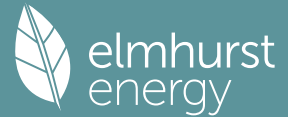


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Property Reference	OP-D320 A2HAZE				Issued on Date	29/11/2024		
Assessment Reference	A2HAZE			Prop Type Ref	A2HAZE			
Property	A2HAZE							
SAP Rating	81 B		DER	4.46		TER	11.54	
Environmental	96 A		% DER < TER				61.35	
CO ₂ Emissions (t/year)	0.33		DFEE	34.60		TFEE	35.98	
Compliance Check	See BREL		% DFEE < TFEE				3.84	
% DPER < TPER	21.79		DPER	47.21		TPER	60.36	
Assessor Details	Mr. Matthew Stainrod					Assessor ID	AU83-0001	
Client								

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	39.9100 (1b)	x 2.3100 (2b)	= 92.1921 (1b) - (3b)
First floor	39.9100 (1c)	x 2.6100 (2c)	= 104.1651 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.8200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 196.3572 (5)

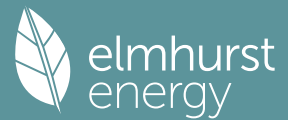
2. Ventilation rate

	m ³ per hour											
Number of open chimneys	0 * 80 = 0.0000 (6a)											
Number of open flues	0 * 20 = 0.0000 (6b)											
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)											
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)											
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)											
Number of blocked chimneys	0 * 20 = 0.0000 (6f)											
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)											
Number of passive vents	0 * 10 = 0.0000 (7b)											
Number of flueless gas fires	0 * 40 = 0.0000 (7c)											
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 0.0000 / (5) = 0.0000 (8)											
Pressure test	Yes											
Pressure Test Method	Blower Door											
Measured/design AP50	3.5000 (17)											
Infiltration rate	0.1750 (18)											
Number of sides sheltered	2 (19)											
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)											
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1487 (21)											
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1897	0.1859	0.1822	0.1636	0.1599	0.1413	0.1413	0.1376	0.1487	0.1599	0.1673	0.1748 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												72.0000 (23c)
Effective ac	0.3297	0.3259	0.3222	0.3036	0.2999	0.2813	0.2813	0.2776	0.2888	0.2999	0.3073	0.3148 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			4.2800	1.0000	4.2800		(26)
Windows (Uw = 1.30)			10.6500	1.2357	13.1606		(27)
Ground Floor			39.9100	0.1100	4.3901		(28a)
External Wall	88.0700	14.9300	73.1400	0.1700	12.4338		(29a)
Roof - ceiling	39.9100		39.9100	0.1100	4.3901		(30)
Total net area of external elements Aum(A, m ²)			167.8900				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		38.6546		(33)
Party Wall			41.8900	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				10.7900	0.0500	0.5395	
E3 Sill				8.7500	0.0500	0.4375	

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E4 Jamb	24.9000	0.0500	1.2450
E5 Ground floor (normal)	17.8900	0.1600	2.8624
E6 Intermediate floor within a dwelling	17.8900	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	9.3800	0.0600	0.5628
E12 Gable (insulation at ceiling level)	8.5100	0.0600	0.5106
E16 Corner (normal)	9.8500	0.0900	0.8865
E18 Party wall between dwellings	9.8500	0.0600	0.5910
P1 Party wall - Ground floor	8.5100	0.0800	0.6808
P2 Party wall - Intermediate floor within a dwelling	8.5100	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	8.5100	0.1200	1.0212

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.3373 (36)

Point Thermal bridges 0.0000

Total fabric heat loss (33) + (36) + (36a) = 47.9919 (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	21.3610	21.1201	20.8791	19.6743	19.4333	18.2285	18.2285	17.9875	18.7104	19.4333	19.9152	20.3972 (38)
Average = Sum(39)m / 12 =	69.3530	69.1120	68.8710	67.6662	67.4252	66.2204	66.2204	65.9794	66.7023	67.4252	67.9072	68.3891 (39)
												67.6060

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.8689	0.8658	0.8628	0.8477	0.8447	0.8296	0.8296	0.8266	0.8357	0.8447	0.8508	0.8568 (40)
HLP (average)												0.8470
Days in month	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.4594 (42)
Hot water usage for mixer showers													
90.0025	88.6500	86.6790	82.9080	80.1250	77.0215	75.2575	77.2135	79.3577	82.6899	86.5420	89.6577	(42a)	
Hot water usage for baths													
29.7596	29.3176	28.6952	27.5477	26.6884	25.7356	25.2209	25.8389	26.5118	27.5314	28.7026	29.6590	(42b)	
Hot water usage for other uses													
41.9127	40.3886	38.8645	37.3404	35.8163	34.2922	34.2922	35.8163	37.3404	38.8645	40.3886	41.9127	(42c)	
Average daily hot water use (litres/day)												148.6736 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	161.6748	158.3562	154.2388	147.7960	142.6297	137.0493	134.7706	138.8687	143.2099	149.0858	155.6332	161.2294 (44)	
Energy content (annual)	256.0534	225.4971	237.0592	202.3254	192.0070	168.5181	162.9933	171.9485	176.5922	202.3081	221.7280	252.4463 (45)	
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		2469.4766	
38.4080	33.8246	35.5589	30.3488	28.8011	25.2777	24.4490	25.7923	26.4888	30.3462	33.2592	37.8669 (46)		
Water storage loss:													
Store volume												230.0000 (47)	
a) If manufacturer declared loss factor is known (kWh/day):												1.8000 (48)	
Temperature factor from Table 2b												0.7800 (49)	
Enter (49) or (54) in (55)												1.4040 (55)	
Total storage loss													
43.5240	39.3120	43.5240	42.1200	43.5240	42.1200	43.5240	43.5240	42.1200	43.5240	42.1200	43.5240 (56)		
If cylinder contains dedicated solar storage													
43.5240	39.3120	43.5240	42.1200	43.5240	42.1200	43.5240	43.5240	42.1200	43.5240	42.1200	43.5240 (57)		
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576 (59)	
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)		
Total heat required for water heating calculated for each month													
354.4350	314.3579	335.4408	297.5334	290.3886	233.1501	229.7797	238.7349	241.2242	300.6897	316.9360	350.8279 (62)		
WWHRS	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 (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 (63c)		
FGHRS	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	354.4350	314.3579	335.4408	297.5334	290.3886	233.1501	229.7797	238.7349	241.2242	300.6897	316.9360	350.8279 (64)	
12Total per year (kWh/year)									Total per year (kWh/year) = Sum(64)m =			3503.4982 (64)	
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)	
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)	
Heat gains from water heating, kWh/month	129.0238	114.6168	122.7083	109.7436	107.7284	74.0419	72.8052	75.7828	76.7265	111.1535	116.1950	127.8245 (65)	

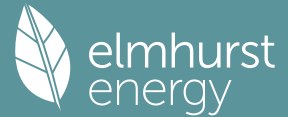
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	122.9718	122.9718	122.9718	122.9718	122.9718	122.9718	122.9718	122.9718	122.9718	122.9718	122.9718	122.9718 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.7948	132.6299	119.7948	123.7879	119.7948	123.7879	119.7948	119.7948	123.7879	119.7948	123.7879	119.7948 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.0639	221.3371	215.6087	203.4137	188.0196	173.5514	163.8857	161.6125	167.3409	179.5359	194.9300	209.3983 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.2972	35.2972	35.2972	35.2972	35.2972	35.2972	35.2972	35.2972	35.2972	35.2972	35.2972	35.2972 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-98.3775	-98.3775	-98.3775	-98.3775	-98.3775	-98.3775	-98.3775	-98.3775	-98.3775	-98.3775	-98.3775	-98.3775 (71)
Water heating gains (Table 5)	173.4191	170.5608	164.9305	152.4217	144.7962	102.8359	97.8565	101.8586	106.5646	149.3999	161.3819	171.8071 (72)
Total internal gains	572.1694	584.4194	560.2255	539.5148	512.5022	460.0668	441.4285	443.1574	457.5849	508.6221	539.9914	560.8916 (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	5.7200	10.6334	0.6300	0.7000	0.7700	18.5883 (74)
East	1.4500	19.6403	0.6300	0.7000	0.7700	8.7034 (76)
South	3.4800	46.7521	0.6300	0.7000	0.7700	49.7224 (78)

