



Description

Very typical rural bungalow from the 1980s. 50mm of polystyrene wall insulation was normally fitted during construction. The part-filled cavity can be full-filled by pumping in additional insulation beads.

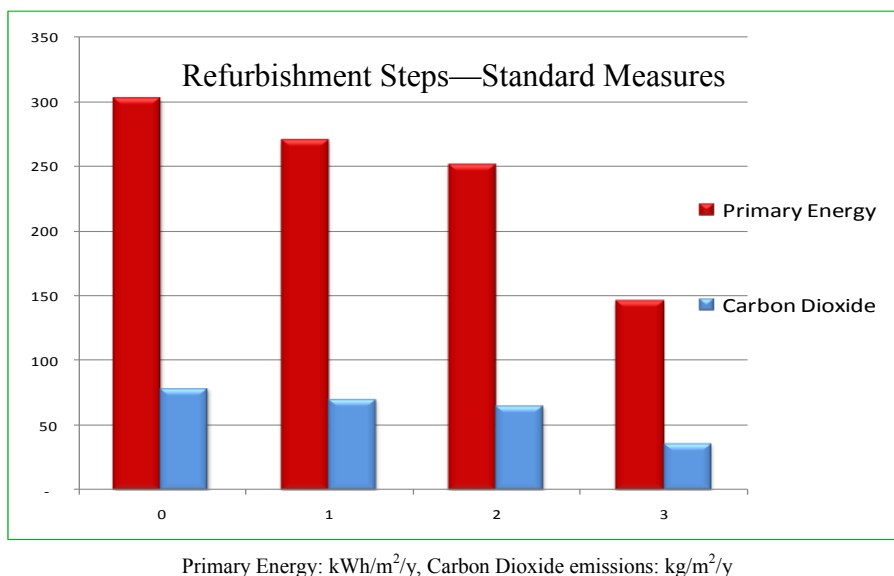
Building elements :		Insulation	U - value
Walls	Cavity walls, partially filled	25-50 mm	0.6
Roofs	Pitched, insulation between joists	100 mm	0.4
Floors	Solid	10-15 mm	0.57
Windows	Double glazed, wooden frame, 6 mm gap	n.a	3.1
Doors	Solid wooden	none	3.0

Heating systems characteristics:		Fuel	Efficiency
Primary	Central heating boiler, pipework uninsulated.	Heating oil	75%
Secondary	Open fire in grate	Coal	30%
Hot water	From primary heating system. Electric immersion heater is used in summer.		
Cylinder	Insulated, spray foam 30mm, no cylinder thermostat.		
Controls	Programmer.		

Refurbishment steps — standard

				Prim. energy kWh/m ² /y	Carbon Dioxide kgCO ₂ /m ² /y	Energy Rating
0	Building fabric upgrade steps:			303 (actual state)	78 (actual state)	E1
1	Roof insulation and standard package*	Add	200 mm mineral wool over the existing insulation.	271	70	D2
2	Wall insulation	Add	Remaining cavity (50mm) filled with insulation beads	252	65	E1
Systems upgrade:						
3	Space and water heating system and controls	Replace	Condensing boiler 90% efficient, two separated heating zones with time and thermostatic control, independent water heating.	146	36	B3

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



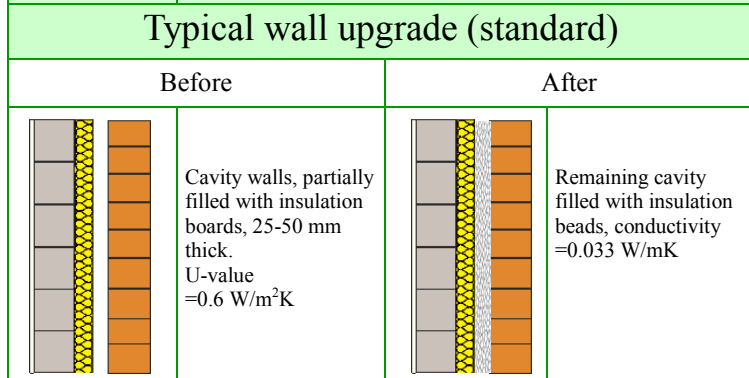
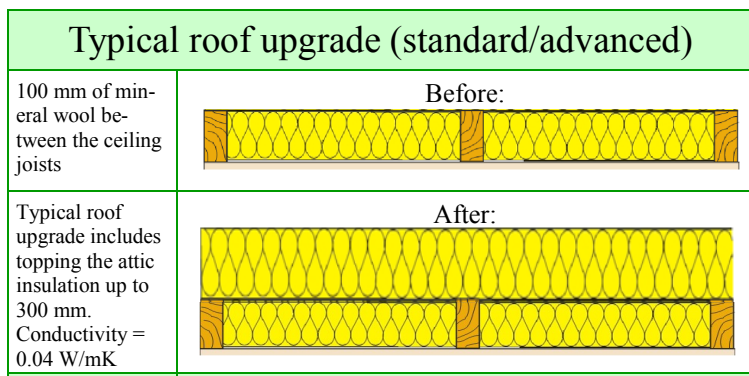
Estimated costs and payback time**

