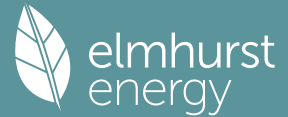


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Property Reference	OP-D320 S3OSPR				Issued on Date	29/11/2024	
Assessment Reference	S3OSPR		Prop Type Ref	S3OSPR			
Property	S3OSPR						
SAP Rating	80 C	DER	4.14	TER	10.64		
Environmental	96 A	% DER < TER				61.09	
CO ₂ Emissions (t/year)	0.46	DFEE	39.16	TFEE	40.22		
Compliance Check	See BREL	% DFEE < TFEE				2.66	
% DPER < TPER	21.65	DPER	43.55	TPER	55.58		
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	52.5800 (1b)	x 2.6000 (2b)	= 136.7080 (1b) - (3b)
First floor	70.0000 (1c)	x 2.3200 (2c)	= 162.4000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	122.5800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 299.1080 (5)

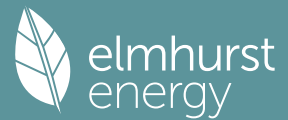
2. Ventilation rate

	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)											
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1897	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)			20.7900	1.2357	25.6911		(27)
Ground Floor			52.5800	0.1100	5.7838		(28a)
Exposed Floor			19.2400	0.1400	2.6936		(28b)
External Wall	154.7700	22.9300	131.8400	0.1700	22.4128		(29a)
Roof - ceiling	70.0000		70.0000	0.1100	7.7000		(30)
Bay Roof	1.8300		1.8300	0.1100	0.2013		(30)
Total net area of external elements Aum (A, m ²)			298.4200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	66.6226		(33)
Party Wall			13.2500	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)	12.8500	0.0500	0.6425
E3 Sill	13.9100	0.0500	0.6955
E4 Jamb	31.5000	0.0500	1.5750
E5 Ground floor (normal)	31.8000	0.1600	5.0880
E6 Intermediate floor within a dwelling	24.5300	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	21.2100	0.0600	1.2726
E12 Gable (insulation at ceiling level)	10.0600	0.0600	0.6036
E16 Corner (normal)	24.3000	0.0900	2.1870
E18 Party wall between dwellings	4.6400	0.0600	0.2784
P4 Party wall - Roof (insulation at ceiling level)	5.7100	0.1200	0.6852
E24 Eaves (insulation at ceiling level - inverted)	2.3400	0.2400	0.5616
E14 Flat roof	3.9000	0.0800	0.3120
E17 Corner (inverted - internal area greater than external area)	9.2600	-0.0900	-0.8334
E20 Exposed floor (normal)	6.7400	0.3200	2.1568
E21 Exposed floor (inverted)	5.7100	0.3200	1.8272
P7 Party Wall - Exposed floor (normal)	5.7100	0.1600	0.9136
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			17.9656 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	84.5882 (37)

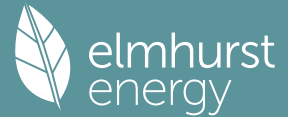
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	32.9338	32.5667	32.1996	30.3643	29.9973	28.1620	28.1620	27.7949	28.8961	29.9973	30.7314	31.4655 (38)
Average = Sum(39)m / 12 =	117.5219	117.1549	116.7878	114.9525	114.5854	112.7501	112.7501	112.3831	113.4842	114.5854	115.3195	116.0537 (39)
												114.8607
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9587	0.9557	0.9527	0.9378	0.9348	0.9198	0.9198	0.9168	0.9258	0.9348	0.9408	0.9468 (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												2.8728 (42)
Hot water usage for mixer showers												
Hot water usage for baths	99.5314	98.0357	95.8560	91.6857	88.6081	85.1760	83.2252	85.3884	87.7596	91.4446	95.7045	99.1501 (42a)
Hot water usage for other uses	32.8966	32.4080	31.7201	30.4515	29.5016	28.4484	27.8795	28.5627	29.3065	30.4335	31.7282	32.7854 (42b)
Average daily hot water use (litres/day)	46.3683	44.6822	42.9961	41.3099	39.6238	37.9377	37.9377	39.6238	41.3099	42.9961	44.6822	46.3683 (42c)
												164.4180 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	178.7963	175.1259	170.5721	163.4472	157.7336	151.5621	149.0424	153.5748	158.3760	164.8742	172.1149	178.3038 (44)
Energy content (annual)	283.1697	249.3769	262.1630	223.7510	212.3397	186.3633	180.2539	190.1577	195.2935	223.7327	245.2092	279.1806 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		2730.9913
Water storage loss:	42.4755	37.4065	39.3245	33.5627	31.8510	27.9545	27.0381	28.5237	29.2940	33.5599	36.7814	41.8771 (46)
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												
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 (56)
Primary 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 (57)
Combi 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)
Total heat required for water heating calculated for each month	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)
WWHRS	381.5513	338.2377	360.5446	318.9590	310.7213	250.9953	247.0403	256.9441	259.9255	322.1143	340.4172	377.5622 (62)
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 (63a)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
12Total per year (kWh/year)	381.5513	338.2377	360.5446	318.9590	310.7213	250.9953	247.0403	256.9441	259.9255	322.1143	340.4172	377.5622 (64)
Electric shower(s)												3765.0129 (64)
												3765 (64)
Heat gains from water heating, kWh/month	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)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	138.0400	122.5569	131.0553	116.8676	114.4890	79.9754	78.5443	81.8374	82.9447	118.2772	124.0024	136.7136 (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	143.6378	143.6378	143.6378	143.6378	143.6378	143.6378	143.6378	143.6378	143.6378	143.6378	143.6378	143.6378 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	150.1611	166.2497	150.1611	155.1664	150.1611	155.1664	150.1611	150.1611	155.1664	150.1611	155.1664	150.1611 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	288.5350	291.5291	283.9840	267.9216	247.6457	228.5892	215.8582	212.8641	220.4091	236.4716	256.7475	275.8040 (68)
Pumps, fans	37.3638	37.3638	37.3638	37.3638	37.3638	37.3638	37.3638	37.3638	37.3638	37.3638	37.3638	37.3638 (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)	-114.9102	-114.9102	-114.9102	-114.9102	-114.9102	-114.9102	-114.9102	-114.9102	-114.9102	-114.9102	-114.9102	-114.9102 (71)
Total internal gains	185.5376	182.3763	176.1496	162.3161	153.8831	111.0770	105.5703	109.9965	115.2009	158.9747	172.2256	183.7549 (72)
	690.3250	706.2464	676.3860	651.4955	617.7812	560.9239	537.6810	539.1130	556.8678	611.6987	650.2309	675.8113 (73)

6. Solar gains												
[Jan]	Area	Solar flux	g	FF	Access	Gains						
	m2	Table 6a	Specific data	Specific data	factor	W						
		W/m2	or Table 6b	or Table 6c	Table 6d							

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North	7.8500	10.6334	0.6300	0.7000	0.7700	25.5102 (74)
East	2.5300	19.6403	0.6300	0.7000	0.7700	15.1859 (76)
South	8.6100	46.7521	0.6300	0.7000	0.7700	123.0200 (78)
West	1.8000	19.6403	0.6300	0.7000	0.7700	10.8042 (80)

