Building Regulations England Part L (BREL) Compliance Report

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

Date: Thu 05 Feb 2026 11:13:36

Project Information			
Assessed By	William Linley	Building Type	House, End-terrace
OCDEA Registration	EES/013386	Assessment Date	2026-02-05

Dwelling Details			
Assessment Type	As designed	Total Floor Area	52 m^2
Site Reference	53J Warminster Road	Plot Reference	53J
Address			

Client Details	
Name	Array
Company	Array
Address	

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	Electricity	
Target carbon dioxide emission rate	*15.02 $kgCO_2/m^2$*	
Dwelling carbon dioxide emission rate	7.08 $kgCO_2/m^2$	OK
1b Target primary energy rate and dwelling primary energy		
Target primary energy	*79.07 kWh_{PE}/m^2*	
Dwelling primary energy	74.22 kWh_{PE}/m^2	OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency		
Target fabric energy efficiency	*47.9 kWh/m^2*	
Dwelling fabric energy efficiency	47.7 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*	0.17	Walls (1) (0.17)	OK
Party walls	*0.2*	0	Party Wall (1) (0)	**N/A**
Curtain walls	*1.6*	0	N/A	**N/A**
Floors	*0.18*	0.12	Heat Loss Floor 1 (0.12)	OK
Roofs	*0.16*	0.11	Roof (1) (0.11)	OK
Windows, doors, and roof windows	*1.6*	1.4	Front (1.4)	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)	41.53	0.17
Exposed wall: Walls (2)	7.86	0.15
Party wall: Party Wall (1)	60.63	0 **(!)**
Ground floor: Heat Loss Floor 1, Heat Loss Floor 1	26.23	0.12
Exposed roof: Roof (1)	26.23	0.11

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	1.89	South	N/A	1.4
Side, Windows	1.26	West	0.7	1.4
Side, Windows	2.61	West	0.7	1.4
Side, Windows	1.82	West	0.7	1.4
Side, Windows	3.77	West	0.7	1.4

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))				
Building part **1**: 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	0.033 **(!)**	Catnic TS150/100

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E3: Sill	Calculated by person with suitable expertise	0.021 **(!)**	
External wall	E4: Jamb	Calculated by person with suitable expertise	0.015 **(!)**	
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.061	
External wall	E6: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0.004 **(!)**	
External wall	E15: Flat roof with parapet	SAP table default	0.3	
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.049	
External wall	E18: Party wall between dwellings	Calculated by person with suitable expertise	0.059	
External wall	E25: Staggered party wall between dwellings	SAP table default	0.24	
Party wall	P1: Ground floor	Calculated by person with suitable expertise	0.043	
Party wall	P2: Intermediate floor within a dwelling	SAP table default	0 **(!)**	
Party wall	P4: Roof (insulation at ceiling level)	SAP table default	0.48	

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: Heat pump with radiators or underfloor heating - Electricity	
Efficiency	211.8%
Emitter type	Underfloor
Flow temperature	45°C
System type	Heat Pump
Manufacturer	NIBE Energy Systems Ltd
Model	F370
Commissioning	
Main heating system 2: Heat pump with radiators or underfloor heating - Electricity	
Efficiency	211.8%
Emitter type	Underfloor
Flow temperature	45°C
System type	Heat Pump
Manufacturer	NIBE Energy Systems Ltd
Model	F370
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: N/A	
Efficiency	
Manufacturer	
Model	

6 Controls		
Main heating 1 - type: Time and temperature zone control by arrangement of plumbing and electrical services		
Function		
Ecodesign class		
Manufacturer		
Model		
Main heating 2 - 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	75 lm/W	**OK**
External lights control	N/A	

8 Mechanical ventilation		
System type: Centralised mechanical extract		
Maximum permitted specific fan power	*0.7 W/(l/s)*	
Specific fan power	0.62 W/(l/s)	**OK**
Minimum permitted heat recovery efficiency	*N/A*	
Heat recovery efficiency	N/A	**N/A**
Manufacturer/Model	F370	
Commissioning		

9 Local generation
N/A

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	

Full SAP Calculation Printout

Plot Reference	53J Warminster Road	**Issued on Date**	05/02/2026
Assessment Reference	53J	**Plot Type Ref**	
Plot Address		**SAP Version**	10.2

SAP Rating	76 C	**DER**	7.08	**TER**	15.02
Environmental	95 A	**% DER < TER**			52.86
CO_2 Emissions (t/year)	0.34	**DFEE**	47.72	**TFEE**	47.91
Compliance Check	See BREL	**% DFEE < TFEE**			0.40
% DPER < TPER	6.13	**DPER**	74.22	**TPER**	79.07

Assessor Details	Mr. William Linley	**Assessor ID**	P977-0001
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)	
Main dwelling						
Ground floor	26.2300 (1b)	x	2.4000 (2b)	=	62.9520	(1b) - (3b)
First floor	26.2300 (1c)	x	3.5200 (2c)	=	92.3296	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	155.2816	(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	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 - centralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5327	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5327	0.5327	0.5327	0.5327	0.5327	0.5327	0.5327	0.5327	0.5327	0.5327	0.5327	0.5327	(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	
Main dwelling								
Door			1.8900	1.4000	2.6460			(26)
Windows			9.4600	1.3258	12.5417			(27)
Heat Loss Floor 1			26.2300	0.1200	3.1476	110.0000	2885.3000	(28a)
Main	52.8792	11.3500	41.5292	0.1700	7.0600	60.0000	2491.7520	(29a)
Retaining	7.8600		7.8600	0.1500	1.1790	110.0000	864.6000	(29a)
External Roof 1	26.2300		26.2300	0.1100	2.8853	9.0000	236.0700	(30)
Total net area of external elements Aum(A, m2)			113.1992					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.4595			(33)
Main dwelling								
Party Wall 1			60.6300	0.0000	0.0000	70.0000	4244.1000	(32)
Internal Wall 1			89.1500			9.0000	802.3500	(32c)
Internal Floor 1			26.2300			18.0000	472.1400	(32d)
Internal Ceiling 1			26.2300			9.0000	236.0700	(32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			12232.3820	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 233.1754 (35)
List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E2	Other lintels (including other steel lintels)	5.2000	0.0330	0.1716
E3	Sill	4.3000	0.0210	0.0903
E4	Jamb	21.8000	0.0150	0.3270
E5	Ground floor (normal)	10.2600	0.0610	0.6259
E6	Intermediate floor within a dwelling	10.2600	0.0040	0.0410
E15	Flat roof with parapet	10.2600	0.3000	3.0780
E16	Corner (normal)	5.9200	0.0490	0.2901
E18	Party wall between dwellings	11.8400	0.0590	0.6986
E25	Staggered party wall between dwellings	5.9200	0.2400	1.4208
P1	Party wall - Ground floor	10.2600	0.0430	0.4412
P2	Party wall - Intermediate floor within a dwelling	10.2600	0.0000	0.0000
P4	Party wall - Roof (insulation at ceiling level)	10.2600	0.4800	4.9248

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 12.1092 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.5688 (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	27.2969	27.2969	27.2969	27.2969	27.2969	27.2969	27.2969	27.2969	27.2969	27.2969	27.2969	27.2969	(38)
Heat transfer coeff	68.8656	68.8656	68.8656	68.8656	68.8656	68.8656	68.8656	68.8656	68.8656	68.8656	68.8656	68.8656	(39)
Average = Sum(39)m / 12 =												68.8656	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3127	1.3127	1.3127	1.3127	1.3127	1.3127	1.3127	1.3127	1.3127	1.3127	1.3127	1.3127	(40)
HLP (average)												1.3127	
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 1.7626 (42)
Hot water usage for mixer showers

77.6451	76.4782	74.7779	71.5246	69.1238	66.4464	64.9245	66.6120	68.4618	71.3365	74.6597	77.3476	(42a)

Hot water usage for baths

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)

Hot water usage for other uses

32.6812	31.4928	30.3044	29.1160	27.9276	26.7392	26.7392	27.9276	29.1160	30.3044	31.4928	32.6812	(42c)

Average daily hot water use (litres/day) 101.2964 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	110.3263	107.9710	105.0823	100.6406	97.0513	93.1855	91.6637	94.5396	97.5778	101.6409	106.1525	110.0288	(44)
Energy conte	174.7299	153.7493	161.5076	137.7719	130.6498	114.5825	110.8593	117.0597	120.3231	137.9257	151.2336	172.2785	(45)
Energy content (annual)										Total = Sum(45)m =		1682.6709	
Distribution loss (46)m = 0.15 x (45)m	26.2095	23.0624	24.2261	20.6658	19.5975	17.1874	16.6289	17.5590	18.0485	20.6889	22.6850	25.8418	(46)
Water storage loss (or HIU loss):													
Store volume												170.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5600	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8424	(55)
Total storage loss	26.1144	23.5872	26.1144	25.2720	26.1144	25.2720	26.1144	26.1144	25.2720	26.1144	25.2720	26.1144	(56)
If cylinder contains dedicated solar storage	26.1144	23.5872	26.1144	25.2720	26.1144	25.2720	26.1144	26.1144	25.2720	26.1144	25.2720	26.1144	(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	200.8443	177.3365	187.6220	163.0439	156.7642	139.8545	136.9737	143.1741	145.5951	164.0401	176.5056	198.3929	(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	200.8443	177.3365	187.6220	163.0439	156.7642	139.8545	136.9737	143.1741	145.5951	164.0401	176.5056	198.3929	(64)
										Total per year (kWh/year) = Sum(64)m =		1990.1469	(64)
12Total per year (kWh/year)												1990	(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	58.0977	51.1216	53.7013	45.8092	43.4410	38.0987	36.8607	38.9224	40.0074	45.8603	50.2852	57.2826	(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	88.1320	88.1320	88.1320	88.1320	88.1320	88.1320	88.1320	88.1320	88.1320	88.1320	88.1320	88.1320	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	79.1148	87.5914	79.1148	81.7519	79.1148	81.7519	79.1148	79.1148	81.7519	79.1148	81.7519	79.1148	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	153.6187	155.2128	151.1957	142.6439	131.8489	121.7030	114.9249	113.3308	117.3479	125.8997	136.6948	146.8406	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8132	31.8132	31.8132	31.8132	31.8132	31.8132	31.8132	31.8132	31.8132	31.8132	31.8132	31.8132	(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)	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	(71)
Water heating gains (Table 5)	78.0883	76.0739	72.1791	63.6238	58.3885	52.9148	49.5440	52.3150	55.5659	61.6402	69.8405	76.9927	(72)
Total internal gains	360.2613	368.3176	351.9292	337.4593	318.7917	305.8093	293.0233	294.2002	304.1053	316.0942	337.7268	352.3877	(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

