

Full SAP Calculation Printout



Property Reference	LANDMARK-7085-23		Issued on Date	31/10/2023	
Assessment Reference	SEC1 ASHP cavity	Prop Type Ref	DS		
Property	Proposed dwelling, 15, Coach Lane, Redruth, Cornwall, TR15 2TP				
SAP Rating	99 A	DER	-1.21	TER	11.92
Environmental	101 A	% DER < TER			110.15
CO ₂ Emissions (t/year)	-0.27	DFEE	43.02	TFEE	44.98
Compliance Check	See BREL	% DFEE < TFEE			4.38
% DPER < TPER	90.78	DPER	5.75	TPER	62.45
Assessor Details	Mr. Stuart Thomas			Assessor ID	V220-0003
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	55.5100 (1b)	x 2.6300 (2b)	= 145.9913 (1b) - (3b)
First floor	50.6300 (1c)	x 2.6500 (2c)	= 134.1695 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	106.1400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 280.1608 (5)

2. Ventilation rate

	m3 per hour												
Number of open chimneys	0 * 80 =											0.0000 (6a)	
Number of open flues	0 * 20 =											0.0000 (6b)	
Number of chimneys / flues attached to closed fire	0 * 10 =											0.0000 (6c)	
Number of flues attached to solid fuel boiler	0 * 20 =											0.0000 (6d)	
Number of flues attached to other heater	0 * 35 =											0.0000 (6e)	
Number of blocked chimneys	0 * 20 =											0.0000 (6f)	
Number of intermittent extract fans	0 * 10 =											0.0000 (7a)	
Number of passive vents	0 * 10 =											0.0000 (7b)	
Number of flueless gas fires	0 * 40 =											0.0000 (7c)	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =											0.0000 (8)	
Pressure test	Yes												
Pressure Test Method	Blower Door												
Measured/design AP50	3.0000											(17)	
Infiltration rate	0.1500											(18)	
Number of sides sheltered	3											(19)	
Shelter factor	(20) = 1 - [0.075 x (19)] =											0.7750 (20)	
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =											0.1162 (21)	
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation												0.5000 (23a)	
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)	
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												81.0000 (23c)	
Effective ac	0.2432	0.2403	0.2374	0.2229	0.2200	0.2054	0.2054	0.2025	0.2112	0.2200	0.2258	0.2316	(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
Window (Uw = 1.20)			18.1200	1.1450	20.7481		(27)
Door			6.3000	1.2000	7.5600		(26a)
Floor 1 P/a 0.54			55.5100	0.1200	6.6612	110.0000	6106.1000 (28a)
External Wall 1 Stone	45.9600	10.4100	35.5500	0.2100	7.4655	190.0000	6754.5000 (29a)
External Wall 2 Render	107.5600	14.0100	93.5500	0.2100	19.6455	190.0000	17774.5000 (29a)
External Roof 1 horz	55.5100		55.5100	0.0900	4.9959	9.0000	499.5900 (30)
Total net area of external elements Aum(A, m ²)			264.5400				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		67.0762		(33)
Internal Wall 1 GF			72.0000			100.0000	7200.0000 (32c)
Internal Wall 2 FF			112.3200			9.0000	1010.8800 (32c)
Internal Floor 1			50.6300			18.0000	911.3400 (32d)
Internal Ceiling 1			50.6300			9.0000	455.6700 (32e)
Heat capacity Cm = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =				40712.5800 (34)

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Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 383.5743 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element			
E16 Corner (normal)	20.2000	0.0520	1.0504
E5 Ground floor (normal)	30.4000	0.1640	4.9856
E6 Intermediate floor within a dwelling	28.8000	0.0020	0.0576
E10 Eaves (insulation at ceiling level)	18.2000	0.0720	1.3104
E12 Gable (insulation at ceiling level)	12.2000	0.1740	2.1228
E1 Steel lintel with perforated steel base plate	17.2000	0.0200	0.3440
E3 Sill	14.2000	0.0180	0.2556
E4 Jamb	40.8000	0.0140	0.5712

Thermal bridges (Sum(L x Psi) calculated using Appendix K)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 77.7738 (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	22.4863	22.2176	21.9489	20.6055	20.3368	18.9933	18.9933	18.7246	19.5307	20.3368	20.8742	21.4116 (38)
Average = Sum(39)m / 12 =	100.2601	99.9914	99.7227	98.3793	98.1106	96.7671	96.7671	96.4984	97.3045	98.1106	98.6480	99.1853 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9446	0.9421	0.9395	0.9269	0.9244	0.9117	0.9117	0.9092	0.9168	0.9244	0.9294	0.9345 (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 (42)
Hot water usage for baths	81.8844	80.6683	78.9558	75.7982	73.4339	70.8122	69.3961	71.0966	72.9482	75.7535	78.9761	81.6076 (42b)
Hot water usage for other uses	43.1979	41.6271	40.0562	38.4854	36.9146	35.3437	35.3437	36.9146	38.4854	40.0562	41.6271	43.1979 (42c)
Average daily hot water use (litres/day)	125.0823	122.2954	119.0120	114.2836	110.3484	106.1559	104.7398	108.0112	111.4336	115.8097	120.6032	124.8055 (43)
Daily hot water use	125.0823	122.2954	119.0120	114.2836	110.3484	106.1559	104.7398	108.0112	111.4336	115.8097	120.6032	124.8055 (44)
Energy conte	198.0998	174.1470	182.9171	156.4486	148.5502	130.5311	126.6737	133.7404	137.4087	157.1527	171.8213	195.4153 (45)
Energy content (annual)	198.0998	174.1470	182.9171	156.4486	148.5502	130.5311	126.6737	133.7404	137.4087	157.1527	171.8213	195.4153 (45)
Distribution loss (46)m = 0.15 x (45)m	29.7150	26.1221	27.4376	23.4673	22.2825	19.5797	19.0011	20.0611	20.6113	23.5729	25.7732	29.3123 (46)
Water storage loss:												
Store volume												200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8640 (55)
Total storage loss	26.7840	24.1920	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	25.9200	26.7840	25.9200	26.7840 (56)
If cylinder contains dedicated solar storage	26.7840	24.1920	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	25.9200	26.7840	25.9200	26.7840 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	248.1462	219.3502	232.9635	204.8806	198.5966	178.9631	176.7201	183.7868	185.8407	207.1991	220.2533	245.4617 (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	248.1462	219.3502	232.9635	204.8806	198.5966	178.9631	176.7201	183.7868	185.8407	207.1991	220.2533	245.4617 (64)
12Total per year (kWh/year)												2502.1618 (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	105.9053	94.0664	100.8570	90.7647	89.4301	82.1472	82.1561	84.5058	84.4340	92.2904	95.8762	105.0127 (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	139.4781	139.4781	139.4781	139.4781	139.4781	139.4781	139.4781	139.4781	139.4781	139.4781	139.4781	139.4781 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	138.2122	153.0206	138.2122	142.8192	138.2122	142.8192	138.2122	138.2122	142.8192	138.2122	142.8192	138.2122 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	265.8891	268.6482	261.6953	246.8936	228.2090	210.6481	198.9164	196.1573	203.1102	217.9119	236.5965	254.1573 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.9478	36.9478	36.9478	36.9478	36.9478	36.9478	36.9478	36.9478	36.9478	36.9478	36.9478	36.9478 (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)	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824 (71)
Water heating gains (Table 5)	142.3458	139.9798	135.5605	126.0622	120.2017	114.0933	110.4249	113.5831	117.2695	124.0462	133.1614	141.1461 (72)
Total internal gains	611.2905	626.4920	600.3115	580.6184	551.4663	532.4041	512.3969	512.7960	528.0423	545.0137	577.4205	598.3590 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
East	8.3100	19.6403	0.7600	0.7000	0.7700	60.1718 (76)
West	9.8100	19.6403	0.7600	0.7000	0.7700	71.0332 (80)

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Solar gains	131.2050	256.6648	422.6904	616.4687	755.5056	773.3944	736.3030	632.4734	491.6064	304.5544	163.5972	107.8966 (83)
Total gains	742.4955	883.1568	1023.0019	1197.0871	1306.9719	1305.7985	1248.6999	1145.2693	1019.6487	849.5682	741.0177	706.2556 (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	112.7971	113.1002	113.4049	114.9536	115.2684	116.8687	116.8687	117.1941	116.2233	115.2684	114.6405	114.0194
alpha	8.5198	8.5400	8.5603	8.6636	8.6846	8.7912	8.7912	8.8129	8.7482	8.6846	8.6427	8.6013
util living area	0.9995	0.9973	0.9843	0.8940	0.6885	0.4739	0.3410	0.3875	0.6525	0.9589	0.9977	0.9996 (86)
Living	20.4536	20.5646	20.7233	20.8981	20.9573	20.9643	20.9646	20.9646	20.9611	20.8513	20.6177	20.4379
Non living	19.4897	19.6334	19.8343	20.0427	20.0967	20.1120	20.1121	20.1144	20.1061	20.0006	19.7108	19.4770
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.7205	20.5646	20.7233	20.8981	20.9573	20.9643	20.9646	20.9646	20.9611	20.8513	20.6177	20.5165 (87)
Th 2	20.1298	20.1319	20.1340	20.1447	20.1469	20.1576	20.1576	20.1597	20.1533	20.1469	20.1426	20.1383 (88)
util rest of house	0.9992	0.9960	0.9768	0.8578	0.6296	0.4117	0.2757	0.3168	0.5756	0.9348	0.9964	0.9995 (89)
MIT 2	19.8746	19.6334	19.8343	20.0427	20.0967	20.1120	20.1121	20.1144	20.1061	20.0006	19.7108	19.5961 (90)
Living area fraction									FLA = Living area / (4) =			
MIT	20.0253	19.7993	19.9927	20.1951	20.2500	20.2639	20.2640	20.2658	20.2585	20.1522	19.8723	19.7601 (92)
Temperature adjustment												0.0000
adjusted MIT	20.0253	19.7993	19.9927	20.1951	20.2500	20.2639	20.2640	20.2658	20.2585	20.1522	19.8723	19.7601 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9991	0.9953	0.9752	0.8601	0.6369	0.4196	0.2839	0.3257	0.5854	0.9350	0.9958	0.9993 (94)
Useful gains	741.8524	878.9933	997.6759	1029.6639	832.3717	547.9209	354.5481	373.0343	596.8700	794.3599	737.8931	705.7950 (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	1576.6186	1489.8002	1345.5246	1111.2054	838.8467	548.0751	354.5521	373.0471	599.2456	937.1682	1259.9657	1543.3340 (97)
Space heating kWh	621.0660	410.4622	258.7994	58.7099	4.8174	0.0000	0.0000	0.0000	0.0000	106.2494	375.8923	623.1290 (98a)
Space heating requirement - total per year (kWh/year)												2459.1256
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	621.0660	410.4622	258.7994	58.7099	4.8174	0.0000	0.0000	0.0000	0.0000	106.2494	375.8923	623.1290 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2459.1256
Space heating per m2												23.1687 (99)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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 %)												303.7151 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	621.0660	410.4622	258.7994	58.7099	4.8174	0.0000	0.0000	0.0000	0.0000	106.2494	375.8923	623.1290 (98)
Space heating efficiency (main heating system 1)	303.7151	303.7151	303.7151	303.7151	303.7151	0.0000	0.0000	0.0000	0.0000	303.7151	303.7151	303.7151 (210)
Space heating fuel (main heating system)	204.4897	135.1471	85.2112	19.3306	1.5862	0.0000	0.0000	0.0000	0.0000	34.9832	123.7648	205.1689 (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	248.1462	219.3502	232.9635	204.8806	198.5966	178.9631	176.7201	183.7868	185.8407	207.1991	220.2533	245.4617 (64)
Efficiency of water heater (217)m	200.2862	200.2862	200.2862	200.2862	200.2862	200.2862	200.2862	200.2862	200.2862	200.2862	200.2862	200.2862 (216)
Fuel for water heating, kWh/month	123.8958	109.5184	116.3153	102.2939	99.1564	89.3537	88.2338	91.7621	92.7876	103.4515	109.9693	122.5554 (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	16.6047	14.9978	16.6047	16.0691	16.6047	16.0691	16.6047	16.6047	16.0691	16.6047	16.0691	16.6047 (231)
Lighting	30.5105	24.4766	22.0385	16.1463	12.4719	10.1896	11.3773	14.7886	19.2090	25.2032	28.4669	31.3584 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-60.0443	-91.9203	-140.7503	-157.4578	-168.0234	-156.6621	-154.2521	-145.5332	-126.6811	-103.5553	-67.1652	-50.5217 (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	-25.4735	-64.2403	-157.9863	-285.5898	-412.8055	-427.2312	-416.5608	-331.5365	-216.5084	-105.2709	-36.9966	-19.1638 (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												809.6817 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												200.2862
Water heating fuel used												1249.2931 (219)

