



Brief instructions

Place your mouse pointer here to see the PHPP assistance.

If no help appears when the mouse passes over cell to the left, activate it in the Excel Options by selecting "Comment indicator only".

Explanation of cell formats:

Example	Cell format	Meaning
78.8	light yellow	Input field: Please enter the required value here
01ud Triple-low-e Kr08	light yellow, drop-down list	Input field with drop-down list (click on cell to display options field)
80	grey, protected	Link (through Variants-macro). Attention: do not overwrite!
6619	white, protected	Calculation field; please do not change
126.0	green, protected	Important result

Overview of worksheets:

Worksheet name (to show/hide worksheets please use the separate 'Profile settings' tool)	Function	Brief description	Required for certification?
Verification	Building data; summary of results	Building description, summary of results, verification of compliance with criteria	yes
Overview	Overview of the specific data of the project entered	In-depth project description, overview of all results and input variables, specific details on building envelope, building services systems as well as general information.	no
Check	Data entry assistance	Information in case PHPP does not calculate, overview of errors, plausibility checks	yes
Variants	Calculation of variants	Input parameters and results for variant calculation, predefined fields for frequent entries as well as user-defined area.	no
Comparison	Comparison between two variants	Comparison between two variants from the perspective of energy demand and economic viability. Input of comparison configurations.	no
PHeco	Cost efficiency calculation	Life cycle costs of different variants can be compared.	no
Moni	Comparison of PHPP calculation and measured values	The PHPP calculation is adapted to the real boundary conditions of the year under consideration and compared with the measured consumption.	no
Climate	Climate region selection or definition of user-defined data	Climate data for the worksheets: Annual heating, Windows, Heating Load, Heating, Summer, Cooling, Cooling units, Cooling Load and location specific PER factors	yes
U-values	Calculation of standard building assembly U-values	Calculation of heat transfer coefficients according to DIN EN ISO 6946, secondary calculations and calculations for special cases	yes
Areas	Areas summary	Building component areas, thermal bridges, Treated Floor Area. Pay attention to the external dimension reference! Additional calculation for internal downpipes	yes
Ground	Calculation of the temperature reduction factors against the ground	More precise calculation of heat losses through the ground	optional
Components	Building component database	Database of certified, Passive House suitable components and entry of user-defined components	yes
Windows	Determination of the U-value for windows and doors	Input of geometry, orientation, frame lengths, frame widths, U _g and U-values of the frame, and the thermal bridge heat loss coefficients of the connections; from these inputs, determine U _w and total radiation.	yes
Shading	Determination of shading reduction factors	Input of shading parameters, e.g. balcony, neighbouring building, window reveal and calculating the shading reduction factors	yes
Ventilation	Air quantities and supply air/extract air balance for the heating period, input of the airtightness test result	Sizing the ventilation system from extract and supply air requirements, infiltration air change rate and actual efficiency of heat recovery, input of pressurisation test results	yes
Addl vent	Design and planning of ventilation systems with diverse ventilation units	Extension of the 'Ventilation' worksheet for dimensioning airflows, for special building uses and systems with various ventilation units	if applicable
Addl vent. 2	Design and planning of ventilation systems with diverse ventilation units	The copy of the Addl. vent. worksheet is used if the 'Addl vent.' worksheet is not sufficient.	if applicable
Annual heating	Annual heating demand / annual method (only informative)	Calculation of the annual heating demand according to the heating period method based on EN 13790: Transmission + ventilation - h (solar offer + internal sources)	no
Heating	Heating demand calculation by the monthly method according to ISO 52016	Calculation procedure for the monthly method based on DIN EN ISO 52016	yes
Heating load	Building heating load calculation	Calculation of the nominal heating load according to heat balance for the design period: Transmission + ventilation - (solar offer + internal sources)	yes
SummVent	Determination of summer ventilation	Summer ventilation and estimation of airflow rates for summer window ventilation	yes
Summer	Assessment of summer climate	Calculation of the frequency of overheating as a measure of summer comfort	In case of no active cooling
Cooling	Monthly method for cooling demand	Annual useful cooling demand calculation	In case of active cooling
Cooling units	Latent cooling energy	Calculation of the energy demand for dehumidification and choice of cooling method	
Cooling load	Building cooling load calculation	Calculation of the daily average cooling load of the building	

DHW+Distribution	Distribution losses; DHW requirement and losses	Calculation of the heat losses of the distribution lines (heating, DHW, cooling); calculation of the useful heat demand for DHW and storage losses	yes
SolarDHW	Solar DHW generation	Solar contribution calculation for DHW and supplementary space heating contribution	if present
PV	Photovoltaic power generation	Electricity generation calculation of PV system	if present
Electricity	Electricity demand for dwellings	Calculation of the electricity demand of Passive Houses with residential use	For residential buildings
Use non-res	Utilisation profiles non-residential	Input or selection of utilisation profiles for planning of electricity demand and internal heat gains	For non-residential buildings
Electricity non-res	Electricity demand for non-residential use	Calculation of the electricity demand for lighting, equipment and kitchens of non-residential buildings, as well as the total electricity demand incl. heating, cooling/dehumidification and DHW	For non-residential buildings
Aux Electricity	Auxiliary electricity demand	Calculation of auxiliary electricity and corresponding primary energy demand	yes
IHG	Internal heat gains residential buildings	Calculation of the internal heat gains based on the 'Electricity' and 'Aux Electricity' worksheets.	For residential buildings in case of no standard IHG
IHG non-res	Internal heat gains non-residential buildings	Calculation of the internal heat gains for non-residential buildings based on the 'Electricity non-res' worksheet and the occupancy	For non-residential buildings in case of no standard IHG
PER	Specific primary energy and CO ₂ demands	Selection of heat generators, calculation of the primary energy and CO ₂ specific demands from the present results	yes
Compact	Performance ratio of heat generator HP-compact unit	Calculation of the performance ratio of combined heat generation for heating and DHW by means of an electric heat pump compact unit exclusively, considering the specific project boundary conditions.	if present
HP	Performance ratio of heat generation of the heat pump	Calculation of the performance ratio for heat generation for one to two electric-run heat pumps, considering the specific project boundary conditions.	if present
HP Ground	Ground probe or ground collector in combination with a heat pump	Heat source calculation for a ground probe or horizontal subsoil heat exchanger for ground-coupled heat pumps, considering the specific project boundary conditions.	if present
Boiler	Performance ratio of heat generator Boiler	For the calculation of the performance ratio of heat generation with standard boilers (NT and calorific boilers) for the project given boundary conditions.	if present
District Heating	District heat transfer station	Calculation of the final and primary energy demands (heat)	if present
Data	Database	Table of primary energy (PE) factors	no

Passive House-Verification

10.4a EN

PHPP



Photo or drawing		Building:	Block C Cranwood House		
		Street:	102-106 Woodside Avenue, Muswell Hill		
		Postcode/City:	N10 3JA	London	
		Province/Country:	Greater London	GB-United Kingdom/ Britain	
		Building type:	5-Multi-family house I Apartment building		
		Climate data set:	GB0027a-Northolt, Altitude corrected		
		Climate zone:	3: Cool-temperate	Altitude of location:	92.4 m
		Home owner / Client:	London Borough of Haringey Council		
		Street:	River Park House, 225 High Rd		
		Postcode/City:	N22 8HQ	London	
		Province/Country:	Greater London	GB-United Kingdom/ Britain	
		Mechanical engineer:	NLY		
		Street:	The Coach House, Furze Hill, Ivy Barnes Lane		
		Postcode/City:	CM4 0EW	Margaretting	
		Province/Country:	Ingatestone	GB-United Kingdom/ Britain	
		Certification:	Mead Consulting		
		Street:	3 Harvey Road		
		Postcode/City:	N8 9PD	London	
		Province/Country:	Greater London	GB-United Kingdom/ Britain	
Architecture:	Delta Architects				
Street:	1 Batemans Row				
Postcode/City:	EC2A 3HH	London			
Province/Country:	Greater London	GB-United Kingdom/ Britain			
Energy consultancy:	PRP				
Street:	10 Lindsey Street				
Postcode/City:	EC1A 9HP	London			
Province/Country:	Greater London	GB-United Kingdom/ Britain			
Year of construction:	2024	Interior temperature winter [°C]:	20.0	Interior temp. summer [°C]:	25.0
No. of dwelling units:	18	Internal heat gains (IHG) winter [W/m²]:	2.8	IHG summer [W/m²]:	2.8
No. of occupants:	32.0	Specific heat capacity [Wh/K per m² TFA]:	60	Mechanical cooling:	

Specific building characteristics with reference to the treated floor area 2 error message(s) in 'Check' worksheet'

		Treated floor area m²	1207.9		Alternative criteria		Fullfilled? ²
Space heating		Heating demand kWh/(m²a)	14	≤	15	-	Yes
		Heating load W/m²	12	≤	-	10	
	Space cooling		Cooling & dehum. demand kWh/(m²a)	-	≤	-	-
		Frequency of overheating (> 25 °C) %	6	≤	10		Yes
		Frequency of excessively high humidity (> 12 g/kg) %	0	≤	20		Yes
Airtightness		Pressurisation test result n ₅₀ 1/h	0.6	≤	0.6		Yes
Non-renewable Primary Energy (PE)		PE demand kWh/(m²a)	30	≤	-		-
Primary Energy Renewable (PER)		PER demand kWh/(m²a)	24	≤	60	60	Yes
		Renew. energy generation (in rel. to projected building footprint area) kWh/(m²a)	0	≥	-	-	

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

Task:	First name:	Surname:	Passive house Classic?	Yes
Certificate-ID	Issued on:	City:	Signature:	

▼ Overview of input errors

There are still 2 error message(s) in your PHPP.

Verification	-
Moni	-
Climate	-
U-values	-
Areas	-
Ground	-
Components	-
Windows	-
Shading	-
Ventilation	-
Addl vent	1 Error(s)
Addl vent 2	-
SummVent	-
Cooling units	-
DHW+Distribution	-
SolarDHW	-
PV	-
Electricity	-
Use non-res	-
Electricity non-res	-
Aux Electricity	-
IHG	-
IHG non-res	-
PER	1 Error(s)
Compact	-
HP	-
HP Ground	-
Boiler	-
District Heating	-

▼ Are results missing from 'Verification' worksheet? Possible causes are listed below

Heating demand / heating load is not calculated because:

-
-
-
-
-
-
-
A different number of rows has been inserted in the 'Windows' and 'Shading' worksheets. The calculation process will be disrupted if rows are not inserted correctly.

Cooling demand / cooling load is not calculated because:

-
-
-
-
-
-
-
-

PE / PER specific value is not calculated because:

-
-
-

▼ The following notes are based on the energy balance

Caution: high daily temperature variations. Calculation of the useful cooling demand is not reliable.
Caution: high daily temperature variations. Considering the daily mean cooling load is not sufficient. Improve solar protection if necessary!
-
-
-
-
-
-
-
-
-
-
-

▼ Plausibility check

		Comment:
<u>Verification</u>	-	
	-	
	-	
	-	
<u>Climate</u>	-	
	-	
<u>U-values</u>	-	
	A very small thermal conductivity [W/(mK)] was set:0.018	
<u>Areas</u>	Info: compactness of the building: 1.3 m² envelope area per m² of treated floor area	
	-	
	-	
	Has the area of the door in the external wall been deducted?	
	There are negative surfaces. Is this intentional? (e.g. all windows were subtracted from a south-facing wall for simplification and not distributed to different partial surfaces of this wall). The calculation is still correct.	
	-	
	The areas facing east and west differ greatly from each other (156 m²) (Query will only work if all orientations have been entered; doors are not taken into account)	
	The areas facing north and south differ greatly from each other (15 m²) (Query will only work if all orientations have been entered; doors are not taken into account)	
	The proportion of glazing [%] of the entire building (including roof) is very high or very small:	
	-	
	-	
	Average reduction factor for shading of building elements: 100 % -> Very little shading	
	-	
	-	
<u>Ground</u>	-	
	More exact results can be achieved if you fill in the 'Ground' worksheet.	
	-	
	-	
	-	
	-	
	-	
	-	
	-	
	-	
<u>Components</u>	-	
	-	
	-	

	-		
	-		
	-		
	Is a transom-mullion construction used? Have the corresponding glass carrier values been entered in the 'Components' worksheet and the quantity in the 'Window' worksheet?		
	-		
	-		
	-		
	-		
	-		
	-		
	-		
	-		
	-		
<u>Windows</u>	-		
	-		
	-		
	-		
	-		
	-		
	-		
	-		
	-		
<u>Shading</u>	North, East, South, West: are there any shading elements on the horizon for this/these orientation(s)? Trees, houses, mountains that are further away almost always have an influence as well.		
	-		
	Info: reduction factor for shading in winter: minimum: 75% , maximum: 75% , average: 75%		
	Info: Reduction factor shading summer: Average:100%		
	Shading from the horizon and wind protection coefficient ('Ventilation' worksheet) do not match.		
<u>Ventilation</u>	-		
	-		
	-		
	-		
	-		
	Has the net air volume for the pressurisation test been calculated correctly? Please check.		
	-		
	There is no heat recovery for the ventilation!		
	-		
	-		
	The average heat recovery efficiency is relatively low.		
	-		
	The electrical efficiency of the ventilation unit is very good.		
	-		
	-		
	-		
<u>Addl vent</u>	-		
	-		
	-		
	-		

	-		
	-		
	-		
	-		
	-		
<u>Heating</u>	-		
	-		
	-		
	-		
<u>Heating load</u>	The maximum permissible supply air temperature which has been entered is relatively low.		
	-		
	-		
<u>SummVent</u>	The basic ventilation for good IAQ in summer is very low.		
	-		
	Additional passive night-time cooling seems to be very high. Has the air change rate from the same ventilation unit/window been set twice (for basic ventilation and additional night ventilation for cooling)?		
	-		
	-		
	-		
	-		
	-		
<u>Summer</u>	Info: Solar aperture per m² building envelope area:0.1		
<u>Cooling units</u>	-		
<u>Cooling load</u>	-		
<u>DHW+Distribution</u>	-		
	-		
	-		
	There are no distribution losses through DHW pipes. Is this correct?		
	-		
	-		
	-		
	-		
	-		
	-		
	-		
	-		
	-		
	-		
	-		
	Is there no storage tank?		
	-		
	-		
<u>PV</u>	-		
	-		
<u>Electricity</u>	-		
	-		
<u>Electricity non-res</u>	-		
	-		
	-		
	-		
<u>Aux Electricity</u>	-		
<u>IHG</u>	-		
<u>IHG non-res</u>	-		

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Climate data

Passive House with PHPP Version 10.4a EN

Block C Cranwood House / Climate: Northolt / TFA: 1208 m² / Heating: 14.5 kWh/(m²a) / Overheating: 6 % / PER: 23.5 kWh/(m²a)



Selection of climate data

Country: GB-United Kingdom/ Britain

Region: Zone 02 - Thames Valley

1-Sort alphabetically

Climate data set: GB0027a-Northolt

Climate zone: 3: Cool-temperate

Altitude

Weather station: 40 m

Building location: 92 m

Temperature increase Summer: °C

Result overview

Annual heating demand 14.5 kWh/(m²a)

Heating load 11.5 W/m²

Frequency of overheating 6.1 %

Sensible cooling 3.7 kWh/(m²a)

Latent cooling 1.3 kWh/(m²a)

Cooling load 19.4 W/m²

PER demand 23.5 kWh/(m²a)

Data for heating

Annual method

Heating / cooling period 201

Heating / cooling degree hours 64

Radiation North 99

Radiation East 214

Radiation South 401

Radiation West 221

Horizontal radiation 315

Data from monthly balance

Heating 212

Cooling 153

d/a

kKh/a

kWh/(m²a)

kWh/(m²a)

kWh/(m²a)

kWh/(m²a)

kWh/(m²a)

GB0027a-Northolt

Month	1	2	3	4	5	6	7	8	9	10	11	12	Heating load		Cooling load		PER factors	
Days	31	28	31	30	31	30	31	31	30	31	30	31	Weather 1	Weather 2	Weather 1	Weather 2		
GB0027a-Northolt, Altitude corrected	Latitude °	51.55	Longitude °	-0.42	Altitude [m]	92	ΔT Summer [K]				9.4	T Comfort criterion [°C]	-4.8	Radiation: [W/m²]		Radiation: [W/m²]		
° C	Exterior temperature	4.8	5.1	7.3	9.7	12.9	15.9	18.1	17.8	15.0	11.5	7.6	5.2	-1.5	1.5	26.0	20.7	1.30
kWh/(m²month)	Radiation North	7	12	23	33	44	53	48	39	24	17	9	6	8	5	95	50	1.30
kWh/(m²month)	Radiation East	17	26	47	72	93	102	96	84	66	39	19	14	12	5	220	180	1.65
kWh/(m²month)	Radiation South	50	58	79	89	90	85	88	93	92	77	55	41	28	15	185	255	1.00
kWh/(m²month)	Radiation West	18	27	49	71	83	88	94	80	58	42	24	14	14	10	220	180	1.15
kWh/(m²month)	Horizontal radiation	22	36	73	111	144	154	152	130	90	55	28	18	20	15	320	260	
° C	Dew point temperature	2.3	1.7	2.6	4.2	7.4	10.0	11.7	12.1	10.3	8.4	5.3	3.2			19.7	17.0	
° C	Sky temperature	-5.4	-5.9	-4.8	-2.9	0.9	4.1	6.5	6.7	4.4	1.8	-1.8	-4.4			17.9	14.5	
	Comment	Temp = 1991-2020 Met Office; Other derived from Meteonorm v8																
° C	Ground temperature (project-specific)	12.0	11.0	9.8	9.0	12.8	13.6	14.3	15.4	15.7	12.4	12.9	12.7	12.0	12.0	14.3	14.3	
	Relative humidity	84%	79%	72%	69%	69%	68%	66%	69%	74%	81%	85%	87%					

Occupant electricity (ε

Domestic hot water

Heating

Cooling

Dehumidification

U-values of building assemblies

Passive House with PHPP Version 10.4a EN

Block C Cranwood House / Climate: Northolt / TFA: 1208 m² / Heating: 14.5 kWh/(m²a) / Overheating: 6 % / PER: 23.5 kWh/(m²a)

Show special cases and secondary calculations on the right ->

Description of building assembly						Assembly no.	
FLOOR GF01 Ground Floor						01ud	
Orientation of building assembly (or R _{si})		3-Floor		Interior insulation?			
Adjacent to (or R _{se})		2-Ground		U-value supplement [W/(m²K)]			
Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]	
Floor Finish							
Screed	1.150					75	
Insulation	0.018					175	
Slab	2.300					225	
Percentage of sec. 1:	100%	Percentage of sec. 2:		Percentage of sec. 3:			
Heat transmission resistance coefficients						Total thickness [cm]:	
Interior R _{si} :		0.17	m²K/W		47.5		
Exterior R _{se} :		0.00	m²K/W		U-value [W/(m²K)]:		
						0.099	

Description of building assembly						Assembly no.	
WALL TYPE E1						02ud	
Orientation of building assembly (or R _{si})		2-Wall		Interior insulation?			
Adjacent to (or R _{se})		1-Outdoor air		U-value supplement [W/(m²K)]		0.030	
Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]	
Brick	0.800					103	
Air Cavity	0.330					50	
Mineral Fibre Insulation	0.035	RCM Y-Wall Sheathing Board	0.030			193	
Rockwool RWA 45	0.050	Metal Stud 60 I 50 'I' Stud				100	
British Gypsum Fireline	0.250					30	
Isover APR 1200 Insulation	0.043					50	
Service Void	0.250	Drylining studwork				60	
Plasterboard	0.019					15	
Percentage of sec. 1:	100%	Percentage of sec. 2:		Percentage of sec. 3:			
Heat transmission resistance coefficients						Total thickness [cm]:	
Interior R _{si} :		0.13	m²K/W		60.0		
Exterior R _{se} :		0.04	m²K/W		U-value [W/(m²K)]:		
						0.127	

Description of building assembly						Assembly no.	
FLOOR TYPE 1						03ud	
Orientation of building assembly (or R _{si})		3-Floor		Interior insulation?			
Adjacent to (or R _{se})		2-Ground		U-value supplement [W/(m²K)]			
Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]	
Floor Finish						15	
Screed	1.150					50	
PIR Rigid Insulation	0.022					185	
RC Slab	0.830					250	
Cellcore Void Former	0.350					150	
Concrete Blinding	0.350					50	

Percentage of sec. 1:		100%	Percentage of sec. 2:			Percentage of sec. 3:		
Heat transmission resistance coefficients								
Interior R _{si} :		0.17			m²K/W		Total thickness [cm]: 70.0	
Exterior R _{se} :		0.00			m²K/W		U-value [W/(m²K)]: 0.105	

Description of building assembly

Assembly no.

FLAT ROOF

04ud

Orientation of building assembly (or R_{si})

1-Roof

Adjacent to (or R_{se})

1-Outdoor air

Interior insulation?

U-value supplement [$W/(m^2K)$]

Area section 1

λ [$W/(mK)$]

Area section 2 (optional)

λ [$W/(mK)$]

Area section 3 (optional)

λ [$W/(mK)$]

Thickness [mm]

Slab

2.300

225

Insulation

0.022

220

Elastometric Underlayer

Capping Sheet

Waterproofing

Ballast

1.100

Percentage of sec. 1:

100%

Percentage of sec. 2:

Percentage of sec. 3:

Heat transmission resistance coefficients

Total thickness [cm]:

44.5

Interior R_{si} :

0.10

m^2K/W

U-value [$W/(m^2K)$]:

0.098

Exterior R_{se} :

0.04

m^2K/W

Description of building assembly

Assembly no.

WALL TYPE E2C

05ud

Orientation of building assembly (or R_{si})

2-Wall

Adjacent to (or R_{se})

1-Outdoor air

Interior insulation?

U-value supplement [$W/(m^2K)$]

0.030

Area section 1

λ [$W/(mK)$]

Area section 2 (optional)

λ [$W/(mK)$]

Area section 3 (optional)

λ [$W/(mK)$]

Thickness [mm]

Brick

2.000

103

Air Cavity

0.330

Metal Stud 60 I 50 'I' Stud

50

Rockwool Frameclad RW45

0.034

BG Metal Stud (LGS infill)

300

Service Void

0.330

Metal Stud 60 I 50 'I' Stud

40

Gyproc Soundbloc

0.250

13

Gyproc Fireline Duplex with VCL

0.250

13

Percentage of sec. 1:

100%

Percentage of sec. 2:

Percentage of sec. 3:

Heat transmission resistance coefficients

Total thickness [cm]:

51.8

Interior R_{si} :

0.13

m^2K/W

U-value [$W/(m^2K)$]:

0.136

Exterior R_{se} :

0.04

m^2K/W

Description of building assembly

Assembly no.

06ud

Orientation of building assembly (or R_{si})

Adjacent to (or R_{se})

Interior insulation?

U-value supplement [$W/(m^2K)$]

Area section 1

λ [$W/(mK)$]

Area section 2 (optional)

λ [$W/(mK)$]

Area section 3 (optional)

λ [$W/(mK)$]

Thickness [mm]

Percentage of sec. 1:

100%

Percentage of sec. 2:

Percentage of sec. 3:

Heat transmission resistance coefficients

Total thickness [cm]:

Interior R_{si} :

m^2K/W

Exterior R_{se} :		m^2K/W	U-value $[W/(m^2K)]$:	
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Description of building assembly

Assembly no.

07ud

Orientation of building assembly (or R_{si})

Adjacent to (or R_{se})

Interior insulation?

U-value supplement [W/(m²K)]

Area section 1

λ [W/(mK)]

Area section 2 (optional)

λ [W/(mK)]

Area section 3 (optional)

λ [W/(mK)]

Thickness [mm]

Percentage of sec. 1:

100%

Percentage of sec. 2:

Percentage of sec. 3:

Heat transmission resistance coefficients

Interior R_{si}:

Exterior R_{se}:

Total thickness [cm]:

U-value [W/(m²K)]:

Description of building assembly

Assembly no.

08ud

Orientation of building assembly (or R_{si})

Adjacent to (or R_{se})

Interior insulation?

U-value supplement [W/(m²K)]

Area section 1

λ [W/(mK)]

Area section 2 (optional)

λ [W/(mK)]

Area section 3 (optional)

λ [W/(mK)]

Thickness [mm]

Percentage of sec. 1:

100%

Percentage of sec. 2:

Percentage of sec. 3:

Heat transmission resistance coefficients

Interior R_{si}:

Exterior R_{se}:

Total thickness [cm]:

U-value [W/(m²K)]:

Description of building assembly

Assembly no.

09ud

Orientation of building assembly (or R_{si})

Adjacent to (or R_{se})

Interior insulation?

U-value supplement [W/(m²K)]

Area section 1

λ [W/(mK)]

Area section 2 (optional)

λ [W/(mK)]

Area section 3 (optional)

λ [W/(mK)]

Thickness [mm]

Percentage of sec. 1:

100%

Percentage of sec. 2:

Percentage of sec. 3:

Heat transmission resistance coefficients

Total thickness [cm]:

Interior R_{si} :		m^2K/W	
Exterior R_{se} :		m^2K/W	
			U-value $[W/(m^2K)]$:

Description of building assembly

Assembly no.

10ud

Orientation of building assembly (or R_{si})

Adjacent to (or R_{se})

Interior insulation?

U-value supplement [W/(m²K)]

Area section 1

λ [W/(mK)]

Area section 2 (optional)

λ [W/(mK)]

Area section 3 (optional)

λ [W/(mK)]

Thickness [mm]

Percentage of sec. 1:

100%

Percentage of sec. 2:

Percentage of sec. 3:

Heat transmission resistance coefficients

Interior R_{si}:

Exterior R_{se}:

Total thickness [cm]:

U-value [W/(m²K)]:

Description of building assembly

Assembly no.

11ud

Orientation of building assembly (or R_{si})

Adjacent to (or R_{se})

Interior insulation?

U-value supplement [W/(m²K)]

Area section 1

λ [W/(mK)]

Area section 2 (optional)

λ [W/(mK)]

Area section 3 (optional)

λ [W/(mK)]

Thickness [mm]

Percentage of sec. 1:

100%

Percentage of sec. 2:

Percentage of sec. 3:

Heat transmission resistance coefficients

Interior R_{si}:

Exterior R_{se}:

Total thickness [cm]:

U-value [W/(m²K)]:

Description of building assembly

Assembly no.

12ud

Orientation of building assembly (or R_{si})

Adjacent to (or R_{se})

Interior insulation?

U-value supplement [W/(m²K)]

Area section 1

λ [W/(mK)]

Area section 2 (optional)

λ [W/(mK)]

Area section 3 (optional)

λ [W/(mK)]

Thickness [mm]

Percentage of sec. 1:

100%

Percentage of sec. 2:

Percentage of sec. 3:

Heat transmission resistance coefficients

Interior R_{si}:

Exterior R_{se}:

Total thickness [cm]:

U-value [W/(m²K)]:

--	--	--

Description of building assembly

Assembly no.

13ud

Orientation of building assembly (or R_{si})

Interior insulation?