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Solar gains	77.0140	133.9813	192.1318	255.0886	302.8960	308.6966	294.2589	257.0823	213.5444	150.3206	92.7211	65.6181 (83)
Total gains	649.1834	718.4006	752.3574	794.6035	815.3982	768.7634	735.6873	700.2397	671.1293	658.9427	632.7125	626.5097 (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	31.9701	32.0816	32.1938	32.7671	32.8842	33.4825	33.4825	33.6047	33.2405	32.8842	32.6508	32.4207
alpha	3.1313	3.1388	3.1463	3.1845	3.1923	3.2322	3.2322	3.2403	3.2160	3.1923	3.1767	3.1614
util living area	0.9211	0.8927	0.8536	0.7723	0.6539	0.5120	0.3838	0.4166	0.6053	0.7846	0.8860	0.9273 (86)
Living	19.4142	19.6642	19.9887	20.4147	20.7319	20.9133	20.9741	20.9661	20.8452	20.4737	19.9075	19.3849
Non living	18.3403	18.6527	19.0564	19.5816	19.9509	20.1562	20.2116	20.2081	20.0868	19.6625	18.9699	18.3108
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	20.1888	19.6642	19.9887	20.4147	20.7319	20.9133	20.9741	20.9661	20.8452	20.4737	19.9075	19.6108 (87)
Th 2	20.1940	20.1966	20.1992	20.2122	20.2147	20.2277	20.2277	20.2303	20.2225	20.2147	20.2096	20.2044 (88)
util rest of house	0.9118	0.8805	0.8368	0.7466	0.6158	0.4595	0.3206	0.3523	0.5535	0.7552	0.8713	0.9187 (89)
MIT 2	19.4550	18.6527	19.0564	19.5816	19.9509	20.1562	20.2116	20.2081	20.0868	19.6625	18.9699	18.6521 (90)
Living area fraction	19.5901	18.8390	19.2281	19.7351	20.0948	20.2956	20.3520	20.3477	20.2264	19.8119	19.1426	0.1842 (91)
MIT	19.5901	18.8390	19.2281	19.7351	20.0948	20.2956	20.3520	20.3477	20.2264	19.8119	19.1426	18.8286 (92)
Temperature adjustment												0.0000
adjusted MIT	19.5901	18.8390	19.2281	19.7351	20.0948	20.2956	20.3520	20.3477	20.2264	19.8119	19.1426	18.8286 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9039	0.8560	0.8133	0.7296	0.6097	0.4643	0.3310	0.3623	0.5538	0.7385	0.8477	0.9007 (94)
Useful gains	586.8114	614.9523	611.9041	579.7107	497.1293	356.9432	243.4830	253.7266	371.6680	486.6243	536.3323	564.3145 (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	1060.4167	963.3506	876.5956	733.1672	566.0195	377.1675	248.4598	260.4663	408.6479	621.1150	817.7767	1000.4388 (97)
Space heating kWh	352.3624	234.1236	196.9305	110.4887	51.2543	0.0000	0.0000	0.0000	0.0000	100.0611	202.6400	324.4765 (98a)
Space heating requirement - total per year (kWh/year)												1572.3370
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	352.3624	234.1236	196.9305	110.4887	51.2543	0.0000	0.0000	0.0000	0.0000	100.0611	202.6400	324.4765 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1572.3370
Space heating per m2										(98c) / (4) =		19.6985 (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 %)												241.8321 (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	352.3624	234.1236	196.9305	110.4887	51.2543	0.0000	0.0000	0.0000	0.0000	100.0611	202.6400	324.4765 (98)
Space heating efficiency (main heating system 1)	241.8321	241.8321	241.8321	241.8321	241.8321	0.0000	0.0000	0.0000	0.0000	241.8321	241.8321	241.8321 (210)
Space heating fuel (main heating system)	145.7054	96.8124	81.4327	45.6882	21.1942	0.0000	0.0000	0.0000	0.0000	41.3763	83.7936	134.1742 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	354.4350	314.3579	335.4408	297.5334	290.3886	233.1501	229.7797	238.7349	241.2242	300.6897	316.9360	350.8279 (64)
Efficiency of water heater (217)m	268.5782	268.5782	268.5782	268.5782	268.5782	268.5782	268.5782	268.5782	268.5782	268.5782	268.5782	268.5782 (216)
Fuel for water heating, kWh/month	131.9672	117.0452	124.8950	110.7809	108.1207	86.8090	85.5541	88.8884	89.8153	111.9561	118.0051	130.6241 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	24.7812	22.3830	24.7812	23.9818	24.7812	23.9818	24.7812	24.7812	23.9818	24.7812	23.9818	24.7812 (231)
Lighting	25.4358	20.4056	18.3730	13.4608	10.3975	8.4949	9.4850	12.3289	16.0141	21.0113	23.7322	26.1428 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												650.1770 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												268.5782
Water heating fuel used												1304.4612 (219)

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Space cooling fuel	0.0000 (221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.2180)	
mechanical ventilation fans (SFP = 1.2180)	291.7789 (230a)
Total electricity for the above, kWh/year	291.7789 (231)
Electricity for lighting (calculated in Appendix L)	205.2819 (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	2451.6991 (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	650.1770	0.1556	101.1806 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1304.4612	0.1415	184.6235 (264)
Space and water heating			285.8041 (265)
Pumps, fans and electric keep-hot	291.7789	0.1387	40.4733 (267)
Energy for lighting	205.2819	0.1443	29.6285 (268)
Total CO2, kg/year			355.9060 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.4600 (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	650.1770	1.5761	1024.7432 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1304.4612	1.5234	1987.1900 (278)
Space and water heating			3011.9332 (279)
Pumps, fans and electric keep-hot	291.7789	1.5128	441.4032 (281)
Energy for lighting	205.2819	1.5338	314.8682 (282)
Total Primary energy kWh/year			3768.2046 (286)
Dwelling Primary energy Rate (DPER)			47.2100 (287)

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

1. Overall dwelling characteristics

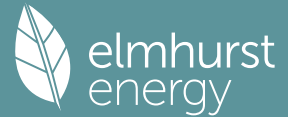
	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	39.9100 (1b)	x 2.3100 (2b)	= 92.1921 (1b) - (3b)
First floor	39.9100 (1c)	x 2.6100 (2c)	= 104.1651 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.8200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	196.3572 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1528 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4028 (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) = 0.3424 (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	0.4365	0.4280	0.4194	0.3766	0.3680	0.3252	0.3252	0.3167	0.3424	0.3680	0.3852	0.4023 (22b)
Effective ac	0.5953	0.5916	0.5879	0.5709	0.5677	0.5529	0.5529	0.5501	0.5586	0.5677	0.5742	0.5809 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			4.2800	1.0000	4.2800			(26)
TER Opening Type (Uw = 1.20)			10.6500	1.1450	12.1947			(27)
Ground Floor			39.9100	0.1300	5.1883			(28a)
External Wall	88.0700	14.9300	73.1400	0.1800	13.1652			(29a)
Roof - ceiling	39.9100		39.9100	0.1100	4.3901			(30)
Total net area of external elements Aum(A, m2)			167.8900					(31)
Fabric heat loss, W/K = Sum (A x U)								(32)
Party Wall			41.8900	0.0000	0.0000			(33)
								(34)

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)	10.7900	0.0500	0.5395	
E3 Sill	8.7500	0.0500	0.4375	
E4 Jamb	24.9000	0.0500	1.2450	
E5 Ground floor (normal)	17.8900	0.1600	2.8624	
E6 Intermediate floor within a dwelling	17.8900	0.0000	0.0000	
E10 Eaves (insulation at ceiling level)	9.3800	0.0600	0.5628	
E12 Gable (insulation at ceiling level)	8.5100	0.0600	0.5106	
E16 Corner (normal)	9.8500	0.0900	0.8865	
E18 Party wall between dwellings	9.8500	0.0600	0.5910	
P1 Party wall - Ground floor	8.5100	0.0800	0.6808	
P2 Party wall - Intermediate floor within a dwelling	8.5100	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	8.5100	0.1200	1.0212	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				9.3373 (36)
Point Thermal bridges				0.0000
Total fabric heat loss				(33) + (36) + (36a) = 48.5556 (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	38.5724	38.3327	38.0977	36.9940	36.7876	35.8263	35.8263	35.6483	36.1965	36.7876	37.2053	37.6420	(38)
Average = Sum(39)m / 12 =													85.5486 (39)
HLP	1.0916	1.0886	1.0856	1.0718	1.0692	1.0572	1.0572	1.0549	1.0618	1.0692	1.0744	1.0799	(40)
HLP (average)												1.0718	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

