Certificate

Certified Passive House Classic

Earth Cycle Technologies

10 Springfield
Wicklow Town
Co. Wicklow

Authorised by:

Passive House Institute
Dr. Wolfgang Feist
64283 Darmstadt
Germany

211 West 29th Street
West 29th Street, 10001 , United States of America

Certified Passive House
Passive House Institute
| classic | plus | premium |

Client	Bernstein Real estate 150 West 30th Street 10001 , United States of America
Architect	Zh Architects 515 Canal St NY10013
Building Services	EP Engineering 110 Williams Street NY 10038
Energy Consultant	Zh Architects 515 Canal St NY 10013

Passive House buildings offer excellent thermal comfort and very good air quality all year round. Due to their high energy efficiency, energy costs as well as greenhouse gas emissions are extremely low.

The design of the above-mentioned building meets the criteria defined by the Passive House Institute for the 'Passive House Classic' standard:

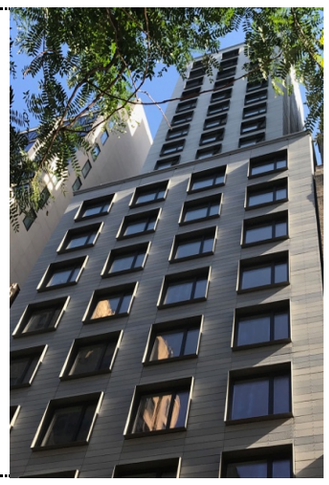
Building quality			This building		Criteria	Alternative criteria
Heating						
	Heating demand	[kWh/(m²a)]	10	≤	15	-
	Heating load	[W/m²]	11	≤	-	10
Cooling						
	Frequency of overheating (> 25 °C)	[%]	-	≤	-	
Airtightness						
	Pressurization test result (n_{50})	[1/h]	0.4	≤	0.6	
Renewable primary energy (PER)						
	PER-demand	[kWh/(m²a)]	85	≤	-	-
	Generation (reference to ground area)	[kWh/(m²a)]	-	≥	-	-

The associated certification booklet contains more characteristic values for this building.

Certifier: Robert Ryan, Earth Cycle Technologies

Passive House Verification

Photo or Drawing



Building:	211 West 29th Street		
Street:	West 29th Street		
Postcode/City:	10001		
Province/Country:	New York	US-United States of America	
Building type:	Multifamily Residential		
Climate data set:	US0055b-New York		
Climate zone:	4: Warm-temperate	Altitude of location:	60 m
Home owner / Client:	Bernstein Real estate		
Street:	150 West 30th Street		
Postcode/City:	10001		
Province/Country:	New York	US-United States of America	
Architecture:	Zh Architects		
Street:	515 Canal St		
Postcode/City:	New York	10013	
Province/Country:	New York	US-United States of America	
Mechanical engineer:	EP Engineering		
Street:	110 Williams Street		
Postcode/City:	10038		
Province/Country:	New York	1-Residential building	
Energy consultancy:	Zh Architects		
Street:	515 Canal St		
Postcode/City:	New York	10013	
Province/Country:	New York	US-United States of America	
Certification:	Earth Cycle Technologies		
Street:	10 Springfield, Wicklow Town		
Postcode/City:	A67 F863		
Province/Country:	Wicklow IE		

Year of construction:	2017	Interior temperature winter [°C]:	20.0	Interior temp. summer [°C]:	25.0
No. of dwelling units:	55	Internal heat gains (IHG) heating case [W/m²]:	2.8	IHG cooling case [W/m²]:	3.2
No. of occupants:	98.7	Specific capacity [Wh/K per m² TFA]:	132	Mechanical cooling:	x

Specific building characteristics with reference to the treated floor area

						Criteria	Alternative criteria	Fullfilled?[2]
	Treated floor area	m²	3734.0					
Space heating	Heating demand	kWh/(m²a)	9.60	≤		15	-	yes
	Heating load	W/m²	11	≤		-	10	
Space cooling	Cooling & dehum. demand	kWh/(m²a)	12	≤		18	18	yes
	Cooling load	W/m²	8	≤		-	11	
	Frequency of overheating (> 25 °C)	%	-	≤		-		-
	Frequency of excessively high humidity (> 12 g/kg)	%	8	≤		10		yes
Airtightness	Pressurization test result n_{50}	1/h	0.4	≤		0.6		yes
Non-renewable Primary Energy (PE)	PE demand	kWh/(m²a)	120	≤		120		yes
Primary Energy Renewable (PER)	PER demand	kWh/(m²a)	85	≤		-	-	-
	Generation of renewable energy (in relation to projected building footprint area)	kWh/(m²a)	-	≥		-	-	

[2] Empty field: Data missing; '-': No requirement

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

Passive House Classic? yes

Task:	First name:	Surname:	Signature:
2-Certifier	Robert	Ryan	

Certificate ID	Issued on:	City:
26716-26770_ECT_PH_20200617_RR	10/07/20	IE Wicklow

PHPP Check

Passive House with PHPP Version 9.6a

211 West 29th Street / Climate: New York / TFA: 3734 m² / Heating: 9.6 kWh/(m²a) / Cooling: 11.5 kWh/(m²a) / PER: 84.6 kWh/(m²a)

▼ Overview input errors

Congratulations! There are no error messages in your PHPP.

Verification	-
Climate	-
U-Values	-
Areas	-
Ground	-
Components	-
Windows	-
Shading	-
Ventilation	-
Addl vent	-
SummVent	-
Cooling units	-
DHW+Distribution	-
SolarDHW	-
PV	-
Electricity	-
Use non-res	-
Electricity non-res	-
Aux Electricity	-
IHG	-
IHG non-res	-
PER	-
Compact	-
HP	-
HP Ground	-
Boiler	-
District Heating	-

▼ **Are results missing from 'Verification' worksheet? Possible causes can be found next**

Climate data

211 West 29th Street / Climate: New York / TFA: 3734 m² / Heating: 9.6 kWh/(m²a) / Cooling: 11.5 kWh/(m²a) / PER: 84.6 kWh/(m²a)

Selection of climate data

Country:	US
Region:	New York
	1-Sortierung: Alphabetisch
Climate data set:	US0055b-New York
Climate zone:	4: Warm-temperate

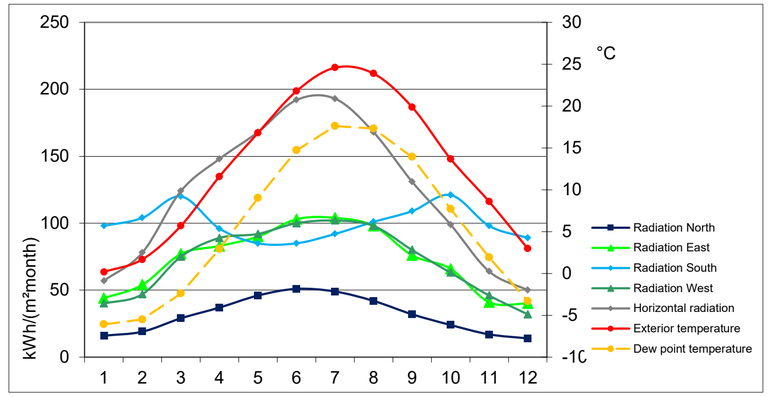
Altitude

Weather station:	40.0	m
Building location:	60	m

Result overview

Annual heating demand	9.6	kWh/(m²a)
Heating load	10.5	W/m²
Frequency of overheating	-	%
Sensible cooling	7.4	kWh/(m²a)
Latent cooling	4.1	kWh/(m²a)
Cooling load	8.4	W/m²
PER demand	84.6	kWh/(m²a)

	Data for heating Annual method	Data from monthly balance Heating	Cooling	
Heating / cooling period	176	212	214	d/a
Heating / cooling degree hours	65	70	-32	kKh/a
Radiation North	116	184	335	kWh/(m²a)
Radiation East	305	405	620	kWh/(m²a)
Radiation South	575	679	696	kWh/(m²a)
Radiation West	291	392	624	kWh/(m²a)
Horizontal radiation	457	620	1099	kWh/(m²a)



	Month	1	2	3	4	5	6	7	8	9	10	11	12	Heating load		Cooling load		PER	
	Days	31	28	31	30	31	30	31	31	30	31	30	31	Weather 1	Weather 2	Weather 1	Weather 2	factors	
	US0055b-New York	Latitude °	40.8	Longitude °	-74.0	Altitude [m]	40	Daily temperature swing Summer [K]			8.0			Radiation: [W/m²]		Radiation: [W/m²]			
° C	Exterior temperature	0.2	1.7	5.7	11.6	16.8	21.8	24.6	23.9	19.9	13.7	8.6	3.0	-10.0	-4.5	30.2	27.3	1.20	Household electric
kWh/(m²month)	Radiation North	16	19	29	37	46	51	49	42	32	24	17	14	25	15	85	55	1.15	Domestic hot wat
kWh/(m²month)	Radiation East	44	54	77	83	90	103	104	98	76	66	41	40	60	20	215	175	1.50	Heating
kWh/(m²month)	Radiation South	98	104	120	96	85	85	92	101	109	121	98	89	115	25	200	220	1.55	Cooling
kWh/(m²month)	Radiation West	40	47	75	89	92	100	102	98	80	63	46	32	50	20	205	175	1.90	Dehumidification
kWh/(m²month)	Horizontal radiation	57	78	124	148	168	192	193	168	131	99	64	50	70	30	325	290		
° C	Dew point temperature	-6.1	-5.5	-2.4	2.9	9.0	14.7	17.6	17.3	13.9	7.7	1.9	-3.3			22.4	20.0		
° C	Sky temperature	-14.4	-15.3	-10.1	-3.4	2.7	10.1	12.1	13.5	9.0	1.5	-3.8	-12.0			21.3	20.0		
° C	Ground temperature	14.1	13.2	13.2	13.9	15.2	16.7	18.0	18.9	18.9	18.2	16.9	15.4	12.5	12.5	19.6	19.6		
	Comment:	Temp = 1981-2010; Other derivede from Meteonrom and TMY3																	

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U-value of building assemblies

211 West 29th Street / Climate: New York / TFA: 3734 m² / Heating: 9.6 kWh/(m²a) / Cooling: 11.5 kWh/(m²a) / PER: 84.6 kWh/(m²a)

Secondary calculation: Equivalent thermal conductivity of still air spaces -> (on the right)
Wedge-shaped assembly layer -> (on the right)
Unheated / uncooled attic -> (on the right)

Assembly no.	Building assembly description	Interior insulation?
01ud	**External wall. South facade. Stone (1)**	

Heat transmission resistance [m²K/W]

Orientation of building element	0	interior R_{si}	0.00
Adjacent to	0	exterior R_{se}:	0.00

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
	0.153					**1000**
				U BTU/hr.ft2.F		
				0.035		
		W/m2K		**R hr.ft2.F/BTU**		
		0.153		**37.000**		

Percentage of sec. 1	Percentage of sec. 2	Percentage of sec. 3	Total
100%			**100.0** cm

U-value supplement: W/(m²K)

U-value: 0.153 W/(m²K)

Assembly no.		Interior insulation?
02ud	**External wall. South facade. Taktl panels (1)**	

Heat transmission resistance [m²K/W]

Orientation of building element	0	interior R_{si}	0.00
Adjacent to	0	exterior R_{se}:	0.00

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
	0.154					**1000**

Percentage of sec. 1	Percentage of sec. 2	Percentage of sec. 3	Total
100%			**100.0** cm

U-value supplement: W/(m²K)

U-value: 0.154 W/(m²K)

Assembly no.		Interior insulation?
03ud	**External wall. North facade (5)**	

Heat transmission resistance [m²K/W]

Orientation of building element	0	interior R_{si}	0.00
Adjacent to	0	exterior R_{se}:	0.00

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
	0.154					**1000**

Percentage of sec. 1	Percentage of sec. 2	Percentage of sec. 3	Total
100%			**100.0** cm

U-value supplement: W/(m²K)

U-value: 0.154 W/(m²K)

Assembly no.		Interior insulation?
04ud	**External wall below grade (9B)**	

Heat transmission resistance [m²K/W]

Orientation of building element	0	interior R_{si}	0.00
Adjacent to	0	exterior R_{se}:	0.00

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
	0.127					**1000**

Percentage of sec. 1	Percentage of sec. 2	Percentage of sec. 3	Total
100%			**100.0** cm

U-value supplement: W/(m²K)

U-value: 0.127 W/(m²K)

Assembly no.		Interior insulation?
05ud	**External wall. Structural concrete below grade (9A)**	

Heat transmission resistance [m²K/W]

Orientation of building element	0	interior R_{si}	0.00
Adjacent to	0	exterior R_{se}:	0.00

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
	0.127					**1000**

Percentage of sec. 1	Percentage of sec. 2	Percentage of sec. 3	Total
100%			**100.0** cm

U-value supplement: W/(m²K)

U-value: 0.127 W/(m²K)

Assembly no.		Interior insulation?
06ud	**External wall. North/East facade**	

Heat transmission resistance [m²K/W]

Orientation of building element	0	interior R_{si}	0.00
Adjacent to	0	exterior R_{se}:	0.00

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
	0.154					**1000**

Percentage of sec. 1	Percentage of sec. 2	Percentage of sec. 3	Total
100%			**100.0** cm

U-value supplement: W/(m²K)

U-value: 0.154 W/(m²K)

Assembly no. | Interior insulation?

07ud | **External wall. East/West**

Heat transmission resistance [m²K/W]

Orientation of building element: 0 | interior R_{si}: 0.00

Adjacent to: 0 | exterior R_{se}: 0.00

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
	0.155					1000

Percentage of sec. 1: 100% | Percentage of sec. 2 | Percentage of sec. 3 | Total: 100.0 cm

U-value supplement: | W/(m²K)

U-value: 0.155 W/(m²K)

Assembly no. | Interior insulation?

08ud | **External wall.Below west parapet level (2)**

Heat transmission resistance [m²K/W]

Orientation of building element: 0 | interior R_{si}: 0.00

Adjacent to: 0 | exterior R_{se}: 0.00

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
	0.127					1000

Percentage of sec. 1: 100% | Percentage of sec. 2 | Percentage of sec. 3 | Total: 100.0 cm

U-value supplement: | W/(m²K)

U-value: 0.127 W/(m²K)

Assembly no. | Interior insulation?

09ud | **External wall. East/West (4)**

Heat transmission resistance [m²K/W]

Orientation of building element: 0 | interior R_{si}: 0.00

Adjacent to: 0 | exterior R_{se}: 0.00

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
	0.155					1000

Percentage of sec. 1: 100% | Percentage of sec. 2 | Percentage of sec. 3 | Total: 100.0 cm

U-value supplement: | W/(m²K)

U-value: 0.155 W/(m²K)

Assembly no. | Interior insulation?

10ud	Terrace	

Heat transmission resistance [m²K/W]

Orientation of building element: 1-Roof — interior R_{si}: 0.13

Adjacent to: 3-Ventilated — exterior R_{se}: 0.13

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
8" Concrete	2.100					203
8" Insulation	0.028					203
Tapered Layer	0.028					45

Percentage of sec. 1: 100% | Percentage of sec. 2 | Percentage of sec. 3 | Total: 45.1 cm

U-value supplement: W/(m²K) | **U-value: 0.108** W/(m²K)

Assembly no. | Interior insulation?

11ud	Cellar floor	

Heat transmission resistance [m²K/W]

Orientation of building element: 3-Floor — interior R_{si}: 0.13

Adjacent to: 0 — exterior R_{se}: 0.00

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
	0.036					100

Percentage of sec. 1: 100% | Percentage of sec. 2 | Percentage of sec. 3 | Total: 10.0 cm

U-value supplement: W/(m²K) | **U-value: 0.344** W/(m²K)

Assembly no. | Interior insulation?

12ud	Floor between commercial-residential	

Heat transmission resistance [m²K/W]

Orientation of building element: 3-Floor — interior R_{si}: 0.13

Adjacent to: 3-Ventilated — exterior R_{se}: 0.13

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
	2.100					200

Percentage of sec. 1: 100% | Percentage of sec. 2 | Percentage of sec. 3 | Total: 20.0 cm

U-value supplement: W/(m²K) | **U-value: 2.815** W/(m²K)

Assembly no. | Interior insulation?

13ud | **Internal wall. Stairs/Elevator (12)** |

Heat transmission resistance [m²K/W]

Orientation of building element: 0 | interior R_{si}: 0.00

Adjacent to: 0 | exterior R_{se}: 0.00

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
	0.196					1000

Percentage of sec. 1: 100% | Percentage of sec. 2 | Percentage of sec. 3 | Total: 100.0 cm

U-value supplement: | W/(m²K)

U-value: 0.196 W/(m²K)

Assembly no. | Interior insulation?

14ud | **Internal wall. CMU with flurry (23B)** |

Heat transmission resistance [m²K/W]

Orientation of building element: 0 | interior R_{si}: 0.00

Adjacent to: 0 | exterior R_{se}: 0.00

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
	0.150					1000

Percentage of sec. 1: 100% | Percentage of sec. 2 | Percentage of sec. 3 | Total: 100.0 cm

U-value supplement: | W/(m²K)

U-value: 0.150 W/(m²K)

Assembly no. | Interior insulation?

15ud | **Solid door. Internal** |

Heat transmission resistance [m²K/W]

Orientation of building element: 0 | interior R_{si}: 0.00

Adjacent to: 0 | exterior R_{se}: 0.00

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
	1.600					1000

Percentage of sec. 1: 100% | Percentage of sec. 2 | Percentage of sec. 3 | Total: 100.0 cm

U-value supplement: | W/(m²K)

U-value: 1.600 W/(m²K)

Assembly no. | Interior insulation?

16ud | **Solid door. Principal facade** |

Heat transmission resistance [m²K/W]

Orientation of building element: 0 | interior R_{si}: 0.00

Adjacent to: 0 | exterior R_{se}: 0.00

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
	1.600					1000

Percentage of sec. 1: 100% | Percentage of sec. 2: | Percentage of sec. 3: | Total: 100.0 cm

U-value supplement: W/(m²K)

U-value: 1.600 W/(m²K)

Assembly no. | Interior insulation?

17ud | **Solid door. Bulkhead** |

Heat transmission resistance [m²K/W]

Orientation of building element: 0 | interior R_{si}: 0.00

Adjacent to: 0 | exterior R_{se}: 0.00

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
	1.600					1000

Percentage of sec. 1: 100% | Percentage of sec. 2: | Percentage of sec. 3: | Total: 100.0 cm

U-value supplement: W/(m²K)

U-value: 1.600 W/(m²K)

Assembly no. | Interior insulation?

18ud | **Commercial floor** |

Heat transmission resistance [m²K/W]

Orientation of building element: 3-Floor | interior R_{si}: 0.13

Adjacent to: 3-Ventilated | exterior R_{se}: 0.13

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
	2.100					300

Percentage of sec. 1: 100% | Percentage of sec. 2: | Percentage of sec. 3: | Total: 30.0 cm

U-value supplement: W/(m²K)

U-value: 2.482 W/(m²K)

Areas determination

211 West 29th Street / Climate: New York / TFA: 3734 m² / Heating: 9.6 kWh/(m²a) / Cooling: 11.5 kWh/(m²a) / PER: 84.6 kWh/(m²a)

Summary

Temp.-zone	Area group	Group no.	Area / Length	Unit	Comment		Building assembly overview	Average U-value [W/(m²K)]	Radiation-gains heating season [kWh/a]	Radiation-load cooling period [kWh/a]
									7 Months	7 Months
	Treated floor area	1	**3734.00**	m²	*Treated floor area according to PHPP manual*					
A	**North windows**	2	**185.76**	m²	Results come from the 'Windows' worksheet.		**North windows**	**0.810**	**2166**	**3374**
A	**East windows**	3	**0.00**	m²	Window areas are subtracted from individual opaque areas.		**East windows**			
A	**South windows**	4	**277.59**	m²	which is displayed in the 'Windows' worksheet.		**South windows**	**0.818**	**16480**	**18003**
A	**West windows**	5	**0.00**	m²			**West windows**			
A	**Horizontal windows**	6	**0.00**	m²			**Horizontal windows**			
A	**Exterior door**	7	**0.00**	m²	*Please subtract area of door from respective building assembly*		**Exterior door**			
A	**External wall - Ambient**	8	**2854.97**	m²	*Temperature zone "A" is ambient air*		**External wall - Ambient**	**0.157**	**313**	**931**
B	**External wall - Ground**	9	**298.66**	m²	*Temperature zone "B" is the ground*		**External wall - Ground**	**0.127**		
A	**Roof/Ceiling - Ambient**	10	**297.92**	m²			**Roof/Ceiling - Ambient**	**0.108**	**-8**	**132**
B	**Floor slab / Basement ceiling**	11	**412.95**	m²			**Floor slab / Basement ceiling**	**0.344**		
		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				
X		14	**0.00**	m²	*Temperature zone "X": Please provide user-defined reduction factor (0 < ft < 1):*	**75%**				
							Thermal bridges - Overview	**Ψ [W/(mK)]**		
A	**Thermal bridges Ambient**	15	**1492.75**	m	*Units in m*		**Thermal bridges Ambient**	**0.110**		
P	**Perimeter thermal bridges**	16	**87.50**	m	*Units in m; temperature zone "P" is perimeter (see 'Ground' worksheet)*		**Perimeter thermal bridges**	**0.075**		
B	**Thermal bridges FS/BC**	17	**222.00**	m	*Units in m*		**Thermal bridges FS/BC**	**0.100**		
I	**Building element towards neigh**	18	**1589.56**	m²	*No heat losses, only considered for the heating load calculation*		**Building element towards neighbour**	0.475		
Total thermal envelope			**4327.85**	**m²**			**Average therm. envelope**	**0.285**		

Go to building components list

Area input

2-Sorting: BY ID

Area no.	Building assembly description	To group No.	Assigned to group	Quan-tity	x (	a [m]	x	b [m]	+	User deter-mined [m²]	-	User sub-traction [m²]	-	Subtraction window areas [m²]	) =	Area [m²]	Selection building assembly / Building system	U-Value [W/(m²K)]	Deviation from North	Angle of inclination from the horizontal	Orientation	Reduction factor shading	Exterior absorptivity	Exterior emissivity
	Projected building footprint	**0**	Projected building footprint		x (		x		+	**0.00**	-		)		=	0.0									
	Treated floor area	**1**	Treated floor area	**1**	x (		x		+	**3734.00**	-		)		=	3734.0									
	Exterior door	**7**	Exterior door		x (		x		+		-		) -		=		Exterior door								
1	**Floor_001_D**	**11**	Floor slab / Basement ceiling	**1**	x (	**11.05**	x	**11.05**	+		-		) -	**0.0**	=	122.1	11ud	**0.344**	**194**	**180**	**Hor**			
2	**Floor_002_D**	**11**	Floor slab / Basement ceiling	**1**	x (		x		+	**71.15**	-		) -	**0.0**	=	71.2	11ud	**0.344**	**90**	**180**	**Hor**			
3	**Floor_003_D**	**11**	Floor slab / Basement ceiling	**1**	x (	**2.84**	x	**2.84**	+		-		) -	**0.0**	=	8.1	11ud	**0.344**	**343**	**180**	**Hor**			
4	**Floor_004_D**	**11**	Floor slab / Basement ceiling	**1**	x (		x		+	**24.41**	-		) -	**0.0**	=	24.4	11ud	**0.344**	**90**	**180**	**Hor**			
5	**Floor_005_D**	**11**	Floor slab / Basement ceiling	**1**	x (		x		+	**187.21**	-		) -	**0.0**	=	187.2	11ud	**0.344**	**242**	**180**	**Hor**			
6	**Wall_006_N**	**9**	External wall - Ground	**1**	x (	**13.80**	x	**3.42**	+		-		) -	**0.0**	=	47.1	05ud	**0.127**	**28**	**90**	**North**			
7	**Wall_007_E**	**9**	External wall - Ground	**1**	x (	**29.92**	x	**3.42**	+		-		) -	**0.0**	=	102.2	04ud	**0.127**	**118**	**90**	**East**			
8	**Wall_008_S**	**9**	External wall - Ground	**1**	x (	**13.80**	x	**3.42**	+		-		) -	**0.0**	=	47.1	05ud	**0.127**	**208**	**90**	**South**			
9	**Wall_009_W**	**9**	External wall - Ground	**1**	x (	**29.92**	x	**3.42**	+		-		) -	**0.0**	=	102.2	04ud	**0.127**	**298**	**90**	**West**			
10	**Surface_010_H**	**18**	Building element towards neighb	**1**	x (		x		+	**240.42**	-		) -	**0.0**	=	240.4	18ud	**2.482**	**305**	**0**	**Hor**			
11	**Surface_011_N**	**18**	Building element towards neighb	**1**	x (	**2.15**	x	**0.95**	+		-		) -	**0.0**	=	2.0	15ud	**1.600**	**28**	**90**	**North**			
12	**Surface_012_N**	**18**	Building element towards neighb	**1**	x (	**2.15**	x	**0.95**	+		-		) -	**0.0**	=	2.0	15ud	**1.600**	**28**	**90**	**North**			
13	**Wall_013_S**	**8**	External wall - Ambient	**1**	x (	**2.18**	x	**1.04**	+		-		) -	**0.0**	=	2.3	16ud	**1.600**	**208**	**90**	**South**	**0.30**	**0.50**	**0.90**
14	**Wall_014_S**	**8**	External wall - Ambient	**1**	x (		x		+	**37.08**	-		) -	**15.3**	=	21.8	01ud	**0.153**	**208**	**90**	**South**	**0.30**	**0.50**	**0.90**
15	**Surface_015_W**	**18**	Building element towards neighb	**1**	x (	**5.44**	x	**2.72**	+		-		) -	**0.0**	=	14.8	14ud	**0.150**	**298**	**90**	**West**			
16	**Surface_016_N**	**19**	Building element towards neighb	**1**	x (	**5.44**	x	**1.20**	+		-		) -	**0.0**	=	6.5	14ud	**0.150**	**28**	**90**	**North**			
17	**Surface_017_W**	**20**	Building element towards neighb	**1**	x (	**5.44**	x	**2.97**	+		-		) -	**0.0**	=	16.2	14ud	**0.150**	**298**	**90**	**West**			
18	**Surface_018_S**	**21**	Building element towards neighb	**1**	x (	**5.44**	x	**2.47**	+		-		) -	**0.0**	=	13.5	14ud	**0.150**	**208**	**90**	**South**			
19	**Surface_019_W**	**22**	Building element towards neighb	**1**	x (	**5.44**	x	**2.99**	+		-		) -	**0.0**	=	16.3	14ud	**0.150**	**298**	**90**	**West**			
20	**Surface_020_W**	**23**	Building element towards neighb	**1**	x (	**5.44**	x	**2.35**	+		-		) -	**0.0**	=	12.8	13ud	**0.196**	**298**	**90**	**West**			
21	**Surface_021_S**	**24**	Building element towards neighb	**1**	x (	**5.44**	x	**0.30**	+		-		) -	**0.0**	=	1.6	14ud	**0.150**	**208**	**90**	**South**			
22	**Surface_022_W**	**25**	Building element towards neighb	**1**	x (	**5.44**	x	**1.77**	+		-		) -	**0.0**	=	9.6	14ud	**0.150**	**298**	**90**	**West**			
23	**Surface_023_W**	**26**	Building element towards neighb	**1**	x (	**5.44**	x	**3.45**	+		-		) -	**0.0**	=	18.8	13ud	**0.196**	**298**	**90**	**West**			
24	**Surface_024_N**	**27**	Building element towards neighb	**1**	x (	**5.44**	x	**1.46**	+		-		) -	**0.0**	=	8.0	13ud	**0.196**	**28**	**90**	**North**			
25	**Surface_025_W**	**28**	Building element towards neighb	**1**	x (		x		+	**32.50**	-		) -	**0.0**	=	32.5	14ud	**0.150**	**298**	**90**	**West**			
26	**Surface_026_N**	**29**	Building element towards neighb	**1**	x (		x		+	**37.67**	-		) -	**0.0**	=	37.7	14ud	**0.150**	**28**	**90**	**North**			
27	**Surface_027_D**	**30**	Building element towards neighb	**1**	x (		x		+	**125.40**	-		) -	**0.0**	=	125.4	12ud	**2.815**	**113**	**180**	**Hor**			
28	**Roof_028_H**	**10**	Roof/Ceiling - Ambient	**1**	x (	**7.34**	x	**1.20**	+		-		) -	**0.0**	=	8.8	10ud	**0.108**	**19**	**0**	**Hor**	**0.30**	**0.50**	**0.90**
29	**Wall_029_W**	**18**	Building element towards neighb	**1**	x (	**20.95**	x	**16.90**	+		-		) -	**0.0**	=	354.1	08ud	**0.127**	**298**	**90**	**West**			
30	**Wall_030_E**	**18**	Building element towards neighb	**1**	x (		x		+	**677.36**	-		) -	**0.0**	=	677.4	09ud	**0.155**	**118**	**90**	**East**			

