

Full SAP Calculation Printout



Property Reference	OP-D320 A2CEDA				Issued on Date	29/11/2024
Assessment Reference	A2CEDA	Prop Type Ref	A2CEDA			
Property	A2CEDA					
SAP Rating	81 B	DER	4.45	TER	11.61	
Environmental	96 A	% DER < TER				61.67
CO ₂ Emissions (t/year)	0.33	DFEE	35.45	TFEE	36.69	
Compliance Check	See BREL	% DFEE < TFEE				3.38
% DPER < TPER	22.24	DPER	47.14	TPER	60.62	
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	39.9500 (1b)	x 2.3100 (2b)	= 92.2845 (1b) - (3b)
First floor	39.9500 (1c)	x 2.6100 (2c)	= 104.2695 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 196.5540 (5)

2. Ventilation rate

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

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.5000	(17)
Infiltration rate		0.1750	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.1487 (21)

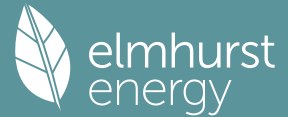
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1897	0.1859	0.1822	0.1636	0.1599	0.1413	0.1413	0.1376	0.1487	0.1599	0.1673	0.1748 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												72.0000 (23c)
Effective ac	0.3297	0.3259	0.3222	0.3036	0.2999	0.2813	0.2813	0.2776	0.2888	0.2999	0.3073	0.3148 (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)			14.0300	1.2357	17.3375		(27)
Ground Floor			39.9500	0.1100	4.3945		(28a)
External Wall	100.7100	16.1700	84.5400	0.1700	14.3718		(29a)
Roof - ceiling	39.9500		39.9500	0.1100	4.3945		(30)
Total net area of external elements Aum(A, m ²)			180.6100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	42.6383		(33)
Party Wall			25.8300	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)				11.1500	0.0500		0.5575
E3 Sill				8.3200	0.0500		0.4160

6. Solar gains													
[Jan]				Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W				
North				7.4700	10.6334	0.6300	0.7000	0.7700	24.2753 (74)				
South				6.5600	46.7521	0.6300	0.7000	0.7700	93.7295 (78)				
Solar gains	118.0048	199.8961	274.3681	347.6218	400.8667	404.2295	387.0259	345.5500	299.0418	220.7921	141.0481	101.2280	(83)

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Total gains 684.0148 777.4715 828.4282 880.7438 907.1745 857.8746 822.2365 782.4893 750.2018 723.2152 674.6438 655.9522 (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	30.2356	30.3352	30.4356	30.9474	31.0519	31.5848	31.5848	31.6936	31.3694	31.0519	30.8437	30.6383
alpha	3.0157	3.0223	3.0290	3.0632	3.0701	3.1057	3.1057	3.1129	3.0913	3.0701	3.0562	3.0426
util living area	0.9158	0.8807	0.8348	0.7483	0.6277	0.4881	0.3646	0.3960	0.5780	0.7646	0.8775	0.9234 (86)
Living	19.3369	19.6300	19.9827	20.4162	20.7333	20.9128	20.9735	20.9654	20.8466	20.4669	19.8596	19.2962
Non living	18.2148	18.5795	19.0158	19.5467	19.9130	20.1143	20.1688	20.1654	20.0477	19.6186	18.8800	18.1711
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.1492	19.6300	19.9827	20.4162	20.7333	20.9128	20.9735	20.9654	20.8466	20.4669	19.8596	19.5345 (87)
Th 2	20.1516	20.1542	20.1567	20.1696	20.1721	20.1850	20.1850	20.1876	20.1798	20.1721	20.1670	20.1619 (88)
util rest of house	0.9058	0.8673	0.8162	0.7206	0.5880	0.4347	0.3009	0.3312	0.5245	0.7330	0.8616	0.9142 (89)
MIT 2	19.3795	18.5795	19.0158	19.5467	19.9130	20.1143	20.1688	20.1654	20.0477	19.6186	18.8800	18.5299 (90)
Living area fraction									fLA = Living area / (4) =			0.1840 (91)
MIT	19.5211	18.7728	19.1937	19.7067	20.0639	20.2612	20.3169	20.3126	20.1947	19.7747	19.0602	18.7147 (92)
Temperature adjustment												0.0000
adjusted MIT	19.5211	18.7728	19.1937	19.7067	20.0639	20.2612	20.3169	20.3126	20.1947	19.7747	19.0602	18.7147 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8974	0.8411	0.7918	0.7038	0.5825	0.4398	0.3114	0.3414	0.5256	0.7162	0.8364	0.8949 (94)
Useful gains	613.8371	653.8990	655.9744	619.8478	528.4513	377.3226	256.0761	267.1112	394.2744	517.9875	564.2551	586.9988 (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	1117.3066	1014.9860	925.6560	775.0181	597.8128	397.8100	261.1824	273.9932	431.2105	655.7624	860.6329	1051.4488 (97)
Space heating kWh	374.5813	242.6505	200.6431	111.7226	51.6049	0.0000	0.0000	0.0000	0.0000	102.5045	213.3920	345.5508 (98a)
Space heating requirement - total per year (kWh/year)												1642.6498
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	374.5813	242.6505	200.6431	111.7226	51.6049	0.0000	0.0000	0.0000	0.0000	102.5045	213.3920	345.5508 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1642.6498
Space heating per m2										(98c) / (4) =		20.5588 (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 %)

248.6050 (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	374.5813	242.6505	200.6431	111.7226	51.6049	0.0000	0.0000	0.0000	0.0000	102.5045	213.3920	345.5508 (98)
Space heating efficiency (main heating system 1)	248.6050	248.6050	248.6050	248.6050	248.6050	0.0000	0.0000	0.0000	0.0000	248.6050	248.6050	248.6050 (210)
Space heating fuel (main heating system)	150.6732	97.6048	80.7076	44.9398	20.7578	0.0000	0.0000	0.0000	0.0000	41.2319	85.8357	138.9959 (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	354.5350	314.4460	335.5334	297.6124	290.4636	233.2159	229.8434	238.8021	241.2931	300.7687	317.0226	350.9264 (64)
Efficiency of water heater (217)m	268.9798	268.9798	268.9798	268.9798	268.9798	268.9798	268.9798	268.9798	268.9798	268.9798	268.9798	268.9798 (216)
Fuel for water heating, kWh/month	131.8073	116.9032	124.7430	110.6449	107.9871	86.7039	85.4501	88.7807	89.7068	111.8183	117.8611	130.4657 (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	24.8061	22.4055	24.8061	24.0059	24.8061	24.0059	24.8061	24.8061	24.0059	24.8061	24.0059	24.8061 (231)
Lighting	24.0694	19.3094	17.3859	12.7377	9.8390	8.0385	8.9754	11.6666	15.1538	19.8825	22.4573	24.7384 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												660.7467 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												268.9798
Water heating fuel used												1302.8722 (219)
Space cooling fuel												0.0000 (221)

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Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.2180)		
mechanical ventilation fans (SFP = 1.2180)	292.0714	(230a)
Total electricity for the above, kWh/year	292.0714	(231)
Electricity for lighting (calculated in Appendix L)	194.2539	(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	2449.9442	(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	660.7467	0.1558	102.9163	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1302.8722	0.1415	184.3986	(264)
Space and water heating			287.3149	(265)
Pumps, fans and electric keep-hot	292.0714	0.1387	40.5139	(267)
Energy for lighting	194.2539	0.1443	28.0368	(268)
Total CO2, kg/year			355.8656	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.4500	(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	660.7467	1.5766	1041.7315	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1302.8722	1.5234	1984.7693	(278)
Space and water heating			3026.5008	(279)
Pumps, fans and electric keep-hot	292.0714	1.5128	441.8456	(281)
Energy for lighting	194.2539	1.5338	297.9531	(282)
Total Primary energy kWh/year			3766.2994	(286)
Dwelling Primary energy Rate (DPER)			47.1400	(287)

