

Full SAP Calculation Printout



Property Reference	Plot 001	Issued on Date	28/09/2023
Assessment Reference	Vaillant ASHP	Prop Type Ref	
Property	1, UB9 6NL		
SAP Rating	79 C	DER	4.59
Environmental	96 A	TER	10.51
CO ₂ Emissions (t/year)	0.5	% DER < TER	56.33
Compliance Check	See BREL	DFEE	37.52
% DPER < TPER	12.74	TFEE	38.89
		% DFEE < TFEE	3.51
		DFEE	47.88
		TPER	54.87
Assessor Details	Mr. Michael Woodbridge	Assessor ID	M818-0001
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	49.8400 (1b)	x 2.7000 (2b)	= 134.5680 (1b) -
First floor	47.0000 (1c)	x 2.7000 (2c)	= 126.9000 (1c) -
Second floor	24.5600 (1d)	x 1.5000 (2d)	= 36.8400 (1d) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	121.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 298.3080 (5)

2. Ventilation rate

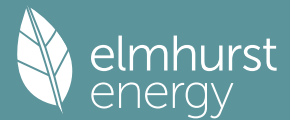
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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)+(7a)+(7b)+(7c) =	Air changes per hour 0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1388 (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	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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 floor			2.1200	1.2000	2.5440		(26)
window (Uw = 1.20)			20.0100	1.1450	22.9122		(27)

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rooflight			2.7400	1.1450	3.1374			(27a)
ground floor			49.8400	0.1100	5.4824			(28a)
External Wall 1	120.6600	20.1000	100.5600	0.1600	16.0896	110.0000	5482.4000	(28a)
Dormer	3.9200	2.0300	1.8900	0.1800	0.3402	9.0000	17.0100	(29a)
Sloping ceiling	59.2400	2.7400	56.5000	0.1100	6.2150	9.0000	508.5000	(30)
Flat roof	6.2500		6.2500	0.1100	0.6875	9.0000	56.2500	(30)
Total net area of external elements Aum(A, m2)			239.9100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		57.4083			(33)
Party Wall 1			70.0000	0.0000	0.0000	180.0000	12600.0000	(32)
Internal Floor 1			94.0000			18.0000	1692.0000	(32d)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 39462.5600 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 325.0623 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	14.4600	0.0500	0.7230
E3 Sill	13.4500	0.0400	0.5380
E4 Jamb	31.5000	0.0400	1.2600
E5 Ground floor (normal)	20.9000	0.1050	2.1945
R1 Head of roof window	2.6000	0.2400	0.6240
R2 Sill of roof window	2.6000	0.2400	0.6240
R3 Jamb of roof window	6.1600	0.2400	1.4784
E6 Intermediate floor within a dwelling	40.0000	0.0500	2.0000
E11 Eaves (insulation at rafter level)	10.0000	0.0800	0.8000
E13 Gable (insulation at rafter level)	12.2000	0.1000	1.2200
E16 Corner (normal)	10.8000	0.0800	0.8640
P1 Party wall - Ground floor	10.0000	0.1600	1.6000
P2 Party wall - Intermediate floor within a dwelling	20.0000	0.0000	0.0000
R8 Roof to wall (rafter)	12.2000	0.0600	0.7320
R4 Ridge (vaulted ceiling)	5.0000	0.1200	0.6000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			15.2579 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 72.6662 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(38)
Heat transfer coeff	49.2208	49.2208	49.2208	49.2208	49.2208	49.2208	49.2208	49.2208	49.2208	49.2208	49.2208	49.2208	
Average = Sum(39)m / 12 =	121.8870	121.8870	121.8870	121.8870	121.8870	121.8870	121.8870	121.8870	121.8870	121.8870	121.8870	121.8870	(39)
HLP	1.0040	1.0040	1.0040	1.0040	1.0040	1.0040	1.0040	1.0040	1.0040	1.0040	1.0040	1.0040	(40)
HLP (average)													1.0040
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8686 (42)
Hot water usage for mixer showers													
72.3162	71.2295	69.6458	66.6158	64.3797	61.8861	60.4687	62.0404	63.7632	66.4406	69.5357	72.0392	72.0392	(42a)
Hot water usage for baths													
31.2216	30.7579	30.1049	28.9010	27.9995	26.9998	26.4599	27.1083	27.8143	28.8839	30.1127	31.1160	31.1160	(42b)
Hot water usage for other uses													
44.0070	42.4067	40.8065	39.2062	37.6060	36.0057	36.0057	37.6060	39.2062	40.8065	42.4067	44.0070	44.0070	(42c)
Average daily hot water use (litres/day)													135.6268 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.5448	144.3941	140.5572	134.7230	129.9852	124.8916	122.9343	126.7546	130.7837	136.1310	142.0551	147.1621	(44)
Energy content (annual)	233.6748	205.6152	216.0312	184.4290	174.9850	153.5688	148.6784	156.9487	161.2693	184.7284	202.3835	230.4204	(45)
Distribution loss (46)m = 0.15 x (45)m													
35.0512	30.8423	32.4047	27.6644	26.2478	23.0353	22.3018	23.5423	24.1904	27.7093	30.3575	34.5631	34.5631	(46)

Water storage loss:

Store volume													200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.7700 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.9558 (55)

Total storage loss	29.6298	26.7624	29.6298	28.6740	29.6298	28.6740	29.6298	29.6298	28.6740	29.6298	28.6740	29.6298	(56)
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If cylinder contains dedicated solar storage	29.6298	26.7624	29.6298	28.6740	29.6298	28.6740	29.6298	29.6298	28.6740	29.6298	28.6740	29.6298	(57)
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Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
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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)
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Total heat required for water heating calculated for each month	286.5670	253.3888	268.9234	235.6150	227.8772	204.7548	201.5706	209.8409	212.4553	237.6206	253.5695	283.3126	(62)
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WVHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
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PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
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Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
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FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
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Output from w/h	286.5670	253.3888	268.9234	235.6150	227.8772	204.7548	201.5706	209.8409	212.4553	237.6206	253.5695	283.3126	(64)
Total per year (kWh/year) = Sum(64)m =													2875.4958 (64)

12Total per year (kWh/year)													2875 (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	120.0106	106.5859	114.1441	102.2715	100.4963	92.0104	91.7493	94.4992	94.5709	103.7360	108.2413	118.9285	(65)
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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	144.9408	160.4702	144.9408	149.7722	144.9408	149.7722	144.9408	144.9408	149.7722	144.9408	149.7722	144.9408	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	287.0247	290.0031	282.4976	266.5193	246.3494	227.3927	214.7284	211.7500	219.2555	235.2338	255.4036	274.3604	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	(71)
Water heating gains (Table 5)	161.3046	158.6100	153.4195	142.0437	135.0756	127.7923	123.3190	127.0150	131.3484	139.4301	150.3351	159.8502	(72)
Total internal gains	659.2986	675.1118	646.8864	624.3636	592.3944	570.9856	549.0166	549.7343	566.4045	585.6332	621.5394	645.1799	(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	
Northeast				12.5900	11.2829	0.5000	0.8000			0.7700		39.3769 (75)
Southwest				5.5300	36.7938	0.5000	0.8000			0.7700		56.4019 (79)
Northwest				1.8900	11.2829	0.5000	0.8000			0.7700		5.9112 (81)
Northeast				2.7400	17.4137	0.7600	0.7000			1.0000		22.8453 (82)
Solar gains	124.5352	235.9725	386.5673	586.3470	755.1965	793.1516	746.6063	613.9225	454.6510	277.9393	153.4976	103.7772 (83)
Total gains	783.8338	911.0843	1033.4537	1210.7106	1347.5909	1364.1372	1295.6230	1163.6568	1021.0555	863.5725	775.0370	748.9571 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)

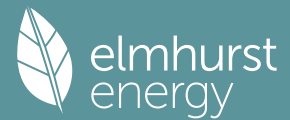
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	89.9343	89.9343	89.9343	89.9343	89.9343	89.9343	89.9343	89.9343	89.9343	89.9343	89.9343	89.9343	21.0000 (85)
alpha	6.9956	6.9956	6.9956	6.9956	6.9956	6.9956	6.9956	6.9956	6.9956	6.9956	6.9956	6.9956	
util living area	0.9992	0.9975	0.9901	0.9433	0.7880	0.5669	0.4134	0.4803	0.7762	0.9772	0.9977	0.9994	(86)
Living	20.0867	20.2316	20.4573	20.7573	20.9477	20.9951	20.9995	20.9987	20.9647	20.6910	20.3283	20.0525	
Non living	19.0128	19.1980	19.4843	19.8474	20.0426	20.0778	20.0799	20.0797	20.0602	19.7773	19.3222	18.9690	
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	20.5328	20.2316	20.4573	20.7573	20.9477	20.9951	20.9995	20.9987	20.9647	20.6910	20.3283	20.1851	(87)
Th 2	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	(88)
util rest of house	0.9989	0.9964	0.9857	0.9203	0.7283	0.4879	0.3273	0.3852	0.6931	0.9635	0.9965	0.9992	(89)
MIT 2	19.6545	19.1980	19.4843	19.8474	20.0426	20.0778	20.0799	20.0797	20.0602	19.7773	19.3222	19.1692	(90)
Living area fraction	19.8426	19.4194	19.6927	20.0423	20.2365	20.2743	20.2768	20.2765	20.2539	19.9730	19.5377	0.2142	(91)
MIT	19.8426	19.4194	19.6927	20.0423	20.2365	20.2743	20.2768	20.2765	20.2539	19.9730	19.5377	19.3868	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8426	19.4194	19.6927	20.0423	20.2365	20.2743	20.2768	20.2765	20.2539	19.9730	19.5377	19.3868	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9988	0.9953	0.9833	0.9191	0.7391	0.5048	0.3458	0.4056	0.7100	0.9614	0.9955	0.9989	(94)
Useful gains	782.8754	906.8141	1016.1942	1112.8164	996.0308	688.6618	447.9846	471.9814	724.9311	830.2562	771.5528	748.1617	(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	1894.4444	1769.7277	1608.0221	1358.0987	1040.4852	691.6197	448.1592	472.4945	750.0806	1142.4457	1515.9935	1851.0681	(97)
Space heating kWh	827.0073	579.8779	440.3200	176.6032	33.0741	0.0000	0.0000	0.0000	0.0000	232.2690	535.9973	820.5624	(98a)
Space heating requirement - total per year (kWh/year)												3645.7112	
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	827.0073	579.8779	440.3200	176.6032	33.0741	0.0000	0.0000	0.0000	0.0000	232.2690	535.9973	820.5624	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3645.7112	
Space heating per m2										(98c) / (4) =		30.0306	(99)

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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 %)													200.7350 (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	827.0073	579.8779	440.3200	176.6032	33.0741	0.0000	0.0000	0.0000	0.0000	232.2690	535.9973	820.5624	(98)
Space heating efficiency (main heating system 1)	200.7350	200.7350	200.7350	200.7350	200.7350	0.0000	0.0000	0.0000	0.0000	200.7350	200.7350	200.7350	(210)
Space heating fuel (main heating system)	411.9896	288.8773	219.3539	87.9783	16.4765	0.0000	0.0000	0.0000	0.0000	115.7092	267.0174	408.7789	(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	286.5670	253.3888	268.9234	235.6150	227.8772	204.7548	201.5706	209.8409	212.4553	237.6206	253.5695	283.3126	(64)
Efficiency of water heater	170.1509	170.1509	170.1509	170.1509	170.1509	170.1509	170.1509	170.1509	170.1509	170.1509	170.1509	170.1509	(216)
Fuel for water heating, kWh/month	168.4194	148.9201	158.0500	138.4742	133.9266	120.3372	118.4658	123.3264	124.8629	139.6529	149.0263	166.5067	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	30.1158	24.1600	21.7534	15.9375	12.3106	10.0579	11.2301	14.5973	18.9605	24.8772	28.0988	30.9528	(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													1816.1811 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													170.1509
Water heating fuel used													1689.9683 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year													0.0000 (231)
Electricity for lighting (calculated in Appendix L)													243.0521 (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													3749.2014 (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	1816.1811	0.1566	284.3787	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1689.9683	0.1410	238.2137	(264)
Space and water heating			522.5923	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	243.0521	0.1443	35.0799	(268)
Total CO2, kg/year			557.6723	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.5900	(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	1816.1811	1.5797	2868.9643	(275)

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Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1689.9683	1.5212	2570.8009 (278)
Space and water heating			5439.7652 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	243.0521	1.5338	372.8014 (282)
Total Primary energy kWh/year			5812.5666 (286)
Dwelling Primary energy Rate (DPER)			47.8800 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	49.8400 (1b)	x 2.7000 (2b)	= 134.5680 (1b) -
First floor	47.0000 (1c)	x 2.7000 (2c)	= 126.9000 (1c) -
Second floor	24.5600 (1d)	x 1.5000 (2d)	= 36.8400 (1d) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	121.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	298.3080 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1341 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3841 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3553 (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	0.4530	0.4441	0.4352	0.3908	0.3819	0.3375	0.3375	0.3286	0.3553	0.3819	0.3997	0.4175 (22b)
Effective ac	0.6026	0.5986	0.5947	0.5764	0.5729	0.5570	0.5570	0.5540	0.5631	0.5729	0.5799	0.5871 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.20)			20.0100	1.1450	22.9122		(27)
rooflight			2.7400	1.5038	4.1203		(27a)
ground floor			49.8400	0.1300	6.4792		(28a)
External Wall 1	120.6600	20.1000	100.5600	0.1800	18.1008		(29a)
Dormer	3.9200	2.0300	1.8900	0.1800	0.3402		(29a)
Sloping ceiling	59.2400	2.7400	56.5000	0.1100	6.2150		(30)
Flat roof	6.2500		6.2500	0.1100	0.6875		(30)
Total net area of external elements Aum(A, m ²)			239.9100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	60.9752		(33)
Party Wall 1			70.0000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							325.0623 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value		Total
E2 Other lintels (including other steel lintels)				14.4600	0.0500		0.7230
E3 Sill				13.4500	0.0500		0.6725

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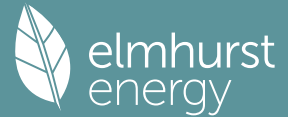
E4 Jamb	31.5000	0.0500	1.5750
E5 Ground floor (normal)	20.9000	0.1600	3.3440
R1 Head of roof window	2.6000	0.0800	0.2080
R2 Sill of roof window	2.6000	0.0600	0.1560
R3 Jamb of roof window	6.1600	0.0800	0.4928
E6 Intermediate floor within a dwelling	40.0000	0.0000	0.0000
E11 Eaves (insulation at rafter level)	10.0000	0.0400	0.4000
E13 Gable (insulation at rafter level)	12.2000	0.0800	0.9760
E16 Corner (normal)	10.8000	0.0900	0.9720
P1 Party wall - Ground floor	10.0000	0.0800	0.8000
P2 Party wall - Intermediate floor within a dwelling	20.0000	0.0000	0.0000
R8 Roof to wall (rafter)	12.2000	0.0600	0.7320
R4 Ridge (vaulted ceiling)	5.0000	0.0800	0.4000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			11.4513 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	72.4265 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	59.3207	58.9285	58.5441	56.7385	56.4007	54.8280	54.8280	54.5368	55.4338	56.4007	57.0841	57.7986
Heat transfer coeff												
	131.7473	131.3551	130.9706	129.1650	128.8272	127.2545	127.2545	126.9633	127.8603	128.8272	129.5106	130.2251
Average = Sum(39)m / 12 =												129.1634
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0852	1.0820	1.0788	1.0640	1.0612	1.0482	1.0482	1.0458	1.0532	1.0612	1.0668	1.0727
HLP (average)												1.0639
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.8686 (42)
Hot water usage for mixer showers												
	72.3162	71.2295	69.6458	66.6158	64.3797	61.8861	60.4687	62.0404	63.7632	66.4406	69.5357	72.0392
Hot water usage for baths												
	31.2216	30.7579	30.1049	28.9010	27.9995	26.9998	26.4599	27.1083	27.8143	28.8839	30.1127	31.1160
Hot water usage for other uses												
	44.0070	42.4067	40.8065	39.2062	37.6060	36.0057	36.0057	37.6060	39.2062	40.8065	42.4067	44.0070
Average daily hot water use (litres/day)												135.6268
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	147.5448	144.3941	140.5572	134.7230	129.9852	124.8916	122.9343	126.7546	130.7837	136.1310	142.0551	147.1621
Energy conte	233.6748	205.6152	216.0312	184.4290	174.9850	153.5688	148.6784	156.9487	161.2693	184.7284	202.3835	230.4204
Energy content (annual)												
												2252.7328
Distribution loss (46)m = 0.15 x (45)m												
	35.0512	30.8423	32.4047	27.6644	26.2478	23.0353	22.3018	23.5423	24.1904	27.7093	30.3575	34.5631
Water storage loss:												
Store volume												200.0000
a) If manufacturer declared loss factor is known (kWh/day):												1.6525
Temperature factor from Table 2b												0.5400
Enter (49) or (54) in (55)												0.8924
Total storage loss												
	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637
If cylinder contains dedicated solar storage												
	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624
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
Total heat required for water heating calculated for each month												
	284.6009	251.6130	266.9573	233.7123	225.9111	202.8521	199.6045	207.8748	210.5526	235.6545	251.6668	281.3464
WWHRS	-33.0600	-29.2385	-30.6169	-25.3520	-23.6271	-20.2179	-18.9511	-20.1526	-20.9182	-24.6603	-27.9371	-32.4477
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
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
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
Output from w/h	251.5410	222.3745	236.3404	208.3604	202.2839	182.6342	180.6534	187.7222	189.6344	210.9942	223.7297	248.8987
Total per year (kWh/year)												2545.1669
Electric shower(s)												2545
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000
Heat gains from water heating, kWh/month												
	118.4377	105.1653	112.5712	100.7493	98.9234	90.4883	90.1764	92.9263	93.0487	102.1631	106.7191	117.3556

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts												
(66)m	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	146.4854	162.1802	146.4854	151.3682	146.4854	151.3682	146.4854	146.4854	151.3682	146.4854	151.3682	146.4854
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	287.0247	290.0031	282.4976	266.5193	246.3494	227.3927	214.7284	211.7500	219.2555	235.2338	255.4036	274.3604
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000
Losses e.g. evaporation (negative values) (Table 5)												
	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426

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Water heating gains (Table 5)												
159.1905	156.4959	151.3054	139.9296	132.9615	125.6782	121.2049	124.9009	129.2343	137.3160	148.2210	157.7361	(72)
Total internal gains												
661.7291	677.7078	649.3169	626.8455	594.8248	570.4675	548.4471	549.1647	565.8865	588.0636	624.0214	647.6103	(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	
Northeast					12.5900	11.2829		0.6300	0.7000	0.7700		43.4130 (75)	
Southwest					5.5300	36.7938		0.6300	0.7000	0.7700		62.1830 (79)	
Northwest					1.8900	11.2829		0.6300	0.7000	0.7700		6.5171 (81)	
Northeast					2.7400	17.4137		0.6300	0.7000	1.0000		18.9375 (82)	
Solar gains	131.0507	247.1074	401.8368	605.2212	776.2213	813.9534	766.6925	632.4283	471.1796	290.2611	161.3098	109.3469 (83)	
Total gains	792.7798	924.8151	1051.1537	1232.0668	1371.0461	1384.4210	1315.1396	1181.5931	1037.0661	878.3247	785.3312	756.9573 (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	83.2034	83.4518	83.6968	84.8668	85.0894	86.1409	86.3385	85.7328	85.0894	84.6404	84.1760	
alpha	6.5469	6.5635	6.5798	6.6578	6.6726	6.7427	6.7427	6.7559	6.7155	6.6726	6.6427	
util living area	0.9992	0.9975	0.9908	0.9482	0.8043	0.5814	0.4250	0.4921	0.7905	0.9786	0.9977	0.9994 (86)
MIT	19.9855	20.1406	20.3815	20.7147	20.9311	20.9931	20.9993	20.9982	20.9548	20.6527	20.2655	19.9669 (87)
Th 2	20.0129	20.0156	20.0182	20.0304	20.0327	20.0433	20.0433	20.0453	20.0392	20.0327	20.0280	20.0232 (88)
util rest of house	0.9988	0.9964	0.9866	0.9262	0.7438	0.4980	0.3330	0.3913	0.7057	0.9654	0.9965	0.9992 (89)
MIT 2	18.8311	19.0314	19.3394	19.7553	19.9828	20.0403	20.0432	20.0449	20.0136	19.6919	19.2013	18.8151 (90)
Living area fraction									fLA = Living area / (4) =			0.2142 (91)
MIT	19.0784	19.2690	19.5626	19.9608	20.1859	20.2444	20.2479	20.2490	20.2152	19.8977	19.4293	19.0618 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0784	19.2690	19.5626	19.9608	20.1859	20.2444	20.2479	20.2490	20.2152	19.8977	19.4293	19.0618 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation	0.9983	0.9953	0.9840	0.9243	0.7541	0.5158	0.3528	0.4130	0.7226	0.9629	0.9954	0.9988	(94)	
Useful gains	791.4680	920.4284	1034.2931	1138.7685	1033.8845	714.1045	463.9485	487.9479	749.3372	845.7491	781.7355	756.0275	(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	1947.0080	1887.4346	1710.8196	1428.6687	1093.2114	718.2708	464.2167	488.6844	781.8903	1197.7911	1596.7689	1935.3778	(97)	
Space heating kWh	859.7218	649.8282	503.3357	208.7281	44.1392	0.0000	0.0000	0.0000	0.0000	261.9193	586.8240	877.4366	(98a)	
Space heating requirement - total per year (kWh/year)	3991.9329													
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	859.7218	649.8282	503.3357	208.7281	44.1392	0.0000	0.0000	0.0000	0.0000	261.9193	586.8240	877.4366	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)	3991.9329													
Space heating per m2											(98c) / (4) =			32.8825 (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	859.7218	649.8282	503.3357	208.7281	44.1392	0.0000	0.0000	0.0000	0.0000	261.9193	586.8240	877.4366 (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)	931.4429	704.0392	545.3258	226.1410	47.8215	0.0000	0.0000	0.0000	0.0000	283.7695	635.7790	950.6355 (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)

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Water heating requirement	251.5410	222.3745	236.3404	208.3604	202.2839	182.6342	180.6534	187.7222	189.6344	210.9942	223.7297	248.8987 (64)
Efficiency of water heater (217)m	86.5895	86.3180	85.7113	84.0637	81.2755	79.8000	79.8000	79.8000	79.8000	84.5458	86.1191	79.8000 (216)
Fuel for water heating, kWh/month	290.4983	257.6225	275.7400	247.8599	248.8868	228.8649	226.3827	235.2408	237.6371	249.5621	259.7910	287.2769 (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	7.0685	7.3041	7.0685	7.3041	7.0685 (231)
Lighting	30.4368	24.4175	21.9853	16.1073	12.4418	10.1650	11.3498	14.7529	19.1626	25.1423	28.3982	31.2827 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-46.7628	-65.9977	-94.9485	-106.8176	-115.1768	-107.4296	-106.0231	-100.0473	-89.5745	-75.4083	-51.4040	-40.4142 (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	-26.2128	-55.1656	-109.7140	-164.9116	-218.2201	-219.3878	-216.8847	-183.6310	-134.5353	-79.0298	-35.0363	-20.7335 (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												4324.9544 (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												3045.3632 (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)												245.6422 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-2463.4669 (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												5238.4929 (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	4324.9544	0.2100	908.2404 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3045.3632	0.2100	639.5263 (264)
Space and water heating			1547.7667 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	245.6422	0.1443	35.4538 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1000.0044	0.1346	-134.5859
PV Unit electricity exported	-1463.4625	0.1259	-184.1978
Total			-318.7837 (269)
Total CO2, kg/year			1276.3660 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.5100 (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	4324.9544	1.1300	4887.1985 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3045.3632	1.1300	3441.2605 (278)
Space and water heating			8328.4589 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	245.6422	1.5338	376.7741 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1000.0044	1.4974	-1497.4112
PV Unit electricity exported	-1463.4625	0.4620	-676.1294
Total			-2173.5405 (283)
Total Primary energy kWh/year			6661.7934 (286)
Target Primary Energy Rate (TPER)			54.8700 (287)

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Property Reference	Plot 002				Issued on Date	28/09/2023	
Assessment Reference	Vaillant ASHP			Prop Type Ref			
Property	2, UB9 6NL						
SAP Rating	81 B		DER	4.09		TER	8.94
Environmental	96 A		% DER < TER				54.25
CO ₂ Emissions (t/year)	0.45		DFEE	30.71		TFEE	31.84
Compliance Check	See BREL		% DFEE < TFEE				3.54
% DPER < TPER	7.80		DPER	42.79		TPER	46.41
Assessor Details	Mr. Michael Woodbridge				Assessor ID	M818-0001	
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	49.8400 (1b)	x 2.7000 (2b)	= 134.5680 (1b) -
First floor	47.0000 (1c)	x 2.7000 (2c)	= 126.9000 (1c) -
Second floor	24.5600 (1d)	x 1.5000 (2d)	= 36.8400 (1d) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	121.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 298.3080 (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)

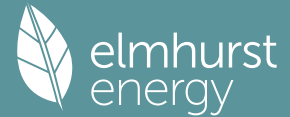
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour 0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1388 (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	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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 floor			2.1200	1.2000	2.5440		(26)
window (Uw = 1.20)			18.1200	1.1450	20.7481		(27)

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rooflight			2.7400	1.1450	3.1374			(27a)
ground floor			49.8400	0.1100	5.4824	110.0000	5482.4000	(28a)
External Wall 1	54.2800	18.2100	36.0700	0.1600	5.7712	190.0000	6853.3000	(29a)
Dormer	3.9200	2.0300	1.8900	0.1800	0.3402	9.0000	17.0100	(29a)
Sloping ceiling	59.2400	2.7400	56.5000	0.1100	6.2150	9.0000	508.5000	(30)
Flat roof	6.2500		6.2500	0.1100	0.6875	9.0000	56.2500	(30)
Total net area of external elements Aum(A, m2)			173.5300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		44.9258			(33)
Party Wall 1			140.0000	0.0000	0.0000	180.0000	25200.0000	(32)
Internal Wall 1			150.0000			75.0000	11250.0000	(32c)
Internal Floor 1			94.0000			18.0000	1692.0000	(32d)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 51059.4600 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 420.5886 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	14.4600	0.0500	0.7230
E3 Sill	13.4500	0.0400	0.5380
E4 Jamb	31.5000	0.0400	1.2600
E5 Ground floor (normal)	10.0000	0.1050	1.0500
R1 Head of roof window	2.6000	0.2400	0.6240
R2 Sill of roof window	2.6000	0.2400	0.6240
R3 Jamb of roof window	6.1600	0.2400	1.4784
E6 Intermediate floor within a dwelling	20.0000	0.0500	1.0000
E11 Eaves (insulation at rafter level)	10.0000	0.0800	0.8000
E16 Corner (normal)	10.8000	0.0800	0.8640
P1 Party wall - Ground floor	10.0000	0.1600	1.6000
P2 Party wall - Intermediate floor within a dwelling	20.0000	0.0000	0.0000
R8 Roof to wall (rafter)	12.2000	0.0600	0.7320
R4 Ridge (vaulted ceiling)	5.0000	0.1200	0.6000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.8934 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 56.8192 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	49.2208	49.2208	49.2208	49.2208	49.2208	49.2208	49.2208	49.2208	49.2208	49.2208	49.2208	49.2208	(38)
Heat transfer coeff	106.0400	106.0400	106.0400	106.0400	106.0400	106.0400	106.0400	106.0400	106.0400	106.0400	106.0400	106.0400	(39)
Average = Sum(39)m / 12 =													106.0400
HLP	0.8735	0.8735	0.8735	0.8735	0.8735	0.8735	0.8735	0.8735	0.8735	0.8735	0.8735	0.8735	(40)
HLP (average)													0.8735
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8686 (42)
Hot water usage for mixer showers	72.3162	71.2295	69.6458	66.6158	64.3797	61.8861	60.4687	62.0404	63.7632	66.4406	69.5357	72.0392	(42a)
Hot water usage for baths	31.2216	30.7579	30.1049	28.9010	27.9995	26.9998	26.4599	27.1083	27.8143	28.8839	30.1127	31.1160	(42b)
Hot water usage for other uses	44.0070	42.4067	40.8065	39.2062	37.6060	36.0057	36.0057	37.6060	39.2062	40.8065	42.4067	44.0070	(42c)
Average daily hot water use (litres/day)													135.6268 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.5448	144.3941	140.5572	134.7230	129.9852	124.8916	122.9343	126.7546	130.7837	136.1310	142.0551	147.1621	(44)
Energy content	233.6748	205.6152	216.0312	184.4290	174.9850	153.5688	148.6784	156.9487	161.2693	184.7284	202.3835	230.4204	(45)
Energy content (annual)													Total = Sum(45)m = 2252.7328
Distribution loss (46)m = 0.15 x (45)m	35.0512	30.8423	32.4047	27.6644	26.2478	23.0353	22.3018	23.5423	24.1904	27.7093	30.3575	34.5631	(46)

Water storage loss:
 Store volume 180.0000 (47)
 a) If manufacturer declared loss factor is known (kWh/day): 1.1100 (48)
 Temperature factor from Table 2b 0.5400 (49)
 Enter (49) or (54) in (55) 0.5994 (55)
 Total storage loss

	18.5814	16.7832	18.5814	17.9820	18.5814	17.9820	18.5814	18.5814	17.9820	18.5814	17.9820	18.5814	(56)
If cylinder contains dedicated solar storage	18.5814	16.7832	18.5814	17.9820	18.5814	17.9820	18.5814	18.5814	17.9820	18.5814	17.9820	18.5814	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	275.5186	243.4096	257.8750	224.9230	216.8288	194.0628	190.5222	198.7925	201.7633	226.5722	242.8775	272.2642	(62)
WVHRS	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	275.5186	243.4096	257.8750	224.9230	216.8288	194.0628	190.5222	198.7925	201.7633	226.5722	242.8775	272.2642	(64)
Total per year (kWh/year) = Sum(64)m =													2745.4098 (64)

12Total per year (kWh/year) 2745 (64)
 Electric shower(s) 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 111.1719 98.6026 105.3054 93.7179 91.6576 83.4568 82.9106 85.6605 86.0173 94.8972 99.6877 110.0898 (65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	145.9669	161.6062	145.9669	150.8325	145.9669	150.8325	145.9669	145.9669	150.8325	145.9669	150.8325	145.9669	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	287.0247	290.0031	282.4976	266.5193	246.3494	227.3927	214.7284	211.7500	219.2555	235.2338	255.4036	274.3604	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	(71)
Water heating gains (Table 5)	149.4246	146.7300	141.5395	130.1637	123.1956	115.9123	111.4390	115.1350	119.4684	127.5501	138.4551	147.9702	(72)
Total internal gains	648.4447	664.3678	636.0325	613.5439	581.5404	560.1659	538.1627	538.8804	555.5848	574.7793	610.7197	634.3260	(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					
Northeast			12.5900	11.2829	0.5000	0.8000	0.7700	39.3769 (75)					
Southwest			5.5300	36.7938	0.5000	0.8000	0.7700	56.4019 (79)					
Northeast			2.7400	17.4137	0.7600	0.7000	1.0000	22.8453 (82)					
Solar gains	118.6240	223.9400	364.8886	550.7444	707.3396	742.1310	698.8777	575.8727	428.2351	263.2347	146.0597	98.9498	(83)
Total gains	767.0687	888.3078	1000.9211	1164.2882	1288.8800	1302.2969	1237.0404	1114.7531	983.8200	838.0139	756.7795	733.2757	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)

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	133.7531	133.7531	133.7531	133.7531	133.7531	133.7531	133.7531	133.7531	133.7531	133.7531	133.7531	133.7531	21.0000 (85)
alpha	9.9169	9.9169	9.9169	9.9169	9.9169	9.9169	9.9169	9.9169	9.9169	9.9169	9.9169	9.9169	
util living area	0.9999	0.9993	0.9950	0.9460	0.7518	0.5207	0.3772	0.4375	0.7332	0.9834	0.9993	0.9999	(86)
Living	20.5221	20.6040	20.7277	20.8877	20.9609	20.9683	20.9686	20.9685	20.9640	20.8446	20.6494	20.5023	
Non living	19.6258	19.7308	19.8880	20.0782	20.1453	20.1497	20.1498	20.1498	20.1478	20.0336	19.7890	19.6005	
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	20.7555	20.6040	20.7277	20.8877	20.9609	20.9683	20.9686	20.9685	20.9640	20.8446	20.6494	20.5720	(87)
Th 2	20.1901	20.1901	20.1901	20.1901	20.1901	20.1901	20.1901	20.1901	20.1901	20.1901	20.1901	20.1901	(88)
util rest of house	0.9998	0.9988	0.9921	0.9205	0.6924	0.4551	0.3077	0.3605	0.6529	0.9706	0.9989	0.9999	(89)
MIT 2	19.9651	19.7308	19.8880	20.0782	20.1453	20.1497	20.1498	20.1498	20.1478	20.0336	19.7890	19.7068	(90)
Living area fraction									fLA = Living area / (4) =			0.2142	(91)
MIT	20.1344	19.9178	20.0678	20.2516	20.3199	20.3250	20.3251	20.3251	20.3226	20.2073	19.9733	19.8921	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1344	19.9178	20.0678	20.2516	20.3199	20.3250	20.3251	20.3251	20.3226	20.2073	19.9733	19.8921	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9998	0.9986	0.9915	0.9228	0.7022	0.4660	0.3193	0.3734	0.6664	0.9710	0.9987	0.9998	(94)
Useful gains	766.8926	887.1032	992.4223	1074.3653	905.0446	606.9131	395.0083	416.2037	655.6525	813.6965	755.8066	733.1545	(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	1679.0814	1592.4920	1438.7315	1203.7192	914.0589	607.0805	395.0115	416.2186	659.8433	1018.7577	1365.0816	1663.9860	(97)
Space heating kWh	678.6685	474.0212	332.0540	93.1348	6.7066	0.0000	0.0000	0.0000	0.0000	152.5655	438.6780	692.5387	(98a)
Space heating requirement - total per year (kWh/year)												2868.3672	
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	678.6685	474.0212	332.0540	93.1348	6.7066	0.0000	0.0000	0.0000	0.0000	152.5655	438.6780	692.5387	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2868.3672	
Space heating per m2										(98c) / (4) =		23.6274	(99)

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

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Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												202.2467 (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	678.6685	474.0212	332.0540	93.1348	6.7066	0.0000	0.0000	0.0000	0.0000	152.5655	438.6780	692.5387 (98)
Space heating efficiency (main heating system 1)	202.2467	202.2467	202.2467	202.2467	202.2467	0.0000	0.0000	0.0000	0.0000	202.2467	202.2467	202.2467 (210)
Space heating fuel (main heating system)	335.5647	234.3778	164.1827	46.0501	3.3160	0.0000	0.0000	0.0000	0.0000	75.4354	216.9024	342.4228 (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	275.5186	243.4096	257.8750	224.9230	216.8288	194.0628	190.5222	198.7925	201.7633	226.5722	242.8775	272.2642 (64)
Efficiency of water heater	170.1600	170.1600	170.1600	170.1600	170.1600	170.1600	170.1600	170.1600	170.1600	170.1600	170.1600	170.1600 (216)
Fuel for water heating, kWh/month	161.9174	143.0475	151.5485	132.1833	127.4264	114.0473	111.9665	116.8268	118.5727	133.1525	142.7348	160.0048 (219)
Space cooling fuel requirement	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	6.7228	6.0722	6.7228	6.5060	6.7228	6.5060	6.7228	6.7228	6.5060	6.7228	6.5060	6.7228 (231)
Lighting	30.3290	24.3311	21.9074	16.0503	12.3977	10.1291	11.3096	14.7007	19.0947	25.0533	28.2977	31.1720 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												1418.2518 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												170.1600
Water heating fuel used												1613.4284 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(MEVDecentralised, Database: total watage = 6.3075, total flow = 29.0000, SFP = 0.2175)												
mechanical ventilation fans (SFP = 0.2175)												79.1560 (230a)
Total electricity for the above, kWh/year												79.1560 (231)
Electricity for lighting (calculated in Appendix L)												244.7727 (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												3355.6090 (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	1418.2518	0.1574	223.1667 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1613.4284	0.1411	227.5964 (264)
Space and water heating			450.7632 (265)
Pumps, fans and electric keep-hot	79.1560	0.1387	10.9799 (267)
Energy for lighting	244.7727	0.1443	35.3283 (268)
Total CO2, kg/year			497.0713 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.0900 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
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Space heating - main system 1	1418.2518	1.5825	2244.3993 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1613.4284	1.5216	2455.0107 (278)
Space and water heating			4699.4100 (279)
Pumps, fans and electric keep-hot	79.1560	1.5128	119.7472 (281)
Energy for lighting	244.7727	1.5338	375.4405 (282)
Total Primary energy kWh/year			5194.5978 (286)
Dwelling Primary energy Rate (DPER)			42.7900 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	49.8400 (1b)	x 2.7000 (2b)	= 134.5680 (1b) -
First floor	47.0000 (1c)	x 2.7000 (2c)	= 126.9000 (1c) -
Second floor	24.5600 (1d)	x 1.5000 (2d)	= 36.8400 (1d) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	121.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 298.3080 (5)

2. Ventilation rate

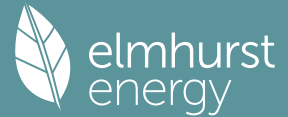
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour 40.0000 / (5) = 0.1341 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3841 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3553 (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	0.4530	0.4441	0.4352	0.3908	0.3819	0.3375	0.3375	0.3286	0.3553	0.3819	0.3997	0.4175 (22b)
Effective ac	0.6026	0.5986	0.5947	0.5764	0.5729	0.5570	0.5570	0.5540	0.5631	0.5729	0.5799	0.5871 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.20)			18.1200	1.1450	20.7481		(27)
rooflight			2.7400	1.5038	4.1203		(27a)
ground floor			49.8400	0.1300	6.4792		(28a)
External Wall 1	54.2800	18.2100	36.0700	0.1800	6.4926		(29a)
Dormer	3.9200	2.0300	1.8900	0.1800	0.3402		(29a)
Sloping ceiling	59.2400	2.7400	56.5000	0.1100	6.2150		(30)
Flat roof	6.2500		6.2500	0.1100	0.6875		(30)
Total net area of external elements Aum(A, m ²)			173.5300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		47.2029		(33)
Party Wall 1			140.0000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							420.5886 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				14.4600	0.0500	0.7230	