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Space cooling fuel	0.0000 (221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.5720)	
mechanical ventilation fans (SFP = 0.5720)	195.5074 (230a)
Total electricity for the above, kWh/year	195.5074 (231)
Electricity for lighting (calculated in Appendix L)	246.2368 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-3921.9303 (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	-1421.2112 (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	809.6817	0.1579	127.8551 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1249.2931	0.1409	175.9960 (264)
Space and water heating			303.8511 (265)
Pumps, fans and electric keep-hot	195.5074	0.1387	27.1193 (267)
Energy for lighting	246.2368	0.1443	35.5396 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1422.5666	0.1342	-190.8615
PV Unit electricity exported	-2499.3637	0.1219	-304.6072
Total			-495.4688 (269)
Total CO2, kg/year			-128.9588 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			-1.2100 (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	809.6817	1.5845	1282.9587 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1249.2931	1.5209	1900.0609 (278)
Space and water heating			3183.0196 (279)
Pumps, fans and electric keep-hot	195.5074	1.5128	295.7636 (281)
Energy for lighting	246.2368	1.5338	377.6863 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1422.5666	1.4959	-2127.9497
PV Unit electricity exported	-2499.3637	0.4472	-1117.6933
Total			-3245.6430 (283)
Total Primary energy kWh/year			610.8265 (286)
Dwelling Primary energy Rate (DPER)			5.7500 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	55.5100 (1b)	x 2.6300 (2b)	= 145.9913 (1b) - (3b)
First floor	50.6300 (1c)	x 2.6500 (2c)	= 134.1695 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	106.1400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	280.1608 (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) = 0.1428 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3928 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3044 (21)

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	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	0.3881	0.3805	0.3729	0.3348	0.3272	0.2892	0.2892	0.2816	0.3044	0.3272	0.3425	0.3577	(22b)
	0.5753	0.5724	0.5695	0.5561	0.5535	0.5418	0.5418	0.5396	0.5463	0.5535	0.5586	0.5640	(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			6.3000	1.0000	6.3000			(26a)
TER Opening Type (Uw = 1.20)			18.1200	1.1450	20.7481			(27)
Floor 1 P/a 0.54			55.5100	0.1300	7.2163			(28a)
External Wall 1 Stone	45.9600	10.4100	35.5500	0.1800	6.3990			(29a)
External Wall 2 Render	107.5600	14.0100	93.5500	0.1800	16.8390			(29a)
External Roof 1 horz	55.5100		55.5100	0.1100	6.1061			(30)
Total net area of external elements Aum(A, m2)			264.5400					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	63.6085		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							383.5743	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E16 Corner (normal)	20.2000	0.0900	1.8180
E5 Ground floor (normal)	30.4000	0.1600	4.8640
E6 Intermediate floor within a dwelling	28.8000	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	18.2000	0.0600	1.0920
E12 Gable (insulation at ceiling level)	12.2000	0.0600	0.7320
E1 Steel lintel with perforated steel base plate	17.2000	0.0500	0.8600
E3 Sill	14.2000	0.0500	0.7100
E4 Jamb	40.8000	0.0500	2.0400
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			12.1160
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 75.7245

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	53.1896	52.9193	52.6542	51.4094	51.1765	50.0922	50.0922	49.8915	50.5099	51.1765	51.6476	52.1402	(38)
Heat transfer coeff	128.9141	128.6437	128.3787	127.1339	126.9010	125.8167	125.8167	125.6160	126.2344	126.9010	127.3721	127.8647	(39)
Average = Sum(39)m / 12 =													127.1328

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2146	1.2120	1.2095	1.1978	1.1956	1.1854	1.1854	1.1835	1.1893	1.1956	1.2000	1.2047	(40)
HLP (average)												1.1978	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.7896	(42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	81.8844	80.6683	78.9558	75.7982	73.4339	70.8122	69.3961	71.0966	72.9482	75.7535	78.9761	81.6076	81.6076	(42b)
Hot water usage for other uses	43.1979	41.6271	40.0562	38.4854	36.9146	35.3437	35.3437	36.9146	38.4854	40.0562	41.6271	43.1979	43.1979	(42c)
Average daily hot water use (litres/day)													115.1906	(43)
Daily hot water use	125.0823	122.2954	119.0120	114.2836	110.3484	106.1559	104.7398	108.0112	111.4336	115.8097	120.6032	124.8055	124.8055	(44)
Energy conte	198.0998	174.1470	182.9171	156.4486	148.5502	130.5311	126.6737	133.7404	137.4087	157.1527	171.8213	195.4153	195.4153	(45)
Energy content (annual)													1912.9058	
Distribution loss (46)m = 0.15 x (45)m	29.7150	26.1221	27.4376	23.4673	22.2825	19.5797	19.0011	20.0611	20.6113	23.5729	25.7732	29.3123	29.3123	(46)
Water storage loss:													200.0000	(47)
Store volume													1.6525	(48)
a) If manufacturer declared loss factor is known (kWh/day):													0.5400	(49)
Temperature factor from Table 2b													0.8924	(55)
Enter (49) or (54) in (55)														
Total storage loss	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	(56)
If cylinder contains dedicated solar storage	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	249.0259	220.1447	233.8431	205.7319	199.4763	179.8144	177.5998	184.6665	186.6920	208.0788	221.1046	246.3413	246.3413	(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)
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	-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	249.0259	220.1447	233.8431	205.7319	199.4763	179.8144	177.5998	184.6665	186.6920	208.0788	221.1046	246.3413	246.3413	(64)
12Total per year (kWh/year)													2512.5192	(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	106.6090	94.7021	101.5608	91.4458	90.1338	82.8282	82.8599	85.2095	85.1150	92.9941	96.5572	105.7164	105.7164	(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	139.4781	139.4781	139.4781	139.4781	139.4781	139.4781	139.4781	139.4781	139.4781	139.4781	139.4781	139.4781	139.4781	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	138.2122	153.0206	138.2122	142.8192	138.2122	142.8192	138.2122	138.2122	142.8192	138.2122	142.8192	138.2122	138.2122	(67)

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Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	265.8891	268.6482	261.6953	246.8936	228.2090	210.6481	198.9164	196.1573	203.1102	217.9119	236.5965	254.1573 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.9478	36.9478	36.9478	36.9478	36.9478	36.9478	36.9478	36.9478	36.9478	36.9478	36.9478	36.9478 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824 (71)
Water heating gains (Table 5)	143.2917	140.9257	136.5064	127.0080	121.1476	115.0392	111.3708	114.5289	118.2153	124.9921	134.1073	142.0920 (72)
Total internal gains	615.2364	630.4379	604.2574	584.5643	555.4122	533.3500	513.3428	513.7419	528.9882	548.9596	581.3664	602.3049 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
East	8.3100	19.6403	0.6300	0.7000	0.7700	49.8793 (76)						
West	9.8100	19.6403	0.6300	0.7000	0.7700	58.8828 (80)						
Solar gains	108.7620	212.7616	350.3881	511.0201	626.2743	641.1032	610.3564	524.2871	407.5158	252.4596	135.6135	89.4406 (83)
Total gains	723.9984	843.1995	954.6454	1095.5844	1181.6865	1174.4532	1123.6992	1038.0290	936.5040	801.4192	716.9799	691.7455 (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)												
tau	87.7254	87.9098	88.0913	88.9539	89.1171	89.8851	89.8851	90.0288	89.5877	89.1171	88.7875	88.4454
alpha	6.8484	6.8607	6.8728	6.9303	6.9411	6.9923	6.9923	7.0019	6.9725	6.9411	6.9192	6.8964
util living area	0.9996	0.9988	0.9950	0.9706	0.8735	0.6694	0.4909	0.5525	0.8407	0.9874	0.9989	0.9997 (86)
MIT	19.9936	20.1342	20.3576	20.6648	20.8956	20.9866	20.9986	20.9970	20.9409	20.6270	20.2562	19.9730 (87)
Th 2	19.9084	19.9104	19.9124	19.9218	19.9235	19.9317	19.9317	19.9332	19.9286	19.9235	19.9200	19.9163 (88)
util rest of house	0.9994	0.9981	0.9922	0.9538	0.8137	0.5662	0.3728	0.4269	0.7490	0.9774	0.9981	0.9996 (89)
MIT 2	18.7440	18.9256	19.2119	19.5991	19.8492	19.9265	19.9315	19.9326	19.8974	19.5613	19.0895	18.7237 (90)
Living area fraction	FLA = Living area / (4) = 0.1782 (91)											
MIT	18.9666	19.1410	19.4160	19.7890	20.0356	20.1153	20.1216	20.1223	20.0833	19.7512	19.2974	18.9462 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.9666	19.1410	19.4160	19.7890	20.0356	20.1153	20.1216	20.1223	20.0833	19.7512	19.2974	18.9462 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9991	0.9974	0.9903	0.9511	0.8208	0.5847	0.3939	0.4495	0.7640	0.9751	0.9974	0.9994 (94)
Useful gains	723.3743	840.9759	945.4156	1042.0432	969.9157	686.6457	442.6739	466.6072	715.5041	781.4466	715.1435	691.3107 (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	1890.7299	1832.0096	1658.1429	1384.3604	1057.7977	693.9200	443.0747	467.5742	755.2999	1161.2915	1553.6063	1885.5230 (97)
Space heating kWh	868.5126	665.9747	530.2691	246.4684	65.3842	0.0000	0.0000	0.0000	0.0000	282.6046	603.6932	888.4940 (98a)
Space heating requirement - total per year (kWh/year)	4151.4007											
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	868.5126	665.9747	530.2691	246.4684	65.3842	0.0000	0.0000	0.0000	0.0000	282.6046	603.6932	888.4940 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	4151.4007											
Space heating per m2	(98c) / (4) = 39.1125 (99)											

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)											
Fraction of space heat from main system(s)	1.0000 (202)											
Efficiency of main space heating system 1 (in %)	92.3000 (206)											
Efficiency of main space heating system 2 (in %)	0.0000 (207)											
Efficiency of secondary/supplementary heating system, %	0.0000 (208)											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	868.5126	665.9747	530.2691	246.4684	65.3842	0.0000	0.0000	0.0000	0.0000	282.6046	603.6932	888.4940 (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)	940.9671	721.5327	574.5061	267.0297	70.8388	0.0000	0.0000	0.0000	0.0000	306.1805	654.0555	962.6154 (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	249.0259	220.1447	233.8431	205.7319	199.4763	179.8144	177.5998	184.6665	186.6920	208.0788	221.1046	246.3413 (64)
Efficiency of water heater (217)m	86.6230	86.3797	85.8373	84.4660	81.8478	79.8000	79.8000	79.8000	79.8000	84.7469	86.1940	86.6780 (217)
Fuel for water heating, kWh/month	287.4824	254.8570	272.4259	243.5678	243.7160	225.3313	222.5561	231.4116	233.9499	245.5297	256.5196	284.2029 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	28.7178	23.0385	20.7436	15.1976	11.7391	9.5909	10.7088	13.9197	18.0803	23.7223	26.7943	29.5159 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												

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(233a)m	-49.9240	-69.3747	-98.2921	-108.8560	-115.9611	-107.6788	-106.2836	-100.9867	-91.4885	-78.4816	-54.5003	-43.2761	(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	-31.3536	-65.5726	-129.6537	-193.7861	-255.3644	-256.3187	-253.3595	-214.9641	-158.1169	-93.5259	-41.7738	-24.8280	(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												4497.7256	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												3001.5502	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												231.7688	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2743.7208	(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												5073.3237	(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	4497.7256	0.2100	944.5224	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3001.5502	0.2100	630.3255	(264)
Space and water heating			1574.8479	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	231.7688	0.1443	33.4514	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1025.1035	0.1349	-138.2976	
PV Unit electricity exported	-1718.6173	0.1260	-216.6056	
Total			-354.9032	(269)
Total CO2, kg/year			1265.3253	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.9200	(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	4497.7256	1.1300	5082.4299	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3001.5502	1.1300	3391.7517	(278)
Space and water heating			8474.1817	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	231.7688	1.5338	355.4947	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1025.1035	1.4986	-1536.2467	
PV Unit electricity exported	-1718.6173	0.4626	-795.1017	
Total			-2331.3485	(283)
Total Primary energy kWh/year			6628.4287	(286)
Target Primary Energy Rate (TPER)			62.4500	(287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	55.5100 (1b)	x 2.6300 (2b)	= 145.9913 (1b) - (3b)	
First floor	50.6300 (1c)	x 2.6500 (2c)	= 134.1695 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	106.1400		(4)	
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	280.1608 (5)	

2. Ventilation rate

Number of open chimneys	0 * 80 =	0.0000 (6a)	m3 per hour
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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	Air changes per hour / (5) =	0.1428 (8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.2928	(18)
Number of sides sheltered			3	(19)

Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2269 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	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												
	0.2893	0.2836	0.2780	0.2496	0.2439	0.2156	0.2156	0.2099	0.2269	0.2439	0.2553	0.2666 (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	0.5418	0.5402	0.5386	0.5311	0.5297	0.5232	0.5232	0.5220	0.5257	0.5297	0.5326	0.5355 (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
Window (Uw = 1.20)			18.1200	1.1450	20.7481		(27)
Door			6.3000	1.2000	7.5600		(26a)
Floor 1 P/a 0.54			55.5100	0.1200	6.6612	110.0000	6106.1000 (28a)
External Wall 1 Stone	45.9600	10.4100	35.5500	0.2100	7.4655	190.0000	6754.5000 (29a)
External Wall 2 Render	107.5600	14.0100	93.5500	0.2100	19.6455	190.0000	17774.5000 (29a)
External Roof 1 horz	55.5100		55.5100	0.0900	4.9959	9.0000	499.5900 (30)
Total net area of external elements Aum(A, m2)			264.5400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	67.0762		(33)
Internal Wall 1 GF			72.0000			100.0000	7200.0000 (32c)
Internal Wall 2 FF			112.3200			9.0000	1010.8800 (32c)
Internal Floor 1			50.6300			18.0000	911.3400 (32d)
Internal Ceiling 1			50.6300			9.0000	455.6700 (32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	40712.5800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		383.5743 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E16 Corner (normal)	20.2000	0.0520	1.0504
E5 Ground floor (normal)	30.4000	0.1640	4.9856
E6 Intermediate floor within a dwelling	28.8000	0.0020	0.0576
E10 Eaves (insulation at ceiling level)	18.2000	0.0720	1.3104
E12 Gable (insulation at ceiling level)	12.2000	0.1740	2.1228
E1 Steel lintel with perforated steel base plate	17.2000	0.0200	0.3440
E3 Sill	14.2000	0.0180	0.2556
E4 Jamb	40.8000	0.0140	0.5712

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		10.6976 (36)
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Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	77.7738 (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
	50.0954	49.9452	49.7979	49.1062	48.9768	48.3744	48.3744	48.2629	48.6065	48.9768	49.2386	49.5123 (38)
Heat transfer coeff	127.8692	127.7190	127.5717	126.8800	126.7506	126.1482	126.1482	126.0366	126.3802	126.7506	127.0124	127.2861 (39)
Average = Sum(39)m / 12 =												126.8794

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1.2047	1.2033	1.2019	1.1954	1.1942	1.1885	1.1885	1.1875	1.1907	1.1942	1.1966	1.1992 (40)
HLP (average)												1.1954
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.7896 (42)
Hot water usage for mixer showers												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths												
	30.6519	30.1967	29.5556	28.3737	27.4886	26.5072	25.9771	26.6137	27.3068	28.3569	29.5632	30.5483 (42b)
Hot water usage for other uses												
	43.1979	41.6271	40.0562	38.4854	36.9146	35.3437	35.3437	36.9146	38.4854	40.0562	41.6271	43.1979 (42c)
Average daily hot water use (litres/day)												67.6900 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	73.8498	71.8238	69.6119	66.8591	64.4032	61.8510	61.3209	63.5283	65.7922	68.4131	71.1903	73.7462 (44)
Energy conte	116.9601	102.2761	106.9909	91.5267	86.6991	76.0530	74.1623	78.6613	81.1284	92.8360	101.4236	115.4687 (45)
Energy content (annual)												Total = Sum(45)m = 1124.1859
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												
	99.4160	86.9347	90.9422	77.7977	73.6942	64.6450	63.0379	66.8621	68.9591	78.9106	86.2101	98.1484 (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)

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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	99.4160	86.9347	90.9422	77.7977	73.6942	64.6450	63.0379	66.8621	68.9591	78.9106	86.2101	98.1484	(64)
													955.5580 (64)
12Total per year (kWh/year)													956 (64)
Electric shower(s)	56.8524	50.6560	55.3144	52.7858	53.7763	51.2974	53.0073	53.7763	52.7858	55.3144	54.2743	56.8524	(64a)
													646.6929 (64a)
Heat gains from water heating, kWh/month	39.0671	34.3977	36.5642	32.6459	31.8676	28.9856	29.0113	30.1596	30.4362	33.5562	35.1211	38.7502	(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)	139.4781	139.4781	139.4781	139.4781	139.4781	139.4781	139.4781	139.4781	139.4781	139.4781	139.4781	139.4781	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	138.2122	153.0206	138.2122	142.8192	138.2122	142.8192	138.2122	138.2122	142.8192	138.2122	142.8192	138.2122	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	265.8891	268.6482	261.6953	246.8936	228.2090	210.6481	198.9164	196.1573	203.1102	217.9119	236.5965	254.1573	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.9478	36.9478	36.9478	36.9478	36.9478	36.9478	36.9478	36.9478	36.9478	36.9478	36.9478	36.9478	(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)	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824	(71)
Water heating gains (Table 5)	52.5096	51.1870	49.1454	45.3415	42.8328	40.2578	38.9937	40.5371	42.2725	45.1025	48.7793	52.0836	(72)
Total internal gains	521.4542	537.6992	513.8963	499.8977	474.0974	458.5686	440.9657	439.7500	453.0454	466.0700	493.0384	509.2965	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data g or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W						
East	8.3100	19.6403	0.7600	0.7000	0.7700	60.1718	(76)						
West	9.8100	19.6403	0.7600	0.7000	0.7700	71.0332	(80)						
Solar gains	131.2050	256.6648	422.6904	616.4687	755.5056	773.3944	736.3030	632.4734	491.6064	304.5544	163.5972	107.8966	(83)
Total gains	652.6592	794.3640	936.5867	1116.3665	1229.6030	1231.9630	1177.2687	1072.2234	944.6518	770.6244	656.6356	617.1931	(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)	0.9998	0.9991	0.9955	0.9675	0.8550	0.6431	0.4702	0.5373	0.8369	0.9899	0.9993	0.9999	(86)
MIT	19.9544	20.1096	20.3529	20.6787	20.9100	20.9893	20.9989	20.9974	20.9424	20.6079	20.2170	19.9266	(87)
Th 2	19.9162	19.9174	19.9185	19.9237	19.9247	19.9292	19.9292	19.9300	19.9275	19.9247	19.9227	19.9206	(88)
util rest of house	0.9997	0.9987	0.9929	0.9494	0.7917	0.5420	0.3566	0.4144	0.7444	0.9816	0.9989	0.9998	(89)
MIT 2	18.9683	19.1242	19.3670	19.6845	19.8760	19.9260	19.9291	19.9297	19.9040	19.6242	19.2361	18.9441	(90)
Living area fraction									fLA = Living area / (4) =				(91)
MIT	19.1440	19.2997	19.5426	19.8616	20.0602	20.1155	20.1197	20.1199	20.0890	19.7995	19.4109	19.1191	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1440	19.2997	19.5426	19.8616	20.0602	20.1155	20.1197	20.1199	20.0890	19.7995	19.4109	19.1191	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	652.3873	792.9893	928.7838	1058.3456	984.5197	690.0822	443.6923	468.0221	718.1169	755.3535	655.7073	617.0191	(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	1898.0884	1839.1197	1663.8701	1390.8080	1059.6604	695.7659	443.9995	468.8417	756.8902	1166.0402	1563.6330	1898.9996	(97)
Space heating kWh	926.8016	702.9996	546.9041	239.3729	55.9046	0.0000	0.0000	0.0000	0.0000	305.5509	653.7065	953.7935	(98a)
Space heating requirement - total per year (kWh/year)												4385.0339	
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	926.8016	702.9996	546.9041	239.3729	55.9046	0.0000	0.0000	0.0000	0.0000	305.5509	653.7065	953.7935	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4385.0339	
Space heating per m2												41.3137	(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	1185.7931	933.4967	957.8785	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9306	0.9721	0.9498	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1103.5173	907.4666	909.8347	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1381.0366	1319.8828	1199.8669	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	199.8140	306.8377	215.7839	0.0000	0.0000	0.0000	0.0000	(104)

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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	49.9535	76.7094	53.9460	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												180.6089 (107)
Energy for space heating												41.3137 (99)
Energy for space cooling												1.7016 (108)
Total												43.0153 (109)
Fabric Energy Efficiency (DFEE)												43.0 (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 (m ²)	Storey height (m)	Volume (m ³)
Ground floor	55.5100 (1b)	x 2.6300 (2b)	= 145.9913 (1b) - (3b)
First floor	50.6300 (1c)	x 2.6500 (2c)	= 134.1695 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	106.1400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 280.1608 (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)
Air changes per hour												
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =											0.1428 (8)
Pressure test	Yes											
Pressure Test Method	Blower Door											
Measured/design AP50												5.0000 (17)
Infiltration rate												0.3928 (18)
Number of sides sheltered												3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =											0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =											0.3044 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	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)
Adj infilt rate	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)
Effective ac	0.3881	0.3805	0.3729	0.3348	0.3272	0.2892	0.2892	0.2816	0.3044	0.3272	0.3425	0.3577 (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	0.5753	0.5724	0.5695	0.5561	0.5535	0.5418	0.5418	0.5396	0.5463	0.5535	0.5586	0.5640 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K					
TER Semi-glazed door			6.3000	1.0000	6.3000		(26a)					
TER Opening Type (Uw = 1.20)			18.1200	1.1450	20.7481		(27)					
Floor 1 P/a 0.54			55.5100	0.1300	7.2163		(28a)					
External Wall 1 Stone	45.9600	10.4100	35.5500	0.1800	6.3990		(29a)					
External Wall 2 Render	107.5600	14.0100	93.5500	0.1800	16.8390		(29a)					
External Roof 1 horz	55.5100		55.5100	0.1100	6.1061		(30)					
Total net area of external elements Aum(A, m ²)			264.5400				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	63.6085	(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K								383.5743 (35)				
List of Thermal Bridges												
K1 Element			Length	Psi-value	Total							
E16 Corner (normal)			20.2000	0.0900	1.8180							
E5 Ground floor (normal)			30.4000	0.1600	4.8640							
E6 Intermediate floor within a dwelling			28.8000	0.0000	0.0000							
E10 Eaves (insulation at ceiling level)			18.2000	0.0600	1.0920							
E12 Gable (insulation at ceiling level)			12.2000	0.0600	0.7320							
E1 Steel lintel with perforated steel base plate			17.2000	0.0500	0.8600							
E3 Sill			14.2000	0.0500	0.7100							
E4 Jamb			40.8000	0.0500	2.0400							
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								12.1160 (36)				
Point Thermal bridges								(36a) = 0.0000				
Total fabric heat loss								(33) + (36) + (36a) = 75.7245 (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	53.1896	52.9193	52.6542	51.4094	51.1765	50.0922	50.0922	49.8915	50.5099	51.1765	51.6476	52.1402 (38)
Average = Sum(39)m / 12 =	128.9141	128.6437	128.3787	127.1339	126.9010	125.8167	125.8167	125.6160	126.2344	126.9010	127.3721	127.8647 (39)
												127.1328

