EIE Projekt ROSH

Development and marketing of integrated concepts for energy efficient

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Cost data base on retrofitting investments / equipment and sustainable retroffiting of social housing

WP 3	Advanced Tailored Financial Schemes
Task 3.1	Analysis of existing financial mechanisms and economic conditions
Deliverable	D 14

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Investment costs

Windows & doors

Total investment costs, including material, manwork and transport

Reference building: stand alone building, 1.000 m² floor area, 140.000 kWh/m².a, 100 kW, 12 flats, 4 floors, gross floor area: 320 m², building height 13 m

Reference installations: central heating system, fuel: oil (extra light), boiler: constant temperature, domestic hot water: decentral (electric), regulation: depending on outside temperature, 2 heater circuits, 2 pipes-system, pipes insulated (2/3 of the pipe diameter), 2 pumps: single level - not insulated, 5 radiators per flat (total 60 radiators), manually operated radiator valves, conventional chimney: 16 cm diameter

Nr.	activity	material	thermal quality	net amount [€]	reference	VAT [%]	gross amount [€]	share of salery on total costs [%]	average life [a]
1.1.1	repair of windows: painting of window frame	-	-	18,00	/m² window	10,00	19,80	40,00%	15
	repair of windows: painting of window frame & improving air tightness	-	-	61,00	/m² window	10,00	67,10	40,00%	15
1.1.2	replacement of panes	-	thermal insulation glazing and thermal edge bonding	76,00	/m² window	10,00	83,60	40,00%	40
		-	3-pane glazing	84,00	/m² window	10,00	92,40	40,00%	40
1.1.3	replacement of windows	wood frame	thermal insulation glazing and thermal edge bonding	239,00	/m² window	10,00	262,90	20,00%	30
		wood frame	3-pane glazing	312,00	/m² window	10,00	343,20	20,00%	30
		aluminium clad wood frame	thermal insulation glazing and thermal edge bonding	385,00	/m² window	10,00	423,50	20,00%	50
		aluminium clad wood frame	3-pane glazing	410,00	/m² window	10,00	451,00	20,00%	50
		vinyl frame	thermal insulation glazing and thermal edge bonding	267,00	/m² window	10,00	293,70	20,00%	40
		vinyl frame	3-pane glazing	306,00	/m² window	10,00	336,60	20,00%	40
1.2	installation of shutters	jalousie	-	157,00	/m² window	10,00	172,70	20,00%	30
		rolling shutter	-	55,00	/m² window	10,00	60,50	40,00%	30
		marquee	-	27,00	/m² window	10,00	29,70	50,00%	15
1.3	replacement of main entrance door	wooden	-	353,00	/m² door	10,00	388,30	30,00%	40
		vinyl	-	n.m.	/m² door	10,00		30,00%	40
					/m² door	10,00	0,00		

Investment costs

Insulation

Total investment costs, including material, manwork and transport

Reference building: stand alone building, 1.000 m² floor area, 140.000 kWh/m².a, 100 kW, 12 flats, 4 floors, gross floor area: 320 m², building height 13 m

Reference installations: central heating system, fuel: oil (extra light), boiler: constant temperature, domestic hot water: decentral (electric), regulation: depending on outside temperature, 2 heater circuits, 2 pipes-system, pipes insulated (2/3 of the pipe diameter), 2 pumps: single level - not insulated, 5 radiators per flat (total 60 radiators), manually operated radiator valves, conventional chimney: 16 cm diameter

