20. Semi detached house, cavity walls, 1983-1993

Description

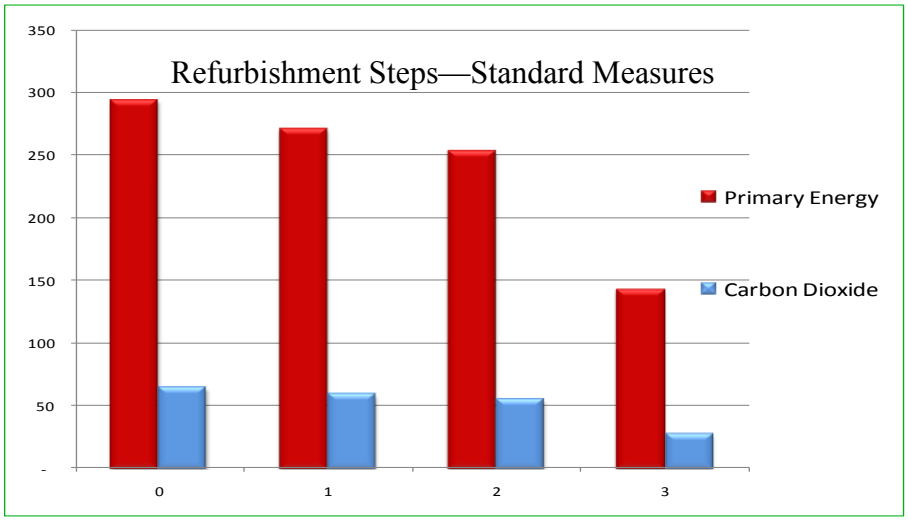
Semi-detached house with part-filled cavity walls and solid floors. The part-filled cavity can be full-filled by pumping in additional insulation beads. This house type is common throughout Ireland during the 1980s.

Building elements :		Insulation	U - value
Walls	Cavity walls, partially filled	25-50 mm	0.6
Roofs	Pitched, insulation between joists	100 mm	0.4
Floors	Solid	10-15 mm	0.64
Windows	Double glazed, PVC frame, 6 mm gap	n.a	3.1
Doors	Solid wooden	none	3.0

Heating systems characteristics:		Fuel	Efficiency
Primary	Central heating boiler, pipework uninsulated.	Mains gas	75%
Secondary	Open fire in grate	Smokeless	30%
Hot water	From primary heating system. Electric immersion heater is used in summer.		
Cylinder	Insulated, loose jacket 35mm, no cylinder thermostat.		
Controls	Programmer.		

Refurbishment steps — standard					Prim. energy kWh/m²/y	Carbon Dioxide kgCO₂/m²/y	Energy Rating
0	Building fabric upgrade steps:			Expected U-values	**294** (actual state)	**63** (actual state)	**D2**
1	**Roof insulation and standard package***	Add	200 mm mineral wool over the existing insulation.	0.13	271	58	D2
2	**Wall insulation**	Add	Remaining cavity (50mm) filled with insulation beads	0.27	253	54	D1
	Systems upgrade:						
3	**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**	**27**	**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**

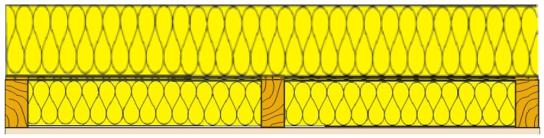
Measure	Estimated costs	Payback (y)
Step 1	€ 760	5.4
Step 2	€ 870	10.6
Step 3	€ 3,000	5.3
Total:	**€ 4,630**	**5.9**

Standard upgrade summary

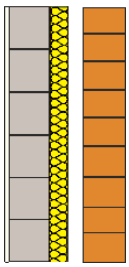
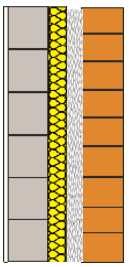
Consumption of primary energy reduced by:	**151 kWh/m²/y**
Emission of carbon dioxide reduced by:	**36 kgCO₂/m²/y**

**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 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	
	Cavity walls, partially filled with insulation boards, 25-50 mm thick. U-value = 0.6 W/m^{2}K		Remaining cavity filled with insulation beads, conductivity = 0.033 W/mK

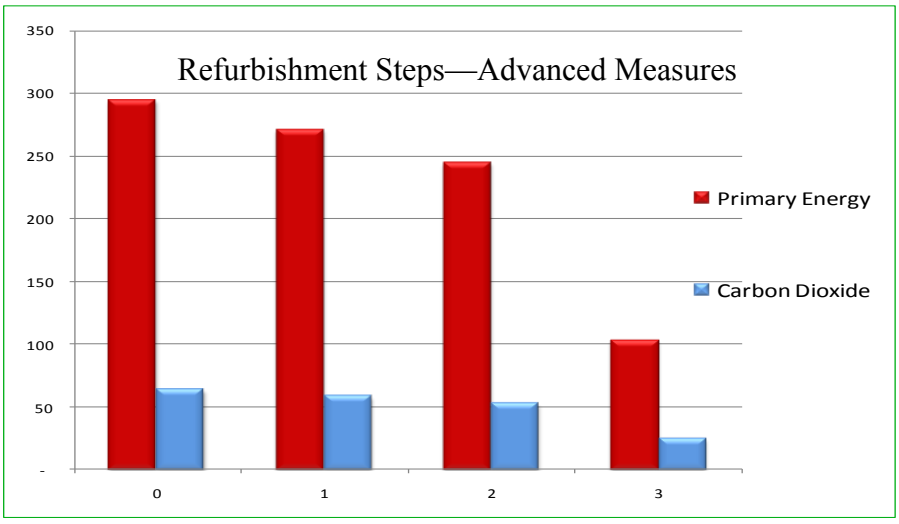
Heating system upgrade

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 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	**294** (actual state)	**63** (actual state)	**D2**
1	**Roof insulation and standard package***	Add	200 mm mineral wool over the existing insulation.	0.13	271	58	D2
2	**Wall insulation**	Add	Remaining cavity (50mm) filled with insulation beads, walls insulated internally with 50 mm phenolic / urethane drylining boards	0.21	244	53	D1
	Systems upgrade:						
3	**Space and water heating system and controls**	Replace	Air source heat pump 380% 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).		**103**	**25**	**B2**

* 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	€ 760	5.4
Step 2	€ 7,800	64.5
Step 3	€ 13,100	24.7
Total:	**€ 21,660**	**27.4**

Advanced upgrade summary

Consumption of primary energy reduced by:	**191 kWh/m^2/y**
Emission of carbon dioxide reduced by:	**38 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