



EIE Projekt ROSH

Development and marketing of integrated concepts for energy efficient and sustainable retrofitting of social housing

[www. Rosh-project.eu](http://www.Rosh-project.eu)

Cost data base on retrofitting investments / equipment

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

Country Germany
Organisation AKNDS
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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	Netto-Kosten		Mwst.	Brutto-Kosten	Anteil der Arbeitskosten in %	durchschn. Lebensdauer des Bauteils
				net amount	reference	VAT	gross amount	share of salary on total costs	average life
				[€]		[%]	[€]	[%]	[a]
1.1.1	repair of windows: painting of window frame	-	17-36 €	25	/m ² window	19,0	30		5 - 10
	repair of windows: painting of window frame & improving air tightness	-	40-50€	45	/m ² window	19,0	54		5 - 10
1.1.2	replacement of panes	-	thermal insulation glazing and thermal edge bonding	40	/m ² window	19,0	48		8 - 15
		-	3-pane glazing - 3-Scheiben-Verglasung		/m ² window	19,0	0		
		-	passive-house panes		/m ² window	19,0	0		
1.1.3	replacement of windows	wood frame	thermal insulation glazing and thermal edge bonding	400	/m ² window	19,0	476		15 - 25
		wood frame	3-pane glazing		/m ² window	19,0	0		
		wood frame	passive-house panes (500-550€)	550	/m ² window	19,0	655		
		aluminium clad wood frame	thermal insulation glazing and thermal edge bonding (480-560)	560	/m ² window	19,0	666		
		aluminium clad wood frame	3-pane glazing		/m ² window	19,0	0		
		aluminium clad wood frame	passive-house panes 550-600)	600	/m ² window	19,0	714		
		vinyl frame	thermal insulation glazing and thermal edge bonding	280	/m ² window	19,0	333		
		vinyl frame	3-pane glazing	470	/m ² window	19,0	559		
		vinyl frame	passive-house panes (400-450€)	450	/m ² window	19,0	536		
1.2	installation of shutters	jalousie		173	/m ² window	19,0	206		12 - 20
		rolling shutter	-	180	/m ² window	19,0	214		

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				[€]		[%]	[€]	[%]	[a]
1.3	ohne Einbau replacement of main entrance door	marquee	-	340	/m ² window	19,0	405		15 - 25
		wooden	-	1.100	/m ² door	19,0	1.309		
		vinyl	-	640	/m ² door	19,0	762		
			-		/m ² door	19,0	0		

Investment costs

Insulation

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Nr.	activity	material	thickness	net amount	reference	VAT	gross amount	costs for additional insulation	share of salary on total costs	average life
				[€]		[%]	[€]	[€/cm]	[%]	[a]
1.4	insulation of balconies including surface	PS	10 cm		/m ² surface	19,0	0			
		PU	10 cm		/m ² floor	19,0	0			
		mineral wool	10 cm	150	/m ² floor	19,0	179			
1.5	changing balconies to wintergardens	wooden construction		420	/m ² window	19,0	500			
		aluminium construction		430	/m ² floor	19,0	512			
2.1	insulation of basement walls against external air including surface				/m ² floor	19,0	0			
		PS	10 cm	95	/m ² wall	19,0	113			
		PU	10 cm	30	/m ² wall	19,0	36			
2.2	insulation of basement walls against soil	mineral wool	10 cm		/m ² wall	19,0	0			
		PS	10 cm	90	/m ² wall	19,0	94			
		PU	10 cm		/m ² wall	19,0	0			
2.3	insulation of basement wall against unheated basement including surface	mineral wool	10 cm		/m ² wall	19,0	0			
		PS	10 cm	50	/m ² wall	19,0	60			
		PU	10 cm		/m ² wall	19,0	0			
2.4.1	insulation of base plate	mineral wool	10 cm		/m ² wall	19,0	0			
		PS	10 cm	22	/m ² floor	19,0	26			
		PU	10 cm	21	/m ² floor	19,0	25			
		mineral wool	10 cm		/m ² floor	19,0	0			

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Nr.	activity	material	thickness	net amount	reference	VAT	gross amount	costs for additional insulation	share of salary on total costs	average life
				[€]		[%]	[€]	[€/cm]	[%]	[a]
2.4.2	insulation of basement ceiling against unheated basement	PS	10 cm	55	/m ² floor	19,0	65			
		PU	10 cm		/m ² floor	19,0	0			
		mineral wool	10 cm	60	/m ² floor	19,0	71			
2.5.1	insulation of exterior wall, inc. surface (includes plaster, without cost for scaffolding)	PS	10 cm	90	/m ² wall	19,0	107			
		mineral wool	10 cm	130	/m ² wall	19,0	155			
					/m ² wall	19,0	0			
2.5.2	painting of outer wall	(6-9€)	-	9	/m ² wall	19,0	11			
2.5.3	renewing of external plaster (without insulation)	-	-	67	/m ² wall	19,0	80			
2.6	insulation of top floor slab	PS	10 cm	17	/m ² floor	19,0	20			
		mineral wool	10 cm	13	/m ² floor	19,0	15			
					/m ² floor	19,0	0			
2.7	insulation of high peaked roof 24 cm insulation needs new roof surface	PS	24 cm	unimplemented in Germany	/m ² floor	19,0				
		mineral wool	24 cm	165	/m ² floor	19,0	196			
					/m ² floor	19,0	0			
2.8	substitution of a flat roof with an attic roof	-	-		/m ² roof	19,0	0			
2.9	insulation of flat roof (10-20)	PS	24 cm	160	/m ² roof	19,0	190			
		PU	24 cm		/m ² roof	19,0	0			
		mineral wool	24 cm	175	/m ² roof	19,0	208			

