Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Thu 13 Jul 2023 09:05:09

Project Information			
Assessed By	Maja Stanisz	Building Type	House, Semi-detached
OCDEA Registration	EES/025674	Assessment Date	2023-07-13

Dwelling Details			
Assessment Type	As designed	Total Floor Area	80 m^2
Site Reference	4907-P637-6460-044	Plot Reference	Plot 044 - Baker Semi
Address	2 Bed Masonry K, WC, B, Country Brick		

Client Details	
Name	South East
Company	Vistry Homes
Address	Linden House, Caterham, Surrey, CR3 5XL

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate		
Fuel for main heating system	Mains gas	
Target carbon dioxide emission rate	*11.86 $kgCO_2/m^2$*	
Dwelling carbon dioxide emission rate	10.79 $kgCO_2/m^2$	OK
1b Target primary energy rate and dwelling primary energy		
Target primary energy	*62.18 kWh_{PE}/m^2*	
Dwelling primary energy	58.29 kWh_{PE}/m^2	OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency		
Target fabric energy efficiency	*36.0 kWh/m^2*	
Dwelling fabric energy efficiency	34.3 kWh/m^2	OK

2a Fabric U-values				
Element	***Maximum permitted average U-Value [W/m^2K]***	**Dwelling average U-Value [W/m^2K]**	**Element with highest individual U-Value**	
External walls	*0.26*	0.24	Walls (2) (0.26)	OK
Party walls	*0.2*	0	Party Wall (1) (0)	**N/A**
Curtain walls	*1.6*	0	N/A	**N/A**
Floors	*0.18*	0.11	McCann P/A=0.50 (0.11)	OK
Roofs	*0.16*	0.09	Roof (1) (0.09)	OK
Windows, doors, and roof windows	*1.6*	1.26	Front Window (1.3)	OK
Rooflights	*2.2*	N/A	N/A	**N/A**

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))		
Name	**Net area [m^2]**	**U-Value [W/m^2K]**
Exposed wall: Walls (1)	76.68575	0.24
Exposed wall: Walls (2)	1.34	0.26
Party wall: Party Wall (1)	49	0 **(!)**
Ground floor: McCann P/A=0.50, McCann P/A=0.50	39.97	0.11
Exposed roof: Roof (1)	39.970001220703125	0.09 **(!)**

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	**Area [m^2]**	**Orientation**	**Frame factor**	**U-Value [W/m^2K]**
Front Door, Solid Door	2.1483	South East	N/A	1.1 **(!)**
Front Window, Window	1.3104	South East	1.0	1.3
Front Window, Window	1.4976	South East	1.0	1.3
Front Window, Window	0.71925	South East	1.0	1.3
Rear HGD, Half Glaze	2.1483	North West	N/A	1.3
Rear Window, Window	1.7784	North West	1.0	1.3
Rear Window, Window	2.172	North West	1.0	1.3

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))
Building part **1 - Main Dwelling**: Thermal bridging calculated from linear thermal transmittances for each junction

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E2: Other lintels (including other steel lintels)	Calculated by person with suitable expertise	0.042	E02-Hi-Therm
External wall	E3: Sill	Calculated by person with suitable expertise	0.009 **(!)**	E03-Knauf-034
External wall	E4: Jamb	Calculated by person with suitable expertise	0.014 **(!)**	E04-Knauf-034
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.06	E5 - Briary
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.048	E05 - Briary
External wall	E6: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0 **(!)**	E06-CD0029
External wall	E10: Eaves (insulation at ceiling level)	Calculated by person with suitable expertise	0.031 **(!)**	E10 - EW02-RE04
External wall	E12: Gable (insulation at ceiling level)	Calculated by person with suitable expertise	0.054	E12-CD0031-054
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.057	E16 - EW02-CN01
External wall	E18: Party wall between dwellings	Calculated by person with suitable expertise	0.049	E18 - EW02-PW02
Party wall	P1: Ground floor	Calculated by person with suitable expertise	0.031 **(!)**	P01 - Briary
Party wall	P2: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0 **(!)**	P02-Default
Party wall	P4: Roof (insulation at ceiling level)	Calculated by person with suitable expertise	0.041	P04-CD0020-041

3 Air permeability (better than typically expected values are flagged with a subsequent (!))		
Maximum permitted air permeability at 50Pa	*8 m^3/hm^2*	
Dwelling air permeability at 50Pa	4 m^3/hm^2, Design value	OK
Air permeability test certificate reference		

4 Space heating	
Main heating system 1: Boiler with radiators or underfloor heating - Mains gas	
Efficiency	89.0%
Emitter type	Radiators
Flow temperature	55°C
System type	Combi boiler
Manufacturer	Ideal Boilers
Model	LOGIC COMBI
Commissioning	
Secondary heating system: N/A	
Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water	
Cylinder/store - type: N/A	
Capacity	N/A
Declared heat loss	N/A
Primary pipework insulated	N/A
Manufacturer	
Model	
Commissioning	
Waste water heat recovery system 1 - type: Instantaneous	
Efficiency	70.6%
Manufacturer	Q-Blue B.V.
Model	QB1-21C

6 Controls		
Main heating 1 - type: Time and temperature zone control by arrangement of plumbing and electrical services		
Function		
Ecodesign class		
Manufacturer		
Model		
Water heating - type: N/A		
Manufacturer		
Model		

7 Lighting		
Minimum permitted light source efficacy	*75 lm/W*	
Lowest light source efficacy	90 lm/W	**OK**
External lights control	N/A	

8 Mechanical ventilation		
System type: Decentralised mechanical extract		
Maximum permitted specific fan power	*0.7 W/(l/s)*	
Specific fan power	0.16 W/(l/s)	**OK**
Minimum permitted heat recovery efficiency	*N/A*	
Heat recovery efficiency	N/A	**N/A**
Manufacturer/Model	Lo-Carbon NBR dMEV C 100, 498095	
Commissioning		

9 Local generation	
Technology type: **Photovoltaic system (1)**	
Peak power	0.81 kWp
Orientation	South East
Pitch	30°
Overshading	None or very little
Manufacturer	
MCS certificate	

10 Heat networks
N/A

11 Supporting documentary evidence
N/A

12 Declarations	
a. Assessor Declaration	
This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design information submitted for this dwelling for the purpose of carrying out the "As designed" assessment, and that the supporting documentary evidence (SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required) has been reviewed in the course of preparing this BREL Compliance Report.	
Signed: Name:	Assessor ID: Date:
b. Client Declaration	
N/A	

Summary for Input Data

elmhurst energy

Property Reference	4907-P637-6460-044	**Issued on Date**	13/07/2023
Assessment Reference	Plot 044 - Baker Semi	**Prop Type Ref**	Baker- END
Property	Masonry, 2 Bed, K, WC, B, Country Brick		

SAP Rating	90 B	**DER**	10.79	**TER**	11.86
Environmental	91 B	**% DER < TER**			9.02
CO_2 Emissions (t/year)	0.76	**DFEE**	34.28	**TFEE**	36.04
Compliance Check	See BREL	**% DFEE < TFEE**			4.88
% DPER < TPER	6.25	**DPER**	58.29	**TPER**	62.18

Assessor Details	Miss Maja Stanisz	**Assessor ID**	Q919-0001
Client			

SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

Orientation	Southeast	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Suburban	
1.0 Property Type	House, Semi-Detached	
Which Floor	0	
2.0 Number of Storeys	2	
3.0 Date Built	2022	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	N/A	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	No	
Smart gas meter fitted	No	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Basement:	0.00 m	0.00 m²	0.00 m
Ground floor:	17.96 m	39.97 m²	2.39 m
1st Storey:	17.96 m	39.97 m²	2.61 m
2nd Storey:	0.00 m	0.00 m²	0.00 m
3rd Storey:	0.00 m	0.00 m²	0.00 m
4th Storey:	0.00 m	0.00 m²	0.00 m
5th Storey:	0.00 m	0.00 m²	0.00 m
6th Storey:	0.00 m	0.00 m²	0.00 m
7th Storey:	0.00 m	0.00 m²	0.00 m

8.0 Living Area	21.30	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
EW Brick AAC011	Cavity Wall	Cavity wall : plasterboard on dabs, AAC block, filled cavity, any outside structure	0.24	60.00	88.46	76.69	0.00	None	11.77	Calculate Wall Area
EW Brick AAC018	Cavity Wall	Cavity wall : plasterboard on dabs, AAC block, filled cavity, any outside structure	0.26	60.00	1.34	1.34	0.00	None	0.00	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
E-WM-30	Filled Cavity with Edge Sealing	Plasterboard on dabs mounted on cement render on both sides, AAC blocks, cavity	0.00	45.00	49.00	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
GF Masonry	Dense block, plasterboard on dabs	75.00	15.30
GF Timber	Plasterboard on timber frame	9.00	45.65
1F Timber	Plasterboard on timber frame	9.00	65.38

10.0 External Roofs

Summary for Input Data

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
PR 500mm MW044	External Plane Roof	Plasterboard, insulated at ceiling level	0.09	9.00	39.97	0.00	None	0.00	Calculate Wall Area	0.00

10.2 Internal Ceilings

Description	Storey	Construction	Area (m²)
Internal Ceiling	Lowest occupied	Other	39.97

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
McCann P/A=0.50	Ground Floor - Solid	Lowest occupied	Suspended concrete floor, carpeted	0.11	None	0.00	75.00	39.97

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor		Plasterboard ceiling, carpeted chipboard floor	9.00	39.97

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Solid Door	Manufacturer	Solid Door			None	0.00	Wood	0.70	1.10
Half Glaze	Manufacturer	Half Glazed Door	Double Low-E Soft 0.05		None	0.63	Wood	0.70	1.30
Window	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.05		None	0.47	Wood	1.00	1.30
French Door	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.05		None	0.40	Wood	1.00	1.40

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Front Door	Solid Door	EW Brick AAC011	South East	2.15	0
Front Window	Window	EW Brick AAC011	South East	3.53	0
Rear HGD	Half Glaze	EW Brick AAC011	North West	2.15	0
Rear Window	Window	EW Brick AAC011	North West	3.95	0

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	
17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E2 Other lintels (including other steel lintels)	Independently assessed	8.29	0.04	0.04	E02-Hi-Therm	No
E3 Sill	Independently assessed	6.24	0.01	0.01	E03-Knauf-034	No
E4 Jamb	Independently assessed	20.25	0.01	0.01	E04-Knauf-034	No
E5 Ground floor (normal)	Independently assessed	8.16	0.06	0.06	E5 - Briary	No
E5 Ground floor (normal)	Independently assessed	9.80	0.05	0.05	E05 - Briary	No
E6 Intermediate floor within a dwelling	Independently assessed	17.96	0.00	0.00	E06-CD0029	No
E10 Eaves (insulation at ceiling level)	Independently assessed	8.16	0.03	0.03	E10 - EW02-RE04	No
E12 Gable (insulation at ceiling level)	Independently assessed	9.80	0.05	0.05	E12-CD0031-054	No
E16 Corner (normal)	Independently assessed	10.00	0.06	0.06	E16 - EW02-CN01	No
E18 Party wall between dwellings	Independently assessed	10.00	0.05	0.05	E18 - EW02-PW02	No
P1 Party wall - Ground floor	Independently assessed	9.80	0.03	0.03	P01 - Briary	No
P2 Party wall - Intermediate floor within a dwelling	Independently assessed	9.80	0.00	0.00	P02-Default	No
P4 Party wall - Roof (insulation at ceiling level)	Independently assessed	9.80	0.04	0.04	P04-CD0020-041	No

