

## Specific energy demand for heating (monthly method)

Energy balance calculation with PHPP Version 10.4 EN



"Stūriši" / Climate: LV0003b-Zilāni / TFA: 3246 m<sup>2</sup> / Heating: 124,6 kWh/(m<sup>2</sup>a) / Overheating: 41 % / PER: 191,6 kWh/(m<sup>2</sup>a)

Interior temperature: 19,5 °C

Building type: 5-Multi-family house I Apartment building

Treated floor area A<sub>TFA</sub>: 3245,8 m<sup>2</sup>

Spec. Capacity: 132 Wh/(m<sup>2</sup>K)

The sum of the heating periods calculated through the monthly method is presented on this worksheet.

### Transmission heat losses Q<sub>T</sub>

Building assembly	Temperature zone	Area m <sup>2</sup>	U-value W/(m <sup>2</sup> K)	Temperature reduction factor	G <sub>t</sub> kWh/a	kWh/a	Per m <sup>2</sup> of TFA
External wall - ambient	A	1776,4	1,059	1,00	96	179707	55,37
External wall ground/basement	B			1,00			
Roof / ceiling - ambient	A	794,4	1,029	1,00	96	78117	24,07
Floor slab / basement ceiling	B	747,0	1,164	1,00	38	32860	10,12
Partition wall (pagraba siena)	X	12,8	2,288	0,50	96	1399	0,43
	A			1,00			
	A			1,00			
Windows	A	574,0	1,479	1,00	96	81109	24,99
Exterior door	A	18,6	2,400	1,00	96	4265	1,31
Thermal bridges ambient (length/m)	A	152,0	0,450	1,00	96	6536	2,01
Perimeter thermal bridges (length/m)	P	152,0	0,450	1,00	38	2585	0,80
Thermal bridges ground (length/m)	B			1,00			0,00
Sum of all areas of the building envelope		3923,2	Total transmission heat losses Q <sub>T</sub> =		386578	119,1	

### Ventilation heat losses Q<sub>V</sub>

Reference volume for the ventilation system, V <sub>V</sub> (A <sub>TFA</sub> *h)	3246	*	2,50	=	8115			
Effective air change rate Ambient n <sub>V,e</sub>	0,415	*	(1 - 0%)	*	(1 - 0,00)	+ 0,007	=	0,423
Effective air change rate Ground n <sub>V,g</sub>	0,415	*	(1 - 0%)	*	(1 - 0,00)		=	0,000
Ventilation losses ambient Q <sub>V</sub>	8115	*	0,423	*	0,33	* 96	=	108121
Ventilation losses ground Q <sub>V,g</sub>	8115	*	0,000	*	0,33	* 19	=	0
Total ventilation heat losses Q <sub>V</sub> =				108121		33,3		

### Total heat losses Q<sub>L</sub>

$$\left( \underset{\substack{Q_T \\ \text{kWh/a}}}{386578} + \underset{\substack{Q_V \\ \text{kWh/a}}}{108121} \right) * \underset{\substack{\text{Reduction factor} \\ \text{night/weekend} \\ \text{lowering}}}{1,0} = \underset{\substack{\text{kWh/a}}}{494699} \quad \text{Per m}^2 \text{ of TFA: } \underset{\substack{\text{kWh/(m}^2\text{a)}}}{152,4}$$

### Available solar heat gains Q<sub>S</sub>

Orientation of the area	Reduction factor see 'Windows' worksheet	g-value (perp. radiation)	Area m <sup>2</sup>	Global radiation kWh/(m <sup>2</sup> a)	kWh/a	
North	0,44	0,55	256,5	78	4848	
East	0,00	0,00	0,0	166	0	
South	0,24	0,53	317,4	267	10809	
West	0,00	0,00	0,0	161	0	
Horizontal	0,00	0,00	0,0	266	0	
Sum opaque areas					13632	
Total available solar heat gains Q <sub>S</sub> =					29289	9,0

### Internal heat gains Q<sub>I</sub>

$$\underset{\substack{\text{kh/d}}}{0,024} * \underset{\substack{\text{Length Heat. Period} \\ \text{d/a}}}{212} * \underset{\substack{\text{Spec. Power} q_i \\ \text{W/m}^2}}{3,7} * \underset{\substack{A_{TFA} \\ \text{m}^2}}{3245,8} = \underset{\substack{\text{kWh/a}}}{61138} \quad \text{Per m}^2 \text{ of TFA: } \underset{\substack{\text{kWh/(m}^2\text{a)}}}{18,8}$$

### Utilisation factor heat gains η<sub>G</sub>

$$\begin{aligned} \text{Free heat } Q_F &= Q_S + Q_I = 90427 \quad \text{Per m}^2 \text{ of TFA: } 27,9 \\ \text{Ratio free heat to losses} &= Q_F / Q_L = 0,18 \\ \text{Utilisation factor heat gains } \eta_G &= 100\% \end{aligned}$$

