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

229 Stratford Road
229 Stratford Rd, Brooklyn, NYC, NY 11218 , United States of America

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

Client	Bo Poulsen / Itzy Garay 229 Stratford Rd, Brooklyn, NYC NY 11218 , United States of America
Architect	ZH Architects 515 Canal Street, Suite 1C NY 10013
Building Services	RJD Engineering 590 Franklin Avenue, Suite 4 NJ 07110
Energy Consultant	ZH Architects 515 Canal Street, Suite 1C 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)]	**15**	≤	15	-
Heating load	[W/m²]	**13**	≤	-	10
Cooling					
Frequency of overheating (> 25 °C)	[%]	**-**	≤	-	
Airtightness					
Pressurization test result (n_{50})	[1/h]	**0.3**	≤	0.6	
Renewable primary energy (PER)					
PER-demand	[kWh/(m²a)]	**52**	≤	60	60
Generation (reference to ground area)	[kWh/(m²a)]	**29**	≥	-	-

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

Certifier: Robert Ryan, Earth Cycle Technologies

Passive House Verification

Photo or Drawing

Building:	229 Stratford Road		
Street:	229 Stratford Rd, Brooklyn, NYC		
Postcode/City:	NY 11218		
Province/Country:	USA	US-United States of America	
Building type:	Residential Dwelling		
Climate data set:	US0055b-New York		
Climate zone:	4: Warm-temperate	Altitude of location:	18 m

Home owner / Client:	Bo Poulsen / Itzy Garay		
Street:	229 Stratford Rd, Brooklyn, NYC		
Postcode/City:	NY 11218		
Province/Country:	New York	US-United States of America	

Architecture:	ZH Architects		
Street:	515 Canal Street, Suite 1C		
Postcode/City:	NY 10013	New York	
Province/Country:	New York	US-United States of America	

Mechanical engineer:	RJD Engineering		
Street:	590 Franklin Avenue, Suite 4		
Postcode/City:	NJ 07110	Nutley	
Province/Country:	New Jersey		

Energy consultancy:	ZH Architects		
Street:	515 Canal Street, Suite 1C		
Postcode/City:	NY 10013	New York	
Province/Country:	New York	US-United States of America	

Certification:	Earth Cycle Technologies		
Street:	10 Spring Field,		
Postcode/City:	A67 F863		
Province/Country:	IE Wicklow		

Year of construction:	2016	Interior temperature winter [°C]:	20.0	Interior temp. summer [°C]:	25.0
No. of dwelling units:	1	Internal heat gains (IHG) heating case [W/m²]:	2.3	IHG cooling case [W/m²]:	3.8
No. of occupants:	3.1	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	241.7				
Space heating	Heating demand	kWh/(m²a)	15	≤	15	-	yes
	Heating load	W/m²	13	≤	-	10	
Space cooling	Cooling & dehum. demand	kWh/(m²a)	17	≤	17	17	yes
	Cooling load	W/m²	11	≤	-	10	
	Frequency of overheating (> 25 °C)	%	-	≤	-		-
	Frequency of excessively high humidity (> 12 g/kg)	%	0	≤	10		yes
Airtightness	Pressurization test result n_{50}	1/h	0.3	≤	0.6		yes
Non-renewable Primary Energy (PE)	PE demand	kWh/(m²a)	66	≤	-		-
Primary Energy Renewable (PER)	PER demand	kWh/(m²a)	52	≤	60	60	yes
	Generation of renewable energy (in relation to projected building footprint area)	kWh/(m²a)	29	≥	-	-	

[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:
25139_ECT_PH_20191223_RR	24/01/20	Wicklow IE

PHPP Check

Passive House with PHPP Version 9.6a

229 Stratford Road / Climate: New York / TFA: 242 m² / Heating: 15.1 kWh/(m²a) / Cooling: 17.3 kWh/(m²a) / PER: 51.9 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

229 Stratford Road / Climate: New York / TFA: 242 m² / Heating: 15.1 kWh/(m²a) / Cooling: 17.3 kWh/(m²a) / PER: 51.9 kWh/(m²a)

Selection of climate data

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

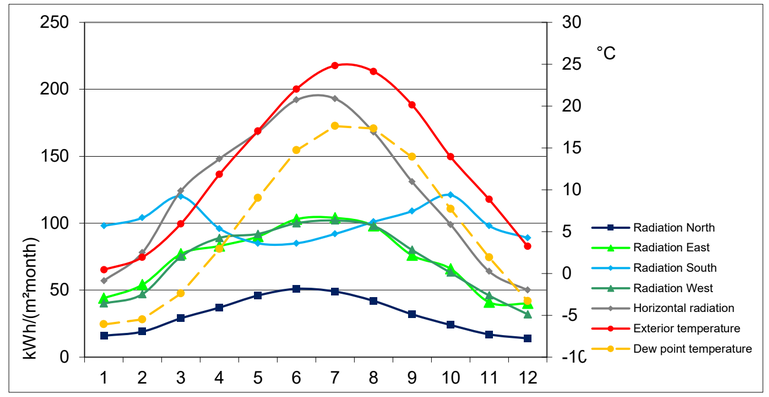
Altitude

Weather station:	40.0	m
Building location:	18	m

Result overview

Annual heating demand	15.1	kWh/(m²a)
Heating load	13.0	W/m²
Frequency of overheating	-	%
Sensible cooling	15.4	kWh/(m²a)
Latent cooling	1.9	kWh/(m²a)
Cooling load	11.2	W/m²
PER demand	51.9	kWh/(m²a)

	Data for heating Annual method	Data from monthly balance Heating	Cooling	
Heating / cooling period	174	212	275	d/a
Heating / cooling degree hours	64	73	-63	kKh/a
Radiation North	114	166	354	kWh/(m²a)
Radiation East	301	371	701	kWh/(m²a)
Radiation South	569	711	904	kWh/(m²a)
Radiation West	287	431	762	kWh/(m²a)
Horizontal radiation	450	620	1287	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	0.4	1.9	5.9	11.8	17.0	22.0	24.8	24.1	20.1	13.9	8.8	3.2	-9.8	-4.3	30.4	27.5	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	12.4	11.2	11.1	12.2	15.5	17.8	19.8	21.1	21.2	18.8	16.8	14.5	11.1	11.1	21.2	21.2		
	Comment:	Temp = 1981-2010; Other derivede from Meteonrom and TMY3																	

U-value of building assemblies

229 Stratford Road / Climate: New York / TFA: 242 m² / Heating: 15.1 kWh/(m²a) / Cooling: 17.3 kWh/(m²a) / PER: 51.9 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	**Exterior Wall**	

Heat transmission resistance [m²K/W]

Orientation of building element: 0.130321518 — interior R_{si}: 0.13
Adjacent to: 0.040505337 — exterior R_{se}: 0.04

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
Cavity Rock DD	**0.034**	**Wood 2x4 stud**	**0.130**		**0.000**	**89**
Comfort Board	**0.036**		**0.000**		**0.000**	**51**
Comfort Board	**0.036**		**0.000**		**0.000**	**51**
Sheathing	**0.130**		**0.000**		**0.000**	**16**
Comfort Batt	**0.034**		**0.000**		**0.000**	**89**
GWB	**0.170**		**0.000**		**0.000**	**16**
	0.000		**0.000**		**0.000**	**0**
	0.000		**0.000**		**0.000**	**0**

Percentage of sec. 1: 91% — Percentage of sec. 2: **9.0%** — Percentage of sec. 3: **0.0%** — Total: **31.1** cm

U-value supplement: **0.00** W/(m²K) — **U-value: 0.124** W/(m²K)

Assembly no.		Interior insulation?
02ud	**Cellar Wall**	

Heat transmission resistance [m²K/W]

Orientation of building element: 0.130321518 — 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]
GWB	**0.170**		**0.000**		**0.000**	**16**
Comfort Batt	**0.034**		**0.000**		**0.000**	**140**
Rubble Wall	**0.720**		**0.000**		**0.000**	**431**
EPS	**0.034**		**0.000**		**0.000**	**114**
	0.000		**0.000**		**0.000**	**0**
	0.000		**0.000**		**0.000**	**0**
	0.000		**0.000**		**0.000**	**0**
	0.000		**0.000**		**0.000**	**0**

Percentage of sec. 1: 100% — Percentage of sec. 2: **0.0%** — Percentage of sec. 3: **0.0%** — Total: **70.1** cm

U-value supplement: **0.00** W/(m²K) — **U-value: 0.121** W/(m²K)

Assembly no.		Interior insulation?
03ud	**Roof**	

Heat transmission resistance [m²K/W]

Orientation of building element: 0.100382791 — interior R_{si}: 0.10
Adjacent to: 0.040505337 — exterior R_{se}: 0.04

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
Comfort Batt	**0.034**	**Wood 2x4 stud**	**0.130**		**0.000**	**152**
Sheathing	**0.130**		**0.000**		**0.000**	**16**
Comfort Board	**0.036**		**0.000**		**0.000**	**51**
Comfort Board	**0.036**		**0.000**		**0.000**	**51**
Comfort Batt	**0.034**	**Wood 2x4 stud**	**0.130**		**0.000**	**127**
	0.000		**0.000**		**0.000**	**0**
	0.000		**0.000**		**0.000**	**0**
	0.000		**0.000**		**0.000**	**0**

Percentage of sec. 1: 91% — Percentage of sec. 2: **9.0%** — Percentage of sec. 3: **0.0%** — Total: **39.7** cm

U-value supplement: **0.00** W/(m²K) — **U-value: 0.101** W/(m²K)

Assembly no. 04ud — **Slab** — Interior insulation?

Heat transmission resistance [m²K/W]

Orientation of building element	0.170826854	interior R_{si}	0.17
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]
Concrete	2.100		0.000		0.000	102
EPS	0.036		0.000		0.000	102
	0.000		0.000		0.000	0
	0.000		0.000		0.000	0
	0.000		0.000		0.000	0
	0.000		0.000		0.000	0
	0.000		0.000		0.000	0
	0.000		0.000		0.000	0

Percentage of sec. 1	Percentage of sec. 2	Percentage of sec. 3	Total
100%	0.0%	0.0%	20.3 cm

U-value supplement: 0.00 W/(m²K) — **U-value: 0.329** W/(m²K)

Assembly no. 05ud — **Cellar Wall Above Grade** — Interior insulation?

Heat transmission resistance [m²K/W]

Orientation of building element	0.130321518	interior R_{si}	0.13
Adjacent to	0.040505337	exterior R_{se}:	0.04

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
GWB	0.170		0.000		0.000	16
Comfort Batt	0.034	Wood 2x4 stud	0.130		0.000	140
Rubble Wall	0.720		0.000		0.000	476
EPS	0.034		0.000		0.000	191
	0.000		0.000		0.000	0
	0.000		0.000		0.000	0
	0.000		0.000		0.000	0
	0.000		0.000		0.000	0

Percentage of sec. 1	Percentage of sec. 2	Percentage of sec. 3	Total
91%	9.0%	0.0%	82.2 cm

U-value supplement: 0.00 W/(m²K) — **U-value: 0.100** W/(m²K)

Assembly no. 06ud — **Cellar Wall Below Grade** — Interior insulation?

Heat transmission resistance [m²K/W]

Orientation of building element	0.130321518	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]
GWB	0.170		0.000		0.000	16
Comfort Batt	0.034	Wood 2x4 stud	0.130		0.000	140
Rubble Wall	0.720		0.000		0.000	568
EPS	0.034		0.000		0.000	102
	0.000		0.000		0.000	0
	0.000		0.000		0.000	0
	0.000		0.000		0.000	0
	0.000		0.000		0.000	0

Percentage of sec. 1	Percentage of sec. 2	Percentage of sec. 3	Total
100%	0.0%	0.0%	82.6 cm

U-value supplement: 0.00 W/(m²K) — **U-value: 0.123** W/(m²K)

Areas determination

229 Stratford Road / Climate: New York / TFA: 242 m² / Heating: 15.1 kWh/(m²a) / Cooling: 17.3 kWh/(m²a) / PER: 51.9 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	9 Months
	Treated floor area	1	**241.70**	m²	*Treated floor area according to PHPP manual*					
A	**North windows**	2	**11.44**	m²	Results come from the 'Windows' worksheet.		**North windows**	**0.880**	**209**	**390**
A	**East windows**	3	**14.48**	m²	Window areas are subtracted from individual opaque areas.		**East windows**	**0.821**	**1050**	**1652**
A	**South windows**	4	**10.72**	m²	which is displayed in the 'Windows' worksheet.		**South windows**	**0.858**	**985**	**1247**
A	**West windows**	5	**15.36**	m²			**West windows**	**0.836**	**917**	**1297**
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	**327.44**	m²	*Temperature zone "A" is ambient air*		**External wall - Ambient**	**0.123**	**80**	**266**
B	**External wall - Ground**	9	**53.02**	m²	*Temperature zone "B" is the ground*		**External wall - Ground**	**0.121**		
A	**Roof/Ceiling - Ambient**	10	**202.51**	m²			**Roof/Ceiling - Ambient**	**0.101**	**26**	**255**
B	**Floor slab / Basement ceiling**	11	**108.55**	m²			**Floor slab / Basement ceiling**	**0.329**		
		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	**190.38**	m	*Units in m*		**Thermal bridges Ambient**	**-0.054**		
P	**Perimeter thermal bridges**	16	**30.18**	m	*Units in m; temperature zone "P" is perimeter (see 'Ground' worksheet)*		**Perimeter thermal bridges**	**0.173**		
B	**Thermal bridges FS/BC**	17	**0.00**	m	*Units in m*		**Thermal bridges FS/BC**			
I	**Building element towards neigh**	18	**0.00**	m²	*No heat losses, only considered for the heating load calculation*		**Building element towards neighbour**			
Total thermal envelope			**743.52**	**m²**			**Average therm. envelope**	**0.191**		

