



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

Photo or drawing

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

No. of dwelling units:

14

No. of occupants:

27.5

Building:

Block A1 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

Interior temperature winter [°C]:

20.0

Interior temp. summer [°C]:

25.0

Internal heat gains (IHG) winter [W/m²]:

2.8

IHG summer [W/m²]:

2.8

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'	
					Alternative	
					Criteria	Fullfilled?²
Space heating	Treated floor area m²	1071.1				
	Heating demand kWh/(m²a)	11	≤	15	-	Yes
	Heating load W/m²	10	≤	-	10	
Space cooling	Cooling & dehum. demand kWh/(m²a)	-	≤	-		-
	Frequency of overheating (> 25 °C) %	8	≤	10		Yes
	Frequency of excessively high humidity (> 12 g/kg) %	0	≤	20		Yes
Airtightness	Pressurisation test result n50 1/h	0.6	≤	0.6		Yes
Non-renewable Primary Energy (PE)	PE demand kWh/(m²a)	28	≤	-		-
Primary Energy Renewable (PER)	PER demand kWh/(m²a)	22	≤	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:

1-Design

Certificate-ID

First name:

Eve

Surname:

Russell

Issued on:

City:

Passive House Classic?

Yes

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:

-
-
-
-
-
-
-
-

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

-
-
-
-
-
-
-
-
-
-
-
-
-

▼ 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: 1.1 m ² envelope area per m ² 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 (-116 m ²) (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 (132 m ²) (Query will only work if all orientations have been entered; doors are not taken into account)	
	-	
	-	
	-	
	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?		
	Are there roller shutters, external venetian blinds, etc.? Has their installation been entered? In which worksheet?		
	-		
	-		
	-		
	-		
	-		
<u>Windows</u>	-		
	-		
	-		
	-		
	-		
	-		
	-		
	-		
	-		
	-		
<u>Shading</u>	North, 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: 98% , average: 93%		
	Info: Reduction factor shading summer: Average:45%		
	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.		
	-		
	-		
	-		
	-		
	-		
	-		
	-		
	-		
<u>Summer</u>	Info: Solar aperture per m² building envelope area:0.01		
<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>	-		

-

--

--

Climate data

Passive House with PHPP Version 10.4a EN

Block A1 Cranwood House / Climate: Northolt / TFA: 1071 m² / Heating: 11.2 kWh/(m²a) / Overheating: 8 % / PER: 22.2 kWh/(m²a)

PHPP

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 11.2 kWh/(m²a)

Heating load 10.3 W/m²

Frequency of overheating 8.5 %

Sensible cooling 2.0 kWh/(m²a)

Latent cooling 0.1 kWh/(m²a)

Cooling load 5.1 W/m²

PER demand 22.2 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 243

Cooling 214

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	9.9	9.1	11.3	13.3	13.9	14.8	15.8	12.2	12.5	12.5	12.5	12.5	13.9	13.9	
	Relative humidity	84%	79%	72%	69%	69%	68%	66%	69%	74%	81%	85%	87%					

Occupant electricity (€)

Domestic hot water

Heating

Cooling

Dehumidification

U-values of building assemblies

Passive House with PHPP Version 10.4a EN

Block A1 Cranwood House / Climate: Northolt / TFA: 1071 m² / Heating: 11.2 kWh/(m²a) / Overheating: 8 % / PER: 22.2 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/(m ² K)]			
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]: 47.5	
Interior R _{si} :		0.17	m ² K/W				
Exterior R _{se} :		0.00	m ² K/W		U-value [W/(m ² K)]: 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/(m ² K)]		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]: 60.0	
Interior R _{si} :		0.13	m ² K/W				
Exterior R _{se} :		0.04	m ² K/W		U-value [W/(m ² K)]: 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/(m ² K)]			
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
Exterior R _{se} :	0.00	m²K/W

Total thickness [cm]: 70.0

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

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}:

m²K/W

m²K/W

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}:

m²K/W

m²K/W

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} :		m²K/W	
Exterior R _{se} :		m²K/W	
			U-value [W/(m²K)]:

Description of building assembly

Assembly no.

10ud

Orientation of building assembly (or R_{si})

Adjacent to (or R_{se})

Interior insulation?

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

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} :

Total thickness $[cm]$:

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

Description of building assembly

Assembly no.

11ud

Orientation of building assembly (or R_{si})

Adjacent to (or R_{se})

Interior insulation?

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

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} :

Total thickness $[cm]$:

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

Description of building assembly

Assembly no.

12ud

Orientation of building assembly (or R_{si})

Adjacent to (or R_{se})

Interior insulation?

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

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} :

Total thickness $[cm]$:

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

--	--	--

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/(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} :			m²K/W				
Exterior R _{se} :			m²K/W		U-value [W/(m²K)]:		

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/(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} :			m²K/W				
Adjacent to (or R _{se})			m²K/W		U-value [W/(m²K)]:		

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/(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} :			m²K/W				
Exterior R _{se} :			m²K/W		U-value [W/(m²K)]:		

--	--	--

Description of building assembly

Assembly no.

16ud

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

Interior R_{si} :

Exterior R_{se} :

m^2K/W

m^2K/W

Total thickness $[cm]$:

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

Description of building assembly

Assembly no.

17ud

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

Interior R_{si} :

Exterior R_{se} :

m^2K/W

m^2K/W

Total thickness $[cm]$:

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

Description of building assembly

Assembly no.

18ud

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

Interior R_{si} :

Exterior R_{se} :

m^2K/W

m^2K/W

Total thickness $[cm]$:

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

--	--	--

Description of building assembly

Assembly no.

19ud

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}:

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})

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}:

m²K/W

m²K/W

Total thickness [cm]:

U-value [W/(m²K)]:

Summary				Average U-value	Radiation gains	Radiation load
Temp.-zone	Thermal envelope Areas [m²]	Area group	Group no.	[W/(m²K)]	Heating period [kWh/a]	Cooling period [kWh/a]
	1071.05	Treated floor area	1		8 months	7 months
A	30.56	North windows	2	1.361	525	1258
A	0.00	East windows	3			
A	113.50	South windows	4	1.016	15075	5561
A	13.10	West windows	5	0.992	896	1922
A	0.00	Horizontal windows	6			
A	50.35	Exterior door	7	0.800		
A	458.89	External wall - ambient	8	0.130	-50	195
B	0.00	External wall ground/basement	9			
A	256.88	Roof / ceiling - ambient	10	0.098	-50	202
B	256.88	Floor slab / basement ceiling	11	0.099		
	0.00		12			
	0.00		13			
	0.00		14			
Thermal bridges, length [m]				Ψ [W/(mK)]		
A	0.00	Thermal bridges ambient	15			
P	0.00	Perimeter thermal bridges	16			
B	0.00	Thermal bridges FS/BC	17			
Building element towards neighbour, [m²]				[W/(m²K)]		
I	0.00	Building element towards neighbour	18			
Total thermal envelope [m²]				[W/(m²K)]		
	1180.15	Average U-value of thermal envelope:		0.271		

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

Go to building components list

Area input															Building assembly selection		Radiation balance input						
Area no.	Building assembly description	Assigned to group	Quantity	x (	a [m]	x	b [m]	+	User-defined calculation [m²]	-	User-defined subtraction [m²]	-	Subtraction window areas [m²]	) =	Area [m²]	Selection building assembly / Building system	U-value [W/(m²K)]	Deviation from North	Angle of inclination from the horizontal	Orien-tation	Reduction factor shading	Exterior absorptivity	Exterior emissivity
	Projected building footprint	0-Projected building footprint:	1	x (		x		+		-		)	=	0.0	2-Sort by ID								
	Treated floor area	1-Treated floor area	1	x (		x		+	1071.05	-		)	=	1071.1									
	Exterior door	7-Exterior door	19	x (		x		+	2.65	-		)	=	50.4	Exterior door	0.80			Radiation balance window frames:				
1	A1 North Elevation Brick (Matt)	8-External wall - ambient	1	x (		x		+	174.30	-		)	=	25.8	148.5	02ud-WALL TYPE E1	0.127	353	90	North	1.00	0.50	0.90
2	A1 North Elevation Concrete	8-External wall - ambient	1	x (		x		+	13.20	-		)	=	0.0	13.2	02ud-WALL TYPE E1	0.127	353	90	North	1.00	0.50	0.90
3	A1 North Elevation Panel	8-External wall - ambient	1	x (		x		+	11.20	-		)	=	4.8	6.4	02ud-WALL TYPE E1	0.127	353	90	North	1.00	0.50	0.90
4	A1 North Elevation Mansard Roof	8-External wall - ambient	1	x (		x		+	77.10	-		)	=	0.0	77.1	05ud-WALL TYPE E2C	0.136	353	90	North	1.00	0.50	0.90
5	A1 North Elevation Floor Slab	8-External wall - ambient	1	x (		x		+	7.66	-		)	=	0.0	7.7	02ud-WALL TYPE E1	0.127	353	90	North	1.00	0.50	0.90
6	A1 East Elevation Floor Slab	8-External wall - ambient	1	x (		x		+	1.00	-		)	=	0.0	1.0	02ud-WALL TYPE E1	0.127	82	90	East	1.00	0.50	0.90
7	A1 East Elevation	8-External wall - ambient	1	x (		x		+	36.50	-		)	=	0.0	36.5	02ud-WALL TYPE E1	0.127	82	90	East	1.00	0.50	0.90
8	A1-E 01 Inset Elevation	8-External wall - ambient	1	x (		x		+	2.50	-		)	=	0.0	2.5	02ud-WALL TYPE E1	0.127	82	90	East	1.00	0.50	0.90
9	A1-E 02 Inset Elevation	8-External wall - ambient	1	x (		x		+	2.50	-		)	=	0.0	2.5	02ud-WALL TYPE E1	0.127	82	90	East	1.00	0.50	0.90
10	A1-E 03 Inset Elevation	8-External wall - ambient	1	x (		x		+	2.60	-		)	=	0.0	2.6	02ud-WALL TYPE E1	0.127	82	90	East	1.00	0.50	0.90
11	A1-E 04 Inset Elevation	8-External wall - ambient	1	x (		x		+	2.50	-		)	=	0.0	2.5	02ud-WALL TYPE E1	0.127	82	90	East	1.00	0.50	0.90
12				x (		x		+		-		)	=	0.0									
13	A1 West Elevation Brick (Matt)	8-External wall - ambient	1	x (		x		+	97.10	-		)	=	13.1	84.0	02ud-WALL TYPE E1	0.127	262	90	West	1.00	0.50	0.90
14	A1 West Elevation Ceramic	8-External wall - ambient	1	x (		x		+	3.10	-		)	=	0.0	3.1	05ud-WALL TYPE E2C	0.136	262	90	West	1.00	0.50	0.90
15	A1 West Elevation Concrete	8-External wall - ambient	1	x (		x		+	8.10	-		)	=	0.0	8.1	02ud-WALL TYPE E1	0.127	262	90	West	1.00	0.50	0.90
16	A1 West Elevation Mansard Roof	8-External wall - ambient	1	x (		x		+	25.74	-		)	=	0.0	25.7	05ud-WALL TYPE E2C	0.136	262	90	West	1.00	0.50	0.90
17	A1 West Elevation Floor Slab	8-External wall - ambient	1	x (		x		+	3.40	-		)	=	0.0	3.4	02ud-WALL TYPE E1	0.127	262	90	West	1.00	0.50	0.90
18	A1-W 01 Inset Elevation	8-External wall - ambient	1	x (		x		+	2.50	-		)	=	0.0	2.5	02ud-WALL TYPE E1	0.127	262	90	West	1.00	0.50	0.90
19	A1-W 02 Inset Elevation	8-External wall - ambient	1	x (		x		+	2.50	-		)	=	0.0	2.5	02ud-WALL TYPE E1	0.127	262	90	West	1.00	0.50	0.90
20	A1-W 03 Inset Elevation	8-External wall - ambient	1	x (		x		+	2.60	-		)	=	0.0	2.6	02ud-WALL TYPE E1	0.127	262	90	West	1.00	0.50	0.90
21	A1-W 04 Inset Elevation	8-External wall - ambient	1	x (		x		+	2.50	-		)	=	0.0	2.5	02ud-WALL TYPE E1	0.127	262	90	West	1.00	0.50	0.90
22				x (		x		+		-		)	=	0.0									
23	A1 Floor Slab	11-Floor slab / basement ceiling	1	x (		x		+	256.88	-		)	=	0.0	256.9	01ud-FLOOR GF01 Ground Floor	0.099	0	180	Hor	1.00	0.50	0.90
24	A1 Roof	10-Roof / ceiling - ambient	1	x (		x		+	256.88	-		)	=	0.0	256.9	04ud-FLAT ROOF	0.098	0	0	Hor	1.00	0.50	0.90
25				x (		x		+		-		)	=	0.0									
26	A1 South Brick (Matt)	8-External wall - ambient	1	x (		x		+	97.10	-		)	=	99.6	-2.5	02ud-WALL TYPE E1	0.127	172	90	South	1.00	0.50	0.90
27	A1 South Ceramic	8-External wall - ambient	1	x (		x		+	3.10	-		)	=	0.0	3.1	05ud-WALL TYPE E2C	0.136	172	90	South	1.00	0.50	0.90
28	A1 South Concrete	8-External wall - ambient	1	x (		x		+	8.10	-		)	=	0.0	8.1	02ud-WALL TYPE E1	0.127	172	90	South	1.00	0.50	0.90
29	A1 South Mansard Roof	8-External wall - ambient	1	x (		x		+	25.74	-		)	=	13.9	11.8	05ud-WALL TYPE E2C	0.136	172	90	South	1.00	0.50	0.90
30	A1 South Floor Slab	8-External wall - ambient	1	x (		x		+	3.40	-		)	=	0.0	3.4	02ud-WALL TYPE E1	0.127	172	90	South	1.00	0.50	0.90
31				x (		x		+		-		)	=	0.0									
32				x (		x		+		-		)	=	0.0									
33				x (		x		+		-		)	=	0.0									
34				x (		x		+		-		)	=	0.0									
35				x (		x		+		-		)	=	0.0									
36				x (		x		+		-		)	=	0.0									
37				x (		x		+		-		)	=	0.0									
38				x (		x		+		-		)	=	0.0									
39				x (		x		+		-		)	=	0.0									
40				x (		x		+		-		)	=	0.0									
41				x (		x		+		-		)	=	0.0									
42				x (		x		+		-		)	=	0.0									
43				x (		x		+		-		)	=	0.0									
44				x (		x		+		-		)	=	0.0									
45				x (		x		+		-		)	=	0.0									
46				x (		x		+		-		)	=	0.0									
47				x (		x		+		-		)	=	0.0									
48				x (		x		+		-		)	=	0.0									
49				x (		x		+		-		)	=	0.0									
50				x (		x		+		-		)	=	0.0									

Aend

[illegible]

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	θ _{e,m}	11.9	°C
				Amplitude of θ _{e,m}	θ _{e,^}	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	256.9	m²	U-value floor slab / basement ceiling	U _f	0.099	W/(m²K)
Perimeter length	P		m	TBs floor slab / basement ceiling	Ψ _B * ℓ	0.00	W/K
Charact. dimension of floor slab	B'		m				

Floor slab type (select only one)

Slab on grade								
	Perimeter insulation width/depth	D		m	Orientation of perimeter insulation (check only one field)	horizontal		x
	Perimeter insulation thickness	d _n		m		vertical		
	Conductivity perimeter insulation	λ _n		W/(mK)				
	Area of interior wall towards heated	A _{wI}		m²	U-value of interior wall towards heated	U _{wI}		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 _{wI}		m²	U-value of interior wall towards heated	U _{wI}		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 _{wI}		m²	U-value of interior wall towards heated	U _{wI}		W/(m²K)

