Heat distribution and domestic hot water (DHW) system

"Stūrīši" / Climate: LV0003b-Zīlāni / TFA: 565 m² / Heating: 125,9 kWh/(m²a) / Overheating: 42 % / PER: 207,3 kWh/(m²a)

Interior temperature:	19	°C
Building type:	5-Multi-family house I Apartment building	
Treated floor area A_{TFA}:	565	m²
Number or occupants per day:	29,8	Pers
Number of dwelling units:	28	
Annual heating demand $q_{Heating}$:	71153	kWh/a
Length of heating period:	212	d/a
Average heating load $P_{Average}$:	14,1	kW
Marginal usability of additional heat gains:	100%	

Interior temperature summer:	25	°C
Annual useful cooling dem. q_{Cool}:	47789	kWh/a
Length cooling period:	153	d/a
Average cooling load $P_{Average}$:	13,0	kW
Marginal usability of additional heat losses:	7498%	

Heat delivery:

	Supply air
x	Radiators
	Underfloor heating or other panel heating
	Concrete core activation
	Split unit or similar
	Wood stove with direct heat emission
	Other

Space heat distribution

			Inside thermal envelope					Outside thermal envelope					Total values	
			1	2	3	4	5	1	2	3	4	5	Absolute	Specific
Length of distribution pipes (forward + return flows)	L_H	m	220,0											
Nominal width of pipe		mm	32											
Insulation thickness		mm	2											
Reflective coating?	-													
Thermal conductivity of insulation		W/(mK)	0,035											
Heat loss coefficient		W/(mK)	0,697											
Insulation quality of mountings, pipe suspensions, etc.	-		1 - None	1 - None	1 - None	1 - None	1 - None	1 - None	1 - None	1 - None	1 - None	1 - None		
Thermal bridging of pipework		W/K	35,000											
Total heat loss coefficient	Ψ	W/(mK)	0,856											
Room temperature	θ_X	°C	19	19	19	19	19							
Forward flow temperature	θ_V	°C	60	60	60	60	60	60	60	60	60	60		
System heating load	$P_{heating}$	kW	33,2	33,2	33,2	33,2	33,2	33,2	33,2	33,2	33,2	33,2		
Flow temperature control?														
Common pipe Heating + DHW?														
Return flow temperature	ϑ_R	°C	48											
Heat emission pipe	q^*_{HL}	kWh/(m·a)	154											
Utilisation factor of released heat	η_G	-	100%										kWh/a	kWh/(m²a)
Heat losses of heating distribution	Q_{HL}	kWh/a	**54**										**54**	**0,1**
Heat losses of heating storage		kWh/a											**0**	**0,0**
Total heat losses of heating		kWh/a											**54**	**0,1**
Performance ratio of space heating distribution	$ea_{,HL}$	-											**100%**	

DHW useful heat

DHW demand for showers, per person and day (with 60 °C)		litre/person/d	30,0
DHW demand others, per person and day (with 60 °C)		litre/person/d	10,0
Performance of drain water heat recovery (shower)	-		0%
Effective DHW demand	V_{DHW}	litre/person/d	40
Average cold water temperature of the supply	θ_{TW}	°C	15,7
DHW demand for washing machines & dishwashers		kWh/a	0

			kWh/a	kWh/(m²a)
Useful heat of DHW	Q_{DHW}		**22326**	**39,5**

Secondary calculation for determining the DHW requirements (for non-res)

Secondary calculation: drain water heat recovery (shower)

DHW distribution

			Inside thermal envelope					Outside thermal envelope					Total values	
			1	2	3	4	5	1	2	3	4	5	Absolute	Specific
Room temperature	θ_X	°C						20,0	20,0	20,0	20,0	20,0		