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E3 Sill	13.4500	0.0500	0.6725
E4 Jamb	31.5000	0.0500	1.5750
E5 Ground floor (normal)	10.0000	0.1600	1.6000
R1 Head of roof window	2.6000	0.0800	0.2080
R2 Sill of roof window	2.6000	0.0600	0.1560
R3 Jamb of roof window	6.1600	0.0800	0.4928
E6 Intermediate floor within a dwelling	20.0000	0.0000	0.0000
E11 Eaves (insulation at rafter level)	10.0000	0.0400	0.4000
E16 Corner (normal)	10.8000	0.0900	0.9720
P1 Party wall - Ground floor	10.0000	0.0800	0.8000
P2 Party wall - Intermediate floor within a dwelling	20.0000	0.0000	0.0000
R8 Roof to wall (rafter)	12.2000	0.0600	0.7320
R4 Ridge (vaulted ceiling)	5.0000	0.0800	0.4000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.7313 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	55.9342 (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	59.3207	58.9285	58.5441	56.7385	56.4007	54.8280	54.8280	54.5368	55.4338	56.4007	57.0841	57.7986 (38)
Average = Sum(39)m / 12 =	115.2549	114.8627	114.4783	112.6727	112.3348	110.7622	110.7622	110.4710	111.3680	112.3348	113.0183	113.7328 (39)
	112.6711											
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9494	0.9462	0.9430	0.9281	0.9253	0.9124	0.9124	0.9100	0.9174	0.9253	0.9310	0.9368 (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												2.8686 (42)
Hot water usage for mixer showers	72.3162	71.2295	69.6458	66.6158	64.3797	61.8861	60.4687	62.0404	63.7632	66.4406	69.5357	72.0392 (42a)
Hot water usage for baths	31.2216	30.7579	30.1049	28.9010	27.9995	26.9998	26.4599	27.1083	27.8143	28.8839	30.1127	31.1160 (42b)
Hot water usage for other uses	44.0070	42.4067	40.8065	39.2062	37.6060	36.0057	36.0057	37.6060	39.2062	40.8065	42.4067	44.0070 (42c)
Average daily hot water use (litres/day)												135.6268 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	147.5448	144.3941	140.5572	134.7230	129.9852	124.8916	122.9343	126.7546	130.7837	136.1310	142.0551	147.1621 (44)
Energy content (annual)	233.6748	205.6152	216.0312	184.4290	174.9850	153.5688	148.6784	156.9487	161.2693	184.7284	202.3835	230.4204 (45)
Distribution loss (46)m = 0.15 x (45)m	35.0512	30.8423	32.4047	27.6644	26.2478	23.0353	22.3018	23.5423	24.1904	27.7093	30.3575	34.5631 (46)
Water storage loss:												
Store volume												180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5520 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8381 (55)
Total storage loss	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (56)
If cylinder contains dedicated solar storage	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	282.9175	250.0925	265.2739	232.0832	224.2277	201.2230	197.9211	206.1913	208.9235	233.9711	250.0377	279.6630 (62)
WWHRS	-33.0600	-29.2385	-30.6169	-25.3520	-23.6271	-20.2179	-18.9511	-20.1526	-20.9182	-24.6603	-27.9371	-32.4477 (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	249.8576	220.8540	234.6570	206.7313	200.6005	181.0051	178.9700	186.0388	188.0053	209.3108	222.1006	247.2153 (64)
	Total per year (kWh/year) = Sum(64)m =											2525.3462 (64)
12Total per year (kWh/year)												2525 (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	117.0910	103.9489	111.2245	99.4460	97.5767	89.1850	88.8297	91.5796	91.7454	100.8163	105.4159	116.0089 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	148.3455	164.2396	148.3455	153.2903	148.3455	153.2903	148.3455	148.3455	153.2903	148.3455	153.2903	148.3455 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	287.0247	290.0031	282.4976	266.5193	246.3494	227.3927	214.7284	211.7500	219.2555	235.2338	255.4036	274.3604 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426 (71)

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Water heating gains (Table 5)												
157.3804	154.6858	149.4953	138.1195	131.1514	123.8681	119.3948	123.0908	127.4242	135.5058	146.4109	155.9259	(72)
Total internal gains												
661.7791	677.9570	649.3668	626.9575	594.8748	570.5795	548.4971	549.2147	565.9984	588.1136	624.1334	647.6603	(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				

Northeast			12.5900	11.2829	0.6300	0.7000	0.7700	43.4130 (75)				
Southwest			5.5300	36.7938	0.6300	0.7000	0.7700	62.1830 (79)				
Northeast			2.7400	17.4137	0.6300	0.7000	1.0000	18.9375 (82)				

Solar gains	124.5336	233.8416	377.9361	565.9693	723.4590	757.7033	714.0717	590.4784	442.0562	274.0492	153.1096	104.0247 (83)
Total gains	786.3126	911.7986	1027.3029	1192.9268	1318.3338	1328.2828	1262.5687	1139.6931	1008.0546	862.1628	777.2429	751.6850 (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		
123.0592	123.4794	123.8941	125.8795	126.2581	128.0508	128.0508	128.3883	127.3543	126.2581	125.4946	124.7062		
9.2039	9.2320	9.2596	9.3920	9.4172	9.5367	9.5367	9.5592	9.4903	9.4172	9.3663	9.3137		
util living area													
0.9998	0.9993	0.9955	0.9525	0.7723	0.5331	0.3860	0.4458	0.7477	0.9844	0.9993	0.9999	(86)	
MIT	20.3310	20.4486	20.6253	20.8662	20.9843	20.9995	21.0000	20.9999	20.9913	20.8117	20.5323	20.3179	(87)
Th 2	20.1257	20.1284	20.1311	20.1437	20.1460	20.1570	20.1570	20.1590	20.1528	20.1460	20.1413	20.1363	(88)
util rest of house													
0.9998	0.9988	0.9928	0.9286	0.7103	0.4632	0.3120	0.3643	0.6638	0.9720	0.9988	0.9998	(89)	
MIT 2	19.3433	19.4961	19.7232	20.0234	20.1366	20.1568	20.1570	20.1590	20.1490	19.9688	19.6142	19.3352	(90)
Living area fraction									fLA = Living area / (4) =			0.2142	(91)
MIT	19.5548	19.7001	19.9164	20.2039	20.3182	20.3373	20.3375	20.3391	20.3294	20.1493	19.8108	19.5457	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5548	19.7001	19.9164	20.2039	20.3182	20.3373	20.3375	20.3391	20.3294	20.1493	19.8108	19.5457	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9997	0.9985	0.9919	0.9306	0.7233	0.4782	0.3279	0.3818	0.6819	0.9721	0.9985	0.9998 (94)
Useful gains	786.0485	910.4522	1018.9570	1110.1087	953.4938	635.1836	413.9706	435.1305	687.3912	838.0724	776.1093	751.5175 (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												
	1758.1914	1699.9764	1535.8906	1273.6420	968.1226	635.4767	413.9773	435.1576	693.7549	1072.7243	1436.5531	1745.3083 (97)
Space heating kWh												
	723.2743	530.5602	384.5986	117.7440	10.8838	0.0000	0.0000	0.0000	0.0000	174.5809	475.5195	739.3804 (98a)
Space heating requirement - total per year (kWh/year)												3156.5418
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												
	723.2743	530.5602	384.5986	117.7440	10.8838	0.0000	0.0000	0.0000	0.0000	174.5809	475.5195	739.3804 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3156.5418
Space heating per m2												(98c) / (4) = 26.0012 (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	723.2743	530.5602	384.5986	117.7440	10.8838	0.0000	0.0000	0.0000	0.0000	174.5809	475.5195	739.3804 (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)	783.6125	574.8215	416.6832	127.5666	11.7917	0.0000	0.0000	0.0000	0.0000	189.1451	515.1891	801.0622 (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

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Water heating requirement	249.8576	220.8540	234.6570	206.7313	200.6005	181.0051	178.9700	186.0388	188.0053	209.3108	222.1006	247.2153 (64)
Efficiency of water heater (217)m	86.3009	85.9508	85.1605	82.8469	80.2184	79.8000	79.8000	79.8000	79.8000	83.6558	85.7220	79.8000 (216)
Fuel for water heating, kWh/month	289.5189	256.9538	275.5467	249.5340	250.0680	226.8235	224.2732	233.1313	235.5956	250.2048	259.0939	286.2631 (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	30.8233	24.7276	22.2644	16.3119	12.5998	10.2941	11.4939	14.9402	19.4059	25.4616	28.7588	31.6799 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-46.7737	-66.0164	-94.9772	-106.8494	-115.2085	-107.4578	-106.0546	-100.0835	-89.6110	-75.4365	-51.4190	-40.4236 (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	-26.2019	-55.1469	-109.6853	-164.8798	-218.1884	-219.3596	-216.8531	-183.5948	-134.4988	-79.0015	-35.0213	-20.7241 (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												3419.8719 (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												3037.0068 (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)												248.7613 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-2463.4669 (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												4328.1732 (238)

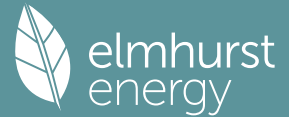
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3419.8719	0.2100	718.1731 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3037.0068	0.2100	637.7714 (264)
Space and water heating			1355.9445 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	248.7613	0.1443	35.9039 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1000.3114	0.1346	-134.6268
PV Unit electricity exported	-1463.1555	0.1259	-184.1566
Total			-318.7834 (269)
Total CO2, kg/year			1084.9944 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			8.9400 (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	3419.8719	1.1300	3864.4553 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3037.0068	1.1300	3431.8177 (278)
Space and water heating			7296.2730 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	248.7613	1.5338	381.5584 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1000.3114	1.4974	-1497.8695
PV Unit electricity exported	-1463.1555	0.4620	-675.9779
Total			-2173.8473 (283)
Total Primary energy kWh/year			5634.0849 (286)
Target Primary Energy Rate (TPER)			46.4100 (287)

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Property Reference	Plot 003	Issued on Date	28/09/2023
Assessment Reference	Vaillant ASHP	Prop Type Ref	
Property	3, UB9 6NL		
SAP Rating	81 B	DER	4.08
Environmental	96 A	TER	8.94
CO ₂ Emissions (t/year)	0.44	% DER < TER	54.36
Compliance Check	See BREL	DFEE	30.71
% DPER < TPER	8.21	TFEE	31.84
		% DFEE < TFEE	3.54
		DFEE	42.60
		TPER	46.41
Assessor Details	Mr. Michael Woodbridge	Assessor ID	M818-0001
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	49.8400 (1b)	x 2.7000 (2b)	= 134.5680 (1b) -
First floor	47.0000 (1c)	x 2.7000 (2c)	= 126.9000 (1c) -
Second floor	24.5600 (1d)	x 1.5000 (2d)	= 36.8400 (1d) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	121.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 298.3080 (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)

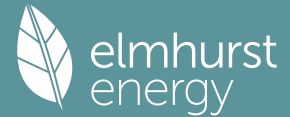
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour 0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1388 (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	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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 floor			2.1200	1.2000	2.5440		(26)
window (Uw = 1.20)			18.1200	1.1450	20.7481		(27)

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rooflight			2.7400	1.1450	3.1374			(27a)
ground floor			49.8400	0.1100	5.4824	110.0000	5482.4000	(28a)
External Wall 1	54.2800	18.2100	36.0700	0.1600	5.7712	190.0000	6853.3000	(29a)
Dormer	3.9200	2.0300	1.8900	0.1800	0.3402	9.0000	17.0100	(29a)
Sloping ceiling	59.2400	2.7400	56.5000	0.1100	6.2150	9.0000	508.5000	(30)
Flat roof	6.2500		6.2500	0.1100	0.6875	9.0000	56.2500	(30)
Total net area of external elements Aum(A, m2)			173.5300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		44.9258			(33)
Party Wall 1			140.0000	0.0000	0.0000	180.0000	25200.0000	(32)
Internal Wall 1			150.0000			75.0000	11250.0000	(32c)
Internal Floor 1			94.0000			18.0000	1692.0000	(32d)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 51059.4600 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 420.5886 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	14.4600	0.0500	0.7230
E3 Sill	13.4500	0.0400	0.5380
E4 Jamb	31.5000	0.0400	1.2600
E5 Ground floor (normal)	10.0000	0.1050	1.0500
R1 Head of roof window	2.6000	0.2400	0.6240
R2 Sill of roof window	2.6000	0.2400	0.6240
R3 Jamb of roof window	6.1600	0.2400	1.4784
E6 Intermediate floor within a dwelling	20.0000	0.0500	1.0000
E11 Eaves (insulation at rafter level)	10.0000	0.0800	0.8000
E16 Corner (normal)	10.8000	0.0800	0.8640
P1 Party wall - Ground floor	10.0000	0.1600	1.6000
P2 Party wall - Intermediate floor within a dwelling	20.0000	0.0000	0.0000
R8 Roof to wall (rafter)	12.2000	0.0600	0.7320
R4 Ridge (vaulted ceiling)	5.0000	0.1200	0.6000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			11.8934 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 56.8192 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(38)
Heat transfer coeff	49.2208	49.2208	49.2208	49.2208	49.2208	49.2208	49.2208	49.2208	49.2208	49.2208	49.2208	49.2208	
Average = Sum(39)m / 12 =	106.0400	106.0400	106.0400	106.0400	106.0400	106.0400	106.0400	106.0400	106.0400	106.0400	106.0400	106.0400	(39)
	106.0400												106.0400
HLP	0.8735	0.8735	0.8735	0.8735	0.8735	0.8735	0.8735	0.8735	0.8735	0.8735	0.8735	0.8735	(40)
HLP (average)													0.8735
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8686 (42)
Hot water usage for mixer showers													
72.3162	71.2295	69.6458	66.6158	64.3797	61.8861	60.4687	62.0404	63.7632	66.4406	69.5357	72.0392	72.0392	(42a)
Hot water usage for baths													
31.2216	30.7579	30.1049	28.9010	27.9995	26.9998	26.4599	27.1083	27.8143	28.8839	30.1127	31.1160	31.1160	(42b)
Hot water usage for other uses													
44.0070	42.4067	40.8065	39.2062	37.6060	36.0057	36.0057	37.6060	39.2062	40.8065	42.4067	44.0070	44.0070	(42c)
Average daily hot water use (litres/day)													135.6268 (43)
Daily hot water use													
147.5448	144.3941	140.5572	134.7230	129.9852	124.8916	122.9343	126.7546	130.7837	136.1310	142.0551	147.1621	147.1621	(44)
Energy content (annual)	233.6748	205.6152	216.0312	184.4290	174.9850	153.5688	148.6784	156.9487	161.2693	184.7284	202.3835	230.4204	(45)
Distribution loss (46)m = 0.15 x (45)m													
35.0512	30.8423	32.4047	27.6644	26.2478	23.0353	22.3018	23.5423	24.1904	27.7093	30.3575	34.5631	34.5631	(46)
Water storage loss:													
Store volume													180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.1100 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.5994 (55)
Total storage loss													
18.5814	16.7832	18.5814	17.9820	18.5814	17.9820	18.5814	18.5814	17.9820	18.5814	17.9820	18.5814	18.5814	(56)
If cylinder contains dedicated solar storage													
18.5814	16.7832	18.5814	17.9820	18.5814	17.9820	18.5814	18.5814	17.9820	18.5814	17.9820	18.5814	18.5814	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
275.5186	243.4096	257.8750	224.9230	216.8288	194.0628	190.5222	198.7925	201.7633	226.5722	242.8775	272.2642	272.2642	(62)
WVHRS	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													
275.5186	243.4096	257.8750	224.9230	216.8288	194.0628	190.5222	198.7925	201.7633	226.5722	242.8775	272.2642	272.2642	(64)
12Total per year (kWh/year)													
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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													
111.1719	98.6026	105.3054	93.7179	91.6576	83.4568	82.9106	85.6605	86.0173	94.8972	99.6877	110.0898	110.0898	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	145.9669	161.6062	145.9669	150.8325	145.9669	150.8325	145.9669	145.9669	150.8325	145.9669	150.8325	145.9669	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	287.0247	290.0031	282.4976	266.5193	246.3494	227.3927	214.7284	211.7500	219.2555	235.2338	255.4036	274.3604	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	(71)
Water heating gains (Table 5)	149.4246	146.7300	141.5395	130.1637	123.1956	115.9123	111.4390	115.1350	119.4684	127.5501	138.4551	147.9702	(72)
Total internal gains	648.4447	664.3678	636.0325	613.5439	581.5404	560.1659	538.1627	538.8804	555.5848	574.7793	610.7197	634.3260	(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					
Northeast			12.5900	11.2829	0.5000	0.8000	0.7700	39.3769 (75)					
Southwest			5.5300	36.7938	0.5000	0.8000	0.7700	56.4019 (79)					
Northeast			2.7400	17.4137	0.7600	0.7000	1.0000	22.8453 (82)					
Solar gains	118.6240	223.9400	364.8886	550.7444	707.3396	742.1310	698.8777	575.8727	428.2351	263.2347	146.0597	98.9498	(83)
Total gains	767.0687	888.3078	1000.9211	1164.2882	1288.8800	1302.2969	1237.0404	1114.7531	983.8200	838.0139	756.7795	733.2757	(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	133.7531	133.7531	133.7531	133.7531	133.7531	133.7531	133.7531	133.7531	133.7531	133.7531	133.7531	133.7531	
alpha	9.9169	9.9169	9.9169	9.9169	9.9169	9.9169	9.9169	9.9169	9.9169	9.9169	9.9169	9.9169	
util living area	0.9999	0.9993	0.9950	0.9460	0.7518	0.5207	0.3772	0.4375	0.7332	0.9834	0.9993	0.9999	(86)
Living	20.4047	20.5140	20.6788	20.8922	20.9898	20.9997	21.0000	21.0000	20.9939	20.8347	20.5744	20.3784	
Non living	19.4915	19.6315	19.8411	20.0947	20.1841	20.1900	20.1901	20.1901	20.1875	20.0352	19.7091	19.4578	
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	20.6955	20.5140	20.6788	20.8922	20.9898	20.9997	21.0000	21.0000	20.9939	20.8347	20.5744	20.4653	(87)
Th 2	20.1901	20.1901	20.1901	20.1901	20.1901	20.1901	20.1901	20.1901	20.1901	20.1901	20.1901	20.1901	(88)
util rest of house	0.9998	0.9988	0.9921	0.9205	0.6924	0.4551	0.3077	0.3605	0.6529	0.9706	0.9989	0.9999	(89)
MIT 2	19.9116	19.6315	19.8411	20.0947	20.1841	20.1900	20.1901	20.1901	20.1875	20.0352	19.7091	19.5897	(90)
Living area fraction									fLA = Living area / (4) =			0.2142	(91)
MIT	20.0795	19.8205	20.0205	20.2655	20.3567	20.3634	20.3636	20.3635	20.3602	20.2065	19.8944	19.7773	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0795	19.8205	20.0205	20.2655	20.3567	20.3634	20.3636	20.3635	20.3602	20.2065	19.8944	19.7773	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9998	0.9986	0.9913	0.9233	0.7050	0.4692	0.3226	0.3770	0.6702	0.9710	0.9986	0.9998	(94)
Useful gains	766.8870	887.0334	992.1865	1074.9464	908.5968	610.9736	399.0837	420.2776	659.4053	813.6822	755.7533	733.1461	(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	1673.2559	1582.1718	1433.7125	1205.1948	917.9517	611.1526	399.0873	420.2940	663.8297	1018.6688	1356.7207	1651.8137	(97)
Space heating kWh	674.3385	467.1330	328.4954	93.7788	6.9601	0.0000	0.0000	0.0000	0.0000	152.5101	432.6965	683.4887	(98a)
Space heating requirement - total per year (kWh/year)												2839.4011	
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	674.3385	467.1330	328.4954	93.7788	6.9601	0.0000	0.0000	0.0000	0.0000	152.5101	432.6965	683.4887	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2839.4011	
Space heating per m ²										(98c) / (4) =		23.3888	(99)

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

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Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												202.2467 (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	674.3385	467.1330	328.4954	93.7788	6.9601	0.0000	0.0000	0.0000	0.0000	152.5101	432.6965	683.4887 (98)
Space heating efficiency (main heating system 1)	202.2467	202.2467	202.2467	202.2467	202.2467	0.0000	0.0000	0.0000	0.0000	202.2467	202.2467	202.2467 (210)
Space heating fuel (main heating system)	333.4238	230.9719	162.4231	46.3685	3.4414	0.0000	0.0000	0.0000	0.0000	75.4079	213.9449	337.9480 (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	275.5186	243.4096	257.8750	224.9230	216.8288	194.0628	190.5222	198.7925	201.7633	226.5722	242.8775	272.2642 (64)
Efficiency of water heater	170.1600	170.1600	170.1600	170.1600	170.1600	170.1600	170.1600	170.1600	170.1600	170.1600	170.1600	170.1600 (216)
Fuel for water heating, kWh/month	161.9174	143.0475	151.5485	132.1833	127.4264	114.0473	111.9665	116.8268	118.5727	133.1525	142.7348	160.0048 (219)
Space cooling fuel requirement	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	6.7228	6.0722	6.7228	6.5060	6.7228	6.5060	6.7228	6.7228	6.5060	6.7228	6.5060	6.7228 (231)
Lighting	30.3290	24.3311	21.9074	16.0503	12.3977	10.1291	11.3096	14.7007	19.0947	25.0533	28.2977	31.1720 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												1403.9296 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												170.1600
Water heating fuel used												1613.4284 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(MEVDecentralised, Database: total watage = 6.3075, total flow = 29.0000, SFP = 0.2175)												
mechanical ventilation fans (SFP = 0.2175)												79.1560 (230a)
Total electricity for the above, kWh/year												79.1560 (231)
Electricity for lighting (calculated in Appendix L)												244.7727 (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												3341.2868 (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	1403.9296	0.1573	220.8860 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1613.4284	0.1411	227.5964 (264)
Space and water heating			448.4824 (265)
Pumps, fans and electric keep-hot	79.1560	0.1387	10.9799 (267)
Energy for lighting	244.7727	0.1443	35.3283 (268)
Total CO2, kg/year			494.7906 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.0800 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
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Space heating - main system 1	1403.9296	1.5824	2221.6322 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1613.4284	1.5216	2455.0107 (278)
Space and water heating			4676.6429 (279)
Pumps, fans and electric keep-hot	79.1560	1.5128	119.7472 (281)
Energy for lighting	244.7727	1.5338	375.4405 (282)
Total Primary energy kWh/year			5171.8307 (286)
Dwelling Primary energy Rate (DPER)			42.6000 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	49.8400 (1b)	x 2.7000 (2b)	= 134.5680 (1b) -
First floor	47.0000 (1c)	x 2.7000 (2c)	= 126.9000 (1c) -
Second floor	24.5600 (1d)	x 1.5000 (2d)	= 36.8400 (1d) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	121.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 298.3080 (5)

2. Ventilation rate

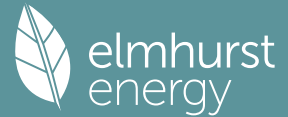
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour 40.0000 / (5) = 0.1341 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3841 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3553 (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	0.4530	0.4441	0.4352	0.3908	0.3819	0.3375	0.3375	0.3286	0.3553	0.3819	0.3997	0.4175 (22b)
Effective ac	0.6026	0.5986	0.5947	0.5764	0.5729	0.5570	0.5570	0.5540	0.5631	0.5729	0.5799	0.5871 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.20)			18.1200	1.1450	20.7481		(27)
rooflight			2.7400	1.5038	4.1203		(27a)
ground floor			49.8400	0.1300	6.4792		(28a)
External Wall 1	54.2800	18.2100	36.0700	0.1800	6.4926		(29a)
Dormer	3.9200	2.0300	1.8900	0.1800	0.3402		(29a)
Sloping ceiling	59.2400	2.7400	56.5000	0.1100	6.2150		(30)
Flat roof	6.2500		6.2500	0.1100	0.6875		(30)
Total net area of external elements Aum(A, m ²)			173.5300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		47.2029		(33)
Party Wall 1			140.0000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							420.5886 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				14.4600	0.0500	0.7230	

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E3 Sill	13.4500	0.0500	0.6725
E4 Jamb	31.5000	0.0500	1.5750
E5 Ground floor (normal)	10.0000	0.1600	1.6000
R1 Head of roof window	2.6000	0.0800	0.2080
R2 Sill of roof window	2.6000	0.0600	0.1560
R3 Jamb of roof window	6.1600	0.0800	0.4928
E6 Intermediate floor within a dwelling	20.0000	0.0000	0.0000
E11 Eaves (insulation at rafter level)	10.0000	0.0400	0.4000
E16 Corner (normal)	10.8000	0.0900	0.9720
P1 Party wall - Ground floor	10.0000	0.0800	0.8000
P2 Party wall - Intermediate floor within a dwelling	20.0000	0.0000	0.0000
R8 Roof to wall (rafter)	12.2000	0.0600	0.7320
R4 Ridge (vaulted ceiling)	5.0000	0.0800	0.4000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.7313 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	55.9342 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	59.3207	58.9285	58.5441	56.7385	56.4007	54.8280	54.8280	54.5368	55.4338	56.4007	57.0841	57.7986 (38)
Heat transfer coeff	115.2549	114.8627	114.4783	112.6727	112.3348	110.7622	110.7622	110.4710	111.3680	112.3348	113.0183	113.7328 (39)
Average = Sum(39)m / 12 =												112.6711
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9494	0.9462	0.9430	0.9281	0.9253	0.9124	0.9124	0.9100	0.9174	0.9253	0.9310	0.9368 (40)
HLP (average)												0.9281
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8686 (42)
Hot water usage for mixer showers	72.3162	71.2295	69.6458	66.6158	64.3797	61.8861	60.4687	62.0404	63.7632	66.4406	69.5357	72.0392 (42a)
Hot water usage for baths	31.2216	30.7579	30.1049	28.9010	27.9995	26.9998	26.4599	27.1083	27.8143	28.8839	30.1127	31.1160 (42b)
Hot water usage for other uses	44.0070	42.4067	40.8065	39.2062	37.6060	36.0057	36.0057	37.6060	39.2062	40.8065	42.4067	44.0070 (42c)
Average daily hot water use (litres/day)												135.6268 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	147.5448	144.3941	140.5572	134.7230	129.9852	124.8916	122.9343	126.7546	130.7837	136.1310	142.0551	147.1621 (44)
Energy conte	233.6748	205.6152	216.0312	184.4290	174.9850	153.5688	148.6784	156.9487	161.2693	184.7284	202.3835	230.4204 (45)
Energy content (annual)										Total = Sum(45)m =		2252.7328
Distribution loss (46)m = 0.15 x (45)m	35.0512	30.8423	32.4047	27.6644	26.2478	23.0353	22.3018	23.5423	24.1904	27.7093	30.3575	34.5631 (46)
Water storage loss:												
Store volume												180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5520 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8381 (55)
Total storage loss	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (56)
If cylinder contains dedicated solar storage	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	282.9175	250.0925	265.2739	232.0832	224.2277	201.2230	197.9211	206.1913	208.9235	233.9711	250.0377	279.6630 (62)
WWHRS	-33.0600	-29.2385	-30.6169	-25.3520	-23.6271	-20.2179	-18.9511	-20.1526	-20.9182	-24.6603	-27.9371	-32.4477 (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	249.8576	220.8540	234.6570	206.7313	200.6005	181.0051	178.9700	186.0388	188.0053	209.3108	222.1006	247.2153 (64)
								Total per year (kWh/year) = Sum(64)m =				2525.3462 (64)
12Total per year (kWh/year)												2525 (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	117.0910	103.9489	111.2245	99.4460	97.5767	89.1850	88.8297	91.5796	91.7454	100.8163	105.4159	116.0089 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	148.3455	164.2396	148.3455	153.2903	148.3455	153.2903	148.3455	148.3455	153.2903	148.3455	153.2903	148.3455 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	287.0247	290.0031	282.4976	266.5193	246.3494	227.3927	214.7284	211.7500	219.2555	235.2338	255.4036	274.3604 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426 (71)

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Water heating gains (Table 5)												
157.3804	154.6858	149.4953	138.1195	131.1514	123.8681	119.3948	123.0908	127.4242	135.5058	146.4109	155.9259	(72)
Total internal gains	661.7791	677.9570	649.3668	626.9575	594.8748	570.5795	548.4971	549.2147	565.9984	588.1136	624.1334	647.6603 (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
Northeast				12.5900	11.2829	0.6300		0.7000		0.7700		43.4130 (75)
Southwest				5.5300	36.7938	0.6300		0.7000		0.7700		62.1830 (79)
Northeast				2.7400	17.4137	0.6300		0.7000		1.0000		18.9375 (82)
Solar gains	124.5336	233.8416	377.9361	565.9693	723.4590	757.7033	714.0717	590.4784	442.0562	274.0492	153.1096	104.0247 (83)
Total gains	786.3126	911.7986	1027.3029	1192.9268	1318.3338	1328.2828	1262.5687	1139.6931	1008.0546	862.1628	777.2429	751.6850 (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	
123.0592	123.4794	123.8941	125.8795	126.2581	128.0508	128.0508	128.3883	127.3543	126.2581	125.4946	124.7062	
9.2039	9.2320	9.2596	9.3920	9.4172	9.5367	9.5367	9.5592	9.4903	9.4172	9.3663	9.3137	
util living area	0.9998	0.9993	0.9955	0.9525	0.7723	0.5331	0.3860	0.4458	0.7477	0.9844	0.9993	0.9999 (86)
MIT	20.3310	20.4486	20.6253	20.8662	20.9843	20.9995	21.0000	20.9999	20.9913	20.8117	20.5323	20.3179 (87)
Th 2	20.1257	20.1284	20.1311	20.1437	20.1460	20.1570	20.1570	20.1590	20.1528	20.1460	20.1413	20.1363 (88)
util rest of house	0.9998	0.9988	0.9928	0.9286	0.7103	0.4632	0.3120	0.3643	0.6638	0.9720	0.9988	0.9998 (89)
MIT 2	19.3433	19.4961	19.7232	20.0234	20.1366	20.1568	20.1570	20.1590	20.1490	19.9688	19.6142	19.3352 (90)
Living area fraction	19.5548	19.7001	19.9164	20.2039	20.3182	20.3373	20.3375	20.3391	20.3294	20.1493	19.8108	19.5457 (92)
MIT	19.5548	19.7001	19.9164	20.2039	20.3182	20.3373	20.3375	20.3391	20.3294	20.1493	19.8108	19.5457 (93)
Temperature adjustment												0.0000
adjusted MIT	19.5548	19.7001	19.9164	20.2039	20.3182	20.3373	20.3375	20.3391	20.3294	20.1493	19.8108	19.5457 (93)

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9997	0.9985	0.9919	0.9306	0.7233	0.4782	0.3279	0.3818	0.6819	0.9721	0.9985	0.9998 (94)
Useful gains	786.0485	910.4522	1018.9570	1110.1087	953.4938	635.1836	413.9706	435.1305	687.3912	838.0724	776.1093	751.5175 (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	1758.1914	1699.9764	1535.8906	1273.6420	968.1226	635.4767	413.9773	435.1576	693.7549	1072.7243	1436.5531	1745.3083 (97)
Space heating kWh	723.2743	530.5602	384.5986	117.7440	10.8838	0.0000	0.0000	0.0000	0.0000	174.5809	475.5195	739.3804 (98a)
Space heating requirement - total per year (kWh/year)												3156.5418
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	723.2743	530.5602	384.5986	117.7440	10.8838	0.0000	0.0000	0.0000	0.0000	174.5809	475.5195	739.3804 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3156.5418
Space heating per m2										(98c) / (4) =		26.0012 (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	723.2743	530.5602	384.5986	117.7440	10.8838	0.0000	0.0000	0.0000	0.0000	174.5809	475.5195	739.3804 (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)	783.6125	574.8215	416.6832	127.5666	11.7917	0.0000	0.0000	0.0000	0.0000	189.1451	515.1891	801.0622 (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

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Water heating requirement	249.8576	220.8540	234.6570	206.7313	200.6005	181.0051	178.9700	186.0388	188.0053	209.3108	222.1006	247.2153 (64)
Efficiency of water heater (217)m	86.3009	85.9508	85.1605	82.8469	80.2184	79.8000	79.8000	79.8000	79.8000	83.6558	85.7220	79.8000 (216)
Fuel for water heating, kWh/month	289.5189	256.9538	275.5467	249.5340	250.0680	226.8235	224.2732	233.1313	235.5956	250.2048	259.0939	286.2631 (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	30.8233	24.7276	22.2644	16.3119	12.5998	10.2941	11.4939	14.9402	19.4059	25.4616	28.7588	31.6799 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-46.7737	-66.0164	-94.9772	-106.8494	-115.2085	-107.4578	-106.0546	-100.0835	-89.6110	-75.4365	-51.4190	-40.4236 (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	-26.2019	-55.1469	-109.6853	-164.8798	-218.1884	-219.3596	-216.8531	-183.5948	-134.4988	-79.0015	-35.0213	-20.7241 (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												3419.8719 (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												3037.0068 (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)												248.7613 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-2463.4669 (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												4328.1732 (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	3419.8719	0.2100	718.1731 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3037.0068	0.2100	637.7714 (264)
Space and water heating			1355.9445 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	248.7613	0.1443	35.9039 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1000.3114	0.1346	-134.6268
PV Unit electricity exported	-1463.1555	0.1259	-184.1566
Total			-318.7834 (269)
Total CO2, kg/year			1084.9944 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			8.9400 (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	3419.8719	1.1300	3864.4553 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3037.0068	1.1300	3431.8177 (278)
Space and water heating			7296.2730 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	248.7613	1.5338	381.5584 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1000.3114	1.4974	-1497.8695
PV Unit electricity exported	-1463.1555	0.4620	-675.9779
Total			-2173.8473 (283)
Total Primary energy kWh/year			5634.0849 (286)
Target Primary Energy Rate (TPER)			46.4100 (287)

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Property Reference	Plot 004	Issued on Date	28/09/2023
Assessment Reference	Vaillant ASHP	Prop Type Ref	
Property	4, UB9 6NL		
SAP Rating	79 C	DER	4.64
Environmental	96 A	TER	10.51
CO ₂ Emissions (t/year)	0.51	% DER < TER	55.85
Compliance Check	See BREL	DFEE	37.52
% DPER < TPER	11.94	TFEE	38.89
		% DFEE < TFEE	3.51
		DFEE	48.32
		TPER	54.87
Assessor Details	Mr. Michael Woodbridge	Assessor ID	M818-0001
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	49.8400 (1b)	x 2.7000 (2b)	= 134.5680 (1b) -
First floor	47.0000 (1c)	x 2.7000 (2c)	= 126.9000 (1c) -
Second floor	24.5600 (1d)	x 1.5000 (2d)	= 36.8400 (1d) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	121.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 298.3080 (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)

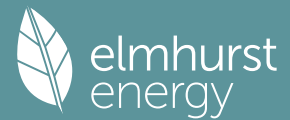
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour 0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1388 (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	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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 floor			2.1200	1.2000	2.5440		(26)
window (Uw = 1.20)			20.0100	1.1450	22.9122		(27)

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rooflight			2.7400	1.1450	3.1374			(27a)
ground floor			49.8400	0.1100	5.4824	110.0000	5482.4000	(28a)
External Wall 1	120.6600	20.1000	100.5600	0.1600	16.0896	190.0000	19106.4000	(29a)
Dormer	3.9200	2.0300	1.8900	0.1800	0.3402	9.0000	17.0100	(29a)
Sloping ceiling	59.2400	2.7400	56.5000	0.1100	6.2150	9.0000	508.5000	(30)
Flat roof	6.2500		6.2500	0.1100	0.6875	9.0000	56.2500	(30)
Total net area of external elements Aum(A, m2)			239.9100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		57.4083			(33)
Party Wall 1			70.0000	0.0000	0.0000	180.0000	12600.0000	(32)
Internal Floor 1			94.0000			18.0000	1692.0000	(32d)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 39462.5600 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 325.0623 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	14.4600	0.0500	0.7230
E3 Sill	13.4500	0.0400	0.5380
E4 Jamb	31.5000	0.0400	1.2600
E5 Ground floor (normal)	20.9000	0.1050	2.1945
R1 Head of roof window	2.6000	0.2400	0.6240
R2 Sill of roof window	2.6000	0.2400	0.6240
R3 Jamb of roof window	6.1600	0.2400	1.4784
E6 Intermediate floor within a dwelling	40.0000	0.0500	2.0000
E11 Eaves (insulation at rafter level)	10.0000	0.0800	0.8000
E13 Gable (insulation at rafter level)	12.2000	0.1000	1.2200
E16 Corner (normal)	10.8000	0.0800	0.8640
P1 Party wall - Ground floor	10.0000	0.1600	1.6000
P2 Party wall - Intermediate floor within a dwelling	20.0000	0.0000	0.0000
R8 Roof to wall (rafter)	12.2000	0.0600	0.7320
R4 Ridge (vaulted ceiling)	5.0000	0.1200	0.6000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			15.2579 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 72.6662 (37)

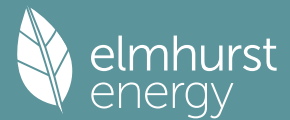
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(38)
Heat transfer coeff	49.2208	49.2208	49.2208	49.2208	49.2208	49.2208	49.2208	49.2208	49.2208	49.2208	49.2208	49.2208	
Average = Sum(39)m / 12 =	121.8870	121.8870	121.8870	121.8870	121.8870	121.8870	121.8870	121.8870	121.8870	121.8870	121.8870	121.8870	(39)
	121.8870	121.8870	121.8870	121.8870	121.8870	121.8870	121.8870	121.8870	121.8870	121.8870	121.8870	121.8870	
HLP	1.0040	1.0040	1.0040	1.0040	1.0040	1.0040	1.0040	1.0040	1.0040	1.0040	1.0040	1.0040	(40)
HLP (average)													1.0040
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8686 (42)
Hot water usage for mixer showers													
72.3162	71.2295	69.6458	66.6158	64.3797	61.8861	60.4687	62.0404	63.7632	66.4406	69.5357	72.0392	72.0392	(42a)
Hot water usage for baths													
31.2216	30.7579	30.1049	28.9010	27.9995	26.9998	26.4599	27.1083	27.8143	28.8839	30.1127	31.1160	31.1160	(42b)
Hot water usage for other uses													
44.0070	42.4067	40.8065	39.2062	37.6060	36.0057	36.0057	37.6060	39.2062	40.8065	42.4067	44.0070	44.0070	(42c)
Average daily hot water use (litres/day)													135.6268 (43)
Daily hot water use													
147.5448	144.3941	140.5572	134.7230	129.9852	124.8916	122.9343	126.7546	130.7837	136.1310	142.0551	147.1621	147.1621	(44)
Energy content (annual)													
233.6748	205.6152	216.0312	184.4290	174.9850	153.5688	148.6784	156.9487	161.2693	184.7284	202.3835	230.4204	230.4204	(45)
Distribution loss (46)m = 0.15 x (45)m													
35.0512	30.8423	32.4047	27.6644	26.2478	23.0353	22.3018	23.5423	24.1904	27.7093	30.3575	34.5631	34.5631	(46)
Water storage loss:													
Store volume													200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.2000 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.6480 (55)
Total storage loss													
20.0880	18.1440	20.0880	19.4400	20.0880	19.4400	20.0880	20.0880	19.4400	20.0880	19.4400	20.0880	20.0880	(56)
If cylinder contains dedicated solar storage													
20.0880	18.1440	20.0880	19.4400	20.0880	19.4400	20.0880	20.0880	19.4400	20.0880	19.4400	20.0880	20.0880	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
277.0252	244.7704	259.3816	226.3810	218.3354	195.5208	192.0288	200.2991	203.2213	228.0788	244.3355	273.7708	273.7708	(62)
WVHRS	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													
277.0252	244.7704	259.3816	226.3810	218.3354	195.5208	192.0288	200.2991	203.2213	228.0788	244.3355	273.7708	273.7708	(64)
12Total per year (kWh/year)													
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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													
112.3772	99.6912	106.5107	94.8843	92.8628	84.6232	84.1159	86.8658	87.1837	96.1025	100.8541	111.2951	111.2951	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	144.9408	160.4702	144.9408	149.7722	144.9408	149.7722	144.9408	144.9408	149.7722	144.9408	149.7722	144.9408	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	287.0247	290.0031	282.4976	266.5193	246.3494	227.3927	214.7284	211.7500	219.2555	235.2338	255.4036	274.3604	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	(71)
Water heating gains (Table 5)	151.0446	148.3500	143.1595	131.7837	124.8156	117.5323	113.0590	116.7550	121.0884	129.1701	140.0751	149.5902	(72)
Total internal gains	649.0386	664.8518	636.6264	614.1036	582.1344	560.7256	538.7566	539.4743	556.1445	575.3732	611.2794	634.9199	(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	
Northeast					12.5900	11.2829		0.5000	0.8000	0.7700		39.3769 (75)	
Southwest					5.5300	36.7938		0.5000	0.8000	0.7700		56.4019 (79)	
Northwest					1.8900	11.2829		0.5000	0.8000	0.7700		5.9112 (81)	
Northeast					2.7400	17.4137		0.7600	0.7000	1.0000		22.8453 (82)	
Solar gains	124.5352	235.9725	386.5673	586.3470	755.1965	793.1516	746.6063	613.9225	454.6510	277.9393	153.4976	103.7772	(83)
Total gains	773.5738	900.8243	1023.1937	1200.4506	1337.3309	1353.8772	1285.3630	1153.3968	1010.7955	853.3125	764.7770	738.6971	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)

