

**Atbilstoši Ministru kabineta 2021.gada 8. aprīļa noteikumiem Nr.222 "Ēku energoefektivitātes aprēķina metodes un ēku energosertifikācijas noteikumi"*

Grādudienas, kWh		Aprēķina periods, dienas		Iekštelpu temperatūra, °C		Āra vides temperatūra, °C	
Zona Nr.1	Zona Nr.2	Zona Nr.1	Zona Nr.2	Zona Nr.1	Zona Nr.2	Zona Nr.1	Zona Nr.2
131,04		8760	0	20,0	0,0	5,04	
						Zona Nr.1	Zona Nr.2
						Iekštelpu vidējā temperatūra periodā:	20,0 °C
						Āra vides vidējā temperatūra periodā:	5,04 °C
						Novērtējuma periods:	365 dienas
						References platība:	5427,0 m ²
						References tilpums:	17754,3 m ³

[illegible]

Kopējā siltuma pārnese ar pārvadi apkurei:	1323586
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Zonas Nr.	Ventilācijas sistēma	Aprēķina tilpums	Gaisa apmaiņas intensitāte	Darbības ilgums periodā	Ventilācijas siltuma zudumu koeficients*	Enerģijas atgūšanas vidējais rādītājs periodā	Piegādātā gaisa temperatūras starpība	Siltuma pārnese ar ventilāciju
		m ³ 3	1/h 4	h 5	W/K 6	% 7	K 8	kWh gadā 9
1	Dabiskā	17754	0,151	8760	898,2	0,0	14,96	117700
	Mehāniskā	17754		8760	0,0	0,00	14,96	0
	Infiltrācija	17754	0,039	8760	232,2	0,0	14,96	30427
2	Dabiskā	0		0		0,0	0,0	
	Mehāniskā	0					0,0	
	Infiltrācija	0	0,30	0		0,0	0,0	

Piezīme* Gaisa tilpuma siltumietilpība $0,336 \text{ W}/(\text{m}^3 \text{K})$, LVS ISO 52016-1 p.6.3.6.

Kopējā siltuma pārnese ar ventilāciju apkurei:	148127
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Nr.p.k.	Novietojums	Caurspīdīgo konstrukciju laukums	Samazinājuma faktors	Stiklojuma vidējā g-vērtība	Starojuma intensitāte periodā	Saules siltuma ieguvumi
		m ²			kWh/m ² gadā	kWh gadā
1	2	3	4	5	6	7
2.3.1.	Ziemeļi	118,47	0,46	0,67	277,70	10123
2.3.2.	Austrumi	234,49	0,49	0,67	575,10	44112
2.3.3.	Dienvidi	215,74	0,57	0,67	642,96	53107
2.3.4.	Rietumi	231,47	0,50	0,67	479,31	36870
2.3.5.	Horizontāli	0,00	0,00	0,00	954,81	0
2.3.6.	Necaurspīdīgās norobežojošās konstrukcijas					256606

Kopējie saules siltuma ieguvumi apkurei:	400818
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Zona	Apkures perioda ilgums	Īpatnējā iekšējo siltuma ieguvumu jauda**	References platība	Iekšējie siltuma ieguvumi
Nr.	h gadā	W/m ²	m ²	kWh gadā
1	2	3	4	5
1	8760	1,07	5427,0	50868
2	0			0

kWh/ ² gadā	kWh gadā
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6.	Gada energoprasība apkurei:	201,18	1091812
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Specific energy for heating (monthly method)

Energy balance calculation with PHPP Version 9.6a

Skolas iela 1, Zilupe, Ludzas nov., LV-5751 / Climate: Rēzekne / TFA: 5427 m² / Heating: 201,2 kWh/(m²a) / Freq. overheating: 0 % / PER: 962 kWh/(m²a)

The sum of the heating periods calculated through the monthly method will be presented on this side.

Interior temperature: **20** °C
 Building type: **Nedzīvojamā ēka - 1263 - skole**
 Treated floor area A_{TFA}: **5427,0** m²
 Spec. Capacity: **204** Wh/(m²K)

Building assembly	Temperature zone	Area m²	U-Value W/(m²K)	Month. red. fac.	G _i kWh/a	Per m² of treated floor area
External wall - Ambient	A	3341,21	0,485	1,00	131,04	39,09
External wall - Ground	B			1,00		
Roof/Ceiling - Ambient	A	3630,66	1,581	1,00	131,04	138,60
Floor slab / Basement ceiling	B	3626,54	1,266	1,00	35,70	30,19
	A			1,00		
	A			1,00		
siena pret bēniņiem	X	74,55	1,123	0,75	131,04	1,52
Windows	A	800,17	1,300	1,00	131,04	25,12
Exterior door	A	45,24	2,000	1,00	131,04	2,18
Exterior TB (length/m)	A	2463,92	0,110	1,00	131,04	6,54
Perimeter TB (length/m)	P	491,42	0,200	1,00	35,70	0,65
Ground TB (length/m)	B			1,00		0,00
						kWh/(m²a)

Transmission heat losses Q_T Total **1323586** **243,9**

	Effective air volume V_V	A_{TFA} m^2	Clear room height m	m^3		
		5427	3,27	=	17754	
	$n_{V,system}$ 1/h	$\eta * SHX$	η_{HR}	$n_{V,Res}$ 1/h	$n_{V,equi,fraction}$ 1/h	
Effective air change rate Ambient $n_{V,e}$	0,151	0%	0,00	0,039	=	0,189
Effective air change rate Ground $n_{V,g}$	0,151	0%	0,00		=	0,000
	V_V m^3	$n_{V,equi,fraction}$ 1/h	C_{Air} Wh/(m^2K)	G_t kKh/a	kWh/a	kWh/(m^2a)
Ventilation losses ambient Q_V	17754	0,189	0,336	131	=	148127
Ventilation losses ground $Q_{V,g}$	17754	0,000	0,336	111	=	0
Ventilation heat losses Q_V					Total	148127
						27,3

Ventilation heat losses Q_V Total **148127** **27,3**

Total heat losses Q_L (**1323586** + **148127**) **1,0** **1471713** **271,2**

Orientation of the area	Reduction factor see 'Windows' worksheet		g-Value (perp. radiation)		Area m²		Global radiation kWh/(m²a)		kWh/a
North	0,46	*	0,67	*	118,5	*	277,70	=	10123
East	0,49	*	0,67	*	234,5	*	575,10	=	44112
South	0,57	*	0,67	*	215,7	*	642,96	=	53107
West	0,50	*	0,67	*	231,5	*	479,31	=	36870
Horizontal	0,00000	*	0,00	*	0,0	*	954,81	=	0
Sum opaque areas									256606,09461
									kWh/(m²a)
Available solar heat gains Q _S									Total
									400818
									73,9

Available solar heat gains Q_S Total **400818** **73,9**

	Length	Heat. Period	Spec. Power q_i	A_{TFA}				
	kh/d	d/a	W/m²	m²	kWh/a	kWh/(m²a)		
Internal heat gains Q_i	0,024	*	365	*	5427,0	=	50868	9,4
						kWh/a	kWh/(m²a)	
		Free heat Q_F			$Q_S + Q_i$	=	451686	83,2
		Ratio free heat to losses			Q_F / Q_L	=	0,31	
	Utilisation factor heat gains h_G					=	84,1072%	
Heat gains Q_G					$\eta_G * Q_F$	=	379901	70,0

Annual heating demand Q_H **Q_L - Q_G = 1091812** **201,18**

Limiting value **Requirement met?** **-**

Specific energy for heating (monthly method)

