Project Documentation

Gebäude-Dokumentation

GAP Energy Efficiency and Consultant Incubation Center

Gaziantep / TURKEY

Data of building / Gebäudedaten

Year of construction/ Baujahr	2015	**Space heating / Heizwärmebedarf**	**20 kWh/(m2a)**
U-value external wall/ U-Wert Außenwand	0.149 W/(m2K)		
U-value Floor slab/ U- Wert Kellerdecke	0.169 W/(m2K)	**Primary Energy Renewable (PER) / Erneuerbare Primärenergie (PER)**	79 kWh/(m2a)
U-value roof/ U-Wert Dach	0.201 W/(m2K)	**Generation of renewable energy / Erzeugung erneuerb. Energie**	6 kWh/(m2a)
U-value window/ U-Wert Fenster	0.81 W/(m2K)	**Non-renewable Primary Energy (PE) Nicht erneuerbare Primärenergie (PE)**	162 kWh/(m2a)
Heat recovery/ Wärmerückgewinnung	75 %	Pressure test n_{50} / Drucktest n_{50}	1.0 h-1
Special features/ Besonderheiten	Solar thermal for hot water generation.		

Abstract / Zusammenfassung

GAP Energy Efficiency Incubation Center, which was renovated according to EnerPHit standards and is used as an office by the EE Audit Companies in Gaziantep. It is set up in a building provided by Gaziantep Chamber of Industry, built in 1970s and located in Gaziantep Organized Industrial Zone. The project is funded fully by the Government of Turkey, and implemented within the technical cooperation project; Utilization of Renewable Energy Resources and Increasing Energy Efficiency in Southeast Anatolia Region (PHASE 2) by Southeastren Anatolia Regional Development Administration (GAP RDA) and United Nations Development Program (UNDP). The EE Incubator building is the first renovated building with the EnerPHit certification in Turkey.

Responsible project participants / Verantwortliche Projektbeteiligte

Architect Entwurfsverfasser	Ekho Architecture and Consultancy Tugba Salman Gurcan www.ekho.com.tr
Implementation planning Ausführungsplanung	Ekho Architecture and Consultancy Tugba Salman Gurcan www.ekho.com.tr
Building systems Haustechnik	Cakmanus Engineering
Structural engineering Baustatik	-
Passive House project planning Passivhaus-Projektierung	Ekho Architecture and Consultancy Tugba Salman Gurcan www.ekho.com.tr
Construction Konstruktion	San-is Construction
Construction management Bauleitung	United Nations Development Program Turkey
Certifying body Zertifizierungsstelle	
Passive House Institute Darmstadt	
Certification ID Zertifizierungs ID	
4974	Project-ID (www.passivehouse-database.org) Projekt-ID (www.passivhausprojekte.de)

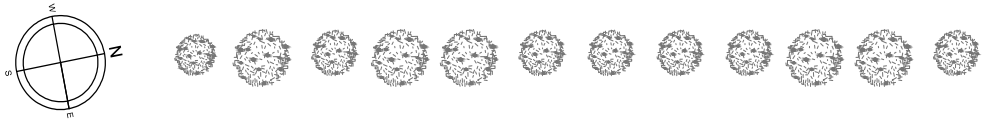
Author of project documentation Verfasser der Gebäude-Dokumentation	
Tugba Salman Gurcan	
Date Datum	Signature Unterschrift
February 22, 2020	