Solar gains	174.5202	301.0684	423.2134	545.2402	631.1672	635.9770	609.2208	543.4325	465.0763	335.6701	209.6973	148.9401 (83)
Total gains	864.8452	1007.3148	1099.5994	1196.7357	1248.9484	1196.9009	1146.9018	1082.5455	1021.9441	947.3688	859.9282	824.7514 (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	28.9733	29.0641	29.1554	29.6209	29.7158	30.1995	30.1995	30.2982	30.0042	29.7158	29.5267	29.3399
alpha	2.9316	2.9376	2.9437	2.9747	2.9811	3.0133	3.0133	3.0199	3.0003	2.9811	2.9684	2.9560
util living area	0.9473	0.9194	0.8797	0.8016	0.6867	0.5429	0.4122	0.4493	0.6433	0.8272	0.9203	0.9531 (86)
Living	18.9629	19.2875	19.7035	20.2250	20.6260	20.8702	20.9578	20.9447	20.7734	20.2666	19.5444	18.9175
Non living	17.7271	18.1352	18.6550	19.2999	19.7706	20.0447	20.1250	20.1177	19.9475	19.3642	18.4718	17.6763
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	19.9579	19.2875	19.7035	20.2250	20.6260	20.8702	20.9578	20.9447	20.7734	20.2666	19.5444	19.2088 (87)
Th 2	20.1179	20.1204	20.1229	20.1355	20.1380	20.1507	20.1507	20.1532	20.1456	20.1380	20.1330	20.1279 (88)
util rest of house	0.9403	0.9091	0.8643	0.7762	0.6466	0.4847	0.3394	0.3755	0.5876	0.7995	0.9085	0.9468 (89)
MIT 2	19.1648	18.1352	18.6550	19.2999	19.7706	20.0447	20.1250	20.1177	19.9475	19.3642	18.4718	18.1181 (90)
Living area fraction									fLA = Living area / (4) =			0.1615 (91)
MIT	19.2929	18.3213	18.8244	19.4493	19.9088	20.1780	20.2595	20.2513	20.0809	19.5100	18.6451	18.2943 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2929	18.3213	18.8244	19.4493	19.9088	20.1780	20.2595	20.2513	20.0809	19.5100	18.6451	18.2943 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9327	0.8825	0.8367	0.7533	0.6351	0.4867	0.3490	0.3844	0.5830	0.7761	0.8825	0.9298 (94)
Useful gains	806.6266	888.9597	919.9897	901.5474	793.2011	582.4806	400.2701	416.0984	595.8339	735.2426	758.9134	766.8752 (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	1761.9915	1572.3759	1439.3357	1212.6714	940.6042	628.9216	412.6082	432.8208	678.7368	1020.9560	1331.3739	1635.6951 (97)
Space heating kWh	710.7915	459.2557	386.3934	224.0093	109.6679	0.0000	0.0000	0.0000	0.0000	212.5707	412.1715	646.4020 (98a)
Space heating requirement - total per year (kWh/year)												3161.2620
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	710.7915	459.2557	386.3934	224.0093	109.6679	0.0000	0.0000	0.0000	0.0000	212.5707	412.1715	646.4020 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3161.2620
Space heating per m2										(98c) / (4) =		25.7894 (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 %)												248.5771 (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	710.7915	459.2557	386.3934	224.0093	109.6679	0.0000	0.0000	0.0000	0.0000	212.5707	412.1715	646.4020 (98)
Space heating efficiency (main heating system 1)	248.5771	248.5771	248.5771	248.5771	248.5771	0.0000	0.0000	0.0000	0.0000	248.5771	248.5771	248.5771 (210)
Space heating fuel (main heating system)	285.9441	184.7538	155.4421	90.1166	44.1183	0.0000	0.0000	0.0000	0.0000	85.5150	165.8124	260.0409 (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	381.5513	338.2377	360.5446	318.9590	310.7213	250.9953	247.0403	256.9441	259.9255	322.1143	340.4172	377.5622 (64)
Efficiency of water heater (217)m	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	141.6195	125.5429	133.8225	118.3873	115.3297	93.1614	91.6934	95.3694	96.4759	119.5584	126.3519	140.1389 (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	45.9929	41.5420	45.9929	44.5092	45.9929	44.5092	45.9929	45.9929	44.5092	45.9929	44.5092	45.9929 (231)
Lighting	31.2005	25.0302	22.5369	16.5115	12.7540	10.4201	11.6346	15.1231	19.6434	25.7732	29.1108	32.0677 (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)												

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(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												1271.7432	(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												1397.4512	(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)												541.5291	(230a)
Total electricity for the above, kWh/year												541.5291	(231)
Electricity for lighting (calculated in Appendix L)												251.8059	(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												3462.5293	(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	1271.7432	0.1555	197.7168	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1397.4512	0.1415	197.7891	(264)
Space and water heating			395.5059	(265)
Pumps, fans and electric keep-hot	541.5291	0.1387	75.1168	(267)
Energy for lighting	251.8059	0.1443	36.3434	(268)
Total CO2, kg/year			506.9660	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.1400	(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	1271.7432	1.5755	2003.6666	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1397.4512	1.5234	2128.8645	(278)
Space and water heating			4132.5311	(279)
Pumps, fans and electric keep-hot	541.5291	1.5128	819.2251	(281)
Energy for lighting	251.8059	1.5338	386.2283	(282)
Total Primary energy kWh/year			5337.9846	(286)
Dwelling Primary energy Rate (DPER)			43.5500	(287)

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

1. Overall dwelling characteristics

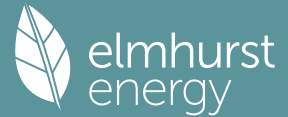
	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	52.5800 (1b)	x 2.6000 (2b)	= 136.7080	(1b) - (3b)
First floor	70.0000 (1c)	x 2.3200 (2c)	= 162.4000	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	122.5800			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 299.1080	(5)

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) =	0.1337	(8)
Pressure test	Yes		
Pressure Test Method	Blower Door		
Measured/design AP50	5.0000		(17)
Infiltration rate	0.3837		(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) =	0.3262	(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												
Effective ac	0.4159	0.4077	0.3996	0.3588	0.3506	0.3099	0.3099	0.3017	0.3262	0.3506	0.3669	0.3833 (22b)
	0.5865	0.5831	0.5798	0.5644	0.5615	0.5480	0.5480	0.5455	0.5532	0.5615	0.5673	0.5734 (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)			20.7900	1.1450	23.8053		(27)
Ground Floor			52.5800	0.1300	6.8354		(28a)
Exposed Floor			19.2400	0.1300	2.5012		(28b)
External Wall	154.7700	22.9300	131.8400	0.1800	23.7312		(29a)
Roof - ceiling	70.0000		70.0000	0.1100	7.7000		(30)
Bay Roof	1.8300		1.8300	0.1100	0.2013		(30)
Total net area of external elements Aum(A, m2)			298.4200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		66.9144		(33)
Party Wall			13.2500	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)	12.8500	0.0500	0.6425
E3 Sill	13.9100	0.0500	0.6955
E4 Jamb	31.5000	0.0500	1.5750
E5 Ground floor (normal)	31.8000	0.1600	5.0880
E6 Intermediate floor within a dwelling	24.5300	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	21.2100	0.0600	1.2726
E12 Gable (insulation at ceiling level)	10.0600	0.0600	0.6036
E16 Corner (normal)	24.3000	0.0900	2.1870
E18 Party wall between dwellings	4.6400	0.0600	0.2784
P4 Party wall - Roof (insulation at ceiling level)	5.7100	0.1200	0.6852
E24 Eaves (insulation at ceiling level - inverted)	2.3400	0.2400	0.5616
E14 Flat roof	3.9000	0.0800	0.3120
E17 Corner (inverted - internal area greater than external area)	9.2600	-0.0900	-0.8334
E20 Exposed floor (normal)	6.7400	0.3200	2.1568
E21 Exposed floor (inverted)	5.7100	0.3200	1.8272
P7 Party Wall - Exposed floor (normal)	5.7100	0.1600	0.9136

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

17.9656 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 84.8800 (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	57.8882	57.5568	57.2319	55.7060	55.4205	54.0914	54.0914	53.8453	54.6034	55.4205	55.9980	56.6018 (38)
Average = Sum(39)m / 12 =	142.7683	142.4368	142.1119	140.5860	140.3005	138.9715	138.9715	138.7254	139.4834	140.3005	140.8781	141.4819 (39)
												140.5846

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1647	1.1620	1.1593	1.1469	1.1446	1.1337	1.1337	1.1317	1.1379	1.1446	1.1493	1.1542 (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												2.8728 (42)
Hot water usage for mixer showers												
	72.3865	71.2987	69.7135	66.6805	64.4423	61.9462	60.5274	62.1006	63.8251	66.5051	69.6032	72.1091 (42a)
Hot water usage for baths												
	31.2518	30.7876	30.1341	28.9289	28.0266	27.0260	26.4855	27.1345	27.8412	28.9119	30.1418	31.1461 (42b)
Hot water usage for other uses												
	44.0499	42.4481	40.8463	39.2444	37.6426	36.0408	36.0408	37.6426	39.2444	40.8463	42.4481	44.0499 (42c)
Average daily hot water use (litres/day)												135.7586 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	147.6882	144.5344	140.6938	134.8539	130.1115	125.0130	123.0538	126.8778	130.9108	136.2633	142.1931	147.3052 (44)
Energy content	233.9019	205.8150	216.2411	184.6083	175.1551	153.7181	148.8229	157.1012	161.4261	184.9080	202.5802	230.6443 (45)
Energy content (annual)										Total = Sum(45)m =		2254.9220

Water storage loss:

Store volume

230.0000 (47)

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

Temperature factor from Table 2b

1.7973 (48)

Enter (49) or (54) in (55)

0.5400 (49)

Total storage loss

0.9706 (55)

30.0872 27.1756 30.0872 29.1167 30.0872 29.1167 30.0872 30.0872 29.1167 30.0872 29.1167 30.0872 (56)

If cylinder contains dedicated solar storage

30.0872 27.1756 30.0872 29.1167 30.0872 29.1167 30.0872 30.0872 29.1167 30.0872 29.1167 30.0872 (57)

Primary loss 23.2624 21.0112 23.2624 22.5120 23.2624 22.5120 23.2624 23.2624 22.5120 23.2624 22.5120 23.2624 (59)

Combi loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (61)

Total heat required for water heating calculated for each month

287.2516 254.0018 269.5907 236.2369 228.5047 205.3467 202.1725 210.4508 213.0547 238.2576 254.2088 283.9939 (62)

WWHRS -33.0921 -29.2669 -30.6466 -25.3766 -23.6501 -20.2375 -18.9695 -20.1721 -20.9385 -24.6842 -27.9642 -32.4793 (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

