



Description

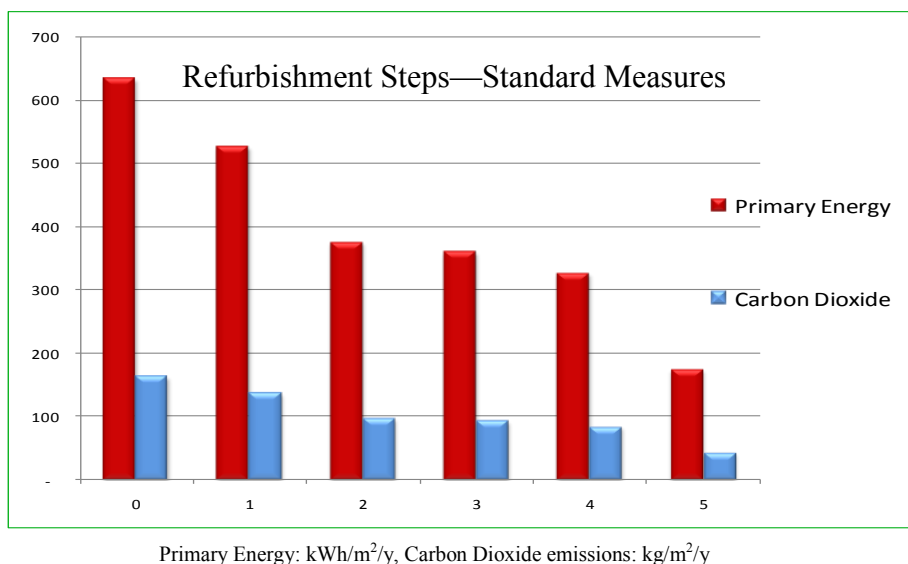
One-off bungalow with uninsulated solid brick walls. Most likely found in outer parts of towns and in rural areas. Often extended to rear. Ideally suited for external wall insulation.

Building elements :		Insulation	U - value
Walls	Solid brick, 225 mm	None	2.1
Roofs	Pitched, insulation between joists Flat roof over the kitchen	50 mm none	0.68 2.3
Floors	Solid floor	none	0.84
Windows	Single glazed, wooden frame	n.a.	4.8
Doors	Solid timber doors half glazed back doors	None None	3.0 3.9
Heating systems characteristics:		Fuel	Efficiency
Primary	Central heating boiler, pipework uninsulated	Heating oil	65%
Secondary	Open fire in grate	Coal	30%
Hot water	From primary heating system. Electric immersion used in Summer.		
Cylinder	Uninsulated, no cylinder thermostat.		
Controls	Programmer only		

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	634 (actual state)	162 (actual state)	G
1	Roof insulation and standard package*	Add	250 mm of mineral wool between and over the ceiling joists	0.13	526	136	G
2	Wall insulation	Add	External wall insulation. Thickness of the boards: 70-100 mm	0.27	375	96	E2
3	Flat roof insulation	Add	Insulation boards, rigid urethane/phenolic (100-110mm)	0.22	360	92	E2
4	Windows and Doors	Replace	Double glazed, low-e windows, air filled, 16mm gap PVC/Timber doors, insulated	2.0	326	83	E1
Systems upgrade:							
5	Space and water heating system and controls	Replace	Condensing boiler 90% efficient, two separated heating zones with time and thermostatic control, independent water heating . Hot water cylinder insulated with 50 mm spray foam.		174	43	C1

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



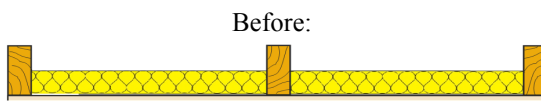
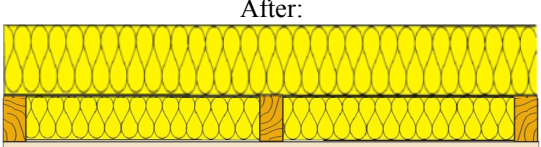
Estimated costs and payback time**