West			9.4600		19.6403		0.6600		0.7000		0.7700		59.4858 (80)
Solar gains	59.4858	116.3669	191.6398	279.4952	342.5318	350.6423	333.8258	286.7514	222.8850	138.0792	74.1719	48.9183	(83)
Total gains	419.7472	484.6845	543.5690	616.9545	661.3236	656.4516	626.8490	580.9516	526.9903	454.1734	411.8987	401.3060	(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	49.3408	49.3408	49.3408	49.3408	49.3408	49.3408	49.3408	49.3408	49.3408	49.3408	49.3408	49.3408	
alpha	4.2894	4.2894	4.2894	4.2894	4.2894	4.2894	4.2894	4.2894	4.2894	4.2894	4.2894	4.2894	
util living area	0.9915	0.9836	0.9650	0.9102	0.7977	0.6259	0.4721	0.5261	0.7668	0.9430	0.9845	0.9930	(86)
Living	19.6202	19.8067	20.0960	20.4664	20.7572	20.9093	20.9510	20.9436	20.8338	20.4368	19.9537	19.5752	
Non living	18.2469	18.4831	18.8461	19.2944	19.6159	19.7543	19.7807	19.7776	19.6987	19.2715	18.6720	18.1897	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	31	28	31	30	31	30	31	31	30	31	30	31	
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0	
MIT	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	(87)
Th2 (88a)m	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	(88a)
ni2,m (89a)m	0.9889	0.9786	0.9540	0.8819	0.7381	0.5291	0.3522	0.4016	0.6794	0.9188	0.9789	0.9908	(89a)
MIT2 (90a)m	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	(90a)
Th2 (88b)m	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	(88b)
ni2,m (89b)m	0.9889	0.9786	0.9540	0.8819	0.7381	0.5291	0.3522	0.4016	0.6794	0.9188	0.9789	0.9908	(89b)
MIT2 (90b)m	18.2469	18.4831	18.8461	19.2944	19.6159	19.7543	19.7807	19.7776	19.6987	19.2715	18.6720	18.1897	(90b)
MIT 2	18.3812	18.5974	18.9296	19.3399	19.6341	19.7608	19.7849	19.7822	19.7099	19.3189	18.7703	18.3288	(90)
Living area fraction										fLA = Living area / (4) =		0.4537	(91)
MIT	19.5693	19.6874	19.8689	20.0930	20.2538	20.3230	20.3362	20.3347	20.2952	20.0816	19.7818	19.5407	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5693	19.6874	19.8689	20.0930	20.2538	20.3230	20.3362	20.3347	20.2952	20.0816	19.7818	19.5407	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9882	0.9779	0.9545	0.8890	0.7613	0.5715	0.4051	0.4568	0.7170	0.9248	0.9786	0.9902	(94)
Useful gains	414.7999	473.9590	518.8168	548.4776	503.4638	375.1886	253.9365	265.3772	377.8449	420.0321	403.0694	397.3666	(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	1051.5300	1018.3445	920.6563	770.8154	589.0615	394.1163	257.2941	270.9632	426.6343	652.9548	873.3431	1056.4462	(97)
Space heating kWh	473.7272	365.8271	298.9686	160.0833	63.6847	0.0000	0.0000	0.0000	0.0000	173.2944	338.5971	490.3552	(98a)
Space heating requirement - total per year (kWh/year)												2364.5375	
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	473.7272	365.8271	298.9686	160.0833	63.6847	0.0000	0.0000	0.0000	0.0000	173.2944	338.5971	490.3552	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2364.5375	
Space heating per m2											(98c) / (4) =	45.0732	(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)
Fraction of main heating from main system 2	0.5000 (203)
Fraction of total heating from main system 1	0.5000 (204)
Fraction of total heating from main system 2	0.5000 (205)
Efficiency of main space heating system 1 (in %)	211.8152 (206)
Efficiency of main space heating system 2 (in %)	211.8152 (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	473.7272	365.8271	298.9686	160.0833	63.6847	0.0000	0.0000	0.0000	0.0000	173.2944	338.5971	490.3552	(98)
Space heating efficiency (main heating system 1)	211.8152	211.8152	211.8152	211.8152	211.8152	0.0000	0.0000	0.0000	0.0000	211.8152	211.8152	211.8152	(210)
Space heating fuel (main heating system)	111.8256	86.3553	70.5730	37.7884	15.0331	0.0000	0.0000	0.0000	0.0000	40.9070	79.9275	115.7507	(211)
Space heating efficiency (main heating system 2)	211.8152	211.8152	211.8152	211.8152	211.8152	0.0000	0.0000	0.0000	0.0000	211.8152	211.8152	211.8152	(212)
Space heating fuel (main heating system 2)	111.8256	86.3553	70.5730	37.7884	15.0331	0.0000	0.0000	0.0000	0.0000	40.9070	79.9275	115.7507	(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)
Space heating fuel used, main system 2												558.1606	(213)
Water heating													
Water heating requirement	200.8443	177.3365	187.6220	163.0439	156.7642	139.8545	136.9737	143.1741	145.5951	164.0401	176.5056	198.3929	(64)
Efficiency of water heater												180.3348	(216)
(217)m	180.3348	180.3348	180.3348	180.3348	180.3348	180.3348	180.3348	180.3348	180.3348	180.3348	180.3348	180.3348	(217)
Fuel for water heating, kWh/month	111.3730	98.3374	104.0409	90.4118	86.9295	77.5527	75.9552	79.3935	80.7360	90.9642	97.8766	110.0137	(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	13.8910	12.5468	13.8910	13.4429	13.8910	13.4429	13.8910	13.8910	13.4429	13.8910	13.4429	13.8910	(231)
Lighting	16.8193	13.4931	12.1490	8.9009	6.8753	5.6172	6.2719	8.1524	10.5892	13.8936	15.6928	17.2867	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)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	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(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	558.1606	(211)
Space heating fuel - main system 2	558.1606	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	180.3348	
Water heating fuel used	1103.5845	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.4000, SFP = 0.8680)		
mechanical ventilation fans (SFP = 0.8680)	163.5559	(230a)
Total electricity for the above, kWh/year	163.5559	(231)
Electricity for lighting (calculated in Appendix L)	135.7412	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(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	2519.2027	(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	558.1606	0.1554	86.7300	(261)
Space heating - main system 2	558.1606	0.1554	86.7300	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1103.5845	0.1412	155.7716	(264)
Space and water heating			329.2315	(265)
Pumps, fans and electric keep-hot	163.5559	0.1387	22.6872	(267)
Energy for lighting	135.7412	0.1443	19.5917	(268)
Total CO2, kg/year			371.5104	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			7.0800	(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	558.1606	1.5753	879.2528	(275)
Space heating - main system 2	558.1606	1.5753	879.2528	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1103.5845	1.5219	1679.5850	(278)
Space and water heating			3438.0905	(279)
Pumps, fans and electric keep-hot	163.5559	1.5128	247.4273	(281)
Energy for lighting	135.7412	1.5338	208.2044	(282)
Total Primary energy kWh/year			3893.7223	(286)
Dwelling Primary energy Rate (DPER)			74.2200	(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)	
Main dwelling						
Ground floor	26.2300 (1b)	x	2.4000 (2b)	=	62.9520	(1b) - (3b)
First floor	26.2300 (1c)	x	3.5200 (2c)	=	92.3296	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	155.2816	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1288	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3788	(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) = 0.3220 (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	0.4105	0.4025	0.3944	0.3542	0.3461	0.3059	0.3059	0.2978	0.3220	0.3461	0.3622	0.3783	(22b)
Effective ac	0.5843	0.5810	0.5778	0.5627	0.5599	0.5468	0.5468	0.5444	0.5518	0.5599	0.5656	0.5716	(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	
Main dwelling								
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Opening Type			9.4600	1.1450	10.8321			(27)
Heat Loss Floor 1			26.2300	0.1300	3.4099			(28a)
Main	52.8792	11.3500	41.5292	0.1800	7.4753			(29a)
Retaining	7.8600		7.8600	0.1800	1.4148			(29a)
External Roof 1	26.2300		26.2300	0.1100	2.8853			(30)
Total net area of external elements Aum(A, m2)			113.1992					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	27.9073			(33)
Main dwelling								
Party Wall 1			60.6300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 233.1754 (35)
List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	5.2000	0.0500	0.2600	
E3 Sill	4.3000	0.0500	0.2150	
E4 Jamb	21.8000	0.0500	1.0900	
E5 Ground floor (normal)	10.2600	0.1600	1.6416	
E6 Intermediate floor within a dwelling	10.2600	0.0000	0.0000	
E15 Flat roof with parapet	10.2600	0.5600	5.7456	
E16 Corner (normal)	5.9200	0.0900	0.5328	
E18 Party wall between dwellings	11.8400	0.0600	0.7104	
E25 Staggered party wall between dwellings	5.9200	0.0600	0.3552	
P1 Party wall - Ground floor	10.2600	0.0800	0.8208	
P2 Party wall - Intermediate floor within a dwelling	10.2600	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	10.2600	0.1200	1.2312	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 12.6026 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 40.5099 (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	29.9394	29.7717	29.6074	28.8354	28.6910	28.0187	28.0187	27.8942	28.2776	28.6910	28.9832	29.2887	(38)
Heat transfer coeff	70.4493	70.2817	70.1173	69.3454	69.2009	68.5286	68.5286	68.4041	68.7876	69.2009	69.4931	69.7986	(39)
Average = Sum(39)m / 12 =												69.3447	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3429	1.3397	1.3366	1.3219	1.3191	1.3063	1.3063	1.3039	1.3112	1.3191	1.3247	1.3305	(40)
HLP (average)												1.3219	
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 1.7626 (42)
Hot water usage for mixer showers

69.0179	67.9807	66.4692	63.5774	61.4434	59.0634	57.7107	59.2107	60.8549	63.4102	66.3641	68.7534	(42a)

Hot water usage for baths

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)

Hot water usage for other uses

32.6812	31.4928	30.3044	29.1160	27.9276	26.7392	26.7392	27.9276	29.1160	30.3044	31.4928	32.6812	(42c)

Average daily hot water use (litres/day) 93.3423 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	101.6991	99.4734	96.7736	92.6934	89.3709	85.8026	84.4499	87.1382	89.9709	93.7146	97.8569	101.4346	(44)
Energy conte	161.0664	141.6489	148.7375	126.8926	120.3104	105.5043	102.1348	107.8953	110.9431	127.1698	139.4151	158.8221	(45)
Energy content (annual)										Total = Sum(45)m =		1550.5405	
Distribution loss (46)m = 0.15 x (45)m	24.1600	21.2473	22.3106	19.0339	18.0466	15.8256	15.3202	16.1843	16.6415	19.0755	20.9123	23.8233	(46)

Water storage loss (or HIU loss):
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.7527 (55)
Total storage loss

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

If cylinder contains dedicated solar storage

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
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

207.6613	183.7346	195.3324	171.9845	166.9053	150.5962	148.7297	154.4902	156.0350	173.7647	184.5070	205.4170	(62)
-31.5521	-27.9049	-29.2204	-24.1957	-22.5495	-19.2958	-18.0867	-19.2334	-19.9641	-23.5355	-26.6629	-30.9678	(63a)
-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)
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)
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

176.1093	155.8297	166.1119	147.7888	144.3558	131.3004	130.6430	135.2569	136.0708	150.2292	157.8441	174.4492	(64)
								Total per year (kWh/year) = Sum(64)m =			1805.9891	(64)
12Total per year (kWh/year)											1806	(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

90.8305	80.7668	86.7311	78.2653	77.2791	71.1537	71.2357	73.1511	72.9621	79.5599	82.4290	90.0843	(65)

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	88.1320	88.1320	88.1320	88.1320	88.1320	88.1320	88.1320	88.1320	88.1320	88.1320	88.1320	88.1320	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	79.1148	87.5914	79.1148	81.7519	79.1148	81.7519	79.1148	79.1148	81.7519	79.1148	81.7519	79.1148	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	153.6187	155.2128	151.1957	142.6439	131.8489	121.7030	114.9249	113.3308	117.3479	125.8997	136.6948	146.8406	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.8132	31.8132	31.8132	31.8132	31.8132	31.8132	31.8132	31.8132	31.8132	31.8132	31.8132	31.8132	(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)													
	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	(71)
Water heating gains (Table 5)													
	122.0840	120.1887	116.5741	108.7018	103.8698	98.8245	95.7470	98.3214	101.3362	106.9353	114.4847	121.0810	(72)
Total internal gains													
	407.2571	415.4324	399.3242	385.5373	367.2730	351.7190	339.2263	340.2066	349.8756	364.3894	385.3710	399.4760	(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	
West	9.4600	19.6403	0.6300	0.7000	0.7700	56.7819	(80)

Solar gains	56.7819	111.0775	182.9289	266.7909	326.9622	334.7040	318.6519	273.7172	212.7539	131.8029	70.8004	46.6947	(83)
Total gains	464.0390	526.5100	582.2531	652.3281	694.2353	686.4230	657.8781	613.9239	562.6294	496.1922	456.1714	446.1707	(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	48.2316	48.3467	48.4600	48.9994	49.1017	49.5835	49.5835	49.6737	49.3968	49.1017	48.8953	48.6813	
alpha	4.2154	4.2231	4.2307	4.2666	4.2734	4.3056	4.3056	4.3116	4.2931	4.2734	4.2597	4.2454	
util living area													
	0.9879	0.9785	0.9573	0.8965	0.7785	0.6020	0.4496	0.4981	0.7365	0.9262	0.9780	0.9897	(86)
MIT	19.5057	19.7166	20.0430	20.4688	20.7844	20.9468	20.9879	20.9815	20.8739	20.4563	19.9146	19.4752	(87)
Th 2	19.8074	19.8099	19.8123	19.8237	19.8259	19.8359	19.8359	19.8378	19.8320	19.8259	19.8215	19.8170	(88)
util rest of house													
	0.9842	0.9720	0.9442	0.8653	0.7168	0.5069	0.3350	0.3792	0.6470	0.8968	0.9702	0.9866	(89)
MIT 2	18.1097	18.3774	18.7866	19.3063	19.6523	19.8068	19.8322	19.8315	19.7508	19.3070	18.6386	18.0777	(90)
Living area fraction									fLA = Living area / (4) =			0.4537	(91)
MIT	18.7430	18.9850	19.3566	19.8337	20.1659	20.3240	20.3565	20.3532	20.2603	19.8284	19.2175	18.7117	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7430	18.9850	19.3566	19.8337	20.1659	20.3240	20.3565	20.3532	20.2603	19.8284	19.2175	18.7117	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9798	0.9662	0.9380	0.8657	0.7360	0.5482	0.3871	0.4332	0.6823	0.8969	0.9649	0.9825	(94)
Useful gains	454.6630	508.7195	546.1418	564.6879	510.9834	376.3306	254.6530	265.9465	383.8876	445.0289	440.1813	438.3796	(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													
	1017.5024	989.9165	901.4699	758.2007	585.8503	392.2575	257.4302	270.4152	423.7523	638.6170	842.0826	1012.8950	(97)
Space heating kWh													
	418.7525	323.3644	264.3641	139.3293	55.7010	0.0000	0.0000	0.0000	0.0000	144.0295	289.3689	427.4395	(98a)
Space heating requirement - total per year (kWh/year)												2062.3492	
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													
	418.7525	323.3644	264.3641	139.3293	55.7010	0.0000	0.0000	0.0000	0.0000	144.0295	289.3689	427.4395	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2062.3492	
Space heating per m2											(98c) / (4) =	39.3128	(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 %)	92.3000	(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													
	418.7525	323.3644	264.3641	139.3293	55.7010	0.0000	0.0000	0.0000	0.0000	144.0295	289.3689	427.4395	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	453.6863	350.3406	286.4183	150.9526	60.3477	0.0000	0.0000	0.0000	0.0000	156.0450	313.5091	463.0980	(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													
	176.1093	155.8297	166.1119	147.7888	144.3558	131.3004	130.6430	135.2569	136.0708	150.2292	157.8441	174.4492	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.9308	85.6584	85.0966	83.9278	82.1173	79.8000	79.8000	79.8000	79.8000	83.9654	85.4005	85.9892	(217)

Fuel for water heating, kWh/month

	204.9430	181.9198	195.2040	176.0905	175.7923	164.5368	163.7130	169.4948	170.5148	178.9181	184.8281	202.8735 (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	16.4385	13.1876	11.8739	8.6994	6.7196	5.4900	6.1299	7.9678	10.3494	13.5790	15.3375	16.8954 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-24.9611	-35.4101	-51.2337	-58.0311	-62.9836	-58.9878	-58.3067	-54.8676	-48.8236	-40.7294	-27.5377	-21.5586 (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	-13.4448	-28.3562	-56.4769	-84.9757	-112.4779	-113.0110	-111.6346	-94.4278	-69.1218	-40.5489	-17.9544	-10.6225 (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	2234.3978 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	2168.8288 (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)	132.6680 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1296.4835 (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	3325.4111 (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	2234.3978	0.2100	469.2235	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2168.8288	0.2100	455.4541	(264)
Space and water heating			924.6776	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	132.6680	0.1443	19.1481	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-543.4311	0.1344	-73.0490	
PV Unit electricity exported	-753.0524	0.1259	-94.7746	
Total			-167.8236	(269)
Total CO2, kg/year			787.9313	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.0200	(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	2234.3978	1.1300	2524.8695	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2168.8288	1.1300	2450.7766	(278)
Space and water heating			4975.6460	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	132.6680	1.5338	203.4906	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-543.4311	1.4968	-813.4026	
PV Unit electricity exported	-753.0524	0.4620	-347.8874	
Total			-1161.2900	(283)
Total Primary energy kWh/year			4147.9474	(286)
Target Primary Energy Rate (TPER)			79.0700	(287)

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)	
Main dwelling						
Ground floor	26.2300 (1b)	x	2.4000 (2b)	=	62.9520	(1b) - (3b)
First floor	26.2300 (1c)	x	3.5200 (2c)	=	92.3296	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	155.2816	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1288	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.3288	(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) =	0.2795	(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	0.3563	0.3493	0.3424	0.3074	0.3004	0.2655	0.2655	0.2585	0.2795	0.3004	0.3144	0.3284	(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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5635	0.5610	0.5586	0.5473	0.5451	0.5352	0.5352	0.5334	0.5391	0.5451	0.5494	0.5539	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Door			1.8900	1.4000	2.6460			(26)
Windows			9.4600	1.3258	12.5417			(27)
Heat Loss Floor 1			26.2300	0.1200	3.1476	110.0000	2885.3000	(28a)
Main	52.8792	11.3500	41.5292	0.1700	7.0606	60.0000	2491.7520	(29a)
Retaining	7.8600		7.8600	0.1500	1.1790	110.0000	864.6000	(29a)
External Roof 1	26.2300		26.2300	0.1100	2.8853	9.0000	236.0700	(30)
Total net area of external elements Aum(A, m2)			113.1992					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.4595			(33)
Main dwelling								
Party Wall 1			60.6300	0.0000	0.0000	70.0000	4244.1000	(32)
Internal Wall 1			89.1500			9.0000	802.3500	(32c)
Internal Floor 1			26.2300			18.0000	472.1400	(32d)
Internal Ceiling 1			26.2300			9.0000	236.0700	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 12232.3820 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 233.1754 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.2000	0.0330	0.1716
E3 Sill	4.3000	0.0210	0.0903
E4 Jamb	21.8000	0.0150	0.3270
E5 Ground floor (normal)	10.2600	0.0610	0.6259
E6 Intermediate floor within a dwelling	10.2600	0.0040	0.0410
E15 Flat roof with parapet	10.2600	0.3000	3.0780
E16 Corner (normal)	5.9200	0.0490	0.2901
E18 Party wall between dwellings	11.8400	0.0590	0.6986
E25 Staggered party wall between dwellings	5.9200	0.2400	1.4208
P1 Party wall - Ground floor	10.2600	0.0430	0.4412
P2 Party wall - Intermediate floor within a dwelling	10.2600	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	10.2600	0.4800	4.9248