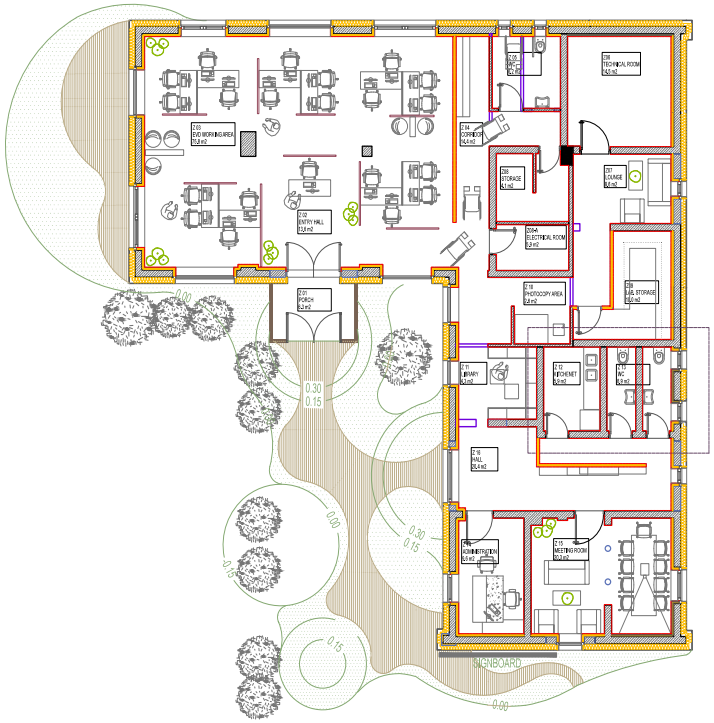
Before EnerPHit Renovation / vor der EnerPHit Renovierung

Constructed in the 1970s, hollow brick masonry building had no insulation in the outer shell (exterior wall: U= 2,70 W/m2K, roof: 1,60 W/m2K, windows: 2,50 W/m2K). It has only one level with a floor area about 250m2 separated into 3 wings (parts) is being used as an office space. The south side of the building is surrounded by dense pine trees with an average height of 8m, which are an asset for design in regards to solar shading. Also the building has a compact form therefore it is a great advantage towards achieving the EnerPHit standard. However the building was in such a bad condition; due to moisture there were heavy molds and irreversible disorders like saltpeter on the interior walls.

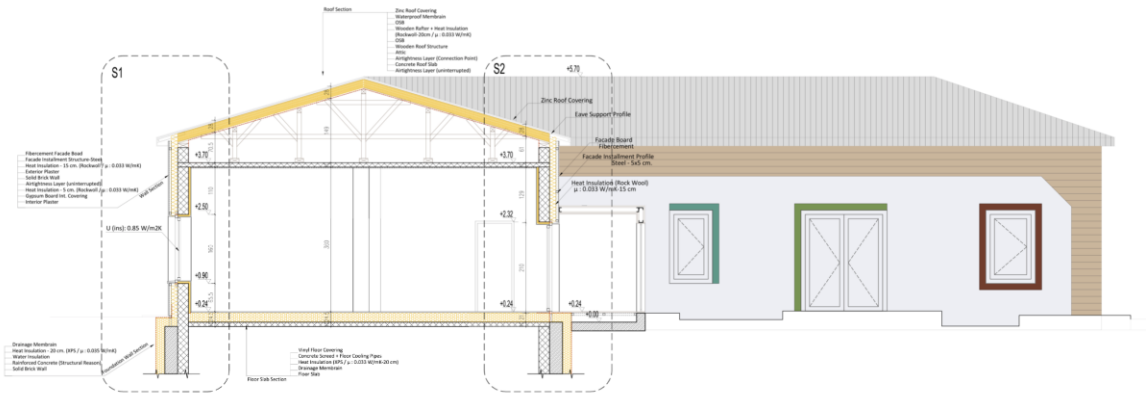
Design

Gaziantep has a Mediterranean climate with influences of a continental climate having very hot, dry summers. The European Passive House concept is considered to be suitable in colder climates between 40 and 60N latitudes (majority of Turkey is located between 36-40N). So in Gaziantep it would be a pitfall just to apply the EnerPHit standards that were developed according to Central European climate. It was noticed that details had to be adapted and special care had to be taken for summer climate to avoid overheating in addition to basic EnerPHit principles.

