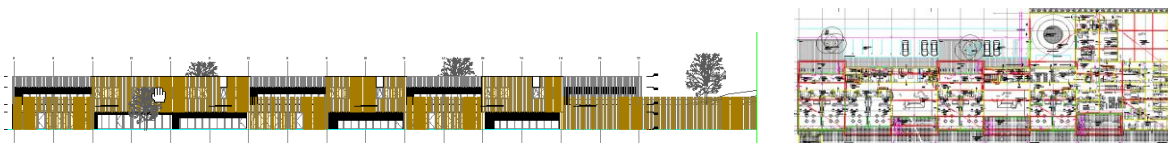


Passive House Verification



Building:	Vrtec KAMNITNIK		
Location and Climate:	Škofja Loka	Ljubljana T1996-2005/J1981-2000	
Street:			
Postcode/City:			
Country:	Slovenija		
Building Type:	P+N		
Home Owner(s) / Client(s):	OBČINA ŠKOFJA LOKA		
Street:			
Postcode/City:	4220 Škofja Loka		
Architect:	MODULAR arhitekti d.o.o.		
Street:	Grudnovo nabrežje 23		
Postcode/City:	1000 Ljubljana		
Mechanical System:			
Street:			
Postcode/City:			
Year of Construction:	2017		
Number of Dwelling Units:	1		
Enclosed Volume V_e :	15800,0	m ³	
Number of Occupants:	390,0		
Interior Temperature:	21,0	°C	
Internal Heat Gains:	2,8	W/m ²	

Specific Demands with Reference to the Treated Floor Area					
Treated Floor Area:	3262,0	m ²			
Applied:	Monthly Method	kWh/(m3a)	PH Certificate:		Fulfilled?
Specific Space Heat Demand:	11,1	kWh/(m²a)	3,09	15 kWh/(m²a)	Yes
Pressurization Test Result:	0,6	h⁻¹		0,6 h ⁻¹	Yes
Specific Primary Energy Demand (DHW, Heating, Cooling, Auxiliary and Household Electricity):	64	kWh/(m²a)		120 kWh/(m ² a)	Yes
Specific Primary Energy Demand (DHW, Heating and Auxiliary Electricity):	64	kWh/(m ² a)			
Specific Primary Energy Demand Energy Conservation by Solar Electricity:		kWh/(m ² a)			
Heating Load:	12	W/m ²			
Frequency of Overheating:	2	%	over	25 °C	
Specific Useful Cooling Energy Demand:		kWh/(m ² a)		15 kWh/(m ² a)	
Cooling Load:	4	W/m ²			

We confirm that the values given herein have been determined following the PHPP methodology and based on the characteristic values of the building. The calculations with PHPP are attached to this application.

Issued on:

jul.16

signed:

Simon BRLEK

Passive House Planning

AREAS DETERMINATION

Building: Vrtec KAMNITNIK

Heat Demand 11 kWh/(m²a)

Summary						Building Element Overview	Average U-Value [W/(m²K)]
Group Nr.	Area Group	Temp Zone	Area	Unit	Comments		
1	Treated Floor Area		3262,00	m²	Living area or useful area within the thermal envelope		
2	North Windows	A	203,78	m²	Results are from the Windows worksheet.	North Windows	0,748
3	East Windows	A	54,51	m²		East Windows	0,763
4	South Windows	A	479,47	m²		South Windows	0,730
5	West Windows	A	29,55	m²		West Windows	0,770
6	Horizontal Windows	A	24,00	m²		Horizontal Windows	1,011
7	Exterior Door	A	5,00	m²	Please subtract area of door from respective building element	Exterior Door	1,000
8	Exterior Wall - Ambient	A	1880,24	m²	Window areas are subtracted from the individual areas specified in the "Windows" worksheet.	Exterior Wall - Ambient	0,116
9	Exterior Wall - Ground	B	275,49	m²	Temperature Zone "A" is ambient air.	Exterior Wall - Ground	0,143
10	Roof/Ceiling - Ambient	A	2496,49	m²	Temperature zone "B" is the ground.	Roof/Ceiling - Ambient	0,099
11	Floor Slab	B	2453,42	m²		Floor Slab	0,148
12			0,00	m²	Temperature zones "A", "B", "P" and "X" may be used. NOT "I"		
13			0,00	m²	Temperature zones "A", "B", "P" and "X" may be used. NOT "I"	Factor for X	
14		X	0,00	m²	Temperature zone "X": Please provide user-defined reduction factor (0 < f, < 1):	75%	
						Thermal Bridge Overview	Ψ [W/(mK)]
15	Thermal Bridges Ambient	A	0,00	m	Units in m	Thermal Bridges Ambient	
16	Perimeter Thermal Bridges	P	120,00	m	Units in m; temperature zone "P" is perimeter (see Ground worksheet).	Perimeter Thermal Bridges	0,050
17	Thermal Bridges Floor Slab	B	0,00	m	Units in m	Thermal Bridges Floor Slab	
18	Partition Wall to Neighbour	I	0,00	m²	No heat losses, only considered for the heat load calculation.	Partition Wall to Neighbour	
Total Thermal Envelope			7901,94	m²		Average Therm. Envelope	0,186

Area Input																	Selection of the Corresponding Building Element Assembly		Nr.	U-Value [W/(m²K)]
Area Nr.	Building Element Description	Group Nr.	Assigned to Group	Quantity	x (	a [m]	x	b [m]	+	User-Determined [m²]	-	User Subtraction [m²]	-	Subtraction Window Areas [m²]	) =	Area [m²]				
	Treated Floor Area	1	Treated Floor Area	1	x (		x		+	3262,00	-				) =	3262,0	From Windows sheet From Windows sheet From Windows sheet From Windows sheet From Windows sheet U-Value Exterior Door	0,748		
	North Windows	2	North Windows													203,8		0,763		
	East Windows	3	East Windows													54,5		0,730		
	South Windows	4	South Windows													479,5		0,770		
	West Windows	5	West Windows													29,6		1,011		
	Horizontal Windows	6	Horizontal Windows													24,0		1,00		
	Exterior Door	7	Exterior Door	1	x (	2,00	x	2,50	+		-				) =	5,0				
1	Sp1 - Zunanja stena	8	Exterior Wall - Ambient	1	x (	12,74	x	4,60	+		-			) =	36,1	=	22,5	Z1.2-AB nosilna stena z lesen	3	0,152
2	Sp2 - Zunanja stena	8	Exterior Wall - Ambient	1	x (	26,36	x	4,60	+		-			) =	6,5	=	114,8	Z1.2-AB nosilna stena z lesen	3	0,152
3	Sp3 - Zunanja stena	8	Exterior Wall - Ambient	1	x (	12,04	x	4,60	+		-			) =	36,1	=	19,3	Z1.2-AB nosilna stena z lesen	3	0,152
4	Sp4 - zunanja stena	8	Exterior Wall - Ambient	1	x (	13,06	x	4,60	+		-			) =	0,0	=	60,1	Z1.2-AB nosilna stena z lesen	3	0,152
5	Sp5 - zunanja stena	8	Exterior Wall - Ambient	1	x (	12,80	x	4,60	+		-			) =	0,0	=	58,9	Z1.2-AB nosilna stena z lesen	3	0,152
6	Sp6 - zunanje stena v zeml	9	Exterior Wall - Ground	1	x (	26,12	x	4,60	+		-			) =	0,0	=	120,2	Zvk1 Vkopan AB zid	1	0,143
7	Vp1 - zunanja stena	8	Exterior Wall - Ambient	1	x (	2,10	x	4,60	+		-			) =	9,6	=	0,1	Z1.2-AB nosilna stena z lesen	3	0,152
8	Vp2 - zunanja stena v zeml	9	Exterior Wall - Ground	1	x (	35,40	x	4,60	+		-			) =	7,5	=	155,3	Zvk1 Vkopan AB zid	1	0,143
9	Vp3 - zunanja stena terasa	8	Exterior Wall - Ambient	1	x (	5,18	x	4,60	+		-			) =	6,0	=	17,8	Z1.1-Zunanja AB stena	2	0,144
10	Vp4 - zunanja stena terasa	8	Exterior Wall - Ambient	1	x (	4,18	x	4,60	+		-			) =	2,6	=	16,6	Z1.1-Zunanja AB stena	2	0,144
11	Vp5 - zunanja stena terasa	8	Exterior Wall - Ambient	1	x (	2,80	x	4,60	+		-			) =	0,0	=	12,9	Z1.1-Zunanja AB stena	2	0,144
12	Vp6 - zunanja stena terasa	8	Exterior Wall - Ambient	1	x (	1,80	x	4,60	+		-			) =	0,0	=	8,3	Z1.1-Zunanja AB stena	2	0,144
13	Jp1-zunanja stena	8	Exterior Wall - Ambient	1	x (	13,44	x	4,60	+		-			) =	0,0	=	61,8	Z1.2-AB nosilna stena z lesen	3	0,152
14	Jp2-zunanja stena	8	Exterior Wall - Ambient	1	x (	12,16	x	4,60	+		-			) =	17,9	=	38,0	Z1.1-Zunanja AB stena	2	0,144
15	Jp3-zunanja stena	8	Exterior Wall - Ambient	2	x (	13,44	x	4,60	+		-			) =	93,0	=	30,6	Z1.1-Zunanja AB stena	2	0,144
16	Jp4-zunanja stena	8	Exterior Wall - Ambient	2	x (	12,16	x	4,60	+		-			) =	75,6	=	36,3	Z1.1-Zunanja AB stena	2	0,144

