



Job no:	PR10654
Date:	16/05/2023
Assessor name:	Iraj Maghounaki
Registration no:	BRE400012
Development name:	1 Burgan Close, Oxford, Oxfordshire, OX4 3RQ

BRE Global 2008. BRE Certification is a registered trademark owned by BRE Global and may not be used without BRE Global's written permission.

Permission is given for this tool to be copied without infringement of copyright for use only on projects where a Code for Sustainable Homes assessment is carried out. Whilst every care is taken in preparing the Wat 1 assessment tool, BREG cannot accept responsibility for any inaccuracies or for consequential loss incurred as a result of such inaccuracies arising through the use of the Wat 1 tool.

PRINTING: before printing please make sure that in "Page Setup" you have selected the page to be as "Landscape" and that the Scale has been set up to 70% (maximum)

WATER EFFICIENCY CALCULATOR FOR NEW DWELLINGS - (BASIC CALCULATOR)																					
House Type:		Type 1		Type 2		Type 3		Type 4		Type 5		Type 6		Type 7		Type 8		Type 9		Type 10	
Description:		1 Burgan Close																			
Installation Type	Unit of measure	Capacity/flow rate	Litres/person/day	Capacity/flow rate	Litres/person/day	Capacity/flow rate	Litres/person/day	Capacity/flow rate	Litres/person/day	Capacity/flow rate	Litres/person/day	Capacity/flow rate	Litres/person/day	Capacity/flow rate	Litres/person/day	Capacity/flow rate	Litres/person/day	Capacity/flow rate	Litres/person/day	Capacity/flow rate	Litres/person/day
Is a dual or single flush WC specified?		Dual																			
WC	Full flush volume	6	8.76		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00
	Part flush volume	3	8.88		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00
Taps (excluding kitchen and external taps)	Flow rate (litres / minute)	6	11.06		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00
Are both a Bath & Shower Present?		Bath & Shower																			
Bath	Capacity to overflow	155	17.05		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00
Shower	Flow rate (litres / minute)	8	34.96		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00
Kitchen sink taps	Flow rate (litres / minute)	6	13.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00
Has a washing machine been specified?		No																			
Washing Machine	Litres / kg	7	17.16		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00
Has a dishwasher been specified?		No																			
Dishwasher	Litres / place setting	0.9	4.50		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00
Has a waste disposal unit been specified?		No																			
Water Softener	Litres / person / day		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00
Calculated Use		115.4		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
Normalisation factor		0.91		0.91		0.91		0.91		0.91		0.91		0.91		0.91		0.91		0.91	
Code for Sustainable Homes	Total Consumption	105.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
	Mandatory level	Level 3/4		-		-		-		-		-		-		-		-		-	
Building Regulations 17.K	External use	5.0		5.0		5.0		5.0		5.0		5.0		5.0		5.0		5.0		5.0	
	Total Consumption	110.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
	17.K Compliance?	Yes		-		-		-		-		-		-		-		-		-	

Full SAP Calculation Printout



Property Reference	PR10654 - 1 Burgan Close		Issued on Date	16/05/2023	
Assessment Reference	Be Lean	Prop Type Ref			
Property	1, Burgan Close, Oxford, Oxfordshire, OX4 3QR				
SAP Rating	75 C	DER	7.16	TER	13.31
Environmental	95 A	% DER < TER	46.21		
CO ₂ Emissions (t/year)	0.38	DfEE	40.35	TfEE	40.39
Compliance Check	See BREL	% DfEE < TfEE	0.10		
% DPER < TPER	-7.51	DPER	75.12	TPER	69.87
Assessor Details	Mr. Iraj Maghounaki		Assessor ID	V571-0001	
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	32.3700 (1b)	2.4000 (2b)	77.6880 (1b)
First floor	26.1000 (1c)	2.6000 (2c)	67.8600 (1c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	58.4700		145.5480 (5)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	145.5480 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.2061 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.8000 (17)
Infiltration rate	0.4461 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3457 (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												
Effective ac	0.4408	0.4322	0.4235	0.3803	0.3717	0.3285	0.3285	0.3198	0.3457	0.3717	0.3890	0.4062 (22b)
	0.5972	0.5934	0.5897	0.5723	0.5691	0.5539	0.5539	0.5511	0.5598	0.5691	0.5756	0.5825 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (U _w = 1.00)			8.6100	0.9615	8.2788		(27)
Door			1.7400	1.0000	1.7400		(26)
Heat Loss Floor			32.3700	0.1300	4.2081	110.0000	3560.7000 (28a)
External Walls	86.8200	10.3500	76.4700	0.1800	13.7646	110.0000	8411.7000 (29a)
Plane Roof	32.3900		32.3900	0.1400	4.5346	9.0000	291.5100 (30)
Total net area of external elements A _{um} (A, m ²)			151.5800				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 32.5261		(33)

Full SAP Calculation Printout



Party Walls	24.0700	0.0000	0.0000	140.0000	3369.8000 (32)
GF - Timber	20.7400			9.0000	186.6600 (32c)
FF - Timber	66.4000			9.0000	597.6000 (32c)
Internal Floor	26.1000			18.0000	469.8000 (32d)
Internal Ceiling	32.3700			9.0000	291.3300 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 17179.1000 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 293.8105 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	7.4300	0.0240	0.1783
E3 Sill	5.0900	0.0150	0.0764
E4 Jamb	16.7000	0.0100	0.1670
E5 Ground floor (normal)	19.2200	0.0970	1.8643
E6 Intermediate floor within a dwelling	15.6500	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	14.3700	0.0600	0.8622
E12 Gable (insulation at ceiling level)	7.1900	0.0840	0.6040
E16 Corner (normal)	12.4000	0.0620	0.7688
E17 Corner (inverted - internal area greater than external area)	2.4000	-0.1060	-0.2544
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	5.0000	0.1320	0.6600
P1 Party wall - Ground floor	4.8100	0.3200	1.5392
P2 Party wall - Intermediate floor within a dwelling	4.8100	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	4.8100	0.4800	2.3088
R4 Ridge (vaulted ceiling)	5.4200	0.1200	0.6504