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2146	1.2120	1.2095	1.1978	1.1956	1.1854	1.1854	1.1835	1.1893	1.1956	1.2000	1.2047 (40)
HLP (average)												1.1978
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.7896 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	30.6519	30.1967	29.5556	28.3737	27.4886	26.5072	25.9771	26.6137	27.3068	28.3569	29.5632	30.5483 (42b)
Hot water usage for other uses	43.1979	41.6271	40.0562	38.4854	36.9146	35.3437	35.3437	36.9146	38.4854	40.0562	41.6271	43.1979 (42c)
Average daily hot water use (litres/day)												67.6900 (43)
Daily hot water use	73.8498	71.8238	69.6119	66.8591	64.4032	61.8510	61.3209	63.5283	65.7922	68.4131	71.1903	73.7462 (44)
Energy content	116.9601	102.2761	106.9909	91.5267	86.6991	76.0530	74.1623	78.6613	81.1284	92.8360	101.4236	115.4687 (45)
Energy content (annual)												1124.1859
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												
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	99.4160	86.9347	90.9422	77.7977	73.6942	64.6450	63.0379	66.8621	68.9591	78.9106	86.2101	98.1484 (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	99.4160	86.9347	90.9422	77.7977	73.6942	64.6450	63.0379	66.8621	68.9591	78.9106	86.2101	98.1484 (64)
12Total per year (kWh/year)												955.5580 (64)
Electric shower(s)	56.8524	50.6560	55.3144	52.7858	53.7763	51.2974	53.0073	53.7763	52.7858	55.3144	54.2743	56.8524 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												646.6929 (64a)
Heat gains from water heating, kWh/month	39.0671	34.3977	36.5642	32.6459	31.8676	28.9856	29.0113	30.1596	30.4362	33.5562	35.1211	38.7502 (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	139.4781	139.4781	139.4781	139.4781	139.4781	139.4781	139.4781	139.4781	139.4781	139.4781	139.4781	139.4781 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	138.2122	153.0206	138.2122	142.8192	138.2122	142.8192	138.2122	138.2122	142.8192	138.2122	142.8192	138.2122 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	265.8891	268.6482	261.6953	246.8936	228.2090	210.6481	198.9164	196.1573	203.1102	217.9119	236.5965	254.1573 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.9478	36.9478	36.9478	36.9478	36.9478	36.9478	36.9478	36.9478	36.9478	36.9478	36.9478	36.9478 (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)	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824 (71)
Water heating gains (Table 5)	52.5096	51.1870	49.1454	45.3415	42.8328	40.2578	38.9937	40.5371	42.2725	45.1025	48.7793	52.0836 (72)
Total internal gains	521.4542	537.6992	513.8963	499.8977	474.0974	458.5686	440.9657	439.7500	453.0454	466.0700	493.0384	509.2965 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access Factor Table 6d	Gains W						
East	8.3100	19.6403	0.6300	0.7000	0.7700	49.8793 (76)						
West	9.8100	19.6403	0.6300	0.7000	0.7700	58.8828 (80)						
Solar gains	108.7620	212.7616	350.3881	511.0201	626.2743	641.1032	610.3564	524.2871	407.5158	252.4596	135.6135	89.4406 (83)
Total gains	630.2163	750.4608	864.2844	1010.9179	1100.3718	1099.6718	1051.3221	964.0372	860.5612	718.5296	628.6519	598.7372 (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	87.7254	87.9098	88.0913	88.9539	89.1171	89.8851	89.8851	90.0288	89.5877	89.1171	88.7875	88.4454
alpha	6.8484	6.8607	6.8728	6.9303	6.9411	6.9923	6.9923	7.0019	6.9725	6.9411	6.9192	6.8964
util living area	0.9998	0.9994	0.9972	0.9806	0.9025	0.7081	0.5237	0.5926	0.8798	0.9933	0.9995	0.9999 (86)
MIT	19.9276	20.0693	20.2956	20.6140	20.8679	20.9812	20.9979	20.9954	20.9195	20.5721	20.1942	19.9075 (87)
Th 2	19.9084	19.9104	19.9124	19.9218	19.9235	19.9317	19.9317	19.9332	19.9286	19.9235	19.9200	19.9163 (88)
util rest of house	0.9998	0.9991	0.9956	0.9687	0.8497	0.6024	0.3983	0.4593	0.7967	0.9874	0.9992	0.9998 (89)
MIT 2	18.9351	19.0783	19.3054	19.6239	19.8469	19.9258	19.9314	19.9325	19.8931	19.5892	19.2111	18.9214 (90)
Living area fraction												0.1782 (91)
MIT	19.1119	19.2548	19.4818	19.8003	20.0288	20.1138	20.1214	20.1219	20.0760	19.7643	19.3862	19.0971 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1119	19.2548	19.4818	19.8003	20.0288	20.1138	20.1214	20.1219	20.0760	19.7643	19.3862	19.0971 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9997	0.9988	0.9947	0.9669	0.8558	0.6213	0.4208	0.4834	0.8102	0.9862	0.9989	0.9998 (94)
Useful gains	630.0031	749.5355	859.6953	977.4433	941.6840	683.2453	442.4446	466.0022	697.2072	708.6041	627.9679	598.5968 (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	1909.4645	1846.6599	1666.5893	1385.8009	1056.9330	693.7282	443.0544	467.5239	754.3732	1162.9566	1564.9226	1904.8112 (97)
Space heating kWh	951.9192	737.2676	600.3292	294.0174	85.7452	0.0000	0.0000	0.0000	0.0000	338.0382	674.6074	971.8235 (98a)
Space heating requirement - total per year (kWh/year)												4653.7478
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	951.9192	737.2676	600.3292	294.0174	85.7452	0.0000	0.0000	0.0000	0.0000	338.0382	674.6074	971.8235 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4653.7478
Space heating per m2												(98c) / (4) = 43.8454 (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	1182.6774	931.0439	954.6813	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8902	0.9512	0.9200	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1052.7921	885.6458	878.3198	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1226.4106	1172.6726	1073.4154	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	125.0054	213.5479	145.1512	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fc = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	31.2513	53.3870	36.2878	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												120.9261 (107)
Energy for space heating												43.8454 (99)
Energy for space cooling												1.1393 (108)
Total												44.9847 (109)
Fabric Energy Efficiency (TFEE)												45.0 (109)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	55.5100 (1b)	x 2.6300 (2b)	= 145.9913 (1b) - (3b)
First floor	50.6300 (1c)	x 2.6500 (2c)	= 134.1695 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	106.1400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	280.1608 (5)

2. Ventilation rate

		m3 per hour
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure Test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	3.0000	(17)
Infiltration rate	0.1500	(18)
Number of sides sheltered	3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)
Wind speed	Jan 5.1000, Feb 5.0000, Mar 4.9000, Apr 4.4000, May 4.3000, Jun 3.8000, Jul 3.8000, Aug 3.7000, Sep 4.0000, Oct 4.3000, Nov 4.5000, Dec 4.7000	(22)
Wind factor	Jan 1.2750, Feb 1.2500, Mar 1.2250, Apr 1.1000, May 1.0750, Jun 0.9500, Jul 0.9500, Aug 0.9250, Sep 1.0000, Oct 1.0750, Nov 1.1250, Dec 1.1750	(22a)
Adj infiltr rate	0.1482, 0.1453, 0.1424, 0.1279, 0.1250, 0.1104, 0.1104, 0.1075, 0.1162, 0.1250, 0.1308, 0.1366	(22b)
Balanced mechanical ventilation with heat recovery		
If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

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If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 81.0000 (23c)
 Effective ac 0.2432 0.2403 0.2374 0.2229 0.2200 0.2054 0.2054 0.2025 0.2112 0.2200 0.2258 0.2316 (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
Window (Uw = 1.20)			18.1200	1.1450	20.7481		(27)
Door			6.3000	1.2000	7.5600		(26a)
Floor 1 P/a 0.54			55.5100	0.1200	6.6612	110.0000	6106.1000 (28a)
External Wall 1 Stone	45.9600	10.4100	35.5500	0.2100	7.4655	190.0000	6754.5000 (29a)
External Wall 2 Render	107.5600	14.0100	93.5500	0.2100	19.6455	190.0000	17774.5000 (29a)
External Roof 1 horz	55.5100		55.5100	0.0900	4.9959	9.0000	499.5900 (30)
Total net area of external elements Aum(A, m2)			264.5400				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 67.0762		(33)
Internal Wall 1 GF			72.0000			100.0000	7200.0000 (32c)
Internal Wall 2 FF			112.3200			9.0000	1010.8800 (32c)
Internal Floor 1			50.6300			18.0000	911.3400 (32d)
Internal Ceiling 1			50.6300			9.0000	455.6700 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) = 40712.5800	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							383.5743 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E16 Corner (normal)	20.2000	0.0520	1.0504
E5 Ground floor (normal)	30.4000	0.1640	4.9856
E6 Intermediate floor within a dwelling	28.8000	0.0020	0.0576
E10 Eaves (insulation at ceiling level)	18.2000	0.0720	1.3104
E12 Gable (insulation at ceiling level)	12.2000	0.1740	2.1228
E1 Steel lintel with perforated steel base plate	17.2000	0.0200	0.3440
E3 Sill	14.2000	0.0180	0.2556
E4 Jamb	40.8000	0.0140	0.5712
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			10.6976 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 77.7738 (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	22.4863	22.2176	21.9489	20.6055	20.3368	18.9933	18.9933	18.7246	19.5307	20.3368	20.8742	21.4116 (38)
Average = Sum(39)m / 12 =	100.2601	99.9914	99.7227	98.3793	98.1106	96.7671	96.7671	96.4984	97.3045	98.1106	98.6480	99.1853 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9446	0.9421	0.9395	0.9269	0.9244	0.9117	0.9117	0.9092	0.9168	0.9244	0.9294	0.9345 (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 2.7896 (42)

Hot water usage for mixer showers 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (42a)

Hot water usage for baths 81.8844 80.6683 78.9558 75.7982 73.4339 70.8122 69.3961 71.0966 72.9482 75.7535 78.9761 81.6076 (42b)

Hot water usage for other uses 43.1979 41.6271 40.0562 38.4854 36.9146 35.3437 35.3437 36.9146 38.4854 40.0562 41.6271 43.1979 (42c)

Average daily hot water use (litres/day) 115.1906 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	125.0823	122.2954	119.0120	114.2836	110.3484	106.1559	104.7398	108.0112	111.4336	115.8097	120.6032	124.8055 (44)
Energy content (annual)	198.0998	174.1470	182.9171	156.4486	148.5502	130.5311	126.6737	133.7404	137.4087	157.1527	171.8213	195.4153 (45)
Distribution loss (46)m = 0.15 x (45)m	29.7150	26.1221	27.4376	23.4673	22.2825	19.5797	19.0011	20.0611	20.6113	23.5729	25.7732	29.3123 (46)
Water storage loss:												200.0000 (47)
Store volume												1.6000 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.8640 (55)
Enter (49) or (54) in (55)												0.8640 (55)
Total storage loss	26.7840	24.1920	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	25.9200	26.7840	25.9200	26.7840 (56)
If cylinder contains dedicated solar storage	26.7840	24.1920	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	25.9200	26.7840	25.9200	26.7840 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	248.1462	219.3502	232.9635	204.8806	198.5966	178.9631	176.7201	183.7868	185.8407	207.1991	220.2533	245.4617 (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	248.1462	219.3502	232.9635	204.8806	198.5966	178.9631	176.7201	183.7868	185.8407	207.1991	220.2533	245.4617 (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	105.9053	94.0664	100.8570	90.7647	89.4301	82.1472	82.1561	84.5058	84.4340	92.2904	95.8762	105.0127 (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	167.3737	167.3737	167.3737	167.3737	167.3737	167.3737	167.3737	167.3737	167.3737	167.3737	167.3737	167.3737 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	34.8574	30.9600	25.1784	19.0616	14.2488	12.0294	12.9982	16.8956	22.6772	28.7940	33.6068	35.8262 (67)

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Cooking gains	396.8494	400.9674	390.5900	368.4979	340.6105	314.4002	296.8902	292.7721	303.1495	325.2417	353.1291	379.3393 (68)
(calculated in Appendix L, equation L15 or L15a), also see Table 5												
Pumps, fans	54.5269	54.5269	54.5269	54.5269	54.5269	54.5269	54.5269	54.5269	54.5269	54.5269	54.5269	54.5269 (69)
Losses e.g. evaporation	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)
(negative values) (Table 5)												
Water heating gains (Table 5)	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824 (71)
Total internal gains	142.3458	139.9798	135.5605	126.0622	120.2017	114.0933	110.4249	113.5831	117.2695	124.0462	133.1614	141.1461 (72)
	684.3707	682.2254	661.6471	623.9398	585.3791	550.8411	530.6315	533.5689	553.4143	588.4000	630.2154	666.6297 (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						
East	8.3100	19.6403	0.7600	0.7000	0.7700	60.1718 (76)						
West	9.8100	19.6403	0.7600	0.7000	0.7700	71.0332 (80)						
Solar gains	131.2050	256.6648	422.6904	616.4687	755.5056	773.3944	736.3030	632.4734	491.6064	304.5544	163.5972	107.8966 (83)
Total gains	815.5757	938.8902	1084.3375	1240.4085	1340.8847	1324.2355	1266.9344	1166.0423	1045.0207	892.9544	793.8126	774.5263 (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	112.7971	113.1002	113.4049	114.9536	115.2684	116.8687	116.8687	117.1941	116.2233	115.2684	114.6405	114.0194
alpha	8.5198	8.5400	8.5603	8.6636	8.6846	8.7912	8.7912	8.8129	8.7482	8.6846	8.6427	8.6013
util living area	0.9989	0.9958	0.9773	0.8771	0.6726	0.4674	0.3361	0.3806	0.6376	0.9459	0.9962	0.9993 (86)
Living	20.4933	20.5943	20.7522	20.9079	20.9583	20.9643	20.9646	20.9646	20.9616	20.8678	20.6459	20.4751
Non living	19.5404	19.6709	19.8689	20.0519	20.0974	20.1120	20.1121	20.1144	20.1064	20.0178	19.7465	19.5246
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.7408	20.5943	20.7522	20.9079	20.9583	20.9643	20.9646	20.9646	20.9616	20.8678	20.6459	20.5485 (87)
Th 2	20.1298	20.1319	20.1340	20.1447	20.1469	20.1576	20.1576	20.1597	20.1533	20.1469	20.1426	20.1383 (88)
util rest of house	0.9983	0.9938	0.9670	0.8384	0.6144	0.4060	0.2717	0.3111	0.5620	0.9168	0.9940	0.9989 (89)
MIT 2	19.8948	19.6709	19.8689	20.0519	20.0974	20.1120	20.1121	20.1144	20.1064	20.0178	19.7465	19.6352 (90)
Living area fraction	20.0455	19.8354	20.0263	20.2044	20.2508	20.2639	20.2640	20.2658	20.2587	20.1692	19.9067	0.1782 (91)
MIT	20.0455	19.8354	20.0263	20.2044	20.2508	20.2639	20.2640	20.2658	20.2587	20.1692	19.9067	19.7979 (92)
Temperature adjustment												0.0000
adjusted MIT	20.0455	19.8354	20.0263	20.2044	20.2508	20.2639	20.2640	20.2658	20.2587	20.1692	19.9067	19.7979 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9983	0.9929	0.9654	0.8413	0.6216	0.4138	0.2798	0.3199	0.5716	0.9177	0.9932	0.9987 (94)
Useful gains	814.1537	932.1882	1046.8730	1043.5892	833.5153	547.9386	354.5486	373.0363	597.2934	819.4973	788.4342	773.5182 (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	1578.6486	1493.4115	1348.8758	1112.1208	838.9212	548.0763	354.5521	373.0473	599.2741	938.8445	1263.3549	1547.0835 (97)
Space heating kWh	568.7842	377.1421	224.6901	49.3428	4.0220	0.0000	0.0000	0.0000	0.0000	88.7943	341.9429	575.5326 (98a)
Space heating requirement - total per year (kWh/year)												2230.2509
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	568.7842	377.1421	224.6901	49.3428	4.0220	0.0000	0.0000	0.0000	0.0000	88.7943	341.9429	575.5326 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2230.2509
Space heating per m ²										(98c) / (4) =		21.0124 (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 %)												303.7151 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	568.7842	377.1421	224.6901	49.3428	4.0220	0.0000	0.0000	0.0000	0.0000	88.7943	341.9429	575.5326 (98)
Space heating efficiency (main heating system 1)	303.7151	303.7151	303.7151	303.7151	303.7151	0.0000	0.0000	0.0000	0.0000	303.7151	303.7151	303.7151 (210)
Space heating fuel (main heating system)	187.2756	124.1763	73.9805	16.2464	1.3243	0.0000	0.0000	0.0000	0.0000	29.2360	112.5867	189.4975 (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	248.1462	219.3502	232.9635	204.8806	198.5966	178.9631	176.7201	183.7868	185.8407	207.1991	220.2533	245.4617 (64)
Efficiency of water heater (217)m	200.2862	200.2862	200.2862	200.2862	200.2862	200.2862	200.2862	200.2862	200.2862	200.2862	200.2862	200.2862 (216)
Fuel for water heating, kWh/month	123.8958	109.5184	116.3153	102.2939	99.1564	89.3537	88.2338	91.7621	92.7876	103.4515	109.9693	122.5554 (219)
Space cooling fuel requirement												

