

Full SAP Calculation Printout



Property Reference	OP-D320 S4HARR				Issued on Date	29/11/2024	
Assessment Reference	S4HARR		Prop Type Ref		S4HARR		
Property	S4HARR						
SAP Rating	82 B		DER	3.55		TER	9.29
Environmental	96 A		% DER < TER				61.79
CO ₂ Emissions (t/year)	0.47		DFEE	33.24		TFEE	34.30
Compliance Check	See BREL		% DFEE < TFEE				3.09
% DPER < TPER	22.69		DPER	37.49		TPER	48.49
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	48.5900 (1b)	x 2.3400 (2b)	= 113.7006 (1b) - (3b)
First floor	48.5900 (1c)	x 2.6300 (2c)	= 127.7917 (1c) - (3c)
Second floor	46.8100 (1d)	x 2.6100 (2d)	= 122.1741 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	143.9900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	363.6664 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
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)

	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	0.1897	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			2.1400	1.0000	2.1400		(26)
Windows (Uw = 1.30)			22.1600	1.2357	27.3840		(27)
Ground Floor			48.5900	0.1100	5.3449		(28a)
External Wall	156.6800	24.3000	132.3800	0.1700	22.5046		(29a)
Roof - ceiling	46.8100		46.8100	0.1100	5.1491		(30)
Bay Roof	1.7900		1.7900	0.1100	0.1969		(30)
Total net area of external elements Aum (A, m ²)			253.8700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	62.7195		(33)
Party Wall			75.6000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	

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E2 Other lintels (including other steel lintels)	14.4600	0.0500	0.7230
E3 Sill	15.1900	0.0500	0.7595
E4 Jamb	40.8000	0.0500	2.0400
E5 Ground floor (normal)	21.3800	0.1600	3.4208
E6 Intermediate floor within a dwelling	38.9700	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	9.9800	0.0600	0.5988
E12 Gable (insulation at ceiling level)	9.3800	0.0600	0.5628
E16 Corner (normal)	25.0800	0.0900	2.2572
E18 Party wall between dwellings	15.1500	0.0600	0.9090
P1 Party wall - Ground floor	9.9800	0.0800	0.7984
P2 Party wall - Intermediate floor within a dwelling	19.9600	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	9.9800	0.1200	1.1976
E24 Eaves (insulation at ceiling level - inverted)	1.7700	0.2400	0.4248
E14 Flat roof	3.7900	0.0800	0.3032
E17 Corner (inverted - internal area greater than external area)	9.9300	-0.0900	-0.8937
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			13.1014 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	75.8209 (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	40.0421	39.5958	39.1495	36.9180	36.4718	34.2403	34.2403	33.7940	35.1329	36.4718	37.3643	38.2569	(38)
Average = Sum(39)m / 12 =	115.8630	115.4167	114.9704	112.7390	112.2927	110.0613	110.0613	109.6150	110.9538	112.2927	113.1853	114.0778	(39)
												112.6274	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.8047	0.8016	0.7985	0.7830	0.7799	0.7644	0.7644	0.7613	0.7706	0.7799	0.7861	0.7923	(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													2.9243 (42)
Hot water usage for mixer showers													
	100.7204	99.2067	97.0011	92.7809	89.6666	86.1935	84.2194	86.4084	88.8079	92.5369	96.8477	100.3345	(42a)
Hot water usage for baths	33.2880	32.7936	32.0975	30.8138	29.8527	28.7869	28.2112	28.9025	29.6552	30.7956	32.1057	33.1755	(42b)
Hot water usage for other uses	46.9242	45.2179	43.5116	41.8052	40.0989	38.3926	38.3926	40.0989	41.8052	43.5116	45.2179	46.9242	(42c)
Average daily hot water use (litres/day)													166.3824 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	180.9326	177.2183	172.6101	165.4000	159.6181	153.3729	150.8231	155.4098	160.2683	166.8441	174.1713	180.4342	(44)
Energy conte	286.5530	252.3565	265.2953	226.4243	214.8767	188.5899	182.4075	192.4297	197.6269	226.4059	248.1389	282.5163	(45)
Energy content (annual)										Total = Sum(45)m =		2763.6210	
Distribution loss (46)m = 0.15 x (45)m													
	42.9830	37.8535	39.7943	33.9636	32.2315	28.2885	27.3611	28.8645	29.6440	33.9609	37.2208	42.3774	(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													
	384.9346	341.2173	363.6769	321.6323	313.2583	253.2219	249.1939	259.2161	262.2589	324.7875	343.3469	380.8979	(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													
	384.9346	341.2173	363.6769	321.6323	313.2583	253.2219	249.1939	259.2161	262.2589	324.7875	343.3469	380.8979	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		3797.6426	(64)
Electric shower(s)												3798	(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													
	139.1650	123.5476	132.0968	117.7565	115.3326	80.7157	79.2604	82.5928	83.7205	119.1660	124.9766	137.8228	(65)

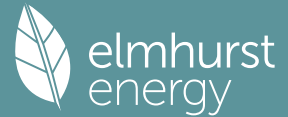
5. Internal gains (see Table 5 and 5a)

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	146.2163	146.2163	146.2163	146.2163	146.2163	146.2163	146.2163	146.2163	146.2163	146.2163	146.2163	146.2163	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	166.4800	184.3172	166.4800	172.0293	166.4800	172.0293	166.4800	166.4800	172.0293	166.4800	172.0293	166.4800	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	313.9047	317.1621	308.9537	291.4789	269.4202	248.6881	234.8378	231.5805	239.7889	257.2636	279.3223	300.0544	(68)
Pumps, fans	37.6216	37.6216	37.6216	37.6216	37.6216	37.6216	37.6216	37.6216	37.6216	37.6216	37.6216	37.6216	(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)	-116.9730	-116.9730	-116.9730	-116.9730	-116.9730	-116.9730	-116.9730	-116.9730	-116.9730	-116.9730	-116.9730	-116.9730	(71)
Total internal gains	187.0497	183.8505	177.5494	163.5507	155.0169	112.1052	106.5328	111.0118	116.2785	160.1694	173.5786	185.2456	(72)
	734.2993	752.1947	719.8480	693.9238	657.7820	599.6875	574.7155	575.9372	594.9616	650.7779	691.7952	718.6450	(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
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North			7.1500		10.6334		0.6300		0.7000		0.7700		23.2354 (74)
East			4.0300		19.6403		0.6300		0.7000		0.7700		24.1893 (76)
South			9.2300		46.7521		0.6300		0.7000		0.7700		131.8786 (78)
West			1.7500		19.6403		0.6300		0.7000		0.7700		10.5041 (80)

Solar gains	189.8074	328.2548	462.3459	595.1549	687.0649	691.1148	662.5534	592.5880	508.1102	366.3460	228.2435	161.8556 (83)
Total gains	924.1067	1080.4495	1182.1938	1289.0787	1344.8469	1290.8024	1237.2689	1168.5251	1103.0719	1017.1239	920.0387	880.5005 (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	34.5211	34.6546	34.7891	35.4777	35.6187	36.3409	36.3409	36.4888	36.0485	35.6187	35.3378	35.0613	
alpha	3.3014	3.3103	3.3193	3.3652	3.3746	3.4227	3.4227	3.4326	3.4032	3.3746	3.3559	3.3374	
util living area	0.9525	0.9230	0.8798	0.7922	0.6661	0.5122	0.3816	0.4175	0.6174	0.8215	0.9241	0.9582 (86)	
Living	19.3032	19.6133	19.9889	20.4436	20.7587	20.9293	20.9803	20.9731	20.8622	20.4602	19.8281	19.2658	
Non living	18.2403	18.6307	19.1000	19.6628	20.0308	20.2252	20.2717	20.2690	20.1562	19.6947	18.9146	18.2002	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.1320	19.6133	19.9889	20.4436	20.7587	20.9293	20.9803	20.9731	20.8622	20.4602	19.8281	19.5083 (87)	
Th 2	20.2493	20.2520	20.2547	20.2681	20.2708	20.2843	20.2843	20.2870	20.2789	20.2708	20.2654	20.2600 (88)	
util rest of house	0.9466	0.9139	0.8657	0.7687	0.6300	0.4629	0.3229	0.3573	0.5683	0.7960	0.9136	0.9530 (89)	
MIT 2	19.4484	18.6307	19.1000	19.6628	20.0308	20.2252	20.2717	20.2690	20.1562	19.6947	18.9146	18.5714 (90)	
Living area fraction									fLA =	Living area / (4) =		0.1250 (91)	
MIT	19.5338	18.7535	19.2111	19.7604	20.1218	20.3133	20.3602	20.3570	20.2445	19.7904	19.0288	18.6885 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.5338	18.7535	19.2111	19.7604	20.1218	20.3133	20.3602	20.3570	20.2445	19.7904	19.0288	18.6885 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9400	0.8913	0.8424	0.7507	0.6222	0.4649	0.3292	0.3633	0.5659	0.7770	0.8917	0.9389 (94)	
Useful gains	868.6897	963.0540	995.8996	967.6871	836.8305	600.1076	407.3181	424.5499	624.2020	790.2860	820.3842	826.7015 (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	1765.0382	1598.9278	1461.3999	1224.3884	945.7066	628.8077	413.8577	433.7497	681.7511	1032.0178	1350.1609	1652.8210 (97)	
Space heating kWh	666.8834	427.3072	346.3322	184.8250	81.0038	0.0000	0.0000	0.0000	0.0000	179.8485	381.4392	614.6329 (98a)	
Space heating requirement - total per year (kWh/year)												2882.2720	
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	666.8834	427.3072	346.3322	184.8250	81.0038	0.0000	0.0000	0.0000	0.0000	179.8485	381.4392	614.6329 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												2882.2720	
Space heating per m2										(98c) / (4) =		20.0172 (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 %)													248.9016 (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	666.8834	427.3072	346.3322	184.8250	81.0038	0.0000	0.0000	0.0000	0.0000	179.8485	381.4392	614.6329 (98)	
Space heating efficiency (main heating system 1)	248.9016	248.9016	248.9016	248.9016	248.9016	0.0000	0.0000	0.0000	0.0000	248.9016	248.9016	248.9016 (210)	
Space heating fuel (main heating system)	267.9305	171.6771	139.1442	74.2562	32.5445	0.0000	0.0000	0.0000	0.0000	72.2568	153.2490	246.9381 (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	384.9346	341.2173	363.6769	321.6323	313.2583	253.2219	249.1939	259.2161	262.2589	324.7875	343.3469	380.8979 (64)	
Efficiency of water heater	269.4200	269.4200	269.4200	269.4200	269.4200	269.4200	269.4200	269.4200	269.4200	269.4200	269.4200	269.4200 (216)	
Fuel for water heating, kWh/month	142.8753	126.6488	134.9851	119.3795	116.2714	93.9878	92.4927	96.2127	97.3420	120.5506	127.4393	141.3770 (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	55.9198	50.5082	55.9198	54.1160	55.9198	54.1160	55.9198	55.9198	54.1160	55.9198	54.1160	55.9198 (231)	
Lighting	34.5913	27.7504	24.9862	18.3059	14.1400	11.5525	12.8990	16.7666	21.7782	28.5741	32.2744	35.5527 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)	