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 12.1092 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.5688 (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	28.8747	28.7484	28.6246	28.0430	27.9342	27.4276	27.4276	27.3338	27.6227	27.9342	28.1543	28.3844	(38)
Heat transfer coeff	70.4435	70.3172	70.1933	69.6117	69.5029	68.9963	68.9963	68.9025	69.1915	69.5029	69.7230	69.9532	(39)
Average = Sum(39)m / 12 =												69.6112	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3428	1.3404	1.3380	1.3269	1.3249	1.3152	1.3152	1.3134	1.3189	1.3249	1.3291	1.3335	(40)
HLP (average)												1.3269	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7626 (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

23.2475	22.9022	22.4160	21.5196	20.8483	20.1040	19.7019	20.1847	20.7104	21.5068	22.4218	23.1689	(42b)

Hot water usage for other uses

32.6812	31.4928	30.3044	29.1160	27.9276	26.7392	26.7392	27.9276	29.1160	30.3044	31.4928	32.6812	(42c)

Average daily hot water use (litres/day) 51.2642 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	55.9287	54.3950	52.7204	50.6355	48.7759	46.8431	46.4411	48.1123	49.8264	51.8112	53.9146	55.8501	(44)
Energy conte	88.5773	77.4577	81.0293	69.3175	65.6617	57.5991	56.1665	59.5731	61.4409	70.3074	76.8112	87.4477	(45)
Energy content (annual)										Total = Sum(45)m =		851.3893	

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	(46)
Water storage loss (or HIU 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	(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	(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	(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	(61)
Total heat required for water heating calculated for each month												
	75.2907	65.8391	68.8749	58.9199	55.8124	48.9592	47.7415	50.6371	52.2248	59.7612	65.2895	74.3305 (62)
WWHRS	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	(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	(63c)
FGHRS	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												
	75.2907	65.8391	68.8749	58.9199	55.8124	48.9592	47.7415	50.6371	52.2248	59.7612	65.2895	74.3305 (64)
									Total per year (kWh/year) = Sum(64)m =			723.6809 (64)
12Total per year (kWh/year)												724 (64)
Electric shower(s)												
	43.0634	38.3698	41.8984	39.9831	40.7334	38.8557	40.1509	40.7334	39.9831	41.8984	41.1105	43.0634 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												489.8432 (64a)
Heat gains from water heating, kWh/month												
	29.5885	26.0522	27.6933	24.7257	24.1364	21.9537	21.9731	22.8426	23.0520	25.4149	26.6000	29.3485 (65)

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	88.1320	88.1320	88.1320	88.1320	88.1320	88.1320	88.1320	88.1320	88.1320	88.1320	88.1320	88.1320	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	79.1148	87.5914	79.1148	81.7519	79.1148	81.7519	79.1148	79.1148	81.7519	79.1148	81.7519	79.1148	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	153.6187	155.2128	151.1957	142.6439	131.8489	121.7030	114.9249	113.3308	117.3479	125.8997	136.6948	146.8406	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.8132	31.8132	31.8132	31.8132	31.8132	31.8132	31.8132	31.8132	31.8132	31.8132	31.8132	31.8132	(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)													
	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	(71)
Water heating gains (Table 5)													
	39.7695	38.7682	37.2222	34.3413	32.4415	30.4913	29.5337	30.7024	32.0166	34.1598	36.9444	39.4469	(72)
Total internal gains													
	321.9426	331.0119	316.9723	308.1768	292.8447	283.3858	273.0130	272.5877	280.5560	288.6138	304.8307	314.8419	(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	
West	9.4600	19.6403	0.6600	0.7000	0.7700	59.4858	(80)

Solar gains	59.4858	116.3669	191.6398	279.4952	342.5318	350.6423	333.8258	286.7514	222.8850	138.0792	74.1719	48.9183	(83)
Total gains	381.4284	447.3789	508.6121	587.6720	635.3765	634.0281	606.8388	559.3390	503.4410	426.6930	379.0026	363.7601	(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, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	48.2356	48.3223	48.4075	48.8119	48.8884	49.2473	49.2473	49.3144	49.1084	48.8884	48.7340	48.5737	
alpha	4.2157	4.2215	4.2272	4.2541	4.2592	4.2832	4.2832	4.2876	4.2739	4.2592	4.2489	4.2382	
util living area													
	0.9941	0.9879	0.9726	0.9230	0.8167	0.6438	0.4871	0.5440	0.7883	0.9537	0.9886	0.9952	(86)
MIT	19.3410	19.5631	19.9104	20.3741	20.7339	20.9301	20.9832	20.9735	20.8316	20.3404	19.7598	19.3048	(87)
Th 2	19.8075	19.8093	19.8112	19.8198	19.8214	19.8289	19.8289	19.8303	19.8260	19.8214	19.8181	19.8147	(88)
util rest of house													
	0.9923	0.9841	0.9636	0.8976	0.7591	0.5459	0.3639	0.4164	0.7030	0.9330	0.9844	0.9937	(89)
MIT 2	18.3218	18.5432	18.8859	19.3342	19.6499	19.7983	19.8249	19.8231	19.7377	19.3144	18.7464	18.2912	(90)
Living area fraction										fLA = Living area / (4) =		0.4537	(91)
MIT	18.7841	19.0059	19.3507	19.8060	20.1417	20.3118	20.3504	20.3450	20.2340	19.7799	19.2062	18.7510	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7841	19.0059	19.3507	19.8060	20.1417	20.3118	20.3504	20.3450	20.2340	19.7799	19.2062	18.7510	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9901	0.9807	0.9593	0.8972	0.7763	0.5882	0.4200	0.4744	0.7356	0.9321	0.9814	0.9918	(94)
Useful gains	377.6334	438.7226	487.8894	527.2787	493.2309	372.9188	254.8657	265.3484	370.3241	397.7309	371.9427	360.7627	(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													
	1020.3137	991.8895	902.0323	759.1837	586.7225	394.0925	258.7638	271.8237	424.4182	638.0305	844.0780	1017.8895	(97)
Space heating kWh													
	478.1541	371.7282	308.1223	166.9716	69.5577	0.0000	0.0000	0.0000	0.0000	178.7829	339.9374	488.9023	(98a)
Space heating requirement - total per year (kWh/year)												2402.1566	
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													
	478.1541	371.7282	308.1223	166.9716	69.5577	0.0000	0.0000	0.0000	0.0000	178.7829	339.9374	488.9023	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2402.1566	
Space heating per m2											(98c) / (4) =	45.7903	(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	648.5656	510.5729	523.6592	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8463	0.9069	0.8762	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	548.8492	463.0295	458.8231	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	711.4927	681.3204	627.3306	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	117.1033	162.4084	125.3696	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	29.2758	40.6021	31.3424	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												101.2203	(107)
Energy for space heating												45.7903	(99)
Energy for space cooling												1.9295	(108)
Total												47.7197	(109)
Fabric Energy Efficiency (DFEE)												47.7	(109)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	26.2300	(1b) x	2.4000	(2b) =	62.9520	(1b) - (3b)
First floor	26.2300	(1c) x	3.5200	(2c) =	92.3296	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		155.2816	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1288	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3788	(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) =	0.3220	(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													
	0.4105	0.4025	0.3944	0.3542	0.3461	0.3059	0.3059	0.2978	0.3220	0.3461	0.3622	0.3783	(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	0.5843	0.5810	0.5778	0.5627	0.5599	0.5468	0.5468	0.5444	0.5518	0.5599	0.5656	0.5716	(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	
Main dwelling								
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Opening Type			9.4600	1.1450	10.8321			(27)
Heat Loss Floor 1			26.2300	0.1300	3.4099			(28a)
Main	52.8792	11.3500	41.5292	0.1800	7.4753			(29a)
Retaining	7.8600		7.8600	0.1800	1.4148			(29a)
External Roof 1	26.2300		26.2300	0.1100	2.8853			(30)
Total net area of external elements Aum(A, m2)			113.1992					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.9073			(33)
Main dwelling								
Party Wall 1			60.6300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 233.1754 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.2000	0.0500	0.2600
E3 Sill	4.3000	0.0500	0.2150
E4 Jamb	21.8000	0.0500	1.0900
E5 Ground floor (normal)	10.2600	0.1600	1.6416
E6 Intermediate floor within a dwelling	10.2600	0.0000	0.0000

E15 Flat roof with parapet	10.2600	0.5600	5.7456	
E16 Corner (normal)	5.9200	0.0900	0.5328	
E18 Party wall between dwellings	11.8400	0.0600	0.7104	
E25 Staggered party wall between dwellings	5.9200	0.0600	0.3552	
P1 Party wall - Ground floor	10.2600	0.0800	0.8208	
P2 Party wall - Intermediate floor within a dwelling	10.2600	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	10.2600	0.1200	1.2312	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 12.6026 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 40.5099 (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	29.9394	29.7717	29.6074	28.8354	28.6910	28.0187	28.0187	27.8942	28.2776	28.6910	28.9832	29.2887	(38)
Heat transfer coeff	70.4493	70.2817	70.1173	69.3454	69.2009	68.5286	68.5286	68.4041	68.7876	69.2009	69.4931	69.7986	(39)
Average = Sum(39)m / 12 =												69.3447	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3429	1.3397	1.3366	1.3219	1.3191	1.3063	1.3063	1.3039	1.3112	1.3191	1.3247	1.3305	(40)
HLP (average)												1.3219	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7626 (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

23.2475	22.9022	22.4160	21.5196	20.8483	20.1040	19.7019	20.1847	20.7104	21.5068	22.4218	23.1689	(42b)

Hot water usage for other uses

32.6812	31.4928	30.3044	29.1160	27.9276	26.7392	26.7392	27.9276	29.1160	30.3044	31.4928	32.6812	(42c)

Average daily hot water use (litres/day) 51.2642 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	55.9287	54.3950	52.7204	50.6355	48.7759	46.8431	46.4411	48.1123	49.8264	51.8112	53.9146	55.8501	(44)
Energy conte	88.5773	77.4577	81.0293	69.3175	65.6617	57.5991	56.1665	59.5731	61.4409	70.3074	76.8112	87.4477	(45)
Energy content (annual)										Total = Sum(45)m =		851.3893	
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 (or HIU 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	75.2907	65.8391	68.8749	58.9199	55.8124	48.9592	47.7415	50.6371	52.2248	59.7612	65.2895	74.3305	(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	75.2907	65.8391	68.8749	58.9199	55.8124	48.9592	47.7415	50.6371	52.2248	59.7612	65.2895	74.3305	(64)
									Total per year (kWh/year) = Sum(64)m =			723.6809	(64)
12Total per year (kWh/year)												724	(64)
Electric shower(s)	43.0634	38.3698	41.8984	39.9831	40.7334	38.8557	40.1509	40.7334	39.9831	41.8984	41.1105	43.0634	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							489.8432	(64a)
Heat gains from water heating, kWh/month	29.5885	26.0522	27.6933	24.7257	24.1364	21.9537	21.9731	22.8426	23.0520	25.4149	26.6000	29.3485	(65)

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	88.1320	88.1320	88.1320	88.1320	88.1320	88.1320	88.1320	88.1320	88.1320	88.1320	88.1320	88.1320	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	79.1148	87.5914	79.1148	81.7519	79.1148	81.7519	79.1148	79.1148	81.7519	79.1148	81.7519	79.1148	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	153.6187	155.2128	151.1957	142.6439	131.8489	121.7030	114.9249	113.3308	117.3479	125.8997	136.6948	146.8406	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8132	31.8132	31.8132	31.8132	31.8132	31.8132	31.8132	31.8132	31.8132	31.8132	31.8132	31.8132	(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)	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	(71)
Water heating gains (Table 5)	39.7695	38.7682	37.2222	34.3413	32.4415	30.4913	29.5337	30.7024	32.0166	34.1598	36.9444	39.4469	(72)
Total internal gains	321.9426	331.0119	316.9723	308.1768	292.8447	283.3858	273.0130	272.5877	280.5560	288.6138	304.8307	314.8419	(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	
West	9.4600	19.6403	0.6300	0.7000	0.7700	56.7819	(80)

Solar gains	56.7819	111.0775	182.9289	266.7909	326.9622	334.7040	318.6519	273.7172	212.7539	131.8029	70.8004	46.6947	(83)
Total gains	378.7245	442.0894	499.9012	574.9676	619.8069	618.0898	591.6649	546.3049	493.3099	420.4167	375.6311	361.5366	(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, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	48.2316	48.3467	48.4600	48.9994	49.1017	49.5835	49.5835	49.6737	49.3968	49.1017	48.8953	48.6813	
alpha	4.2154	4.2231	4.2307	4.2666	4.2734	4.3056	4.3056	4.3116	4.2931	4.2734	4.2597	4.2454	
util living area	0.9943	0.9884	0.9741	0.9273	0.8253	0.6534	0.4955	0.5521	0.7951	0.9556	0.9890	0.9953	(86)
MIT	19.3353	19.5537	19.8964	20.3609	20.7240	20.9273	20.9825	20.9726	20.8275	20.3354	19.7587	19.3047	(87)
Th 2	19.8074	19.8099	19.8123	19.8237	19.8259	19.8359	19.8359	19.8378	19.8320	19.8259	19.8215	19.8170	(88)
util rest of house	0.9925	0.9847	0.9656	0.9030	0.7690	0.5557	0.3713	0.4239	0.7110	0.9356	0.9848	0.9938	(89)
MIT 2	18.3161	18.5344	18.8732	19.3258	19.6468	19.8038	19.8316	19.8303	19.7409	19.3136	18.7480	18.2928	(90)
Living area fraction										fLA = Living area / (4) =		0.4537	(91)
MIT	18.7785	18.9968	19.3374	19.7954	20.1355	20.3135	20.3538	20.3485	20.2339	19.7772	19.2066	18.7519	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7785	18.9968	19.3374	19.7954	20.1355	20.3135	20.3538	20.3485	20.2339	19.7772	19.2066	18.7519	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9903	0.9814	0.9613	0.9023	0.7853	0.5978	0.4279	0.4821	0.7429	0.9346	0.9819	0.9919	(94)
Useful gains	375.0479	433.8612	480.5456	518.7866	486.7464	369.4811	253.1627	263.3847	366.4757	392.9120	368.8321	358.6229	(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	1020.0003	990.7493	900.1246	755.5483	583.7429	391.5377	257.2397	270.0952	421.9331	635.0688	841.3223	1015.7017	(97)
Space heating kWh	479.8446	374.2288	312.1667	170.4684	72.1654	0.0000	0.0000	0.0000	0.0000	180.1647	340.1929	488.8666	(98a)
Space heating requirement - total per year (kWh/year)												2418.0981	
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	479.8446	374.2288	312.1667	170.4684	72.1654	0.0000	0.0000	0.0000	0.0000	180.1647	340.1929	488.8666	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2418.0981	
Space heating per m2											(98c) / (4) =	46.0941	(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	644.1687	507.1115	519.8710	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8398	0.9025	0.8715	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	541.0040	457.6785	453.0787	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	692.8635	663.5847	612.0959	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	109.3389	153.1942	118.3088	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	27.3347	38.2986	29.5772	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												95.2105	(107)
Energy for space heating												46.0941	(99)
Energy for space cooling												1.8149	(108)
Total												47.9090	(109)
Fabric Energy Efficiency (TFEE)												47.9	(109)

