Certificate

Certified retrofit
'EnerPHit Classic'
(Climate zone: Warm-temperate)

Earth Cycle Technologies A67F863
ww.earthcycle.co Wicklow Ireland

Authorised by:

Passive House Institute
Dr. Wolfgang Feist
64283 Darmstadt
Germany

St Johns Pl Passive House
852 St Johns Place , 11216 Brooklyn, United States of America

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

Client	Blue Cube Properties 925 Bergen Street, #203 11238 Brooklyn,
Architect	Zh Architects 515 Canal St New York 10013, United States of America
Building Services	RJD Engineering 590 Franklin Avenue 7110 Nutley, esidential building
Energy Consultant	Zh Architects 515 Canal St New York 10013, United States of America

Buildings retrofitted to the EnerPHit Standard 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 modernization to the 'EnerPHit Classic' standard:

Building quality			This building		Criteria	Alternative criteria
Heating	Heating demand	[kWh/(m²a)]	**16**	≤	20	-
Cooling	Cooling + dehumidification demand	[kWh/(m²a)]	**11**	≤	18	18
	Cooling load	[W/m²]	**10**	≤	-	11
	Frequency of excessively high humidity	[%]	**5**	≤	10	
Airtightness	Pressurization test result (n_{50})	[1/h]	**0.8**	≤	1.0	
Non-renewable primary energy (PE)	PE demand	[kWh/(m²a)]	**121**	≤	122	
Component quality						
	Building envelope to ambient air (U-value)	[W/(m²K)]	**0.17**	≤	-	
	Building envelope to ground (U-value)	[W/(m²K)]	**0.51**	≤	-	
	Windows/Exterior doors (Uw,installed)	[W/(m²K)]	**0.80**	≤	-	
	Glazing (g-value)	[-]	**0.51**	≥	-	
	Glazing/shading (max. solar load)	[kWh/(m²a)]	**130**	≤	-	
	Ventilation (effect. heat recovery efficieny)	[%]	**80**	≥	-	

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

##

Certifier: Robert Ryan, Earth Cycle Technologies

EnerPHit Verification

Photo or Drawing

Building:	St Johns Pl Passive House		
Street:	852 St Johns Place		
Postcode/City:	11216	Brooklyn	
Province/Country:	New York	US-United States of America	
Building type:	Multifamily Residential		
Climate data set:	US0055b-New York		
Climate zone:	4: Warm-temperate	Altitude of location:	20 m

Home owner / Client:	Blue Cube Properties		
Street:	925 Bergen Street, #203		
Postcode/City:	11238	Brooklyn	
Province/Country:	New York	USA	

Architecture:	Zh Architects		
Street:	515 Canal St		
Postcode/City:	New York	10013	
Province/Country:	New York	US-United States of America	

Mechanical engineer:	RJD Engineering		
Street:	590 Franklin Avenue		
Postcode/City:	7110	Nutley	
Province/Country:	New Jersey	1-Residential building	

Energy consultancy:	Zh Architects		
Street:	515 Canal St		
Postcode/City:	New York	10013	
Province/Country:	New York	US-United States of America	

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

Year of construction:	2016	Interior temperature winter [°C]:	20.0
No. of dwelling units:	5	Internal heat gains (IHG) heating case [W/m²]:	2.6
No. of occupants:	11.6	Specific capacity [Wh/K per m² TFA]:	84

Interior temp. summer [°C]:	25.0	
IHG cooling case [W/m²]:	2.9	
Mechanical cooling:	x	

Specific building characteristics with reference to the treated floor area

	Treated floor area	m²	477.9		Criteria	Alternative criteria	Fullfilled?[2]
Space heating	Heating demand	kWh/(m²a)	16.35	≤	20	-	yes
	Heating load	W/m²	14	≤	-	-	
Space cooling	Cooling & dehum. demand	kWh/(m²a)	11	≤	18	18	yes
	Cooling load	W/m²	10	≤	-	11	
	Frequency of overheating (> 25 °C)	%	-	≤	-		-
	Frequency of excessively high humidity (> 12 g/kg)	%	5	≤	10		yes
Airtightness	Pressurization test result n_{50}	1/h	0.8	≤	1.0		yes
Non-renewable Primary Energy (PE)	PE demand	kWh/(m²a)	121	≤	122		yes
Primary Energy Renewable (PER)	PER demand	kWh/(m²a)	84	≤	-	-	-
	Generation of renewable energy (in relation to projected building footprint area)	kWh/(m²a)	-	≥	-	-	

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

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

EnerPHit Classic? yes

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

Certificate ID	Issued on:	City:
26557-26561_ECT_EP_20200527_RR	27/05/20	IE Wicklow

Climate data

St Johns Pl Passive House / Climate: New York / TFA: 478 m² / Heating: 16.3 kWh/(m²a) / Cooling: 10.6 kWh/(m²a) / PER: 83.9 kWh/(m²a)

Selection of climate data

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

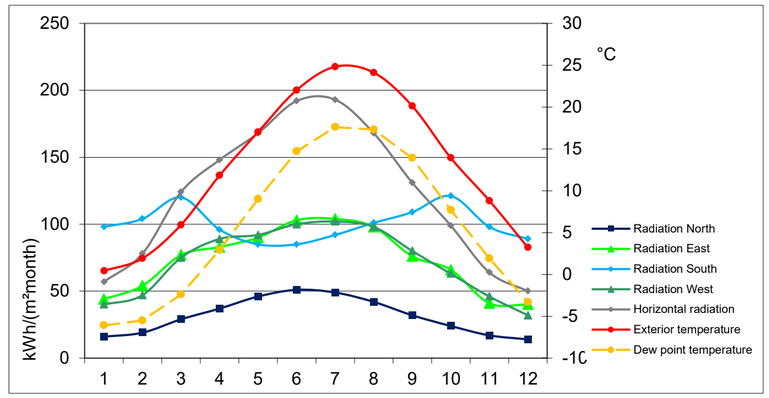
Altitude

Weather station:	40.0	m
Building location:	20	m

Result overview

Annual heating demand	16.3	kWh/(m²a)
Heating load	14.4	W/m²
Frequency of overheating	-	%
Sensible cooling	7.1	kWh/(m²a)
Latent cooling	3.5	kWh/(m²a)
Cooling load	10.1	W/m²
PER demand	83.9	kWh/(m²a)

	Data for heating Annual method	Data from monthly balance Heating	Cooling	
Heating / cooling period	174	243	275	d/a
Heating / cooling degree hours	64	73	-59	kKh/a
Radiation North	114	203	328	kWh/(m²a)
Radiation East	301	495	738	kWh/(m²a)
Radiation South	570	810	907	kWh/(m²a)
Radiation West	287	484	745	kWh/(m²a)
Horizontal radiation	450	788	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 electri
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	15.9	15.5	15.5	15.9	16.6	19.9	20.6	21.0	21.0	18.1	17.4	16.6	15.5	15.5	21.0	21.0		
	Comment:	Temp = 1981-2010; Other derivede from Meteonrom and TMY3																	

U-value of building assemblies

St Johns Pl Passive House / Climate: New York / TFA: 478 m² / Heating: 16.3 kWh/(m²a) / Cooling: 10.6 kWh/(m²a) / PER: 83.9 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	**01. Exterior wall**	

Heat transmission resistance [m²K/W]

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

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
Finite Calculation	**0.173**					**1000**

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

U-value supplement: W/(m²K) | **U-value: 0.173** W/(m²K)

Assembly no.		Interior insulation?
02ud	**02. Party wall**	

Heat transmission resistance [m²K/W]

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

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
Finite Calculation	**0.405**					**1000**

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

U-value supplement: W/(m²K) | **U-value: 0.405** W/(m²K)

Assembly no.		Interior insulation?
03ud	**03. Party wall**	

Heat transmission resistance [m²K/W]

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

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
Finite Calculation	**0.405**					**1000**

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

U-value supplement: W/(m²K) | **U-value: 0.405** W/(m²K)

Assembly no. | Interior insulation?

04ud	04. Exterior wall	

Heat transmission resistance [m²K/W]

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

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
Finite Calculation	**0.135**					**1000**

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

U-value supplement [ ] W/(m²K) **U-value: 0.135** W/(m²K)

Assembly no. | Interior insulation?

05ud	05. Exterior wall	

Heat transmission resistance [m²K/W]

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

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
Finite Calculation	**0.129**					**1000**

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

U-value supplement [ ] W/(m²K) **U-value: 0.129** W/(m²K)

Assembly no. | Interior insulation?

06ud	15. Exterior wall	

Heat transmission resistance [m²K/W]

Orientation of building element	2-Wall	interior R_{si}	0.13
Adjacent to	1-Outdoor air	exterior R_{se}:	0.04

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
CMU Wall	**1.330**					**152**
EPS	**0.036**					**254**

Percentage of sec. 1	Percentage of sec. 2	Percentage of sec. 3	Total
100%			**40.6** cm

U-value supplement [ ] W/(m²K) **U-value: 0.136** W/(m²K)

Assembly no. | Interior insulation?

07ud | **16. Exterior wall** |

Heat transmission resistance [m²K/W]

Orientation of building element: 2-Wall | interior R_{si}: 0.13

Adjacent to: 1-Outdoor air | exterior R_{se}: 0.04

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
CMU Wall	**1.330**					**203**
EPS	**0.036**					**254**

Percentage of sec. 1: 100% | Percentage of sec. 2 | Percentage of sec. 3 | Total: **45.7** cm

U-value supplement: | W/(m²K)

U-value: 0.136 W/(m²K)

Assembly no. | Interior insulation?

08ud | **17. Interior wall** |

Heat transmission resistance [m²K/W]

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

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

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
	0.136					**1000**

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

U-value supplement: | W/(m²K)

U-value: 0.136 W/(m²K)

Assembly no. | Interior insulation?

09ud | **18. Exterior wall** |

Heat transmission resistance [m²K/W]

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

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

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
Finite Calculation	**0.440**					**1000**

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

U-value supplement: | W/(m²K)

U-value: 0.440 W/(m²K)

Assembly no.		Interior insulation?
10ud	**20. Exterior wall**	

Heat transmission resistance [m²K/W]

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

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
Finite Calculation	**0.129**					**1000**

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

U-value supplement: W/(m²K)

U-value: 0.129 W/(m²K)

Assembly no.		Interior insulation?
11ud	**21. Exterior wall**	

Heat transmission resistance [m²K/W]

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

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
Finite Calculation	**0.146**					**1000**

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

U-value supplement: W/(m²K)

U-value: 0.146 W/(m²K)

Assembly no.		Interior insulation?
12ud	**Roof**	

Heat transmission resistance [m²K/W]

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

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
	0.026					**229**

Percentage of sec. 1	Percentage of sec. 2	Percentage of sec. 3	Total
100%			**22.9** cm

U-value supplement: W/(m²K)

U-value: 0.114 W/(m²K)

Assembly no. | Interior insulation?

13ud | **Cellar floor** |

Heat transmission resistance [m²K/W]

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

Adjacent to: **2-Ground** | exterior R_{se}: 0.00

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
Foam	**0.032**					**50**

Percentage of sec. 1: 100% | Percentage of sec. 2 | Percentage of sec. 3 | Total: **5.0** cm

U-value supplement: | W/(m²K) | **U-value: 0.591** W/(m²K)

Assembly no. | Interior insulation?

14ud | **First plan floor** |

Heat transmission resistance [m²K/W]

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

Adjacent to: **2-Ground** | exterior R_{se}: 0.00

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
Concrete	**1.400**					**76**
EPS	**0.036**					**102**

Percentage of sec. 1: 100% | Percentage of sec. 2 | Percentage of sec. 3 | Total: **17.8** cm

U-value supplement: | W/(m²K) | **U-value: 0.333** W/(m²K)

Assembly no. | Interior insulation?

15ud | **Solid door** |

Heat transmission resistance [m²K/W]

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

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

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
	2.000					**1000**

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

U-value supplement: | W/(m²K) | **U-value: 2.000** W/(m²K)

Areas determination

St Johns Pl Passive House / Climate: New York / TFA: 478 m² / Heating: 16.3 kWh/(m²a) / Cooling: 10.6 kWh/(m²a) / PER: 83.9 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] 8 Months	Radiation-load cooling period [kWh/a] 9 Months
	Treated floor area	1	**477.89**	m²	*Treated floor area according to PHPP manual*					
A	**North windows**	2	**32.68**	m²	Results come from the 'Windows' worksheet.		**North windows**	**0.788**	**1284**	**2078**
A	**East windows**	3	**0.00**	m²	Window areas are subtracted from individual opaque areas.		**East windows**			
A	**South windows**	4	**32.33**	m²	which is displayed in the 'Windows' worksheet.		**South windows**	**0.819**	**2945**	**2953**
A	**West windows**	5	**0.00**	m²			**West windows**			
A	**Horizontal windows**	6	**0.00**	m²			**Horizontal windows**			
A	**Exterior door**	7	**7.31**	m²	*Please subtract area of door from respective building assembly*		**Exterior door**	**0.500**		
A	**External wall - Ambient**	8	**494.91**	m²	*Temperature zone "A" is ambient air*		**External wall - Ambient**	**0.139**	**125**	**339**
B	**External wall - Ground**	9	**45.01**	m²	*Temperature zone "B" is the ground*		**External wall - Ground**	**0.440**		
A	**Roof/Ceiling - Ambient**	10	**204.90**	m²			**Roof/Ceiling - Ambient**	**0.241**	**62**	**190**
B	**Floor slab / Basement ceiling**	11	**115.62**	m²			**Floor slab / Basement ceiling**	**0.532**		
		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	**71.00**	m	*Units in m*		**Thermal bridges Ambient**	**0.101**		
P	**Perimeter thermal bridges**	16	**0.00**	m	*Units in m; temperature zone "P" is perimeter (see 'Ground' worksheet)*		**Perimeter thermal bridges**			
B	**Thermal bridges FS/BC**	17	**22.00**	m	*Units in m*		**Thermal bridges FS/BC**	**0.500**		
I	**Building element towards neigh**	18	**412.73**	m²	*No heat losses, only considered for the heating load calculation*		**Building element towards neighbour**	0.340		
Total thermal envelope			**932.76**	**m²**			**Average therm. envelope**	**0.293**		

