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 11:13:59

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	58 m^2
Site Reference	53K Warminster Road	Plot Reference	53K
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	*14.7 $kgCO_2/m^2$*	
Dwelling carbon dioxide emission rate	5.73 $kgCO_2/m^2$	OK
1b Target primary energy rate and dwelling primary energy		
Target primary energy	*77.29 kWh_{PE}/m^2*	
Dwelling primary energy	60.09 kWh_{PE}/m^2	OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency		
Target fabric energy efficiency	*48.7 kWh/m^2*	
Dwelling fabric energy efficiency	46.9 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)	57.96	0.17
Exposed wall: Walls (2)	3.83	0.15
Party wall: Party Wall (1)	60.63	0 **(!)**
Ground floor: Heat Loss Floor 1, Heat Loss Floor 1	28.99	0.12
Exposed roof: Roof (1)	28.99	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	East	0.7	1.4
Side, Windows	2.16	East	0.7	1.4
Side, Windows	1.82	East	0.7	1.4
Side, Windows	3.12	East	0.7	1.4
Front, Windows	1.26	South	0.7	1.4
Front, Windows	1.82	South	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
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	
External wall	E17: Corner (inverted - internal area greater than external area)	Calculated by person with suitable expertise	-0.103	

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	263.4%
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	263.4%
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	53K Warminster Road	**Issued on Date**	05/02/2026
Assessment Reference	53K	**Plot Type Ref**	
Plot Address		**SAP Version**	10.2

SAP Rating	80 C	**DER**	5.73	**TER**	14.70
Environmental	96 A	**% DER < TER**			61.02
CO_2 Emissions (t/year)	0.3	**DFEE**	46.91	**TFEE**	48.68
Compliance Check	See BREL	**% DFEE < TFEE**			3.65
% DPER < TPER	22.25	**DPER**	60.09	**TPER**	77.29

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	28.9900 (1b)	x	2.4000 (2b)	=	69.5760	(1b) - (3b)
First floor	28.9900 (1c)	x	3.5200 (2c)	=	102.0448	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	57.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	171.6208	(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)	0.5218	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5218	0.5218	0.5218	0.5218	0.5218	0.5218	0.5218	0.5218	0.5218	0.5218	0.5218	0.5218	(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			11.4400	1.3258	15.1667			(27)
Heat Loss Floor 1			28.9900	0.1200	3.4788	110.0000	3188.9000	(28a)
Main	71.2948	13.3300	57.9648	0.1700	9.8540	60.0000	3477.8880	(29a)
Retaining	3.8300		3.8300	0.1500	0.5745	110.0000	421.3000	(29a)
External Roof 1	28.9900		28.9900	0.1100	3.1889	9.0000	260.9100	(30)
Total net area of external elements Aum(A, m2)			133.1048					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		34.9089			(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			28.9900			18.0000	521.8200	(32d)
Internal Ceiling 1			28.9900			9.0000	260.9100	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		13178.1780	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 227.2883 (35)

List of Thermal Bridges

	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.1000	0.0330	0.2013
E3 Sill	5.2000	0.0210	0.1092
E4 Jamb	30.6000	0.0150	0.4590
E5 Ground floor (normal)	12.6900	0.0610	0.7741
E6 Intermediate floor within a dwelling	12.6900	0.0040	0.0508
E15 Flat roof with parapet	12.6900	0.3000	3.8070
E16 Corner (normal)	17.7600	0.0490	0.8702
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
E17 Corner (inverted - internal area greater than external area)	11.8400	-0.1030	-1.2195

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 12.5374 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 47.4463 (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	29.5522	29.5522	29.5522	29.5522	29.5522	29.5522	29.5522	29.5522	29.5522	29.5522	29.5522	29.5522	(38)
Heat transfer coeff	76.9985	76.9985	76.9985	76.9985	76.9985	76.9985	76.9985	76.9985	76.9985	76.9985	76.9985	76.9985	(39)
Average = Sum(39)m / 12 =												76.9985	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3280	1.3280	1.3280	1.3280	1.3280	1.3280	1.3280	1.3280	1.3280	1.3280	1.3280	1.3280	(40)
HLP (average)												1.3280	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.9240 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	81.5677	80.3419	78.5556	75.1380	72.6159	69.8032	68.2045	69.9772	71.9204	74.9404	78.4314	81.2552	(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	34.3335	33.0850	31.8365	30.5880	29.3395	28.0911	28.0911	29.3395	30.5880	31.8365	33.0850	34.3335	(42c)
Average daily hot water use (litres/day)												106.4150	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	115.9012	113.4269	110.3922	105.7260	101.9554	97.8943	96.2956	99.3168	102.5085	106.7769	111.5165	115.5887	(44)
Energy conte	183.5592	161.5184	169.6687	144.7337	137.2516	120.3724	116.4611	122.9749	126.4032	144.8953	158.8756	180.9839	(45)
Energy content (annual)										Total = Sum(45)m =		1767.6980	
Distribution loss (46)m = 0.15 x (45)m	27.5339	24.2278	25.4503	21.7101	20.5877	18.0559	17.4692	18.4462	18.9605	21.7343	23.8313	27.1476	(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	209.6736	185.1056	195.7831	170.0057	163.3660	145.6444	142.5755	149.0893	151.6752	171.0097	184.1476	207.0983	(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	209.6736	185.1056	195.7831	170.0057	163.3660	145.6444	142.5755	149.0893	151.6752	171.0097	184.1476	207.0983	(64)
										Total per year (kWh/year) = Sum(64)m =		2075.1740	(64)
12Total per year (kWh/year)												2075	(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	61.0334	53.7049	56.4148	48.1239	45.6362	40.0238	38.7233	40.8892	42.0291	48.1777	52.8261	60.1772	(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	96.1992	96.1992	96.1992	96.1992	96.1992	96.1992	96.1992	96.1992	96.1992	96.1992	96.1992	96.1992	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	85.3703	94.5171	85.3703	88.2160	85.3703	88.2160	85.3703	85.3703	88.2160	85.3703	88.2160	85.3703	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	167.8252	169.5667	165.1782	155.8356	144.0421	132.9580	125.5531	123.8116	128.2001	137.5428	149.3362	160.4203	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.6199	32.6199	32.6199	32.6199	32.6199	32.6199	32.6199	32.6199	32.6199	32.6199	32.6199	32.6199	(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)	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	(71)
Water heating gains (Table 5)	82.0342	79.9180	75.8264	66.8388	61.3389	55.5887	52.0475	54.9585	58.3737	64.7549	73.3697	80.8833	(72)
Total internal gains	387.0895	395.8616	378.2347	362.7501	342.6111	328.6224	314.8306	316.0002	326.6496	339.5278	362.7816	378.5337	(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

East				8.3600		19.6403		0.6600		0.7000		0.7700	52.5689 (76)
South				3.0800		46.7521		0.6600		0.7000		0.7700	46.1027 (78)
Solar gains	98.6716	178.3403	265.5353	355.6991	415.9782	418.8823	401.5206	356.8459	297.4387	203.4620	120.1947	83.0671 (83)	
Total gains	485.7611	574.2019	643.7700	718.4492	758.5893	747.5047	716.3512	672.8461	624.0882	542.9898	482.9763	461.6008 (84)	

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	47.5413	47.5413	47.5413	47.5413	47.5413	47.5413	47.5413	47.5413	47.5413	47.5413	47.5413	47.5413	
alpha	4.1694	4.1694	4.1694	4.1694	4.1694	4.1694	4.1694	4.1694	4.1694	4.1694	4.1694	4.1694	
util living area	0.9892	0.9779	0.9547	0.8952	0.7826	0.6145	0.4617	0.5086	0.7368	0.9264	0.9798	0.9912	(86)
Living	19.6066	19.8209	20.1178	20.4771	20.7568	20.9066	20.9494	20.9428	20.8426	20.4615	19.9574	19.5550	
Non living	18.2241	18.4944	18.8647	19.2963	19.6036	19.7399	19.7672	19.7644	19.6930	19.2905	18.6703	18.1586	
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	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	(88a)
ni2,m (89a)m	0.9860	0.9714	0.9413	0.8642	0.7217	0.5181	0.3433	0.3865	0.6475	0.8974	0.9727	0.9885	(89a)
MIT2 (90a)m	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	(90a)
Th2 (88b)m	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	(88b)
ni2,m (89b)m	0.9860	0.9714	0.9413	0.8642	0.7217	0.5181	0.3433	0.3865	0.6475	0.8974	0.9727	0.9885	(89b)
MIT2 (90b)m	18.2241	18.4944	18.8647	19.2963	19.6036	19.7399	19.7672	19.7644	19.6930	19.2905	18.6703	18.1586	(90b)
MIT 2	18.3540	18.6023	18.9424	19.3389	19.6212	19.7464	19.7714	19.7689	19.7033	19.3335	18.7638	18.2938	(90)
Living area fraction										fLA = Living area / (4) =		0.4557	(91)
MIT	19.5597	19.6949	19.8800	20.0958	20.2495	20.3176	20.3312	20.3299	20.2942	20.0929	19.7828	19.5270	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5597	19.6949	19.8800	20.0958	20.2495	20.3176	20.3312	20.3299	20.2942	20.0929	19.7828	19.5270	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9851	0.9706	0.9421	0.8723	0.7455	0.5605	0.3957	0.4407	0.6860	0.9051	0.9724	0.9877	(94)
Useful gains	478.5188	557.3459	606.4901	626.6950	565.5541	418.9641	283.4527	296.5479	428.1370	491.4761	469.6638	455.9457	(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	1174.9748	1139.1811	1030.2408	862.0611	658.2956	440.2483	287.3005	302.5937	476.9413	730.9374	976.5550	1180.1520	(97)
Space heating kWh	518.1633	390.9932	315.2705	169.4636	68.9996	0.0000	0.0000	0.0000	0.0000	178.1592	364.9617	538.8095	(98a)
Space heating requirement - total per year (kWh/year)												2544.8205	
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	518.1633	390.9932	315.2705	169.4636	68.9996	0.0000	0.0000	0.0000	0.0000	178.1592	364.9617	538.8095	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2544.8205	
Space heating per m2										(98c) / (4) =		43.8914	(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 %)	263.3840 (206)
Efficiency of main space heating system 2 (in %)	263.3840 (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	518.1633	390.9932	315.2705	169.4636	68.9996	0.0000	0.0000	0.0000	0.0000	178.1592	364.9617	538.8095	(98)
Space heating efficiency (main heating system 1)	263.3840	263.3840	263.3840	263.3840	263.3840	0.0000	0.0000	0.0000	0.0000	263.3840	263.3840	263.3840	(210)
Space heating fuel (main heating system)	98.3665	74.2249	59.8500	32.1704	13.0987	0.0000	0.0000	0.0000	0.0000	33.8212	69.2832	102.2859	(211)
Space heating efficiency (main heating system 2)	263.3840	263.3840	263.3840	263.3840	263.3840	0.0000	0.0000	0.0000	0.0000	263.3840	263.3840	263.3840	(212)
Space heating fuel (main heating system 2)	98.3665	74.2249	59.8500	32.1704	13.0987	0.0000	0.0000	0.0000	0.0000	33.8212	69.2832	102.2859	(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												483.1009	(213)
Water heating													
Water heating requirement	209.6736	185.1056	195.7831	170.0057	163.3660	145.6444	142.5755	149.0893	151.6752	171.0097	184.1476	207.0983	(64)
Efficiency of water heater												210.4328	(216)
(217)m	210.4328	210.4328	210.4328	210.4328	210.4328	210.4328	210.4328	210.4328	210.4328	210.4328	210.4328	210.4328	(217)
Fuel for water heating, kWh/month	99.6392	87.9642	93.0383	80.7886	77.6333	69.2118	67.7535	70.8489	72.0777	81.2657	87.5090	98.4154	(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	13.2455	11.9637	13.2455	12.8182	13.2455	12.8182	13.2455	13.2455	12.8182	13.2455	12.8182	13.2455	(231)
Lighting	18.1492	14.5599	13.1096	9.6047	7.4189	6.0613	6.7678	8.7970	11.4265	14.9921	16.9336	18.6536	(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	483.1009	(211)
Space heating fuel - main system 2	483.1009	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	210.4328	
Water heating fuel used	986.1455	(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)	155.9548	(230a)
Total electricity for the above, kWh/year	155.9548	(231)
Electricity for lighting (calculated in Appendix L)	146.4742	(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	2254.7761	(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	483.1009	0.1555	75.1302	(261)
Space heating - main system 2	483.1009	0.1555	75.1302	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	986.1455	0.1412	139.2130	(264)
Space and water heating			289.4734	(265)
Pumps, fans and electric keep-hot	155.9548	0.1387	21.6329	(267)
Energy for lighting	146.4742	0.1443	21.1407	(268)
Total CO2, kg/year			332.2470	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.7300	(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	483.1009	1.5757	761.2437	(275)
Space heating - main system 2	483.1009	1.5757	761.2437	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	986.1455	1.5220	1500.9178	(278)
Space and water heating			3023.4051	(279)
Pumps, fans and electric keep-hot	155.9548	1.5128	235.9284	(281)
Energy for lighting	146.4742	1.5338	224.6670	(282)
Total Primary energy kWh/year			3484.0005	(286)
Dwelling Primary energy Rate (DPER)			60.0900	(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	28.9900 (1b)	x	2.4000 (2b)	=	69.5760	(1b) - (3b)
First floor	28.9900 (1c)	x	3.5200 (2c)	=	102.0448	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	57.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	171.6208	(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) =	0.1165	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3665	(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) = 0.3116 (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	0.3972	0.3894	0.3817	0.3427	0.3349	0.2960	0.2960	0.2882	0.3116	0.3349	0.3505	0.3661	(22b)
Effective ac	0.5789	0.5758	0.5728	0.5587	0.5561	0.5438	0.5438	0.5415	0.5485	0.5561	0.5614	0.5670	(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			11.4400	1.1450	13.0992			(27)
Heat Loss Floor 1			28.9900	0.1300	3.7687			(28a)
Main	71.2948	13.3300	57.9648	0.1800	10.4337			(29a)
Retaining	3.8300		3.8300	0.1800	0.6894			(29a)
External Roof 1	28.9900		28.9900	0.1100	3.1889			(30)
Total net area of external elements Aum(A, m2)			133.1048					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		33.0699			(33)
Main dwelling								
Party Wall 1			60.6300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 227.2883 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.1000	0.0500	0.3050
E3 Sill	5.2000	0.0500	0.2600
E4 Jamb	30.6000	0.0500	1.5300
E5 Ground floor (normal)	12.6900	0.1600	2.0304
E6 Intermediate floor within a dwelling	12.6900	0.0000	0.0000
E15 Flat roof with parapet	12.6900	0.5600	7.1064
E16 Corner (normal)	17.7600	0.0900	1.5984
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
E17 Corner (inverted - internal area greater than external area)	11.8400	-0.0900	-1.0656