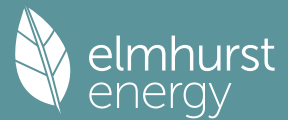
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.4594 (42)
Hot water usage for mixer showers													
65.4564	64.4727	63.0393	60.2967	58.2727	56.0156	54.7327	56.1553	57.7147	60.1381	62.9396	65.2056	65.2056	(42a)
Hot water usage for baths													
28.2716	27.8517	27.2605	26.1703	25.3539	24.4488	23.9598	24.5470	25.1863	26.1548	27.2675	28.1760	28.1760	(42b)
Hot water usage for other uses													
39.8171	38.3692	36.9213	35.4734	34.0255	32.5776	32.5776	34.0255	35.4734	36.9213	38.3692	39.8171	39.8171	(42c)
Average daily hot water use (litres/day)													122.7582 (43)
Daily hot water use													
133.5451	130.6936	127.2210	121.9404	117.6522	113.0420	111.2702	114.7278	118.3743	123.2142	128.5763	133.1987	133.1987	(44)
Energy conte	211.5028	186.1060	195.5340	166.9303	158.3825	138.9984	134.5716	142.0569	145.9674	167.2006	183.1805	208.5570	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													2038.9878
31.7254	27.9159	29.3301	25.0395	23.7574	20.8498	20.1857	21.3085	21.8951	25.0801	27.4771	31.2835	31.2835	(46)
Water storage loss:													
Store volume													230.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.7973 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.9706 (55)
Total storage loss													
30.0872	27.1756	30.0872	29.1167	30.0872	29.1167	30.0872	30.0872	29.1167	30.0872	29.1167	30.0872	30.0872	(56)
If cylinder contains dedicated solar storage													
30.0872	27.1756	30.0872	29.1167	30.0872	29.1167	30.0872	30.0872	29.1167	30.0872	29.1167	30.0872	30.0872	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
264.8524	234.2927	248.8836	218.5589	211.7321	190.6270	187.9212	195.4066	197.5961	220.5502	234.8091	261.9066	261.9066	(62)
WWHRS	-29.9239	-26.4650	-27.7126	-22.9471	-21.3859	-18.3001	-17.1534	-18.2409	-18.9339	-22.3210	-25.2870	-29.3698	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
234.9285	207.8278	221.1711	195.6118	190.3462	172.3270	170.7679	177.1656	178.6621	198.2291	209.5221	232.5368	232.5368	(64)
12Total per year (kWh/year)													2389.0960 (64)
Electric shower(s)													2389 (64)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000 (64a)
Heat gains from water heating, kWh/month													
113.0044	100.4296	107.6948	96.8073	95.3419	87.5199	87.4248	89.9136	89.8371	98.2739	102.2104	112.0249	112.0249	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	122.9718	122.9718	122.9718	122.9718	122.9718	122.9718	122.9718	122.9718	122.9718	122.9718	122.9718	122.9718	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
119.7948	132.6299	119.7948	123.7879	119.7948	123.7879	119.7948	119.7948	123.7879	119.7948	123.7879	119.7948	119.7948	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
219.0639	221.3371	215.6087	203.4137	188.0196	173.5514	163.8857	161.6125	167.3409	179.5359	194.9300	209.3983	209.3983	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
35.2972	35.2972	35.2972	35.2972	35.2972	35.2972	35.2972	35.2972	35.2972	35.2972	35.2972	35.2972	35.2972	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													

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	-98.3775	-98.3775	-98.3775	-98.3775	-98.3775	-98.3775	-98.3775	-98.3775	-98.3775	-98.3775	-98.3775	-98.3775 (71)
Water heating gains (Table 5)	151.8876	149.4489	144.7510	134.4545	128.1477	121.5554	117.5064	120.8516	124.7737	132.0886	141.9589	150.5711 (72)
Total internal gains	553.6378	566.3075	543.0461	524.5477	498.8536	478.7863	461.0784	462.1505	475.7941	494.3108	523.5684	542.6557 (73)

6. Solar gains

[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	5.7200		10.6334		0.6300		0.7000		0.7700		18.5883 (74)	
East	1.4500		19.6403		0.6300		0.7000		0.7700		8.7034 (76)	
South	3.4800		46.7521		0.6300		0.7000		0.7700		49.7224 (78)	
Solar gains	77.0140	133.9813	192.1318	255.0886	302.8960	308.6966	294.2589	257.0823	213.5444	150.3206	92.7211	65.6181 (83)
Total gains	630.6519	700.2887	735.1779	779.6363	801.7496	787.4829	755.3373	719.2327	689.3385	644.6314	616.2895	608.2737 (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	25.4479	25.5181	25.5873	25.9174	25.9801	26.2761	26.2761	26.3316	26.1613	25.9801	25.8535	25.7226	
alpha	2.6965	2.7012	2.7058	2.7278	2.7320	2.7517	2.7517	2.7554	2.7441	2.7320	2.7236	2.7148	
util living area	0.9377	0.9165	0.8872	0.8254	0.7283	0.5850	0.4535	0.4885	0.6702	0.8361	0.9124	0.9427 (86)	
MIT	18.7479	19.0238	19.4212	19.9716	20.4487	20.7905	20.9241	20.9049	20.6763	20.0837	19.3478	18.7097 (87)	
Th 2	20.0077	20.0102	20.0126	20.0239	20.0261	20.0360	20.0360	20.0378	20.0322	20.0261	20.0218	20.0173 (88)	
util rest of house	0.9292	0.9053	0.8715	0.7999	0.6865	0.5192	0.3664	0.4016	0.6096	0.8071	0.8988	0.9348 (89)	
MIT 2	17.3893	17.7361	18.2347	18.9187	19.4858	19.8671	19.9913	19.9787	19.7530	19.0677	18.1560	17.3470 (90)	
Living area fraction	fLA = Living area / (4) =												0.1842 (91)
MIT	17.6395	17.9733	18.4532	19.1126	19.6631	20.0372	20.1631	20.1493	19.9230	19.2548	18.3755	17.5979 (92)	
Temperature adjustment													0.0000
adjusted MIT	17.6395	17.9733	18.4532	19.1126	19.6631	20.0372	20.1631	20.1493	19.9230	19.2548	18.3755	17.5979 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9018	0.8754	0.8404	0.7719	0.6691	0.5193	0.3784	0.4123	0.6020	0.7797	0.8692	0.9085 (94)
Useful gains	568.7088	613.0080	617.8519	601.8280	536.4192	408.9212	285.8483	296.5085	415.0123	502.6302	535.6955	552.6275 (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	1162.2411	1135.9126	1035.7861	873.6838	679.5981	458.7993	300.6634	315.7012	493.5131	738.6307	966.9933	1154.8681 (97)
Space heating kWh	441.5880	351.3919	310.9431	195.7362	106.5251	0.0000	0.0000	0.0000	0.0000	175.5844	310.5344	448.0670 (98a)
Space heating requirement - total per year (kWh/year)	2340.3700											
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	441.5880	351.3919	310.9431	195.7362	106.5251	0.0000	0.0000	0.0000	0.0000	175.5844	310.5344	448.0670 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2340.3700											
Space heating per m2	(98c) / (4) = 29.3206 (99)											

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	441.5880	351.3919	310.9431	195.7362	106.5251	0.0000	0.0000	0.0000	0.0000	175.5844	310.5344	448.0670 (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)	478.4269	380.7063	336.8830	212.0652	115.4118	0.0000	0.0000	0.0000	0.0000	190.2323	336.4403	485.4464 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	234.9285	207.8278	221.1711	195.6118	190.3462	172.3270	170.7679	177.1656	178.6621	198.2291	209.5221	232.5368 (64)
Efficiency of water heater (217)m	85.4532	85.2278	84.8237	84.0612	82.8117	79.8000	79.8000	79.8000	79.8000	83.7888	84.9405	79.8000 (216)
Fuel for water heating, kWh/month	274.9205	243.8499	260.7421	232.7017	229.8544	215.9486	213.9948	222.0121	223.8874	236.5818	246.6693	271.9564 (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	24.8910	19.9685	17.9794	13.1725	10.1748	8.3129	9.2818	12.0648	15.6710	20.5612	23.2239	25.5828 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-37.2364	-52.4350	-75.2759	-84.5213	-91.0360	-84.9309	-83.8866	-79.2557	-71.0492	-59.9184	-40.9185	-32.2007 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)

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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	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)														
(233b)m	-21.1997	-44.5880	-88.6101	-133.0693	-175.9357	-176.7723	-174.6858	-147.9032	-108.4095	-63.7498	-28.2997	-16.7641		(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													2535.6121	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													79.8000	
Water heating fuel used													2873.1189	(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)													200.8845	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-1972.6517	(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													3722.9638	(238)

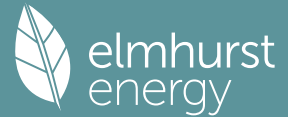
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2535.6121	0.2100	532.4785	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2873.1189	0.2100	603.3550	(264)
Space and water heating			1135.8335	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	200.8845	0.1443	28.9938	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-792.6647	0.1346	-106.7037	
PV Unit electricity exported	-1179.9871	0.1259	-148.5606	
Total			-255.2643	(269)
Total CO2, kg/year			921.4923	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.5400	(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	2535.6121	1.1300	2865.2417	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2873.1189	1.1300	3246.6244	(278)
Space and water heating			6111.8660	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	200.8845	1.5338	308.1234	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-792.6647	1.4975	-1187.0249	
PV Unit electricity exported	-1179.9871	0.4621	-545.3196	
Total			-1732.3445	(283)
Total Primary energy kWh/year			4817.7457	(286)
Target Primary Energy Rate (TPER)			60.3600	(287)