254.1595 224.7349 238.9441 210.8603 204.8546 185.1092 183.2030 190.2787 192.1162 213.5734 226.2446 251.5146 (64)

12Total per year (kWh/year)

Electric shower(s)

2575.5930 (64)

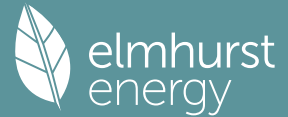
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (64a)

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

Heat gains from water heating, kWh/month

120.4521 106.9829 114.5799 102.6852 100.9188 92.4142 92.1633 94.9158 94.9771 104.1616 108.6608 119.3689 (65)

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	143.6378	143.6378	143.6378	143.6378	143.6378	143.6378	143.6378	143.6378	143.6378	143.6378	143.6378	143.6378 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	150.1611	166.2497	150.1611	155.1664	150.1611	155.1664	150.1611	150.1611	155.1664	150.1611	155.1664	150.1611 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	288.5350	291.5291	283.9840	267.9216	247.6457	228.5892	215.8582	212.8641	220.4091	236.4716	256.7475	275.8040 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3638	37.3638	37.3638	37.3638	37.3638	37.3638	37.3638	37.3638	37.3638	37.3638	37.3638	37.3638 (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)	-114.9102	-114.9102	-114.9102	-114.9102	-114.9102	-114.9102	-114.9102	-114.9102	-114.9102	-114.9102	-114.9102	-114.9102 (71)
Water heating gains (Table 5)	161.8980	159.2007	154.0052	142.6183	135.6435	128.3530	123.8754	127.5751	131.9126	140.0021	150.9178	160.4421 (72)
Total internal gains	669.6853	686.0709	657.2416	634.7977	602.5416	578.2000	555.9860	556.6916	573.5795	595.7261	631.9231	655.4985 (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				7.8500	10.6334	0.6300	0.7000			0.7700		25.5102 (74)
East				2.5300	19.6403	0.6300	0.7000			0.7700		15.1859 (76)
South				8.6100	46.7521	0.6300	0.7000			0.7700		123.0200 (78)
West				1.8000	19.6403	0.6300	0.7000			0.7700		10.8042 (80)
Solar gains	174.5202	301.0684	423.2134	545.2402	631.1672	635.9770	609.2208	543.4325	465.0763	335.6701	209.6973	148.9401 (83)
Total gains	844.2056	987.1392	1080.4550	1180.0379	1233.7087	1214.1770	1165.2068	1100.1241	1038.6558	931.3962	841.6204	804.4386 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	23.8498	23.9053	23.9600	24.2200	24.2693	24.5014	24.5014	24.5449	24.4115	24.2693	24.1698	24.0667
alpha	2.5900	2.5937	2.5973	2.6147	2.6180	2.6334	2.6334	2.6363	2.6274	2.6180	2.6113	2.6044
util living area	0.9550	0.9328	0.9014	0.8395	0.7435	0.6051	0.4743	0.5128	0.6962	0.8609	0.9340	0.9598 (86)
MIT	18.3882	18.7262	19.1980	19.8168	20.3542	20.7411	20.9016	20.8762	20.6002	19.9045	19.0496	18.3342 (87)
Th 2	19.9483	19.9505	19.9527	19.9627	19.9646	19.9734	19.9734	19.9750	19.9700	19.9646	19.9608	19.9568 (88)
util rest of house	0.9484	0.9231	0.8867	0.8144	0.7008	0.5356	0.3796	0.4187	0.6338	0.8339	0.9229	0.9539 (89)
MIT 2	16.9039	17.3303	17.9232	18.6927	19.3338	19.7664	19.9166	19.8992	19.6259	18.8157	17.7506	16.8405 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	17.1437	17.5558	18.1292	18.8743	19.4986	19.9239	20.0757	20.0570	19.7833	18.9916	17.9604	17.0818 (92)
Temperature adjustment	0.0000											
adjusted MIT	17.1437	17.5558	18.1292	18.8743	19.4986	19.9239	20.0757	20.0570	19.7833	18.9916	17.9604	17.0818 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9229	0.8928	0.8534	0.7825	0.6789	0.5320	0.3896	0.4268	0.6210	0.8021	0.8932	0.9299 (94)
Useful gains	779.0859	881.3249	922.0785	923.3568	837.5722	645.9162	454.0220	469.5318	645.0085	747.0980	751.7278	748.0817 (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	1833.6665	1802.6504	1652.6422	1402.2470	1094.1536	739.8645	483.0246	507.3207	792.7272	1177.3449	1529.9954	1822.5399 (97)
Space heating kWh	784.6080	619.1307	543.5394	344.8010	190.8965	0.0000	0.0000	0.0000	0.0000	320.1037	560.3527	799.3969 (98a)
Space heating requirement - total per year (kWh/year)	4162.8288											
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	784.6080	619.1307	543.5394	344.8010	190.8965	0.0000	0.0000	0.0000	0.0000	320.1037	560.3527	799.3969 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	4162.8288											
Space heating per m ²	(98c) / (4) = 33.9601 (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	784.6080	619.1307	543.5394	344.8010	190.8965	0.0000	0.0000	0.0000	0.0000	320.1037	560.3527	799.3969 (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)	850.0628	670.7808	588.8834	373.5655	206.8218	0.0000	0.0000	0.0000	0.0000	346.8079	607.0993	866.0855 (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	254.1595	224.7349	238.9441	210.8603	204.8546	185.1092	183.2030	190.2787	192.1162	213.5734	226.2446	251.5146 (64)

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Efficiency of water heater (217)m	86.4154	86.2106	85.8436	85.1555	83.9018	79.8000	79.8000	79.8000	79.8000	84.9651	86.0099	79.8000 (216)
Fuel for water heating, kWh/month	294.1137	260.6812	278.3483	247.6179	244.1599	231.9664	229.5777	238.4445	240.7471	251.3658	263.0447	86.4661 (217)
Space cooling fuel requirement												290.8824 (219)
(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	31.2005	25.0302	22.5369	16.5115	12.7540	10.4201	11.6346	15.1231	19.6434	25.7732	29.1108	32.0677 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-48.8027	-68.6013	-98.2992	-110.1251	-118.3514	-110.2483	-108.8065	-102.8697	-92.4000	-78.1772	-53.5502	-42.2098 (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	-28.1847	-59.2230	-117.6149	-176.5426	-233.3743	-234.5362	-231.8534	-196.4042	-144.0304	-84.7512	-37.6423	-22.2995 (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												4510.1071 (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												3070.9497 (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)												251.8059 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-2598.8982 (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												5319.9644 (238)

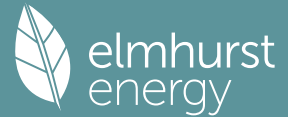
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	4510.1071	0.2100	947.1225 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3070.9497	0.2100	644.8994 (264)
Space and water heating			1592.0219 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	251.8059	0.1443	36.3434 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1032.4414	0.1347	-139.0410
PV Unit electricity exported	-1566.4568	0.1259	-197.2260
Total			-336.2670 (269)
Total CO2, kg/year			1304.0276 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.6400 (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	4510.1071	1.1300	5096.4210 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3070.9497	1.1300	3470.1731 (278)
Space and water heating			8566.5941 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	251.8059	1.5338	386.2283 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1032.4414	1.4977	-1546.3186
PV Unit electricity exported	-1566.4568	0.4622	-723.9546
Total			-2270.2732 (283)
Total Primary energy kWh/year			6812.6501 (286)
Target Primary Energy Rate (TPER)			55.5800 (287)

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Property Reference	OP-D320 S3OSPR				Issued on Date	29/11/2024	
Assessment Reference	S3OSPR		Prop Type Ref	S3OSPR			
Property	S3OSPR						
SAP Rating	80 C	DER	4.14	TER	10.64		
Environmental	96 A	% DER < TER				61.09	
CO ₂ Emissions (t/year)	0.46	DFEE	39.16	TFEE	40.22		
Compliance Check	See BREL	% DFEE < TFEE				2.66	
% DPER < TPER	21.65	DPER	43.55	TPER	55.58		
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	52.5800 (1b)	x 2.6000 (2b)	= 136.7080 (1b) - (3b)
First floor	70.0000 (1c)	x 2.3200 (2c)	= 162.4000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	122.5800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 299.1080 (5)

2. Ventilation rate

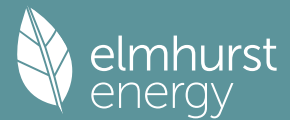
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) = 0.1337 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.5000 (17)
Infiltration rate	0.3087 (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) = 0.2624 (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	0.3346	0.3280	0.3215	0.2887	0.2821	0.2493	0.2493	0.2427	0.2624	0.2821	0.2952	0.3083 (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	0.5560	0.5538	0.5517	0.5417	0.5398	0.5311	0.5311	0.5295	0.5344	0.5398	0.5436	0.5475 (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)			20.7900	1.2357	25.6911		(27)
Ground Floor			52.5800	0.1100	5.7838		(28a)
Exposed Floor			19.2400	0.1400	2.6936		(28b)
External Wall	154.7700	22.9300	131.8400	0.1700	22.4128		(29a)
Roof - ceiling	70.0000		70.0000	0.1100	7.7000		(30)
Bay Roof	1.8300		1.8300	0.1100	0.2013		(30)
Total net area of external elements Aum(A, m ²)			298.4200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	66.6226		(33)
Party Wall			13.2500	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)				12.8500	0.0500	0.6425	
E3 Sill				13.9100	0.0500	0.6955	
E4 Jamb				31.5000	0.0500	1.5750	