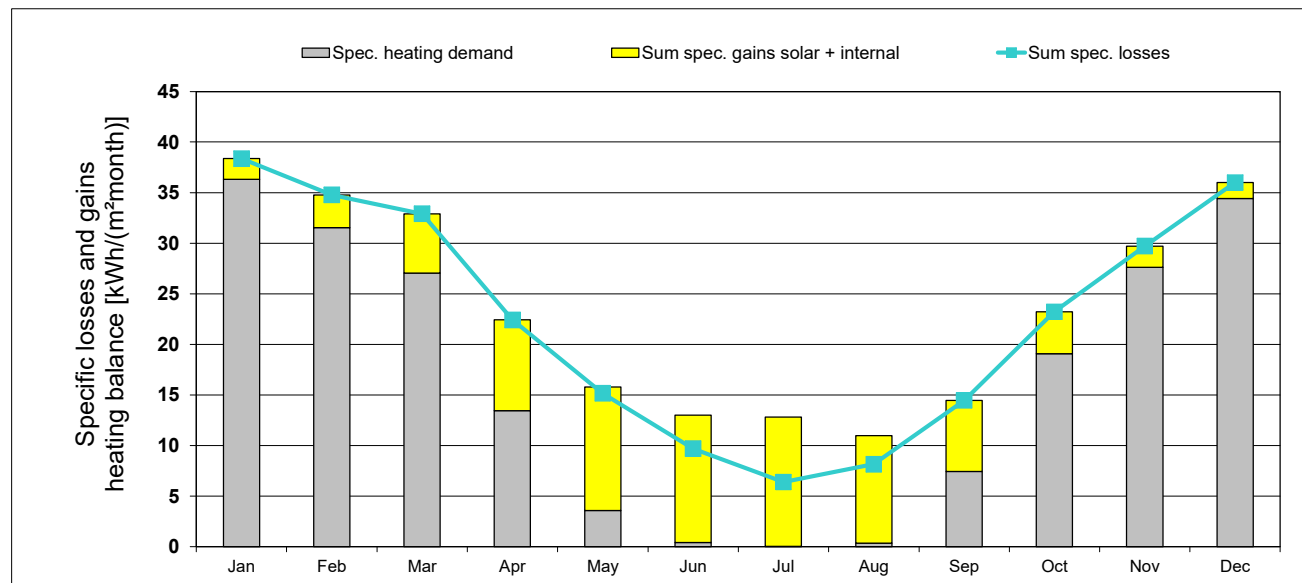
Energy balance calculation with PHPP Version 9.6a

Skolas iela 1, Zilupe, Ludzas nov., LV-5751 / Climate: Rēzekne / TFA: 5427 m² / Heating: 201,2 kWh/(m²a) / Freq. overheating: 0 % / PER: 962 kWh/(m²a)

lātes un zinātniskajai pētniecībai paredzētās ēkas

Interior temperature: **20** °C
Building type: **Nedzīvojamā ēka - 1263 - skolas, universitā**
Treated floor area A_{TFA}: **5427** m²

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	
Heating degree hours - External	19,1	17,3	16,1	10,6	6,9	4,1	2,5	3,5	6,8	11,4	14,8	17,9	131	kKh
Heating degree hours - Ground	3,9	3,6	3,8	3,3	3,0	2,4	2,2	2,1	2,2	2,6	3,0	3,6	36	kKh
Losses - Exterior	189948	171815	160672	105986	68338	41157	24411	34384	68166	113720	147161	178603	1304361	kWh
Losses - Ground	18240	16864	17914	15651	13913	11362	10238	9807	10223	12305	14095	16738	167352	kWh
Sum spec. losses	38,4	34,8	32,9	22,4	15,2	9,7	6,4	8,1	14,4	23,2	29,7	36,0	271,2	kWh/m²
Solar gains - North	144	311	694	1085	1549	1815	1730	1282	804	433	179	96	10123	kWh
Solar gains - East	967	1770	3170	4834	6638	6757	6780	5593	3805	2241	928	627	44112	kWh
Solar gains - South	1808	2992	4464	5928	6744	6233	6693	6616	5282	3566	1644	1138	53107	kWh
Solar gains - West	501	1071	2359	3981	5826	6296	6305	5054	3000	1554	598	325	36870	kWh
Solar gains - Horiz.	0	0	0	0	0	0	0	0	0	0	0	0	0	kWh
Solar gains - Opaque	3339	7435	16703	28701	41223	43076	43586	34977	21152	10498	3823	2091	256606	kWh
Internal heat gains	4320	3902	4320	4181	4320	4181	4320	4320	4181	4320	4181	4320	50868	kWh
Sum spec. gains solar + internal	2,0	3,2	5,8	9,0	12,2	12,6	12,8	10,7	7,0	4,2	2,1	1,6	83,2	kWh/m²
Utilisation factor	100%	100%	100%	100%	95%	74%	50%	73%	100%	100%	100%	100%	84%	
Annual heating demand	197109	171198	146875	72971	19323	2126	126	1741	40286	103413	149902	186742	1091812	kWh
Spec. heating demand	36,3	31,5	27,1	13,4	3,6	0,4	0,0	0,3	7,4	19,1	27,6	34,4	201,2	kWh/m²



Annual heating demand: Comparison

Monthly method	(<i>*Heating</i>)	1091812 kWh/a	201,2 kWh/(m²a) reference to treated floor area according to PHPP
Annual method	(<i>*Annual heating</i>)	1059703 kWh/a	195,3 kWh/(m²a) reference to treated floor area according to PHPP
		- kWh/a	-

Ēkas platības											
			Kopējā				Apkurināmā				
Stāvs	Numurs	Nosaukums	Platība, m²	Augstums, m	Tilpums, m³	TFA koef.	TFA, m²	TFV, m³	Tin, °C	Tin avg, °C	
1	1	001	30,10	3,40	102,34	1	30,10	102,34	20,00	0,12	
1	2	002	111,80	3,40	380,12	1	111,80	380,12	20,00	0,43	
1	3	003	44,60	3,40	151,64	1	44,60	151,64	20,00	0,17	
1	4	004	70,80	3,40	240,72	1	70,80	240,72	20,00	0,27	
2	5	005	50,40	3,40	171,36	1	50,40	171,36	20,00	0,19	
2	6	006	52,20	3,40	177,48	1	52,20	177,48	20,00	0,20	
2	7	007	37,90	3,40	128,86	1	37,90	128,86	20,00	0,15	
2	8	008	32,20	3,40	109,48	1	32,20	109,48	20,00	0,12	
2	9	009	37,60	3,40	127,84	1	37,60	127,84	20,00	0,14	
2	10	010	52,50	3,40	178,50	1	52,50	178,50	20,00	0,20	
2	11	011	49,80	3,40	169,32	1	49,80	169,32	20,00	0,19	
2	12	012	24,70	3,40	83,98	1	24,70	83,98	20,00	0,09	
3	13	013	50,50	3,52	177,76	1	50,50	177,76	20,00	0,20	
3	14	014	52,00	3,52	183,04	1	52,00	183,04	20,00	0,21	
3	15	015	218,00	4,41	961,38	1	218,00	961,38	20,00	1,08	
3	16	016	51,50	3,52	181,28	1	51,50	181,28	20,00	0,20	
3	17	017	60,90	3,87	235,68	1	60,90	235,68	20,00	0,27	
4	18	018	83,10	3,20	265,92	1	83,10	265,92	20,00	0,30	
-1	19	019	322,50	2,42	780,45	0	0,00	0,00	20,00	0,00	
1	20	020	6,70	2,30	15,41	1	6,70	15,41	20,00	0,02	
1	21	021	6,70	2,30	15,41	1	6,70	15,41	20,00	0,02	
1	22	022	6,70	2,30	15,41	1	6,70	15,41	20,00	0,02	
1	23	023	6,70	2,30	15,41	1	6,70	15,41	20,00	0,02	
1	24	024	6,70	2,30	15,41	1	6,70	15,41	20,00	0,02	
1	25	025	6,70	2,30	15,41	1	6,70	15,41	20,00	0,02	
1	26	026	6,70	2,30	15,41	1	6,70	15,41	20,00	0,02	
1	27	027	6,70	2,30	15,41	1	6,70	15,41	20,00	0,02	
1	28	028	6,70	2,30	15,41	1	6,70	15,41	20,00	0,02	
1	29	029	6,70	2,30	15,41	1	6,70	15,41	20,00	0,02	
1	30	030	6,70	2,30	15,41	1	6,70	15,41	20,00	0,02	
1	31	031	6,70	2,30	15,41	1	6,70	15,41	20,00	0,02	
1	32	032	6,70	2,30	15,41	1	6,70	15,41	20,00	0,02	
1	33	033	6,70	2,30	15,41	1	6,70	15,41	20,00	0,02	