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Annual totals kWh/year	
Space heating fuel - main system 1	1157.9964 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	269.4200
Water heating fuel used	1409.5622 (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)	658.4107 (230a)
Total electricity for the above, kWh/year	658.4107 (231)
Electricity for lighting (calculated in Appendix L)	279.1713 (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	3505.1406 (238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1157.9964	0.1559	180.5630 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1409.5622	0.1415	199.5037 (264)
Space and water heating			380.0667 (265)
Pumps, fans and electric keep-hot	658.4107	0.1387	91.3297 (267)
Energy for lighting	279.1713	0.1443	40.2930 (268)
Total CO2, kg/year			511.6895 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.5500 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1157.9964	1.5772	1826.4149 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1409.5622	1.5234	2147.3161 (278)
Space and water heating			3973.7310 (279)
Pumps, fans and electric keep-hot	658.4107	1.5128	996.0438 (281)
Energy for lighting	279.1713	1.5338	428.2022 (282)
Total Primary energy kWh/year			5397.9770 (286)
Dwelling Primary energy Rate (DPER)			37.4900 (287)

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

1. Overall dwelling characteristics

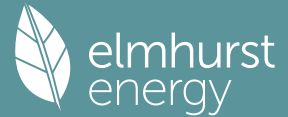
	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	48.5900 (1b)	x 2.3400 (2b)	= 113.7006 (1b) - (3b)
First floor	48.5900 (1c)	x 2.6300 (2c)	= 127.7917 (1c) - (3c)
Second floor	46.8100 (1d)	x 2.6100 (2d)	= 122.1741 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	143.9900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	363.6664 (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) = 0.1100 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3600 (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) = 0.3060 (21)

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

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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												
	0.3901	0.3825	0.3748	0.3366	0.3289	0.2907	0.2907	0.2830	0.3060	0.3289	0.3442	0.3595 (22b)
Effective ac	0.5761	0.5731	0.5703	0.5566	0.5541	0.5423	0.5423	0.5401	0.5468	0.5541	0.5593	0.5646 (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			2.1400	1.0000	2.1400		(26)
TER Opening Type (Uw = 1.20)			22.1600	1.1450	25.3740		(27)
Ground Floor			48.5900	0.1300	6.3167		(28a)
External Wall	156.6800	24.3000	132.3800	0.1800	23.8284		(29a)
Roof - ceiling	46.8100		46.8100	0.1100	5.1491		(30)
Bay Roof	1.7900		1.7900	0.1100	0.1969		(30)
Total net area of external elements Aum(A, m2)			253.8700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		63.0051		(33)
Party Wall			75.6000	0.0000	0.0000		(32)

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

List of Thermal Bridges 100.0000 (35)

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	14.4600	0.0500	0.7230
E3 Sill	15.1900	0.0500	0.7595
E4 Jamb	40.8000	0.0500	2.0400
E5 Ground floor (normal)	21.3800	0.1600	3.4208
E6 Intermediate floor within a dwelling	38.9700	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	9.9800	0.0600	0.5988
E12 Gable (insulation at ceiling level)	9.3800	0.0600	0.5628
E16 Corner (normal)	25.0800	0.0900	2.2572
E18 Party wall between dwellings	15.1500	0.0600	0.9090
P1 Party wall - Ground floor	9.9800	0.0800	0.7984
P2 Party wall - Intermediate floor within a dwelling	19.9600	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	9.9800	0.1200	1.1976
E24 Eaves (insulation at ceiling level - inverted)	1.7700	0.2400	0.4248
E14 Flat roof	3.7900	0.0800	0.3032
E17 Corner (inverted - internal area greater than external area)	9.9300	-0.0900	-0.8937

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

Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 76.1065 (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
	69.1383	68.7836	68.4360	66.8031	66.4977	65.0755	65.0755	64.8121	65.6233	66.4977	67.1157	67.7618 (38)
Heat transfer coeff	145.2448	144.8902	144.5425	142.9097	142.6042	141.1821	141.1821	140.9187	141.7298	142.6042	143.2222	143.8683 (39)
Average = Sum(39)m / 12 =												142.9082

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0087	1.0063	1.0038	0.9925	0.9904	0.9805	0.9805	0.9787	0.9843	0.9904	0.9947	0.9992 (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												2.9243 (42)
Hot water usage for mixer showers	73.2512	72.1503	70.5462	67.4770	65.2121	62.6862	61.2505	62.8424	64.5875	67.2996	70.4347	72.9705 (42a)
Hot water usage for baths	31.6236	31.1540	30.4926	29.2731	28.3600	27.3475	26.8006	27.4574	28.1725	29.2559	30.5004	31.5167 (42b)
Hot water usage for other uses	44.5780	42.9570	41.3360	39.7150	38.0939	36.4729	36.4729	38.0939	39.7150	41.3360	42.9570	44.5780 (42c)
Average daily hot water use (litres/day)												137.3807 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	149.4528	146.2613	142.3748	136.4652	131.6660	126.5066	124.5240	128.3938	132.4750	137.8914	143.8921	149.0652 (44)
Energy conte	236.6967	208.2742	218.8248	186.8140	177.2478	155.5547	150.6010	158.9783	163.3549	187.1174	205.0007	233.4001 (45)
Energy content (annual)										Total = Sum(45)m =		2281.8645
Distribution loss (46)m = 0.15 x (45)m	35.5045	31.2411	32.8237	28.0221	26.5872	23.3332	22.5902	23.8467	24.5032	28.0676	30.7501	35.0100 (46)

Water storage loss: 230.0000 (47)

Store volume 1.7973 (48)

a) If manufacturer declared loss factor is known (kWh/day): 0.5400 (49)

Temperature factor from Table 2b 0.9706 (55)

Enter (49) or (54) in (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 290.0463 256.4609 272.1744 238.4426 230.5974 207.1833 203.9506 212.3279 214.9835 240.4670 256.6294 286.7498 (62)

WWHRS -33.4874 -29.6165 -31.0127 -25.6797 -23.9326 -20.4793 -19.1961 -20.4131 -21.1887 -24.9791 -28.2983 -32.8672 (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 256.5590 226.8444 241.1617 212.7629 206.6648 186.7040 184.7546 191.9148 193.7949 215.4879 228.3311 253.8825 (64)

12Total per year (kWh/year) Total per year (kWh/year) = Sum(64)m = 2598.8626 (64)

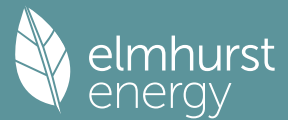
Electric shower(s) 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (64a)

Total Energy used by instantaneous electric shower (s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month 121.3814 107.8006 115.4389 103.4186 101.6146 93.0249 92.7545 95.5400 95.6184 104.8962 109.4657 120.2852 (65)