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E5 Ground floor (normal)	31.8000	0.1600	5.0880
E6 Intermediate floor within a dwelling	24.5300	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	21.2100	0.0600	1.2726
E12 Gable (insulation at ceiling level)	10.0600	0.0600	0.6036
E16 Corner (normal)	24.3000	0.0900	2.1870
E18 Party wall between dwellings	4.6400	0.0600	0.2784
P4 Party wall - Roof (insulation at ceiling level)	5.7100	0.1200	0.6852
E24 Eaves (insulation at ceiling level - inverted)	2.3400	0.2400	0.5616
E14 Flat roof	3.9000	0.0800	0.3120
E17 Corner (inverted - internal area greater than external area)	9.2600	-0.0900	-0.8334
E20 Exposed floor (normal)	6.7400	0.3200	2.1568
E21 Exposed floor (inverted)	5.7100	0.3200	1.8272
P7 Party Wall - Exposed floor (normal)	5.7100	0.1600	0.9136
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			17.9656 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	84.5882 (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	54.8778	54.6633	54.4530	53.4652	53.2804	52.4201	52.4201	52.2608	52.7515	53.2804	53.6543	54.0451 (38)
Average = Sum(39)m / 12 =	139.4660	139.2514	139.0411	138.0534	137.8686	137.0083	137.0083	136.8490	137.3397	137.8686	138.2424	138.6333 (39)
												138.0525
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1378	1.1360	1.1343	1.1262	1.1247	1.1177	1.1177	1.1164	1.1204	1.1247	1.1278	1.1310 (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	2.8728 (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	31.2518	30.7876	30.1341	28.9289	28.0266	27.0260	26.4855	27.1345	27.8412	28.9119	30.1418	31.1461 (42b)
Hot water usage for other uses	44.0499	42.4481	40.8463	39.2444	37.6426	36.0408	36.0408	37.6426	39.2444	40.8463	42.4481	44.0499 (42c)
Average daily hot water use (litres/day)												69.0207 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	75.3017	73.2357	70.9803	68.1734	65.6692	63.0668	62.5263	64.7772	67.0856	69.7581	72.5899	75.1960 (44)
Energy content (annual)	119.2594	104.2867	109.0941	93.3260	88.4034	77.5480	75.6202	80.2077	82.7233	94.6611	103.4176	117.7388 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	101.3705	88.6437	92.7300	79.3271	75.1429	65.9158	64.2771	68.1765	70.3148	80.4619	87.9049	100.0780 (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	101.3705	88.6437	92.7300	79.3271	75.1429	65.9158	64.2771	68.1765	70.3148	80.4619	87.9049	100.0780 (64)
12Total per year (kWh/year)												974.3432 (64)
Electric shower(s)	57.9695	51.6513	56.4013	53.8230	54.8330	52.3054	54.0489	54.8330	53.8230	56.4013	55.3407	57.9695 (64a)
Heat gains from water heating, kWh/month	39.8350	35.0737	37.2828	33.2875	32.4940	29.5553	29.5815	30.7524	31.0345	34.2158	35.8114	39.5119 (65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 659.3998 (64a)												

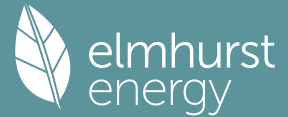
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	143.6378	143.6378	143.6378	143.6378	143.6378	143.6378	143.6378	143.6378	143.6378	143.6378	143.6378	143.6378 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	150.1611	166.2497	150.1611	155.1664	150.1611	155.1664	150.1611	150.1611	155.1664	150.1611	155.1664	150.1611 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	288.5350	291.5291	283.9840	267.9216	247.6457	228.5892	215.8582	212.8641	220.4091	236.4716	256.7475	275.8040 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3638	37.3638	37.3638	37.3638	37.3638	37.3638	37.3638	37.3638	37.3638	37.3638	37.3638	37.3638 (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)	-114.9102	-114.9102	-114.9102	-114.9102	-114.9102	-114.9102	-114.9102	-114.9102	-114.9102	-114.9102	-114.9102	-114.9102 (71)
Water heating gains (Table 5)	53.5417	52.1931	50.1113	46.2327	43.6747	41.0490	39.7601	41.3338	43.1034	45.9890	49.7381	53.1074 (72)
Total internal gains	558.3290	576.0632	550.3477	535.4120	507.5727	490.8959	471.8707	470.4504	484.7703	498.7129	527.7433	545.1638 (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	7.8500	10.6334	0.6300	0.7000	0.7700	25.5102 (74)
East	2.5300	19.6403	0.6300	0.7000	0.7700	15.1859 (76)
South	8.6100	46.7521	0.6300	0.7000	0.7700	123.0200 (78)
West	1.8000	19.6403	0.6300	0.7000	0.7700	10.8042 (80)

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Solar gains	174.5202	301.0684	423.2134	545.2402	631.1672	635.9770	609.2208	543.4325	465.0763	335.6701	209.6973	148.9401 (83)
Total gains	732.8493	877.1316	973.5611	1080.6523	1138.7399	1126.8729	1081.0915	1013.8829	949.8466	834.3831	737.4406	694.1039 (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	24.4146	24.4522	24.4892	24.6644	24.6974	24.8525	24.8525	24.8814	24.7925	24.6974	24.6306	24.5612
alpha	2.6276	2.6301	2.6326	2.6443	2.6465	2.6568	2.6568	2.6588	2.6528	2.6465	2.6420	2.6374
util living area	0.9667	0.9466	0.9181	0.8597	0.7673	0.6305	0.4984	0.5405	0.7254	0.8841	0.9494	0.9708 (86)
MIT	18.2924	18.6402	19.1228	19.7564	20.3145	20.7201	20.8922	20.8629	20.5653	19.8317	18.9522	18.2282 (87)
Th 2	19.9701	19.9715	19.9729	19.9795	19.9807	19.9864	19.9864	19.9875	19.9842	19.9807	19.9782	19.9756 (88)
util rest of house	0.9616	0.9387	0.9055	0.8369	0.7267	0.5617	0.4020	0.4452	0.6653	0.8605	0.9405	0.9664 (89)
MIT 2	17.4963	17.8396	18.3140	18.9308	19.4535	19.8096	19.9371	19.9208	19.6881	19.0152	18.1563	17.4365 (90)
Living area fraction	17.6249	17.9689	18.4447	19.0642	19.5926	19.9567	20.0914	20.0730	19.8298	19.1471	18.2849	17.5644 (92)
Temperature adjustment												0.0000
adjusted MIT	17.6249	17.9689	18.4447	19.0642	19.5926	19.9567	20.0914	20.0730	19.8298	19.1471	18.2849	17.5644 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9456	0.9182	0.8816	0.8123	0.7091	0.5595	0.4127	0.4538	0.6549	0.8365	0.9207	0.9517 (94)
Useful gains	692.9951	805.4242	858.2496	877.8566	807.4474	630.4336	446.1515	460.1430	622.0958	697.9367	678.9517	660.5783 (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	1858.3710	1819.8643	1660.8019	1403.1982	1088.1366	733.9123	478.3452	502.6415	786.9239	1178.3753	1546.2243	1852.7448 (97)
Space heating kWh	867.0396	681.7037	597.0989	378.2460	208.8328	0.0000	0.0000	0.0000	0.0000	357.4463	624.4363	886.9719 (98a)
Space heating requirement - total per year (kWh/year)												4601.7755
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	867.0396	681.7037	597.0989	378.2460	208.8328	0.0000	0.0000	0.0000	0.0000	357.4463	624.4363	886.9719 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4601.7755
Space heating per m2												(98c) / (4) = 37.5410 (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	1287.8780	1013.8614	1040.0522	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7160	0.7848	0.7546	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	922.1015	795.6537	784.8519	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1251.2795	1200.7738	1125.2401	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	237.0081	301.4094	253.2488	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	59.2520	75.3523	63.3122	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												197.9166 (107)
Energy for space heating												37.5410 (99)
Energy for space cooling												1.6146 (108)
Total												39.1556 (109)
Fabric Energy Efficiency (DFEE)												39.2 (109)

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

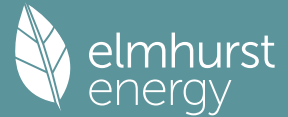
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	52.5800 (1b)	x	2.6000 (2b) = 136.7080 (1b) - (3b)
First floor	70.0000 (1c)	x	2.3200 (2c) = 162.4000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	122.5800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	299.1080 (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
Number of intermittent extract fans
Number of passive vents
Number of flueless gas fires

