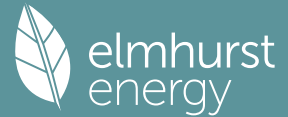


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Property Reference	OP-D320 S3HERO				Issued on Date	29/11/2024
Assessment Reference	S3HERO	Prop Type Ref	S3HERO			
Property	S3HERO					
SAP Rating	82 B	DER	3.85	TER	9.99	
Environmental	96 A	% DER < TER				61.46
CO ₂ Emissions (t/year)	0.45	DFEE	35.49	TFEE	36.33	
Compliance Check	See BREL	% DFEE < TFEE				2.32
% DPER < TPER	22.15	DPER	40.60	TPER	52.15	
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	48.6500 (1b)	x 2.3100 (2b)	= 112.3815 (1b) - (3b)
First floor	46.8100 (1c)	x 2.6100 (2c)	= 122.1741 (1c) - (3c)
Second floor	32.6700 (1d)	x 2.5400 (2d)	= 82.9818 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	128.1300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 317.5374 (5)

2. Ventilation rate

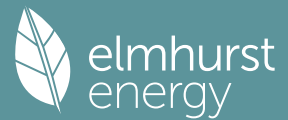
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.5000 (17)
Infiltration rate	0.1750 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1487 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1897	0.1859	0.1822	0.1636	0.1599	0.1413	0.1413	0.1376	0.1487	0.1599	0.1673	0.1748 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												71.2000 (23c)
Effective ac	0.3337	0.3299	0.3262	0.3076	0.3039	0.2853	0.2853	0.2816	0.2927	0.3039	0.3113	0.3188 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1400	1.0000	2.1400		(26)
Windows (Uw = 1.30)			18.6200	1.2357	23.0095		(27)
Ground Floor			48.6500	0.1100	5.3515		(28a)
External Wall	115.5900	18.5900	97.0000	0.1700	16.4900		(29a)
Dormer Cheeks	5.5100	2.1700	3.3400	0.1900	0.6346		(29a)
Stud Wall	20.9900		20.9900	0.1700	3.5683		(29a)
Roof - ceiling	39.4700		39.4700	0.1100	4.3417		(30)
Roof - pitch	5.4000		5.4000	0.2000	1.0800		(30)
Dormer Roof	3.6700		3.6700	0.2000	0.7340		(30)
Bay Roof	1.8500		1.8500	0.1100	0.2035		(30)
Total net area of external elements Aum(A, m ²)			241.1300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		57.5531		(33)
Party Wall			65.6500	0.0000	0.0000		(32)

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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)	9.1000	0.0500	0.4550
E3 Sill	10.0200	0.0500	0.5010
E4 Jamb	25.2000	0.0500	1.2600
E5 Ground floor (normal)	20.9400	0.1600	3.3504
E6 Intermediate floor within a dwelling	23.5200	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	13.3000	0.0600	0.7980
E12 Gable (insulation at ceiling level)	8.8800	0.0600	0.5328
E16 Corner (normal)	23.7100	0.0900	2.1339
E18 Party wall between dwellings	9.8700	0.0600	0.5922
P1 Party wall - Ground floor	9.9800	0.0800	0.7984
P2 Party wall - Intermediate floor within a dwelling	16.4800	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	8.8800	0.1200	1.0656
E17 Corner (inverted - internal area greater than external area)	8.5900	-0.0900	-0.7731
E24 Eaves (insulation at ceiling level - inverted)	13.9800	0.2400	3.3552
E13 Gable (insulation at rafter level)	1.5500	0.0800	0.1240
E18 Party wall between dwellings	9.2100	0.0600	0.5526
E25 Staggered party wall between dwellings	3.5800	0.0600	0.2148
P5 Party wall - Roof (insulation at rafter level)	1.5500	0.0800	0.1240
R1 Head of roof window	1.8100	0.0800	0.1448
R2 Sill of roof window	1.8100	0.0600	0.1086
R3 Jamb of roof window	2.4000	0.0800	0.1920
R6 Flat ceiling	13.1800	0.0600	0.7908
R8 Roof to wall (rafter)	14.1500	0.0600	0.8490
E25 Staggered party wall between dwellings	4.0800	0.0600	0.2448

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

17.4148 (36)

Point Thermal bridges

0.0000

Total fabric heat loss

(33) + (36) + (36a) = 74.9679 (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	34.9630	34.5733	34.1836	32.2352	31.8455	29.8971	29.8971	29.5075	30.6765	31.8455	32.6249	33.4042	(38)
Heat transfer coeff	109.9309	109.5412	109.1515	107.2031	106.8134	104.8650	104.8650	104.4754	105.6444	106.8134	107.5928	108.3721	(39)
Average = Sum(39)m / 12 =												107.1057	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8580	0.8549	0.8519	0.8367	0.8336	0.8184	0.8184	0.8154	0.8245	0.8336	0.8397	0.8458	(40)
HLP (average)												0.8359	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy

2.8900 (42)

Hot water usage for mixer showers

99.9284 98.4267 96.2383 92.0514 88.9615 85.5158 83.5572 85.7289 88.1096 91.8093 96.0862 99.5455 (42a)

Hot water usage for baths

33.0273 32.5368 31.8461 30.5725 29.6188 28.5614 27.9902 28.6761 29.4229 30.5544 31.8542 32.9156 (42b)

Hot water usage for other uses

46.5539 44.8610 43.1682 41.4753 39.7824 38.0896 38.0896 39.7824 41.4753 43.1682 44.8610 46.5539 (42c)

Average daily hot water use (litres/day)

165.0739 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	179.5096	175.8245	171.2526	164.0992	158.3628	152.1667	149.6370	154.1875	159.0078	165.5319	172.8015	179.0151	(44)
Energy conte	284.2993	250.3717	263.2088	224.6436	213.1868	187.1067	180.9729	190.9163	196.0725	224.6252	246.1874	280.2943	(45)
Energy content (annual)										Total = Sum(45)m =		2741.8857	
Distribution loss (46)m = 0.15 x (45)m													
42.6449 37.5558 39.4813 33.6965 31.9780 28.0660 27.1459 28.6374 29.4109 33.6938 36.9281 42.0442 (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 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 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

382.6809 339.2325 361.5904 319.8516 311.5684 251.7387 247.7593 257.7027 260.7045 323.0068 341.3954 378.6759 (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 382.6809 339.2325 361.5904 319.8516 311.5684 251.7387 247.7593 257.7027 260.7045 323.0068 341.3954 378.6759 (64)

Total per year (kWh/year) = Sum(64)m = 3775.9073 (64)

12Total per year (kWh/year)

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

138.4156 122.8876 131.4030 117.1644 114.7707 80.2226 78.7834 82.0896 83.2037 118.5740 124.3277 137.0839 (65)

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

Metabolic gains (Table 5), Watts

(66)m 144.4987 144.4987 144.4987 144.4987 144.4987 144.4987 144.4987 144.4987 144.4987 144.4987 144.4987 144.4987 (66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

158.5911 175.5830 158.5911 163.8775 158.5911 163.8775 158.5911 158.5911 163.8775 158.5911 163.8775 158.5911 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

295.4523 298.5182 290.7923 274.3448 253.5828 234.0694 221.0332 217.9674 225.6933 242.1408 262.9028 282.4162 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

37.4499 37.4499 37.4499 37.4499 37.4499 37.4499 37.4499 37.4499 37.4499 37.4499 37.4499 37.4499 (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)

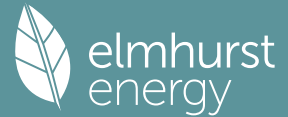
Losses e.g. evaporation (negative values) (Table 5)

-115.5989 -115.5989 -115.5989 -115.5989 -115.5989 -115.5989 -115.5989 -115.5989 -115.5989 -115.5989 -115.5989 -115.5989 (71)

Water heating gains (Table 5)

186.0425 182.8685 176.6170 162.7283 154.2617 111.4203 105.8917 110.3355 115.5607 159.3736 172.6774 184.2526 (72)

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Total internal gains
706.4355 723.3194 692.3500 667.3002 632.7852 575.7167 551.8657 553.2436 571.4811 626.4551 665.8073 691.6096 (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				8.0100	10.6334	0.6300	0.7000		0.7700		26.0301 (74)	
East				1.7500	19.6403	0.6300	0.7000		0.7700		10.5041 (76)	
South				7.8800	46.7521	0.6300	0.7000		0.7700		112.5897 (78)	
West				0.9800	19.6403	0.6300	0.7000		0.7700		5.8823 (80)	