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.7250 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 42.2511 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	28.6821	28.5009	28.3233	27.4890	27.3329	26.6063	26.6063	26.4717	26.8861	27.3329	27.6487	27.9788 (38)
Average = Sum(39)m / 12 =	70.9333	70.7521	70.5744	69.7401	69.5840	68.8574	68.8574	68.7228	69.1373	69.5840	69.8998	70.2299 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2132	1.2101	1.2070	1.1928	1.1901	1.1777	1.1777	1.1754	1.1824	1.1901	1.1955	1.2011 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.9381 (42)
Hot water usage for mixer showers	70.8931	69.8277	68.2752	65.3048	63.1128	60.6682	59.2787	60.8194	62.5084	65.1331	68.1673	70.6215 (42a)	
Hot water usage for baths	24.5123	24.1483	23.6356	22.6904	21.9826	21.1978	20.7739	21.2829	21.8372	22.6770	23.6417	24.4294 (42b)	
Hot water usage for other uses	34.4777	33.2239	31.9702	30.7165	29.4627	28.2090	28.2090	29.4627	30.7165	31.9702	33.2239	34.4777 (42c)	
Average daily hot water use (litres/day)													119.4312 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	129.8831	127.1999	123.8810	118.7117	114.5581	110.0750	108.2616	111.5651	115.0620	119.7803	125.0329	129.5286 (44)
Energy content (annual)	205.7030	181.1310	190.4006	162.5104	154.2173	135.3501	130.9330	138.1409	141.8830	162.5407	178.1323	202.8104 (45)
Distribution loss (46)m = 0.15 x (45)m	30.8555	27.1696	28.5601	24.3766	23.1326	20.3025	19.6400	20.7211	21.2825	24.3811	26.7198	30.4216 (46)

Water storage loss: 120.0000 (47)
 Store volume

b) If manufacturer declared loss factor is not known :
 Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0115 (51)
 Volume factor from Table 2a 1.0000 (52)
 Temperature factor from Table 2b 0.5400 (53)
 Enter (49) or (54) in (55) 0.7483 (55)

Total storage loss	23.1969	20.9520	23.1969	22.4486	23.1969	22.4486	23.1969	23.1969	22.4486	23.1969	22.4486	23.1969 (56)
If cylinder contains dedicated solar storage	23.1969	20.9520	23.1969	22.4486	23.1969	22.4486	23.1969	23.1969	22.4486	23.1969	22.4486	23.1969 (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	252.1623	223.0942	236.8598	207.4710	200.6765	180.3106	177.3923	184.6002	186.8436	209.0000	223.0929	249.2697 (62)
WVHRS	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 252.1623 223.0942 236.8598 207.4710 200.6765 180.3106 177.3923 184.6002 186.8436 209.0000 223.0929 249.2697 (64)
 Total per year (kWh/year) = Sum(64)m = 2530.7729 (64)
 2531 (64)

12Total per year (kWh/year)
 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 105.5637 93.7966 100.4756 90.0032 88.4446 80.9724 80.7026 83.0993 83.1446 91.2122 95.1974 104.6019 (65)

Full SAP Calculation Printout



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	96.9030	96.9030	96.9030	96.9030	96.9030	96.9030	96.9030	96.9030	96.9030	96.9030	96.9030	96.9030 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	90.4985	100.1947	90.4985	93.5151	90.4985	93.5151	90.4985	90.4985	93.5151	90.4985	93.5151	90.4985 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	169.0724	170.8268	166.4057	156.9936	145.1126	133.9460	126.4861	124.7317	129.1528	138.5649	150.4460	161.6125 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.6903	32.6903	32.6903	32.6903	32.6903	32.6903	32.6903	32.6903	32.6903	32.6903	32.6903	32.6903 (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)	-77.5224	-77.5224	-77.5224	-77.5224	-77.5224	-77.5224	-77.5224	-77.5224	-77.5224	-77.5224	-77.5224	-77.5224 (71)
Water heating gains (Table 5)	141.8866	139.5783	135.0478	125.0044	118.8772	112.4616	108.4713	111.6926	115.4786	122.5970	132.2187	140.5939 (72)
Total internal gains	456.5284	465.6708	447.0229	430.5840	409.5591	391.9936	377.5268	378.9936	390.2174	406.7313	431.2506	447.7758 (73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b	g Specific data or Table 6c	FF Specific data or Table 6c	Access factor Table 6d	Gains W					
North	3.8400	10.6334	0.5700	0.8000	0.7700	12.9033 (74)						
South	4.0300	46.7521	0.5700	0.8000	0.7700	59.5393 (78)						
West	0.7400	19.6403	0.5700	0.8000	0.7700	4.5928 (80)						
Solar gains	77.0354	131.1534	180.9082	229.2687	263.4013	264.9163	253.9464	227.6177	197.3403	145.1878	92.2190	65.9812 (83)
Total gains	533.5639	596.8242	627.9311	659.8527	672.9605	656.9100	631.4732	606.6113	587.5576	551.9191	523.4696	513.7570 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation factor for gains for living area, nil,m (see Table 9a)	0.9930	0.9862	0.9726	0.9307	0.8308	0.6456	0.4757	0.5147	0.7483	0.9369	0.9848	0.9943 (86)
MIT	20.1606	20.2850	20.4499	20.6686	20.8387	20.9249	20.9417	20.9402	20.8997	20.6964	20.3973	20.1425 (87)
Th 2	19.9095	19.9120	19.9144	19.9258	19.9279	19.9379	19.9379	19.9398	19.9341	19.9279	19.9236	19.9191 (88)
util rest of house	0.9905	0.9811	0.9623	0.9044	0.7719	0.5499	0.3632	0.3996	0.6579	0.9075	0.9784	0.9922 (89)
MIT 2	18.9490	19.1080	19.3162	19.5892	19.7748	19.8573	19.8663	19.8677	19.8371	19.6283	19.2608	18.9337 (90)
Living area fraction	19.5514	19.6932	19.8799	20.1259	20.3037	20.3881	20.4010	20.4009	20.3654	20.1593	19.8258	19.5347 (92)
MIT	19.5514	19.6932	19.8799	20.1259	20.3037	20.3881	20.4010	20.4009	20.3654	20.1593	19.8258	19.5347 (93)
Temperature adjustment												0.0000
adjusted MIT	19.5514	19.6932	19.8799	20.1259	20.3037	20.3881	20.4010	20.4009	20.3654	20.1593	19.8258	19.5347 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9894	0.9799	0.9619	0.9100	0.7942	0.5918	0.4127	0.4504	0.6967	0.9148	0.9776	0.9912 (94)
Useful gains	527.9047	584.8111	604.0130	600.4339	534.4714	388.7422	260.6373	273.1981	409.3534	504.9206	511.7564	509.2365 (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	1081.8315	1046.6490	944.2764	782.8947	598.6818	398.5530	261.7261	274.9555	433.1751	665.1776	889.5331	1076.9536 (97)
Space heating kWh	412.1215	310.3551	253.1560	131.3718	47.7726	0.0000	0.0000	0.0000	0.0000	119.2312	271.9992	422.3815 (98a)
Space heating requirement - total per year (kWh/year)												1968.3889
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	412.1215	310.3551	253.1560	131.3718	47.7726	0.0000	0.0000	0.0000	0.0000	119.2312	271.9992	422.3815 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1968.3889
Space heating per m ²												33.6649 (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 %)												170.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