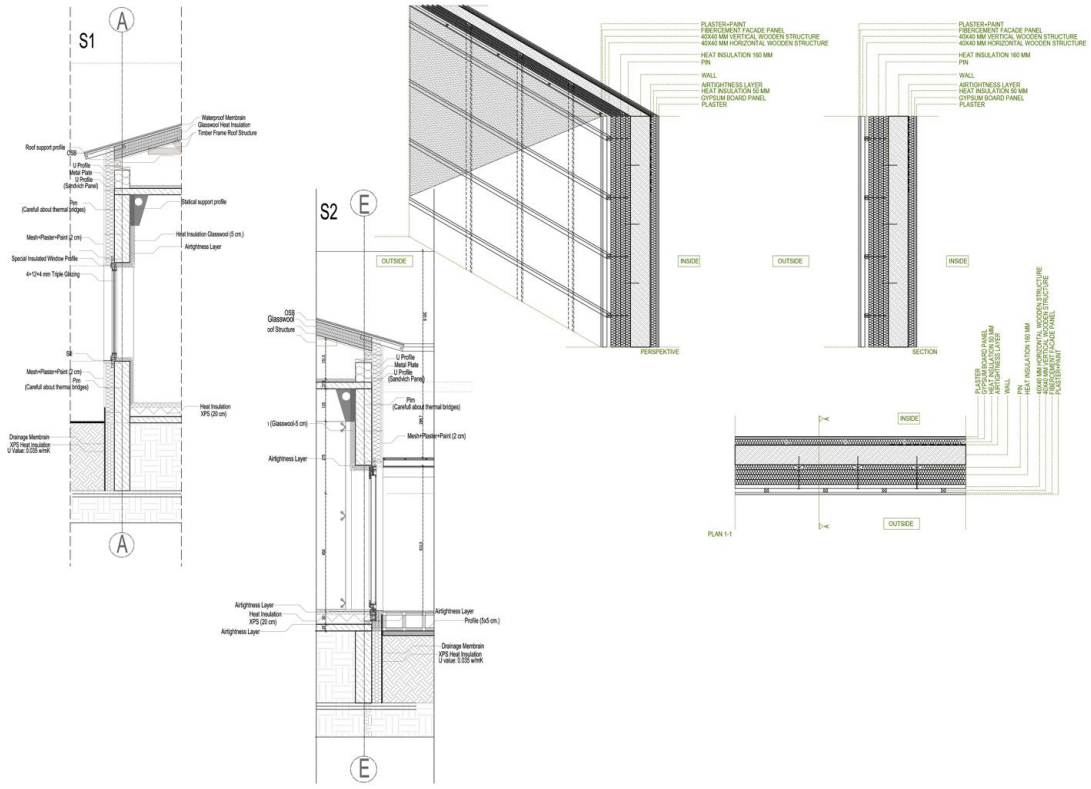




Floor Plan



Cross Section – South West



Building Fabric Details

The planned EnerPHit design delivers a reduction of the space heating demand by 87% and a reduction of the overall demand of delivered energy by 75%.

CONSTRUCTION / KONSTRUKTION

Cost / Kosten € 174,000
Construction Period / Bauzeit 4 Months

Assembly no.	Building assembly description					Interior insulation?
01ud	**Wall (upgraded)**					**0**
		Heat transmission resistance [m²K/W]				
Orientation of building element	**2-Wall**	interior R_{si}	0.13			
Adjacent to	**3-Ventilated**	exterior R_{se}:	0.13			
Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
Rain screen	**0.000**					**0**
Rockwool	**0.033**					**150**
Render	**0.900**					**20**
Solid brick	**0.770**					**225**
Rockwool	**0.033**					**50**
Plasterboard	**0.250**					**15**
	Percentage of sec. 1		Percentage of sec. 2		Percentage of sec. 3	Total
	100%					**46.0** cm
U-value supplement		W/(m²K)		**U-value:**	**0.149**	W/(m²K)

- Super insulated building fabric with (walls and roof: 200 mm rockwool – 0,033 w/mK, ground floor and foundation wall: 200mm XPS, 0,035 w/mK). A building envelope with minimized thermal bridges and air leakage.
- Besides energy efficiency the building with thermal insulation, air tightness and ventilation guaranteed new and healthy air, without any risk of disease related to non-controlled ambient moisture. Also insulation in combination with good ventilation and air tightness brought a building sustainability, which avoids all the nuisances such as; moisture that generates molds and irreversible disorders like saltpeter, which was observed on the existing interior walls before the renovation.