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	89.9343	89.9343	89.9343	89.9343	89.9343	89.9343	89.9343	89.9343	89.9343	89.9343	89.9343	89.9343	21.0000 (85)
alpha	6.9956	6.9956	6.9956	6.9956	6.9956	6.9956	6.9956	6.9956	6.9956	6.9956	6.9956	6.9956	
util living area	0.9993	0.9977	0.9907	0.9454	0.7922	0.5710	0.4167	0.4845	0.7819	0.9786	0.9979	0.9995	(86)
Living	20.0793	20.2243	20.4503	20.7521	20.9460	20.9948	20.9995	20.9986	20.9630	20.6845	20.3210	20.0451	
Non living	19.0032	19.1887	19.4756	19.8417	20.0412	20.0777	20.0799	20.0796	20.0592	19.7697	19.3128	18.9594	
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	20.5290	20.2243	20.4503	20.7521	20.9460	20.9948	20.9995	20.9986	20.9630	20.6845	20.3210	20.1786	(87)
Th 2	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	(88)
util rest of house	0.9990	0.9967	0.9865	0.9230	0.7328	0.4916	0.3299	0.3886	0.6991	0.9656	0.9968	0.9993	(89)
MIT 2	19.6507	19.1887	19.4756	19.8417	20.0412	20.0777	20.0799	20.0796	20.0592	19.7697	19.3128	19.1614	(90)
Living area fraction	19.8388	19.4105	19.6844	20.0367	20.2350	20.2741	20.2768	20.2765	20.2527	19.9656	19.5287	19.3792	(91)
MIT	19.8388	19.4105	19.6844	20.0367	20.2350	20.2741	20.2768	20.2765	20.2527	19.9656	19.5287	19.3792	(92)
Temperature adjustment	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
adjusted MIT	19.8388	19.4105	19.6844	20.0367	20.2350	20.2741	20.2768	20.2765	20.2527	19.9656	19.5287	19.3792	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9989	0.9956	0.9841	0.9218	0.7435	0.5085	0.3485	0.4092	0.7158	0.9635	0.9958	0.9990	(94)
Useful gains	772.7020	896.8643	1006.9541	1106.5292	994.2530	688.5099	447.9742	471.9483	723.5297	822.1372	761.5893	737.9760	(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	1893.9813	1768.6386	1607.0030	1357.4133	1040.3045	691.6042	448.1580	472.4908	749.9387	1141.5509	1514.9033	1850.1511	(97)
Space heating kWh	834.2318	585.8323	446.4364	180.6366	34.2623	0.0000	0.0000	0.0000	0.0000	237.6438	542.3861	827.4583	(98a)
Space heating requirement - total per year (kWh/year)												3688.8875	
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	834.2318	585.8323	446.4364	180.6366	34.2623	0.0000	0.0000	0.0000	0.0000	237.6438	542.3861	827.4583	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3688.8875	
Space heating per m ²												30.3862	(99)

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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 %)													200.7350 (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	834.2318	585.8323	446.4364	180.6366	34.2623	0.0000	0.0000	0.0000	0.0000	237.6438	542.3861	827.4583	(98)
Space heating efficiency (main heating system 1)	200.7350	200.7350	200.7350	200.7350	200.7350	0.0000	0.0000	0.0000	0.0000	200.7350	200.7350	200.7350	(210)
Space heating fuel (main heating system)	415.5886	291.8436	222.4009	89.9876	17.0684	0.0000	0.0000	0.0000	0.0000	118.3868	270.2000	412.2143	(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	277.0252	244.7704	259.3816	226.3810	218.3354	195.5208	192.0288	200.2991	203.2213	228.0788	244.3355	273.7708	(64)
Efficiency of water heater	170.1509	170.1509	170.1509	170.1509	170.1509	170.1509	170.1509	170.1509	170.1509	170.1509	170.1509	170.1509	(216)
Fuel for water heating, kWh/month	162.8115	143.8549	152.4421	133.0472	128.3187	114.9103	112.8579	117.7185	119.4360	134.0451	143.5993	160.8988	(217)
Space cooling fuel requirement	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	6.7228	6.0722	6.7228	6.5060	6.7228	6.5060	6.7228	6.7228	6.5060	6.7228	6.5060	6.7228	(231)
Lighting	30.1158	24.1600	21.7534	15.9375	12.3106	10.0579	11.2301	14.5973	18.9605	24.8772	28.0988	30.9528	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1													1837.6902 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													170.1509
Water heating fuel used													1623.9404 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 6.3075, total flow = 29.0000, SFP = 0.2175)													
mechanical ventilation fans (SFP = 0.2175)													79.1560 (230a)
Total electricity for the above, kWh/year													79.1560 (231)
Electricity for lighting (calculated in Appendix L)													243.0521 (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													3783.8387 (238)

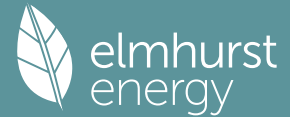
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1837.6902	0.1565	287.6763	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1623.9404	0.1410	229.0548	(264)
Space and water heating			516.7310	(265)
Pumps, fans and electric keep-hot	79.1560	0.1387	10.9799	(267)
Energy for lighting	243.0521	0.1443	35.0799	(268)
Total CO2, kg/year			562.7909	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.6400	(273)

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

Energy Primary energy factor Primary energy

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Space heating - main system 1	kWh/year	kg CO2/kWh	kWh/year
Total CO2 associated with community systems	1837.6902	1.5795	2902.6833 (275)
Water heating (other fuel)	1623.9404	1.5216	0.0000 (473)
Space and water heating			2470.9140 (278)
Pumps, fans and electric keep-hot	79.1560	1.5128	5373.5972 (279)
Energy for lighting	243.0521	1.5338	119.7472 (281)
Total Primary energy kWh/year			372.8014 (282)
Dwelling Primary energy Rate (DPER)			5866.1458 (286)
			48.3200 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	49.8400 (1b)	x 2.7000 (2b)	= 134.5680 (1b) -
First floor	47.0000 (1c)	x 2.7000 (2c)	= 126.9000 (1c) -
Second floor	24.5600 (1d)	x 1.5000 (2d)	= 36.8400 (1d) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	121.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 298.3080 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1341 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3841 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3553 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infiltr rate	0.4530	0.4441	0.4352	0.3908	0.3819	0.3375	0.3375	0.3286	0.3553	0.3819	0.3997	0.4175 (22b)
Effective ac	0.6026	0.5986	0.5947	0.5764	0.5729	0.5570	0.5570	0.5540	0.5631	0.5729	0.5799	0.5871 (25)

3. Heat losses and heat loss parameter

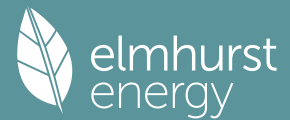
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.20)			20.0100	1.1450	22.9122		(27)
rooflight			2.7400	1.5038	4.1203		(27a)
ground floor			49.8400	0.1300	6.4792		(28a)
External Wall 1	120.6600	20.1000	100.5600	0.1800	18.1008		(29a)
Dormer	3.9200	2.0300	1.8900	0.1800	0.3402		(29a)
Sloping ceiling	59.2400	2.7400	56.5000	0.1100	6.2150		(30)
Flat roof	6.2500		6.2500	0.1100	0.6875		(30)
Total net area of external elements Aum(A, m ²)			239.9100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	60.9752		(33)
Party Wall 1			70.0000	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K			325.0623 (35)
List of Thermal Bridges			
K1 Element	Length	Psi-value	Total

elmhurst
energy

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	146.4854	162.1802	146.4854	151.3682	146.4854	151.3682	146.4854	146.4854	151.3682	146.4854	151.3682	146.4854 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	287.0247	290.0031	282.4976	266.5193	246.3494	227.3927	214.7284	211.7500	219.2555	235.2338	255.4036	274.3604 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428 (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)

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Losses e.g. evaporation (negative values) (Table 5)	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426 (71)
Water heating gains (Table 5)	159.1905	156.4959	151.3054	139.9296	132.9615	125.6782	121.2049	124.9009	129.2343	137.3160	148.2210	157.7361 (72)
Total internal gains	661.7291	677.7078	649.3169	626.8455	594.8248	570.4675	548.4471	549.1647	565.8865	588.0636	624.0214	647.6103 (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	
Northeast				12.5900	11.2829	0.6300	0.7000		0.7700		43.4130 (75)	
Southwest				5.5300	36.7938	0.6300	0.7000		0.7700		62.1830 (79)	
Northwest				1.8900	11.2829	0.6300	0.7000		0.7700		6.5171 (81)	
Northeast				2.7400	17.4137	0.6300	0.7000		1.0000		18.9375 (82)	
Solar gains	131.0507	247.1074	401.8368	605.2212	776.2213	813.9534	766.6925	632.4283	471.1796	290.2611	161.3098	109.3469 (83)
Total gains	792.7798	924.8151	1051.1537	1232.0668	1371.0461	1384.4210	1315.1396	1181.5931	1037.0661	878.3247	785.3312	756.9573 (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	83.2034	83.4518	83.6968	84.8668	85.0894	86.1409	86.1409	86.3385	85.7328	85.0894	84.6404	84.1760
alpha	6.5469	6.5635	6.5798	6.6578	6.6726	6.7427	6.7427	6.7559	6.7155	6.6726	6.6427	6.6117
util living area	0.9992	0.9975	0.9908	0.9482	0.8043	0.5814	0.4250	0.4921	0.7905	0.9786	0.9977	0.9994 (86)
MIT	19.9855	20.1406	20.3815	20.7147	20.9311	20.9931	20.9993	20.9982	20.9548	20.6527	20.2655	19.9669 (87)
Th 2	20.0129	20.0156	20.0182	20.0304	20.0327	20.0433	20.0433	20.0453	20.0392	20.0327	20.0280	20.0232 (88)
util rest of house	0.9988	0.9964	0.9866	0.9262	0.7438	0.4980	0.3330	0.3913	0.7057	0.9654	0.9965	0.9992 (89)
MIT 2	18.8311	19.0314	19.3394	19.7553	19.9828	20.0403	20.0432	20.0449	20.0136	19.6919	19.2013	18.8151 (90)
Living area fraction									flA = Living area / (4) =			0.2142 (91)
MIT	19.0784	19.2690	19.5626	19.9608	20.1859	20.2444	20.2479	20.2490	20.2152	19.8977	19.4293	19.0618 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0784	19.2690	19.5626	19.9608	20.1859	20.2444	20.2479	20.2490	20.2152	19.8977	19.4293	19.0618 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9983	0.9953	0.9840	0.9243	0.7541	0.5158	0.3528	0.4130	0.7226	0.9629	0.9954	0.9988 (94)
Ext temp.	791.4680	920.4284	1034.2931	1138.7685	1033.8845	714.1045	463.9485	487.9479	749.3372	845.7491	781.7355	756.0275 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Space heating kWh	1947.0080	1887.4346	1710.8196	1428.6687	1093.2114	718.2708	464.2167	488.6844	781.8903	1197.7911	1596.7689	1935.3778 (97)
Space heating requirement - total per year (kWh/year)	859.7218	649.8282	503.3357	208.7281	44.1392	0.0000	0.0000	0.0000	0.0000	261.9193	586.8240	877.4366 (98a)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)	859.7218	649.8282	503.3357	208.7281	44.1392	0.0000	0.0000	0.0000	0.0000	261.9193	586.8240	877.4366 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3991.9329
Space heating per m2												(98c) / (4) = 32.8825 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating efficiency (main heating system 1)	859.7218	649.8282	503.3357	208.7281	44.1392	0.0000	0.0000	0.0000	0.0000	261.9193	586.8240	877.4366 (98)
Space heating fuel (main heating system)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating efficiency (main heating system 2)	931.4429	704.0392	545.3258	226.1410	47.8215	0.0000	0.0000	0.0000	0.0000	283.7695	635.7790	950.6355 (211)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)

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	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 (215)
Water heating requirement	251.5410	222.3745	236.3404	208.3604	202.2839	182.6342	180.6534	187.7222	189.6344	210.9942	223.7297	248.8987	(64)
Efficiency of water heater (217)m	86.5895	86.3180	85.7113	84.0637	81.2755	79.8000	79.8000	79.8000	79.8000	84.5458	86.1191	79.8000	(216)
Fuel for water heating, kWh/month	290.4983	257.6225	275.7400	247.8599	248.8868	228.8649	226.3827	235.2408	237.6371	249.5621	259.7910	287.2769	(217)
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	(219)
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	(221)
Lighting	30.4368	24.4175	21.9853	16.1073	12.4418	10.1650	11.3498	14.7529	19.1626	25.1423	28.3982	31.2827	(222)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-46.7628	-65.9977	-94.9485	-106.8176	-115.1768	-107.4296	-106.0231	-100.0473	-89.5745	-75.4083	-51.4040	-40.4142	(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	-26.2128	-55.1656	-109.7140	-164.9116	-218.2201	-219.3878	-216.8847	-183.6310	-134.5353	-79.0298	-35.0363	-20.7335	(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												4324.9544	(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												3045.3632	(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)												245.6422	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2463.4669	(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												5238.4929	(238)

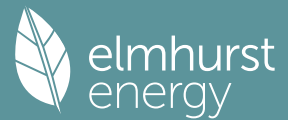
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	4324.9544	0.2100	908.2404 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3045.3632	0.2100	639.5263 (264)
Space and water heating			1547.7667 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	245.6422	0.1443	35.4538 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1000.0044	0.1346	-134.5859
PV Unit electricity exported	-1463.4625	0.1259	-184.1978
Total			-318.7837 (269)
Total CO2, kg/year			1276.3660 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.5100 (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	4324.9544	1.1300	4887.1985 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3045.3632	1.1300	3441.2605 (278)
Space and water heating			8328.4589 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	245.6422	1.5338	376.7741 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1000.0044	1.4974	-1497.4112
PV Unit electricity exported	-1463.4625	0.4620	-676.1294
Total			-2173.5405 (283)
Total Primary energy kWh/year			6661.7934 (286)
Target Primary Energy Rate (TPER)			54.8700 (287)

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Property Reference	Plot 005	Issued on Date	28/09/2023
Assessment Reference	Vaillant ASHP	Prop Type Ref	
Property	5, UB9 6NL		
SAP Rating	79 C	DER	5.06
Environmental	96 A	TER	10.95
CO ₂ Emissions (t/year)	0.41	% DER < TER	53.79
Compliance Check	See BREL	DFEE	36.20
% DPER < TPER	7.22	TFEE	37.25
		% DFEE < TFEE	2.81
		DPER	52.97
		TPER	57.09
Assessor Details	Mr. Michael Woodbridge	Assessor ID	M818-0001
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	45.8400 (1b)	x 2.3300 (2b)	= 106.8072 (1b) -
First floor	42.9900 (1c)	x 2.6300 (2c)	= 113.0637 (1c) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.8300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	219.8709 (5)

2. Ventilation rate

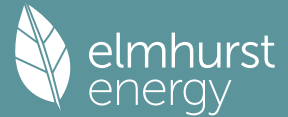
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1388 (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	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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 floor			2.1200	1.2000	2.5440		(26)
window (Uw = 1.20)			17.2600	1.1450	19.7634		(27)
ground floor			45.8400	0.1100	5.0424	110.0000	5042.4000 (28a)

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External Wall 1	106.8348	19.3800	87.4548	0.1600	13.9928	190.0000	16616.4120 (29a)
Sloping ceiling	45.8400		45.8400	0.1100	5.0424	9.0000	412.5600 (30)
Total net area of external elements Aum(A, m2)			198.5148				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	46.3849			(33)
Party Wall 1			35.0600	0.0000	0.0000	180.0000	6310.8000 (32)
Internal Wall 1			200.0000			9.0000	1800.0000 (32c)
Internal Floor 1			43.0000			18.0000	774.0000 (32d)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 30956.1720 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 348.4878 (35)

List of Thermal Bridges							
K1 Element	Length	Psi-value	Total				
E6 Intermediate floor within a dwelling	20.0000	0.0500	1.0000				
E10 Eaves (insulation at ceiling level)	22.0000	0.0800	1.7600				
E16 Corner (normal)	17.2100	0.0800	1.3768				
P1 Party wall - Ground floor	7.0700	0.1000	0.7070				
P2 Party wall - Intermediate floor within a dwelling	7.0700	0.0000	0.0000				
E2 Other lintels (including other steel lintels)	12.1600	0.0500	0.6080				
E3 Sill	11.1500	0.0400	0.4460				
E4 Jamb	27.2000	0.0400	1.0880				
E5 Ground floor (normal)	23.1300	0.1050	2.4286				
E25 Staggered party wall between dwellings	12.2600	0.2400	2.9424				
P4 Party wall - Roof (insulation at ceiling level)	7.0700	0.1000	0.7070				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.0639 (36)
Point Thermal bridges							(36a) = 0.0000
Total fabric heat loss							(33) + (36) + (36a) = 59.4488 (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	36.2787	36.2787	36.2787	36.2787	36.2787	36.2787	36.2787	36.2787	36.2787	36.2787	36.2787	36.2787	(38)
Average = Sum(39)m / 12 =	95.7275	95.7275	95.7275	95.7275	95.7275	95.7275	95.7275	95.7275	95.7275	95.7275	95.7275	95.7275	(39)
	95.7275	95.7275	95.7275	95.7275	95.7275	95.7275	95.7275	95.7275	95.7275	95.7275	95.7275	95.7275	(39)
HLP	1.0776	1.0776	1.0776	1.0776	1.0776	1.0776	1.0776	1.0776	1.0776	1.0776	1.0776	1.0776	(40)
HLP (average)													1.0776
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6094 (42)
Hot water usage for mixer showers													
Hot water usage for baths	67.9702	66.9488	65.4603	62.6124	60.5107	58.1669	56.8347	58.3119	59.9312	62.4477	65.3568	67.7098	(42a)
Hot water usage for other uses	29.3526	28.9167	28.3028	27.1710	26.3234	25.3836	24.8760	25.4856	26.1493	27.1549	28.3101	29.2534	(42b)
Average daily hot water use (litres/day)	41.3525	39.8488	38.3451	36.8413	35.3376	33.8339	33.8339	35.3376	36.8413	38.3451	39.8488	41.3525	(42c)
	41.3525	39.8488	38.3451	36.8413	35.3376	33.8339	33.8339	35.3376	36.8413	38.3451	39.8488	41.3525	(42c)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	138.6754	135.7143	132.1082	126.6247	122.1717	117.3844	115.5446	119.1351	122.9218	127.9477	133.5157	138.3157	(44)
Energy content (annual)	219.6279	193.2553	203.0453	173.3428	164.4666	144.3378	139.7411	147.5141	151.5749	173.6238	190.2176	216.5690	(45)
Distribution loss (46)m = 0.15 x (45)m													
Water storage loss:	32.9442	28.9883	30.4568	26.0014	24.6700	21.6507	20.9612	22.1271	22.7362	26.0436	28.5326	32.4853	(46)
Store volume													180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.1100 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.5994 (55)
Total storage loss	18.5814	16.7832	18.5814	17.9820	18.5814	17.9820	18.5814	18.5814	17.9820	18.5814	17.9820	18.5814	(56)
If cylinder contains dedicated solar storage	18.5814	16.7832	18.5814	17.9820	18.5814	17.9820	18.5814	18.5814	17.9820	18.5814	17.9820	18.5814	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	261.4717	231.0497	244.8891	213.8368	206.3104	184.8318	181.5849	189.3579	192.0689	215.4676	230.7116	258.4128	(62)
WVHRS	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	261.4717	231.0497	244.8891	213.8368	206.3104	184.8318	181.5849	189.3579	192.0689	215.4676	230.7116	258.4128	(64)
Total per year (kWh/year)													2609.9932 (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	106.5013	94.4929	100.9876	90.0317	88.1602	80.3875	79.9390	82.5235	82.7939	91.2049	95.6425	105.4842	(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

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(66)m	130.4682	130.4682	130.4682	130.4682	130.4682	130.4682	130.4682	130.4682	130.4682	130.4682	130.4682	130.4682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.5036	132.3075	119.5036	123.4870	119.5036	123.4870	119.5036	119.5036	123.4870	119.5036	123.4870	119.5036	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	236.9087	239.3671	233.1721	219.9836	203.3355	187.6887	177.2357	174.7773	180.9723	194.1608	210.8088	226.4557	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0468	36.0468	36.0468	36.0468	36.0468	36.0468	36.0468	36.0468	36.0468	36.0468	36.0468	36.0468	(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)	-104.3746	-104.3746	-104.3746	-104.3746	-104.3746	-104.3746	-104.3746	-104.3746	-104.3746	-104.3746	-104.3746	-104.3746	(71)
Water heating gains (Table 5)	143.1469	140.6144	135.7360	125.0440	118.4949	111.6493	107.4449	110.9187	114.9915	122.5873	132.8369	141.7799	(72)
Total internal gains	561.6997	574.4295	550.5522	530.6551	503.4745	484.9656	466.3246	467.3400	481.5913	498.3921	529.2732	549.8796	(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				2.6500	10.6334	0.5000	0.8000	0.7700	7.8111 (74)			
Northeast				1.7100	11.2829	0.5000	0.8000	0.7700	5.3482 (75)			
East				0.6300	19.6403	0.5000	0.8000	0.7700	3.4299 (76)			
South				10.5600	46.7521	0.5000	0.8000	0.7700	136.8541 (78)			
Northwest				1.7100	11.2829	0.5000	0.8000	0.7700	5.3482 (81)			
Solar gains	158.7916	267.5418	361.1473	443.9640	497.4872	494.8952	476.6461	435.9577	389.3914	294.0862	189.5904	136.3222 (83)
Total gains	720.4913	841.9713	911.6994	974.6191	1000.9617	979.8608	942.9706	903.2977	870.9827	792.4783	718.8636	686.2017 (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	89.8273	89.8273	89.8273	89.8273	89.8273	89.8273	89.8273	89.8273	89.8273	89.8273	89.8273	89.8273
alpha	6.9885	6.9885	6.9885	6.9885	6.9885	6.9885	6.9885	6.9885	6.9885	6.9885	6.9885	6.9885
util living area	0.9979	0.9933	0.9812	0.9366	0.8181	0.6162	0.4458	0.4858	0.7286	0.9506	0.9937	0.9985 (86)
Living	20.1823	20.3448	20.5413	20.7718	20.9336	20.9918	20.9992	20.9986	20.9759	20.7748	20.4272	20.1420
Non living	19.0811	19.2874	19.5334	19.8072	19.9723	20.0157	20.0190	20.0188	20.0070	19.8167	19.3932	19.0296
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	20.5817	20.3448	20.5413	20.7718	20.9336	20.9918	20.9992	20.9986	20.9759	20.7748	20.4272	20.2620 (87)
Th 2	20.0191	20.0191	20.0191	20.0191	20.0191	20.0191	20.0191	20.0191	20.0191	20.0191	20.0191	20.0191 (88)
util rest of house	0.9970	0.9904	0.9728	0.9098	0.7564	0.5265	0.3470	0.3832	0.6389	0.9236	0.9904	0.9978 (89)
MIT 2	19.6452	19.2874	19.5334	19.8072	19.9723	20.0157	20.0190	20.0188	20.0070	19.8167	19.3932	19.2079 (90)
Living area fraction	fLA = Living area / (4) = 0.3569 (91)											
MIT	19.9794	19.6648	19.8930	20.1515	20.3154	20.3640	20.3688	20.3685	20.3528	20.1586	19.7622	19.5841 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.9794	19.6648	19.8930	20.1515	20.3154	20.3640	20.3688	20.3685	20.3528	20.1586	19.7622	19.5841 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9969	0.9890	0.9715	0.9140	0.7763	0.5586	0.3823	0.4200	0.6708	0.9282	0.9893	0.9974	(94)
Useful gains	718.2661	832.7072	885.6781	890.7912	777.0674	547.3735	360.5060	379.3734	584.2350	735.5821	711.1506	684.4348	(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													
	1500.9474	1413.3943	1282.0822	1077.0730	824.7277	551.7753	360.7764	379.8913	598.5628	915.0233	1212.1221	1472.6796	(97)
Space heating kWh													
	582.3148	390.2217	294.9246	134.1229	35.4593	0.0000	0.0000	0.0000	0.0000	133.5042	360.6995	586.4541	(98a)
Space heating requirement - total per year (kWh/year)												2517.7012	
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													
	582.3148	390.2217	294.9246	134.1229	35.4593	0.0000	0.0000	0.0000	0.0000	133.5042	360.6995	586.4541	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2517.7012	
Space heating per m2													
										(98c)	/ (4) =	28.3429	(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 %)	203.8564	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)

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Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	582.3148	390.2217	294.9246	134.1229	35.4593	0.0000	0.0000	0.0000	0.0000	133.5042	360.6995	586.4541 (98)
Space heating efficiency (main heating system 1)	203.8564	203.8564	203.8564	203.8564	203.8564	0.0000	0.0000	0.0000	0.0000	203.8564	203.8564	203.8564 (210)
Space heating fuel (main heating system)	285.6495	191.4199	144.6727	65.7928	17.3942	0.0000	0.0000	0.0000	0.0000	65.4893	176.9380	287.6800 (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	261.4717	231.0497	244.8891	213.8368	206.3104	184.8318	181.5849	189.3579	192.0689	215.4676	230.7116	258.4128 (64)
Efficiency of water heater	170.1600	170.1600	170.1600	170.1600	170.1600	170.1600	170.1600	170.1600	170.1600	170.1600	170.1600	170.1600 (216)
Fuel for water heating, kWh/month	153.6622	135.7838	143.9170	125.6681	121.2449	108.6224	106.7142	111.2823	112.8755	126.6265	135.5851	151.8646 (219)
Space cooling fuel requirement	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	4.9551	4.4756	4.9551	4.7953	4.9551	4.7953	4.9551	4.9551	4.7953	4.9551	4.7953	4.9551 (231)
Lighting	26.7984	21.4987	19.3572	14.1819	10.9545	8.9499	9.9931	12.9894	16.8719	22.1368	25.0035	27.5432 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												1235.0365 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												170.1600
Water heating fuel used												1533.8465 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(MEVDecentralised, Database: total watage = 6.3075, total flow = 29.0000, SFP = 0.2175)												
mechanical ventilation fans (SFP = 0.2175)												58.3427 (230a)
Total electricity for the above, kWh/year												58.3427 (231)
Electricity for lighting (calculated in Appendix L)												216.2783 (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												3043.5040 (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	1235.0365	0.1567	193.5434 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1533.8465	0.1410	216.3294 (264)
Space and water heating			409.8728 (265)
Pumps, fans and electric keep-hot	58.3427	0.1387	8.0929 (267)
Energy for lighting	216.2783	0.1443	31.2156 (268)
Total CO2, kg/year			449.1813 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.0600 (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	1235.0365	1.5801	1951.5215 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1533.8465	1.5215	2333.7646 (278)
Space and water heating			4285.2860 (279)
Pumps, fans and electric keep-hot	58.3427	1.5128	88.2609 (281)

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Energy for lighting 216.2783 1.5338 331.7349 (282)
 Total Primary energy kWh/year 4705.2819 (286)
 Dwelling Primary energy Rate (DPER) 52.9700 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	45.8400 (1b)	x 2.3300 (2b)	= 106.8072 (1b) -
First floor	42.9900 (1c)	x 2.6300 (2c)	= 113.0637 (1c) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.8300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 219.8709 (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) =	Air changes per hour 30.0000 / (5) = 0.1364 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3864 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3575 (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	0.4558	0.4468	0.4379	0.3932	0.3843	0.3396	0.3396	0.3307	0.3575	0.3843	0.4021	0.4200 (22b)
Effective ac	0.6039	0.5998	0.5959	0.5773	0.5738	0.5577	0.5577	0.5547	0.5639	0.5738	0.5809	0.5882 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.20)			17.2600	1.1450	19.7634		(27)
ground floor			45.8400	0.1300	5.9592		(28a)
External Wall 1	106.8348	19.3800	87.4548	0.1800	15.7419		(29a)
Sloping ceiling	45.8400		45.8400	0.1100	5.0424		(30)
Total net area of external elements Aum(A, m ²)			198.5148				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		48.6268		(33)
Party Wall 1			35.0600	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 348.4878 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E6 Intermediate floor within a dwelling	20.0000	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	22.0000	0.0600	1.3200
E16 Corner (normal)	17.2100	0.0900	1.5489
P1 Party wall - Ground floor	7.0700	0.0800	0.5656
P2 Party wall - Intermediate floor within a dwelling	7.0700	0.0000	0.0000
E2 Other lintels (including other steel lintels)	12.1600	0.0500	0.6080
E3 Sill	11.1500	0.0500	0.5575
E4 Jamb	27.2000	0.0500	1.3600
E5 Ground floor (normal)	23.1300	0.1600	3.7008
E25 Staggered party wall between dwellings	12.2600	0.0600	0.7356

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P4 Party wall - Roof (insulation at ceiling level) 7.0700 0.1200 0.8484
 Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.2448 (36)
 Point Thermal bridges 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 59.8716 (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
	43.8145	43.5219	43.2350	41.8878	41.6357	40.4623	40.4623	40.2450	40.9143	41.6357	42.1457	42.6787 (38)
Heat transfer coeff	103.6861	103.3935	103.1066	101.7594	101.5074	100.3340	100.3340	100.1167	100.7859	101.5074	102.0173	102.5504 (39)
Average = Sum(39)m / 12 =												101.7582
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1672	1.1639	1.1607	1.1456	1.1427	1.1295	1.1295	1.1271	1.1346	1.1427	1.1485	1.1545 (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												2.6094 (42)
Hot water usage for mixer showers												
	67.9702	66.9488	65.4603	62.6124	60.5107	58.1669	56.8347	58.3119	59.9312	62.4477	65.3568	67.7098 (42a)
Hot water usage for baths												
	29.3526	28.9167	28.3028	27.1710	26.3234	25.3836	24.8760	25.4856	26.1493	27.1549	28.3101	29.2534 (42b)
Hot water usage for other uses												
	41.3525	39.8488	38.3451	36.8413	35.3376	33.8339	33.8339	35.3376	36.8413	38.3451	39.8488	41.3525 (42c)
Average daily hot water use (litres/day)												127.4740 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	138.6754	135.7143	132.1082	126.6247	122.1717	117.3844	115.5446	119.1351	122.9218	127.9477	133.5157	138.3157 (44)
Energy conte	219.6279	193.2553	203.0453	173.3428	164.4666	144.3378	139.7411	147.5141	151.5749	173.6238	190.2176	216.5690 (45)
Energy content (annual)												Total = Sum(45)m = 2117.3162
Distribution loss (46)m = 0.15 x (45)m												
	32.9442	28.9883	30.4568	26.0014	24.6700	21.6507	20.9612	22.1271	22.7362	26.0436	28.5326	32.4853 (46)
Water storage loss:												
Store volume												180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5520 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8381 (55)
Total storage loss												
	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (56)
If cylinder contains dedicated solar storage												
	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month												
	268.8706	237.7325	252.2880	220.9970	213.7093	191.9920	188.9838	196.7568	199.2291	222.8664	237.8717	265.8117 (62)
WWHRS	-31.0731	-27.4813	-28.7769	-23.8284	-22.2072	-19.0029	-17.8122	-18.9414	-19.6611	-23.1783	-26.2582	-30.4977 (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	237.7974	210.2512	223.5111	197.1686	191.5021	172.9891	171.1717	177.8153	179.5680	199.6882	211.6136	235.3139 (64)
Total per year (kWh/year) = Sum(64)m =												2408.3903 (64)
12Total per year (kWh/year)												
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month												
	112.4204	99.8392	106.9067	95.7598	94.0793	86.1157	85.8581	88.4426	88.5220	97.1240	101.3707	111.4033 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	130.4682	130.4682	130.4682	130.4682	130.4682	130.4682	130.4682	130.4682	130.4682	130.4682	130.4682	130.4682 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	120.7294	133.6647	120.7294	124.7537	120.7294	124.7537	120.7294	120.7294	124.7537	120.7294	124.7537	120.7294 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	236.9087	239.3671	233.1721	219.9836	203.3355	187.6887	177.2357	174.7773	180.9723	194.1608	210.8088	226.4557 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	36.0468	36.0468	36.0468	36.0468	36.0468	36.0468	36.0468	36.0468	36.0468	36.0468	36.0468	36.0468 (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)												
	-104.3746	-104.3746	-104.3746	-104.3746	-104.3746	-104.3746	-104.3746	-104.3746	-104.3746	-104.3746	-104.3746	-104.3746 (71)
Water heating gains (Table 5)												
	151.1027	148.5702	143.6918	132.9998	126.4506	119.6051	115.4006	118.8744	122.9472	130.5431	140.7926	149.7356 (72)
Total internal gains	573.8813	586.7424	562.7337	542.8776	515.6560	494.1880	475.5062	476.5216	490.8137	510.5737	541.4956	562.0612 (73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains
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				m2	Table 6a W/m2	Specific data or Table 6b		Specific data or Table 6c		factor Table 6d		W
				2.6500	10.6334	0.6300		0.7000		0.7700		8.6117 (74)
North				1.7100	11.2829	0.6300		0.7000		0.7700		5.8964 (75)
Northeast				0.6300	19.6403	0.6300		0.7000		0.7700		3.7815 (76)
East				10.5600	46.7521	0.6300		0.7000		0.7700		150.8817 (78)
South				1.7100	11.2829	0.6300		0.7000		0.7700		5.8964 (81)
Northwest												
Solar gains	175.0678	294.9649	398.1649	489.4703	548.4797	545.6220	525.5023	480.6434	429.3041	324.2300	209.0235	150.2952 (83)
Total gains	748.9490	881.7073	960.8986	1032.3479	1064.1357	1039.8100	1001.0084	957.1650	920.1178	834.8037	750.5191	712.3563 (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	82.9324	83.1671	83.3985	84.5026	84.7124	85.7031	85.7031	85.8892	85.3188	84.7124	84.2890	83.8509
alpha	6.5288	6.5445	6.5599	6.6335	6.6475	6.7135	6.7135	6.7259	6.6879	6.6475	6.6193	6.5901
util living area	0.9976	0.9926	0.9796	0.9321	0.8118	0.6080	0.4400	0.4793	0.7237	0.9473	0.9930	0.9983 (86)
MIT	20.0963	20.2750	20.4912	20.7523	20.9262	20.9909	20.9991	20.9984	20.9728	20.7560	20.3808	20.0696 (87)
Th 2	19.9463	19.9490	19.9516	19.9638	19.9661	19.9768	19.9768	19.9788	19.9727	19.9661	19.9615	19.9566 (88)
util rest of house	0.9965	0.9893	0.9705	0.9035	0.7475	0.5158	0.3383	0.3740	0.6308	0.9185	0.9892	0.9975 (89)
MIT 2	18.9145	19.1433	19.4158	19.7356	19.9145	19.9730	19.9766	19.9784	19.9592	19.7486	19.2887	18.8883 (90)
Living area fraction	fLA = Living area / (4) = 0.3569 (91)											
MIT	19.3362	19.5471	19.7996	20.0984	20.2755	20.3363	20.3415	20.3424	20.3209	20.1081	19.6784	19.3099 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.3362	19.5471	19.7996	20.0984	20.2755	20.3363	20.3415	20.3424	20.3209	20.1081	19.6784	19.3099 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9956	0.9877	0.9688	0.9078	0.7681	0.5488	0.3747	0.4117	0.6638	0.9232	0.9879	0.9968 (94)
Useful gains	745.6903	870.8368	930.9654	937.1278	817.3768	570.6449	375.0746	394.1016	610.7696	770.6872	741.4195	710.0530 (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	1559.0476	1514.4157	1371.2755	1139.5453	870.4797	575.5415	375.3990	394.7017	626.9765	965.1453	1283.2150	1549.5228 (97)
Space heating kWh	605.1378	432.4850	327.5908	145.7406	39.5085	0.0000	0.0000	0.0000	0.0000	144.6769	390.0927	624.5655 (98a)
Space heating requirement - total per year (kWh/year)												2709.7978
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	605.1378	432.4850	327.5908	145.7406	39.5085	0.0000	0.0000	0.0000	0.0000	144.6769	390.0927	624.5655 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2709.7978
Space heating per m2	(98c) / (4) =											30.5054 (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	605.1378	432.4850	327.5908	145.7406	39.5085	0.0000	0.0000	0.0000	0.0000	144.6769	390.0927	624.5655 (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)	655.6206	468.5645	354.9196	157.8988	42.8044	0.0000	0.0000	0.0000	0.0000	156.7464	422.6357	676.6690 (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	237.7974	210.2512	223.5111	197.1686	191.5021	172.9891	171.1717	177.8153	179.5680	199.6882	211.6136	235.3139 (64)
Efficiency of water heater	86.0618	85.6405	84.9159	83.3922	81.2076	79.8000	79.8000	79.8000	79.8000	83.3490	85.4122	79.8000 (216)
(217)m	276.3100	245.5045	263.2149	236.4354	235.8178	216.7784	214.5008	222.8262	225.0226	239.5807	247.7557	273.1719 (219)
Fuel for water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Space cooling fuel requirement	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)
(221)m	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)
Pumps and Fa	25.0852	20.1243	18.1197	13.2752	10.2542	8.3778	9.3542	12.1590	15.7933	20.7216	23.4050	25.7824 (232)
Lighting												

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Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-42.0596	-58.8781	-84.0428	-93.8119	-100.5773	-93.6513	-92.4621	-87.5481	-78.8226	-66.9693	-46.0780	-36.4097 (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	(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	(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	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-25.0592	-52.5610	-104.1941	-156.1091	-206.0623	-206.9369	-204.5301	-173.3631	-127.3008	-75.0741	-33.4249	-19.8305 (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	(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	(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	(235d)
Annual totals kWh/year												
Space heating fuel - main system 1												2935.8589 (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												2896.9189 (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)												202.4518 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-2265.7568 (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												3855.4728 (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	2935.8589	0.2100	616.5304 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2896.9189	0.2100	608.3530 (264)
Space and water heating			1224.8833 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	202.4518	0.1443	29.2201 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-881.3108	0.1347	-118.7496
PV Unit electricity exported	-1384.4460	0.1260	-174.3925
Total			-293.1421 (269)
Total CO2, kg/year			972.8906 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.9500 (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	2935.8589	1.1300	3317.5206 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2896.9189	1.1300	3273.5184 (278)
Space and water heating			6591.0389 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	202.4518	1.5338	310.5273 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-881.3108	1.4980	-1320.1971
PV Unit electricity exported	-1384.4460	0.4624	-640.1444
Total			-1960.3415 (283)
Total Primary energy kWh/year			5071.3256 (286)
Target Primary Energy Rate (TPER)			57.0900 (287)

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Property Reference	Plot 006	Issued on Date	28/09/2023
Assessment Reference	Vaillant ASHP	Prop Type Ref	
Property	6, UB9 6NL		
SAP Rating	78 C	DER	5.20
Environmental	96 A	TER	11.34
CO ₂ Emissions (t/year)	0.42	% DER < TER	54.14
Compliance Check	See BREL	DFEE	37.86
% DPER < TPER	7.93	TFEE	38.75
		% DFEE < TFEE	2.32
		TPER	59.13
Assessor Details	Mr. Michael Woodbridge	Assessor ID	M818-0001
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	44.3100 (1b)	x 2.3300 (2b)	= 103.2423 (1b) -
First floor	44.3100 (1c)	x 2.6300 (2c)	= 116.5353 (1c) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.6200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	219.7776 (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)

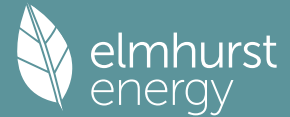
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1388 (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	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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 foar			2.1200	1.2000	2.5440		(26)
window (Uw = 1.20)			21.4200	1.1450	24.5267		(27)
ground floor			44.3100	0.1100	4.8741	110.0000	4874.1000 (28a)

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External Wall 1	116.6096	23.5400	93.0696	0.1600	14.8911	110.0000	10237.6560 (29a)
Sloping ceiling	44.3100		44.3100	0.1100	4.8741	9.0000	398.7900 (30)
Total net area of external elements Aum(A, m2)			205.2296				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	51.7101			(33)
Party Wall 1			35.0600	0.0000	0.0000	110.0000	3856.6000 (32)
Internal Wall 1			200.0000			9.0000	1800.0000 (32c)
Internal Floor 1			43.0000			18.0000	774.0000 (32d)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 21941.1460 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 247.5868 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E6 Intermediate floor within a dwelling	23.5100	0.0500	1.1755
E10 Eaves (insulation at ceiling level)	23.5100	0.0800	1.8808
E16 Corner (normal)	19.8400	0.0800	1.5872
P1 Party wall - Ground floor	7.0700	0.1000	0.7070
P2 Party wall - Intermediate floor within a dwelling	7.0700	0.0000	0.0000
E5 Ground floor (normal)	23.5100	0.1050	2.4686
E25 Staggered party wall between dwellings	12.2600	0.2400	2.9424
P4 Party wall - Roof (insulation at ceiling level)	7.0700	0.1000	0.7070
E2 Other lintels (including other steel lintels)	14.3200	0.0500	0.7160
E3 Sill	13.3100	0.0400	0.5324
E4 Jamb	31.4000	0.0400	1.2560