Passive House Planning

AREAS DETERMINATION

Building: Vrtec KAMNITNIK

Heat Demand 11 kWh/(m²a)

Summary						Building Element Overview	Average U-Value [W/(m²K)]
Group Nr.	Area Group	Temp Zone	Area	Unit	Comments		
1	Treated Floor Area		3262,00	m²	Living area or useful area within the thermal envelope		
2	North Windows	A	203,78	m²	Results are from the Windows worksheet.	North Windows	0,748
3	East Windows	A	54,51	m²		East Windows	0,763
4	South Windows	A	479,47	m²		South Windows	0,730
5	West Windows	A	29,55	m²		West Windows	0,770
6	Horizontal Windows	A	24,00	m²		Horizontal Windows	1,011
7	Exterior Door	A	5,00	m²	Please subtract area of door from respective building element	Exterior Door	1,000
8	Exterior Wall - Ambient	A	1880,24	m²	Window areas are subtracted from the individual areas specified in the "Windows" worksheet.	Exterior Wall - Ambient	0,116
9	Exterior Wall - Ground	B	275,49	m²	Temperature Zone "A" is ambient air.	Exterior Wall - Ground	0,143
10	Roof/Ceiling - Ambient	A	2496,49	m²	Temperature zone "B" is the ground.	Roof/Ceiling - Ambient	0,099
11	Floor Slab	B	2453,42	m²		Floor Slab	0,148
12			0,00	m²	Temperature zones "A", "B", "P" and "X" may be used. NOT "I"		
13			0,00	m²	Temperature zones "A", "B", "P" and "X" may be used. NOT "I"	Factor for X	
14		X	0,00	m²	Temperature zone "X": Please provide user-defined reduction factor (0 < f, < 1):	75%	
						Thermal Bridge Overview	Ψ [W/(mK)]
15	Thermal Bridges Ambient	A	0,00	m	Units in m	Thermal Bridges Ambient	
16	Perimeter Thermal Bridges	P	120,00	m	Units in m; temperature zone "P" is perimeter (see Ground worksheet).	Perimeter Thermal Bridges	0,050
17	Thermal Bridges Floor Slab	B	0,00	m	Units in m	Thermal Bridges Floor Slab	
18	Partition Wall to Neighbour	I	0,00	m²	No heat losses, only considered for the heat load calculation.	Partition Wall to Neighbour	
Total Thermal Envelope			7901,94	m²		Average Therm. Envelope	0,186

17	Jp5-zunanja stena	8	Exterior Wall - Ambient	1	x (	12,80	x	4,60	+		-		)	-	37,2	=	21,7	Z1.1-Zunanja AB stena	▼	2	0,144
18	Jp6-zunanja stena	8	Exterior Wall - Ambient	1	x (	13,50	x	4,60	+		-		)	-	38,1	=	24,0	Z1.1-Zunanja AB stena	▼	2	0,144
19	Zp1-zunanja stena	8	Exterior Wall - Ambient	1	x (	5,18	x	4,60	+		-		)	-	15,0	=	8,8	Z1.1-Zunanja AB stena	▼	2	0,144
20	Zp2-zunanja stena	8	Exterior Wall - Ambient	2	x (	4,18	x	4,60	+		-		)	-	0,0	=	38,5	Z1.1-Zunanja AB stena	▼	2	0,144
21	Zp3-zunanja stena	8	Exterior Wall - Ambient	1	x (	17,18	x	4,60	+		-		)	-	8,6	=	70,5	Z1.2-AB nosilna stena z lesen	▼	3	0,152
22	Zp4-zunanja stena	8	Exterior Wall - Ambient	2	x (	1,88	x	4,60	+		-		)	-	0,0	=	17,3	Z1.2-AB nosilna stena z lesen	▼	3	0,152
23	Zp5-zunanja stena	8	Exterior Wall - Ambient	1	x (	16,34	x	4,60	+		-		)	-	6,0	=	69,2	Z1.1-Zunanja AB stena	▼	2	0,144
24	Sn1-zunanja stena	8	Exterior Wall - Ambient	1	x (	13,48	x	4,80	+		-		)	-	9,9	=	54,8	Z 2.1, Z2.3 Lesena skeletna s	▼	4	0,090
25	Sn2-zunanja stena	8	Exterior Wall - Ambient	1	x (	25,00	x	4,80	+		-		)	-	0,0	=	120,0	Z 2.1, Z2.3 Lesena skeletna s	▼	4	0,090
26	Sn3-zunanja stena	8	Exterior Wall - Ambient	2	x (	13,40	x	4,80	+		-		)	-	54,3	=	74,3	Z 2.1, Z2.3 Lesena skeletna s	▼	4	0,090
27	Sn4-zunanja stena	8	Exterior Wall - Ambient	2	x (	12,20	x	4,80	+		-		)	-	13,2	=	103,9	Z 2.1, Z2.3 Lesena skeletna s	▼	4	0,090
28	Sn5-zunanja stena	8	Exterior Wall - Ambient	1	x (	13,48	x	4,80	+		-		)	-	47,6	=	17,1	Z 2.1, Z2.3 Lesena skeletna s	▼	4	0,090
29	Vn1-zunanja stana	8	Exterior Wall - Ambient	3	x (	3,70	x	4,80	+		-		)	-	0,0	=	53,3	Z 2.1, Z2.3 Lesena skeletna s	▼	4	0,090
30	Vn2-zunanja stana	8	Exterior Wall - Ambient	1	x (	12,10	x	4,80	+		-		)	-	28,8	=	29,3	Z 2.2 Lesena skeletna stena	▼	5	0,101
31	Vn3-zunanja stana	8	Exterior Wall - Ambient	3	x (	10,10	x	4,80	+		-		)	-	0,0	=	145,4	Z 2.2 Lesena skeletna stena	▼	5	0,101
32	Jn1-zunanja stena	8	Exterior Wall - Ambient	1	x (	13,48	x	4,80	+		-		)	-	0,0	=	64,7	Z 2.1, Z2.3 Lesena skeletna s	▼	4	0,090
33	Jn2-zunanja stena	8	Exterior Wall - Ambient	2	x (	12,20	x	4,80	+		-		)	-	37,9	=	79,2	Z 2.2 Lesena skeletna stena	▼	5	0,101
34	Jn3-zunanja stena	8	Exterior Wall - Ambient	2	x (	13,40	x	4,80	+		-		)	-	71,0	=	57,6	Z 2.1, Z2.3 Lesena skeletna s	▼	4	0,090
35	Jn4-zunanja stena	8	Exterior Wall - Ambient	1	x (	25,00	x	4,80	+		-		)	-	63,8	=	56,2	Z 2.1, Z2.3 Lesena skeletna s	▼	4	0,090
36	Jn5-zunanja stena	8	Exterior Wall - Ambient	1	x (	13,48	x	4,80	+		-		)	-	44,9	=	19,8	Z 2.2 Lesena skeletna stena	▼	5	0,101
37	Zn1-zunanja stena	8	Exterior Wall - Ambient	3	x (	10,10	x	4,80	+		-		)	-	0,0	=	145,4	Z 2.2 Lesena skeletna stena	▼	5	0,101
38	Zn2-zunanja stena	8	Exterior Wall - Ambient	1	x (	12,10	x	4,80	+		-		)	-	0,0	=	58,1	Z 2.1, Z2.3 Lesena skeletna s	▼	4	0,090
39	Zn3-zunanja stena	8	Exterior Wall - Ambient	3	x (	3,70	x	4,80	+		-		)	-	0,0	=	53,3	Z 2.1, Z2.3 Lesena skeletna s	▼	4	0,090
40	T1a proti terenu	11	Floor Slab	1	x (	17,65	x	103,10	+	423,10	-	153,70	)	-	0,0	=	2089,1	T1.1 Tla proti terenu	▼	6	0,151
41	T1a nadstropja-previs S	11	Floor Slab	1	x (		x		+	121,90	-		)	-	0,0	=	121,9	T2.1 Tla nadstropja-previs	▼	7	0,129
42	T1a nadstropja-previs J	11	Floor Slab	1	x (		x		+	242,40	-		)	-	0,0	=	242,4	T2.1 Tla nadstropja-previs	▼	7	0,129
43					x (		x		+		-		)	-	0,0	=			▼	0	
44	S1 Ravna streha - prodec	10	Roof/Ceiling - Ambient	1	x (		x		+	1628,58	-		)	-	24,0	=	1604,6	S1 ravna streha, ekstenzivna	▼	8	0,090