Perimeter thermal bridges				Perimeter TBs steady-state fraction	Ψ _{P,stat} * ℓ	0.000	W/K
Phase shifting (optional)	β		Months	Perimeter TBs harmonic fraction	Ψ _{P,harm} * ℓ	0.000	W/K

Groundwater correction							
Depth of the groundwater table	z _w	3.0	m	Groundwater correction factor	G _w		-
Groundwater flow rate	q _w	0.05	m/d				

Interim results							
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}	244.7	W	Heat losses during heating period	Q _{tot}	1087	kWh
External periodic heat flow	Φ _{harm,e}	22.1	W	Charact. dimension of floor slab	B'	6.94	m
Internal harmonic conductance	Φ _{harm,i}	42.0	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	205	229	258	283	298	298	285	260	231	206	191	191	245

Design ground temperature for 'Heating load' worksheet

12.5

For 'Cooling load' worksheet

13.9

Passive House Components

Block A1 Cranwood House / Climate: Northolt / TFA: 1071 m² / Heating: 11.2 kWh/(m²a) / Overheating: 8 % / PER: 22.2 kWh/(m²a)

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

Building assemblies (U-values)

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

		1			
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			

Window and door frames					Frame: opening casement (see comment)										Frame: fixed glazing								Mullion frame profile								Transom frame profile						Installation thermal bridges						
		Glazing edge			Left si		Right si		Top to		Bottom bo		Threshold th		Left fixed sif		Right fixed sif		Top fixed tof		Bottom fixed bof		Flying mullion fm		Mullions with 2 openings m2		Mullions with 1 opening m1		Mullions m		Transom with 2 openings t2		Transom with 1 opening t1		Transom t		Opening casement				Fixed glazing		
ID	Description	Spacer Description	Ψ _g (average)	min. f _{rei}	Width	U _f	Width	U _f	Width	U _f	Width	U _f	Width	U _f	Width	U _f	Width	U _f	Width	U _f	Width	U _f	Width	U _f	Width	U _f	Width	U _f	Width	U _f	Width	U _f	Width	U _f	Ψ _{installed} sides	Ψ _{installed} top	Ψ _{installed} bottom	Ψ _{installed} threshold	Ψ _{installed} sides	Ψ _{installed} top	Ψ _{installed} bottom		
			W/(mK)	-	mm	W/(m²K)	mm	W/(m²K)	mm	W/(m²K)	mm	W/(m²K)	mm	W/(m²K)	mm	W/(m²K)	mm	W/(m²K)	mm	W/(m²K)	mm	W/(m²K)	mm	W/(m²K)	mm	W/(m²K)	mm	W/(m²K)	mm	W/(m²K)	mm	W/(m²K)	W/(mK)				W/(mK)						
01ud	Generic NorDan Type 24A	SWISSPACER ULTIMAT	0.050	0.000	109	1.01	109	1.01	9	1.01	121	1.03											134	1.10											0.040	0.040	0.040	0.040	0.040	0.040	0.040		
02ud	Generic GlasCurtain Inc. - ThermPH	Super Spacer TriSeal / T-	0.028	0.800	109	1.01	109	1.01	9	1.01	109	1.01	109	1.01	64	0.76	64	0.76	64	0.76	64	0.76	64	0.76					64	0.61					0.040	0.040	0.040	0.040	0.040	0.040	0.040		
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																																										
with heating and/or cooling function and, if applicable, DHW generation																																										
Heating / DHW																																										
ID		Description	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								
						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		°C	°C	kW		
01ud																																										
02ud																																										
03ud																																										
04ud																																										
05ud																																										
06ud																																										
07ud																																										
08ud																																										
09ud																																										
10ud																																										
11ud																																										
12ud																																										
13ud																																										

[illegible]

Combined ventilation and split units (air source heat pump), PHI test method															Heating																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
ID		Description		Ventilation													Heating																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
Ventilation function		Heating period		Cooling period		Humidity recovery rate		HR efficiency, cooling		Humidity recovery rate		Specific electric efficiency		Range of use from to		External pressure per section		Frost protection necessary		Noise protection		Heating function		Heating test point 1								Heating test point 2								Heating																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
																								Temperature								Normal operation				Silent mode				Temperature				Normal operation				Silent mode				Temperature																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
Mark with an 'x'		%		%		%		%		Wh/m³		m³/h		m³/h		Pa		35 dB(A)		Supply air dB(A)		Extract air dB(A)		°C		°C		kW		kW		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C		°C		kW		kW		°C	

Windows and entrance doors

Block A1 Cranwood House / Climate: Northolt / TFA: 1071 m² / Heating: 11.2 kWh/(m²a) / Overheating: 8 % / PER: 22.2 kWh/(m²a)

Window orientation

Global radiation (main direction) kWh/m²a

Shading

Dirt

Non-perpendicular radiation incidence 0.85

Glazing fraction

g-value

Solar irradiation reduction factor

Window area m²

Window U_t installed W/(m²K)

Glazing area m²

Average global radiation kWh/m²a

North

East

South

West

Horizontal

99

214

401

221

315

0.75

1.00

0.98

0.75

1.00

0.95

1.00

0.95

0.95

0.95

0.85

0.85

0.85

0.85

0.85

0.40

0.00

0.68

0.69

0.00

0.46

0.00

0.54

0.42

0.00

30.6

0.0

113.5

13.1

0.0

1.36

0.00

1.02

0.99

0.00

12.36

0.00

77.51

9.08

0.00

100

0

398

241

315

0.46

0.47

157.15

1.08

98.94

346

Total or average value for all windows.

Frame absorptivity

Frame emissivity

Heating degree hours [KkWha]:

71

Cooling degree hours [KkWha]:

57

■ Transmission losses heating period

□ Heating gains solar radiation...

■ Heating gains solar radiation cooling period

■ Heat load solar radiation cooling period

20,000

15,000

10,000

5,000

0

kWh/a

North

East

South

West

Horizontal

8,000

6,000

4,000

2,000

0

kWh/a

North

East

South

West

Horizontal

Recommendation for U_{m, installed}

Horizontal

1.10

Vertical

0.85

Exterior temperature

-4.8 °C

°C

User-defined

Quanty

Description

Deviation from north

Angle of inclination from the horizontal

Orien- tation

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

f_{m2}

f_{m1}

f_m

t₂

t₁

t

Pieces

Left

Right

Top

Bottom

U_f frame (mean)

g-value glazing

U_g glazing

Ψ_{glazing edge}

Ψ_{enclosure} (Avg.)

Window area

Glazing area

Glazing fraction per window

U_w

U_w installed

Exemption

Exemption

Comfort

Heat gains heating period

Heat loads cooling period

Pos. no.

-

-

m

m

I-Sort as list

I-Sort as list

m

m

W/(mK) or 1/0

W/(m²K)

-

W/(m²K)

W/(mK)

W/(mK)

m²

m²

%

W/(m²K)

W/(m²K)

Exemption

Exemption

kWh/a

kWh/a

9

267

Block A1 North - 267 WA1.05.1

352.6

90

North

0.20

2.29

1-A1 North Elevation Brick (Matt)

01ud-Generic NorDan Type 24A

01ud-Generic NorDan Type 24A

2.29

2.29

0.20

0.20

1

1

1

1

1.01

0.46

0.64

0.050

0.040

4.1

-0.3

-8%

1.510

1.945

-586

-491

1

308

Block A1 North - 308 WA2.05.1

352.6

90

North

0.20

2.29

1-A1 North Elevation Brick (Matt)

01ud-Generic NorDan Type 24A

01ud-Generic NorDan Type 24A

2.29

2.29

0.20

0.20

1

1

1

1

1.01

0.46

0.64

0.050

0.040

0.5

0.0

-8%

1.510

1.945

-65

-55

4

309

Block A1 North - 309 WA0.06.1

352.6

90

North

0.20

2.44

1-A1 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

2.0

-0.2

-9%

1.512

1.945

-277

-233

4

311

Block A1 North - 311 WA0.06.2

352.6

90

North

0.80

1.21

1-A1 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

3.9

2.5

65%

0.943

1.109

-199

12

10

313

Block A1 North - 313 WA1.05.2 LH

352.6

90

North

0.80

1.06

1-A1 North Elevation Brick (Matt)

01ud-Generic NorDan Type 24A

01ud-Generic NorDan Type 24A

1.06

1.06

0.80

0.80

1

0

1

1

1.02

0.46

0.64

0.050

0.040

8.4

5.4

64%

0.955

1.081

-421

29

10

313

Block A1 North - 313 WA1.05.2 RH

352.6

90

North

0.29

1.06

1-A1 North Elevation Brick (Matt)

01ud-Generic NorDan Type 24A

01ud-Generic NorDan Type 24A

1.06

1.06

0.29

0.29

0

1

1

1

1.01

0.46

0.64

0.050

0.040

3.0

0.6

21%

1.261

1.476

-292

-189

3

314

Block A1 North - 314 WB11.00.980

352.6

90

North

0.20

2.29

1-A1 North Elevation Brick (Matt)

01ud-Generic NorDan Type 24A

01ud-Generic NorDan Type 24A

2.29

2.29

0.20

0.20

1

1

1

1

1.01

0.46

0.64

0.050

0.040

1.4

-0.1

-8%

1.510

1.945

-195

-164

3

315

Block A1 North - 315 WA3.06.2

352.6

90

North

0.80

1.06

1-A1 North Elevation Brick (Matt)

01ud-Generic NorDan Type 24A

01ud-Generic NorDan Type 24A

1.06

1.06

0.80

0.80

1

1

1

1

1.02

0.46

0.64

0.050

0.040

2.5

1.6

64%

0.954

1.130

-135

2

4

342

Block A1 North - 342 WA3.06.5 TOP

352.6

90

North

0.80

1.09

3-A1 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

3.5

2.2

64%

0.952

1.088

-175

12

4

342

Block A1 North - 342 WA3.06.5 BOTTOM

352.6

90

North

0.80

0.40

3-A1 North Elevation Panel

01ud-Generic NorDan Type 24A

01ud-Generic NorDan Type 24A

0.40

0.40

0.80

0.80

1

1

0

1

1.02

0.46

0.64

0.050

0.040

1.3

0.6

49%

1.100

1.300

-92

-31

</

Calculation of reduction factors for shading



Block A1 Cranwood House / Climate: Northolt / TFA: 1071 m² / Heating: 11.2 kWh/(m²a) / Overheating: 8 % / PER: 22.2 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/(m² _{GlazingA})]
North	12.36	75%	100%	100%	102
East	0.00	100%	100%	100%	0
South	77.51	98%	30%	11%	72
West	9.08	75%	100%	100%	212
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 [m ²]	h _{Hor} [m]	d _{Hor} [m]	r _{Reveal} [m]	d _{Reveal} [m]	r _{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} [%]
9	267 Block A1 North - 267 WA1.0	353	90	North	-0.02	2.16	-0.3														75%				100%	100%
1	308 Block A1 North - 308 WA2.0	353	90	North	-0.02	2.16	0.0														75%				100%	100%
4	309 Block A1 North - 309 WA0.0	353	90	North	-0.02	2.31	-0.2														75%				100%	100%
4	311 Block A1 North - 311 WA0.0	353	90	North	0.58	1.08	2.5														75%				100%	100%
10	313 Block A1 North - 313 WA1.0	353	90	North	0.58	0.93	5.4														75%				100%	100%
10	313 Block A1 North - 313 WA1.0	353	90	North	0.07	0.93	0.6														75%				100%	100%
3	314 Block A1 North - 314 WB11.0	353	90	North	-0.02	2.16	-0.1														75%				100%	100%
3	315 Block A1 North - 315 WA3.0	353	90	North	0.59	0.93	1.6														75%				100%	100%
4	342 Block A1 North - 342 WA3.0	353	90	North	0.59	0.96	2.2														75%				100%	100%
4	342 Block A1 North - 342 WA3.0	353	90	North	0.59	0.27	0.6														75%				100%	100%
4	315 Block A1 South - 315 WA3.0	172	90	South	0.59	0.93	2.2	1.00	0.00	0.00	0.200	0.200	0.200	100%	100%	1%			100%	96%	96%		100%	93%	28%	10%
10	317 Block A1 South - 317 WA3.0	172	90	South	0.63	2.11	13.3	2.50	0.00	0.00	0.200	0.200	0.200	100%	100%	1%			100%	98%	98%		100%	98%	30%	11%
10	317 Block A1 South - 317 WA3.0	172	90	South	0.63	2.11	13.3	2.50	0.00	0.00	0.200	0.200	0.200	100%	100%	1%			100%	98%	98%		100%	98%	30%	11%
4	318 Block A1 South - 318 WA0.0	172	90	South	0.63	2.26	5.7	2.50	0.00	0.00	0.200	0.200	0.200	100%	100%	1%			100%	98%	98%		100%	98%	30%	11%
4	318 Block A1 South - 318 WA0.0	172	90	South	0.63	2.26	5.7	2.50	0.00	0.00	0.200	0.200	0.200	100%	100%	1%			100%	98%	98%		100%	98%	30%	11%
4	320 Block A1 South - 320 WA0.0	172	90	South	0.59	1.26	2.9	1.50	0.00	0.00	0.200	0.200	0.200	100%	100%	1%			100%	97%	97%		100%	95%	29%	10%
4	320 Block A1 South - 320 WA0.0	172	90	South	0.70	0.76	2.1	1.00	0.00	0.00	0.200	0.200	0.200	100%	100%	1%			100%	96%	96%		100%	91%	28%	10%
4	322 Block A1 South - 322 WA0.0	172	90	South	0.59	2.20	5.1	2.50	0.00	0.00	0.200	0.200	0.200	100%	100%	1%			100%	98%	98%		100%	98%	30%	11%
6	328 Block A1 South - 328 WA3.0	172	90	South	0.59	2.05	7.2	2.50	0.00	0.00	0.200	0.200	0.200	100%	100%	1%			100%	98%	98%		100%	98%	30%	11%
2	329 Block A1 South - 329 WA2.0	172	90	South	0.59	2.05	2.4	2.50	0.00	0.00	0.200	0.200	0.200	100%	100%	1%			100%	98%	98%		100%	98%	30%	11%
6	330 Block A1 South - 330 WA3.0	172	90	South	0.59	1.11	3.9	1.50	0.00	0.00	0.200	0.200	0.200	100%	100%	1%			100%	97%	97%		100%	94%	29%	10%
6	330 Block A1 South - 330 WA3.0	172	90	South	0.69	0.76	3.2	1.00	0.00	0.00	0.200	0.200	0.200	100%	100%	1%			100%	96%	96%		100%	91%	28%	10%
4	332 Block A1 South - 332 WA0.0	172	90	South	0.61	1.31	3.2	1.50	0.00	0.00	0.200	0.200	0.200	100%	100%	1%			100%	97%	97%		100%	95%	29%	10%
4	332 Block A1 South - 332 WA0.0	172	90	South	0.72	0.76	2.2	1.00	0.00	0.00	0.200	0.200	0.200	100%	100%	1%			100%	96%	96%		100%	91%	28%	10%
4	332 Block A1 South - 332 WA0.0	172	90	South	0.61	1.31	3.2	1.50	0.00	0.00	0.200	0.200	0.200	100%	100%	1%			100%	97%	97%		100%	95%	29%	10%
4	332 Block A1 South - 332 WA0.0	172	90	South	0.61	0.76	1.8	1.00	0.00	0.00	0.200	0.200	0.200	100%	100%	1%			100%	96%	96%		100%	91%	28%	10%
3	325 Block A1 West - 325 WA3.0	262	90	West	0.63	2.11	4.0														75%				100%	100%
3	325 Block A1 West - 325 WA3.0	262	90	West	0.63	2.11	4.0														75%				100%	100%
1	335 Block A1 West - 335 WB11.0	262	90	West	0.61	0.90	0.5														75%				100%	100%
1	335 Block A1 West - 335 WB11.0	262	90	West	0.61	0.90	0.5														75%				100%	100%