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

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		26.2300	(1b)	x 2.4000	(2b) =	62.9520	(1b) - (3b)
First floor		26.2300	(1c)	x 3.5200	(2c) =	92.3296	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4600						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		155.2816	(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 - centralised		
If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5327	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5327	0.5327	0.5327	0.5327	0.5327	0.5327	0.5327	0.5327	0.5327	0.5327	0.5327	0.5327	(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	
Main dwelling								
Door			1.8900	1.4000	2.6460			(26)
Windows			9.4600	1.3258	12.5417			(27)
Heat Loss Floor 1			26.2300	0.1200	3.1476	110.0000	2885.3000	(28a)
Main	52.8792	11.3500	41.5292	0.1700	7.0600	60.0000	2491.7520	(29a)
Retaining	7.8600		7.8600	0.1500	1.1790	110.0000	864.6000	(29a)
External Roof 1	26.2300		26.2300	0.1100	2.8853	9.0000	236.0700	(30)
Total net area of external elements Aum(A, m2)			113.1992					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.4595			(33)
Main dwelling								
Party Wall 1			60.6300	0.0000	0.0000	70.0000	4244.1000	(32)
Internal Wall 1			89.1500			9.0000	802.3500	(32c)
Internal Floor 1			26.2300			18.0000	472.1400	(32d)
Internal Ceiling 1			26.2300			9.0000	236.0700	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 12232.3820	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	233.1754	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.2000	0.0330	0.1716
E3 Sill	4.3000	0.0210	0.0903
E4 Jamb	21.8000	0.0150	0.3270
E5 Ground floor (normal)	10.2600	0.0610	0.6259
E6 Intermediate floor within a dwelling	10.2600	0.0040	0.0410
E15 Flat roof with parapet	10.2600	0.3000	3.0780
E16 Corner (normal)	5.9200	0.0490	0.2901
E18 Party wall between dwellings	11.8400	0.0590	0.6986
E25 Staggered party wall between dwellings	5.9200	0.2400	1.4208
P1 Party wall - Ground floor	10.2600	0.0430	0.4412
P2 Party wall - Intermediate floor within a dwelling	10.2600	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	10.2600	0.4800	4.9248

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	12.1092	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	41.5688	(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	27.2969	27.2969	27.2969	27.2969	27.2969	27.2969	27.2969	27.2969	27.2969	27.2969	27.2969	27.2969	(38)
Heat transfer coeff	68.8656	68.8656	68.8656	68.8656	68.8656	68.8656	68.8656	68.8656	68.8656	68.8656	68.8656	68.8656	(39)
Average = Sum(39)m / 12 =												68.8656	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3127	1.3127	1.3127	1.3127	1.3127	1.3127	1.3127	1.3127	1.3127	1.3127	1.3127	1.3127	(40)
HLP (average)												1.3127	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.7626	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	77.6451	76.4782	74.7779	71.5246	69.1238	66.4464	64.9245	66.6120	68.4618	71.3365	74.6597	77.3476	(42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses	32.6812	31.4928	30.3044	29.1160	27.9276	26.7392	26.7392	27.9276	29.1160	30.3044	31.4928	32.6812	(42c)
Average daily hot water use (litres/day)												101.2964	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	110.3263	107.9710	105.0823	100.6406	97.0513	93.1855	91.6637	94.5396	97.5778	101.6409	106.1525	110.0288	(44)
Energy conte	174.7299	153.7493	161.5076	137.7719	130.6498	114.5825	110.8593	117.0597	120.3231	137.9257	151.2336	172.2785	(45)
Energy content (annual)										Total = Sum(45)m =		1682.6709	
Distribution loss (46)m = 0.15 x (45)m	26.2095	23.0624	24.2261	20.6658	19.5975	17.1874	16.6289	17.5590	18.0485	20.6889	22.6850	25.8418	(46)

Water storage loss (or HIU loss):		
Store volume	170.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.5600	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.8424	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	26.1144	23.5872	26.1144	25.2720	26.1144	25.2720	26.1144	26.1144	25.2720	26.1144	25.2720	26.1144	(56)
If cylinder contains dedicated solar storage	26.1144	23.5872	26.1144	25.2720	26.1144	25.2720	26.1144	26.1144	25.2720	26.1144	25.2720	26.1144	(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	200.8443	177.3365	187.6220	163.0439	156.7642	139.8545	136.9737	143.1741	145.5951	164.0401	176.5056	198.3929	(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

	200.8443	177.3365	187.6220	163.0439	156.7642	139.8545	136.9737	143.1741	145.5951	164.0401	176.5056	198.3929 (64)
Total per year (kWh/year) = Sum(64)m =												1990.1469 (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												
	58.0977	51.1216	53.7013	45.8092	43.4410	38.0987	36.8607	38.9224	40.0074	45.8603	50.2852	57.2826 (65)

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	105.7584	105.7584	105.7584	105.7584	105.7584	105.7584	105.7584	105.7584	105.7584	105.7584	105.7584	105.7584	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	19.2156	17.0671	13.8799	10.5080	7.8548	6.6314	7.1654	9.3139	12.5011	15.8730	18.5262	19.7496	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	229.2816	231.6609	225.6653	212.9014	196.7893	181.6462	171.5297	169.1505	175.1461	187.9099	204.0220	219.1651	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	47.3385	47.3385	47.3385	47.3385	47.3385	47.3385	47.3385	47.3385	47.3385	47.3385	47.3385	47.3385	(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)													
	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	(71)
Water heating gains (Table 5)													
	78.0883	76.0739	72.1791	63.6238	58.3885	52.9148	49.5440	52.3150	55.5659	61.6402	69.8405	76.9927	(72)
Total internal gains													
	409.1768	407.3931	394.3156	369.6245	345.6239	323.7837	310.8304	313.3707	325.8044	348.0144	374.9800	398.4988	(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	
West	9.4600	19.6403	0.6600	0.7000	0.7700	59.4858	(80)

Solar gains	59.4858	116.3669	191.6398	279.4952	342.5318	350.6423	333.8258	286.7514	222.8850	138.0792	74.1719	48.9183	(83)
Total gains	468.6626	523.7600	585.9554	649.1197	688.1558	674.4260	644.6562	600.1221	548.6894	486.0936	449.1519	447.4170	(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	49.3408	49.3408	49.3408	49.3408	49.3408	49.3408	49.3408	49.3408	49.3408	49.3408	49.3408	49.3408	
alpha	4.2894	4.2894	4.2894	4.2894	4.2894	4.2894	4.2894	4.2894	4.2894	4.2894	4.2894	4.2894	
util living area													
	0.9873	0.9784	0.9553	0.8967	0.7807	0.6127	0.4601	0.5112	0.7485	0.9301	0.9789	0.9895	(86)
Living	19.7053	19.8721	20.1605	20.5040	20.7750	20.9136	20.9522	20.9457	20.8459	20.4804	20.0163	19.6561	
Non living	18.3546	18.5649	18.9243	19.3363	19.6322	19.7569	19.7811	19.7784	19.7079	19.3210	18.7499	18.2923	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	31	28	31	30	31	30	31	31	30	31	30	31	
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0	
MIT	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	(87)
Th2 (88a)m	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	(88a)
ni2,m (89a)m	0.9835	0.9720	0.9419	0.8657	0.7194	0.5166	0.3428	0.3893	0.6597	0.9018	0.9715	0.9863	(89a)
MIT2 (90a)m	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	(90a)
Th2 (88b)m	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	(88b)
ni2,m (89b)m	0.9835	0.9720	0.9419	0.8657	0.7194	0.5166	0.3428	0.3893	0.6597	0.9018	0.9715	0.9863	(89b)
MIT2 (90b)m	18.3546	18.5649	18.9243	19.3363	19.6322	19.7569	19.7811	19.7784	19.7079	19.3210	18.7499	18.2923	(90b)
MIT 2	18.4797	18.6722	19.0012	19.3783	19.6490	19.7631	19.7853	19.7829	19.7183	19.3642	18.8416	18.4228	(90)
Living area fraction									fLA = Living area / (4) =			0.4537	(91)
MIT	19.6231	19.7283	19.9080	20.1140	20.2619	20.3243	20.3364	20.3351	20.2998	20.1063	19.8208	19.5920	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6231	19.7283	19.9080	20.1140	20.2619	20.3243	20.3364	20.3351	20.2998	20.1063	19.8208	19.5920	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9827	0.9714	0.9429	0.8741	0.7436	0.5587	0.3944	0.4433	0.6980	0.9094	0.9714	0.9856	(94)
Useful gains	460.5372	508.7672	552.4942	567.3669	511.7043	376.8244	254.2762	266.0066	382.9928	442.0749	436.3110	440.9548	(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													
	1055.2371	1021.1600	923.3509	772.2600	589.6233	394.2062	257.3079	270.9902	426.9516	654.6596	876.0258	1059.9796	(97)
Space heating kWh													
	442.4567	344.3280	275.9174	147.5230	57.9717	0.0000	0.0000	0.0000	0.0000	158.1630	316.5947	460.5545	(98a)
Space heating requirement - total per year (kWh/year)												2203.5090	
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													
	442.4567	344.3280	275.9174	147.5230	57.9717	0.0000	0.0000	0.0000	0.0000	158.1630	316.5947	460.5545	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2203.5090	
Space heating per m2											(98c) / (4) =	42.0036	(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)
Fraction of main heating from main system 2	0.5000	(203)
Fraction of total heating from main system 1	0.5000	(204)
Fraction of total heating from main system 2	0.5000	(205)
Efficiency of main space heating system 1 (in %)	211.8152	(206)

Efficiency of main space heating system 2 (in %) 211.8152 (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													
	442.4567	344.3280	275.9174	147.5230	57.9717	0.0000	0.0000	0.0000	0.0000	158.1630	316.5947	460.5545	(98)
Space heating efficiency (main heating system 1)													
	211.8152	211.8152	211.8152	211.8152	211.8152	0.0000	0.0000	0.0000	0.0000	211.8152	211.8152	211.8152	(210)
Space heating fuel (main heating system)													
	104.4440	81.2803	65.1316	34.8235	13.6845	0.0000	0.0000	0.0000	0.0000	37.3352	74.7337	108.7161	(211)
Space heating efficiency (main heating system 2)													
	211.8152	211.8152	211.8152	211.8152	211.8152	0.0000	0.0000	0.0000	0.0000	211.8152	211.8152	211.8152	(212)
Space heating fuel (main heating system 2)													
	104.4440	81.2803	65.1316	34.8235	13.6845	0.0000	0.0000	0.0000	0.0000	37.3352	74.7337	108.7161	(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)
Space heating fuel used, main system 2												520.1490	(213)
Water heating													
Water heating requirement													
	200.8443	177.3365	187.6220	163.0439	156.7642	139.8545	136.9737	143.1741	145.5951	164.0401	176.5056	198.3929	(64)
Efficiency of water heater												180.3348	(216)
(217)m	180.3348	180.3348	180.3348	180.3348	180.3348	180.3348	180.3348	180.3348	180.3348	180.3348	180.3348	180.3348	(217)
Fuel for water heating, kWh/month													
	111.3730	98.3374	104.0409	90.4118	86.9295	77.5527	75.9552	79.3935	80.7360	90.9642	97.8766	110.0137	(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	13.8910	12.5468	13.8910	13.4429	13.8910	13.4429	13.8910	13.8910	13.4429	13.8910	13.4429	13.8910	(231)
Lighting	16.8193	13.4931	12.1490	8.9009	6.8753	5.6172	6.2719	8.1524	10.5892	13.8936	15.6928	17.2867	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)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	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(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 1 520.1490 (211)
Space heating fuel - main system 2 520.1490 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 180.3348
Water heating fuel used 1103.5845 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
(MEVCentralised, Database: in-use factor = 1.4000, SFP = 0.8680)
mechanical ventilation fans (SFP = 0.8680) 163.5559 (230a)
Total electricity for the above, kWh/year 163.5559 (231)
Electricity for lighting (calculated in Appendix L) 135.7412 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation 0.0000 (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 2443.1796 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	520.1490	16.4900	85.7726	(240)
Space heating - main system 2	520.1490	16.4900	85.7726	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1103.5845	16.4900	181.9811	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	163.5559	16.4900	26.9704	(249)
Energy for lighting	135.7412	16.4900	22.3837	(250)
Additional standing charges			0.0000	(251)
Total energy cost			402.8803	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12): 0.3600 (256)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] = 1.4882 (257)
SAP value 75.8768
SAP rating (Section 12) 76 (258)
SAP band C

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	520.1490	0.1555	80.8636	(261)
Space heating - main system 2	520.1490	0.1555	80.8636	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1103.5845	0.1412	155.7716	(264)
Space and water heating			317.4987	(265)
Pumps, fans and electric keep-hot	163.5559	0.1387	22.6872	(267)
Energy for lighting	135.7412	0.1443	19.5917	(268)

Total CO2, kg/year	359.7776	(272)
CO2 emissions per m2	6.8600	(273)
EI value	95.0533	
EI rating	95	(274)
EI band	A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	26.2300 (1b)	x	2.4000 (2b)	=	62.9520	(1b) - (3b)
First floor	26.2300 (1c)	x	3.5200 (2c)	=	92.3296	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	155.2816	(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	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	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000	(22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500	(22a)
Adj infilt rate	0.1785	0.1700	0.1700	0.1573	0.1573	0.1403	0.1445	0.1360	0.1403	0.1488	0.1488	0.1615	(22b)
Mechanical extract ventilation - centralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5327	(23b)
Effective ac	0.5327	0.5327	0.5327	0.5327	0.5327	0.5327	0.5327	0.5327	0.5327	0.5327	0.5327	0.5327	(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	
Main dwelling								
Door			1.8900	1.4000	2.6460			(26)
Windows			9.4600	1.3258	12.5417			(27)
Heat Loss Floor 1			26.2300	0.1200	3.1476	110.0000	2885.3000	(28a)
Main	52.8792	11.3500	41.5292	0.1700	7.0600	60.0000	2491.7520	(29a)
Retaining	7.8600		7.8600	0.1500	1.1790	110.0000	864.6000	(29a)
External Roof 1	26.2300		26.2300	0.1100	2.8853	9.0000	236.0700	(30)
Total net area of external elements Aum(A, m2)			113.1992					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.4595			(33)
Main dwelling								
Party Wall 1			60.6300	0.0000	0.0000	70.0000	4244.1000	(32)
Internal Wall 1			89.1500			9.0000	802.3500	(32c)
Internal Floor 1			26.2300			18.0000	472.1400	(32d)
Internal Ceiling 1			26.2300			9.0000	236.0700	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12232.3820	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		233.1754	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.2000	0.0330	0.1716
E3 Sill	4.3000	0.0210	0.0903
E4 Jamb	21.8000	0.0150	0.3270
E5 Ground floor (normal)	10.2600	0.0610	0.6259
E6 Intermediate floor within a dwelling	10.2600	0.0040	0.0410
E15 Flat roof with parapet	10.2600	0.3000	3.0780
E16 Corner (normal)	5.9200	0.0490	0.2901
E18 Party wall between dwellings	11.8400	0.0590	0.6986
E25 Staggered party wall between dwellings	5.9200	0.2400	1.4208
P1 Party wall - Ground floor	10.2600	0.0430	0.4412
P2 Party wall - Intermediate floor within a dwelling	10.2600	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	10.2600	0.4800	4.9248