Go to building components list

Area input

Sort: 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	**1**	x (		x		+	**108.55**	-		)		=	108.5								
	Treated floor area	**1**	Treated floor area	**1**	x (	**0.00**	x	**0.00**	+	**241.70**	-	**0.00**	)		=	241.7								
	Exterior door	**7**	Exterior door	**0**	x (	**0.00**	x	**0.00**	+	**0.00**	-	**0.00**	) -		=	0.0	Exterior door	**0.85**						
1	**N1**	**8**	External wall - Ambient	**1**	x (	**0.00**	x	**0.00**	+	**78.53**	-	**0.00**	) -	**6.1**	=	72.4	01ud Exterior Wall	**0.124**	**353**	**90**	North	**0.90**	**0.50**	**0.90**
2	**N2**	**8**	External wall - Ambient	**1**	x (	**0.00**	x	**0.00**	+	**4.28**	-	**0.00**	) -	**1.3**	=	2.9	01ud Exterior Wall	**0.124**	**353**	**90**	North	**0.90**	**0.50**	**0.90**
3	**N3**	**8**	External wall - Ambient	**1**	x (	**0.00**	x	**0.00**	+	**5.09**	-	**0.00**	) -	**1.3**	=	3.7	01ud Exterior Wall	**0.124**	**317**	**90**	North	**0.90**	**0.50**	**0.90**
4	**N4**	**8**	External wall - Ambient	**1**	x (	**0.00**	x	**0.00**	+	**4.45**	-	**0.00**	) -	**1.3**	=	3.1	01ud Exterior Wall	**0.124**	**387**	**90**	North	**0.90**	**0.50**	**0.90**
5	**N5**	**10**	Roof/Ceiling - Ambient	**1**	x (	**0.00**	x	**0.00**	+	**2.35**	-	**0.00**	) -	**0.0**	=	2.4	03ud Roof	**0.101**	**353**	**78**	North	**0.90**	**0.50**	**0.90**
6	**N6**	**10**	Roof/Ceiling - Ambient	**1**	x (	**0.00**	x	**0.00**	+	**58.55**	-	**0.00**	) -	**0.0**	=	58.5	03ud Roof	**0.101**	**353**	**40**	North	**0.90**	**0.50**	**0.90**
7	**N7**	**8**	External wall - Ambient	**1**	x (	**0.00**	x	**0.00**	+	**7.08**	-	**0.00**	) -	**0.0**	=	7.1	02ud Cellar Wall	**0.121**	**353**	**90**	North	**0.90**	**0.50**	**0.90**
8	**N8**	**8**	External wall - Ambient	**1**	x (	**0.00**	x	**0.00**	+	**1.70**	-	**0.00**	) -	**0.0**	=	1.7	02ud Cellar Wall	**0.121**	**353**	**90**	North	**0.90**	**0.50**	**0.90**
9	**N9**	**8**	External wall - Ambient	**1**	x (	**0.00**	x	**0.00**	+	**2.02**	-	**0.00**	) -	**0.7**	=	1.4	02ud Cellar Wall	**0.121**	**353**	**90**	North	**0.90**	**0.50**	**0.90**
10	**N10**	**8**	External wall - Ambient	**1**	x (	**0.00**	x	**0.00**	+	**1.70**	-	**0.00**	) -	**0.0**	=	1.7	02ud Cellar Wall	**0.121**	**353**	**90**	North	**0.90**	**0.50**	**0.90**
11	**N11**	**8**	External wall - Ambient	**1**	x (	**0.00**	x	**0.00**	+	**6.12**	-	**0.00**	) -	**0.7**	=	5.4	02ud Cellar Wall	**0.121**	**353**	**90**	North	**0.90**	**0.50**	**0.90**
12	**N12**	**9**	External wall - Ground	**1**	x (	**0.00**	x	**0.00**	+	**6.48**	-	**0.00**	) -	**0.0**	=	6.5	02ud Cellar Wall	**0.121**	**353**	**90**	North	**0.90**	**0.50**	**0.90**
13	**N13**	**9**	External wall - Ground	**1**	x (	**0.00**	x	**0.00**	+	**1.55**	-	**0.00**	) -	**0.0**	=	1.6	02ud Cellar Wall	**0.121**	**353**	**90**	North	**0.90**	**0.50**	**0.90**
14	**N14**	**9**	External wall - Ground	**1**	x (	**0.00**	x	**0.00**	+	**1.85**	-	**0.00**	) -	**0.0**	=	1.8	02ud Cellar Wall	**0.121**	**353**	**90**	North	**0.90**	**0.50**	**0.90**
15	**N15**	**9**	External wall - Ground	**1**	x (	**0.00**	x	**0.00**	+	**1.55**	-	**0.00**	) -	**0.0**	=	1.6	02ud Cellar Wall	**0.121**	**353**	**90**	North	**0.90**	**0.50**	**0.90**
16	**N16**	**9**	External wall - Ground	**1**	x (	**0.00**	x	**0.00**	+	**5.59**	-	**0.00**	) -	**0.0**	=	5.6	02ud Cellar Wall	**0.121**	**353**	**90**	North	**0.90**	**0.50**	**0.90**
17	**S1**	**8**	External wall - Ambient	**1**	x (	**0.00**	x	**0.00**	+	**74.19**	-	**0.00**	) -	**5.4**	=	68.8	01ud Exterior Wall	**0.124**	**173**	**90**	South	**0.90**	**0.50**	**0.90**
18	**S2**	**8**	External wall - Ambient	**1**	x (	**0.00**	x	**0.00**	+	**4.64**	-	**0.00**	) -	**1.3**	=	3.3	01ud Exterior Wall	**0.124**	**139**	**90**	South	**0.90**	**0.50**	**0.90**
19	**S3**	**8**	External wall - Ambient	**1**	x (	**0.00**	x	**0.00**	+	**5.52**	-	**0.00**	) -	**1.3**	=	4.2	01ud Exterior Wall	**0.124**	**173**	**90**	South	**0.90**	**0.50**	**0.90**
20	**S4**	**8**	External wall - Ambient	**1**	x (	**0.00**	x	**0.00**	+	**4.65**	-	**0.00**	) -	**1.3**	=	3.3	01ud Exterior Wall	**0.124**	**200**	**90**	South	**0.90**	**0.50**	**0.90**
21	**S5**	**10**	Roof/Ceiling - Ambient	**1**	x (	**0.00**	x	**0.00**	+	**4.94**	-	**0.00**	) -	**0.0**	=	4.9	03ud Roof	**0.101**	**173**	**73**	South	**0.90**	**0.50**	**0.90**
22	**S6**	**10**	Roof/Ceiling - Ambient	**1**	x (	**0.00**	x	**0.00**	+	**2.53**	-	**0.00**	) -	**0.0**	=	2.5	03ud Roof	**0.101**	**173**	**78**	South	**0.90**	**0.50**	**0.90**
23	**S7**	**10**	Roof/Ceiling - Ambient	**1**	x (	**0.00**	x	**0.00**	+	**58.80**	-	**0.00**	) -	**0.0**	=	58.8	03ud Roof	**0.101**	**173**	**40**	South	**0.90**	**0.50**	**0.90**
24	**S8**	**8**	External wall - Ambient	**1**	x (	**0.00**	x	**0.00**	+	**2.92**	-	**0.00**	) -	**0.0**	=	2.9	02ud Cellar Wall	**0.121**	**173**	**90**	South	**0.90**	**0.50**	**0.90**
25	**S9**	**8**	External wall - Ambient	**1**	x (	**0.00**	x	**0.00**	+	**1.69**	-	**0.00**	) -	**0.0**	=	1.7	02ud Cellar Wall	**0.121**	**139**	**90**	South	**0.90**	**0.50**	**0.90**
26	**S10**	**8**	External wall - Ambient	**1**	x (	**0.00**	x	**0.00**	+	**2.02**	-	**0.00**	) -	**0.7**	=	1.4	02ud Cellar Wall	**0.121**	**173**	**90**	South	**0.90**	**0.50**	**0.90**
27	**S11**	**8**	External wall - Ambient	**1**	x (	**0.00**	x	**0.00**	+	**1.69**	-	**0.00**	) -	**0.0**	=	1.7	02ud Cellar Wall	**0.121**	**200**	**90**	South	**0.90**	**0.50**	**0.90**
28	**S12**	**8**	External wall - Ambient	**1**	x (	**0.00**	x	**0.00**	+	**7.08**	-	**0.00**	) -	**0.7**	=	6.4	02ud Cellar Wall	**0.121**	**173**	**90**	South	**0.90**	**0.50**	**0.90**
29	**S13**	**9**	External wall - Ground	**1**	x (	**0.00**	x	**0.00**	+	**2.68**	-	**0.00**	) -	**0.0**	=	2.7	02ud Cellar Wall	**0.121**	**173**	**90**	South	**0.90**	**0.50**	**0.90**
30	**S14**	**9**	External wall - Ground	**1**	x (	**0.00**	x	**0.00**	+	**1.55**	-	**0.00**	) -	**0.0**	=	1.6	02ud Cellar Wall	**0.121**	**173**	**90**	South	**0.90**	**0.50**	**0.90**

Areas determination

229 Stratford Road / Climate: New York / TFA: 242 m² / Heating: 15.1 kWh/(m²a) / Cooling: 17.3 kWh/(m²a) / PER: 51.9 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	9 Months
	Treated floor area	1	**241.70**	m²	*Treated floor area according to PHPP manual*					
A	**North windows**	2	**11.44**	m²	Results come from the 'Windows' worksheet.		**North windows**	**0.880**	**209**	**390**
A	**East windows**	3	**14.48**	m²	Window areas are subtracted from individual opaque areas.		**East windows**	**0.821**	**1050**	**1652**
A	**South windows**	4	**10.72**	m²	which is displayed in the 'Windows' worksheet.		**South windows**	**0.858**	**985**	**1247**
A	**West windows**	5	**15.36**	m²			**West windows**	**0.836**	**917**	**1297**
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	**327.44**	m²	*Temperature zone "A" is ambient air*		**External wall - Ambient**	**0.123**	**80**	**266**
B	**External wall - Ground**	9	**53.02**	m²	*Temperature zone "B" is the ground*		**External wall - Ground**	**0.121**		
A	**Roof/Ceiling - Ambient**	10	**202.51**	m²			**Roof/Ceiling - Ambient**	**0.101**	**26**	**255**
B	**Floor slab / Basement ceiling**	11	**108.55**	m²			**Floor slab / Basement ceiling**	**0.329**		
		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	**190.38**	m	*Units in m*		**Thermal bridges Ambient**	**-0.054**		
P	**Perimeter thermal bridges**	16	**30.18**	m	*Units in m; temperature zone "P" is perimeter (see 'Ground' worksheet)*		**Perimeter thermal bridges**	**0.173**		
B	**Thermal bridges FS/BC**	17	**0.00**	m	*Units in m*		**Thermal bridges FS/BC**			
I	**Building element towards neigh**	18	**0.00**	m²	*No heat losses, only considered for the heating load calculation*		**Building element towards neighbour**			
Total thermal envelope			**743.52**	**m²**			**Average therm. envelope**	**0.191**		

Go to building components list

31	**S15**	**9**	External wall - Ground	**1**	x (	**0.00**	x	**0.00**	+	**1.85**	-	**0.00**	) -	**0.0**	=	1.8	02ud Cellar Wall	**0.121**	**173**	**90**	**South**	**0.90**	**0.50**	**0.90**
32	**S16**	**9**	External wall - Ground	**1**	x (	**0.00**	x	**0.00**	+	**1.55**	-	**0.00**	) -	**0.0**	=	1.6	02ud Cellar Wall	**0.121**	**173**	**90**	**South**	**0.90**	**0.50**	**0.90**
33	**S17**	**9**	External wall - Ground	**1**	x (	**0.00**	x	**0.00**	+	**6.48**	-	**0.00**	) -	**0.0**	=	6.5	02ud Cellar Wall	**0.121**	**173**	**90**	**South**	**0.90**	**0.50**	**0.90**
34	**S18**	**8**	External wall - Ambient	**1**	x (	**0.00**	x	**0.00**	+	**3.19**	-	**0.00**	) -	**0.0**	=	3.2	02ud Cellar Wall	**0.121**	**173**	**90**	**South**	**0.90**	**0.50**	**0.90**
35	**S19**	**9**	External wall - Ground	**1**	x (	**0.00**	x	**0.00**	+	**2.92**	-	**0.00**	) -	**0.0**	=	2.9	02ud Cellar Wall	**0.121**	**173**	**90**	**South**	**0.90**	**0.50**	**0.90**
36	**S20**	**8**	External wall - Ambient	**1**	x (	**0.00**	x	**0.00**	+	**1.62**	-	**0.00**	) -	**0.0**	=	1.6	01ud Exterior Wall	**0.124**	**173**	**90**	**South**	**0.90**	**0.50**	**0.90**
37	**FS1**	**11**	Floor slab / Basement ceiling	**1**	x (	**0.00**	x	**0.00**	+	**108.55**	-	**0.00**	) -	**0.0**	=	108.5	04ud Slab	**0.329**	**173**	**0**	**Hor**	**1.00**		
38	**FS2**	**10**	Roof/Ceiling - Ambient	**1**	x (	**0.00**	x	**0.00**	+	**10.15**	-	**0.00**	) -	**0.0**	=	10.1	03ud Roof	**0.101**	**173**	**0**	**Hor**	**0.90**	**0.80**	**0.90**
39	**E1**	**8**	External wall - Ambient	**1**	x (	**0.00**	x	**0.00**	+	**42.45**	-	**0.00**	) -	**8.9**	=	33.5	01ud Exterior Wall	**0.124**	**83**	**90**	**East**	**0.90**	**0.50**	**0.90**
40	**E2**	**8**	External wall - Ambient	**1**	x (	**0.00**	x	**0.00**	+	**25.23**	-	**0.00**	) -	**5.6**	=	19.7	01ud Exterior Wall	**0.124**	**83**	**90**	**East**	**0.90**	**0.50**	**0.90**
41	**E3**	**10**	Roof/Ceiling - Ambient	**1**	x (	**0.00**	x	**0.00**	+	**15.04**	-	**0.00**	) -	**0.0**	=	15.0	03ud Roof	**0.101**	**83**	**74**	**East**	**0.90**	**0.50**	**0.90**
42	**E4**	**10**	Roof/Ceiling - Ambient	**1**	x (	**0.00**	x	**0.00**	+	**8.08**	-	**0.00**	) -	**0.0**	=	8.1	03ud Roof	**0.101**	**83**	**90**	**East**	**0.90**	**0.50**	**0.90**
43	**E5**	**10**	Roof/Ceiling - Ambient	**1**	x (	**0.00**	x	**0.00**	+	**8.17**	-	**0.00**	) -	**0.0**	=	8.2	03ud Roof	**0.101**	**83**	**40**	**East**	**0.90**	**0.50**	**0.90**
44	**E6**	**8**	External wall - Ambient	**1**	x (	**0.00**	x	**0.00**	+	**8.25**	-	**0.00**	) -	**0.0**	=	8.3	02ud Cellar Wall	**0.121**	**83**	**40**	**East**	**0.90**	**0.50**	**0.90**
45	**E7**	**8**	External wall - Ambient	**1**	x (	**0.00**	x	**0.00**	+	**2.13**	-	**0.00**	) -	**0.0**	=	2.1	02ud Cellar Wall	**0.121**	**83**	**90**	**East**	**0.90**	**0.50**	**0.90**
46	**E8**	**9**	External wall - Ground	**1**	x (	**0.00**	x	**0.00**	+	**7.55**	-	**0.00**	) -	**0.0**	=	7.5	02ud Cellar Wall	**0.121**	**83**	**90**	**East**	**0.90**	**0.50**	**0.90**
47	**E9**	**9**	External wall - Ground	**1**	x (	**0.00**	x	**0.00**	+	**1.94**	-	**0.00**	) -	**0.0**	=	1.9	02ud Cellar Wall	**0.121**	**83**	**90**	**East**	**0.90**	**0.50**	**0.90**
48	**W1**	**8**	External wall - Ambient	**1**	x (	**0.00**	x	**0.00**	+	**27.49**	-	**0.00**	) -	**4.2**	=	23.3	01ud Exterior Wall	**0.124**	**263**	**90**	**West**	**0.90**	**0.50**	**0.90**
49	**W2**	**8**	External wall - Ambient	**1**	x (	**0.00**	x	**0.00**	+	**24.11**	-	**0.00**	) -	**4.8**	=	19.3	01ud Exterior Wall	**0.124**	**263**	**90**	**West**	**0.90**	**0.50**	**0.90**
50	**W3**	**8**	External wall - Ambient	**1**	x (	**0.00**	x	**0.00**	+	**4.40**	-	**0.00**	) -	**1.3**	=	3.1	01ud Exterior Wall	**0.124**	**226**	**90**	**West**	**0.90**	**0.50**	**0.90**
51	**W4**	**8**	External wall - Ambient	**1**	x (	**0.00**	x	**0.00**	+	**5.00**	-	**0.00**	) -	**1.3**	=	3.7	01ud Exterior Wall	**0.124**	**300**	**90**	**West**	**0.90**	**0.50**	**0.90**
52	**W5**	**8**	External wall - Ambient	**1**	x (	**0.00**	x	**0.00**	+	**4.39**	-	**0.00**	) -	**1.3**	=	3.1	01ud Exterior Wall	**0.124**	**263**	**90**	**West**	**0.90**	**0.50**	**0.90**
53	**W6**	**8**	External wall - Ambient	**1**	x (	**0.00**	x	**0.00**	+	**2.63**	-	**0.00**	) -	**1.2**	=	1.4	01ud Exterior Wall	**0.124**	**226**	**90**	**West**	**0.90**	**0.50**	**0.90**
54	**W7**	**8**	External wall - Ambient	**1**	x (	**0.00**	x	**0.00**	+	**2.82**	-	**0.00**	) -	**1.2**	=	1.6	01ud Exterior Wall	**0.124**	**300**	**90**	**West**	**0.90**	**0.50**	**0.90**
55	**W8**	**10**	Roof/Ceiling - Ambient	**1**	x (	**0.00**	x	**0.00**	+	**2.03**	-	**0.00**	) -	**0.0**	=	2.0	03ud Roof	**0.101**	**263**	**0**	**Hor**	**0.90**	**0.50**	**0.90**
56	**W9**	**10**	Roof/Ceiling - Ambient	**1**	x (	**0.00**	x	**0.00**	+	**8.17**	-	**0.00**	) -	**0.0**	=	8.2	03ud Roof	**0.101**	**263**	**40**	**West**	**0.90**	**0.50**	**0.90**
57	**W10**	**10**	Roof/Ceiling - Ambient	**1**	x (	**0.00**	x	**0.00**	+	**8.08**	-	**0.00**	) -	**0.0**	=	8.1	03ud Roof	**0.101**	**263**	**40**	**West**	**0.90**	**0.50**	**0.90**
58	**W11**	**8**	External wall - Ambient	**1**	x (	**0.00**	x	**0.00**	+	**10.35**	-	**0.00**	) -	**0.0**	=	10.4	02ud Cellar Wall	**0.121**	**263**	**90**	**West**	**0.90**	**0.50**	**0.90**
59	**W12**	**9**	External wall - Ground	**1**	x (	**0.00**	x	**0.00**	+	**9.47**	-	**0.00**	) -	**0.0**	=	9.5	02ud Cellar Wall	**0.121**	**263**	**90**	**West**	**0.90**		
60	**FS3**	**10**	Roof/Ceiling - Ambient	**1**	x (	**0.00**	x	**0.00**	+	**3.93**	-	**0.00**	) -	**0.0**	=	3.9	03ud Roof	**0.101**	**263**	**0**	**Hor**	**0.90**	**0.80**	**0.90**
61	**FS4**	**10**	Roof/Ceiling - Ambient	**1**	x (	**0.00**	x	**0.00**	+	**10.15**	-	**0.00**	) -	**0.0**	=	10.1	03ud Roof	**0.101**	**263**	**0**	**Hor**	**0.90**	**0.80**	**0.90**
62	**FS5**	**10**	Roof/Ceiling - Ambient	**1**	x (	**0.00**	x	**0.00**	+	**1.54**	-	**0.00**	) -	**0.0**	=	1.5	03ud Roof	**0.101**	**263**	**0**	**Hor**	**0.90**	**0.80**	**0.90**
63					x (	**0.00**	x	**0.00**	+	**0.00**	-	**0.00**	) -	**0.0**	=									
64					x (	**0.00**	x	**0.00**	+	**0.00**	-	**0.00**	) -	**0.0**	=									
100					x (	**0.00**	x	**0.00**	+	**0.00**	-	**0.00**	) -	**0.0**	=									
Aend																								

Areas determination

229 Stratford Road / Climate: New York / TFA: 242 m² / Heating: 15.1 kWh/(m²a) / Cooling: 17.3 kWh/(m²a) / PER: 51.9 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]
								7 Months
	Treated floor area	1	**241.70**	m²	*Treated floor area according to PHPP manual*			
A	**North windows**	2	**11.44**	m²	Results come from the 'Windows' worksheet.	**North windows**	**0.880**	**209**
A	**East windows**	3	**14.48**	m²	Window areas are subtracted from individual opaque areas.	**East windows**	**0.821**	**1050**
A	**South windows**	4	**10.72**	m²	which is displayed in the 'Windows' worksheet.	**South windows**	**0.858**	**985**
A	**West windows**	5	**15.36**	m²		**West windows**	**0.836**	**917**
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	**327.44**	m²	*Temperature zone "A" is ambient air*	**External wall - Ambient**	**0.123**	**80**
B	**External wall - Ground**	9	**53.02**	m²	*Temperature zone "B" is the ground*	**External wall - Ground**	**0.121**	
A	**Roof/Ceiling - Ambient**	10	**202.51**	m²		**Roof/Ceiling - Ambient**	**0.101**	**26**
B	**Floor slab / Basement ceiling**	11	**108.55**	m²		**Floor slab / Basement ceiling**	**0.329**	
		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	**190.38**	m	*Units in m*	**Thermal bridges Ambient**	**-0.054**	
P	**Perimeter thermal bridges**	16	**30.18**	m	*Units in m; temperature zone "P" is perimeter (see 'Ground' worksheet)*	**Perimeter thermal bridges**	**0.173**	
B	**Thermal bridges FS/BC**	17	**0.00**	m	*Units in m*	**Thermal bridges FS/BC**		
I	**Building element towards neigh**	18	**0.00**	m²	*No heat losses, only considered for the heating load calculation*	**Building element towards neighbour**		
Total thermal envelope			**743.52**	**m²**		**Average therm. envelope**	**0.191**	

