



Building elements :		Insulation	U - value
Walls	Solid mass concrete	none	2.2
Roofs	Pitched, insulation between joists Flat roof (kitchen)	50 mm none	0.68 2.3
Floors	Solid floor	none	0.84
Windows	Single glazed, wooden frame	n.a.	4.8
Doors	Solid timber (back door)	none	3.0
Heating systems characteristics:		Fuel	Efficiency
Primary	Central heating boiler, pipework uninsulated	Heating oil	65%
Secondary	Open fire in grate	Coal	30%
Hot water	From primary heating system. Electric immersion used in Summer.		
Cylinder	Insulated with loose jacket, 25mm, no cylinder thermostat		
Controls	Programmer only		

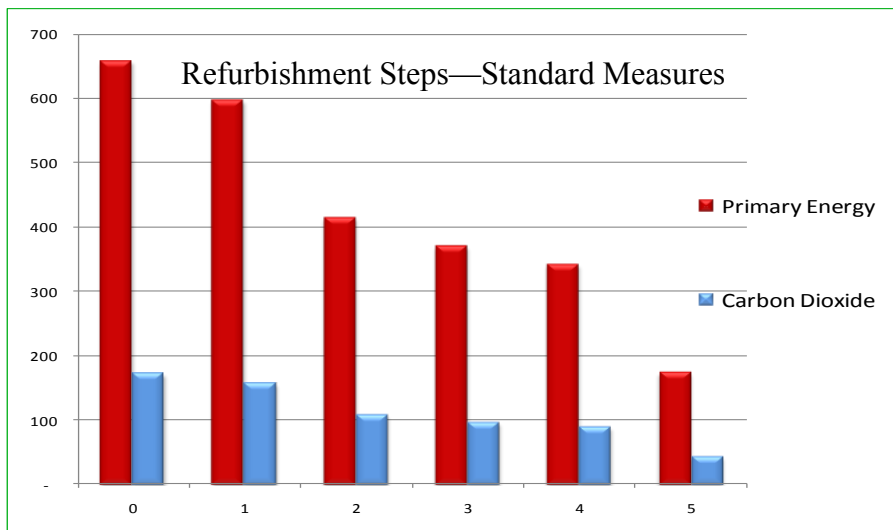
Description

This house type very common in rural areas and towns in 1940s and 1950s. Mass concrete walls have good thermal mass and is suited for external insulation. Flat roof often in kitchen annex.

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	657 (actual state)	171 (actual state)	G
1	Roof insulation and standard package*	Add	250 mm of mineral wool between and over the ceiling joists	0.13	596	156	G
2	Wall insulation	Add	External wall insulation. Thickness: 70-100 mm	0.27	414	107	F
3	Flat roof	Add	Flat roof drylined or externally insulated, 80-110 mm	0.22	369	96	E2
4	Windows and Doors	Replace	Double glazed, low-e windows, air filled, 16mm gap Insulated doors	2.0	341	88	E2
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.		174	43	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

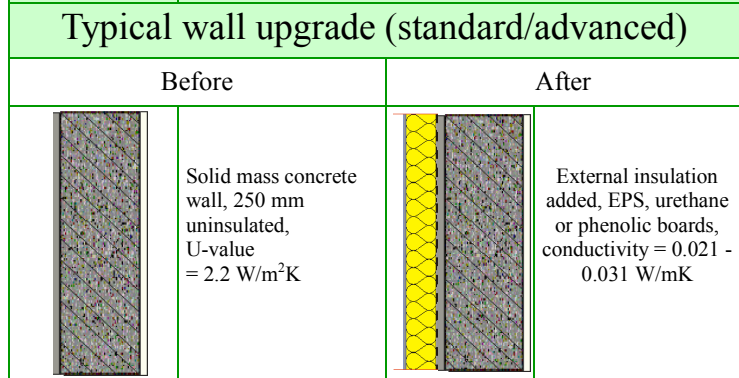
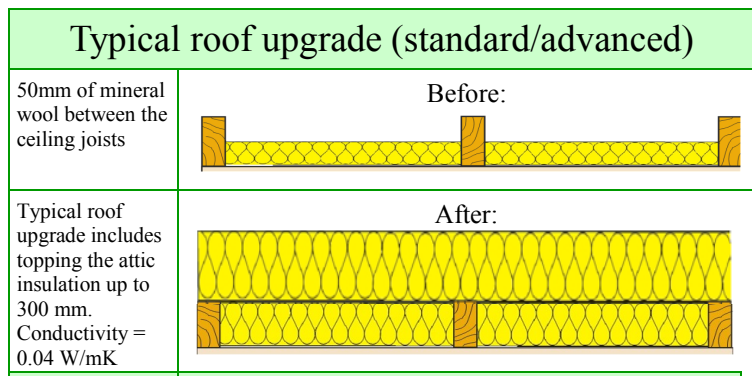
Estimated costs and payback time**

