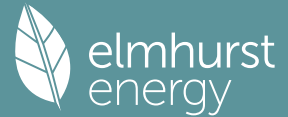


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Property Reference	OP-D320 S4KEST				Issued on Date	29/11/2024	
Assessment Reference	S4KEST		Prop Type Ref	S4KEST			
Property	S4KEST						
SAP Rating	80 C	DER	4.09	TER	10.25		
Environmental	96 A	% DER < TER				60.10	
CO ₂ Emissions (t/year)	0.53	DFEE	41.16	TFEE	42.33		
Compliance Check	See BREL	% DFEE < TFEE				2.77	
% DPER < TPER	19.86	DPER	43.00	TPER	53.66		
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	65.1500 (1b)	x 2.6000 (2b)	= 169.3900 (1b) - (3b)
First floor	74.7300 (1c)	x 2.3200 (2c)	= 173.3736 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	139.8800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	342.7636 (5)

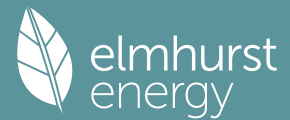
2. Ventilation rate

											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											3.5000 (17)	
Infiltration rate											0.1750 (18)	
Number of sides sheltered											2 (19)	
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.1487 (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)
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												
	0.1897	0.1859	0.1822	0.1636	0.1599	0.1413	0.1413	0.1376	0.1487	0.1599	0.1673	0.1748 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.3337	0.3299	0.3262	0.3076	0.3039	0.2853	0.2853	0.2816	0.2927	0.3039	0.3113	0.3188 (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
Front Door			6.4200	1.0000	6.4200		(26)
Windows (U _w = 1.30)			21.1100	1.2357	26.0865		(27)
Ground Floor			65.1500	0.1100	7.1665		(28a)
Exposed Floor			19.3700	0.1400	2.7118		(28b)
External Wall	167.3000	25.3900	141.9100	0.1700	24.1247		(29a)
Garage Wall	24.1800	2.1400	22.0400	0.1700	3.7468		(29a)
Roof - ceiling	84.5200		84.5200	0.1100	9.2972		(30)
Total net area of external elements A _{um} (A, m ²)			360.5200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	79.5535		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				19.0500	0.0500	0.9525	

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E3 Sill	13.6200	0.0500	0.6810
E4 Jamb	40.2000	0.0500	2.0100
E5 Ground floor (normal)	41.0400	0.1600	6.5664
E6 Intermediate floor within a dwelling	22.8900	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	19.5100	0.0600	1.1706
E12 Gable (insulation at ceiling level)	25.8800	0.0600	1.5528
E16 Corner (normal)	27.2000	0.0900	2.4480
E17 Corner (inverted - internal area greater than external area)	7.5200	-0.0900	-0.6768
E24 Eaves (insulation at ceiling level - inverted)	4.3500	0.2400	1.0440
E20 Exposed floor (normal)	9.3000	0.3200	2.9760
E21 Exposed floor (inverted)	9.3000	0.3200	2.9760
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			21.7005 (36)
Point Thermal Bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	101.2540 (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	37.7405	37.3199	36.8993	34.7961	34.3754	32.2723	32.2723	31.8516	33.1135	34.3754	35.2167	36.0580 (38)
Average = Sum(39)m / 12 =	138.9945	138.5739	138.1533	136.0501	135.6294	133.5263	133.5263	133.1056	134.3675	135.6294	136.4707	137.3120 (39)
												135.9449
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9937	0.9907	0.9877	0.9726	0.9696	0.9546	0.9546	0.9516	0.9606	0.9696	0.9756	0.9816 (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	2.9169 (42)											
Hot water usage for mixer showers	100.5481	99.0371	96.8352	92.6223	89.5133	86.0461	84.0754	86.2606	88.6560	92.3787	96.6821	100.1629 (42a)
Hot water usage for baths	33.2313	32.7378	32.0428	30.7614	29.8018	28.7378	28.1631	28.8533	29.6047	30.7432	32.0510	33.1190 (42b)
Hot water usage for other uses	46.8437	45.1403	43.4369	41.7335	40.0301	38.3267	38.3267	40.0301	41.7335	43.4369	45.1403	46.8437 (42c)
Average daily hot water use (litres/day)												166.0979 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	180.6232	176.9152	172.3149	165.1171	159.3452	153.1107	150.5652	155.1440	159.9942	166.5588	173.8734	180.1256 (44)
Energy content (annual)	286.0630	251.9249	264.8416	226.0371	214.5092	188.2674	182.0956	192.1007	197.2889	226.0187	247.7146	282.0332 (45)
Distribution loss (46)m = 0.15 x (45)m	42.9094	37.7887	39.7262	33.9056	32.1764	28.2401	27.3143	28.8151	29.5933	33.9028	37.1572	42.3050 (46)
Water storage loss:												
Store volume												230.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8000 (48)
Temperature factor from Table 2b												0.7800 (49)
Enter (49) or (54) in (55)												1.4040 (55)
Total storage loss	43.5240	39.3120	43.5240	42.1200	43.5240	42.1200	43.5240	43.5240	42.1200	43.5240	42.1200	43.5240 (56)
If cylinder contains dedicated solar storage	43.5240	39.3120	43.5240	42.1200	43.5240	42.1200	43.5240	43.5240	42.1200	43.5240	42.1200	43.5240 (57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576 (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	384.4446	340.7857	363.2232	321.2451	312.8908	252.8994	248.8820	258.8871	261.9209	324.4003	342.9226	380.4148 (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	384.4446	340.7857	363.2232	321.2451	312.8908	252.8994	248.8820	258.8871	261.9209	324.4003	342.9226	380.4148 (64)
12Total per year (kWh/year)												3792.9164 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Heat gains from water heating, kWh/month	139.0020	123.4041	131.9459	117.6277	115.2104	80.6085	79.1567	82.4834	83.6082	119.0373	124.8355	137.6621 (65)

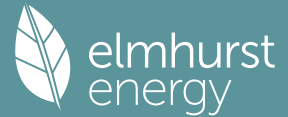
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	145.8428	145.8428	145.8428	145.8428	145.8428	145.8428	145.8428	145.8428	145.8428	145.8428	145.8428	145.8428 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	164.6911	182.3366	164.6911	170.1808	164.6911	170.1808	164.6911	164.6911	170.1808	164.6911	170.1808	164.6911 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	309.2756	312.4849	304.3975	287.1805	265.4471	245.0207	231.3746	228.1653	236.2527	253.4697	275.2032	295.6295 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.5843	37.5843	37.5843	37.5843	37.5843	37.5843	37.5843	37.5843	37.5843	37.5843	37.5843	37.5843 (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)	-116.6742	-116.6742	-116.6742	-116.6742	-116.6742	-116.6742	-116.6742	-116.6742	-116.6742	-116.6742	-116.6742	-116.6742 (71)
Water heating gains (Table 5)	186.8307	183.6370	177.3467	163.3719	154.8527	111.9563	106.3934	110.8648	116.1224	159.9964	173.3826	185.0297 (72)
Total internal gains	727.5502	745.2113	713.1882	687.4860	651.7437	593.9107	569.2120	570.4741	589.3088	644.9101	685.5195	712.1032 (73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	6.3900	10.6334	0.6300	0.7000	0.7700	20.7656 (74)
East	2.2200	19.6403	0.6300	0.7000	0.7700	13.3252 (76)
South	10.9500	46.7521	0.6300	0.7000	0.7700	156.4540 (78)
West	1.5500	19.6403	0.6300	0.7000	0.7700	9.3036 (80)

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Solar gains	199.8484	340.1821	466.7272	583.5316	660.6226	659.5311	634.2804	575.8076	506.8194	376.1344	239.2838	171.1107 (83)
Total gains	927.3986	1085.3935	1179.9153	1271.0176	1312.3663	1253.4418	1203.4924	1146.2817	1096.1282	1021.0445	924.8033	883.2139 (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	27.9547	28.0396	28.1250	28.5597	28.6483	29.0996	29.0996	29.1915	28.9174	28.6483	28.4717	28.2973
alpha	2.8636	2.8693	2.8750	2.9040	2.9099	2.9400	2.9400	2.9461	2.9278	2.9099	2.8981	2.8865
util living area	0.9553	0.9308	0.8970	0.8308	0.7293	0.5915	0.4559	0.4913	0.6801	0.8497	0.9320	0.9604 (86)
Living	18.7878	19.1163	19.5405	20.0833	20.5269	20.8230	20.9393	20.9231	20.7166	20.1556	19.3940	18.7419
Non living	17.4892	17.9035	18.4362	19.1121	19.6397	19.9753	20.0842	20.0743	19.8666	19.2135	18.2670	17.4374
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	19.8683	19.1163	19.5405	20.0833	20.5269	20.8230	20.9393	20.9231	20.7166	20.1556	19.3940	19.0578 (87)
Th 2	20.0886	20.0911	20.0936	20.1062	20.1087	20.1214	20.1214	20.1239	20.1163	20.1087	20.1037	20.0987 (88)
util rest of house	0.9492	0.9216	0.8830	0.8071	0.6899	0.5301	0.3753	0.4109	0.6237	0.8237	0.9214	0.9550 (89)
MIT 2	19.0523	17.9035	18.4362	19.1121	19.6397	19.9753	20.0842	20.0743	19.8666	19.2135	18.2670	17.9170 (90)
Living area fraction									FLA = Living area / (4) =			0.1037 (91)
MIT	19.1369	18.0293	18.5507	19.2128	19.7317	20.0632	20.1728	20.1623	19.9547	19.3112	18.3838	18.0352 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1369	18.0293	18.5507	19.2128	19.7317	20.0632	20.1728	20.1623	19.9547	19.3112	18.3838	18.0352 (93)

