



Description

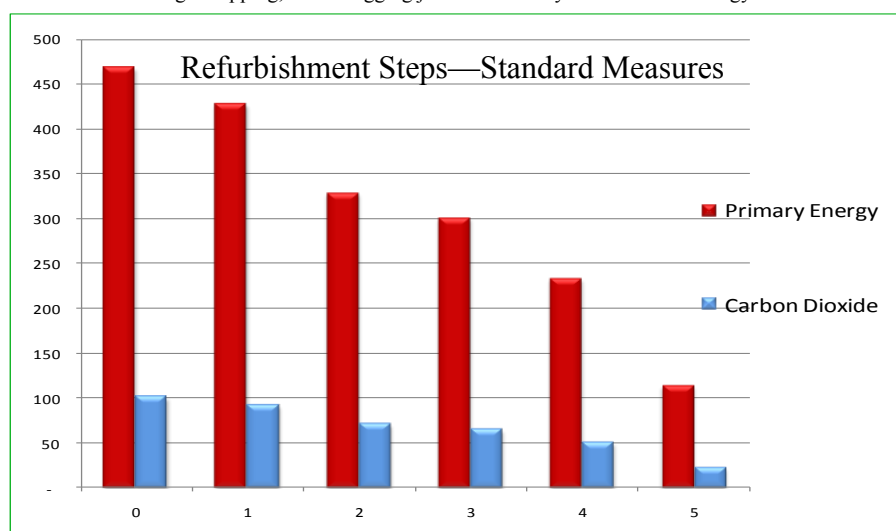
Mid terrace house with half brick front. Very common in Dublin in 1950s and 1960s. Small 50mm cavity behind brick wall with 9 inch (225mm) hollow block walls elsewhere. Uninsulated exposed floor above the garage. Suspended timber floors.

Building elements :		Insulation	U - value
Walls	Hollow block (up front, rear and extension)	none	2.4
	Cavity wall (lower front)	none	1.78
Roofs	Pitched, insulation between joists	50 mm	0.68
Floors	Suspended floor	none	0.54
	Exposed floor (over the garage)	none	1.2
Windows	Single glazed, metal frame	n.a.	5.7
Doors	Single glazed, metal frame	none	5.7
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 lagging jacket 25mm thick, 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	468 (actual state)	100 (actual state)	G
1	Roof insulation and standard package*	Add	250 mm of mineral wool between and over the ceiling joists	0.13	428	91	F
2	Wall insulation	Add	Hollow block walls– internal drylining, 82.5 mm urethane/phenolic boards Front - cavity fill, 60mm	0.27 0.48	328	70	E1
3	Flat roof and floor over the garage	Add	Phenolic / urethane drylining boards, 70-100 mm	0.22	301	64	E1
4	Windows and Doors	Replace	Double glazed, low-e windows and doors, air filled, 16mm gap	2.0	233	50	D1
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.		114	22	B2

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



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

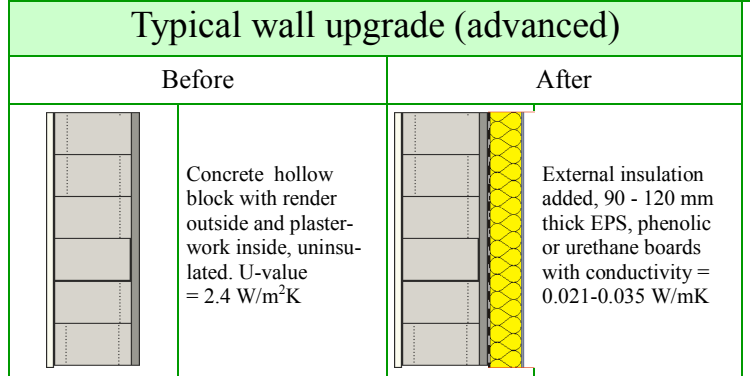
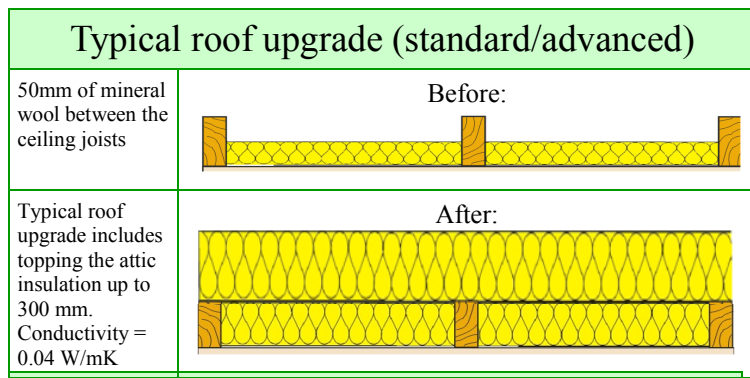
Estimated costs and payback time**