Ventilation data

Block A1 Cranwood House / Climate: Northolt / TFA: 1071 m² / Heating: 11.2 kWh/(m²a) / Overheating: 8 % / PER: 22.2 kWh/(m²a)

Treated floor area A_{TFA}	1071	m²
Room height h	2.50	m
Reference volume for the ventilation system ($A_{TFA} \cdot h$) = V_V	2678	m³

Used m

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}	3853	m³	
Air change rate from pressurisation test	n_{50}	0.60	1/h	
Air permeability	q_{50}	1.96	m³/(hm²)	
Excess extract air		0.00	0.00	1/h
Infiltration air change rate	$n_{V,Rest}$	0.060	0.151	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	[-]
684	0.26	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
50%	48%	50%	54%	63%	-	-	-	-	66%	57%	52%

Ventilation data

Passive House with PHPP Version 10.4a EN

PHPP

ψ

Dimensioning of a ventilation system with only one ventilation unit

Occupant density	m²/P	39					
Number of occupants	P	27.5					
Supply air per person	m³/(P*h)	30					
Supply air demand	m³/h	824					
Extract air rooms			Bathroom				
Quantity			Kitchen	Bathroom	(shower only)	WC	
Extract air demand per room	m³/h	60		40	20	20	
Total extract air demand	m³/h	0					
Design airflow rate (maximum)	m³/h	1044	Recommended:	1044	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	1044	0.39
Standard	24.0	0.77	803	0.30
Basic ventilation		0.54	562	0.21
Minimum		0.40	418	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	Go to ventilation units list 1-Sort as list 97ud-Default	0.75	N/A	0.65	N/A	0.45	N/A	N/A
						Implementation of frost protection		2-Electr.
Conductivity of outdoor air duct Ψ W/(mK)						Limit temperature [°C]		
Length of outdoor air duct m						Useful energy [kWh/a]		0
Conductivity of exhaust air duct Ψ W/(mK)								
Length of exhaust air duct m								
Temperature of mechanical room °C						Room temperature (°C)		20
(enter only if the unit is outside of the thermal envelope)						Avg. ambient temp. heating period (°C)		7.5
						Avg. ground temp (°C)		11.9

Effective heat recovery efficiency	η _{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

Treated floor area A_{TFA}	1071	m ²	('Areas' worksheet)
Room height h	2.50	m	('Ventilation' worksheet)
Reference volume for the ventilation system ($A_{TFA} \cdot h$) = V_v	2678	m ³	('Annual heating' worksheet)
Number of occupants	27.5	P	('Verification' worksheet)
Interior temperature	20	°C	('Annual heating' worksheet)
Average ambient temp. heating period	7.5	°C	('Ventilation' worksheet)
Average ground temperature	11.9	°C	('Ground' worksheet)
Length of the heating period	201	d/a	('Heating' worksheet)
Ventilation type	1-Balanced PH ventilation with HR		('Ventilation' worksheet)

--	--	--	--

1	Unit 1	2280	2280	684	684	---
2						---
3						---
4						---
5						---
6						---
7						---
8						---
9						---
10						---

Overall results vent. system	2280	2280	684	684	0.26
------------------------------	------	------	-----	-----	------

	0%		N/A	0.44	0%
					0%

Use building materials/furnishings with low odour and low VOCs

It is strongly recommended to use building materials that cause very low or no VOCs/odours instead of increasing the outdoor air volume in order to clear the air.

This holds true regardless of the chosen approach to determine air quality; emissions of all sources in the room should be considered, e.g. furniture, carpets and ventilation or air-conditioning units themselves.

Also in non-residential buildings, the number of persons is fundamentally important for assessing the airflow rates. For good indoor air quality, airflow rates between 20 to 30 m³/(h*P) are sufficient.

Greater airflow rates can lead to indoor air that is too dry in winter. The airflow rates are defined by the classification according to the EN 13779 norm. The classification must be agreed with the client in advance.

IDA 3 is adequate for office buildings. IDA 4 has proven to be satisfactory for school buildings, as flushing ventilation is carried out during breaks anyway. For typical outdoor air CO₂ concentrations of around 400-500 ppm,

it is possible to comply even with 1500 ppm. Exceeding this figure temporarily is permissible.

- Recommended for residential buildings: around 30 m³/h per person (EN 16798-3:2017)

- Recommendation for office-like uses: around 30 m³ /h per person (AMEV: 28 m³ / (h person); EN 13779 / IDA 3: at least 24 m³ /h per person)
- Recommended for schools and day care centres: 15 to 20 m³/h per person (Source: Guidelines for energy-efficient educational buildings, Passive House Institute, 2010)
- Recommendation for sport halls: 60 m³/h per person (DIN 18032-1)

In case the ventilation is used intermittently (turned off at night), then the air in the room should be flushed in the morning during approx. 1 or 2 hours before the building is occupied, and in order to eliminate

emissions released during the night. The flushing phase increases the operating period of the ventilation system (utilisation time + flushing phase). Please consider this during the design stage.

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		30%	100%					46	46		0.26
2	1	Dwelling unit	1	64	2.70	173	152	152		0.88	24	7		30%	100%					46	46		0.26
3	1	Dwelling unit	1	64	2.70	173	152	152		0.88	24	7		30%	100%					46	46		0.26
4	1	Dwelling unit	1	64	2.70	173	152	152		0.88	24	7		30%	100%					46	46		0.26
5	1	Dwelling unit	1	64	2.70	173	152	152		0.88	24	7		30%	100%					46	46		0.26
6	1	Dwelling unit	1	64	2.70	173	152	152		0.88	24	7		30%	100%					46	46		0.26
7	1	Dwelling unit	1	64	2.70	173	152	152		0.88	24	7		30%	100%					46	46		0.26
8	1	Dwelling unit	1	64	2.70	173	152	152		0.88	24	7		30%	100%					46	46		0.26
9	1	Dwelling unit	1	64	2.70	173	152	152		0.88	24	7		30%	100%					46	46		0.26
10	1	Dwelling unit	1	64	2.70	173	152	152		0.88	24	7		30%	100%					46	46		0.26
11	1	Dwelling unit	1	64	2.70	173	152	152		0.88	24	7		30%	100%					46	46		0.26
12	1	Dwelling unit	1	64	2.70	173	152	152		0.88	24	7		30%	100%					46	46		0.26
13	1	Dwelling unit	1	64	2.70	173	152	152		0.88	24	7		30%	100%					46	46		0.26
14	1	Dwelling unit	1	64	2.70	173	152	152		0.88	24	7		30%	100%					46	46		0.26
15	1	Dwelling unit	1	64	2.70	173	152	152		0.88	24	7		30%	100%					46	46		0.26
16														100%	100%								
17														100%	100%								
18														100%	100%								
19														100%	100%								
20														100%	100%								
21														100%	100%								
22														100%	100%								
23														100%	100%								
24														100%	100%								
25														100%	100%								
26														100%	100%								
27														100%	100%								
28														100%	100%								
29														100%	100%								
30														100%	100%								
Additional rows: please select full rows above, and copy and insert them multiple times.																				684	684	---	0.26

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 from to m³/h m³/h		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.)			
								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	
								Δp _{Duct}	Δp _{Duct}	Δp _{Intern}	Δp _{External}	Δp _{Intern}			Unit	Effective	[-]	[-]		efficiency	efficiency	°C	temperature	energy	
	[-]							Pa	Pa	Pa	Pa	Pa			[-]	[-]	[-]	[-]		efficiency	efficiency				
1	1	Unit 1	01ud-Generic MVHR	2280	75	120	0.44	100	100		100	-	x		0.86		0%	N/A	N/A	yes		0%	2-Electr.	-3	41
2																								0	
3																								0	
4																								0	
5																								0	
6																								0	
7																								0	
8																								0	
9																								0	
10																								0	
Total (direct electric)																								41	
Total (hydraulic via heat generator)																								0	

[Sorting options](#)

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										
												0										
												0										
												0										
												0										
												0										
												0										
												0										
												0										
												0										
												0										
												0										
												0										
												0										
												0										
												0										
												0										
												0										
												0										
												0										
												0										

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}:1071.1m²

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	458.9	*	0.130	*	1.00	*	64.5	=	3838	3.58
External wall ground/basement	B		*		*	0.66	*		=		
Roof / ceiling - ambient	A	256.9	*	0.098	*	1.00	*	64.5	=	1617	1.51
Floor slab / basement ceiling	B	256.9	*	0.099	*	0.66	*	64.5	=	1087	1.01
	A		*		*	1.00	*		=		
	A		*		*	1.00	*		=		
	A		*		*	1.00	*		=		
Windows	A	157.2	*	1.081	*	1.00	*	64.5	=	10950	10.22
Exterior door	A	50.4	*	0.800	*	1.00	*	64.5	=	2596	2.42
Thermal bridges ambient (length/m)	A		*		*	1.00	*		=		0.00
Perimeter thermal bridges (length/m)	P		*		*	0.66	*		=		0.00
Thermal bridges ground (length/m)	B		*		*	0.66	*		=		0.00
											kWh/(m²a)
Sum of all areas of the building envelope		1180.2								20087	18.8

Total transmission heat losses Q_T = 20087 kWh/a

Ventilation heat losses Q_V

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

Ventilation system:

Effective heat recovery efficiency of the heat exchanger

Heat recovery efficiency of SHX

Energetically effective air changes n_V

Total ventilation heat losses Q_V = 17990 kWh/a

16.8 kWh/(m²a)

Total heat losses Q_L

35.6 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	0.24	*	0.46	*	30.56	*	100	=	343	
East	0.00	*	0.00	*	0.00	*	214	=	0	
South	0.54	*	0.46	*	113.50	*	398	=	11184	
West	0.42	*	0.46	*	13.10	*	241	=	610	
Horizontal	0.00	*	0.00	*	0.00	*	315	=	0	
										kWh/(m²a)
									12138	11.3

Total available solar heat gains Q_S = 12138 kWh/a

Internal heat gains Q_I

Length heating period

Spec. power q_I

A_{TFA}

0.024 kh/d

201 d/a

2.75 W/m²

1071.1 m²

14257 kWh/a

13.3 kWh/(m²a)

Utilisation factor heat gains η_G					
	Free heat Q_F		$Q_S + Q_L =$	kWh/a26395	kWh/(m²a)24.6
	Ratio of free heat to losses		$Q_F / Q_L =$	0.69	
	Utilisation factor heat gains η_G	$(1 - (Q_F / Q_L)^5) / (1 - (Q_F / Q_L)^6) =$		94%	
Total heat gains Q_G			$\eta_G * Q_F =$	kWh/a24937	kWh/(m²a)23.3

Annual heating demand Q_H					
		kWh/(m²a)	$Q_L - Q_G =$	kWh/a13141	kWh/(m²a)12.3
	Limit value	kWh/(m²a)15	Requirement met?		Yes

Specific energy demand for heating (monthly method)

Passive House with PHPP Version 10.4a EN

PHPP 

Block A1 Cranwood House / Climate: Northolt / TFA: 1071 m² / Heating: 11.2 kWh/(m²a) / Overheating: 8 % / PER: 22.2 kWh/(m²a)

Interior temperature:	20	°C
Building type:	5-Multi-family house I Apartment building	
Treated floor area A _{TFA} :	1071.1	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	458.9	*	0.130	*	1.00	*	71	=	4239		3.96
External wall ground/basement	B		*		*	1.00	*		=			
Roof / ceiling - ambient	A	256.9	*	0.098	*	1.00	*	71	=	1786		1.67
Floor slab / basement ceiling	B	256.9	*	0.099	*	1.00	*	53	=	1357		1.27
	A		*		*	1.00	*		=			
	A		*		*	1.00	*		=			
	A		*		*	1.00	*		=			
Windows	A	157.2	*	1.081	*	1.00	*	71	=	12095		11.29
Exterior door	A	50.4	*	0.800	*	1.00	*	71	=	2868		2.68
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		1180.2	Total transmission heat losses Q _T =							22344	kWh/(m²a)	20.9

Ventilation heat losses Q_V

	n _{V,system} 1/h		η*SHX		η _{HR}		n _{V,Res} 1/h		n _{V,equi,fraction} 1/h			
Reference volume for the ventilation system, V _V (A _{TFA} *h)												
Effective air change rate Ambient n _{V,e}	0.255	*(1-	0%	)*(1-	0.00	)+	0.060	=	0.316			
Effective air change rate Ground n _{V,g}	0.255	*	0%	)*(1-	0.00	)		=	0.000			
Ventilation losses ambient Q _V	2678	*	0.316	*	0.33	*	71	=	19871	kWh/(m²a)		18.6
Ventilation losses ground Q _{V,e}	2678	*	0.000	*	0.33	*	47	=	0			0.0
Total ventilation heat losses Q _V =										19871		18.6

Total heat losses Q_L

(	22344	+	19871	)	*	1.0	=	42215		39.4
	Q _T		Q _V			Reduction factor				
	kWh/a		kWh/a			night/weekend		kWh/a		kWh/(m²a)
						lowering				

Available solar heat gains Q_S

Orientation of the area	Reduction factor see 'Windows' worksheet		g-value (perp. radiation)		Area m²		Global radiation kWh/(m²a)		kWh/a			
North	0.24	*	0.46	*	30.6	*	152	=	525			
East	0.00	*	0.00	*	0.0	*	327	=	0			
South	0.54	*	0.46	*	113.5	*	537	=	15075			
West	0.42	*	0.46	*	13.1	*	354	=	896			
Horizontal	0.00	*	0.00	*	0.0	*	487	=	0			
Sum opaque areas									689			
Total available solar heat gains Q _S =										17185	kWh/(m²a)	16.0

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	*	243	*	2.8	*	1071.1	=	17200		16.1

Utilisation factor heat gains η_G

Free heat Q _F	Q _S + Q _I =	34385	kWh/(m²a)	32.1
Ratio free heat to losses	Q _F / Q _L =	0.81		
Utilisation factor heat gains η _G	=	88%		

Total heat gains Q_G

η _G * Q _F =	30265	kWh/a	28.3
		kWh/(m²a)	

Annual heating demand Q_H

Q _L - Q _G =	11950	kWh/(m²a)	11.2
-----------------------------------	-------	-----------	------

Limit value

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

Specific energy for heating (monthly method)

Passive House with PHPP Version 10.4a EN



Block A1 Cranwood House / Climate: Northolt / TFA: 1071 m² / Heating: 11.2 kWh/(m²a) / Overheating: 8 % / PER: 22.2 kWh/(m²a)

Interior temperature:

20

°C

Building type:

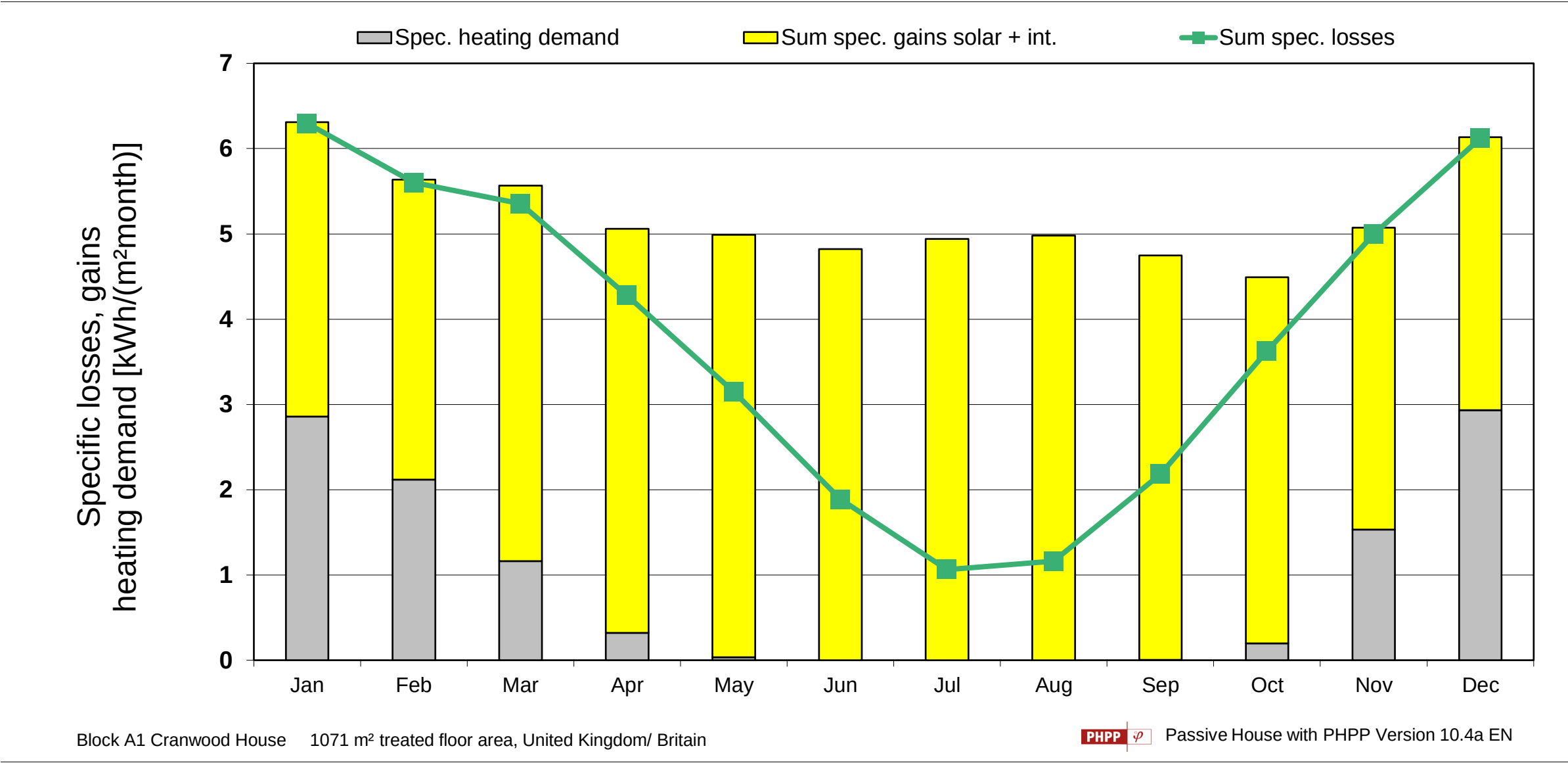
5-Multi-family house I Apartment building

Treated floor area A_{TFA}:

1071

m²

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	
Heating degree hours - exterior	11.5	10.2	9.7	7.6	5.5	3.1	1.6	1.8	3.8	6.5	9.1	11.2	82	kKh
Heating degree hours - ground	6.0	6.0	7.5	8.0	8.7	8.4	8.3	7.6	6.5	6.0	5.4	5.6	84	kKh
Losses - exterior	6591	5844	5542	4376	3150	1807	926	1050	2168	3726	5214	6415	46809	kWh
Losses - ground	152	154	192	204	222	215	212	193	167	153	138	142	2144	kWh
Sum spec. losses	6.3	5.6	5.4	4.3	3.1	1.9	1.1	1.2	2.2	3.6	5.0	6.1	45.7	kWh/m²
Solar gains - North	24	42	80	115	151	181	167	135	82	60	32	21	1090	kWh
Solar gains - East	0	0	0	0	0	0	0	0	0	0	0	0	0	kWh
Solar gains - South	1390	1616	2206	2500	2554	2426	2486	2622	2593	2145	1523	1141	25203	kWh
Solar gains - West	53	76	134	189	217	227	243	211	158	117	69	42	1735	kWh
Solar gains - Horiz.	0	0	0	0	0	0	0	0	0	0	0	0	0	kWh
Solar gains - Opaque	36	55	103	150	189	206	203	174	123	82	45	29	1395	kWh
Internal heat gains	2194	1982	2194	2123	2194	2123	2194	2194	2123	2194	2123	2194	25835	kWh
Sum spec. gains solar + int.	3.5	3.5	4.4	4.7	5.0	4.8	4.9	5.0	4.7	4.3	3.5	3.2	51.6	kWh/m²
Utilisation factor	100%	99%	95%	83%	63%	39%	21%	23%	46%	80%	98%	100%	67%	
Annual heating demand	3062	2267	1244	341	38	1	0	0	3	212	1642	3141	11950	kWh
Spec. heating demand	2.9	2.1	1.2	0.3	0.0	0.0	0.0	0.0	0.0	0.2	1.5	2.9	11.2	kWh/m²



Annual heating demand: Comparison

Monthly method	(<i>'Heating'</i>)	11950 kWh/a	11.2 kWh/(m²a) reference to treated floor area according to PHPP
Annual method	(<i>'Annual heating'</i>)	13141 kWh/a	12.3 kWh/(m²a) reference to treated floor area according to PHPP

Heating load



Block A1 Cranwood House / Climate: Northolt / TFA: 1071 m² / Heating: 11.2 kWh/(m²a) / Overheating: 8 % / PER: 22.2 kWh/(m²a)

Interior temperature:

20

°C

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

Treated floor area A_{TFA}:

1071.1

m²

Design temperature

Radiation:

North

East

South

West

Horizontal

Weather 1:

-1.5

°C

Weather 2:

1.5

°C

Ground design temp.

12.5

°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	458.9	* 0.130	* 1.00	* 21.5	or 18.5	= 1281	or 1102
External wall ground/basement	B		*	* 1.00	* 7.5	or 7.5	=	or
Roof / ceiling - ambient	A	256.9	* 0.098	* 1.00	* 21.5	or 18.5	= 540	or 465
Floor slab / basement ceiling	B	256.9	* 0.099	* 1.00	* 7.5	or 7.5	= 191	or 191
	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	157.2	* 1.081	* 1.00	* 21.5	or 18.5	= 3655	or 3145
Exterior door	A	50.4	* 0.800	* 1.00	* 21.5	or 18.5	= 867	or 746
Thermal bridges ambient (length/m)	A		*	* 1.00	* 21.5	or 18.5	=	or
Perimeter thermal bridges (length/m)	P		*	* 1.00	* 7.5	or 7.5	=	or
Thermal bridges ground (length/m)	B		*	* 1.00	* 7.5	or 7.5	=	or
Building element towards neighbour	I		*	* 1.00	* 3.0	or 3.0	=	or
Total							= 6533	or 5649

Ventilation heat load P_V

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

1071.1

*

2.50

=

2677.6

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

0.151

+

n_{V,system}

1/h

0.255

*(1-

Φ_{HP}

0.00

or

Φ_{HP}

0.00

) =

1/h

0.407

or

1/h

0.407

V_V

m³

2677.6

*

n_V

1/h

0.407

or

n_V

1/h

0.407

*

c_{Air}

Wh/(m³K)

0.33

*

TempDiff 1

K

21.5

or

TempDiff 2

K

18.5

=

P_V 1

W

7729

or

P_V 2

W

6651

Total heat load P_L

P_T + P_V

=

14262

or

12300

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		30.6	* 0.5	* 0.24	* 8	or 5	= 28	or 18
East		0.0	* 0.0	* 0.40	* 12	or 5	= 0	or 0
South		113.5	* 0.5	* 0.54	* 28	or 15	= 777	or 409
West		13.1	* 0.5	* 0.42	* 15	or 11	= 39	or 27
Horizontal		0.0	* 0.0	* 0.40	* 20	or 15	= 0	or 0
Total solar heat power P _S							= 844	or 454

Internal heat load P_I

Spec. power

W/m²

2.3

*

A_{TFA}

m²

1071

=

P_I 1

W

2414

or

P_I 2

W

2414

Total heat power (gains) P_G

P_S + P_I

=

3258

or

2868

P_G 1

W

P_G 2

W

Heating load P_H

P_L - P_G

=

11005

or

9432

Heating load P_H

=

11005

W

Area specific space heating load P_H / A_{TFA}

=

10.3

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}

=

12079

W

P_{Supply,Max} / A_{TFA}

=

11.3

W/m²

Heating via supply air?

Yes

PHPP, Heating load

BP10479 PHPP_Block A1-Rev 3.xlsx

Summer ventilation



Block A1 Cranwood House / Climate: Northolt / TFA: 1071 m² / Heating: 11.2 kWh/(m²a) / Overheating: 8 % / PER: 22.2 kWh/(m²a)

Building volume:	2678	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:

0.26

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}		$n_{V,\text{equi},\text{fraction}}$ 1/h
Exterior $n_{V,e}$	0.255	*(1-	0%	)*(1-	0.00	) =	0.255
without HR	0.255	*(1-	0%	)		=	0.255
Ground $n_{L,g}$	0.255	*	0%	*(1-	0.00	) =	0.000
without HR	0.255	*	0%			=	0.000

Ventilation conductance

	V_V m³		$n_{V,\text{equi},\text{fraction}}$ 1/h		C_{Air} Wh/(m³K)		
exterior $H_{V,e}$	2678	*	0.255	*	0.33	=	225.7 W/K
without HR	2678	*	0.255	*	0.33	=	225.7 W/K
ground $H_{V,g}$	2678	*	0.000	*	0.33	=	0.0 W/K
without HR	2678	*	0.000	*	0.33	=	0.0 W/K
Infiltration, window, extract air system	2678	*	0.060	*	0.33	=	53.4 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

0.01

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: 8.5% Max. humidity: 17.0 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	30%						
Climate boundary conditions							
Temperature diff interior - exterior	1	1	1	1	1	1	K
Wind velocity	0	0	0	0	0	0	m/s
Window group 1							
Quantity	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	0.01	0.00	0.00	0.00	0.00	0.00	0.01 1/h

Treated floor area A_{TFA} :	1071.1	m ²
Building volume:	2678	m ³
Internal humidity sources:	2.6	g/(m ² h)

Temperature

Summer ventilation

HRV/ERV
X

Additional ventilation

X

Orientation of the area	Angle factor		Shading factor		Dirt		g-value (perp. radiation)		Area		Glazing fraction		Aperture	
	Summer		Summer						m ²				m ²	
North	0.9	*	1.00	*	0.95	*	0.46	*	30.6	*	40%	=	4.9	
East	0.9	*	1.00	*	0.95	*	0.00	*	0.0	*	0%	=	0.0	
South	0.9	*	0.11	*	0.95	*	0.46	*	113.5	*	68%	=	3.2	
West	0.9	*	1.00	*	0.95	*	0.46	*	13.1	*	69%	=	3.6	
Horizontal	0.9	*	1.00	*	0.95	*	0.00	*	0.0	*	0%	=	0.0	
Sum opaque areas													2.2	
												Solar aperture	=	13.8

Specif. power q_i		A_{TFA}		
W/m^2		m^2		W
2.8	*	1071	=	2949

At the overheating limit $\vartheta_{\max} = 25\text{ °C}$

1.0 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	0.01	0.01	0.00	0.01	0.01	
Use of temporary shading	-	90%	70%	90%	0%	90%	
Internal heat gains	W/m²	2.8	3.4	2.8	2.8	5.5	

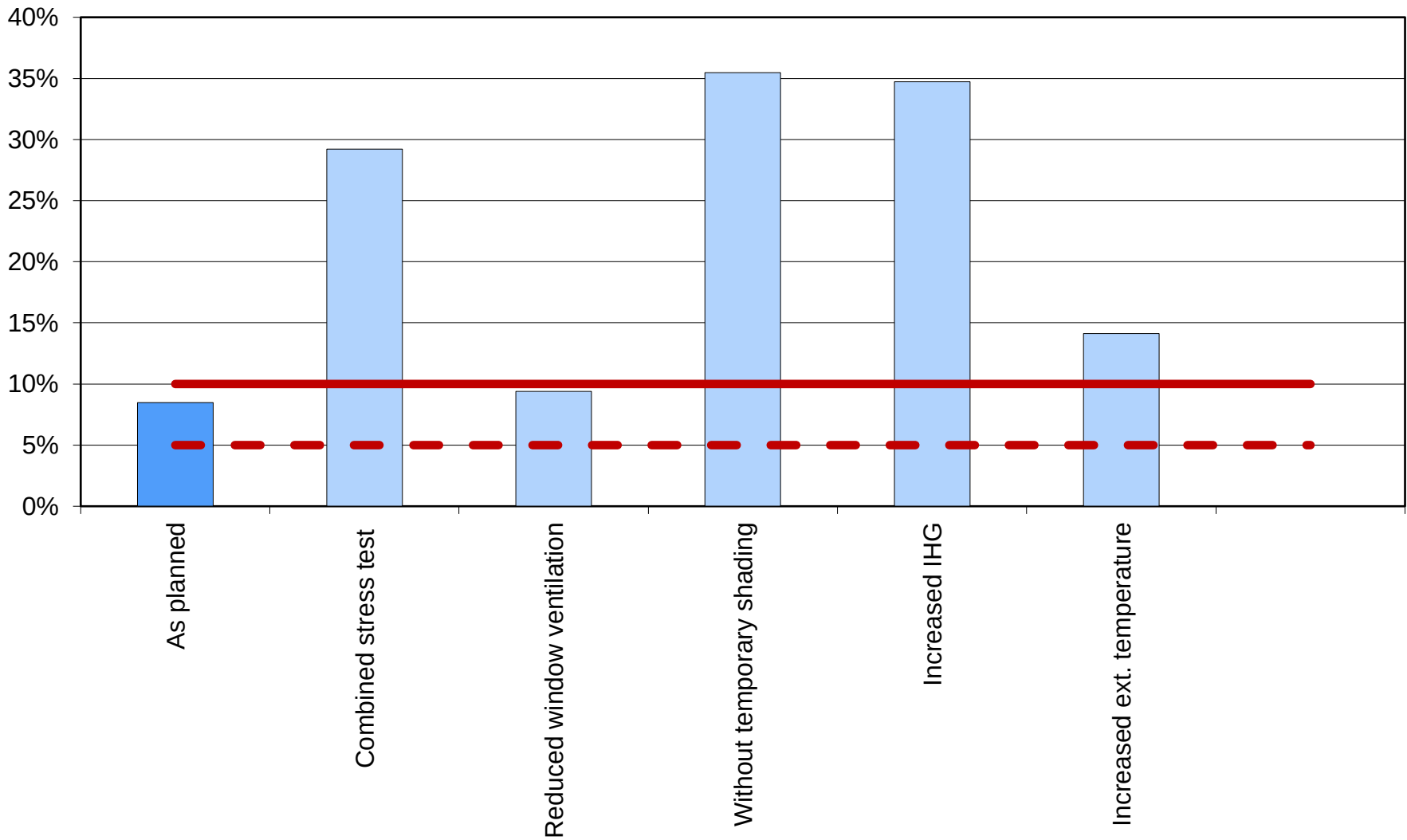
Summer climate

Summer temperature increase	K	0.0	1.5	0.0	0.0	0.0	2.0	
-----------------------------	---	-----	-----	-----	-----	-----	-----	--