Passive House Planning

AREAS DETERMINATION

Building: **Vrtec KAMNITNIK**

Heat Demand **11** kWh/(m²a)

Summary						Building Element Overview	Average U-Value [W/(m²K)]
Group Nr.	Area Group	Temp Zone	Area	Unit	Comments		
1	Treated Floor Area		3262,00	m²	Living area or useful area within the thermal envelope		
2	North Windows	A	203,78	m²	Results are from the Windows worksheet.	North Windows	0,748
3	East Windows	A	54,51	m²		East Windows	0,763
4	South Windows	A	479,47	m²		South Windows	0,730
5	West Windows	A	29,55	m²		West Windows	0,770
6	Horizontal Windows	A	24,00	m²		Horizontal Windows	1,011
7	Exterior Door	A	5,00	m²	Please subtract area of door from respective building element	Exterior Door	1,000
8	Exterior Wall - Ambient	A	1880,24	m²	Window areas are subtracted from the individual areas specified in the "Windows" worksheet.	Exterior Wall - Ambient	0,116
9	Exterior Wall - Ground	B	275,49	m²	Temperature Zone "A" is ambient air.	Exterior Wall - Ground	0,143
10	Roof/Ceiling - Ambient	A	2496,49	m²	Temperature zone "B" is the ground.	Roof/Ceiling - Ambient	0,099
11	Floor Slab	B	2453,42	m²		Floor Slab	0,148
12			0,00	m²	Temperature zones "A", "B", "P" and "X" may be used. NOT "I"		
13			0,00	m²	Temperature zones "A", "B", "P" and "X" may be used. NOT "I"	Factor for X	
14		X	0,00	m²	Temperature zone "X": Please provide user-defined reduction factor (0 < f, < 1):	75%	
						Thermal Bridge Overview	Ψ [W/(mK)]
15	Thermal Bridges Ambient	A	0,00	m	Units in m	Thermal Bridges Ambient	
16	Perimeter Thermal Bridges	P	120,00	m	Units in m; temperature zone "P" is perimeter (see Ground worksheet).	Perimeter Thermal Bridges	0,050
17	Thermal Bridges Floor Slab	B	0,00	m	Units in m	Thermal Bridges Floor Slab	
18	Partition Wall to Neighbour	I	0,00	m²	No heat losses, only considered for the heat load calculation.	Partition Wall to Neighbour	
Total Thermal Envelope			7901,94	m²		Average Therm. Envelope	0,186

45	S2 -zunanja terasa	10	Roof/Ceiling - Ambient	1	x (	x	+	63,24	-	) -	0,0	=	63,2	S1 ravna streha, ekstenzivna : ▼	8	0,090
46	F2.1 zunanja terasa	10	Roof/Ceiling - Ambient	1	x (	x	+	107,43	-	) -	0,0	=	107,4	T2.4-zunanja terasa ▼	9	0,116
47	F2.2, 2.3 zunanja terasa	10	Roof/Ceiling - Ambient	2	x (	x	+	104,24	-	) -	0,0	=	208,5	T2.4-zunanja terasa ▼	9	0,116
48	F2.4 zunanja terasa	10	Roof/Ceiling - Ambient	1	x (	x	+	112,34	-	) -	0,0	=	112,3	T2.4-zunanja terasa ▼	9	0,116
49	F2.5 zunanja terasa	10	Roof/Ceiling - Ambient	1	x (	x	+	586,92	-	) -	0,0	=	400,4	T2.4-zunanja terasa ▼	9	0,116
50					x (	x	+		-	) -	0,0	=		▼	0	

Passive House Planning

U-VALUES OF BUILDING ELEMENTS

Building: Vrtec KAMNITNIK

Wedge Shaped Building Element Layers and
Still Air Spaces -> Secondary Calculation to the Right

1	Zvkl Vkopan AB zid					
Assembly No. Building Assembly Description						
Heat Transfer Resistance [m²K/W] interior R _{si} : 0,13						
exterior R _{se} : 0,00						
Area Section 1	λ [W/(mK)]	Area Section 2 (optional)	λ [W/(mK)]	Area Section 3 (optional)	λ [W/(mK)]	Total Width Thickness [mm]
1. oplesk	0,500					10
2. AB zid	2,040					200
3. hidroizolacija	0,130					10
4. XPS	0,036					240
5.						
6.						
7.						
8.						
		Percentage of Sec. 2		Percentage of Sec. 3		Total 46,0 cm
U-Value: 0,143 W/(m²K)						

2	Z1.1-Zunanja AB stena					
Assembly No. Building Assembly Description						
Heat Transfer Resistance [m²K/W] interior R _{si} : 0,13						
exterior R _{se} : 0,04						
Area Section 1	λ [W/(mK)]	Area Section 2 (optional)	λ [W/(mK)]	Area Section 3 (optional)	λ [W/(mK)]	Total Width Thickness [mm]
1. oplesk	0,500					10
2. AB zid	2,040					200
3. lesno-vlaknena plošča	0,038	Les-konstrukcija	0,140			240
4. Agepan THD	0,047					60
5. fasada	0,700					15
6.						
7.						
8.						
		Percentage of Sec. 2 8,0%		Percentage of Sec. 3		Total 52,5 cm
U-Value: 0,144 W/(m²K)						

3	Z1.2-AB nosilna stena z leseno fasado					
Assembly No. Building Assembly Description						
Heat Transfer Resistance [m²K/W] interior R _{si} : 0,13						
exterior R _{se} : 0,04						
Area Section 1	λ [W/(mK)]	Area Section 2 (optional)	λ [W/(mK)]	Area Section 3 (optional)	λ [W/(mK)]	Total Width Thickness [mm]
1. oplesk	0,500					10
2. AB zid	2,040					200
3. lesno-vlaknena plošča	0,038	Les-konstrukcija	0,140			300
4. protivetrna folija	0,200					1
5. lesena podkonstrukcija						15
6. lesena fasada						
7.						
8.						
		Percentage of Sec. 2 10,0%		Percentage of Sec. 3 8,0%		Total 52,6 cm
U-Value: 0,152 W/(m²K)						