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 14.8822 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 47.9521 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.7858	32.6123	32.4422	31.6433	31.4939	30.7981	30.7981	30.6693	31.0661	31.4939	31.7962	32.1123	(38)
Heat transfer coeff	80.7379	80.5644	80.3943	79.5954	79.4460	78.7502	78.7502	78.6214	79.0182	79.4460	79.7483	80.0644	(39)
Average = Sum(39)m / 12 =												79.5947	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3925	1.3895	1.3866	1.3728	1.3702	1.3582	1.3582	1.3560	1.3629	1.3702	1.3754	1.3809	(40)
HLP (average)												1.3728	
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 1.9240 (42)
Hot water usage for mixer showers

72.5046	71.4150	69.8272	66.7893	64.5474	62.0473	60.6262	62.2020	63.9293	66.6137	69.7168	72.2268	(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

34.3335	33.0850	31.8365	30.5880	29.3395	28.0911	28.0911	29.3395	30.5880	31.8365	33.0850	34.3335	(42c)

Average daily hot water use (litres/day) 98.0591 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	106.8381	104.5000	101.6638	97.3774	93.8870	90.1384	88.7173	91.5415	94.5173	98.4502	102.8019	106.5603	(44)
Energy conte	169.2055	148.8066	156.2534	133.3048	126.3899	110.8356	107.2959	113.3475	116.5493	133.5960	146.4601	166.8477	(45)
Energy content (annual)										Total = Sum(45)m =		1628.8924	
Distribution loss (46)m = 0.15 x (45)m	25.3808	22.3210	23.4380	19.9957	18.9585	16.6253	16.0944	17.0021	17.4824	20.0394	21.9690	25.0272	(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)
Primary loss 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)
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

215.8004	190.8924	202.8483	178.3966	172.9848	155.9275	153.8908	159.9424	161.6411	180.1909	191.5519	213.4426	(62)
WWHRS -33.1461	-29.3147	-30.6966	-25.4180	-23.6887	-20.2706	-19.0004	-20.2051	-20.9727	-24.7245	-28.0099	-32.5323	(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													
182.6543	161.5777	172.1517	152.9786	149.2962	135.6569	134.8903	139.7374	140.6684	155.4664	163.5420	180.9104	(64)
									Total per year (kWh/year) = Sum(64)m =		1869.5302	(64)
12Total per year (kWh/year)											1870	(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

93.5367	83.1468	89.2302	80.3973	79.3006	72.9263	72.9518	74.9640	74.8261	81.6966	84.7715	92.7528	(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	96.1992	96.1992	96.1992	96.1992	96.1992	96.1992	96.1992	96.1992	96.1992	96.1992	96.1992	96.1992	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	85.3703	94.5171	85.3703	88.2160	85.3703	88.2160	85.3703	85.3703	88.2160	85.3703	88.2160	85.3703	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	167.8252	169.5667	165.1782	155.8356	144.0421	132.9580	125.5531	123.8116	128.2001	137.5428	149.3362	160.4203	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	32.6199	32.6199	32.6199	32.6199	32.6199	32.6199	32.6199	32.6199	32.6199	32.6199	32.6199	32.6199	(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)													
	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	(71)
Water heating gains (Table 5)													
	125.7214	123.7303	119.9330	111.6629	106.5868	101.2866	98.0535	100.7580	103.9252	109.8072	117.7381	124.6677	(72)
Total internal gains													
	433.7767	442.6739	425.3413	410.5742	390.8590	374.3203	360.8366	361.7997	372.2010	387.5801	410.1501	425.3181	(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	
East	8.3600	19.6403	0.6300	0.7000	0.7700	50.1794	(76)
South	3.0800	46.7521	0.6300	0.7000	0.7700	44.0072	(78)

Solar gains	94.1866	170.2339	253.4655	339.5310	397.0701	399.8422	383.2696	340.6256	283.9187	194.2138	114.7313	79.2913	(83)
Total gains	527.9633	612.9079	678.8068	750.1052	787.9291	774.1625	744.1063	702.4253	656.1198	581.7938	524.8813	504.6095	(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	45.3394	45.4370	45.5332	45.9901	46.0767	46.4837	46.4837	46.5599	46.3261	46.0767	45.9020	45.7207	
alpha	4.0226	4.0291	4.0355	4.0660	4.0718	4.0989	4.0989	4.1040	4.0884	4.0718	4.0601	4.0480	
util living area													
	0.9859	0.9737	0.9496	0.8885	0.7762	0.6070	0.4546	0.4979	0.7230	0.9147	0.9741	0.9881	(86)
MIT	19.4260	19.6676	20.0080	20.4339	20.7570	20.9347	20.9842	20.9772	20.8645	20.4385	19.8608	19.3870	(87)
Th 2	19.7691	19.7714	19.7736	19.7842	19.7862	19.7955	19.7955	19.7972	19.7919	19.7862	19.7822	19.7780	(88)
util rest of house													
	0.9817	0.9660	0.9347	0.8558	0.7137	0.5095	0.3355	0.3758	0.6316	0.8820	0.9652	0.9846	(89)
MIT 2	17.9864	18.2919	18.7168	19.2347	19.5900	19.7594	19.7907	19.7895	19.7051	19.2554	18.5467	17.9431	(90)
Living area fraction										fLA = Living area / (4) =		0.4557	(91)
MIT	18.6424	18.9188	19.3052	19.7812	20.1218	20.2950	20.3345	20.3307	20.2334	19.7945	19.1455	18.6010	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6424	18.9188	19.3052	19.7812	20.1218	20.2950	20.3345	20.3307	20.2334	19.7945	19.1455	18.6010	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9764	0.9591	0.9277	0.8557	0.7324	0.5516	0.3899	0.4314	0.6675	0.8823	0.9591	0.9799	(94)
Useful gains	515.5282	587.8694	629.7116	641.8803	577.0617	427.0213	290.1022	302.9912	437.9416	513.3252	503.4081	494.4478	(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													
	1157.9711	1129.4164	1029.4626	866.0921	669.0750	448.4803	294.0966	309.0364	484.6525	730.4674	960.6076	1153.0096	(97)
Space heating kWh													
	477.9775	363.9196	297.4147	161.4325	68.4579	0.0000	0.0000	0.0000	0.0000	161.5538	329.1837	489.9700	(98a)
Space heating requirement - total per year (kWh/year)												2349.9098	
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													
	477.9775	363.9196	297.4147	161.4325	68.4579	0.0000	0.0000	0.0000	0.0000	161.5538	329.1837	489.9700	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2349.9098	
Space heating per m2											(98c) / (4) =	40.5297	(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													
	477.9775	363.9196	297.4147	161.4325	68.4579	0.0000	0.0000	0.0000	0.0000	161.5538	329.1837	489.9700	(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)													
	517.8521	394.2790	322.2261	174.8998	74.1689	0.0000	0.0000	0.0000	0.0000	175.0312	356.6454	530.8451	(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

	182.6543	161.5777	172.1517	152.9786	149.2962	135.6569	134.8903	139.7374	140.6684	155.4664	163.5420	180.9104 (64)
Efficiency of water heater												79.8000 (216)
(217)m	86.1147	85.8238	85.2741	84.1806	82.4264	79.8000	79.8000	79.8000	79.8000	84.1460	85.5958	86.1790 (217)
Fuel for water heating, kWh/month												
	212.1057	188.2667	201.8804	181.7266	181.1267	169.9961	169.0355	175.1095	176.2762	184.7578	191.0631	209.9238 (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	17.7383	14.2303	12.8128	9.3872	7.2509	5.9241	6.6146	8.5979	11.1678	14.6527	16.5502	18.2313 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-27.4641	-38.8983	-56.1875	-63.5255	-68.8361	-64.4137	-63.6525	-59.9412	-53.4187	-44.6691	-30.2700	-23.7262 (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	-14.9830	-31.5777	-62.8567	-94.5288	-125.0880	-125.6834	-124.1705	-105.0635	-76.9373	-45.1615	-20.0090	-11.8410 (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	2545.9477 (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	2241.2683 (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)	143.1579 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1432.9034 (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	3583.4706 (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	2545.9477	0.2100	534.6490	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2241.2683	0.2100	470.6663	(264)
Space and water heating			1005.3154	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	143.1579	0.1443	20.6621	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-595.0031	0.1345	-80.0063	
PV Unit electricity exported	-837.9003	0.1259	-105.4622	
Total			-185.4685	(269)
Total CO2, kg/year			852.4382	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.7000	(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	2545.9477	1.1300	2876.9209	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2241.2683	1.1300	2532.6332	(278)
Space and water heating			5409.5541	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	143.1579	1.5338	219.5804	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-595.0031	1.4969	-890.6886	
PV Unit electricity exported	-837.9003	0.4620	-387.1183	
Total			-1277.8069	(283)
Total Primary energy kWh/year			4481.4285	(286)
Target Primary Energy Rate (TPER)			77.2900	(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	28.9900	(1b)	x 2.4000	(2b)	=	69.5760	(1b) - (3b)
First floor	28.9900	(1c)	x 3.5200	(2c)	=	102.0448	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	57.9800						(4)

Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 171.6208 (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) =	0.1165	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.3165	(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) =	0.2691	(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													
	0.3430	0.3363	0.3296	0.2960	0.2892	0.2556	0.2556	0.2489	0.2691	0.2892	0.3027	0.3161	(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	0.5588	0.5566	0.5543	0.5438	0.5418	0.5327	0.5327	0.5310	0.5362	0.5418	0.5458	0.5500	(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	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Door			1.8900	1.4000	2.6460			(26)
Windows			11.4400	1.3258	15.1667			(27)
Heat Loss Floor 1			28.9900	0.1200	3.4788	110.0000	3188.9000	(28a)
Main	71.2948	13.3300	57.9648	0.1700	9.8540	60.0000	3477.8880	(29a)
Retaining	3.8300		3.8300	0.1500	0.5745	110.0000	421.3000	(29a)
External Roof 1	28.9900		28.9900	0.1100	3.1889	9.0000	260.9100	(30)
Total net area of external elements Aum(A, m2)			133.1048					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		34.9089			(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			28.9900			18.0000	521.8200	(32d)
Internal Ceiling 1			28.9900			9.0000	260.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	13178.1780 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		227.2883 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.1000	0.0330	0.2013
E3 Sill	5.2000	0.0210	0.1092
E4 Jamb	30.6000	0.0150	0.4590
E5 Ground floor (normal)	12.6900	0.0610	0.7741
E6 Intermediate floor within a dwelling	12.6900	0.0040	0.0508
E15 Flat roof with parapet	12.6900	0.3000	3.8070
E16 Corner (normal)	17.7600	0.0490	0.8702
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
E17 Corner (inverted - internal area greater than external area)	11.8400	-0.1030	-1.2195