Areas determination

211 West 29th Street / Climate: New York / TFA: 3734 m² / Heating: 9.6 kWh/(m²a) / Cooling: 11.5 kWh/(m²a) / PER: 84.6 kWh/(m²a)

Summary

Temp.-zone	Area group	Group no.	Area / Length	Unit	Comment		Building assembly overview	Average U-value [W/(m²K)]	Radiation-gains heating season [kWh/a]	Radiation-load cooling period [kWh/a]
									7 Months	7 Months
	Treated floor area	1	**3734.00**	m²	*Treated floor area according to PHPP manual*					
A	**North windows**	2	**185.76**	m²	Results come from the 'Windows' worksheet.		**North windows**	**0.810**	**2166**	**3374**
A	**East windows**	3	**0.00**	m²	Window areas are subtracted from individual opaque areas.		**East windows**			
A	**South windows**	4	**277.59**	m²	which is displayed in the 'Windows' worksheet.		**South windows**	**0.818**	**16480**	**18003**
A	**West windows**	5	**0.00**	m²			**West windows**			
A	**Horizontal windows**	6	**0.00**	m²			**Horizontal windows**			
A	**Exterior door**	7	**0.00**	m²	*Please subtract area of door from respective building assembly*		**Exterior door**			
A	**External wall - Ambient**	8	**2854.97**	m²	*Temperature zone "A" is ambient air*		**External wall - Ambient**	**0.157**	**313**	**931**
B	**External wall - Ground**	9	**298.66**	m²	*Temperature zone "B" is the ground*		**External wall - Ground**	**0.127**		
A	**Roof/Ceiling - Ambient**	10	**297.92**	m²			**Roof/Ceiling - Ambient**	**0.108**	**-8**	**132**
B	**Floor slab / Basement ceiling**	11	**412.95**	m²			**Floor slab / Basement ceiling**	**0.344**		
		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				
X		14	**0.00**	m²	*Temperature zone "X": Please provide user-defined reduction factor (0 < ft < 1):*	**75%**				
							Thermal bridges - Overview	**Ψ [W/(mK)]**		
A	**Thermal bridges Ambient**	15	**1492.75**	m	*Units in m*		**Thermal bridges Ambient**	**0.110**		
P	**Perimeter thermal bridges**	16	**87.50**	m	*Units in m; temperature zone "P" is perimeter (see 'Ground' worksheet)*		**Perimeter thermal bridges**	**0.075**		
B	**Thermal bridges FS/BC**	17	**222.00**	m	*Units in m*		**Thermal bridges FS/BC**	**0.100**		
I	**Building element towards neigh**	18	**1589.56**	m²	*No heat losses, only considered for the heating load calculation*		**Building element towards neighbour**	0.475		
Total thermal envelope			**4327.85**	**m²**			**Average therm. envelope**	**0.285**		

Go to building components list

31	**Wall_031_S**	**8**	External wall - Ambient	**1**	x (	**26.56**	x	**13.80**	+		-		) -	**124.7**	=	241.6	02ud	**0.154**	**208**	**90**	**South**	**0.30**	**0.50**	**0.90**
32	**Roof_032_H**	**10**	Roof/Ceiling - Ambient	**1**	x (		x		+	**0.00**	-		) -	**0.0**	=	0.0	10ud-Terrace	**0.108**	**28**	**0**	**Hor**	**0.30**	**0.50**	**0.90**
33	**Roof_033_H**	**10**	Roof/Ceiling - Ambient	**1**	x (		x		+	**102.58**	-		) -	**0.0**	=	102.6	10ud	**0.108**	**323**	**0**	**Hor**	**0.30**	**0.50**	**0.90**
34	**Wall_034_N**	**8**	External wall - Ambient	**1**	x (		x		+	**730.32**	-		) -	**176.1**	=	554.2	03ud	**0.154**	**28**	**90**	**North**	**0.30**	**0.50**	**0.90**
35	**Wall_035_W**	**8**	External wall - Ambient	**1**	x (		x		+	**815.40**	-		) -	**0.0**	=	815.4	09ud	**0.155**	**298**	**90**	**West**	**0.30**	**0.50**	**0.90**
36	**Wall_036_E**	**8**	External wall - Ambient	**1**	x (	**32.15**	x	**4.51**	+		-		) -	**0.0**	=	145.1	06ud	**0.154**	**118**	**90**	**East**	**0.30**	**0.50**	**0.90**
37	**Wall_037_E**	**8**	External wall - Ambient	**1**	x (	**37.99**	x	**3.59**	+		-		) -	**0.0**	=	136.2	06ud	**0.154**	**118**	**90**	**East**	**0.30**	**0.50**	**0.90**
38	**Wall_038_S**	**8**	External wall - Ambient	**1**	x (	**37.99**	x	**11.37**	+		-		) -	**137.6**	=	294.5	02ud	**0.154**	**208**	**90**	**South**	**0.30**	**0.50**	**0.90**
39	**Wall_039_E**	**8**	External wall - Ambient	**1**	x (	**46.07**	x	**2.84**	+		-		) -	**0.0**	=	130.8	06ud	**0.154**	**118**	**90**	**East**	**0.30**	**0.50**	**0.90**
40	**Wall_040_E**	**8**	External wall - Ambient	**1**	x (	**46.07**	x	**2.43**	+		-		) -	**0.0**	=	111.8	06ud	**0.154**	**118**	**90**	**East**	**0.30**	**0.50**	**0.90**
41	**Wall_041_E**	**8**	External wall - Ambient	**1**	x (	**46.07**	x	**3.02**	+		-		) -	**0.0**	=	139.1	06ud	**0.154**	**118**	**90**	**East**	**0.30**	**0.50**	**0.90**
42	**Roof_042_H**	**10**	Roof/Ceiling - Ambient	**1**	x (		x		+	**38.07**	-		) -	**0.0**	=	38.1	10ud	**0.108**	**329**	**0**	**Hor**	**0.30**	**0.50**	**0.90**
43	**Wall_043_N**	**8**	External wall - Ambient	**1**	x (	**5.84**	x	**4.81**	+		-		) -	**9.7**	=	18.4	03ud	**0.154**	**28**	**90**	**North**	**0.30**	**0.50**	**0.90**
44	**Wall_044_E**	**8**	External wall - Ambient	**1**	x (	**5.84**	x	**2.76**	+		-		) -	**0.0**	=	16.1	06ud	**0.154**	**118**	**90**	**East**	**0.30**	**0.50**	**0.90**
45	**Roof_045_H**	**10**	Roof/Ceiling - Ambient	**1**	x (		x		+	**0.00**	-		) -	**0.0**	=	0.0	10ud-Terrace	**0.108**	**118**	**0**	**Hor**	**0.30**	**0.50**	**0.90**
46	**Roof_046_H**	**10**	Roof/Ceiling - Ambient	**1**	x (		x		+	**94.47**	-		) -	**0.0**	=	94.5	10ud	**0.108**	**311**	**0**	**Hor**	**0.30**	**0.50**	**0.90**
47	**Wall_047_W**	**8**	External wall - Ambient	**1**	x (	**2.15**	x	**0.95**	+		-		) -	**0.0**	=	2.0	17ud	**1.600**	**298**	**90**	**West**	**0.30**	**0.50**	**0.90**
48	**Wall_048_N**	**8**	External wall - Ambient	**1**	x (		x		+	**99.42**	-		) -	**0.0**	=	99.4	03ud	**0.154**	**28**	**90**	**North**	**0.30**	**0.50**	**0.90**
49	**Wall_049_S**	**8**	External wall - Ambient	**1**	x (	**8.08**	x	**3.52**	+		-		) -	**0.0**	=	28.4	07ud	**0.155**	**208**	**90**	**South**	**0.30**	**0.50**	**0.90**
50	**Wall_050_W**	**8**	External wall - Ambient	**1**	x (	**8.08**	x	**0.36**	+		-		) -	**0.0**	=	2.9	09ud	**0.155**	**298**	**90**	**West**	**0.30**	**0.50**	**0.90**
51	**Wall_051_S**	**8**	External wall - Ambient	**1**	x (	**8.08**	x	**2.75**	+		-		) -	**0.0**	=	22.2	07ud	**0.155**	**208**	**90**	**South**	**0.30**	**0.50**	**0.90**
52	**Wall_052_W**	**8**	External wall - Ambient	**1**	x (	**8.08**	x	**2.30**	+		-		) -	**0.0**	=	18.6	07ud	**0.155**	**298**	**90**	**West**	**0.30**	**0.50**	**0.90**
53	**Wall_053_S**	**8**	External wall - Ambient	**1**	x (	**8.08**	x	**0.30**	+		-		) -	**0.0**	=	2.4	07ud	**0.155**	**208**	**90**	**South**	**0.30**	**0.50**	**0.90**
54	**Wall_054_W**	**8**	External wall - Ambient	**1**	x (		x		+	**30.43**	-		) -	**0.0**	=	30.4	07ud	**0.155**	**298**	**90**	**West**	**0.30**	**0.50**	**0.90**
55	**Wall_055_S**	**8**	External wall - Ambient	**1**	x (	**8.08**	x	**1.00**	+		-		) -	**0.0**	=	8.1	07ud	**0.155**	**208**	**90**	**South**	**0.30**	**0.50**	**0.90**
56	**Wall_056_W**	**8**	External wall - Ambient	**1**	x (	**8.08**	x	**1.38**	+		-		) -	**0.0**	=	11.1	07ud	**0.155**	**298**	**90**	**West**	**0.30**	**0.50**	**0.90**
57	**Wall_057_W**	**8**	External wall - Ambient	**1**	x (	**1.95**	x	**0.95**	+		-		) -	**0.0**	=	1.9	17ud	**1.600**	**298**	**90**	**West**	**0.30**	**0.50**	**0.90**
58	**Roof_058_H**	**10**	Roof/Ceiling - Ambient	**1**	x (		x		+	**53.98**	-		) -	**0.0**	=	54.0	10ud	**0.108**	**4**	**0**	**Hor**	**0.30**	**0.50**	**0.90**
59	**-**				x (		x		+		-		) -	**0.0**	=									
98	**-**				x (		x		+		-		) -	**0.0**	=									
99	**-**				x (		x		+		-		) -	**0.0**	=									
100	**<End of designPH import!>**				x (		x		+		-		) -	**0.0**	=									

Aend

Areas determination

211 West 29th Street / Climate: New York / TFA: 3734 m² / Heating: 9.6 kWh/(m²a) / Cooling: 11.5 kWh/(m²a) / PER: 84.6 kWh/(m²a)

Summary

Temp.-zone	Area group	Group no.	Area / Length	Unit	Comment		Building assembly overview	Average U-value [W/(m²K)]	Radiation-gains heating season [kWh/a]
	Treated floor area	1	**3734.00**	m²	*Treated floor area according to PHPP manual*				7 Months
A	**North windows**	2	**185.76**	m²	Results come from the 'Windows' worksheet.		**North windows**	**0.810**	**2166**
A	**East windows**	3	**0.00**	m²	Window areas are subtracted from individual opaque areas.		**East windows**		
A	**South windows**	4	**277.59**	m²	which is displayed in the 'Windows' worksheet.		**South windows**	**0.818**	**16480**
A	**West windows**	5	**0.00**	m²			**West windows**		
A	**Horizontal windows**	6	**0.00**	m²			**Horizontal windows**		
A	**Exterior door**	7	**0.00**	m²	*Please subtract area of door from respective building assembly*		**Exterior door**		
A	**External wall - Ambient**	8	**2854.97**	m²	*Temperature zone "A" is ambient air*		**External wall - Ambient**	**0.157**	**313**
B	**External wall - Ground**	9	**298.66**	m²	*Temperature zone "B" is the ground*		**External wall - Ground**	**0.127**	
A	**Roof/Ceiling - Ambient**	10	**297.92**	m²			**Roof/Ceiling - Ambient**	**0.108**	**-8**
B	**Floor slab / Basement ceiling**	11	**412.95**	m²			**Floor slab / Basement ceiling**	**0.344**	
		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			
X		14	**0.00**	m²	*Temperature zone "X": Please provide user-defined reduction factor (0 < ft < 1):*	**75%**			
							Thermal bridges - Overview	**Ψ [W/(mK)]**	
A	**Thermal bridges Ambient**	15	**1492.75**	m	*Units in m*		**Thermal bridges Ambient**	**0.110**	
P	**Perimeter thermal bridges**	16	**87.50**	m	*Units in m; temperature zone "P" is perimeter (see 'Ground' worksheet)*		**Perimeter thermal bridges**	**0.075**	
B	**Thermal bridges FS/BC**	17	**222.00**	m	*Units in m*		**Thermal bridges FS/BC**	**0.100**	
I	**Building element towards neigh**	18	**1589.56**	m²	*No heat losses, only considered for the heating load calculation*		**Building element towards neighbour**	0.475	
Total thermal envelope			**4327.85**	**m²**			**Average therm. envelope**	**0.285**	

Go to building components list

Thermal bridge inputs

Sortierung ändern

No.	Thermal bridge - denomination	Group No.	Assigned to group	Quantity	x (	Length [m]	-	Subtraction length [m]	)=	Length ℓ [m]	User determined psi value [W/(mK)]	User determined $f_{Rsi=0,25}$ (optional)	or	Selection building system	Ψ-Value [W/(mK)]	f_{Rsi}-Requirement met?
1	**Parapet**	**15**	Thermal bridges Ambient	**1**	x (	**129.32**	-		) =	129.32	**0.170**		or		**0.170**	
2	**External Corner**	**15**	Thermal bridges Ambient	**1**	x (	**279.42**	-		) =	279.42	**-0.040**		or		**-0.040**	
3	**Internal Corner**	**15**	Thermal bridges Ambient	**1**	x (	**30.48**	-		) =	30.48	**0.030**		or		**0.030**	
4					x (		-		) =				or			
5					x (		-		) =				or			
6	**External Wall to Terrace**	**15**	Thermal bridges Ambient	**1**	x (	**59.63**	-		) =	59.63	**0.150**		or		**0.150**	
7	**Junction to Neighbour Horizontal**	**15**	Thermal bridges Ambient	**1**	x (	**16.90**	-		) =	16.90	**0.100**		or		**0.100**	
8	**Junction to Neighbour Vertical**	**15**	Thermal bridges Ambient	**1**	x (	**6.00**	-		) =	6.00	**0.100**		or		**0.100**	
9	**Basement Perimeter**	**16**	Perimeter thermal bridges	**1**	x (	**87.50**	-		) =	87.50	**0.075**		or		**0.075**	
10	**Basement Pads**	**17**	Thermal bridges FS/BC	**1**	x (	**26.00**	-		) =	26.00	**0.100**		or		**0.100**	
11	**Internal Walls to Basement Slab**	**17**	Thermal bridges FS/BC	**1**	x (	**196.00**	-		) =	196.00	**0.100**		or		**0.100**	
12	-				x (		-		) =				or			
13	**Mechanical Upstand**	**15**	Thermal bridges Ambient	**27**	x (	**1.00**	-		) =	27.00	**0.150**		or		**0.150**	
14	-				x (		-		) =				or			
15	**Intermediate Floor**	**15**	Thermal bridges Ambient	**12**	x (	**52.00**	-		) =	624.00	0.145		or		**0.145**	
16	**Intermediate Floor**	**15**	Thermal bridges Ambient	**10**	x (	**28.00**	-		) =	280.00	0.145		or		**0.145**	
17	**Intermediate Floor**	**15**	Thermal bridges Ambient	**2**	x (	**20.00**	-		) =	40.00	0.145		or		**0.145**	
18	-				x (		-		) =				or			
19	-				x (		-		) =				or			
20	-				x (		-		) =				or			
21	-				x (		-		) =				or			
22	-				x (		-		) =				or			
23	-				x (		-		) =				or			
24	-				x (		-		) =				or			
25	-				x (		-		) =				or			
26	-				x (		-		) =				or			
27	-				x (		-		) =				or			
28	-				x (		-		) =				or			
29	-				x (		-		) =				or			
30	-				x (		-		) =				or			
31	-				x (		-		) =				or			
32	-				x (		-		) =				or			

Areas determination

211 West 29th Street / Climate: New York / TFA: 3734 m² / Heating: 9.6 kWh/(m²a) / Cooling: 11.5 kWh/(m²a) / PER: 84.6 kWh/(m²a)

Summary

Temp.-zone	Area group	Group no.	Area / Length	Unit	Comment		Building assembly overview	Average U-value [W/(m²K)]	Radiation-gains heating season [kWh/a]
	Treated floor area	1	**3734.00**	m²	*Treated floor area according to PHPP manual*				7 Months
A	**North windows**	2	**185.76**	m²	Results come from the 'Windows' worksheet.		**North windows**	**0.810**	**2166**
A	**East windows**	3	**0.00**	m²	Window areas are subtracted from individual opaque areas.		**East windows**		
A	**South windows**	4	**277.59**	m²	which is displayed in the 'Windows' worksheet.		**South windows**	**0.818**	**16480**
A	**West windows**	5	**0.00**	m²			**West windows**		
A	**Horizontal windows**	6	**0.00**	m²			**Horizontal windows**		
A	**Exterior door**	7	**0.00**	m²	*Please subtract area of door from respective building assembly*		**Exterior door**		
A	**External wall - Ambient**	8	**2854.97**	m²	*Temperature zone "A" is ambient air*		**External wall - Ambient**	**0.157**	**313**
B	**External wall - Ground**	9	**298.66**	m²	*Temperature zone "B" is the ground*		**External wall - Ground**	**0.127**	
A	**Roof/Ceiling - Ambient**	10	**297.92**	m²			**Roof/Ceiling - Ambient**	**0.108**	**-8**
B	**Floor slab / Basement ceiling**	11	**412.95**	m²			**Floor slab / Basement ceiling**	**0.344**	
		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			
X		14	**0.00**	m²	*Temperature zone "X": Please provide user-defined reduction factor (0 < ft < 1):*	**75%**			
							Thermal bridges - Overview	**Ψ [W/(mK)]**	
A	**Thermal bridges Ambient**	15	**1492.75**	m	*Units in m*		**Thermal bridges Ambient**	**0.110**	
P	**Perimeter thermal bridges**	16	**87.50**	m	*Units in m; temperature zone "P" is perimeter (see 'Ground' worksheet)*		**Perimeter thermal bridges**	**0.075**	
B	**Thermal bridges FS/BC**	17	**222.00**	m	*Units in m*		**Thermal bridges FS/BC**	**0.100**	
I	**Building element towards neigh**	18	**1589.56**	m²	*No heat losses, only considered for the heating load calculation*		**Building element towards neighbour**	0.475	
Total thermal envelope			**4327.85**	**m²**			**Average therm. envelope**	**0.285**	

Go to building components list

33	-				x (		-		) =								or			
34	-				x (		-		) =								or			
35	-				x (		-		) =								or			
36	-				x (		-		) =								or			
37	-				x (		-		) =								or			
38	-				x (		-		) =								or			
39	-				x (		-		) =								or			
40	-				x (		-		) =								or			
41	-				x (		-		) =								or			
42	-				x (		-		) =								or			
43	-				x (		-		) =								or			
44	-				x (		-		) =								or			
45	-				x (		-		) =								or			
46	-				x (		-		) =								or			
47	-				x (		-		) =								or			
48	-				x (		-		) =								or			
49	-				x (		-		) =								or			
50	-				x (		-		) =								or			
TBend																				

Heat losses through the ground

211 West 29th Street / Climate: New York / TFA: 3734 m² / Heating: 9.6 kWh/(m²a) / Cooling: 11.5 kWh/(m²a) / PER: 84.6 kWh/(m²a)

Building section 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			
Avg indoor temp. winter	T_i	20.0	°C
Avg indoor temp. summer	T_i	25.0	°C
Avg ground surface temperature	$T_{g,ave}$	13.6	°C
Amplitude of $T_{g,ave}$	$T_{g,\wedge}$	12.2	°C
Phase shifting of $T_{e,m}$	τ	1.2	Months
Length of the heating period	n	5.8	Months
Heating degree hours - exterior	G_t	65.1	kKh/a

Building data							
Area of ground floor slab / basement c	A		m²	U-value floor slab/basement ceiling	U_f		W/(m²K)
Perimeter length	P		m	TBs floor slab / basement ceiling	Ψ_B*l		W/K
Charact. dimension of floor slab	B'		m	U-value floor slab / basement ceiling i	U_f'	0.000	W/(m²K)
				Equivalent thickness floor	d_t	0.00	m

Floor slab type (select only one)

	Slab on grade						
	Perimeter insulation width/depth	D	m	Orientation of perimeter insulation	horizontal		
	Perimeter insulation thickness	d_n	m	(check only one field)	vertical	x	
	Conductivity perimeter insulation	λ_n	W/(mK)				
	Heated basement or floor slab completely / partially below ground level						
	Basement wall height below ground le	z	m	U-Value wall below ground	U_{wB}		W/(m²K)
	Unheated basement						
	Height aboveground wall	h	m	U-Value wall above ground	U_W		W/(m²K)
	Basement wall height below ground le	z	m	U-Value wall below ground	U_{WB}		W/(m²K)
	Air change unheated basement	n	0.20 h⁻¹	U-Value basement floor slab	U_{fB}		W/(m²K)
	Air volume 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		W/K
Phase shift	β		Months	Harmonic fraction	$\Psi_{P,harm}$*l	0.000	W/K

Groundwater correction						
Depth of the groundwater table	z_w	3.0	m	Groundwater correction factor	G_w	-
Groundwater flow rate	q_w	0.05	m/d			

Interim results

Phase shift	β	Months	Steady-state heat flow	Φ_{stat}	W
Steady-state transmittance	L_S	W/K	Periodic heat flow	Φ_{harm}	W
Exterior periodic transmittance	L_{pe}	W/K	Heat losses during heating period	Q_{tot}	kWh
Transmittance building	L_0	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	Avg. value
Winter													
Summer													

Design ground temperature for 'Heating load' worksheet | **For 'Cooling load' worksheet**

Reduction factor for 'Annual heating' worksheet

Total result (all building parts)

Phase shift	β		Months	Steady-state heat flow	Φ_{stat}	W
Steady-state transmittance	L_S		W/K	Periodic heat flow	Φ_{harm}	W
Exterior periodic transmittance	L_{pe}		W/K	Heat losses during heating period	Q_{tot}	kWh
Transmittance building	L_0	0.00	W/K	Charact. dimension of floor slab	B'	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	Avg. value
Winter													
Summer													

Design ground temperature for 'Heating load' worksheet | **For 'Cooling load' worksheet**

Reduction factor for 'Annual heating' worksheet

Passive House Components

211 West 29th Street / Climate: New York / TFA: 3734 m² / Heating: 9.6 kWh/(m²a) / Cooling: 11.5 kWh/(m²a) / PER: 84.6 kWh/(m²a)

Go to: 'AREAS'
Thermal bridges (Psi-values)
Glazing
Window frames
www.passivehouse.com/component-database
Ventilation units
Compact units
Heat recovery DHW

Building assemblies (U-Values)

Recommended starting values for optimisation: U-values for walls and roofs | Floor slabs: 0.3 W/(m²K) | 4.06 W/(m²K)