DHW circulation pipes or, for heat interface units, forward and return flows

			1	2	3	4	5	1	2	3	4	5	Absolute	Specific
Common pipe heating + DHW?														
Length of pipes (forward + return flows)	L_{HS}	m	0,0											
Nominal width of pipe		mm	16											
Insulation thickness		mm	2											
Reflective coating?		-												
Thermal conductivity of insulation		W/(mK)	0,038											
Heat loss coefficient		W/(mK)	0,383											
Insulation quality of mountings, pipe suspensions, etc.		-	1 - None	1 - None	1 - None	1 - None	1 - None	1 - None	1 - None	1 - None	1 - None	1 - None		
Thermal bridge surcharge mountings		W/K	2,000											
Total heat loss coefficient	Ψ	W/(mK)	#DIV/0!											
Daily operating time of circulation	td_{Circ}	h/d	24	24	24	24	24	24	24	24	24	24		
Forward flow temperature	θ_V	°C	40	40	40	40	40	40	40	40	40	40		
Pipes to heat interface unit?														
Return flow temperature	θ_R	°C												
Operating time of the circulation in winter	t_{Circ}	h/a	5042											
Operating time of the circulation in summer	t_{Circ}	h/a	3718										kWh/a	kWh/(m²a)
Heat loss circulation pipes in winter	QZ	kWh/a											0	0,0
Heat loss circulation pipes in summer	QZ	kWh/a												

DHW stub pipes / individual pipes

			1	2	3	4	5	1	2	3	4	5	Absolute	Specific
DHW temperature	θ_V	°C												
Exterior pipe diameter	d_{U_Pipe}	mm												
Total length of individual pipes	L_U	m												
Number of tapping points in building	$n_{tapping\ point}$	-												
Average pipe length per tapping point	$L_{U,\ average}$	m												
Tap openings per person per day		-	6	6	6	6	6	6	6	6	6	6		
Utilisation days per year		d	365	365	365	365	365	365	365	365	365	365		
Number of tap openings per year and person	n_{Tap}	Openings/a												
Heat emission per tap opening in winter	$q_{Individual}$	kWh/Opening												
Heat emission per tap opening in summer	$q_{Individual}$	kWh/Opening											kWh/a	kWh/(m²a)
Heat emission from single pipes in winter	Q_U	kWh/a											0	0,0
Heat emission from single pipes in summer	Q_U	kWh/a												

													kWh/a	kWh/(m²a)
Total heat losses of DHW distribution	Q_{WL}													0	0,0
Performance ratio of DHW distribution pipes	$ea_{,HL}$	-													100%

Storage heat losses

		Storage type 1	Storage type 2	Buffer storage tank (only heating)	Compact unit
Selection of storage tank		0-No storage tank	0-No storage tank	0-No storage tank	0-No
Storage necessary for HP			---------		---------
Solar DHW connection				---------	
Heat loss rate	W/K				
Storage volume	litre				---------
Standby fraction	-			---------	---------
Location of storage tank, inside or outside of thermal envelope		1-Inside	1-Inside	1-Inside	
Temperature of mechanical room	°C				
Typical storage tank temperature	°C				
Manual entry of storage temperature	°C				---------
Average standby heat losses storage tank	W				
Additional heat loss storage, solar system operation	W			---------	---------
Possible utilisation factor of heat losses		---------	---------		---------

		Storage type 1	Storage type 2	Buffer storage tank (only heating)	kWh/a	kWh/(m²a)
Annual heat losses DHW storage tank	kWh/a				**0**	**0,0**
Annual heat losses buffer storage tank	kWh/a				---------	

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

Total energy demand of DHW

			kWh/a	kWh/(m²a)
Heat losses of DHW distribution and storage	Q_{WL}		**0**	**0,0**
Performance ratio DHW distribution + storage	$e_{a,WL}$		**100%**	
Total heat demand of DHW system including storage tank	Q_{gDHW}		**22326**	**39,5**

Cooling distribution

			Inside thermal envelope					Outside thermal envelope					Total values	
			1	2	3	4	5	1	2	3	4	5	Absolute	Specific
Length of distribution pipes	L_H	m												
Nominal width of pipe		mm												
Insulation thickness		mm												
Reflective coating?		-												
Thermal conductivity of insulation		W/(mK)												
Heat loss coefficient per m pipe	Ψ	W/(mK)												
Temp. of room through which the pipes pass	θ_X	°C	25,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0		
Design flow temperature	θ_V	°C	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0		
System cooling load	P_{Cool}	kW												
Flow temperature control ('x' if appropriate)														
Design return temperature	θ_R	°C												
Annual heat absorption per m of pipe	q^*_{HL}	kWh/(m·a)												
Possible utilisation factor of this heat absorption	η_G	-											kWh/a	kWh/(m²a)
Annual losses of cooling distribution	Q_{HL}	kWh/a											**0**	**0,0**
Performance ratio cold water distribution pipes	$ea,_{HL}$	-											**100%**	

DHW heating and distribution losses in kWh/a

"Stūrīši"   565 m² treated floor area, Latvia

PHPP Energy balance calculation with PHPP Version 10.4 EN