Results

Frequency of overheating		8%	29%	9%	35%	35%	14%	-
Overheating degree hours	Kh	698	6311	804	10844	9420	2669	-
Daily indoor temperature fluctuation	K	1.0	1.3	1.0	1.9	1.5	1.0	-

Frequency of overheating



Cooling: specific energy demand for useful cooling

Passive House with PHPP Version 10.4a EN



Block A1 Cranwood House / Climate: Northolt / TFA: 1071 m² / Heating: 11.2 kWh/(m²a) / Overheating: 8 % / PER: 22.2 kWh/(m²a)

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} :	1071.1	m²
Interior temperature summer:	25	°C	Building volume:	2678	m³
Max. indoor absolute humidity:	12	g/kg	Internal humidity sources:	2.6	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	458.9	*	0.130	*	1.00	*	57	=	3385		3.16
External wall ground/basement	B		*		*	1.00	*		=			
Roof / ceiling - ambient	A	256.9	*	0.098	*	1.00	*	57	=	1426		1.33
Floor slab / basement ceiling	B	256.9	*	0.099	*	1.00	*	53	=	1365		1.27
	A		*		*	1.00	*		=			
	A		*		*	1.00	*		=			
	A		*		*	1.00	*		=			
Windows	A	157.2	*	1.081	*	1.00	*	57	=	9659		9.02
Exterior door	A	50.4	*	0.800	*	1.00	*	57	=	2290		2.14
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		1180.2				Total transmission heat losses Q _T			=	18126		16.9
												kWh/(m²a)

Ventilation heat losses Q _V			Information from the 'SummVent' worksheet							
Ventilation conductance, vent. unit			Ventilation parameter s			Summer ventilation control				
exterior H _{V,e}	225.7	W/K	Daily temperature fluctuation in summer	9.4	K	HRV/ERV in summer				
without HR	225.7	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	0.26	1/h	Enthalpy controlled				
Ventilation conductance, others			Outdoor air change rate	0.06	1/h	Always				
exterior	53.4	W/K	Window night vent. air change rate, manual @ 1K	0.01	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:			η _{V,system}	η* _{SHX}	η _{HR}	η _{V,Rest}	η _{V,equi,fraction}			
			1/h		(considers bypass)	1/h	1/h			
Effective air change rate ambient n _{V,e}			0.255	*(1-	0.00	)+	0.060	= 0.316		
Effective air change rate ground n _{V,g}			0.255	*	0.00	)		= 0.000		
Ventilation losses ambient Q _V			V _V	η _{V,equi,fraction}	c _{Air}	G _t				
			m³	1/h	Wh/(m³K)	kKh/a	kWh/a	kWh/(m²a)		
			2678	* 0.316	* 0.33	* 54	= 15178	14.2		
Ventilation losses ground Q _{V,e}			2678	* 0.000	* 0.33	* 0	= 0	0.0		
Heat losses summer ventilation			2678	* 0.012	* 0.33	* 72	= 756	0.7		
Total ventilation heat losses Q _V							=	15934	14.9	
Total heat losses Q _L					18126	+	15934	=	34060	31.8
					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	0.35	*	0.46	*	30.6	*	259	=	1258		1.2
East	0.40	*	0.00	*	0.0	*	552	=	0		0.0
South	0.17	*	0.46	*	113.5	*	617	=	5561		5.2
West	0.59	*	0.46	*	13.1	*	538	=	1922		1.8
Horizontal	0.40	*	0.00	*	0.0	*	836	=	0		0.0
Sum opaque areas									1127		1.1
Total										9868	9.2
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	*	214	*	2.8	*	1071.1	=	15147		14.1
Sum heat loads Q _F							Q _S + Q _I	=	25015		23.4
										kWh/a	kWh/(m²a)

Utilisation factor heat losses η_L									
Useful cooling demand Q_K	Ratio of losses to free heat gains		$Q_L / Q_F =$		1.36				
	Utilisation factor heat losses η_L		$=$		67%				
					kWh/a		kWh/(m²a)		
	Useful heat losses $Q_{L,n}$		$\eta_L * Q_L =$		22905		21.4		
					kWh/a		kWh/(m²a)		
			$Q_F - Q_{L,n} =$		2109		2.0		
		kWh/(m²*a)							
Recommendation		15		Target value reached?		Yes			

Dehumidification demand Q _{Dr}						
			Q _{Tr}	=	88	0.1
			kWh/(m²*a)			
	Recommendation		0			
Target value reached?				Yes		

Cooling: specific energy demand for useful cooling

Passive House with PHPP Version 10.4a EN



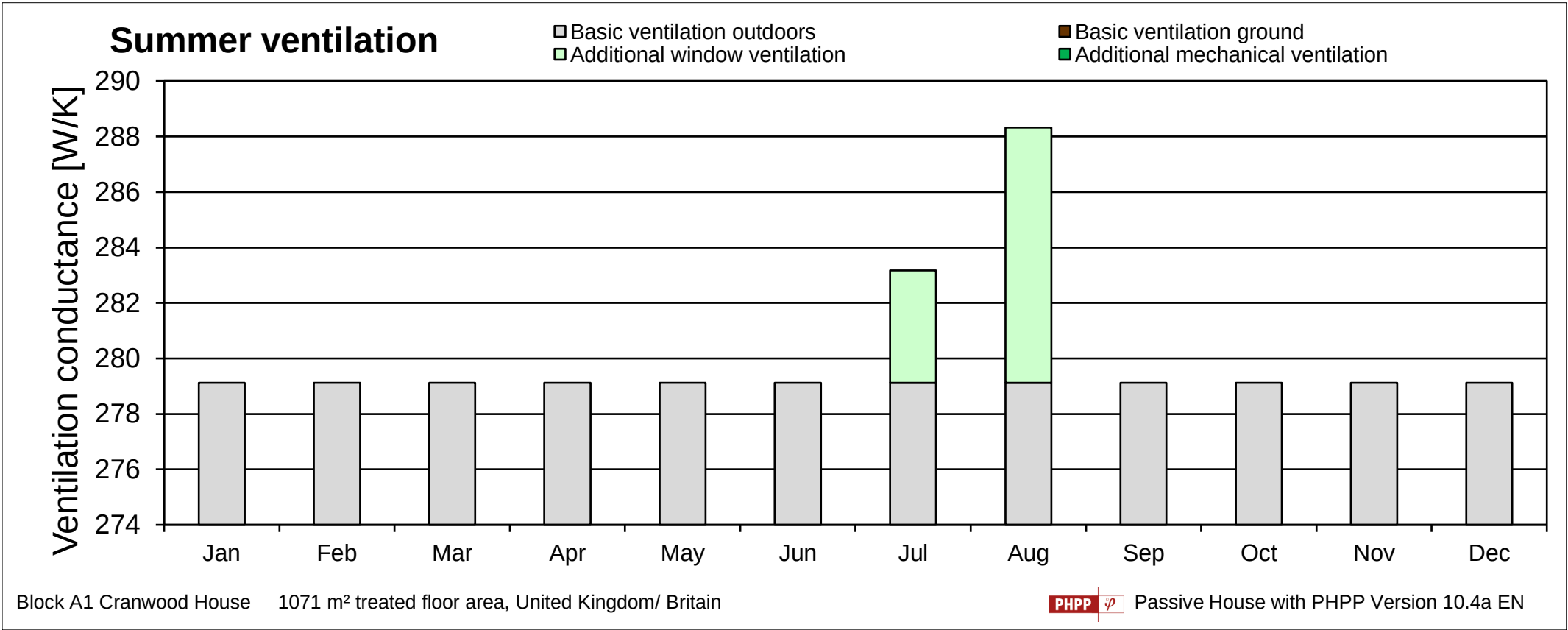
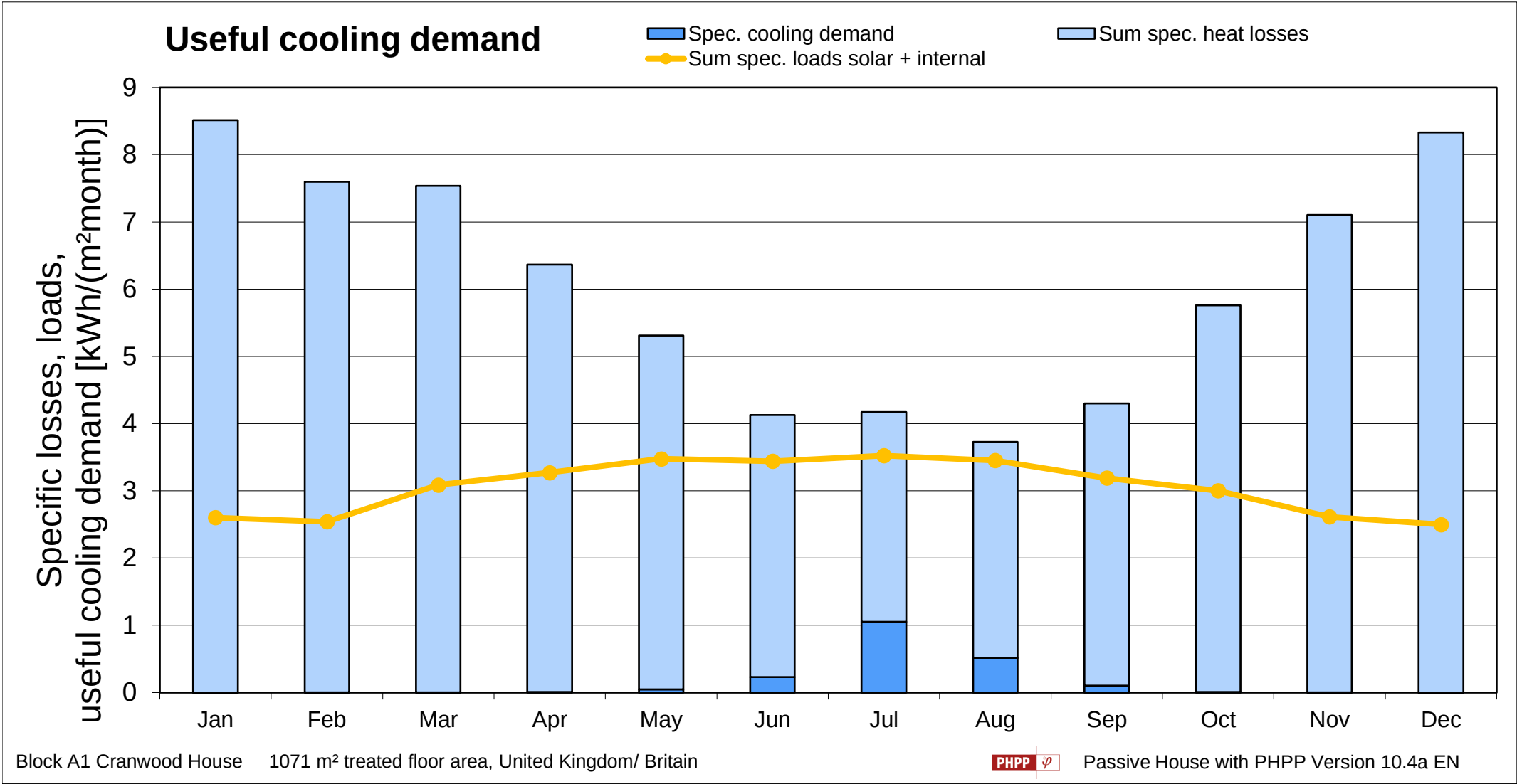
Block A1 Cranwood House / Climate: Northolt / TFA: 1071 m² / Heating: 11.2 kWh/(m²a) / Overheating: 8 % / PER: 22.2 kWh/(m²a)

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

Interior Temperature: 25 °C

Treated floor area A_{TFA}: 1071 m²

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	
Heating degree hours - Exterior	15.4	13.7	13.6	11.4	9.4	6.9	5.5	5.7	7.5	10.4	12.8	15.0	127	kKh
Heating degree hours - Ground	6.0	6.0	7.5	8.0	8.7	8.4	8.3	7.6	6.5	6.0	5.4	5.6	84	kKh
Losses - Exterior	8726	7772	7676	6442	5285	3873	3061	3184	4234	5861	7280	8549	71942	kWh
Losses - Ground	152	154	192	204	222	215	212	193	167	153	138	142	2144	kWh
Losses summer ventilation	239	212	202	162	126	87	69	70	97	144	191	233	1833	kWh
Sum spec. heat losses	8.5	7.6	7.5	6.4	5.3	3.9	3.1	3.2	4.2	5.7	7.1	8.3	70.9	kWh/m²
Solar load North	34	59	113	162	213	256	236	191	116	84	45	29	1539	kWh
Solar load East	0	0	0	0	0	0	0	0	0	0	0	0	0	kWh
Solar load South	446	519	708	803	820	779	798	842	832	688	489	366	8089	kWh
Solar load West	75	108	189	266	306	320	343	298	223	165	97	59	2450	kWh
Solar load Horiz.	0	0	0	0	0	0	0	0	0	0	0	0	0	kWh
Solar load Opaque	36	55	103	150	189	206	203	174	123	82	45	29	1395	kWh
Internal heat gains	2194	1982	2194	2123	2194	2123	2194	2194	2123	2194	2123	2194	25835	kWh
Sum spec. loads solar + internal	2.6	2.5	3.1	3.3	3.5	3.4	3.5	3.5	3.2	3.0	2.6	2.5	36.7	kWh/m²
Utilisation factor losses	31%	33%	41%	51%	65%	82%	79%	91%	74%	52%	37%	30%	50%	
Useful cooling energy demand	0	0	2	10	53	249	1127	548	109	10	1	0	2109	kWh
Spec. cooling demand	0.0	0.0	0.0	0.0	0.0	0.2	1.1	0.5	0.1	0.0	0.0	0.0	2.0	kWh/m²
Specif. dehumidification demand	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	kWh/m²
Sensible fraction	100%	100%	100%	100%	100%	100%	93%	100%	100%	100%	100%	100%	96%	



Cooling units

Passive House with PHPP Version 10.4a EN



Block A1 Cranwood House / Climate: Northolt / TFA: 1071 m² / Heating: 11.2 kWh/(m²a) / Overheating: 8 % / PER: 22.2 kWh/(m²a)

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

Treated floor area A_{TFA}: 1071.1 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: 0.3 1/h

Internal humidity sources: 2.6 g/(m²h)

