

Full SAP Calculation Printout



Property Reference	24 Ambleside Drive Planning		Issued on Date	07/11/2023	
Assessment Reference	Notional	Prop Type Ref			
Property	24, Ambleside Drive, Oxford, OX3 0AQ				
SAP Rating	80 C	DER	3.93	TER	7.68
Environmental	96 A	% DER < TER	48.83		
CO ₂ Emissions (t/year)	0.77	DFEE	40.02	TFEE	40.14
Compliance Check	See BREL	% DFEE < TFEE	0.31		
% DPER < TPER	0.41	DPER	40.57	TPER	40.74
Assessor Details	Mr. Peter Yearsley			Assessor ID	R301-0001
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	125.0000 (1b)	x 2.3800 (2b)	= 297.5000 (1b) - (3b)
First floor	102.8000 (1c)	x 2.7500 (2c)	= 282.7000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	227.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	580.2000 (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	5 * 10 = 50.0000 (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) =	50.0000 / (5) = 0.0862 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3362 (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) = 0.2858 (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	0.3643	0.3572	0.3500	0.3143	0.3072	0.2715	0.2715	0.2643	0.2858	0.3072	0.3215	0.3358 (22b)
Effective ac	0.5664	0.5638	0.5613	0.5494	0.5472	0.5368	0.5368	0.5349	0.5408	0.5472	0.5517	0.5564 (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
HGD			1.9100	1.2000	2.2920		(26a)
Windows (Uw = 1.20)			27.0800	1.1450	31.0076		(27)
Fully Glazed Doors (Uw = 1.20)			9.0300	1.1450	10.3397		(27)
Heatloss Floor 1			125.0000	0.1300	16.2500	110.0000	13750.0000 (28a)
Brick Facing	127.3500	22.2700	105.0800	0.1900	19.9652	60.0000	6304.8000 (29a)
Rendered	102.0300	13.8800	88.1500	0.1900	16.7485	60.0000	5289.0000 (29a)
Dormer Walls	3.5000	1.8700	1.6300	0.2000	0.3260	9.0000	14.6700 (29a)
RIR Stud	7.6900		7.6900	0.2000	1.5380	9.0000	69.2100 (29a)
Plane Ceiling	96.9500		96.9500	0.1100	10.6645	9.0000	872.5500 (30)
GF Flat Roof	20.0000		20.0000	0.1100	2.2000	9.0000	180.0000 (30)
Dormer Flat Roof	3.8000		3.8000	0.1100	0.4180	9.0000	34.2000 (30)
Adj To RIR	2.0000		2.0000	0.1100	0.2200	9.0000	18.0000 (30)
Slope Roof	2.9000		2.9000	0.1100	0.3190	9.0000	26.1000 (30)
Total net area of external elements Aum (A, m ²)			491.2200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	112.2885		(33)
Internal Wall 1			381.7200			9.0000	3435.4800 (32c)
Internal Floor 1			102.8000			18.0000	1850.4000 (32d)
Internal Ceiling 1			102.8000			9.0000	925.2000 (32e)

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	m2	Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	factor Table 6d	W
North	1.3200	10.6334	0.7600	0.7000	0.7700	5.1748 (74)
East	9.3800	19.6403	0.7600	0.7000	0.7700	67.9196 (76)
South	4.2900	46.7521	0.7600	0.7000	0.7700	73.9440 (78)
West	12.0900	19.6403	0.7600	0.7000	0.7700	87.5424 (80)
East	9.0300	19.6403	0.7600	0.7000	0.7700	65.3853 (76)

Solar gains	299.9660	563.0146	882.5479	1238.9952	1489.7273	1515.5648	1446.5374	1259.3294	1008.8316	655.0239	369.4032	249.8224 (83)
Total gains	1082.9939	1369.7694	1651.1227	1980.6322	2189.2693	2188.3053	2090.1508	1902.6671	1674.0202	1343.7266	1104.2926	1013.8328 (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	37.4078	37.4838	37.5586	37.9140	37.9813	38.2975	38.2975	38.3566	38.1750	37.9813	37.8455	37.7046
alpha	3.4939	3.4989	3.5039	3.5276	3.5321	3.5532	3.5532	3.5571	3.5450	3.5321	3.5230	3.5136
util living area	0.9928	0.9833	0.9611	0.8999	0.7863	0.6232	0.4780	0.5369	0.7732	0.9447	0.9864	0.9942 (86)
MIT	19.2878	19.5184	19.8635	20.3002	20.6357	20.8271	20.8878	20.8750	20.7212	20.2451	19.6834	19.2521 (87)
Th 2	20.0269	20.0287	20.0304	20.0386	20.0402	20.0473	20.0473	20.0487	20.0446	20.0402	20.0371	20.0338 (88)
util rest of house	0.9913	0.9799	0.9530	0.8790	0.7426	0.5505	0.3833	0.4396	0.7111	0.9288	0.9831	0.9930 (89)
MIT 2	17.9937	18.2888	18.7268	19.2731	19.6669	19.8727	19.9233	19.9168	19.7738	19.2177	18.5071	17.9531 (90)
Living area fraction										fLA = Living area / (4) = 0.1708 (91)		
MIT	18.2147	18.4988	18.9209	19.4485	19.8324	20.0357	20.0880	20.0804	19.9356	19.3931	18.7080	18.1749 (92)
Temperature adjustment												0.0000
adjusted MIT	18.2147	18.4988	18.9209	19.4485	19.8324	20.0357	20.0880	20.0804	19.9356	19.3931	18.7080	18.1749 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	1069.1844	1332.1750	1553.7191	1710.5205	1602.6052	1202.4848	810.0478	842.9285	1176.9059	1229.5134	1078.4770	1003.4097 (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	3385.9521	3302.3572	3010.3091	2532.5642	1949.0214	1291.9791	829.0454	873.4269	1391.4622	2107.3758	2791.9754	3373.8404 (97)
Space heating kWh	1723.6751	1323.9624	1083.7029	591.8715	257.7336	0.0000	0.0000	0.0000	0.0000	653.1297	1233.7189	1763.6004 (98a)
Space heating requirement - total per year (kWh/year)												8631.3945
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	1723.6751	1323.9624	1083.7029	591.8715	257.7336	0.0000	0.0000	0.0000	0.0000	653.1297	1233.7189	1763.6004 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												8631.3945
Space heating per m2												(98c) / (4) = 37.8902 (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												0.0000 (203)
Fraction of total heating from main system 1												1.0000 (204)
Fraction of total heating from main system 2												0.0000 (205)
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)
Space heating requirement	1723.6751	1323.9624	1083.7029	591.8715	257.7336	0.0000	0.0000	0.0000	0.0000	653.1297	1233.7189	1763.6004 (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)	1013.9266	778.8014	637.4723	348.1597	151.6080	0.0000	0.0000	0.0000	0.0000	384.1939	725.7170	1037.4120 (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)
Space heating fuel used, main system 2												0.0000 (213)
Water heating												
Water heating requirement	264.8238	233.5355	246.4862	212.9333	203.8264	180.8599	176.4858	185.0813	188.8635	213.9533	231.5938	261.4414 (64)
Efficiency of water heater (217)m	313.4050	313.4050	313.4050	313.4050	313.4050	313.4050	313.4050	313.4050	313.4050	313.4050	313.4050	313.4050 (216)
Fuel for water heating, kWh/month	84.4989	74.5156	78.6478	67.9419	65.0361	57.7080	56.3124	59.0550	60.2618	68.2673	73.8960	83.4197 (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	53.8980	43.2390	38.9319	28.5232	22.0321	18.0004	20.0985	26.1247	33.9334	44.5225	50.2881	55.3960 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-14.7565	-23.5812	-38.1060	-47.4193	-54.0669	-49.4410	-48.7590	-43.9011	-36.1320	-28.5083	-17.0896	-12.4561 (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	-1.5216	-3.5823	-8.1565	-14.5816	-22.5300	-25.8660	-25.5528	-21.0255	-14.7185	-6.2166	-2.2186	-1.1659 (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)												

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(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												5077.2909	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												313.4050	
Water heating fuel used												829.5605	(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)												434.9880	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-561.3528	(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												5780.4866	(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	5077.2909	0.1552	788.1424 (261)
Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	829.5605	0.1413	117.2112 (264)
Space and water heating			905.3536 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	434.9880	0.1443	62.7822 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-414.2171	0.1330	-55.0845
PV Unit electricity exported	-147.1357	0.1201	-17.6732
Total			-72.7577 (269)
Total CO2, kg/year			895.3781 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.9300 (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	5077.2909	1.5747	7995.1266 (275)
Space heating - main system 2	0.0000	0.0000	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	829.5605	1.5225	1262.9811 (278)
Space and water heating			9258.1077 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	434.9880	1.5338	667.1991 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-414.2171	1.4914	-617.7680
PV Unit electricity exported	-147.1357	0.4405	-64.8110
Total			-682.5790 (283)
Total Primary energy kWh/year			9242.7279 (286)
Dwelling Primary energy Rate (DPER)			40.5700 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	125.0000 (1b)	x 2.3800 (2b)	= 297.5000 (1b) - (3b)
First floor	102.8000 (1c)	x 2.7500 (2c)	= 282.7000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	227.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 580.2000 (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	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

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Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour	40.0000 / (5) =	0.0689 (8)
Pressure test		Yes		
Pressure Test Method		Blower Door		
Measured/design AP50		5.0000		(17)
Infiltration rate		0.3189		(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) =		0.2711 (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	0.3457	0.3389	0.3321	0.2982	0.2914	0.2575	0.2575	0.2508	0.2711	0.2914	0.3050	0.3185 (22b)
	0.5597	0.5574	0.5551	0.5445	0.5425	0.5332	0.5332	0.5314	0.5367	0.5425	0.5465	0.5507 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Semi-glazed door			1.9100	1.0000	1.9100		(26a)
TER Opening Type (Uw = 1.20)			36.1100	1.1450	41.3473		(27)
Heatloss Floor 1			125.0000	0.1300	16.2500		(28a)
Brick Facing	127.3500	22.2700	105.0800	0.1800	18.9144		(29a)
Rendered	102.0300	13.8800	88.1500	0.1800	15.8670		(29a)
Dormer Walls	3.5000	1.8700	1.6300	0.1800	0.2934		(29a)
RIR Stud	7.6900		7.6900	0.1800	1.3842		(29a)
Plane Ceiling	96.9500		96.9500	0.1100	10.6645		(30)
GF Flat Roof	20.0000		20.0000	0.1100	2.2000		(30)
Dormer Flat Roof	3.8000		3.8000	0.1100	0.4180		(30)
Adj To RIR	2.0000		2.0000	0.1100	0.2200		(30)
Slope Roof	2.9000		2.9000	0.1100	0.3190		(30)
Total net area of external elements Aum(A, m2)			491.2200				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	109.7878	(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 143.8525 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	25.9100	0.0500	1.2955
E3 Sill	20.7000	0.0500	1.0350
E4 Jamb	59.8000	0.0500	2.9900
E5 Ground floor (normal)	52.4000	0.1600	8.3840
E6 Intermediate floor within a dwelling	42.4000	0.0000	0.0000
E16 Corner (normal)	43.0500	0.0900	3.8745
E10 Eaves (insulation at ceiling level)	41.1500	0.0600	2.4690
E17 Corner (inverted - internal area greater than external area)	22.5300	-0.0900	-2.0277
R6 Flat ceiling	2.3000	0.0600	0.1380
R7 Flat ceiling (inverted)	3.0000	0.0400	0.1200
R8 Roof to wall (rafter)	2.3000	0.0600	0.1380
R9 Roof to wall (flat ceiling)	3.0000	0.0400	0.1200
E13 Gable (insulation at rafter level)	1.4000	0.0800	0.1120
E14 Flat roof	12.8000	0.0800	1.0240

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 19.6723 (36)

Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 129.4601 (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	107.1708	106.7267	106.2913	104.2465	103.8639	102.0829	102.0829	101.7531	102.7689	103.8639	104.6379	105.4470 (38)
Average = Sum(39)m / 12 =	236.6309	236.1868	235.7514	233.7066	233.3240	231.5431	231.5431	231.2133	232.2291	233.3240	234.0980	234.9071 (39)
												233.7048

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0388	1.0368	1.0349	1.0259	1.0242	1.0164	1.0164	1.0150	1.0194	1.0242	1.0276	1.0312 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

