SABIEDRĪBA AR IEROBEŽOTU ATBILDĪBU
KRAUKLIS GRENDE
LATVIJAS REPUBLIKA

Photo: Ansis Starks

Basic information about the building

The name and location of the building:

Passive house "Lielkalni", Ģipka village, Roja district, Latvia; 57°34'18.49"N 22°39'5.63"E; design 2007-2009, completed 2010; architect: Ervins Krauklis, "Krauklis Grende", Kalnciema Str. 33, Riga LV-1046 ervins.krauklis@gmail.com Phone: +371 29288920

The overall floor area of the building (in m2):

Living house: 191.8 m^2
Guest house with garage: 96.7 m^2

The precise location of the building – rural, semi rural, semi urban, urban: **Semi rural**

The proximity of the building to public facilities and services (transport, water, electricity, gas etc..):

Electricity grid connection, bus stop 1 km, nearest town Roja 12 km

Whether the building is new build, renovation or renovation and extension: **New build**

The typology of the building and its current use: **One-family house**

The overall u-value of each main element (external walls, roof, ground floor):

External walls U=0,071 W/m²K
Roof U=0,053 W/m²K
Ground floor U=0,076 W/m²K
Windows U=0,8 W/m²K

The U-value of the building as a whole: **0,147 W/m²K**

Type and amount of parking system provided: **Garage for 2 cars**

Design choices:

Measures of the ecological and environmental quality of the site before and after development:

Maximum preservation of Latvian seaside meadow vegetation was done, as well as preservation of existing trees and integration of new landscaping solutions into existing environment. Buildings are designed to fit in the landscape of typical Latvian fishermen's village, in forms, materials and placement principles.

Contribution of the development to the local community:

As first Latvian building, designed and built according to the Passive House principles (*Passivhaus Institut*, Dr. Wolfgang Feist, www.passiv.de), "Lielkalni" raised high public interest. Located 150 kilometres from Latvian capital city Riga, it attracted building professionals, journalists and people just planning to build their houses in the future. It was built by a small local building company from Roja town with great care and completely wiped off doubts that local builders cannot deal with such challenges of Passive House as airtightness, for instance. Every local knows where the "eco-house", as they name it, is located. Several people from the bulding company got new, well-paid jobs just because of their unique experience, which is still not common in Latvia.
Building was designed accordingly to to the 'traditional' Latvian construction practice at the beginning. As the project was redesigned to meet Passive House standards as close as possible, it offers unique experience about the difference of solutions and construction principles.

Involvement of pubic/user in design process:

The final decision to go for a Passive House was made by the client after several discussions with architect. Quite serious research work was done by him. Owner was highly involved in the design of mechanical systems and several parts of construction process, especially procurement and logistics of some eco-friendly materials. In fact, he became a specialist in Passive House standard. Interior decoration, parts of interior design and lighting concept was done by the owner as well, in close collaboration with architect.

Consideration of design for all (accessibility) principles:

Ground floor level is easily accessible; no steps in the house at ground floor level, including terrace.

Contribution of the project to improvements in infrastructure

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Basic principle structure of the building including description of materials used:

Load bearing external walls: lightweight clay ceramsite concrete bricks 25 cm, insulated with 50 cm glass wool (Isover Premium) in timber I-beam system
Roof: nail plate timber trusses, insulated with 60 cm glass wool (Isover Premium)
Foundation slab: monolythic concrete 20 cm on 70 cm insulating layer of foamglass granulate
Internal partition walls: reused clay bricks from demolished old bulding
First floor slab: monolythic concrete
Wooden windows with 3-pane glazing (Mira Therm)
Roof cover: aspen shingles (traditional local material)
Timber cladding and all glulam elements, as well as timber board terrace covering painted with locally produced natural oil paints. Only local timber used

Toxicity of materials used:

Non-toxic materials used

Integration of energy efficient technologies such as heat pumps, solar panels etc.:

Solar photovoltaic cells integrated in skylight glazing, power: 1.2 kW_p
Main heat generator: ground-to-water heat pump Vaillant GeoTherm VWS 61/2
Local sewage water treatment system

Type of heating/cooling systems used:

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Floor heating in bathrooms and corridor, supply air post-heating integrated in mechanical ventilation system, one floor radiator in the living room installed