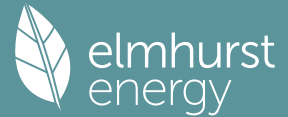
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9415	0.8940	0.8530	0.7794	0.6714	0.5258	0.3802	0.4146	0.6124	0.7958	0.8944	0.9382 (94)
Useful gains	873.1691	970.3382	1006.5179	990.6004	881.1872	659.0390	457.5955	475.2178	671.2171	812.5167	827.1408	828.6281 (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	2062.2504	1819.3725	1664.8393	1403.0573	1089.3366	729.4812	477.0642	500.7780	786.6802	1181.4946	1539.9085	1899.7407 (97)
Space heating kWh	884.6765	570.5511	489.7911	296.9689	154.8632	0.0000	0.0000	0.0000	0.0000	274.5196	513.1928	796.9078 (98a)
Space heating requirement - total per year (kWh/year)												3981.4709
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	884.6765	570.5511	489.7911	296.9689	154.8632	0.0000	0.0000	0.0000	0.0000	274.5196	513.1928	796.9078 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3981.4709
Space heating per m2										(98c) / (4) =		28.4635 (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 %)												247.9487 (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	884.6765	570.5511	489.7911	296.9689	154.8632	0.0000	0.0000	0.0000	0.0000	274.5196	513.1928	796.9078 (98)
Space heating efficiency (main heating system 1)	247.9487	247.9487	247.9487	247.9487	247.9487	0.0000	0.0000	0.0000	0.0000	247.9487	247.9487	247.9487 (210)
Space heating fuel (main heating system)	356.7982	230.1085	197.5372	119.7703	62.4578	0.0000	0.0000	0.0000	0.0000	110.7163	206.9754	321.4002 (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	384.4446	340.7857	363.2232	321.2451	312.8908	252.8994	248.8820	258.8871	261.9209	324.4003	342.9226	380.4148 (64)
Efficiency of water heater (217)m	272.0155	272.0155	272.0155	272.0155	272.0155	272.0155	272.0155	272.0155	272.0155	272.0155	272.0155	272.0155 (216)
Fuel for water heating, kWh/month	141.3319	125.2817	133.5303	118.0981	115.0268	92.9724	91.4955	95.1736	96.2890	119.2580	126.0673	139.8504 (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	52.7057	47.6051	52.7057	51.0055	52.7057	51.0055	52.7057	52.7057	51.0055	52.7057	51.0055	52.7057 (223)
Lighting	34.2196	27.4522	24.7177	18.1092	13.9881	11.4284	12.7604	16.5864	21.5442	28.2671	31.9276	35.1706 (232)
Electricity generated by PVs (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 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												1605.7637 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)

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Efficiency of water heater	272.0155	
Water heating fuel used	1394.3751	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.4840)		
mechanical ventilation fans (SFP = 1.4840)	620.5666	(230a)
Total electricity for the above, kWh/year	620.5666	(231)
Electricity for lighting (calculated in Appendix L)	276.1715	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3896.8770	(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	1605.7637	0.1552	249.2692	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1394.3751	0.1415	197.3541	(264)
Space and water heating			446.6233	(265)
Pumps, fans and electric keep-hot	620.5666	0.1387	86.0802	(267)
Energy for lighting	276.1715	0.1443	39.8601	(268)
Total CO2, kg/year			572.5636	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.0900	(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	1605.7637	1.5747	2528.5258	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1394.3751	1.5234	2124.1799	(278)
Space and water heating			4652.7058	(279)
Pumps, fans and electric keep-hot	620.5666	1.5128	938.7932	(281)
Energy for lighting	276.1715	1.5338	423.6011	(282)
Total Primary energy kWh/year			6015.1000	(286)
Dwelling Primary energy Rate (DPER)			43.0000	(287)

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

1. Overall dwelling characteristics

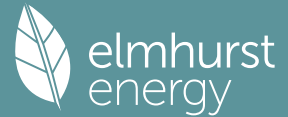
	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	65.1500 (1b)	x 2.6000 (2b)	= 169.3900	(1b) - (3b)
First floor	74.7300 (1c)	x 2.3200 (2c)	= 173.3736	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	139.8800			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 342.7636	(5)

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) = 0.1167 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3667	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3117 (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	0.3974	0.3896	0.3818	0.3429	0.3351	0.2961	0.2961	0.2883	0.3117	0.3351	0.3507	0.3662	(22b)
Effective ac	0.5790	0.5759	0.5729	0.5588	0.5561	0.5438	0.5438	0.5416	0.5486	0.5561	0.5615	0.5671	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			6.4200	1.0000	6.4200			(26)
TER Opening Type (Uw = 1.20)			21.1100	1.1450	24.1718			(27)
Ground Floor			65.1500	0.1300	8.4695			(28a)
Exposed Floor			19.3700	0.1300	2.5181			(28b)
External Wall	167.3000	25.3900	141.9100	0.1800	25.5438			(29a)
Garage Wall	24.1800	2.1400	22.0400	0.1800	3.9672			(29a)
Roof - ceiling	84.5200		84.5200	0.1100	9.2972			(30)
Total net area of external elements Aum (A, m2)			360.5200					(31)
Fabric heat loss, W/K = Sum (A x U)					80.3876			(33)

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

100.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	19.0500	0.0500	0.9525
E3 Sill	13.6200	0.0500	0.6810
E4 Jamb	40.2000	0.0500	2.0100
E5 Ground floor (normal)	41.0400	0.1600	6.5664
E6 Intermediate floor within a dwelling	22.8900	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	19.5100	0.0600	1.1706
E12 Gable (insulation at ceiling level)	25.8800	0.0600	1.5528
E16 Corner (normal)	27.2000	0.0900	2.4480
E17 Corner (inverted - internal area greater than external area)	7.5200	-0.0900	-0.6768
E24 Eaves (insulation at ceiling level - inverted)	4.3500	0.2400	1.0440
E20 Exposed floor (normal)	9.3000	0.3200	2.9760
E21 Exposed floor (inverted)	9.3000	0.3200	2.9760

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

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 102.0881 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	65.4881	65.1413	64.8013	63.2044	62.9057	61.5149	61.5149	61.2573	62.0506	62.9057	63.5101	64.1420	(38)
Heat transfer coeff	167.5762	167.2293	166.8894	165.2925	164.9937	163.6029	163.6029	163.3454	164.1386	164.9937	165.5981	166.2300	(39)
Average = Sum(39)m / 12 =												165.2911	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1980	1.1955	1.1931	1.1817	1.1795	1.1696	1.1696	1.1678	1.1734	1.1795	1.1839	1.1884	(40)
HLP (average)												1.1817	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

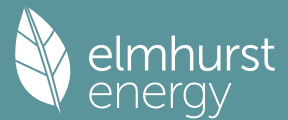
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9169 (42)
Hot water usage for mixer showers													
73.1259	72.0270	70.4256	67.3617	65.1006	62.5790	61.1457	62.7350	64.4771	67.1845	70.3143	72.8458	(42a)	
Hot water usage for baths													
31.5698	31.1009	30.4407	29.2233	28.3117	27.3010	26.7550	27.4106	28.1245	29.2060	30.4485	31.4630	(42b)	
Hot water usage for other uses													
44.5015	42.8833	41.2650	39.6468	38.0286	36.4103	36.4103	38.0286	39.6468	41.2650	42.8833	44.5015	(42c)	
Average daily hot water use (litres/day)												137.1457	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
149.1972	146.0112	142.1313	136.2318	131.4409	126.2903	124.3111	128.1742	132.2484	137.6556	143.6460	148.8103	(44)	
Energy content	236.2919	207.9180	218.4506	186.4945	176.9447	155.2887	150.3435	158.7064	163.0755	186.7973	204.6501	233.0010	(45)
Energy content (annual)										Total = Sum(45)m =		2277.9621	
Distribution loss (46)m = 0.15 x (45)m													
35.4438	31.1877	32.7676	27.9742	26.5417	23.2933	22.5515	23.8060	24.4613	28.0196	30.6975	34.9501	(46)	
Water storage loss:													
Store volume												230.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7973	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9706	(55)
Total storage loss													
30.0872	27.1756	30.0872	29.1167	30.0872	29.1167	30.0872	30.0872	29.1167	30.0872	29.1167	30.0872	30.0872	(56)
If cylinder contains dedicated solar storage													
30.0872	27.1756	30.0872	29.1167	30.0872	29.1167	30.0872	30.0872	29.1167	30.0872	29.1167	30.0872	30.0872	(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													
289.6415	256.1047	271.8002	238.1232	230.2943	206.9173	203.6931	212.0560	214.7042	240.1470	256.2788	286.3506	(62)	
WWHRS	-33.4301	-29.5659	-30.9597	-25.6358	-23.8917	-20.4443	-19.1633	-20.3782	-21.1524	-24.9364	-28.2499	-32.8110	(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													
256.2114	226.5389	240.8405	212.4873	206.4026	186.4730	184.5298	191.6778	193.5517	215.2106	228.0289	253.5396	(64)	
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2595.4922	(64)
Electric shower(s)												2595	(64)
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													
121.2468	107.6821	115.3145	103.3124	101.5138	92.9364	92.6689	95.4496	95.5255	104.7898	109.3491	120.1525	(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	145.8428	145.8428	145.8428	145.8428	145.8428	145.8428	145.8428	145.8428	145.8428	145.8428	145.8428	145.8428	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	164.6911	182.3366	164.6911	170.1808	164.6911	170.1808	164.6911	164.6911	170.1808	164.6911	170.1808	164.6911	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	309.2756	312.4849	304.3975	287.1805	265.4471	245.0207	231.3746	228.1653	236.2527	253.4697	275.2032	295.6295	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													