1	34	034	6,70	2,30	15,41	1	6,70	15,41	20,00	0,02
1	35	035	6,70	2,30	15,41	1	6,70	15,41	20,00	0,02
1	36	036	6,70	2,30	15,41	1	6,70	15,41	20,00	0,02
1	37	037	6,70	2,30	15,41	1	6,70	15,41	20,00	0,02
1	38	038	6,70	2,30	15,41	1	6,70	15,41	20,00	0,02
1	39	039	6,70	2,30	15,41	1	6,70	15,41	20,00	0,02
1	40	040	97,40	3,10	301,94	1	97,40	301,94	20,00	0,34
1	41	041	148,10	3,10	459,11	1	148,10	459,11	20,00	0,52
1	42	042	130,10	3,10	403,31	1	130,10	403,31	20,00	0,45
1	43	043	727,00	3,83	2780,78	1	727,00	2780,78	20,00	3,13
1	44	044	32,30	3,10	100,13	1	32,30	100,13	20,00	0,11
1	45	045	49,30	3,10	152,83	1	49,30	152,83	20,00	0,17
1	46	046	47,90	3,10	148,49	1	47,90	148,49	20,00	0,17
1	47	047	9,40	3,10	29,14	1	9,40	29,14	20,00	0,03
1	48	048	31,40	3,10	97,34	1	31,40	97,34	20,00	0,11
1	49	049	198,30	2,80	555,24	1	198,30	555,24	20,00	0,63
1	50	050	78,50	2,80	219,80	1	78,50	219,80	20,00	0,25
1	51	051	7,70	2,80	21,56	1	7,70	21,56	20,00	0,02
1	52	052	3,60	2,80	10,08	1	3,60	10,08	20,00	0,01
1	53	053	5,50	2,80	15,40	1	5,50	15,40	20,00	0,02
1	54	054	4,90	2,80	13,72	1	4,90	13,72	20,00	0,02
1	55	055	5,20	2,80	14,56	1	5,20	14,56	20,00	0,02
1	56	056	29,60	2,80	82,88	1	29,60	82,88	20,00	0,09
1	57	057	12,30	2,80	34,44	1	12,30	34,44	20,00	0,04
2	58	058	76,10	3,10	235,91	1	76,10	235,91	20,00	0,27
2	59	059	49,50	3,10	153,45	1	49,50	153,45	20,00	0,17
2	60	060	49,80	3,10	154,38	1	49,80	154,38	20,00	0,17
2	61	061	99,60	3,10	308,76	1	99,60	308,76	20,00	0,35
2	62	062	81,00	3,10	251,10	1	81,00	251,10	20,00	0,28
2	63	063	51,00	3,10	158,10	1	51,00	158,10	20,00	0,18
2	64	064	46,90	3,10	145,39	1	46,90	145,39	20,00	0,16
2	65	065	23,70	2,60	61,62	1	23,70	61,62	20,00	0,07
3	66	066	49,20	3,00	147,60	1	49,20	147,60	20,00	0,17
3	67	067	10,70	3,00	32,10	1	10,70	32,10	20,00	0,04
3	68	068	49,20	3,00	147,60	1	49,20	147,60	20,00	0,17
3	69	069	49,20	3,00	147,60	1	49,20	147,60	20,00	0,17
3	70	070	67,80	3,00	203,40	1	67,80	203,40	20,00	0,23
3	71	071	83,00	3,00	249,00	1	83,00	249,00	20,00	0,28
3	72	072	31,80	3,00	95,40	1	31,80	95,40	20,00	0,11
3	73	073	51,00	3,00	153,00	1	51,00	153,00	20,00	0,17
3	74	074	15,00	3,00	45,00	1	15,00	45,00	20,00	0,05

3	75	075	32,40	3,00	97,20	1	32,40	97,20	20,00	0,11
3	76	076	30,70	3,00	92,10	1	30,70	92,10	20,00	0,10
1	77	901	123,00	3,40	418,20	1	123,00	418,20	20,00	0,47
1	78	902	137,30	3,40	466,82	1	137,30	466,82	20,00	0,53
1	79	903	67,00	3,52	235,67	1	67,00	235,67	20,00	0,27
1	80	904	1,90	3,40	6,46	1	1,90	6,46	20,00	0,01
2	81	905	18,10	3,40	61,54	1	18,10	61,54	20,00	0,07
2	82	906	17,70	3,40	60,18	1	17,70	60,18	20,00	0,07
-1	83	907	19,20	2,42	46,46	0	0,00	0,00	20,00	0,00
-1	84	908	40,50	2,42	98,01	0	0,00	0,00	20,00	0,00
1	85	909	13,80	3,10	42,78	1	13,80	42,78	20,00	0,05
1	86	910	556,00	3,10	1723,60	1	556,00	1723,60	20,00	1,94
1-3	87	911	46,30	3,08	142,37	1	46,30	142,37	20,00	0,16
1-3	88	912	49,10	3,08	151,23	1	49,10	151,23	20,00	0,17
1	89	913	14,00	3,10	43,40	1	14,00	43,40	20,00	0,05
1	90	914	22,40	3,10	69,44	1	22,40	69,44	20,00	0,08
1	91	915	17,70	3,10	54,87	1	17,70	54,87	20,00	0,06
1	92	916	17,70	3,10	54,87	1	17,70	54,87	20,00	0,06
1	93	917	12,50	3,10	38,75	1	12,50	38,75	20,00	0,04
1	94	918	7,00	3,10	21,70	1	7,00	21,70	20,00	0,02
2	95	919	200,10	3,10	620,31	1	200,10	620,31	20,00	0,70
2	96	920	4,60	3,10	14,26	1	4,60	14,26	20,00	0,02
2	97	921	15,60	3,10	48,36	1	15,60	48,36	20,00	0,05
2	98	922	16,50	3,10	51,15	1	16,50	51,15	20,00	0,06
3	99	923	217,60	3,00	652,80	1	217,60	652,80	20,00	0,74
3	100	924	4,70	3,00	14,10	1	4,70	14,10	20,00	0,02
3	101	925	15,60	3,00	46,80	1	15,60	46,80	20,00	0,05
3	102	926	3,60	3,00	10,80	1	3,60	10,80	20,00	0,01
3	103	927	16,50	3,00	49,50	1	16,50	49,50	20,00	0,06
					0,00	1	0,00	0,00	20,00	0,00
					0,00	1	0,00	0,00	20,00	0,00
		KOPĀ	5809,20	3,27	18679,25		5427,00	17754,32		20,00

Climate data

Energy balance calculation with PHPP Version 9.6a

Skolas iela 1, Zilupe, Ludzas nov., LV-5751 / Climate: Rēzekne / TFA: 5427 m² / Heating: 201,2 kWh/(m²a) / Freq. overheating: 0 % / PER: 962 kWh/(m²a)

Selection of climate data

Country: ud-User Data

Region: All

Climate data set: ud-04-Rēzekne

Climate zone: 2: Cold

Altitude

Weather station: 169,0 m

Building location: 129,5 m

Result overview

Annual heating demand201,2 kWh/(m²a)

Heating load70,5 W/m²

Frequency of overheating0,1 %

Sensible cooling1,0 kWh/(m²a)

Latent cooling0,0 kWh/(m²a)

Cooling load- W/m²

PER demand962,0 kWh/(m²a)

Data for heating

Annual method

Heating

Cooling

Heating / cooling period224

Heating / cooling degree hours104

Radiation North89

Radiation East188

Radiation South287

Radiation West182

Horizontal radiation310

365

183

d/a

131

-65

kWh/(m²a)