Nr.	activity	material	thickness	net amount [€]	reference	VAT [%]	gross amount [€]	costs for additional insulation [€/cm]	share of salery on total costs [%]	average life [a]
1.4	total insulation of balconies	PS	10 cm	28,00	/m² floor	10,0	30,80	1,90	30,00	20
		PS	16 cm	42,00	/m² floor	10,0	46,20	1,90	30,00	20
		PU	10 cm	33,50	/m² floor	10,0	36,85	1,90	30,00	20
		PU	16 cm	51,00	/m² floor	10,0	56,10	1,90	30,00	20
		mineral wool	10 cm	12,00	/m² floor	10,0	13,20	1,81	30,00	20
		mineral wool	16 cm	18,00	/m² floor	10,0	19,80	1,81	30,00	20
1.5	changing balconies to wintergardens (1)	wooden construction	low energy standard		/m² floor	10,0	0,00			
		wooden construction	passive house standard		/m² floor	10,0	0,00			
		aluminium construction	low energy standard		/m² floor	10,0	0,00			
		aluminium construction	passive house standard		/m² floor	10,0	0,00			
2.1	insulation of basement walls against external air	PS	10 cm	47,00	/m² wall	10,0	51,70	1,90	20,00	20
		PS	16 cm	61,00	/m² wall	10,0	67,10	1,90	20,00	20
		PU	10 cm	52,00	/m² wall	10,0	57,20	1,90	20,00	20
		PU	16 cm	70,00	/m² wall	10,0	77,00	1,90	20,00	20
		mineral wool	10 cm	31,00	/m² wall	10,0	34,10	1,81	20,00	20
		mineral wool	16 cm	37,00	/m² wall	10,0	40,70	1,81	20,00	20
2.2	insulation of basement walls against soil	PS	10 cm	47,00	/m² wall	10,0	51,70	1,90	20,00	20

Nr.	activity	material	thickness	net amount [€]	reference	VAT [%]	gross amount [€]	costs for additional insulation [€/cm]	share of salery on total costs [%]	average life [a]
		PS	16 cm	61,00	/m² wall	10,0	67,10	1,90	20,00	20
		PU	10 cm	52,00	/m² wall	10,0	57,20	1,90	20,00	20
		PU	16 cm	70,00	/m² wall	10,0	77,00	1,90	20,00	20
		mineral wool	10 cm	31,00	/m² wall	10,0	34,10	1,81	20,00	20
		mineral wool	16 cm	37,00	/m² wall	10,0	40,70	1,81	20,00	20
2.3	insulation of basement wall against unheated basement	PS	10 cm	37,00	/m² wall	10,0	40,70	1,90	20,00	20
		PS	16 cm	50,00	/m² wall	10,0	55,00	1,90	20,00	20
		PU	10 cm	42,00	/m² wall	10,0	46,20	1,90	20,00	20
		PU	16 cm	60,00	/m² wall	10,0	66,00	1,90	20,00	20
		mineral wool	10 cm	25,00	/m² wall	10,0	27,50	1,81	20,00	20
		mineral wool	16 cm	30,00	/m² wall	10,0	33,00	1,81	20,00	20
2.4.1	insulation of base plate	PS	10 cm	u.k.	/m² floor	10,0	#WERT!			
		PS	16 cm	u.k.	/m² floor	10,0	#WERT!			
		PU	10 cm	u.k.	/m² floor	10,0	#WERT!			
		PU	16 cm	u.k.	/m² floor	10,0	#WERT!			
		mineral wool	10 cm	u.k.	/m² floor	10,0	#WERT!			
		mineral wool	16 cm	u.k.	/m² floor	10,0	#WERT!			
2.4.2	insulation of basement ceiling against unheated basement	PS	10 cm	47,00	/m² floor	10,0	51,70	1,90	20,00	20
		PS	16 cm	61,00	/m² floor	10,0	67,10	1,90	20,00	20
		PU	10 cm	52,00	/m² floor	10,0	57,20	1,90	20,00	20
		PU	16 cm	70,00	/m² floor	10,0	77,00	1,90	20,00	20
		mineral wool	10 cm	31,00	/m² floor	10,0	34,10	1,81	20,00	20
		mineral wool	16 cm	37,00	/m² floor	10,0	40,70	1,81	20,00	20
2.5.1	insulation of exterior wall	PS	10 cm	47,00	/m² wall	10,0	51,70	1,90	20,00	30