Y-value	0.02	W/m²K
18.0 Pressure Testing	Yes	
Designed AP_{50}	4.00	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	15.00	m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	No
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - decentralised
MV Reference Number	500776
Duct Type	Rigid

MVHR Efficiency	0.00
Wet Rooms	3
SFP from Installer Commissioning Certificate	No

19.1 Mechanical extract ventilation - Decentralised

SFP	Fan/Room Type	Count
0.14	In Room Fan Kitchen	1
0.11	In Room Fan Other Wet Room	2
0.00	In Duct Fan Kitchen	0
0.00	In Duct Fan Other Wet Room	0
0.08	Through Wall Fan Kitchen	0
0.08	Through Wall Fan Other Wet Room	0

20.0 Fans, Open Fireplaces, Flues

21.0 Fixed Cooling System	No

22.0 Lighting

No Fixed Lighting	No

Name	Efficacy	Power	Capacity	Count
PL1 8.5watt bayonet cap lamp PL1LED3K-BC	90.00	9	810	9

24.0 Main Heating 1	Database	
Percentage of Heat	100.00	%
Database Ref. No.	17929	
Fuel Type	Mains gas	
SAP Code	104	
In Winter	89.00	
In Summer	87.30	
Model Name	LOGIC COMBI	
Manufacturer	Ideal Boilers	
System Type	Combi boiler	
Controls SAP Code	2110	
PCDF Controls	0	
Delayed Start Stat	Yes	
Burner Control	Modulating	
Boiler Compensator	0	
HETAS approved System	No	
Oil Pump Inside	No	
FI Case	0.00	
FI Water	0.00	
Flue Type	Balanced	
Smoke Control Area	Unknown	
Fan Assisted Flue	Yes	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Radiators	
Flow Temperature	Enter value	
Flow Temperature Value	55.00	
Boiler Interlock	Yes	
Electric CPSU Temperature	0.00	
Combi boiler type	Standard Combi	

Summary for Input Data

elmhurst energy

Combi keep hot type	None

25.0 Main Heating 2 — None

26.0 Heat Networks — None

	Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1	None			0.00	0.00	0.00	0.00	0.00		
Heat source 2	None			0.00	0.00	0.00	0.00	0.00		
Heat source 3	None			0.00	0.00	0.00	0.00	0.00		
Heat source 4	None			0.00	0.00	0.00	0.00	0.00		
Heat source 5	None			0.00	0.00	0.00	0.00	0.00		

28.0 Water Heating

Water Heating	Main Heating 1
SAP Code	901
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	Yes
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Summer Immersion	No
Cold Water Source	From mains
Bath Count	1
Baths connected to WWHRS	0
Supplementary Immersion	No
Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower Bathroom	Combi boiler or unvented hot water system	8.00		Yes	Instantaneous System 1

28.3 Waste Water Heat Recovery System Instantaneous System 1

Database ID	80117
Brand Model	Showersave, QB1-21C
Details	Year: 2017 + current Efficiency: 0 Utilisation factor: 0.973

29.0 Hot Water Cylinder — None

Cylinder Stat	No	
Cylinder In Heated Space	No	
Independent Time Control	No	
Insulation Type	None	
Insulation Thickness	0	
Cylinder Volume	0.00	L
Loss	0.00	kWh/day
In Airing Cupboard	No	

31.0 Thermal Store — None

Thermal Store Pipework	within a single casing

32.0 Photovoltaic Unit — One Dwelling

Export Capable Meter?	Yes
Connected To Dwelling	Yes
Diverter	No
Battery Capacity [kWh]	0.00

Summary for Input Data

PV Cells kWp	Orientation	Elevation	Overshading	FGHRS	MCS Certificate	Overshading Factor	MCS Certificate Reference	Panel Manufacturer
0.81	South East	30°	None Or Little	No	No	1.00		

34.0 Small-scale Hydro	None	
Electricity Generated	0.00	
Apportioned	0.00	kWh/Year
Connected to dwelling's electricity meter	Yes	
Electricity Generation	Annual	

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

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Property	Masonry, 2 Bed, K, WC, B, Country Brick		

SAP Rating	90 B	DER	10.79	TER	11.86
Environmental	91 B	% DER < TER			9.02
CO_2 Emissions (t/year)	0.76	DFEE	34.28	TFEE	36.04
Compliance Check	See BREL	% DFEE < TFEE			4.88
% DPER < TPER	6.25	DPER	58.29	TPER	62.18

Assessor Details	Miss Maja Stanisz	Assessor ID	Q919-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

			Area (m2)		Storey height (m)		Volume (m3)	
Ground floor			39.9700 (1b)	x	2.3900 (2b)	=	95.5283 (1b)	-
First floor			39.9700 (1c)	x	2.6100 (2c)	=	104.3217 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9400							(4)
Dwelling volume					(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	199.8500	(5)

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2. Ventilation rate

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		m3 per hour		
Number of open chimneys		0 * 80	=	0.0000 (6a)
Number of open flues		0 * 20	=	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10	=	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20	=	0.0000 (6d)
Number of flues attached to other heater		0 * 35	=	0.0000 (6e)
Number of blocked chimneys		0 * 20	=	0.0000 (6f)
Number of intermittent extract fans		0 * 10	=	0.0000 (7a)
Number of passive vents		0 * 10	=	0.0000 (7b)
Number of flueless gas fires		0 * 40	=	0.0000 (7c)
		Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5)	=	0.0000 (8)
Pressure test				Yes
Pressure Test Method				Blower Door
Measured/design AP50				4.0000 (17)
Infiltration rate				0.2000 (18)
Number of sides sheltered				2 (19)
Shelter factor		(20) = 1 - [0.075 x (19)]	=	0.8500 (20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20)	=	0.1700 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2167	0.2125	0.2083	0.1870	0.1827	0.1615	0.1615	0.1573	0.1700	0.1827	0.1913	0.1998	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Solid Door			2.1500	1.1000	2.3650			(26)
Half Glaze			2.1500	1.3000	2.7950			(26a)
Window (Uw = 1.30)			7.4800	1.2357	9.2433			(27)

McCann P/A=0.50			39.9700	0.1100	4.3967	75.0000	2997.7500 (28a)
EW Brick AAC011	88.4600	11.7800	76.6800	0.2400	18.4032	60.0000	4600.8000 (29a)
EW Brick AAC018	1.3400		1.3400	0.2600	0.3484	60.0000	80.4000 (29a)
PR 500mm MW044	39.9700		39.9700	0.0900	3.5973	9.0000	359.7300 (30)
Total net area of external elements Aum(A, m2)			169.7400				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		41.1489		(33)
E-WM-30			49.0000	0.0000	0.0000	45.0000	2205.0000 (32)
GF Masonry			15.3000			75.0000	1147.5000 (32c)
GF Timber			45.6500			9.0000	410.8500 (32c)
1F Timber			65.3800			9.0000	588.4200 (32c)
Internal Floor			39.9700			18.0000	719.4600 (32d)
Internal Ceiling			39.9700			9.0000	359.7300 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 13469.6400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 168.4969 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.2900	0.0420	0.3482
E3 Sill	6.2400	0.0090	0.0562
E4 Jamb	20.2500	0.0140	0.2835
E5 Ground floor (normal)	8.1600	0.0600	0.4896
E5 Ground floor (normal)	9.8000	0.0480	0.4704
E6 Intermediate floor within a dwelling	17.9600	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	8.1600	0.0310	0.2530
E12 Gable (insulation at ceiling level)	9.8000	0.0540	0.5292
E16 Corner (normal)	10.0000	0.0570	0.5700
E18 Party wall between dwellings	10.0000	0.0490	0.4900
P1 Party wall - Ground floor	9.8000	0.0310	0.3038
P2 Party wall - Intermediate floor within a dwelling	9.8000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	9.8000	0.0410	0.4018

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 4.1956 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 45.3445 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.9753	32.9753	32.9753	32.9753	32.9753	32.9753	32.9753	32.9753	32.9753	32.9753	32.9753	32.9753	(38)
Heat transfer coeff	78.3198	78.3198	78.3198	78.3198	78.3198	78.3198	78.3198	78.3198	78.3198	78.3198	78.3198	78.3198	(39)

Average = Sum(39)m / 12 = 78.3198

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9797	0.9797	0.9797	0.9797	0.9797	0.9797	0.9797	0.9797	0.9797	0.9797	0.9797	0.9797	(40)
HLP (average)												0.9797	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4617 (42)
Hot water usage for mixer showers

65.4947	64.5104	63.0762	60.3320	58.3068	56.0484	54.7647	56.1881	57.7484	60.1733	62.9764	65.2438	(42a)

Hot water usage for baths

28.2881	27.8680	27.2764	26.1855	25.3687	24.4630	23.9738	24.5613	25.2009	26.1701	27.2834	28.1925	(42b)

Hot water usage for other uses

39.8405	38.3917	36.9430	35.4943	34.0455	32.5968	32.5968	34.0455	35.4943	36.9430	38.3917	39.8405	(42c)

Average daily hot water use (litres/day) 122.8300 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6233	130.7701	127.2955	122.0118	117.7211	113.1082	111.3353	114.7949	118.4436	123.2864	128.6515	133.2767	(44)
Energy conte	211.6266	186.2149	195.6485	167.0280	158.4752	139.0797	134.6504	142.1401	146.0528	167.2984	183.2877	208.6791	(45)

Energy content (annual) Total = Sum(45)m = 2040.1815

Distribution loss (46)m = 0.15 x (45)m												
31.7440	27.9322	29.3473	25.0542	23.7713	20.8620	20.1976	21.3210	21.9079	25.0948	27.4932	31.3019	(46)
Water storage loss:												
Total storage loss												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.2645	12.8722	14.2261	13.7137	14.1369	13.6466	14.0797	14.0977	13.6633	14.1581	13.7527	14.2574	(61)
Total heat required for water heating calculated for each month												
225.8911	199.0871	209.8746	180.7417	172.6121	152.7263	148.7301	156.2378	159.7162	181.4565	197.0404	222.9365	(62)
WWHRS	-58.2991	-51.5602	-53.9908	-44.7066	-41.6649	-35.6529	-33.4190	-35.5377	-36.8879	-43.4868	-49.2652	-57.2195	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
167.5920	147.5270	155.8838	136.0351	130.9472	117.0734	115.3112	120.7001	122.8283	137.9697	147.7752	165.7170	(64)