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Pumps, fans	37.5843	37.5843	37.5843	37.5843	37.5843	37.5843	37.5843	37.5843	37.5843	37.5843	37.5843	37.5843	(69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Water heating gains (Table 5)	-116.6742	-116.6742	-116.6742	-116.6742	-116.6742	-116.6742	-116.6742	-116.6742	-116.6742	-116.6742	-116.6742	-116.6742	(71)
Total internal gains	162.9661	160.2413	154.9926	143.4894	136.4433	129.0783	124.5550	128.2924	132.6744	140.8465	151.8737	161.4953	(72)
	706.6856	724.8156	693.8341	670.6035	636.3343	611.0327	587.3736	587.9018	605.8607	628.7602	667.0106	691.5688	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
North				6.3900	10.6334		0.6300		0.7000		0.7700		20.7656 (74)
East				2.2200	19.6403		0.6300		0.7000		0.7700		13.3252 (76)
South				10.9500	46.7521		0.6300		0.7000		0.7700		156.4540 (78)
West				1.5500	19.6403		0.6300		0.7000		0.7700		9.3036 (80)
Solar gains	199.8484	340.1821	466.7272	583.5316	660.6226	659.5311	634.2804	575.8076	506.8194	376.1344	239.2838		171.1107 (83)
Total gains	906.5340	1064.9977	1160.5613	1254.1351	1296.9569	1270.5638	1221.6540	1163.7094	1112.6801	1004.8947	906.2944		862.6795 (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	23.1868	23.2349	23.2822	23.5072	23.5497	23.7499	23.7499	23.7874	23.6724	23.5497	23.4638	23.3746	
alpha	2.5458	2.5490	2.5521	2.5671	2.5700	2.5833	2.5833	2.5858	2.5782	2.5700	2.5643	2.5583	
util living area	0.9609	0.9410	0.9139	0.8612	0.7774	0.6482	0.5166	0.5524	0.7269	0.8770	0.9424	0.9652	(86)
MIT	18.2361	18.5741	19.0476	19.6734	20.2407	20.6765	20.8715	20.8428	20.5318	19.7956	18.9139	18.1802	(87)
Th 2	19.9216	19.9236	19.9255	19.9347	19.9364	19.9444	19.9444	19.9459	19.9413	19.9364	19.9329	19.9293	(88)
util rest of house	0.9550	0.9321	0.9004	0.8380	0.7365	0.5774	0.4150	0.4529	0.6651	0.8518	0.9323	0.9600	(89)
MIT 2	16.6977	17.1250	17.7219	18.5043	19.1887	19.6830	19.8697	19.8489	19.5354	18.6689	17.5659	16.6311	(90)
Living area fraction	16.8572	17.2752	17.8593	18.6255	19.2978	19.7860	19.9736	19.9519	19.6386	18.7857	17.7056	16.7917	(91)
MIT	16.8572	17.2752	17.8593	18.6255	19.2978	19.7860	19.9736	19.9519	19.6386	18.7857	17.7056	16.7917	(92)
Temperature adjustment	16.8572	17.2752	17.8593	18.6255	19.2978	19.7860	19.9736	19.9519	19.6386	18.7857	17.7056	16.7917	(93)
adjusted MIT	16.8572	17.2752	17.8593	18.6255	19.2978	19.7860	19.9736	19.9519	19.6386	18.7857	17.7056	16.7917	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9297	0.9014	0.8656	0.8022	0.7075	0.5656	0.4180	0.4535	0.6445	0.8164	0.9020	0.9364	(94)
Ext temp.	842.8393	959.9985	1004.6331	1006.0266	917.6464	718.5690	510.6817	527.7684	717.1723	820.3657	817.4802	807.8195	(95)
Heat loss rate W	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)
Space heating kWh	2104.2808	2069.4936	1895.7531	1607.5535	1253.5860	848.4370	551.9259	580.1907	909.1052	1350.5864	1756.2664	2093.1157	(97)
Space heating requirement - total per year (kWh/year)	938.5125	745.5808	662.9933	433.0994	249.9391	0.0000	0.0000	0.0000	0.0000	394.4842	675.9260	956.2604	(98a)
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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98c)
Space heating kWh	938.5125	745.5808	662.9933	433.0994	249.9391	0.0000	0.0000	0.0000	0.0000	394.4842	675.9260	956.2604	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)	938.5125	745.5808	662.9933	433.0994	249.9391	0.0000	0.0000	0.0000	0.0000	394.4842	675.9260	956.2604	(98c)
Space heating per m ²	(98c) / (4) =												36.1510 (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)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating efficiency (main heating system 1)	938.5125	745.5808	662.9933	433.0994	249.9391	0.0000	0.0000	0.0000	0.0000	394.4842	675.9260	956.2604	(98)
Space heating fuel (main heating system)	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 efficiency (main heating system 2)	1016.8066	807.7798	718.3026	469.2301	270.7899	0.0000	0.0000	0.0000	0.0000	427.3935	732.3142	1036.0351	(211)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (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	(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	256.2114	226.5389	240.8405	212.4873	206.4026	186.4730	184.5298	191.6778	193.5517	215.2106	228.0289	253.5396	(64)
Efficiency of water heater (217)m	86.7030	86.5259	86.2092	85.6217	84.4901	79.8000	79.8000	79.8000	79.8000	85.4002	86.3435	86.7496	(216)
Fuel for water heating, kWh/month	295.5048	261.8162	279.3675	248.1701	244.2922	233.6755	231.2404	240.1978	242.5460	252.0023	264.0949	292.2660	(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	34.2196	27.4522	24.7177	18.1092	13.9881	11.4284	12.7604	16.5864	21.5442	28.2671	31.9276	35.1706	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-58.3519	-80.9573	-114.4975	-126.5329	-134.5199	-124.7652	-123.1103	-117.0956	-106.2909	-91.4272	-63.6401	-50.5938	(233a)

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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	-37.0406	-77.4253	-153.0339	-228.6668	-301.2909	-302.4450	-298.9892	-253.7239	-186.6616	-110.4515	-49.3532	-29.3374	(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												5478.6519	(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												3085.1737	(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)												276.1715	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-3220.2020	(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												5705.7951	(238)

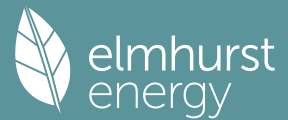
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	5478.6519	0.2100	1150.5169 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3085.1737	0.2100	647.8865 (264)
Space and water heating			1798.4034 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	276.1715	0.1443	39.8601 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1191.7827	0.1350	-160.8433
PV Unit electricity exported	-2028.4193	0.1260	-255.6620
Total			-416.5053 (269)
Total CO2, kg/year			1433.6874 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.2500 (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	5478.6519	1.1300	6190.8766 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3085.1737	1.1300	3486.2463 (278)
Space and water heating			9677.1229 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	276.1715	1.5338	423.6011 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1191.7827	1.4988	-1786.2574
PV Unit electricity exported	-2028.4193	0.4627	-938.4671
Total			-2724.7245 (283)
Total Primary energy kWh/year			7506.1003 (286)
Target Primary Energy Rate (TPER)			53.6600 (287)

