

PassivHaus Standard - The Energy Saving Potential in Ireland

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PassivHaus Definition

“Specific construction standard for dwellings with good comfort conditions during winter and summer, without traditional heating systems and without active cooling.”



PassivHaus Basic Principles

- Very high level of building envelope insulation
- Minimised thermal bridges
- Very low infiltration through building fabric
- Highly efficient heat recovery mechanical ventilation
- Use of passive solar and incidental gains

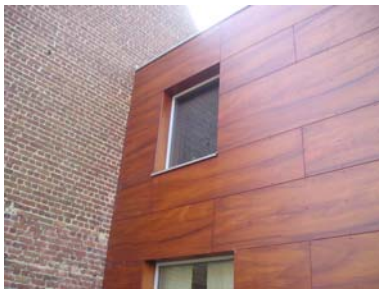


PassivHaus Energy Demand

The total energy demand for space heating is limited to 15 kWh/m² *treated floor area*.

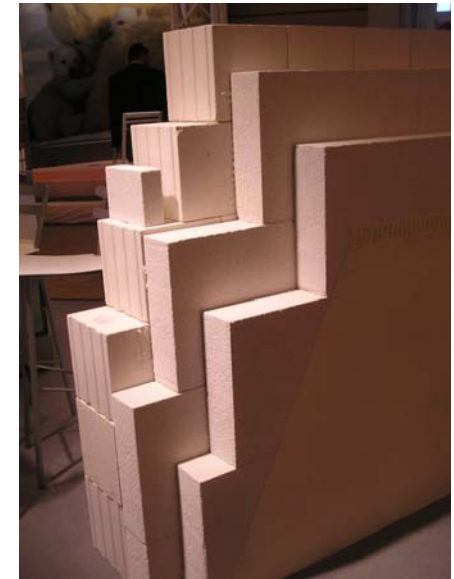
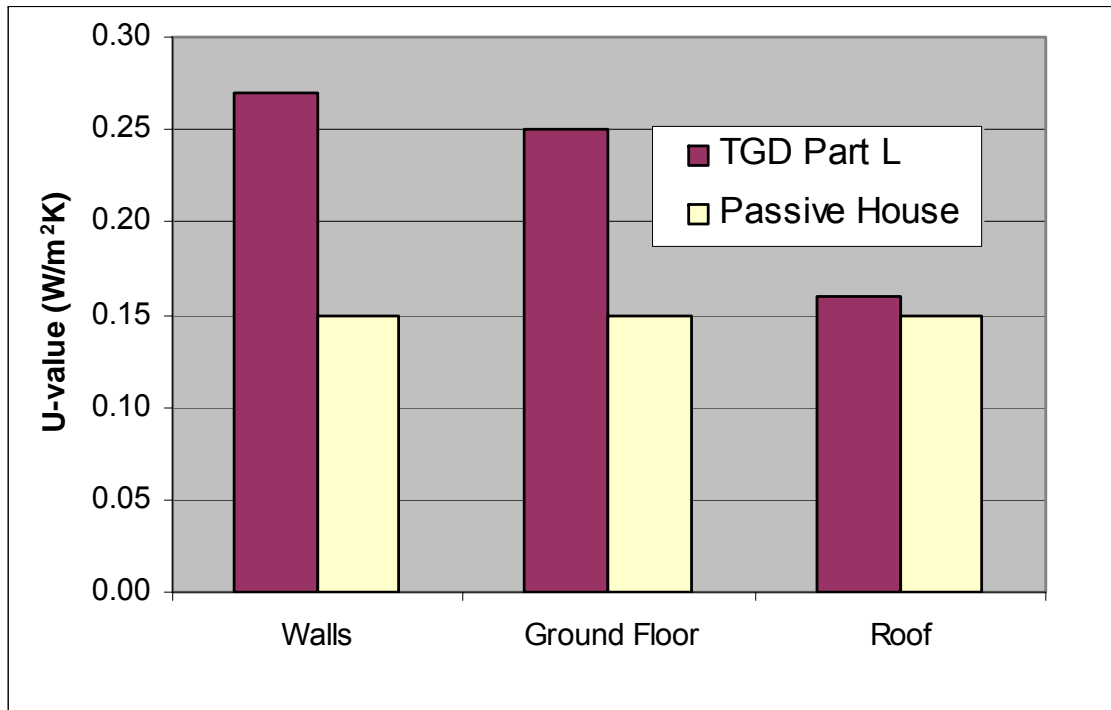
The total energy demand for space heating, domestic hot water and all appliances is limited to 120 kWh/m² total *primary energy*.