Passive House Planning

U-VALUES OF BUILDING ELEMENTS

Wedge Shaped Building Element Layers and
Still Air Spaces -> Secondary Calculation to the Right

Building: Vrtec KAMNITNIK

4		Z 2.1, Z2.3 Lesena skeletna stena						
Assembly No. Building Assembly Description								
Heat Transfer Resistance [m²K/W] interior R _{si} : 0,13								
exterior R _{se} : 0,04								
Area Section 1	λ [W/(mK)]	Area Section 2 (optional)	λ [W/(mK)]	Area Section 3 (optional)	λ [W/(mK)]	Total Width		
						Thickness [mm]		
1. lesena stenska obloga	0,300					25		
2. oplesk	0,700					1		
3. mavčne plošče	0,400					15		
4. lesno-vlakenne plošče	0,038			les-konstrukcija	0,130	60		
5. OSB	0,140					15		
6. lesno-vlakenne plošče	0,038	les-konstrukcija	0,130			180		
7. mavčne plošče	0,400					15		
8. lesno-vlakenne plošče	0,038					200		
9. protivetrna folija	0,200					1		
10. fasadna obloga								
Percentage of Sec. 2						10,0%	Percentage of Sec. 3	
Percentage of Sec. 3						8,0%	Total	
						51,2	cm	
U-Value:						0,090	W/(m²K)	

5		Z 2.2 Lesena skeletna stena						
Assembly No. Building Assembly Description								
Heat Transfer Resistance [m²K/W] interior R _{si} : 0,13								
exterior R _{se} : 0,04								
Area Section 1	λ [W/(mK)]	Area Section 2 (optional)	λ [W/(mK)]	Area Section 3 (optional)	λ [W/(mK)]	Total Width		
						Thickness [mm]		
1. lesena stenska obloga	0,300					25		
2. oplesk	0,700					1		
3. mavčne plošče	0,400					15		
4. lesno-vlakenne plošče	0,038			les-konstrukcija	0,130	60		
5. OSB	0,140					15		
6. lesno-vlakenne plošče	0,038	les-konstrukcija	0,130			180		
7. mavčne plošče	0,400					15		
8. lesno-vlakenne plošče	0,038					120		
9. Agepan THD	0,047					80		
10. fasadni omet	0,500					15		
Percentage of Sec. 2						10,0%	Percentage of Sec. 3	
Percentage of Sec. 3						8,0%	Total	
						52,6	cm	
U-Value:						0,101	W/(m²K)	

6		T1.1 Tla proti terenu						
Assembly No. Building Assembly Description								
Heat Transfer Resistance [m²K/W] interior R _{si} : 0,17								
exterior R _{se} : 0,00								
Area Section 1	λ [W/(mK)]	Area Section 2 (optional)	λ [W/(mK)]	Area Section 3 (optional)	λ [W/(mK)]	Total Width		
						Thickness [mm]		
1. parket	0,150					15		
2. cementni estrih	1,600					70		
3. Mineralna volna	0,037					70		
4. AB plošča	2,040					300		
5. XPS	0,036					100		
6. XPS	0,036					50		
7. hidroizolacija	0,200					10		
8. podložni beton	1,800					100		
Percentage of Sec. 2							Percentage of Sec. 3	
							Total	
						71,5	cm	
U-Value:						0,151	W/(m²K)	

Passive House Planning

U-VALUES OF BUILDING ELEMENTS

Wedge Shaped Building Element Layers and
Still Air Spaces -> Secondary Calculation to the Right

Building: Vrtec KAMNITNIK

7		T2.1 Tla nadstropja-previs						
Assembly No. Building Assembly Description								
Heat Transfer Resistance [m²K/W] interior R _{si} : 0,17								
exterior R _{se} : 0,04								
Area Section 1	λ [W/(mK)]	Area Section 2 (optional)	λ [W/(mK)]	Area Section 3 (optional)	λ [W/(mK)]	Total Width Thickness [mm]		
1. parket	0,150					15		
2. cementni estrih	1,600					70		
3. EPS	0,036					30		
4. MV (TPS)	0,037					40		
5. AB plošča	2,040					250		
6. lesno-vlakenne plošče	0,038					200		
7. mavčno-vlakena plošča	0,400					30		
8. fasadni omet	0,700					15		
Percentage of Sec. 2							Percentage of Sec. 3	
U-Value:						0,129	W/(m²K)	
						65,0	cm	

8		S1 ravna streha, ekstenzivna zazelenitev						
Assembly No. Building Assembly Description								
Heat Transfer Resistance [m²K/W] interior R _{si} : 0,10								
exterior R _{se} : 0,04								
Area Section 1	λ [W/(mK)]	Area Section 2 (optional)	λ [W/(mK)]	Area Section 3 (optional)	λ [W/(mK)]	Total Width Thickness [mm]		
1. mavčna plošča	0,400					13		
2. austičen strop	0,050					25		
3. zračni kanal	1,530					250		
4. mavčna plošča	0,400					15		
5. zračni kanal	0,124					20		
6. lesno-vlakenne plošče	0,038			les-konstrukcija	0,130	80		
7. parna zapora						1		
8. lesno-vlakenne plošče	0,038	les-konstrukcija	0,130			300		
9. lesno-vlakenne plošče	0,038			les-konstrukcija	0,130	80		
10. paropropustna folija	0,200					1		
11. zračni kanal	0,234					40		
12. OSB	0,140					15		
13. Protekt SYS	0,200					1		
14. FPO hidroizolacija	0,200					2		
14. XPS	0,033					40		
15. protikoreninska zaščita								
Percentage of Sec. 2							Percentage of Sec. 3	
						10,0%	8,0%	
U-Value:						0,090	W/(m²K)	
						88,3	cm	

9		T2.4-zunanja terasa						
Assembly No. Building Assembly Description								
Heat Transfer Resistance [m²K/W] interior R _{si} : 0,10								
exterior R _{se} : 0,04								
Area Section 1	λ [W/(mK)]	Area Section 2 (optional)	λ [W/(mK)]	Area Section 3 (optional)	λ [W/(mK)]	Total Width Thickness [mm]		
1. mavčna plošča	0,400					15		
2. austičen strop	0,050					25		
3. zračni kanal	1,530					700		
4. AB plošča	2,040					250		
5. parna zapora	0,200					1		
6. lesno-vlakenne plošče	0,038	lesena konstrukcija	0,140			300		
7. zračni kanal	0,170					80		
8. OSB	0,140					22		
Percentage of Sec. 2							Percentage of Sec. 3	
						8,0%		
U-Value:						0,116	W/(m²K)	
						139,3	cm	

Passive House Planning

REDUCTION FACTOR SOLAR RADIATION, WINDOW U-VALUE

==

Building: Vrtec KAMNITNIK

Annual Heat Demand: 11 kWh/(m²a)

Heating Degree Hour

Climate:	Ljubljana T1996-2005/J1981-2000										
Window Area Orientation	Global Radiation (Cardinal Points)	Shading	Dirt	Non-Perpendicular Incident Radiation	Glazing Fraction	g-Value	Reduction Factor for Solar Radiation	Window Area	Window U-Value	Glazing Area	Average Global Radiation
maximum:	kWh/(m²a)	0,75	0,95	0,85				m²	W/(m²K)	m²	kWh/(m²a)
North	108	0,65	0,95	0,85	0,857	0,50	0,45	203,78	0,75	174,6	108
East	228	0,48	0,95	0,85	0,839	0,50	0,33	54,51	0,76	45,8	228
South	431	0,65	0,95	0,85	0,874	0,50	0,46	479,47	0,73	419,1	431
West	248	0,49	0,95	0,85	0,833	0,50	0,33	29,55	0,77	24,6	248
Horizontal	369	0,98	0,95	0,85	0,587	0,60	0,46	24,00	1,01	14,1	385
Total or Average Value for All Windows.						0,50	0,44	791,30	0,75	678,2	