Assembly no.						Interior insulation?
03ud	Floor (upgraded)					0
		Heat transmission resistance [m²K/W]				
Orientation of building element	3-Floor	interior R_{si}:	0.13			
Adjacent to	2-Ground	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]
RC concrete	2.100					100
XPS	0.035					200
Screed	1.400					35

Percentage of sec. 1	Percentage of sec. 2	Percentage of sec. 3	Total	
100%			33.5	cm

U-value supplement		W/(m²K)	U-value:	0.169	W/(m²K)

Assembly no.						Interior insulation?
02ud	Roof (upgraded)					0
		Heat transmission resistance [m²K/W]				
Orientation of building element	1-Roof	interior R_{si}:	0.13			
Adjacent to	1-Outdoor air	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]
OSB	0.130					18
Rockwool	0.033	Rafters	0.130			200
OSB	0.130					18

Percentage of sec. 1	Percentage of sec. 2	Percentage of sec. 3	Total	
88%	12.5%		23.6	cm

U-value supplement		W/(m²K)	U-value:	0.201	W/(m²K)

SOUTH EAST

SOUTH WEST

NORTH WEST

NORTH EAST

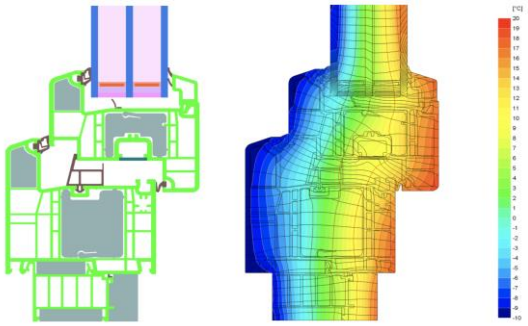
Window and Window Installation
Fenster und Fenster-Einbau

Manufacturer: REHAU AG + Co GERMANY

Product name: REHAU GENEO PHZ - Plastic Frame

Glass: Triple Glazed, low-e 4 I 16 I 4 I 16 I 4

g-Value	U-Value		Ψ Glazing edge
Perpen-dicular radiation	Glazing	Frames (avg.)	$\Psi_{Glazing\ edge}$ (Avg.)
-	W/(m²K)	W/(m²K)	W/(mK)
0.39	0.56	0.79	0.030