		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	**External wall. South facade. Stone (1)**	**External wall. South facade. Stone (1)**	**1.000**	**0.153**	**0**
02ud	**External wall. South facade. Taktl panels (1)**	**External wall. South facade. Taktl panels (1)**	**1.000**	**0.154**	**0**
03ud	**External wall. North facade (5)**	**External wall. North facade (5)**	**1.000**	**0.154**	**0**
04ud	**External wall below grade (9B)**	**External wall below grade (9B)**	**1.000**	**0.127**	**0**
05ud	**External wall. Structural concrete below grade (**	**External wall. Structural concrete below grade (**	**1.000**	**0.127**	**0**
06ud	**External wall. North/East facade**	**External wall. North/East facade**	**1.000**	**0.154**	**0**
07ud	**External wall. East/West**	**External wall. East/West**	**1.000**	**0.155**	**0**
08ud	**External wall.Below west parapet level (2)**	**External wall.Below west parapet level (2)**	**1.000**	**0.127**	**0**
09ud	**External wall. East/West (4)**	**External wall. East/West (4)**	**1.000**	**0.155**	**0**
10ud	**Terrace**	**Terrace**	**0.451**	**0.108**	**0**

Glazing			Glazing
	Recommended glazing type to start planning: Triple thermally insulated glazing (Please consider the comfort criterion!)		
ID	Description	g-Value	U_g-Value
			W/(m²K)
01ud	PH Glazing	0.50	0.58
02ud		0.00	0.00
03ud		0.00	0.00
04ud		0.00	0.00
05ud		0.00	0.00
06ud		0.00	0.00
07ud		0.00	0.00
08ud		0.00	0.00
09ud		0.00	0.00
10ud		0.00	0.00

Window frames

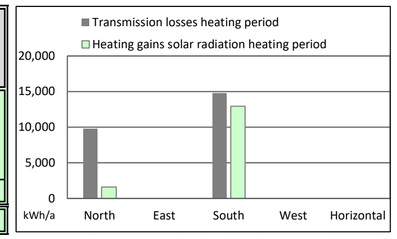
Window frames

ID	Description	U_f-Value				Frame width				Glazing edge thermal bridge				Installation thermal bridge				Curtain wall facades:
		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	**Fixed**	**0.80**	**0.80**	**0.80**	**0.80**	**0.071**	**0.071**	**0.101**	**0.071**	**0.024**	**0.024**	**0.024**	**0.024**	**0.047**	**0.047**	**0.047**	**0.047**	**0.000**
02ud	**Sash**	**0.80**	**0.80**	**0.80**	**0.80**	**0.188**	**0.188**	**0.188**	**0.188**	**0.024**	**0.024**	**0.024**	**0.024**	**0.047**	**0.047**	**0.047**	**0.047**	**0.000**
03ud	**Glazed door**	**0.80**	**0.80**	**0.80**	**0.80**	**0.184**	**0.184**	**0.143**	**0.184**	**0.024**	**0.024**	**0.024**	**0.024**	**0.047**	**0.047**	**0.047**	**0.047**	**0.000**
04ud	**Main door**	**0.80**	**0.80**	**0.80**	**0.80**	**0.210**	**0.210**	**0.250**	**0.210**	**0.024**	**0.024**	**0.024**	**0.024**	**0.047**	**0.047**	**0.047**	**0.047**	**0.000**
05ud		**0.00**	**0.00**	**0.00**	**0.00**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
06ud		**0.00**	**0.00**	**0.00**	**0.00**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
07ud		**0.00**	**0.00**	**0.00**	**0.00**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
08ud		**0.00**	**0.00**	**0.00**	**0.00**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
09ud		**0.00**	**0.00**	**0.00**	**0.00**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
10ud		**0.00**	**0.00**	**0.00**	**0.00**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**

Windows

211 West 29th Street / Climate: New York / TFA: 3734 m² / Heating: 9.6 kWh/(m²a) / Cooling: 11.5 kWh/(m²a) / PER: 84.6 kWh/(m²a)

Window area orientation	Global radiation (main orientations)	Shading	Dirt	Non-vertical radiation incidence	Glazing fraction	g-Value	Solar irradiation reduction factor	Window area	Window U-Value	Glazing area	Average global radiation		Transmission losses heating period	Heating gains solar radiation heating period
Standard values →	kWh/(m²a)	0.75	0.95	0.85				m²	W/(m²K)	m²	kWh/(m²a)		kWh/a	kWh/a
North	116	0.24	0.95	0.85	0.66	0.50	0.13	185.76	0.81	122.43	136	North	9793	1603
East	305	1.00	0.95	0.85	0.00	0.00	0.00	0.00	0.00	0.00	305	East	0	0
South	575	0.33	0.95	0.85	0.65	0.50	0.17	277.59	0.82	180.31	534	South	14780	12941
West	291	1.00	0.95	0.85	0.00	0.00	0.00	0.00	0.00	0.00	291	West	0	0
Horizontal	457	1.00	0.95	0.85	0.00	0.00	0.00	0.00	0.00	0.00	457	Horizontal	0	0
Total or average value for all windows.						0.50	0.16	463.35	0.82	302.73			24573	14545



Heating degree hours [kKh/a]: 65.1

Go to glazing list Go to window frames list

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

0.88	1.04	1.14	0.48

Quantity	Description	Deviation from north	Angle of inclination from the horizontal	Orientation	Window rough openings: Width	Window rough openings: Height	Installed in: Selection from 'Areas' worksheet	Glazing: Selection from 'Components' worksheet	Frame: Selection from 'Components' worksheet	g-Value: Perpendicular radiation	U-Value: Glazing	U-Value: Frames (avg.)	Ψ Glazing edge ($\Psi_{Glazing\ edge}$) (Avg.)	Installation situation: left	right	bottom	top	Ψ Installation ($\Psi_{Installation}$) (Avg.)	Results: Window Area	Glazing area	U_w installed	Glazed fraction per window
		°	°		m	m		1-Sorting: LIKE LIST	1-Sorting: LIKE LIST	-	W/(m²K)	W/(m²K)	W/(mK)	W/(mK) or 1/0				W/(mK)	m²	m²	W/(m²K)	%
1	Door_south_lev01_02	208.3	90	South	1.283	2.181	14-Wall_014_S	01ud	04ud	0.50	0.58	0.80	0.024	1	1	1	1	0.047	2.8	1.48	0.84	53%
1	Door_south_lev01_01c	208.3	90	South	0.678	2.181	14-Wall_014_S	01ud	01ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.5	1.08	0.83	73%
1	Door_south_lev01_01b	208.3	90	South	1.138	2.181	14-Wall_014_S	01ud	04ud	0.50	0.58	0.80	0.024	0	0	1	1	0.047	2.5	1.24	0.78	50%
1	Door_south_lev01_01a	208.3	90	South	0.618	2.181	14-Wall_014_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	1.3	0.96	0.85	71%
1	Win_south_levmez_02	208.3	90	South	1.283	1.934	14-Wall_014_S	01ud	01ud	0.50	0.58	0.80	0.024	1	1	1	1	0.047	2.5	2.01	0.80	81%
1	Win_south_levmez_01	208.3	90	South	2.433	1.934	14-Wall_014_S	01ud	01ud	0.50	0.58	0.80	0.024	1	1	1	1	0.047	4.7	4.04	0.74	86%
1	Door_nortth_lev02_01b	28.3	90	North	1.397	2.370	34-Wall_034_N	01ud	03ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	3.3	2.10	0.78	63%
1	Door_nortth_lev02_01a	28.3	90	North	0.584	2.370	34-Wall_034_N	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	1.4	0.97	0.86	70%
1	Win_nortth_lev02_02b	28.3	90	North	0.762	2.370	34-Wall_034_N	01ud	01ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.8	1.36	0.81	75%
1	Win_nortth_lev02_02a	28.3	90	North	1.575	2.370	34-Wall_034_N	01ud	03ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	3.7	2.47	0.77	66%
1	Win_nortth_lev02_01	28.3	90	North	1.270	1.774	34-Wall_034_N	01ud	02ud	0.50	0.58	0.80	0.024	1	1	1	1	0.047	2.3	1.25	0.85	55%
1	Win_south_lev02_04b	208.3	90	South	0.697	1.774	31-Wall_031_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.45	0.91	36%
1	Win_south_lev02_04a	208.3	90	South	1.256	1.774	31-Wall_031_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.2	1.78	0.77	80%
1	Win_south_lev02_03b	208.3	90	South	0.697	1.774	31-Wall_031_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.45	0.91	36%
1	Win_south_lev02_03a	208.3	90	South	1.256	1.774	31-Wall_031_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.2	1.78	0.77	80%
1	Win_south_lev02_02b	208.3	90	South	0.697	1.774	31-Wall_031_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.45	0.91	36%
1	Win_south_lev02_02a	208.3	90	South	1.256	1.774	31-Wall_031_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.2	1.78	0.77	80%
1	Win_south_lev02_01b	208.3	90	South	0.697	1.774	31-Wall_031_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.45	0.91	36%
1	Win_south_lev02_01a	208.3	90	South	1.256	1.774	31-Wall_031_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.2	1.78	0.77	80%
1	Win_nortth_lev03_02	28.3	90	North	1.270	1.774	34-Wall_034_N	01ud	02ud	0.50	0.58	0.80	0.024	1	1	1	1	0.047	2.3	1.25	0.85	55%
1	Win_nortth_lev03_01b	28.3	90	North	1.397	1.774	34-Wall_034_N	01ud	01ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	2.5	2.01	0.76	81%
1	Win_nortth_lev03_01a	28.3	90	North	0.584	1.774	34-Wall_034_N	01ud	02ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	1.0	0.29	0.95	28%
1	Win_nortth_lev03_03b	28.3	90	North	0.762	1.774	34-Wall_034_N	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.4	0.54	0.89	40%
1	Win_nortth_lev03_03a	28.3	90	North	1.575	1.774	34-Wall_034_N	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.8	2.30	0.75	82%
1	Win_south_lev03_04b	208.3	90	South	0.697	1.774	31-Wall_031_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.45	0.91	36%
1	Win_south_lev03_04a	208.3	90	South	1.256	1.774	31-Wall_031_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.2	1.78	0.77	80%
1	Win_south_lev03_03b	208.3	90	South	0.697	1.774	31-Wall_031_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.45	0.91	36%
1	Win_south_lev03_03a	208.3	90	South	1.256	1.774	31-Wall_031_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.2	1.78	0.77	80%
1	Win_south_lev03_02b	208.3	90	South	0.697	1.774	31-Wall_031_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.45	0.91	36%
1	Win_south_lev03_02a	208.3	90	South	1.256	1.774	31-Wall_031_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.2	1.78	0.77	80%
1	Win_south_lev03_01b	208.3	90	South	0.697	1.774	31-Wall_031_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.45	0.91	36%
1	Win_south_lev03_01a	208.3	90	South	1.256	1.774	31-Wall_031_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.2	1.78	0.77	80%
1	Win_nortth_lev04_02	28.3	90	North	1.270	1.774	34-Wall_034_N	01ud	02ud	0.50	0.58	0.80	0.024	1	1	1	1	0.047	2.3	1.25	0.85	55%
1	Win_nortth_lev04_01b	28.3	90	North	1.397	1.774	34-Wall_034_N	01ud	01ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	2.5	2.01	0.76	81%
1	Win_nortth_lev04_01a	28.3	90	North	0.584	1.774	34-Wall_034_N	01ud	02ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	1.0	0.29	0.95	28%
1	Win_north_lev04_03b	28.3	90	North	0.762	1.774	34-Wall_034_N	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.4	0.54	0.89	40%
1	Win_nortth_lev04_03a	28.3	90	North	1.575	1.774	34-Wall_034_N	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.8	2.30	0.75	82%
1	Win_south_lev04_04b	208.3	90	South	0.697	1.774	31-Wall_031_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.45	0.91	36%
1	Win_south_lev04_04a	208.3	90	South	1.256	1.774	31-Wall_031_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.2	1.78	0.77	80%
1	Win_south_lev01_03b	208.3	90	South	0.697	1.774	31-Wall_031_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.45	0.91	36%
1	Win_south_lev04_03a	208.3	90	South	1.256	1.774	31-Wall_031_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.2	1.78	0.77	80%
1	Win_south_lev04_02b	208.3	90	South	0.697	1.774	31-Wall_031_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.45	0.91	36%
1	Win_south_lev04_02a	208.3	90	South	1.256	1.774	31-Wall_031_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.2	1.78	0.77	80%
1	Win_south_lev04_01b	208.3	90	South	0.697	1.774	31-Wall_031_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.45	0.91	36%
1	Win_south_lev04_01a	208.3	90	South	1.256	1.774	31-Wall_031_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.2	1.78	0.77	80%
1	Win_nortth_lev05_02	28.3	90	North	1.270	1.774	34-Wall_034_N	01ud	02ud	0.50	0.58	0.80	0.024	1	1	1	1	0.047	2.3	1.25	0.85	55%

Heating degree hours [kKh/a]: **65.1**

Quan-tity	Description	Deviation from north	Angle of inclination from the horizontal	Orien- tation	Window rough openings: Width	Window rough openings: Height	Installed in: Selection from 'Areas' worksheet	Glazing: Selection from 'Components' worksheet	Frame: Selection from 'Components' worksheet	g-Value: Perpen-dicular radiation	U-Value: Glazing	U-Value: Frames (avg.)	Ψ Glazing edge: $\Psi_{Glazing\ edge}$ (Avg.)	Installation situation: left	right	bottom	top	$\Psi_{Installation}$ (Avg.)	Results: Window Area	Glazing area	U_w installed	Glazed fraction per window
		°	°		m	m		1-Sorting: LIKE LIST	1-Sorting: LIKE LIST	-	W/(m²K)	W/(m²K)	W/(mK)	W/(mK) or 1/0				W/(mK)	m²	m²	W/(m²K)	%
1	Win_nortth_lev05_01b	28.3	90	North	1.397	1.774	34-Wall_034_N	01ud	01ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	2.5	2.01	0.76	81%
1	Win_nortth_lev05_01a	28.3	90	North	0.584	1.774	34-Wall_034_N	01ud	02ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	1.0	0.29	0.95	28%
1	Win_nortth_lev05_03b	28.3	90	North	0.762	1.774	34-Wall_034_N	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.4	0.54	0.89	40%
1	Win_nortth_lev05_03a	28.3	90	North	1.575	1.774	34-Wall_034_N	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.8	2.30	0.75	82%
1	Win_south_lev05_04b	208.3	90	South	0.697	1.774	31-Wall_031_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.45	0.91	36%
1	Win_south_lev05_04a	208.3	90	South	1.256	1.774	31-Wall_031_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.2	1.78	0.77	80%
1	Win_south_lev05_03b	208.3	90	South	0.697	1.774	31-Wall_031_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.45	0.91	36%
1	Win_south_lev05_03a	208.3	90	South	1.256	1.774	31-Wall_031_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.2	1.78	0.77	80%
1	Win_south_lev05_02b	208.3	90	South	0.697	1.774	31-Wall_031_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.45	0.91	36%
1	Win_south_lev05_02a	208.3	90	South	1.256	1.774	31-Wall_031_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.2	1.78	0.77	80%
1	Win_south_lev05_01b	208.3	90	South	0.697	1.774	31-Wall_031_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.45	0.91	36%
1	Win_south_lev05_01a	208.3	90	South	1.256	1.774	31-Wall_031_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.2	1.78	0.77	80%
1	Win_nortth_lev06_02	28.3	90	North	1.270	1.774	34-Wall_034_N	01ud	02ud	0.50	0.58	0.80	0.024	1	1	1	1	0.047	2.3	1.25	0.85	55%
1	Win_nortth_lev06_01b	28.3	90	North	1.397	1.774	34-Wall_034_N	01ud	01ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	2.5	2.01	0.76	81%
1	Win_nortth_lev06_01a	28.3	90	North	0.584	1.774	34-Wall_034_N	01ud	02ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	1.0	0.29	0.95	28%
1	Win_nortth_lev06_03b	28.3	90	North	0.762	1.774	34-Wall_034_N	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.4	0.54	0.89	40%
1	Win_nortth_lev06_03a	28.3	90	North	1.575	1.774	34-Wall_034_N	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.8	2.30	0.75	82%
1	Win_south_lev06_04b	208.3	90	South	0.697	1.774	31-Wall_031_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.45	0.91	36%
1	Win_south_lev06_04a	208.3	90	South	1.256	1.774	31-Wall_031_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.2	1.78	0.77	80%
1	Win_south_lev06_03b	208.3	90	South	0.697	1.774	31-Wall_031_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.45	0.91	36%
1	Win_south_lev06_03a	208.3	90	South	1.256	1.774	31-Wall_031_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.2	1.78	0.77	80%
1	Win_south_lev06_02b	208.3	90	South	0.697	1.774	31-Wall_031_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.45	0.91	36%
1	Win_south_lev06_02a	208.3	90	South	1.256	1.774	31-Wall_031_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.2	1.78	0.77	80%
1	Win_south_lev06_01b	208.3	90	South	0.697	1.774	31-Wall_031_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.45	0.91	36%
1	Win_south_lev06_01a	208.3	90	South	1.256	1.774	31-Wall_031_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.2	1.78	0.77	80%
1	Win_nortth_lev07_02	28.3	90	North	1.270	1.774	34-Wall_034_N	01ud	02ud	0.50	0.58	0.80	0.024	1	1	1	1	0.047	2.3	1.25	0.85	55%
1	Win_nortth_lev07_01b	28.3	90	North	1.397	1.774	34-Wall_034_N	01ud	01ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	2.5	2.01	0.76	81%
1	Win_nortth_lev07_01a	28.3	90	North	0.584	1.774	34-Wall_034_N	01ud	02ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	1.0	0.29	0.95	28%
1	Win_nortth_lev07_03b	28.3	90	North	0.762	1.774	34-Wall_034_N	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.4	0.54	0.89	40%
1	Win_nortth_lev07_03a	28.3	90	North	1.575	1.774	34-Wall_034_N	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.8	2.30	0.75	82%
1	Win_south_lev07_04b	208.3	90	South	0.697	1.774	31-Wall_031_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.45	0.91	36%
1	Win_south_lev07_04a	208.3	90	South	1.256	1.774	31-Wall_031_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.2	1.78	0.77	80%
1	Win_south_lev07_03b	208.3	90	South	0.697	1.774	31-Wall_031_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.45	0.91	36%
1	Win_south_lev07_03a	208.3	90	South	1.256	1.774	31-Wall_031_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.2	1.78	0.77	80%
1	Win_south_lev07_02b	208.3	90	South	0.697	1.774	31-Wall_031_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.45	0.91	36%
1	Win_south_lev07_02a	208.3	90	South	1.256	1.774	31-Wall_031_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.2	1.78	0.77	80%
1	Win_south_lev07_01b	208.3	90	South	0.697	1.774	31-Wall_031_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.45	0.91	36%
1	Win_south_lev07_01a	208.3	90	South	1.256	1.774	31-Wall_031_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.2	1.78	0.77	80%
1	Win_nortth_lev08_02	28.3	90	North	1.270	1.774	34-Wall_034_N	01ud	02ud	0.50	0.58	0.80	0.024	1	1	1	1	0.047	2.3	1.25	0.85	55%
1	Win_nortth_lev08_01b	28.3	90	North	1.397	1.774	34-Wall_034_N	01ud	01ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	2.5	2.01	0.76	81%
1	Win_nortth_lev08_01a	28.3	90	North	0.584	1.774	34-Wall_034_N	01ud	02ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	1.0	0.29	0.95	28%
1	Win_nortth_lev08_03b	28.3	90	North	0.762	1.774	34-Wall_034_N	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.4	0.54	0.89	40%
1	Win_nortth_lev08_03a	28.3	90	North	1.575	1.774	34-Wall_034_N	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.8	2.30	0.75	82%
1	Win_south_lev08_04b	208.3	90	South	0.697	1.774	31-Wall_031_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.45	0.91	36%
1	Win_south_lev08_04a	208.3	90	South	1.256	1.774	31-Wall_031_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.2	1.78	0.77	80%
1	Win_south_lev08_03b	208.3	90	South	0.697	1.774	31-Wall_031_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.45	0.91	36%
1	Win_south_lev08_03a	208.3	90	South	1.256	1.774	31-Wall_031_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.2	1.78	0.77	80%
1	Win_south_lev08_02b	208.3	90	South	0.697	1.774	31-Wall_031_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.45	0.91	36%
1	Win_south_lev08_02a	208.3	90	South	1.256	1.774	31-Wall_031_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.2	1.78	0.77	80%
1	Win_south_lev08_01b	208.3	90	South	0.697	1.774	31-Wall_031_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.45	0.91	36%
1	Win_south_lev08_01a	208.3	90	South	1.256	1.774	31-Wall_031_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.2	1.78	0.77	80%
1	Win_nortth_lev09_02	28.3	90	North	1.270	1.774	34-Wall_034_N	01ud	02ud	0.50	0.58	0.80	0.024	1	1	1	1	0.047	2.3	1.25	0.85	55%
1	Win_nortth_lev09_01b	28.3	90	North	1.397	1.774	34-Wall_034_N	01ud	01ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	2.5	2.01	0.76	81%
1	Win_nortth_lev09_01a	28.3	90	North	0.584	1.774	34-Wall_034_N	01ud	02ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	1.0	0.29	0.95	28%
1	Win_nortth_lev09_03b	28.3	90	North	0.762	1.774	34-Wall_034_N	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.4	0.54	0.89	40%
1	Win_nortth_lev09_03a	28.3	90	North	1.575	1.774	34-Wall_034_N	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.8	2.30	0.75	82%
1	Win_south_lev09_04b	208.3	90	South	0.697	1.774	31-Wall_031_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.45	0.91	36%
1	Win_south_lev09_04a	208.3	90	South	1.256	1.774	31-Wall_031_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.2	1.78	0.77	80%
1	Win_south_lev09_03b	208.3	90	South	0.697	1.774	31-Wall_031_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.45	0.91	36%
1	Win_south_lev09_03a	208.3	90	South	1.256	1.774	31-Wall_031_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.2	1.78	0.77	80%
1	Win_south_lev09_02b	208.3	90	South	0.697	1.774	31-Wall_031_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.45	0.91	36%
1	Win_south_lev09_02a	208.3	90	South	1.256	1.774	31-Wall_031_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.2	1.78	0.77	80%
1	Win_south_lev09_01b	208.3	90	South	0.697	1.774	31-Wall_031_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.45	0.91	36%
1	Win_south_lev09_01a	208.3	90	South	1.256	1.774	31-Wall_031_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.2	1.78	0.77	80%
1	Win_nortth_lev10_02	28.3	90	North	1.270	1.774	34-Wall_034_N	01ud	02ud	0.50	0.58	0.80	0.024	1	1	1	1	0.047	2.3	1.25	0.85	55%