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		12.5374 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	47.4463 (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	31.6498	31.5204	31.3936	30.7978	30.6864	30.1675	30.1675	30.0714	30.3674	30.6864	30.9119	31.1476	(38)
Heat transfer coeff													
	79.0961	78.9667	78.8399	78.2441	78.1327	77.6138	77.6138	77.5177	77.8136	78.1327	78.3582	78.5939	(39)
Average = Sum(39)m / 12 =												78.2436	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3642	1.3620	1.3598	1.3495	1.3476	1.3386	1.3386	1.3370	1.3421	1.3476	1.3515	1.3555	(40)
HLP (average)												1.3495	
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	1.9240	(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

	24.4108	24.0483	23.5377	22.5964	21.8916	21.1100	20.6879	21.1948	21.7468	22.5831	23.5438	24.3283	(42b)

Hot water usage for other uses

	34.3335	33.0850	31.8365	30.5880	29.3395	28.0911	28.0911	29.3395	30.5880	31.8365	33.0850	34.3335	(42c)
Average daily hot water use (litres/day)												53.8449	(43)

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

Daily hot water use

	58.7443	57.1333	55.3743	53.1845	51.2311	49.2011	48.7789	50.5344	52.3348	54.4196	56.6288	58.6618 (44)
Energy conte	93.0366	81.3570	85.1082	72.8069	68.9669	60.4985	58.9939	62.5721	64.5341	73.8469	80.6781	91.8502 (45)
Energy content (annual)										Total = Sum(45)m =		894.2493
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												
	79.0811	69.1535	72.3420	61.8858	58.6219	51.4237	50.1448	53.1863	54.8540	62.7699	68.5764	78.0727 (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												
	79.0811	69.1535	72.3420	61.8858	58.6219	51.4237	50.1448	53.1863	54.8540	62.7699	68.5764	78.0727 (64)
									Total per year (kWh/year) = Sum(64)m =			760.1119 (64)
12Total per year (kWh/year)												760 (64)
Electric shower(s)												
	45.2298	40.3001	44.0062	41.9946	42.7826	40.8104	42.1708	42.7826	41.9946	44.0062	43.1787	45.2298 (64a)
						Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =						514.4864 (64a)
Heat gains from water heating, kWh/month												
	31.0777	27.3634	29.0870	25.9701	25.3511	23.0585	23.0789	23.9922	24.2121	26.6940	27.9388	30.8256 (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	96.1992	96.1992	96.1992	96.1992	96.1992	96.1992	96.1992	96.1992	96.1992	96.1992	96.1992	96.1992	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	85.3703	94.5171	85.3703	88.2160	85.3703	88.2160	85.3703	85.3703	88.2160	85.3703	88.2160	85.3703	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	167.8252	169.5667	165.1782	155.8356	144.0421	132.9580	125.5531	123.8116	128.2001	137.5428	149.3362	160.4203	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	32.6199	32.6199	32.6199	32.6199	32.6199	32.6199	32.6199	32.6199	32.6199	32.6199	32.6199	32.6199	(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)													
	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	(71)
Water heating gains (Table 5)													
	41.7711	40.7193	39.0955	36.0696	34.0741	32.0257	31.0200	32.2476	33.6280	35.8791	38.8039	41.4323	(72)
Total internal gains													
	346.8264	356.6630	341.5038	331.9809	315.3463	305.0595	293.8032	293.2892	301.9038	310.6519	328.2158	339.0827	(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	
East	8.3600	19.6403	0.6600	0.7000	0.7700	52.5689	(76)
South	3.0800	46.7521	0.6600	0.7000	0.7700	46.1027	(78)

Solar gains	98.6716	178.3403	265.5353	355.6991	415.9782	418.8823	401.5206	356.8459	297.4387	203.4620	120.1947	83.0671	(83)
Total gains	445.4981	535.0033	607.0391	687.6800	731.3245	723.9418	695.3237	650.1351	599.3425	514.1139	448.4105	422.1498	(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	46.2805	46.3563	46.4309	46.7844	46.8511	47.1644	47.1644	47.2228	47.0432	46.8511	46.7163	46.5762	
alpha	4.0854	4.0904	4.0954	4.1190	4.1234	4.1443	4.1443	4.1482	4.1362	4.1234	4.1144	4.1051	
util living area													
	0.9922	0.9830	0.9634	0.9090	0.8022	0.6333	0.4777	0.5270	0.7587	0.9385	0.9846	0.9937	(86)
MIT	19.3199	19.5744	19.9318	20.3834	20.7316	20.9266	20.9820	20.9732	20.8422	20.3670	19.7589	19.2751	(87)
Th 2	19.7909	19.7926	19.7943	19.8023	19.8038	19.8107	19.8107	19.8120	19.8080	19.8038	19.8007	19.7976	(88)
util rest of house													
	0.9897	0.9779	0.9521	0.8806	0.7429	0.5354	0.3551	0.4010	0.6703	0.9129	0.9790	0.9917	(89)
MIT 2	18.2916	18.5441	18.8948	19.3279	19.6315	19.7784	19.8063	19.8047	19.7266	19.3248	18.7349	18.2520	(90)
Living area fraction									fLA = Living area / (4) =			0.4557	(91)
MIT	18.7602	19.0136	19.3673	19.8088	20.1328	20.3016	20.3420	20.3371	20.2350	19.7997	19.2015	18.7182	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7602	19.0136	19.3673	19.8088	20.1328	20.3016	20.3420	20.3371	20.2350	19.7997	19.2015	18.7182	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9869	0.9735	0.9471	0.8807	0.7607	0.5777	0.4111	0.4584	0.7047	0.9128	0.9753	0.9893	(94)
Useful gains	439.6737	520.8422	574.9304	605.6708	556.3403	418.2194	285.8439	298.0213	422.3815	469.3060	437.3212	417.6330	(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													
	1143.7425	1114.5033	1014.4601	853.5514	658.8764	442.5209	290.4341	305.1976	477.3841	718.7995	948.2538	1141.0409	(97)
Space heating kWh													
	523.8272	398.9403	327.0101	178.4740	76.2869	0.0000	0.0000	0.0000	0.0000	185.6232	367.8715	538.2155	(98a)
Space heating requirement - total per year (kWh/year)												2596.2486	
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													
	523.8272	398.9403	327.0101	178.4740	76.2869	0.0000	0.0000	0.0000	0.0000	185.6232	367.8715	538.2155	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2596.2486	

Space heating per m2 (98c) / (4) = 44.7783 (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	729.5695	574.3420	589.1345	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8472	0.9073	0.8820	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	618.1191	521.1286	519.6170	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	814.4904	782.7411	731.5723	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	141.3873	194.6397	157.6948	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	35.3468	48.6599	39.4237	0.0000	0.0000	0.0000	0.0000	(107)

Space cooling requirement 123.4305 (107)
Energy for space heating 44.7783 (99)
Energy for space cooling 2.1288 (108)
Total 46.9072 (109)
Fabric Energy Efficiency (DFEE) 46.9 (109)

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	28.9900	(1b)	x 2.4000	(2b) =	69.5760	(1b) - (3b)
First floor	28.9900	(1c)	x 3.5200	(2c) =	102.0448	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	57.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		171.6208	(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) =	0.1165 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3665 (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) =	0.3116 (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	0.3972	0.3894	0.3817	0.3427	0.3349	0.2960	0.2960	0.2882	0.3116	0.3349	0.3505	0.3661	(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	0.5789	0.5758	0.5728	0.5587	0.5561	0.5438	0.5438	0.5415	0.5485	0.5561	0.5614	0.5670	(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			11.4400	1.1450	13.0992			(27)
Heat Loss Floor 1			28.9900	0.1300	3.7687			(28a)
Main	71.2948	13.3300	57.9648	0.1800	10.4337			(29a)
Retaining	3.8300		3.8300	0.1800	0.6894			(29a)
External Roof 1	28.9900		28.9900	0.1100	3.1889			(30)
Total net area of external elements Aum(A, m2)			133.1048					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		33.0699			(33)
Main dwelling								
Party Wall 1			60.6300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 227.2883 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.1000	0.0500	0.3050
E3 Sill	5.2000	0.0500	0.2600
E4 Jamb	30.6000	0.0500	1.5300
E5 Ground floor (normal)	12.6900	0.1600	2.0304
E6 Intermediate floor within a dwelling	12.6900	0.0000	0.0000
E15 Flat roof with parapet	12.6900	0.5600	7.1064
E16 Corner (normal)	17.7600	0.0900	1.5984
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
E17 Corner (inverted - internal area greater than external area)	11.8400	-0.0900	-1.0656

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 14.8822 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 47.9521 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.7858	32.6123	32.4422	31.6433	31.4939	30.7981	30.7981	30.6693	31.0661	31.4939	31.7962	32.1123	(38)
Heat transfer coeff	80.7379	80.5644	80.3943	79.5954	79.4460	78.7502	78.7502	78.6214	79.0182	79.4460	79.7483	80.0644	(39)
Average = Sum(39)m / 12 =												79.5947	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3925	1.3895	1.3866	1.3728	1.3702	1.3582	1.3582	1.3560	1.3629	1.3702	1.3754	1.3809	(40)
HLP (average)												1.3728	
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 1.9240 (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

24.4108	24.0483	23.5377	22.5964	21.8916	21.1100	20.6879	21.1948	21.7468	22.5831	23.5438	24.3283	(42b)

Hot water usage for other uses

34.3335	33.0850	31.8365	30.5880	29.3395	28.0911	28.0911	29.3395	30.5880	31.8365	33.0850	34.3335	(42c)

Average daily hot water use (litres/day) 53.8449 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	58.7443	57.1333	55.3743	53.1845	51.2311	49.2011	48.7789	50.5344	52.3348	54.4196	56.6288	58.6618	(44)
Energy conte	93.0366	81.3570	85.1082	72.8069	68.9669	60.4985	58.9939	62.5721	64.5341	73.8469	80.6781	91.8502	(45)
Energy content (annual)										Total = Sum(45)m =		894.2493	
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													
	79.0811	69.1535	72.3420	61.8858	58.6219	51.4237	50.1448	53.1863	54.8540	62.7699	68.5764	78.0727	(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													
	79.0811	69.1535	72.3420	61.8858	58.6219	51.4237	50.1448	53.1863	54.8540	62.7699	68.5764	78.0727	(64)
										Total per year (kWh/year) = Sum(64)m =		760.1119	(64)
12Total per year (kWh/year)												760	(64)
Electric shower(s)													
	45.2298	40.3001	44.0062	41.9946	42.7826	40.8104	42.1708	42.7826	41.9946	44.0062	43.1787	45.2298	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		514.4864	(64a)
Heat gains from water heating, kWh/month													
	31.0777	27.3634	29.0870	25.9701	25.3511	23.0585	23.0789	23.9922	24.2121	26.6940	27.9388	30.8256	(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	96.1992	96.1992	96.1992	96.1992	96.1992	96.1992	96.1992	96.1992	96.1992	96.1992	96.1992	96.1992	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	85.3703	94.5171	85.3703	88.2160	85.3703	88.2160	85.3703	85.3703	88.2160	85.3703	88.2160	85.3703	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	167.8252	169.5667	165.1782	155.8356	144.0421	132.9580	125.5531	123.8116	128.2001	137.5428	149.3362	160.4203	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	32.6199	32.6199	32.6199	32.6199	32.6199	32.6199	32.6199	32.6199	32.6199	32.6199	32.6199	32.6199	(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)													
	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	(71)
Water heating gains (Table 5)													
	41.7711	40.7193	39.0955	36.0696	34.0741	32.0257	31.0200	32.2476	33.6280	35.8791	38.8039	41.4323	(72)
Total internal gains													
	346.8264	356.6630	341.5038	331.9809	315.3463	305.0595	293.8032	293.2892	301.9038	310.6519	328.2158	339.0827	(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	
East	8.3600	19.6403	0.6300	0.7000	0.7700	50.1794	(76)
South	3.0800	46.7521	0.6300	0.7000	0.7700	44.0072	(78)

Solar gains	94.1866	170.2339	253.4655	339.5310	397.0701	399.8422	383.2696	340.6256	283.9187	194.2138	114.7313	79.2913	(83)

Total gains	441.0130	526.8969	594.9693	671.5119	712.4164	704.9017	677.0728	633.9149	585.8226	504.8657	442.9471	418.3740	(84)