Solar gains	155.0062	266.1930	372.2029	478.2361	553.8930	558.6156	534.8805	476.6332	408.3922	296.1361	186.0006	132.4632 (83)
Total gains	861.4417	989.5124	1064.5530	1145.5363	1186.6782	1134.3324	1086.7462	1029.8767	979.8733	922.5912	851.8079	824.0728 (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	32.3764	32.4916	32.6076	33.2002	33.3213	33.9404	33.9404	34.0670	33.6901	33.3213	33.0800	32.8421
alpha	3.1584	3.1661	3.1738	3.2133	3.2214	3.2627	3.2627	3.2711	3.2460	3.2214	3.2053	3.1895
util living area	0.9492	0.9226	0.8851	0.8077	0.6914	0.5429	0.4092	0.4453	0.6420	0.8285	0.9218	0.9547 (86)
Living	19.1971	19.4919	19.8632	20.3360	20.6910	20.9005	20.9700	20.9603	20.8208	20.3807	19.7333	19.1606
Non living	18.0763	18.4475	18.9122	19.4992	19.9167	20.1543	20.2184	20.2136	20.0727	19.5648	18.7644	18.0372
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	20.0777	19.4919	19.8632	20.3360	20.6910	20.9005	20.9700	20.9603	20.8208	20.3807	19.7333	19.4179 (87)
Th 2	20.2034	20.2060	20.2086	20.2217	20.2243	20.2374	20.2374	20.2400	20.2321	20.2243	20.2190	20.2138 (88)
util rest of house	0.9427	0.9132	0.8709	0.7842	0.6543	0.4894	0.3434	0.3785	0.5905	0.8026	0.9108	0.9489 (89)
MIT 2	19.3554	18.4475	18.9122	19.4992	19.9167	20.1543	20.2184	20.2136	20.0727	19.5648	18.7644	18.4294 (90)
Living area fraction	19.4546	18.5909	19.0429	19.6141	20.0231	20.2568	20.3217	20.3162	20.1755	19.6769	18.8975	0.1374 (91)
MIT	19.4546	18.5909	19.0429	19.6141	20.0231	20.2568	20.3217	20.3162	20.1755	19.6769	18.8975	18.5652 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4546	18.5909	19.0429	19.6141	20.0231	20.2568	20.3217	20.3162	20.1755	19.6769	18.8975	18.5652 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9357	0.8892	0.8460	0.7637	0.6440	0.4908	0.3509	0.3854	0.5864	0.7817	0.8874	0.9335 (94)
Useful gains	806.0671	879.8838	900.6377	874.8144	764.1730	556.7694	381.3063	396.8710	574.6114	721.1798	755.8650	769.2621 (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	1665.9585	1499.7212	1369.0712	1148.5873	889.0179	593.2019	390.2719	409.1479	641.8421	969.5343	1269.3239	1556.7872 (97)
Space heating kWh	639.7592	416.5307	348.5146	197.1165	92.8846	0.0000	0.0000	0.0000	0.0000	184.7757	369.6904	585.9187 (98a)
Space heating requirement - total per year (kWh/year)												2835.1904
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	639.7592	416.5307	348.5146	197.1165	92.8846	0.0000	0.0000	0.0000	0.0000	184.7757	369.6904	585.9187 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2835.1904
Space heating per m2										(98c) / (4) =		22.1275 (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 %)												249.7664 (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	639.7592	416.5307	348.5146	197.1165	92.8846	0.0000	0.0000	0.0000	0.0000	184.7757	369.6904	585.9187 (98)
Space heating efficiency (main heating system 1)	249.7664	249.7664	249.7664	249.7664	249.7664	0.0000	0.0000	0.0000	0.0000	249.7664	249.7664	249.7664 (210)
Space heating fuel (main heating system)	256.1431	166.7681	139.5362	78.9204	37.1886	0.0000	0.0000	0.0000	0.0000	73.9794	148.0145	234.5867 (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	382.6809	339.2325	361.5904	319.8516	311.5684	251.7387	247.7593	257.7027	260.7045	323.0068	341.3954	378.6759 (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	142.0388	125.9122	134.2107	118.7186	115.6441	93.4373	91.9603	95.6509	96.7651	119.8897	126.7149	140.5523 (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	48.8267	44.1015	48.8267	47.2517	48.8267	47.2517	48.8267	48.8267	47.2517	48.8267	47.2517	48.8267 (231)
Lighting	32.9521	26.4354	23.8021	17.4385	13.4700	11.0051	12.2878	15.9721	20.7462	27.2201	30.7451	33.8679 (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)												

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(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												1135.1370	(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												1401.4948	(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)												574.8951	(230a)
Total electricity for the above, kWh/year												574.8951	(231)
Electricity for lighting (calculated in Appendix L)												265.9424	(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												3377.4693	(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	1135.1370	0.1556	176.6268	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1401.4948	0.1415	198.3616	(264)
Space and water heating			374.9884	(265)
Pumps, fans and electric keep-hot	574.8951	0.1387	79.7450	(267)
Energy for lighting	265.9424	0.1443	38.3837	(268)
Total CO2, kg/year			493.1171	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.8500	(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	1135.1370	1.5760	1788.9920	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1401.4948	1.5234	2135.0251	(278)
Space and water heating			3924.0170	(279)
Pumps, fans and electric keep-hot	574.8951	1.5128	869.7013	(281)
Energy for lighting	265.9424	1.5338	407.9113	(282)
Total Primary energy kWh/year			5201.6296	(286)
Dwelling Primary energy Rate (DPER)			40.6000	(287)

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

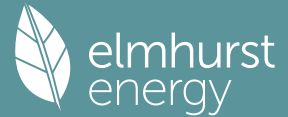
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	48.6500 (1b)	x 2.3100 (2b)	= 112.3815 (1b) - (3b)	
First floor	46.8100 (1c)	x 2.6100 (2c)	= 122.1741 (1c) - (3c)	
Second floor	32.6700 (1d)	x 2.5400 (2d)	= 82.9818 (1d) - (3d)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)... (1n)	128.1300		(4)	
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)... (3n) =	317.5374 (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)

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Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 40.0000 / (5) = 0.1260 (8)
Pressure test Yes
Pressure Test Method Blower Door
Measured/design AP50 5.0000 (17)
Infiltration rate 0.3760 (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) = 0.3196 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Effective ac	0.4075	0.3995	0.3915	0.3515	0.3435	0.3036	0.3036	0.2956	0.3196	0.3435	0.3595	0.3755	(22b)
	0.5830	0.5798	0.5766	0.5618	0.5590	0.5461	0.5461	0.5437	0.5511	0.5590	0.5646	0.5705	(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)			18.6200	1.1450	21.3206			(27)
Ground Floor			48.6500	0.1300	6.3245			(28a)
External Wall	115.5900	18.5900	97.0000	0.1800	17.4600			(29a)
Dormer Cheeks	5.5100	2.1700	3.3400	0.1800	0.6012			(29a)
Stud Wall	20.9900		20.9900	0.1800	3.7782			(29a)
Roof - ceiling	39.4700		39.4700	0.1100	4.3417			(30)
Roof - pitch	5.4000		5.4000	0.1100	0.5940			(30)
Dormer Roof	3.6700		3.6700	0.1100	0.4037			(30)
Bay Roof	1.8500		1.8500	0.1100	0.2035			(30)
Total net area of external elements Aum(A, m2)			241.1300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	57.1674			(33)
Party Wall			65.6500	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)	9.1000	0.0500	0.4550	
E3 Sill	10.0200	0.0500	0.5010	
E4 Jamb	25.2000	0.0500	1.2600	
E5 Ground floor (normal)	20.9400	0.1600	3.3504	
E6 Intermediate floor within a dwelling	23.5200	0.0000	0.0000	
E10 Eaves (insulation at ceiling level)	13.3000	0.0600	0.7980	
E12 Gable (insulation at ceiling level)	8.8800	0.0600	0.5328	
E16 Corner (normal)	23.7100	0.0900	2.1339	
E18 Party wall between dwellings	9.8700	0.0600	0.5922	
P1 Party wall - Ground floor	9.9800	0.0800	0.7984	
P2 Party wall - Intermediate floor within a dwelling	16.4800	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	8.8800	0.1200	1.0656	
E17 Corner (inverted - internal area greater than external area)	8.5900	-0.0900	-0.7731	
E24 Eaves (insulation at ceiling level - inverted)	13.9800	0.2400	3.3552	
E13 Gable (insulation at rafter level)	1.5500	0.0800	0.1240	
E18 Party wall between dwellings	9.2100	0.0600	0.5526	
E25 Staggered party wall between dwellings	3.5800	0.0600	0.2148	
P5 Party wall - Roof (insulation at rafter level)	1.5500	0.0800	0.1240	
R1 Head of roof window	1.8100	0.0800	0.1448	
R2 Sill of roof window	1.8100	0.0600	0.1086	
R3 Jamb of roof window	2.4000	0.0800	0.1920	
R6 Flat ceiling	13.1800	0.0600	0.7908	
R8 Roof to wall (rafter)	14.1500	0.0600	0.8490	
E25 Staggered party wall between dwellings	4.0800	0.0600	0.2448	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 17.4148 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 74.5822 (37)

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

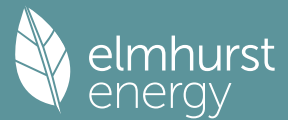
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	61.0921	60.7544	60.4233	58.8682	58.5772	57.2228	57.2228	56.9720	57.7445	58.5772	59.1658	59.7812	(38)
Average = Sum(39)m / 12 =	135.6743	135.3366	135.0055	133.4504	133.1594	131.8050	131.8050	131.5542	132.3267	133.1594	133.7480	134.3634	(39)
												133.4490	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0589	1.0562	1.0537	1.0415	1.0393	1.0287	1.0287	1.0267	1.0328	1.0393	1.0438	1.0486	(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													2.8900 (42)
Hot water usage for mixer showers													
Hot water usage for baths	72.6752	71.5830	69.9915	66.9465	64.6993	62.1933	60.7688	62.3483	64.0797	66.7704	69.8808	72.3967	(42a)
Hot water usage for other uses	31.3759	30.9100	30.2538	29.0439	28.1379	27.1333	26.5907	27.2423	27.9518	29.0267	30.2615	31.2699	(42b)
Average daily hot water use (litres/day)	44.2262	42.6180	41.0098	39.4015	37.7933	36.1851	36.1851	37.7933	39.4015	41.0098	42.6180	44.2262	(42c)
												136.3002	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	148.2773	145.1110	141.2550	135.3919	130.6305	125.5117	123.5447	127.3839	131.4330	136.8069	142.7604	147.8928	(44)
Energy content (annual)	234.8351	206.6361	217.1037	185.3447	175.8538	154.3313	149.4166	157.7279	162.0701	185.6456	203.3883	231.5644	(45)
Distribution loss (46)m = 0.15 x (45)m													
Water storage loss:	35.2253	30.9954	32.5656	27.8017	26.3781	23.1497	22.4125	23.6592	24.3105	27.8468	30.5082	34.7347	(46)
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													

