PHPP

BRIEF INSTRUCTIONS

For use in EuroPHit, c

Place your mouse here to see the PHPP help.

If no help appears when the mouse passes over cell B4, you can activate it by going into the Menu Bar Tools/Options/View, and under "Comments", select "Comment Indicator Only".

Passive House Verification: Meaning of Field Formats

Example	Field Format	Meaning
78,8	Courier New, blue, bold on yellow background	Input Field: Please enter the required value here
01ud tripple-low-e-cr08	Arial Narrow, blue, bold on brown	Data entry field with drop down list
6619	Arial, black, standard on white background	Calculation field; please do not change
78,8	Courier New, purple, bold on white background	Field with references to another sheet - should not be changed.
126,0	Arial, black, large & bold on green background	**Important result**

Passive House Planning: Worksheet Directory

Worksheet name (to show/hide worksheets please use the separate 'Profile settings' tool)	Function	Brief Description	Required for the certification?
erification	Building data; summary of results	Building description, selection of the calculation method, summary of results	yes
verview	Overview of the specific data of the project entered	In-depth project description, overview of all results and input variables, specific details on building envelope, building services systems as well as general information.	no
ariants	Variant calculation	Input parameters and results for the variant calculations. Predefined fields for frequent entries, as well as user-defined area.	no
omparison	Comparison between two variants	Comparison between two variants under the energy demand and economic viability perspective. Input of comparison configurations.	no
limate	Climate Region Selection or Definition of User Data	Climate data for: Annual Heating, Windows, Heating Load, Heating, Summer, Cooling, Cooling Units, Cooling Load worksheets	yes
-Values	Calculation of Standard building assembly U-Values	Heat transmission coefficient calculations in accordance with DIN EN ISO 6946.	yes
reas	Areas summary	Building assembly Areas, Thermal Bridges, Treated Floor Area. Use exterior dimension references!	yes
round	Calculation of reduction factors against ground	More precise calculation of heat losses through the ground	if applicable
omponents	Building component database	Database of certified, Passive House suitable components and entry of user-defined components	yes
indows	U_W-Value Determination	Input of geometry, orientation, frame lengths, frame widths, U_g and U-values of the frame, and the thermal bridge heat loss coefficients of the connections; from these inputs, determine U_W and total radiation.	yes
hading	Determination of shading coefficients	Input of shading parameters, e.g. balcony, neighbouring building, window reveal and calculating the shading factors	yes
entilation	Air Flow Rates, Exhaust/Supply Air Balancing, Pressurization Test Results	Sizing the ventilation system from extract and supply air requirements, infiltration air change rate and actual efficiency of heat recovery, input of pressurization test results	yes
dditional Vent	Design and planning of ventilation systems with diverse ventilation units	Extension of the Ventilation worksheet for dimensioning air flows, for special building uses and systems with various ventilation units	if used
nnual heating	Annual heating demand / Annual Method	Calculation of the annual space heating demand according to the energy balance method following EN 13790: Transmission + Ventilation - h (Solar Gains + Internal Gains)	no
eating	Space heating demand calculation Monthly method according to EN 13790	Calculation procedure for the monthly method following EN 13790. Make appropriate selection in the Verification worksheet, if calculations should be performed following this procedure	yes
eating Load	Building Heating Load Calculation	Calculation of the nominal heating load using a balance procedure for the design day: max transmission + max ventilation - η (minimum solar gains + internal heat gains)	yes
ummVent	Determination of Summer Ventilation	Ventilation in cooling case and estimation of air flow rates for natural ventilation during the summer period	yes
ummer	Assessment of Summer Climate	Calculation of the frequency of overheating as a measure of summer comfort	yes
ooling	Monthly Method for Cooling Demand	Annual useful cooling demand calculation	if present
ooling units	Latent Cooling Energy	Calculation of the energy demand for dehumidification and choice of cooling method	if present
ooling load	Building Cooling Load Calculation	Calculation of the daily average cooling load of the building	no
HW+Distribution	Distribution losses; DHW Requirement and Losses	Heat loss calculation of the distribution systems (heating; DHW); calculation of the useful heat requirement of DHW and storage losses	yes
olarDHW	Solar DHW Heating	Solar contribution calculation for DHW and space heating contribution	if solar panels are used
V	Electricity generation by photovoltaic	Electricity generation calculation of PV system	no
lectricity	Electricity Demand for Dwellings	Calculation of the electricity demand of Passive Houses with residential use	yes
se non-res	Patterns of non-residential Utilisation	Input or selection of utilisation patterns for planning of electricity demand and internal heat gains	no
lectricity non-res	Electricity Demand for non-residential Use	Calculation of the electricity demand for lighting, electric devices and kitchens for non-residential buildings	no
ux Electricity	Auxiliary Electricity Demand	Calculation of auxiliary electricity and corresponding primary energy demand	yes
HG	Internal Heat Gains in Dwellings	Calculation of the internal heat gains based on the Electricity and Aux Electricity sheets.	no
HG non-res	Internal Heat Gains for non-residential Use	Calculation of the internal heat gains for non-residential buildings based on the Electricity non-res worksheet and the occupancy	no
E-Value	Specific Primary Energy and CO_2 Demands	Selection of heat generators, calculation of the specific primary energy and CO2 demands from the present results	yes
ompact	Efficiency of Heat Generator Compact Heat Pump Unit	Calculation of combined heat generation efficiency for heating and DHW only by means of a electric heat pump compact unit, considering the specific project boundary conditions.	if present
P	Heat generation efficiency of the heat pump	Calculation of heat generation efficiency for one to two electric-run heat pumps, considering the specific project boundary conditions.	if present
P Ground	Ground probe or ground collector in combination with a heat pump	Heat source calculation for a ground probe or horizontal subsoil heat exchanger for ground-coupled heat pumps, considering the specific project boundary conditions.	if present
oiler	Efficiency of Heat Generator Boiler	For the calculation of the efficiency of heat generation with standard boilers (NT and calorific boilers) for the project given boundary conditions.	if present
istrict Heating	District Heat Transfer Station	Calculation of the final and primary energy demands (heat)	if present
ata	Database	Table of primary energy factors following [GEMIS] and database of EnEV (German energy efficiency regulation).	no

EnerPHit verification

Building:	Primary School 8 "Sveti Sveti Kiril I M
Street:	69 Mogilov blv.
Postcode/City:	Gabrovo
Country:	Bulgaria
Building type:	School
Climate:	Велико Търнов
Altitude of building site (in [m] above sea level):	426
Home owner/client:	Municipality of Gabrovo
Street:	3 Vazrazhdane square
Postcode/City:	Gabrovo

Architecture:		Mechanical System:	
Street:		Street:	
Postcode/City:		Postcode/City:	
Energy consulting:		Certification:	
Street:		Street:	
Postcode/City:		Postcode/City:	

Year of Construction:	2014	Interior temperature winter [C°]	20,0	Interior temp. summer [C°]	25,0
Number of dwelling units:	1	Internal heat gains winter [W/m²]	2,8	IHG summer [W/m²]	2,8
Number of Occupants:	680,0			Spec. capacity [Wh/K per m² TFA]	204
Exterior vol. V_e:	15290,3 m³			Mechanical cooling:	

Specific building demands with reference to the treated floor area

				Requirements	Fulfilled?*
	Treated floor area	4630,4	m²		
Space heating	Annual heating demand	**17**	**kWh/(m²a)**	25 kWh/(m²a)	yes
	Heating load	**13**	**W/m²**	-	-
Space cooling	Overall specific space cooling demand		**kWh/(m²a)**	-	-
	Cooling load		**W/m²**	-	-
	Frequency of overheating (> 25 °C)	3,1	%	-	-
Primary Energy	Heating, cooling, dehumidifying, DHW, auxiliary electricity, lighting, elect.	**90**	**kWh/(m²a)**	123 kWh/(m²a)	yes
	DHW, space heating and auxiliary electricity	63	kWh/(m²a)	-	-
	Specific primary energy reduction through solar electricity		kWh/(m²a)	-	-
Airtightness	Pressurization test result n_{50}	**1,0**	**1/h**	1 1/h	yes

* empty field: data missing; '-': no requirement

EnerPHit building retrofit (acc. to heating demand)? yes

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

Name:	Company:	Registration number PHPP:
Surname:	Issued on:	
		Signature

EnerPHit planning:

PROJECT OVERVIEW

Basic data

Building, name of the object	Primary School 8 "Sveti Sveti Kiril I Metodi" -		
Street:	69 Mogilov blv.		
Postcode/City:	Gabrovo		
Country:	Bulgaria		
Building type:			
Climate: region / climate data set	User Data		User data - Вел
Climate: degree days / altitude	77	kKh/a	426
Building type / building status	School | University		
Context of urban development	Urban development		
Building type / construction	EnerPHit building retrofit (acc. to heating demand)		
Building category, in terms of energy	EnerPHit-i		
Year of construction / year of construction of existing building	2014		1970,0
Amount of dwelling units for residential use / non-residential use		Dwelling units	46
Number of occupants standard / planned		P	680
Standard / design occupancy rate		m²/P	7
Home owner / client	Municipality of Gabrovo		
Architect			
Building services			
PHPP/Energy balance			
Building physics			
Structural engineering			
Contractor / tradesperson / other (max. 5000 characters)			
Interior temperatures winter/summer	20	°C	25
IHG winter / summer	2,8	W/m²	2,8
Type of certification	EnerPHit building retrofit (acc. to heating dem		
Project certification / Certificate ID			
Certification body			
PHPP-version / PHPP-registration number	Version 9.0 beta		

Characteristic value according to EnerPHit verification

Treated floor area A_{TFA} / exterior volume V_e	4630,41	m²	15290,25
	Specific Demand		Requirement
Space heating demand	17	kWh/(m²a)	25
Heating load residential		kWh/(m²a)	-
Heating load Non-residential	13	kWh/(m²a)	-
Frequency of overheating	3	%	Recommendation: < 10%
Overall specific space cooling demand		kWh/(m²a)	-
Cooling load residential		kWh/(m²a)	-
Cooling load non-residential	13	kWh/(m²a)	-
Airtightness pressure air exchange rate test n_{50}	1,0	1/h	1
Total PE Value	90	kWh/(m²a)	123
Heating, cooling, DHW, auxiliary electricity, lighting, electrical appliances			
Specific PE Demand - Mechanical System / CO_2-Equivalent	63	kWh/(m²a)	15
Heating, DHW, auxiliary electricity (no lighting and electrical appliances)			
Solar power: Primary energy savings / CO2 emissions		kWh/(m²a)	

Average building quality

	Specific Demand		Requirement
Average U-value of external insulation to outside air	0,14	W/(m²K)	-
Average U-value of external insulation to ground	1,76	W/(m²K)	-
Average U-value interior insulation to outside air		W/(m²K)	-
Average U-value interior insulation to ground	3,18	W/(m²K)	-
Average U-value of thermal bridges ΔU	0,00	W/(m²K)	-
Average U-value windows	0,97	W/(m²K)	-
Average U-value of exterior doors	2,20	W/(m²K)	-
Ventilation system eff. heat recovery efficiency	80,83	%	-

Building envelope and site

Building envelope area A_{total} / treated floor area A_{TFA}	7287	m²	4630
A/V-ratio / Envelope area use (A_{total}/A_{TFA})	0,48		1,57
Window area / Window area percentage	1248	m²	17,1%
Specific solar aperture / Passive solar heating mode	2,4%		47346
Building site area / built-up area		m²	
Gross floor area BGF / Gross external volume BRI		m²	
Floor space ratio / Amount of complete storeys			

Building description (max.5000 characters)

Opaque building components			
Exterior wall: U-value (average value) / area	0,14	W/(m²K)	2553,98
Standard exterior wall: U-value / thickness		W/(m²K)	0,0
Standard exterior wall: total area / area fraction		W/(m²K)	
Standard exterior wall: name / certified?			
Standard exterior wall: short description (materials, manufacturer, product name, special features)			
Exterior wall against ground: U-value (average value) / area	0,18	W/(m²K)	362,08
Standard exterior wall against ground: U-value / thickness		W/(m²K)	0,0
Standard exterior wall against ground: area / area fraction		W/(m²K)	
Standard exterior wall against ground: name / certified?			
Standard exterior wall against ground: short description (materials, manufacturer, product name, special features)			
Roof / top floor ceiling: U-value (average value) / area	0,13	W/(m²K)	1557,73
Standard roof / top floor ceiling: U-value / thickness		W/(m²K)	0,0
Standard roof / top floor ceiling: area / area percentage		W/(m²K)	
Standard roof / top floor ceiling: name / certified?			
Standard roof / top floor ceiling: short description (materials, manufacturer, product name, special features)			

Floor slab / basement ceiling: U-value (average value) / area	2,60	W/(m²K)	1557,73
Standard floor slab / basement ceiling: U-value / thickness		W/(m²K)	0,0
Floor slab / basement ceiling standard: area / area fraction		W/(m²K)	
Standard floor slab / basement ceiling: name / certified?			
Standard floor slab / basement ceiling: short description (materials, manufacturer, product name, special features)			
Thermal bridges: Y-value (Average value) / length	-0,069	W/(mK)	590,05
Thermal bridge free limit value / Complied?	0,01	W/(mK)	yes
Thermal bridges: short description (max.5000 letters) (additional notices, manufacturer, product name, materials, others)			

Windows / doors / shading systems

windows/facades: U-value (average value) / area	0,97	W/(m²K)	1247,78
window/facade frames: U-value (average value) / area	0,80	W/(m²K)	605,89
Glazing: U-value (Average value) / areas	0,80	W/(m²K)	641,89
Ψ-Value Glazing edge (average) / Ψ-Value Installation (average)	0,030	W/(mK)	0,040
Standard window frame: U-value / frame width		W/(m²K)	
Standard window frame: window area / area percentage		W/(m²K)	
Standard window frame: glass edge Ψ-value / installation Ψ-value		W/(mK)	
Standard window frame: name, certified?			
Standard window frame: Short description (materials, manufacturer, product name, installation)			
Standard curtain wall facade: U-value / Frame width		W/(m²K)	
Standard curtain wall facade: Facade area / Total area percentage		W/(m²K)	
Standard curtain wall facade:Ψ-value glazing edge / Ψ-value installation		W/(mK)	
Standard curtain wall facade: Description / Certified?			
Standard curtain wall facade: short description (materials, manufacturer, product name, installation)			
Standard glazing: U-value / g-value		W/(m²K)	
Standard glazing: Facade area / Area ratio		W/(m²K)	
Standard glazing: Description / Certified?			
Standard glazing: short description (description, manufacturer, product name, installation)			
Standard glazing 2: U-value / g-value		W/(m²K)	
Standard glazing 2: Facade area / Area percentage		W/(m²K)	
Standard glazing 2: Description / Certified?			
Standard glazing 2: short description (description, manufacturer, product name, installation)			
Roof lights / light domes: U-value / frame width		W/(m²K)	
Roof lights / light domes: window area / area section		W/(m²K)	
Roof lights / light domes: glazing U-value / g-value		W/(m²K)	
Roof lights / light domes: Y-value glass edge / Installation Y-value		W/(mK)	
Roof lights / light domes: name / certified?			
Roof lights / light domes: short description (materials, manufacturer, product name, installation situation)			
Exterior door: U-value (average value) / Area	2,20	W/(m²K)	7,97
Standard exterior door: door U-value / door U-value installed		W/(m²K)	
Standard exterior door: frame U-value / door leaf U-value		W/(m²K)	
Standard exterior door: door leaf thickness / frame width		mm	
Standard exterior door: panel border Y-value / installation Y-value		W/(mK)	
Standard exterior door: Name / certified?			
Standard exterior door: Short description (materials, manufacturer, product name, installation situation)			
Temporary sun protection: Type / Add. Reduction factor		W/(m²K)	5,75
Temporary sun protection: Area / Area ratio		W/(m²K)	

Shading reduction factors: orientation	Reduction factor winter		Summer reduction factor
North	81	%	53
East	60	%	43
South	68	%	40
West	51	%	34
Horizontal	100	%	100

Ventilation

Ventilation: Type of ventilation	Balanced PH-Ventilation with HR		
Calculated supply air demand / supply air per person	10200	m³/h	15
Calculated extract air demand / Amount extract air rooms	0	m³/h	
Design air flow rate (maximum) / Average value reference to maximum		m³/h	55
Average flow rate / Average air exchange		m³/h	
Airtightness test pressure at n_{50} / Air permeability q_{50}	1,00	1/h	0,87
Net air flow for pressurization test / Infiltration flow $n_{V,Rest}$	6329	m³	0,04
Ventilation unit: Description / Certified?			
Ventilation system: effective heat recovery efficiency / electrical efficiency		%	
Ventilation system: Description (type of heat recovery, manufacturer, product name)			
Ventilation system: installation site / Temperature of mechanical services room			20
Nominal width exterior or supply air / exhaust or extract air ducts	60	mm	60
Conductance ambient- or supply air duct / exhaust- or extract air duct		W/(mK)	
Length ambient- or supply air duct / exhaust- or extract air duct	2,00	m	2,00
SHX: efficiency / effective heat recovery efficiency		%	0,00
HE defrosting / Defrosting at a minimum temperature of	yes		4,00
Effective energy recovery efficiency ventilation / Humidity recovery		%	0,0
Ventilation system: Short description (installation site, ducts, silencers, others)			

Summer ventilation

Summer base ventilation: ventilation type		
Air exchange via ventilation system with supply air:	Without heat recovery	1,17
Air exchange via extract air system		0,62
Window ventilation air exchange		0,14
Night summer ventilation: Type of ventilation		
Night air exchange Window Night Ventilation, Manual		0,00
Night air exchange mechanical, automatically Controlled ventilation	Humidity differenceregulated	0,62
Summer ventilation: short description (window opening profiles, night ventilation concepts, others)		

Cooling

Max. indoor absolute humidity / Internal humidity sources	12,0	g/kg	2,0
Frequency of overheating / Overtemperature limit:	3,1	%	25,0
Mechanical cooling: Applied cooling units			
		kW	
		kW	
	0,0		
		kWh/(m²a)	
Mechanical cooling: Average annual coefficient of performance / Electricity demand			0,0
Mechanical cooling: Short description (unit, manufacturer, product name, installation site, installation)			

Heating and DHW				
DHW Demand	12,83	kWh/(m²a)	59405	
Annual heating demand	17,46	kWh/(m²a)	80824	
Direct electricity: contribution to space heating / domestic hot water		%		
PE value energy carrier / CO_2-emission factor		kWh/kWh		
Direct electric heating / domestic hot water				
Final energy demand		kWh/(m²a)		
Direct electricity: short description (description, manufacturer, product name)				
Heat pump: covered fraction of space heating / domestic hot water		%		
PE value energy carrier / CO_2-emission factor		kWh/kWh		
COP heat pump for heating / heat pump for DHW				
Final energy demand		kWh/(m²a)		
Compact unit: Short description (description, manufacturer, product name)				
Compact unit: covered fraction of space heating / domestic hot water		%		
PE value energy carrier / CO_2-emission factor		kWh/kWh		
COP heat pump for heating / heat pump for DHW				
Final energy demand		kWh/(m²a)		
Compact unit: Short description (description, manufacturer, product name)				
Boiler: covered fraction of space heating / domestic hot water	100	%	100	
PE value energy carrier / CO_2-emission factor	1,1	kWh/kWh	250	
Heat generator: building type / COP	Low Temperature Boi-ler Gas		114	
Final energy demand	31,5	kWh/(m²a)		
Boiler: short description (description, manufacturer, product name)				
District heating: Covered fraction of space heating / domestic hot water		%		
PE value energy carrier / CO_2-emission factor		kWh/kWh		
Heat source / Performance of heat generator				
Final energy demand		kWh/(m²a)		
Compact unit: Short description (description, manufacturer, product name)				

Solarthermics			
Collector	Improved flat plate PK SL AL		
Collector area / Specific collector area	22,30	m²	0,03
Deviation from north / Angle of inclination from the horizontal	180	°	45
Solarthermics: Short description (description, manufacturer, product name, installation location)			
Solar contribution to DHW	1,86	kWh/(m²a)	15
Solar contribution to space heating	0,71	kWh/(m²a)	4
Solar contribution total	2,57	kWh/(m²a)	8
Solar Storage	Water storage two heat exchangers		

PHOTOVOLTAIC			
Module technology	Poly-Si		
Nominal current / Nominal voltage		A	30,60
Nominal power / Number of modules	#WERT!	Wp	45
Deviation from north / Angle of inclination from the horizontal	180	°	45
Solarthermics: Short description (description, manufacturer, product name, installation location)			
Annual yield of PV modules		kWh/(m²a)	

Aux. electricity / Household electricity

Aux Electricity

Ventilation units / Electricity demand			47505
Heating system Devices / Electricity demand			2318
DHW-system units / Electricity demand			644
Aux. Electricity solar devices / electr. demand			481
Total aux. Electricity	**11,00**	kWh/(m²a)	**50946,48**

Household electricity

Dishwasher / useful energy demand			48620
Washing machine units / Energy demand			42636
Clothes dryer unit / Energy demand			118703
Refrigerator, Freezer or combination unit / Useful energy demand			574
Cooking unit / energy demand			85000
Lighting			118320
Consumer Electronics			29920
Small appliances, etc.			34000
Other			
Total household electricity	**103,18**	kWh/(m²a)	**477772,28**

Economic data

Total gross construction costs / contained VAT		€	
Building costs (cost group 300+400) / (cost group 200-700)		€	
Total gross construction costs per m² BGF / per m³ BRI		€/m²	
Explanation building costs			
Fostering (Passivhaus, refurbishment, etc.)			
Explanation fostering			

Other

Ecological aspects: rainwater utilization, etc.	
Material used: Regional products / Natural products	
Special features: first project in the country / first project used as	
Building awards	
Research project / funded project	
Description of research / funded project	
Other	

Section

ико Търнов

m

Dwelling units

P

m²/P

°C

W/m²

and)

m³

W/(m²K)

W/m²

W/m²

> 25 °C

W/(m²K)

W/m²

W/m²

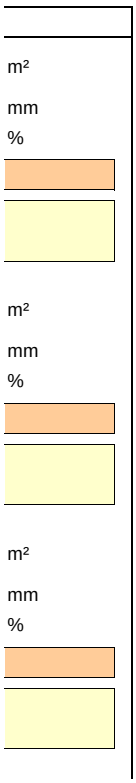
1/h

W/(m²K)

kg/(m²a)

kg/(m²a)

	W/(m²K)
	W/(m²K)
	W/(m²K)
	W/(m²K)
	W/(m²K)
	W/(m²K)
	W/(m²K)
	%
	m²
	kWh/a
	m²
	m³
	floors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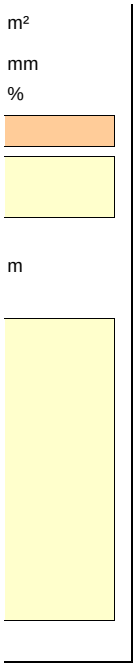
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m²
m²
W/(m²K)
mm
W/(mK)
m²
%
%
%
%
%
%

m³/(P*h)
pcs
%
1/h
1/h
1/h
Wh/m³
°C
mm
W/(mK)
mm
%
°C
%
1/h
1/h
1/h
1/h
1/h
g/(m²h)
0
m³/h
kWh/(m²a)
kWh/(m²a)

kWh/a
kWh/a

%

g/kWh

%

g/kWh

%

g/kWh

%

g/kWh
%

%

g/kWh
%

m²/P
°

%
%
%

V
pcs
°

kWh

kWh/a
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%
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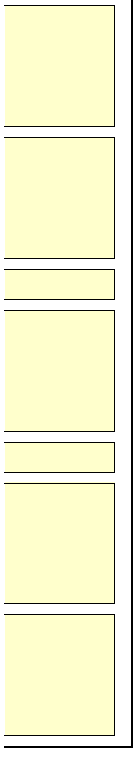
€/m³



EnerPHit planning:

select active variants
>>

Results	Units
Annual heating demand	kwh/(m²a)
Heating Load	W/m²
Overall specific space cooling demand	kwh/(m²a)
Cooling load	W/m²
Frequency of overheating	%
Total primary energy demand	kwh/(m²a)
Certifiable as EnerPHit building retrofit (acc. to heating demand)?	yes / no

<<	User defined	Units

Input variables	Units

<< Assembly layers ('U-value')

a	Exterior insulation EPS-F	W/(mK)
		mm
b	New outside plaster	W/(mK)
		mm
c	of insulation mineral wool (on top of lower slab)	W/(mK)
		mm
d		W/(mK)
		mm
e		W/(mK)
		mm
f	Wall insulation XPS	W/(mK)
		mm
g	Hydroinsulation	W/(mK)
		mm
h		W/(mK)
		mm
i		W/(mK)
		mm
j		W/(mK)
		mm
k	ulation wool on the ceiling of technical corridor	W/(mK)
		mm
l	Floor insulation XPS	W/(mK)

		mm
m		W/(mK)
		mm
n		W/(mK)
		mm
o		W/(mK)
		mm
p	**Wall cocle**	W/(mK)
		mm
q		W/(mK)
		mm
r		W/(mK)
		mm
s		W/(mK)
		mm
t		W/(mK)
		mm
u		W/(mK)
		mm
v		W/(mK)
		mm
w		W/(mK)
		mm
x		W/(mK)
		mm
y		W/(mK)
		mm
z		W/(mK)
		mm

<< Radiation balance ('Areas')

<< Thermal bridges ('Areas')

<< Glazing and frames ('Window', 'Shading')

a	**Doors with console**	
	Active variants: *g-Value:0,51* *U-Value: 0,8 W/(m²K)*	Glazing
	U-Value [W/(m²K]: Left: 1,1 Right: 1,1 Bottom: 1,14 Top: 1,1 *Width [m]: Left: 0,116 Right: 0,116 Bottom: 0,126 Top: 0,116*	Frame
	Window reveal depth	m
	Distance from glazing edge to reveal	m
	Overhang depth	m
	Distance of the upper edge of glazing to the overhang	m

	Reduction factor for temporary sun protection	%
b	**Without winter shading**	
	Active variants: *g-Value:0,51* *U-Value: 0,8 W/(m²K)*	Glazing
	U-Value [W/(m²K]: Left: 0,79 Right: 0,79 Bottom: 0,79 Top: 0,79 *Width [m]: Left: 0,131 Right: 0,131 Bottom: 0,161 Top: 0,131*	Frame
	Window reveal depth	m
	Distance from glazing edge to reveal	m
	Overhang depth	m
	Distance of the upper edge of glazing to the overhang	m
	Reduction factor for temporary sun protection	%
c	**Windows with console**	
	Active variants: *g-Value:0,51* *U-Value: 0,8 W/(m²K)*	Glazing
	U-Value [W/(m²K]: Left: 0,79 Right: 0,79 Bottom: 0,79 Top: 0,79 *Width [m]: Left: 0,131 Right: 0,131 Bottom: 0,161 Top: 0,131*	Frame
	Window reveal depth	m
	Distance from glazing edge to reveal	m
	Overhang depth	m
	Distance of the upper edge of glazing to the overhang	m
	Reduction factor for temporary sun protection	%
d	**Sector A with console**	
	Active variants: *g-Value:0,51* *U-Value: 0,8 W/(m²K)*	Glazing
	U-Value [W/(m²K]: Left: 0,79 Right: 0,79 Bottom: 0,79 Top: 0,79 *Width [m]: Left: 0,131 Right: 0,131 Bottom: 0,161 Top: 0,131*	Frame
	Window reveal depth	m
	Distance from glazing edge to reveal	m
	Overhang depth	m
	Distance of the upper edge of glazing to the overhang	m
	Reduction factor for temporary sun protection	%
a		
		Glazing

		Frame
	Window reveal depth	m
	Distance from glazing edge to reveal	m
	Overhang depth	m
	Distance of the upper edge of glazing to the overhang	m
	Reduction factor for temporary sun protection	%
e	**Sector A without winter shading north**	
	Active variants: *g-Value:0,51* *U-Value: 0,8 W/(m²K)*	Glazing
	U-Value [W/(m²K]: Left: 0,79 Right: 0,79 Bottom: 0,79 Top: 0,79 *Width [m]: Left: 0,131 Right: 0,131 Bottom: 0,161 Top: 0,131*	Frame
	Window reveal depth	m
	Distance from glazing edge to reveal	m
	Overhang depth	m
	Distance of the upper edge of glazing to the overhang	m
	Reduction factor for temporary sun protection	%
f	**Sector C Eaves**	
	Active variants: *g-Value:0,51* *U-Value: 0,8 W/(m²K)*	Glazing
	U-Value [W/(m²K]: Left: 0,79 Right: 0,79 Bottom: 0,79 Top: 0,79 *Width [m]: Left: 0,131 Right: 0,131 Bottom: 0,161 Top: 0,131*	Frame
	Window reveal depth	m
	Distance from glazing edge to reveal	m
	Overhang depth	m
	Distance of the upper edge of glazing to the overhang	m
	Reduction factor for temporary sun protection	%
g		
		Glazing
		Frame
	Window reveal depth	m
	Distance from glazing edge to reveal	m
	Overhang depth	m

	Distance of the upper edge of glazing to the overhang	m
	Reduction factor for temporary sun protection	%
h		
	Glazing	
	Frame	
	Window reveal depth	m
	Distance from glazing edge to reveal	m
	Overhang depth	m
	Distance of the upper edge of glazing to the overhang	m
	Reduction factor for temporary sun protection	%
i		
	Glazing	
	Frame	
	Window reveal depth	m
	Distance from glazing edge to reveal	m
	Overhang depth	m
	Distance of the upper edge of glazing to the overhang	m
	Reduction factor for temporary sun protection	%
j		
	Glazing	
	Frame	
	Window reveal depth	m
	Distance from glazing edge to reveal	m
	Overhang depth	m
	Distance of the upper edge of glazing to the overhang	m
	Reduction factor for temporary sun protection	%
k		
	Glazing	

		Frame
	Window reveal depth	m
	Distance from glazing edge to reveal	m
	Overhang depth	m
	Distance of the upper edge of glazing to the overhang	m
	Reduction factor for temporary sun protection	%
l		
		Glazing
		Frame
	Window reveal depth	m
	Distance from glazing edge to reveal	m
	Overhang depth	m
	Distance of the upper edge of glazing to the overhang	m
	Reduction factor for temporary sun protection	%
m		
		Glazing
		Frame
	Window reveal depth	m
	Distance from glazing edge to reveal	m
	Overhang depth	m
	Distance of the upper edge of glazing to the overhang	m
	Reduction factor for temporary sun protection	%
n		
		Glazing
		Frame
	Window reveal depth	m
	Distance from glazing edge to reveal	m
	Overhang depth	m

	Distance of the upper edge of glazing to the overhang	m
	Reduction factor for temporary sun protection	%
o		
	Glazing	
	Frame	
	Window reveal depth	m
	Distance from glazing edge to reveal	m
	Overhang depth	m
	Distance of the upper edge of glazing to the overhang	m
	Reduction factor for temporary sun protection	%
p		
	Glazing	
	Frame	
	Window reveal depth	m
	Distance from glazing edge to reveal	m
	Overhang depth	m
	Distance of the upper edge of glazing to the overhang	m
	Reduction factor for temporary sun protection	%
q		
	Glazing	
	Frame	
	Window reveal depth	m
	Distance from glazing edge to reveal	m
	Overhang depth	m
	Distance of the upper edge of glazing to the overhang	m
	Reduction factor for temporary sun protection	%
r		
	Glazing	

		Frame
	Window reveal depth	m
	Distance from glazing edge to reveal	m
	Overhang depth	m
	Distance of the upper edge of glazing to the overhang	m
	Reduction factor for temporary sun protection	%
s		
		Glazing
		Frame
	Window reveal depth	m
	Distance from glazing edge to reveal	m
	Overhang depth	m
	Distance of the upper edge of glazing to the overhang	m
	Reduction factor for temporary sun protection	%
t		
		Glazing
		Frame
	Window reveal depth	m
	Distance from glazing edge to reveal	m
	Overhang depth	m
	Distance of the upper edge of glazing to the overhang	m
	Reduction factor for temporary sun protection	%
u		
		Glazing
		Frame
	Window reveal depth	m
	Distance from glazing edge to reveal	m
	Overhang depth	m

	Distance of the upper edge of glazing to the overhang	m
	Reduction factor for temporary sun protection	%
v		
		Glazing
		Frame
	Window reveal depth	m
	Distance from glazing edge to reveal	m
	Overhang depth	m
	Distance of the upper edge of glazing to the overhang	m
	Reduction factor for temporary sun protection	%
w		
		Glazing
		Frame
	Window reveal depth	m
	Distance from glazing edge to reveal	m
	Overhang depth	m
	Distance of the upper edge of glazing to the overhang	m
	Reduction factor for temporary sun protection	%
x		
		Glazing
		Frame
	Window reveal depth	m
	Distance from glazing edge to reveal	m
	Overhang depth	m
	Distance of the upper edge of glazing to the overhang	m
	Reduction factor for temporary sun protection	%
y		
		Glazing

		Frame
	Window reveal depth	m
	Distance from glazing edge to reveal	m
	Overhang depth	m
	Distance of the upper edge of glazing to the overhang	m
	Reduction factor for temporary sun protection	%
z		
		Glazing
		Frame
	Window reveal depth	m
	Distance from glazing edge to reveal	m
	Overhang depth	m
	Distance of the upper edge of glazing to the overhang	m
	Reduction factor for temporary sun protection	%

<< Ventilation ('Ventilation', 'SummVent')

<< Heat generator ('PE-value')

<< Compressor cooling unit ('Cooling units')

<< User defined

1	**Description**	**Units**
2	**Mechanical cooling**	**x**
3	**Light Transmission Glazing**	**-**
4	**Defroster HX**	**0/1**
5	**Extra kitchen consumption**	**kWh/d**
6	**Refrigeratior**	**kWh/d**
7	**Solar Collector Area**	**m2**
8	**Insulation Thickness:**	**mm**
9	**Heat Loss Coefficient per m Pipe**	**W/mK**
10	**Heat Loss Coefficient per m Pipe**	**W/mK**
11	**Power of the boiler**	**kW**
12	**Shading**	
13	**Hybrid solar collector (PV + Heat generation)**	**(A)**
14	**Cooking appliances**	**el/gas**
15	**Lighting in classrooms**	**W/m2**
16	**Lighting in 200 lux**	**W/m2**
17	**Lighting in 100 lux**	**W/m2**
18	**Lighting in 200 lux with fluorescent**	**W/m2**

19	**Lighting in 100 lux with fluorescent**	**W/m2**
20		
21		
22		
23		
24		
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26		
27		
28		
29		
30		
31		
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97		
98		
99		
100		

CALCULATION OF VARIANTS

Active

5-Step 4 (after 10 years) - Windows	No measures	Step 1 - Roof	Step 2 - walls, HVAC, DHW & kitchen appliances, airtightnes	Step 3 - Ground walls periferial insulatio; insulation
5	1	2	3	4
17,3	142,4	111,0	50,5	44,2
13,0	66,3	53,1	27,8	26,1
3,1	7,9	2,9	6,6	5,2
89,9	233,5	196,4	117,2	120,8
yes	no	no	no	no
Link	Link	Link	Link	Link

Value	1	2	3	4
0,032			0,032	0,032
200			200	200
0,87			0,87	0,87
20			20	20
0,041		0,041	0,041	0,041
300		300	300	300
0				
0				
0				
0				
0,035				0,035
180				180
0,17				0,17
7,5				7,5
0				
0				
0				
0				
0				
0				
0,041				0,041
100				100
0				

0				
0				
0				
0				
0				
0				
0				
0,87				**0,87**
30				**30**
0				
0				
0				
0				
0				
0				
0				
0				
0				
0				
0				
0				
0				
0				
0				
0				
0				
0				
0				
0				
0				

Go to glazing list Go to window frames list

01ud 44 mm. triple glazing, 2 Low-E, air, alum.spacer	94ud Double glazing 4/16mm air/4	94ud Double glazing 4/16mm air/4	94ud Double glazing 4/16mm air/4	94ud Double glazing 4/16mm air/4
0066wi03 Nestle - Novum K1-P - with Thermix	01ud Plastic window frame good	01ud Plastic window frame good	02ud Plastic window frame good after wall insulation	02ud Plastic window frame good after wall insulation
0,180	**0,2**	**0,2**	**0,2**	**0,2**
0,070	**0,14**	**0,14**	**0,14**	**0,14**
2,050	**2,15**	**2,15**	**2,15**	**2,15**
0,170	**0,24**	**0,24**	**0,24**	**0,24**

80%	80%	80%	80%	80%

Go to glazing list | Go to window frames list

01ud 44 mm. triple glazing, 2 Low-E, air, alum.spacer	94ud Double glazing 4/16mm air/4	94ud Double glazing 4/16mm air/4	94ud Double glazing 4/16mm air/4	94ud Double glazing 4/16mm air/4
0081wi03 Rehau - REHAU GENEO PHZ - with Swisspacer V	01ud Plastic window frame good	01ud Plastic window frame good	02ud Plastic window frame good after wall insulation	02ud Plastic window frame good after wall insulation
0,180	0,2	0,2	0,2	0,2
0,070	0,14	0,14	0,14	0,14
0,180	0,15	0,15	0,15	0,15
0,070	0,14	0,14	0,14	0,14
60%	80%	80%	80%	80%

Go to glazing list | Go to window frames list

01ud 44 mm. triple glazing, 2 Low-E, air, alum.spacer	94ud Double glazing 4/16mm air/4	94ud Double glazing 4/16mm air/4	94ud Double glazing 4/16mm air/4	94ud Double glazing 4/16mm air/4
0081wi03 Rehau - REHAU GENEO PHZ - with Swisspacer V	01ud Plastic window frame good	01ud Plastic window frame good	02ud Plastic window frame good after wall insulation	02ud Plastic window frame good after wall insulation
0,180	0,2	0,2	0,2	0,2
0,070	0,14	0,14	0,14	0,14
2,050	2,15	2,15	2,15	2,15
0,170	0,24	0,24	0,24	0,24
80%	80%	80%	80%	80%

Go to glazing list | Go to window frames list

01ud 44 mm. triple glazing, 2 Low-E, air, alum.spacer	94ud Double glazing 4/16mm air/4	94ud Double glazing 4/16mm air/4	94ud Double glazing 4/16mm air/4	94ud Double glazing 4/16mm air/4
0081wi03 Rehau - REHAU GENEO PHZ - with Swisspacer V	01ud Plastic window frame good	01ud Plastic window frame good	02ud Plastic window frame good after wall insulation	02ud Plastic window frame good after wall insulation
0,180	0,2	0,2	0,2	0,2
0,070	0,14	0,14	0,14	0,14
1,580	1,62	1,62	1,62	1,62
0,170	0,25	0,25	0,25	0,25
80%	80%	80%	80%	80%

Go to glazing list | Go to window frames list

Go to glazing list Go to window frames list

01ud 44 mm. triple glazing, 2 Low-E, air, alum.spacer	94ud Double glazing 4/16mm air/4	94ud Double glazing 4/16mm air/4	94ud Double glazing 4/16mm air/4	94ud Double glazing 4/16mm air/4
0081wi03 Rehau - REHAU GENEO PHZ - with Swisspacer V	01ud Plastic window frame good	01ud Plastic window frame good	02ud Plastic window frame good after wall insulation	02ud Plastic window frame good after wall insulation
0,180	0,2	0,2	0,2	0,2
0,070	0,14	0,14	0,14	0,14
0,180	0,15	0,15	0,15	0,15
0,070	0,14	0,14	0,14	0,14
80%	80%	80%	80%	80%

Go to glazing list Go to window frames list

01ud 44 mm. triple glazing, 2 Low-E, air, alum.spacer	94ud Double glazing 4/16mm air/4	94ud Double glazing 4/16mm air/4	94ud Double glazing 4/16mm air/4	94ud Double glazing 4/16mm air/4
0081wi03 Rehau - REHAU GENEO PHZ - with Swisspacer V	01ud Plastic window frame good	01ud Plastic window frame good	02ud Plastic window frame good after wall insulation	02ud Plastic window frame good after wall insulation
0,180	0,2	0,2	0,2	0,2
0,070	0,14	0,14	0,14	0,14
0,750	0,75	0,75	0,75	0,75
1,400	1,4	1,4	1,4	1,4
60%	80%	80%	60%	60%

Go to glazing list Go to window frames list

[Go to glazing list](#) [Go to window frames list](#)

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0,510	**0,78**	**0,78**	**0,78**	**0,78**
1,000	**0**	**0**	**1**	**1**
0,000	**8**	**8**	**0**	**0**
1,640	**7,5**	**7,5**	**1,64**	**1,64**
22,300	**0**	**0**	**22,3**	**22,3**
60,000	**60**	**60**	**60**	**60**
0,253	**0,295**	**0,295**	**0,253**	**0,253**
0,198	**0,23**	**0,23**	**0,198**	**0,198**
400,000	**400**	**400**	**400**	**400**
0,600			**0,6**	**0,6**
Gas	**Electricity**	**Electricity**	**Gas**	**Gas**
8,000	**8**	**8**	**8**	**8**
21,600	**21,6**	**21,6**	**21,6**	**21,6**
13,800	**13,8**	**13,8**	**13,8**	**13,8**
7,200	**7,2**	**7,2**	**7,2**	**7,2**

4,600	4,6	4,6	4,6	4,6

Step 4 (after 10 years) - Windows				
5	6	7	8	9
17,3				
13,0				
3,1				
89,9				
yes				
Link	Link	Link	Link	

5	6	7	8	9
0,032				
200				
0,87				
20				
0,041				
300				
0,035				
180				
0,17				
7,5				
0,041				
100				

0,87				
30				

01ud 44 mm. triple glazing, 2 Low-E, air, alum.spacer				
0066wi03 Nestle - Novum K1-P - with Thermix				
0,18				
0,07				
2,05				
0,17				

80%				

01ud 44 mm. triple glazing, 2 Low-E, air, alum.spacer				
0081wi03 Rehau - REHAU GENEO PHZ - with Swisspacer V				
0,18				
0,07				
0,18				
0,07				
60%				

01ud 44 mm. triple glazing, 2 Low-E, air, alum.spacer				
0081wi03 Rehau - REHAU GENEO PHZ - with Swisspacer V				
0,18				
0,07				
2,05				
0,17				
80%				

01ud 44 mm. triple glazing, 2 Low-E, air, alum.spacer				
0081wi03 Rehau - REHAU GENEO PHZ - with Swisspacer V				
0,18				
0,07				
1,58				
0,17				
80%				

01ud 44 mm. triple glazing, 2 Low-E, air, alum.spacer				
0081wi03 Rehau - REHAU GENEO PHZ - with Swisspacer V				
0,18				
0,07				
0,18				
0,07				
80%				

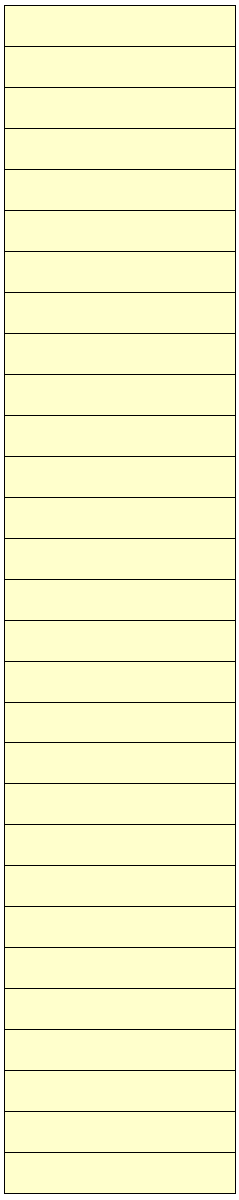
01ud 44 mm. triple glazing, 2 Low-E, air, alum.spacer				
0081wi03 Rehau - REHAU GENEO PHZ - with Swisspacer V				
0,18				
0,07				
0,75				
1,4				
60%				

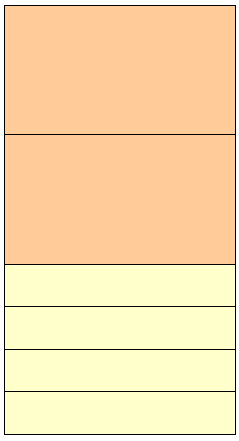
0,51				
1				
0				
1,64				
22,3				
60				
0,253				
0,198				
400				
0,6				
Gas				
8				
21,6				
13,8				
7,2				