Heating degree hours [kKh/a]: **65.1**

Quan-tity	Description	Deviation from north	Angle of inclination from the horizontal	Orien- tation	Window rough openings: Width	Window rough openings: Height	Installed in: Selection from 'Areas' worksheet	Glazing: Selection from 'Components' worksheet	Frame: Selection from 'Components' worksheet	g-Value: Perpen-dicular radiation	U-Value: Glazing	U-Value: Frames (avg.)	Ψ Glazing edge: $\Psi_{Glazing\ edge}$ (Avg.)	Installation situation: left	right	bottom	top	$\Psi_{Installation}$ (Avg.)	Results: Window Area	Glazing area	U_w installed	Glazed fraction per window
		°	°		m	m		1-Sorting: LIKE LIST	1-Sorting: LIKE LIST	-	W/(m²K)	W/(m²K)	W/(mK)	W/(mK) or 1/0				W/(mK)	m²	m²	W/(m²K)	%
1	Win_nortth_lev10_01b	28.3	90	North	1.397	1.774	34-Wall_034_N	01ud	01ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	2.5	2.01	0.76	81%
1	Win_nortth_lev10_01a	28.3	90	North	0.584	1.774	34-Wall_034_N	01ud	02ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	1.0	0.29	0.95	28%
1	Win_nortth_lev10_03b	28.3	90	North	0.762	1.774	34-Wall_034_N	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.4	0.54	0.89	40%
1	Win_nortth_lev10_03a	28.3	90	North	1.575	1.774	34-Wall_034_N	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.8	2.30	0.75	82%
1	Win_south_lev10_04b	208.3	90	South	0.697	1.774	31-Wall_031_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.45	0.91	36%
1	Win_south_lev10_04a	208.3	90	South	1.256	1.774	31-Wall_031_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.2	1.78	0.77	80%
1	Win_south_lev10_03b	208.3	90	South	0.697	1.774	31-Wall_031_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.45	0.91	36%
1	Win_south_lev10_03a	208.3	90	South	1.256	1.774	31-Wall_031_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.2	1.78	0.77	80%
1	Win_south_lev10_02b	208.3	90	South	0.697	1.774	31-Wall_031_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.45	0.91	36%
1	Win_south_lev10_02a	208.3	90	South	1.256	1.774	31-Wall_031_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.2	1.78	0.77	80%
1	Win_south_lev10_01b	208.3	90	South	0.697	1.774	31-Wall_031_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.45	0.91	36%
1	Win_south_lev10_01a	208.3	90	South	1.256	1.774	31-Wall_031_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.2	1.78	0.77	80%
1	Door_south_lev11_01b	208.2	90	South	0.672	2.390	38-Wall_038_S	01ud	01ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.6	1.17	0.83	73%
1	Door_south_lev11_01a	208.2	90	South	1.281	2.390	38-Wall_038_S	01ud	03ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	3.1	1.88	0.79	62%
1	Win_south_lev11_02b	208.2	90	South	0.678	1.787	38-Wall_038_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.43	0.91	35%
1	Win_south_lev11_02a	208.2	90	South	1.288	1.787	38-Wall_038_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.3	1.85	0.77	80%
1	Win_south_lev11_01b	208.2	90	South	0.678	1.787	38-Wall_038_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.43	0.91	35%
1	Win_south_lev11_01a	208.2	90	South	1.288	1.787	38-Wall_038_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.3	1.85	0.77	80%
1	Win_nortth_lev11_01b	28.3	90	North	1.397	1.774	34-Wall_034_N	01ud	01ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	2.5	2.01	0.76	81%
1	Win_nortth_lev11_01a	28.3	90	North	0.584	1.774	34-Wall_034_N	01ud	02ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	1.0	0.29	0.95	28%
1	Win_nortth_lev11_02b	28.3	90	North	0.762	1.774	34-Wall_034_N	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.4	0.54	0.89	40%
1	Win_nortth_lev11_02a	28.3	90	North	1.575	1.774	34-Wall_034_N	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.8	2.30	0.75	82%
1	Win_south_lev12_03b	208.2	90	South	0.678	1.787	38-Wall_038_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.43	0.91	35%
1	Win_south_lev12_03a	208.2	90	South	1.288	1.787	38-Wall_038_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.3	1.85	0.77	80%
1	Win_south_lev12_02b	208.2	90	South	0.678	1.787	38-Wall_038_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.43	0.91	35%
1	Win_south_lev12_02a	208.2	90	South	1.288	1.787	38-Wall_038_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.3	1.85	0.77	80%
1	Win_nortth_lev12_01b	28.3	90	North	1.397	1.774	34-Wall_034_N	01ud	01ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	2.5	2.01	0.76	81%
1	Win_nortth_lev12_01a	28.3	90	North	0.584	1.774	34-Wall_034_N	01ud	02ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	1.0	0.29	0.95	28%
1	Win_nortth_lev12_02b	28.3	90	North	0.762	1.774	34-Wall_034_N	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.4	0.54	0.89	40%
1	Win_nortth_lev12_02a	28.3	90	North	1.575	1.774	34-Wall_034_N	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.8	2.30	0.75	82%
1	Win_south_lev12_01b	208.2	90	South	0.672	1.774	38-Wall_038_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.41	0.91	35%
1	Win_south_lev12_01a	208.2	90	South	1.281	1.774	38-Wall_038_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.3	1.83	0.77	80%
1	Win_south_lev13_03b	208.2	90	South	0.678	1.787	38-Wall_038_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.43	0.91	35%
1	Win_south_lev13_03a	208.2	90	South	1.288	1.787	38-Wall_038_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.3	1.85	0.77	80%
1	Win_south_lev13_02b	208.2	90	South	0.678	1.787	38-Wall_038_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.43	0.91	35%
1	Win_south_lev13_02a	208.2	90	South	1.288	1.787	38-Wall_038_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.3	1.85	0.77	80%
1	Win_nortth_lev13_01b	28.3	90	North	1.397	1.774	34-Wall_034_N	01ud	01ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	2.5	2.01	0.76	81%
1	Win_nortth_lev13_01a	28.3	90	North	0.584	1.774	34-Wall_034_N	01ud	02ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	1.0	0.29	0.95	28%
1	Win_nortth_lev13_02b	28.3	90	North	0.762	1.774	34-Wall_034_N	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.4	0.54	0.89	40%
1	Win_nortth_lev13_02a	28.3	90	North	1.575	1.774	34-Wall_034_N	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.8	2.30	0.75	82%
1	Win_south_lev13_01b	208.2	90	South	0.672	1.774	38-Wall_038_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.41	0.91	35%
1	Win_south_lev13_01a	208.2	90	South	1.281	1.774	38-Wall_038_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.3	1.83	0.77	80%
1	Win_south_lev14_03b	208.2	90	South	0.678	1.787	38-Wall_038_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.43	0.91	35%
1	Win_south_lev14_03a	208.2	90	South	1.288	1.787	38-Wall_038_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.3	1.85	0.77	80%
1	Win_south_lev14_02b	208.2	90	South	0.678	1.787	38-Wall_038_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.43	0.91	35%
1	Win_south_lev14_02a	208.2	90	South	1.288	1.787	38-Wall_038_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.3	1.85	0.77	80%
1	Win_nortth_lev14_01b	28.3	90	North	1.397	1.774	34-Wall_034_N	01ud	01ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	2.5	2.01	0.76	81%
1	Win_nortth_lev14_01a	28.3	90	North	0.584	1.774	34-Wall_034_N	01ud	02ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	1.0	0.29	0.95	28%
1	Win_nortth_lev14_02b	28.3	90	North	0.762	1.774	34-Wall_034_N	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.4	0.54	0.89	40%
1	Win_nortth_lev14_02a	28.3	90	North	1.575	1.774	34-Wall_034_N	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.8	2.30	0.75	82%
1	Win_south_lev14_01b	208.2	90	South	0.672	1.774	38-Wall_038_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.41	0.91	35%
1	Win_south_lev14_01a	208.2	90	South	1.281	1.774	38-Wall_038_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.3	1.83	0.77	80%
1	Win_south_lev15_03b	208.2	90	South	0.678	1.787	38-Wall_038_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.43	0.91	35%
1	Win_south_lev15_03a	208.2	90	South	1.288	1.787	38-Wall_038_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.3	1.85	0.77	80%
1	Win_south_lev15_02b	208.2	90	South	0.678	1.787	38-Wall_038_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.43	0.91	35%
1	Win_south_lev15_02a	208.2	90	South	1.288	1.787	38-Wall_038_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.3	1.85	0.77	80%
1	Win_nortth_lev15_01b	28.3	90	North	1.397	1.774	34-Wall_034_N	01ud	01ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	2.5	2.01	0.76	81%
1	Win_nortth_lev15_01a	28.3	90	North	0.584	1.774	34-Wall_034_N	01ud	02ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	1.0	0.29	0.95	28%
1	Win_nortth_lev15_02b	28.3	90	North	0.762	1.774	34-Wall_034_N	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.4	0.54	0.89	40%
1	Win_nortth_lev15_02a	28.3	90	North	1.575	1.774	34-Wall_034_N	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.8	2.30	0.75	82%
1	Win_south_lev15_01b	208.2	90	South	0.672	1.774	38-Wall_038_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.41	0.91	35%
1	Win_south_lev15_01a	208.2	90	South	1.281	1.774	38-Wall_038_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.3	1.83	0.77	80%
1	Win_south_lev16_03b	208.2	90	South	0.678	1.787	38-Wall_038_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.43	0.91	35%
1	Win_south_lev16_03a	208.2	90	South	1.288	1.787	38-Wall_038_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.3	1.85	0.77	80%
1	Win_south_lev16_02b	208.2	90	South	0.678	1.787	38-Wall_038_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.43	0.91	35%

Heating degree hours [kKh/a]: **65.1**

Quan-tity	Description	Deviation from north	Angle of inclination from the horizontal	Orien- tation	Window rough openings: Width	Window rough openings: Height	Installed in: Selection from 'Areas' worksheet	Glazing: Selection from 'Components' worksheet	Frame: Selection from 'Components' worksheet	g-Value: Perpen-dicular radiation	U-Value: Glazing	U-Value: Frames (avg.)	Ψ Glazing edge: $\Psi_{Glazing\ edge}$ (Avg.)	Installation situation: left	right	bottom	top	$\Psi_{Installation}$ (Avg.)	Results: Window Area	Glazing area	U_w installed	Glazed fraction per window
		°	°		m	m		1-Sorting: LIKE LIST	1-Sorting: LIKE LIST	-	W/(m²K)	W/(m²K)	W/(mK)	W/(mK) or 1/0				W/(mK)	m²	m²	W/(m²K)	%
1	Win_south_lev16_02a	208.2	90	South	1.288	1.787	38-Wall_038_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.3	1.85	0.77	80%
1	Win_nortth_lev16_01b	28.3	90	North	1.397	1.774	34-Wall_034_N	01ud	01ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	2.5	2.01	0.76	81%
1	Win_nortth_lev16_01a	28.3	90	North	0.584	1.774	34-Wall_034_N	01ud	02ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	1.0	0.29	0.95	28%
1	Win_north_lev16_02b	28.3	90	North	0.762	1.774	34-Wall_034_N	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.4	0.54	0.89	40%
1	Win_nortth_lev16_02a	28.3	90	North	1.575	1.774	34-Wall_034_N	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.8	2.30	0.75	82%
1	Win_south_lev16_01b	208.2	90	South	0.672	1.774	38-Wall_038_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.41	0.91	35%
1	Win_south_lev16_01a	208.2	90	South	1.281	1.774	38-Wall_038_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.3	1.83	0.77	80%
1	Win_south_lev17_03b	208.2	90	South	0.678	1.787	38-Wall_038_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.43	0.91	35%
1	Win_south_lev17_03a	208.2	90	South	1.288	1.787	38-Wall_038_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.3	1.85	0.77	80%
1	Win_south_lev17_02b	208.2	90	South	0.678	1.787	38-Wall_038_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.43	0.91	35%
1	Win_south_lev17_02a	208.2	90	South	1.288	1.787	38-Wall_038_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.3	1.85	0.77	80%
1	Win_nortth_lev17_01b	28.3	90	North	1.397	1.774	34-Wall_034_N	01ud	01ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	2.5	2.01	0.76	81%
1	Win_nortth_lev17_01a	28.3	90	North	0.584	1.774	34-Wall_034_N	01ud	02ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	1.0	0.29	0.95	28%
1	Win_nortth_lev17_02b	28.3	90	North	0.762	1.774	34-Wall_034_N	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.4	0.54	0.89	40%
1	Win_nortth_lev17_02a	28.3	90	North	1.575	1.774	34-Wall_034_N	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.8	2.30	0.75	82%
1	Win_south_lev17_01b	208.2	90	South	0.672	1.774	38-Wall_038_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.41	0.91	35%
1	Win_south_lev17_01a	208.2	90	South	1.281	1.774	38-Wall_038_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.3	1.83	0.77	80%
1	Win_south_lev18_03b	208.2	90	South	0.678	1.787	38-Wall_038_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.43	0.91	35%
1	Win_south_lev18_03a	208.2	90	South	1.288	1.787	38-Wall_038_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.3	1.85	0.77	80%
1	Win_south_lev18_02b	208.2	90	South	0.678	1.787	38-Wall_038_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.43	0.91	35%
1	Win_south_lev18_02a	208.2	90	South	1.288	1.787	38-Wall_038_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.3	1.85	0.77	80%
1	Win_nortth_lev18_01b	28.3	90	North	1.397	1.774	34-Wall_034_N	01ud	01ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	2.5	2.01	0.76	81%
1	Win_nortth_lev18_01a	28.3	90	North	0.584	1.774	34-Wall_034_N	01ud	02ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	1.0	0.29	0.95	28%
1	Win_nortth_lev18_02b	28.3	90	North	0.762	1.774	34-Wall_034_N	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.4	0.54	0.89	40%
1	Win_nortth_lev18_02a	28.3	90	North	1.575	1.774	34-Wall_034_N	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.8	2.30	0.75	82%
1	Win_south_lev18_01b	208.2	90	South	0.672	1.774	38-Wall_038_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.41	0.91	35%
1	Win_south_lev18_01a	208.2	90	South	1.281	1.774	38-Wall_038_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.3	1.83	0.77	80%
1	Win_south_lev19_03b	208.2	90	South	0.678	1.787	38-Wall_038_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.43	0.91	35%
1	Win_south_lev19_03a	208.2	90	South	1.288	1.787	38-Wall_038_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.3	1.85	0.77	80%
1	Win_south_lev19_02b	208.2	90	South	0.678	1.787	38-Wall_038_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.43	0.91	35%
1	Win_south_lev19_02a	208.2	90	South	1.288	1.787	38-Wall_038_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.3	1.85	0.77	80%
1	Win_nortth_lev19_01b	28.3	90	North	1.397	1.774	34-Wall_034_N	01ud	01ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	2.5	2.01	0.76	81%
1	Win_nortth_lev19_01a	28.3	90	North	0.584	1.774	34-Wall_034_N	01ud	02ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	1.0	0.29	0.95	28%
1	Win_nortth_lev19_02b	28.3	90	North	0.762	1.774	34-Wall_034_N	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.4	0.54	0.89	40%
1	Win_nortth_lev19_02a	28.3	90	North	1.575	1.774	34-Wall_034_N	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.8	2.30	0.75	82%
1	Win_south_lev19_01b	208.2	90	South	0.672	1.774	38-Wall_038_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.41	0.91	35%
1	Win_south_lev19_01a	208.2	90	South	1.281	1.774	38-Wall_038_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.3	1.83	0.77	80%
1	Win_south_lev20_03b	208.2	90	South	0.678	1.787	38-Wall_038_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.43	0.91	35%
1	Win_south_lev20_03a	208.2	90	South	1.288	1.787	38-Wall_038_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.3	1.85	0.77	80%
1	Win_south_lev20_02b	208.2	90	South	0.678	1.787	38-Wall_038_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.43	0.91	35%
1	Win_south_lev20_02a	208.2	90	South	1.288	1.787	38-Wall_038_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.3	1.85	0.77	80%
1	Win_nortth_lev20_01b	28.3	90	North	1.397	1.774	34-Wall_034_N	01ud	01ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	2.5	2.01	0.76	81%
1	Win_nortth_lev20_01a	28.3	90	North	0.584	1.774	34-Wall_034_N	01ud	02ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	1.0	0.29	0.95	28%
1	Win_nortth_lev20_02b	28.3	90	North	0.762	1.774	34-Wall_034_N	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.4	0.54	0.89	40%
1	Win_nortth_lev20_02a	28.3	90	North	1.575	1.774	34-Wall_034_N	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.8	2.30	0.75	82%
1	Win_south_lev20_01b	208.2	90	South	0.672	1.774	38-Wall_038_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.41	0.91	35%
1	Win_south_lev20_01a	208.2	90	South	1.281	1.774	38-Wall_038_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.3	1.83	0.77	80%
1	Win_south_lev21_03b	208.2	90	South	0.678	1.787	38-Wall_038_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.43	0.91	35%
1	Win_south_lev21_03a	208.2	90	South	1.288	1.787	38-Wall_038_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.3	1.85	0.77	80%
1	Win_south_lev21_02b	208.2	90	South	0.678	1.787	38-Wall_038_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.43	0.91	35%
1	Win_south_lev21_02a	208.2	90	South	1.288	1.787	38-Wall_038_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.3	1.85	0.77	80%
1	Win_nortth_lev21_01b	28.3	90	North	1.397	1.774	34-Wall_034_N	01ud	01ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	2.5	2.01	0.76	81%
1	Win_nortth_lev21_01a	28.3	90	North	0.584	1.774	34-Wall_034_N	01ud	02ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	1.0	0.29	0.95	28%
1	Win_nortth_lev21_02b	28.3	90	North	0.762	1.774	34-Wall_034_N	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.4	0.54	0.89	40%
1	Win_nortth_lev21_02a	28.3	90	North	1.575	1.774	34-Wall_034_N	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.8	2.30	0.75	82%
1	Win_south_lev21_01b	208.2	90	South	0.672	1.774	38-Wall_038_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.41	0.91	35%
1	Win_south_lev21_01a	208.2	90	South	1.281	1.774	38-Wall_038_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.3	1.83	0.77	80%
1	Door_nortth_lev22_01b	28.3	90	North	0.762	2.370	43-Wall_043_N	01ud	01ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.8	1.36	0.81	75%
1	Door_nortth_lev22_01a	28.3	90	North	1.575	2.370	43-Wall_043_N	01ud	03ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	3.7	2.47	0.77	66%
1	Win_north_lev22_01b	208.2	90	South	0.678	1.787	38-Wall_038_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.43	0.91	35%
1	Win_south_lev22_03a	208.2	90	South	1.288	1.787	38-Wall_038_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.3	1.85	0.77	80%
1	Win_south_lev22_02b	208.2	90	South	0.678	1.787	38-Wall_038_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.43	0.91	35%
1	Win_south_lev22_02a	208.2	90	South	1.288	1.787	38-Wall_038_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.3	1.85	0.77	80%
1	Win_south_lev22_01b	208.2	90	South	0.672	1.774	38-Wall_038_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.41	0.91	35%
1	Win_south_lev22_01a	208.2	90	South	1.281	1.774	38-Wall_038_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.3	1.83	0.77	80%

Heating degree hours [kKh/a]: **65.1**

Quantity	Description	Deviation from north	Angle of inclination from the horizontal	Orientation	Window rough openings: Width	Window rough openings: Height	Installed in: Selection from 'Areas' worksheet	Glazing: Selection from 'Components' worksheet	Frame: Selection from 'Components' worksheet	g-Value: Perpendicular radiation	U-Value: Glazing	U-Value: Frames (avg.)	Ψ Glazing edge: $\Psi_{Glazing\ edge}$ (Avg.)	Installation situation: left	right	bottom	top	$\Psi_{Installation}$ (Avg.)	Results: Window Area	Glazing area	U_w installed	Glazed fraction per window
		°	°		m	m		1-Sorting: LIKE LIST	1-Sorting: LIKE LIST	-	W/(m²K)	W/(m²K)	W/(mK)	W/(mK) or 1/0				W/(mK)	m²	m²	W/(m²K)	%
1	Win_south_lev23_03b	208.2	90	South	0.678	1.787	38-Wall_038_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.43	0.91	35%
1	Win_south_lev23_03a	208.2	90	South	1.288	1.787	38-Wall_038_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.3	1.85	0.77	80%
1	Win_south_lev22_02b	208.2	90	South	0.678	1.787	38-Wall_038_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.43	0.91	35%
1	Win_south_lev23_02a	208.2	90	South	1.288	1.787	38-Wall_038_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.3	1.85	0.77	80%
1	Win_nortth_lev23_01b	28.3	90	North	0.762	1.774	43-Wall_043_N	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.4	0.54	0.89	40%
1	Win_nortth_lev23_01a	28.3	90	North	1.575	1.774	43-Wall_043_N	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.8	2.30	0.75	82%
1	Win_south_lev23_01b	208.2	90	South	0.672	1.774	38-Wall_038_S	01ud	02ud	0.50	0.58	0.80	0.024	0	1	1	1	0.047	1.2	0.41	0.91	35%
1	Win_south_lev23_01a	208.2	90	South	1.281	1.774	38-Wall_038_S	01ud	01ud	0.50	0.58	0.80	0.024	1	0	1	1	0.047	2.3	1.83	0.77	80%
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Calculation of shading coefficients

211 West 29th Street / Climate: New York / TFA: 3734 m² / Heating: 9.6 kWh/(m²a) / Cooling: 11.5 kWh/(m²a) / PER: 84.6 kWh/(m²a)

Latitude: 40.78 °

Orientation	Glazing area [m²]	Reduction factor winter r_v	Reduction factor cooling $r_{v,1}$	Reduction factor cooling load $r_{v,2}$	Solar load [kWh/($m^2_{Glazing}$a)]
North	122.43	24%	19%	18%	28
East	0.00	100%	100%	100%	0
South	180.31	33%	34%	31%	100
West	0.00	100%	100%	100%	0
Horizontal	0.00	100%	100%	100%	0

								Horizon		Lateral reveal		Reveal / Overhang						Reduction factors for shading in winter				Reduction factors for shading in summer					
Quan-tity	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	Regulated / transparent	Horizon	Reveal	Overhang	Total for heating case	Horizon	Reveal	Overhang	Total for cooling case	Total for cooling load
		[Degree]	[Degree]		w_G [m]	h_G [m]	A_G [m^2]	h_{Hori} [m]	d_{Hori} [m]	o_{Reveal} [m]	d_{Reveal} [m]	o_{over} [m]	d_{over} [m]	$r_{other,w}$ [%]	$r_{other,s}$ [%]	z [%]		r_H [%]	r_R [%]	r_O [%]	r_S [%]	r_H [%]	r_R [%]	r_O [%]	$r_{S,1}$ [%]	$r_{S,2}$ [%]
1	Door_south_lev01_02	208	90	South	0.86	1.72	1.5							12%	26%	73%					12%				21%	20%
1	Door_south_lev01_01	208	90	South	0.54	2.01	1.1							12%	26%	73%					12%				21%	20%
1	Door_south_lev01_01	208	90	South	0.72	1.72	1.2							12%	26%	73%					12%				21%	20%
1	Door_south_lev01_01	208	90	South	0.48	2.01	1.0							12%	27%	73%					12%				22%	20%
1	Win_south_levmez_0	208	90	South	1.14	1.76	2.0							15%	28%	73%					15%				23%	21%
1	Win_south_levmez_0	208	90	South	2.29	1.76	4.0							15%	27%	73%					15%				22%	20%
1	Door_nortth_lev02_0	28	90	North	1.03	2.04	2.1							21%	21%	73%					21%				17%	16%
1	Door_nortth_lev02_0	28	90	North	0.44	2.20	1.0							21%	21%	73%					21%				17%	16%
1	Win_nortth_lev02_02	28	90	North	0.62	2.20	1.4							20%	21%	73%					20%				17%	16%
1	Win_nortth_lev02_02	28	90	North	1.21	2.04	2.5							20%	21%	73%					20%				17%	16%
1	Win_nortth_lev02_01	28	90	North	0.89	1.40	1.3							20%	21%	73%					20%				17%	16%
1	Win_south_lev02_04b	208	90	South	0.32	1.40	0.4							18%	34%	73%					18%				27%	25%
1	Win_south_lev02_04a	208	90	South	1.11	1.60	1.8							18%	29%	73%					18%				24%	22%
1	Win_south_lev02_03b	208	90	South	0.32	1.40	0.4							15%	28%	73%					15%				22%	21%
1	Win_south_lev02_03a	208	90	South	1.11	1.60	1.8							15%	28%	73%					15%				23%	21%
1	Win_south_lev02_02b	208	90	South	0.32	1.40	0.4							15%	29%	73%					15%				23%	22%
1	Win_south_lev02_02a	208	90	South	1.11	1.60	1.8							15%	30%	73%					15%				24%	23%
1	Win_south_lev02_01b	208	90	South	0.32	1.40	0.4							15%	29%	73%					15%				24%	22%
1	Win_south_lev02_01a	208	90	South	1.11	1.60	1.8							15%	30%	73%					15%				24%	23%
1	Win_nortth_lev03_02	28	90	North	0.89	1.40	1.3							21%	21%	73%					21%				17%	16%
1	Win_nortth_lev03_01	28	90	North	1.26	1.60	2.0							21%	22%	73%					21%				18%	16%
1	Win_nortth_lev03_01	28	90	North	0.21	1.40	0.3							21%	21%	73%					21%				17%	16%
1	Win_nortth_lev03_03	28	90	North	0.39	1.40	0.5							21%	21%	73%					21%				17%	16%
1	Win_nortth_lev03_03	28	90	North	1.43	1.60	2.3							21%	21%	73%					21%				17%	16%
1	Win_south_lev03_04b	208	90	South	0.32	1.40	0.4							20%	37%	73%					20%				30%	28%
1	Win_south_lev03_04a	208	90	South	1.11	1.60	1.8							19%	34%	73%					19%				28%	26%
1	Win_south_lev03_03b	208	90	South	0.32	1.40	0.4							21%	34%	73%					21%				27%	25%
1	Win_south_lev03_03a	208	90	South	1.11	1.60	1.8							18%	32%	73%					18%				26%	24%
1	Win_south_lev03_02b	208	90	South	0.32	1.40	0.4							18%	31%	73%					18%				25%	23%
1	Win_south_lev03_02a	208	90	South	1.11	1.60	1.8							18%	31%	73%					18%				25%	23%
1	Win_south_lev03_01b	208	90	South	0.32	1.40	0.4							20%	33%	73%					20%				26%	25%
1	Win_south_lev03_01a	208	90	South	1.11	1.60	1.8							22%	31%	73%					22%				25%	23%
1	Win_nortth_lev04_02	28	90	North	0.89	1.40	1.3							21%	21%	73%					21%				17%	16%
1	Win_nortth_lev04_01	28	90	North	1.26	1.60	2.0							21%	22%	73%					21%				18%	16%
1	Win_nortth_lev04_01	28	90	North	0.21	1.40	0.3							21%	21%	73%					21%				17%	16%
1	Win_nortth_lev04_02	28	90	North	0.89	1.40	1.3							21%	21%	73%					21%				17%	16%
1	Win_nortth_lev04_01	28	90	North	1.26	1.60	2.0							21%	22%	73%					21%				18%	16%
1	Win_nortth_lev04_01	28	90	North	0.21	1.40	0.3							21%	21%	73%					21%				17%	16%
1	Win_nortth_lev04_03	28	90	North	0.39	1.40	0.5							21%	21%	73%					21%				17%	16%
1	Win_nortth_lev04_03	28	90	North	1.43	1.60	2.3							21%	22%	73%					21%				17%	16%
1	Win_south_lev04_04b	208	90	South	0.32	1.40	0.4							25%	38%	73%					25%				31%	29%
1	Win_south_lev04_04a	208	90	South	1.11	1.60	1.8							26%	39%	73%					26%				32%	30%
1	Win_south_lev01_03b	208	90	South	0.32	1.40	0.4							30%	35%	73%					30%				28%	26%
1	Win_south_lev04_03a	208	90	South	1.11	1.60	1.8							27%	35%	73%					27%				28%	27%
1	Win_south_lev04_02b	208	90	South	0.32	1.40	0.4							25%	32%	73%					25%				26%	24%
1	Win_south_lev04_02a	208	90	South	1.11	1.60	1.8							23%	32%	73%					23%				26%	24%
1	Win_south_lev04_01b	208	90	South	0.32	1.40	0.4							25%	36%	73%					25%				30%	28%
1	Win_south_lev04_01a	208	90	South	1.11	1.60	1.8							28%	33%	73%					28%				27%	25%
1	Win_nortth_lev05_02	28	90	North	0.89	1.40	1.3							21%	22%	73%					21%				18%	16%
1	Win_nortth_lev05_01	28	90	North	1.26	1.60	2.0							21%	22%	73%					21%				18%	17%
1	Win_nortth_lev05_01	28	90	North	0.21	1.40	0.3							21%	22%	73%					21%				18%	16%
1	Win_nortth_lev05_03	28	90	North	0.39	1.40	0.5							21%	22%	73%					21%				18%	16%
1	Win_nortth_lev05_03	28	90	North	1.43	1.60	2.3							21%	22%	73%					21%				18%	16%
1	Win_south_lev05_04b	208	90	South	0.32	1.40	0.4							34%	41%	73%					34%				33%	31%
1	Win_south_lev05_04a	208	90	South	1.11	1.60	1.8							34%	41%	73%					34%				34%	31%
1	Win_south_lev05_03b	208	90	South	0.32	1.40	0.4							36%	38%	73%					36%				31%	29%
1	Win_south_lev05_03a	208	90	South	1.11	1.60	1.8							36%	37%	73%					36%				30%	28%
1	Win_south_lev05_02b	208	90	South	0.32	1.40	0.4							30%	35%	73%					30%				29%	27%
1	Win_south_lev05_02a	208	90	South	1.11	1.60	1.8							28%	33%	73%					28%				27%	25%
1	Win_south_lev05_01b	208	90	South	0.32	1.40	0.4							27%	38%	73%					27%				31%	29%
1	Win_south_lev05_01a	208	90	South	1.11	1.60	1.8							31%	37%	73%					31%				30%	28%
1	Win_nortth_lev06_02	28	90	North	0.89	1.40	1.3							21%	22%	73%					21%				18%	17%
1	Win_nortth_lev06_01	28	90	North	1.26	1.60	2.0							21%	22%	73%					21%				18%	17%
1	Win_nortth_lev06_01	28	90	North	0.21	1.40	0.3							21%	22%	73%					21%				18%	17%
1	Win_nortth_lev06_03	28	90	North	0.39	1.40	0.5							21%	22%	73%					21%				18%	17%
1	Win_nortth_lev06_03	28	90	North	1.43	1.60	2.3							21%	22%	73%					21%				18%	17%
1	Win_south_lev06_04b	208	90	South	0.32	1.40	0.4							35%	43%	73%					35%				35%	33%
1	Win_south_lev06_04a	208	90	South	1.11	1.60	1.8							35%	44%	73%					35%				35%	33%
1	Win_south_lev06_03b	208	90	South	0.32	1.40	0.4							39%	44%	73%					39%				36%	33%
1	Win_south_lev06_03a	208	90	South	1.11	1.60	1.8							37%	45%	73%					37%				36%	34%
1	Win_south_lev06_02b	208	90	South	0.32	1.40	0.4							33%	42%	73%					33%				34%	32%
1	Win_south_lev06_02a	208	90	South	1.11	1.60	1.8							29%	41%	73%					29%				33%	31%
1	Win_south_lev06_01b	208	90	South	0.32	1.40	0.4							28%	41%	73%					28%				33%	31%
1	Win_south_lev06_01a	208	90	South	1.11	1.60	1.8							32%	39%	73%					32%				31%	29%
1	Win_nortth_lev07_02	28	90	North	0.89	1.40	1.3							22%	22%	73%					22%				18%	17%
1	Win_nortth_lev07_01	28	90	North	1.26	1.60	2.0							22%	22%	73%					22%				18%	17%
1	Win_nortth_lev07_01	28	90	North	0.21	1.40	0.3							22%	22%	73%					22%				18%	17%
1	Win_nortth_lev07_03	28	90	North	0.39	1.40	0.5							22%	22%	73%					22%				18%	17%
1	Win_nortth_lev07_03	28	90	North	1.43	1.60	2.3							22%	22%	73%					22%				18%	17%
1	Win_south_lev07_04b	208	90	South	0.32	1.40	0.4							36%	46%	73%					36%				37%	35%