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7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	45.3394	45.4370	45.5332	45.9901	46.0767	46.4837	46.4837	46.5599	46.3261	46.0767	45.9020	45.7207	
alpha	4.0226	4.0291	4.0355	4.0660	4.0718	4.0989	4.0989	4.1040	4.0884	4.0718	4.0601	4.0480	
util living area	0.9925	0.9841	0.9664	0.9167	0.8172	0.6521	0.4952	0.5445	0.7736	0.9430	0.9854	0.9939	(86)
MIT	19.2685	19.5188	19.8755	20.3368	20.7008	20.9152	20.9785	20.9685	20.8240	20.3314	19.7181	19.2292	(87)
Th 2	19.7691	19.7714	19.7736	19.7842	19.7862	19.7955	19.7955	19.7972	19.7919	19.7862	19.7822	19.7780	(88)
util rest of house	0.9901	0.9792	0.9558	0.8899	0.7593	0.5525	0.3676	0.4142	0.6859	0.9187	0.9800	0.9920	(89)
MIT 2	18.2246	18.4736	18.8248	19.2713	19.5924	19.7578	19.7902	19.7886	19.7002	19.2784	18.6810	18.1921	(90)
Living area fraction										fLA = Living area / (4) =		0.4557	(91)
MIT	18.7003	18.9498	19.3036	19.7568	20.0975	20.2852	20.3317	20.3262	20.2123	19.7582	19.1536	18.6647	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7003	18.9498	19.3036	19.7568	20.0975	20.2852	20.3317	20.3262	20.2123	19.7582	19.1536	18.6647	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9873	0.9749	0.9507	0.8892	0.7756	0.5951	0.4259	0.4736	0.7194	0.9180	0.9763	0.9896	(94)
Useful gains	435.4262	513.6829	565.6286	597.0905	552.5733	419.5076	288.3592	300.2082	421.4199	463.4801	432.4608	414.0143	(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	1162.6466	1131.9157	1029.3353	864.1531	667.1482	447.7101	293.8722	308.6863	482.9853	727.5824	961.2526	1158.1087	(97)
Space heating kWh	541.0519	415.4525	344.9978	192.2851	85.2437	0.0000	0.0000	0.0000	0.0000	196.4921	380.7301	553.6062	(98a)
Space heating requirement - total per year (kWh/year)												2709.8595	
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	541.0519	415.4525	344.9978	192.2851	85.2437	0.0000	0.0000	0.0000	0.0000	196.4921	380.7301	553.6062	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2709.8595	
Space heating per m2											(98c) / (4) =	46.7378	(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	740.2521	582.7516	597.5225	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8302	0.8946	0.8678	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	614.5296	521.3542	518.5459	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	792.2357	761.4089	712.6136	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	127.9484	178.6007	144.3864	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	31.9871	44.6502	36.0966	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												112.7339	(107)
Energy for space heating												46.7378	(99)
Energy for space cooling												1.9444	(108)
Total												48.6822	(109)
Fabric Energy Efficiency (TFEE)												48.7	(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	28.9900	(1b)	x 2.4000	(2b) =	69.5760	(1b) - (3b)
First floor	28.9900	(1c)	x 3.5200	(2c) =	102.0448	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	57.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		171.6208	(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)	0.5218 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5218	0.5218	0.5218	0.5218	0.5218	0.5218	0.5218	0.5218	0.5218	0.5218	0.5218	0.5218	(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	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Door			1.8900	1.4000	2.6460			(26)
Windows			11.4400	1.3258	15.1667			(27)
Heat Loss Floor 1			28.9900	0.1200	3.4788	110.0000	3188.9000	(28a)
Main	71.2948	13.3300	57.9648	0.1700	9.8540	60.0000	3477.8880	(29a)
Retaining	3.8300		3.8300	0.1500	0.5745	110.0000	421.3000	(29a)
External Roof 1	28.9900		28.9900	0.1100	3.1889	9.0000	260.9100	(30)
Total net area of external elements Aum(A, m2)			133.1048					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		34.9089			(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			28.9900			18.0000	521.8200	(32d)
Internal Ceiling 1			28.9900			9.0000	260.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	13178.1780 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		227.2883 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.1000	0.0330	0.2013
E3 Sill	5.2000	0.0210	0.1092
E4 Jamb	30.6000	0.0150	0.4590
E5 Ground floor (normal)	12.6900	0.0610	0.7741
E6 Intermediate floor within a dwelling	12.6900	0.0040	0.0508
E15 Flat roof with parapet	12.6900	0.3000	3.8070
E16 Corner (normal)	17.7600	0.0490	0.8702
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
E17 Corner (inverted - internal area greater than external area)	11.8400	-0.1030	-1.2195

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		12.5374 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	47.4463 (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	29.5522	29.5522	29.5522	29.5522	29.5522	29.5522	29.5522	29.5522	29.5522	29.5522	29.5522	29.5522	(38)
Heat transfer coeff	76.9985	76.9985	76.9985	76.9985	76.9985	76.9985	76.9985	76.9985	76.9985	76.9985	76.9985	76.9985	(39)
Average = Sum(39)m / 12 =												76.9985	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3280	1.3280	1.3280	1.3280	1.3280	1.3280	1.3280	1.3280	1.3280	1.3280	1.3280	1.3280	(40)
HLP (average)												1.3280	
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		1.9240 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
81.5677	80.3419	78.5556	75.1380	72.6159	69.8032	68.2045	69.9772	71.9204	74.9404	78.4314	81.2552	(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

34.3335	33.0850	31.8365	30.5880	29.3395	28.0911	28.0911	29.3395	30.5880	31.8365	33.0850	34.3335	(42c)

Average daily hot water use (litres/day)	106.4150 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	115.9012	113.4269	110.3922	105.7260	101.9554	97.8943	96.2956	99.3168	102.5085	106.7769	111.5165	115.5887	(44)
Energy conte	183.5592	161.5184	169.6687	144.7337	137.2516	120.3724	116.4611	122.9749	126.4032	144.8953	158.8756	180.9839	(45)
Energy content (annual)										Total = Sum(45)m =		1767.6980	

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

27.5339	24.2278	25.4503	21.7101	20.5877	18.0559	17.4692	18.4462	18.9605	21.7343	23.8313	27.1476	(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													
	209.6736	185.1056	195.7831	170.0057	163.3660	145.6444	142.5755	149.0893	151.6752	171.0097	184.1476	207.0983	(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													
	209.6736	185.1056	195.7831	170.0057	163.3660	145.6444	142.5755	149.0893	151.6752	171.0097	184.1476	207.0983	(64)
									Total per year (kWh/year) = Sum(64)m =			2075.1740	(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													
	61.0334	53.7049	56.4148	48.1239	45.6362	40.0238	38.7233	40.8892	42.0291	48.1777	52.8261	60.1772	(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	115.4390	115.4390	115.4390	115.4390	115.4390	115.4390	115.4390	115.4390	115.4390	115.4390	115.4390	115.4390	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	20.7349	18.4166	14.9774	11.3388	8.4759	7.1557	7.7320	10.0504	13.4896	17.1281	19.9910	21.3112	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	250.4854	253.0847	246.5347	232.5904	214.9883	198.4448	187.3927	184.7934	191.3435	205.2877	222.8898	239.4334	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	48.4679	48.4679	48.4679	48.4679	48.4679	48.4679	48.4679	48.4679	48.4679	48.4679	48.4679	48.4679	(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)													
	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	(71)
Water heating gains (Table 5)													
	82.0342	79.9180	75.8264	66.8388	61.3389	55.5887	52.0475	54.9585	58.3737	64.7549	73.3697	80.8833	(72)
Total internal gains													
	440.2021	438.3668	424.2860	397.7156	371.7506	348.1367	334.1197	336.7499	350.1543	374.1183	403.1981	428.5754	(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	
East	8.3600	19.6403	0.6600	0.7000	0.7700	52.5689	(76)
South	3.0800	46.7521	0.6600	0.7000	0.7700	46.1027	(78)

Solar gains	98.6716	178.3403	265.5353	355.6991	415.9782	418.8823	401.5206	356.8459	297.4387	203.4620	120.1947	83.0671	(83)
Total gains	538.8737	616.7071	689.8213	753.4147	787.7289	767.0190	735.6403	693.5958	647.5930	577.5804	523.3928	511.6425	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	47.5413	47.5413	47.5413	47.5413	47.5413	47.5413	47.5413	47.5413	47.5413	47.5413	47.5413	47.5413	
alpha	4.1694	4.1694	4.1694	4.1694	4.1694	4.1694	4.1694	4.1694	4.1694	4.1694	4.1694	4.1694	
util living area													
	0.9844	0.9719	0.9440	0.8816	0.7663	0.6021	0.4506	0.4950	0.7196	0.9125	0.9735	0.9873	(86)
Living	19.6907	19.8846	20.1794	20.5125	20.7736	20.9107	20.9506	20.9447	20.8531	20.5019	20.0185	19.6351	
Non living	18.3302	18.5736	18.9387	19.3353	19.6189	19.7425	19.7676	19.7652	19.7008	19.3354	18.7459	18.2599	
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	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	(88a)
ni2,m (89a)m	0.9798	0.9639	0.9281	0.8481	0.7040	0.5065	0.3345	0.3754	0.6295	0.8797	0.9645	0.9835	(89a)
MIT2 (90a)m	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	(90a)
Th2 (88b)m	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	(88b)
ni2,m (89b)m	0.9798	0.9639	0.9281	0.8481	0.7040	0.5065	0.3345	0.3754	0.6295	0.8797	0.9645	0.9835	(89b)
MIT2 (90b)m	18.3302	18.5736	18.9387	19.3353	19.6189	19.7425	19.7676	19.7652	19.7008	19.3354	18.7459	18.2599	(90b)
MIT 2	18.4514	18.6750	19.0104	19.3747	19.6352	19.7487	19.7718	19.7695	19.7104	19.3748	18.8333	18.3869	(90)
Living area fraction										fLA = Living area / (4) =		0.4557	(91)
MIT	19.6127	19.7345	19.9170	20.1153	20.2571	20.3189	20.3314	20.3302	20.2981	20.1154	19.8206	19.5776	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6127	19.7345	19.9170	20.1153	20.2571	20.3189	20.3314	20.3302	20.2981	20.1154	19.8206	19.5776	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9789	0.9633	0.9296	0.8573	0.7287	0.5485	0.3858	0.4285	0.6685	0.8890	0.9645	0.9826	(94)
Useful gains	527.4946	594.0502	641.2492	645.9106	573.9811	420.6846	283.8140	297.1751	432.9343	513.4838	504.7944	502.7384	(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													
	1179.0571	1142.2307	1033.0890	863.5614	658.8833	440.3454	287.3156	302.6214	477.2407	732.6686	979.4667	1184.0534	(97)
Space heating kWh													
	484.7625	368.3773	291.5289	156.7086	63.1672	0.0000	0.0000	0.0000	0.0000	163.0735	341.7641	506.8984	(98a)
Space heating requirement - total per year (kWh/year)												2376.2803	
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													
	484.7625	368.3773	291.5289	156.7086	63.1672	0.0000	0.0000	0.0000	0.0000	163.0735	341.7641	506.8984	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2376.2803	
Space heating per m2											(98c) / (4) =	40.9845	(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 %)												263.3840	(206)
Efficiency of main space heating system 2 (in %)												263.3840	(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													
	484.7625	368.3773	291.5289	156.7086	63.1672	0.0000	0.0000	0.0000	0.0000	163.0735	341.7641	506.8984	(98)
Space heating efficiency (main heating system 1)													
	263.3840	263.3840	263.3840	263.3840	263.3840	0.0000	0.0000	0.0000	0.0000	263.3840	263.3840	263.3840	(210)
Space heating fuel (main heating system)													
	92.0258	69.9316	55.3429	29.7491	11.9915	0.0000	0.0000	0.0000	0.0000	30.9574	64.8794	96.2280	(211)
Space heating efficiency (main heating system 2)													
	263.3840	263.3840	263.3840	263.3840	263.3840	0.0000	0.0000	0.0000	0.0000	263.3840	263.3840	263.3840	(212)
Space heating fuel (main heating system 2)													
	92.0258	69.9316	55.3429	29.7491	11.9915	0.0000	0.0000	0.0000	0.0000	30.9574	64.8794	96.2280	(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												451.1057	(213)
Water heating													
Water heating requirement													
	209.6736	185.1056	195.7831	170.0057	163.3660	145.6444	142.5755	149.0893	151.6752	171.0097	184.1476	207.0983	(64)
Efficiency of water heater												210.4328	(216)
(217)m	210.4328	210.4328	210.4328	210.4328	210.4328	210.4328	210.4328	210.4328	210.4328	210.4328	210.4328	210.4328	(217)
Fuel for water heating, kWh/month													
	99.6392	87.9642	93.0383	80.7886	77.6333	69.2118	67.7535	70.8489	72.0777	81.2657	87.5090	98.4154	(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	13.2455	11.9637	13.2455	12.8182	13.2455	12.8182	13.2455	13.2455	12.8182	13.2455	12.8182	13.2455	(231)
Lighting	18.1492	14.5599	13.1096	9.6047	7.4189	6.0613	6.7678	8.7970	11.4265	14.9921	16.9336	18.6536	(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												451.1057	(211)
Space heating fuel - main system 2												451.1057	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												210.4328	
Water heating fuel used												986.1455	(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)												155.9548	(230a)
Total electricity for the above, kWh/year												155.9548	(231)
Electricity for lighting (calculated in Appendix L)												146.4742	(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												2190.7859	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	451.1057	16.4900	74.3873	(240)
Space heating - main system 2	451.1057	16.4900	74.3873	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	986.1455	16.4900	162.6154	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	155.9548	16.4900	25.7169	(249)
Energy for lighting	146.4742	16.4900	24.1536	(250)
Additional standing charges			0.0000	(251)
Total energy cost			361.2606	(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] =	1.2629	(257)
SAP value		79.5283	
SAP rating (Section 12)		80	(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	451.1057	0.1556	70.1859	(261)
Space heating - main system 2	451.1057	0.1556	70.1859	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	986.1455	0.1412	139.2130	(264)
Space and water heating			279.5848	(265)
Pumps, fans and electric keep-hot	155.9548	0.1387	21.6329	(267)
Energy for lighting	146.4742	0.1443	21.1407	(268)
Total CO2, kg/year			322.3584	(272)
CO2 emissions per m2			5.5600	(273)
EI value			95.8054	
EI rating			96	(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	28.9900	(1b) x	2.4000	(2b) =	69.5760	(1b) - (3b)
First floor	28.9900	(1c) x	3.5200	(2c) =	102.0448	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	57.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		171.6208	(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)												0.5218	(23b)
Effective ac	0.5218	0.5218	0.5218	0.5218	0.5218	0.5218	0.5218	0.5218	0.5218	0.5218	0.5218	0.5218	(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			11.4400	1.3258	15.1667			(27)
Heat Loss Floor 1			28.9900	0.1200	3.4788	110.0000	3188.9000	(28a)
Main	71.2948	13.3300	57.9648	0.1700	9.8540	60.0000	3477.8880	(29a)
Retaining	3.8300		3.8300	0.1500	0.5745	110.0000	421.3000	(29a)
External Roof 1	28.9900		28.9900	0.1100	3.1889	9.0000	260.9100	(30)
Total net area of external elements Aum(A, m2)			133.1048					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		34.9089			(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			28.9900			18.0000	521.8200	(32d)
Internal Ceiling 1			28.9900			9.0000	260.9100	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		13178.1780	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							227.2883	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.1000	0.0330	0.2013
E3 Sill	5.2000	0.0210	0.1092
E4 Jamb	30.6000	0.0150	0.4590
E5 Ground floor (normal)	12.6900	0.0610	0.7741
E6 Intermediate floor within a dwelling	12.6900	0.0040	0.0508