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Property Reference	OP-D320 S4KEST				Issued on Date	29/11/2024	
Assessment Reference	S4KEST		Prop Type Ref	S4KEST			
Property	S4KEST						
SAP Rating	80 C	DER	4.09	TER	10.25		
Environmental	96 A	% DER < TER				60.10	
CO ₂ Emissions (t/year)	0.53	DFEE	41.16	TFEE	42.33		
Compliance Check	See BREL	% DFEE < TFEE				2.77	
% DPER < TPER	19.86	DPER	43.00	TPER	53.66		
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	65.1500 (1b)	x 2.6000 (2b)	= 169.3900 (1b) - (3b)
First floor	74.7300 (1c)	x 2.3200 (2c)	= 173.3736 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	139.8800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 342.7636 (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) =	0.1167 (8)
Pressure test											Yes	
Pressure Test Method											Blower Door	
Measured/design AP50											3.5000 (17)	
Infiltration rate											0.2917 (18)	
Number of sides sheltered											2 (19)	
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.2479 (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	0.3161	0.3099	0.3037	0.2727	0.2665	0.2355	0.2355	0.2293	0.2479	0.2665	0.2789	0.2913 (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	0.5500	0.5480	0.5461	0.5372	0.5355	0.5277	0.5277	0.5263	0.5307	0.5355	0.5389	0.5424 (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
Front Door			6.4200	1.0000	6.4200		(26)
Windows (Uw = 1.30)			21.1100	1.2357	26.0865		(27)
Ground Floor			65.1500	0.1100	7.1665		(28a)
Exposed Floor			19.3700	0.1400	2.7118		(28b)
External Wall	167.3000	25.3900	141.9100	0.1700	24.1247		(29a)
Garage Wall		2.1400	22.0400	0.1700	3.7468		(29a)
Roof - ceiling	84.5200		84.5200	0.1100	9.2972		(30)
Total net area of external elements Aum(A, m ²)			360.5200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		79.5535		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				19.0500	0.0500	0.9525	
E3 Sill				13.6200	0.0500	0.6810	
E4 Jamb				40.2000	0.0500	2.0100	
E5 Ground floor (normal)				41.0400	0.1600	6.5664	

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E6 Intermediate floor within a dwelling									22.8900	0.0000	0.0000	
E10 Eaves (insulation at ceiling level)									19.5100	0.0600	1.1706	
E12 Gable (insulation at ceiling level)									25.8800	0.0600	1.5528	
E16 Corner (normal)									27.2000	0.0900	2.4480	
E17 Corner (inverted - internal area greater than external area)									7.5200	-0.0900	-0.6768	
E24 Eaves (insulation at ceiling level - inverted)									4.3500	0.2400	1.0440	
E20 Exposed floor (normal)									9.3000	0.3200	2.9760	
E21 Exposed floor (inverted)									9.3000	0.3200	2.9760	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												21.7005 (36)
Point Thermal bridges												0.0000
Total fabric heat loss												(33) + (36) + (36a) = 101.2540 (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	62.2080	61.9886	61.7734	60.7630	60.5739	59.6938	59.6938	59.5309	60.0328	60.5739	60.9564	61.3562 (38)
Average = Sum(39)m / 12 =	163.4620	163.2426	163.0274	162.0170	161.8279	160.9478	160.9478	160.7849	161.2868	161.8279	162.2104	162.6102 (39)
												162.0161
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1686	1.1670	1.1655	1.1583	1.1569	1.1506	1.1506	1.1494	1.1530	1.1569	1.1596	1.1625 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												

Assumed occupancy												2.9169 (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												
	31.5698	31.1009	30.4407	29.2233	28.3117	27.3010	26.7550	27.4106	28.1245	29.2060	30.4485	31.4630 (42b)
Hot water usage for other uses												
	44.5015	42.8833	41.2650	39.6468	38.0286	36.4103	36.4103	38.0286	39.6468	41.2650	42.8833	44.5015 (42c)
Average daily hot water use (litres/day)												69.7261 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	76.0713	73.9842	71.7057	68.8701	66.3403	63.7113	63.1653	65.4392	67.7713	70.4711	73.3318	75.9646 (44)
Energy content (annual)	120.4783	105.3525	110.2090	94.2797	89.3068	78.3405	76.3930	81.0274	83.5688	95.6286	104.4745	118.9421 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1158.0013
	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												
	102.4066	89.5496	93.6777	80.1378	75.9108	66.5894	64.9340	68.8733	71.0335	81.2843	88.8034	101.1008 (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												
	102.4066	89.5496	93.6777	80.1378	75.9108	66.5894	64.9340	68.8733	71.0335	81.2843	88.8034	101.1008 (64)
12Total per year (kWh/year)												984 (64)
Electric shower(s)												
	58.5617	52.1789	56.9774	54.3728	55.3931	52.8397	54.6010	55.3931	54.3728	56.9774	55.9060	58.5617 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												666.1357 (64a)
Heat gains from water heating, kWh/month												
	40.2421	35.4321	37.6638	33.6276	32.8260	29.8573	29.8838	31.0666	31.3516	34.5654	36.1773	39.9156 (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	145.8428	145.8428	145.8428	145.8428	145.8428	145.8428	145.8428	145.8428	145.8428	145.8428	145.8428	145.8428 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	164.6911	182.3366	164.6911	170.1808	164.6911	170.1808	164.6911	164.6911	170.1808	164.6911	170.1808	164.6911 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	309.2756	312.4849	304.3975	287.1805	265.4471	245.0207	231.3746	228.1653	236.2527	253.4697	275.2032	295.6295 (68)
Pumps, fans	37.5843	37.5843	37.5843	37.5843	37.5843	37.5843	37.5843	37.5843	37.5843	37.5843	37.5843	37.5843 (69)
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Water heating gains (Table 5)	-116.6742	-116.6742	-116.6742	-116.6742	-116.6742	-116.6742	-116.6742	-116.6742	-116.6742	-116.6742	-116.6742	-116.6742 (71)
Total internal gains	54.0888	52.7264	50.6233	46.7051	44.1209	41.4684	40.1663	41.7562	43.5439	46.4589	50.2463	53.6500 (72)
	594.8083	614.3007	586.4648	570.8192	541.0120	523.4228	502.9850	501.3655	516.7302	531.3726	562.3832	580.7235 (73)

6. Solar gains												

[Jan]												
	Area											
	m2											
	Solar flux											
	Table 6a											
	W/m2											
	Specific data											
	or Table 6b											
	g											
	Specific data											
	or Table 6c											
	FF											
	Access											
	factor											
	Table 6d											
	Gains											
	W											
North	6.3900											20.7656 (74)
East	2.2200											13.3252 (76)
South	10.9500											156.4540 (78)
West	1.5500											9.3036 (80)

Solar gains	199.8484	340.1821	466.7272	583.5316	660.6226	659.5311	634.2804	575.8076	506.8194	376.1344	239.2838	171.1107 (83)
Total gains	794.6567	954.4829	1053.1920	1154.3508	1201.6346	1182.9539	1137.2654	1077.1731	1023.5496	907.5071	801.6670	751.8342 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	23.7704	23.8023	23.8338	23.9824	24.0104	24.1417	24.1417	24.1662	24.0910	24.0104	23.9538	23.8949
alpha	2.5847	2.5868	2.5889	2.5988	2.6007	2.6094	2.6094	2.6111	2.6061	2.6007	2.5969	2.5930
util living area	0.9705	0.9524	0.9277	0.8781	0.7979	0.6713	0.5394	0.5781	0.7522	0.8963	0.9550	0.9742 (86)
MIT	18.1629	18.5084	18.9889	19.6236	20.2056	20.6561	20.8619	20.8295	20.5005	19.7353	18.8363	18.0978 (87)
Th 2	19.9452	19.9465	19.9477	19.9535	19.9546	19.9597	19.9597	19.9607	19.9578	19.9546	19.9524	19.9501 (88)
util rest of house	0.9659	0.9451	0.9161	0.8570	0.7593	0.6019	0.4370	0.4782	0.6932	0.8742	0.9469	0.9702 (89)
MIT 2	17.3526	17.6941	18.1677	18.7884	19.3389	19.7401	19.8959	19.8770	19.6151	18.9068	18.0262	17.2913 (90)
Living area fraction									fLA = Living area / (4) =			0.1037 (91)
MIT	17.4366	17.7785	18.2529	18.8750	19.4287	19.8351	19.9961	19.9758	19.7069	18.9927	18.1101	17.3749 (92)
Temperature adjustment												0.0000
adjusted MIT	17.4366	17.7785	18.2529	18.8750	19.4287	19.8351	19.9961	19.9758	19.7069	18.9927	18.1101	17.3749 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9504	0.9248	0.8917	0.8303	0.7366	0.5925	0.4409	0.4799	0.6766	0.8482	0.9271	0.9560 (94)
Useful gains	755.2022	882.6700	939.1403	958.4135	885.0956	700.9373	501.4235	516.8838	692.5434	769.7184	743.2019	718.7674 (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	2147.3343	2102.3237	1916.0379	1616.1121	1250.7243	842.5731	546.5909	574.9309	904.3188	1358.1718	1785.9571	2142.3757 (97)
Space heating kWh	1035.7463	819.6073	726.8118	473.5430	272.0277	0.0000	0.0000	0.0000	0.0000	437.8094	750.7837	1059.1646 (98a)
Space heating requirement - total per year (kWh/year)												5575.4939
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	1035.7463	819.6073	726.8118	473.5430	272.0277	0.0000	0.0000	0.0000	0.0000	437.8094	750.7837	1059.1646 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5575.4939
Space heating per m2										(98c) / (4) =		39.8591 (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	1512.9097	1191.0141	1221.9650	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6680	0.7419	0.7132	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1010.6530	883.6398	871.5227	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1306.2164	1256.1938	1189.3174	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	212.8057	277.1802	236.4392	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	53.2014	69.2950	59.1098	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												181.6063 (107)
Energy for space heating												39.8591 (99)
Energy for space cooling												1.2983 (108)
Total												41.1574 (109)
Fabric Energy Efficiency (DFEE)												41.2 (109)