Quan-tity	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	Regulated / transparent	Horizon	Reveal	Overhang	**Total for heating case**	Horizon	Reveal	Overhang	**Total for cooling case**	**Total for cooling load**
		[Degree]	[Degree]		w_G [m]	h_G [m]	A_G [m²]	h_{Hori} [m]	d_{Hori} [m]	o_{Reveal} [m]	d_{Reveal} [m]	o_{over} [m]	d_{over} [m]	$r_{other,w}$ [%]	$r_{other,s}$ [%]	**z [%]**		r_H [%]	r_R [%]	r_O [%]	r_S [%]	r_H [%]	r_R [%]	r_O [%]	$r_{S,1}$ [%]	$r_{S,2}$ [%]
1	Win_south_lev07_04a	208	90	South	1.11	1.60	1.8							36%	46%	73%					36%				38%	35%
1	Win_south_lev07_03b	208	90	South	0.32	1.40	0.4							40%	46%	73%					40%				37%	34%
1	Win_south_lev07_03a	208	90	South	1.11	1.60	1.8							41%	46%	73%					41%				37%	35%
1	Win_south_lev07_02b	208	90	South	0.32	1.40	0.4							36%	43%	73%					36%				35%	33%
1	Win_south_lev07_02a	208	90	South	1.11	1.60	1.8							34%	44%	73%					34%				35%	33%
1	Win_south_lev07_01b	208	90	South	0.32	1.40	0.4							32%	42%	73%					32%				34%	32%
1	Win_south_lev07_01a	208	90	South	1.11	1.60	1.8							36%	40%	73%					36%				32%	30%
1	Win_northth_lev08_02	28	90	North	0.89	1.40	1.3							22%	23%	73%					22%				18%	17%
1	Win_northth_lev08_01b	28	90	North	1.26	1.60	2.0							23%	23%	73%					23%				19%	17%
1	Win_northth_lev08_01a	28	90	North	0.21	1.40	0.3							22%	23%	73%					22%				18%	17%
1	Win_northth_lev08_03b	28	90	North	0.39	1.40	0.5							22%	23%	73%					22%				18%	17%
1	Win_northth_lev08_03a	28	90	North	1.43	1.60	2.3							22%	23%	73%					22%				18%	17%
1	Win_south_lev08_04b	208	90	South	0.32	1.40	0.4							42%	46%	73%					42%				38%	35%
1	Win_south_lev08_04a	208	90	South	1.11	1.60	1.8							41%	47%	73%					41%				38%	35%
1	Win_south_lev08_03b	208	90	South	0.32	1.40	0.4							40%	46%	73%					40%				37%	35%
1	Win_south_lev08_03a	208	90	South	1.11	1.60	1.8							41%	47%	73%					41%				38%	35%
1	Win_south_lev08_02b	208	90	South	0.32	1.40	0.4							38%	46%	73%					38%				37%	35%
1	Win_south_lev08_02a	208	90	South	1.11	1.60	1.8							37%	44%	73%					37%				36%	34%
1	Win_south_lev08_01b	208	90	South	0.32	1.40	0.4							36%	43%	73%					36%				35%	33%
1	Win_south_lev08_01a	208	90	South	1.11	1.60	1.8							39%	41%	73%					39%				33%	31%
1	Win_northth_lev09_02	28	90	North	0.89	1.40	1.3							23%	23%	73%					23%				19%	18%
1	Win_northth_lev09_01b	28	90	North	1.26	1.60	2.0							24%	24%	73%					24%				19%	18%
1	Win_northth_lev09_01a	28	90	North	0.21	1.40	0.3							23%	23%	73%					23%				19%	18%
1	Win_northth_lev09_03b	28	90	North	0.39	1.40	0.5							23%	23%	73%					23%				19%	18%
1	Win_northth_lev09_03a	28	90	North	1.43	1.60	2.3							23%	23%	73%					23%				19%	18%
1	Win_south_lev09_04b	208	90	South	0.32	1.40	0.4							43%	47%	73%					43%				38%	36%
1	Win_south_lev09_04a	208	90	South	1.11	1.60	1.8							43%	47%	73%					43%				39%	36%
1	Win_south_lev09_03b	208	90	South	0.32	1.40	0.4							43%	47%	73%					43%				38%	36%
1	Win_south_lev09_03a	208	90	South	1.11	1.60	1.8							43%	47%	73%					43%				38%	36%
1	Win_south_lev09_02b	208	90	South	0.32	1.40	0.4							43%	47%	73%					43%				38%	35%
1	Win_south_lev09_02a	208	90	South	1.11	1.60	1.8							42%	49%	73%					42%				39%	37%
1	Win_south_lev09_01b	208	90	South	0.32	1.40	0.4							40%	47%	73%					40%				38%	35%
1	Win_south_lev09_01a	208	90	South	1.11	1.60	1.8							44%	42%	73%					44%				34%	32%
1	Win_northth_lev10_02	28	90	North	0.89	1.40	1.3							25%	24%	73%					25%				20%	18%
1	Win_northth_lev10_01b	28	90	North	1.26	1.60	2.0							25%	25%	73%					25%				20%	19%
1	Win_northth_lev10_01a	28	90	North	0.21	1.40	0.3							25%	24%	73%					25%				20%	18%
1	Win_northth_lev10_03b	28	90	North	0.39	1.40	0.5							25%	24%	73%					25%				20%	18%
1	Win_northth_lev10_03a	28	90	North	1.43	1.60	2.3							25%	24%	73%					25%				20%	18%
1	Win_south_lev10_04b	208	90	South	0.32	1.40	0.4							46%	49%	73%					46%				40%	37%
1	Win_south_lev10_04a	208	90	South	1.11	1.60	1.8							46%	49%	73%					46%				40%	37%
1	Win_south_lev10_03b	208	90	South	0.32	1.40	0.4							47%	48%	73%					47%				39%	37%
1	Win_south_lev10_03a	208	90	South	1.11	1.60	1.8							48%	49%	73%					48%				40%	37%
1	Win_south_lev10_02b	208	90	South	0.32	1.40	0.4							46%	50%	73%					46%				41%	38%
1	Win_south_lev10_02a	208	90	South	1.11	1.60	1.8							47%	51%	73%					47%				41%	38%
1	Win_south_lev10_01b	208	90	South	0.32	1.40	0.4							47%	50%	73%					47%				41%	38%
1	Win_south_lev10_01a	208	90	South	1.11	1.60	1.8							48%	49%	73%					48%				40%	37%
1	Door_south_lev11_01	208	90	South	0.53	2.22	1.2							45%	52%	73%					45%				42%	39%
1	Door_south_lev11_01	208	90	South	0.91	2.06	1.9							46%	56%	73%					46%				45%	42%
1	Win_south_lev11_02b	208	90	South	0.30	1.41	0.4							46%	53%	73%					46%				43%	40%
1	Win_south_lev11_02a	208	90	South	1.15	1.61	1.9							48%	53%	73%					48%				43%	40%
1	Win_south_lev11_01b	208	90	South	0.30	1.41	0.4							47%	53%	73%					47%				43%	40%
1	Win_south_lev11_01a	208	90	South	1.15	1.61	1.9							48%	53%	73%					48%				43%	40%
1	Win_northth_lev11_01b	28	90	North	1.26	1.60	2.0							27%	26%	73%					27%				21%	20%
1	Win_northth_lev11_01a	28	90	North	0.21	1.40	0.3							27%	26%	73%					27%				21%	20%
1	Win_northth_lev11_02b	28	90	North	0.39	1.40	0.5							27%	26%	73%					27%				21%	20%
1	Win_northth_lev11_02a	28	90	North	1.43	1.60	2.3							27%	26%	73%					27%				21%	20%
1	Win_south_lev12_03b	208	90	South	0.30	1.41	0.4							47%	55%	73%					47%				44%	41%
1	Win_south_lev12_03a	208	90	South	1.15	1.61	1.9							48%	55%	73%					48%				44%	41%
1	Win_south_lev12_02b	208	90	South	0.30	1.41	0.4							49%	54%	73%					49%				44%	41%
1	Win_south_lev12_02a	208	90	South	1.15	1.61	1.9							49%	55%	73%					49%				44%	41%
1	Win_northth_lev12_01b	28	90	North	1.26	1.60	2.0							31%	29%	73%					31%				23%	22%
1	Win_northth_lev12_01a	28	90	North	0.21	1.40	0.3							31%	29%	73%					31%				23%	22%
1	Win_northth_lev12_02b	28	90	North	0.39	1.40	0.5							31%	28%	73%					31%				23%	21%
1	Win_northth_lev12_02a	28	90	North	1.43	1.60	2.3							31%	29%	73%					31%				23%	22%
1	Win_south_lev12_01b	208	90	South	0.30	1.40	0.4							47%	56%	73%					47%				45%	42%
1	Win_south_lev12_01a	208	90	South	1.14	1.60	1.8							46%	56%	73%					46%				45%	42%
1	Win_south_lev13_03b	208	90	South	0.30	1.41	0.4							49%	57%	73%					49%				47%	43%
1	Win_south_lev13_03a	208	90	South	1.15	1.61	1.9							50%	57%	73%					50%				46%	43%
1	Win_south_lev13_02b	208	90	South	0.30	1.41	0.4							50%	58%	73%					50%				47%	44%
1	Win_south_lev13_02a	208	90	South	1.15	1.61	1.9							50%	58%	73%					50%				47%	44%
1	Win_northth_lev13_01b	28	90	North	1.26	1.60	2.0							37%	33%	73%					37%				27%	25%
1	Win_northth_lev13_01a	28	90	North	0.21	1.40	0.3							37%	33%	73%					37%				27%	25%
1	Win_northth_lev13_02b	28	90	North	0.39	1.40	0.5							37%	33%	73%					37%				27%	25%
1	Win_northth_lev13_02a	28	90	North	1.43	1.60	2.3							37%	33%	73%					37%				27%	25%
1	Win_south_lev13_01b	208	90	South	0.30	1.40	0.4							48%	60%	73%					48%				48%	45%
1	Win_south_lev13_01a	208	90	South	1.14	1.60	1.8							47%	61%	73%					47%				49%	46%
1	Win_south_lev14_03b	208	90	South	0.30	1.41	0.4							51%	60%	73%					51%				49%	45%
1	Win_south_lev14_03a	208	90	South	1.15	1.61	1.9							53%	60%	73%					53%				48%	45%
1	Win_south_lev14_02b	208	90	South	0.30	1.41	0.4							50%	59%	73%					50%				47%	44%
1	Win_south_lev14_02a	208	90	South	1.15	1.61	1.9							50%	61%	73%					50%				50%	46%
1	Win_northth_lev14_01b	28	90	North	1.26	1.60	2.0							42%	36%	73%					42%				30%	28%
1	Win_northth_lev14_01a	28	90	North	0.21	1.40	0.3							41%	35%	73%					41%				29%	27%
1	Win_northth_lev14_02b	28	90	North	0.39	1.40	0.5							41%	36%	73%					41%				29%	27%
1	Win_northth_lev14_02a	28	90	North	1.43	1.60	2.3							40%	35%	73%					40%				29%	27%
1	Win_south_lev14_01b	208	90	South	0.30	1.40	0.4							48%	60%	73%					48%				49%	45%
1	Win_south_lev14_01a	208	90	South	1.14	1.60	1.8							48%	61%	73%					48%				50%	47%
1	Win_south_lev15_03b	208	90	South	0.30	1.41	0.4							53%	63%	73%					53%				51%	48%
1	Win_south_lev15_03a	208	90	South	1.15	1.61	1.9							55%	61%	73%					55%				49%	46%
1	Win_south_lev15_02b	208	90	South	0.30	1.41	0.4							52%	64%	73%					52%				52%	48%
1	Win_south_lev15_02a	208	90	South	1.15	1.61	1.9							52%	64%	73%					52%				52%	49%
1	Win_northth_lev15_01b	28	90	North	1.26	1.60	2.0							44%	38%	73%					44%				31%	29%

Quan-tity	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	Regulated / transparent	Horizon	Reveal	Overhang	**Total for heating case**	Horizon	Reveal	Overhang	**Total for cooling case**	**Total for cooling load**
		[Degree]	[Degree]		w_G [m]	h_G [m]	A_G [m²]	h_{Hori} [m]	d_{Hori} [m]	o_{Reveal} [m]	d_{Reveal} [m]	o_{over} [m]	d_{over} [m]	$r_{other,w}$ [%]	$r_{other,s}$ [%]	**z [%]**		r_H [%]	r_R [%]	r_O [%]	r_S [%]	r_H [%]	r_R [%]	r_O [%]	$r_{S,1}$ [%]	$r_{S,2}$ [%]
1	Win_nortth_lev15_01a	28	90	North	0.21	1.40	0.3							43%	37%	73%					43%				30%	28%
1	Win_nortth_lev15_02b	28	90	North	0.39	1.40	0.5							45%	38%	73%					45%				31%	29%
1	Win_nortth_lev15_02a	28	90	North	1.43	1.60	2.3							45%	38%	73%					45%				31%	29%
1	Win_south_lev15_01b	208	90	South	0.30	1.40	0.4							53%	63%	73%					53%				51%	48%
1	Win_south_lev15_01a	208	90	South	1.14	1.60	1.8							54%	65%	73%					54%				52%	49%
1	Win_south_lev16_03b	208	90	South	0.30	1.41	0.4							54%	65%	73%					54%				53%	49%
1	Win_south_lev16_03a	208	90	South	1.15	1.61	1.9							56%	65%	73%					56%				53%	49%
1	Win_south_lev16_02b	208	90	South	0.30	1.41	0.4							56%	67%	73%					56%				54%	50%
1	Win_south_lev16_02a	208	90	South	1.15	1.61	1.9							56%	67%	73%					56%				54%	51%
1	Win_nortth_lev16_01b	28	90	North	1.26	1.60	2.0							46%	40%	73%					46%				32%	30%
1	Win_nortth_lev16_01a	28	90	North	0.21	1.40	0.3							44%	38%	73%					44%				31%	29%
1	Win_nortth_lev16_02b	28	90	North	0.39	1.40	0.5							47%	40%	73%					47%				32%	30%
1	Win_nortth_lev16_02a	28	90	North	1.43	1.60	2.3							46%	39%	73%					46%				32%	30%
1	Win_south_lev16_01b	208	90	South	0.30	1.40	0.4							57%	66%	73%					57%				54%	50%
1	Win_south_lev16_01a	208	90	South	1.14	1.60	1.8							56%	67%	73%					56%				55%	51%
1	Win_south_lev17_03b	208	90	South	0.30	1.41	0.4							55%	69%	73%					55%				56%	52%
1	Win_south_lev17_03a	208	90	South	1.15	1.61	1.9							57%	69%	73%					57%				56%	52%
1	Win_south_lev17_02b	208	90	South	0.30	1.41	0.4							57%	70%	73%					57%				57%	53%
1	Win_south_lev17_02a	208	90	South	1.15	1.61	1.9							57%	71%	73%					57%				57%	54%
1	Win_nortth_lev17_01b	28	90	North	1.26	1.60	2.0							47%	40%	73%					47%				33%	31%
1	Win_nortth_lev17_01a	28	90	North	0.21	1.40	0.3							45%	39%	73%					45%				32%	29%
1	Win_nortth_lev17_02b	28	90	North	0.39	1.40	0.5							48%	41%	73%					48%				33%	31%
1	Win_nortth_lev17_02a	28	90	North	1.43	1.60	2.3							48%	41%	73%					48%				33%	31%
1	Win_south_lev17_01b	208	90	South	0.30	1.40	0.4							62%	68%	73%					62%				55%	51%
1	Win_south_lev17_01a	208	90	South	1.14	1.60	1.8							57%	69%	73%					57%				56%	52%
1	Win_south_lev18_03b	208	90	South	0.30	1.41	0.4							59%	71%	73%					59%				58%	54%
1	Win_south_lev18_03a	208	90	South	1.15	1.61	1.9							61%	71%	73%					61%				58%	54%
1	Win_south_lev18_02b	208	90	South	0.30	1.41	0.4							62%	73%	73%					62%				59%	55%
1	Win_south_lev18_02a	208	90	South	1.15	1.61	1.9							62%	74%	73%					62%				60%	56%
1	Win_nortth_lev18_01b	28	90	North	1.26	1.60	2.0							49%	41%	73%					49%				34%	31%
1	Win_nortth_lev18_01a	28	90	North	0.21	1.40	0.3							47%	40%	73%					47%				32%	30%
1	Win_nortth_lev18_02b	28	90	North	0.39	1.40	0.5							52%	43%	73%					52%				35%	33%
1	Win_nortth_lev18_02a	28	90	North	1.43	1.60	2.3							52%	44%	73%					52%				35%	33%
1	Win_south_lev18_01b	208	90	South	0.30	1.40	0.4							64%	73%	73%					64%				59%	55%
1	Win_south_lev18_01a	208	90	South	1.14	1.60	1.8							63%	73%	73%					63%				59%	55%
1	Win_south_lev19_03b	208	90	South	0.30	1.41	0.4							60%	72%	73%					60%				59%	55%
1	Win_south_lev19_03a	208	90	South	1.15	1.61	1.9							62%	73%	73%					62%				59%	55%
1	Win_south_lev19_02b	208	90	South	0.30	1.41	0.4							63%	75%	73%					63%				61%	57%
1	Win_south_lev19_02a	208	90	South	1.15	1.61	1.9							63%	75%	73%					63%				61%	57%
1	Win_nortth_lev19_01b	28	90	North	1.26	1.60	2.0							51%	43%	73%					51%				35%	33%
1	Win_nortth_lev19_01a	28	90	North	0.21	1.40	0.3							48%	41%	73%					48%				34%	31%
1	Win_nortth_lev19_02b	28	90	North	0.39	1.40	0.5							56%	48%	73%					56%				39%	36%
1	Win_nortth_lev19_02a	28	90	North	1.43	1.60	2.3							56%	46%	73%					56%				38%	35%
1	Win_south_lev19_01b	208	90	South	0.30	1.40	0.4							66%	76%	73%					66%				61%	57%
1	Win_south_lev19_01a	208	90	South	1.14	1.60	1.8							65%	76%	73%					65%				61%	57%
1	Win_south_lev20_03b	208	90	South	0.30	1.41	0.4							63%	75%	73%					63%				61%	57%
1	Win_south_lev20_03a	208	90	South	1.15	1.61	1.9							65%	76%	73%					65%				61%	57%
1	Win_south_lev20_02b	208	90	South	0.30	1.41	0.4							69%	79%	73%					69%				64%	59%
1	Win_south_lev20_02a	208	90	South	1.15	1.61	1.9							69%	80%	73%					69%				65%	60%
1	Win_nortth_lev20_01b	28	90	North	1.26	1.60	2.0							53%	45%	73%					53%				37%	34%
1	Win_nortth_lev20_01a	28	90	North	0.21	1.40	0.3							51%	43%	73%					51%				35%	33%
1	Win_nortth_lev20_02b	28	90	North	0.39	1.40	0.5							61%	52%	73%					61%				42%	39%
1	Win_nortth_lev20_02a	28	90	North	1.43	1.60	2.3							61%	50%	73%					61%				41%	38%
1	Win_south_lev20_01b	208	90	South	0.30	1.40	0.4							72%	80%	73%					72%				65%	61%
1	Win_south_lev20_01a	208	90	South	1.14	1.60	1.8							71%	80%	73%					71%				65%	61%
1	Win_south_lev21_03b	208	90	South	0.30	1.41	0.4							68%	77%	73%					68%				63%	58%
1	Win_south_lev21_03a	208	90	South	1.15	1.61	1.9							69%	78%	73%					69%				63%	59%
1	Win_south_lev21_02b	208	90	South	0.30	1.41	0.4							75%	81%	73%					75%				66%	61%
1	Win_south_lev21_02a	208	90	South	1.15	1.61	1.9							76%	82%	73%					76%				66%	62%
1	Win_nortth_lev21_01b	28	90	North	1.26	1.60	2.0							56%	47%	73%					56%				38%	35%
1	Win_nortth_lev21_01a	28	90	North	0.21	1.40	0.3							54%	46%	73%					54%				37%	35%
1	Win_nortth_lev21_02b	28	90	North	0.39	1.40	0.5							62%	53%	73%					62%				43%	40%
1	Win_nortth_lev21_02a	28	90	North	1.43	1.60	2.3							62%	51%	73%					62%				42%	39%
1	Win_south_lev21_01b	208	90	South	0.30	1.40	0.4							76%	82%	73%					76%				67%	62%
1	Win_south_lev21_01a	208	90	South	1.14	1.60	1.8							77%	82%	73%					77%				67%	62%
1	Door_nortth_lev22_01	28	90	North	0.62	2.20	1.4							62%	52%	73%					62%				42%	39%
1	Door_nortth_lev22_01	28	90	North	1.21	2.04	2.5							62%	51%	73%					62%				42%	39%
1	Win_nortth_lev22_01b	208	90	South	0.30	1.41	0.4							72%	79%	73%					72%				64%	60%
1	Win_south_lev22_03a	208	90	South	1.15	1.61	1.9							74%	79%	73%					74%				64%	60%
1	Win_south_lev22_02b	208	90	South	0.30	1.41	0.4							82%	84%	73%					82%				68%	63%
1	Win_south_lev22_02a	208	90	South	1.15	1.61	1.9							84%	84%	73%					84%				68%	64%
1	Win_south_lev22_01b	208	90	South	0.30	1.40	0.4							87%	85%	73%					87%				69%	64%
1	Win_south_lev22_01a	208	90	South	1.14	1.60	1.8							87%	85%	73%					87%				69%	64%
1	Win_south_lev23_03b	208	90	South	0.30	1.41	0.4							79%	81%	73%					79%				66%	62%
1	Win_south_lev23_03a	208	90	South	1.15	1.61	1.9							82%	83%	73%					82%				67%	63%
1	Win_south_lev22_02b	208	90	South	0.30	1.41	0.4							89%	87%	73%					89%				70%	66%
1	Win_south_lev23_02a	208	90	South	1.15	1.61	1.9							90%	87%	73%					90%				70%	66%
1	Win_nortth_lev23_01b	28	90	North	0.39	1.40	0.5							65%	55%	73%					65%				44%	41%
1	Win_nortth_lev23_01a	28	90	North	1.43	1.60	2.3							65%	55%	73%					65%				45%	42%
1	Win_south_lev23_01b	208	90	South	0.30	1.40	0.4							91%	87%	73%					91%				71%	66%
1	Win_south_lev23_01a	208	90	South	1.14	1.60	1.8							91%	88%	73%					91%				71%	67%
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Ventilation data

211 West 29th Street / Climate: New York / TFA: 3734 m² / Heating: 9.6 kWh/(m²a) / Cooling: 11.5 kWh/(m²a) / PER: 84.6 kWh/(m²a)

Treated floor area A_{TFA}	m²	3734	*('Areas' worksheet)*
Room height h	m	2.50	
Volume of ventilated space (A_{TFA}*h) : V_V	m³	9335	*(Worksheet 'Annual heating')*

Ventilation type

Please select: 1-Balanced PH ventilation with HR

Infiltration air change rate

Wind protection coefficients e and f	Several sides exposed	One side exposed
Coefficient e for wind protection class		
No protection	0.10	0.03
Moderate protection	0.07	0.02
High protection	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	0.36	0.36	12370	m³	1.03 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	0.033	0.083

Selection of ventilation input - Results

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

	Ventilation unit / Heat recovery efficiency design	
x	Standard design	*('Ventilation' worksheet, see below)*
	Multiple ventilation units, non-res	*('Addl vent' worksheet)*

Average air flow rate m³/h	Average air change rate 1/h	Extract air excess (extract air system) 1/h	Effective heat recovery efficiency unit [-]	Humidity recovery efficiency [-]	Specific power input Wh/m³	Heat recovery efficiency SHX [-]
5245	0.56	0.00	83.5%	0%	0.45	0.0%

Cooling recovery

Efficiency SHX η^*_{SHX} 0%

Average interior humidity during winter operation

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
27%	28%	32%	42%	-	-	-	-	-	55%	40%	31%