227

449

454

396

796

180

160

140

120

100

80

60

40

20

0

-20

-40

-60

-80

-100

-120

-140

-160

-180

1

2

3

4

5

6

7

8

9

10

11

12

°C

15

10

5

0

-5

-10

-15

-20

-25

-30

-35

-40

-45

-50

-55

-60

-65

-70

-75

-80

-85

-90

-95

-100

-105

-110

-115

-120

-125

-130

-135

-140

-145

-150

-155

-160

-165

-170

-175

-180

— Radiation North

— Radiation East

— Radiation South

— Radiation West

— Horizontal radiation

— Exterior temperature

— Dew point temperature

Month	1	2	3	4	5	6	7	8	9	10	11	12	Heating load		Cooling load		PER	
Days	31	28	31	30	31	30	31	31	30	31	30	31	Weather 1	Weather 2	Weather 1	Weather 2	factors	
ud-04-Rēzekne	Latitude °	56,5	Longitude °	27,3	Altitude [m]	169	Daily temperature swing Summer [K]				9,7		Radiation: [W/m²]		Radiation: [W/m²]			
° C	Exterior temperature	-4,4	-4,4	-0,2	6,7	12,2	15,5	18,0	16,6	11,7	5,8	0,8	-2,8	-13,9	-15,2	25,3	22,0	1,25
kWh/(m²month)	Radiation North	4	8	18	29	40	48	46	34	21	11	5	2	5	1	100	60	1,25
kWh/(m²month)	Radiation East	10	19	37	58	83	86	86	68	44	25	10	7	11	5	215	165	1,65
kWh/(m²month)	Radiation South	23	37	55	72	81	74	80	79	65	44	20	14	46	10	235	265	1,30
kWh/(m²month)	Radiation West	9	17	35	58	82	87	88	73	45	24	10	6	15	5	215	165	1,25
kWh/(m²month)	Horizontal radiation	11	27	62	107	155	161	163	131	79	38	14	7	20	10	345	230	
° C	Dew point temperature	-5,6	-5,9	-1,5	0,4	3,8	8,1	10,4	9,7	6,4	3,1	-0,2	-4,8			13,4		
° C	Sky temperature	-17,0	-17,3	-14,4	-6,8	-0,3	4,8	7,1	6,0	0,9	-5,1	-12,0	-15,8			9,7	7,7	
° C	Ground temperature	14,8	14,6	14,9	15,4	16,0	16,6	17,1	17,2	17,0	16,5	15,8	15,2	14,6	14,6	21,9	21,9	
	Comment:	PHPP, LBN003-19																

kWh/(m²month)

°C

Household electricity

Domestic hot water

Heating

Cooling

Dehumidification

U-value of building assemblies

Energy balance calculation with PHPP Version 9.6a

Skolas iela 1, Zīlupe, Ludzas nov., LV-5751 / Climate: Rēzekne / TFA: 5427 m² / Heating: 201,2 kWh/(m²a) / Freq. overheating: 0 % / PER: 962 kWh/(m²a)

Secondary calculation: Equivalent thermal conductivity of still air spaces -> (on the right)

Wedge-shaped assembly layer -> (on the right)

Unheated / uncooled attic -> (on the right)

Assembly no.	Building assembly description					Interior insulation?
01ud	Pagraba pārsegums					
Heat transmission resistance [m²K/W]						
Orientation of building element		interior R _{si}		0,17		
Adjacent to		exterior R _{se}		0,17		
Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
Grīdas segums	0,500					20
smiltis/ būvgruži	1,500					200
Mūra velvēs	0,870					130
Percentage of sec. 1		Percentage of sec. 2		Percentage of sec. 3		Total
100%						35,0 cm
U-value supplement		W/(m²K)		U-value: 1,509 W/(m²K)		

Assembly no.	Building assembly description					Interior insulation?
02ud	Ārsiena					
Heat transmission resistance [m²K/W]						
Orientation of building element		interior R _{si}		0,13		
Adjacent to		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)]	Thickness [mm]
Apmetums	0,900					20
ķieģeļu mūris	0,870			vid.sv.biezums		640
Apmetums	0,900					20
Percentage of sec. 1		Percentage of sec. 2		Percentage of sec. 3		Total
100%						68,0 cm
U-value supplement		W/(m²K)		U-value: 1,053 W/(m²K)		

Assembly no.	Building assembly description					Interior insulation?
03ud	bēniņu pārsegums					
Heat transmission resistance [m²K/W]						
Orientation of building element		interior R _{si}		0,10		
Adjacent to		exterior R _{se}		0,10		
Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
sākotnējā izolācija	0,300	sijas	0,130			50
dēļu klājs	0,150					35
apdare						
Percentage of sec. 1		Percentage of sec. 2		Percentage of sec. 3		Total
93%		7,0%				8,5 cm
U-value supplement		W/(m²K)		U-value: 1,642 W/(m²K)		

Assembly no.		04ud pagraba grīda				Interior insulation?
		Heat transmission resistance [m²K/W]				
Orientation of building element		3-Floor		interior R _{si}	0,17	
Adjacent to		2-Ground		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)]	Thickness [mm]
betons	2,000					60
šķembas/grunts	2,000					100
Percentage of sec. 1		Percentage of sec. 2		Percentage of sec. 3		Total
100%						16,0 cm
U-value supplement				U-value: 4,000 W/(m²K)		

Assembly no.		05ud Pagraba ĀS cokols				Interior insulation?
		Heat transmission resistance [m²K/W]				
Orientation of building element		2-Wall		interior R _{si}	0,13	
Adjacent to		1-Outdoor air		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)]	Thickness [mm]
Apmetums	0,900					10
betona/laukakm.mūris	2,000					400
Percentage of sec. 1		Percentage of sec. 2		Percentage of sec. 3		Total
100%						41,0 cm
U-value supplement				U-value: 2,624 W/(m²K)		

Assembly no.		06ud Pagraba ĀS pret grunti				Interior insulation?
		Heat transmission resistance [m²K/W]				
Orientation of building element		2-Wall		interior R _{si}	0,13	
Adjacent to		2-Ground		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)]	Thickness [mm]
betona/laukakm. mūris	2,000					400
Percentage of sec. 1		Percentage of sec. 2		Percentage of sec. 3		Total
100%						40,0 cm
U-value supplement				U-value: 3,030 W/(m²K)		

Assembly no.		07ud Grīda uz grunts piebūvei				Interior insulation?
		Heat transmission resistance [m²K/W]				
Orientation of building element		3-Floor		interior R _{si}	0,17	
Adjacent to		2-Ground		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)]	Thickness [mm]
Grīdas segums	0,500					20
betons	2,000					60
keramzīts	0,200					100
betons	2,000					60
šķembas/ smilts	2,000					100
Percentage of sec. 1		Percentage of sec. 2		Percentage of sec. 3		Total
100%						34,0 cm
U-value supplement				U-value: 1,220 W/(m²K)		

Assembly no.		08ud Ārsienas piebūvei				Interior insulation?
		Heat transmission resistance [m²K/W]				
Orientation of building element		2-Wall		interior R _{si}	0,13	
Adjacent to		1-Outdoor air		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)]	Thickness [mm]
Apmetums	0,900					10
ķieģeļu mūris	0,870					510
Siltumizolācija	0,040					150
Apmetums	0,900					10
Percentage of sec. 1		Percentage of sec. 2		Percentage of sec. 3		Total
100%						68,0 cm
U-value supplement				U-value: 0,221 W/(m²K)		

Assembly no.		09ud Jumts piebūvei				Interior insulation?
		Heat transmission resistance [m²K/W]				
Orientation of building element		1-Roof		interior R _{si}	0,10	
Adjacent to		1-Outdoor air		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)]	Thickness [mm]
Ruberoīds	0,230					6
javas slānis	2,000					40
siltumizolācija	0,300					100
Dz/betona paneļi	2,000					220
apdare	0,900					10
Percentage of sec. 1		Percentage of sec. 2		Percentage of sec. 3		Total
100%						37,6 cm
U-value supplement				U-value: 1,561 W/(m²K)		

Assembly no.		Interior insulation?			
10ud		Siena pret bēniņiem 4.st.			
		Heat transmission resistance [m²K/W]			
Orientation of building element		interior R _{si}		0,13	
Adjacent to		exterior R _{se}		0,13	
Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]
Apmetums	0,900				
Ķieģeļu mūris	0,870				
Apmetums	0,900				
Percentage of sec. 1		Percentage of sec. 2		Percentage of sec. 3	
100%					
U-value supplement		W/(m²K)		U-value: 1,123 W/(m²K)	

Thickness [mm]	
20	
510	
20	
Total	55,0 cm

Assembly no.		Interior insulation?			
11ud		Jumts sporta zālē			
		Heat transmission resistance [m²K/W]			
Orientation of building element		interior R _{si}		0,10	
Adjacent to		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)]
Ruberoīds	0,230				
javas slānis	2,000				
esošā izolācija	0,300				
ribotais panelis	2,000				
Percentage of sec. 1		Percentage of sec. 2		Percentage of sec. 3	
100%					
U-value supplement		W/(m²K)		U-value: 1,597 W/(m²K)	