Building volume: 2678 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

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

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

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			2.0		0.1				96%	

PHPP, Cooling units

BP10479 PHPP_Block A1-Rev 3.xlsx

Unsatisfied demand

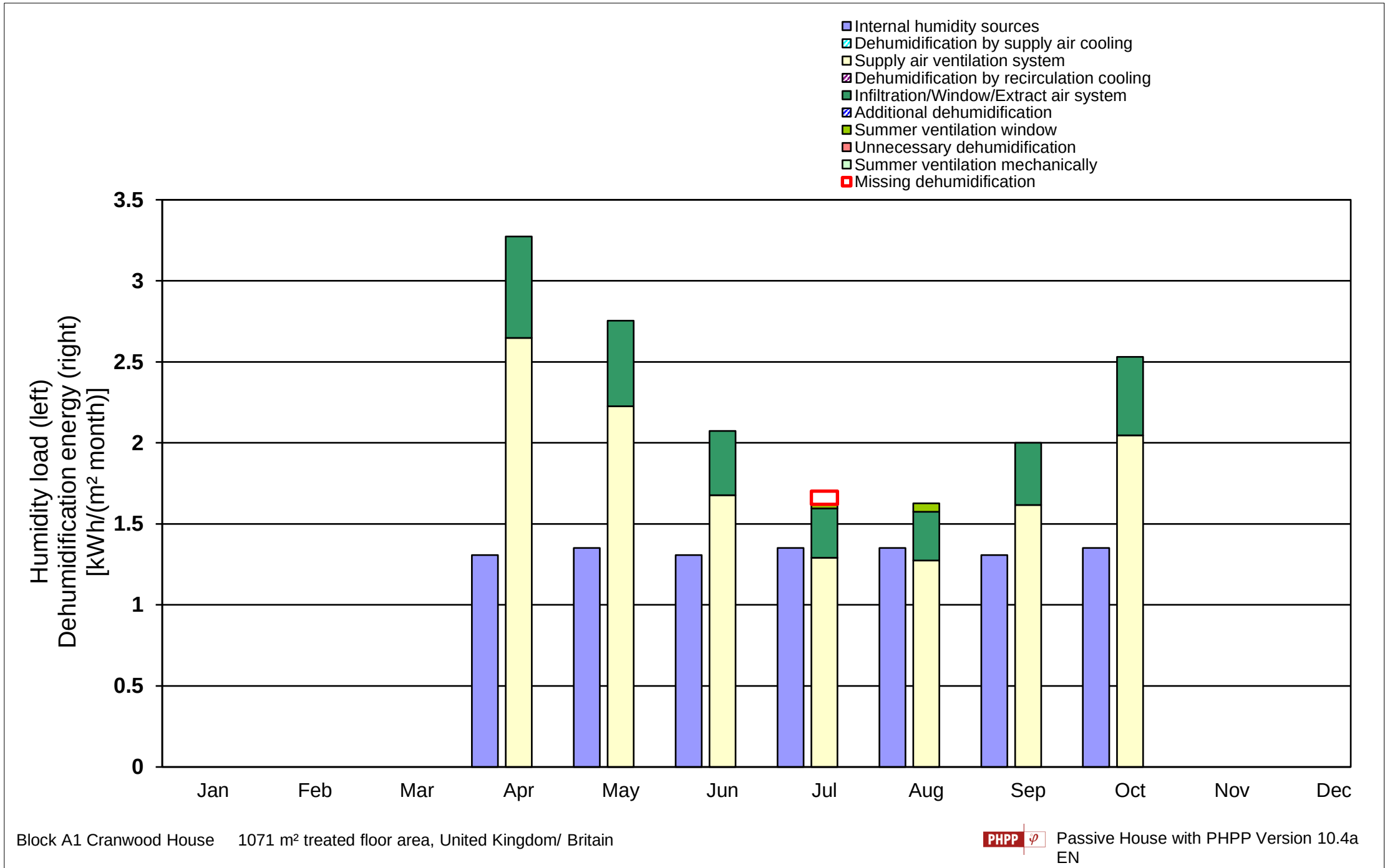
Cooling demand covered?

Cooling units

Block A1 Cranwood House / Climate: Northolt / TFA: 1071 m² / Heating: 11.2 kWh/(m²a) / Overheating: 8 % / PER: 22.2 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	1.2	1.4	1.3	1.4	1.3	1.4	1.4	1.3	1.4	1.3	1.4	16	kWh/m²
Infiltration/Window/Extract air system	-0.7	-0.7	-0.7	-0.6	-0.5	-0.4	-0.3	-0.3	-0.4	-0.5	-0.6	-0.7	-6	kWh/m²
Supply air ventilation system	-3.0	-2.8	-3.0	-2.6	-2.2	-1.7	-1.3	-1.3	-1.6	-2.0	-2.5	-2.9	-27	kWh/m²
Summer ventilation window	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0	kWh/m²
Summer ventilation mechanically	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	kWh/m²
Total humidity load	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	kWh/m²
Dehumidification by supply air cooling	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	kWh/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	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0	kWh/m²



Cooling load



Block A1 Cranwood House / Climate: Northolt / TFA: 1071 m² / Heating: 11.2 kWh/(m²a) / Overheating: 8 % / PER: 22.2 kWh/(m²a)

Building type:	5-Multi-family house Apartment building	
Treated floor area A _{TFA} :	1071.1	m²
Building volume:	2678	m³
Spec. capacity:	60	Wh/(m²K)
Max. indoor absolute humidity:	12.0	g/kg
Internal humidity sources:	2.6	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.		13.9	°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	458.9	0.130	1.00	1.0	-4.3	59	-257
External wall ground/basement	B			1.00	-11.1	-11.1		
Roof / ceiling - ambient	A	256.9	0.098	1.00	1.0	-4.3	25	-108
Floor slab / basement ceiling	B	256.9	0.099	1.00	-11.1	-11.1	-285	-285
	A			1.00	1.0	-4.3		
	A			1.00	1.0	-4.3		
	A			1.00	1.0	-4.3		
Windows	A	157.2	1.081	1.00	1.0	-4.3	167	-733
Exterior door	A	50.4	0.800	1.00	1.0	-4.3	40	-174
Thermal bridges ambient (length/m)	A			1.00	1.0	-4.3		
Perimeter thermal bridges (length/m)	P			1.00	-11.1	-11.1		
Thermal bridges ground (length/m)	B			1.00	-11.1	-11.1		
Building element towards neighbour	I			1.00	3.0	3.0		
Radiation correction outdoor air			L _{ambient} W/K	-12.8	1.0	-4.3	-13	55
Radiation correction sky			L _{Sky} W/K	12.6	-7.1	-10.5	-89	-133
Total transmission heat load P _T							-96	-1635

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}	2678	0.316	0.33	1.0	-4.3	275	-1204
Ventilation load ground P _{V,g}	2678	0.000	0.33	-13.1	-13.1	0	0
Ventilation load summer ventilation	2678	0.000	0.33	0.0	0.0	0	0
Total ventilation heat load P _L						275	-1204

Orientation of the area	Area	g-value	Reduction factor	Radiation 1	Radiation 2	P _T 1	P _T 2
	m²	(perp. radiation)	(see 'Windows' worksheet)	W/m²	W/m²	W	W
North	30.6	0.5	0.35	97	51	470	249
East	0.0	0.0	0.40	220	180	0	0
South	113.5	0.5	0.06	186	255	596	815
West	13.1	0.5	0.59	225	193	802	690
Horizontal	0.0	0.0	0.40	320	260	0	0
Sum opaque areas						435	343
Total solar load P _S						2303	2097

Spec. power	A _{TFA}	P _I 1	P _I 2
W/m²	m²	W	W
2.8	1071	2949	2949

Cooling load P _C		P _T + P _V + P _S + P _I	5431	2207
Cooling load P _C			5431	W
Area specific cooling load P _C / A _{TFA}			5.1	W/m²
For comparison: cooling capacity that can be transported by the supply air				
Please enter the minimum supply air temperature.		Supply air temperature without cooling	26.0	20.7
		°C		
Cooling capacity that can be transported by the supply air P _{Supply air; max}			5188	3992
P _{Supply air; max} /A _{TFA}			4.8	3.7
			W	W/m²
Air conditioning over the supply air possible?			No	
Conductance values		Performance	Part of the day	ΔT [K]
Transmittance	294.8 W/K	Transmission + Ventilation	13	-1349
Ventilation conductance	279.1 W/K	Solar load	6 h - 12 h	9156
Conductance summer ventilation	0.0 W/K	Internal load	12 h - 18 h	11853
Heat capacity	64263 Wh/K	Night ventilation	18 h - 24 h	1349
			Average value	5252
Cross check: daily indoor temperature fluctuation		Daily indoor temperature fluctuation		1.0 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	191	or	191	kg/h	Supply air mass flow	807	or	807	kg/h																		
Summer vent. air mass flow	0	or	0	kg/h	Hum. load, supply air	1953	or	104	g/h																		
Humidity load, outdoor air	462	or	25	g/h	Hum. load, internal	2748	or	2748	g/h																		
										Enthalpy of vaporisation		Humidity load		Humidity load		P _D 1		P _D 2									
										Wh/kg	g/kg	g/h	g/h	W	W												
										708	/	1000	*	5163	or	2876	=	3654	or	2036							
																				Dehumidification load P _T		=	3654	W			
																				Area specific dehumidification load P _T / A _{TFA}		=	3.4	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	0.2	1.1	0.5	0.1	0.0	0.0	0.0	0.0	kWh/m ²
Specific dehumidification demand														0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	kWh/m ²
Sensible fraction														100%	100%	100%	100%	100%	100%	93%	100%	100%	100%	100%	100%	100%	

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

Heat distribution and domestic hot water (DHW) system



Block A1 Cranwood House / Climate: Northolt / TFA: 1071 m² / Heating: 11.2 kWh/(m²a) / Overheating: 8 % / PER: 22.2 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} :	1071	m²			
Number or occupants per day:	27.5	Pers			
Number of dwelling units:	14				
Annual heating demand q _{Heating} :	11950	kWh/a	Annual useful cooling dem. q _{Cool} :	2109	kWh/a
Length of heating period:	243	d/a	Length cooling period:	214	d/a
Average heating load P _{Average} :	2.5	kW	Average cooling load P _{Average} :	0.4	kW
Marginal usability of additional heat gains:	62%		Marginal usability of additional heat losses:	17%	

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	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0		
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											0	0.0
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)
				13991	13.1

Secondary calculation for determining the DHW requirements (for non-res)

DHW distribution

Room temperature θ_x °C

DHW circulation pipes or, for heat interface units, forward and return flows

Common pipe heating + DHW?					
Length of pipes (forward + return flows)	L_{HS}	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
Thermal bridge surcharge mountings		W/K			
Total heat loss coefficient	Ψ	W/(mK)			
Daily operating time of circulation	t_{dCirc}	h/d	24	24	24
Forward flow temperature	θ_V	°C			
Pipes to heat interface unit?					
Return flow temperature	θ_R	°C			
Operating time of the circulation in winter	t_{Circ}	h/a			
Operating time of the circulation in summer	t_{Circ}	h/a			
Heat loss circulation pipes in winter	QZ	kWh/a			
Heat loss circulation pipes in summer	QZ	kWh/a			

DHW stub pipes / individual pipes

DHW temperature	θ_v	°C					
Exterior pipe diameter	d_{U_Pipe}	mm					
Total length of individual pipes	L_U	m					
Number of tapping points in building	$n_{tapping\ point}$	-					
Average pipe length per tapping point	$L_{U,\ average}$	m					
Tap openings per person per day		-	6	6	6	6	6
Utilisation days per year		d	365	365	365	365	365
Number of tap openings per year and person	n_{Tap}	Openings/a					
Heat emission per tap opening in winter	$q_{Individual}$	kWh/Opening					
Heat emission per tap opening in summer	$q_{Individual}$	kWh/Opening					
Heat emission from single pipes in winter	Q_U	kWh/a					
Heat emission from single pipes in summer	Q_U	kWh/a					

Total heat losses of DHW distribution

Total heat losses of DHW distribution Q_{WL}

Performance ratio of DHW distribution pipes

Performance ratio of DHW distribution pipes	ea_{HL}	-
---	-----------	---

Outside thermal envelope				
1	2	3	4	5
11.0	11.0	11.0	11.0	11.0

1 - None	1 - None	1 - None	1 - None	1 - None
24	24	24	24	24

Total values	
Absolute	Specific

kWh/a	kWh/(m ² a)
0	0.0

6	6	6	6	6
365	365	365	365	365

kWh/a	kWh/(m ² a)
0	0.0

kWh/a	kWh/(m ² a)
0	0.0

100%

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

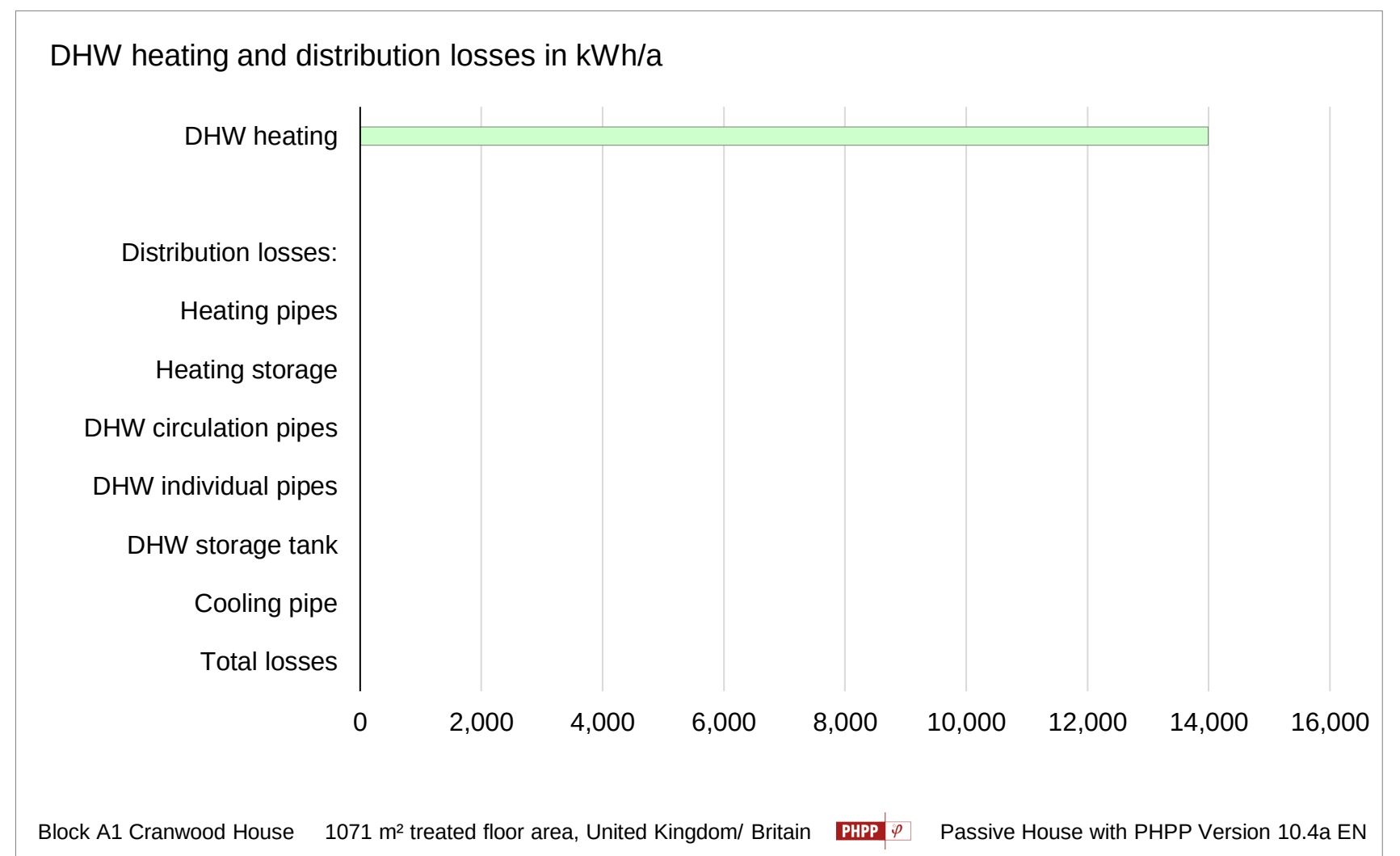
Heat losses of DHW distribution and storage	Q _{WL}	kWh/a	kWh/(m²a)
		0	0.0
Performance ratio DHW distribution + storage	e _{a,WL}	100%	
Total heat demand of DHW system including storage tank	Q _{gDHW}	kWh/a	kWh/(m²a)
		13991	13.1

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
0	0.0
100%	



Solar thermal system



Block A1 Cranwood House / Climate: Northolt / TFA: 1071 m² / Heating: 11.2 kWh/(m²a) / Overheating: 8 % / PER: 22.2 kWh/(m²a)