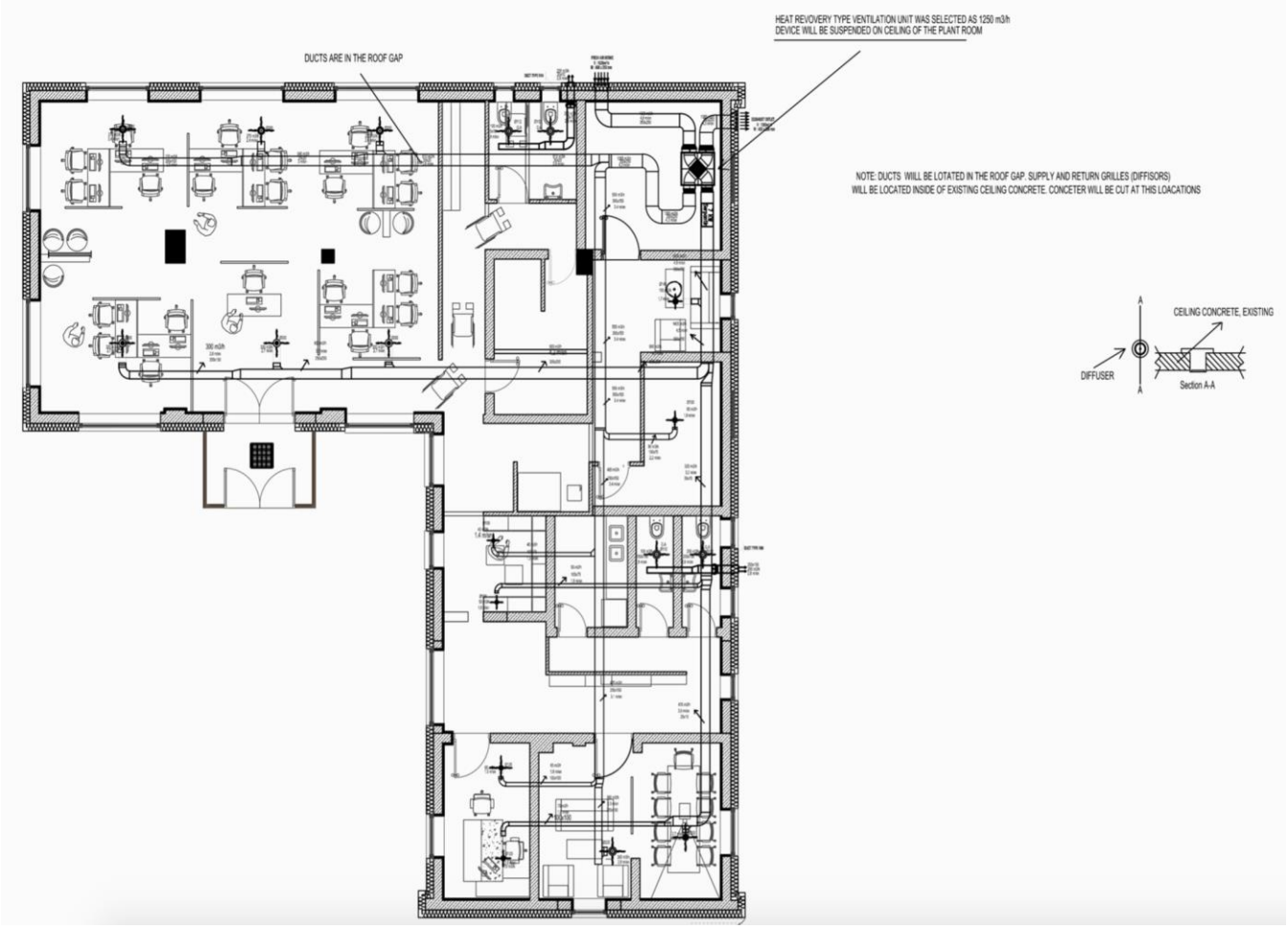
Window area orientation	Global radiation (main orientations)	Shading	Dirt	Non-vertical radiation incidence	Glazing fraction	g-Value	Solar irradiation reduction factor	Window area	Window U-Value	Glazing area	Average global radiation
Standard values →	kWh/(m²a)	0.75	0.95	0.85				m²	W/(m²K)	m²	kWh/(m²a)
North	100	0.50	0.95	0.85	0.68	**0.39**	**0.27**	**4.91**	**0.89**	**3.35**	**102**
East	275	0.29	0.95	0.85	0.85	**0.32**	**0.20**	**13.09**	**0.76**	**11.17**	**319**
South	543	0.44	0.95	0.85	0.66	**0.39**	**0.23**	**15.21**	**0.81**	**10.00**	**539**
West	285	0.52	0.95	0.85	0.70	**0.39**	**0.29**	**11.33**	**0.81**	**7.96**	**244**
Horizontal	439	1.00	0.95	0.85	0.00	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**439**
Total or average value for all windows.						**0.36**	**0.24**	**44.54**	**0.81**	**32.48**	

Mechanical Systems / Mechanische Systeme

Ventilation
Swegon AB, Gold RX Series
effective specif. heat recovery efficiency: 75%
Specific electric power *P*el,spec ≤ 0.45 Wh/m3

The ventilation system was designed with steel ductwork and the MVHR unit is located in the technical room. This location allowed the unit to minimize the ductwork lengths.

Ducting plan of the ventilation system produced by Cakmanus Engineering:



Domestic hot water
Solar panel system
VITOSOL 100-F

Solar Panels on the Roof

Heating installation
Air Sourced Heat Pump
Vitocal 242-S, 10,6 kW AWT-AC 241.A13 (Z011470)