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

1. Overall dwelling characteristics

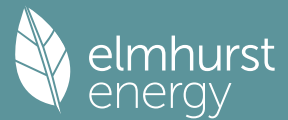
	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	39.9500 (1b)	x 2.3100 (2b)	= 92.2845	(1b) - (3b)
First floor	39.9500 (1c)	x 2.6100 (2c)	= 104.2695	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9000			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 196.5540	(5)

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	3 * 10 =	30.0000 (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) =	30.0000 / (5) = 0.1526 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4026 (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) =	0.3422 (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	0.4364	0.4278	0.4192	0.3765	0.3679	0.3251	0.3251	0.3166	0.3422	0.3679	0.3850	0.4021 (22b)
Effective ac	0.5952	0.5915	0.5879	0.5709	0.5677	0.5529	0.5529	0.5501	0.5586	0.5677	0.5741	0.5809 (25)

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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)			14.0300	1.1450	16.0649			(27)
Ground Floor			39.9500	0.1300	5.1935			(28a)
External Wall	100.7100	16.1700	84.5400	0.1800	15.2172			(29a)
Roof - ceiling	39.9500		39.9500	0.1100	4.3945			(30)
Total net area of external elements Aum(A, m ²)			180.6100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)... (30) + (32) =	43.0101			(33)
Party Wall			25.8300	0.0000	0.0000			(32)

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

100.0000 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element	11.1500	0.0500	0.5575	
E2 Other lintels (including other steel lintels)	8.3200	0.0500	0.4160	
E3 Sill	27.6000	0.0500	1.3800	
E4 Jamb	20.4700	0.1600	3.2752	
E5 Ground floor (normal)	20.4700	0.0000	0.0000	
E6 Intermediate floor within a dwelling	15.2200	0.0600	0.9132	
E10 Baves (insulation at ceiling level)	5.2500	0.0600	0.3150	
E12 Gable (insulation at ceiling level)	9.8500	0.0900	0.8865	
E16 Corner (normal)	9.8500	0.0600	0.5910	
E18 Party wall between dwellings	5.2500	0.0800	0.4200	
P1 Party wall - Ground floor	5.2500	0.0000	0.0000	
P2 Party wall - Intermediate floor within a dwelling	5.2500	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	5.2500	0.1200	0.6300	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				9.3844 (36)
Point Thermal Bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	52.3945 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	38.6064	38.3666	38.1316	37.0276	36.8211	35.8596	35.8596	35.6815	36.2299	36.8211	37.2389	37.6758	(38)
Heat transfer coeff	91.0009	90.7611	90.5261	89.4221	89.2156	88.2541	88.2541	88.0760	88.6244	89.2156	89.6334	90.0702	(39)
Average = Sum(39)m / 12 =												89.4211	
HLP	1.1389	1.1359	1.1330	1.1192	1.1166	1.1046	1.1046	1.1023	1.1092	1.1166	1.1218	1.1273	(40)
HLP (average)												1.1192	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

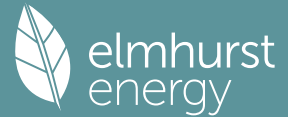
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.4610 (42)
Hot water usage for mixer showers	65.4819	64.4979	63.0639	60.3202	58.2955	56.0375	54.7541	56.1772	57.7372	60.1616	62.9642	65.2310	(42a)
Hot water usage for baths	28.2826	27.8626	27.2711	26.1804	25.3638	24.4583	23.9692	24.5565	25.1960	26.1650	27.2781	28.1870	(42b)
Hot water usage for other uses	39.8327	38.3842	36.9358	35.4873	34.0389	32.5904	32.5904	34.0389	35.4873	36.9358	38.3842	39.8327	(42c)
Average daily hot water use (litres/day)												122.8061	(43)
Daily hot water use	133.5972	130.7447	127.2707	121.9880	117.6981	113.0862	111.3136	114.7726	118.4206	123.2624	128.6265	133.2507	(44)
Energy conte	211.5854	186.1787	195.6104	166.9955	158.4443	139.0526	134.6242	142.1124	146.0244	167.2658	183.2520	208.6384	(45)
Energy content (annual)										Total = Sum(45)m =		2039.7841	
Distribution loss (46)m = 0.15 x (45)m	31.7378	27.9268	29.3416	25.0493	23.7666	20.8579	20.1936	21.3169	21.9037	25.0899	27.4878	31.2958	(46)
Water storage loss:													
Store volume												230.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7973	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9706	(55)
Total storage loss	30.0872	27.1756	30.0872	29.1167	30.0872	29.1167	30.0872	30.0872	29.1167	30.0872	29.1167	30.0872	(56)
If cylinder contains dedicated solar storage	30.0872	27.1756	30.0872	29.1167	30.0872	29.1167	30.0872	30.0872	29.1167	30.0872	29.1167	30.0872	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.9350	234.3654	248.9600	218.6241	211.7939	190.6813	187.9738	195.4620	197.6531	220.6155	234.8807	261.9881	(62)
WWHRS	-29.9356	-26.4753	-27.7234	-22.9561	-21.3942	-18.3072	-17.1601	-18.2480	-18.9413	-22.3297	-25.2969	-29.3812	(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	234.9994	207.8901	221.2366	195.6681	190.3997	172.3741	170.8137	177.2140	178.7117	198.2857	209.5838	232.6068	(64)
Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2389.7837	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month	113.0318	100.4538	107.7201	96.8289	95.3624	87.5379	87.4422	89.9321	89.8560	98.2956	102.2342	112.0520	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	123.0480	123.0480	123.0480	123.0480	123.0480	123.0480	123.0480	123.0480	123.0480	123.0480	123.0480	123.0480	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	113.4003	125.5503	113.4003	117.1803	113.4003	117.1803	113.4003	113.4003	117.1803	113.4003	117.1803	113.4003	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.2314	221.5064	215.7736	203.5692	188.1634	173.6841	164.0110	161.7361	167.4688	179.6732	195.0790	209.5583	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3048	35.3048	35.3048	35.3048	35.3048	35.3048	35.3048	35.3048	35.3048	35.3048	35.3048	35.3048	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4384	-98.4384	-98.4384	-98.4384	-98.4384	-98.4384	-98.4384	-98.4384	-98.4384	-98.4384	-98.4384	-98.4384	(71)

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Water heating gains (Table 5)	151.9245	149.4848	144.7851	134.4846	128.1753	121.5805	117.5299	120.8764	124.8001	132.1177	141.9920	150.6075 (72)
Total internal gains	547.4706	559.4559	536.8734	518.1485	492.6534	472.3592	454.8556	455.9272	469.3636	488.1056	517.1657	536.4805 (73)