Go to building components list

Area input

2-Sorting: BY ID

Area no.	Building assembly description	To group No.	Assigned to group	Quan-tity	x (	a [m]	x	b [m]	+	User deter-mined [m²]	-	User sub-traction [m²]	-	Subtraction window areas [m²]	) =	Area [m²]	Selection building assembly / Building system	U-Value [W/(m²K)]	Deviation from North	Angle of inclination from the horizontal	Orientation	Reduction factor shading	Exterior absorptivity	Exterior emissivity
	Projected building footprint	**0**	Projected building footprint		x (		x		+	**0.00**	-		)		=	0.0								
	Treated floor area	**1**	Treated floor area	**1**	x (		x		+	**477.89**	-		)		=	477.9								
	Exterior door	**7**	Exterior door		x (		x		+		-		) -		=		Exterior door							
1	**Floor_001_D**	**11**	Floor slab / Basement ceiling	**1**	x (		x		+	**89.28**	-		) -	**0.0**	=	89.3	13ud	**0.591**	**91**	**180**	**Hor**			
2	**Wall_002_N**	**9**	External wall - Ground	**1**	x (	**2.29**	x	**1.74**	+		-		) -	**0.0**	=	4.0	09ud-18. Exterior wall	**0.440**	**4**	**90**	**North**			
3	**Wall_003_E**	**9**	External wall - Ground	**1**	x (	**3.58**	x	**2.29**	+		-		) -	**0.0**	=	8.2	09ud-18. Exterior wall	**0.440**	**94**	**90**	**East**			
4	**Wall_004_N**	**9**	External wall - Ground	**1**	x (	**2.34**	x	**2.29**	+		-		) -	**0.0**	=	5.4	09ud-18. Exterior wall	**0.440**	**4**	**90**	**North**			
5	**Wall_005_S**	**9**	External wall - Ground	**1**	x (	**6.07**	x	**2.29**	+		-		) -	**0.0**	=	13.9	09ud-18. Exterior wall	**0.440**	**184**	**90**	**South**			
6	**Wall_006_N**	**9**	External wall - Ground	**1**	x (	**2.29**	x	**0.64**	+		-		) -	**0.0**	=	1.5	09ud-18. Exterior wall	**0.440**	**4**	**90**	**North**			
7	**Wall_007_W**	**9**	External wall - Ground	**1**	x (	**2.29**	x	**1.19**	+		-		) -	**0.0**	=	2.7	09ud-18. Exterior wall	**0.440**	**274**	**90**	**West**			
8	**Wall_008_N**	**9**	External wall - Ground	**1**	x (	**2.29**	x	**1.35**	+		-		) -	**0.0**	=	3.1	09ud-18. Exterior wall	**0.440**	**4**	**90**	**North**			
9	**Wall_009_W**	**9**	External wall - Ground	**1**	x (	**2.78**	x	**2.29**	+		-		) -	**0.0**	=	6.3	09ud-18. Exterior wall	**0.440**	**274**	**90**	**West**			
10	**Wall_010_E**	**18**	Building element towards neighb	**1**	x (	**2.32**	x	**2.29**	+		-		) -	**0.0**	=	5.3	03ud-03. Party wall	**0.405**	**94**	**90**	**East**			
11	**Wall_011_E**	**18**	Building element towards neighb	**1**	x (	**3.05**	x	**2.29**	+		-		) -	**0.0**	=	7.0	03ud-03. Party wall	**0.405**	**94**	**90**	**East**			
12	**Wall_012_E**	**18**	Building element towards neighb	**1**	x (	**4.51**	x	**2.29**	+		-		) -	**0.0**	=	10.3	03ud-03. Party wall	**0.405**	**94**	**90**	**East**			
13	**Wall_013_E**	**18**	Building element towards neighb	**1**	x (	**3.66**	x	**2.29**	+		-		) -	**0.0**	=	8.4	03ud-03. Party wall	**0.405**	**94**	**90**	**East**			
14	**Wall_014_W**	**18**	Building element towards neighb	**1**	x (	**6.27**	x	**2.29**	+		-		) -	**0.0**	=	14.3	03ud-03. Party wall	**0.405**	**274**	**90**	**West**			
15	**Wall_015_W**	**18**	Building element towards neighb	**1**	x (	**5.56**	x	**2.29**	+		-		) -	**0.0**	=	12.7	03ud-03. Party wall	**0.405**	**274**	**90**	**West**			
16	**Wall_016_W**	**18**	Building element towards neighb	**1**	x (	**2.29**	x	**1.33**	+		-		) -	**0.0**	=	3.0	03ud-03. Party wall	**0.405**	**274**	**90**	**West**			
17	**Roof_017_D**	**10**	Roof/Ceiling - Ambient	**1**	x (		x		+	**89.28**	-		) -	**0.0**	=	89.3	03ud-03. Party wall	**0.405**	**91**	**180**	**Hor**	**0.60**	**0.50**	**0.90**
18	**Floor_018_D**	**11**	Floor slab / Basement ceiling	**1**	x (	**3.58**	x	**2.34**	+		-		) -	**0.0**	=	8.4	14ud-First plan floor	**0.333**	**91**	**180**	**Hor**			
19	**Floor_019_D**	**11**	Floor slab / Basement ceiling	**1**	x (	**6.07**	x	**1.92**	+		-		) -	**0.0**	=	11.7	14ud-First plan floor	**0.333**	**91**	**180**	**Hor**			
20	**Floor_020_D**	**11**	Floor slab / Basement ceiling	**1**	x (		x		+	**6.27**	-		) -	**0.0**	=	6.3	14ud-First plan floor	**0.333**	**91**	**180**	**Hor**			
21	**Wall_021_N**	**8**	External wall - Ambient	**1**	x (	**6.07**	x	**2.90**	+		-		) -	**7.0**	=	10.6	01ud-01. Exterior wall	**0.173**	**4**	**90**	**North**	**0.60**	**0.50**	**0.90**
22	**Wall_022_W**	**18**	Building element towards neighb	**1**	x (	**6.25**	x	**3.31**	+		-		) -	**0.0**	=	20.7	02ud-02. Party wall	**0.405**	**274**	**90**	**West**			
23	**Wall_023_W**	**18**	Building element towards neighb	**1**	x (	**3.31**	x	**3.28**	+		-		) -	**0.0**	=	10.9	03ud-03. Party wall	**0.405**	**274**	**90**	**West**			
24	**Wall_024_W**	**18**	Building element towards neighb	**1**	x (	**7.33**	x	**3.31**	+		-		) -	**0.0**	=	24.3	02ud-02. Party wall	**0.405**	**274**	**90**	**West**			
25	**Wall_025_N**	**8**	External wall - Ambient	**1**	x (	**1.64**	x	**1.07**	+		-		) -	**0.0**	=	1.8	01ud-01. Exterior wall	**0.173**	**4**	**90**	**North**	**0.60**	**0.50**	**0.90**
26	**Wall_026_E**	**18**	Building element towards neighb	**1**	x (	**9.56**	x	**5.90**	+		-		) -	**0.0**	=	56.5	02ud-02. Party wall	**0.405**	**94**	**90**	**East**			
27	**Wall_027_E**	**18**	Building element towards neighb	**1**	x (	**9.56**	x	**7.56**	+		-		) -	**0.0**	=	72.3	08ud-17. Interior wall	**0.136**	**94**	**90**	**East**			
28	**Wall_028_E**	**18**	Building element towards neighb	**1**	x (	**9.56**	x	**3.63**	+		-		) -	**0.0**	=	34.7	02ud-02. Party wall	**0.405**	**94**	**90**	**East**			
29	**Wall_029_W**	**18**	Building element towards neighb	**1**	x (	**4.96**	x	**3.12**	+		-		) -	**0.0**	=	15.5	02ud-02. Party wall	**0.405**	**274**	**90**	**West**			
30	**Wall_030_W**	**18**	Building element towards neighb	**1**	x (	**7.37**	x	**3.12**	+		-		) -	**0.0**	=	23.0	03ud-03. Party wall	**0.405**	**274**	**90**	**West**			

Areas determination

St Johns Pl Passive House / Climate: New York / TFA: 478 m² / Heating: 16.3 kWh/(m²a) / Cooling: 10.6 kWh/(m²a) / PER: 83.9 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] 8 Months	Radiation-load cooling period [kWh/a] 9 Months
	Treated floor area	1	**477.89**	m²	*Treated floor area according to PHPP manual*					
A	**North windows**	2	**32.68**	m²	Results come from the 'Windows' worksheet.		**North windows**	**0.788**	**1284**	**2078**
A	**East windows**	3	**0.00**	m²	Window areas are subtracted from individual opaque areas.		**East windows**			
A	**South windows**	4	**32.33**	m²	which is displayed in the 'Windows' worksheet.		**South windows**	**0.819**	**2945**	**2953**
A	**West windows**	5	**0.00**	m²			**West windows**			
A	**Horizontal windows**	6	**0.00**	m²			**Horizontal windows**			
A	**Exterior door**	7	**7.31**	m²	*Please subtract area of door from respective building assembly*		**Exterior door**	**0.500**		
A	**External wall - Ambient**	8	**494.91**	m²	*Temperature zone "A" is ambient air*		**External wall - Ambient**	**0.139**	**125**	**339**
B	**External wall - Ground**	9	**45.01**	m²	*Temperature zone "B" is the ground*		**External wall - Ground**	**0.440**		
A	**Roof/Ceiling - Ambient**	10	**204.90**	m²			**Roof/Ceiling - Ambient**	**0.241**	**62**	**190**
B	**Floor slab / Basement ceiling**	11	**115.62**	m²			**Floor slab / Basement ceiling**	**0.532**		
		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	**71.00**	m	*Units in m*		**Thermal bridges Ambient**	**0.101**		
P	**Perimeter thermal bridges**	16	**0.00**	m	*Units in m; temperature zone "P" is perimeter (see 'Ground' worksheet)*		**Perimeter thermal bridges**			
B	**Thermal bridges FS/BC**	17	**22.00**	m	*Units in m*		**Thermal bridges FS/BC**	**0.500**		
I	**Building element towards neigh**	18	**412.73**	m²	*No heat losses, only considered for the heating load calculation*		**Building element towards neighbour**	0.340		
Total thermal envelope			**932.76**	**m²**			**Average therm. envelope**	**0.293**		

Go to building components list

31	Wall_031_W	18	Building element towards neighb	1	x (	4.53	x	3.12	+		-		) -	0.0	=	14.2	02ud-02. Party wall	0.405	274	90	West			
32	Wall_032_N	8	External wall - Ambient	1	x (	1.65	x	1.06	+		-		) -	0.0	=	1.7	01ud-01. Exterior wall	0.173	4	90	North	0.60	0.50	0.90
33	Wall_033_W	18	Building element towards neighb	1	x (	6.75	x	3.12	+		-		) -	0.0	=	21.1	02ud-02. Party wall	0.405	274	90	West			
34	Wall_034_W	18	Building element towards neighb	1	x (	3.12	x	1.77	+		-		) -	0.0	=	5.5	03ud-03. Party wall	0.405	274	90	West			
35	Wall_035_W	18	Building element towards neighb	1	x (	8.34	x	3.12	+		-		) -	0.0	=	26.1	02ud-02. Party wall	0.405	274	90	West			
36	Wall_036_E	8	External wall - Ambient	1	x (	16.12	x	1.95	+		-		) -	0.0	=	31.4	11ud-21. Exterior wall	0.146	94	90	East	0.60	0.50	0.90
37	Wall_037_S	8	External wall - Ambient	1	x (	16.12	x	6.07	+		-		) -	32.3	=	65.5	11ud-21. Exterior wall	0.146	184	90	South	0.60	0.50	0.90
38	Wall_038_W	8	External wall - Ambient	1	x (	16.12	x	2.18	+		-		) -	0.0	=	35.2	11ud-21. Exterior wall	0.146	274	90	West	0.60	0.50	0.90
39	Wall_039_N	8	External wall - Ambient	1	x (		x		+	73.26	-		) -	25.7	=	47.6	10ud-20. Exterior wall	0.129	4	90	North	0.60	0.50	0.90
40	Wall_040_E	18	Building element towards neighb	1	x (		x		+	0.74	-		) -	0.0	=	0.7	04ud-04. Exterior wall	0.135	94	90	East			
41	Wall_041_E	18	Building element towards neighb	1	x (		x		+	4.45	-		) -	0.0	=	4.5	08ud-17. Interior wall	0.136	94	90	East			
42	Wall_042_W	18	Building element towards neighb	1	x (		x		+	4.92	-		) -	0.0	=	4.9	04ud-04. Exterior wall	0.135	274	90	West			
43	Wall_043_W	18	Building element towards neighb	1	x (		x		+	1.58	-		) -	0.0	=	1.6	05ud-05. Exterior wall	0.129	274	90	West			
44	Wall_044_E	18	Building element towards neighb	1	x (		x		+	6.22	-		) -	0.0	=	6.2	04ud-04. Exterior wall	0.135	94	90	East			
45	Wall_045_W	18	Building element towards neighb	1	x (		x		+	9.01	-		) -	0.0	=	9.0	04ud-04. Exterior wall	0.135	274	90	West			
46	Wall_046_N	8	External wall - Ambient	1	x (	1.67	x	1.06	+		-		) -	0.0	=	1.8	01ud-01. Exterior wall	0.173	4	90	North	0.60	0.50	0.90
47	External Door_047_W	7	Exterior door	1	x (	1.31	x	0.85	+		-		) -	0.0	=	1.1	89ud	0.500	274	90	West	0.60	0.50	0.90
48	Wall_048_E	8	External wall - Ambient	1	x (		x		+	23.06	-		) -	0.0	=	23.1	04ud-04. Exterior wall	0.135	94	90	East	0.60	0.50	0.90
49	Wall_049_E	8	External wall - Ambient	1	x (		x		+	45.11	-		) -	0.0	=	45.1	08ud-17. Interior wall	0.136	94	90	East	0.60	0.50	0.90
50	Wall_050_W	8	External wall - Ambient	1	x (		x		+	39.31	-		) -	0.0	=	39.3	04ud-04. Exterior wall	0.135	274	90	West	0.60	0.50	0.90
51	Wall_051_E	8	External wall - Ambient	1	x (		x		+	32.48	-		) -	0.0	=	32.5	04ud-04. Exterior wall	0.135	94	90	East	0.60	0.50	0.90
52	Wall_052_W	8	External wall - Ambient	1	x (		x		+	10.04	-		) -	0.0	=	10.0	05ud-05. Exterior wall	0.129	274	90	West	0.60	0.50	0.90
53	Wall_053_W	8	External wall - Ambient	1	x (		x		+	44.54	-		) -	0.0	=	44.5	04ud-04. Exterior wall	0.135	274	90	West	0.60	0.50	0.90
54	Wall_054_N	8	External wall - Ambient	1	x (	1.65	x	1.06	+		-		) -	0.0	=	1.7	01ud-01. Exterior wall	0.173	4	90	North	0.60	0.50	0.90
55	Roof_055_H	10	Roof/Ceiling - Ambient	1	x (		x		+	94.47	-		) -	0.0	=	94.5	12ud-Roof	0.114	91	0	Hor	0.60	0.50	0.90
56	External Door_056_W	7	Exterior door	1	x (	1.88	x	1.02	+		-		) -	0.0	=	1.9	89ud	0.500	274	90	West	0.60	0.50	0.90
57	Wall_057_N	8	External wall - Ambient	1	x (	5.18	x	2.69	+		-		) -	0.0	=	14.0	07ud-16. Exterior wall	0.136	4	90	North	0.60	0.50	0.90
58	Wall_058_E	8	External wall - Ambient	1	x (	7.85	x	5.18	+		-		) -	0.0	=	40.7	06ud-15. Exterior wall	0.136	94	90	East	0.60	0.50	0.90
59	Wall_059_W	8	External wall - Ambient	1	x (		x		+	34.09	-		) -	0.0	=	34.1	06ud-15. Exterior wall	0.136	274	90	West	0.60	0.50	0.90
60	Wall_060_S	8	External wall - Ambient	1	x (		x		+	13.75	-		) -	0.0	=	13.7	07ud-16. Exterior wall	0.136	184	90	South	0.60	0.50	0.90
61	External Door_061_W	7	Exterior door	1	x (	2.13	x	1.02	+		-		) -	0.0	=	2.2	89ud	0.500	274	90	West	0.60	0.50	0.90
62	External Door_062_W	7	Exterior door	1	x (	2.08	x	1.02	+		-		) -	0.0	=	2.1	89ud	0.500	274	90	West	0.60	0.50	0.90
63	Wall_063_W	8	External wall - Ambient	1	x (	0.46	x	0.46	+		-		) -	0.0	=	0.2	06ud-15. Exterior wall	0.136	274	90	West	0.60	0.50	0.90
64	Wall_064_W	8	External wall - Ambient	1	x (	0.46	x	0.46	+		-		) -	0.0	=	0.2	06ud-15. Exterior wall	0.136	274	90	West	0.60	0.50	0.90
65	Wall_065_S	8	External wall - Ambient	1	x (	0.46	x	0.46	+		-		) -	0.0	=	0.2	07ud-16. Exterior wall	0.136	184	90	South	0.60	0.50	0.90
66	Roof_066_H	10	Roof/Ceiling - Ambient	1	x (	7.85	x	2.69	+		-		) -	0.0	=	21.1	12ud-Roof	0.114	91	0	Hor	0.60	0.50	0.90
67	-				x (		x		+		-		) -	0.0	=									
68	-				x (		x		+		-		) -	0.0	=									

Areas determination

St Johns Pl Passive House / Climate: New York / TFA: 478 m² / Heating: 16.3 kWh/(m²a) / Cooling: 10.6 kWh/(m²a) / PER: 83.9 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]
	Treated floor area	1	**477.89**	m²	*Treated floor area according to PHPP manual*				8 Months
A	**North windows**	2	**32.68**	m²	Results come from the 'Windows' worksheet.		**North windows**	**0.788**	**1284**
A	**East windows**	3	**0.00**	m²	Window areas are subtracted from individual opaque areas.		**East windows**		
A	**South windows**	4	**32.33**	m²	which is displayed in the 'Windows' worksheet.		**South windows**	**0.819**	**2945**
A	**West windows**	5	**0.00**	m²			**West windows**		
A	**Horizontal windows**	6	**0.00**	m²			**Horizontal windows**		
A	**Exterior door**	7	**7.31**	m²	*Please subtract area of door from respective building assembly*		**Exterior door**	**0.500**	
A	**External wall - Ambient**	8	**494.91**	m²	*Temperature zone "A" is ambient air*		**External wall - Ambient**	**0.139**	**125**
B	**External wall - Ground**	9	**45.01**	m²	*Temperature zone "B" is the ground*		**External wall - Ground**	**0.440**	
A	**Roof/Ceiling - Ambient**	10	**204.90**	m²			**Roof/Ceiling - Ambient**	**0.241**	**62**
B	**Floor slab / Basement ceiling**	11	**115.62**	m²			**Floor slab / Basement ceiling**	**0.532**	
		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	**71.00**	m	*Units in m*		**Thermal bridges Ambient**	**0.101**	
P	**Perimeter thermal bridges**	16	**0.00**	m	*Units in m; temperature zone "P" is perimeter (see 'Ground' worksheet)*		**Perimeter thermal bridges**		
B	**Thermal bridges FS/BC**	17	**22.00**	m	*Units in m*		**Thermal bridges FS/BC**	**0.500**	
I	**Building element towards neigh**	18	**412.73**	m²	*No heat losses, only considered for the heating load calculation*		**Building element towards neighbour**	0.340	
Total thermal envelope			**932.76**	**m²**			**Average therm. envelope**	**0.293**	