Adjacent to (or R_{se})

U-value supplement $[W/(m^2K)]$

Area section 1

λ $[W/(mK)]$

Area section 2 (optional)

λ $[W/(mK)]$

Area section 3 (optional)

λ $[W/(mK)]$

Thickness [mm]

Percentage of sec. 1:

100%

Percentage of sec. 2:

Percentage of sec. 3:

Heat transmission resistance coefficients

Interior R_{si} :

m^2K/W

Exterior R_{se} :

m^2K/W

Total thickness [cm]:

U-value $[W/(m^2K)]$:

Description of building assembly

Assembly no.

14ud

Orientation of building assembly (or R_{si})

Interior insulation?

Adjacent to (or R_{se})

U-value supplement $[W/(m^2K)]$

Area section 1

λ $[W/(mK)]$

Area section 2 (optional)

λ $[W/(mK)]$

Area section 3 (optional)

λ $[W/(mK)]$

Thickness [mm]

Percentage of sec. 1:

100%

Percentage of sec. 2:

Percentage of sec. 3:

Heat transmission resistance coefficients

Interior R_{si} :

m^2K/W

Adjacent to (or R_{se})

m^2K/W

Total thickness [cm]:

U-value $[W/(m^2K)]$:

Description of building assembly

Assembly no.

15ud

Orientation of building assembly (or R_{si})

Interior insulation?

Adjacent to (or R_{sa})

U-value supplement $[W/(m^2K)]$

Area section 1

λ $[W/(mK)]$

Area section 2 (optional)

λ $[W/(mK)]$

Area section 3 (optional)

λ $[W/(mK)]$

Thickness [mm]

Percentage of sec. 1:

100%

Percentage of sec. 2:

Percentage of sec. 3:

Heat transmission resistance coefficients

Interior R_{si} :

m^2K/W

Exterior R_{se} :

m^2K/W

Total thickness [cm]:

U-value $[W/(m^2K)]$:

--	--	--

Description of building assembly

Assembly no.

16ud

Orientation of building assembly (or R_{si})

Interior insulation?

Adjacent to (or R_{se})

U-value supplement [$W/(m^2K)$]

Area section 1

λ [$W/(mK)$]

Area section 2 (optional)

λ [$W/(mK)$]

Area section 3 (optional)

λ [$W/(mK)$]

Thickness [mm]

Percentage of sec. 1:	100%	Percentage of sec. 2:		Percentage of sec. 3:	

Heat transmission resistance coefficients

Interior R_{si} :

Exterior R_{se} :

m²K/W

m²K/W

Total thickness [cm]:

U-value [$W/(m^2K)$]:

Description of building assembly

Assembly no.

17ud

Orientation of building assembly (or R_{si})

Interior insulation?

Adjacent to (or R_{se})

U-value supplement [$W/(m^2K)$]

Area section 1

λ [$W/(mK)$]

Area section 2 (optional)

λ [$W/(mK)$]

Area section 3 (optional)

λ [$W/(mK)$]

Thickness [mm]

Percentage of sec. 1:	100%	Percentage of sec. 2:		Percentage of sec. 3:	

Heat transmission resistance coefficients

Interior R_{si} :

Exterior R_{se} :

m²K/W

m²K/W

Total thickness [cm]:

U-value [$W/(m^2K)$]:

Description of building assembly

Assembly no.

18ud

Orientation of building assembly (or R_{si})

Interior insulation?

Adjacent to (or R_{se})

U-value supplement [$W/(m^2K)$]

Area section 1

λ [$W/(mK)$]

Area section 2 (optional)

λ [$W/(mK)$]

Area section 3 (optional)

λ [$W/(mK)$]

Thickness [mm]

Percentage of sec. 1:	100%	Percentage of sec. 2:		Percentage of sec. 3:	

Heat transmission resistance coefficients

Interior R_{si} :

Exterior R_{se} :

m²K/W

m²K/W

Total thickness [cm]:

U-value [$W/(m^2K)$]:

--	--	--

Description of building assembly						Assembly no.	
						19ud	

Orientation of building assembly (or R _{si})						Interior insulation?		
Adjacent to (or R _{se})						U-value supplement [W/(m²K)]		

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
Percentage of sec. 1:	100%	Percentage of sec. 2:		Percentage of sec. 3:		

Heat transmission resistance coefficients

Interior R_{si}:

Exterior R_{se}:

m²K/W

m²K/W

Total thickness [cm]:

U-value [W/(m²K)]:

Description of building assembly						Assembly no.	
						20ud	

Orientation of building assembly (or R _{si})						Interior insulation?		
Adjacent to (or R _{se})						U-value supplement [W/(m²K)]		

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
Percentage of sec. 1:	100%	Percentage of sec. 2:		Percentage of sec. 3:		

Heat transmission resistance coefficients

Interior R_{si}:

Exterior R_{se}:

m²K/W

m²K/W

Total thickness [cm]:

U-value [W/(m²K)]:

Show special cases and secondary calculations on the right ->

Show special cases and secondary calculations on the right ->

Show special cases and secondary calculations on the right ->

Show special cases and secondary calculations on the right ->

Show special cases and secondary calculations on the right ->

User-defined temperature reduction factors					
Zone	Heating-demand	Heating load	Cooling demand	Cooling load	Passive cooling
X					
Y					
Z					
Auxiliary calculation for the determination of temperature reduction factors					
	Temperature of the adjacent zone [°C]:				

PHPP, Areas

97				x (	x	+	-	) -	0.0	=									
98				x (	x	+	-	) -	0.0	=									
99				x (	x	+	-	) -	0.0	=									
100				x (	x	+	-	) -	0.0	=									
Aend																			

Auxiliary calculation for interior drain pipes that are ventilated through the roof									
		Nominal width:	λ	Insulation	Reflective	Ψ -value	Length	$\Psi \cdot l$	
Climate		mm	W/(mK)	thickness	coating?	W/(mK)	m	W/K	
Room temperature °C	20.0								
Ground temperature °C	11.9								
Ambient temperature heating period °C	7.5								
Limitation of airflow rate in the pipe system:							m	W/K	
Nominal width mm							0.00	0.000	
Number of parallel pipes									0.649
Capacitance rate W/K	0.0								1.000
						Spec. loss with respect to ambient air [W/K]		0.000	
This result is automatically transferred to the energy balance									

Heat losses through the ground

Passive House with PHPP Version 10.4a EN

PHPP

Block C Cranwood House / Climate: Northolt / TFA: 1208 m² / Heating: 14.5 kWh/(m²a) / Overheating: 6 % / PER: 23.5 kWh/(m²a)

Building section 1

Ground characteristics				Climate data			
Thermal conductivity	λ	2.0	W/(mK)	Avg. indoor temp. winter	θ_i	20.0	°C
Heat capacity	ρc	2.0	MJ/(m³K)	Avg. indoor temp. summer	θ_i	25.0	°C
Periodic penetration depth	δ	3.17	m	Avg. ground surface temperature	$\theta_{e,m}$	11.9	°C
				Amplitude of $\theta_{e,m}$	$\theta_{e,\wedge}$	6.7	°C
				Phase shift of θ_e	τ	1.2	Months
				Length of the heating period	n	6.6	Months
				Heating degree hours - exterior	G_t	64.5	kKh/a

Building data							
Area floor slab / basement ceiling	A	297.9	m²	U-value floor slab / basement ceiling	U_f	0.099	W/(m²K)
Perimeter length	P	86.1	m	TBs floor slab / basement ceiling	$\Psi_{B,*\ell}$	0.00	W/K
Charact. dimension of floor slab	B'	6.92	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)				
Area of interior wall towards heated	A_{wl}		m²	U-value of interior wall towards heated	U_{wl}		W/(m²K)
Heated basement or floor slab completely / partially below ground level							
Area basement wall below ground	A_{wb}		m²	U-value wall below ground	U_{wB}		W/(m²K)
Unheated basement							
Area basement wall above ground	A_W		m²	U-value wall above ground	U_W		W/(m²K)
Area basement wall below ground	A_{wb}		m²	U-value wall below ground	U_{wB}		W/(m²K)
Area of interior wall towards heated	A_{wl}		m²	U-value of interior wall towards heated	U_{wl}		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	-
Area of interior wall towards heated	A_{wl}		m²	U-value of interior wall towards heated	U_{wl}		W/(m²K)

Perimeter thermal bridges				Perimeter TBs steady-state fraction	$\Psi_{P,stat}*\ell$	0.000	W/K
Phase shifting (optional)	β		Months	Perimeter TBs harmonic fraction	$\Psi_{P,harm}*\ell$	0.000	W/K

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

Interim results							
Steady-state conductance	H_S		W/K	Conductance building	H_0		W/K
Exterior periodic conductance	H_{pe}		W/K	Internal harmonic conductance	H_{pi}		W/K
External phase shift	β		Months	Internal phase shift	α		Months

Total result - Standard values

Steady-state conductance	H_S		W/K	Conductance building	H_0		W/K
Exterior periodic conductance	H_{pe}		W/K	Internal harmonic conductance	H_{pi}		W/K
External phase shift	β		Months	Internal phase shift	α		Months
Steady-state heat flow	Φ_{stat}	275.9	W	Heat losses during heating period	Q_{tot}	1241	kWh
External periodic heat flow	$\Phi_{harm,e}$	23.8	W	Charact. dimension of floor slab	B'	6.92	m
Internal harmonic conductance	$\Phi_{harm,i}$	43.0	W				

Heat flow into the ground for monthly method (all building parts)

Month	1	2	3	4	5	6	7	8	9	10	11	12	Avg. value
heat flow	236	267	301	328	341	337	316	285	251	224	211	215	276

Design ground temperature for 'Heating load' worksheet

12.0

For 'Cooling load' worksheet

14.3

Passive House Components

Block C Cranwood House / Climate: Northolt / TFA: 1208 m² / Heating: 14.5 kWh/(m²a) / Overheating: 6 % / PER: 23.5 kWh/(m²a)

[◀ Contents](#) [Link to 'Areas' worksheet](#)

Typical for climate zone 'Cool-temperate': U-value for walls and roofs 0.15 W/(m²K)

ID	Building system	Building assembly	Total thickness	U-value	Interior insulation
	Summary of building assemblies calculated in 'U values' worksheet		m	W/(m²K)	-
01ud	<u>FLOOR GF01 Ground Floor</u>	FLOOR GF01 Ground Floor	0.475	0.099	0
02ud	<u>WALL TYPE E1</u>	WALL TYPE E1	0.600	0.127	0
03ud	<u>FLOOR TYPE 1</u>	FLOOR TYPE 1	0.700	0.105	0
04ud	<u>FLAT ROOF</u>	FLAT ROOF	0.445	0.098	0
05ud	<u>WALL TYPE E2C</u>	WALL TYPE E2C	0.518	0.136	0
06ud					
07ud					
08ud					
09ud					
10ud					
11ud					
12ud					
13ud					

Glazing and door panels			
Typical for 'Cool-temperate' climate zone: Triple low-e glazing			
ID	Description	g-value	U _p -value
			W/(m²K)
01ud	Generic NorDan Type 24A	0.46	0.64
02ud			
03ud			
04ud			
05ud			
06ud			
07ud			
08ud			
09ud			
10ud			
11ud			
12ud			
13ud			

Ventilation units															
Typical for climate zone 'Cool-temperate': Frost protection: Yes, Energy recovery: No		75 %				0.45									
ID	Description	Heating period		Cooling period		Specific electric power	Additional device data								
		Heat recovery efficiency	Humidity recovery efficiency η_{ERV}	HR efficiency, cooling	Humidity recovery efficiency η_{ERV}		Air flow range		External pressure	Fittings $D_{p_{extern}}$	Frost protection necessary	Noise protection			Additional info
		%	%	%	%	Wh/m³	m³/h	m³/h	Pa	Pa		35 dB(A)	Supply air dB(A)	Extract air dB(A)	
01ud	Generic MVHR	86%	0%			0.44	75	120	100	incl.	yes	/	62	49	
02ud															
03ud															
04ud															
05ud															
06ud															
07ud															
08ud															
09ud															
10ud															
11ud															
12ud															
13ud															

Drain water heat recovery (shower)				
ID	Description	Nominal efficiency	Effective dead time	Nominal airflow rate
		-	s	l/min
01ud				
02ud				
03ud				
04ud				
05ud				
06ud				
07ud				
08ud				
09ud				
10ud				
11ud				
12ud				
13ud				

Heat pumps, e.g. according to EN 14825 / EN 14511																																				
			Heating / DHW																																	
			Use for heating/DHW	Heat source	Heat sink	Test point 1				Test point 2				Test point 3				Test point 4				Test point 5				Test point 6				Test point 7				Test point 8		
ID	Description				Temp. source	Temp. sink	Heating capacity	COP	Temp. source	Temp. sink	Htg. capacity	COP	Temp. source	Temp. sink	Htg. capacity	COP	Temp. source	Temp. sink	Htg. capacity	COP	Temp. source	Temp. sink	Htg. capacity	COP	Temp. source	Temp. sink	Htg. capacity	COP	Temp. source	Temp. sink	Htg. capacity	COP	Temp. source	Temp. sink	Htg. capacity	COP
			select		°C	°C	kW		°C	°C	kW		°C	°C	kW		°C	°C	kW		°C	°C	kW		°C	°C	kW		°C	°C	kW		°C	°C	kW	
01ud																																				
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08ud																																				
09ud																																				
10ud																																				
11ud																																				
12ud																																				
13ud																																				

[illegible]

Combined ventilation and split units (air source heat pump), PHI test method															Heating																					
ID		Ventilation													Heating																					
															Heating test point 1								Heating test point 2								Heating					
															Temperature		Normal operation				Silent mode				Temperature		Normal operation				Silent mode				Tempe	
Description		Ventilation function	Heat recovery efficiency	Humidity recovery rate η_{ERV}	HR efficiency, cooling	Humidity recovery rate η_{ERV}	Specific electric efficiency	Range of use from to		External pressure per section	Frost protection necessary	Noise protection			Heating function	Source	Sink	Heating capacity max / on-off limit		COP max / on-off limit		Heating capacity max / on-off limit		COP max / on-off limit		Source	Sink	Heating capacity max / on-off limit		COP max / on-off limit		Heating capacity max / on-off limit		COP max / on-off limit		Source
		Mark with an 'x'	%	%	%	%	Wh/m³	m³/h	m³/h	Pa		35 dB(A)	Supply air dB(A)	Extract air dB(A)	Mark with an 'x'	°C	°C	kW	kW			kW	kW			°C	°C	kW	kW			kW	kW			°C
01ud																																				
02ud																																				
03ud																																				
04ud																																				
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06ud																																				
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09ud																																				
10ud																																				
11ud																																				
12ud																																				
13ud																																				

Windows and entrance doors

Block C Cranwood House / Climate: Northolt / TFA: 1208 m² / Heating: 14.5 kWh/(m²a) / Overheating: 6 % / PER: 23.5 kWh/(m²a)

Window orientation	Global radiation (main direction) kWh/(m²a)	Shading	Dirť	Non-perpendicular radiation incidence kWh/(m²a)	Glazing fraction	g-value	Solar irradiation reduction factor	Window area m²	Window U _g installed W/(m²K)	Glazing area m²	Average global radiation kWh/(m²a)
North	99	0.75	0.95	0.85	0.64	0.46	0.39	23.8	1.10	15.22	100
East	214	0.75	0.95	0.85	0.70	0.46	0.42	355.3	0.98	248.05	130
South	401	0.75	0.95	0.85	0.68	0.46	0.41	25.6	1.01	17.47	400
West	221	0.75	0.95	0.85	0.53	0.46	0.32	44.4	1.20	23.41	210
Horizontal	315	1.00	0.95	0.85	0.00	0.00	0.00	0.0	0.00	0.00	315
Total or average value for all windows.						0.46	0.41	449.00	1.01	304.15	150

Frame absorptivity

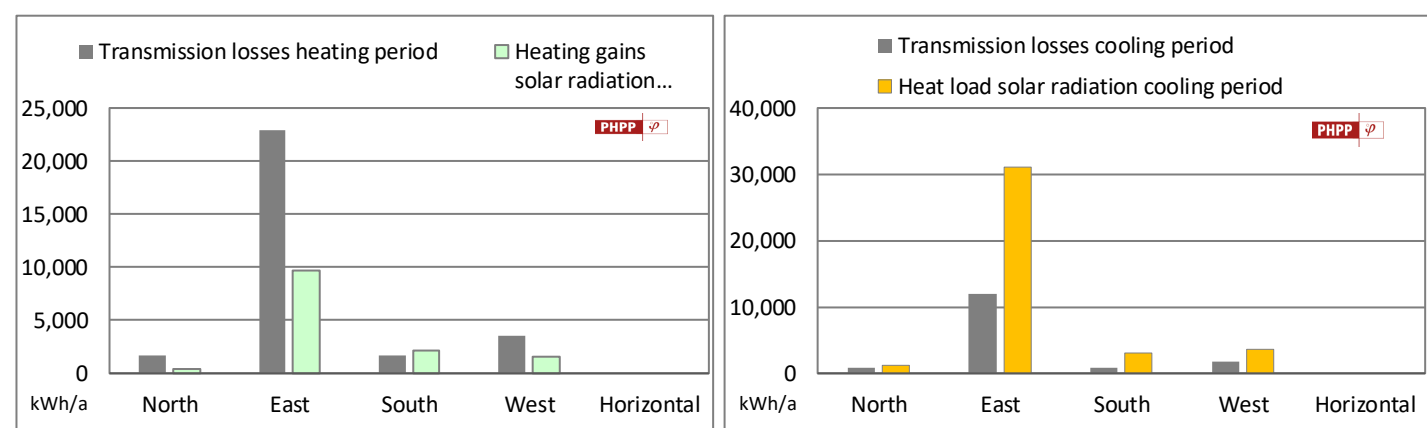
Frame emissivity

Heating degree hours [KkWh/a]: 66

Cooling degree hours [KkWh/a]: 34

	Transmission losses heating period kWh/a	Heating gains solar radiation heating period kWh/a
North	1712	460
East	22892	9715
South	1696	2184
West	3499	1517
Horizontal	0	0
Total	29799	13876

	Transmission losses cooling period kWh/a	Heat load solar radiation cooling period kWh/a
North	895	1246
East	11967	31125
South	887	3070
West	1829	3624
Horizontal	0	0
Total	15578	39066



Recommendation for U _g installed	Horizontal	Inclined	Vertical
	1.10	1.00	0.85

Exterior temperature

-4.8 °C

°C User-defined

					Dimensions windows, doors etc.		Installed in	Glazing/panel	Frame	Opening casement: length of outer frame					Fixed glazing: length of outer frame				Mullion length				Transom length			Number of glass carriers	Installation: own value for Ψ _{frame} or 1 = Ψ _{values} from 'Components' worksheet 0 = adjacent to other window				Thermal parameters					Results					Ener-Phit	Window surface temperature assessment				
Quantity	Description	Deviation from north	Angle of inclination from the horizontal	Orientation	Width	Height	Selection from 'Areas' worksheet	Selection list in 'Components' worksheet	Selection list in 'Components' worksheet	Left	Right	Top	Bottom	Threshold	Left fixed	Right fixed	Top fixed	Bottom fixed	f _m	m ₂	m ₁	m	t ₂	t ₁	t		Places	Left	Right	Top	Bottom	U _g frame (mean)	g-value glazing	U _g glazing	Ψ _{glazing edge}	Ψ _{installation (Avg.)}	Window area	Glazing area	Glazing fraction per window	U _g		U _g installed	Exemption	Exemption	Comfort	Heat gains heating period
	Pos. no.	°	°		m	m		1- Sort as list	1- Sort as list	m					m					m				m					W/(m²) or 1/0				W/(m²K)	-	W/(m²K)	W/(mK)	W/(m²K)	m²	m²	%	W/(m²K)	W/(m²K)			kWh/a	kWh/a
1	310	Block A2 North - 310 WA0.05.1	352.26	90	North	0.20	2.44	1-A2 North Elevation Brick (Matt)	01ud-Generic NorDan Type 24A	01ud-Generic NorDan Type 24A	2.44	2.44	0.20	0.20													1	1	1	1	1.01	0.46	0.64	0.050	0.040	0.5	0.0	-8%	1.508	1.939			-64	-36		
3	316	Block A2 North - 316 WA3.05.2	352.26	90	North	0.80	2.18	1-A2 North Elevation Brick (Matt)	01ud-Generic NorDan Type 24A	01ud-Generic NorDan Type 24A	2.18	2.18	0.80	0.80													1	1	1	1	1.01	0.46	0.64	0.050	0.040	5.2	3.6	68%	0.908	1.045			-251	106		
1	342	Block A2 North - 342 WA3.06.5 TOP	352.26	90	North	0.80	1.09	3-A2 North Elevation Panel	01ud-Generic NorDan Type 24A	01ud-Generic NorDan Type 24A	1.09	1.09	0.80	0.80													1	1	1	0	1.02	0.46	0.64	0.050	0.040	0.9	0.6	64%	0.952	1.088			-45	13		
1	342	Block A2 North - 342 WA3.06.5 BOTTOM	352.26	90	North	0.91	0.67	3-A2 North Elevation Panel	01ud-Generic NorDan Type 24A	01ud-Generic NorDan Type 24A	0.67	0.67	0.91	0.91													1	1	0	1	1.02	0.46	0.64	0.050	0.040	0.6	0.4	61%	0.990	1.137			-34	7		
1	311	Block A2 North-East - 311 WA0.06.2	352.26	90	North	0.80	1.21	1-A2 North Elevation Brick (Matt)	01ud-Generic NorDan Type 24A	01ud-Generic NorDan Type 24A	1.21	1.21	0.80	0.80													1	1	1	1	1.02	0.46	0.64	0.050	0.040	1.0	0.6	65%	0.943	1.109			-51	15		
3	316	Block A2 North-East - 316 WA3.05.2	352.26	90	North	0.80	2.18	1-A2 North Elevation Brick (Matt)	01ud-Generic NorDan Type 24A	01ud-Generic NorDan Type 24A	2.18	2.18	0.80	0.80													1	1	1	1	1.01	0.46	0.64	0.050	0.040	5.2	3.6	68%	0.908	1.045			-251	106		
											0.00	0.00	0.00	0.00													1	1	1	1																
											0.00	0.00	0.00	0.00													1	1	1	1																
15	317	Block A2 East - 317 WA3.09.3 LH	49.55	90	East	0.85	2.24	13-A2 North-East Brick (Matt)	01ud-Generic NorDan Type 24A	01ud-Generic NorDan Type 24A	2.24	2.24	0.85	0.85													1	0	1	1	1.01	0.46	0.64	0.050	0.040	28.6	20.0	70%	0.896	0.978			-1049	1554		
155	317	Block A2 East - 317 WA3.09.3 RH	49.55	90	East	0.85	2.24	13-A2 North-East Brick (Matt)	01ud-Generic NorDan Type 24A	01ud-Generic NorDan Type 24A	2.24	2.24	0.85	0.85													0	1	1	1	1.01	0.46	0.64	0.050	0.040	295.2	206.9	70%	0.896	0.978			-10841	16054		
5	318	Block A2 East - 318 WA0.09.5 LH	49.55	90	East	0.85	2.39	13-A2 North-East Brick (Matt)	01ud-Generic NorDan Type 24A	01ud-Generic NorDan Type 24A	2.39	2.39	0.85	0.85													1	0	1	1	1.01	0.46	0.64	0.050	0.040	10.2	7.1	70%	0.893	0.973			-369	558		
5	318	Block A2 East - 318 WA0.09.5 RH	49.55	90	East	0.85	2.39	13-A2 North-East Brick (Matt)	01ud-Generic NorDan Type 24A	01ud-Generic NorDan Type 24A	2.39	2.39	0.85	0.85													0	1	1	1	1.01	0.46	0.64	0.050	0.040	10.2	7.1	70%	0.893	0.973			-369	558		
3	319	Block A2 East - 319 WA3.04.4 TOP	49.55	90	East	0.80	1.24	13-A2 North-East Brick (Matt)	01ud-Generic NorDan Type 24A	01ud-Generic NorDan Type 24A	1.24	1.24	0.80	0.80													1	1	1	0	1.02	0.46	0.64	0.050	0.040	3.0	1.9	65%	0.941	1.074			-133	134		
3	319	Block A2 East - 319 WA3.04.4 BOTTOM	49.55	90	East	0.91	0.89	13-A2 North-East Brick (Matt)	01ud-Generic NorDan Type 24A	01ud-Generic NorDan Type 24A	0.89	0.89	0.91	0.91													1	1	0	1	1.02	0.46	0.64	0.050	0.040	2.4	1.6	65%	0.951	1.084			-111	108		
1	320	Block A2 East - 320 WA0.09.6 TOP	49.55	90	East	0.80	1.39	13-A2 North-East Brick (Matt)	01ud-Generic NorDan Type 24A	01ud-Generic NorDan Type 24A	1.39	1.39	0.80	0.80													1	1	1	0	1.02	0.46	0.64	0.050	0.040	1.1	0.7	66%	0.933	1.061			-49	52		
1	320	Block A2 East - 320 WA0.09.6 BOTTOM	49.55	90	East	0.91	0.89	13-A2 North-East Brick (Matt)	01ud-Generic NorDan Type 24A	01ud-Generic NorDan Type 24A	0.89	0.89	0.91	0.91													1	1	0	1	1.02	0.46	0.64	0.050	0.040	0.8	0.5	65%	0.951	1.084			-37	36		
3	321	Block A2 East - 321 WAB1.01.3 LH	49.55	90	East	0.29	1.21	13-A2 North-East Brick (Matt)	01ud-Generic NorDan Type 24A	01ud-Generic NorDan Type 24A	1.21	1.21	0.29	0.29													1	0	1	1	1.01	0.46	0.64	0.050	0.040	1.0	0.2	21%	1.263	1.469			-91	-24		
3	321	Block A2 East - 321 WAB1.01.3 RH	49.55	90	East	0.80	1.21	13-A2 North-East Brick (Matt)	01ud-Generic NorDan Type 24A	01ud-Generic NorDan Type 24A	1.21	1.21	0.80	0.80													0	1	1	1	1.02	0.46	0.64	0.050	0.040	2.9	1.9	65%	0.944	1.060			-128	130		
7	342	Block A2 East - 342 WA3.06.5 TOP	352.26	90	North	0.80	1.09	7-A2 North Inset A2-E 01 Panel	01ud-Generic NorDan Type 24A	01ud-Generic NorDan Type 24A	1.09	1.09	0.80	0.80													1	1	1	0	1.02	0.46	0.64	0.050	0.040	6.1	3.9	64%	0.952	1.088			-317	93		
7	342	Block A2 East - 342 WA3.06.5 BOTTOM	352.26	90	North	0.91	0.67	7-A2 North Inset A2-E 01 Panel	01ud-Generic NorDan Type 24A	01ud-Generic NorDan Type 24A	0.67	0.67	0.91	0.91													1	1	0	1	1.02	0.46	0.64	0.050	0.040	4.3	2.6	61%	0.990	1.137			-238	47		
											0.00	0.00	0.00	0.00													1	1	1	1																
3	323	Block A2 South - 323 WA3.01.4	184.22	90	South	0.80	2.18	38-A2 South Brick (Matt)	01ud-Generic NorDan Type 24A	01ud-Generic NorDan Type 24A	2.18	2.18	0.80	0.80													1	1	1	1	1.01	0.46	0.64	0.050	0.040	5.3	3.6	69%	0.908	1.044			90	444		
1	324	Block A2 South - 324 WAB1.01.7	184.22	90	South	0.80	2.33	38-A2 South Brick (Matt)	01ud-Generic NorDan Type 24A	01ud-Generic NorDan Type 24A	2.33	2.33	0.80	0.80													1	1	1	1	1.01	0.46	0.64	0.050	0.040	1.9	1.3	69%	0.905	1.039			33	159		
3	325	Block A2 South - 325 WA3.09.5 LH	184.22	90	South	0.85	2.24	38-A2 South Brick (Matt)	01ud-Generic NorDan Type 24A	01ud-Generic NorDan Type 24A	2.24	2.24	0.85	0.85													1	0	1	1	1.01	0.46	0.64	0.050	0.040	5.7	4.0	70%	0.896	0.979			133	511		
3	325	Block A2 South - 325 WA3.09.5 RH	184.22	90	South	0.85	2.24	38-A2 South Brick (Matt)	01ud-Generic NorDan Type 24A	01ud-Generic NorDan Type 24A	2.24	2.24	0.85	0.85													0	1	1	1	1.01	0.46	0.64	0.050	0.040	5.7	4.0	70%	0.896	0.979			133	511		
1	327	Block A2 South - 327 WAB1.01.6 TLH	184.22	90	South	0.83	1.26	38-A2 South Brick (Matt)	01ud-Generic NorDan Type 24A	01ud-Generic NorDan Type 24A	1.26	1.26	0.83	0.83													1	0	1	0	1.02	0.46	0.64	0.050	0.040	1.0	0.7	66%	0.935	1.015			17	84		
1	327	Block A2 South - 327 WAB1.01.6 BLH	184.22	90	South	0.94	1.02	38-A2 South Brick (Matt)	01ud-Generic NorDan Type 24A	01ud-Generic NorDan Type 24A	1.02	1.02	0.94	0.94													1	0	0	1	1.02	0.46	0.64	0.050	0.040	0.9	0.6	67%	0.934	1.016			16	78		
1	327	Block A2 South - 327 WAB1.01.6 TRH	184.22	90	South	0.83	1.26	38-A2 South Brick (Matt)	01ud-Generic NorDan Type 24A	01ud-Generic NorDan Type 24A	1.26	1.26	0.83	0.83													0	1	1	0	1.02	0.46	0.64	0.050	0.040	1.0	0.7	66%	0.935	1.015			17	84		
1	327	Block A2 South - 327 WAB1.01.6 BRH	184.22	90	South	0.94	1.02	38-A2 South Brick (Matt)	01ud-Generic NorDan Type 24A	01ud-Generic NorDan Type 24A	1.02	1.02	0.94	0.94																																