### Total heat gains Q<sub>G</sub>

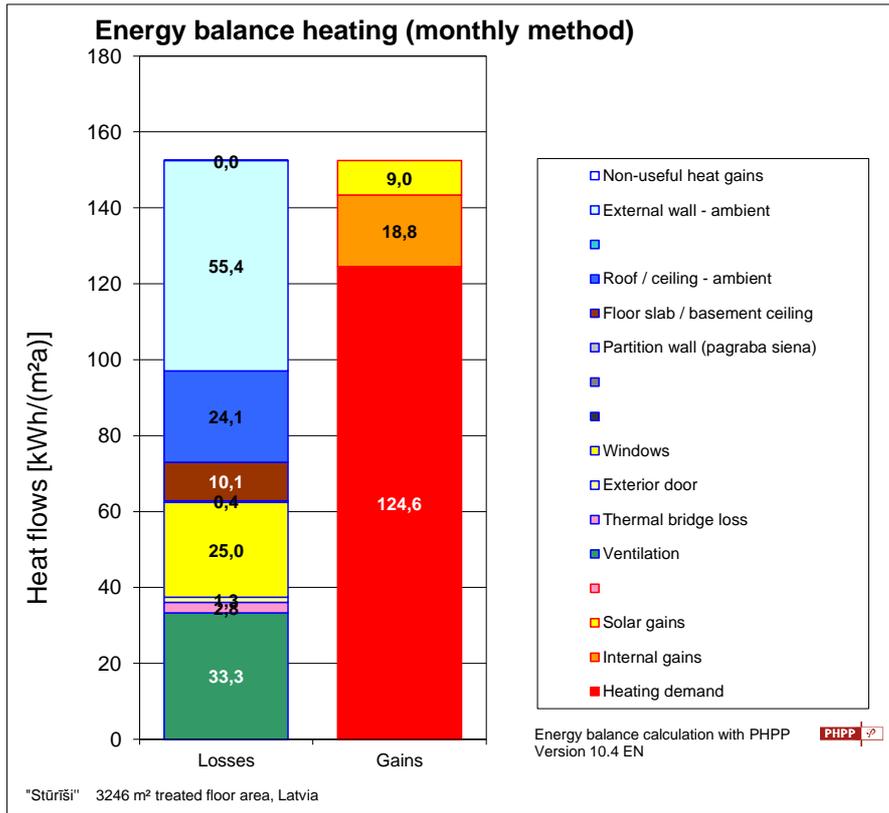
$$\eta_G * Q_F = 90404 \quad \text{Per m}^2 \text{ of TFA: } 27,9$$

### Annual heating demand Q<sub>H</sub>

$$Q_L - Q_G = 404295 \quad \text{Per m}^2 \text{ of TFA: } 124,6$$

### Limit value

Requirement met? -



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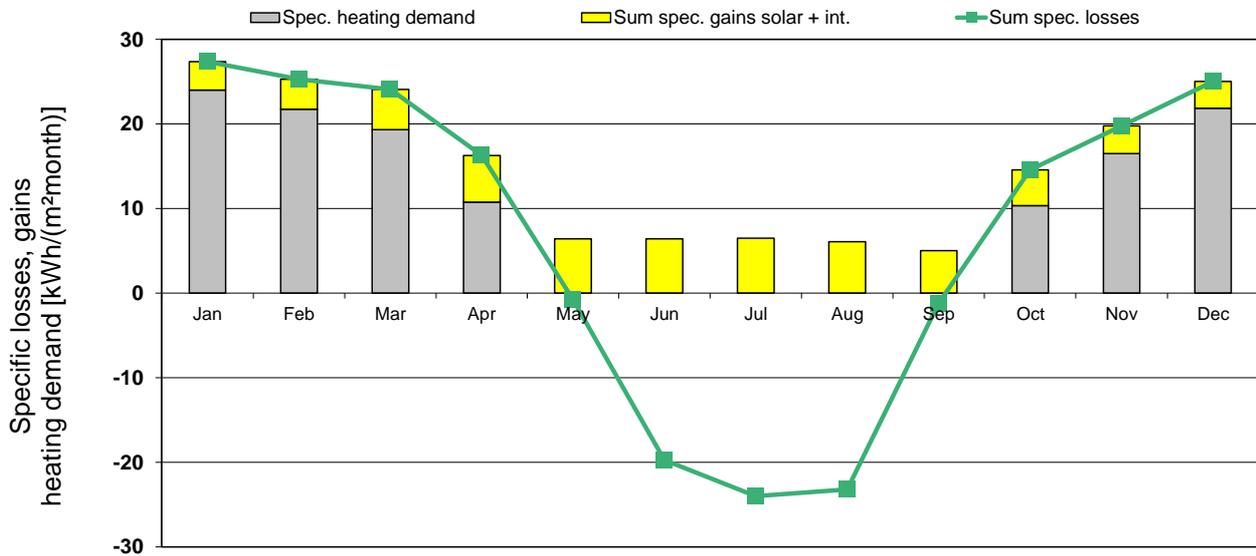
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PHPP