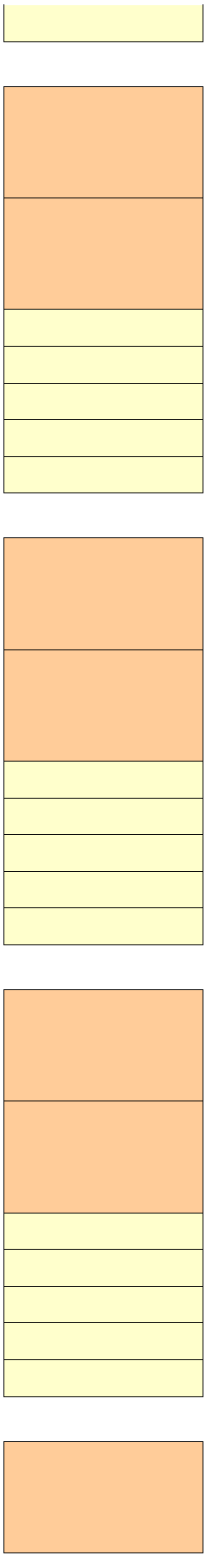
4,6				

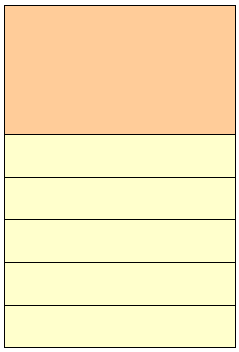
10

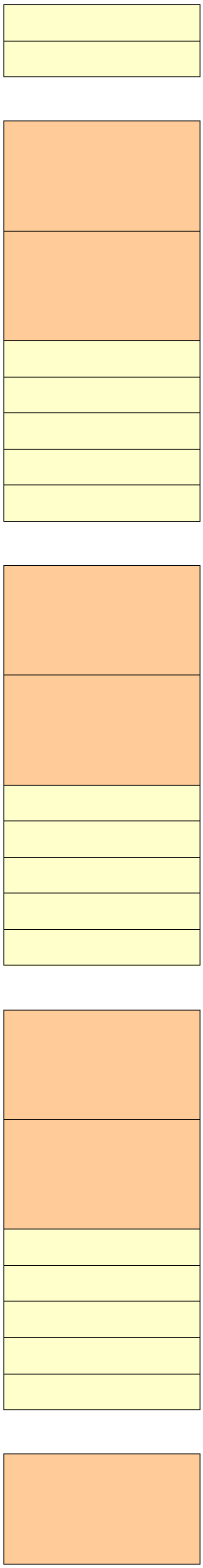
10

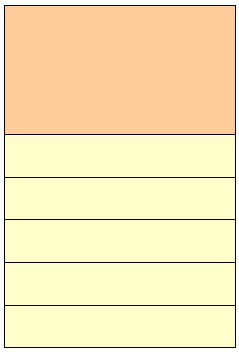


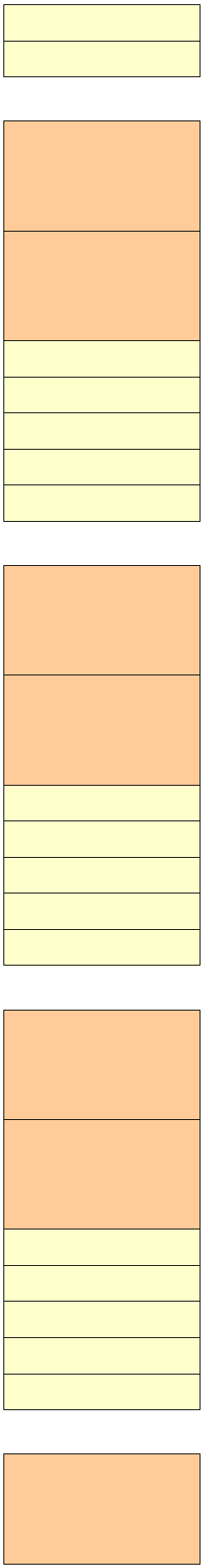


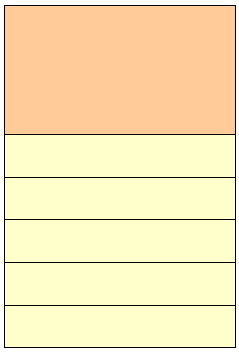


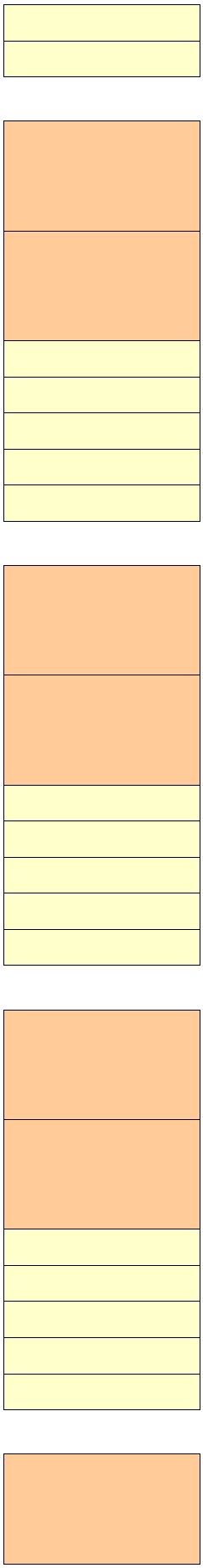


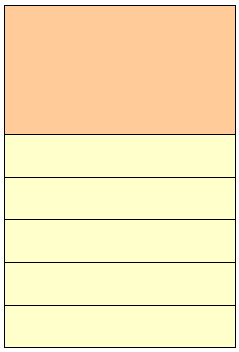












EnerPHit planning: **C O M P A R I S O N B**

Selection of comparison configuration

Description	8-S4:windows
Component type	Complete building
Component	- No additional input

Calculation of selected configuration

	Lower Efficiency	Hig Effici
Design according to variant	4-Step 3 - Ground wal	5-Step 4 (a
Annual heating demand	44,162	17,
Minimal interior surface temperature	-	-
Design Temperature outside	-	-
Interior temperature	20,0	20
Normal surface thermal resistance	-	-
Increased Heat Transfer Resistance	-	-
Minimal surface temperature unobstructed	-	-

			Inves
	Per m² of TFA	Entire building	Per m² of TFA
Treated Floor Area (TFA)	1,00	4630	1,00
Investment costs less sum of financial support	0,00	0	42,77
Investment costs	0,00	0	42,77
Real interest rate	4,89%		4,8
Period of use	35		3
Annuity factor (Lifespan)	0,06		0,(
Present value factor (period under consideration)	12,58		12,
Annuity factor (period under consideration)	0,08		0,(
Residual value after period under consideration	0,00	0	10,37
Investment costs less residual value	0,00	0	32,41
Annuity (capital costs)	0,00	0	2,58

			Energy (Space heating + c
	Per m² of TFA	Entire building	Per m² of TFA
Area	1	4630	1
Annual heating demand	44,16	204488	17,33

Cooling + dehumidification demand			
Electricity demand:			
Auxiliary electricity for Heating	0,56	2591	0,50
Auxiliary electricity ventilation winter	2,64	12202	2,64
Direct electric	0,00	0	0,00
HP	0,00	0	0,00
Compact heat pump unit	0,00	0	0,00
Auxiliary electricity ventilation summer	6,71	31076	6,71
Compressor cooling unit	0,00	0	0,00
Final energy demand:			
Total electricity demand	9,91	45869	9,85
Gas	47,44	219666	18,79
Oil	0,00	0	0,00
Logs	0,00	0	0,00
Pellet	0,00	0	0,00
District Heat	0,00	0	0,00
Others	0,00	0	0,00
CO2-Emissions:			
Total electricity demand	6,74	31191	6,70
Gas	11,86	54917	4,70
Oil	0,00	0	0,00
Logs	0,00	0	0,00
Pellet	0,00	0	0,00
District Heat	0,00	0	0,00
Others	0,00	0	0,00
PE-demand			
Total electricity	25,76	119258	25,60
Gas	52,18	241633	20,67
Oil	0,00	0	0,00
Logs	0,00	0	0,00
Pellet	0,00	0	0,00
District Heat	0,00	0	0,00
Others	0,00	0	0,00
Costs:			
Total electricity	0,99	4587	0,98
Gas	2,85	13180	1,13
Oil	0,00	0	0,00
Logs	0,00	0	0,00
Pellet	0,00	0	0,00
District Heat	0,00	0	0,00
Others	0,00	0	0,00
Total energy costs	3,84	17767	2,11
Maintenance costs	0,00	0	0,00

Final energy demand	67,25	311404	38,49
CO_2-Emissions	18,60	86107	11,39
Primary energy demand	77,94	360891	46,28
Total cost space conditioning	3,84	17767	2,11

			Economi
Total annual costs	3,84	17767	4,69

Maximal economically viable additional i

Cost per kWh of sa

<< Boundary conditions

Approximate estimate of cost effectiveness (all c

		Boundary
Interest rate + Inflation		**Energy price**
Nominal interest rate	6,50%	Electricity
Inflation	1,53%	Gas/Oil
Period under consideration [a]	20	Logs
		Pellet
		District heating
		Others

z

E T W E E N T W O V A R I A N T S

her iency	Difference / Savings / Profit	
after 10 ye		
330	kWh(m²a)	
-	°C	
-	°C	
,0	°C	
-	m²K/W	
-	m²K/W	
-	°C	

tment			
Entire building	Per m² of TFA	Entire building	
4630	1,00	4630	m²
198052	42,77	198052	€
198052	42,77	198052	€
9%			
5			a
06			
,58			
08			
47996	10,37	47996	€
150056	32,41	150056	€
11931	**2,58**	**11931**	€/a

ooling + mech. ventilation)			
Entire building	Per m² of TFA	Entire building	
4630	1	4630	m²
80244	**26,83**	**124244**	kWh/a

			kWh/a

2318	0,06	273	kWh/a
12202	0,00	0	kWh/a
0	0,00	0	kWh/a
0	0,00	0	kWh/a
0	0,00	0	kWh/a
31076	0,00	0	kWh/a
0	0,00	0	kWh/a

45595	0,06	273	kWh/a
87022	28,65	132645	kWh/a
0	0,00	0	kWh/a
0	0,00	0	kWh/a
0	0,00	0	kWh/a
0	0,00	0	kWh/a
0	0,00	0	kWh/a

31005	0,04	186	kg/a
21755	7,16	33161	kg/a
0	0,00	0	kg/a
0	0,00	0	kg/a
0	0,00	0	kg/a
0	0,00	0	kg/a
0	0,00	0	kg/a

118548	0,15	710	kWh/a
95724	31,51	145909	kWh/a
0	0,00	0	kWh/a
0	0,00	0	kWh/a
0	0,00	0	kWh/a
0	0,00	0	kWh/a
0	0,00	0	kWh/a

4560	0,01	27	€/a
5221	1,72	7959	€/a
0	0,00	0	€/a
0	0,00	0	€/a
0	0,00	0	€/a
0	0,00	0	€/a
0	0,00	0	€/a
9781	1,72	7986	€/a
0	0,00	0	€/a

178213	28,76	133191	kWh/a
52760	7,20	33347	kg/a
214272	31,66	146619	kWh/a
9781	**1,72**	**7986**	€/a

c viability

21711	**-0,85**	**-3945**	€/a
investment costs	**28,63**	**132571**	€
aved final energy	**9,0**		Cent/kWh

omponents with the same mean lifetime)!

conditions

s [cent/kWh]	Period of use		
10	Build. assemblies	**50**	a
6	Vent. system	**25**	a
3	Thermal bridges	**50**	a
4	Complete building	**35**	a
6	Windows	**30**	a
20			

Input: comparison configuration

	1	2
Description	31.Roof_Insulati on	32.Wall_Insulati on
Component type	Building assemblies ('U-Value')	Building assemblies ('U-Value')
Component	03ud Ventilated roof	01ud Brick walls
"Lower Efficiency" variant	1-No measures	2-Step 1 - Roof
Investment costs [€]	30.949,25	26.180,94
Annual maintenance costs [€/a]		
"Higher Efficiency" variant	2-Step 1 - Roof	3-Step 2 - walls, HVAC, DHW &
Investment costs [€]	63.196,24	97.929,71
Annual maintenance costs [€/a]		0,00
Financial support (present value) [€]		

Results (manual transfer)

Description		
Investments in BGN - repear	60.531,48	51.205,47
Investments in BGN - complete	123.601,10	191.533,87
Maintenance costs in BGN/a		

3	4	5
S2:HVAC	S2:Building	S3:Gr.walls
Ventilation system ('Ventilation'	Complete building	Building assemblies ('U-Value')
- No additional input	- No additional input	04ud Ground walls

2-Step 1 - Roof	2-Step 1 - Roof	3-Step 2 - walls, HVAC, DHW & I
27.592,59	53.773,53	0,00

3-Step 2 - walls, HVAC, DHW & I	3-Step 2 - walls, HVAC, DHW & I	4-Step 3 - Ground walls periferia
91.198,62	380.458,54	14.187,94
0,00	799,94	

53.966,41	105.171,88	
178.369,00	744.112,22	27.749,20
	1.564,55	

6	7	8
S3:Floor_corridor	S3:Building	S4:windows
Building assemblies ('U-Value')	Complete building	Complete building
05ud Floor to unheated baseme	- No additional input	- No additional input
4-Step 3 - Ground walls periferia	1-No measures	4-Step 3 - Ground walls periferia
0,00	0,00	0,00
5-Step 4 (after 10 years) - Windo	5-Step 4 (after 10 years) - Windo	5-Step 4 (after 10 years) - Windo
5.681,68	19.869,62	198.051,57
11.112,40	38.861,60	387.355,20

9	10
Compl.renovation	S4:building
Complete building	Complete building
- No additional input	- No additional input
1-No measures	4-Step 3 - Ground walls periferial insulatio; insulation of the technical corridor
84.722,78	0,00
5-Step 4 (after 10 years) - Windo	5-Step 4 (after 10 years) - Windows
693.677,14	230.152,72
	0,00
165.703,36	
1.356.714,57	450.139,60
1.564,55	

EnerPHit planning:

CLIMATE DATA

Building: Primary School 8 "Sveti Sveti Kiril I Metodi" - Section B

Climate Building: Велико Търнов

Monthly Data: User data - Велико Търнов

Annual Data:

Use Annual Climate Data Set: no

Results:

Annual heating demand	17,3	kWh/(m²a)
Heating load	13,0	W/m²
Primary Energy	89,9	kWh/(m²a)

Transfer to annual method (Annual Heating)

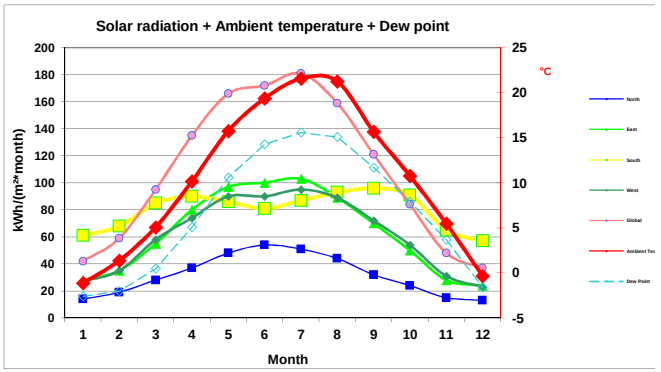
H_T	194	d/a
G_t	77	kKh/a
North	127	kWh/(m²a)
East	251	kWh/(m²a)
South	444	kWh/(m²a)
West	253	kWh/(m²a)
Horizontal	417	kWh/(m²a)

Region: User Data

Climate data set: User data - Велико Търнов

Weather station (altitude): 137,0 m

Building location (height above sea level): 426 m



Month	1	2	3	4	5	6	7	8	9	10	11	12	Heating load		Cooling
Days	31	28	31	30	31	30	31	31	30	31	30	31	Weather 1	Weather 2	Weather 1
Parameters for PHPP Calculated Ground Temperatures:	User data - Велико Търнов	Latitude:	43,1	Longitude °	25,7	Altitude m	137	Daily Temperature Swing Summer (K)			11,2	Radiation Data:	kWh/(m²month)	Radiation: W/m²		Radiation
Phase shift months	Ambient Temp	-1,1	1,4	5,1	10,2	15,8	19,4	21,6	21,3	15,7	10,8	5,5	-0,3	-9,3	-4,8	27,9
0,60	North	14	19	28	37	48	54	51	44	32	24	15	13	19	16	92
Damping	East	28	35	55	80	97	100	103	89	70	50	28	24	39	23	197
-0,31	South	61	68	85	90	86	81	87	93	96	91	65	57	82	40	185
Depth m	West	27	35	58	74	90	90	95	89	72	54	31	23	35	24	197
1,00	Global	42	59	95	135	166	172	181	159	121	84	48	37	56	36	349
User data - Example	Dew Point	-2,6	-2,0	0,5	5,1	10,6	14,3	15,6	15,1	11,7	7,9	3,7	-1,6			18,6
1,00	Sky Temp	-11,1	-9,3	-6,3	-1,1	5,3	9,4	11,4	10,9	6,3	1,9	-2,6	-9,3			16,5
	Ground Temp	18,2	18,1	18,2	18,4	18,7	23,2	23,4	23,4	19,1	18,9	18,6	18,4	18,1	18,1	23,4

Building: Primary School 8 "Sveti Sveti Kiril I Metodi" - Section B

Wedge-shaped building assemblies (tapered insulation), unventilated air layers and unheated attics

-> Auxiliary calculation to the right

Assembly No.	Building assembly description	Interior insulation?
01ud	Brick walls	

Heat transfer resistance [m²K/W] interior Rsi : 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)]	Thickness [mm]
1.	Inside plaster	0,700					40
2.	Bricks	0,520					250
3.	Outside plaster	0,870					40
4.	EPS	0,032					200
5.	Outside plaster	0,870					20
6.							
7.							
8.							

Percentage of sec. 1: 100% | Percentage of sec. 2: | Percentage of sec. 3: | Total: 55,0 cm

U-value supplement: W/(m²K) **U-Value:** 0,142 W/(m²K)

Assembly No.	Building assembly description	Interior insulation?
02ud	Wall socle	

Heat transfer resistance [m²K/W] interior Rsi : 0,13
exterior R_{se} : 0,04

	Area section 2	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
1.	Inside plaster	0,700					20
2.	Bricks	0,520					400
3.	Boucharde	2,100					30
4.	EPS	0,035					180
5.	Outside plaster	0,870					30
6.							
7.							
8.							

Percentage of sec. 1: 100% | Percentage of sec. 2: | Percentage of sec. 3: | Total: 66,0 cm

U-value supplement: W/(m²K) **U-Value:** 0,162 W/(m²K)

Assembly No.	Building assembly description	Interior insulation?
03ud	Ventilated roof	

Heat transfer resistance [m²K/W] interior Rsi : 0,10
exterior R_{se} : 0,10

	Area section 3	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
1.	Cement plaster	0,930					30
2.	Concrete	2,100					120
3.	Inside plaster	0,700					20
4.	Mineral wool	0,041					300
5.	Перлит	0,260					85
6.							
7.							
8.							

Percentage of sec. 1: 100% | Percentage of sec. 2: | Percentage of sec. 3: | Total: 55,5 cm

U-value supplement: W/(m²K) **U-Value:** 0,126 W/(m²K)

Assembly No.	Building assembly description	Interior insulation?
04ud	Ground walls	

Heat transfer resistance [m²K/W] interior Rsi : 0,13
exterior R_{se} :

	Area section 4	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
1.	Inside plaster	0,700					20
2.	Concrete	2,100					400
3.	XPS	0,035					180
4.	Hydroisulation	0,170					8
5.							
6.							
7.							
8.							

Percentage of sec. 1	Percentage of sec. 2	Percentage of sec. 3	Total
100%			60,8 cm

U-value supplement W/(m²K) **U-Value:** 0,181 W/(m²K)

Assembly No.	Building assembly description	Interior insulation?
05ud	Floor to unheated basement	

Heat transfer resistance [m²K/W] interior Rsi : 0,17
exterior R_{se} : 0,17

	Area section 5	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
1.	New flooring	0,000					0
2.	XPS	0,000					0
3.	Flooring	3,500					30
4.	Cement	0,930					20
5.	Concrete	2,100					150
6.	Plaster	0,700					20
7.	EPS	0,041					100
8.							

Percentage of sec. 1	Percentage of sec. 2	Percentage of sec. 3	Total
100%			32,0 cm

U-value supplement W/(m²K) **U-Value:** 0,344 W/(m²K)

Assembly No.	Building assembly description	Interior insulation?
06ud	Floor	

Heat transfer resistance [m²K/W] interior Rsi : 0,17
exterior R_{se} :

	Area section 6	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
1.	Flooring	3,500					30
2.	Cement	0,930					20
3.	Concrete	2,100					150
4.	Rubble	3,500					150
5.							
6.							
7.							
8.							

Percentage of sec. 1	Percentage of sec. 2	Percentage of sec. 3	Total
100%			35,0 cm

U-value supplement W/(m²K) **U-Value:** 3,181 W/(m²K)

Assembly No.	Building assembly description	Interior insulation?
07ud	Inside brick wall	

Heat transfer resistance [m²K/W] interior Rsi : 0,13
exterior R_{se} : 0,04

	Area section 7	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
1.	Inside plaster	0,700					40
2.	Bricks	0,520					250
3.	Inside plaster	0,070					40
4.							
5.							
6.							
7.							
8.							

Percentage of sec. 1	Percentage of sec. 2	Percentage of sec. 3	Total
100%			33,0 cm

U-value supplement W/(m²K) **U-Value:** 0,782 W/(m²K)

Assembly No.	Building assembly description	Interior insulation?
08ud	Non ventilated roof	

Heat transfer resistance [m²K/W] interior Rsi : 0,10
exterior R_{se} : 0,10

	Area section 8	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
1.	Inside plaster	0,700					20
2.	Concrete	2,100					150
3.	Hydroinsulation	0,170					8
4.	balast/mineral wool	0,000					0
5.	new hydroinsulation	0,000					0
6.	balast new	0,000					0
7.							
8.							

Percentage of sec. 1	Percentage of sec. 2	Percentage of sec. 3	Total
100%			17,8 cm

U-value supplement W/(m²K) **U-Value:** 2,906 W/(m²K)

Assembly No.	Building assembly description	Interior insulation?
09ud	Floor Block A	yes

Heat transfer resistance [m²K/W] interior Rsi : 0,17
exterior R_{se} :

	Area section 9	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
1.	New flooring	0,000					0
2.	XPS	0,000					0
3.	Flooring	3,500					30
4.	Cement	0,930					20
5.	Concrete	2,100					150
6.	Rubble	3,500					150
7.							
8.							

Percentage of sec. 1	Percentage of sec. 2	Percentage of sec. 3	Total
100%			35,0 cm

U-value supplement W/(m²K) **U-Value:** 3,181 W/(m²K)

Assembly No.	Building assembly description	Interior insulation?
10ud	Floor to unheated basement Block C	

Heat transfer resistance [m²K/W] interior Rsi : 0,17
exterior R_{se} : 0,17

	Area section 10	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
1.	Flooring	3,500					30
2.	Cement	0,930					20
3.	Concrete	2,100					150
4.	Plaster	0,700					20
5.	EPS	0,000					0
6.	Plaster	0,000					0
7.							
8.							

Percentage of sec. 1: 100% | Percentage of sec. 2: | Percentage of sec. 3: | Total: 22,0 cm

U-value supplement: W/(m²K) **U-Value:** 2,127 W/(m²K)

Assembly No.	Building assembly description	Interior insulation?
11ud	Ground walls Sector B	

Heat transfer resistance [m²K/W] interior Rsi : 0,13
exterior R_{se} :

	Area section 11	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
1.	Inside plaster	0,700					20
2.	Concrete	2,100					500
3.	XPS	0,035					180
4.	Hydroisulation	0,170					8
5.							
6.							
7.							
8.							

Percentage of sec. 1: 100% | Percentage of sec. 2: | Percentage of sec. 3: | Total: 70,8 cm

U-value supplement: W/(m²K) **U-Value:** 0,179 W/(m²K)

Assembly No.	Building assembly description	Interior insulation?
12ud	Wall socle Sector B	

Heat transfer resistance [m²K/W] interior Rsi : 0,13
exterior R_{se} : 0,04

	Area section 12	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
1.	Inside plaster	0,700					40
2.	Bricks	0,520					500
3.	Boucharde	2,100					40
4.	EPS	0,032					200
5.	Outside plaster	0,870					20
6.							
7.							
8.							

Percentage of sec. 1: 100% | Percentage of sec. 2: | Percentage of sec. 3: | Total: 80,0 cm

U-value supplement: W/(m²K) **U-Value:** 0,134 W/(m²K)

Assembly No.	Building assembly description	Interior insulation?
13ud		

Heat transfer resistance [m²K/W] interior Rsi :

exterior R_{se} :

	Area section 13	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
1.							
2.							
3.							
4.							
5.							
6.							
7.							
8.							
	Percentage of sec. 1		Percentage of sec. 2		Percentage of sec. 3		Total
	100%						cm

U-value supplement W/(m²K) **U-Value:** W/(m²K)

Assembly No. 14ud | Building assembly description | Interior insulation?

Heat transfer resistance [m²K/W] interior Rsi :
exterior R_{se} :

	Area section 14	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
1.							
2.							
3.							
4.							
5.							
6.							
7.							
8.							
	Percentage of sec. 1		Percentage of sec. 2		Percentage of sec. 3		Total
	100%						cm

U-value supplement W/(m²K) **U-Value:** W/(m²K)

Assembly No. 15ud | Building assembly description | Interior insulation?

Heat transfer resistance [m²K/W] interior Rsi :
exterior R_{se} :

	Area section 15	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
1.							
2.							
3.							
4.							
5.							
6.							
7.							
8.							
	Percentage of sec. 1		Percentage of sec. 2		Percentage of sec. 3		Total
	100%						cm

U-value supplement W/(m²K) **U-Value:** W/(m²K)

Assembly No. 16ud | Building assembly description | Interior insulation?

Heat transfer resistance [m²K/W] interior Rsi :
exterior R_{se} :

	Area section 16	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]

1.							
2.							
3.							
4.							
5.							
6.							
7.							
8.							
	Percentage of sec. 1		Percentage of sec. 2		Percentage of sec. 3		Total
	100%						cm

U-value supplement W/(m²K) **U-Value:** W/(m²K)

Assembly No. 17ud | Building assembly description | Interior insulation?

Heat transfer resistance [m²K/W] interior Rsi :
exterior R_{se} :

Area section 17	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
	Percentage of sec. 1		Percentage of sec. 2		Percentage of sec. 3		Total
	100%						cm

U-value supplement W/(m²K) **U-Value:** W/(m²K)

Assembly No. 18ud | Building assembly description | Interior insulation?

Heat transfer resistance [m²K/W] interior Rsi :
exterior R_{se} :

Area section 18	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
	Percentage of sec. 1		Percentage of sec. 2		Percentage of sec. 3		Total
	100%						cm

U-value supplement W/(m²K) **U-Value:** W/(m²K)

Assembly No. 19ud | Building assembly description | Interior insulation?

Heat transfer resistance [m²K/W] interior Rsi :
exterior R_{se} :

Area section 19	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
1.						
2.						
3.						
4.						

5.							
6.							
7.							
8.							
	Percentage of sec. 1		Percentage of sec. 2		Percentage of sec. 3		Total
	100%						cm

U-value supplement W/(m²K) **U-Value:** W/(m²K)

Assembly No. | Building assembly description | Interior insulation?

20ud

Heat transfer resistance [m²K/W] interior Rsi :
exterior R_{se} :

	Area section 20	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
1.							
2.							
3.							
4.							
5.							
6.							
7.							
8.							
	Percentage of sec. 1		Percentage of sec. 2		Percentage of sec. 3		Total
	100%						cm

U-value supplement W/(m²K) **U-Value:** W/(m²K)

Secondary Calculation: Equivalent Thermal Conductivity of Still Air Spaces

Air Layer Thickness		mm	Convective heat transfer	
Direction of the thermal flow:		Upwards	h_a	W/(m²K)
		Horizontal	Radiation heat transfer	
		Downwards	h_r	W/(m²K)
Emissivity of surface 1			equivalent thermal conductivity	
Emissivity of surface 2			λ	W/(mK)

Secondary Calculation: Equivalent Thermal Conductivity of Still Air Spaces

Air Layer Thickness		mm	Convective heat transfer	
of the		Upwards	h_a	W/(m²K)
		Horizontal	Radiation heat transfer	
		Downwards	h_r	W/(m²K)
Emissivity of surface 1			equivalent thermal conductivity	
Emissivity of surface 3			λ	W/(mK)

Wedge-shaped layers (at an inclination of max. 5%)

(Calculation following EN 6946 Appendix C)

Assembly No.	Building assembly description
1a	Exemplary flat roof with wedge-shaped insulation

Heat transfer resistance [m²K/W] interior Rsi : 0,10
exterior R_{se} : 0,04

A parallel assemblies layer

	Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Total Width Thickness d_0 [mm]
1.	Concrete Ceiling	2,100					160
2.	PS Rigid Foam	0,040					200
3.							
4.							
5.							
6.							
7.							
8.							

Percentage of sec. 1	Percentage of sec. 2	Percentage of sec. 3	Total
100%			36,0 cm

U_0: 0,192 W/(m²K)
R_0: 5,216 (m²K)/W

B Wedge-Shaped Assembly Layer

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness d_1 [mm]
PS rigid foam insulation	0,040					150

Percentage of sec. 2	Percentage of sec. 3	Thickness d_1 [cm]
		15,0 cm

U_1: 0,267 W/(m²K)
R_1: 3,750 (m²K)/W
Rectangular Area U-Value: 0,144 W/(m²K)
U-value of triangular area with the thickest point at the apex: 0,157 W/(m²K)
U-value of triangular area with the thinnest point at the apex: 0,131 W/(m²K)

Wedge-shaped layers (at an inclination of max. 5%)

(Calculation following EN 6946 Appendix C)

Assembly No.	Building assembly description
2a	

Heat transfer resistance [m²K/W] interior Rsi :

exterior R_{se} :

A parallel assemblies layer

Total Width

	Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness d_0 [mm]
1.							
2.							
3.							
4.							
5.							
6.							
7.							
8.							

Percentage of sec. 1	Percentage of sec. 2	Percentage of sec. 3	Total
100%			cm

U_0: W/(m²K)

R_0: (m²K)/W

B Wedge-Shaped Assembly Layer

		Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness d_1 [mm]

Percentage of sec. 2	Percentage of sec. 3	Thickness d_1 [cm]
		cm

U_1: W/(m²K)

R_1: (m²K)/W

Rectangular Area U-Value: W/(m²K)

U-value of triangular area with the thickest point at the apex: W/(m²K)

U-value of triangular area with the thinnest point at the apex: W/(m²K)

Non-conditioned attic

Building assembly description

Roof

Heat transfer resistance [m²K/W] interior Rsi : 0,17 Exterior absorption coefficient **0,80**

exterior R_{se} : 0,04 Exterior emissivity **0,93**

	Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
1.	Corrugated galvanised iro	60,000					3
2.							
3.							
4.							
5.							
6.							
7.							
8.							

Percentage of sec. 1	Percentage of sec. 2	Percentage of sec. 3	Total
100%			**0,3** cm

U-value supplement W/(m²K) **U-Value: 4,761** W/(m²K)

Building assembly description

Exterior attic wall

Heat transfer resistance [m²K/W] interior Rsi : 0,13 Exterior absorption coefficient 0,80

exterior R_{se} : 0,04 Exterior emissivity 0,93

	Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
1.	Interior plaster	0,350					15
2.	Masonry	1,100					175
3.	Exterior Render	0,800					20
4.							
5.							
6.							
7.							
8.							

Percentage of sec. 1	Percentage of sec. 2	Percentage of sec. 3	Total
100%			**21,0** cm

U-value supplement W/(m²K) **U-Value: 2,519** W/(m²K)

Building assembly description

Intermediate ceiling

Heat transfer resistance [m²K/W] interior Rsi : 0,17

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]
1.	Wooden floor	0,130					22
2.							
3.							
4.							
5.							
6.							
7.							
8.							

Percentage of sec. 1	Percentage of sec. 2	Percentage of sec. 3	Total
83%	16,7%		2,2 cm

U-value supplement W/(m²K)

U-Value: 1,964 W/(m²K)

Attic area

Roof area	200,0	m²
Area of exterior walls and attic	200,0	m²
Area of intermediate ceiling	100,0	m²

emissivity in the attic

Inner side of the roof / exterior wall	0,93
Upper side of the interior ceiling	0,93

Air exchange in the attic

Air change rate	0,20	1/h
Volume	200,0	m³

Equivalent value for the intermediate ceiling (to be linked to worksheets "Components" and "Areas"')

U-Value: 2,732 **Absorptivity: 0,780** **Emissivity: 0,907**

Total solar energy transmittance (informative): 0,085

EnerPHit planning: **AREAS DETERMINATION**

Building: Primary School 8 "Sveti Sveti Kiril I Metodij" Sec Heating demand 17 kWh/(m²a)

Summary

Group Nr.	Area group	Temp.-zone	Area	Unit	Comment		Building assembly overview	Average U-Value [W/(m²K)]	Radiation-gains heating season	Radiation-load cooling period [kWh/a]
1	Treated Floor Area		4630,41	m²	*Treated floor area according to PHPP manual*				9 months	7 months
2	North Windows	A	258,55	m²			North Windows	0,969	11657	10241
3	East Windows	A	286,55	m²	Results come from the 'Windows' worksheet.		East Windows	0,977	16109	15406
4	South Windows	A	348,24	m²	Window areas are subtracted from individual opaque areas.		South Windows	0,969	34616	18986
5	West Windows	A	354,44	m²	which is displayed in the "Windows" worksheet.		West Windows	0,976	18476	15187
6	Horizontal Windows	A	0,00	m²			Horizontal Windows			
7	Exterior Door	A	7,97	m²	*Please subtract area of door from respective building assembly*		Exterior Door	2,200		
8	Exterior Wall - Ambient	A	2553,98	m²	*Temperature Zone "A" is ambient air.*		Exterior Wall - Ambient	0,143	568	1149
9	Exterior Wall - Ground	B	362,08	m²	*Temperature zone "B" is the ground.*		Exterior Wall - Ground	0,180		
10	Roof/Ceiling - Ambient	A	1557,73	m²			Roof/Ceiling - Ambient	0,126	3044	4932
11	Floor slab / basement ceiling	B	1557,73	m²			Floor slab / basement ceiling	2,597		
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 bridges - Overview	Ψ [W/(mK)]		
15	Thermal Bridges Ambient	A	316,95	m	*Units in m*		Thermal Bridges Ambient	0,062		
16	Perimeter Thermal Bridges	P	273,10	m	*Units in m; temperature zone "P" is perimeter (see Ground worksheet).*		Perimeter Thermal Bridges	-0,221		
17	Thermal bridges FS/BC	B	0,00	m	*Units in m*		Thermal bridges FS/BC			
18	Partition Wall to Neighbour	I	28,60	m²	*No heat losses, only considered for the heating load calculation.*		Partition Wall to Neighbour	0,782		
Total thermal envelope			7287,27	m²			Average Therm. Envelope	0,804		

Go to building components list

Area input

Sort: AS LIST

Area Nr.	Building assembly 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]	Selection of building element assembly / certified building system	Nr.	Description (certified component)	U-Value [W/(m²K)]	Deviation from North	Angle of inclination from the horizontal	Orientation	Reduction factor shading	Exterior absorptivity	Exterior emissivity
	Treated floor area	1	Treated Floor Area	1	x (		x		+	4630,41	-				) =	4630,4										
	North Windows	2	North Windows													258,6	From 'Windows' worksheet			0,969						
	East Windows	3	East Windows													286,6	From 'Windows' worksheet			0,977						
	South Windows	4	South Windows													348,2	From 'Windows' worksheet			0,969						
	West Windows	5	West Windows													354,4	From 'Windows' worksheet			0,976						
	Horizontal Windows	6	Horizontal Windows													0,0	From 'Windows' worksheet			0,000						
	Exterior Door	7	Exterior Door	1	x (	1,70	x	2,10	+	4,40	-		) -		=	8,0	U-value exterior door:			2,20						
1	Section 2 West fasade	8	Exterior Wall - Ambient	1	x (	2,95	x	10,65	+		-		) -	5,0	=	26,5	01ud Brick walls			0,142	260	90	West	0,70	0,40	0,90
2	Section 2 North fasade	8	Exterior Wall - Ambient	1	x (	53,70	x	10,65	+		-		) -	173,5	=	398,4	01ud Brick walls			0,142	0	90	North	0,70	0,40	0,90
3	Section 2 East fasade	8	Exterior Wall - Ambient	1	x (	12,50	x	10,65	+		-	5,75	) -	0,0	=	127,4	01ud Brick walls			0,142	90	90	East	0,70	0,40	0,90
4	Section 2 South fasade 1	8	Exterior Wall - Ambient	1	x (	45,00	x	10,65	+		-		) -	211,5	=	267,8	01ud Brick walls			0,142	180	90	South	0,70	0,40	0,90
5	Section 2 South fasade 2	8	Exterior Wall - Ambient	1	x (	9,35	x	10,65	+		-		) -	9,4	=	90,2	01ud Brick walls			0,142	180	90	South	0,70	0,40	0,90
6	Section 2 Roof	10	Roof/Ceiling - Ambient	1	x (		x		+	546,63	-		) -	0,0	=	546,6	03ud Ventilated roof			0,126	0	0	Hor	0,70	0,95	0,90
7	Section 2 Floor	11	Floor slab / basement ceiling	1	x (		x		+	546,63	-		) -	0,0	=	546,6	06ud Floor			3,181						
8	Section 2 socle - West	8	Exterior Wall - Ambient	1	x (		x		+	4,72	-		) -	0,7	=	4,0	12ud Wall socle Sector B			0,134	260	90	West	0,70	0,40	0,90
9	Section 2 socle - North	8	Exterior Wall - Ambient	1	x (		x		+	85,92	-		) -	37,0	=	48,9	12ud Wall socle Sector B			0,134	0	90	North	0,70	0,40	0,90
10	Section 2 socle - East	8	Exterior Wall - Ambient	1	x (		x		+	4,80	-		) -	0,0	=	4,8	12ud Wall socle Sector B			0,134	90	90	East	0,70	0,40	0,90
11	Section 2 socle - South	8	Exterior Wall - Ambient	1	x (		x		+	86,96	-		) -	39,0	=	47,9	12ud Wall socle Sector B			0,134	180	90	South	0,70	0,40	0,90
12	Section 2 ground - West	9	Exterior Wall - Ground	1	x (	2,95	x	3,55	+		-	4,72	) -	0,0	=	5,8	11ud Ground walls Sector B			0,179						
13	Section 2 ground - North	9	Exterior Wall - Ground	1	x (	53,70	x	3,55	+		-	85,92	) -	0,0	=	104,7	11ud Ground walls Sector B			0,179						
14	Section 2 ground - East	9	Exterior Wall - Ground	1	x (	12,50	x	3,55	+		-	4,80	) -	0,0	=	39,6	11ud Ground walls Sector B			0,179						
15	Section 2 ground - South	9	Exterior Wall - Ground	1	x (	45,00	x	3,55	+		-	77,14	) -	0,0	=	82,6	11ud Ground walls Sector B			0,179						
16	Section 2 ground - South	9	Exterior Wall - Ground	1	x (	9,35	x	3,55	+		-	9,82	) -	0,0	=	23,4	11ud Ground walls Sector B			0,179						
17	Section 3 North fasade	8	Exterior Wall - Ambient	1	x (	20,95	x	7,10	+		-		) -	29,9	=	118,8	01ud Brick walls			0,142	0	90	North	0,70	0,40	0,90
18	Section 3 East fasade	8	Exterior Wall - Ambient	1	x (	9,50	x	7,10	+		-		) -	2,8	=	64,7	01ud Brick walls			0,142	90	90	East	0,70	0,40	0,90
19	Section 3 South fasade	8	Exterior Wall - Ambient	1	x (	20,95	x	7,10	+		-		) -	65,5	=	83,2	01ud Brick walls			0,142	180	90	South	0,70	0,40	0,90
20	Section 3 Roof	10	Roof/Ceiling - Ambient	1	x (		x		+	199,03	-		) -	0,0	=	199,0	03ud Ventilated roof			0,126	0	0	Hor	0,70	0,90	0,90
21	Section 3 Floor	11	Floor slab / basement ceiling	1	x (		x		+	199,03	-	63,73	) -	0,0	=	135,3	06ud Floor			3,181						
22	Section 3 Floor above te	11	Floor slab / basement ceiling	1	x (		x		+	63,73	-		) -	0,0	=	63,7	10ud Floor to unheated basement Block C			2,127						
23	Section 1 - West fasade	8	Exterior Wall - Ambient	1	x (	51,55	x	14,25	+		-		) -	327,6	=	407,0	01ud Brick walls			0,142	260	90	West	0,70	0,40	0,90
24	Section 1 - North 1 fasa	8	Exterior Wall - Ambient	1	x (	15,90	x	14,25	+		-	14,12	) -	18,1	=	194,3	01ud Brick walls			0,142	0	90	North	0,70	0,40	0,90
25	Section 1 - North 2 fasa	8	Exterior Wall - Ambient	1	x (	0,65	x	14,25	+		-		) -	0,0	=	9,3	01ud Brick walls			0,142	0	90	North	0,70	0,40	0,90
26	Section 1 - East 1 fasad	8	Exterior Wall - Ambient	1	x (	15,30	x	14,25	+		-		) -	96,4	=	121,7	01ud Brick walls			0,142	90	90	East	0,70	0,40	0,90
27	Section 1 - East 2 fasad	8	Exterior Wall - Ambient	1	x (	11,95	x	14,25	+		-	101,71	) -	8,3	=	60,3	01ud Brick walls			0,142	90	90	East	0,70	0,40	0,90
28	Section 1 - East 3 fasad	8	Exterior Wall - Ambient	1	x (	24,30	x	14,25	+		-		) -	160,1	=	186,2	01ud Brick walls			0,142	90	90	East	0,70	0,40	0,90
29	Section 1 - South 1 fasa	8	Exterior Wall - Ambient	1	x (	15,90	x	14,25	+		-		) -	22,8	=	203,8	01ud Brick walls			0,142	180	90	South	0,70	0,40	0,90
30	Section 1 - South 2 fasa	8	Exterior Wall - Ambient	1	x (	0,65	x	3,60	+		-		) -	0,0	=	2,3	01ud Brick walls			0,142	180	90	South	0,70	0,40	0,90
31	Section 1 socle - West	8	Exterior Wall - Ambient	1	x (		x		+	64,40	-		) -	21,2	=	43,2	02ud Wall socle			0,162	260	90	West	0,70	0,40	0,90
32	Section 1 socle - North	8	Exterior Wall - Ambient	1	x (		x		+	23,96	-		) -	0,0	=	24,0	02ud Wall socle			0,162	0	90	North	0,70	0,40	0,90
33	Section 1 socle - East	8	Exterior Wall - Ambient	1	x (		x		+	38,43	-		) -	19,0	=	19,4	02ud Wall socle			0,162	90	90	East	0,70	0,40	0,90
34	Section 1 socle - South	8	Exterior Wall - Ambient	1	x (		x		+		-		) -	0,0	=	0,0	02ud Wall socle			0,162	180	90	South	0,70	0,40	0,90
35	Section 1 ground - West	9	Exterior Wall - Ground	1	x (	31,96	x	3,30	+		-	64,40	) -	0,0	=	41,1	04ud Ground walls			0,181						

Please complete in Windows worksheet only!