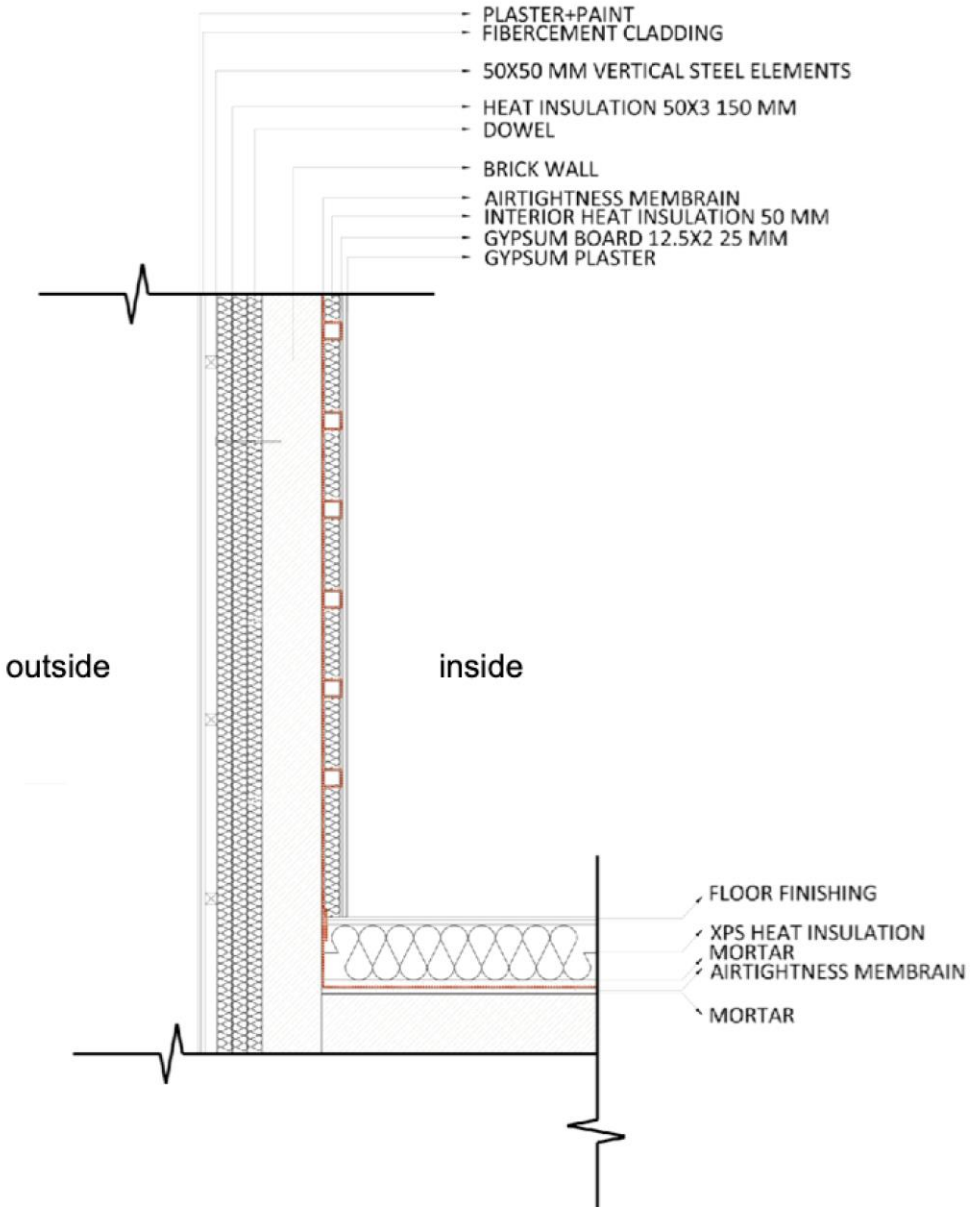
Mechanical Room

Heating and cooling was performed by using radiant floor heating/cooling system which activated by air sourced heat pump.
The ventilation unit; Swegon does not have a coil, therefor an additional one was implemented but just to condition fresh air, not for cooling purpose.
For example when the outside temperature is 35 °C in summer period we get inside supply air temperature as 18 °C. And condensation was avoided by keeping supply cooling water temperature above inside air dewpoint temperature in summer period.