Energy performance certificate for the building:

PHPP2007 and thermal bridge calculations done by Agris Kamenders (RTU) and Ervins Krauklis. PHPP Verification sheet:

Passive House Verification

Building:	Pasīvā ēka	
Location and Climate:	Austrumkurzeme	Mersrags
Street:	Ģipka, Rojas novads, "Lielkalni"	
Postcode/City:		
Country:	Latvija	
Building Type:	Vienģimenes dzīvojamā ēka	
Home Owner(s) / Client(s):	Artis Rozenbergs	
Street:	Ģipka, Rojas novads, "Lielkalni"	
Postcode/City:		
Architect:	Ervins Krauklis	
Street:	Krūzes 22-2	
Postcode/City:	Rīga, LV-1046	
Mechanical System:	SIA "Artiva"	
Street:		
Postcode/City:		

Year of Construction:	2009				
Number of Dwelling Units:	1		Interior Temperature:	20,0	℃
Enclosed Volume V_e:	1016,0	m^3	Internal Heat Gains:	2,1	W/m²
Number of Occupants:	5,0				

Specific Demands with Reference to the Treated Floor Area

				Requirement
Treated Floor Area:	184,4	m^2		
	Applied:	Monthly Method	PH Certificate:	fulfilled?
Specific Space Heat Demand:	**26**	**kWh/(m²a)**	**15 kWh/(m²a)**	**No**
Pressurization Test Result:	**0,7**	**h^{-1}**	0,6 h^{-1}	**No**
Specific Primary Energy Demand (DHW, Heating, Cooling, Auxiliary and Household Electricity):	**88**	**kWh/(m²a)**	120 kWh/(m²a)	**Yes**
Specific Primary Energy Demand (DHW, Heating and Auxiliary Electricity):	39	**kWh/(m²a)**		
Specific Primary Energy Demand Energy conservation by solar-generated electricity:		**kWh/(m²a)**		
Heating Load:	23	**W/m²**		
Frequency of Overheating:	9	%	over 25 ℃	
Specific Useful Cooling Energy Demand:		**kWh/(m²a)**	15 kWh/(m²a)	
Cooling Load:	9	**W/m²**		

CO2 emissions calculation for the building:

Heating, Cooling, DHW, Auxiliary and Household Electricity		32,5	87,9	22,1
Total PE Value	87,9	kWh/(m²a)		
Total Emissions CO_2-Equivalent	22,1	kg/(m²a)		(Yes/No)
Primary Energy Requirement		120	kWh/(m²a)	Yes

Heating, DHW, Auxiliary Electricity (No Household Applications)		14,9	38,8	9,8
Specific PE Demand - Mechanical System	38,8	kWh/(m²a)		
Total Emissions CO_2-Equivalent	9,8	kg/(m²a)		

Recycling of waste from the building including grey water:

Waste sorting by user, waste collecting by municipal service company, local sewage water treatment system, possible to use greywater for watering

Use of building management systems and electronic control systems:
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Integration of information and communication technology:

Heat pump steering unit: possibility of remote operation via Internet

Use of mechanical ventilation systems and whether or not they include heat exchange elements:

Mechanical ventilation system with heat recovery unit Paul Thermos 300dc, heat recovery efficiency of whole system 89% (PHPP2007 calculation)

Design for dismantling at end of use:
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Use of day lighting (natural light): **All rooms lighted by natural light**

Artificial lighting used: **Halogen, Economy bulbs, LED**

Adaptability of the building to changes in use: **Medium**

Quality of green spaces around the building: **High**

Other considerations:

If calculations on other aspects such as air tightness, overall embodied energy, have been made, should be included:

Four blower door tests were carried out, final test result after completion of construction works n_{50}=0,7h^{-1}

Cost of construction (in € per square metre):

1520.- incl. VAT for net floor area

Cost of maintenance (in € per square metre per year):

Heating and hot water: EUR 300.-/year (current price of electricity: EUR 0.105 per kWh)

Cost of dismantling at end of use (in € per square metre at 2010 prices):
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Any environmental impact assessment label that has been used (BREAM, LEED, SBtool etc…):
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Ervins Krauklis, architect
2010.07.23.