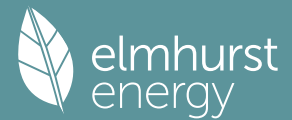
Assumed occupancy	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hot water usage for mixer showers	75.1583	74.0288	72.3830	69.2339	66.9099	64.3183	62.8452	64.4786	66.2691	69.0518	72.2685	74.8704 (42a)
Hot water usage for baths	32.4438	31.9619	31.2834	30.0323	29.0955	28.0568	27.4957	28.1695	28.9031	30.0146	31.2914	32.3341 (42b)
Hot water usage for other uses	45.7429	44.0795	42.4161	40.7527	39.0894	37.4260	37.4260	39.0894	40.7527	42.4161	44.0795	45.7429 (42c)
Average daily hot water use (litres/day)												140.9584 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	153.3449	150.0702	146.0825	140.0189	135.0948	129.8010	127.7668	131.7374	135.9250	141.4825	147.6394	152.9473 (44)
Energy content (annual)	242.8609	213.6980	224.5233	191.6789	181.8636	159.6055	154.5229	163.1184	167.6091	191.9904	210.3394	239.4785 (45)
Distribution loss (46)m = 0.15 x (45)m	36.4291	32.0547	33.6785	28.7518	27.2795	23.9408	23.1784	24.4678	25.1414	28.7986	31.5509	35.9218 (46)

Water storage 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												
Primary 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 (57)
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 (59)
Total heat required for water heating calculated for each month	289.4558	255.7838	271.1182	236.7707	228.4585	204.6973	201.1178	209.7133	212.7009	238.5853	255.4313	286.0734 (62)
WWHRS	-34.3592	-30.3876	-31.8201	-26.3483	-24.5557	-21.0125	-19.6959	-20.9446	-21.7403	-25.6295	-29.0351	-33.7230 (63a)

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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	255.0966	225.3962	239.2981	210.4224	203.9028	183.6849	181.4220	188.7688	190.9606	212.9558	226.3962	252.3505	(64)
	Total per year (kWh/year) = Sum(64)m =											2570.6546 (64)	
12Total per year (kWh/year)												2571 (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	118.0272	104.7232	111.9299	99.8067	97.7456	89.1423	88.6548	91.5128	91.8035	101.1127	106.0113	116.9025	(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	
(66m)	151.9035	151.9035	151.9035	151.9035	151.9035	151.9035	151.9035	151.9035	151.9035	151.9035	151.9035	151.9035	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	209.1648	231.5753	209.1648	216.1370	209.1648	216.1370	209.1648	209.1648	216.1370	209.1648	216.1370	209.1648	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	396.7554	400.8725	390.4976	368.4106	340.5298	314.3258	296.8199	292.7028	303.0777	325.1647	353.0455	379.2495	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	38.1903	38.1903	38.1903	38.1903	38.1903	38.1903	38.1903	38.1903	38.1903	38.1903	38.1903	38.1903	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-121.5228	-121.5228	-121.5228	-121.5228	-121.5228	-121.5228	-121.5228	-121.5228	-121.5228	-121.5228	-121.5228	-121.5228	(71)
Water heating gains (Table 5)	158.6387	155.8381	150.4434	138.6204	131.3784	123.8088	119.1597	123.0011	127.5048	135.9042	147.2380	157.1271	(72)
Total internal gains	836.1299	859.8569	821.6769	794.7391	752.6441	722.8426	693.7154	693.4398	715.2906	741.8047	787.9915	817.1124	(73)

6. Solar gains

[Jan]		Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
North		1.3200	10.6334	0.6300	0.7000	0.7700	4.2896 (74)						
East		18.4100	19.6403	0.6300	0.7000	0.7700	110.5027 (76)						
South		4.2900	46.7521	0.6300	0.7000	0.7700	61.2957 (78)						
West		12.0900	19.6403	0.6300	0.7000	0.7700	72.5680 (80)						
Solar gains	248.6561	466.7094	731.5857	1027.0618	1234.9055	1256.3235	1199.1034	1043.9178	836.2683	542.9803	306.2158	207.0896	(83)
Total gains	1084.7860	1326.5664	1553.2626	1821.8009	1987.5496	1979.1660	1892.8188	1737.3575	1551.5589	1284.7850	1094.2073	1024.2020	(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	38.4678	38.5401	38.6113	38.9491	39.0130	39.3131	39.3131	39.3692	39.1969	39.0130	38.8840	38.7501	38.7501
alpha	3.5645	3.5693	3.5741	3.5966	3.6009	3.6209	3.6209	3.6246	3.6131	3.6009	3.5923	3.5833	3.5833
util living area	0.9927	0.9847	0.9665	0.9156	0.8156	0.6593	0.5103	0.5675	0.7957	0.9496	0.9867	0.9941	(86)
MIT	18.8996	19.1751	19.5978	20.1496	20.5974	20.8698	20.9611	20.9429	20.7298	20.1149	19.4064	18.8560	(87)
Th 2	20.0512	20.0528	20.0543	20.0618	20.0632	20.0697	20.0697	20.0709	20.0672	20.0632	20.0604	20.0574	(88)
util rest of house	0.9913	0.9816	0.9595	0.8974	0.7754	0.5875	0.4132	0.4692	0.7370	0.9351	0.9835	0.9929	(89)
MIT 2	17.5650	17.9171	18.4540	19.1455	19.6770	19.9718	20.0497	20.0392	19.8388	19.1156	18.2190	17.5131	(90)
Living area fraction									fLA = Living area / (4) =			0.1708	(91)
MIT	17.7929	18.1319	18.6494	19.3170	19.8342	20.1251	20.2053	20.1935	19.9909	19.2863	18.4218	17.7424	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.7929	18.1319	18.6494	19.3170	19.8342	20.1251	20.2053	20.1935	19.9909	19.2863	18.4218	17.7424	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9858	0.9724	0.9453	0.8795	0.7642	0.5921	0.4280	0.4829	0.7315	0.9192	0.9751	0.9883	(94)
Useful gains	1069.4029	1289.9895	1468.2973	1602.2782	1518.9635	1171.8142	810.1477	839.0267	1134.9416	1180.9208	1066.9682	1012.1706	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.4000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	3192.8330	3125.2108	2864.2294	2434.5196	1897.9023	1279.3046	834.7866	877.1051	1368.0416	2026.7172	2650.4075	3181.2092	(97)
Space heating kWh	1579.8320	1233.2687	1038.5735	599.2138	281.9305	0.0000	0.0000	0.0000	0.0000	629.2725	1140.0763	1613.7647	(98a)
Space heating requirement - total per year (kWh/year)												8115.9321	
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	1579.8320	1233.2687	1038.5735	599.2138	281.9305	0.0000	0.0000	0.0000	0.0000	629.2725	1140.0763	1613.7647	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												8115.9321	
Space heating per m ²												(98c) / (4) = 35.6274 (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	

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Space heating requirement	1579.8320	1233.2687	1038.5735	599.2138	281.9305	0.0000	0.0000	0.0000	0.0000	629.2725	1140.0763	1613.7647	(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)	1711.6273	1336.1525	1125.2150	649.2024	305.4501	0.0000	0.0000	0.0000	0.0000	681.7687	1235.1856	1748.3908	(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	255.0966	225.3962	239.2981	210.4224	203.9028	183.6849	181.4220	188.7688	190.9606	212.9558	226.3962	252.3505	(64)
Efficiency of water heater (217)m	87.4292	87.2790	86.9633	86.2712	84.7867	79.8000	79.8000	79.8000	79.8000	86.3379	87.1712	87.4660	(216)
Fuel for water heating, kWh/month	291.7751	258.2480	275.1712	243.9079	240.4891	230.1815	227.3458	236.5524	239.2990	246.6539	259.7146	288.5125	(219)
Space cooling fuel requirement	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	7.0685	7.3041	7.0685	7.3041	7.0685	(231)
Lighting	43.4603	34.8655	31.3925	22.9995	17.7655	14.5145	16.2063	21.0655	27.3620	35.9004	40.5495	44.6682	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-99.6185	-132.4431	-179.5383	-189.8325	-194.8605	-178.1732	-175.6281	-170.2553	-159.8721	-145.1234	-106.4765	-87.0639	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	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)	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)	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)	-83.4061	-171.4375	-333.7605	-491.6712	-641.3075	-641.4934	-634.2329	-541.2172	-402.2010	-242.2112	-110.3181	-66.2961	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	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)	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)	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												8792.9925	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	(216)
Water heating fuel used												3037.8510	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:												86.0000	(231)
Total electricity for the above, kWh/year												350.7496	(232)
Electricity for lighting (calculated in Appendix L)													
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-6178.4382	(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												6089.1549	(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	8792.9925	0.2100	1846.5284 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3037.8510	0.2100	637.9487 (264)
Space and water heating			2484.4771 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	350.7496	0.1443	50.6240 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1818.8855	0.1359	-247.2204
PV Unit electricity exported	-4359.5527	0.1265	-551.3354
Total			-798.5558 (269)
Total CO2, kg/year			1748.4746 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			7.6800 (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	8792.9925	1.1300	9936.0815 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3037.8510	1.1300	3432.7716 (278)
Space and water heating			13368.8531 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	350.7496	1.5338	537.9915 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1818.8855	1.5024	-2732.7032
PV Unit electricity exported	-4359.5527	0.4642	-2023.8867
Total			-4756.5899 (283)
Total Primary energy kWh/year			9280.3555 (286)
Target Primary Energy Rate (TPER)			40.7400 (287)

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CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	125.0000 (1b)	x 2.3800 (2b)	= 297.5000 (1b) - (3b)
First floor	102.8000 (1c)	x 2.7500 (2c)	= 282.7000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	227.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 580.2000 (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	4 * 10 = 40.0000 (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) =	40.0000 / (5) = 0.0689 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AF50	5.0000 (17)
Infiltration rate	0.3189 (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) = 0.2711 (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	0.3457	0.3389	0.3321	0.2982	0.2914	0.2575	0.2575	0.2508	0.2711	0.2914	0.3050	0.3185 (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	0.5597	0.5574	0.5551	0.5445	0.5425	0.5332	0.5332	0.5314	0.5367	0.5425	0.5465	0.5507 (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
HGD			1.9100	1.2000	2.2920		(26a)
Windows (Uw = 1.20)			27.0800	1.1450	31.0076		(27)
Fully Glazed Doors (Uw = 1.20)			9.0300	1.1450	10.3397		(27)
Heatloss Floor 1			125.0000	0.1300	16.2500	110.0000	13750.0000 (28a)
Brick Facing	127.3500	22.2700	105.0800	0.1900	19.9652	60.0000	6304.8000 (29a)
Rendered	102.0300	13.8800	88.1500	0.1900	16.7485	60.0000	5289.0000 (29a)
Dormer Walls	3.5000	1.8700	1.6300	0.2000	0.3260	9.0000	14.6700 (29a)
RIR Stud	7.6900		7.6900	0.2000	1.5380	9.0000	69.2100 (29a)
Plane Ceiling	96.9500		96.9500	0.1100	10.6645	9.0000	872.5500 (30)
GF Flat Roof	20.0000		20.0000	0.1100	2.2000	9.0000	180.0000 (30)
Dormer Flat Roof	3.8000		3.8000	0.1100	0.4180	9.0000	34.2000 (30)
Adj To RIR	2.0000		2.0000	0.1100	0.2200	9.0000	18.0000 (30)
Slope Roof	2.9000		2.9000	0.1100	0.3190	9.0000	26.1000 (30)
Total net area of external elements Aum(A, m ²)			491.2200				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 112.2885		(33)
Internal Wall 1			381.7200			9.0000	3435.4800 (32c)
Internal Floor 1			102.8000			18.0000	1850.4000 (32d)
Internal Ceiling 1			102.8000			9.0000	925.2000 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 32769.6100 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							143.8525 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element	25.9100	0.3950	10.2345
E1 Steel lintel with perforated steel base plate	20.7000	0.0220	0.4554
E3 Sill	59.8000	0.0170	1.0166
E4 Jamb	52.4000	0.0840	4.4016
E6 Intermediate floor within a dwelling	42.4000	0.0010	0.0424
E16 Corner (normal)	43.0500	0.0460	1.9803
E10 Eaves (insulation at ceiling level)	41.1500	0.0600	2.4690
E17 Corner (inverted - internal area greater than external area)	22.5300	-0.0880	-1.9826
R6 Flat ceiling	2.3000	0.1200	0.2760
R7 Flat ceiling (inverted)	3.0000	0.1200	0.3600
R8 Roof to wall (rafter)	2.3000	0.1200	0.2760
R9 Roof to wall (flat ceiling)	3.0000	0.3200	0.9600
E13 Gable (insulation at rafter level)	1.4000	0.0500	0.0700
E14 Flat roof	12.8000	0.1600	2.0480
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			22.6071 (36)
Point Thermal bridges			0.0000 (36a)
Total fabric heat loss			(33) + (36) + (36a) = 134.8956 (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	107.1708	106.7267	106.2913	104.2465	103.8639	102.0829	102.0829	101.7531	102.7689	103.8639	104.6379	105.4470 (38)
Heat transfer coeff	242.0664	241.6223	241.1869	239.1421	238.7595	236.9786	236.9786	236.6488	237.6646	238.7595	239.5335	240.3426 (39)
Average = Sum(39)m / 12 =												239.1403