Measure	Estimated costs	Payback (y)
Step 1	€ 1,360	4.4
Step 2	€ 6,400	10.2
Step 3	€ 2,200	12.5
Step 4	€ 11,400	26.6
Step 5	€ 3,000	3.7
Total:	€ 24,360	10.3

Standard upgrade summary

Consumption of primary energy reduced by:	354 kWh/m²/y
Emission of carbon dioxide reduced by:	78 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.



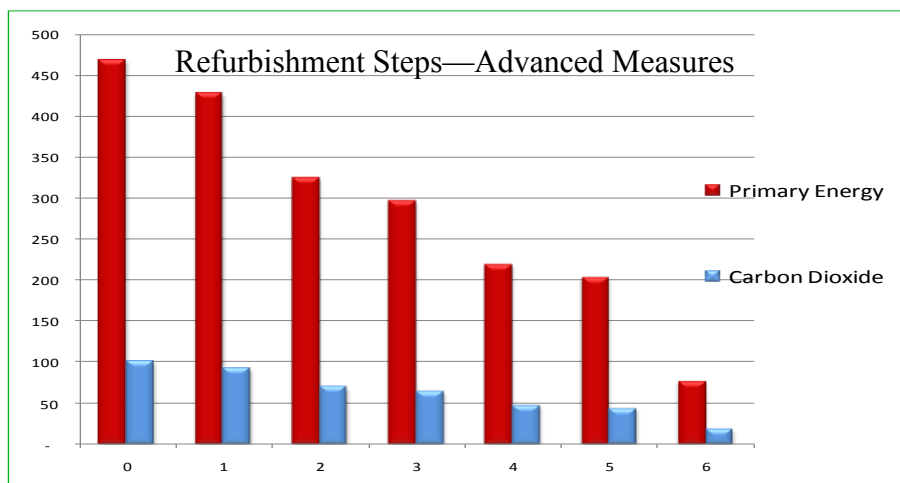
Heating system upgrade

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

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	468 (actual state)	100 (actual state)	G
1	Roof insulation and standard package*	Add	250 mm of mineral wool between and over the ceiling joist	0.13	428	91	F
2	Wall insulation	Add	All walls: external insulation. Thickness 90-150 mm	0.21	325	69	E1
3	Flat roof and floor over the garage	Add	Phenolic / urethane drylining boards, 70-100 mm	0.22	297	63	D2
4	Windows and Doors	Replace	Insulated PVC/wooden doors, Triple glazed, argon filled, low-e windows	2.0 1.3	219	47	C3
5	Suspended floor	Add	70-100 mm of insulation boards between the floor joists	0.25	203	43	C3
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).		77	18	B1

* 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

**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.

Estimated costs and payback time**

Measure	Estimated costs	Payback (y)
Step 1	€ 1,360	4.4
Step 2	€ 12,200	18,7
Step 3	€ 2,220	12.6
Step 4	€ 16,000	32.7
Step 5	€ 3,630	36.4
Step 6	€ 13,100	18.9
Total:	€ 48,510	20

Advanced upgrade summary

Consumption of primary energy reduced by:	391 kWh/m²/y
Emission of carbon dioxide reduced by:	82 kgCO₂/m²/y