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.9729 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 65.6829 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	36.2633	36.2633	36.2633	36.2633	36.2633	36.2633	36.2633	36.2633	36.2633	36.2633	36.2633	36.2633 (38)
Heat transfer coeff	101.9462	101.9462	101.9462	101.9462	101.9462	101.9462	101.9462	101.9462	101.9462	101.9462	101.9462	101.9462 (39)
Average = Sum(39)m / 12 =												101.9462

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1504	1.1504	1.1504	1.1504	1.1504	1.1504	1.1504	1.1504	1.1504	1.1504	1.1504	1.1504 (40)
HLP (average)												1.1504
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6064 (42)
 Hot water usage for mixer showers 67.9198 66.8991 65.4117 62.5659 60.4658 58.1237 56.7925 58.2686 59.8867 62.4014 65.3083 67.6595 (42a)
 Hot water usage for baths 29.3309 28.8953 28.2819 27.1509 26.3040 25.3649 24.8576 25.4668 26.1300 27.1348 28.2892 29.2318 (42b)
 Hot water usage for other uses 41.3217 39.8191 38.3165 36.8139 35.3113 33.8087 33.8087 35.3113 36.8139 38.3165 39.8191 41.3217 (42c)
 Average daily hot water use (litres/day) 127.3793 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	138.5724	135.6135	132.0101	126.5307	122.0810	117.2973	115.4588	119.0466	122.8306	127.8527	133.4166	138.2130 (44)
Energy conte	219.4648	193.1118	202.8946	173.2141	164.3445	144.2307	139.6374	147.4046	151.4624	173.4949	190.0763	216.4082 (45)
Energy content (annual)										Total = Sum(45)m =		2115.7445
Distribution loss (46)m = 0.15 x (45)m	32.9197	28.9668	30.4342	25.9821	24.6517	21.6346	20.9456	22.1107	22.7194	26.0242	28.5115	32.4612 (46)

Water storage loss:
 Store volume 180.0000 (47)
 a) If manufacturer declared loss factor is known (kWh/day): 1.1100 (48)
 Temperature factor from Table 2b 0.5400 (49)
 Enter (49) or (54) in (55) 0.5994 (55)
 Total storage loss

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
If cylinder contains dedicated solar storage	18.5814	16.7832	18.5814	17.9820	18.5814	17.9820	18.5814	18.5814	17.9820	18.5814	17.9820	18.5814 (56)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Total heat required for water heating calculated for each month	261.3086	230.9062	244.7384	213.7081	206.1883	184.7247	181.4812	189.2484	191.9564	215.3387	230.5703	258.2520 (62)
WVHRS	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 261.3086 230.9062 244.7384 213.7081 206.1883 184.7247 181.4812 189.2484 191.9564 215.3387 230.5703 258.2520 (64)
 Total per year (kWh/year) = Sum(64)m = 2608.4215 (64)
 2608 (64)

12Total per year (kWh/year)
 Electric shower(s) 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (64a)
 Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month 106.4471 94.4452 100.9375 89.9889 88.1196 80.3519 79.9045 82.4871 82.7564 91.1621 95.5956 105.4308 (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
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(66)m	130.3178	130.3178	130.3178	130.3178	130.3178	130.3178	130.3178	130.3178	130.3178	130.3178	130.3178	130.3178	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.2951	132.0767	119.2951	123.2716	119.2951	123.2716	119.2951	119.2951	123.2716	119.2951	123.2716	119.2951	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	236.5159	238.9702	232.7854	219.6188	202.9984	187.3775	176.9418	174.4875	180.6722	193.8388	210.4593	226.0802	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0318	36.0318	36.0318	36.0318	36.0318	36.0318	36.0318	36.0318	36.0318	36.0318	36.0318	36.0318	(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)	-104.2543	-104.2543	-104.2543	-104.2543	-104.2543	-104.2543	-104.2543	-104.2543	-104.2543	-104.2543	-104.2543	-104.2543	(71)
Water heating gains (Table 5)	143.0741	140.5435	135.6687	124.9846	118.4403	111.5999	107.3985	110.8697	114.9395	122.5297	132.7716	141.7080	(72)
Total internal gains	560.9804	573.6857	549.8445	529.9704	502.8291	484.3443	465.7307	466.7477	480.9787	497.7589	528.5979	549.1786	(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				3.2800	10.6334	0.5000	0.8000	0.7700	9.6680 (74)			
Northeast				1.1500	11.2829	0.5000	0.8000	0.7700	3.5968 (75)			
East				3.7800	19.6403	0.5000	0.8000	0.7700	20.5794 (76)			
South				12.0600	46.7521	0.5000	0.8000	0.7700	156.2936 (78)			
Northwest				1.1500	11.2829	0.5000	0.8000	0.7700	3.5968 (81)			

Solar gains	193.7346	329.3452	450.1343	558.9648	628.6893	625.6834	602.5553	550.0404	487.6086	363.7433	231.8995	165.9100 (83)
Total gains	754.7150	903.0308	999.9788	1088.9352	1131.5184	1110.0277	1068.2861	1016.7880	968.5873	861.5023	760.4973	715.0886 (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	59.7841	59.7841	59.7841	59.7841	59.7841	59.7841	59.7841	59.7841	59.7841	59.7841	59.7841	59.7841	
alpha	4.9856	4.9856	4.9856	4.9856	4.9856	4.9856	4.9856	4.9856	4.9856	4.9856	4.9856	4.9856	
util living area	0.9903	0.9765	0.9490	0.8803	0.7518	0.5699	0.4167	0.4559	0.6789	0.9064	0.9787	0.9925	(86)
Living	19.8359	20.0742	20.3549	20.6648	20.8812	20.9758	20.9958	20.9934	20.9441	20.6595	20.1800	19.7775	
Non living	18.6284	18.9280	19.2747	19.6391	19.8668	19.9470	19.9587	19.9578	19.9258	19.6431	19.0645	18.5544	
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	20.4045	20.0742	20.3549	20.6648	20.8812	20.9758	20.9958	20.9934	20.9441	20.6595	20.1800	19.9485	(87)
Th 2	19.9599	19.9599	19.9599	19.9599	19.9599	19.9599	19.9599	19.9599	19.9599	19.9599	19.9599	19.9599	(88)
util rest of house	0.9873	0.9695	0.9341	0.8471	0.6916	0.4849	0.3199	0.3556	0.5943	0.8724	0.9711	0.9901	(89)
MIT 2	19.4291	18.9280	19.2747	19.6391	19.8668	19.9470	19.9587	19.9578	19.9258	19.6431	19.0645	18.8077	(90)
Living area fraction									fLA = Living area / (4) =			0.3284	(91)
MIT	19.7494	19.3044	19.6294	19.9760	20.1999	20.2849	20.2992	20.2978	20.2602	19.9768	19.4308	19.1823	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7494	19.3044	19.6294	19.9760	20.1999	20.2849	20.2992	20.2978	20.2602	19.9768	19.4308	19.1823	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9865	0.9639	0.9284	0.8477	0.7064	0.5121	0.3517	0.3886	0.6200	0.8731	0.9661	0.9878	(94)
Useful gains	744.5544	870.4645	928.3661	923.0517	799.2514	568.4780	375.7602	395.1250	600.4909	752.1686	734.7022	706.3474	(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	1575.0038	1468.4709	1338.4916	1129.1515	866.5329	579.5504	377.1207	397.3700	628.0102	955.9303	1257.0779	1527.3891	(97)
Space heating kWh	617.8544	401.8603	305.1334	148.3919	50.0574	0.0000	0.0000	0.0000	0.0000	151.5987	376.1105	610.8550	(98a)
Space heating requirement - total per year (kWh/year)												2661.8616	
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	617.8544	401.8603	305.1334	148.3919	50.0574	0.0000	0.0000	0.0000	0.0000	151.5987	376.1105	610.8550	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2661.8616	
Space heating per m2										(98c) / (4) =		30.0368	(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 %)	202.8437	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)

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Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	617.8544	401.8603	305.1334	148.3919	50.0574	0.0000	0.0000	0.0000	0.0000	151.5987	376.1105	610.8550 (98)
Space heating efficiency (main heating system 1)	202.8437	202.8437	202.8437	202.8437	202.8437	0.0000	0.0000	0.0000	0.0000	202.8437	202.8437	202.8437 (210)
Space heating fuel (main heating system)	304.5962	198.1132	150.4278	73.1557	24.6778	0.0000	0.0000	0.0000	0.0000	74.7367	185.4188	301.1456 (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	261.3086	230.9062	244.7384	213.7081	206.1883	184.7247	181.4812	189.2484	191.9564	215.3387	230.5703	258.2520 (64)
Efficiency of water heater	170.1600	170.1600	170.1600	170.1600	170.1600	170.1600	170.1600	170.1600	170.1600	170.1600	170.1600	170.1600 (216)
Fuel for water heating, kWh/month	153.5664	135.6995	143.8284	125.5925	121.1732	108.5594	106.6533	111.2179	112.8093	126.5507	135.5021	151.7701 (219)
Space cooling fuel requirement	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	4.9530	4.4737	4.9530	4.7933	4.9530	4.7933	4.9530	4.9530	4.7933	4.9530	4.7933	4.9530 (231)
Lighting	26.7767	21.4813	19.3415	14.1704	10.9456	8.9427	9.9850	12.9788	16.8582	22.1189	24.9833	27.5209 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												1312.2719 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												170.1600
Water heating fuel used												1532.9228 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(MEV)Decentralised, Database: total watage = 6.3075, total flow = 29.0000, SFP = 0.2175)												
mechanical ventilation fans (SFP = 0.2175)												58.3180 (230a)
Total electricity for the above, kWh/year												58.3180 (231)
Electricity for lighting (calculated in Appendix L)												216.1033 (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												3119.6160 (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	1312.2719	0.1565	205.3307 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1532.9228	0.1410	216.1986 (264)
Space and water heating			421.5293 (265)
Pumps, fans and electric keep-hot	58.3180	0.1387	8.0894 (267)
Energy for lighting	216.1033	0.1443	31.1904 (268)
Total CO2, kg/year			460.8091 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.2000 (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	1312.2719	1.5792	2072.3766 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1532.9228	1.5215	2332.3573 (278)
Space and water heating			4404.7338 (279)
Pumps, fans and electric keep-hot	58.3180	1.5128	88.2234 (281)

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Energy for lighting	216.1033	1.5338	331.4664 (282)
Total Primary energy kWh/year			4824.4237 (286)
Dwelling Primary energy Rate (DPER)			54.4400 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	44.3100 (1b)	x 2.3300 (2b)	= 103.2423 (1b) -
First floor	44.3100 (1c)	x 2.6300 (2c)	= 116.5353 (1c) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.6200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 219.7776 (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) =	Air changes per hour 30.0000 / (5) = 0.1365 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3865 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3575 (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	0.4558	0.4469	0.4380	0.3933	0.3843	0.3396	0.3396	0.3307	0.3575	0.3843	0.4022	0.4201 (22b)
Effective ac	0.6039	0.5999	0.5959	0.5773	0.5739	0.5577	0.5577	0.5547	0.5639	0.5739	0.5809	0.5882 (25)

3. Heat losses and heat loss parameter

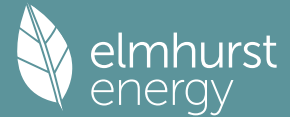
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.20)			20.0500	1.1450	22.9580		(27)
ground floor			44.3100	0.1300	5.7603		(28a)
External Wall 1	116.6096	22.1700	94.4396	0.1800	16.9991		(29a)
Sloping ceiling	44.3100		44.3100	0.1100	4.8741		(30)
Total net area of external elements Aum(A, m ²)			205.2296				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		52.7115		(33)
Party Wall 1			35.0600	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 247.5868 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E6 Intermediate floor within a dwelling	23.5100	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	23.5100	0.0600	1.4106
E16 Corner (normal)	19.8400	0.0900	1.7856
P1 Party wall - Ground floor	7.0700	0.0800	0.5656
P2 Party wall - Intermediate floor within a dwelling	7.0700	0.0000	0.0000
E5 Ground floor (normal)	23.5100	0.1600	3.7616
E25 Staggered party wall between dwellings	12.2600	0.0600	0.7356
P4 Party wall - Roof (insulation at ceiling level)	7.0700	0.1200	0.8484
E2 Other lintels (including other steel lintels)	14.3200	0.0500	0.7160
E3 Sill	13.3100	0.0500	0.6655

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E4 Jamb													
Thermal bridges (Sum(L x Psi) calculated using Appendix K)													
Point Thermal bridges													12.0589 (36)
Total fabric heat loss													0.0000
													(36a) =
													(33) + (36) + (36a) =
													64.7704 (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	43.7981	43.5056	43.2188	41.8717	41.6197	40.4464	40.4464	40.2292	40.8983	41.6197	42.1295	42.6626	(38)
Average = Sum(39)m / 12 =	108.5686	108.2760	107.9892	106.6421	106.3901	105.2169	105.2169	104.9996	105.6688	106.3901	106.9000	107.4330	(39)
													106.6409
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.2251	1.2218	1.2186	1.2034	1.2005	1.1873	1.1873	1.1848	1.1924	1.2005	1.2063	1.2123	(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													2.6064 (42)
Hot water usage for mixer showers													
	67.9198	66.8991	65.4117	62.5659	60.4658	58.1237	56.7925	58.2686	59.8867	62.4014	65.3083	67.6595	(42a)
Hot water usage for baths													
	29.3309	28.8953	28.2819	27.1509	26.3040	25.3649	24.8576	25.4668	26.1300	27.1348	28.2892	29.2318	(42b)
Hot water usage for other uses													
	41.3217	39.8191	38.3165	36.8139	35.3113	33.8087	33.8087	35.3113	36.8139	38.3165	39.8191	41.3217	(42c)
Average daily hot water use (litres/day)													127.3793 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	138.5724	135.6135	132.0101	126.5307	122.0810	117.2973	115.4588	119.0466	122.8306	127.8527	133.4166	138.2130	(44)
Energy conte	219.4648	193.1118	202.8946	173.2141	164.3445	144.2307	139.6374	147.4046	151.4624	173.4949	190.0763	216.4082	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													Total = Sum(45)m =
	32.9197	28.9668	30.4342	25.9821	24.6517	21.6346	20.9456	22.1107	22.7194	26.0242	28.5115	32.4612	(46)
Water storage loss:													
Store volume													180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.5520 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.8381 (55)
Total storage loss													
	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(56)
If cylinder contains dedicated solar storage													
	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	268.7075	237.5891	252.1373	220.8683	213.5872	191.8849	188.8801	196.6473	199.1166	222.7376	237.7305	265.6509	(62)
WWHRS	-31.0501	-27.4610	-28.7555	-23.8107	-22.1907	-18.9888	-17.7989	-18.9274	-19.6465	-23.1611	-26.2387	-30.4751	(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													
	237.6574	210.1281	223.3818	197.0576	191.3964	172.8961	171.0811	177.7199	179.4701	199.5765	211.4919	235.1758	(64)
12Total per year (kWh/year)													Total per year (kWh/year) = Sum(64)m =
Electric shower(s)													2407.0328 (64)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
													0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													
Heat gains from water heating, kWh/month													
	112.3662	99.7915	106.8566	95.7171	94.0387	86.0801	85.8236	88.4062	88.4846	97.0812	101.3237	111.3499	(65)

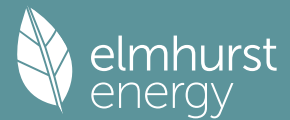
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	119.2727	132.0519	119.2727	123.2484	119.2727	123.2484	119.2727	119.2727	123.2484	119.2727	123.2484	119.2727	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	236.5159	238.9702	232.7854	219.6188	202.9984	187.3775	176.9418	174.4875	180.6722	193.8388	210.4593	226.0802	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.0318	36.0318	36.0318	36.0318	36.0318	36.0318	36.0318	36.0318	36.0318	36.0318	36.0318	36.0318	(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)													
	-104.2543	-104.2543	-104.2543	-104.2543	-104.2543	-104.2543	-104.2543	-104.2543	-104.2543	-104.2543	-104.2543	-104.2543	(71)
Water heating gains (Table 5)													
	151.0298	148.4992	143.6245	132.9404	126.3961	119.5556	115.3543	118.8255	122.8953	130.4855	140.7274	149.6638	(72)
Total internal gains													
	571.9137	584.6166	560.7779	540.9029	513.7625	492.2769	473.6641	474.6810	488.9113	508.6923	539.5304	560.1120	(73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains
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				m2	Table 6a W/m2	Specific data or Table 6b		Specific data or Table 6c		factor Table 6d		W
North				3.0700	10.6334	0.6300		0.7000		0.7700		9.9766 (74)
Northeast				1.0800	11.2829	0.6300		0.7000		0.7700		3.7241 (75)
East				3.5400	19.6403	0.6300		0.7000		0.7700		21.2482 (76)
South				11.2800	46.7521	0.6300		0.7000		0.7700		161.1691 (78)
Northwest				1.0800	11.2829	0.6300		0.7000		0.7700		3.7241 (81)
Solar gains	199.8420	339.7461	464.3957	576.7456	648.7487	645.6723	621.7949	567.5610	503.0819	375.2432	239.2134	171.1379 (83)
Total gains	771.7557	924.3627	1025.1735	1117.6485	1162.5112	1137.9492	1095.4590	1042.2420	991.9931	883.9355	778.7439	731.2499 (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	56.1374	56.2891	56.4386	57.1515	57.2869	57.9257	57.9257	58.0456	57.6780	57.2869	57.0137	56.7308
alpha	4.7425	4.7526	4.7626	4.8101	4.8191	4.8617	4.8617	4.8697	4.8452	4.8191	4.8009	4.7821
util living area	0.9899	0.9763	0.9497	0.8815	0.7554	0.5720	0.4189	0.4575	0.6825	0.9065	0.9781	0.9921 (86)
MIT	19.7386	19.9885	20.2871	20.6317	20.8656	20.9728	20.9951	20.9925	20.9370	20.6315	20.1262	19.6991 (87)
Th 2	19.9000	19.9026	19.9052	19.9173	19.9196	19.9302	19.9302	19.9322	19.9261	19.9196	19.9150	19.9102 (88)
util rest of house	0.9868	0.9692	0.9346	0.8479	0.6938	0.4847	0.3190	0.3543	0.5957	0.8720	0.9702	0.9895 (89)
MIT 2	18.4618	18.7780	19.1491	19.5653	19.8144	19.9158	19.9287	19.9297	19.8878	19.5776	18.9639	18.4191 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.8811	19.1755	19.5228	19.9155	20.1595	20.2629	20.2789	20.2787	20.2323	19.9236	19.3455	18.8394 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.8811	19.1755	19.5228	19.9155	20.1595	20.2629	20.2789	20.2787	20.2323	19.9236	19.3455	18.8394 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9827	0.9632	0.9283	0.8478	0.7084	0.5126	0.3519	0.3883	0.6218	0.8722	0.9648	0.9861 (94)
Useful gains	758.4356	890.3185	951.6210	947.5738	823.5696	583.3316	385.4846	404.6976	616.8656	770.9420	751.3310	721.0831 (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	1583.0481	1545.6918	1406.3210	1174.7129	900.0125	595.8298	387.0803	407.2628	647.9965	991.9419	1309.0484	1572.7580 (97)
Space heating kWh	613.5117	440.4109	338.2968	163.5402	56.8735	0.0000	0.0000	0.0000	0.0000	164.4240	401.5565	633.6461 (98a)
Space heating requirement - total per year (kWh/year)												2812.2597
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	613.5117	440.4109	338.2968	163.5402	56.8735	0.0000	0.0000	0.0000	0.0000	164.4240	401.5565	633.6461 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2812.2597
Space heating per m2	(98c) / (4) =											31.7339 (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	613.5117	440.4109	338.2968	163.5402	56.8735	0.0000	0.0000	0.0000	0.0000	164.4240	401.5565	633.6461 (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)	664.6931	477.1515	366.5188	177.1833	61.6181	0.0000	0.0000	0.0000	0.0000	178.1408	435.0558	686.5072 (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	237.6574	210.1281	223.3818	197.0576	191.3964	172.8961	171.0811	177.7199	179.4701	199.5765	211.4919	235.1758 (64)
Efficiency of water heater	86.0890	85.6788	84.9880	83.6448	81.6968	79.8000	79.8000	79.8000	79.8000	83.6287	85.4744	79.8000 (216)
Fuel for water heating, kWh/month	276.0600	245.2511	262.8393	235.5887	234.2766	216.6618	214.3874	222.7066	224.8998	238.6460	247.4331	272.9226 (219)
Space cooling fuel requirement	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	24.7825	19.8814	17.9010	13.1151	10.1305	8.2767	9.2413	12.0122	15.6027	20.4716	23.1226	25.4713 (232)

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Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-40.9609	-57.4986	-82.2997	-92.1291	-98.9946	-92.2571	-91.0845	-86.1329	-77.3789	-65.5182	-44.9300	-35.4397 (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	-23.9176	-50.2210	-99.6544	-149.4504	-197.4102	-198.2983	-195.9950	-166.0699	-121.8648	-71.7841	-31.9194	-18.9233 (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												3046.8685 (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												2891.6731 (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)												200.0090 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-2190.1328 (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												4034.4178 (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	3046.8685	0.2100	639.8424 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2891.6731	0.2100	607.2513 (264)
Space and water heating			1247.0937 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	200.0090	0.1443	28.8675 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-864.6243	0.1347	-116.4499
PV Unit electricity exported	-1325.5084	0.1259	-166.9305
Total			-283.3804 (269)
Total CO2, kg/year			1004.5101 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.3400 (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	3046.8685	1.1300	3442.9614 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2891.6731	1.1300	3267.5906 (278)
Space and water heating			6710.5520 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	200.0090	1.5338	306.7805 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-864.6243	1.4978	-1295.0083
PV Unit electricity exported	-1325.5084	0.4623	-612.7518
Total			-1907.7600 (283)
Total Primary energy kWh/year			5239.6732 (286)
Target Primary Energy Rate (TPER)			59.1300 (287)

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Property Reference	Plot 001	Issued on Date	28/09/2023
Assessment Reference	Vaillant ASHP	Prop Type Ref	
Property	1, UB9 6NL		
SAP Rating	79 C	DER	4.59
Environmental	96 A	TER	10.51
CO ₂ Emissions (t/year)	0.5	% DER < TER	56.33
Compliance Check	See BREL	DFEE	37.52
% DPER < TPER	12.74	TFEE	38.89
		% DFEE < TFEE	3.51
		DPER	47.88
		TPER	54.87
Assessor Details	Mr. Michael Woodbridge	Assessor ID	M818-0001
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	49.8400 (1b)	x 2.7000 (2b)	= 134.5680 (1b) -
First floor	47.0000 (1c)	x 2.7000 (2c)	= 126.9000 (1c) -
Second floor	24.5600 (1d)	x 1.5000 (2d)	= 36.8400 (1d) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	121.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 298.3080 (5)

2. Ventilation rate

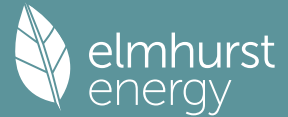
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(7a)+(7b)+(7c) =	Air changes per hour 40.0000 / (5) = 0.1341 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.2841 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2628 (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	0.3350	0.3285	0.3219	0.2891	0.2825	0.2496	0.2496	0.2431	0.2628	0.2825	0.2956	0.3088 (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	0.5561	0.5539	0.5518	0.5418	0.5399	0.5312	0.5312	0.5295	0.5345	0.5399	0.5437	0.5477 (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 floor			2.1200	1.2000	2.5440		(26)
window (Uw = 1.20)			20.0100	1.1450	22.9122		(27)
rooflight			2.7400	1.1450	3.1374		(27a)
ground floor			49.8400	0.1100	5.4824	110.0000	5482.4000 (28a)

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External Wall 1	120.6600	20.1000	100.5600	0.1600	16.0896	190.0000	19106.4000 (29a)
Dormer	3.9200	2.0300	1.8900	0.1800	0.3402	9.0000	17.0100 (29a)
Sloping ceiling	59.2400	2.7400	56.5000	0.1100	6.2150	9.0000	508.5000 (30)
Flat roof	6.2500		6.2500	0.1100	0.6875	9.0000	56.2500 (30)
Total net area of external elements Aum(A, m2)			239.9100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	57.4083			(33)
Party Wall 1			70.0000	0.0000	0.0000	180.0000	12600.0000 (32)
Internal Floor 1			94.0000			18.0000	1692.0000 (32d)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 39462.5600 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 325.0623 (35)

List of Thermal Bridges							
K1 Element	Length	Psi-value	Total				
E2 Other lintels (including other steel lintels)	14.4600	0.0500	0.7230				
E3 Sill	13.4500	0.0400	0.5380				
E4 Jamb	31.5000	0.0400	1.2600				
E5 Ground floor (normal)	20.9000	0.1050	2.1945				
R1 Head of roof window	2.6000	0.2400	0.6240				
R2 Sill of roof window	2.6000	0.2400	0.6240				
R3 Jamb of roof window	6.1600	0.2400	1.4784				
E6 Intermediate floor within a dwelling	40.0000	0.0500	2.0000				
E11 Eaves (insulation at rafter level)	10.0000	0.0800	0.8000				
E13 Gable (insulation at rafter level)	12.2000	0.1000	1.2200				
E16 Corner (normal)	10.8000	0.0800	0.8640				
P1 Party wall - Ground floor	10.0000	0.1600	1.6000				
P2 Party wall - Intermediate floor within a dwelling	20.0000	0.0000	0.0000				
R8 Roof to wall (rafter)	12.2000	0.0600	0.7320				
R4 Ridge (vaulted ceiling)	5.0000	0.1200	0.6000				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.2579 (36)
Point Thermal bridges			(36a) =	0.0000			
Total fabric heat loss			(33) + (36) + (36a) =	72.6662 (37)			

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	54.7462	54.5317	54.3213	53.3335	53.1487	52.2884	52.2884	52.1290	52.6198	53.1487	53.5226	53.9135 (38)	
Average = Sum(39)m / 12 =	127.4124	127.1979	126.9876	125.9998	125.8149	124.9546	124.9546	124.7953	125.2860	125.8149	126.1888	126.5797 (39)	125.9989
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0495	1.0478	1.0460	1.0379	1.0364	1.0293	1.0293	1.0280	1.0320	1.0364	1.0394	1.0427 (40)	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

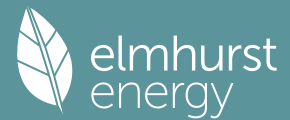
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8686 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)	
Hot water usage for baths	31.2216	30.7579	30.1049	28.9010	27.9995	26.9998	26.4599	27.1083	27.8143	28.8839	30.1127	31.1160 (42b)	
Hot water usage for other uses	44.0070	42.4067	40.8065	39.2062	37.6060	36.0057	36.0057	37.6060	39.2062	40.8065	42.4067	44.0070 (42c)	
Average daily hot water use (litres/day)												68.9537 (43)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	75.2285	73.1646	70.9114	68.1072	65.6054	63.0055	62.4656	64.7143	67.0205	69.6904	72.5194	75.1230 (44)	
Energy content (annual)	119.1436	104.1854	108.9882	93.2353	88.3175	77.4727	75.5467	80.1298	82.6430	94.5692	103.3171	117.6244 (45)	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)	
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)	
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)	
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)	
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)	
Total heat required for water heating calculated for each month	101.2721	88.5576	92.6399	79.2500	75.0699	65.8518	64.2147	68.1103	70.2465	80.3838	87.8196	99.9808 (62)	
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)	
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)	
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)	
Output from w/h	101.2721	88.5576	92.6399	79.2500	75.0699	65.8518	64.2147	68.1103	70.2465	80.3838	87.8196	99.9808 (64)	
12Total per year (kWh/year)													
Electric shower(s)	57.9132	51.6012	56.3465	53.7708	54.7798	52.2546	53.9964	54.7798	53.7708	56.3465	55.2870	57.9132 (64a)	
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												658.7598 (64a)	
Heat gains from water heating, kWh/month	39.7963	35.0397	37.2466	33.2552	32.4624	29.5266	29.5528	30.7225	31.0043	34.1826	35.7766	39.4735 (65)	

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

Metabolic gains (Table 5), Watts

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	(66)
Lighting gains	(calculated in Appendix L, equation L9 or L9a), also see Table 5												
Appliances gains	(calculated in Appendix L, equation L13 or L13a), also see Table 5												
Cooking gains	(calculated in Appendix L, equation L15 or L15a), also see Table 5												
Pumps, fans													
Losses e.g. evaporation (negative values) (Table 5)													
Water heating gains (Table 5)													
Total internal gains													

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				
Northeast				12.5900	11.2829		0.5000	0.8000	0.7700		39.3769 (75)				
Southwest				5.5300	36.7938		0.5000	0.8000	0.7700		56.4019 (79)				
Northwest				1.8900	11.2829		0.5000	0.8000	0.7700		5.9112 (81)				
Northeast				2.7400	17.4137		0.7600	0.7000	1.0000		22.8453 (82)				
Solar gains				124.5352	235.9725	386.5673	586.3470	755.1965	793.1516	746.6063	613.9225	454.6510	277.9393	153.4976	103.7772 (83)
Total gains				676.0189	804.6167	930.0968	1114.8547	1256.1475	1277.3540	1212.0255	1077.9355	932.7686	770.0868	674.3916	642.1627 (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)													
tau	86.0342	86.1793	86.3220	86.9988	87.1266	87.7265	87.7265	87.8385	87.4944	87.1266	86.8684	86.6002	
alpha	6.7356	6.7453	6.7548	6.7999	6.8084	6.8484	6.8484	6.8559	6.8330	6.8084	6.7912	6.7733	
util living area	0.9997	0.9989	0.9951	0.9650	0.8390	0.6163	0.4525	0.5292	0.8368	0.9887	0.9991	0.9998	(86)
MIT	19.9483	20.0986	20.3363	20.6743	20.9157	20.9910	20.9990	20.9974	20.9391	20.6029	20.2163	19.9236	(87)
Th 2	20.0423	20.0437	20.0452	20.0519	20.0531	20.0590	20.0590	20.0601	20.0567	20.0531	20.0506	20.0479	(88)
util rest of house	0.9996	0.9984	0.9927	0.9487	0.7827	0.5306	0.3564	0.4231	0.7579	0.9811	0.9986	0.9997	(89)
MIT 2	19.0789	19.2301	19.4677	19.7998	20.0039	20.0558	20.0588	20.0596	20.0282	19.7383	19.3536	19.0589	(90)
Living area fraction									fLA = Living area / (4) =			0.2142	(91)
MIT	19.2651	19.4161	19.6538	19.9871	20.1992	20.2561	20.2602	20.2604	20.2232	19.9235	19.5384	19.2441	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2651	19.4161	19.6538	19.9871	20.1992	20.2561	20.2602	20.2604	20.2232	19.9235	19.5384	19.2441	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9994	0.9979	0.9914	0.9474	0.7922	0.5490	0.3771	0.4459	0.7734	0.9797	0.9982	0.9996	(94)
Useful gains	675.6146	802.9400	922.1144	1056.1985	995.0711	701.2219	456.9978	480.6935	721.4477	754.4318	673.1496	641.8926	(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	1906.7364	1846.4198	1670.3642	1396.9708	1069.3240	706.7573	457.3576	481.7612	767.1571	1173.0310	1569.5835	1904.2748	(97)
Space heating kWh	915.9546	701.2184	556.6978	245.3561	55.2441	0.0000	0.0000	0.0000	0.0000	311.4378	645.4324	939.2124	(98a)
Space heating requirement - total per year (kWh/year)												4370.5537	
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	915.9546	701.2184	556.6978	245.3561	55.2441	0.0000	0.0000	0.0000	0.0000	311.4378	645.4324	939.2124	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4370.5537	
Space heating per m2										(98c) / (4) =		36.0013	(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	1174.5730	924.6639	948.4439	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9344	0.9726	0.9460	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1097.4763	899.3018	897.2609	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1395.2575	1324.1884	1177.7573	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													

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Cooled fraction	0.0000	0.0000	0.0000	0.0000	0.0000	214.4025	316.1157	208.6894	0.0000	0.0000	0.0000	0.0000 (104)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	1.0000 (105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	53.6006	79.0289	52.1723	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling requirement												184.8019 (107)
Energy for space heating												36.0013 (99)
Energy for space cooling												1.5223 (108)
Total												37.5235 (109)
Fabric Energy Efficiency (DFEE)												37.5 (109)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	49.8400 (1b)	x 2.7000 (2b)	= 134.5680 (1b) -
First floor	47.0000 (1c)	x 2.7000 (2c)	= 126.9000 (1c) -
Second floor	24.5600 (1d)	x 1.5000 (2d)	= 36.8400 (1d) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	121.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 298.3080 (5)

2. Ventilation rate

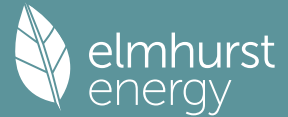
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1341 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3841 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3553 (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	0.4530	0.4441	0.4352	0.3908	0.3819	0.3375	0.3375	0.3286	0.3553	0.3819	0.3997	0.4175 (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	0.6026	0.5986	0.5947	0.5764	0.5729	0.5570	0.5570	0.5540	0.5631	0.5729	0.5799	0.5871 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.20)			20.0100	1.1450	22.9122		(27)
rooflight			2.7400	1.5038	4.1203		(27a)
ground floor			49.8400	0.1300	6.4792		(28a)
External Wall 1	120.6600	20.1000	100.5600	0.1800	18.1008		(29a)
Dormer	3.9200	2.0300	1.8900	0.1800	0.3402		(29a)
Sloping ceiling	59.2400	2.7400	56.5000	0.1100	6.2150		(30)
Flat roof	6.2500		6.2500	0.1100	0.6875		(30)
Total net area of external elements Aum(A, m ²)			239.9100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	60.9752		(33)
Party Wall 1			70.0000	0.0000	0.0000		(32)

Full SAP Calculation Printout



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

325.0623 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	14.4600	0.0500	0.7230
E3 Sill	13.4500	0.0500	0.6725
E4 Jamb	31.5000	0.0500	1.5750
E5 Ground floor (normal)	20.9000	0.1600	3.3440
R1 Head of roof window	2.6000	0.0800	0.2080
R2 Sill of roof window	2.6000	0.0600	0.1560
R3 Jamb of roof window	6.1600	0.0800	0.4928
E6 Intermediate floor within a dwelling	40.0000	0.0000	0.0000
E11 Eaves (insulation at rafter level)	10.0000	0.0400	0.4000
E13 Gable (insulation at rafter level)	12.2000	0.0800	0.9760
E16 Corner (normal)	10.8000	0.0900	0.9720
P1 Party wall - Ground floor	10.0000	0.0800	0.8000
P2 Party wall - Intermediate floor within a dwelling	20.0000	0.0000	0.0000
R8 Roof to wall (rafter)	12.2000	0.0600	0.7320
R4 Ridge (vaulted ceiling)	5.0000	0.0800	0.4000

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

11.4513 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 72.4265 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	59.3207	58.9285	58.5441	56.7385	56.4007	54.8280	54.8280	54.5368	55.4338	56.4007	57.0841	57.7986	(38)
Heat transfer coeff	131.7473	131.3551	130.9706	129.1650	128.8272	127.2545	127.2545	126.9633	127.8603	128.8272	129.5106	130.2251	(39)
Average = Sum(39)m / 12 =												129.1634	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0852	1.0820	1.0788	1.0640	1.0612	1.0482	1.0482	1.0458	1.0532	1.0612	1.0668	1.0727	(40)
HLP (average)												1.0639	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

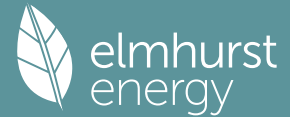
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8686 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	31.2216	30.7579	30.1049	28.9010	27.9995	26.9998	26.4599	27.1083	27.8143	28.8839	30.1127	31.1160	(42b)
Hot water usage for other uses	44.0070	42.4067	40.8065	39.2062	37.6060	36.0057	36.0057	37.6060	39.2062	40.8065	42.4067	44.0070	(42c)
Average daily hot water use (litres/day)													68.9537 (43)
Daily hot water use	75.2285	73.1646	70.9114	68.1072	65.6054	63.0055	62.4656	64.7143	67.0205	69.6904	72.5194	75.1230	(44)
Energy content (annual)	119.1436	104.1854	108.9882	93.2353	88.3175	77.4727	75.5467	80.1298	82.6430	94.5692	103.3171	117.6244	(45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	101.2721	88.5576	92.6399	79.2500	75.0699	65.8518	64.2147	68.1103	70.2465	80.3838	87.8196	99.9808	(62)
WVHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	101.2721	88.5576	92.6399	79.2500	75.0699	65.8518	64.2147	68.1103	70.2465	80.3838	87.8196	99.9808	(64)
12Total per year (kWh/year)													
Electric shower(s)	57.9132	51.6012	56.3465	53.7708	54.7798	52.2546	53.9964	54.7798	53.7708	56.3465	55.2870	57.9132	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												658.7598	(64a)
Heat gains from water heating, kWh/month	39.7963	35.0397	37.2466	33.2552	32.4624	29.5266	29.5528	30.7225	31.0043	34.1826	35.7766	39.4735	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	146.4854	162.1802	146.4854	151.3682	146.4854	151.3682	146.4854	146.4854	151.3682	146.4854	151.3682	146.4854	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	287.0247	290.0031	282.4976	266.5193	246.3494	227.3927	214.7284	211.7500	219.2555	235.2338	255.4036	274.3604	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	(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)

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

	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426 (71)
Water heating gains (Table 5)	53.4897	52.1424	50.0626	46.1878	43.6323	41.0092	39.7215	41.2937	43.0616	45.9443	49.6898	53.0558 (72)
Total internal gains	553.0283	570.3543	545.0741	530.1037	502.4956	485.7985	466.9637	465.5575	479.7137	493.6920	522.4901	539.9301 (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
Northeast				12.5900	11.2829		0.6300		0.7000		0.7700		43.4130 (75)
Southwest				5.5300	36.7938		0.6300		0.7000		0.7700		62.1830 (79)
Northwest				1.8900	11.2829		0.6300		0.7000		0.7700		6.5171 (81)
Northeast				2.7400	17.4137		0.6300		0.7000		1.0000		18.9375 (82)
Solar gains	131.0507	247.1074	401.8368	605.2212	776.2213	813.9534	766.6925	632.4283	471.1796	290.2611	161.3098	109.3469	(83)
Total gains	684.0790	817.4616	946.9109	1135.3250	1278.7168	1299.7520	1233.6562	1097.9858	950.8933	783.9531	683.7999	649.2770	(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	83.2034	83.4518	83.6968	84.8668	85.0894	86.1409	86.3385	85.7328	85.0894	84.6404	84.1760		
alpha	6.5469	6.5635	6.5798	6.6578	6.6726	6.7427	6.7559	6.7155	6.6726	6.6427	6.6117		
util living area	0.9997	0.9988	0.9948	0.9643	0.8397	0.6163	0.4527	0.5284	0.8356	0.9882	0.9990	0.9998 (86)	
MIT	19.9075	20.0641	20.3098	20.6617	20.9101	20.9903	20.9989	20.9972	20.9365	20.5914	20.1929	19.8893 (87)	
Th 2	20.0129	20.0156	20.0182	20.0304	20.0327	20.0433	20.0433	20.0453	20.0392	20.0327	20.0280	20.0232 (88)	
util rest of house	0.9995	0.9983	0.9924	0.9478	0.7827	0.5293	0.3550	0.4208	0.7555	0.9803	0.9985	0.9997 (89)	
MIT 2	19.0140	19.1726	19.4190	19.7690	19.9802	20.0399	20.0431	20.0448	20.0095	19.7097	19.3116	19.0043 (90)	
Living area fraction									fLA = Living area / (4) =			0.2142 (91)	
MIT	19.2054	19.3635	19.6098	19.9602	20.1793	20.2435	20.2478	20.2487	20.2081	19.8985	19.5004	19.1939 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.2054	19.3635	19.6098	19.9602	20.1793	20.2435	20.2478	20.2487	20.2081	19.8985	19.5004	19.1939 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9993	0.9977	0.9910	0.9463	0.7922	0.5480	0.3760	0.4440	0.7712	0.9788	0.9980	0.9995 (94)	
Ext temp.	683.6313	815.6209	938.3550	1074.3505	1013.0203	712.2135	463.8069	487.5034	733.3419	767.3073	682.4465	648.9782 (95)	
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)	
Space heating kWh	1963.7439	1899.8545	1716.9957	1428.5883	1092.3690	718.1592	464.2047	488.6481	780.9786	1197.8995	1605.9823	1952.5763 (97)	
Space heating requirement - total per year (kWh/year)	952.4038	728.6050	579.3086	255.0512	59.0355	0.0000	0.0000	0.0000	0.0000	320.3606	664.9458	969.8770 (98a)	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)	
Solar heating contribution - total per year (kWh/year)	952.4038	728.6050	579.3086	255.0512	59.0355	0.0000	0.0000	0.0000	0.0000	320.3606	664.9458	969.8770 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												4529.5874	
Space heating per m2												(98c) / (4) =	37.3113 (99)