0 * 20 = 0.0000 (6f)
4 * 10 = 40.0000 (7a)
0 * 10 = 0.0000 (7b)
0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =
Pressure Test
Pressure Test Method
Measured/design AP50
Infiltration rate
Number of sides sheltered

Air changes per hour
40.0000 / (5) = 0.1337 (8)
Yes
Blower Door
5.0000 (17)
0.3837 (18)
2 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3262 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infiltr rate	0.4159	0.4077	0.3996	0.3588	0.3506	0.3099	0.3099	0.3017	0.3262	0.3506	0.3669	0.3833	(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	0.5865	0.5831	0.5798	0.5644	0.5615	0.5480	0.5480	0.5455	0.5532	0.5615	0.5673	0.5734	(25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K	
TER Opaque door			2.1400	1.0000	2.1400			(26)
TER Opening Type (Uw = 1.20)			20.7900	1.1450	23.8053			(27)
Ground Floor			52.5800	0.1300	6.8354			(28a)
Exposed Floor			19.2400	0.1300	2.5012			(28b)
External Wall	154.7700	22.9300	131.8400	0.1800	23.7312			(29a)
Roof - ceiling	70.0000		70.0000	0.1100	7.7000			(30)
Bay Roof	1.8300		1.8300	0.1100	0.2013			(30)
Total net area of external elements Aum(A, m ²)			298.4200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	66.9144			(33)
Party Wall			13.2500	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)	12.8500	0.0500	0.6425
E3 Sill	13.9100	0.0500	0.6955
E4 Jamb	31.5000	0.0500	1.5750
E5 Ground floor (normal)	31.8000	0.1600	5.0880
E6 Intermediate floor within a dwelling	24.5300	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	21.2100	0.0600	1.2726
E12 Gable (insulation at ceiling level)	10.0600	0.0600	0.6036
E16 Corner (normal)	24.3000	0.0900	2.1870
E18 Party wall between dwellings	4.6400	0.0600	0.2784
P4 Party wall - Roof (insulation at ceiling level)	5.7100	0.1200	0.6852
E24 Eaves (insulation at ceiling level - inverted)	2.3400	0.2400	0.5616
E14 Flat roof	3.9000	0.0800	0.3120
E17 Corner (inverted - internal area greater than external area)	9.2600	-0.0900	-0.8334
E20 Exposed floor (normal)	6.7400	0.3200	2.1568
E21 Exposed floor (inverted)	5.7100	0.3200	1.8272
P7 Party Wall - Exposed floor (normal)	5.7100	0.1600	0.9136

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 17.9656 (36)
Point Thermal Bridges 0.0000
Total fabric heat loss (33) + (36) + (36a) = 84.8800 (37)

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

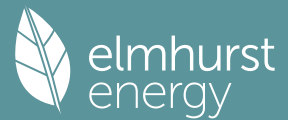
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	57.8882	57.5568	57.2319	55.7060	55.4205	54.0914	54.0914	53.8453	54.6034	55.4205	55.9980	56.6018	(38)
Average = Sum(39)m / 12 =	142.7683	142.4368	142.1119	140.5860	140.3005	138.9715	138.9715	138.7254	139.4834	140.3005	140.8781	141.4819	(39)
												140.5846	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1647	1.1620	1.1593	1.1469	1.1446	1.1337	1.1337	1.1317	1.1379	1.1446	1.1493	1.1542	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8728 (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	31.2518	30.7876	30.1341	28.9289	28.0266	27.0260	26.4855	27.1345	27.8412	28.9119	30.1418	31.1461	(42b)
Hot water usage for other uses	44.0499	42.4481	40.8463	39.2444	37.6426	36.0408	36.0408	37.6426	39.2444	40.8463	42.4481	44.0499	(42c)
Average daily hot water use (litres/day)													69.0207 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	75.3017	73.2357	70.9803	68.1734	65.6692	63.0668	62.5263	64.7772	67.0856	69.7581	72.5899	75.1960	(44)
Energy content (annual)	119.2594	104.2867	109.0941	93.3260	88.4034	77.5480	75.6202	80.2077	82.7233	94.6611	103.4176	117.7388	(45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
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	101.3705	88.6437	92.7300	79.3271	75.1429	65.9158	64.2771	68.1765	70.3148	80.4619	87.9049	100.0780	(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)

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PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	101.3705	88.6437	92.7300	79.3271	75.1429	65.9158	64.2771	68.1765	70.3148	80.4619	87.9049	100.0780	(64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =											974.3432	(64)
Electric shower(s)	57.9695	51.6513	56.4013	53.8230	54.8330	52.3054	54.0489	54.8330	53.8230	56.4013	55.3407	57.9695	(64a)
	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											659.3998	(64a)
Heat gains from water heating, kWh/month	39.8350	35.0737	37.2828	33.2875	32.4940	29.5553	29.5815	30.7524	31.0345	34.2158	35.8114	39.5119	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.6378	143.6378	143.6378	143.6378	143.6378	143.6378	143.6378	143.6378	143.6378	143.6378	143.6378	143.6378	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	150.1611	166.2497	150.1611	155.1664	150.1611	155.1664	150.1611	155.1664	150.1611	155.1664	150.1611	155.1664	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	288.5350	291.5291	283.9840	267.9216	247.6457	228.5892	215.8582	212.8641	220.4091	236.4716	256.7475	275.8040	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3638	37.3638	37.3638	37.3638	37.3638	37.3638	37.3638	37.3638	37.3638	37.3638	37.3638	37.3638	(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)	-114.9102	-114.9102	-114.9102	-114.9102	-114.9102	-114.9102	-114.9102	-114.9102	-114.9102	-114.9102	-114.9102	-114.9102	(71)
Water heating gains (Table 5)	53.5417	52.1931	50.1113	46.2327	43.6747	41.0490	39.7601	41.3338	43.1034	45.9890	49.7381	53.1074	(72)
Total internal gains	558.3290	576.0632	550.3477	535.4120	507.5727	490.8959	471.8707	470.4504	484.7703	498.7129	527.7433	545.1638	(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				7.8500	10.6334		0.6300		0.7000		0.7700		25.5102 (74)
East				2.5300	19.6403		0.6300		0.7000		0.7700		15.1859 (76)
South				8.6100	46.7521		0.6300		0.7000		0.7700		123.0200 (78)
West				1.8000	19.6403		0.6300		0.7000		0.7700		10.8042 (80)
Solar gains	174.5202	301.0684	423.2134	545.2402	631.1672	635.9770	609.2208	543.4325	465.0763	335.6701	209.6973	148.9401	(83)
Total gains	732.8493	877.1316	973.5611	1080.6523	1138.7399	1126.8729	1081.0915	1013.8829	949.8466	834.3831	737.4406	694.1039	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	23.8498	23.9053	23.9600	24.2200	24.2693	24.5014	24.5014	24.5449	24.4115	24.2693	24.1698	24.0667	
alpha	2.5900	2.5937	2.5973	2.6147	2.6180	2.6334	2.6334	2.6363	2.6274	2.6180	2.6113	2.6044	
util living area	0.9669	0.9473	0.9193	0.8618	0.7709	0.6346	0.5029	0.5449	0.7291	0.8858	0.9499	0.9710	(86)
MIT	18.2266	18.5773	19.0672	19.7181	20.2883	20.7085	20.8866	20.8565	20.5491	19.7999	18.9071	18.1711	(87)
Th 2	19.9483	19.9505	19.9527	19.9627	19.9646	19.9734	19.9734	19.9750	19.9700	19.9646	19.9608	19.9568	(88)
util rest of house	0.9618	0.9394	0.9067	0.8390	0.7301	0.5652	0.4051	0.4482	0.6687	0.8622	0.9410	0.9665	(89)
MIT 2	17.4173	17.7640	18.2463	18.8826	19.4177	19.7896	19.9217	19.9055	19.6632	18.9738	18.1007	17.3680	(90)
Living area fraction	17.5480	17.8954	18.3789	19.0176	19.5583	19.9380	20.0776	20.0591	19.8063	19.1072	18.2309	17.4977	(91)
MIT	17.5480	17.8954	18.3789	19.0176	19.5583	19.9380	20.0776	20.0591	19.8063	19.1072	18.2309	17.4977	(92)
Temperature adjustment	17.5480	17.8954	18.3789	19.0176	19.5583	19.9380	20.0776	20.0591	19.8063	19.1072	18.2309	17.4977	(93)
adjusted MIT	17.5480	17.8954	18.3789	19.0176	19.5583	19.9380	20.0776	20.0591	19.8063	19.1072	18.2309	17.4977	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9456	0.9186	0.8824	0.8140	0.7118	0.5625	0.4157	0.4568	0.6577	0.8377	0.9209	0.9517	(94)
Useful gains	693.0058	805.7426	859.1015	879.6189	810.5668	633.9129	449.3946	463.1032	624.7094	698.9409	679.1443	660.5503	(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	1891.3938	1851.0216	1688.1329	1422.3906	1102.5304	741.8288	483.2820	507.6084	795.9324	1193.5639	1568.1023	1881.3869	(97)
Space heating kWh	891.6007	702.4274	616.7994	390.7956	217.2209	0.0000	0.0000	0.0000	0.0000	367.9995	640.0497	908.3024	(98a)
Space heating requirement - total per year (kWh/year)												4735.1956	
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	891.6007	702.4274	616.7994	390.7956	217.2209	0.0000	0.0000	0.0000	0.0000	367.9995	640.0497	908.3024	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4735.1956	
Space heating per m ²												38.6294	(99)