Total per year (kWh/year) = Sum(64)m = 1665.3598 (64)
12Total per year (kWh/year) 1665 (64)
Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month												
73.9320	65.1345	68.6097	58.9652	56.2272	49.6557	48.2912	50.7860	51.9784	59.1663	64.3813	72.9501	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.0861	123.0861	123.0861	123.0861	123.0861	123.0861	123.0861	123.0861	123.0861	123.0861	123.0861	123.0861	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	129.5055	143.3811	129.5055	133.8223	129.5055	133.8223	129.5055	129.5055	133.8223	129.5055	133.8223	129.5055	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	219.3151	221.5909	215.8560	203.6469	188.2352	173.7504	164.0736	161.7978	167.5327	179.7418	195.1535	209.6383	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.3086	35.3086	35.3086	35.3086	35.3086	35.3086	35.3086	35.3086	35.3086	35.3086	35.3086	35.3086	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.4689	-98.4689	-98.4689	-98.4689	-98.4689	-98.4689	-98.4689	-98.4689	-98.4689	-98.4689	-98.4689	-98.4689	(71)
Water heating gains (Table 5)													
	99.3709	96.9264	92.2173	81.8961	75.5742	68.9662	64.9075	68.2608	72.1922	79.5245	89.4185	98.0513	(72)
Total internal gains													
	511.1173	524.8242	500.5045	482.2912	456.2407	436.4647	418.4124	419.4899	433.4731	451.6976	481.3202	500.1209	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	3.5300	36.7938	0.4700	0.0000	0.7700	47.0044	(77)
Northwest	3.9500	11.2829	0.4700	0.0000	0.7700	16.1290	(81)

Solar gains	63.1334	112.8969	168.7008	232.8805	282.6166	290.1492	275.7496	237.1801	190.6957	128.6120	76.5949	53.3977	(83)
Total gains	574.2507	637.7211	669.2053	715.1717	738.8573	726.6139	694.1620	656.6700	624.1688	580.3096	557.9151	553.5187	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	47.7729	47.7729	47.7729	47.7729	47.7729	47.7729	47.7729	47.7729	47.7729	47.7729	47.7729	47.7729	
alpha	4.1849	4.1849	4.1849	4.1849	4.1849	4.1849	4.1849	4.1849	4.1849	4.1849	4.1849	4.1849	
util living area													
	0.9818	0.9706	0.9520	0.9016	0.8013	0.6369	0.4827	0.5276	0.7450	0.9159	0.9693	0.9844	(86)
MIT	19.5971	19.7897	20.0601	20.4290	20.7430	20.9274	20.9821	20.9740	20.8579	20.4664	19.9671	19.5466	(87)
Th 2	20.1003	20.1003	20.1003	20.1003	20.1003	20.1003	20.1003	20.1003	20.1003	20.1003	20.1003	20.1003	(88)
util rest of house													
	0.9780	0.9645	0.9416	0.8797	0.7577	0.5639	0.3900	0.4332	0.6793	0.8926	0.9618	0.9811	(89)
MIT 2	18.4652	18.7083	19.0478	19.5001	19.8629	20.0493	20.0920	20.0873	19.9891	19.5534	18.9353	18.4013	(90)
Living area fraction										fLA = Living area / (4) =		0.2664	(91)
MIT	18.7668	18.9964	19.3175	19.7476	20.0974	20.2833	20.3291	20.3236	20.2206	19.7967	19.2102	18.7065	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.6168	18.8464	19.1675	19.5976	19.9474	20.1333	20.1791	20.1736	20.0706	19.6467	19.0602	18.5565	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9694	0.9534	0.9280	0.8652	0.7494	0.5667	0.3984	0.4412	0.6769	0.8783	0.9504	0.9732	(94)
Useful gains	556.6736	607.9773	621.0272	618.7543	553.7024	411.7693	276.5245	289.6973	422.4901	509.6759	530.2306	538.6638	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1121.2903	1092.2817	992.1165	837.8334	645.9361	433.3642	280.3172	295.5441	467.6132	708.5328	936.7216	1124.3943	(97)
Space heating kWh													
	420.0748	325.4525	276.0905	157.7369	68.6218	0.0000	0.0000	0.0000	0.0000	147.9496	292.6735	435.7834	(98a)
Space heating requirement - total per year (kWh/year)												2124.3831	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	420.0748	325.4525	276.0905	157.7369	68.6218	0.0000	0.0000	0.0000	0.0000	147.9496	292.6735	435.7834	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2124.3831	
Space heating per m2											(98c) / (4) =	26.5747	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												89.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	420.0748	325.4525	276.0905	157.7369	68.6218	0.0000	0.0000	0.0000	0.0000	147.9496	292.6735	435.7834	(98)

Space heating efficiency (main heating system 1)

89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)

Space heating fuel (main heating system)

471.9941	365.6770	310.2140	177.2325	77.1032	0.0000	0.0000	0.0000	0.0000	166.2355	328.8467	489.6443 (211)

Space heating efficiency (main heating system 2)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)

Space heating fuel (main heating system 2)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)

Space heating fuel (secondary)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)

Water heating

Water heating requirement

167.5920	147.5270	155.8838	136.0351	130.9472	117.0734	115.3112	120.7001	122.8283	137.9697	147.7752	165.7170 (64)

Efficiency of water heater

											87.3000 (216)
(217)m	88.5085	88.4627	88.3790	88.2046	87.8772	87.3000	87.3000	87.3000	87.3000	88.1715	88.4223	88.5251 (217)

Fuel for water heating, kWh/month

189.3513	166.7674	176.3811	154.2267	149.0116	134.1047	132.0861	138.2590	140.6967	156.4789	167.1243	187.1979 (219)

Space cooling fuel requirement

(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	10.6273	9.5989	10.6273	10.2845	10.6273	10.2845	10.6273	10.6273	10.2845	10.6273	10.2845	10.6273 (231)
Lighting	27.8711	22.3593	20.1320	14.7496	11.3930	9.3082	10.3931	13.5093	17.5473	23.0230	26.0044	28.6457 (232)

Electricity generated by PVs (Appendix M) (negative quantity)

(233a)m	-14.0005	-21.8365	-34.8618	-43.2847	-50.0254	-47.9147	-47.2484	-42.8402	-35.5798	-26.5735	-16.0575	-11.8364 (233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m	-3.8525	-8.7689	-19.0724	-31.0501	-43.1666	-44.1587	-43.4255	-35.5587	-24.4498	-13.0777	-5.2877	-2.9849 (233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year

Space heating fuel - main system 1	2386.9473 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	87.3000
Water heating fuel used	1891.6857 (219)
Space cooling fuel	0.0000 (221)

Electricity for pumps and fans:

(MEVDecentralised, Database: total watage = 4.6540, total flow = 29.0000, SFP = 0.1605)

mechanical ventilation fans (SFP = 0.1605)	39.1284 (230a)
central heating pump	41.0000 (230c)
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	125.1284 (231)
Electricity for lighting (calculated in Appendix L)	224.9359 (232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	-666.9130 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	3961.7844 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2386.9473	0.2100	501.2589	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1891.6857	0.2100	397.2540	(264)
Space and water heating			898.5129	(265)
Pumps, fans and electric keep-hot	125.1284	0.1387	17.3569	(267)
Energy for lighting	224.9359	0.1443	32.4652	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-392.0595	0.1326	-52.0040	
PV Unit electricity exported	-274.8535	0.1238	-34.0368	
Total			-86.0408	(269)
Total CO2, kg/year			862.2942	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			10.7900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2386.9473	1.1300	2697.2505	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1891.6857	1.1300	2137.6049	(278)

Space and water heating			4834.8553 (279)
Pumps, fans and electric keep-hot	125.1284	1.5128	189.2943 (281)
Energy for lighting	224.9359	1.5338	345.0142 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-392.0595	1.4901	-584.2145
PV Unit electricity exported	-274.8535	0.4545	-124.9115
Total			-709.1260 (283)
Total Primary energy kWh/year			4660.0378 (286)
Dwelling Primary energy Rate (DPER)			58.2900 (287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	39.9700 (1b)	x	2.3900 (2b)	=	95.5283 (1b)	-
First floor	39.9700 (1c)	x	2.6100 (2c)	=	104.3217 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	199.8500	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1501	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4001	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3401	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4336	0.4251	0.4166	0.3741	0.3656	0.3231	0.3231	0.3146	0.3401	0.3656	0.3826	0.3996	(22b)
Effective ac	0.5940	0.5904	0.5868	0.5700	0.5668	0.5522	0.5522	0.5495	0.5578	0.5668	0.5732	0.5798	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Semi-glazed door			2.1500	1.0000	2.1500			(26a)
TER Opening Type (Uw = 1.20)			7.4800	1.1450	8.5649			(27)
McCann P/A=0.50			39.9700	0.1300	5.1961			(28a)
EW Brick AAC011	88.4600	11.7800	76.6800	0.1800	13.8024			(29a)
EW Brick AAC018	1.3400		1.3400	0.1800	0.2412			(29a)
PR 500mm MW044	39.9700		39.9700	0.1100	4.3967			(30)
Total net area of external elements Aum(A, m2)			169.7400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.5013			(33)
E-WM-30			49.0000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 168.4969 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.2900	0.0500	0.4145

E3 Sill	6.2400	0.0500	0.3120	
E4 Jamb	20.2500	0.0500	1.0125	
E5 Ground floor (normal)	8.1600	0.1600	1.3056	
E5 Ground floor (normal)	9.8000	0.1600	1.5680	
E6 Intermediate floor within a dwelling	17.9600	0.0000	0.0000	
E10 Eaves (insulation at ceiling level)	8.1600	0.0600	0.4896	
E12 Gable (insulation at ceiling level)	9.8000	0.0600	0.5880	
E16 Corner (normal)	10.0000	0.0900	0.9000	
E18 Party wall between dwellings	10.0000	0.0600	0.6000	
P1 Party wall - Ground floor	9.8000	0.0800	0.7840	
P2 Party wall - Intermediate floor within a dwelling	9.8000	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	9.8000	0.1200	1.1760	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.1502 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 45.6515 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	39.1755	38.9348	38.6988	37.5903	37.3829	36.4175	36.4175	36.2387	36.7893	37.3829	37.8025	38.2411	(38)
Heat transfer coeff	84.8270	84.5862	84.3502	83.2418	83.0344	82.0689	82.0689	81.8902	82.4408	83.0344	83.4539	83.8926	(39)

Average = Sum(39)m / 12 = 83.2408

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0611	1.0581	1.0552	1.0413	1.0387	1.0266	1.0266	1.0244	1.0313	1.0387	1.0440	1.0494	(40)
HLP (average)												1.0413	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4617 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	65.4947	64.5104	63.0762	60.3320	58.3068	56.0484	54.7647	56.1881	57.7484	60.1733	62.9764	65.2438	(42a)
Hot water usage for baths	28.2881	27.8680	27.2764	26.1855	25.3687	24.4630	23.9738	24.5613	25.2009	26.1701	27.2834	28.1925	(42b)
Hot water usage for other uses	39.8405	38.3917	36.9430	35.4943	34.0455	32.5968	32.5968	34.0455	35.4943	36.9430	38.3917	39.8405	(42c)

Average daily hot water use (litres/day) 122.8300 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6233	130.7701	127.2955	122.0118	117.7211	113.1082	111.3353	114.7949	118.4436	123.2864	128.6515	133.2767	(44)
Energy conte	211.6266	186.2149	195.6485	167.0280	158.4752	139.0797	134.6504	142.1401	146.0528	167.2984	183.2877	208.6791	(45)