EnerPHit planning: **AREAS DETERMINATION**

Building: Primary School 8 "Sveti Sveti Kiril I Metodij" Se... Heating demand 17 kWh/(m²a)

Summary

Group Nr.	Area group	Temp.-zone	Area	Unit	Comment
1	Treated Floor Area		4630,41	m²	*Treated floor area according to PHPP manual*
2	North Windows	A	258,55	m²	
3	East Windows	A	286,55	m²	Results come from the 'Windows' worksheet.
4	South Windows	A	348,24	m²	Window areas are subtracted from individual opaque areas.
5	West Windows	A	354,44	m²	which is displayed in the "Windows" worksheet.
6	Horizontal Windows	A	0,00	m²	
7	Exterior Door	A	7,97	m²	*Please subtract area of door from respective building assembly*
8	Exterior Wall - Ambient	A	2553,98	m²	*Temperature Zone "A" is ambient air.*
9	Exterior Wall - Ground	B	362,08	m²	*Temperature zone "B" is the ground.*
10	Roof/Ceiling - Ambient	A	1557,73	m²	
11	Floor slab / basement ceiling	B	1557,73	m²	
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%
15	Thermal Bridges Ambient	A	316,95	m	*Units in m*
16	Perimeter Thermal Bridges	P	273,10	m	*Units in m; temperature zone "P" is perimeter (see Ground worksheet).*
17	Thermal bridges FS/BC	B	0,00	m	*Units in m*
18	Partition Wall to Neighbour	I	28,60	m²	*No heat losses, only considered for the heating load calculation.*
Total thermal envelope			7287,27	m²	

Building assembly overview	Average U-Value [W/(m²K)]	Radiation-gains heating season	Radiation-load cooling period [kWh/a]
		9 months	7 months
North Windows	0,969	11657	10241
East Windows	0,977	16109	15406
South Windows	0,969	34616	18986
West Windows	0,976	18476	15187
Horizontal Windows			
Exterior Door	2,200		
Exterior Wall - Ambient	0,143	568	1149
Exterior Wall - Ground	0,180		
Roof/Ceiling - Ambient	0,126	3044	4932
Floor slab / basement ceiling	2,597		
Thermal bridges - Overview	Ψ [W/(mK)]		
Thermal Bridges Ambient	0,062		
Perimeter Thermal Bridges	-0,221		
Thermal bridges FS/BC			
Partition Wall to Neighbour	0,782		
Average Therm. Envelope	0,804		

Go to building components list

36	Section 1 ground - North	9	Exterior Wall - Ground	1	x (	11,90	x	3,30	+		-	23,96	) -	0,0	=	15,3	04ud Ground walls			0,181						
37	Section 1 ground - East	9	Exterior Wall - Ground	1	x (	26,70	x	3,30	+		-	38,43	) -	0,0	=	49,7	04ud Ground walls			0,181						
38	Section 1 Roof	10	Roof/Ceiling - Ambient	1	x (		x		+	812,07	-		) -	0,0	=	812,1	03ud Ventilated roof			0,126	0	0	Hor	0,70	0,90	0,90
39	Section 1 Floor	11	Floor slab / basement ceiling	1	x (		x		+	812,07	-	296,98	) -	0,0	=	515,1	09ud Floor Block A			3,181						
40	Wall to Sector D	18	Partition Wall to Neighbour	1	x (	4,00	x	7,15	+		-		) -	0,0	=	28,6	07ud Inside brick wall			0,782						
41	Section 1 Floor	11	Floor slab / basement ceiling	1	x (		x		+	296,98	-		) -	0,0	=	297,0	05ud Floor to unheated basement			0,344						
42					x (		x		+		-		) -	0,0	=											
43					x (		x		+		-		) -	0,0	=											
44					x (		x		+		-		) -	0,0	=											
45					x (		x		+		-		) -	0,0	=											
46					x (		x		+		-		) -	0,0	=											
47					x (		x		+		-		) -	0,0	=											
48					x (		x		+		-		) -	0,0	=											
49					x (		x		+		-		) -	0,0	=											
50					x (		x		+		-		) -	0,0	=											

Aend

EnerPHit planning: # AREAS DETERMINATION

Building: Primary School 8 "Sveti Sveti Kiril I Metodi" Sa... Heating demand 17 kWh/(m²a)

Summary

Group Nr.	Area group	Temp.-zone	Area	Unit	Comment		Building assembly overview	Average U-Value [W/(m²K)]	Radiation-gains heating season	Radiation-load cooling period
									9 months	7 months
1	Treated Floor Area		4630,41	m²	*Treated floor area according to PHPP manual*					
2	North Windows	A	258,55	m²			North Windows	0,969	11657	10241
3	East Windows	A	286,55	m²	Results come from the 'Windows' worksheet.		East Windows	0,977	16109	15406
4	South Windows	A	348,24	m²	Window areas are subtracted from individual opaque areas.		South Windows	0,969	34616	18986
5	West Windows	A	354,44	m²	which is displayed in the "Windows" worksheet.		West Windows	0,976	18476	15187
6	Horizontal Windows	A	0,00	m²			Horizontal Windows			
7	Exterior Door	A	7,97	m²	*Please subtract area of door from respective building assembly*		Exterior Door	2,200		
8	Exterior Wall - Ambient	A	2553,98	m²	*Temperature Zone "A" is ambient air.*		Exterior Wall - Ambient	0,143	568	1149
9	Exterior Wall - Ground	B	362,08	m²	*Temperature zone "B" is the ground.*		Exterior Wall - Ground	0,180		
10	Roof/Ceiling - Ambient	A	1557,73	m²			Roof/Ceiling - Ambient	0,126	3044	4932
11	Floor slab / basement ceiling	B	1557,73	m²			Floor slab / basement ceiling	2,597		
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$_i$ < 1):*	75%				
							Thermal bridges - Overview	Ψ [W/(mK)]		
15	Thermal Bridges Ambient	A	316,95	m	*Units in m*		Thermal Bridges Ambient	0,062		
16	Perimeter Thermal Bridges	P	273,10	m	*Units in m; temperature zone "P" is perimeter (see Ground worksheet).*		Perimeter Thermal Bridges	-0,221		
17	Thermal bridges FS/BC	B	0,00	m	*Units in m*		Thermal bridges FS/BC			
18	Partition Wall to Neighbour	I	28,60	m²	*No heat losses, only considered for the heating load calculation.*		Partition Wall to Neighbour	0,782		
Total thermal envelope			7287,27	m²			Average Therm. Envelope	0,804		

Go to building components list

Thermal Bridge Inputs

Nr.	Thermal bridge description	Group Nr.	Assigned to group	Quantity	x (	User determined length [m]	-	Subtraction user-determined length [m]	)=	Length ℓ [m]	Input of thermal bridge heat loss coefficient W/(mK)	Ψ W/(mK)
1	Ceiling to walls connect	15	Thermal Bridges Ambient	1	x (	123,50	-		) =	123,50	Ceiling to walls connection	0,066
2	Entrance ceiling to wall	15	Thermal Bridges Ambient	1	x (	7,45	-		) =	7,45	Entrance ceiling to walls connection	0,443
3	Entrance floor to walls	16	Perimeter Thermal Bridges	1	x (	6,45	-		) =	6,45	Entrance floor to walls connection	0,079
4	Consola entrance East	15	Thermal Bridges Ambient	1	x (	1,50	-		) =	1,50	Consola entrance East	0,004
5	Consola entrance South	15	Thermal Bridges Ambient	1	x (	2,00	-		) =	2,00	Consola entrance South	0,004
6	Consola entrance North	15	Thermal Bridges Ambient	1	x (	2,00	-		) =	2,00	Consola entrance North	0,004
7	Ceiling to walls connect	15	Thermal Bridges Ambient	1	x (	136,20	-		) =	136,20	Ceiling to walls connection	0,066
8	Consola entrance South	15	Thermal Bridges Ambient	1	x (	3,45	-		) =	3,45	Consola entrance South	0,004
9	Consola entrance West	15	Thermal Bridges Ambient	1	x (	6,20	-		) =	6,20	Consola entrance West	0,004
10	Consola entrance East 1	15	Thermal Bridges Ambient	1	x (	2,65	-		) =	2,65	Consola entrance East 1	0,004
11	Consola entrance East 2	15	Thermal Bridges Ambient	1	x (	6,30	-		) =	6,30	Consola entrance East 2	0,004
12	Steirs South	16	Perimeter Thermal Bridges	1	x (	3,45	-		) =	3,45	Steirs South	-0,271
13	Steirs West	16	Perimeter Thermal Bridges	1	x (	6,20	-		) =	6,20	Steirs West	-0,271
14	Steirs East 2	16	Perimeter Thermal Bridges	1	x (	6,30	-		) =	6,30	Steirs East 2	-0,271
15	Ceiling to walls connect	16	Perimeter Thermal Bridges	1	x (	51,40	-		) =	51,40	Ceiling to walls connection	0,066
16	Consola	15	Thermal Bridges Ambient	1	x (	22,00	-		) =	22,00	Consola	0,004
17	Насип	16	Perimeter Thermal Bridges	1	x (	20,95	-		) =	20,95	Насип	-0,271
18	Stairs	15	Thermal Bridges Ambient	1	x (	3,70	-		) =	3,70	Stairs	-0,271
19	Wall_to_ground SectA	16	Perimeter Thermal Bridges	1	x (	26,75	-		) =	26,75	Wall_to_ground SectA	-0,048
20	Walls_to_ground Sect B	16	Perimeter Thermal Bridges	1	x (	151,60	-		) =	151,60	Walls_to_ground Sect B	-0,349
21					x (		-		) =			
22					x (		-		) =			
23					x (		-		) =			
24					x (		-		) =			
25					x (		-		) =			
26					x (		-		) =			
27					x (		-		) =			
28					x (		-		) =			
29					x (		-		) =			
30					x (		-		) =			
31					x (		-		) =			
32					x (		-		) =			
33					x (		-		) =			
34					x (		-		) =			
35					x (		-		) =			
36					x (		-		) =			
37					x (		-		) =			
38					x (		-		) =			
39					x (		-		) =			

EnerPHit planning: # AREAS DETERMINATION

Building: Primary School 8 "Sveti Sveti Kiril I Metodi" Sa... Heating demand 17 kWh/(m²a)

Summary

Group Nr.	Area group	Temp.-zone	Area	Unit	Comment
1	**Treated Floor Area**		**4630,41**	m²	*Treated floor area according to PHPP manual*
2	**North Windows**	**A**	**258,55**	m²	
3	**East Windows**	**A**	**286,55**	m²	Results come from the 'Windows' worksheet.
4	**South Windows**	**A**	**348,24**	m²	Window areas are subtracted from individual opaque areas.
5	**West Windows**	**A**	**354,44**	m²	which is displayed in the "Windows" worksheet.
6	**Horizontal Windows**	**A**	**0,00**	m²	
7	**Exterior Door**	**A**	**7,97**	m²	*Please subtract area of door from respective building assembly*
8	**Exterior Wall - Ambient**	**A**	**2553,98**	m²	*Temperature Zone "A" is ambient air.*
9	**Exterior Wall - Ground**	**B**	**362,08**	m²	*Temperature zone "B" is the ground.*
10	**Roof/Ceiling - Ambient**	**A**	**1557,73**	m²	
11	**Floor slab / basement ceiling**	**B**	**1557,73**	m²	
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_x < 1):* **75%**
15	**Thermal Bridges Ambient**	**A**	**316,95**	m	*Units in m*
16	**Perimeter Thermal Bridges**	**P**	**273,10**	m	*Units in m; temperature zone "P" is perimeter (see Ground worksheet).*
17	**Thermal bridges FS/BC**	**B**	**0,00**	m	*Units in m*
18	**Partition Wall to Neighbour**	**I**	**28,60**	m²	*No heat losses, only considered for the heating load calculation.*
Total thermal envelope			**7287,27**	**m²**	

Building assembly overview	Average U-Value [W/(m²K)]	Radiation-gains heating season	Radiation-load cooling period [kWh/a]
		9 months	7 months
North Windows	**0,969**	**11657**	**10241**
East Windows	**0,977**	**16109**	**15406**
South Windows	**0,969**	**34616**	**18986**
West Windows	**0,976**	**18476**	**15187**
Horizontal Windows			
Exterior Door	**2,200**		
Exterior Wall - Ambient	**0,143**	**568**	**1149**
Exterior Wall - Ground	**0,180**		
Roof/Ceiling - Ambient	**0,126**	**3044**	**4932**
Floor slab / basement ceiling	**2,597**		
Thermal bridges - Overview	**Ψ [W/(mK)]**		
Thermal Bridges Ambient	**0,062**		
Perimeter Thermal Bridges	**-0,221**		
Thermal bridges FS/BC			
Partition Wall to Neighbour	0,782		
Average Therm. Envelope	**0,804**		

Go to building components list

40					x (		-		) =			
41					x (		-		) =			
42					x (		-		) =			
43					x (		-		) =			
44					x (		-		) =			
45					x (		-		) =			
46					x (		-		) =			
47					x (		-		) =			
48					x (		-		) =			
49					x (		-		) =			
50					x (		-		) =			

TBend

A tool for thermal bridge conversion to exterior dimensions					
Description		Units	oof perimeter		
	Ψ Interior Dimensions	W/(mK)	0,699	0,213	0,256
	Temperature Diff. TB	K	20,000	20,000	20,000
Adjacent Aarea I	Temperature Diff. Δϑ I	K	20,000	20,000	20,000
	Exterior - Interior Dim. I	m	0,235	0,235	0,235
	U-Value building assembly I	W/(m²K)	1,326	0,142	0,142
Adjacent Area II	Temperature Diff. Δϑ II	K	20,000	20,000	20,000
	Exterior - Interior Dim. II	m	0,275	0,275	0,275
	U-Value building assembly II	W/(m²K)	0,131	0,131	0,131
	Ψ Exterior Dimensions	W/(mK)	0,351	0,144	0,187

EnerPHit planning:

HEAT LOSSES THROUGH THE GROUND

Building part 1

Ground characteristics			
Thermal conductivity	λ	2,0	W/(mK)
Heat capacity	ρc	2,0	MJ/(m³K)
Periodic Penetration Depth	δ	3,17	m

Climate data			
Av. Indoor Temp. Winter	T_i	20,0	°C
Av. Indoor Temp. Summer	T_i	25,0	°C
Average Ground Surface Temperature	$T_{g,ave}$	11,4	°C
Amplitude of $T_{g,ave}$	$T_{g,\wedge}$	11,4	°C
Phase shifting of $T_{e,m}$	τ	1,0	Months
Length of the Heating Period	n	6,4	Months
Heating Degree Hours - Exterior	G_t	76,7	kKh/a

Building data							
Area of ground floor slab / basement ceiling	A	1557,7	m²	U-value floor slab/basement ceiling	U_f	2,597	W/(m²K)
Perimeter length	P	291,4	m	Thermal bridges floor slab/basement ceiling	Ψ_B*l	0,00	W/K
Charact. Dimension of floor slab	B'	10,69	m	U-value floor slab / basement ceiling incl. TB	U_f'	2,597	W/(m²K)
				Eq. Thickness Floor	d_t	0,77	m

Floor Slab Type (select only one)

	Slab on Grade						
	Perimeter Insulation Width/Depth	D	m	Orientation of the Perimeter Ins.	horizontal		
	Perimeter Insulation Thickness	d_n	m	(check only one field)	vertical	x	
	Conductivity perimeter insulation	λ_n	W/(mK)				
x	**Heated basement or floor slab completely / partially below ground level**						
	Basement wall height below ground level	z	1,71 m	U-Value below ground wall	U_{wB}	0,181	W/(m²K)
	Unheated basement						
	Height aboveground wall	h	m	U-Value above ground wall	U_W		W/(m²K)
	Basement wall height below ground level	z	m	U-Value below ground wall	U_{wB}		W/(m²K)
	Air Change Unheated Basement	n	h^{-1}	U-Value Basement Floor Slab	U_{fB}		W/(m²K)
	Air flow basement	V	m³				
	Suspended Floor Above a Ventilated Crawl Space (at max. 0.5 m Below Ground)						
	U-Value Crawl Space	U_{Crawl}	W/(m²K)	Area of Ventilation Openings	εP		m²
	Height of crawl space wall	h	m	Wind Velocity at 10 m Height	v	4,0	m/s
	U-Value crawl space wall	U_W	W/(m²K)	Wind Shield factor	f_W	0,05	-

Additional Thermal Bridge Heat Losses at Perimeter						
				Steady-State Fraction	$\Psi_{P,stat}$*l	-60,290 W/K
Phase shift	β		Months	Harmonic Fraction	$\Psi_{P,harm}$*l	-60,290 W/K

Groundwater correction							
Depth of the Groundwater Table	z_w	3,0	m	Groundwater Correction Factor	G_w	1,14964435	-
Groundwater flow rate	q_w	0,05	m/d				

Interim Results

Phase shift	β	0,81	Months	Steady-state heat flow	Φ_{stat}	5461,2	W
Steady-state transmittance	L_S	636,21	W/K	Periodic Heat Flow	Φ_{harm}	1171,0	W
Exterior Periodic transmittance	L_{pe}	190,12	W/K	Heat Losses During Heating Period	Q_{tot}	30875	kWh
Transmittance building	L_0	4075,15	W/K				

Monthly Average temperatures in the ground for monthly method (building assembly 1)

Month	1	2	3	4	5	6	7	8	9	10	11	12	Average value
Winter	18,2	18,1	18,2	18,4	18,7	19,0	19,1	19,2	19,1	18,9	18,6	18,4	18,7
Summer	22,4	22,4	22,4	22,7	22,9	23,2	23,4	23,4	23,3	23,1	22,8	22,6	22,9

Design ground temperature for 'Heating load' worksheet 18,1 **For 'Cooling load' worksheet** 23,4

Reduction factor for 'Annual heating' worksheet 0,10

Total result (all building parts)

Phase shift	β	0,81	Months	Steady-state heat flow	Φ_{stat}	5461,2	W
Steady-state transmittance	L_S	636,21	W/K	Periodic Heat Flow	Φ_{harm}	1171,0	W
Exterior Periodic transmittance	L_{pe}	190,12	W/K	Heat Losses During Heating Period	Q_{tot}	30875	kWh
Transmittance building	L_0	4075,15	W/K	Charact. Dimension of floor slab	B'	10,69	m

Monthly Average temperatures in the ground for monthly method (all building assemblies)

Month	1	2	3	4	5	6	7	8	9	10	11	12	Average value
Winter	18,2	18,1	18,2	18,4	18,7	19,0	19,1	19,2	19,1	18,9	18,6	18,4	18,7
Summer	22,4	22,4	22,4	22,7	22,9	23,2	23,4	23,4	23,3	23,1	22,8	22,6	22,9

Design ground temperature for 'Heating load' worksheet 18,1 **For 'Cooling load' worksheet** 23,4

Reduction factor for 'Annual heating' worksheet 0,10

Either there are inconsistencies between the building assemblies in contact with the ground entered in the worksheets 'Areas' and 'Ground' OR you made an incorrect selection of the typ

Go to: 'AREAS'
Glazing
Window frame
http://www.passiv.de/komponentendatenbank/en-EN
Ventilation units
Compact units

Building assemblies (U-values)

		1			
ID	**Building system**	**Building assembly**	**Total thickness**	**U-Value**	**Interior insulation**
	Summary of the constructions calculated in 'U values' worksheet		m	W/(m²K)	-
01ud	Brick walls	Brick walls	0,550	0,142	
02ud	Wall socle	Wall socle	0,660	0,162	
03ud	Ventilated roof	Ventilated roof	0,555	0,126	
04ud	Ground walls	Ground walls	0,608	0,181	
05ud	Floor to unheated basement	Floor to unheated basement	0,320	0,344	
06ud	Floor	Floor	0,350	3,181	
07ud	Inside brick wall	Inside brick wall	0,330	0,782	
08ud	Non ventilated roof	Non ventilated roof	0,178	2,906	
09ud	Floor Block A	Floor Block A	0,350	3,181	yes
10ud	Floor to unheated basement Block C	Floor to unheated basement Block C	0,220	2,127	
11ud	Ground walls Sector B	Ground walls Sector B	0,708	0,179	
12ud	Wall socle Sector B	Wall socle Sector B	0,800	0,134	
13ud					
14ud					
15ud					
16ud					
17ud					
18ud					
19ud					
20ud					
21ud					
22ud					
23ud					
24ud					
25ud					
26ud					
27ud					
28ud					
29ud					
30ud					
31ud					
32ud					
33ud					
34ud					
35ud					
36ud					
37ud					
38ud					
39ud					
40ud					
41ud					
42ud					
43ud					
44ud					
45ud					

Building assemblies (U-values)

		1			
ID	Building system	Building assembly	Total thickness	U-Value	Interior insulation
	Summary of the constructions calculated in 'U values' worksheet		m	W/(m²K)	-
46ud					
47ud					
48ud					
49ud					
50ud					
51ud					
52ud					
53ud					
54ud					
55ud					
56ud					
57ud					
58ud					
59ud					
60ud					
61ud					
62ud					
63ud					
64ud					
65ud					
66ud					
67ud					
68ud					
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82ud					
83ud					
84ud					
85ud					
86ud					
87ud					
88ud					
89ud					
90ud					
91ud					
92ud					
93ud	Brickwork 24 years old	Brickwork 24 years old	0,275	1,440	
94ud	Solid Brick 38-old	Solid Brick 38-old	0,415	1,640	
95ud	Half timbered 18-old	Half timbered 18-old	0,210	1,800	
96ud	Brickwork 30 years old	Brickwork 30 years old	0,335	1,230	

Building assemblies (U-values)

		1			
ID	Building system	Building assembly	Total thickness	U-Value	Interior insulation
	Summary of the constructions calculated in 'U values' worksheet		m	W/(m²K)	-
97ud	Precast concrete-old	Precast concrete-old	0,275	1,300	
98ud	Wooden joist ceiling-old	Wooden joist ceiling-old	0,284	0,990	
99ud	Basement ceiling-old	Basement ceiling-old	0,242	1,230	

Glazing

Glazing

ID	Description	g-Value	U_g-Value
			W/(m²K)
01ud	44 mm. triple glazing, 2 Low-E, air, alum.spacer	0,51	0,80
02ud			
03ud			
04ud			
05ud			
06ud			
07ud			
08ud			
09ud			
10ud			
11ud			
12ud			
13ud			
14ud			
15ud			
16ud			
17ud			
18ud			
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46ud			
47ud			
48ud			
49ud			
50ud			
51ud			

Glazing			Glazing
ID	Description	g-Value	U_g-Value
			W/(m²K)
52ud			
53ud			
54ud			
55ud			
56ud			
57ud			
58ud			
59ud			
60ud			
61ud			
62ud			
63ud			
64ud			
65ud			
66ud			
67ud			
68ud			
69ud			
70ud			
71ud			
72ud			
73ud			
74ud			
75ud			
76ud			
77ud			
78ud			
79ud			
80ud			
81ud			
82ud			
83ud			
84ud			
85ud			
86ud			
87ud			
88ud			
89ud			
90ud			
91ud			
92ud	**Single glazing**	**0,87**	**5,80**
93ud	**Double glazing 4/12mm air/4**	**0,77**	**2,90**
94ud	**Double glazing 4/16mm air/4**	**0,77**	**2,70**
95ud	**Double glazing 4/20mm air/4**	**0,77**	**2,80**
96ud	**Double glazing 4/25mm air/4**	**0,77**	**2,80**
97ud	**Double glazing 4/30mm air/4**	**0,77**	**2,80**
98ud	**Triple glazing 4/10 air/4/10 air/4**	**0,70**	**2,00**
99ud	**Double low-e 4/16Argon90%/4 Epsilon=0.1**	**0,64**	**1,30**

Window frames

		U_f-Value				Frame Width				Glazing edge thermal bridge				Installation thermal bridge				Curtain wall facades:
ID	Description	left	right	bottom	above	left	right	bottom	above	$\Psi_{Glazing\ edge}$ left	$\Psi_{Glazing\ edge}$ right	$\Psi_{Glazing\ edge}$ bottom	$\Psi_{Glazing\ edge}$ top	$\Psi_{Installation}$ left	$\Psi_{Installation}$ right	$\Psi_{Installation}$ bottom	$\Psi_{Installation}$ top	χ_{GC} -value Glass carrier
		W/(m²K)	W/(m²K)	W/(m²K)	W/(m²K)	m	m	m	m	W/(mK)	W/(mK)	W/(mK)	W/(mK)	W/(mK)	W/(mK)	W/(mK)	W/(mK)	W/K
01ud	Plastic window frame good	1,60	1,60	1,60	1,60	0,140	0,140	0,140	0,140	0,040	0,040	0,040	0,040	0,040	0,040	0,040	0,040	
02ud	Plastic window frame good after wall insulation	1,60	1,60	1,60	1,60	0,140	0,140	0,140	0,140	0,040	0,040	0,040	0,040	0,088	0,088	0,088	0,088	
03ud	VEKA AG ALPHALINE 90 MD	0,97	0,97	0,97	0,97	0,118	0,118	0,118	0,118	0,030	0,030	0,030	0,030	0,040	0,040	0,040	0,040	
04ud																		
05ud																		
06ud																		
07ud																		
08ud																		
09ud																		
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38ud																		
39ud																		
40ud																		
41ud																		
42ud																		
43ud																		
44ud																		
45ud																		
46ud																		
47ud																		
48ud																		
49ud																		
50ud																		
51ud	PH-FRAMES: average thermal quality	0,75	0,75	0,75	0,75	0,140	0,140	0,140	0,140	0,040	0,040	0,040	0,040	0,040	0,040	0,040	0,040	

Window frames

		U_f-Value				Frame Width				Glazing edge thermal bridge				Installation thermal bridge				Curtain wall facades:
ID	Description	left	right	bottom	above	left	right	bottom	above	$\Psi_{Glazing\ edge\ left}$	$\Psi_{Glazing\ edge\ right}$	$\Psi_{Glazing\ edge\ bottom}$	$\Psi_{Glazing\ edge\ top}$	$\Psi_{Installation\ left}$	$\Psi_{Installation\ right}$	$\Psi_{Installation\ bottom}$	$\Psi_{Installation\ top}$	χ_{GC} -value Glass carrier
		W/(m²K)	W/(m²K)	W/(m²K)	W/(m²K)	m	m	m	m	W/(mK)	W/(mK)	W/(mK)	W/(mK)	W/(mK)	W/(mK)	W/(mK)	W/(mK)	W/K
52ud	PH-FRAMES: good thermal quality	0,72	0,72	0,72	0,72	0,140	0,140	0,140	0,140	0,035	0,035	0,035	0,035	0,040	0,040	0,040	0,040	
53ud	EXISTING: timber 45 mm	2,50	2,50	2,50	2,50	0,140	0,140	0,140	0,140	0,050	0,050	0,050	0,050	0,040	0,040	0,040	0,040	
54ud	EXISTING: timber 68 mm	1,60	1,60	1,60	1,60	0,140	0,140	0,140	0,140	0,040	0,040	0,040	0,040	0,040	0,040	0,040	0,040	
55ud	EXISTING: synthetic, good	1,60	1,60	1,60	1,60	0,140	0,140	0,140	0,140	0,040	0,040	0,040	0,040	0,040	0,040	0,040	0,040	
56ud	EXISTING: synthetic before 1998	1,80	1,80	1,80	1,80	0,140	0,140	0,140	0,140	0,050	0,050	0,050	0,050	0,040	0,040	0,040	0,040	
57ud	EXISTING: synthetic, before 1972	2,20	2,20	2,20	2,20	0,140	0,140	0,140	0,140	0,050	0,050	0,050	0,050	0,040	0,040	0,040	0,040	
58ud	EXISTING: metal, thermal break	2,40	2,40	2,40	2,40	0,140	0,140	0,140	0,140	0,040	0,040	0,040	0,040	0,040	0,040	0,040	0,040	
59ud	EXISTING: metal, no thermal break	4,50	4,50	4,50	4,50	0,140	0,140	0,140	0,140	0,030	0,030	0,030	0,030	0,040	0,040	0,040	0,040	
60ud	EXISTING: metal, no thermal break, paint finish	5,50	5,50	5,50	5,50	0,140	0,140	0,140	0,140	0,030	0,030	0,030	0,030	0,040	0,040	0,040	0,040	
61ud	INSTALLATION SITUATION: timber, not insulated, masonry, not ins													0,088				
62ud	INSTALLATION SITUATION: timber, not insulated, covered with 60													0,002				
63ud	INSTALLATION SITUATION: PVC, not insulated, masonry, not insula													0,088				
64ud	INSTALLATION SITUATION: PVC, not insulated,überdämmt mit WDVS 6													0,002				
65ud	INSTALLATION SITUATION: Metal, no thermal break, masonry wall,													0,088				
66ud	INSTALLATION SITUATION: insulated timber, EIFS, in insulation l													0,009				
67ud	INSTALLATION SITUATION: insulated timber, EIFS, partially on ma													0,021				
68ud	INSTALLATION SITUATION: insulated timber, EIFS, flush with the													0,076				
69ud	INSTALLATION SITUATION: insulated timber, lightweight wall (opt													0,009				
70ud	INSTALLATION SITUATION: insulated timber, insulated concrete fo													0,001				
71ud	INSTALLATION SITUATION: insulated PVC, EIFS, insulation layer													0,009				
72ud	INSTALLATION SITUATION: insulated PVC, EIFS, partially on mason													0,021				
73ud	INSTALLATION SITUATION: insulated PVC, EIFS, flush with the mas													0,076				
74ud	INSTALLATION SITUATION: insulated PVC, lightweight wall (optima													0,009				
75ud	INSTALLATION SITUATION: insulated PVC, insulated concrete formw													0,001				
76ud	INSTALLATION SITUATION: insulated timber-aluminium, EIFS, insul													0,013				
77ud	INSTALLATION SITUATION: insulated timber-aluminium, EIFS, parti													0,023				
78ud	INSTALLATION SITUATION: insulated timber-aluminium, lightweight													0,013				
79ud	INSTALLATION SITUATION: insulated timber-aluminium, insulated c													0,002				
80ud	INSTALLATION SITUATION: insulated timber-aluminium, insulated c													0,013				
81ud	INSTALLATION SITUATION: insulated timber-aluminium, short alum													0,002				
82ud	INSTALLATION SITUATION: insulated timber-aluminium, short alum													0,010				
83ud	INSTALLATION SITUATION: insulated timber-aluminium, short alum													0,006				
84ud	INSTALLATION SITUATION: insulated timber-aluminium, short alum													0,013				
85ud	INSTALLATION SITUATION MULLION-TRANSOM: timber, outside, in front of the facade													0,343				
86ud	INSTALLATION SITUATION MULLION-TRANSOM: timber, flush with the facade on the outside													0,036				
87ud	INSTALLATION SITUATION MULLION-TRANSOM: timber, in the insulation layer													0,034				
88ud	INSTALLATION SITUATION MULLION-TRANSOM: timber, between insulation layer and wall													0,059				
89ud	INSTALLATION SITUATION MULLION-TRANSOM: timber, flush with the insulation layer on the inside													0,397				
90ud	INSTALLATION SITUATION MULLION-TRANSOM: steel, outside, in front of the facade													0,666				
91ud	INSTALLATION SITUATION MULLION-TRANSOM: steel, flush with the insulation layer on the outside													0,047				
92ud	INSTALLATION SITUATION MULLION-TRANSOM: steel, in the insulation layer													0,044				
93ud	INSTALLATION SITUATION MULLION-TRANSOM: steel, between insulation layer and wall													0,062				
94ud	INSTALLATION SITUATION MULLION-TRANSOM: steel, flush with the insulation layer on the inside													0,409				
95ud	INSTALLATION SITUATION MULLION-TRANSOM: Alum, outside, in front of the facade													0,747				
96ud	INSTALLATION SITUATION MULLION-TRANSOM: Alum, flush with the insulation layer on the outside													0,056				
97ud	INSTALLATION SITUATION MULLION-TRANSOM: Alum, in the insulation layer													0,053				
98ud	INSTALLATION SITUATION MULLION-TRANSOM: Alum, between insulation layer and wall													0,070				
99ud	INSTALLATION SITUATION MULLION-TRANSOM: Alum, flush with the insulation layer on the inside													0,421				

Ventilation units with heat recovery

Ventilation units with heat recovery

					Additional Device Data								
ID	Description	Heat recovery efficiency	Energy recovery value η_{FRG}	Electric efficiency	Entry area		External pressure per line	Fittings Δp_{intern}	Frost protection required	Noise protection			Additional info
	User defined area	%	%	Wh/m³	m³/h	m³/h	Pa	Pa		35 dB(A)	Supply air dB(A)	Extract air dB(A)	
01ud	Tangra ventilation unit EVB 04 HiE	82%	0%	0,40	150	400	100	incl.	yes	–	57	57	
02ud	Tangra ventilation unit EVB 06 HiE	82%	0%	0,40	250	600	100	incl.	yes	–	61	61	
03ud	Tangra ventilation unit EVB 08 HiE	82%	0%	0,40	400	800			yes	–	61	61	
04ud	Tangra ventilation unit EVB 10 HiE	82%	0%	0,40	500	1000			yes	–	61	61	
05ud	Tangra ventilation unit EVB 12 HiE	82%	0%	0,40	750	1200			yes	–	68	68	
06ud	Tangra ventilation unit EVB 16 HiE	82%	0%	0,40	800	1600			yes	–	68	68	
07ud	Tangra ventilation unit EVB 20 HiE	82%	0%	0,40	1000	2000			yes	–	68	68	
08ud													
09ud													
10ud													
11ud													
12ud													
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Ventilation units with heat recovery

Ventilation units with heat recovery

					Additional Device Data								
ID	Description	Heat recovery efficiency	Energy recovery value η_{FRG}	Electric efficiency	Entry area		External pressure per line	Fittings Δp_{intern}	Frost protection required	Noise protection			Additional info
	User defined area	%	%	Wh/m³	m³/h	m³/h	Pa	Pa		35 dB(A)	Supply air dB(A)	Extract air dB(A)	
52ud													
53ud													
54ud													
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94ud													
95ud													
96ud													
97ud	**Default**	**75%**		**0,45**									
98ud	**Extract air system**	**0%**		**0,25**									
99ud	Compact unit to be chosen from 'Compact' worksheet												

EnerPHit planning:

REDUCTION FACTOR SOLAR RADIATION, WINDOW U-VALUE

Building: Primary School 8 "Sveti Sveti Kiril I Metodi" - Section B

Annual heating demand: 17 kWh/(m²a)

Heating degree hours: 76,7

Climate:	User data - Велико Търнов													
Window area orientation	Global radiation (cardinal points)	Shading	Dirt	Non-perpendicular incident radiation	Glazing fraction	g-Value	Solar radiation reduction factor	Window area	Window U-Value	Glazing area	Average global radiation		Transmission losses	Heat gains solar radiation
maximum:	kWh/(m²a)	0,75	0,95	0,85				m²	W/(m²K)	m²	kWh/(m²a)		kWh/a	kWh/a
North	127	0,81	0,95	0,85	0,586	0,51	0,38	258,55	0,97	151,54	127		19217	6435
East	251	0,60	0,95	0,85	0,489	0,51	0,24	286,55	0,98	140,16	251		21456	8646
South	444	0,68	0,95	0,85	0,507	0,51	0,28	348,24	0,97	176,40	444		25867	21971
West	253	0,51	0,95	0,85	0,490	0,51	0,20	354,44	0,98	173,79	281		26537	10294
Horizontal	417	1,00	0,95	0,85	0,000	0,00	0,00	0,00	0,00	0,00	417		0	0
		Total or Average Value for All Windows.				0,51	0,27	1247,78	0,97	641,89			93078	47346

Go to glazing list

Go to window frames list

					Window rough openings		installed in	Glazing	Frame	g-Value	U-Value		Ψ Glazing edge	Installation situation user-defined value for $\Psi_{installed}$ or '1': $\Psi_{installed}$ from worksheet 'Components' '0': in the case of abutting windows					Results U- and Ψ-values from 'Components' worksheet can be shown through clicking the '+' sign on the top edge of the sheet.					
Quantity	Description	Deviation from North	Angle of inclination from the horizontal	Orientation	Width	Height	Selection from worksheet 'Areas'	Selection from worksheet 'Components'	Selection from worksheet 'Components'	Perpendicular Radiation	Glazing	Frames (centre)	Ψ_{spacer} (centre)	left	right	bottom	above	$\Psi_{Installation}$ (Average)	Window Area	Glazing Area	U-Value Window	Glazed fraction per window	Transmission-losses	Solar gains
		Degrees	Degrees		m	m		Sort: AS LIST	Sort: AS LIST	-	W/(m²K)	W/(m²K)	W/(mK)	W/(mK) or 1/0				W/(mK)	m²	m²	W/(m²K)	%	kWh/a	kWh/a
1	S2/Type 1	180	90	South	0,800	0,900	11-Section 2 socle - South	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	1	1	0,040	0,7	0,33	1,03	45%	57	38
1	S2/Type 1	180	90	South	1,000	0,900	11-Section 2 socle - South	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	1	1	0,040	0,9	0,45	1,01	50%	70	54
1	S2/Type 2 level	260	90	West	0,800	1,000	1-Section 2 West fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	1	1	0,040	0,8	0,38	1,02	48%	62	32
1	S2/Type 2 level	260	90	West	0,850	1,000	1-Section 2 West fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	1	1	0,040	0,9	0,42	1,01	49%	66	35
1	S2/Type 2 level	260	90	West	0,800	1,000	1-Section 2 West fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	1	1	0,040	0,8	0,38	1,02	48%	62	32
1	S2/Type 2 level	260	90	West	0,850	1,000	1-Section 2 West fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	1	1	0,040	0,9	0,42	1,01	49%	66	35
1	S2/Type 2 level	260	90	West	0,800	1,000	1-Section 2 West fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	1	1	0,040	0,8	0,38	1,02	48%	62	32
1	S2/Type 2 level	260	90	West	0,850	1,000	1-Section 2 West fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	1	1	0,040	0,9	0,42	1,01	49%	66	35
1	S2/Type 3 level	260	90	West	0,600	1,150	8-Section 2 socle - West	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	1	1	1	0,040	0,7	0,29	1,10	42%	58	23
12	S2/Type 4	180	90	South	0,800	1,450	11-Section 2 socle - South	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	1	1	0,040	13,9	7,48	0,99	54%	1055	1000
12	S2/Type 4	180	90	South	1,350	1,450	11-Section 2 socle - South	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	1	1	0,040	23,5	15,12	0,95	64%	1711	2145
8	S2/Type 4	0	90	North	0,800	1,450	9-Section 2 socle - North	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	1	1	0,040	9,3	4,98	0,99	54%	703	207
8	S2/Type 4	0	90	North	1,350	1,450	9-Section 2 socle - North	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	1	1	0,040	15,7	10,08	0,95	64%	1141	448
4	S2/Type 5	0	90	North	0,700	1,450	9-Section 2 socle - North	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	1	1	0,040	4,1	2,03	1,00	50%	312	82
4	S2/Type 5	0	90	North	0,700	1,450	9-Section 2 socle - North	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	1	1	0,040	4,1	2,03	1,00	50%	312	82
1	S2/Type 6	0	90	North	0,800	1,450	9-Section 2 socle - North	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	1	1	0,040	1,2	0,62	0,99	54%	88	26
1	S2/Type 6	0	90	North	1,300	1,450	9-Section 2 socle - North	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	1	1	0,040	1,9	1,20	0,95	64%	138	53
15	S2/Type 7 level	0	90	North	0,800	1,500	2-Section 2 North fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	1	1	0,040	18,0	9,75	0,99	54%	1361	406
15	S2/Type 7 level	0	90	North	1,350	1,500	2-Section 2 North fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	1	1	0,040	30,4	19,71	0,95	65%	2207	878
15	S2/Type 7 level	0	90	North	0,800	1,500	2-Section 2 North fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	1	1	0,040	18,0	9,75	0,99	54%	1361	406
15	S2/Type 7 level	0	90	North	1,350	1,500	2-Section 2 North fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	1	1	0,040	30,4	19,71	0,95	65%	2207	878
15	S2/Type 7 level	0	90	North	0,800	1,500	2-Section 2 North fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	1	1	0,040	18,0	9,75	0,99	54%	1361	406
15	S2/Type 7 level	0	90	North	1,350	1,500	2-Section 2 North fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	1	1	0,040	30,4	19,71	0,95	65%	2207	878
10	S2/Type 8 Level	180	90	South	1,175	0,400	4-Section 2 South fasade 1	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	0	1	0,040	4,7	0,99	1,06	21%	381	66
10	S2/Type 8 Level	180	90	South	1,175	0,400	4-Section 2 South fasade 1	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	0	1	0,040	4,7	0,99	1,06	21%	381	66
10	S2/Type 8 Level	180	90	South	0,800	1,600	4-Section 2 South fasade 1	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	1	0	0,040	12,8	7,04	0,96	55%	939	959
10	S2/Type 8 Level	180	90	South	0,750	1,600	4-Section 2 South fasade 1	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	0	1	0	0,040	12,0	6,38	0,91	53%	837	861
10	S2/Type 8 Level	180	90	South	0,800	1,600	4-Section 2 South fasade 1	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	1	0	0,040	12,8	7,04	0,96	55%	939	959
10	S2/Type 8 Level	180	90	South	1,175	0,400	4-Section 2 South fasade 1	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	0	1	0,040	4,7	0,99	1,06	21%	381	66
10	S2/Type 8 Level	180	90	South	1,175	0,400	4-Section 2 South fasade 1	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	0	1	0,040	4,7	0,99	1,06	21%	381	66
10	S2/Type 8 Level	180	90	South	0,800	1,600	4-Section 2 South fasade 1	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	1	0	0,040	12,8	7,04	0,96	55%	939	959
10	S2/Type 8 Level	180	90	South	0,750	1,600	4-Section 2 South fasade 1	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	0	1	0	0,040	12,0	6,38	0,91	53%	837	861
10	S2/Type 8 Level	180	90	South	0,800	1,600	4-Section 2 South fasade 1	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	1	0	0,040	12,8	7,04	0,96	55%	939	959
1	S2/Type 8 Level	180	90	South	1,175	0,400	5-Section 2 South fasade 2	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	0	1	0,040	0,5	0,10	1,06	21%	38	7
1	S2/Type 8 Level	180	90	South	1,175	0,400	5-Section 2 South fasade 2	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	0	1	0,040	0,5	0,10	1,06	21%	38	7
1	S2/Type 8 Level	180	90	South	0,800	1,600	5-Section 2 South fasade 2	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	1	0	0,040	1,3	0,70	0,96	55%	94	96
1	S2/Type 8 Level	180	90	South	0,750	1,600	5-Section 2 South fasade 2	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	0	1	0	0,040	1,2	0,64	0,91	53%	84	86
1	S2/Type 8 Level	180	90	South	0,800	1,600	5-Section 2 South fasade 2	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	1	0	0,040	1,3	0,70	0,96	55%	94	96
2	S2/Type 8 Level	0	90	North	1,175	0,400	2-Section 2 North fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	0	1	0,040	0,9	0,20	1,06	21%	76	6
2	S2/Type 8 Level	0	90	North	1,175	0,400	2-Section 2 North fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	0	1	0,040	0,9	0,20	1,06	21%	76	6
2	S2/Type 8 Level	0	90	North	0,800	1,600	2-Section 2 North fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	1	0	0,040	2,6	1,41	0,96	55%	188	59
2	S2/Type 8 Level	0	90	North	0,750	1,600	2-Section 2 North fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	0	1	0	0,040	2,4	1,28	0,91	53%	167	53

					Window rough openings		installed in	Glazing	Frame	g-Value	U-Value		Ψ Glazing edge	Installation situation user-defined value for $\Psi_{installed}$ or '1': $\Psi_{installed}$ from worksheet 'Components' '0': in the case of abutting windows					Results U- and Ψ-values from 'Components' worksheet can be shown through clicking the '+' sign on the top edge of the sheet.					
Quantity	Description	Deviation from North	Angle of inclination from the horizontal	Orientation	Width	Height	Selection from worksheet 'Areas'	Selection from worksheet 'Components'	Selection from worksheet 'Components'	Perpen-dicular Radiation	Glazing	Frames (centre)	Ψ_{spacer} (centre)	left	right	bottom	above	$\Psi_{installation}$ (Average)	Window Area	Glazing Area	U-Value Window	Glazed fraction per window	Trans-mission-losses	Solar gains
		Degrees	Degrees		m	m		Sort: AS LIST	Sort: AS LIST	-	W/(m²K)	W/(m²K)	W/(mK)	W/(mK) or 1/0				W/(mK)	m²	m²	W/(m²K)	%	kWh/a	kWh/a
2	S2/Type 8 Level	0	90	North	0,800	1,600	2-Section 2 North fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	1	0	0,040	2,6	1,41	0,96	55%	188	59
2	S2/Type 8 Level	0	90	North	1,175	0,400	2-Section 2 North fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	0	1	0,040	0,9	0,20	1,06	21%	76	6
2	S2/Type 8 Level	0	90	North	1,175	0,400	2-Section 2 North fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	0	1	0,040	0,9	0,20	1,06	21%	76	6
2	S2/Type 8 Level	0	90	North	0,800	1,600	2-Section 2 North fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	1	0	0,040	2,6	1,41	0,96	55%	188	59
2	S2/Type 8 Level	0	90	North	0,750	1,600	2-Section 2 North fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	0	1	0	0,040	2,4	1,28	0,91	53%	167	53
2	S2/Type 8 Level	0	90	North	0,800	1,600	2-Section 2 North fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	1	0	0,040	2,6	1,41	0,96	55%	188	59
10	S2/Type 8 Level	180	90	South	1,175	0,400	4-Section 2 South fasade 1	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	0	1	0,040	4,7	0,99	1,06	21%	381	66
10	S2/Type 8 Level	180	90	South	1,175	0,400	4-Section 2 South fasade 1	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	0	1	0,040	4,7	0,99	1,06	21%	381	66
10	S2/Type 8 Level	180	90	South	0,800	1,600	4-Section 2 South fasade 1	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	1	0	0,040	12,8	7,04	0,96	55%	939	959
10	S2/Type 8 Level	180	90	South	0,750	1,600	4-Section 2 South fasade 1	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	0	1	0	0,040	12,0	6,38	0,91	53%	837	861
10	S2/Type 8 Level	180	90	South	0,800	1,600	4-Section 2 South fasade 1	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	1	0	0,040	12,8	7,04	0,96	55%	939	959
1	S2/Type 8 Level	180	90	South	1,175	0,400	5-Section 2 South fasade 2	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	0	1	0,040	0,5	0,10	1,06	21%	38	7
1	S2/Type 8 Level	180	90	South	1,175	0,400	5-Section 2 South fasade 2	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	0	1	0,040	0,5	0,10	1,06	21%	38	7
1	S2/Type 8 Level	180	90	South	0,800	1,600	5-Section 2 South fasade 2	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	1	0	0,040	1,3	0,70	0,96	55%	94	96
1	S2/Type 8 Level	180	90	South	0,750	1,600	5-Section 2 South fasade 2	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	0	1	0	0,040	1,2	0,64	0,91	53%	84	86
1	S2/Type 8 Level	180	90	South	0,800	1,600	5-Section 2 South fasade 2	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	1	0	0,040	1,3	0,70	0,96	55%	94	96
2	S2/Type 9	0	90	North	0,800	0,800	2-Section 2 North fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0066wi03 Nestle - Novum K1-P - with Ther	0,51	0,80	1,11	0,031	1	0	0	1	0,040	1,3	0,63	1,17	50%	115	12
2	S2/Type 9	0	90	North	0,800	0,800	2-Section 2 North fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0066wi03 Nestle - Novum K1-P - with Ther	0,51	0,80	1,11	0,031	0	1	0	1	0,040	1,3	0,63	1,17	50%	115	12
2	S2/Type 9	0	90	North	0,800	1,400	2-Section 2 North fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0066wi03 Nestle - Novum K1-P - with Ther	0,51	0,80	1,11	0,031	1	0	0	0	0,040	2,2	1,32	1,07	59%	184	32
2	S2/Type 9	0	90	North	0,800	1,400	2-Section 2 North fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0066wi03 Nestle - Novum K1-P - with Ther	0,51	0,80	1,11	0,031	0	1	0	0	0,040	2,2	1,32	1,07	59%	184	32
2	S2/Type 9	0	90	North	0,800	0,800	2-Section 2 North fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0066wi03 Nestle - Novum K1-P - with Ther	0,51	0,80	1,11	0,031	1	0	1	0	0,040	1,3	0,63	1,17	50%	115	12
2	S2/Type 9	0	90	North	0,800	0,800	2-Section 2 North fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0066wi03 Nestle - Novum K1-P - with Ther	0,51	0,80	1,11	0,031	0	1	1	0	0,040	1,3	0,63	1,17	50%	115	12
1	S2/Type 10	0	90	North	1,100	0,800	9-Section 2 socle - North	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	1	1	1	0,040	0,9	0,43	1,06	48%	71	17
3	S2/Type 8 Level	180	90	South	1,175	0,400	4-Section 2 South fasade 1	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	0	1	0,040	1,4	0,30	1,06	21%	114	15
3	S2/Type 8 Level	180	90	South	1,175	0,400	4-Section 2 South fasade 1	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	0	1	0,040	1,4	0,30	1,06	21%	114	15
3	S2/Type 8 Level	180	90	South	0,800	1,600	4-Section 2 South fasade 1	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	1	0	0,040	3,8	2,11	0,96	55%	282	216
3	S2/Type 8 Level	180	90	South	0,750	1,600	4-Section 2 South fasade 1	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	0	1	0	0,040	3,6	1,91	0,91	53%	251	194
3	S2/Type 8 Level	180	90	South	0,800	1,600	4-Section 2 South fasade 1	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	1	0	0,040	3,8	2,11	0,96	55%	282	216
3	S2/Type 8 Level	180	90	South	1,175	0,400	4-Section 2 South fasade 1	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	0	1	0,040	1,4	0,30	1,06	21%	114	11
3	S2/Type 8 Level	180	90	South	1,175	0,400	4-Section 2 South fasade 1	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	0	1	0,040	1,4	0,30	1,06	21%	114	11
3	S2/Type 8 Level	180	90	South	0,800	1,600	4-Section 2 South fasade 1	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	1	0	0,040	3,8	2,11	0,96	55%	282	167
3	S2/Type 8 Level	180	90	South	0,750	1,600	4-Section 2 South fasade 1	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	0	1	0	0,040	3,6	1,91	0,91	53%	251	150
3	S2/Type 8 Level	180	90	South	0,800	1,600	4-Section 2 South fasade 1	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	1	0	0,040	3,8	2,11	0,96	55%	282	167
3	S2/Type 8 Level	180	90	South	1,175	0,400	4-Section 2 South fasade 1	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	0	1	0,040	1,4	0,30	1,06	21%	114	13
3	S2/Type 8 Level	180	90	South	1,175	0,400	4-Section 2 South fasade 1	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	0	1	0,040	1,4	0,30	1,06	21%	114	13
3	S2/Type 8 Level	180	90	South	0,800	1,600	4-Section 2 South fasade 1	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	1	0	0,040	3,8	2,11	0,96	55%	282	184
3	S2/Type 8 Level	180	90	South	0,750	1,600	4-Section 2 South fasade 1	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	0	1	0	0,040	3,6	1,91	0,91	53%	251	165
3	S2/Type 8 Level	180	90	South	0,800	1,600	4-Section 2 South fasade 1	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	1	0	0,040	3,8	2,11	0,96	55%	282	184
3	S2/Type 8 Level	180	90	South	1,175	0,400	4-Section 2 South fasade 1	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	0	1	0,040	1,4	0,30	1,06	21%	114	14
3	S2/Type 8 Level	180	90	South	1,175	0,400	4-Section 2 South fasade 1	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	0	1	0,040	1,4	0,30	1,06	21%	114	14
3	S2/Type 8 Level	180	90	South	0,800	1,600	4-Section 2 South fasade 1	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	1	0	0,040	3,8	2,11	0,96	55%	282	201
3	S2/Type 8 Level	180	90	South	0,750	1,600	4-Section 2 South fasade 1	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	0	1	0	0,040	3,6	1,91	0,91	53%	251	181
3	S2/Type 8 Level	180	90	South	0,800	1,600	4-Section 2 South fasade 1	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	1	0	0,040	3,8	2,11	0,96	55%	282	201
3	S2/Type 8 Level	180	90	South	1,175	0,400	4-Section 2 South fasade 1	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	0	1	0,040	1,4	0,30	1,06	21%	114	15
3	S2/Type 8 Level	180	90	South	1,175	0,400	4-Section 2 South fasade 1	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	0	1	0,040	1,4	0,30	1,06	21%	114	15
3	S2/Type 8 Level	180	90	South	0,800	1,600	4-Section 2 South fasade 1	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	1	0	0,040	3,8	2,11	0,96	55%	282	216
3	S2/Type 8 Level	180	90	South	0,750	1,600	4-Section 2 South fasade 1	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	0	1	0	0,040	3,6	1,91	0,91	53%	251	194
3	S2/Type 8 Level	180	90	South	0,800	1,600	4-Section 2 South fasade 1	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	1	0	0,040	3,8	2,11	0,96	55%	282	216
2	S1/Type 3 level	90	90	East	0,600	1,150	18-Section 3 East fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	1	1	1	0,040	1,4	0,58	1,10	42%	117	40
2	S1/Type 3 level	90	90	East	0,600	1,150	18-Section 3 East fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	1	1	1	0,040	1,4	0,58	1,10	42%	117	40
1	S1/Type 11	0	90	North	0,850	1,400	17-Section 3 North fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	1	1	1	0,040	1,2	0,65	1,03	55%	94	27
4	S1/Type 12 Leve	0	90	North	0,800	1,450	17-Section 3 North fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	1	1	0,040	4,6	2,49	0,99	54%	352	103
4	S1/Type 12 Leve	0	90	North	1,400	1,450	17-Section 3 North fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	1	1	0,040	8,1	5,27	0,95	65%	590	235
5	S1/Type 12 Leve	0	90	North	0,800	1,450	17-Section 3 North fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	1	1	0,040	5,8	3,12	0,99	54%	440	129
5	S1/Type 12 Leve	0	90	North	1,400	1,450	17-Section 3 North fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	1	1	0,040	10,2	6,59	0,95	65%	738	294
7	S1/Type 13	180	90	South	0,900	1,800	19-Section 3 South fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	1	1	0,040	11,3	6,73	0,96	59%	838	952
7	S1/Type 13	180	90	South	0,900	1,800	19-Section 3 South fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	1	1	0,040	11,3	6,73	0,96	59%	838	952
7	S1/Type 14	180	90	South	0,900	1,550	19-Section 3 South fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	1	1	0,040	9,8	5,62	0,97	58%	729	774
5	S1/Type 14	180	90	South	0,850	1,550	19-Section 3 South fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	0	1	1	0,040	6,6	3,70	0,93	56%	470	506
7	S1/Type 14	180	90	South	0,900	1,550	19-Section 3 South fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	1	1	0,040	9,8	5,62	0,97	58%	729	774
2	S1/Type 15	180	90	South	0,850	1,550	19-Section 3 South fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	0	0	1	0,040	2,6	1,48	0,91	56%	183	202
2	S1/Type 15	180	90	South	0,850	0,650	19-Section 3 South fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	1	1	0	0,040	1,1	0,42	1,05	38%	89	43
7	S1/Type 16	180	90	South	0,900	0,700	19-Section 3 South fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	1	1	0,040	4,4	1,82	1,05	41%	356	194