Full SAP Calculation Printout



Space heating requirement	412.1215	310.3551	253.1560	131.3718	47.7726	0.0000	0.0000	0.0000	0.0000	119.2312	271.9992	422.3815	(98)
Space heating efficiency (main heating system 1)	170.0000	170.0000	170.0000	170.0000	170.0000	0.0000	0.0000	0.0000	0.0000	170.0000	170.0000	170.0000	(210)
Space heating fuel (main heating system)	242.4244	182.5618	148.9153	77.2775	28.1015	0.0000	0.0000	0.0000	0.0000	70.1360	159.9995	248.4597	(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 requirement	252.1623	223.0942	236.8598	207.4710	200.6765	180.3106	177.3923	184.6002	186.8436	209.0000	223.0929	249.2697	(64)
Efficiency of water heater (217)m	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	(216)
Fuel for water heating, kWh/month	148.3308	131.2319	139.3293	122.0417	118.0450	106.0651	104.3484	108.5883	109.9080	122.9412	131.2311	146.6292	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	24.3670	19.5481	17.6009	12.8952	9.9606	8.1379	9.0864	11.8108	15.3411	20.1284	22.7350	25.0442	(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												1157.8758	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												170.0000	
Water heating fuel used												1488.6899	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												196.6557	(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												2843.2214	(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	1157.8758	0.1559	180.4666 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1488.6899	0.1410	209.8439 (264)
Space and water heating			390.3105 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	196.6557	0.1443	28.3835 (268)
Total CO2, kg/year			418.6940 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			7.1600 (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	1157.8758	1.5770	1825.9988 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1488.6899	1.5212	2264.6212 (278)
Space and water heating			4090.6200 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	196.6557	1.5338	301.6370 (282)
Total Primary energy kWh/year			4392.2570 (286)
Dwelling Primary energy Rate (DPER)			75.1200 (287)

Full SAP Calculation Printout



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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	32.3700 (1b)	x 2.4000 (2b)	= 77.6880 (1b) -
First floor	26.1000 (1c)	x 2.6000 (2c)	= 67.8600 (1c) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	58.4700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	145.5480 (5)

2. Ventilation rate

	m ³ 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)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1374 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3874 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3002 (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	0.3828	0.3753	0.3678	0.3303	0.3228	0.2852	0.2852	0.2777	0.3002	0.3228	0.3378	0.3528 (22b)
Effective ac	0.5733	0.5704	0.5676	0.5545	0.5521	0.5407	0.5407	0.5386	0.5451	0.5521	0.5570	0.5622 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.7400	1.0000	1.7400		(26)
TER Opening Type (Uw = 1.20)			8.6100	1.1450	9.8588		(27)
Heat Loss Floor			32.3700	0.1300	4.2081		(28a)
External Walls	86.8200	10.3500	76.4700	0.1800	13.7646		(29a)
Plane Roof	32.3900		32.3900	0.1100	3.5629		(30)
Total net area of external elements Aum(A, m ²)			151.5800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.1344		(33)
Party Walls			24.0700	0.0000	0.0000		(32)

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

List of Thermal Bridges	Length	Psi-value	Total
K1 Element	7.4300	0.0500	0.3715
E2 Other lintels (including other steel lintels)	5.0900	0.0500	0.2545
E3 Sill	16.7000	0.0500	0.8350
E4 Jamb	19.2200	0.1600	3.0752
E5 Ground floor (normal)	15.6500	0.0000	0.0000
E6 Intermediate floor within a dwelling	14.3700	0.0600	0.8622
E10 Eaves (insulation at ceiling level)	7.1900	0.0600	0.4314
E12 Gable (insulation at ceiling level)	12.4000	0.0900	1.1160
E16 Corner (normal)	2.4000	-0.0900	-0.2160
E17 Corner (inverted - internal area greater than external area)	5.0000	0.0600	0.3000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	4.8100	0.0800	0.3848
P1 Party wall - Ground floor	4.8100	0.0800	0.3848
P2 Party wall - Intermediate floor within a dwelling	4.8100	0.1200	0.5772
P4 Party wall - Roof (insulation at ceiling level)	5.4200	0.0800	0.4336
R4 Ridge (vaulted ceiling)			

Full SAP Calculation Printout



Thermal bridges (Sum(L x Psi) calculated using Appendix K)
 Point Thermal bridges
 Total fabric heat loss

8.7254 (36)
 0.0000
 (33) + (36) + (36a) = 41.8598 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	27.5347	27.3981	27.2641	26.6350	26.5172	25.9692	25.9692	25.8678	26.1803	26.5172	26.7554	27.0043 (38)
Heat transfer coeff	69.3945	69.2579	69.1239	68.4947	68.3770	67.8290	67.8290	67.7275	68.0401	68.3770	68.6152	68.8641 (39)
Average = Sum(39)m / 12 =												68.4942

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1868	1.1845	1.1822	1.1715	1.1694	1.1601	1.1601	1.1583	1.1637	1.1694	1.1735	1.1778 (40)
HLP (average)												1.1714
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.9381 (42)
Hot water usage for mixer showers	56.7145	55.8622	54.6202	52.2439	50.4902	48.5346	47.4230	48.6555	50.0067	52.1065	54.5338	56.4972 (42a)	
Hot water usage for baths	24.5123	24.1483	23.6356	22.6904	21.9826	21.1978	20.7739	21.2829	21.8372	22.6770	23.6417	24.4294 (42b)	
Hot water usage for other uses	34.4777	33.2239	31.9702	30.7165	29.4627	28.2090	28.2090	29.4627	30.7165	31.9702	33.2239	34.4777 (42c)	
Average daily hot water use (litres/day)													106.3589 (43)
Daily hot water use	115.7044	113.2344	110.2260	105.6507	101.9356	97.9414	96.4059	99.4012	102.5604	106.7537	111.3994	115.4043 (44)	
Energy conte	183.2476	161.2442	169.4133	144.6306	137.2249	120.4303	116.5945	123.0795	126.4672	144.8637	158.7089	180.6952 (45)	
Energy content (annual)													Total = Sum(45)m = 1766.5999
Distribution loss (46)m = 0.15 x (45)m	27.4871	24.1866	25.4120	21.6946	20.5837	18.0646	17.4892	18.4619	18.9701	21.7296	23.8063	27.1043 (46)	
Water storage loss:													120.0000 (47)
Store volume													1.2247 (48)
a) If manufacturer declared loss factor is known (kWh/day):													0.5400 (49)
Temperature factor from Table 2b													0.6613 (55)
Enter (49) or (54) in (55)													
Total storage loss	20.5007	18.5168	20.5007	19.8394	20.5007	19.8394	20.5007	20.5007	19.8394	20.5007	19.8394	20.5007 (56)	
If cylinder contains dedicated solar storage	20.5007	18.5168	20.5007	19.8394	20.5007	19.8394	20.5007	20.5007	19.8394	20.5007	19.8394	20.5007 (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	227.0107	200.7722	213.1764	186.9820	180.9880	162.7817	160.3576	166.8426	168.8186	188.6268	201.0603	224.4583 (62)	
WMHRS	-32.9275	-22.9305	-24.0115	-19.8825	-18.5297	-15.8560	-14.8625	-15.8048	-16.4053	-19.3400	-21.9099	-25.4473 (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	201.0832	177.8417	189.1649	167.0995	162.4582	146.9257	145.4951	151.0378	152.4133	169.2868	179.1505	199.0110 (64)	
12Total per year (kWh/year)													Total per year (kWh/year) = Sum(64)m = 2040.9678 (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	95.9403	85.2361	91.3404	81.9708	80.6378	73.9242	73.7782	75.9344	75.9315	83.1777	86.6518	95.0916 (65)	