How do current Irish Building Regulations compare with the PassivHaus Standard?



Current Building Regulations Compared to the PassivHaus Standard

Building Fabric

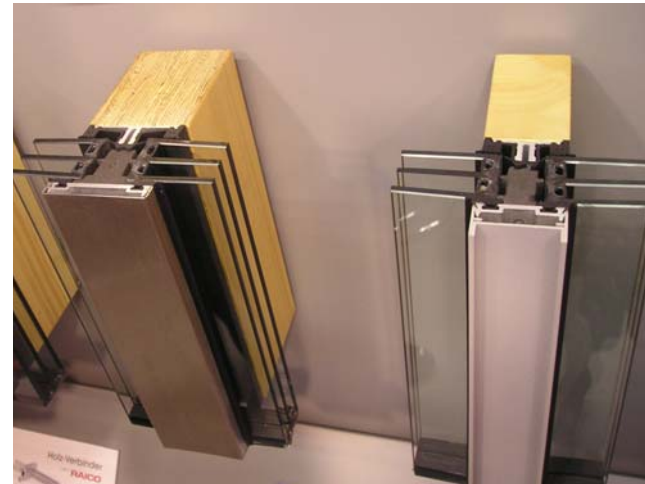
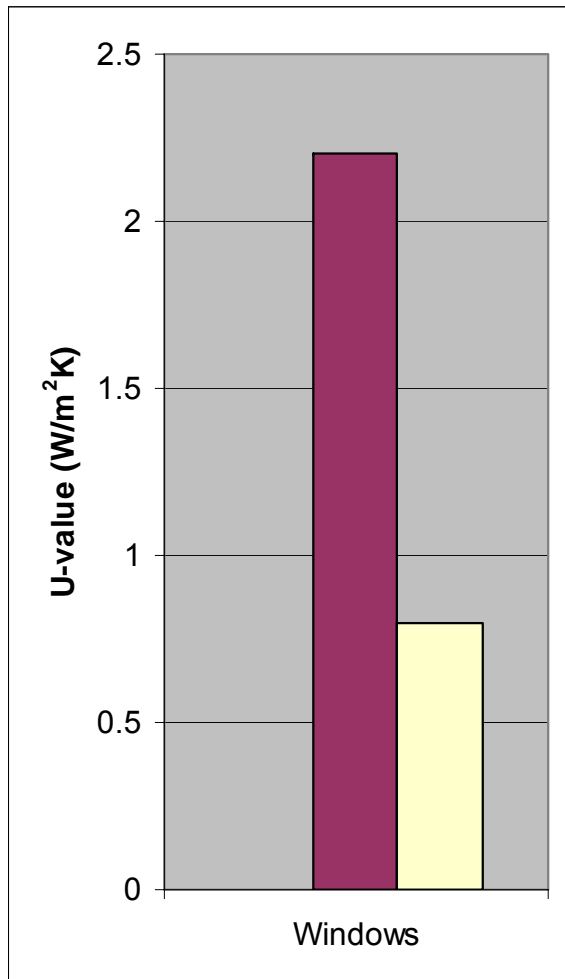


	PHS (W/m²K)	TGD Part L (W/m²K)
Insulation Walls	$U \leq 0.15$	$U \leq 0.27$
Insulation Roof	$U \leq 0.15$	$U \leq 0.16$
Insulation Floor	$U \leq 0.15$	$U \leq 0.25$



Current Building Regulations Compared to the PassivHaus Standard

Windows



Windows

PHS
(W/m²K)
 $U \leq 0.8$

TGD Part L
(W/m²K)
 $U \leq 2.2$



Current Building Regulations Compared to the PassivHaus Standard

Infiltration

PassivHaus

Very airtight house: $n_{50} < 0.6$ ach (requirement)



Post construction air-tightness pressurisation test is mandatory to achieve the PassivHaus Standard

Building Regulations TGD Part L



In Ireland, no specific air-tightness pressurisation tests are required by the building regulations.