Calculation of reduction factors for shading

Block C Cranwood House / Climate: Northolt / TFA: 1208 m² / Heating: 14.5 kWh/(m²a) / Overheating: 6 % / PER: 23.5 kWh/(m²a)

Latitude: 51.6 °

Orientation	Glazing area [m²]	Reduction factor winter r_s	Reduction factor cooling $r_{s,1}$	Reduction factor cooling load $r_{s,2}$	Solar load [kWh/(m²Glazinga)]
North	15.22	75%	100%	100%	82
East	248.05	75%	100%	100%	125
South	17.47	75%	100%	100%	176
West	23.41	75%	100%	100%	155
Horizontal	0.00	100%	100%	100%	0

Quantity	Description	Deviation from North	Angle of inclination from the horizontal	Orientation	Glazing width	Glazing height	Glazing area	Horizon		Lateral reveal		Reveal / Overhang		Additional shading reduction factor, winter	Additional shading reduction factor, summer	Reduction factor z for temporary sun protection	Regulated / transparent	Reduction factors for shading in winter				Reduction factors for shading in summer				
								Height of the shading object	Distance of horizon	Window reveal depth	Distance from glazing edge to reveal	Overhang depth	Distance from upper glazing edge to overhang					Horizon	Reveal	Overhang	Total for winter	Horizon	Reveal	Overhang	Total for summer	Total for cooling load
		[Degrees]	[Degrees]		w_G [m]	h_G [m]	A_G [m²]	h_{Hor} [m]	d_{Hor} [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	310 Block A2 North - 310 WA0.0	352	90	North	-0.02	2.31	0.0														75%				100%	100%
3	316 Block A2 North - 316 WA3.0	352	90	North	0.58	2.05	3.6														75%				100%	100%
1	342 Block A2 North - 342 WA3.0	352	90	North	0.59	0.96	0.6														75%				100%	100%
1	342 Block A2 North - 342 WA3.0	352	90	North	0.70	0.54	0.4														75%				100%	100%
1	311 Block A2 North-East - 311 WA0.0	352	90	North	0.58	1.08	0.6														75%				100%	100%
3	316 Block A2 North-East - 316 WA3.0	352	90	North	0.58	2.05	3.6														75%				100%	100%
15	317 Block A2 East - 317 WA3.0	50	90	East	0.63	2.11	20.0														75%				100%	100%
155	317 Block A2 East - 317 WA3.0	50	90	East	0.63	2.11	206.9														75%				100%	100%
5	318 Block A2 East - 318 WA0.0	50	90	East	0.63	2.26	7.1														75%				100%	100%
5	318 Block A2 East - 318 WA0.0	50	90	East	0.63	2.26	7.1														75%				100%	100%
3	319 Block A2 East - 319 WA3.0	50	90	East	0.58	1.11	1.9														75%				100%	100%
3	319 Block A2 East - 319 WA3.0	50	90	East	0.69	0.76	1.6														75%				100%	100%
1	320 Block A2 East - 320 WA0.0	50	90	East	0.59	1.26	0.7														75%				100%	100%
1	320 Block A2 East - 320 WA0.0	50	90	East	0.70	0.76	0.5														75%				100%	100%
3	321 Block A2 East - 321 WAB1.0	50	90	East	0.07	1.08	0.2														75%				100%	100%
3	321 Block A2 East - 321 WAB1.0	50	90	East	0.58	1.08	1.9														75%				100%	100%
7	342 Block A2 East - 342 WA3.0	352	90	North	0.59	0.96	3.9														75%				100%	100%
7	342 Block A2 East - 342 WA3.0	352	90	North	0.70	0.54	2.6														75%				100%	100%
3	323 Block A2 South - 323 WA3.0	184	90	South	0.59	2.05	3.6														75%				100%	100%
1	324 Block A2 South - 324 WAB1.0	184	90	South	0.59	2.20	1.3														75%				100%	100%
3	325 Block A2 South - 325 WA3.0	184	90	South	0.63	2.11	4.0														75%				100%	100%
3	325 Block A2 South - 325 WA3.0	184	90	South	0.63	2.11	4.0														75%				100%	100%
1	327 Block A2 South - 327 WAB1.0	184	90	South	0.61	1.13	0.7														75%				100%	100%
1	327 Block A2 South - 327 WAB1.0	184	90	South	0.72	0.89	0.6														75%				100%	100%
1	327 Block A2 South - 327 WAB1.0	184	90	South	0.61	1.13	0.7														75%				100%	100%
1	327 Block A2 South - 327 WAB1.0	184	90	South	0.72	0.89	0.6														75%				100%	100%
1	343 Block A2 South - 343 WA3.0	184	90	South	0.61	0.85	0.5														75%				100%	100%
1	343 Block A2 South - 343 WA3.0	184	90	South	0.72	0.65	0.5														75%				100%	100%
1	343 Block A2 South - 343 WA3.0	184	90	South	0.61	0.85	0.5														75%				100%	100%
1	343 Block A2 South - 343 WA3.0	184	90	South	0.72	0.65	0.5														75%				100%	100%
7	267 Block A2 West - 267 WA1.0	274	90	West	-0.02	2.16	-0.3														75%				100%	100%
3	313 Block A2 West - 313 WA1.0	274	90	West	0.58	0.93	1.6														75%				100%	100%
3	313 Block A2 West - 313 WA1.0	274	90	West	0.07	0.93	0.2														75%				100%	100%
6	315 Block A2 West - 315 WA3.0	274	90	West	0.59	0.93	3.2														75%				100%	100%
3	321 Block A2 West - 321 WAB1.0	274	90	West	0.07	1.08	0.2														75%				100%	100%

Ventilation data

Block C Cranwood House / Climate: Northolt / TFA: 1208 m² / Heating: 14.5 kWh/(m²a) / Overheating: 6 % / PER: 23.5 kWh/(m²a)

Treated floor area A_{TFA}	1208	m²	Used	2.50	m
Room height h	2.50	m			
Reference volume for the ventilation system ($A_{TFA} \cdot h$) = V_V	3020	m³			

Selection of ventilation input

Type of ventilation	1-Balanced PH ventilation with HR
'Ventilation' worksheet	Standard project design for residential buildings
'Addl vent' worksheet	x Multiple ventilation units, non-res

Infiltration air change rate

		For annual demand:		For heating load:	
Wind protection coefficient, e	2-Moderate protection	0.07		0.18	
Wind protection coefficient, f		15		15	
Net air volume for pressurisation test	V_{n50}	5361	m³		
Air change rate from pressurisation test	n_{50}	0.60	1/h		
Air permeability	q_{50}	2.05	m³/(hm²)		
		For annual demand:		For heating load:	
Excess extract air		0.00		0.00	1/h
Infiltration air change rate	$n_{V,Rest}$	0.075		0.186	1/h

Results

Average airflow rate	Average air change rate heating period	Excess air (extract air system)	Effective heat recovery efficiency	Humidity recovery efficiency	Heat recovery efficiency, cooling	Humidity recovery efficiency	Specific electric efficiency	SHX Heat recovery efficiency
m³/h	1/h	1/h	[-]	[-]	[-]	[-]	Wh/m³	[-]
109	0.04	0.00	0.0%	0.0%	0.0%	0.0%	0.00	0.0%
				Transfer		Efficiency SHX		
						η_{*SHX} 0%		

Average interior humidity during winter operation

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
86%	85%	86%	90%	-	-	-	-	-	100%	93%	88%

Ventilation data

Passive House with PHPP Version 10.4a EN

PHPP

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Dimensioning of a ventilation system with only one ventilation unit

Occupant density	m²/P	38				
Number of occupants	P	32.0				
Supply air per person	m³/(P*h)	30				
Supply air demand	m³/h	961				
Extract air rooms		Kitchen	Bathroom	Bathroom (shower only)	WC	
Quantity						
Extract air demand per room	m³/h	60	40	20	20	
Total extract air demand	m³/h	0				

Design airflow rate (maximum)

m³/h1178

Recommended:

1178

m³/h

Calculation of the average air change rate

Type of operation	Daily operation hours h/d	Factors referenced to maximum	Airflow rate m³/h	Air change rate 1/h
Maximum		1.00	1178	0.39
Standard	24.0	0.77	906	0.30
Basic ventilation		0.54	634	0.21
Minimum		0.40	471	0.16
Average value		0.77		

Average airflow rate (m³/h)

Average air change rate (1/h)

Selection of ventilation unit with heat recovery

Location of ventilation unit

1-Inside thermal envelope

	T _{room} > T _{outdoor}		T _{room} < T _{outdoor}				
	Heat recovery efficiency Unit η_{HR}	Energy recovery efficiency	Cool recovery rate Unit η_{HR}	Energy recovery efficiency	Specific power input [Wh/m³]	Airflow range [m³/h]	Frost protection necessary
Selection of ventilation unit	97ud-Default	0.75	N/A	0.65	N/A	0.45	N/A

Go to ventilation units list

1-Sort as list

Conductivity of outdoor air duct	Ψ	W/(mK)	0.000	HR efficiency, cooling	Implementation of frost protection	Limit temperature [°C]	Useful energy [kWh/a]	2-Electr.
Length of outdoor air duct		m						
Conductivity of exhaust air duct	Ψ	W/(mK)	0.000					
Length of exhaust air duct		m						
Temperature of mechanical room (enter only if the unit is outside of the thermal envelope)		°C			Room temperature (°C)			20
					Avg. ambient temp. heating period (°C)			7.5
					Avg. ground temp (°C)			11.9

Effective heat recovery efficiency

$\eta_{HR,eff}$

Effective heat recovery efficiency subsoil heat exchanger

SHX efficiency

η^{*}_{SHX}

Heat recovery efficiency SHX

η_{SHX}

0%

Secondary calculation

Ψ-value supply or outdoor air duct

Nominal width:		mm
Insulation thickness:		mm
Reflective coating?		
Thermal conductivity		W/(mK)
Nominal airflow rate		m³/h
Δθ	12	K
Exterior duct diameter	0.000	m
Exterior diameter	0.000	m
α-Interior		W/(m²K)
α-Surface		W/(m²K)
Ψ-value		W/(mK)
Surface temperature difference		K

Secondary calculation

Ψ-value extract or exhaust air duct

Nominal width:		mm
Insulation thickness:		mm
Reflective coating?		
Thermal conductivity		W/(mK)
Nominal airflow rate		m³/h
Δθ	12	K
Exterior duct diameter	0.000	m
Exterior diameter	0.000	m
α-Interior		W/(m²K)
α-Surface		W/(m²K)
Ψ-value		W/(mK)
Surface temperature difference		K

Dimensioning of air quantities

When dimensioning the air quantities, please consider the design recommendations given above.
The operation period of the ventilation system can be determined on the basis of the daily utilisation hours including the flushing phase.
Periods with a lower air demand (operation modes) can be taken into account by means of reduction factors.

Room no.	Quantity q	Room name	Allocation to ventilation unit (No.)	Area A m²	Clear height h m	Room vol. A x h m³	Volume flow per room			ACH per room n 1/h	Utilisation period h/d h	d/week d	Duration of holidays d	Reduction factor 1	Operation red. 1	Reduction factor 2	Operation red. 2	Reduction factor 3	Operation red. 3	Annual average value:			
							V _{SUP} m³/h	V _{ETA} m³/h	V _{TRANS} m³/h											V _{SUP} m³/h	V _{ETA} m³/h	V _{TRANS} m³/h	ACH 1/h
1	1	Dwelling unit	1	64	2.70	173	152	152		0.88	24	7		4%	100%					6	6		0.04
2	1	Dwelling unit	1	64	2.70	173	152	152		0.88	24	7		4%	100%					6	6		0.04
3	1	Dwelling unit	1	64	2.70	173	152	152		0.88	24	7		4%	100%					6	6		0.04
4	1	Dwelling unit	1	64	2.70	173	152	152		0.88	24	7		4%	100%					6	6		0.04
5	1	Dwelling unit	1	64	2.70	173	152	152		0.88	24	7		4%	100%					6	6		0.04
6	1	Dwelling unit	1	64	2.70	173	152	152		0.88	24	7		4%	100%					6	6		0.04
7	1	Dwelling unit	1	64	2.70	173	152	152		0.88	24	7		4%	100%					6	6		0.04
8	1	Dwelling unit	1	64	2.70	173	152	152		0.88	24	7		4%	100%					6	6		0.04
9	1	Dwelling unit	1	64	2.70	173	152	152		0.88	24	7		4%	100%					6	6		0.04
10	1	Dwelling unit	1	64	2.70	173	152	152		0.88	24	7		4%	100%					6	6		0.04
11	1	Dwelling unit	1	64	2.70	173	152	152		0.88	24	7		4%	100%					6	6		0.04
12	1	Dwelling unit	1	64	2.70	173	152	152		0.88	24	7		4%	100%					6	6		0.04
13	1	Dwelling unit	1	64	2.70	173	152	152		0.88	24	7		4%	100%					6	6		0.04
14	1	Dwelling unit	1	64	2.70	173	152	152		0.88	24	7		4%	100%					6	6		0.04
15	1	Dwelling unit	1	64	2.70	173	152	152		0.88	24	7		4%	100%					6	6		0.04
16	1	Dwelling unit	1	64	2.70	173	152	152		0.88	24	7		4%	100%					6	6		0.04
17	1	Dwelling unit	1	64	2.70	173	152	152		0.88	24	7		4%	100%					6	6		0.04
18	1	Dwelling unit	1	64	2.70	173	152	152		0.88	24	7		4%	100%					6	6		0.04
19														100%	100%								
20														100%	100%								
21														100%	100%								
22														100%	100%								
23														100%	100%								
24														100%	100%								
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28														100%	100%								
29														100%	100%								
30														100%	100%								
Additional rows: please select full rows above, and copy and insert them multiple times.																				109	109	---	0.04

Selection of the ventilation unit

Up to 10 different ventilation units can be considered. Identical units can be considered by changing the quantity. The data from ventilation units certified by the Passive House Institute can be found in the 'Components' worksheet together with the entry of user-defined data. If compact units are used, then standard project planning in the worksheet "Ventilation" should be used.

[Go to list of ventilation units](#)

Ventilation unit no.	Quantity	Description of ventilation units	Selection of ventilation unit	Design air flow rate per unit m³/h	Application range air flow rate		Specific electric efficiency Wh/m³	Pressure loss calculation			Application range		Interior location (x)	Exterior location (x)	T _{room} > T _{outdoor}		T _{room} < T _{outdoor}		Frost protection necessary	Subsoil HX		Frost protection (electr. / hydr.)			
					from	to		ODA-SUP	ETA-EHA	Additional	per line	Subtraction			Heat recovery efficiency	Humidity recovery efficiency	HR efficiency, cooling	Humidity recovery efficiency		Heat recovery	Effective HR	Execution	Limit	Useful	
					m³/h	m³/h		Pa	Pa	Pa	Pa	Pa			Unit	Effective	[-]	[-]		efficiency	efficiency	efficiency	efficiency	°C	kWh/a
Sorting options																									
1	1	Unit 1	01ud-Generic MVHR	2736	75	120	0.44	100	100		100	-	x		0.86		0%	N/A	N/A	yes		0%	2-Electr.	-3	7
2																								0	
3																								0	
4																								0	
5																								0	
6																								0	
7																								0	
8																								0	
9																								0	
10																								0	
Total (direct electric)																							Total (hydraulic via heat generator)		7
																									0

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

The duct sections between the ventilation unit and the thermal envelope should be as short as possible and should be well insulated, whether the ventilation unit is located indoors or outdoors. The dimensions of these duct sections can be entered here. The heat losses are considered through the effective heat recovery in the section above.

One section of a duct entered here may also be used for multiple ventilation units.

If a ventilation unit is considered more than once in a given row (quantity >1 for identical units) in the section "Selection of the ventilation unit", the ducts corresponding to this unit should be entered once (duct sections for one ventilation unit).

Temperature of installation room

(only enter when at least one unit is installed outside of the thermal envelope)

Quantity	Round duct diameter mm	Rectangular duct width mm	Height mm	Insulation thickness mm	Thermal conductivity W/(m K)	Reflective aluminum coating? (x)	Conductance duct W/(m K)	Length of supply air duct m	Outdoor or supply air duct (1)	Exhaust or extract air duct (1)	Duct type	Design air flow rate	Assignment to ventilation unit (enter 1 for the corresponding ventilation unit)									
													vent. unit 1	vent. unit 2	vent. unit 3	vent. unit 4	vent. unit 5	vent. unit 6	vent. unit 7	vent. unit 8	vent. unit 9	vent. unit 10
												0										
												0										
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Additional rows: please select full rows above, and compy and insert them multiple times.

Interior temperature:20.0°C

Building type:5-Multi-family house I Apartment building

Treated floor area A_{TFA}:1207.9m²

Transmission heat losses Q_T

Building assembly	Temperature zone	Area m²		U-value W/(m²K)		Temperature reduction factor		G _t kKh/a	=	kWh/a	Per m² of TFA
External wall - ambient	A	477.5	*	0.130	*	1.00	*	64.5	=	4011	3.32
External wall ground/basement	B		*		*	0.65	*		=		
Roof / ceiling - ambient	A	300.4	*	0.098	*	1.00	*	64.5	=	1896	1.57
Floor slab / basement ceiling	B	297.9	*	0.099	*	0.65	*	64.5	=	1241	1.03
	A		*		*	1.00	*		=		
	A		*		*	1.00	*		=		
	A		*		*	1.00	*		=		
Windows	A	449.0	*	1.012	*	1.00	*	64.5	=	29278	24.24
Exterior door	A	44.8	*	0.800	*	1.00	*	64.5	=	2310	1.91
Thermal bridges ambient (length/m)	A		*		*	1.00	*		=		0.00
Perimeter thermal bridges (length/m)	P		*		*	0.65	*		=		0.00
Thermal bridges ground (length/m)	B		*		*	0.65	*		=		0.00
										kWh/(m²a)	
Sum of all areas of the building envelope		1569.5							Total transmission heat losses Q _T =	38736	32.1

Ventilation heat losses Q_V

Reference volume for the ventilation system, V _V (A _{TFA} *h)	m²	*	m	=	m³	
	1207.9	*	2.50	=	3019.7	
Ventilation system:						
Effective heat recovery efficiency of the heat exchanger	η _{eff}		0%			
Heat recovery efficiency of SHX	η _{SHX}		0%			
	n _{V,system} 1/h		η _{HR}		n _{V,Res} 1/h	1/h
Energetically effective air changes n _V	0.036	*	(1 - 0.00)	+	0.075	= 0.111
	V _V m³	*	n _V 1/h	*	c _{Air} Wh/(m³K)	G _t kKh/a
Total ventilation heat losses Q _V =	3019.7	*	0.111	*	0.33	* 64.5 = 7117 kWh/a
						kWh/(m²a)
Total heat losses Q _L			(38736 + 7117)		1.0	= 45853 kWh/a
			Q _T kWh/a		Q _V kWh/a	Reduction factor night/weekend lowering
						kWh/(m²a)

Available solar heat gains Q_S

Orientation of the area	Reduction factor See 'Windows' worksheet		g-value (perp. radiation)		Area m²	Global radiation heating period kWh/(m²a)	=	kWh/a	
North	0.39	*	0.46	*	23.77	100	=	423	
East	0.42	*	0.46	*	355.30	130	=	8996	
South	0.41	*	0.46	*	25.57	400	=	1949	
West	0.32	*	0.46	*	44.36	210	=	1367	
Horizontal	0.00	*	0.00	*	0.00	315	=	0	
								kWh/(m²a)	
								Total available solar heat gains Q _S =	12735
									10.5

Internal heat gains Q_I

	Length heating period		Spec. power q _I W/m²		A _{TFA} m²	=	kWh/a	kWh/(m²a)
	kh/d	*	d/a	*				
	0.024	*	201	*	2.85	* 1207.9 =	16613	13.8

Utilisation factor heat gains η_G					
	Free heat Q_F		$Q_S + Q_L =$	kWh/a29348	kWh/(m²a)24.3
	Ratio of free heat to losses		$Q_F / Q_L =$	0.64	
	Utilisation factor heat gains h_G	$(1 - (Q_F / Q_L)^5) / (1 - (Q_F / Q_L)^6) =$		96%	
Total heat gains Q_G			$\eta_G * Q_F =$	kWh/a28129	kWh/(m²a)23.3

Annual heating demand Q_H				
		kWh/(m²a)17724	$Q_L - Q_G =$	kWh/(m²a)14.7
	Limit value	kWh/(m²a)15	Requirement met?	Yes

Specific energy demand for heating (monthly method)

Passive House with PHPP Version 10.4a EN



Block C Cranwood House / Climate: Northolt / TFA: 1208 m² / Heating: 14.5 kWh/(m²a) / Overheating: 6 % / PER: 23.5 kWh/(m²a)

Interior temperature:	20	°C
Building type:	5-Multi-family house I Apartment building	
Treated floor area A _{TFA} :	1207.9	m²
Spec. Capacity:	60	Wh/(m²K)

The sum of the heating periods calculated through the monthly method is presented on this worksheet.