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	**Roof Rake**	**15**	Thermal bridges Ambient	**1**	x (	**46.16**	-	**0.00**	) =	46.16	**-0.128**		or		**-0.128**	
2					x (	**0.00**	-	**0.00**	) =		**0.000**		or		**0.000**	
3	**Roof Eave**	**15**	Thermal bridges Ambient	**1**	x (	**10.97**	-	**0.00**	) =	10.97	**-0.016**		or		**-0.016**	
4	**Perimeter at First Floor**	**15**	Thermal bridges Ambient	**1**	x (	**41.32**	-	**0.00**	) =	41.32	**0.002**		or		**0.002**	
5					x (	**0.00**	-	**0.00**	) =		**0.000**		or		**0.000**	
6	**90 Degree Corner at Wood Stud**	**15**	Thermal bridges Ambient	**1**	x (	**26.57**	-	**0.00**	) =	26.57	**-0.031**		or		**-0.031**	
7	**90 Degree Corner at Masonry Wall**	**15**	Thermal bridges Ambient	**1**	x (	**13.18**	-	**0.00**	) =	13.18	**-0.276**		or		**-0.276**	
8	**Floor Rim Joist**	**15**	Thermal bridges Ambient	**1**	x (	**30.16**	-	**0.00**	) =	30.16	**0.005**		or		**0.005**	
9	**Balcony Connection**	**15**	Thermal bridges Ambient	**1**	x (	**22.02**	-	**0.00**	) =	22.02	**0.003**		or		**0.003**	
10					x (	**0.00**	-	**0.00**	) =		**0.000**		or		**0.000**	
11	**Perimeter at Foundation**	**16**	Perimeter thermal bridges	**1**	x (	**30.18**	-	**0.00**	) =	30.18	**0.173**		or		**0.173**	
12					x (	**0.00**	-	**0.00**	) =		**0.000**		or		**0.000**	
13					x (	**0.00**	-	**0.00**	) =		**0.000**		or		**0.000**	
14					x (	**0.00**	-	**0.00**	) =		**0.000**		or		**0.000**	
15					x (	**0.00**	-	**0.00**	) =		**0.000**		or		**0.000**	
16					x (	**0.00**	-	**0.00**	) =		**0.000**		or		**0.000**	
17					x (	**0.00**	-	**0.00**	) =		**0.000**		or		**0.000**	
18					x (	**0.00**	-	**0.00**	) =		**0.000**		or		**0.000**	
19					x (	**0.00**	-	**0.00**	) =		**0.000**		or		**0.000**	
20					x (	**0.00**	-	**0.00**	) =		**0.000**		or		**0.000**	
21					x (	**0.00**	-	**0.00**	) =		**0.000**		or		**0.000**	
22					x (	**0.00**	-	**0.00**	) =		**0.000**		or		**0.000**	
23					x (	**0.00**	-	**0.00**	) =		**0.000**		or		**0.000**	
24					x (	**0.00**	-	**0.00**	) =		**0.000**		or		**0.000**	
25					x (	**0.00**	-	**0.00**	) =		**0.000**		or		**0.000**	
26					x (	**0.00**	-	**0.00**	) =		**0.000**		or		**0.000**	
27					x (	**0.00**	-	**0.00**	) =		**0.000**		or		**0.000**	
28					x (	**0.00**	-	**0.00**	) =		**0.000**		or		**0.000**	
29					x (	**0.00**	-	**0.00**	) =		**0.000**		or		**0.000**	
30					x (	**0.00**	-	**0.00**	) =		**0.000**		or		**0.000**	
31					x (	**0.00**	-	**0.00**	) =		**0.000**		or		**0.000**	
32					x (	**0.00**	-	**0.00**	) =		**0.000**		or		**0.000**	
33					x (	**0.00**	-	**0.00**	) =		**0.000**		or		**0.000**	

Heat losses through the ground

229 Stratford Road / Climate: New York / TFA: 242 m² / Heating: 15.1 kWh/(m²a) / Cooling: 17.3 kWh/(m²a) / PER: 51.9 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	$T_{g,ave}$	13.9	°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	5.7	Months
Heating degree hours - exterior	G_t	63.7	kKh/a

Building data				U-value floor slab/basement ceiling	U_f	0.329	W/(m²K)
Area of ground floor slab / basement c	A	108.5	m²	TBs floor slab / basement ceiling	Ψ_B*l	0.02	W/K
Perimeter length	P	44.2	m	U-value floor slab / basement ceiling i	U_f'	0.329	W/(m²K)
Charact. dimension of floor slab	B'	4.91	m	Equivalent thickness floor	d_t	6.08	m

Floor slab type (select only one)

	Slab on grade						
	Perimeter insulation width/depth	D	0.00	m	Orientation of perimeter insulation	horizontal	
	Perimeter insulation thickness	d_n	0.00	m	(check only one field)	vertical	x
	Conductivity perimeter insulation	λ_n		W/(mK)			
x	**Heated basement or floor slab completely / partially below ground level**						
	Basement wall height below ground le	z	1.52	m	U-Value wall below ground	U_{wB}	0.121 W/(m²K)
	Unheated basement						
	Height aboveground wall	h	0.00	m	U-Value wall above ground	U_W	0.124 W/(m²K)
	Basement wall height below ground le	z	0.00	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	0	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	0.00 m²
	Height of crawl space wall	h	0.00	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	5.223	W/K
Phase shift	β		Months	Harmonic fraction	$\Psi_{P,harm}$*l	5.223	W/K

Groundwater correction							
Depth of the groundwater table	z_w	3.0	m	Groundwater correction factor	G_w	1.00479611	-
Groundwater flow rate	q_w	0.05	m/d				

Interim results

Phase shift	β	1.32	Months	Steady-state heat flow	Φ_{stat}	222.3	W
Steady-state transmittance	L_S	36.19	W/K	Periodic heat flow	Φ_{harm}	112.9	W
Exterior periodic transmittance	L_{pe}	18.07	W/K	Heat losses during heating period	Q_{tot}	1400	kWh
Transmittance building	L_0	49.05	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	12.4	11.2	11.1	12.2	14.2	16.5	18.5	19.8	19.8	18.8	16.8	14.5	15.5
Summer	13.7	12.5	12.4	13.5	15.5	17.8	19.8	21.1	21.2	20.1	18.1	15.8	16.8

Design ground temperature for 'Heating load' worksheet 11.1 **For 'Cooling load' worksheet** 21.2

Reduction factor for 'Annual heating' worksheet 0.45

Total result (all building parts)

Phase shift	β	1.32	Months	Steady-state heat flow	Φ_{stat}	222.3	W
Steady-state transmittance	L_S	36.19	W/K	Periodic heat flow	Φ_{harm}	112.9	W
Exterior periodic transmittance	L_{pe}	18.07	W/K	Heat losses during heating period	Q_{tot}	1400	kWh
Transmittance building	L_0	49.05	W/K	Charact. dimension of floor slab	B'	4.91	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	**12.4**	**11.2**	**11.1**	**12.2**	**14.2**	**16.5**	**18.5**	**19.8**	**19.8**	**18.8**	**16.8**	**14.5**	**15.5**
Summer	**13.7**	**12.5**	**12.4**	**13.5**	**15.5**	**17.8**	**19.8**	**21.1**	**21.2**	**20.1**	**18.1**	**15.8**	**16.8**

Design ground temperature for 'Heating load' worksheet 11.1 **For 'Cooling load' worksheet** 21.2

Reduction factor for 'Annual heating' worksheet **0.45**

Passive House Components

229 Stratford Road / Climate: New York / TFA: 242 m² / Heating: 15.1 kWh/(m²a) / Cooling: 17.3 kWh/(m²a) / PER: 51.9 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) | 0.61 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	**Exterior Wall**	**Exterior Wall**	**0.311**	**0.124**	**0**
02ud	**Cellar Wall**	**Cellar Wall**	**0.701**	**0.121**	**0**
03ud	**Roof**	**Roof**	**0.397**	**0.101**	**0**
04ud	**Slab**	**Slab**	**0.203**	**0.329**	**0**
05ud	**Cellar Wall Above Grade**	**Cellar Wall Above Grade**	**0.822**	**0.100**	**0**
06ud	**Cellar Wall Below Grade**	**Cellar Wall Below Grade**	**0.826**	**0.123**	**0**
07ud			**0.025**	**6.680**	**0**
08ud			**1.000**	**0.150**	**0**
09ud					
10ud					

Glazing Glazing

ID	Description	g-Value	U_g-Value
	Recommended glazing type to start planning: Triple thermally insulated glazing (Please consider the comfort criterion!)		
			W/(m²K)
01ud	**Optiwin Tarredo Glazed Door**	**0.49**	**0.77**
02ud	**Optiwin Tarredo Solid Panel Door**	**0.00**	**0.75**
03ud			
04ud	**Glastrosch Standard (Optiwin Revista Window and Tarredo Glazed Door)**	**0.53**	**0.53**
05ud			
06ud			
07ud			
08ud			
09ud			
10ud			

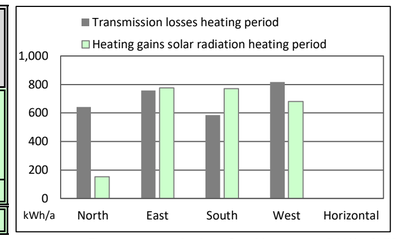
Window frames

		U_f-Value				Frame width				Glazing edge thermal bridge				Installation thermal bridge				Curtain wall facades:
ID	Description	left	right	bottom	above	left	right	bottom	above	$\Psi_{Glazing\ edge}$ left	$\Psi_{Glazing\ edge}$ right	$\Psi_{Glazing\ edge}$ bottom	$\Psi_{Glazing\ edge}$ top	$\Psi_{Installation}$ left	$\Psi_{Installation}$ right	$\Psi_{Installation}$ bottom	$\Psi_{Installation}$ top	χ_{GC} -value Glass carrier
		W/(m²K)	W/(m²K)	W/(m²K)	W/(m²K)	m	m	m	m	W/(mK)	W/(mK)	W/(mK)	W/(mK)	W/(mK)	W/(mK)	W/(mK)	W/(mK)	W/K
01ud	Optiwin Resista	0.81	0.81	0.91	0.81	0.095	0.095	0.095	0.095	0.024	0.024	0.024	0.024	0.026	0.026	0.065	0.060	
02ud	Optiwin Tarredo Glazed Door	0.88	0.88	0.88	0.88	0.080	0.080	0.100	0.080	0.025	0.025	0.025	0.025	0.026	0.026	-0.021	0.026	
03ud	Optiwin Tarredo Solid Panel Door	0.88	0.88	0.88	0.88	0.080	0.080	0.100	0.080	0.025	0.025	0.025	0.025	0.026	0.026	-0.021	0.026	
04ud																		
05ud	PassiV Future Proof Casement/Fixed- withSuperSp. Tri-Seal PU	0.74	0.74	0.74	0.74	0.102	0.102	0.102	0.102	0.024	0.024	0.024	0.024	0.040	0.040	0.040	0.040	0.000
06ud	PassiV Future Proof Tilt & Turn - withSuperSp. Tri-Seal PU	0.68	0.68	0.68	0.68	0.125	0.125	0.125	0.125	0.024	0.024	0.024	0.024	0.040	0.040	0.040	0.040	0.000
07ud																		
08ud																		
09ud																		
10ud																		

Windows

229 Stratford Road / Climate: New York / TFA: 242 m² / Heating: 15.1 kWh/(m²a) / Cooling: 17.3 kWh/(m²a) / PER: 51.9 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	114	0.40	0.95	0.85	0.66	0.53	0.21	11.44	0.88	7.50	120	North	641	152
East	301	0.66	0.95	0.85	0.70	0.52	0.38	14.48	0.82	10.21	274	East	757	776
South	569	0.46	0.95	0.85	0.67	0.53	0.25	10.72	0.86	7.13	556	South	586	771
West	287	0.55	0.95	0.85	0.69	0.46	0.30	15.36	0.84	10.59	320	West	817	681
Horizontal	450	1.00	0.95	0.85	0.00	0.00	0.00	0.00	0.00	0.00	450	Horizontal	0	0
Total or average value for all windows.						0.50	0.29	52.01	0.85	35.43			2802	2379



Heating degree hours [kKh/a]: 63.7

Go to glazing list Go to window frames list

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

0.87	1.04	1.13	0.48

Qua n-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		Sort: AS LIST	Sort: AS LIST	-	W/(m²K)	W/(m²K)	W/(mK)	W/(mK) or 1/0				W/(mK)	m²	m²	W/(m²K)	%
1	Win-N-08 K T&T	353	90	North	0.914	1.626	1-N1	04ud Glastrosch Standard (Optiwin Revista)	01ud Revista	0.53	0.53	0.83	0.024	1	1	1	1	0.039	1.5	1.04	0.82	70%
0	Win-N-07 K T&T	353	90	North	0.914	1.626	1-N1	04ud Glastrosch Standard (Optiwin Revista)	01ud Revista	0.53	0.53	0.83	0.024	1	1	1	1	0.039				
1	Win-N-06 N T&T	353	90	North	0.762	1.753	1-N1	04ud Glastrosch Standard (Optiwin Revista)	01ud Revista	0.53	0.53	0.83	0.024	1	1	1	1	0.037	1.3	0.89	0.84	67%
1	Win-N-05 C T&T	353	90	North	0.762	0.737	1-N1	04ud Glastrosch Standard (Optiwin Revista)	01ud Revista	0.53	0.53	0.84	0.024	1	1	1	1	0.045	0.6	0.31	1.00	56%
1	Win-N-04 E FIXED	353	90	North	2.426	0.610	1-N1	04ud Glastrosch Standard (Optiwin Revista)	01ud Revista	0.53	0.53	0.85	0.024	1	1	1	1	0.055	1.5	0.94	0.96	63%
1	Win-S-05 K T&T	173	90	South	0.914	1.626	17-S1	04ud Glastrosch Standard (Optiwin Revista)	01ud Revista	0.53	0.53	0.83	0.024	1	1	1	1	0.039	1.5	1.04	0.82	70%
1	Win-S-06 K T&T	173	90	South	0.914	1.626	17-S1	04ud Glastrosch Standard (Optiwin Revista)	01ud Revista	0.53	0.53	0.83	0.024	1	1	1	1	0.039	1.5	1.04	0.82	70%
1	Win-S-04 G T&T	173	90	South	0.610	1.651	17-S1	04ud Glastrosch Standard (Optiwin Revista)	01ud Revista	0.53	0.53	0.82	0.024	1	1	1	1	0.036	1.0	0.61	0.90	61%
1	Win-E-06 I T&T	83	90	East	0.914	1.626	39-E1	04ud Glastrosch Standard (Optiwin Revista)	01ud Revista	0.53	0.53	0.83	0.024	0	1	1	1	0.045	1.5	1.04	0.79	70%
1	Win-E-05 I T&T	83	90	East	0.914	1.626	39-E1	04ud Glastrosch Standard (Optiwin Revista)	01ud Revista	0.53	0.53	0.83	0.024	1	0	1	1	0.045	1.5	1.04	0.79	70%
1	Win-E-10 I T&T	83	90	East	0.914	1.626	39-E1	04ud Glastrosch Standard (Optiwin Revista)	01ud Revista	0.53	0.53	0.83	0.024	0	1	1	1	0.045	1.5	1.04	0.79	70%
1	Win-E-09 I T&T	83	90	East	0.914	1.626	39-E1	04ud Glastrosch Standard (Optiwin Revista)	01ud Revista	0.53	0.53	0.83	0.024	1	0	1	1	0.045	1.5	1.04	0.79	70%
1	Win-E-08 I T&T	83	90	East	0.914	1.626	39-E1	04ud Glastrosch Standard (Optiwin Revista)	01ud Revista	0.53	0.53	0.83	0.024	0	1	1	1	0.045	1.5	1.04	0.79	70%
1	Win-E-07 I T&T	83	90	East	0.914	1.626	39-E1	04ud Glastrosch Standard (Optiwin Revista)	01ud Revista	0.53	0.53	0.83	0.024	1	0	1	1	0.045	1.5	1.04	0.79	70%
1	Win-W-05 J T&T	263	90	West	0.762	1.626	48-W1	04ud Glastrosch Standard (Optiwin Revista)	01ud Revista	0.53	0.53	0.83	0.024	1	1	1	1	0.038	1.2	0.82	0.85	66%
1	Win-W-10 I T&T	263	90	West	0.914	1.626	48-W1	04ud Glastrosch Standard (Optiwin Revista)	01ud Revista	0.53	0.53	0.83	0.024	0	1	1	1	0.045	1.5	1.04	0.79	70%
1	Win-W-09 I T&T	263	90	West	0.914	1.626	48-W1	04ud Glastrosch Standard (Optiwin Revista)	01ud Revista	0.53	0.53	0.83	0.024	1	0	1	1	0.045	1.5	1.04	0.79	70%
1	Door-E-01 Glass Door	83	90	East	1.067	2.178	40-E2	01ud Optiwin Tarredo Glazed Door	02ud Optiwin Tarredo Glazed Door	0.49	0.77	0.88	0.025	1	1	1	1	0.018	2.3	1.81	0.91	78%
1	Win-E-02 F T&T	83	90	East	0.914	1.181	40-E2	04ud Glastrosch Standard (Optiwin Revista)	01ud Revista	0.53	0.53	0.83	0.024	1	0	1	1	0.048	1.1	0.72	0.84	66%
1	Win-E-03 F T&T	83	90	East	0.914	1.181	40-E2	04ud Glastrosch Standard (Optiwin Revista)	01ud Revista	0.53	0.53	0.83	0.024	0	0	1	1	0.062	1.1	0.72	0.81	66%
1	Win-E-04 F T&T	83	90	East	0.914	1.181	40-E2	04ud Glastrosch Standard (Optiwin Revista)	01ud Revista	0.53	0.53	0.83	0.024	0	1	1	1	0.048	1.1	0.72	0.84	66%
1	Win-N-08 L T&T	353	90	North	0.914	1.346	1-N1	04ud Glastrosch Standard (Optiwin Revista)	01ud Revista	0.53	0.53	0.83	0.024	1	1	1	1	0.041	1.2	0.84	0.85	68%
1	Win-S-07 M T&T	173	90	South	0.914	1.524	17-S1	04ud Glastrosch Standard (Optiwin Revista)	01ud Revista	0.53	0.53	0.83	0.024	1	1	1	1	0.040	1.4	0.97	0.83	69%
1	Door-W-01 N Solid	263	90	West	0.914	2.032	49-W2	02ud Optiwin Tarredo Solid Panel Door	03ud Optiwin Tarredo Solid Panel Door	0.00	0.75	0.88	0.025	1	1	1	1	0.019	1.9	1.40	0.91	75%
1	Win-W-08 I T&T	263	90	West	0.914	1.626	49-W2	04ud Glastrosch Standard (Optiwin Revista)	01ud Revista	0.53	0.53	0.83	0.024	0	1	1	1	0.045	1.5	1.04	0.79	70%
1	Win-W-07 I T&T	263	90	West	0.914	1.626	49-W2	04ud Glastrosch Standard (Optiwin Revista)	01ud Revista	0.53	0.53	0.83	0.024	1	0	1	1	0.045	1.5	1.04	0.79	70%
1	Win-S-01 A T&T	173	90	South	0.965	0.692	26-S10	04ud Glastrosch Standard (Optiwin Revista)	01ud Revista	0.53	0.53	0.84	0.024	1	1	1	1	0.047	0.7	0.39	0.99	58%