78,6	
Transmission Losses	Heat Gains Solar Radiation
kWh/a	kWh/a
11982	4979
3270	2032
27500	47063
1788	1216
1906	2571
46445	57862

					Window Rough Openings		Installed		Glazing		Frame		g-Value		U-Value		Window Frame Dimensions				Installation				Ψ-Value		Results			
Quantity	Description	Deviation from North	Angle of Inclination from Horizontal	Orientation	Width	Height	in Area in the Areas worksheet	Nr.	Select glazing from the WinType worksheet	Nr.	Select window from the WinType worksheet	Nr.	Perpendicular Radiation	Glazing	Frames	Width - Left	Width - Right	Width - Below	Width - Above	Left 1/0	Right 1/0	Sill 1/0	Head 1/0	Ψ _{Spacer}	Ψ _{Installation}	Window Area	Glazing Area	U-Value Window	Glazed Fraction per Window	
		Degrees	Degrees		m	m	Select:		Select:		Select:		-	W/(m²K)	W/(m²K)	m	m	m	m					W/(mK)	W/(mK)	m²	m²	W/(m²K)	%	
1	Sp-01_1	0	90	North	12,040	3,000		1		4		2	0,50	0,60	1,20	0,09	0,09	0,11	0,09	1	1	1	1	0,040	0,010	36,1	33,21	0,69	0,92	
2	Sp-03_1	0	90	North	1,500	2,150		2		4		2	0,50	0,60	1,20	0,09	0,09	0,11	0,09	1	1	1	1	0,040	0,010	6,5	5,15	0,82	0,80	
1	Sp-02_1	0	90	North	12,040	3,000		3		4		2	0,50	0,60	1,20	0,09	0,09	0,11	0,09	0	0	1	1	0,040	0,010	36,1	33,21	0,69	0,92	
1	Jp-07_1	180	90	South	5,980	3,000		14		4		1	0,50	0,60	1,20	0,12	0,12	0,12	0,12	0	0	1	1	0,040	0,010	17,9	15,88	0,71	0,89	
1	Jp-08_1P	180	90	South	6,200	3,000		15	Steklo 0,5/0,6	4		1	0,50	0,60	1,20	0,12	0,12	0,12	0,12	1	1	1	1	0,040	0,010	18,6	16,49	0,72	0,89	
4	Jp-010_1	180	90	South	6,200	3,000	Vp1 - zunanja stena	15	Steklo 0,5/0,6	4		2	0,50	0,60	1,20	0,09	0,09	0,11	0,09	1	1	1	1	0,040	0,010	74,4	67,42	0,70	0,91	
2	Jp-012_1	180	90	South	12,600	3,000	Vp3 - zunanja stena	16	Steklo 0,5/0,6	4	Okno	1	0,50	0,60	1,20	0,12	0,12	0,12	0,12	1	1	1	1	0,040	0,010	75,6	68,33	0,70	0,90	
2	Jp-010_1	180	90	South	6,200	3,000	Zp1-zunanja stena	17		4		2	0,50	0,60	1,20	0,09	0,09	0,11	0,09	1	1	1	1	0,040	0,010	37,2	33,71	0,70	0,91	
1	Jp-015_1	180	90	South	6,500	3,000		18		4		1	0,50	0,60	1,20	0,12	0,12	0,12	0,12	1	1	1	1	0,040	0,010	19,5	17,32	0,71	0,89	
1	Jp-010_1	180	90	South	6,200	3,000		18		4		1	0,50	0,60	1,20	0,12	0,12	0,12	0,12	1	1	1	1	0,040	0,010	18,6	16,49	0,72	0,89	
1	Vp-09_1	90	90	East	3,200	3,000		7		4		1	0,50	0,60	1,20	0,12	0,12	0,12	0,12	1	1	1	1	0,040	0,010	9,6	8,20	0,75	0,85	
1	Vp-011_1	90	90	East	2,500	3,000		8		4		1	0,50	0,60	1,20	0,12	0,12	0,12	0,12	1	1	1	1	0,040	0,010	7,5	6,27	0,77	0,84	
1	Vp-013_1	90	90	East	2,000	3,000	Jn3-zunanja stena	9		4		1	0,50	0,60	1,20	0,12	0,12	0,12	0,12	1	1	1	1	0,040	0,010	6,0	4,89	0,79	0,81	
1	Vp-014_1	90	90	East	0,900	2,900		10		4		1	0,50	0,60	1,20	0,12	0,12	0,12	0,12	1	1	1	1	0,040	0,010	2,6	1,78	0,92	0,68	
1	Zp-05_1	270	90	West	3,800	2,250	Jn5-zunanja stena	21	Steklo 0,5/0,6	4	Okno	1	0,50	0,60	1,20	0,12	0,12	0,12	0,12	1	1	1	1	0,040	0,010	8,6	7,18	0,76	0,84	
2	Zp-011_1	270	90	West	2,500	3,000		19		4		1	0,50	0,60	1,20	0,12	0,12	0,12	0,12	1	1	1	1	0,040	0,010	15,0	12,54	0,77	0,84	
1	Zp-016_1	270	90	West	2,000	3,000		23		4		1	0,50	0,60	1,20	0,12	0,12	0,12	0,12	1	1	1	1	0,040	0,010	6,0	4,89	0,79	0,81	
1	Sn-01_2	0	90	North	4,400	2,250		24		4		1	0,50	0,60	1,20	0,12	0,12	0,12	0,12	1	1	1	1	0,040	0,010	9,9	8,39	0,75	0,85	
8	Sn-02_2	0	90	North	1,100	3,000		26		4		1	0,50	0,60	1,20	0,12	0,12	0,12	0,12	1	1	1	1	0,040	0,010	26,4	19,22	0,88	0,73	
1	Sn-03_2	0	90	North	12,420	2,250		26		4		1	0,50	0,60	1,20	0,12	0,12	0,12	0,12	1	1	1	1	0,040	0,010	27,9	24,53	0,72	0,88	
4	Sn-02_2	0	90	North	1,100	3,000		27		4		1	0,50	0,60	1,20	0,12	0,12	0,12	0,12	1	1	1	1	0,040	0,010	13,2	9,61	0,88	0,73	
2	Sn-04_2	0	90	North	6,110	3,000		28		4		1	0,50	0,60	1,20	0,12	0,12	0,12	0,12	1	1	1	1	0,040	0,010	36,7	32,48	0,72	0,89	
2	Sn-05_2	0	90	North	1,830	3,000		28		4		1	0,50	0,60	1,20	0,12	0,12	0,12	0,12	1	1	1	1	0,040	0,010	11,0	8,84	0,80	0,80	
3	Vn_06_2	90	90	East	3,200	3,000		30		4		1	0,50	0,60	1,20	0,12	0,12	0,12	0,12	1	1	1	1	0,040	0,010	28,8	24,61	0,75	0,85	
4	Jn_07_2	180	90	South	4,510	2,100		33		4		1	0,50	0,60	1,20	0,12	0,12	0,12	0,12	1	1	1	1	0,040	0,010	37,9	31,88	0,76	0,84	
2	Jn_07_2	180	90	South	4,510	2,100		34		4		1	0,50	0,60	1,20	0,12	0,12	0,12	0,12	1	1	1	1	0,040	0,010	18,9	15,94	0,76	0,84	
4	Jn_010_2	180	90	South	6,200	2,100		34		4		1	0,50	0,60	1,20	0,12	0,12	0,12	0,12	1	1	1	1	0,040	0,010	52,1	44,46	0,75	0,85	
4	Jn_08_2	180	90	South	3,160	3,000		35		4		1	0,50	0,60	1,20	0,12	0,12	0,12	0,12	1	1	1	1	0,040	0,010	37,9	32,37	0,75	0,85	
4	Jn_09_2	180	90	South	2,160	3,000		35		4		1	0,50	0,60	1,20	0,12	0,12	0,12	0,12	1	1	1	1	0,040	0,010	25,9	21,32	0,78	0,82	
2	Jn_011_2	180	90	South	3,160	3,000		36		4		1	0,50	0,60	1,20	0,12	0,12	0,12	0,12	1	1	1	1	0,040	0,010	19,0	16,19	0,75	0,85	
4	Jn_09_2	180	90	South	2,160	3,000		36		4		1	0,50	0,60	1,20	0,12	0,12	0,12	0,12	1	1	1	1	0,040	0,010	25,9	21,32	0,78	0,82	
24	strešno okno	180	3	Horizontal	1,000	1,000		44		2		1	0,60	0,60	1,20	0,12	0,12	0,12	0,12	1	1	1	1	0,040	0,010	24,0	14,08	1,01	0,59	