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HLP	1.0626	1.0607	1.0588	1.0498	1.0481	1.0403	1.0403	1.0388	1.0433	1.0481	1.0515	1.0551 (40)
HLP (average)												1.0498
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												3.0381 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42b)
Hot water usage for other uses	32.4438	31.9619	31.2834	30.0323	29.0955	28.0568	27.4957	28.1695	28.9031	30.0146	31.2914	32.3341 (42c)
Average daily hot water use (litres/day)	45.7429	44.0795	42.4161	40.7527	39.0894	37.4260	37.4260	39.0894	40.7527	42.4161	44.0795	45.7429 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content	78.1866	76.0414	73.6995	70.7851	68.1849	65.4828	64.9217	67.2588	69.6558	72.4307	75.3709	78.0769 (44)
Energy content (annual)	123.8285	108.2820	113.2734	96.9012	91.7900	80.5187	78.5171	83.2805	85.8926	98.2878	107.3797	122.2496 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1190.2011
Water 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 (46)
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	105.2542	92.0397	96.2824	82.3660	78.0215	68.4409	66.7396	70.7884	73.0087	83.5446	91.2727	103.9122 (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	105.2542	92.0397	96.2824	82.3660	78.0215	68.4409	66.7396	70.7884	73.0087	83.5446	91.2727	103.9122 (64)
12Total per year (kWh/year)												Total per year (kWh/year) = Sum(64)m = 1011.6709 (64)
Electric shower(s)	60.1893	53.6292	58.5610	55.8840	56.9327	54.3082	56.1185	56.9327	55.8840	58.5610	57.4598	60.1893 (64a)
Heat gains from water heating, kWh/month	41.3609	36.4172	38.7108	34.5625	33.7385	30.6873	30.7145	31.9303	32.2232	35.5264	37.1831	41.0254 (65)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 684.6496 (64a)	

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	151.9035	151.9035	151.9035	151.9035	151.9035	151.9035	151.9035	151.9035	151.9035	151.9035	151.9035	151.9035 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	209.1648	231.5753	209.1648	216.1370	209.1648	216.1370	209.1648	209.1648	216.1370	209.1648	216.1370	209.1648 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	396.7554	400.8725	390.4976	368.4106	340.5298	314.3258	296.8199	292.7028	303.0777	325.1647	353.0455	379.2495 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	38.1903	38.1903	38.1903	38.1903	38.1903	38.1903	38.1903	38.1903	38.1903	38.1903	38.1903	38.1903 (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)	-121.5228	-121.5228	-121.5228	-121.5228	-121.5228	-121.5228	-121.5228	-121.5228	-121.5228	-121.5228	-121.5228	-121.5228 (71)
Water heating gains (Table 5)	55.5926	54.1923	52.0307	48.0035	45.3475	42.6212	41.2830	42.9170	44.7544	47.7505	51.6432	55.1416 (72)
Total internal gains	730.0838	755.2111	720.2641	701.1221	663.6132	641.6550	615.8387	613.3557	632.5402	650.6511	689.3967	712.1270 (73)

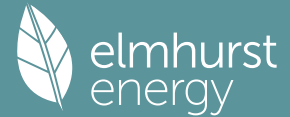
6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains						
	m ²	Table 6a	Specific data	Specific data	factor	W						
		W/m ²	or Table 6b	or Table 6c	Table 6d							
North	1.3200	10.6334	0.7600	0.7000	0.7700	5.1748 (74)						
East	9.3800	19.6403	0.7600	0.7000	0.7700	67.9196 (76)						
South	4.2900	46.7521	0.7600	0.7000	0.7700	73.9440 (78)						
West	12.0900	19.6403	0.7600	0.7000	0.7700	87.5424 (80)						
East	9.0300	19.6403	0.7600	0.7000	0.7700	65.3853 (76)						
Solar gains	299.9660	563.0146	882.5479	1238.9952	1489.7273	1515.5648	1446.5374	1259.3294	1008.8316	655.0239	369.4032	249.8224 (83)
Total gains	1030.0499	1318.2257	1602.8120	1940.1173	2153.3404	2157.2199	2062.3761	1872.6851	1641.3718	1305.6749	1058.7999	961.9494 (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	37.6040	37.6731	37.7411	38.0638	38.1248	38.4114	38.4114	38.4649	38.3005	38.1248	38.0017	37.8737
alpha	3.5069	3.5115	3.5161	3.5376	3.5417	3.5608	3.5608	3.5643	3.5534	3.5417	3.5334	3.5249
util living area	0.9938	0.9851	0.9641	0.9043	0.7916	0.6286	0.4825	0.5429	0.7800	0.9486	0.9880	0.9951 (86)
MIT	18.8092	19.1183	19.5819	20.1703	20.6241	20.8827	20.9653	20.9474	20.7376	20.0931	19.3377	18.7597 (87)
Th 2	20.0315	20.0331	20.0346	20.0420	20.0434	20.0499	20.0499	20.0511	20.0474	20.0434	20.0406	20.0377 (88)
util rest of house	0.9925	0.9820	0.9565	0.8840	0.7485	0.5559	0.3874	0.4451	0.7188	0.9336	0.9851	0.9941 (89)
MIT 2	18.0099	18.3180	18.7769	19.3505	19.7663	19.9825	20.0363	20.0289	19.8769	19.2888	18.5434	17.9649 (90)
Living area fraction												fLA = Living area / (4) = 0.1708 (91)
MIT	18.1464	18.4547	18.9143	19.4905	19.9128	20.1362	20.1950	20.1857	20.0239	19.4261	18.6790	18.1006 (92)
Temperature adjustment												0.0000

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adjusted MIT 18.1464 18.4547 18.9143 19.4905 19.9128 20.1362 20.1950 20.1857 20.0239 19.4261 18.6790 18.1006 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9889	0.9751	0.9451	0.8701	0.7420	0.5629	0.4025	0.4597	0.7171	0.9212	0.9792	0.9911	(94)
Useful gains	1018.6071	1285.4423	1514.8222	1688.1128	1597.7035	1214.3618	830.0733	860.9285	1176.9662	1202.8213	1036.7320	953.4132	(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	3351.7371	3275.1157	2994.1774	2532.6393	1960.8905	1311.9601	851.9281	895.8844	1407.8910	2107.3174	2773.5641	3340.9095	(97)
Space heating kWh	1735.8488	1337.0605	1100.6402	608.0591	270.2112	0.0000	0.0000	0.0000	0.0000	672.9451	1250.5191	1776.2973	(98a)
Space heating requirement - total per year (kWh/year)												8751.5813	
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	1735.8488	1337.0605	1100.6402	608.0591	270.2112	0.0000	0.0000	0.0000	0.0000	672.9451	1250.5191	1776.2973	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												8751.5813	
Space heating per m2										(98c) / (4) =		38.4178	(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	2227.5986	1753.6415	1798.5306	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8117	0.8740	0.8362	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1808.0391	1532.7253	1503.8511	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	2418.5326	2311.8586	2094.4625	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	439.5553	579.6752	439.4149	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	109.8888	144.9188	109.8537	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												364.6614	(107)
Energy for space heating												38.4178	(99)
Energy for space cooling												1.6008	(108)
Total												40.0186	(109)
Fabric Energy Efficiency (DFEE)												40.0	(109)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	125.0000 (1b)	x 2.3800 (2b)	= 297.5000 (1b) - (3b)	
First floor	102.8000 (1c)	x 2.7500 (2c)	= 282.7000 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	227.8000		(4)	
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	580.2000 (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	4 * 10 =	40.0000 (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) =	40.0000 / (5) =	0.0689 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3189 (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) =	0.2711 (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	0.3457	0.3389	0.3321	0.2982	0.2914	0.2575	0.2575	0.2508	0.2711	0.2914	0.3050	0.3185	(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)

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Effective ac 0.5597 0.5574 0.5551 0.5445 0.5425 0.5332 0.5332 0.5314 0.5367 0.5425 0.5465 0.5507 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Semi-glazed door			1.9100	1.0000	1.9100			(26a)
TER Opening Type (Uw = 1.20)			36.1100	1.1450	41.3473			(27)
Heatloss Floor 1			125.0000	0.1300	16.2500			(28a)
Brick Facing	127.3500	22.2700	105.0800	0.1800	18.9144			(29a)
Rendered	102.0300	13.8800	88.1500	0.1800	15.8670			(29a)
Dormer Walls	3.5000	1.8700	1.6300	0.1800	0.2934			(29a)
RIR Stud	7.6900		7.6900	0.1800	1.3842			(29a)
Plane Ceiling	96.9500		96.9500	0.1100	10.6645			(30)
GF Flat Roof	20.0000		20.0000	0.1100	2.2000			(30)
Dormer Flat Roof	3.8000		3.8000	0.1100	0.4180			(30)
Adj To RIR	2.0000		2.0000	0.1100	0.2200			(30)
Slope Roof	2.9000		2.9000	0.1100	0.3190			(30)
Total net area of external elements Aum(A, m2)			491.2200					(31)
Fabric heat loss, W/K = Sum (A x U)					109.7878			(33)

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

143.8525 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E1 Steel lintel with perforated steel base plate	25.9100	0.0500	1.2955	
E3 Sill	20.7000	0.0500	1.0350	
E4 Jamb	59.8000	0.0500	2.9900	
E5 Ground floor (normal)	52.4000	0.1600	8.3840	
E6 Intermediate floor within a dwelling	42.4000	0.0000	0.0000	
E16 Corner (normal)	43.0500	0.0900	3.8745	
E10 Eaves (insulation at ceiling level)	41.1500	0.0600	2.4690	
E17 Corner (inverted - internal area greater than external area)	22.5300	-0.0900	-2.0277	
R6 Flat ceiling	2.3000	0.0600	0.1380	
R7 Flat ceiling (inverted)	3.0000	0.0400	0.1200	
R8 Roof to wall (rafter)	2.3000	0.0600	0.1380	
R9 Roof to wall (flat ceiling)	3.0000	0.0400	0.1200	
E13 Gable (insulation at rafter level)	1.4000	0.0800	0.1120	
E14 Flat roof	12.8000	0.0800	1.0240	

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

19.6723 (36)

Point Thermal bridges

0.0000

Total fabric heat loss

(33) + (36) + (36a) = 129.4601 (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	107.1708	106.7267	106.2913	104.2465	103.8639	102.0829	102.0829	101.7531	102.7689	103.8639	104.6379	105.4470 (38)
Average = Sum(39)m / 12 =	236.6309	236.1868	235.7514	233.7066	233.3240	231.5431	231.5431	231.2133	232.2291	233.3240	234.0980	234.9071 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0388	1.0368	1.0349	1.0259	1.0242	1.0164	1.0164	1.0150	1.0194	1.0242	1.0276	1.0312 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Hot water usage for baths	32.4438	31.9619	31.2834	30.0323	29.0955	28.0568	27.4957	28.1695	28.9031	30.0146	31.2914	32.3341 (42b)
Hot water usage for other uses	45.7429	44.0795	42.4161	40.7527	39.0894	37.4260	37.4260	39.0894	40.7527	42.4161	44.0795	45.7429 (42c)
Average daily hot water use (litres/day)												71.6649 (43)
Daily hot water use	78.1866	76.0414	73.6995	70.7851	68.1849	65.4828	64.9217	67.2588	69.6558	72.4307	75.3709	78.0769 (44)
Energy content (annual)	123.8285	108.2820	113.2734	96.9012	91.7900	80.5187	78.5171	83.2805	85.8926	98.2878	107.3797	122.2496 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	105.2542	92.0397	96.2824	82.3660	78.0215	68.4409	66.7396	70.7884	73.0087	83.5446	91.2727	103.9122 (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	105.2542	92.0397	96.2824	82.3660	78.0215	68.4409	66.7396	70.7884	73.0087	83.5446	91.2727	103.9122 (64)
12Total per year (kWh/year)												1011.6709 (64)
Electric shower(s)	60.1893	53.6292	58.5610	55.8840	56.9327	54.3082	56.1185	56.9327	55.8840	58.5610	57.4598	60.1893 (64a)
Heat gains from water heating, kWh/month	41.3609	36.4172	38.7108	34.5625	33.7385	30.6873	30.7145	31.9303	32.2232	35.5264	37.1831	41.0254 (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	151.9035	151.9035	151.9035	151.9035	151.9035	151.9035	151.9035	151.9035	151.9035	151.9035	151.9035	151.9035 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												