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		12.1092	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	41.5688	(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	27.2969	27.2969	27.2969	27.2969	27.2969	27.2969	27.2969	27.2969	27.2969	27.2969	27.2969	27.2969	(38)
Heat transfer coeff	68.8656	68.8656	68.8656	68.8656	68.8656	68.8656	68.8656	68.8656	68.8656	68.8656	68.8656	68.8656	(39)
Average = Sum(39)m / 12 =												68.8656	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3127	1.3127	1.3127	1.3127	1.3127	1.3127	1.3127	1.3127	1.3127	1.3127	1.3127	1.3127	(40)
HLP (average)												1.3127	
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												1.7626	(42)
Hot water usage for mixer showers	77.6451	76.4782	74.7779	71.5246	69.1238	66.4464	64.9245	66.6120	68.4618	71.3365	74.6597	77.3476	(42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses	32.6812	31.4928	30.3044	29.1160	27.9276	26.7392	26.7392	27.9276	29.1160	30.3044	31.4928	32.6812	(42c)
Average daily hot water use (litres/day)												101.2964	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	110.3263	107.9710	105.0823	100.6406	97.0513	93.1855	91.6637	94.5396	97.5778	101.6409	106.1525	110.0288	(44)
Energy conte	174.7299	153.7493	161.5076	137.7719	130.6498	114.5825	110.8593	117.0597	120.3231	137.9257	151.2336	172.2785	(45)
Energy content (annual)										Total = Sum(45)m =		1682.6709	
Distribution loss (46)m = 0.15 x (45)m	26.2095	23.0624	24.2261	20.6658	19.5975	17.1874	16.6289	17.5590	18.0485	20.6889	22.6850	25.8418	(46)
Water storage loss (or HIU loss):													
Store volume												170.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5600	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8424	(55)
Total storage loss	26.1144	23.5872	26.1144	25.2720	26.1144	25.2720	26.1144	26.1144	25.2720	26.1144	25.2720	26.1144	(56)
If cylinder contains dedicated solar storage	26.1144	23.5872	26.1144	25.2720	26.1144	25.2720	26.1144	26.1144	25.2720	26.1144	25.2720	26.1144	(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	200.8443	177.3365	187.6220	163.0439	156.7642	139.8545	136.9737	143.1741	145.5951	164.0401	176.5056	198.3929	(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	200.8443	177.3365	187.6220	163.0439	156.7642	139.8545	136.9737	143.1741	145.5951	164.0401	176.5056	198.3929	(64)
									Total per year (kWh/year) = Sum(64)m =			1990.1469	(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	58.0977	51.1216	53.7013	45.8092	43.4410	38.0987	36.8607	38.9224	40.0074	45.8603	50.2852	57.2826	(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	105.7584	105.7584	105.7584	105.7584	105.7584	105.7584	105.7584	105.7584	105.7584	105.7584	105.7584	105.7584	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.2156	17.0671	13.8799	10.5080	7.8548	6.6314	7.1654	9.3139	12.5011	15.8730	18.5262	19.7496	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	229.2816	231.6609	225.6653	212.9014	196.7893	181.6462	171.5297	169.1505	175.1461	187.9099	204.0220	219.1651	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.3385	47.3385	47.3385	47.3385	47.3385	47.3385	47.3385	47.3385	47.3385	47.3385	47.3385	47.3385	(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)	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	(71)
Water heating gains (Table 5)	78.0883	76.0739	72.1791	63.6238	58.3885	52.9148	49.5440	52.3150	55.5659	61.6402	69.8405	76.9927	(72)
Total internal gains	409.1768	407.3931	394.3156	369.6245	345.6239	323.7837	310.8304	313.3707	325.8044	348.0144	374.9800	398.4988	(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	
West	9.4600	22.3313	0.6600	0.7000	0.7700	67.6364	(80)

Solar gains	67.6364	119.0161	193.2611	289.6430	345.1218	377.7990	355.9019	313.1093	243.3683	150.7060	86.3972	55.0812	(83)
Total gains	476.8132	526.4092	587.5767	659.2675	690.7458	701.5827	666.7324	626.4800	569.1727	498.7205	461.3773	453.5800	(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	49.3408	49.3408	49.3408	49.3408	49.3408	49.3408	49.3408	49.3408	49.3408	49.3408	49.3408	49.3408	
alpha	4.2894	4.2894	4.2894	4.2894	4.2894	4.2894	4.2894	4.2894	4.2894	4.2894	4.2894	4.2894	
util living area	0.9838	0.9744	0.9449	0.8657	0.7099	0.4787	0.3185	0.3492	0.6476	0.8998	0.9709	0.9865	(86)

Living	19.8180	19.9613	20.2656	20.6093	20.8530	20.9485	20.9620	20.9610	20.9076	20.6003	20.1449	19.7783	
Non living	18.4976	18.6775	19.0540	19.4565	19.7065	19.7788	19.7844	19.7842	19.7558	19.4593	18.9112	18.4479	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	31	28	31	30	31	30	31	31	30	31	30	31	
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0	
MIT	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	(87)
Th2 (88a)m	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	(88a)
ni2,m (89a)m	0.9788	0.9666	0.9277	0.8255	0.6329	0.3725	0.1993	0.2230	0.5388	0.8589	0.9602	0.9822	(89a)
MIT2 (90a)m	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	(90a)
Th2 (88b)m	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	(88b)
ni2,m (89b)m	0.9788	0.9666	0.9277	0.8255	0.6329	0.3725	0.1993	0.2230	0.5388	0.8589	0.9602	0.9822	(89b)
MIT2 (90b)m	18.4976	18.6775	19.0540	19.4565	19.7065	19.7788	19.7844	19.7842	19.7558	19.4593	18.9112	18.4479	(90b)
MIT 2	18.6107	18.7752	19.1198	19.4882	19.7171	19.7832	19.7883	19.7882	19.7622	19.4908	18.9892	18.5651	(90)
Living area fraction										fLA = Living area / (4) =		0.4537	(91)
MIT	19.6947	19.7846	19.9728	20.1741	20.2991	20.3352	20.3380	20.3380	20.3238	20.1755	19.9014	19.6698	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6947	19.7846	19.9728	20.1741	20.2991	20.3352	20.3380	20.3380	20.3238	20.1755	19.9014	19.6698	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9781	0.9662	0.9301	0.8384	0.6654	0.4192	0.2513	0.2781	0.5870	0.8726	0.9610	0.9815	(94)
Useful gains	466.3809	508.6154	546.4921	552.7515	459.6423	294.1087	167.5583	174.2501	334.1085	435.1626	443.3674	445.2054	(95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000	(96)
Heat loss rate W	1005.0708	976.8294	865.8359	707.5312	502.6585	298.5489	167.8974	174.7784	352.8513	590.5577	819.6008	1003.3565	(97)
Space heating kWh	400.7853	314.6398	237.5918	111.4414	32.0040	0.0000	0.0000	0.0000	0.0000	115.6139	270.8881	415.2644	(98a)
Space heating requirement - total per year (kWh/year)												1898.2288	
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	400.7853	314.6398	237.5918	111.4414	32.0040	0.0000	0.0000	0.0000	0.0000	115.6139	270.8881	415.2644	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1898.2288	
Space heating per m2											(98c) / (4) =	36.1843	(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)
Fraction of main heating from main system 2	0.5000	(203)
Fraction of total heating from main system 1	0.5000	(204)
Fraction of total heating from main system 2	0.5000	(205)
Efficiency of main space heating system 1 (in %)	211.8152	(206)
Efficiency of main space heating system 2 (in %)	211.8152	(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	400.7853	314.6398	237.5918	111.4414	32.0040	0.0000	0.0000	0.0000	0.0000	115.6139	270.8881	415.2644	(98)
Space heating efficiency (main heating system 1)	211.8152	211.8152	211.8152	211.8152	211.8152	0.0000	0.0000	0.0000	0.0000	211.8152	211.8152	211.8152	(210)
Space heating fuel (main heating system)	94.6073	74.2723	56.0847	26.3063	7.5547	0.0000	0.0000	0.0000	0.0000	27.2912	63.9444	98.0252	(211)
Space heating efficiency (main heating system 2)	211.8152	211.8152	211.8152	211.8152	211.8152	0.0000	0.0000	0.0000	0.0000	211.8152	211.8152	211.8152	(212)
Space heating fuel (main heating system 2)	94.6073	74.2723	56.0847	26.3063	7.5547	0.0000	0.0000	0.0000	0.0000	27.2912	63.9444	98.0252	(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)
Space heating fuel used, main system 2												448.0861	(213)
Water heating													
Water heating requirement	200.8443	177.3365	187.6220	163.0439	156.7642	139.8545	136.9737	143.1741	145.5951	164.0401	176.5056	198.3929	(64)
Efficiency of water heater												180.3348	(216)
(217)m	180.3348	180.3348	180.3348	180.3348	180.3348	180.3348	180.3348	180.3348	180.3348	180.3348	180.3348	180.3348	(217)
Fuel for water heating, kWh/month	111.3730	98.3374	104.0409	90.4118	86.9295	77.5527	75.9552	79.3935	80.7360	90.9642	97.8766	110.0137	(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	13.8910	12.5468	13.8910	13.4429	13.8910	13.4429	13.8910	13.8910	13.4429	13.8910	13.4429	13.8910	(231)
Lighting	16.8193	13.4931	12.1490	8.9009	6.8753	5.6172	6.2719	8.1524	10.5892	13.8936	15.6928	17.2867	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)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	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(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												448.0861	(211)
Space heating fuel - main system 2												448.0861	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												180.3348	
Water heating fuel used												1103.5845	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(MEVCentralised, Database: in-use factor = 1.4000, SFP = 0.8680)													
mechanical ventilation fans (SFP = 0.8680)												163.5559	(230a)
Total electricity for the above, kWh/year												163.5559	(231)
Electricity for lighting (calculated in Appendix L)												135.7412	(232)

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

PV generation	0.0000	(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	2299.0538	(238)

10a. Fuel costs - using BEDF prices (590)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	448.0861	28.4300	127.3909	(240)
Space heating - main system 2	448.0861	28.4300	127.3909	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1103.5845	28.4300	313.7491	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	163.5559	28.4300	46.4989	(249)
Energy for lighting	135.7412	28.4300	38.5912	(250)
Additional standing charges			0.0000	(251)
Total energy cost			653.6210	(255)

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	448.0861	0.1562	69.9899	(261)
Space heating - main system 2	448.0861	0.1562	69.9899	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1103.5845	0.1412	155.7716	(264)
Space and water heating			295.7513	(265)
Pumps, fans and electric keep-hot	163.5559	0.1387	22.6872	(267)
Energy for lighting	135.7412	0.1443	19.5917	(268)
Total CO2, kg/year			338.0301	(272)

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	448.0861	1.5783	707.2037	(275)
Space heating - main system 2	448.0861	1.5783	707.2037	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1103.5845	1.5219	1679.5850	(278)
Space and water heating			3093.9925	(279)
Pumps, fans and electric keep-hot	163.5559	1.5128	247.4273	(281)
Energy for lighting	135.7412	1.5338	208.2044	(282)
Total Primary energy kWh/year			3549.6242	(286)

SAP 10 EPC IMPROVEMENTS

53J

Current energy efficiency rating: C 76
Current environmental impact rating: A 95

N	Solar water heating	Recommended
U	Solar photovoltaic panels	Recommended
V2	Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 2.4	-£ 77	-34 kg (9.9%)
U Solar photovoltaic panels	+ 7.6	-£ 223	-106 kg (34.9%)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
Solar water heating	£77	0.64 kg/m²	C 78	A 95
Solar photovoltaic panels	£223	2.02 kg/m²	B 86	A 97
Total Savings	£299	2.66 kg/m²		

Potential energy efficiency rating: B 86
Potential environmental impact rating: A 97

Fuel prices for cost data on this page from database revision number 590 TEST (30 Jan 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£654	£577	£77
Space heating	£301	£324	-£23
Water heating	£314	£214	£99
Lighting	£39	£39	£0
Generated (PV)	-£0	-£223	£223
Total cost of fuels	£654	£354	£300
Total cost of uses	£654	£354	£299
Delivered energy	44 kWh/m²	24 kWh/m²	20 kWh/m²
Carbon dioxide emissions	0.3 tonnes	0.2 tonnes	0.1 tonnes
CO2 emissions per m²	6 kg/m²	4 kg/m²	3 kg/m²
Primary energy	68 kWh/m²	38 kWh/m²	30 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	26.2300 (1b)	x	2.4000 (2b)	=	62.9520	(1b) - (3b)
First floor	26.2300 (1c)	x	3.5200 (2c)	=	92.3296	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	155.2816	(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	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 - centralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5327	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5327	0.5327	0.5327	0.5327	0.5327	0.5327	0.5327	0.5327	0.5327	0.5327	0.5327	0.5327	(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	
Main dwelling								
Door			1.8900	1.4000	2.6460			(26)
Windows			9.4600	1.3258	12.5417			(27)
Heat Loss Floor 1			26.2300	0.1200	3.1476	110.0000	2885.3000	(28a)
Main	52.8792	11.3500	41.5292	0.1700	7.0600	60.0000	2491.7520	(29a)
Retaining	7.8600		7.8600	0.1500	1.1790	110.0000	864.6000	(29a)
External Roof 1	26.2300		26.2300	0.1100	2.8853	9.0000	236.0700	(30)
Total net area of external elements Aum(A, m2)			113.1992					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.4595			(33)
Main dwelling								
Party Wall 1			60.6300	0.0000	0.0000	70.0000	4244.1000	(32)
Internal Wall 1			89.1500			9.0000	802.3500	(32c)
Internal Floor 1			26.2300			18.0000	472.1400	(32d)
Internal Ceiling 1			26.2300			9.0000	236.0700	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 12232.3820	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	233.1754	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.2000	0.0330	0.1716
E3 Sill	4.3000	0.0210	0.0903
E4 Jamb	21.8000	0.0150	0.3270
E5 Ground floor (normal)	10.2600	0.0610	0.6259
E6 Intermediate floor within a dwelling	10.2600	0.0040	0.0410
E15 Flat roof with parapet	10.2600	0.3000	3.0780
E16 Corner (normal)	5.9200	0.0490	0.2901
E18 Party wall between dwellings	11.8400	0.0590	0.6986
E25 Staggered party wall between dwellings	5.9200	0.2400	1.4208
P1 Party wall - Ground floor	10.2600	0.0430	0.4412
P2 Party wall - Intermediate floor within a dwelling	10.2600	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	10.2600	0.4800	4.9248