Energy content (annual) Total = Sum(45)m = 2040.1815

Distribution loss (46)m = 0.15 x (45)m	31.7440	27.9322	29.3473	25.0542	23.7713	20.8620	20.1976	21.3210	21.9079	25.0948	27.4932	31.3019	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	262.5855	232.2423	246.6074	216.3431	209.4341	188.3948	185.6093	193.0990	195.3679	218.2573	232.6028	259.6380	(62)
WWHRS	-29.9414	-26.4805	-27.7288	-22.9605	-21.3984	-18.3108	-17.1634	-18.2516	-18.9450	-22.3341	-25.3018	-29.3870	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	232.6441	205.7619	218.8786	193.3825	188.0357	170.0840	168.4459	174.8474	176.4229	195.9233	207.3010	230.2510	(64)

Total per year (kWh/year) = Sum(64)m = 2361.9782 (64)

12Total per year (kWh/year) 2362 (64)

Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month	83.1056	73.4233	77.7928	67.8656	65.4327	58.5728	57.5110	60.0013	60.8913	68.3665	73.2719	82.1255	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.0861	123.0861	123.0861	123.0861	123.0861	123.0861	123.0861	123.0861	123.0861	123.0861	123.0861	123.0861	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	129.5055	143.3811	129.5055	133.8223	129.5055	133.8223	129.5055	129.5055	133.8223	129.5055	133.8223	129.5055	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3151	221.5909	215.8560	203.6469	188.2352	173.7504	164.0736	161.7978	167.5327	179.7418	195.1535	209.6383	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3086	35.3086	35.3086	35.3086	35.3086	35.3086	35.3086	35.3086	35.3086	35.3086	35.3086	35.3086	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4689	-98.4689	-98.4689	-98.4689	-98.4689	-98.4689	-98.4689	-98.4689	-98.4689	-98.4689	-98.4689	-98.4689	(71)
Water heating gains (Table 5)	111.7010	109.2609	104.5603	94.2577	87.9472	81.3511	77.2997	80.6469	84.5713	91.8904	101.7666	110.3838	(72)
Total internal gains	523.4475	537.1587	512.8475	494.6528	468.6137	448.8496	430.8046	431.8760	445.8522	464.0635	493.6682	512.4534	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Southeast	3.5300	36.7938	0.6300	0.7000	0.7700	39.6937 (77)
Northwest	3.9500	11.2829	0.6300	0.7000	0.7700	13.6204 (81)

Solar gains	53.3141	95.3379	142.4624	196.6601	238.6607	245.0217	232.8617	200.2911	161.0364	108.6087	64.6819	45.0927 (83)
Total gains	576.7616	632.4966	655.3100	691.3130	707.2744	693.8714	663.6663	632.1671	606.8886	572.6722	558.3502	557.5461 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	44.1082	44.2337	44.3575	44.9482	45.0604	45.5905	45.5905	45.6901	45.3849	45.0604	44.8339	44.5995	
alpha	3.9405	3.9489	3.9572	3.9965	4.0040	4.0394	4.0394	4.0460	4.0257	4.0040	3.9889	3.9733	
util living area	0.9826	0.9735	0.9588	0.9178	0.8337	0.6778	0.5218	0.5639	0.7743	0.9254	0.9712	0.9847	(86)
MIT	19.4304	19.6210	19.9000	20.3081	20.6609	20.8976	20.9725	20.9623	20.8159	20.3804	19.8542	19.4063	(87)
Th 2	20.0327	20.0352	20.0376	20.0491	20.0512	20.0612	20.0612	20.0631	20.0573	20.0512	20.0469	20.0423	(88)
util rest of house	0.9788	0.9678	0.9494	0.8980	0.7922	0.6019	0.4200	0.4620	0.7087	0.9035	0.9639	0.9814	(89)
MIT 2	18.2079	18.4506	18.8041	19.3172	19.7339	19.9882	20.0484	20.0441	19.9116	19.4140	18.7563	18.1839	(90)
Living area fraction										fLA = Living area / (4) =		0.2664	(91)
MIT	18.5337	18.7625	19.0961	19.5812	19.9809	20.2305	20.2946	20.2888	20.1526	19.6715	19.0488	18.5096	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5337	18.7625	19.0961	19.5812	19.9809	20.2305	20.2946	20.2888	20.1526	19.6715	19.0488	18.5096	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9708	0.9578	0.9377	0.8863	0.7887	0.6165	0.4462	0.4876	0.7160	0.8928	0.9539	0.9740	(94)
Useful gains	559.9341	605.7848	614.4889	612.6943	557.8390	427.7902	296.1200	308.2728	434.5533	511.2790	532.6163	543.0455	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1207.3986	1172.5762	1062.4847	889.1222	687.5977	462.0912	303.2144	318.4534	498.9790	753.2483	997.1747	1200.4697	(97)
Space heating kWh	481.7136	380.8839	333.3088	199.0281	96.5405	0.0000	0.0000	0.0000	0.0000	180.0252	334.4821	489.1236	(98a)
Space heating requirement - total per year (kWh/year)												2495.1058	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	481.7136	380.8839	333.3088	199.0281	96.5405	0.0000	0.0000	0.0000	0.0000	180.0252	334.4821	489.1236	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2495.1058	
Space heating per m2										(98c) / (4) =		31.2122	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.4000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	481.7136	380.8839	333.3088	199.0281	96.5405	0.0000	0.0000	0.0000	0.0000	180.0252	334.4821	489.1236	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	521.3350	412.2120	360.7238	215.3984	104.4811	0.0000	0.0000	0.0000	0.0000	194.8324	361.9936	529.3546	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	232.6441	205.7619	218.8786	193.3825	188.0357	170.0840	168.4459	174.8474	176.4229	195.9233	207.3010	230.2510	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.9038	85.6815	85.2797	84.4432	83.0247	80.3000	80.3000	80.3000	80.3000	84.2005	85.4004	85.9536	(217)
Fuel for water heating, kWh/month	270.8193	240.1475	256.6597	229.0090	226.4817	211.8108	209.7707	217.7427	219.7047	232.6867	242.7400	267.8783	(219)

Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	26.9087	21.5871	19.4368	14.2403	10.9996	8.9868	10.0342	13.0428	16.9413	22.2279	25.1064	27.6566 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-37.3467	-52.6059	-75.5279	-84.7979	-91.3170	-85.1842	-84.1557	-79.5448	-71.3320	-60.1469	-41.0543	-32.2957 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-21.1773	-44.5630	-88.6045	-133.1197	-176.0561	-176.9123	-174.8054	-147.9557	-108.3965	-63.7072	-28.2679	-16.7427 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	2700.3309 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	80.3000
Water heating fuel used	2825.4511 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	217.1685 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1975.6175 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	3853.3331 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2700.3309	0.2100	567.0695	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2825.4511	0.2100	593.3447	(264)
Space and water heating			1160.4142	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	217.1685	0.1443	31.3441	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-795.3090	0.1346	-107.0585	
PV Unit electricity exported	-1180.3084	0.1259	-148.5875	
Total			-255.6460	(269)
Total CO2, kg/year			948.0416	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.8600	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2700.3309	1.1300	3051.3739	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2825.4511	1.1300	3192.7598	(278)
Space and water heating			6244.1337	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	217.1685	1.5338	333.1003	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-795.3090	1.4975	-1190.9803	
PV Unit electricity exported	-1180.3084	0.4621	-545.4181	
Total			-1736.3984	(283)
Total Primary energy kWh/year			4970.9364	(286)
Target Primary Energy Rate (TPER)			62.1800	(287)

Full SAP Calculation Printout

Property Reference	4907-P637-6460-044	Issued on Date	13/07/2023
Assessment Reference	Plot 044 - Baker Semi	Prop Type Ref	Baker- END
Property	Masonry, 2 Bed, K, WC, B, Country Brick		

SAP Rating	90 B	DER	10.79	TER	11.86
Environmental	91 B	% DER < TER			9.02
CO_2 Emissions (t/year)	0.76	DFEE	34.28	TFEE	36.04
Compliance Check	See BREL	% DFEE < TFEE			4.88
% DPER < TPER	6.25	DPER	58.29	TPER	62.18

Assessor Details	Miss Maja Stanisz	Assessor ID	Q919-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)
Ground floor		39.9700 (1b)	x	2.3900 (2b)	=	95.5283 (1b) -
First floor		39.9700 (1c)	x	2.6100 (2c)	=	104.3217 (1c) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9400					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	199.8500 (5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		3 * 10 =	30.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		30.0000 / (5) =	0.1501 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			4.0000 (17)
Infiltration rate			0.3501 (18)
Number of sides sheltered			2 (19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.2976 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3794	0.3720	0.3646	0.3274	0.3199	0.2827	0.2827	0.2753	0.2976	0.3199	0.3348	0.3497	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000 (23c)
Effective ac	0.5720 0.5692 0.5665 0.5536 0.5512 0.5400 0.5400 0.5379 0.5443 0.5512 0.5560 0.5611 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Solid Door			2.1500	1.1000	2.3650			(26)
Half Glaze			2.1500	1.3000	2.7950			(26a)
Window (Uw = 1.30)			7.4800	1.2357	9.2433			(27)
McCann P/A=0.50			39.9700	0.1100	4.3967	75.0000	2997.7500	(28a)
EW Brick AAC011	88.4600	11.7800	76.6800	0.2400	18.4032	60.0000	4600.8000	(29a)

EW Brick AAC018	1.3400	1.3400	0.2600	0.3484	60.0000	80.4000	(29a)
PR 500mm MW044	39.9700	39.9700	0.0900	3.5973	9.0000	359.7300	(30)
Total net area of external elements Aum(A, m2)		169.7400					(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =		41.1489			(33)
E-WM-30		49.0000	0.0000	0.0000	45.0000	2205.0000	(32)
GF Masonry		15.3000			75.0000	1147.5000	(32c)
GF Timber		45.6500			9.0000	410.8500	(32c)
1F Timber		65.3800			9.0000	588.4200	(32c)
Internal Floor		39.9700			18.0000	719.4600	(32d)
Internal Ceiling		39.9700			9.0000	359.7300	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 13469.6400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 168.4969 (35)
List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E2	Other lintels (including other steel lintels)	8.2900	0.0420	0.3482
E3	Sill	6.2400	0.0090	0.0562
E4	Jamb	20.2500	0.0140	0.2835
E5	Ground floor (normal)	8.1600	0.0600	0.4896
E5	Ground floor (normal)	9.8000	0.0480	0.4704
E6	Intermediate floor within a dwelling	17.9600	0.0000	0.0000
E10	Eaves (insulation at ceiling level)	8.1600	0.0310	0.2530
E12	Gable (insulation at ceiling level)	9.8000	0.0540	0.5292
E16	Corner (normal)	10.0000	0.0570	0.5700
E18	Party wall between dwellings	10.0000	0.0490	0.4900
P1	Party wall - Ground floor	9.8000	0.0310	0.3038
P2	Party wall - Intermediate floor within a dwelling	9.8000	0.0000	0.0000
P4	Party wall - Roof (insulation at ceiling level)	9.8000	0.0410	0.4018

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 4.1956 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 45.3445 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.7227	37.5384	37.3577	36.5089	36.3501	35.6109	35.6109	35.4740	35.8956	36.3501	36.6714	37.0072	(38)
Heat transfer coeff	83.0673	82.8829	82.7022	81.8535	81.6947	80.9555	80.9555	80.8186	81.2402	81.6947	82.0159	82.3518	(39)