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	**Intermediate Floor (NEUT)**				x (		-		) =				or			
2	**Footing (NEUT)**				x (		-		) =				or			
3	**Wall Corner (NEUT**				x (		-		) =				or			
4	**Balcony Connection**	**15**	Thermal bridges Ambient	**6**	x (	**1.00**	-		) =	6.00	**0.50**		or		**0.500**	
5	**Plumbing**	**15**	Thermal bridges Ambient	**5**	x (	**1.00**	-		) =	5.00	**0.30**		or		**0.300**	
6	**Structural**	**17**	Thermal bridges FS/BC	**22**	x (	**1.00**	-		) =	22.00	**0.50**		or		**0.500**	
7	**Party Wall**	**15**	Thermal bridges Ambient	**4**	x (	**15.00**	-		) =	60.00	**0.045**		or		**0.045**	
8	-				x (		-		) =				or			
9	-				x (		-		) =				or			
10	-				x (		-		) =				or			
11	-				x (		-		) =				or			
12	-				x (		-		) =				or			
13	-				x (		-		) =				or			
14	-				x (		-		) =				or			
15	-				x (		-		) =				or			
16	-				x (		-		) =				or			
17	-				x (		-		) =				or			
18	-				x (		-		) =				or			
19	-				x (		-		) =				or			
20	-				x (		-		) =				or			
21	-				x (		-		) =				or			
22	-				x (		-		) =				or			
23	-				x (		-		) =				or			
24	-				x (		-		) =				or			
25	-				x (		-		) =				or			
26	-				x (		-		) =				or			
27	-				x (		-		) =				or			
28	-				x (		-		) =				or			
29	-				x (		-		) =				or			
30	-				x (		-		) =				or			
31	-				x (		-		) =				or			
32	-				x (		-		) =				or			
33	-				x (		-		) =				or			
34	-				x (		-		) =				or			

Heat losses through the ground

St Johns Pl Passive House / Climate: New York / TFA: 478 m² / Heating: 16.3 kWh/(m²a) / Cooling: 10.6 kWh/(m²a) / PER: 83.9 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	$T_{g,ave}$	13.8	°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	0.532	W/(m²K)
Area of ground floor slab / basement c	A	89.3	m²	TBs floor slab / basement ceiling	Ψ_B*l		W/K
Perimeter length	P	12.0	m	U-value floor slab / basement ceiling i	U_f'	0.532	W/(m²K)
Charact. dimension of floor slab	B'	14.88	m	Equivalent thickness floor	d_t	3.76	m

Floor slab type (select only one)

	Slab on grade						
	Perimeter insulation width/depth	D		m	Orientation of perimeter insulation	horizontal	
	Perimeter insulation thickness	d_n		m	(check only one field)	vertical	x
	Conductivity perimeter insulation	λ_n		W/(mK)			
x	**Heated basement or floor slab completely / partially below ground level**						
	Basement wall height below ground le	z	2.00	m	U-Value wall below ground	U_{wB}	0.440 W/(m²K)
	Unheated basement						
	Height aboveground wall	h		m	U-Value wall above ground	U_W	W/(m²K)
	Basement wall height below ground le	z		m	U-Value wall below ground	U_{WB}	W/(m²K)
	Air change unheated basement	n	0.20	h^{-1}	U-Value basement floor slab	U_{fB}	W/(m²K)
	Air volume basement	V		m³			
	Suspended floor above a ventilated crawl space (at max. 0.5 m below ground)						
	U-Value crawl space	U_{Crawl}		W/(m²K)	Area of ventilation openings	εP	m²
	Height of crawl space wall	h		m	Wind velocity at 10 m height	v	4.0 m/s
	U-Value crawl space wall	U_W		W/(m²K)	Wind shield factor	f_W	0.05 -

Additional thermal bridge heat losses at perimeter				Steady-state fraction	$\Psi_{P,stat}$*l		W/K
Phase shift	β		Months	Harmonic fraction	$\Psi_{P,harm}$*l	0.000	W/K

Groundwater correction							
Depth of the groundwater table	z_w	3.0	m	Groundwater correction factor	G_w	1.18934198	-
Groundwater flow rate	q_w	0.05	m/d				

Interim results

Phase shift	β	1.24	Months	Steady-state heat flow	Φ_{stat}	175.0	W
Steady-state transmittance	L_S	28.43	W/K	Periodic heat flow	Φ_{harm}	47.1	W
Exterior periodic transmittance	L_{pe}	7.28	W/K	Heat losses during heating period	Q_{tot}	928	kWh
Transmittance building	L_0	58.07	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	15.9	15.5	15.5	15.9	16.6	17.4	18.1	18.5	18.5	18.1	17.4	16.6	17.0
Summer	18.4	18.1	18.1	18.5	19.2	19.9	20.6	21.0	21.0	20.6	19.9	19.1	19.5

Design ground temperature for 'Heating load' worksheet 15.5 **For 'Cooling load' worksheet** 21.0

Reduction factor for 'Annual heating' worksheet 0.25

Total result (all building parts)

Phase shift	β	1.24	Months	Steady-state heat flow	Φ_{stat}	175.0	W
Steady-state transmittance	L_S	28.43	W/K	Periodic heat flow	Φ_{harm}	47.1	W
Exterior periodic transmittance	L_{pe}	7.28	W/K	Heat losses during heating period	Q_{tot}	928	kWh
Transmittance building	L_0	58.07	W/K	Charact. dimension of floor slab	B'	14.88	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	**15.9**	**15.5**	**15.5**	**15.9**	**16.6**	**17.4**	**18.1**	**18.5**	**18.5**	**18.1**	**17.4**	**16.6**	**17.0**
Summer	**18.4**	**18.1**	**18.1**	**18.5**	**19.2**	**19.9**	**20.6**	**21.0**	**21.0**	**20.6**	**19.9**	**19.1**	**19.5**

Design ground temperature for 'Heating load' worksheet 15.5 **For 'Cooling load' worksheet** 21.0

Reduction factor for 'Annual heating' worksheet **0.25**

Passive House Components

St Johns Pl Passive House / Climate: New York / TFA: 478 m² / Heating: 16.3 kWh/(m²a) / Cooling: 10.6 kWh/(m²a) / PER: 83.9 kWh/(m²a)

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

Building assemblies (U-Values)

Recommended starting values for optimisation: U-values for walls and roofs | Floor slabs: 0.3 W/(m²K) | 0.77 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	**01. Exterior wall**	**01. Exterior wall**	**1.000**	**0.173**	**0**
02ud	**02. Party wall**	**02. Party wall**	**1.000**	**0.405**	**0**
03ud	**03. Party wall**	**03. Party wall**	**1.000**	**0.405**	**0**
04ud	**04. Exterior wall**	**04. Exterior wall**	**1.000**	**0.135**	**0**
05ud	**05. Exterior wall**	**05. Exterior wall**	**1.000**	**0.129**	**0**
06ud	**15. Exterior wall**	**15. Exterior wall**	**0.406**	**0.136**	**0**
07ud	**16. Exterior wall**	**16. Exterior wall**	**0.457**	**0.136**	**0**
08ud	**17. Interior wall**	**17. Interior wall**	**1.000**	**0.136**	**0**
09ud	**18. Exterior wall**	**18. Exterior wall**	**1.000**	**0.440**	**0**
10ud	**20. Exterior wall**	**20. Exterior wall**	**1.000**	**0.129**	**0**

Glazing			Glazing
	Recommended glazing type to start planning: Triple thermally insulated glazing (Please consider the comfort criterion!)		
ID	Description	g-Value	U_g-Value
			W/(m²K)
01ud	Windows	0.49	0.51
02ud	Doors	0.61	0.79
03ud		0.00	0.00
04ud		0.00	0.00
05ud		0.00	0.00
06ud		0.00	0.00
07ud		0.00	0.00
08ud		0.00	0.00
09ud		0.00	0.00
10ud		0.00	0.00

Window frames

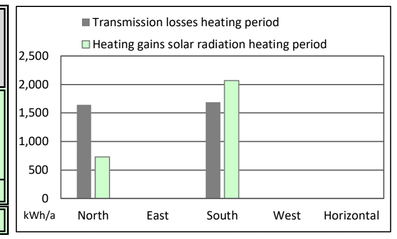
Window frames

ID	Description	U_f-Value				Frame width				Glazing edge thermal bridge				Installation thermal bridge				Curtain wall facades:
		left	right	bottom	above	left	right	bottom	above	$\Psi_{Glazing\ edge}$ left	$\Psi_{Glazing\ edge}$ right	$\Psi_{Glazing\ edge}$ bottom	$\Psi_{Glazing\ edge}$ top	$\Psi_{Installation}$ left	$\Psi_{Installation}$ right	$\Psi_{Installation}$ bottom	$\Psi_{Installation}$ top	χ_{GC} -value Glass carrier
		W/(m²K)	W/(m²K)	W/(m²K)	W/(m²K)	m	m	m	m	W/(mK)	W/(mK)	W/(mK)	W/(mK)	W/(mK)	W/(mK)	W/(mK)	W/(mK)	W/K
01ud	Fixed	0.76	0.76	0.76	0.76	0.081	0.081	0.081	0.081	0.024	0.024	0.024	0.024	0.052	0.052	0.052	0.052	
02ud	Tilt & Turn	0.76	0.76	0.76	0.76	0.102	0.102	0.102	0.102	0.024	0.024	0.024	0.024	0.052	0.052	0.052	0.052	
03ud	Glazed door	0.76	0.76	0.76	0.76	0.102	0.102	0.102	0.102	0.024	0.024	0.024	0.024	0.052	0.052	0.052	0.052	
04ud	Entrance door	0.76	0.76	0.76	0.76	0.125	0.125	0.125	0.125	0.024	0.024	0.024	0.024	0.052	0.052	0.052	0.052	
05ud	Sash	0.76	0.76	0.76	0.76	0.102	0.102	0.102	0.102	0.024	0.024	0.024	0.024	0.052	0.052	0.052	0.052	
06ud	Fixed part door	0.76	0.76	0.76	0.76	0.080	0.080	0.080	0.080	0.024	0.024	0.024	0.024	0.052	0.052	0.052	0.052	
07ud																		
08ud																		
09ud																		
10ud																		

Windows

St Johns Pl Passive House / Climate: New York / TFA: 478 m² / Heating: 16.3 kWh/(m²a) / Cooling: 10.6 kWh/(m²a) / PER: 83.9 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	0.67	0.95	0.85	0.71	0.50	0.39	32.68	0.79	23.32	115	North	1642	727
East	301	1.00	0.95	0.85	0.00	0.00	0.00	0.00	0.00	0.00	301	East	0	0
South	570	0.38	0.95	0.85	0.70	0.52	0.22	32.33	0.82	22.79	568	South	1687	2067
West	287	1.00	0.95	0.85	0.00	0.00	0.00	0.00	0.00	0.00	287	West	0	0
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.						0.51	0.30	65.01	0.80	46.10			3328	2794



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

Quantity	Description	Deviation from north	Angle of inclination from the horizontal	Orientation	Window rough openings: Width	Window rough openings: Height	Installed in: Selection from 'Areas' worksheet	Glazing: Selection from 'Components' worksheet	Frame: Selection from 'Components' worksheet	g-Value: Perpendicular radiation	U-Value: Glazing	U-Value: Frames (avg.)	Ψ Glazing edge (Avg.)	Installation situation: left	right	bottom	top	Ψ Installation (Avg.)	Results: Window Area	Glazing area	U_w installed	Glazed fraction per window
		°	°		m	m		1-Sorting: LIKE LIST	1-Sorting: LIKE LIST	-	W/(m²K)	W/(m²K)	W/(mK)	W/(mK) or 1/0				W/(mK)	m²	m²	W/(m²K)	%
1	d-front-01b	3.8	90	North	1.017	2.134	21-Wall_021_N	02ud-Doors	04ud-Entrance door	0.61	0.79	0.76	0.024	0	1	1	0	0.052	2.2	1.44	0.92	67%
1	d-front-01a	3.8	90	North	0.457	2.134	21-Wall_021_N	02ud-Doors	06ud-Fixed part door	0.61	0.79	0.76	0.024	1	0	1	0	0.052	1.0	0.59	1.03	60%
1	d-rear-01	183.8	90	South	0.915	2.285	37-Wall_037_S	02ud-Doors	03ud-Glazed door	0.61	0.79	0.76	0.024	0	1	1	1	0.052	2.1	1.48	0.95	71%
1	w-rear-02b	183.8	90	South	1.275	1.470	37-Wall_037_S	01ud-Windows	01ud-Fixed	0.49	0.51	0.76	0.024	0	1	1	1	0.052	1.9	1.46	0.74	78%
1	w-rear-02a	183.8	90	South	0.860	1.470	37-Wall_037_S	01ud-Windows	02ud-Tilt & Turn	0.49	0.51	0.76	0.024	1	0	1	1	0.052	1.3	0.83	0.80	66%
1	w-rear-01	183.8	90	South	0.915	1.470	37-Wall_037_S	01ud-Windows	05ud-Sash	0.49	0.51	0.76	0.024	1	0	1	1	0.052	1.3	0.90	0.79	67%
1	w-front-01a	3.8	90	North	1.281	1.522	21-Wall_021_N	01ud-Windows	01ud-Fixed	0.49	0.51	0.76	0.024	1	0	1	1	0.052	1.9	1.52	0.74	78%
1	w-front-01b	3.8	90	North	0.849	1.522	21-Wall_021_N	01ud-Windows	02ud-Tilt & Turn	0.49	0.51	0.76	0.024	0	1	1	1	0.052	1.3	0.85	0.80	66%
1	d-front-01c	3.8	90	North	1.474	0.432	21-Wall_021_N	02ud-Doors	06ud-Fixed part door	0.61	0.79	0.76	0.024	1	1	0	1	0.052	0.6	0.36	1.09	56%
1	w-front-03a	3.8	90	North	1.275	1.664	39-Wall_039_N	01ud-Windows	01ud-Fixed	0.49	0.51	0.76	0.024	1	0	1	1	0.052	2.1	1.67	0.73	79%
1	w-front-02b	3.8	90	North	0.681	1.664	39-Wall_039_N	01ud-Windows	02ud-Tilt & Turn	0.49	0.51	0.76	0.024	0	1	1	1	0.052	1.1	0.70	0.83	61%
1	w-front-02a	3.8	90	North	1.036	1.664	39-Wall_039_N	01ud-Windows	01ud-Fixed	0.49	0.51	0.76	0.024	1	0	1	1	0.052	1.7	1.31	0.75	76%
1	w-front-03b	3.8	90	North	0.860	1.664	39-Wall_039_N	01ud-Windows	02ud-Tilt & Turn	0.49	0.51	0.76	0.024	0	1	1	1	0.052	1.4	0.96	0.79	67%
1	w-rear-03b	183.8	90	South	0.915	1.525	37-Wall_037_S	01ud-Windows	05ud-Sash	0.49	0.51	0.76	0.024	0	1	1	1	0.052	1.4	0.94	0.79	67%
1	w-rear-03a	183.8	90	South	0.915	1.525	37-Wall_037_S	01ud-Windows	05ud-Sash	0.49	0.51	0.76	0.024	1	0	1	1	0.052	1.4	0.94	0.79	67%
1	w-rear-04b	183.8	90	South	1.275	1.525	37-Wall_037_S	01ud-Windows	01ud-Fixed	0.49	0.51	0.76	0.024	0	1	1	1	0.052	1.9	1.52	0.74	78%
1	w-rear-04a	183.8	90	South	0.860	1.525	37-Wall_037_S	01ud-Windows	02ud-Tilt & Turn	0.49	0.51	0.76	0.024	1	0	1	1	0.052	1.3	0.87	0.80	66%
1	d-rear-02	183.8	90	South	0.915	2.286	37-Wall_037_S	02ud-Doors	04ud-Entrance door	0.61	0.79	0.76	0.024	0	1	1	1	0.052	2.1	1.35	0.95	65%
1	w-front-04b	3.8	90	North	0.681	1.670	39-Wall_039_N	01ud-Windows	02ud-Tilt & Turn	0.49	0.51	0.76	0.024	0	1	1	1	0.052	1.1	0.70	0.83	61%
1	w-front-04a	3.8	90	North	1.036	1.670	39-Wall_039_N	01ud-Windows	01ud-Fixed	0.49	0.51	0.76	0.024	1	0	1	1	0.052	1.7	1.32	0.75	76%
1	w-front-05a	3.8	90	North	1.275	1.664	39-Wall_039_N	01ud-Windows	01ud-Fixed	0.49	0.51	0.76	0.024	1	0	1	1	0.052	2.1	1.67	0.73	79%
1	w-front-05b	3.8	90	North	0.860	1.664	39-Wall_039_N	01ud-Windows	02ud-Tilt & Turn	0.49	0.51	0.76	0.024	0	1	1	1	0.052	1.4	0.96	0.79	67%
1	w-rear-06b	183.8	90	South	1.275	1.470	37-Wall_037_S	01ud-Windows	01ud-Fixed	0.49	0.51	0.76	0.024	0	1	1	1	0.052	1.9	1.46	0.74	78%
1	w-rear-06a	183.8	90	South	0.860	1.470	37-Wall_037_S	01ud-Windows	02ud-Tilt & Turn	0.49	0.51	0.76	0.024	1	0	1	1	0.052	1.3	0.83	0.80	66%
1	w-rear-05	183.8	90	South	0.915	1.470	37-Wall_037_S	01ud-Windows	05ud-Sash	0.49	0.51	0.76	0.024	1	0	1	1	0.052	1.3	0.90	0.79	67%
1	d-rear-03	183.8	90	South	0.915	2.285	37-Wall_037_S	02ud-Doors	03ud-Glazed door	0.61	0.79	0.76	0.024	0	1	1	1	0.052	2.1	1.48	0.95	71%
1	w-front-07a	3.8	90	North	1.067	1.664	39-Wall_039_N	01ud-Windows	01ud-Fixed	0.49	0.51	0.76	0.024	1	0	1	1	0.052	1.8	1.36	0.75	77%
1	w-front-06b	3.8	90	North	0.681	1.667	39-Wall_039_N	01ud-Windows	02ud-Tilt & Turn	0.49	0.51	0.76	0.024	0	1	1	1	0.052	1.1	0.70	0.83	61%
1	w-front-06a	3.8	90	North	1.036	1.667	39-Wall_039_N	01ud-Windows	01ud-Fixed	0.49	0.51	0.76	0.024	1	0	1	1	0.052	1.7	1.31	0.75	76%
1	w-front-07b	3.8	90	North	1.067	1.664	39-Wall_039_N	01ud-Windows	02ud-Tilt & Turn	0.49	0.51	0.76	0.024	0	1	1	1	0.052	1.8	1.26	0.76	71%
1	w-rear-08b	183.8	90	South	1.275	1.470	37-Wall_037_S	01ud-Windows	01ud-Fixed	0.49	0.51	0.76	0.024	0	1	1	1	0.052	1.9	1.46	0.74	78%
1	w-rear-08a	183.8	90	South	0.860	1.470	37-Wall_037_S	01ud-Windows	02ud-Tilt & Turn	0.49	0.51	0.76	0.024	1	0	1	1	0.052	1.3	0.83	0.80	66%
1	w-rear-07	183.8	90	South	0.915	1.470	37-Wall_037_S	01ud-Windows	05ud-Sash	0.49	0.51	0.76	0.024	1	0	1	1	0.052	1.3	0.90	0.79	67%
1	d-rear-04	183.8	90	South	0.915	2.285	37-Wall_037_S	02ud-Doors	03ud-Glazed door	0.61	0.79	0.76	0.024	0	1	1	1	0.052	2.1	1.48	0.95	71%
1	w-front-09a	3.8	90	North	1.275	1.664	39-Wall_039_N	01ud-Windows	01ud-Fixed	0.49	0.51	0.76	0.024	1	0	1	1	0.052	2.1	1.67	0.73	79%
1	w-front-08b	3.8	90	North	0.681	1.668	39-Wall_039_N	01ud-Windows	02ud-Tilt & Turn	0.49	0.51	0.76	0.024	0	1	1	1	0.052	1.1	0.70	0.83	61%
1	w-front-08a	3.8	90	North	1.036	1.668	39-Wall_039_N	01ud-Windows	01ud-Fixed	0.49	0.51	0.76	0.024	1	0	1	1	0.052	1.7	1.32	0.75	76%
1	w-front-09b	3.8	90	North	0.860	1.664	39-Wall_039_N	01ud-Windows	02ud-Tilt & Turn	0.49	0.51	0.76	0.024	0	1	1	1	0.052	1.4	0.96	0.79	67%
1	w-rear-10b	183.8	90	South	1.275	1.470	37-Wall_037_S	01ud-Windows	01ud-Fixed	0.49	0.51	0.76	0.024	0	1	1	1	0.052	1.9	1.46	0.74	78%
1	w-rear-10a	183.8	90	South	0.860	1.470	37-Wall_037_S	01ud-Windows	02ud-Tilt & Turn	0.49	0.51	0.76	0.024	1	0	1	1	0.052	1.3	0.83	0.80	66%
1	w-rear-09	183.8	90	South	0.915	1.470	37-Wall_037_S	01ud-Windows	05ud-Sash	0.49	0.51	0.76	0.024	1	0	1	1	0.052	1.3	0.90	0.79	67%
	-																					
	-																					
	-																					
	<End of designPH import!>																					