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		12.1092 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	41.5688 (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	27.2969	27.2969	27.2969	27.2969	27.2969	27.2969	27.2969	27.2969	27.2969	27.2969	27.2969	27.2969	(38)
Heat transfer coeff	68.8656	68.8656	68.8656	68.8656	68.8656	68.8656	68.8656	68.8656	68.8656	68.8656	68.8656	68.8656	(39)

Average = Sum(39)m / 12 = 68.8656

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3127	1.3127	1.3127	1.3127	1.3127	1.3127	1.3127	1.3127	1.3127	1.3127	1.3127	1.3127	(40)
HLP (average)												1.3127	
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 1.7626 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	77.6451	76.4782	74.7779	71.5246	69.1238	66.4464	64.9245	66.6120	68.4618	71.3365	74.6597	77.3476	(42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses	32.6812	31.4928	30.3044	29.1160	27.9276	26.7392	26.7392	27.9276	29.1160	30.3044	31.4928	32.6812	(42c)
Average daily hot water use (litres/day)												101.2964	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	110.3263	107.9710	105.0823	100.6406	97.0513	93.1855	91.6637	94.5396	97.5778	101.6409	106.1525	110.0288	(44)
Energy conte	174.7299	153.7493	161.5076	137.7719	130.6498	114.5825	110.8593	117.0597	120.3231	137.9257	151.2336	172.2785	(45)
Energy content (annual)										Total = Sum(45)m =		1682.6709	
Distribution loss (46)m = 0.15 x (45)m	26.2095	23.0624	24.2261	20.6658	19.5975	17.1874	16.6289	17.5590	18.0485	20.6889	22.6850	25.8418	(46)
Water storage loss (or HIU loss):													
Store volume												170.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5600	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8424	(55)
Total storage loss	26.1144	23.5872	26.1144	25.2720	26.1144	25.2720	26.1144	26.1144	25.2720	26.1144	25.2720	26.1144	(56)
If cylinder contains dedicated solar storage	26.1144	23.5872	26.1144	25.2720	26.1144	25.2720	26.1144	26.1144	25.2720	26.1144	25.2720	26.1144	(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	200.8443	177.3365	187.6220	163.0439	156.7642	139.8545	136.9737	143.1741	145.5951	164.0401	176.5056	198.3929	(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)
Aperture area of solar collector												3.0000	(H1)
Zero-loss collector efficiency												0.8000	(H2)
Collector linear heat loss coefficient												1.8000	(H3)
Collector 2nd order heat loss coefficient												0.0000	(H4)
Collector loop efficiency												0.9000	(H5)
Incidence angle modifier												1.0000	(H6)
Overshading factor												0.8000	(H8)
Overall heat loss coefficient of system												6.5000	(H10)
Heat loss coefficient of collector loop												3.9667	(H11)
Dedicated solar storage volume												75.0000	(H12)
Effective solar volume												75.0000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.3161	(H16)
Heat delivered to hot water												579.5505	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												579.5505	
Solar input	-0.0000	-16.2980	-55.9099	-75.1247	-96.3129	-88.2138	-87.2000	-77.5222	-54.6386	-28.3304	-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	200.8443	161.0385	131.7120	87.9192	60.4512	51.6407	49.7737	65.6519	90.9565	135.7097	176.5056	198.3929	(64)
									Total per year (kWh/year) = Sum(64)m =			1410.5964	(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	58.0977	51.1216	53.7013	45.8092	43.4410	38.0987	36.8607	38.9224	40.0074	45.8603	50.2852	57.2826	(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	105.7584	105.7584	105.7584	105.7584	105.7584	105.7584	105.7584	105.7584	105.7584	105.7584	105.7584	105.7584	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.2156	17.0671	13.8799	10.5080	7.8548	6.6314	7.1654	9.3139	12.5011	15.8730	18.5262	19.7496	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	229.2816	231.6609	225.6653	212.9014	196.7893	181.6462	171.5297	169.1505	175.1461	187.9099	204.0220	219.1651	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.3385	47.3385	47.3385	47.3385	47.3385	47.3385	47.3385	47.3385	47.3385	47.3385	47.3385	47.3385	(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)	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	(71)
Water heating gains (Table 5)	78.0883	76.0739	72.1791	63.6238	58.3885	52.9148	49.5440	52.3150	55.5659	61.6402	69.8405	76.9927	(72)
Total internal gains	409.1768	407.3931	394.3156	369.6245	345.6239	323.7837	310.8304	313.3707	325.8044	348.0144	374.9800	398.4988	(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	
West	9.4600	19.6403	0.6600	0.7000	0.7700	59.4858	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	59.4858	116.3669	191.6398	279.4952	342.5318	350.6423	333.8258	286.7514	222.8850	138.0792	74.1719	48.9183	(83)
Total gains	468.6626	523.7600	585.9554	649.1197	688.1558	674.4260	644.6562	600.1221	548.6894	486.0936	449.1519	447.4170	(84)

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7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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)													
tau	49.3408	49.3408	49.3408	49.3408	49.3408	49.3408	49.3408	49.3408	49.3408	49.3408	49.3408	49.3408	
alpha	4.2894	4.2894	4.2894	4.2894	4.2894	4.2894	4.2894	4.2894	4.2894	4.2894	4.2894	4.2894	
util living area	0.9873	0.9784	0.9553	0.8967	0.7807	0.6127	0.4601	0.5112	0.7485	0.9301	0.9789	0.9895	(86)
Living	19.7053	19.8721	20.1605	20.5040	20.7750	20.9136	20.9522	20.9457	20.8459	20.4804	20.0163	19.6561	
Non living	18.3546	18.5649	18.9243	19.3363	19.6322	19.7569	19.7811	19.7784	19.7079	19.3210	18.7499	18.2923	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	31	28	31	30	31	30	31	31	30	31	30	31	
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0	
MIT	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	(87)
Th2 (88a)m	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	(88a)
ni2,m (89a)m	0.9835	0.9720	0.9419	0.8657	0.7194	0.5166	0.3428	0.3893	0.6597	0.9018	0.9715	0.9863	(89a)
MIT2 (90a)m	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	(90a)
Th2 (88b)m	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	(88b)
ni2,m (89b)m	0.9835	0.9720	0.9419	0.8657	0.7194	0.5166	0.3428	0.3893	0.6597	0.9018	0.9715	0.9863	(89b)
MIT2 (90b)m	18.3546	18.5649	18.9243	19.3363	19.6322	19.7569	19.7811	19.7784	19.7079	19.3210	18.7499	18.2923	(90b)
MIT 2	18.4797	18.6722	19.0012	19.3783	19.6490	19.7631	19.7853	19.7829	19.7183	19.3642	18.8416	18.4228	(90)
Living area fraction									fLA = Living area / (4) =			0.4537	(91)
MIT	19.6231	19.7283	19.9080	20.1140	20.2619	20.3243	20.3364	20.3351	20.2998	20.1063	19.8208	19.5920	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6231	19.7283	19.9080	20.1140	20.2619	20.3243	20.3364	20.3351	20.2998	20.1063	19.8208	19.5920	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9827	0.9714	0.9429	0.8741	0.7436	0.5587	0.3944	0.4433	0.6980	0.9094	0.9714	0.9856	(94)
Useful gains	460.5372	508.7672	552.4942	567.3669	511.7043	376.8244	254.2762	266.0066	382.9928	442.0749	436.3110	440.9548	(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	1055.2371	1021.1600	923.3509	772.2600	589.6233	394.2062	257.3079	270.9902	426.9516	654.6596	876.0258	1059.9796	(97)
Space heating kWh	442.4567	344.3280	275.9174	147.5230	57.9717	0.0000	0.0000	0.0000	0.0000	158.1630	316.5947	460.5545	(98a)
Space heating requirement - total per year (kWh/year)												2203.5090	
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	442.4567	344.3280	275.9174	147.5230	57.9717	0.0000	0.0000	0.0000	0.0000	158.1630	316.5947	460.5545	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2203.5090	
Space heating per m2											(98c) / (4) =	42.0036	(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)
Fraction of main heating from main system 2	0.5000	(203)
Fraction of total heating from main system 1	0.5000	(204)
Fraction of total heating from main system 2	0.5000	(205)
Efficiency of main space heating system 1 (in %)	211.8152	(206)
Efficiency of main space heating system 2 (in %)	211.8152	(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	442.4567	344.3280	275.9174	147.5230	57.9717	0.0000	0.0000	0.0000	0.0000	158.1630	316.5947	460.5545	(98)
Space heating efficiency (main heating system 1)	211.8152	211.8152	211.8152	211.8152	211.8152	0.0000	0.0000	0.0000	0.0000	211.8152	211.8152	211.8152	(210)
Space heating fuel (main heating system)	104.4440	81.2803	65.1316	34.8235	13.6845	0.0000	0.0000	0.0000	0.0000	37.3352	74.7337	108.7161	(211)
Space heating efficiency (main heating system 2)	211.8152	211.8152	211.8152	211.8152	211.8152	0.0000	0.0000	0.0000	0.0000	211.8152	211.8152	211.8152	(212)
Space heating fuel (main heating system 2)	104.4440	81.2803	65.1316	34.8235	13.6845	0.0000	0.0000	0.0000	0.0000	37.3352	74.7337	108.7161	(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)
Space heating fuel used, main system 2												520.1490	(213)
Water heating													
Water heating requirement	200.8443	161.0385	131.7120	87.9192	60.4512	51.6407	49.7737	65.6519	90.9565	135.7097	176.5056	198.3929	(64)
Efficiency of water heater												180.3348	(216)
(217)m	180.3348	180.3348	180.3348	180.3348	180.3348	180.3348	180.3348	180.3348	180.3348	180.3348	180.3348	180.3348	(217)
Fuel for water heating, kWh/month	111.3730	89.2998	73.0375	48.7533	33.5217	28.6360	27.6007	36.4056	50.4376	75.2543	97.8766	110.0137	(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	20.6856	18.6837	20.6856	20.0183	20.6856	20.0183	20.6856	20.6856	20.0183	20.6856	20.0183	20.6856	(231)
Lighting	16.8193	13.4931	12.1490	8.9009	6.8753	5.6172	6.2719	8.1524	10.5892	13.8936	15.6928	17.2867	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-36.9741	-54.2306	-78.8307	-86.2628	-87.1273	-76.6592	-75.7070	-72.8566	-66.3456	-60.5240	-41.1619	-31.7701	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(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												520.1490	(211)
Space heating fuel - main system 2												520.1490	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												180.3348	

Water heating fuel used	782.2098	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.4000, SFP = 0.8680)		
mechanical ventilation fans (SFP = 0.8680)	163.5559	(230a)
pump for solar water heating	80.0000	(230g)
Total electricity for the above, kWh/year	243.5559	(231)
Electricity for lighting (calculated in Appendix L)	135.7412	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-768.4499	(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	1433.3549	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	520.1490	16.4900	85.7726	(240)
Space heating - main system 2	520.1490	16.4900	85.7726	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	782.2098	16.4900	128.9864	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	163.5559	16.4900	26.9704	(249)
Pump for solar water heating	80.0000	16.4900	13.1920	(249)
Energy for lighting	135.7412	16.4900	22.3837	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-768.4499	16.4900	-126.7174	
PV Unit electricity exported	0.0000	5.5900	0.0000	
Total			-126.7174	(252)
Total energy cost			236.3602	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600	(256)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.8731	(257)
SAP value	85.8475	
SAP rating (Section 12)	86	(258)
SAP band	B	

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	520.1490	0.1555	80.8636	(261)
Space heating - main system 2	520.1490	0.1555	80.8636	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	782.2098	0.1466	114.6901	(264)
Space and water heating			276.4172	(265)
Pumps, fans and electric keep-hot	243.5559	0.1387	33.7842	(267)
Energy for lighting	135.7412	0.1443	19.5917	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-768.4499	0.1354	-104.0831	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-104.0831	(269)
Total CO2, kg/year			225.7100	(272)
CO2 emissions per m2			4.3000	(273)
EI value			96.8967	
EI rating			97	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	26.2300	(1b) x	2.4000	(2b) =	62.9520	(1b) - (3b)
First floor	26.2300	(1c) x	3.5200	(2c) =	92.3296	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 52.4600						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		155.2816	(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	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	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000	(22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500	(22a)
Adj infilt rate													
	0.1785	0.1700	0.1700	0.1573	0.1573	0.1403	0.1445	0.1360	0.1403	0.1488	0.1488	0.1615	(22b)
Mechanical extract ventilation - centralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5327	(23b)
Effective ac	0.5327	0.5327	0.5327	0.5327	0.5327	0.5327	0.5327	0.5327	0.5327	0.5327	0.5327	0.5327	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Door			1.8900	1.4000	2.6460			(26)
Windows			9.4600	1.3258	12.5417			(27)
Heat Loss Floor 1			26.2300	0.1200	3.1476	110.0000	2885.3000	(28a)
Main	52.8792	11.3500	41.5292	0.1700	7.0600	60.0000	2491.7520	(29a)
Retaining	7.8600		7.8600	0.1500	1.1790	110.0000	864.6000	(29a)
External Roof 1	26.2300		26.2300	0.1100	2.8853	9.0000	236.0700	(30)
Total net area of external elements Aum(A, m2)			113.1992					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.4595			(33)
Main dwelling								
Party Wall 1			60.6300	0.0000	0.0000	70.0000	4244.1000	(32)
Internal Wall 1			89.1500			9.0000	802.3500	(32c)
Internal Floor 1			26.2300			18.0000	472.1400	(32d)
Internal Ceiling 1			26.2300			9.0000	236.0700	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12232.3820 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		233.1754 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.2000	0.0330	0.1716
E3 Sill	4.3000	0.0210	0.0903
E4 Jamb	21.8000	0.0150	0.3270
E5 Ground floor (normal)	10.2600	0.0610	0.6259
E6 Intermediate floor within a dwelling	10.2600	0.0040	0.0410
E15 Flat roof with parapet	10.2600	0.3000	3.0780
E16 Corner (normal)	5.9200	0.0490	0.2901
E18 Party wall between dwellings	11.8400	0.0590	0.6986
E25 Staggered party wall between dwellings	5.9200	0.2400	1.4208
P1 Party wall - Ground floor	10.2600	0.0430	0.4412
P2 Party wall - Intermediate floor within a dwelling	10.2600	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	10.2600	0.4800	4.9248

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		12.1092 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	41.5688 (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	27.2969	27.2969	27.2969	27.2969	27.2969	27.2969	27.2969	27.2969	27.2969	27.2969	27.2969	27.2969	(38)
Heat transfer coeff													
	68.8656	68.8656	68.8656	68.8656	68.8656	68.8656	68.8656	68.8656	68.8656	68.8656	68.8656	68.8656	(39)
Average = Sum(39)m / 12 =												68.8656	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3127	1.3127	1.3127	1.3127	1.3127	1.3127	1.3127	1.3127	1.3127	1.3127	1.3127	1.3127	(40)
HLP (average)												1.3127	
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		1.7626 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
77.6451	76.4782	74.7779	71.5246	69.1238	66.4464	64.9245	66.6120	68.4618	71.3365	74.6597	77.3476	(42a)