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	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	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	(61)
Total heat required for water heating calculated for each month												
WWHRS	288.1847	254.8228	270.4534	236.9734	229.2034	205.9599	202.7662	211.0775	213.6987	238.9953	255.0170	284.9140 (62)
PV diverter	-33.2241	-29.3836	-30.7688	-25.4778	-23.7444	-20.3183	-19.0451	-20.2526	-21.0221	-24.7827	-28.0758	-32.6088 (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)
	254.9606	225.4392	239.6845	211.4955	205.4590	185.6417	183.7210	190.8250	192.6767	214.2126	226.9412	252.3052 (64)
12Total per year (kWh/year)												2583.3622 (64)
Electric shower(s)												2583 (64)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
												0.0000 (64a)
Heat gains from water heating, kWh/month												
	120.7624	107.2559	114.8667	102.9300	101.1511	92.6181	92.3607	95.1242	95.1912	104.4069	108.9296	119.6749 (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	144.4987	144.4987	144.4987	144.4987	144.4987	144.4987	144.4987	144.4987	144.4987	144.4987	144.4987	144.4987	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	158.5911	175.5830	158.5911	163.8775	158.5911	163.8775	158.5911	158.5911	163.8775	158.5911	163.8775	158.5911	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	295.4523	298.5182	290.7923	274.3448	253.5828	234.0694	221.0332	217.9674	225.6933	242.1408	262.9028	282.4162	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.4499	37.4499	37.4499	37.4499	37.4499	37.4499	37.4499	37.4499	37.4499	37.4499	37.4499	37.4499	(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)	-115.5989	-115.5989	-115.5989	-115.5989	-115.5989	-115.5989	-115.5989	-115.5989	-115.5989	-115.5989	-115.5989	-115.5989	(71)
Water heating gains (Table 5)	162.3150	159.6070	154.3907	142.9584	135.9558	128.6362	124.1407	127.8552	132.2100	140.3318	151.2910	160.8533	(72)
Total internal gains	685.7081	703.0578	673.1238	650.5303	617.4792	592.9327	570.1147	570.7633	588.1304	610.4133	647.4210	671.2102	(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				8.0100	10.6334		0.6300		0.7000		0.7700		26.0301 (74)
East				1.7500	19.6403		0.6300		0.7000		0.7700		10.5041 (76)
South				7.8800	46.7521		0.6300		0.7000		0.7700		112.5897 (78)
West				0.9800	19.6403		0.6300		0.7000		0.7700		5.8823 (80)
Solar gains	155.0062	266.1930	372.2029	478.2361	553.8930	558.6156	534.8805	476.6332	408.3922	296.1361	186.0006		132.4632 (83)
Total gains	840.7143	969.2509	1045.3267	1128.7664	1171.3723	1151.5484	1104.9952	1047.3964	996.5226	906.5494	833.4215		803.6735 (84)

7. Mean internal temperature (heating season)

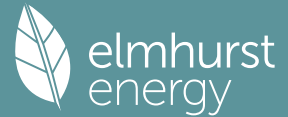
Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	26.2332	26.2986	26.3631	26.6703	26.7286	27.0033	27.0033	27.0548	26.8968	26.7286	26.6110	26.4891	
alpha	2.7489	2.7532	2.7575	2.7780	2.7819	2.8002	2.8002	2.8037	2.7931	2.7819	2.7741	2.7659	
util living area	0.9578	0.9373	0.9087	0.8499	0.7557	0.6144	0.4800	0.5179	0.7034	0.8669	0.9374	0.9622	(86)
MIT	18.5997	18.9102	19.3409	19.9161	20.4155	20.7739	20.9176	20.8958	20.6481	20.0087	19.2191	18.5522	(87)
Th 2	20.0346	20.0367	20.0389	20.0489	20.0508	20.0595	20.0595	20.0611	20.0561	20.0508	20.0470	20.0430	(88)
util rest of house	0.9517	0.9286	0.8955	0.8270	0.7162	0.5494	0.3916	0.4302	0.6452	0.8420	0.9272	0.9568	(89)
MIT 2	17.2201	17.6124	18.1549	18.8727	19.4708	19.8742	20.0099	19.9948	19.7469	18.9992	18.0139	17.1650	(90)
Living area fraction													0.1374 (91)
MIT	17.4096	17.7907	18.3178	19.0160	19.6006	19.9978	20.1346	20.1186	19.8707	19.1379	18.1794	17.3556	(92)
Temperature adjustment													0.0000
adjusted MIT	17.4096	17.7907	18.3178	19.0160	19.6006	19.9978	20.1346	20.1186	19.8707	19.1379	18.1794	17.3556	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9285	0.9010	0.8650	0.7972	0.6949	0.5448	0.3990	0.4359	0.6323	0.8124	0.8999	0.9350	(94)
Useful gains	780.5795	873.2811	904.1927	899.8283	814.0019	627.3716	440.9430	456.5443	630.1425	736.4730	750.0314	751.4525	(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	1778.6356	1744.5805	1595.4662	1349.9825	1052.0329	711.4584	465.8763	489.1939	763.6215	1136.9037	1481.8510	1767.6273	(97)
Space heating kWh	742.5537	585.5132	514.3075	324.1110	177.0950	0.0000	0.0000	0.0000	0.0000	297.9205	526.9101	756.0341	(98a)
Space heating requirement - total per year (kWh/year)												3924.4451	
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	742.5537	585.5132	514.3075	324.1110	177.0950	0.0000	0.0000	0.0000	0.0000	297.9205	526.9101	756.0341	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3924.4451	
Space heating per m ²												30.6286	(99)

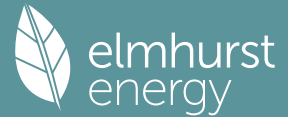
9a. Energy requirements - Individual heating systems, including micro-CHP

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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	742.5537	585.5132	514.3075	324.1110	177.0950	0.0000	0.0000	0.0000	0.0000	297.9205	526.9101	756.0341	(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)	804.5002	634.3588	557.2128	351.1495	191.8690	0.0000	0.0000	0.0000	0.0000	322.7741	570.8669	819.1052	(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	254.9606	225.4392	239.6845	211.4955	205.4590	185.6417	183.7210	190.8250	192.6767	214.2126	226.9412	252.3052	(64)
Efficiency of water heater	86.3119	86.1005	85.7265	85.0140	83.7284	79.8000	79.8000	79.8000	79.8000	84.7997	85.8841	86.3628	(217)
Fuel for water heating, kWh/month	295.3944	261.8326	279.5920	248.7774	245.3874	232.6337	230.2269	239.1290	241.4495	252.6101	264.2414	292.1456	(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	32.9521	26.4354	23.8021	17.4385	13.4700	11.0051	12.2878	15.9721	20.7462	27.2201	30.7451	33.8679	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-46.2175	-65.5157	-94.6518	-106.9318	-115.6633	-108.0052	-106.6023	-100.4361	-89.6567	-75.0866	-50.9120	-39.9102	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)	-25.0157	-52.7546	-105.1241	-158.3095	-209.7733	-211.0090	-208.5956	-176.4691	-129.1022	-75.6640	-33.4645	-19.7775	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												4251.8365	(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												3083.4201	(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)												265.9424	(232)
Energy saving/generation technologies (Appendices M, N and Q)													
PV generation												-2404.6481	(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												5282.5507	(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	4251.8365	0.2100	892.8857	(261)									
Total CO2 associated with community systems			0.0000	(373)									
Water heating (other fuel)	3083.4201	0.2100	647.5182	(264)									
Space and water heating			1540.4039	(265)									
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)									
Energy for lighting	265.9424	0.1443	38.3837	(268)									
Energy saving/generation technologies													
PV Unit electricity used in dwelling	-999.5891	0.1345	-134.4418										
PV Unit electricity exported	-1405.0590	0.1258	-176.7692										
Total			-311.2110	(269)									
Total CO2, kg/year			1279.5059	(272)									
EPC Target Carbon Dioxide Emission Rate (TER)			9.9900	(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	4251.8365	1.1300	4804.5752	(275)									
Total CO2 associated with community systems			0.0000	(473)									
Water heating (other fuel)	3083.4201	1.1300	3484.2647	(278)									
Space and water heating			8288.8399	(279)									
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)									
Energy for lighting	265.9424	1.5338	407.9113	(282)									
Energy saving/generation technologies													
PV Unit electricity used in dwelling	-999.5891	1.4971	-1496.4584										
PV Unit electricity exported	-1405.0590	0.4618	-648.8576										
Total			-2145.3161	(283)									
Total Primary energy kWh/year			6681.5359	(286)									
Target Primary Energy Rate (TPER)			52.1500	(287)									