8c. Space cooling requirement

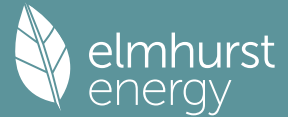
Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1306.3318	1028.3889	1054.3127	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7090	0.7783	0.7482	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	926.1870	800.3899	788.7926	0.0000	0.0000	0.0000	0.0000	(102)

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Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1251.2795	1200.7738	1125.2401	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	234.0666	297.8856	250.3169	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction	0.0000	0.0000	0.0000	0.0000	0.0000	234.0666	297.8856	250.3169	0.0000	0.0000	0.0000	0.0000 (104)
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	1.0000 (105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	58.5166	74.4714	62.5792	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling requirement												0.0000 (107)
Energy for space heating												195.5673 (107)
Energy for space cooling												38.6294 (99)
Total												1.5954 (108)
Fabric Energy Efficiency (TFEE)												40.2249 (109)
												40.2 (109)

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Property Reference	OP-D320 S3OSPR				Issued on Date	29/11/2024	
Assessment Reference	S3OSPR			Prop Type Ref	S3OSPR		
Property	S3OSPR						
SAP Rating	80 C		DER	4.14		TER	10.64
Environmental	96 A		% DER < TER				61.09
CO ₂ Emissions (t/year)	0.46		DFEE	39.16		TFEE	40.22
Compliance Check	See BREL		% DFEE < TFEE				2.66
% DPER < TPER	21.65		DPER	43.55		TPER	55.58
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	52.5800 (1b)	x 2.6000 (2b)	= 136.7080 (1b) - (3b)
First floor	70.0000 (1c)	x 2.3200 (2c)	= 162.4000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	122.5800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 299.1080 (5)

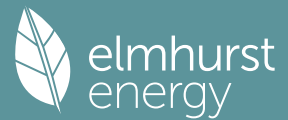
2. Ventilation rate

	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)											
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1897	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)			20.7900	1.2357	25.6911		(27)
Ground Floor			52.5800	0.1100	5.7838		(28a)
Exposed Floor			19.2400	0.1400	2.6936		(28b)
External Wall	154.7700	22.9300	131.8400	0.1700	22.4128		(29a)
Roof - ceiling	70.0000		70.0000	0.1100	7.7000		(30)
Bay Roof	1.8300		1.8300	0.1100	0.2013		(30)
Total net area of external elements Aum (A, m ²)			298.4200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	66.6226		(33)
Party Wall			13.2500	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)	12.8500	0.0500	0.6425									
E3 Sill	13.9100	0.0500	0.6955									
E4 Jamb	31.5000	0.0500	1.5750									
E5 Ground floor (normal)	31.8000	0.1600	5.0880									
E6 Intermediate floor within a dwelling	24.5300	0.0000	0.0000									
E10 Eaves (insulation at ceiling level)	21.2100	0.0600	1.2726									
E12 Gable (insulation at ceiling level)	10.0600	0.0600	0.6036									
E16 Corner (normal)	24.3000	0.0900	2.1870									
E18 Party wall between dwellings	4.6400	0.0600	0.2784									
P4 Party wall - Roof (insulation at ceiling level)	5.7100	0.1200	0.6852									
E24 Eaves (insulation at ceiling level - inverted)	2.3400	0.2400	0.5616									
E14 Flat roof	3.9000	0.0800	0.3120									
E17 Corner (inverted - internal area greater than external area)	9.2600	-0.0900	-0.8334									
E20 Exposed floor (normal)	6.7400	0.3200	2.1568									
E21 Exposed floor (inverted)	5.7100	0.3200	1.8272									
P7 Party Wall - Exposed floor (normal)	5.7100	0.1600	0.9136									
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				17.9656 (36)								
Point Thermal bridges			(36a) =	0.0000								
Total fabric heat loss		(33) + (36) + (36a) =		84.5882 (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	32.9338	32.5667	32.1996	30.3643	29.9973	28.1620	28.1620	27.7949	28.8961	29.9973	30.7314	31.4655 (38)
Average = Sum(39)m / 12 =	117.5219	117.1549	116.7878	114.9525	114.5854	112.7501	112.7501	112.3831	113.4842	114.5854	115.3195	116.0537 (39)
												114.8607
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9587	0.9557	0.9527	0.9378	0.9348	0.9198	0.9198	0.9168	0.9258	0.9348	0.9408	0.9468 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31
												31

4. Water heating energy requirements (kWh/year)												

Assumed occupancy												2.8728 (42)
Hot water usage for mixer showers												
Hot water usage for baths	99.5314	98.0357	95.8560	91.6857	88.6081	85.1760	83.2252	85.3884	87.7596	91.4446	95.7045	99.1501 (42a)
Hot water usage for other uses	32.8966	32.4080	31.7201	30.4515	29.5016	28.4484	27.8795	28.5627	29.3065	30.4335	31.7282	32.7854 (42b)
Average daily hot water use (litres/day)	46.3683	44.6822	42.9961	41.3099	39.6238	37.9377	37.9377	39.6238	41.3099	42.9961	44.6822	46.3683 (42c)
												164.4180 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	178.7963	175.1259	170.5721	163.4472	157.7336	151.5621	149.0424	153.5748	158.3760	164.8742	172.1149	178.3038 (44)
Energy content (annual)	283.1697	249.3769	262.1630	223.7510	212.3397	186.3633	180.2539	190.1577	195.2935	223.7327	245.2092	279.1806 (45)
Distribution loss (46)m = 0.15 x (45)m	42.4755	37.4065	39.3245	33.5627	31.8510	27.9545	27.0381	28.5237	29.2940	33.5599	36.7814	41.8771 (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	381.5513	338.2377	360.5446	318.9590	310.7213	250.9953	247.0403	256.9441	259.9255	322.1143	340.4172	377.5622 (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	381.5513	338.2377	360.5446	318.9590	310.7213	250.9953	247.0403	256.9441	259.9255	322.1143	340.4172	377.5622 (64)
										Total per year (kWh/year) = Sum(64)m =		3765.0129 (64)
12Total per year (kWh/year)												3765 (64)
Electric shower(s)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
												0.0000 (64a)
Heat gains from water heating, kWh/month	138.0400	122.5569	131.0553	116.8676	114.4890	79.9754	78.5443	81.8374	82.9447	118.2772	124.0024	136.7136 (65)

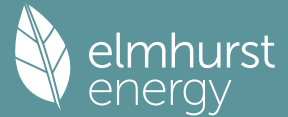
5. Internal gains (see Table 5 and 5a)												

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	143.6378	143.6378	143.6378	143.6378	143.6378	143.6378	143.6378	143.6378	143.6378	143.6378	143.6378	143.6378 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	150.1611	166.2497	150.1611	155.1664	150.1611	155.1664	150.1611	150.1611	155.1664	150.1611	155.1664	150.1611 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	288.5350	291.5291	283.9840	267.9216	247.6457	228.5892	215.8582	212.8641	220.4091	236.4716	256.7475	275.8040 (68)
Pumps, fans	37.3638	37.3638	37.3638	37.3638	37.3638	37.3638	37.3638	37.3638	37.3638	37.3638	37.3638	37.3638 (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)	-114.9102	-114.9102	-114.9102	-114.9102	-114.9102	-114.9102	-114.9102	-114.9102	-114.9102	-114.9102	-114.9102	-114.9102 (71)
Total internal gains	185.5376	182.3763	176.1496	162.3161	153.8831	111.0770	105.5703	109.9965	115.2009	158.9747	172.2256	183.7549 (72)
	690.3250	706.2464	676.3860	651.4955	617.7812	560.9239	537.6810	539.1130	556.8678	611.6987	650.2309	675.8113 (73)

6. Solar gains												

[Jan]			Area		Solar flux		g		FF		Access	Gains
			m2		Table 6a		Specific data		Specific data		factor	W
					W/m2		or Table 6b		or Table 6c		Table 6d	

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North	7.8500	10.6334	0.6300	0.7000	0.7700	25.5102 (74)
East	2.5300	19.6403	0.6300	0.7000	0.7700	15.1859 (76)
South	8.6100	46.7521	0.6300	0.7000	0.7700	123.0200 (78)
West	1.8000	19.6403	0.6300	0.7000	0.7700	10.8042 (80)