6. Solar gains

[Jan]	Area m ²			Solar flux Table 6a W/m ²		Specific data or Table 6b		Specific data or Table 6c		Access factor Table 6d		Gains W
North	7.4700			10.6334		0.6300		0.7000		0.7700		24.2753 (74)
South	6.5600			46.7521		0.6300		0.7000		0.7700		93.7295 (78)
Solar gains	118.0048	199.8961	274.3681	347.6218	400.8667	404.2295	387.0259	345.5500	299.0418	220.7921	141.0481	101.2280 (83)
Total gains	665.4754	759.3520	811.2415	865.7703	893.5200	876.5888	841.8815	801.4772	768.4054	708.8978	658.2139	637.7086 (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	24.3893	24.4537	24.5172	24.8199	24.8773	25.1484	25.1484	25.1992	25.0433	24.8773	24.7614	24.6413
alpha	2.6260	2.6302	2.6345	2.6547	2.6585	2.6766	2.6766	2.6799	2.6696	2.6585	2.6508	2.6428
util living area	0.9323	0.9053	0.8699	0.8016	0.6992	0.5561	0.4280	0.4618	0.6402	0.8158	0.9037	0.9384 (86)
MIT	18.6960	19.0155	19.4417	19.9990	20.4708	20.7995	20.9274	20.9091	20.6904	20.0975	19.3219	18.6468 (87)
Th 2	19.9692	19.9716	19.9740	19.9852	19.9873	19.9971	19.9971	19.9989	19.9933	19.9873	19.9831	19.9786 (88)
util rest of house	0.9231	0.8927	0.8520	0.7735	0.6548	0.4891	0.3413	0.3749	0.5772	0.7841	0.8888	0.9299 (89)
MIT 2	17.3008	17.7007	18.2327	18.9207	19.4762	19.8389	19.9557	19.9440	19.7316	19.0541	18.0988	17.2448 (90)
Living area fraction	17.5575	17.9426	18.4552	19.1191	19.6592	20.0156	20.1345	20.1216	19.9080	19.2461	18.3239	17.5028 (91)
MIT	17.5575	17.9426	18.4552	19.1191	19.6592	20.0156	20.1345	20.1216	19.9080	19.2461	18.3239	17.5028 (92)
Temperature adjustment	17.5575	17.9426	18.4552	19.1191	19.6592	20.0156	20.1345	20.1216	19.9080	19.2461	18.3239	17.5028 (93)
adjusted MIT	17.5575	17.9426	18.4552	19.1191	19.6592	20.0156	20.1345	20.1216	19.9080	19.2461	18.3239	17.5028 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8937	0.8607	0.8195	0.7457	0.6389	0.4904	0.3537	0.3861	0.5713	0.7566	0.8574	0.9018 (94)
Useful gains	594.7314	653.5603	664.8082	645.5926	570.8986	429.9182	297.7927	309.4557	439.0187	536.3406	564.3560	575.0745 (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	1206.4470	1183.7634	1082.2532	913.8112	710.0866	477.9507	311.9298	327.7801	514.7313	771.3654	1006.0323	1198.1840 (97)
Space heating kWh	455.1165	356.2965	310.5791	193.1174	103.5559	0.0000	0.0000	0.0000	0.0000	174.8584	318.0069	463.5934 (98a)
Space heating requirement - total per year (kWh/year)												2375.1241
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	455.1165	356.2965	310.5791	193.1174	103.5559	0.0000	0.0000	0.0000	0.0000	174.8584	318.0069	463.5934 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2375.1241
Space heating per m ²										(98c) / (4) =		29.7262 (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	455.1165	356.2965	310.5791	193.1174	103.5559	0.0000	0.0000	0.0000	0.0000	174.8584	318.0069	463.5934 (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)	493.0839	386.0201	336.4887	209.2279	112.1949	0.0000	0.0000	0.0000	0.0000	189.4458	344.5362	502.2681 (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	234.9994	207.8901	221.2366	195.6681	190.3997	172.3741	170.8137	177.2140	178.7117	198.2857	209.5838	232.6068 (64)
Efficiency of water heater	85.5158	85.2569	84.8204	84.0304	82.7547	79.8000	79.8000	79.8000	79.8000	83.7790	84.9922	85.5754 (217)
Fuel for water heating, kWh/month	274.8023	243.8396	260.8294	232.8540	230.0772	216.0077	214.0523	222.0727	223.9495	236.6771	246.5919	271.8151 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	23.5623	18.9026	17.0197	12.4693	9.6317	7.8692	7.8693	11.4208	14.8345	19.4637	21.9842	24.2172 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-37.2317	-52.4152	-75.2392	-84.4798	-90.9990	-84.9005	-83.8434	-79.1930	-70.9798	-59.8705	-40.9023	-32.1971 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)

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Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-21.2630	-44.7050	-88.8111	-133.3288	-176.2404	-177.0649	-174.9882	-148.1936	-108.6587	-63.9216	-28.3853	-16.8167	(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												2573.2656	(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												2873.5687	(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)												190.1616	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1974.6288	(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												3748.3669	(238)

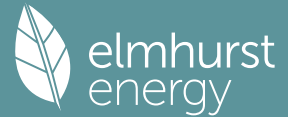
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2573.2656	0.2100	540.3858 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2873.5687	0.2100	603.4494 (264)
Space and water heating			1143.8352 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	190.1616	0.1443	27.4462 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-792.2516	0.1346	-106.6499
PV Unit electricity exported	-1182.3773	0.1259	-148.8712
Total			-255.5211 (269)
Total CO2, kg/year			927.6896 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.6100 (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	2573.2656	1.1300	2907.7901 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2873.5687	1.1300	3247.1326 (278)
Space and water heating			6154.9227 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	190.1616	1.5338	291.6761 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-792.2516	1.4975	-1186.4128
PV Unit electricity exported	-1182.3773	0.4622	-546.4603
Total			-1732.8731 (283)
Total Primary energy kWh/year			4843.8265 (286)
Target Primary Energy Rate (TPER)			60.6200 (287)

Full SAP Calculation Printout



Property Reference	OP-D320 A2CEDA				Issued on Date	29/11/2024			
Assessment Reference	A2CEDA		Prop Type Ref		A2CEDA				
Property	A2CEDA								
SAP Rating	81 B		DER		4.45		TER	11.61	
Environmental	96 A		% DER < TER					61.67	
CO ₂ Emissions (t/year)	0.33		DFEE		35.45		TFEE	36.69	
Compliance Check	See BREL		% DFEE < TFEE					3.38	
% DPER < TPER	22.24		DPER		47.14		TPER	60.62	
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	39.9500 (1b)	x 2.3100 (2b)	= 92.2845 (1b) - (3b)
First floor	39.9500 (1c)	x 2.6100 (2c)	= 104.2695 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 196.5540 (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	3 * 10 = 30.0000 (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) =	30.0000 / (5) = 0.1526 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.5000 (17)
Infiltration rate	0.3276 (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) = 0.2785 (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	0.3551	0.3481	0.3411	0.3063	0.2994	0.2646	0.2646	0.2576	0.2785	0.2994	0.3133	0.3272 (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	0.5630	0.5606	0.5582	0.5469	0.5448	0.5350	0.5350	0.5332	0.5388	0.5448	0.5491	0.5535 (25)

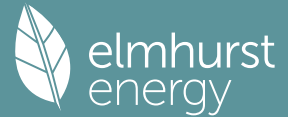
3. Heat losses and heat loss parameter

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)			14.0300	1.2357	17.3375		(27)
Ground Floor			39.9500	0.1100	4.3945		(28a)
External Wall	100.7100	16.1700	84.5400	0.1700	14.3718		(29a)
Roof - ceiling	39.9500		39.9500	0.1100	4.3945		(30)
Total net area of external elements Aum(A, m ²)			180.6100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	42.6383		(33)
Party Wall			25.8300	0.0000	0.0000		(32)