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

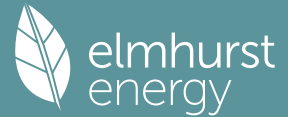
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	65.1500 (1b)	x	2.6000 (2b) = 169.3900 (1b) - (3b)
First floor	74.7300 (1c)	x	2.3200 (2c) = 173.3736 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	139.8800		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 342.7636 (5)
Dwelling volume			

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)

Full SAP Calculation Printout



Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 40.0000 / (5) = 0.1167 (8)
Pressure test Yes
Pressure Test Method Blower Door
Measured/design AP50 5.0000 (17)
Infiltration rate 0.3667 (18)
Number of sides sheltered 2 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3117 (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)
	0.3974	0.3896	0.3818	0.3429	0.3351	0.2961	0.2961	0.2883	0.3117	0.3351	0.3507	0.3662 (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	0.5790	0.5759	0.5729	0.5588	0.5561	0.5438	0.5438	0.5416	0.5486	0.5561	0.5615	0.5671 (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 Opaque door			6.4200	1.0000	6.4200		(26)
TER Opening Type (Uw = 1.20)			21.1100	1.1450	24.1718		(27)
Ground Floor			65.1500	0.1300	8.4695		(28a)
Exposed Floor			19.3700	0.1300	2.5181		(28b)
External Wall	167.3000	25.3900	141.9100	0.1800	25.5438		(29a)
Garage Wall	24.1800	2.1400	22.0400	0.1800	3.9672		(29a)
Roof - ceiling	84.5200		84.5200	0.1100	9.2972		(30)
Total net area of external elements Aum(A, m2)			360.5200				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 80.3876		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 100.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	19.0500	0.0500	0.9525
E3 Sill	13.6200	0.0500	0.6810
E4 Jamb	40.2000	0.0500	2.0100
E5 Ground floor (normal)	41.0400	0.1600	6.5664
E6 Intermediate floor within a dwelling	22.8900	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	19.5100	0.0600	1.1706
E12 Gable (insulation at ceiling level)	25.8800	0.0600	1.5528
E16 Corner (normal)	27.2000	0.0900	2.4480
E17 Corner (inverted - internal area greater than external area)	7.5200	-0.0900	-0.6768
E24 Eaves (insulation at ceiling level - inverted)	4.3500	0.2400	1.0440
E20 Exposed floor (normal)	9.3000	0.3200	2.9760
E21 Exposed floor (inverted)	9.3000	0.3200	2.9760

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 21.7005 (36)

Point Thermal bridges

Total fabric heat loss (33) + (36) + (36a) = 102.0881 (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	65.4881	65.1413	64.8013	63.2044	62.9057	61.5149	61.5149	61.2573	62.0506	62.9057	63.5101	64.1420 (38)
Average = Sum(39)m / 12 =	167.5762	167.2293	166.8894	165.2925	164.9937	163.6029	163.6029	163.3454	164.1386	164.9937	165.5981	166.2300 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1980	1.1955	1.1931	1.1817	1.1795	1.1696	1.1696	1.1678	1.1734	1.1795	1.1839	1.1884 (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 2.9169 (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)

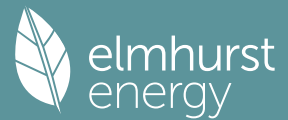
Hot water usage for baths 31.5698 31.1009 30.4407 29.2233 28.3117 27.3010 26.7550 27.4106 28.1245 29.2060 30.4485 31.4630 (42b)

Hot water usage for other uses 44.5015 42.8833 41.2650 39.6468 38.0286 36.4103 36.4103 38.0286 39.6468 41.2650 42.8833 44.5015 (42c)

Average daily hot water use (litres/day) 69.7261 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	76.0713	73.9842	71.7057	68.8701	66.3403	63.7113	63.1653	65.4392	67.7713	70.4711	73.3318	75.9646 (44)
Energy content (annual)	120.4783	105.3525	110.2090	94.2797	89.3068	78.3405	76.3930	81.0274	83.5688	95.6286	104.4745	118.9421 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	102.4066	89.5496	93.6777	80.1378	75.9108	66.5894	64.9340	68.8733	71.0335	81.2843	88.8034	101.1008 (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	102.4066	89.5496	93.6777	80.1378	75.9108	66.5894	64.9340	68.8733	71.0335	81.2843	88.8034	101.1008 (64)
12Total per year (kWh/year)												984.3011 (64)
Electric shower(s)	58.5617	52.1789	56.9774	54.3728	55.3931	52.8397	54.6010	55.3931	54.3728	56.9774	55.9060	58.5617 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												666.1357 (64a)

Full SAP Calculation Printout



Heat gains from water heating, kWh/month
40.2421 35.4321 37.6638 33.6276 32.8260 29.8573 29.8838 31.0666 31.3516 34.5654 36.1773 39.9156 (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	145.8428	145.8428	145.8428	145.8428	145.8428	145.8428	145.8428	145.8428	145.8428	145.8428	145.8428	145.8428 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	164.6911	182.3366	164.6911	170.1808	164.6911	170.1808	164.6911	164.6911	170.1808	164.6911	170.1808	164.6911 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	309.2756	312.4849	304.3975	287.1805	265.4471	245.0207	231.3746	228.1653	236.2527	253.4697	275.2032	295.6295 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.5843	37.5843	37.5843	37.5843	37.5843	37.5843	37.5843	37.5843	37.5843	37.5843	37.5843	37.5843 (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)	-116.6742	-116.6742	-116.6742	-116.6742	-116.6742	-116.6742	-116.6742	-116.6742	-116.6742	-116.6742	-116.6742	-116.6742 (71)
Water heating gains (Table 5)	54.0888	52.7264	50.6233	46.7051	44.1209	41.4684	40.1663	41.7562	43.5439	46.4589	50.2463	53.6500 (72)
Total internal gains	594.8083	614.3007	586.4648	570.8192	541.0120	523.4228	502.9850	501.3655	516.7302	531.3726	562.3832	580.7235 (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				
North				6.3900	10.6334		0.6300		0.7000		0.7700		20.7656 (74)		
East				2.2200	19.6403		0.6300		0.7000		0.7700		13.3252 (76)		
South				10.9500	46.7521		0.6300		0.7000		0.7700		156.4540 (78)		
West				1.5500	19.6403		0.6300		0.7000		0.7700		9.3036 (80)		
Solar gains				199.8484	340.1821	466.7272	583.5316	660.6226	659.5311	634.2804	575.8076	506.8194	376.1344	239.2838	171.1107 (83)
Total gains				794.6567	954.4829	1053.1920	1154.3508	1201.6346	1182.9539	1137.2654	1077.1731	1023.5496	907.5071	801.6670	751.8342 (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	23.1868	23.2349	23.2822	23.5072	23.5497	23.7499	23.7499	23.7874	23.6724	23.5497	23.4638	23.3746
alpha	2.5458	2.5490	2.5521	2.5671	2.5700	2.5833	2.5833	2.5858	2.5782	2.5700	2.5643	2.5583
util living area	0.9706	0.9529	0.9287	0.8800	0.8013	0.6757	0.5445	0.5829	0.7559	0.8978	0.9554	0.9743 (86)
MIT	18.0930	18.4412	18.9290	19.5807	20.1751	20.6412	20.8543	20.8211	20.4811	19.6996	18.7868	18.0360 (87)
Th 2	19.9216	19.9236	19.9255	19.9347	19.9364	19.9444	19.9444	19.9459	19.9413	19.9364	19.9329	19.9293 (88)
util rest of house	0.9660	0.9456	0.9171	0.8590	0.7626	0.6056	0.4404	0.4817	0.6966	0.8757	0.9472	0.9703 (89)
MIT 2	17.2685	17.6132	18.0946	18.7344	19.2977	19.7157	19.8774	19.8584	19.5859	18.8603	17.9650	17.2171 (90)
Living area fraction	17.3540	17.6991	18.1811	18.8221	19.3887	19.8117	19.9787	19.9582	19.6787	18.9473	18.0502	17.3020 (92)
MIT	17.3540	17.6991	18.1811	18.8221	19.3887	19.8117	19.9787	19.9582	19.6787	18.9473	18.0502	17.3020 (93)
Temperature adjustment												0.0000
adjusted MIT	17.3540	17.6991	18.1811	18.8221	19.3887	19.8117	19.9787	19.9582	19.6787	18.9473	18.0502	17.3020 (93)

8. Space heating requirement

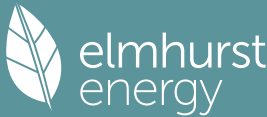
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9503	0.9250	0.8924	0.8317	0.7391	0.5957	0.4441	0.4830	0.6793	0.8492	0.9272	0.9559 (94)
Useful gains	755.1464	882.9034	939.8808	960.0649	888.1444	704.6934	505.1120	520.2700	695.3399	770.6959	743.3337	718.6856 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	2187.5356	2140.3767	1949.4575	1640.0499	1268.5852	852.6424	552.7649	581.2205	915.6783	1377.2510	1813.3308	2177.9392 (97)
Space heating kWh	1065.6976	845.0220	751.1250	489.5892	283.0480	0.0000	0.0000	0.0000	0.0000	451.2770	770.3979	1085.6847 (98a)
Space heating requirement - total per year (kWh/year)												5741.8414
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	1065.6976	845.0220	751.1250	489.5892	283.0480	0.0000	0.0000	0.0000	0.0000	451.2770	770.3979	1085.6847 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5741.8414
Space heating per m2										(98c) / (4) =		41.0483 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