					Window rough openings		installed in	Glazing	Frame	g-Value	U-Value		Ψ Glazing edge	Installation situation user-defined value for $\Psi_{installed}$ or '1': $\Psi_{installed}$ from worksheet 'Components' '0': in the case of abutting windows					Results U- and Ψ-values from 'Components' worksheet can be shown through clicking the '+' sign on the top edge of the sheet.					
Quantity	Description	Deviation from North	Angle of inclination from the horizontal	Orientation	Width	Height	Selection from worksheet 'Areas'	Selection from worksheet 'Components'	Selection from worksheet 'Components'	Perpendicular Radiation	Glazing	Frames (centre)	Ψ_{spacer} (centre)	left	right	bottom	above	$\Psi_{installation}$ (Average)	Window Area	Glazing Area	U-Value Window	Glazed fraction per window	Transmission-losses	Solar gains
		Degrees	Degrees		m	m		Sort: AS LIST	Sort: AS LIST	-	W/(m²K)	W/(m²K)	W/(mK)	W/(mK) or 1/0				W/(mK)	m²	m²	W/(m²K)	%	kWh/a	kWh/a
7	S1/Type 16	180	90	South	0,850	0,700	19-Section 3 South fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	0	1	1	0,040	4,2	1,68	1,01	40%	322	178
7	S1/Type 16	180	90	South	0,900	0,700	19-Section 3 South fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	1	1	0,040	4,4	1,82	1,05	41%	356	194
1	L-1 W Type 6	260	90	West	1,175	0,450	31-Section 1 socle - West	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	0	1	0,040	0,5	0,14	1,04	27%	42	5
1	L-1 W Type 6	260	90	West	1,175	0,450	31-Section 1 socle - West	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	0	1	0,040	0,5	0,14	1,04	27%	42	5
1	L-1 W Type 6	260	90	West	0,800	1,600	31-Section 1 socle - West	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	1	0	0,040	1,3	0,70	0,96	55%	94	28
1	L-1 W Type 6	260	90	West	0,750	1,600	31-Section 1 socle - West	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	0	1	0	0,040	1,2	0,64	0,91	53%	84	25
1	L-1 W Type 6	260	90	West	0,800	1,600	31-Section 1 socle - West	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	1	0	0,040	1,3	0,70	0,96	55%	94	28
5	L-1 W Type 7	260	90	West	0,800	1,350	31-Section 1 socle - West	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	1	1	0,040	5,4	2,85	0,99	53%	411	113
5	L-1 W Type 7	260	90	West	0,750	1,350	31-Section 1 socle - West	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	0	1	1	0,040	5,1	2,58	0,95	51%	367	101
5	L-1 W Type 7	260	90	West	0,800	1,350	31-Section 1 socle - West	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	1	1	0,040	5,4	2,85	0,99	53%	411	113
1	L-1 W Type 1	260	90	West	0,550	0,900	31-Section 1 socle - West	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	1	1	1	0,040	0,5	0,18	1,14	35%	43	6
6	L-1 E Type 7	90	90	East	0,800	1,350	33-Section 1 socle - East	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	1	1	0,040	6,5	3,42	0,99	53%	493	121
6	L-1 E Type 7	90	90	East	0,750	1,350	33-Section 1 socle - East	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	0	1	1	0,040	6,1	3,10	0,95	51%	441	108
6	L-1 E Type 7	90	90	East	0,800	1,350	33-Section 1 socle - East	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	1	1	0,040	6,5	3,42	0,99	53%	493	121
10	L 0 W Type 6 -	260	90	West	1,175	0,450	23-Section 1 - West fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	0	1	0,040	5,3	1,44	1,04	27%	421	67
10	L 0 W Type 6 -	260	90	West	1,175	0,450	23-Section 1 - West fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	0	1	0,040	5,3	1,44	1,04	27%	421	67
10	L 0 W Type 6 -	260	90	West	0,800	1,600	23-Section 1 - West fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	1	0	0,040	12,8	7,04	0,96	55%	939	399
10	L 0 W Type 6 -	260	90	West	0,750	1,600	23-Section 1 - West fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	0	1	0	0,040	12,0	6,38	0,91	53%	837	356
10	L 0 W Type 6 -	260	90	West	0,800	1,600	23-Section 1 - West fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	1	0	0,040	12,8	7,04	0,96	55%	939	399
2	L 0 W Type 6 -	260	90	West	1,175	0,450	23-Section 1 - West fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	0	1	0,040	1,1	0,29	1,04	27%	84	8
2	L 0 W Type 6 -	260	90	West	1,175	0,450	23-Section 1 - West fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	0	1	0,040	1,1	0,29	1,04	27%	84	8
2	L 0 W Type 6 -	260	90	West	0,800	1,600	23-Section 1 - West fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	1	0	0,040	2,6	1,41	0,96	55%	188	50
2	L 0 W Type 6 -	260	90	West	0,750	1,600	23-Section 1 - West fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	0	1	0	0,040	2,4	1,28	0,91	53%	167	44
2	L 0 W Type 6 -	260	90	West	0,800	1,600	23-Section 1 - West fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	1	0	0,040	2,6	1,41	0,96	55%	188	50
2	L 0 W Type 6 -	260	90	West	1,175	0,450	23-Section 1 - West fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	0	1	0,040	1,1	0,29	1,04	27%	84	13
2	L 0 W Type 6 -	260	90	West	1,175	0,450	23-Section 1 - West fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0066wi03 Nestle - Novum K1-P - with Ther	0,51	0,80	1,12	0,031	0	1	0	1	0,040	1,1	0,39	1,26	37%	102	6
2	L 0 W Type 6 -	260	90	West	0,800	1,600	23-Section 1 - West fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0066wi03 Nestle - Novum K1-P - with Ther	0,51	0,80	1,11	0,031	1	0	1	0	0,040	2,6	1,54	1,09	60%	214	50
2	L 0 W Type 6 -	260	90	West	0,750	1,600	23-Section 1 - West fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0066wi03 Nestle - Novum K1-P - with Ther	0,51	0,80	1,11	0,031	0	0	1	0	0,040	2,4	1,41	1,05	59%	193	45
2	L 0 W Type 6 -	260	90	West	0,800	1,600	23-Section 1 - West fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0066wi03 Nestle - Novum K1-P - with Ther	0,51	0,80	1,11	0,031	0	1	1	0	0,040	2,6	1,54	1,09	60%	214	50
2	L 0 W Type 2	260	90	West	0,850	0,450	23-Section 1 - West fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	1	0	1	0,040	0,8	0,19	1,09	24%	64	8
2	L 0 W Type 2	260	90	West	0,850	1,600	23-Section 1 - West fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	1	1	0	0,040	2,7	1,54	1,00	57%	208	88
2	O1/Door 1 (Glass	260	90	West	0,800	0,800	23-Section 1 - West fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0066wi03 Nestle - Novum K1-P - with Ther	0,51	0,80	1,11	0,031	1	0	0	1	0,040	1,3	0,63	1,17	50%	115	19
2	O1/Door 1 (Glass	260	90	West	0,900	0,800	23-Section 1 - West fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0066wi03 Nestle - Novum K1-P - with Ther	0,51	0,80	1,11	0,031	0	0	0	1	0,040	1,4	0,75	1,11	52%	122	23
2	O1/Door 1 (Glass	260	90	West	0,800	0,800	23-Section 1 - West fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0066wi03 Nestle - Novum K1-P - with Ther	0,51	0,80	1,11	0,031	0	1	0	1	0,040	1,3	0,63	1,17	50%	115	19
2	O1/Door 1 (Glass	260	90	West	0,800	1,400	23-Section 1 - West fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0066wi03 Nestle - Novum K1-P - with Ther	0,51	0,80	1,11	0,031	1	0	0	0	0,040	2,2	1,32	1,07	59%	184	57
2	O1/Door 1 (Glass	260	90	West	0,900	1,400	23-Section 1 - West fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0066wi03 Nestle - Novum K1-P - with Ther	0,51	0,80	1,11	0,031	0	0	0	0	0,000	2,5	1,55	1,01	61%	195	69
2	O1/Door 1 (Glass	260	90	West	0,800	1,400	23-Section 1 - West fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0066wi03 Nestle - Novum K1-P - with Ther	0,51	0,80	1,11	0,031	0	1	0	0	0,040	2,2	1,32	1,07	59%	184	57
2	O1/Door 1 (Glass	260	90	West	0,800	0,800	23-Section 1 - West fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0066wi03 Nestle - Novum K1-P - with Ther	0,51	0,80	1,11	0,031	1	0	1	0	0,040	1,3	0,63	1,17	50%	115	19
2	O1/Door 1 (Glass	260	90	West	0,900	0,800	23-Section 1 - West fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0066wi03 Nestle - Novum K1-P - with Ther	0,51	0,80	1,11	0,031	0	0	1	0	0,040	1,4	0,75	1,11	52%	122	23
2	O1/Door 1 (Glass	260	90	West	0,800	0,800	23-Section 1 - West fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0066wi03 Nestle - Novum K1-P - with Ther	0,51	0,80	1,11	0,031	0	1	1	0	0,040	1,3	0,63	1,17	50%	115	19
3	O1/Type 8 South	180	90	South	1,000	0,450	29-Section 1 - South 1 fasad	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	0	1	0,040	1,4	0,35	1,04	26%	108	46
3	O1/Type 8 South	180	90	South	0,950	0,450	29-Section 1 - South 1 fasad	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	0	0	1	0,040	1,3	0,33	1,00	25%	98	42
3	O1/Type 8 South	180	90	South	1,000	0,450	29-Section 1 - South 1 fasad	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	0	1	0,040	1,4	0,35	1,04	26%	108	46
3	O1/Type 8 South	180	90	South	1,000	1,600	29-Section 1 - South 1 fasad	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	1	0	0,040	4,8	2,90	0,94	60%	345	455
3	O1/Type 8 South	180	90	South	0,950	1,600	29-Section 1 - South 1 fasad	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	0	1	0	0,040	4,6	2,70	0,90	59%	315	422
3	O1/Type 8 South	180	90	South	1,000	1,600	29-Section 1 - South 1 fasad	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	1	0	0,040	4,8	2,90	0,94	60%	345	455
2	O1/Type 8 NORTH	0	90	North	1,000	0,450	24-Section 1 - North 1 fasad	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	0	1	0,040	0,9	0,23	1,04	26%	72	#WERT!
2	O1/Type 8 NORTH	0	90	North	0,950	0,450	24-Section 1 - North 1 fasad	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	0	0	1	0,040	0,9	0,22	1,00	25%	66	#WERT!
2	O1/Type 8 NORTH	0	90	North	1,000	0,450	24-Section 1 - North 1 fasad	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	0	1	0,040	0,9	0,23	1,04	26%	72	0
2	O1/Type 8 NORTH	0	90	North	1,000	1,600	24-Section 1 - North 1 fasad	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	1	0	0,040	3,2	1,93	0,94	60%	230	0
2	O1/Type 8 NORTH	0	90	North	0,950	1,600	24-Section 1 - North 1 fasad	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	0	1	0	0,040	3,0	1,80	0,90	59%	210	0
2	O1/Type 8 NORTH	0	90	North	1,000	1,600	24-Section 1 - North 1 fasad	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	1	0	0,040	3,2	1,93	0,94	60%	230	0
1	O1/Door 2 (Glass	180	90	South	0,800	0,800	29-Section 1 - South 1 fasad	01ud 44 mm. triple glazing, 2 Low-E, air, al	0066wi03 Nestle - Novum K1-P - with Ther	0,51	0,80	1,11	0,031	1	0	0	1	0,040	0,6	0,32	1,17	50%	57	0
1	O1/Door 2 (Glass	180	90	South	0,800	1,300	29-Section 1 - South 1 fasad	01ud 44 mm. triple glazing, 2 Low-E, air, al	0066wi03 Nestle - Novum K1-P - with Ther	0,51	0,80	1,11	0,031	1	0	0	0	0,040	1,0	0,60	1,08	58%	86	0
1	O1/Door 2 (Glass	180	90	South	0,800	1,300	29-Section 1 - South 1 fasad	01ud 44 mm. triple glazing, 2 Low-E, air, al	0066wi03 Nestle - Novum K1-P - with Ther	0,51	0,80	1,11	0,031	0	1	0	0	0,040	1,0	0,60	1,08	58%	86	0
1	O1/Door 2 (Glass	180	90	South	0,800	0,800	29-Section 1 - South 1 fasad	01ud 44 mm. triple glazing, 2 Low-E, air, al	0066wi03 Nestle - Novum K1-P - with Ther	0,51	0,80	1,11	0,031	1	0	1	0	0,040	0,6	0,32	1,17	50%	57	0
1	O1/Door 2 (Glass	180	90	South	0,800	0,800	29-Section 1 - South 1 fasad	01ud 44 mm. triple glazing, 2 Low-E, air, al	0066wi03 Nestle - Novum K1-P - with Ther	0,51	0,80	1,11	0,031	0	1	1	0	0,040	0,6	0,32	1,17	50%	57	0
1	O1/Type 8 NORTH	0	90	North	1,000	0,450	24-Section 1 - North 1 fasad	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	0	1	0,040	0,5	0,12	1,04	26%	36	0
1	O1/Type 8 NORTH	0	90	North	0,950	0,450	24-Section 1 - North 1 fasad	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	0	0	1	0,040	0,4	0,11	1,00	25%	33	0
1	O1/Type 8 NORTH	0	90	North	1,000	0,450	24-Section 1 - North 1 fasad	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	0	1	0,040	0,5	0,12	1,04	26%	36	0
1	O1/Type 8 NORTH	0	90	North	1,000	1,600	24-Section 1 - North 1 fasad	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	1	0	0,040	1,6	0,97	0,94	60%	115	0
1	O1/Type 8 NORTH	0	90	North	0,950	1,600	24-Section 1 - North 1 fasad	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	0	1	0	0,040	1,5	0,90	0,90	59%	105	0

					Window rough openings		installed in	Glazing	Frame	g-Value	U-Value		Ψ Glazing edge	Installation situation user-defined value for $\Psi_{installed}$ or '1': $\Psi_{installed}$ from worksheet 'Components' '0': in the case of abutting windows					Results U- and Ψ-values from 'Components' worksheet can be shown through clicking the '+' sign on the top edge of the sheet.					
Quantity	Description	Deviation from North	Angle of inclination from the horizontal	Orientation	Width	Height	Selection from worksheet 'Areas'	Selection from worksheet 'Components'	Selection from worksheet 'Components'	Perpen-dicular Radiation	Glazing	Frames (centre)	Ψ_{spacer} (centre)	left	right	bottom	above	$\Psi_{installation}$ (Average)	Window Area	Glazing Area	U-Value Window	Glazed fraction per window	Trans-mission-losses	Solar gains
		Degrees	Degrees		m	m		Sort: AS LIST	Sort: AS LIST	-	W/(m²K)	W/(m²K)	W/(mK)	W/(mK) or 1/0				W/(mK)	m²	m²	W/(m²K)	%	kWh/a	kWh/a
1	O1/Type 8 NORTH	0	90	North	1,000	1,600	24-Section 1 - North 1 fasad	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	1	0	0,040	1,6	0,97	0,94	60%	115	0
16	L 1 W Type 6	260	90	West	1,175	0,450	23-Section 1 - West fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	0	1	0,040	8,5	2,31	1,04	27%	673	0
16	L 1 W Type 6	260	90	West	1,175	0,450	23-Section 1 - West fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	0	1	0,040	8,5	2,31	1,04	27%	673	0
16	L 1 W Type 6	260	90	West	0,800	1,600	23-Section 1 - West fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	1	0	0,040	20,5	11,26	0,96	55%	1503	0
16	L 1 W Type 6	260	90	West	0,750	1,600	23-Section 1 - West fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	0	1	0	0,040	19,2	10,21	0,91	53%	1340	0
16	L 1 W Type 6	260	90	West	0,800	1,600	23-Section 1 - West fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	1	0	0,040	20,5	11,26	0,96	55%	1503	0
2	L 1 W Type 2	260	90	West	0,850	0,450	23-Section 1 - West fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	1	0	1	0,040	0,8	0,19	1,09	24%	64	0
2	L 1 W Type 2	260	90	West	0,850	1,600	23-Section 1 - West fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	1	1	0	0,040	2,7	1,54	1,00	57%	208	0
16	L 2 W Type 6	260	90	West	1,175	0,450	23-Section 1 - West fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	0	1	0,040	8,5	2,31	1,04	27%	673	0
16	L 2 W Type 6	260	90	West	1,175	0,450	23-Section 1 - West fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	0	1	0,040	8,5	2,31	1,04	27%	673	0
16	L 2 W Type 6	260	90	West	0,800	1,600	23-Section 1 - West fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	1	0	0,040	20,5	11,26	0,96	55%	1503	0
16	L 2 W Type 6	260	90	West	0,750	1,600	23-Section 1 - West fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	0	1	0	0,040	19,2	10,21	0,91	53%	1340	0
16	L 2 W Type 6	260	90	West	0,800	1,600	23-Section 1 - West fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	1	0	0,040	20,5	11,26	0,96	55%	1503	0
2	L 2 W Type 2	260	90	West	0,850	0,450	23-Section 1 - West fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	1	0	1	0,040	0,8	0,19	1,09	24%	64	0
2	L 2 W Type 2	260	90	West	0,850	1,600	23-Section 1 - West fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	1	1	0	0,040	2,7	1,54	1,00	57%	208	0
16	L 3 W Type 6	260	90	West	1,175	0,450	23-Section 1 - West fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	0	1	0,040	8,5	2,31	1,04	27%	673	0
16	L 3 W Type 6	260	90	West	1,175	0,450	23-Section 1 - West fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	0	1	0,040	8,5	2,31	1,04	27%	673	0
16	L 3 W Type 6	260	90	West	0,800	1,600	23-Section 1 - West fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	1	0	0,040	20,5	11,26	0,96	55%	1503	0
16	L 3 W Type 6	260	90	West	0,750	1,600	23-Section 1 - West fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	0	1	0	0,040	19,2	10,21	0,91	53%	1340	0
16	L 3 W Type 6	260	90	West	0,800	1,600	23-Section 1 - West fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	1	0	0,040	20,5	11,26	0,96	55%	1503	0
2	L 3 W Type 2	260	90	West	0,850	0,450	23-Section 1 - West fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	1	0	1	0,040	0,8	0,19	1,09	24%	64	0
2	L 3 W Type 2	260	90	West	0,850	1,600	23-Section 1 - West fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	1	1	0	0,040	2,7	1,54	1,00	57%	208	0
20	L0,1,2,3 E Type	90	90	East	1,175	0,450	26-Section 1 - East 1 fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	0	1	0,040	10,6	2,89	1,04	27%	841	0
20	L0,1,2,3 E Type	90	90	East	1,175	0,450	26-Section 1 - East 1 fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	0	1	0,040	10,6	2,89	1,04	27%	841	0
20	L0,1,2,3 E Type	90	90	East	0,800	1,600	26-Section 1 - East 1 fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	1	0	0,040	25,6	14,07	0,96	55%	1879	0
20	L0,1,2,3 E Type	90	90	East	0,750	1,600	26-Section 1 - East 1 fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	0	1	0	0,040	24,0	12,77	0,91	53%	1675	0
20	L0,1,2,3 E Type	90	90	East	0,800	1,600	26-Section 1 - East 1 fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	1	0	0,040	25,6	14,07	0,96	55%	1879	0
1	O1/Door 3 (Glass	90	90	East	0,450	1,400	27-Section 1 - East 2 fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0066wi03 Nestle - Novum K1-P - with Ther	0,51	0,80	1,11	0,031	1	0	0	1	0,040	0,6	0,25	1,24	40%	60	0
1	O1/Door 3 (Glass	90	90	East	0,450	1,400	27-Section 1 - East 2 fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0066wi03 Nestle - Novum K1-P - with Ther	0,51	0,80	1,11	0,031	0	0	0	1	0,040	0,6	0,25	1,15	40%	55	0
1	O1/Door 3 (Glass	90	90	East	0,450	1,400	27-Section 1 - East 2 fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0066wi03 Nestle - Novum K1-P - with Ther	0,51	0,80	1,11	0,031	0	0	0	1	0,040	0,6	0,25	1,15	40%	55	0
1	O1/Door 3 (Glass	90	90	East	0,450	1,400	27-Section 1 - East 2 fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0066wi03 Nestle - Novum K1-P - with Ther	0,51	0,80	1,11	0,031	0	1	0	1	0,040	0,6	0,25	1,24	40%	60	0
1	O1/Door 3 (Glass	90	90	East	0,900	0,800	27-Section 1 - East 2 fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0066wi03 Nestle - Novum K1-P - with Ther	0,51	0,80	1,11	0,031	1	0	1	0	0,040	0,7	0,37	1,15	52%	64	0
1	O1/Door 3 (Glass	90	90	East	0,900	0,800	27-Section 1 - East 2 fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0066wi03 Nestle - Novum K1-P - with Ther	0,51	0,80	1,11	0,031	0	1	1	0	0,040	0,7	0,37	1,15	52%	64	0
3	L 1,2,3 E Type (	90	90	East	0,900	0,800	27-Section 1 - East 2 fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	1	1	0,040	2,2	0,97	1,03	45%	171	0
3	L 1,2,3 E Type (	90	90	East	0,900	0,800	27-Section 1 - East 2 fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	1	1	0,040	2,2	0,97	1,03	45%	171	0
2	O1/Door 4 (Glass	90	90	East	0,850	0,800	28-Section 1 - East 3 fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0066wi03 Nestle - Novum K1-P - with Ther	0,51	0,80	1,11	0,031	1	0	0	1	0,040	1,4	0,69	1,16	51%	121	0
2	O1/Door 4 (Glass	90	90	East	0,900	0,800	28-Section 1 - East 3 fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0066wi03 Nestle - Novum K1-P - with Ther	0,51	0,80	1,11	0,031	0	0	0	1	0,040	1,4	0,75	1,11	52%	122	0
2	O1/Door 4 (Glass	90	90	East	0,850	0,800	28-Section 1 - East 3 fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0066wi03 Nestle - Novum K1-P - with Ther	0,51	0,80	1,11	0,031	0	1	0	1	0,040	1,4	0,69	1,16	51%	121	0
2	O1/Door 4 (Glass	90	90	East	0,850	1,400	28-Section 1 - East 3 fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0066wi03 Nestle - Novum K1-P - with Ther	0,51	0,80	1,11	0,031	1	0	0	0	0,040	2,4	1,43	1,06	60%	194	0
2	O1/Door 4 (Glass	90	90	East	0,900	1,400	28-Section 1 - East 3 fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0066wi03 Nestle - Novum K1-P - with Ther	0,51	0,80	1,11	0,031	0	0	0	0	0,000	2,5	1,55	1,01	61%	195	0
2	O1/Door 4 (Glass	90	90	East	0,850	1,400	28-Section 1 - East 3 fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0066wi03 Nestle - Novum K1-P - with Ther	0,51	0,80	1,11	0,031	0	1	0	0	0,040	2,4	1,43	1,06	60%	194	0
2	O1/Door 4 (Glass	90	90	East	0,850	0,800	28-Section 1 - East 3 fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0066wi03 Nestle - Novum K1-P - with Ther	0,51	0,80	1,11	0,031	1	0	1	0	0,040	1,4	0,69	1,16	51%	121	0
2	O1/Door 4 (Glass	90	90	East	0,900	0,800	28-Section 1 - East 3 fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0066wi03 Nestle - Novum K1-P - with Ther	0,51	0,80	1,11	0,031	0	0	1	0	0,040	1,4	0,75	1,11	52%	122	0
2	O1/Door 4 (Glass	90	90	East	0,850	0,800	28-Section 1 - East 3 fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0066wi03 Nestle - Novum K1-P - with Ther	0,51	0,80	1,11	0,031	0	1	1	0	0,040	1,4	0,69	1,16	51%	121	0
6	L 0 E Type 6	90	90	East	1,175	0,450	28-Section 1 - East 3 fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	0	1	0,040	3,2	0,87	1,04	27%	252	0
6	L 0 E Type 6	90	90	East	1,175	0,450	28-Section 1 - East 3 fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	0	1	0,040	3,2	0,87	1,04	27%	252	0
6	L 0 E Type 6	90	90	East	0,800	1,600	28-Section 1 - East 3 fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	1	0	0,040	7,7	4,22	0,96	55%	564	0
6	L 0 E Type 6	90	90	East	0,750	1,600	28-Section 1 - East 3 fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	0	1	0	0,040	7,2	3,83	0,91	53%	502	0
6	L 0 E Type 6	90	90	East	0,800	1,600	28-Section 1 - East 3 fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	1	0	0,040	7,7	4,22	0,96	55%	564	0
8	L 1 E Type 6	90	90	East	1,175	0,450	28-Section 1 - East 3 fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	0	1	0,040	4,2	1,15	1,04	27%	336	0
8	L 1 E Type 6	90	90	East	1,175	0,450	28-Section 1 - East 3 fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	0	1	0,040	4,2	1,15	1,04	27%	336	0
8	L 1 E Type 6	90	90	East	0,800	1,600	28-Section 1 - East 3 fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	1	0	0,040	10,2	5,63	0,96	55%	751	0
8	L 1 E Type 6	90	90	East	0,750	1,600	28-Section 1 - East 3 fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	0	1	0	0,040	9,6	5,11	0,91	53%	670	0
8	L 1 E Type 6	90	90	East	0,800	1,600	28-Section 1 - East 3 fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	1	0	0,040	10,2	5,63	0,96	55%	751	0
8	L 2 E Type 6	90	90	East	1,175	0,450	28-Section 1 - East 3 fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	0	1	0,040	4,2	1,15	1,04	27%	336	0
8	L 2 E Type 6	90	90	East	1,175	0,450	28-Section 1 - East 3 fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	0	1	0,040	4,2	1,15	1,04	27%	336	0
8	L 2 E Type 6	90	90	East	0,800	1,600	28-Section 1 - East 3 fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	1	0	0,040	10,2	5,63	0,96	55%	751	0
8	L 2 E Type 6	90	90	East	0,750	1,600	28-Section 1 - East 3 fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	0	1	0	0,040	9,6	5,11	0,91	53%	670	0
8	L 2 E Type 6	90	90	East	0,800	1,600	28-Section 1 - East 3 fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	1	0	0,040	10,2	5,63	0,96	55%	751	0
8	L 3 E Type 6	90	90	East	1,175	0,450	28-Section 1 - East 3 fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	0	1	0,040	4,2	1,15	1,04	27%	336	0
8	L 3 E Type 6	90	90	East	1,175	0,450	28-Section 1 - East 3 fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	1	0	1	0,040	4,2	1,15	1,04	27%	336	0
8	L 3 E Type 6	90	90	East	0,800	1,600	28-Section 1 - East 3 fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	1	0	1	0	0,040	10,2	5,63	0,96	55%	751	0
8	L 3 E Type 6	90	90	East	0,750	1,600	28-Section 1 - East 3 fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al	0081wi03 Rehau - REHAU GENEO PHZ - w	0,51	0,80	0,79	0,030	0	0	1	0	0,040	9,6	5,11	0,91	53%	670	0

					Window rough openings		installed in	Glazing	Frame	g-Value	U-Value		Ψ Glazing edge	Installation situation user-defined value for $\Psi_{installed}$ or '1': $\Psi_{installed}$ from worksheet 'Components' '0': in the case of abutting windows					Results U- and Ψ-values from 'Components' worksheet can be shown through clicking the '+' sign on the top edge of the sheet.					
Quantity	Description	Deviation from North	Angle of inclination from the horizontal	Orientation	Width	Height	Selection from worksheet 'Areas'	Selection from worksheet 'Components'	Selection from worksheet 'Components'	Perpen-dicular Radiation	Glazing	Frames (centre)	Ψ_{spacer} (centre)	left	right	bottom	above	$\Psi_{installation}$ (Average)	Window Area	Glazing Area	U-Value Window	Glazed fraction per window	Trans-mission-losses	Solar gains
		Degrees	Degrees		m	m		Sort: AS LIST	Sort: AS LIST	-	W/(m²K)	W/(m²K)	W/(mK)	W/(mK) or 1/0				W/(mK)	m²	m²	W/(m²K)	%	kWh/a	kWh/a
8	L 3 E Type 6	90	90	East	0,800	1,600	28-Section 1 - East 3 fasade	01ud 44 mm. triple glazing, 2 Low-E, air, al0081wi03 Rehau - REHAU GENEO PHZ - w		0,51	0,80	0,79	0,030	0	1	1	0	0,040	10,2	5,63	0,96	55%	751	0

EnerPHit planning:

CALCULATING SHADING FACTORS

Climate: User data - Велико Търнов

Building: Primary School 8 "Sveti Sveti Kiril I Metodi" - Section B

Latitude: 43,086 °

Orientation	Glazing area m²	Reduction factor winter r_S	Summer reduction factor r_S
North	151,54	81%	53%
East	140,16	60%	43%
South	176,40	68%	40%
West	173,79	51%	34%
Horizontal	0,00	100%	100%

Space heating demand:	17,3	kWh/(m²a)
Useful Cooling Demand:	1,1	kWh/(m²a)
Frequency of overheating:	3,1%	

								Horizon		Reveal		Overhang					Winter				Summer			
Quantity	Description	Deviation from North	Angle of Inclination from the Horizontal	Orientation	Glazing width	Glazing height	Glazing area	Height of the shading object	Horizontal distance	Window reveal depth	Distance from glazing edge to reveal	Overhang depth	Distance from upper glazing edge to overhang	Additional reduction factor winter shading	Additional reduction factor summer shading	Reduction factor z for temporary sun protection	Horizontal shading reduction factor	Reveal Shading Reduction Factor	Overhang shading reduction factor	Total shading reduction factor	Horizontal Shading Reduction Factor	Reveal Shading Reduction Factor	Overhang shading reduction factor	Total shading reduction factor
		Degrees	Degrees		m	m		m	m	m	m	m	m	%	%	%	%	%	%	%	%	%	%	%
					w_G	h_G	A_G	h_{Hori}	d_{Hori}	o_{Reveal}	d_{Reveal}	o_{over}	d_{over}	$r_{other,w}$	$r_{other,s}$	z	r_H	r_R	r_O	r_S	r_H	r_R	r_O	r_S
1	S2/Type 1	180	90	South	0,54	0,61	0,3			0,18	0,07	0,60	0,07				100%	88%	73%	64%	100%	85%	29%	25%
1	S2/Type 1	180	90	South	0,74	0,61	0,4			0,18	0,07	0,60	0,07				100%	90%	73%	66%	100%	88%	29%	26%
1	S2/Type 2 leve	260	90	West	0,54	0,71	0,4			0,18	0,070	0,18	0,07			60%	100%	81%	89%	72%	100%	93%	93%	52%
1	S2/Type 2 leve	260	90	West	0,59	0,71	0,4			0,18	0,070	0,18	0,07			60%	100%	82%	89%	73%	100%	93%	93%	52%
1	S2/Type 2 leve	260	90	West	0,54	0,71	0,4			0,18	0,070	0,18	0,07			60%	100%	81%	89%	72%	100%	93%	93%	52%
1	S2/Type 2 leve	260	90	West	0,59	0,71	0,4			0,18	0,070	0,18	0,07			60%	100%	82%	89%	73%	100%	93%	93%	52%
1	S2/Type 2 leve	260	90	West	0,54	0,71	0,4			0,18	0,070	0,18	0,07			60%	100%	81%	89%	72%	100%	93%	93%	52%
1	S2/Type 2 leve	260	90	West	0,59	0,71	0,4			0,18	0,070	0,18	0,07			60%	100%	82%	89%	73%	100%	93%	93%	52%
1	S2/Type 3 leve	260	90	West	0,34	0,86	0,3			0,18	0,070	0,18	0,07			60%	100%	75%	90%	67%	100%	90%	95%	51%
12	S2/Type 4	180	90	South	0,54	1,16	7,5			0,18	0,07	0,60	0,07				100%	88%	84%	73%	100%	85%	48%	41%
12	S2/Type 4	180	90	South	1,09	1,16	15,1			0,18	0,07	0,60	0,07				100%	93%	84%	78%	100%	91%	48%	44%
8	S2/Type 4	0	90	North	0,54	1,16	5,0			0,18	0,070	0,18	0,07			60%	100%	86%	93%	79%	100%	86%	97%	50%
8	S2/Type 4	0	90	North	1,09	1,16	10,1			0,18	0,070	0,18	0,07			60%	100%	92%	93%	85%	100%	92%	97%	53%
4	S2/Type 5	0	90	North	0,44	1,16	2,0			0,18	0,070	0,18	0,07			60%	100%	84%	93%	77%	100%	84%	97%	49%
4	S2/Type 5	0	90	North	0,44	1,16	2,0			0,18	0,070	0,18	0,07			60%	100%	84%	93%	77%	100%	84%	97%	49%
1	S2/Type 6	0	90	North	0,54	1,16	0,6			0,18	0,070	0,18	0,07			60%	100%	86%	93%	79%	100%	86%	97%	50%
1	S2/Type 6	0	90	North	1,04	1,16	1,2			0,18	0,070	0,18	0,07			60%	100%	91%	93%	85%	100%	91%	97%	53%
15	S2/Type 7 leve	0	90	North	0,54	1,21	9,7			0,18	0,070	0,18	0,07			60%	100%	86%	93%	80%	100%	86%	97%	50%
15	S2/Type 7 leve	0	90	North	1,09	1,21	19,7			0,18	0,070	0,18	0,07			60%	100%	92%	93%	85%	100%	92%	97%	54%
15	S2/Type 7 leve	0	90	North	0,54	1,21	9,7			0,18	0,070	0,18	0,07			60%	100%	86%	93%	80%	100%	86%	97%	50%
15	S2/Type 7 leve	0	90	North	1,09	1,21	19,7			0,18	0,070	0,18	0,07			60%	100%	92%	93%	85%	100%	92%	97%	54%
15	S2/Type 7 leve	0	90	North	0,54	1,21	9,7			0,18	0,070	0,18	0,07			60%	100%	86%	93%	80%	100%	86%	97%	50%
15	S2/Type 7 leve	0	90	North	1,09	1,21	19,7			0,18	0,070	0,18	0,07			60%	100%	92%	93%	85%	100%	92%	97%	54%
10	S2/Type 8 Leve	180	90	South	0,91	0,11	1,0			0,18	0,07	0,60	0,07				100%	92%	40%	37%	100%	90%	20%	18%
10	S2/Type 8 Leve	180	90	South	0,91	0,11	1,0			0,18	0,07	0,60	0,07				100%	92%	40%	37%	100%	90%	20%	18%
10	S2/Type 8 Leve	180	90	South	0,54	1,31	7,0			0,18	0,07	0,60	0,07				100%	88%	85%	75%	100%	85%	53%	45%
10	S2/Type 8 Leve	180	90	South	0,49	1,31	6,4			0,18	0,07	0,60	0,07				100%	87%	85%	74%	100%	83%	53%	44%
10	S2/Type 8 Leve	180	90	South	0,54	1,31	7,0			0,18	0,07	0,60	0,07				100%	88%	85%	75%	100%	85%	53%	45%
10	S2/Type 8 Leve	180	90	South	0,91	0,11	1,0			0,18	0,07	0,60	0,07				100%	92%	40%	37%	100%	90%	20%	18%
10	S2/Type 8 Leve	180	90	South	0,91	0,11	1,0			0,18	0,07	0,60	0,07				100%	92%	40%	37%	100%	90%	20%	18%
10	S2/Type 8 Leve	180	90	South	0,54	1,31	7,0			0,18	0,07	0,60	0,07				100%	88%	85%	75%	100%	85%	53%	45%
10	S2/Type 8 Leve	180	90	South	0,49	1,31	6,4			0,18	0,07	0,60	0,07				100%	87%	85%	74%	100%	83%	53%	44%
10	S2/Type 8 Leve	180	90	South	0,54	1,31	7,0			0,18	0,07	0,60	0,07				100%	88%	85%	75%	100%	85%	53%	45%
1	S2/Type 8 Leve	180	90	South	0,91	0,11	0,1			0,18	0,07	0,60	0,07				100%	92%	40%	37%	100%	90%	20%	18%
1	S2/Type 8 Leve	180	90	South	0,91	0,11	0,1			0,18	0,07	0,60	0,07				100%	92%	40%	37%	100%	90%	20%	18%
1	S2/Type 8 Leve	180	90	South	0,54	1,31	0,7			0,18	0,07	0,60	0,07				100%	88%	85%	75%	100%	85%	53%	45%
1	S2/Type 8 Leve	180	90	South	0,49	1,31	0,6			0,18	0,07	0,60	0,07				100%	87%	85%	74%	100%	83%	53%	44%
1	S2/Type 8 Leve	180	90	South	0,54	1,31	0,7			0,18	0,07	0,60	0,07				100%	88%	85%	75%	100%	85%	53%	45%
2	S2/Type 8 Leve	0	90	North	0,91	0,11	0,2			0,18	0,070	0,18	0,07			60%	100%	90%	69%	63%	100%	90%	68%	37%
2	S2/Type 8 Leve	0	90	North	0,91	0,11	0,2			0,18	0,070	0,18	0,07			60%	100%	90%	69%	63%	100%	90%	68%	37%
2	S2/Type 8 Leve	0	90	North	0,54	1,31	1,4			0,18	0,070	0,18	0,07			60%	100%	86%	93%	80%	100%	86%	98%	50%
2	S2/Type 8 Leve	0	90	North	0,49	1,31	1,3			0,18	0,070	0,18	0,07			60%	100%	85%	93%	79%	100%	85%	98%	50%
2	S2/Type 8 Leve	0	90	North	0,54	1,31	1,4			0,18	0,070	0,18	0,07			60%	100%	86%	93%	80%	100%	86%	98%	50%
2	S2/Type 8 Leve	0	90	North	0,91	0,11	0,2			0,18	0,070	0,18	0,07			60%	100%	90%	69%	63%	100%	90%	68%	37%
2	S2/Type 8 Leve	0	90	North	0,91	0,11	0,2			0,18	0,070	0,18	0,07			60%	100%	90%	69%	63%	100%	90%	68%	37%
2	S2/Type 8 Leve	0	90	North	0,54	1,31	1,4			0,18	0,070	0,18	0,07			60%	100%	86%	93%	80%	100%	86%	98%	50%
2	S2/Type 8 Leve	0	90	North	0,49	1,31	1,3			0,18	0,070	0,18	0,07			60%	100%	85%	93%	79%	100%	85%	98%	50%
2	S2/Type 8 Leve	0	90	North	0,54	1,31	1,4			0,18	0,070	0,18	0,07			60%	100%	86%	93%	80%	100%	86%	98%	50%
10	S2/Type 8 Leve	180	90	South	0,91	0,11	1,0			0,18	0,07	0,60	0,07				100%	92%	40%	37%	100%	90%	20%	18%
10	S2/Type 8 Leve	180	90	South	0,91	0,11	1,0			0,18	0,07	0,60	0,07				100%	92%	40%	37%	100%	90%	20%	18%
10	S2/Type 8 Leve	180	90	South	0,54	1,31	7,0			0,18	0,07	0,60	0,07				100%	88%	85%	75%	100%	85%	53%	45%
10	S2/Type 8 Leve	180	90	South	0,49	1,31	6,4			0,18	0,07	0,60	0,07				100%	87%	85%	74%	100%	83%	53%	44%
10	S2/Type 8 Leve	180	90	South	0,54	1,31	7,0			0,18	0,07	0,60	0,07				100%	88%	85%	75%	100%	85%	53%	45%
1	S2/Type 8 Leve	180	90	South	0,91	0,11	0,1			0,18	0,07	0,60	0,07				100%	92%	40%	37%	100%	90%	20%	18%
1	S2/Type 8 Leve	180	90	South	0,91	0,11	0,1			0,18	0,07	0,60	0,07				100%	92%	40%	37%	100%	90%	20%	18%
1	S2/Type 8 Leve	180	90	South	0,54	1,31	0,7			0,18	0,07	0,60	0,07				100%	88%	85%	75%	100%	85%	53%	45%
1	S2/Type 8 Leve	180	90	South	0,49	1,31	0,6			0,18	0,07	0,60	0,07				100%	87%	85%	74%	100%	83%	53%	44%
1	S2/Type 8 Leve	180	90	South	0,54	1,31	0,7			0,18	0,07	0,60	0,07				100%	88%	85%	75%	100%	85%	53%	45%
2	S2/Type 9	0	90	North	0,57	0,56	0,6			0,18	0,070	2,05	0,17			80%	100%	86%	42%	36%	100%	86%	45%	31%
2	S2/Type 9	0	90	North	0,57	0,56	0,6			0,18	0,070	2,05	0,17			80%	100%	86%	42%	36%	100%	86%	45%	31%
2	S2/Type 9	0	90	North	0,57	1,16	1,3			0,18	0,070	2,05	0,17			80%	100%	86%	54%	46%	100%	86%	53%	36%
2	S2/Type 9	0	90	North	0,57	1,16	1,3			0,18	0,070	2,05	0,17			80%	100%	86%	54%	46%	100%	86%	53%	36%
2	S2/Type 9	0	90	North	0,57	0,56	0,6			0,18	0,070	2,05	0,17			80%	100%	86%	42%	36%	100%	86%	45%	31%
2	S2/Type 9	0	90	North	0,57	0,56	0,6			0,18	0,070	2,05	0,17			80%	100%	86%	42%	36%	100%	86%	45%	31%
1	S2/Type 10	0	90	North	0,84	0,51	0,4			0,18	0,070	0,18	0,07			60%	100%	90%	86%	77%	100%	90%	90%	49%
3	S2/Type 8 Leve	180	90	South	0,91	0,11	0,3			0,18	0,07	0,60	0,07	75%	75%		100%	92%	40%	27%	100%	90%	20%	14%
3	S2/Type 8 Leve	180	90	South	0,91	0,11	0,3			0,18	0,07	0,60	0,07	75%	75%		100%	92%	40%	27%	100%	90%	20%	14%
3	S2/Type 8 Leve	180	90	South	0,54	1,31	2,1			0,18	0,07	0,60	0,07	75%	75%		100%	88%	85%	56%	100%	85%	53%	34%
3	S2/Type 8 Leve	180	90	South	0,49	1,31	1,9			0,18	0,07	0,60	0,07	75%	75%		100%	87%	85%	55%	100%	83%	53%	33%