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

Metabolic gains (Table 5), Watts	96.9030	96.9030	96.9030	96.9030	96.9030	96.9030	96.9030	96.9030	96.9030	96.9030	96.9030	96.9030 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	90.4985	100.1947	90.4985	93.5151	90.4985	93.5151	90.4985	90.4985	93.5151	90.4985	93.5151	90.4985 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	169.0724	170.8268	166.4057	156.9936	145.1126	133.9460	126.4861	124.7317	129.1528	138.5649	150.4460	161.6125 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.6903	32.6903	32.6903	32.6903	32.6903	32.6903	32.6903	32.6903	32.6903	32.6903	32.6903	32.6903 (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)	-77.5224	-77.5224	-77.5224	-77.5224	-77.5224	-77.5224	-77.5224	-77.5224	-77.5224	-77.5224	-77.5224	-77.5224 (71)
Water heating gains (Table 5)	128.9520	126.8394	122.7693	113.8483	108.3841	102.6725	99.1642	102.0624	105.4604	111.7979	120.3498	127.8113 (72)
Total internal gains	443.5938	452.9319	434.7444	419.4279	399.0660	382.2045	368.2197	369.3634	380.1992	395.9322	419.3817	434.9932 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W
-------	------------	------------------------	--------------------	---------------------	------------------	------------

Full SAP Calculation Printout



	W/m2	or Table 6b	or Table 6c	Table 6d
North	3.8400	10.6334	0.6300	0.7700
South	4.0300	46.7521	0.6300	0.7700
West	0.7400	19.6403	0.6300	0.7700

Solar gains	74.5014	126.8392	174.9572	221.7270	254.7368	256.2020	245.5929	220.1303	190.8488	140.4119	89.1855	63.8108 (83)
Total gains	518.0952	579.7711	609.7017	641.1549	653.8028	638.4065	613.8126	589.4937	571.0480	536.3441	508.5672	498.8040 (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	68.7658	68.9015	69.0350	69.6692	69.7891	70.3530	70.3530	70.4584	70.1347	69.7891	69.5469	69.2955	
alpha	5.5844	5.5934	5.6023	5.6446	5.6526	5.6902	5.6902	5.6972	5.6756	5.6526	5.6365	5.6197	
util living area	0.9938	0.9875	0.9749	0.9350	0.8376	0.6538	0.4821	0.5218	0.7562	0.9411	0.9863	0.9949 (86)	
MIT	19.9690	20.1311	20.3465	20.6321	20.8583	20.9731	20.9959	20.9937	20.9395	20.6687	20.2746	19.9409 (87)	
Th 2	19.9305	19.9324	19.9343	19.9429	19.9445	19.9521	19.9521	19.9535	19.9492	19.9445	19.9413	19.9378 (88)	
util rest of house	0.9915	0.9829	0.9653	0.9101	0.7803	0.5585	0.3696	0.4068	0.6670	0.9132	0.9804	0.9931 (89)	
MIT 2	18.7576	18.9640	19.2352	19.5869	19.8341	19.9388	19.9510	19.9517	19.9140	19.6373	19.1538	18.7273 (90)	
Living area fraction									fLA = Living area / (4) =			0.4972 (91)	
MIT	19.3599	19.5443	19.7877	20.1065	20.3433	20.4530	20.4705	20.4697	20.4238	20.1501	19.7111	19.3307 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.3599	19.5443	19.7877	20.1065	20.3433	20.4530	20.4705	20.4697	20.4238	20.1501	19.7111	19.3307 (93)	

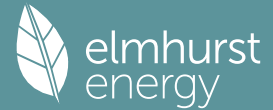
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9899	0.9808	0.9637	0.9145	0.8037	0.6054	0.4258	0.4643	0.7096	0.9195	0.9788	0.9916 (94)
Useful gains	512.8522	568.6141	587.5830	586.3407	525.4365	386.5077	261.3328	273.6910	405.2094	493.1934	497.7664	494.6308 (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	1045.0761	1014.2301	918.4981	767.5886	591.0059	397.0036	262.5336	275.6335	430.2743	653.0064	865.3110	1041.9620 (97)
Space heating kWh	395.9746	299.4540	246.2009	130.4985	48.7836	0.0000	0.0000	0.0000	0.0000	118.9008	264.6321	407.2144 (98a)
Space heating requirement - total per year (kWh/year)												1911.6589
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	395.9746	299.4540	246.2009	130.4985	48.7836	0.0000	0.0000	0.0000	0.0000	118.9008	264.6321	407.2144 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1911.6589
Space heating per m2												(98c) / (4) = 32.6947 (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	395.9746	299.4540	246.2009	130.4985	48.7836	0.0000	0.0000	0.0000	0.0000	118.9008	264.6321	407.2144 (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)	429.0082	324.4355	266.7398	141.3851	52.8533	0.0000	0.0000	0.0000	0.0000	128.8200	286.7087	441.1857 (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 requirement	201.0832	177.8417	189.1649	167.0995	162.4582	146.9257	145.4951	151.0378	152.4133	169.2868	179.1505	199.0110 (64)	
Efficiency of water heater (217)m	85.5505	85.2189	84.6518	83.5115	81.7125	79.8000	79.8000	79.8000	79.8000	83.2825	84.9331	79.8000 (216)	
Fuel for water heating, kWh/month	235.0463	208.6882	223.4624	200.0916	198.8168	184.1174	182.3247	189.2704	190.9942	203.2682	210.9313	232.4089 (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	18.8038	15.0851	13.5825	9.9511	7.6865	6.2799	7.0119	9.1143	11.8386	15.5329	17.5444	19.3264 (232)	
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-29.9781	-42.1026	-60.3054	-67.5855	-72.7333	-67.8827	-67.0887	-63.4326	-56.9138	-48.0903	-32.9188	-25.9407 (233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)													