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Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	209.1648	231.5753	209.1648	216.1370	209.1648	216.1370	209.1648	216.1370	209.1648	216.1370	209.1648	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	396.7554	400.8725	390.4976	368.4106	340.5298	314.3258	296.8199	292.7028	303.0777	325.1647	353.0455	379.2495 (68)
Pumps, fans	38.1903	38.1903	38.1903	38.1903	38.1903	38.1903	38.1903	38.1903	38.1903	38.1903	38.1903	38.1903 (69)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (Table 5)	-121.5228	-121.5228	-121.5228	-121.5228	-121.5228	-121.5228	-121.5228	-121.5228	-121.5228	-121.5228	-121.5228	-121.5228 (71)
Total internal gains	55.5926	54.1923	52.0307	48.0035	45.3475	42.6212	41.2830	42.9170	44.7544	47.7505	51.6432	55.1416 (72)
	730.0838	755.2111	720.2641	701.1221	663.6132	641.6550	615.8387	613.3557	632.5402	650.6511	689.3967	712.1270 (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	1.3200	10.6334	0.6300	0.7000	0.7700	4.2896 (74)						
East	18.4100	19.6403	0.6300	0.7000	0.7700	110.5027 (76)						
South	4.2900	46.7521	0.6300	0.7000	0.7700	61.2957 (78)						
West	12.0900	19.6403	0.6300	0.7000	0.7700	72.5680 (80)						
Solar gains	248.6561	466.7094	731.5857	1027.0618	1234.9055	1256.3235	1199.1034	1043.9178	836.2683	542.9803	306.2158	207.0896 (83)
Total gains	978.7399	1221.9206	1451.8499	1728.1839	1898.5187	1897.9785	1814.9421	1657.2735	1468.8085	1193.6314	995.6125	919.2166 (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	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	38.4678	38.5401	38.6113	38.9491	39.0130	39.3131	39.3131	39.3692	39.1969	39.0130	38.8840	38.7501	
tau	3.5645	3.5693	3.5741	3.5966	3.6009	3.6209	3.6209	3.6246	3.6131	3.6009	3.5923	3.5833	
util living area	0.9948	0.9881	0.9725	0.9262	0.8317	0.6782	0.5286	0.5889	0.8159	0.9589	0.9901	0.9959	(86)
MIT	18.8242	19.1029	19.5324	20.1001	20.5664	20.8569	20.9564	20.9356	20.7033	20.0595	19.3376	18.7807	(87)
Th 2	20.0512	20.0528	20.0543	20.0618	20.0632	20.0697	20.0697	20.0709	20.0672	20.0632	20.0604	20.0574	(88)
util rest of house	0.9937	0.9857	0.9666	0.9096	0.7933	0.6066	0.4294	0.4890	0.7599	0.9467	0.9877	0.9950	(89)
MIT 2	18.0386	18.3170	18.7435	19.3017	19.7365	19.9850	20.0520	20.0427	19.8691	19.2723	18.5574	17.9997	(90)
Living area fraction	18.1727	18.4512	18.8783	19.4380	19.8782	20.1339	20.2065	20.1951	20.0115	19.4068	18.6906	18.1331	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1727	18.4512	18.8783	19.4380	19.8782	20.1339	20.2065	20.1951	20.0115	19.4068	18.6906	18.1331	(93)

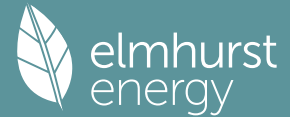
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9906	0.9799	0.9568	0.8962	0.7846	0.6119	0.4447	0.5032	0.7560	0.9354	0.9826	0.9924	(94)
Useful gains	969.5087	1197.3232	1389.1010	1548.7882	1489.6346	1161.4588	807.1626	833.9888	1110.4523	1116.5477	978.2431	912.2146	(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	3282.7200	3200.6149	2918.1922	2462.8035	1908.1720	1281.3343	835.0522	877.4840	1372.8299	2054.8315	2713.3410	3272.9777	(97)
Space heating kWh	1721.0292	1346.2120	1137.6439	658.0910	311.3918	0.0000	0.0000	0.0000	0.0000	698.0831	1249.2705	1756.4078	(98a)
Space heating requirement - total per year (kWh/year)												8878.1293	
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	1721.0292	1346.2120	1137.6439	658.0910	311.3918	0.0000	0.0000	0.0000	0.0000	698.0831	1249.2705	1756.4078	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												8878.1293	
Space heating per m2										(98c) / (4) =		38.9734	(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	2176.5048	1713.4187	1757.2207	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7723	0.8434	0.8020	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1680.9606	1445.1330	1409.2505	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	2115.5232	2022.6500	1842.6827	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	312.8851	429.6727	322.4736	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction													(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	78.2213	107.4182	80.6184	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement													(108)
Energy for space heating													266.2578
Energy for space cooling													38.9734
Total													1.1688
Fabric Energy Efficiency (TFEE)													40.1422
													40.1

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CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	125.0000 (1b)	x 2.3800 (2b)	= 297.5000 (1b) - (3b)
First floor	102.8000 (1c)	x 2.7500 (2c)	= 282.7000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	227.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 580.2000 (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	5 * 10 = 50.0000 (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) =	50.0000 / (5) = 0.0862 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AF50	5.0000 (17)
Infiltration rate	0.3362 (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) = 0.2858 (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	0.3643	0.3572	0.3500	0.3143	0.3072	0.2715	0.2715	0.2643	0.2858	0.3072	0.3215	0.3358 (22b)
Effective ac	0.5664	0.5638	0.5613	0.5494	0.5472	0.5368	0.5368	0.5349	0.5408	0.5472	0.5517	0.5564 (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
HGD			1.9100	1.2000	2.2920		(26a)
Windows (Uw = 1.20)			27.0800	1.1450	31.0076		(27)
Fully Glazed Doors (Uw = 1.20)			9.0300	1.1450	10.3397		(27)
Heatloss Floor 1			125.0000	0.1300	16.2500	110.0000	13750.0000 (28a)
Brick Facing	127.3500	22.2700	105.0800	0.1900	19.9652	60.0000	6304.8000 (29a)
Rendered	102.0300	13.8800	88.1500	0.1900	16.7485	60.0000	5289.0000 (29a)
Dormer Walls	3.5000	1.8700	1.6300	0.2000	0.3260	9.0000	14.6700 (29a)
RIR Stud	7.6900		7.6900	0.2000	1.5380	9.0000	69.2100 (29a)
Plane Ceiling	96.9500		96.9500	0.1100	10.6645	9.0000	872.5500 (30)
GF Flat Roof	20.0000		20.0000	0.1100	2.2000	9.0000	180.0000 (30)
Dormer Flat Roof	3.8000		3.8000	0.1100	0.4180	9.0000	34.2000 (30)
Adj To RIR	2.0000		2.0000	0.1100	0.2200	9.0000	18.0000 (30)
Slope Roof	2.9000		2.9000	0.1100	0.3190	9.0000	26.1000 (30)
Total net area of external elements Aum(A, m ²)			491.2200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	112.2885		(33)
Internal Wall 1			381.7200			9.0000	3435.4800 (32c)
Internal Floor 1			102.8000			18.0000	1850.4000 (32d)
Internal Ceiling 1			102.8000			9.0000	925.2000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	32769.6100 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							143.8525 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	25.9100	0.3950	10.2345
E3 Sill	20.7000	0.0220	0.4554
E4 Jamb	59.8000	0.0170	1.0166
E5 Ground floor (normal)	52.4000	0.0840	4.4016
E6 Intermediate floor within a dwelling	42.4000	0.0010	0.0424
E16 Corner (normal)	43.0500	0.0460	1.9803
E10 Eaves (insulation at ceiling level)	41.1500	0.0600	2.4690
E17 Corner (inverted - internal area greater than external area)	22.5300	-0.0880	-1.9826
R6 Flat ceiling	2.3000	0.1200	0.2760
R7 Flat ceiling (inverted)	3.0000	0.1200	0.3600
R8 Roof to wall (rafter)	2.3000	0.1200	0.2760
R9 Roof to wall (flat ceiling)	3.0000	0.3200	0.9600
E13 Gable (insulation at rafter level)	1.4000	0.0500	0.0700
E14 Flat roof	12.8000	0.1600	2.0480
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			22.6071 (36)
Point Thermal bridges			0.0000 (36a)
Total fabric heat loss			(33) + (36) + (36a) = 134.8956 (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	108.4404	107.9469	107.4633	105.1915	104.7664	102.7878	102.7878	102.4214	103.5499	104.7664	105.6263	106.5252 (38)
Average = Sum(39)m / 12 =	243.3360	242.8426	242.3589	240.0871	239.6621	237.6834	237.6834	237.3170	238.4456	239.6621	240.5219	241.4209 (39)
HLP	1.0682	1.0660	1.0639	1.0539	1.0521	1.0434	1.0434	1.0418	1.0467	1.0521	1.0558	1.0598 (40)
HLP (average)												1.0539

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Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												

Assumed occupancy												3.0381 (42)
Hot water usage for mixer showers	75.1583	74.0288	72.3830	69.2339	66.9099	64.3183	62.8452	64.4786	66.2691	69.0518	72.2685	74.8704 (42a)
Hot water usage for baths	32.4438	31.9619	31.2834	30.0323	29.0955	28.0568	27.4957	28.1695	28.9031	30.0146	31.2914	32.3341 (42b)
Hot water usage for other uses	45.7429	44.0795	42.4161	40.7527	39.0894	37.4260	37.4260	39.0894	40.7527	42.4161	44.0795	45.7429 (42c)
Average daily hot water use (litres/day)												140.9584 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	153.3449	150.0702	146.0825	140.0189	135.0948	129.8010	127.7668	131.7374	135.9250	141.4825	147.6394	152.9473 (44)
Energy content (annual)	242.8609	213.6980	224.5233	191.6789	181.8636	159.6055	154.5229	163.1184	167.6091	191.9904	210.3394	239.4785 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 2341.2890
Water storage loss:	36.4291	32.0547	33.6785	28.7518	27.2795	23.9408	23.1784	24.4678	25.1414	28.7986	31.5509	35.9218 (46)
Store volume												196.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3120 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7085 (55)
Total storage loss												
If cylinder contains dedicated solar storage	21.9629	19.8374	21.9629	21.2544	21.9629	21.2544	21.9629	21.9629	21.2544	21.9629	21.2544	21.9629 (56)
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 (57)
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 (59)
Total heat required for water heating calculated for each month	264.8238	233.5355	246.4862	212.9333	203.8264	180.8599	176.4858	185.0813	188.8635	213.9533	231.5938	261.4414 (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	264.8238	233.5355	246.4862	212.9333	203.8264	180.8599	176.4858	185.0813	188.8635	213.9533	231.5938	261.4414 (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)
Heat gains from water heating, kWh/month	80.7513	71.0546	74.6540	63.7332	60.4696	53.0688	51.3789	54.2369	55.7300	63.8368	69.9379	79.6266 (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	182.2842	182.2842	182.2842	182.2842	182.2842	182.2842	182.2842	182.2842	182.2842	182.2842	182.2842	182.2842 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	61.5771	54.6922	44.4787	33.6732	25.1711	21.2505	22.9619	29.8468	40.0603	50.8658	59.3679	63.2885 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	592.1723	598.3172	582.8322	549.8666	508.2535	469.1430	443.0148	436.8699	452.3548	485.3204	526.9336	566.0441 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	56.2665	56.2665	56.2665	56.2665	56.2665	56.2665	56.2665	56.2665	56.2665	56.2665	56.2665	56.2665 (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)	-121.5228	-121.5228	-121.5228	-121.5228	-121.5228	-121.5228	-121.5228	-121.5228	-121.5228	-121.5228	-121.5228	-121.5228 (71)
Water heating gains (Table 5)	108.5366	105.7360	100.3414	88.5184	81.2764	73.7067	69.0576	72.8990	77.4028	85.8022	97.1359	107.0250 (72)
Total internal gains	879.3138	875.7733	844.6802	789.0861	731.7289	681.1281	652.0622	656.6436	686.8458	739.0162	800.4652	853.3854 (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			1.3200	10.6334	0.7600	0.7000	0.7700					5.1748 (74)
East			9.3800	19.6403	0.7600	0.7000	0.7700					67.9196 (76)
South			4.2900	46.7521	0.7600	0.7000	0.7700					73.9440 (78)
West			12.0900	19.6403	0.7600	0.7000	0.7700					87.5424 (80)
East			9.0300	19.6403	0.7600	0.7000	0.7700					65.3853 (76)

Solar gains	299.9660	563.0146	882.5479	1238.9952	1489.7273	1515.5648	1446.5374	1259.3294	1008.8316	655.0239	369.4032	249.8224 (83)
Total gains	1179.2799	1438.7878	1727.2281	2028.0813	2221.4562	2196.6929	2098.5996	1915.9730	1695.6775	1394.0401	1169.8684	1103.2078 (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	37.4078	37.4838	37.5586	37.9140	37.9813	38.2975	38.2975	38.3566	38.1750	37.9813	37.8455	37.7046
alpha	3.4939	3.4989	3.5039	3.5276	3.5321	3.5532	3.5532	3.5571	3.5450	3.5321	3.5230	3.5136
util living area	0.9905	0.9807	0.9560	0.8942	0.7806	0.6214	0.4764	0.5339	0.7681	0.9390	0.9838	0.9925 (86)
MIT	19.3383	19.5532	19.8985	20.3172	20.6427	20.8279	20.8881	20.8757	20.7256	20.2667	19.7170	19.2994 (87)
Th 2	20.0269	20.0287	20.0304	20.0386	20.0402	20.0473	20.0473	20.0487	20.0446	20.0402	20.0371	20.0338 (88)
util rest of house	0.9886	0.9768	0.9470	0.8725	0.7365	0.5488	0.3819	0.4368	0.7055	0.9219	0.9799	0.9909 (89)
MIT 2	18.0581	18.3328	18.7701	19.2931	19.6742	19.8734	19.9235	19.9172	19.7779	19.2437	18.5496	18.0135 (90)
Living area fraction												FLA = Living area / (4) = 0.1708 (91)
MIT	18.2767	18.5412	18.9628	19.4680	19.8396	20.0364	20.0882	20.0809	19.9397	19.4184	18.7490	18.2331 (92)