Hot water usage for baths

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)

Hot water usage for other uses

32.6812	31.4928	30.3044	29.1160	27.9276	26.7392	26.7392	27.9276	29.1160	30.3044	31.4928	32.6812	(42c)

Average daily hot water use (litres/day)		101.2964 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	110.3263	107.9710	105.0823	100.6406	97.0513	93.1855	91.6637	94.5396	97.5778	101.6409	106.1525	110.0288	(44)
Energy conte	174.7299	153.7493	161.5076	137.7719	130.6498	114.5825	110.8593	117.0597	120.3231	137.9257	151.2336	172.2785	(45)
Energy content (annual)										Total = Sum(45)m =		1682.6709	
Distribution loss (46)m = 0.15 x (45)m													
	26.2095	23.0624	24.2261	20.6658	19.5975	17.1874	16.6289	17.5590	18.0485	20.6889	22.6850	25.8418	(46)
Water storage loss (or HIU loss):													
Store volume												170.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5600	(48)

Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8424	(55)
Total storage loss													
	26.1144	23.5872	26.1144	25.2720	26.1144	25.2720	26.1144	26.1144	25.2720	26.1144	25.2720	26.1144	(56)
If cylinder contains dedicated solar storage													
	26.1144	23.5872	26.1144	25.2720	26.1144	25.2720	26.1144	26.1144	25.2720	26.1144	25.2720	26.1144	(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													
	200.8443	177.3365	187.6220	163.0439	156.7642	139.8545	136.9737	143.1741	145.5951	164.0401	176.5056	198.3929	(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)
Aperture area of solar collector												3.0000	(H1)
Zero-loss collector efficiency												0.8000	(H2)
Collector linear heat loss coefficient												1.8000	(H3)
Collector 2nd order heat loss coefficient												0.0000	(H4)
Collector loop efficiency												0.9000	(H5)
Incidence angle modifier												1.0000	(H6)
Overshading factor												0.8000	(H8)
Overall heat loss coefficient of system												6.5000	(H10)
Heat loss coefficient of collector loop												3.9667	(H11)
Dedicated solar storage volume												75.0000	(H12)
Effective solar volume												75.0000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.3161	(H16)
Heat delivered to hot water												630.4578	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												630.4578	
Solar input	-0.0000	-17.5870	-56.8670	-79.0119	-98.1285	-96.2149	-93.9888	-86.5322	-62.3177	-34.7061	-5.1037	-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													
	200.8443	159.7495	130.7549	84.0320	58.6356	43.6396	42.9850	56.6419	83.2775	129.3340	171.4020	198.3929	(64)
									Total per year (kWh/year) = Sum(64)m =			1359.6892	(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													
	58.0977	51.1216	53.7013	45.8092	43.4410	38.0987	36.8607	38.9224	40.0074	45.8603	50.2852	57.2826	(65)

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	105.7584	105.7584	105.7584	105.7584	105.7584	105.7584	105.7584	105.7584	105.7584	105.7584	105.7584	105.7584	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	19.2156	17.0671	13.8799	10.5080	7.8548	6.6314	7.1654	9.3139	12.5011	15.8730	18.5262	19.7496	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	229.2816	231.6609	225.6653	212.9014	196.7893	181.6462	171.5297	169.1505	175.1461	187.9099	204.0220	219.1651	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	47.3385	47.3385	47.3385	47.3385	47.3385	47.3385	47.3385	47.3385	47.3385	47.3385	47.3385	47.3385	(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)													
	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	-70.5056	(71)
Water heating gains (Table 5)													
	78.0883	76.0739	72.1791	63.6238	58.3885	52.9148	49.5440	52.3150	55.5659	61.6402	69.8405	76.9927	(72)
Total internal gains													
	409.1768	407.3931	394.3156	369.6245	345.6239	323.7837	310.8304	313.3707	325.8044	348.0144	374.9800	398.4988	(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	
West	9.4600	22.3313	0.6600	0.7000	0.7700	67.6364	(80)

Solar gains	67.6364	119.0161	193.2611	289.6430	345.1218	377.7990	355.9019	313.1093	243.3683	150.7060	86.3972	55.0812	(83)
Total gains	476.8132	526.4092	587.5767	659.2675	690.7458	701.5827	666.7324	626.4800	569.1727	498.7205	461.3773	453.5800	(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, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	49.3408	49.3408	49.3408	49.3408	49.3408	49.3408	49.3408	49.3408	49.3408	49.3408	49.3408	49.3408	
alpha	4.2894	4.2894	4.2894	4.2894	4.2894	4.2894	4.2894	4.2894	4.2894	4.2894	4.2894	4.2894	
util living area													
	0.9838	0.9744	0.9449	0.8657	0.7099	0.4787	0.3185	0.3492	0.6476	0.8998	0.9709	0.9865	(86)
Living	19.8180	19.9613	20.2656	20.6093	20.8530	20.9485	20.9620	20.9610	20.9076	20.6003	20.1449	19.7783	
Non living	18.4976	18.6775	19.0540	19.4565	19.7065	19.7788	19.7844	19.7842	19.7558	19.4593	18.9112	18.4479	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	31	28	31	30	31	30	31	31	30	31	30	31	
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0	
MIT	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	(87)
Th2 (88a)m	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	(88a)
ni2,m (89a)m	0.9788	0.9666	0.9277	0.8255	0.6329	0.3725	0.1993	0.2230	0.5388	0.8589	0.9602	0.9822	(89a)
MIT2 (90a)m	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	(90a)
Th2 (88b)m	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	19.8309	(88b)
ni2,m (89b)m	0.9788	0.9666	0.9277	0.8255	0.6329	0.3725	0.1993	0.2230	0.5388	0.8589	0.9602	0.9822	(89b)
MIT2 (90b)m	18.4976	18.6775	19.0540	19.4565	19.7065	19.7788	19.7844	19.7842	19.7558	19.4593	18.9112	18.4479	(90b)
MIT 2	18.6107	18.7752	19.1198	19.4882	19.7171	19.7832	19.7883	19.7882	19.7622	19.4908	18.9892	18.5651	(90)
Living area fraction										fLA = Living area / (4) =		0.4537	(91)
MIT	19.6947	19.7846	19.9728	20.1741	20.2991	20.3352	20.3380	20.3380	20.3238	20.1755	19.9014	19.6698	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6947	19.7846	19.9728	20.1741	20.2991	20.3352	20.3380	20.3380	20.3238	20.1755	19.9014	19.6698	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9781	0.9662	0.9301	0.8384	0.6654	0.4192	0.2513	0.2781	0.5870	0.8726	0.9610	0.9815	(94)
Useful gains	466.3809	508.6154	546.4921	552.7515	459.6423	294.1087	167.5583	174.2501	334.1085	435.1626	443.3674	445.2054	(95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000	(96)
Heat loss rate W													
	1005.0708	976.8294	865.8359	707.5312	502.6585	298.5489	167.8974	174.7784	352.8513	590.5577	819.6008	1003.3565	(97)
Space heating kWh													
	400.7853	314.6398	237.5918	111.4414	32.0040	0.0000	0.0000	0.0000	0.0000	115.6139	270.8881	415.2644	(98a)
Space heating requirement - total per year (kWh/year)												1898.2288	
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													
	400.7853	314.6398	237.5918	111.4414	32.0040	0.0000	0.0000	0.0000	0.0000	115.6139	270.8881	415.2644	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1898.2288	
Space heating per m2											(98c) / (4) =	36.1843	(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)
Fraction of main heating from main system 2	0.5000	(203)
Fraction of total heating from main system 1	0.5000	(204)
Fraction of total heating from main system 2	0.5000	(205)
Efficiency of main space heating system 1 (in %)	211.8152	(206)
Efficiency of main space heating system 2 (in %)	211.8152	(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													
	400.7853	314.6398	237.5918	111.4414	32.0040	0.0000	0.0000	0.0000	0.0000	115.6139	270.8881	415.2644	(98)
Space heating efficiency (main heating system 1)													
	211.8152	211.8152	211.8152	211.8152	211.8152	0.0000	0.0000	0.0000	0.0000	211.8152	211.8152	211.8152	(210)
Space heating fuel (main heating system)													
	94.6073	74.2723	56.0847	26.3063	7.5547	0.0000	0.0000	0.0000	0.0000	27.2912	63.9444	98.0252	(211)
Space heating efficiency (main heating system 2)													
	211.8152	211.8152	211.8152	211.8152	211.8152	0.0000	0.0000	0.0000	0.0000	211.8152	211.8152	211.8152	(212)
Space heating fuel (main heating system 2)													
	94.6073	74.2723	56.0847	26.3063	7.5547	0.0000	0.0000	0.0000	0.0000	27.2912	63.9444	98.0252	(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)
Space heating fuel used, main system 2												448.0861	(213)
Water heating													
Water heating requirement													
	200.8443	159.7495	130.7549	84.0320	58.6356	43.6396	42.9850	56.6419	83.2775	129.3340	171.4020	198.3929	(64)
Efficiency of water heater												180.3348	(216)
(217)m	180.3348	180.3348	180.3348	180.3348	180.3348	180.3348	180.3348	180.3348	180.3348	180.3348	180.3348	180.3348	(217)
Fuel for water heating, kWh/month													
	111.3730	88.5850	72.5068	46.5978	32.5149	24.1992	23.8362	31.4093	46.1794	71.7188	95.0465	110.0137	(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	20.6856	18.6837	20.6856	20.0183	20.6856	20.0183	20.6856	20.6856	20.0183	20.6856	20.0183	20.6856	(231)
Lighting	16.8193	13.4931	12.1490	8.9009	6.8753	5.6172	6.2719	8.1524	10.5892	13.8936	15.6928	17.2867	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-40.4506	-54.2363	-77.6606	-85.5025	-84.8759	-77.9999	-76.8328	-74.7758	-68.7089	-62.4336	-45.5012	-34.5202	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(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	448.0861	(211)
Space heating fuel - main system 2	448.0861	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	180.3348	
Water heating fuel used	753.9805	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.4000, SFP = 0.8680)		
mechanical ventilation fans (SFP = 0.8680)	163.5559	(230a)
pump for solar water heating	80.0000	(230g)
Total electricity for the above, kWh/year	243.5559	(231)
Electricity for lighting (calculated in Appendix L)	135.7412	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-783.4982	(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	1245.9515	(238)

10a. Fuel costs - using BEDF prices (590)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	448.0861	28.4300	127.3909	(240)
Space heating - main system 2	448.0861	28.4300	127.3909	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	753.9805	28.4300	214.3566	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)

Pumps, fans and electric keep-hot	163.5559	28.4300	46.4989	(249)
Pump for solar water heating	80.0000	28.4300	22.7440	(249)
Energy for lighting	135.7412	28.4300	38.5912	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-783.4982	28.4300	-222.7486	
PV Unit electricity exported	0.0000	5.8100	0.0000	
Total			-222.7486	(252)
Total energy cost			354.2240	(255)

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	448.0861	0.1562	69.9899	(261)
Space heating - main system 2	448.0861	0.1562	69.9899	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	753.9805	0.1474	111.1158	(264)
Space and water heating			251.0955	(265)
Pumps, fans and electric keep-hot	243.5559	0.1387	33.7842	(267)
Energy for lighting	135.7412	0.1443	19.5917	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-783.4982	0.1356	-106.2180	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-106.2180	(269)
Total CO2, kg/year			198.2534	(272)

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	448.0861	1.5783	707.2037	(275)
Space heating - main system 2	448.0861	1.5783	707.2037	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	753.9805	1.5452	1165.0551	(278)
Space and water heating			2579.4625	(279)
Pumps, fans and electric keep-hot	243.5559	1.5128	368.4513	(281)
Energy for lighting	135.7412	1.5338	208.2044	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-783.4982	1.5011	-1176.1122	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-1176.1122	(283)
Total Primary energy kWh/year			1980.0060	(286)

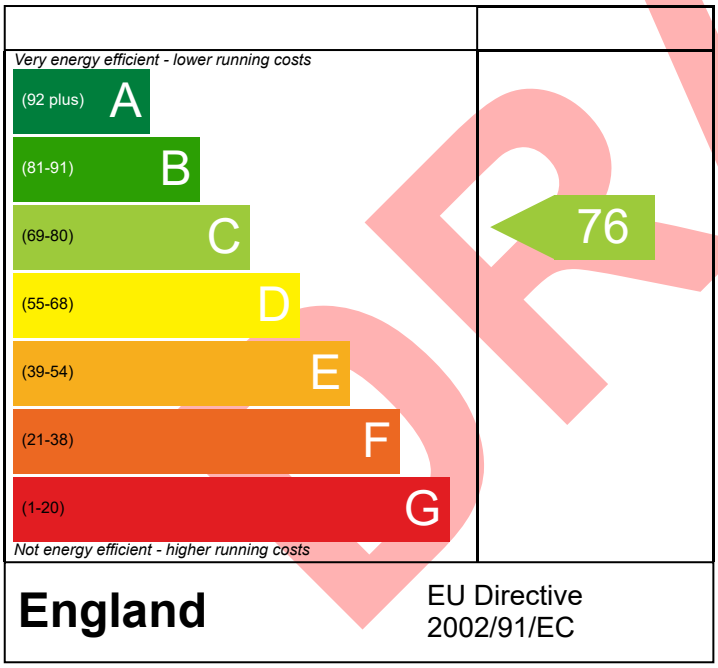
Predicted Energy Assessment

Dwelling type:	House, End-Terrace
Date of assessment:	05/02/2026
SAP Version:	10.2
Produced by:	William Linley
Total floor area:	52.46 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.

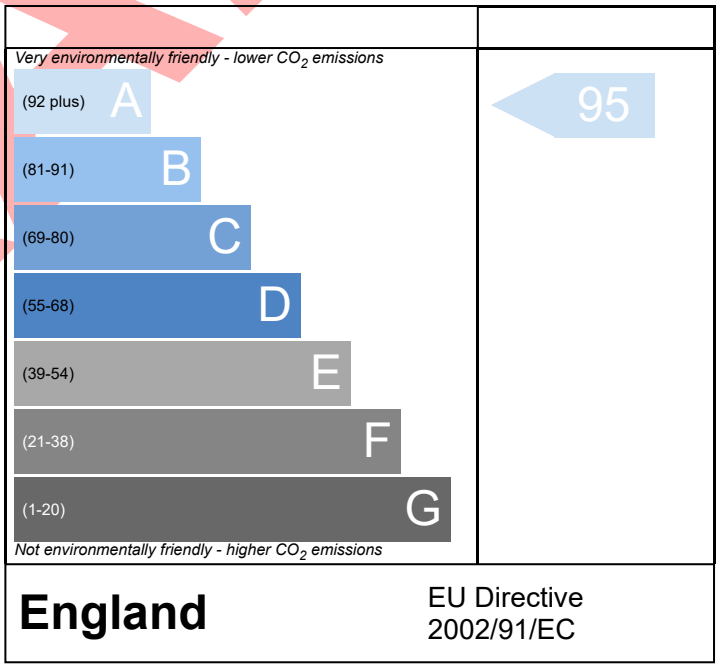
The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO2) emissions.

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.