Passive House Planning

VENTILATION DATA

Building: **Vrtec KAMNITNIK**

Treated Floor Area A_{TFA} m^2 **3262** (Areas worksheet)
 Room Height h m **3,6** (Annual Heat Demand worksheet)
 Room Ventilation Volume $(A_{TFA} \cdot h) = V_V$ m^3 **11743** (Annual Heat Demand worksheet)

Ventilation System Design - Standard Operation

Occupancy	m^2/P	8				
Number of Occupants	P	390,0				
Supply Air per Person	$m^3/(P \cdot h)$	20				
Supply Air Requirement	m^3/h	7800				
Extract Air Rooms			Kitchen	Bathroom	Shower	WC
Quantity			1	1	4	10
Extract Air Requirement per Room	m^3/h		60	40	20	20
Total Extract Air Requirement	m^3/h	380				

Design Air Flow Rate (Maximum) m^3/h **8000**

Average Air Change Rate Calculation

Type of Operation	Daily Operation Duration h/d	Factors Referenced to Maximum	Air Flow Rate m^3/h	Air Change Rate $1/h$
Maximum	14,0	1,00	8000	0,68
Standard		0,77	6154	0,52
Basic	10,0	0,54	4308	0,37
Minimum		0,40	3200	0,27
☐ Residential Building	Average value	0,81	Average Air Flow Rate (m^3/h) 6462	Average Air Change Rate ($1/h$) 0,55

Infiltration Air Change Rate according to EN 13790

Wind Protection Coefficients According to EN 13790		
Coefficient e for Screening Class	Several Sides Exposed	One Side Exposed
No Screening	0,10	0,03
Moderate Screening	0,07	0,02
High Screening	0,04	0,01
Coefficient f	15	20

Wind Protection Coefficient, e **0,07** for Annual Demand: **0,18** for Heat Load:
 Wind Protection Coefficient, f **15**
 Net Air Volume for Press. Test V_{n50} m^3 **13000**
 Air Change Rate at Press. Test n_{50} $1/h$ **0,60** $0,60$
 Air Permeability q_{50} $m^3/(hm^2)$ **0,99**

Type of Ventilation System

☒ Balanced PH Ventilation	Please Check	for Annual Demand:	for Heat Load:
☐ Pure Extract Air			
Excess Extract Air		$1/h$ 0,00	$1/h$ 0,00
Infiltration Air Change Rate $n_{V,Res}$		$1/h$ 0,046	$1/h$ 0,116

Effective Heat Recovery Efficiency of the Ventilation System with Heat Recovery

☒ Central unit within the thermal envelope.					
☐ Central unit outside of the thermal envelope.					
Efficiency of Heat Recovery η_{HR}	0,90	Rekuperator			
Transmittance Ambient Air Duct Ψ	$W/(mK)$ 1,100	Calculation see Secondary Calculation			
Length Ambient Air Duct m	4				
Transmittance Exhaust Air Duct Ψ	$W/(mK)$ 0,884	Calculation see Secondary Calculation			
Length Exhaust Air Duct m	4				
Temperature of Mechanical Services Room $^{\circ}C$		Room Temperature ($^{\circ}C$)		21	
(Enter only if the central unit is outside of the thermal envelope.)		Av. Ambient Temp. Heating P. ($^{\circ}C$)		6,0	
		Av. Ground Temp ($^{\circ}C$)		11,9	

Effective Heat Recovery Efficiency $\eta_{HR,eff}$ **89,7%**

Effective Heat Recovery Efficiency Subsoil Heat Exchanger

SHX Efficiency	η_{SHX}	
Heat Recovery Efficiency SHX	η_{SHX}	0%

CERTIFIED HEAT RECOVERY UNITS

No.	Heat Recovery Unit	Heat Recovery Efficiency %	Electric Efficiency Wh/m^3
1	Rekuperator	90%	0,35

Passive House Planning

SPECIFIC ANNUAL HEAT DEMAND

Climate: **Ljubljana T1996-2005/J1981-2000**
 Building: **Vrtec KAMNITNIK**
 Location: **Škofja Loka**

Interior Temperature: **21,0** °C
 Building Type/Use: **P+N**
 Treated Floor Area A_{TFA}: **3262,0** m²

per m²
Treated
Floor Area

Building Element	Temperature Zone	Area m ²	U-Value W/(m ² K)	Temp. Factor f _t	G _t kKh/a	kWh/a
1. Exterior Wall - Ambient	A	1880,2	0,116	1,00	78,6	17084
2. Exterior Wall - Ground	B	275,5	0,143	0,45	78,6	1392
3. Roof/Ceiling - Ambient	A	2496,5	0,099	1,00	78,6	19326
4. Floor Slab	B	2453,4	0,148	0,45	78,6	12799
5.	A			1,00		
6.	A			1,00		
7.	X			0,75		
8. Windows	A	791,3	0,747	1,00	78,6	46445
9. Exterior Door	A	5,0	1,000	1,00	78,6	393
10. Exterior TB (length/m)	A			1,00		
11. Perimeter TB (length/m)	P	120,0	0,050	0,45	78,6	212
12. Ground TB (length/m)	B			0,45		

Total of All Building Envelope Areas

7901,9

Transmission Heat Losses Q_T

Total 97650

kWh/(m²a)

29,9

Ventilation System:

Effective Heat Recovery Efficiency
of Heat Recovery
Efficiency of Subsoil Heat Exchanger

Effective Air Volume, V_V

η_{eff} 90%

η_{SHX} 0%

Energetically Effective Air Exchange n_V

n_{V,system}
1/h

0,550

A_{TFA}
m²

3262,0

Clear Room Height

m

3,60

m³

11743,2

Φ_{HR}

0,90

n_{V,Res}
1/h

0,046

1/h

0,103

Ventilation Heat Losses Q_V

V_V
m³

11743

n_V
1/h

0,103

C_{Air}
Wh/(m³K)

0,33

G_t
kKh/a

78,6

kWh/a

31487

kWh/(m²a)

9,7

Total Heat Losses Q_L

Q_T
kWh/a

97650

Q_V
kWh/a

31487

Reduction Factor
Night/Weekend

1,0

kWh/a

129137

kWh/(m²a)

39,6

Orientation
of the Area

Reduction Factor
See Windows Sheet

g-Value
(perp. radiation)

Area
m²

Radiation HP
kWh/(m²a)

kWh/a

1. North	0,45	0,50	203,78	108	4979
2. East	0,33	0,50	54,51	228	2032
3. South	0,46	0,50	479,47	431	47063
4. West	0,33	0,50	29,55	248	1216
5. Horizontal	0,46	0,60	24,00	385	2571

Available Solar Heat Gains Q_S

Total 57862

kWh/(m²a)

17,7

Internal Heat Gains Q_I

Length Heat. Period
d/a

0,024

Spec. Power q_i
W/m²

2,80

A_{TFA}
m²

3262,0

kWh/a

44831

kWh/(m²a)

13,7

Free Heat Q_F

Q_S + Q_I

102693

kWh/(m²a)

31,5

Ratio of Free Heat to Losses

Q_F / Q_L

0,80

Utilisation Factor Heat Gains η_G

(1 - (Q_F / Q_L)⁵) / (1 - (Q_F / Q_L)⁶)

91%

Heat Gains Q_G

η_G * Q_F

93742

kWh/(m²a)

28,7

Annual Heat Demand Q_H

Q_L - Q_G

35395

kWh/(m²a)

11

Limiting Value

kWh/(m²a)

15

Requirement met?