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Property Reference	OP-D320 S3HERO				Issued on Date	29/11/2024	
Assessment Reference	S3HERO		Prop Type Ref	S3HERO			
Property	S3HERO						
SAP Rating	82 B	DER	3.85	TER	9.99		
Environmental	96 A	% DER < TER				61.46	
CO ₂ Emissions (t/year)	0.45	DFEE	35.49	TFEE	36.33		
Compliance Check	See BREL	% DFEE < TFEE				2.32	
% DPER < TPER	22.15	DPER	40.60	TPER	52.15		
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)		Storey height (m)		Volume (m ³)	
Ground floor	48.6500 (1b)	x	2.3100 (2b)	=	112.3815 (1b)	- (3b)
First floor	46.8100 (1c)	x	2.6100 (2c)	=	122.1741 (1c)	- (3c)
Second floor	32.6700 (1d)	x	2.5400 (2d)	=	82.9818 (1d)	- (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	128.1300					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	317.5374	(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) =	0.1260 (8)	
Pressure test	Yes		
Pressure Test Method	Blower Door		
Measured/design AP50	3.5000	(17)	
Infiltration rate	0.3010	(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) =	0.2558 (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	0.3262	0.3198	0.3134	0.2814	0.2750	0.2430	0.2430	0.2366	0.2558	0.2750	0.2878	0.3006	(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	0.5532	0.5511	0.5491	0.5396	0.5378	0.5295	0.5295	0.5280	0.5327	0.5378	0.5414	0.5452	(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)			18.6200	1.2357	23.0095			(27)
Ground Floor			48.6500	0.1100	5.3515			(28a)
External Wall	115.5900	18.5900	97.0000	0.1700	16.4900			(29a)
Dormer Cheeks	5.5100	2.1700	3.3400	0.1900	0.6346			(29a)
Stud Wall	20.9900		20.9900	0.1700	3.5683			(29a)
Roof - ceiling	39.4700		39.4700	0.1100	4.3417			(30)
Roof - pitch	5.4000		5.4000	0.2000	1.0800			(30)
Dormer Roof	3.6700		3.6700	0.2000	0.7340			(30)
Bay Roof	1.8500		1.8500	0.1100	0.2035			(30)
Total net area of external elements Aum(A, m ²)			241.1300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	57.5531			(33)
Party Wall			65.6500	0.0000	0.0000			(32)

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

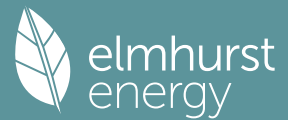
100.0000 (35)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 57.9679	Feb 57.7514	Mar 57.5392	Apr 56.5427	May 56.3563	Jun 55.4883	Jul 55.4883	Aug 55.3276	Sep 55.8226	Oct 56.3563	Nov 56.7334	Dec 57.1278 (38)
Heat transfer coeff	132.9358	132.7193	132.5071	131.5106	131.3242	130.4562	130.4562	130.2955	130.7905	131.3242	131.7013	132.0957 (39)
Average = Sum(39)m / 12 =												131.5097
HLP	Jan 1.0375	Feb 1.0358	Mar 1.0342	Apr 1.0264	May 1.0249	Jun 1.0182	Jul 1.0182	Aug 1.0169	Sep 1.0208	Oct 1.0249	Nov 1.0279	Dec 1.0310 (40)
HLP (average)												1.0264
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

Assumed occupancy											2.8900 (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 (42a)	
Hot water usage for baths	31.3759	30.9100	30.2538	29.0439	28.1379	27.1333	26.5907	27.2423	27.9518	29.0267	30.2615 (42b)	
Hot water usage for other uses	44.2262	42.6180	41.0098	39.4015	37.7933	36.1851	36.1851	37.7933	39.4015	41.0098	44.2262 (42c)	
Average daily hot water use (litres/day)											69.2961 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	75.6021	73.5279	71.2635	68.4454	65.9312	63.3184	62.7758	65.0356	67.3533	70.0365	72.8795	75.4961 (44)
Energy content (annual)	119.7353	104.7028	109.5294	93.6983	88.7561	77.8574	75.9219	80.5277	83.0534	95.0388	103.8302	118.2086 (45)
Distribution loss (46)m = 0.15 x (45)m											1150.8600	
Water 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 (46)
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)
Combustion 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	101.7750	88.9974	93.1000	79.6436	75.4427	66.1788	64.5336	68.4485	70.5954	80.7830	88.2557	100.4773 (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	101.7750	88.9974	93.1000	79.6436	75.4427	66.1788	64.5336	68.4485	70.5954	80.7830	88.2557	100.4773 (64)
12Total per year (kWh/year)											978.2310 (64)	
Electric shower(s)	58.2007	51.8573	56.6262	54.0377	55.0517	52.5140	54.2644	55.0517	54.0377	56.6262	55.5614	58.2007 (64a)
											662.0297 (64a)	
Heat gains from water heating, kWh/month	39.9939	35.2137	37.4315	33.4203	32.6236	29.6732	29.6995	30.8751	31.1583	34.3523	35.9543	39.6695 (65)

6. Solar gains

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[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF Access factor Table 6d	Gains W
North	8.0100	10.6334	0.6300	0.7000	0.7700	26.0301 (74)
East	1.7500	19.6403	0.6300	0.7000	0.7700	10.5041 (76)
South	7.8800	46.7521	0.6300	0.7000	0.7700	112.5897 (78)
West	0.9800	19.6403	0.6300	0.7000	0.7700	5.8823 (80)

Solar gains	155.0062	266.1930	372.2029	478.2361	553.8930	558.6156	534.8805	476.6332	408.3922	296.1361	186.0006	132.4632 (83)
Total gains	729.1546	859.0452	938.2472	1029.2251	1076.2654	1064.1249	1020.7732	961.0400	907.5879	809.3900	729.0670	693.1394 (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	26.7736	26.8172	26.8602	27.0637	27.1021	27.2825	27.2825	27.3161	27.2127	27.1021	27.0245	26.9439
alpha	2.7849	2.7878	2.7907	2.8042	2.8068	2.8188	2.8188	2.8211	2.8142	2.8068	2.8016	2.7963
util living area	0.9693	0.9513	0.9259	0.8714	0.7820	0.6434	0.5077	0.5495	0.7357	0.8914	0.9530	0.9731 (86)
MIT	18.4939	18.8134	19.2546	19.8454	20.3683	20.7494	20.9070	20.8811	20.6089	19.9281	19.1123	18.4358 (87)
Th 2	20.0522	20.0536	20.0550	20.0614	20.0626	20.0682	20.0682	20.0693	20.0661	20.0626	20.0602	20.0576 (88)
util rest of house	0.9648	0.9443	0.9147	0.8510	0.7447	0.5789	0.4172	0.4600	0.6798	0.8699	0.9450	0.9692 (89)
MIT 2	17.7494	18.0651	18.4999	19.0770	19.5690	19.9060	20.0239	20.0092	19.7940	19.1666	18.3686	17.6955 (90)
Living area fraction	17.8517	18.1679	18.6036	19.1826	19.6788	20.0218	20.1452	20.1290	19.9060	19.2712	18.4707	17.7972 (91)
MIT	17.8517	18.1679	18.6036	19.1826	19.6788	20.0218	20.1452	20.1290	19.9060	19.2712	18.4707	17.7972 (92)
Temperature adjustment												0.0000
adjusted MIT	17.8517	18.1679	18.6036	19.1826	19.6788	20.0218	20.1452	20.1290	19.9060	19.2712	18.4707	17.7972 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9504	0.9259	0.8930	0.8280	0.7274	0.5755	0.4251	0.4662	0.6690	0.8475	0.9270	0.9560 (94)
Useful gains	693.0167	795.3609	837.8818	852.2051	782.8286	612.3547	433.9460	447.9992	607.1960	685.9433	675.8205	662.6178 (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	1801.4999	1760.9088	1603.8073	1352.2666	1047.8091	707.3115	462.4882	485.8654	759.3634	1138.7407	1497.5389	1796.1318 (97)
Space heating kWh	824.7115	648.8482	569.8486	360.0443	197.1455	0.0000	0.0000	0.0000	0.0000	336.8813	591.6373	843.3345 (98a)
Space heating requirement - total per year (kWh/year)												4372.4510
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	824.7115	648.8482	569.8486	360.0443	197.1455	0.0000	0.0000	0.0000	0.0000	336.8813	591.6373	843.3345 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4372.4510
Space heating per m2										(98c) / (4) =		34.1251 (99)

8c. Space cooling requirement

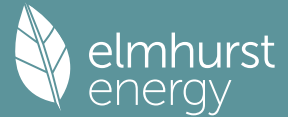
Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W												
	0.0000	0.0000	0.0000	0.0000	0.0000	1226.2883	965.3759	990.2456	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7207	0.7911	0.7617	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	883.7743	763.7397	754.2601	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1170.4028	1123.0270	1056.4454	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	206.3725	267.3098	224.8259	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	51.5931	66.8274	56.2065	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												174.6271 (107)
Energy for space heating												34.1251 (99)
Energy for space cooling												1.3629 (108)
Total												35.4880 (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	48.6500 (1b)	x	2.3100 (2b) = 112.3815 (1b) - (3b)
First floor	46.8100 (1c)	x	2.6100 (2c) = 122.1741 (1c) - (3c)
Second floor	32.6700 (1d)	x	2.5400 (2d) = 82.9818 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	128.1300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	317.5374 (5)

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2. Ventilation rate

											m3 per hour	
Number of open chimneys											0 * 80 =	0.0000 (6a)
Number of open flues											0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire											0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler											0 * 20 =	0.0000 (6d)
Number of flues attached to other heater											0 * 35 =	0.0000 (6e)
Number of blocked chimneys											0 * 20 =	0.0000 (6f)
Number of intermittent extract fans											4 * 10 =	40.0000 (7a)
Number of passive vents											0 * 10 =	0.0000 (7b)
Number of flueless gas fires											0 * 40 =	0.0000 (7c)
											Air changes per hour	
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =										40.0000 / (5) =	0.1260 (8)
Pressure test											Yes	
Pressure Test Method											Blower Door	
Measured/design AP50											5.0000 (17)	
Infiltration rate											0.3760 (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) =	0.3196 (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 infiltr rate	0.4075	0.3995	0.3915	0.3515	0.3435	0.3036	0.3036	0.2956	0.3196	0.3435	0.3595	0.3755 (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	0.5830	0.5798	0.5766	0.5618	0.5590	0.5461	0.5461	0.5437	0.5511	0.5590	0.5646	0.5705 (25)

