9. Bungalow, hollow block, pre-1978

Description

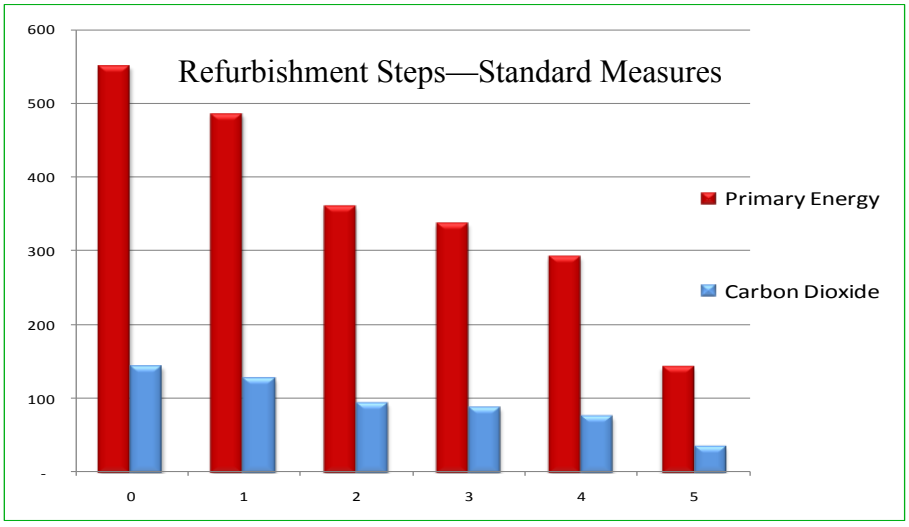
1950s detached bungalow with uninsulated 9 inch (225mm) hollow block walls, uninsulated suspended timber floors and a standard pitched roof insulated at ceiling level between the attic joists. This house type is located in the Dublin and east coast areas in particular.

Building elements :		Insulation	U - value
Walls	Concrete hollow block	none	2.4
Roofs	Main roof insulated on ceiling Flat roof over the extension	50mm none	0.68 2.3
Floors	Suspended wooden floor, unsealed	none	0.69
Windows	Single glazed, wooden frame Single glazed, metal frame	n.a. n.a.	4.8 5.7
Doors	Solid timber doors	none	3.0

Heating systems characteristics:		Fuel	Efficiency
Primary	Central heating boiler, pipework uninsulated.	Heating oil	65%
Secondary	Open fire in grate	Smokeless	30%
Hot water	From primary heating system. Electric immersion heater is used in summer.		
Cylinder	Insulated with 25mm thick loose jacket, 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	**549** (actual state)	**142** (actual state)	**G**
1	**Roof insulation and standard package***	Add	250 mm mineral wool between and over the ceiling joists.	0.13	485	126	G
2	**Wall insulation**	Add	70-100 mm external insulation, main and extension walls (phenolic/urethane/EPS)	0.24-0.27	360	93	E2
3	**Flat roof insulation**	Add	External insulation or drylining boards (urethane/ phenolic) , 100-110 mm	0.22	337	87	E1
4	**Windows and Doors**	Replace	Double glazed low-e windows, air filled, 16mm gap, Insulated doors.	2.0	292	75	D2
	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.		**143**	**35**	**B3**

*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**

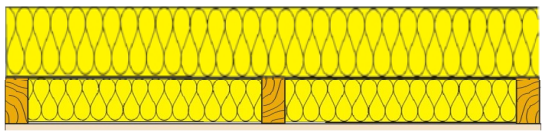
Measure	Estimated costs	Payback (y)
Step 1	€ 2,360	3.1
Step 2	€ 13,050	8.5
Step 3	€ 1,900	6.7
Step 4	€ 9,150	16.5
Step 5	€ 3,500	2.0
Total:	**€ 29,960**	**6.1**

Standard upgrade summary

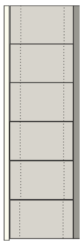
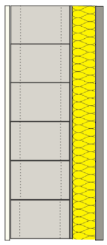
Consumption of primary energy reduced by:	**406 kWh/m²/y**
Emission of carbon dioxide reduced by:	**107 kgCO₂/m²/y**

**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)

50mm 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 (standard)

Before		After	
	Concrete hollow block with render outside and plaster-work inside, uninsulated. U-value =2.4 W/m^{2}K		External insulation added, 70 - 120 mm thick EPS, phenolic or urethane boards with conductivity = 0.021-0.035 W/mK

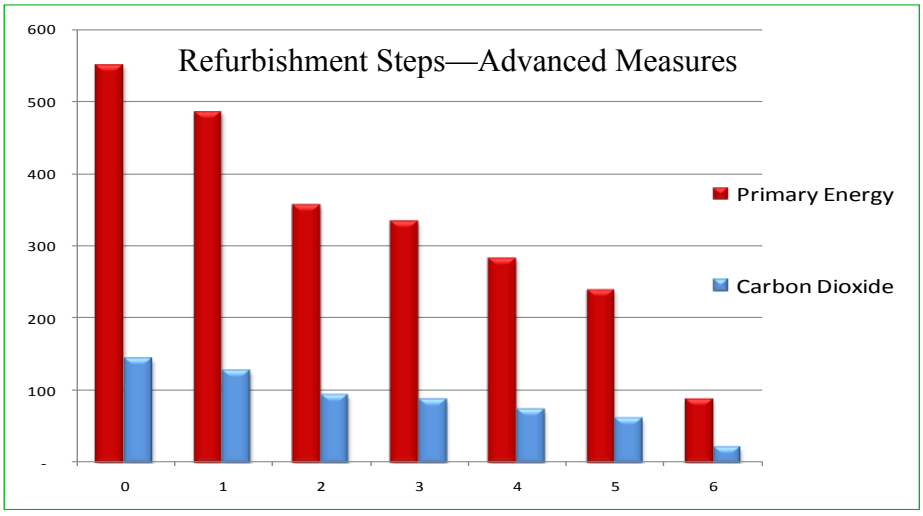
Heating system upgrade

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	**549** (actual state)	**142** (actual state)	**G**
1	**Roof insulation and standard package***	Add	250 mm mineral wool between and over the ceiling joists.	0.13	485	126	G
2	**Wall insulation**	Add	External wall insulation. Thickness: 90-150 mm	0.21	356	92	E2
3	**Flat roof insulation**	Add	External urethane/phenolic insulation, 100-110 mm	0.22	333	86	E1
4	**Windows and Doors**	Replace	Triple glazed, argon filled low-e windows, Insulated doors.	1.3 2.0	283	73	D2
5	**Floors**	Add	Add insulation between the floor joists 70-100mm	0.25	239	61	D1
	Systems upgrade:						
6	**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).		**89**	**21**	**B1**

* package also includes draughtstripping, 80mm lagging jacket for HW 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	€ 2,360	3.1
Step 2	€ 14,400	9.1
Step 3	€ 1,900	6.6
Step 4	€ 12,400	20.0
Step 5	€ 6,800	12.8
Step 6	€ 18,100	9.2
Total	**€ 55.960**	**9.8**

Advanced upgrade summary

Consumption of primary energy reduced by:	**406 kWh/m^2/y**
Emission of carbon dioxide reduced by:	**107 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

INTELLIGENT ENERGY EUROPE