Average = Sum(39)m / 12 = 81.8527

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0391	1.0368	1.0346	1.0239	1.0219	1.0127	1.0127	1.0110	1.0163	1.0219	1.0260	1.0302	(40)
HLP (average)												1.0239	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4617 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

28.2881	27.8680	27.2764	26.1855	25.3687	24.4630	23.9738	24.5613	25.2009	26.1701	27.2834	28.1925	(42b)

Hot water usage for other uses

39.8405	38.3917	36.9430	35.4943	34.0455	32.5968	32.5968	34.0455	35.4943	36.9430	38.3917	39.8405	(42c)

Average daily hot water use (litres/day) 62.4461 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.1286	66.2597	64.2194	61.6798	59.4142	57.0598	56.5706	58.6068	60.6952	63.1131	65.6751	68.0329	(44)
Energy conte	107.8990	94.3529	98.7028	84.4365	79.9830	70.1617	68.4172	72.5675	74.8432	85.6438	93.5662	106.5231	(45)

Energy content (annual) Total = Sum(45)m = 1037.0970
Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

91.7142	80.2000	83.8973	71.7711	67.9855	59.6374	58.1546	61.6823	63.6168	72.7973	79.5313	90.5447	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

91.7142	80.2000	83.8973	71.7711	67.9855	59.6374	58.1546	61.6823	63.6168	72.7973	79.5313	90.5447	(64)

Total per year (kWh/year) = Sum(64)m = 881.5325 (64)
12Total per year (kWh/year) 882 (64)
Electric shower(s)

52.4503	46.7337	51.0314	48.6986	49.6124	47.3254	48.9030	49.6124	48.6986	51.0314	50.0718	52.4503	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 596.6194 (64a)
Heat gains from water heating, kWh/month

36.0411	31.7334	33.7322	30.1174	29.3995	26.7407	26.7644	27.8237	28.0788	30.9572	32.4008	35.7488	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.0861	123.0861	123.0861	123.0861	123.0861	123.0861	123.0861	123.0861	123.0861	123.0861	123.0861	123.0861	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	129.5055	143.3811	129.5055	133.8223	129.5055	133.8223	129.5055	129.5055	133.8223	129.5055	133.8223	129.5055	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	219.3151	221.5909	215.8560	203.6469	188.2352	173.7504	164.0736	161.7978	167.5327	179.7418	195.1535	209.6383	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.3086	35.3086	35.3086	35.3086	35.3086	35.3086	35.3086	35.3086	35.3086	35.3086	35.3086	35.3086	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.4689	-98.4689	-98.4689	-98.4689	-98.4689	-98.4689	-98.4689	-98.4689	-98.4689	-98.4689	-98.4689	-98.4689	(71)
Water heating gains (Table 5)													
	48.4424	47.2224	45.3390	41.8297	39.5154	37.1399	35.9737	37.3974	38.9984	41.6091	45.0011	48.0494	(72)
Total internal gains													
	457.1888	472.1202	450.6262	439.2248	417.1820	404.6384	389.4786	388.6265	400.2793	410.7822	433.9027	447.1191	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	3.5300	36.7938	0.4700	0.0000	0.7700	47.0044	(77)
Northwest	3.9500	11.2829	0.4700	0.0000	0.7700	16.1290	(81)

Solar gains	63.1334	112.8969	168.7008	232.8805	282.6166	290.1492	275.7496	237.1801	190.6957	128.6120	76.5949	53.3977	(83)
Total gains	520.3222	585.0171	619.3270	672.1053	699.7985	694.7876	665.2281	625.8067	590.9750	539.3942	510.4976	500.5168	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	45.0426	45.1428	45.2414	45.7105	45.7994	46.2176	46.2176	46.2959	46.0556	45.7994	45.6200	45.4340	
alpha	4.0028	4.0095	4.0161	4.0474	4.0533	4.0812	4.0812	4.0864	4.0704	4.0533	4.0413	4.0289	
util living area													
	0.9876	0.9791	0.9647	0.9221	0.8336	0.6718	0.5152	0.5632	0.7810	0.9356	0.9781	0.9893	(86)
MIT	19.3781	19.5847	19.8812	20.3089	20.6710	20.9040	20.9748	20.9638	20.8151	20.3566	19.8062	19.3465	(87)
Th 2	20.0509	20.0528	20.0546	20.0634	20.0651	20.0728	20.0728	20.0742	20.0698	20.0651	20.0617	20.0583	(88)
util rest of house													
	0.9848	0.9745	0.9565	0.9032	0.7925	0.5967	0.4153	0.4624	0.7166	0.9162	0.9725	0.9870	(89)
MIT 2	18.5727	18.7784	19.0718	19.4916	19.8248	20.0195	20.0636	20.0600	19.9550	19.5446	19.0060	18.5470	(90)
Living area fraction									fLA = Living area / (4) =			0.2664	(91)
MIT	18.7873	18.9932	19.2875	19.7094	20.0503	20.2552	20.3064	20.3008	20.1842	19.7609	19.2192	18.7600	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7873	18.9932	19.2875	19.7094	20.0503	20.2552	20.3064	20.3008	20.1842	19.7609	19.2192	18.7600	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9799	0.9678	0.9481	0.8947	0.7917	0.6124	0.4413	0.4881	0.7254	0.9085	0.9659	0.9825	(94)
Useful gains	509.8673	566.1746	587.2077	601.3420	554.0649	425.4768	293.5480	305.4633	428.6889	490.0140	493.0843	491.7765	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1203.4194	1168.0893	1057.5527	884.7847	682.1746	457.8176	300.0529	315.2588	494.2779	748.3993	993.9691	1199.0417	(97)
Space heating kWh													
	516.0028	404.4866	349.9367	204.0787	95.3136	0.0000	0.0000	0.0000	0.0000	192.2386	360.6370	526.2054	(98a)
Space heating requirement - total per year (kWh/year)												2648.8996	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	516.0028	404.4866	349.9367	204.0787	95.3136	0.0000	0.0000	0.0000	0.0000	192.2386	360.6370	526.2054	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2648.8996	
Space heating per m2											(98c) / (4) =	33.1361	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	760.9813	599.0703	614.2210	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7964	0.8680	0.8386	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	606.0792	519.9938	515.0558	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	748.4019	716.8746	673.4916	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	102.4723	146.4793	117.8763	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)

Intermittency factor (Table 10b)												
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	25.6181	36.6198	29.4691	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												91.7070 (107)
Energy for space heating												33.1361 (99)
Energy for space cooling												1.1472 (108)
Total												34.2833 (109)
Fabric Energy Efficiency (DFEE)												34.3 (109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	39.9700 (1b)	x	2.3900 (2b)	=	95.5283 (1b)	-
First floor	39.9700 (1c)	x	2.6100 (2c)	=	104.3217 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	199.8500	(5)

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2. Ventilation rate

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			m3 per hour
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		3 * 10 =	30.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
			Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		30.0000 / (5) =	0.1501 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			5.0000 (17)
Infiltration rate			0.4001 (18)
Number of sides sheltered			2 (19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.3401 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.4336	0.4251	0.4166	0.3741	0.3656	0.3231	0.3231	0.3146	0.3401	0.3656	0.3826	0.3996	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5940	0.5904	0.5868	0.5700	0.5668	0.5522	0.5522	0.5495	0.5578	0.5668	0.5732	0.5798	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Semi-glazed door			2.1500	1.0000	2.1500			(26a)
TER Opening Type (Uw = 1.20)			7.4800	1.1450	8.5649			(27)
McCann P/A=0.50			39.9700	0.1300	5.1961			(28a)
EW Brick AAC011	88.4600	11.7800	76.6800	0.1800	13.8024			(29a)
EW Brick AAC018	1.3400		1.3400	0.1800	0.2412			(29a)
PR 500mm MW044	39.9700		39.9700	0.1100	4.3967			(30)
Total net area of external elements Aum(A, m2)			169.7400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.5013			(33)
E-WM-30			49.0000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 168.4969 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E2 Other lintels (including other steel lintels)	8.2900	0.0500	0.4145	
E3 Sill	6.2400	0.0500	0.3120	
E4 Jamb	20.2500	0.0500	1.0125	
E5 Ground floor (normal)	8.1600	0.1600	1.3056	
E5 Ground floor (normal)	9.8000	0.1600	1.5680	
E6 Intermediate floor within a dwelling	17.9600	0.0000	0.0000	
E10 Eaves (insulation at ceiling level)	8.1600	0.0600	0.4896	
E12 Gable (insulation at ceiling level)	9.8000	0.0600	0.5880	
E16 Corner (normal)	10.0000	0.0900	0.9000	
E18 Party wall between dwellings	10.0000	0.0600	0.6000	
P1 Party wall - Ground floor	9.8000	0.0800	0.7840	
P2 Party wall - Intermediate floor within a dwelling	9.8000	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	9.8000	0.1200	1.1760	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.1502 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 45.6515 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	39.1755	38.9348	38.6988	37.5903	37.3829	36.4175	36.4175	36.2387	36.7893	37.3829	37.8025	38.2411	(38)
Heat transfer coeff	84.8270	84.5862	84.3502	83.2418	83.0344	82.0689	82.0689	81.8902	82.4408	83.0344	83.4539	83.8926	(39)

Average = Sum(39)m / 12 = 83.2408

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0611	1.0581	1.0552	1.0413	1.0387	1.0266	1.0266	1.0244	1.0313	1.0387	1.0440	1.0494	(40)
HLP (average)												1.0413	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4617 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	28.2881	27.8680	27.2764	26.1855	25.3687	24.4630	23.9738	24.5613	25.2009	26.1701	27.2834	28.1925	(42b)
Hot water usage for other uses	39.8405	38.3917	36.9430	35.4943	34.0455	32.5968	32.5968	34.0455	35.4943	36.9430	38.3917	39.8405	(42c)

Average daily hot water use (litres/day) 62.4461 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.1286	66.2597	64.2194	61.6798	59.4142	57.0598	56.5706	58.6068	60.6952	63.1131	65.6751	68.0329	(44)
Energy conte	107.8990	94.3529	98.7028	84.4365	79.9830	70.1617	68.4172	72.5675	74.8432	85.6438	93.5662	106.5231	(45)

Energy content (annual) Total = Sum(45)m = 1037.0970

Distribution loss (46)m = 0.15 x (45)m

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

	91.7142	80.2000	83.8973	71.7711	67.9855	59.6374	58.1546	61.6823	63.6168	72.7973	79.5313	90.5447	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

	91.7142	80.2000	83.8973	71.7711	67.9855	59.6374	58.1546	61.6823	63.6168	72.7973	79.5313	90.5447	(64)

Total per year (kWh/year) = Sum(64)m = 881.5325 (64)

12Total per year (kWh/year) 882 (64)

Electric shower(s)

	52.4503	46.7337	51.0314	48.6986	49.6124	47.3254	48.9030	49.6124	48.6986	51.0314	50.0718	52.4503	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 596.6194 (64a)