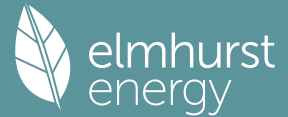
3. Heat losses and heat loss parameter

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)			18.6200	1.1450	21.3206		(27)
Ground Floor			48.6500	0.1300	6.3245		(28a)
External Wall	115.5900	18.5900	97.0000	0.1800	17.4600		(29a)
Dormer Cheeks	5.5100	2.1700	3.3400	0.1800	0.6012		(29a)
Stud Wall	20.9900		20.9900	0.1800	3.7782		(29a)
Roof - ceiling	39.4700		39.4700	0.1100	4.3417		(30)
Roof - pitch	5.4000		5.4000	0.1100	0.5940		(30)
Dormer Roof	3.6700		3.6700	0.1100	0.4037		(30)
Bay Roof	1.8500		1.8500	0.1100	0.2035		(30)
Total net area of external elements Aum(A, m2)			241.1300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)... (30) + (32) =	57.1674		(33)
Party Wall			65.6500	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)				9.1000	0.0500	0.4550	
E3 Sill				10.0200	0.0500	0.5010	
E4 Jamb				25.2000	0.0500	1.2600	
E5 Ground floor (normal)				20.9400	0.1600	3.3504	
E6 Intermediate floor within a dwelling				23.5200	0.0000	0.0000	
E10 Eaves (insulation at ceiling level)				13.3000	0.0600	0.7980	
E12 Gable (insulation at ceiling level)				8.8800	0.0600	0.5328	
E16 Corner (normal)				23.7100	0.0900	2.1339	
E18 Party wall between dwellings				9.8700	0.0600	0.5922	
P1 Party wall - Ground floor				9.9800	0.0800	0.7984	
P2 Party wall - Intermediate floor within a dwelling				16.4800	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)				8.8800	0.1200	1.0656	
E17 Corner (inverted - internal area greater than external area)				8.5900	-0.0900	-0.7731	
E24 Eaves (insulation at ceiling level - inverted)				13.9800	0.2400	3.3552	
E13 Gable (insulation at rafter level)				1.5500	0.0800	0.1240	
E18 Party wall between dwellings				9.2100	0.0600	0.5526	
E25 Staggered party wall between dwellings				3.5800	0.0600	0.2148	
P5 Party wall - Roof (insulation at rafter level)				1.5500	0.0800	0.1240	
R1 Head of roof window				1.8100	0.0800	0.1448	
R2 Sill of roof window				1.8100	0.0600	0.1086	
R3 Jamb of roof window				2.4000	0.0800	0.1920	
R6 Flat ceiling				13.1800	0.0600	0.7908	
R8 Roof to wall (rafter)				14.1500	0.0600	0.8490	
E25 Staggered party wall between dwellings				4.0800	0.0600	0.2448	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							17.4148 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	74.5822 (37)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.8900 (42)
Hot water usage for mixer showers	

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Hot water usage for baths	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 other uses	31.3759	30.9100	30.2538	29.0439	28.1379	27.1333	26.5907	27.2423	27.9518	29.0267	30.2615	31.2699 (42b)
Average daily hot water use (litres/day)	44.2262	42.6180	41.0098	39.4015	37.7933	36.1851	36.1851	37.7933	39.4015	41.0098	42.6180	44.2262 (42c)
												69.2961 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	75.6021	73.5279	71.2635	68.4454	65.9312	63.3184	62.7758	65.0356	67.3533	70.0365	72.8795	75.4961 (44)
Distribution loss (46)m = 0.15 x (45)m	119.7353	104.7028	109.5294	93.6983	88.7561	77.8574	75.9219	80.5277	83.0534	95.0388	103.8302	118.2086 (45)
Water 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 (46)
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	101.7750	88.9974	93.1000	79.6436	75.4427	66.1788	64.5336	68.4485	70.5954	80.7830	88.2557	100.4773 (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	101.7750	88.9974	93.1000	79.6436	75.4427	66.1788	64.5336	68.4485	70.5954	80.7830	88.2557	100.4773 (64)
12Total per year (kWh/year)												978.2310 (64)
Electric shower(s)	58.2007	51.8573	56.6262	54.0377	55.0517	52.5140	54.2644	55.0517	54.0377	56.6262	55.5614	58.2007 (64a)
												662.0297 (64a)
Heat gains from water heating, kWh/month	39.9939	35.2137	37.4315	33.4203	32.6236	29.6732	29.6995	30.8751	31.1583	34.3523	35.9543	39.6695 (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	144.4987	144.4987	144.4987	144.4987	144.4987	144.4987	144.4987	144.4987	144.4987	144.4987	144.4987	144.4987 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	158.5911	175.5830	158.5911	163.8775	158.5911	163.8775	158.5911	158.5911	163.8775	158.5911	163.8775	158.5911 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	295.4523	298.5182	290.7923	274.3448	253.5828	234.0694	221.0332	217.9674	225.6933	242.1408	262.9028	282.4162 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.4499	37.4499	37.4499	37.4499	37.4499	37.4499	37.4499	37.4499	37.4499	37.4499	37.4499	37.4499 (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)	-115.5989	-115.5989	-115.5989	-115.5989	-115.5989	-115.5989	-115.5989	-115.5989	-115.5989	-115.5989	-115.5989	-115.5989 (71)
Water heating gains (Table 5)	53.7553	52.4013	50.3112	46.4171	43.8489	41.2128	39.9187	41.4987	43.2754	46.1725	49.9365	53.3192 (72)
Total internal gains	574.1484	592.8522	566.0443	550.9890	522.3724	505.5092	485.8927	484.4068	499.1957	513.2540	543.0664	560.6762 (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					8.0100	10.6334	0.6300	0.7000			0.7700	26.0301 (74)				
East					1.7500	19.6403	0.6300	0.7000			0.7700	10.5041 (76)				
South					7.8800	46.7521	0.6300	0.7000			0.7700	112.5897 (78)				
West					0.9800	19.6403	0.6300	0.7000			0.7700	5.8823 (80)				
Solar gains					155.0062	266.1930	372.2029	478.2361	553.8930	558.6156	534.8805	476.6332	408.3922	296.1361	186.0006	132.4632 (83)
Total gains					729.1546	859.0452	938.2472	1029.2251	1076.2654	1064.1249	1020.7732	961.0400	907.5879	809.3900	729.0670	693.1394 (84)

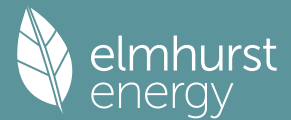
7. Mean internal temperature (heating season)

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	26.2332	26.2986	26.3631	26.6703	26.7286	27.0033	27.0033	27.0548	26.8968	26.7286	26.6110	26.4891
alpha	2.7489	2.7532	2.7575	2.7780	2.7819	2.8002	2.8002	2.8037	2.7931	2.7819	2.7741	2.7659
util living area	0.9695	0.9518	0.9269	0.8731	0.7848	0.6465	0.5111	0.5527	0.7386	0.8926	0.9533	0.9732 (86)
MIT	18.4382	18.7608	19.2087	19.8157	20.3484	20.7415	20.9033	20.8770	20.5973	19.9038	19.0766	18.3894 (87)
Th 2	20.0346	20.0367	20.0389	20.0489	20.0508	20.0595	20.0595	20.0611	20.0561	20.0508	20.0470	20.0430 (88)
util rest of house	0.9650	0.9448	0.9157	0.8526	0.7475	0.5816	0.4196	0.4623	0.6825	0.8712	0.9454	0.9693 (89)
MIT 2	17.6826	18.0021	18.4440	19.0397	19.5418	19.8923	20.0135	19.9991	19.7762	19.1350	18.3246	17.6400 (90)
Living area fraction	17.7864	18.1063	18.5491	19.1463	19.6526	20.0089	20.1357	20.1196	19.8890	19.2406	18.4279	17.7429 (91)
MIT	17.7864	18.1063	18.5491	19.1463	19.6526	20.0089	20.1357	20.1196	19.8890	19.2406	18.4279	17.7429 (92)
Temperature adjustment												0.0000
adjusted MIT	17.7864	18.1063	18.5491	19.1463	19.6526	20.0089	20.1357	20.1196	19.8890	19.2406	18.4279	17.7429 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9505	0.9262	0.8938	0.8293	0.7296	0.5778	0.4274	0.4684	0.6712	0.8485	0.9272	0.9559 (94)
Ext temp.	693.0387	795.6355	838.5724	853.5599	785.2378	614.8739	436.3264	450.1280	609.1917	686.7472	675.9903	662.6056 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)

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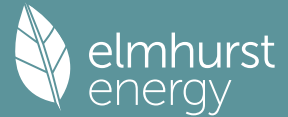
Space heating kWh	1829.7594	1787.2934	1626.6901	1367.3720	1058.9656	712.9219	466.0213	489.3348	766.0376	1150.5778	1515.0869	1819.6693	(97)
Space heating requirement - total per year (kWh/year)	845.7202	666.3942	586.3596	369.9448	203.6535	0.0000	0.0000	0.0000	0.0000	345.0900	604.1496	860.8554	(98a)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Space heating kWh	845.7202	666.3942	586.3596	369.9448	203.6535	0.0000	0.0000	0.0000	0.0000	345.0900	604.1496	860.8554	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4482.1671	(98c)
Space heating per m2												34.9814	(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													
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	1238.9671	975.3571	999.8119	0.0000	0.0000	0.0000	0.0000	(100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.7155	0.7864	0.7571	0.0000	0.0000	0.0000	0.0000	(101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	886.5312	766.9995	756.9081	0.0000	0.0000	0.0000	0.0000	(102)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	1170.4028	1123.0270	1056.4454	0.0000	0.0000	0.0000	0.0000	(103)
Cooled fraction													
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	(104)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	51.0969	66.2211	55.7139	0.0000	0.0000	0.0000	0.0000	(105)
Space cooling requirement													(106)
Energy for space heating													(107)
Energy for space cooling													(108)
Total													(109)
Fabric Energy Efficiency (TFEE)													(109)