Solar gains	174.5202	301.0684	423.2134	545.2402	631.1672	635.9770	609.2208	543.4325	465.0763	335.6701	209.6973	148.9401 (83)
Total gains	864.8452	1007.3148	1099.5994	1196.7357	1248.9484	1196.9009	1146.9018	1082.5455	1021.9441	947.3688	859.9282	824.7514 (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	28.9733	29.0641	29.1554	29.6209	29.7158	30.1995	30.1995	30.2982	30.0042	29.7158	29.5267	29.3399
alpha	2.9316	2.9376	2.9437	2.9747	2.9811	3.0133	3.0133	3.0199	3.0003	2.9811	2.9684	2.9560
util living area	0.9473	0.9194	0.8797	0.8016	0.6867	0.5429	0.4122	0.4493	0.6433	0.8272	0.9203	0.9531 (86)
Living	18.9629	19.2875	19.7035	20.2250	20.6260	20.8702	20.9578	20.9447	20.7734	20.2666	19.5444	18.9175
Non living	17.7271	18.1352	18.6550	19.2999	19.7706	20.0447	20.1250	20.1177	19.9475	19.3642	18.4718	17.6763
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	19.9579	19.2875	19.7035	20.2250	20.6260	20.8702	20.9578	20.9447	20.7734	20.2666	19.5444	19.2088 (87)
Th 2	20.1179	20.1204	20.1229	20.1355	20.1380	20.1507	20.1507	20.1532	20.1456	20.1380	20.1330	20.1279 (88)
util rest of house	0.9403	0.9091	0.8643	0.7762	0.6466	0.4847	0.3394	0.3755	0.5876	0.7995	0.9085	0.9468 (89)
MIT 2	19.1648	18.1352	18.6550	19.2999	19.7706	20.0447	20.1250	20.1177	19.9475	19.3642	18.4718	18.1181 (90)
Living area fraction									fLA = Living area / (4) =			0.1615 (91)
MIT	19.2929	18.3213	18.8244	19.4493	19.9088	20.1780	20.2595	20.2513	20.0809	19.5100	18.6451	18.2943 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2929	18.3213	18.8244	19.4493	19.9088	20.1780	20.2595	20.2513	20.0809	19.5100	18.6451	18.2943 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9327	0.8825	0.8367	0.7533	0.6351	0.4867	0.3490	0.3844	0.5830	0.7761	0.8825	0.9298 (94)
Useful gains	806.6266	888.9597	919.9897	901.5474	793.2011	582.4806	400.2701	416.0984	595.8339	735.2426	758.9134	766.8752 (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	1761.9915	1572.3759	1439.3357	1212.6714	940.6042	628.9216	412.6082	432.8208	678.7368	1020.9560	1331.3739	1635.6951 (97)
Space heating kWh	710.7915	459.2557	386.3934	224.0093	109.6679	0.0000	0.0000	0.0000	0.0000	212.5707	412.1715	646.4020 (98a)
Space heating requirement - total per year (kWh/year)												3161.2620
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	710.7915	459.2557	386.3934	224.0093	109.6679	0.0000	0.0000	0.0000	0.0000	212.5707	412.1715	646.4020 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3161.2620
Space heating per m2										(98c) / (4) =		25.7894 (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 %)												248.5771 (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	710.7915	459.2557	386.3934	224.0093	109.6679	0.0000	0.0000	0.0000	0.0000	212.5707	412.1715	646.4020 (98)
Space heating efficiency (main heating system 1)	248.5771	248.5771	248.5771	248.5771	248.5771	0.0000	0.0000	0.0000	0.0000	248.5771	248.5771	248.5771 (210)
Space heating fuel (main heating system)	285.9441	184.7538	155.4421	90.1166	44.1183	0.0000	0.0000	0.0000	0.0000	85.5150	165.8124	260.0409 (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	381.5513	338.2377	360.5446	318.9590	310.7213	250.9953	247.0403	256.9441	259.9255	322.1143	340.4172	377.5622 (64)
Efficiency of water heater (217)m	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	141.6195	125.5429	133.8225	118.3873	115.3297	93.1614	91.6934	95.3694	96.4759	119.5584	126.3519	140.1389 (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	45.9929	41.5420	45.9929	44.5092	45.9929	44.5092	45.9929	45.9929	44.5092	45.9929	44.5092	45.9929 (231)
Lighting	31.2005	25.0302	22.5369	16.5115	12.7540	10.4201	11.6346	15.1231	19.6434	25.7732	29.1108	32.0677 (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)												

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(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												1271.7432	(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												1397.4512	(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)												541.5291	(230a)
Total electricity for the above, kWh/year												541.5291	(231)
Electricity for lighting (calculated in Appendix L)												251.8059	(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												3462.5293	(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	1271.7432	0.1555	197.7168	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1397.4512	0.1415	197.7891	(264)
Space and water heating			395.5059	(265)
Pumps, fans and electric keep-hot	541.5291	0.1387	75.1168	(267)
Energy for lighting	251.8059	0.1443	36.3434	(268)
Total CO2, kg/year			506.9660	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.1400	(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	1271.7432	1.5755	2003.6666	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1397.4512	1.5234	2128.8645	(278)
Space and water heating			4132.5311	(279)
Pumps, fans and electric keep-hot	541.5291	1.5128	819.2251	(281)
Energy for lighting	251.8059	1.5338	386.2283	(282)
Total Primary energy kWh/year			5337.9846	(286)
Dwelling Primary energy Rate (DPER)			43.5500	(287)

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

1. Overall dwelling characteristics

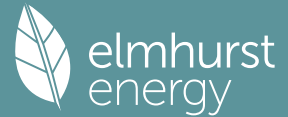
	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	52.5800 (1b)	x 2.6000 (2b)	= 136.7080	(1b) - (3b)
First floor	70.0000 (1c)	x 2.3200 (2c)	= 162.4000	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	122.5800			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 299.1080	(5)

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) =	0.1337	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3837	(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) =	0.3262	(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												
Effective ac	0.4159	0.4077	0.3996	0.3588	0.3506	0.3099	0.3099	0.3017	0.3262	0.3506	0.3669	0.3833 (22b)
	0.5865	0.5831	0.5798	0.5644	0.5615	0.5480	0.5480	0.5455	0.5532	0.5615	0.5673	0.5734 (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)			20.7900	1.1450	23.8053		(27)
Ground Floor			52.5800	0.1300	6.8354		(28a)
Exposed Floor			19.2400	0.1300	2.5012		(28b)
External Wall	154.7700	22.9300	131.8400	0.1800	23.7312		(29a)
Roof - ceiling	70.0000		70.0000	0.1100	7.7000		(30)
Bay Roof	1.8300		1.8300	0.1100	0.2013		(30)
Total net area of external elements Aum(A, m2)			298.4200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		66.9144		(33)
Party Wall			13.2500	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)	12.8500	0.0500	0.6425
E3 Sill	13.9100	0.0500	0.6955
E4 Jamb	31.5000	0.0500	1.5750
E5 Ground floor (normal)	31.8000	0.1600	5.0880
E6 Intermediate floor within a dwelling	24.5300	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	21.2100	0.0600	1.2726
E12 Gable (insulation at ceiling level)	10.0600	0.0600	0.6036
E16 Corner (normal)	24.3000	0.0900	2.1870
E18 Party wall between dwellings	4.6400	0.0600	0.2784
P4 Party wall - Roof (insulation at ceiling level)	5.7100	0.1200	0.6852
E24 Eaves (insulation at ceiling level - inverted)	2.3400	0.2400	0.5616
E14 Flat roof	3.9000	0.0800	0.3120
E17 Corner (inverted - internal area greater than external area)	9.2600	-0.0900	-0.8334
E20 Exposed floor (normal)	6.7400	0.3200	2.1568
E21 Exposed floor (inverted)	5.7100	0.3200	1.8272
P7 Party Wall - Exposed floor (normal)	5.7100	0.1600	0.9136

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

17.9656 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 84.8800 (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	57.8882	57.5568	57.2319	55.7060	55.4205	54.0914	54.0914	53.8453	54.6034	55.4205	55.9980	56.6018 (38)
Average = Sum(39)m / 12 =	142.7683	142.4368	142.1119	140.5860	140.3005	138.9715	138.9715	138.7254	139.4834	140.3005	140.8781	141.4819 (39)
												140.5846

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1647	1.1620	1.1593	1.1469	1.1446	1.1337	1.1337	1.1317	1.1379	1.1446	1.1493	1.1542 (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											2.8728 (42)	
Hot water usage for mixer showers												
	72.3865	71.2987	69.7135	66.6805	64.4423	61.9462	60.5274	62.1006	63.8251	66.5051	69.6032	72.1091 (42a)
Hot water usage for baths												
	31.2518	30.7876	30.1341	28.9289	28.0266	27.0260	26.4855	27.1345	27.8412	28.9119	30.1418	31.1461 (42b)
Hot water usage for other uses												
	44.0499	42.4481	40.8463	39.2444	37.6426	36.0408	36.0408	37.6426	39.2444	40.8463	42.4481	44.0499 (42c)
Average daily hot water use (litres/day)												135.7586 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	147.6882	144.5344	140.6938	134.8539	130.1115	125.0130	123.0538	126.8778	130.9108	136.2633	142.1931	147.3052 (44)
Energy content	233.9019	205.8150	216.2411	184.6083	175.1551	153.7181	148.8229	157.1012	161.4261	184.9080	202.5802	230.6443 (45)
Energy content (annual)										Total = Sum(45)m =		2254.9220