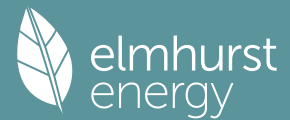
8c. Space cooling requirement

Calculated for June, July and August. See Table 10b													
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	1196.1925	941.6834	964.9210	0.0000	0.0000	0.0000	0.0000 (100)	
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1116.9331	915.2971	912.6215	0.0000	0.0000	0.0000	0.0000 (101)	
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1426.0931	1353.7703	1204.2668	0.0000	0.0000	0.0000	0.0000 (102)	
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	222.5952	326.2241	216.9841	0.0000	0.0000	0.0000	0.0000 (104)	
Cooled fraction									fC = cooled area / (4) =			1.0000 (105)	
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)	
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	55.6488	81.5560	54.2460	0.0000	0.0000	0.0000	0.0000 (107)	
Space cooling requirement												191.4508 (107)	
Energy for space heating												37.3113 (99)	
Energy for space cooling												1.5770 (108)	

Total
Fabric Energy Efficiency (TFEE)

38.8883 (109)
38.9 (109)

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Property Reference	Plot 002	Issued on Date	28/09/2023
Assessment Reference	Vaillant ASHP	Prop Type Ref	
Property	2, UB9 6NL		
SAP Rating	81 B	DER	4.09
Environmental	96 A	TER	8.94
CO ₂ Emissions (t/year)	0.45	% DER < TER	54.25
Compliance Check	See BREL	DFEE	30.71
% DPER < TPER	7.80	TFEE	31.84
		% DFEE < TFEE	3.54
		DPER	42.79
		TPER	46.41
Assessor Details	Mr. Michael Woodbridge	Assessor ID	M818-0001
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	49.8400 (1b)	x 2.7000 (2b)	= 134.5680 (1b) -
First floor	47.0000 (1c)	x 2.7000 (2c)	= 126.9000 (1c) -
Second floor	24.5600 (1d)	x 1.5000 (2d)	= 36.8400 (1d) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	121.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 298.3080 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

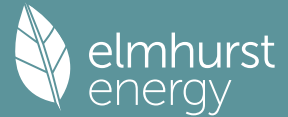
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1341 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	3.0000 (17)	
Infiltration rate	0.2841 (18)	
Number of sides sheltered	1 (19)	
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2628 (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	0.3350	0.3285	0.3219	0.2891	0.2825	0.2496	0.2496	0.2431	0.2628	0.2825	0.2956	0.3088 (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	0.5561	0.5539	0.5518	0.5418	0.5399	0.5312	0.5312	0.5295	0.5345	0.5399	0.5437	0.5477 (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 foor			2.1200	1.2000	2.5440		(26)
window (Uw = 1.20)			18.1200	1.1450	20.7481		(27)
rooflight			2.7400	1.1450	3.1374		(27a)
ground floor			49.8400	0.1100	5.4824	110.0000	5482.4000 (28a)

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External Wall 1	54.2800	18.2100	36.0700	0.1600	5.7712	190.0000	6853.3000 (29a)
Dormer	3.9200	2.0300	1.8900	0.1800	0.3402	9.0000	17.0100 (29a)
Sloping ceiling	59.2400	2.7400	56.5000	0.1100	6.2150	9.0000	508.5000 (30)
Flat roof	6.2500		6.2500	0.1100	0.6875	9.0000	56.2500 (30)
Total net area of external elements Aum(A, m2)			173.5300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	44.9258			(33)
Party Wall 1			140.0000	0.0000	0.0000	180.0000	25200.0000 (32)
Internal Wall 1			150.0000			75.0000	11250.0000 (32c)
Internal Floor 1			94.0000			18.0000	1692.0000 (32d)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 51059.4600 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 420.5886 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	14.4600	0.0500	0.7230
E3 Sill	13.4500	0.0400	0.5380
E4 Jamb	31.5000	0.0400	1.2600
E5 Ground floor (normal)	10.0000	0.1050	1.0500
R1 Head of roof window	2.6000	0.2400	0.6240
R2 Sill of roof window	2.6000	0.2400	0.6240
R3 Jamb of roof window	6.1600	0.2400	1.4784
E6 Intermediate floor within a dwelling	20.0000	0.0500	1.0000
E11 Eaves (insulation at rafter level)	10.0000	0.0800	0.8000
E16 Corner (normal)	10.8000	0.0800	0.8640
P1 Party wall - Ground floor	10.0000	0.1600	1.6000
P2 Party wall - Intermediate floor within a dwelling	20.0000	0.0000	0.0000
R8 Roof to wall (rafter)	12.2000	0.0600	0.7320
R4 Ridge (vaulted ceiling)	5.0000	0.1200	0.6000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.8934 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 56.8192 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	54.7462	54.5317	54.3213	53.3335	53.1487	52.2884	52.2884	52.1290	52.6198	53.1487	53.5226	53.9135 (38)
Heat transfer coeff	111.5654	111.3509	111.1405	110.1527	109.9679	109.1076	109.1076	108.9482	109.4390	109.9679	110.3418	110.7327 (39)
Average = Sum(39)m / 12 =												110.1518

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9190	0.9172	0.9155	0.9074	0.9058	0.8987	0.8987	0.8974	0.9015	0.9058	0.9089	0.9121 (40)
HLP (average)												0.9073
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

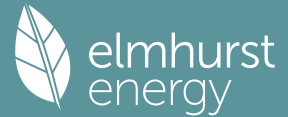
Assumed occupancy												2.8686 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	31.2216	30.7579	30.1049	28.9010	27.9995	26.9998	26.4599	27.1083	27.8143	28.8839	30.1127	31.1160 (42b)
Hot water usage for other uses	44.0070	42.4067	40.8065	39.2062	37.6060	36.0057	36.0057	37.6060	39.2062	40.8065	42.4067	44.0070 (42c)
Average daily hot water use (litres/day)												68.9537 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	75.2285	73.1646	70.9114	68.1072	65.6054	63.0055	62.4656	64.7143	67.0205	69.6904	72.5194	75.1230 (44)
Energy conte	119.1436	104.1854	108.9882	93.2353	88.3175	77.4727	75.5467	80.1298	82.6430	94.5692	103.3171	117.6244 (45)
Energy content (annual)										Total = Sum(45)m =		1145.1729
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	101.2721	88.5576	92.6399	79.2500	75.0699	65.8518	64.2147	68.1103	70.2465	80.3838	87.8196	99.9808 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	101.2721	88.5576	92.6399	79.2500	75.0699	65.8518	64.2147	68.1103	70.2465	80.3838	87.8196	99.9808 (64)
Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		973.3970 (64)
Electric shower(s)	57.9132	51.6012	56.3465	53.7708	54.7798	52.2546	53.9964	54.7798	53.7708	56.3465	55.2870	57.9132 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												658.7598 (64a)
Heat gains from water heating, kWh/month	39.7963	35.0397	37.2466	33.2552	32.4624	29.5266	29.5528	30.7225	31.0043	34.1826	35.7766	39.4735 (65)

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

Metabolic gains (Table 5), Watts

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	145.9669	161.6062	145.9669	150.8325	145.9669	150.8325	145.9669	145.9669	150.8325	145.9669	150.8325	145.9669	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	287.0247	290.0031	282.4976	266.5193	246.3494	227.3927	214.7284	211.7500	219.2555	235.2338	255.4036	274.3604	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	(71)
Water heating gains (Table 5)	53.4897	52.1424	50.0626	46.1878	43.6323	41.0092	39.7215	41.2937	43.0616	45.9443	49.6898	53.0558	(72)
Total internal gains	552.5098	569.7802	544.5556	529.5680	501.9771	485.2627	466.4452	465.0390	479.1780	493.1735	521.9543	539.4116	(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				

Northeast			12.5900	11.2829	0.5000	0.8000	0.7700	39.3769 (75)				
Southwest			5.5300	36.7938	0.5000	0.8000	0.7700	56.4019 (79)				
Northeast			2.7400	17.4137	0.7600	0.7000	1.0000	22.8453 (82)				

Solar gains	118.6240	223.9400	364.8886	550.7444	707.3396	742.1310	698.8777	575.8727	428.2351	263.2347	146.0597	98.9498 (83)
Total gains	671.1338	793.7202	909.4442	1080.3123	1209.3167	1227.3938	1165.3229	1040.9117	907.4131	756.4082	668.0141	638.3613 (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, n _{l,m} (see Table 9a)														
Jan	127.1289	127.3738	127.6148	128.7593	128.9757	129.9927	129.9927	130.1828	129.5990	128.9757	128.5386	128.0849		
Feb	9.4753	9.4916	9.5077	9.5840	9.5984	9.6662	9.6662	9.6789	9.6399	9.5984	9.5692	9.5390		
util living area	1.0000	0.9998	0.9981	0.9716	0.8142	0.5679	0.4119	0.4813	0.8045	0.9935	0.9998	1.0000	(86)	
MIT	20.2970	20.4106	20.5848	20.8328	20.9775	20.9992	21.0000	20.9999	20.9852	20.7684	20.4888	20.2788	(87)	
Th 2	20.1514	20.1529	20.1544	20.1613	20.1625	20.1686	20.1686	20.1697	20.1662	20.1625	20.1599	20.1572	(88)	
util rest of house	0.9999	0.9996	0.9969	0.9553	0.7542	0.4947	0.3341	0.3945	0.7216	0.9877	0.9997	1.0000	(89)	
MIT 2	19.5043	19.6191	19.7939	20.0382	20.1516	20.1684	20.1686	20.1697	20.1609	19.9827	19.7034	19.4911	(90)	
Living area fraction									f _{LA} = Living area / (4) =			0.2142	(91)	
MIT	19.6740	19.7886	19.9633	20.2084	20.3285	20.3463	20.3466	20.3475	20.3374	20.1510	19.8716	19.6598	(92)	
Temperature adjustment												0.0000		
adjusted MIT	19.6740	19.7886	19.9633	20.2084	20.3285	20.3463	20.3466	20.3475	20.3374	20.1510	19.8716	19.6598	(93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9999	0.9995	0.9965	0.9564	0.7668	0.5104	0.3508	0.4131	0.7397	0.9876	0.9996	0.9999	(94)
Useful gains	671.0775	793.3394	906.2920	1033.2633	927.2872	626.5013	408.7744	430.0211	671.1889	747.0561	667.7364	638.3286	(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	1715.2113	1657.8581	1496.3189	1245.6466	948.8586	626.9659	408.7850	430.0697	682.6156	1050.3022	1409.2381	1711.9020	(97)
Space heating kWh	776.8356	580.9566	438.9800	152.9159	16.0491	0.0000	0.0000	0.0000	0.0000	225.6151	533.8812	798.7386	(98a)
Space heating requirement - total per year (kWh/year)												3523.9721	
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	776.8356	580.9566	438.9800	152.9159	16.0491	0.0000	0.0000	0.0000	0.0000	225.6151	533.8812	798.7386	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3523.9721	
Space heating per m2										(98c) / (4) =		29.0278	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b													
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	1025.6110	807.3959	828.0066	0.0000	0.0000	0.0000	0.0000	(100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.9808	0.9953	0.9866	0.0000	0.0000	0.0000	0.0000	(101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1005.9085	803.6412	816.9341	0.0000	0.0000	0.0000	0.0000	(102)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	1335.7129	1268.4987	1133.4096	0.0000	0.0000	0.0000	0.0000	(103)
	0.0000	0.0000	0.0000	0.0000	0.0000	237.4591	345.8540	235.4578	0.0000	0.0000	0.0000	0.0000	(104)

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Cooled fraction	fC = cooled area / (4) =										1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	59.3648	86.4635	58.8644	0.0000	0.0000	0.0000 (107)
Space cooling requirement											204.6927 (107)
Energy for space heating											29.0278 (99)
Energy for space cooling											1.6861 (108)
Total											30.7139 (109)
Fabric Energy Efficiency (DFEE)											30.7 (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 (m ²)	Storey height (m)	Volume (m ³)
Ground floor	49.8400 (1b)	x 2.7000 (2b)	= 134.5680 (1b) -
First floor	47.0000 (1c)	x 2.7000 (2c)	= 126.9000 (1c) -
Second floor	24.5600 (1d)	x 1.5000 (2d)	= 36.8400 (1d) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	121.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	298.3080 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour 40.0000 / (5) = 0.1341 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3841 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3553 (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	0.4530	0.4441	0.4352	0.3908	0.3819	0.3375	0.3375	0.3286	0.3553	0.3819	0.3997	0.4175 (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	0.6026	0.5986	0.5947	0.5764	0.5729	0.5570	0.5570	0.5540	0.5631	0.5729	0.5799	0.5871 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.20)			18.1200	1.1450	20.7481		(27)
rooflight			2.7400	1.5038	4.1203		(27a)
ground floor			49.8400	0.1300	6.4792		(28a)
External Wall 1	54.2800	18.2100	36.0700	0.1800	6.4926		(29a)
Dormer	3.9200	2.0300	1.8900	0.1800	0.3402		(29a)
Sloping ceiling	59.2400	2.7400	56.5000	0.1100	6.2150		(30)
Flat roof	6.2500		6.2500	0.1100	0.6875		(30)
Total net area of external elements Aum(A, m ²)					173.5300		(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	47.2029		(33)
Party Wall 1				140.0000	0.0000	0.0000	(32)

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

420.5886 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	14.4600	0.0500	0.7230
E2 Other lintels (including other steel lintels)	13.4500	0.0500	0.6725
E3 Sill	31.5000	0.0500	1.5750
E4 Jamb	10.0000	0.1600	1.6000
E5 Ground floor (normal)	2.6000	0.0800	0.2080
R1 Head of roof window	2.6000	0.0600	0.1560
R2 Sill of roof window	6.1600	0.0800	0.4928
R3 Jamb of roof window	20.0000	0.0000	0.0000
E6 Intermediate floor within a dwelling	10.0000	0.0400	0.4000
E11 Eaves (insulation at rafter level)	10.8000	0.0900	0.9720
E16 Corner (normal)	10.0000	0.0800	0.8000
P1 Party wall - Ground floor	20.0000	0.0000	0.0000
P2 Party wall - Intermediate floor within a dwelling	12.2000	0.0600	0.7320
R8 Roof to wall (rafter)	5.0000	0.0800	0.4000
R4 Ridge (vaulted ceiling)			

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

Point Thermal bridges	(36a) =	8.7313 (36)
Total fabric heat loss	(33) + (36) + (36a) =	55.9342 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	59.3207	58.9285	58.5441	56.7385	56.4007	54.8280	54.8280	54.5368	55.4338	56.4007	57.0841	57.7986	(38)
Heat transfer coeff	115.2549	114.8627	114.4783	112.6727	112.3348	110.7622	110.7622	110.4710	111.3680	112.3348	113.0183	113.7328	(39)
Average = Sum(39)m / 12 =												112.6711	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9494	0.9462	0.9430	0.9281	0.9253	0.9124	0.9124	0.9100	0.9174	0.9253	0.9310	0.9368	(40)
HLP (average)												0.9281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

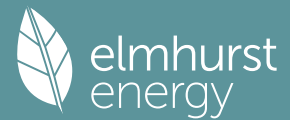
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8686 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	31.2216	30.7579	30.1049	28.9010	27.9995	26.9998	26.4599	27.1083	27.8143	28.8839	30.1127	31.1160	(42b)
Hot water usage for other uses	44.0070	42.4067	40.8065	39.2062	37.6060	36.0057	36.0057	37.6060	39.2062	40.8065	42.4067	44.0070	(42c)
Average daily hot water use (litres/day)												68.9537	(43)
Daily hot water use	75.2285	73.1646	70.9114	68.1072	65.6054	63.0055	62.4656	64.7143	67.0205	69.6904	72.5194	75.1230	(44)
Energy conte	119.1436	104.1854	108.9882	93.2353	88.3175	77.4727	75.5467	80.1298	82.6430	94.5692	103.3171	117.6244	(45)
Energy content (annual)										Total = Sum(45)m =		1145.1729	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	101.2721	88.5576	92.6399	79.2500	75.0699	65.8518	64.2147	68.1103	70.2465	80.3838	87.8196	99.9808	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	101.2721	88.5576	92.6399	79.2500	75.0699	65.8518	64.2147	68.1103	70.2465	80.3838	87.8196	99.9808	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		973.3970	(64)
Electric shower(s)	57.9132	51.6012	56.3465	53.7708	54.7798	52.2546	53.9964	54.7798	53.7708	56.3465	55.2870	57.9132	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												658.7598	(64a)
Heat gains from water heating, kWh/month	39.7963	35.0397	37.2466	33.2552	32.4624	29.5266	29.5528	30.7225	31.0043	34.1826	35.7766	39.4735	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	148.3455	164.2396	148.3455	153.2903	148.3455	153.2903	148.3455	148.3455	153.2903	148.3455	153.2903	148.3455	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	287.0247	290.0031	282.4976	266.5193	246.3494	227.3927	214.7284	211.7500	219.2555	235.2338	255.4036	274.3604	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	(71)

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Water heating gains (Table 5)	53.4897	52.1424	50.0626	46.1878	43.6323	41.0092	39.7215	41.2937	43.0616	45.9443	49.6898	53.0558 (72)
Total internal gains	554.8883	572.4136	546.9342	532.0258	504.3557	487.7206	468.8238	467.4176	481.6358	495.5521	524.4122	541.7901 (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
Northeast			12.5900		11.2829		0.6300		0.7000		0.7700		43.4130 (75)
Southwest			5.5300		36.7938		0.6300		0.7000		0.7700		62.1830 (79)
Northeast			2.7400		17.4137		0.6300		0.7000		1.0000		18.9375 (82)
Solar gains	124.5336	233.8416	377.9361	565.9693	723.4590	757.7033	714.0717	590.4784	442.0562	274.0492	153.1096	104.0247	(83)
Total gains	679.4219	806.2552	924.8702	1097.9952	1227.8147	1245.4239	1182.8954	1057.8960	923.6920	769.6013	677.5218	645.8149	(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)												
tau	123.0592	123.4794	123.8941	125.8795	126.2581	128.0508	128.0508	128.3883	127.3543	126.2581	125.4946	124.7062
alpha	9.2039	9.2320	9.2596	9.3920	9.4172	9.5367	9.5367	9.5592	9.4903	9.4172	9.3663	9.3137
util living area	1.0000	0.9997	0.9980	0.9715	0.8168	0.5680	0.4119	0.4801	0.8034	0.9932	0.9998	1.0000 (86)
MIT	20.2683	20.3868	20.5667	20.8253	20.9754	20.9992	21.0000	20.9999	20.9845	20.7620	20.4738	20.2557 (87)
Th 2	20.1257	20.1284	20.1311	20.1437	20.1460	20.1570	20.1570	20.1590	20.1528	20.1460	20.1413	20.1363 (88)
util rest of house	0.9999	0.9996	0.9968	0.9551	0.7561	0.4939	0.3331	0.3925	0.7195	0.9872	0.9996	1.0000 (89)
MIT 2	19.4532	19.5740	19.7556	20.0151	20.1340	20.1568	20.1570	20.1590	20.1472	19.9618	19.6722	19.4498 (90)
Living area fraction	19.6278	19.7481	19.9293	20.1886	20.3142	20.3372	20.3375	20.3391	20.3265	20.1332	19.8439	19.6224 (92)
MIT	19.6278	19.7481	19.9293	20.1886	20.3142	20.3372	20.3375	20.3391	20.3265	20.1332	19.8439	19.6224 (93)
Temperature adjustment												0.0000
adjusted MIT	19.6278	19.7481	19.9293	20.1886	20.3142	20.3372	20.3375	20.3391	20.3265	20.1332	19.8439	19.6224 (93)

8. Space heating requirement

Utilisation	0.9999	0.9995	0.9964	0.9561	0.7688	0.5098	0.3500	0.4113	0.7378	0.9871	0.9995	0.9999 (94)
Useful gains	679.3586	805.8337	921.5190	1049.8060	943.9050	634.9545	413.9648	435.1028	681.4648	759.6379	677.2147	645.7778 (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	1766.6025	1705.4930	1537.3683	1271.9213	967.6734	635.4633	413.9769	435.1554	693.4302	1070.9090	1440.2881	1754.0291 (97)
Space heating kWh	808.9095	604.5711	458.1919	159.9230	17.6837	0.0000	0.0000	0.0000	0.0000	231.5857	549.4129	824.5390 (98a)
Space heating requirement - total per year (kWh/year)												3654.8167
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	808.9095	604.5711	458.1919	159.9230	17.6837	0.0000	0.0000	0.0000	0.0000	231.5857	549.4129	824.5390 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3654.8167
Space heating per m2												(98c) / (4) = 30.1056 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
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	1041.1646	819.6402	839.5793	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9805	0.9952	0.9866	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1020.8968	815.7116	828.3543	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1360.5089	1292.4413	1155.4630	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	244.5207	354.6869	243.3689	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fc = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	61.1302	88.6717	60.8422	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												210.6441 (107)
Energy for space heating												30.1056 (99)
Energy for space cooling												1.7351 (108)
Total												31.8407 (109)
Fabric Energy Efficiency (TFEE)												31.8 (109)

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Property Reference	Plot 003	Issued on Date	28/09/2023
Assessment Reference	Vaillant ASHP	Prop Type Ref	
Property	3, UB9 6NL		
SAP Rating	81 B	DER	4.08
Environmental	96 A	TER	8.94
CO ₂ Emissions (t/year)	0.44	% DER < TER	54.36
Compliance Check	See BREL	DFEE	30.71
% DPER < TPER	8.21	TFEE	31.84
		% DFEE < TFEE	3.54
		TPER	46.41
Assessor Details	Mr. Michael Woodbridge	Assessor ID	M818-0001
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	49.8400 (1b)	x 2.7000 (2b)	= 134.5680 (1b) -
First floor	47.0000 (1c)	x 2.7000 (2c)	= 126.9000 (1c) -
Second floor	24.5600 (1d)	x 1.5000 (2d)	= 36.8400 (1d) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	121.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 298.3080 (5)

2. Ventilation rate

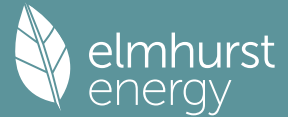
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(7a)+(7b)+(7c) =	Air changes per hour 40.0000 / (5) = 0.1341 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.2841 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2628 (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	0.3350	0.3285	0.3219	0.2891	0.2825	0.2496	0.2496	0.2431	0.2628	0.2825	0.2956	0.3088 (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	0.5561	0.5539	0.5518	0.5418	0.5399	0.5312	0.5312	0.5295	0.5345	0.5399	0.5437	0.5477 (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 floor			2.1200	1.2000	2.5440		(26)
window (Uw = 1.20)			18.1200	1.1450	20.7481		(27)
rooflight			2.7400	1.1450	3.1374		(27a)
ground floor			49.8400	0.1100	5.4824	110.0000	5482.4000 (28a)

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External Wall 1	54.2800	18.2100	36.0700	0.1600	5.7712	190.0000	6853.3000 (29a)
Dormer	3.9200	2.0300	1.8900	0.1800	0.3402	9.0000	17.0100 (29a)
Sloping ceiling	59.2400	2.7400	56.5000	0.1100	6.2150	9.0000	508.5000 (30)
Flat roof	6.2500		6.2500	0.1100	0.6875	9.0000	56.2500 (30)
Total net area of external elements Aum(A, m2)			173.5300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	44.9258			(33)
Party Wall 1			140.0000	0.0000	0.0000	180.0000	25200.0000 (32)
Internal Wall 1			150.0000			75.0000	11250.0000 (32c)
Internal Floor 1			94.0000			18.0000	1692.0000 (32d)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 51059.4600 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 420.5886 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	14.4600	0.0500	0.7230
E3 Sill	13.4500	0.0400	0.5380
E4 Jamb	31.5000	0.0400	1.2600
E5 Ground floor (normal)	10.0000	0.1050	1.0500
R1 Head of roof window	2.6000	0.2400	0.6240
R2 Sill of roof window	2.6000	0.2400	0.6240
R3 Jamb of roof window	6.1600	0.2400	1.4784
E6 Intermediate floor within a dwelling	20.0000	0.0500	1.0000
E11 Eaves (insulation at rafter level)	10.0000	0.0800	0.8000
E16 Corner (normal)	10.8000	0.0800	0.8640
P1 Party wall - Ground floor	10.0000	0.1600	1.6000
P2 Party wall - Intermediate floor within a dwelling	20.0000	0.0000	0.0000
R8 Roof to wall (rafter)	12.2000	0.0600	0.7320
R4 Ridge (vaulted ceiling)	5.0000	0.1200	0.6000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.8934 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 56.8192 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	54.7462	54.5317	54.3213	53.3335	53.1487	52.2884	52.2884	52.1290	52.6198	53.1487	53.5226	53.9135 (38)
Heat transfer coeff	111.5654	111.3509	111.1405	110.1527	109.9679	109.1076	109.1076	108.9482	109.4390	109.9679	110.3418	110.7327 (39)
Average = Sum(39)m / 12 =												110.1518

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9190	0.9172	0.9155	0.9074	0.9058	0.8987	0.8987	0.8974	0.9015	0.9058	0.9089	0.9121 (40)
HLP (average)												0.9073
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

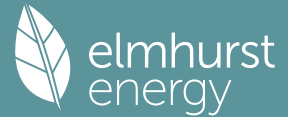
Assumed occupancy												2.8686 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	31.2216	30.7579	30.1049	28.9010	27.9995	26.9998	26.4599	27.1083	27.8143	28.8839	30.1127	31.1160 (42b)
Hot water usage for other uses	44.0070	42.4067	40.8065	39.2062	37.6060	36.0057	36.0057	37.6060	39.2062	40.8065	42.4067	44.0070 (42c)
Average daily hot water use (litres/day)												68.9537 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	75.2285	73.1646	70.9114	68.1072	65.6054	63.0055	62.4656	64.7143	67.0205	69.6904	72.5194	75.1230 (44)
Energy conte	119.1436	104.1854	108.9882	93.2353	88.3175	77.4727	75.5467	80.1298	82.6430	94.5692	103.3171	117.6244 (45)
Energy content (annual)										Total = Sum(45)m =		1145.1729
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	101.2721	88.5576	92.6399	79.2500	75.0699	65.8518	64.2147	68.1103	70.2465	80.3838	87.8196	99.9808 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	101.2721	88.5576	92.6399	79.2500	75.0699	65.8518	64.2147	68.1103	70.2465	80.3838	87.8196	99.9808 (64)
Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		973.3970 (64)
Electric shower(s)	57.9132	51.6012	56.3465	53.7708	54.7798	52.2546	53.9964	54.7798	53.7708	56.3465	55.2870	57.9132 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												658.7598 (64a)
Heat gains from water heating, kWh/month	39.7963	35.0397	37.2466	33.2552	32.4624	29.5266	29.5528	30.7225	31.0043	34.1826	35.7766	39.4735 (65)

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

Metabolic gains (Table 5), Watts

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	145.9669	161.6062	145.9669	150.8325	145.9669	150.8325	145.9669	145.9669	150.8325	145.9669	150.8325	145.9669	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	287.0247	290.0031	282.4976	266.5193	246.3494	227.3927	214.7284	211.7500	219.2555	235.2338	255.4036	274.3604	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	(71)
Water heating gains (Table 5)	53.4897	52.1424	50.0626	46.1878	43.6323	41.0092	39.7215	41.2937	43.0616	45.9443	49.6898	53.0558	(72)
Total internal gains	552.5098	569.7802	544.5556	529.5680	501.9771	485.2627	466.4452	465.0390	479.1780	493.1735	521.9543	539.4116	(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				
Northeast			12.5900	11.2829	0.5000	0.8000	0.7700	39.3769 (75)				
Southwest			5.5300	36.7938	0.5000	0.8000	0.7700	56.4019 (79)				
Northeast			2.7400	17.4137	0.7600	0.7000	1.0000	22.8453 (82)				
Solar gains	118.6240	223.9400	364.8886	550.7444	707.3396	742.1310	698.8777	575.8727	428.2351	263.2347	146.0597	98.9498 (83)
Total gains	671.1338	793.7202	909.4442	1080.3123	1209.3167	1227.3938	1165.3229	1040.9117	907.4131	756.4082	668.0141	638.3613 (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, n _{l,m} (see Table 9a)													
Jan	127.1289	127.3738	127.6148	128.7593	128.9757	129.9927	129.9927	130.1828	129.5990	128.9757	128.5386	128.0849	
Feb	9.4753	9.4916	9.5077	9.5840	9.5984	9.6662	9.6662	9.6789	9.6399	9.5984	9.5692	9.5390	
util living area	1.0000	0.9998	0.9981	0.9716	0.8142	0.5679	0.4119	0.4813	0.8045	0.9935	0.9998	1.0000	(86)
MIT	20.2970	20.4106	20.5848	20.8328	20.9775	20.9992	21.0000	20.9999	20.9852	20.7684	20.4888	20.2788	(87)
Th 2	20.1514	20.1529	20.1544	20.1613	20.1625	20.1686	20.1686	20.1697	20.1662	20.1625	20.1599	20.1572	(88)
util rest of house	0.9999	0.9996	0.9969	0.9553	0.7542	0.4947	0.3341	0.3945	0.7216	0.9877	0.9997	1.0000	(89)
MIT 2	19.5043	19.6191	19.7939	20.0382	20.1516	20.1684	20.1686	20.1697	20.1609	19.9827	19.7034	19.4911	(90)
Living area fraction									f _{LA} = Living area / (4) =			0.2142	(91)
MIT	19.6740	19.7886	19.9633	20.2084	20.3285	20.3463	20.3466	20.3475	20.3374	20.1510	19.8716	19.6598	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6740	19.7886	19.9633	20.2084	20.3285	20.3463	20.3466	20.3475	20.3374	20.1510	19.8716	19.6598	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9999	0.9995	0.9965	0.9564	0.7668	0.5104	0.3508	0.4131	0.7397	0.9876	0.9996	0.9999	(94)
Useful gains	671.0775	793.3394	906.2920	1033.2633	927.2872	626.5013	408.7744	430.0211	671.1889	747.0561	667.7364	638.3286	(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	1715.2113	1657.8581	1496.3189	1245.6466	948.8586	626.9659	408.7850	430.0697	682.6156	1050.3022	1409.2381	1711.9020	(97)
Space heating kWh	776.8356	580.9566	438.9800	152.9159	16.0491	0.0000	0.0000	0.0000	0.0000	225.6151	533.8812	798.7386	(98a)
Space heating requirement - total per year (kWh/year)												3523.9721	
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	776.8356	580.9566	438.9800	152.9159	16.0491	0.0000	0.0000	0.0000	0.0000	225.6151	533.8812	798.7386	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3523.9721	
Space heating per m2										(98c) / (4) =		29.0278	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b													
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	1025.6110	807.3959	828.0066	0.0000	0.0000	0.0000	0.0000	(100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.9808	0.9953	0.9866	0.0000	0.0000	0.0000	0.0000	(101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1005.9085	803.6412	816.9341	0.0000	0.0000	0.0000	0.0000	(102)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	1335.7129	1268.4987	1133.4096	0.0000	0.0000	0.0000	0.0000	(103)
	0.0000	0.0000	0.0000	0.0000	0.0000	237.4591	345.8540	235.4578	0.0000	0.0000	0.0000	0.0000	(104)

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Cooled fraction	fC = cooled area / (4) =										1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	59.3648	86.4635	58.8644	0.0000	0.0000	0.0000 (107)
Space cooling requirement											204.6927 (107)
Energy for space heating											29.0278 (99)
Energy for space cooling											1.6861 (108)
Total											30.7139 (109)
Fabric Energy Efficiency (DFEE)											30.7 (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 (m ²)	Storey height (m)	Volume (m ³)
Ground floor	49.8400 (1b)	x 2.7000 (2b)	= 134.5680 (1b) -
First floor	47.0000 (1c)	x 2.7000 (2c)	= 126.9000 (1c) -
Second floor	24.5600 (1d)	x 1.5000 (2d)	= 36.8400 (1d) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	121.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	298.3080 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour 40.0000 / (5) = 0.1341 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3841 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3553 (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	0.4530	0.4441	0.4352	0.3908	0.3819	0.3375	0.3375	0.3286	0.3553	0.3819	0.3997	0.4175 (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	0.6026	0.5986	0.5947	0.5764	0.5729	0.5570	0.5570	0.5540	0.5631	0.5729	0.5799	0.5871 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.20)			18.1200	1.1450	20.7481		(27)
rooflight			2.7400	1.5038	4.1203		(27a)
ground floor			49.8400	0.1300	6.4792		(28a)
External Wall 1	54.2800	18.2100	36.0700	0.1800	6.4926		(29a)
Dormer	3.9200	2.0300	1.8900	0.1800	0.3402		(29a)
Sloping ceiling	59.2400	2.7400	56.5000	0.1100	6.2150		(30)
Flat roof	6.2500		6.2500	0.1100	0.6875		(30)
Total net area of external elements Aum(A, m ²)					173.5300		(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	47.2029		(33)
Party Wall 1				140.0000	0.0000	0.0000	(32)

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

420.5886 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	14.4600	0.0500	0.7230
E2 Other lintels (including other steel lintels)	13.4500	0.0500	0.6725
E3 Sill	31.5000	0.0500	1.5750
E4 Jamb	10.0000	0.1600	1.6000
E5 Ground floor (normal)	2.6000	0.0800	0.2080
R1 Head of roof window	2.6000	0.0600	0.1560
R2 Sill of roof window	6.1600	0.0800	0.4928
R3 Jamb of roof window	20.0000	0.0000	0.0000
E6 Intermediate floor within a dwelling	10.0000	0.0400	0.4000
E11 Eaves (insulation at rafter level)	10.8000	0.0900	0.9720
E16 Corner (normal)	10.0000	0.0800	0.8000
P1 Party wall - Ground floor	20.0000	0.0000	0.0000
P2 Party wall - Intermediate floor within a dwelling	12.2000	0.0600	0.7320
R8 Roof to wall (rafter)	5.0000	0.0800	0.4000
R4 Ridge (vaulted ceiling)			
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.7313 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	55.9342 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	59.3207	58.9285	58.5441	56.7385	56.4007	54.8280	54.8280	54.5368	55.4338	56.4007	57.0841	57.7986 (38)
Heat transfer coeff	115.2549	114.8627	114.4783	112.6727	112.3348	110.7622	110.7622	110.4710	111.3680	112.3348	113.0183	113.7328 (39)
Average = Sum(39)m / 12 =												112.6711

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9494	0.9462	0.9430	0.9281	0.9253	0.9124	0.9124	0.9100	0.9174	0.9253	0.9310	0.9368 (40)
HLP (average)												0.9281
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

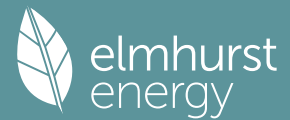
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8686 (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	0.0000 (42a)
Hot water usage for baths	31.2216	30.7579	30.1049	28.9010	27.9995	26.9998	26.4599	27.1083	27.8143	28.8839	30.1127	31.1160	31.1160 (42b)
Hot water usage for other uses	44.0070	42.4067	40.8065	39.2062	37.6060	36.0057	36.0057	37.6060	39.2062	40.8065	42.4067	44.0070	44.0070 (42c)
Average daily hot water use (litres/day)													68.9537 (43)
Daily hot water use	75.2285	73.1646	70.9114	68.1072	65.6054	63.0055	62.4656	64.7143	67.0205	69.6904	72.5194	75.1230	75.1230 (44)
Energy conte	119.1436	104.1854	108.9882	93.2353	88.3175	77.4727	75.5467	80.1298	82.6430	94.5692	103.3171	117.6244	117.6244 (45)
Energy content (annual)													
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	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	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	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	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	0.0000 (61)
Total heat required for water heating calculated for each month	101.2721	88.5576	92.6399	79.2500	75.0699	65.8518	64.2147	68.1103	70.2465	80.3838	87.8196	99.9808	99.9808 (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	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	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	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	0.0000 (63d)
Output from w/h	101.2721	88.5576	92.6399	79.2500	75.0699	65.8518	64.2147	68.1103	70.2465	80.3838	87.8196	99.9808	99.9808 (64)
12Total per year (kWh/year)													973.3970 (64)
Electric shower(s)	57.9132	51.6012	56.3465	53.7708	54.7798	52.2546	53.9964	54.7798	53.7708	56.3465	55.2870	57.9132	57.9132 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													658.7598 (64a)
Heat gains from water heating, kWh/month	39.7963	35.0397	37.2466	33.2552	32.4624	29.5266	29.5528	30.7225	31.0043	34.1826	35.7766	39.4735	39.4735 (65)

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

Metabolic gains (Table 5), Watts													
(66)m	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	148.3455	164.2396	148.3455	153.2903	148.3455	153.2903	148.3455	148.3455	153.2903	148.3455	153.2903	148.3455	148.3455 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	287.0247	290.0031	282.4976	266.5193	246.3494	227.3927	214.7284	211.7500	219.2555	235.2338	255.4036	274.3604	274.3604 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428 (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	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426 (71)

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Water heating gains (Table 5)	53.4897	52.1424	50.0626	46.1878	43.6323	41.0092	39.7215	41.2937	43.0616	45.9443	49.6898	53.0558 (72)
Total internal gains	554.8883	572.4136	546.9342	532.0258	504.3557	487.7206	468.8238	467.4176	481.6358	495.5521	524.4122	541.7901 (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			

Northeast			12.5900		11.2829	0.6300	0.7000	0.7700	43.4130 (75)			
Southwest			5.5300		36.7938	0.6300	0.7000	0.7700	62.1830 (79)			
Northeast			2.7400		17.4137	0.6300	0.7000	1.0000	18.9375 (82)			

Solar gains	124.5336	233.8416	377.9361	565.9693	723.4590	757.7033	714.0717	590.4784	442.0562	274.0492	153.1096	104.0247 (83)
Total gains	679.4219	806.2552	924.8702	1097.9952	1227.8147	1245.4239	1182.8954	1057.8960	923.6920	769.6013	677.5218	645.8149 (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)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	123.0592	123.4794	123.8941	125.8795	126.2581	128.0508	128.0508	128.3883	127.3543	126.2581	125.4946	124.7062
util living area	9.2039	9.2320	9.2596	9.3920	9.4172	9.5367	9.5367	9.5592	9.4903	9.4172	9.3663	9.3137
	1.0000	0.9997	0.9980	0.9715	0.8168	0.5680	0.4119	0.4801	0.8034	0.9932	0.9998	1.0000 (86)
MIT	20.2683	20.3868	20.5667	20.8253	20.9754	20.9992	21.0000	20.9999	20.9845	20.7620	20.4738	20.2557 (87)
Th 2	20.1257	20.1284	20.1311	20.1437	20.1460	20.1570	20.1570	20.1590	20.1528	20.1460	20.1413	20.1363 (88)
util rest of house	0.9999	0.9996	0.9968	0.9551	0.7561	0.4939	0.3331	0.3925	0.7195	0.9872	0.9996	1.0000 (89)
MIT 2	19.4532	19.5740	19.7556	20.0151	20.1340	20.1568	20.1570	20.1590	20.1472	19.9618	19.6722	19.4498 (90)
Living area fraction	19.6278	19.7481	19.9293	20.1886	20.3142	20.3372	20.3375	20.3391	20.3265	20.1332	19.8439	19.6224 (92)
MIT	19.6278	19.7481	19.9293	20.1886	20.3142	20.3372	20.3375	20.3391	20.3265	20.1332	19.8439	19.6224 (93)
Temperature adjustment												0.0000
adjusted MIT	19.6278	19.7481	19.9293	20.1886	20.3142	20.3372	20.3375	20.3391	20.3265	20.1332	19.8439	19.6224 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9999	0.9995	0.9964	0.9561	0.7688	0.5098	0.3500	0.4113	0.7378	0.9871	0.9995	0.9999 (94)
Ext temp.	679.3586	805.8337	921.5190	1049.8060	943.9050	634.9545	413.9648	435.1028	681.4648	759.6379	677.2147	645.7778 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Space heating kWh	1766.6025	1705.4930	1537.3683	1271.9213	967.6734	635.4633	413.9769	435.1554	693.4302	1070.9090	1440.2881	1754.0291 (97)
Space heating requirement - total per year (kWh/year)	808.9095	604.5711	458.1919	159.9230	17.6837	0.0000	0.0000	0.0000	0.0000	231.5857	549.4129	824.5390 (98a)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Space heating kWh	808.9095	604.5711	458.1919	159.9230	17.6837	0.0000	0.0000	0.0000	0.0000	231.5857	549.4129	824.5390 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3654.8167
Space heating per m2												(98c) / (4) = 30.1056 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	1041.1646	819.6402	839.5793	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.9805	0.9952	0.9866	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1020.8968	815.7116	828.3543	0.0000	0.0000	0.0000	0.0000 (102)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	1360.5089	1292.4413	1155.4630	0.0000	0.0000	0.0000	0.0000 (103)
Cooled fraction	0.0000	0.0000	0.0000	0.0000	0.0000	244.5207	354.6869	243.3689	0.0000	0.0000	0.0000	0.0000 (104)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	61.1302	88.6717	60.8422	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling requirement												210.6441 (107)
Energy for space heating												30.1056 (99)
Energy for space cooling												1.7351 (108)
Total												31.8407 (109)
Fabric Energy Efficiency (TFEE)												31.8 (109)