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

List of Thermal Bridges	Length	Psi-value	Total
K1 Element	11.1500	0.0500	0.5575
E2 Other lintels (including other steel lintels)	8.3200	0.0500	0.4160
E3 Sill	27.6000	0.0500	1.3800
E4 Jamb	20.4700	0.1600	3.2752
E5 Ground floor (normal)	20.4700	0.0000	0.0000
E6 Intermediate floor within a dwelling			

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E10 Eaves (insulation at ceiling level)	15.2200	0.0600	0.9132	
E12 Gable (insulation at ceiling level)	5.2500	0.0600	0.3150	
E16 Corner (normal)	9.8500	0.0900	0.8865	
E18 Party wall between dwellings	9.8500	0.0600	0.5910	
P1 Party wall - Ground floor	5.2500	0.0800	0.4200	
P2 Party wall - Intermediate floor within a dwelling	5.2500	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	5.2500	0.1200	0.6300	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			9.3844	(36)
Point Thermal Bridges			0.0000	
Total fabric heat loss			(33) + (36) + (36a) =	52.0227 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	36.5202	36.3614	36.2058	35.4748	35.3380	34.7014	34.7014	34.5835	34.9466	35.3380	35.6147	35.9039
Heat transfer coeff	88.5428	88.3840	88.2284	87.4974	87.3607	86.7240	86.7240	86.6061	86.9693	87.3607	87.6373	87.9266
Average = Sum(39)m / 12 =												87.4968
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1082	1.1062	1.1042	1.0951	1.0934	1.0854	1.0854	1.0839	1.0885	1.0934	1.0968	1.1005
HLP (average)												1.0951
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4610	(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	28.2826	27.8626	27.2711	26.1804	25.3638	24.4583	23.9692	24.5565	25.1960	26.1650	27.2781	28.1870	(42b)
Hot water usage for other uses	39.8327	38.3842	36.9358	35.4873	34.0389	32.5904	32.5904	34.0389	35.4873	36.9358	38.3842	39.8327	(42c)
Average daily hot water use (litres/day)												62.4340	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.1153	66.2468	64.2068	61.6678	59.4027	57.0487	56.5595	58.5954	60.6834	63.1008	65.6623	68.0197	(44)
Energy conte	107.8780	94.3346	98.6835	84.4201	79.9674	70.1480	68.4039	72.5533	74.8287	85.6271	93.5480	106.5024	(45)
Energy content (annual)										Total = Sum(45)m =		1036.8949	
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	91.6963	80.1844	83.8810	71.7571	67.9723	59.6258	58.1433	61.6703	63.6044	72.7831	79.5158	90.5270	(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	91.6963	80.1844	83.8810	71.7571	67.9723	59.6258	58.1433	61.6703	63.6044	72.7831	79.5158	90.5270	(64)
12Total per year (kWh/year)								Total per year (kWh/year) = Sum(64)m =				881.3607	(64)
Electric shower(s)	52.4401	46.7246	51.0214	48.6891	49.6028	47.3162	48.8934	49.6028	48.6891	51.0214	50.0620	52.4401	(64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				596.5032	(64a)
Heat gains from water heating, kWh/month	36.0341	31.7272	33.7256	30.1116	29.3938	26.7355	26.7592	27.8183	28.0734	30.9511	32.3945	35.7418	(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	123.0480	123.0480	123.0480	123.0480	123.0480	123.0480	123.0480	123.0480	123.0480	123.0480	123.0480	123.0480	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	113.4003	125.5503	113.4003	117.1803	113.4003	117.1803	113.4003	113.4003	117.1803	113.4003	117.1803	113.4003	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.2314	221.5064	215.7736	203.5692	188.1634	173.6841	164.0110	161.7361	167.4688	179.6732	195.0790	209.5583	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3048	35.3048	35.3048	35.3048	35.3048	35.3048	35.3048	35.3048	35.3048	35.3048	35.3048	35.3048	(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)	-98.4384	-98.4384	-98.4384	-98.4384	-98.4384	-98.4384	-98.4384	-98.4384	-98.4384	-98.4384	-98.4384	-98.4384	(71)
Water heating gains (Table 5)	48.4329	47.2132	45.3301	41.8216	39.5077	37.1326	35.9666	37.3902	38.9908	41.6010	44.9923	48.0400	(72)
Total internal gains	440.9790	454.1842	434.4184	422.4855	400.9858	387.9114	373.2923	372.4409	383.5543	394.5889	417.1660	430.9131	(73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	7.4700	10.6334	0.6300	0.7000	0.7700	24.2753
South	6.5600	46.7521	0.6300	0.7000	0.7700	93.7295
Solar gains	118.0048	199.8961	274.3681	347.6218	400.8667	404.2295
Total gains	558.9839	654.0804	708.7865	770.1073	801.8525	792.1409
						387.0259
						760.3183
						345.5500
						299.0418
						220.7921
						141.0481
						101.2280
						532.1411

7. Mean internal temperature (heating season)

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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	25.0663	25.1114	25.1557	25.3658	25.4055	25.5920	25.5920	25.6269	25.5199	25.4055	25.3253	25.2420
alpha	2.6711	2.6741	2.6770	2.6911	2.6937	2.7061	2.7061	2.7085	2.7013	2.6937	2.6884	2.6828
util living area	0.9524	0.9283	0.8964	0.8325	0.7340	0.5913	0.4599	0.4984	0.6813	0.8519	0.9296	0.9577 (86)
MIT	18.5493	18.8858	19.3300	19.9135	20.4172	20.7738	20.9167	20.8941	20.6478	19.9995	19.1818	18.4875 (87)
Th 2	19.9942	19.9958	19.9974	20.0048	20.0062	20.0128	20.0128	20.0140	20.0103	20.0062	20.0034	20.0005 (88)
util rest of house	0.9456	0.9183	0.8815	0.8074	0.6919	0.5242	0.3702	0.4087	0.6201	0.8244	0.9180	0.9516 (89)
MIT 2	17.7643	18.0946	18.5294	19.0945	19.5615	19.8712	19.9749	19.9630	19.7736	19.1878	18.3956	17.7077 (90)
Living area fraction									fLA = Living area /	(4) =		0.1840 (91)
MIT	17.9087	18.2402	18.6767	19.2452	19.7190	20.0373	20.1482	20.1343	19.9344	19.3371	18.5403	17.8512 (92)
Temperature adjustment												0.0000
adjusted MIT	17.9087	18.2402	18.6767	19.2452	19.7190	20.0373	20.1482	20.1343	19.9344	19.3371	18.5403	17.8512 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9267	0.8960	0.8573	0.7850	0.6784	0.5260	0.3831	0.4203	0.6149	0.8023	0.8962	0.9339 (94)
Useful gains	518.0256	586.0248	607.6632	604.5225	543.9386	416.6279	291.2968	301.7931	419.7063	493.7224	500.2797	496.9722 (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	1204.9544	1179.0585	1074.3294	905.1792	700.5417	471.5453	307.7114	323.4117	507.4141	763.2814	1002.5941	1200.3027 (97)
Space heating kWh	511.0750	398.5187	347.1997	216.4728	116.5127	0.0000	0.0000	0.0000	0.0000	200.5519	361.6664	523.2779 (98a)
Space heating requirement - total per year (kWh/year)												2675.2751
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	511.0750	398.5187	347.1997	216.4728	116.5127	0.0000	0.0000	0.0000	0.0000	200.5519	361.6664	523.2779 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2675.2751
Space heating per m2										(98c) / (4) =		33.4828 (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	815.2058	641.7577	658.2065	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7575	0.8214	0.7963	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	617.5499	527.1418	524.1371	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	880.2067	845.2942	798.0585	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	189.1129	236.7054	203.7976	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	47.2782	59.1764	50.9494	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												157.4040 (107)
Energy for space heating												33.4828 (99)
Energy for space cooling												1.9700 (108)
Total												35.4528 (109)
Fabric Energy Efficiency (DFEE)												35.5 (109)