Transmission heat losses Q_T

Building assembly	Temperature zone	Area m²		U-value W/(m²K)		Temperature reduction factor		G _t kKh/a		kWh/a		Per m² of TFA
External wall - ambient	A	477.5	*	0.130	*	1.00	*	66	=	4082		3.38
External wall ground/basement	B		*		*	1.00	*		=			
Roof / ceiling - ambient	A	300.4	*	0.098	*	1.00	*	66	=	1929		1.60
Floor slab / basement ceiling	B	297.9	*	0.099	*	1.00	*	44	=	1293		1.07
	A		*		*	1.00	*		=			
	A		*		*	1.00	*		=			
	A		*		*	1.00	*		=			
Windows	A	449.0	*	1.012	*	1.00	*	66	=	29799		24.67
Exterior door	A	44.8	*	0.800	*	1.00	*	66	=	2351		1.95
Thermal bridges ambient (length/m)	A		*		*	1.00	*		=			0.00
Perimeter thermal bridges (length/m)	P		*		*	1.00	*		=			0.00
Thermal bridges ground (length/m)	B		*		*	1.00	*		=			0.00
Sum of all areas of the building envelope		1569.5	Total transmission heat losses Q _T =							39455		32.7

Ventilation heat losses Q_V

Reference volume for the ventilation system, V _V (A _{TFA} *h)	m²	*	m	=	m³		
	1208	*	2.50	=	3020		
	n _{V,system} 1/h		η*SHX		η _{HR}	n _{V,Res} 1/h	n _{V,equi,fraction} 1/h
Effective air change rate Ambient n _{V,e}	0.036	*(1-	0%	)*(1-	0.00	0.075	0.111
Effective air change rate Ground n _{V,g}	0.036	*	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
Ventilation losses ambient Q _V	3020	*	0.111	*	0.33	66	7244
Ventilation losses ground Q _{V,e}	3020	*	0.000	*	0.33	41	0
Total ventilation heat losses Q _V =							7244

Total heat losses Q_L

(	39455	+	7244	)	*	1.0	=	46699	38.7
	Q _T kWh/a		Q _V kWh/a		Reduction factor night/weekend lowering			kWh/a	kWh/(m²a)

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		kWh/(m²a)
North	0.39	*	0.46	*	23.8	*	109	=	460		
East	0.42	*	0.46	*	355.3	*	141	=	9715		
South	0.41	*	0.46	*	25.6	*	449	=	2184		
West	0.32	*	0.46	*	44.4	*	233	=	1517		
Horizontal	0.00	*	0.00	*	0.0	*	343	=	0		
Sum opaque areas								=	775		
Total available solar heat gains Q _S =									14651		12.1

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)
	0.024	*	212	*	2.8	*	1207.9	=	17485		14.5

Utilisation factor heat gains η_G

Free heat Q _F	Q _S + Q _I =	32136		26.6
Ratio free heat to losses	Q _F / Q _L =	0.69		
Utilisation factor heat gains η _G	=	91%		

Total heat gains Q_G

η _G * Q _F =	29211		24.2
	kWh/a		kWh/(m²a)

Annual heating demand Q_H

Q _L - Q _G =	17487		14.5
	kWh/(m²a)		

Limit value

15	Requirement met?	Yes
----	------------------	-----

Specific energy for heating (monthly method)

Passive House with PHPP Version 10.4a EN



Block C Cranwood House / Climate: Northolt / TFA: 1208 m² / Heating: 14.5 kWh/(m²a) / Overheating: 6 % / PER: 23.5 kWh/(m²a)

Interior temperature:

20

°C

Building type:

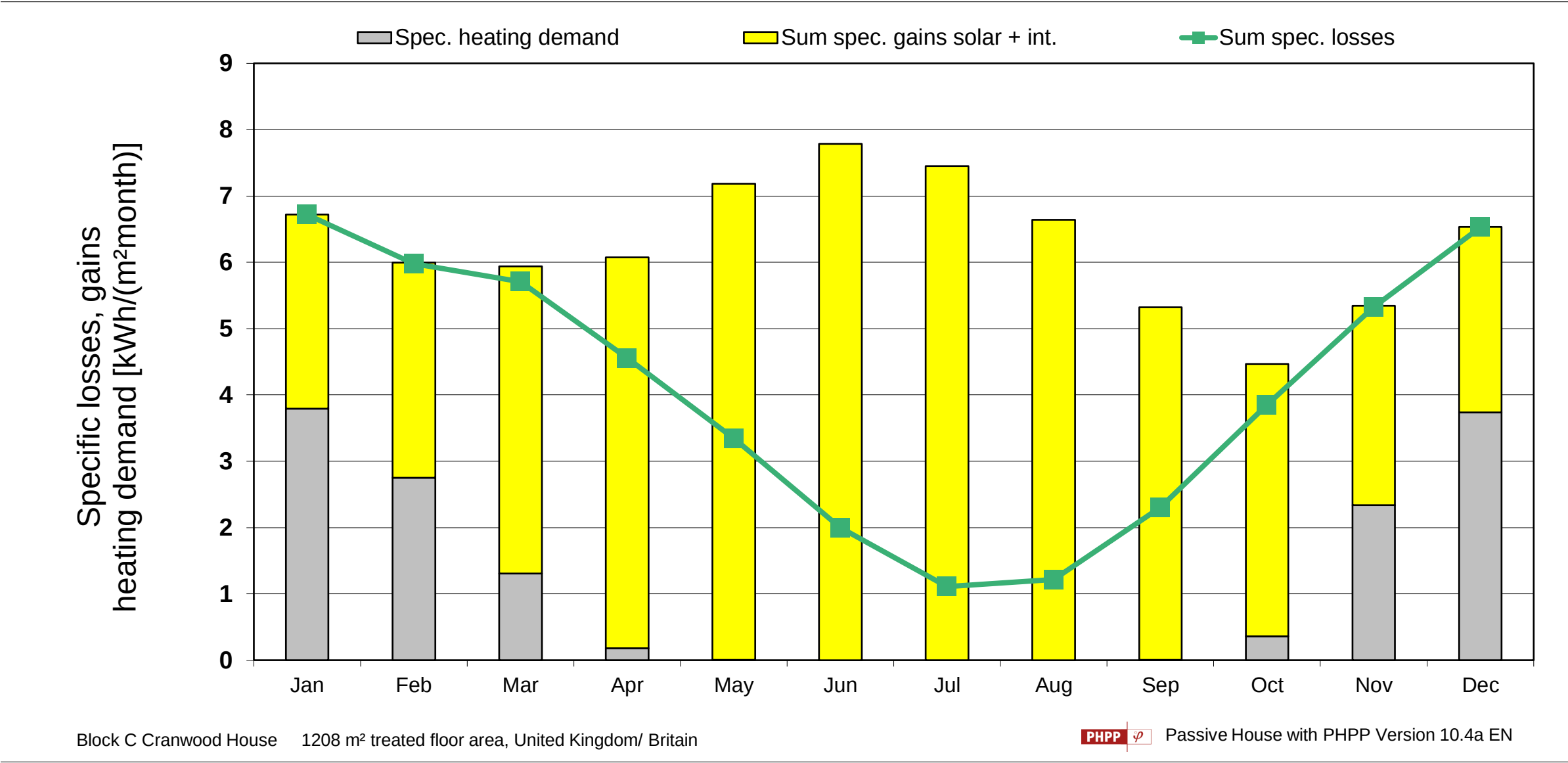
5-Multi-family house I Apartment building

Treated floor area A_{TFA}:

1208

m²

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	
Heating degree hours - exterior	11.5	10.2	9.6	7.6	5.5	3.1	1.6	1.8	3.8	6.5	9.1	11.2	81	kKh
Heating degree hours - ground	5.9	6.1	7.6	8.0	8.6	8.2	7.9	7.1	6.1	5.6	5.1	5.4	82	kKh
Losses - exterior	7939	7039	6671	5265	3787	2168	1106	1255	2605	4484	6280	7727	56326	kWh
Losses - ground	175	180	224	236	254	242	235	212	181	167	152	160	2417	kWh
Sum spec. losses	6.7	6.0	5.7	4.6	3.3	2.0	1.1	1.2	2.3	3.9	5.3	6.5	48.6	kWh/m²
Solar gains - North	30	51	99	141	186	223	206	166	101	74	40	25	1343	kWh
Solar gains - East	539	1021	2096	3407	4702	5459	4935	4096	2854	1564	629	459	31762	kWh
Solar gains - South	243	282	384	433	437	412	428	452	446	375	268	199	4359	kWh
Solar gains - West	107	165	306	449	530	565	602	508	362	260	146	83	4084	kWh
Solar gains - Horiz.	0	0	0	0	0	0	0	0	0	0	0	0	0	kWh
Solar gains - Opaque	64	89	152	213	256	268	270	241	188	130	76	52	1998	kWh
Internal heat gains	2557	2309	2557	2474	2557	2474	2557	2557	2474	2557	2474	2557	30104	kWh
Sum spec. gains solar + int.	2.9	3.2	4.6	5.9	7.2	7.8	7.4	6.6	5.3	4.1	3.0	2.8	61.0	kWh/m²
Utilisation factor	100%	99%	95%	74%	47%	26%	15%	18%	43%	85%	99%	100%	56%	
Annual heating demand	4579	3321	1580	217	8	0	0	0	4	439	2824	4516	17487	kWh
Spec. heating demand	3.8	2.7	1.3	0.2	0.0	0.0	0.0	0.0	0.0	0.4	2.3	3.7	14.5	kWh/m²



Annual heating demand: Comparison

Monthly method	(<i>'Heating'</i>)	17487 kWh/a	14.5 kWh/(m²a) reference to treated floor area according to PHPP
Annual method	(<i>'Annual heating'</i>)	17724 kWh/a	14.7 kWh/(m²a) reference to treated floor area according to PHPP

Heating load

Block C Cranwood House / Climate: Northolt / TFA: 1208 m² / Heating: 14.5 kWh/(m²a) / Overheating: 6 % / PER: 23.5 kWh/(m²a)

Interior temperature:

20

°C

Building type:5-Multi-family house I Apartment building

Treated floor area A_{TFA}:

1207.9

m²

Design temperature

Radiation:

North

East

South

West

Horizontal

Weather 1:

-1.5

°C

Weather 2:

1.5

°C

Ground design temp.

12.0

°C

8

12

28

14

20

W/m²

5

5

15

10

15

W/m²

Transmission heat load P _T		Area	U-value	Temperature	Temp Diff 1	Temp Diff 2	PT 1	PT 2
Building assembly	Temperature zone	m²	W/(m²K)	reduction factor	K	K	W	W
External wall - ambient	A	477.5	* 0.130	* 1.00	* 21.5	or 18.5	= 1339	or 1152
External wall ground/basement	B		*	* 1.00	* 8.0	or 8.0	=	or
Roof / ceiling - ambient	A	300.4	* 0.098	* 1.00	* 21.5	or 18.5	= 633	or 545
Floor slab / basement ceiling	B	297.9	* 0.099	* 1.00	* 8.0	or 8.0	= 236	or 236
	A		*	* 1.00	* 21.5	or 18.5	=	or
	A		*	* 1.00	* 21.5	or 18.5	=	or
	A		*	* 1.00	* 21.5	or 18.5	=	or
Windows	A	449.0	* 1.012	* 1.00	* 21.5	or 18.5	= 9773	or 8410
Exterior door	A	44.8	* 0.800	* 1.00	* 21.5	or 18.5	= 771	or 664
Thermal bridges ambient (length/m)	A		*	* 1.00	* 21.5	or 18.5	=	or
Perimeter thermal bridges (length/m)	P		*	* 1.00	* 8.0	or 8.0	=	or
Thermal bridges ground (length/m)	B		*	* 1.00	* 8.0	or 8.0	=	or
Building element towards neighbour	I		*	* 1.00	* 3.0	or 3.0	=	or
Total							= 12752	or 11006

Ventilation heat load P_V

Reference volume for the ventilation system, V_V (A_{TFA}*h)

1207.9

m²

*

2.50

m

=

3019.7

m³

Ventilation system:

Heat recovery efficiency of the heat exchanger

η_{HR}

0%

Efficiency of SHX

0%

Heat recovery efficiency SHX

η_{SHX 1}

0%

or

η_{SHX 2}

0%

Energetically effective air changes n_V

n_{V,Res} (Heating Load)

1/h

0.186

+

n_{V,system}

1/h

0.036

*(1-

Φ_{HP}

0.00

or

Φ_{HP}

0.00

) =

1/h

0.223

or

1/h

0.223

V_V

m³

3019.7

*

n_V

1/h

0.223

or

n_V

1/h

0.223

*

c_{Air}

Wh/(m³K)

0.33

*

TempDiff 1

K

21.5

or

TempDiff 2

K

18.5

=

P_V 1

W

4774

or

P_V 2

W

4108

Total heat load P_L

P_T + P_V

=

17525

or

15114

PL 1

W

PL 2

W

Solar heat power P _S		Area	g-value	Reduction factor	Radiation 1	Radiation 2	P _T 1	P _T 2
Orientation of the area		m²	(perp. radiation)	(see 'Windows' worksheet)	W/m²	W/m²	W	W
North		23.8	* 0.5	* 0.39	* 8	or 5	= 34	or 23
East		355.3	* 0.5	* 0.42	* 8	or 3	= 543	or 235
South		25.6	* 0.5	* 0.41	* 28	or 15	= 136	or 74
West		44.4	* 0.5	* 0.32	* 13	or 10	= 87	or 63
Horizontal		0.0	* 0.0	* 0.40	* 20	or 15	= 0	or 0
Total solar heat power P _S							= 800	or 395

Internal heat load P_I

Spec. power

W/m²

2.3

*

A_{TFA}

m²

1208

=

P_I 1

W

2833

or

P_I 2

W

2833

Total heat power (gains) P_G

P_S + P_I

=

3633

or

3227

P_G 1

W

P_G 2

W

Heating load P_H

P_L - P_G

=

13892

or

11887

Heating load P_H

=

13892

W

Area specific space heating load P_H / A_{TFA}

=

11.5

W/m²

For comparison: heat load via supply air

Input max. supply air temperature

52

°C

Max. supply air temperature ϑ_{Supply,Max}

°C

Supply air temperature without heating

ϑ_{Supply,Min}

-1.5

°C

1.5

°C

Heating load that can be transported by the supply air P_{Supply,Max}

=

1933

W

P_{Supply,Max} / A_{TFA}

=

1.6

W/m²

Heating via supply air?

No

PHPP, Heating load

BP10479_PHPP - Block A2-Rev 3.xlsx

Summer ventilation



Block C Cranwood House / Climate: Northolt / TFA: 1208 m² / Heating: 14.5 kWh/(m²a) / Overheating: 6 % / PER: 23.5 kWh/(m²a)

Building volume:	3020	m³	Building type:	5-Multi-family house I Apartment building
Max. absolute indoor humidity:	12	g/kg	Heat recovery efficiency:	0%
Internal humidity sources:	100	g/(P*h)	Humidity recovery efficiency η_{EER} :	0%
			Subsoil heat exchanger efficiency η^*_{SHX} :	0%

Basic ventilation to ensure adequate air quality (summer)

Air change via vent. system with supply air:

0.04

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

	$n_{V,\text{system}}$ 1/h		η^*_{SHX}		η_{HR}		$n_{V,\text{equi,fraction}}$ 1/h
Exterior $n_{V,e}$	0.036	*(1-	0%	)*(1-	0.00	) =	0.036
without HR	0.036	*(1-	0%	)		=	0.036
Ground $n_{L,g}$	0.036	*	0%	*(1-	0.00	) =	0.000
without HR	0.036	*	0%			=	0.000

Ventilation conductance

	V_V m³		$n_{V,\text{equi,fraction}}$ 1/h		C_{Air} Wh/(m³K)		
exterior $H_{V,e}$	3020	*	0.036	*	0.33	=	36.1 W/K
without HR	3020	*	0.036	*	0.33	=	36.1 W/K
ground $H_{V,g}$	3020	*	0.000	*	0.33	=	0.0 W/K
without HR	3020	*	0.000	*	0.33	=	0.0 W/K
Infiltration, window, extract air system	3020	*	0.075	*	0.33	=	74.3 W/K

Additional night ventilation for cooling (summer)

Additional ventilation regulation

Minimum acceptable indoor temp.

22.0

°C

Type of additional ventilation

Window night ventilation, manual

Night ventilation rate

0.97

1/h

Mechanical, automatically controlled ventilation

Corresponding air change rate

1/h

Specific electric efficiency released as heat into the building

Wh/m³

Temperature increase

0.0

K

Controlled by (please check)

Temperature diff.

x

Humidity diff.

Results passive cooling	Results active cooling
Overheating limit ϑ_{max}: 25 °C Frequency of overheating: 6.1% Max. humidity: 14.7 g/kg Frequency of excessively high humidity: 0.3%	Useful cooling demand: kWh/(m²a) Dehumidification demand: kWh/(m²a) Frequency of excessively high humidity:

Secondary calculation: basic ventilation through windows

Estimation of the window air exchange to ensure adequate air quality in summer

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

Secondary calculation: Additional night ventilation through windows

Parameters for additional night ventilation through windows for cooling in summer

Description	Night						
	Reduction factor	5000%					
Climate boundary conditions							
	Temperature diff interior - exterior	1	1	1	1	1	K
	Wind velocity	0	0	0	0	0	m/s
Window group 1							
	Quantity	1					
	Clear width	0.84					m
	Clear height	1.92					m
	Tilting window (check if appropriate)	x					
	Opening width (for tilting windows)	0.055					m
Window group 2 (cross ventilation)							
	Quantity	2					
	Clear width	0.84					m
	Clear height	1.92					m
	Tilting window (check if appropriate)	x					
	Opening width (for tilting windows)	0.055					m
	Difference in height to window 1						m
Total							
Result: Night ventilation rates	0.97	0.00	0.00	0.00	0.00	0.00	0.97 1/h

Summer: Passive cooling



Block C Cranwood House / Climate: Northolt / TFA: 1208 m² / Heating: 14.5 kWh/(m²a) / Overheating: 6 % / PER: 23.5 kWh/(m²a)

Building type:	5-Multi-family house I Apartment building	
Overheating limit:	25	°C
Max. indoor absolute humidity:	12	g/kg
Spec. capacity:	60	Wh/(m²K)

Treated floor area A _{TFA} :	1207.9	m²
Building volume:	3020	m³
Internal humidity sources:	2.7	g/(m²h)

Conductance

Building assembly		Temperature zone	Area m²		U-value W/(m²K)		Temperature reduction factor		H _{Summer} heat conductance
External wall - ambient		A	477.5	*	0.130	*	1.00	=	62.2
External wall ground/basement		B		*		*	1.00	=	
Roof / ceiling - ambient		A	300.4	*	0.098	*	1.00	=	29.4
Floor slab / basement ceiling		B	297.9	*	0.099	*	1.00	=	29.6
		A		*		*	1.00	=	
		A		*		*	1.00	=	
		A		*		*	1.00	=	
Windows		A	449.0	*	1.012	*	1.00	=	454.3
Exterior door		A	44.8	*	0.800	*	1.00	=	35.8
Thermal bridges ambient (length/m)		A		*		*	1.00	=	
Perimeter thermal bridges (length/m)		P		*		*	1.00	=	
Thermal bridges ground (length/m)		B		*		*	1.00	=	
Exterior thermal conductance H _{T,e}									= 581.7 W/K
Ground thermal conductance, H _{T,g}									= 29.6 W/K

Summer ventilation

from 'SummVent' worksheet

Ventilation conductance, unit		Ventilation parameters			Summer ventilation control		
exterior H _{V,e}	36.1 W/K	Daily temperature fluctuation in summer	9.4 K			HRV/ERV	
without HR	36.1 W/K	Minimum acceptable indoor temperature	22.0 °C		None		x
ground H _{V,g}	0.0 W/K	Heat capacity air	0.33 Wh/(m³K)		Temperature controlled		
without HR	0.0 W/K	Supply air change rate	0.04 1/h		Enthalpy controlled		
Ventilation conductance, others		Outdoor air change rate	0.07 1/h		Always		
exterior	74.3 W/K	Window night ventilation air change rate, manual @ 1K	0.97 1/h			Additional ventilation	
Ventilation system		Air change rate due to mech. automatically controlled vent.	0.00 1/h		Temperature controlled		x
η _{HR}	0%	Specific electricity consumption for this	0.00 Wh/m³		Enthalpy controlled		
η _{ERV}	0%	Temperature increase	0.0 K				
η*SHX	0%						

Solar aperture

Orientation of the area	Angle factor Summer		Shading factor Summer		Dirt		g-value (perp. radiation)		Area m²		Glazing fraction		Aperture m²
North	0.9	*	1.00	*	0.95	*	0.46	*	23.8	*	64%	=	6.0
East	0.9	*	1.00	*	0.95	*	0.46	*	355.3	*	70%	=	97.6
South	0.9	*	1.00	*	0.95	*	0.46	*	25.6	*	68%	=	6.9
West	0.9	*	1.00	*	0.95	*	0.46	*	44.4	*	53%	=	9.2
Horizontal	0.9	*	1.00	*	0.95	*	0.00	*	0.0	*	0%	=	0.0
Sum opaque areas													2.3
Solar aperture													= 122.0

Internal heat gains Q_I

Specif. power q _I W/m²		A _{TFA} m²		W
2.8	*	1208	=	3437

Frequency of overheating h_{ḡ ≥ ḡ_{max}}

6.1%

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

Recommendation: maximum 5%. If the frequency of overheating (25 °C) exceeds 10%, additional measures to protect against summer heat are mandatory.

Overheating degree hours

1637

Kh

Daily indoor temperature fluctuation

3.8

K

Influence of use

Basic summer ventilation via windows	1/h	0.00	0.00	0.00	0.00	0.00	
Additional night ventilation via windows	1/h	0.97	0.10	0.00	0.97	0.97	
Use of temporary shading	-	0%	0%	0%	0%	0%	
Internal heat gains	W/m²	2.8	3.6	2.8	2.8	5.7	

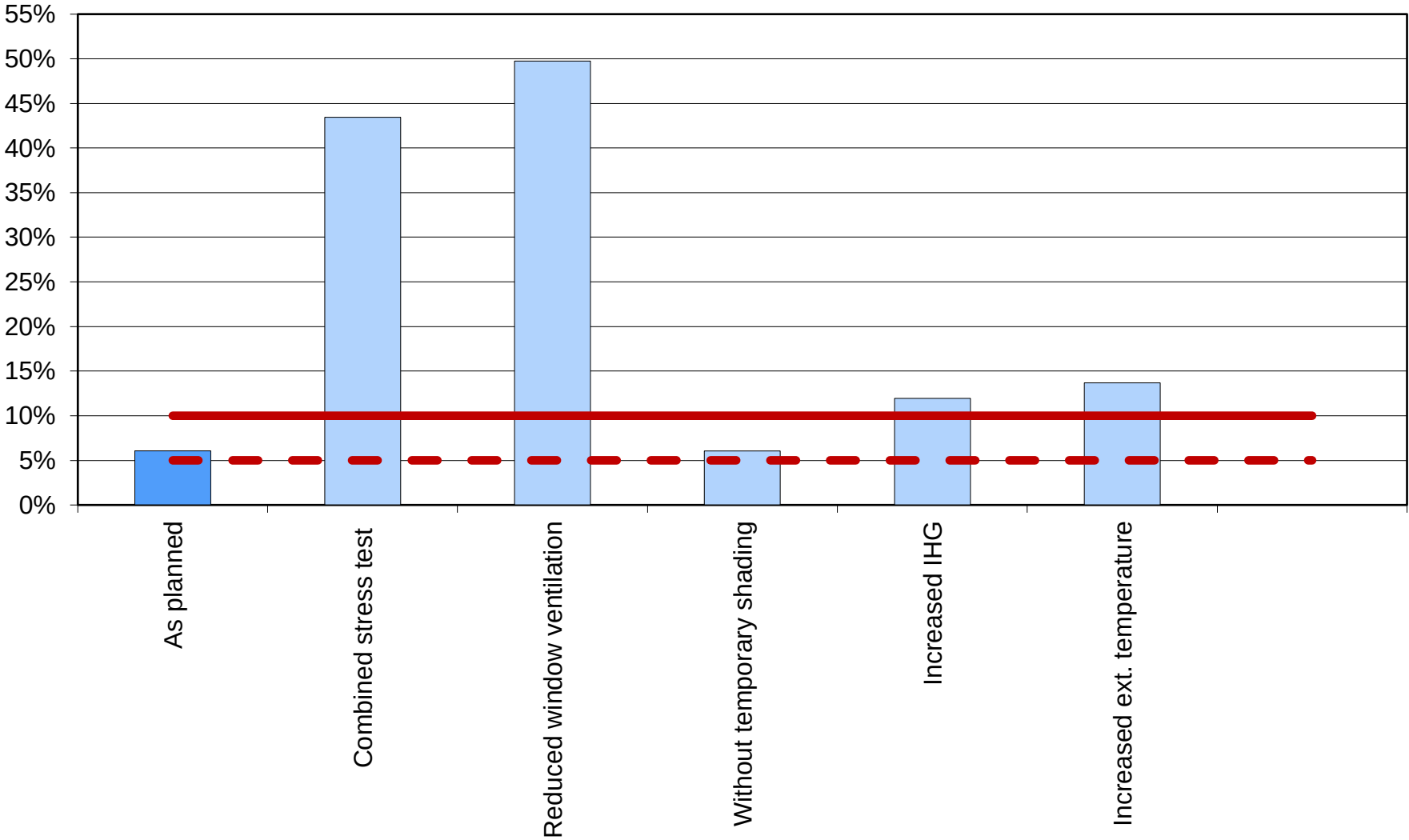
Summer climate

Summer temperature increase	K	0.0	1.5	0.0	0.0	0.0	2.0	
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Results

Frequency of overheating		6%	43%	50%	6%	12%	14%	-
Overheating degree hours	Kh	1637	29489	41384	1637	3115	3706	-
Daily indoor temperature fluctuation	K	3.8	4.0	3.8	3.8	4.4	3.8	-

Frequency of overheating



The sum of the cooling periods calculated through the monthly method is presented on this worksheet.

Building type:	5-Multi-family house I Apartment building		Treated floor area A _{TFA} :	1207.9	m²
Interior temperature summer:	25	°C	Building volume:	3020	m³
Max. indoor absolute humidity:	12	g/kg	Internal humidity sources:	2.7	g/(m²h)
Spec. capacity:	60	Wh/(m²K)			

Transmission losses Q _T (negative: heat loads)				Temperature								
Building assembly	Temperature zone	Area m²		U-value W/(m²K)		reduction factor		G _t kKh/a		kWh/a		Per m² of TFA
External wall - ambient	A	477.5	*	0.130	*	1.00	*	34	=	2134		1.77
External wall ground/basement	B		*		*	1.00	*		=			
Roof / ceiling - ambient	A	300.4	*	0.098	*	1.00	*	34	=	1009		0.84
Floor slab / basement ceiling	B	297.9	*	0.099	*	1.00	*	38	=	1124		0.93
	A		*		*	1.00	*		=			
	A		*		*	1.00	*		=			
	A		*		*	1.00	*		=			
Windows	A	449.0	*	1.012	*	1.00	*	34	=	15578		12.90
Exterior door	A	44.8	*	0.800	*	1.00	*	34	=	1229		1.02
Thermal bridges ambient (length/m)	A		*		*	1.00	*		=			0.00
Perimeter thermal bridges (length/m)	P		*		*	1.00	*		=			0.00
Thermal bridges ground (length/m)	B		*		*	1.00	*		=			0.00
Sum of all areas of the building envelope		1569.5										
Total transmission heat losses Q _T = 21073 kWh/(m²a)												
17.4												

Ventilation heat losses Q_V			Information from the 'SummVent' worksheet							
Ventilation conductance, vent. unit			Ventilation parameter s			Summer ventilation control				
exterior $H_{V,e}$	36.1	W/K	Daily temperature fluctuation in summer	9.4	K	HRV/ERV in summer				
without HR	36.1	W/K	Minimum acceptable indoor temperature	22.0	°C	None	x			
ground $H_{V,g}$	0.0	W/K	Heat capacity air	0.33	Wh/(m³K)	Temperature controlled				
without HR	0.0	W/K	Supply air change rate	0.04	1/h	Enthalpy controlled				
Ventilation conductance, others			Outdoor air change rate	0.07	1/h	Always				
exterior	74.3	W/K	Window night vent. air change rate, manual @ 1K	0.97	1/h	Additional ventilation				
Ventilation system			Air change rate due to mech., autom. controlled vent.	0.00	1/h	Temperature controlled	x			
η_{HR}	0%		Specific electricity consumption for this	0.00	Wh/m³	Humidity controlled				
η_{ERV}	0%		Temperature increase	0.0	K					
η^{*SHX}	0%									
Hygienic change rate:			$n_{V,system}$	η^{*SHX}	η_{HR}	$n_{V,Rest}$	$n_{V,equi,fraction}$			
			1/h		(considers bypass)	1/h	1/h			
Effective air change rate ambient $n_{V,e}$	0.036	*(1-	0%	)*(1-	0.00	)+	0.075	=	0.111	
Effective air change rate ground $n_{V,g}$	0.036	*	0%	*(1-	0.00	)		=	0.000	
Ventilation losses ambient Q_V			V_V	$n_{V,equi,fraction}$	c_{Air}	G_t				
			m³	1/h	Wh/(m³K)	kKh/a	kWh/a		kWh/(m²a)	
			3020	*	0.111	*	33	=	3677	3.0
Ventilation losses ground $Q_{V,e}$			3020	*	0.000	*	0	=	0	0.0
Heat losses summer ventilation			3020	*	1.178	*	45	=	52974	43.9
Total ventilation heat losses Q_V								=	56650	46.9
Total heat losses Q_L					21073	+	56650	=	77724	64.3
					Q_T		Q_V		kWh/a	kWh/(m²a)
					kWh/a		kWh/a			

Available solar heat gains Q _S											
Orientation of the area	Reduction factor		g-value (perp. radiation)		Area m²	Global radiation kWh/(m²a)		kWh/a		kWh/(m²a)	
North	0.55	*	0.46	*	23.8	208	=	1246		1.0	
East	0.60	*	0.46	*	355.3	319	=	31125		25.8	
South	0.58	*	0.46	*	25.6	447	=	3070		2.5	
West	0.45	*	0.46	*	44.4	394	=	3624		3.0	
Horizontal	0.40	*	0.00	*	0.0	670	=	0		0.0	
Sum opaque areas							=	1223		1.0	
Total										40288	33.4
Internal heat gains Q _I											
	kh/d	Length cooling period d/a		Spec. power q _I W/m²		A _{TFA} m²		kWh/a		kWh/(m²a)	
	0.024	153	*	2.8	*	1207.9	=	12619		10.4	
Sum heat loads Q _F							Q _S + Q _I	=	52907	43.8	
									kWh/a	kWh/(m²a)	

Utilisation factor heat losses η_L

Ratio of losses to free heat gains

Utilisation factor heat losses η_L

Useful heat losses $Q_{L,n}$

$Q_L / Q_F =$

1.47

$=$

62%

$\eta_L * Q_L =$

48452

kWh/a

kWh/(m²a)

$Q_F - Q_{L,n} =$

4455

kWh/a

kWh/(m²a)

Useful cooling demand Q_K

Recommendation

15

kWh/(m²a)

Target value reached?