DRAFT

Summary for Input Data

elmhurst energy

Plot Reference	53J Warminster Road	**Issued on Date**	05/02/2026
Assessment Reference	53J	**Plot Type Ref**	
Plot Address		**SAP Version**	10.2

SAP Rating	76 C	**DER**	7.08	**TER**	15.02
Environmental	95 A	**% DER < TER**			52.86
CO_2 Emissions (t/year)	0.34	**DFEE**	47.72	**TFEE**	47.91
Compliance Check	See BREL	**% DFEE < TFEE**			0.40
% DPER < TPER	6.13	**DPER**	74.22	**TPER**	79.07

Assessor Details	Mr. William Linley	**Assessor ID**	P977-0001
Client	,		

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

Orientation	South	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Suburban	
1.0 Property Type	House, End-Terrace	
2.0 Number of Storeys	2	
3.0 Date Built	2026	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	233.18	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
Ground floor:	10.26 m	26.23 m²	2.40 m
1st Storey:	10.26 m	26.23 m²	3.52 m

8.0 Living Area	23.80	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
Main	Cavity Wall	Cavity wall : plasterboard on dabs, AAC block, filled cavity, any outside structure	0.17	60.00	52.88	41.53	0.00	None	11.35	Calculate Wall Area
Retaining	Solid Wall	Other	0.15	110.00	7.86	7.86	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
Party Wall 1	Filled Cavity with Edge Sealing	Other	0.00	70.00	60.63		None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	89.15

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
External Roof 1	External Flat Roof	Plasterboard, insulated flat roof	0.11	9.00	26.23	26.23	None	0.00	Calculate Wall Area	0.00

10.2 Internal Ceilings

Description	Storey	Construction	Kappa	Area (m²)
Internal Ceiling 1	Lowest occupied	Plasterboard ceiling, carpeted chipboard floor	9.00	26.23

11.0 Heat Loss Floors

Summary for Input Data

elmhurst energy

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Heat Loss Floor 1	Ground Floor - Solid	Lowest occupied	Slab on ground, screed over insulation	0.12	None	0.00	110.00	26.23

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	+1	Plasterboard ceiling, carpeted chipboard floor	18.00	26.23

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Door	Manufacturer	Solid Door				0.00			1.40
Windows	Manufacturer	Window	Double Low-E Soft 0.05			0.66		0.70	1.40

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Front	Door	Main	South	1.89	
Side	Windows	Main	West	9.46	

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	5.20	0.03	0.03	Catnic TS150/100	Yes
E3 Sill	Independently assessed	4.30	0.02	0.02		Yes
E4 Jamb	Independently assessed	21.80	0.01	0.01		Yes
E5 Ground floor (normal)	Independently assessed	10.26	0.06	0.06		Yes
E6 Intermediate floor within a dwelling	Independently assessed	10.26	0.00	0.00		Yes
E15 Flat roof with parapet	Table K1 - Default	10.26	0.30	0.30		No
E16 Corner (normal)	Independently assessed	5.92	0.05	0.05		No
E18 Party wall between dwellings	Independently assessed	11.84	0.06	0.06		No
E25 Staggered party wall between dwellings	Table K1 - Default	5.92	0.24	0.24		No
P1 Party wall - Ground floor	Independently assessed	10.26	0.04	0.04		No
P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	10.26	0.00	0.00		No
P4 Party wall - Roof (insulation at ceiling level)	Table K1 - Default	10.26	0.48	0.48		No

Y-value	0.11	W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	No
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - centralised
MV Reference Number	500225
Configuration	2
Manufacturer SFP	0.62
Duct Type	Rigid
Wet Rooms	2

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0
Number of open flues	0
Number of chimneys/flues attached to closed fire	0
Number of flues attached to solid fuel boiler	0
Number of flues attached to other heater	0
Number of blocked chimneys	0
Number of intermittent extract fans	0
Number of passive vents	0
Number of flueless gas fires	0
21.0 Fixed Cooling System	No
22.0 Pressure Testing	Yes

Summary for Input Data

Designed AP_{50}	4.00	$m^3/(h.m^2)$ @ 50 Pa
Test Method	Blower Door	

22.0 Lighting

No Fixed Lighting	No				
	Name	**Efficacy**	**Power**	**Capacity**	**Count**
	Low energy Lighting	75.00	5.00	375.00	28

24.0 Main Heating 1	Database	
Percentage of Heat	50.00	%
Database Ref. No.	100272	
Fuel Type	Electricity	
In Winter	211.82	
In Summer	180.33	
Model Name	F370	
Manufacturer	NIBE Energy Systems Ltd	
System Type	Heat Pump	
Controls SAP Code	2207	
Controls description	Time and temperature zone control by arrangement	
PCDF Controls	0	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Underfloor	
Underfloor Heating	Yes - Pipes in thin screed	
Flow Temperature	Enter value	
Flow Temperature Value	45.00	

25.0 Main Heating 2	Database	
Percentage of Heat	50.00	%
Database Ref. No.	100272	
Fuel Type	Electricity	
In Winter	211.82	
In Summer	180.33	
Model Name	F370	
Manufacturer	NIBE Energy Systems Ltd	
Controls	2207	
Controls description	Time and temperature zone control by arrangement	
PCDF Controls	0	
Is MHS Pumped	Pump in heated space	
Heat Emitter	Underfloor	
Underfloor Heating	Yes - Pipes in Wood	
Flow Temperature	Enter value	

26.0 Heat Networks	None	
27.0 Secondary Heating	None	

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	No	
Waste Water Heat Recovery Instantaneous System 2	No	

Summary for Input Data

Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Cold Water Source	From mains
Bath Count	0
Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
1	Combi boiler or unvented hot water system	9.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	170.00	L
Loss	1.56	kWh/day

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

	Typical Cost	Typical savings per year	Ratings after improvement	
			SAP rating	Environmental Impact
Solar water heating	£4,000 - £7,000	£77	C 78	A 95
Photovoltaic	£8,000 - £10,000	£223	B 86	A 97
Wind turbine			0	0

Thermal Bridging

Plot Reference	53J Warminster Road	**Issued on Date**	05/02/2026
Assessment Reference	53J	**Plot Type Ref**	End-Terrace House
Plot Address		**SAP Version**	10.2

SAP Rating	76 C	**DER**	7.08	**TER**	15.02
Environmental	95 A	**% DER < TER**			52.86
CO_2 Emissions (t/year)	0.34	**DFEE**	47.72	**TFEE**	47.91
Compliance Check	See BREL	**% DFEE < TFEE**			0.40
% DPER < TPER	6.13	**DPER**	74.22	**TPER**	79.07

Assessor Details	Mr. William Linley	**Assessor ID**	P977-0001
Client	,		

	Junction details	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.033	5.20	0.17	Catnic TS150/100
External wall	E3 Sill	Independently assessed	0.021	4.30	0.09	
External wall	E4 Jamb	Independently assessed	0.015	21.80	0.33	
External wall	E5 Ground floor (normal)	Independently assessed	0.061	10.26	0.63	
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.004	10.26	0.04	
External wall	E15 Flat roof with parapet	Table K1 - Default	0.300	10.26	3.08	
External wall	E16 Corner (normal)	Independently assessed	0.049	5.92	0.29	
External wall	E18 Party wall between dwellings	Independently assessed	0.059	11.84	0.70	
External wall	E25 Staggered party wall between dwellings	Table K1 - Default	0.240	5.92	1.42	
Party wall	P1 Party wall - Ground floor	Independently assessed	0.043	10.26	0.44	
Party wall	P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	0.000	10.26	0.00	
Party wall	P4 Party wall - Roof (insulation at ceiling level)	Table K1 - Default	0.480	10.26	4.92	

Total: 116.54 W/mK:

Y-Value: 0.11 W/m²K:

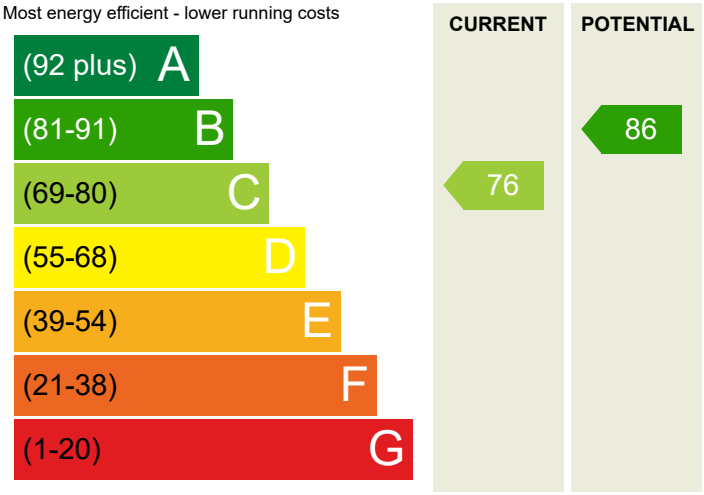
Energy Report

Dwelling Address	
Reference	53J Warminster Road-53J
SAP Version	10.2
Assessment Date	03/02/2026
Submission Date	
Property Type	House, End-Terrace
Total Floor Area	52

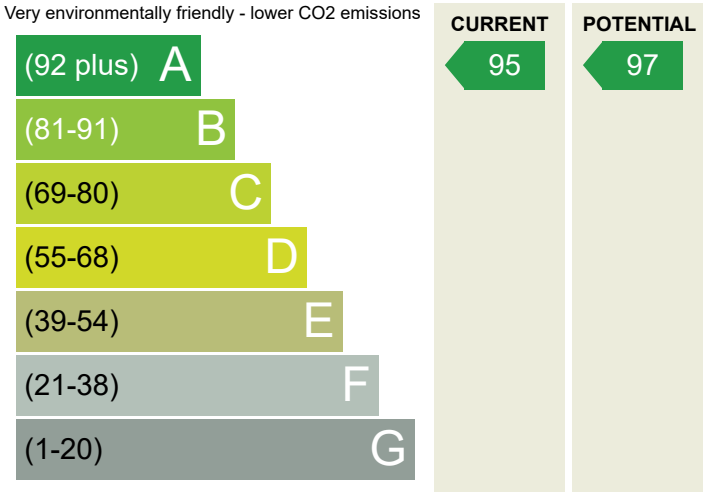
This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

This document is not an Energy Performance Certificate (EPC) as required by the Energy Performance of Buildings Regulations

Energy Efficiency Rating

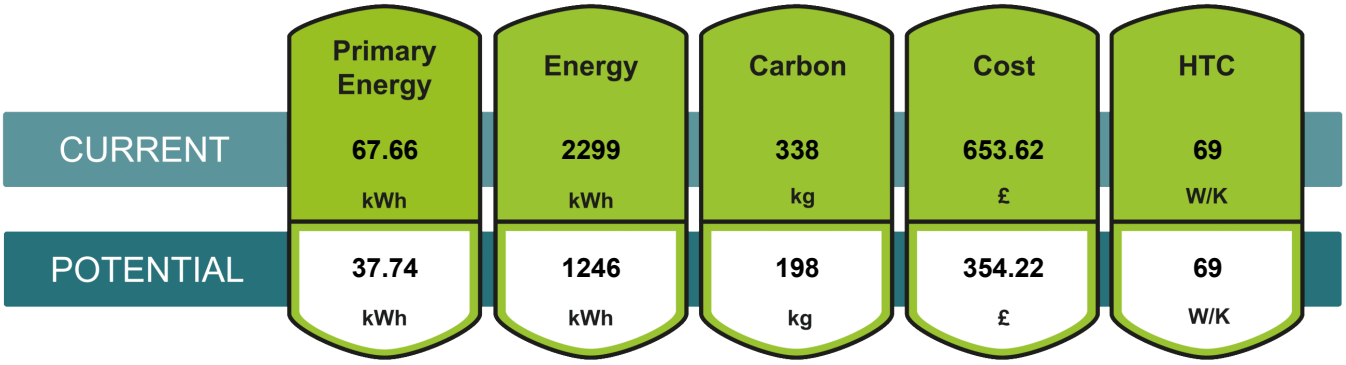


Carbon Dioxide (CO2) Emissions Rating



Additional ratings for your home

Energy Report



Energy Report

Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor | Poor | Average | Good | Very Good

Feature	Description	Energy Performance
Walls	Average thermal transmittance 0.17 W/m²K	Very Good
Roof	Average thermal transmittance 0.11 W/m²K	Very Good
Floor	Average thermal transmittance 0.12 W/m²K	Very Good
Windows	High performance glazing	Good
Main heating	Air source heat pump, underfloor, electric	Average
Main heating	Air source heat pump, underfloor, electric	Average
Main heating controls	Time and temperature zone control	Very Good
Main heating controls	Time and temperature zone control	Very Good
Secondary heating	None	
Hot water	From main system	Average
Lighting	Good lighting efficiency	Good
Air tightness	Air permeability [AP50] = 4.0 m³/h.m² (assumed)	Good

Recommendations

The recommended measures provided below will help to improve the energy efficiency of the dwelling.
To reach the dwelling's potential energy rating all of the recommended measures shown below would need to be installed.
Having these measures installed individually or in any other order may give a different result when compared with the cumulative potential rating.

Recommended measures	Cumulative savings (per year)	Cumulative rating	Typical costs	Incremental savings (per year)	Cumulative CO2 rating
Solar water heating	£77	C 78	£4,000 - £7,000	£77	A 95

Photovoltaic	£299	B 86	£8,000 - £10,000	£223	A 97

The typical cost is based on average installation prices across the country so may not be representative of the actual costs in your area.

Estimated energy costs of the dwelling

The table below shows the estimated running costs of the space and water heating and lighting within the dwelling. It does not include the energy used from household appliances. The estimated annual costs after potential improvements indicates the total energy cost if all recommended measures named above were installed.

	Estimated annual costs	Estimated annual costs after potential improvements	Potential future savings
Lighting	£39	£39	
Heating	£301	£324	
Hot Water	£314	£214	
New Technologies e.g. Impact of PV	£0	-(£223)	
TOTAL	£654	£354	



Estimated energy use and potential savings

Space Heating
896
kWh per year

Water Heating
1104
kWh per year

Energy Report

About this document

Created by:	
Company/Trading name:	
Phone number:	
Email address:	

Disclaimer

This Energy Report should not under any circumstances be treated as a Condition Survey and cannot be used to indicate that any element of the dwelling (e.g.heating system) is working correctly.
This Energy Report must not be used in situations where an Energy Performance Certificate (EPC) is required.
This Energy Report is generated from a set of data inputs which may not reflect the actual dimensions, services or construction of the dwelling.
The calculation used to generate this report reflects the SAP Methodology current at the time of report generation.

Glossary terms for additional metrics

Primary Energy	The measure of the energy required for lighting, heating and hot water in a property. This includes the efficiency of the property's heating system, power station efficiency for electricity and the energy used to produce the fuel and deliver it to the property.
Energy Used	The estimated amount of fuel energy for lighting, heating and hot water for the property. The estimate is based on typical usage which is likely to be different to actual consumption.
Carbon (CO2)	The current emissions based on the energy estimates.
Cost	The estimated cost of energy. The cost of each unit of fuel is based on an industry standard which is likely to be different to those the occupier actually pays.
Heat Transfer Coefficient	Heat flow through the property envelope where internal and external temperatures are different.