E15 Flat roof with parapet	12.6900	0.3000	3.8070	
E16 Corner (normal)	17.7600	0.0490	0.8702	
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	
E17 Corner (inverted - internal area greater than external area)	11.8400	-0.1030	-1.2195	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 12.5374 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 47.4463 (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	29.5522	29.5522	29.5522	29.5522	29.5522	29.5522	29.5522	29.5522	29.5522	29.5522	29.5522	29.5522	(38)
Heat transfer coeff	76.9985	76.9985	76.9985	76.9985	76.9985	76.9985	76.9985	76.9985	76.9985	76.9985	76.9985	76.9985	(39)
Average = Sum(39)m / 12 =												76.9985	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3280	1.3280	1.3280	1.3280	1.3280	1.3280	1.3280	1.3280	1.3280	1.3280	1.3280	1.3280	(40)
HLP (average)												1.3280	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.9240 (42)
Hot water usage for mixer showers

81.5677	80.3419	78.5556	75.1380	72.6159	69.8032	68.2045	69.9772	71.9204	74.9404	78.4314	81.2552	(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

34.3335	33.0850	31.8365	30.5880	29.3395	28.0911	28.0911	29.3395	30.5880	31.8365	33.0850	34.3335	(42c)

Average daily hot water use (litres/day) 106.4150 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	115.9012	113.4269	110.3922	105.7260	101.9554	97.8943	96.2956	99.3168	102.5085	106.7769	111.5165	115.5887	(44)
Energy conte	183.5592	161.5184	169.6687	144.7337	137.2516	120.3724	116.4611	122.9749	126.4032	144.8953	158.8756	180.9839	(45)
Energy content (annual)										Total = Sum(45)m =		1767.6980	
Distribution loss (46)m = 0.15 x (45)m	27.5339	24.2278	25.4503	21.7101	20.5877	18.0559	17.4692	18.4462	18.9605	21.7343	23.8313	27.1476	(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

209.6736	185.1056	195.7831	170.0057	163.3660	145.6444	142.5755	149.0893	151.6752	171.0097	184.1476	207.0983	(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

209.6736	185.1056	195.7831	170.0057	163.3660	145.6444	142.5755	149.0893	151.6752	171.0097	184.1476	207.0983	(64)
									Total per year (kWh/year) = Sum(64)m =		2075.1740	(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

61.0334	53.7049	56.4148	48.1239	45.6362	40.0238	38.7233	40.8892	42.0291	48.1777	52.8261	60.1772	(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	115.4390	115.4390	115.4390	115.4390	115.4390	115.4390	115.4390	115.4390	115.4390	115.4390	115.4390	115.4390	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.7349	18.4166	14.9774	11.3388	8.4759	7.1557	7.7320	10.0504	13.4896	17.1281	19.9910	21.3112	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	250.4854	253.0847	246.5347	232.5904	214.9883	198.4448	187.3927	184.7934	191.3435	205.2877	222.8898	239.4334	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	48.4679	48.4679	48.4679	48.4679	48.4679	48.4679	48.4679	48.4679	48.4679	48.4679	48.4679	48.4679	(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)	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	(71)
Water heating gains (Table 5)	82.0342	79.9180	75.8264	66.8388	61.3389	55.5887	52.0475	54.9585	58.3737	64.7549	73.3697	80.8833	(72)
Total internal gains	440.2021	438.3668	424.2860	397.7156	371.7506	348.1367	334.1197	336.7499	350.1543	374.1183	403.1981	428.5754	(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	
East	8.3600	22.3313	0.6600	0.7000	0.7700	59.7717	(76)
South	3.0800	50.9848	0.6600	0.7000	0.7700	50.2767	(78)

Solar gains	110.0484	179.0724	263.6201	364.4627	415.9013	448.5641	425.1656	385.8702	320.2499	218.1960	137.3533	91.7382	(83)
Total gains	550.2505	617.4392	687.9061	762.1783	787.6519	796.7008	759.2853	722.6200	670.4042	592.3143	540.5514	520.3136	(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	47.5413	47.5413	47.5413	47.5413	47.5413	47.5413	47.5413	47.5413	47.5413	47.5413	47.5413	47.5413	
alpha	4.1694	4.1694	4.1694	4.1694	4.1694	4.1694	4.1694	4.1694	4.1694	4.1694	4.1694	4.1694	
util living area	0.9801	0.9673	0.9328	0.8498	0.6970	0.4709	0.3126	0.3384	0.6196	0.8780	0.9632	0.9836	(86)
Living	19.8093	19.9718	20.2801	20.6143	20.8502	20.9464	20.9607	20.9599	20.9104	20.6198	20.1541	19.7630	
Non living	18.4805	18.6834	19.0623	19.4508	19.6919	19.7651	19.7711	19.7710	19.7447	19.4691	18.9150	18.4225	
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	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	(88a)
ni2,m (89a)m	0.9741	0.9578	0.9131	0.8074	0.6199	0.3654	0.1944	0.2148	0.5121	0.8323	0.9504	0.9786	(89a)
MIT2 (90a)m	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	(90a)
Th2 (88b)m	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	(88b)
ni2,m (89b)m	0.9741	0.9578	0.9131	0.8074	0.6199	0.3654	0.1944	0.2148	0.5121	0.8323	0.9504	0.9786	(89b)
MIT2 (90b)m	18.4805	18.6834	19.0623	19.4508	19.6919	19.7651	19.7711	19.7710	19.7447	19.4691	18.9150	18.4225	(90b)
MIT 2	18.5895	18.7759	19.1239	19.4808	19.7023	19.7695	19.7750	19.7749	19.7508	19.4976	18.9886	18.5363	(90)
Living area fraction									fLA = Living area / (4) =			0.4557	(91)
MIT	19.6879	19.7894	19.9788	20.1730	20.2936	20.3302	20.3332	20.3331	20.3200	20.1822	19.9051	19.6589	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6879	19.7894	19.9788	20.1730	20.2936	20.3302	20.3332	20.3331	20.3200	20.1822	19.9051	19.6589	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9733	0.9575	0.9161	0.8212	0.6525	0.4120	0.2462	0.2691	0.5598	0.8480	0.9515	0.9777	(94)
Useful gains	535.5590	591.2029	630.1990	625.9212	513.9754	328.2296	186.9408	194.4415	375.2644	502.2680	514.3179	508.7326	(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	1123.2478	1092.5592	968.5498	791.0080	561.5964	333.4184	187.3538	195.0477	394.2335	660.8176	916.6770	1121.0151	(97)
Space heating kWh	437.2404	336.9114	251.7330	118.8625	35.4300	0.0000	0.0000	0.0000	0.0000	117.9609	289.6985	455.5382	(98a)
Space heating requirement - total per year (kWh/year)												2043.3750	
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	437.2404	336.9114	251.7330	118.8625	35.4300	0.0000	0.0000	0.0000	0.0000	117.9609	289.6985	455.5382	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2043.3750	
Space heating per m2											(98c) / (4) =	35.2428	(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 %) 263.3840 (206)
Efficiency of main space heating system 2 (in %) 263.3840 (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	437.2404	336.9114	251.7330	118.8625	35.4300	0.0000	0.0000	0.0000	0.0000	117.9609	289.6985	455.5382	(98)
Space heating efficiency (main heating system 1)	263.3840	263.3840	263.3840	263.3840	0.0000	0.0000	0.0000	0.0000	263.3840	263.3840	263.3840		(210)
Space heating fuel (main heating system)	83.0044	63.9582	47.7882	22.5645	6.7259	0.0000	0.0000	0.0000	0.0000	22.3933	54.9955	86.4780	(211)
Space heating efficiency (main heating system 2)	263.3840	263.3840	263.3840	263.3840	263.3840	0.0000	0.0000	0.0000	0.0000	263.3840	263.3840	263.3840	(212)
Space heating fuel (main heating system 2)	83.0044	63.9582	47.7882	22.5645	6.7259	0.0000	0.0000	0.0000	0.0000	22.3933	54.9955	86.4780	(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												387.9080	(213)
Water heating													
Water heating requirement	209.6736	185.1056	195.7831	170.0057	163.3660	145.6444	142.5755	149.0893	151.6752	171.0097	184.1476	207.0983	(64)
Efficiency of water heater												210.4328	(216)
(217)m	210.4328	210.4328	210.4328	210.4328	210.4328	210.4328	210.4328	210.4328	210.4328	210.4328	210.4328	210.4328	(217)
Fuel for water heating, kWh/month	99.6392	87.9642	93.0383	80.7886	77.6333	69.2118	67.7535	70.8489	72.0777	81.2657	87.5090	98.4154	(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	13.2455	11.9637	13.2455	12.8182	13.2455	12.8182	13.2455	13.2455	12.8182	13.2455	12.8182	13.2455	(231)
Lighting	18.1492	14.5599	13.1096	9.6047	7.4189	6.0613	6.7678	8.7970	11.4265	14.9921	16.9336	18.6536	(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												387.9080	(211)
Space heating fuel - main system 2												387.9080	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	210.4328	
Water heating fuel used	986.1455	(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)	155.9548	(230a)
Total electricity for the above, kWh/year	155.9548	(231)
Electricity for lighting (calculated in Appendix L)	146.4742	(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	2064.3904	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	387.9080	28.4300	110.2822	(240)
Space heating - main system 2	387.9080	28.4300	110.2822	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	986.1455	28.4300	280.3612	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	155.9548	28.4300	44.3379	(249)
Energy for lighting	146.4742	28.4300	41.6426	(250)
Additional standing charges			0.0000	(251)
Total energy cost			586.9062	(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	387.9080	0.1563	60.6349	(261)
Space heating - main system 2	387.9080	0.1563	60.6349	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	986.1455	0.1412	139.2130	(264)
Space and water heating			260.4828	(265)
Pumps, fans and electric keep-hot	155.9548	0.1387	21.6329	(267)
Energy for lighting	146.4742	0.1443	21.1407	(268)
Total CO2, kg/year			303.2564	(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	387.9080	1.5787	612.3887	(275)
Space heating - main system 2	387.9080	1.5787	612.3887	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	986.1455	1.5220	1500.9178	(278)
Space and water heating			2725.6951	(279)
Pumps, fans and electric keep-hot	155.9548	1.5128	235.9284	(281)
Energy for lighting	146.4742	1.5338	224.6670	(282)
Total Primary energy kWh/year			3186.2905	(286)