Full SAP Calculation Printout



(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	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	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	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)														
(233b)m	-17.4179	-36.5903	-72.6185	-108.8967	-143.8008	-144.3781	-142.6329	-120.8104	-88.6407	-52.2138	-23.2223	-13.7734		(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	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	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	0.0000	(235d)
Annual totals kWh/year														
Space heating fuel - main system 1													2071.1364	(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													2459.4204	(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)													151.7574	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-1599.9684	(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													3168.3458	(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	2071.1364	0.2100	434.9386 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2459.4204	0.2100	516.4783 (264)
Space and water heating			951.4169 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	151.7574	0.1443	21.9033 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-634.9724	0.1346	-85.4951
PV Unit electricity exported	-964.9959	0.1260	-121.5414
Total			-207.0366 (269)
Total CO2, kg/year			778.2129 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.3100 (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	2071.1364	1.1300	2340.3841 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2459.4204	1.1300	2779.1450 (278)
Space and water heating			5119.5292 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	151.7574	1.5338	232.7706 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-634.9724	1.4976	-950.9499
PV Unit electricity exported	-964.9959	0.4623	-446.1437
Total			-1397.0936 (283)
Total Primary energy kWh/year			4085.3070 (286)
Target Primary Energy Rate (TPER)			69.8700 (287)

Full SAP Calculation Printout



Property Reference	PR10654 - 1 Burgan Close		Issued on Date	16/05/2023	
Assessment Reference	Be Green	Prop Type Ref			
Property	1, Burgan Close, Oxford, Oxfordshire, OX4 3QR				
SAP Rating	90 B	DER	1.48	TER	13.31
Environmental	99 A	% DER < TER			88.88
CO ₂ Emissions (t/year)	0.04	DFEE	40.13	TFEE	40.39
Compliance Check	See BREL	% DFEE < TFEE			0.65
% DPER < TPER	55.45	DPER	31.12	TPER	69.87
Assessor Details	Mr. Iraj Maghounaki		Assessor ID	V571-0001	
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	32.3700 (1b)	x 2.4000 (2b)	= 77.6880 (1b) -
First floor	26.1000 (1c)	x 2.6000 (2c)	= 67.8600 (1c) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	58.4700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	145.5480 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.2061 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.5000 (17)
Infiltration rate	0.4311 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3341 (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												
Effective ac	0.4260	0.4176	0.4093	0.3675	0.3592	0.3174	0.3174	0.3091	0.3341	0.3592	0.3759	0.3926 (22b)
	0.5907	0.5872	0.5838	0.5675	0.5645	0.5504	0.5504	0.5478	0.5558	0.5645	0.5706	0.5771 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (U _w = 1.00)			8.6100	0.9615	8.2788		(27)
Door			1.7400	1.0000	1.7400		(26)
Heat Loss Floor			32.3700	0.1300	4.2081	110.0000	3560.7000 (28a)
External Walls	86.8200	10.3500	76.4700	0.1800	13.7646	110.0000	8411.7000 (29a)
Plane Roof	32.3900		32.3900	0.1400	4.5346	9.0000	291.5100 (30)
Total net area of external elements A _{um} (A, m ²)			151.5800				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	32.5261	(33)

Full SAP Calculation Printout



Party Walls	24.0700	0.0000	0.0000	140.0000	3369.8000 (32)
GF - Timber	20.7400			9.0000	186.6600 (32c)
FF - Timber	66.4000			9.0000	597.6000 (32c)
Internal Floor	26.1000			18.0000	469.8000 (32d)
Internal Ceiling	32.3700			9.0000	291.3300 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 17179.1000 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 293.8105 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	7.4300	0.0240	0.1783
E3 Sill	5.0900	0.0150	0.0764
E4 Jamb	16.7000	0.0100	0.1670
E5 Ground floor (normal)	19.2200	0.0970	1.8643
E6 Intermediate floor within a dwelling	15.6500	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	14.3700	0.0600	0.8622
E12 Gable (insulation at ceiling level)	7.1900	0.0840	0.6040
E16 Corner (normal)	12.4000	0.0620	0.7688
E17 Corner (inverted - internal area greater than external area)	2.4000	-0.1060	-0.2544
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	5.0000	0.1320	0.6600
P1 Party wall - Ground floor	4.8100	0.3200	1.5392
P2 Party wall - Intermediate floor within a dwelling	4.8100	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	4.8100	0.4800	2.3088
R4 Ridge (vaulted ceiling)	5.4200	0.1200	0.6504

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.7250 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 42.2511 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	28.3736	28.2044	28.0385	27.2593	27.1136	26.4350	26.4350	26.3093	26.6963	27.1136	27.4085	27.7168 (38)
Average = Sum(39)m / 12 =	70.6247	70.4555	70.2896	69.5105	69.3647	68.6861	68.6861	68.5604	68.9475	69.3647	69.6596	69.9679 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2079	1.2050	1.2021	1.1888	1.1863	1.1747	1.1747	1.1726	1.1792	1.1863	1.1914	1.1966 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.9381 (42)
Hot water usage for mixer showers	70.8931	69.8277	68.2752	65.3048	63.1128	60.6682	59.2787	60.8194	62.5084	65.1331	68.1673	70.6215 (42a)	
Hot water usage for baths	24.5123	24.1483	23.6356	22.6904	21.9826	21.1978	20.7739	21.2829	21.8372	22.6770	23.6417	24.4294 (42b)	
Hot water usage for other uses	34.4777	33.2239	31.9702	30.7165	29.4627	28.2090	28.2090	29.4627	30.7165	31.9702	33.2239	34.4777 (42c)	
Average daily hot water use (litres/day)													119.4312 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy cont	129.8831	127.1999	123.8810	118.7117	114.5581	110.0750	108.2616	111.5651	115.0620	119.7803	125.0329	129.5286 (44)
Energy content (annual)	205.7030	181.1310	190.4006	162.5104	154.2173	135.3501	130.9330	138.1409	141.8830	162.5407	178.1323	202.8104 (45)
Distribution loss (46)m = 0.15 x (45)m	30.8555	27.1696	28.5601	24.3766	23.1326	20.3025	19.6400	20.7211	21.2825	24.3811	26.7198	30.4216 (46)

Water storage loss: 120.0000 (47)
 Store volume

b) If manufacturer declared loss factor is not known :
 Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0115 (51)
 Volume factor from Table 2a 1.0000 (52)
 Temperature factor from Table 2b 0.5400 (53)
 Enter (49) or (54) in (55) 0.7483 (55)