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Property Reference	OP-D320 A2HAZE				Issued on Date	29/11/2024		
Assessment Reference	A2HAZE			Prop Type Ref	A2HAZE			
Property	A2HAZE							
SAP Rating	81 B		DER	4.46		TER	11.54	
Environmental	96 A		% DER < TER				61.35	
CO ₂ Emissions (t/year)	0.33		DFEE	34.60		TFEE	35.98	
Compliance Check	See BREL		% DFEE < TFEE				3.84	
% DPER < TPER	21.79		DPER	47.21		TPER	60.36	
Assessor Details	Mr. Matthew Stainrod					Assessor ID	AU83-0001	
Client								

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	39.9100 (1b)	x 2.3100 (2b)	= 92.1921 (1b) - (3b)
First floor	39.9100 (1c)	x 2.6100 (2c)	= 104.1651 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.8200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 196.3572 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1528 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.5000 (17)
Infiltration rate	0.3278 (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) = 0.2786 (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	0.3552	0.3483	0.3413	0.3065	0.2995	0.2647	0.2647	0.2577	0.2786	0.2995	0.3134	0.3274 (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	0.5631	0.5606	0.5582	0.5470	0.5449	0.5350	0.5350	0.5332	0.5388	0.5449	0.5491	0.5536 (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			4.2800	1.0000	4.2800		(26)
Windows (Uw = 1.30)			10.6500	1.2357	13.1606		(27)
Ground Floor			39.9100	0.1100	4.3901		(28a)
External Wall	88.0700	14.9300	73.1400	0.1700	12.4338		(29a)
Roof - ceiling	39.9100		39.9100	0.1100	4.3901		(30)
Total net area of external elements Aum(A, m ²)			167.8900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	38.6546		(33)
Party Wall			41.8900	0.0000	0.0000		(32)

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

List of Thermal Bridges	Length	Psi-value	Total
K1 Element	10.7900	0.0500	0.5395
E2 Other lintels (including other steel lintels)	8.7500	0.0500	0.4375
E3 Sill	24.9000	0.0500	1.2450
E4 Jamb	17.8900	0.1600	2.8624
E5 Ground floor (normal)	17.8900	0.0000	0.0000
E6 Intermediate floor within a dwelling			

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E10 Eaves (insulation at ceiling level)	9.3800	0.0600	0.5628	
E12 Gable (insulation at ceiling level)	8.5100	0.0600	0.5106	
E16 Corner (normal)	9.8500	0.0900	0.8865	
E18 Party wall between dwellings	9.8500	0.0600	0.5910	
P1 Party wall - Ground floor	8.5100	0.0800	0.6808	
P2 Party wall - Intermediate floor within a dwelling	8.5100	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	8.5100	0.1200	1.0212	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				9.3373 (36)
Point Thermal bridges				0.0000
Total fabric heat loss				(33) + (36) + (36a) = 47.9919 (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	36.4874	36.3287	36.1730	35.4421	35.3054	34.6687	34.6687	34.5508	34.9140	35.3054	35.5820	35.8712
Average = Sum(39)m / 12 =	84.4794	84.3206	84.1650	83.4341	83.2973	82.6607	82.6607	82.5428	82.9059	83.2973	83.5740	83.8632
												83.4334
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0584	1.0564	1.0544	1.0453	1.0436	1.0356	1.0356	1.0341	1.0387	1.0436	1.0470	1.0507
Days in month	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.4594 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	28.2716	27.8517	27.2605	26.1703	25.3539	24.4488	23.9598	24.5470	25.1863	26.1548	27.2675	28.1760	(42b)
Hot water usage for other uses	39.8171	38.3692	36.9213	35.4734	34.0255	32.5776	32.5776	34.0255	35.4734	36.9213	38.3692	39.8171	(42c)
Average daily hot water use (litres/day)													62.4096 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy content	68.0887	66.2209	64.1818	61.6437	59.3795	57.0264	56.5375	58.5725	60.6597	63.0761	65.6367	67.9931	(44)
Energy content (annual)	107.8359	94.2977	98.6450	84.3871	79.9362	70.1206	68.3772	72.5250	74.7994	85.5937	93.5115	106.4608	(45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	91.6605	80.1531	83.8482	71.7291	67.9457	59.6025	58.1206	61.6462	63.5795	72.7547	79.4847	90.4917	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	91.6605	80.1531	83.8482	71.7291	67.9457	59.6025	58.1206	61.6462	63.5795	72.7547	79.4847	90.4917	(64)
12Total per year (kWh/year)													881.0165 (64)
Electric shower(s)	52.4197	46.7063	51.0015	48.6701	49.5834	47.2978	48.8744	49.5834	48.6701	51.0015	50.0425	52.4197	(64a)
Heat gains from water heating, kWh/month	36.0200	31.7149	33.7124	30.0998	29.3823	26.7251	26.7487	27.8074	28.0624	30.9390	32.3818	35.7278	(65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													596.2705 (64a)

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

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	122.9718	122.9718	122.9718	122.9718	122.9718	122.9718	122.9718	122.9718	122.9718	122.9718	122.9718	122.9718	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	119.7948	132.6299	119.7948	123.7879	119.7948	123.7879	119.7948	119.7948	123.7879	119.7948	123.7879	119.7948	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	219.0639	221.3371	215.6087	203.4137	188.0196	173.5514	163.8857	161.6125	167.3409	179.5359	194.9300	209.3983	(68)
Pumps, fans	35.2972	35.2972	35.2972	35.2972	35.2972	35.2972	35.2972	35.2972	35.2972	35.2972	35.2972	35.2972	(69)
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Water heating gains (Table 5)	-98.3775	-98.3775	-98.3775	-98.3775	-98.3775	-98.3775	-98.3775	-98.3775	-98.3775	-98.3775	-98.3775	-98.3775	(71)
Total internal gains	48.4140	47.1947	45.3124	41.8053	39.4923	37.1182	35.9526	37.3756	38.9756	41.5847	44.9747	48.0213	(72)
	447.1643	461.0533	440.6075	428.8984	407.1983	394.3490	379.5246	378.6744	389.9959	400.8070	423.5842	437.1059	(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				5.7200	10.6334		0.6300		0.7000		0.7700		18.5883 (74)
East				1.4500	19.6403		0.6300		0.7000		0.7700		8.7034 (76)
South				3.4800	46.7521		0.6300		0.7000		0.7700		49.7224 (78)
Solar gains	77.0140	133.9813	192.1318	255.0886	302.8960	308.6966	294.2589	257.0823	213.5444	150.3206	92.7211	65.6181	(83)
Total gains	524.1783	595.0346	632.7393	683.9871	710.0943	703.0456	673.7835	635.7566	603.5403	551.1276	516.3053	502.7239	(84)

7. Mean internal temperature (heating season)

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Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	26.2457	26.2951	26.3438	26.5745	26.6182	26.8232	26.8232	26.8615	26.7438	26.6182	26.5301	26.4386
alpha	2.7497	2.7530	2.7563	2.7716	2.7745	2.7882	2.7882	2.7908	2.7829	2.7745	2.7687	2.7626
util living area	0.9577	0.9393	0.9139	0.8576	0.7662	0.6247	0.4905	0.5307	0.7156	0.8733	0.9383	0.9619 (86)
MIT	18.6021	18.8912	19.3034	19.8787	20.3883	20.7610	20.9116	20.8875	20.6276	19.9787	19.2058	18.5517 (87)
Th 2	20.0350	20.0366	20.0382	20.0458	20.0472	20.0538	20.0538	20.0550	20.0512	20.0472	20.0443	20.0413 (88)
util rest of house	0.9516	0.9307	0.9013	0.8355	0.7273	0.5594	0.4005	0.4414	0.6579	0.8491	0.9281	0.9565 (89)
MIT 2	17.8438	18.1289	18.5343	19.0954	19.5727	19.9007	20.0122	19.9990	19.7952	19.2011	18.4479	17.7985 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	17.9834	18.2693	18.6760	19.2397	19.7229	20.0591	20.1779	20.1626	19.9485	19.3443	18.5874	17.9372 (92)
Temperature adjustment	0.0000											
adjusted MIT	17.9834	18.2693	18.6760	19.2397	19.7229	20.0591	20.1779	20.1626	19.9485	19.3443	18.5874	17.9372 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9345	0.9106	0.8789	0.8134	0.7124	0.5598	0.4130	0.4523	0.6509	0.8275	0.9081	0.9403 (94)
Useful gains	489.8504	541.8163	556.1342	556.3377	505.8612	393.5546	278.2712	287.5375	392.8234	456.0845	468.8813	472.7312 (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	1155.9686	1127.3058	1024.7889	862.6807	668.2892	451.2564	295.7500	310.5763	484.8758	728.3807	960.0502	1152.0476 (97)
Space heating kWh	495.5920	393.4490	348.6791	220.5670	120.8464	0.0000	0.0000	0.0000	0.0000	202.5884	353.6416	505.4115 (98a)
Space heating requirement - total per year (kWh/year)	2640.7749											
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	495.5920	393.4490	348.6791	220.5670	120.8464	0.0000	0.0000	0.0000	0.0000	202.5884	353.6416	505.4115 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2640.7749											
Space heating per m2	(98c) / (4) = 33.0841 (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	777.0105	611.6891	627.3252	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7321	0.8004	0.7728	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	568.8695	489.5952	484.7784	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	768.8507	737.2275	695.2004	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	143.9864	184.2385	156.5540	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction	fc = cooled area / (4) =											
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	35.9966	46.0596	39.1385	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement	121.1947 (107)											
Energy for space heating	33.0841 (99)											
Energy for space cooling	1.5184 (108)											
Total	34.6025 (109)											
Fabric Energy Efficiency (DFEE)	34.6 (109)											