Water storage loss:

Store volume

230.0000 (47)

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

Temperature factor from Table 2b

1.7973 (48)

Enter (49) or (54) in (55)

0.5400 (49)

Total storage loss

0.9706 (55)

30.0872 27.1756 30.0872 29.1167 30.0872 29.1167 30.0872 30.0872 29.1167 30.0872 29.1167 30.0872 (56)

If cylinder contains dedicated solar storage

30.0872 27.1756 30.0872 29.1167 30.0872 29.1167 30.0872 30.0872 29.1167 30.0872 29.1167 30.0872 (57)

Primary loss 23.2624 21.0112 23.2624 22.5120 23.2624 22.5120 23.2624 23.2624 22.5120 23.2624 22.5120 23.2624 (59)

Combi loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (61)

Total heat required for water heating calculated for each month

287.2516 254.0018 269.5907 236.2369 228.5047 205.3467 202.1725 210.4508 213.0547 238.2576 254.2088 283.9939 (62)

WWHRS -33.0921 -29.2669 -30.6466 -25.3766 -23.6501 -20.2375 -18.9695 -20.1721 -20.9385 -24.6842 -27.9642 -32.4793 (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

254.1595 224.7349 238.9441 210.8603 204.8546 185.1092 183.2030 190.2787 192.1162 213.5734 226.2446 251.5146 (64)

12Total per year (kWh/year)

Electric shower(s)

2575.5930 (64)

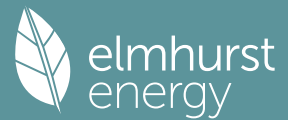
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (64a)

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

Heat gains from water heating, kWh/month

120.4521 106.9829 114.5799 102.6852 100.9188 92.4142 92.1633 94.9158 94.9771 104.1616 108.6608 119.3689 (65)

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	143.6378	143.6378	143.6378	143.6378	143.6378	143.6378	143.6378	143.6378	143.6378	143.6378	143.6378	143.6378 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	150.1611	166.2497	150.1611	155.1664	150.1611	155.1664	150.1611	150.1611	155.1664	150.1611	155.1664	150.1611 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	288.5350	291.5291	283.9840	267.9216	247.6457	228.5892	215.8582	212.8641	220.4091	236.4716	256.7475	275.8040 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3638	37.3638	37.3638	37.3638	37.3638	37.3638	37.3638	37.3638	37.3638	37.3638	37.3638	37.3638 (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)	-114.9102	-114.9102	-114.9102	-114.9102	-114.9102	-114.9102	-114.9102	-114.9102	-114.9102	-114.9102	-114.9102	-114.9102 (71)
Water heating gains (Table 5)	161.8980	159.2007	154.0052	142.6183	135.6435	128.3530	123.8754	127.5751	131.9126	140.0021	150.9178	160.4421 (72)
Total internal gains	669.6853	686.0709	657.2416	634.7977	602.5416	578.2000	555.9860	556.6916	573.5795	595.7261	631.9231	655.4985 (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				7.8500	10.6334	0.6300	0.7000			0.7700		25.5102 (74)
East				2.5300	19.6403	0.6300	0.7000			0.7700		15.1859 (76)
South				8.6100	46.7521	0.6300	0.7000			0.7700		123.0200 (78)
West				1.8000	19.6403	0.6300	0.7000			0.7700		10.8042 (80)
Solar gains	174.5202	301.0684	423.2134	545.2402	631.1672	635.9770	609.2208	543.4325	465.0763	335.6701	209.6973	148.9401 (83)
Total gains	844.2056	987.1392	1080.4550	1180.0379	1233.7087	1214.1770	1165.2068	1100.1241	1038.6558	931.3962	841.6204	804.4386 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	23.8498	23.9053	23.9600	24.2200	24.2693	24.5014	24.5014	24.5449	24.4115	24.2693	24.1698	24.0667
alpha	2.5900	2.5937	2.5973	2.6147	2.6180	2.6334	2.6334	2.6363	2.6274	2.6180	2.6113	2.6044
util living area	0.9550	0.9328	0.9014	0.8395	0.7435	0.6051	0.4743	0.5128	0.6962	0.8609	0.9340	0.9598 (86)
MIT	18.3882	18.7262	19.1980	19.8168	20.3542	20.7411	20.9016	20.8762	20.6002	19.9045	19.0496	18.3342 (87)
Th 2	19.9483	19.9505	19.9527	19.9627	19.9646	19.9734	19.9734	19.9750	19.9700	19.9646	19.9608	19.9568 (88)
util rest of house	0.9484	0.9231	0.8867	0.8144	0.7008	0.5356	0.3796	0.4187	0.6338	0.8339	0.9229	0.9539 (89)
MIT 2	16.9039	17.3303	17.9232	18.6927	19.3338	19.7664	19.9166	19.8992	19.6259	18.8157	17.7506	16.8405 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	17.1437	17.5558	18.1292	18.8743	19.4986	19.9239	20.0757	20.0570	19.7833	18.9916	17.9604	17.0818 (92)
Temperature adjustment	0.0000											
adjusted MIT	17.1437	17.5558	18.1292	18.8743	19.4986	19.9239	20.0757	20.0570	19.7833	18.9916	17.9604	17.0818 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9229	0.8928	0.8534	0.7825	0.6789	0.5320	0.3896	0.4268	0.6210	0.8021	0.8932	0.9299 (94)
Useful gains	779.0859	881.3249	922.0785	923.3568	837.5722	645.9162	454.0220	469.5318	645.0085	747.0980	751.7278	748.0817 (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	1833.6665	1802.6504	1652.6422	1402.2470	1094.1536	739.8645	483.0246	507.3207	792.7272	1177.3449	1529.9954	1822.5399 (97)
Space heating kWh	784.6080	619.1307	543.5394	344.8010	190.8965	0.0000	0.0000	0.0000	0.0000	320.1037	560.3527	799.3969 (98a)
Space heating requirement - total per year (kWh/year)	4162.8288											
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	784.6080	619.1307	543.5394	344.8010	190.8965	0.0000	0.0000	0.0000	0.0000	320.1037	560.3527	799.3969 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	4162.8288											
Space heating per m ²	(98c) / (4) = 33.9601 (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	784.6080	619.1307	543.5394	344.8010	190.8965	0.0000	0.0000	0.0000	0.0000	320.1037	560.3527	799.3969 (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)	850.0628	670.7808	588.8834	373.5655	206.8218	0.0000	0.0000	0.0000	0.0000	346.8079	607.0993	866.0855 (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	254.1595	224.7349	238.9441	210.8603	204.8546	185.1092	183.2030	190.2787	192.1162	213.5734	226.2446	251.5146 (64)

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Efficiency of water heater (217)m	86.4154	86.2106	85.8436	85.1555	83.9018	79.8000	79.8000	79.8000	79.8000	84.9651	86.0099	79.8000 (216)
Fuel for water heating, kWh/month	294.1137	260.6812	278.3483	247.6179	244.1599	231.9664	229.5777	238.4445	240.7471	251.3658	263.0447	86.4661 (217)
Space cooling fuel requirement												290.8824 (219)
(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	31.2005	25.0302	22.5369	16.5115	12.7540	10.4201	11.6346	15.1231	19.6434	25.7732	29.1108	32.0677 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-48.8027	-68.6013	-98.2992	-110.1251	-118.3514	-110.2483	-108.8065	-102.8697	-92.4000	-78.1772	-53.5502	-42.2098 (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	-28.1847	-59.2230	-117.6149	-176.5426	-233.3743	-234.5362	-231.8534	-196.4042	-144.0304	-84.7512	-37.6423	-22.2995 (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												4510.1071 (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												3070.9497 (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)												251.8059 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-2598.8982 (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												5319.9644 (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	4510.1071	0.2100	947.1225	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3070.9497	0.2100	644.8994	(264)
Space and water heating			1592.0219	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	251.8059	0.1443	36.3434	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1032.4414	0.1347	-139.0410	
PV Unit electricity exported	-1566.4568	0.1259	-197.2260	
Total			-336.2670	(269)
Total CO2, kg/year			1304.0276	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.6400	(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	4510.1071	1.1300	5096.4210	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3070.9497	1.1300	3470.1731	(278)
Space and water heating			8566.5941	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	251.8059	1.5338	386.2283	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1032.4414	1.4977	-1546.3186	
PV Unit electricity exported	-1566.4568	0.4622	-723.9546	
Total			-2270.2732	(283)
Total Primary energy kWh/year			6812.6501	(286)
Target Primary Energy Rate (TPER)			55.5800	(287)