(Yes/No)

Yes

For buildings with a gain-loss-ratio above 0,7 you should use the Monthly Method (cf. manual).

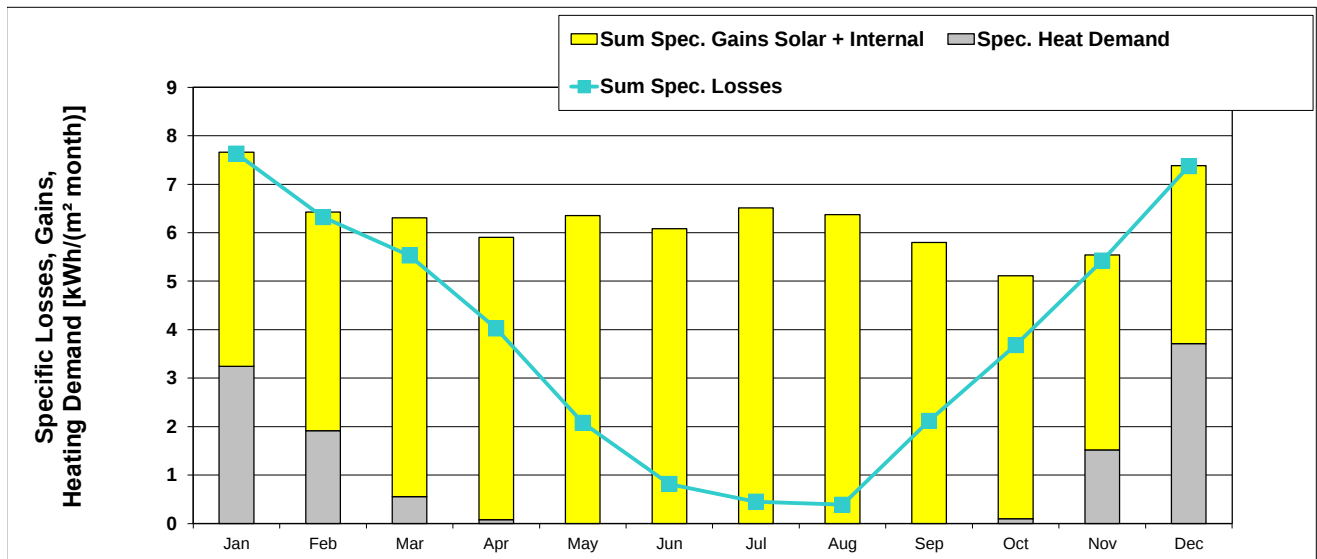
PASSIVE HOUSE PLANNING

SPECIFIC ANNUAL HEAT DEMAND MONTHLY METHOD

Climate: **Ljubljana T1996-2005/J1981-2000**
 Building: **Vrtec KAMNITNIK**
 Location: **Škofja Loka**

Interior Temperature: **21** °C
 Building Type/Use: **P+N**
 Treated Floor Area A_{TFA}: **3262** m²

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	
Heating Degree Hours - E	15,5	12,7	10,8	7,6	3,6	0,9	0,2	0,1	4,0	7,1	10,9	15,1	89	kKh
Heating Degree Hours - G	5,4	5,1	5,6	5,1	3,8	3,2	2,8	2,6	2,5	3,9	4,2	4,9	49	kKh
Losses - Exterior	22703	18544	15751	11038	5214	1367	326	217	5887	10428	15979	22051	129505	kWh
Losses - Ground	2189	2071	2282	2091	1564	1296	1149	1045	1022	1573	1717	1999	19998	kWh
Sum Spec. Losses	7,6	6,3	5,5	4,0	2,1	0,8	0,5	0,4	2,1	3,7	5,4	7,4	45,8	kWh/m²
Solar Gains - North	415	692	1199	1568	2121	2167	2167	1752	1153	830	461	323	14848	kWh
Solar Gains - East	205	286	509	616	821	830	920	768	554	312	170	134	6125	kWh
Solar Gains - South	6660	7096	9389	9062	9498	8734	9717	10044	9607	7751	5568	4476	97603	kWh
Solar Gains - West	118	167	265	368	432	447	471	442	319	216	118	83	3446	kWh
Solar Gains - Horiz.	226	349	623	815	1052	1094	1171	996	697	431	225	162	7842	kWh
Solar Gains - Opaque	0	0	0	0	0	0	0	0	0	0	0	0	0	kWh
Internal Heat Gains	6795	6138	6795	6576	6795	6576	6795	6795	6576	6795	6576	6795	80010	kWh
Sum Spec. Gains Solar +	4,4	4,5	5,8	5,8	6,4	6,1	6,5	6,4	5,8	5,0	4,0	3,7	64,3	kWh/m²
Utilisation Factor	99%	98%	86%	68%	33%	13%	7%	6%	37%	71%	97%	100%	54%	
Annual Heat Demand	10572	6239	1801	260	1	0	0	0	2	334	4962	12108	36279	kWh
Spec. Heat Demand	3,2	1,9	0,6	0,1	0,0	0,0	0,0	0,0	0,0	0,1	1,5	3,7	11,1	kWh/m²



Passive House Planning

SPECIFIC SPACE HEATING LOAD

Building: Vrtec KAMNITNIK		Building Type/Use: P+N	
Location: Škofja Loka		Treated Floor Area A _{TFA} : 3262,0 m ²	Interior Temperature: 21 °C
		Climate (HL): Ljubljana T1996-2005/J1981-2000	

Design Temperature		Radiation: North East South West Horizontal				
Weather Condition 1:	-6,8 °C	11	29	88	32	41 W/m ²
Weather Condition 2:	-5,9 °C	8	9	39	29	23 W/m ²
Ground Design Temp.	13,4 °C					

Building Element	Temperature Zone	m ²	U-Value W/(m ² K)	Factor Always 1 (except "X")	TempDiff 1 K	TempDiff 2 K	P _T 1 W	P _T 2 W
1. Exterior Wall - Ambient	A	1880,2	0,116	1,00	27,8	26,9	6044	5848
2. Exterior Wall - Ground	B	275,5	0,143	1,00	7,6	7,6	298	298
3. Roof/Ceiling - Ambient	A	2496,5	0,099	1,00	27,8	26,9	6837	6615
4. Floor Slab	B	2453,4	0,148	1,00	7,6	7,6	2739	2739
5.	A			1,00	27,8	26,9		
6.	A			1,00	27,8	26,9		
7.	X			0,75	27,8	26,9		
8. Windows	A	791,3	0,747	1,00	27,8	26,9	16431	15899
9. Exterior Door	A	5,0	1,000	1,00	27,8	26,9	139	135
10. Exterior TB (length/m)	A			1,00	27,8	26,9		
11. Perimeter TB (length/m)	P	120,0	0,050	1,00	7,6	7,6	45	45
12. Ground TB (length/m)	B			1,00	7,6	7,6		
13. House/DU Partition Wall	I			1,00	4,0	4,0		

Transmission Heat Losses P _T		Total	=	32532	or	31579
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Ventilation System:		A _{TFA} m ²	Clear Room Height m	m ³				
Effective Air Volume, V _v		3262,0	3,60	11743				
Efficiency of Heat Recovery of the Heat Exchanger	η _{HR} 90%	Heat Recovery Efficiency SHX	0%	Efficiency SHX	0%	or	0%	
Energetically Effective Air Exchange n _v	n _{v,Res} (Heating Load) 1/h	0,116	n _{v,system} 1/h	0,550	Φ _{HR}	0,90	or	0,90

Ventilation Heating Load P _V		V _L m ³	η _L 1/h	η _L 1/h	C _{air} Wh/(m ³ K)	TempDiff 1 K	TempDiff 2 K	P _V 1 W	P _V 2 W		
		11743,2	0,173	or	0,173	0,33	27,8	26,9	18652	or	18049