Total storage loss	23.1969	20.9520	23.1969	22.4486	23.1969	22.4486	23.1969	23.1969	22.4486	23.1969	22.4486	23.1969 (56)
If cylinder contains dedicated solar storage	23.1969	20.9520	23.1969	22.4486	23.1969	22.4486	23.1969	23.1969	22.4486	23.1969	22.4486	23.1969 (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	252.1623	223.0942	236.8598	207.4710	200.6765	180.3106	177.3923	184.6002	186.8436	209.0000	223.0929	249.2697 (62)
WVHRS	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 252.1623 223.0942 236.8598 207.4710 200.6765 180.3106 177.3923 184.6002 186.8436 209.0000 223.0929 249.2697 (64)
 Total per year (kWh/year) = Sum(64)m = 2530.7729 (64)
 2531 (64)

12Total per year (kWh/year)
 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 105.5637 93.7966 100.4756 90.0032 88.4446 80.9724 80.7026 83.0993 83.1446 91.2122 95.1974 104.6019 (65)

Full SAP Calculation Printout



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	96.9030	96.9030	96.9030	96.9030	96.9030	96.9030	96.9030	96.9030	96.9030	96.9030	96.9030	96.9030 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	90.4985	100.1947	90.4985	93.5151	90.4985	93.5151	90.4985	90.4985	93.5151	90.4985	93.5151	90.4985 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	169.0724	170.8268	166.4057	156.9936	145.1126	133.9460	126.4861	124.7317	129.1528	138.5649	150.4460	161.6125 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.6903	32.6903	32.6903	32.6903	32.6903	32.6903	32.6903	32.6903	32.6903	32.6903	32.6903	32.6903 (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)	-77.5224	-77.5224	-77.5224	-77.5224	-77.5224	-77.5224	-77.5224	-77.5224	-77.5224	-77.5224	-77.5224	-77.5224 (71)
Water heating gains (Table 5)	141.8866	139.5783	135.0478	125.0044	118.8772	112.4616	108.4713	111.6926	115.4786	122.5970	132.2187	140.5939 (72)
Total internal gains	456.5284	465.6708	447.0229	430.5840	409.5591	391.9936	377.5268	378.9936	390.2174	406.7313	431.2506	447.7758 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
North	3.8400	10.6334	0.5700	0.8000	0.7700	12.9033 (74)						
South	4.0300	46.7521	0.5700	0.8000	0.7700	59.5393 (78)						
West	0.7400	19.6403	0.5700	0.8000	0.7700	4.5928 (80)						
Solar gains	77.0354	131.1534	180.9082	229.2687	263.4013	264.9163	253.9464	227.6177	197.3403	145.1878	92.2190	65.9812 (83)
Total gains	533.5639	596.8242	627.9311	659.8527	672.9605	656.9100	631.4732	606.6113	587.5576	551.9191	523.4696	513.7570 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	67.5680	67.7303	67.8902	68.6511	68.7954	69.4751	69.4751	69.6025	69.2117	68.7954	68.5042	68.2023
alpha	5.5045	5.5154	5.5260	5.5767	5.5864	5.6317	5.6317	5.6402	5.6141	5.5864	5.5669	5.5468
util living area	0.9930	0.9861	0.9724	0.9302	0.8297	0.6444	0.4746	0.5136	0.7471	0.9365	0.9848	0.9943 (86)
MIT	20.1663	20.2903	20.4545	20.6716	20.8403	20.9253	20.9419	20.9404	20.9005	20.6989	20.4011	20.1473 (87)
Th 2	19.9137	19.9160	19.9183	19.9290	19.9310	19.9403	19.9403	19.9420	19.9367	19.9310	19.9269	19.9227 (88)
util rest of house	0.9904	0.9810	0.9620	0.9038	0.7708	0.5489	0.3626	0.3989	0.6568	0.9069	0.9782	0.9921 (89)
MIT 2	18.9596	19.1180	19.3251	19.5953	19.7792	19.8600	19.8688	19.8701	19.8403	19.6337	19.2682	18.9428 (90)
Living area fraction										fLA = Living area / (4) =		
MIT	19.5596	19.7009	19.8866	20.1304	20.3068	20.3897	20.4023	20.4022	20.3674	20.1633	19.8314	19.5417 (92)
Temperature adjustment												0.0000
adjusted MIT	19.5596	19.7009	19.8866	20.1304	20.3068	20.3897	20.4023	20.4022	20.3674	20.1633	19.8314	19.5417 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9894	0.9798	0.9617	0.9094	0.7931	0.5907	0.4119	0.4495	0.6956	0.9144	0.9775	0.9912 (94)
Useful gains	527.8844	584.7493	603.8635	600.0794	533.7477	388.0318	260.1039	272.6737	408.6848	504.6565	511.7041	509.2242 (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	1077.7029	1042.8024	940.9410	780.6310	597.0056	397.6691	261.1680	274.3952	432.1241	663.3541	886.8654	1073.4239 (97)
Space heating kWh	409.0649	307.8116	250.7857	129.9971	47.0639	0.0000	0.0000	0.0000	0.0000	118.0710	270.1161	419.7646 (98a)
Space heating requirement - total per year (kWh/year)												1952.6749
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	409.0649	307.8116	250.7857	129.9971	47.0639	0.0000	0.0000	0.0000	0.0000	118.0710	270.1161	419.7646 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1952.6749
Space heating per m2												(98c) / (4) =
												33.3962 (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 %)												249.9000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)

Full SAP Calculation Printout



Space heating requirement	409.0649	307.8116	250.7857	129.9971	47.0639	0.0000	0.0000	0.0000	0.0000	118.0710	270.1161	419.7646 (98)
Space heating efficiency (main heating system 1)	249.9000	249.9000	249.9000	249.9000	249.9000	0.0000	0.0000	0.0000	0.0000	249.9000	249.9000	249.9000 (210)
Space heating fuel (main heating system)	163.6914	123.1739	100.3544	52.0197	18.8331	0.0000	0.0000	0.0000	0.0000	47.2473	108.0897	167.9730 (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 requirement	252.1623	223.0942	236.8598	207.4710	200.6765	180.3106	177.3923	184.6002	186.8436	209.0000	223.0929	249.2697 (64)
Efficiency of water heater (217)m	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000 (216)
Fuel for water heating, kWh/month	144.0104	127.4096	135.2712	118.4871	114.6068	102.9758	101.3091	105.4256	106.7068	119.3603	127.4088	142.3585 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	24.3670	19.5481	17.6009	12.8952	9.9606	8.1379	9.0864	11.8108	15.3411	20.1284	22.7350	25.0442 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-42.9627	-62.4561	-91.6061	-102.2439	-107.9629	-98.1778	-96.8615	-91.5288	-80.8436	-69.7535	-47.4404	-36.9640 (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	-17.1411	-37.8398	-79.2094	-126.6826	-174.8564	-179.8787	-177.5203	-148.2000	-106.9121	-58.4615	-23.8514	-13.3326 (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												781.3825 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												175.1000 (216)
Water heating fuel used												1445.3300 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												0.0000 (231)
Electricity for lighting (calculated in Appendix L)												196.6557 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-2072.6873 (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												350.6810 (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	781.3825	0.1559	121.7953 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1445.3300	0.1410	203.7320 (264)
Space and water heating			325.5273 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	196.6557	0.1443	28.3835 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-928.8014	0.1348	-125.2058
PV Unit electricity exported	-1143.8859	0.1242	-142.0168
Total			-267.2227 (269)
Total CO2, kg/year			86.6881 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.4800 (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	781.3825	1.5771	1232.2927 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1445.3300	1.5212	2198.6613 (278)
Space and water heating			3430.9541 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)