Heat gains from water heating, kWh/month

	36.0411	31.7334	33.7322	30.1174	29.3995	26.7407	26.7644	27.8237	28.0788	30.9572	32.4008	35.7488	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.0861	123.0861	123.0861	123.0861	123.0861	123.0861	123.0861	123.0861	123.0861	123.0861	123.0861	123.0861	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	129.5055	143.3811	129.5055	133.8223	129.5055	133.8223	129.5055	129.5055	133.8223	129.5055	133.8223	129.5055	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3151	221.5909	215.8560	203.6469	188.2352	173.7504	164.0736	161.7978	167.5327	179.7418	195.1535	209.6383	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3086	35.3086	35.3086	35.3086	35.3086	35.3086	35.3086	35.3086	35.3086	35.3086	35.3086	35.3086	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4689	-98.4689	-98.4689	-98.4689	-98.4689	-98.4689	-98.4689	-98.4689	-98.4689	-98.4689	-98.4689	-98.4689	(71)
Water heating gains (Table 5)	48.4424	47.2224	45.3390	41.8297	39.5154	37.1399	35.9737	37.3974	38.9984	41.6091	45.0011	48.0494	(72)
Total internal gains	457.1888	472.1202	450.6262	439.2248	417.1820	404.6384	389.4786	388.6265	400.2793	410.7822	433.9027	447.1191	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Southeast	3.5300	36.7938	0.6300	0.7000	0.7700	39.6937 (77)
Northwest	3.9500	11.2829	0.6300	0.7000	0.7700	13.6204 (81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	53.3141	95.3379	142.4624	196.6601	238.6607	245.0217	232.8617	200.2911	161.0364	108.6087	64.6819	45.0927	(83)
Total gains	510.5029	567.4580	593.0886	635.8850	655.8427	649.6602	622.3403	588.9176	561.3157	519.3909	498.5847	492.2117	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	44.1082	44.2337	44.3575	44.9482	45.0604	45.5905	45.5905	45.6901	45.3849	45.0604	44.8339	44.5995	
alpha	3.9405	3.9489	3.9572	3.9965	4.0040	4.0394	4.0394	4.0460	4.0257	4.0040	3.9889	3.9733	
util living area	0.9885	0.9814	0.9698	0.9348	0.8597	0.7087	0.5514	0.5974	0.8063	0.9435	0.9801	0.9900	(86)
MIT	19.3157	19.5123	19.8016	20.2338	20.6129	20.8792	20.9665	20.9536	20.7837	20.3063	19.7547	19.2920	(87)
Th 2	20.0327	20.0352	20.0376	20.0491	20.0512	20.0612	20.0612	20.0631	20.0573	20.0512	20.0469	20.0423	(88)
util rest of house	0.9859	0.9772	0.9626	0.9181	0.8218	0.6334	0.4458	0.4925	0.7443	0.9258	0.9748	0.9877	(89)
MIT 2	18.4975	18.6939	18.9815	19.4101	19.7643	19.9929	20.0489	20.0445	19.9208	19.4868	18.9443	18.4811	(90)
Living area fraction										fLA = Living area / (4) =		0.2664	(91)
MIT	18.7155	18.9119	19.2000	19.6296	19.9904	20.2290	20.2934	20.2868	20.1508	19.7051	19.1602	18.6972	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7155	18.9119	19.2000	19.6296	19.9904	20.2290	20.2934	20.2868	20.1508	19.7051	19.1602	18.6972	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9811	0.9708	0.9546	0.9093	0.8191	0.6479	0.4730	0.5189	0.7512	0.9178	0.9684	0.9835	(94)
Useful gains	500.8593	550.8876	566.1404	578.2068	537.1715	420.9384	294.3730	305.5873	421.6509	476.7126	482.8418	484.0683	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1222.8235	1185.2176	1071.2481	893.1512	688.3920	461.9695	303.1107	318.2880	498.8292	756.0379	1006.4745	1216.2045	(97)
Space heating kWh	537.1414	426.2698	375.8001	226.7600	112.5080	0.0000	0.0000	0.0000	0.0000	207.8180	377.0156	544.7094	(98a)
Space heating requirement - total per year (kWh/year)												2808.0223	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	537.1414	426.2698	375.8001	226.7600	112.5080	0.0000	0.0000	0.0000	0.0000	207.8180	377.0156	544.7094	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2808.0223	
Space heating per m2										(98c) / (4) =		35.1266	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	771.4481	607.3102	622.3652	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7581	0.8371	0.8069	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	584.8404	508.3876	502.1966	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	695.6555	666.7459	630.3745	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	79.7869	117.8186	95.3643	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	19.9467	29.4546	23.8411	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												73.2425	(107)
Energy for space heating												35.1266	(99)
Energy for space cooling												0.9162	(108)
Total												36.0428	(109)
Fabric Energy Efficiency (TFEE)												36.0	(109)

Full SAP Calculation Printout

Property Reference	4907-P637-6460-044	Issued on Date	13/07/2023
Assessment Reference	Plot 044 - Baker Semi	Prop Type Ref	Baker- END
Property	Masonry, 2 Bed, K, WC, B, Country Brick		

SAP Rating	90 B	DER	10.79	TER	11.86
Environmental	91 B	% DER < TER			9.02
CO_2 Emissions (t/year)	0.76	DFEE	34.28	TFEE	36.04
Compliance Check	See BREL	% DFEE < TFEE			4.88
% DPER < TPER	6.25	DPER	58.29	TPER	62.18

Assessor Details	Miss Maja Stanisz	Assessor ID	Q919-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

			Area (m2)		Storey height (m)		Volume (m3)	
Ground floor			39.9700 (1b)	x	2.3900 (2b)	=	95.5283 (1b)	-
First floor			39.9700 (1c)	x	2.6100 (2c)	=	104.3217 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9400							(4)
Dwelling volume					(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	199.8500	(5)

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2. Ventilation rate

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		m3 per hour		
Number of open chimneys		0 * 80	=	0.0000 (6a)
Number of open flues		0 * 20	=	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10	=	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20	=	0.0000 (6d)
Number of flues attached to other heater		0 * 35	=	0.0000 (6e)
Number of blocked chimneys		0 * 20	=	0.0000 (6f)
Number of intermittent extract fans		0 * 10	=	0.0000 (7a)
Number of passive vents		0 * 10	=	0.0000 (7b)
Number of flueless gas fires		0 * 40	=	0.0000 (7c)
		Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5)	=	0.0000 (8)
Pressure test				Yes
Pressure Test Method				Blower Door
Measured/design AP50				4.0000 (17)
Infiltration rate				0.2000 (18)
Number of sides sheltered				2 (19)
Shelter factor		(20) = 1 - [0.075 x (19)]	=	0.8500 (20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20)	=	0.1700 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2167	0.2125	0.2083	0.1870	0.1827	0.1615	0.1615	0.1573	0.1700	0.1827	0.1913	0.1998	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Solid Door			2.1500	1.1000	2.3650			(26)
Half Glaze			2.1500	1.3000	2.7950			(26a)
Window (Uw = 1.30)			7.4800	1.2357	9.2433			(27)

McCann P/A=0.50			39.9700	0.1100	4.3967	75.0000	2997.7500 (28a)
EW Brick AAC011	88.4600	11.7800	76.6800	0.2400	18.4032	60.0000	4600.8000 (29a)
EW Brick AAC018	1.3400		1.3400	0.2600	0.3484	60.0000	80.4000 (29a)
PR 500mm MW044	39.9700		39.9700	0.0900	3.5973	9.0000	359.7300 (30)
Total net area of external elements Aum(A, m2)			169.7400				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		41.1489		(33)
E-WM-30			49.0000	0.0000	0.0000	45.0000	2205.0000 (32)
GF Masonry			15.3000			75.0000	1147.5000 (32c)
GF Timber			45.6500			9.0000	410.8500 (32c)
1F Timber			65.3800			9.0000	588.4200 (32c)
Internal Floor			39.9700			18.0000	719.4600 (32d)
Internal Ceiling			39.9700			9.0000	359.7300 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 13469.6400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 168.4969 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.2900	0.0420	0.3482
E3 Sill	6.2400	0.0090	0.0562
E4 Jamb	20.2500	0.0140	0.2835
E5 Ground floor (normal)	8.1600	0.0600	0.4896
E5 Ground floor (normal)	9.8000	0.0480	0.4704
E6 Intermediate floor within a dwelling	17.9600	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	8.1600	0.0310	0.2530
E12 Gable (insulation at ceiling level)	9.8000	0.0540	0.5292
E16 Corner (normal)	10.0000	0.0570	0.5700
E18 Party wall between dwellings	10.0000	0.0490	0.4900
P1 Party wall - Ground floor	9.8000	0.0310	0.3038
P2 Party wall - Intermediate floor within a dwelling	9.8000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	9.8000	0.0410	0.4018

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 4.1956 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 45.3445 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.9753	32.9753	32.9753	32.9753	32.9753	32.9753	32.9753	32.9753	32.9753	32.9753	32.9753	32.9753	(38)
Heat transfer coeff	78.3198	78.3198	78.3198	78.3198	78.3198	78.3198	78.3198	78.3198	78.3198	78.3198	78.3198	78.3198	(39)

Average = Sum(39)m / 12 = 78.3198

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9797	0.9797	0.9797	0.9797	0.9797	0.9797	0.9797	0.9797	0.9797	0.9797	0.9797	0.9797	(40)
HLP (average)												0.9797	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4617 (42)
Hot water usage for mixer showers

65.4947	64.5104	63.0762	60.3320	58.3068	56.0484	54.7647	56.1881	57.7484	60.1733	62.9764	65.2438	(42a)

Hot water usage for baths

28.2881	27.8680	27.2764	26.1855	25.3687	24.4630	23.9738	24.5613	25.2009	26.1701	27.2834	28.1925	(42b)

Hot water usage for other uses

39.8405	38.3917	36.9430	35.4943	34.0455	32.5968	32.5968	34.0455	35.4943	36.9430	38.3917	39.8405	(42c)

Average daily hot water use (litres/day) 122.8300 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6233	130.7701	127.2955	122.0118	117.7211	113.1082	111.3353	114.7949	118.4436	123.2864	128.6515	133.2767	(44)
Energy conte	211.6266	186.2149	195.6485	167.0280	158.4752	139.0797	134.6504	142.1401	146.0528	167.2984	183.2877	208.6791	(45)

Energy content (annual) Total = Sum(45)m = 2040.1815

Distribution loss (46)m = 0.15 x (45)m												
31.7440	27.9322	29.3473	25.0542	23.7713	20.8620	20.1976	21.3210	21.9079	25.0948	27.4932	31.3019	(46)
Water storage loss:												
Total storage loss												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.2645	12.8722	14.2261	13.7137	14.1369	13.6466	14.0797	14.0977	13.6633	14.1581	13.7527	14.2574	(61)
Total heat required for water heating calculated for each month												
225.8911	199.0871	209.8746	180.7417	172.6121	152.7263	148.7301	156.2378	159.7162	181.4565	197.0404	222.9365	(62)
WWHRS	-58.2991	-51.5602	-53.9908	-44.7066	-41.6649	-35.6529	-33.4190	-35.5377	-36.8879	-43.4868	-49.2652	-57.2195	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
167.5920	147.5270	155.8838	136.0351	130.9472	117.0734	115.3112	120.7001	122.8283	137.9697	147.7752	165.7170	(64)

