



Building elements :		Insulation	U - value
Walls	Cavity walls, partially filled	50-70 mm	0.37
Roofs	Pitched, insulation between joists	200 mm	0.2
Floors	Solid	40-80 mm	0.25
Windows	Double glazed, Low-E, wood/PVC frame, 16 mm gap	n.a.	2.0
Doors	Solid wooden	none	3.0
Heating systems characteristics:		Fuel	Efficiency
Primary	Central heating boiler, primary pipework insulated.	Mains gas	80%
Secondary	Open fire in grate	Smokeless	30%
Hot water	From primary heating system. Separated time controls.		
Cylinder	Factory insulated, 50mm, cylinder thermostat		
Controls	Separated timers for SH and DHW, room thermostat, TRV's		

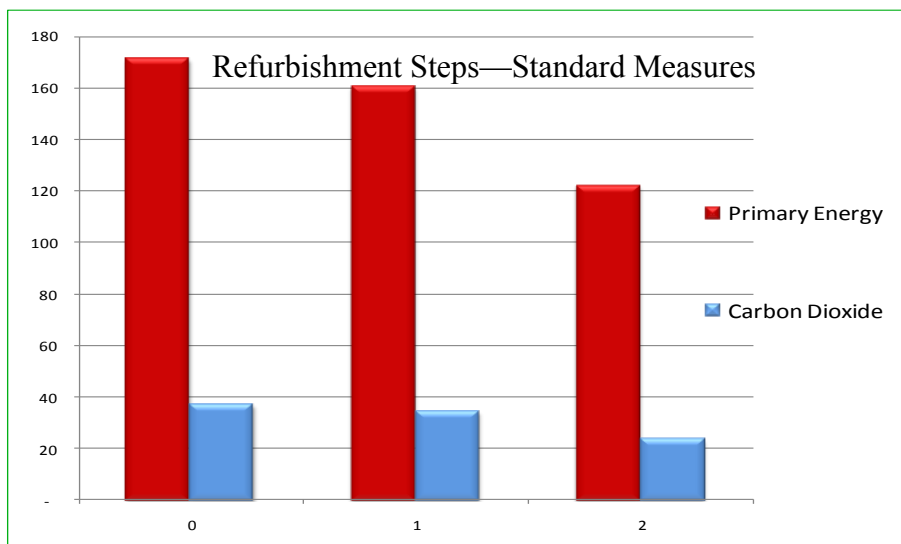
Description

The cavity walls of this house are well insulated with U values as low as 0.27 W/m²K and the floors are well insulated. Apart from adding additional roof insulation, the focus for retrofit would be on upgrading the space & water heating systems.

Refurbishment steps — standard

Refurbishment steps — standard				Prim. energy kWh/m ² /y	Carbon Dioxide kgCO ₂ /m ² /y	Energy Rating	
0	Building fabric upgrade steps:			Expected U-values	171 (actual state)	37 (actual state)	C1
1	Roof insulation and standard package*	Add	100 mm of mineral wool over the existing insulation	0.13	160	34	C1
Systems upgrade:							
3	Space and water heating system and controls	Add/replace	Gas condensing boiler 90% efficient, additional space heating zone, secondary heating removed		122	23	B2

*also includes draughtstripping (if not present), 80mm lagging jacket for DHW cylinder (if insulation is not present) and low energy bulbs.



Primary Energy: kWh/m²/y, Carbon Dioxide emissions: kg/m²/y



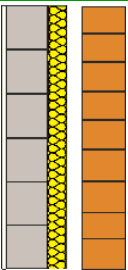
Estimated costs and payback time**

Measure	Estimated costs	Payback (y)
Step 1	€ 540	6.4
Step 2	€ 2,200	11.7
Total:	€ 2,740	10

Standard upgrade summary

Consumption of primary energy reduced by:	49 kWh/m²/y
Emission of carbon dioxide reduced by:	14 kgCO₂/m²/y