SAP 10 EPC IMPROVEMENTS

53K

Current energy efficiency rating: C 80
Current environmental impact rating: A 96

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	+ 1.9	-£ 64	-28 kg (9.1%)
U Solar photovoltaic panels	+ 7.2	-£ 225	-107 kg (38.9%)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
Solar water heating	£64	0.48 kg/m²	B 81	A 96
Solar photovoltaic panels	£225	1.85 kg/m²	B 89	A 97
Total Savings	£289	2.32 kg/m²		

Potential energy efficiency rating: B 89
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	£587	£523	£64
Space heating	£265	£288	-£23

Water heating	£280	£194	£86
Lighting	£42	£42	£0
Generated (PV)	-£0	-£225	£225
Total cost of fuels	£587	£298	£289
Total cost of uses	£587	£299	£288
Delivered energy	36 kWh/m²	18 kWh/m²	18 kWh/m²
Carbon dioxide emissions	0.3 tonnes	0.2 tonnes	0.1 tonnes
CO2 emissions per m²	5 kg/m²	3 kg/m²	2 kg/m²
Primary energy	55 kWh/m²	29 kWh/m²	26 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	28.9900	(1b) x	2.4000	(2b) =	69.5760	(1b) - (3b)
First floor	28.9900	(1c) x	3.5200	(2c) =	102.0448	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	57.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		171.6208	(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)	0.5218	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5218	0.5218	0.5218	0.5218	0.5218	0.5218	0.5218	0.5218	0.5218	0.5218	0.5218	0.5218	(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			11.4400	1.3258	15.1667			(27)
Heat Loss Floor 1			28.9900	0.1200	3.4788	110.0000	3188.9000	(28a)
Main	71.2948	13.3300	57.9648	0.1700	9.8540	60.0000	3477.8880	(29a)
Retaining	3.8300		3.8300	0.1500	0.5745	110.0000	421.3000	(29a)
External Roof 1	28.9900		28.9900	0.1100	3.1889	9.0000	260.9100	(30)
Total net area of external elements Aum(A, m2)			133.1048					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		34.9089			(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			28.9900			18.0000	521.8200	(32d)
Internal Ceiling 1			28.9900			9.0000	260.9100	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		13178.1780	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							227.2883	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.1000	0.0330	0.2013
E3 Sill	5.2000	0.0210	0.1092
E4 Jamb	30.6000	0.0150	0.4590
E5 Ground floor (normal)	12.6900	0.0610	0.7741
E6 Intermediate floor within a dwelling	12.6900	0.0040	0.0508
E15 Flat roof with parapet	12.6900	0.3000	3.8070
E16 Corner (normal)	17.7600	0.0490	0.8702
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	
E17 Corner (inverted - internal area greater than external area)	11.8400	-0.1030	-1.2195	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 12.5374 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 47.4463 (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	29.5522	29.5522	29.5522	29.5522	29.5522	29.5522	29.5522	29.5522	29.5522	29.5522	29.5522	29.5522	(38)
Heat transfer coeff	76.9985	76.9985	76.9985	76.9985	76.9985	76.9985	76.9985	76.9985	76.9985	76.9985	76.9985	76.9985	(39)
Average = Sum(39)m / 12 =												76.9985	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3280	1.3280	1.3280	1.3280	1.3280	1.3280	1.3280	1.3280	1.3280	1.3280	1.3280	1.3280	(40)
HLP (average)												1.3280	
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 1.9240 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	81.5677	80.3419	78.5556	75.1380	72.6159	69.8032	68.2045	69.9772	71.9204	74.9404	78.4314	81.2552	(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	34.3335	33.0850	31.8365	30.5880	29.3395	28.0911	28.0911	29.3395	30.5880	31.8365	33.0850	34.3335	(42c)
Average daily hot water use (litres/day)												106.4150	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	115.9012	113.4269	110.3922	105.7260	101.9554	97.8943	96.2956	99.3168	102.5085	106.7769	111.5165	115.5887	(44)
Energy conte	183.5592	161.5184	169.6687	144.7337	137.2516	120.3724	116.4611	122.9749	126.4032	144.8953	158.8756	180.9839	(45)
Energy content (annual)										Total = Sum(45)m =		1767.6980	
Distribution loss (46)m = 0.15 x (45)m	27.5339	24.2278	25.4503	21.7101	20.5877	18.0559	17.4692	18.4462	18.9605	21.7343	23.8313	27.1476	(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	209.6736	185.1056	195.7831	170.0057	163.3660	145.6444	142.5755	149.0893	151.6752	171.0097	184.1476	207.0983	(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												586.4732	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												586.4732	
Solar input	-0.0000	-16.2822	-56.2946	-75.9434	-97.7455	-89.5876	-88.5898	-78.5389	-55.1129	-28.3783	-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	209.6736	168.8234	139.4885	94.0623	65.6205	56.0568	53.9857	70.5504	96.5623	142.6314	184.1476	207.0983	(64)
										Total per year (kWh/year) = Sum(64)m =		1488.7008	(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	61.0334	53.7049	56.4148	48.1239	45.6362	40.0238	38.7233	40.8892	42.0291	48.1777	52.8261	60.1772	(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	115.4390	115.4390	115.4390	115.4390	115.4390	115.4390	115.4390	115.4390	115.4390	115.4390	115.4390	115.4390	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.7349	18.4166	14.9774	11.3388	8.4759	7.1557	7.7320	10.0504	13.4896	17.1281	19.9910	21.3112	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	250.4854	253.0847	246.5347	232.5904	214.9883	198.4448	187.3927	184.7934	191.3435	205.2877	222.8898	239.4334	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	48.4679	48.4679	48.4679	48.4679	48.4679	48.4679	48.4679	48.4679	48.4679	48.4679	48.4679	48.4679	(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)	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	(71)
Water heating gains (Table 5)	82.0342	79.9180	75.8264	66.8388	61.3389	55.5887	52.0475	54.9585	58.3737	64.7549	73.3697	80.8833	(72)
Total internal gains	440.2021	438.3668	424.2860	397.7156	371.7506	348.1367	334.1197	336.7499	350.1543	374.1183	403.1981	428.5754	(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	
East	8.3600	19.6403	0.6600	0.7000	0.7700	52.5689	(76)
South	3.0800	46.7521	0.6600	0.7000	0.7700	46.1027	(78)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	98.6716	178.3403	265.5353	355.6991	415.9782	418.8823	401.5206	356.8459	297.4387	203.4620	120.1947	83.0671	(83)
Total gains	538.8737	616.7071	689.8213	753.4147	787.7289	767.0190	735.6403	693.5958	647.5930	577.5804	523.3928	511.6425	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	47.5413	47.5413	47.5413	47.5413	47.5413	47.5413	47.5413	47.5413	47.5413	47.5413	47.5413	47.5413	
alpha	4.1694	4.1694	4.1694	4.1694	4.1694	4.1694	4.1694	4.1694	4.1694	4.1694	4.1694	4.1694	
util living area	0.9844	0.9719	0.9440	0.8816	0.7663	0.6021	0.4506	0.4950	0.7196	0.9125	0.9735	0.9873	(86)
Living	19.6907	19.8846	20.1794	20.5125	20.7736	20.9107	20.9506	20.9447	20.8531	20.5019	20.0185	19.6351	
Non living	18.3302	18.5736	18.9387	19.3353	19.6189	19.7425	19.7676	19.7652	19.7008	19.3354	18.7459	18.2599	
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	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	(88a)
ni2,m (89a)m	0.9798	0.9639	0.9281	0.8481	0.7040	0.5065	0.3345	0.3754	0.6295	0.8797	0.9645	0.9835	(89a)
MIT2 (90a)m	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	(90a)
Th2 (88b)m	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	(88b)
ni2,m (89b)m	0.9798	0.9639	0.9281	0.8481	0.7040	0.5065	0.3345	0.3754	0.6295	0.8797	0.9645	0.9835	(89b)
MIT2 (90b)m	18.3302	18.5736	18.9387	19.3353	19.6189	19.7425	19.7676	19.7652	19.7008	19.3354	18.7459	18.2599	(90b)
MIT 2	18.4514	18.6750	19.0104	19.3747	19.6352	19.7487	19.7718	19.7695	19.7104	19.3748	18.8333	18.3869	(90)
Living area fraction									fLA = Living area / (4) =			0.4557	(91)
MIT	19.6127	19.7345	19.9170	20.1153	20.2571	20.3189	20.3314	20.3302	20.2981	20.1154	19.8206	19.5776	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6127	19.7345	19.9170	20.1153	20.2571	20.3189	20.3314	20.3302	20.2981	20.1154	19.8206	19.5776	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9789	0.9633	0.9296	0.8573	0.7287	0.5485	0.3858	0.4285	0.6685	0.8890	0.9645	0.9826	(94)
Useful gains	527.4946	594.0502	641.2492	645.9106	573.9811	420.6846	283.8140	297.1751	432.9343	513.4838	504.7944	502.7384	(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	1179.0571	1142.2307	1033.0890	863.5614	658.8833	440.3454	287.3156	302.6214	477.2407	732.6686	979.4667	1184.0534	(97)
Space heating kWh	484.7625	368.3773	291.5289	156.7086	63.1672	0.0000	0.0000	0.0000	0.0000	163.0735	341.7641	506.8984	(98a)
Space heating requirement - total per year (kWh/year)												2376.2803	
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	484.7625	368.3773	291.5289	156.7086	63.1672	0.0000	0.0000	0.0000	0.0000	163.0735	341.7641	506.8984	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2376.2803	
Space heating per m2											(98c) / (4) =	40.9845	(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 %)	263.3840	(206)
Efficiency of main space heating system 2 (in %)	263.3840	(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	484.7625	368.3773	291.5289	156.7086	63.1672	0.0000	0.0000	0.0000	0.0000	163.0735	341.7641	506.8984	(98)
Space heating efficiency (main heating system 1)	263.3840	263.3840	263.3840	263.3840	263.3840	0.0000	0.0000	0.0000	0.0000	263.3840	263.3840	263.3840	(210)
Space heating fuel (main heating system)	92.0258	69.9316	55.3429	29.7491	11.9915	0.0000	0.0000	0.0000	0.0000	30.9574	64.8794	96.2280	(211)
Space heating efficiency (main heating system 2)	263.3840	263.3840	263.3840	263.3840	263.3840	0.0000	0.0000	0.0000	0.0000	263.3840	263.3840	263.3840	(212)
Space heating fuel (main heating system 2)	92.0258	69.9316	55.3429	29.7491	11.9915	0.0000	0.0000	0.0000	0.0000	30.9574	64.8794	96.2280	(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												451.1057	(213)
Water heating													
Water heating requirement	209.6736	168.8234	139.4885	94.0623	65.6205	56.0568	53.9857	70.5504	96.5623	142.6314	184.1476	207.0983	(64)
Efficiency of water heater												210.4328	(216)
(217)m	210.4328	210.4328	210.4328	210.4328	210.4328	210.4328	210.4328	210.4328	210.4328	210.4328	210.4328	210.4328	(217)
Fuel for water heating, kWh/month	99.6392	80.2268	66.2865	44.6994	31.1836	26.6388	25.6546	33.5263	45.8875	67.7800	87.5090	98.4154	(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	20.0400	18.1006	20.0400	19.3935	20.0400	19.3935	20.0400	20.0400	19.3935	20.0400	19.3935	20.0400	(231)
Lighting	18.1492	14.5599	13.1096	9.6047	7.4189	6.0613	6.7678	8.7970	11.4265	14.9921	16.9336	18.6536	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-36.7610	-53.7833	-78.2495	-86.3096	-88.5352	-78.8306	-77.8340	-74.4795	-67.3332	-60.1861	-40.8868	-31.5971	(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	451.1057	(211)
Space heating fuel - main system 2	451.1057	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	210.4328	
Water heating fuel used	707.4470	(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)	155.9548	(230a)
pump for solar water heating	80.0000	(230g)
Total electricity for the above, kWh/year	235.9548	(231)
Electricity for lighting (calculated in Appendix L)	146.4742	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-774.7861	(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	1217.3012	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	451.1057	16.4900	74.3873	(240)
Space heating - main system 2	451.1057	16.4900	74.3873	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	707.4470	16.4900	116.6580	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	155.9548	16.4900	25.7169	(249)
Pump for solar water heating	80.0000	16.4900	13.1920	(249)
Energy for lighting	146.4742	16.4900	24.1536	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-774.7861	16.4900	-127.7622	
PV Unit electricity exported	0.0000	5.5900	0.0000	
Total			-127.7622	(252)
Total energy cost			200.7330	(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] =	0.7017	(257)
SAP value		88.6250	
SAP rating (Section 12)		89	(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	451.1057	0.1556	70.1859	(261)
Space heating - main system 2	451.1057	0.1556	70.1859	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	707.4470	0.1464	103.5987	(264)
Space and water heating			243.9705	(265)
Pumps, fans and electric keep-hot	235.9548	0.1387	32.7298	(267)
Energy for lighting	146.4742	0.1443	21.1407	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-774.7861	0.1352	-104.7636	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-104.7636	(269)
Total CO2, kg/year			193.0775	(272)
CO2 emissions per m2			3.3300	(273)
EI value			97.4876	
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