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

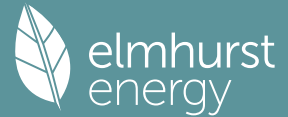
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	39.9100 (1b)	x 2.3100 (2b)	= 92.1921 (1b) - (3b)
First floor	39.9100 (1c)	x 2.6100 (2c)	= 104.1651 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.8200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	196.3572 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1528 (8)

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Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4028 (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) =	0.3424 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.4365	0.4280	0.4194	0.3766	0.3680	0.3252	0.3252	0.3167	0.3424	0.3680	0.3852	0.4023 (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	0.5953	0.5916	0.5879	0.5709	0.5677	0.5529	0.5529	0.5501	0.5586	0.5677	0.5742	0.5809 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opaque door			4.2800	1.0000	4.2800		(26)
TER Opening Type (Uw = 1.20)			10.6500	1.1450	12.1947		(27)
Ground Floor			39.9100	0.1300	5.1883		(28a)
External Wall	88.0700	14.9300	73.1400	0.1800	13.1652		(29a)
Roof - ceiling	39.9100		39.9100	0.1100	4.3901		(30)
Total net area of external elements Aum(A, m2)			167.8900				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	39.2183	(33)
Party Wall			41.8900	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)	10.7900	0.0500	0.5395
E3 Sill	8.7500	0.0500	0.4375
E4 Jamb	24.9000	0.0500	1.2450
E5 Ground floor (normal)	17.8900	0.1600	2.8624
E6 Intermediate floor within a dwelling	17.8900	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	9.3800	0.0600	0.5628
E12 Gable (insulation at ceiling level)	8.5100	0.0600	0.5106
E16 Corner (normal)	9.8500	0.0900	0.8865
E18 Party wall between dwellings	9.8500	0.0600	0.5910
P1 Party wall - Ground floor	8.5100	0.0800	0.6808
P2 Party wall - Intermediate floor within a dwelling	8.5100	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	8.5100	0.1200	1.0212

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

9.3373 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 48.5556 (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	38.5724	38.3327	38.0977	36.9940	36.7876	35.8263	35.8263	35.6483	36.1965	36.7876	37.2053	37.6420 (38)
Average = Sum(39)m / 12 =	87.1280	86.8883	86.6533	85.5496	85.3431	84.3818	84.3818	84.2038	84.7521	85.3431	85.7608	86.1976 (39)

85.5486

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0916	1.0886	1.0856	1.0718	1.0692	1.0572	1.0572	1.0549	1.0618	1.0692	1.0744	1.0799 (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													2.4594 (42)
Hot water usage for mixer showers													
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	28.2716	27.8517	27.2605	26.1703	25.3539	24.4488	23.9598	24.5470	25.1863	26.1548	27.2675	28.1760	(42b)
Average daily hot water use (litres/day)	39.8171	38.3692	36.9213	35.4734	34.0255	32.5776	32.5776	34.0255	35.4734	36.9213	38.3692	39.8171	(42c)
													62.4096 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy content (annual)	68.0887	66.2209	64.1818	61.6437	59.3795	57.0264	56.5375	58.5725	60.6597	63.0761	65.6367	67.9931	(44)
Distribution loss (46)m = 0.15 x (45)m	107.8359	94.2977	98.6450	84.3871	79.9362	70.1206	68.3772	72.5250	74.7994	85.5937	93.5115	106.4608	(45)
										Total = Sum(45)m =		1036.4901	
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	91.6605	80.1531	83.8482	71.7291	67.9457	59.6025	58.1206	61.6462	63.5795	72.7547	79.4847	90.4917	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	91.6605	80.1531	83.8482	71.7291	67.9457	59.6025	58.1206	61.6462	63.5795	72.7547	79.4847	90.4917	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64a)m =		881.0165	(64)
Electric shower(s)	52.4197	46.7063	51.0015	48.6701	49.5834	47.2978	48.8744	49.5834	48.6701	51.0015	50.0425	52.4197	(64a)
												596.2705	(64a)
Heat gains from water heating, kWh/month	36.0200	31.7149	33.7124	30.0998	29.3823	26.7251	26.7487	27.8074	28.0624	30.9390	32.3818	35.7278	(65)

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	122.9718	122.9718	122.9718	122.9718	122.9718	122.9718	122.9718	122.9718	122.9718	122.9718	122.9718	122.9718 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.7948	132.6299	119.7948	123.7879	119.7948	123.7879	119.7948	119.7948	123.7879	119.7948	123.7879	119.7948 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.0639	221.3371	215.6087	203.4137	188.0196	173.5514	163.8857	161.6125	167.3409	179.5359	194.9300	209.3983 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.2972	35.2972	35.2972	35.2972	35.2972	35.2972	35.2972	35.2972	35.2972	35.2972	35.2972	35.2972 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-98.3775	-98.3775	-98.3775	-98.3775	-98.3775	-98.3775	-98.3775	-98.3775	-98.3775	-98.3775	-98.3775	-98.3775 (71)
Water heating gains (Table 5)	48.4140	47.1947	45.3124	41.8053	39.4923	37.1182	35.9526	37.3756	38.9756	41.5847	44.9747	48.0213 (72)
Total internal gains	447.1643	461.0533	440.6075	428.8984	407.1983	394.3490	379.5246	378.6744	389.9959	400.8070	423.5842	437.1059 (73)

6. Solar gains

[Jan]	Area m ²		Solar flux Table 6a W/m ²		Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W	
North	5.7200		10.6334		0.6300		0.7000		0.7700		18.5883 (74)	
East	1.4500		19.6403		0.6300		0.7000		0.7700		8.7034 (76)	
South	3.4800		46.7521		0.6300		0.7000		0.7700		49.7224 (78)	
Solar gains	77.0140	133.9813	192.1318	255.0886	302.8960	308.6966	294.2589	257.0823	213.5444	150.3206	92.7211	65.6181 (83)
Total gains	524.1783	595.0346	632.7393	683.9871	710.0943	703.0456	673.7835	635.7566	603.5403	551.1276	516.3053	502.7239 (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	25.4479	25.5181	25.5873	25.9174	25.9801	26.2761	26.2761	26.3316	26.1613	25.9801	25.8535	25.7226
alpha	2.6965	2.7012	2.7058	2.7278	2.7320	2.7517	2.7517	2.7554	2.7441	2.7320	2.7236	2.7148
util living area	0.9583	0.9404	0.9158	0.8607	0.7714	0.6310	0.4973	0.5373	0.7212	0.8759	0.9393	0.9623 (86)
MIT	18.5157	18.8090	19.2309	19.8277	20.3536	20.7454	20.9044	20.8791	20.6060	19.9360	19.1449	18.4750 (87)
Th 2	20.0077	20.0102	20.0126	20.0239	20.0261	20.0360	20.0360	20.0378	20.0322	20.0261	20.0218	20.0173 (88)
util rest of house	0.9522	0.9319	0.9032	0.8386	0.7323	0.5648	0.4052	0.4461	0.6630	0.8518	0.9292	0.9569 (89)
MIT 2	17.7406	18.0305	18.4462	19.0313	19.5252	19.8732	19.9913	19.9779	19.7617	19.1456	18.3731	17.7069 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	17.8833	18.1739	18.5908	19.1779	19.6777	20.0339	20.1594	20.1439	19.9172	19.2912	18.5152	17.8484 (92)
Temperature adjustment	0.0000											
adjusted MIT	17.8833	18.1739	18.5908	19.1779	19.6777	20.0339	20.1594	20.1439	19.9172	19.2912	18.5152	17.8484 (93)