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

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Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	146.2163	146.2163	146.2163	146.2163	146.2163	146.2163	146.2163	146.2163	146.2163	146.2163	146.2163	146.2163	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	166.4800	184.3172	166.4800	172.0293	166.4800	172.0293	166.4800	166.4800	172.0293	166.4800	172.0293	166.4800	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	313.9047	317.1621	308.9537	291.4789	269.4202	248.6881	234.8378	231.5805	239.7889	257.2636	279.3223	300.0544	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6216	37.6216	37.6216	37.6216	37.6216	37.6216	37.6216	37.6216	37.6216	37.6216	37.6216	37.6216	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-116.9730	-116.9730	-116.9730	-116.9730	-116.9730	-116.9730	-116.9730	-116.9730	-116.9730	-116.9730	-116.9730	-116.9730	(71)
Water heating gains (Table 5)	163.1470	160.4175	155.1599	143.6369	136.5788	129.2012	124.6701	128.4140	132.8034	140.9895	152.0356	161.6737	(72)
Total internal gains	713.3966	731.7616	700.4584	677.0101	642.3438	616.7835	592.8528	593.3393	611.4865	634.5980	673.2522	698.0730	(73)

6. Solar gains

[Jan]													Gains	
	Area				Solar flux		g		FF		Access		W	
	m2				Table 6a		Specific data		Specific data		factor			
					W/m2		or Table 6b		or Table 6c		Table 6d			
North	7.1500				10.6334		0.6300		0.7000		0.7700		23.2354 (74)	
East	4.0300				19.6403		0.6300		0.7000		0.7700		24.1893 (76)	
South	9.2300				46.7521		0.6300		0.7000		0.7700		131.8786 (78)	
West	1.7500				19.6403		0.6300		0.7000		0.7700		10.5041 (80)	
Solar gains	189.8074	328.2548	462.3459	595.1549	687.0649	691.1148	662.5534	592.5880	508.1102	366.3460	228.2435	161.8556	(83)	
Total gains	903.2040	1060.0164	1162.8043	1272.1649	1329.4087	1307.8984	1255.4062	1185.9273	1119.5967	1000.9440	901.4958	859.9286	(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	27.5378	27.6052	27.6716	27.9878	28.0477	28.3302	28.3302	28.3832	28.2207	28.0477	27.9267	27.8013	
alpha	2.8359	2.8403	2.8448	2.8659	2.8698	2.8887	2.8887	2.8922	2.8814	2.8698	2.8618	2.8534	
util living area	0.9610	0.9390	0.9070	0.8421	0.7407	0.5946	0.4598	0.4989	0.6903	0.8654	0.9405	0.9656	(86)
MIT	18.6805	19.0067	19.4468	20.0145	20.4880	20.8107	20.9338	20.9148	20.6918	20.0753	19.2893	18.6290	(87)
Th 2	20.0761	20.0781	20.0801	20.0896	20.0914	20.0996	20.0996	20.1011	20.0964	20.0914	20.0878	20.0840	(88)
util rest of house	0.9555	0.9306	0.8939	0.8192	0.7014	0.5321	0.3770	0.4159	0.6333	0.8410	0.9309	0.9607	(89)
MIT 2	17.3467	17.7588	18.3124	19.0189	19.5832	19.9441	20.0594	20.0464	19.8249	19.1069	18.1270	17.2863	(90)
Living area fraction									fLA = Living area / (4) =			0.1250	(91)
MIT	17.5135	17.9148	18.4543	19.1434	19.6963	20.0524	20.1687	20.1550	19.9332	19.2280	18.2723	17.4542	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.5135	17.9148	18.4543	19.1434	19.6963	20.0524	20.1687	20.1550	19.9332	19.2280	18.2723	17.4542	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9339	0.9042	0.8644	0.7909	0.6823	0.5286	0.3836	0.4212	0.6219	0.8125	0.9051	0.9407	(94)
Useful gains	843.4874	958.5187	1005.1796	1006.1016	907.0802	691.2934	481.6186	499.4683	696.2664	813.2759	815.9725	808.8944	(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	1919.1880	1885.7167	1727.8977	1463.8804	1140.3017	769.7824	503.8412	529.1488	826.7454	1230.3846	1600.1219	1906.8561	(97)
Space heating kWh	800.3212	623.0771	537.7022	329.6007	173.5168	0.0000	0.0000	0.0000	0.0000	310.3289	564.5876	816.8835	(98a)
Space heating requirement - total per year (kWh/year)												4156.0180	
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	800.3212	623.0771	537.7022	329.6007	173.5168	0.0000	0.0000	0.0000	0.0000	310.3289	564.5876	816.8835	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4156.0180	
Space heating per m2										(98c) / (4) =		28.8632	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													92.3000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	800.3212	623.0771	537.7022	329.6007	173.5168	0.0000	0.0000	0.0000	0.0000	310.3289	564.5876	816.8835	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	867.0869	675.0564	582.5593	357.0972	187.9922	0.0000	0.0000	0.0000	0.0000	336.2177	611.6875	885.0309	(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	256.5590	226.8444	241.1617	212.7629	206.6648	186.7040	184.7546	191.9148	193.7949	215.4879	228.3311	253.8825	(64)
Efficiency of water heater													79.8000 (216)
(217)m	86.4336	86.2051	85.8037	85.0377	83.6704	79.8000	79.8000	79.8000	79.8000	84.8770	86.0068	86.4872	(217)

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Fuel for water heating, kWh/month	296.8277	263.1450	281.0623	250.1984	246.9988	233.9650	231.5220	240.4948	242.8507	253.8825	265.4804	293.5491	(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	34.5913	27.7504	24.9862	18.3059	14.1400	11.5525	12.8990	16.7666	21.7782	28.5741	32.2744	35.5527	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-46.7378	-66.5571	-96.5900	-109.6237	-118.9903	-111.2475	-109.7883	-103.2254	-91.8315	-76.4911	-51.5866	-40.3230	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-24.4075	-51.5674	-102.9396	-155.2904	-206.0449	-207.3733	-205.0209	-173.3382	-126.6575	-74.0736	-32.6858	-19.2911	(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												4502.7281	(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												3099.9767	(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)												279.1713	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2401.6825	(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												5566.1936	(238)

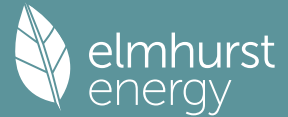
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4502.7281	0.2100	945.5729	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3099.9767	0.2100	650.9951	(264)
Space and water heating			1596.5680	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	279.1713	0.1443	40.2930	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1022.9922	0.1344	-137.4945	
PV Unit electricity exported	-1378.6903	0.1258	-173.3780	
Total			-310.8725	(269)
Total CO2, kg/year			1337.9178	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.2900	(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	4502.7281	1.1300	5088.0828	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3099.9767	1.1300	3502.9737	(278)
Space and water heating			8591.0564	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	279.1713	1.5338	428.2022	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1022.9922	1.4967	-1531.1383	
PV Unit electricity exported	-1378.6903	0.4616	-636.4061	
Total			-2167.5444	(283)
Total Primary energy kWh/year			6981.8150	(286)
Target Primary Energy Rate (TPER)			48.4900	(287)

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Property Reference	OP-D320 S4HARR				Issued on Date	29/11/2024	
Assessment Reference	S4HARR			Prop Type Ref	S4HARR		
Property	S4HARR						
SAP Rating	82 B		DER	3.55		TER	9.29
Environmental	96 A		% DER < TER				61.79
CO ₂ Emissions (t/year)	0.47		DFEE	33.24		TFEE	34.30
Compliance Check	See BREL		% DFEE < TFEE				3.09
% DPER < TPER	22.69		DPER	37.49		TPER	48.49
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	48.5900 (1b)	x	2.3400 (2b)	=	113.7006 (1b)	- (3b)
First floor	48.5900 (1c)	x	2.6300 (2c)	=	127.7917 (1c)	- (3c)
Second floor	46.8100 (1d)	x	2.6100 (2d)	=	122.1741 (1d)	- (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	143.9900					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	363.6664	(5)

2. Ventilation rate

		m ³ per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)	
Number of open flues	0 * 20 =	0.0000 (6b)	
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)	
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)	
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)	
Number of blocked chimneys	0 * 20 =	0.0000 (6f)	
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)	
Number of passive vents	0 * 10 =	0.0000 (7b)	
Number of flueless gas fires	0 * 40 =	0.0000 (7c)	
Infiltration due to chimneys, flues and fans	(6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		40.0000 / (5) = 0.1100 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			3.5000 (17)
Infiltration rate			0.2850 (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) =		0.2422 (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	0.3089	0.3028	0.2967	0.2665	0.2604	0.2301	0.2301	0.2241	0.2422	0.2604	0.2725	0.2846	(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	0.5477	0.5458	0.5440	0.5355	0.5339	0.5265	0.5265	0.5251	0.5293	0.5339	0.5371	0.5405	(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			2.1400	1.0000	2.1400			(26)
Windows (Uw = 1.30)			22.1600	1.2357	27.3840			(27)
Ground Floor			48.5900	0.1100	5.3449			(28a)
External Wall	156.6800	24.3000	132.3800	0.1700	22.5046			(29a)
Roof - ceiling	46.8100		46.8100	0.1100	5.1491			(30)
Bay Roof	1.7900		1.7900	0.1100	0.1969			(30)
Total net area of external elements Aum(A, m ²)			253.8700					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	62.7195			(33)
Party Wall			75.6000	0.0000	0.0000			(32)
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)				14.4600	0.0500		0.7230	
E3 Sill				15.1900	0.0500		0.7595	
E4 Jamb				40.8000	0.0500		2.0400	