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Temperature adjustment													0.0000
adjusted MIT	18.2767	18.5412	18.9628	19.4680	19.8396	20.0364	20.0882	20.0809	19.9397	19.4184	18.7490		18.2331 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9837	0.9687	0.9343	0.8571	0.7262	0.5479	0.3861	0.4403	0.6977	0.9077	0.9726	0.9868	(94)
Useful gains	1160.0807	1393.7444	1613.7259	1738.2807	1613.2417	1203.4756	810.3115	843.6217	1183.1068	1265.3892	1137.8395	1088.6796	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	14.1000	10.6000	7.1000	4.2000		(96)
Heat loss rate W	3401.0444	3312.6724	3020.4712	2537.2293	1950.7462	1292.1323	829.0868	873.5352	1392.4621	2113.4281	2801.8315	3387.8850	(97)
Space heating kWh	1667.2770	1289.5196	1046.6185	575.2430	251.1034	0.0000	0.0000	0.0000	0.0000	630.9409	1198.0743	1710.6088	(98a)
Space heating requirement - total per year (kWh/year)												8369.3854	
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	1667.2770	1289.5196	1046.6185	575.2430	251.1034	0.0000	0.0000	0.0000	0.0000	630.9409	1198.0743	1710.6088	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												8369.3854	
Space heating per m2												36.7401	(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													0.0000	(203)
Fraction of total heating from main system 1													1.0000	(204)
Fraction of total heating from main system 2													0.0000	(205)
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)
Space heating requirement	1667.2770	1289.5196	1046.6185	575.2430	251.1034	0.0000	0.0000	0.0000	0.0000	630.9409	1198.0743	1710.6088	(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)	980.7512	758.5410	615.6579	338.3782	147.7079	0.0000	0.0000	0.0000	0.0000	371.1417	704.7496	1006.2404	(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)	
Space heating fuel used, main system 2													0.0000	(213)
Water heating requirement	264.8238	233.5355	246.4862	212.9333	203.8264	180.8599	176.4858	185.0813	188.8635	213.9533	231.5938	261.4414	(64)	
Efficiency of water heater	(217)m	313.4050	313.4050	313.4050	313.4050	313.4050	313.4050	313.4050	313.4050	313.4050	313.4050	313.4050	(216)	
Fuel for water heating, kWh/month	84.4989	74.5156	78.6478	67.9419	65.0361	57.7080	56.3124	59.0550	60.2618	68.2673	73.8960	83.4197	(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	(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	53.8980	43.2390	38.9319	28.5232	22.0321	18.0004	20.0985	26.1247	33.9334	44.5225	50.2881	55.3960	(232)	
Electricity generated by PVs (Appendix M) (negative quantity)	(233a)m	-14.7410	-23.5547	-38.0369	-47.3447	-54.0076	-49.4410	-48.7590	-43.9011	-36.1320	-28.4651	-17.0715	-12.4450	(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	(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	(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	(235c)	
Electricity generated by PVs (Appendix M) (negative quantity)	(233b)m	-1.5371	-3.6088	-8.2256	-14.6562	-22.5893	-25.8660	-25.5528	-21.0255	-14.7185	-6.2598	-2.2367	-1.1770	(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	(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	(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	(235d)	
Annual totals kWh/year														
Space heating fuel - main system 1													4923.1679	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													313.4050	
Water heating fuel used													829.5605	(219)
Space cooling fuel													0.0000	(221)
Electricity for pumps and fans:													0.0000	(231)
Total electricity for the above, kWh/year													434.9880	(232)
Electricity for lighting (calculated in Appendix L)														
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-561.3528	(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													5626.3636	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	4923.1679	16.4900	811.8304 (240)

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Space heating - main system 2	0.0000	16.4900	0.0000 (241)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	829.5605	16.4900	136.7945 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	434.9880	16.4900	71.7295 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-413.8996	16.4900	-68.2520
PV Unit electricity exported	-147.4532	5.5900	-8.2426
Total			-76.4947 (252)
Total energy cost			943.8598 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.2456 (257)
SAP value		79.8094
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	4923.1679	0.1552	764.2198 (261)
Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	829.5605	0.1413	117.2112 (264)
Space and water heating			881.4310 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	434.9880	0.1443	62.7822 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-413.8996	0.1330	-55.0383
PV Unit electricity exported	-147.4532	0.1202	-17.7236
Total			-72.7619 (269)
Total CO2, kg/year			871.4514 (272)
CO2 emissions per m2			3.8300 (273)
EI value			95.7194
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)
Ground floor	125.0000 (1b)	x 2.3800 (2b)	= 297.5000 (1b) - (3b)
First floor	102.8000 (1c)	x 2.7500 (2c)	= 282.7000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	227.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	580.2000 (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	5 * 10 =	50.0000 (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) =	50.0000 / (5) =	0.0862 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3362 (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) =	0.2858 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.6000	4.1000	4.1000	4.0000	3.8000	3.3000	3.3000	3.2000	3.4000	3.9000	3.8000	3.9000 (22)
Wind factor	1.1500	1.0250	1.0250	1.0000	0.9500	0.8250	0.8250	0.8000	0.8500	0.9750	0.9500	0.9750 (22a)
Adj infilt rate	0.3286	0.2929	0.2929	0.2858	0.2715	0.2357	0.2357	0.2286	0.2429	0.2786	0.2715	0.2786 (22b)

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Effective ac 0.5540 0.5429 0.5429 0.5408 0.5368 0.5278 0.5278 0.5261 0.5295 0.5388 0.5368 0.5388 (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	
HGD			1.9100	1.2000	2.2920			(26a)
Windows (Uw = 1.20)			27.0800	1.1450	31.0076			(27)
Fully Glazed Doors (Uw = 1.20)			9.0300	1.1450	10.3397			(27)
Heatloss Floor 1			125.0000	0.1300	16.2500	110.0000	13750.0000	(28a)
Brick Facing	127.3500	22.2700	105.0800	0.1900	19.9652	60.0000	6304.8000	(29a)
Rendered	102.0300	13.8800	88.1500	0.1900	16.7485	60.0000	5289.0000	(29a)
Dormer Walls	3.5000	1.8700	1.6300	0.2000	0.3260	9.0000	14.6700	(29a)
RIR Stud	7.6900		7.6900	0.2000	1.5380	9.0000	69.2100	(29a)
Plane Ceiling	96.9500		96.9500	0.1100	10.6645	9.0000	872.5500	(30)
GF Flat Roof	20.0000		20.0000	0.1100	2.2000	9.0000	180.0000	(30)
Dormer Flat Roof	3.8000		3.8000	0.1100	0.4180	9.0000	34.2000	(30)
Adj To RIR	2.0000		2.0000	0.1100	0.2200	9.0000	18.0000	(30)
Slope Roof	2.9000		2.9000	0.1100	0.3190	9.0000	26.1000	(30)
Total net area of external elements Aum(A, m2)			491.2200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		112.2885			(33)
Internal Wall 1			381.7200			9.0000	3435.4800	(32c)
Internal Floor 1			102.8000			18.0000	1850.4000	(32d)
Internal Ceiling 1			102.8000			9.0000	925.2000	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 32769.6100 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 143.8525 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	25.9100	0.3950	10.2345
E3 Sill	20.7000	0.0220	0.4554
E4 Jamb	59.8000	0.0170	1.0166
E5 Ground floor (normal)	52.4000	0.0840	4.4016
E6 Intermediate floor within a dwelling	42.4000	0.0010	0.0424
E16 Corner (normal)	43.0500	0.0460	1.9803
E10 Eaves (insulation at ceiling level)	41.1500	0.0600	2.4690
E17 Corner (inverted - internal area greater than external area)	22.5300	-0.0880	-1.9826
R6 Flat ceiling	2.3000	0.1200	0.2760
R7 Flat ceiling (inverted)	3.0000	0.1200	0.3600
R8 Roof to wall (rafter)	2.3000	0.1200	0.2760
R9 Roof to wall (flat ceiling)	3.0000	0.3200	0.9600
E13 Gable (insulation at rafter level)	1.4000	0.0500	0.0700
E14 Flat roof	12.8000	0.1600	2.0480

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 22.6071 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 134.8956 (37)

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

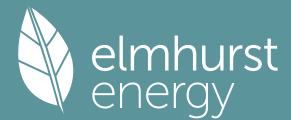
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	106.0709	103.9457	103.9457	103.5499	102.7878	101.0534	101.0534	100.7358	101.3807	103.1640	102.7878	103.1640
Average = Sum(39)m / 12 =	240.9665	238.8413	238.8413	238.4456	237.6834	235.9490	235.9490	235.6315	236.2764	238.0596	237.6834	238.0596