Yes

Dehumidification demand Q_{Dr}

Recommendation

0

kWh/(m²a)

$Q_{Tr} =$

1522

Target value reached?

No

Cooling: specific energy demand for useful cooling

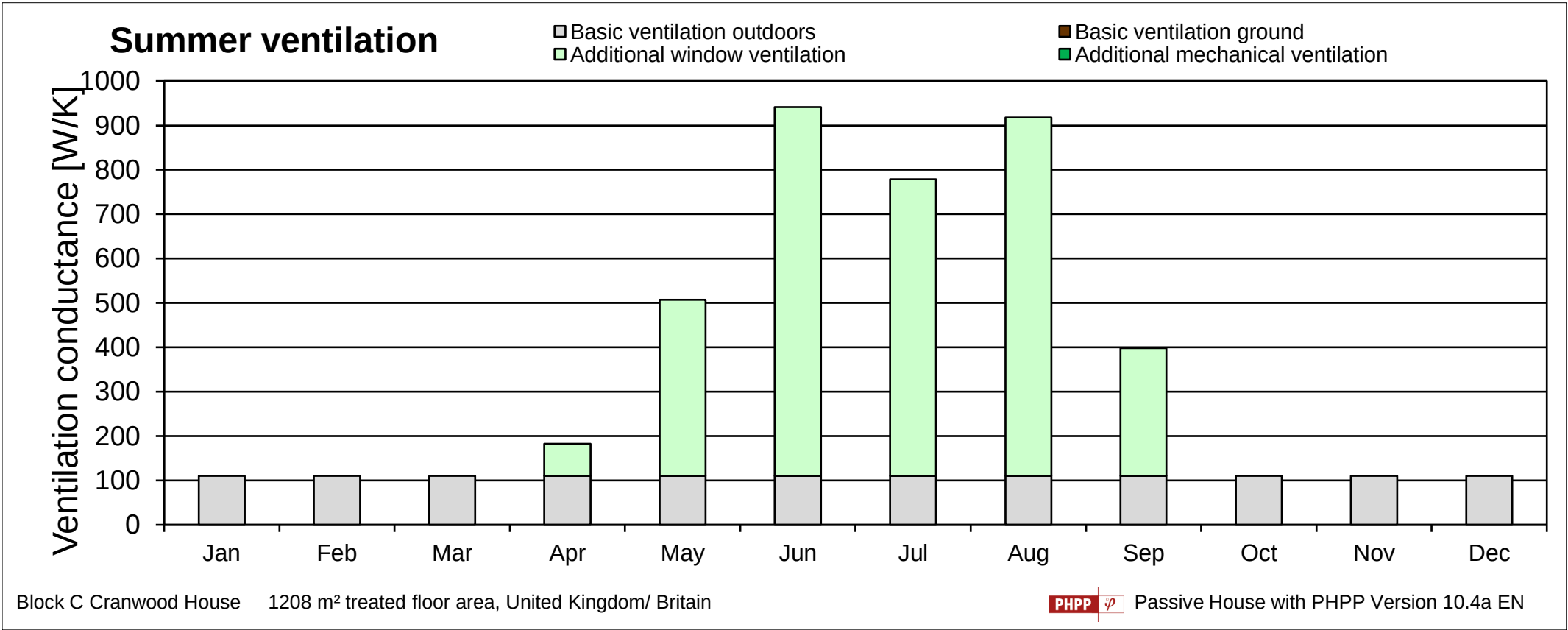
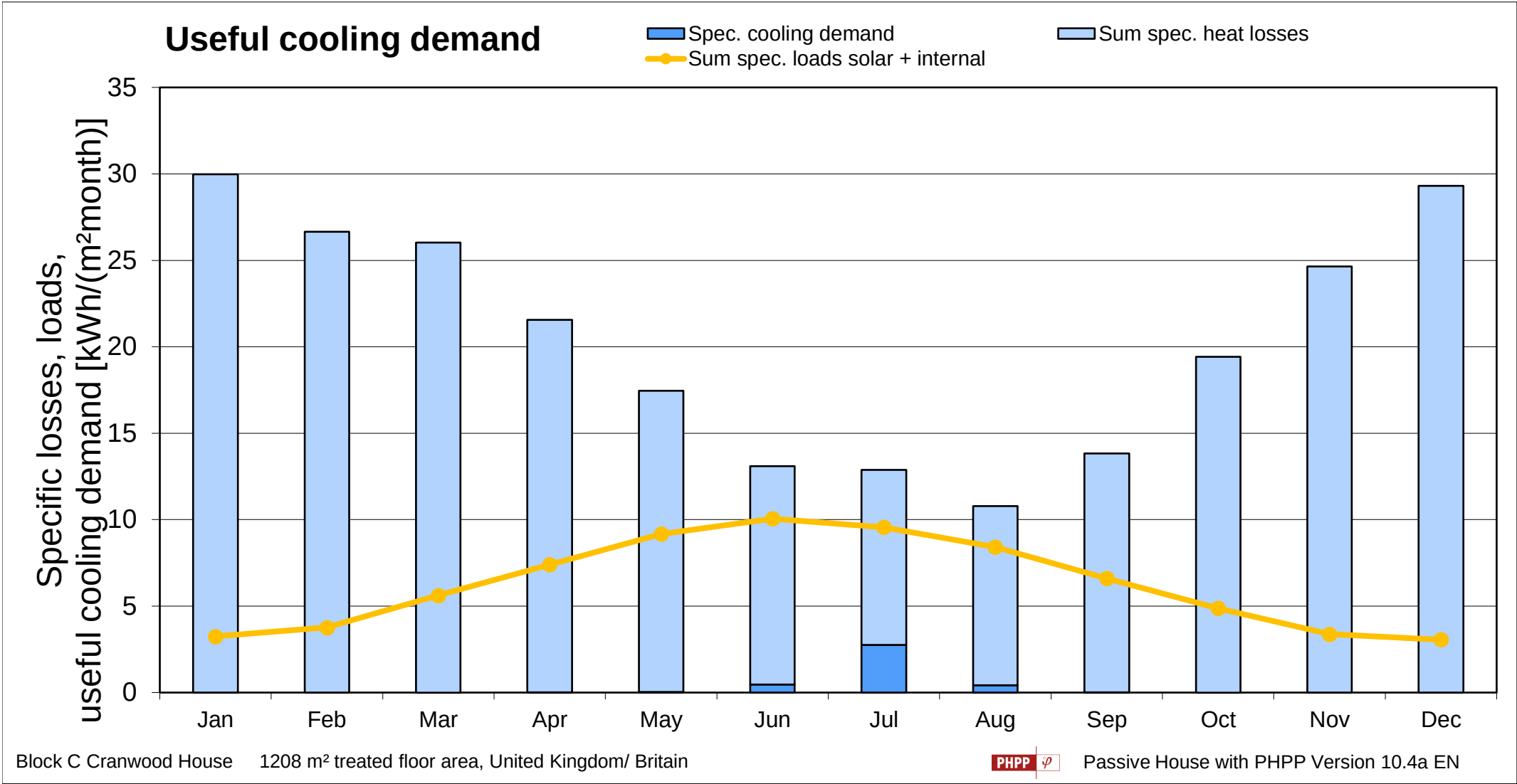
Passive House with PHPP Version 10.4a EN



Block C Cranwood House / Climate: Northolt / TFA: 1208 m² / Heating: 14.5 kWh/(m²a) / Overheating: 6 % / PER: 23.5 kWh/(m²a)

Building type:	5-Multi-family house I Apartment building	
Interior Temperature:	25	°C
Treated floor area A _{TFA} :	1208	m²

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	
Heating degree hours - Exterior	15.2	13.6	13.4	11.2	9.2	6.8	5.3	5.6	7.4	10.2	12.7	14.9	126	kKh
Heating degree hours - Ground	5.9	6.1	7.6	8.0	8.6	8.2	7.9	7.1	6.1	5.6	5.1	5.4	82	kKh
Losses - Exterior	10513	9364	9246	7757	6362	4660	3680	3829	5096	7059	8771	10301	86637	kWh
Losses - Ground	175	180	224	236	254	242	235	212	181	167	152	160	2417	kWh
Losses summer ventilation	25523	22661	21953	18037	14415	10349	8326	8480	11403	16233	20838	24945	203164	kWh
Sum spec. heat losses	30.0	26.7	26.0	21.6	17.4	12.6	10.1	10.4	13.8	19.4	24.6	29.3	241.9	kWh/m²
Solar load North	42	73	140	200	263	315	290	235	143	104	56	36	1896	kWh
Solar load East	761	1441	2960	4809	6638	7707	6968	5782	4029	2208	887	648	44840	kWh
Solar load South	343	398	543	611	616	581	605	638	630	529	378	281	6153	kWh
Solar load West	152	233	432	634	748	798	850	717	511	367	206	117	5766	kWh
Solar load Horiz.	0	0	0	0	0	0	0	0	0	0	0	0	0	kWh
Solar load Opaque	64	89	152	213	256	268	270	241	188	130	76	52	1998	kWh
Internal heat gains	2557	2309	2557	2474	2557	2474	2557	2557	2474	2557	2474	2557	30104	kWh
Sum spec. loads solar + internal	3.2	3.8	5.6	7.4	9.2	10.1	9.6	8.4	6.6	4.9	3.4	3.1	75.1	kWh/m²
Utilisation factor losses	11%	14%	22%	34%	52%	76%	67%	77%	48%	25%	14%	10%	30%	
Useful cooling energy demand	0	0	0	2	49	553	3320	510	19	0	0	0	4455	kWh
Spec. cooling demand	0.0	0.0	0.0	0.0	0.0	0.5	2.7	0.4	0.0	0.0	0.0	0.0	3.7	kWh/m²
Specif. dehumidification demand	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.5	0.3	0.1	1.3	kWh/m²
Sensible fraction	0%	0%	0%	100%	100%	100%	98%	100%	100%	0%	0%	0%	75%	



Cooling units



Block C Cranwood House / Climate: Northolt / TFA: 1208 m² / Heating: 14.5 kWh/(m²a) / Overheating: 6 % / PER: 23.5 kWh/(m²a)

Building type: 5-Multi-family house I Apartment building

Treated floor area A_{TFA}: 1207.9 m²

Interior temperature summer: 25.0 °C

Mechanical cooling:

Max. indoor absolute humidity: 12.0 g/kg

Air change rate via ventilation system with supply air: 0.0 1/h

Internal humidity sources: 2.7 g/(m²h)

Building volume: 3020 m³

Operation time:

hours per day

days a week

Supply air cooling (w/ recirculating air if necessary)

Number of units

Selection list of units

Selection unit

2-Sort by ID

Go to list of combined ventilation/split units

Go to list of HPs according to EN 14825 / EN 14511

Recirculation airflow

Variable?

Total cooling coil

Internal heat recovery

Normal operation

Dehumidification mode

T_e-T_i

K

Cooling capacity kW

maximum

on-off limit

EER

maximum

on-off limit

Cooling capacity kW

maximum

on-off limit

EER

maximum

on-off limit

Reduction coefficient C_c

Reheating capacity

Performance ratio of reheating

Dry temperature diff.

K

K

Seasonal energy efficiency ratio

Recirculation cooling

Number of units

Selection list of units

Selection unit

1-Sorting: AS LIST

Go to list of combined ventilation/split units

Go to list of HPs according to EN 14825 / EN 14511

Nominal airflow rate

Variable?

Silent operation

Dehumidification mode

T_a-T_i

K

Cooling capacity kW

maximum

on-off limit

EER

maximum

on-off limit

Cooling capacity kW

maximum

on-off limit

EER

maximum

on-off limit

Reduction coefficient C_c

Reheating capacity

Performance ratio of reheating

Dry temperature diff.

K

K

Seasonal energy efficiency ratio

Additional dehumidification

Waste heat to room (check if appropriate)

Seasonal energy efficiency ratio

Panel cooling

Selection unit

1-Sorting: AS LIST

Go to list of HPs according to EN 14825 / EN 14511

Normal operation

No dehumidification

T_a-T_i

K

Cooling capacity kW

maximum

on-off limit

EER

maximum

on-off limit

Reduction coefficient C_c

Seasonal energy efficiency ratio

Results		Sensible		Latent		SEER	Electricity demand		Sensible fraction	
		kWh/(m²a)		kWh/(m²a)			kWh/(m²a)			
Cooling contribution by:	Supply air cooling	(		+		) /	=			
	Recirculation cooling	(		+		) /	=			
	Dehumidification					/	=		0%	
	Panel cooling					/	=		100%	
	Post heating					/	=		100%	
	Cooling distribution					/	=		100%	
Total cooling contribution		(	0.0	+	0.0	) /	=	0.0	0%	
Useful cooling demand			3.7		1.3				75%	

PHPP, Cooling units

BP10479_PHPP - Block A2-Rev 3.xlsx

Unsatisfied demand

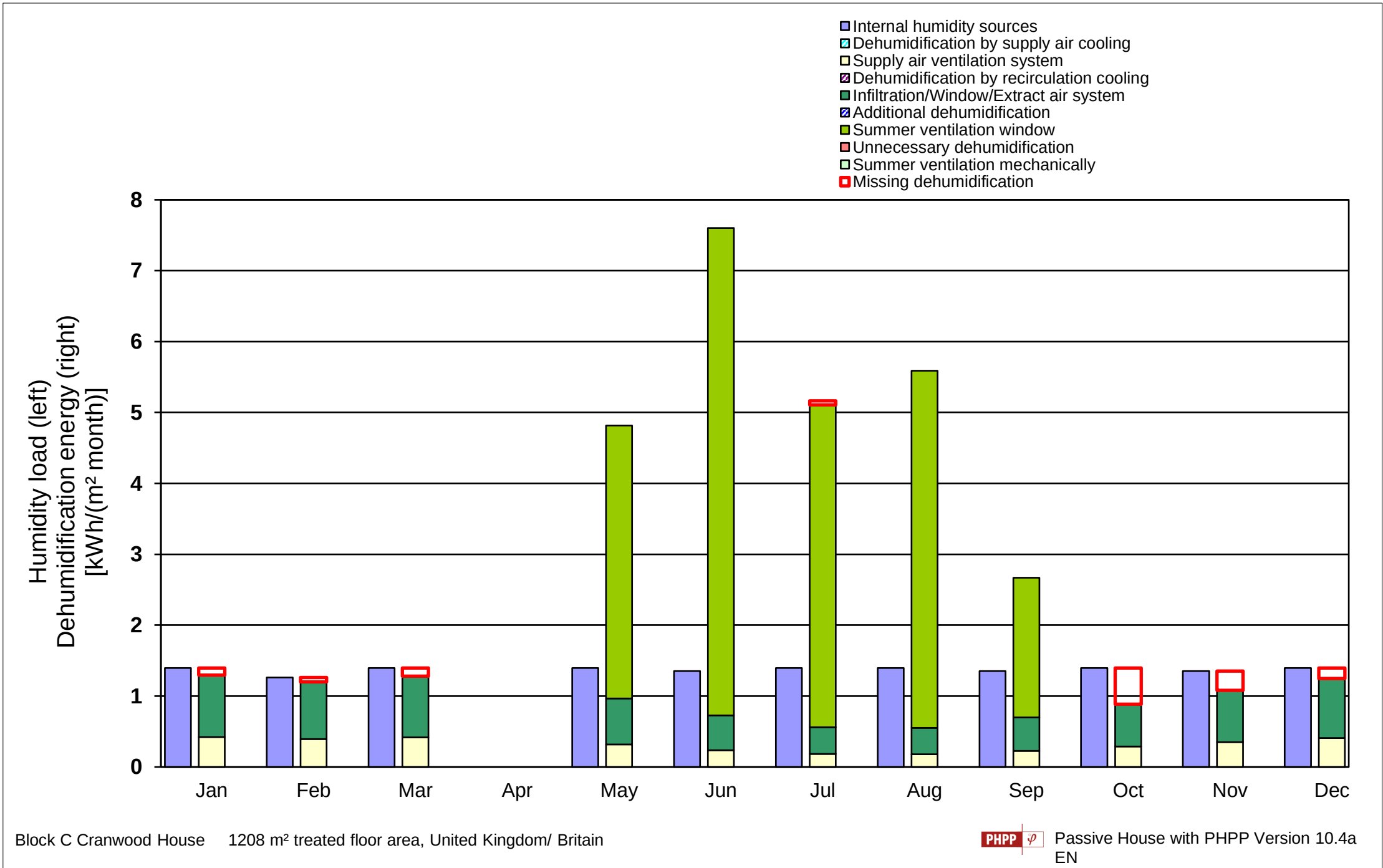
Cooling demand covered?

Cooling units

Block C Cranwood House / Climate: Northolt / TFA: 1208 m² / Heating: 14.5 kWh/(m²a) / Overheating: 6 % / PER: 23.5 kWh/(m²a)

Humidity loads and humidity removal

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	
Internal humidity sources	1.4	1.3	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	16	kWh/m²
Infiltration/Window/Extract air system	-0.9	-0.8	-0.9	-0.8	-0.7	-0.5	-0.4	-0.4	-0.5	-0.6	-0.7	-0.8	-8	kWh/m²
Supply air ventilation system	-0.4	-0.4	-0.4	-0.4	-0.3	-0.2	-0.2	-0.2	-0.2	-0.3	-0.4	-0.4	-4	kWh/m²
Summer ventilation window	0.0	0.0	0.0	-0.8	-3.8	-6.9	-4.5	-5.0	-2.0	0.0	0.0	0.0	-23	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	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.3	0.1	1	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 recirculation cooling	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	kWh/m²
Additional dehumidification	0.0	0.0	0.0	0.0	0.0	0.0	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	
Unnecessary dehumidification	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	kWh/m²
Missing dehumidification	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.5	0.3	0.1	1	kWh/m²



Cooling load



Block C Cranwood House / Climate: Northolt / TFA: 1208 m² / Heating: 14.5 kWh/(m²a) / Overheating: 6 % / PER: 23.5 kWh/(m²a)

Building type:	5-Multi-family house I Apartment building	
Treated floor area A _{TFA} :	1207.9	m²
Building volume:	3020	m³
Spec. capacity:	60	Wh/(m²K)
Max. indoor absolute humidity:	12.0	g/kg
Internal humidity sources:	2.7	g/(m²h)
Interior temperature summer:	25	°C
SHX	11.9	°C

From 'Climate' worksheet:

Temperature:	Weather 1 °C	Weather 2 °C	Radiation:	Weather 1 W/m²	Weather 2 W/m²
Outdoor air	26.0	20.7	North	95	50
Dew point	19.7	17.0	East	220	180
Sky	17.9	14.5	South	185	255
			West	220	180
			Horizontal	320	260

Ground design temp.	14.3	°C
Daily temperature swing	9.4	K

Transmission heat load P _T		Area	U-value	Temperature	Temp Diff 1	Temp Diff 2	P _T 1	P _T 2
Building assembly	Temperature zone	m²	W/(m²K)	reduction factor	K	K	W	W
External wall - ambient	A	477.5	0.130	1.00	1.0	-4.3	61	-268
External wall ground/basement	B			1.00	-10.7	-10.7		
Roof / ceiling - ambient	A	300.4	0.098	1.00	1.0	-4.3	29	-127
Floor slab / basement ceiling	B	297.9	0.099	1.00	-10.7	-10.7	-316	-316
	A			1.00	1.0	-4.3		
	A			1.00	1.0	-4.3		
	A			1.00	1.0	-4.3		
Windows	A	449.0	1.012	1.00	1.0	-4.3	448	-1960
Exterior door	A	44.8	0.800	1.00	1.0	-4.3	35	-155
Thermal bridges ambient (length/m)	A			1.00	1.0	-4.3		
Perimeter thermal bridges (length/m)	P			1.00	-10.7	-10.7		
Thermal bridges ground (length/m)	B			1.00	-10.7	-10.7		
Building element towards neighbour	I			1.00	3.0	3.0		
Radiation correction outdoor air			L _{ambient} W/K	-14.0	1.0	-4.3	-14	61
Radiation correction sky			L _{Sky} W/K	13.9	-7.1	-10.5	-98	-147
Total transmission heat load P _T							145	-2912

V _V	n _{V,equi,fraction}	n _{V,equi,fraction}	C _{Air}	TempDiff 1	TempDiff 2	P _V 1	P _V 2
m³	1/h	1/h	Wh/(m³K)	K	K	W	W
Ventilation load ambient P _{V,a}	3020	0.111	0.33	1.0	-4.3	109	-476
Ventilation load ground P _{V,g}	3020	0.000	0.33	-13.1	-13.1	0	0
Ventilation load summer ventilation	3020	0.000	0.33	0.0	0.0	0	0
Total ventilation heat load P _L						109	-476

Solar load P _S	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	23.8	0.5	0.55	97	51	580	308
	East	355.3	0.5	0.60	157	102	15330	9944
	South	25.6	0.5	0.58	185	255	1273	1751
	West	44.4	0.5	0.45	216	172	1991	1586
	Horizontal	0.0	0.0	0.40	320	260	0	0
	Sum opaque areas						594	545
Total solar load P _S							19767	14134

Internal heating load P _I	Spec. power W/m²	A _{TFA} m²	P _I 1 W	P _I 2 W
	2.8	1208	3437	3437

Cooling load P _C	P _T + P _V + P _S + P _I		23458	14182
	Cooling load P _C		23458	W
	Area specific cooling load P _C / A _{TFA}		19.4	W/m²
For comparison: cooling capacity that can be transported by the supply air	Supply air temperature without cooling θ _{Supply,Min}	26.0	°C	20.7
Please enter the minimum supply air temperature.	3	°C		
Cooling capacity that can be transported by the supply air P _{Supply air;max}		830	W	639
	P _{Supply air; max} /A _{TFA}	0.7	W/m²	0.5
Air conditioning over the supply air possible?	No			
Conductance values	Transmittance	581.7	W/K	
	Ventilation conductance	110.4	W/K	
	Conductance summer ventilation	0.0	W/K	
	Heat capacity	72472	Wh/K	
Performance	Transmission + Ventilation	1627	W	
	Solar load	39535	W	
	Internal load	6873	W	
	Night ventilation	0	W	
Part of the day	P [W]	ΔT [K]		
13	-1627	-2.1		
6 h - 12 h	44781	-0.3		
12 h - 18 h	48034	1.8		
18 h - 24 h	1627	0.0		
Average value	23204			
Cross check: daily indoor temperature fluctuation	Daily indoor temperature fluctuation		3.8	K

Dehumidification load P _T				from 'Cooling' worksheet									
Humidity ambient air	14.4	or	12.1	g/kg	Humidity supply air	14.4	or	12.1	g/kg				
Outdoor air mass flow	266	or	266	kg/h	Supply air mass flow	129	or	129	kg/h				
Summer vent. air mass flow	0	or	0	kg/h	Hum. load, supply air	313	or	17	g/h				
Humidity load, outdoor air	643	or	34	g/h	Hum. load, internal	3202	or	3202	g/h				
Enthalpy of vaporisation					Humidity load		Humidity load	P _D 1	P _D 2				
Wh/kg				g/kg	g/h	g/h	g/h	W	W				
708				/	1000	*	4158	or	3253	=	2942	or	2302
Dehumidification load P _T										=	2942	W	
Area specific dehumidification load P _T / A _{TFA}										=	2.4	W/m ²	
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	0.5	2.7	0.4	0.0	0.0	0.0	0.0	kWh/m ²
Specific dehumidification demand	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.5	0.3	0.1	kWh/m ²
Sensible fraction	0%	0%	0%	100%	100%	100%	98%	100%	100%	0%	0%	0%	

Minimum sensible share of the cooling load	=	100%
--	---	------

Heat distribution and domestic hot water (DHW) system



Block C Cranwood House / Climate: Northolt / TFA: 1208 m² / Heating: 14.5 kWh/(m²a) / Overheating: 6 % / PER: 23.5 kWh/(m²a)

Interior temperature:	20	°C	Interior temperature summer:	25	°C
Building type:	5-Multi-family house I Apartment building				
Treated floor area A _{TFA} :	1208	m²			
Number or occupants per day:	32.0	Pers			
Number of dwelling units:	18				
Annual heating demand q _{Heating} :	17487	kWh/a	Annual useful cooling dem. q _{Cool} :	4455	kWh/a
Length of heating period:	212	d/a	Length cooling period:	153	d/a
Average heating load P _{Average} :	3.6	kW	Average cooling load P _{Average} :	1.2	kW
Marginal usability of additional heat gains:	76%		Marginal usability of additional heat losses:	12%	

Heat delivery:

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

Space heat distribution

			Inside thermal envelope					Outside thermal envelope					Total values	
			1	2	3	4	5	1	2	3	4	5	Absolute	Specific
Length of distribution pipes (forward + return flows)	L _H	m												
Nominal width of pipe		mm												
Insulation thickness		mm												
Reflective coating?		-												
Thermal conductivity of insulation		W/(mK)												
Heat loss coefficient		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 bridging of pipework		W/K												
Total heat loss coefficient	Ψ	W/(mK)												
Room temperature	θ _x	°C	20	20	20	20	20							
Forward flow temperature	θ _v	°C	55	55	55	55	55	55	55	55	55	55		
System heating load	P _{heating}	kW	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9		
Flow temperature control?														
Common pipe Heating + DHW?														
Return flow temperature	θ _R	°C												
Heat emission pipe	q* _{HL}	kWh/(m·a)												
Utilisation factor of released heat	η _G	-												
Heat losses of heating distribution	Q _{HL}	kWh/a											kWh/a	kWh/(m²a)
Heat losses of heating storage		kWh/a											0	0.0
Total heat losses of heating		kWh/a											0	0.0
Performance ratio of space heating distribution	ea _{HL}	-											100%	