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E5 Ground floor (normal)													21.3800	0.1600	3.4208
E6 Intermediate floor within a dwelling													38.9700	0.0000	0.0000
E10 Eaves (insulation at ceiling level)													9.9800	0.0600	0.5988
E12 Gable (insulation at ceiling level)													9.3800	0.0600	0.5628
E16 Corner (normal)													25.0800	0.0900	2.2572
E18 Party wall between dwellings													15.1500	0.0600	0.9090
P1 Party wall - Ground floor													9.9800	0.0800	0.7984
P2 Party wall - Intermediate floor within a dwelling													19.9600	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)													9.9800	0.1200	1.1976
E24 Eaves (insulation at ceiling level - inverted)													1.7700	0.2400	0.4248
E14 Flat roof													3.7900	0.0800	0.3032
E17 Corner (inverted - internal area greater than external area)													9.9300	-0.0900	-0.8937
Thermal bridges (Sum(L x Psi) calculated using Appendix K)															13.1014 (36)
Point Thermal bridges															0.0000
Total fabric heat loss															(33) + (36) + (36a) = 75.8209 (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	65.7291	65.5068	65.2889	64.2656	64.0741	63.1828	63.1828	63.0178	63.5261	64.0741	64.4614	64.8664	(38)		
Average = Sum(39)m / 12 =	141.5500	141.3277	141.1098	140.0865	139.8950	139.0037	139.0037	138.8387	139.3471	139.8950	140.2824	140.6873	(39)		
													140.0856		
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
HLP (average)	0.9831	0.9815	0.9800	0.9729	0.9716	0.9654	0.9654	0.9642	0.9678	0.9716	0.9743	0.9771	(40)		
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31			
													0.9729		
													31		

4. Water heating energy requirements (kWh/year)															

Assumed occupancy															2.9243 (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															
	31.6236	31.1540	30.4926	29.2731	28.3600	27.3475	26.8006	27.4574	28.1725	29.2559	30.5004	31.5167	(42b)		
Hot water usage for other uses															
	44.5780	42.9570	41.3360	39.7150	38.0939	36.4729	36.4729	38.0939	39.7150	41.3360	42.9570	44.5780	(42c)		
Average daily hot water use (litres/day)															69.8456 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
	76.2016	74.1110	71.8286	68.9881	66.4540	63.8205	63.2736	65.5513	67.8874	70.5918	73.4574	76.0947	(44)		
Energy conte	120.6848	105.5330	110.3978	94.4413	89.4598	78.4747	76.5239	81.1662	83.7120	95.7925	104.6536	119.1460	(45)		
Energy content (annual)															
Distribution loss (46)m = 0.15 x (45)m															1159.9855
	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															
	102.5821	89.7031	93.8382	80.2751	76.0408	66.7035	65.0453	68.9913	71.1552	81.4236	88.9555	101.2741	(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															
	102.5821	89.7031	93.8382	80.2751	76.0408	66.7035	65.0453	68.9913	71.1552	81.4236	88.9555	101.2741	(64)		
12Total per year (kWh/year)															985.9877 (64)
Electric shower(s)															986 (64)
	58.6620	52.2683	57.0750	54.4660	55.4880	52.9302	54.6945	55.4880	54.4660	57.0750	56.0018	58.6620	(64a)		
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =															667.2766 (64a)
Heat gains from water heating, kWh/month															
	40.3110	35.4928	37.7283	33.6853	32.8822	29.9084	29.9350	31.1198	31.4053	34.6246	36.2393	39.9840	(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			
	146.2163	146.2163	146.2163	146.2163	146.2163	146.2163	146.2163	146.2163	146.2163	146.2163	146.2163	146.2163	(66)		
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5															
	166.4800	184.3172	166.4800	172.0293	166.4800	172.0293	166.4800	166.4800	172.0293	166.4800	172.0293	166.4800	(67)		
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5															
	313.9047	317.1621	308.9537	291.4789	269.4202	248.6881	234.8378	231.5805	239.7889	257.2636	279.3223	300.0544	(68)		
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5															
	37.6216	37.6216	37.6216	37.6216	37.6216	37.6216	37.6216	37.6216	37.6216	37.6216	37.6216	37.6216	(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)															
	-116.9730	-116.9730	-116.9730	-116.9730	-116.9730	-116.9730	-116.9730	-116.9730	-116.9730	-116.9730	-116.9730	-116.9730	(71)		
Water heating gains (Table 5)															
	54.1815	52.8167	50.7101	46.7851	44.1965	41.5395	40.2351	41.8277	43.6185	46.5385	50.3324	53.7420	(72)		
Total internal gains															
	601.4311	621.1609	593.0086	577.1582	546.9616	529.1218	508.4178	506.7531	522.3016	537.1470	568.5490	587.1413	(73)		

6. Solar gains															

[Jan]															
				Area	Solar flux	g	FF								
				m2	Table 6a	Specific data	Specific data								
					W/m2	or Table 6b	or Table 6c								
North				7.1500	10.6334	0.6300	0.7000			0.7700		23.2354	(74)		
East				4.0300	19.6403	0.6300	0.7000			0.7700		24.1893	(76)		
South				9.2300	46.7521	0.6300	0.7000			0.7700		131.8786	(78)		
West				1.7500	19.6403	0.6300	0.7000			0.7700		10.5041	(80)		

Solar gains	189.8074	328.2548	462.3459	595.1549	687.0649	691.1148	662.5534	592.5880	508.1102	366.3460	228.2435	161.8556	(83)		

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Total gains 791.2385 949.4157 1055.3545 1172.3131 1234.0265 1220.2366 1170.9712 1099.3410 1030.4118 903.4930 796.7925 748.9968 (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	28.2566	28.3010	28.3447	28.5518	28.5909	28.7742	28.7742	28.8084	28.7033	28.5909	28.5119	28.4299
alpha	2.8838	2.8867	2.8896	2.9035	2.9061	2.9183	2.9183	2.9206	2.9136	2.9061	2.9008	2.8953
util living area	0.9713	0.9516	0.9226	0.8614	0.7633	0.6184	0.4816	0.5244	0.7182	0.8876	0.9545	0.9752 (86)
MIT	18.6019	18.9367	19.3862	19.9662	20.4580	20.7958	20.9279	20.9059	20.6652	20.0143	19.2064	18.5397 (87)
Th 2	20.0975	20.0988	20.1000	20.1060	20.1071	20.1123	20.1123	20.1133	20.1103	20.1071	20.1048	20.1025 (88)
util rest of house	0.9671	0.9448	0.9114	0.8405	0.7258	0.5563	0.3974	0.4402	0.6631	0.8662	0.9470	0.9716 (89)
MIT 2	17.8864	18.2173	18.6595	19.2241	19.6838	19.9800	20.0776	20.0654	19.8771	19.2808	18.4915	17.8284 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	17.9759	18.3072	18.7503	19.3169	19.7806	20.0820	20.1839	20.1705	19.9756	19.3725	18.5809	17.9173 (92)
Temperature adjustment	0.0000											
adjusted MIT	17.9759	18.3072	18.7503	19.3169	19.7806	20.0820	20.1839	20.1705	19.9756	19.3725	18.5809	17.9173 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9538	0.9272	0.8903	0.8188	0.7105	0.5540	0.4045	0.4460	0.6538	0.8447	0.9299	0.9595 (94)
Useful gains	754.6588	880.2601	939.6049	959.8530	876.8077	675.9989	473.6832	490.2705	673.7044	763.1996	740.9292	718.6533 (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	1935.8199	1894.8112	1728.6421	1459.2652	1130.4347	762.0139	498.1795	523.4875	818.7521	1227.2273	1610.5624	1929.8492 (97)
Space heating kWh	878.7838	681.7783	587.0437	359.5768	188.6985	0.0000	0.0000	0.0000	0.0000	345.2367	626.1359	901.1298 (98a)
Space heating requirement - total per year (kWh/year)	4568.3835											
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	878.7838	681.7783	587.0437	359.5768	188.6985	0.0000	0.0000	0.0000	0.0000	345.2367	626.1359	901.1298 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	4568.3835											
Space heating per m2	(98c) / (4) = 31.7271 (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	1306.6352	1028.6277	1055.1740	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7566	0.8232	0.7947	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	988.5399	846.8065	838.5780	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1349.0354	1294.8486	1214.5210	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	259.5568	333.3433	279.7016	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction	fc = cooled area / (4) =											
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 (105)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	64.8892	83.3358	69.9254	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement	218.1504 (107)											
Energy for space heating	31.7271 (99)											
Energy for space cooling	1.5150 (108)											
Total	33.2421 (109)											
Fabric Energy Efficiency (DFEE)	33.2 (109)											

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

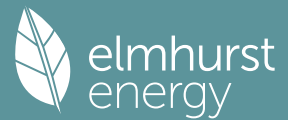
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	48.5900 (1b)	x 2.3400 (2b)	= 113.7006 (1b) - (3b)
First floor	48.5900 (1c)	x 2.6300 (2c)	= 127.7917 (1c) - (3c)
Second floor	46.8100 (1d)	x 2.6100 (2d)	= 122.1741 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	143.9900		
Dwelling volume	(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 363.6664 (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)