Nr.	activity	material	thickness	net amount [€]	reference	VAT [%]	gross amount [€]	costs for additional insulation [€/cm]	share of salery on total costs [%]	average life [a]
		PS	16 cm	61,00	/m² wall	10,0	67,10	1,90	20,00	30
		mineral wool	10 cm	31,00	/m² wall	10,0	34,10	1,81	20,00	30
		mineral wool	16 cm	37,00	/m² wall	10,0	40,70	1,81	20,00	30
2.5.2	painting of outer wall	-	-	7,00	/m² wall	10,0	7,70		50,00	15
2.5.3	renewing of external plaster (without insulation)	-	-	18,00	/m² wall	10,0	19,80		40,00	30
2.6	insulation of top floor slab	PS	24 cm	61,00	/m² floor	10,0	67,10	1,80	20,00	20
		PS	36 cm	90,00	/m² floor	10,0	99,00	1,80	20,00	20
		mineral wool	24 cm	66,00	/m² floor	10,0	72,60	1,00	20,00	20
		mineral wool	36 cm	84,00	/m² floor	10,0	92,40	1,00	20,00	20
2.7	insulation of high peaked roof	PS	24 cm	61,00	/m² floor	10,0	67,10	1,80	20,00	20
		PS	36 cm	90,00	/m² floor	10,0	99,00	1,80	20,00	20
		mineral wool	24 cm	66,00	/m² floor	10,0	72,60	1,00	20,00	20
		mineral wool	36 cm	84,00	/m² floor	10,0	92,40	1,00	20,00	20
2.8	substitution of a flat roof with an attic roof	-	-	80,00	/m² roof	10,0	88,00		40,00	40
2.9	insulation of flat roof	PS	24 cm	61,00	/m² roof	10,0	67,10	1,80	20,00	20
		PS	36 cm	90,00	/m² roof	10,0	99,00	1,80	20,00	20
		PU	24 cm	52,00	/m² roof	10,0	57,20	1,80	20,00	20
		PU	36 cm	70,00	/m² roof	10,0	77,00	1,80	20,00	20
		mineral wool	24 cm	66,00	/m² roof	10,0	72,60	1,00	20,00	20
		mineral wool	36 cm	84,00	/m² roof	10,0	92,40	1,00	20,00	20

(1) There are no "standard", costs are the same for Windows

Investment costs

Building services

Total investment costs, including material, manwork and transport

Reference building (insulated!): stand alone building, 1.000 m² floor area, **70.000 kWh/m².a, 50 kW,** 12 flats, 4 floors, gross floor area: 320 m², building height 13 m

Reference installations: central heating system, fuel: oil (extra light), boiler: constant temperature, domestic hot water: decentral (electric), regulation: depending on outside temperature, 2 heater circuits, 2 pipes-system, pipes insulated (2/3 of the pipe diameter), 2 pumps: single level - not insulated, 5 radiators per flat (total 60 radiators), manually operated radiator valves, conventional chimney: 16 cm diameter

Nr.	activity	net amount [€]	reference	VAT [%]	gross amount [€]	costs for additional power [€/10kW]	share of salery on total costs [%]	average life [a]
3.1	installation of a condensing gas-boiler (including fee for connecting to the gas-net)	11,00	/m² floor area	10,0	12,10	n.e.	30,00	15
3.2	installation of a gas-boiler (including fee for connecting to the gas-net)	9,00	/m² floor area	10,0	9,90	n.e.	30,00	15
3.3	installation of a condensing oil-boiler	4,00	/m² floor area	10,0	4,40	n.e.	30,00	15
3.4	installation of an oil-boiler	n.m.	/m² floor area	10,0	#WERT!	n.e.		15
3.5	installation of a district heating station, including fee for connection to district heating system	n.m.	/m² floor area	10,0	#WERT!	n.e.		15
3.6	installation of a pellets-boiler (10-12)	11,00	/m² floor area	10,0	12,10	n.e.	30,00	15
3.7	installation of a biomass-boiler with heat storage (18-20)	19,00	/m² floor area	10,0	20,90	n.e.	30,00	15
3.8.1	installation of an electric heatpump (vertical borehole system) (100-150)	125,00	/m² floor area	10,0	137,50	n.e.	30,00	15
3.8.2	installation of an electric heatpump (horizontal pipe trench system) (70-110)	90,00	/m² floor area	10,0	99,00	n.e.		15
3.9	installation of a solar system for hot water supply (35 m² collectors, 1.700 l storage) (20-25)	22,50	/m² floor area	10,0	24,75	n.e.	40,00	18
3.10	installation of a solar combi system - for hot water & heating (90 m² collectors, 4.500 l storage) (40-50)	45,00	/m² floor area	10,0	49,50	n.e.	40,00	18
3.11	installation of a photovoltaik system (40 m² PV-panels) (150-175)	162,50	/m² floor area	10,0	178,75	n.e.	40,00	18
3.12	installation of a decentral ventilation system - with heat recovery (3 ventilation appliances per flat)	13,00	/m² floor area	10,0	14,30	n.e.	30,00	20
3.13	installation of a central ventilation system - with heat recovery (3 exhausts for inlet air and 3 discharge air outlets per flat)	18,00	/m² floor area	10,0	19,80	n.e.	30,00	20
3.14	insulation of pipelines (thickness corresponds to diameter of pipes)	2,50	/m² floor area	10,0	2,75	n.e.	60,00	25
3.15	installation of thermostatic valves	2,50	/m² floor area	10,0	2,75	n.e.	40,00	15
3.16	installation of energyefficient and speed controlled pumps	1,50	/m² floor area	10,0	1,65	n.e.	30,00	15
3.17	hydraulic adjustment	1,90	/m² floor area	10,0	2,09	n.e.	80,00	