DHW useful heat

DHW demand for showers, per person and day (with 60 °C)		litre/person/d	16.0		
DHW demand others, per person and day (with 60 °C)		litre/person/d	9.0		
Performance of drain water heat recovery (shower)		-	0%		
Effective DHW demand	V_{DHW}	litre/person/d	25		
Average cold water temperature of the supply	θ_{TW}	°C	11.9		
DHW demand for washing machines & dishwashers		kWh/a	0		
Useful heat of DHW	Q_{DHW}			kWh/a	kWh/(m²a)
				16307	13.5
Secondary calculation for determining the DHW requirements (for non-res)					

DHW distribution

[illegible]

Storage heat losses

		Storage type 1	Storage type 2	Buffer storage tank (only heating)	Compact unit		
Selection of storage tank		0-No storage tank	0-No storage tank	0-No storage tank	0-No		
Storage necessary for HP			-----		-----		
Solar DHW connection				-----			
Heat loss rate	W/K						
Storage volume	litre				-----		
Standby fraction	-			-----	-----		
Location of storage tank, inside or outside of thermal envelope		1-Inside	1-Inside	1-Inside			
Temperature of mechanical room	°C						
Typical storage tank temperature	°C						
Manual entry of storage temperature	°C				-----		
Average standby heat losses storage tank	W						
Additional heat loss storage, solar system operation	W			-----	-----		
Possible utilisation factor of heat losses		-----	-----		-----		
Annual heat losses DHW storage tank	kWh/a					kWh/a	kWh/(m²a)
Annual heat losses buffer storage tank	kWh/a				-----	0	0.0
Auxiliary calculation - heat losses through storage tank according to EU efficiency classes							

Total energy demand of DHW

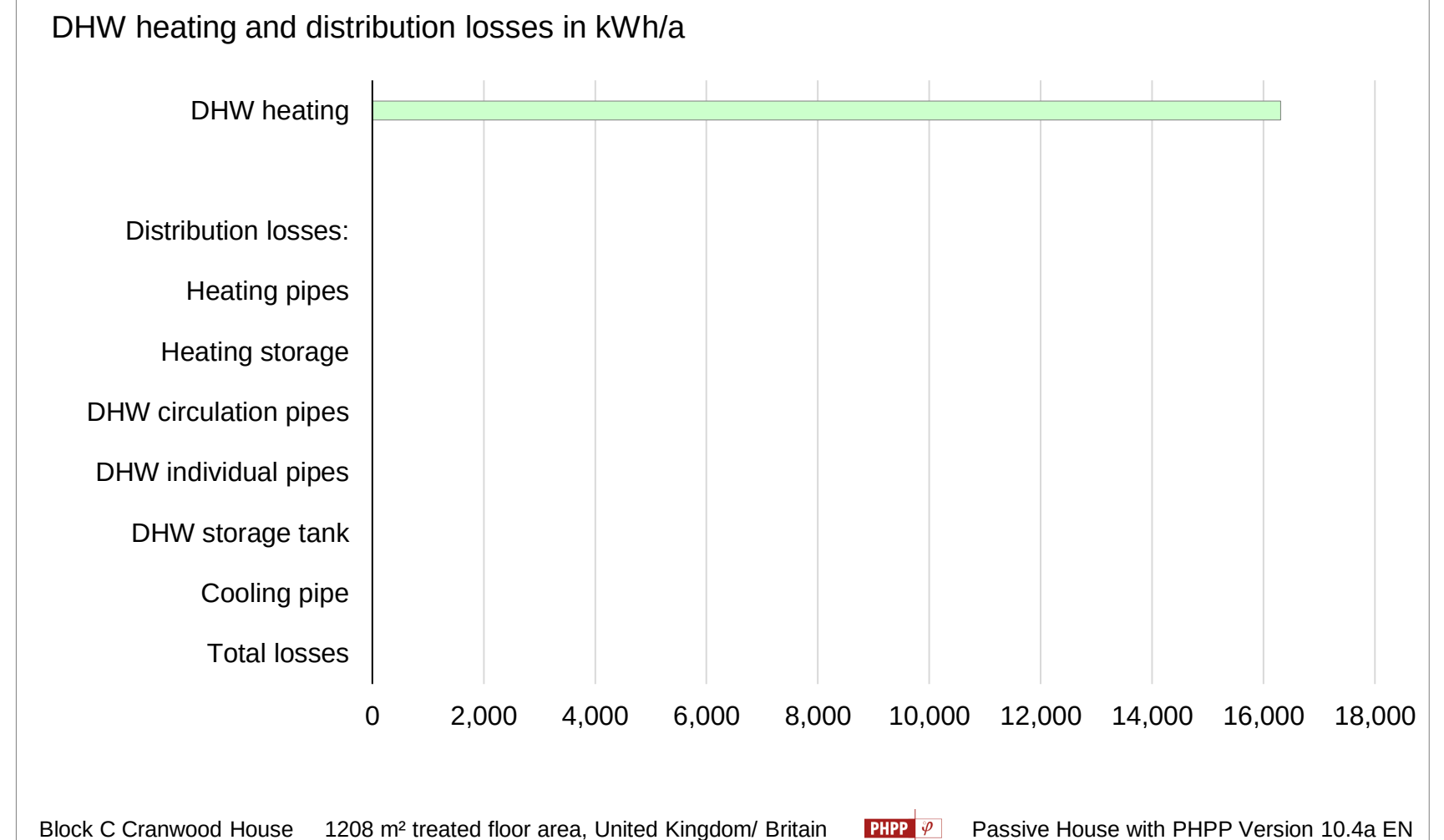
Heat losses of DHW distribution and storage	Q _{WL}	kWh/a	kWh/(m²a)
		0	0.0
Performance ratio DHW distribution + storage	e _{a,WL}	100%	
Total heat demand of DHW system including storage tank	Q _{gDHW}	kWh/a	kWh/(m²a)
		16307	13.5

Cooling distribution

Length of distribution pipes	L_H	m
Nominal width of pipe		mm
Insulation thickness		mm
Reflective coating?		-
Thermal conductivity of insulation		W/(mK)
Heat loss coefficient per m pipe	Ψ	W/(mK)
Temp. of room through which the pipes pass	θ_X	°C
Design flow temperature	θ_V	°C
System cooling load	P_{Cool}	kW
Flow temperature control ('x' if appropriate)		
Design return temperature	θ_R	°C
Annual heat absorption per m of pipe	q_{HL}^*	kWh/(m·a)
Possible utilisation factor of this heat absorption	η_G	-
Annual losses of cooling distribution	Q_{HL}	kWh/a
Performance ratio cold water distribution pipes	ea_{HL}	-

[illegible][illegible]

Total values	
Absolute	Specific
kWh/a	kWh/(m ² a)
0	0.0
100%	



Solar thermal system



Block C Cranwood House / Climate: Northolt / TFA: 1208 m² / Heating: 14.5 kWh/(m²a) / Overheating: 6 % / PER: 23.5 kWh/(m²a)

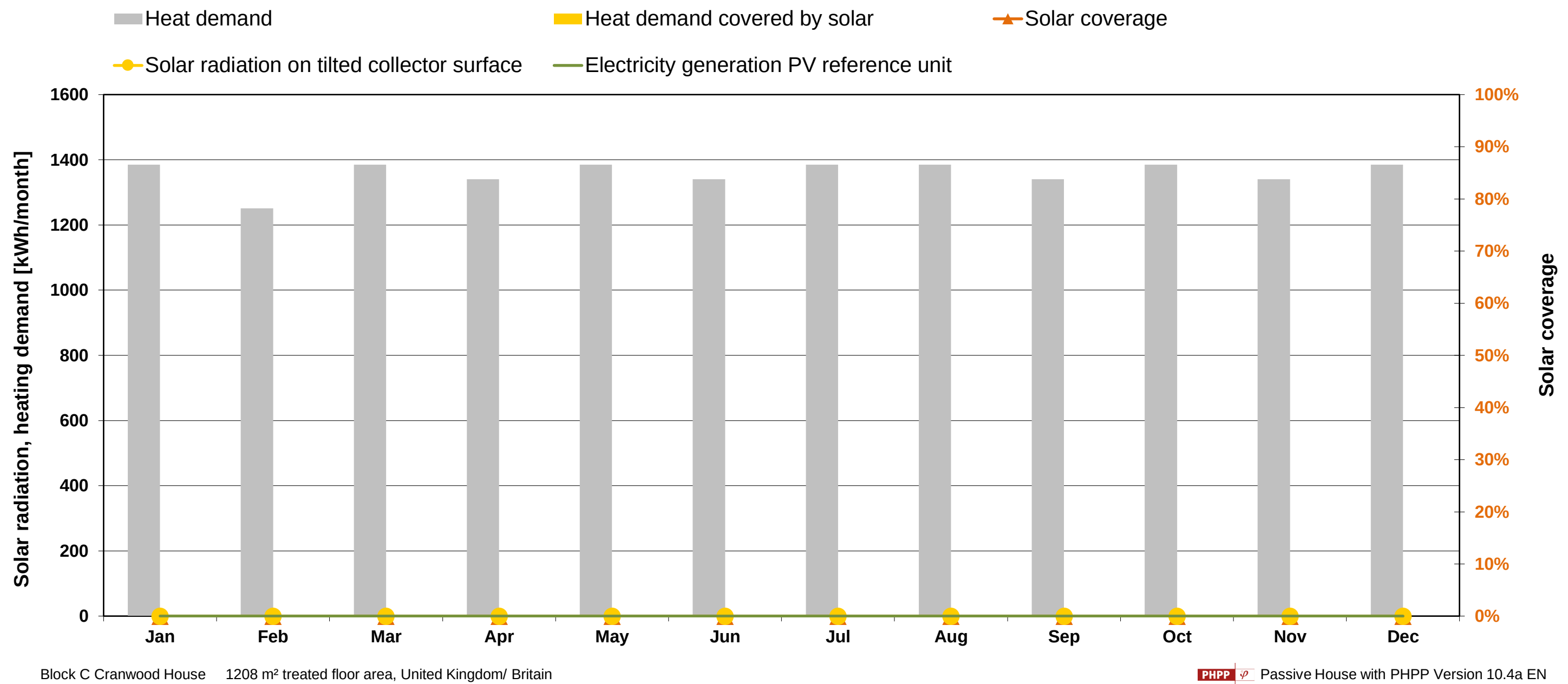
Building type:	5-Multi-family house I Apartment building	
Treated floor area A _{TFA} :	1207.9	m²
Projected building footprint A _{Projected} :	0.0	m²
Latitude ('Climate' worksheet)	51.6	°
DHW heat demand (sheet DHW + distribution)	16307	kWh/a
Heating demand ('Heating' and 'DHW+Distribution' worksheets)	17487	kWh/a
No. of occupants	32.0	Persons

Location: Selection in 'Areas' worksheet			
Size of selected area		m²	
Free area (less solar thermal and electrical systems)		m²	
Deviation from North		°	
Angle of inclination from the horizontal		°	
Alternative input: deviation from North		°	
Alternative input: angle of inclination from the horizontal		°	
Solar collector area		m²	
Specific collector area	0.0	m²/Pers	
Height of the collector field		m	
Height of horizon	h _{Hori}	m	
Distance of horizon	a _{Hori}	m	
Additional reduction factor shading	r _{other}		
Collector			
Supplementary heating (check if appropriate)			
DHW priority (check if appropriate)			

Results		Projected building footprint area	Absolute
		kWh/(m² _{Projected} *a)	kWh/a
Solar contribution total	0%	0.0	0
Solar contribution to DHW	0%		0
Solar contribution to space heating	0%		0

Determination of PER factors		
Yield reference PV syst.	PER _{el}	PER _{sol.therm}
kWh _{el} /a	kWh _{prim-el} /kWh _{el}	$\frac{kWh_{el}}{kWh_{th}} * kWh_{prime}/kWh_{el}$
		-
	1.30	
	1.65	

		kgCO ₂ eq/ a	kgCO ₂ eq/a
1-CO2 factors GEMIS (Germany)	kgCO2eq/kWhFinal		



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	
Heat demand DHW generation	1385	1251	1385	1340	1385	1340	1385	1385	1340	1385	1340	1385	16307	kWh/month
Heat demand space heating	0	0	0	0	0	0	0	0	0	0	0	0	0	kWh/month
Heat demand	1385	1251	1385	1340	1385	1340	1385	1385	1340	1385	1340	1385	16307	kWh/month
Solar radiation on tilted collector surface	0	0	0	0	0	0	0	0	0	0	0	0	0	kWh/month
Input: Solar yield DHW													0	kWh/month
Input: Solar yield heating													0	kWh/month
Heat demand covered by solar, DHW	0	0	0	0	0	0	0	0	0	0	0	0	0	kWh/month
Heat demand covered by solar, space heating	0	0	0	0	0	0	0	0	0	0	0	0	0	kWh/month
Heat demand covered by solar	0	0	0	0	0	0	0	0	0	0	0	0	0	kWh/month
Solar coverage	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	-
Electricity generation PV reference unit														kWh/month

Photovoltaic systems



Block C Cranwood House / Climate: Northolt / TFA: 1208 m² / Heating: 14.5 kWh/(m²a) / Overheating: 6 % / PER: 23.5 kWh/(m²a)

Climate data set: GB0027a-Northolt, Altitude corrected

Building type: 5-Multi-family house I Apartment building

Projected building footprint: 0.0 m²

Name of system	System 1	System 2	System 3	System 4	System 5	Reference PV syst.
Location: Selection from 'Areas' worksheet						
Size of selected area						m²
Deviation from North						°
Angle of inclination from horizontal						°
Alternative input: deviation from north						°
Alternative input: angle of inclination from horizontal						°

Information from the PV module data sheet for standard test conditions (STC)

Technology						4-Mono-Si	
Nominal current	I_{MPP0}					10.00	A
Nominal voltage	U_{MPP0}					34.00	V
Nominal power	P_n	0	0	0	0	340	Wp
Temperature coefficient short-circuit current	α					0.050	%/K
Temperature coefficient open-circuit voltage	β					-0.270	%/K
PV module dimensions: height						1.750	m
PV module dimensions: width						1.050	m
						1.8	PV module area [m²]

Further specifications

Number of PV modules	n_M						0.0	
Height of PV module array								m
Height of horizon	h_{Hori}							m
Distance of horizon	a_{Hori}							m
Additional reduction factor shading	r_{other}							
Efficiency of the inverter	η_{Inv}						95%	

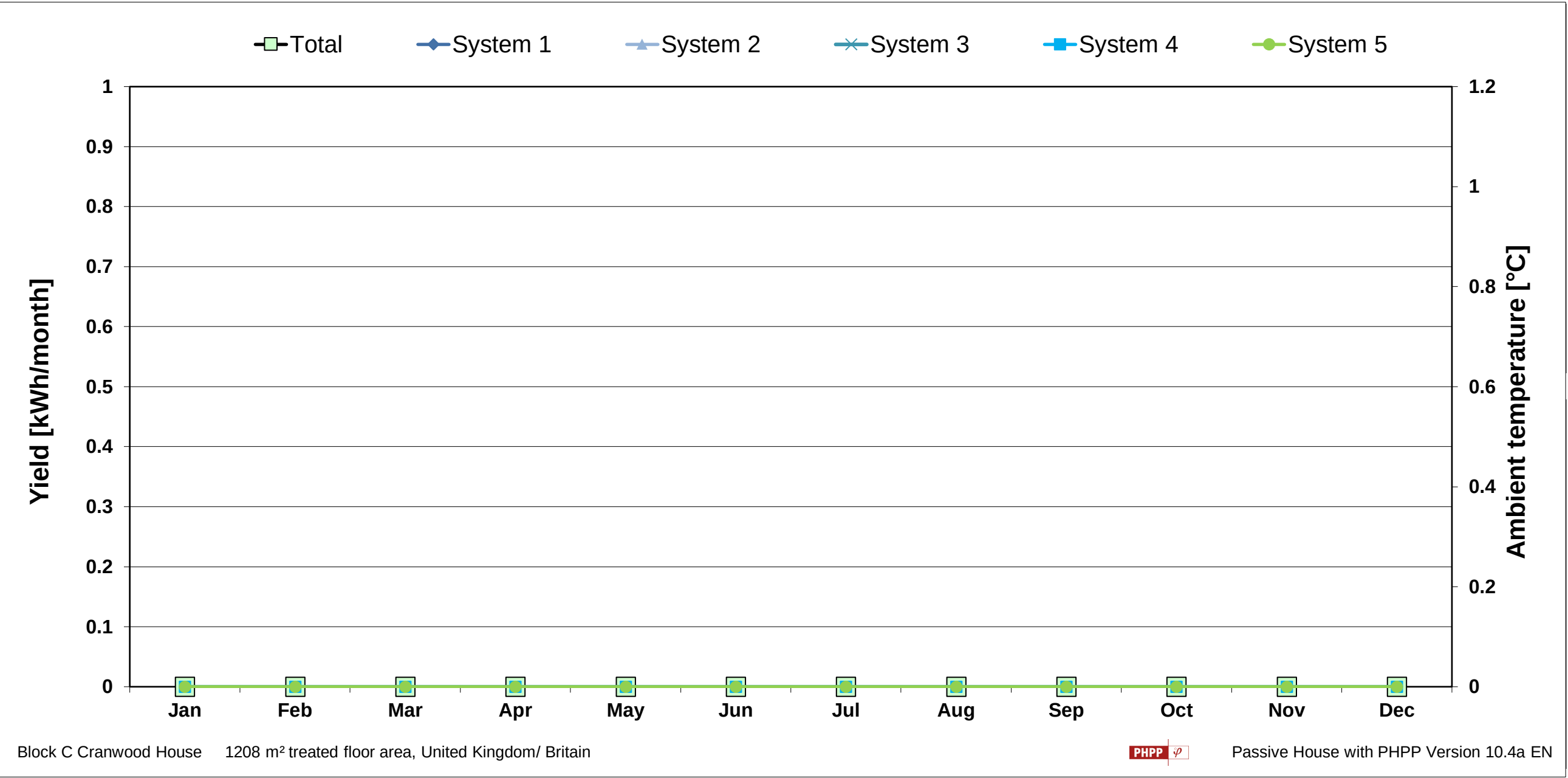
Results

Area of PV module array	0.0	0.0	0.0	0.0	0.0	0.0	m²
Free area on the selected building element							m²
Used fraction of building element							
Annual losses due to shading							kWh

Annual electricity yield after the inverter, absolute

Referred to projected building footprint area						0	kWh/a
CO2-equivalent emissions according to 1-CO2 factors GEMIS (Germany)						0	kWh/m²A _{Projected} *a
PE-factor according to 1-PE factors (non-renewable) PHI Certification						0.0	kg/a
					0.0	0.00	kWh _{prim} /kWh _{End}

Total



List of PV module technologies

	Technology	AEE kWh/Wp	CO ₂ kg/Wp	Lifespan years	PER factor kWh/kWh	1-PE factors (non-renewable) PHI Certification kWh/kWh	1-CO2 factors GEMIS (Germany) kg/kWh
1							
2	Amorph-Si	7.955	1.141695	30	1.00	0.00	0.063
3	CIGS	5.805	0.788184	30	1.00	0.00	0.063
4	Mono-Si	11.85	1.782135	30	1.00	0.00	0.130
5	Poly-Si	8.04	1.595889	30	1.00	0.00	0.063

System 1

Electricity demand for residential buildings



Block C Cranwood House / Climate: Northolt / TFA: 1208 m² / Heating: 14.5 kWh/(m²a) / Overheating: 6 % / PER: 23.5 kWh/(m²a)

Number of dwelling units

18

dwelling units

Number of occupants

32.0

persons

Treated floor area A_{TFA}

1208

m²

Solar fraction of DHW Laundry&Dish

0%

Marginal performance ratio DHW

0%

Marginal performance ratio heating

0%

PER factors

Electricity

1.30

1.50

Energy carrier for DHW:

Energy carrier for space heating:

Gas for cooking, drying

1.75

0.00

Applications	Quantity	Consider for IHG?	Utilisation factor	Reference value	Frequency	In operation				When not in operation			Total Useful energy kWh/a	Electricity demand		Additional heating demand					PER demand kWh/a	PE demand kWh/a								
						Average power / electricity demand of the application	Duration of use h/app.	Size of the unit	Useful energy kWh/a	Power W	Hours per unit h/d	Useful energy kWh/a		Electric fraction	Final energy kWh/a	Fraction additional demand	Additional/reduced demand	Marginal performance ratio	Solar fraction	Final energy kWh/a										
Refrigerating																														
Refrigerator	0	1	1.00	18	dwelling unit(s)	365	d/a	0.34	kWh/d				0	100%	0						0	0								
Freezer	0	1	1.00	18	dwelling unit(s)	365	d/a	0.55	kWh/d				0	100%	0						0	0								
Refrigerator-freezer combination	1	1	1.00	18	dwelling unit(s)	365	d/a	0.61	kWh/d				4008	100%	4008						5210	6016								
Cooking with:																														
1-Electricity																														
Electricity demand	1	1	1.00	32.0	person(s)	500	/(P*a)	0.25	kWh/Use				4003	100%	4003						5204	6009								
Gas demand																0%			0	0										
Dishwashing																														
2-Cold water connection																														
Electricity demand	1	1	1.00	32.0	person(s)	65	/(P*a)	0.92	kWh/Use	3.0	12	Place settings	106	0.75	23.0	6	2029	100%	2029			2637	3045							
DHW demand																0%	*	1.30	*	0.00	*(1-	0.00	) =	0						
Clothes washing																														
2-Cold water connection																														
Electricity demand	1	1	1.00	32.0	person(s)	57	/(P*a)	0.79	kWh/Use	2.9	5	kg wash load	80	0.75	23.2	6	1556	100%	1556			2023	2336							
DHW demand																0%	*	1.05	*	0.00	*(1-	0.00	) =	0						
Drying with																														
4-Condensation dryer																														
Electricity demand	1	1	0.75	32.0	person(s)	57	/(P*a)	2.13	kWh/Use	2.4	5	kg wash load	162	1.50	23.5	13	3148	100%	3148			4092	4725							
Gas demand (for gas dryers)																	0		0%		0			0	0					
Energy demand from evaporation	0	1	0.50	32.0	person(s)	57	/(P*a)	3.13	kWh/Use								0		100%	*	1.00	*	0.00	*(1-	0.68	) =	0		0	0
Lighting																														
Inside dwelling unit:	1	1	4.20	32.0	person(s)	1.2	kh/(P*a)	12	W/lamp	60	lm/W (efficacy)	1937	1937	100%	1937						2518	2907								
Outside of dwelling unit:	0	1											Nominal illuminance:	0	100%	0					0	0								
Other devices:		Quantity	IHG?	Reference value	Frequency	In operation				When not in operation				kWh/a																
Total other devices		1	1.00															7460	100%	7460										
Total household electricity															kWh/a	24140	kWh/a	31382	36234	kWh/a										
															kWh/(m²a)	20	kWh/(m²a)	26	30	kWh/(m²a)										
Electricity demand for:																														
Space heating		from 'PER' worksheet, without aux. electricity										kWh/a	0	kWh/a	0	0	kWh/a													
Cooling + dehumidification		from 'PER' worksheet, without aux. electricity										kWh/a	0	kWh/a	0	0	kWh/a													
Domestic hot water		from 'PER' worksheet, without aux. electricity										kWh/a	0	kWh/a	0	0	kWh/a													
Aux Electricity		from 'Aux. Electricity' worksheet										kWh/a	7	kWh/a	11	10	kWh/a													
Total sum electricity demand																														
															kWh/a	24147	kWh/a	31393	36244	kWh/a										
															kWh/(m²a)	20	kWh/(m²a)	26	30	kWh/(m²a)										
Additional demand transferred to other worksheets:																														
DHW for washing machines and dishwashers															0	kWh/a														
Additional space heating (energy demand from evaporation)															0	kWh/a														
Gas demand for clothes drying / cooking															0	kWh/a														

Use non-residential buildings



Block C Cranwood House / Climate: Northolt / TFA: 1208 m² / Heating: 14.5 kWh/(m²a) / Overheating: 6 % / PER: 23.5 kWh/(m²a)

Latitude [°]: 51.6

	2	5	6	7	8	9	10	11		15	16	17	18	20	27
	Utilisation profile	Begin utilisation	End utilisation	Daily utilisation hours	Annual utilisation days	Annual utilisation hours	Annual utilisation hours during daytime	Annual utilisation hours during nighttime		Illumination level	User-defined data: height of utilisation level [0.8 or 0.0 m]	applied height of utilisation level	Occupants: Relative presence	Part use factor for lighting	Average No. of occupants
		h	h	h/d	d/a	h/a	h/a	h/a		lux	m	m			m²/person
1				0		0	0	0				0.8			
2				0		0	0	0				0.8			
3				0		0	0	0				0.8			
4				0		0	0	0				0.8			
5				0		0	0	0				0.8			
6				0		0	0	0				0.8			
7				0		0	0	0				0.8			
8				0		0	0	0				0.8			
9				0		0	0	0				0.8			
10				0		0	0	0				0.8			
11				0		0	0	0				0.8			
12				0		0	0	0				0.8			
13				0		0	0	0				0.8			
14				0		0	0	0				0.8			
15				0		0	0	0				0.8			
16				0		0	0	0				0.8			
17				0		0	0	0				0.8			
18				0		0	0	0				0.8			
19				0		0	0	0				0.8			
20				0		0	0	0				0.8			
21				0		0	0	0				0.8			
22				0		0	0	0				0.8			
23				0		0	0	0				0.8			
24				0		0	0	0				0.8			
25				0		0	0	0				0.8			
26				0		0	0	0				0.8			
27				0		0	0	0				0.8			
28				0		0	0	0				0.8			
29				0		0	0	0				0.8			
30				0		0	0	0				0.8			
31				0		0	0	0				0.8			
32				0		0	0	0				0.8			
33				0		0	0	0				0.8			
34				0		0	0	0				0.8			
35				0		0	0	0				0.8			
36				0		0	0	0				0.8			
37				0		0	0	0				0.8			
38				0		0	0	0				0.8			
39				0		0	0	0				0.8			
40				0		0	0	0				0.8			
41				0		0	0	0				0.8			
42				0		0	0	0				0.8			
43				0		0	0	0				0.8			
44				0		0	0	0				0.8			
45				0		0	0	0				0.8			
46				0		0	0	0				0.8			
47				0		0	0	0				0.8			
48				0		0	0	0				0.8			
49				0		0	0	0				0.8			
50				0		0	0	0				0.8			
51				0		0	0	0				0.8			
52				0		0	0	0				0.8			
53				0		0	0	0				0.8			
54				0		0	0	0				0.8			
55				0		0	0	0				0.8			
56				0		0	0	0				0.8			
57				0		0	0	0				0.8			
58				0		0	0	0				0.8			
59				0		0	0	0				0.8			
60				0		0	0	0				0.8			

Building type:

5-Multi-family house I Apartment building

Treated floor area A_{TFA}:

1207.9

m²

For dishwasher + washing machine with DHW connection:

Solar fraction of DHW:

0%

Marginal performance ratio DHW:

0%

Electricity:

RE gas / Natural gas:

Energy carrier for DHW:

PER factors	1.30	1.5	kWh/kWh
PE factors	1.75	1.1	kWh/kWh
			kWh/kWh

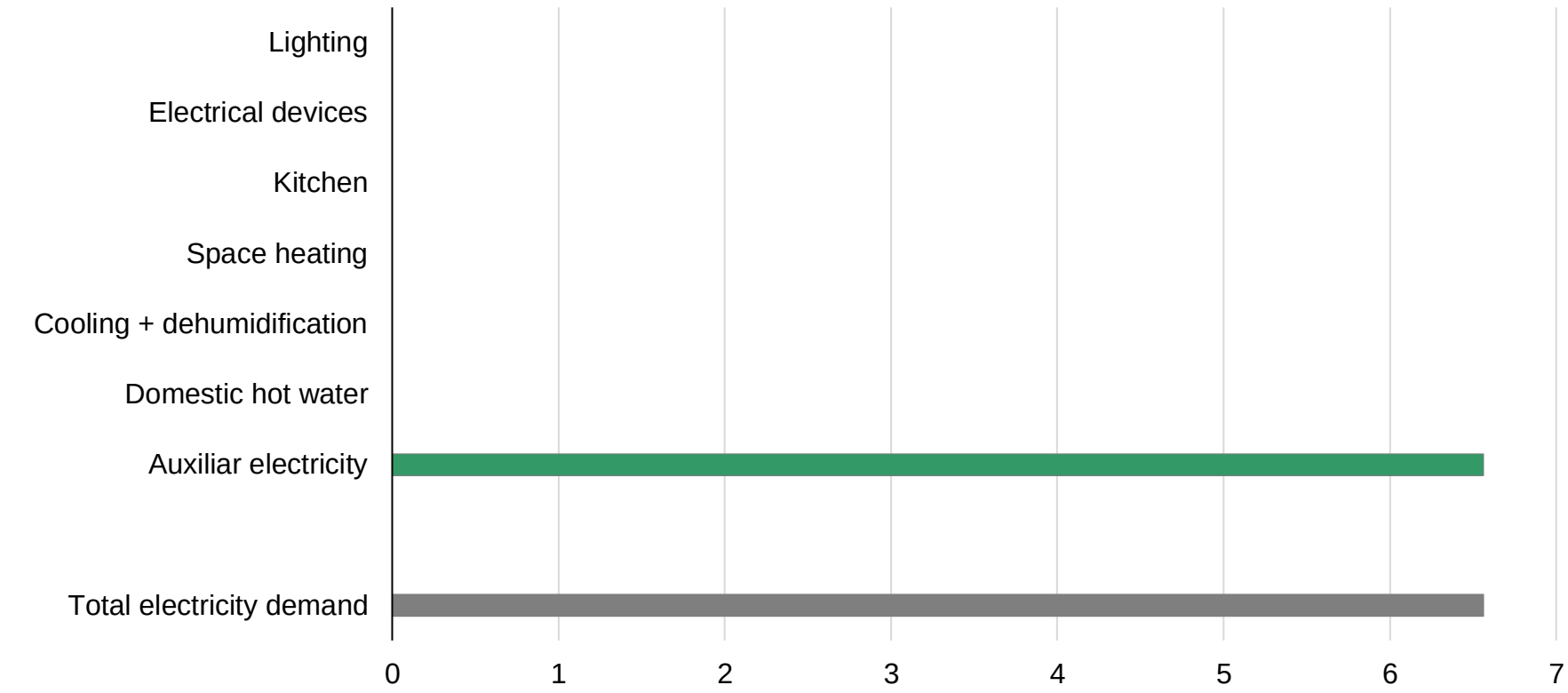
Lighting			Façade with windows					Geometry: input of a typical room																			
	Net floor area	Utilisation profile	Window existing?	Deviation from North	Orientation	Factor	Light transmission glazing	Room depth	Room width	Room height	Lintel height (top of window)	Window width	Daylight utilisation	Nominal illuminance	Installed lighting power			Lighting control	Motion detector used?	Utilisation hours per year	User-defined: full load hours of lighting	Full load hours of lighting		Electricity demand	Specific electricity demand (per m² room area)	PER demand	PE demand
Room / Zone	m²		[x]	Degrees			-	m	m	m	m	m		Lux	W/m²	W/m²	W/(m²*100lux)		[x]	h/a	h/a	h/a	h/d	kWh/a	kWh/(m²a)	kWh/a	kWh/a
							69%						None					1-Manual									
							69%						None					1-Manual									
							69%						None					1-Manual									
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							69%						None					1-Manual									

[illegible]

PHPP, Electricity non-res

	0	kWh/(m²a)	0	0	kWh/(m²a)
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Electricity demand in kWh/a



Block C Cranwood House 1208 m² treated floor area, United Kingdom/ Britain PHPP  Passive House with PHPP Version 10.4a EN

Aux Electricity

Heating period	212	d/a	Runtime vent. syst in winter	4.83	kh/a	Treated floor area	1208	m²	
Cooling period	144	d/a	Runtime vent. syst in summer	3.93	kh/a	Boiler design output	15	kW	
Dwelling units	18		Heat recovery efficiency ventilation	0.00		DHW system heat demand	16307	kWh/a	
Reference volume for the vent. system	3020	m³	Air change rate	0.04	h ⁻¹	Design flow temperature	55	°C	
								PE factor for electricity	1.50

Application	Used?	Consider for IHG?	Final energy demand								Internal heat gains (IHG)				PER		PE
			Norm demand or power	Utilisation factor	Period of operatio kh/a	Reference value	Electricity demand	Availability	Utilisation period	Winter	Summer	PER factor	PER demand	PE demand			
Column no.	1	2	3	4	5	6	7	8	9	10	11	12	13	14			
Heating, ventilation winter																	
Ventilation system																	
Ventilation in winter	1		0.00	Wh/m³	0.04	h ⁻¹	4.83	3020	m³	0	IHG included in heat recovery efficiency				1.65	0	0
Defroster HX	1	1	From worksheet 'Ventilation/Addl. Vent'							7	1.0	5.08	1	1.65	11	10	
Heating system																	
Circulation pump heating		1	178	W	1.00		5.08		0	1.0	5.08	0	1.65	0	0		
Regulated?				W user-defined pump nominal power							1.0	5.08	0	1.65	0	0	
Aux. energy - Heat. boiler	0	0	55	W	1.00		0.00		0	0.0	5.08	0	1.65	0	0		
				W user-defined el. power at 30% load													
Aux. energy - wood-burning/pellet boiler		0	0	from 'Boiler' worksheet, incl. aux. energy for DHW						0	0.0	5.08	0	1.65	0	0	
Fan coils		1		W	0.25		5.08		0	1.0	5.08	0	1.65	0	0		
				kWh/a						0	0.0	5.08	0	1.65	0	0	
				kWh/a						0	0.0	5.08	0	1.65	0	0	
				kWh/a						0	0.0	5.08	0	1.65	0	0	
				kWh/a						0	0.0	5.08	0	1.65	0	0	
				kWh/a						0	0.0	5.08	0	1.65	0	0	
				kWh/a						0	0.0	5.08	0	1.65	0	0	
Total aux. electricity heating, ventilation winter									7				1	11		10	

Cooling, ventilation in summer				Final energy demand							Internal heat gains (IHG)				PER		PE
Ventilation system																	
Ventilation in summer	1		0.00	Wh/m³	0.04	h ⁻¹	3.93	3020	m³	0	IHG included in recovery efficiency for cooling				1.00	0	0
Additional vent. summer	0		0.00	Wh/m³	0.00	h ⁻¹	3.93	3020	m³	0	IHG included in the worksheets 'Summer' + 'Cooling'				1.00	0	0
Cooling system																	
Circulation pump cooling		1		W	0.0		3.5			0	1.0	3.5		0	1.00	0	0
Fan coils (recirculation cooling)		1		W	0.0		3.5			0	1.0	3.5		0	1.00	0	0
Cooling server rooms		0		kWh/a						0					1.00	0	0
				kWh/a						0	0.0	3.93		0	1.00	0	0
				kWh/a						0	0.0	3.93		0	1.00	0	0
				kWh/a						0	0.0	3.93		0	1.00	0	0
				kWh/a						0	0.0	3.93		0	1.00	0	0
				kWh/a						0	0.0	3.93		0	1.00	0	0
Total aux. electricity cooling, ventilation summer										0					0	0	0

Dehumidification				Final energy demand				Internal heat gains				PER		PE
					kWh/a		0	0.0	3.93		0	1.15	0	0
					kWh/a		0	0.0	3.93		0	1.15	0	0
					kWh/a		0	0.0	3.93		0	1.15	0	0
Total aux. electricity dehumidification							0				0		0	0

DHW system				Final energy demand				Internal heat gains				PER		PE	
Circulation pump DHW	0	0	40	W	8.76	kh/a	0	0.0	8.76	0	0	1.30	0	0	
				W user-defined nominal power of the pump											
Storage load pump DHW		0	137	W	1.10	kh/a	0	0.0	8.76	0	0	1.30	0	0	
				W user-defined nominal power of the pump											
DHW boiler aux. energy	0	0	165	W	0.00	kh/a	0	0.0	8.76	0	0	1.30	0	0	
				W user-defined nominal power of the pump											
Solar aux. electricity		0	109	W	1.75	kh/a	0	0.0	8.76	0	0	1.30	0	0	
				W user-defined nominal power of the pump											
Total aux. electricity DHW+Solar							0			0	0			0	0

Other				Final energy demand				Internal heat gains				PER		PE
Inverter	0		0	W in winter	0	W in summer		0.0		0	0			
Elevator				kWh/a			0	0.0	8.76	0	0	1.30	0	0
				kWh/a			0	0.0	8.76	0	0	1.30	0	0
				kWh/a			0	0.0	8.76	0	0	1.30	0	0
				kWh/a			0	0.0	8.76	0	0	1.30	0	0
				kWh/a			0	0.0	8.76	0	0	1.30	0	0
				kWh/a			0	0.0	8.76	0	0	1.30	0	0
Total aux. electricity other							0			0	0		0	0

Total internal heat gains										Winter	Summer		
										1	0	W	
										0.0	0.0	W/m²	

Total auxiliary electricity					Final energy		PER					PE	
					7	kWh/a						11	10
					0.01	kWh/(m² _{TFA} a)						0.0	0.0

Internal heat gains for residential buildings (IHG)

Passive House with PHPP Version 10.4a EN



Block C Cranwood House / Climate: Northolt / TFA: 1208 m² / Heating: 14.5 kWh/(m²a) / Overheating: 6 % / PER: 23.5 kWh/(m²a)

Number of occupants 32.0 P
Treated floor area 1208 m²

Building use: 10-Residential building: Residential
Values used for IHG: 2-Standard
[Link to drop-down list](#)

IHG winter
IHG summer
No input necessary
Used for energy balance: 2.85 2.85 W/m²

Application	Number / number of occupants		Consider for IHG?	Norm consumption		Utilisation factor	Frequency		Useful energy (kWh/a)		Included in electricity balance?		Availability		Utilisation period [kh/a]		IHG winter [W]	IHG summer [W]
Persons	32	P	1	80.0	W/P	1.00	8.76	kh/a	22443	*			0.55	/	8.76	=	1409	1409
Evaporation	32	P	1	-25.0	W/P	1.00	8.76	kh/a	-7013	*			1.00	/	8.76	=	-801	-801
Refrigerator	0		1	0.3	kWh/d	1.00	365	d/a	0	*			1.00	/	8.76	=	0	0
Freezer	0		1	0.6	kWh/d	1.00	365	d/a	0	*			1.00	/	8.76	=	0	0
Refrigerator-freezer combination	1		1	0.6	kWh/d	1.00	365	d/a	4008	*			1.00	/	8.76	=	458	458
Cooking	1		1	0.3	kWh/Use	1.00	500	/(P*a)	4003	*			0.50	/	8.76	=	228	228
Dishwashing	1		1	1.0	kWh/Use	1.00	65	/(P*a)	2029	*			0.30	/	8.76	=	69	69
Clothes washing	1		1	0.9	kWh/Use	1.00	57	/(P*a)	1556	*			0.30	/	8.76	=	53	53
Drying with Condensation dryer	1		1	2.3	kWh/Use	0.75	57	/(P*a)	3148	*			0.70	/	8.76	=	252	252
Gas demand (for gas dryers)			1	0.0	kWh/Use				0	*			0.80	/	8.76	=	0	0
Energy demand from evaporation																=	0	0
Lighting inside of dwelling unit	1		1	12.0	W	4.20	1.2	kh/(P*a)	1937	*			1.00	/	8.76	=	221	221
Lighting outside of dwelling unit	0		1						0	*			1.00	/	8.76	=	0	0
Other devices (see 'Electricity' worksheet)	1		1.0						7460	*			1	/	8.76	=	852	852
Auxiliary appliances (cf. 'Aux electricity' worksheet)																=	1	0
																=		
																=		
DHW - circulation	0		0														0	0
DHW - individual pipes	1		1														0	0

DHW storage tank	0	P	0	0.0	0.0	W	=	0	0		
Cold water	32		1	-16.3	-18.9	W/P	=	-523	-606		
Internal heat gains (IHG)								2220	2136	W	
								1.84	1.77	W/m²	

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

Passive House with PHPP Version 10.4a EN



Block C Cranwood House / Climate: Northolt / TFA: 1208 m² / Heating: 14.5 kWh/(m²a) / Overheating: 6 % / PER: 23.5 kWh/(m²a)

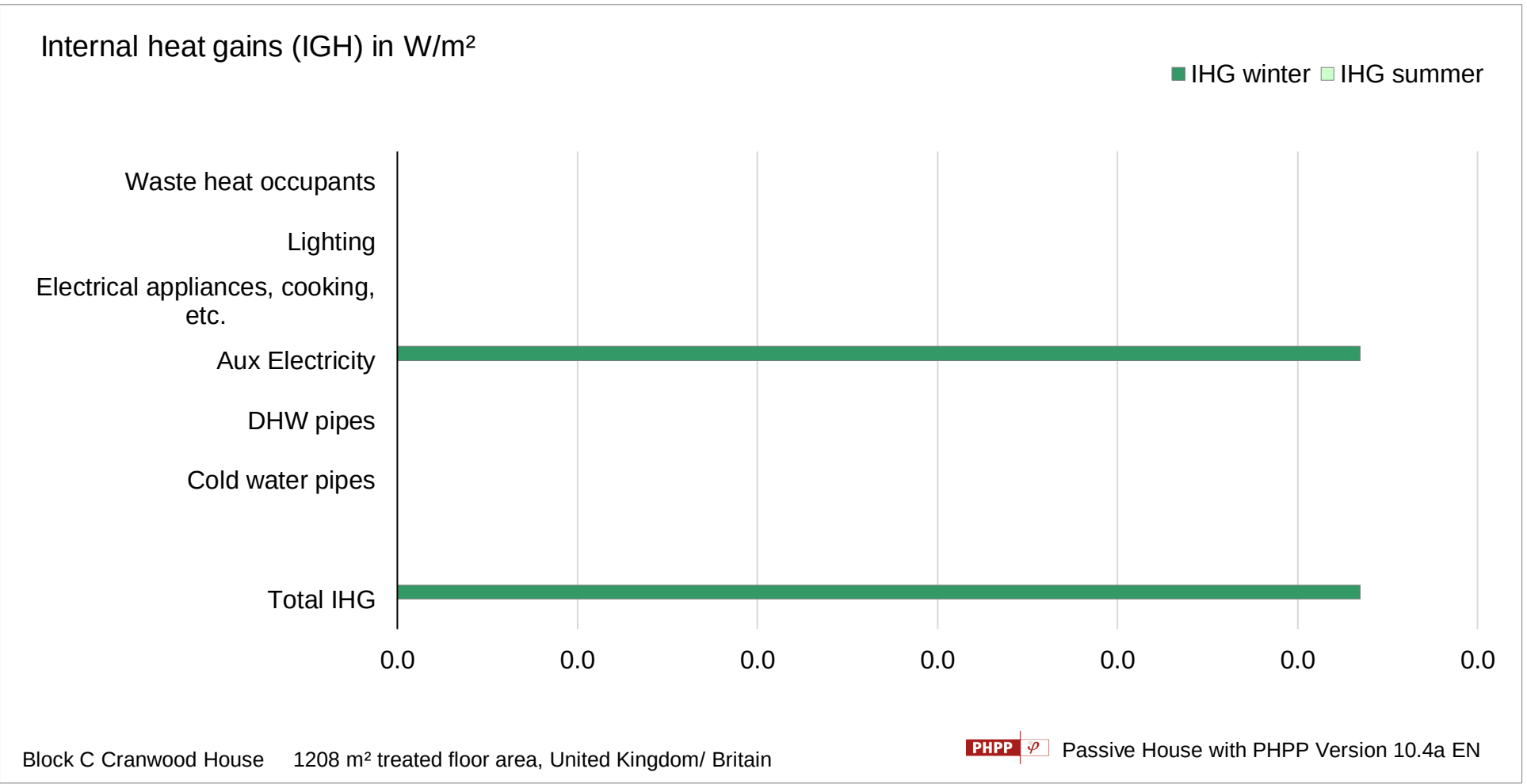
Building use: 10-Residential building: Residential
Values used for IHG: 2-Standard
[Link to drop-down list](#)

Number of occupants: 32.0 P
Treated floor area: 1207.87 m²
Room temperature: 20 °C

IHG winter
IHG summer
No input necessary
Applied in energy balance: 2.85 2.85 W/m²

Persons	Selection of utilisation profile	Activity of persons	Planning	Number of occupants	Ground area of useful zone [m²]	Average occupancy [Pers./m²]	Heat emitted per person [W]	Utilisation hours per year [h/a]	Relative presence	Used in period [h/a]	IHG winter [W]	IHG summer [W]
Persons in				{ }*	or { }	*	*	0	* 0.00 /	8760 =		
Persons in				{ }*	or { }	*	*	0	* 0.00 /	8760 =		
Persons in				{ }*	or { }	*	*	0	* 0.00 /	8760 =		
Persons in				{ }*	or { }	*	*	0	* 0.00 /	8760 =		
Persons in				{ }*	or { }	*	*	0	* 0.00 /	8760 =		
Persons in				{ }*	or { }	*	*	0	* 0.00 /	8760 =		
Persons in				{ }*	or { }	*	*	0	* 0.00 /	8760 =		
Persons in				{ }*	or { }	*	*	0	* 0.00 /	8760 =		
Evaporation (person specific)				0 *			-15 *	0 *	0.00 /	8760 =	0	0
User applications and aux electricity						Contribution for IHG	Useful energy [kWh/a]		Availability	used in period [h/a]	IHG Winter [W]	IHG Summer [W]
Lighting						1.0	0		* 1 /	8.76 =	0	0
Electrical devices						0.0	0		* 1 /	8.76 =	0	0
Cooking						0.0	0		* 0.5 /	8.76 =	0	0
Washing up						0.0	0		* 0.3 /	8.76 =	0	0
Kitchen other						0.0	0		* 1 /	8.76 =	0	0
Auxiliary appliances (see 'Aux Electricity' worksheet)											1	0
Water pipes		Power winter or summer				Contribution for IHG	Useful energy winter or summer		Usage period winter or summer		IHG Winter [W]	IHG Summer [W]
DHW - circulation						0	0 or 0		4.83 or 3.93		0	0
DHW - individual pipes						0	0 or 0		4.83 or 3.93		0	0
DHW storage tank winter		0.0 0.0				0					0	0
	On/off	Predominant utilisation	Cold water temperature [K]	No. of WCs (user-defined)	School?	applied						
Cold water pipe and WC flushing		62-Group office	10.3 or 13.8			0	0 or 0		4.83 or 3.93		0	0
Internal heat gains (IHG)												1 0 W
												0.0 0.0 W/m²

Heat emitted by people (sensible heat) with different activities [W/P]	
Sitting, <= 10 years	60
Sitting, > 10 years	80
Standing, light activity, > 10 years	100



Selection of the heat generation system

-

-

-

-

Additionally:

Solar thermal

Contribution (useful energy)

Heating

DHW

0.0

0.0

kWh/(m²a)

Building type:

5-Multi-family house I Apartment build

Treated floor area A_{TFA}:

1208

m²

Projected building footprint A_{Projected}:

0

m²

Heating demand incl. distribution & hydr. frost protection

14.5

kWh/(m²a)

Cooling energy demand incl. dehumidification

kWh/(m²a)

DHW demand including distribution:

13.5

kWh/(m²a)

Biomass contingent (PER):

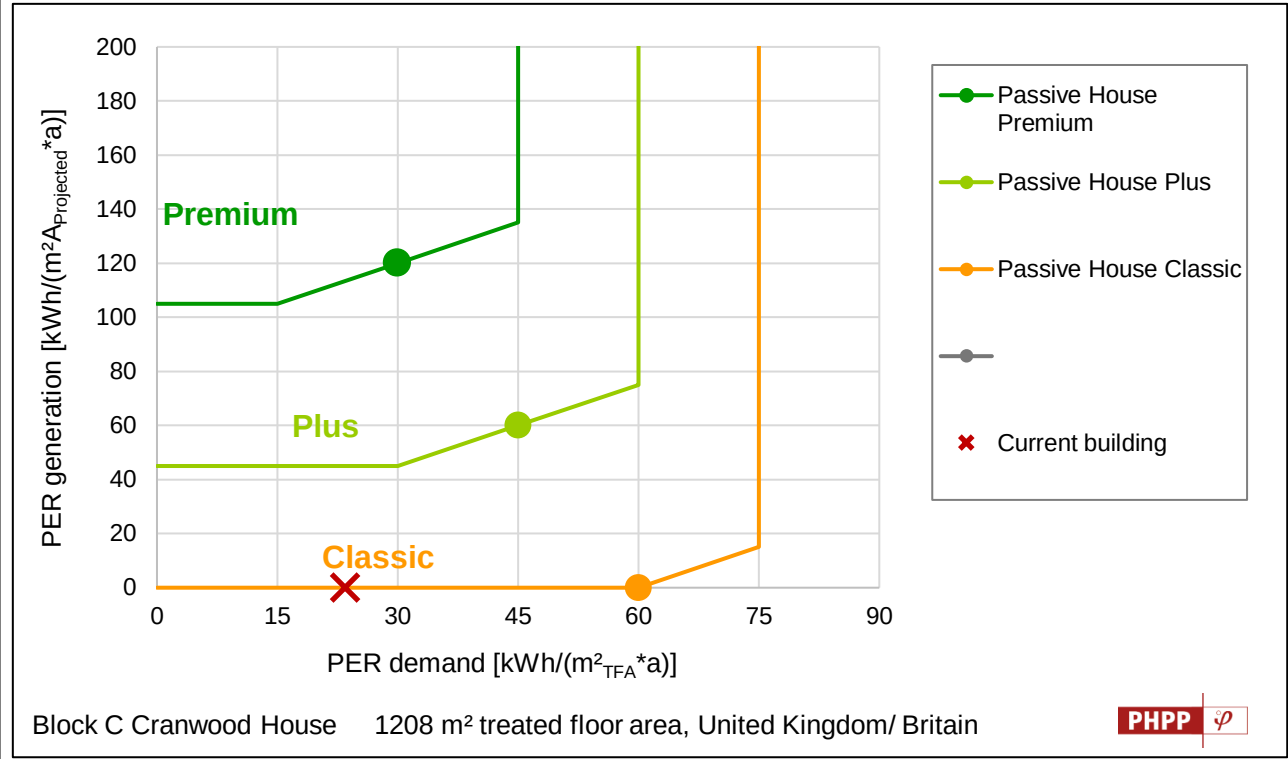
20

kWh/(m²a)

Energy demand referred to treated floor area	Efficiency Calcula- tion -	User defined -	Useful energy Covered fraction	Final energy demand kWh/(m²a)	PER factor kWh/kWh	PER PER demand kWh/(m²a)	PE factor kWh/kWh	PE PE demand kWh/(m²a)	Emission factor (CO ₂ -eq) kg/kWh	CO ₂ CO ₂ eq emissions kg/a	
							1-PE factors (non-renewable) PHI Certification		1-CO2 factors GEMIS (Germany)		
Heating			0%								
Electricity (HP compact unit)					1.65		1.50		0.363		
Electricity (heat pump)					1.65		1.50		0.363		
Other (heating)					1.65		1.50		0.363		
Boiler					0.00						
District heating					0.91		0.30		0.000		
Solar thermal system											
Aux. electricity (heating, wintertime ventilation)					1.65		1.50		0.363		
Total heating						0.0		0.0		0	
Cooling and dehumidification					PER		PE		CO ₂		
Electricity cooling (HP)					1.00		1.50		0.363		
Electricity dehumidification (HP)					1.15		1.50		0.363		
Auxiliary electricity cooling, ventilation summer					1.00		1.50		0.363		
Auxiliary electricity (dehumidification)					1.15		1.50		0.363		
Total cooling and dehumidification						0.00		0.00		0.00	
DHW generation			0%		PER		PE		CO ₂		
Electricity (HP compact unit)					1.30		1.50		0.363		
Electricity (heat pump)					1.30		1.50		0.363		
Electricity (direct)					1.30		1.50		0.363		
Boiler					0.00						
District heating					0.86		0.30		0.000		
Solar thermal system											
Aux. electricity (DHW + solar DHW)					1.30		1.50		0.363		
Total DHW						0.0		0.0		0	
Household electricity + Auxiliary electricity (other)					PER		PE		CO ₂		
Household electricity (lighting, electrical devices, etc.)				20.0	1.30	26.0	1.50	30.0	0.363	8763	
Auxiliary electricity (other)					1.30		1.50		0.363		
Total household electricity and auxiliary electricity						26.0		30.0		8763	
Additional gas demand					PER		PE		CO ₂		
Drying/Cooking				0.0	1.75	0.0	0.00	0.0	0.000		
Total additional gas demand						0.00		0.00		0	
Total PER demand without bioenergy budget						26.0					
Bioenergy utilisation						-2.5	The bioenergy budget will be used with 4.2 kWh/(m²a).				
Total energy demand kWh/(m² _{TFA} a)					PER:	23.5	PE:	30.0	CO ₂ :	8763	kg/a

Energy generation referred to projected building footprint	Final energy		PER		PE		CO ₂		
	Final energy generation kWh/a	Final energy generation kWh/(m²A _{Projected} *a)	PER factor kWh/kWh	PER generation kWh/(m²A _{Projected} a)	PE factor kWh/kWh	PE generation kWh/(m²A _{Projected} a)	Emission factor (CO ₂ -eq) kg/kWh	Emissions generated kg/a	Emissions saved kg/a
PV electricity	0	0.0	1.00	0.0	0.00	0.0	0 0.363	0	0
Solar thermal system	0	0.0	-	0.0	0.00	0.0			
		0.0							
Total energy production kWh/(m² _{Projected building footprint} a)			PER:	0.00	PE:	0.00	CO ₂ :	0	0