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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	Air changes per hour	
Pressure Test	40.0000 / (5) =	0.1100 (8)
Pressure Test Method	Yes	
Measured/design AF50	Blower Door	5.0000 (17)
Infiltration rate		0.3600 (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) =	0.3060 (21)
Wind speed	Jan 5.1000 Feb 5.0000 Mar 4.9000 Apr 4.4000 May 4.3000 Jun 3.8000 Jul 3.8000 Aug 3.7000 Sep 4.0000 Oct 4.3000 Nov 4.5000 Dec 4.7000	(22)
Wind factor	Jan 1.2750 Feb 1.2500 Mar 1.2250 Apr 1.1000 May 1.0750 Jun 0.9500 Jul 0.9500 Aug 0.9250 Sep 1.0000 Oct 1.0750 Nov 1.1250 Dec 1.1750	(22a)
Adj infiltr rate	0.3901 0.3825 0.3748 0.3366 0.3289 0.2907 0.2907 0.2830 0.3060 0.3289 0.3442 0.3595	(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	0.5761 0.5731 0.5703 0.5566 0.5541 0.5423 0.5423 0.5401 0.5468 0.5541 0.5593 0.5646	(25)

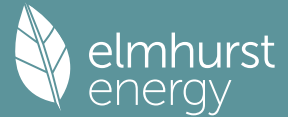
3. Heat losses and heat loss parameter

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			2.1400	1.0000	2.1400		(26)
TER Opening Type (Uw = 1.20)			22.1600	1.1450	25.3740		(27)
Ground Floor			48.5900	0.1300	6.3167		(28a)
External Wall	156.6800	24.3000	132.3800	0.1800	23.8284		(29a)
Roof - ceiling	46.8100		46.8100	0.1100	5.1491		(30)
Bay Roof	1.7900		1.7900	0.1100	0.1969		(30)
Total net area of external elements Aum(A, m2)			253.8700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		63.0051		(33)
Party Wall			75.6000	0.0000	0.0000		(32)
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)				14.4600	0.0500	0.7230	
E3 Sill				15.1900	0.0500	0.7595	
E4 Jamb				40.8000	0.0500	2.0400	
E5 Ground floor (normal)				21.3800	0.1600	3.4208	
E6 Intermediate floor within a dwelling				38.9700	0.0000	0.0000	
E10 Eaves (insulation at ceiling level)				9.9800	0.0600	0.5988	
E12 Gable (insulation at ceiling level)				9.3800	0.0600	0.5628	
E16 Corner (normal)				25.0800	0.0900	2.2572	
E18 Party wall between dwellings				15.1500	0.0600	0.9090	
P1 Party wall - Ground floor				9.9800	0.0800	0.7984	
P2 Party wall - Intermediate floor within a dwelling				19.9600	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)				9.9800	0.1200	1.1976	
E24 Eaves (insulation at ceiling level - inverted)				1.7700	0.2400	0.4248	
E14 Flat roof				3.7900	0.0800	0.3032	
E17 Corner (inverted - internal area greater than external area)				9.9300	-0.0900	-0.8937	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.1014 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	76.1065 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	Jan 69.1383 Feb 68.7836 Mar 68.4360 Apr 66.8031 May 66.4977 Jun 65.0755 Jul 65.0755 Aug 64.8121 Sep 65.6233 Oct 66.4977 Nov 67.1157 Dec 67.7618						(38)
Heat transfer coeff	145.2448 144.8902 144.5425 142.9097 142.6042 141.1821 141.1821 140.9187 141.7298 142.6042 143.2222 143.8683						(39)
Average = Sum(39)m / 12 =							142.9082
HLP	Jan 1.0087 Feb 1.0063 Mar 1.0038 Apr 0.9925 May 0.9904 Jun 0.9805 Jul 0.9805 Aug 0.9787 Sep 0.9843 Oct 0.9904 Nov 0.9947 Dec 0.9992						(40)
HLP (average)							0.9925
Days in mont	31 28 31 30 31 30 31 31 30 31 30 31						

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9243 (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	31.6236	31.1540	30.4926	29.2731	28.3600	27.3475	26.8006	27.4574	28.1725	29.2559	30.5004	31.5167 (42b)
Hot water usage for other uses	44.5780	42.9570	41.3360	39.7150	38.0939	36.4729	36.4729	38.0939	39.7150	41.3360	42.9570	44.5780 (42c)
Average daily hot water use (litres/day)												69.8456 (43)
Daily hot water use	Jan 76.2016 Feb 74.1110 Mar 71.8286 Apr 68.9881 May 66.4540 Jun 63.8205 Jul 63.2736 Aug 65.5513 Sep 67.8874 Oct 70.5918 Nov 73.4574 Dec 76.0947											(44)
Energy conte	120.6848 105.5330 110.3978 94.4413 89.4598 78.4747 76.5239 81.1662 83.7120 95.7925 104.6536 119.1460											(45)
Energy content (annual)												Total = Sum(45)m = 1159.9855
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Total heat required for water heating calculated for each month	102.5821 89.7031 93.8382 80.2751 76.0408 66.7035 65.0453 68.9913 71.1552 81.4236 88.9555 101.2741											(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)

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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	102.5821	89.7031	93.8382	80.2751	76.0408	66.7035	65.0453	68.9913	71.1552	81.4236	88.9555	101.2741 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =											985.9877 (64)
Electric shower(s)	58.6620	52.2683	57.0750	54.4660	55.4880	52.9302	54.6945	55.4880	54.4660	57.0750	56.0018	58.6620 (64a)
Heat gains from water heating, kWh/month	40.3110	35.4928	37.7283	33.6853	32.8822	29.9084	29.9350	31.1198	31.4053	34.6246	36.2393	667.2766 (64a)
												986 (64)

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	146.2163	146.2163	146.2163	146.2163	146.2163	146.2163	146.2163	146.2163	146.2163	146.2163	146.2163	146.2163	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	166.4800	184.3172	166.4800	172.0293	166.4800	172.0293	166.4800	166.4800	172.0293	166.4800	172.0293	166.4800	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	313.9047	317.1621	308.9537	291.4789	269.4202	248.6881	234.8378	231.5805	239.7889	257.2636	279.3223	300.0544	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6216	37.6216	37.6216	37.6216	37.6216	37.6216	37.6216	37.6216	37.6216	37.6216	37.6216	37.6216	(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)	-116.9730	-116.9730	-116.9730	-116.9730	-116.9730	-116.9730	-116.9730	-116.9730	-116.9730	-116.9730	-116.9730	-116.9730	(71)
Water heating gains (Table 5)	54.1815	52.8167	50.7101	46.7851	44.1965	41.5395	40.2351	41.8277	43.6185	46.5385	50.3324	53.7420	(72)
Total internal gains	601.4311	621.1609	593.0086	577.1582	546.9616	529.1218	508.4178	506.7531	522.3016	537.1470	568.5490	587.1413	(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					7.1500	10.6334	0.6300	0.7000	0.7700	23.2354 (74)			
East					4.0300	19.6403	0.6300	0.7000	0.7700	24.1893 (76)			
South					9.2300	46.7521	0.6300	0.7000	0.7700	131.8786 (78)			
West					1.7500	19.6403	0.6300	0.7000	0.7700	10.5041 (80)			
Solar gains	189.8074	328.2548	462.3459	595.1549	687.0649	691.1148	662.5534	592.5880	508.1102	366.3460	228.2435	161.8556	(83)
Total gains	791.2385	949.4157	1055.3545	1172.3131	1234.0265	1220.2366	1170.9712	1099.3410	1030.4118	903.4930	796.7925	748.9968	(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	27.5378	27.6052	27.6716	27.9878	28.0477	28.3302	28.3302	28.3832	28.2207	28.0477	27.9267	27.8013	
alpha	2.8359	2.8403	2.8448	2.8659	2.8698	2.8887	2.8887	2.8922	2.8814	2.8698	2.8618	2.8534	
util living area	0.9715	0.9523	0.9241	0.8640	0.7677	0.6234	0.4869	0.5294	0.7227	0.8895	0.9550	0.9753	(86)
MIT	18.5327	18.8708	19.3282	19.9270	20.4320	20.7851	20.9232	20.9003	20.6495	19.9815	19.1592	18.4799	(87)
Th 2	20.0761	20.0781	20.0801	20.0896	20.0914	20.0996	20.0996	20.1011	20.0964	20.0914	20.0878	20.0840	(88)
util rest of house	0.9674	0.9455	0.9129	0.8431	0.7301	0.5605	0.4010	0.4439	0.6672	0.8682	0.9475	0.9717	(89)
MIT 2	17.8037	18.1384	18.5891	19.1748	19.6481	19.9605	20.0628	20.0506	19.8525	19.2382	18.4336	17.7568	(90)
Living area fraction	17.8948	18.2299	18.6815	19.2688	19.7461	20.0636	20.1703	20.1568	19.9521	19.3311	18.5243	17.8472	(91)
MIT	17.8948	18.2299	18.6815	19.2688	19.7461	20.0636	20.1703	20.1568	19.9521	19.3311	18.5243	17.8472	(92)
Temperature adjustment	17.8948	18.2299	18.6815	19.2688	19.7461	20.0636	20.1703	20.1568	19.9521	19.3311	18.5243	17.8472	(93)
adjusted MIT	17.8948	18.2299	18.6815	19.2688	19.7461	20.0636	20.1703	20.1568	19.9521	19.3311	18.5243	17.8472	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9538	0.9276	0.8914	0.8209	0.7140	0.5578	0.4081	0.4495	0.6573	0.8463	0.9302	0.9595	(94)
Ext temp.	754.6920	880.6984	940.7731	962.2979	881.1290	680.6938	477.9306	494.1955	677.3265	764.5881	741.1960	718.6355	(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	1974.5778	1931.3768	1760.7427	1481.8064	1147.4013	771.3622	504.0692	529.4081	829.4222	1245.0920	1636.2110	1963.3995	(97)
Space heating requirement - total per year (kWh/year)	907.5950	706.0559	610.0574	374.0461	198.1066	0.0000	0.0000	0.0000	0.0000	357.4949	644.4108	926.1044	(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	907.5950	706.0559	610.0574	374.0461	198.1066	0.0000	0.0000	0.0000	0.0000	357.4949	644.4108	926.1044	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)	907.5950	706.0559	610.0574	374.0461	198.1066	0.0000	0.0000	0.0000	0.0000	357.4949	644.4108	926.1044	(98c)
Space heating per m2	(98c) / (4) =											32.8069	(99)