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

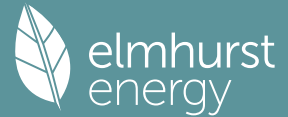
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	39.9500 (1b)	x 2.3100 (2b)	= 92.2845 (1b) - (3b)
First floor	39.9500 (1c)	x 2.6100 (2c)	= 104.2695 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	196.5540 (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	3 * 10 = 30.0000 (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) = 30.0000 / (5) = 0.1526 (8)
Pressure test	Yes

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Pressure Test Method
Measured/design AP50
Infiltration rate
Number of sides sheltered

Blower Door
5.0000 (17)
0.4026 (18)
2 (19)

Shelter factor
Infiltration rate adjusted to include shelter factor

(20) = 1 - [0.075 x (19)] = 0.8500 (20)
(21) = (18) x (20) = 0.3422 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4364	0.4278	0.4192	0.3765	0.3679	0.3251	0.3251	0.3166	0.3422	0.3679	0.3850	0.4021	(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	0.5952	0.5915	0.5879	0.5709	0.5677	0.5529	0.5529	0.5501	0.5586	0.5677	0.5741	0.5809	(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)			14.0300	1.1450	16.0649			(27)
Ground Floor			39.9500	0.1300	5.1935			(28a)
External Wall	100.7100	16.1700	84.5400	0.1800	15.2172			(29a)
Roof - ceiling	39.9500		39.9500	0.1100	4.3945			(30)
Total net area of external elements Aum (A, m2)			180.6100					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	43.0101		(33)
Party Wall			25.8300	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)	11.1500	0.0500	0.5575	
E3 Sill	8.3200	0.0500	0.4160	
E4 Jamb	27.6000	0.0500	1.3800	
E5 Ground floor (normal)	20.4700	0.1600	3.2752	
E6 Intermediate floor within a dwelling	20.4700	0.0000	0.0000	
E10 Eaves (insulation at ceiling level)	15.2200	0.0600	0.9132	
E12 Gable (insulation at ceiling level)	5.2500	0.0600	0.3150	
E16 Corner (normal)	9.8500	0.0900	0.8865	
E18 Party wall between dwellings	9.8500	0.0600	0.5910	
P1 Party wall - Ground floor	5.2500	0.0800	0.4200	
P2 Party wall - Intermediate floor within a dwelling	5.2500	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	5.2500	0.1200	0.6300	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				9.3844 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	52.3945 (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	
	38.6064	38.3666	38.1316	37.0276	36.8211	35.8596	35.8596	35.6815	36.2299	36.8211	37.2389	37.6758	(38)
Heat transfer coeff	91.0009	90.7611	90.5261	89.4221	89.2156	88.2541	88.2541	88.0760	88.6244	89.2156	89.6334	90.0702	(39)
Average = Sum(39)m / 12 =												89.4211	

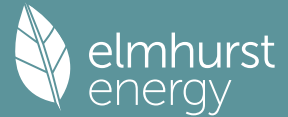
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	1.1389	1.1359	1.1330	1.1192	1.1166	1.1046	1.1046	1.1023	1.1092	1.1166	1.1218	1.1273	(40)
HLP (average)												1.1192	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.4610 (42)
Hot water usage for mixer showers													(42a)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Hot water usage for baths	28.2826	27.8626	27.2711	26.1804	25.3638	24.4583	23.9692	24.5565	25.1960	26.1650	27.2781	28.1870	(42b)
Hot water usage for other uses	39.8327	38.3842	36.9358	35.4873	34.0389	32.5904	32.5904	34.0389	35.4873	36.9358	38.3842	39.8327	(42c)
Average daily hot water use (litres/day)												62.4340	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.1153	66.2468	64.2068	61.6678	59.4027	57.0487	56.5595	58.5954	60.6834	63.1008	65.6623	68.0197	(44)
Energy conte	107.8780	94.3346	98.6835	84.4201	79.9674	70.1480	68.4039	72.5533	74.8287	85.6271	93.5480	106.5024	(45)
Energy content (annual)										Total = Sum(45)m =		1036.8949	
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	91.6963	80.1844	83.8810	71.7571	67.9723	59.6258	58.1433	61.6703	63.6044	72.7831	79.5158	90.5270	(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	91.6963	80.1844	83.8810	71.7571	67.9723	59.6258	58.1433	61.6703	63.6044	72.7831	79.5158	90.5270	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		881.3607	(64)
Electric shower(s)	52.4401	46.7246	51.0214	48.6891	49.6028	47.3162	48.8934	49.6028	48.6891	51.0214	50.0620	52.4401	(64a)
												596.5032	(64a)
Heat gains from water heating, kWh/month	36.0341	31.7272	33.7256	30.1116	29.3938	26.7355	26.7592	27.8183	28.0734	30.9511	32.3945	35.7418	(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	123.0480	123.0480	123.0480	123.0480	123.0480	123.0480	123.0480	123.0480	123.0480	123.0480	123.0480	123.0480 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	113.4003	125.5503	113.4003	117.1803	113.4003	117.1803	113.4003	113.4003	117.1803	113.4003	117.1803	113.4003 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.2314	221.5064	215.7736	203.5692	188.1634	173.6841	164.0110	161.7361	167.4688	179.6732	195.0790	209.5583 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3048	35.3048	35.3048	35.3048	35.3048	35.3048	35.3048	35.3048	35.3048	35.3048	35.3048	35.3048 (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)	-98.4384	-98.4384	-98.4384	-98.4384	-98.4384	-98.4384	-98.4384	-98.4384	-98.4384	-98.4384	-98.4384	-98.4384 (71)
Water heating gains (Table 5)	48.4329	47.2132	45.3301	41.8216	39.5077	37.1326	35.9666	37.3902	38.9908	41.6010	44.9923	48.0400 (72)
Total internal gains	440.9790	454.1842	434.4184	422.4855	400.9858	387.9114	373.2923	372.4409	383.5543	394.5889	417.1660	430.9131 (73)

6. Solar gains

[Jan]	Area m ²		Solar flux Table 6a W/m ²		Specific data or Table 6b		Specific data or Table 6c		Access factor Table 6d		Gains W	
North	7.4700		10.6334		0.6300		0.7000		0.7700		24.2753 (74)	
South	6.5600		46.7521		0.6300		0.7000		0.7700		93.7295 (78)	
Solar gains	118.0048	199.8961	274.3681	347.6218	400.8667	404.2295	387.0259	345.5500	299.0418	220.7921	141.0481	101.2280 (83)
Total gains	558.9839	654.0804	708.7865	770.1073	801.8525	792.1409	760.3183	717.9909	682.5962	615.3810	558.2142	532.1411 (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	24.3893	24.4537	24.5172	24.8199	24.8773	25.1484	25.1484	25.1992	25.0433	24.8773	24.7614	24.6413
alpha	2.6260	2.6302	2.6345	2.6547	2.6585	2.6766	2.6766	2.6799	2.6696	2.6585	2.6508	2.6428
util living area	0.9530	0.9295	0.8985	0.8357	0.7389	0.5967	0.4655	0.5039	0.6864	0.8546	0.9306	0.9581 (86)
MIT	18.4713	18.8116	19.2650	19.8690	20.3876	20.7611	20.9109	20.8874	20.6298	19.9621	19.1277	18.4190 (87)
Th 2	19.9692	19.9716	19.9740	19.9852	19.9873	19.9971	19.9971	19.9989	19.9933	19.9873	19.9831	19.9786 (88)
util rest of house	0.9462	0.9195	0.8836	0.8106	0.6966	0.5287	0.3739	0.4125	0.6246	0.8271	0.9191	0.9520 (89)
MIT 2	17.6710	18.0058	18.4503	19.0383	19.5204	19.8479	19.9568	19.9449	19.7449	19.1391	18.3291	17.6259 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	17.8183	18.1541	18.6002	19.1911	19.6800	20.0159	20.1323	20.1183	19.9077	19.2905	18.4761	17.7718 (92)
Temperature adjustment	0.0000											
adjusted MIT	17.8183	18.1541	18.6002	19.1911	19.6800	20.0159	20.1323	20.1183	19.9077	19.2905	18.4761	17.7718 (93)