Quantity	Description	Deviation from North	Angle of Inclination from the Horizontal	Orientation	Glazing width	Glazing height	Glazing area	Height of the shading object	Horizontal distance	Window reveal depth	Distance from glazing edge to reveal	Overhang depth	Distance from upper glazing edge to overhang	Additional reduction factor winter shading	Additional reduction factor summer shading	Reduction factor z for temporary sun protection	Horizontal shading reduction factor	Reveal Shading Reduction Factor	Overhang shading reduction factor	Total shading reduction factor	Horizontal Shading Reduction Factor	Reveal Shading Reduction Factor	Overhang shading reduction factor	Total shading reduction factor
		Degrees	Degrees		m	m		m	m	m	m	m	m	%	%	%	%	%	%	%	%	%	%	%
					w_G	h_G	A_G	h_{Hori}	d_{Hori}	o_{Reveal}	d_{Reveal}	o_{over}	d_{over}	$r_{other,w}$	$r_{other,s}$	z	r_H	r_R	r_O	r_S	r_H	r_R	r_O	r_S
3	S2/Type 8 Leve	180	90	South	0,54	1,31	2,1			0,18	0,07	0,60	0,07	75%	75%		100%	88%	85%	56%	100%	85%	53%	34%
3	S2/Type 8 Leve	180	90	South	0,91	0,11	0,3			0,18	0,07	0,60	0,07	58%	58%		100%	92%	40%	21%	100%	90%	20%	11%
3	S2/Type 8 Leve	180	90	South	0,91	0,11	0,3			0,18	0,07	0,60	0,07	58%	58%		100%	92%	40%	21%	100%	90%	20%	11%
3	S2/Type 8 Leve	180	90	South	0,54	1,31	2,1			0,18	0,07	0,60	0,07	58%	58%		100%	88%	85%	43%	100%	85%	53%	26%
3	S2/Type 8 Leve	180	90	South	0,49	1,31	1,9			0,18	0,07	0,60	0,07	58%	58%		100%	87%	85%	43%	100%	83%	53%	26%
3	S2/Type 8 Leve	180	90	South	0,54	1,31	2,1			0,18	0,07	0,60	0,07	58%	58%		100%	88%	85%	43%	100%	85%	53%	26%
3	S2/Type 8 Leve	180	90	South	0,91	0,11	0,3			0,18	0,07	0,60	0,07	64%	64%		100%	92%	40%	23%	100%	90%	20%	12%
3	S2/Type 8 Leve	180	90	South	0,91	0,11	0,3			0,18	0,07	0,60	0,07	64%	64%		100%	92%	40%	23%	100%	90%	20%	12%
3	S2/Type 8 Leve	180	90	South	0,54	1,31	2,1			0,18	0,07	0,60	0,07	64%	64%		100%	88%	85%	48%	100%	85%	53%	29%
3	S2/Type 8 Leve	180	90	South	0,49	1,31	1,9			0,18	0,07	0,60	0,07	64%	64%		100%	87%	85%	47%	100%	83%	53%	28%
3	S2/Type 8 Leve	180	90	South	0,54	1,31	2,1			0,18	0,07	0,60	0,07	64%	64%		100%	88%	85%	48%	100%	85%	53%	29%
3	S2/Type 8 Leve	180	90	South	0,91	0,11	0,3			0,18	0,07	0,60	0,07	70%	70%		100%	92%	40%	26%	100%	90%	20%	13%
3	S2/Type 8 Leve	180	90	South	0,91	0,11	0,3			0,18	0,07	0,60	0,07	70%	70%		100%	92%	40%	26%	100%	90%	20%	13%
3	S2/Type 8 Leve	180	90	South	0,54	1,31	2,1			0,18	0,07	0,60	0,07	70%	70%		100%	88%	85%	52%	100%	85%	53%	31%
3	S2/Type 8 Leve	180	90	South	0,49	1,31	1,9			0,18	0,07	0,60	0,07	70%	70%		100%	87%	85%	52%	100%	83%	53%	31%
3	S2/Type 8 Leve	180	90	South	0,54	1,31	2,1			0,18	0,07	0,60	0,07	70%	70%		100%	88%	85%	52%	100%	85%	53%	31%
3	S2/Type 8 Leve	180	90	South	0,91	0,11	0,3			0,18	0,07	0,60	0,07	75%	75%		100%	92%	40%	27%	100%	90%	20%	14%
3	S2/Type 8 Leve	180	90	South	0,91	0,11	0,3			0,18	0,07	0,60	0,07	75%	75%		100%	92%	40%	27%	100%	90%	20%	14%
3	S2/Type 8 Leve	180	90	South	0,54	1,31	2,1			0,18	0,07	0,60	0,07	75%	75%		100%	88%	85%	56%	100%	85%	53%	34%
3	S2/Type 8 Leve	180	90	South	0,49	1,31	1,9			0,18	0,07	0,60	0,07	75%	75%		100%	87%	85%	55%	100%	83%	53%	33%
3	S2/Type 8 Leve	180	90	South	0,54	1,31	2,1			0,18	0,07	0,60	0,07	75%	75%		100%	88%	85%	56%	100%	85%	53%	34%
2	S1/Type 3 leve	90	90	East	0,34	0,86	0,6			0,18	0,070	0,18	0,07			80%	100%	74%	90%	67%	100%	90%	95%	68%
2	S1/Type 3 leve	90	90	East	0,34	0,86	0,6			0,18	0,070	0,18	0,07			80%	100%	74%	90%	67%	100%	90%	95%	68%
1	S1/Type 11	0	90	North	0,59	1,11	0,7			0,18	0,070	0,18	0,07			80%	100%	87%	92%	80%	100%	87%	97%	67%
4	S1/Type 12 Lev	0	90	North	0,54	1,16	2,5			0,18	0,070	0,18	0,07			80%	100%	86%	93%	79%	100%	86%	97%	67%
4	S1/Type 12 Lev	0	90	North	1,14	1,16	5,3			0,18	0,070	0,18	0,07			80%	100%	92%	93%	85%	100%	92%	97%	71%
5	S1/Type 12 Lev	0	90	North	0,54	1,16	3,1			0,18	0,070	0,18	0,07			80%	100%	86%	93%	79%	100%	86%	97%	67%
5	S1/Type 12 Lev	0	90	North	1,14	1,16	6,6			0,18	0,070	0,18	0,07			80%	100%	92%	93%	85%	100%	92%	97%	71%
7	S1/Type 13	180	90	South	0,64	1,51	6,7			0,18	0,07	0,60	0,07				100%	89%	87%	77%	100%	86%	59%	51%
7	S1/Type 13	180	90	South	0,64	1,51	6,7			0,18	0,07	0,60	0,07				100%	89%	87%	77%	100%	86%	59%	51%
7	S1/Type 14	180	90	South	0,64	1,26	5,6			0,18	0,07	0,60	0,07				100%	89%	85%	75%	100%	86%	51%	44%
5	S1/Type 14	180	90	South	0,59	1,26	3,7			0,18	0,07	0,60	0,07				100%	88%	85%	75%	100%	85%	51%	44%
7	S1/Type 14	180	90	South	0,64	1,26	5,6			0,18	0,07	0,60	0,07				100%	89%	85%	75%	100%	86%	51%	44%
2	S1/Type 15	180	90	South	0,59	1,26	1,5			0,18	0,07	0,60	0,07				100%	88%	85%	75%	100%	85%	51%	44%
2	S1/Type 15	180	90	South	0,59	0,36	0,4			0,18	0,07	0,60	0,07				100%	88%	63%	56%	100%	85%	23%	20%
7	S1/Type 16	180	90	South	0,64	0,41	1,8			0,18	0,07	0,60	0,07				100%	89%	65%	58%	100%	86%	24%	21%
7	S1/Type 16	180	90	South	0,59	0,41	1,7			0,18	0,07	0,60	0,07				100%	88%	65%	58%	100%	85%	24%	20%
7	S1/Type 16	180	90	South	0,64	0,41	1,8			0,18	0,07	0,60	0,07				100%	89%	65%	58%	100%	86%	24%	21%
1	L-1 W Type 6	260	90	West	0,91	0,16	0,1	1,00	1,10	0,18	0,070	0,18	0,07	95%	70%	60%	49%	87%	71%	29%	57%	95%	68%	15%
1	L-1 W Type 6	260	90	West	0,91	0,16	0,1	1,00	1,10	0,18	0,070	0,18	0,07	95%	70%	60%	49%	87%	71%	29%	57%	95%	68%	15%
1	L-1 W Type 6	260	90	West	0,54	1,31	0,7	1,00	1,10	0,18	0,070	0,18	0,07	95%	70%	60%	49%	81%	93%	35%	57%	93%	97%	22%
1	L-1 W Type 6	260	90	West	0,49	1,31	0,6	1,00	1,10	0,18	0,070	0,18	0,07	95%	70%	60%	49%	80%	93%	34%	57%	92%	97%	21%
1	L-1 W Type 6	260	90	West	0,54	1,31	0,7	1,00	1,10	0,18	0,070	0,18	0,07	95%	70%	60%	49%	81%	93%	35%	57%	93%	97%	22%
5	L-1 W Type 7	260	90	West	0,54	1,06	2,8	1,00	1,10	0,18	0,070	0,18	0,07	95%	70%	60%	49%	81%	92%	34%	57%	93%	96%	21%
5	L-1 W Type 7	260	90	West	0,49	1,06	2,6	1,00	1,10	0,18	0,070	0,18	0,07	95%	70%	60%	49%	80%	92%	34%	57%	92%	96%	21%
5	L-1 W Type 7	260	90	West	0,54	1,06	2,8	1,00	1,10	0,18	0,070	0,18	0,07	95%	70%	60%	49%	81%	92%	34%	57%	93%	96%	21%
1	L-1 W Type 1	260	90	West	0,29	0,61	0,2	1,00	1,10	0,18	0,070	0,18	0,07	95%	70%	60%	49%	72%	87%	29%	57%	89%	91%	19%
6	L-1 E Type 7	90	90	East	0,54	1,06	3,4	1,00	1,10	0,18	0,070	0,18	0,07	95%	70%	60%	49%	81%	92%	34%	57%	93%	96%	21%
6	L-1 E Type 7	90	90	East	0,49	1,06	3,1	1,00	1,10	0,18	0,070	0,18	0,07	95%	70%	60%	49%	80%	92%	34%	57%	92%	96%	21%
6	L-1 E Type 7	90	90	East	0,54	1,06	3,4	1,00	1,10	0,18	0,070	0,18	0,07	95%	70%	60%	49%	81%	92%	34%	57%	93%	96%	21%
10	L 0 W Type 6 -	260	90	West	0,91	0,16	1,4	21,40	47,00	0,18	0,070	0,18	0,07	95%	70%	60%	68%	87%	71%	40%	74%	95%	68%	20%
10	L 0 W Type 6 -	260	90	West	0,91	0,16	1,4	21,40	47,00	0,18	0,070	0,18	0,07	95%	70%	60%	68%	87%	71%	40%	74%	95%	68%	20%
10	L 0 W Type 6 -	260	90	West	0,54	1,31	7,0	21,40	47,00	0,18	0,070	0,18	0,07	95%	70%	60%	68%	81%	93%	49%	74%	93%	97%	28%
10	L 0 W Type 6 -	260	90	West	0,49	1,31	6,4	21,40	47,00	0,18	0,070	0,18	0,07	95%	70%	60%	68%	80%	93%	48%	74%	92%	97%	28%
10	L 0 W Type 6 -	260	90	West	0,54	1,31	7,0	21,40	47,00	0,18	0,070	0,18	0,07	95%	70%	60%	68%	81%	93%	49%	74%	93%	97%	28%
2	L 0 W Type 6 -	260	90	West	0,91	0,16	0,3	3,10	2,80	0,18	0,070	0,18	0,07	95%	70%	60%	43%	87%	71%	25%	51%	95%	68%	14%
2	L 0 W Type 6 -	260	90	West	0,91	0,16	0,3	3,10	2,80	0,18	0,070	0,18	0,07	95%	70%	60%	43%	87%	71%	25%	51%	95%	68%	14%
2	L 0 W Type 6 -	260	90	West	0,54	1,31	1,4	3,10	2,80	0,18	0,070	0,18	0,07	95%	70%	60%	43%	81%	93%	31%	51%	93%	97%	19%
2	L 0 W Type 6 -	260	90	West	0,49	1,31	1,3	3,10	2,80	0,18	0,070	0,18	0,07	95%	70%	60%	43%	80%	93%	30%	51%	92%	97%	19%
2	L 0 W Type 6 -	260	90	West	0,54	1,31	1,4	3,10	2,80	0,18	0,070	0,18	0,07	95%	70%	60%	43%	81%	93%	31%	51%	93%	97%	19%
2	L 0 W Type 6 -	260	90	West	0,91	0,16	0,3	21,40	47,00	0,18	0,070	0,18	0,07	95%	70%	60%	68%	87%	71%	40%	74%	95%	68%	20%
2	L 0 W Type 6 -	260	90	West	0,94	0,21	0,4	21,40	47,00	0,18	0,070	2,05	0,17	95%	70%	80%	68%	88%	22%	12%	74%	95%	22%	9%
2	L 0 W Type 6 -	260	90	West	0,57	1,36	1,5	21,40	47,00	0,18	0,070	2,05	0,17	95%	70%	80%	68%	82%	52%	28%	74%	93%	45%	17%
2	L 0 W Type 6 -	260	90	West	0,52	1,36	1,4	21,40	47,00	0,18	0,070	2,05	0,17	95%	70%	80%	68%	81%	52%	27%	74%	92%	45%	17%
2	L 0 W Type 6 -	260	90	West	0,57	1,36	1,5	21,40	47,00	0,18	0,070	2,05	0,17	95%	70%	80%	68%	82%	52%	28%	74%	93%	45%	17%
2	L 0 W Type 2	260	90	West	0,59	0,16	0,2	21,40	47,00	0,18	0,070	0,18	0,07	95%	70%	60%	68%	82%	71%	38%	74%	93%	68%	20%
2	L 0 W Type 2	260	90	West	0,59	1,31	1,5	21,40	47,00	0,18	0,070	0,18	0,07	95%	70%	60%	68%	82%	93%	50%	74%	93%	97%	28%
2	O1/Door 1 (Gla	260	90	West	0,57	0,56	0,6			0,18	0,070	2,05	0,17	95%	70%	80%	100%	82%	33%	26%	100%	93%	30%	16%
2	O1/Door 1 (Gla	260	90	West	0,67	0,56	0,7			0,18	0,070	2,05	0,17	95%	70%	80%	100%	84%	33%	26%	100%	94%	30%	16%
2	O1/Door 1 (Gla	260	90	West	0,57	0,56	0,6			0,18	0,070	2,05	0,17	95%	70%	80%	100%	82%	33%	26%	100%	93%	30%	16%
2	O1/Door 1 (Gla	260	90	West	0,57	1,16	1,3			0,18	0,070	2,05	0,17	95%	70%	80%	100%	82%	49%	38%	100%	93%	41%	22%
2	O1/Door 1 (Gla	260	90	West	0,67	1,16	1,5			0,18	0,070	2,05	0,17	95%	70%	80%	100%	84%	49%	39%	100%	94%	41%	22%
2	O1/Door 1 (Gla	260	90	West	0,57	1,16	1,3			0,18	0,070	2,05	0,17	95%	70%	80%	100%	82%	49%	38%	100%	93%	41%	22%
2	O1/Door 1 (Gla	260	90	West	0,57	0,56	0,6			0,18	0,070	2,05	0,17	95%	70%	80%	100%	82%	33%	26%	100%	93%	30%	16%
2	O1/Door 1 (Gla	260	90	West	0,67	0,56	0,7			0,18	0,070	2,05	0,17	95%	70%	80%	100%	84%	33%	26%	100%	94%	30%	16%
2	O1/Door 1 (Gla	260	90	West	0,57	0,56	0,6			0,18	0,070	2,05	0,17	95%	70%	80%	100%	82%	33%	26%	100%	93%	30%	16%
3	O1/Type 8 Sout	180	90	South	0,74	0,16	0,3			0,18	0,070	0,18	0,07			60%	100%	90%	79%	71%	100%	88%	37%	20%
3	O1/Type 8 Sout	180	90	South	0,69	0,16	0,3			0,18	0,070	0,18	0,07			60%	100%	90%	79%	71%	100%	87%	37%	19%
3	O1/Type 8 Sout	180	90	South	0,74	0,16	0,3			0,18	0,070	0,18	0,07			60%	100%	90%	79%	71%	100%	88%	37%	20%
3	O1/Type 8 Sout	180	90	South	0,74	1,31	2,9			0,18	0,070	0,18	0,07			60%	100%	90%	95%	86%	100%	88%	92%	49%
3	O1/Type 8 Sout	180	90	South	0,69	1,31	2,7			0,18	0,070	0,18	0,07			60%	100%	90%	95%	86%	100%	87%	92%	48%
3	O1/Type 8 Sout	180	90	South	0,74	1,31	2,9			0,18	0,070	0,18	0,07			60%	100%	90%	95%	86%	100%	88%	92%	49%
2	O1/Type 8 NORT	0	90	North	0,74	0,16	0,2			0,18	0,070	0,18	0,07			60%	100%	89%	73%	65%	100%	89%	73%	39%
2	O1/Type 8 NORT	0	90	North	0,69	0,16	0,2			0,18	0,070	0,18	0,07			60%	100%	88%	73%	64%	100%	88%	73%	38%
2	O1/Type 8 NORT	0	90	North	0,74	0,16	0,2			0,18	0,070	0,18	0,07			60%	100%	89%	73%	65%	100%	89%	73%	39%
2	O1/Type 8 NORT	0	90	North	0,74	1,31	1,9			0,18	0,070	0,18	0,07			60%	100%	89%	93%	83%	100%	89%	98%	52%

Quantity	Description	Deviation from North	Angle of Inclination from the Horizontal	Orientation	Glazing width	Glazing height	Glazing area	Height of the shading object	Horizontal distance	Window reveal depth	Distance from glazing edge to reveal	Overhang depth	Distance from upper glazing edge to overhang	Additional reduction factor winter shading	Additional reduction factor summer shading	Reduction factor z for temporary sun protection	Horizontal shading reduction factor	Reveal Shading Reduction Factor	Overhang shading reduction factor	Total shading reduction factor	Horizontal Shading Reduction Factor	Reveal Shading Reduction Factor	Overhang shading reduction factor	Total shading reduction factor
		Degrees	Degrees		m	m		m	m	m	m	m	m	%	%	%	%	%	%	%	%	%	%	%
					w_G	h_G	A_G	h_{Hori}	d_{Hori}	o_{Reveal}	d_{Reveal}	o_{over}	d_{over}	$r_{other,w}$	$r_{other,s}$	z	r_H	r_R	r_O	r_S	r_H	r_R	r_O	r_S
2	O1/Type 8 NORT	0	90	North	0,69	1,31	1,8			0,18	0,070	0,18	0,07			60%	100%	88%	93%	82%	100%	88%	98%	52%
2	O1/Type 8 NORT	0	90	North	0,74	1,31	1,9			0,18	0,070	0,18	0,07			60%	100%	89%	93%	83%	100%	89%	98%	52%
1	O1/Door 2 (Gla	180	90	South	0,57	0,56	0,3			0,18	0,070	2,05	0,17			80%	100%	88%	42%	37%	100%	85%	20%	14%
1	O1/Door 2 (Gla	180	90	South	0,57	0,56	0,3			0,18	0,070	2,05	0,17			80%	100%	88%	42%	37%	100%	85%	20%	14%
1	O1/Door 2 (Gla	180	90	South	0,57	1,06	0,6			0,18	0,070	2,05	0,17			80%	100%	88%	57%	50%	100%	85%	22%	15%
1	O1/Door 2 (Gla	180	90	South	0,57	1,06	0,6			0,18	0,070	2,05	0,17			80%	100%	88%	57%	50%	100%	85%	22%	15%
1	O1/Door 2 (Gla	180	90	South	0,57	0,56	0,3			0,18	0,070	2,05	0,17			80%	100%	88%	42%	37%	100%	85%	20%	14%
1	O1/Door 2 (Gla	180	90	South	0,57	0,56	0,3			0,18	0,070	2,05	0,17			80%	100%	88%	42%	37%	100%	85%	20%	14%
1	O1/Type 8 NORT	0	90	North	0,74	0,16	0,1			0,18	0,070	0,18	0,07			60%	100%	89%	73%	65%	100%	89%	73%	39%
1	O1/Type 8 NORT	0	90	North	0,69	0,16	0,1			0,18	0,070	0,18	0,07			60%	100%	88%	73%	64%	100%	88%	73%	38%
1	O1/Type 8 NORT	0	90	North	0,74	0,16	0,1			0,18	0,070	0,18	0,07			60%	100%	89%	73%	65%	100%	89%	73%	39%
1	O1/Type 8 NORT	0	90	North	0,74	1,31	1,0			0,18	0,070	0,18	0,07			60%	100%	89%	93%	83%	100%	89%	98%	52%
1	O1/Type 8 NORT	0	90	North	0,69	1,31	0,9			0,18	0,070	0,18	0,07			60%	100%	88%	93%	82%	100%	88%	98%	52%
1	O1/Type 8 NORT	0	90	North	0,74	1,31	1,0			0,18	0,070	0,18	0,07			60%	100%	89%	93%	83%	100%	89%	98%	52%
16	L 1 W Type 6	260	90	West	0,91	0,16	2,3	17,85	47,00	0,18	0,070	0,18	0,07	95%	70%	60%	73%	87%	71%	43%	78%	95%	68%	21%
16	L 1 W Type 6	260	90	West	0,91	0,16	2,3	17,85	47,00	0,18	0,070	0,18	0,07	95%	70%	60%	73%	87%	71%	43%	78%	95%	68%	21%
16	L 1 W Type 6	260	90	West	0,54	1,31	11,3	17,85	47,00	0,18	0,070	0,18	0,07	95%	70%	60%	73%	81%	93%	52%	78%	93%	97%	29%
16	L 1 W Type 6	260	90	West	0,49	1,31	10,2	17,85	47,00	0,18	0,070	0,18	0,07	95%	70%	60%	73%	80%	93%	51%	78%	92%	97%	29%
16	L 1 W Type 6	260	90	West	0,54	1,31	11,3	17,85	47,00	0,18	0,070	0,18	0,07	95%	70%	60%	73%	81%	93%	52%	78%	93%	97%	29%
2	L 1 W Type 2	260	90	West	0,59	0,16	0,2	17,85	47,00	0,18	0,070	0,18	0,07	95%	70%	60%	73%	82%	71%	40%	78%	93%	68%	21%
2	L 1 W Type 2	260	90	West	0,59	1,31	1,5	17,85	47,00	0,18	0,070	0,18	0,07	95%	70%	60%	73%	82%	93%	53%	78%	93%	97%	30%
16	L 2 W Type 6	260	90	West	0,91	0,16	2,3	14,30	47,00	0,18	0,070	0,18	0,07			60%	77%	87%	71%	48%	82%	95%	68%	32%
16	L 2 W Type 6	260	90	West	0,91	0,16	2,3	14,30	47,00	0,18	0,070	0,18	0,07			60%	77%	87%	71%	48%	82%	95%	68%	32%
16	L 2 W Type 6	260	90	West	0,54	1,31	11,3	14,30	47,00	0,18	0,070	0,18	0,07			60%	77%	81%	93%	58%	82%	93%	97%	44%
16	L 2 W Type 6	260	90	West	0,49	1,31	10,2	14,30	47,00	0,18	0,070	0,18	0,07			60%	77%	80%	93%	57%	82%	92%	97%	44%
16	L 2 W Type 6	260	90	West	0,54	1,31	11,3	14,30	47,00	0,18	0,070	0,18	0,07			60%	77%	81%	93%	58%	82%	93%	97%	44%
2	L 2 W Type 2	260	90	West	0,59	0,16	0,2	14,30	47,00	0,18	0,070	0,18	0,07			60%	77%	82%	71%	45%	82%	93%	68%	31%
2	L 2 W Type 2	260	90	West	0,59	1,31	1,5	14,30	47,00	0,18	0,070	0,18	0,07			60%	77%	82%	93%	59%	82%	93%	97%	44%
16	L 3 W Type 6	260	90	West	0,91	0,16	2,3	10,75	47,00	0,18	0,070	0,18	0,07			60%	82%	87%	71%	51%	86%	95%	68%	33%
16	L 3 W Type 6	260	90	West	0,91	0,16	2,3	10,75	47,00	0,18	0,070	0,18	0,07			60%	82%	87%	71%	51%	86%	95%	68%	33%
16	L 3 W Type 6	260	90	West	0,54	1,31	11,3	10,75	47,00	0,18	0,070	0,18	0,07			60%	82%	81%	93%	62%	86%	93%	97%	46%
16	L 3 W Type 6	260	90	West	0,49	1,31	10,2	10,75	47,00	0,18	0,070	0,18	0,07			60%	82%	80%	93%	61%	86%	92%	97%	46%
16	L 3 W Type 6	260	90	West	0,54	1,31	11,3	10,75	47,00	0,18	0,070	0,18	0,07			60%	82%	81%	93%	62%	86%	93%	97%	46%
2	L 3 W Type 2	260	90	West	0,59	0,16	0,2	10,75	47,00	0,18	0,070	0,18	0,07			60%	82%	82%	71%	48%	86%	93%	68%	32%
2	L 3 W Type 2	260	90	West	0,59	1,31	1,5			0,18	0,070	0,18	0,07			60%	100%	82%	93%	77%	100%	93%	97%	54%
20	L0,1,2,3 E Typ	90	90	East	0,91	0,16	2,9			0,18	0,070	0,18	0,07			60%	100%	87%	71%	62%	100%	95%	68%	39%
20	L0,1,2,3 E Typ	90	90	East	0,91	0,16	2,9			0,18	0,070	0,18	0,07			60%	100%	87%	71%	62%	100%	95%	68%	39%
20	L0,1,2,3 E Typ	90	90	East	0,54	1,31	14,1			0,18	0,070	0,18	0,07			60%	100%	81%	93%	75%	100%	93%	97%	54%
20	L0,1,2,3 E Typ	90	90	East	0,49	1,31	12,8			0,18	0,070	0,18	0,07			60%	100%	80%	93%	74%	100%	92%	97%	54%
20	L0,1,2,3 E Typ	90	90	East	0,54	1,31	14,1			0,18	0,070	0,18	0,07			60%	100%	81%	93%	75%	100%	93%	97%	54%
1	O1/Door 3 (Gla	90	90	East	0,22	1,16	0,3			0,18	0,070	2,05	0,17			80%	100%	68%	48%	33%	100%	87%	42%	29%
1	O1/Door 3 (Gla	90	90	East	0,22	1,16	0,3			0,18	0,070	2,05	0,17			80%	100%	68%	48%	33%	100%	87%	42%	29%
1	O1/Door 3 (Gla	90	90	East	0,22	1,16	0,3			0,18	0,070	2,05	0,17			80%	100%	68%	48%	33%	100%	87%	42%	29%
1	O1/Door 3 (Gla	90	90	East	0,22	1,16	0,3			0,18	0,070	2,05	0,17			80%	100%	68%	48%	33%	100%	87%	42%	29%
1	O1/Door 3 (Gla	90	90	East	0,67	0,56	0,4			0,18	0,070	2,05	0,17			80%	100%	84%	33%	27%	100%	94%	30%	23%
1	O1/Door 3 (Gla	90	90	East	0,67	0,56	0,4			0,18	0,070	2,05	0,17			80%	100%	84%	33%	27%	100%	94%	30%	23%
3	L 1,2,3 E Type	90	90	East	0,64	0,51	1,0			0,18	0,070	0,18	0,07			60%	100%	83%	85%	71%	100%	94%	89%	50%
3	L 1,2,3 E Type	90	90	East	0,64	0,51	1,0			0,18	0,070	0,18	0,07			60%	100%	83%	85%	71%	100%	94%	89%	50%
2	O1/Door 4 (Gla	90	90	East	0,62	0,56	0,7			0,18	0,070	2,05	0,17	57%	57%	80%	100%	83%	33%	15%	100%	94%	30%	13%
2	O1/Door 4 (Gla	90	90	East	0,67	0,56	0,7			0,18	0,070	2,05	0,17	57%	57%	80%	100%	84%	33%	16%	100%	94%	30%	13%
2	O1/Door 4 (Gla	90	90	East	0,62	0,56	0,7			0,18	0,070	2,05	0,17	57%	57%	80%	100%	83%	33%	15%	100%	94%	30%	13%
2	O1/Door 4 (Gla	90	90	East	0,62	1,16	1,4			0,18	0,070	2,05	0,17	57%	57%	80%	100%	83%	48%	23%	100%	94%	42%	18%
2	O1/Door 4 (Gla	90	90	East	0,67	1,16	1,5			0,18	0,070	2,05	0,17	57%	57%	80%	100%	84%	48%	23%	100%	94%	42%	18%
2	O1/Door 4 (Gla	90	90	East	0,62	1,16	1,4			0,18	0,070	2,05	0,17	57%	57%	80%	100%	83%	48%	23%	100%	94%	42%	18%
2	O1/Door 4 (Gla	90	90	East	0,62	0,56	0,7			0,18	0,070	2,05	0,17	57%	57%	80%	100%	83%	33%	15%	100%	94%	30%	13%
2	O1/Door 4 (Gla	90	90	East	0,67	0,56	0,7			0,18	0,070	2,05	0,17	57%	57%	80%	100%	84%	33%	16%	100%	94%	30%	13%
2	O1/Door 4 (Gla	90	90	East	0,62	0,56	0,7			0,18	0,070	2,05	0,17	57%	57%	80%	100%	83%	33%	15%	100%	94%	30%	13%
6	L 0 E Type 6	90	90	East	0,91	0,16	0,9			0,18	0,070	0,18	0,07	57%	57%	60%	100%	87%	71%	35%	100%	95%	68%	22%
6	L 0 E Type 6	90	90	East	0,91	0,16	0,9			0,18	0,070	0,18	0,07	57%	57%	60%	100%	87%	71%	35%	100%	95%	68%	22%
6	L 0 E Type 6	90	90	East	0,54	1,31	4,2			0,18	0,070	0,18	0,07	57%	57%	60%	100%	81%	93%	43%	100%	93%	97%	31%
6	L 0 E Type 6	90	90	East	0,49	1,31	3,8			0,18	0,070	0,18	0,07	57%	57%	60%	100%	80%	93%	42%	100%	92%	97%	31%
6	L 0 E Type 6	90	90	East	0,54	1,31	4,2			0,18	0,070	0,18	0,07	57%	57%	60%	100%	81%	93%	43%	100%	93%	97%	31%
8	L 1 E Type 6	90	90	East	0,91	0,16	1,2			0,18	0,070	0,18	0,07	75%	75%	60%	100%	87%	71%	46%	100%	95%	68%	29%
8	L 1 E Type 6	90	90	East	0,91	0,16	1,2			0,18	0,070	0,18	0,07	75%	75%	60%	100%	87%	71%	46%	100%	95%	68%	29%
8	L 1 E Type 6	90	90	East	0,54	1,31	5,6			0,18	0,070	0,18	0,07	75%	75%	60%	100%	81%	93%	56%	100%	93%	97%	41%
8	L 1 E Type 6	90	90	East	0,49	1,31	5,1			0,18	0,070	0,18	0,07	75%	75%	60%	100%	80%	93%	56%	100%	92%	97%	40%
8	L 1 E Type 6	90	90	East	0,54	1,31	5,6			0,18	0,070	0,18	0,07	75%	75%	60%	100%	81%	93%	56%	100%	93%	97%	41%
8	L 2 E Type 6	90	90	East	0,91	0,16	1,2			0,18	0,070	0,18	0,07	88%	88%	60%	100%	87%	71%	54%	100%	95%	68%	34%
8	L 2 E Type 6	90	90	East	0,91	0,16	1,2			0,18	0,070	0,18	0,07	88%	88%	60%	100%	87%	71%	54%	100%	95%	68%	34%
8	L 2 E Type 6	90	90	East	0,54	1,31	5,6			0,18	0,070	0,18	0,07	88%	88%	60%	100%	81%	93%	66%	100%	93%	97%	48%
8	L 2 E Type 6	90	90	East	0,49	1,31	5,1			0,18	0,070	0,18	0,07	88%	88%	60%	100%	80%	93%	65%	100%	92%	97%	47%
8	L 2 E Type 6	90	90	East	0,54	1,31	5,6			0,18	0,070	0,18	0,07	88%	88%	60%	100%	81%	93%	66%	100%	93%	97%	48%
8	L 3 E Type 6	90	90	East	0,91	0,16	1,2			0,18	0,070	0,18	0,07			60%	100%	87%	71%	62%	100%	95%	68%	39%
8	L 3 E Type 6	90	90	East	0,91	0,16	1,2			0,18	0,070	0,18	0,07			60%	100%	87%	71%	62%	100%	95%	68%	39%
8	L 3 E Type 6	90	90	East	0,54	1,31	5,6			0,18	0,070	0,18	0,07			60%	100%	81%	93%	75%	100%	93%	97%	54%
8	L 3 E Type 6	90	90	East	0,49	1,31	5,1			0,18	0,070	0,18	0,07			60%	100%	80%	93%	74%	100%	92%	97%	54%
8	L 3 E Type 6	90	90	East	0,54	1,31	5,6			0,18	0,070	0,18	0,07			60%	100%	81%	93%	75%	100%	93%	97%	54%

Quantity	Description	Deviation from North	Angle of Inclination from the Horizontal	Orientation	Glazing width	Glazing height	Glazing area	Height of the shading object	Horizontal distance	Window reveal depth	Distance from glazing edge to reveal	Overhang depth	Distance from upper glazing edge to overhang	Additional reduction factor winter shading	Additional reduction factor summer shading	Reduction factor z for temporary sun protection	Horizontal shading reduction factor	Reveal Shading Reduction Factor	Overhang shading reduction factor	Total shading reduction factor	Horizontal Shading Reduction Factor	Reveal Shading Reduction Factor	Overhang shading reduction factor	Total shading reduction factor
		Degrees	Degrees		m	m		m	m	m	m	m	m	%	%	%	%	%	%	%	%	%	%	%
					w_G	h_G	A_G	h_{Hori}	d_{Hori}	o_{Reveal}	d_{Reveal}	o_{over}	d_{over}	$r_{other,w}$	$r_{other,s}$	z	r_H	r_R	r_O	r_S	r_H	r_R	r_O	r_S

EnerPHit planning: # VENTILATION DATA

Building: Primary School 8 "Sveti Sveti Kiril I Metodi" - Section B

Treated floor area A_{TFA}		m²	4630	*(Areas worksheet)*
Room Height h		m	2,50	
Room ventilation volume (A_{TFA}*h) =	V_V	m³	11576	*(Worksheet Annual heating)*

Ventilation type

Please select: **Balanced PH-Ventilation with HR**

Infiltration air change rate

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

			for annual demand:	for Heating Load:				
Wind protection coefficient, e			0,07	0,18				
Wind protection coefficient, f			15	15	Net Air Volume for Press. Test	V_{n50}	Air permeability	q_{50}
Air Change Rate at Press. Test	n_{50}	1/h	1,00	1,00	6329	m³	0,87	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	0,038	0,096

Selection of ventilation data input - Results

The PHPP offers two methods for dimensioning the air quantities and choosing the ventilation unit. Fresh air or extract air quantities for residential buildings and parameters for ventilation system can be determined using the standard planning option in the 'Ventilation' sheet. The 'Additional Vent' sheet has been created for more complex ventilation systems and allows up to 10 different ve Furthermore, air quantities can be determined on a room-by-room or zone-by-zone basis. Please select your design method here.

	Ventilation unit / Heat recovery efficiency design		Average Air Exchange m³/h	Average Air Change Rate 1/h	Extract air excess (Extract air system) 1/h	Effective heat recovery efficiency Unit [-]	Energy recovery value [-]	Specific power input Wh/m³	Heat recovery efficiency SHX [-]
	Standard design	*(Ventilation worksheet see below)*							
x	Various vent. units, non residential	*(Worksheet Additional vent)*	2028	0,18	0,00	80,8%	0,0%	0,40	0,0%

SHX efficiency η^*_{SHX} 0%

STANDARD INPUT FOR BALANCED VENTILATION

Ventilation dimensioning for systems with one ventilation unit

Calculation in sheet 'Additional Vent': Extended data input for balanced ventilation

Occupancy	m²/P	7				
Number of occupants	P	680,0				
Supply air per person	m³/(P*h)	15				
Supply air requirement	m³/h	10200				
Extract air rooms		Kitchen	Bathroom	Bathroom (shower only)	WC	
Quantity						
Extract air requirement per room	m³/h	60	40	20	20	
Total Extract Air Requirement	m³/h	0				

Design air flow rate (maximum) m³/h

Average air change rate calculation

Type of operation	Daily operation duration h/d	Factors referenced to maximum	Air flow rate m³/h	Air change rate 1/h
maximum		1,00	#WERT!	#WERT!
Standard	8,0	0,77	#WERT!	#WERT!
Basic	4,0	0,54	#WERT!	#WERT!
Minimum	12,0	0,40	#WERT!	#WERT!
			Average air flow rate (m³/h)	Average air change rate (1/h)
	Average value	0,55		

Selection of ventilation unit with heat recovery

Installation site of ventilation unit

Heat recovery?

Sort: BY ID

Ventilation unit selection	Heat recovery efficiency Unit η_{HR}	Energy recovery η_{ERV}	Specific power input [Wh/m³]	Application range [m³/h]	Frost required

Go to ventilation units list

Ψ	W/(mK)	0,000	See calculation below	Enter input for auxiliary calculation of exterior/supply
	m	2		
Ψ	W/(mK)	0,000	See calculation below	Enter input for auxiliary calculation of exhaust/extrac
	m	2	Room temperature (°C)	20
Temperature of mechanical services room	°C	20	Av. Ambient Temp. Heating P. (°C)	4,5
(Enter only if the central unit is outside of the thermal envelope.)			Av. Ground Temp (°C)	11,4

Effective heat recovery efficiency $\eta_{HR,eff}$

Effective heat recovery efficiency subsoil heat exchanger

SHX efficiency	η^*_{SHX}	
Heat recovery efficiency SHX	η_{SHX}	0%

Secondary calculation

Ψ-value supply or ambient air duct

Nominal width:	60	mm
Insul. Thickness	80	mm
Reflective?		Yes
	x	No
Thermal conductivity	0,033	W/(mK)
Nominal air flow rate		m³/h
Δϑ	15	K
Exterior duct diameter	0,060	m
Exterior diameter	0,220	m
α-Interior	#WERT!	W/(m²K)
α–Surface		W/(m²K)
Ψ-value		**W/(mK)**
Surface temperature difference		K

Secondary calculation

Ψ-value extract or exhaust air duct

Nominal width:	60	mm
Insul. Thickness:	80	mm
Reflective?		yes
	x	no
Thermal conductivity	0,033	W/(mK)
Nominal air flow rate		m³/h
Δϑ	15	K
Exterior duct diameter	0,060	m
Exterior diameter	0,220	m
α-Interior	#WERT!	W/(m²K)
α–Surface		W/(m²K)
Ψ-value		**W/(mK)**
Surface temperature difference		K

EnerPHit planning: # EXTENDED DATA INPUT FOR BALANCED VENTILATION

Planning ventilation systems with multiple ventilation units

Building: Primary School 8 "Sveti Sveti Kiril I Metodi" - Section B

Ventilation unit / Heat recovery efficiency design

In Ventilation worksheet (standard design)			*(Ventilation worksheet)*
In Additional Vent (this worksheet)		x	*(Additional vent)*
Treated Floor Area A_{TFA}	m²	4630	*(Areas worksheet)*
Room Height h	m	2,50	*(Worksheet Annual heating)*
Room air volume for ventilation (A_{TFA}*h) = V_v	m³	11576	*(Worksheet Annual heating)*
Number of Occupants	P	680,0	*(Ventilation worksheet)*
Room temperature	°C	20	*(Worksheet Annual heating)*
Average external temp. heating period	°C	4,5	*(Ventilation worksheet)*
Average ground temp.	°C	11,4	*(Ground worksheet)*
Ventilation type		Balanced PH-Ventilation with HR	*(Ventilation worksheet)*

Results of ventilation design and unit selection:

Venti-lation Unit no.	Description of the unit	Design V_{SUP} m³/h	Design V_{ETA} m³/h	Average value / yr. V_{SUP} m³/h	Average value / yr. V_{ETA} m³/h	Air ch.rt. 1/h	Effective heat recovery efficiency	Energy recovery value	spec. Input power	Heat recov. efficiency SHX	Cross check
1	Parter	1500	1500	223	223	---	81%	0%	0,40	0%	
2	First floor	1500	1500	223	223	---	81%	0%	0,40	0%	
3	Second floor	1500	1500	223	223	---	82%	0%	0,40	0%	
4	Floor -1	1750	1750	183	183	---	81%	0%	0,40	0%	
5	Sector A 1 floor	470	470	52	52	---	81%	0%	0,40	0%	
6	Sector A 2 floor	300	300	38	38	---	75%	0%	0,40	0%	
7	Floor -1	550	550	82	82	---	78%	0%	0,40	0%	
8	Parter	1350	1250	201	186	---	80%	0%	0,40	0%	Supply and extract air should be the same!
9	Floor 1	5400	5500	803	818	---	81%	0%	0,40	0%	Supply and extract air should be the same!
10						---					
Result for overall vent. syst.		**14320**	**14320**	**2028**	**2028**	**0,18**	**81%**	**0%**	**0,40**	**0%**	

Recommendations for dimensioning air quantities

Use of low odour and low-emission building materials/ furnishings:
It is strongly recommended to use building materials that cause no or only little pollution instead of increasing the outdoor air volume flow in order to reduce preventable pollution.
This holds true independently from the chosen approach for the air quality determination; 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 the amounts of 20 to 30 m³/h/person are completely 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 purge ventilation is carried out during breaks anyway. For typical external air CO_2 concentrations of around 400-500 ppm, it is possible to comply even with 1500 ppm. Exceeding this figure temporarily is permissible.

Fresh 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)

Purging phase for intermittent ventilation operation
Due to the purge ventilation phase, the ventilation operation period is extended accordingly (utilisation time + purge ventilation phase). Please consider this for the ventilation design.
Emissions have to be removed. Flushing the building prolongs the utilization time of the ventilation system (utilization time + flushing phase). Please consider this at design stage.

Design of air quantities

When designing the air quantities, please consider the design recommendations given above.
The ventilation operation period can be determined on the basis of the daily utilisation hours including purging phase if applicable. In addition, time periods with reduced ventilation requirements (operation modes) can be
Taken into account by means of reduction factors.

Room Nr.	Amount a	Room name	Asignment to ventilation unit	Area A m²	Clear height h m	Room vol. A x h m³	Volume flow per room V_{SUP} m³/h	V_{ETA} m³/h	V_{TRANS} m³/h	Air change rate per room n 1/h	Utilisation times h/d h	d/week d	weeks/yr Weeks	Reduction Red.1	Operation Red. 1	Reduction Red.2	Operation Red.2	Reduction Red.3	Operation Red. 3	Cross check	Average volume flows V_{SUP} m³/h	V_{ETA} m³/h	V_{TRANS} m³/h	Average air change rate 1/h
1	5	Classroom	1	53	3,30	175	300			1,72	14	5	32	100%	30%	60%	0%	40%	70%		223			0,26
2	1	Corridors	1	122	3,30	403		1000	500	2,48	14	5	32	100%	30%	60%	0%	40%	70%			149	74	0,37
3	1	Lobbies	1	69	3,30	228		500		2,20	14	5	32	100%	30%	60%	0%	40%	70%			74		0,33
4	5	Classroom	2	53	3,30	175	300			1,72	14	5	32	100%	30%	60%	0%	40%	70%		223			0,26
5	1	Corridors	2	122	3,30	403		1000	500	2,48	14	5	32	100%	30%	60%	0%	40%	70%			149	74	0,37
6	1	Lobbies	2	69	3,30	228		500		2,20	14	5	32	100%	30%	60%	0%	40%	70%			74		0,33
7	5	Classroom	3	53	3,30	175	300			1,72	14	5	32	100%	30%	60%	0%	40%	70%		223			0,26
8	1	Corridors	3	122	3,30	403		1000	500	2,48	14	5	32	100%	30%	60%	0%	40%	70%			149	74	0,37
9	1	Lobbies	3	69	3,30	228		500		2,20	14	5	32	100%	30%	60%	0%	40%	70%			74		0,33
10	1	Lobbie -1	4	69	3,30	228	100			0,44	10	5	32	100%	30%	50%	30%	30%	40%		10			0,05
11	1	Corridor -1	4	18	3,30	59		150		2,53	10	5	32	100%	30%	50%	30%	30%	40%			16		0,26
12	1	Canteen	4	176	3,30	581	1550		50	2,67	10	5	32	100%	30%	50%	30%	30%	40%		162		5	0,28
13	1	Kitchen	4	68	3,30	224		1600	50	7,13	10	5	32	100%	30%	50%	30%	30%	40%			167	5	0,74
14	1	m behind kitcl	4	79	3,30	262	100			0,38	10	5	32	100%	30%	50%	30%	30%	40%		10			0,04
15	1	mputer classro	5	51	3,30	168	300			1,79	14	5	32	100%	10%	70%	30%	20%	60%		33			0,20
16	1	Bookstore	5	16	3,30	52	50			0,96	14	5	32	100%	10%	70%	30%	20%	60%		6			0,11
17	1	Canteen	5	51	3,30	168	120	140		0,83	14	5	32	100%	10%	70%	30%	20%	60%		13	15		0,09
18	1	WC	5	8	3,30	26		80		3,06	14	5	32	100%	10%	70%	30%	20%	60%			9		0,34
19	1	Corridor	5	41	3,30	136		250	80	1,84	14	5	32	100%	10%	70%	30%	20%	60%			28	9	0,20
20	1	Corridor 2	5	8	3,30	26			80	3,03	14	5	32	100%	10%	70%	30%	20%	60%				9	0,33
21	1	eachers room	6	17	3,30	56	30			0,53	14	5	50	100%	0%	50%	40%	20%	60%		4			0,07
22	1	eachers room	6	33	3,30	109	90			0,82	14	5	50	100%	0%	50%	40%	20%	60%		12			0,11
23	1	eachers room	6	16	3,30	52	30			0,58	14	5	50	100%	0%	50%	40%	20%	60%		4			0,07
24	1	eachers room	6	51	3,30	169	150			0,89	14	5	50	100%	0%	50%	40%	20%	60%		19			0,11
25	1	WC	6	8	3,30	26		80		3,06	14	5	50	100%	0%	50%	40%	20%	60%			10		0,39
26	1	Corridor	6	41	3,30	136		220		1,62	14	5	50	100%	0%	50%	40%	20%	60%			28		0,21
27	1	Corridor 2	6	8	3,30	26			80	3,03	14	5	50	100%	0%	50%	40%	20%	60%				10	0,39
28	1	Fitness	7	96	3,30	317	250			0,79	14	5	32	100%	30%	60%	0%	40%	70%		37			0,12
29	1	Classroom	7	143	3,30	472	300			0,64	14	5	32	100%	30%	60%	0%	40%	70%		45			0,09
30	1	Corridor	7	120	3,30	396			550	1,39	14	5	32	100%	30%	60%	0%	40%	70%				82	0,21
31	1	Mechanical	7	256	4,40	1126		350		0,31	14	5	32	100%	30%	60%	0%	40%	70%			52		0,05
32	1	WC	7	11	3,30	36		100		2,75	14	5	32	100%	30%	60%	0%	40%	70%			15		0,41
33	1	Otehrs	7	67	3,30	221		100		0,45	14	5	32	100%	30%	60%	0%	40%	70%			15		0,07
34	2	Classroom	8	64	3,30	211	300			1,42	14	5	32	100%	30%	60%	0%	40%	70%		89			0,21
35	1	Classroom	8	51	3,30	167	300			1,80	14	5	32	100%	30%	60%	0%	40%	70%		45			0,27
36	1	Classroom	8	67	3,30	221	300			1,36	14	5	32	100%	30%	60%	0%	40%	70%		45			0,20
37	1	Entrance room	8	53	3,30	175	150			0,86	14	5	32	100%	30%	60%	0%	40%	70%		22			0,13
38	6	Storages	8	16	3,30	53		100		1,89	14	5	32	100%	30%	60%	0%	40%	70%			89		0,28
39	1	Corridor	8	202	3,30	667		450	700	1,05	14	5	32	100%	30%	60%	0%	40%	70%			67	104	0,16
40	1	WC	8	39	3,30	129		200		1,55	14	5	32	100%	30%	60%	0%	40%	70%			30		0,23
41	1	Others entran	9	55	3,30	182		100		0,55	14	5	32	100%	30%	60%	0%	40%	70%			15		0,08
42	1	Classroom	9	58	3,30	191	300			1,57	14	5	32	100%	30%	60%	0%	40%	70%		45			0,23
43	1	Classroom	9	76	3,30	251	300			1,20	14	5	32	100%	30%	60%	0%	40%	70%		45			0,18
44	5	Storages	9	16	3,30	53		100		1,89	14	5	32	100%	30%	60%	0%	40%	70%			74		0,28
45	2	Classroom	9	67	3,30	221	300			1,36	14	5	32	100%	30%	60%	0%	40%	70%		89			0,20
46	2	Classroom	9	51	3,30	168	300			1,78	14	5	32	100%	30%	60%	0%	40%	70%		89			0,27
47	1	Corridor	9	204	3,30	673		1100	500	1,63	14	5	32	100%	30%	60%	0%	40%	70%			164	74	0,24
48	1	WC	9	39	3,30	129		200		1,55	14	5	32	100%	30%	60%	0%	40%	70%			30		0,23
49	1	Classroom	9	58	3,30	191	300			1,57	14	5	32	100%	30%	60%	0%	40%	70%		45			0,23
50	1	Classroom	9	76	3,30	251	300			1,20	14	5	32	100%	30%	60%	0%	40%	70%		45			0,18
51	5	Storages	9	16	3,30	53		100		1,89	14	5	32	100%	30%	60%	0%	40%	70%			74		0,28
52	2	Classroom	9	67	3,30	221	300			1,36	14	5	32	100%	30%	60%	0%	40%	70%		89			0,20
53	2	Classroom	9	51	3,30	168	300			1,78	14	5	32	100%	30%	60%	0%	40%	70%		89			0,27
54	1	Corridor	9	204	3,30	673		1100	500	1,63	14	5	32	100%	30%	60%	0%	40%	70%			164	74	0,24
55	1	WC	9	39	3,30	129		200		1,55	14	5	32	100%	30%	60%	0%	40%	70%			30		0,23
56	1	Classroom	9	58	3,30	191	300			1,57	14	5	32	100%	30%	60%	0%	40%	70%		45			0,23
57	1	Classroom	9	76	3,30	251	300			1,20	14	5	32	100%	30%	60%	0%	40%	70%		45			0,18
58	5	Storages	9	16	3,30	53		100		1,89	14	5	32	100%	30%	60%	0%	40%	70%			74		0,28
59	2	Classroom	9	67	3,30	221	300			1,36	14	5	32	100%	30%	60%	0%	40%	70%		89			0,20
60	2	Classroom	9	51	3,30	168	300			1,78	14	5	32	100%	30%	60%	0%	40%	70%		89			0,27
61	1	Corridor	9	204	3,30	673		1100	500	1,63	14	5	32	100%	30%	60%	0%	40%	70%			164	74	0,24
62	1	WC	9	39	3,30	129		200		1,55	14	5	32	100%	30%	60%	0%	40%	70%			30		0,23

63												100%	100%							
64												100%	100%							
65												100%	100%							
66												100%	100%							
67												100%	100%							
68												100%	100%							
69												100%	100%							
70												100%	100%							
71												100%	100%							
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73												100%	100%							
74												100%	100%							
30												100%	100%							

Additional lines: Please mark complete lines above, copy and paste multiple times

2028	2028	---	0,11

Ventilation unit selection

Up to 10 different ventilation units are considered. By changing the amount, identical units can be considered. The data from PHI certified ventilation units
as well as the entry data lines for user data for other ventilation units can also be found in the worksheet "Components". When choosing to use a compact unit the standard design in the Ventilation worksheet has to be used.