Thickness [mm]	
6	
30	
120	
90	
Total	24,6 cm

Assembly no.		Interior insulation?			
12ud					
		Heat transmission resistance [m²K/W]			
Orientation of building element		interior R _{si}			
Adjacent to		exterior R _{se}			
Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]
Percentage of sec. 1		Percentage of sec. 2		Percentage of sec. 3	
100%					
U-value supplement		W/(m²K)		U-value: W/(m²K)	

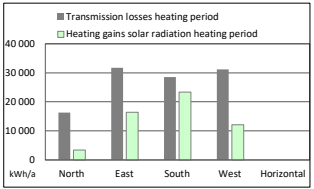
Thickness [mm]	
Total	cm

Windows

Skolas iela 1, Zilupe, Ludzas nov., LV-5751 / Climate: Rēzekne / TFA: 5427 m² / Heating: 201,2 kWh/(m²a) / Freq. overheating: 0 % / PER: 962 kWh/(m²a)

Window area orientation	Global radiation (main orientations) kWh/(m²a)	Shading	Dirt	Non-vertical radiation incidence	Glazing fraction	g-Value	Solar irradiation reduction factor	Window area m²	Window U-Value W/(m²K)	Glazing area m²	Average global radiation kWh/(m²a)
Standard values →		0,75	0,95	0,85							
North	89	0,79	0,95	0,85	0,72	0,67	0,46	118,47	1,33	85,23	93
East	188	0,79	0,95	0,85	0,77	0,67	0,49	234,49	1,31	180,31	214
South	287	0,86	0,95	0,85	0,82	0,67	0,57	215,74	1,28	177,14	283
West	182	0,79	0,95	0,85	0,78	0,67	0,50	231,47	1,30	180,04	157
Horizontal	310	1,00	0,95	0,85	0,00	0,00	0,00	0,00	0,00	0,00	310
Total or average value for all windows.						0,67	0,51	800,17	1,30	622,72	

Transmission losses heating period kWh/a	Heating gains solar radiation heating period kWh/a
16338	3386
31706	16421
28563	23359
31180	12067
0	0
107787	55233



Recommendation for $U_{w, installed}$ [W/(m²K)]

0,65	0,70	0,80	0,42
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Heating degree hours [KKh/a]: 103,6

[Go to glazing list](#)

[Go to window frames list](#)

Heating degree hours [KKh/a]: 103,6					Window rough openings		Installed in	Glazing	Frame	g-Value	U-Value		Ψ Glazing edge	Installation situation user determined value for Ψ _{installation} Of "1": Ψ _{installation} from 'Components' worksheet "0": in the case of abutting windows					Results			
Qna n-ty	Description	Deviation from north	Angle of inclination from the horizontal	Orien-tation	Width	Height	Selection from 'Areas' worksheet	Selection from 'Components' worksheet	Selection from 'Components' worksheet	Perpen-dicular radiation	Glazing	Frames (avg.)	Ψ _{Glazing edge} (Avg.)	left	right	bottom	top	Ψ _{Installation} (Avg.)	Window Area	Glazing area	U _w installed	Glazed fraction per window
		°	°		m	m		1-Sorting: LIKE LIST	1-Sorting: LIKE LIST	-	W/(m²·K)	W/(m²·K)	W/(mK)	W/(mK) or 1/0				W/(mK)	m²	m²	W/(m²·K)	%
4	Z L-1 E	15	90	North	0,230	0,680	2-Z AS esoša	01ud-2 stiklu logi	01ud-PVC logi	0,67	1,18	1,30	0,045	1	1	1	1	0,000	0,6	0,06	1,58	9%
6	Z L-2 E	15	90	North	1,850	2,100	2-Z AS esoša	01ud-2 stiklu logi	01ud-PVC logi	0,67	1,18	1,30	0,045	1	1	1	1	0,000	23,3	18,81	1,29	81%
6	Z L-3 E	15	90	North	0,650	2,150	2-Z AS esoša	01ud-2 stiklu logi	01ud-PVC logi	0,67	1,18	1,30	0,045	1	1	1	1	0,000	8,4	5,27	1,38	63%
6	Z L-4 E	15	90	North	0,650	4,300	2-Z AS esoša	01ud-2 stiklu logi	01ud-PVC logi	0,67	1,18	1,30	0,045	1	1	1	1	0,000	16,8	11,07	1,37	66%
7	Z L-5 E	15	90	North	0,650	1,600	2-Z AS esoša	01ud-2 stiklu logi	01ud-PVC logi	0,67	1,18	1,30	0,045	1	1	1	1	0,000	7,3	4,41	1,39	61%
7	Z L-6 E	15	90	North	0,700	1,600	2-Z AS esoša	01ud-2 stiklu logi	01ud-PVC logi	0,67	1,18	1,30	0,045	1	1	1	1	0,000	7,8	4,90	1,38	63%
6	Z L-7 E	15	90	North	0,700	1,560	2-Z AS esoša	01ud-2 stiklu logi	01ud-PVC logi	0,67	1,18	1,30	0,045	1	1	1	1	0,000	6,6	4,08	1,38	62%
7	A L-8 E	105	90	East	1,250	2,900	3-A AS esoša	01ud-2 stiklu logi	01ud-PVC logi	0,67	1,18	1,30	0,045	1	1	1	1	0,000	25,4	19,85	1,30	78%
12	A L-9 E	105	90	East	1,850	2,220	3-A AS esoša	01ud-2 stiklu logi	01ud-PVC logi	0,67	1,18	1,30	0,045	1	1	1	1	0,000	49,3	40,00	1,28	81%
2	D L-8 E	195	90	South	1,250	2,900	4-D AS esoša	01ud-2 stiklu logi	01ud-PVC logi	0,67	1,18	1,30	0,045	1	1	1	1	0,000	7,3	5,67	1,30	78%
10	D L-9 E	195	90	South	1,850	2,220	4-D AS esoša	01ud-2 stiklu logi	01ud-PVC logi	0,67	1,18	1,30	0,045	1	1	1	1	0,000	41,1	33,33	1,28	81%
7	D L-10 E	195	90	South	1,220	3,350	4-D AS esoša	01ud-2 stiklu logi	01ud-PVC logi	0,67	1,18	1,30	0,045	1	1	1	1	0,000	28,6	22,49	1,30	79%
7	R L-8 E	285	90	West	1,250	2,900	5-R AS esoša	01ud-2 stiklu logi	01ud-PVC logi	0,67	1,18	1,30	0,045	1	1	1	1	0,000	25,4	19,85	1,30	78%
12	R L-9 E	285	90	West	1,850	2,220	5-R AS esoša	01ud-2 stiklu logi	01ud-PVC logi	0,67	1,18	1,30	0,045	1	1	1	1	0,000	49,3	40,00	1,28	81%
2	Z L-1	15	90	North	1,450	1,600	7-Z AS piebūve	01ud-2 stiklu logi	01ud-PVC logi	0,67	1,18	1,30	0,045	1	1	1	1	0,000	4,6	3,50	1,31	75%
4	Z L-2	15	90	North	1,450	0,800	7-Z AS piebūve	01ud-2 stiklu logi	01ud-PVC logi	0,67	1,18	1,30	0,045	1	1	1	1	0,000	4,6	3,00	1,37	65%
2	Z L-3	15	90	North	3,000	2,100	7-Z AS piebūve	01ud-2 stiklu logi	01ud-PVC logi	0,67	1,18	1,30	0,045	1	1	1	1	0,000	12,6	10,64	1,27	84%
3	Z L-4	15	90	North	1,000	4,000	7-Z AS piebūve	01ud-2 stiklu logi	01ud-PVC logi	0,67	1,18	1,30	0,045	1	1	1	1	0,000	12,0	9,12	1,31	76%
3	Z L-5	15	90	North	1,000	3,000	7-Z AS piebūve	01ud-2 stiklu logi	01ud-PVC logi	0,67	1,18	1,30	0,045	1	1	1	1	0,000	9,0	6,72	1,32	75%
2	Z L-6	15	90	North	1,380	1,750	7-Z AS piebūve	01ud-2 stiklu logi	01ud-PVC logi	0,67	1,18	1,30	0,045	1	1	1	1	0,000	4,8	3,66	1,31	76%
7	A L-7	105	90	East	1,100	3,550	8-A AS piebūve	01ud-2 stiklu logi	01ud-PVC logi	0,67	1,18	1,30	0,045	1	1	1	1	0,000	27,3	21,11	1,31	77%
7	A L-8	105	90	East	0,840	1,430	8-A AS piebūve	01ud-2 stiklu logi	01ud-PVC logi	0,67	1,18	1,30	0,045	1	1	1	1	0,000	8,4	5,51	1,36	66%
51	A L-9	105	90	East	1,380	1,750	8-A AS piebūve	01ud-2 stiklu logi	01ud-PVC logi	0,67	1,18	1,30	0,045	1	1	1	1	0,000	123,2	93,28	1,31	76%
1	A L-10	105	90	East	0,800	1,150	8-A AS piebūve	01ud-2 stiklu logi	01ud-PVC logi	0,67	1,18	1,30	0,045	1	1	1	1	0,000	0,9	0,57	1,38	62%
4	D L-3	195	90	South	3,000	2,100	9-D AS piebūve	01ud-2 stiklu logi	01ud-PVC logi	0,67	1,18	1,30	0,045	1	1	1	1	0,000	25,2	21,28	1,27	84%
1	D DURVIS	195	90	South	3,000	4,660	9-D AS piebūve	01ud-2 stiklu logi	01ud-PVC logi	0,67	1,18	1,30	0,045	1	1	1	1	0,000	14,0	12,49	1,24	89%
18	D L-9	195	90	South	1,380	1,750	9-D AS piebūve	01ud-2 stiklu logi	01ud-PVC logi	0,67	1,18	1,30	0,045	1	1	1	1	0,000	43,5	32,92	1,31	76%
6	D L-11 sporta zāle	195	90	South	2,600	3,60	9-D AS piebūve	01ud-2 stiklu logi	01ud-PVC logi	0,67	1,18	1,30	0,045	1	1	1	1	0,000	56,2	48,96	1,25	87%
4	R L-12	285	90	West	1,800	2,05	10-R AS piebūve	01ud-2 stiklu logi	01ud-PVC logi	0,67	1,18	1,30	0,045	1	1	1	1	0,000	14,8	11,84	1,29	80%
1	R DURVIS	285	90	West	4,600	3,100	10-R AS piebūve	01ud-2 stiklu logi	01ud-PVC logi	0,67	1,18	1,30	0,045	1	1	1	1	0,000	14,3	12,76	1,24	89%
9	R L-1	285	90	West	1,450	1,600	10-R AS piebūve	01ud-2 stiklu logi	01ud-PVC logi	0,67	1,18	1,30	0,045	1	1	1	1	0,000	20,9	15,75	1,31	75%
2	R L-2	285	90	West	0,800	1,450	10-R AS piebūve	01ud-2 stiklu logi	01ud-PVC logi	0,67	1,18	1,30	0,045	1	1	1	1	0,000	2,3	1,50	1,37	65%
30	R L-13	285	90	West	1,400	1,800	10-R AS piebūve	01ud-2 stiklu logi	01ud-PVC logi	0,67	1,18	1,30	0,045	1	1	1	1	0,000	75,6	57,60	1,31	76%
6	R L-14	285	90	West	0,830	1,410	10-R AS piebūve	01ud-2 stiklu logi	01ud-PVC logi	0,67	1,18	1,30	0,045	1	1	1	1	0,000	7,0	4,57	1,36	65%
5	R L-8	285	90	West	0,840	1,430	10-R AS piebūve	01ud-2 stiklu logi	01ud-PVC logi	0,67	1,18	1,30	0,045	1	1	1	1	0,000	6,0	3,94	1,36	66%
6	R L-15	285	90	West	1,400	1,900	10-R AS piebūve	01ud-2 stiklu logi	01ud-PVC logi	0,67	1,18	1,30	0,045	1	1	1	1	0,000	16,0	12,24	1,31	77%