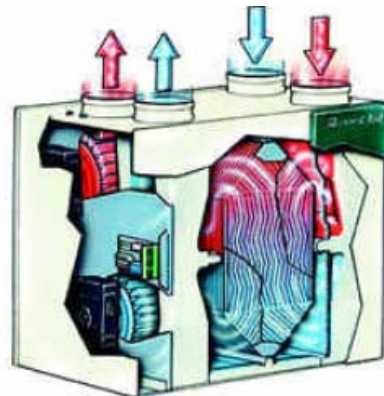
Current Building Regulations Compared to the PassivHaus Standard

Ventilation

PassivHaus

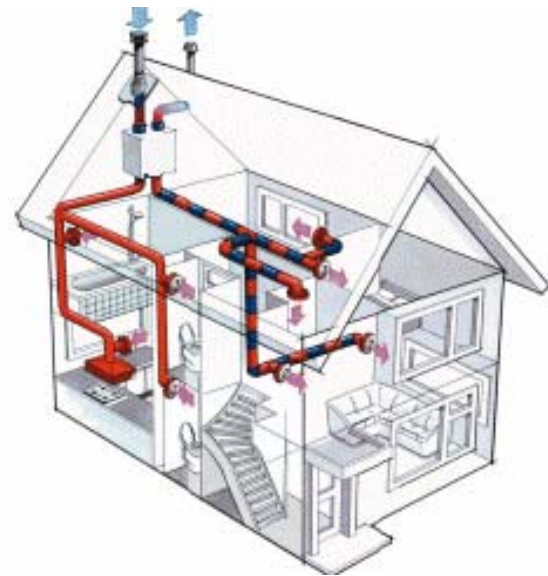
Highly efficient mechanical ventilation system with heat recovery $\geq 75\%$

Air quality through ventilation rate:
Minimum ventilation $30 \text{ m}^3/\text{h}/\text{pers}$ or
Minimum ventilation rate of $0.4 \text{ ac}/\text{h}$



Building Regulations TGD Part L

Infiltration and natural ventilation techniques used for housing are often difficult to control and with high thermal losses

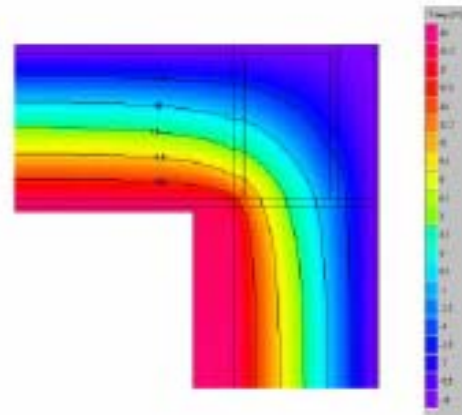
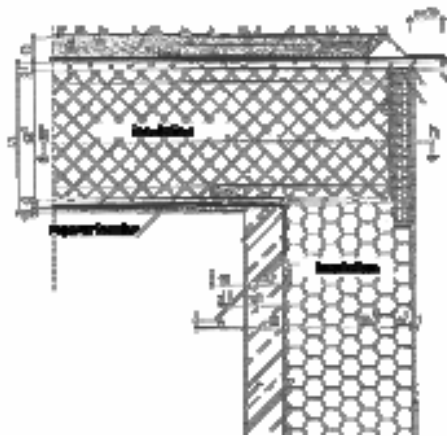