Go to ventilation units list

Venti-lation Unit no.	Quan-tity	Description Ventilation units	Selection Unit type	Design vol. flow per unit	Entry area for volume flow rate from	to	Electrical efficiency	Pressure loss calculation ODA-SUP Δp_{duct}	ETA-EHA Δp_{duct}	Additional Δp_{intern}	Entry area per line $\Delta p_{external}$	Subtraction Δp_{intern}	Cross check ---------- Pressure loss assessment duct network	Interior location (x)	Exterior location (x)	Heat recovery efficiency Unit	effective	Energy recovery value	Frost protection necessary	Subsoil HX Effective-efficiency degree	Efficiency of heat recovery	Noise protecti U noise level	adapter Supply air
	[-]			m³/h	m³/h	m³/h	Wh/m³	Pa	Pa	Pa	Pa	Pa				[-]	[-]	[-]				< 35dB(A)	db(A)
1	1	Parter	06ud Tangra ventilation unit EVB 16 Hi	1500	800	1600	0,40	55	55	65	-	-	ok	x		0,82	81%	0%	yes		0%	n.a.	68
2	1	First floor	06ud Tangra ventilation unit EVB 16 Hi	1500	800	1600	0,40	55	55	65	-	-	ok	x		0,82	81%	0%	yes		0%	n.a.	68
3	1	Second floor	06ud Tangra ventilation unit EVB 16 Hi	1500	800	1600	0,40	55	55	65	-	-	ok	x		0,82	82%	0%	yes		0%	n.a.	68
4	1	Floor -1	07ud Tangra ventilation unit EVB 20 Hi	1750	1000	2000	0,40	55	105	90	-	-	ok	x		0,82	81%	0%	yes		0%	n.a.	68
5	1	ector A 1 floo	02ud Tangra ventilation unit EVB 06 Hi	470	250	600	0,40	45	45		100	-	ok	x		0,82	81%	0%	yes		0%	n.a.	61
6	1	ector A 2 floo	01ud Tangra ventilation unit EVB 04 Hi	300	150	400	0,40	45	45		100	-	ok	x		0,82	75%	0%	yes		0%	n.a.	57
7	1	Floor -1	02ud Tangra ventilation unit EVB 06 Hi	550	250	600	0,40	55	50		100	-	ok	x		0,82	78%	0%	yes		0%	n.a.	61
8	1	Parter	06ud Tangra ventilation unit EVB 16 Hi	1350	800	1600	0,40	65	55	60	-	-	ok	x		0,82	80%	0%	yes		0%	n.a.	68
9	1	Floor 1	07ud Tangra ventilation unit EVB 20 Hi	5400	1000	2000	0,40	70	55	70	-	-	ok	x		0,82	81%	0%	yes		0%	n.a.	68
10																							

Data entries for duct sections between the ventilation unit and the thermal envelope

The duct sections between the ventilation unit and the thermal envelope should be as short as possible and should be well insulated, both for interior as for exterior location of the ventilation unit. These duct sections can be entered here. The heat losses of the overlying duct section will be considered for the effective heat recovery efficiency.
An entered duct section can also be used for multiple ventilation units.
If in the section "Ventilation unit - selection" in one line a ventilation unit is selected as multiple units (amount larger than 1 for identical units), then the corresponding duct sections may simply be entered (duct sections for one ventilation unit).

Temperature of the location of installation: 20,0 (only enter when at least one unit is installed outside of the thermal envelope)

Quan-tity	Cross check	Round duct ins. diameter mm	Rectangular duct Width mm	Height mm	Insulation Thickness mm	Thermal conducti-vity W/(m K)	Reflective insulation duct (x)	Transmittance duct W/(m K)	Length of Supply air m	Ambient or Extract air Duct (1)	Exhaust or flow Duct (1)	Duct type	Design Volume rate	Allocation to ventilation units (when central unit applicable enter "1") Vent. Unit 1	Vent. Unit 2	Vent. Unit 3	Vent. Unit 4	Vent. Unit 5	Vent. Unit 6	Vent. Unit 7	Vent. Unit 8	Vent. Unit 9	Vent. Unit 10
1		315			150	0,033		0,291	2	1		Supply air	1500	1									
1		315			150	0,033		0,291	11		1	Abluft	1500	1									
1		315			150	0,033		0,293	2	1		Ambient air	1500		1								
1		315			150	0,033		0,293	7,5		1	Fortluft	1500		1								
1		315			150	0,033		0,293	2	1		Ambient air	1500			1							
1		315			150	0,033		0,293	4		1	Fortluft	1500			1							
1		315			150	0,033		0,294	2	1		Ambient air	1750				1						
1		315			150	0,033		0,294	14,5		1	Fortluft	1750				1						
1		200			150	0,033		0,212	2	1		Ambient air	470					1					
1		200			100	0,033		0,272	3		1	Fortluft	470					1					
1		200			150	0,033		0,205	5,5	1		Ambient air	300						1				
1		200			100	0,033		0,261	6,5		1	Fortluft	300						1				
1		160			150	0,033		0,187	6	1		Ambient air	550							1			
1		160			100	0,033		0,239	18		1	Fortluft	550							1			
1		315			150	0,033		0,293	3,5	1		Ambient air	1350								1		
1		315			150	0,033		0,293	14,5		1	Fortluft	1350								1		
3		315			150	0,033		0,298	3,5	1		Ambient air	5400									1	
3		315			150	0,033		0,298	11		1	Fortluft	5400									1	
													0										
													0										

Additional lines: Please mark complete lines above, copy and paste multiple times

EnerPHit planning: # SPECIFIC ANNUAL HEATING DEMAND (annual method)

Climate: User data - Велико Търнов
Building: Primary School 8 "Sveti Sveti Kiril I Metodi" - Section B

Interior Temperature: 20,0 °C
Building type: School
Treated Floor Area A_{TFA}: 4630,4 m²

Building assembly	Temperature Zone	Area m²		U-Value W/(m²K)		Temp. Factor f_t		G_t kKh/a		kWh/a	per m² Treated Floor Area kWh/(m²a)
Exterior Wall - Ambient	A	2554,0	*	0,143	*	1,00	*	76,7	=	27932	6,03
Exterior Wall - Ground	B	362,1	*	0,180	*	0,10	*	76,7	=	493	0,11
Roof/Ceiling - Ambient	A	1557,7	*	0,126	*	1,00	*	76,7	=	15001	3,24
Floor slab / basement ceiling	B	1557,7	*	2,597	*	0,10	*	76,7	=	30650	6,62
	A		*		*	1,00	*		=		
	A		*		*	1,00	*		=		
	X		*		*	0,75	*		=		
Windows	A	1247,8	*	0,973	*	1,00	*	76,7	=	93078	20,10
Exterior Door	A	8,0	*	2,200	*	1,00	*	76,7	=	1344	0,29
Exterior TB (length/m)	A	317,0	*	0,062	*	1,00	*	76,7	=	1505	0,32
Perimeter TB (length/m)	P	273,1	*	-0,221	*	0,10	*	76,7	=	-457	-0,10
Ground TB (length/m)	B		*		*	0,10	*		=		0,00
Total of all building envelope areas		7287,3									kWh/(m²a)
Transmission heat losses Q_T									Total	169545	36,6

		A_{TFA} m²		Clear Room Height m		m³	
Ventilation System:	Effective Air Volume, V_V	4630,4	*	2,50	=	11576,0	
Effective heat recovery efficiency of heat recovery	η_{eff} 81%						
Efficiency of Subsoil Heat Exchanger	η_{SHX} 0%						

	$n_{V,system}$ 1/h		η_{HR}		$n_{V,Res}$ 1/h		1/h
Energetically Effective Air Exchange n_v	0,175	* (1 -	0,81	) +	0,038	=	0,072

	V_V m³		n_V 1/h		c_{Air} Wh/(m³K)		G_t kKh/a		kWh/a	kWh/(m²a)
Ventilation heat losses Q_V	11576,0	*	0,072	*	0,33	*	76,7	=	21048	4,5

	Q_T kWh/a		Q_V kWh/a		Reduction Factor Night/Weekend Saving		kWh/a	kWh/(m²a)
Total heat losses Q_L	169545	(	21048	)	1,0	=	190593	41,2

Orientation of the area	Reduction Factor See 'Windows' worksheet		g-Value (perp. radiation)		Area m²		Radiation HP kWh/(m²a)		kWh/a
1. North	0,38	*	0,51	*	258,55	*	127	=	6435
2. East	0,24	*	0,51	*	286,55	*	251	=	8646
3. South	0,28	*	0,51	*	348,24	*	444	=	21971
4. West	0,20	*	0,51	*	354,44	*	281	=	10294
5. Horizontal	0,00	*	0,00	*	0,00	*	417	=	0
Available Solar Heat Gains Q_S								Total	47346

	kh/d		Length heating period d/a		Spec. Power q_i W/m²		A_{TFA} m²		kWh/a	kWh/(m²a)
Internal Heat Gains Q_I	0,024	*	194	*	2,80	*	4630,4	=	60356	13,0

		kWh/a	kWh/(m²a)
Free Heat Q_F	$Q_S + Q_I$ =	107702	23,3
Ratio of Free Heat to Losses	Q_F / Q_L =	0,57	
Utilisation Factor Heat Gains η_G	$(1 - (Q_F/Q_L)^5) / (1 - (Q_F/Q_L)^6)$ =	97%	
Heat Gains Q_G	$\eta_G * Q_F$ =	104912	22,7

		kWh/a	kWh/(m²a)
Annual heating demand QH	$Q_L - Q_G$ =	85681	19

	kWh/(m²a)	(Yes/No)
Limiting value	25	**Requirement met?** yes

(This page displays the sums of the monthly method over the heating period)

Climate: Велико Търново | Interior Temperature: 20 °C

Building: primary School 8 "Sveti Sveti Kiril I Metodi" - Section B | Building type: School

Spec. Capacity: 204 Wh/(m²K) | Treated Floor Area A_{TFA}: 4630,4 m²

Building assembly	Temperature Zone	Area m²		U-Value W/(m²K)		Month. Red. Fac.		G_t kKh/a		kWh/a	per m² Treated Floor Area
Exterior Wall - Ambient	A	2554,0	*	0,143	*	1,00	*	87	=	31702	6,85
Exterior Wall - Ground	B	362,1	*	0,180	*	1,00	*	10	=	632	0,14
Roof/Ceiling - Ambient	A	1557,7	*	0,126	*	1,00	*	87	=	17027	3,68
Floor slab / basement ceiling	B	1557,7	*	2,597	*	1,00	*	10	=	39321	8,49
	A		*		*	1,00	*		=		
	A		*		*	1,00	*		=		
	X		*		*	0,75	*		=		
Windows	A	1247,8	*	0,973	*	1,00	*	87	=	105643	22,82
Exterior Door	A	8,0	*	2,200	*	1,00	*	87	=	1526	0,33
Exterior TB (length/m)	A	317,0	*	0,062	*	1,00	*	87	=	1708	0,37
Perimeter TB (length/m)	P	273,1	*	-0,221	*	1,00	*	10	=	-586	-0,13
Ground TB (length/m)	B		*		*	1,00	*		=		0,00

Transmission heat losses Q_T — Total: 196973 kWh/a | 42,5 kWh/(m²a)

Effective Air Volume V_V: A_{TFA} 4630 m² * Clear Room Height 2,50 m = 11576 m³

	$n_{V,system}$ 1/h		η^*_{SHX}		η_{HR}		$n_{V,Res}$ 1/h	$n_{V,equi,fraction}$ 1/h
Effective Air Change Rate Ambient $n_{v,e}$	0,175	*(1-	0%	)*(1-	0,81	)+	0,038	= 0,072
Effective Air Change Rate Ground $n_{V,g}$	0,175	*	0%	*(1-	0,81	)		= 0,000

	V_V m³		$n_{V,equi,fraction}$ 1/h		c_{Air} Wh/(m³K)		G_t kKh/a		kWh/a	kWh/(m²a)
Ventilation losses ambient Q_V	11576	*	0,072	*	0,33	*	87	=	23889	5,2
Ventilation losses ground $Q_{V,e}$	11576	*	0,000	*	0,33	*	56	=	0	0,0

Ventilation heat losses Q_V — Total: 23889 kWh/a | 5,2 kWh/(m²a)

Total heat losses Q_L = (Q_T 196973 kWh/a + Q_V 23889 kWh/a) * Reduction Factor Night/Weekend Saving 1,0 = 220862 kWh/a | 47,7 kWh/(m²a)

Orientation of the area	Reduction Factor See 'Windows' worksheet		g-Value (perp. radiation)		Area m²		Global Radiation kWh/(m²a)		kWh/a
North	0,38	*	0,51	*	258,6	*	230	=	11657
East	0,24	*	0,51	*	286,6	*	467	=	16109
South	0,28	*	0,51	*	348,2	*	699	=	34616
West	0,20	*	0,51	*	354,4	*	505	=	18476
Horizontal	0,00	*	0,00	*	0,0	*	787	=	0
Sum opaque areas									7484

Available Solar Heat Gains Q_S — Total: 88342 kWh/a | 19,1 kWh/(m²a)

Internal Heat Gains Q_I = kh/d 0,024 * Length Heat. Period 273 d/a * Spec. Power q_i 2,8 W/m² * A_{TFA} 4630,4 m² = 84948 kWh/a | 18,3 kWh/(m²a)

		kWh/a	kWh/(m²a)
Free Heat Q_F	Q_S + Q_I =	173289	37,4
Ratio Free Heat to Losses	Q_F / Q_L =	0,78	
Utilisation Factor Heat Gains η_G	=	81%	
Heat Gains Q_G	η_G * Q_F =	140618 kWh/a	30,4 kWh/(m²a)
Annual heating demand QH	Q_L - Q_G =	80244 kWh/a	**17** kWh/(m²a)

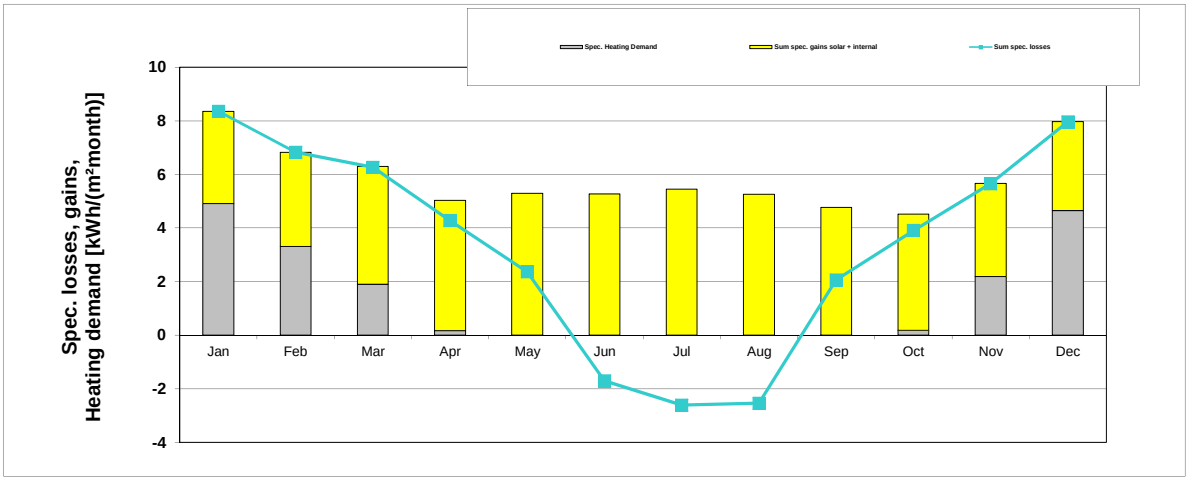
Limiting value 25 kWh/(m²a) — Requirement met? (Yes/No): yes

EnerPHit planning: **SPECIFIC ANNUAL HEATING DEMAND (monthly method)**

Climate: Велико Търнов
Building: Primary School 8 "Sveti Sveti Kiril I Metodi" - Section B

Interior Temperature: 20 °C
Building type: School
Treated Floor Area A_{TFA}: 4630 m²

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	
Heating Degree Hours - Exterior	15,9	12,7	11,4	7,3	3,4	0,7	-0,9	-0,7	3,3	7,1	10,6	15,3	86	kKh
Heating Degree Hours - Ground	1,4	1,3	1,3	1,1	1,0	-2,3	-2,5	-2,5	0,7	0,8	1,0	1,2	2	kKh
Losses - Exterior	33230	26541	23677	15254	7041	1389	-1968	-1494	6916	14724	22168	31944	179422	kWh
Losses - Ground	5481	5084	5349	4567	3906	-9276	-10119	-10266	2639	3358	4036	4948	9705	kWh
Sum spec. losses	8,4	6,8	6,3	4,3	2,4	-1,7	-2,6	-2,5	2,1	3,9	5,7	8,0	40,8	kWh/m²
Solar gains - North	710	963	1419	1875	2433	2737	2585	2230	1622	1216	760	659	19209	kWh
Solar gains - East	966	1207	1897	2760	3346	3449	3553	3070	2415	1725	966	828	26181	kWh
Solar gains - South	3021	3367	4209	4457	4259	4011	4308	4605	4754	4506	3219	2823	47541	kWh
Solar gains - West	1149	1446	2304	2864	3388	3353	3561	3391	2831	2195	1304	995	28781	kWh
Solar gains - Horiz.	0	0	0	0	0	0	0	0	0	0	0	0	0	kWh
Solar gains - Opaque	444	588	905	1229	1475	1519	1590	1424	1127	827	494	395	12018	kWh
Internal Heat Gains	9646	8713	9646	9335	9646	9335	9646	9646	9335	9646	9335	9646	113575	kWh
Sum spec. gains solar + internal	3,4	3,5	4,4	4,9	5,3	5,3	5,5	5,3	4,8	4,3	3,5	3,3	53,4	kWh/m²
Utilisation Factor	100%	100%	99%	85%	45%	100%	100%	100%	43%	86%	100%	100%	44%	
Annual heating demand	22777	15347	8790	792	1	0	0	0	1	829	10161	21546	80244	kWh
Spec. Heating Demand	**4,9**	**3,3**	**1,9**	**0,2**	**0,0**	**0,0**	**0,0**	**0,0**	**0,0**	**0,2**	**2,2**	**4,7**	**17,3**	kWh/m²



Annual heating demand: Comparison

Monthly method	*(Worksheet Heat*	**80244**	**kWh/a**	**17,3**	**kWh/(m²a) reference to treated floor area according to PHPP**
Annual method	*(Worksheet Annu*	**85681**	**kWh/a**	**18,5**	**kWh/(m²a) reference to treated floor area according to PHPP**

EnerPHit planning: # SPECIFIC SPACE HEATING LOAD

Building: primary School 8 "Sveti Sveti Kiril I Metodi" - Section B — Building type: School

Climate (HL): Велико Търново — Treated Floor Area A_{TFA}: 4630,4 m² — Interior Temperature: 20 °C

	Design Temperature		Radiation:	North	East	South	West	Horizontal	
Weather 1:	-9,3	°C		19	39	82	35	56	W/m²
Weather 2:	-4,8	°C		16	23	40	24	36	W/m²
Ground Design Temp.	18,1	°C							

	Building assembly	Temperature Zone	Area m²		U-Value W/(m²K)		Factor Always 1 (except "X")		TempDiff 1 K		TempDiff 2 K		P_T 1 W		P_T 2 W
1.	Exterior Wall - Ambient	A	2554,0	*	0,143	*	1,00	*	29,3	or	24,8	=	10686	or	9047
2.	Exterior Wall - Ground	B	362,1	*	0,180	*	1,00	*	1,9	or	1,9	=	121	or	121
3.	Roof/Ceiling - Ambient	A	1557,7	*	0,126	*	1,00	*	29,3	or	24,8	=	5739	or	4859
4.	Floor slab / basement ceiling	B	1557,7	*	2,597	*	1,00	*	1,9	or	1,9	=	7556	or	7556
5.		A		*		*	1,00	*	29,3	or	24,8	=		or	
6.		A		*		*	1,00	*	29,3	or	24,8	=		or	
7.		X		*		*	0,75	*	29,3	or	24,8	=		or	
8.	Windows	A	1247,8	*	0,973	*	1,00	*	29,3	or	24,8	=	35609	or	30146
9.	Exterior Door	A	8,0	*	2,200	*	1,00	*	29,3	or	24,8	=	514	or	435
10.	Exterior TB (length/m)	A	317,0	*	0,062	*	1,00	*	29,3	or	24,8	=	576	or	487
11.	Perimeter TB (length/m)	P	273,1	*	-0,221	*	1,00	*	1,9	or	1,9	=	-113	or	-113
12.	Ground TB (length/m)	B		*		*	1,00	*	1,9	or	1,9	=		or	
13.	House/DU Partition Wall	I	28,6	*	0,782	*	1,00	*	3,0	or	3,0	=	67	or	67

Transmission heat load P_T

Total = 60756 or 52606

Ventilation System:

Effective Air Volume, V_V: A_{TFA} 4630,4 m² * Clear Room Height 2,50 m = 11576 m³

Heat recovery efficiency of the Heat Exchanger η_{HR} 81% — Heat Recovery Efficiency SHX 0% — Efficiency SHX η_{SHX} 1: 0% or η_{SHX} 2: 0%

Energetically Effective Air Exchange n_V: $n_{V,Res}$ (Heating Load) 0,096 1/h + $n_{V,system}$ 0,175 1/h *(1- Φ_{HR} 0,81 or Φ_{HR} 0,81) = 0,129 1/h or 0,129 1/h

Ventilation heat load P_V

V_V m³		n_V 1/h		n_V 1/h		c_{Air} Wh/(m³K)		TempDiff 1 K		TempDiff 2 K		P_V 1 W		P_V 2 W
11576,0	*	0,129	or	0,129	*	0,33	*	29,3	or	24,8	=	14485	or	12263

Total heating load P_L

$P_T + P_V$ = 75241 or 64869

	Orientation of the area	Area m²		g-Value (perp. radiation)		Reduction Factor (see 'Windows' worksheet)		Radiation 1 W/m²		Radiation 2 W/m²		P_T 1 W		P_T 2 W
1.	North	258,6	*	0,5	*	0,38	*	19	or	16	=	963	or	811
2.	East	286,6	*	0,5	*	0,24	*	39	or	23	=	1345	or	793
3.	South	348,2	*	0,5	*	0,28	*	82	or	40	=	4061	or	1981
4.	West	354,4	*	0,5	*	0,20	*	41	or	26	=	1497	or	960
5.	Horizontal	0,0	*	0,0	*	0,40	*	56	or	36	=	0	or	0

Solar heating power P_S

Total = 7867 or 4545

Internal heating load P_I

Spec. Power W/m² 1,6 * A_{TFA} m² 4630 = P_I 1: 7409 W or P_I 2: 7409 W

Heating power (gains) P_G

$P_T + P_I$ = P_G 1: 15275 W or P_G 2: 11953 W

$P_L - P_G$ = 59966 or 52916

Heating load P_H = 59966 W

Area specific space heating load PH / A_{TFA} = 13,0 W/m²

Input Max. Supply Air Temperature 52 °C

Max. Supply Air Temperature $\vartheta_{Supply,Max}$ 52 °C — Supply Air Temperature Without Heating $\vartheta_{Supply,Min}$: 14,4 °C or 15,2 °C

For comparison: heating load transportable by the supply Air. $P_{Supply\ Air,Max}$ = 25178 W specific: 5,4 W/m²

Supply Air Heating Sufficient? (Yes/No): no

EnerPHit planning:

SUMMER VENTILATION

Building:	Primary School 8 "Sveti Sveti Kiril I Metodi" - S		Building type:	School	
Building volume:	11576	m³	Heat recovery η_{HRV}:	81%	
Max. indoor absolute humidity:	12	g/kg	Energy recovery η_{ER}:	0%	
Internal humidity sources:	2	g/(m²h)	Subsoil heat exchanger η^*_{SHX}:	0%	

Results passive cooling

Frequency of overheating:	3,1%	at the overheating limit ϑ_{max} = 25 °C	Useful Cooling Demand:	1,1	kWh/(m²a)
Frequency of exceeded humidity:	0,0%		Dehumidification demand:	0,2	kWh/(m²a)
max. humidity:	11,3	g/kg			

Results active cooling

Summer background ventilation to ensure adequate air quality

Air exchange via ventilation system with supply	1,17	1/h	HRV/ERV in Summer (check only one field)	
			None	x
			automatic bypass, controlled by temperature difference	
			automatic bypass, controlled by enthalpy difference	
			always	
Air exchange via extract air system	0,62	1/h		
			Specific power consumption (for extract air system)	0,30 Wh/m³
Window ventilation air exchange	0,14	1/h		

Effective air exchange

	$n_{V,system}$ 1/h		η^*_{SHX}		η_{HR}		$n_{V,equi,fraction}$ 1/h
exterior $n_{V,e}$	1,170	*(1-	0%	)*(1-	0,81	) =	0,224
without HR	1,170	*(1-	0%	)		=	1,170
Ground nL,g	1,170	*	0%	*(1-	0,81	) =	0,000
without HR	1,170	*	0%			=	0,000

Ventilation conductance

	V_V m³		$n_{V,equi,fraction}$ 1/h		c_{Air} Wh/(m³K)			
exterior $H_{V,e}$	11576	*	0,224	*	0,33	=	856,9	W/K
without HR	11576	*	1,170	*	0,33	=	4469,5	W/K
Ground $H_{V,g}$	11576	*	0,000	*	0,33	=	0,0	W/K
without HR	11576	*	0,000	*	0,33	=	0,0	W/K
Infiltration, window, extract air system	11576	*	0,796	*	0,33	=	3039,0	W/K

Additional Summer Ventilation for Cooling

Additional ventilation regulation

Minimum Acceptable Indoor Temperatur: 22,0 °C

Type of additional ventilation

Window Night Ventilation, Manual	Night ventilation value	0,00 1/h		
	Corresponding air change rate	0,62 1/h		Controlled by (please cl
mechanical, automatically Controlled ventilation	during operation, in addition to base air change		Temperature difference	
	Specific power consumption	0,30 Wh/m³	Humidity difference	x

Secondary Calculation: hygienic air exchange through window ventilation

Estimation for window air exchange to ensure sufficient air quality

Description								
Open duration [h/d]	4	4	4	4	1	4		
Climate Boundary Conditions								
Temperature Diff Interior - Exterior	4	4	4	4	4	4	K	
Wind Velocity	1	1	1	1	1	1	m/s	
Window Group 1								
Quantity	30	4	25	6	2	10		
Clear Width	0,75	0,75	0,75	0,75	0,90	0,84	m	
Clear Height	1,60	1,60	1,60	1,35	3,00	1,92	m	
Tilting window (check if appropriate	x	x	x	x		x		
Opening Width (for tilting windows)	0,070	0,070	0,070	0,070		0,070	m	
Window Group 2 (Cross Ventilation)								
Quantity	30	4	25	6	2	9		
Clear Width	0,75	0,75	0,75	0,75	0,90	0,80	m	
Clear Height	1,60	1,60	1,60	1,35	3,00	1,45	m	
Tilting window (check if appropriate	x	x	x	x		x		
Opening Width (for Tilting Window	0,070	0,070	0,070	0,070		0,070	m	
Difference in Height to Window 1							m	
								Total
Result: air exchange	0,05	0,01	0,04	0,01	0,02	0,02	0,14	1/h

Secondary calculation: additional night ventilation for cooling

Air change value during additional window night ventilation

Description								
Reduction Factor	100%	100%	100%	100%	100%	100%		
Climate Boundary Conditions								
Temperature Diff Interior - Exterior	1	1	1	1	1	1	K	
Wind Velocity	0	0	0	0	0	0	m/s	
Window Group 1								
Quantity	30	4	25	6	7	4		
Clear Width	0,75	0,75	0,75	0,75	2,15	2,40	m	
Clear Height	1,60	1,60	1,60	1,35	2,05	2,60	m	
Tilting window (check if appropriate	x	x	x	x	x	x		
Opening Width (for Tilting Window	0,070	0,070	0,070	0,070	0,060	0,060	m	
Window Group 2 (Cross Ventilation)								
Quantity	30	4	25	6	7	2		
Clear Width	0,75	0,75	0,75	0,75	2,15	3,50	m	
Clear Height	1,60	1,60	1,60	1,35	1,45	2,60	m	
Tilting window (check if appropriate	x	x	x	x	x	x		
Opening Width (for Tilting Window	0,070	0,070	0,070	0,070	0,060	0,060	m	
Difference in Height to Window 1							m	
								Total
Result: night ventilation values	0,10	0,01	0,08	0,02	0,03	0,02	0,27	1/h

EnerPHit planning:

SUMMER: PASSIVE COOLING

Climate: Велико Търнов
Building: Primary School 8 "Sveti Sveti Kiril I Metodi" - Section B
Overtemperature limit: 25 °C
Nominal humidity: 12 g/kg
Spec. Capacity: 204 Wh/(m²K)

Building type: School
Treated Floor Area A_{TFA}: 4630,4 m²
Building volume: 11576 m³
Internal humidity sources: 2,0 g/(m²h)

	Building assembly	Temperature Zone	Area m²		U-Value W/(m²K)		Red. Factor $f_{T,Summer}$		H_{Summer} Heat Conductance
1.	Exterior Wall - Ambient	A	2554,0	*	0,143	*	1,00	=	364,3
2.	Exterior Wall - Ground	B	362,1	*	0,180	*	1,00	=	65,0
3.	Roof/Ceiling - Ambient	A	1557,7	*	0,126	*	1,00	=	195,6
4.	Floor slab / basement ceili	B	1557,7	*	2,597	*	1,00	=	4045,4
5.		A		*		*	1,00	=	
6.		A		*		*	1,00	=	
7.		X		*		*	0,75	=	
8.	Windows	A	1247,8	*	0,973	*	1,00	=	1213,9
9.	Exterior Door	A	8,0	*	2,200	*	1,00	=	17,5
10.	Exterior TB (length/m)	A	317,0	*	0,062	*	1,00	=	19,6
11.	Perimeter TB (length/m)	P	273,1	*	-0,221	*	1,00	=	-60,3
12.	Ground TB (length/m)	B		*		*	1,00	=	

Exterior Thermal Transmittance, $H_{T,e}$ 1811,0 W/K
Ground Thermal Transmittance, $H_{T,g}$ 4050,1 W/K

Summer Ventilation

from 'SummVent' worksheet

Ventilation unit conductance

Exterior $H_{V,e}$	856,9	W/K
without HR	4469,5	W/K
Ground HV,g	0,0	W/K
without HR	0,0	W/K

Ventilation conductance, others

Exterior	3039,0	W/K

Ventilation parameter

Temperature amplitude summer	11,2	K
Minimum Acceptable Indoor Temperature	22,0	°C
Heat capacity air	0,33	Wh/(m³K)
Supply air exchange	1,17	1/h
Ambient air exchange	0,80	1/h
Window night ventilation air exchange rate, manual @ 1K	0,00	1/h
Air change rate due to mechanical, automatically controlled ventilation	0,62	1/h
Specific power consumption for	0,30	Wh/m³
η_{HR}	81%	
η_{ERV}	0%	
η^*_{SHX}	0%	

Summer ventilation regulation

	HRV/ERV
None	x
Controlled by temperature	
Controlled by enthalpy	
always	
	Additional ventilation
Controlled by temperature	
Controlled by humidity	x

	Orientation of the area	Angle Factor Summer		Shading Factor Summer		Loss-Dirt		g-Value (perp. radiation)		Area m²		Portion of Glazing	=	**Aperture** m²
1.	North	0,9	*	0,53	*	0,95	*	0,51	*	258,6	*	59%	=	35,3
2.	East	0,9	*	0,43	*	0,95	*	0,51	*	286,6	*	49%	=	26,2
3.	South	0,9	*	0,40	*	0,95	*	0,51	*	348,2	*	51%	=	30,4
4.	West	0,9	*	0,34	*	0,95	*	0,51	*	354,4	*	49%	=	25,8
5.	Horizontal	0,9	*	1,00	*	0,95	*	0,00	*	0,0	*	0%	=	0,0
6	Sum opaque areas													11,7

Solar Aperture

Total 129,3 m² | 0,03 m²/m²

Internal Heat Gains Q_I

Specif. Power q_I W/m²		A_{TFA} m²	=	W	W/m²
2,8	*	4630	=	12965	2,8

Frequency of Overheating $h_{\vartheta \geq \vartheta max}$ **3,1%** **At the overheating limit ϑ_{max} = 25 °C**

If the "frequency over 25°C" exceeds 10%, additional measures to protect against the heat during the summer are necessary.

Daily internal temperature stroke

Transmission kWh/d		Ventilation kWh/d		Solar load kWh/d		1/k		Spec. Capacity Wh/(m²K)		A_{TFA} m²			
(243,4	+	1305,0	+	536,7	) *	1000	/ (	204	*	4630	) =	2,2	K

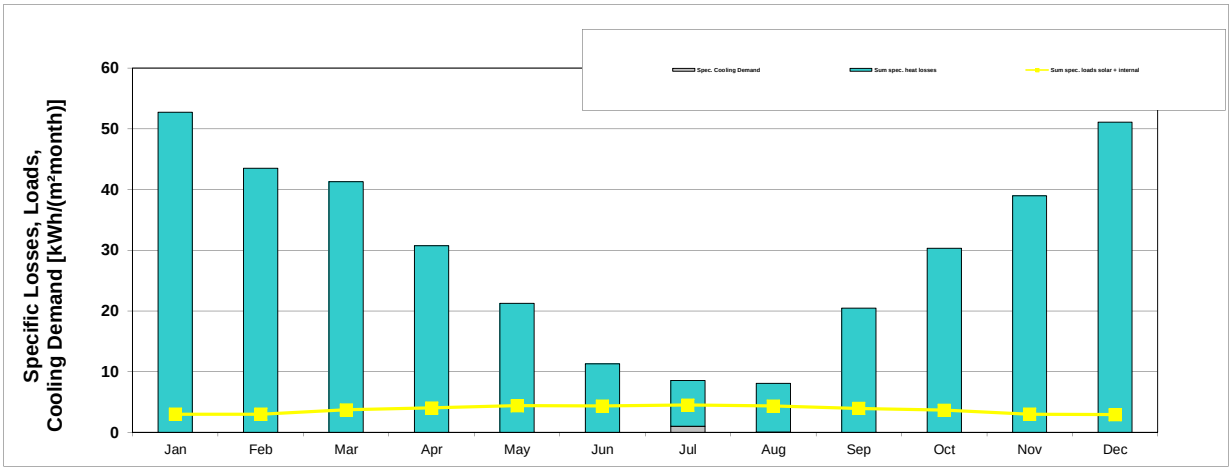
EnerPHit planning:

SPECIFIC USEFUL COOLING DEMAND

Climate: Велико Търнов
Building: Primary School 8 "Sveti Sveti Kiril I Metodi" - Section B

Interior Temperature: 25 °C
Building type: School
Treated Floor Area A_{TFA}: 4630 m²

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	
Heating Degree Hours - Exterior	19,7	16,1	15,1	11,0	7,1	4,3	2,8	3,0	7,0	10,8	14,3	19,1	130	kKh
Heating Degree Hours - Ground	5,1	4,6	5,0	4,7	4,7	1,3	1,2	1,2	4,3	4,5	4,6	4,9	46	kKh
Losses - Exterior	180467	147477	137824	99377	64080	37993	24115	26190	62631	98448	130567	174911	1184082	kWh
Losses - Ground	20854	18970	20720	19432	19255	5383	5021	4872	17476	18698	18893	20312	189887	kWh
Losses summer ventilation	42808	34966	32652	23514	15125	8931	5776	6116	14796	23315	30965	41497	280462	kWh
Sum spec. heat losses	52,7	43,5	41,3	30,7	21,3	11,3	7,5	8,0	20,5	30,3	39,0	51,1	357,3	kWh/m²
Solar load North	494	671	989	1307	1695	1907	1801	1554	1130	848	530	459	13384	kWh
Solar load East	732	915	1439	2093	2537	2616	2694	2328	1831	1308	732	628	19853	kWh
Solar load South	1856	2069	2586	2738	2617	2465	2647	2830	2921	2769	1978	1734	29210	kWh
Solar load West	809	1018	1621	2015	2384	2359	2506	2386	1992	1544	918	700	20252	kWh
Solar load Horiz.	0	0	0	0	0	0	0	0	0	0	0	0	0	kWh
Solar load Opaque	444	588	905	1229	1475	1519	1590	1424	1127	827	494	395	12018	kWh
Internal Heat Gains	9646	8713	9646	9335	9646	9335	9646	9646	9335	9646	9335	9646	113575	kWh
Sum spec. loads solar + internal	3,0	3,0	3,7	4,0	4,4	4,4	4,5	4,4	4,0	3,7	3,0	2,9	45,0	kWh/m²
Utilisation Factor Losses	6%	7%	9%	13%	21%	38%	46%	53%	19%	12%	8%	6%	13%	
Useful Cooling Energy Demand	0	0	0	0	3	72	4826	343	2	0	0	0	5246	kWh
Spec. Cooling Demand	**0,0**	**0,0**	**0,0**	**0,0**	**0,0**	**0,0**	**1,0**	**0,1**	**0,0**	**0,0**	**0,0**	**0,0**	**1,1**	kWh/m²
specif. dehumidification demand	**0,0**	**0,0**	**0,0**	**0,0**	**0,0**	**0,0**	**0,2**	**0,0**	**0,0**	**0,0**	**0,0**	**0,0**	**0,2**	kWh/m²
Sensible Fraction	100%	100%	100%	100%	100%	100%	86%	100%	100%	100%	100%	100%	87%	



EnerPHit planning:

SPECIFIC USEFUL COOLING DEMAND

(This page displays the sums of the monthly method over the cooling period))

Climate: Велико Търнов
Building: primary School 8 "Sveti Sveti Kiril I Metodi" - Section B
Interior temperature summer: 25 °C
Nominal humidity: 12 g/kg
Spec. Capacity: 204 Wh/(m²K)

Building type: School
Treated Floor Area A_{TFA}: 4630,4 m²
Building volume: 11576 m³
Internal humidity sources: 2,0 g/(m²h)

	Building assembly	Temperature Zone	Area m²		U-Value W/(m²K)		Mon. Red. Fac.		G_t kKh/a		kWh/a	per m² Treated Floor Area
1.	Exterior Wall - Ambient	A	2554,0	*	0,143	*	1,00	*	46	=	16767	3,62
2.	Exterior Wall - Ground	B	362,1	*	0,180	*	1,00	*	22	=	1426	0,31
3.	Roof/Ceiling - Ambient	A	1557,7	*	0,126	*	1,00	*	46	=	9005	1,94
4.	Floor slab / basement c	B	1557,7	*	2,597	*	1,00	*	22	=	88712	19,16
5.		A		*		*	1,00	*		=		
6.		A		*		*	1,00	*		=		
7.		X		*		*	0,75	*		=		
8.	Windows	A	1247,8	*	0,973	*	1,00	*	46	=	55873	12,07
9.	Exterior Door	A	8,0	*	2,200	*	1,00	*	46	=	807	0,17
10.	Exterior TB (length/m)	A	317,0	*	0,062	*	1,00	*	46	=	903	0,20
11.	Perimeter TB (length/m)	P	273,1	*	-0,221	*	1,00	*	46	=	-2775	-0,60
12.	Ground TB (length/m)	B		*		*	1,00	*		=		0,00

Transmission losses Q_T (negative: heat loads) — Total 170718 kWh/a; 36,9 kWh/(m²a)

Summer Ventilation from 'SummVent' worksheet

Ventilation unit conductance

Exterior $H_{V,e}$	856,9	W/K
without HR	4469,5	W/K
Ground HV,g	0,0	W/K
without HR	0,0	W/K

Ventilation conductance, others

Exterior	3039,0	W/K

Ventilation parameter

Temperature amplitude summer	11,2	K
Minimum Acceptable Indoor Temperature	22,0	°C
Heat capacity air	0,33	Wh/(m³K)
Supply air exchange	1,17	1/h
Ambient air exchange	0,80	1/h
Window night ventilation air exchange rate, manual @ 1K	0,00	1/h
Air change rate due to mechanical, automatically controlled v	0,62	1/h
Specific power consumption for	0,30	Wh/m³
η_{HR}	81%	
η_{ERV}	0%	
η^*_{SHX}	0%	

Summer ventilation regulation

	HRV/ERV
None	x
Controlled by temperature	
Controlled by enthalpy	
always	
	Additional ventilation
Controlled by temperature	
Controlled by humidity	x

	$n_{V,system}$ 1/h		η^*_{SHX}		η_{HR} (considers bypass)		$n_{V,Rest}$ 1/h		$n_{V,equi,fraction}$ 1/h
Hygienic air change									
Effective Air Change Rate Ambient $n_{V,e}$	1,170	*(1-	0%	)*(1-	0,00	)+	0,796	=	1,966
Effective Air Change Rate Ground $n_{V,g}$	1,170	*	0%	*(1-	0,00	)		=	0,000

	V_V m³		$n_{V,equi,fraction}$ 1/h		c_{Air} Wh/(m³K)		G_t kKh/a	=	kWh/a	kWh/(m²a)
Ventilation losses ambient Q_V	11576	*	1,966	*	0,33	*	44	=	332254	71,8
Ventilation losses ground $Q_{V,e}$	11576	*	0,000	*	0,33	*	0	=	0	0,0
Heat losses summer ventilation	11576	*	0,574	*	0,33	*	45	=	97575	21,1

Ventilation heat losses Q_V — Total 429828 kWh/a; 92,8 kWh/(m²a)

Total heat losses Q_L: Q_T 170718 kWh/a + Q_V 429828 kWh/a = 600547 kWh/a; 129,7 kWh/(m²a)

	Orientation of the area	Reduction Factor		g-Value (perp. radiation)		Area m²		Global Radiation kWh/(m²a)	=	kWh/a
1.	North	0,27	*	0,51	*	258,6	*	290	=	10241
2.	East	0,18	*	0,51	*	286,6	*	589	=	15406
3.	South	0,17	*	0,51	*	348,2	*	624	=	18986
4.	West	0,14	*	0,51	*	354,4	*	590	=	15187
5.	Horizontal	0,40	*	0,00	*	0,0	*	1018	=	0
6.	Sum opaque areas									9192

Available Solar Heat Gains Q_S — Total 69013 kWh/a; 14,9 kWh/(m²a)

	kh/d		Length Heat. Period d/a		Spec. Power q_i W/m²		A_{TFA} m²	=	kWh/a	kWh/(m²a)
Internal Heat Gains Q_I	0,024	*	214	*	2,8	*	4630,4	=	66589	14,4

Sum heat loads Q_F: Q_S + Q_I = 135602 kWh/a; 29,3 kWh/(m²a)

Ratio of Losses to Free Heat Gains: Q_L / Q_F = 4,43

Utilisation Factor Heat Losses η_G = 22%

Useful heat losses $Q_{V,n}$: η_G * Q_L = 130356 kWh/a; 28,2 kWh/(m²a)

Useful Cooling Demand Q_K: Q_F - $Q_{V,n}$ = 5246 kWh/a; **1** kWh/(m²a)

Limiting value: 15 kWh/(m²a)

Requirement met? (Yes/No): -

EnerPHit planning:

COMPRESSOR COOLING UNITS

Climate:	Велико Търнов		Building type:	School	
Building:	Primary School 8 "Sveti Sveti Kiril I Metodi" - Section B		Treated Floor Area A_{TFA}:	4630,4	m²
Interior temperature summer:	25,0	°C	Mechanical cooling:		
Nominal humidity:	12,0	g/kg	Air exchange via ventilation system with supply air:	1,2	
Internal humidity sources:	2,0	g/(m²h)			

Supply Air Cooling
check as appropriate

On/Off Mode (check as appropriate)		
max. cooling capacity (sensible + latent)		kW
Temperature reduction dry	0,0	K
Seasonal energy efficiency ratio	2,0	

Recirculation Cooling
check as appropriate

On/Off Mode (check as appropriate)		
max. cooling capacity (sensible + latent)		kW
Volume flow rate at nominal power		m³/h
Temperature reduction dry		K
Variable volume flow (check if appropriate)		
Seasonal energy efficiency ratio		

Additional Dehumidification
check as appropriate

Waste heat to room (please check if applicable)	
Seasonal energy efficiency ratio	

Panel Cooling
check as appropriate

Seasonal energy efficiency ratio	

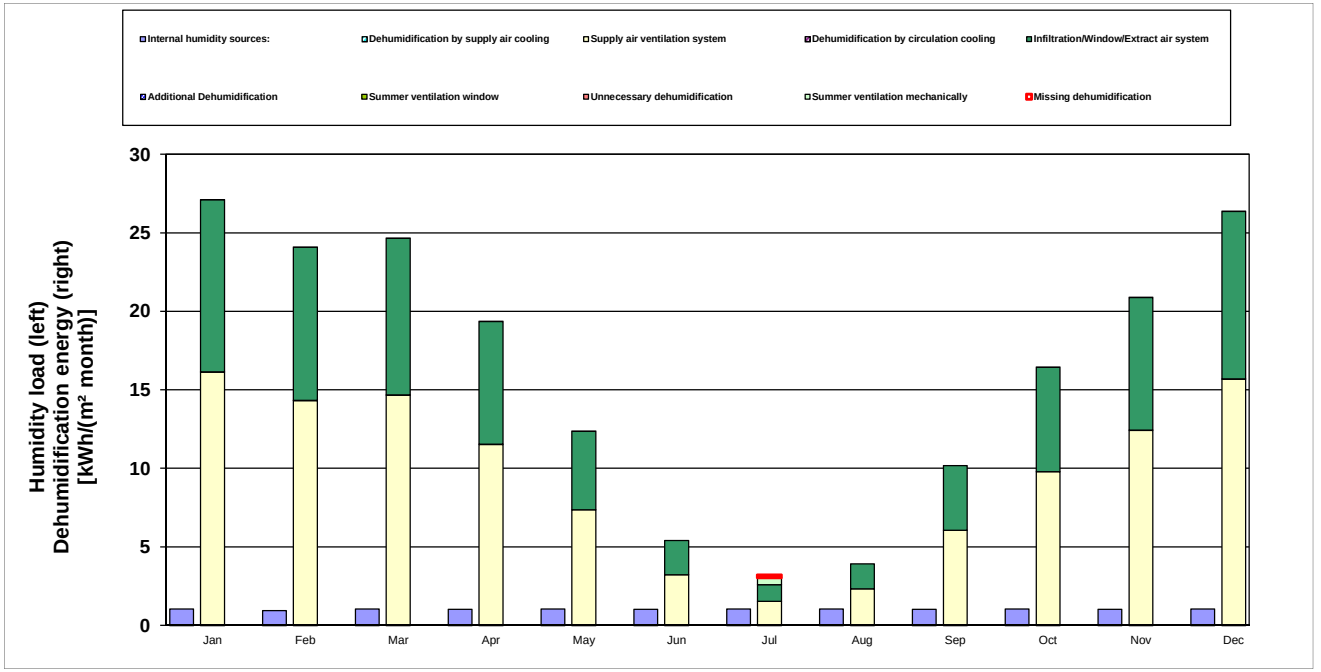
	sensible kWh/(m²a)		latent kWh/(m²a)		COP		lectricity Demand (kWh/a) kWh/(m²a)	Sensible Fraction
Useful cooling total	1,1		0,2					87%
Cooling contribution by:								
Supply Air Cooling	(	+		) /	2,0	=		
Recirculation Cooling	(	+		) /	0,0	=		
Dehumidification				/		=		0%
Remaining for Panel Cooling				/	0,0	=		100%
Total	(0,0	+	0,0	) /		=	0,0	0%
Unsatisfied Demand	1,1		0,2					

(Yes/No)

Cooling demand covered?