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Property Reference	OP-D320 S3HERO				Issued on Date	29/11/2024
Assessment Reference	S3HERO		Prop Type Ref	S3HERO		
Property	S3HERO					
SAP Rating	82 B	DER	3.85	TER	9.99	
Environmental	96 A	% DER < TER				61.46
CO ₂ Emissions (t/year)	0.45	DFEE	35.49	TFEE	36.33	
Compliance Check	See BREL	% DFEE < TFEE				2.32
% DPER < TPER	22.15	DPER	40.60	TPER	52.15	
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	48.6500 (1b)	x 2.3100 (2b)	= 112.3815 (1b) - (3b)
First floor	46.8100 (1c)	x 2.6100 (2c)	= 122.1741 (1c) - (3c)
Second floor	32.6700 (1d)	x 2.5400 (2d)	= 82.9818 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	128.1300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 317.5374 (5)

2. Ventilation rate

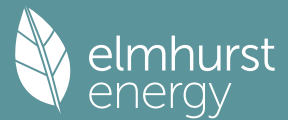
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.5000 (17)
Infiltration rate	0.1750 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1487 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1897	0.1859	0.1822	0.1636	0.1599	0.1413	0.1413	0.1376	0.1487	0.1599	0.1673	0.1748 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												71.2000 (23c)
Effective ac	0.3337	0.3299	0.3262	0.3076	0.3039	0.2853	0.2853	0.2816	0.2927	0.3039	0.3113	0.3188 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1400	1.0000	2.1400		(26)
Windows (Uw = 1.30)			18.6200	1.2357	23.0095		(27)
Ground Floor			48.6500	0.1100	5.3515		(28a)
External Wall	115.5900	18.5900	97.0000	0.1700	16.4900		(29a)
Dormer Cheeks	5.5100	2.1700	3.3400	0.1900	0.6346		(29a)
Stud Wall	20.9900		20.9900	0.1700	3.5683		(29a)
Roof - ceiling	39.4700		39.4700	0.1100	4.3417		(30)
Roof - pitch	5.4000		5.4000	0.2000	1.0800		(30)
Dormer Roof	3.6700		3.6700	0.2000	0.7340		(30)
Bay Roof	1.8500		1.8500	0.1100	0.2035		(30)
Total net area of external elements Aum(A, m ²)			241.1300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		57.5531		(33)
Party Wall			65.6500	0.0000	0.0000		(32)

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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)	9.1000	0.0500	0.4550
E3 Sill	10.0200	0.0500	0.5010
E4 Jamb	25.2000	0.0500	1.2600
E5 Ground floor (normal)	20.9400	0.1600	3.3504
E6 Intermediate floor within a dwelling	23.5200	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	13.3000	0.0600	0.7980
E12 Gable (insulation at ceiling level)	8.8800	0.0600	0.5328
E16 Corner (normal)	23.7100	0.0900	2.1339
E18 Party wall between dwellings	9.8700	0.0600	0.5922
P1 Party wall - Ground floor	9.9800	0.0800	0.7984
P2 Party wall - Intermediate floor within a dwelling	16.4800	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	8.8800	0.1200	1.0656
E17 Corner (inverted - internal area greater than external area)	8.5900	-0.0900	-0.7731
E24 Eaves (insulation at ceiling level - inverted)	13.9800	0.2400	3.3552
E13 Gable (insulation at rafter level)	1.5500	0.0800	0.1240
E18 Party wall between dwellings	9.2100	0.0600	0.5526
E25 Staggered party wall between dwellings	3.5800	0.0600	0.2148
P5 Party wall - Roof (insulation at rafter level)	1.5500	0.0800	0.1240
R1 Head of roof window	1.8100	0.0800	0.1448
R2 Sill of roof window	1.8100	0.0600	0.1086
R3 Jamb of roof window	2.4000	0.0800	0.1920
R6 Flat ceiling	13.1800	0.0600	0.7908
R8 Roof to wall (rafter)	14.1500	0.0600	0.8490
E25 Staggered party wall between dwellings	4.0800	0.0600	0.2448

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

17.4148 (36)

Point Thermal bridges

0.0000

Total fabric heat loss

(33) + (36) + (36a) = 74.9679 (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	34.9630	34.5733	34.1836	32.2352	31.8455	29.8971	29.8971	29.5075	30.6765	31.8455	32.6249	33.4042	(38)
Heat transfer coeff	109.9309	109.5412	109.1515	107.2031	106.8134	104.8650	104.8650	104.4754	105.6444	106.8134	107.5928	108.3721	(39)
Average = Sum(39)m / 12 =												107.1057	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8580	0.8549	0.8519	0.8367	0.8336	0.8184	0.8184	0.8154	0.8245	0.8336	0.8397	0.8458	(40)
HLP (average)												0.8359	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy

2.8900 (42)

Hot water usage for mixer showers

99.9284 98.4267 96.2383 92.0514 88.9615 85.5158 83.5572 85.7289 88.1096 91.8093 96.0862 99.5455 (42a)

Hot water usage for baths

33.0273 32.5368 31.8461 30.5725 29.6188 28.5614 27.9902 28.6761 29.4229 30.5544 31.8542 32.9156 (42b)

Hot water usage for other uses

46.5539 44.8610 43.1682 41.4753 39.7824 38.0896 38.0896 39.7824 41.4753 43.1682 44.8610 46.5539 (42c)

Average daily hot water use (litres/day)

165.0739 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	179.5096	175.8245	171.2526	164.0992	158.3628	152.1667	149.6370	154.1875	159.0078	165.5319	172.8015	179.0151	(44)
Energy conte	284.2993	250.3717	263.2088	224.6436	213.1868	187.1067	180.9729	190.9163	196.0725	224.6252	246.1874	280.2943	(45)
Energy content (annual)										Total = Sum(45)m =		2741.8857	
Distribution loss (46)m = 0.15 x (45)m													
42.6449 37.5558 39.4813 33.6965 31.9780 28.0660 27.1459 28.6374 29.4109 33.6938 36.9281 42.0442 (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 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 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

382.6809 339.2325 361.5904 319.8516 311.5684 251.7387 247.7593 257.7027 260.7045 323.0068 341.3954 378.6759 (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 382.6809 339.2325 361.5904 319.8516 311.5684 251.7387 247.7593 257.7027 260.7045 323.0068 341.3954 378.6759 (64)

Total per year (kWh/year) = Sum(64)m = 3775.9073 (64)

12Total per year (kWh/year)

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

138.4156 122.8876 131.4030 117.1644 114.7707 80.2226 78.7834 82.0896 83.2037 118.5740 124.3277 137.0839 (65)

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

Metabolic gains (Table 5), Watts

(66)m 144.4987 144.4987 144.4987 144.4987 144.4987 144.4987 144.4987 144.4987 144.4987 144.4987 144.4987 144.4987 (66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

158.5911 175.5830 158.5911 163.8775 158.5911 163.8775 158.5911 158.5911 163.8775 158.5911 163.8775 158.5911 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

295.4523 298.5182 290.7923 274.3448 253.5828 234.0694 221.0332 217.9674 225.6933 242.1408 262.9028 282.4162 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

37.4499 37.4499 37.4499 37.4499 37.4499 37.4499 37.4499 37.4499 37.4499 37.4499 37.4499 37.4499 (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)

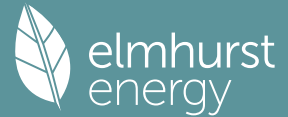
Losses e.g. evaporation (negative values) (Table 5)

-115.5989 -115.5989 -115.5989 -115.5989 -115.5989 -115.5989 -115.5989 -115.5989 -115.5989 -115.5989 -115.5989 -115.5989 (71)

Water heating gains (Table 5)

186.0425 182.8685 176.6170 162.7283 154.2617 111.4203 105.8917 110.3355 115.5607 159.3736 172.6774 184.2526 (72)

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Total internal gains
706.4355 723.3194 692.3500 667.3002 632.7852 575.7167 551.8657 553.2436 571.4811 626.4551 665.8073 691.6096 (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				8.0100	10.6334	0.6300	0.7000		0.7700		26.0301 (74)	
East				1.7500	19.6403	0.6300	0.7000		0.7700		10.5041 (76)	
South				7.8800	46.7521	0.6300	0.7000		0.7700		112.5897 (78)	
West				0.9800	19.6403	0.6300	0.7000		0.7700		5.8823 (80)	