Full SAP Calculation Printout



Energy for lighting	196.6557	1.5338	301.6370 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-928.8014	1.4982	-1391.5644
PV Unit electricity exported	-1143.8859	0.4556	-521.2028
Total			-1912.7672 (283)
Total Primary energy kWh/year			1819.8239 (286)
Dwelling Primary energy Rate (DPER)			31.1200 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	32.3700 (1b)	x 2.4000 (2b)	= 77.6880 (1b) -
First floor	26.1000 (1c)	x 2.6000 (2c)	= 67.8600 (1c) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	58.4700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 145.5480 (5)

2. Ventilation rate

	m ³ 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)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1374 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3874 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3002 (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	0.3828	0.3753	0.3678	0.3303	0.3228	0.2852	0.2852	0.2777	0.3002	0.3228	0.3378	0.3528 (22b)
Effective ac	0.5733	0.5704	0.5676	0.5545	0.5521	0.5407	0.5407	0.5386	0.5451	0.5521	0.5570	0.5622 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.7400	1.0000	1.7400		(26)
TER Opening Type (Uw = 1.20)			8.6100	1.1450	9.8588		(27)
Heat Loss Floor			32.3700	0.1300	4.2081		(28a)
External Walls	86.8200	10.3500	76.4700	0.1800	13.7646		(29a)
Plane Roof	32.3900		32.3900	0.1100	3.5629		(30)
Total net area of external elements Aum(A, m ²)			151.5800				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	33.1344	(33)
Party Walls			24.0700	0.0000	0.0000		(32)

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

List of Thermal Bridges	Length	Psi-value	Total
K1 Element	7.4300	0.0500	0.3715
E2 Other lintels (including other steel lintels)	5.0900	0.0500	0.2545
E3 Sill	16.7000	0.0500	0.8350
E4 Jamb	19.2200	0.1600	3.0752
E5 Ground floor (normal)	15.6500	0.0000	0.0000
E6 Intermediate floor within a dwelling			

Full SAP Calculation Printout



E10 Eaves (insulation at ceiling level)	14.3700	0.0600	0.8622	
E12 Gable (insulation at ceiling level)	7.1900	0.0600	0.4314	
E16 Corner (normal)	12.4000	0.0900	1.1160	
E17 Corner (inverted - internal area greater than external area)	2.4000	-0.0900	-0.2160	
E18 Party wall between dwellings	5.0000	0.0600	0.3000	
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000	
P1 Party wall - Ground floor	4.8100	0.0800	0.3848	
P2 Party wall - Intermediate floor within a dwelling	4.8100	0.0800	0.3848	
P4 Party wall - Roof (insulation at ceiling level)	4.8100	0.1200	0.5772	
R4 Ridge (vaulted ceiling)	5.4200	0.0800	0.4336	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				8.7254 (36)
Point Thermal bridges				0.0000
Total fabric heat loss		(33) + (36) + (36a) =		41.8598 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	27.5347	27.3981	27.2641	26.6350	26.5172	25.9692	25.9692	25.8678	26.1803	26.5172	26.7554	27.0043 (38)
Heat transfer coeff	69.3945	69.2579	69.1239	68.4947	68.3770	67.8290	67.8290	67.7275	68.0401	68.3770	68.6152	68.8641 (39)
Average = Sum(39)m / 12 =												68.4942

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1868	1.1845	1.1822	1.1715	1.1694	1.1601	1.1601	1.1583	1.1637	1.1694	1.1735	1.1778 (40)
HLP (average)												1.1714
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.9381 (42)

Hot water usage for mixer showers 56.4972 (42a)

Hot water usage for baths 24.4294 (42b)

Hot water usage for other uses 34.4777 (42c)

Average daily hot water use (litres/day) 106.3589 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	115.7044	113.2344	110.2260	105.6507	101.9356	97.9414	96.4059	99.4012	102.5604	106.7537	111.3994	115.4043 (44)
Energy conte	183.2476	161.2442	169.4133	144.6306	137.2249	120.4303	116.5945	123.0795	126.4672	144.8637	158.7089	180.6952 (45)
Energy content (annual)												Total = Sum(45)m = 1766.5999
Distribution loss (46)m = 0.15 x (45)m	27.4871	24.1866	25.4120	21.6946	20.5837	18.0646	17.4892	18.4619	18.9701	21.7296	23.8063	27.1043 (46)
Water storage loss:												120.0000 (47)
Store volume												1.2247 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.6613 (55)
Enter (49) or (54) in (55)												
Total storage loss	20.5007	18.5168	20.5007	19.8394	20.5007	19.8394	20.5007	20.5007	19.8394	20.5007	19.8394	20.5007 (56)
If cylinder contains dedicated solar storage	20.5007	18.5168	20.5007	19.8394	20.5007	19.8394	20.5007	20.5007	19.8394	20.5007	19.8394	20.5007 (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	227.0107	200.7722	213.1764	186.9820	180.9880	162.7817	160.3576	166.8426	168.8186	188.6268	201.0603	224.4583 (62)
WwHRS	-25.9275	-22.9305	-24.0115	-19.8825	-18.5297	-15.8560	-14.8625	-15.8048	-16.4053	-19.3400	-21.9099	-25.4473 (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	201.0832	177.8417	189.1649	167.0995	162.4582	146.9257	145.4951	151.0378	152.4133	169.2868	179.1505	199.0110 (64)
Total per year (kWh/year)												Total per year (kWh/year) = Sum(64)m = 2040.9678 (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	95.9403	85.2361	91.3404	81.9708	80.6378	73.9242	73.7782	75.9344	75.9315	83.1777	86.6518	95.0916 (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	96.9030	96.9030	96.9030	96.9030	96.9030	96.9030	96.9030	96.9030	96.9030	96.9030	96.9030	96.9030 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	90.4985	100.1947	90.4985	93.5151	90.4985	93.5151	90.4985	90.4985	93.5151	90.4985	93.5151	90.4985 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	169.0724	170.8268	166.4057	156.9936	145.1126	133.9460	126.4861	124.7317	129.1528	138.5649	150.4460	161.6125 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.6903	32.6903	32.6903	32.6903	32.6903	32.6903	32.6903	32.6903	32.6903	32.6903	32.6903	32.6903 (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)	-77.5224	-77.5224	-77.5224	-77.5224	-77.5224	-77.5224	-77.5224	-77.5224	-77.5224	-77.5224	-77.5224	-77.5224 (71)
Water heating gains (Table 5)	128.9520	126.8394	122.7693	113.8483	108.3841	102.6725	99.1642	102.0624	105.4604	111.7979	120.3498	127.8113 (72)
Total internal gains												