The airtight envelope

Before the EnerPHit renovation the building fabric was reported to be very leaky and an air leakage test was undertaken with BlowerDoor Test following EN13829 Standard. The building was separated in 3 zones, so 3 different tests were done and the results came out as; 9.04 ach50, 3.80 ach50 and 4.84 ach50.

The airtightness strategy was to ensure a single layer of airtightness by the use of proprietary airtightness membrane, and tapes from the same manufacturer. The contractor chose to work with Delta Dorken for its extensive warranty and cheaper cost due to local manufacturing function in Turkey.



Floor – Wall Connection Detail with Continuous Airtightness Layer

Thermal Envelope – Wall's inside view with insulation and airtightness membrane

Within the roof, walls and ground floor airtightness membrane - ***Delta Reflex*** implemented continuously. Also window and door reveals were carefully cut and taped in accordance with the window manufacturer's recommendations.

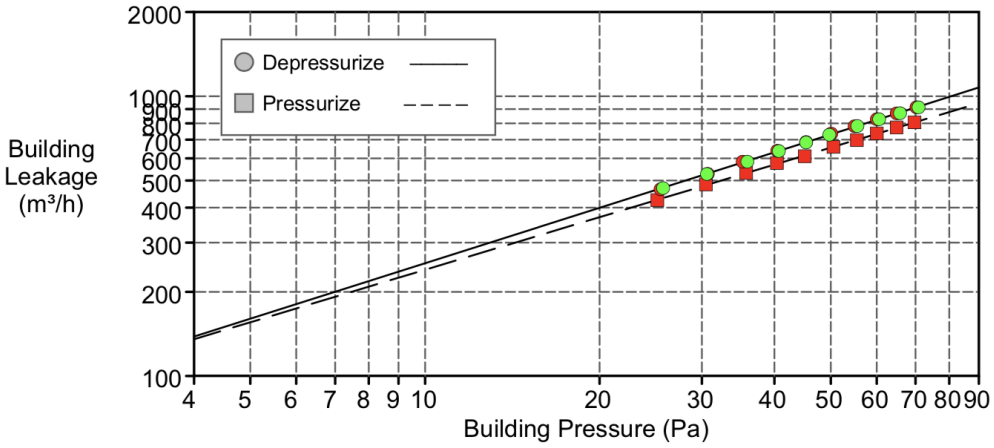
Final Blower Door after EnerPHit Renovation
Test Date: 13.06.2015

Air changes per hour, n50 = 1.00 1/h

BlowerDoor Test

according to EN 13829, Method A

	Depressurization	Pressurization	Average
Test Results at 50 Pascals:			
V50: Airflow (m³/h)	730 (+/- 0.1 %)	655 (+/- 0.1 %)	693
n50: Air Changes per Hour (1/h)	1.05	0.94	1.00
w50: m³/(h*m² Floor Area)	3.04	2.73	2.89
q50: m³/(h*m² Surface Area)	3.11	2.79	2.95



PHPP RESULTS / PHPP ERGEBNISSE

The PHPP was used throughout the design process to test strategies and refine the design.

EnerPHit Verification

Building:	GAP Energy Efficiency and Consultant Incubation Center				
Street:	27600 Baspinar OSB				
Postcode/City:	27060	Sehitkamil - Gaziantep			
Province/Country:	Southeastern Anatolia	TR-Turkey			
Building type:	Non-residential building - Administartive				
Climate data set:	ud---01-TR001-Gaziantep				
Climate zone:	4: Warm-temperate		Altitude of location:	847 m	
Home owner / Client:	GAP Regional Development Administration				
Street:	Doğukent Mah. 104.Cad. No: 1155/2				
Postcode/City:	63000	Sanliurfa			
Province/Country:	Southeastern Anatolia	TR-Turkey			

Architecture:	Ekho Architecture and Design		**Mechanical system:**	Cakmanus Engineering	
Street:	Angora Cad. Greenpark Sitesi A -7		Street:	Ivedik Organize Sanayi Bölgesi 667 Sokak No:69	
Postcode/City:	06800	Cankaya - Ankara	Postcode/City:	06378	Yenimahalle - Ankara
Province/Country:	Ankara	TR-Turkey	Province/Country:	Ankara	TR-Turkey
Energy consultancy:	Ekho Architecture and Consultancy		**Certification:**	Passive House Institute Dr. Wolfgang Feist	
Street:	Angora Cad. Greenpark Sitesi A -7		Street:	Rheinstraße 44/46	
Postcode/City:	06800	Cankaya - Ankara	Postcode/City:	64283	Darmstadt
Province/Country:	Ankara	TR-Turkey	Province/Country:	Hessen	DE-Germany