8c. Space cooling requirement

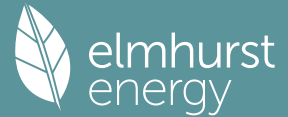
Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1327.1113	1044.7472	1070.9821	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7489	0.8164	0.7878	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	993.8704	852.9306	843.7061	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1349.0354	1294.8486	1214.5210	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													

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Cooled fraction	0.0000	0.0000	0.0000	0.0000	0.0000	255.7188	328.7870	275.8863	0.0000	0.0000	0.0000	0.0000 (104)
Intermittency factor (Table 10b)	fC = cooled area / (4) =											
Space cooling kWh	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	1.0000 (105)
Space cooling requirement	0.0000	0.0000	0.0000	0.0000	0.0000	63.9297	82.1968	68.9716	0.0000	0.0000	0.0000	0.0000 (107)
Energy for space heating												215.0980 (107)
Energy for space cooling												32.8069 (99)
Total												1.4938 (108)
Fabric Energy Efficiency (TFEE)												34.3008 (109)
												34.3 (109)

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Property Reference	OP-D320 S4HARR				Issued on Date	29/11/2024
Assessment Reference	S4HARR		Prop Type Ref	S4HARR		
Property	S4HARR					
SAP Rating	82 B	DER	3.55	TER	9.29	
Environmental	96 A	% DER < TER				61.79
CO ₂ Emissions (t/year)	0.47	DFEE	33.24	TFEE	34.30	
Compliance Check	See BREL	% DFEE < TFEE				3.09
% DPER < TPER	22.69	DPER	37.49	TPER	48.49	
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	48.5900 (1b)	x 2.3400 (2b)	= 113.7006 (1b) - (3b)
First floor	48.5900 (1c)	x 2.6300 (2c)	= 127.7917 (1c) - (3c)
Second floor	46.8100 (1d)	x 2.6100 (2d)	= 122.1741 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	143.9900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 363.6664 (5)

2. Ventilation rate

	m ³ per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
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)

	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	0.1897	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			2.1400	1.0000	2.1400		(26)
Windows (Uw = 1.30)			22.1600	1.2357	27.3840		(27)
Ground Floor			48.5900	0.1100	5.3449		(28a)
External Wall	156.6800	24.3000	132.3800	0.1700	22.5046		(29a)
Roof - ceiling	46.8100		46.8100	0.1100	5.1491		(30)
Bay Roof	1.7900		1.7900	0.1100	0.1969		(30)
Total net area of external elements Aum (A, m ²)			253.8700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	62.7195		(33)
Party Wall			75.6000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	

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E2 Other lintels (including other steel lintels)	14.4600	0.0500	0.7230
E3 Sill	15.1900	0.0500	0.7595
E4 Jamb	40.8000	0.0500	2.0400
E5 Ground floor (normal)	21.3800	0.1600	3.4208
E6 Intermediate floor within a dwelling	38.9700	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	9.9800	0.0600	0.5988
E12 Gable (insulation at ceiling level)	9.3800	0.0600	0.5628
E16 Corner (normal)	25.0800	0.0900	2.2572
E18 Party wall between dwellings	15.1500	0.0600	0.9090
P1 Party wall - Ground floor	9.9800	0.0800	0.7984
P2 Party wall - Intermediate floor within a dwelling	19.9600	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	9.9800	0.1200	1.1976
E24 Eaves (insulation at ceiling level - inverted)	1.7700	0.2400	0.4248
E14 Flat roof	3.7900	0.0800	0.3032
E17 Corner (inverted - internal area greater than external area)	9.9300	-0.0900	-0.8937
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			13.1014 (36)
Point Thermal bridges			0.0000
Total fabric heat loss	(33) + (36) + (36a) =		75.8209 (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	40.0421	39.5958	39.1495	36.9180	36.4718	34.2403	34.2403	33.7940	35.1329	36.4718	37.3643	38.2569 (38)
Average = Sum(39)m / 12 =	115.8630	115.4167	114.9704	112.7390	112.2927	110.0613	110.0613	109.6150	110.9538	112.2927	113.1853	114.0778 (39)
												112.6274
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8047	0.8016	0.7985	0.7830	0.7799	0.7644	0.7644	0.7613	0.7706	0.7799	0.7861	0.7923 (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												2.9243 (42)
Hot water usage for mixer showers												
	100.7204	99.2067	97.0011	92.7809	89.6666	86.1935	84.2194	86.4084	88.8079	92.5369	96.8477	100.3345 (42a)
Hot water usage for baths	33.2880	32.7936	32.0975	30.8138	29.8527	28.7869	28.2112	28.9025	29.6552	30.7956	32.1057	33.1755 (42b)
Hot water usage for other uses	46.9242	45.2179	43.5116	41.8052	40.0989	38.3926	38.3926	40.0989	41.8052	43.5116	45.2179	46.9242 (42c)
Average daily hot water use (litres/day)												166.3824 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	180.9326	177.2183	172.6101	165.4000	159.6181	153.3729	150.8231	155.4098	160.2683	166.8441	174.1713	180.4342 (44)
Energy conte	286.5530	252.3565	265.2953	226.4243	214.8767	188.5899	182.4075	192.4297	197.6269	226.4059	248.1389	282.5163 (45)
Energy content (annual)										Total = Sum(45)m =		2763.6210
Distribution loss (46)m = 0.15 x (45)m												
	42.9830	37.8535	39.7943	33.9636	32.2315	28.2885	27.3611	28.8645	29.6440	33.9609	37.2208	42.3774 (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												
	384.9346	341.2173	363.6769	321.6323	313.2583	253.2219	249.1939	259.2161	262.2589	324.7875	343.3469	380.8979 (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												
	384.9346	341.2173	363.6769	321.6323	313.2583	253.2219	249.1939	259.2161	262.2589	324.7875	343.3469	380.8979 (64)
12Total per year (kWh/year)												3797.6426 (64)
Electric shower(s)												3798 (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												
	139.1650	123.5476	132.0968	117.7565	115.3326	80.7157	79.2604	82.5928	83.7205	119.1660	124.9766	137.8228 (65)

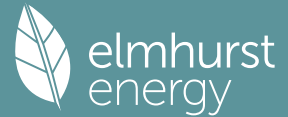
5. Internal gains (see Table 5 and 5a)

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	146.2163	146.2163	146.2163	146.2163	146.2163	146.2163	146.2163	146.2163	146.2163	146.2163	146.2163	146.2163 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	166.4800	184.3172	166.4800	172.0293	166.4800	172.0293	166.4800	166.4800	172.0293	166.4800	172.0293	166.4800 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	313.9047	317.1621	308.9537	291.4789	269.4202	248.6881	234.8378	231.5805	239.7889	257.2636	279.3223	300.0544 (68)
Pumps, fans	37.6216	37.6216	37.6216	37.6216	37.6216	37.6216	37.6216	37.6216	37.6216	37.6216	37.6216	37.6216 (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)	-116.9730	-116.9730	-116.9730	-116.9730	-116.9730	-116.9730	-116.9730	-116.9730	-116.9730	-116.9730	-116.9730	-116.9730 (71)
Total internal gains	187.0497	183.8505	177.5494	163.5507	155.0169	112.1052	106.5328	111.0118	116.2785	160.1694	173.5786	185.2456 (72)
	734.2993	752.1947	719.8480	693.9238	657.7820	599.6875	574.7155	575.9372	594.9616	650.7779	691.7952	718.6450 (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
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North	7.1500	10.6334	0.6300	0.7000	0.7700	23.2354 (74)
East	4.0300	19.6403	0.6300	0.7000	0.7700	24.1893 (76)
South	9.2300	46.7521	0.6300	0.7000	0.7700	131.8786 (78)
West	1.7500	19.6403	0.6300	0.7000	0.7700	10.5041 (80)