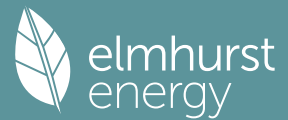
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1537.8674	1210.6615	1241.4247	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6599	0.7341	0.7055	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1014.8420	888.7520	875.8179	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1306.2164	1256.1938	1189.3174	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	209.7896	273.3767	233.2437	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	52.4474	68.3442	58.3109	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												179.1025 (107)
Energy for space heating												41.0483 (99)

Full SAP Calculation Printout



Energy for space cooling	1.2804	(108)
Total	42.3287	(109)
Fabric Energy Efficiency (TFEE)	42.3	(109)

Full SAP Calculation Printout



Property Reference	OP-D320 S4KEST				Issued on Date	29/11/2024	
Assessment Reference	S4KEST		Prop Type Ref	S4KEST			
Property	S4KEST						
SAP Rating	80 C	DER	4.09	TER	10.25		
Environmental	96 A	% DER < TER				60.10	
CO ₂ Emissions (t/year)	0.53	DFEE	41.16	TFEE	42.33		
Compliance Check	See BREL	% DFEE < TFEE				2.77	
% DPER < TPER	19.86	DPER	43.00	TPER	53.66		
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	65.1500 (1b)	x 2.6000 (2b)	= 169.3900 (1b) - (3b)
First floor	74.7300 (1c)	x 2.3200 (2c)	= 173.3736 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	139.8800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 342.7636 (5)

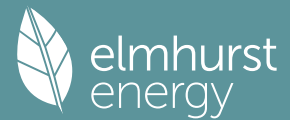
2. Ventilation rate

											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											3.5000 (17)	
Infiltration rate											0.1750 (18)	
Number of sides sheltered											2 (19)	
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.1487 (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)
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												
	0.1897	0.1859	0.1822	0.1636	0.1599	0.1413	0.1413	0.1376	0.1487	0.1599	0.1673	0.1748 (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) =											71.2000 (23c)	
Effective ac	0.3337	0.3299	0.3262	0.3076	0.3039	0.2853	0.2853	0.2816	0.2927	0.3039	0.3113	0.3188 (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
Front Door			6.4200	1.0000	6.4200		(26)
Windows (Uw = 1.30)			21.1100	1.2357	26.0865		(27)
Ground Floor			65.1500	0.1100	7.1665		(28a)
Exposed Floor			19.3700	0.1400	2.7118		(28b)
External Wall	167.3000	25.3900	141.9100	0.1700	24.1247		(29a)
Garage Wall	24.1800	2.1400	22.0400	0.1700	3.7468		(29a)
Roof - ceiling	84.5200		84.5200	0.1100	9.2972		(30)
Total net area of external elements Aum (A, m ²)			360.5200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	79.5535		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				19.0500	0.0500	0.9525	

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E3 Sill	13.6200	0.0500	0.6810
E4 Jamb	40.2000	0.0500	2.0100
E5 Ground floor (normal)	41.0400	0.1600	6.5664
E6 Intermediate floor within a dwelling	22.8900	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	19.5100	0.0600	1.1706
E12 Gable (insulation at ceiling level)	25.8800	0.0600	1.5528
E16 Corner (normal)	27.2000	0.0900	2.4480
E17 Corner (inverted - internal area greater than external area)	7.5200	-0.0900	-0.6768
E24 Eaves (insulation at ceiling level - inverted)	4.3500	0.2400	1.0440
E20 Exposed floor (normal)	9.3000	0.3200	2.9760
E21 Exposed floor (inverted)	9.3000	0.3200	2.9760
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			21.7005 (36)
Point Thermal Bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	101.2540 (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	37.7405	37.3199	36.8993	34.7961	34.3754	32.2723	32.2723	31.8516	33.1135	34.3754	35.2167	36.0580 (38)
Average = Sum(39)m / 12 =	138.9945	138.5739	138.1533	136.0501	135.6294	133.5263	133.5263	133.1056	134.3675	135.6294	136.4707	137.3120 (39)
												135.9449
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9937	0.9907	0.9877	0.9726	0.9696	0.9546	0.9546	0.9516	0.9606	0.9696	0.9756	0.9816 (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												2.9169 (42)
Hot water usage for mixer showers	100.5481	99.0371	96.8352	92.6223	89.5133	86.0461	84.0754	86.2606	88.6560	92.3787	96.6821	100.1629 (42a)
Hot water usage for baths	33.2313	32.7378	32.0428	30.7614	29.8018	28.7378	28.1631	28.8533	29.6047	30.7432	32.0510	33.1190 (42b)
Hot water usage for other uses	46.8437	45.1403	43.4369	41.7335	40.0301	38.3267	38.3267	40.0301	41.7335	43.4369	45.1403	46.8437 (42c)
Average daily hot water use (litres/day)												166.0979 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	180.6232	176.9152	172.3149	165.1171	159.3452	153.1107	150.5652	155.1440	159.9942	166.5588	173.8734	180.1256 (44)
Energy content (annual)	286.0630	251.9249	264.8416	226.0371	214.5092	188.2674	182.0956	192.1007	197.2889	226.0187	247.7146	282.0332 (45)
Distribution loss (46)m = 0.15 x (45)m	42.9094	37.7887	39.7262	33.9056	32.1764	28.2401	27.3143	28.8151	29.5933	33.9028	37.1572	42.3050 (46)
Water storage loss:												
Store volume												230.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8000 (48)
Temperature factor from Table 2b												0.7800 (49)
Enter (49) or (54) in (55)												1.4040 (55)
Total storage loss	43.5240	39.3120	43.5240	42.1200	43.5240	42.1200	43.5240	43.5240	42.1200	43.5240	42.1200	43.5240 (56)
If cylinder contains dedicated solar storage	43.5240	39.3120	43.5240	42.1200	43.5240	42.1200	43.5240	43.5240	42.1200	43.5240	42.1200	43.5240 (57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576 (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	384.4446	340.7857	363.2232	321.2451	312.8908	252.8994	248.8820	258.8871	261.9209	324.4003	342.9226	380.4148 (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	384.4446	340.7857	363.2232	321.2451	312.8908	252.8994	248.8820	258.8871	261.9209	324.4003	342.9226	380.4148 (64)
12Total per year (kWh/year)												3792.9164 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Heat gains from water heating, kWh/month	139.0020	123.4041	131.9459	117.6277	115.2104	80.6085	79.1567	82.4834	83.6082	119.0373	124.8355	137.6621 (65)

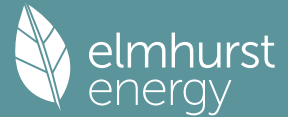
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	145.8428	145.8428	145.8428	145.8428	145.8428	145.8428	145.8428	145.8428	145.8428	145.8428	145.8428	145.8428 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	164.6911	182.3366	164.6911	170.1808	164.6911	170.1808	164.6911	164.6911	170.1808	164.6911	170.1808	164.6911 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	309.2756	312.4849	304.3975	287.1805	265.4471	245.0207	231.3746	228.1653	236.2527	253.4697	275.2032	295.6295 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.5843	37.5843	37.5843	37.5843	37.5843	37.5843	37.5843	37.5843	37.5843	37.5843	37.5843	37.5843 (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)	-116.6742	-116.6742	-116.6742	-116.6742	-116.6742	-116.6742	-116.6742	-116.6742	-116.6742	-116.6742	-116.6742	-116.6742 (71)
Water heating gains (Table 5)	186.8307	183.6370	177.3467	163.3719	154.8527	111.9563	106.3934	110.8648	116.1224	159.9964	173.3826	185.0297 (72)
Total internal gains	727.5502	745.2113	713.1882	687.4860	651.7437	593.9107	569.2120	570.4741	589.3088	644.9101	685.5195	712.1032 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	6.3900	10.6334	0.6300	0.7000	0.7700	20.7656 (74)
East	2.2200	19.6403	0.6300	0.7000	0.7700	13.3252 (76)
South	10.9500	46.7521	0.6300	0.7000	0.7700	156.4540 (78)
West	1.5500	19.6403	0.6300	0.7000	0.7700	9.3036 (80)