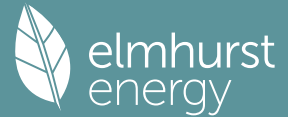
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9348	0.9113	0.8803	0.8159	0.7165	0.5646	0.4177	0.4569	0.6552	0.8296	0.9088	0.9405 (94)
Useful gains	490.0097	542.2750	557.0262	558.0323	508.7616	396.9372	281.4173	290.4657	395.4281	457.2227	469.2409	472.8250 (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	1183.4892	1153.3446	1047.7035	879.2734	680.8443	458.5197	300.3513	315.2473	493.0174	741.7298	978.9770	1176.4570 (97)
Space heating kWh	515.9487	410.6388	365.0639	231.2936	128.0295	0.0000	0.0000	0.0000	0.0000	211.6733	367.0099	523.5022 (98a)
Space heating requirement - total per year (kWh/year)												2753.1600
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	515.9487	410.6388	365.0639	231.2936	128.0295	0.0000	0.0000	0.0000	0.0000	211.6733	367.0099	523.5022 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2753.1600
Space heating per m ²												(98c) / (4) = 34.4921 (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	793.1893	624.4256	639.9491	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7219	0.7911	0.7633	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	572.6242	493.9537	488.4846	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	768.8507	737.2275	695.2004	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	141.2831	180.9957	153.7965	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction	fC = cooled area / (4) =											
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	35.3208	45.2489	38.4491	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												119.0188 (107)
Energy for space heating												34.4921 (99)
Energy for space cooling												1.4911 (108)
Total												35.9832 (109)
Fabric Energy Efficiency (TFEE)												36.0 (109)

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Property Reference	OP-D320 A2HAZE				Issued on Date	29/11/2024		
Assessment Reference	A2HAZE			Prop Type Ref	A2HAZE			
Property	A2HAZE							
SAP Rating	81 B		DER	4.46		TER	11.54	
Environmental	96 A		% DER < TER				61.35	
CO ₂ Emissions (t/year)	0.33		DFEE	34.60		TFEE	35.98	
Compliance Check	See BREL		% DFEE < TFEE				3.84	
% DPER < TPER	21.79		DPER	47.21		TPER	60.36	
Assessor Details	Mr. Matthew Stainrod					Assessor ID	AU83-0001	
Client								

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	39.9100 (1b)	x 2.3100 (2b)	= 92.1921 (1b) - (3b)
First floor	39.9100 (1c)	x 2.6100 (2c)	= 104.1651 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.8200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 196.3572 (5)

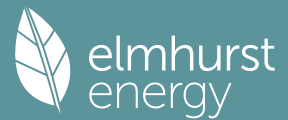
2. Ventilation rate

	m ³ per hour											
Number of open chimneys	0 * 80 = 0.0000 (6a)											
Number of open flues	0 * 20 = 0.0000 (6b)											
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)											
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)											
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)											
Number of blocked chimneys	0 * 20 = 0.0000 (6f)											
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)											
Number of passive vents	0 * 10 = 0.0000 (7b)											
Number of flueless gas fires	0 * 40 = 0.0000 (7c)											
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 0.0000 / (5) = 0.0000 (8)											
Pressure test	Yes											
Pressure Test Method	Blower Door											
Measured/design AP50	3.5000 (17)											
Infiltration rate	0.1750 (18)											
Number of sides sheltered	2 (19)											
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)											
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1487 (21)											
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1897	0.1859	0.1822	0.1636	0.1599	0.1413	0.1413	0.1376	0.1487	0.1599	0.1673	0.1748 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												72.0000 (23c)
Effective ac	0.3297	0.3259	0.3222	0.3036	0.2999	0.2813	0.2813	0.2776	0.2888	0.2999	0.3073	0.3148 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			4.2800	1.0000	4.2800		(26)
Windows (Uw = 1.30)			10.6500	1.2357	13.1606		(27)
Ground Floor			39.9100	0.1100	4.3901		(28a)
External Wall	88.0700	14.9300	73.1400	0.1700	12.4338		(29a)
Roof - ceiling	39.9100		39.9100	0.1100	4.3901		(30)
Total net area of external elements Aum(A, m ²)			167.8900				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		38.6546		(33)
Party Wall			41.8900	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				10.7900	0.0500	0.5395	
E3 Sill				8.7500	0.0500	0.4375	

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E4 Jamb	24.9000	0.0500	1.2450
E5 Ground floor (normal)	17.8900	0.1600	2.8624
E6 Intermediate floor within a dwelling	17.8900	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	9.3800	0.0600	0.5628
E12 Gable (insulation at ceiling level)	8.5100	0.0600	0.5106
E16 Corner (normal)	9.8500	0.0900	0.8865
E18 Party wall between dwellings	9.8500	0.0600	0.5910
P1 Party wall - Ground floor	8.5100	0.0800	0.6808
P2 Party wall - Intermediate floor within a dwelling	8.5100	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	8.5100	0.1200	1.0212

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.3373 (36)

Point Thermal bridges 0.0000

Total fabric heat loss (33) + (36) + (36a) = 47.9919 (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	21.3610	21.1201	20.8791	19.6743	19.4333	18.2285	18.2285	17.9875	18.7104	19.4333	19.9152	20.3972 (38)
Average = Sum(39)m / 12 =	69.3530	69.1120	68.8710	67.6662	67.4252	66.2204	66.2204	65.9794	66.7023	67.4252	67.9072	68.3891 (39)
												67.6060

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.8689	0.8658	0.8628	0.8477	0.8447	0.8296	0.8296	0.8266	0.8357	0.8447	0.8508	0.8568 (40)
HLP (average)												0.8470
Days in month	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.4594 (42)
Hot water usage for mixer showers													
90.0025	88.6500	86.6790	82.9080	80.1250	77.0215	75.2575	77.2135	79.3577	82.6899	86.5420	89.6577	(42a)	
Hot water usage for baths													
29.7596	29.3176	28.6952	27.5477	26.6884	25.7356	25.2209	25.8389	26.5118	27.5314	28.7026	29.6590	(42b)	
Hot water usage for other uses													
41.9127	40.3886	38.8645	37.3404	35.8163	34.2922	34.2922	35.8163	37.3404	38.8645	40.3886	41.9127	(42c)	
Average daily hot water use (litres/day)												148.6736 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	161.6748	158.3562	154.2388	147.7960	142.6297	137.0493	134.7706	138.8687	143.2099	149.0858	155.6332	161.2294	(44)
Energy content (annual)	256.0534	225.4971	237.0592	202.3254	192.0070	168.5181	162.9933	171.9485	176.5922	202.3081	221.7280	252.4463	(45)
Distribution loss (46)m = 0.15 x (45)m													
38.4080	33.8246	35.5589	30.3488	28.8011	25.2777	24.4490	25.7923	26.4888	30.3462	33.2592	37.8669	(46)	
Water storage loss:													
Store volume													230.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.8000 (48)
Temperature factor from Table 2b													0.7800 (49)
Enter (49) or (54) in (55)													1.4040 (55)
Total storage loss													
43.5240	39.3120	43.5240	42.1200	43.5240	42.1200	43.5240	43.5240	42.1200	43.5240	42.1200	43.5240	(56)	
If cylinder contains dedicated solar storage													
43.5240	39.3120	43.5240	42.1200	43.5240	42.1200	43.5240	43.5240	42.1200	43.5240	42.1200	43.5240	(57)	
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
354.4350	314.3579	335.4408	297.5334	290.3886	233.1501	229.7797	238.7349	241.2242	300.6897	316.9360	350.8279	(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	354.4350	314.3579	335.4408	297.5334	290.3886	233.1501	229.7797	238.7349	241.2242	300.6897	316.9360	350.8279	(64)
12Total per year (kWh/year)													3503.4982 (64)
Electric shower(s)													3503 (64a)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000 (64a)
Heat gains from water heating, kWh/month													
129.0238	114.6168	122.7083	109.7436	107.7284	74.0419	72.8052	75.7828	76.7265	111.1535	116.1950	127.8245	(65)	

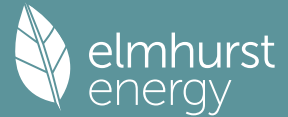
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	122.9718	122.9718	122.9718	122.9718	122.9718	122.9718	122.9718	122.9718	122.9718	122.9718	122.9718	122.9718 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.7948	132.6299	119.7948	123.7879	119.7948	123.7879	119.7948	119.7948	123.7879	119.7948	123.7879	119.7948 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.0639	221.3371	215.6087	203.4137	188.0196	173.5514	163.8857	161.6125	167.3409	179.5359	194.9300	209.3983 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.2972	35.2972	35.2972	35.2972	35.2972	35.2972	35.2972	35.2972	35.2972	35.2972	35.2972	35.2972 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-98.3775	-98.3775	-98.3775	-98.3775	-98.3775	-98.3775	-98.3775	-98.3775	-98.3775	-98.3775	-98.3775	-98.3775 (71)
Water heating gains (Table 5)	173.4191	170.5608	164.9305	152.4217	144.7962	102.8359	97.8565	101.8586	106.5646	149.3999	161.3819	171.8071 (72)
Total internal gains	572.1694	584.4194	560.2255	539.5148	512.5022	460.0668	441.4285	443.1574	457.5849	508.6221	539.9914	560.8916 (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	5.7200	10.6334	0.6300	0.7000	0.7700	18.5883 (74)
East	1.4500	19.6403	0.6300	0.7000	0.7700	8.7034 (76)
South	3.4800	46.7521	0.6300	0.7000	0.7700	49.7224 (78)