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0578	1.0485	1.0485	1.0467	1.0434	1.0358	1.0358	1.0344	1.0372	1.0450	1.0434	1.0450
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													3.0381	(42)
Hot water usage for mixer showers	75.1583	74.0288	72.3830	69.2339	66.9099	64.3183	62.8452	64.4786	66.2691	69.0518	72.2685	74.8704	74.8704	(42a)
Hot water usage for baths	32.4438	31.9619	31.2834	30.0323	29.0955	28.0568	27.4957	28.1695	28.9031	30.0146	31.2914	32.3341	32.3341	(42b)
Hot water usage for other uses	45.7429	44.0795	42.4161	40.7527	39.0894	37.4260	37.4260	39.0894	40.7527	42.4161	44.0795	45.7429	45.7429	(42c)
Average daily hot water use (litres/day)													140.9584	(43)
Daily hot water use	153.3449	150.0702	146.0825	140.0189	135.0948	129.8010	127.7668	131.7374	135.9250	141.4825	147.6394	152.9473	152.9473	(44)
Energy conte	242.8609	213.6980	224.5233	191.6789	181.8636	159.6055	154.5229	163.1184	167.6091	191.9904	210.3394	239.4785	239.4785	(45)
Energy content (annual)													2341.2890	
Distribution loss (46)m = 0.15 x (45)m	36.4291	32.0547	33.6785	28.7518	27.2795	23.9408	23.1784	24.4678	25.1414	28.7986	31.5509	35.9218	35.9218	(46)
Water storage loss:														
Store volume													196.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):													1.3120	(48)
Temperature factor from Table 2b													0.5400	(49)
Enter (49) or (54) in (55)													0.7085	(55)
Total storage loss	21.9629	19.8374	21.9629	21.2544	21.9629	21.2544	21.9629	21.9629	21.2544	21.9629	21.2544	21.9629	21.9629	(56)
If cylinder contains dedicated solar storage	21.9629	19.8374	21.9629	21.2544	21.9629	21.2544	21.9629	21.9629	21.2544	21.9629	21.2544	21.9629	21.9629	(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	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	0.0000	(61)
Total heat required for water heating calculated for each month	264.8238	233.5355	246.4862	212.9333	203.8264	180.8599	176.4858	185.0813	188.8635	213.9533	231.5938	261.4414	261.4414	(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	0.0000	(63a)
FV 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	-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	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	0.0000	(63d)
Output from w/h	264.8238	233.5355	246.4862	212.9333	203.8264	180.8599	176.4858	185.0813	188.8635	213.9533	231.5938	261.4414	261.4414	(64)
Total per year (kWh/year) = Sum(64)m =													2599.8842	(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	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	80.7513	71.0546	74.6540	63.7332	60.4696	53.0688	51.3789	54.2369	55.7300	63.8368	69.9379	79.6266	79.6266	(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	182.2842	182.2842	182.2842	182.2842	182.2842	182.2842	182.2842	182.2842	182.2842	182.2842	182.2842	182.2842 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	61.5771	54.6922	44.4787	33.6732	25.1711	21.2505	22.9619	29.8468	40.0603	50.8658	59.3679	63.2885 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	592.1723	598.3172	582.8322	549.8666	508.2535	469.1430	443.0148	436.8699	452.3548	485.3204	526.9336	566.0441 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	56.2665	56.2665	56.2665	56.2665	56.2665	56.2665	56.2665	56.2665	56.2665	56.2665	56.2665	56.2665 (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)	-121.5228	-121.5228	-121.5228	-121.5228	-121.5228	-121.5228	-121.5228	-121.5228	-121.5228	-121.5228	-121.5228	-121.5228 (71)
Water heating gains (Table 5)	108.5366	105.7360	100.3414	88.5184	81.2764	73.7067	69.0576	72.8990	77.4028	85.8022	97.1359	107.0250 (72)
Total internal gains	879.3138	875.7733	844.6802	789.0861	731.7289	681.1281	652.0622	656.6436	686.8458	739.0162	800.4652	853.3854 (73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b	Specific data or Table 6c	FF	Access Factor Table 6d	Gains W					
North	1.3200	12.4105	0.7600	0.7000	0.7700	6.0396 (74)						
East	9.3800	23.1112	0.7600	0.7000	0.7700	79.9228 (76)						
South	4.2900	52.9996	0.7600	0.7000	0.7700	83.8252 (78)						
West	12.0900	23.1112	0.7600	0.7000	0.7700	103.0135 (80)						
East	9.0300	23.1112	0.7600	0.7000	0.7700	76.9406 (76)						
Solar gains	349.7417	592.2986	912.4338	1304.2573	1521.2809	1660.9047	1547.4418	1363.5735	1105.2711	720.1269	427.0812	290.7327 (83)
Total gains	1229.0556	1468.0719	1757.1140	2093.3434	2253.0098	2342.0328	2199.5040	2020.2172	1792.1169	1459.1432	1227.5465	1144.1181 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												
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	37.7757	38.1118	38.1118	38.1750	38.2975	38.5790	38.5790	38.6310	38.5255	38.2369	38.2975	38.2369
alpha	3.5184	3.5408	3.5408	3.5450	3.5532	3.5719	3.5719	3.5754	3.5684	3.5491	3.5532	3.5491
util living area	0.9877	0.9768	0.9445	0.8638	0.7207	0.4977	0.3383	0.3877	0.6746	0.9133	0.9780	0.9904 (86)
MIT	19.4728	19.6736	20.0448	20.4416	20.7353	20.8802	20.9077	20.9040	20.8122	20.4051	19.8533	19.4365 (87)
Th 2	20.0354	20.0431	20.0431	20.0446	20.0473	20.0536	20.0536	20.0548	20.0524	20.0460	20.0473	20.0460 (88)
util rest of house	0.9852	0.9721	0.9328	0.8359	0.6663	0.4164	0.2406	0.2840	0.5952	0.8885	0.9726	0.9883 (89)
MIT 2	18.2361	18.4965	18.9633	19.4469	19.7805	19.9230	19.9412	19.9409	19.8688	19.4166	18.7303	18.1975 (90)
Living area fraction	18.4472	18.6975	19.1480	19.6167	19.9436	20.0864	20.1062	20.1053	20.0299	19.5854	18.9221	18.4091 (92)
MIT	18.4472	18.6975	19.1480	19.6167	19.9436	20.0864	20.1062	20.1053	20.0299	19.5854	18.9221	18.4091 (92)
Temperature adjustment												0.0000
adjusted MIT	18.4472	18.6975	19.1480	19.6167	19.9436	20.0864	20.1062	20.1053	20.0299	19.5854	18.9221	18.4091 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9792	0.9631	0.9191	0.8213	0.6598	0.4193	0.2461	0.2897	0.5931	0.8736	0.9638	0.9834 (94)
Useful gains	1203.5506	1413.9710	1614.9186	1719.3339	1486.4709	982.1186	541.3529	585.1778	1062.9522	1274.7515	1183.1238	1125.1297 (95)
Ext temp.	5.0000	5.0000	7.4000	9.8000	12.8000	15.8000	17.8000	17.6000	15.1000	11.5000	7.8000	4.9000 (96)
Heat loss rate W	3240.3369	3152.1153	2805.9108	2340.7574	1697.9100	1011.3746	544.1471	590.3327	1164.8250	1924.8005	2643.5284	3215.9629 (97)
Space heating kWh	1515.3690	1168.0330	886.0982	447.4249	157.3107	0.0000	0.0000	0.0000	0.0000	483.6365	1051.4913	1555.5799 (98a)
Space heating requirement - total per year (kWh/year)												7264.9434
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	1515.3690	1168.0330	886.0982	447.4249	157.3107	0.0000	0.0000	0.0000	0.0000	483.6365	1051.4913	1555.5799 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												7264.9434
Space heating per m ²												(98c) / (4) = 31.8918 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												
Fraction of main heating from main system 2												
Fraction of total heating from main system 1												
Fraction of total heating from main system 2												
Efficiency of main space heating system 1 (in %)												
Efficiency of main space heating system 2 (in %)												
Efficiency of secondary/supplementary heating system, %												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	1515.3690	1168.0330	886.0982	447.4249	157.3107	0.0000	0.0000	0.0000	0.0000	483.6365	1051.4913	1555.5799 (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 (201)
Space heating fuel (main heating system)	891.3935	687.0782	521.2342	263.1911	92.5357	0.0000	0.0000	0.0000	0.0000	284.4920	618.5243	915.0470 (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 (202)
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 (203)
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 (204)
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 (205)
Space heating fuel (main heating system 1)	891.3935	687.0782	521.2342	263.1911	92.5357	0.0000	0.0000	0.0000	0.0000	284.4920	618.5243	915.0470 (211)
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 (212)
Space heating fuel (main heating system 1)	891.3935	687.0782	521.2342	263.1911	92.5357	0.0000	0.0000	0.0000	0.0000	284.4920	618.5243	915.0470 (211)
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)

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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	0.0000	(215)
Space heating fuel used, main system 2														0.0000 (213)
Water heating														
Water heating requirement	264.8238	233.5355	246.4862	212.9333	203.8264	180.8599	176.4858	185.0813	188.8635	213.9533	231.5938	261.4414	261.4414	(64)
Efficiency of water heater (217)m	313.4050	313.4050	313.4050	313.4050	313.4050	313.4050	313.4050	313.4050	313.4050	313.4050	313.4050	313.4050	313.4050	(216)
Fuel for water heating, kWh/month	84.4989	74.5156	78.6478	67.9419	65.0361	57.7080	56.3124	59.0550	60.2618	68.2673	73.8960	83.4197	83.4197	(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	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	0.0000	(231)
Lighting	53.8980	43.2390	38.9319	28.5232	22.0321	18.0004	20.0985	26.1247	33.9334	44.5225	50.2881	55.3960	55.3960	(232)
Electricity generated by PVs (Appendix M) (negative quantity)														
(233a)m	-16.9374	-24.5087	-38.7718	-48.7646	-53.9967	-53.0863	-51.3764	-46.7311	-38.8809	-30.5500	-19.3907	-14.2867	-14.2867	(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	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	-1.9756	-3.9763	-8.9408	-16.4115	-24.1726	-29.4131	-28.0814	-23.4965	-16.7179	-7.5133	-2.8556	-1.5099	-1.5099	(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														4273.4961 (211)
Space heating fuel - main system 2														0.0000 (213)
Space heating fuel - secondary														0.0000 (215)
Efficiency of water heater														313.4050
Water heating fuel used														829.5605 (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)														434.9880 (232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation														-602.3459 (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														4935.6988 (238)

10a. Fuel costs - using BEDF prices (531)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	4273.4961	21.5100	919.2290 (240)
Space heating - main system 2	0.0000	21.5100	0.0000 (241)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	829.5605	21.5100	178.4385 (247)
Energy for instantaneous electric shower(s)	0.0000	21.5100	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	434.9880	21.5100	93.5659 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-437.2813	21.5100	-94.0592
PV Unit electricity exported	-165.0645	5.5900	-9.2271
Total			-103.2863 (252)
Total energy cost			1087.9471 (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	4273.4961	0.1559	666.0703 (261)
Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	829.5605	0.1413	117.2112 (264)
Space and water heating			783.2815 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	434.9880	0.1443	62.7822 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-437.2813	0.1330	-58.1772
PV Unit electricity exported	-165.0645	0.1204	-19.8789
Total			-78.0561 (269)
Total CO2, kg/year			768.0076 (272)

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

	Energy kWh/year	Primary energy factor kWh/year	Primary energy kWh/year
Space heating - main system 1	4273.4961	1.5770	6739.3786 (275)
Space heating - main system 2	0.0000	0.0000	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	829.5605	1.5225	1262.9811 (278)
Space and water heating			8002.3597 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)

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Energy for lighting	434.9880	1.5338	667.1991 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-437.2813	1.4916	-652.2546
PV Unit electricity exported	-165.0645	0.4417	-72.9023
Total			-725.1569 (283)
Total Primary energy kWh/year			7944.4020 (286)

SAP 10 EPC IMPROVEMENTS

Notional

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

N Solar water heating SAP increase too small
U Solar photovoltaic panels Already installed
V2 Wind turbine Not applicable

Recommended measures: (none)	SAP change	Cost change	CO2 change
---------------------------------	------------	-------------	------------

Measures omitted - SAP change or cost saving too small:
N Solar water heating + 0.4 -£ 30 -17 kg (2.2%)

Recommended measures (none)	Typical annual savings	Energy efficiency	Environmental impact
	Total Savings £0	0.00 kg/m ²	

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

Fuel prices for cost data on this page from database revision number 531 TEST (31 Oct 2023)
Recommendation texts revision number 6.1 (11 Jun 2019)

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

	Current £1191	Potential £1191	Saving £0
Electricity			
Space heating	£919	£919	£0
Water heating	£178	£178	£0
Lighting	£94	£94	£0
Generated (PV)	-£103	-£103	£0
Total cost of fuels	£1088	£1088	£0
Total cost of uses	£1088	£1088	£0
Delivered energy	22 kWh/m ²	22 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	0.8 tonnes	0.8 tonnes	0.0 tonnes
CO2 emissions per m ²	3 kg/m ²	3 kg/m ²	0 kg/m ²
Primary energy	35 kWh/m ²	35 kWh/m ²	0 kWh/m ²

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 (m ²)	Storey height (m)	Volume (m ³)
Ground floor	125.0000 (1b)	x 2.3800 (2b)	= 297.5000 (1b) - (3b)
First floor	102.8000 (1c)	x 2.7500 (2c)	= 282.7000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	227.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 580.2000 (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	5 * 10 = 50.0000 (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) =	50.0000 / (5) = 0.0862 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3362 (18)
Number of sides sheltered	2 (19)

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Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
 Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.2858 (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	0.3643	0.3572	0.3500	0.3143	0.3072	0.2715	0.2715	0.2643	0.2858	0.3072	0.3215	0.3358 (22b)
	0.5664	0.5638	0.5613	0.5494	0.5472	0.5368	0.5368	0.5349	0.5408	0.5472	0.5517	0.5564 (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
HGD			1.9100	1.2000	2.2920		(26a)
Windows (Uw = 1.20)			27.0800	1.1450	31.0076		(27)
Fully Glazed Doors (Uw = 1.20)			9.0300	1.1450	10.3397		(27)
Heatloss Floor 1			125.0000	0.1300	16.2500	110.0000	13750.0000 (28a)
Brick Facing	127.3500	22.2700	105.0800	0.1900	19.9652	60.0000	6304.8000 (29a)
Rendered	102.0300	13.8800	88.1500	0.1900	16.7485	60.0000	5289.0000 (29a)
Dormer Walls	3.5000	1.8700	1.6300	0.2000	0.3260	9.0000	14.6700 (29a)
RIR Stud			7.6900	0.2000	1.5380	9.0000	69.2100 (29a)
Plane Ceiling	96.9500		96.9500	0.1100	10.6645	9.0000	872.5500 (30)
GF Flat Roof	20.0000		20.0000	0.1100	2.2000	9.0000	180.0000 (30)
Dormer Flat Roof	3.8000		3.8000	0.1100	0.4180	9.0000	34.2000 (30)
Adj To RIR	2.0000		2.0000	0.1100	0.2200	9.0000	18.0000 (30)
Slope Roof	2.9000		2.9000	0.1100	0.3190	9.0000	26.1000 (30)
Total net area of external elements Aum(A, m2)			491.2200				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 112.2885		(33)
Internal Wall 1			381.7200			9.0000	3435.4800 (32c)
Internal Floor 1			102.8000			18.0000	1850.4000 (32d)
Internal Ceiling 1			102.8000			9.0000	925.2000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 32769.6100 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 143.8525 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	25.9100	0.3950	10.2345
E3 Sill	20.7000	0.0220	0.4554
E4 Jamb	59.8000	0.0170	1.0166
E5 Ground floor (normal)	52.4000	0.0840	4.4016
E6 Intermediate floor within a dwelling	42.4000	0.0010	0.0424
E16 Corner (normal)	43.0500	0.0460	1.9803
E10 Eaves (insulation at ceiling level)	41.1500	0.0600	2.4690
E17 Corner (inverted - internal area greater than external area)	22.5300	-0.0880	-1.9826
R6 Flat ceiling	2.3000	0.1200	0.2760
R7 Flat ceiling (inverted)	3.0000	0.1200	0.3600
R8 Roof to wall (rafter)	2.3000	0.1200	0.2760
R9 Roof to wall (flat ceiling)	3.0000	0.3200	0.9600
E13 Gable (insulation at rafter level)	1.4000	0.0500	0.0700
E14 Flat roof	12.8000	0.1600	2.0480