Ventilation data

Energy balance calculation with PHPP Version 9.6a

Skolas iela 1, Zilupe, Ludzas nov., LV-5751 / Climate: Rēzekne / TFA: 5427 m² / Heating: 201,2 kWh/(m²a) / Freq. overheating: 0 % / PER: 962 kWh/(m²a)

Treated floor area A_{TFA}	m²	5427	(Areas' worksheet)
Room height h	m	3,27	
Volume of ventilated space ($A_{TFA} \cdot h$) V_V	m³	17754	(Worksheet 'Annual heating')

Ventilation type

Please select

1-Balanced PH ventilation with HR

Infiltration air change rate

Wind protection coefficients e and f		
Coefficient e for wind protection class	Several side exposed	One side exposed
No protection	0,10	0,03
Moderate protection	0,07	0,02
High protection	0,04	0,01
Coefficient f	15	20

Wind protection coefficient, e

For annual demand: 0,02

For heating load: 0,05

Wind protection coefficient, f

20

20

Net air volume for press. test V_{n50}

Air change rate at press. test n_{50}

1/h 1,95

1,95

17754 m³

Air permeability q_{50}

3,00 m³/(hm²)

For annual demand:

For heating load:

Excess extract air

1/h 0,00

0,00

Infiltration air change rate $n_{V,Rest}$

1/h 0,039

0,097

Selection of ventilation input - Results

PHPP offers two methods for dimensioning air quantities and choosing the ventilation unit. With "Standard data input for balanced ventilation", supply or extract air quantities for residential buildings and parameters for ventilation systems with a maximum of 1 ventilation unit can be planned. Projects with up to 10 different ventilation units and air quantities determined according to rooms or zones can be entered in the 'Addl vent' worksheet. Please select your design method here:

Ventilation unit / Heat recovery efficiency design

☐	Standard design	(Ventilation' worksheet, see below)
☒	Multiple ventilation units, non-res	(Addl vent' worksheet)

Average air flow rate m^3/h	Average air change rate $1/h$	Extract air excess (extract air system) $1/h$	Effective heat recovery efficiency unit $[-]$	Humidity recovery efficiency $[-]$	Specific power input Wh/m^3	Heat recovery efficiency SHX $[-]$
2673	0,15	0,00	0,0%	0,0%	0,02	0,0%
Cooling recovery						Efficiency SHX
						η_{SHX} 0%

Average interior humidity during winter operation

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
22%	21%	28%	31%	39%	50%	58%	56%	45%	37%	30%	23%

Extended input for balanced ventilation

Energy balance calculation with PHPP Version 9.6a

Skolas iela 1, Zīlupe, Ludzas nov., LV-5751 / Climate: Rēzekne / TFA: 5427 m² / Heating: 201,2 kWh/(m²a) / Freq. overheating: 0 % / PER: 962 kWh/(m²a)

Planning ventilation systems with multiple ventilation units

Ventilation unit / Heat recovery efficiency design
In Ventilation sheet (standard design)
In 'Addl vent worksheet (this worksheet)

	(Ventilation' worksheet)
x	(Addl vent)

Treated floor area A_{TFA}

m²	5427	(A'area' worksheet)
----	------	---------------------

Room height h

m	3,27	(Worksheet 'Annual heating')
---	------	------------------------------

Room air volume for ventilation ($A_{TFA} \cdot h$) = V_V

m³	17754	(Worksheet 'Annual heating')
----	-------	------------------------------

Number of occupants

P	248,0	(Ventilation' worksheet)
---	-------	--------------------------

Room temperature

°C	20	(Worksheet 'Annual heating')
----	----	------------------------------

Average external temp. heating period

°C	1,2	(Ventilation' worksheet)
----	-----	--------------------------

Average ground temp.

°C	7,3	(Ground' worksheet)
----	-----	---------------------

Length of the heating period

d/a	224	(Heating' worksheet)
-----	-----	----------------------

Ventilation type

1-Balanced PH ventilation with HR	(Ventilation' worksheet)
-----------------------------------	--------------------------

Results of ventilation design and unit selection:

Ventilation unit no.	Description of the unit	Design		Annual average value		
		V_{SUP} m³/h	V_{ETA} m³/h	V_{SUP} m³/h	V_{ETA} m³/h	Air ch.r.t. 1/h
1	nosūce sporta zālē	3001	3001	214	214	---
2	dabiskā pārējās	14754	14754	2459	2459	---
3						---
4						---
5						---
6						---
7						---
8						---
9						---
10						---

Result for overall vent. syst

17754	17754	2673	2673	0,15
-------	-------	------	------	------

Effective heat recovery efficiency	Humidity recovery efficiency	Spec. input power	Heat recov. efficiency SHX
0%	0%	0,25	0%
0%	0%	0,00	0%

0,00%	0%	0,02	0%
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Recommendations for dimensioning air quantities

Use of low odour and low VOCs building materials/furnishings:

It is strongly recommended to use building materials that cause no or very low VOCs/odours instead of increasing the outdoor air volume in order to clear the air.