Verification Passive House/EnerPHit standard



Classes in subdivisions:				PHI Criteria Low Energy Building	Criteria Passive House :			Achieved class
Current value:					Classic	Plus	Premium	
Heating demand referred to TFA	14 kWh/(m²a)	≤		30		15		Premium
Heating load referred to TFA	12 W/m²	≤		-		10		
Cooling and dehumidification demand referred to TFA	- kWh/(m²a)	≤		-		-		-
Airtightness n ₅₀	0.6 1/h	≤		1		0.6		Premium
PER demand referred to TFA	24 kWh/(m²a)	≤		75	60	45	30	Classic
PER generation referred to projected building footprint	0 kWh/(m²a)	≥		-	0	60	120	
PE demand (non-renewable primary energy)	30 kWh/(m²a)	≤		85		85		Classic
Energy standard of the whole building								With the selected verification method PER (renewable) the following class can be reached: Classic

Standard criteria

Summary	Final energy	PER (renewable primary energy)	PE (non-renewable primary energy)	CO2eq emissions	CO2eq substitution
Different final energy sources are added up here. Though this is not scientifically correct, it is required by other single verifications.			1-PE factors (non-renewable) PHI Certification	1-CO2 factors GEMIS (Germany)	1-CO2 factors GEMIS (Germany)
	MWh/a	MWh/a	MWh/a	kg/a	kg/a
Demand	24.1	28.4	36.23	8763	8763
Generation	0.0	0.0	0.00	0	0
Cumulated demand and generation (annual balance)	24.14	28.39	36.23	8763	8763
Demand without occupant electricity consumption	0.00	-3.00	0.00	-10575566	-10575566
Demand without occupant electricity consumption, accumulated generation	0.00	-3.00	0.00	-10575566	-10575566

Passive House compact unit with exhaust air heat pump

Passive House with PHPP Version 10.4a EN

Block C Cranwood House / Climate: Northolt / TFA: 1208 m² / Heating: 14.5 kWh/(m²a) / Overheating: 6 % / PER: 23.5 kWh/(m²a)



Calculation based on measured values of laboratory evaluation for component certification

	Building type:	5-Multi-family house I Apartment building	
	Treated floor area A _{TFA} :	1208	m²
Covered fraction of space heating demand	(‘PER’ worksheet)	0%	
Space heating demand + distribution losses	Q _H +Q _{HL} : (DHW+Distribution)	17487	kWh/a
Solar contribution for space heating	η _{Solar, H} (‘SolarDHW’ worksheet)	0%	
Effective annual heating demand	Q _{H,Wi} =Q _H *(1-η _{Solar, H})	0	kWh/a
Covered fraction of DHW demand	(‘PER’ worksheet)	0%	
Total heating demand of DHW system	Q _{gDHW} (DHW+Distribution)	16307	kWh/a
Solar contribution for DHW generation	η _{Solar, DHW} (‘SolarDHW’ worksheet)	0%	
Effective DHW demand	Q _{DHW,Wi} =Q _{DHW} *(1-η _{Solar, DHW})	0	kWh/a
1-Sort as list			
Compact unit selection:			
Number of (similar) compact devices for e.g. MFH (default = 1)			
Measured values from laboratory test			
Ventilation			
Effective heat recovery efficiency	η _{eff} (Test value)		
Electric efficiency	(Test value)	Wh/m³	
Heating			
Ambient air temperature	T _{amb}	Test point 1	Test point 2
Measured thermal power heat pump heating	P _{HP,Heating}	Test point 3	Test point 4
Measured COP heating	COP _{Heating}		
Domestic hot water			
Outdoor air temperature	T _{amb}	Test point 1	Test point 2
Measured thermal power DHW storage heating-up	P _{DHW,Heating-Up}	Test point 3	Test point 4
Measured thermal power DHW storage reload	P _{DHW,Reload}		
Measured COP DHW storage heating-up	COP _{DHW,Heating-Up}		
Measured COP DHW storage reload	COP _{DHW,Reload}		
Standby (inputs required only if different from storage reload)		Test point 1	Test point 2
Outdoor air temperature	T _{amb}	Test point 3	Test point 4
Measured thermal power heat pump standby	P _{HP,Standby}		
Measured COP standby	COP _{Standby}		
		0%	
Specific heat loss storage incl. connections	U * A _{Storage} (Test value)	W/K	
Average storage temperature in standby mode	T _{DHW,Standby} (Test value)	°C	
Heat pump priority	Separate heat pumps	DHW priority	Heating priority
	Room temperature (°C)	20	
	Avg. ambient temp. htg. period (°C)	8	
	Avg. ground temp (°C)	12	
Efficiency SHX exhaust air mixing	η*SHX		
Heat recovery efficiency SHX exhaust air mixing (if applicable)	η _{SHX,add} (Design Value)	0%	
Volume flow rate of added exhaust air (if applicable)	V _{add} (Test value)		m³/h
Hydraulic frost protection			
Heat supplied by direct electricity	Q _{E,dir}		kWh/a
Space heat supplied by HP	Q _{HP,Heating}		kWh/a
Winter DHW supplied by HP	Q _{HP,DHW,Winter}	0	kWh/a
Winter standby heat supplied by HP	Q _{HP,Standby,Winter}		kWh/a
Summer DHW supplied by HP	Q _{HP,DHW,Summer}	0	kWh/a
Summer standby heat supplied by HP	Q _{HP,Standby,Summer}		kWh/a
		Electricity demand	COP
			1.00

Performance ratio of heat generator, DHW & space heating

Seasonal performance factor

SPF_{H-3}

kWh/a

kWh/(m²a)

Final energy demand heat generation

Q_{final}

Annual PER demand (renewable primary energy)

Annual PE demand (non-renewable primary energy)

kg/a

kg/(m²a)

Annual CO₂-equivalent emissions

Heat pump



Block C Cranwood House / Climate: Northolt / TFA: 1208 m² / Heating: 14.5 kWh/(m²a) / Overheating: 6 % / PER: 23.5 kWh/(m²a)

		Building type:	5-Multi-family house I Apartment building	
Heating demand to be covered	Treated floor area A _{TFA} :	1208	m²	
		(‘PER’ worksheet)	0%	
	Q _H +Q _{H,L} : (DHW+Distribution)	17487	kWh/a	
	η _{Solar, H} (‘SolarDHW’ worksheet)	0%		
	Effective annual heating demand	Q _{H,WI} =Q _H *(1-η _{Solar, H})	0	kWh/a
		(‘PER’ worksheet)	0%	
	Total heating demand of the DHW system (without storage losses)	Q _{gDHW} (DHW+Distribution)	16307	kWh/a
	Solar fraction for DHW	η _{Solar, DHW} (‘SolarDHW’ worksheet)	0%	
	Effective DHW demand	Q _{DHW,WI} =Q _{DHW} *(1-η _{Solar, DHW})	0	kWh/a
	Nominal power of distribution system	P _{nom}	0.00	kW

Space heating

Water-based heating with HP (according to EN 14825 / EN 14511, heating HP)				
Selection of the heat pump:		96ud-Standard air/water heat pump	Go to list of HPs according to EN 14825 / EN 14511	
		1-Sort as list		
Heat source		1-Outdoor air		
Selection of heat delivery		2-Radiators		
Design distribution temperature	θ _{design} (DHW+Distribution)	55		
Heat pump control strategy		2-Acc. to ambient temperature		
Heat storage tank (buffer storage tank 'DHW+Distribution' worksheet)		0-No		
Location of buffer storage		1-Inside		
Temperature in installation room of storage tank (inside thermal envelope)	(DHW+Distribution)		°C	
Specific heat losses storage	U * A _{Storage}		W/K	
Sink temperature of heat pump for heating			°C	
Detailed information (to be filled in by experts only)				
Nominal power of distribution system	P _{nom}		kW	
Radiator exponent	n			
Ground: no input necessary here				
Depth ground water / Ground collector / Ground probe	z	20.0	m	
Power of pump for ground heat exchanger	P _{pump}	0.05	kW	
Air to air HP (according to EN 14825 / EN 14511)				
Number of units	1			
Unit selection		Go to list of HPs according to EN 14825 / EN 14511		
		1-Sort as list		
Heat source				
Heating system				
Heat pump control strategy				
Silent mode				
Supplementary heating available		x		
Combined ventilation unit with HP or split unit				
Number of units	1			
Unit selection		Go to list of combined ventilation/split units		
		1-Sort as list		
Heat pump with ventilation function				

DHW generation

Type of backup heater	1-Elec. immersion heater	
Δθ of electric continuous flow water heater		K
With HP for heating (see above for details)		
Same sink temperature for heating and DHW	0-No	
Heat pump priority	(Manufacturer, tech. data)	1-DHW priority
Separate HP for DHW		
Unit selection		Go to list of HPs according to EN 14825 / EN 14511
		1-Sort as list
Heat source		
DHW temperature	(DHW+Distribution)	°C
Location of DHW storage tank ('storage 1' in 'DHW+Distribution' worksheet)		1-Inside
Specific heat losses storage	U * A _{Storage}	0.0
Temperature in the installation room of storage tank (inside thermal envelope)	(DHW+Distribution)	°C
No input necessary here		
Depth ground water / Ground collector / Ground probe	z	
Power of pump for ground heat exchanger	P _{pump}	

Results				
Electrical energy consumption pump (ground water / brine)	Q _{EI,pump}	0	kWh/a	
Electricity demand for heat supply direct electric	Q _{EI,dir}	0	kWh/a	
Electrical consumption of HP	Q _{EI,HP}		kWh/a	
		without storage losses	with storage losses	
Space heat supplied by HP	Q _{HP,Heating}	0	0	kWh/a
Winter DHW supplied by HP	Q _{HP,DHW,Winter}	0	0	kWh/a
Summer DHW supplied by HP	Q _{HP,DHW,Summer}	0	0	kWh/a
		1st HP: Heating	2nd HP: DHW	
Seasonal performance factor of heat pump	SPF _{H-1}			
Seasonal performance factor system	SPF _{H-3}			
Performance ratio of heat generator, space heating				
Final electrical energy demand heat generation	Q _{final}		kWh/a	
				kWh/(m²a)
Annual PER demand (renewable primary energy)			kWh/a	
Annual PE demand (non-renewable primary energy)			kWh/a	kWh/(m²a)
Annual CO ₂ -equivalent emissions			kg/a	kg/(m²a)

HP for heating

Not active

Selection: Standard air/water heat pump

Source: 1-Outdoor air

Sink: 2-Water

	θ_{source} °C	θ_{sink} °C	Heating capacity kW	COP
Test point 1	-7.0	35.0	0.7	2.7
Test point 2	2.0	35.0	0.9	3.1
Test point 3	10.0	35.0	1.0	4.0
Test point 4	15.0	35.0	1.3	4.3
Test point 5	-7.0	50.0	0.7	2.0
Test point 6	2.0	50.0	0.8	2.3
Test point 7	7.0	50.0	1.0	2.8
Test point 8	15.0	50.0	1.2	3.3

Max. heating capacity

-20.0

35.0

Max. heating capacity

-20.0

55.0

Max. heating capacity

-10.0

35.0

Max. heating capacity

-10.0

55.0

Temperature difference in sink $\Delta\theta$

5.0

Cycle limit [-]

Part load coefficient Cc [-]

Surface sump heater [W]

Standby Power [W]

Air to air Heat pump

Not active

Select

Source: 1-Outdoor air

Sink: 1-Indoor air

	θ_{source} °C	θ_{sink} °C	Heating capacity kW	COP
Test point 1				
Test point 2				
Test point 3				
Test point 4				
Test point 5				
Test point 6				
Test point 7				
Test point 8				

Ventilation system with heat pump

Not active

Select

Source: 1-Outdoor air

Sink: 1-Room air

	θ_{source} °C	θ_{sink} °C	Heating capacity kW	COP
Test point 1- maximum				
Test point 1- ON/OFF limit				
Test point 2- Maximum				
Test point 2- ON/OFF limit				
Test point 3- Maximum				
Test point 3- ON/OFF limit				
Test point 4- Maximum				
Test point 4- ON/OFF limit				
Test point 5- Maximum				
Test point 5- ON/OFF limit				

Hot drinking water production - Heat pump

Not active

Selection: Standard air/water heat pump

Source: 1-Outdoor air

Sink: 2-Water

	θ_{source} °C	θ_{sink} °C	Heating capacity kW	COP
Test point 1	-7.0	35.0	0.7	2.7
Test point 2	2.0	35.0	0.9	3.1
Test point 3	10.0	35.0	1.0	4.0
Test point 4	15.0	35.0	1.3	4.3
Test point 5	-7.0	50.0	0.7	2.0
Test point 6	2.0	50.0	0.8	2.3
Test point 7	7.0	50.0	1.0	2.8
Test point 8	15.0	50.0	1.2	3.3

Max. heating capacity

-20

35

Max. heating capacity

-20

55

Max. heating capacity

-10

35

Max. heating capacity

-10

55

Temperature difference in sink $\Delta\theta$

5.0

Heat pump ground (ground collectors / ground probes)

Block C Cranwood House / Climate: Northolt / TFA: 1208 m² / Heating: 14.5 kWh/(m²a) / Overheating: 6 % / PER: 23.5 kWh/(m²a)

Building type: 5-Multi-family house I Apartment building

Treated floor area A_{TFA}:

1208

m²

Ground probes

Probe field configuration

Length of probe

Probes spacing/distance

Depth (z=H/2)

Type of probe

Borehole radius

Inner radius of pipe

Exterior pipe radius

Distance between pipes

Interior radius of pipe casing (only coaxial)

Exterior radius pipe casing (only coaxial)

Thermal conductivity of pipe

Thermal conductivity of back fill

Probe time constant

Internal borehole resistance

Borehole resistance

A

Individual probe

H

0

m

B

10

m

z

0

m

A

Double-U

r_b

0.090

m

r_i

0.013

m

r_a

0.016

m

B_U

0.070

m

r_{i2}

0.050

m

r_{a2}

0.052

m

λ_R

0.42

W/(mK)

λ_F

2.00

W/(mK)

t_p

0

d

R_a

Km/W

R_b

Km/W

Ground

Soil type

Density of the ground

Heat capacity of ground

Thermal conductivity of ground

Soil temperature conductivity

Ground temperature gradient

J

Other soil type

ρ_E

2000

kg/m³

c_{pE}

1000

J/(kgK)

λ_E

2.0

W/(mK)

α_E

0.000001

m²/s

Δ_{TG}

0.022

K/m

Brine

Brine (characteristics at 2 °C)

Density of the brine

dynamic viscosity of the brine

Heat capacity brine

Thermal conductivity of brine

Brine - mass flow

E

Brine

ρ_S

1036

kg/m³

η_S

0.0052

kg/(ms)

c_{pS}

3815

J/(kgK)

λ_S

0.4405

W/(mK)

m_S

0.6

kg/s

Operation type

Waste heat from active cooling to ground probe? Please check if appropriate.

Heat pump operation duration

Specific heat extraction rate as an annual average

x

h/a

q_{ex}

W/m

H/R_b

W/K

Ground collectors

Inner radius of pipe

Exterior pipe radius

Thermal conductivity of pipe

Pipe depth

Ground water depth

Pipe spacing

Base area

Pipe outer surface

Pipe length

r_i

0.013

m

r_a

0.016

m

λ_r

0.420

W/(mK)

z_{pipe}

m

z_{gw}

m

D

0.4

m

80

m²

20.1

m²

L

200.0

m

Brine

Brine (characteristics at 2 °C)

Density of brine

Dynamic viscosity of brine

Heat capacity of brine

Thermal conductivity of brine

Brine mass flow

Specific heat extraction rate

E

Brine

ρ_S

1036

kg/m³

η_S

0.0052

kg/(ms)

c_{pS}

3815

J/(kgK)

λ_S

0.4405

W/(mK)

m_S

0.5

kg/s

q_{ex}

W/m²

U * A

2361

W/K

Climate

Period duration

Average ground surface temp.

Surface temperature amplitude

Phase shift surface

T_{m0}

T₁

t₀₂

365

11.9

6.7

37

d

°C

°C

d

Ground characteristics							
		Thermal conductivity	Density	Heat capacity	Heat capacity	Thermal conductivity	Source
		[W/(mK)]	[kg/m³]	[J/(kgK)]	[MJ/(m³K)]	[10 ⁻⁷ m²/s]	
A	Sand, 9% moisture	0.980	1440	1507	2.170	4.520	[Neiß 1977]
B	Sand, 13% moisture	1.500	1600	1800	2.880	5.210	[Neiß 1977]
C	Ground, coarse gravel	0.520	2000	1840	3.680	1.410	[VDI 1984]
D	Loam, 36% moisture	2.300	1650	2847	4.700	4.900	[Neiß 1977]
E	Clay	1.280	1500	880	1.320	9.700	[VDI 1984]
F	Clay / Silt	2.200	2550	882	2.250	9.780	[VDI 2000]
G	Slate	2.100	2700	870	2.350	8.940	[VDI 2000]
H	Silt	1.500	1920	2938	5.640	2.660	[ISO 13370]
I	Rock	3.500	2500	2500	6.250	5.600	[ISO 13370]
J	Other soil type	2.000	2000	1000	2.000		

Properties of the brine						
		Temperature	Density	Heat capacity	Thermal conductivity	Dynamic viscosity
		[°C]	[kg/m³]	[J/(kg K)]	[W/(mK)]	[kg/(ms)]
A	Ethylene glycol 25%	2	1052	3950	0.480	0.0052
B	Potassium carbonate	2	1265	2941	0.544	0.0031
C	Potassium formate	2	1226	3190	0.534	0.00237
D	Water	2	997	4190	0.590	0.001307
E	Brine	2	1036	3815	0.441	0.005

Result ground probe calculation	
Month	Borehole temperature °C
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	

Boiler (gas, oil and wood)

Block C Cranwood House / Climate: Northolt / TFA: 1208 m² / Heating: 14.5 kWh/(m²a) / Overheating: 6 % / PER: 23.5 kWh/(m²a)

	Building type:	5-Multi-family house I Apartment building	
	Treated floor area A _{TFA} :	1208	m²
Covered fraction of space heating demand	(‘PER’ worksheet)	0%	
Space heating demand + distribution losses	Q _H +Q _{HS} : (DHW+Distribution)	17487	kWh/a
Solar contribution for space heating	η _{Solar, H} (‘SolarDHW’ worksheet)	0%	
Effective annual heating demand	Q _{H,Wi} =Q _H *(1-η _{Solar, H})	0	kWh/a
Space heating demand without distribution losses	Q _H (‘Verification’ worksheet)	17487	kWh/a
Covered fraction of DHW demand	(‘PER’ worksheet)	0%	
Total heating demand of DHW system	Q _{gDHW} (DHW+Distribution)	16307	kWh/a
Solar contribution for DHW generation	η _{Solar, DHW} (‘SolarDHW’ worksheet)	0%	
Effective DHW demand	Q _{DHW,Wi} =Q _{DHW} *(1-η _{Solar, DHW})	0	kWh/a

Boiler type		1-None	
Fuel		-	
PER factors (renewable primary energy)	(‘Data’ worksheet)	0.00	kWh _{PER} /kWh _{Final}
PE factor (non-renewable primary energy)	(‘Data’ worksheet)		kWh _{PE} /kWh _{Final}
CO ₂ emissions factor (CO ₂ -equivalent)	(‘Data’ worksheet)		kg/kWh
Useful heat provided	Q _{Useful}		kWh/a
Max. heating capacity required for heating the building	P _{BH} (‘Heating load’ worksheet)	13.89	kW
Length of the heating period	t _{HP}	5080	h/a
Length of DHW heating period	t _{DHW}	8760	h/a

Apply user-defined values entered (check if appropriate)?

		Project data		Standard values		User-defined	
Design output	P _{nom} (Rating plate)	15	kW	15	kW		
Installation of boiler (Outdoor: 0, Indoor: 1)		0		0			
Input values (oil and gas boiler)		Project data		Standard values		User-defined	
Boiler efficiency at 30% load	η _{30%} (Manufacturer)						
Boiler efficiency at nominal output	η _{100%} (Manufacturer)						
Standby heat loss boiler at 70 °C	Q _{B,70} (Manufacturer)						
Average return temperature measured at 30% load	ϑ _{30%} (Manufacturer)		°C				
Input values (biomass heat generator)		Project data		Standard values		User-defined	
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	Δϑ (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
Performance ratio heat generator space heating	h _{H,g,K} =f _j * h _k ''	0%					
Performance ratio heat generator DHW	h _{DW,g,K} =h _{100%} / f _{j,DW}	0%					
Performance ratio of heat generator, DHW & space heating	h _{g,K}	0%					
		kWh/a		kWh/(m²a)			
Final energy demand space heating	Q _{Final,HE} = Q _{H,Wi} * e _{H,g,K}	0					
Final energy demand DHW	Q _{Final,TW} = Q _{DHW,Wi} * e _{TW,g,K}	0					
Total final energy demand	Q _{Final} = Q _{Final,HE} + Q _{Final,TW}	0		0.0			
Annual PER demand (renewable primary energy)							
Annual PE demand (non-renewable primary energy)							
		kg/a		kg/(m²a)			
Annual CO ₂ -equivalent emissions							

District heating and combined heat and power (CHP)

Block C Cranwood House / Climate: Northolt / TFA: 1208 m² / Heating: 14.5 kWh/(m²a) / Overheating: 6 % / PER: 23.5 kWh/(m²a)



Building type:		5-Multi-family house I Apartment building	
Treated floor area A _{TFA} :	1208	m²	
Covered fraction of space heating demand	(‘PER’ worksheet)	0%	
Heating demand	Q _H (DHW+Distribution)	17487	kWh/a
Solar contribution for space heating	η _{Solar, H} (‘SolarDHW’ worksheet)	0%	
Effective annual heating demand	Q _{H,WI} = Q _H * (1 - η _{Solar, H})	0	kWh/a
Covered fraction of DHW demand	(‘PER’ worksheet)	0%	
DHW demand	Q _{DHW} (DHW+Distribution)	16307	kWh/a
Solar contribution for DHW generation	η _{Solar, DHW} (‘SolarDHW’ worksheet)	0%	
Effective DHW demand	Q _{DHW,WI} = Q _{DHW} * (1 - η _{Solar, DHW})	0	kWh/a

Standard procedure Entries in this area take precedence over the detailed calculation below.						
PER (renewable energy)		PE, CO ₂ (non-renewable energy)		PE factor	CO ₂ factor	
Reference district heating:	x	Standard heat generator	x	1-None	0.00	0.000
Detailed calculation:		Detailed calculation:	(see below)			
		User-defined:				

Detailed calculation

Utilisation factor of heat transfer station	η _{a,HX}	95%				
Performance ratio of heat transfer station	h _{a,HX}	105%				
Final energy demand heat generation	Q _{Final} = Q _{Useful} * e _{a,HX}		kWh/a			kWh/(m²a)
Annual PER demand (renewable primary energy)			kWh/a			kWh/(m²a)
Annual PE demand (non-renewable primary energy)			kWh/a			kWh/(m²a)
Annual CO ₂ -equivalent emissions			kg/a			kg/(m²a)

	PER factor		Bioenergy budget			PE factor result	PE factor for verification		CO ₂ factor	
			PER factor	Used budget						
Heating	0.91		0.37	0.99		0.00	0.30		0.00	
Domestic hot water	0.86		0.51	0.72						

PHPP Version

10.4a

Language

EN

Header:
Block C Cranwood House / Climate: Northolt / TFA: 1208 m² / Heating: 14.5 kWh/(m²a) / Overheating: 6 % / PER: 23.5 kWh/(m²a)
Passive House with PHPP Version 10.4a EN

for diagrams
Block C Cranwood House 1208 m² treated floor area, United Kingdom/ Britain

Table of PER and PE factors as well as CO ₂ -equivalent emission factors of different energy carriers and uses from different sources					
Energy type	Number	Energy carrier	Transfer to 'PER' worksheet		
			PER factor	1-PE factors (non-renewable) PHI Certification	1-CO2 factors GEMIS (Germany)
			kWh _{prim-el} / kWh _{Final}	kWh _{prim} / kWh _{Final}	kg _{CO2eq} / kWh _{Final}
Fuels within bioenergy budget			1.1		
	10	None			
Fuels above bioenergy budget	20	Heating oil	2.30	1.10	0.320
	30	Natural gas	1.75	1.10	0.250
	31	LPG	1.75	1.10	0.270
	41	Hard coal	2.30	1.10	0.444
	42	Brown coal	2.30	1.20	0.455
	32	Biogas	1.75	1.10	-
	21	Pyrolysis oil or bio oil	1.75	1.10	-
	43	Wood	1.75	0.20	-
	44	Wood logs	1.75	0.20	0.017
	50	Pellets	1.75	0.20	0.025
	46	Forest woodchips	1.75	0.20	0.026
	47	Poplar woodchips (SRF)	1.75	0.20	0.037
	33	RE-Gas	1.75		
	22	RE-Methanol	2.30		
	48	Biomass	1.75		
Electricity	60	Electricity-mix		1.50	0.363
	61	Displacement electricity mix		2.40	0.860
	00	Primary electricity	1.00		
	01	Occupant electricity consumption	1.30	1.50	-
	02	Electricity for DHW	1.30	1.50	-
	03	Electricity for heating	1.65	1.50	-
	04	Electricity for cooling	1.00	1.50	-
	05	Electricity for dehumidification	1.15	1.50	-
	06	RE summer	1.10	1.50	-
	62	Electricity from photovoltaics	1.00	0.00	-
	63	Monocrystalline PV panels	1.00	0.00	0.130
	64	Polycrystalline PV panels	1.00	0.00	0.063
	65	Onshore wind power	1.00	0.00	0.009
	66	Offshore wind power	1.00	0.00	0.022
	67	Hydro power station > 10MW	1.00	0.00	0.003
Environmental energy, solar thermal energy	71	Ground heat, geothermal energy	1.00	0.00	-
	72	Ambient heat	0.00	0.00	-
	73	Ambient cold	0.00	0.00	-
	80	Solar thermal flat plate (generation)	1.00	0.00	0.045
	81	Vacuum tube (generation)	1.00	0.00	0.025
	74	Waste heat	0.20	0.00	-
User defined energy carrier (for generation, please ente	98	User defined energy carrier (generation, please enter			
tors for demand please enter on the far right)	99	factors for demand on the far right)			
District heat	1	1-None		0.00	0.000
	10	10-Hard coal-CHP plant (>70% CHP)		0.80	0.240
	11	11-Hard coal-CHP plant (>35% CHP)		1.10	0.320
	12	12-Hard coal HP (0% CHP)		1.50	0.410
Gas CHP plant	20	20-Gas CHP plant (70% CHP)	Calculation	0.70	-0.070
	21	21-Gas CHP plant (35% CHP)	in	1.10	0.130
	22	22-Gas HP (0% CHP)	'District	1.50	0.320
Heating oil CHP plant	30	30-Oil CHP plant (70% CHP)	heating'	0.80	0.100
	31	31-Oil CHP plant (35% CHP)	worksheet	1.10	0.250
	32	32-Oil HP (0% CHP)		1.50	0.410
District heat: User-defined	40	40-User-defined		0.00	0.000
District heat from combined heat and power (CHP)	13	Fossil fuel		0.70	-
	14	Renewable fuel		0.00	-
District heat from heating plant	15	Fossil fuel		1.30	-
	16	Renewable fuel		0.10	0.117