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 22.6071 (36)
 Point Thermal bridges 0.0000 (36a) =
 Total fabric heat loss (33) + (36) + (36a) = 134.8956 (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	108.4404	107.9469	107.4633	105.1915	104.7664	102.7878	102.7878	102.4214	103.5499	104.7664	105.6263	106.5252 (38)
Heat transfer coeff	243.3360	242.8426	242.3589	240.0871	239.6621	237.6834	237.6834	237.3170	238.4456	239.6621	240.5219	241.4209 (39)
Average = Sum(39)m / 12 =												240.0851

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0682	1.0660	1.0639	1.0539	1.0521	1.0434	1.0434	1.0418	1.0467	1.0521	1.0558	1.0598 (40)
HLP (average)												1.0539
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												3.0381 (42)
Hot water usage for mixer showers												
75.1583	74.0288	72.3830	69.2339	66.9099	64.3183	62.8452	64.4786	66.2691	69.0518	72.2685	74.8704 (42a)	
Hot water usage for baths												
32.4438	31.9619	31.2834	30.0323	29.0955	28.0568	27.4957	28.1695	28.9031	30.0146	31.2914	32.3341 (42b)	
Hot water usage for other uses												
45.7429	44.0795	42.4161	40.7527	39.0894	37.4260	37.4260	39.0894	40.7527	42.4161	44.0795	45.7429 (42c)	
Average daily hot water use (litres/day)												140.9584 (43)
Daily hot water use	153.3449	150.0702	146.0825	140.0189	135.0948	129.8010	127.7668	131.7374	135.9250	141.4825	147.6394	152.9473 (44)
Energy conte	242.8609	213.6980	224.5233	191.6789	181.8636	159.6055	154.5229	163.1184	167.6091	191.9904	210.3394	239.4785 (45)
Energy content (annual)												Total = Sum(45)m = 2341.2890
Distribution loss (46)m = 0.15 x (45)m												
36.4291	32.0547	33.6785	28.7518	27.2795	23.9408	23.1784	24.4678	25.1414	28.7986	31.5509	35.9218 (46)	
Water storage loss:												
Store volume												196.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3120 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7085 (55)
Total storage loss	21.9629	19.8374	21.9629	21.2544	21.9629	21.2544	21.9629	21.9629	21.2544	21.9629	21.2544	21.9629 (56)
If cylinder contains dedicated solar storage	21.9629	19.8374	21.9629	21.2544	21.9629	21.2544	21.9629	21.9629	21.2544	21.9629	21.2544	21.9629 (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	264.8238	233.5355	246.4862	212.9333	203.8264	180.8599	176.4858	185.0813	188.8635	213.9533	231.5938	261.4414 (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)

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Output from w/h	264.8238	233.5355	246.4862	212.9333	203.8264	180.8599	176.4858	185.0813	188.8635	213.9533	231.5938	261.4414 (64)
	Total per year (kWh/year) = Sum(64)m = 2599.8842 (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	80.7513	71.0546	74.6540	63.7332	60.4696	53.0688	51.3789	54.2369	55.7300	63.8368	69.9379	79.6266 (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	182.2842	182.2842	182.2842	182.2842	182.2842	182.2842	182.2842	182.2842	182.2842	182.2842	182.2842	182.2842 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	61.5771	54.6922	44.4787	33.6732	25.1711	21.2505	22.9619	29.8468	40.0603	50.8658	59.3679	63.2885 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	592.1723	598.3172	582.8322	549.8666	508.2535	469.1430	443.0148	436.8699	452.3548	485.3204	526.9336	566.0441 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	56.2665	56.2665	56.2665	56.2665	56.2665	56.2665	56.2665	56.2665	56.2665	56.2665	56.2665	56.2665 (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)	-121.5228	-121.5228	-121.5228	-121.5228	-121.5228	-121.5228	-121.5228	-121.5228	-121.5228	-121.5228	-121.5228	-121.5228 (71)
Water heating gains (Table 5)	108.5366	105.7360	100.3414	88.5184	81.2764	73.7067	69.0576	72.8990	77.4028	85.8022	97.1359	107.0250 (72)
Total internal gains	879.3138	875.7733	844.6802	789.0861	731.7289	681.1281	652.0622	656.6436	686.8458	739.0162	800.4652	853.3854 (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	1.3200	10.6334	0.7600	0.7000	0.7700	5.1748 (74)						
East	9.3800	19.6403	0.7600	0.7000	0.7700	67.9196 (76)						
South	4.2900	46.7521	0.7600	0.7000	0.7700	73.9440 (78)						
West	12.0900	19.6403	0.7600	0.7000	0.7700	87.5424 (80)						
East	9.0300	19.6403	0.7600	0.7000	0.7700	65.3853 (76)						
Solar gains	299.9660	563.0146	882.5479	1238.9952	1489.7273	1515.5648	1446.5374	1259.3294	1008.8316	655.0239	369.4032	249.8224 (83)
Total gains	1179.2799	1438.7878	1727.2281	2028.0813	2221.4562	2196.6929	2098.5996	1915.9730	1695.6775	1394.0401	1169.8684	1103.2078 (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)	0.9905	0.9807	0.9560	0.8942	0.7806	0.6214	0.4764	0.5339	0.7681	0.9390	0.9838	0.9925 (86)
tau	37.4078	37.4838	37.5586	37.9140	37.9813	38.2975	38.2975	38.3566	38.1750	37.9813	37.8455	37.7046
alpha	3.4939	3.4989	3.5039	3.5276	3.5321	3.5532	3.5532	3.5571	3.5450	3.5321	3.5230	3.5136
util living area	0.9905	0.9807	0.9560	0.8942	0.7806	0.6214	0.4764	0.5339	0.7681	0.9390	0.9838	0.9925 (86)
MIT	19.3383	19.5532	19.8985	20.3172	20.6427	20.8279	20.8881	20.8757	20.7256	20.2667	19.7170	19.2994 (87)
Th 2	20.0269	20.0287	20.0304	20.0386	20.0402	20.0473	20.0473	20.0487	20.0446	20.0402	20.0371	20.0338 (88)
util rest of house	0.9886	0.9768	0.9470	0.8725	0.7365	0.5488	0.3819	0.4368	0.7055	0.9219	0.9799	0.9909 (89)
MIT 2	18.0581	18.3328	18.7701	19.2931	19.6742	19.8734	19.9235	19.9172	19.7779	19.2437	18.5496	18.0135 (90)
Living area fraction	18.2767	18.5412	18.9628	19.4680	19.8396	20.0364	20.0882	20.0809	19.9397	19.4184	18.7490	18.2331 (92)
Temperature adjustment	18.2767	18.5412	18.9628	19.4680	19.8396	20.0364	20.0882	20.0809	19.9397	19.4184	18.7490	0.0000
adjusted MIT	18.2767	18.5412	18.9628	19.4680	19.8396	20.0364	20.0882	20.0809	19.9397	19.4184	18.7490	18.2331 (93)

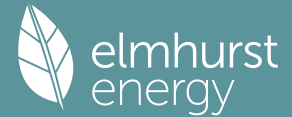
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	1160.0807	1393.7444	1613.7259	1738.2807	1613.2417	1203.4756	810.3115	843.6217	1183.1068	1265.3892	1137.8395	1088.6796 (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	3401.0444	3312.6724	3020.4712	2537.2293	1950.7462	1292.1323	829.0868	873.5352	1392.4621	2113.4281	2801.8315	3387.8850 (97)
Space heating kWh	1667.2770	1289.5196	1046.6185	575.2430	251.1034	0.0000	0.0000	0.0000	0.0000	630.9409	1198.0743	1710.6088 (98a)
Space heating requirement - total per year (kWh/year)												8369.3854
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	1667.2770	1289.5196	1046.6185	575.2430	251.1034	0.0000	0.0000	0.0000	0.0000	630.9409	1198.0743	1710.6088 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												8369.3854
Space heating per m2												(98c) / (4) = 36.7401 (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												0.0000 (203)
Fraction of total heating from main system 1												1.0000 (204)
Fraction of total heating from main system 2												0.0000 (205)
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	

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Space heating requirement	1667.2770	1289.5196	1046.6185	575.2430	251.1034	0.0000	0.0000	0.0000	0.0000	630.9409	1198.0743	1710.6088	(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)	980.7512	758.5410	615.6579	338.3782	147.7079	0.0000	0.0000	0.0000	0.0000	371.1417	704.7496	1006.2404	(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)
Space heating fuel used, main system 2												0.0000	(213)
Water heating requirement	264.8238	233.5355	246.4862	212.9333	203.8264	180.8599	176.4858	185.0813	188.8635	213.9533	231.5938	261.4414	(64)
Efficiency of water heater (217)m	313.4050	313.4050	313.4050	313.4050	313.4050	313.4050	313.4050	313.4050	313.4050	313.4050	313.4050	313.4050	(216)
Fuel for water heating, kWh/month	84.4989	74.5156	78.6478	67.9419	65.0361	57.7080	56.3124	59.0550	60.2618	68.2673	73.8960	83.4197	(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	53.8980	43.2390	38.9319	28.5232	22.0321	18.0004	20.0985	26.1247	33.9334	44.5225	50.2881	55.3960	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-14.7410	-23.5547	-38.0369	-47.3447	-54.0076	-49.4410	-48.7590	-43.9011	-36.1320	-28.4651	-17.0715	-12.4450	(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	-1.5371	-3.6088	-8.2256	-14.6562	-22.5893	-25.8660	-25.5528	-21.0255	-14.7185	-6.2598	-2.2367	-1.1770	(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												4923.1679	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												313.4050	
Water heating fuel used												829.5605	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:												0.0000	(231)
Total electricity for the above, kWh/year												434.9880	(232)
Electricity for lighting (calculated in Appendix L)													
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-561.3528	(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												5626.3636	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	4923.1679	16.4900	811.8304	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	829.5605	16.4900	136.7945	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Energy for lighting	434.9880	16.4900	71.7295	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-413.8996	16.4900	-68.2520	
PV Unit electricity exported	-147.4532	5.5900	-8.2426	
Total			-76.4947	(252)
Total energy cost			943.8598	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)		1.2456	(257)
SAP value	$[(255) \times (256)] / [(4) + 45.0] =$	79.8094	
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	4923.1679	0.1552	764.2198	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	829.5605	0.1413	117.2112	(264)
Space and water heating			881.4310	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	434.9880	0.1443	62.7822	(268)

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Energy saving/generation technologies			
PV Unit electricity used in dwelling	-413.8996	0.1330	-55.0383
PV Unit electricity exported	-147.4532	0.1202	-17.7236
Total			-72.7619 (269)
Total CO2, kg/year			871.4514 (272)
CO2 emissions per m2			3.8300 (273)
EI value			95.7194
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 FOR IMPROVED DWELLING

 1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	125.0000 (1b)	x 2.3800 (2b)	= 297.5000 (1b) - (3b)
First floor	102.8000 (1c)	x 2.7500 (2c)	= 282.7000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	227.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 580.2000 (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	5 * 10 = 50.0000 (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) =	50.0000 / (5) = 0.0862 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3362 (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) = 0.2858 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.6000	4.1000	4.1000	4.0000	3.8000	3.3000	3.3000	3.2000	3.4000	3.9000	3.8000	3.9000 (22)
Wind factor	1.1500	1.0250	1.0250	1.0000	0.9500	0.8250	0.8250	0.8000	0.8500	0.9750	0.9500	0.9750 (22a)
Adj infilt rate												
Effective ac	0.3286	0.2929	0.2929	0.2858	0.2715	0.2357	0.2357	0.2286	0.2429	0.2786	0.2715	0.2786 (22b)
	0.5540	0.5429	0.5429	0.5408	0.5368	0.5278	0.5278	0.5261	0.5295	0.5388	0.5368	0.5388 (25)