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Solar gains	199.8484	340.1821	466.7272	583.5316	660.6226	659.5311	634.2804	575.8076	506.8194	376.1344	239.2838	171.1107 (83)
Total gains	927.3986	1085.3935	1179.9153	1271.0176	1312.3663	1253.4418	1203.4924	1146.2817	1096.1282	1021.0445	924.8033	883.2139 (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	27.9547	28.0396	28.1250	28.5597	28.6483	29.0996	29.0996	29.1915	28.9174	28.6483	28.4717	28.2973
alpha	2.8636	2.8693	2.8750	2.9040	2.9099	2.9400	2.9400	2.9461	2.9278	2.9099	2.8981	2.8865
util living area	0.9553	0.9308	0.8970	0.8308	0.7293	0.5915	0.4559	0.4913	0.6801	0.8497	0.9320	0.9604 (86)
Living	18.7878	19.1163	19.5405	20.0833	20.5269	20.8230	20.9393	20.9231	20.7166	20.1556	19.3940	18.7419
Non living	17.4892	17.9035	18.4362	19.1121	19.6397	19.9753	20.0842	20.0743	19.8666	19.2135	18.2670	17.4374
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	19.8683	19.1163	19.5405	20.0833	20.5269	20.8230	20.9393	20.9231	20.7166	20.1556	19.3940	19.0578 (87)
Th 2	20.0886	20.0911	20.0936	20.1062	20.1087	20.1214	20.1214	20.1239	20.1163	20.1087	20.1037	20.0987 (88)
util rest of house	0.9492	0.9216	0.8830	0.8071	0.6899	0.5301	0.3753	0.4109	0.6237	0.8237	0.9214	0.9550 (89)
MIT 2	19.0523	17.9035	18.4362	19.1121	19.6397	19.9753	20.0842	20.0743	19.8666	19.2135	18.2670	17.9170 (90)
Living area fraction									FLA = Living area / (4) =			0.1037 (91)
MIT	19.1369	18.0293	18.5507	19.2128	19.7317	20.0632	20.1728	20.1623	19.9547	19.3112	18.3838	18.0352 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1369	18.0293	18.5507	19.2128	19.7317	20.0632	20.1728	20.1623	19.9547	19.3112	18.3838	18.0352 (93)

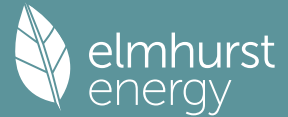
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9415	0.8940	0.8530	0.7794	0.6714	0.5258	0.3802	0.4146	0.6124	0.7958	0.8944	0.9382 (94)
Useful gains	873.1691	970.3382	1006.5179	990.6004	881.1872	659.0390	457.5955	475.2178	671.2171	812.5167	827.1408	828.6281 (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	2062.2504	1819.3725	1664.8393	1403.0573	1089.3366	729.4812	477.0642	500.7780	786.6802	1181.4946	1539.9085	1899.7407 (97)
Space heating kWh	884.6765	570.5511	489.7911	296.9689	154.8632	0.0000	0.0000	0.0000	0.0000	274.5196	513.1928	796.9078 (98a)
Space heating requirement - total per year (kWh/year)												3981.4709
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	884.6765	570.5511	489.7911	296.9689	154.8632	0.0000	0.0000	0.0000	0.0000	274.5196	513.1928	796.9078 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3981.4709
Space heating per m2										(98c) / (4) =		28.4635 (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 %)												247.9487 (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	884.6765	570.5511	489.7911	296.9689	154.8632	0.0000	0.0000	0.0000	0.0000	274.5196	513.1928	796.9078 (98)
Space heating efficiency (main heating system 1)	247.9487	247.9487	247.9487	247.9487	247.9487	0.0000	0.0000	0.0000	0.0000	247.9487	247.9487	247.9487 (210)
Space heating fuel (main heating system)	356.7982	230.1085	197.5372	119.7703	62.4578	0.0000	0.0000	0.0000	0.0000	110.7163	206.9754	321.4002 (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	384.4446	340.7857	363.2232	321.2451	312.8908	252.8994	248.8820	258.8871	261.9209	324.4003	342.9226	380.4148 (64)
Efficiency of water heater (217)m	272.0155	272.0155	272.0155	272.0155	272.0155	272.0155	272.0155	272.0155	272.0155	272.0155	272.0155	272.0155 (216)
Fuel for water heating, kWh/month	141.3319	125.2817	133.5303	118.0981	115.0268	92.9724	91.4955	95.1736	96.2890	119.2580	126.0673	139.8504 (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	52.7057	47.6051	52.7057	51.0055	52.7057	51.0055	52.7057	52.7057	51.0055	52.7057	51.0055	52.7057 (223)
Lighting	34.2196	27.4522	24.7177	18.1092	13.9881	11.4284	12.7604	16.5864	21.5442	28.2671	31.9276	35.1706 (232)
Electricity generated by PVs (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 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												1605.7637 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)

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Efficiency of water heater	272.0155	
Water heating fuel used	1394.3751	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.4840)		
mechanical ventilation fans (SFP = 1.4840)	620.5666	(230a)
Total electricity for the above, kWh/year	620.5666	(231)
Electricity for lighting (calculated in Appendix L)	276.1715	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3896.8770	(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	1605.7637	0.1552	249.2692	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1394.3751	0.1415	197.3541	(264)
Space and water heating			446.6233	(265)
Pumps, fans and electric keep-hot	620.5666	0.1387	86.0802	(267)
Energy for lighting	276.1715	0.1443	39.8601	(268)
Total CO2, kg/year			572.5636	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.0900	(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	1605.7637	1.5747	2528.5258	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1394.3751	1.5234	2124.1799	(278)
Space and water heating			4652.7058	(279)
Pumps, fans and electric keep-hot	620.5666	1.5128	938.7932	(281)
Energy for lighting	276.1715	1.5338	423.6011	(282)
Total Primary energy kWh/year			6015.1000	(286)
Dwelling Primary energy Rate (DPER)			43.0000	(287)

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

1. Overall dwelling characteristics

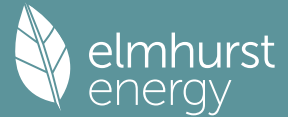
	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	65.1500 (1b)	x 2.6000 (2b)	= 169.3900	(1b) - (3b)
First floor	74.7300 (1c)	x 2.3200 (2c)	= 173.3736	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	139.8800			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 342.7636	(5)

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) = 0.1167 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3667	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3117 (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	0.3974	0.3896	0.3818	0.3429	0.3351	0.2961	0.2961	0.2883	0.3117	0.3351	0.3507	0.3662	(22b)
Effective ac	0.5790	0.5759	0.5729	0.5588	0.5561	0.5438	0.5438	0.5416	0.5486	0.5561	0.5615	0.5671	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			6.4200	1.0000	6.4200			(26)
TER Opening Type (Uw = 1.20)			21.1100	1.1450	24.1718			(27)
Ground Floor			65.1500	0.1300	8.4695			(28a)
Exposed Floor			19.3700	0.1300	2.5181			(28b)
External Wall	167.3000	25.3900	141.9100	0.1800	25.5438			(29a)
Garage Wall	24.1800	2.1400	22.0400	0.1800	3.9672			(29a)
Roof - ceiling	84.5200		84.5200	0.1100	9.2972			(30)
Total net area of external elements Aum (A, m2)			360.5200					(31)
Fabric heat loss, W/K = Sum (A x U)								(32)
			(26)...(30) + (32) =		80.3876			(33)

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

100.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	19.0500	0.0500	0.9525
E3 Sill	13.6200	0.0500	0.6810
E4 Jamb	40.2000	0.0500	2.0100
E5 Ground floor (normal)	41.0400	0.1600	6.5664
E6 Intermediate floor within a dwelling	22.8900	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	19.5100	0.0600	1.1706
E12 Gable (insulation at ceiling level)	25.8800	0.0600	1.5528
E16 Corner (normal)	27.2000	0.0900	2.4480
E17 Corner (inverted - internal area greater than external area)	7.5200	-0.0900	-0.6768
E24 Eaves (insulation at ceiling level - inverted)	4.3500	0.2400	1.0440
E20 Exposed floor (normal)	9.3000	0.3200	2.9760
E21 Exposed floor (inverted)	9.3000	0.3200	2.9760

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

21.7005 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 102.0881 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	65.4881	65.1413	64.8013	63.2044	62.9057	61.5149	61.5149	61.2573	62.0506	62.9057	63.5101	64.1420	(38)
Heat transfer coeff	167.5762	167.2293	166.8894	165.2925	164.9937	163.6029	163.6029	163.3454	164.1386	164.9937	165.5981	166.2300	(39)
Average = Sum(39)m / 12 =												165.2911	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1980	1.1955	1.1931	1.1817	1.1795	1.1696	1.1696	1.1678	1.1734	1.1795	1.1839	1.1884	(40)
HLP (average)												1.1817	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