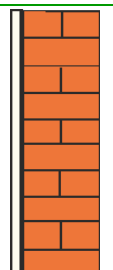
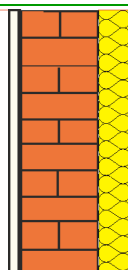
Measure	Estimated costs	Payback (y)
Step 1	€ 1,350	1.9
Step 2	€ 11,940	10.9
Step 3	€ 830	7.5
Step 4	€ 5,250	21.1
Step 5	€ 3,500	3.3
Total:	€ 22,900	7.1

Standard upgrade summary

Consumption of primary energy reduced by:	460 kWh/m²/y
Emission of carbon dioxide reduced by:	119 kg CO₂/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.

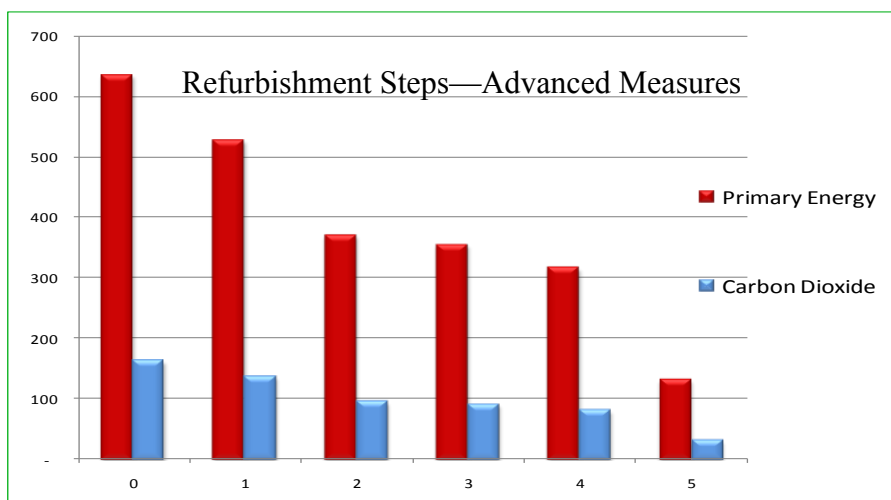
Typical roof upgrade (standard/advanced)	
50mm of mineral wool between the ceiling joists	 <p>Before:</p>
Typical roof upgrade includes topping the attic insulation up to 300 mm. Conductivity = 0.04 W/mK	 <p>After:</p>

Typical wall upgrade (standard/advanced)	
Before	After
 <p>Solid brick wall 225 mm, uninsulated, U-value = 2.1 W/m²K</p>	 <p>External insulation added, EPS, urethane or phenolic boards, conductivity = 0.021 - 0.031 W/mK</p>

Heating system upgrade		
Feature:	Standard	Advanced
Heat generator	Regular condensing boiler	Air source heat pump
Efficiency:	90%	380%
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 thermostatic	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	634 (actual state)	162 (actual state)	G
1	Roof insulation and standard package*	Add	250 mm of mineral wool between and over the ceiling joist	0.13	526	136	G	
2	Wall insulation	Add	External wall insulation. Thickness : 90-150 mm	0.21	370	95	E2	
3	Flat roof	Add	Insulation boards, rigid urethane/phenolic (100-110mm)	0.22	355	91	E2	
4	Windows and Doors	Replace	Insulated PVC/wooden doors, Triple glazed, argon filled, low-e windows	2.0 1.3	316	81	E1	
Systems upgrade:								
5	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).		132	31	B3	

* package also includes draughtstripping, 80mm lagging jacket for HW 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	€ 1,340	1.9
Step 2	€ 13,130	10.5
Step 3	€ 830	7.5
Step 4	€ 7,000	24.8
Step 5	€ 11,100	7.6
Total:	€ 33,400	9

Advanced upgrade summary

Consumption of primary energy reduced by:	502 kWh/m²/y
Emission of carbon dioxide reduced by:	131 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.