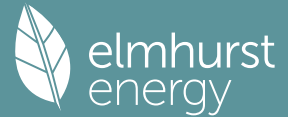
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9271	0.8968	0.8589	0.7875	0.6822	0.5300	0.3869	0.4241	0.6187	0.8044	0.8969	0.9341 (94)
Useful gains	518.2155	586.5957	608.7665	606.4409	547.0009	419.8688	294.1642	304.4835	422.3442	494.9949	500.6834	497.0816 (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	1230.1735	1202.9535	1095.3826	920.2544	711.9370	477.9778	311.7421	327.4944	514.7046	775.3286	1019.6742	1222.4159 (97)
Space heating kWh	529.6967	414.1925	362.0424	225.9457	122.7125	0.0000	0.0000	0.0000	0.0000	208.5682	373.6734	539.6487 (98a)
Space heating requirement - total per year (kWh/year)												2776.4802
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	529.6967	414.1925	362.0424	225.9457	122.7125	0.0000	0.0000	0.0000	0.0000	208.5682	373.6734	539.6487 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2776.4802
Space heating per m ²												(98c) / (4) = 34.7494 (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	829.5882	653.0801	669.3777	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7492	0.8139	0.7887	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	621.5210	531.5659	527.9567	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	880.2067	845.2942	798.0585	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	186.2537	233.4139	200.9558	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction	fc = cooled area / (4) =											
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	46.5634	58.3535	50.2389	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												155.1558 (107)
Energy for space heating												34.7494 (99)
Energy for space cooling												1.9419 (108)
Total												36.6913 (109)
Fabric Energy Efficiency (TFEE)												36.7 (109)

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Property Reference	OP-D320 A2CEDA				Issued on Date	29/11/2024		
Assessment Reference	A2CEDA			Prop Type Ref	A2CEDA			
Property	A2CEDA							
SAP Rating	81 B		DER	4.45		TER	11.61	
Environmental	96 A		% DER < TER				61.67	
CO ₂ Emissions (t/year)	0.33		DFEE	35.45		TFEE	36.69	
Compliance Check	See BREL		% DFEE < TFEE				3.38	
% DPER < TPER	22.24		DPER	47.14		TPER	60.62	
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	39.9500 (1b)	x 2.3100 (2b)	= 92.2845 (1b) - (3b)
First floor	39.9500 (1c)	x 2.6100 (2c)	= 104.2695 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 196.5540 (5)

2. Ventilation rate

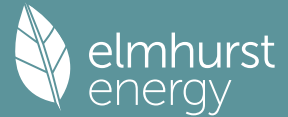
	m ³ per hour											
Number of open chimneys	0 * 80 = 0.0000 (6a)											
Number of open flues	0 * 20 = 0.0000 (6b)											
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)											
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)											
Number 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) =												72.0000 (23c)
Effective ac	0.3297	0.3259	0.3222	0.3036	0.2999	0.2813	0.2813	0.2776	0.2888	0.2999	0.3073	0.3148 (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)			14.0300	1.2357	17.3375		(27)
Ground Floor			39.9500	0.1100	4.3945		(28a)
External Wall	100.7100	16.1700	84.5400	0.1700	14.3718		(29a)
Roof - ceiling	39.9500		39.9500	0.1100	4.3945		(30)
Total net area of external elements Aum(A, m ²)			180.6100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	42.6383		(33)
Party Wall			25.8300	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)				11.1500	0.0500	0.5575	
E3 Sill				8.3200	0.0500	0.4160	

6. Solar gains													
[Jan]				Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W				
North				7.4700	10.6334	0.6300	0.7000	0.7700	24.2753 (74)				
South				6.5600	46.7521	0.6300	0.7000	0.7700	93.7295 (78)				
Solar gains	118.0048	199.8961	274.3681	347.6218	400.8667	404.2295	387.0259	345.5500	299.0418	220.7921	141.0481	101.2280	(83)

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Total gains 684.0148 777.4715 828.4282 880.7438 907.1745 857.8746 822.2365 782.4893 750.2018 723.2152 674.6438 655.9522 (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	30.2356	30.3352	30.4356	30.9474	31.0519	31.5848	31.5848	31.6936	31.3694	31.0519	30.8437	30.6383
alpha	3.0157	3.0223	3.0290	3.0632	3.0701	3.1057	3.1057	3.1129	3.0913	3.0701	3.0562	3.0426
util living area	0.9158	0.8807	0.8348	0.7483	0.6277	0.4881	0.3646	0.3960	0.5780	0.7646	0.8775	0.9234 (86)
Living	19.3369	19.6300	19.9827	20.4162	20.7333	20.9128	20.9735	20.9654	20.8466	20.4669	19.8596	19.2962
Non living	18.2148	18.5795	19.0158	19.5467	19.9130	20.1143	20.1688	20.1654	20.0477	19.6186	18.8800	18.1711
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.1492	19.6300	19.9827	20.4162	20.7333	20.9128	20.9735	20.9654	20.8466	20.4669	19.8596	19.5345 (87)
Th 2	20.1516	20.1542	20.1567	20.1696	20.1721	20.1850	20.1850	20.1876	20.1798	20.1721	20.1670	20.1619 (88)
util rest of house	0.9058	0.8673	0.8162	0.7206	0.5880	0.4347	0.3009	0.3312	0.5245	0.7330	0.8616	0.9142 (89)
MIT 2	19.3795	18.5795	19.0158	19.5467	19.9130	20.1143	20.1688	20.1654	20.0477	19.6186	18.8800	18.5299 (90)
Living area fraction									fLA = Living area / (4) =			0.1840 (91)
MIT	19.5211	18.7728	19.1937	19.7067	20.0639	20.2612	20.3169	20.3126	20.1947	19.7747	19.0602	18.7147 (92)
Temperature adjustment												0.0000
adjusted MIT	19.5211	18.7728	19.1937	19.7067	20.0639	20.2612	20.3169	20.3126	20.1947	19.7747	19.0602	18.7147 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8974	0.8411	0.7918	0.7038	0.5825	0.4398	0.3114	0.3414	0.5256	0.7162	0.8364	0.8949 (94)
Useful gains	613.8371	653.8990	655.9744	619.8478	528.4513	377.3226	256.0761	267.1112	394.2744	517.9875	564.2551	586.9988 (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	1117.3066	1014.9860	925.6560	775.0181	597.8128	397.8100	261.1824	273.9932	431.2105	655.7624	860.6329	1051.4488 (97)
Space heating kWh	374.5813	242.6505	200.6431	111.7226	51.6049	0.0000	0.0000	0.0000	0.0000	102.5045	213.3920	345.5508 (98a)
Space heating requirement - total per year (kWh/year)												1642.6498
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	374.5813	242.6505	200.6431	111.7226	51.6049	0.0000	0.0000	0.0000	0.0000	102.5045	213.3920	345.5508 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1642.6498
Space heating per m2										(98c) / (4) =		20.5588 (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 %)