Humidity loads and humidity removal

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	
Internal humidity sources:	1,1	1,0	1,1	1,0	1,1	1,0	1,1	1,1	1,0	1,1	1,0	1,1	12	kWh/m²
Infiltration/Window/Extract air system	-11,0	-9,8	-10,0	-7,8	-5,0	-2,2	-1,0	-1,6	-4,1	-6,7	-8,5	-10,7	-78	kWh/m²
Supply air ventilation system	-16,1	-14,3	-14,7	-11,5	-7,4	-3,2	-1,5	-2,3	-6,1	-9,8	-12,4	-15,7	-115	kWh/m²
Summer ventilation window	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0	kWh/m²
Summer ventilation mechanically	0,0	0,0	0,0	0,0	0,0	0,0	-0,5	0,0	0,0	0,0	0,0	0,0	0	kWh/m²
Total humidity load	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0	kWh/m²
Dehumidification by supply air cooling	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0	kWh
Dehumidification by circulation cooling	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0	kWh
Additional Dehumidification	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0	kWh
Total dehumidification	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0	
Unnecessary dehumidification	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0	kWh
Missing dehumidification	0,0	0,0	0,0	0,0	0,0	0,0	0,2	0,0	0,0	0,0	0,0	0,0	0	kWh



EnerPHit planning: **COOLING LOAD**

Building: primary School 8 "Sveti Sveti Kiril I Metodi" - Section B
Building type: School
Climate (HL): Велико Търнов
Treated Floor Area A_{TFA}: 4630,4 m²
Interior Temperature: 25 °C
Building volume: 11576 m³
Spec. Capacity: 204 Wh/(m²
Nominal humidity: 12,0 g/kg
Internal humidity sources: 2,0 g/kg

Temperature:	Ambient Air		Dew Point	Sky		Radiation:	North	East	South	West	Horizontal	
Weather 1:	27,9	°C	18,6	16,5	°C		92	197	185	197	349	W/m²
Weather 2:	24,3	°C	18,6	18,6	°C		63	158	236	158	268	W/m²
Ground Design Temp.	23,4	°C	SHX	11,4	°C							

	Building assembly	Temperature Zone	Area m²		U-Value W/(m²K)		Factor Always 1 (except "X")		TempDiff 1 K		TempDiff 2 K		P_T 1 W		P_T 2 W
1.	Exterior Wall - Ambient	A	2554,0	*	0,143	*	1,00	*	2,9	or	-0,7	=	1044	or	-267
2.	Exterior Wall - Ground	B	362,1	*	0,180	*	1,00	*	-1,6	or	-1,6	=	-104	or	-104
3.	Roof/Ceiling - Ambient	A	1557,7	*	0,126	*	1,00	*	2,9	or	-0,7	=	561	or	-144
4.	Floor slab / basement ceiling	B	1557,7	*	2,597	*	1,00	*	-1,6	or	-1,6	=	-6444	or	-6444
5.		A		*		*	1,00	*	2,9	or	-0,7	=		or	
6.		A		*		*	1,00	*	2,9	or	-0,7	=		or	
7.		X		*		*	0,75	*	2,9	or	-0,7	=		or	
8.	Windows	A	1247,8	*	0,973	*	1,00	*	2,9	or	-0,7	=	3479	or	-891
9.	Exterior Door	A	8,0	*	2,200	*	1,00	*	2,9	or	-0,7	=	50	or	-13
10.	Exterior TB (length/m)	A	317,0	*	0,062	*	1,00	*	2,9	or	-0,7	=	56	or	-14
11.	Perimeter TB (length/m)	P	273,1	*	-0,221	*	1,00	*	-1,6	or	-1,6	=	96	or	96
12.	Ground TB (length/m)	B		*		*	1,00	*	-1,6	or	-1,6	=		or	
13.	House/DU Partition Wall	I	28,6	*	0,782	*	1,00	*	3,0	or	3,0	=	67	or	67
14.	Radiation correction ambient air				$L_{ambient}$ W/K		-61,8	*	2,9	or	-0,7	=	-177	or	45
15.	Radiation correction sky				L_{Sky} W/K		60,9	*	-8,5	or	-6,4	=	-516	or	-390

Transmission heat load P_T Total = **-1888** or **-8059**

Ventilation load	V_V m³		$n_{V,equi,fraction}$ 1/h		$n_{V,equi,fraction}$ 1/h		c_{Air} Wh/(m³K)		TempDiff 1 K		TempDiff 2 K		P_V 1 W		P_V 2 W
Exterior $P_{V,e}$	11576	*	1,966	or	1,966	*	0,33	*	2,9	or	-0,7	=	21519	or	-5511
Ground PL,e	11576	*	0,000	or	0,000	*	0,33	*	-13,6	or	-13,6	=	0	or	0
Summer ventilation $P_{L,S}$	11576	*	0,000	or	0,000	*	0,33	*	0,0	or	0,0	=	0	or	0

Ventilation heat load P_V Total = **21519** or **-5511**

	Orientation of the area	Area m²		g-Value (perp. radiation)		Reduction Factor (see 'Windows' worksheet)		Radiation 1 W/m²		Radiation 2 W/m²		P_T 1 W		P_T 2 W
1.	North	258,6	*	0,5	*	0,27	*	92	or	63	=	3249	or	2234
2.	East	286,6	*	0,5	*	0,18	*	197	or	158	=	5153	or	4140
3.	South	348,2	*	0,5	*	0,17	*	185	or	236	=	5629	or	7189
4.	West	354,4	*	0,5	*	0,14	*	203	or	173	=	5237	or	4457
5.	Horizontal	0,0	*	0,0	*	0,40	*	349	or	268	=	0	or	0
6.	Sum opaque areas											3094	or	2524

Solar load P_S Total = **22362** or **20544**

Internal heating load P_I Spec. Power W/m² = 2,8 * A_{TFA} m² 4630 = **P_I 1** **12965** or **P_I 2** **12965**

$P_T + P_V + P_S + P_I$ = **54958** or **19939**

Cooling load P_C = **54958** W

Area specific cooling load P_C / A_{TFA} = **11,9** W/m²

Please enter the minimum supply air temperature. 3 °C

Supply air temperature without cooling $\vartheta_{Supply,Min}$ °C **27,9** °C **24,3**

For comparison: cooling load, transportable through the supply air $P_{Supply;Max}$ = W **111139** W **95048**
specific: W/m² 24,0 W/m² 20,5

Air conditioning over the supply air possible? (yes/no) **yes**

Daily internal temperature stroke

Transmission W		Ventilation W		Solar load W		Time h/d		Spec. Capacity Wh/(m²K)		A_{TFA} m²		
(-1887,9	+	21519,2	+	22361,7	) *	24	/ (	204	*	4630	) =	**1,1** K

Dehumidification load from 'Cooling' worksheet

Absolute humidity exterior air	13,4	or	13,4	g/kg	Absolute humidity supply air	13,4	or	13,4	g/kg
Ambient air mass flow	10867	or	10867	kg/h	Supply air mass flow	15982	or	15982	kg/h
Summer ventilation air mass flow	0	or	0	kg/h	**Humidity load, supply air**	23070	or	23070	g/h
Humidity load, outside air	15686	or	15686	g/h	**Humidity load, internal**	9261	or	9261	g/h

	Enthalpy of vaporisation Wh/kg		g/kg		Humidity load g/h		Humidity load g/h		P_D 1 W		P_D 2 W
	707,639	/	1000	*	48017	or	48017	=	**33979**	or	**33979**

Dehumidification load P_T = **33979** W

Area specific dehumidification load P_T / A_{TFA} = **7,3** W/m²

Monthly Average values

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Spec. Cooling Demand	0,0	0,0	0,0	0,0	0,0	0,0	1,0	0,1	0,0	0,0	0,0	0,0	kWh/m²
Specif. dehumidification demand	0,0	0,0	0,0	0,0	0,0	0,0	0,2	0,0	0,0	0,0	0,0	0,0	kWh/m²
Sensible Fraction	100%	100%	100%	100%	100%	100%	86%	100%	100%	100%	100%	100%	

Minimum of sensible cooling load fraction occurred **100%**

HEAT DISTRIBUTION AND DHW SYSTEM

Building: Primary School 8 "Sveti Sveti Kiril I Metodi" - Section B

Interior Temperature:	20	°C
Building type:	School	
Treated Floor Area A_{TFA}:	4630	m²
Occupancy:	680,0	Pers
Number of dwelling units:	1	
Annual heating demand qHeating	80244	kWh/a
Length of Heating Period:	194	d
Average heating load Pave:	17,2	kW
Marginal Utilisability of Additional Heat Gains:	87%	

				Parts	Warm region	Cold Region		Total		
Space Heat Distribution					1	2	3			
Length of Distribution Pipes	L_H	*(Project)*			30,00	15,00	80,00		m	
Heat Loss Coefficient per m Pipe	Ψ	*(Project)*			0,253	0,253	0,198		W/(mK)	
Temperature of the Room Through Which the Pipes	ϑ_X	*Mechanical Room*			20	10,0	20,0		°C	
Design Flow Temperature	ϑ_{dist}	*Flow, Design Value*			55,0	55,0	55,0		°C	
Design system heating load	$P_{heating}$	*(exist./calc.)*			62,0	62,0	40,0		kW	
Flow Temperature Control (check)					x	x	x			
Design Return Temperature	ϑ_R		=0.714*(J_{dist}-20)+20		45,0	45,0	45,0		°C	
Annual Heat Emission per m of Plumbing	q^*_{HL}		= Y (J_m−ϑ_X) $t_{Heating}$*0.024		14	25	15		kWh/(m·a)	
Possible Utilization Factor of Released Heat	η_G				87%	0%	87%		-	
Annual Losses	Q_{HL}		= L_H · q^*_{HL} · (1-η_G)		52	380	149	580	kWh/a	
Specif. losses	q_{HL}		= ΣQ_{HL} / A_{TFA}						kWh/(m²a)	0,1
'Performance ratio of heat distribution	$e_{a,HL}$		= (q_H + q_{HV}) / q_H					101%	-	

DHW: Standard Useful Heat				
DHW Consumption per Person and Day (60 °C)	V_{DHW}	*(Project or Average Value 25 Litres/P/d)*	4,0	Litre/Person/d
Average Cold Water Temperature of the Supply	ϑ_{DW}	*Temperature of drinking water*	11,4	°C
DHW Non-Electric Wash and Dish		*(Electricity worksheet)*	1053	kWh/a
Useful heat - DHW	Q_{DHW}		57005	kWh/a
Specif. useful heat - DHW	q_{DHW}	= Q_{DHW} / A_{TFA}		kWh/(m²a) 12,3

				Warm region	Cold Region		Total		
DHW Distribution and Storage									
Length of Circulation Pipes (Flow + Return)	L_{HS}	*(Project)*		40,0	15,00			m	
Heat Loss Coefficient per m Pipe	Ψ	*(Project)*		0,295	0,295			W/m/K	
Temperature of the Room Through Which the Pipes	ϑ_X	*Mechanical Room*		20	10,0			°C	
Design Flow Temperature	ϑ_{dist}	*Flow, Design Value*		60,0	55,0			°C	
Daily circulation period of operation.	td_{Circ}	*(Project)*		5,0	8,0			h/d	
Design Return Temperature	ϑ_R		=0.875*(ϑ_{dist}-20)+20	55	51			°C	
Circulation period of operation per year	t_{Circ}		= 365 td_{Circ}	1825	2920			h/a	
Annual Heat Released per m of Pipe	q^*_z		= Y (J_m−ϑ_X) t_{Circ}	20	37			kWh/m/a	
Possible Utilization Factor of Released Heat	η_{GDHW}		=$t_{heating}$/365d * η_G	46%	0%			-	
Annual Heat Loss from Circulation Lines	Q_Z		= L_{HS} · q^*_z ·(1-η_{GDHW})	433	553		986	kWh/a	
Total length of individual pipes	L_U	*(Project)*		2,00				m	
Exterior pipe diameter	d_{U_Pipe}	*(Project)*		0,010				m	
Tap openings per person per day				3	3	3		-	
Utilisation days per year				150	150	150		d	
Heat loss per tap opening	$q_{Individual}$		=($c_{pH2O}V_{H2O}$+$c_{pMat}V_{Mat}$)(ϑ_{dist}-ϑ_X)	0,0046				kWh/tap opening	
Amount of tap openings per year	n_{Tap}		= n_{Pers} · n_{Tap} · d / n_{WE}	306000				Tap openings per year	
Annual Heat Loss	q_U		= n_{Tap} · $q_{Individual}$	1419				kWh/a	
Possible Utilization Factor of Released Heat	η_{G_U}		=$t_{heating}$/8760*η_G	46%				-	
Annual Heat Loss of individual pipes	Q_U		= q_U ·(1-η_{G_U})	761			761	kWh/a	
Average Heat Released from storage	P_S			139				W	
Possible Utilization Factor of Released Heat	η_{G_S}		=$t_{heating}$/8760*η_G	46%					
Annual Heat Losses from storage	Q_S		= P_S·8.760 kh·(1-η_{G_S})	654			654	kWh/a	
Total heat losses of the DHW system	Q_{WL}		= Q_Z+Q_U+Q_S				2401	kWh/a	
Specif. losses of the DHW system	q_{WL}		= Q_{WL} / A_{TFA}					kWh/(m²a)	0,5
Performance ratio DHW-distribution + storage	$e_{a,WL}$		= (q_{TDHW} + q_{WV}) / q_{TDHW}				104%	-	
Total heating demand of DHW system	Q_{gDHW}		= Q_{DHW}+Q_{WL}				59405	kWh/a	
Totalspec. heating demand of DHW system	q_{gDHW}		= Q_{gDHW} / A_{TFA}					kWh/(m²a)	12,8

Secondary calculation: Ψ-values of plumbing

Nominal width:	100	mm
Insulation Thickness:	80	mm
Mirrored?		Yes
	x	No
Thermal Conductivity	0,047	W/(mK)

$\Delta\vartheta$	30	K
Interior Pipe Diameter:	0,100	m
Exterior Pipe Diameter	0,102	m
Exterior Pipe Diameter	0,262	m
α–Surface	6,04	W/(m²K)
Ψ-Value	**0,295**	**W/(mK)**
Surface Temperature Difference	1,778	K

EnerPHit planning:

SOLAR THERMAL SYSTEM

Building: Primary School 8 "Sveti Sveti Kiril I Metodi" - Section B

Building type: School

Treated Floor Area A_{TFA}: 4630,4 m²

Solar fraction

Heating Demand DHW	q_{gDHW}	59405	kWh/a	*(DHW+Distribution)*
Annual heating demand		80824	kWh/a	*(Worksheets Heating & DHW+Distribution)*
Heating support (please check, if applicable)				
DHW priority (check if appropriate)				
Latitude:		43,1	°	*(Worksheet Climate)*

Collector: Improved flat plate PK SL AL

Solar Collector Area		22,30	m²
Deviation from North		180	°
Angle of Inclination from the Horizontal		45	°
Height of the Collector Field		1,00	m
Height of Horizon	h_{Hori}		m
Horizontal Distance	a_{Hori}		m
Additional Reduction Factor Shading	r_{other}		

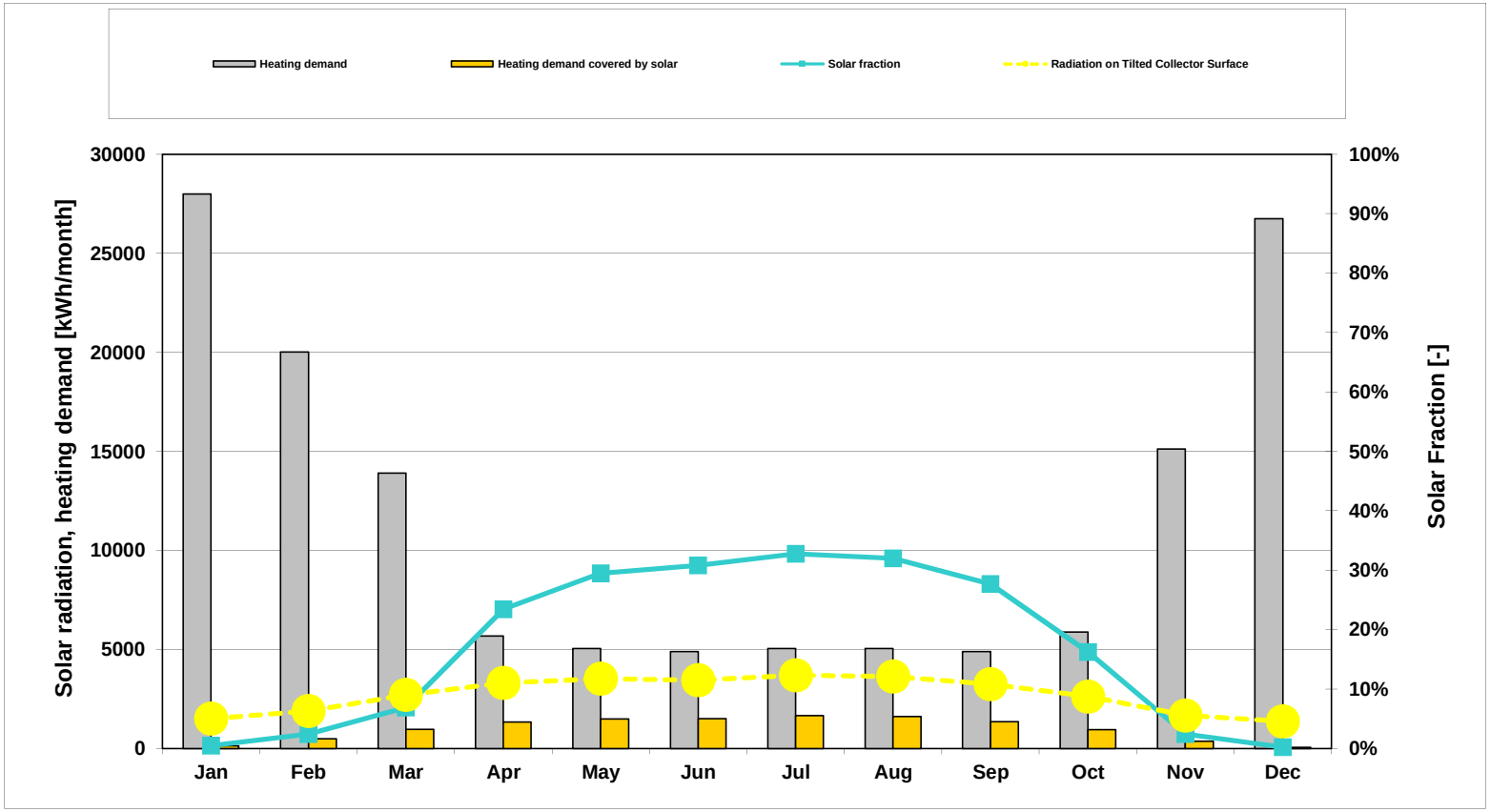
Occupancy	680,0	Persons
Specific Collector Area	0,0	m²/Pers

Estimated solar DHW fraction	**15%**	**8620**	kWh/a	**2**	kWh/(m²a)
Estimated solar coverage for heating	**4%**	**3275**	kWh/a	**1**	kWh/(m²a)
Solar heat contribution total	**8%**	**11895**	kWh/a	**3**	kWh/(m²a)

Secondary Calculation of Storage Losses

Solar Storage: Water storage two heat exchangers

Total storage volume	977	litre
Volume Standby Part (above)	293	litre
Volume Solar Part (below)	684	litre
Specific heat losses storage (total)	4,0	W/K
Typical Temperature DHW	60	°C
Room Temperature	20	°C
Storage heat losses (standby part only)	**40**	W
Total storage heat losses	**159**	W



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	
Heating demand DHW-preparation	5045	4557	5045	4883	5045	4883	5045	5045	4883	5045	4883	5045	59405	kWh/month
Heating demand space heating	22942	15458	8854	797	1	0	0	0	1	835	10234	21702	80824	kWh/month
Heating demand	27987	20015	13899	5680	5047	4883	5045	5045	4883	5881	15117	26748	140230	kWh/month
Radiation on Tilted Collector Surface	1511	1897	2706	3312	3533	3451	3702	3630	3249	2625	1671	1368	32655	kWh/month
Please enter: Solar production for DHW													0	kWh/month
Please enter: Solar production for heating													0	kWh/month
DHW heat demand covered by solar	0	2	18	637	1486	1504	1654	1614	1350	355	2	0	8620	kWh/month
Heating demand covered by solar	136	485	939	693	1	0	0	0	1	599	361	60	3275	kWh/month
Heating demand covered by solar	136	487	957	1330	1487	1504	1654	1614	1351	953	363	60	11895	kWh/month
Solar fraction	0%	2%	7%	23%	29%	31%	33%	32%	28%	16%	2%	0%	8%	-

Hit planning:

PHOTOVOLTAIC SYSTEM

Building: Primary School 8 "Sveti Sveti Kiril I Metodi" - Section B

Climate: Велико Търнов

Building type: School

Information from the module data sheet

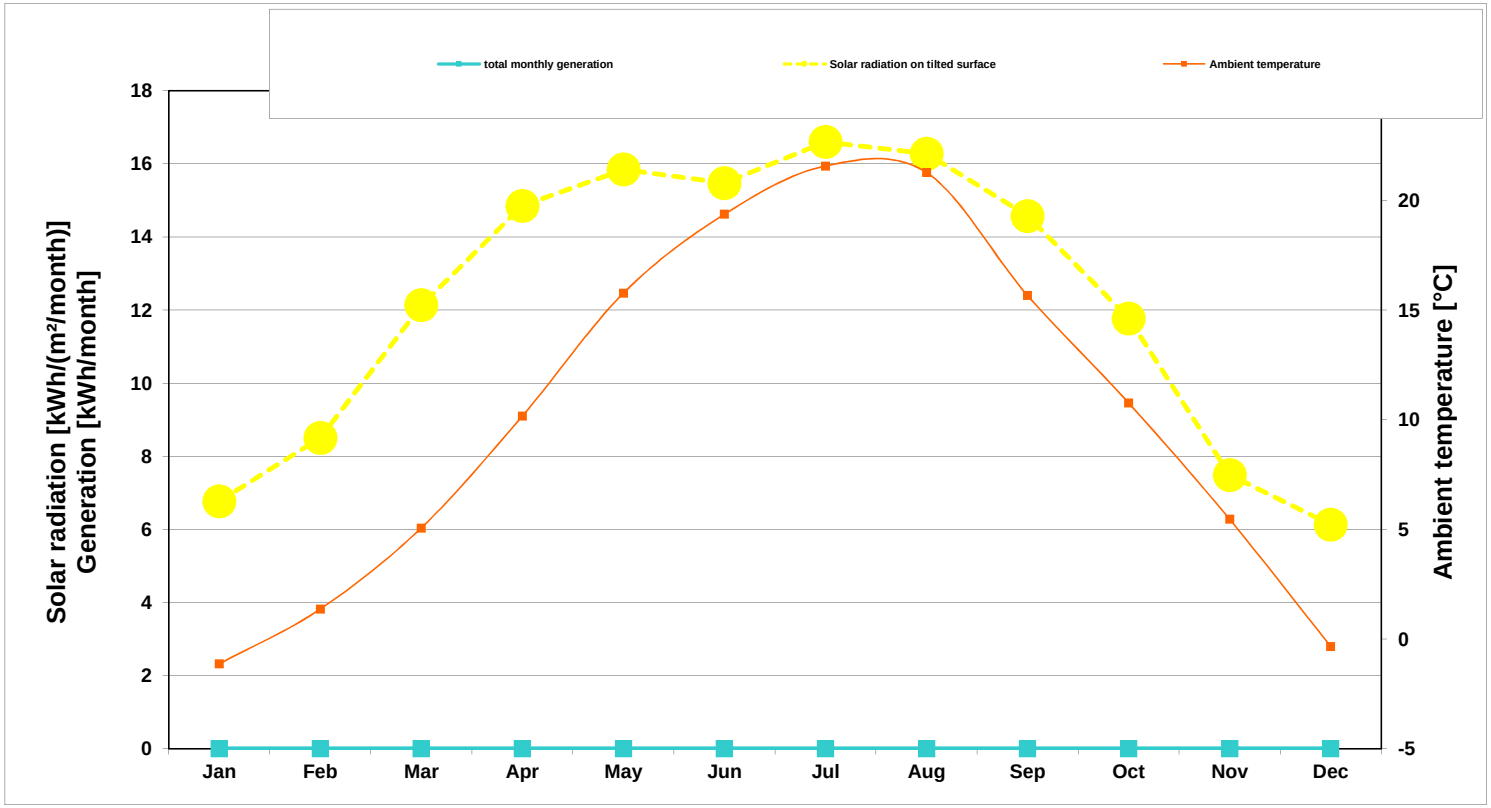
Technology: Poly-Si

Nominal current	I_{MPP0}		A
Nominal voltage	U_{MPP0}	30,60	V
Nominal power	P_n	#WERT!	W_p
Temperature coefficient short-circuit current	α	0,065	%/K
Temperature coefficient open-circuit voltage	β	-0,300	%/K

Further specifications

Latitude:		43,1	°	*(Worksheet Climate)*
Number of modules	n_M	45		
Deviation from North		180	°	
Angle of inclination from the horizontal		45	°	
Height of module array		1	m	
Height of horizon	h_{Hori}		m	
Horizontal distance	a_{Hori}		m	
Additional Reduction Factor Shading	r_{other}	10%		
Efficiency of the inverter	η_{HRV}	93%		

Annual yield of the inverter		kWh
Annual losses due to shading		kWh
PE value (non-renewable)		
CO_2-equivalent emission value		g/kWh



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		Year	
Solar radiation on tilted surface	7	9	12	15	16	15	17	16	15	12	7	6	kWh/m²/Month	146,4	kWh/m²/a
Ambient temperature	-1	1	5	10	16	19	22	21	16	11	5	0	°C	10,4	°C
total monthly generation													kWh/month		kWh/a
Losses due to shading situation													kWh/month		kWh/a

EnerPHit planning: **ELECTRICITY DEMAND**

Building: Primary School 8 "Sveti Sveti Kiril I Metodi" **Calculation in worksheet 'Electricity non-res'!**

Households	1	HH
Persons	680,0	P
Living Area	4630	m²
Annual heating demand	17	kWh/(m²a)

Solar fraction of DHW Laundry&Dish	2%
Marginal Performance Ratio DHW	110%
Marginal Performance Ratio Heating	110%

Prim. Energy Factors:		kWh/kWh
Electricity	2,6	
Natural Gas	1,1	kWh/kWh
Energy Carrier for Space Heating/DHW:	1,1	1,1

Column Nr.	1	2	3			4		5		6		7		8	8a		9	10	11	12	13	14
Application	Used ? (1/0)	Within the Thermal Envelope? (1/0)	Norm Demand			Utilization Factor		Frequency		Reference Quantity		Useful Energy (kWh/a)		Electric Fraction	Non-Electric Fraction		**Electricity Demand (kWh/a)**	Additional demand	Marginal Performance Ratio	Solar Fraction	Non-Electric Demand (kWh/a)	**Primary Energy-Demand (kWh/a)**
Dishwashing	1	1	1,10	kWh/Use		* 1,00	*	65	/(P*a)	* ####	P =	48620	*	100%		=	**48620**					**126412**
Cold water connection													*	0%				* (1+ 0,30) *	1,10	*(1- 0,02) =	**0**	**0**
Clothes washing	1	1	1,10	kWh/Use		* 1,00	*	57	/(P*a)	* ####	P =	42636	*	100%		=	**42636**					**110854**
Cold water connection													*	0%				* (1+ 0,05) *	1,10	*(1- 0,02) =	**0**	**0**
Clothes drying with:	1	1	3,50	kWh/Use	Residual dampness	0,88	*	57	/(P*a)	* ####	P =	#####		100%		=	**118703**					**308627**
Condensation Dryer					0,60						=	0		0%					1,00	*	**0**	**0**
Energy consumed by evaporation	0	1	3,13	kWh/Use		* 0,60	*	57	/(P*a)	* ####	P =	0	*	100%				* (1+ 0,00) *	1,10	*(1- 0,66) =	**0**	**0**
Refrigerating	1	1	0,78	kWh/d		* 1,00	*	365	d/a	* 1	HH =	285	*	100%		=	**285**					**740**
Freezing	1	0	0,88	kWh/d		* 0,90	*	365	d/a	* 1	HH =	289	*	100%		=	**289**					**752**
or combination	0	1	1,00	kWh/d		* 1,00	*	365	d/a	* 1	HH =	0	*	100%		=	**0**					**0**
Cooking with:	1	1	0,25	kWh/Use		* 1,00	*	500	/(P*a)	* ####	P =	85000	*	100%		=	**85000**					**221000**
Electricity					Percentage CFLs								*	0%							**0**	**0**
Lighting	1	1	60	W	0%	* 1,00	*	2,90	kh/(P*a)	* ####	P =	#####	*	100%		=	**118320**					**307632**
Consumer electronics	1	1	80	W		* 1,00	*	0,55	kh/(P*a)	* ####	P =	29920	*	100%		=	**29920**					**77792**
Small appliances, etc.	1	1	50	kWh		* 1,00	*	1,00	/(P*a)	* ####	P =	34000	*	100%		=	**34000**					**88400**
Total aux. electricity												50946					**50946**					**132461**
Other:																						
				kWh/a								0					**0**					**0**
				kWh/a								0					**0**					**0**
				kWh/a								0					**0**					**0**
Total												#####	kWh				**528719**	kWh	0	kWh	**0**	**1374669**
Specific Demand																	**114,2**	kWh/(m²a)	0,0	kWh/(m²a)	**0,0**	**296,9**
Recommended maximum value																	**18**					**50**

DHW Non-Electric - Wash&Dish

Non-Renewable Non-Electric DHW Wash&Dish

EnerPHit planning:

U T I L I S A T I O N non-residential Use

Building: Primary School 8 "Sveti Sveti Kiril I Metodi" - Section B

Latitude [°]: 43

	Utilisation Pattern	Periods of utilisation and operation	Begin Utilisation [h]	End Utilisation [h]	Daily Utilisation Hours [h/d]	Annual Utilisation Days [d/a]	Annual Utilisation Hours [h/a]	Annual Utilisation Hours During Daytime [h/a]	Annual Utilisation Hours During Nighttime [h/a]	Daily operating hours of heating	Daily operating hours of ventilation	Lighting	Illumination Level [lux]	Height of utilisation level (0.8 or 0.0 m)	Height of utilisation level (0.8 or 0.0 m)	Relative Absenteeism	Part Use Factor of Building Operating Period for Lighting	Average Occupancy [m²/Pers.]
1	Lobbies		7,5	18	11	180	1890	1803	87	13	13		200	0,0	0,0	0,80	1,00	
2	Corridors		7,5	18	11	180	1890	1803	87	13	13		100	0,0	0,0	0,80	1,00	
3	Computer room		7,5	18	11	180	1890	1803	87	13	13		300	0,8	0,8	0,30	0,40	2,0
4	Bookstore		9,0	18	9	180	1620	1534	86	11	11		300	0,8	0,8	0,90	1,00	
5	Teacher offices		7,5	18	11	180	1890	1803	87	13	13		300	0,8	0,8	0,30	0,70	10,0
6	Classroom		7,5	18	11	180	1890	1803	87	13	13		300	0,8	0,8	0,25	0,90	3,0
7	Stairs		7,5	18	11	180	1890	1803	87	13	13		100	0,0	0,0	0,80	1,0	
8	Kitchen		10,0	16	6	180	990	990	0	8	8		100	0,8	0,8	0,80	0,4	
9	Canteen		10,0	16	6	180	990	990	0	8	8		100	0,8	0,8	0,80	0,4	
10	WC, Sanitary		7,5	18	11	180	1890	1803	87	13	13		200	0,8	0,8	0,90	1,0	
11					0		0	0	0	2	2				0,8			
12					0		0	0	0	2	2				0,8			
13					0		0	0	0	2	2				0,8			
14					0		0	0	0	2	2				0,8			
15					0		0	0	0	2	2				0,8			
16					0		0	0	0	2	2				0,8			
17					0		0	0	0	2	2				0,8			
18					0		0	0	0	2	2				0,8			
19					0		0	0	0	2	2				0,8			
20					0		0	0	0	2	2				0,8			
21	Single Office		7	18	11	250	2750	2543	207	13			500	0,8	0,8	0,30	0,70	10,00
22	Group Office		7	18	11	250	2750	2543	207	13			500	0,8	0,8	0,30	0,70	
23	Open-Plan Office		7	18	11	250	2750	2543	207	13			500	0,8	0,8	0,00	1,00	15,00
24	Meeting		7	18	11	250	2750	2543	207	13			500	0,8	0,8	0,50	1,00	2,00
25	Counter Area		7	18	11	250	2750	2543	207	13			200	0,8	0,8	0,00	1,00	
26	Retail		8	20	12	300	3600	2999	601	14			300	0,8	0,8	0,00	1,00	7,00
27	Classroom		8	15	7	200	1400	1398	2	9			300	0,8	0,8	0,25	0,90	2,00
28	University Auditorium		8	18	10	150	1500	1409	91	12			500	0,8	0,8	0,25	0,70	0,75
29	Bedroom		0	24	24	365	8760	4407	4353	24			300	0,8	0,8	0,00	0,50	
30	Hotel Room		21	8	11	365	4015	755	3260	24			200	0,8	0,8	0,25	0,30	
31	Canteen		8	15	7	250	1750	1748	2	9			200	0,8	0,8	0,00	1,00	
32	Restaurant		10	0	14	300	4200	2404	1796	16			200	0,8	0,8	0,00	1,00	1,50
33	Kitchen Non-Residential		10	23	13	300	3900	2404	1496	15			500	0,8	0,8	0,00	1,00	
34	Kitchen, Storage, Preparation		7	23	16	300	3900	2404	1496	15			300	0,8	0,8	0,50	1,00	
35	WC, Sanitary		7	18	11	250	2750	2543	207	13			200	0,8	0,8	0,90	1,00	
36	Other Habitable Rooms		7	18	11	250	2750	2543	207	13			300	0,8	0,8	0,50	1,00	
37	Secondary Areas		7	18	11	250	2750	2543	207	13			100	0,8	0,8	0,90	1,00	
38	Circulation Area		7	18	11	250	2750	2543	207	13			100	0,0	0,0	0,80	1,00	
39	Storage, Services		7	18	11	250	2750	2543	207	13			100	0,8	0,8	0,98	1,00	
40	Server Room		0	24	24	365	8760	4407	4353	24			500	0,8	0,8	0,50	0,50	
41	Workshop		7	16	9	250	2250	2192	58	11			500	0,8	0,8	0,00	1,00	
42	Theatre Auditorium		19	23	4	250	1001	55	946	6			200	0,8	0,8	0,00	1,00	
43	Theatre Foyer		19	23	4	250	1001	55	946	6			300	0,8	0,8	0,50	1,00	
44	Theatre Stage		13	23	10	250	2500	1253	1247	12			1000	0,8	0,8	0,00	0,60	
45	Fair, Congress		13	18	5	150	1350	1260	90	11			300	0,8	0,8	0,50	1,00	
46	Exhibition		10	18	8	250	2001	1850	151	24			200	0,8	0,8	0,00	1,00	
47	Library Reading Room		8	20	12	300	3600	2999	601	14			500	0,8	0,8	0,00	1,00	
48	Open Access Library		8	20	12	300	3600	2999	601	14			200	0,8	0,8	0,00	1,00	
49	Library Repository		8	20	12	300	3600	2999	601	14			100	0,8	0,8	0,90	1,00	
50	Gymnasium		8	23	15	300	4500	3002	1498	17			300	0,8	0,8	0,30	1,00	
51	Parking Garage		7	18	11	250	2750	2543	207	0			75	0,0	0,0	0,95	1,00	
52	Public Parking Garage		9	0	15	365	5475	3290	2185	0			75	0,0	0,0	0,80	1,00	

EnerPHit planning: **E L E C T R I C I T Y D E M A N D Non-Residential Use**

Building: Primary School 8 "Sveti Sveti Kiril I Metodi" - Section B

Treated Floor Area A_{TFA}: 4630,4 m²

Auxiliary Electricity Demand: 50946,5 kWh/a

Primary Energy factors:

Electricity:	2,6	kWh/kWh
Natural gas:	1,1	kWh/kWh
Energy Carrier for DHW:		kWh/kWh
Solar fraction of DHW	15%	
Marginal Performance Ratio DHW:		

Window Properties (from Windows worksheet):

	Shading	Dirt Factor	Non-Perpendicular Radiation	Glazing Fraction
North	0,81	0,95	0,85	0,59
East	0,60			0,49
South	0,68			0,51
West	0,51			0,49

Lighting / non-residential	Percentage of treated floor area	Room Category	Room Category	Nominal Illuminance Level	Facade with Windows: Deviation from North	Facade with Windows: Orientation	Facade with Windows: Light Transmission Glazing	Facade with Windows: Existing window	Room Geometry: Input of a Typical Room or Room by Room: Room Depth	Room Width	Room Height	Lintel Height	Window Width	Input Warning	Daylight Utilisation	User Data: Installed Lighting Power	Installed Lighting Power (Standard)	Lighting Control	With motion?	Lighting Control	Utilisation Hours per Year [h/a]	User Determined: Lighting Full Load Hours	Full Load Hours of Lighting	Electricity Demand (kWh/a)	Spec. Electricity Demand (kWh/(m²a))	Primary Energy Demand (kWh/a)
Room / Zone				Lux	Degrees		-	[x]	m	m	m	m	m			W/m²	W/m²		[x]		h/a	h/a	h/a	kWh/a	kWh/(m²a)	kWh/a
Area total is larger than 100%!		2		15																							
Corridors	11%	2	Corridors	100	0	North	51%	x	2,7	45,0	3,3	2,3	35,3		medium	5	4,6			Manual	Without motion	1890		960,0	2249,3	4,4	5848,1
Classrooms	25%	6	Classroom	300	180	South	51%	x	6,0	9,0	3,3	3,0	7,1		none	8	8,0			Manual	Without motion	1890		1170,0	10835,2	9,4	28171,4
Lobbies	7%	1	Lobbies	200	0	North	51%	x	5,8	8,8	3,3	3,0	4,7		low	7	7,2			Manual	Without motion	1890		1120,0	2613,8	8,1	6795,8
Stairs	2%	7	Stairs	100	0	North	51%	x	4,2	6,0	3,3	2,5	1,0		none	5	4,6			Manual	Without motion	1890		1280,0	545,3	5,9	1417,7
Storages	5%	39	Storage, Services	100	0	North	51%		3,0	5,0	3,3	2,5			none	14	13,8			Manual	Without motion	2750	800	800,0	2556,0	11,0	6645,6
Offices	2%	5	Teacher offices	300	180	South	51%	x	6,1	4,4	3,3	3,0	2,0		none	8	8,0			Manual	Without motion	1890		1008,0	746,8	8,1	1941,7
Offices	1%	5	Teacher offices	300	0	North	51%	x	6,1	4,4	3,3	3,0	2,0		none	8	8,0			Manual	Without motion	1890		1043,0	386,4	8,3	1004,5
Kitchen	2%	8	Kitchen	100	180	South	51%	x	5,7	8,9	3,3	2,3	6,5		none	14	13,8			Manual	Without motion	990		243,7	311,4	3,4	809,7
Kitchen extra	1%	8	Kitchen	100	0	North	51%	x	2,5	7,6	3,3	2,3	2,8		low	14	13,8			Manual	Without motion	990		220,0	140,6	3,0	365,5
Canteen S	4%	9	Canteen	100	180	South	51%	x	4,3	21,0	3,3	2,3	15,1		none	14	13,8			Manual	Without motion	990		216,0	552,1	3,0	1435,4
Canteen N	2%	9	Canteen	100	0	North	51%	x	4,3	21,0	3,3	2,3	15,1		low	14	13,8			Manual	Without motion	990		220,0	281,2	3,0	731,0
Corridor no windows	1%	2	Corridors	100	0	North	51%		2,7	12,2	3,3	2,3			none	14	13,8			Manual	Without motion	1890		1410,0	901,0	19,5	2342,6
Classroom west	10%	6	Classroom	300	270	West	51%	x	5,8	8,9	3,3	2,7	7,1		none	8	8,0			Manual	Without motion	1890		1386,6	5136,4	11,1	13354,5
Classroom east	9%	6	Classroom	300	90	East	51%	x	5,8	8,9	3,3	2,7	7,1		none	8	8,0			Manual	Without motion	1890		1307,6	4359,5	10,5	11334,8
Corridors	8%	2	Corridors	100	180	South	51%	x	26,7	3,3	3,3	3,0	2,1		none	5	4,6			Manual	Without motion	1890		1352,0	2303,8	6,2	5989,8
WCs	1%	10	WC, Sanitary	200	270	West	51%	x	4,4	2,8	3,3	3,0	2,1		none	22	21,6			Manual	Without motion	1890		1070,0	1070,2	23,1	2782,5
WCs	1%	10	WC, Sanitary	200	270	West	51%		5,0	4,0	3,3	3,0			none	22	21,6			Manual	Without motion	1890		1350,0	1350,2	29,2	3510,6
Gymnasium	1%	3	Computer room	300	90	East	51%	x	5,8	11,9	3,3	1,6	9,4		none	8	8,0			Manual	Without motion	1890		635,7	235,5	5,1	612,3
Mechanical room	2%	39	Storage, Services	100	180	South	51%		5,0	4,0	3,3	3,0			none	14	13,8			Manual	Without motion	2750		1930,0	2466,5	26,6	6413,0
Others without windows	0%	37	Secondary Areas	100	90	East	51%		5,0	4,0	3,3	3,0			none	14	13,8			Manual	Without motion	2750		0,0	0,0	0,0	0,0
Entrances	0%	1	Lobbies	200	270	West	51%	x	2,2	6,2	3,3	3,0	5,2		medium	7	7,2			Manual	Without motion	1890		0,0	0,0	0,0	0,0
Classroom east level -	2%	6	Classroom	300	90	East	51%	x	5,8	19,1	3,3	1,4	6,8		none	8	8,0			Manual	Without motion	1890		1527,3	1131,5	12,2	2941,9
Corridors	1%	2	Corridors	100	0	North	51%	x	2,8	14,7	3,3	2,3	8,8		low	5	4,6			Manual	Without motion	1890		1020,0	217,3	4,7	564,9
WC	0%	10	WC, Sanitary	200	260	West	51%	x	1,0	1,3	3,3	2,0	0,6		low	22	21,6			Manual	Without motion	1890		0,0	0,0	0,0	0,0
WC	0%	10	WC, Sanitary	200	0	North	51%	x	2,8	1,7	3,3	2,3	0,9		low	22	21,6			Manual	Without motion	1890		0,0	0,0	0,0	0,0
Computer room	1%	3	Computer room	300	180	South	51%	x	5,9	8,7	3,3	3,2	8,0		low	8	8,0			Manual	Without motion	1890		496,0	183,7	4,0	477,7
Bookstore	0%	4	Bookstore	300	180	South	51%	x	5,9	2,7	3,3	3,2	2,7		low	8	8,0			Manual	Without motion	1620		0,0	0,0	0,0	0,0
Teacher offices sectio	0%	5	Teacher offices	300	180	South	51%	x	5,9	2,7	3,3	2,6	1,8		none	8	8,0			Manual	Without motion	1890		0,0	0,0	0,0	0,0