This holds true independently from the chosen approach to determine air quality; emissions of all sources in the room should be considered, e.g. furniture, carpets and ventilation or air-conditioning unit.

Assessment of volume flow rates according to the number of persons

Also in non-residential buildings, the number of persons is fundamentally important for assessing the volume air flow rates. For good indoor air quality volumes between 20 to 30 m³/h/person are sufficient.

Higher outdoor air amounts may lead to excessively dry indoor air in winter. The air flow rates are specified by classification according to EN 13779. The classification must be agreed with the client in advance.

IDA 3 is adequate for office buildings. IDA 4 has proven satisfactory for school buildings as flushing ventilation is carried out during breaks anyway. For typical outdoor air CO₂ concentrations of around 400-500 ppm,

it is possible to comply even with 1500 ppm. Exceeding this figure temporarily is permissible.

Outdoor air flow rates per person:

- Recommended for residential buildings: around 30 m³/(h person)
- Recommended for offices and similar uses: around 30 m³/(h person) (AMEV: 28 m³/(h person); EN 13779 / IDA 3: at least 24 m³/(h person))
- Recommended for schools and day care centres: 15 to 20 m³/(h person) (Source: Guidelines for energy-efficient educational buildings, Passive House Institute, 2010)
- Recommendation for sport halls: 60 m³/(h person) (DIN 18032-1)

Flushing phase for intermittent ventilation operation

In case the ventilation is to be used intermittently (turned off at night), then it should be flushed in the morning, approx. 1 to 2 hours before building is occupied. This should be done in order to refresh air from emissions such as VOCs. Flushing the building causes that the ventilation system works for a longer period (utilisation time + flushing phase). Please consider this at design stage.

Heat distribution and domestic hot water (DHW) system

Energy balance calculation with PHPP Version 9.6a

Skolas iela 1, Zilupe, Ludzas nov., LV-5751 / Climate: Rēzekne / TFA: 5427 m² / Heating: 201.2 kWh/(m²a) / Freq. overheating: 0 % / PER: 962 kWh/(m²a)

Interior temperature:	20	°C	Interior temperature summer:	27	°C
Building type:	Nedzīvojamā ēka - 1263 - skolas, universitātes un zinātniskajai pētniecībai paredzētās ēkas				
Treated floor area A _{TFA} :	5427	m²			
Occupancy:	248,0	Pers			
Number of dwelling units:	1				
Annual heating demand q _{Heating} :	#####	kWh/a	Annual useful cooling dem. q _{Cool} :	5613	kWh/a
Length of heating period:	224	d	Length cooling period:	183	d
Average heating load P _{ave} :	203,2	kW	Average cooling load P _{Average} :	1,3	kW
Marginal usability of additional heat gains:	100%		Marginal utility of additional heat losses:	1%	

Space heat distribution

Length of distribution pipes	L _H	m	1104,8					
Nominal width of pipe		mm	21					
Insulation thickness		mm	20					
Insulation reflective coating?		-	x					
Thermal conductivity of insulation		W/(mK)	0,040					
Heat loss coefficient per m of insulated pipe		W/(mK)	0,189					
Insulation quality of mountings, pipe suspensions, etc.		-	2 - Moderate	1-None	1-None	1-None	1-None	1-None
Thermal bridge supplement		W/K	39,267					
Total heating loss coefficient per m of pipe	Ψ	W/(mK)	0,224					
Temp. of the room through which the pipes pass	θ _x	°C	20	20	20	20	20	20
Design forward flow temperature	θ _v	°C	55,0	55,0	55,0	55,0	55,0	55,0
Design system heating load	P _{heating}	kW	382,5	382,5	382,5	382,5	382,5	382,5
Forward flow temperature control ('x' if appropriate)			x	x	x	x	x	x
Design return flow temperature	θ _R	°C	45,0					
Annual heat emission per m of plumbing	q [*] _{HL}	kWh/(m·a)	22					
Possible utilisation factor of released heat	η _G	-	100%					
Annual heat losses of heating distribution	Q _{HL}	kWh/a	0					
Annual heat losses of heating storage		kWh/a						
Annual heat losses of heating		kWh/a						
Performance ratio of heat distribution	ea _{HL}	-						

Outside thermal envelope				
1	2	3	4	5
103,6				
21				
20				
0,060				
0,301				
2 - Moderate	1-None	1-None	1-None	1-None
4,224				
0,342				
5,0	5,0	5,0	5,0	5,0
55,0	55,0	55,0	55,0	55,0
382,5	382,5	382,5	382,5	382,5
x	x	x	x	x
45,0				
62				
0%				
6399				
kWh/a		kWh/(m²a)		
6399		1,2		
0		0,0		
6399		1,2		
101%				

DHW useful heat

DHW demand for showers, per person and day (with 60°C)	litre/person/d	0,5	
DHW demand others, per person and day (with 60°C)	litre/person/d	3,0	
Performance of shower drain-water heat recovery	-	0%	
Effective DHW demand	V _{DHW}	litre/person/d	3
Average cold water temperature of the supply	θ _{TW}	°C	7,3
DHW demand for washing machines and dishwashers non-elec		kWh/a	0
Effective useful heat DHW	Q _{DHW}	kWh/a	19098

kWh/a	kWh/(m²a)
19098	3,5

Auxiliary calculation - DHW demand calculation (for non-res)

Days of use per year [d/a]

180

I/(P*d) at 60 °C

DHW demand for showering:

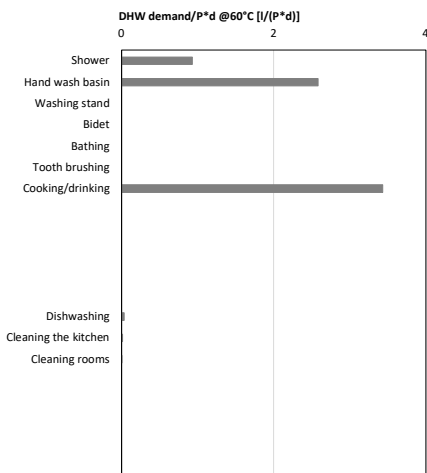
0,5

DHW demand for other uses:

3,0

Application	Used?	Single-lever mixer?	Time of use per use	Amount of uses according to type of use	Flow rate	Useful temperature	Equivalent average amount of water @ 60°C	Equivalent average amount of water @ 60°C	Useful heat @ 60°C
	-	-	min	-	l/min	°C	I/(WE*d)	I/(P*d)	kWh/a
Shower	x	x	0,2	1,0	8,0	38	231	1	2550
Hand wash basin	x	x	0,6	2,0	5,0	30	640	3	7067
Washing stand		x	1,0	0,4	8,0	38			
Bidet		x	1,0	0,1	8,0	38			
Bathing		x	10,0	0,0	15,0	38			
Tooth brushing		x	1,3	1,0	4,0	30			
Cooking/drinking	x	x	0,8	1,0	6,0	45	851	3	9395
		N/A							
		N/A							
		N/A							
		N/A							
Dishwashing	x	x	2,0	1,0	6,0	45	9	0	95
Cleaning the kitchen	x	x	1,0	1,0	6,0	38	3	0	39
Cleaning rooms	x	x	3,0	0,1	6,0	38	1	0	17
		N/A							
		N/A							
		N/A							
		N/A							

DHW demand according to use



Auxiliary calculation - shower drain-water heat recovery

DHW distribution

Temp. of room through which the pipes pass

θ_x

°C

Design forward flow temperature

θ_{dist}

°C

Inside thermal envelope				
1	2	3	4	5
20,0	20,0	20,0	20,0	20,0
60,0	60,0	60,0	60,0	60,0

DHW circulation pipes

Length of circulation pipes (forward + return flow)

L_{HS}

m

Nominal width of pipe

mm

Insulation thickness

mm

Insulation reflective coating?

-

Thermal conductivity of insulation

W/(mK)

Heat loss coefficient per m of insulated pipe

W/(mK)

Insulation quality of mountings, pipe suspensions, etc.