248.6050 (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	374.5813	242.6505	200.6431	111.7226	51.6049	0.0000	0.0000	0.0000	0.0000	102.5045	213.3920	345.5508 (98)
Space heating efficiency (main heating system 1)	248.6050	248.6050	248.6050	248.6050	248.6050	0.0000	0.0000	0.0000	0.0000	248.6050	248.6050	248.6050 (210)
Space heating fuel (main heating system)	150.6732	97.6048	80.7076	44.9398	20.7578	0.0000	0.0000	0.0000	0.0000	41.2319	85.8357	138.9959 (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	354.5350	314.4460	335.5334	297.6124	290.4636	233.2159	229.8434	238.8021	241.2931	300.7687	317.0226	350.9264 (64)
Efficiency of water heater (217)m	268.9798	268.9798	268.9798	268.9798	268.9798	268.9798	268.9798	268.9798	268.9798	268.9798	268.9798	268.9798 (216)
Fuel for water heating, kWh/month	131.8073	116.9032	124.7430	110.6449	107.9871	86.7039	85.4501	88.7807	89.7068	111.8183	117.8611	130.4657 (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	24.8061	22.4055	24.8061	24.0059	24.8061	24.0059	24.8061	24.8061	24.0059	24.8061	24.0059	24.8061 (231)
Lighting	24.0694	19.3094	17.3859	12.7377	9.8390	8.0385	8.9754	11.6666	15.1538	19.8825	22.4573	24.7384 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												660.7467 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												268.9798
Water heating fuel used												1302.8722 (219)
Space cooling fuel												0.0000 (221)

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Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.2180)		
mechanical ventilation fans (SFP = 1.2180)	292.0714	(230a)
Total electricity for the above, kWh/year	292.0714	(231)
Electricity for lighting (calculated in Appendix L)	194.2539	(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	2449.9442	(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	660.7467	0.1558	102.9163	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1302.8722	0.1415	184.3986	(264)
Space and water heating			287.3149	(265)
Pumps, fans and electric keep-hot	292.0714	0.1387	40.5139	(267)
Energy for lighting	194.2539	0.1443	28.0368	(268)
Total CO2, kg/year			355.8656	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.4500	(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	660.7467	1.5766	1041.7315	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1302.8722	1.5234	1984.7693	(278)
Space and water heating			3026.5008	(279)
Pumps, fans and electric keep-hot	292.0714	1.5128	441.8456	(281)
Energy for lighting	194.2539	1.5338	297.9531	(282)
Total Primary energy kWh/year			3766.2994	(286)
Dwelling Primary energy Rate (DPER)			47.1400	(287)

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

1. Overall dwelling characteristics

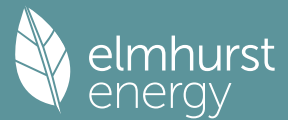
	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	39.9500 (1b)	x 2.3100 (2b)	= 92.2845	(1b) - (3b)
First floor	39.9500 (1c)	x 2.6100 (2c)	= 104.2695	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9000			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 196.5540	(5)

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	3 * 10 =	30.0000 (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) =	30.0000 / (5) = 0.1526 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4026 (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) =	0.3422 (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	0.4364	0.4278	0.4192	0.3765	0.3679	0.3251	0.3251	0.3166	0.3422	0.3679	0.3850	0.4021 (22b)
Effective ac	0.5952	0.5915	0.5879	0.5709	0.5677	0.5529	0.5529	0.5501	0.5586	0.5677	0.5741	0.5809 (25)

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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)			14.0300	1.1450	16.0649			(27)
Ground Floor			39.9500	0.1300	5.1935			(28a)
External Wall	100.7100	16.1700	84.5400	0.1800	15.2172			(29a)
Roof - ceiling	39.9500		39.9500	0.1100	4.3945			(30)
Total net area of external elements Aum(A, m ²)			180.6100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	43.0101			(33)
Party Wall			25.8300	0.0000	0.0000			(32)

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

100.0000 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element	11.1500	0.0500	0.5575	
E2 Other lintels (including other steel lintels)	8.3200	0.0500	0.4160	
E3 Sill	27.6000	0.0500	1.3800	
E4 Jamb	20.4700	0.1600	3.2752	
E5 Ground floor (normal)	20.4700	0.0000	0.0000	
E6 Intermediate floor within a dwelling	15.2200	0.0600	0.9132	
E10 Baves (insulation at ceiling level)	5.2500	0.0600	0.3150	
E12 Gable (insulation at ceiling level)	9.8500	0.0900	0.8865	
E16 Corner (normal)	9.8500	0.0600	0.5910	
E18 Party wall between dwellings	5.2500	0.0800	0.4200	
P1 Party wall - Ground floor	5.2500	0.0000	0.0000	
P2 Party wall - Intermediate floor within a dwelling	5.2500	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	5.2500	0.1200	0.6300	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				9.3844 (36)
Point Thermal Bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	52.3945 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	38.6064	38.3666	38.1316	37.0276	36.8211	35.8596	35.8596	35.6815	36.2299	36.8211	37.2389	37.6758	(38)
Heat transfer coeff	91.0009	90.7611	90.5261	89.4221	89.2156	88.2541	88.2541	88.0760	88.6244	89.2156	89.6334	90.0702	(39)
Average = Sum(39)m / 12 =												89.4211	
HLP	1.1389	1.1359	1.1330	1.1192	1.1166	1.1046	1.1046	1.1023	1.1092	1.1166	1.1218	1.1273	(40)
HLP (average)												1.1192	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

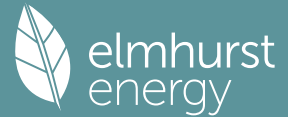
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.4610 (42)
Hot water usage for mixer showers	65.4819	64.4979	63.0639	60.3202	58.2955	56.0375	54.7541	56.1772	57.7372	60.1616	62.9642	65.2310	(42a)
Hot water usage for baths	28.2826	27.8626	27.2711	26.1804	25.3638	24.4583	23.9692	24.5565	25.1960	26.1650	27.2781	28.1870	(42b)
Hot water usage for other uses	39.8327	38.3842	36.9358	35.4873	34.0389	32.5904	32.5904	34.0389	35.4873	36.9358	38.3842	39.8327	(42c)
Average daily hot water use (litres/day)												122.8061	(43)
Daily hot water use	133.5972	130.7447	127.2707	121.9880	117.6981	113.0862	111.3136	114.7726	118.4206	123.2624	128.6265	133.2507	(44)
Energy conte	211.5854	186.1787	195.6104	166.9955	158.4443	139.0526	134.6242	142.1124	146.0244	167.2658	183.2520	208.6384	(45)
Energy content (annual)										Total = Sum(45)m =		2039.7841	
Distribution loss (46)m = 0.15 x (45)m	31.7378	27.9268	29.3416	25.0493	23.7666	20.8579	20.1936	21.3169	21.9037	25.0899	27.4878	31.2958	(46)
Water storage loss:													
Store volume												230.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7973	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9706	(55)
Total storage loss	30.0872	27.1756	30.0872	29.1167	30.0872	29.1167	30.0872	30.0872	29.1167	30.0872	29.1167	30.0872	(56)
If cylinder contains dedicated solar storage	30.0872	27.1756	30.0872	29.1167	30.0872	29.1167	30.0872	30.0872	29.1167	30.0872	29.1167	30.0872	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.9350	234.3654	248.9600	218.6241	211.7939	190.6813	187.9738	195.4620	197.6531	220.6155	234.8807	261.9881	(62)
WWHRS	-29.9356	-26.4753	-27.7234	-22.9561	-21.3942	-18.3072	-17.1601	-18.2480	-18.9413	-22.3297	-25.2969	-29.3812	(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	234.9994	207.8901	221.2366	195.6681	190.3997	172.3741	170.8137	177.2140	178.7117	198.2857	209.5838	232.6068	(64)
Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2389.7837	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month	113.0318	100.4538	107.7201	96.8289	95.3624	87.5379	87.4422	89.9321	89.8560	98.2956	102.2342	112.0520	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	123.0480	123.0480	123.0480	123.0480	123.0480	123.0480	123.0480	123.0480	123.0480	123.0480	123.0480	123.0480	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	113.4003	125.5503	113.4003	117.1803	113.4003	117.1803	113.4003	113.4003	117.1803	113.4003	117.1803	113.4003	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.2314	221.5064	215.7736	203.5692	188.1634	173.6841	164.0110	161.7361	167.4688	179.6732	195.0790	209.5583	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3048	35.3048	35.3048	35.3048	35.3048	35.3048	35.3048	35.3048	35.3048	35.3048	35.3048	35.3048	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4384	-98.4384	-98.4384	-98.4384	-98.4384	-98.4384	-98.4384	-98.4384	-98.4384	-98.4384	-98.4384	-98.4384	(71)

