17. Detached house, hollow block walls,1978-1982

Description

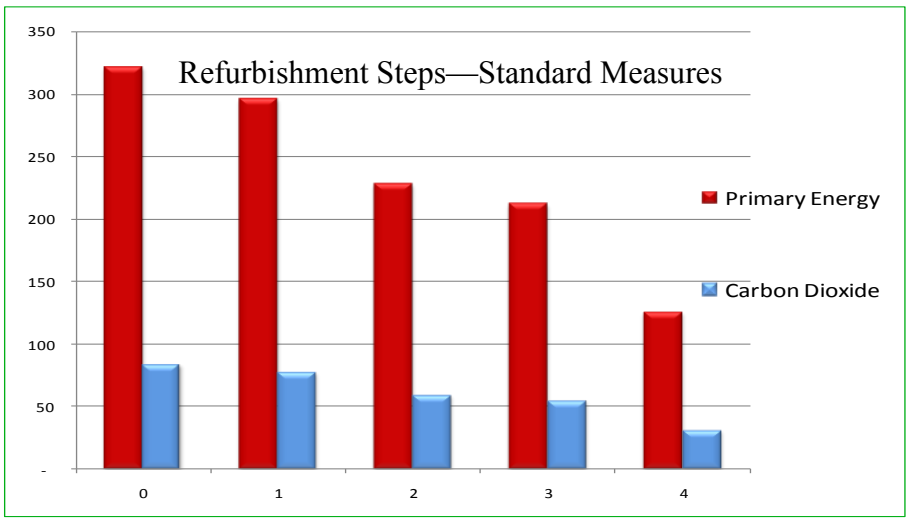
Detached house with hollow block walls. These walls would be dry-lined internally with perhaps 25mm of insulation board on timber battens or else 50mm of fibre insulation may be placed between the battens.

Building elements :		Insulation	U - value
Walls	Concrete hollow block, drylined	25-50 mm	1.1
Roofs	Pitched, insulation between joists	100 mm	0.4
Floors	Solid	10-15 mm	0.64
Windows	Double glazed, metal frame, 6mm gap	n.a.	3.7
Doors	Double glazed, metal frame, 6mm gap	none	3.0

Heating systems characteristics:		Fuel	Efficiency
Primary	Central heating boiler, pipework uninsulated.	Heating oil	75%
Secondary	Open fire in grate	Solid multi-fuel	30%
Hot water	From primary heating system. Electric immersion heater is used in summer.		
Cylinder	Insulated with loose jacket, 35 mm thick, no thermostat		
Controls	Time clock only		

Refurbishment steps — standard				Prim. energy kWh/m²/y	Carbon Dioxide kgCO₂/m²/y	Energy Rating
0	Building fabric upgrade steps:			Expected U-values	**322** (actual state)	**83** (actual state)	**E1**
1	**Roof insulation and standard package***	Add	200 mm mineral wool over the existing insulation.	0.13	296	77	D2
2	**Wall insulation**	Replace insulation	Walls re-drylined with 82.5mm phenolic/urethane boards.	0.27	228	59	D1
3	**Windows and Doors**	Replace	Double glazed low-e windows and doors, air filled, 16mm gap	2.0	212	55	C3
	Systems upgrade:						
4	**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.		**126**	**31**	**B3**

*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**

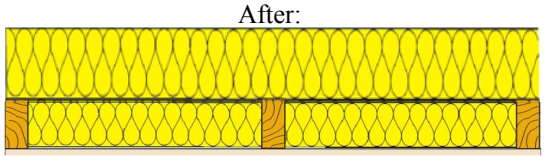
Measure	Estimated costs	Payback (y)
Step 1	€ 1,060	3.9
Step 2	€ 14,780	17.3
Step 3	€ 6,250	11.9
Step 4	€ 3,500	5.0
Total:	**€ 25,590**	**10.9**

Standard upgrade summary

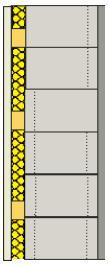
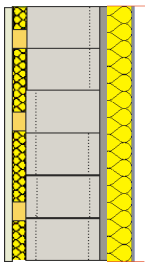
Consumption of primary energy reduced by:	**196 kWh/m²/y**
Emission of carbon dioxide reduced by:	**52 kgCO₂/m²/y**

**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.

Typical roof upgrade (standard/advanced)

100 mm of mineral wool between the ceiling joists	Before: 
Typical roof upgrade includes topping the attic insulation up to 300 mm. Conductivity = 0.04 W/mK	After: 

Typical wall upgrade (advanced)

Before		After	
	Concrete hollow block walls, drylined insulation between the timber battens, U-value =1.1 W/m^{2}K		External wall insulation added, urethane, phenolic or EPS boards, thickness: 80-120mm, conductivity = 0.021—0.031 W/mK

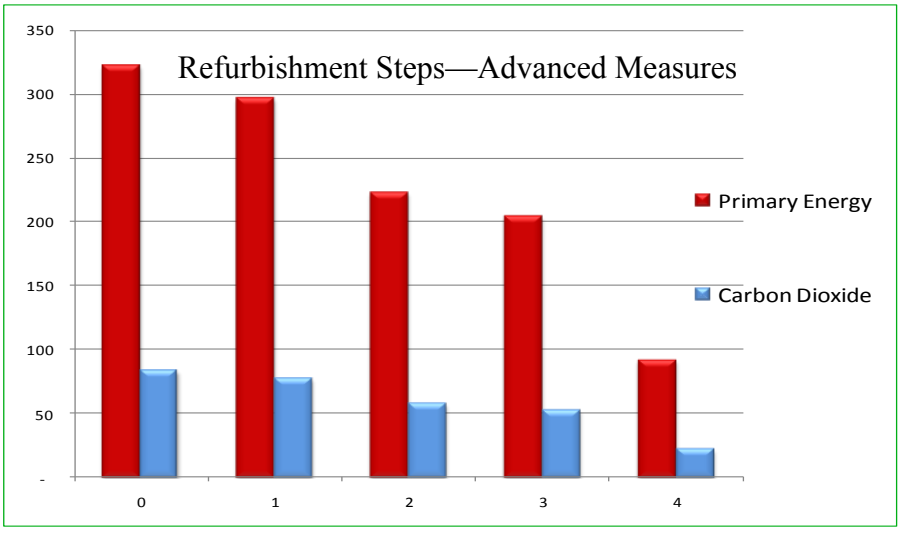
Heating system upgrade

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, load compensation
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	**322** (actual state)	**83** (actual state)	**E1**
1	**Roof insulation and standard package***	Add	200 mm mineral wool over the existing insulation.	0.13	296	77	D2
2	**Wall insulation**	Add	Walls insulated externally with 80-120 mm thick insulation boards	0.21	223	57	C3
3	**Windows and Doors**	Replace	Triple glazed low-e windows and doors, argon filled, 16mm gap	1.3	204	52	C3
	Systems upgrade:						
4	**Space and water heating system and controls**	Replace	Ground source heat pump 400% 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).		**92**	**22**	**B1**

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



Primary Energy: kWh/m^2/y, Carbon Dioxide emissions: kg/m^2/y

Estimated costs and payback time**

Measure	Estimated costs	Payback (y)
Step 1	€ 1,060	3.9
Step 2	€ 19,800	21.5
Step 3	€ 8,250	34.7
Step 4	€ 18,100	11.8
Total:	**€ 47,210**	**12.2**

Advanced upgrade summary

Consumption of primary energy reduced by:	**196 kWh/m^2/y**
Emission of carbon dioxide reduced by:	**52 kgCO$_2$/m^2/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

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