Heating degree hours [kKh/a]: **63.7**

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		Sort: AS LIST	Sort: AS LIST	-	W/(m²K)	W/(m²K)	W/(mK)	W/(mK) or 1/0					W/(mK)	m²	m²	W/(m²K)	%
1	Win-S-01 A T&T	173	90	South	0.965	0.692	28-S12	04ud Glastrosch Standard (Optiwin Revista)	01ud Revista	0.53	0.53	0.84	0.024	1	1	1	1	0.047	0.7	0.39	0.99	58%
1	Win-W-02 B T&T	225.5	90	West	0.787	1.626	50-W3	04ud Glastrosch Standard (Optiwin Revista)	01ud Revista	0.53	0.53	0.83	0.024	1	1	1	1	0.038	1.3	0.86	0.85	67%
1	Win-W-03 B T&T	300.3	90	West	0.787	1.626	51-W4	04ud Glastrosch Standard (Optiwin Revista)	01ud Revista	0.53	0.53	0.83	0.024	1	1	1	1	0.038	1.3	0.86	0.85	67%
1	Win-S-04 N T&T	173	90	South	0.775	1.727	19-S3	04ud Glastrosch Standard (Optiwin Revista)	01ud Revista	0.53	0.53	0.83	0.024	1	1	1	1	0.037	1.3	0.90	0.84	67%
1	Win-W-01 B T&T	263	90	West	0.787	1.626	52-W5	04ud Glastrosch Standard (Optiwin Revista)	01ud Revista	0.53	0.53	0.83	0.024	1	1	1	1	0.038	1.3	0.86	0.85	67%
1	Win-N-03 N T&T	317	90	North	0.775	1.727	3-N3	04ud Glastrosch Standard (Optiwin Revista)	01ud Revista	0.53	0.53	0.83	0.024	1	1	1	1	0.037	1.3	0.90	0.84	67%
1	Win-W-04 J T&T	225.5	90	West	0.762	1.626	53-W6	04ud Glastrosch Standard (Optiwin Revista)	01ud Revista	0.53	0.53	0.83	0.024	1	1	1	1	0.038	1.2	0.82	0.85	66%
1	Win-W-06 J T&T	300.3	90	West	0.762	1.626	54-W7	04ud Glastrosch Standard (Optiwin Revista)	01ud Revista	0.53	0.53	0.83	0.024	1	1	1	1	0.038	1.2	0.82	0.85	66%
1	Win-N-02 A T&T	353	90	North	0.965	0.692	9-N9	04ud Glastrosch Standard (Optiwin Revista)	01ud Revista	0.53	0.53	0.84	0.024	1	1	1	1	0.047	0.7	0.39	0.99	58%
1	Win-N-02 A T&T	353	90	North	0.965	0.692	11-N11	04ud Glastrosch Standard (Optiwin Revista)	01ud Revista	0.53	0.53	0.84	0.024	1	1	1	1	0.047	0.7	0.39	0.99	58%
1	Win-S-05 N T&T	200	90	South	0.775	1.727	20-S4	04ud Glastrosch Standard (Optiwin Revista)	01ud Revista	0.53	0.53	0.83	0.024	1	1	1	1	0.037	1.3	0.90	0.84	67%
1	Win-S-06 N T&T	138.5	90	South	0.775	1.727	18-S2	04ud Glastrosch Standard (Optiwin Revista)	01ud Revista	0.53	0.53	0.83	0.024	1	1	1	1	0.037	1.3	0.90	0.84	67%
1	Win-N-05 N T&T	353	90	North	0.775	1.727	2-N2	04ud Glastrosch Standard (Optiwin Revista)	01ud Revista	0.53	0.53	0.83	0.024	1	1	1	1	0.037	1.3	0.90	0.84	67%
1	Win-N-06 N T&T	387	90	North	0.775	1.727	4-N4	04ud Glastrosch Standard (Optiwin Revista)	01ud Revista	0.53	0.53	0.83	0.024	1	1	1	1	0.037	1.3	0.90	0.84	67%

Calculation of shading coefficients

229 Stratford Road / Climate: New York / TFA: 242 m² / Heating: 15.1 kWh/(m²a) / Cooling: 17.3 kWh/(m²a) / PER: 51.9 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	7.50	40%	33%	30%	52
East	10.21	66%	52%	48%	162
South	7.13	46%	43%	40%	175
West	10.59	55%	41%	38%	141
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	Win-N-08 K T&T	353	90	North	0.72	1.44	1.0	5.93	6.23	0.13	0.140	0.38	0.96	90%	80%	70%		54%	93%	94%	43%	60%	93%	98%	35%	32%
0	Win-N-07 K T&T	353	90	North	0.72	1.44		5.81	6.46	0.13	0.140	0.13	0.14	90%	80%	70%										
1	Win-N-06 N T&T	353	90	North	0.57	1.56	0.9	6.52	6.63	0.42	0.921	0.13	0.14	90%	80%	70%		54%	90%	96%	42%	60%	90%	99%	34%	31%
1	Win-N-05 C T&T	353	90	North	0.57	0.55	0.3	7.92	6.88	0.13	0.140	0.13	0.14	90%	80%	70%		50%	92%	92%	38%	57%	92%	97%	32%	30%
1	Win-N-04 E FIXED	353	90	North	2.24	0.42	0.9	7.32	5.93	0.52	1.322	0.13	0.14	90%	80%	70%		49%	94%	91%	38%	56%	94%	95%	32%	29%
1	Win-S-05 K T&T	173	90	South	0.72	1.44	1.0	5.44	7.91	0.13	0.140	0.40	0.82	90%	80%	70%		63%	94%	95%	50%	83%	92%	91%	44%	41%
1	Win-S-06 K T&T	173	90	South	0.72	1.44	1.0	5.43	8.20	0.13	0.140	0.13	0.14	90%	80%	70%		64%	94%	97%	53%	84%	92%	97%	47%	44%
1	Win-S-04 G T&T	173	90	South	0.42	1.46	0.6	8.50	8.58	0.51	1.003	0.13	0.14	90%	80%	70%		45%	90%	97%	35%	77%	87%	97%	41%	38%
1	Win-E-06 I T&T	83	90	East	0.72	1.44	1.0	5.75	26.74	0.12	0.597	0.50	4.12	90%	80%	70%		83%	95%	97%	69%	87%	98%	100%	53%	49%
1	Win-E-05 I T&T	83	90	East	0.72	1.44	1.0	5.75	26.77	0.12	0.597	0.50	3.03	90%	80%	70%		83%	95%	96%	68%	87%	98%	99%	53%	49%
1	Win-E-10 I T&T	83	90	East	0.72	1.44	1.0	2.96	26.68	0.50	2.655	0.49	2.37	90%	80%	70%		91%	94%	95%	73%	93%	98%	99%	57%	52%
1	Win-E-09 I T&T	83	90	East	0.72	1.44	1.0	2.96	26.71	0.50	2.655	0.13	0.14	90%	80%	70%		91%	94%	96%	73%	93%	98%	99%	57%	52%
1	Win-E-08 I T&T	83	90	East	0.72	1.44	1.0	5.75	26.59	0.12	0.597	0.50	2.00	90%	80%	70%		83%	95%	95%	67%	86%	98%	99%	53%	49%
1	Win-E-07 I T&T	83	90	East	0.72	1.44	1.0	5.75	26.62	0.12	0.597	0.50	3.11	90%	80%	70%		83%	95%	96%	68%	86%	98%	99%	53%	49%
1	Win-W-05 J T&T	263	90	West	0.57	1.44	0.8	5.86	21.42	0.13	0.140	0.49	3.41	90%	80%	70%		80%	89%	97%	62%	83%	96%	99%	50%	47%
1	Win-W-10 I T&T	263	90	West	0.72	1.44	1.0	2.77	21.34	0.50	2.497	0.50	2.20	90%	80%	70%		90%	93%	95%	72%	92%	98%	99%	56%	52%
1	Win-W-09 I T&T	263	90	West	0.72	1.44	1.0	2.77	21.37	0.50	2.497	0.50	2.14	90%	80%	70%		90%	93%	95%	72%	92%	98%	99%	56%	52%
1	Door-E-01 Glass Doo	83	90	East	0.91	2.00	1.8	9.44	24.33	0.13	0.140	0.13	0.14	90%	80%	70%		72%	92%	97%	58%	77%	97%	99%	47%	44%
1	Win-E-02 F T&T	83	90	East	0.72	0.99	0.7	8.45	24.20	0.12	1.054	0.13	0.14	90%	80%	70%		75%	97%	94%	61%	79%	99%	98%	49%	45%
1	Win-E-03 F T&T	83	90	East	0.72	0.99	0.7	8.45	24.20	0.12	1.054	0.13	0.14	90%	80%	70%		75%	97%	94%	61%	79%	99%	98%	49%	45%
1	Win-E-04 F T&T	83	90	East	0.72	0.99	0.7	8.45	24.17	0.12	1.054	0.13	0.14	90%	80%	70%		75%	97%	94%	61%	79%	99%	98%	49%	45%
1	Win-N-08 L T&T	353	90	North	0.72	1.16	0.8	2.83	6.52	0.39	1.591	0.38	1.38	90%	80%	70%		71%	94%	95%	57%	74%	94%	98%	43%	40%
1	Win-S-07 M T&T	173	90	South	0.72	1.33	1.0	2.49	8.20	0.39	1.470	0.39	1.15	90%	80%	70%		90%	95%	95%	73%	92%	93%	94%	51%	47%
1	Door-W-01 N Solid	263	90	West	0.75	1.85	1.4	9.44	22.08	0.52	1.106	2.62	0.65	90%	80%	70%		70%	87%	63%	35%	76%	95%	57%	26%	24%
1	Win-W-08 I T&T	263	90	West	0.72	1.44	1.0	5.86	21.96	0.46	1.683	0.80	0.33	90%	80%	70%		80%	91%	80%	53%	84%	97%	82%	42%	39%
1	Win-W-07 I T&T	263	90	West	0.72	1.44	1.0	5.86	21.99	0.46	1.683	0.80	0.33	90%	80%	70%		80%	91%	80%	53%	84%	97%	82%	42%	39%
1	Win-S-01 A T&T	173	90	South	0.78	0.50	0.4	10.27	8.15	0.51	0.966	0.13	0.14	90%	80%	70%		34%	91%	93%	26%	72%	88%	87%	35%	32%
1	Win-S-01 A T&T	173	90	South	0.78	0.50	0.4	10.60	6.17	0.51	1.105	0.13	0.14	90%	80%	70%		23%	91%	93%	18%	65%	89%	87%	32%	29%
1	Win-W-02 B T&T	226	90	West	0.60	1.44	0.9	8.88	21.18	0.13	0.140	1.82	0.49	90%	80%	70%		76%	91%	69%	43%	82%	94%	46%	22%	21%
1	Win-W-03 B T&T	300	90	West	0.60	1.44	0.9	8.83	26.38	0.26	0.467	2.76	0.49	90%	80%	70%		76%	88%	55%	33%	80%	94%	49%	23%	22%
1	Win-S-04 N T&T	173	90	South	0.58	1.54	0.9	8.57	7.54	0.13	0.140	0.13	0.14	90%	80%	70%		39%	93%	97%	31%	74%	91%	97%	41%	38%
1	Win-W-01 B T&T	263	90	West	0.60	1.44	0.9	8.89	27.85	1.34	1.883	2.75	0.49	90%	80%	70%		77%	79%	54%	29%	81%	92%	47%	22%	20%
1	Win-N-03 N T&T	317	90	North	0.58	1.54	0.9	8.92	5.58	0.13	0.140	0.13	0.14	90%	80%	70%		40%	91%	96%	31%	48%	94%	99%	28%	26%
1	Win-W-04 J T&T	226	90	West	0.57	1.44	0.8	5.86	26.53	0.22	0.410	0.97	1.45	90%	80%	70%		88%	90%	89%	64%	90%	93%	85%	45%	42%
1	Win-W-06 J T&T	300	90	West	0.57	1.44	0.8	5.84	26.09	1.42	2.047	0.54	0.33	90%	80%	70%		83%	80%	86%	52%	86%	90%	91%	44%	41%
1	Win-N-02 A T&T	353	90	North	0.78	0.50	0.4	10.60	5.70	0.19	0.095	0.15	0.04	90%	80%	70%		43%	89%	87%	30%	52%	89%	91%	27%	25%
1	Win-N-02 A T&T	353	90	North	0.78	0.50	0.4	10.27	7.63	0.19	0.095	0.15	0.04	90%	80%	70%		47%	89%	87%	33%	55%	89%	91%	28%	26%
1	Win-S-05 N T&T	200	90	South	0.58	1.54	0.9	5.44	7.91	0.19	0.095	0.15	0.04	90%	80%	70%		62%	88%	96%	47%	81%	86%	96%	42%	39%
1	Win-S-06 N T&T	139	90	South	0.58	1.54	0.9	5.44	7.91	0.19	0.095	0.15	0.04	90%	80%	70%		61%	86%	95%	45%	75%	89%	97%	41%	38%
1	Win-N-05 N T&T	353	90	North	0.58	1.54	0.9	6.52	6.63	0.19	0.095	0.15	0.04	90%	80%	70%		54%	87%	95%	40%	60%	87%	99%	32%	30%
1	Win-N-06 N T&T	387	90	North	0.58	1.54	0.9	6.52	6.63	0.19	0.095	0.15	0.04	90%	80%	70%		52%	86%	95%	38%	59%	88%	99%	32%	30%

Ventilation data

229 Stratford Road / Climate: New York / TFA: 242 m² / Heating: 15.1 kWh/(m²a) / Cooling: 17.3 kWh/(m²a) / PER: 51.9 kWh/(m²a)

Treated floor area A_{TFA}	m²	242		*('Areas' worksheet)*
Room height h	m	2.50	**2.50**	
Volume of ventilated space (A_{TFA}*h) : V_V	m³	604		*(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	**0.32**	0.32	**761**	m³	0.33 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	**0.028**	**0.071**

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 [-]
231	**0.38**	**0.00**	**83.0%**	**0.0%**	**0.31**	**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
24%	25%	29%	40%	-	-	-	-	-	52%	37%	28%

Standard data input for balanced ventilation

Dimensioning of ventilation system with only one ventilation unit

Occupancy	m²/P	77					
Number of occupants	P	3.1					
Supply air per person	m³/(P*h)	31					
Supply air requirement	m³/h	**96**			Bathroom		
Extract air rooms		Kitchen	Bathroom		(shower only)	WC	
Quantity		1	3		0	2	
Extract air requirement per room	m³/h	60	40		20	20	
Total extract air requirement	m³/h	**220**					

Design air flow rate (maximum) m³/h **308** Recommended: 236 m³/h

Average air change rate calculation

Type of operation	Daily operation times h/d	maximum	Air flow rate m³/h	Air change rate 1/h
maximum	0.0	1.00	308	0.51
Standard	24.0	0.75	231	0.38
Basic	0.0	0.54	166	0.27
Minimum	0.0	0.40	123	0.20
		Average value 0.75	Average air flow rate (m³/h) **231**	Average air change rate (1/h) **0.38**

Factors referenced to

Selection of ventilation unit with heat recovery

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

	Go to ventilation units list Sort: AS LIST	Heat recovery efficiency	Humidity recovery efficiency	Specific efficiency [Wh/m³]	Application [m³/h]	Frost power input
Ventilation unit selection	0329vs03 ComfoAir550, ComfoD550, WHR960 - Zehn	0.84	0.00	0.31	110 - 308	yes

Conductivity outdoor air duct	Ψ	W/(mK)	0.244
Length of outdoor air duct		m	1.4478
Conductivity exhaust air duct	Ψ	W/(mK)	0.244
Length of exhaust air duct		m	2.3622
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]	5
Useful energy [kWh/a]	817
Room temperature (°C)	20
Avg. ambient temp. heat. period (°C)	5.6
Avg. ground temp (°C)	13.9