Calculation of shading coefficients

St Johns Pl Passive House / Climate: New York / TFA: 478 m² / Heating: 16.3 kWh/(m²a) / Cooling: 10.6 kWh/(m²a) / PER: 83.9 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	23.32	67%	63%	63%	89
East	0.00	100%	100%	100%	0
South	22.79	38%	32%	32%	130
West	0.00	100%	100%	100%	0
Horizontal	0.00	100%	100%	100%	0

								Horizon		Lateral reveal		Reveal / Overhang							Reduction factors for shading in winter				Reduction factors for shading in summer				
Quan-tity	Description	Deviation from North	Angle of inclination from the horizontal	Orientation	Glazing width	Glazing height	Glazing area	Height of the shading object	Horizontal distance	Window reveal depth	Distance from glazing edge to reveal	Overhang depth	Distance from upper glazing edge to overhang	Additional reduction factor winter shading	Additional reduction factor summer shading	Reduction factor z for temporary sun protection	Regulated / transparent	Horizon	Reveal	Overhang	Total for heating case	Horizon	Reveal	Overhang	Total for cooling case	Total for cooling load
		[Degree]	[Degree]		w_G [m]	h_G [m]	A_G [m^2]	h_{Hori} [m]	d_{Hori} [m]	o_{Reveal} [m]	d_{Reveal} [m]	o_{over} [m]	d_{over} [m]	$r_{other,w}$ [%]	$r_{other,s}$ [%]	z [%]		r_H [%]	r_R [%]	r_O [%]	r_S [%]	r_H [%]	r_R [%]	r_O [%]	$r_{S,1}$ [%]	$r_{S,2}$ [%]
1	d-front-01b	4	90	North	0.77	1.88	1.4							51%	48%						51%				48%	48%
1	d-front-01a	4	90	North	0.30	1.97	0.6							49%	47%						49%				47%	47%
1	d-rear-01	184	90	South	0.71	2.08	1.5							21%	25%						21%				25%	25%
1	w-rear-02b	184	90	South	1.11	1.31	1.5							20%	20%						20%				20%	20%
1	w-rear-02a	184	90	South	0.66	1.27	0.8							20%	20%						20%				20%	20%
1	w-rear-01	184	90	South	0.71	1.27	0.9							17%	20%						17%				20%	20%
1	w-front-01a	4	90	North	1.12	1.36	1.5							56%	52%						56%				52%	52%
1	w-front-01b	4	90	North	0.65	1.32	0.9							55%	51%						55%				51%	51%
1	d-front-01c	4	90	North	1.31	0.27	0.4							45%	43%						45%				43%	43%
1	w-front-03a	4	90	North	1.11	1.50	1.7							60%	56%						60%				56%	56%
1	w-front-02b	4	90	North	0.48	1.46	0.7							51%	48%						51%				48%	48%
1	w-front-02a	4	90	North	0.87	1.50	1.3							55%	52%						55%				52%	52%
1	w-front-03b	4	90	North	0.66	1.46	1.0							57%	53%						57%				53%	53%
1	w-rear-03b	184	90	South	0.71	1.32	0.9							22%	20%						22%				20%	20%
1	w-rear-03a	184	90	South	0.71	1.32	0.9							20%	19%						20%				19%	19%
1	w-rear-04b	184	90	South	1.11	1.36	1.5							25%	23%						25%				23%	23%
1	w-rear-04a	184	90	South	0.66	1.32	0.9							22%	22%						22%				22%	22%
1	d-rear-02	184	90	South	0.66	2.04	1.4							38%	31%						38%				31%	31%
1	w-front-04b	4	90	North	0.48	1.47	0.7							61%	56%						61%				56%	56%
1	w-front-04a	4	90	North	0.87	1.51	1.3							65%	61%						65%				61%	61%
1	w-front-05a	4	90	North	1.11	1.50	1.7							70%	66%						70%				66%	66%
1	w-front-05b	4	90	North	0.66	1.46	1.0							67%	62%						67%				62%	62%
1	w-rear-06b	184	90	South	1.11	1.31	1.5							32%	28%						32%				28%	28%
1	w-rear-06a	184	90	South	0.66	1.27	0.8							31%	26%						31%				26%	26%
1	w-rear-05	184	90	South	0.71	1.27	0.9							26%	23%						26%				23%	23%
1	d-rear-03	184	90	South	0.71	2.08	1.5							62%	47%						62%				47%	47%
1	w-front-07a	4	90	North	0.91	1.50	1.4							80%	77%						80%				77%	77%
1	w-front-06b	4	90	North	0.48	1.46	0.7							71%	68%						71%				68%	68%
1	w-front-06a	4	90	North	0.87	1.50	1.3							75%	72%						75%				72%	72%
1	w-front-07b	4	90	North	0.86	1.46	1.3							79%	75%						79%				75%	75%
1	w-rear-08b	184	90	South	1.11	1.31	1.5							47%	38%						47%				38%	38%
1	w-rear-08a	184	90	South	0.66	1.27	0.8							46%	36%						46%				36%	36%
1	w-rear-07	184	90	South	0.71	1.27	0.9							52%	42%						52%				42%	42%
1	d-rear-04	184	90	South	0.71	2.08	1.5							68%	54%						68%				54%	54%
1	w-front-09a	4	90	North	1.11	1.50	1.7							87%	84%						87%				84%	84%
1	w-front-08b	4	90	North	0.48	1.46	0.7							79%	75%						79%				75%	75%
1	w-front-08a	4	90	North	0.87	1.51	1.3							82%	80%						82%				80%	80%
1	w-front-09b	4	90	North	0.66	1.46	1.0							84%	80%						84%				80%	80%
1	w-rear-10b	184	90	South	1.11	1.31	1.5							53%	42%						53%				42%	42%
1	w-rear-10a	184	90	South	0.66	1.27	0.8							53%	43%						53%				43%	43%
1	w-rear-09	184	90	South	0.71	1.27	0.9							54%	43%						54%				43%	43%
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Ventilation data

St Johns Pl Passive House / Climate: New York / TFA: 478 m² / Heating: 16.3 kWh/(m²a) / Cooling: 10.6 kWh/(m²a) / PER: 83.9 kWh/(m²a)

Treated floor area A_{TFA}	m²	478	*('Areas' worksheet)*
Room height h	m	2.50	
Volume of ventilated space (A_{TFA}*h) : V_V	m³	1195	*(Worksheet 'Annual heating')*

Ventilation type

Please select: 1-Balanced PH ventilation with HR

Infiltration air change rate

Wind protection coefficients e and f		
Coefficient e for wind protection class	Several side exposed	One side exposed
No protection	0.10	0.03
Moderate protection	0.07	0.02
High protection	0.04	0.01
Coefficient f	15	20

			For annual demand:	For heating load:			
Wind protection coefficient, e			0.04	0.10			
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	0.80	0.80	1553	m³	1.33 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	0.042	0.104

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 [-]
508	0.42	0.00	79.9%	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
29%	29%	34%	44%	61%	-	-	-	-	57%	42%	33%

Standard data input for balanced ventilation

Dimensioning of ventilation system with only one ventilation unit

Occupancy	m²/P	41				
Number of occupants	P	11.6				
Supply air per person	m³/(P*h)	30				
Supply air requirement	m³/h	347		Bathroom		
Extract air rooms		Kitchen	Bathroom	(shower only)	WC	
Quantity		5	9			
Extract air requirement per room	m³/h	60	40	20	20	
Total extract air requirement	m³/h	660				

Design air flow rate (maximum) m³/h **660** Recommended: 660 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		1.00	660	0.55
Standard	**24.0**	**0.77**	508	0.42
Basic ventilation		**0.54**	355	0.30
Minimum		**0.40**	264	0.22
		Average value 0.77	Average air flow rate (m³/h) **508**	Average air change rate (1/h) **0.42**

Factors referenced to

Selection of ventilation unit with heat recovery

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

	Go to ventilation units list 1-Sorting: LIKE LIST	Heat recovery efficiency	Humidity recovery efficiency	Specific efficiency [Wh/m³]	Application [m³/h]	Frost power input
Ventilation unit selection	**0329vs03-Zehnder - ComfoAir550, ComfoD550, WHR**	**0.84**	**0.00**	**0.31**	**110 - 308**	**yes**

Conductivity outdoor air duct	Ψ	W/(mK)	**0.491**
Length of outdoor air duct		m	**9**
Conductivity exhaust air duct	Ψ	W/(mK)	**0.491**
Length of exhaust air duct		m	**9**
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]	**3**
Useful energy [kWh/a]	1182
Room temperature (°C)	**20**
Avg. ambient temp. heat. period (°C)	**5.6**
Avg. ground temp (°C)	**13.8**

Effective heat recovery efficiency $\eta_{HR,eff}$ **79.9%**

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	160	mm
Insulation thic	50	mm
Reflective coating?		Yes
	x	No
Thermal conductivity	0.044	W/(mK)
Nominal air flow rate	508	m³/h
Δϑ	14	K
Exterior duct diameter	0.160	m
Exterior diameter	0.260	m
α–Interior	26.41	W/(m²K)
α-Surface	5.92	W/(m²K)
Ψ–value	**0.491**	**W/(mK)**
Surface temperature difference	1.458	K

Secondary calculation

Ψ-value extract or exhaust air duct

Nominal width:	160	mm
Insulation thickness	50	mm
Reflective coating?		yes
	x	no
Thermal conductivity	0.044	W/(mK)
Nominal air flow rate	508	m³/h
Δϑ	14	K
Exterior duct diameter	0.160	m
Exterior diameter	0.260	m
α–Interior	26.41	W/(m²K)
α-Surface	5.92	W/(m²K)
Ψ–value	**0.491**	**W/(mK)**
Surface temperature difference	1.458	K

Specific energy for heating (monthly method)

St Johns Pl Passive House / Climate: New York / TFA: 478 m² / Heating: 16.3 kWh/(m²a) / Cooling: 10.6 kWh/(m²a) / PER: 83.9 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:	Multifamily Residential	
Treated floor area A_{TFA}:	477.9	m²
Spec. Capacity:	84	Wh/(m²K)

Transmission heat losses Q_T

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	494.9	*	0.139	*	1.00	*	73	=	4999	10.46
External wall - Ground	B	45.0	*	0.440	*	1.00	*	21	=	411	0.86
Roof/Ceiling - Ambient	A	204.9	*	0.241	*	1.00	*	73	=	3591	7.51
Floor slab / Basement ceiling	B	115.6	*	0.532	*	1.00	*	21	=	1278	2.67
	A		*		*	1.00	*		=		
	A		*		*	1.00	*		=		
	X		*		*	0.75	*		=		
Windows	A	65.0	*	0.803	*	1.00	*	73	=	3801	7.95
Exterior door	A	7.3	*	0.500	*	1.00	*	73	=	266	0.56
Exterior TB (length/m)	A	71.0	*	0.101	*	1.00	*	73	=	524	1.10
Perimeter TB (length/m)	P		*		*	1.00	*		=		0.00
Ground TB (length/m)	B	22.0	*	0.500	*	1.00	*	21	=	228	0.48
											kWh/(m²a)
Transmission heat losses Q_T									Total	15099	31.6

Ventilation heat losses Q_V

	Effective air volume V_V	A_{TFA} m²		Clear room height m		m³
		478	*	2.50	=	1195

	$n_{V,system}$ 1/h		η*SHX		η_{HR}		$n_{V,Res}$ 1/h		$n_{V,equi,fraction}$ 1/h
Effective air change rate Ambient nV,e	0.425	*(1-	0%	)*(1-	0.80	)+	0.042	=	0.127
Effective air change rate Ground nV,g	0.425	*	0%	*(1-	0.80	)		=	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	1195	*	0.127	*	0.33	*	73	=	3643	7.6
Ventilation losses ground $Q_{V,e}$	1195	*	0.000	*	0.33	*	36	=	0	0.0
Ventilation heat losses Q_V								Total	3643	7.6

Total heat losses Q_L

	Q_T kWh/a		Q_V kWh/a		Reduction factor night/weekend saving		kWh/a	kWh/(m²a)
Total heat losses Q_L	(15099	+	3643	) *	1.0	=	18742	**39.2**

Available solar heat gains Q_S

Orientation of the area	Reduction factor see 'Windows' worksheet		g-Value (perp. radiation)		Area m²		Global radiation kWh/(m²a)		kWh/a
North	0.39	*	0.50	*	32.7	*	203	=	1284
East	0.00	*	0.00	*	0.0	*	495	=	0
South	0.22	*	0.52	*	32.3	*	810	=	2945
West	0.00	*	0.00	*	0.0	*	484	=	0
Horizontal	0.00	*	0.00	*	0.0	*	788	=	0
Sum opaque areas									756
									kWh/(m²a)
Available solar heat gains Q_S								Total	4985	10.4