Full SAP Calculation Printout



Property Reference	Plot 004	Issued on Date	28/09/2023
Assessment Reference	Vaillant ASHP	Prop Type Ref	
Property	4, UB9 6NL		
SAP Rating	79 C	DER	4.64
Environmental	96 A	TER	10.51
CO ₂ Emissions (t/year)	0.51	% DER < TER	55.85
Compliance Check	See BREL	DFEE	37.52
% DPER < TPER	11.94	TFEE	38.89
		% DFEE < TFEE	3.51
		DPER	48.32
		TPER	54.87
Assessor Details	Mr. Michael Woodbridge	Assessor ID	M818-0001
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	49.8400 (1b)	x 2.7000 (2b)	= 134.5680 (1b) -
First floor	47.0000 (1c)	x 2.7000 (2c)	= 126.9000 (1c) -
Second floor	24.5600 (1d)	x 1.5000 (2d)	= 36.8400 (1d) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	121.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 298.3080 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

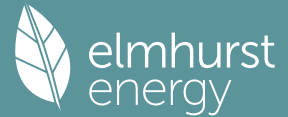
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour 40.0000 / (5) = 0.1341 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.2841 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2628 (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	0.3350	0.3285	0.3219	0.2891	0.2825	0.2496	0.2496	0.2431	0.2628	0.2825	0.2956	0.3088 (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	0.5561	0.5539	0.5518	0.5418	0.5399	0.5312	0.5312	0.5295	0.5345	0.5399	0.5437	0.5477 (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 foar			2.1200	1.2000	2.5440		(26)
window (Uw = 1.20)			20.0100	1.1450	22.9122		(27)
rooflight			2.7400	1.1450	3.1374		(27a)
ground floor			49.8400	0.1100	5.4824	110.0000	5482.4000 (28a)

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External Wall 1	120.6600	20.1000	100.5600	0.1600	16.0896	190.0000	19106.4000 (29a)
Dormer	3.9200	2.0300	1.8900	0.1800	0.3402	9.0000	17.0100 (29a)
Sloping ceiling	59.2400	2.7400	56.5000	0.1100	6.2150	9.0000	508.5000 (30)
Flat roof	6.2500		6.2500	0.1100	0.6875	9.0000	56.2500 (30)
Total net area of external elements Aum(A, m2)			239.9100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	57.4083			(33)
Party Wall 1			70.0000	0.0000	0.0000	180.0000	12600.0000 (32)
Internal Floor 1			94.0000			18.0000	1692.0000 (32d)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 39462.5600 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 325.0623 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	14.4600	0.0500	0.7230
E3 Sill	13.4500	0.0400	0.5380
E4 Jamb	31.5000	0.0400	1.2600
E5 Ground floor (normal)	20.9000	0.1050	2.1945
R1 Head of roof window	2.6000	0.2400	0.6240
R2 Sill of roof window	2.6000	0.2400	0.6240
R3 Jamb of roof window	6.1600	0.2400	1.4784
E6 Intermediate floor within a dwelling	40.0000	0.0500	2.0000
E11 Eaves (insulation at rafter level)	10.0000	0.0800	0.8000
E13 Gable (insulation at rafter level)	12.2000	0.1000	1.2200
E16 Corner (normal)	10.8000	0.0800	0.8640
P1 Party wall - Ground floor	10.0000	0.1600	1.6000
P2 Party wall - Intermediate floor within a dwelling	20.0000	0.0000	0.0000
R8 Roof to wall (rafter)	12.2000	0.0600	0.7320
R4 Ridge (vaulted ceiling)	5.0000	0.1200	0.6000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.2579 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 72.6662 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	54.7462	54.5317	54.3213	53.3335	53.1487	52.2884	52.2884	52.1290	52.6198	53.1487	53.5226	53.9135 (38)
Heat transfer coeff	127.4124	127.1979	126.9876	125.9998	125.8149	124.9546	124.9546	124.7953	125.2860	125.8149	126.1888	126.5797 (39)
Average = Sum(39)m / 12 =												125.9989

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0495	1.0478	1.0460	1.0379	1.0364	1.0293	1.0293	1.0280	1.0320	1.0364	1.0394	1.0427 (40)
HLP (average)												1.0379
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

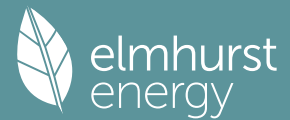
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8686 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	31.2216	30.7579	30.1049	28.9010	27.9995	26.9998	26.4599	27.1083	27.8143	28.8839	30.1127	31.1160 (42b)
Hot water usage for other uses	44.0070	42.4067	40.8065	39.2062	37.6060	36.0057	36.0057	37.6060	39.2062	40.8065	42.4067	44.0070 (42c)
Average daily hot water use (litres/day)												68.9537 (43)
Daily hot water use	75.2285	73.1646	70.9114	68.1072	65.6054	63.0055	62.4656	64.7143	67.0205	69.6904	72.5194	75.1230 (44)
Energy content (annual)	119.1436	104.1854	108.9882	93.2353	88.3175	77.4727	75.5467	80.1298	82.6430	94.5692	103.3171	117.6244 (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	1145.1729
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	101.2721	88.5576	92.6399	79.2500	75.0699	65.8518	64.2147	68.1103	70.2465	80.3838	87.8196	99.9808 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	101.2721	88.5576	92.6399	79.2500	75.0699	65.8518	64.2147	68.1103	70.2465	80.3838	87.8196	99.9808 (64)
12Total per year (kWh/year)												973.3970 (64)
Electric shower(s)	57.9132	51.6012	56.3465	53.7708	54.7798	52.2546	53.9964	54.7798	53.7708	56.3465	55.2870	57.9132 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												658.7598 (64a)
Heat gains from water heating, kWh/month	39.7963	35.0397	37.2466	33.2552	32.4624	29.5266	29.5528	30.7225	31.0043	34.1826	35.7766	39.4735 (65)

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

Metabolic gains (Table 5), Watts

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	(66)
Lighting gains	(calculated in Appendix L, equation L9 or L9a), also see Table 5												
Appliances gains	(calculated in Appendix L, equation L13 or L13a), also see Table 5												
Cooking gains	(calculated in Appendix L, equation L15 or L15a), also see Table 5												
Pumps, fans													
Losses e.g. evaporation (negative values) (Table 5)													
Water heating gains (Table 5)													
Total internal gains													
	551.4837	568.6442	543.5296	528.5077	500.9510	484.2025	465.4191	464.0130	478.1177	492.1474	520.8941	538.3855	(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
Northeast				12.5900			0.5000		0.8000		0.7700		39.3769 (75)
Southwest				5.5300			0.5000		0.8000		0.7700		56.4019 (79)
Northwest				1.8900			0.5000		0.8000		0.7700		5.9112 (81)
Northeast				2.7400			0.7600		0.7000		1.0000		22.8453 (82)
Solar gains	124.5352	235.9725	386.5673	586.3470	755.1965	793.1516	746.6063	613.9225	454.6510	277.9393	153.4976	103.7772	(83)
Total gains	676.0189	804.6167	930.0968	1114.8547	1256.1475	1277.3540	1212.0255	1077.9355	932.7686	770.0868	674.3916	642.1627	(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	86.0342	86.1793	86.3220	86.9988	87.1266	87.7265	87.7265	87.8385	87.4944	87.1266	86.8684	86.6002
alpha	6.7356	6.7453	6.7548	6.7999	6.8084	6.8484	6.8484	6.8559	6.8330	6.8084	6.7912	6.7733
util living area	0.9997	0.9989	0.9951	0.9650	0.8390	0.6163	0.4525	0.5292	0.8368	0.9887	0.9991	0.9998 (86)
MIT	19.9483	20.0986	20.3363	20.6743	20.9157	20.9910	20.9990	20.9974	20.9391	20.6029	20.2163	19.9236 (87)
Th 2	20.0423	20.0437	20.0452	20.0519	20.0531	20.0590	20.0590	20.0601	20.0567	20.0531	20.0506	20.0479 (88)
util rest of house	0.9996	0.9984	0.9927	0.9487	0.7827	0.5306	0.3564	0.4231	0.7579	0.9811	0.9986	0.9997 (89)
MIT 2	19.0789	19.2301	19.4677	19.7998	20.0039	20.0558	20.0588	20.0596	20.0282	19.7383	19.3536	19.0589 (90)
Living area fraction	fLA = Living area / (4) = 0.2142 (91)											
MIT	19.2651	19.4161	19.6538	19.9871	20.1992	20.2561	20.2602	20.2604	20.2232	19.9235	19.5384	19.2441 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.2651	19.4161	19.6538	19.9871	20.1992	20.2561	20.2602	20.2604	20.2232	19.9235	19.5384	19.2441 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9994	0.9979	0.9914	0.9474	0.7922	0.5490	0.3771	0.4459	0.7734	0.9797	0.9982	0.9996	(94)
Useful gains	675.6146	802.9400	922.1144	1056.1985	995.0711	701.2219	456.9978	480.6935	721.4477	754.4318	673.1496	641.8926	(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	1906.7364	1846.4198	1670.3642	1396.9708	1069.3240	706.7573	457.3576	481.7612	767.1571	1173.0310	1569.5835	1904.2748	(97)
Space heating kWh	915.9546	701.2184	556.6978	245.3561	55.2441	0.0000	0.0000	0.0000	0.0000	311.4378	645.4324	939.2124	(98a)
Space heating requirement - total per year (kWh/year)												4370.5537	
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	915.9546	701.2184	556.6978	245.3561	55.2441	0.0000	0.0000	0.0000	0.0000	311.4378	645.4324	939.2124	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4370.5537	
Space heating per m2										(98c) / (4) =		36.0013	(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	1174.5730	924.6639	948.4439	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9344	0.9726	0.9460	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1097.4763	899.3018	897.2609	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1395.2575	1324.1884	1177.7573	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													

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Cooled fraction	0.0000	0.0000	0.0000	0.0000	0.0000	214.4025	316.1157	208.6894	0.0000	0.0000	0.0000	0.0000 (104)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	1.0000 (105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	53.6006	79.0289	52.1723	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling requirement												184.8019 (107)
Energy for space heating												36.0013 (99)
Energy for space cooling												1.5223 (108)
Total												37.5235 (109)
Fabric Energy Efficiency (DFEE)												37.5 (109)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	49.8400 (1b)	x 2.7000 (2b)	= 134.5680 (1b) -
First floor	47.0000 (1c)	x 2.7000 (2c)	= 126.9000 (1c) -
Second floor	24.5600 (1d)	x 1.5000 (2d)	= 36.8400 (1d) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	121.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 298.3080 (5)

2. Ventilation rate

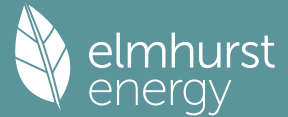
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1341 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3841 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3553 (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	0.4530	0.4441	0.4352	0.3908	0.3819	0.3375	0.3375	0.3286	0.3553	0.3819	0.3997	0.4175 (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	0.6026	0.5986	0.5947	0.5764	0.5729	0.5570	0.5570	0.5540	0.5631	0.5729	0.5799	0.5871 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.20)			20.0100	1.1450	22.9122		(27)
rooflight			2.7400	1.5038	4.1203		(27a)
ground floor			49.8400	0.1300	6.4792		(28a)
External Wall 1	120.6600	20.1000	100.5600	0.1800	18.1008		(29a)
Dormer	3.9200	2.0300	1.8900	0.1800	0.3402		(29a)
Sloping ceiling	59.2400	2.7400	56.5000	0.1100	6.2150		(30)
Flat roof	6.2500		6.2500	0.1100	0.6875		(30)
Total net area of external elements Aum(A, m ²)			239.9100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	60.9752		(33)
Party Wall 1			70.0000	0.0000	0.0000		(32)

Full SAP Calculation Printout



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

325.0623 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	14.4600	0.0500	0.7230
E3 Sill	13.4500	0.0500	0.6725
E4 Jamb	31.5000	0.0500	1.5750
E5 Ground floor (normal)	20.9000	0.1600	3.3440
R1 Head of roof window	2.6000	0.0800	0.2080
R2 Sill of roof window	2.6000	0.0600	0.1560
R3 Jamb of roof window	6.1600	0.0800	0.4928
E6 Intermediate floor within a dwelling	40.0000	0.0000	0.0000
E11 Eaves (insulation at rafter level)	10.0000	0.0400	0.4000
E13 Gable (insulation at rafter level)	12.2000	0.0800	0.9760
E16 Corner (normal)	10.8000	0.0900	0.9720
P1 Party wall - Ground floor	10.0000	0.0800	0.8000
P2 Party wall - Intermediate floor within a dwelling	20.0000	0.0000	0.0000
R8 Roof to wall (rafter)	12.2000	0.0600	0.7320
R4 Ridge (vaulted ceiling)	5.0000	0.0800	0.4000

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

11.4513 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 72.4265 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	59.3207	58.9285	58.5441	56.7385	56.4007	54.8280	54.8280	54.5368	55.4338	56.4007	57.0841	57.7986	(38)
Heat transfer coeff	131.7473	131.3551	130.9706	129.1650	128.8272	127.2545	127.2545	126.9633	127.8603	128.8272	129.5106	130.2251	(39)
Average = Sum(39)m / 12 =												129.1634	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0852	1.0820	1.0788	1.0640	1.0612	1.0482	1.0482	1.0458	1.0532	1.0612	1.0668	1.0727	(40)
HLP (average)												1.0639	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

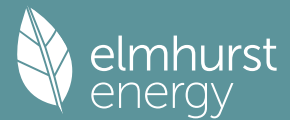
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8686 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	31.2216	30.7579	30.1049	28.9010	27.9995	26.9998	26.4599	27.1083	27.8143	28.8839	30.1127	31.1160	(42b)
Hot water usage for other uses	44.0070	42.4067	40.8065	39.2062	37.6060	36.0057	36.0057	37.6060	39.2062	40.8065	42.4067	44.0070	(42c)
Average daily hot water use (litres/day)													68.9537 (43)
Daily hot water use	75.2285	73.1646	70.9114	68.1072	65.6054	63.0055	62.4656	64.7143	67.0205	69.6904	72.5194	75.1230	(44)
Energy content (annual)	119.1436	104.1854	108.9882	93.2353	88.3175	77.4727	75.5467	80.1298	82.6430	94.5692	103.3171	117.6244	(45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	101.2721	88.5576	92.6399	79.2500	75.0699	65.8518	64.2147	68.1103	70.2465	80.3838	87.8196	99.9808	(62)
WVHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	101.2721	88.5576	92.6399	79.2500	75.0699	65.8518	64.2147	68.1103	70.2465	80.3838	87.8196	99.9808	(64)
12Total per year (kWh/year)													
Electric shower(s)	57.9132	51.6012	56.3465	53.7708	54.7798	52.2546	53.9964	54.7798	53.7708	56.3465	55.2870	57.9132	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												658.7598	(64a)
Heat gains from water heating, kWh/month	39.7963	35.0397	37.2466	33.2552	32.4624	29.5266	29.5528	30.7225	31.0043	34.1826	35.7766	39.4735	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	146.4854	162.1802	146.4854	151.3682	146.4854	151.3682	146.4854	146.4854	151.3682	146.4854	151.3682	146.4854	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	287.0247	290.0031	282.4976	266.5193	246.3494	227.3927	214.7284	211.7500	219.2555	235.2338	255.4036	274.3604	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	(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)

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

	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426 (71)
Water heating gains (Table 5)	53.4897	52.1424	50.0626	46.1878	43.6323	41.0092	39.7215	41.2937	43.0616	45.9443	49.6898	53.0558 (72)
Total internal gains	553.0283	570.3543	545.0741	530.1037	502.4956	485.7985	466.9637	465.5575	479.7137	493.6920	522.4901	539.9301 (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
Northeast				12.5900	11.2829		0.6300		0.7000		0.7700		43.4130 (75)
Southwest				5.5300	36.7938		0.6300		0.7000		0.7700		62.1830 (79)
Northwest				1.8900	11.2829		0.6300		0.7000		0.7700		6.5171 (81)
Northeast				2.7400	17.4137		0.6300		0.7000		1.0000		18.9375 (82)
Solar gains	131.0507	247.1074	401.8368	605.2212	776.2213	813.9534	766.6925	632.4283	471.1796	290.2611	161.3098	109.3469	(83)
Total gains	684.0790	817.4616	946.9109	1135.3250	1278.7168	1299.7520	1233.6562	1097.9858	950.8933	783.9531	683.7999	649.2770	(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	83.2034	83.4518	83.6968	84.8668	85.0894	86.1409	86.1409	86.3385	85.7328	85.0894	84.6404	84.1760
alpha	6.5469	6.5635	6.5798	6.6578	6.6726	6.7427	6.7427	6.7559	6.7155	6.6726	6.6427	6.6117
util living area	0.9997	0.9988	0.9948	0.9643	0.8397	0.6163	0.4527	0.5284	0.8356	0.9882	0.9990	0.9998 (86)
MIT	19.9075	20.0641	20.3098	20.6617	20.9101	20.9903	20.9989	20.9972	20.9365	20.5914	20.1929	19.8893 (87)
Th 2	20.0129	20.0156	20.0182	20.0304	20.0327	20.0433	20.0433	20.0453	20.0392	20.0327	20.0280	20.0232 (88)
util rest of house	0.9995	0.9983	0.9924	0.9478	0.7827	0.5293	0.3550	0.4208	0.7555	0.9803	0.9985	0.9997 (89)
MIT 2	19.0140	19.1726	19.4190	19.7690	19.9802	20.0399	20.0431	20.0448	20.0095	19.7097	19.3116	19.0043 (90)
Living area fraction									fLA = Living area / (4) =			0.2142 (91)
MIT	19.2054	19.3635	19.6098	19.9602	20.1793	20.2435	20.2478	20.2487	20.2081	19.8985	19.5004	19.1939 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2054	19.3635	19.6098	19.9602	20.1793	20.2435	20.2478	20.2487	20.2081	19.8985	19.5004	19.1939 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9993	0.9977	0.9910	0.9463	0.7922	0.5480	0.3760	0.4440	0.7712	0.9788	0.9980	0.9995 (94)
Useful gains	683.6313	815.6209	938.3550	1074.3505	1013.0203	712.2135	463.8069	487.5034	733.3419	767.3073	682.4465	648.9782 (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	1963.7439	1899.8545	1716.9957	1428.5883	1092.3690	718.1592	464.2047	488.6481	780.9786	1197.8995	1605.9823	1952.5763 (97)
Space heating kWh	952.4038	728.6050	579.3086	255.0512	59.0355	0.0000	0.0000	0.0000	0.0000	320.3606	664.9458	969.8770 (98a)
Space heating requirement - total per year (kWh/year)												4529.5874
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	952.4038	728.6050	579.3086	255.0512	59.0355	0.0000	0.0000	0.0000	0.0000	320.3606	664.9458	969.8770 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4529.5874
Space heating per m2										(98c) / (4) =		37.3113 (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	1196.1925	941.6834	964.9210	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9337	0.9720	0.9458	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1116.9331	915.2971	912.6215	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1426.0931	1353.7703	1204.2668	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	222.5952	326.2241	216.9841	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	55.6488	81.5560	54.2460	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												191.4508 (107)
Energy for space heating												37.3113 (99)
Energy for space cooling												1.5770 (108)

Total
Fabric Energy Efficiency (TFEE)

38.8883 (109)
38.9 (109)

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Property Reference	Plot 005	Issued on Date	28/09/2023
Assessment Reference	Vaillant ASHP	Prop Type Ref	
Property	5, UB9 6NL		
SAP Rating	79 C	DER	5.06
Environmental	96 A	TER	10.95
CO ₂ Emissions (t/year)	0.41	% DER < TER	53.79
Compliance Check	See BREL	DFEE	36.20
% DPER < TPER	7.22	TFEE	37.25
		% DFEE < TFEE	2.81
		TPER	57.09
Assessor Details	Mr. Michael Woodbridge	Assessor ID	M818-0001
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	45.8400 (1b)	x 2.3300 (2b)	= 106.8072 (1b) -
First floor	42.9900 (1c)	x 2.6300 (2c)	= 113.0637 (1c) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.8300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	219.8709 (5)

2. Ventilation rate

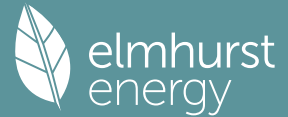
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) =	Air changes per hour 30.0000 / (5) = 0.1364 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.2864 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2650 (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	0.3378	0.3312	0.3246	0.2915	0.2848	0.2517	0.2517	0.2451	0.2650	0.2848	0.2981	0.3113 (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	0.5571	0.5548	0.5527	0.5425	0.5406	0.5317	0.5317	0.5300	0.5351	0.5406	0.5444	0.5485 (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 foor			2.1200	1.2000	2.5440		(26)
window (Uw = 1.20)			17.2600	1.1450	19.7634		(27)
ground floor			45.8400	0.1100	5.0424	110.0000	5042.4000 (28a)
External Wall 1	106.8348	19.3800	87.4548	0.1600	13.9928	190.0000	16616.4120 (29a)
Sloping ceiling	45.8400		45.8400	0.1100	5.0424	9.0000	412.5600 (30)

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Total net area of external elements Aum(A, m2)	198.5148			(31)
Fabric heat loss, W/K = Sum(A x U)	(26)...(30) + (32) =	46.3849		(33)
Party Wall 1	35.0600	0.0000	0.0000	180.0000 (32)
Internal Wall 1	200.0000		9.0000	1800.0000 (32c)
Internal Floor 1	43.0000		18.0000	774.0000 (32d)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	30956.1720	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		348.4878	(35)

List of Thermal Bridges				
K1 Element	Length	Psi-value	Total	
E6 Intermediate floor within a dwelling	20.0000	0.0500	1.0000	
E10 Eaves (insulation at ceiling level)	22.0000	0.0800	1.7600	
E16 Corner (normal)	17.2100	0.0800	1.3768	
P1 Party wall - Ground floor	7.0700	0.1000	0.7070	
P2 Party wall - Intermediate floor within a dwelling	7.0700	0.0000	0.0000	
E2 Other lintels (including other steel lintels)	12.1600	0.0500	0.6080	
E3 Sill	11.1500	0.0400	0.4460	
E4 Jamb	27.2000	0.0400	1.0880	
E5 Ground floor (normal)	23.1300	0.1050	2.4286	
E25 Staggered party wall between dwellings	12.2600	0.2400	2.9424	
P4 Party wall - Roof (insulation at ceiling level)	7.0700	0.1000	0.7070	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				13.0639 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	59.4488 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	40.4190	40.2582	40.1007	39.3605	39.2220	38.5773	38.5773	38.4579	38.8256	39.2220	39.5021	39.7950 (38)
Average = Sum(39)m / 12 =	99.8678	99.7070	99.5494	98.8092	98.6707	98.0261	98.0261	97.9067	98.2744	98.6707	98.9509	99.2438 (39)
												98.8086
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1243	1.1224	1.1207	1.1123	1.1108	1.1035	1.1035	1.1022	1.1063	1.1108	1.1139	1.1172 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

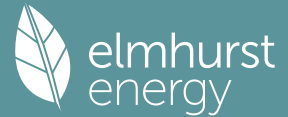
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6094 (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	29.3526	28.9167	28.3028	27.1710	26.3234	25.3836	24.8760	25.4856	26.1493	27.1549	28.3101	29.2534 (42b)
Hot water usage for other uses	41.3525	39.8488	38.3451	36.8413	35.3376	33.8339	33.8339	35.3376	36.8413	38.3451	39.8488	41.3525 (42c)
Average daily hot water use (litres/day)												64.8077 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	70.7051	68.7655	66.6479	64.0123	61.6610	59.2175	58.7099	60.8232	62.9906	65.5000	68.1589	70.6059 (44)
Energy content (annual)	111.9797	97.9211	102.4353	87.6296	83.0076	72.8148	71.0045	75.3118	77.6738	88.8828	97.1048	110.5518 (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	95.1827	83.2330	87.0700	74.4852	70.5564	61.8926	60.3538	64.0150	66.0227	75.5504	82.5391	93.9690 (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	95.1827	83.2330	87.0700	74.4852	70.5564	61.8926	60.3538	64.0150	66.0227	75.5504	82.5391	93.9690 (64)
12Total per year (kWh/year)												914.8700 (64)
Electric shower(s)	54.4328	48.5001	52.9602	50.5393	51.4877	49.1142	50.7514	51.4877	50.5393	52.9602	51.9644	54.4328 (64a)
Heat gains from water heating, kWh/month	37.4039	32.9333	35.0076	31.2561	30.5110	27.7517	27.7763	28.8757	29.1405	32.1277	33.6259	37.1005 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	130.4682	130.4682	130.4682	130.4682	130.4682	130.4682	130.4682	130.4682	130.4682	130.4682	130.4682	130.4682 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	119.5036	132.3075	119.5036	123.4870	119.5036	123.4870	119.5036	119.5036	123.4870	119.5036	123.4870	119.5036 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	236.9087	239.3671	233.1721	219.9836	203.3355	187.6887	177.2357	174.7773	180.9723	194.1608	210.8088	226.4557 (68)

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Pumps, fans	36.0468	36.0468	36.0468	36.0468	36.0468	36.0468	36.0468	36.0468	36.0468	36.0468	36.0468	36.0468	(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)	-104.3746	-104.3746	-104.3746	-104.3746	-104.3746	-104.3746	-104.3746	-104.3746	-104.3746	-104.3746	-104.3746	-104.3746	(71)
Total internal gains	50.2740	49.0078	47.0532	43.4113	41.0094	38.5440	37.3337	38.8114	40.4729	43.1823	46.7026	49.8662	(72)
	468.8268	482.8229	461.8693	449.0224	425.9890	411.8603	396.2135	395.2328	407.0727	418.9872	443.1389	457.9659	(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				2.6500	10.6334	0.5000	0.8000	0.7700	7.8111 (74)			
Northeast				1.7100	11.2829	0.5000	0.8000	0.7700	5.3482 (75)			
East				0.6300	19.6403	0.5000	0.8000	0.7700	3.4299 (76)			
South				10.5600	46.7521	0.5000	0.8000	0.7700	136.8541 (78)			
Northwest				1.7100	11.2829	0.5000	0.8000	0.7700	5.3482 (81)			
Solar gains	158.7916	267.5418	361.1473	443.9640	497.4872	494.8952	476.6461	435.9577	389.3914	294.0862	189.5904	136.3222 (83)
Total gains	627.6184	750.3647	823.0166	892.9864	923.4763	906.7555	872.8595	831.1904	796.4642	713.0733	632.7294	594.2881 (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	86.1032	86.2420	86.3786	87.0256	87.1478	87.7209	87.7209	87.8279	87.4993	87.1478	86.9010	86.6446
alpha	6.7402	6.7495	6.7586	6.8017	6.8099	6.8481	6.8481	6.8552	6.8333	6.8099	6.7934	6.7763
util living area	0.9991	0.9968	0.9902	0.9612	0.8692	0.6738	0.4921	0.5381	0.7926	0.9728	0.9972	0.9994 (86)
MIT	20.0389	20.2081	20.4193	20.6881	20.8936	20.9848	20.9984	20.9971	20.9566	20.6924	20.3115	20.0078 (87)
Th 2	19.9811	19.9825	19.9840	19.9908	19.9920	19.9980	19.9980	19.9991	19.9957	19.9920	19.9895	19.9868 (88)
util rest of house	0.9987	0.9954	0.9855	0.9423	0.8135	0.5774	0.3813	0.4233	0.7029	0.9556	0.9957	0.9991 (89)
MIT 2	19.1137	19.2833	19.4931	19.7555	19.9301	19.9928	19.9977	19.9985	19.9776	19.7650	19.3926	19.0874 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.4439	19.6134	19.8237	20.0883	20.2740	20.3468	20.3548	20.3549	20.3269	20.0960	19.7205	19.4158 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.4439	19.6134	19.8237	20.0883	20.2740	20.3468	20.3548	20.3549	20.3269	20.0960	19.7205	19.4158 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9984	0.9947	0.9845	0.9445	0.8307	0.6120	0.4210	0.4645	0.7347	0.9578	0.9951	0.9989 (94)
Useful gains	626.6394	746.3713	810.2897	843.4322	767.1415	554.9415	367.4922	386.1069	585.1305	682.9679	629.6349	593.6384 (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	1512.3866	1467.0252	1326.3620	1105.5045	846.0002	563.3348	368.0682	387.2096	611.9497	936.9755	1248.8102	1510.0774 (97)
Space heating kWh	658.9959	484.2794	383.9578	188.6921	58.6709	0.0000	0.0000	0.0000	0.0000	188.9816	445.8063	681.8306 (98a)
Space heating requirement - total per year (kWh/year)	3091.2146											
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	658.9959	484.2794	383.9578	188.6921	58.6709	0.0000	0.0000	0.0000	0.0000	188.9816	445.8063	681.8306 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	3091.2146											
Space heating per m2	(98c) / (4) = 34.7992 (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	921.4450	725.3929	744.0907	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9099	0.9627	0.9474	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	838.4615	698.3137	704.9599	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1013.0344	975.7344	929.3726	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	125.6924	206.4010	166.9630	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction	fc = cooled area / (4) =											1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	31.4231	51.6003	41.7408	0.0000	0.0000	0.0000	0.0000 (107)

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Space cooling requirement	124.7641 (107)
Energy for space heating	34.7992 (99)
Energy for space cooling	1.4045 (108)
Total	36.2037 (109)
Fabric Energy Efficiency (DFEE)	36.2 (109)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	45.8400 (1b)	x 2.3300 (2b)	= 106.8072 (1b) -
First floor	42.9900 (1c)	x 2.6300 (2c)	= 113.0637 (1c) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.8300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	219.8709 (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) =	Air changes per hour 30.0000 / (5) = 0.1364 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3864 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3575 (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	0.4558	0.4468	0.4379	0.3932	0.3843	0.3396	0.3396	0.3307	0.3575	0.3843	0.4021	0.4200 (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	0.6039	0.5998	0.5959	0.5773	0.5738	0.5577	0.5577	0.5547	0.5639	0.5738	0.5809	0.5882 (25)

3. Heat losses and heat loss parameter

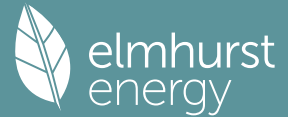
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.20)			17.2600	1.1450	19.7634		(27)
ground floor			45.8400	0.1300	5.9592		(28a)
External Wall 1	106.8348	19.3800	87.4548	0.1800	15.7419		(29a)
Sloping ceiling	45.8400		45.8400	0.1100	5.0424		(30)
Total net area of external elements Aum(A, m ²)			198.5148				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	48.6268		(33)
Party Wall 1			35.0600	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 348.4878 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E6 Intermediate floor within a dwelling	20.0000	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	22.0000	0.0600	1.3200
E16 Corner (normal)	17.2100	0.0900	1.5489
P1 Party wall - Ground floor	7.0700	0.0800	0.5656
P2 Party wall - Intermediate floor within a dwelling	7.0700	0.0000	0.0000
E2 Other lintels (including other steel lintels)	12.1600	0.0500	0.6080

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E3 Sill	11.1500	0.0500	0.5575
E4 Jamb	27.2000	0.0500	1.3600
E5 Ground floor (normal)	23.1300	0.1600	3.7008
E25 Staggered party wall between dwellings	12.2600	0.0600	0.7356
P4 Party wall - Roof (insulation at ceiling level)	7.0700	0.1200	0.8484
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			11.2448 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	59.8716 (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	43.8145	43.5219	43.2350	41.8878	41.6357	40.4623	40.4623	40.2450	40.9143	41.6357	42.1457	42.6787 (38)
Average = Sum(39)m / 12 =	103.6861	103.3935	103.1066	101.7594	101.5074	100.3340	100.3340	100.1167	100.7859	101.5074	102.0173	102.5504 (39)
												101.7582
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1672	1.1639	1.1607	1.1456	1.1427	1.1295	1.1295	1.1271	1.1346	1.1427	1.1485	1.1545 (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												2.6094 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths	29.3526	28.9167	28.3028	27.1710	26.3234	25.3836	24.8760	25.4856	26.1493	27.1549	28.3101	29.2534 (42b)
Hot water usage for other uses	41.3525	39.8488	38.3451	36.8413	35.3376	33.8339	33.8339	35.3376	36.8413	38.3451	39.8488	41.3525 (42c)
Average daily hot water use (litres/day)												64.8077 (43)
Daily hot water use	70.7051	68.7655	66.6479	64.0123	61.6610	59.2175	58.7099	60.8232	62.9906	65.5000	68.1589	70.6059 (44)
Energy conte	111.9797	97.9211	102.4353	87.6296	83.0076	72.8148	71.0045	75.3118	77.6738	88.8828	97.1048	110.5518 (45)
Energy content (annual)												1076.3177
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Total heat required for water heating calculated for each month	95.1827	83.2330	87.0700	74.4852	70.5564	61.8926	60.3538	64.0150	66.0227	75.5504	82.5391	93.9690 (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	95.1827	83.2330	87.0700	74.4852	70.5564	61.8926	60.3538	64.0150	66.0227	75.5504	82.5391	93.9690 (64)
12Total per year (kWh/year)												915 (64)
Electric shower(s)	54.4328	48.5001	52.9602	50.5393	51.4877	49.1142	50.7514	51.4877	50.5393	52.9602	51.9644	54.4328 (64a)
Heat gains from water heating, kWh/month	37.4039	32.9333	35.0076	31.2561	30.5110	27.7517	27.7763	28.8757	29.1405	32.1277	33.6259	37.1005 (65)

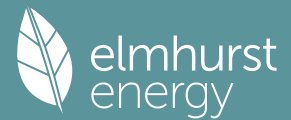
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	130.4682	130.4682	130.4682	130.4682	130.4682	130.4682	130.4682	130.4682	130.4682	130.4682	130.4682	130.4682 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	120.7294	133.6647	120.7294	124.7537	120.7294	124.7537	120.7294	120.7294	124.7537	120.7294	124.7537	120.7294 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	236.9087	239.3671	233.1721	219.9836	203.3355	187.6887	177.2357	174.7773	180.9723	194.1608	210.8088	226.4557 (68)
Pumps, fans	36.0468	36.0468	36.0468	36.0468	36.0468	36.0468	36.0468	36.0468	36.0468	36.0468	36.0468	36.0468 (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)	-104.3746	-104.3746	-104.3746	-104.3746	-104.3746	-104.3746	-104.3746	-104.3746	-104.3746	-104.3746	-104.3746	-104.3746 (71)
Total internal gains	50.2740	49.0078	47.0532	43.4113	41.0094	38.5440	37.3337	38.8114	40.4729	43.1823	46.7026	49.8662 (72)
	470.0526	484.1801	463.0951	450.2891	427.2148	413.1269	397.4393	396.4586	408.3394	420.2130	444.4056	459.1917 (73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains
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	m2	Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	factor Table 6d	W
North	2.6500	10.6334	0.6300	0.7000	0.7700	8.6117 (74)
Northeast	1.7100	11.2829	0.6300	0.7000	0.7700	5.8964 (75)
East	0.6300	19.6403	0.6300	0.7000	0.7700	3.7815 (76)
South	10.5600	46.7521	0.6300	0.7000	0.7700	150.8817 (78)
Northwest	1.7100	11.2829	0.6300	0.7000	0.7700	5.8964 (81)

Solar gains	175.0678	294.9649	398.1649	489.4703	548.4797	545.6220	525.5023	480.6434	429.3041	324.2300	209.0235	150.2952 (83)
Total gains	645.1204	779.1449	861.2600	939.7594	975.6945	958.7489	922.9416	877.1019	837.6435	744.4430	653.4291	609.4869 (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	82.9324	83.1671	83.3985	84.5026	84.7124	85.7031	85.7031	85.8892	85.3188	84.7124	84.2890	83.8509
alpha	6.5288	6.5445	6.5599	6.6335	6.6475	6.7135	6.7135	6.7259	6.6879	6.6475	6.6193	6.5901
util living area	0.9990	0.9963	0.9884	0.9548	0.8545	0.6541	0.4766	0.5218	0.7768	0.9689	0.9968	0.9993 (86)
MIT	20.0021	20.1841	20.4085	20.6925	20.8984	20.9861	20.9985	20.9973	20.9588	20.6920	20.2943	19.9757 (87)
Th 2	19.9463	19.9490	19.9516	19.9638	19.9661	19.9768	19.9768	19.9788	19.9727	19.9661	19.9615	19.9566 (88)
util rest of house	0.9985	0.9946	0.9829	0.9334	0.7954	0.5574	0.3668	0.4079	0.6848	0.9495	0.9950	0.9990 (89)
MIT 2	19.0484	19.2316	19.4550	19.7348	19.9081	19.9722	19.9766	19.9783	19.9558	19.7415	19.3522	19.0306 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.3887	19.5715	19.7953	20.0766	20.2615	20.3340	20.3413	20.3420	20.3137	20.0807	19.6884	19.3679 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.3887	19.5715	19.7953	20.0766	20.2615	20.3340	20.3413	20.3420	20.3137	20.0807	19.6884	19.3679 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9982	0.9937	0.9818	0.9361	0.8139	0.5921	0.4061	0.4488	0.7174	0.9522	0.9944	0.9987 (94)
Useful gains	643.9523	774.2719	845.6150	879.7288	794.1324	567.7054	374.8440	393.6455	600.9557	708.8607	649.7429	608.7145 (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	1564.4903	1516.9403	1370.8313	1137.3200	869.0544	575.3152	375.3750	394.6565	626.2568	962.3602	1284.2374	1555.4708 (97)
Space heating kWh	684.8803	499.0732	390.7609	185.4657	55.7420	0.0000	0.0000	0.0000	0.0000	188.6036	456.8360	704.3867 (98a)
Space heating requirement - total per year (kWh/year)	3165.7484											
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	684.8803	499.0732	390.7609	185.4657	55.7420	0.0000	0.0000	0.0000	0.0000	188.6036	456.8360	704.3867 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	3165.7484											
Space heating per m2	(98c) / (4) = 35.6383 (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	943.1393	742.4714	760.8867	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9191	0.9668	0.9529	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	866.8075	717.7879	725.0521	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1072.4326	1032.9550	981.7533	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	148.0501	234.4843	190.9856	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction	fC = cooled area / (4) =											
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	37.0125	58.6211	47.7464	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement	143.3800 (107)											
Energy for space heating	35.6383 (99)											
Energy for space cooling	1.6141 (108)											
Total	37.2524 (109)											
Fabric Energy Efficiency (TFEE)	37.3 (109)											

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Property Reference	Plot 006	Issued on Date	28/09/2023
Assessment Reference	Vaillant ASHP	Prop Type Ref	
Property	6, UB9 6NL		
SAP Rating	78 C	DER	5.20
Environmental	96 A	TER	11.34
CO ₂ Emissions (t/year)	0.42	% DER < TER	54.14
Compliance Check	See BREL	DFEE	37.86
% DPER < TPER	7.93	TFEE	38.75
		% DFEE < TFEE	2.32
		TPER	59.13
Assessor Details	Mr. Michael Woodbridge	Assessor ID	M818-0001
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	44.3100 (1b)	x 2.3300 (2b)	= 103.2423 (1b) -
First floor	44.3100 (1c)	x 2.6300 (2c)	= 116.5353 (1c) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.6200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	219.7776 (5)