Effective heat recovery efficiency $\eta_{HR,eff}$ **83.0%**

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	127	mm
Insulation thic	102	mm
Reflective coating?		Yes
	x	No
Thermal conductivity	0.040	W/(mK)
Nominal air flow rate	231	m³/h
Δϑ	14	K
Exterior duct diameter	0.127	m
Exterior diameter	0.330	m
α–Interior	21.29	W/(m²K)
α-Surface	5.46	W/(m²K)
Ψ–value	**0.244**	**W/(mK)**
Surface temperature difference	0.618	K

Secondary calculation

Ψ-value extract or exhaust air duct

Nominal width:	127	mm
Insulation thickness	102	mm
Reflective coating?		yes
	x	no
Thermal conductivity	0.040	W/(mK)
Nominal air flow rate	231	m³/h
Δϑ	14	K
Exterior duct diameter	0.127	m
Exterior diameter	0.330	m
α–Interior	21.29	W/(m²K)
α-Surface	5.46	W/(m²K)
Ψ–value	**0.244**	**W/(mK)**
Surface temperature difference	0.618	K

Specific energy for heating (monthly method)

229 Stratford Road / Climate: New York / TFA: 242 m² / Heating: 15.1 kWh/(m²a) / Cooling: 17.3 kWh/(m²a) / PER: 51.9 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:	Residential Dwelling	
Treated floor area A_{TFA}:	241.7	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	327.4	*	0.123	*	1.00	*	73	=	2961	12.25
External wall - Ground	B	53.0	*	0.121	*	1.00	*	31	=	200	0.83
Roof/Ceiling - Ambient	A	202.5	*	0.101	*	1.00	*	73	=	1493	6.18
Floor slab / Basement ceiling	B	108.5	*	0.329	*	1.00	*	31	=	1114	4.61
	A		*		*	1.00	*		=		
	A		*		*	1.00	*		=		
	X		*		*	0.75	*		=		
Windows	A	52.0	*	0.846	*	1.00	*	73	=	3224	13.34
Exterior door	A		*		*	1.00	*		=		
Exterior TB (length/m)	A	190.4	*	-0.054	*	1.00	*	73	=	-753	-3.12
Perimeter TB (length/m)	P	30.2	*	0.173	*	1.00	*	31	=	163	0.67
Ground TB (length/m)	B		*		*	1.00	*		=		0.00
											kWh/(m²a)
Transmission heat losses Q_T									Total	8402	34.8

	Effective air volume V_V	A_{TFA} m²		Clear room height m		m³
		242	*	2.50	=	604

	$n_{V,system}$ 1/h		η*SHX		η_{HR}		$n_{V,Res}$ 1/h		$n_{V,equi,fraction}$ 1/h
Effective air change rate Ambient nV,e	0.382	*(1-	0%	)*(1-	0.83	)+	0.028	=	0.093
Effective air change rate Ground nV,g	0.382	*	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	604	*	0.093	*	0.33	*	73	=	1358	5.6
Ventilation losses ground $Q_{V,e}$	604	*	0.000	*	0.33	*	31	=	0	0.0
Ventilation heat losses Q_V								Total	1358	5.6

		Q_T kWh/a		Q_V kWh/a		Reduction factor night/weekend saving		kWh/a	kWh/(m²a)
Total heat losses Q_L	(	8402	+	1358	) *	1.0	=	9760	**40.4**

Orientation of the area	Reduction factor see 'Windows' worksheet		g-Value (perp. radiation)		Area m²		Global radiation kWh/(m²a)		kWh/a
North	0.21	*	0.53	*	11.4	*	166	=	209
East	0.38	*	0.52	*	14.5	*	371	=	1050
South	0.25	*	0.53	*	10.7	*	711	=	985
West	0.30	*	0.46	*	15.4	*	431	=	917
Horizontal	0.00	*	0.00	*	0.0	*	620	=	0
Sum opaque areas									693
									kWh/(m²a)
Available solar heat gains Q_S								Total	3854	15.9

	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	*	2.3	*	241.7	=	2837	11.7

			kWh/a	kWh/(m²a)
Free heat Q_F	Q_S + Q_I	=	6691	27.7
Ratio free heat to losses	Q_F / Q_L	=	0.69	
Utilisation factor heat gains h_G		=	92%	
Heat gains Q_G	η_G * Q_F	=	6123	**25.3**

		kWh/a	kWh/(m²a)
Annual heating demand Q_H	Q_L - Q_G =	3638	**15**

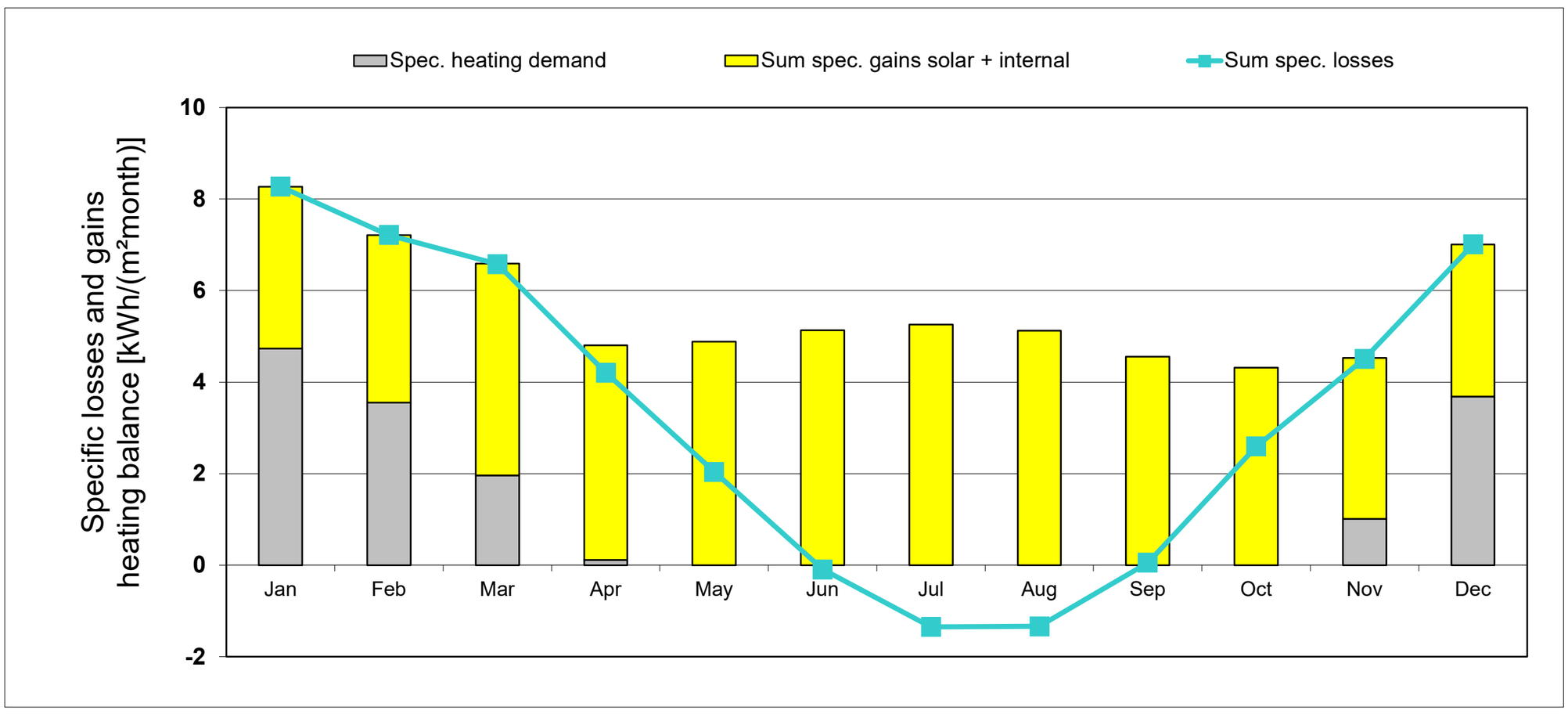
	kWh/(m²*a)		(Yes/No)
Limiting value	15	**Requirement met?**	**Yes**

Specific energy for heating (monthly method)

229 Stratford Road / Climate: New York / TFA: 242 m² / Heating: 15.1 kWh/(m²a) / Cooling: 17.3 kWh/(m²a) / PER: 51.9 kWh/(m²a)

Interior temperature: 20 °C
Building type: Residential Dwelling
Treated floor area A_{TFA}: 242 m²

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	
Heating degree hours - Externa	15.3	12.9	11.3	6.6	2.9	-0.9	-2.9	-2.5	0.5	5.2	8.7	13.3	70	kKh
Heating degree hours - Ground	5.7	5.9	6.6	5.6	3.4	1.6	0.1	-0.8	-0.8	0.9	2.3	4.1	35	kKh
Losses - Exterior	1732	1463	1276	751	333	-98	-332	-285	52	583	980	1499	7955	kWh
Losses - Ground	268	281	314	266	159	75	5	-38	-39	44	110	195	1640	kWh
Sum spec. losses	8.3	7.2	6.6	4.2	2.0	-0.1	-1.3	-1.3	0.1	2.6	4.5	7.0	39.7	kWh/m²
Solar gains - North	21	25	40	51	62	69	67	58	44	32	23	18	510	kWh
Solar gains - East	111	139	202	224	247	284	286	266	202	170	103	101	2334	kWh
Solar gains - South	132	141	164	133	119	121	130	141	149	164	131	120	1645	kWh
Solar gains - West	100	114	171	191	194	208	214	209	178	148	111	82	1920	kWh
Solar gains - Horiz.	0	0	0	0	0	0	0	0	0	0	0	0	0	kWh
Solar gains - Opaque	77	92	127	134	143	157	160	150	128	112	81	69	1431	kWh
Internal heat gains	415	375	415	401	415	401	415	415	401	415	401	415	4884	kWh
Sum spec. gains solar + interna	3.5	3.7	4.6	4.7	4.9	5.1	5.3	5.1	4.6	4.3	3.5	3.3	52.6	kWh/m²
Utilisation factor	100%	100%	100%	87%	42%	100%	100%	100%	1%	60%	99%	100%	47%	
Annual heating demand	1144	859	474	27	0	0	0	0	0	0	245	890	3638	kWh
Spec. heating demand	**4.7**	**3.6**	**2.0**	**0.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**1.0**	**3.7**	**15.1**	kWh/m²



Annual heating demand: Comparison

Monthly method	*('Heating')*	3638	**kWh/a**	15.1	**kWh/(m²a)** reference to treated floor area according to PHPP
Annual method	*('Annual heatin*	3950	**kWh/a**	16.3	**kWh/(m²a)** reference to treated floor area according to PHPP
		#REF!	**kWh/a**	#REF!	

Heating load

229 Stratford Road / Climate: New York / TFA: 242 m² / Heating: 15.1 kWh/(m²a) / Cooling: 17.3 kWh/(m²a) / PER: 51.9 kWh/(m²a)

Interior temperature:	20	°C
Building type:	Residential Dwelling	
Treated floor area A_{TFA}:	241.7	m²

	Design temperature		Radiation:	North	East	South	West	Horizontal	
Weather 1:	-9.8	°C		25	60	115	50	70	W/m²
Weather 2:	-4.3	°C		15	20	25	20	30	W/m²
Ground design temp.	11.1	°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	327.4	*	0.123	*	1.00	*	29.8	or	24.3	=	1203	or	981
External wall - Ground	B	53.0	*	0.121	*	1.00	*	8.9	or	8.9	=	57	or	57
Roof/Ceiling - Ambient	A	202.5	*	0.101	*	1.00	*	29.8	or	24.3	=	607	or	495
Floor slab / Basement ceiling	B	108.5	*	0.329	*	1.00	*	8.9	or	8.9	=	318	or	318
	A		*		*	1.00	*	29.8	or	24.3	=		or	
	A		*		*	1.00	*	29.8	or	24.3	=		or	
	A		*		*	1.00	*	29.8	or	24.3	=		or	
	X		*		*	0.75	*	29.8	or	24.3	=		or	
Windows	A	52.0	*	0.846	*	1.00	*	29.8	or	24.3	=	1310	or	1068
Exterior door	A		*		*	1.00	*	29.8	or	24.3	=		or	
Exterior TB (length/m)	A	190.4	*	-0.054	*	1.00	*	29.8	or	24.3	=	-306	or	-250
Perimeter TB (length/m)	P	30.2	*	0.173	*	1.00	*	8.9	or	8.9	=	47	or	47
Ground TB (length/m)	B		*		*	1.00	*	8.9	or	8.9	=		or	
Building element towards neighbour	I		*		*	1.00	*	3.0	or	3.0	=		or	

Transmission heat load P_T

Total = 3235 or 2715

Ventilation system:

		A_{TFA} m²		Clear room height m		m³			
Effective air volume, V_V		241.7	*	2.50	=	604			

							η_{SHX} 1		η_{SHX} 2
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	0.071	+	0.382	*(1-	0.83	or	0.83	) =	0.135	or	0.135

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
604.2	*	0.135	or	0.135	*	0.33	*	29.8	or	24.3	=	803	or	655

Total heating load P_L

		PL 1 W		**PL 2** W
$P_T + P_V$	=	**4038**	or	**3370**

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	11.4	*	0.5	*	0.21	*	25	or	15	=	32	or	19
East	14.5	*	0.5	*	0.38	*	55	or	19	=	155	or	55
South	10.7	*	0.5	*	0.25	*	112	or	25	=	156	or	34
West	15.4	*	0.5	*	0.30	*	57	or	21	=	122	or	44
Horizontal	0.0	*	0.0	*	0.40	*	70	or	30	=	0	or	0

Solar heating power P_S

Total = 465 or 152

Internal heating load P_I

Spec. power W/m²		A_{TFA} m²		**P_I 1** W		**P_I 2** W
1.8	*	242	=	437	or	437

Heating power (gains) P_G

		P_G 1 W		**P_G 2** W
$P_T + P_I$	=	**902**	or	**589**

$P_L - P_G$	=	3136	or	2781
Heating load P_H	=	**3136**		**W**
Area specific space heating load P_H / A_{TFA}	=	**13.0**		**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 $P_{Supply\ Air,Max}$ = **2820** W specific: 11.7 W/m²

(Yes/No)

Supply air heating: Sufficient? **No**

Summer ventilation

229 Stratford Road / Climate: New York / TFA: 242 m² / Heating: 15.1 kWh/(m²a) / Cooling: 17.3 kWh/(m²a) / PER: 51.9 kWh/(m²a)

Building volume:	604	m³	Building type:	Residential Dwelling
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:	34.9%	at the overheating limit ϑ_{max} = 25 °C	Useful cooling demand:	15.4	kWh/(m²a)
max. humidity:	18.4	g/kg	Dehumidification demand:	1.9	kWh/(m²a)
Frequency of exceeded humidity:	19.3%		Frequency of exceeded humidity:	0.0%	

Summer basic ventilation to ensure adequate air quality

Air change rate via vent. system with supply ai	0.30	1/h	HRV/ERV in summer (check only one field)	
			None	
			Automatic bypass, controlled by temperature difference	x
			Automatic bypass, controlled by enthalpy difference	
			Always	
Air change rate via extract air system:	0.00	1/h		
			Specific power consumption (for extract air system)	Wh/m³
Window ventilation air change rate:	0.00	1/h		

Effective air change rate

	$n_{V,system}$ 1/h		η^*_{SHX}		η_{HP}		$n_{V,equi,fraction}$ 1/h
Exterior $n_{V,e}$	0.300	*(1-	0%	)*(1-	0.83	) =	0.051
without HR	0.300	*(1-	0%	)		=	0.300
Ground $n_{L,g}$	0.300	*	0%	*(1-	0.83	) =	0.000
without HR	0.300	*	0%			=	0.000

Ventilation conductance

	V_V m³		$n_{V,equi,fraction}$ 1/h		c_{Air} Wh/(m³K)			
exterior $H_{V,e}$	604	*	0.051	*	0.33	=	10.1	W/K
without HR	604	*	0.300	*	0.33	=	59.8	W/K
ground $H_{V,g}$	604	*	0.000	*	0.33	=	0.0	W/K
without HR	604	*	0.000	*	0.33	=	0.0	W/K
Infiltration, window, extract air system	604	*	0.028	*	0.33	=	5.6	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	0.00	1/h	Controlled by (please check) Temperature diff.	
	Specific power consumption		Wh/m³	Humidity diff.	x

Secondary calculation: Hygienic air change rate through window ventilation

Estimation for window air change rate to ensure sufficient air quality

Description							
Open duration [h/d]	0	0	0	0	0	0	
Climate boundary conditions							
Temperature diff interior - exterior	0	0	0	0	0	0	K
Wind velocity	0	0	0	0	0	0	m/s
Window group 1							
Quantity	0	0	0	0	0	0	
Clear width	0.00	0.00	0.00	0.00	0.00	0.00	m
Clear height	0.00	0.00	0.00	0.00	0.00	0.00	m
Tilting window (check if appropriate)							
Opening width (for tilting windows)	0.000	0.000	0.000	0.000	0.000	0.000	m
Window group 2 (cross ventilation)							
Quantity	0	0	0	0	0	0	
Clear width	0.00	0.00	0.00	0.00	0.00	0.00	m
Clear height	0.00	0.00	0.00	0.00	0.00	0.00	m
Tilting window (check if appropriate)							
Opening width (for tilting windows)	0.000	0.000	0.000	0.000	0.000	0.000	m
Difference in height to window 1	0.00	0.00	0.00	0.00	0.00	0.00	m

