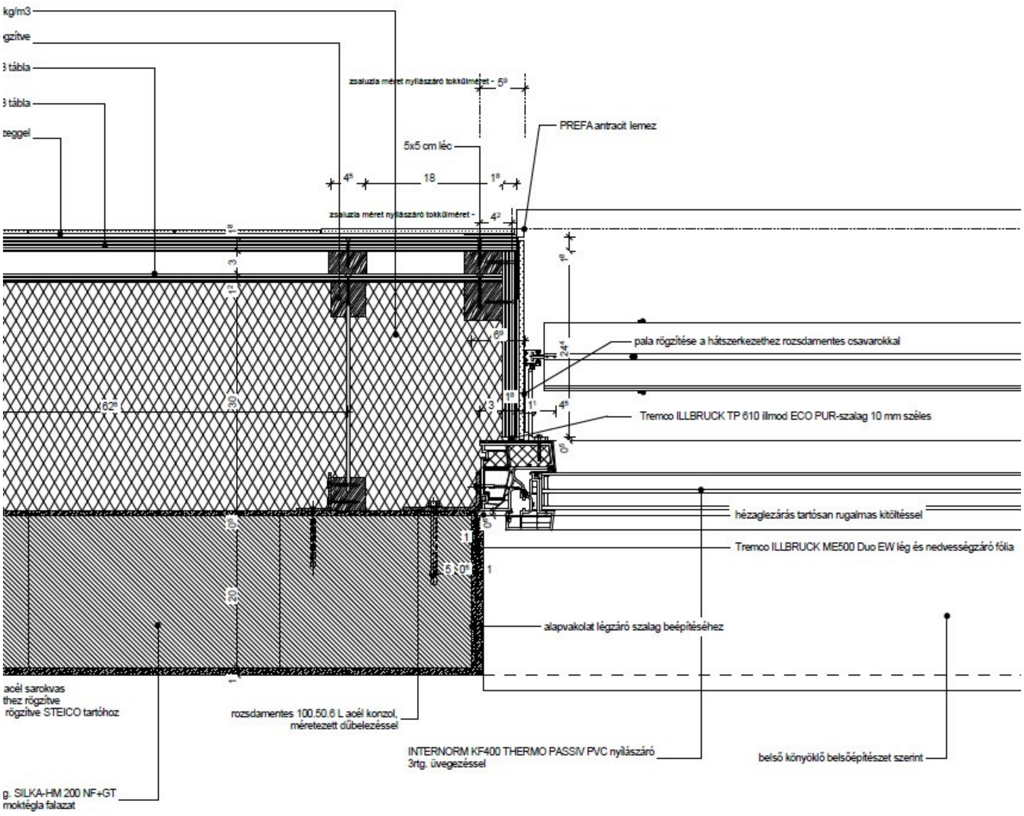
The windows are Internorm KF400 Thermo Passiv plastic windows with aluminium finish on the external side. The installation has been implemented with consoles off the wall surface. We applied triple glazing. The glass used on the southern facade is SOLAR glass in order to maximize the efficiency of utilizing solar gain in the winter period. Except for the northern side, there are motorized blinds installed in front of the doors and windows.

$U_{w\ south}$= 0,74 W/m²K, Uf= 0,73 W/m²K Ug=0,6 W/m²K g=62%

$U_{w\ east/west}$= 0,69 W/m²K, Uf= 0,73 W/m²K Ug=0,5 W/m²K g=54%



Details of the raffstore and the insulation behind the box



6 Description of the airtight envelope; documentation of thepressure test result

We paid special attention to provide airtightness. For this end, we minimized the number of fixtures fitted into the external walls. Wherever the airtight flat surface had to be cut through, we used appropriate sealants. At the doors and windows the constructor applied RAL installation. A nail sealing tape has been applied at the foil on the internal side of the roof structure, and the foil cover has also been applied to the connecting wall.

In the course of the delayed construction, air tightness was verified twice and prior to issuing the certificate for the building, a third measurement had also been applied to the finished building.