Solar gains	155.0062	266.1930	372.2029	478.2361	553.8930	558.6156	534.8805	476.6332	408.3922	296.1361	186.0006	132.4632 (83)
Total gains	861.4417	989.5124	1064.5530	1145.5363	1186.6782	1134.3324	1086.7462	1029.8767	979.8733	922.5912	851.8079	824.0728 (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	32.3764	32.4916	32.6076	33.2002	33.3213	33.9404	33.9404	34.0670	33.6901	33.3213	33.0800	32.8421
alpha	3.1584	3.1661	3.1738	3.2133	3.2214	3.2627	3.2627	3.2711	3.2460	3.2214	3.2053	3.1895
util living area	0.9492	0.9226	0.8851	0.8077	0.6914	0.5429	0.4092	0.4453	0.6420	0.8285	0.9218	0.9547 (86)
Living	19.1971	19.4919	19.8632	20.3360	20.6910	20.9005	20.9700	20.9603	20.8208	20.3807	19.7333	19.1606
Non living	18.0763	18.4475	18.9122	19.4992	19.9167	20.1543	20.2184	20.2136	20.0727	19.5648	18.7644	18.0372
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	20.0777	19.4919	19.8632	20.3360	20.6910	20.9005	20.9700	20.9603	20.8208	20.3807	19.7333	19.4179 (87)
Th 2	20.2034	20.2060	20.2086	20.2217	20.2243	20.2374	20.2374	20.2400	20.2321	20.2243	20.2190	20.2138 (88)
util rest of house	0.9427	0.9132	0.8709	0.7842	0.6543	0.4894	0.3434	0.3785	0.5905	0.8026	0.9108	0.9489 (89)
MIT 2	19.3554	18.4475	18.9122	19.4992	19.9167	20.1543	20.2184	20.2136	20.0727	19.5648	18.7644	18.4294 (90)
Living area fraction	19.4546	18.5909	19.0429	19.6141	20.0231	20.2568	20.3217	20.3162	20.1755	19.6769	18.8975	0.1374 (91)
MIT	19.4546	18.5909	19.0429	19.6141	20.0231	20.2568	20.3217	20.3162	20.1755	19.6769	18.8975	18.5652 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4546	18.5909	19.0429	19.6141	20.0231	20.2568	20.3217	20.3162	20.1755	19.6769	18.8975	18.5652 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9357	0.8892	0.8460	0.7637	0.6440	0.4908	0.3509	0.3854	0.5864	0.7817	0.8874	0.9335 (94)
Useful gains	806.0671	879.8838	900.6377	874.8144	764.1730	556.7694	381.3063	396.8710	574.6114	721.1798	755.8650	769.2621 (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	1665.9585	1499.7212	1369.0712	1148.5873	889.0179	593.2019	390.2719	409.1479	641.8421	969.5343	1269.3239	1556.7872 (97)
Space heating kWh	639.7592	416.5307	348.5146	197.1165	92.8846	0.0000	0.0000	0.0000	0.0000	184.7757	369.6904	585.9187 (98a)
Space heating requirement - total per year (kWh/year)												2835.1904
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	639.7592	416.5307	348.5146	197.1165	92.8846	0.0000	0.0000	0.0000	0.0000	184.7757	369.6904	585.9187 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2835.1904
Space heating per m2										(98c) / (4) =		22.1275 (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 %)												249.7664 (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	639.7592	416.5307	348.5146	197.1165	92.8846	0.0000	0.0000	0.0000	0.0000	184.7757	369.6904	585.9187 (98)
Space heating efficiency (main heating system 1)	249.7664	249.7664	249.7664	249.7664	249.7664	0.0000	0.0000	0.0000	0.0000	249.7664	249.7664	249.7664 (210)
Space heating fuel (main heating system)	256.1431	166.7681	139.5362	78.9204	37.1886	0.0000	0.0000	0.0000	0.0000	73.9794	148.0145	234.5867 (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	382.6809	339.2325	361.5904	319.8516	311.5684	251.7387	247.7593	257.7027	260.7045	323.0068	341.3954	378.6759 (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	142.0388	125.9122	134.2107	118.7186	115.6441	93.4373	91.9603	95.6509	96.7651	119.8897	126.7149	140.5523 (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	48.8267	44.1015	48.8267	47.2517	48.8267	47.2517	48.8267	48.8267	47.2517	48.8267	47.2517	48.8267 (231)
Lighting	32.9521	26.4354	23.8021	17.4385	13.4700	11.0051	12.2878	15.9721	20.7462	27.2201	30.7451	33.8679 (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)												

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(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												1135.1370	(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												1401.4948	(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)												574.8951	(230a)
Total electricity for the above, kWh/year												574.8951	(231)
Electricity for lighting (calculated in Appendix L)												265.9424	(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												3377.4693	(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	1135.1370	0.1556	176.6268	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1401.4948	0.1415	198.3616	(264)
Space and water heating			374.9884	(265)
Pumps, fans and electric keep-hot	574.8951	0.1387	79.7450	(267)
Energy for lighting	265.9424	0.1443	38.3837	(268)
Total CO2, kg/year			493.1171	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.8500	(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	1135.1370	1.5760	1788.9920	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1401.4948	1.5234	2135.0251	(278)
Space and water heating			3924.0170	(279)
Pumps, fans and electric keep-hot	574.8951	1.5128	869.7013	(281)
Energy for lighting	265.9424	1.5338	407.9113	(282)
Total Primary energy kWh/year			5201.6296	(286)
Dwelling Primary energy Rate (DPER)			40.6000	(287)

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

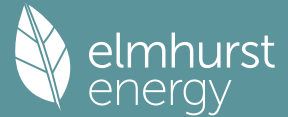
1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	48.6500 (1b)	x	2.3100 (2b)	=	112.3815 (1b)	- (3b)
First floor	46.8100 (1c)	x	2.6100 (2c)	=	122.1741 (1c)	- (3c)
Second floor	32.6700 (1d)	x	2.5400 (2d)	=	82.9818 (1d)	- (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)... (1n)	128.1300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)... (3n)	=	317.5374	(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)

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Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 40.0000 / (5) = 0.1260 (8)
 Pressure test Yes
 Pressure Test Method Blower Door
 Measured/design AP50 5.0000 (17)
 Infiltration rate 0.3760 (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) = 0.3196 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Effective ac	0.4075	0.3995	0.3915	0.3515	0.3435	0.3036	0.3036	0.2956	0.3196	0.3435	0.3595	0.3755	(22b)
	0.5830	0.5798	0.5766	0.5618	0.5590	0.5461	0.5461	0.5437	0.5511	0.5590	0.5646	0.5705	(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)			18.6200	1.1450	21.3206			(27)
Ground Floor			48.6500	0.1300	6.3245			(28a)
External Wall	115.5900	18.5900	97.0000	0.1800	17.4600			(29a)
Dormer Cheeks	5.5100	2.1700	3.3400	0.1800	0.6012			(29a)
Stud Wall	20.9900		20.9900	0.1800	3.7782			(29a)
Roof - ceiling	39.4700		39.4700	0.1100	4.3417			(30)
Roof - pitch	5.4000		5.4000	0.1100	0.5940			(30)
Dormer Roof	3.6700		3.6700	0.1100	0.4037			(30)
Bay Roof	1.8500		1.8500	0.1100	0.2035			(30)
Total net area of external elements Aum(A, m2)			241.1300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	57.1674			(33)
Party Wall			65.6500	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)	9.1000	0.0500	0.4550	
E3 Sill	10.0200	0.0500	0.5010	
E4 Jamb	25.2000	0.0500	1.2600	
E5 Ground floor (normal)	20.9400	0.1600	3.3504	
E6 Intermediate floor within a dwelling	23.5200	0.0000	0.0000	
E10 Eaves (insulation at ceiling level)	13.3000	0.0600	0.7980	
E12 Gable (insulation at ceiling level)	8.8800	0.0600	0.5328	
E16 Corner (normal)	23.7100	0.0900	2.1339	
E18 Party wall between dwellings	9.8700	0.0600	0.5922	
P1 Party wall - Ground floor	9.9800	0.0800	0.7984	
P2 Party wall - Intermediate floor within a dwelling	16.4800	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	8.8800	0.1200	1.0656	
E17 Corner (inverted - internal area greater than external area)	8.5900	-0.0900	-0.7731	
E24 Eaves (insulation at ceiling level - inverted)	13.9800	0.2400	3.3552	
E13 Gable (insulation at rafter level)	1.5500	0.0800	0.1240	
E18 Party wall between dwellings	9.2100	0.0600	0.5526	
E25 Staggered party wall between dwellings	3.5800	0.0600	0.2148	
P5 Party wall - Roof (insulation at rafter level)	1.5500	0.0800	0.1240	
R1 Head of roof window	1.8100	0.0800	0.1448	
R2 Sill of roof window	1.8100	0.0600	0.1086	
R3 Jamb of roof window	2.4000	0.0800	0.1920	
R6 Flat ceiling	13.1800	0.0600	0.7908	
R8 Roof to wall (rafter)	14.1500	0.0600	0.8490	
E25 Staggered party wall between dwellings	4.0800	0.0600	0.2448	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 17.4148 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 74.5822 (37)

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

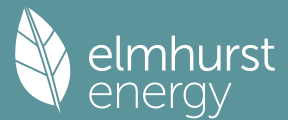
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	61.0921	60.7544	60.4233	58.8682	58.5772	57.2228	57.2228	56.9720	57.7445	58.5772	59.1658	59.7812	(38)
Average = Sum(39)m / 12 =	135.6743	135.3366	135.0055	133.4504	133.1594	131.8050	131.8050	131.5542	132.3267	133.1594	133.7480	134.3634	(39)
												133.4490	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0589	1.0562	1.0537	1.0415	1.0393	1.0287	1.0287	1.0267	1.0328	1.0393	1.0438	1.0486	(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													2.8900 (42)
Hot water usage for mixer showers													
Hot water usage for baths	72.6752	71.5830	69.9915	66.9465	64.6993	62.1933	60.7688	62.3483	64.0797	66.7704	69.8808	72.3967	(42a)
Hot water usage for other uses	31.3759	30.9100	30.2538	29.0439	28.1379	27.1333	26.5907	27.2423	27.9518	29.0267	30.2615	31.2699	(42b)
Average daily hot water use (litres/day)	44.2262	42.6180	41.0098	39.4015	37.7933	36.1851	36.1851	37.7933	39.4015	41.0098	42.6180	44.2262	(42c)
												136.3002	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	148.2773	145.1110	141.2550	135.3919	130.6305	125.5117	123.5447	127.3839	131.4330	136.8069	142.7604	147.8928	(44)
Energy content (annual)	234.8351	206.6361	217.1037	185.3447	175.8538	154.3313	149.4166	157.7279	162.0701	185.6456	203.3883	231.5644	(45)
Distribution loss (46)m = 0.15 x (45)m													
	35.2253	30.9954	32.5656	27.8017	26.3781	23.1497	22.4125	23.6592	24.3105	27.8468	30.5082	34.7347	(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													