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(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	16.6047	14.9978	16.6047	16.0691	16.6047	16.0691	16.6047	16.6047	16.0691	16.6047	16.0691	16.6047	16.6047	(231)
Lighting	30.5105	24.4766	22.0385	16.1463	12.4719	10.1896	11.3773	14.7886	19.2090	25.2032	28.4669	31.3584	31.3584	(232)
Electricity generated by PVs (Appendix M) (negative quantity)														
(233a)m	-59.7686	-91.4355	-139.6304	-156.8681	-167.9539	-156.6621	-154.2521	-145.5332	-126.6811	-103.0675	-66.8552	-50.3262	-50.3262	(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	-25.7491	-64.7251	-159.1062	-286.1794	-412.8749	-427.2312	-416.5608	-331.5365	-216.5084	-105.7587	-37.3066	-19.3593	-19.3593	(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													734.3233	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													200.2862	
Water heating fuel used													1249.2931	(219)
Space cooling fuel													0.0000	(221)
Electricity for pumps and fans:														
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.5720)														
mechanical ventilation fans (SFP = 0.5720)													195.5074	(230a)
Total electricity for the above, kWh/year													195.5074	(231)
Electricity for lighting (calculated in Appendix L)													246.2368	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-3921.9303	(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													-1496.5696	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	734.3233	16.4900	121.0899	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1249.2931	16.4900	206.0084	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	195.5074	16.4900	32.2392	(249)
Energy for lighting	246.2368	16.4900	40.6045	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1419.0339	16.4900	-233.9987	
PV Unit electricity exported	-2502.8964	5.5900	-139.9119	
Total			-373.9106	(252)
Total energy cost			26.0314	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.0620	(257)
SAP value		98.9949	
SAP rating (Section 12)		99	(258)
SAP band		A	

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	734.3233	0.1581	116.0760	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1249.2931	0.1409	175.9960	(264)
Space and water heating			292.0720	(265)
Pumps, fans and electric keep-hot	195.5074	0.1387	27.1193	(267)
Energy for lighting	246.2368	0.1443	35.5396	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1419.0339	0.1341	-190.3292	
PV Unit electricity exported	-2502.8964	0.1219	-305.2067	
Total			-495.5359	(269)
Total CO2, kg/year			-140.8051	(272)
CO2 emissions per m2			-1.3300	(273)
EI value			101.2484	
EI rating			101	(274)
EI band			A	

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1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	55.5100 (1b)	x 2.6300 (2b)	= 145.9913 (1b) - (3b)
First floor	50.6300 (1c)	x 2.6500 (2c)	= 134.1695 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	106.1400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 280.1608 (5)

2. Ventilation rate

m3 per hour													
Number of open chimneys	0 * 80 =											0.0000 (6a)	
Number of open flues	0 * 20 =											0.0000 (6b)	
Number of chimneys / flues attached to closed fire	0 * 10 =											0.0000 (6c)	
Number of flues attached to solid fuel boiler	0 * 20 =											0.0000 (6d)	
Number of flues attached to other heater	0 * 35 =											0.0000 (6e)	
Number of blocked chimneys	0 * 20 =											0.0000 (6f)	
Number of intermittent extract fans	0 * 10 =											0.0000 (7a)	
Number of passive vents	0 * 10 =											0.0000 (7b)	
Number of flueless gas fires	0 * 40 =											0.0000 (7c)	
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											0.0000 / (5) =	0.0000 (8)
Pressure test												Yes	
Pressure Test Method												Blower Door	
Measured/design AP50												3.0000 (17)	
Infiltration rate												0.1500 (18)	
Number of sides sheltered												3 (19)	
Shelter factor	(20) = 1 - [0.075 x (19)] =											0.7750 (20)	
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =											0.1162 (21)	
Wind speed	Jan 6.3000	Feb 6.0000	Mar 6.0000	Apr 5.4000	May 5.2000	Jun 4.7000	Jul 4.5000	Aug 4.4000	Sep 4.9000	Oct 5.6000	Nov 5.8000	Dec 6.1000 (22)	
Wind factor	1.5750	1.5000	1.5000	1.3500	1.3000	1.1750	1.1250	1.1000	1.2250	1.4000	1.4500	1.5250 (22a)	
Adj infilt rate	0.1831	0.1744	0.1744	0.1569	0.1511	0.1366	0.1308	0.1279	0.1424	0.1627	0.1686	0.1773 (22b)	
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation												0.5000 (23a)	
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)	
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												81.0000 (23c)	
Effective ac	0.2781	0.2694	0.2694	0.2519	0.2461	0.2316	0.2258	0.2229	0.2374	0.2577	0.2636	0.2723 (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					
Window (Uw = 1.20)			18.1200	1.1450	20.7481		(27)					
Door			6.3000	1.2000	7.5600		(26a)					
Floor 1 P/a 0.54			55.5100	0.1200	6.6612	110.0000	6106.1000 (28a)					
External Wall 1 Stone	45.9600	10.4100	35.5500	0.2100	7.4655	190.0000	6754.5000 (29a)					
External Wall 2 Render	107.5600	14.0100	93.5500	0.2100	19.6455	190.0000	17774.5000 (29a)					
External Roof 1 horz	55.5100		55.5100	0.0900	4.9959	9.0000	499.5900 (30)					
Total net area of external elements Aum (A, m ²)			264.5400				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	67.0762			(33)					
Internal Wall 1 GF			72.0000			100.0000	7200.0000 (32c)					
Internal Wall 2 FF			112.3200			9.0000	1010.8800 (32c)					
Internal Floor 1			50.6300			18.0000	911.3400 (32d)					
Internal Ceiling 1			50.6300			9.0000	455.6700 (32e)					
Heat capacity Cm = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =				40712.5800 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							383.5743 (35)					
List of Thermal Bridges				Length	Psi-value	Total						
K1 Element				20.2000	0.0520	1.0504						
E16 Corner (normal)				30.4000	0.1640	4.9856						
E5 Ground floor (normal)				28.8000	0.0020	0.0576						
E6 Intermediate floor within a dwelling				18.2000	0.0720	1.3104						
E10 Eaves (insulation at ceiling level)				12.2000	0.1740	2.1228						
E12 Gable (insulation at ceiling level)				17.2000	0.0200	0.3440						
E1 Steel lintel with perforated steel base plate				14.2000	0.0180	0.2556						
E3 Sill				40.8000	0.0140	0.5712						
E4 Jamb												
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.6976 (36)					
Point Thermal bridges							(36a) = 0.0000					
Total fabric heat loss							(33) + (36) + (36a) = 77.7738 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan 25.7106	Feb 24.9045	Mar 24.9045	Apr 23.2924	May 22.7550	Jun 21.4116	Jul 20.8742	Aug 20.6055	Sep 21.9489	Oct 23.8298	Nov 24.3672	Dec 25.1732 (38)
Heat transfer coeff	103.4844	102.6783	102.6783	101.0662	100.5288	99.1853	98.6480	98.3793	99.7227	101.6036	102.1410	102.9470 (39)
Average = Sum(39)m / 12 =	101.0886											
HLP	Jan 0.9750	Feb 0.9674	Mar 0.9674	Apr 0.9522	May 0.9471	Jun 0.9345	Jul 0.9294	Aug 0.9269	Sep 0.9395	Oct 0.9573	Nov 0.9623	Dec 0.9699 (40)
HLP (average)	0.9524											
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.7896 (42)											
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)

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Hot water usage for baths	81.8844	80.6683	78.9558	75.7982	73.4339	70.8122	69.3961	71.0966	72.9482	75.7535	78.9761	81.6076 (42b)
Hot water usage for other uses	43.1979	41.6271	40.0562	38.4854	36.9146	35.3437	35.3437	36.9146	38.4854	40.0562	41.6271	43.1979 (42c)
Average daily hot water use (litres/day)												115.1906 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	125.0823	122.2954	119.0120	114.2836	110.3484	106.1559	104.7398	108.0112	111.4336	115.8097	120.6032	124.8055 (44)
Distribution loss (46)m = 0.15 x (45)m	198.0998	174.1470	182.9171	156.4486	148.5502	130.5311	126.6737	133.7404	137.4087	157.1527	171.8213	195.4153 (45)
Water storage loss:												Total = Sum(45)m = 1912.9058
Store volume												200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8640 (55)
Total storage loss	26.7840	24.1920	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	25.9200	26.7840	25.9200	26.7840 (56)
If cylinder contains dedicated solar storage	26.7840	24.1920	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	25.9200	26.7840	25.9200	26.7840 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	248.1462	219.3502	232.9635	204.8806	198.5966	178.9631	176.7201	183.7868	185.8407	207.1991	220.2533	245.4617 (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	248.1462	219.3502	232.9635	204.8806	198.5966	178.9631	176.7201	183.7868	185.8407	207.1991	220.2533	245.4617 (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	105.9053	94.0664	100.8570	90.7647	89.4301	82.1472	82.1561	84.5058	84.4340	92.2904	95.8762	105.0127 (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	167.3737	167.3737	167.3737	167.3737	167.3737	167.3737	167.3737	167.3737	167.3737	167.3737	167.3737	167.3737 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.8574	30.9600	25.1784	19.0616	14.2488	12.0294	12.9982	16.8956	22.6772	28.7940	33.6068	35.8262 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	396.8494	400.9674	390.5900	368.4979	340.6105	314.4002	296.8902	292.7721	303.1495	325.2417	353.1291	379.3393 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.5269	54.5269	54.5269	54.5269	54.5269	54.5269	54.5269	54.5269	54.5269	54.5269	54.5269	54.5269 (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)	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824 (71)
Water heating gains (Table 5)	142.3458	139.9798	135.5605	126.0622	120.2017	114.0933	110.4249	113.5831	117.2695	124.0462	133.1614	141.1461 (72)
Total internal gains	684.3707	682.2254	661.6471	623.9398	585.3791	550.8411	530.6315	533.5689	553.4143	588.4000	630.2154	666.6297 (73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains						
	m2	Table 6a	Specific data	Specific data	factor	W						
		W/m2	or Table 6b	or Table 6c	Table 6d							
East	8.3100	26.5119	0.7600	0.7000	0.7700	81.2244 (76)						
West	9.8100	26.5119	0.7600	0.7000	0.7700	95.8859 (80)						
Solar gains	177.1103	297.0081	482.9080	715.1587	822.9623	917.1424	800.1673	741.7021	591.1410	365.3018	212.7372	140.2064 (83)
Total gains	861.4811	979.2335	1144.5551	1339.0986	1408.3414	1467.9835	1330.7987	1275.2710	1144.5554	953.7018	842.9526	806.8361 (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)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	109.2826	110.1406	110.1406	111.8975	112.4956	114.0194	114.6405	114.9536	113.4049	111.3056	110.7200	109.8531
util living area	8.2855	8.3427	8.3427	8.4598	8.4997	8.6013	8.6427	8.6636	8.5603	8.4204	8.3813	8.3235
	0.9957	0.9884	0.9541	0.8404	0.6634	0.4726	0.3854	0.3857	0.5644	0.8741	0.9836	0.9965 (86)
Living	20.6123	20.6898	20.8135	20.9209	20.9575	20.9635	20.9639	20.9640	20.9624	20.9189	20.7632	20.6152
Non living	19.6701	19.7724	19.9194	20.0425	20.0771	20.0917	20.0963	20.0986	20.0869	20.0408	19.8682	19.6777
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.8017	20.6898	20.8135	20.9209	20.9575	20.9635	20.9639	20.9640	20.9624	20.9189	20.7632	20.6690 (87)
Th 2	20.1042	20.1106	20.1106	20.1234	20.1276	20.1383	20.1426	20.1447	20.1340	20.1191	20.1148	20.1085 (88)
util rest of house	0.9933	0.9825	0.9344	0.7962	0.6052	0.4146	0.3219	0.3197	0.4903	0.8188	0.9733	0.9944 (89)
MIT 2	19.9312	19.7724	19.9194	20.0425	20.0771	20.0917	20.0963	20.0986	20.0869	20.0408	19.8682	19.7554 (90)
Living area fraction												FLA = Living area / (4) = 0.1782 (91)
MIT	20.0862	19.9358	20.0787	20.1990	20.2340	20.2470	20.2509	20.2528	20.2429	20.1972	20.0276	19.9181 (92)
Temperature adjustment												0.0000
adjusted MIT	20.0862	19.9358	20.0787	20.1990	20.2340	20.2470	20.2509	20.2528	20.2429	20.1972	20.0276	19.9181 (93)