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1. Overall dwelling characteristics

	Area	Storey height	Volume

Main dwelling	(m2)	(m)		(m3)
Ground floor	28.9900 (1b)	x 2.4000 (2b)	=	69.5760 (1b) - (3b)
First floor	28.9900 (1c)	x 3.5200 (2c)	=	102.0448 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	57.9800			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	171.6208 (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)		0.5218 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5218	0.5218	0.5218	0.5218	0.5218	0.5218	0.5218	0.5218	0.5218	0.5218	0.5218	0.5218	(25)

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			11.4400	1.3258	15.1667			(27)
Heat Loss Floor 1			28.9900	0.1200	3.4788	110.0000	3188.9000	(28a)
Main	71.2948	13.3300	57.9648	0.1700	9.8540	60.0000	3477.8880	(29a)
Retaining	3.8300		3.8300	0.1500	0.5745	110.0000	421.3000	(29a)
External Roof 1	28.9900		28.9900	0.1100	3.1889	9.0000	260.9100	(30)
Total net area of external elements Aum(A, m2)			133.1048					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		34.9089			(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			28.9900			18.0000	521.8200	(32d)
Internal Ceiling 1			28.9900			9.0000	260.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	13178.1780 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		227.2883 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.1000	0.0330	0.2013
E3 Sill	5.2000	0.0210	0.1092
E4 Jamb	30.6000	0.0150	0.4590
E5 Ground floor (normal)	12.6900	0.0610	0.7741
E6 Intermediate floor within a dwelling	12.6900	0.0040	0.0508
E15 Flat roof with parapet	12.6900	0.3000	3.8070
E16 Corner (normal)	17.7600	0.0490	0.8702
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
E17 Corner (inverted - internal area greater than external area)	11.8400	-0.1030	-1.2195

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		12.5374 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	47.4463 (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	29.5522	29.5522	29.5522	29.5522	29.5522	29.5522	29.5522	29.5522	29.5522	29.5522	29.5522	29.5522	(38)
Heat transfer coeff	76.9985	76.9985	76.9985	76.9985	76.9985	76.9985	76.9985	76.9985	76.9985	76.9985	76.9985	76.9985	(39)

Average = Sum(39)m / 12 =		76.9985

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3280	1.3280	1.3280	1.3280	1.3280	1.3280	1.3280	1.3280	1.3280	1.3280	1.3280	1.3280	(40)
HLP (average)												1.3280	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.9240 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	81.5677	80.3419	78.5556	75.1380	72.6159	69.8032	68.2045	69.9772	71.9204	74.9404	78.4314	81.2552	(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													
	34.3335	33.0850	31.8365	30.5880	29.3395	28.0911	28.0911	29.3395	30.5880	31.8365	33.0850	34.3335	(42c)
Average daily hot water use (litres/day)												106.4150	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	115.9012	113.4269	110.3922	105.7260	101.9554	97.8943	96.2956	99.3168	102.5085	106.7769	111.5165	115.5887	(44)
Energy conte	183.5592	161.5184	169.6687	144.7337	137.2516	120.3724	116.4611	122.9749	126.4032	144.8953	158.8756	180.9839	(45)
Energy content (annual)										Total = Sum(45)m =		1767.6980	
Distribution loss (46)m = 0.15 x (45)m													
	27.5339	24.2278	25.4503	21.7101	20.5877	18.0559	17.4692	18.4462	18.9605	21.7343	23.8313	27.1476	(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													
	209.6736	185.1056	195.7831	170.0057	163.3660	145.6444	142.5755	149.0893	151.6752	171.0097	184.1476	207.0983	(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												638.3755	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												638.3755	
Solar input	-0.0000	-17.5842	-57.2636	-79.9107	-99.5987	-97.8468	-95.6059	-87.7987	-62.9474	-34.8362	-4.9835	-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													
	209.6736	167.5214	138.5195	90.0950	63.7673	47.7977	46.9696	61.2906	88.7279	136.1735	179.1641	207.0983	(64)
										Total per year (kWh/year) = Sum(64)m =		1436.7985	(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													
	61.0334	53.7049	56.4148	48.1239	45.6362	40.0238	38.7233	40.8892	42.0291	48.1777	52.8261	60.1772	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	115.4390	115.4390	115.4390	115.4390	115.4390	115.4390	115.4390	115.4390	115.4390	115.4390	115.4390	115.4390	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	20.7349	18.4166	14.9774	11.3388	8.4759	7.1557	7.7320	10.0504	13.4896	17.1281	19.9910	21.3112	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	250.4854	253.0847	246.5347	232.5904	214.9883	198.4448	187.3927	184.7934	191.3435	205.2877	222.8898	239.4334	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	48.4679	48.4679	48.4679	48.4679	48.4679	48.4679	48.4679	48.4679	48.4679	48.4679	48.4679	48.4679	(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)													
	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	-76.9593	(71)
Water heating gains (Table 5)													
	82.0342	79.9180	75.8264	66.8388	61.3389	55.5887	52.0475	54.9585	58.3737	64.7549	73.3697	80.8833	(72)
Total internal gains													
	440.2021	438.3668	424.2860	397.7156	371.7506	348.1367	334.1197	336.7499	350.1543	374.1183	403.1981	428.5754	(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	
East	8.3600	22.3313	0.6600	0.7000	0.7700	59.7717	(76)
South	3.0800	50.9848	0.6600	0.7000	0.7700	50.2767	(78)

Solar gains	110.0484	179.0724	263.6201	364.4627	415.9013	448.5641	425.1656	385.8702	320.2499	218.1960	137.3533	91.7382	(83)
Total gains	550.2505	617.4392	687.9061	762.1783	787.6519	796.7008	759.2853	722.6200	670.4042	592.3143	540.5514	520.3136	(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	47.5413	47.5413	47.5413	47.5413	47.5413	47.5413	47.5413	47.5413	47.5413	47.5413	47.5413	47.5413	
alpha	4.1694	4.1694	4.1694	4.1694	4.1694	4.1694	4.1694	4.1694	4.1694	4.1694	4.1694	4.1694	
util living area													
	0.9801	0.9673	0.9328	0.8498	0.6970	0.4709	0.3126	0.3384	0.6196	0.8780	0.9632	0.9836	(86)
Living	19.8093	19.9718	20.2801	20.6143	20.8502	20.9464	20.9607	20.9599	20.9104	20.6198	20.1541	19.7630	
Non living	18.4805	18.6834	19.0623	19.4508	19.6919	19.7651	19.7711	19.7710	19.7447	19.4691	18.9150	18.4225	
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	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	(88a)
ni2,m (89a)m	0.9741	0.9578	0.9131	0.8074	0.6199	0.3654	0.1944	0.2148	0.5121	0.8323	0.9504	0.9786	(89a)
MIT2 (90a)m	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	(90a)
Th2 (88b)m	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	19.8190	(88b)
ni2,m (89b)m	0.9741	0.9578	0.9131	0.8074	0.6199	0.3654	0.1944	0.2148	0.5121	0.8323	0.9504	0.9786	(89b)
MIT2 (90b)m	18.4805	18.6834	19.0623	19.4508	19.6919	19.7651	19.7711	19.7710	19.7447	19.4691	18.9150	18.4225	(90b)
MIT 2	18.5895	18.7759	19.1239	19.4808	19.7023	19.7695	19.7750	19.7749	19.7508	19.4976	18.9886	18.5363	(90)
Living area fraction										fLA = Living area / (4) =		0.4557	(91)
MIT	19.6879	19.7894	19.9788	20.1730	20.2936	20.3302	20.3332	20.3331	20.3200	20.1822	19.9051	19.6589	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6879	19.7894	19.9788	20.1730	20.2936	20.3302	20.3332	20.3331	20.3200	20.1822	19.9051	19.6589	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9733	0.9575	0.9161	0.8212	0.6525	0.4120	0.2462	0.2691	0.5598	0.8480	0.9515	0.9777	(94)
Useful gains	535.5590	591.2029	630.1990	625.9212	513.9754	328.2296	186.9408	194.4415	375.2644	502.2680	514.3179	508.7326	(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	1123.2478	1092.5592	968.5498	791.0080	561.5964	333.4184	187.3538	195.0477	394.2335	660.8176	916.6770	1121.0151	(97)
Space heating kWh	437.2404	336.9114	251.7330	118.8625	35.4300	0.0000	0.0000	0.0000	0.0000	117.9609	289.6985	455.5382	(98a)
Space heating requirement - total per year (kWh/year)												2043.3750	
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	437.2404	336.9114	251.7330	118.8625	35.4300	0.0000	0.0000	0.0000	0.0000	117.9609	289.6985	455.5382	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2043.3750	
Space heating per m2											(98c) / (4) =	35.2428	(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 %)	263.3840 (206)
Efficiency of main space heating system 2 (in %)	263.3840 (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	437.2404	336.9114	251.7330	118.8625	35.4300	0.0000	0.0000	0.0000	0.0000	117.9609	289.6985	455.5382	(98)
Space heating efficiency (main heating system 1)	263.3840	263.3840	263.3840	263.3840	263.3840	0.0000	0.0000	0.0000	0.0000	263.3840	263.3840	263.3840	(210)
Space heating fuel (main heating system)	83.0044	63.9582	47.7882	22.5645	6.7259	0.0000	0.0000	0.0000	0.0000	22.3933	54.9955	86.4780	(211)
Space heating efficiency (main heating system 2)	263.3840	263.3840	263.3840	263.3840	263.3840	0.0000	0.0000	0.0000	0.0000	263.3840	263.3840	263.3840	(212)
Space heating fuel (main heating system 2)	83.0044	63.9582	47.7882	22.5645	6.7259	0.0000	0.0000	0.0000	0.0000	22.3933	54.9955	86.4780	(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												387.9080	(213)
Water heating													
Water heating requirement	209.6736	167.5214	138.5195	90.0950	63.7673	47.7977	46.9696	61.2906	88.7279	136.1735	179.1641	207.0983	(64)
Efficiency of water heater												210.4328	(216)
(217)m	210.4328	210.4328	210.4328	210.4328	210.4328	210.4328	210.4328	210.4328	210.4328	210.4328	210.4328	210.4328	(217)
Fuel for water heating, kWh/month	99.6392	79.6080	65.8260	42.8141	30.3029	22.7140	22.3205	29.1260	42.1645	64.7111	85.1408	98.4154	(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	20.0400	18.1006	20.0400	19.3935	20.0400	19.3935	20.0400	20.0400	19.3935	20.0400	19.3935	20.0400	(231)
Lighting	18.1492	14.5599	13.1096	9.6047	7.4189	6.0613	6.7678	8.7970	11.4265	14.9921	16.9336	18.6536	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-40.2112	-53.8267	-77.2349	-85.9113	-86.7014	-80.4865	-79.2210	-76.6939	-69.8804	-62.2449	-45.1987	-34.3293	(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												387.9080	(211)
Space heating fuel - main system 2												387.9080	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												210.4328	
Water heating fuel used												682.7825	(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)												155.9548	(230a)
pump for solar water heating												80.0000	(230g)
Total electricity for the above, kWh/year												235.9548	(231)
Electricity for lighting (calculated in Appendix L)												146.4742	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-791.9403	(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	1049.0870	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	387.9080	28.4300	110.2822	(240)
Space heating - main system 2	387.9080	28.4300	110.2822	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	682.7825	28.4300	194.1151	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	155.9548	28.4300	44.3379	(249)
Pump for solar water heating	80.0000	28.4300	22.7440	(249)
Energy for lighting	146.4742	28.4300	41.6426	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-791.9403	28.4300	-225.1486	
PV Unit electricity exported	0.0000	5.8100	0.0000	
Total			-225.1486	(252)
Total energy cost			298.2554	(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	387.9080	0.1563	60.6349	(261)
Space heating - main system 2	387.9080	0.1563	60.6349	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	682.7825	0.1472	100.4804	(264)
Space and water heating			221.7501	(265)
Pumps, fans and electric keep-hot	235.9548	0.1387	32.7298	(267)
Energy for lighting	146.4742	0.1443	21.1407	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-791.9403	0.1353	-107.1666	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-107.1666	(269)
Total CO2, kg/year			168.4541	(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	387.9080	1.5787	612.3887	(275)
Space heating - main system 2	387.9080	1.5787	612.3887	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	682.7825	1.5444	1054.5060	(278)
Space and water heating			2279.2833	(279)
Pumps, fans and electric keep-hot	235.9548	1.5128	356.9524	(281)
Energy for lighting	146.4742	1.5338	224.6670	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-791.9403	1.5002	-1188.0460	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-1188.0460	(283)
Total Primary energy kWh/year			1672.8566	(286)