Current Building Regulations Compared to the PassivHaus Standard

Thermal Bridging

PassivHaus

Thermal bridges linear heat coeff $\psi \leq 0,01\text{W/mK}$



Building Regulations TGD Part L

Table 39 Maximum values of linear thermal transmittance (ψ) for selected locations	
Detail in external element/junction with external element	Maximum value of ψ (W/mK)
Windows/doors	
Steel lintel with perforated steel baseplate	0.50
Other lintel (including other steel lintel)	0.30
Cills/jamb	0.06
Junctions with external element	
Ground floor, intermediate floor, party wall	0.16
Eaves (ceiling level)	0.06
Gable (ceiling level)	0.24



Current Building Regulations Compared to the PassivHaus Standard

Summary

The PassivHaus Standards go much further than current Irish building regulations by setting specific requirements in order to minimise heat losses through the building envelope, infiltration and ventilation.

In addition, the PassivHaus Standard rely on the use of incidental gains, passive solar gains and use of on-site renewable energy to meet the resulting energy demand.



PassivHaus Standard - The Energy Saving Potential in Ireland

Investigate the potential for energy and CO₂ emissions reduction when the PassivHaus space heating standard of 15kWh/m² is applied on dwellings built as per current Irish building regulations (TGD Part L).



Methodology

The tool used in this study was a computer based model, developed as part of Ireland's "Homes of the 21st Century" study [Brophy et al. 1999].

The model was used to predict the energy consumption and CO₂ emissions of dwellings with a typical floor area of 100m², constructed as per the current building regulations.



Calculation Results

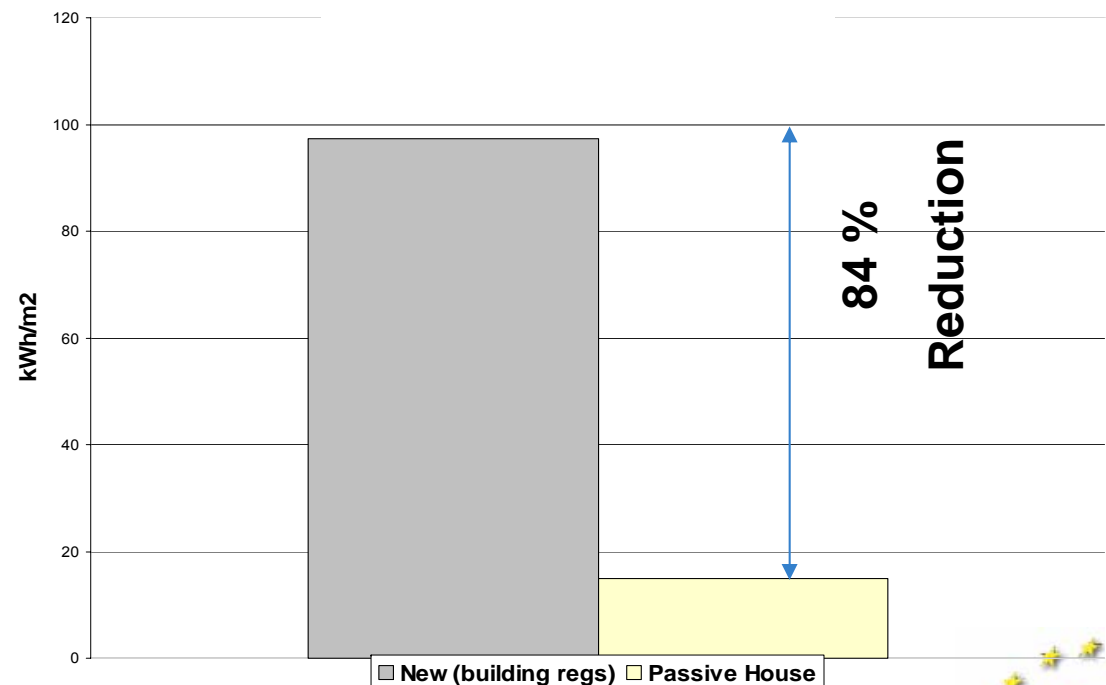
Calculated energy use for new build construction in Ireland

- Space heating: 97.2 kWh/m²

(DHW heating: 33 kWh/m²; Electricity use for appliances: 27.8 kWh/m²;
Total electricity use: 49.1 kWh/m²)