Solar gains	189.8074	328.2548	462.3459	595.1549	687.0649	691.1148	662.5534	592.5880	508.1102	366.3460	228.2435	161.8556 (83)
Total gains	924.1067	1080.4495	1182.1938	1289.0787	1344.8469	1290.8024	1237.2689	1168.5251	1103.0719	1017.1239	920.0387	880.5005 (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	34.5211	34.6546	34.7891	35.4777	35.6187	36.3409	36.3409	36.4888	36.0485	35.6187	35.3378	35.0613
alpha	3.3014	3.3103	3.3193	3.3652	3.3746	3.4227	3.4227	3.4326	3.4032	3.3746	3.3559	3.3374
util living area	0.9525	0.9230	0.8798	0.7922	0.6661	0.5122	0.3816	0.4175	0.6174	0.8215	0.9241	0.9582 (86)
Living	19.3032	19.6133	19.9889	20.4436	20.7587	20.9293	20.9803	20.9731	20.8622	20.4602	19.8281	19.2658
Non living	18.2403	18.6307	19.1000	19.6628	20.0308	20.2252	20.2717	20.2690	20.1562	19.6947	18.9146	18.2002
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.1320	19.6133	19.9889	20.4436	20.7587	20.9293	20.9803	20.9731	20.8622	20.4602	19.8281	19.5083 (87)
Th 2	20.2493	20.2520	20.2547	20.2681	20.2708	20.2843	20.2843	20.2870	20.2789	20.2708	20.2654	20.2600 (88)
util rest of house	0.9466	0.9139	0.8657	0.7687	0.6300	0.4629	0.3229	0.3573	0.5683	0.7960	0.9136	0.9530 (89)
MIT 2	19.4484	18.6307	19.1000	19.6628	20.0308	20.2252	20.2717	20.2690	20.1562	19.6947	18.9146	18.5714 (90)
Living area fraction									fLA = Living area / (4) =			0.1250 (91)
MIT	19.5338	18.7535	19.2111	19.7604	20.1218	20.3133	20.3602	20.3570	20.2445	19.7904	19.0288	18.6885 (92)
Temperature adjustment												0.0000
adjusted MIT	19.5338	18.7535	19.2111	19.7604	20.1218	20.3133	20.3602	20.3570	20.2445	19.7904	19.0288	18.6885 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9400	0.8913	0.8424	0.7507	0.6222	0.4649	0.3292	0.3633	0.5659	0.7770	0.8917	0.9389 (94)
Useful gains	868.6897	963.0540	995.8996	967.6871	836.8305	600.1076	407.3181	424.5499	624.2020	790.2860	820.3842	826.7015 (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	1765.0382	1598.9278	1461.3999	1224.3884	945.7066	628.8077	413.8577	433.7497	681.7511	1032.0178	1350.1609	1652.8210 (97)
Space heating kWh	666.8834	427.3072	346.3322	184.8250	81.0038	0.0000	0.0000	0.0000	0.0000	179.8485	381.4392	614.6329 (98a)
Space heating requirement - total per year (kWh/year)												2882.2720
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	666.8834	427.3072	346.3322	184.8250	81.0038	0.0000	0.0000	0.0000	0.0000	179.8485	381.4392	614.6329 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2882.2720
Space heating per m2										(98c) / (4) =		20.0172 (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 %)												248.9016 (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	666.8834	427.3072	346.3322	184.8250	81.0038	0.0000	0.0000	0.0000	0.0000	179.8485	381.4392	614.6329 (98)
Space heating efficiency (main heating system 1)	248.9016	248.9016	248.9016	248.9016	248.9016	0.0000	0.0000	0.0000	0.0000	248.9016	248.9016	248.9016 (210)
Space heating fuel (main heating system)	267.9305	171.6771	139.1442	74.2562	32.5445	0.0000	0.0000	0.0000	0.0000	72.2568	153.2490	246.9381 (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	384.9346	341.2173	363.6769	321.6323	313.2583	253.2219	249.1939	259.2161	262.2589	324.7875	343.3469	380.8979 (64)
Efficiency of water heater	269.4200	269.4200	269.4200	269.4200	269.4200	269.4200	269.4200	269.4200	269.4200	269.4200	269.4200	269.4200 (216)
Fuel for water heating, kWh/month	142.8753	126.6488	134.9851	119.3795	116.2714	93.9878	92.4927	96.2127	97.3420	120.5506	127.4393	141.3770 (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	55.9198	50.5082	55.9198	54.1160	55.9198	54.1160	55.9198	55.9198	54.1160	55.9198	54.1160	55.9198 (231)
Lighting	34.5913	27.7504	24.9862	18.3059	14.1400	11.5525	12.8990	16.7666	21.7782	28.5741	32.2744	35.5527 (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)

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Annual totals kWh/year	
Space heating fuel - main system 1	1157.9964 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	269.4200
Water heating fuel used	1409.5622 (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)	658.4107 (230a)
Total electricity for the above, kWh/year	658.4107 (231)
Electricity for lighting (calculated in Appendix L)	279.1713 (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	3505.1406 (238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1157.9964	0.1559	180.5630 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1409.5622	0.1415	199.5037 (264)
Space and water heating			380.0667 (265)
Pumps, fans and electric keep-hot	658.4107	0.1387	91.3297 (267)
Energy for lighting	279.1713	0.1443	40.2930 (268)
Total CO2, kg/year			511.6895 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.5500 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1157.9964	1.5772	1826.4149 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1409.5622	1.5234	2147.3161 (278)
Space and water heating			3973.7310 (279)
Pumps, fans and electric keep-hot	658.4107	1.5128	996.0438 (281)
Energy for lighting	279.1713	1.5338	428.2022 (282)
Total Primary energy kWh/year			5397.9770 (286)
Dwelling Primary energy Rate (DPER)			37.4900 (287)

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

1. Overall dwelling characteristics

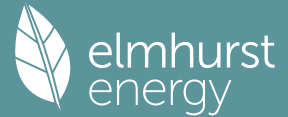
	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	48.5900 (1b)	x 2.3400 (2b)	= 113.7006 (1b) - (3b)
First floor	48.5900 (1c)	x 2.6300 (2c)	= 127.7917 (1c) - (3c)
Second floor	46.8100 (1d)	x 2.6100 (2d)	= 122.1741 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	143.9900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	363.6664 (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) = 0.1100 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3600 (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) = 0.3060 (21)

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

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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												
	0.3901	0.3825	0.3748	0.3366	0.3289	0.2907	0.2907	0.2830	0.3060	0.3289	0.3442	0.3595 (22b)
Effective ac	0.5761	0.5731	0.5703	0.5566	0.5541	0.5423	0.5423	0.5401	0.5468	0.5541	0.5593	0.5646 (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			2.1400	1.0000	2.1400		(26)
TER Opening Type (Uw = 1.20)			22.1600	1.1450	25.3740		(27)
Ground Floor			48.5900	0.1300	6.3167		(28a)
External Wall	156.6800	24.3000	132.3800	0.1800	23.8284		(29a)
Roof - ceiling	46.8100		46.8100	0.1100	5.1491		(30)
Bay Roof	1.7900		1.7900	0.1100	0.1969		(30)
Total net area of external elements Aum(A, m2)			253.8700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	63.0051		(33)
Party Wall			75.6000	0.0000	0.0000		(32)

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

List of Thermal Bridges 100.0000 (35)

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	14.4600	0.0500	0.7230
E3 Sill	15.1900	0.0500	0.7595
E4 Jamb	40.8000	0.0500	2.0400
E5 Ground floor (normal)	21.3800	0.1600	3.4208
E6 Intermediate floor within a dwelling	38.9700	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	9.9800	0.0600	0.5988
E12 Gable (insulation at ceiling level)	9.3800	0.0600	0.5628
E16 Corner (normal)	25.0800	0.0900	2.2572
E18 Party wall between dwellings	15.1500	0.0600	0.9090
P1 Party wall - Ground floor	9.9800	0.0800	0.7984
P2 Party wall - Intermediate floor within a dwelling	19.9600	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	9.9800	0.1200	1.1976
E24 Eaves (insulation at ceiling level - inverted)	1.7700	0.2400	0.4248
E14 Flat roof	3.7900	0.0800	0.3032
E17 Corner (inverted - internal area greater than external area)	9.9300	-0.0900	-0.8937

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

Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 76.1065 (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
	69.1383	68.7836	68.4360	66.8031	66.4977	65.0755	65.0755	64.8121	65.6233	66.4977	67.1157	67.7618 (38)
Heat transfer coeff	145.2448	144.8902	144.5425	142.9097	142.6042	141.1821	141.1821	140.9187	141.7298	142.6042	143.2222	143.8683 (39)
Average = Sum(39)m / 12 =												142.9082

