

Passive house- Ballymacarbry

1) Characteristics and Description



- **Initial cost:** €220,000 (payback extra cost estimated in 15 – 20 years)
- **Surface:** 133m² (ground floor) & 87m² (first floor); 220m² overall
- **Orientation:** South – South - East
- **Occupancy:** 2 people
- **Construction time:** was erected on site in 2 weeks
- This is the first Irish Factory built, **Certified PassivHaus** in Ireland.
- Project followed and manufactured in Cahir by www.viking-house.ie

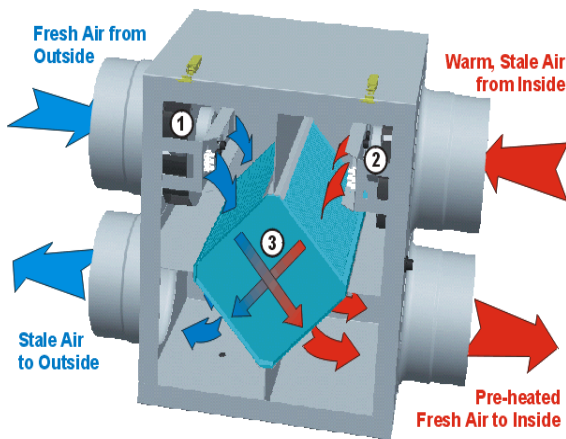
Element	Material	λ value ⁽¹⁾ (W/m ² .K)	Thickness (mm)	Comments
	 Fermacell	0.320	13	<p style="text-align: center;">Average U-value⁽²⁾: 0.112 W/m².K Overall tickness: 407mm Surface: 243 m²</p> <p><i>The walls are lined internally with Fermacell and the house is built on the PassivHaus certified foundation system which makes this a Thermal Bridge free construction.</i></p>
	 Batten insulated with cellulose	0.312	50	
	 OSB	0.130	9	
	 Stub insulated with cellulose	0.0013	240	
	 Fibreboard	0.042	80	
	 Render	0.220	15	
 Roof	 Fermacell	0.320	15	<p style="text-align: center;">Average U-value: 0.098 W/m².K Overall tickness: 465mm Surface: 87 m²</p> <p><i>Cellulose put on in the attic of the roof.</i></p>
	 Cellulose	0.035	450	
 Floor	 Concrete Slab	2.500	100	<p style="text-align: center;">Average U-value: 0.114 W/m².K Overall tickness: 400mm Surface: 133m²</p> <p><i>Underfloor heating installed for use if required (see heating system below).</i></p>
	 Expanded polystyrene	0.035	300	
 Windows	Triple glazing with gas			<p style="text-align: center;">Average U value= 0.85 W/m².K Surface: 37m²</p> <p>Triple glazed windows and electricity conduits were fitted in the factory to PassivHaus standards.</p>



The λ value ⁽¹⁾ is a measure of the insulation properties of the material. A low λ value means very good insulation properties
The **U-value** ⁽²⁾ is the relation between λ and the thickness (e) of the material: $U = \lambda / e$. A low λ value means very good insulation properties

2) Heating system

The house is heated by a Mechanical Heat Recovery Ventilation (M.H.R.V.) system from Germany (www.paul-lueftung.net) which has an efficiency of 90.5% for a cost of €6,000.



The system supplies fresh, draft-free air which is also free of particulates through the house via ducts. Also, because the air intake into the house is controlled noise transmission from outside is reduced.

Used odorous, warm and moist air is extracted from kitchens, bathrooms and toilets. During the cold seasons the energy contained in this air is used in the heat exchanger to heat the supply air (cold air from outside) and save valuable heating energy. In the warmer seasons an underground heat exchanger can pre-cool the supply air and provide a pollen and insect free interior climate.

The ventilation units intelligent and user-friendly control systems combine increased comfort with maximum well-being whilst adding value to and protecting the structure of your home.



A local plumber installed an underfloor heating system as a precaution on the ground floor if the Heat Recovery Ventilation cannot meet the full heating demand. During the first year, the home owner will use portable electric radiators to meet any additional heating needs. . At the end of the year, it will be possible to estimate if a condensing boiler is needed to meet additional heating requirements.

3) Passive House definition

➤ Historic



Passivhaus logo

The term passive house (Passivhaus in German) refers to the rigorous, voluntary, Passivhaus standard for energy efficiency in buildings. It results in ultra-low energy buildings that require little energy for space heating or cooling.

The Passive House standard originated from a conversation in May 1988. Their concept was developed through a number of research projects, aided by financial assistance from the German State of Hesse. The first Passivhaus buildings were built in Darmstadt, Germany, in 1990, and occupied the following year. In September 1996 the Passivhaus-Institut was founded in Darmstadt to promote and control the standard. Since then, thousands of Passive Houses have been built, to an estimate of 15,000 currently (most of them in Germany and Austria, with others in various countries worldwide).

After the concept had been validated at Darmstadt, with space heating 90% less than required for a standard new building of the time, the 'Economical Passive Houses Working Group' was created in 1996.

This developed the planning package and initiated the production of the novel components that had been used, notably the windows and the high-efficiency ventilation systems. Meanwhile further passive houses were built in Stuttgart (1993), Naumburg, Hesse, Wiesbaden, and Cologne (1997).



First Passive House built in 1991 in Darmstadt-Germany

➤ **Definition:**



Inside the first Passive House

A Passive House is a very well insulated, virtually air tight building that is primarily heated by passive solar gain and by internal gains from people, electrical equipment, etc. Energy losses are minimized. Any remaining heat demand is provided by an extremely small source. Avoidance of heat gain through shading and window orientation also helps to limit any cooling load, which is similarly minimized. A heat recovery ventilation system provides a constant, balanced fresh air supply.

A Passive House is a comprehensive system. Working with natural resources, free solar energy is captured and applied efficiently, instead of relying predominantly on 'active' systems to bring a building to 'zero' energy. High performance triple glazed windows, super insulation, an airtight building shell, limitation of thermal bridging and balanced energy recovery ventilation make possible extraordinary reductions in energy use and carbon emission.

Today, many in the building sector have applied this concept to design, and build towards a carbon neutral future. Over the last 10 years more than 6000 buildings in Europe from single and multifamily residences, to schools, factories and office buildings have been designed and built or remodeled to the passive house standard.

➤ **Standards required for a passive house:**

Performance Characteristics	Passive House Standard	Passive House Ballymacarbry
Airtight building shell	≤ 0.6 ACH @ 50 pascal pressure	0.6 ACH
Annual heat requirement	≤ 15 kWh/m ² /year	12 kWh/m ² /year
Primary Energy	≤ 120 kWh/m ² /year	73 kWh/m ² /year
Ventilation system with heat recovery with	≥ 75% efficiency with low electric consumption @ 0.45 Wh/m ³	90.5% @ 0.33 Wh/m ³
Thermal Bridge Free Construction	≤ 0.01 W/mK	0.01 W/mK