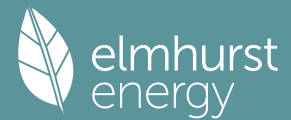
 3. Heat losses and heat loss parameter

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
HGD			1.9100	1.2000	2.2920		(26a)
Windows (Uw = 1.20)			27.0800	1.1450	31.0076		(27)
Fully Glazed Doors (Uw = 1.20)			9.0300	1.1450	10.3397		(27)
Heatloss Floor 1			125.0000	0.1300	16.2500	110.0000	13750.0000 (28a)
Brick Facing	127.3500	22.2700	105.0800	0.1900	19.9652	60.0000	6304.8000 (29a)
Rendered	102.0300	13.8800	88.1500	0.1900	16.7485	60.0000	5289.0000 (29a)
Dormer Walls	3.5000	1.8700	1.6300	0.2000	0.3260	9.0000	14.6700 (29a)
RIR Stud	7.6900		7.6900	0.2000	1.5380	9.0000	69.2100 (29a)
Plane Ceiling	96.9500		96.9500	0.1100	10.6645	9.0000	872.5500 (30)
GF Flat Roof	20.0000		20.0000	0.1100	2.2000	9.0000	180.0000 (30)
Dormer Flat Roof	3.8000		3.8000	0.1100	0.4180	9.0000	34.2000 (30)
Adj To RIR	2.0000		2.0000	0.1100	0.2200	9.0000	18.0000 (30)
Slope Roof	2.9000		2.9000	0.1100	0.3190	9.0000	26.1000 (30)
Total net area of external elements Aum(A, m2)			491.2200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	112.2885		(33)
Internal Wall 1			381.7200			9.0000	3435.4800 (32c)
Internal Floor 1			102.8000			18.0000	1850.4000 (32d)
Internal Ceiling 1			102.8000			9.0000	925.2000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	32769.6100 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							143.8525 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	25.9100	0.3950	10.2345
E3 Sill	20.7000	0.0220	0.4554
E4 Jamb	59.8000	0.0170	1.0166
E5 Ground floor (normal)	52.4000	0.0840	4.4016
E6 Intermediate floor within a dwelling	42.4000	0.0010	0.0424
E16 Corner (normal)	43.0500	0.0460	1.9803
E10 Eaves (insulation at ceiling level)	41.1500	0.0600	2.4690
E17 Corner (inverted - internal area greater than external area)	22.5300	-0.0880	-1.9826

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R6 Flat ceiling	2.3000	0.1200	0.2760
R7 Flat ceiling (inverted)	3.0000	0.1200	0.3600
R8 Roof to wall (rafter)	2.3000	0.1200	0.2760
R9 Roof to wall (flat ceiling)	3.0000	0.3200	0.9600
E13 Gable (insulation at rafter level)	1.4000	0.0500	0.0700
E14 Flat roof	12.8000	0.1600	2.0480

Thermal bridges (Sum(L x Psi) calculated using Appendix K)
 Point Thermal bridges (36a) = 22.6071 (36)
 Total fabric heat loss (33) + (36) + (36a) = 134.8956 (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	106.0709	103.9457	103.9457	103.5499	102.7878	101.0534	101.0534	100.7358	101.3807	103.1640	102.7878	103.1640 (38)
Average = Sum(39)m / 12 =	240.9665	238.8413	238.8413	238.4456	237.6834	235.9490	235.9490	235.6315	236.2764	238.0596	237.6834	238.0596 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0578	1.0485	1.0485	1.0467	1.0434	1.0358	1.0358	1.0344	1.0372	1.0450	1.0434	1.0450 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 3.0381 (42)

Hot water usage for mixer showers 75.1583 74.0288 72.3830 69.2339 66.9099 64.3183 62.8452 64.4786 66.2691 69.0518 72.2685 74.8704 (42a)

Hot water usage for baths 32.4438 31.9619 31.2834 30.0323 29.0955 28.0568 27.4957 28.1695 28.9031 30.0146 31.2914 32.3341 (42b)

Hot water usage for other uses 45.7429 44.0795 42.4161 40.7527 39.0894 37.4260 37.4260 39.0894 40.7527 42.4161 44.0795 45.7429 (42c)

Average daily hot water use (litres/day) 140.9584 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy cont	153.3449	150.0702	146.0825	140.0189	135.0948	129.8010	127.7668	131.7374	135.9250	141.4825	147.6394	152.9473 (44)
Energy content (annual)	242.8609	213.6980	224.5233	191.6789	181.8636	159.6055	154.5229	163.1184	167.6091	191.9904	210.3394	239.4785 (45)
Distribution loss (46)m = 0.15 x (45)m	36.4291	32.0547	33.6785	28.7518	27.2795	23.9408	23.1784	24.4678	25.1414	28.7986	31.5509	35.9218 (46)
Water storage loss:												196.0000 (47)
Store volume												1.3120 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.7085 (55)
Enter (49) or (54) in (55)												
Total storage loss	21.9629	19.8374	21.9629	21.2544	21.9629	21.2544	21.9629	21.9629	21.2544	21.9629	21.2544	21.9629 (56)
If cylinder contains dedicated solar storage	21.9629	19.8374	21.9629	21.2544	21.9629	21.2544	21.9629	21.9629	21.2544	21.9629	21.2544	21.9629 (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	264.8238	233.5355	246.4862	212.9333	203.8264	180.8599	176.4858	185.0813	188.8635	213.9533	231.5938	261.4414 (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	264.8238	233.5355	246.4862	212.9333	203.8264	180.8599	176.4858	185.0813	188.8635	213.9533	231.5938	261.4414 (64)
Total per year (kWh/year) = Sum(64)m =												2599.8842 (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	80.7513	71.0546	74.6540	63.7332	60.4696	53.0688	51.3789	54.2369	55.7300	63.8368	69.9379	79.6266 (65)

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

Metabolic gains (Table 5), Watts

(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	182.2842	182.2842	182.2842	182.2842	182.2842	182.2842	182.2842	182.2842	182.2842	182.2842	182.2842	182.2842 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	61.5771	54.6922	44.4787	33.6732	25.1711	21.2505	22.9619	29.8468	40.0603	50.8658	59.3679	63.2885 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	592.1723	598.3172	582.8322	549.8666	508.2535	469.1430	443.0148	436.8699	452.3548	485.3204	526.9336	566.0441 (68)
Pumps, fans	56.2665	56.2665	56.2665	56.2665	56.2665	56.2665	56.2665	56.2665	56.2665	56.2665	56.2665	56.2665 (69)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (Table 5)	-121.5228	-121.5228	-121.5228	-121.5228	-121.5228	-121.5228	-121.5228	-121.5228	-121.5228	-121.5228	-121.5228	-121.5228 (71)
Total internal gains	108.5366	105.7360	100.3414	88.5184	81.2764	73.7067	69.0576	72.8990	77.4028	85.8022	97.1359	107.0250 (72)
	879.3138	875.7733	844.6802	789.0861	731.7289	681.1281	652.0622	656.6436	686.8458	739.0162	800.4652	853.3854 (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	1.3200	12.4105	0.7600	0.7000	0.7700	6.0396 (74)						
East	9.3800	23.1112	0.7600	0.7000	0.7700	79.9228 (76)						
South	4.2900	52.9996	0.7600	0.7000	0.7700	83.8252 (78)						
West	12.0900	23.1112	0.7600	0.7000	0.7700	103.0135 (80)						
East	9.0300	23.1112	0.7600	0.7000	0.7700	76.9406 (76)						
Solar gains	349.7417	592.2986	912.4338	1304.2573	1521.2809	1660.9047	1547.4418	1363.5735	1105.2711	720.1269	427.0812	290.7327 (83)
Total gains	1229.0556	1468.0719	1757.1140	2093.3434	2253.0098	2342.0328	2199.5040	2020.2172	1792.1169	1459.1432	1227.5465	1144.1181 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												
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	37.7757	38.1118	38.1118	38.1750	38.2975	38.5790	38.5790	38.6310	38.5255	38.2369	38.2975	38.2369
alpha	3.5184	3.5408	3.5408	3.5450	3.5532	3.5719	3.5719	3.5754	3.5684	3.5491	3.5532	3.5491
util living area	0.9877	0.9768	0.9445	0.8638	0.7207	0.4977	0.3383	0.3877	0.6746	0.9133	0.9780	0.9904 (86)
MIT	19.4728	19.6736	20.0448	20.4416	20.7353	20.8802	20.9077	20.9040	20.8122	20.4051	19.8533	19.4365 (87)
Th 2	20.0354	20.0431	20.0431	20.0446	20.0473	20.0536	20.0536	20.0548	20.0524	20.0460	20.0473	20.0460 (88)
util rest of house	0.9852	0.9721	0.9328	0.8359	0.6663	0.4164	0.2406	0.2840	0.5952	0.8885	0.9726	0.9883 (89)
MIT 2	18.2361	18.4965	18.9633	19.4469	19.7805	19.9230	19.9412	19.9409	19.8688	19.4166	18.7303	18.1975 (90)
Living area fraction										FLA = Living area / (4) = 0.1708 (91)		
MIT	18.4472	18.6975	19.1480	19.6167	19.9436	20.0864	20.1062	20.1053	20.0299	19.5854	18.9221	18.4091 (92)
Temperature adjustment												0.0000
adjusted MIT	18.4472	18.6975	19.1480	19.6167	19.9436	20.0864	20.1062	20.1053	20.0299	19.5854	18.9221	18.4091 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9792	0.9631	0.9191	0.8213	0.6598	0.4193	0.2461	0.2897	0.5931	0.8736	0.9638	0.9834 (94)
Useful gains	1203.5506	1413.9710	1614.9186	1719.3339	1486.4709	982.1186	541.3529	585.1778	1062.9522	1274.7515	1183.1238	1125.1297 (95)
Ext temp.	5.0000	5.5000	7.4000	9.8000	12.8000	15.8000	17.8000	17.6000	15.1000	11.5000	7.8000	4.9000 (96)
Heat loss rate W	3240.3369	3152.1153	2805.9108	2340.7574	1697.9100	1011.3746	544.1471	590.3327	1164.8250	1924.8005	2643.5284	3215.9629 (97)
Space heating kWh	1515.3690	1168.0330	886.0982	447.4249	157.3107	0.0000	0.0000	0.0000	0.0000	483.6365	1051.4913	1555.5799 (98a)
Space heating requirement - total per year (kWh/year)												7264.9434
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	1515.3690	1168.0330	886.0982	447.4249	157.3107	0.0000	0.0000	0.0000	0.0000	483.6365	1051.4913	1555.5799 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												7264.9434
Space heating per m2										(98c) / (4) =		31.8918 (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												0.0000 (203)
Fraction of total heating from main system 1												1.0000 (204)
Fraction of total heating from main system 2												0.0000 (205)
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)
Space heating requirement	1515.3690	1168.0330	886.0982	447.4249	157.3107	0.0000	0.0000	0.0000	0.0000	483.6365	1051.4913	1555.5799 (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)	891.3935	687.0782	521.2342	263.1911	92.5357	0.0000	0.0000	0.0000	0.0000	284.4920	618.5243	915.0470 (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)
Space heating fuel used, main system 2												0.0000 (213)
Water heating												
Water heating requirement	264.8238	233.5355	246.4862	212.9333	203.8264	180.8599	176.4858	185.0813	188.8635	213.9533	231.5938	261.4414 (64)
Efficiency of water heater (217)m	313.4050	313.4050	313.4050	313.4050	313.4050	313.4050	313.4050	313.4050	313.4050	313.4050	313.4050	313.4050 (216)
Fuel for water heating, kWh/month	84.4989	74.5156	78.6478	67.9419	65.0361	57.7080	56.3124	59.0550	60.2618	68.2673	73.8960	83.4197 (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	53.8980	43.2390	38.9319	28.5232	22.0321	18.0004	20.0985	26.1247	33.9334	44.5225	50.2881	55.3960 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-16.9374	-24.5087	-38.7718	-48.7646	-53.9967	-53.0863	-51.3764	-46.7311	-38.8809	-30.5500	-19.3907	-14.2867 (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	-1.9756	-3.9763	-8.9408	-16.4115	-24.1726	-29.4131	-28.0814	-23.4965	-16.7179	-7.5133	-2.8556	-1.5099 (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												4273.4961 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												313.4050
Water heating fuel used												829.5605 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												0.0000 (231)

Full SAP Calculation Printout



Electricity for lighting (calculated in Appendix L)	434.9880	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-602.3459	(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	4935.6988	(238)

10a. Fuel costs - using BEDF prices (531)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	4273.4961	21.5100	919.2290	(240)
Space heating - main system 2	0.0000	21.5100	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	829.5605	21.5100	178.4385	(247)
Energy for instantaneous electric shower(s)	0.0000	21.5100	0.0000	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Energy for lighting	434.9880	21.5100	93.5659	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-437.2813	21.5100	-94.0592	
PV Unit electricity exported	-165.0645	5.5900	-9.2271	
Total			-103.2863	(252)
Total energy cost			1087.9471	(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	4273.4961	0.1559	666.0703	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	829.5605	0.1413	117.2112	(264)
Space and water heating			783.2815	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	434.9880	0.1443	62.7822	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-437.2813	0.1330	-58.1772	
PV Unit electricity exported	-165.0645	0.1204	-19.8789	
Total			-78.0561	(269)
Total CO2, kg/year			768.0076	(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	4273.4961	1.5770	6739.3786	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	829.5605	1.5225	1262.9811	(278)
Space and water heating			8002.3597	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	434.9880	1.5338	667.1991	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-437.2813	1.4916	-652.2546	
PV Unit electricity exported	-165.0645	0.4417	-72.9023	
Total			-725.1569	(283)
Total Primary energy kWh/year			7944.4020	(286)