Dörken Delta-Reflex vapour barrier and Kaiser airtight rubber sealing plug.

flexible window membrane glued on the plaster

Blower-Door test

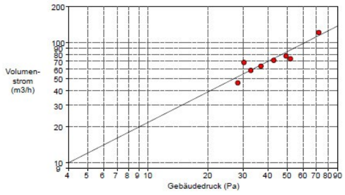
BlowerDoor-Messung Seite 1

Datum: 07.10.2017 Prüfer/in: Debreczy Zoltán
Dateiname: Ilyés Imre - Budapest - 2017-10-07 - alulnyomás

Name:	Magyarország - Budapest Tel.: Fax:	Gebäudestandort:	Családiház Magyarország - Budapest

Volumenstrom bei 50 Pascal:		84 m3/h (+/- 4.2 %) Leckagestrom
	n50:	0.19 /h Luftwechselrate pro Stunde, bezogen auf das Innenvolumen
	w50:	0.52 m3/hm2 bezogen auf die Nettogrundfläche
Leckagefläche:		24.1 cm2 (+/- 20.7 %) Canadian EqLA @ 10 Pa 10.7 cm2 (+/- 32.4 %) LBL ELA @ 4 Pa
	q50:	0.16 m3/hm2 bezogen auf die Hüllfläche
Leckageparameter:		Leckagen Koeffizient (C) = 3.1 (+/- 50.1 %) Exponent (n) = 0.845 (+/- 0.129) Korrelations-Koeffizient = 0.93685
Messnorm:		EN 13829 Messmethode: Unterdruck
Verfahren:		A Anforderungen nach: Passzívház szabvány
Gerät:		Modell 4 (230V) Minneapolis Blower Door

Innen-Temperatur:	22 °C	Volumen:	432 m3
Außen-Temperatur:	16 °C	Gebäudehüllfläche:	539 m2
Barometrischer Druck:	101325 Pa	Gebäudegrundflächen:	161 m2
Windstärke nach Beaufort:	3 Schwache Brise	Unsicherheit der Bezugsgrößen:	5 %
Windschutzklasse:	Teilweise exponiertes Gebäude	Baujahr:	2017
Art der Heizungsanlage:	Vizes felületfűtés		
Art der Klimaanlage:	nincs		
Art der Lüftungsanlage:	Hővisszanyerős szellőztető		



underpressure result n_{50}=0.19 h^{-1}

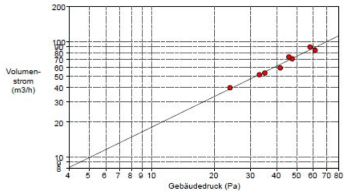
BlowerDoor-Messung Seite 1

Datum: 07.10.2017 Prüfer/in: Debreczy Zoltán
Dateiname: Ilyés Imre - Budapest - 2017-10-07 - túlnyomás

Name:	Magyarország - Budapest Tel.: Fax:	Gebäudestandort:	Családiház Magyarország - Budapest

Volumenstrom bei 50 Pascal:		74 m3/h (+/- 2.1 %) Leckagestrom
	n50:	0.17 /h Luftwechselrate pro Stunde, bezogen auf das Innenvolumen
	w50:	0.46 m3/hm2 bezogen auf die Nettogrundfläche
Leckagefläche:		20.2 cm2 (+/- 13.1 %) Canadian EqLA @ 10 Pa 8.7 cm2 (+/- 20.7 %) LBL ELA @ 4 Pa
	q50:	0.14 m3/hm2 bezogen auf die Hüllfläche
Leckageparameter:		Leckagen Koeffizient (C) = 2.4 (+/- 32.2 %) Exponent (n) = 0.877 (+/- 0.083) Korrelations-Koeffizient = 0.97404
Messnorm:		EN 13829 Messmethode: Überdruck
Verfahren:		A Anforderungen nach: Passzívház szabvány
Gerät:		Modell 4 (230V) Minneapolis Blower Door

Innen-Temperatur:	22 °C	Volumen:	432 m3
Außen-Temperatur:	16 °C	Gebäudehüllfläche:	539 m2
Barometrischer Druck:	101325 Pa	Gebäudegrundflächen:	161 m2
Windstärke nach Beaufort:	3 Schwache Brise	Unsicherheit der Bezugsgrößen:	5 %
Windschutzklasse:	Teilweise exponiertes Gebäude	Baujahr:	2017
Art der Heizungsanlage:	Vizes felületfűtés		
Art der Klimaanlage:	nincs		
Art der Lüftungsanlage:	Hővisszanyerős szellőztető		