Canteen	1%	6	Classroom	300	180	South	51%	x	5,9	8,7	3,3	3,2	8,0		low	8	8,0			Manual	Without motion	1890		1134,0	420,1	9,1	1092,2
Teacher offices sectio	0%	5	Teacher offices	300	180	South	51%	x	5,9	2,7	3,3	2,6	1,8		none	8	8,0			Manual	Without motion	1890		0,0	0,0	0,0	0,0
Teacher offices sectio	1%	5	Teacher offices	300	180	South	51%	x	5,9	2,7	3,3	2,6	1,8		none	8	8,0			Manual	Without motion	1890		978,1	362,3	7,8	942,0
							51%								none		0,0			Manual	Without motion					0,0	

Office Equipment	Room Category	Room Category	In the thermal envelope? (1/0)	Existing/Planned ? (1/0)		Quantity		Power Rating (W)		Utilisation Hours per Year (h/a)		relative absenteeism			Duration of Utilisation in Energy Saving Mode (h/a)		Useful Energy (kWh/a)		Electricity Demand (kWh/a)	Primary Energy Demand (kWh/a)
		2								9	20	18								
PC 1	3	Computer room	1	1	*	20	*	55	* (	756	* (1-	0,3	)			=	582	=	582,1	1514
PC in Energy Saving Mode			1			20	*	2,0	*	756	*	0,3				=	9	=	9,1	24
Monitor 1	3	Computer room	1	1	*	20	*	20	* (	756	* (1-	0,3	)			=	212	=	211,7	550
Monitor in Energy Saving Mode			1			20	*	1,5	*	756	*	0,3				=	7	=	6,8	18
PC 2	5	Teacher offices	1	1	*	4	*	55	* (	1323	* (1-	0,3	)			=	204	=	203,7	530
PC in Energy Saving Mode			1			4	*	2,0	*	1323	*	0,3				=	3	=	3,2	8
Monitor 2	5	Teacher offices	1	1	*	4	*	20	* (	1323	* (1-	0,3	)			=	74	=	74,1	193
Monitor in Energy Saving Mode			1			4	*	1,5	*	1323	*	0,3				=	2	=	2,4	6
Copier	5	Teacher offices	1	1	*	1	*	400	* (	1890				-	1701	) =	76	=	75,6	197
Copier in Energy Saving Mode			1			1	*	30	*	1701						=	51	=	51,0	133
Printer	5	Teacher offices	1	1	*	1	*	300	* (	1890				-	1701	) =	57	=	56,7	147
Printer in Energy Saving Mode			1			1	*	2	*	1701						=	3	=	3,4	9
Server	5	Teacher offices	1	1	*	0	*	100	* (	1890						=	0	=	0,0	0
Server in Energy Saving Mode			1			0	*	2,0	* (	8760				-	1890	) =	0	=	0,0	0
Telephone System			1	1	*	1	*	94	*	8760						=	823	=	823,4	2141
Hand Dryer (WC)			1	1	*	4	*	2000	*	20						=	160	=	160,0	416
TV + DVD			1	1	*	1	*	440	*	250						=	110	=	110,0	286
TV + DVD in Ener. Saving Mode			1	1	*	1	*	44	*	250						=	11	=	11,0	29
					*		*		*							=	0	=	0,0	0
					*		*		*							=	0	=	0,0	0

Kitchen / Aux. Electricity	Room Category	Predominant Utilisation Pattern of Building	In the thermal envelope? (1/0)	Existing/Planned? (1/0)		Utilisation Days per Year (d/a)		Number of Meals per Utilisation Day		Norm Consumption		Useful Energy (kWh/a)		Non-Electric Fraction	Electric Fraction		Additional demand		Marginal Performance Ratio			Solar Fraction		Other Primary Energy Demand (kWh/a)	Electricity Demand (kWh/a)	Primary Energy Demand (kWh/a)
						8				kWh / Meal																
Cooking	8	Kitchen	1	1	*	180	*	100	*	0,25	=	4500	{ *		0%								=		0,0	0
Gas										kWh / Cover			*	100%									=	4500		4950
Dishwashing			1	1	*	180	*	100	*	0,10	=	1800	{ *		55%								=		990,0	2574
DHW connection										kWh/d			*	45%		* (1+	0,30	) *	1,20	*(1-		0,15	) =	1080		0
Refrigerating			1	1		365				1,64	=	599	*		100%								=		598,6	1556
Exrta cooking energy use - old cooking equipment			1	1		180				0,0		0	*		100%								=		0,0	0
Coffee machine			1	1		200				0,25		50	*		100%								=		50,0	130
												0	*		100%								=		0,0	0
												0	*		100%								=		0,0	0
												0	*		100%								=		0,0	0
												0	*		100%								=		0,0	0
												0	*		100%								=		0,0	0
												0	*		100%								=		0,0	0
Total Auxiliary Electricity												50946									Hot Water Non-Electric Dishwashing				50946,5	132461
Total												101635 kWh									1053			5580	96325 kWh/a	255395 kWh/a
Specific Demand																					0,2			1,2	21 kWh/(m²a)	55 kWh/(m²a)

EnerPHit planning: # AUXILIARY ELECTRICITY

Building: Primary School 8 "Sveti Sveti Kiril I Metodi" - Section B

Treated Floor Area	4630	m²
Heating period	194	d
Air Volume	11576	m³
Dwelling Units	1	HH
Enclosed Volume	15290	m³

Operation Vent. System Winter	4,66	kh/a
Operation Vent. System Summer	4,10	kh/a
Air Change Rate	0,18	h^{-1}
Defrosting HX from	4,0	°C

Primary Energy factor - Electricity	2,60	kWh/kWh
Annual Space Heating Demand	17	kWh/(m²a)
Boiler Rated Power	400	kW
DHW System Heating Demand	59405	kWh/a
Design Flow Temperature	55	°C

Column Nr.	1	2	3		4		5		6		7		8		9		10		11	12
Application	Used ? (1/0)	Within the Thermal Envelope? (1/0)	Norm Demand		Utilization Factor		Period of Operation		Reference Size		Electricity Demand (kWh/a)		Available as Interior Heat		Used During Time Period (kh/a)		Internal heat source Winter (W)		Internal heat source Summer (W)	Primary Energy Demand (kWh/a)
Ventilation System																				
Winter Ventilation	1		0,40	Wh/m³	* 0,18	h^{-1}	* 4,7	kh/a	* 11576	m³	= **3776**		considered in heat recovery efficiency							**9818**
Defroster HX	1	1	11031	W	* 1,00		* 0,8	kh/a	* 1		= **8426**	*	1,0	/	4,66	=	**1810**			**21908**
Summer Ventilation	1	1,00	0,37	Wh/m³	* 1,79	h^{-1}	* 4,1	kh/a	* 11576	m³	= **31076**	*	1,0	/	4,10	=			**7571**	**80797**
																			Internal heat sources ' Additional summer ventilation' 1030	
Additional ventilation summer	1	1,00	0,30	Wh/m³	* 0,30	h^{-1}	* 4,1	kh/a	* 11576	m³	= **4227**	*	1,0	/	4,10	=				**10989**
Heating System					Controlled/UnControlled (1/0)															
Enter the Rated Power of the pump				W																
Circulation Pump	1	1	461	W	* 1,0		* 4,7	kh/a	* 1		= **2146**	*	1,0	/	4,66	=	**461**			**5579**
Boiler Electricity Consumption at 30% Load				W																
Aux. Energy - Heat. Boiler	1	0	266	W	* 1,00		* 0,65	kh/a	* 1		= **172**	*	1,0	/	4,66	=	**0**			**447**
Aux. Energy - Wood fired/pellet boiler	0	0	Data entries in Boiler worksheet. Auxiliary energy demand including possible drinking water prod.								**0**	*	1,0	/	4,66	=	**0**			**0**
DHW system																				
Enter average power consumption of pump				W																
Circulation Pump	1	1	66	W	* 1,00		* 8,2	kh/a	* 1		= **542**	*	0,5	/	8,76	=	**33**		**33**	**1410**
Enter the Rated Power of the pump				W																
Storage Load Pump DHW			333	W	* 1,00		* 0,1	kh/a	* 1		= **0**	*	1,0	/	4,66	=	**0**		**0**	**0**
Boiler Electricity Consumption at 100% Load				W																
DHW Boiler Aux. Energy	1	0	798	W	* 1,00		* 0,1	kh/a	* 1		= **101**	*	1,0	/	4,66	=	**0**		**0**	**264**
Enter the Rated Power of the Solar DHW pump				W																
Solar Aux Electricity	1		275	W	* 1,00		* 1,8	kh/a	* 1		= **481**	*	0,5	/	8,76	=	**0**		**0**	**1250**
Misc. Aux. Electricity																				
Misc. Aux. Electricity				kWh/a	* 1,00		* 1,0		* 1	HH	= **0**	*	1,0	/	8,76	=	**0**		**0**	**0**
Total											**50946**						**2304**		**7604**	**132461**
Specific Demand	kWh/(m²a)		divided by treated floor area:								**11,0**									**28,6**

EnerPHit planning:

INTERNAL HEAT GAINS

Building: Primary School 8 "Sveti Sveti Kiril I Metodi" **Calculation in worksheet 'IHG non-res'!**

Utilisation Pattern: School — 2,80 W/m²

Type of Values Used: Standard — 12,18 W/m² in summer

No data input necessary — 1,34 W/m²

Go to utilisation pattern selection

Calculation Internal Heat Household

Persons 680,0 P

Living Area 4630 m²

Heating Demand 17 kWh/(m²a)

Heating period 194 d/a

Column Nr.		1	2	3		4	5		6		7		8		9		10
Application		Existing (1/0), or number of people	In the Thermal Envelope (1/0)	Norm Consumption		Utilization Factor	Frequency		Useful Energy (kWh/a)		Included in Electricity Balance?		Availability		Used During Time Period (kh/a)		**Internal heat source Winter (W)**
Dishwashing		1	1	1,1	kWh/Use	1,00	65	/(P*a)	48620	*			0,30	/	8,76	=	**1665**
Clothes Washing		1	1	1,1	kWh/Use	1,00	57	/(P*a)	42636	*			0,30	/	8,76	=	**1460**
Clothes drying with:		1	1	3,5	kWh/Use	0,88	57	/(P*a)	118703	*			0,70	/	8,76	=	**9485**
Condensation Dryer			1	0,0					0				0,80				
Energy consumed by evaporation		0	1	-3,1	kWh/Use	0,60	57	/(P*a)	0	* (1-	0	) *	0,00	/	8,76	=	**0**
Refrigerating		1	1	0,8	kWh/d	1,00	365	d/a	285	*			1,00	/	8,76	=	**33**
Freezing		1	0	0,9	kWh/d	0,90	365	d/a	289	*			1,00	/	8,76	=	**0**
or combination		0	1	1,0	kWh/d	1,00	365	d/a	0	*			1,00	/	8,76	=	**0**
Cooking		1	1	0,3	kWh/Use	1,00	500	/(P*a)	85000	*			0,50	/	8,76	=	**4852**
Lighting		1	1	60,0	W	1,00	2,9	kh/(P*a)	118320	*			1,00	/	8,76	=	**13507**
Consumer Electronics		1	1	80,0	W	1,00	0,55	kh/(P*a)	29920	*			1,00	/	8,76	=	**3416**
Household Appliances/Other		1	1	50,0	kWh	1,00	1,0	/(P*a)	34000	*			1,00	/	8,76	=	**3881**
Auxiliary Appliances (cf. Aux Electricity Sheet)																=	**2304**
Other Applications (cf. Electricity Sheet)		0	0,0						0	*			0	/	8,76	=	**0**
Persons		680	1	80,0	W/P	1,00	8,76	kh/a	476544	*			0,55	/	8,76	=	**29920**
Cold Water		680	1	-4,1	W/P	1,00	8,76	kh/a								=	**-2821**
DHW - circulation		1	1	92,2	W	1,00	8,76	kh/a	807	*			1,00	/	8,76	=	**92**
DHW - individual pipes		1	1	162,0	W	1,00	8,76	kh/a	1419	*			1,00	/	8,76	=	**162**
DHW - storage		1	1	139,3	W	1,00	8,76	kh/a	1220	*			1,00	/	8,76	=	**139**
Evaporation		680	1	-25,0	W/P	1,00	8,76	kh/a	######	*			1,00	/	8,76	=	**-17000**
Total															W		**50701**
Specific Demand															W/m²		**10,95**
Heat Available From Internal Sources											194	d/a			kWh/(m²a)		**51,0**

EnerPHit planning: **I N T E R N A L H E A T G A I N S non-residential Use**

Building: Primary School 8 "Sveti Sveti Kiril I Metodi"

Utilisation Pattern: School | 2,80 W/m² | Type of Values Used: Standard | No data input necessary

Calculation Internal Heat

Persons: 680,0 P | Treated floor area: 4630,41 m² | Heating period: 193,97 d/a | Room Temperature: 20 °C | Internal Heat Gains Aux. Electricity: 2303,8 W

Column Nr.

Persons	Select	Utilisation Pattern	Select	Activity of Persons	Planning with the number of persons or via floor area of utilisation zone (planning via area only if the occupancy is available for this utilisation pattern). Pers./Area (1 / 0)		Number of Occupants		Floor Area of Utilisation Zone (m²)		Average Occupancy (Persons / m²) (27)		Heat emitted per person (W)		Utilisation Hours per Year [h/a] (9)		Relative Presence (18)		Used in Time Span (h/a)		Average Heat Emitted by Persons (W)
Persons A	6	Classroom	1	<= 10 yr., sitting	1	Planning with occupancy	{ 290 }*	or	{		* 0,333333333	}*	60	*	1890	*	0,75	/	8760	=	2816
Persons B	6	Classroom	2	> 10 yr., sitting	1	Planning with occupancy	{ 290 }*	or	{		* 0,333333333	}*	80	*	1890	*	0,75	/	8760	=	3754
Persons C	5	Teacher offices	2	> 10 yr., sitting	1	Planning with occupancy	{ 45 }*	or	{		* 0,1	}*	80	*	1890	*	0,70	/	8760	=	544
Persons D	3	Computer room	2	> 10 yr., sitting	1	Planning with occupancy	{ 20 }*	or	{		* 0,5	}*	80	*	1890	*	0,70	/	8760	=	242
Persons E	9	Canteen	2	> 10 yr., sitting	1	Planning with occupancy	{ 30 }*	or	{		* No standard value	}*	80	*	990	*	0,20	/	8760	=	54
Persons F	8	Kitchen	1	<= 10 yr., sitting	1	Planning with occupancy	{ 5 }*	or	{		* No standard value	}*	60	*	990	*	0,20	/	8760	=	7
Persons G				Invalid data input		Enter occupancy or floor area	{ }*	or	{		* No standard value	}*	0	*	0	*	1,00	/	8760	=	0
Evaporation (person specific)							573 *								1890	*	0,75	/	8760	=	0

Lighting / Equipment / Aux. Electricity	Useful Energy [kWh/a]	Availability	Used in Time Period (kh/a)	Average Heat Release
Lighting	41356	* 1,00	/ 8,76	= 4721
Office Applications (Within Therm. Envelope)	2384	* 1,00	/ 8,76	= 272
Cooking (Within Therm. Envelope)	4500	* 0,50	/ 8,76	= 257
Dishwashing (Within Therm. Envelope)	1800	* 0,30	/ 8,76	= 62
Cooling (Within Therm. Envelope)	599	* 1,00	/ 8,76	= 68
Other (Within Therm. Envelope)	50	* 1,00	/ 8,76	= 6
Auxiliary Appliances (See Aux Electricity Worksheet)				= 2304

Heat loss due to cold water (calculation from column AJ)	on/off (1 / 0)	Predominant Utilisation Pattern of Building (Data transfered from Electricity non-res worksheet; input kitchen) (2)	Number of WCs (user data)	Amount of WCs: Standard values for schools are used (X)	Number of WCs (calculation value)	DT: Cold Water Temp. - Room Temp. [K]	Occupied Days per Year [d/a] (8)	Loss daytime [W]	Loss Nighttime [W]	Availability	Used in Period (d/a)	Average Power Cold Water
Cold Water Due to Flushing WC		8 Kitchen			0	-8	180	*(-40	+ -13	)* 1,00	/ 365	= 0

Total	W	15106
Specific Demand	W/m²	3,3
Heat Available From Internal Sources	194 d/a	kWh/(m²a) 15

EnerPHit planning:

PRIMARY ENERGY VALUE

Building: Primary School 8 "Sveti Sveti Kiril I Metodi" - Section B

Building type: School

Treated Floor Area A_{TFA}: 4630 m²

Space Heating Demand incl. Distribution: 17 kWh/(m²a)

Useful cooling demand incl. dehumidification: kWh/(m²a)

			Final Energy kWh/(m²a)	Primary Energy kWh/(m²a)	Emissions CO_2-Equivalent kg/(m²a)
Electricity Demand (without Heat Pump)				PE Value	CO_2-Emissions Factor (CO_2-Equivalent)
Covered Fraction of Space Heating Demand		*(Project)*	0%	kWh/kWh	g/kWh
Covered Fraction of DHW Demand		*(Project)*	0%	2,6	680
Direct Electric Heating	$Q_{H,de}$		0,0	0,0	0,0
Hot water, direct electric (without DHW wash&dish)	$Q_{DHW,de}$	*(DHW+Distribution, SolarDHW)*	0,0	0,0	0,0
Electric Post heating DHW Wash&Dish		*(Electricity, SolarDHW)*	0,0	0,0	0,0
Electricity demand lighting/auxiliary tools/kitchen	Q_{EHH}	*(Electricity worksheet)*	9,8	25,5	6,7
Electricity Demand - Auxiliary Electricity			11,0	28,6	7,5
Total electricity demand (without heat pump)			**20,8**	**54,1**	**14,1**
Heat pump				PE Value	CO_2-Emission Factor (CO_2-Equivalent)
Covered Fraction of Space Heating Demand		*(Project)*	0%	kWh/kWh	g/kWh
Covered Fraction of DHW Demand		*(Project)*	0%	2,6	680
Energy Carrier - Supplementary Heating			Electricity	2,6	680
Annual coefficient of performance of heat pump 1 (heating / heating&DHW)	SPF_{H-1}	*(HP worksheet)*			
Annual coefficient of performance of heat pump 2 (DHW)	SPF_{H-1}	*(HP worksheet)*			
Heat generation efficiency (excl. DHW wash&dish)		*(HP worksheet)*			
Heat generation efficiency (incl. DHW wash&dish)		*(HP worksheet)*			
Electricity Demand Heat Pump (without DHW Wash&Dish)	Q_{HP}	*(HP worksheet)*	0,0	0,0	0,0
Non-Electric Demand, DHW Wash&Dish			0,0	0,0	0,0
Total electricity demand heat pump		*(HP worksheet)*	**0,0**	**0,0**	**0,0**
Compact Heat Pump Unit				PE Value	CO_2-Emission Factor (CO_2-Equivalent)
Covered fraction of space heating demand		*(Project)*	0%	kWh/kWh	g/kWh
Covered Fraction of DHW Demand		*(Project)*	0%	2,6	680
Energy Carrier - Supplementary Heating			Electricity	2,6	680
COP Heat Pump Heating	SPF_{H-1}	*(Compact worksheet)*	0,0		
COP Heat Pump DHW	SPF_{H-1}	*(Compact worksheet)*	0,0		
Heat generation efficiency (excl. DHW wash&dish)		*(Compact worksheet)*			
Heat generation efficiency (incl. DHW wash&dish)		*(Compact worksheet)*			
Electricity Demand Heat Pump (without DHW Wash&Dish)	Q_{HP}	*(Compact worksheet)*	0,0	0,0	0,0
Non-Electric Demand, DHW Wash&Dish			0,0	0,0	0,0
Total Compact Unit		*(Compact worksheet)*	**0,0**	**0,0**	**0,0**
Boiler				PE Value	CO_2-Emission Factor (CO_2-Equivalent)
Covered fraction of space heating demand		*(Project)*	100%	kWh/kWh	g/kWh
Covered Fraction of DHW Demand		*(Project)*	100%	1,1	250
Boiler Type		*(Boiler worksheet)*	Low Temperature Boi-ler Gas		
Performance Ratio of Heat Generator		*(Boiler worksheet)*	114%		
Annual Energy Demand (without DHW Wash&Dish)		*(Boiler worksheet)*	31,3	34,5	7,8
Non-Electric Demand, DHW Wash&Dish		*(Electricity worksheet)*	0,2	0,2	0,1
Total heating oil/gas/wood			**31,5**	**34,7**	**7,9**
District Heat				PE Value	CO_2-Emission Factor (CO_2-Equivalent)
Covered fraction of space heating demand		*(Project)*	0%	kWh/kWh	g/kWh
Covered Fraction of DHW Demand		*(Project)*	0%		0
Heat source		*(District heating worksheet)*			
Performance Ratio of Heat Generator		*(District heating worksheet)*	0%		
Heating Demand District Heat (without DHW Wash&Dish)		*(District heating worksheet)*	0,0	0,0	0,0
Non-Electric Demand, DHW Wash&Dish		*(Electricity worksheet)*	0,0	0,0	0,0
Total district heat			**0,0**	**0,0**	**0,0**
Other				PE Value	CO_2-Emission Factor (CO_2-Equivalent)
Covered fraction of space heating demand		*(Project)*	0%	kWh/kWh	g/kWh
Covered Fraction of DHW Demand		*(Project)*	0%	0,2	55
Heat source		*(Project)*	Wood		
Performance Ratio of Heat Generator		*(Project)*	0%		
Annual Energy Demand, Space Heating			0,0	0,0	0,0
Annual Energy Demand, DHW (without DHW Wash&Dish)			0,0	0,0	0,0
Non-Electric Demand, DHW Wash&Dish		*(Electricity worksheet)*	0,0	0,0	0,0
Non-Electric Demand Cooking/Drying (Gas)		*(Electricity worksheet)*	1,0	1,1	0,1
Total - Other			**1,0**	**1,1**	**0,1**
Cooling with Electric Heat Pump				PE Value	CO_2-Emission Factor (CO_2-Equivalent)
				kWh/kWh	g/kWh
Covered Fraction of Cooling Demand		*(Project)*	100%	2,6	680
Heat source			Electricity		
Seasonal energy efficiency ratio cooling					
Energy Demand Space Cooling			**0,0**	**0,0**	**0,0**
Heating, cooling, DHW, auxiliary electricity, lighting, electrical appliances			**53,3**	**89,9**	**22,1**
Total PE Value		**89,9**	kWh/(m²a)		
Total emissions CO_2-Equivalent		**22,1**	kg/(m²a)		(Yes/No)
Primary Energy Requirement		**123**	kWh/(m²a)		**yes**
Heating, DHW, auxiliary electricity (no lighting and electrical appliances)			**42,3**	**63,1**	**15,3**
Specific PE Demand - Mechanical System		**63,1**	kWh/(m²a)		
Total emissions CO_2-Equivalent		**15,3**	kg/(m²a)		
Solar electricity			kWh/a	PE-Value (Generation) kWh/kWh	CO_2-Emission Factor g/kWh
Planned Annual Electricity Generation		*(Worksheet PV)*			
Specific Demand					
PE Value: conservation by solar electricity			kWh/(m²a)		
Saved CO_2 emissions through solar electricity			kg/(m²a)		

EnerPHit planning: **HEAT PUMP**

Building: Primary School 8 "Sveti Sveti Kiril I Metodi" | Building type: School
Climate: Велико Търнов | Treated Floor Area A_{TFA}: 4630 m²

lows

Covered fraction of space heating demand			*(PE Value worksheet)*	0%	
Space Heat Demand + Distribution Losses		Q_H+Q_{HL}:	*(DHW+Distribution)*	80824	kWh/a
Solar fraction for space heat		$\eta_{Solar,\ H}$	*(SolarDHW worksheet)*	4%	
Effective Annual Heat Demand		$Q_{H,Wi}=Q_H*(1-\eta_{Solar,\ H})$		**0**	kWh/a
Covered Fraction of DHW Demand			*(PE Value worksheet)*	0%	
Total heat demand of DHW system		Q_{gDHW}	*(DHW+Distribution)*	57698	kWh/a
Solar fraction for DHW		$\eta_{Solar,\ DHW}$	*(SolarDHW worksheet)*	0%	
Effective DHW demand		$Q_{DHW,Wi}=Q_{DHW}*(1-\eta_{Solar,\ DHW})$		**0**	kWh/a
Number of heat pumps in the system				1	
Functionality				Heating & DHW	

Heating

Selection of HP:	None	Heat source:			
Selection of distribution system				Supply air heating	
Design distribution temperature		θ_{design}	*(DHW+Distribution)*	55,00	°C
Nomimal Power of distribution system		P_{nom}		300,00	kW

Distribution system (fulfilled from expert users only)

Nominal Power of distribution system		P_{nom}		300,00	kW
Radiator exponent		n		1,30	
Heating storage				No	
Specific heat losses storage		U * $A_{storage}$			W/K
Storage location in thermal envelope	Inside or outside of the thermal envelope			Inside	
Room temperature (Storage location: outside of thermal envelope)			*(DHW+Distribution)*	15,00	°C
Sink temperature of heat pump for heating		θ_{snk}		55,00	°C

Entries in relation to the domestic hot water system

Selection of HP:	None	Heat source:			
DHW temperature			*(DHW+Distribution)*	60,00	°C
DHW storage location	inside or outside of the thermal envelope			Outside	
Specific heat losses storage		U * $A_{storage}$		2,5	W/K
Room temperature (Storage location: outside of thermal envelope)			*(DHW+Distribution)*	10,00	°C
Type of backup heater				Electr. immersion heater	
Δθ of Electric flow type heater				5,0	K

In case of one heat pump with functionality: Heating & DHW

Same heat pump's sink temperature for Heating and for DHW				No	
Heat Pump Priority			*(Manufacturer, Techn. Data)*	DHW priority	

Control

Control strategy				On / off	

Heating

Depth (horizontal / vertical) ground heat exchanger		z		50,0	m
Power of pump for ground heat exchanger		P_{pump}		0,05	kW

EnerPHit planning: **H E A T P U M P**

0

Heating

Heat pump:
Source:

	θ_source °C	θ_sink °C	Heating capacity kW	COP
Test Point 1				
Test Point 2				
Test Point 3				
Test Point 4				
Test Point 5				
Test Point 6				
Test Point 7				
Test Point 8				
Test Point 9				
Test Point 10				
Test Point 11				
Test Point 12				
Test Point 13				
Test Point 14				
Test Point 15				

Temperature difference in sink $\Delta\theta_{Sink}$ K

DHW

Heat pump:
Source:

	θ_source °C	θ_sink °C	Heating capacity kW	COP
Test Point 1				
Test Point 2				
Test Point 3				
Test Point 4				
Test Point 5				
Test Point 6				
Test Point 7				
Test Point 8				
Test Point 9				
Test Point 10				
Test Point 11				
Test Point 12				
Test Point 13				
Test Point 14				
Test Point 15				

Temperature difference in sink $\Delta\theta_{Sink}$ K

Electrical energy consumption of pump (groundwater / groun	Q_{pump}	0	kWh/a
Energy by Direct Electricity	$Q_{E,dir}$	0	kWh/a
Space heat supplied by HP	$Q_{HP,Heating}$	0	kWh/a
Winter DHW supplied by HP	$Q_{HP,DHW,Winter}$	0	kWh/a
Summer DHW supplied by HP	$Q_{HP,DHW,Summer}$	0	kWh/a
Space heating supplied by HP without storage losses	$Q_{HP,Heating}$	0	kWh/a
Winter DHW supplied by HP without storage losses	$Q_{HP,DHW,Winter}$	0	kWh/a
Summer DHW supplied by HP without storage losses	$Q_{HP,DHW,Summer}$	0	kWh/a
Electrical consumption of HP	Qel_{HP}		kWh/a

		1. HP: Heating or heating & DHW	2. HP: Domestic hot water
Seasonal performance factor of Heat Pump	SPF_{H-1}		
Seasonal Performance factor of System	SPF_{H-3}		
Heat generation efficiency DHW & heating			
		kWh/a	kWh/(m²a)
Final electrical energy demand heat generation	Q_{final}		
Annual primary energy demand			
		kg/a	kg/(m²a)
Annual CO_2-Equivalent Emissions			

EnerPHit planning:

HP Ground (Ground probes / Ground collectors)

Building: Primary School 8 "Sveti Sveti Kiril I Metodi" - Section B Building type: School

Climate: Велико Търнов Treated Floor Area A_{TFA}: 4630 m²

Ground probes

Probe field configuration		A	Individual probe	
Length of probe	*(HP worksheet)*	H	50	m
Probes spacing/distance		B		m
Depth (z=H/2)		z	25	m
Type of probe		A	Double-U	
Borehole radius		R_b		m
Inner radius of pipe		R_i		m
Exterior pipe radius		R_a		m
Distance between pipes		BU		m
Inner radius of pipe casing (only coaxial)		R_{i2}		m
Exterior radius casing pipe (only coaxial)		R_{a2}		m
Thermal conductivity of pipe		λ_R		W/(mK)
Thermal conductivity of back fill		λ_F		W/(mK)
Probe time constant		t_p	#DIV/0!	d
Internal borehole resistance		R_a		Km/W
Borehole resistance		R_b		Km/W

Ground

Soil type	J	0	
Density of the ground	ρ_E	0	kg/m³
Thermal capacity of ground	cp_E	0	J/(kgK)
Thermal conductivity of ground	λ_E	0,0	W/(mK)
Soil temperature conductivity	a_E	#DIV/0!	m/s²
Ground temperature gradient	ΔT_G	0,022	K/m

Brine

Brine (characteristics at 2 °C)	E	0	
Density of the brine	ρ_S	0	kg/m³
dynamic viscosity of the brine	η_S	0	kg/(ms)
Heat capacity brine	cp_S	0	J/(kgK)
Thermal conductivity of brine	λ_S	0	W/(mK)
Brine - mass flow	m_S		kg/s

Operation type

Waste heat of active cooling to ground probe? Please check, if applicable.			
Heat pump operation duration			h/a
Specific heat extraction rate as an annual average	q_{ex}		W/m
	H/R_b		W/K

Ground collectors

Inner radius of pipe	r_i	0,013	m
Exterior pipe radius	r_a	0,016	m
Thermal conductivity of pipe	λ_r	0,420	W/(mK)
Pipe depth	z_{pipe}	50	m
Ground water depth	z_{gw}		m
Pipe spacing	D	0,4	m
Base area		80	m²
Pipe outer surface		20,1	m²
Pipe length	L	200,0	m

Brine

Brine (characteristics at 2 °C)	E	0	
Density of the brine	ρ_S	0	kg/m³
dynamic viscosity of the brine	η_S	0	kg/(ms)
Heat capacity brine	cp_S	0	J/(kgK)
Thermal conductivity of brine	λ_S	0	W/(mK)
Brine - mass flow	m_S	0,5	kg/s
Specific heat extraction rate	q_{ex}		W/m²
U * A			W/K

Climate

Period duration		365	d
Average ground surface temperature	T_{m0}	11,4	°C
Surface temperature amplitude	T1	11,4	°C
Phase shifting surface	t_{02}	31	d

EnerPHit planning:

HP Ground (Ground probes / Ground collectors)

Ground characteristics		Thermal conductivity [W/(mK)]	Density [kg/m³]	Heat capacity [J/(kg K)]	Heat capacity [MJ/(m³ K)]	Temperature conductivity [10-7 m²/s]	Source
A	Sand, 9% moisture	0,980	1440	1507	2,170	4,520	[Neiß 1977]
B	Sand, 13% moisture	1,500	1600	1800	2,880	5,210	[Neiß 1977]
C	Ground, coarse gravel	0,520	2000	1840	3,680	1,410	[VDI 1984]
D	Loam, 36% moisture	2,300	1650	2847	4,700	4,900	[Neiß 1977]
E	Clay	1,280	1500	880	1,320	9,700	[VDI 1984]
F	Clay / Silt	2,200	2550	882	2,250	9,780	[VDI 2000]
G	Slate	2,100	2700	870	2,350	8,940	[VDI 2000]
H	Silt	1,500	1920	2938	5,640	2,660	[ISO 13370]
I	Rock	3,500	2500	2500	6,250	5,600	[ISO 13370]
J							

Properties of the brine		Temperature [°C]	Density [kg/m³]	Heat capacity [J/(kg K)]	Thermal conductivity [W/(mK)]	Dynamic viscosity [kg/(ms)]
A	Ethylene glycol 25%	2	1052	3950	0,480	0,0052
B	Potassium carbonate	2	1265	2941	0,544	0,0031
C	Potassium formate	2	1226	3190	0,534	0,00237
D	Water	2	997	4190	0,590	0,001307
E						

Result ground probe calculation

Month	Borehole Temperature °C
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	

EnerPHit planning: **COMPACT UNIT WITH EXHAUST AIR HEAT PUMP**

Calculation based on measured values of the laboratory evaluation for component certification

Building: Primary School 8 "Sveti Sveti Kiril I Metodi" - Se | Building type: School

Treated Floor Area A_{TFA}: 4630 m²

				incl. DHW Connection for Washing Machines & Dishwashers	
Covered fraction of space heating demand	*(PE Value worksheet)*	0%			
Space Heating Demand + Distribution Losses	Q_H+Q_{HL} *(DHW+Distribution)*	80824	kWh		
Solar contribution for space heaing	$\eta_{Solar,\ H}$ *(SolarDHW worksheet)*	4%			
Effective Annual heating demand	$Q_{H,WI}=Q_H*(1-\eta_{Solar,\ H})$	0	kWh		
Covered Fraction of DHW Demand	*(PE Value worksheet)*	0%			
Total Heating Demand of DHW system	Q_{gDHW} *(DHW+Distribution)*	58352	kWh	59405	kWh
Solar contribution for DHW	$\eta_{Solar,\ DHW}$ *(SolarDHW worksheet)*	15%		15%	
Effective DHW Demand	$Q_{DHW,WI}=Q_{DHW}*(1-\eta_{Solar,\ DHW})$	0	kWh	0	kWh

Sort: AS LIST

Compact unit selection: Go to list of compact units

Measured Values from Laboratory Test Invalid selection: for the time being compact HP units or combined HPs can ONLY be considered as single units, meaning they can ONLY be calculated with the 'Ventilation' worksheet (please check the

Ventilation

Effective heat recovery efficiency	η_{eff} *(Test stand)*		
Electric Efficiency	*(Test stand)*		Wh/m³

Heating

		Test point 1	Test point 2	Test point 3	Test point 4	
Ambient Air Temperature	T_{amb}					°C
Measured Thermal Power Heat Pump Heating	$P_{HP,Heating}$					kW
Measured COP Heating	$COP_{Heating}$					-

Domestic Hot Water

		Test point 1	Test point 2	Test point 3	Test point 4	
Ambient Air Temperature	T_{amb}					°C
Measured Thermal Power DHW Storage Heating-Up	$P_{DHW,Heating-Up}$					kW
Measured Thermal Power DHW Storage Reload	$P_{DHW,Reload}$					kW
Measured COP DHW Storage Heating-Up	$COP_{DHW,Heating-Up}$					-
Measured COP DHW Storage Reload	$COP_{DHW,Reload}$					-

Standby (Inputs required only if different from storage reload)

		Test point 1	Test point 2	Test point 3	Test point 4	
Ambient Air Temperature	T_{amb}					°C
Measured Thermal Power Heat Pump Standby	$P_{HP,Standby}$					kW
Measured COP Standby	$COP_{Standby}$					-

0%

Specific heat loss storage incl. connections	$U * A_{Storage}$ *(Test stand)*		W/K	
Average Storage Temperature in Standby Mode	$T_{DHW,Standby}$ *(Test stand)*		°C	
Heat pump priority	separate heat pumps	DHW Priority		Heating priority
	Room temperature (°C)	20		
	Av. Ambient Temp. Heating P. (°C)	5		
	Av. Ground Temp (°C)	11		
Efficiency SHX Exhaust Air Mixing	η^*_{SHX}			
Heat Recovery Efficiency SHX Exhaust Air Mixing (if applicable)	$\eta_{SHX,add}$ *(Design Value)*	0%		
Volume Flow Rate of Added Exhaust Air (if applicable)	V_{add} *(Test stand)*		m³/h	
Hydraulic frost protection				

Heat supplied by direct electricity	$Q_{E,dir}$		kWh/a		kWh/a
Space heat supplied by HP	$Q_{HP,Heating}$		kWh/a		kWh/a
Winter DHW supplied by HP	$Q_{HP,DHW,Winter}$	0	kWh/a	0	kWh/a
Winter standby heat supplied by HP	$Q_{HP,Standby,Winter}$		kWh/a		kWh/a
Summer DHW supplied by HP	$Q_{HP,DHW,Summer}$	0	kWh/a	0	kWh/a
Summer standby heat supplied by HP	$Q_{HP,Standby,Summer}$		kWh/a		kWh/a

Performance Ratio of Heat Generator, DHW & Space Heating

Annual Coefficient of Performance SPF_{H-3}

		kWh/a	kWh/(m²a)	kWh/a	kWh/(m²a)
Final energy demand heat generation	Q_{final}				
Annual primary energy demand					

	kg/a	kg/(m²a)	kg/a	kg/(m²a)
Annual CO_2-Equivalent Emissions				

EFFICIENCY OF HEAT GENERATION (gas, oil & wood)

Building: Primary School 8 "Sveti Sveti Kiril I Metodi" - Sectic | Building type: School

Treated Floor Area A_{TFA}: 4630 m²

Covered fraction of space heating demand	*(PE Value worksheet)*	100%	
Space Heating Demand + Distribution Losses	$Q_H+Q_{HS;}$ *(DHW+Distribution)*	80824	kWh
Solar contribution for space heaing	$\eta_{Solar,\ H}$ *(SolarDHW worksheet)*	4%	
Effective Annual heating demand	$Q_{H,Wi}=Q_H*(1-\eta_{Solar,\ H})$	**77549**	kWh
Space Heating Demand without Distribution Losses	Q_H *(Verification sheet)*	80244	kWh
Covered Fraction of DHW Demand	*(PE Value worksheet)*	100%	
Total Heating Demand of DHW system	Q_{gDHW} *(DHW+Distribution)*	59405	kWh
Solar contribution for DHW	$\eta_{Solar,\ DHW}$ *(SolarDHW worksheet)*	15%	
Effective DHW Demand	$Q_{DHW,Wi}=Q_{DHW}*(1-\eta_{Solar,\ DHW})$	**50785**	kWh

				Additional selection only in the case of
Boiler Type	*(Project)*	Low Temperature Boi-ler Gas		Natural Gas
Primary Energy factor	*(Data worksheet)*	1,1	kWh/kWh	
CO_2-Emissions Factor (CO_2-Equivalent)		250	g/kWh	
Useful heat provided	Q_{Use}	128334	kWh/a	
Max. Heating Power Required for Heating the Building	P_{BH} *(Heating load worksheet)*	59,97	kW	
Length of the Heating Period	t_{HP}	4655	h	
Length of DHW Heating Period	t_{DHW}	8760	h	

Use characteristic values entered (check if appropriate)? x

		Project Data		Standard Values		Input field	
Design Output	P_{Nom} *(Rating Plate)*	400	kW	60	kW	400	
Installation of Boiler (Outdoor: 0, Indoor: 1)		0		0		0	
Input Values (Oil and Gas Boiler)		Project Data		Standard Values		Input field	
Boiler Efficiency at 30% Load	$\eta_{30\%}$ *(Manufacturer)*	92%		92%		92%	
Boiler Efficiency at Nominal Output	$\eta_{100\%}$ *(Manufacturer)*	91%		91%		91%	
Standby Heat Loss Boiler at 70 °C	$q_{B,70}$ *(Manufacturer)*	0,4%		0,4%		0%	
Average Return Temperature Measured at 30% Load	$\vartheta_{30\%}$ *(Manufacturer)*	40	°C	40		40	
Input Values (Biomass Heat Generator)		Project Data		Standard Values		Input field	
Efficiency of Heat Generator in Basic Cycle	η_{GZ} *(Manufacturer)*			60%		60%	
Efficiency of Heat Generator in Constant Operation	η_{SO} *(Manufacturer)*			70%		70%	
Average Fraction of Heat Output Released to Heating Circuit	$z_{HC,m}$ *(Manufacturer)*			0,4		0,4	
Temperature Difference Betw. Power-On and Power-Off	$\Delta\vartheta$ *(Manufacturer)*		K	30	K	30	
For Interior Installations: Area of Mechanical Room	$A_{install}$ *(Project)*		m²	0	m²	0	
Useful heat output per basic cycle	$Q_{N,GZ}$ *(Manufacturer)*		kWh	600,0	kWh	600,0	
Average Power Output of the Heat Generator	$Q_{N,m}$ *(Manufacturer)*		kW	400,0	kW	400,0	
Heat generator without pellets conveyor							
Unit with regulation (no fan / no starting aid)							
Heating energy demand for a basic machine cycle	$Q_{HE,GZ}$ *(Manufacturer)*		kWh	12,02	kWh	12,0	kWh
Power consumption in steady state operation	$P_{el,SB}$ *(Manufacturer)*		W	6010	W	6010,0	W

Utilisation factor heat generator heating run	$h_{H,g,K}$ $=f_{\varphi}*\eta_{K}$	89%
Utilisation factor heat generator DHW run	$h_{TW,g,K}$ $=\eta_{100\%}/f_{\varphi,TW}$	86%
Utilisation factor heat generator DHW & heating	$h_{g,K}$	88%

		kWh/a	kWh/(m²a)
Final energy demand space heating	$Q_{Final,\ HE}$ $= Q_{H,wi}* e_{H,g,K}$	87022	
Final energy demand DHW	$Q_{Final,\ DHW}$ $= Q_{DHW,wi}* e_{TW,g,K}$	59030	
Total final energy demand	Q_{Final} $= Q_{Final,DHW} + Q_{Final,HE}$	146052	31,5
Annual primary energy demand		160657	34,7
		kg/a	kg/(m²a)
Annual CO_2-Equivalent Emissions		36513	7,9

Building:	Primary School 8 "Sveti Sveti Kiril I Metodi" - Se	Building type:	School	
		Treated Floor Area A_{TFA}:	4630	m²
Covered fraction of space heating demand		*(PE Value worksheet)*	0%	
Annual heating demand kWh/a		Q_H *(DHW+Distribution)*	80824	kWh
Solar contribution for space heaing		$\eta_{Solar,\ H}$ *(SolarDHW worksheet)*	4%	
Effective Annual heating demand	$Q_{H,Wi}=Q_H*(1-\eta_{Solar,\ H})$		0	kWh
Covered Fraction of DHW Demand		*(PE Value worksheet)*	0%	
DHW Demand		Q_{DHW} *(DHW+Distribution)*	59405	kWh
Solar contribution for DHW		$\eta_{Solar,\ DHW}$ *(SolarDHW worksheet)*	15%	
Effective DHW Demand	$Q_{DHW,Wi}=Q_{DHW}*(1-\eta_{Solar,\ DHW})$		0	kWh
Heat source			None	
Primary Energy factor		*(Data worksheet)*		kWh/kWh
CO_2-Emissions factor (CO_2-Equivalent)		*(Data worksheet)*	0	g/kWh
Utilisation factor of heat transfer station	ha,HX			

		kWh/a	kWh/(m²a)
Final energy demand heat generation	$Q_{final} = Q_{Use} * e_{a,DH}$	0	0,0
Annual primary energy demand		0	0,0
		kg/a	kg/(m²a)
Annual CO_2-Equivalent Emissions		0	0,0

Table of Primary Energy Factors and CO_2-Equivalent Emissions Factors of Various Energy Carriers

Energy Type		Energy Carrier	PE (non-regenerative) kWh_{Prim}/kWh_{Final}	CO_2 GEMIS 3.0 kg/kWh_{Final}
	1	None		
Fuel Source	2	Oil	1,1	0,31
	3	Natural Gas	1,1	0,25
	4	LPG	1,1	0,27
	5	Hard Coal	1,1	0,44
	6	Wood	0,2	0,05
Electricity	7	Electricity-Mix	2,6	0,68
	8	Electricity from Photovoltaics	0,7	0,25
	1	None	0	0
District Heat	2	Hard Coal CGS 70% PHC	0,8	0,24
	3	Hard Coal CGS 35% PHC	1,1	0,32
	4	Hard Coal HS 0% PHC	1,5	0,41
Gas CGS	5	Gas CGS 70% PHC	0,7	-0,07
	6	Gas CGS 35% PHC	1,1	0,13
	7	Gas HS 0% PHC	1,5	0,32
Heating Oil-EL CGS	8	Oil CGS 70% PHC	0,8	0,1
	9	Oil CGS 35% PHC	1,1	0,25
	10	Oil HS 0% PHC	1,5	0,41

Data Source: DIN V 4701-10/GEMIS 4.14

Heat Generator		Selection of gas type	
Nr.	Type	Nr.	Type
1	None	1	Natural Gas
2	Improved gas condensing boi-er	2	LPG
3	Improved oil condensing boi-ler	3	
4	Condensing boi-ler gas		
5	Condensing boi-ler oil		
6	Low Temperature Boi-ler Gas		
7	Low Temperature Boi-ler Oil		
8	Wood Log Burning (Direct and Indirect Release of Heat)		
9	Wood Pellet Burning (Direct and Indirect Release of Heat)		
10	Wood Pellet Burning (Only Indirect Release of Heat)		
11	Reserve		

Dishwashing	Washing
1	DHW Connection
2	Cold water connection

Clothes Drying		Availability Electricity	Availability Evaporation
1	Clothesline	1	1
2	Drying Closet (cold!)	1	1
3	Drying Closet (cold!) in Exhaust Air	0,9	0,9
4	Condensation Dryer	0,7	0
5	Electric Exhaust Air Dryer	1	1
6	Gas Exhaust Air Dryer	1	1

Cooking		Electric Fraction	Primärenergiefaktor	CO_2 factor
1	Electricity	100%	2,6	0,68
2	Natural Gas	0%	1,1	0,25
3	LPG	0%	1,1	0,27