Result: Air change rate	0.00	0.00	0.00	0.00	0.00	0.00	**Total** 0.00	**1/h**

Secondary calculation: Additional night ventilation for cooling

Air change value during additional window night ventilation

Description							
Reduction factor	100%	100%	100%	100%	100%	100%	
Climate boundary conditions							
Temperature diff interior - exterior	1	1	1	1	1	1	K
Wind velocity	0	0	0	0	0	0	m/s
Window group 1							
Quantity	6	0	0	0	0	0	
Clear width	1.00	0.00	0.00	0.00	0.00	0.00	m
Clear height	1.00	0.00	0.00	0.00	0.00	0.00	m
Tilting window (check if appropriate)	x						
Opening width (for tilting windows)	0.100	0.000	0.000	0.000	0.000	0.000	m
Window group 2 (cross ventilation)							
Quantity	6	0	0	0	0	0	
Clear width	1.00	0.00	0.00	0.00	0.00	0.00	m
Clear height	1.00	0.00	0.00	0.00	0.00	0.00	m
Tilting window (check if appropriate)	x						
Opening width (for tilting windows)	0.100	0.000	0.000	0.000	0.000	0.000	m
Difference in height to window 1	0.00	0.00	0.00	0.00	0.00	0.00	m

Result: Night ventilation values	0.34	0.00	0.00	0.00	0.00	0.00	**Total** 0.34	**1/h**

Summer: Passive cooling

229 Stratford Road / Climate: New York / TFA: 242 m² / Heating: 15.1 kWh/(m²a) / Cooling: 17.3 kWh/(m²a) / PER: 51.9 kWh/(m²a)

Building type:	Residential Dwelling		Treated floor area A_{TFA}:	241.7	m²
Upper temperature limit:	25	°C	Building volume:	604	m³
Nominal humidity:	12	g/kg	Internal humidity sources:	1.3	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	327.4	*	0.123	*	1.00	=	40.4
External wall - Ground	B	53.0	*	0.121	*	1.00	=	6.4
Roof/Ceiling - Ambient	A	202.5	*	0.101	*	1.00	=	20.4
Floor slab / Basement ceiling	B	108.5	*	0.329	*	1.00	=	35.7
	A		*		*	1.00	=	
	A		*		*	1.00	=	
	X		*		*	0.75	=	
Windows	A	52.0	*	0.846	*	1.00	=	44.0
Exterior door	A		*		*	1.00	=	
Exterior TB (length/m)	A	190.4	*	-0.054	*	1.00	=	-10.3
Perimeter TB (length/m)	P	30.2	*	0.173	*	1.00	=	5.2
Ground TB (length/m)	B		*		*	1.00	=	
Exterior thermal transmittance, $H_{T,e}$								94.5 W/K
Ground thermal transmittance, $H_{T,g}$								47.3 W/K

Summer ventilation

from 'SummVent' worksheet

Ventilation unit conductance			**Ventilation parameter**			**Summer ventilation regulation**	
exterior $H_{V,e}$	10.1	W/K	Temperature amplitude summer	8.0	K		HRV/ERV
without HR	59.8	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	x
without HR	0.0	W/K	Supply air changes	0.30	1/h	Controlled by enthalpy	
Ventilation conductance, others			Outdoor air changes	0.03	1/h	Always	
exterior	5.6	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	*	0.30	*	0.95	*	0.53	*	11.4	*	66%	=	1.0
East	0.9	*	0.48	*	0.95	*	0.52	*	14.5	*	70%	=	2.2
South	0.9	*	0.40	*	0.95	*	0.53	*	10.7	*	67%	=	1.3
West	0.9	*	0.38	*	0.95	*	0.46	*	15.4	*	69%	=	1.6
Horizontal	0.9	*	1.00	*	0.95	*	0.00	*	0.0	*	0%	=	0.0
Sum opaque areas													1.4

Solar aperture

Total 7.5 m² — 0.03 m²/m²

Internal heat gains Q_I

Specif. power q_I W/m²		A_{TFA} m²		W	W/m²
3.8	*	242	=	926	3.8

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

34.9%

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

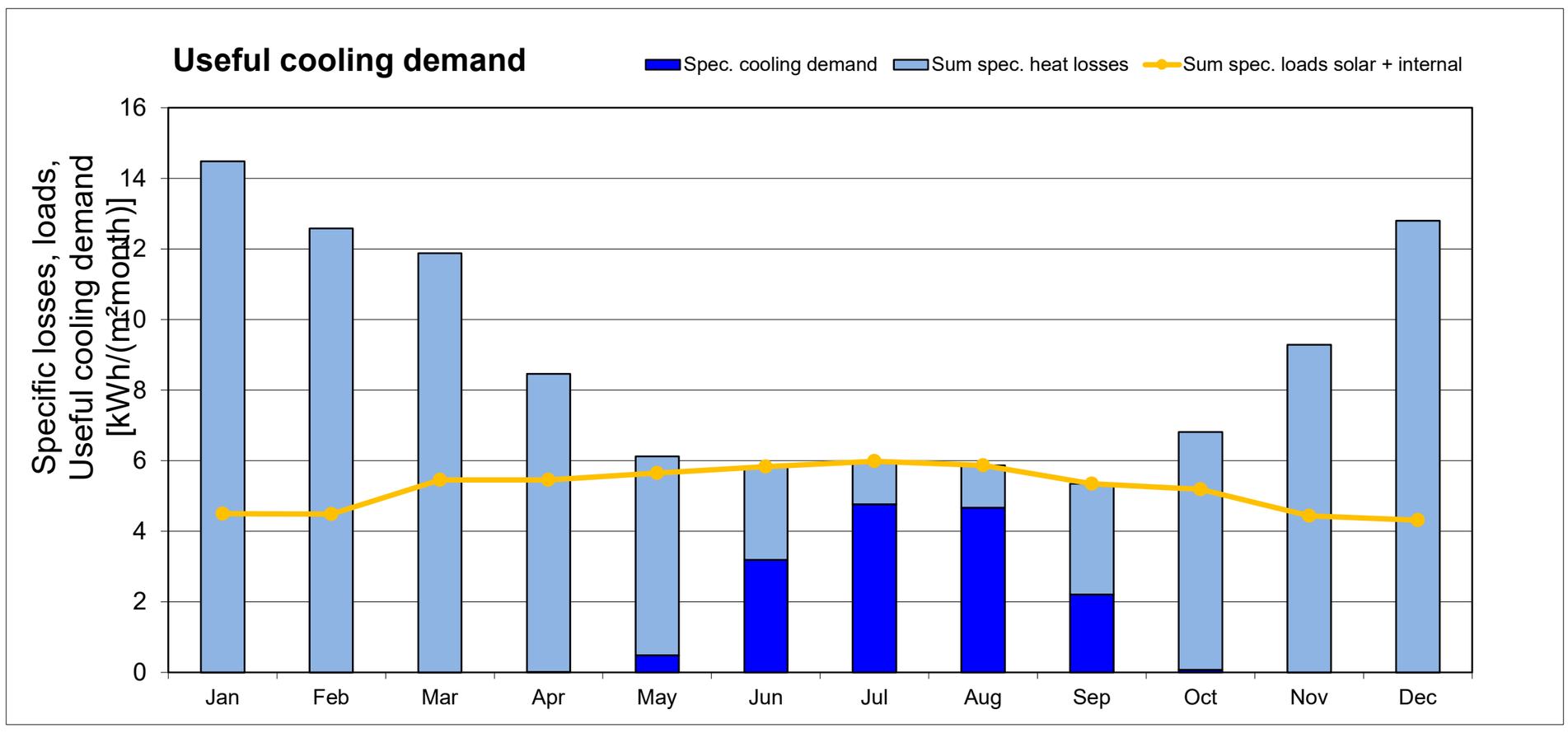
Transmission kWh/d		Ventilation kWh/d		Solar load kWh/d	) *	1/k	/ (	Spec. capacity Wh/(m²K)	*	A_{TFA}: m²	) =		
(9.1	+	6.3	+	34.3	) *	1000	/ (	132	*	242	) =	**1.6**	K

Cooling: energy value for useful cooling energy

229 Stratford Road / Climate: New York / TFA: 242 m² / Heating: 15.1 kWh/(m²a) / Cooling: 17.3 kWh/(m²a) / PER: 51.9 kWh/(m²a)

Interior Temperature: 25 °C
Building type: Residential Dwelling
Treated Floor Area A_{TFA}: 242 m²

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	
Heating degree hours - Exterior	19.1	16.4	15.1	10.3	6.8	2.8	0.9	1.3	4.1	9.0	12.4	17.1	115	kKh
Heating degree hours - Ground	9.4	9.3	10.3	9.2	7.1	5.2	3.8	2.9	2.8	4.6	5.9	7.8	78	kKh
Losses - Exterior	3105	2651	2436	1652	1063	420	132	169	642	1432	1994	2763	18459	kWh
Losses - Ground	395	391	436	388	298	218	161	123	116	196	249	330	3302	kWh
Losses summer ventilation	0	0	0	0	0	0	0	0	0	0	0	0	0	kWh
Sum spec. heat losses	14.5	12.6	11.9	8.4	5.6	2.6	1.2	1.2	3.1	6.7	9.3	12.8	90.0	kWh/m²
Solar load North	18	22	35	45	55	60	58	51	38	28	20	15	445	kWh
Solar load East	92	115	168	187	206	237	238	222	168	142	86	84	1944	kWh
Solar load South	131	140	163	132	119	120	129	140	148	163	131	119	1638	kWh
Solar load West	80	91	136	153	155	166	171	167	142	119	89	66	1533	kWh
Solar load Horiz.	0	0	0	0	0	0	0	0	0	0	0	0	0	kWh
Solar load Opaque	77	92	127	134	143	157	160	150	128	112	81	69	1431	kWh
Internal heat gains	689	622	689	667	689	667	689	689	667	689	667	689	8115	kWh
Sum spec. loads solar + internal	4.5	4.5	5.5	5.5	5.7	5.8	6.0	5.9	5.3	5.2	4.4	4.3	62.5	kWh/m²
Utilisation factor losses	31%	36%	46%	64%	92%	100%	100%	100%	100%	76%	48%	34%	52%	
Useful cooling energy demand	0	0	0	4	117	769	1153	1127	534	17	0	0	3722	kWh
Spec. cooling demand	**0.0**	**0.0**	**0.0**	**0.0**	**0.5**	**3.2**	**4.8**	**4.7**	**2.2**	**0.1**	**0.0**	**0.0**	**15.4**	kWh/m²
Specif. dehumidification demand	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**1.1**	**0.9**	**0.0**	**0.0**	**0.0**	**0.0**	**1.9**	kWh/m²
Sensible fraction	100%	100%	100%	100%	100%	100%	82%	84%	100%	100%	100%	100%	89%	



Cooling: energy value for useful cooling energy

229 Stratford Road / Climate: New York / TFA: 242 m² / Heating: 15.1 kWh/(m²a) / Cooling: 17.3 kWh/(m²a) / PER: 51.9 kWh/(m²a)

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

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

Treated floor area A_{TFA}:	241.7	m²
Building volume:	604	m³
Internal humidity sources:	1.3	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	327.4	*	0.123	*	1.00	*	63	=	2531	10.47
External wall - Ground	B	53.0	*	0.121	*	1.00	*	52	=	332	1.37
Roof/Ceiling - Ambient	A	202.5	*	0.101	*	1.00	*	63	=	1276	5.28
Floor slab / Basement ceiling	B	108.5	*	0.329	*	1.00	*	52	=	1854	7.67
	A		*		*	1.00	*		=		
	A		*		*	1.00	*		=		
	X		*		*	0.75	*		=		
Windows	A	52.0	*	0.846	*	1.00	*	63	=	2756	11.40
Exterior door	A		*		*	1.00	*		=		
Exterior TB (length/m)	A	190.4	*	-0.054	*	1.00	*	63	=	-644	-2.66
Perimeter TB (length/m)	P	30.2	*	0.173	*	1.00	*	63	=	327	1.35
Ground TB (length/m)	B		*		*	1.00	*		=		0.00
											kWh/(m²a)
Transmission losses Q_T (negative: heat loads)									Total	8432	34.9

Summer ventilation

from 'SummVent' worksheet

Ventilation conductance, vent. unit

exterior $H_{V,e}$	10.1	W/K
without HR	59.8	W/K
ground $H_{V,g}$	0.0	W/K
without HR	0.0	W/K

Ventilation conductance, others

exterior	5.6	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	0.30	1/h
Outdoor air changes	0.03	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.	x
Controlled by enthalpy	
Always	
	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 $n_{V,e}$	0.300	*(1-	0%	)*(1-	0.05	)+	0.028	=	0.313
Effective air change rate Ground $n_{V,g}$	0.300	*	0%	*(1-	0.05	)		=	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	604	*	0.313	*	0.33	*	59	=	3694	15.3
Ventilation losses ground $Q_{V,e}$	604	*	0.000	*	0.33	*	0	=	0	0.0
Heat losses summer ventilation	604	*	0.000	*	0.33	*	0	=	0	0.0
Ventilation heat losses Q_V								Total	3694	15.3

	Q_T kWh/a		Q_V kWh/a		kWh/a	kWh/(m²a)
Total heat losses Q_L	8432	+	3694	=	12126	**50.2**

Orientation of the area	Reduction factor		g-Value (perp. radiation)		Area m²		Global radiation kWh/(m²a)		kWh/a
North	0.18	*	0.53	*	11.4	*	354	=	390
East	0.31	*	0.52	*	14.5	*	701	=	1652
South	0.24	*	0.53	*	10.7	*	904	=	1247
West	0.24	*	0.46	*	15.4	*	762	=	1297
Horizontal	0.40	*	0.00	*	0.0	*	1287	=	0
Sum opaque areas									1194
									kWh/(m²a)
Available solar heat gains Q_S								Total	5779	23.9

	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	*	275	*	3.8	*	241.7	=	6114	25.3

			kWh/a	kWh/(m²a)
Sum heat loads Q_F	Q_S + Q_I	=	11893	**49.2**

Ratio of losses to free heat gains	Q_L / Q_F	=	1.02	
Utilisation factor heat losses η_G		=	67%	
			kWh/a	kWh/(m²a)
Useful heat losses $Q_{V,n}$	η_G * Q_L	=	8171	**33.8**
			kWh/a	kWh/(m²a)
Useful cooling demand Q_K	Q_F - $Q_{V,n}$	=	3722	**15**

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

Compressor - cooling units

229 Stratford Road / Climate: New York / TFA: 242 m² / Heating: 15.1 kWh/(m²a) / Cooling: 17.3 kWh/(m²a) / PER: 51.9 kWh/(m²a)

Building type:	Residential Dwelling		Treated floor area A_{TFA}:	241.7	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:	0.3	
Internal humidity sources:	1.3	g/(m²h)			

Supply air cooling
check as appropriate

On/Off mode (check as appropriate)		
Max. cooling capacity (sensible + latent)	0.0	kW
Temperature reduction dry	0.0	K
Seasonal energy efficiency ratio	0.0	

x Recirculation cooling
check as appropriate

On/Off mode (check as appropriate)		
Max. cooling capacity (sensible + latent)	10.6	kW
Volume flow rate at nominal power	1529.1	m³/h
Temperature reduction dry	20.3	K
Variable air volume (check if appropriate)		
Seasonal energy efficiency ratio	3.0	

x Additional dehumidification
check as appropriate

Waste heat to room (check if appropriate)	
Seasonal energy efficiency ratio	3.0

Panel cooling
check as appropriate

Seasonal energy efficiency ratio	0.0

	Sensible kWh/(m²a)		Latent kWh/(m²a)		COP		Electricity demand (kWh/a) kWh/(m²a)	Sensible fraction
Useful cooling total	15.4		1.9					89%
Cooling contribution by:								
Supply air cooling	(	+		) /	0.0	=		
Recirculation cooling	(15.4	+	0.0	) /	3.0	=	5.1	100%
Dehumidification			1.9	/	3.0	=	0.6	0%
Remaining for panel cooling				/	0.0	=		100%
Cooling distribution				/	3.0	=		100%
Total	(15.4	+	1.9	) /	3.0	=	5.8	89%

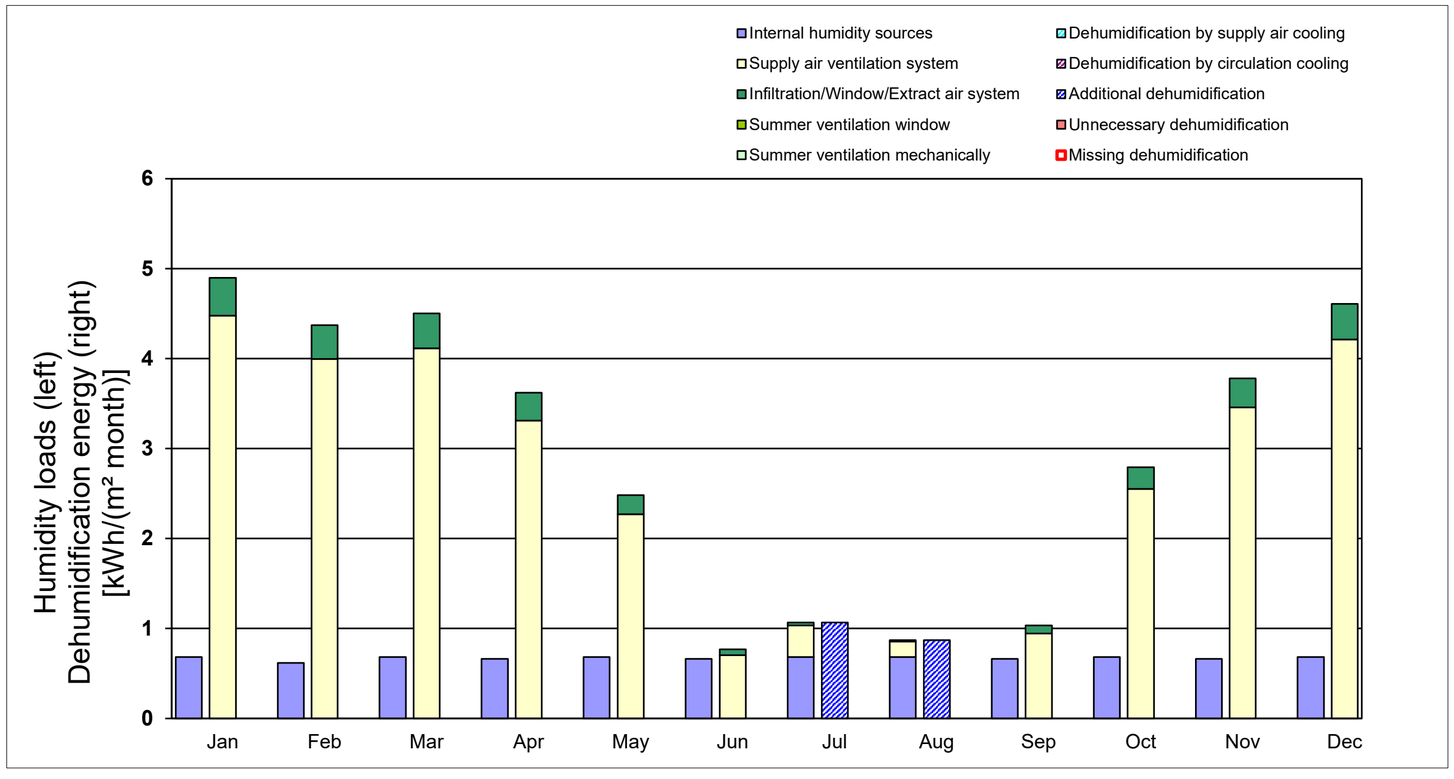
			(Yes/No)
Unsatisfied demand	0.0	0.0	**Cooling demand covered?** **Yes**