Internal heat gains Q_I

	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	*	243	*	2.6	*	477.9	=	7311	15.3

			kWh/a	kWh/(m²a)
Free heat Q_F	Q_S + Q_I	=	12296	25.7
Ratio free heat to losses	Q_F / Q_L	=	0.66	
Utilisation factor heat gains h_G		=	89%	
Heat gains Q_G	η_G * Q_F	=	10930	**22.9**

			kWh/a	kWh/(m²a)
Annual heating demand Q_H	Q_L - Q_G	=	7812	**16**

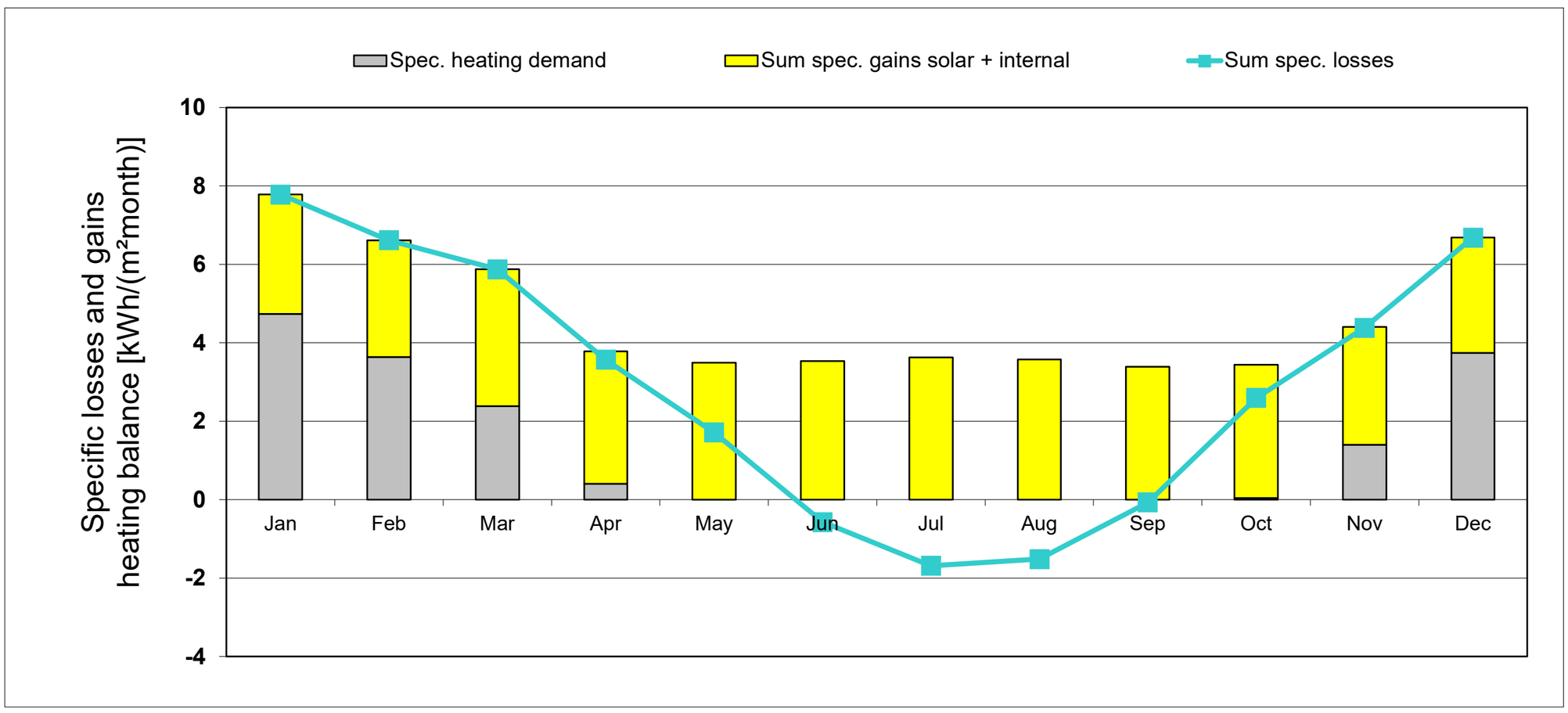
	kWh/(m²*a)		(Yes/No)
Limiting value	20	**Requirement met?**	**Yes**

Specific energy for heating (monthly method)

St Johns Pl Passive House / Climate: New York / TFA: 478 m² / Heating: 16.3 kWh/(m²a) / Cooling: 10.6 kWh/(m²a) / PER: 83.9 kWh/(m²a)

Interior temperature: **20** °C
Building type: **Multifamily Residential**
Treated floor area A_{TFA}: **478** m²

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	
Heating degree hours - Externa	14.9	12.5	10.8	6.2	2.5	-1.2	-3.3	-2.8	0.1	4.8	8.3	12.8	66	kKh
Heating degree hours - Ground	3.1	3.0	3.3	2.9	2.5	0.0	-0.5	-0.8	-0.7	1.4	1.9	2.5	19	kKh
Losses - Exterior	3438	2883	2499	1434	584	-277	-763	-654	35	1107	1920	2959	15165	kWh
Losses - Ground	282	279	308	272	233	3	-43	-70	-67	133	175	235	1740	kWh
Sum spec. losses	7.8	6.6	5.9	3.6	1.7	-0.6	-1.7	-1.5	-0.1	2.6	4.4	6.7	35.4	kWh/m²
Solar gains - North	102	122	185	234	292	324	312	267	202	153	107	90	2389	kWh
Solar gains - East	0	0	0	0	0	0	0	0	0	0	0	0	0	kWh
Solar gains - South	355	377	436	350	310	309	335	367	397	439	356	322	4353	kWh
Solar gains - West	0	0	0	0	0	0	0	0	0	0	0	0	0	kWh
Solar gains - Horiz.	0	0	0	0	0	0	0	0	0	0	0	0	0	kWh
Solar gains - Opaque	67	80	116	128	136	151	153	144	118	100	70	58	1322	kWh
Internal heat gains	933	842	933	903	933	903	933	933	903	933	903	933	10981	kWh
Sum spec. gains solar + interna	3.0	3.0	3.5	3.4	3.5	3.5	3.6	3.6	3.4	3.4	3.0	2.9	39.9	kWh/m²
Utilisation factor	100%	100%	100%	94%	49%	100%	100%	100%	100%	75%	99%	100%	48%	
Annual heating demand	2263	1741	1141	193	0	0	0	0	0	17	667	1790	7812	kWh
Spec. heating demand	**4.7**	**3.6**	**2.4**	**0.4**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**1.4**	**3.7**	**16.3**	kWh/m²



Annual heating demand: Comparison

Monthly method	*('Heating')*	**7812**	**kWh/a**	**16.3**	**kWh/(m²a)** reference to treated floor area according to PHPP
Annual method	*('Annual heatin*	**8298**	**kWh/a**	**17.4**	**kWh/(m²a)** reference to treated floor area according to PHPP
		#REF!	**kWh/a**	**#REF!**	

Heating load

St Johns Pl Passive House / Climate: New York / TFA: 478 m² / Heating: 16.3 kWh/(m²a) / Cooling: 10.6 kWh/(m²a) / PER: 83.9 kWh/(m²a)

Interior temperature: 20 °C
Building type: Multifamily Residential
Treated floor area A_{TFA}: 477.9 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.	15.5	°C							

Building assembly	Temperature zone	Area m²		U-Value W/(m²K)		Factor always 1 (except "X")		TempDiff 1 K		TempDiff 2 K		**PT 1** W		**PT 2** W
External wall - Ambient	A	494.9	*	0.139	*	1.00	*	29.8	or	24.3	=	2045	or	1667
External wall - Ground	B	45.0	*	0.440	*	1.00	*	4.5	or	4.5	=	89	or	89
Roof/Ceiling - Ambient	A	204.9	*	0.241	*	1.00	*	29.8	or	24.3	=	1469	or	1198
Floor slab / Basement ceiling	B	115.6	*	0.532	*	1.00	*	4.5	or	4.5	=	277	or	277
	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	65.0	*	0.803	*	1.00	*	29.8	or	24.3	=	1555	or	1268
Exterior door	A	7.3	*	0.500	*	1.00	*	29.8	or	24.3	=	109	or	89
Exterior TB (length/m)	A	71.0	*	0.101	*	1.00	*	29.8	or	24.3	=	214	or	175
Perimeter TB (length/m)	P		*		*	1.00	*	4.5	or	4.5	=		or	
Ground TB (length/m)	B	22.0	*	0.500	*	1.00	*	4.5	or	4.5	=	49	or	49
Building element towards neighbour	I	412.7	*	0.340	*	1.00	*	3.0	or	3.0	=	421	or	421

Transmission heat load P_T

Total = 6229 or 5233

Ventilation system:

Effective air volume, V_V: A_{TFA} 477.9 m² * Clear room height 2.50 m = 1195 m³

Heat recovery efficiency of the heat exchanger η_{HR} 80%

Heat recovery efficiency SHX 0% | Heat recovery efficiency SHX $\eta_{SHX\ 1}$ 0% or $\eta_{SHX\ 2}$ 0%

Energetically effective air changes n_V: $n_{V,Res}$ (Heating Load) 0.104 1/h + $n_{V,system}$ 0.425 1/h *(1- Φ_{HP} 0.80 or 0.80) = 0.189 1/h or 0.189 1/h

Ventilation heat load P_V

V_V m³		n_V 1/h		n_V 1/h		c_{Air} Wh/(m³K)		TempDiff 1 K		TempDiff 2 K		**P_V 1** W		**P_V 2** W
1194.7	*	0.189	or	0.189	*	0.33	*	29.8	or	24.3	=	2223	or	1812

Total heating load P_L

$P_T + P_V$ = **PL 1** 8452 W or **PL 2** 7046 W

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	32.7	*	0.5	*	0.39	*	25	or	15	=	160	or	95
East	0.0	*	0.0	*	0.40	*	60	or	20	=	0	or	0
South	32.3	*	0.5	*	0.22	*	115	or	25	=	416	or	91
West	0.0	*	0.0	*	0.40	*	50	or	20	=	0	or	0
Horizontal	0.0	*	0.0	*	0.40	*	70	or	30	=	0	or	0

Solar heating power P_S

Total = 577 or 186

Internal heating load P_I

Spec. power 2.1 W/m² * A_{TFA} 478 m² = **P_I 1** 1015 W or **P_I 2** 1015 W

Heating power (gains) P_G

$P_T + P_I$ = **P_G 1** 1591 W or **P_G 2** 1200 W

$P_L - P_G$ = 6861 or 5845

Heating load P_H

= **6861 W**

Area specific space heating load P_H / A_{TFA}

= **14.4 W/m²**

Input max. supply air temperature 52 °C
Max. supply air temperature $\vartheta_{Supply,Max}$ 52 °C

Supply air temperature without heating $\vartheta_{Supply,Min}$ 14.0 °C or 15.1 °C

For comparison: heating load transportable by the supply Air $P_{Supply\ Air,Max}$ = 6363 W specific: 13.3 W/m²

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

Summer ventilation

St Johns Pl Passive House / Climate: New York / TFA: 478 m² / Heating: 16.3 kWh/(m²a) / Cooling: 10.6 kWh/(m²a) / PER: 83.9 kWh/(m²a)

Building volume:	1195	m³	Building type:	Multifamily Residential	
Max. indoor absolute humidity:	12	g/kg	Heat recovery efficiency:	80%	
Internal humidity sources:	100	g/(P*h)	Humidity recovery efficiency:	0%	
			Subsoil heat exchanger efficiency:	0%	

Results passive cooling

Frequency of overheating:	30.4%	at the overheating limit ϑ_{max} = 25 °C	Useful cooling demand:	7.1	kWh/(m²a)
max. humidity:	18.9	g/kg	Dehumidification demand:	3.5	kWh/(m²a)
Frequency of exceeded humidity:	24.1%		Frequency of exceeded humidity:	4.6%	

Summer basic ventilation to ensure adequate air quality

Air change rate via vent. system with supply ai	0.42	1/h	HRV/ERV in summer (check only one field)	
			None	x
			Automatic bypass, controlled by temperature difference	
			Automatic bypass, controlled by enthalpy difference	
			Always	
Air change rate via extract air system:		1/h		
			Specific power consumption (for extract air system)	0.20 Wh/m³
Window ventilation air change rate:	0.00	1/h		

Effective air change rate

	$n_{V,system}$ 1/h		η^*_{SHX}		η_{HP}		$n_{V,equi,fraction}$ 1/h
Exterior $n_{V,e}$	0.425	*(1-	0%	)*(1-	0.80	) =	0.085
without HR	0.425	*(1-	0%	)		=	0.425
Ground $n_{L,g}$	0.425	*	0%	*(1-	0.80	) =	0.000
without HR	0.425	*	0%			=	0.000

Ventilation conductance

	V_V m³		$n_{V,equi,fraction}$ 1/h		c_{Air} Wh/(m³K)			
exterior $H_{V,e}$	1195	*	0.085	*	0.33	=	33.6	W/K
without HR	1195	*	0.425	*	0.33	=	167.5	W/K
ground $H_{V,g}$	1195	*	0.000	*	0.33	=	0.0	W/K
without HR	1195	*	0.000	*	0.33	=	0.0	W/K
Infiltration, window, extract air system	1195	*	0.042	*	0.33	=	16.4	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		
	Corresponding air change rate		1/h	Controlled by (please check)	
Mechanical, automatically	during operation, in addition to basic air change			Temperature diff.	
Controlled ventilation	Specific power consumption		Wh/m³	Humidity diff.	x

Summer: Passive cooling

St Johns Pl Passive House / Climate: New York / TFA: 478 m² / Heating: 16.3 kWh/(m²a) / Cooling: 10.6 kWh/(m²a) / PER: 83.9 kWh/(m²a)

Building type:	Multifamily Residential		Treated floor area A_{TFA}:	477.9	m²
Upper temperature limit:	25	°C	Building volume:	1195	m³
Nominal humidity:	12	g/kg	Internal humidity sources:	2.4	g/(m²h)
Spec. capacity:	84	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	494.9	*	0.139	*	1.00	=	68.7
External wall - Ground	B	45.0	*	0.440	*	1.00	=	19.8
Roof/Ceiling - Ambient	A	204.9	*	0.241	*	1.00	=	49.3
Floor slab / Basement ceiling	B	115.6	*	0.532	*	1.00	=	61.5
	A		*		*	1.00	=	
	A		*		*	1.00	=	
	X		*		*	0.75	=	
Windows	A	65.0	*	0.803	*	1.00	=	52.2
Exterior door	A	7.3	*	0.500	*	1.00	=	3.7
Exterior TB (length/m)	A	71.0	*	0.101	*	1.00	=	7.2
Perimeter TB (length/m)	P		*		*	1.00	=	
Ground TB (length/m)	B	22.0	*	0.500	*	1.00	=	11.0

Exterior thermal transmittance, $H_{T,e}$	181.1	W/K
Ground thermal transmittance, $H_{T,g}$	92.3	W/K

Summer ventilation

from 'SummVent' worksheet

Ventilation unit conductance

exterior $H_{V,e}$	33.6	W/K
without HR	167.5	W/K
ground $H_{V,g}$	0.0	W/K
without HR	0.0	W/K

Ventilation conductance, others

exterior	16.4	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	0.42	1/h
Outdoor air changes	0.04	1/h
Window night ventilation air change rate, manual @ 1K	0.00	1/h
Air change rate due to mech. automatically controlled vent.	0.00	1/h
Specific power consumption for	0.00	Wh/m³
η_{HR}	80%	
η_{ERV}	0%	
η^*_{SHX}	0%	

Summer ventilation regulation

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

Orientation of the area	Angle factor Summer		Shading factor Summer		Shading dirt		g-Value (perp. radiation)		Area m²		Portion of glazing		**Aperture** m²
North	0.9	*	0.63	*	0.95	*	0.50	*	32.7	*	71%	=	6.3
East	0.9	*	1.00	*	0.95	*	0.00	*	0.0	*	0%	=	0.0
South	0.9	*	0.32	*	0.95	*	0.52	*	32.3	*	70%	=	3.3
West	0.9	*	1.00	*	0.95	*	0.00	*	0.0	*	0%	=	0.0
Horizontal	0.9	*	1.00	*	0.95	*	0.00	*	0.0	*	0%	=	0.0
Sum opaque areas													1.9