PassivHaus Standard

- The total energy demand for *space heating* is limited to 15 kWh/m² *treated floor area*



Calculated space heating use for 100m² Irish dwelling



Calculation Results for Space Heating Demand

	New Build, Building Regulations			PassivHaus Standard		
Energy source	Delivered Energy (kWh/year)	Irish conversion factor	Carbon Dioxide Emissions (kgCO ₂ /yr)	Standard (kWh/year)	Irish conversion factor	Carbon Dioxide Emissions (kgCO ₂ /year)
Electricity	532	0.65	345.8	0	0.65	0
Gas	1935	0.184	356.0	750	0.184	138
Oil	2902	0.247	716.8	0	0.247	0
Solid	4353	0.33	1436.6	0	0.33	0
Pellets	0	0.05	0	750	0.05	37.5
Totals	9,722		2,855.2	1,500		175.5

Calculated Energy and CO₂ emissions for 100m² Irish dwelling



Calculation Results for Space Heating Demand

Conclusions

Using the calculation model it was found that a typical Irish dwelling (100m²), constructed as per current building regulations:

Consumes 9,722kWh/year of delivered energy on space heating

Releases 2,855kg CO₂/year.

The space heating requirements for the same size of dwelling built to PassivHaus Standards was found to:

Consumes 1,500kWh/year of delivered energy on space heating which equates to 176kgCO₂/year.



Calculation Results for Space Heating Demand

Conclusions

The difference in delivered energy consumption and CO₂ emissions between the two examples over one year:

8,222kWh/year and 2,680kgCO₂/year.



Calculation Results for Space Heating Demand 'What if Scenarios'

Applying these potential energy and CO₂ emissions savings on different percentage of new build dwellings (based on construction rate of 80,000 dwellings per year) the following results were calculated:



Calculation Results for Space Heating Demand 'What if Scenarios'

Percentage (number) of new dwellings built to PassivHaus Standard	Potential energy and CO ₂ emissions savings per year
0.5% (400)	3.29 GWh
	1.07 ktCO ₂
1% (800)	6.58 GWh
	2.14 ktCO ₂
5% (4,000)	32.91 GWh
	10.7 ktCO ₂
10% (8,000)	65.78 GWh
	21.43 ktCO ₂
20% (16,000)	131.56 GWh
	42.87 ktCO ₂



Calculated potential for space heating energy and carbon dioxide savings per year



Calculation Results for Space Heating Demand 'What if Scenarios'

Potential savings per year could range from:

	<i>Space Heating</i>	<i>Carbon Dioxide</i>
0.5% (400)	3.29 GWh	1.07 ktCO ₂
20% (16,000)	131.56 GWh	42.87 ktCO ₂

Over a 10yr period (cumulative) the potential for savings could range from:

	<i>Space Heating</i>	<i>Carbon Dioxide</i>
0.5% (400)	180.89 GWh	58.95 KtCO ₂
20% (16,000)	7.23 TWh	2.35 MtCO ₂



http://www.europeanpassivehouses.org



Register

Please fill in Registration Form to receive PEP Newsletter and recent project updates.

News & Updates

* Use of Internet Explorer 5 or above recommended

Welcome to PEP website

Promotion of European Passive Houses

The objective of the PEP project is to promote the potential of the European Passive House concept in Europe by the development of information packages and design tools for passive houses, the organization or (inter) national workshops, symposia and conferences and the set up of international passive house website.

The term 'Passive House' refers to a construction standard, that aims to reduce the heating needs in housing to a point where conventional heating systems are no longer necessary.

European Commission Directorate-General for Energy and Transport EIE 2003-030, related to SAVE, ALTENER, STEER and Horizontal Key Actions 2-4. (EIE/04/030/SO7.39990)

Quick Links

Passive House Solutions
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Energy Saving from Passive House in Europe
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Heat Load Study
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Passive House National Publication - Overview can be found under the National Information section in each partner country
[More information >>](#)

Conference Papers, 10th International Passive House Conference, Germany, May 2006
[More information >>](#)

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