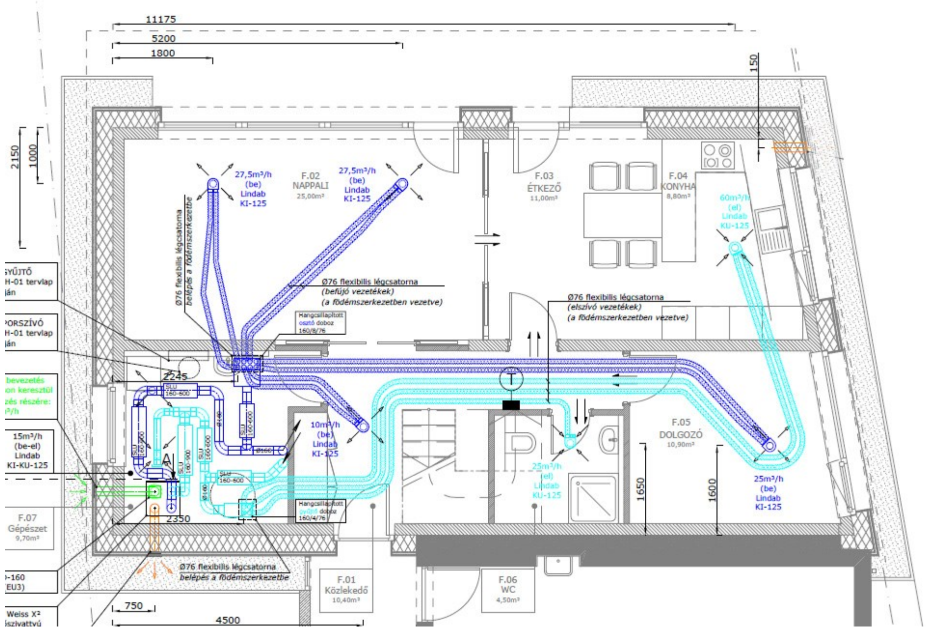


overpressure result n_{50}=0.17 h^{-1}

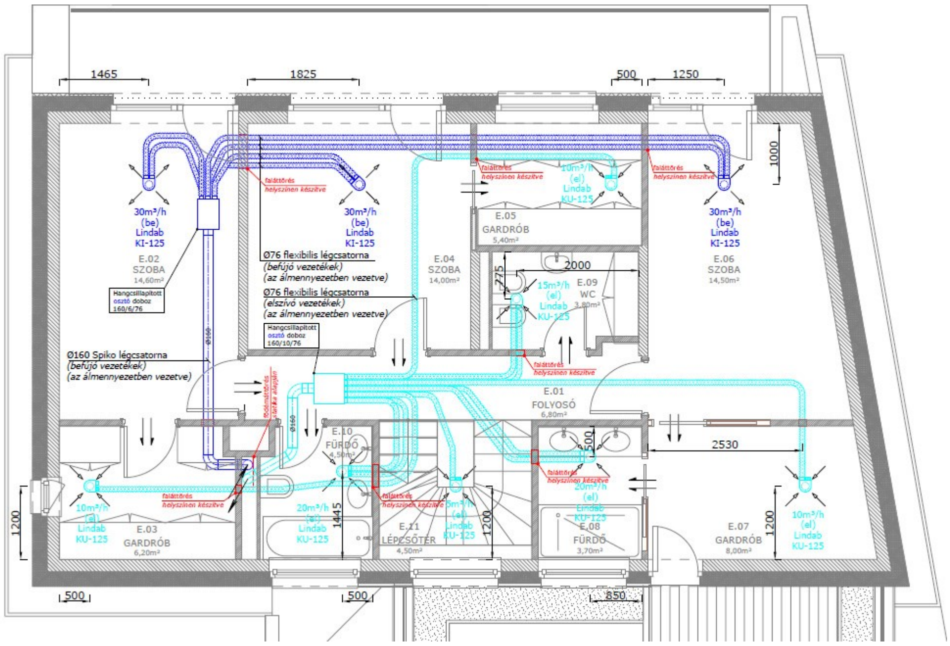
The final test result is n_{50}=0.18 h^{-1}

7 Ventilation system ducting

Ventilation is provided by the compact heat pump unit. Frost protection is guaranteed through an electric preheating solution. The distribution pipes of the ventilation are placed in the flooring above the ground floor and in the space above the suspended ceiling. In order to eliminate overhearing, apart from the sound dampers above the machine, the dispensing boxes have also been furnished with sound dampers.