Running costs

Fuel costs only for heating

Reference building : insulated! (see 1.3_Building services)
Definitions:
old heating system : ~ 30 years old
new heating system : new installed heating system
efficiency of heating system : includes heat losses of boiler (heat exchanger, heat pump, oven), storage, distribution and heat dissipation (e.g. radiator) for an average old heating system and for an average new heating system

Nr.	heating system	fuel	unit [...]	net amount [€/...]	energy content [kWh/...]	efficiency of old heating system [%]	efficiency of new heating system [%]
1.1.	central heating	biomass	pm				
1.2		pellets	kg				
1.3		district heatin	kWh				
1.4		oil	l				
1.5		gas	m³				
1.6		heat pump	kWh				
2.1	individual central heating	biomass	pm				
2.2		pellets	kg				
2.3		district heatin	kWh				
2.4		oil	l				
2.5		gas	m³				
3.1	stove heating	biomass	pm				
3.2		pellets	kg				
3.3		oil	l				
3.4		gas	m³				
3.5		electricity	kWh				
3.6		coal	kg				

Running costs for old heating systems

Reference building: insulated! (see 1.3_Building services)
Definitions:
Net amount in € per kWh: is estimated by the total energy costs and the efficiency of the heating system
Total energy costs include fuel costs as well as costs for maintenance, for delivery of fuels, for chimney sweeper, for electricity of pumps, regulation etc., for mandatory checks, for meter charge, for demand rate (dirstrict heating) and for costs which occure irrespective of consumption (e.g. costs for network access)
Efficiency of heating system: see 2.1_Fuel costs

Nr.	heating system	fuel	net amount [€/kWh]	VAT [%]	gross amount [€/kWh]
1.1.	central heating	biomass			0,00
1.2		pellets			0,00
1.3		district heating			0,00
1.4		oil			0,00
1.5		gas			0,00
1.6		heat pump			0,00
2.1	individual central heating	biomass			0,00
2.2		pellets			0,00
2.3		district heating			0,00
2.4		oil			0,00
2.5		gas			0,00
3.1	stove heating	biomass			0,00
3.2		pellets			0,00
3.3		oil			0,00
3.4		gas			0,00
3.5		electricity			0,00
3.6		coal			0,00

Running costs for new heating systems

Reference building: insulated! (see 1.3_Building services)
Definitions:
Net amount in € per kWh: is estimated by the total energy costs and the efficiency of the heating system
Total energy costs include fuel costs as well as costs for maintenance, for delivery of fuels, for chimney sweeper, for electricity of pumps, regulation etc., for mandatory checks, for meter charge, for demand rate (dirstrict heating) and for costs which occure irrespective of consumption (e.g. costs for network access)
Efficiency of heating system: see 2.1_Fuel costs

Nr.	heating system	fuel	net amount [€/kWh]	VAT [%]	gross amount [€/kWh]
1.1.	central heating	biomass			0,00
1.2		pellets			0,00
1.3		district heating			0,00
1.4		oil			0,00
1.5		gas			0,00
1.6		heat pump			0,00
2.1	individual central heating	biomass			0,00
2.2		pellets			0,00
2.3		district heating			0,00
2.4		oil			0,00
2.5		gas			0,00
3.1	stove heating	biomass			0,00
3.2		pellets			0,00
3.3		oil			0,00
3.4		gas			0,00
3.5		electricity			0,00
3.6		coal			0,00

Running costs

Total operating costs: without energy costs

	net amount [€/per total floor area]	**VAT** [%]	**gross amount** [€/per total floor area]
minimum			0,00
maximum			0,00
on average			0,00