Standard data input for balanced ventilation

Dimensioning of ventilation system with only one ventilation unit

Occupancy	m²/P	38					
Number of occupants	P	98.7					
Supply air per person	m³/(P*h)	30					
Supply air requirement	m³/h	2961			Bathroom		
Extract air rooms		Kitchen	Bathroom		(shower only)	WC	
Quantity		44	62				
Extract air requirement per room	m³/h	60	40		20	20	
Total extract air requirement	m³/h	5120					

Design air flow rate (maximum) m³/h **6818** Recommended: 5120 m³/h

Average air change rate calculation

Type of operation	Daily operation times h/d	Factors referenced to maximum	Air flow rate m³/h	Air change rate 1/h
maximum		1.00	6818	0.73
Standard	**24.0**	**0.77**	5245	0.56
Basic ventilation		**0.54**	3671	0.39
Minimum		**0.40**	2727	0.29
	Average value	0.77	Average air flow rate (m³/h) **5245**	Average air change rate (1/h) **0.56**

Selection of ventilation unit with heat recovery

Location of ventilation unit: **1-Inside thermal envelope**

	Go to ventilation units list 1-Sorting: LIKE LIST	Heat recovery efficiency	Humidity recovery efficiency	Specific efficiency [Wh/m³]	Application [m³/h]	Frost power input
Ventilation unit selection	**0568vl03-Swegon - GOLD RX 35**	**0.85**	**0%**	**0.45**	**3600 - 7500**	**no**

Conductivity outdoor air duct	Ψ	W/(mK)	1.677
Length of outdoor air duct		m	10
Conductivity exhaust air duct	Ψ	W/(mK)	1.677
Length of exhaust air duct		m	10
Temperature of mechanical services room		°C	20
(Enter only if the central unit is outside of the thermal envelope)			

Implementation of frost protection	2-Elec.
Limit temperature [°C]	0
Useful energy [kWh/a]	6148
Room temperature (°C)	20
Avg. ambient temp. heat. period (°C)	5.5
Avg. ground temp (°C)	13.6

Effective heat recovery efficiency $\eta_{HR,eff}$ **83.5%**

Effective heat recovery efficiency subsoil heat exchanger

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

Secondary calculation
Ψ-value supply or outdoor air duct

Nominal width	500	mm
Insulation thic	25	mm
Reflective coating?		Yes
	x	No
Thermal conductivity	0.032	W/(mK)
Nominal air flow rate	5245	m³/h
Δϑ	15	K
Exterior duct diameter	0.500	m
Exterior diameter	0.550	m
α–Interior	21.99	W/(m²K)
α-Surface	6.21	W/(m²K)
Ψ–value	**1.677**	**W/(mK)**
Surface temperature difference	2.273	K

Secondary calculation
Ψ-value extract or exhaust air duct

Nominal width:	500	mm
Insulation thickness	25	mm
Reflective coating?		yes
	x	no
Thermal conductivity	0.032	W/(mK)
Nominal air flow rate	5245	m³/h
Δϑ	15	K
Exterior duct diameter	0.500	m
Exterior diameter	0.550	m
α–Interior	21.99	W/(m²K)
α-Surface	6.21	W/(m²K)
Ψ–value	**1.677**	**W/(mK)**
Surface temperature difference	2.273	K

Specific energy for heating (monthly method)

211 West 29th Street / Climate: New York / TFA: 3734 m² / Heating: 9.6 kWh/(m²a) / Cooling: 11.5 kWh/(m²a) / PER: 84.6 kWh/(m²a)

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

Interior temperature:	20	°C
Building type:	Multifamily Residential	
Treated floor area A_{TFA}:	3734.0	m²
Spec. Capacity:	132	Wh/(m²K)

Building assembly	Temperature zone	Area m²		U-Value W/(m²K)		Month. red. fac.		G_t kKh/a		kWh/a	Per m² of treated floor area
External wall - Ambient	A	2855.0	*	0.157	*	1.00	*	70	=	31547	8.45
External wall - Ground	B	298.7	*	0.127	*	1.00	*	25	=	960	0.26
Roof/Ceiling - Ambient	A	297.9	*	0.108	*	1.00	*	70	=	2269	0.61
Floor slab / Basement ceiling	B	413.0	*	0.344	*	1.00	*	25	=	3606	0.97
	A		*		*	1.00	*		=		
	A		*		*	1.00	*		=		
	X		*		*	0.75	*		=		
Windows	A	463.4	*	0.815	*	1.00	*	70	=	26530	7.10
Exterior door	A		*		*	1.00	*		=		
Exterior TB (length/m)	A	1492.8	*	0.110	*	1.00	*	70	=	11512	3.08
Perimeter TB (length/m)	P	87.5	*	0.075	*	1.00	*	25	=	167	0.04
Ground TB (length/m)	B	222.0	*	0.100	*	1.00	*	25	=	564	0.15
											kWh/(m²a)
Transmission heat losses Q_T									Total	77154	20.7

	Effective air volume V_V	A_{TFA} m²		Clear room height m		m³
		3734	*	2.50	=	9335

	$n_{V,system}$ 1/h		η*SHX		η_{HR}		$n_{V,Res}$ 1/h		$n_{V,equi,fraction}$ 1/h
Effective air change rate Ambient nV,e	0.562	*(1-	0%	)*(1-	0.83	)+	0.033	=	0.126
Effective air change rate Ground nV,g	0.562	*	0%	*(1-	0.83	)		=	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	9335	*	0.126	*	0.33	*	70	=	27335	7.3
Ventilation losses ground $Q_{V,e}$	9335	*	0.000	*	0.33	*	33	=	0	0.0
Ventilation heat losses Q_V								Total	27335	7.3

	Q_T kWh/a		Q_V kWh/a		Reduction factor night/weekend saving		kWh/a	kWh/(m²a)
Total heat losses Q_L	(77154	+	27335	) *	1.0	=	104489	**28.0**

Orientation of the area	Reduction factor see 'Windows' worksheet		g-Value (perp. radiation)		Area m²		Global radiation kWh/(m²a)		kWh/a
North	0.13	*	0.50	*	185.8	*	184	=	2166
East	0.00	*	0.00	*	0.0	*	405	=	0
South	0.17	*	0.50	*	277.6	*	679	=	16480
West	0.00	*	0.00	*	0.0	*	392	=	0
Horizontal	0.00	*	0.00	*	0.0	*	620	=	0
Sum opaque areas									1548
									kWh/(m²a)
Available solar heat gains Q_S								Total	20194	5.4

	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	*	212	*	2.8	*	3734.0	=	53889	14.4

			kWh/a	kWh/(m²a)
Free heat Q_F	Q_S + Q_I	=	74083	19.8
Ratio free heat to losses	Q_F / Q_L	=	0.71	
Utilisation factor heat gains h_G		=	93%	
Heat gains Q_G	η_G * Q_F	=	68644	**18.4**

		kWh/a	kWh/(m²a)
Annual heating demand Q_H	Q_L - Q_G =	35845	**10**

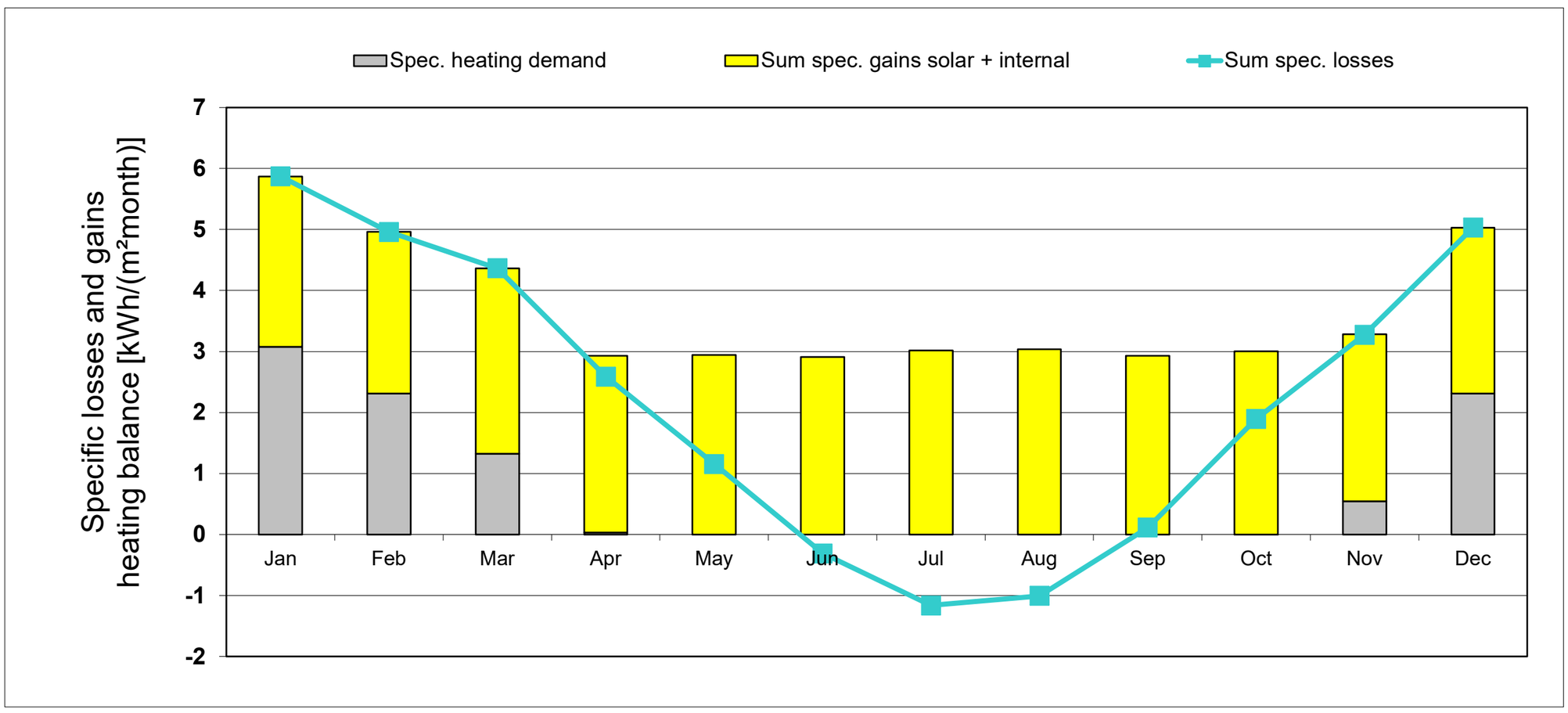
	kWh/(m²*a)		(Yes/No)
Limiting value	15	**Requirement met?**	**Yes**

Specific energy for heating (monthly method)

211 West 29th Street / Climate: New York / TFA: 3734 m² / Heating: 9.6 kWh/(m²a) / Cooling: 11.5 kWh/(m²a) / PER: 84.6 kWh/(m²a)

Interior temperature: 20 °C
Building type: Multifamily Residential
Treated floor area A_{TFA}: 3734 m²

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	
Heating degree hours - Externa	14.9	12.4	10.8	6.2	2.5	-1.2	-3.3	-2.8	0.2	4.8	8.3	12.8	66	kKh
Heating degree hours - Ground	4.4	4.5	5.1	4.4	3.6	2.4	1.5	0.9	0.8	1.3	2.2	3.4	34	kKh
Losses - Exterior	21002	17576	15243	8747	3567	-1659	-4644	-3937	261	6796	11762	18067	92781	kWh
Losses - Ground	922	947	1058	918	750	497	305	178	163	278	462	713	7189	kWh
Sum spec. losses	5.9	5.0	4.4	2.6	1.2	-0.3	-1.2	-1.0	0.1	1.9	3.3	5.0	26.8	kWh/m²
Solar gains - North	218	275	416	513	632	723	700	607	441	339	207	199	5269	kWh
Solar gains - East	0	0	0	0	0	0	0	0	0	0	0	0	0	kWh
Solar gains - South	2154	2300	2776	2384	2155	2177	2334	2508	2596	2734	2213	1920	28251	kWh
Solar gains - West	0	0	0	0	0	0	0	0	0	0	0	0	0	kWh
Solar gains - Horiz.	0	0	0	0	0	0	0	0	0	0	0	0	0	kWh
Solar gains - Opaque	176	204	283	297	311	340	346	331	283	252	183	155	3160	kWh
Internal heat gains	7880	7117	7880	7626	7880	7626	7880	7880	7626	7880	7626	7880	92781	kWh
Sum spec. gains solar + interna	2.8	2.7	3.0	2.9	2.9	2.9	3.0	3.0	2.9	3.0	2.7	2.7	34.7	kWh/m²
Utilisation factor	100%	100%	100%	88%	39%	100%	100%	100%	4%	63%	100%	100%	50%	
Annual heating demand	11496	8627	4949	109	0	0	0	0	0	0	2038	8626	35845	kWh
Spec. heating demand	**3.1**	**2.3**	**1.3**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.5**	**2.3**	**9.6**	kWh/m²



Annual heating demand: Comparison

Monthly method	*('Heating')*	35845	kWh/a	9.6	**kWh/(m²a)** reference to treated floor area according to PHPP
Annual method	*('Annual heatin*	40093	kWh/a	10.7	**kWh/(m²a)** reference to treated floor area according to PHPP
		#REF!	kWh/a	#REF!	

Heating load

211 West 29th Street / Climate: New York / TFA: 3734 m² / Heating: 9.6 kWh/(m²a) / Cooling: 11.5 kWh/(m²a) / PER: 84.6 kWh/(m²a)

Interior temperature: 20 °C
Building type: Multifamily Residential
Treated floor area A_{TFA}: 3734.0 m²

	Design temperature		Radiation:	North	East	South	West	Horizontal	
Weather 1:	-10.0	°C		25	60	115	50	70	W/m²
Weather 2:	-4.5	°C		15	20	25	20	30	W/m²
Ground design temp.	12.5	°C							

Building assembly	Temperature zone	Area m²		U-Value W/(m²K)		Factor always 1 (except "X")		TempDiff 1 K		TempDiff 2 K		**PT 1** W		**PT 2** W
External wall - Ambient	A	2855.0	*	0.157	*	1.00	*	30.0	or	24.5	=	13483	or	11012
External wall - Ground	B	298.7	*	0.127	*	1.00	*	7.5	or	7.5	=	284	or	284
Roof/Ceiling - Ambient	A	297.9	*	0.108	*	1.00	*	30.0	or	24.5	=	970	or	792
Floor slab / Basement ceiling	B	413.0	*	0.344	*	1.00	*	7.5	or	7.5	=	1066	or	1066
	A		*		*	1.00	*	30.0	or	24.5	=		or	
	A		*		*	1.00	*	30.0	or	24.5	=		or	
	A		*		*	1.00	*	30.0	or	24.5	=		or	
	X		*		*	0.75	*	30.0	or	24.5	=		or	
Windows	A	463.4	*	0.815	*	1.00	*	30.0	or	24.5	=	11338	or	9261
Exterior door	A		*		*	1.00	*	30.0	or	24.5	=		or	
Exterior TB (length/m)	A	1492.8	*	0.110	*	1.00	*	30.0	or	24.5	=	4920	or	4018
Perimeter TB (length/m)	P	87.5	*	0.075	*	1.00	*	7.5	or	7.5	=	49	or	49
Ground TB (length/m)	B	222.0	*	0.100	*	1.00	*	7.5	or	7.5	=	167	or	167
Building element towards neighbour	I	1589.6	*	0.475	*	1.00	*	3.0	or	3.0	=	2265	or	2265

Transmission heat load P_T

Total = 34541 or 28915

Ventilation system:

	A_{TFA} m²		Clear room height m		m³		η_{SHX} 1		η_{SHX} 2
Effective air volume, V_V	3734.0	*	2.50	=	9335				
Heat recovery efficiency of the heat exchanger η_{HR} 83%	Heat recovery efficiency SHX		0%		Heat recovery efficiency SHX		0%	or	0%

	$n_{V,Res}$ (Heating Load) 1/h		$n_{V,system}$ 1/h		Φ_{HP}		Φ_{HP}		1/h		1/h
Energetically effective air changes n_V	0.083	+	0.562	*(1-	0.83	or	0.83	) =	0.176	or	0.176

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
9335.0	*	0.176	or	0.176	*	0.33	*	30.0	or	24.5	=	16315	or	13326

Total heating load P_L

		PL 1 W		**PL 2** W
$P_T + P_V$	=	**50856**	or	**42240**

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
North	185.8	*	0.5	*	0.13	*	29	or	16	=	347	or	184
East	0.0	*	0.0	*	0.40	*	60	or	20	=	0	or	0
South	277.6	*	0.5	*	0.17	*	104	or	24	=	2520	or	592
West	0.0	*	0.0	*	0.40	*	50	or	20	=	0	or	0
Horizontal	0.0	*	0.0	*	0.40	*	70	or	30	=	0	or	0

Solar heating power P_S

Total = 2867 or 776

Internal heating load P_I

Spec. power W/m²		A_{TFA} m²		**P_I 1** W		**P_I 2** W
2.3	*	3734	=	8724	or	8724

Heating power (gains) P_G

		P_G 1 W		**P_G 2** W
$P_T + P_I$	=	**11591**	or	**9500**

$P_L - P_G$	=	39265	or	32740
Heating load P_H	=	**39265**		**W**
Area specific space heating load P_H / A_{TFA}	=	**10.5**		**W/m²**

Input max. supply air temperature	52	°C			°C		°C
Max. supply air temperature $\vartheta_{Supply,Max}$	52	°C	Supply air temperature without heating	$\vartheta_{Supply,Min}$	15.0		15.9

For comparison: heating load transportable by the supply Air $P_{Supply\ Air,Max}$ = **63977** W specific: 17.1 W/m²

Supply air heating: Sufficient? (Yes/No) **Yes**

Summer ventilation

211 West 29th Street / Climate: New York / TFA: 3734 m² / Heating: 9.6 kWh/(m²a) / Cooling: 11.5 kWh/(m²a) / PER: 84.6 kWh/(m²a)

Building volume:	9335	m³	Building type:	Multifamily Residential	
Max. indoor absolute humidity:	12	g/kg	Heat recovery efficiency:	83%	
Internal humidity sources:	100	g/(P*h)	Humidity recovery efficiency:	0%	
			Subsoil heat exchanger efficiency:	0%	

Results passive cooling

Frequency of overheating:	33.4%	at the overheating limit ϑ_{max} = 25 °C	Useful cooling demand:	7.4	kWh/(m²a)
max. humidity:	18.3	g/kg	Dehumidification demand:	4.1	kWh/(m²a)
Frequency of exceeded humidity:	17.9%		Frequency of exceeded humidity:	7.6%	

Summer basic ventilation to ensure adequate air quality

Air change rate via vent. system with supply air:	0.43	1/h	HRV/ERV in summer (check only one field)	
			None	
			Automatic bypass, controlled by temperature difference	
			Automatic bypass, controlled by enthalpy difference	
			Always	x
Air change rate via extract air system:		1/h		
			Specific power consumption (for extract air system)	0.20 Wh/m³
Window ventilation air change rate:	0.30	1/h		

Effective air change rate

	$n_{V,system}$ 1/h		η^*_{SHX}		η_{HP}		$n_{V,equi,fraction}$ 1/h
Exterior $n_{V,e}$	0.433	*(1-	0%	)*(1-	0.83	) =	0.072
without HR	0.433	*(1-	0%	)		=	0.433
Ground $n_{L,g}$	0.433	*	0%	*(1-	0.83	) =	0.000
without HR	0.433	*	0%			=	0.000

Ventilation conductance

	V_V m³		$n_{V,equi,fraction}$ 1/h		c_{Air} Wh/(m³K)			
exterior $H_{V,e}$	9335	*	0.072	*	0.33	=	220.4	W/K
without HR	9335	*	0.433	*	0.33	=	1332.7	W/K
ground $H_{V,g}$	9335	*	0.000	*	0.33	=	0.0	W/K
without HR	9335	*	0.000	*	0.33	=	0.0	W/K
Infiltration, window, extract air system	9335	*	0.333	*	0.33	=	1027.0	W/K

Additional summer ventilation for cooling

Additional ventilation regulation

Minimum acceptable indoor temp. 22.0 °C

Type of additional ventilation

Window night ventilation, manual	Night ventilation value	0.00	1/h		
Mechanical, automatically Controlled ventilation	Corresponding air change rate during operation, in addition to basic air change		1/h	Controlled by (please check) Temperature diff.	
	Specific power consumption		Wh/m³	Humidity diff.	x

Summer: Passive cooling

211 West 29th Street / Climate: New York / TFA: 3734 m² / Heating: 9.6 kWh/(m²a) / Cooling: 11.5 kWh/(m²a) / PER: 84.6 kWh/(m²a)

Building type:	Multifamily Residential		Treated floor area A_{TFA}:	3734.0	m²
Upper temperature limit:	25	°C	Building volume:	9335	m³
Nominal humidity:	12	g/kg	Internal humidity sources:	2.6	g/(m²h)
Spec. capacity:	132	Wh/(m²K)			

Building assembly	Temperature zone	Area m²		U-Value W/(m²K)		Red. factor $f_{T,Summer}$		H_{Summer} heat conductance	
External wall - Ambient	A	2855.0	*	0.157	*	1.00	=	449.1	
External wall - Ground	B	298.7	*	0.127	*	1.00	=	37.8	
Roof/Ceiling - Ambient	A	297.9	*	0.108	*	1.00	=	32.3	
Floor slab / Basement ceiling	B	413.0	*	0.344	*	1.00	=	142.0	
	A		*		*	1.00	=		
	A		*		*	1.00	=		
	X		*		*	0.75	=		
Windows	A	463.4	*	0.815	*	1.00	=	377.7	
Exterior door	A		*		*	1.00	=		
Exterior TB (length/m)	A	1492.8	*	0.110	*	1.00	=	163.9	
Perimeter TB (length/m)	P	87.5	*	0.075	*	1.00	=	6.6	
Ground TB (length/m)	B	222.0	*	0.100	*	1.00	=	22.2	
Exterior thermal transmittance, $H_{T,e}$								1023.0	W/K
Ground thermal transmittance, $H_{T,g}$								208.6	W/K

Summer ventilation

from 'SummVent' worksheet

Ventilation unit conductance			Ventilation parameter			Summer ventilation regulation	
exterior $H_{V,e}$	220.4	W/K	Temperature amplitude summer	8.0	K		HRV/ERV
without HR	1332.7	W/K	Minimum acceptable indoor temperature	22.0	°C	None	
ground $H_{V,g}$	0.0	W/K	Heat capacity air	0.33	Wh/(m³K)	Controlled by temperature	
without HR	0.0	W/K	Supply air changes	0.43	1/h	Controlled by enthalpy	
Ventilation conductance, others			Outdoor air changes	0.33	1/h	Always	x
exterior	1027.0	W/K	Window night ventilation air change rate, manual @ 1K	0.00	1/h		Additional ventilation
			Air change rate due to mech. automatically controlled vent.	0.00	1/h	Controlled by temperature	
			Specific power consumption for	0.00	Wh/m³	Controlled by humidity	x
			η_{HR}	83%			
			η_{ERV}	0%			
			η^*_{SHX}	0%			

Orientation of the area	Angle factor Summer		Shading factor Summer		Shading dirt		g-Value (perp. radiation)		Area m²		Portion of glazing		**Aperture** m²	
North	0.9	*	0.18	*	0.95	*	0.50	*	185.8	*	66%	=	9.4	
East	0.9	*	1.00	*	0.95	*	0.00	*	0.0	*	0%	=	0.0	
South	0.9	*	0.31	*	0.95	*	0.50	*	277.6	*	65%	=	24.1	
West	0.9	*	1.00	*	0.95	*	0.00	*	0.0	*	0%	=	0.0	
Horizontal	0.9	*	1.00	*	0.95	*	0.00	*	0.0	*	0%	=	0.0	
Sum opaque areas													3.7	

Solar aperture

Total 37.2 m²/m² 0.01

Internal heat gains Q_I

Specif. power q_I W/m²		A_{TFA} m²		W	W/m²
3.2	*	3734	=	11906	3.2

Frequency of overheating $h_{\vartheta \geq Jmax}$

33.4%

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 fluctuation

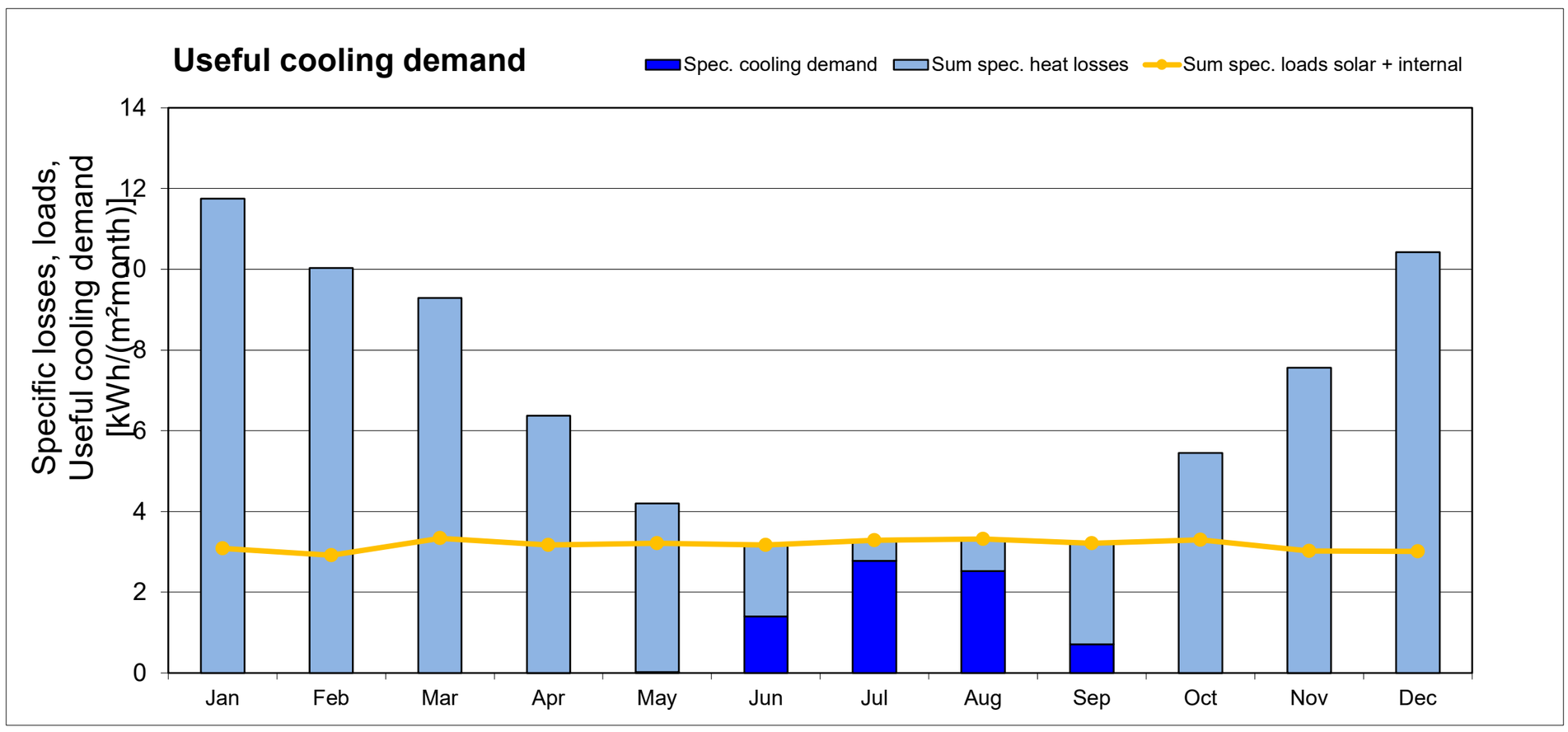
Transmission kWh/d		Ventilation kWh/d		Solar load kWh/d		1/k	Spec. capacity Wh/(m²K)		A_{TFA}: m²		
(98.2	+	119.8	+	160.3	) *	1000	/ (132	*	3734	) =	0.8 K