Solar aperture

		m²/m²
Total	11.5	0.02

Internal heat gains Q_I

Specif. power q_I W/m²		A_{TFA} m²		W	W/m²
2.9	*	478	=	1371	2.9

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

30.4%

At the overheating limit ϑ_{max} = 25 °C

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

Daily internal temperature fluctuation

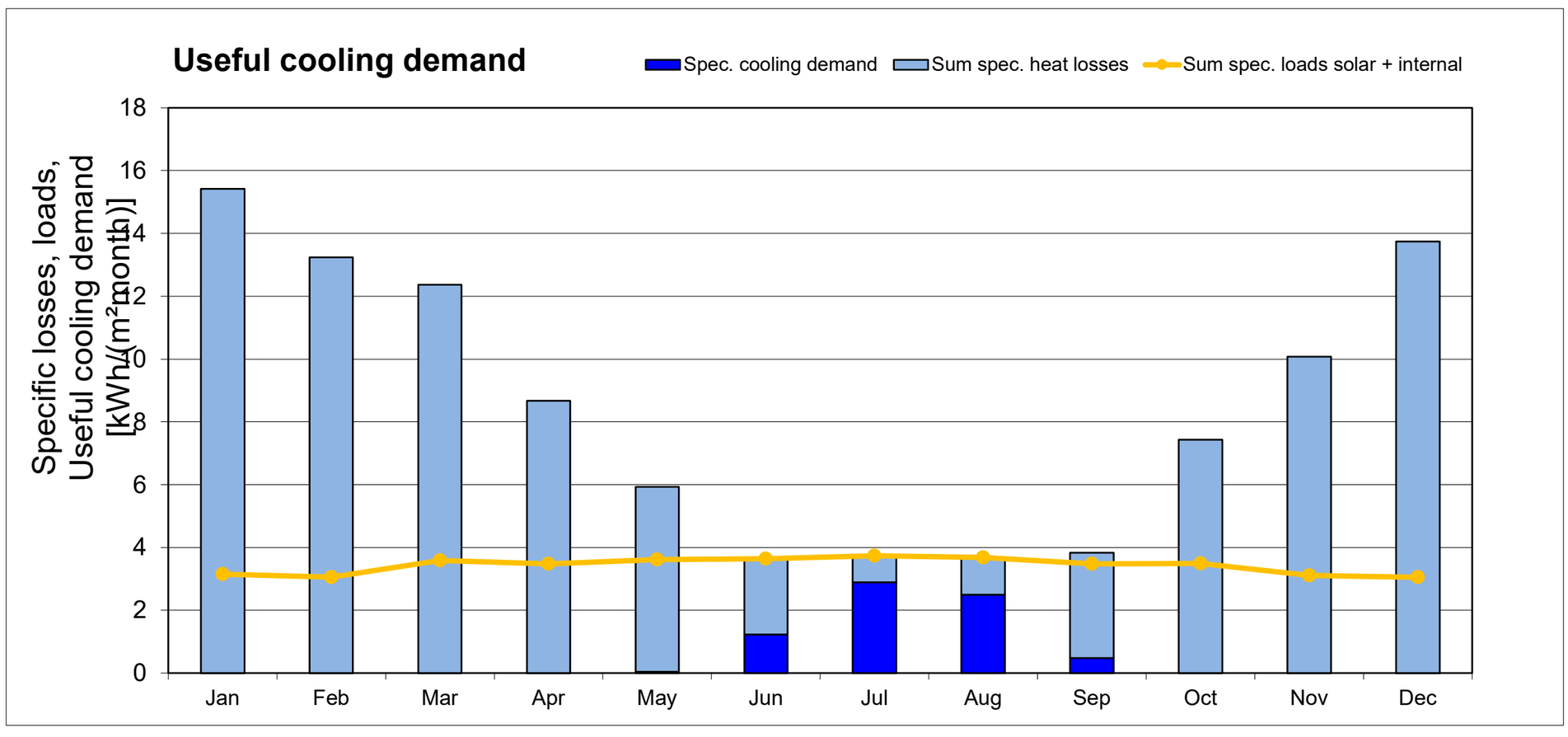
Transmission kWh/d		Ventilation kWh/d		Solar load kWh/d		1/k	Spec. capacity Wh/(m²K)		A_{TFA}: m²		
(17.4	+	17.7	+	35.7	) *	1000	/ (84	*	478	) =	**1.8** K

Cooling: energy value for useful cooling energy

St Johns Pl Passive House / Climate: New York / TFA: 478 m² / Heating: 16.3 kWh/(m²a) / Cooling: 10.6 kWh/(m²a) / PER: 83.9 kWh/(m²a)

Interior Temperature: 25 °C
Building type: Multifamily Residential
Treated Floor Area A_{TFA}: 478 m²

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	
Heating degree hours - Exterior	18.7	15.9	14.6	9.9	6.3	2.5	0.5	1.0	3.8	8.6	12.0	16.6	110	kKh
Heating degree hours - Ground	6.8	6.4	7.1	6.5	6.2	3.6	3.3	3.0	2.9	5.2	5.5	6.3	63	kKh
Losses - Exterior	6745	5736	5259	3536	2238	841	113	293	1336	3070	4311	5987	39463	kWh
Losses - Ground	625	589	652	604	577	336	300	273	265	477	507	579	5784	kWh
Losses summer ventilation	0	0	0	0	0	0	0	0	0	0	0	0	0	kWh
Sum spec. heat losses	15.4	13.2	12.4	8.7	5.9	2.5	0.9	1.2	3.4	7.4	10.1	13.7	94.7	kWh/m²
Solar load North	102	122	185	234	292	325	312	267	203	153	107	90	2392	kWh
Solar load East	0	0	0	0	0	0	0	0	0	0	0	0	0	kWh
Solar load South	318	337	390	313	277	277	300	329	355	393	319	288	3896	kWh
Solar load West	0	0	0	0	0	0	0	0	0	0	0	0	0	kWh
Solar load Horiz.	0	0	0	0	0	0	0	0	0	0	0	0	0	kWh
Solar load Opaque	67	80	116	128	136	151	153	144	118	100	70	58	1322	kWh
Internal heat gains	1020	921	1020	987	1020	987	1020	1020	987	1020	987	1020	12010	kWh
Sum spec. loads solar + internal	3.2	3.1	3.6	3.5	3.6	3.6	3.7	3.7	3.5	3.5	3.1	3.0	41.1	kWh/m²
Utilisation factor losses	20%	23%	29%	40%	61%	98%	98%	100%	90%	47%	31%	22%	36%	
Useful cooling energy demand	0	0	0	1	18	585	1379	1194	227	3	0	0	3408	kWh
Spec. cooling demand	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**1.2**	**2.9**	**2.5**	**0.5**	**0.0**	**0.0**	**0.0**	**7.1**	kWh/m²
Specif. dehumidification demand	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.1**	**1.8**	**1.5**	**0.0**	**0.0**	**0.0**	**0.0**	**3.5**	kWh/m²
Sensible fraction	100%	100%	100%	100%	100%	90%	61%	62%	100%	100%	100%	100%	67%	



Cooling: energy value for useful cooling energy

St Johns Pl Passive House / Climate: New York / TFA: 478 m² / Heating: 16.3 kWh/(m²a) / Cooling: 10.6 kWh/(m²a) / PER: 83.9 kWh/(m²a)

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

Building type:	Multifamily Residential		Treated floor area A_{TFA}:	477.9	m²
Interior temperature summer:	25	°C	Building volume:	1195	m³
Nominal humidity:	12	g/kg	Internal humidity sources:	2.4	g/(m²h)
Spec. capacity:	84	Wh/(m²K)			

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	494.9	*	0.139	*	1.00	*	59	=	4058	8.49
External wall - Ground	B	45.0	*	0.440	*	1.00	*	43	=	856	1.79
Roof/Ceiling - Ambient	A	204.9	*	0.241	*	1.00	*	59	=	2916	6.10
Floor slab / Basement ceiling	B	115.6	*	0.532	*	1.00	*	43	=	2659	5.56
	A		*		*	1.00	*		=		
	A		*		*	1.00	*		=		
	X		*		*	0.75	*		=		
Windows	A	65.0	*	0.803	*	1.00	*	59	=	3086	6.46
Exterior door	A	7.3	*	0.500	*	1.00	*	59	=	216	0.45
Exterior TB (length/m)	A	71.0	*	0.101	*	1.00	*	59	=	426	0.89
Perimeter TB (length/m)	P		*		*	1.00	*		=		0.00
Ground TB (length/m)	B	22.0	*	0.500	*	1.00	*	43	=	475	0.99
											kWh/(m²a)
Transmission losses Q_T (negative: heat loads)									Total	14693	30.7

Summer ventilation

from 'SummVent' worksheet

Ventilation conductance, vent. unit

exterior $H_{V,e}$	33.6	W/K
without HR	167.5	W/K
ground $H_{V,g}$	0.0	W/K
without HR	0.0	W/K

Ventilation conductance, others

exterior	16.4	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	0.42	1/h
Outdoor air changes	0.04	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}	80%	
η_{ERV}	0%	
η^*_{SHX}	0%	

Summer ventilation regulation

	HRV/ERV in summer
None	x
Controlled by temp.	
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 $n_{V,e}$	0.425	*(1-	0%	)*(1-	0.00	)+	0.042	=	0.467
Effective air change rate Ground $n_{V,g}$	0.425	*	0%	*(1-	0.00	)		=	0.000

	V_V m³		$n_{V,equi,fraction}$ 1/h		c_{Air} Wh/(m³K)		G_t kKh/a		kWh/a	kWh/(m²a)
Ventilation losses ambient Q_V	1195	*	0.467	*	0.33	*	56	=	10294	21.5
Ventilation losses ground $Q_{V,e}$	1195	*	0.000	*	0.33	*	0	=	0	0.0
Heat losses summer ventilation	1195	*	0.000	*	0.33	*	0	=	0	0.0
Ventilation heat losses Q_V								Total	10294	21.5

	Q_T kWh/a		Q_V kWh/a		kWh/a	kWh/(m²a)
Total heat losses Q_L	14693	+	10294	=	24986	**52.3**

Orientation of the area	Reduction factor		g-Value (perp. radiation)		Area m²		Global radiation kWh/(m²a)		kWh/a
North	0.39	*	0.50	*	32.7	*	328	=	2078
East	0.40	*	0.00	*	0.0	*	738	=	0
South	0.19	*	0.52	*	32.3	*	907	=	2953
West	0.40	*	0.00	*	0.0	*	745	=	0
Horizontal	0.40	*	0.00	*	0.0	*	1287	=	0
Sum opaque areas									1117
Available solar heat gains Q_S								Total	6147

	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	*	2.9	*	477.9	=	9049	18.9

			kWh/a	kWh/(m²a)
Sum heat loads Q_F	Q_S + Q_I	=	15196	**31.8**

	Ratio of losses to free heat gains	Q_L / Q_F =	1.64	
	Utilisation factor heat losses η_G	=	47%	
			kWh/a	kWh/(m²a)
Useful heat losses $Q_{V,n}$		η_G * Q_L =	11788	**24.7**
			kWh/a	kWh/(m²a)
Useful cooling demand Q_K		Q_F - $Q_{V,n}$ =	3408	**7**
	kWh/(m²*a)		(Yes/No)	
Recommended maximum value	15	**Requirement met?**	Yes	

Compressor - cooling units

St Johns Pl Passive House / Climate: New York / TFA: 478 m² / Heating: 16.3 kWh/(m²a) / Cooling: 10.6 kWh/(m²a) / PER: 83.9 kWh/(m²a)

Building type:	Multifamily Residential		Treated floor area A_{TFA}:	477.9	m²
Interior temperature summer:	25.0	°C	Mechanical cooling:	x	
Nominal humidity:	12.0	g/kg	Air change rate via ventilation system with supply air:	0.4	
Internal humidity sources:	2.4	g/(m²h)			

Supply air cooling
check as appropriate

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

x Recirculation cooling
check as appropriate

On/Off mode (check as appropriate)		
Max. cooling capacity (sensible + latent)	17.6	kW
Volume flow rate at nominal power	4000.0	m³/h
Temperature reduction dry	12.9	K
Variable air volume (check if appropriate)	x	
Seasonal energy efficiency ratio	4.2	

Additional dehumidification
check as appropriate

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

Panel cooling
check as appropriate

Seasonal energy efficiency ratio	

	Sensible kWh/(m²a)		Latent kWh/(m²a)		COP		Electricity demand (kWh/a) kWh/(m²a)	Sensible fraction
Useful cooling total	7.1		3.5					67%
Cooling contribution by:								
Supply air cooling	(	+		) /	0.0	=		
Recirculation cooling	(7.1	+	5.2	) /	4.2	=	2.9	58%
Dehumidification				/		=		0%
Remaining for panel cooling				/	0.0	=		100%
Cooling distribution				/	4.2	=		100%
Total	(7.1	+	5.2	) /	4.2	=	2.9	58%

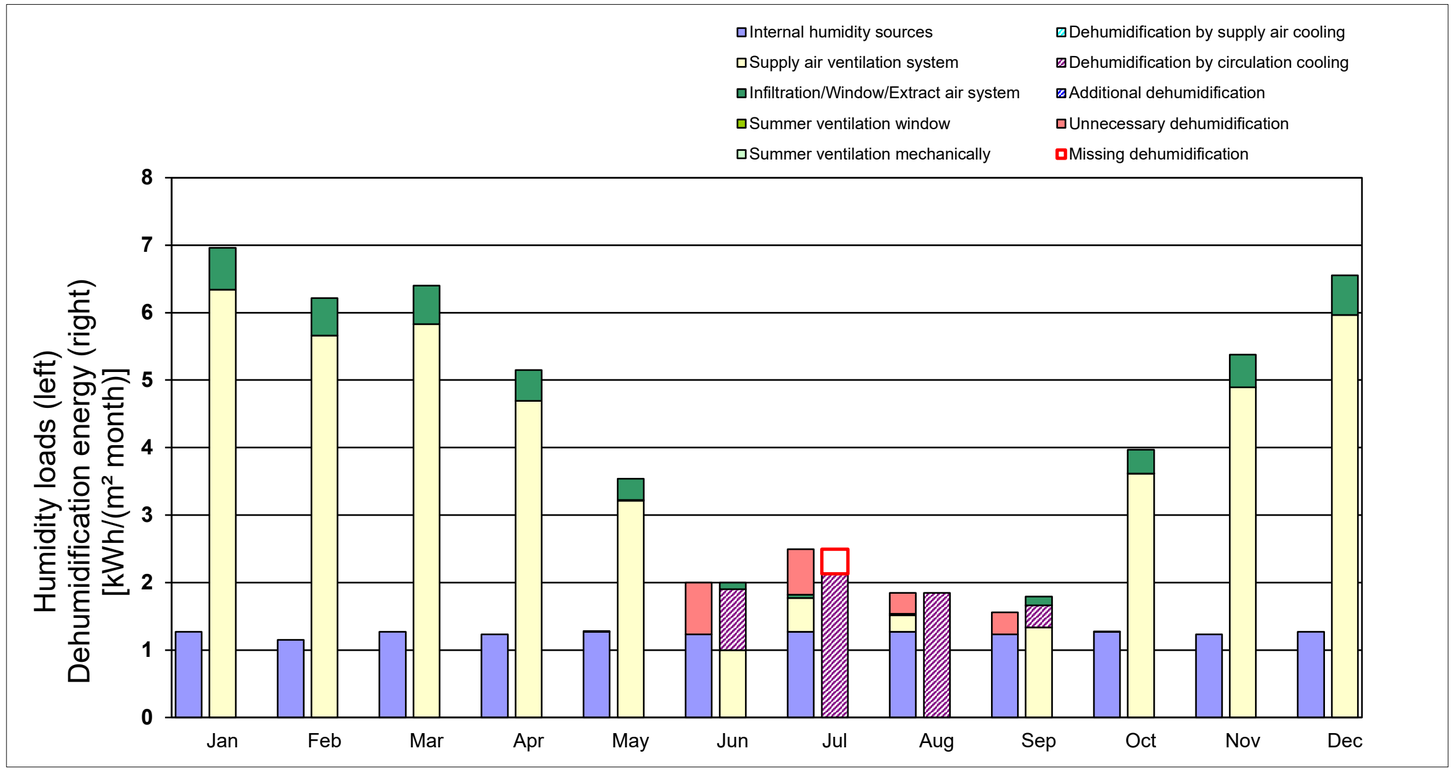
			(Yes/No)
Unsatisfied demand	0.0	0.4	**Cooling demand covered?** **Yes**

Compressor - cooling units

St Johns Pl Passive House / Climate: New York / TFA: 478 m² / Heating: 16.3 kWh/(m²a) / Cooling: 10.6 kWh/(m²a) / PER: 83.9 kWh/(m²a)

Humidity loads and humidity removal

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	
Internal humidity sources	1.3	1.1	1.3	1.2	1.3	1.2	1.3	1.3	1.2	1.3	1.2	1.3	15	kWh/m²
Infiltration/Window/Extract air system	-0.6	-0.6	-0.6	-0.5	-0.3	-0.1	0.0	0.0	-0.1	-0.4	-0.5	-0.6	-4	kWh/m²
Supply air ventilation system	-6.3	-5.7	-5.8	-4.7	-3.2	-1.0	0.5	0.2	-1.3	-3.6	-4.9	-6.0	-42	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	0.1	1.8	1.5	0.0	0.0	0.0	0.0	3	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	0.9	2.1	1.8	0.3	0.0	0.0	0.0	5	kWh/m²
Additional dehumidification	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	kWh/m²
Total dehumidification	0.0	0.0	0.0	0.0	0.0	0.9	2.1	1.8	0.3	0.0	0.0	0.0	5	
Unnecessary dehumidification	0.0	0.0	0.0	0.0	0.0	0.8	0.7	0.3	0.3	0.0	0.0	0.0	2	kWh/m²
Missing dehumidification	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0	kWh/m²