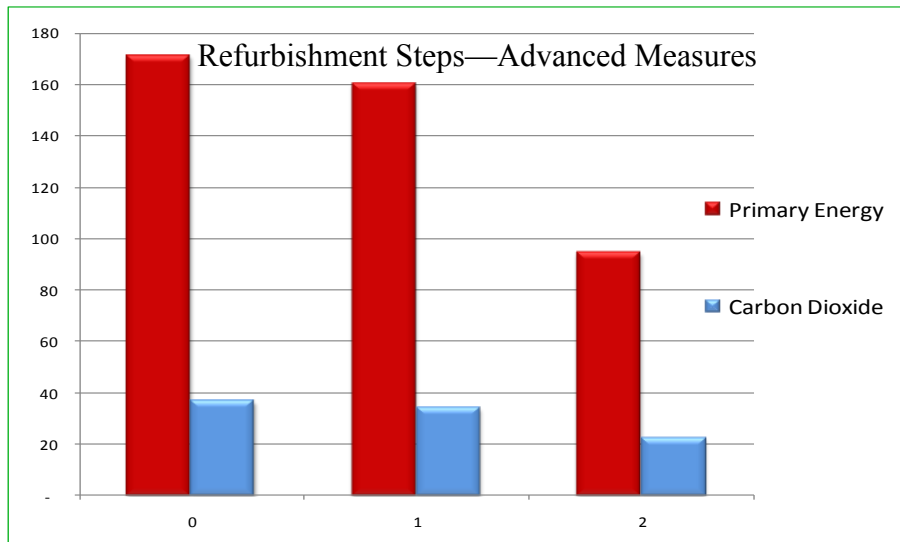
**Note: 1. Costs are indicative only, based on typical prices (2011). 2. Measures analysed are one of many options, especially for the renewable heating systems.

Typical roof upgrade (standard/advanced)	
200 mm of mineral wool between ceiling joists	 <p>Before:</p>
Typical roof upgrade includes topping the attic insulation up to 300 mm. Conductivity = 0.04 W/mK	 <p>After:</p>
Typical wall construction	
Cavity walls, partially filled	
	Cavity walls, partially filled with the expanded polystyrene boards, U-value = 0.37 W/m ² K

Heating system upgrade		
Feature:	Standard	Advanced
Heat generator	Regular condensing boiler	Air source heat pump
Efficiency:	90%	380%
Fuel:	Mains Gas	Electricity
SH Controls type:	Full zone control	Full zone control
Hot water source (HW):	Primary heating system	Primary heating system and solar thermal panels providing 50% of HW demand
HW Cylinder:	120 litre, factory insulated	200 litre combined cylinder, factory insulated
HW Controls type:	Time and thermostat	Time and thermostatic
Ventilation:	Natural	MVHR, 90% efficient

Refurbishment steps — advanced				Prim. energy kWh/m ² /y	Carbon Dioxide kgCO ₂ /m ² /y	Energy Rating	
0	Building fabric upgrade steps:			Expected U-values	171 (actual state)	37 (actual state)	C1
1	Roof insulation and standard package*	Add	100 mm of mineral wool over the existing insulation.	0.13	160	34	C1
Systems upgrade:							
2	Space and water heating system and controls	Replace	Air source heat pump 380% efficient, two separated heating zones with time and thermostatic control, independent water heating, solar thermal panels providing 50% of hot water demand with combined HW cylinder. Mechanical ventilation with heat recovery (MVHR).		95	23	B1

* package also includes draughtstripping, 80mm lagging jacket for DHW cylinder and low energy bulbs.



Primary Energy: kWh/m²/y, Carbon Dioxide emissions: kg/m²/y

Estimated costs and payback time**

Measure	Estimated costs	Payback (y)
Step 1	€ 540	6.4
Step 2	€ 13,100	87.9
Total:	€ 13,640	58.3

Advanced upgrade summary

Consumption of primary energy reduced by:	76 kWh/m²/y
Emission of carbon dioxide reduced by:	14 kgCO₂/m²/y

**Note: 1. Costs are indicative only, based on typical prices (2011). 2. Measures analysed are one of many options, especially for the renewable heating systems.

Analysis conducted in association with IHER Energy Services, www.iher.ie