"Stūriši" / Climate: LV0003b-Zilāni / TFA: 3246 m<sup>2</sup> / Heating: 124,6 kWh/(m<sup>2</sup>a) / Overheating: 41 % / PER: 191,6 kWh/(m<sup>2</sup>a)

Interior temperature: 19,5 °C  
Building type: 5-Multi-family house I Apartment building  
Treated floor area A<sub>TFA</sub>: 3246 m<sup>2</sup>

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	
Heating degree hours - exterior	17,2	15,6	14,4	9,2	-2,1	-14,4	-16,8	-15,9	-0,8	9,9	13,1	16,2	46	kKh
Heating degree hours - ground	6,3	7,7	9,7	9,2	8,1	5,6	3,1	1,0	-0,2	-0,1	1,3	3,7	55	kKh
Losses - exterior	82892	74870	69074	44192	-10038	-69347	-80821	-76239	-3731	47437	62979	77809	219078	kWh
Losses - ground	5911	7201	9086	8664	7608	5238	2955	893	-213	-87	1217	3453	51924	kWh
Sum spec. losses	27,4	25,3	24,1	16,3	-0,7	-19,8	-24,0	-23,2	-1,2	14,6	19,8	25,0	83,5	kWh/m <sup>2</sup>
Solar gains - North	250	505	1137	1753	2485	2909	2741	2119	1342	732	298	173	16445	kWh
Solar gains - East	0	0	0	0	0	0	0	0	0	0	0	0	0	kWh
Solar gains - South	890	1404	2282	2924	3285	2997	3119	3223	2609	1868	837	602	26041	kWh
Solar gains - West	0	0	0	0	0	0	0	0	0	0	0	0	0	kWh
Solar gains - Horiz.	0	0	0	0	0	0	0	0	0	0	0	0	0	kWh
Solar gains - Opaque	843	1524	3051	4633	6186	6322	6252	5477	3662	2171	870	540	41531	kWh
Internal heat gains	8940	8075	8940	8652	8940	8652	8940	8940	8652	8940	8652	8940	105262	kWh
Sum spec. gains solar + int.	3,4	3,5	4,7	5,5	6,4	6,4	6,5	6,1	5,0	4,2	3,3	3,2	58,3	kWh/m <sup>2</sup>
Utilisation factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	-70%	
Annual heating demand	77879	70563	62751	34912	0	0	0	0	0	33644	53539	71007	404295	kWh
Spec. heating demand	24,0	21,7	19,3	10,8	0,0	0,0	0,0	0,0	0,0	10,4	16,5	21,9	124,6	kWh/m <sup>2</sup>



"Stūriši" 3246 m<sup>2</sup> treated floor area, Latvia

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### Annual heating demand: Comparison

Monthly method	( <i>Heating</i> )	404295 kWh/a	124,6 kWh/(m <sup>2</sup> a) reference to treated floor area according to PHPP
Annual method	( <i>Annual heating</i> )	421635 kWh/a	129,9 kWh/(m <sup>2</sup> a) reference to treated floor area according to PHPP

Month	1	2	3	4	5	6	7	8	9	10	11	12	Annual total
Days	31	28	31	30	31	30	31	31	30	31	30	31	365
Ambient Temp.	-3,9	-3,9	0,0	6,6	23,1	41,5	44,1	42,8	21,2	6,1	1,1	-2,5	14,8
Radiation - North	4,0	8,1	18,3	28,2	40,0	46,8	44,1	34,1	21,6	11,8	4,8	2,8	265
Radiation - East	10,2	18,5	37,2	58,5	83,7	85,5	82,2	68,5	44,7	25,4	9,3	6,5	530
Radiation - South	22,0	34,7	56,4	72,3	81,2	74,1	77,1	79,7	64,5	46,2	20,7	14,9	644
Radiation - West	8,7	16,5	36,3	58,8	81,5	86,4	85,8	73,2	45,0	25,4	9,6	5,9	533
Horizontal radiation	11,5	25,5	62,6	107,7	155,3	161,1	158,1	131,8	78,6	39,4	13,8	6,0	951
T <sub>sky</sub>	-4,0	-4,0	-0,1	6,6	12,1	15,7	18,1	16,9	11,9	6,1	1,4	-2,1	6,6
Ground Temp	11,03	8,08	6,48	6,67	8,60	11,74	15,27	18,22	19,82	19,62	17,70	14,55	13,2