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Solar gains	77.0140	133.9813	192.1318	255.0886	302.8960	308.6966	294.2589	257.0823	213.5444	150.3206	92.7211	65.6181 (83)
Total gains	649.1834	718.4006	752.3574	794.6035	815.3982	768.7634	735.6873	700.2397	671.1293	658.9427	632.7125	626.5097 (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	31.9701	32.0816	32.1938	32.7671	32.8842	33.4825	33.4825	33.6047	33.2405	32.8842	32.6508	32.4207
alpha	3.1313	3.1388	3.1463	3.1845	3.1923	3.2322	3.2322	3.2403	3.2160	3.1923	3.1767	3.1614
util living area	0.9211	0.8927	0.8536	0.7723	0.6539	0.5120	0.3838	0.4166	0.6053	0.7846	0.8860	0.9273 (86)
Living	19.4142	19.6642	19.9887	20.4147	20.7319	20.9133	20.9741	20.9661	20.8452	20.4737	19.9075	19.3849
Non living	18.3403	18.6527	19.0564	19.5816	19.9509	20.1562	20.2116	20.2081	20.0868	19.6625	18.9699	18.3108
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	20.1888	19.6642	19.9887	20.4147	20.7319	20.9133	20.9741	20.9661	20.8452	20.4737	19.9075	19.6108 (87)
Th 2	20.1940	20.1966	20.1992	20.2122	20.2147	20.2277	20.2277	20.2303	20.2225	20.2147	20.2096	20.2044 (88)
util rest of house	0.9118	0.8805	0.8368	0.7466	0.6158	0.4595	0.3206	0.3523	0.5535	0.7552	0.8713	0.9187 (89)
MIT 2	19.4550	18.6527	19.0564	19.5816	19.9509	20.1562	20.2116	20.2081	20.0868	19.6625	18.9699	18.6521 (90)
Living area fraction	19.5901	18.8390	19.2281	19.7351	20.0948	20.2956	20.3520	20.3477	20.2264	19.8119	19.1426	0.1842 (91)
MIT	19.5901	18.8390	19.2281	19.7351	20.0948	20.2956	20.3520	20.3477	20.2264	19.8119	19.1426	18.8286 (92)
Temperature adjustment												0.0000
adjusted MIT	19.5901	18.8390	19.2281	19.7351	20.0948	20.2956	20.3520	20.3477	20.2264	19.8119	19.1426	18.8286 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9039	0.8560	0.8133	0.7296	0.6097	0.4643	0.3310	0.3623	0.5538	0.7385	0.8477	0.9007 (94)
Useful gains	586.8114	614.9523	611.9041	579.7107	497.1293	356.9432	243.4830	253.7266	371.6680	486.6243	536.3323	564.3145 (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	1060.4167	963.3506	876.5956	733.1672	566.0195	377.1675	248.4598	260.4663	408.6479	621.1150	817.7767	1000.4388 (97)
Space heating kWh	352.3624	234.1236	196.9305	110.4887	51.2543	0.0000	0.0000	0.0000	0.0000	100.0611	202.6400	324.4765 (98a)
Space heating requirement - total per year (kWh/year)												1572.3370
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	352.3624	234.1236	196.9305	110.4887	51.2543	0.0000	0.0000	0.0000	0.0000	100.0611	202.6400	324.4765 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1572.3370
Space heating per m2										(98c) / (4) =		19.6985 (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 %)												241.8321 (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	352.3624	234.1236	196.9305	110.4887	51.2543	0.0000	0.0000	0.0000	0.0000	100.0611	202.6400	324.4765 (98)
Space heating efficiency (main heating system 1)	241.8321	241.8321	241.8321	241.8321	241.8321	0.0000	0.0000	0.0000	0.0000	241.8321	241.8321	241.8321 (210)
Space heating fuel (main heating system)	145.7054	96.8124	81.4327	45.6882	21.1942	0.0000	0.0000	0.0000	0.0000	41.3763	83.7936	134.1742 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	354.4350	314.3579	335.4408	297.5334	290.3886	233.1501	229.7797	238.7349	241.2242	300.6897	316.9360	350.8279 (64)
Efficiency of water heater (217)m	268.5782	268.5782	268.5782	268.5782	268.5782	268.5782	268.5782	268.5782	268.5782	268.5782	268.5782	268.5782 (216)
Fuel for water heating, kWh/month	131.9672	117.0452	124.8950	110.7809	108.1207	86.8090	85.5541	88.8884	89.8153	111.9561	118.0051	130.6241 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	24.7812	22.3830	24.7812	23.9818	24.7812	23.9818	24.7812	24.7812	23.9818	24.7812	23.9818	24.7812 (231)
Lighting	25.4358	20.4056	18.3730	13.4608	10.3975	8.4949	9.4850	12.3289	16.0141	21.0113	23.7322	26.1428 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												650.1770 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												268.5782
Water heating fuel used												1304.4612 (219)

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Space cooling fuel	0.0000 (221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.2180)	
mechanical ventilation fans (SFP = 1.2180)	291.7789 (230a)
Total electricity for the above, kWh/year	291.7789 (231)
Electricity for lighting (calculated in Appendix L)	205.2819 (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	2451.6991 (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	650.1770	0.1556	101.1806 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1304.4612	0.1415	184.6235 (264)
Space and water heating			285.8041 (265)
Pumps, fans and electric keep-hot	291.7789	0.1387	40.4733 (267)
Energy for lighting	205.2819	0.1443	29.6285 (268)
Total CO2, kg/year			355.9060 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.4600 (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	650.1770	1.5761	1024.7432 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1304.4612	1.5234	1987.1900 (278)
Space and water heating			3011.9332 (279)
Pumps, fans and electric keep-hot	291.7789	1.5128	441.4032 (281)
Energy for lighting	205.2819	1.5338	314.8682 (282)
Total Primary energy kWh/year			3768.2046 (286)
Dwelling Primary energy Rate (DPER)			47.2100 (287)

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

1. Overall dwelling characteristics

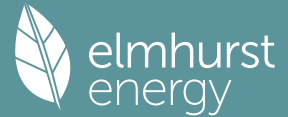
	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	39.9100 (1b)	x 2.3100 (2b)	= 92.1921 (1b) - (3b)
First floor	39.9100 (1c)	x 2.6100 (2c)	= 104.1651 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.8200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	196.3572 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1528 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4028 (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) = 0.3424 (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	0.4365	0.4280	0.4194	0.3766	0.3680	0.3252	0.3252	0.3167	0.3424	0.3680	0.3852	0.4023 (22b)
Effective ac	0.5953	0.5916	0.5879	0.5709	0.5677	0.5529	0.5529	0.5501	0.5586	0.5677	0.5742	0.5809 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			4.2800	1.0000	4.2800			(26)
TER Opening Type (Uw = 1.20)			10.6500	1.1450	12.1947			(27)
Ground Floor			39.9100	0.1300	5.1883			(28a)
External Wall	88.0700	14.9300	73.1400	0.1800	13.1652			(29a)
Roof - ceiling	39.9100		39.9100	0.1100	4.3901			(30)
Total net area of external elements Aum(A, m2)			167.8900					(31)
Fabric heat loss, W/K = Sum (A x U)								(32)
Party Wall			41.8900	0.0000	0.0000			(33)
								(34)

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

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	10.7900	0.0500	0.5395	
E3 Sill	8.7500	0.0500	0.4375	
E4 Jamb	24.9000	0.0500	1.2450	
E5 Ground floor (normal)	17.8900	0.1600	2.8624	
E6 Intermediate floor within a dwelling	17.8900	0.0000	0.0000	
E10 Eaves (insulation at ceiling level)	9.3800	0.0600	0.5628	
E12 Gable (insulation at ceiling level)	8.5100	0.0600	0.5106	
E16 Corner (normal)	9.8500	0.0900	0.8865	
E18 Party wall between dwellings	9.8500	0.0600	0.5910	
P1 Party wall - Ground floor	8.5100	0.0800	0.6808	
P2 Party wall - Intermediate floor within a dwelling	8.5100	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	8.5100	0.1200	1.0212	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				9.3373 (36)
Point Thermal bridges				0.0000
Total fabric heat loss				(33) + (36) + (36a) = 48.5556 (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	38.5724	38.3327	38.0977	36.9940	36.7876	35.8263	35.8263	35.6483	36.1965	36.7876	37.2053	37.6420	(38)
Average = Sum(39)m / 12 =													85.5486 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0916	1.0886	1.0856	1.0718	1.0692	1.0572	1.0572	1.0549	1.0618	1.0692	1.0744	1.0799	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	(41)