Total Heating Load P _L		P _L 1 W	P _L 2 W	
		51185	or	49628

Orientation the Area		Area m ²	g-Value (perp. radiation)	Reduction Factor (see Windows worksheet)	Radiation 1 W/m ²	Radiation 2 W/m ²	P _S 1 W	P _S 2 W
1. North		203,8	0,5	0,5	11	8	507	369
2. East		54,5	0,5	0,3	29	9	259	80
3. South		479,5	0,5	0,5	88	39	9607	4258
4. West		29,6	0,5	0,3	32	29	157	142
5. Horizontal		24,0	0,6	0,5	44	24	291	162

Solar Heat Gain, P _S		Total	=	10822	or	5011
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Internal Heat Gains P _I		Spec. Power W/m ²	A _{TFA} m ²	P _I 1 W	P _I 2 W	
		1,6	3262	5219	or	5219

Heat Gains P _G		P _G 1 W	P _G 2 W	
		16041	or	10230
		35144	or	39397

Heating Load P _H		=	39397 W
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Specific Heating Load P _H / A _{TFA}		=	12,1 W/m ²
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Input Max. Supply Air Temperature	52 °C	Supply Air Temperature Without Heating	18,1 °C	18,2 °C
Max. Supply Air Temperature θ _{Supply,Max}	52 °C	θ _{Supply,Min}	18,1	18,2

For Comparison: Heating Load Transportable by Supply Air. P _{Supply Air,Max}		=	72033 W	specific: 22,1 W/m ²
Supply Air Heating Sufficient?		Yes		

Passive House Planning

COOLING LOAD

Building:	Vrtec KAMNITNIK			Building Type/Use:	P+N		Interior Temperature:	25 °C	
Location:	Škofja Loka			Treated Floor Area A _{TFA} :	3262,0 m²				
Spec. Capacity:	60 Wh/(m²K) (Enter in "Summer" worksheet.)			Climate (Cooling Load):	Ljubljana T1996-2005/J1981-2000				

Design Temperature:	Ambient Air	Sky	Ground	Radiation:	North	East	South	West	Horizontal	W/m²
	25,9 °C	17,0 °C	17,6 °C		47	114	131	124	203	

Building Elements	Temperature Zone	Area m²	U-Value W/(m²K)	Factor Always 1 (except "X")	K	W
1. Exterior Wall - Ambient	A	1880,2	0,116	1,00	0,9	196
2. Exterior Wall - Ground	B	275,5	0,143	1,00	-7,4	-293
3. Roof/Ceiling - Ambient	A	2496,5	0,099	1,00	0,9	221
4. Floor Slab	B	2453,4	0,148	1,00	-7,4	-2698
5.	A			1,00	0,9	
6.	A			1,00	0,9	
7.	X			0,75	0,9	
8. Windows	A	791,3	0,747	1,00	0,9	532
9. Exterior Door	A	5,0	1,000	1,00	0,9	4
10. Exterior TB (length/m)	A			1,00	0,9	
11. Perimeter TB (length/m)	P	120,0	0,050	1,00	-7,4	-45
12. Ground TB (length/m)	B			1,00	-7,4	
13. House/DU Partition Wall	I			1,00	3,0	
14. Radiation Correction		L _{ambient} W/K 0,0	TempDiff K 0,9	L _{Sky} W/K 0,0	TempDiff K -8,0	0

Transmission Heat Losses P_T

Total	=	-2082
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Ventilation System:

A _{TFA} m²	3262,0	Clear Room Height m	3,60	m³	11743
Effective Air Volume, V _V					
Vent. Transm. W/K	1342,8	TempDiff K	0,9	W	1208
Exterior					
Ground	0,0		-7,4	W	0

Additional Summer Ventilation:

Window Night Ventilation, Manual	Corresponding Air Change Rate	0,30 1/h
Mechanical, Automatically Controlled Ventilation	Minimum Indoor Temperature	21,0 °C
Heat Removal Cooling Design Day (from Cooling worksheet)	Window Ventilation	0,0 kWh/d / 0,024 kh/d = 0 W
	Automatic Night Ventilation	0,0 kWh/d / 0,024 kh/d = 0 W

Ventilation Heat Load P_V

Total	=	1208
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Orientation of the Area	Area m²	g-Value (perp. radiation)	Reduction Factor	Radiation W/m²	P _S W
1. North	203,8	0,5	0,09	47	419
2. East	54,5	0,5	0,05	114	148
3. South	479,5	0,5	0,06	131	2007
4. West	29,6	0,5	0,05	124	94
5. Horizontal	24,0	0,6	0,07	208	222
6. Sum Opaque Areas					0

Heat Gain - Solar Heat Load, P_S

Total	=	2890
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Internal Heat Load P_I

Spec. Power W/m²	3,8	A _{TFA} m²	3262	P _I W	12396
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Cooling Load P_C

P _T + P _V + P _S + P _I	=	14411	W
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Specific Maximum Cooling Load P_C / A_{EB}

	=	4,4	W/m²
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Daily Temperature Swing due to Solar Load	Solar Load W 2889,8	Time h/d 24	Spec. Capacity Wh/(m²K) 60	A _{TFA} m² 3262	=	0,4	K
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Passive House Planning

CLIMATE DATA

Standard/Regional Climate: Select here.

Regional Climate Data

▼

Select Region Here

User Data

▼

Select regional climate here:

Ljubljana T1996-2005/J1981-2000

▼

Building: Vrtec KAMNITNIK

Use Regional Data? Yes

Climate Building Ljubljana T1996-2005/J1981-2000

Chosen Method for Annual Heat Demand: Monthly Method

Monthly Data: Ljubljana T1996-2005/J1981-2000

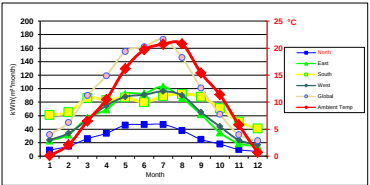
Annual Data:

Use Annual Climate Data Set No

Results:

Annual Heat Demand	11,1	kWh/(m²a)
Heat Load	12,1	W/m²

Transfer to Annual Method		
H _f	205	d/a
G _i	74	kWh/a
North	108	kWh/(m²a)
East	228	kWh/(m²a)
South	431	kWh/(m²a)
West	248	kWh/(m²a)
Horizontal	369	kWh/(m²a)



Parameters for PHPP Calculated Ground Temperatures:	Month	1	2	3	4	5	6	7	8	9	10	11	12	Heating Load		Cooling Load
	Days	31	28	31	30	31	30	31	31	30	31	30	31	Weather 1	Weather 2	Radiation
Phase Shift Months	Ljubljana T1996-2005/J1981-2000	Latitude:	46.1	Longitude ° East	-14.7	Altitude m	385	Daily Temperature Swing Summer (K)				Radiation Data:	kWh/(m²*month)	Radiation: W/m²		W/m²
	Ambient Temp	0.1	2.1	6.5	10.5	16.2	19.7	20.7	20.8	15.4	11.4	5.8	0.7	-6.8	-5.9	25.9
Damping 2.00	North	9	15	26	34	46	47	47	38	25	18	10	7	11	8	47
	East	23	32	57	69	92	93	103	86	62	35	29	15	29	9	114
Damping -1.05	South	61	65	86	83	87	80	89	92	88	71	51	41	88	39	131
	West	24	34	54	75	88	91	96	90	65	44	24	17	32	29	124
Depth m 3.32	Global	32	50	90	119	155	162	173	146	101	62	32	23	41	23	203
	Dew Point	-2.8	-2.5	0.6	4.3	9.4	12.5	13.8	14.6	10.8	8.1	3.1	-1.7			
Shift of Average Temperature K 1.60	Sky Temp	-11.2	-10.4	-6.4	-1.9	4.0	8.2	9.2	9.9	5.4	2.6	-3.5	-9.4			17.0
	Ground Temp	13.8	13.4	13.5	13.9	15.8	16.6	17.2	17.6	17.5	15.8	15.2	14.4	13.4	13.4	17.6