-

Thermal bridge supplement

W/K

Total heating loss coefficient per m of pipe

ψ

W/(mK)

Daily circulation period of operation.

t_{Circ}

h/d

Design return flow temperature

θ_R

°C

Circulation period of operation per year

t_{Circ}

h/a

Annual heat released per m of pipe

q*_z

kWh/m/a

Annual heat loss from circulation lines

QZ

kWh/a

8,0				
21				
30				
x				
0,040				
0,163				
2 - Moderate	1-None	1-None	1-None	1-None
0,880				
0,273				
4,0				
55				
1460				
15				
119				

Outside thermal envelope

1	2	3	4	5
5,0	5,0	5,0	5,0	5,0
60,0	60,0	60,0	60,0	60,0

3 - Good	2 - Moderate	1-None	1-None	1-None

Total values

Absolute

Specific

kWh/a

119

kWh/(m²a)

0,02

DHW individual pipes

Exterior pipe diameter

d_{U, Pipe}

m

Accumulated length per single pipes

L_U

m

Amount of tapping points in building

n_{tapping point}

-

Average pipe length per tapping point

L_{U, average}

m

0,019				
68,00				
34,00				
2,0				

Tap openings per person per day	-	6				
Utilisation days per year	d	180				
Heat loss per tap opening	$q_{\text{Individual}}$ h/tap opening	0,0206				
Amount of tap openings per year and person	n_{Tap} ings per year	1080				
Annual heat loss of individual pipes	Q_U kWh/a	5512				

kWh/a	kWh/(m²a)
5512	1,0

Total heat losses of DHW distribution	Q_{WL}	
Performance ratio of DHW distribution pipes	$ea_{,HL}$	-

kWh/a	kWh/(m²a)
5632	1,0

129%

Storage heat losses

	Storage 1	Storage 2	Buffer storage tank (only heating)	Compact unit		
Selection of storage tank	2-DHW only	0-No storage tank	0-No storage tank	0-No		
Storage necessary for HP						
Solar DHW connection						
Heat loss rate	W/K1,7	0,2				
Storage volume	litre407					
Standby fraction	-					
Location of storage tank, inside or outside of thermal envelope	1-Inside	1-Inside	1-Inside			
Temperature of mechanical room	°C20,0					
Typical storage tank temperature	°C60,0					
Manual entry of storage temperature	°C					
Average standby heat losses storage tank	W69					
Additional heat losses storage tank, solar operation	W					
Possibly utilisation factor of heat losses						
Annual heat losses DHW storage tank	kWh/a604				kWh/a604	kWh/(m²a)0,1
Annual heat losses buffer storage tank						

Auxiliary calculation - heat losses through storage tank according to EU efficiency classes

Storage tank volume	Litre	407,0	0,0	
ErP classification	-	B	A	C
Maximum permissible standby heat loss	W	78	9	
Heat loss ratio for PHPP calculation	W/K	1,7	0,2	

Total energy demand of domestic hot water

Heat losses of DHW distribution and storage	Q _{WL}	kWh/a6236	kWh/(m²a)1,1
Performance ratio DHW-distribution + storage	e _{a, WL}	133%	
Total heating demand of DHW system			
Including storage tank	Q _{gDHW}	kWh/a25334	kWh/(m²a)4,7

Treated floor area A_{TFA} :	5427,0	m ²
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Auxiliary electricity demand:	4353,7	kWh/a
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	12 factors:	12 factors:	
Electricity:	1,25	2,6	kWh/kWh

RE gas / Natural gas:	1,75	1,1	kWh/kWh
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Energy carrier for DHW:	1,1	kWh/kWh
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Solar fraction of DHW	0%	
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Marginal performance ratio DHW:

Window properties (from 'Windows' worksheet):

	Shading	Dirt factor	Non-perpendicular air radiation	Glazing fraction
North	0,79	0,95	0,85	0,72
East	0,79			0,77
South	0,86			0,82
West	0,79			0,78

		Facade with windows					
Lighting / non-residential	Net ground area	Room category	Power of external lighting	Deviation from North	Orientation	Light transmission glazing	Window existing?
Room / Zone	m²		Lux	Degrees		-	Yes

15

Geometry: input of a typical room				
Room depth	Room width	Room height	Lintel height	Window width
m	m	m	m	m

[illegible][illegible][illegible][illegible]

[illegible]

Total	41275 kWh	0	0,0	41275 kWh/a kWh
Specific demand		0,0	0,0	8 kWh/(m²a) kWh

PIRMS												
CO2 emisiju un primārās enerģijas aprēķins												
Enerģijas patēriņa pakalpojums	Energonesējs	kWh/m ² g	MWh/g	Sezonālās efektivitātes koeficients	CO ₂ emisijas faktors, kgCO ₂ / MWh	CO ₂ emisijas kgCO ₂	f_{Pnren}	f_{Pren}	PE nren kWh/m ² g	PE ren kWh/m ² g	PE tot kWh/m2g	CO ₂ emisijas kgCO ₂ /m ²
Apkure	Siltumenerģija no centralizētās siltumapgādes sistēmas, saražota no atjaunojamiem kurināmiem bez koģenerācijas	202,36	1098,21	1,00	50	54911	0,20	1,10	40,47	222,60	263,07	10,12
Karstā ūdens sagatavošana	Elektroenerģija no tīkla	4,67	25,33	1,00	109	2761	1,90	0,60	8,87	2,80	11,67	0,51
Ventilācija	Elektroenerģija no tīkla	0,23	1,22	1,00	109	133	1,90	0,60	0,43	0,14	0,56	0,02
Apgaismojums	Elektroenerģija no tīkla	4,22	22,91	1,00	109	2497	1,90	0,60	8,02	2,53	10,55	0,46
Dzesēšana	Elektroenerģija no tīkla	0,00	0,00	3,50	109	0	1,90	0,60	0,00	0,00	0,00	0,00
Papildu (apkure)	Elektroenerģija no tīkla	0,45	2,43	1,00	109	265	1,90	0,60	0,85	0,27	1,12	0,05
Papildu (karstā ūdens sagatavošana)	Elektroenerģija no tīkla	0,13	0,70	1,00	109	76	1,90	0,60	0,24	0,08	0,32	0,01
KOPĀ:		212,05	1150,81			60644			58,89	228,41	287,30	11,17
				CO ₂ emisijas kgCO ₂ /m ²		11,17						
				CO ₂ emisijas tCO ₂		60,64						

PĒC												
CO2 emisiju un primārās enerģijas aprēķins												
Enerģijas patēriņa pakalpojums	Energonesējs	kWh/m ² g	MWh/g	Sezonālās efektivitātes koeficients	CO ₂ emisijas faktors, kgCO ₂ / MWh	CO ₂ emisijas kgCO ₂	f_{Pnren}	f_{Pren}	PE nren kWh/m ² g	PE ren kWh/m ² g	PE tot kWh/m2g	CO ₂ emisijas kgCO ₂ /m ²
Apkure	Siltumenerģija no centralizētās siltumapgādes sistēmas, saražota no atjaunojamiem kurināmiem bez koģenerācijas	69,12	375,12	1,00	50	18756	0,20	1,10	13,82	76,03	89,86	3,46
Karstā ūdens sagatavošana	Elektroenerģija no tīkla	4,67	25,33	1,00	109	2761	1,90	0,60	8,87	2,80	11,67	0,51
Ventilācija	Elektroenerģija no tīkla	2,85	15,48	1,00	109	1687	1,90	0,60	5,42	1,71	7,13	0,31
Apgaismojums	Elektroenerģija no tīkla	2,11	11,44	1,00	109	1247	1,90	0,60	4,01	1,27	5,27	0,23
Dzesēšana	Elektroenerģija no tīkla	0,00	0,00	3,50	109	0	1,90	0,60	0,00	0,00	0,00	0,00
Papildu (apkure)	Elektroenerģija no tīkla	0,45	2,43	1,00	109	265	1,90	0,60	0,85	0,27	1,12	0,05
Papildu (karstā ūdens sagatavošana)	Elektroenerģija no tīkla	0,13	0,70	1,00	109	76	1,90	0,60	0,24	0,08	0,32	0,01
KOPĀ:		79,3	430,50			24793			33,21	82,16	115,37	4,57
				CO ₂ emisijas kgCO ₂ /m ²		4,57						
				CO ₂ emisijas tCO ₂		24,79						