Total per year (kWh/year) = Sum(64)m = 1665.3598 (64)
12Total per year (kWh/year) 1665 (64)
Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month												
73.9320	65.1345	68.6097	58.9652	56.2272	49.6557	48.2912	50.7860	51.9784	59.1663	64.3813	72.9501	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.0861	123.0861	123.0861	123.0861	123.0861	123.0861	123.0861	123.0861	123.0861	123.0861	123.0861	123.0861	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	129.5055	143.3811	129.5055	133.8223	129.5055	133.8223	129.5055	129.5055	133.8223	129.5055	133.8223	129.5055	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	219.3151	221.5909	215.8560	203.6469	188.2352	173.7504	164.0736	161.7978	167.5327	179.7418	195.1535	209.6383	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.3086	35.3086	35.3086	35.3086	35.3086	35.3086	35.3086	35.3086	35.3086	35.3086	35.3086	35.3086	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.4689	-98.4689	-98.4689	-98.4689	-98.4689	-98.4689	-98.4689	-98.4689	-98.4689	-98.4689	-98.4689	-98.4689	(71)
Water heating gains (Table 5)													
	99.3709	96.9264	92.2173	81.8961	75.5742	68.9662	64.9075	68.2608	72.1922	79.5245	89.4185	98.0513	(72)
Total internal gains													
	511.1173	524.8242	500.5045	482.2912	456.2407	436.4647	418.4124	419.4899	433.4731	451.6976	481.3202	500.1209	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	3.5300	36.7938	0.4700	0.0000	0.7700	47.0044	(77)
Northwest	3.9500	11.2829	0.4700	0.0000	0.7700	16.1290	(81)

Solar gains	63.1334	112.8969	168.7008	232.8805	282.6166	290.1492	275.7496	237.1801	190.6957	128.6120	76.5949	53.3977	(83)
Total gains	574.2507	637.7211	669.2053	715.1717	738.8573	726.6139	694.1620	656.6700	624.1688	580.3096	557.9151	553.5187	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	47.7729	47.7729	47.7729	47.7729	47.7729	47.7729	47.7729	47.7729	47.7729	47.7729	47.7729	47.7729	
alpha	4.1849	4.1849	4.1849	4.1849	4.1849	4.1849	4.1849	4.1849	4.1849	4.1849	4.1849	4.1849	
util living area													
	0.9818	0.9706	0.9520	0.9016	0.8013	0.6369	0.4827	0.5276	0.7450	0.9159	0.9693	0.9844	(86)
MIT	19.5971	19.7897	20.0601	20.4290	20.7430	20.9274	20.9821	20.9740	20.8579	20.4664	19.9671	19.5466	(87)
Th 2	20.1003	20.1003	20.1003	20.1003	20.1003	20.1003	20.1003	20.1003	20.1003	20.1003	20.1003	20.1003	(88)
util rest of house													
	0.9780	0.9645	0.9416	0.8797	0.7577	0.5639	0.3900	0.4332	0.6793	0.8926	0.9618	0.9811	(89)
MIT 2	18.4652	18.7083	19.0478	19.5001	19.8629	20.0493	20.0920	20.0873	19.9891	19.5534	18.9353	18.4013	(90)
Living area fraction										fLA = Living area / (4) =		0.2664	(91)
MIT	18.7668	18.9964	19.3175	19.7476	20.0974	20.2833	20.3291	20.3236	20.2206	19.7967	19.2102	18.7065	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.6168	18.8464	19.1675	19.5976	19.9474	20.1333	20.1791	20.1736	20.0706	19.6467	19.0602	18.5565	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9694	0.9534	0.9280	0.8652	0.7494	0.5667	0.3984	0.4412	0.6769	0.8783	0.9504	0.9732	(94)
Useful gains	556.6736	607.9773	621.0272	618.7543	553.7024	411.7693	276.5245	289.6973	422.4901	509.6759	530.2306	538.6638	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1121.2903	1092.2817	992.1165	837.8334	645.9361	433.3642	280.3172	295.5441	467.6132	708.5328	936.7216	1124.3943	(97)
Space heating kWh													
	420.0748	325.4525	276.0905	157.7369	68.6218	0.0000	0.0000	0.0000	0.0000	147.9496	292.6735	435.7834	(98a)
Space heating requirement - total per year (kWh/year)												2124.3831	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	420.0748	325.4525	276.0905	157.7369	68.6218	0.0000	0.0000	0.0000	0.0000	147.9496	292.6735	435.7834	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2124.3831	
Space heating per m2											(98c) / (4) =	26.5747	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												89.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	420.0748	325.4525	276.0905	157.7369	68.6218	0.0000	0.0000	0.0000	0.0000	147.9496	292.6735	435.7834	(98)

Space heating efficiency (main heating system 1)

89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)

Space heating fuel (main heating system)

471.9941	365.6770	310.2140	177.2325	77.1032	0.0000	0.0000	0.0000	0.0000	166.2355	328.8467	489.6443 (211)

Space heating efficiency (main heating system 2)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)

Space heating fuel (main heating system 2)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)

Space heating fuel (secondary)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)

Water heating

Water heating requirement

167.5920	147.5270	155.8838	136.0351	130.9472	117.0734	115.3112	120.7001	122.8283	137.9697	147.7752	165.7170 (64)

Efficiency of water heater

											87.3000 (216)
(217)m	88.5085	88.4627	88.3790	88.2046	87.8772	87.3000	87.3000	87.3000	87.3000	88.1715	88.4223	88.5251 (217)

Fuel for water heating, kWh/month

189.3513	166.7674	176.3811	154.2267	149.0116	134.1047	132.0861	138.2590	140.6967	156.4789	167.1243	187.1979 (219)

Space cooling fuel requirement

(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	10.6273	9.5989	10.6273	10.2845	10.6273	10.2845	10.6273	10.6273	10.2845	10.6273	10.2845	10.6273 (231)
Lighting	27.8711	22.3593	20.1320	14.7496	11.3930	9.3082	10.3931	13.5093	17.5473	23.0230	26.0044	28.6457 (232)

Electricity generated by PVs (Appendix M) (negative quantity)

(233a)m	-14.0005	-21.8365	-34.8618	-43.2847	-50.0254	-47.9147	-47.2484	-42.8402	-35.5798	-26.5735	-16.0575	-11.8364 (233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m	-3.8525	-8.7689	-19.0724	-31.0501	-43.1666	-44.1587	-43.4255	-35.5587	-24.4498	-13.0777	-5.2877	-2.9849 (233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year

Space heating fuel - main system 1	2386.9473 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	87.3000
Water heating fuel used	1891.6857 (219)
Space cooling fuel	0.0000 (221)

Electricity for pumps and fans:

(MEVDecentralised, Database: total watage = 4.6540, total flow = 29.0000, SFP = 0.1605)

mechanical ventilation fans (SFP = 0.1605)	39.1284 (230a)
central heating pump	41.0000 (230c)
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	125.1284 (231)
Electricity for lighting (calculated in Appendix L)	224.9359 (232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	-666.9130 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	3961.7844 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2386.9473	0.2100	501.2589	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1891.6857	0.2100	397.2540	(264)
Space and water heating			898.5129	(265)
Pumps, fans and electric keep-hot	125.1284	0.1387	17.3569	(267)
Energy for lighting	224.9359	0.1443	32.4652	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-392.0595	0.1326	-52.0040	
PV Unit electricity exported	-274.8535	0.1238	-34.0368	
Total			-86.0408	(269)
Total CO2, kg/year			862.2942	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			10.7900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2386.9473	1.1300	2697.2505	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1891.6857	1.1300	2137.6049	(278)

Space and water heating			4834.8553 (279)
Pumps, fans and electric keep-hot	125.1284	1.5128	189.2943 (281)
Energy for lighting	224.9359	1.5338	345.0142 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-392.0595	1.4901	-584.2145
PV Unit electricity exported	-274.8535	0.4545	-124.9115
Total			-709.1260 (283)
Total Primary energy kWh/year			4660.0378 (286)
Dwelling Primary energy Rate (DPER)			58.2900 (287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	39.9700 (1b)	x	2.3900 (2b)	=	95.5283 (1b)	-
First floor	39.9700 (1c)	x	2.6100 (2c)	=	104.3217 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	199.8500	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1501	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4001	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3401	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4336	0.4251	0.4166	0.3741	0.3656	0.3231	0.3231	0.3146	0.3401	0.3656	0.3826	0.3996	(22b)
Effective ac	0.5940	0.5904	0.5868	0.5700	0.5668	0.5522	0.5522	0.5495	0.5578	0.5668	0.5732	0.5798	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Semi-glazed door			2.1500	1.0000	2.1500			(26a)
TER Opening Type (Uw = 1.20)			7.4800	1.1450	8.5649			(27)
McCann P/A=0.50			39.9700	0.1300	5.1961			(28a)
EW Brick AAC011	88.4600	11.7800	76.6800	0.1800	13.8024			(29a)
EW Brick AAC018	1.3400		1.3400	0.1800	0.2412			(29a)
PR 500mm MW044	39.9700		39.9700	0.1100	4.3967			(30)
Total net area of external elements Aum(A, m2)			169.7400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.5013			(33)
E-WM-30			49.0000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 168.4969 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.2900	0.0500	0.4145

E3 Sill	6.2400	0.0500	0.3120	
E4 Jamb	20.2500	0.0500	1.0125	
E5 Ground floor (normal)	8.1600	0.1600	1.3056	
E5 Ground floor (normal)	9.8000	0.1600	1.5680	
E6 Intermediate floor within a dwelling	17.9600	0.0000	0.0000	
E10 Eaves (insulation at ceiling level)	8.1600	0.0600	0.4896	
E12 Gable (insulation at ceiling level)	9.8000	0.0600	0.5880	
E16 Corner (normal)	10.0000	0.0900	0.9000	
E18 Party wall between dwellings	10.0000	0.0600	0.6000	
P1 Party wall - Ground floor	9.8000	0.0800	0.7840	
P2 Party wall - Intermediate floor within a dwelling	9.8000	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	9.8000	0.1200	1.1760	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.1502 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 45.6515 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	39.1755	38.9348	38.6988	37.5903	37.3829	36.4175	36.4175	36.2387	36.7893	37.3829	37.8025	38.2411	(38)
Heat transfer coeff	84.8270	84.5862	84.3502	83.2418	83.0344	82.0689	82.0689	81.8902	82.4408	83.0344	83.4539	83.8926	(39)

Average = Sum(39)m / 12 = 83.2408

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0611	1.0581	1.0552	1.0413	1.0387	1.0266	1.0266	1.0244	1.0313	1.0387	1.0440	1.0494	(40)
HLP (average)												1.0413	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4617 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	65.4947	64.5104	63.0762	60.3320	58.3068	56.0484	54.7647	56.1881	57.7484	60.1733	62.9764	65.2438	(42a)
Hot water usage for baths	28.2881	27.8680	27.2764	26.1855	25.3687	24.4630	23.9738	24.5613	25.2009	26.1701	27.2834	28.1925	(42b)
Hot water usage for other uses	39.8405	38.3917	36.9430	35.4943	34.0455	32.5968	32.5968	34.0455	35.4943	36.9430	38.3917	39.8405	(42c)