Cooling: energy value for useful cooling energy

211 West 29th Street / Climate: New York / TFA: 3734 m² / Heating: 9.6 kWh/(m²a) / Cooling: 11.5 kWh/(m²a) / PER: 84.6 kWh/(m²a)

Interior Temperature: 25 °C
Building type: Multifamily Residential
Treated Floor Area A_{TFA}: 3734 m²

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	
Heating degree hours - Exterior	18.6	15.9	14.6	9.8	6.3	2.5	0.5	1.0	3.8	8.6	12.0	16.6	110	kKh
Heating degree hours - Ground	8.1	7.9	8.8	8.0	7.3	6.0	5.2	4.6	4.4	5.1	5.8	7.1	78	kKh
Losses - Exterior	42223	35871	32925	22184	14106	5426	876	2034	8530	19330	27067	37486	248056	kWh
Losses - Ground	1644	1596	1776	1617	1478	1209	1047	924	885	1021	1174	1442	15812	kWh
Losses summer ventilation	0	0	0	0	0	0	0	0	0	0	0	0	0	kWh
Sum spec. heat losses	11.7	10.0	9.3	6.4	4.2	1.8	0.5	0.8	2.5	5.5	7.6	10.4	70.7	kWh/m²
Solar load North	186	234	355	438	539	617	597	518	376	289	176	170	4495	kWh
Solar load East	0	0	0	0	0	0	0	0	0	0	0	0	0	kWh
Solar load South	2296	2451	2959	2541	2297	2321	2488	2674	2767	2914	2358	2047	30114	kWh
Solar load West	0	0	0	0	0	0	0	0	0	0	0	0	0	kWh
Solar load Horiz.	0	0	0	0	0	0	0	0	0	0	0	0	0	kWh
Solar load Opaque	176	204	283	297	311	340	346	331	283	252	183	155	3160	kWh
Internal heat gains	8858	8001	8858	8572	8858	8572	8858	8858	8572	8858	8572	8858	104296	kWh
Sum spec. loads solar + internal	3.1	2.9	3.3	3.2	3.2	3.2	3.3	3.3	3.2	3.3	3.0	3.0	38.0	kWh/m²
Utilisation factor losses	26%	29%	36%	50%	77%	100%	100%	100%	99%	60%	40%	29%	43%	
Useful cooling energy demand	0	0	0	0	79	5216	10367	9423	2659	5	0	0	27750	kWh
Spec. cooling demand	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**1.4**	**2.8**	**2.5**	**0.7**	**0.0**	**0.0**	**0.0**	**7.4**	kWh/m²
Specif. dehumidification demand	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**2.3**	**1.8**	**0.0**	**0.0**	**0.0**	**0.0**	**4.1**	kWh/m²
Sensible fraction	100%	100%	100%	100%	100%	100%	55%	58%	100%	100%	100%	100%	64%	



Cooling: energy value for useful cooling energy

211 West 29th Street / Climate: New York / TFA: 3734 m² / Heating: 9.6 kWh/(m²a) / Cooling: 11.5 kWh/(m²a) / PER: 84.6 kWh/(m²a)

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

Building type:	Multifamily Residential	
Interior temperature summer:	25	°C
Nominal humidity:	12	g/kg
Spec. capacity:	132	Wh/(m²K)

Treated floor area A_{TFA}:	3734.0	m²
Building volume:	9335	m³
Internal humidity sources:	2.6	g/(m²h)

Transmission losses Q_T (negative: heat loads)

Building assembly	Temperature zone	Area m²		U-Value W/(m²K)		Mon. red. fac.		G_t kKh/a		kWh/a	per m² treated floor area
External wall - Ambient	A	2855.0	*	0.157	*	1.00	*	32	=	14559	3.90
External wall - Ground	B	298.7	*	0.127	*	1.00	*	40	=	1531	0.41
Roof/Ceiling - Ambient	A	297.9	*	0.108	*	1.00	*	32	=	1047	0.28
Floor slab / Basement ceiling	B	413.0	*	0.344	*	1.00	*	40	=	5750	1.54
	A		*		*	1.00	*		=		
	A		*		*	1.00	*		=		
	X		*		*	0.75	*		=		
Windows	A	463.4	*	0.815	*	1.00	*	32	=	12244	3.28
Exterior door	A		*		*	1.00	*		=		
Exterior TB (length/m)	A	1492.8	*	0.110	*	1.00	*	32	=	5313	1.42
Perimeter TB (length/m)	P	87.5	*	0.075	*	1.00	*	32	=	213	0.06
Ground TB (length/m)	B	222.0	*	0.100	*	1.00	*	40	=	899	0.24
											kWh/(m²a)
									Total	41555	11.1

Summer ventilation

from 'SummVent' worksheet

Ventilation conductance, vent. unit

exterior $H_{V,e}$	220.4	W/K
without HR	1332.7	W/K
ground $H_{V,g}$	0.0	W/K
without HR	0.0	W/K

Ventilation conductance, others

exterior	1027.0	W/K

Ventilation parameter

Temperature amplitude summer	8.0	K
Minimum acceptable indoor temperature	22.0	°C
Heat capacity air	0.33	Wh/(m³K)
Supply air changes	0.43	1/h
Outdoor air changes	0.33	1/h
Window night vent. air change rate, manual @ 1K	0.00	1/h
Air changes rate due to mech., autom. controlled vent.	0.00	1/h
Specific power consumption for	0.00	Wh/m³
η_{HR}	83%	
η_{ERV}	0%	
η^*_{SHX}	0%	

Summer ventilation regulation

	HRV/ERV in summer
None	
Controlled by temp.	
Controlled by enthalpy	
Always	x
	Additional ventilation
Controlled by temp.	
Controlled by humidity	x

Hygienic air change

	$n_{V,system}$ 1/h		η_{*SHX}		η_{HR} (considers bypass)		$n_{V,Rest}$ 1/h		$n_{V,equi,fraction}$ 1/h
Effective air change rate Ambient $n_{V,e}$	0.433	*(1-	0%	)*(1-	0.83	)+	0.333	=	0.405
Effective air change rate Ground $n_{V,g}$	0.433	*	0%	*(1-	0.83	)		=	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	9335	*	0.405	*	0.33	*	31	=	39109	10.5
Ventilation losses ground $Q_{V,e}$	9335	*	0.000	*	0.33	*	0	=	0	0.0
Heat losses summer ventilation	9335	*	0.000	*	0.33	*	0	=	0	0.0
								Total	39109	10.5

Ventilation heat losses Q_V

	Q_T kWh/a		Q_V kWh/a		kWh/a	kWh/(m²a)
Total heat losses Q_L	41555	+	39109	=	80664	**21.6**

Orientation of the area	Reduction factor		g-Value (perp. radiation)		Area m²		Global radiation kWh/(m²a)		kWh/a
North	0.11	*	0.50	*	185.8	*	335	=	3374
East	0.40	*	0.00	*	0.0	*	620	=	0
South	0.19	*	0.50	*	277.6	*	696	=	18003
West	0.40	*	0.00	*	0.0	*	624	=	0
Horizontal	0.40	*	0.00	*	0.0	*	1099	=	0
Sum opaque areas									2160
									kWh/(m²a)
								Total	23537

Available solar heat gains Q_S — 6.3 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	*	3.2	*	3734.0	=	61149	16.4

			kWh/a	kWh/(m²a)
Sum heat loads Q_F	Q_S + Q_I	=	84686	**22.7**

Ratio of losses to free heat gains	Q_L / Q_F	=	0.95	
Utilisation factor heat losses η_G		=	71%	
			kWh/a	kWh/(m²a)
Useful heat losses $Q_{V,n}$	η_G * Q_L	=	56935	**15.2**
			kWh/a	kWh/(m²a)
Useful cooling demand Q_K	Q_F - $Q_{V,n}$	=	27750	**7**

	kWh/(m²*a)		(Yes/No)
Recommended maximum value	15	**Requirement met?**	**Yes**

Compressor - cooling units

211 West 29th Street / Climate: New York / TFA: 3734 m² / Heating: 9.6 kWh/(m²a) / Cooling: 11.5 kWh/(m²a) / PER: 84.6 kWh/(m²a)

Building type:	Multifamily Residential		Treated floor area A_{TFA}:	3734.0	m²
Interior temperature summer:	25.0	°C	Mechanical cooling:	x	
Nominal humidity:	12.0	g/kg	Air change rate via ventilation system with supply air:	0.4	
Internal humidity sources:	2.6	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		

x Recirculation cooling
check as appropriate

On/Off mode (check as appropriate)		
Max. cooling capacity (sensible + latent)	65.0	kW
Volume flow rate at nominal power	13750.0	m³/h
Temperature reduction dry	13.9	K
Variable air volume (check if appropriate)	x	
Seasonal energy efficiency ratio	3.2	

Additional dehumidification
check as appropriate

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

Panel cooling
check as appropriate

Seasonal energy efficiency ratio	

	Sensible kWh/(m²a)		Latent kWh/(m²a)		COP		Electricity demand (kWh/a) kWh/(m²a)	Sensible fraction
Useful cooling total	7.4		4.1					64%
Cooling contribution by:								
Supply air cooling	(	+		) /	0.0	=		
Recirculation cooling	(7.4	+	5.5	) /	3.2	=	4.1	57%
Dehumidification				/		=		0%
Remaining for panel cooling				/	0.0	=		100%
Cooling distribution				/	3.2	=		100%
Total	(7.4	+	5.5	) /	3.2	=	4.1	57%

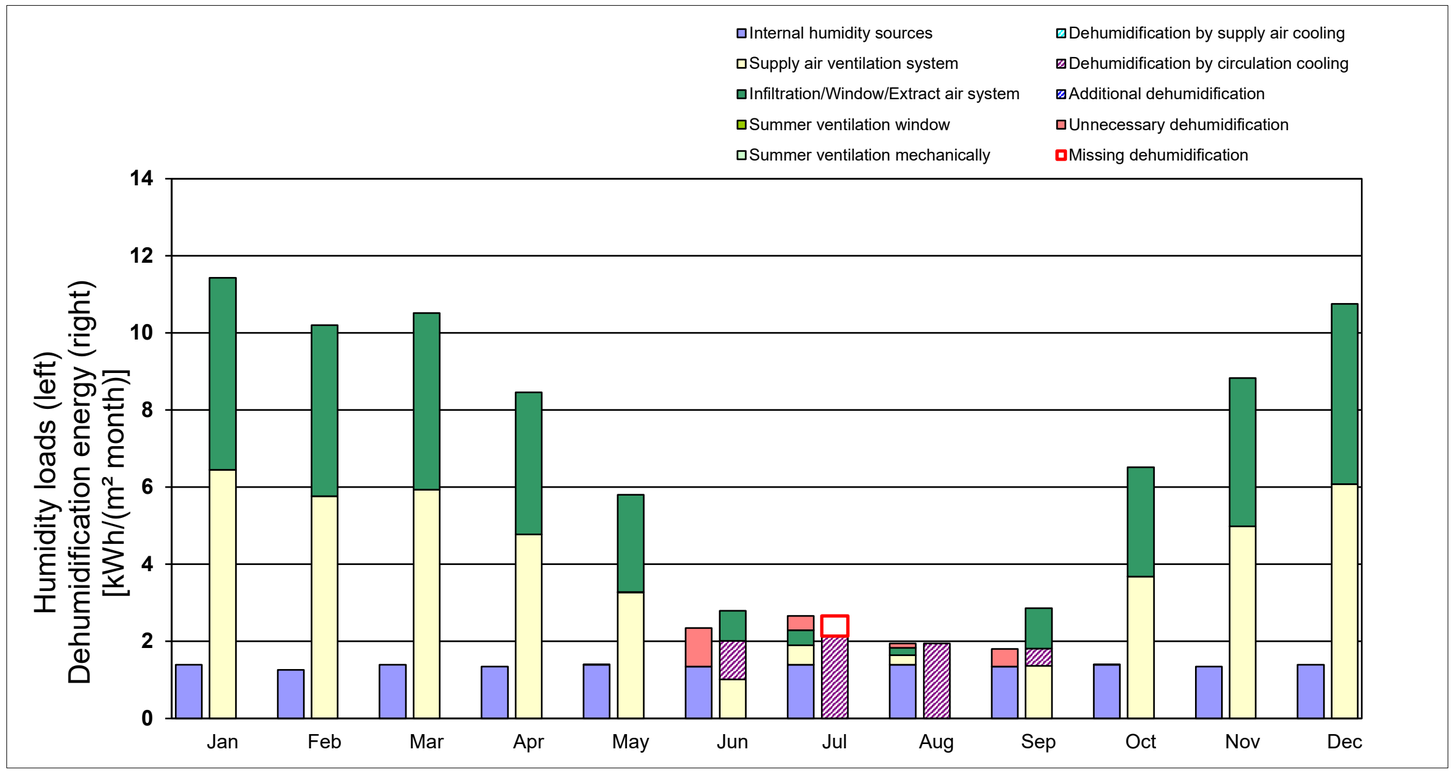
			(Yes/No)
Unsatisfied demand	0.0	0.5	**Cooling demand covered?** **Yes**

Compressor - cooling units

211 West 29th Street / Climate: New York / TFA: 3734 m² / Heating: 9.6 kWh/(m²a) / Cooling: 11.5 kWh/(m²a) / PER: 84.6 kWh/(m²a)

Humidity loads and humidity removal

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	
Internal humidity sources	1.4	1.3	1.4	1.3	1.4	1.3	1.4	1.4	1.3	1.4	1.3	1.4	16	kWh/m²
Infiltration/Window/Extract air system	-5.0	-4.4	-4.6	-3.7	-2.5	-0.8	0.4	0.2	-1.0	-2.8	-3.8	-4.7	-33	kWh/m²
Supply air ventilation system	-6.5	-5.8	-5.9	-4.8	-3.3	-1.0	0.5	0.2	-1.4	-3.7	-5.0	-6.1	-43	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	0.0	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	2.3	1.8	0.0	0.0	0.0	0.0	4	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/m²
Dehumidification by circulation cooling	0.0	0.0	0.0	0.0	0.0	1.0	2.1	1.9	0.5	0.0	0.0	0.0	6	kWh/m²
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/m²
Total dehumidification	0.0	0.0	0.0	0.0	0.0	1.0	2.1	1.9	0.5	0.0	0.0	0.0	6	
Unnecessary dehumidification	0.0	0.0	0.0	0.0	0.0	1.0	0.4	0.1	0.5	0.0	0.0	0.0	2	kWh/m²
Missing dehumidification	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	1	kWh/m²



Cooling load

211 West 29th Street / Climate: New York / TFA: 3734 m² / Heating: 9.6 kWh/(m²a) / Cooling: 11.5 kWh/(m²a) / PER: 84.6 kWh/(m²a)

Building type: **Multifamily Residential**

Treated floor area A_{TFA}:	3734.0	m²	Spec. capacity:	132	Wh/(m²
Building volume:	9335	m³	Nominal humidity:	12.0	g/kg
Interior temperature:	25	°C	Internal humidity sources:	2.6	g/(m²h)

Temperature:	Outdoor air		Dew point		Sky	
Weather 1:	30.2	°C	22.4	°C	21.3	°C
Weather 2:	27.3	°C	20.0	°C	20.0	°C
Ground design temp.	19.6	°C		SHX	13.6	°C

Radiation:	North	East	South	West	Horizontal	
	85	215	200	205	325	W/m²
	55	175	220	175	290	W/m²

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
External wall - Ambient	A	2855.0	*	0.157	*	1.00	*	5.2	or	2.3	=	2326	or	1024
External wall - Ground	B	298.7	*	0.127	*	1.00	*	-5.4	or	-5.4	=	-204	or	-204
Roof/Ceiling - Ambient	A	297.9	*	0.108	*	1.00	*	5.2	or	2.3	=	167	or	74
Floor slab / Basement ceiling	B	413.0	*	0.344	*	1.00	*	-5.4	or	-5.4	=	-767	or	-767
	A		*		*	1.00	*	5.2	or	2.3	=		or	
	A		*		*	1.00	*	5.2	or	2.3	=		or	
	X		*		*	0.75	*	5.2	or	2.3	=		or	
Windows	A	463.4	*	0.815	*	1.00	*	5.2	or	2.3	=	1956	or	861
Exterior door	A		*		*	1.00	*	5.2	or	2.3	=		or	
Exterior TB (length/m)	A	1492.8	*	0.110	*	1.00	*	5.2	or	2.3	=	849	or	374
Perimeter TB (length/m)	P	87.5	*	0.075	*	1.00	*	-5.4	or	-5.4	=	-35	or	-35
Ground TB (length/m)	B	222.0	*	0.100	*	1.00	*	-5.4	or	-5.4	=	-120	or	-120
Building element towards neighbour	I	1589.6	*	0.475	*	1.00	*	3.0	or	3.0	=	2265	or	2265
Radiation correction outdoor air				$L_{ambient}$ W/K		-18.7	*	5.2	or	2.3	=	-97	or	-43
Radiation correction sky				L_{Sky} W/K		17.7	*	-3.7	or	-5.0	=	-65	or	-89
Transmission heat load P_T										Total	=	**6276**	or	**3340**

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 $P_{V,o}$	9335	*	0.405	or	0.405	*	0.33	*	5.2	or	2.3	=	6462	or	2844
Ground $P_{L,e}$	9335	*	0.000	or	0.000	*	0.33	*	-11.4	or	-11.4	=	0	or	0
Summer ventilation $P_{L,S}$	9335	*	0.000	or	0.000	*	0.33	*	0.0	or	0.0	=	0	or	0
Ventilation heat load P_V												Total	**6462**	or	**2844**

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
North	185.8	*	0.5	*	0.10	*	109	or	73	=	1028	or	689
East	0.0	*	0.0	*	0.40	*	215	or	175	=	0	or	0
South	277.6	*	0.5	*	0.17	*	206	or	219	=	4969	or	5275
West	0.0	*	0.0	*	0.40	*	205	or	175	=	0	or	0
Horizontal	0.0	*	0.0	*	0.40	*	325	or	290	=	0	or	0
Sum opaque areas											684	or	600
Solar load P_S									Total	=	**6681**	or	**6564**

Internal heating load P_I	Spec. power W/m²		A_{TFA} m²		P_I 1 W		P_I 2 W
	3.2	*	3734	=	**11906**	or	**11906**

$P_T + P_V + P_S + P_I$ = **31325** or **24654**

Cooling load P_C = **31325** W

Area specific cooling load P_C / A_{TFA} = **8.4** W/m²

Please enter the minimum supply air temperature. [ ] °C

Supply air temperature without cooling $\vartheta_{Supply,Min}$ = **25.9** °C / **25.4** °C

For comparison: cooling load, transportable through the supply air $P_{Supply;Max}$ = **34458** W / **33819** W

specific: 9.2 W/m² / 9.1 W/m²

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

Daily internal temperature stroke

(Transmission 6276.3 W + Ventilation 6461.9 W + Solar load 6680.6 W) * Time 24 h/d / (Spec. capacity 132 Wh/(m²K) * A_{TFA} 3734 m²) = **0.9** K

Dehumidific. load

from 'Cooling' worksheet

Absolute humidity exterior air	17.1	or	14.7	g/kg	Absolute humid. supply air	17.1	or	14.7	g/kg
Outdoor air mass flow	3672	or	3672	kg/h	Supply air mass flow	4765	or	4765	kg/h
Summer vent. air mass flow	0	or	0	kg/h	**Humid. load, supply air**	24273	or	12853	g/h
Humidity load, outdoor air	18706	or	9905	g/h	**Humidity load, internal**	9870	or	9870	g/h

Enthalpy of vaporisation 707.639 Wh/kg / 1000 g/kg * Humidity load 52849 g/h or 32629 g/h = P_D 1 **37398** W or P_D 2 **23089** W

Dehumidification load P_T = **37398** W

Area specific dehumidification load P_T / A_{TFA} = **10.0** W/m²

Monthly average values

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Specific cooling demand	0.0	0.0	0.0	0.0	0.0	1.4	2.8	2.5	0.7	0.0	0.0	0.0	kWh/m²
Specific dehumidification demand	0.0	0.0	0.0	0.0	0.0	0.0	2.3	1.8	0.0	0.0	0.0	0.0	kWh/m²
Sensible fraction	100%	100%	100%	100%	100%	100%	55%	58%	100%	100%	100%	100%	

Minimum of sensible cooling load fraction occurred **55%**

DHW useful heat

DHW demand for showers, per person and day (with 60°C)		litre/person/d	16.0
DHW demand others, per person and day (with 60°C)		litre/person/d	9.0
Performance of shower drain-water heat recovery		-	0%
Effective DHW demand	V_{DHW}	litre/person/d	25
Average cold water temperature of the supply	ϑ_{TW}	°C	13.6
DHW demand for washing machines and dishwashers non-elec		kWh/a	6828
Effective useful heat DHW	Q_{DHW}	kWh/a	55299

kWh/a	kWh/(m²a)
55299	14.8

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

DHW distribution

			Inside thermal envelope					Outside thermal envelope					Total values	
			1	2	3	4	5	1	2	3	4	5	Absolute	Specific
Temp. of room through which the pipes pass	ϑ_X	°C	20.0	20.0	20.0	20.0	20.0							
Design forward flow temperature	ϑ_{dist}	°C	**50.0**	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0		
DHW circulation pipes														
Length of circulation pipes (forward + return flow)	L_{HS}	m	**845.0**											
Nominal width of pipe		mm	**13**											
Insulation thickness		mm	**40**											
Insulation reflective coating?		-	**x**											
Thermal conductivity of insulation		W/(mK)	**0.036**											
Heat loss coefficient per m of insulated pipe		W/(mK)	0.107											
Insulation quality of mountings, pipe suspensions, etc.		-	**3 - Good**	**1-None**	**1-None**	**1-None**	**1-None**	**1-None**	**1-None**	**1-None**	**1-None**	**1-None**		
Thermal bridge supplement		W/K	4.365											
Total heating loss coefficient per m of pipe	Ψ	W/(mK)	**0.112**											
Daily circulation period of operation.	td_{Circ}	h/d	**18.0**											
Design return flow temperature	ϑ_R	°C	46											
Circulation period of operation per year	t_{Circ}	h/a	6570											
Annual heat released per m of pipe	q^*_Z	kWh/m/a	21											
Annual heat loss from circulation lines	QZ	kWh/a	**17496**										kWh/a **17496**	kWh/(m²a) **4.7**
DHW individual pipes														
Exterior pipe diameter	d_{U_Pipe}	m	**0.013**											
Accumulated length per single pipes	L_U	m	**1380.00**											
Amount of tapping points in building	$n_{tapping\ poin}$	-	**165.00**											
Average pipe length per tapping point	$L_{U,\ average}$	m	8.4											
Tap openings per person per day		-	**6**											
Utilisation days per year		d	**365**											
Heat loss per tap opening	$q_{Individual}$	'h/tap opening	0.0247											
Amount of tap openings per year and person	n_{Tap}	nings per year	2190											
Annual heat loss of individual pipes	Q_U	kWh/a	**5343**										kWh/a **5343**	kWh/(m²a) **1.4**
Total heat losses of DHW distribution	Q_{WL}												kWh/a **22839**	kWh/(m²a) **6.1**
Performance ratio of DHW distribution pipes	$ea_{,HL}$	-											**141%**	

Storage heat losses

		Storage 1	Storage 2	Buffer storage tank (only heating)	Compact unit
Selection of storage tank		2-DHW only	0-No storage tank	0-No storage tank	0-No
Storage necessary for HP				(x)	
Solar DHW connection					
Heat loss rate	W/K	2.6			
Storage volume	litre	150*55			---
Standby fraction	-	100%			
Location of storage tank, inside or outside of thermal envelope		1-Inside	1-Inside	1-Inside	
Temperature of mechanical room	°C	20.0			
Typical storage tank temperature	°C	50.0			
Manual entry of storage temperature	°C				
Average standby heat losses storage tank	W	77			
Additional heat losses storage tank, solar operation	W			---	---
Possibly utilisation factor of heat losses		---	---		---
Annual heat losses DHW storage tank	kWh/a	673		---	
Annual heat losses buffer storage tank		---	---		---

	kWh/a	kWh/(m²a)
	673	0.2

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

Total energy demand of domestic hot water

		kWh/a	kWh/(m²a)
Heat losses of DHW distribution and storage	Q_{WL}	23512	6.3
Performance ratio DHW-distribution + storage	$e_{a,WL}$	143%	
Total heating demand of DHW system			
Including storage tank	Q_{gDHW}	78811	21.1

Electricity demand for residential buildings

211 West 29th Street / Climate: New York / TFA: 3734 m² / Heating: 9.6 kWh/(m²a) / Cooling: 11.5 kWh/(m²a) / PER: 84.6 kWh/(m²a)