Year of construction:	2015	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]:	4.2	IHG cooling case [W/m²]:	4.2
No. of occupants:	10.0	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	208.4				
Space heating	Heating demand	kWh/(m²a)	20	≤	-	-	-
	Heating load	W/m²	19	≤	-	-	
Space cooling	Cooling & dehum. demand	kWh/(m²a)	29	≤	-	-	-
	Cooling load	W/m²	18	≤	-	-	
Frequency of overheating (> 25 °C)		%	-	≤	-		-
Frequency excessively high humidity (> 12 g/kg)		%	0	≤	10		yes
Airtightness	Pressurization test result n_{50}	1/h	1.0	≤	1.0		yes
Non-renewable Primary Energy (PE)	PE demand	kWh/(m²a)	162	≤	-		-
Primary Energy Renewable (PER)	PER demand	kWh/(m²a)	79	≤	70	79	yes
	Generation of renewable energy (in relation to projected building	kWh/(m²a)	6	≥	-	6	

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.

EnerPHit Classic? yes

Task:	First name:	Surname:	Signature:
1-Designer	Tugba	SALMAN GURCAN	

Issued on:	City:
27/06/16	Darmstadt

13790_PHI_EP_20160627_JV

Certificate / Zertifikat

Certificate

Certified retrofit
'EnerPHit Classic'
(Climate zone: Warm-temperate)

Passive House Institute
Dr. Wolfgang Feist
64283 Darmstadt
Germany

GAP Energy Efficiency and Consultant Incubation Center, 27600 Baspinar OSB , 27060 Sehitkamil - Gaziantep , Turkey

EnerPHit Certified Retrofit
Passive House Institute
| classic | plus | premium |

Client	GAP Regional Development Administration Doğukent Mah. 104.Cad. No: 1155/2 63000 Sanliurfa , Turkey
Architect	Ekho Architecture and Design Angora Cad. Greenpark Sitesi A -7 06800 Cankaya - Ankara , Turkey
Building Services	Cakmanus Engineering İvedik Organize Sanayi Bölgesi 667 Sokak No:69 06378 Yenimahalle - Ankara, Germany
Energy Consultants	Ekho Architecture and Consultancy Angora Cad. Greenpark Sitesi A -7 06800 Cankaya - Ankara, Turkey

Buildings retrofitted to the EnerPHit Standard offer excellent thermal comfort and very good air quality all year round. Due to their high energy efficiency, energy costs as well as greenhouse gas emissions are extremely low.

The design of the above-mentioned building meets the criteria defined by the Passive House Institute for modernization to the 'EnerPHit Classic' standard:

Building quality			This building		Criteria	Alternative criteria
Heating	Heating demand	[kWh/(m²a)]	20	≤	-	-
Airtightness	Pressurization test result (n_{50})	[1/h]	1,0	≤	1,0	
Renewable primary energy (PER)	PER-demand	[kWh/(m²a)]	79	≤	70	79
	Generation (reference to ground area)	[kWh/(m²a)]	6	≥	-	6
Component quality						
	Building envelope to ground (U-value)	[W/(m²K)]	0,17	≤	5,00	
	Wall with interior insulation to ambient air (U-value)	[W/(m²K)]	0,18	≤	0,50	
	Windows/Exterior doors (Uw,installed)	[W/(m²K)]	0,81	≤	1,05	
	Glazing (g-value)	[-]	0,39	≥	0,20	
	Glazing/shading (max. solar load)	[kWh/(m²a)]	93	≤	100	
	Ventilation (effect. heat recovery efficieny)	[%]	75	≥	75	

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

Darmstadt, 27.Juni 2016
Certifier: Jan Vahala, Passive House Institute Dr. Wolfgang Feist