2. Ventilation rate

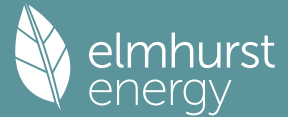
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) =	Air changes per hour 30.0000 / (5) = 0.1365 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.2865 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2650 (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	0.3379	0.3313	0.3246	0.2915	0.2849	0.2518	0.2518	0.2451	0.2650	0.2849	0.2981	0.3114 (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	0.5571	0.5549	0.5527	0.5425	0.5406	0.5317	0.5317	0.5300	0.5351	0.5406	0.5444	0.5485 (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 foor			2.1200	1.2000	2.5440		(26)
window (Uw = 1.20)			21.4200	1.1450	24.5267		(27)
ground floor			44.3100	0.1100	4.8741	110.0000	4874.1000 (28a)
External Wall 1	116.6096	23.5400	93.0696	0.1600	14.8911	110.0000	10237.6560 (29a)
Sloping ceiling	44.3100		44.3100	0.1100	4.8741	9.0000	398.7900 (30)

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Total net area of external elements Aum(A, m2)	205.2296			(31)
Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =	51.7101		(33)
Party Wall 1	35.0600	0.0000	110.0000	3856.6000 (32)
Internal Wall 1	200.0000		9.0000	1800.0000 (32c)
Internal Floor 1	43.0000		18.0000	774.0000 (32d)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	21941.1460	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		247.5868	(35)

List of Thermal Bridges				
K1 Element	Length	Psi-value	Total	
E6 Intermediate floor within a dwelling	23.5100	0.0500	1.1755	
E10 Eaves (insulation at ceiling level)	23.5100	0.0800	1.8808	
E16 Corner (normal)	19.8400	0.0800	1.5872	
P1 Party wall - Ground floor	7.0700	0.1000	0.7070	
P2 Party wall - Intermediate floor within a dwelling	7.0700	0.0000	0.0000	
E5 Ground floor (normal)	23.5100	0.1050	2.4686	
E25 Staggered party wall between dwellings	12.2600	0.2400	2.9424	
P4 Party wall - Roof (insulation at ceiling level)	7.0700	0.1000	0.7070	
E2 Other lintels (including other steel lintels)	14.3200	0.0500	0.7160	
E3 Sill	13.3100	0.0400	0.5324	
E4 Jamb	31.4000	0.0400	1.2560	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				13.9729 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	65.6829 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(38)
Heat transfer coeff	40.4035	40.2428	40.0852	39.3450	39.2065	38.5618	38.5618	38.4425	38.8102	39.2065	39.4867	39.7796	
Average = Sum(39)m / 12 =	106.0864	105.9257	105.7681	105.0279	104.8894	104.2447	104.2447	104.1254	104.4931	104.8894	105.1696	105.4625	(39)
												105.0272	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1971	1.1953	1.1935	1.1851	1.1836	1.1763	1.1763	1.1750	1.1791	1.1836	1.1867	1.1901	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

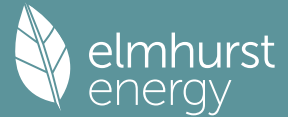
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6064 (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	29.3309	28.8953	28.2819	27.1509	26.3040	25.3649	24.8576	25.4668	26.1300	27.1348	28.2892	29.2318	(42b)
Hot water usage for other uses	41.3217	39.8191	38.3165	36.8139	35.3113	33.8087	33.8087	35.3113	36.8139	38.3165	39.8191	41.3217	(42c)
Average daily hot water use (litres/day)												64.7596	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	70.6526	68.7144	66.5984	63.9648	61.6152	59.1735	58.6663	60.7780	62.9439	65.4513	68.1083	70.5535	(44)
Energy content (annual)	111.8965	97.8484	102.3593	87.5645	82.9459	72.7608	70.9518	75.2559	77.6161	88.8168	97.0327	110.4697	(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	95.1120	83.1712	87.0054	74.4299	70.5041	61.8466	60.3090	63.9675	65.9737	75.4943	82.4778	93.8993	(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	95.1120	83.1712	87.0054	74.4299	70.5041	61.8466	60.3090	63.9675	65.9737	75.4943	82.4778	93.8993	(64)
12Total per year (kWh/year)												914	(64)
Electric shower(s)	54.3924	48.4641	52.9209	50.5018	51.4494	49.0778	50.7137	51.4494	50.5018	52.9209	51.9258	54.3924	(64a)
Heat gains from water heating, kWh/month	37.3761	32.9088	34.9816	31.2329	30.4884	27.7311	27.7557	28.8542	29.1189	32.1038	33.6009	37.0729	(65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												618.7106	(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	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	130.3178	130.3178	130.3178	130.3178	130.3178	130.3178	130.3178	130.3178	130.3178	130.3178	130.3178	130.3178	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	119.2951	132.0767	119.2951	123.2716	119.2951	123.2716	119.2951	119.2951	123.2716	119.2951	123.2716	119.2951	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	236.5159	238.9702	232.7854	219.6188	202.9984	187.3775	176.9418	174.4875	180.6722	193.8388	210.4593	226.0802	(68)

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Pumps, fans	36.0318	36.0318	36.0318	36.0318	36.0318	36.0318	36.0318	36.0318	36.0318	36.0318	36.0318	36.0318	(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)	-104.2543	-104.2543	-104.2543	-104.2543	-104.2543	-104.2543	-104.2543	-104.2543	-104.2543	-104.2543	-104.2543	-104.2543	(71)
Total internal gains	50.2367	48.9715	47.0182	43.3790	40.9790	38.5154	37.3060	38.7826	40.4429	43.1503	46.6679	49.8292	(72)
	468.1430	482.1137	461.1941	448.3648	425.3678	411.2599	395.6382	394.6605	406.4820	418.3795	442.4941	457.2998	(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				3.2800	10.6334	0.5000	0.8000	0.7700	9.6680 (74)			
Northeast				1.1500	11.2829	0.5000	0.8000	0.7700	3.5968 (75)			
East				3.7800	19.6403	0.5000	0.8000	0.7700	20.5794 (76)			
South				12.0600	46.7521	0.5000	0.8000	0.7700	156.2936 (78)			
Northwest				1.1500	11.2829	0.5000	0.8000	0.7700	3.5968 (81)			
Solar gains	193.7346	329.3452	450.1343	558.9648	628.6893	625.6834	602.5553	550.0404	487.6086	363.7433	231.8995	165.9100 (83)
Total gains	661.8776	811.4588	911.3284	1007.3296	1054.0571	1036.9433	998.1936	944.7009	894.0907	782.1229	674.3936	623.2097 (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	57.4509	57.5381	57.6238	58.0299	58.1066	58.4659	58.4659	58.5329	58.3270	58.1066	57.9518	57.7908	
alpha	4.8301	4.8359	4.8416	4.8687	4.8738	4.8977	4.8977	4.9022	4.8885	4.8738	4.8635	4.8527	
util living area	0.9946	0.9854	0.9657	0.9101	0.7961	0.6148	0.4539	0.4979	0.7305	0.9348	0.9874	0.9959	(86)
MIT	19.6545	19.9050	20.2097	20.5712	20.8348	20.9640	20.9933	20.9896	20.9177	20.5643	20.0362	19.6071	(87)
Th 2	19.9223	19.9238	19.9252	19.9319	19.9332	19.9390	19.9390	19.9401	19.9367	19.9332	19.9306	19.9280	(88)
util rest of house	0.9928	0.9808	0.9548	0.8820	0.7380	0.5246	0.3474	0.3878	0.6448	0.9081	0.9826	0.9946	(89)
MIT 2	18.7136	18.9620	19.2603	19.6047	19.8294	19.9238	19.9374	19.9374	19.8963	19.6076	19.0991	18.6709	(90)
Living area fraction									fLA = Living area / (4) =			0.3284	(91)
MIT	19.0226	19.2717	19.5720	19.9221	20.1596	20.2654	20.2841	20.2829	20.2317	19.9217	19.4068	18.9783	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0226	19.2717	19.5720	19.9221	20.1596	20.2654	20.2841	20.2829	20.2317	19.9217	19.4068	18.9783	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9908	0.9771	0.9503	0.8818	0.7514	0.5534	0.3825	0.4241	0.6703	0.9077	0.9794	0.9929	(94)
Useful gains	655.8058	792.9076	866.0770	888.2140	792.0166	573.8405	381.8459	400.6731	599.2796	709.9600	660.5307	618.8132	(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													
Space heating	1561.8674	1522.3287	1382.6036	1157.6270	887.3181	590.5837	384.0503	404.3053	640.7170	977.7520	1294.3048	1558.5584	(97)
kWh													
Space heating requirement - total per year (kWh/year)	674.1099	490.1709	384.2958	193.9773	70.9043	0.0000	0.0000	0.0000	0.0000	199.2373	456.3174	699.1704	(98a)
Solar heating kWh												3168.1834	
Solar heating contribution - total per year (kWh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Space heating kWh												0.0000	
Space heating requirement after solar contribution - total per year (kWh/year)	674.1099	490.1709	384.2958	193.9773	70.9043	0.0000	0.0000	0.0000	0.0000	199.2373	456.3174	699.1704	(98c)
Space heating per m2												3168.1834	
										(98c) / (4) =		35.7502	(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	979.9006	771.4111	791.3528	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8936	0.9440	0.9269	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	875.6689	728.2352	733.4970	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1165.3111	1122.3338	1062.1478	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	208.5424	293.2094	244.5162	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction	fc = cooled area / (4) =											1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	52.1356	73.3023	61.1291	0.0000	0.0000	0.0000	0.0000 (107)

Full SAP Calculation Printout



Space cooling requirement	186.5670 (107)
Energy for space heating	35.7502 (99)
Energy for space cooling	2.1052 (108)
Total	37.8555 (109)
Fabric Energy Efficiency (DFEE)	37.9 (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 (m ²)	Storey height (m)	Volume (m ³)
Ground floor	44.3100 (1b)	x 2.3300 (2b)	= 103.2423 (1b) -
First floor	44.3100 (1c)	x 2.6300 (2c)	= 116.5353 (1c) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.6200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	219.7776 (5)

2. Ventilation rate

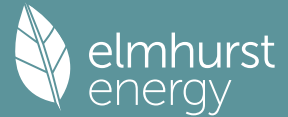
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) =	Air changes per hour 30.0000 / (5) = 0.1365 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3865 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3575 (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	0.4558	0.4469	0.4380	0.3933	0.3843	0.3396	0.3396	0.3307	0.3575	0.3843	0.4022	0.4201 (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	0.6039	0.5999	0.5959	0.5773	0.5739	0.5577	0.5577	0.5547	0.5639	0.5739	0.5809	0.5882 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.20)			20.0500	1.1450	22.9580		(27)
ground floor			44.3100	0.1300	5.7603		(28a)
External Wall 1	116.6096	22.1700	94.4396	0.1800	16.9991		(29a)
Sloping ceiling	44.3100		44.3100	0.1100	4.8741		(30)
Total net area of external elements Aum(A, m ²)			205.2296				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	52.7115		(33)
Party Wall 1			35.0600	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							247.5868 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value		Total
E6 Intermediate floor within a dwelling				23.5100	0.0000		0.0000
E10 Eaves (insulation at ceiling level)				23.5100	0.0600		1.4106
E16 Corner (normal)				19.8400	0.0900		1.7856
P1 Party wall - Ground floor				7.0700	0.0800		0.5656
P2 Party wall - Intermediate floor within a dwelling				7.0700	0.0000		0.0000
E5 Ground floor (normal)				23.5100	0.1600		3.7616

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E25 Staggered party wall between dwellings	12.2600	0.0600	0.7356	
P4 Party wall - Roof (insulation at ceiling level)	7.0700	0.1200	0.8484	
E2 Other lintels (including other steel lintels)	14.3200	0.0500	0.7160	
E3 Sill	13.3100	0.0500	0.6655	
E4 Jamb	31.4000	0.0500	1.5700	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				12.0589 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =		64.7704 (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	43.7981	43.5056	43.2188	41.8717	41.6197	40.4464	40.4464	40.2292	40.8983	41.6197	42.1295	42.6626 (38)
Average = Sum(39)m / 12 =	108.5686	108.2760	107.9892	106.6421	106.3901	105.2169	105.2169	104.9996	105.6688	106.3901	106.9000	107.4330 (39)
												106.6409
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2251	1.2218	1.2186	1.2034	1.2005	1.1873	1.1873	1.1848	1.1924	1.2005	1.2063	1.2123 (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												2.6064 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths	29.3309	28.8953	28.2819	27.1509	26.3040	25.3649	24.8576	25.4668	26.1300	27.1348	28.2892	29.2318 (42b)
Hot water usage for other uses	41.3217	39.8191	38.3165	36.8139	35.3113	33.8087	33.8087	35.3113	36.8139	38.3165	39.8191	41.3217 (42c)
Average daily hot water use (litres/day)												64.7596 (43)
Daily hot water use	70.6526	68.7144	66.5984	63.9648	61.6152	59.1735	58.6663	60.7780	62.9439	65.4513	68.1083	70.5535 (44)
Energy content (annual)	111.8965	97.8484	102.3593	87.5645	82.9459	72.7608	70.9518	75.2559	77.6161	88.8168	97.0327	110.4697 (45)
Distribution loss (46)m = 0.15 x (45)m												1075.5185
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Total heat required for water heating calculated for each month	95.1120	83.1712	87.0054	74.4299	70.5041	61.8466	60.3090	63.9675	65.9737	75.4943	82.4778	93.8993 (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	95.1120	83.1712	87.0054	74.4299	70.5041	61.8466	60.3090	63.9675	65.9737	75.4943	82.4778	93.8993 (64)
12Total per year (kWh/year)												914.1907 (64)
Electric shower(s)	54.3924	48.4641	52.9209	50.5018	51.4494	49.0778	50.7137	51.4494	50.5018	52.9209	51.9258	54.3924 (64a)
Heat gains from water heating, kWh/month	37.3761	32.9088	34.9816	31.2329	30.4884	27.7311	27.7557	28.8542	29.1189	32.1038	33.6009	37.0729 (65)

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	130.3178	130.3178	130.3178	130.3178	130.3178	130.3178	130.3178	130.3178	130.3178	130.3178	130.3178	130.3178 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	119.2727	132.0519	119.2727	123.2484	119.2727	123.2484	119.2727	119.2727	123.2484	119.2727	123.2484	119.2727 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	236.5159	238.9702	232.7854	219.6188	202.9984	187.3775	176.9418	174.4875	180.6722	193.8388	210.4593	226.0802 (68)
Pumps, fans	36.0318	36.0318	36.0318	36.0318	36.0318	36.0318	36.0318	36.0318	36.0318	36.0318	36.0318	36.0318 (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)	-104.2543	-104.2543	-104.2543	-104.2543	-104.2543	-104.2543	-104.2543	-104.2543	-104.2543	-104.2543	-104.2543	-104.2543 (71)
Total internal gains	50.2367	48.9715	47.0182	43.3790	40.9790	38.5154	37.3060	38.7826	40.4429	43.1503	46.6679	49.8292 (72)
	468.1206	482.0888	461.1717	448.3416	425.3454	411.2367	395.6158	394.6381	406.4589	418.3571	442.4710	457.2773 (73)

6. Solar gains												
[Jan]	Area	Solar flux	g	FF	Access	Gains						

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				m2	Table 6a W/m2	Specific data or Table 6b		Specific data or Table 6c		factor Table 6d		W
North				3.0700	10.6334	0.6300		0.7000		0.7700		9.9766 (74)
Northeast				1.0800	11.2829	0.6300		0.7000		0.7700		3.7241 (75)
East				3.5400	19.6403	0.6300		0.7000		0.7700		21.2482 (76)
South				11.2800	46.7521	0.6300		0.7000		0.7700		161.1691 (78)
Northwest				1.0800	11.2829	0.6300		0.7000		0.7700		3.7241 (81)
Solar gains	199.8420	339.7461	464.3957	576.7456	648.7487	645.6723	621.7949	567.5610	503.0819	375.2432	239.2134	171.1379 (83)
Total gains	667.9626	821.8349	925.5673	1025.0872	1074.0941	1056.9090	1017.4107	962.1991	909.5407	793.6004	681.6844	628.4153 (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	56.1374	56.2891	56.4386	57.1515	57.2869	57.9257	57.9257	58.0456	57.6780	57.2869	57.0137	56.7308
alpha	4.7425	4.7526	4.7626	4.8101	4.8191	4.8617	4.8617	4.8697	4.8452	4.8191	4.8009	4.7821
util living area	0.9944	0.9850	0.9649	0.9079	0.7925	0.6093	0.4496	0.4931	0.7265	0.9334	0.9870	0.9958 (86)
MIT	19.6187	19.8766	20.1901	20.5658	20.8331	20.9644	20.9933	20.9897	20.9174	20.5583	20.0190	19.5790 (87)
Th 2	19.9000	19.9026	19.9052	19.9173	19.9196	19.9302	19.9302	19.9322	19.9261	19.9196	19.9150	19.9102 (88)
util rest of house	0.9926	0.9802	0.9536	0.8791	0.7336	0.5189	0.3431	0.3832	0.6401	0.9060	0.9821	0.9944 (89)
MIT 2	18.6608	18.9175	19.2251	19.5869	19.8151	19.9152	19.9286	19.9295	19.8857	19.5905	19.0699	18.6292 (90)
Living area fraction	fLA = Living area / (4) = 0.3284 (91)											
MIT	18.9753	19.2324	19.5420	19.9083	20.1494	20.2597	20.2782	20.2776	20.2244	19.9083	19.3816	18.9411 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.9753	19.2324	19.5420	19.9083	20.1494	20.2597	20.2782	20.2776	20.2244	19.9083	19.3816	18.9411 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9905	0.9765	0.9490	0.8788	0.7472	0.5478	0.3782	0.4194	0.6658	0.9057	0.9789	0.9927 (94)
Useful gains	661.6351	802.4891	878.3974	900.8919	802.5720	578.9439	384.8210	403.5610	605.5872	718.7377	667.2711	623.8321 (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	1593.2795	1551.8581	1408.3915	1173.9499	898.9318	595.4980	387.0115	407.1479	647.1625	990.3085	1312.9000	1583.6821 (97)
Space heating kWh	693.1434	503.5760	394.3156	196.6018	71.6917	0.0000	0.0000	0.0000	0.0000	202.0487	464.8528	714.1284 (98a)
Space heating requirement - total per year (kWh/year)												3240.3583
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	693.1434	503.5760	394.3156	196.6018	71.6917	0.0000	0.0000	0.0000	0.0000	202.0487	464.8528	714.1284 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3240.3583
Space heating per m2										(98c) / (4) = 36.5646 (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	989.0386	778.6048	797.9970	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8958	0.9452	0.9286	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	886.0284	735.9227	740.9843	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1188.6728	1144.8195	1082.6237	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	217.9039	304.2192	254.1797	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction	fC = cooled area / (4) = 1.0000 (105)											
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	54.4760	76.0548	63.5449	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												194.0757 (107)
Energy for space heating												36.5646 (99)
Energy for space cooling												2.1900 (108)
Total												38.7546 (109)
Fabric Energy Efficiency (TFEE)												38.8 (109)

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Property Reference	Plot 001	Issued on Date	28/09/2023
Assessment Reference	Vaillant ASHP	Prop Type Ref	
Property	1, UB9 6NL		
SAP Rating	79 C	DER	4.59
Environmental	96 A	TER	10.51
CO ₂ Emissions (t/year)	0.5	% DER < TER	56.33
Compliance Check	See BREL	DFEE	37.52
% DPER < TPER	12.74	TFEE	38.89
		% DFEE < TFEE	3.51
		DFEE	47.88
		TPER	54.87
Assessor Details	Mr. Michael Woodbridge	Assessor ID	M818-0001
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	49.8400 (1b)	x 2.7000 (2b)	= 134.5680 (1b) -
First floor	47.0000 (1c)	x 2.7000 (2c)	= 126.9000 (1c) -
Second floor	24.5600 (1d)	x 1.5000 (2d)	= 36.8400 (1d) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	121.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 298.3080 (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)

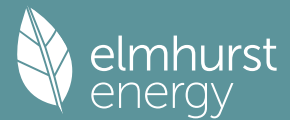
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour 0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1388 (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	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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 floor			2.1200	1.2000	2.5440		(26)
window (Uw = 1.20)			20.0100	1.1450	22.9122		(27)

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rooflight			2.7400	1.1450	3.1374			(27a)
ground floor			49.8400	0.1100	5.4824			(28a)
External Wall 1	120.6600	20.1000	100.5600	0.1600	16.0896	110.0000	5482.4000	(28a)
Dormer	3.9200	2.0300	1.8900	0.1800	0.3402	9.0000	17.0100	(29a)
Sloping ceiling	59.2400	2.7400	56.5000	0.1100	6.2150	9.0000	508.5000	(30)
Flat roof	6.2500		6.2500	0.1100	0.6875	9.0000	56.2500	(30)
Total net area of external elements Aum(A, m2)			239.9100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		57.4083			(33)
Party Wall 1			70.0000	0.0000	0.0000	180.0000	12600.0000	(32)
Internal Floor 1			94.0000			18.0000	1692.0000	(32d)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 39462.5600 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 325.0623 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	14.4600	0.0500	0.7230
E3 Sill	13.4500	0.0400	0.5380
E4 Jamb	31.5000	0.0400	1.2600
E5 Ground floor (normal)	20.9000	0.1050	2.1945
R1 Head of roof window	2.6000	0.2400	0.6240
R2 Sill of roof window	2.6000	0.2400	0.6240
R3 Jamb of roof window	6.1600	0.2400	1.4784
E6 Intermediate floor within a dwelling	40.0000	0.0500	2.0000
E11 Eaves (insulation at rafter level)	10.0000	0.0800	0.8000
E13 Gable (insulation at rafter level)	12.2000	0.1000	1.2200
E16 Corner (normal)	10.8000	0.0800	0.8640
P1 Party wall - Ground floor	10.0000	0.1600	1.6000
P2 Party wall - Intermediate floor within a dwelling	20.0000	0.0000	0.0000
R8 Roof to wall (rafter)	12.2000	0.0600	0.7320
R4 Ridge (vaulted ceiling)	5.0000	0.1200	0.6000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			15.2579 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 72.6662 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(38)
Heat transfer coeff	49.2208	49.2208	49.2208	49.2208	49.2208	49.2208	49.2208	49.2208	49.2208	49.2208	49.2208	49.2208	
Average = Sum(39)m / 12 =	121.8870	121.8870	121.8870	121.8870	121.8870	121.8870	121.8870	121.8870	121.8870	121.8870	121.8870	121.8870	(39)
HLP	1.0040	1.0040	1.0040	1.0040	1.0040	1.0040	1.0040	1.0040	1.0040	1.0040	1.0040	1.0040	(40)
HLP (average)													1.0040
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8686 (42)
Hot water usage for mixer showers													
72.3162	71.2295	69.6458	66.6158	64.3797	61.8861	60.4687	62.0404	63.7632	66.4406	69.5357	72.0392	72.0392	(42a)
Hot water usage for baths													
31.2216	30.7579	30.1049	28.9010	27.9995	26.9998	26.4599	27.1083	27.8143	28.8839	30.1127	31.1160	31.1160	(42b)
Hot water usage for other uses													
44.0070	42.4067	40.8065	39.2062	37.6060	36.0057	36.0057	37.6060	39.2062	40.8065	42.4067	44.0070	44.0070	(42c)
Average daily hot water use (litres/day)													135.6268 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.5448	144.3941	140.5572	134.7230	129.9852	124.8916	122.9343	126.7546	130.7837	136.1310	142.0551	147.1621	(44)
Energy content (annual)	233.6748	205.6152	216.0312	184.4290	174.9850	153.5688	148.6784	156.9487	161.2693	184.7284	202.3835	230.4204	(45)
Distribution loss (46)m = 0.15 x (45)m													
35.0512	30.8423	32.4047	27.6644	26.2478	23.0353	22.3018	23.5423	24.1904	27.7093	30.3575	34.5631	34.5631	(46)

Water storage loss:

Store volume													200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.7700 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.9558 (55)

Total storage loss	29.6298	26.7624	29.6298	28.6740	29.6298	28.6740	29.6298	29.6298	28.6740	29.6298	28.6740	29.6298	(56)
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If cylinder contains dedicated solar storage	29.6298	26.7624	29.6298	28.6740	29.6298	28.6740	29.6298	29.6298	28.6740	29.6298	28.6740	29.6298	(57)
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Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
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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)
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Total heat required for water heating calculated for each month	286.5670	253.3888	268.9234	235.6150	227.8772	204.7548	201.5706	209.8409	212.4553	237.6206	253.5695	283.3126	(62)
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WVHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
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PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
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Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
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FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
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Output from w/h	286.5670	253.3888	268.9234	235.6150	227.8772	204.7548	201.5706	209.8409	212.4553	237.6206	253.5695	283.3126	(64)
Total per year (kWh/year) = Sum(64)m =													2875.4958 (64)

12Total per year (kWh/year)													2875 (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	120.0106	106.5859	114.1441	102.2715	100.4963	92.0104	91.7493	94.4992	94.5709	103.7360	108.2413	118.9285	(65)
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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	144.9408	160.4702	144.9408	149.7722	144.9408	149.7722	144.9408	144.9408	149.7722	144.9408	149.7722	144.9408	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	287.0247	290.0031	282.4976	266.5193	246.3494	227.3927	214.7284	211.7500	219.2555	235.2338	255.4036	274.3604	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	(71)
Water heating gains (Table 5)	161.3046	158.6100	153.4195	142.0437	135.0756	127.7923	123.3190	127.0150	131.3484	139.4301	150.3351	159.8502	(72)
Total internal gains	659.2986	675.1118	646.8864	624.3636	592.3944	570.9856	549.0166	549.7343	566.4045	585.6332	621.5394	645.1799	(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	
Northeast					12.5900	11.2829	0.5000	0.8000			0.7700	39.3769 (75)	
Southwest					5.5300	36.7938	0.5000	0.8000			0.7700	56.4019 (79)	
Northwest					1.8900	11.2829	0.5000	0.8000			0.7700	5.9112 (81)	
Northeast					2.7400	17.4137	0.7600	0.7000			1.0000	22.8453 (82)	
Solar gains	124.5352	235.9725	386.5673	586.3470	755.1965	793.1516	746.6063	613.9225	454.6510	277.9393	153.4976	103.7772 (83)	
Total gains	783.8338	911.0843	1033.4537	1210.7106	1347.5909	1364.1372	1295.6230	1163.6568	1021.0555	863.5725	775.0370	748.9571 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)

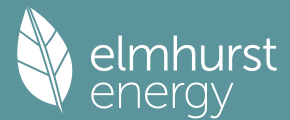
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	89.9343	89.9343	89.9343	89.9343	89.9343	89.9343	89.9343	89.9343	89.9343	89.9343	89.9343	89.9343	21.0000 (85)
alpha	6.9956	6.9956	6.9956	6.9956	6.9956	6.9956	6.9956	6.9956	6.9956	6.9956	6.9956	6.9956	
util living area	0.9992	0.9975	0.9901	0.9433	0.7880	0.5669	0.4134	0.4803	0.7762	0.9772	0.9977	0.9994	(86)
Living	20.0867	20.2316	20.4573	20.7573	20.9477	20.9951	20.9995	20.9987	20.9647	20.6910	20.3283	20.0525	
Non living	19.0128	19.1980	19.4843	19.8474	20.0426	20.0778	20.0799	20.0797	20.0602	19.7773	19.3222	18.9690	
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	20.5328	20.2316	20.4573	20.7573	20.9477	20.9951	20.9995	20.9987	20.9647	20.6910	20.3283	20.1851	(87)
Th 2	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	(88)
util rest of house	0.9989	0.9964	0.9857	0.9203	0.7283	0.4879	0.3273	0.3852	0.6931	0.9635	0.9965	0.9992	(89)
MIT 2	19.6545	19.1980	19.4843	19.8474	20.0426	20.0778	20.0799	20.0797	20.0602	19.7773	19.3222	19.1692	(90)
Living area fraction	19.8426	19.4194	19.6927	20.0423	20.2365	20.2743	20.2768	20.2765	20.2539	19.9730	19.5377	0.2142	(91)
MIT	19.8426	19.4194	19.6927	20.0423	20.2365	20.2743	20.2768	20.2765	20.2539	19.9730	19.5377	19.3868	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8426	19.4194	19.6927	20.0423	20.2365	20.2743	20.2768	20.2765	20.2539	19.9730	19.5377	19.3868	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9988	0.9953	0.9833	0.9191	0.7391	0.5048	0.3458	0.4056	0.7100	0.9614	0.9955	0.9989	(94)
Useful gains	782.8754	906.8141	1016.1942	1112.8164	996.0308	688.6618	447.9846	471.9814	724.9311	830.2562	771.5528	748.1617	(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	1894.4444	1769.7277	1608.0221	1358.0987	1040.4852	691.6197	448.1592	472.4945	750.0806	1142.4457	1515.9935	1851.0681	(97)
Space heating kWh	827.0073	579.8779	440.3200	176.6032	33.0741	0.0000	0.0000	0.0000	0.0000	232.2690	535.9973	820.5624	(98a)
Space heating requirement - total per year (kWh/year)												3645.7112	
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	827.0073	579.8779	440.3200	176.6032	33.0741	0.0000	0.0000	0.0000	0.0000	232.2690	535.9973	820.5624	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3645.7112	
Space heating per m ²										(98c) / (4) =		30.0306	(99)

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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 %)													200.7350 (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	827.0073	579.8779	440.3200	176.6032	33.0741	0.0000	0.0000	0.0000	0.0000	232.2690	535.9973	820.5624	(98)
Space heating efficiency (main heating system 1)	200.7350	200.7350	200.7350	200.7350	200.7350	0.0000	0.0000	0.0000	0.0000	200.7350	200.7350	200.7350	(210)
Space heating fuel (main heating system)	411.9896	288.8773	219.3539	87.9783	16.4765	0.0000	0.0000	0.0000	0.0000	115.7092	267.0174	408.7789	(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	286.5670	253.3888	268.9234	235.6150	227.8772	204.7548	201.5706	209.8409	212.4553	237.6206	253.5695	283.3126	(64)
Efficiency of water heater	170.1509	170.1509	170.1509	170.1509	170.1509	170.1509	170.1509	170.1509	170.1509	170.1509	170.1509	170.1509	(216)
Fuel for water heating, kWh/month	168.4194	148.9201	158.0500	138.4742	133.9266	120.3372	118.4658	123.3264	124.8629	139.6529	149.0263	166.5067	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	30.1158	24.1600	21.7534	15.9375	12.3106	10.0579	11.2301	14.5973	18.9605	24.8772	28.0988	30.9528	(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													1816.1811 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													170.1509
Water heating fuel used													1689.9683 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year													0.0000 (231)
Electricity for lighting (calculated in Appendix L)													243.0521 (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													3749.2014 (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	1816.1811	0.1566	284.3787	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1689.9683	0.1410	238.2137	(264)
Space and water heating			522.5923	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	243.0521	0.1443	35.0799	(268)
Total CO2, kg/year			557.6723	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.5900	(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	1816.1811	1.5797	2868.9643	(275)

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Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1689.9683	1.5212	2570.8009 (278)
Space and water heating			5439.7652 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	243.0521	1.5338	372.8014 (282)
Total Primary energy kWh/year			5812.5666 (286)
Dwelling Primary energy Rate (DPER)			47.8800 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	49.8400 (1b)	x 2.7000 (2b)	= 134.5680 (1b) -
First floor	47.0000 (1c)	x 2.7000 (2c)	= 126.9000 (1c) -
Second floor	24.5600 (1d)	x 1.5000 (2d)	= 36.8400 (1d) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	121.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	298.3080 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1341 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3841 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3553 (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	0.4530	0.4441	0.4352	0.3908	0.3819	0.3375	0.3375	0.3286	0.3553	0.3819	0.3997	0.4175 (22b)
Effective ac	0.6026	0.5986	0.5947	0.5764	0.5729	0.5570	0.5570	0.5540	0.5631	0.5729	0.5799	0.5871 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.20)			20.0100	1.1450	22.9122		(27)
rooflight			2.7400	1.5038	4.1203		(27a)
ground floor			49.8400	0.1300	6.4792		(28a)
External Wall 1	120.6600	20.1000	100.5600	0.1800	18.1008		(29a)
Dormer	3.9200	2.0300	1.8900	0.1800	0.3402		(29a)
Sloping ceiling	59.2400	2.7400	56.5000	0.1100	6.2150		(30)
Flat roof	6.2500		6.2500	0.1100	0.6875		(30)
Total net area of external elements Aum(A, m ²)			239.9100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		60.9752		(33)
Party Wall 1			70.0000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							325.0623 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value		Total
E2 Other lintels (including other steel lintels)				14.4600	0.0500		0.7230
E3 Sill				13.4500	0.0500		0.6725

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E4 Jamb	31.5000	0.0500	1.5750
E5 Ground floor (normal)	20.9000	0.1600	3.3440
R1 Head of roof window	2.6000	0.0800	0.2080
R2 Sill of roof window	2.6000	0.0600	0.1560
R3 Jamb of roof window	6.1600	0.0800	0.4928
E6 Intermediate floor within a dwelling	40.0000	0.0000	0.0000
E11 Eaves (insulation at rafter level)	10.0000	0.0400	0.4000
E13 Gable (insulation at rafter level)	12.2000	0.0800	0.9760
E16 Corner (normal)	10.8000	0.0900	0.9720
P1 Party wall - Ground floor	10.0000	0.0800	0.8000
P2 Party wall - Intermediate floor within a dwelling	20.0000	0.0000	0.0000
R8 Roof to wall (rafter)	12.2000	0.0600	0.7320
R4 Ridge (vaulted ceiling)	5.0000	0.0800	0.4000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			11.4513 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	72.4265 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	59.3207	58.9285	58.5441	56.7385	56.4007	54.8280	54.8280	54.5368	55.4338	56.4007	57.0841	57.7986 (38)
Heat transfer coeff												
	131.7473	131.3551	130.9706	129.1650	128.8272	127.2545	127.2545	126.9633	127.8603	128.8272	129.5106	130.2251 (39)
Average = Sum(39)m / 12 =												129.1634
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0852	1.0820	1.0788	1.0640	1.0612	1.0482	1.0482	1.0458	1.0532	1.0612	1.0668	1.0727 (40)
HLP (average)												1.0639
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

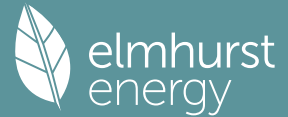
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8686 (42)
Hot water usage for mixer showers													
	72.3162	71.2295	69.6458	66.6158	64.3797	61.8861	60.4687	62.0404	63.7632	66.4406	69.5357	72.0392 (42a)	
Hot water usage for baths													
	31.2216	30.7579	30.1049	28.9010	27.9995	26.9998	26.4599	27.1083	27.8143	28.8839	30.1127	31.1160 (42b)	
Hot water usage for other uses													
	44.0070	42.4067	40.8065	39.2062	37.6060	36.0057	36.0057	37.6060	39.2062	40.8065	42.4067	44.0070 (42c)	
Average daily hot water use (litres/day)												135.6268 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	147.5448	144.3941	140.5572	134.7230	129.9852	124.8916	122.9343	126.7546	130.7837	136.1310	142.0551	147.1621 (44)	
Energy content (annual)													
	233.6748	205.6152	216.0312	184.4290	174.9850	153.5688	148.6784	156.9487	161.2693	184.7284	202.3835	230.4204 (45)	
Distribution loss (46)m = 0.15 x (45)m													
	35.0512	30.8423	32.4047	27.6644	26.2478	23.0353	22.3018	23.5423	24.1904	27.7093	30.3575	34.5631 (46)	
Water storage loss:													
Store volume												200.0000 (47)	
a) If manufacturer declared loss factor is known (kWh/day):												1.6525 (48)	
Temperature factor from Table 2b												0.5400 (49)	
Enter (49) or (54) in (55)												0.8924 (55)	
Total storage loss													
	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637 (56)	
If cylinder contains dedicated solar storage													
	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637 (57)	
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)	
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)	
Total heat required for water heating calculated for each month													
	284.6009	251.6130	266.9573	233.7123	225.9111	202.8521	199.6045	207.8748	210.5526	235.6545	251.6668	281.3464 (62)	
WWHRS	-33.0600	-29.2385	-30.6169	-25.3520	-23.6271	-20.2179	-18.9511	-20.1526	-20.9182	-24.6603	-27.9371	-32.4477 (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													
	251.5410	222.3745	236.3404	208.3604	202.2839	182.6342	180.6534	187.7222	189.6344	210.9942	223.7297	248.8987 (64)	
												Total per year (kWh/year) = Sum(64)m = 2545.1669 (64)	
12Total per year (kWh/year)												2545 (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													
	118.4377	105.1653	112.5712	100.7493	98.9234	90.4883	90.1764	92.9263	93.0487	102.1631	106.7191	117.3556 (65)	

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	146.4854	162.1802	146.4854	151.3682	146.4854	151.3682	146.4854	146.4854	151.3682	146.4854	151.3682	146.4854 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	287.0247	290.0031	282.4976	266.5193	246.3494	227.3927	214.7284	211.7500	219.2555	235.2338	255.4036	274.3604 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426 (71)

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Water heating gains (Table 5)												
159.1905	156.4959	151.3054	139.9296	132.9615	125.6782	121.2049	124.9009	129.2343	137.3160	148.2210	157.7361	(72)
Total internal gains												
661.7291	677.7078	649.3169	626.8455	594.8248	570.4675	548.4471	549.1647	565.8865	588.0636	624.0214	647.6103	(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	
Northeast					12.5900	11.2829		0.6300	0.7000			0.7700	43.4130 (75)	
Southwest					5.5300	36.7938		0.6300	0.7000			0.7700	62.1830 (79)	
Northwest					1.8900	11.2829		0.6300	0.7000			0.7700	6.5171 (81)	
Northeast					2.7400	17.4137		0.6300	0.7000			1.0000	18.9375 (82)	
Solar gains	131.0507	247.1074	401.8368	605.2212	776.2213	813.9534	766.6925	632.4283	471.1796	290.2611	161.3098	109.3469 (83)		
Total gains	792.7798	924.8151	1051.1537	1232.0668	1371.0461	1384.4210	1315.1396	1181.5931	1037.0661	878.3247	785.3312	756.9573 (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	83.2034	83.4518	83.6968	84.8668	85.0894	86.1409	86.3385	85.7328	85.0894	84.6404	84.1760			
alpha	6.5469	6.5635	6.5798	6.6578	6.6726	6.7427	6.7559	6.7155	6.6726	6.6427	6.6117			
util living area	0.9992	0.9975	0.9908	0.9482	0.8043	0.5814	0.4250	0.4921	0.7905	0.9786	0.9977	0.9994	(86)	
MIT	19.9855	20.1406	20.3815	20.7147	20.9311	20.9931	20.9993	20.9982	20.9548	20.6527	20.2655	19.9669	(87)	
Th 2	20.0129	20.0156	20.0182	20.0304	20.0327	20.0433	20.0433	20.0453	20.0392	20.0327	20.0280	20.0232	(88)	
util rest of house	0.9988	0.9964	0.9866	0.9262	0.7438	0.4980	0.3330	0.3913	0.7057	0.9654	0.9965	0.9992	(89)	
MIT 2	18.8311	19.0314	19.3394	19.7553	19.9828	20.0403	20.0432	20.0449	20.0136	19.6919	19.2013	18.8151	(90)	
Living area fraction									fLA = Living area / (4) =			0.2142	(91)	
MIT	19.0784	19.2690	19.5626	19.9608	20.1859	20.2444	20.2479	20.2490	20.2152	19.8977	19.4293	19.0618	(92)	
Temperature adjustment												0.0000		
adjusted MIT	19.0784	19.2690	19.5626	19.9608	20.1859	20.2444	20.2479	20.2490	20.2152	19.8977	19.4293	19.0618	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
0.9983	0.9953	0.9840	0.9243	0.7541	0.5158	0.3528	0.4130	0.7226	0.9629	0.9954	0.9988	(94)		
Useful gains	791.4680	920.4284	1034.2931	1138.7685	1033.8845	714.1045	463.9485	487.9479	749.3372	845.7491	781.7355	756.0275	(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	1947.0080	1887.4346	1710.8196	1428.6687	1093.2114	718.2708	464.2167	488.6844	781.8903	1197.7911	1596.7689	1935.3778	(97)	
Space heating kWh	859.7218	649.8282	503.3357	208.7281	44.1392	0.0000	0.0000	0.0000	0.0000	261.9193	586.8240	877.4366	(98a)	
Space heating requirement - total per year (kWh/year)												3991.9329		
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	859.7218	649.8282	503.3357	208.7281	44.1392	0.0000	0.0000	0.0000	0.0000	261.9193	586.8240	877.4366	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												3991.9329		
Space heating per m2										(98c) / (4) =		32.8825	(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	859.7218	649.8282	503.3357	208.7281	44.1392	0.0000	0.0000	0.0000	0.0000	261.9193	586.8240	877.4366	(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)	931.4429	704.0392	545.3258	226.1410	47.8215	0.0000	0.0000	0.0000	0.0000	283.7695	635.7790	950.6355	(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)	