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0087	1.0063	1.0038	0.9925	0.9904	0.9805	0.9805	0.9787	0.9843	0.9904	0.9947	0.9992 (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												2.9243 (42)
Hot water usage for mixer showers	73.2512	72.1503	70.5462	67.4770	65.2121	62.6862	61.2505	62.8424	64.5875	67.2996	70.4347	72.9705 (42a)
Hot water usage for baths	31.6236	31.1540	30.4926	29.2731	28.3600	27.3475	26.8006	27.4574	28.1725	29.2559	30.5004	31.5167 (42b)
Hot water usage for other uses	44.5780	42.9570	41.3360	39.7150	38.0939	36.4729	36.4729	38.0939	39.7150	41.3360	42.9570	44.5780 (42c)
Average daily hot water use (litres/day)												137.3807 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	149.4528	146.2613	142.3748	136.4652	131.6660	126.5066	124.5240	128.3938	132.4750	137.8914	143.8921	149.0652 (44)
Energy conte	236.6967	208.2742	218.8248	186.8140	177.2478	155.5547	150.6010	158.9783	163.3549	187.1174	205.0007	233.4001 (45)
Energy content (annual)										Total = Sum(45)m =		2281.8645
Distribution loss (46)m = 0.15 x (45)m	35.5045	31.2411	32.8237	28.0221	26.5872	23.3332	22.5902	23.8467	24.5032	28.0676	30.7501	35.0100 (46)

Water storage loss: 230.0000 (47)

Store volume 1.7973 (48)

a) If manufacturer declared loss factor is known (kWh/day): 0.5400 (49)

Temperature factor from Table 2b 0.9706 (55)

Enter (49) or (54) in (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 290.0463 256.4609 272.1744 238.4426 230.5974 207.1833 203.9506 212.3279 214.9835 240.4670 256.6294 286.7498 (62)

WWHRS -33.4874 -29.6165 -31.0127 -25.6797 -23.9326 -20.4793 -19.1961 -20.4131 -21.1887 -24.9791 -28.2983 -32.8672 (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 256.5590 226.8444 241.1617 212.7629 206.6648 186.7040 184.7546 191.9148 193.7949 215.4879 228.3311 253.8825 (64)

12Total per year (kWh/year) Total per year (kWh/year) = Sum(64)m = 2598.8626 (64)

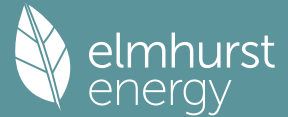
Electric shower(s) 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (64a)

Total Energy used by instantaneous electric shower (s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month 121.3814 107.8006 115.4389 103.4186 101.6146 93.0249 92.7545 95.5400 95.6184 104.8962 109.4657 120.2852 (65)

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

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Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	146.2163	146.2163	146.2163	146.2163	146.2163	146.2163	146.2163	146.2163	146.2163	146.2163	146.2163	146.2163	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	166.4800	184.3172	166.4800	172.0293	166.4800	172.0293	166.4800	166.4800	172.0293	166.4800	172.0293	166.4800	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	313.9047	317.1621	308.9537	291.4789	269.4202	248.6881	234.8378	231.5805	239.7889	257.2636	279.3223	300.0544	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6216	37.6216	37.6216	37.6216	37.6216	37.6216	37.6216	37.6216	37.6216	37.6216	37.6216	37.6216	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-116.9730	-116.9730	-116.9730	-116.9730	-116.9730	-116.9730	-116.9730	-116.9730	-116.9730	-116.9730	-116.9730	-116.9730	(71)
Water heating gains (Table 5)	163.1470	160.4175	155.1599	143.6369	136.5788	129.2012	124.6701	128.4140	132.8034	140.9895	152.0356	161.6737	(72)
Total internal gains	713.3966	731.7616	700.4584	677.0101	642.3438	616.7835	592.8528	593.3393	611.4865	634.5980	673.2522	698.0730	(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				7.1500	10.6334	0.6300	0.7000		0.7700		23.2354 (74)	
East				4.0300	19.6403	0.6300	0.7000		0.7700		24.1893 (76)	
South				9.2300	46.7521	0.6300	0.7000		0.7700		131.8786 (78)	
West				1.7500	19.6403	0.6300	0.7000		0.7700		10.5041 (80)	
Solar gains	189.8074	328.2548	462.3459	595.1549	687.0649	691.1148	662.5534	592.5880	508.1102	366.3460	228.2435	161.8556 (83)
Total gains	903.2040	1060.0164	1162.8043	1272.1649	1329.4087	1307.8984	1255.4062	1185.9273	1119.5967	1000.9440	901.4958	859.9286 (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	27.5378	27.6052	27.6716	27.9878	28.0477	28.3302	28.3302	28.3832	28.2207	28.0477	27.9267	27.8013	
alpha	2.8359	2.8403	2.8448	2.8659	2.8698	2.8887	2.8887	2.8922	2.8814	2.8698	2.8618	2.8534	
util living area	0.9610	0.9390	0.9070	0.8421	0.7407	0.5946	0.4598	0.4989	0.6903	0.8654	0.9405	0.9656	(86)
MIT	18.6805	19.0067	19.4468	20.0145	20.4880	20.8107	20.9338	20.9148	20.6918	20.0753	19.2893	18.6290	(87)
Th 2	20.0761	20.0781	20.0801	20.0896	20.0914	20.0996	20.1011	20.1011	20.0964	20.0914	20.0878	20.0840	(88)
util rest of house	0.9555	0.9306	0.8939	0.8192	0.7014	0.5321	0.3770	0.4159	0.6333	0.8410	0.9309	0.9607	(89)
MIT 2	17.3467	17.7588	18.3124	19.0189	19.5832	19.9441	20.0594	20.0464	19.8249	19.1069	18.1270	17.2863	(90)
Living area fraction									fLA = Living area / (4) =			0.1250	(91)
MIT	17.5135	17.9148	18.4543	19.1434	19.6963	20.0524	20.1687	20.1550	19.9332	19.2280	18.2723	17.4542	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.5135	17.9148	18.4543	19.1434	19.6963	20.0524	20.1687	20.1550	19.9332	19.2280	18.2723	17.4542	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9339	0.9042	0.8644	0.7909	0.6823	0.5286	0.3836	0.4212	0.6219	0.8125	0.9051	0.9407	(94)
Ext temp.	843.4874	958.5187	1005.1796	1006.1016	907.0802	691.2934	481.6186	499.4683	696.2664	813.2759	815.9725	808.8944	(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	1919.1880	1885.7167	1727.8977	1463.8804	1140.3017	769.7824	503.8412	529.1488	826.7454	1230.3846	1600.1219	1906.8561	(97)
Space heating requirement - total per year (kWh/year)	800.3212	623.0771	537.7022	329.6007	173.5168	0.0000	0.0000	0.0000	0.0000	310.3289	564.5876	816.8835	(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)	800.3212	623.0771	537.7022	329.6007	173.5168	0.0000	0.0000	0.0000	0.0000	310.3289	564.5876	816.8835	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4156.0180	(99)
Space heating per m2										(98c) / (4) =		28.8632	(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)	800.3212	623.0771	537.7022	329.6007	173.5168	0.0000	0.0000	0.0000	0.0000	310.3289	564.5876	816.8835	(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)	867.0869	675.0564	582.5593	357.0972	187.9922	0.0000	0.0000	0.0000	0.0000	336.2177	611.6875	885.0309	(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 requirement	256.5590	226.8444	241.1617	212.7629	206.6648	186.7040	184.7546	191.9148	193.7949	215.4879	228.3311	253.8825	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.4336	86.2051	85.8037	85.0377	83.6704	79.8000	79.8000	79.8000	79.8000	84.8770	86.0068	86.4872	(217)

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Fuel for water heating, kWh/month	296.8277	263.1450	281.0623	250.1984	246.9988	233.9650	231.5220	240.4948	242.8507	253.8825	265.4804	293.5491	(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	34.5913	27.7504	24.9862	18.3059	14.1400	11.5525	12.8990	16.7666	21.7782	28.5741	32.2744	35.5527	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-46.7378	-66.5571	-96.5900	-109.6237	-118.9903	-111.2475	-109.7883	-103.2254	-91.8315	-76.4911	-51.5866	-40.3230	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-24.4075	-51.5674	-102.9396	-155.2904	-206.0449	-207.3733	-205.0209	-173.3382	-126.6575	-74.0736	-32.6858	-19.2911	(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												4502.7281	(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												3099.9767	(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)												279.1713	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2401.6825	(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												5566.1936	(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	4502.7281	0.2100	945.5729	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3099.9767	0.2100	650.9951	(264)
Space and water heating			1596.5680	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	279.1713	0.1443	40.2930	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1022.9922	0.1344	-137.4945	
PV Unit electricity exported	-1378.6903	0.1258	-173.3780	
Total			-310.8725	(269)
Total CO2, kg/year			1337.9178	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.2900	(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	4502.7281	1.1300	5088.0828	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3099.9767	1.1300	3502.9737	(278)
Space and water heating			8591.0564	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	279.1713	1.5338	428.2022	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1022.9922	1.4967	-1531.1383	
PV Unit electricity exported	-1378.6903	0.4616	-636.4061	
Total			-2167.5444	(283)
Total Primary energy kWh/year			6981.8150	(286)
Target Primary Energy Rate (TPER)			48.4900	(287)