Compressor - cooling units

229 Stratford Road / Climate: New York / TFA: 242 m² / Heating: 15.1 kWh/(m²a) / Cooling: 17.3 kWh/(m²a) / PER: 51.9 kWh/(m²a)

Humidity loads and humidity removal

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	
Internal humidity sources	0.7	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	8	kWh/m²
Infiltration/Window/Extract air system	-0.4	-0.4	-0.4	-0.3	-0.2	-0.1	0.0	0.0	-0.1	-0.2	-0.3	-0.4	-3	kWh/m²
Supply air ventilation system	-4.5	-4.0	-4.1	-3.3	-2.3	-0.7	0.4	0.2	-0.9	-2.6	-3.5	-4.2	-30	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	1.1	0.9	0.0	0.0	0.0	0.0	2	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	kWh/m²
Additional dehumidification	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.9	0.0	0.0	0.0	0.0	2	kWh/m²
Total dehumidification	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.9	0.0	0.0	0.0	0.0	2	
Unnecessary dehumidification	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	kWh/m²
Missing 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



Cooling load

229 Stratford Road / Climate: New York / TFA: 242 m² / Heating: 15.1 kWh/(m²a) / Cooling: 17.3 kWh/(m²a) / PER: 51.9 kWh/(m²a)

Building type: **Residential Dwelling**

Treated floor area A_{TFA}:	241.7	m²	Spec. capacity:	132	Wh/(m²
Building volume:	604	m³	Nominal humidity:	12.0	g/kg
Interior temperature:	25	°C	Internal humidity sources:	1.3	g/(m²h)

Temperature:	Outdoor air		Dew point		Sky	
Weather 1:	30.4	°C	22.4	°C	21.3	°C
Weather 2:	27.5	°C	20.0	°C	20.0	°C
Ground design temp.	21.2	°C		SHX	13.9	°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	327.4	*	0.123	*	1.00	*	5.4	or	2.5	=	220	or	102
External wall - Ground	B	53.0	*	0.121	*	1.00	*	-3.8	or	-3.8	=	-25	or	-25
Roof/Ceiling - Ambient	A	202.5	*	0.101	*	1.00	*	5.4	or	2.5	=	111	or	52
Floor slab / Basement ceiling	B	108.5	*	0.329	*	1.00	*	-3.8	or	-3.8	=	-137	or	-137
	A		*		*	1.00	*	5.4	or	2.5	=		or	
	A		*		*	1.00	*	5.4	or	2.5	=		or	
	X		*		*	0.75	*	5.4	or	2.5	=		or	
Windows	A	52.0	*	0.846	*	1.00	*	5.4	or	2.5	=	239	or	111
Exterior door	A		*		*	1.00	*	5.4	or	2.5	=		or	
Exterior TB (length/m)	A	190.4	*	-0.054	*	1.00	*	5.4	or	2.5	=	-56	or	-26
Perimeter TB (length/m)	P	30.2	*	0.173	*	1.00	*	-3.8	or	-3.8	=	-20	or	-20
Ground TB (length/m)	B		*		*	1.00	*	-3.8	or	-3.8	=		or	
Building element towards neighbour	I		*		*	1.00	*	3.0	or	3.0	=		or	
Radiation correction outdoor air				$L_{ambient}$ W/K		-8.0	*	5.4	or	2.5	=	-43	or	-20
Radiation correction sky				L_{Sky} W/K		7.9	*	-3.7	or	-5.0	=	-29	or	-39
Transmission heat load P_T										Total	=	**260**	or	**-2**

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 $P_{V,o}$	604	*	0.079	or	0.079	*	0.33	*	5.4	or	2.5	=	86	or	40
Ground $P_{L,e}$	604	*	0.000	or	0.000	*	0.33	*	-11.1	or	-11.1	=	0	or	0
Summer ventilation $P_{L,S}$	604	*	0.000	or	0.000	*	0.33	*	0.0	or	0.0	=	0	or	0
Ventilation heat load P_V												Total	**86**	or	**40**

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	11.4	*	0.5	*	0.17	*	94	or	63	=	95	or	64
East	14.5	*	0.5	*	0.29	*	207	or	164	=	451	or	358
South	10.7	*	0.5	*	0.23	*	204	or	219	=	260	or	280
West	15.4	*	0.5	*	0.22	*	203	or	180	=	320	or	282
Horizontal	0.0	*	0.0	*	0.40	*	325	or	290	=	0	or	0
Sum opaque areas											302	or	271
Solar load P_S										Total	**1428**	or	**1256**

Internal heating load P_I	Spec. power W/m²		A_{TFA} m²		P_I 1 W		P_I 2 W
	3.8	*	242	=	**926**	or	**926**

$P_T + P_V + P_S + P_I$ =	**2699**	or	**2220**
Cooling load P_C =	**2699**		**W**
Area specific cooling load P_C / A_{TFA} =	**11.2**		**W/m²**

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

		°C	°C
Supply air temperature without cooling	$\vartheta_{Supply,Min}$	25.9	25.4
		W	W
For comparison: cooling load, transportable through the supply air $P_{Supply;Max}$	=	1551	1521
		W/m²	W/m²
	specific:	6.4	6.3

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

Daily internal temperature stroke

(Transmission 259.5 W + Ventilation 85.7 W + Solar load 1427.7 W) * Time 24 h/d / (Spec. capacity 132 Wh/(m²K) * A_{TFA} 242 m²) = **1.3** 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	20	or	20	kg/h	Supply air mass flow	214	or	214	kg/h
Summer vent. air mass flow	0	or	0	kg/h	**Humid. load, supply air**	1090	or	577	g/h
Humidity load, outdoor air	102	or	54	g/h	**Humidity load, internal**	314	or	314	g/h

Enthalpy of vaporisation 707.639 Wh/kg / 1000 g/kg * Humidity load 1506 g/h or 945 g/h = | P_D 1 **1066** W | or | P_D 2 **669** W

Dehumidification load P_T =	**1066**	**W**
Area specific dehumidification load P_T / A_{TFA} =	**4.4**	**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	0.5	3.2	4.8	4.7	2.2	0.1	0.0	0.0	kWh/m²
Specific dehumidification demand	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.9	0.0	0.0	0.0	0.0	kWh/m²
Sensible fraction	100%	100%	100%	100%	100%	100%	82%	84%	100%	100%	100%	100%	

Minimum of sensible cooling load fraction occurred **82%**

Heat distribution and domestic hot water (DHW) system

229 Stratford Road / Climate: New York / TFA: 242 m² / Heating: 15.1 kWh/(m²a) / Cooling: 17.3 kWh/(m²a) / PER: 51.9 kWh/(m²a)

Interior temperature:	20	°C	Interior temperature summer:	25	°C
Building type:	Residential Dwelling				
Treated floor area A_{TFA}:	242	m²			
Occupancy:	3.1	Pers			
Number of dwelling units:	1				
Annual heating demand $q_{Heating}$	3638	kWh/a	Annual useful cooling dem. q_{Cool}	3722	kWh/a
Length of heating period:	174	d	Length cooling period:	275	d
Average heating load P_{ave}:	0.9	kW	Average cooling load $P_{Average}$:	0.6	kW
Marginal usability of additional heat gains:	88%		Marginal utility of additional heat losses:	40%	

Space heat distribution

			Inside thermal envelope					Outside thermal envelope					Total values	
			1	2	3	4	5	1	2	3	4	5	Absolute	Specific
Length of distribution pipes	L_H	m	0.0											
Nominal width of pipe		mm	25											
Insulation thickness		mm	51											
Insulation reflective coating?		-												
Thermal conductivity of insulation		W/(mK)	0.036											
Heat loss coefficient per m of insulated pipe		W/(mK)	0.139											
Insulation quality of mountings, pipe suspensions, etc.		-	1-None	1-None	1-None	1-None	1-None	1-None	1-None	1-None	1-None	1-None		
Thermal bridge supplement		W/K	2.000											
Total heating loss coefficient per m of pipe	Ψ	W/(mK)	#DIV/0!											
Temp. of the room through which the pipes pass	ϑ_X	°C	20	20	20	20	20	0.0	0.0	0.0	0.0	0.0		
Design forward flow temperature	ϑ_V	°C	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0		
Design system heating load	$P_{heating}$	kW	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1		
Forward flow temperature control ('x' if appropriate)														
Design return flow temperature	ϑ_R	°C												
Annual heat emission per m of plumbing	q^*_{HL}	kWh/(m·a)												
Possible utilisation factor of released heat	η_G	-												
Annual heat losses of heating distribution	Q_{HL}	kWh/a											kWh/a	kWh/(m²a)
													0	0.0
Annual heat losses of heating storage		kWh/a											0	0.0
Annual heat losses of heating		kWh/a											0	0.0
Performance ratio of heat distribution	$ea_{,HL}$	-											100%	

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	13.9
DHW demand for washing machines and dishwashers non-elec		kWh/a	239
Effective useful heat DHW	Q_{DHW}	kWh/a	1773

kWh/a	kWh/(m²a)
1773	7.3

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	**0.0**	0.0	0.0	0.0	0.0		
Design forward flow temperature	ϑ_{dist}	°C	**60.0**	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0		
DHW circulation pipes														
Length of circulation pipes (forward + return flow)	L_{HS}	m	**57.0**											
Nominal width of pipe		mm	**25**											
Insulation thickness		mm	**51**											
Insulation reflective coating?		-												
Thermal conductivity of insulation		W/(mK)	**0.036**											
Heat loss coefficient per m of insulated pipe		W/(mK)	0.139											
Insulation quality of mountings, pipe suspensions, etc.		-	**1-None**	**1-None**	**1-None**	**1-None**	**1-None**	**1-None**	**1-None**	**1-None**	**1-None**	**1-None**		
Thermal bridge supplement		W/K	10.550											
Total heating loss coefficient per m of pipe	Ψ	W/(mK)	**0.324**											
Daily circulation period of operation.	td_{Circ}	h/d	**18.0**											
Design return flow temperature	ϑ_R	°C	55											
Circulation period of operation per year	t_{Circ}	h/a	6570											
Annual heat released per m of pipe	q^*_Z	kWh/m/a	80											
Annual heat loss from circulation lines	QZ	kWh/a	**4548**										kWh/a **4548**	kWh/(m²a) **18.8**
DHW individual pipes														
Exterior pipe diameter	d_{U_Pipe}	m	**0.017**											
Accumulated length per single pipes	L_U	m	**17.53**											
Amount of tapping points in building	$n_{tapping\ poin}$	-	**9.00**											
Average pipe length per tapping point	$L_{U,\ average}$	m	1.9											
Tap openings per person per day		-	**3**											
Utilisation days per year		d	**365**											
Heat loss per tap opening	$q_{Individual}$	'h/tap opening	0.0159											
Amount of tap openings per year and person	n_{Tap}	nings per year	1095											
Annual heat loss of individual pipes	Q_U	kWh/a	**55**										kWh/a **55**	kWh/(m²a) **0.2**
Total heat losses of DHW distribution	Q_{WL}												kWh/a **4603**	kWh/(m²a) **19.0**
Performance ratio of DHW distribution pipes	$ea_{,HL}$	-											**360%**	

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	4.5			
Storage volume	litre	500			---
Standby fraction	-				
Location of storage tank, inside or outside of thermal envelope		1-Inside	1-Inside	2-Outside	
Temperature of mechanical room	°C	20.0			
Typical storage tank temperature	°C	60.0			
Manual entry of storage temperature	°C				
Average standby heat losses storage tank	W	180			
Additional heat losses storage tank, solar operation	W			---	---
Possibly utilisation factor of heat losses		---	---		---
Annual heat losses DHW storage tank	kWh/a	1577		---	
Annual heat losses buffer storage tank		---	---		---

kWh/a	kWh/(m²a)
1577	**6.5**

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}	**6180**	**25.6**
Performance ratio DHW-distribution + storage	$e_{a,WL}$	**449%**	
Total heating demand of DHW system			
Including storage tank	Q_{gDHW}	**7952**	**32.9**

Photovoltaic systems

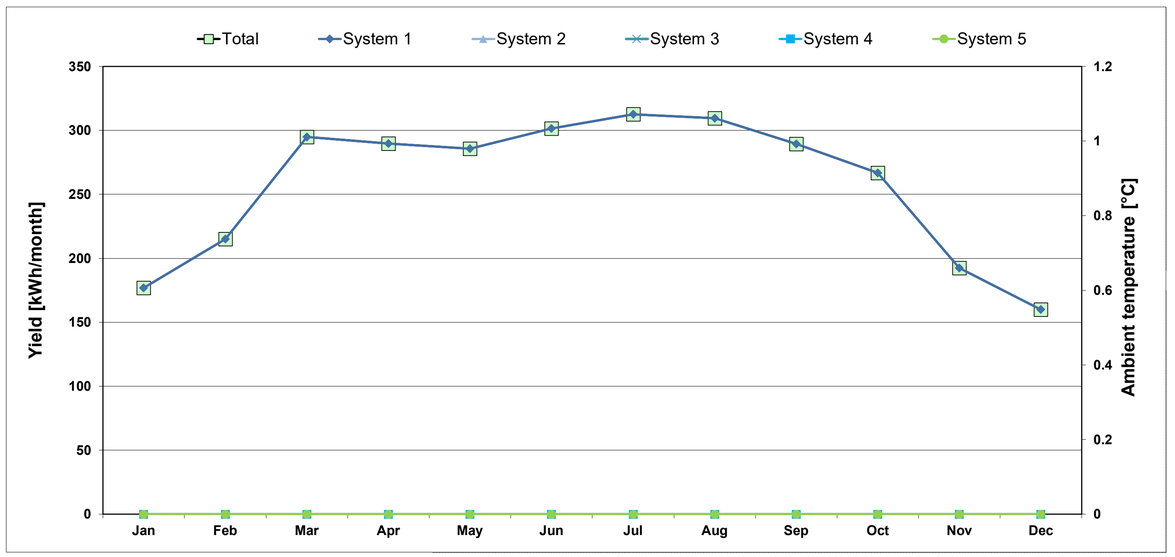
229 Stratford Road / Climate: New York / TFA: 242 m² / Heating: 15.1 kWh/(m²a) / Cooling: 17.3 kWh/(m²a) / PER: 51.9 kWh/(m²a)

Climate data set: US0055b-New York
Building type: Residential Dwelling
Projected building footprint: 108.5 m²

Name of system		System 1	System 2	System 3	System 4	System 5	Reference PV syst.	
Location: Selection in 'Areas' worksheet								
Size of selected area								m²
Deviation from North		180						°
Angle of inclination from horizontal		45						°
Alternative input: Deviation from North		180						°
Alternative input: Angle of inclination from the horizontal		45						°
Information from the module data sheet								
Technology		2-Amorph-Si	2-Amorph-Si	2-Amorph-Si	2-Amorph-Si	2-Amorph-Si	4-Mono-Si	
Nominal current	I_{MPP0}	8.30					7.71	A
Nominal voltage	U_{MPP0}	12.65					30.50	V
Nominal power	P_n	105	0	0	0	0	235	Wp
Temperature coefficient short-circuit current	α	0.047					0.040	%/K
Temperature coefficient open-circuit voltage	β	-0.450					-0.340	%/K
Module dimensions: Height		1.320					1.658	m
Module dimensions: Width		0.584					0.994	m
							1.6	Module area [m²]
Further specifications								
Number of modules	n_M	51					0.0	
Height of module array		1.6						m
Height of horizon	h_{Hori}	61.0						m
Horizontal distance	a_{Hori}	61.0						m
Additional reduction factor shading	r_{other}	80%						
Efficiency of the inverter	η_{HRV}	98%					95%	

Results

Area of module field	39.3	0.0	0.0	0.0	0.0	0.0		m²
Free area on the selected building element								m²
Allocation to building element								
Annual losses due to shading	4519							kWh
							Total	
Annual electricity yield after the inverter, absolute	3095						3095	kWh/a
Related to projected building footprint area	28.5						29	kWh/m²A_{Proje}
CO2-equivalent emissions according to 1-CO2 factors GEMIS (Germany)	195.0						195.0	kg/a
PE-factor according to 1-PE factors (non-renewable) PHI Certification	0.00	0.00	0.00	0.00	0.00	0.0	0.00	kWh$_{prim}$/kWh



Electricity demand for residential buildings

229 Stratford Road / Climate: New York / TFA: 242 m² / Heating: 15.1 kWh/(m²a) / Cooling: 17.3 kWh/(m²a) / PER: 51.9 kWh/(m²a)

Households	1
Persons	3.1
Living area (m²)	242
Heating demand [kWh/(m²a)]	15.1

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:	1.21	2.6
Energy carrier for DHW:	1.15	0.1

Solar fraction of DHW Laundry&Dish	0%
Marginal performance ratio DHW	100%
Marginal performance ratio Heating	37%