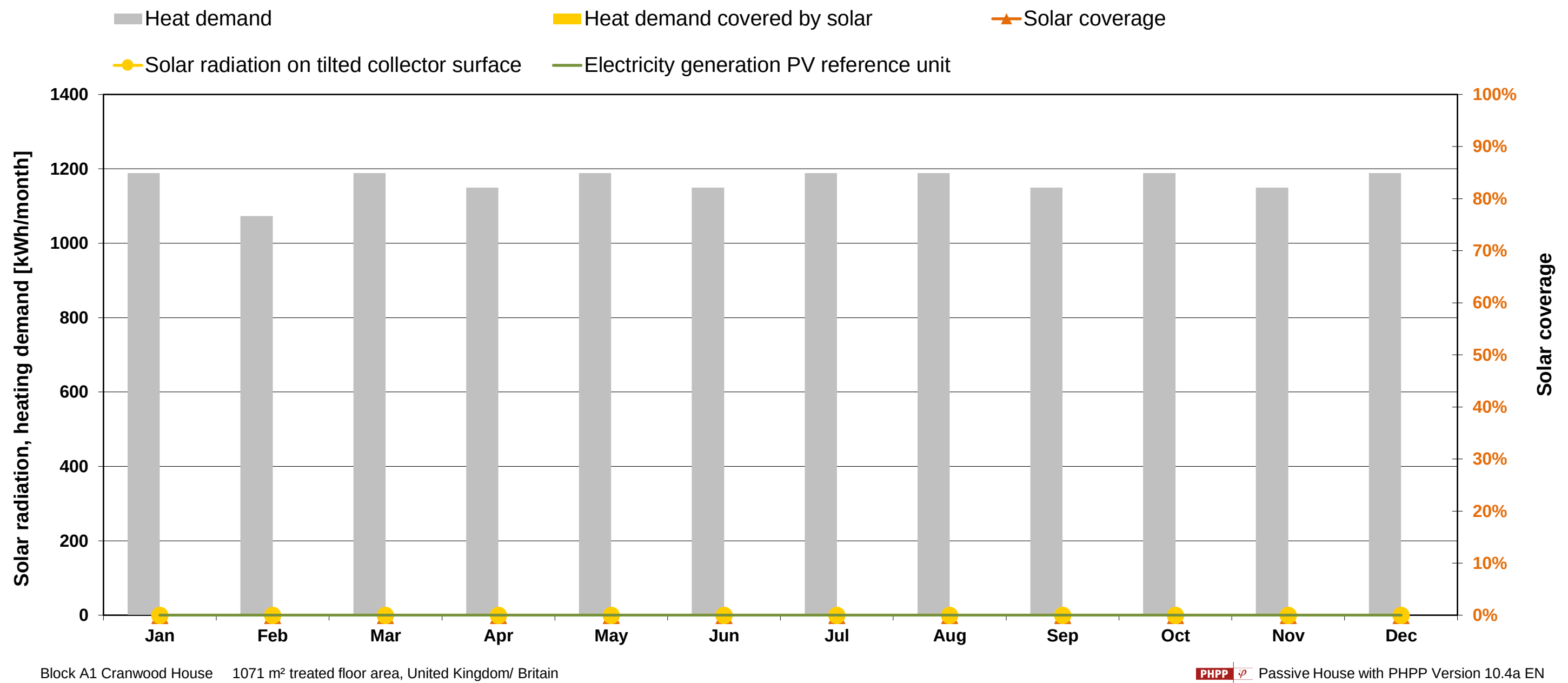
Building type:	5-Multi-family house I Apartment building	
Treated floor area A _{TFA} :	1071.1	m²
Projected building footprint A _{Projected} :	0.0	m²
Latitude ('Climate' worksheet)	51.6	°
DHW heat demand (sheet DHW + distribution)	13991	kWh/a
Heating demand ('Heating' and 'DHW+Distribution' worksheets)	11950	kWh/a
No. of occupants	27.5	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	1188	1073	1188	1150	1188	1150	1188	1188	1150	1188	1150	1188	13991	kWh/month
Heat demand space heating	0	0	0	0	0	0	0	0	0	0	0	0	0	kWh/month
Heat demand	1188	1073	1188	1150	1188	1150	1188	1188	1150	1188	1150	1188	13991	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 A1 Cranwood House / Climate: Northolt / TFA: 1071 m² / Heating: 11.2 kWh/(m²a) / Overheating: 8 % / PER: 22.2 kWh/(m²a)

Climate data set: GB0027a-Northolt, Altitude corrected

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

Projected building footprint: 0.0 m²

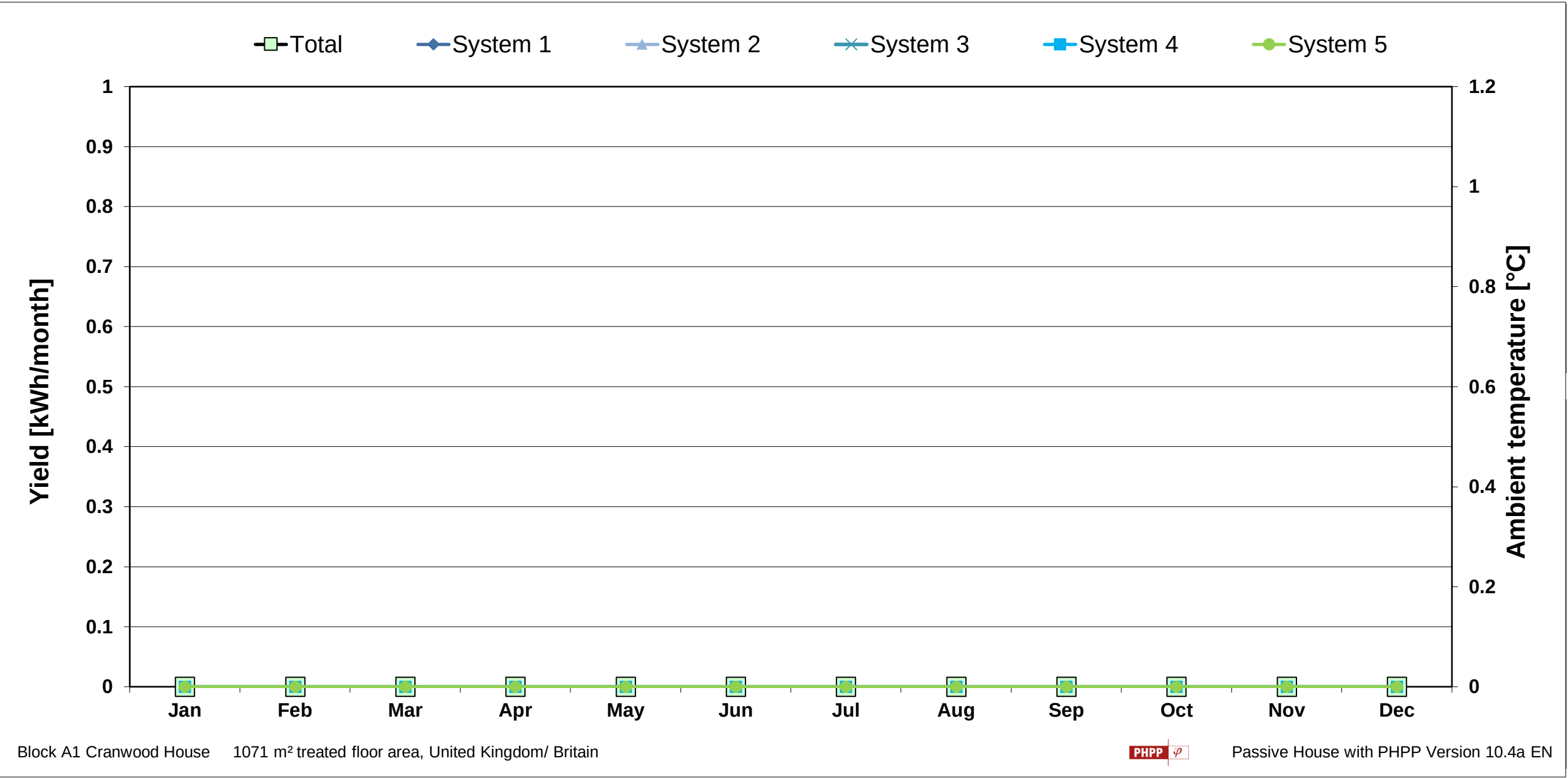
Name of system	System 1	System 2	System 3	System 4	System 5	Reference PV syst.
Location: Selection from 'Areas' worksheet						
Size of selected area						m²
Deviation from North						°
Angle of inclination from horizontal						°
Alternative input: deviation from north						°
Alternative input: angle 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	m²
Free area on the selected building element						m²
Used fraction of building element						
Annual losses due to shading						kWh

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



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

Block A1 Cranwood House / Climate: Northolt / TFA: 1071 m² / Heating: 11.2 kWh/(m²a) / Overheating: 8 % / PER: 22.2 kWh/(m²a)

Number of dwelling units

14

dwelling units

Number of occupants

27.5

persons

Treated floor area A_{TFA}

1071

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									
Column no.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23						
Refrigerating																													
Refrigerator	0	1		1.00	14	dwelling unit(s)	365	d/a		0.34	kWh/d			0	100%	0						0	0						
Freezer	0	1		1.00	14	dwelling unit(s)	365	d/a		0.55	kWh/d			0	100%	0						0	0						
Refrigerator-freezer combination	1	1		1.00	14	dwelling unit(s)	365	d/a		0.61	kWh/d			3117	100%	3117						4052	4679						
Cooking with:																													
1-Electricity																													
Electricity demand	1	1		1.00	27.5	person(s)	500	/(P*a)		0.25	kWh/Use			3434	100%	3434						4465	5155						
Gas demand																	0%					0	0						
Dishwashing																													
2-Cold water connection																													
Electricity demand	1	1		1.00	27.5	person(s)	65	/(P*a)		0.92	kWh/Use	3.0	12	Place settings	117	0.75	23.0	6	1731	100%	1731						2250	2598	
DHW demand																	0%	*	1.30	*	0.00	*(1-	0.00	) =	0				
Clothes washing																													
2-Cold water connection																													
Electricity demand	1	1		1.00	27.5	person(s)	57	/(P*a)		0.79	kWh/Use	2.9	5	kg wash load	88	0.75	23.1	6	1326	100%	1326						1724	1990	
DHW demand																	0%	*	1.05	*	0.00	*(1-	0.00	) =	0				
Drying with																													
4-Condensation dryer																													
Electricity demand	1	1		0.75	27.5	person(s)	57	/(P*a)		2.13	kWh/Use	2.4	5	kg wash load	179	1.50	23.5	13	2682	100%	2682						3486	4025	
Gas demand (for gas dryers)											kWh/Use										0						0	0	
Energy demand from evaporation	0	1		0.50	27.5	person(s)	57	/(P*a)		3.13	kWh/Use										0						0	0	
Lighting																													
Inside dwelling unit:	1	1		4.20	27.5	person(s)	1.2	kh/(P*a)		12	W/lamp	60	lm/W (efficacy)	1662	1662	100%	1662						2160	2494					
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												6259	100%	6259						8137	9395						
Total household electricity															kWh/a	20211	kWh/a				26274	30337	kWh/a						
															kWh/(m²a)	19	kWh/(m²a)				25	28	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	41	kWh/a				68	62	kWh/a							
Total sum electricity demand															kWh/a	20252	kWh/a				26342	30398	kWh/a						
															kWh/(m²a)	19	kWh/(m²a)				25	28	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 A1 Cranwood House / Climate: Northolt / TFA: 1071 m² / Heating: 11.2 kWh/(m²a) / Overheating: 8 % / PER: 22.2 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			

Electricity demand for non-residential buildings (at the moment this worksheet is inactive. Calculation takes place in the 'Electricity' worksheet.)

Passive House with PHPP Version 10.4a EN



Block A1 Cranwood House / Climate: Northolt / TFA: 1071 m² / Heating: 11.2 kWh/(m²a) / Overheating: 8 % / PER: 22.2 kWh/(m²a)

Building type:	5-Multi-family house Apartment building	
Treated floor area A_{TFA} :	1071.1	m ²

For dishwasher + washing machine with DHW connection:

Solar fraction of DHW:	0%
Marginal performance ratio DHW:	0%

	PER factors	PE factors	
Electricity:	1.30	1.5	kWh/kWh
RE gas / Natural gas:	1.75	1.1	kWh/kWh
Energy carrier for DHW:			kWh/kWh

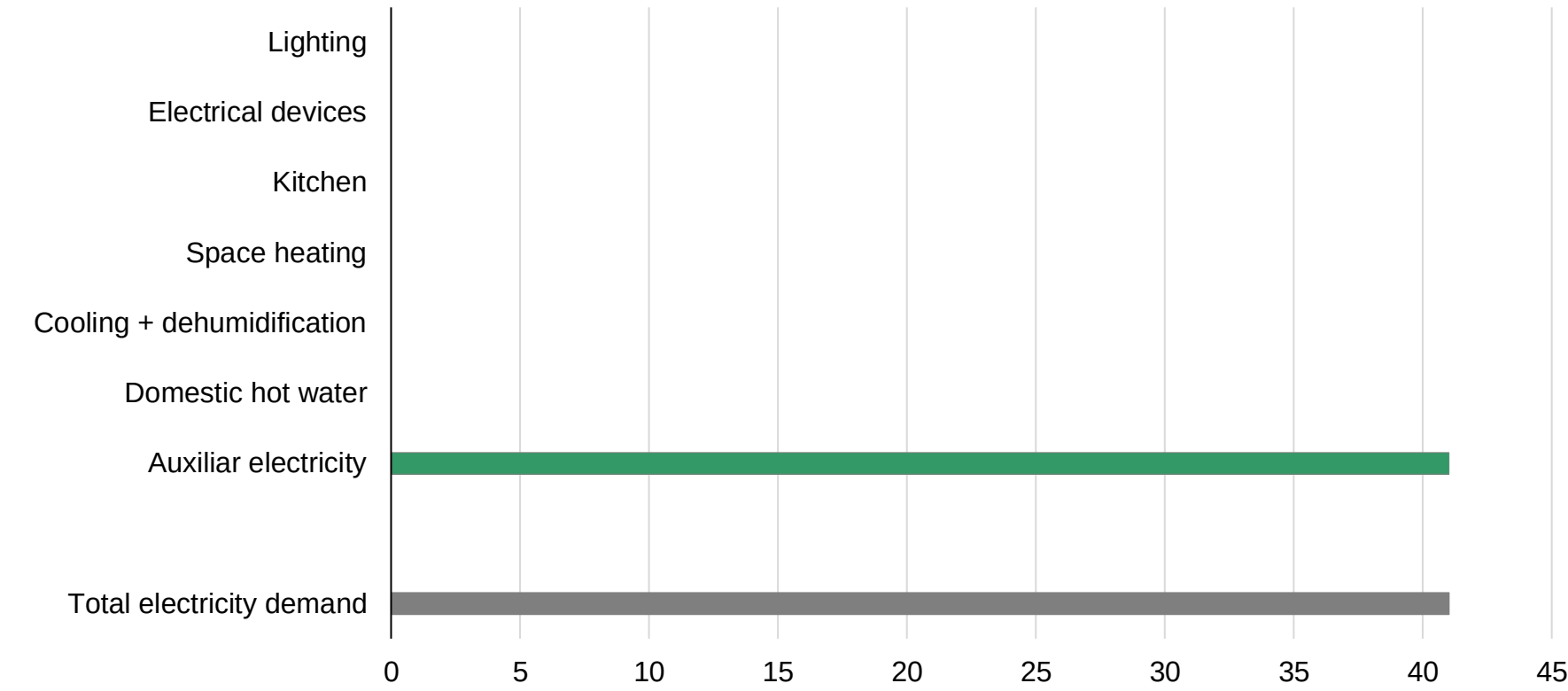
Lighting			Net floor area	Utilisation profile	Façade with windows			Geometry: input of a typical room					Daylight utilisation			Nominal illuminance	Installed lighting power				Lighting control	Motion detector used?	Utilisation hours per year	User-defined: full load hours of lighting	Full load hours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