Cooling load

St Johns Pl Passive House / Climate: New York / TFA: 478 m² / Heating: 16.3 kWh/(m²a) / Cooling: 10.6 kWh/(m²a) / PER: 83.9 kWh/(m²a)

Building type: **Multifamily Residential**

Treated floor area A_{TFA}:	477.9	m²	Spec. capacity:	84	Wh/(m²
Building volume:	1195	m³	Nominal humidity:	12.0	g/kg
Interior temperature:	25	°C	Internal humidity sources:	2.4	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.	21.0	°C		SHX	13.8	°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	494.9	*	0.139	*	1.00	*	5.4	or	2.5	=	372	or	173
External wall - Ground	B	45.0	*	0.440	*	1.00	*	-4.0	or	-4.0	=	-79	or	-79
Roof/Ceiling - Ambient	A	204.9	*	0.241	*	1.00	*	5.4	or	2.5	=	267	or	124
Floor slab / Basement ceiling	B	115.6	*	0.532	*	1.00	*	-4.0	or	-4.0	=	-245	or	-245
	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	65.0	*	0.803	*	1.00	*	5.4	or	2.5	=	283	or	132
Exterior door	A	7.3	*	0.500	*	1.00	*	5.4	or	2.5	=	20	or	9
Exterior TB (length/m)	A	71.0	*	0.101	*	1.00	*	5.4	or	2.5	=	39	or	18
Perimeter TB (length/m)	P		*		*	1.00	*	-4.0	or	-4.0	=		or	
Ground TB (length/m)	B	22.0	*	0.500	*	1.00	*	-4.0	or	-4.0	=	-44	or	-44
Building element towards neighbour	I	412.7	*	0.340	*	1.00	*	3.0	or	3.0	=	421	or	421
Radiation correction outdoor air				$L_{ambient}$ W/K		-7.1	*	5.4	or	2.5	=	-39	or	-18
Radiation correction sky				L_{Sky} W/K		6.8	*	-3.7	or	-5.0	=	-25	or	-34
Transmission heat load P_T										Total	=	**972**	or	**458**

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 $P_{V,o}$	1195	*	0.467	or	0.467	*	0.33	*	5.4	or	2.5	=	997	or	464
Ground $P_{L,e}$	1195	*	0.000	or	0.000	*	0.33	*	-11.2	or	-11.2	=	0	or	0
Summer ventilation $P_{L,S}$	1195	*	0.000	or	0.000	*	0.33	*	0.0	or	0.0	=	0	or	0
Ventilation heat load P_V												Total	**997**	or	**464**

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	32.7	*	0.5	*	0.39	*	86	or	55	=	543	or	351
East	0.0	*	0.0	*	0.40	*	215	or	175	=	0	or	0
South	32.3	*	0.5	*	0.19	*	200	or	220	=	650	or	716
West	0.0	*	0.0	*	0.40	*	205	or	175	=	0	or	0
Horizontal	0.0	*	0.0	*	0.40	*	325	or	290	=	0	or	0
Sum opaque areas											295	or	257
Solar load P_S										Total	**1488**	or	**1324**

Internal heating load P_I	Spec. power W/m²		A_{TFA} m²		P_I 1 W		P_I 2 W
	2.9	*	478	=	**1371**	or	**1371**

$P_T + P_V + P_S + P_I$ =	**4828**	or	**3617**
Cooling load P_C =	**4828**		**W**
Area specific cooling load P_C / A_{TFA} =	**10.1**		**W/m²**

Please enter the minimum supply air temperature. ____ °C

Supply air temperature without cooling $\vartheta_{Supply,Min}$ = **30.4** °C / **27.5** °C

For comparison: cooling load, transportable through the supply air $P_{Supply;Max}$ = **5097** W / **4611** W

specific: 10.7 W/m² / 9.6 W/m²

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

Daily internal temperature stroke

(Transmission 971.9 W + Ventilation 997.0 W + Solar load 1488.2 W) * Time 24 h/d / (Spec. capacity 84 Wh/(m²K) * A_{TFA} 478 m²) = **2.1** 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	59	or	59	kg/h	Supply air mass flow	599 or 599	kg/h
Summer vent. air mass flow	0	or	0	kg/h	**Humid. load, supply air**	3052 or 1616	g/h
Humidity load, outdoor air	299	or	158	g/h	**Humidity load, internal**	1155 or 1155	g/h

Enthalpy of vaporisation 707.639 Wh/kg / 1000 g/kg * Humidity load 4505 g/h or 2929 g/h = **P_D 1** **3188** W or **P_D 2** **2073** W

Dehumidification load P_T =	**3188**	**W**
Area specific dehumidification load P_T / A_{TFA} =	**6.7**	**W/m²**

Monthly average values

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Specific cooling demand	0.0	0.0	0.0	0.0	0.0	1.2	2.9	2.5	0.5	0.0	0.0	0.0	kWh/m²
Specific dehumidification demand	0.0	0.0	0.0	0.0	0.0	0.1	1.8	1.5	0.0	0.0	0.0	0.0	kWh/m²
Sensible fraction	100%	100%	100%	100%	100%	90%	61%	62%	100%	100%	100%	100%	

Minimum of sensible cooling load fraction occurred **61%**

Heat distribution and domestic hot water (DHW) system

St Johns Pl Passive House / Climate: New York / TFA: 478 m² / Heating: 16.3 kWh/(m²a) / Cooling: 10.6 kWh/(m²a) / PER: 83.9 kWh/(m²a)

Interior temperature:	20	°C	Interior temperature summer:	25	°C
Building type:	Multifamily Residential				
Treated floor area A_{TFA}:	478	m²			
Occupancy:	11.6	Pers			
Number of dwelling units:	5				
Annual heating demand $q_{Heating}$	7812	kWh/a	Annual useful cooling dem. q_{Cool}	3408	kWh/a
Length of heating period:	174	d	Length cooling period:	275	d
Average heating load P_{ave}:	1.9	kW	Average cooling load $P_{Average}$:	0.5	kW
Marginal usability of additional heat gains:	92%		Marginal utility of additional heat losses:	8%	

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												
Nominal width of pipe		mm												
Insulation thickness		mm												
Insulation reflective coating?		-												
Thermal conductivity of insulation		W/(mK)												
Heat loss coefficient per m of insulated pipe		W/(mK)												
Insulation quality of mountings, pipe suspensions, etc.		-	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												
Total heating loss coefficient per m of pipe	Ψ	W/(mK)												
Temp. of the room through which the pipes pass	ϑ_X	°C	20	20	20	20	20							
Design forward flow temperature	ϑ_V	°C	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0		
Design system heating load	$P_{heating}$	kW	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9		
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	13.8
DHW demand for washing machines and dishwashers non-elec		kWh/a	879
Effective useful heat DHW	Q_{DHW}	kWh/a	6523

kWh/a	kWh/(m²a)
6523	13.6

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

DHW distribution

			Inside thermal envelope					Outside thermal envelope					Total values	
			1	2	3	4	5	1	2	3	4	5	Absolute	Specific
Temp. of room through which the pipes pass	ϑ_X	°C	20.0	20.0	20.0	20.0	20.0							
Design forward flow temperature	ϑ_{dist}	°C	**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	**37.2**											
Nominal width of pipe		mm	**19**											
Insulation thickness		mm	**40**											
Insulation reflective coating?		-												
Thermal conductivity of insulation		W/(mK)	**0.035**											
Heat loss coefficient per m of insulated pipe		W/(mK)	0.132											
Insulation quality of mountings, pipe suspensions, etc.		-	**3 - Good**	**1-None**	**1-None**	**1-None**	**1-None**	**1-None**	**1-None**	**1-None**	**1-None**	**1-None**		
Thermal bridge supplement		W/K	0.326											
Total heating loss coefficient per m of pipe	Ψ	W/(mK)	**0.140**											
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	35											
Annual heat loss from circulation lines	QZ	kWh/a	**1287**										kWh/a **1287**	kWh/(m²a) **2.7**
DHW individual pipes														
Exterior pipe diameter	d_{U_Pipe}	m	**0.013**											
Accumulated length per single pipes	L_U	m	**130.00**											
Amount of tapping points in building	$n_{tapping\ poin}$	-	**28.00**											
Average pipe length per tapping point	$L_{U,\ average}$	m	4.6											
Tap openings per person per day		-	**6**											
Utilisation days per year		d	**365**											
Heat loss per tap opening	$q_{Individual}$	'h/tap opening	0.0201											
Amount of tap openings per year and person	n_{Tap}	nings per year	2190											
Annual heat loss of individual pipes	Q_U	kWh/a	**507**										kWh/a **507**	kWh/(m²a) **1.1**
Total heat losses of DHW distribution	Q_{WL}												kWh/a **1794**	kWh/(m²a) **3.8**
Performance ratio of DHW distribution pipes	$ea_{,HL}$	-											**128%**	

Storage heat losses

		Storage 1	Storage 2	Buffer storage tank (only heating)	Compact unit
Selection of storage tank		2-DHW only	0-No storage tank	0-No storage tank	0-No
Storage necessary for HP				(x)	
Solar DHW connection					
Heat loss rate	W/K	2.5			
Storage volume	litre	1500			---
Standby fraction	-				
Location of storage tank, inside or outside of thermal envelope		1-Inside	1-Inside	1-Inside	
Temperature of mechanical room	°C	20.0			
Typical storage tank temperature	°C	60.0			
Manual entry of storage temperature	°C				
Average standby heat losses storage tank	W	100			
Additional heat losses storage tank, solar operation	W			---	---
Possibly utilisation factor of heat losses		---	---		---
Annual heat losses DHW storage tank	kWh/a	876		---	
Annual heat losses buffer storage tank		---	---		---

	kWh/a	kWh/(m²a)
	876	1.8

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}	2670	5.6
Performance ratio DHW-distribution + storage	$e_{a,WL}$	141%	
Total heating demand of DHW system			
Including storage tank	Q_{gDHW}	9193	19.2

Electricity demand for residential buildings

St Johns Pl Passive House / Climate: New York / TFA: 478 m² / Heating: 16.3 kWh/(m²a) / Cooling: 10.6 kWh/(m²a) / PER: 83.9 kWh/(m²a)

Households	5
Persons	11.6
Living area (m²)	478
Heating demand [kWh/(m²a)]	16.3

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:	1.19	2.6
Energy carrier for DHW:	1.73	1.1

Solar fraction of DHW Laundry&Dish	0%
Marginal performance ratio DHW	107%
Marginal performance ratio Heating	35%

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)	*	11.6	P	=	826	* 50%	* 50%	=	**413**								
1-DHW connection																			* (1+	0.30	) *	1.07	*(1-	0.00	) =	**576**
Clothes washing	1	1	1.10	kWh/Use		* **1.00**	*	57	/(P*a)	*	11.6	P	=	724	* 55%	* 45%	=	**398**								
1-DHW connection																			* (1+	0.05	) *	1.07	*(1-	0.00	) =	**367**
Clothes drying with:	1	1	3.50	kWh/Use	Residual dampness	0.88	*	57	/(P*a)	*	11.6	P	=	2017	100%		=	**2017**								
4-Condensation dryer					0.60								=	0	0%							1.00	*			**0**
Energy consumed by evaporation	0	1	3.13	kWh/Use		* 0.60	*	57	/(P*a)	*	11.6	P	=	0	* 100%				* (1+	0.00	) *	0.35	*(1-	0.71	) =	**0**
Refrigerating	1	1	0.78	kWh/d		* 1.00	*	365	d/a	*	5	HH	=	1424	* 100%		=	**1424**								
Freezing	1	1	0.88	kWh/d		* 1.00	*	365	d/a	*	5	HH	=	1606	* 100%		=	**1606**								
or combination	0	1	1.00	kWh/d		* 1.00	*	365	d/a	*	5	HH	=	0	* 100%		=	**0**								
Cooking with:	1	1	0.25	kWh/Use		* 1.00	*	500	/(P*a)	*	11.6	P	=	1444	* 100%		=	**1444**								
1-Electricity					Average lamp efficiency [lm/W]										*	0%										**0**
Lighting	1	1	10	W	**75**	* 1.00	*	2.90	kh/(P*a	*	11.6	P	=	322	* 100%		=	**322**								
Consumer electronics	1	1	**80**	W		* 1.00	*	**0.55**	kh/(P*a	*	11.6	P	=	508	* 100%		=	**508**								
Small appliances, etc.	1	1	50	kWh		* 1.00	*	1.00	/(P*a)	*	11.6	P	=	578	* 100%		=	**578**								
Total aux. electricity														2856				2856								
Other:																										
Lift	1	1	2300	kWh/a										2300				**2300**								
				kWh/a										0				**0**								
				kWh/a										0				**0**								

			DHW Non-Electric - Wash&Dish		
Total	14604 kWh	**13865** kWh	**879**	kWh	**944**
			Non-Renewable	Non-Electric DHW Wash&Dish	
Specific demand		**29.0** kWh/(m²a)	**1.8**	kWh/(m²a)	**2.0**
Recommended maximum value		18			

Aux Electricity

St Johns Pl Passive House / Climate: New York / TFA: 478 m² / Heating: 16.3 kWh/(m²a) / Cooling: 10.6 kWh/(m²a) / PER: 83.9 kWh/(m²a)

Treated floor area	478	m²
Heating period	174	d
Air volume	1195	m³
Dwelling units	5	HH

Heat recovery efficiency ventilation unit	0.80	
Operation vent. system Winter	4.18	kh/a
Operation vent. system Summer	4.58	kh/a
Air change rate	0.42	h^{-1}

Annual space heating demand	16	kWh/(m^{2}a)
Boiler rated power	15	kW
DHW system heating demand	9193	kWh/a
Design forward flow temperature	55	°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	* 0.42	h^{-1}	* 4.2	kh/a	* 1195	m³	= **657**		considered in heat recovery efficiency					
Defroster HX	1	1	Data entries in 'Ventilation' worksheet or in 'Addl vent'								**1182**	*	0.2	/	4.18	=	**57**	
Summer ventilation	1	**0.90**	0.31	Wh/m³	* 0.42	h^{-1}	* 4.6	kh/a	* 1195	m³	= **721**	*	1.0	/	4.58	=		**142**
																	Internal heat sources ' Additional summer ventilation'	0.0
Additional vent. summer	0		0.00	Wh/m³	* 0.00	h^{-1}	* 4.6	kh/a	* 1195	m³	= **0**	*	1.0	/	4.58	=		
Heating system			Controlled / non controlled [1/0]															
Enter the rated power of the pump				W														
Circulator pump heating			98	W	* 1.0		* 4.2	kh/a	* 1		= **0**	*	1.0	/	4.18	=	**0**	
Boiler electricity consumption at 30% load				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				W														
Circulation pump DHW	1	**1**	32	W	* 1.00		* 6.1	kh/a	* 1		= **194**	*	1.0	/	8.76	=	**22**	**22**
Enter the rated power of the pump				W														
Storage load pump DHW			81	W	* 1.00		* 0.6	kh/a	* 1		= **0**	*	1.0	/	8.76	=	**0**	**0**
Boiler electricity consumption at 100% load				W														
DHW boiler aux. energy	1	0	165	W	* 1.00		* 0.6	kh/a	* 1		= **101**	*	1.0	/	8.76	=	**0**	**0**
Enter the rated power of the solar DHW pump				W														
Solar aux. electricity	0		61	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		* 5		= **0**	*	1.0	/	4.58	=		**0**
Aux. electricity dehum.				kWh/a	* 1.00		* 1.0		* 5		= **0**	*	1.0	/	4.58	=		**0**
Misc. aux. electricity																		
Misc. aux. electricity				kWh/a	* 1.00		* 1.0		* 5		= **0**	*	1.0	/	8.76	=	**0**	**0**
Total											**2856**						**79**	**164**
Specific demand	kWh/(m²a) (treated floor area)										**6.0**							

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

St Johns Pl Passive House / Climate: New York / TFA: 478 m² / Heating: 16.3 kWh/(m²a) / Cooling: 10.6 kWh/(m²a) / PER: 83.9 kWh/(m²a)