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	1.10	kWh/Use		* 1.00	*	65	/(P*a)	* 3.1	P	=	225	* 50%		=	112								
1-DHW connection														*	50%			* (1+	0.30	) *	1.00	*(1-	0.00	) =	146
Clothes washing	1	1	1.10	kWh/Use		* 1.00	*	57	/(P*a)	* 3.1	P	=	197	* 55%		=	108								
1-DHW connection														*	45%			* (1+	0.05	) *	1.00	*(1-	0.00	) =	93
Clothes drying with:	1	1	3.50	kWh/Use	Residual dampness	0.88	*	57	/(P*a)	* 3.1	P	=	548	100%		=	548								
4-Condensation dryer			0.00		0.60							=	0		0%						1.00	*			0
Energy consumed by evaporation	0	1	3.13	kWh/Use		* 0.60	*	57	/(P*a)	* 3.1	P	=	0	*	100%			* (1+	0.00	) *	0.37	*(1-	0.71	) =	0
Refrigerating	0	1	0.78	kWh/d		* 1.00	*	365	d/a	* 1	HH	=	0	* 100%		=	0								
Freezing	0	0	0.88	kWh/d		* 0.90	*	365	d/a	* 1	HH	=	0	* 100%		=	0								
or combination	1	1	1.00	kWh/d		* 1.00	*	365	d/a	* 1	HH	=	365	* 100%		=	365								
Cooking with:	1	1	0.20	kWh/Use		* 1.00	*	500	/(P*a)	* 3.1	P	=	314	* 100%		=	314								
1-Electricity				Average lamp efficiency [lm/W]										*	0%										0
Lighting	1	1	11	W	65	* 1.00	*	2.90	kh/(P*a	* 3.1	P	=	100	* 100%		=	100								
Consumer electronics	1	1	80	W		* 1.00	*	0.55	kh/(P*a	* 3.1	P	=	138	* 100%		=	138								
Small appliances, etc.	1	1	50	kWh		* 1.00	*	1.00	/(P*a)	* 3.1	P	=	157	* 100%		=	157								
Total aux. electricity													1528				1528								
Other:																									
	0	0	0	kWh/a									0				0								
	0	0	0	kWh/a									0				0								
	0	0	0	kWh/a									0				0								
Total													3572	kWh			3371	kWh			239	kWh			239
Specific demand																	**13.9**	kWh/(m²a)			**1.0**	kWh/(m²a)			**1.0**
Recommended maximum value																	18								

DHW Non-Electric - Wash&Dish

Non-Renewable Non-Electric DHW Wash&Dish

Aux Electricity

229 Stratford Road / Climate: New York / TFA: 242 m² / Heating: 15.1 kWh/(m²a) / Cooling: 17.3 kWh/(m²a) / PER: 51.9 kWh/(m²a)

Treated floor area	242	m²
Heating period	174	d
Air volume	604	m³
Dwelling units	1	HH

Heat recovery efficiency ventilation unit	0.83	
Operation vent. system Winter	4.18	kh/a
Operation vent. system Summer	4.58	kh/a
Air change rate	0.38	h^{-1}

Annual space heating demand	15	kWh/(m^2a)
Boiler rated power	15	kW
DHW system heating demand	7952	kWh/a
Design forward flow temperature	50	°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		0.31	Wh/m³ *	0.38	h^{-1} *	4.2	kh/a *	604	m³ =	299		considered in heat recovery efficiency					
Defroster HX	1	1	Data entries in 'Ventilation' worksheet or in 'Addl vent'								817	*	0.2	/	4.18	=	33	
Summer ventilation	1	0.55	0.31	Wh/m³ *	0.30	h^{-1} *	4.6	kh/a *	604	m³ =	258	*	1.0	/	4.58	=		31
																	Internal heat sources ' Additional summer ventilation'	0.0
Additional vent. summer	0	0.00	0.00	Wh/m³ *	0.00	h^{-1} *	4.6	kh/a *	604	m³ =	0	*	1.0	/	4.58	=		0.0
Heating system			Controlled / non controlled [1/0]															
Enter the rated power of the pump			0	W	0													
Circulator pump heating	0	0	72	W *	1.0	*	4.2	kh/a *	1	=	0	*	1.0	/	4.18	=	0	
Boiler electricity consumption at 30% load			0	W														
Aux. energy - Heat. boiler	0	0	55	W *	1.00	*	0.00	kh/a *	1	=	0	*	1.0	/	4.18	=	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	/	4.18	=	0	
DHW system																		
Enter average power consumption of pump			0	W														
Circulation pump DHW	1	0	30	W *	1.00	*	5.2	kh/a *	1	=	155	*	1.0	/	8.76	=	0	0
Enter the rated power of the pump			0	W														
Storage load pump DHW	0	0	63	W *	1.00	*	0.0	kh/a *	1	=	0	*	1.0	/	8.76	=	0	0
Boiler electricity consumption at 100% load			0	W														
DHW boiler aux. energy	0	0	165	W *	1.00	*	0.0	kh/a *	1	=	0	*	1.0	/	8.76	=	0	0
Enter the rated power of the solar DHW pump			0	W														
Solar aux. electricity	0	0	46	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	*	1	=	0	*	1.0	/	4.58	=		0
Aux. electricity dehum.				kWh/a *	1.00	*	1.0	*	1	=	0	*	1.0	/	4.58	=		0
Misc. aux. electricity																		
Misc. aux. electricity	0	0	0	kWh/a *	1.00	*	1.0	*	1	=	0	*	1.0	/	8.76	=	0	0
Total											1528						33	31
Specific demand	kWh/(m²a) (treated floor area)										6.3							

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

229 Stratford Road / Climate: New York / TFA: 242 m² / Heating: 15.1 kWh/(m²a) / Cooling: 17.3 kWh/(m²a) / PER: 51.9 kWh/(m²a)

Utilisation: 10-Dwelling

Type of values used: 2-Standard

IHG heating 2.31 W/m²

IHG cooling 3.83 W/m²

No input is necessary 0.00 W/m²

Go to utilisation pattern selection

Persons	3.1	P
Living area	242	m²

Heating demand	15	kWh/(m²a)
Heating period	174	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	1.1	kWh/Use	1.00	65	/(P*a)	225	*			0.30	/	8.76	=	8
Clothes washing	1	1	1.1	kWh/Use	1.00	57	/(P*a)	197	*			0.30	/	8.76	=	7
Clothes drying with:	1	1	3.5	kWh/Use	0.88	57	/(P*a)	548	*			0.70	/	8.76	=	44
4-Condensation dryer		1	0.0					0				0.80				
Energy consumed by evaporation	0	1	-3.1	kWh/Use	0.60	57	/(P*a)	0	* (1-	0	) *	0.00	/	8.76	=	0
Refrigerating	0	1	0.8	kWh/d	1.00	365	d/a	0	*			1.00	/	8.76	=	0
Freezing	0	0	0.9	kWh/d	0.90	365	d/a	0	*			1.00	/	8.76	=	0
or combination	1	1	1.0	kWh/d	1.00	365	d/a	365	*			1.00	/	8.76	=	42
Cooking	1	1	0.2	kWh/Use	1.00	500	/(P*a)	314	*			0.50	/	8.76	=	18
Lighting	1	1	11.0	W	1.00	2.9	kh/(P*a)	100	*			1.00	/	8.76	=	11
Consumer electronics	1	1	80.0	W	1.00	0.55	kh/(P*a)	138	*			1.00	/	8.76	=	16
Household appliances/Other	1	1	50.0	kWh	1.00	1.0	/(P*a)	157	*			1.00	/	8.76	=	18
Auxiliary appliances (cf. aux Electricity sheet)															=	33
Other applications (cf. Electricity sheet)	0	0.0						0	*			0	/	8.76	=	0
Persons	3	1	80.0	W/P	1.00	8.76	kh/a	2201	*			0.55	/	8.76	=	138
Cold water	3	1	-10.4	W/P	1.00	8.76	kh/a								=	-33
DHW - circulation	1	1	519.2	W	1.00	8.76	kh/a	4548	*			1.00	/	8.76	=	519
DHW - individual pipes	1	1	6.2	W	1.00	8.76	kh/a	55	*			1.00	/	8.76	=	6
DHW storage tank heating case	1	1	180.0	W	1.00	8.76	kh/a	1577	*			1.00	/	8.76	=	180
DHW storage tank cooling case	1	0	0.0	W	1.00	8.76	kh/a	0	*			1.00	/	8.76	=	0
Evaporation	3	1	-25.0	W/P	1.00	8.76	kh/a	-688	*			1.00	/	8.76	=	-79
Total IHG														W		929
Specific IHG														W/m²		3.84
Heat available from internal sources										174	d/a			kWh/(m²a)		16.0

Primary Energy Renewable PER

229 Stratford Road / Climate: New York / TFA: 242 m² / Heating: 15.1 kWh/(m²a) / Cooling: 17.3 kWh/(m²a) / PER: 51.9 kWh/(m²a)

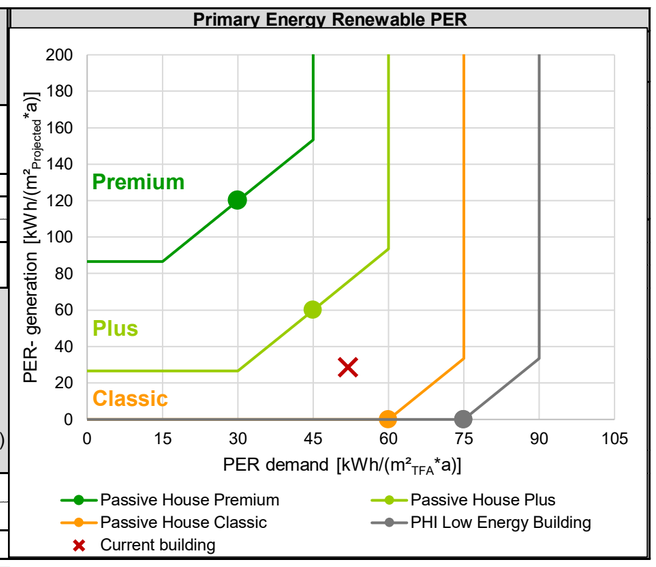
				Building type:	Residential Dwelling
				Treated floor area A_{TFA}:	242 m²
				Projected building footprint $A_{Projected}$:	109 m²
Selection of heat generation system(s)	**Contribution margin (useful energy)**			Heating demand incl. distribution & hydr. frost protection	15 kWh/(m²a)
Primary heat generation type	**Heating**	**DHW**	**Addl. input in following worksheets**	Cooling energy dem. incl. dehumidification	17 kWh/(m²a)
2-Heat pump(s)	100%	0%	HP, possibly HP ground	DHW demand including distribution:	33 kWh/(m²a)
Secondary heat generation type (optional & different)					
6-Other	0%	100%	-		

Energy demand	**Efficiency**		**Final energy**		**PER**			**PE**		**CO_2**	
Reference: Treated floor area	Calculation	User defined value	Contribution (final energy)	**Final energy demand**	PER factor	Effective PER factor (including biomass	**PER specific value**	PE factor	PE value	CO_2 emissions factor (CO_2-eq)	CO_2eq emissions
	-	-		kWh/(m²a)	kWh/kWh	kWh/kWh	kWh/(m²a)	kWh/kWh	kWh/(m²a)	kg/kWh	kg/(m²a)
								1-PE factors (non-renewable) PHI Certification		1-CO2 factors GEMIS (Germany)	
							51.9		65.6		13.4
Heating			100%			1.21	**12.3**	2.60	**26.3**		**5.4**
Electricity (HP compact unit)					1.50			2.60		0.532	
Electricity (heat pump)	2.73		100%	5.5	1.50	1.10	6.1	2.60	14.3	0.532	2.9
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)				4.6	1.50	1.35	6.2	2.60	12.0	0.532	2.5
Cooling and dehumidification					1.58		**10.8**		**17.8**		**3.6**
Electricity cooling (heat pump)	3.00			5.1	1.55		8.0	2.60	13.3	0.532	2.7
Auxiliary electricity cooling, ventilation summer				1.1	1.55		1.7	2.60	2.8	0.532	0.6
Electricity dehumidification (heat pump)	3.00			0.6	1.90		1.2	2.60	1.7	0.532	0.3
Auxiliary electricity (dehumidification)					1.90			2.60		0.532	
DHW generation			100%			1.15	**19.7**	0.10	**1.7**		**0.3**
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					1.75			1.10		0.250	
Heating oil / Methanol					2.30			1.10		0.320	
Solar thermal system											
Electricity (direct)	1.00	2.00	100%		1.15			2.60		0.532	
Heat Pump Water Heater Estimation		2.00		16.5	1.15	1.15	18.9				0.0
Aux. electricity (DHW + solar DHW)				0.6	1.15	1.15	0.7	2.60	1.7	0.532	0.3
Household electricity				7.6		1.20	9.2		19.8		4.1
Electricity (household or non-residential lighting, etc.)				7.6	1.20	1.20	9.2	2.60	19.8	0.532	4.1
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	**Final energy**		**PER**		**PE**		**CO_2**	
Reference: Projected building footprint area	Final energy generation	**Final energy generation**	PER factor	**PER specific value**	PE factor	PE Value	Emission factor (CO_2-eq)	CO_2eq emissions
	kWh/a	**kWh/(m²$A_{Projected}$*a)**	kWh/kWh	kWh/(m²$A_{Projected}$a)	kWh/kWh	kWh/(m²a)	kg/kWh	kg/a
				28.5		**0.0**		**195.0**
PV electricity	3095	28.5	1.00	28.5	0.00	0.0	0.063	195.0
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)]	-	**Current building reaches following class**	66	**Requirement met?** -

Achievable energy standard through the verification of renewable primary energy (assessment of individual aspects)	**Useful energy, performance**				**Airtightness**
	Annual heat. dem. Treated floor area	**Heating load** Treated floor area	**Useful cool. energy** Treated floor area	**Cooling load** Treated floor area	n_{50}
	kWh/(m²a)	W/m²	kWh/(m²a)	W/m²	1/h
Requirement Passive House Premium					
Requirement Passive House Plus	15	10	17	10	0.60
Requirement Passive House Classic					
Requirement PHI Low Energy Building	30		32		1.00
Current building reaches following class for aspe	15	13	17	11	0.3
	Premium		PHI Low Energy Building		Premium



Summary	**Final energy**	**PER specific value**	**PE value**	**CO2eq emissions**	**CO_2eq substitution balance**
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.	MWh/a	MWh/a	1-PE factors (non-renewable) PHI Certification MWh/a	1-CO2 factors GEMIS (Germany) kg/a	1-CO2 factors GEMIS (Germany) kg/a
Demand	**10.1**	**12.5**	15.86	3245	3245
Generation	**-3.1**	**-3.1**	0.00	195	-1451
Demand, cumulative generation (annual balance)	6.98	9.45	15.86	3440	1793
Demand w/o household electricity	**8.2**	**10.3**	11.07	2264	2264
Demand w/o household electricity, cum. generation	5.14	7.24	11.07	2459	813

Heat pump

229 Stratford Road / Climate: New York / TFA: 242 m² / Heating: 15.1 kWh/(m²a) / Cooling: 17.3 kWh/(m²a) / PER: 51.9 kWh/(m²a)

			Building type:	Residential Dwelling
			Treated floor area A_{TFA}:	242 m²
Covered fraction of space heating demand		*('PER' worksheet)*	100%	
Space heating demand + distribution losses	Q_H+Q_{HL}:	*(DHW+Distribution)*	3638	kWh/a
Solar fraction for space heat	$\eta_{Solar,\ H}$	*('SolarDHW' worksheet)*	0%	
Effective annual heating demand	$Q_{H,Wi}=Q_H*(1-\eta_{Solar,\ H})$		**3638**	kWh/a
Covered fraction of DHW demand		*('PER' worksheet)*	0%	
Total heating demand of DHW system	Q_{gDHW}	*(DHW+Distribution)*	6137	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: 1-PUMY P36 NHMU BS	Heat source:		1-Outdoor air	
Selection of distribution system			2-Radiators	
Design distribution temperature	θ_{design}	*(DHW+Distribution)*	50.00	°C
Nominal power of distribution system	P_{nom}		3.14	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			2-Outside	
Room temperature (storage location: outside of thermal envelope)		*(DHW+Distribution)*		°C
Sink temperature of heat pump for heating	θ_{snk}		50.00	°C

Entries in relation to the domestic hot water system

Selection of HP: 0-None	Heat source:			
DHW temperature		*(DHW+Distribution)*	60.00	°C
Orientation of DHW storage tank ('storage 1' in 'DHW+Distribution' worksheet)			1-Inside	
Specific heat losses storage	U * A $_{Storage}$		4.5	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)*		

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

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Heating

Heat pump: PUMY P36 NHMU BS

Source: 1-Outdoor air

	θ_source °C	θ_sink °C	Heating capacity kW	COP
Test point 1	-21.3	31.2	6.4	2.8
Test point 2	-14.4	34.6	8.7	3.2
Test point 3	-9.9	36.3	9.7	3.4
Test point 4	-5.3	37.5	10.5	3.5
Test point 5	3.5	41.2	12.9	3.9
Test point 6	7.9	43.0	14.0	3.7
Test point 7	-19.6	28.2	3.2	3.1
Test point 8	-12.2	30.6	4.3	3.4
Test point 9	-7.5	31.8	4.9	3.6
Test point 10	-2.7	32.7	5.3	3.8
Test point 11	6.7	35.3	6.4	4.7
Test point 12	11.5	36.6	7.0	4.7
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	$Q_{HP,Heating}$	3638	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	$Q_{HP,Heating}$	3638	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}	1332	kWh/a

		1. HP: Heating or heating & DHW	2. HP: Domestic hot
Seasonal performance factor of heat pump	SPF_{H-1}	2.73	
		kWh/a	kWh/(m²a)
Final electrical energy demand heat generation	Q_{final}	1332	5.5
Annual primary energy demand		3462	14.3
		kg/a	kg/(m²a)
Annual CO_2-equivalent emissions		708	2.9