[illegible]

Total user electricity		Electricity		PER	PE	
		0	kWh/a	0	0	kWh/a
		0	kWh/(m²a)	0	0	kWh/(m²a)
Electricity demand for:						
Space heating	from 'PER' worksheet, without aux. electricity	0	kWh/a	0	0	kWh/a
Cooling + dehumidification	from 'PER' worksheet, without aux. electricity	0		0	0	kWh/a
Domestic hot water	from 'PER' worksheet, without aux. electricity	0		0	0	kWh/a
Auxiliar electricity	from 'Aux. Electricity' worksheet	41		kWh/a	68	62
Total electricity demand		41	kWh/a	68	62	kWh/a

	0	kWh/(m²a)	0	0	kWh/(m²a)
--	---	-----------	---	---	-----------

Electricity demand in kWh/a



Block A1 Cranwood House 1071 m² treated floor area, United Kingdom/ Britain **PHPP**  Passive House with PHPP Version 10.4a EN

Aux Electricity

Passive House with PHPP Version 10.4a EN



Block A1 Cranwood House / Climate: Northolt / TFA: 1071 m² / Heating: 11.2 kWh/(m²a) / Overheating: 8 % / PER: 22.2 kWh/(m²a)

Heating period	223	d/a	Runtime vent. syst in winter	4.83	kh/a	Treated floor area	1071	m²	
Cooling period	141	d/a	Runtime vent. syst in summer	3.93	kh/a	Boiler design output	15	kW	
Dwelling units	14		Heat recovery efficiency ventilation	0.00		DHW system heat demand	13991	kWh/a	
Reference volume for the vent. system	2678	m³	Air change rate	0.26	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					
	[1/0]	[1/0]																	
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	0.26	h ⁻¹	4.83	2678	m³	0		IHG included in heat recovery efficiency				1.65	0	0	
Defroster HX	1	1	From worksheet 'Ventilation/Addl. Vent'					41		1.0				5.34	8	1.65	68	62	
Heating system																			
Circulation pump heating		1	163	W	1.00	5.34		0		1.0				5.34	0	1.65	0	0	
Regulated?				W user-defined pump nominal power					1.0				5.34	0	1.65	0	0		
Aux. energy - Heat. boiler	0	0	55	W	1.00	0.00		0		0.0				5.34	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				5.34	0	1.65	0	0	
Fan coils		1		W	0.23	5.34		0		1.0				5.34	0	1.65	0	0	
				kWh/a					0		0.0				5.34	0	1.65	0	0
				kWh/a					0		0.0				5.34	0	1.65	0	0
				kWh/a					0		0.0				5.34	0	1.65	0	0
				kWh/a					0		0.0				5.34	0	1.65	0	0
				kWh/a					0		0.0				5.34	0	1.65	0	0
				kWh/a					0		0.0				5.34	0	1.65	0	0
Total aux. electricity heating, ventilation winter								41		8				68				62	

Cooling, ventilation in summer				Final energy demand							Internal heat gains (IHG)				PER		PE	
Ventilation system																		
Ventilation in summer	1		0.00	Wh/m³	0.26	h ⁻¹	3.93	2678	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	2678	m³	0	IHG included in the worksheets 'Summer' + 'Cooling'				1.00	0	0	
Cooling system																		
Circulation pump cooling		1		W	0.0		3.4			0	1.0	3.4		0	1.00	0	0	
Fan coils (recirculation cooling)		1		W	0.0		3.4			0	1.0	3.4		0	1.00	0	0	
Cooling server rooms																		
		0		kWh/a						0					1.00	0	0	
				kWh/a						0	0.03.93				0	1.00	0	0
				kWh/a						0	0.03.93				0	1.00	0	0
				kWh/a						0	0.03.93				0	1.00	0	0
				kWh/a						0	0.03.93				0	1.00	0	0
				kWh/a						0	0.03.93				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	38	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	126	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	100	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
Total aux. electricity other							0			0	0		0	0

Total internal heat gains									Winter	Summer							
									8	0	W						
									0.0	0.0	W/m²						

		Final energy		PER	PE
Total auxiliary electricity	41	kWh/a		68	62
	0.04	kWh/(m ² _{TFA} a)		0.1	0.1

Internal heat gains for residential buildings (IHG)

Passive House with PHPP Version 10.4a EN



Block A1 Cranwood House / Climate: Northolt / TFA: 1071 m² / Heating: 11.2 kWh/(m²a) / Overheating: 8 % / PER: 22.2 kWh/(m²a)

Number of occupants 27.5 P
Treated floor area 1071 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: 2.75 2.75 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	27	P	1	80.0	W/P	1.00	8.76	kh/a	19255	*			0.55	/	8.76	=	1209	1209
Evaporation	27	P	1	-25.0	W/P	1.00	8.76	kh/a	-6017	*			1.00	/	8.76	=	-687	-687
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	3117	*			1.00	/	8.76	=	356	356
Cooking	1		1	0.3	kWh/Use	1.00	500	/(P*a)	3434	*			0.50	/	8.76	=	196	196
Dishwashing	1		1	1.0	kWh/Use	1.00	65	/(P*a)	1731	*			0.30	/	8.76	=	59	59
Clothes washing	1		1	0.8	kWh/Use	1.00	57	/(P*a)	1326	*			0.30	/	8.76	=	45	45
Drying with Condensation dryer	1		1	2.3	kWh/Use	0.75	57	/(P*a)	2682	*			0.70	/	8.76	=	214	214
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)	1662	*			1.00	/	8.76	=	190	190
Lighting outside of dwelling unit	0		1						0	*			1.00	/	8.76	=	0	0
Other devices (see 'Electricity' worksheet)	1		1.0						6259	*			1	/	8.76	=	715	715
Auxiliary appliances (cf. 'Aux electricity' worksheet)																=	8	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	27		1	-16.3	-18.9	W/P	=	-449	-520	
Internal heat gains (IHG)							1856	1777	W	
							1.73	1.66	W/m²	

Block A1 Cranwood House / Climate: Northolt / TFA: 1071 m² / Heating: 11.2 kWh/(m²a) / Overheating: 8 % / PER: 22.2 kWh/(m²a)

Building use:

10-Residential building: Residential

Values used for IHG:

2-Standard

[Link to drop-down list](#)

Number of occupants:

27.5

P

Treated floor area:

1071.05

m²

Room temperature:

20

°C

No input necessary

Applied in energy balance:

IHG winter

IHG summer

2.75

2.75

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)														=	8	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)												8	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

Internal heat gains (IGH) in W/m²

IHG winter

IHG summer

Block A1 Cranwood House 1071 m² treated floor area, United Kingdom/ Britain

PHPP

Passive House with PHPP Version 10.4a EN

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}:

1071

m²

Projected building footprint A_{Projected}:

0

m²

Heating demand incl. distribution & hydr. frost protection

11.2

kWh/(m²a)

Cooling energy demand incl. dehumidification

kWh/(m²a)

DHW demand including distribution:

13.1

kWh/(m²a)

Biomass contingent (PER):

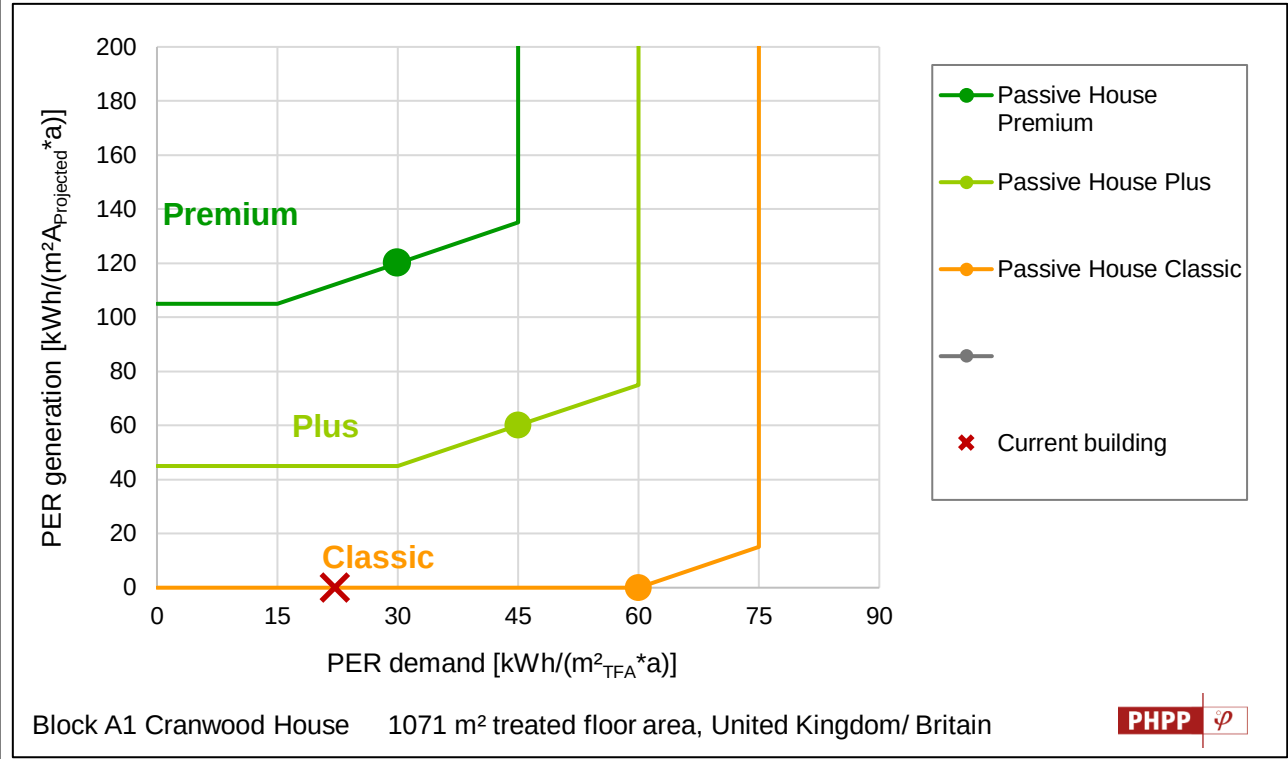
20

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					0.87		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.)				18.9	1.30	24.5	1.50	28.3	0.363	7337	
Auxiliary electricity (other)					1.30		1.50		0.363		
Total household electricity and auxiliary electricity						24.5		28.3		7337	
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						24.5					
Bioenergy utilisation						-2.3	The bioenergy budget will be used with 4 kWh/(m²a).				
Total energy demand kWh/(m² _{TFA} a)					PER:	22.2	PE:	28.3	CO ₂ :	7337	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	11 kWh/(m²a)	≤		30		15		Premium
Heating load referred to TFA	10 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	22 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)	28 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	20.2	23.8	30.34	7337	7337
Generation	0.0	0.0	0.00	0	0
Cumulated demand and generation (annual balance)	20.21	23.77	30.34	7337	7337
Demand without occupant electricity consumption	0.00	-2.51	0.00	-7850521	-7850521
Demand without occupant electricity consumption, accumulated generation	0.00	-2.51	0.00	-7850521	-7850521

Passive House compact unit with exhaust air heat pump

Passive House with PHPP Version 10.4a EN

Block A1 Cranwood House / Climate: Northolt / TFA: 1071 m² / Heating: 11.2 kWh/(m²a) / Overheating: 8 % / PER: 22.2 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} :		1071	m²
Covered fraction of space heating demand	(‘PER’ worksheet)	0%	
Space heating demand + distribution losses	Q _H +Q _{HL} : (DHW+Distribution)	11950	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)	13991	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)			
Outdoor air temperature	T _{amb}	Test point 1	Test point 2
Measured thermal power heat pump standby	P _{HP,Standby}	Test point 3	Test point 4
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

Heat pump



Block A1 Cranwood House / Climate: Northolt / TFA: 1071 m² / Heating: 11.2 kWh/(m²a) / Overheating: 8 % / PER: 22.2 kWh/(m²a)

		Building type: 5-Multi-family house I Apartment building	
Heating demand to be covered		Treated floor area A _{TFA} : 1071 m²	
Covered fraction of space heating demand	(‘PER’ worksheet)	0%	
Space heating demand + distribution losses	Q _H +Q _{H,L} : (DHW+Distribution)	11950	kWh/a
Solar fraction for space heat	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 the DHW system (without storage losses)	Q _{gDHW} (DHW+Distribution)	13991	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)	
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)	
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,direct}	0	kWh/a
Electrical consumption of HP	Q _{EI,HP}		kWh/a
Space heat supplied by HP	Q _{HP,Heating}	without storage losses 0	with storage losses 0
Winter DHW supplied by HP	Q _{HP,DHW,Winter}	0	0
Summer DHW supplied by HP	Q _{HP,DHW,Summer}	0	0
Seasonal performance factor of heat pump	SPF _{H-1}	1st HP: Heating	
Seasonal performance factor system	SPF _{H-3}	2nd HP: DHW	
Performance ratio of heat generator, space heating			
Final electrical energy demand heat generation	Q _{final}		
Annual PER demand (renewable primary energy)			
Annual PE demand (non-renewable primary energy)			
Annual CO ₂ -equivalent emissions			

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 A1 Cranwood House / Climate: Northolt / TFA: 1071 m² / Heating: 11.2 kWh/(m²a) / Overheating: 8 % / PER: 22.2 kWh/(m²a)

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

Treated floor area A_{TFA}:

1071

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 A1 Cranwood House / Climate: Northolt / TFA: 1071 m² / Heating: 11.2 kWh/(m²a) / Overheating: 8 % / PER: 22.2 kWh/(m²a)

Building type:		5-Multi-family house I Apartment building	
Treated floor area A _{TFA} :		1071	m²
Covered fraction of space heating demand	(‘PER’ worksheet)	0%	
Space heating demand + distribution losses	Q _H +Q _{HS} : (DHW+Distribution)	11950	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)	11950	kWh/a
Covered fraction of DHW demand	(‘PER’ worksheet)	0%	
Total heating demand of DHW system	Q _{gDHW} (DHW+Distribution)	13991	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)	11.00	kW
Length of the heating period	t _{HP}	5341	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 A1 Cranwood House / Climate: Northolt / TFA: 1071 m² / Heating: 11.2 kWh/(m²a) / Overheating: 8 % / PER: 22.2 kWh/(m²a)



Building type:		5-Multi-family house I Apartment building	
Treated floor area A _{TFA} :	1071	m²	
Covered fraction of space heating demand	(‘PER’ worksheet)	0%	
Heating demand	Q _H (DHW+Distribution)	11950	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)	13991	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	0.87		0.50	0.74						

PHPP Version

10.4a

Language

EN

Header:
Block A1 Cranwood House / Climate: Northolt / TFA: 1071 m² / Heating: 11.2 kWh/(m²a) / Overheating: 8 % / PER: 22.2 kWh/(m²a)
Passive House with PHPP Version 10.4a EN

for diagrams
Block A1 Cranwood House 1071 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 enter factors for demand please enter on the far right)	98	User defined energy carrier (generation, please enter factors for demand on the far right)			
	99				
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 in 'District heating' worksheet	0.70	-0.070
	21	21-Gas CHP plant (35% CHP)		1.10	0.130
	22	22-Gas HP (0% CHP)		1.50	0.320
Heating oil CHP plant	30	30-Oil CHP plant (70% CHP)		0.80	0.100
	31	31-Oil CHP plant (35% CHP)		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