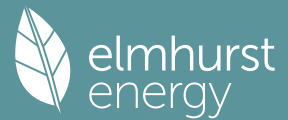
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.4594 (42)
Hot water usage for mixer showers													
65.4564	64.4727	63.0393	60.2967	58.2727	56.0156	54.7327	56.1553	57.7147	60.1381	62.9396	65.2056	65.2056	(42a)
Hot water usage for baths													
28.2716	27.8517	27.2605	26.1703	25.3539	24.4488	23.9598	24.5470	25.1863	26.1548	27.2675	28.1760	28.1760	(42b)
Hot water usage for other uses													
39.8171	38.3692	36.9213	35.4734	34.0255	32.5776	32.5776	34.0255	35.4734	36.9213	38.3692	39.8171	39.8171	(42c)
Average daily hot water use (litres/day)													122.7582 (43)
Daily hot water use													
133.5451	130.6936	127.2210	121.9404	117.6522	113.0420	111.2702	114.7278	118.3743	123.2142	128.5763	133.1987	133.1987	(44)
Energy conte	211.5028	186.1060	195.5340	166.9303	158.3825	138.9984	134.5716	142.0569	145.9674	167.2006	183.1805	208.5570	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													2038.9878
31.7254	27.9159	29.3301	25.0395	23.7574	20.8498	20.1857	21.3085	21.8951	25.0801	27.4771	31.2835	31.2835	(46)
Water storage loss:													
Store volume													230.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.7973 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.9706 (55)
Total storage loss													
30.0872	27.1756	30.0872	29.1167	30.0872	29.1167	30.0872	30.0872	29.1167	30.0872	29.1167	30.0872	30.0872	(56)
If cylinder contains dedicated solar storage													
30.0872	27.1756	30.0872	29.1167	30.0872	29.1167	30.0872	30.0872	29.1167	30.0872	29.1167	30.0872	30.0872	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
264.8524	234.2927	248.8836	218.5589	211.7321	190.6270	187.9212	195.4066	197.5961	220.5502	234.8091	261.9066	261.9066	(62)
WWHRS	-29.9239	-26.4650	-27.7126	-22.9471	-21.3859	-18.3001	-17.1534	-18.2409	-18.9339	-22.3210	-25.2870	-29.3698	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
234.9285	207.8278	221.1711	195.6118	190.3462	172.3270	170.7679	177.1656	178.6621	198.2291	209.5221	232.5368	232.5368	(64)
12Total per year (kWh/year)													2389.0960 (64)
Electric shower(s)													2389 (64)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000 (64a)
Heat gains from water heating, kWh/month													
113.0044	100.4296	107.6948	96.8073	95.3419	87.5199	87.4248	89.9136	89.8371	98.2739	102.2104	112.0249	112.0249	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	122.9718	122.9718	122.9718	122.9718	122.9718	122.9718	122.9718	122.9718	122.9718	122.9718	122.9718	122.9718	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
119.7948	132.6299	119.7948	123.7879	119.7948	123.7879	119.7948	119.7948	123.7879	119.7948	123.7879	119.7948	119.7948	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
219.0639	221.3371	215.6087	203.4137	188.0196	173.5514	163.8857	161.6125	167.3409	179.5359	194.9300	209.3983	209.3983	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
35.2972	35.2972	35.2972	35.2972	35.2972	35.2972	35.2972	35.2972	35.2972	35.2972	35.2972	35.2972	35.2972	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													

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	-98.3775	-98.3775	-98.3775	-98.3775	-98.3775	-98.3775	-98.3775	-98.3775	-98.3775	-98.3775	-98.3775	(71)
Water heating gains (Table 5)	151.8876	149.4489	144.7510	134.4545	128.1477	121.5554	117.5064	120.8516	124.7737	132.0886	141.9589	(72)
Total internal gains	553.6378	566.3075	543.0461	524.5477	498.8536	478.7863	461.0784	462.1505	475.7941	494.3108	523.5684	(73)

6. Solar gains

[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	5.7200		10.6334		0.6300		0.7000		0.7700		18.5883 (74)	
East	1.4500		19.6403		0.6300		0.7000		0.7700		8.7034 (76)	
South	3.4800		46.7521		0.6300		0.7000		0.7700		49.7224 (78)	
Solar gains	77.0140	133.9813	192.1318	255.0886	302.8960	308.6966	294.2589	257.0823	213.5444	150.3206	92.7211	65.6181 (83)
Total gains	630.6519	700.2887	735.1779	779.6363	801.7496	787.4829	755.3373	719.2327	689.3385	644.6314	616.2895	608.2737 (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	25.4479	25.5181	25.5873	25.9174	25.9801	26.2761	26.2761	26.3316	26.1613	25.9801	25.8535	25.7226
alpha	2.6965	2.7012	2.7058	2.7278	2.7320	2.7517	2.7517	2.7554	2.7441	2.7320	2.7236	2.7148
util living area	0.9377	0.9165	0.8872	0.8254	0.7283	0.5850	0.4535	0.4885	0.6702	0.8361	0.9124	0.9427 (86)
MIT	18.7479	19.0238	19.4212	19.9716	20.4487	20.7905	20.9241	20.9049	20.6763	20.0837	19.3478	18.7097 (87)
Th 2	20.0077	20.0102	20.0126	20.0239	20.0261	20.0360	20.0360	20.0378	20.0322	20.0261	20.0218	20.0173 (88)
util rest of house	0.9292	0.9053	0.8715	0.7999	0.6865	0.5192	0.3664	0.4016	0.6096	0.8071	0.8988	0.9348 (89)
MIT 2	17.3893	17.7361	18.2347	18.9187	19.4858	19.8671	19.9913	19.9787	19.7530	19.0677	18.1560	17.3470 (90)
Living area fraction									fLA = Living area / (4) =			0.1842 (91)
MIT	17.6395	17.9733	18.4532	19.1126	19.6631	20.0372	20.1631	20.1493	19.9230	19.2548	18.3755	17.5979 (92)
Temperature adjustment												0.0000
adjusted MIT	17.6395	17.9733	18.4532	19.1126	19.6631	20.0372	20.1631	20.1493	19.9230	19.2548	18.3755	17.5979 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9018	0.8754	0.8404	0.7719	0.6691	0.5193	0.3784	0.4123	0.6020	0.7797	0.8692	0.9085 (94)
Useful gains	568.7088	613.0080	617.8519	601.8280	536.4192	408.9212	285.8483	296.5085	415.0123	502.6302	535.6955	552.6275 (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	1162.2411	1135.9126	1035.7861	873.6838	679.5981	458.7993	300.6634	315.7012	493.5131	738.6307	966.9933	1154.8681 (97)
Space heating kWh	441.5880	351.3919	310.9431	195.7362	106.5251	0.0000	0.0000	0.0000	0.0000	175.5844	310.5344	448.0670 (98a)
Space heating requirement - total per year (kWh/year)												2340.3700
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	441.5880	351.3919	310.9431	195.7362	106.5251	0.0000	0.0000	0.0000	0.0000	175.5844	310.5344	448.0670 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2340.3700
Space heating per m2										(98c) / (4) =		29.3206 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	441.5880	351.3919	310.9431	195.7362	106.5251	0.0000	0.0000	0.0000	0.0000	175.5844	310.5344	448.0670 (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)	478.4269	380.7063	336.8830	212.0652	115.4118	0.0000	0.0000	0.0000	0.0000	190.2323	336.4403	485.4464 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	234.9285	207.8278	221.1711	195.6118	190.3462	172.3270	170.7679	177.1656	178.6621	198.2291	209.5221	232.5368 (64)
Efficiency of water heater (217)m	85.4532	85.2278	84.8237	84.0612	82.8117	79.8000	79.8000	79.8000	79.8000	83.7888	84.9405	79.8000 (216)
Fuel for water heating, kWh/month	274.9205	243.8499	260.7421	232.7017	229.8544	215.9486	213.9948	222.0121	223.8874	236.5818	246.6693	271.9564 (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	24.8910	19.9685	17.9794	13.1725	10.1748	8.3129	9.2818	12.0648	15.6710	20.5612	23.2239	25.5828 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-37.2364	-52.4350	-75.2759	-84.5213	-91.0360	-84.9309	-83.8866	-79.2557	-71.0492	-59.9184	-40.9185	-32.2007 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)

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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	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)														
(233b)m	-21.1997	-44.5880	-88.6101	-133.0693	-175.9357	-176.7723	-174.6858	-147.9032	-108.4095	-63.7498	-28.2997	-16.7641		(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													2535.6121	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													79.8000	
Water heating fuel used													2873.1189	(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)													200.8845	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-1972.6517	(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													3722.9638	(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	2535.6121	0.2100	532.4785	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2873.1189	0.2100	603.3550	(264)
Space and water heating			1135.8335	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	200.8845	0.1443	28.9938	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-792.6647	0.1346	-106.7037	
PV Unit electricity exported	-1179.9871	0.1259	-148.5606	
Total			-255.2643	(269)
Total CO2, kg/year			921.4923	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.5400	(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	2535.6121	1.1300	2865.2417	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2873.1189	1.1300	3246.6244	(278)
Space and water heating			6111.8660	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	200.8845	1.5338	308.1234	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-792.6647	1.4975	-1187.0249	
PV Unit electricity exported	-1179.9871	0.4621	-545.3196	
Total			-1732.3445	(283)
Total Primary energy kWh/year			4817.7457	(286)
Target Primary Energy Rate (TPER)			60.3600	(287)