Ground Floor Plan.

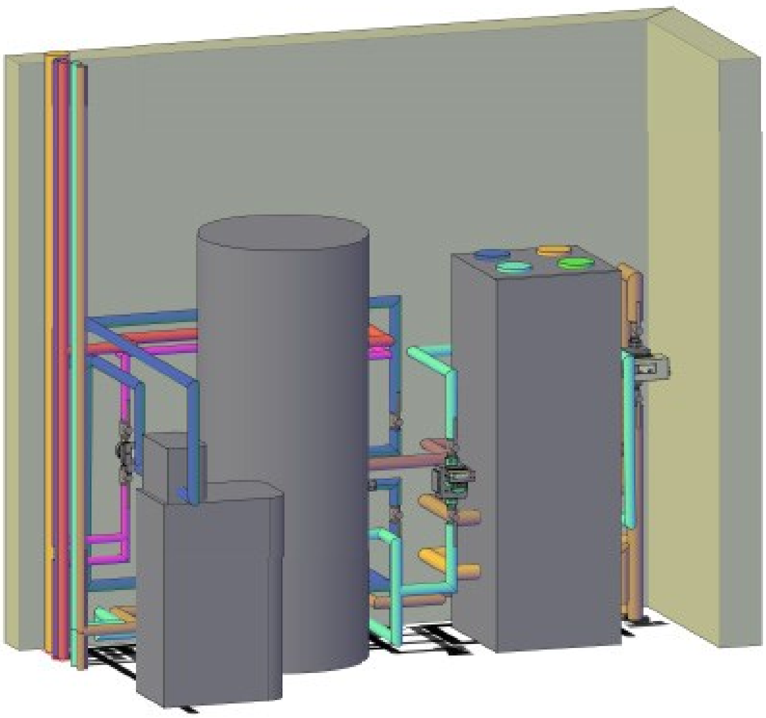


First Floor Plan

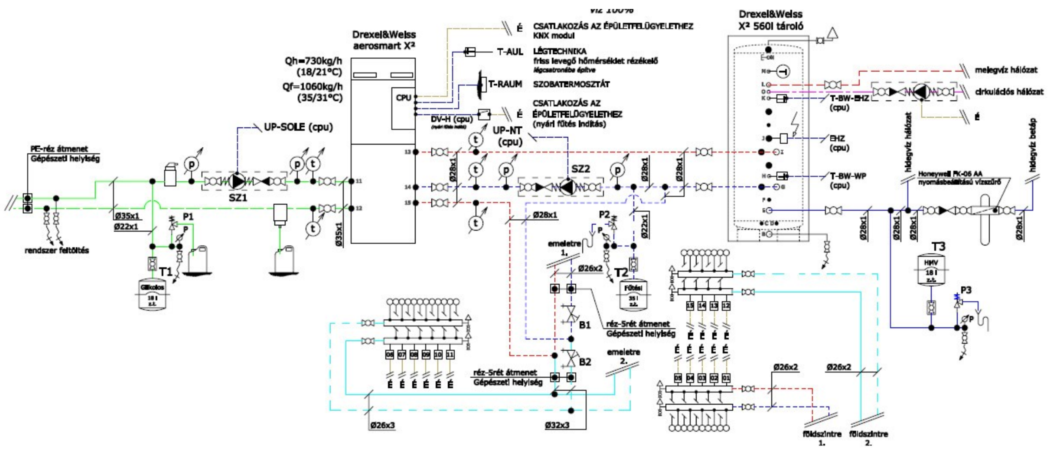
Ventilation pipes

8 Heat supply

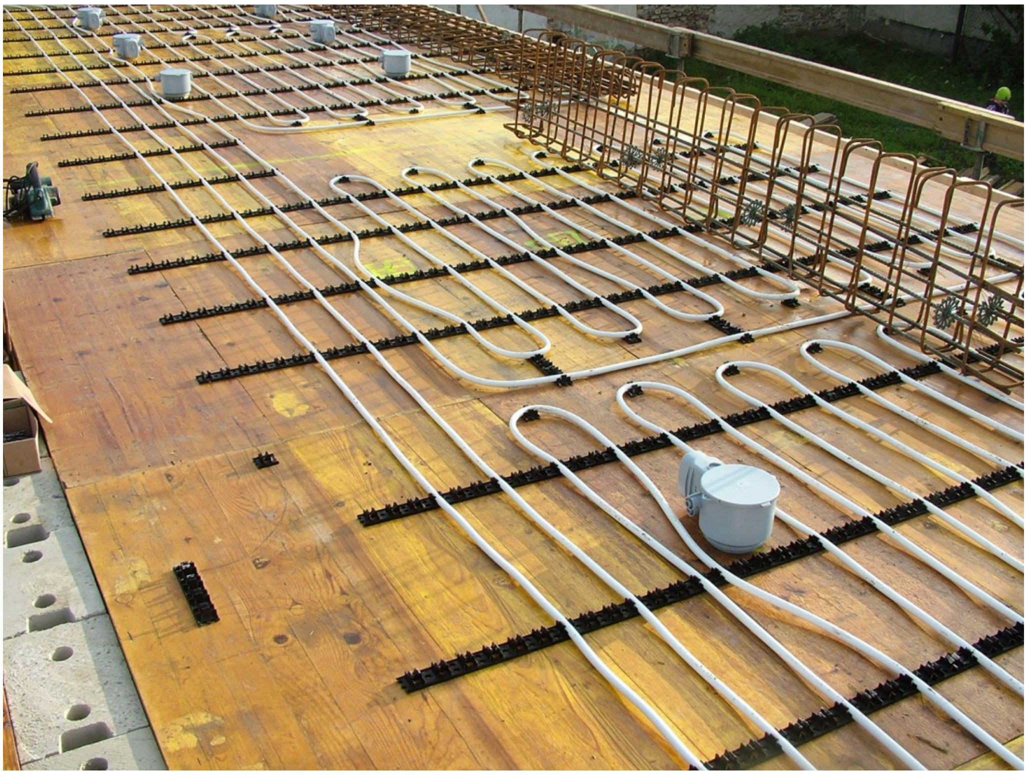
The heating, cooling and heat recovering ventilation of the building is provided by a Drexel & Weiss compact heat pump unit. This unit gains energy from shallow position soil heat probes. Heat is stored in a 510-litre storage tank, which is also fed by a sun collector. Heat transfer takes place through the floor and the suspended ceiling surfaces. The upper tubes of the ground floor run in the reinforced steel flooring, and those of the first floor are placed above the suspended ceiling. Heating and cooling are controlled by a KNX system that is connected to the shading system.



3D view of the compact unit and hot water stroage



Schema of the heating system



In Ground Floor, the pipes for the ceiling heating (and cooling) were built into the concrete slab

In First Floor, the pipes for the ceiling heating (and cooling) were built into the plasterboard ceiling.

Drexel & Weiss X2 S5 compact heat pump unit

Heat recovery efficiency = 83%

Electrical efficiency 0.32 Wh/m³

9 PHPP calculations

Polski Instytut Budownictwa Pasywnego i Energii Odnawialnej im. Güntera Schlagowskiego Sp. z o.o. ul. Homera 55 80-299 GDAŃSK

Authorised by:
Passive House Institute Dr. Wolfgang Feist Rheinstr. 44/46 D-64283 Darmstadt

Passive House Institute

Certificate

Polski Instytut Budownictwa Pasywnego i Energii Odnawialnej im. Güntera Schlagowskiego Sp. z o.o. awards the seal "Certified Passive House" to the following building

EFH [redacted] Budapest, Hungary

Certified Passive House
Passive House Institute

Client: **Hegyi Adrienn és Ilyés Imre**
Vaskút utca 10., 1181 Budapest, Hungary

Architect: V2 építésziroda Kft.
Rózsakvarc utca 6/B1, 1188 Budapest, Hungary

Building Services: Légkomfort Kft
Mezsgye utca 1., 2143 Kistarcsa, Hungary

This building was designed to meet Passive House criteria as defined by the Passive House Institute. With appropriate on-site implementation, this building will have the following characteristics:

- Excellent thermal insulation and optimised connection details with respect to building physics. The heating demand or heating load will be limited to
  15 kWh per m² of living area and year or a heating load of 10 W/m², respectively
- When outdoor temperatures are high, thermal comfort can be ensured with passive solutions or with minimal energy demand for cooling and dehumidification according to the location-specific Passive House requirements.
- A highly airtight building envelope, which eliminates draughts and reduces the heating energy demand: The air change rate through the envelope at a 50 Pascal pressure difference, as verified in accordance with ISO 9972, is less than
  0.6 air changes per hour with respect to the building's volume
- A controlled ventilation system with high quality filters, highly efficient heat recovery and low electricity consumption, ensuring excellent indoor air quality with low energy consumption
- A total primary energy demand for heating, domestic hot water, ventilation and all other electric appliances during normal use of less than
  120 kWh per m² of living area and year

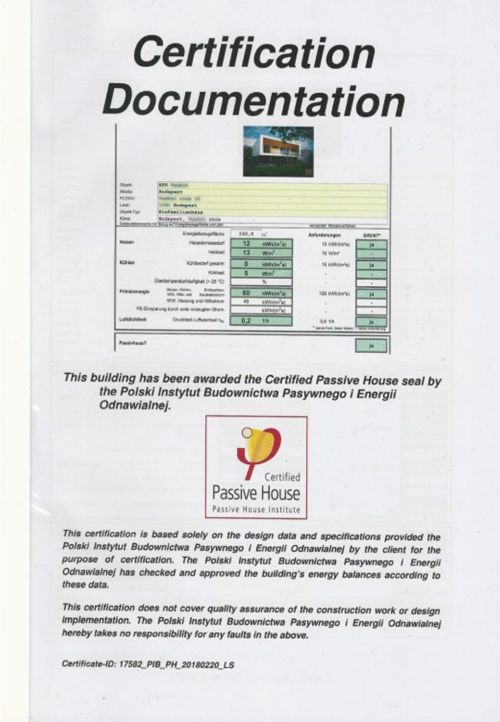
This certificate is to be used only in combination with the associated certification documents, which describe the exact characteristics of the building.

Passive Houses offer high comfort throughout the year and can be heated or cooled with little effort, for example, by heating/cooling the supply air. Even in times of cold outdoor temperatures the building envelope of a Passive House is evenly warm on the inside and the internal surface temperatures hardly differ from indoor air temperatures. Due to the highly airtight envelope, draughts are eliminated during normal use. The ventilation system constantly provides fresh air of excellent quality. Energy costs for ensuring excellent thermal comfort in a Passive House are very low. Thanks to this, Passive Houses offer security against energy scarcity and future rises in energy prices. Moreover, the climate impact of Passive Houses is low as they reduce energy use, thereby resulting in the emission of comparatively low levels of carbon dioxide (CO_2) and air pollutants.

issued:
Gdańsk, 20.02.2018

Certificate-ID: 17582_PIB_PH_20180220_LS

POLSKI INSTYTUT BUDOWNICTWA PASYWNEGO I ENERGII ODNAWIALNEJ IMIENIA GÜNTERA SCHLAGOWSKIEGO NON PROFIT SP. Z O.O.
80-299 Gdańsk, Homera 55
NIP 204-00-00-444, REGON 193102200
tel. 58 524 12 00, fax 58 522 98 50



Certification Documentation

Objekt:	EFH	
Straße:	Budapest	
Land:	Budapest	
Objekt-Typ:	Einfamilienhaus	
Klima:	Budapest,	

		Wert	Einheit	Anforderungen	Erfüllt?*
	Energiebezugsfläche	160,8	m²		
Heizen	Heizwärmebedarf	12	kWh/(m²a)	15 kWh/(m²a)	ja
	Heizlast	13	W/m²	10 W/m²	-
Kühlen	Kühlbedarf gesamt	0	kWh/(m²a)	15 kWh/(m²a)	ja
	Kühllast	5	W/m²	-	-
	Übertemperaturhäufigkeit (> 25 °C)		%	-	-
Primärenergie	Heizen, Kühlen, Entfeuchten, WW, Hilfs- und Haushaltsstrom	80	kWh/(m²a)	120 kWh/(m²a)	ja
	WW, Heizung und Hilfsstrom	49	kWh/(m²a)	-	-
	PE-Einsparung durch solar erzeugten Strom		kWh/(m²a)	-	-
Luftdichtheit	Drucktest-Luftwechsel n_{50}	0,2	1/h	0,6 1/h	ja