Measure	Estimated costs	Payback (y)
Step 1	€ 1,670	7.7
Step 2	€ 15,800	9.3
Step 3	€ 2,700	6.6
Step 4	€ 5,230	19.8
Step 5	€ 3,000	2.0
Total:	€ 28,400	7.0

Standard upgrade summary**

Consumption of primary energy reduced by:	483 kWh/m²/y
Emission of carbon dioxide reduced by:	128 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.



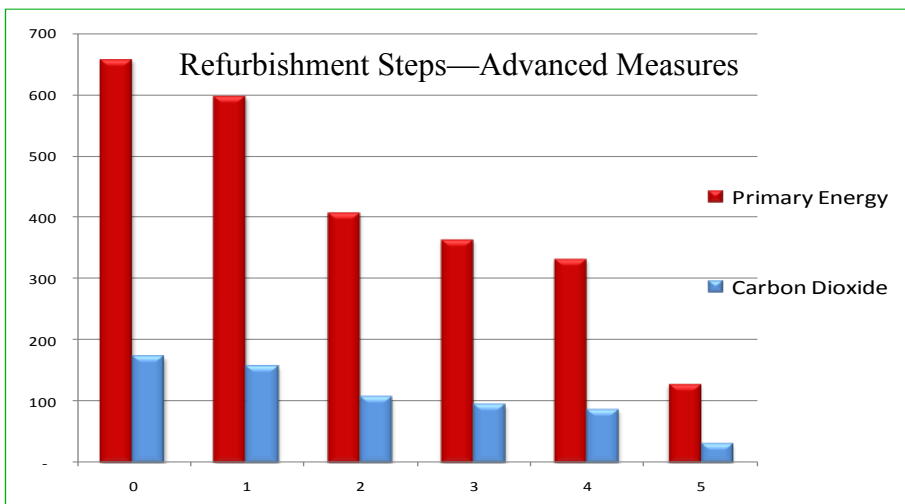
Heating system upgrade

Feature:	Standard	Advanced
Heat generator	Regular condensing boiler	Ground source heat pump
Efficiency:	90%	400%
Fuel:	Heating oil	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	657 (actual state)	171 (actual state)	G
1	Roof insulation and standard package*	Add	250 mm of mineral wool between and over the ceiling joists	0.13	596	156	G
2	Wall insulation	Add	External wall insulation, Thickness: 90-150 mm	0.21	407	106	F
3	Flat roof	Add	Flat roof drylined or externally insulated	0.22	363	94	E2
4	Windows and Doors	Replace	Insulated PVC/wooden doors Triple glazed, argon filled, low-e windows	2.0 1.3	331	85	E1
Systems upgrade:							
5	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).		128	30	B

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



Estimated costs and payback time**

Measure	Estimated costs	Payback (y)
Step 1	€ 1,670	7.7
Step 2	€ 17,400	9.9
Step 3	€ 2,700	6.6
Step 4	€ 7,450	24.7
Step 5	€ 16,100	7.9
Total:	€ 45,320	9.6

Advanced upgrade summary**

Consumption of primary energy reduced by:	529 kWh/m²/y
Emission of carbon dioxide reduced by:	141 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.