Utilisation: 10-Dwelling

Type of values used: 2-Standard

IHG heating 2.62 W/m²

IHG cooling 2.87 W/m²

No input is necessary

Go to utilisation pattern selection

Persons	11.6	P
Living area	478	m²

Heating demand	16	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)	826	*			0.30	/	8.76	=	28
Clothes washing	1	1	1.1	kWh/Use	1.00	57	/(P*a)	724	*			0.30	/	8.76	=	25
Clothes drying with:	1	1	3.5	kWh/Use	0.88	57	/(P*a)	2017	*			0.70	/	8.76	=	161
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	1	1	0.8	kWh/d	1.00	365	d/a	1424	*			1.00	/	8.76	=	163
Freezing	1	1	0.9	kWh/d	1.00	365	d/a	1606	*			1.00	/	8.76	=	183
or combination	0	1	1.0	kWh/d	1.00	365	d/a	0	*			1.00	/	8.76	=	0
Cooking	1	1	0.3	kWh/Use	1.00	500	/(P*a)	1444	*			0.50	/	8.76	=	82
Lighting	1	1	9.6	W	1.00	2.9	kh/(P*a)	322	*			1.00	/	8.76	=	37
Consumer electronics	1	1	80.0	W	1.00	0.55	kh/(P*a)	508	*			1.00	/	8.76	=	58
Household appliances/Other	1	1	50.0	kWh	1.00	1.0	/(P*a)	578	*			1.00	/	8.76	=	66
Auxiliary appliances (cf. aux Electricity sheet)															=	79
Other applications (cf. Electricity sheet)	1	1.0						2300	*				/	8.76	=	0
Persons	12	1	80.0	W/P	1.00	8.76	kh/a	8096	*			0.55	/	8.76	=	508
Cold water	12	1	-10.4	W/P	1.00	8.76	kh/a								=	-120
DHW - circulation	1	1	146.9	W	1.00	8.76	kh/a	1287	*			1.00	/	8.76	=	147
DHW - individual pipes	1	1	57.9	W	1.00	8.76	kh/a	507	*			1.00	/	8.76	=	58
DHW storage tank heating case	1	1	100.0	W	1.00	8.76	kh/a	876	*			1.00	/	8.76	=	100
DHW storage tank cooling case	1	0	0.0	W	1.00	8.76	kh/a	0	*			1.00	/	8.76	=	0
Evaporation	12	1	-25.0	W/P	1.00	8.76	kh/a	-2530	*			1.00	/	8.76	=	-289
Total IHG														W		1286
Specific IHG														W/m²		2.69
Heat available from internal sources										174	d/a			kWh/(m²a)		11.2

Primary Energy Renewable PER

St Johns Pl Passive House / Climate: New York / TFA: 478 m² / Heating: 16.3 kWh/(m²a) / Cooling: 10.6 kWh/(m²a) / PER: 83.9 kWh/(m²a)

Building type:	Multifamily Residential				
Treated floor area A_{TFA}:	478	m²			
Projected building footprint $A_{Projected}$:	0	m²			
Heating demand incl. distribution & hydr. frost protection	16	kWh/(m²a)			
Cooling energy dem. incl. dehumidification		kWh/(m²a)			
DHW demand including distribution:	19	kWh/(m²a)			

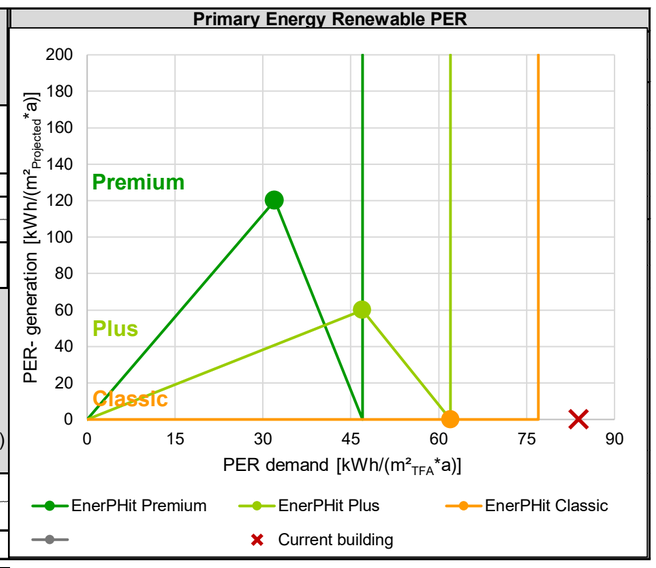
Selection of heat generation system(s)	Contribution margin (useful energy)		
Primary heat generation type	Heating	DHW	Addl. input in following worksheets
2-Heat pump(s)	100%		HP, possibly HP ground
Secondary heat generation type (optional & different)			
4-Heating boiler	0%	100%	Boiler

Energy demand Reference: Treated floor area	Efficiency		Final energy		PER			PE		CO_2	
	Calculation -	User defined value -	Contribution (final energy)	Final energy demand kWh/(m²a)	PER factor kWh/kWh	Effective PER factor (including biomass kWh/kWh	PER specific value kWh/(m²a)	PE factor kWh/kWh	PE value kWh/(m²a)	CO_2 emissions factor (CO_2-eq) kg/kWh	CO_2eq emissions kg/(m²a)
								1-PE factors (non-renewable) PHI Certification		1-CO2 factors GEMIS (Germany)	
							83.9		121.2		25.3
Heating			100%			1.19	**11.4**	2.60	**24.7**		**5.1**
Electricity (HP compact unit)					1.50			2.60		0.532	
Electricity (heat pump)	2.89		100%	5.7	1.50	1.10	6.2	2.60	14.7	0.532	3.0
District heating: 1-None					2.8|4.5|3.3					0.000	
Wood and other biomass					1.10			-		-	
Natural gas / RE gas					1.75			1.10		0.250	
Heating oil / RE methanol					2.30			1.10		0.320	
Solar thermal system											
Electricity (direct)					1.50			2.60		0.532	
Aux. electricity (heating, wintertime ventilation)				3.8	1.50	1.33	5.1	2.60	10.0	0.532	2.0
Cooling and dehumidification					1.55		**6.9**		**11.6**		**2.4**
Electricity cooling (heat pump)	4.20			2.9	1.55		4.6	2.60	7.6	0.532	1.6
Auxiliary electricity cooling, ventilation summer				1.5	1.55		2.3	2.60	3.9	0.532	0.8
Electricity dehumidification (heat pump)					1.90			2.60		0.532	
Auxiliary electricity (dehumidification)					1.90			2.60		0.532	
DHW generation			100%			1.73	**38.0**	1.14	**25.0**		**5.7**
Electricity (HP compact unit)					1.15			2.60		0.532	
Electricity (heat pump)					1.15			2.60		0.532	
District heating: 1-None					2.8|4.5|3.3					0.000	
Wood and other biomass					1.10			-		-	
Natural gas / RE gas	0.90		100%	21.3	1.75	1.75	37.3	1.10	23.4	0.250	5.3
Heating oil / Methanol					2.30			1.10		0.320	
Solar thermal system											
Electricity (direct)					1.15			2.60		0.532	
Aux. electricity (DHW + solar DHW)				0.6	1.15	1.15	0.7	2.60	1.6	0.532	0.3
Household electricity				**23.0**		1.20	**27.6**		**59.9**		**12.3**
Electricity (household or non-residential lighting, etc.)				23.0	1.20	1.20	27.6	2.60	59.9	0.532	12.3
Auxiliary electricity (other)					1.20			2.60		0.532	
Gas / RE gas dry/cook				**0.0**	1.75		**0.0**	2.60	**0.0**	0.270	**0.0**

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

PE demand requirement in case of verification through PE (non-renewable) [kWh/(m²a)]	121.6163366	Current building reaches following class	121	Requirement met?	yes

Achievable energy standard through the verification of renewable primary energy (assessment of individual aspects)	Useful energy, performance				Airtightness
	Annual heat. dem. Treated floor area kWh/(m²a)	Heating load Treated floor area W/m²	Useful cool. energy Treated floor area kWh/(m²a)	Cooling load Treated floor area W/m²	n_{50} 1/h
Requirement EnerPHit Premium Requirement EnerPHit Plus Requirement EnerPHit Classic	20		18	11	1.00
Requirement					
Current building reaches following class for aspe	16 Premium	14	11 Premium	10	0.8 Premium



Summary Though, from the scientific point of view, not entirely correct, different energy carriers will be added together here. This is done to meet the criteria of other energy standards.	Final energy MWh/a	PER specific value MWh/a	PE value 1-PE factors (non-renewable) PHI Certification MWh/a	CO2eq emissions 1-CO2 factors GEMIS (Germany) kg/a	CO_2eq substitution balance 1-CO2 factors GEMIS (Germany) kg/a
Demand	**28.2**	**40.1**	57.94	12109	12109
Generation	**0.0**	**0.0**	0.00	0	0
Demand, cumulative generation (annual balance)	28.16	40.09	57.94	12109	12109
Demand w/o household electricity	**17.1**	**26.9**	29.32	6252	6252
Demand w/o household electricity, cum. generation	17.15	26.88	29.32	6252	6252

Heat pump

St Johns Pl Passive House / Climate: New York / TFA: 478 m² / Heating: 16.3 kWh/(m²a) / Cooling: 10.6 kWh/(m²a) / PER: 83.9 kWh/(m²a)

			Building type:	Multifamily Residential
			Treated floor area A_{TFA}:	478 m²
Covered fraction of space heating demand		*('PER' worksheet)*	100%	
Space heating demand + distribution losses	Q_H+Q_{HL}:	*(DHW+Distribution)*	7812	kWh/a
Solar fraction for space heat	$\eta_{Solar,\ H}$	*('SolarDHW' worksheet)*	0%	
Effective annual heating demand	$Q_{H,Wi}=Q_H*(1-\eta_{Solar,\ H})$		**7812**	kWh/a
Covered fraction of DHW demand		*('PER' worksheet)*	0%	
Total heating demand of DHW system	Q_{gDHW}	*(DHW+Distribution)*	7438	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-Heat Pump Adjusted for Old Method	Heat source:		1-Outdoor air	
Selection of distribution system			2-Radiators	
Design distribution temperature	θ_{design}	*(DHW+Distribution)*	55.00	°C
Nominal power of distribution system	P_{nom}		6.86	kW
Distribution system (to be completed by experienced users only)				
Nominal power of distribution system	P_{nom}			kW
Radiator exponent	n			
Heat storage tank (buffer storage tank 'DHW+Distribution' worksheet)			0-No	
Specific heat losses storage	U * A $_{Storage}$			W/K
Storage location in thermal envelope			1-Inside	
Room temperature (storage location: outside of thermal envelope)		*(DHW+Distribution)*		°C
Sink temperature of heat pump for heating	θ_{snk}		55.00	°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 $_{Storage}$		2.5	W/K
Room temperature (storage location: outside of thermal envelope)		*(DHW+Distribution)*	20.00	°C
Type of backup heater			2-Electric continuous flow water heater	
Δθ of electric continuous flow water heater				K

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

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

Control strategy

Heat pump control strategy			2-Ideal	

Heating

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

-

Heating

Heat pump: Heat Pump Adjusted for Old Method

Source: 1-Outdoor air

	θ_source °C	θ_sink °C	Heating capacity kW	COP
Test point 1	-7.0	35.0	8.0	3.8
Test point 2	2.0	35.0	9.0	4.2
Test point 3	7.0	35.0	10.0	4.8
Test point 4	15.0	35.0	11.0	5.2
Test point 5	20.0	35.0	12.0	6.5
Test point 6	-7.0	50.0	8.0	3.8
Test point 7	2.0	50.0	9.0	4.2
Test point 8	7.0	50.0	10.0	4.8
Test point 9	15.0	50.0	11.0	5.2
Test point 10	20.0	50.0	12.0	6.5
Test point 11				
Test point 12				
Test point 13				
Test point 14				
Test point 15				

Temperature difference in sink $\Delta\theta_{Sink}$ 0.0 K

DHW

Heat pump:

Source:

	θ_source °C	θ_sink °C	Heating capacity kW	COP
Test point 1				
Test point 2				
Test point 3				
Test point 4				
Test point 5				
Test point 6				
Test point 7	Source type number	Source type name	Wärmequelle	
Test point 8				
Test point 9	1.0	1-Outdoor air	1-Outdoor air	
Test point 10	3.0	3-Ground probes	2-Ground water	
Test point 11	2.0	2-Ground water	3-Ground probes	
Test point 12	1.0	1-Outdoor air	-Horizontal ground collecto	
Test point 13	1.0	1-Outdoor air		
Test point 14	1.0	1-Outdoor air		
Test point 15	1.0	1-Outdoor air		

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

Electr. energy consumption pump (grnd. water / ground)	$Q_{El,Pump}$	0	kWh/a
Energy by direct electricity	$Q_{El,dir}$	0	kWh/a
Space heat supplied by HP	$Q_{HP,Heating}$	7812	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	$Q_{HP,Heating}$	7812	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}	2707	kWh/a

		1. HP: Heating or heating & DHW	2. HP: Domestic hot
Seasonal performance factor of heat pump	SPF_{H-1}	2.89	
		kWh/a	kWh/(m²a)
Final electrical energy demand heat generation	Q_{final}	2707	5.7
Annual primary energy demand		7037	14.7
		kg/a	kg/(m²a)
Annual CO_2-equivalent emissions		1440	3.0

Boiler (gas, oil and wood)

St Johns Pl Passive House / Climate: New York / TFA: 478 m² / Heating: 16.3 kWh/(m²a) / Cooling: 10.6 kWh/(m²a) / PER: 83.9 kWh/(m²a)

		Building type:	Multifamily Residential	
		Treated floor area A_{TFA}:	478	m²
Covered fraction of space heating demand	*('PER' worksheet)*		0%	
Space heating demand + distribution losses	Q_H+Q_{HS}: *(DHW+Distribution)*		7812	kWh
Solar contribution for space heating	$\eta_{Solar,\ H}$ *('SolarDHW' worksheet)*		0%	
Effective annual heating demand	$Q_{H,Wi}=Q_H*(1-\eta_{Solar,\ H})$		**0**	kWh
Space heating demand without distribution losses	Q_H *('Verification' worksheet)*		7812	kWh
Covered fraction of DHW demand	*('PER' worksheet)*		100%	
Total heating demand of DHW system	Q_{gDHW} *(DHW+Distribution)*		9193	kWh
Solar contribution for DHW	$\eta_{Solar,\ DHW}$ *('SolarDHW' worksheet)*		0%	
Effective DHW demand	$Q_{DHW,Wi}=Q_{DHW}*(1-\eta_{Solar,\ DHW})$		**9193**	kWh

Boiler type			12-Gas condensing boiler	
Fuel			30-Natural gas	
PER factors (renewable primary energy)	*('Data' worksheet)*		1.75	kWh_{PER}/kWh_{Final}
PE factor (non-renewable primary energy)	*('Data' worksheet)*		1.10	kWh_{PE}/kWh_{Final}
CO_2 emissions factor (CO_2-equivalent)	*('Data' worksheet)*		0.250	g/kWh
Useful heat provided	Q_{Use}		9193	kWh/a
Max. heating power required for heating the building	P_{BH} *('Heating load' worksheet)*		6.86	kW
Length of the heating period	t_{HP}		4177	h
Length of DHW heating period	t_{DHW}		8760	h

Use characteristic values entered (check if appropriate)? x

			Project data		Standard values		Input field	
Design output	P_{nom} *(Rating plate)*		15	kW	15	kW	15	
Installation of boiler (Outdoor: 0, Indoor: 1)			1		0		1	
Input values (oil and gas boiler)			Project data		Standard values		Input field	
Boiler efficiency at 30% load	$\eta_{30\%}$ *(Manufacturer)*		99%		99%			
Boiler efficiency at nominal output	$\eta_{100\%}$ *(Manufacturer)*		93%		93%			
Standby heat loss boiler at 70 °C	$q_{B,70}$ *(Manufacturer)*		1.4%		1.4%			
Average return flow temperature measured at 30% load	$\vartheta_{30\%}$ *(Manufacturer)*		30	°C	30			
Input values (biomass heat generator)			Project data		Standard values		Input field	
Efficiency of heat generator in basic cycle	η_{GZ} *(Manufacturer)*				60%			
Efficiency of heat generator in steady-state operation	η_{SO} *(Manufacturer)*				70%			
Average fraction of heat output released to heating circuit	$z_{HC,m}$ *(Manufacturer)*				0.4			
Temperature difference betw. power-on and power-off	$\Delta\vartheta$ *(Manufacturer)*			K	30	K		
In case of inside installation: area of installation room	$A_{install}$ *(Project)*			m²	0	m²		
Useful heat output per basic cycle	$Q_{N,GZ}$ *(Manufacturer)*			kWh	22.5	kWh		
Average power output of the heat generator	$Q_{N,m}$ *(Manufacturer)*			kW	15.0	kW		
Heat generator with built in conveyor for pellets								
Unit only with regulation (no fan / no starting aid)								
Auxiliary energy demand for a basic cycle	$Q_{HE,GZ}$ *(Manufacturer)*			kWh		kWh		kWh
Power consumption in steady-state operation	$P_{el,SB}$ *(Manufacturer)*			W		W		W

Utilisation factor of heat generator space heating	$h_{H,g,K}$ $=f_j*h_{k''}$	0%
Utilisation factor heat generator DHW	$h_{DW,g,K}$ $=h_{100\%}/f_{j,DW}$	111%
Utilisation factor heat generator DHW & space heating	$h_{g,K}$	111%

		kWh/a	kWh/(m²a)
Final energy demand space heating	$\mathbf{Q}_{Final,HE}$ $= Q_{H,wi}* e_{H,g,K}$	0	
Final energy demand DHW	$\mathbf{Q}_{Final,TW}$ $= Q_{DHW,wi}* e_{TW,g,K}$	10181	
Total final energy demand	$\mathbf{Q}_{Final}$ $= Q_{End,HE} + Q_{End,TW}$	10181	21.3
Annual PE demand (non-renewable primary energy)		11199	23.4
		kg/a	kg/(m²a)
Annual CO_2-equivalent emissions		2545	5.3