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	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	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	(61)
Total heat required for water heating calculated for each month												
WWHRS	288.1847	254.8228	270.4534	236.9734	229.2034	205.9599	202.7662	211.0775	213.6987	238.9953	255.0170	284.9140 (62)
PV diverter	-33.2241	-29.3836	-30.7688	-25.4778	-23.7444	-20.3183	-19.0451	-20.2526	-21.0221	-24.7827	-28.0758	-32.6088 (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)
	254.9606	225.4392	239.6845	211.4955	205.4590	185.6417	183.7210	190.8250	192.6767	214.2126	226.9412	252.3052 (64)
12Total per year (kWh/year)												2583.3622 (64)
Electric shower(s)												2583 (64)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
												0.0000 (64a)
Heat gains from water heating, kWh/month												
	120.7624	107.2559	114.8667	102.9300	101.1511	92.6181	92.3607	95.1242	95.1912	104.4069	108.9296	119.6749 (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	144.4987	144.4987	144.4987	144.4987	144.4987	144.4987	144.4987	144.4987	144.4987	144.4987	144.4987	144.4987	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	158.5911	175.5830	158.5911	163.8775	158.5911	163.8775	158.5911	158.5911	163.8775	158.5911	163.8775	158.5911	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	295.4523	298.5182	290.7923	274.3448	253.5828	234.0694	221.0332	217.9674	225.6933	242.1408	262.9028	282.4162	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.4499	37.4499	37.4499	37.4499	37.4499	37.4499	37.4499	37.4499	37.4499	37.4499	37.4499	37.4499	(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)													
	-115.5989	-115.5989	-115.5989	-115.5989	-115.5989	-115.5989	-115.5989	-115.5989	-115.5989	-115.5989	-115.5989	-115.5989	(71)
Water heating gains (Table 5)													
	162.3150	159.6070	154.3907	142.9584	135.9558	128.6362	124.1407	127.8552	132.2100	140.3318	151.2910	160.8533	(72)
Total internal gains													
	685.7081	703.0578	673.1238	650.5303	617.4792	592.9327	570.1147	570.7633	588.1304	610.4133	647.4210	671.2102	(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				8.0100	10.6334		0.6300		0.7000		0.7700		26.0301 (74)
East				1.7500	19.6403		0.6300		0.7000		0.7700		10.5041 (76)
South				7.8800	46.7521		0.6300		0.7000		0.7700		112.5897 (78)
West				0.9800	19.6403		0.6300		0.7000		0.7700		5.8823 (80)
Solar gains	155.0062	266.1930	372.2029	478.2361	553.8930	558.6156	534.8805	476.6332	408.3922	296.1361	186.0006		132.4632 (83)
Total gains	840.7143	969.2509	1045.3267	1128.7664	1171.3723	1151.5484	1104.9952	1047.3964	996.5226	906.5494	833.4215		803.6735 (84)

7. Mean internal temperature (heating season)

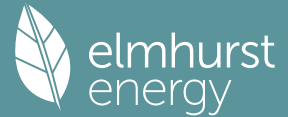
Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	26.2332	26.2986	26.3631	26.6703	26.7286	27.0033	27.0033	27.0548	26.8968	26.7286	26.6110	26.4891	
alpha	2.7489	2.7532	2.7575	2.7780	2.7819	2.8002	2.8002	2.8037	2.7931	2.7819	2.7741	2.7659	
util living area	0.9578	0.9373	0.9087	0.8499	0.7557	0.6144	0.4800	0.5179	0.7034	0.8669	0.9374	0.9622	(86)
MIT	18.5997	18.9102	19.3409	19.9161	20.4155	20.7739	20.9176	20.8958	20.6481	20.0087	19.2191	18.5522	(87)
Th 2	20.0346	20.0367	20.0389	20.0489	20.0508	20.0595	20.0595	20.0611	20.0561	20.0508	20.0470	20.0430	(88)
util rest of house													
	0.9517	0.9286	0.8955	0.8270	0.7162	0.5494	0.3916	0.4302	0.6452	0.8420	0.9272	0.9568	(89)
MIT 2	17.2201	17.6124	18.1549	18.8727	19.4708	19.8742	20.0099	19.9948	19.7469	18.9992	18.0139	17.1650	(90)
Living area fraction													
MIT	17.4096	17.7907	18.3178	19.0160	19.6006	19.9978	20.1346	20.1186	19.8707	19.1379	18.1794	17.3556	(91)
Temperature adjustment													
adjusted MIT	17.4096	17.7907	18.3178	19.0160	19.6006	19.9978	20.1346	20.1186	19.8707	19.1379	18.1794	17.3556	(92)
													0.0000
													17.3556 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9285	0.9010	0.8650	0.7972	0.6949	0.5448	0.3990	0.4359	0.6323	0.8124	0.8999	0.9350	(94)
Useful gains	780.5795	873.2811	904.1927	899.8283	814.0019	627.3716	440.9430	456.5443	630.1425	736.4730	750.0314	751.4525	(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													
	1778.6356	1744.5805	1595.4662	1349.9825	1052.0329	711.4584	465.8763	489.1939	763.6215	1136.9037	1481.8510	1767.6273	(97)
Space heating kWh													
	742.5537	585.5132	514.3075	324.1110	177.0950	0.0000	0.0000	0.0000	0.0000	297.9205	526.9101	756.0341	(98a)
Space heating requirement - total per year (kWh/year)													3924.4451
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													
	742.5537	585.5132	514.3075	324.1110	177.0950	0.0000	0.0000	0.0000	0.0000	297.9205	526.9101	756.0341	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)													3924.4451
Space heating per m ²													(98c) / (4) = 30.6286 (99)

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

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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	742.5537	585.5132	514.3075	324.1110	177.0950	0.0000	0.0000	0.0000	0.0000	297.9205	526.9101	756.0341	(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)	804.5002	634.3588	557.2128	351.1495	191.8690	0.0000	0.0000	0.0000	0.0000	322.7741	570.8669	819.1052	(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	254.9606	225.4392	239.6845	211.4955	205.4590	185.6417	183.7210	190.8250	192.6767	214.2126	226.9412	252.3052	(64)
Efficiency of water heater	86.3119	86.1005	85.7265	85.0140	83.7284	79.8000	79.8000	79.8000	79.8000	84.7997	85.8841	86.3628	(217)
Fuel for water heating, kWh/month	295.3944	261.8326	279.5920	248.7774	245.3874	232.6337	230.2269	239.1290	241.4495	252.6101	264.2414	292.1456	(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	32.9521	26.4354	23.8021	17.4385	13.4700	11.0051	12.2878	15.9721	20.7462	27.2201	30.7451	33.8679	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-46.2175	-65.5157	-94.6518	-106.9318	-115.6633	-108.0052	-106.6023	-100.4361	-89.6567	-75.0866	-50.9120	-39.9102	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)	-25.0157	-52.7546	-105.1241	-158.3095	-209.7733	-211.0090	-208.5956	-176.4691	-129.1022	-75.6640	-33.4645	-19.7775	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												4251.8365	(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												3083.4201	(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)												265.9424	(232)
Energy saving/generation technologies (Appendices M, N and Q)													
PV generation												-2404.6481	(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												5282.5507	(238)
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP													
	Energy							Emission factor				Emissions	
	kWh/year							kg CO2/kWh				kg CO2/year	
Space heating - main system 1	4251.8365							0.2100				892.8857	(261)
Total CO2 associated with community systems												0.0000	(373)
Water heating (other fuel)	3083.4201							0.2100				647.5182	(264)
Space and water heating												1540.4039	(265)
Pumps, fans and electric keep-hot	86.0000							0.1387				11.9293	(267)
Energy for lighting	265.9424							0.1443				38.3837	(268)
Energy saving/generation technologies													
PV Unit electricity used in dwelling	-999.5891							0.1345				-134.4418	
PV Unit electricity exported	-1405.0590							0.1258				-176.7692	
Total												-311.2110	(269)
Total CO2, kg/year												1279.5059	(272)
EPC Target Carbon Dioxide Emission Rate (TER)												9.9900	(273)
13a. Primary energy - Individual heating systems including micro-CHP													
	Energy							Primary energy factor				Primary energy	
	kWh/year							kg CO2/kWh				kWh/year	
Space heating - main system 1	4251.8365							1.1300				4804.5752	(275)
Total CO2 associated with community systems												0.0000	(473)
Water heating (other fuel)	3083.4201							1.1300				3484.2647	(278)
Space and water heating												8288.8399	(279)
Pumps, fans and electric keep-hot	86.0000							1.5128				130.1008	(281)
Energy for lighting	265.9424							1.5338				407.9113	(282)
Energy saving/generation technologies													
PV Unit electricity used in dwelling	-999.5891							1.4971				-1496.4584	
PV Unit electricity exported	-1405.0590							0.4618				-648.8576	
Total												-2145.3161	(283)
Total Primary energy kWh/year												6681.5359	(286)
Target Primary Energy Rate (TPER)												52.1500	(287)

