

6. Terraced house, solid brick wall, pre-1978



Description

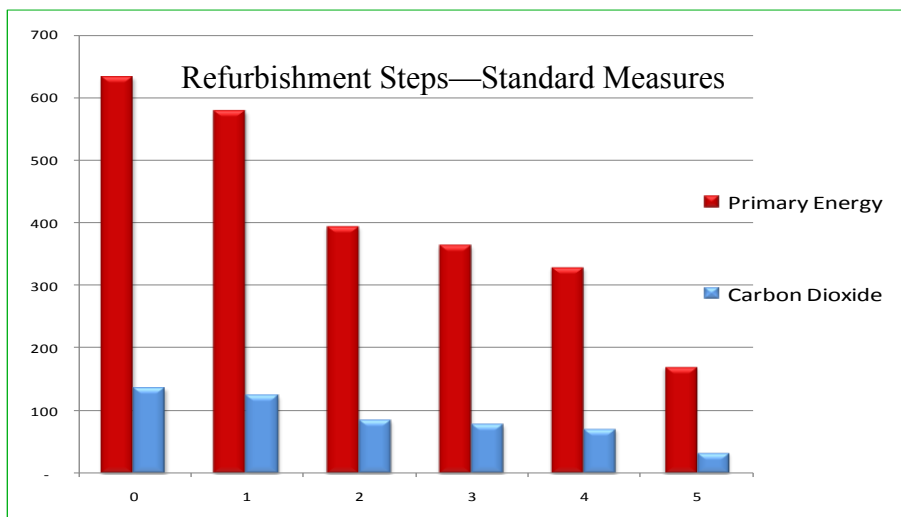
Typical redbrick house found in Dublin, Cork, Limerick etc from late 1800s up to 1930s. Often includes a flat roof extension to rear. Suited to a mix of internal and external wall insulation. Suspended timber floors are common that can be retrofitted with insulation.

Building elements :		Insulation	U - value
Walls	Solid brick, 325 mm	none	1.64
Roofs	Pitched, insulation between joists	50 mm	0.68
Floors	Suspended timber floor Solid floor (kitchen)	none none	0.69 0.79
Windows	Single glazed, wooden frame Single glazed, metal frame	n.a. n.a.	4.8 5.7
Doors	Solid timber	none	3.0
Heating systems characteristics:		Fuel	Efficiency
Primary	Central heating boiler, pipework uninsulated	Mains gas	65%
Secondary	Open fire in grate	Smokeless	30%
Hot water	From primary heating system. Electric immersion used in Summer.		
Cylinder	Insulated with 25mm lagging jacket, no cylinder thermostat.		
Controls	Programmer only		

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	632 (actual state)	134 (actual state)	G
1	Roof insulation and standard package*	Add	250 mm of mineral wool between and over the ceiling joists	0.13	577	123	G
2	Wall insulation	Add	Internal drylining. 77.5 mm phenolic boards, extension walls externally insulated.	0.27	393	83	F
3	Flat roof	Add	Flat roof drylined or externally insulated	0.22	363	77	E2
4	Windows and Doors	Replace	Double glazed, low-e windows, air filled, 16mm gap Insulated doors	2.0	328	70	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.		169	32	C1

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



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

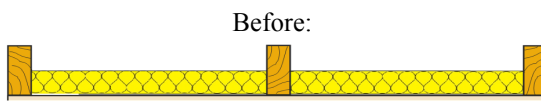

Estimated costs and payback time**

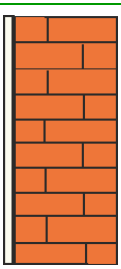
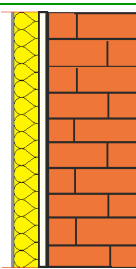
Measure	Estimated costs	Payback (y)
Step 1	€ 1,140	4.4
Step 2	€ 12,900	17.4
Step 3	€ 1,230	10.1
Step 4	€ 4,600	32.8
Step 5	€ 3,000	4.3
Total:	€ 22,870	11.7

Standard upgrade summary

Consumption of primary energy reduced by:	463 kWh/m²/y
Emission of carbon dioxide reduced by:	102 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.

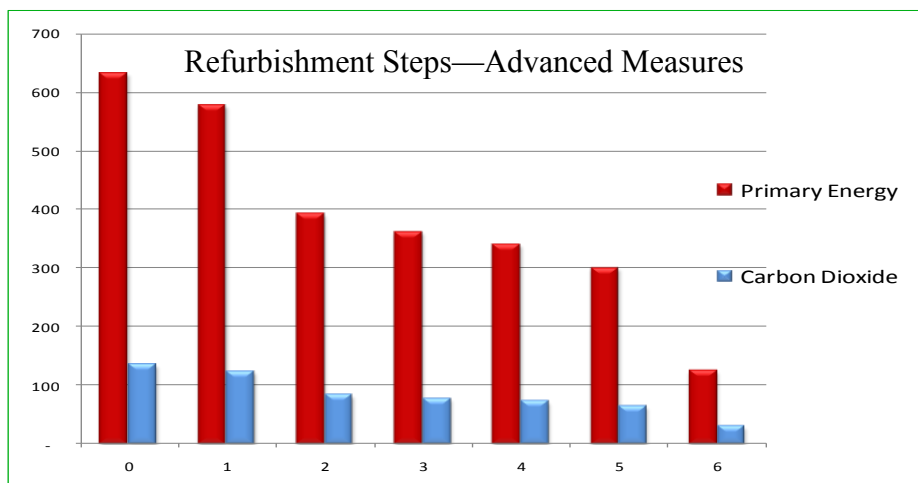
Typical roof upgrade (standard/advanced)	
50mm of mineral wool between the ceiling joists	 <p>Before:</p>
Typical roof upgrade includes topping the attic insulation up to 300 mm. Conductivity = 0.04 W/mK	 <p>After:</p>

Typical wall upgrade (standard/advanced)	
Before	After
 <p>Solid brick wall 325 mm, uninsulated, U-value = 2.1 W/m²K</p>	 <p>Internal insulation added, (on dabs or timber battens)-urethane or phenolic boards, conductivity = 0.021 - 0.025 W/mK</p>

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	632 (actual state)	134 (actual state)	G
1	Roof insulation and standard package*	Add	250 mm of mineral wool between and over the ceiling joists	0.13	577	123	G	
2	Wall insulation	Add	Main wall: Internal drylining. 77.5 mm phenolic / urethane boards Extension: external insulation 100 –150mm.	0.27 0.21	392	83	F	
3	Flat roof	Add	Flat roof drylined or externally insulated	0.22	361	77	E2	
4	Suspended floor	Add	Insulation boards between the floor joists, 70-100 mm	0.25	340	72	D2	
5	Windows and Doors	Replace	Insulated PVC/wooden doors, Triple glazed, argon filled, low-e windows	2.0 1.3	300	64	D2	
Systems upgrade:								
6	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).		124	30	B2	

* 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	€ 1,140	4.4
Step 2	€ 20,620	27.6
Step 3	€ 1,230	10.1
Step 4	€ 1,650	19.2
Step 5	€ 6,100	38.0
Step 6	€ 11,100	19.6
Total:	€ 41,840	15.6
Advanced upgrade summary		
Consumption of primary energy reduced by:	508 kWh/m²/y	
Emission of carbon dioxide reduced by:	104 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.