8. Space heating requirement

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9932	0.9810	0.9335	0.8003	0.6124	0.4219	0.3299	0.3281	0.4997	0.8242	0.9720	0.9938	(94)
Useful gains	855.6558	960.5917	1068.4718	1071.6714	862.4641	619.3973	439.0505	418.3646	571.9306	786.0884	819.3497	801.8335	(95)
Ext temp.	6.5000	6.7000	7.7000	9.1000	11.6000	14.0000	15.8000	16.0000	14.5000	12.0000	9.3000	7.0000	(96)
Heat loss rate W	1405.9642	1359.0331	1271.0195	1121.7374	867.9619	619.6121	439.0708	418.3826	572.6944	832.8659	1095.7320	1329.8844	(97)
Space heating kWh	409.4294	267.7526	150.6955	36.0475	4.0903	0.0000	0.0000	0.0000	0.0000	34.8025	198.9952	392.8699	(98a)
Space heating requirement - total per year (kWh/year)												1494.6829	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	409.4294	267.7526	150.6955	36.0475	4.0903	0.0000	0.0000	0.0000	0.0000	34.8025	198.9952	392.8699	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1494.6829	
Space heating per m2										(98c) / (4) =		14.0822	(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 %)													301.7937	(206)
Efficiency of main space heating system 2 (in %)													0.0000	(207)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	409.4294	267.7526	150.6955	36.0475	4.0903	0.0000	0.0000	0.0000	0.0000	34.8025	198.9952	392.8699	(98)	
Space heating efficiency (main heating system 1)	301.7937	301.7937	301.7937	301.7937	301.7937	0.0000	0.0000	0.0000	0.0000	301.7937	301.7937	301.7937	(210)	
Space heating fuel (main heating system)	135.6653	88.7204	49.9333	11.9444	1.3553	0.0000	0.0000	0.0000	0.0000	11.5319	65.9375	130.1783	(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	248.1462	219.3502	232.9635	204.8806	198.5966	178.9631	176.7201	183.7868	185.8407	207.1991	220.2533	245.4617	(64)	
Efficiency of water heater (217)m	199.6736	199.6736	199.6736	199.6736	199.6736	199.6736	199.6736	199.6736	199.6736	199.6736	199.6736	199.6736	(216)	
Fuel for water heating, kWh/month	124.2759	109.8544	116.6721	102.6077	99.4606	89.6278	88.5045	92.0436	93.0723	103.7689	110.3067	122.9314	(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	16.6047	14.9978	16.6047	16.0691	16.6047	16.0691	16.6047	16.6047	16.0691	16.6047	16.0691	16.6047	(231)	
Lighting	30.5105	24.4766	22.0385	16.1463	12.4719	10.1896	11.3773	14.7886	19.2090	25.2032	28.4669	31.3584	(232)	
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-75.5169	-100.5481	-149.5929	-167.7280	-173.8442	-165.3537	-158.9702	-155.0565	-138.9629	-114.5201	-80.4547	-61.9423	(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	-41.4903	-82.7552	-196.6564	-353.0874	-466.0799	-534.1871	-468.0596	-411.4482	-279.5704	-139.6072	-56.8729	-29.8130	(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													495.2665	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													199.6736	
Water heating fuel used													1253.1258	(219)
Space cooling fuel													0.0000	(221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.5720)													195.5074	(230a)
mechanical ventilation fans (SFP = 0.5720)													195.5074	(231)
Total electricity for the above, kWh/year													246.2368	(232)
Electricity for lighting (calculated in Appendix L)														
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-4602.1180	(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													-2411.9815	(238)

10a. Fuel costs - using BEDF prices (528)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	495.2665	21.5100	106.5318	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1253.1258	21.5100	269.5474	(247)
Energy for instantaneous electric shower(s)	0.0000	21.5100	0.0000	(247a)
Pumps, fans and electric keep-hot	195.5074	21.5100	42.0536	(249)
Energy for lighting	246.2368	21.5100	52.9655	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1542.4905	21.5100	-331.7897	
PV Unit electricity exported	-3059.6276	5.5900	-171.0332	
Total			-502.8229	(252)

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Total energy cost -31.7245 (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	495.2665	0.1587	78.5794 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1253.1258	0.1409	176.5359 (264)
Space and water heating			255.1154 (265)
Pumps, fans and electric keep-hot	195.5074	0.1387	27.1193 (267)
Energy for lighting	246.2368	0.1443	35.5396 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1542.4905	0.1347	-207.8451
PV Unit electricity exported	-3059.6276	0.1228	-375.8703
Total			-583.7155 (269)
Total CO2, kg/year			-265.9412 (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	495.2665	1.5873	786.1338 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1253.1258	1.5209	1905.8901 (278)
Space and water heating			2692.0239 (279)
Pumps, fans and electric keep-hot	195.5074	1.5128	295.7636 (281)
Energy for lighting	246.2368	1.5338	377.6863 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1542.4905	1.4980	-2310.6598
PV Unit electricity exported	-3059.6276	0.4508	-1379.3631
Total			-3690.0229 (283)
Total Primary energy kWh/year			-324.5492 (286)

 SAP 10 EPC IMPROVEMENTS

SECI ASHP cavity

Current energy efficiency rating: A 99
 Current environmental impact rating: A 101

	SAP change	Cost change	CO2 change
N Solar water heating			Recommended
U Solar photovoltaic panels			Already installed
V2 Wind turbine			Recommended
Recommended measures:			
N Solar water heating	+ 1.3	-£ 55	-40 kg (15.0%)
V2 Wind turbine	+ 18.3	-£ 598	-496 kg (162.1%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£55	0.38 kg/m ²	A 100 A 102
Wind turbine	£598	4.67 kg/m ²	A 119 A 106
Total Savings	£654	5.05 kg/m ²	

Potential energy efficiency rating: A 119
 Potential environmental impact rating: A 106

Fuel prices for cost data on this page from database revision number 528 TEST (04 Oct 2023)
 Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, South West England):

	Current	Potential	Saving
Electricity	£471	£401	£70
Space heating	£149	£166	-£17
Water heating	£270	£182	£87
Lighting	£53	£53	£0
Generated (PV)	-£503	-£488	-£15
Generated (wind)	-£0	-£598	£598
Total cost of fuels	-£32	-£685	£653
Total cost of uses	-£31	-£685	£653
Delivered energy	-23 kWh/m ²	-59 kWh/m ²	37 kWh/m ²
Carbon dioxide emissions	-0.3 tonnes	-0.8 tonnes	0.5 tonnes
CO2 emissions per m ²	-3 kg/m ²	-8 kg/m ²	5 kg/m ²
Primary energy	-3 kWh/m ²	-48 kWh/m ²	44 kWh/m ²

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

Full SAP Calculation Printout



1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	55.5100 (1b)	x 2.6300 (2b)	= 145.9913 (1b) - (3b)
First floor	50.6300 (1c)	x 2.6500 (2c)	= 134.1695 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	106.1400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 280.1608 (5)

2. Ventilation rate

		m3 per hour
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	0.0000 / (5) =	0.0000 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (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	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												81.0000 (23c)
Effective ac	0.2432	0.2403	0.2374	0.2229	0.2200	0.2054	0.2054	0.2025	0.2112	0.2200	0.2258	0.2316 (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
Window (Uw = 1.20)			18.1200	1.1450	20.7481		(27)
Door			6.3000	1.2000	7.5600		(26a)
Floor 1 P/a 0.54			55.5100	0.1200	6.6612	110.0000	6106.1000 (28a)
External Wall 1 Stone	45.9600	10.4100	35.5500	0.2100	7.4655	190.0000	6754.5000 (29a)
External Wall 2 Render	107.5600	14.0100	93.5500	0.2100	19.6455	190.0000	17774.5000 (29a)
External Roof 1 horz	55.5100		55.5100	0.0900	4.9959	9.0000	499.5900 (30)
Total net area of external elements Aum(A, m2)			264.5400				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	67.0762	(33)
Internal Wall 1 GF			72.0000			100.0000	7200.0000 (32c)
Internal Wall 2 PF			112.3200			9.0000	1010.8800 (32c)
Internal Floor 1			50.6300			18.0000	911.3400 (32d)
Internal Ceiling 1			50.6300			9.0000	455.6700 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 40712.5800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							383.5743 (35)

List of Thermal Bridges	K1 Element	Length	Psi-value	Total
E16 Corner (normal)		20.2000	0.0520	1.0504
E5 Ground floor (normal)		30.4000	0.1640	4.9856
E6 Intermediate floor within a dwelling		28.8000	0.0020	0.0576
E10 Eaves (insulation at ceiling level)		18.2000	0.0720	1.3104
E12 Gable (insulation at ceiling level)		12.2000	0.1740	2.1228
E1 Steel lintel with perforated steel base plate		17.2000	0.0200	0.3440
E3 Sill		14.2000	0.0180	0.2556
E4 Jamb		40.8000	0.0140	0.5712
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				10.6976 (36)
Point Thermal bridges				0.0000
Total fabric heat loss				(33) + (36) + (36a) = 77.7738 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	22.4863	22.2176	21.9489	20.6055	20.3368	18.9933	18.9933	18.7246	19.5307	20.3368	20.8742	21.4116 (38)
Heat transfer coeff	100.2601	99.9914	99.7227	98.3793	98.1106	96.7671	96.7671	96.4984	97.3045	98.1106	98.6480	99.1853 (39)
Average = Sum(39)m / 12 =												98.3121
HLP	0.9446	0.9421	0.9395	0.9269	0.9244	0.9117	0.9117	0.9092	0.9168	0.9244	0.9294	0.9345 (40)
HLP (average)												0.9262
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												2.7896 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	81.8844	80.6683	78.9558	75.7982	73.4339	70.8122	69.3961	71.0966	72.9482	75.7535	78.9761	81.6076 (42b)
Hot water usage for other uses												