Full SAP Calculation Printout



443.5938 452.9319 434.7444 419.4279 399.0660 382.2045 368.2197 369.3634 380.1992 395.9322 419.3817 434.9932 (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
North	3.8400	10.6334	0.6300	0.7000	0.7700	12.4789 (74)
South	4.0300	46.7521	0.6300	0.7000	0.7700	57.5808 (78)
West	0.7400	19.6403	0.6300	0.7000	0.7700	4.4417 (80)

Solar gains	74.5014	126.8392	174.9572	221.7270	254.7368	256.2020	245.5929	220.1303	190.8488	140.4119	89.1855	63.8108 (83)
Total gains	518.0952	579.7711	609.7017	641.1549	653.8028	638.4065	613.8126	589.4937	571.0480	536.3441	508.5672	498.8040 (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	68.7658	68.9015	69.0350	69.6692	69.7891	70.3530	70.3530	70.4584	70.1347	69.7891	69.5469	69.2955
alpha	5.5844	5.5934	5.6023	5.6446	5.6526	5.6902	5.6902	5.6972	5.6756	5.6526	5.6365	5.6197
util living area	0.9938	0.9875	0.9749	0.9350	0.8376	0.6538	0.4821	0.5218	0.7562	0.9411	0.9863	0.9949 (86)
MIT	19.9690	20.1311	20.3465	20.6321	20.8583	20.9731	20.9959	20.9937	20.9395	20.6687	20.2746	19.9409 (87)
Th 2	19.9305	19.9324	19.9343	19.9429	19.9445	19.9521	19.9521	19.9535	19.9492	19.9445	19.9413	19.9378 (88)
util rest of house	0.9915	0.9829	0.9653	0.9101	0.7803	0.5585	0.3696	0.4068	0.6670	0.9132	0.9804	0.9931 (89)
MIT 2	18.7576	18.9640	19.2352	19.5869	19.8341	19.9388	19.9510	19.9517	19.9140	19.6373	19.1538	18.7273 (90)
Living area fraction	fLA = Living area / (4) = 0.4972 (91)											
MIT	19.3599	19.5443	19.7877	20.1065	20.3433	20.4530	20.4705	20.4697	20.4238	20.1501	19.7111	19.3307 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.3599	19.5443	19.7877	20.1065	20.3433	20.4530	20.4705	20.4697	20.4238	20.1501	19.7111	19.3307 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9899	0.9808	0.9637	0.9145	0.8037	0.6054	0.4258	0.4643	0.7096	0.9195	0.9788	0.9916 (94)
Useful gains	512.8522	568.6141	587.5830	586.3407	525.4365	386.5077	261.3328	273.6910	405.2094	493.1934	497.7664	494.6308 (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	1045.0761	1014.2301	918.4981	767.5886	591.0059	397.0036	262.5336	275.6335	430.2743	653.0064	865.3110	1041.9620 (97)
Space heating kWh	395.9746	299.4540	246.2009	130.4985	48.7836	0.0000	0.0000	0.0000	0.0000	118.9008	264.6321	407.2144 (98a)
Space heating requirement - total per year (kWh/year)	1911.6589											
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	395.9746	299.4540	246.2009	130.4985	48.7836	0.0000	0.0000	0.0000	0.0000	118.9008	264.6321	407.2144 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	1911.6589											
Space heating per m2	(98c) / (4) = 32.6947 (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	395.9746	299.4540	246.2009	130.4985	48.7836	0.0000	0.0000	0.0000	0.0000	118.9008	264.6321	407.2144 (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)	429.0082	324.4355	266.7398	141.3851	52.8533	0.0000	0.0000	0.0000	0.0000	128.8200	286.7087	441.1857 (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 requirement	201.0832	177.8417	189.1649	167.0995	162.4582	146.9257	145.4951	151.0378	152.4133	169.2868	179.1505	199.0110 (64)
Efficiency of water heater	79.8000 (216)											

Full SAP Calculation Printout



(217)m	85.5505	85.2189	84.6518	83.5115	81.7125	79.8000	79.8000	79.8000	79.8000	83.2825	84.9331	85.6297	(217)		
Fuel for water heating, kWh/month															
	235.0463	208.6882	223.4624	200.0916	198.8168	184.1174	182.3247	189.2704	190.9942	203.2682	210.9313	232.4089	(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	18.8038	15.0851	13.5825	9.9511	7.6865	6.2799	7.0119	9.1143	11.8386	15.5329	17.5444	19.3264	(232)		
Electricity generated by PVs (Appendix M) (negative quantity)															
(233a)m	-29.9781	-42.1026	-60.3054	-67.5855	-72.7333	-67.8827	-67.0887	-63.4326	-56.9138	-48.0903	-32.9188	-25.9407	(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	-17.4179	-36.5903	-72.6185	-108.8967	-143.8008	-144.3781	-142.6329	-120.8104	-88.6407	-52.2138	-23.2223	-13.7734	(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													2071.1364	(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													2459.4204	(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)														151.7574	(232)
Energy saving/generation technologies (Appendices M ,N and Q)															
PV generation														-1599.9684	(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														3168.3458	(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	2071.1364	0.2100	434.9386 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2459.4204	0.2100	516.4783 (264)
Space and water heating			951.4169 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	151.7574	0.1443	21.9033 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-634.9724	0.1346	-85.4951
PV Unit electricity exported	-964.9959	0.1260	-121.5414
Total			-207.0366 (269)
Total CO2, kg/year			778.2129 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.3100 (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	2071.1364	1.1300	2340.3841 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2459.4204	1.1300	2779.1450 (278)
Space and water heating			5119.5292 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	151.7574	1.5338	232.7706 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-634.9724	1.4976	-950.9499
PV Unit electricity exported	-964.9959	0.4623	-446.1437
Total			-1397.0936 (283)
Total Primary energy kWh/year			4085.3070 (286)
Target Primary Energy Rate (TPER)			69.8700 (287)