Measure	Estimated costs	Payback (y)
Step 1	€ 1,940	5.3
Step 2	€ 1,270	5.2
Step 3	€ 3,500	2.8
Total	€ 6,710	3.6

Standard upgrade summary

Consumption of primary energy reduced by:	157 kWh/m²/y
Emission of carbon dioxide reduced by:	42 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.



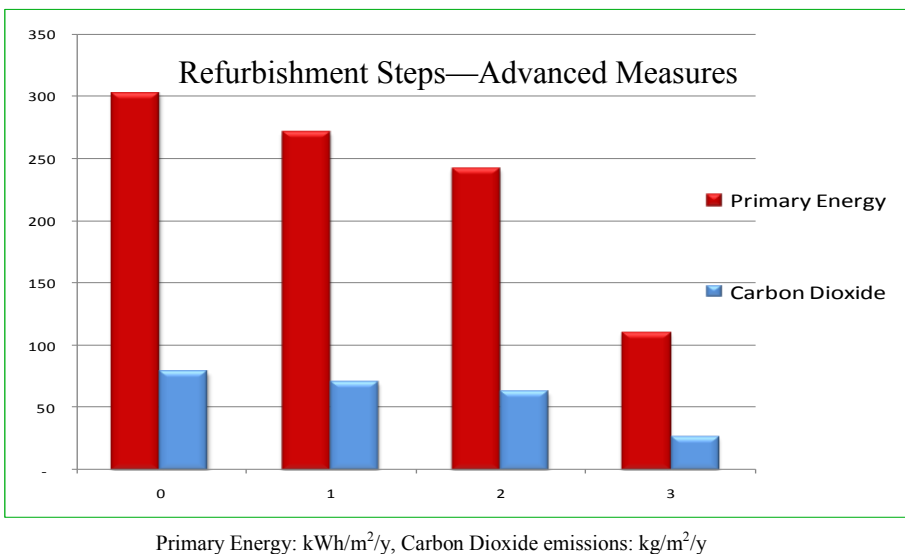
Heating system upgrade

Feature:	Standard	Advanced
Heat generator	Regular condensing boiler	Ground source heat pump
Efficiency:	90%	400%
Fuel:	Heating oil	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

			Expected U-values	Prim. energy kWh/m ² /y	Carbon Dioxide kgCO ₂ /m ² /y	Energy Rating	
0	Building fabric upgrade steps:			303 (actual state)	78 (actual state)	E1	
1	Roof insulation and standard package*	Add	200 mm mineral wool over the existing insulation.	0.13	271	70	D2
2	Wall insulation	Add	Remaining cavity (50mm) filled with insulation beads, walls insulated internally with 50 mm phenolic/urethane drylining boards	0.21	242	62	D1
Systems upgrade:							
3	Space and water heating system and controls	Replace	Ground source heat pump 400%, 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).		110	26	B2

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



Estimated costs and payback time**

Measure	Estimated costs	Payback (y)
Step 1	€ 1,940	5.3
Step 2	€ 11,400	30.9
Step 3	€ 18,100	9.8
Total:	€ 31,440	12.2

Advanced upgrade summary

Consumption of primary energy reduced by:	157 kWh/m²/y
Emission of carbon dioxide reduced by:	52 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.