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	43.1979	41.6271	40.0562	38.4854	36.9146	35.3437	35.3437	36.9146	38.4854	40.0562	41.6271	43.1979 (42c)
Average daily hot water use (litres/day)												115.1906 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	125.0823	122.2954	119.0120	114.2836	110.3484	106.1559	104.7398	108.0112	111.4336	115.8097	120.6032	124.8055 (44)
Energy content (annual)	198.0998	174.1470	182.9171	156.4486	148.5502	130.5311	126.6737	133.7404	137.4087	157.1527	171.8213	195.4153 (45)
Energy content (annual)												1912.9058
Distribution loss (46)m = 0.15 x (45)m	29.7150	26.1221	27.4376	23.4673	22.2825	19.5797	19.0011	20.0611	20.6113	23.5729	25.7732	29.3123 (46)
Water storage loss:												200.0000 (47)
Store volume												1.6000 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.8640 (55)
Enter (49) or (54) in (55)												
Total storage loss	26.7840	24.1920	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	25.9200	26.7840	25.9200	26.7840 (56)
If cylinder contains dedicated solar storage	26.7840	24.1920	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	25.9200	26.7840	25.9200	26.7840 (57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	248.1462	219.3502	231.5677	198.1270	185.8023	166.3563	163.6931	171.6903	180.4379	205.8033	220.2533	245.4617 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.8000 (H2)
Collector linear heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0000 (H4)
Collector loop efficiency												0.9000 (H5)
Incidence angle modifier												1.0000 (H6)
Overshading factor												0.8000 (H8)
Overall heat loss coefficient of system												6.5000 (H10)
Heat loss coefficient of collector loop												3.9667 (H11)
Dedicated solar storage volume												75.0000 (H12)
Effective solar volume												75.0000 (H14)
Reference volume												225.0000 (H15)
Storage tank correction coefficient												1.3161 (H16)
Heat delivered to hot water												608.9982 (H24)
Heat delivered to space heating												0.0000 (H29)
Solar input												608.9982
Solar input	-0.0000	-16.2302	-57.6870	-78.7284	-101.9609	-93.8416	-93.1179	-81.8695	-56.9773	-28.5854	-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	248.1462	203.1200	173.8808	119.3986	83.8413	72.5148	70.5752	89.8208	123.4606	177.2179	220.2533	245.4617 (64)
												1827.6912 (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)
												0.0000 (64a)
Heat gains from water heating, kWh/month	105.9053	94.0664	99.7405	85.3619	79.1946	72.0618	71.7346	74.8286	80.1117	91.1738	95.8762	105.0127 (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	167.3737	167.3737	167.3737	167.3737	167.3737	167.3737	167.3737	167.3737	167.3737	167.3737	167.3737	167.3737 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.8574	30.9600	25.1784	19.0616	14.2488	12.0294	12.9982	16.8956	22.6772	28.7940	33.6068	35.8262 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	396.8494	400.9674	390.5900	368.4979	340.6105	314.4002	296.8902	292.7721	303.1495	325.2417	353.1291	379.3393 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.5269	54.5269	54.5269	54.5269	54.5269	54.5269	54.5269	54.5269	54.5269	54.5269	54.5269	54.5269 (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)	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824 (71)
Water heating gains (Table 5)	142.3458	139.9798	134.0597	118.5582	106.4444	100.0858	96.4174	100.5761	111.2663	122.5454	133.1614	141.1461 (72)
Total internal gains	684.3707	682.2254	660.1463	616.4358	571.6218	536.8336	516.6240	520.5620	547.4111	586.8992	630.2154	666.6297 (73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b g	Specific data or Table 6c FF	Access factor Table 6d	Gains W						
East	8.3100	19.6403	0.7600	0.7000	0.7700	60.1718 (76)						
West	9.8100	19.6403	0.7600	0.7000	0.7700	71.0332 (80)						
Solar gains	131.2050	256.6648	422.6904	616.4687	755.5056	773.3944	736.3030	632.4734	491.6064	304.5544	163.5972	107.8966 (83)
Total gains	815.5757	938.8902	1082.8367	1232.9045	1327.1273	1310.2280	1252.9270	1153.0354	1039.0175	891.4536	793.8126	774.5263 (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)	112.7971	113.1002	113.4049	114.9536	115.2684	116.8687	116.8687	117.1941	116.2233	115.2684	114.6405	114.0194
util living area	0.9989	0.9958	0.9775	0.8801	0.6790	0.4723	0.3398	0.3849	0.6411	0.9464	0.9962	0.9993 (86)
Living	20.4933	20.5943	20.7515	20.9063	20.9579	20.9643	20.9646	20.9646	20.9615	20.8673	20.6459	20.4751
Non living	19.5404	19.6709	19.8681	20.0504	20.0971	20.1120	20.1121	20.1144	20.1063	20.0173	19.7465	19.5246
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.7408	20.5943	20.7515	20.9063	20.9579	20.9643	20.9646	20.9646	20.9615	20.8673	20.6459	20.5485 (87)
Th 2	20.1298	20.1319	20.1340	20.1447	20.1469	20.1576	20.1576	20.1597	20.1533	20.1469	20.1426	20.1383 (88)
util rest of house												

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MIT 2	0.9983	0.9938	0.9673	0.8418	0.6205	0.4104	0.2748	0.3146	0.5652	0.9175	0.9940	0.9989 (89)
Living area fraction	19.8948	19.6709	19.8681	20.0504	20.0971	20.1120	20.1121	20.1144	20.1063	20.0173	19.7465	19.6352 (90)
MIT	20.0455	19.8354	20.0255	20.2029	20.2505	20.2639	20.2640	20.2658	20.2587	20.1687	19.9067	19.7979 (92)
Temperature adjustment												0.0000
adjusted MIT	20.0455	19.8354	20.0255	20.2029	20.2505	20.2639	20.2640	20.2658	20.2587	20.1687	19.9067	19.7979 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9983	0.9929	0.9657	0.8446	0.6277	0.4182	0.2830	0.3235	0.5748	0.9184	0.9932	0.9987	(94)
Useful gains	814.1537	932.1882	1045.7117	1041.3296	833.0777	547.9254	354.5483	373.0351	597.2006	818.6818	788.4342	773.5182	(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	1578.6486	1493.4115	1348.7967	1111.9725	838.8927	548.0754	354.5521	373.0472	599.2678	938.7902	1263.3549	1547.0835	(97)
Space heating kWh	568.7842	377.1421	225.4952	50.8629	4.3263	0.0000	0.0000	0.0000	0.0000	89.3607	341.9429	575.5326	(98a)
Space heating requirement - total per year (kWh/year)												2233.4469	
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	568.7842	377.1421	225.4952	50.8629	4.3263	0.0000	0.0000	0.0000	0.0000	89.3607	341.9429	575.5326	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2233.4469	
Space heating per m2												(98c) / (4) =	21.0425 (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 %)													303.7151 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement	568.7842	377.1421	225.4952	50.8629	4.3263	0.0000	0.0000	0.0000	0.0000	89.3607	341.9429	575.5326	(98)
Space heating efficiency (main heating system 1)	303.7151	303.7151	303.7151	303.7151	303.7151	0.0000	0.0000	0.0000	0.0000	303.7151	303.7151	303.7151	(210)
Space heating fuel (main heating system)	187.2756	124.1763	74.2456	16.7469	1.4245	0.0000	0.0000	0.0000	0.0000	29.4225	112.5867	189.4975	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	248.1462	203.1200	173.8808	119.3986	83.8413	72.5148	70.5752	89.8208	123.4606	177.2179	220.2533	245.4617	(64)
Efficiency of water heater (217)m	200.2862	200.2862	200.2862	200.2862	200.2862	200.2862	200.2862	200.2862	200.2862	200.2862	200.2862	200.2862	(216)
Fuel for water heating, kWh/month	123.8958	101.4149	86.8162	59.6140	41.8608	36.2056	35.2372	44.8462	61.6421	88.4823	109.9693	122.5554	(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	23.3993	21.1348	23.3993	22.6444	23.3993	22.6444	23.3993	23.3993	22.6444	23.3993	22.6444	23.3993	(231)
Lighting	30.5105	24.4766	22.0385	16.1463	12.4719	10.1896	11.3773	14.7886	19.2090	25.2032	28.4669	31.3584	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-59.8786	-91.3474	-137.3120	-149.7496	-153.7944	-142.2381	-140.0636	-135.1463	-122.1743	-102.3770	-67.0386	-50.4117	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	-212.5732	-192.0016	-212.5732	-205.7160	-212.5732	-205.7160	-212.5732	-212.5732	-205.7160	-212.5732	-205.7160	-212.5732	(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	-25.6392	-64.8133	-161.4246	-293.2980	-427.0345	-441.6552	-430.7492	-341.9235	-221.0152	-106.4492	-37.1233	-19.2738	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	-91.1028	-82.2864	-91.1028	-88.1640	-91.1028	-88.1640	-91.1028	-88.1640	-91.1028	-88.1640	-91.1028	-88.1640	(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													735.3756 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													200.2862
Water heating fuel used													912.5397 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.5720)													
mechanical ventilation fans (SFP = 0.5720)													195.5074 (230a)
pump for solar water heating													80.0000 (230g)
Total electricity for the above, kWh/year													275.5074 (231)
Electricity for lighting (calculated in Appendix L)													246.2368 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-3921.9303 (233)
Wind generation													-3575.5408 (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													-5327.8115 (238)

10a. Fuel costs - using Table 12 prices

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	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	735.3756	16.4900	121.2634 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	912.5397	16.4900	150.4778 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	195.5074	16.4900	32.2392 (249)
Pump for solar water heating	80.0000	16.4900	13.1920 (249)
Energy for lighting	246.2368	16.4900	40.6045 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1351.5314	16.4900	-222.8675
PV Unit electricity exported	-2570.3989	5.5900	-143.6853
Total			-366.5528 (252)
Wind Turbine electricity used in dwelling	-2502.8785	16.4900	-412.7247
Wind Turbine electricity exported	-1072.6622	5.5900	-59.9618
Total			-472.6865 (252)
Total energy cost			-481.4624 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	-1.1468 (257)
SAP value		118.5895
SAP rating (Section 12)		119 (258)
SAP band		A

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	735.3756	0.1581	116.2267 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	912.5397	0.1459	133.1693 (264)
Space and water heating			249.3960 (265)
Pumps, fans and electric keep-hot	275.5074	0.1387	38.2163 (267)
Energy for lighting	246.2368	0.1443	35.5396 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1351.5314	0.1347	-182.0200
PV Unit electricity exported	-2570.3989	0.1217	-312.8669
Total			-494.8869 (269)
Wind Turbine electricity used in dwelling	-2502.8785	0.1387	-347.1801
Wind Turbine electricity exported	-1072.6622	0.1387	-148.7915
Total			-495.9716 (269)
Total CO2, kg/year			-667.7066 (272)
CO2 emissions per m2			-6.2900 (273)
EI value			105.9199
EI rating			106 (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 (m ²)	Storey height (m)	Volume (m ³)
Ground floor	55.5100 (1b)	x 2.6300 (2b)	= 145.9913 (1b) - (3b)
First floor	50.6300 (1c)	x 2.6500 (2c)	= 134.1695 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	106.1400		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 280.1608 (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	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1162 (21)

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	6.3000	6.0000	6.0000	5.4000	5.2000	4.7000	4.5000	4.4000	4.9000	5.6000	5.8000	6.1000	(22)
Wind factor	1.5750	1.5000	1.5000	1.3500	1.3000	1.1750	1.1250	1.1000	1.2250	1.4000	1.4500	1.5250	(22a)
Adj infilt rate													
	0.1831	0.1744	0.1744	0.1569	0.1511	0.1366	0.1308	0.1279	0.1424	0.1627	0.1686	0.1773	(22b)
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation													0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													81.0000 (23c)
Effective ac	0.2781	0.2694	0.2694	0.2519	0.2461	0.2316	0.2258	0.2229	0.2374	0.2577	0.2636	0.2723	(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	
Window (Uw = 1.20)			18.1200	1.1450	20.7481			(27)
Door			6.3000	1.2000	7.5600			(26a)
Floor 1 P/a 0.54			55.5100	0.1200	6.6612	110.0000	6106.1000	(28a)
External Wall 1 Stone	45.9600	10.4100	35.5500	0.2100	7.4655	190.0000	6754.5000	(29a)
External Wall 2 Render	107.5600	14.0100	93.5500	0.2100	19.6455	190.0000	17774.5000	(29a)
External Roof 1 horz	55.5100		55.5100	0.0900	4.9959	9.0000	499.5900	(30)
Total net area of external elements Aum(A, m2)			264.5400					(31)
Fabric heat loss, W/K = Sum (A x U)					67.0762			(32)
Internal Wall 1 GF			72.0000			100.0000	7200.0000	(32c)
Internal Wall 2 FF			112.3200			9.0000	1010.8800	(32c)
Internal Floor 1			50.6300			18.0000	911.3400	(32d)
Internal Ceiling 1			50.6300			9.0000	455.6700	(32e)
Heat capacity Cm = Sum(A x k)								(28)...(30) + (32) = 40712.5800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								383.5743 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E16 Corner (normal)	20.2000	0.0520	1.0504
E5 Ground floor (normal)	30.4000	0.1640	4.9856
E6 Intermediate floor within a dwelling	28.8000	0.0020	0.0576
E10 Eaves (insulation at ceiling level)	18.2000	0.0720	1.3104
E12 Gable (insulation at ceiling level)	12.2000	0.1740	2.1228
E1 Steel lintel with perforated steel base plate	17.2000	0.0200	0.3440
E3 Sill	14.2000	0.0180	0.2556
E4 Jamb	40.8000	0.0140	0.5712

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

Point Thermal bridges													10.6976 (36)
Total fabric heat loss													(33) + (36) + (36a) = 77.7738 (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	25.7106	24.9045	24.9045	23.2924	22.7550	21.4116	20.8742	20.6055	21.9489	23.8298	24.3672	25.1732	(38)
Average = Sum(39)m / 12 =	103.4844	102.6783	102.6783	101.0662	100.5288	99.1853	98.6480	98.3793	99.7227	101.6036	102.1410	102.9470	(39)
													101.0886