Households	55
Persons	98.7
Living area (m²)	3734
Heating demand [kWh/(m²a)]	9.6

PER and PE factors (KWh/kWh)		
Electricity:	1.20	2.6
Non-electric energy carrier for cooking, drying:	1.20	2.6
Energy carrier for heating:	1.14	2.6
Energy carrier for DHW:	1.74	1.1

Solar fraction of DHW Laundry&Dish	0%
Marginal performance ratio DHW	105%
Marginal performance ratio Heating	39%

Column no.	1	2	3			4		5			6			7	8	8a		9		10		11		12		13
Application	Used ? (1/0)	Within the thermal envelope? (1/0)	Norm demand			Utilisation 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)
Dishwashing	1	1	1.00	kWh/Use		1.00	*	65	/(P*a)	*	98.7	P	=	6416	50%		=	3208								
1-DHW connection																50%			* (1+	0.30	) *	1.05	*(1-	0.00	) =	4362
Clothes washing	1	1	1.00	kWh/Use		1.00	*	57	/(P*a)	*	98.7	P	=	5626	55%		=	3094								
1-DHW connection																45%			* (1+	0.05	) *	1.05	*(1-	0.00	) =	2781
Clothes drying with:	1	1	3.00	kWh/Use	Residual dampness	0.75	*	57	/(P*a)	*	98.7	P	=	12658	100%		=	12658								
4-Condensation dryer					0.50								=	0	0%							1.00	*			0
Energy consumed by evaporation	0	1	3.13	kWh/Use		0.50	*	57	/(P*a)	*	98.7	P	=	0	100%				* (1+	0.00	) *	0.39	*(1-	0.77	) =	0
Refrigerating	1	1	0.78	kWh/d		1.00	*	365	d/a	*	55	HH	=	15659	100%		=	15659								
Freezing	1	1	0.88	kWh/d		1.00	*	365	d/a	*	55	HH	=	17666	100%		=	17666								
or combination	0	1	1.00	kWh/d		1.00	*	365	d/a	*	55	HH	=	0	100%		=	0								
Cooking with:	1	1	0.25	kWh/Use		1.00	*	500	/(P*a)	*	98.7	P	=	12338	100%		=	12338								
1-Electricity					Average lamp efficiency [lm/W]											0%											0
Lighting	1	1	11	W	65	1.00	*	2.90	kh/(P*a	*	98.7	P	=	3171	100%		=	3171								
Consumer electronics	1	1	80	W		1.00	*	0.55	kh/(P*a	*	98.7	P	=	4343	100%		=	4343								
Small appliances, etc.	1	1	50	kWh		1.00	*	1.00	/(P*a)	*	98.7	P	=	4935	100%		=	4935								
Total aux. electricity														25385				25385								
Other:																										
Lift Enrgy	1	1	5000	kWh/a										5000				5000								
				kWh/a										0				0								
				kWh/a										0				0								
Total														113195 kWh				107456 kWh				6828				7143 kWh
Specific demand																		28.8 kWh/(m²a)				1.8				1.9 kWh/(m²a)
Recommended maximum value																		18								

DHW Non-Electric - Wash&Dish

Non-Renewable Non-Electric DHW Wash&Dish

Aux Electricity

211 West 29th Street / Climate: New York / TFA: 3734 m² / Heating: 9.6 kWh/(m²a) / Cooling: 11.5 kWh/(m²a) / PER: 84.6 kWh/(m²a)

Treated floor area	3734	m²
Heating period	176	d
Air volume	9335	m³
Dwelling units	55	HH

Heat recovery efficiency ventilation unit	0.83	
Operation vent. system Winter	4.22	kh/a
Operation vent. system Summer	4.54	kh/a
Air change rate	0.56	h^{-1}

Annual space heating demand	10	kWh/(m²a)
Boiler rated power	45	kW
DHW system heating demand	78811	kWh/a
Design forward flow temperature	53	°C

Column no.	1	2	3		4		5		6		7		8		9		10	11
Application	Existing [1/0]	Within the thermal envelope [1/0]	Norm demand		Utilisation factor		Period of operation		Reference size		Electricity demand [kWh/a]		Available as interior heat		Utilisation period [h/a]		Internal heat gains winter [W]	Internal heat gains summer [W]
Ventilation system																		
Winter ventilation	1		0.45	Wh/m³ *	0.56	h^{-1} *	4.2	kh/a *	9335	m³ =	**9952**		considered in heat recovery efficiency					
Defroster HX	1	1	Data entries in 'Ventilation' worksheet or in 'Addl vent'								**6148**	*	0.2	/	4.22	=	**241**	
Summer ventilation	1	0.55	0.45	Wh/m³ *	0.43	h^{-1} *	4.5	kh/a *	9335	m³ =	**8256**	*	1.0	/	4.54	=		**999**
																	Internal heat sources ' Additional summer ventilation'	0.0
Additional vent. summer	0		0.00	Wh/m³ *	0.00	h^{-1} *	4.5	kh/a *	9335	m³ =	**0**	*	1.0	/	4.54	=		
Heating system			Controlled / non controlled [1/0]															
Enter the rated power of the pump				W														
Circulator pump heating			458	W *	1.0	*	4.2	kh/a *	1	=	**0**	*	1.0	/	4.22	=	**0**	
Boiler electricity consumption at 30% load				W														
Aux. energy - Heat. boiler	0	0	93	W *	1.00	*	0.00	kh/a *	1	=	**0**	*	1.0	/	4.22	=	**0**	
Aux. energy - Wood fired/Pellet boiler	0	0	Data entries in 'Boiler' worksheet. Aux. energy demand including possible drinking water production.								**0**	*	1.0	/	4.22	=	**0**	
DHW system																		
Enter average power consumption of pump				W														
Circulation pump DHW	1	1	66	W *	1.00	*	8.2	kh/a *	1	=	**540**	*	1.0	/	8.76	=	**62**	**62**
Enter the rated power of the pump				W														
Storage load pump DHW			330	W *	1.00	*	1.8	kh/a *	1	=	**0**	*	1.0	/	8.76	=	**0**	**0**
Boiler electricity consumption at 100% load				W														
DHW boiler aux. energy	1	0	280	W *	1.00	*	1.8	kh/a *	1	=	**490**	*	1.0	/	8.76	=	**0**	**0**
Enter the rated power of the solar DHW pump				W														
Solar aux. electricity	0		273	W *	1.00	*	1.8	kh/a *	1	=	**0**	*	1.0	/	8.76	=	**0**	**0**
Aux. electricity cooling and dehumidification																		
Aux. electricity cooling				kWh/a *	1.00	*	1.0	*	55	=	**0**	*	1.0	/	4.54	=		**0**
Aux. electricity dehum.				kWh/a *	1.00	*	1.0	*	55	=	**0**	*	1.0	/	4.54	=		**0**
Misc. aux. electricity																		
Misc. aux. electricity				kWh/a *	1.00	*	1.0	*	55	=	**0**	*	1.0	/	8.76	=	**0**	**0**
Total											**25385**						**303**	**1061**
Specific demand	kWh/(m²a) (treated floor area)										**6.8**							

Internal heat gains for residential buildings (at the moment this worksheet is inactive)

211 West 29th Street / Climate: New York / TFA: 3734 m² / Heating: 9.6 kWh/(m²a) / Cooling: 11.5 kWh/(m²a) / PER: 84.6 kWh/(m²a)

Utilisation: 10-Dwelling

Type of values used: 2-Standard

IHG heating	2.84	W/m²
IHG cooling	3.19	W/m²

No input is necessary

Go to utilisation pattern selection

Persons	98.7	P
Living area	3734	m²

Heating demand	10	kWh/(m²a)
Heating period	176	d/a

Application	Existing [1/0] or occupancy	Within the thermal envelope [1/0]	Norm consumption		Utilisation factor	Frequency		Useful energy [kWh/a]		Included in electricity balance?		Availability		Utilisation period [h/a]		Internal heat gains [W]
Dishwashing	1	1	1.0	kWh/Use	1.00	65	/(P*a)	6416	*			0.30	/	8.76	=	220
Clothes washing	1	1	1.0	kWh/Use	1.00	57	/(P*a)	5626	*			0.30	/	8.76	=	193
Clothes drying with:	1	1	3.0	kWh/Use	0.75	57	/(P*a)	12658	*			0.70	/	8.76	=	1012
4-Condensation dryer		1	0.0					0				0.80				
Energy consumed by evaporation	0	1	-3.1	kWh/Use	0.50	57	/(P*a)	0	* (1-	0	) *	0.00	/	8.76	=	0
Refrigerating	1	1	0.8	kWh/d	1.00	365	d/a	15659	*			1.00	/	8.76	=	1788
Freezing	1	1	0.9	kWh/d	1.00	365	d/a	17666	*			1.00	/	8.76	=	2017
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)	12338	*			0.50	/	8.76	=	704
Lighting	1	1	11.1	W	1.00	2.9	kh/(P*a)	3171	*			1.00	/	8.76	=	362
Consumer electronics	1	1	80.0	W	1.00	0.55	kh/(P*a)	4343	*			1.00	/	8.76	=	496
Household appliances/Other	1	1	50.0	kWh	1.00	1.0	/(P*a)	4935	*			1.00	/	8.76	=	563
Auxiliary appliances (cf. aux Electricity sheet)															=	303
Other applications (cf. Electricity sheet)	1	1.0						5000	*				/	8.76	=	0
Persons	99	1	80.0	W/P	1.00	8.76	kh/a	69169	*			0.55	/	8.76	=	4343
Cold water	99	1	-10.8	W/P	1.00	8.76	kh/a								=	-1068
DHW - circulation	1	1	1997.2	W	1.00	8.76	kh/a	17496	*			1.00	/	8.76	=	1997
DHW - individual pipes	1	1	610.0	W	1.00	8.76	kh/a	5343	*			1.00	/	8.76	=	610
DHW storage tank heating case	1	1	76.8	W	1.00	8.76	kh/a	673	*			1.00	/	8.76	=	77
DHW storage tank cooling case	1	0	0.0	W	1.00	8.76	kh/a	0	*			1.00	/	8.76	=	0
Evaporation	99	1	-25.0	W/P	1.00	8.76	kh/a	-21615	*			1.00	/	8.76	=	-2468
Total IHG														W		11148
Specific IHG														W/m²		2.99
Heat available from internal sources										176	d/a			kWh/(m²a)		12.6

Primary Energy Renewable PER

211 West 29th Street / Climate: New York / TFA: 3734 m² / Heating: 9.6 kWh/(m²a) / Cooling: 11.5 kWh/(m²a) / PER: 84.6 kWh/(m²a)

Building type:	Multifamily Residential		
Treated floor area A_{TFA}:	3734	m²	
Projected building footprint $A_{Projected}$:	0	m²	
Heating demand incl. distribution & hydr. frost protection	10	kWh/(m²a)	
Cooling energy dem. incl. dehumidification		kWh/(m²a)	
DHW demand including distribution:	21	kWh/(m²a)	

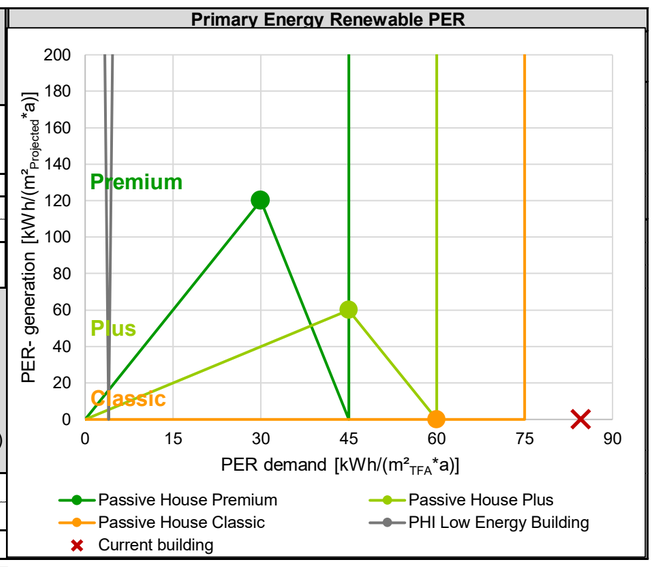
Selection of heat generation system(s)	Contribution margin (useful energy)		
Primary heat generation type	Heating	DHW	Addl. input in following worksheets
2-Heat pump(s)	100%		HP, possibly HP ground
Secondary heat generation type (optional & different)			
4-Heating boiler	0%	100%	Boiler

Energy demand Reference: Treated floor area	Efficiency		Final energy		PER			PE		CO_2	
	Calculation -	User defined value -	Contribution (final energy)	Final energy demand kWh/(m²a)	PER factor kWh/kWh	Effective PER factor (including biomass kWh/kWh	PER specific value kWh/(m²a)	PE factor kWh/kWh	PE value kWh/(m²a)	CO_2 emissions factor (CO_2-eq) kg/kWh	CO_2eq emissions kg/(m²a)
								1-PE factors (non-renewable) PHI Certification		1-CO2 factors GEMIS (Germany)	
							84.6		119.6		25.0
Heating			100%			1.14	9.2	2.60	21.0		4.3
Electricity (HP compact unit)					1.50			2.60		0.532	
Electricity (heat pump)	2.56		100%	3.8	1.50	1.10	4.1	2.60	9.8	0.532	2.0
District heating: 1-None					2.8|4.5|3.3					0.000	
Wood and other biomass					1.10			-		-	
Natural gas / RE gas					1.75			1.10		0.250	
Heating oil / RE methanol					2.30			1.10		0.320	
Solar thermal system											
Electricity (direct)					1.50			2.60		0.532	
Aux. electricity (heating, wintertime ventilation)				4.3	1.50	1.17	5.1	2.60	11.2	0.532	2.3
Cooling and dehumidification					1.55		9.7		16.3		3.3
Electricity cooling (heat pump)	3.20			4.1	1.55		6.3	2.60	10.5	0.532	2.2
Auxiliary electricity cooling, ventilation summer				2.2	1.55		3.4	2.60	5.7	0.532	1.2
Electricity dehumidification (heat pump)					1.90			2.60		0.532	
Auxiliary electricity (dehumidification)					1.90			2.60		0.532	
DHW generation			100%			1.74	39.3	1.12	25.2		5.7
Electricity (HP compact unit)					1.15			2.60		0.532	
Electricity (heat pump)					1.15			2.60		0.532	
District heating: 1-None					2.8|4.5|3.3					0.000	
Wood and other biomass					1.10			-		-	
Natural gas / RE gas	0.95		100%	22.3	1.75	1.75	39.0	1.10	24.5	0.250	5.6
Heating oil / Methanol					2.30			1.10		0.320	
Solar thermal system											
Electricity (direct)					1.15			2.60		0.532	
Aux. electricity (DHW + solar DHW)				0.3	1.15	1.15	0.3	2.60	0.7	0.532	0.1
Household electricity				22.0		1.20	26.4		57.1		11.7
Electricity (household or non-residential lighting, etc.)				22.0	1.20	1.20	26.4	2.60	57.1	0.532	11.7
Auxiliary electricity (other)					1.20			2.60		0.532	
Gas / RE gas dry/cook				0.0	1.75		0.0	2.60	0.0	0.270	0.0

Energy generation Reference: Projected building footprint area	Final energy		PER		PE		CO_2	
	Final energy generation kWh/a	Final energy generation kWh/(m²$A_{Projected}$*a)	PER factor kWh/kWh	PER specific value kWh/(m²$A_{Projected}$a)	PE factor kWh/kWh	PE Value kWh/(m²a)	Emission factor (CO_2-eq) kg/kWh	CO_2eq emissions kg/a
				0.0		0.0		0.0
PV electricity	0	0.0	1.00	0.0	-		-	
Solar thermal system	0	0.0	-	0.0	1.22	0.0		
		0.0						

PE demand requirement in case of verification through PE (non-renewable) [kWh/(m²a)]	120	Current building reaches following class	120	Requirement met?	yes

Achievable energy standard through the verification of renewable primary energy (assessment of individual aspects)	Useful energy, performance				Airtightness
	Annual heat. dem. Treated floor area kWh/(m²a)	Heating load Treated floor area W/m²	Useful cool. energy Treated floor area kWh/(m²a)	Cooling load Treated floor area W/m²	n_{50} 1/h
Requirement Passive House Premium					
Requirement Passive House Plus	15	10	18	11	0.60
Requirement Passive House Classic					
Requirement PHI Low Energy Building	30		33		1.00
Current building reaches following class for aspe	10	11	12	8	0.4
	Premium		Premium		Premium



Summary Though, from the scientific point of view, not entirely correct, different energy carriers will be added together here. This is done to meet the criteria of other energy standards.	Final energy MWh/a	PER specific value MWh/a	PE value 1-PE factors (non-renewable) PHI Certification MWh/a	CO2eq emissions 1-CO2 factors GEMIS (Germany) kg/a	CO_2eq substitution balance 1-CO2 factors GEMIS (Germany) kg/a
Demand	**219.7**	**315.7**	446.60	93453	93453
Generation	**0.0**	**0.0**	0.00	0	0
Demand, cumulative generation (annual balance)	219.74	315.73	446.60	93453	93453
Demand w/o household electricity	**137.7**	**217.2**	233.21	49791	49791
Demand w/o household electricity, cum. generation	137.67	217.24	233.21	49791	49791

Heat pump

211 West 29th Street / Climate: New York / TFA: 3734 m² / Heating: 9.6 kWh/(m²a) / Cooling: 11.5 kWh/(m²a) / PER: 84.6 kWh/(m²a)

			Building type:	Multifamily Residential
			Treated floor area A_{TFA}:	3734 m²
Covered fraction of space heating demand		*('PER' worksheet)*	100%	
Space heating demand + distribution losses	Q_H+Q_{HL}:	*(DHW+Distribution)*	35845	kWh/a
Solar fraction for space heat	$\eta_{Solar,\ H}$	*('SolarDHW' worksheet)*	0%	
Effective annual heating demand	$Q_{H,Wi}=Q_H*(1-\eta_{Solar,\ H})$		**35845**	kWh/a
Covered fraction of DHW demand		*('PER' worksheet)*	0%	
Total heating demand of DHW system	Q_{gDHW}	*(DHW+Distribution)*	71310	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	

Heating

Selection of HP: 4-REYQ144TTJU Estimate	Heat source:		1-Outdoor air	
Selection of distribution system			2-Radiators	
Design distribution temperature	θ_{design}	*(DHW+Distribution)*	53.00	°C
Nominal power of distribution system	P_{nom}		39.26	kW
Distribution system (to be completed by experienced users only)				
Nominal power of distribution system	P_{nom}			kW
Radiator exponent	n			
Heat storage tank (buffer storage tank 'DHW+Distribution' worksheet)			0-No	
Specific heat losses storage	U * A $_{Storage}$			W/K
Storage location in thermal envelope			1-Inside	
Room temperature (storage location: outside of thermal envelope)		*(DHW+Distribution)*		°C
Sink temperature of heat pump for heating	θ_{snk}		53.00	°C

Entries in relation to the domestic hot water system

Selection of HP: 0-None	Heat source:			
DHW temperature		*(DHW+Distribution)*	50.00	°C
Orientation of DHW storage tank ('storage 1' in 'DHW+Distribution' worksheet)			1-Inside	
Specific heat losses storage	U * A $_{Storage}$		2.6	W/K
Room temperature (storage location: outside of thermal envelope)		*(DHW+Distribution)*	20.00	°C
Type of backup heater			1-Elec. Immersion heater	
Δθ of electric continuous flow water heater				K

Additional options in case of <u>one</u> heat pump for both functions: Heating & DHW

Same heat pump's sink temperature for Heating and for DHW			1-Yes	
Heat pump priority		*(Manufacturer, tech. data)*	2-Heating priority	

Control strategy

Heat pump control strategy			1-On/Off	

Heating

Depth ground water / Ground collector / Ground probe	z			m
Power of pump for ground heat exchanger	P_{pump}			kW

-

Heating

Heat pump: REYQ144TTJU Estimate

Source: 1-Outdoor air

	θ_source °C	θ_sink °C	Heating capacity kW	COP
Test point 1	-7.9	37.3	43.9	2.9
Test point 2	-9.0	36.2	41.0	2.8
Test point 3	-8.5	35.7	39.6	3.0
Test point 4	0.2	37.8	22.0	3.8
Test point 5	-1.4	36.6	20.5	3.7
Test point 6	-1.2	36.1	19.8	3.6
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 $\Delta\theta_{Sink}$ 0.0 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	Source type number	Source type name	Wärmequelle	
Test point 8				
Test point 9	1.0	1-Outdoor air	1-Outdoor air	
Test point 10	3.0	3-Ground probes	2-Ground water	
Test point 11	2.0	2-Ground water	3-Ground probes	
Test point 12	1.0	1-Outdoor air	-Horizontal ground collecto	
Test point 13	1.0	1-Outdoor air		
Test point 14	1.0	1-Outdoor air		
Test point 15	1.0	1-Outdoor air		

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

Electr. energy consumption pump (grnd. water / ground)	$Q_{El,Pump}$	0	kWh/a
Energy by direct electricity	$Q_{El,dir}$	0	kWh/a
Space heat supplied by HP	$Q_{HP,Heating}$	35845	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	$Q_{HP,Heating}$	35845	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}	14004	kWh/a

		1. HP: Heating or heating & DHW	2. HP: Domestic hot
Seasonal performance factor of heat pump	SPF_{H-1}	2.56	
		kWh/a	kWh/(m²a)
Final electrical energy demand heat generation	Q_{final}	14004	3.8
Annual primary energy demand		36410	9.8
		kg/a	kg/(m²a)
Annual CO_2-equivalent emissions		7450	2.0

Boiler (gas, oil and wood)

211 West 29th Street / Climate: New York / TFA: 3734 m² / Heating: 9.6 kWh/(m²a) / Cooling: 11.5 kWh/(m²a) / PER: 84.6 kWh/(m²a)

Building type:			Multifamily Residential	
Treated floor area A_{TFA}:			3734	m²
Covered fraction of space heating demand		*('PER' worksheet)*	0%	
Space heating demand + distribution losses	Q_H+Q_{HS}:	*(DHW+Distribution)*	35845	kWh
Solar contribution for space heating	$\eta_{Solar,\ H}$	*('SolarDHW' worksheet)*	0%	
Effective annual heating demand	$Q_{H,Wi}=Q_H*(1-\eta_{Solar,\ H})$		**0**	kWh
Space heating demand without distribution losses	Q_H	*('Verification' worksheet)*	35845	kWh
Covered fraction of DHW demand		*('PER' worksheet)*	100%	
Total heating demand of DHW system	Q_{gDHW}	*(DHW+Distribution)*	78811	kWh
Solar contribution for DHW	$\eta_{Solar,\ DHW}$	*('SolarDHW' worksheet)*	0%	
Effective DHW demand	$Q_{DHW,Wi}=Q_{DHW}*(1-\eta_{Solar,\ DHW})$		**78811**	kWh

Boiler type			10-Improved gas condensing boiler	
Fuel			30-Natural gas	
PER factors (renewable primary energy)		*('Data' worksheet)*	1.75	kWh_{PER}/kWh_{Final}
PE factor (non-renewable primary energy)		*('Data' worksheet)*	1.10	kWh_{PE}/kWh_{Final}
CO_2 emissions factor (CO_2-equivalent)		*('Data' worksheet)*	0.250	g/kWh
Useful heat provided	Q_{Use}		78811	kWh/a
Max. heating power required for heating the building	P_{BH}	*('Heating load' worksheet)*	39.26	kW
Length of the heating period	t_{HP}		4217	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)*	45	kW	39	kW	45	
Installation of boiler (Outdoor: 0, Indoor: 1)			1		0		1	
Input values (oil and gas boiler)			Project data		Standard values		Input field	
Boiler efficiency at 30% load	$\eta_{30\%}$	*(Manufacturer)*	105%		105%			
Boiler efficiency at nominal output	$\eta_{100\%}$	*(Manufacturer)*	96%		96%			
Standby heat loss boiler at 70 °C	$q_{B,70}$	*(Manufacturer)*	0.9%		0.9%			
Average return flow temperature measured at 30% load	$\vartheta_{30\%}$	*(Manufacturer)*	30	°C	30			
Input values (biomass heat generator)			Project data		Standard values		Input field	
Efficiency of heat generator in basic cycle	η_{GZ}	*(Manufacturer)*			60%			
Efficiency of heat generator in steady-state operation	η_{SO}	*(Manufacturer)*			70%			
Average fraction of heat output released to heating circuit	$z_{HC,m}$	*(Manufacturer)*			0.4			
Temperature difference betw. power-on and power-off	$\Delta\vartheta$	*(Manufacturer)*		K	30	K		
In case of inside installation: area of installation room	$A_{install}$	*(Project)*		m²	0	m²		
Useful heat output per basic cycle	$Q_{N,GZ}$	*(Manufacturer)*		kWh	67.5	kWh		
Average power output of the heat generator	$Q_{N,m}$	*(Manufacturer)*		kW	45.0	kW		
Heat generator with built in conveyor for pellets								
Unit only with regulation (no fan / no starting aid)								
Auxiliary energy demand for a basic cycle	$Q_{HE,GZ}$	*(Manufacturer)*		kWh		kWh		kWh
Power consumption in steady-state operation	$P_{el,SB}$	*(Manufacturer)*		W		W		W

Utilisation factor of heat generator space heating	$h_{H,g,K}$ $=f_j*h_{k''}$	0%
Utilisation factor heat generator DHW	$h_{DW,g,K}$ $=h_{100\%}/f_{j,DW}$	106%
Utilisation factor heat generator DHW & space heating	$h_{g,K}$	106%

		kWh/a	kWh/(m²a)
Final energy demand space heating	$\mathbf{Q}_{Final,HE}$ $= Q_{H,wi}* e_{H,g,K}$	0	
Final energy demand DHW	$\mathbf{Q}_{Final,TW}$ $= Q_{DHW,wi}* e_{TW,g,K}$	83157	
Total final energy demand	$\mathbf{Q}_{Final}$ $= Q_{End,HE} + Q_{End,TW}$	83157	22.3
Annual PE demand (non-renewable primary energy)		91473	24.5
		kg/a	kg/(m²a)
Annual CO_2-equivalent emissions		20789	5.6