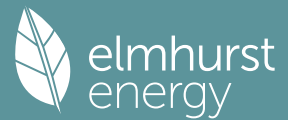
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9169 (42)
Hot water usage for mixer showers	73.1259	72.0270	70.4256	67.3617	65.1006	62.5790	61.1457	62.7350	64.4771	67.1845	70.3143	72.8458 (42a)	
Hot water usage for baths	31.5698	31.1009	30.4407	29.2233	28.3117	27.3010	26.7550	27.4106	28.1245	29.2060	30.4485	31.4630 (42b)	
Hot water usage for other uses	44.5015	42.8833	41.2650	39.6468	38.0286	36.4103	36.4103	38.0286	39.6468	41.2650	42.8833	44.5015 (42c)	
Average daily hot water use (litres/day)												137.1457 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	149.1972	146.0112	142.1313	136.2318	131.4409	126.2903	124.3111	128.1742	132.2484	137.6556	143.6460	148.8103 (44)	
Energy content (annual)	236.2919	207.9180	218.4506	186.4945	176.9447	155.2887	150.3435	158.7064	163.0755	186.7973	204.6501	233.0010 (45)	
Distribution loss (46)m = 0.15 x (45)m	35.4438	31.1877	32.7676	27.9742	26.5417	23.2933	22.5515	23.8060	24.4613	28.0196	30.6975	34.9501 (46)	
Water storage loss:													
Store volume												230.0000 (47)	
a) If manufacturer declared loss factor is known (kWh/day):												1.7973 (48)	
Temperature factor from Table 2b												0.5400 (49)	
Enter (49) or (54) in (55)												0.9706 (55)	
Total storage loss	30.0872	27.1756	30.0872	29.1167	30.0872	29.1167	30.0872	30.0872	29.1167	30.0872	29.1167	30.0872 (56)	
If cylinder contains dedicated solar storage	30.0872	27.1756	30.0872	29.1167	30.0872	29.1167	30.0872	30.0872	29.1167	30.0872	29.1167	30.0872 (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													
WWHRS	289.6415	256.1047	271.8002	238.1232	230.2943	206.9173	203.6931	212.0560	214.7042	240.1470	256.2788	286.3506 (62)	
PV diverter	-33.4301	-29.5659	-30.9597	-25.6358	-23.8917	-20.4443	-19.1633	-20.3782	-21.1524	-24.9364	-28.2499	-32.8110 (63a)	
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 (63b)	
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 (63c)	
Output from w/h	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)	
	256.2114	226.5389	240.8405	212.4873	206.4026	186.4730	184.5298	191.6778	193.5517	215.2106	228.0289	253.5396 (64)	
12Total per year (kWh/year)												2595.4922 (64)	
Electric shower(s)												2595 (64)	
	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													
	121.2468	107.6821	115.3145	103.3124	101.5138	92.9364	92.6689	95.4496	95.5255	104.7898	109.3491	120.1525 (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	145.8428	145.8428	145.8428	145.8428	145.8428	145.8428	145.8428	145.8428	145.8428	145.8428	145.8428	145.8428	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	164.6911	182.3366	164.6911	170.1808	164.6911	170.1808	164.6911	164.6911	170.1808	164.6911	170.1808	164.6911	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	309.2756	312.4849	304.3975	287.1805	265.4471	245.0207	231.3746	228.1653	236.2527	253.4697	275.2032	295.6295	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													

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Pumps, fans	37.5843	37.5843	37.5843	37.5843	37.5843	37.5843	37.5843	37.5843	37.5843	37.5843	37.5843	37.5843	(69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	(70)
Water heating gains (Table 5)	-116.6742	-116.6742	-116.6742	-116.6742	-116.6742	-116.6742	-116.6742	-116.6742	-116.6742	-116.6742	-116.6742	-116.6742	(71)
Total internal gains	162.9661	160.2413	154.9926	143.4894	136.4433	129.0783	124.5550	128.2924	132.6744	140.8465	151.8737	161.4953	(72)
	706.6856	724.8156	693.8341	670.6035	636.3343	611.0327	587.3736	587.9018	605.8607	628.7602	667.0106	691.5688	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d			Gains W
North					6.3900	10.6334	0.6300	0.7000	0.7700			20.7656 (74)
East					2.2200	19.6403	0.6300	0.7000	0.7700			13.3252 (76)
South					10.9500	46.7521	0.6300	0.7000	0.7700			156.4540 (78)
West					1.5500	19.6403	0.6300	0.7000	0.7700			9.3036 (80)
Solar gains	199.8484	340.1821	466.7272	583.5316	660.6226	659.5311	634.2804	575.8076	506.8194	376.1344	239.2838	171.1107 (83)
Total gains	906.5340	1064.9977	1160.5613	1254.1351	1296.9569	1270.5638	1221.6540	1163.7094	1112.6801	1004.8947	906.2944	862.6795 (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	23.1868	23.2349	23.2822	23.5072	23.5497	23.7499	23.7499	23.7874	23.6724	23.5497	23.4638	23.3746	
alpha	2.5458	2.5490	2.5521	2.5671	2.5700	2.5833	2.5833	2.5858	2.5782	2.5700	2.5643	2.5583	
util living area	0.9609	0.9410	0.9139	0.8612	0.7774	0.6482	0.5166	0.5524	0.7269	0.8770	0.9424	0.9652	(86)
MIT	18.2361	18.5741	19.0476	19.6734	20.2407	20.6765	20.8715	20.8428	20.5318	19.7956	18.9139	18.1802	(87)
Th 2	19.9216	19.9236	19.9255	19.9347	19.9364	19.9444	19.9444	19.9459	19.9413	19.9364	19.9329	19.9293	(88)
util rest of house	0.9550	0.9321	0.9004	0.8380	0.7365	0.5774	0.4150	0.4529	0.6651	0.8518	0.9323	0.9600	(89)
MIT 2	16.6977	17.1250	17.7219	18.5043	19.1887	19.6830	19.8697	19.8489	19.5354	18.6689	17.5659	16.6311	(90)
Living area fraction	16.8572	17.2752	17.8593	18.6255	19.2978	19.7860	19.9736	19.9519	19.6386	18.7857	17.7056	16.7917	(91)
MIT	16.8572	17.2752	17.8593	18.6255	19.2978	19.7860	19.9736	19.9519	19.6386	18.7857	17.7056	16.7917	(92)
Temperature adjustment	16.8572	17.2752	17.8593	18.6255	19.2978	19.7860	19.9736	19.9519	19.6386	18.7857	17.7056	16.7917	(93)
adjusted MIT	16.8572	17.2752	17.8593	18.6255	19.2978	19.7860	19.9736	19.9519	19.6386	18.7857	17.7056	16.7917	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9297	0.9014	0.8656	0.8022	0.7075	0.5656	0.4180	0.4535	0.6445	0.8164	0.9020	0.9364	(94)
Ext temp.	842.8393	959.9985	1004.6331	1006.0266	917.6464	718.5690	510.6817	527.7684	717.1723	820.3657	817.4802	807.8195	(95)
Heat loss rate W	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)
Space heating kWh	2104.2808	2069.4936	1895.7531	1607.5535	1253.5860	848.4370	551.9259	580.1907	909.1052	1350.5864	1756.2664	2093.1157	(97)
Space heating requirement - total per year (kWh/year)	938.5125	745.5808	662.9933	433.0994	249.9391	0.0000	0.0000	0.0000	0.0000	394.4842	675.9260	956.2604	(98a)
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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98c)
Space heating kWh	938.5125	745.5808	662.9933	433.0994	249.9391	0.0000	0.0000	0.0000	0.0000	394.4842	675.9260	956.2604	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)	938.5125	745.5808	662.9933	433.0994	249.9391	0.0000	0.0000	0.0000	0.0000	394.4842	675.9260	956.2604	(98c)
Space heating per m ²	(98c) / (4) =												36.1510 (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)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating efficiency (main heating system 1)	938.5125	745.5808	662.9933	433.0994	249.9391	0.0000	0.0000	0.0000	0.0000	394.4842	675.9260	956.2604	(98)
Space heating fuel (main heating system)	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 efficiency (main heating system 2)	1016.8066	807.7798	718.3026	469.2301	270.7899	0.0000	0.0000	0.0000	0.0000	427.3935	732.3142	1036.0351	(211)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (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	(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	256.2114	226.5389	240.8405	212.4873	206.4026	186.4730	184.5298	191.6778	193.5517	215.2106	228.0289	253.5396	(64)
Efficiency of water heater (217)m	86.7030	86.5259	86.2092	85.6217	84.4901	79.8000	79.8000	79.8000	79.8000	85.4002	86.3435	86.7496	(216)
Fuel for water heating, kWh/month	295.5048	261.8162	279.3675	248.1701	244.2922	233.6755	231.2404	240.1978	242.5460	252.0023	264.0949	292.2660	(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	34.2196	27.4522	24.7177	18.1092	13.9881	11.4284	12.7604	16.5864	21.5442	28.2671	31.9276	35.1706	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-58.3519	-80.9573	-114.4975	-126.5329	-134.5199	-124.7652	-123.1103	-117.0956	-106.2909	-91.4272	-63.6401	-50.5938	(233a)

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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	-37.0406	-77.4253	-153.0339	-228.6668	-301.2909	-302.4450	-298.9892	-253.7239	-186.6616	-110.4515	-49.3532	-29.3374	(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												5478.6519	(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												3085.1737	(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)												276.1715	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-3220.2020	(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												5705.7951	(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	5478.6519	0.2100	1150.5169 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3085.1737	0.2100	647.8865 (264)
Space and water heating			1798.4034 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	276.1715	0.1443	39.8601 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1191.7827	0.1350	-160.8433
PV Unit electricity exported	-2028.4193	0.1260	-255.6620
Total			-416.5053 (269)
Total CO2, kg/year			1433.6874 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.2500 (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	5478.6519	1.1300	6190.8766 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3085.1737	1.1300	3486.2463 (278)
Space and water heating			9677.1229 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	276.1715	1.5338	423.6011 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1191.7827	1.4988	-1786.2574
PV Unit electricity exported	-2028.4193	0.4627	-938.4671
Total			-2724.7245 (283)
Total Primary energy kWh/year			7506.1003 (286)
Target Primary Energy Rate (TPER)			53.6600 (287)