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9750	0.9674	0.9674	0.9522	0.9471	0.9345	0.9294	0.9269	0.9395	0.9573	0.9623	0.9699	(40)
HLP (average)													0.9524
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.7896 (42)
Hot water usage for mixer showers													0.0000 (42a)
Hot water usage for baths	81.8844	80.6683	78.9558	75.7982	73.4339	70.8122	69.3961	71.0966	72.9482	75.7535	78.9761	81.6076	(42b)
Hot water usage for other uses	43.1979	41.6271	40.0562	38.4854	36.9146	35.3437	35.3437	36.9146	38.4854	40.0562	41.6271	43.1979	(42c)
Average daily hot water use (litres/day)													115.1906 (43)
Daily hot water use	125.0823	122.2954	119.0120	114.2836	110.3484	106.1559	104.7398	108.0112	111.4336	115.8097	120.6032	124.8055	(44)
Energy conte	198.0998	174.1470	182.9171	156.4486	148.5502	130.5311	126.6737	133.7404	137.4087	157.1527	171.8213	195.4153	(45)
Energy content (annual)													Total = Sum(45)m = 1912.9058
Distribution loss (46)m = 0.15 x (45)m	29.7150	26.1221	27.4376	23.4673	22.2825	19.5797	19.0011	20.0611	20.6113	23.5729	25.7732	29.3123	(46)
Water storage loss:													200.0000 (47)
Store volume													1.6000 (48)
a) If manufacturer declared loss factor is known (kWh/day):													0.5400 (49)
Temperature factor from Table 2b													0.8640 (55)
Enter (49) or (54) in (55)													
Total storage loss	26.7840	24.1920	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	25.9200	26.7840	25.9200	26.7840	(56)
If cylinder contains dedicated solar storage	26.7840	24.1920	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	25.9200	26.7840	25.9200	26.7840	(57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	248.1462	219.3502	231.5677	198.1270	185.8023	166.3563	163.6931	171.6903	180.4379	205.8033	220.2533	245.4617	(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)
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	(63b)
Aperture area of solar collector													3.0000 (H1)
Zero-loss collector efficiency													0.8000 (H2)
Collector linear heat loss coefficient													1.8000 (H3)
Collector 2nd order heat loss coefficient													0.0000 (H4)
Collector loop efficiency													0.9000 (H5)
Incidence angle modifier													1.0000 (H6)
Overshading factor													0.8000 (H8)
Overall heat loss coefficient of system													6.5000 (H10)
Heat loss coefficient of collector loop													3.9667 (H11)
Dedicated solar storage volume													75.0000 (H12)
Effective solar volume													75.0000 (H14)
Reference volume													225.0000 (H15)
Storage tank correction coefficient													1.3161 (H16)

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Heat delivered to hot water												743.5141 (H24)
Heat delivered to space heating												0.0000 (H29)
Solar input												743.5141
Solar input	-7.5652	-25.4721	-70.3593	-93.8084	-110.9558	-110.7985	-100.3857	-97.0871	-73.2710	-42.6099	-11.2012	-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	240.5810	193.8781	161.2085	104.3186	74.8465	55.5578	63.3075	74.6032	107.1668	163.1935	209.0521	245.4617 (64)
												Total per year (kWh/year) = Sum(64)m = 1693.1753 (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	105.9053	94.0664	99.7405	85.3619	79.1946	72.0618	71.7346	74.8286	80.1117	91.1738	95.8762	105.0127 (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	167.3737	167.3737	167.3737	167.3737	167.3737	167.3737	167.3737	167.3737	167.3737	167.3737	167.3737	167.3737 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.8574	30.9600	25.1784	19.0616	14.2488	12.0294	12.9982	16.8956	22.6772	28.7940	33.6068	35.8262 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	396.8494	400.9674	390.5900	368.4979	340.6105	314.4002	296.8902	292.7721	303.1495	325.2417	353.1291	379.3393 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.5269	54.5269	54.5269	54.5269	54.5269	54.5269	54.5269	54.5269	54.5269	54.5269	54.5269	54.5269 (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)	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824	-111.5824 (71)
Water heating gains (Table 5)	142.3458	139.9798	134.0597	118.5582	106.4444	100.0858	96.4174	100.5761	111.2663	122.5454	133.1614	141.1461 (72)
Total internal gains	684.3707	682.2254	660.1463	616.4358	571.6218	536.8336	516.6240	520.5620	547.4111	586.8992	630.2154	666.6297 (73)

6. Solar gains

[Jan]		Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W					
East		8.3100	26.5119	0.7600	0.7000	0.7700	81.2244 (76)					
West		9.8100	26.5119	0.7600	0.7000	0.7700	95.8859 (80)					
Solar gains	177.1103	297.0081	482.9080	715.1587	822.9623	917.1424	800.1673	741.7021	591.1410	365.3018	212.7372	140.2064 (83)
Total gains	861.4811	979.2335	1143.0543	1331.5946	1394.5841	1453.9760	1316.7912	1262.2641	1138.5522	952.2010	842.9526	806.8361 (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	109.2826	110.1406	110.1406	111.8975	112.4956	114.0194	114.6405	114.9536	113.4049	111.3056	110.7200	109.8531
alpha	8.2855	8.3427	8.3427	8.4598	8.4997	8.6013	8.6427	8.6636	8.5603	8.4204	8.3813	8.3235
util living area	0.9957	0.9884	0.9544	0.8434	0.6694	0.4771	0.3895	0.3896	0.5673	0.8749	0.9836	0.9965 (86)
Living	20.6123	20.6898	20.8129	20.9197	20.9571	20.9634	20.9639	20.9640	20.9624	20.9186	20.7632	20.6152
Non living	19.6701	19.7724	19.9187	20.0415	20.0769	20.0917	20.0963	20.0986	20.0869	20.0405	19.8682	19.6777
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.8017	20.6898	20.8129	20.9197	20.9571	20.9634	20.9639	20.9640	20.9624	20.9186	20.7632	20.6690 (87)
Th 2	20.1042	20.1106	20.1106	20.1234	20.1276	20.1383	20.1426	20.1447	20.1340	20.1191	20.1148	20.1085 (88)
util rest of house	0.9933	0.9825	0.9348	0.7996	0.6109	0.4186	0.3253	0.3230	0.4929	0.8197	0.9733	0.9944 (89)
MIT 2	19.9312	19.7724	19.9187	20.0415	20.0769	20.0917	20.0963	20.0986	20.0869	20.0405	19.8682	19.7554 (90)
Living area fraction									flA = Living area / (4) =			0.1782 (91)
MIT 20.0862	19.9358	20.0780	20.1980	20.2337	20.2470	20.2509	20.2528	20.2428	20.1969	20.0276	19.9181 (92)	
Temperature adjustment												0.0000
adjusted MIT	20.0862	19.9358	20.0780	20.1980	20.2337	20.2470	20.2509	20.2528	20.2428	20.1969	20.0276	19.9181 (93)

8. Space heating requirement

Utilisation	0.9932	0.9810	0.9339	0.8036	0.6181	0.4260	0.3334	0.3314	0.5023	0.8251	0.9720	0.9938 (94)
Useful gains	855.6558	960.5917	1067.5405	1070.0346	862.0484	619.3792	439.0485	418.3629	571.8973	785.6884	819.3497	801.8335 (95)
Ext temp.	6.5000	6.7000	7.7000	9.1000	11.6000	14.0000	15.8000	16.0000	14.5000	12.0000	9.3000	7.0000 (96)
Heat loss rate W	1405.9642	1359.0331	1270.9547	1121.6281	867.9342	619.6108	439.0706	418.3825	572.6920	832.8389	1095.7320	1329.8844 (97)
Space heating kWh	409.4294	267.7526	151.3401	37.1473	4.3791	0.0000	0.0000	0.0000	0.0000	35.0799	198.9952	392.8699 (98a)
Space heating requirement - total per year (kWh/year)												1496.9936
Solar heating kWh	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	409.4294	267.7526	151.3401	37.1473	4.3791	0.0000	0.0000	0.0000	0.0000	35.0799	198.9952	392.8699 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1496.9936
Space heating per m2										(98c) / (4) =		14.1040 (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 %)	301.7937 (206)

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement	409.4294	267.7526	151.3401	37.1473	4.3791	0.0000	0.0000	0.0000	0.0000	35.0799	198.9952	392.8699	(98)
Space heating efficiency (main heating system 1)	301.7937	301.7937	301.7937	301.7937	301.7937	0.0000	0.0000	0.0000	0.0000	301.7937	301.7937	301.7937	(210)
Space heating fuel (main heating system)	135.6653	88.7204	50.1469	12.3088	1.4510	0.0000	0.0000	0.0000	0.0000	11.6238	65.9375	130.1783	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	240.5810	193.8781	161.2085	104.3186	74.8465	55.5578	63.3075	74.6032	107.1668	163.1935	209.0521	245.4617	(64)
Efficiency of water heater	199.6736	199.6736	199.6736	199.6736	199.6736	199.6736	199.6736	199.6736	199.6736	199.6736	199.6736	199.6736	(216)
Fuel for water heating, kWh/month	120.4871	97.0975	80.7360	52.2446	37.4844	27.8243	31.7055	37.3626	53.6710	81.7301	104.6969	122.9314	(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	23.3993	21.1348	23.3993	22.6444	23.3993	22.6444	23.3993	23.3993	22.6444	23.3993	22.6444	23.3993	(231)
Lighting	30.5105	24.4766	22.0385	16.1463	12.4719	10.1896	11.3773	14.7886	19.2090	25.2032	28.4669	31.3584	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-75.5985	-100.1553	-145.8699	-157.4292	-156.9821	-145.4705	-142.3473	-140.5599	-131.5931	-112.7922	-80.4977	-62.0817	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	-212.5732	-192.0016	-212.5732	-205.7160	-212.5732	-205.7160	-212.5732	-212.5732	-205.7160	-212.5732	-205.7160	-212.5732	(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)	-41.4088	-83.1479	-200.3794	-363.3862	-482.9420	-554.0703	-484.6824	-425.9448	-286.9403	-141.3350	-56.8299	-29.6736	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	-91.1028	-82.2864	-91.1028	-88.1640	-91.1028	-88.1640	-91.1028	-91.1028	-88.1640	-91.1028	-88.1640	-91.1028	(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													496.0321 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													199.6736
Water heating fuel used													847.9714 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.5720)													
mechanical ventilation fans (SFP = 0.5720)													195.5074 (230a)
pump for solar water heating													80.0000 (230g)
Total electricity for the above, kWh/year													275.5074 (231)
Electricity for lighting (calculated in Appendix L)													246.2368 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-4602.1180 (233)
Wind generation													-3575.5408 (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													-6311.9110 (238)

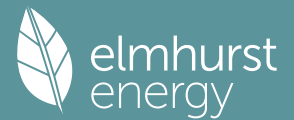
10a. Fuel costs - using BEDF prices (528)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	496.0321	21.5100	106.6965	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	847.9714	21.5100	182.3986	(247)
Energy for instantaneous electric shower(s)	0.0000	21.5100	0.0000	(247a)
Pumps, fans and electric keep-hot	195.5074	21.5100	42.0536	(249)
Pump for solar water heating	80.0000	21.5100	17.2080	(249)
Energy for lighting	246.2368	21.5100	52.9655	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1451.3775	21.5100	-312.1913	
PV Unit electricity exported	-3150.7405	5.5900	-176.1264	
Total			-488.3177	(252)
Wind Turbine electricity used in dwelling	-2502.8785	21.5100	-538.3692	
Wind Turbine electricity exported	-1072.6622	5.5900	-59.9618	
Total			-598.3310	(252)
Total energy cost			-685.3263	(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	496.0321	0.1586	78.6894	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	847.9714	0.1468	124.4996	(264)
Space and water heating			203.1889	(265)
Pumps, fans and electric keep-hot	275.5074	0.1387	38.2163	(267)
Energy for lighting	246.2368	0.1443	35.5396	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1451.3775	0.1354	-196.5678	
PV Unit electricity exported	-3150.7405	0.1226	-386.3309	

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Total				-582.8987 (269)
Wind Turbine electricity used in dwelling	-2502.8785	0.1387		-347.1801
Wind Turbine electricity exported	-1072.6622	0.1387		-148.7915
Total				-495.9716 (269)
Total CO2, kg/year				-801.9255 (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	496.0321	1.5872	787.3068	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	847.9714	1.5432	1308.5483	(278)
Space and water heating			2095.8551	(279)
Pumps, fans and electric keep-hot	275.5074	1.5128	416.7876	(281)
Energy for lighting	246.2368	1.5338	377.6863	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1451.3775	1.5006	-2177.9356	
PV Unit electricity exported	-3150.7405	0.4500	-1417.7146	
Total			-3595.6502	(283)
Wind Turbine electricity used in dwelling	-2502.8785	1.5128	-3786.3546	
Wind Turbine electricity exported	-1072.6622	0.5128	-550.0612	
Total			-4336.4158	(283)
Total Primary energy kWh/year			-5041.7370	(286)