Average daily hot water use (litres/day) 122.8300 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6233	130.7701	127.2955	122.0118	117.7211	113.1082	111.3353	114.7949	118.4436	123.2864	128.6515	133.2767	(44)
Energy conte	211.6266	186.2149	195.6485	167.0280	158.4752	139.0797	134.6504	142.1401	146.0528	167.2984	183.2877	208.6791	(45)

Energy content (annual) Total = Sum(45)m = 2040.1815

Distribution loss (46)m = 0.15 x (45)m	31.7440	27.9322	29.3473	25.0542	23.7713	20.8620	20.1976	21.3210	21.9079	25.0948	27.4932	31.3019	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	262.5855	232.2423	246.6074	216.3431	209.4341	188.3948	185.6093	193.0990	195.3679	218.2573	232.6028	259.6380	(62)
WWHRS	-29.9414	-26.4805	-27.7288	-22.9605	-21.3984	-18.3108	-17.1634	-18.2516	-18.9450	-22.3341	-25.3018	-29.3870	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	232.6441	205.7619	218.8786	193.3825	188.0357	170.0840	168.4459	174.8474	176.4229	195.9233	207.3010	230.2510	(64)

Total per year (kWh/year) = Sum(64)m = 2361.9782 (64)

12Total per year (kWh/year) 2362 (64)

Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month	83.1056	73.4233	77.7928	67.8656	65.4327	58.5728	57.5110	60.0013	60.8913	68.3665	73.2719	82.1255	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.0861	123.0861	123.0861	123.0861	123.0861	123.0861	123.0861	123.0861	123.0861	123.0861	123.0861	123.0861	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	129.5055	143.3811	129.5055	133.8223	129.5055	133.8223	129.5055	129.5055	133.8223	129.5055	133.8223	129.5055	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3151	221.5909	215.8560	203.6469	188.2352	173.7504	164.0736	161.7978	167.5327	179.7418	195.1535	209.6383	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3086	35.3086	35.3086	35.3086	35.3086	35.3086	35.3086	35.3086	35.3086	35.3086	35.3086	35.3086	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4689	-98.4689	-98.4689	-98.4689	-98.4689	-98.4689	-98.4689	-98.4689	-98.4689	-98.4689	-98.4689	-98.4689	(71)
Water heating gains (Table 5)	111.7010	109.2609	104.5603	94.2577	87.9472	81.3511	77.2997	80.6469	84.5713	91.8904	101.7666	110.3838	(72)
Total internal gains	523.4475	537.1587	512.8475	494.6528	468.6137	448.8496	430.8046	431.8760	445.8522	464.0635	493.6682	512.4534	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Southeast	3.5300	36.7938	0.6300	0.7000	0.7700	39.6937 (77)
Northwest	3.9500	11.2829	0.6300	0.7000	0.7700	13.6204 (81)

Solar gains	53.3141	95.3379	142.4624	196.6601	238.6607	245.0217	232.8617	200.2911	161.0364	108.6087	64.6819	45.0927 (83)
Total gains	576.7616	632.4966	655.3100	691.3130	707.2744	693.8714	663.6663	632.1671	606.8886	572.6722	558.3502	557.5461 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	44.1082	44.2337	44.3575	44.9482	45.0604	45.5905	45.5905	45.6901	45.3849	45.0604	44.8339	44.5995	
alpha	3.9405	3.9489	3.9572	3.9965	4.0040	4.0394	4.0394	4.0460	4.0257	4.0040	3.9889	3.9733	
util living area	0.9826	0.9735	0.9588	0.9178	0.8337	0.6778	0.5218	0.5639	0.7743	0.9254	0.9712	0.9847	(86)
MIT	19.4304	19.6210	19.9000	20.3081	20.6609	20.8976	20.9725	20.9623	20.8159	20.3804	19.8542	19.4063	(87)
Th 2	20.0327	20.0352	20.0376	20.0491	20.0512	20.0612	20.0612	20.0631	20.0573	20.0512	20.0469	20.0423	(88)
util rest of house	0.9788	0.9678	0.9494	0.8980	0.7922	0.6019	0.4200	0.4620	0.7087	0.9035	0.9639	0.9814	(89)
MIT 2	18.2079	18.4506	18.8041	19.3172	19.7339	19.9882	20.0484	20.0441	19.9116	19.4140	18.7563	18.1839	(90)
Living area fraction										fLA = Living area / (4) =		0.2664	(91)
MIT	18.5337	18.7625	19.0961	19.5812	19.9809	20.2305	20.2946	20.2888	20.1526	19.6715	19.0488	18.5096	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5337	18.7625	19.0961	19.5812	19.9809	20.2305	20.2946	20.2888	20.1526	19.6715	19.0488	18.5096	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9708	0.9578	0.9377	0.8863	0.7887	0.6165	0.4462	0.4876	0.7160	0.8928	0.9539	0.9740	(94)
Useful gains	559.9341	605.7848	614.4889	612.6943	557.8390	427.7902	296.1200	308.2728	434.5533	511.2790	532.6163	543.0455	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1207.3986	1172.5762	1062.4847	889.1222	687.5977	462.0912	303.2144	318.4534	498.9790	753.2483	997.1747	1200.4697	(97)
Space heating kWh	481.7136	380.8839	333.3088	199.0281	96.5405	0.0000	0.0000	0.0000	0.0000	180.0252	334.4821	489.1236	(98a)
Space heating requirement - total per year (kWh/year)												2495.1058	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	481.7136	380.8839	333.3088	199.0281	96.5405	0.0000	0.0000	0.0000	0.0000	180.0252	334.4821	489.1236	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2495.1058	
Space heating per m2										(98c) / (4) =		31.2122	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.4000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	481.7136	380.8839	333.3088	199.0281	96.5405	0.0000	0.0000	0.0000	0.0000	180.0252	334.4821	489.1236	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	521.3350	412.2120	360.7238	215.3984	104.4811	0.0000	0.0000	0.0000	0.0000	194.8324	361.9936	529.3546	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	232.6441	205.7619	218.8786	193.3825	188.0357	170.0840	168.4459	174.8474	176.4229	195.9233	207.3010	230.2510	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.9038	85.6815	85.2797	84.4432	83.0247	80.3000	80.3000	80.3000	80.3000	84.2005	85.4004	85.9536	(217)
Fuel for water heating, kWh/month	270.8193	240.1475	256.6597	229.0090	226.4817	211.8108	209.7707	217.7427	219.7047	232.6867	242.7400	267.8783	(219)

Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	26.9087	21.5871	19.4368	14.2403	10.9996	8.9868	10.0342	13.0428	16.9413	22.2279	25.1064	27.6566 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-37.3467	-52.6059	-75.5279	-84.7979	-91.3170	-85.1842	-84.1557	-79.5448	-71.3320	-60.1469	-41.0543	-32.2957 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-21.1773	-44.5630	-88.6045	-133.1197	-176.0561	-176.9123	-174.8054	-147.9557	-108.3965	-63.7072	-28.2679	-16.7427 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	2700.3309 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	80.3000
Water heating fuel used	2825.4511 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	217.1685 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1975.6175 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	3853.3331 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2700.3309	0.2100	567.0695	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2825.4511	0.2100	593.3447	(264)
Space and water heating			1160.4142	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	217.1685	0.1443	31.3441	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-795.3090	0.1346	-107.0585	
PV Unit electricity exported	-1180.3084	0.1259	-148.5875	
Total			-255.6460	(269)
Total CO2, kg/year			948.0416	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.8600	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2700.3309	1.1300	3051.3739	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2825.4511	1.1300	3192.7598	(278)
Space and water heating			6244.1337	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	217.1685	1.5338	333.1003	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-795.3090	1.4975	-1190.9803	
PV Unit electricity exported	-1180.3084	0.4621	-545.4181	
Total			-1736.3984	(283)
Total Primary energy kWh/year			4970.9364	(286)
Target Primary Energy Rate (TPER)			62.1800	(287)

Predicted Energy Assessment

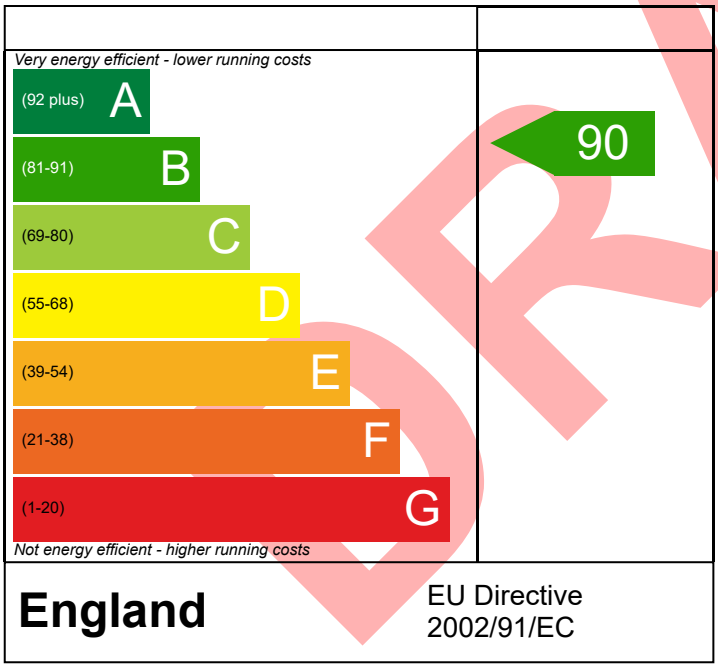
Masonry, 2 Bed, K, WC, B, Country Brick

Dwelling type:	House, Semi-Detached
Date of assessment:	13/07/2023
Produced by:	Maja Stanisz
Total floor area:	79.94 m²
DRRN:	

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

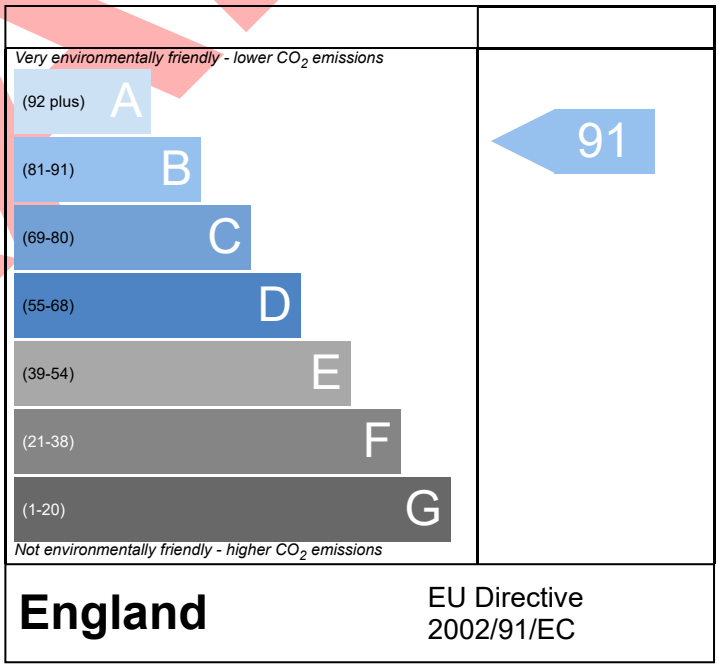
The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

Environmental Impact (CO_2) Rating



The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.