Passivhaus? ja

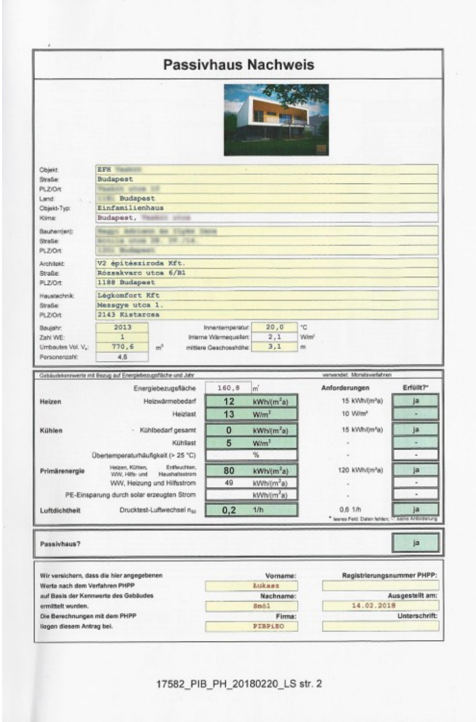
This building has been awarded the Certified Passive House seal by the Polski Instytut Budownictwa Pasywnego i Energii Odnawialnej.

Certified Passive House
Passive House Institute

This certification is based solely on the design data and specifications provided the Polski Instytut Budownictwa Pasywnego i Energii Odnawialnej by the client for the purpose of certification. The Polski Instytut Budownictwa Pasywnego i Energii Odnawialnej has checked and approved the building's energy balances according to these data.

This certification does not cover quality assurance of the construction work or design implementation. The Polski Instytut Budownictwa Pasywnego i Energii Odnawialnej hereby takes no responsibility for any faults in the above.

Certificate-ID: 17582_PIB_PH_20180220_LS



Passivhaus Nachweis

Objekt:	EFH
Straße:	Budapest
PLZ/Ort:	
Land:	Budapest
Objekt-Typ:	Einfamilienhaus
Klima:	Budapest,
Bauherr(en):	
Straße:	
PLZ/Ort:	
Architekt:	V2 építésziroda Kft.
Straße:	Rózsakvarc utca 6/B1
PLZ/Ort:	1188 Budapest
Haustechnik:	Légkomfort Kft
Straße:	Mezsgye utca 1.
PLZ/Ort:	2143 Kistarcsa

Baujahr:	2013		Innentemperatur:	20,0	°C
Zahl WE:	1		Interne Wärmequellen:	2,1	W/m²
Umbautes Vol. V_e:	770,6	m³	mittlere Geschosshöhe:	3,1	m
Personenzahl:	4,6				

Gebäudekennwerte mit Bezug auf Energiebezugsfläche und Jahr — verwendet: Monatsverfahren

		Wert	Einheit	Anforderungen	Erfüllt?*
	Energiebezugsfläche	160,8	m²		
Heizen	Heizwärmebedarf	12	kWh/(m²a)	15 kWh/(m²a)	ja
	Heizlast	13	W/m²	10 W/m²	-
Kühlen	Kühlbedarf gesamt	0	kWh/(m²a)	15 kWh/(m²a)	ja
	Kühllast	5	W/m²	-	-
	Übertemperaturhäufigkeit (> 25 °C)		%	-	-
Primärenergie	Heizen, Kühlen, Entfeuchten, WW, Hilfs- und Haushaltsstrom	80	kWh/(m²a)	120 kWh/(m²a)	ja
	WW, Heizung und Hilfsstrom	49	kWh/(m²a)	-	-
	PE-Einsparung durch solar erzeugten Strom		kWh/(m²a)	-	-
Luftdichtheit	Drucktest-Luftwechsel n_{50}	0,2	1/h	0,6 1/h	ja

* leeres Feld: Daten fehlen; '-': keine Anforderung

Passivhaus? ja

Wir versichern, dass die hier angegebenen Werte nach dem Verfahren PHPP auf Basis der Kennwerte des Gebäudes ermittelt wurden. Die Berechnungen mit dem PHPP liegen diesem Antrag bei.

Vorname:	Łukasz	Registrierungsnummer PHPP:	
Nachname:	Smól	Ausgestellt am:	14.02.2018
Firma:	PIBPiEO	Unterschrift:	

17582_PIB_PH_20180220_LS str. 2

10 Building costs

The owners don't like to share this info.