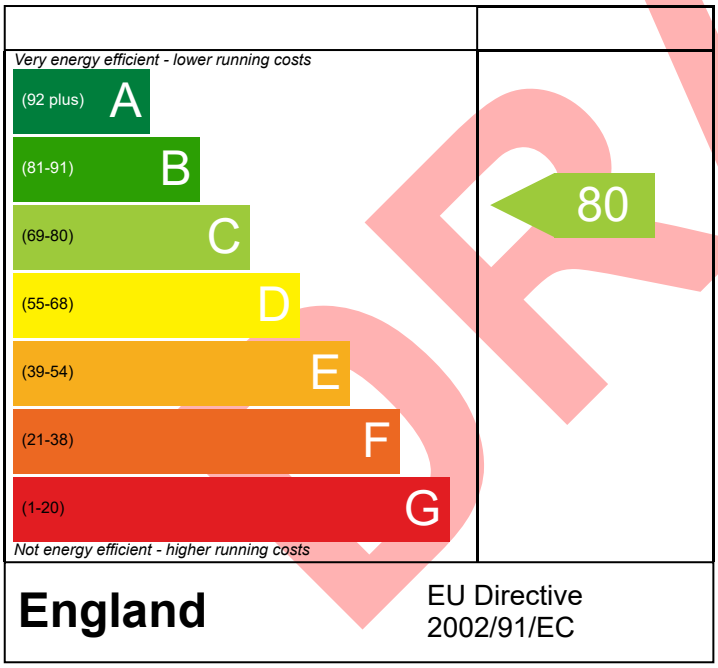
Predicted Energy Assessment

Dwelling type:	House, End-Terrace
Date of assessment:	05/02/2026
SAP Version:	10.2
Produced by:	William Linley
Total floor area:	57.98 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.

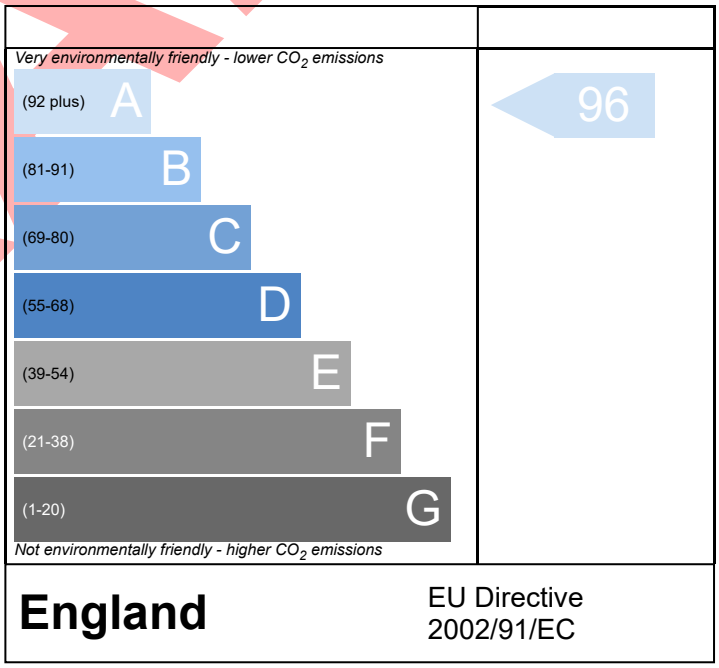
The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO2) emissions.

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

SAP Rating	80 C	**DER**	5.73	**TER**	14.70
Environmental	96 A	**% DER < TER**			61.02
CO_2 Emissions (t/year)	0.3	**DFEE**	46.91	**TFEE**	48.68
Compliance Check	See BREL	**% DFEE < TFEE**			3.65
% DPER < TPER	22.25	**DPER**	60.09	**TPER**	77.29

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	227.29	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:	12.69 m	28.99 m²	2.40 m
1st Storey:	12.69 m	28.99 m²	3.52 m

8.0 Living Area	26.42	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	71.29	57.96	0.00	None	13.33	Calculate Wall Area
Retaining	Solid Wall	Other	0.15	110.00	3.83	3.83	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	28.99	28.99	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	28.99

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	28.99

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	+1	Plasterboard ceiling, carpeted chipboard floor	18.00	28.99

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	East	8.36	
Front	Windows	Main	South	3.08	

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	6.10	0.03	0.03	Catnic TS150/100	No
E3 Sill	Independently assessed	5.20	0.02	0.02		No
E4 Jamb	Independently assessed	30.60	0.01	0.01		No
E5 Ground floor (normal)	Independently assessed	12.69	0.06	0.06		No
E6 Intermediate floor within a dwelling	Independently assessed	12.69	0.00	0.00		No
E15 Flat roof with parapet	Table K1 - Default	12.69	0.30	0.30		No
E16 Corner (normal)	Independently assessed	17.76	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
E17 Corner (inverted – internal area greater than external area)	Independently assessed	11.84	-0.10	-0.10		No

Y-value	0.09	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

Summary for Input Data

22.0 Pressure Testing	Yes	
Designed AP_{50}	4.00	m³/(h.m²) @ 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	29

24.0 Main Heating 1	Database	
Percentage of Heat	50.00	%
Database Ref. No.	100272	
Fuel Type	Electricity	
In Winter	263.38	
In Summer	210.43	
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	263.38	
In Summer	210.43	
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

Summary for Input Data

Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
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

34.0 Small-scale Hydro	None

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

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	£64	B 81	A 96
Photovoltaic	£8,000 - £10,000	£225	B 89	A 97
Wind turbine			0	0

Thermal Bridging

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

SAP Rating	80 C	**DER**	5.73	**TER**	14.70
Environmental	96 A	**% DER < TER**			61.02
CO_2 Emissions (t/year)	0.3	**DFEE**	46.91	**TFEE**	48.68
Compliance Check	See BREL	**% DFEE < TFEE**			3.65
% DPER < TPER	22.25	**DPER**	60.09	**TPER**	77.29

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	6.10	0.20	Catnic TS150/100
External wall	E3 Sill	Independently assessed	0.021	5.20	0.11	
External wall	E4 Jamb	Independently assessed	0.015	30.60	0.46	
External wall	E5 Ground floor (normal)	Independently assessed	0.061	12.69	0.77	
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.004	12.69	0.05	
External wall	E15 Flat roof with parapet	Table K1 - Default	0.300	12.69	3.81	
External wall	E16 Corner (normal)	Independently assessed	0.049	17.76	0.87	
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	
External wall	E17 Corner (inverted – internal area greater than external area)	Independently assessed	-0.103	11.84	-1.22	

Total: 158.11 W/mK:

Y-Value: 0.09 W/m²K:

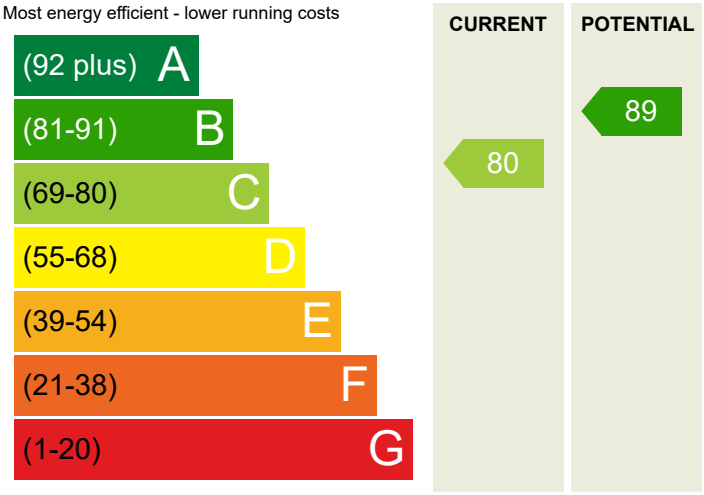
Energy Report

Dwelling Address	
Reference	53K Warminster Road-53K
SAP Version	10.2
Assessment Date	03/02/2026
Submission Date	
Property Type	House, End-Terrace
Total Floor Area	58

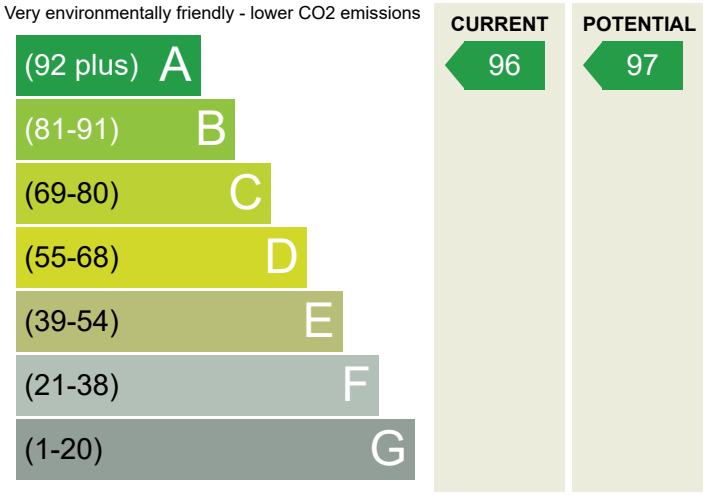
This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

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

Energy Efficiency Rating

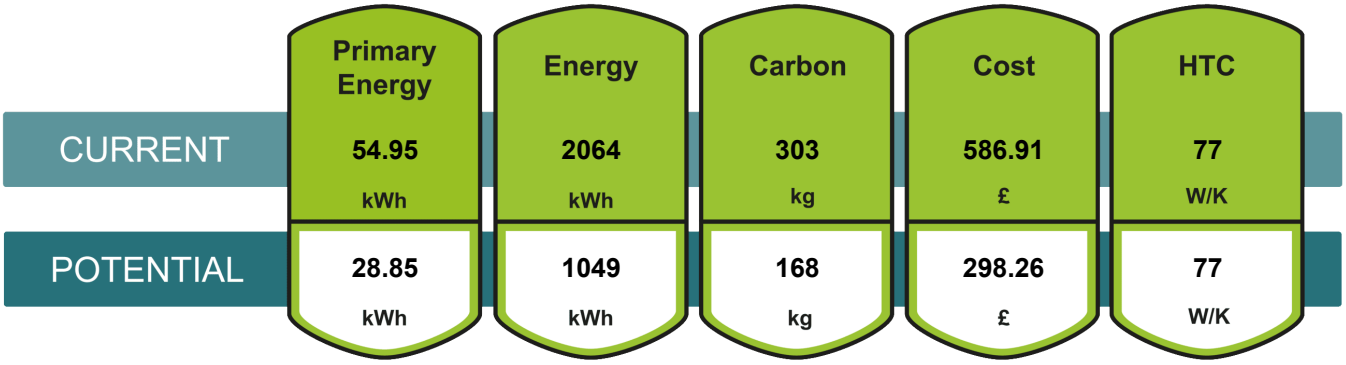


Carbon Dioxide (CO2) Emissions Rating



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	Good
Main heating	Air source heat pump, underfloor, electric	Good
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	£64	B 81	£4,000 - £7,000	£64	A 96

Photovoltaic	£289	B 89	£8,000 - £10,000	£225	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.

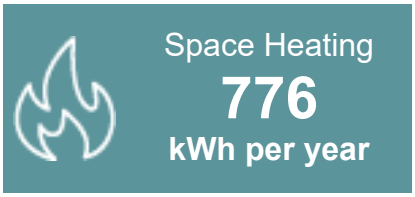
Estimated energy costs of the dwelling

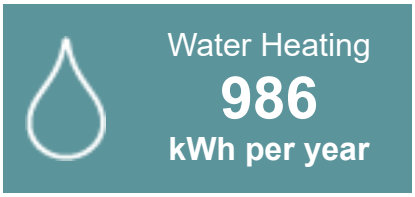
The table below shows the estimated running costs of the space and water heating and lighting within the dwelling. It does not include the energy used from household appliances. The estimated annual costs after potential improvements indicates the total energy cost if all recommended measures named above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

	Estimated annual costs	Estimated annual costs after potential improvements	Potential future savings
Lighting	£42	£42	
Heating	£265	£288	
Hot Water	£280	£194	
New Technologies e.g. Impact of PV	£0	-(£225)	
TOTAL	£587	£298	



Estimated energy use and potential savings





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.