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

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Further references for the mentioned sums:

each flat 5 heating objects

Criteria / Footnotes for the No. in detail

3.6. and 3.7. additional costs for space / room for fuel tank

3.16. average life for pipes 40 years, for heating 30



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)	9,40	/m ² floor area	19,0	11,66			20
3.2	installation of a gas-boiler (including fee for connecting to the gas-net)	8,55	/m ² floor area	19,0	12,50			20
3.3	installation of a condensing oil-boiler	14,00	/m ² floor area	19,0	22,61			20
3.4	installation of an oil-boiler	8,20	/m ² floor area	19,0	11,66			20
3.5	installation of a district heating station, including fee for connection to district heating system	2,50	/m ² floor area	19,0	4,76			20
3.6	installation of a pellets-boiler	31,60	/m ² floor area	19,0	53,55			20
3.7	installation of a biomass-boiler with heat storage	14,00	/m ² floor area	19,0	33,32			20
3.8.1	installation of an electric heatpump (<i>Tiefenbohrung</i>)	61,00	/m ² floor area	19,0	116,62			20
3.8.2	installation of an electric heatpump (<i>Flachkollektor</i>)	28,00	/m ² floor area	19,0	66,64			20
3.9	installation of a solar system for hot water supply (35 m ² collectors, 1.700 l storage)	15,00	/m ² floor area	19,0	16,66			20
3.10	installation of a solar combi system - for hot water & heating (90 m ² collectors, 4.500 l storage)	50,50	/m ² floor area	19,0	67,83			20
3.11	installation of a photovoltaik system (40 m ² PV-panels)	750,00	/m ² floor area	19,0	892,50			20
3.12	installation of a decentral ventilation system - with heat recovery (3 ventilation appliances per flat)	36,50	/m ² floor area	19,0	45,22			20
3.13	installation of a central ventilation system - with heat recovery (3 exhausts for inlet air and 3 discharge air outlets per flat)	78,00	/m ² floor area	19,0	90,44			20

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Nr.	activity	net amount [€]	reference	VAT [%]	gross amount [€]	costs for additional power [€/10kW]	share of salery on total costs [%]	average life [a]
3.14	insulation of pipelines (thickness corresponds to diameter of pipes)	14,50	/m ² floor area	19,0	17,26			20
3.15	installation of thermostatic valves	5,60	/m ² floor area	19,0	6,66			20
3.16	installation of energyefficient and speed controlled pumps	37,50	/m ² floor area	19,0	44,63			30 to 40
3.17	hydraulic adjustment	19,50	/m ² floor area	19,0	23,21			-

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 heating system [%]	cost note
1.1.	central heating	biomass wood, dry	m ³	0,260	4,7	80,00	incl. delivery
1.2		pellets	kg	0,198	4,9	82,00	incl. delivery
1.3		district heating	kWh	0,070	1 - 1	therm. : 85,00	
1.4		oil	l	0,935	10,0	80,00	3000 l - demand
1.5		gas	m ³	0,750	11,0	NT: 76,00 BW: 87,00	
1.6		heat pump	kWh	0,135	1 - 3 to 1 - 5	95,00	depends on power ratio of heat pump: 1/3 to 1/5
2.1	individual central heating	biomass	pm	0,260	4,7	80,00	incl. delivery
2.2		pellets	kg	0,198	4,9	82,00	incl. delivery
2.3		district heating	kWh	0,070	1 - 1	therm. : 85,00	
2.4		oil	l	0,950	10,0	80,00	2000 l - demand
2.5		gas	m ³	0,790	11,0	NT: 76,00 BW: 87,00	
3.1	stove heating	biomass	pm	n.e.	4,7	80,00	
3.2		pellets	kg	n.e.	4,9	82,00	
3.3		oil	l	1,013	10,0	80,00	1000 l - demand
3.4		gas	m ³	0,790	11,0	NT: 76,00 BW: 87,00	
3.5		electricity	kWh	0,14	1 - 1	93,00 - 97,00	
3.6		coal	kg	0,60	8,0	n.e. [75 ?]	