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Water heating gains (Table 5)	151.9245	149.4848	144.7851	134.4846	128.1753	121.5805	117.5299	120.8764	124.8001	132.1177	141.9920	150.6075 (72)
Total internal gains	547.4706	559.4559	536.8734	518.1485	492.6534	472.3592	454.8556	455.9272	469.3636	488.1056	517.1657	536.4805 (73)

6. Solar gains

[Jan]	Area m ²			Solar flux Table 6a W/m ²		Specific data or Table 6b		Specific data or Table 6c		Access factor Table 6d		Gains W
North	7.4700			10.6334		0.6300		0.7000		0.7700		24.2753 (74)
South	6.5600			46.7521		0.6300		0.7000		0.7700		93.7295 (78)
Solar gains	118.0048	199.8961	274.3681	347.6218	400.8667	404.2295	387.0259	345.5500	299.0418	220.7921	141.0481	101.2280 (83)
Total gains	665.4754	759.3520	811.2415	865.7703	893.5200	876.5888	841.8815	801.4772	768.4054	708.8978	658.2139	637.7086 (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	24.3893	24.4537	24.5172	24.8199	24.8773	25.1484	25.1484	25.1992	25.0433	24.8773	24.7614	24.6413
alpha	2.6260	2.6302	2.6345	2.6547	2.6585	2.6766	2.6766	2.6799	2.6696	2.6585	2.6508	2.6428
util living area	0.9323	0.9053	0.8699	0.8016	0.6992	0.5561	0.4280	0.4618	0.6402	0.8158	0.9037	0.9384 (86)
MIT	18.6960	19.0155	19.4417	19.9990	20.4708	20.7995	20.9274	20.9091	20.6904	20.0975	19.3219	18.6468 (87)
Th 2	19.9692	19.9716	19.9740	19.9852	19.9873	19.9971	19.9971	19.9989	19.9933	19.9873	19.9831	19.9786 (88)
util rest of house	0.9231	0.8927	0.8520	0.7735	0.6548	0.4891	0.3413	0.3749	0.5772	0.7841	0.8888	0.9299 (89)
MIT 2	17.3008	17.7007	18.2327	18.9207	19.4762	19.8389	19.9557	19.9440	19.7316	19.0541	18.0988	17.2448 (90)
Living area fraction	17.5575	17.9426	18.4552	19.1191	19.6592	20.0156	20.1345	20.1216	19.9080	19.2461	18.3239	17.5028 (91)
MIT	17.5575	17.9426	18.4552	19.1191	19.6592	20.0156	20.1345	20.1216	19.9080	19.2461	18.3239	17.5028 (92)
Temperature adjustment												0.0000
adjusted MIT	17.5575	17.9426	18.4552	19.1191	19.6592	20.0156	20.1345	20.1216	19.9080	19.2461	18.3239	17.5028 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8937	0.8607	0.8195	0.7457	0.6389	0.4904	0.3537	0.3861	0.5713	0.7566	0.8574	0.9018 (94)
Useful gains	594.7314	653.5603	664.8082	645.5926	570.8986	429.9182	297.7927	309.4557	439.0187	536.3406	564.3560	575.0745 (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	1206.4470	1183.7634	1082.2532	913.8112	710.0866	477.9507	311.9298	327.7801	514.7313	771.3654	1006.0323	1198.1840 (97)
Space heating kWh	455.1165	356.2965	310.5791	193.1174	103.5559	0.0000	0.0000	0.0000	0.0000	174.8584	318.0069	463.5934 (98a)
Space heating requirement - total per year (kWh/year)												2375.1241
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	455.1165	356.2965	310.5791	193.1174	103.5559	0.0000	0.0000	0.0000	0.0000	174.8584	318.0069	463.5934 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2375.1241
Space heating per m ²										(98c) / (4) =		29.7262 (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	455.1165	356.2965	310.5791	193.1174	103.5559	0.0000	0.0000	0.0000	0.0000	174.8584	318.0069	463.5934 (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)	493.0839	386.0201	336.4887	209.2279	112.1949	0.0000	0.0000	0.0000	0.0000	189.4458	344.5362	502.2681 (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	234.9994	207.8901	221.2366	195.6681	190.3997	172.3741	170.8137	177.2140	178.7117	198.2857	209.5838	232.6068 (64)
Efficiency of water heater	85.5158	85.2569	84.8204	84.0304	82.7547	79.8000	79.8000	79.8000	79.8000	83.7790	84.9922	85.5754 (217)
Fuel for water heating, kWh/month	274.8023	243.8396	260.8294	232.8540	230.0772	216.0077	214.0523	222.0727	223.9495	236.6771	246.5919	271.8151 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	23.5623	18.9026	17.0197	12.4693	9.6317	7.8692	7.8693	11.4208	14.8345	19.4637	21.9842	24.2172 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-37.2317	-52.4152	-75.2392	-84.4798	-90.9990	-84.9005	-83.8434	-79.1930	-70.9798	-59.8705	-40.9023	-32.1971 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)

Full SAP Calculation Printout



Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-21.2630	-44.7050	-88.8111	-133.3288	-176.2404	-177.0649	-174.9882	-148.1936	-108.6587	-63.9216	-28.3853	-16.8167	(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												2573.2656	(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												2873.5687	(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)												190.1616	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1974.6288	(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												3748.3669	(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	2573.2656	0.2100	540.3858 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2873.5687	0.2100	603.4494 (264)
Space and water heating			1143.8352 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	190.1616	0.1443	27.4462 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-792.2516	0.1346	-106.6499
PV Unit electricity exported	-1182.3773	0.1259	-148.8712
Total			-255.5211 (269)
Total CO2, kg/year			927.6896 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.6100 (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	2573.2656	1.1300	2907.7901 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2873.5687	1.1300	3247.1326 (278)
Space and water heating			6154.9227 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	190.1616	1.5338	291.6761 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-792.2516	1.4975	-1186.4128
PV Unit electricity exported	-1182.3773	0.4622	-546.4603
Total			-1732.8731 (283)
Total Primary energy kWh/year			4843.8265 (286)
Target Primary Energy Rate (TPER)			60.6200 (287)