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Water heating requirement	251.5410	222.3745	236.3404	208.3604	202.2839	182.6342	180.6534	187.7222	189.6344	210.9942	223.7297	248.8987 (64)
Efficiency of water heater (217)m	86.5895	86.3180	85.7113	84.0637	81.2755	79.8000	79.8000	79.8000	79.8000	84.5458	86.1191	79.8000 (216)
Fuel for water heating, kWh/month	290.4983	257.6225	275.7400	247.8599	248.8868	228.8649	226.3827	235.2408	237.6371	249.5621	259.7910	287.2769 (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	7.0685	7.3041	7.0685	7.3041	7.0685 (231)
Lighting	30.4368	24.4175	21.9853	16.1073	12.4418	10.1650	11.3498	14.7529	19.1626	25.1423	28.3982	31.2827 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-46.7628	-65.9977	-94.9485	-106.8176	-115.1768	-107.4296	-106.0231	-100.0473	-89.5745	-75.4083	-51.4040	-40.4142 (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	-26.2128	-55.1656	-109.7140	-164.9116	-218.2201	-219.3878	-216.8847	-183.6310	-134.5353	-79.0298	-35.0363	-20.7335 (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												4324.9544 (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												3045.3632 (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)												245.6422 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-2463.4669 (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												5238.4929 (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	4324.9544	0.2100	908.2404 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3045.3632	0.2100	639.5263 (264)
Space and water heating			1547.7667 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	245.6422	0.1443	35.4538 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1000.0044	0.1346	-134.5859
PV Unit electricity exported	-1463.4625	0.1259	-184.1978
Total			-318.7837 (269)
Total CO2, kg/year			1276.3660 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.5100 (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	4324.9544	1.1300	4887.1985 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3045.3632	1.1300	3441.2605 (278)
Space and water heating			8328.4589 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	245.6422	1.5338	376.7741 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1000.0044	1.4974	-1497.4112
PV Unit electricity exported	-1463.4625	0.4620	-676.1294
Total			-2173.5405 (283)
Total Primary energy kWh/year			6661.7934 (286)
Target Primary Energy Rate (TPER)			54.8700 (287)

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Property Reference	Plot 002				Issued on Date	28/09/2023		
Assessment Reference	Vaillant ASHP			Prop Type Ref				
Property	2, UB9 6NL							
SAP Rating	81 B		DER	4.09		TER	8.94	
Environmental	96 A		% DER < TER				54.25	
CO ₂ Emissions (t/year)	0.45		DFEE	30.71		TFEE	31.84	
Compliance Check	See BREL		% DFEE < TFEE				3.54	
% DPER < TPER	7.80		DPER	42.79		TPER	46.41	
Assessor Details	Mr. Michael Woodbridge				Assessor ID	M818-0001		
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	49.8400 (1b)	x 2.7000 (2b)	= 134.5680 (1b) -
First floor	47.0000 (1c)	x 2.7000 (2c)	= 126.9000 (1c) -
Second floor	24.5600 (1d)	x 1.5000 (2d)	= 36.8400 (1d) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	121.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 298.3080 (5)

2. Ventilation rate

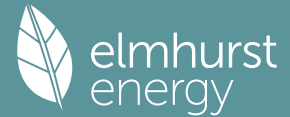
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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)+(7a)+(7b)+(7c) =	Air changes per hour 0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1388 (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	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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 floor			2.1200	1.2000	2.5440		(26)
window (Uw = 1.20)			18.1200	1.1450	20.7481		(27)

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rooflight			2.7400	1.1450	3.1374			(27a)
ground floor			49.8400	0.1100	5.4824	110.0000	5482.4000	(28a)
External Wall 1	54.2800	18.2100	36.0700	0.1600	5.7712	190.0000	6853.3000	(29a)
Dormer	3.9200	2.0300	1.8900	0.1800	0.3402	9.0000	17.0100	(29a)
Sloping ceiling	59.2400	2.7400	56.5000	0.1100	6.2150	9.0000	508.5000	(30)
Flat roof	6.2500		6.2500	0.1100	0.6875	9.0000	56.2500	(30)
Total net area of external elements Aum(A, m2)			173.5300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		44.9258			(33)
Party Wall 1			140.0000	0.0000	0.0000	180.0000	25200.0000	(32)
Internal Wall 1			150.0000			75.0000	11250.0000	(32c)
Internal Floor 1			94.0000			18.0000	1692.0000	(32d)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 51059.4600 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 420.5886 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	14.4600	0.0500	0.7230
E3 Sill	13.4500	0.0400	0.5380
E4 Jamb	31.5000	0.0400	1.2600
E5 Ground floor (normal)	10.0000	0.1050	1.0500
R1 Head of roof window	2.6000	0.2400	0.6240
R2 Sill of roof window	2.6000	0.2400	0.6240
R3 Jamb of roof window	6.1600	0.2400	1.4784
E6 Intermediate floor within a dwelling	20.0000	0.0500	1.0000
E11 Eaves (insulation at rafter level)	10.0000	0.0800	0.8000
E16 Corner (normal)	10.8000	0.0800	0.8640
P1 Party wall - Ground floor	10.0000	0.1600	1.6000
P2 Party wall - Intermediate floor within a dwelling	20.0000	0.0000	0.0000
R8 Roof to wall (rafter)	12.2000	0.0600	0.7320
R4 Ridge (vaulted ceiling)	5.0000	0.1200	0.6000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			11.8934 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 56.8192 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(38)
Heat transfer coeff	49.2208	49.2208	49.2208	49.2208	49.2208	49.2208	49.2208	49.2208	49.2208	49.2208	49.2208	49.2208	
Average = Sum(39)m / 12 =	106.0400	106.0400	106.0400	106.0400	106.0400	106.0400	106.0400	106.0400	106.0400	106.0400	106.0400	106.0400	(39)
	106.0400												106.0400
HLP	0.8735	0.8735	0.8735	0.8735	0.8735	0.8735	0.8735	0.8735	0.8735	0.8735	0.8735	0.8735	(40)
HLP (average)													0.8735
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8686 (42)
Hot water usage for mixer showers													
72.3162	71.2295	69.6458	66.6158	64.3797	61.8861	60.4687	62.0404	63.7632	66.4406	69.5357	72.0392	72.0392	(42a)
Hot water usage for baths													
31.2216	30.7579	30.1049	28.9010	27.9995	26.9998	26.4599	27.1083	27.8143	28.8839	30.1127	31.1160	31.1160	(42b)
Hot water usage for other uses													
44.0070	42.4067	40.8065	39.2062	37.6060	36.0057	36.0057	37.6060	39.2062	40.8065	42.4067	44.0070	44.0070	(42c)
Average daily hot water use (litres/day)													135.6268 (43)
Daily hot water use													
147.5448	144.3941	140.5572	134.7230	129.9852	124.8916	122.9343	126.7546	130.7837	136.1310	142.0551	147.1621	147.1621	(44)
Energy content (annual)	233.6748	205.6152	216.0312	184.4290	174.9850	153.5688	148.6784	156.9487	161.2693	184.7284	202.3835	230.4204	(45)
Distribution loss (46)m = 0.15 x (45)m													
35.0512	30.8423	32.4047	27.6644	26.2478	23.0353	22.3018	23.5423	24.1904	27.7093	30.3575	34.5631	34.5631	(46)
Water storage loss:													
Store volume													180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.1100 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.5994 (55)
Total storage loss													
18.5814	16.7832	18.5814	17.9820	18.5814	17.9820	18.5814	18.5814	17.9820	18.5814	17.9820	18.5814	18.5814	(56)
If cylinder contains dedicated solar storage													
18.5814	16.7832	18.5814	17.9820	18.5814	17.9820	18.5814	18.5814	17.9820	18.5814	17.9820	18.5814	18.5814	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
275.5186	243.4096	257.8750	224.9230	216.8288	194.0628	190.5222	198.7925	201.7633	226.5722	242.8775	272.2642	272.2642	(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													
275.5186	243.4096	257.8750	224.9230	216.8288	194.0628	190.5222	198.7925	201.7633	226.5722	242.8775	272.2642	272.2642	(64)
12Total per year (kWh/year)													
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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													
111.1719	98.6026	105.3054	93.7179	91.6576	83.4568	82.9106	85.6605	86.0173	94.8972	99.6877	110.0898	110.0898	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	145.9669	161.6062	145.9669	150.8325	145.9669	150.8325	145.9669	145.9669	150.8325	145.9669	150.8325	145.9669	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	287.0247	290.0031	282.4976	266.5193	246.3494	227.3927	214.7284	211.7500	219.2555	235.2338	255.4036	274.3604	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	(71)
Water heating gains (Table 5)	149.4246	146.7300	141.5395	130.1637	123.1956	115.9123	111.4390	115.1350	119.4684	127.5501	138.4551	147.9702	(72)
Total internal gains	648.4447	664.3678	636.0325	613.5439	581.5404	560.1659	538.1627	538.8804	555.5848	574.7793	610.7197	634.3260	(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					
Northeast			12.5900	11.2829	0.5000	0.8000	0.7700	39.3769 (75)					
Southwest			5.5300	36.7938	0.5000	0.8000	0.7700	56.4019 (79)					
Northeast			2.7400	17.4137	0.7600	0.7000	1.0000	22.8453 (82)					
Solar gains	118.6240	223.9400	364.8886	550.7444	707.3396	742.1310	698.8777	575.8727	428.2351	263.2347	146.0597	98.9498	(83)
Total gains	767.0687	888.3078	1000.9211	1164.2882	1288.8800	1302.2969	1237.0404	1114.7531	983.8200	838.0139	756.7795	733.2757	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)

Utilisation factor for gains for living area, nil,m (see Table 9a)													21.0000 (85)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	133.7531	133.7531	133.7531	133.7531	133.7531	133.7531	133.7531	133.7531	133.7531	133.7531	133.7531	133.7531	
alpha	9.9169	9.9169	9.9169	9.9169	9.9169	9.9169	9.9169	9.9169	9.9169	9.9169	9.9169	9.9169	
util living area	0.9999	0.9993	0.9950	0.9460	0.7518	0.5207	0.3772	0.4375	0.7332	0.9834	0.9993	0.9999	(86)
Living	20.5221	20.6040	20.7277	20.8877	20.9609	20.9683	20.9686	20.9685	20.9640	20.8446	20.6494	20.5023	
Non living	19.6258	19.7308	19.8880	20.0782	20.1453	20.1497	20.1498	20.1498	20.1478	20.0336	19.7890	19.6005	
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	20.7555	20.6040	20.7277	20.8877	20.9609	20.9683	20.9686	20.9685	20.9640	20.8446	20.6494	20.5720	(87)
Th 2	20.1901	20.1901	20.1901	20.1901	20.1901	20.1901	20.1901	20.1901	20.1901	20.1901	20.1901	20.1901	(88)
util rest of house	0.9998	0.9988	0.9921	0.9205	0.6924	0.4551	0.3077	0.3605	0.6529	0.9706	0.9989	0.9999	(89)
MIT 2	19.9651	19.7308	19.8880	20.0782	20.1453	20.1497	20.1498	20.1498	20.1478	20.0336	19.7890	19.7068	(90)
Living area fraction										fLA = Living area / (4) =		0.2142	(91)
MIT	20.1344	19.9178	20.0678	20.2516	20.3199	20.3250	20.3251	20.3251	20.3226	20.2073	19.9733	19.8921	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1344	19.9178	20.0678	20.2516	20.3199	20.3250	20.3251	20.3251	20.3226	20.2073	19.9733	19.8921	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9998	0.9986	0.9915	0.9228	0.7022	0.4660	0.3193	0.3734	0.6664	0.9710	0.9987	0.9998	(94)
Useful gains	766.8926	887.1032	992.4223	1074.3653	905.0446	606.9131	395.0083	416.2037	655.6525	813.6965	755.8066	733.1545	(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	1679.0814	1592.4920	1438.7315	1203.7192	914.0589	607.0805	395.0115	416.2186	659.8433	1018.7577	1365.0816	1663.9860	(97)
Space heating kWh	678.6685	474.0212	332.0540	93.1348	6.7066	0.0000	0.0000	0.0000	0.0000	152.5655	438.6780	692.5387	(98a)
Space heating requirement - total per year (kWh/year)												2868.3672	
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	678.6685	474.0212	332.0540	93.1348	6.7066	0.0000	0.0000	0.0000	0.0000	152.5655	438.6780	692.5387	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2868.3672	
Space heating per m ²										(98c) / (4) =		23.6274	(99)

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

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Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												202.2467 (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	678.6685	474.0212	332.0540	93.1348	6.7066	0.0000	0.0000	0.0000	0.0000	152.5655	438.6780	692.5387 (98)
Space heating efficiency (main heating system 1)	202.2467	202.2467	202.2467	202.2467	202.2467	0.0000	0.0000	0.0000	0.0000	202.2467	202.2467	202.2467 (210)
Space heating fuel (main heating system)	335.5647	234.3778	164.1827	46.0501	3.3160	0.0000	0.0000	0.0000	0.0000	75.4354	216.9024	342.4228 (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	275.5186	243.4096	257.8750	224.9230	216.8288	194.0628	190.5222	198.7925	201.7633	226.5722	242.8775	272.2642 (64)
Efficiency of water heater	170.1600	170.1600	170.1600	170.1600	170.1600	170.1600	170.1600	170.1600	170.1600	170.1600	170.1600	170.1600 (216)
Fuel for water heating, kWh/month	161.9174	143.0475	151.5485	132.1833	127.4264	114.0473	111.9665	116.8268	118.5727	133.1525	142.7348	160.0048 (219)
Space cooling fuel requirement	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	6.7228	6.0722	6.7228	6.5060	6.7228	6.5060	6.7228	6.7228	6.5060	6.7228	6.5060	6.7228 (231)
Lighting	30.3290	24.3311	21.9074	16.0503	12.3977	10.1291	11.3096	14.7007	19.0947	25.0533	28.2977	31.1720 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												1418.2518 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												170.1600
Water heating fuel used												1613.4284 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(MEVDecentralised, Database: total watage = 6.3075, total flow = 29.0000, SFP = 0.2175)												
mechanical ventilation fans (SFP = 0.2175)												79.1560 (230a)
Total electricity for the above, kWh/year												79.1560 (231)
Electricity for lighting (calculated in Appendix L)												244.7727 (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												3355.6090 (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	1418.2518	0.1574	223.1667 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1613.4284	0.1411	227.5964 (264)
Space and water heating			450.7632 (265)
Pumps, fans and electric keep-hot	79.1560	0.1387	10.9799 (267)
Energy for lighting	244.7727	0.1443	35.3283 (268)
Total CO2, kg/year			497.0713 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.0900 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
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Space heating - main system 1	1418.2518	1.5825	2244.3993 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1613.4284	1.5216	2455.0107 (278)
Space and water heating			4699.4100 (279)
Pumps, fans and electric keep-hot	79.1560	1.5128	119.7472 (281)
Energy for lighting	244.7727	1.5338	375.4405 (282)
Total Primary energy kWh/year			5194.5978 (286)
Dwelling Primary energy Rate (DPER)			42.7900 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	49.8400 (1b)	x 2.7000 (2b)	= 134.5680 (1b) -
First floor	47.0000 (1c)	x 2.7000 (2c)	= 126.9000 (1c) -
Second floor	24.5600 (1d)	x 1.5000 (2d)	= 36.8400 (1d) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	121.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 298.3080 (5)

2. Ventilation rate

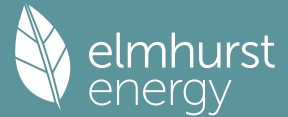
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour 40.0000 / (5) = 0.1341 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3841 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3553 (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	0.4530	0.4441	0.4352	0.3908	0.3819	0.3375	0.3375	0.3286	0.3553	0.3819	0.3997	0.4175 (22b)
Effective ac	0.6026	0.5986	0.5947	0.5764	0.5729	0.5570	0.5570	0.5540	0.5631	0.5729	0.5799	0.5871 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.20)			18.1200	1.1450	20.7481		(27)
rooflight			2.7400	1.5038	4.1203		(27a)
ground floor			49.8400	0.1300	6.4792		(28a)
External Wall 1	54.2800	18.2100	36.0700	0.1800	6.4926		(29a)
Dormer	3.9200	2.0300	1.8900	0.1800	0.3402		(29a)
Sloping ceiling	59.2400	2.7400	56.5000	0.1100	6.2150		(30)
Flat roof	6.2500		6.2500	0.1100	0.6875		(30)
Total net area of external elements Aum(A, m ²)			173.5300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		47.2029		(33)
Party Wall 1			140.0000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							420.5886 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				14.4600	0.0500	0.7230	

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E3 Sill	13.4500	0.0500	0.6725
E4 Jamb	31.5000	0.0500	1.5750
E5 Ground floor (normal)	10.0000	0.1600	1.6000
R1 Head of roof window	2.6000	0.0800	0.2080
R2 Sill of roof window	2.6000	0.0600	0.1560
R3 Jamb of roof window	6.1600	0.0800	0.4928
E6 Intermediate floor within a dwelling	20.0000	0.0000	0.0000
E11 Eaves (insulation at rafter level)	10.0000	0.0400	0.4000
E16 Corner (normal)	10.8000	0.0900	0.9720
P1 Party wall - Ground floor	10.0000	0.0800	0.8000
P2 Party wall - Intermediate floor within a dwelling	20.0000	0.0000	0.0000
R8 Roof to wall (rafter)	12.2000	0.0600	0.7320
R4 Ridge (vaulted ceiling)	5.0000	0.0800	0.4000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.7313 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	55.9342 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	59.3207	58.9285	58.5441	56.7385	56.4007	54.8280	54.8280	54.5368	55.4338	56.4007	57.0841	57.7986 (38)
Heat transfer coeff	115.2549	114.8627	114.4783	112.6727	112.3348	110.7622	110.7622	110.4710	111.3680	112.3348	113.0183	113.7328 (39)
Average = Sum(39)m / 12 =												112.6711
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9494	0.9462	0.9430	0.9281	0.9253	0.9124	0.9124	0.9100	0.9174	0.9253	0.9310	0.9368 (40)
HLP (average)												0.9281
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

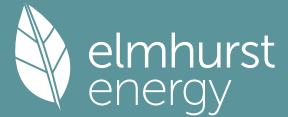
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8686 (42)
Hot water usage for mixer showers	72.3162	71.2295	69.6458	66.6158	64.3797	61.8861	60.4687	62.0404	63.7632	66.4406	69.5357	72.0392 (42a)	
Hot water usage for baths	31.2216	30.7579	30.1049	28.9010	27.9995	26.9998	26.4599	27.1083	27.8143	28.8839	30.1127	31.1160 (42b)	
Hot water usage for other uses	44.0070	42.4067	40.8065	39.2062	37.6060	36.0057	36.0057	37.6060	39.2062	40.8065	42.4067	44.0070 (42c)	
Average daily hot water use (litres/day)												135.6268 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.5448	144.3941	140.5572	134.7230	129.9852	124.8916	122.9343	126.7546	130.7837	136.1310	142.0551	147.1621 (44)	
Energy content (annual)	233.6748	205.6152	216.0312	184.4290	174.9850	153.5688	148.6784	156.9487	161.2693	184.7284	202.3835	230.4204 (45)	
Distribution loss (46)m = 0.15 x (45)m	35.0512	30.8423	32.4047	27.6644	26.2478	23.0353	22.3018	23.5423	24.1904	27.7093	30.3575	34.5631 (46)	
Water storage loss:													
Store volume												180.0000 (47)	
a) If manufacturer declared loss factor is known (kWh/day):												1.5520 (48)	
Temperature factor from Table 2b												0.5400 (49)	
Enter (49) or (54) in (55)												0.8381 (55)	
Total storage loss	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (56)	
If cylinder contains dedicated solar storage	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (57)	
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)	
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)	
Total heat required for water heating calculated for each month	282.9175	250.0925	265.2739	232.0832	224.2277	201.2230	197.9211	206.1913	208.9235	233.9711	250.0377	279.6630 (62)	
WWHRS	-33.0600	-29.2385	-30.6169	-25.3520	-23.6271	-20.2179	-18.9511	-20.1526	-20.9182	-24.6603	-27.9371	-32.4477 (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	249.8576	220.8540	234.6570	206.7313	200.6005	181.0051	178.9700	186.0388	188.0053	209.3108	222.1006	247.2153 (64)	
												Total per year (kWh/year) = Sum(64)m = 2525.3462 (64)	
12Total per year (kWh/year)												2525 (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	117.0910	103.9489	111.2245	99.4460	97.5767	89.1850	88.8297	91.5796	91.7454	100.8163	105.4159	116.0089 (65)	

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

Metabolic gains (Table 5), Watts												
(66)m	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	148.3455	164.2396	148.3455	153.2903	148.3455	153.2903	148.3455	148.3455	153.2903	148.3455	153.2903	148.3455 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	287.0247	290.0031	282.4976	266.5193	246.3494	227.3927	214.7284	211.7500	219.2555	235.2338	255.4036	274.3604 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426 (71)

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Water heating gains (Table 5)												
157.3804	154.6858	149.4953	138.1195	131.1514	123.8681	119.3948	123.0908	127.4242	135.5058	146.4109	155.9259	(72)
Total internal gains	661.7791	677.9570	649.3668	626.9575	594.8748	570.5795	548.4971	549.2147	565.9984	588.1136	624.1334	647.6603 (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
Northeast				12.5900	11.2829	0.6300		0.7000				0.7700	43.4130 (75)
Southwest				5.5300	36.7938	0.6300		0.7000				0.7700	62.1830 (79)
Northeast				2.7400	17.4137	0.6300		0.7000				1.0000	18.9375 (82)
Solar gains	124.5336	233.8416	377.9361	565.9693	723.4590	757.7033	714.0717	590.4784	442.0562	274.0492	153.1096	104.0247	(83)
Total gains	786.3126	911.7986	1027.3029	1192.9268	1318.3338	1328.2828	1262.5687	1139.6931	1008.0546	862.1628	777.2429	751.6850	(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	123.0592	123.4794	123.8941	125.8795	126.2581	128.0508	128.0508	128.3883	127.3543	126.2581	125.4946	124.7062	
alpha	9.2039	9.2320	9.2596	9.3920	9.4172	9.5367	9.5367	9.5592	9.4903	9.4172	9.3663	9.3137	
util living area	0.9998	0.9993	0.9955	0.9525	0.7723	0.5331	0.3860	0.4458	0.7477	0.9844	0.9993	0.9999	(86)
MIT	20.3310	20.4486	20.6253	20.8662	20.9843	20.9995	21.0000	20.9999	20.9913	20.8117	20.5323	20.3179	(87)
Th 2	20.1257	20.1284	20.1311	20.1437	20.1460	20.1570	20.1570	20.1590	20.1528	20.1460	20.1413	20.1363	(88)
util rest of house	0.9998	0.9988	0.9928	0.9286	0.7103	0.4632	0.3120	0.3643	0.6638	0.9720	0.9988	0.9998	(89)
MIT 2	19.3433	19.4961	19.7232	20.0234	20.1366	20.1568	20.1570	20.1590	20.1490	19.9688	19.6142	19.3352	(90)
Living area fraction	19.5548	19.7001	19.9164	20.2039	20.3182	20.3373	20.3375	20.3391	20.3294	20.1493	19.8108	19.5457	(92)
MIT	19.5548	19.7001	19.9164	20.2039	20.3182	20.3373	20.3375	20.3391	20.3294	20.1493	19.8108	19.5457	(93)
Temperature adjustment													
adjusted MIT	19.5548	19.7001	19.9164	20.2039	20.3182	20.3373	20.3375	20.3391	20.3294	20.1493	19.8108	19.5457	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.9997	0.9985	0.9919	0.9306	0.7233	0.4782	0.3279	0.3279	0.3818	0.6819	0.9721	0.9985	0.9998	(94)
Useful gains	786.0485	910.4522	1018.9570	1110.1087	953.4938	635.1836	413.9706	435.1305	687.3912	838.0724	776.1093	751.5175	(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	1758.1914	1699.9764	1535.8906	1273.6420	968.1226	635.4767	413.9773	435.1576	693.7549	1072.7243	1436.5531	1745.3083	(97)
Space heating kWh	723.2743	530.5602	384.5986	117.7440	10.8838	0.0000	0.0000	0.0000	0.0000	174.5809	475.5195	739.3804	(98a)
Space heating requirement - total per year (kWh/year)												3156.5418	
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	723.2743	530.5602	384.5986	117.7440	10.8838	0.0000	0.0000	0.0000	0.0000	174.5809	475.5195	739.3804	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3156.5418	
Space heating per m2												(98c) / (4) =	26.0012 (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	723.2743	530.5602	384.5986	117.7440	10.8838	0.0000	0.0000	0.0000	0.0000	174.5809	475.5195	739.3804	(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)	783.6125	574.8215	416.6832	127.5666	11.7917	0.0000	0.0000	0.0000	0.0000	189.1451	515.1891	801.0622	(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

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Water heating requirement	249.8576	220.8540	234.6570	206.7313	200.6005	181.0051	178.9700	186.0388	188.0053	209.3108	222.1006	247.2153 (64)
Efficiency of water heater (217)m	86.3009	85.9508	85.1605	82.8469	80.2184	79.8000	79.8000	79.8000	79.8000	83.6558	85.7220	79.8000 (216)
Fuel for water heating, kWh/month	289.5189	256.9538	275.5467	249.5340	250.0680	226.8235	224.2732	233.1313	235.5956	250.2048	259.0939	286.2631 (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	30.8233	24.7276	22.2644	16.3119	12.5998	10.2941	11.4939	14.9402	19.4059	25.4616	28.7588	31.6799 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-46.7737	-66.0164	-94.9772	-106.8494	-115.2085	-107.4578	-106.0546	-100.0835	-89.6110	-75.4365	-51.4190	-40.4236 (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	-26.2019	-55.1469	-109.6853	-164.8798	-218.1884	-219.3596	-216.8531	-183.5948	-134.4988	-79.0015	-35.0213	-20.7241 (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												3419.8719 (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												3037.0068 (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)												248.7613 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-2463.4669 (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												4328.1732 (238)

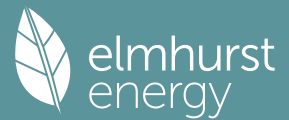
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3419.8719	0.2100	718.1731 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3037.0068	0.2100	637.7714 (264)
Space and water heating			1355.9445 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	248.7613	0.1443	35.9039 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1000.3114	0.1346	-134.6268
PV Unit electricity exported	-1463.1555	0.1259	-184.1566
Total			-318.7834 (269)
Total CO2, kg/year			1084.9944 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			8.9400 (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	3419.8719	1.1300	3864.4553 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3037.0068	1.1300	3431.8177 (278)
Space and water heating			7296.2730 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	248.7613	1.5338	381.5584 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1000.3114	1.4974	-1497.8695
PV Unit electricity exported	-1463.1555	0.4620	-675.9779
Total			-2173.8473 (283)
Total Primary energy kWh/year			5634.0849 (286)
Target Primary Energy Rate (TPER)			46.4100 (287)

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Property Reference	Plot 003				Issued on Date	28/09/2023
Assessment Reference	Vaillant ASHP		Prop Type Ref			
Property	3, UB9 6NL					
SAP Rating	81 B	DER	4.08	TER	8.94	
Environmental	96 A	% DER < TER				54.36
CO ₂ Emissions (t/year)	0.44	DFEE	30.71	TFEE	31.84	
Compliance Check	See BREL	% DFEE < TFEE				3.54
% DPER < TPER	8.21	DPER	42.60	TPER	46.41	
Assessor Details	Mr. Michael Woodbridge				Assessor ID	M818-0001
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	49.8400 (1b)	x 2.7000 (2b)	= 134.5680 (1b) -
First floor	47.0000 (1c)	x 2.7000 (2c)	= 126.9000 (1c) -
Second floor	24.5600 (1d)	x 1.5000 (2d)	= 36.8400 (1d) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	121.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 298.3080 (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)

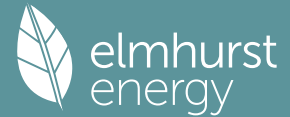
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour 0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1388 (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	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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 floor			2.1200	1.2000	2.5440		(26)
window (Uw = 1.20)			18.1200	1.1450	20.7481		(27)

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rooflight			2.7400	1.1450	3.1374			(27a)
ground floor			49.8400	0.1100	5.4824	110.0000	5482.4000	(28a)
External Wall 1	54.2800	18.2100	36.0700	0.1600	5.7712	190.0000	6853.3000	(29a)
Dormer	3.9200	2.0300	1.8900	0.1800	0.3402	9.0000	17.0100	(29a)
Sloping ceiling	59.2400	2.7400	56.5000	0.1100	6.2150	9.0000	508.5000	(30)
Flat roof	6.2500		6.2500	0.1100	0.6875	9.0000	56.2500	(30)
Total net area of external elements Aum(A, m2)			173.5300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		44.9258			(33)
Party Wall 1			140.0000	0.0000	0.0000	180.0000	25200.0000	(32)
Internal Wall 1			150.0000			75.0000	11250.0000	(32c)
Internal Floor 1			94.0000			18.0000	1692.0000	(32d)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 51059.4600 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 420.5886 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	14.4600	0.0500	0.7230
E3 Sill	13.4500	0.0400	0.5380
E4 Jamb	31.5000	0.0400	1.2600
E5 Ground floor (normal)	10.0000	0.1050	1.0500
R1 Head of roof window	2.6000	0.2400	0.6240
R2 Sill of roof window	2.6000	0.2400	0.6240
R3 Jamb of roof window	6.1600	0.2400	1.4784
E6 Intermediate floor within a dwelling	20.0000	0.0500	1.0000
E11 Eaves (insulation at rafter level)	10.0000	0.0800	0.8000
E16 Corner (normal)	10.8000	0.0800	0.8640
P1 Party wall - Ground floor	10.0000	0.1600	1.6000
P2 Party wall - Intermediate floor within a dwelling	20.0000	0.0000	0.0000
R8 Roof to wall (rafter)	12.2000	0.0600	0.7320
R4 Ridge (vaulted ceiling)	5.0000	0.1200	0.6000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			11.8934 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 56.8192 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(38)
Heat transfer coeff	49.2208	49.2208	49.2208	49.2208	49.2208	49.2208	49.2208	49.2208	49.2208	49.2208	49.2208	49.2208	
Average = Sum(39)m / 12 =	106.0400	106.0400	106.0400	106.0400	106.0400	106.0400	106.0400	106.0400	106.0400	106.0400	106.0400	106.0400	(39)
	106.0400												106.0400
HLP	0.8735	0.8735	0.8735	0.8735	0.8735	0.8735	0.8735	0.8735	0.8735	0.8735	0.8735	0.8735	(40)
HLP (average)													0.8735
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8686 (42)
Hot water usage for mixer showers													
72.3162	71.2295	69.6458	66.6158	64.3797	61.8861	60.4687	62.0404	63.7632	66.4406	69.5357	72.0392	72.0392	(42a)
Hot water usage for baths													
31.2216	30.7579	30.1049	28.9010	27.9995	26.9998	26.4599	27.1083	27.8143	28.8839	30.1127	31.1160	31.1160	(42b)
Hot water usage for other uses													
44.0070	42.4067	40.8065	39.2062	37.6060	36.0057	36.0057	37.6060	39.2062	40.8065	42.4067	44.0070	44.0070	(42c)
Average daily hot water use (litres/day)													135.6268 (43)
Daily hot water use													
147.5448	144.3941	140.5572	134.7230	129.9852	124.8916	122.9343	126.7546	130.7837	136.1310	142.0551	147.1621	147.1621	(44)
Energy content (annual)	233.6748	205.6152	216.0312	184.4290	174.9850	153.5688	148.6784	156.9487	161.2693	184.7284	202.3835	230.4204	(45)
Distribution loss (46)m = 0.15 x (45)m													
35.0512	30.8423	32.4047	27.6644	26.2478	23.0353	22.3018	23.5423	24.1904	27.7093	30.3575	34.5631	34.5631	(46)
Water storage loss:													
Store volume													180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.1100 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.5994 (55)
Total storage loss													
18.5814	16.7832	18.5814	17.9820	18.5814	17.9820	18.5814	18.5814	17.9820	18.5814	17.9820	18.5814	18.5814	(56)
If cylinder contains dedicated solar storage													
18.5814	16.7832	18.5814	17.9820	18.5814	17.9820	18.5814	18.5814	17.9820	18.5814	17.9820	18.5814	18.5814	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
275.5186	243.4096	257.8750	224.9230	216.8288	194.0628	190.5222	198.7925	201.7633	226.5722	242.8775	272.2642	272.2642	(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													
275.5186	243.4096	257.8750	224.9230	216.8288	194.0628	190.5222	198.7925	201.7633	226.5722	242.8775	272.2642	272.2642	(64)
12Total per year (kWh/year)													
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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													
111.1719	98.6026	105.3054	93.7179	91.6576	83.4568	82.9106	85.6605	86.0173	94.8972	99.6877	110.0898	110.0898	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	145.9669	161.6062	145.9669	150.8325	145.9669	150.8325	145.9669	145.9669	150.8325	145.9669	150.8325	145.9669	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	287.0247	290.0031	282.4976	266.5193	246.3494	227.3927	214.7284	211.7500	219.2555	235.2338	255.4036	274.3604	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	(71)
Water heating gains (Table 5)	149.4246	146.7300	141.5395	130.1637	123.1956	115.9123	111.4390	115.1350	119.4684	127.5501	138.4551	147.9702	(72)
Total internal gains	648.4447	664.3678	636.0325	613.5439	581.5404	560.1659	538.1627	538.8804	555.5848	574.7793	610.7197	634.3260	(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					
Northeast			12.5900	11.2829	0.5000	0.8000	0.7700	39.3769 (75)					
Southwest			5.5300	36.7938	0.5000	0.8000	0.7700	56.4019 (79)					
Northeast			2.7400	17.4137	0.7600	0.7000	1.0000	22.8453 (82)					
Solar gains	118.6240	223.9400	364.8886	550.7444	707.3396	742.1310	698.8777	575.8727	428.2351	263.2347	146.0597	98.9498	(83)
Total gains	767.0687	888.3078	1000.9211	1164.2882	1288.8800	1302.2969	1237.0404	1114.7531	983.8200	838.0139	756.7795	733.2757	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)

Utilisation factor for gains for living area, nil,m (see Table 9a)													21.0000 (85)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	133.7531	133.7531	133.7531	133.7531	133.7531	133.7531	133.7531	133.7531	133.7531	133.7531	133.7531	133.7531	
alpha	9.9169	9.9169	9.9169	9.9169	9.9169	9.9169	9.9169	9.9169	9.9169	9.9169	9.9169	9.9169	
util living area	0.9999	0.9993	0.9950	0.9460	0.7518	0.5207	0.3772	0.4375	0.7332	0.9834	0.9993	0.9999	(86)
Living	20.4047	20.5140	20.6788	20.8922	20.9898	20.9997	21.0000	21.0000	20.9939	20.8347	20.5744	20.3784	
Non living	19.4915	19.6315	19.8411	20.0947	20.1841	20.1900	20.1901	20.1901	20.1875	20.0352	19.7091	19.4578	
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	20.6955	20.5140	20.6788	20.8922	20.9898	20.9997	21.0000	21.0000	20.9939	20.8347	20.5744	20.4653	(87)
Th 2	20.1901	20.1901	20.1901	20.1901	20.1901	20.1901	20.1901	20.1901	20.1901	20.1901	20.1901	20.1901	(88)
util rest of house	0.9998	0.9988	0.9921	0.9205	0.6924	0.4551	0.3077	0.3605	0.6529	0.9706	0.9989	0.9999	(89)
MIT 2	19.9116	19.6315	19.8411	20.0947	20.1841	20.1900	20.1901	20.1901	20.1875	20.0352	19.7091	19.5897	(90)
Living area fraction									fLA = Living area / (4) =			0.2142	(91)
MIT	20.0795	19.8205	20.0205	20.2655	20.3567	20.3634	20.3636	20.3635	20.3602	20.2065	19.8944	19.7773	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0795	19.8205	20.0205	20.2655	20.3567	20.3634	20.3636	20.3635	20.3602	20.2065	19.8944	19.7773	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9998	0.9986	0.9913	0.9233	0.7050	0.4692	0.3226	0.3770	0.6702	0.9710	0.9986	0.9998	(94)
Useful gains	766.8870	887.0334	992.1865	1074.9464	908.5968	610.9736	399.0837	420.2776	659.4053	813.6822	755.7533	733.1461	(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	1673.2559	1582.1718	1433.7125	1205.1948	917.9517	611.1526	399.0873	420.2940	663.8297	1018.6688	1356.7207	1651.8137	(97)
Space heating kWh	674.3385	467.1330	328.4954	93.7788	6.9601	0.0000	0.0000	0.0000	0.0000	152.5101	432.6965	683.4887	(98a)
Space heating requirement - total per year (kWh/year)												2839.4011	
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	674.3385	467.1330	328.4954	93.7788	6.9601	0.0000	0.0000	0.0000	0.0000	152.5101	432.6965	683.4887	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2839.4011	
Space heating per m ²										(98c) / (4) =		23.3888	(99)

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

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Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												202.2467 (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	674.3385	467.1330	328.4954	93.7788	6.9601	0.0000	0.0000	0.0000	0.0000	152.5101	432.6965	683.4887 (98)
Space heating efficiency (main heating system 1)	202.2467	202.2467	202.2467	202.2467	202.2467	0.0000	0.0000	0.0000	0.0000	202.2467	202.2467	202.2467 (210)
Space heating fuel (main heating system)	333.4238	230.9719	162.4231	46.3685	3.4414	0.0000	0.0000	0.0000	0.0000	75.4079	213.9449	337.9480 (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	275.5186	243.4096	257.8750	224.9230	216.8288	194.0628	190.5222	198.7925	201.7633	226.5722	242.8775	272.2642 (64)
Efficiency of water heater	170.1600	170.1600	170.1600	170.1600	170.1600	170.1600	170.1600	170.1600	170.1600	170.1600	170.1600	170.1600 (216)
Fuel for water heating, kWh/month	161.9174	143.0475	151.5485	132.1833	127.4264	114.0473	111.9665	116.8268	118.5727	133.1525	142.7348	160.0048 (219)
Space cooling fuel requirement	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	6.7228	6.0722	6.7228	6.5060	6.7228	6.5060	6.7228	6.7228	6.5060	6.7228	6.5060	6.7228 (231)
Lighting	30.3290	24.3311	21.9074	16.0503	12.3977	10.1291	11.3096	14.7007	19.0947	25.0533	28.2977	31.1720 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												1403.9296 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												170.1600
Water heating fuel used												1613.4284 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(MEVDecentralised, Database: total watage = 6.3075, total flow = 29.0000, SFP = 0.2175)												
mechanical ventilation fans (SFP = 0.2175)												79.1560 (230a)
Total electricity for the above, kWh/year												79.1560 (231)
Electricity for lighting (calculated in Appendix L)												244.7727 (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												3341.2868 (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	1403.9296	0.1573	220.8860 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1613.4284	0.1411	227.5964 (264)
Space and water heating			448.4824 (265)
Pumps, fans and electric keep-hot	79.1560	0.1387	10.9799 (267)
Energy for lighting	244.7727	0.1443	35.3283 (268)
Total CO2, kg/year			494.7906 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.0800 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
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Space heating - main system 1	1403.9296	1.5824	2221.6322 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1613.4284	1.5216	2455.0107 (278)
Space and water heating			4676.6429 (279)
Pumps, fans and electric keep-hot	79.1560	1.5128	119.7472 (281)
Energy for lighting	244.7727	1.5338	375.4405 (282)
Total Primary energy kWh/year			5171.8307 (286)
Dwelling Primary energy Rate (DPER)			42.6000 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	49.8400 (1b)	x 2.7000 (2b)	= 134.5680 (1b) -
First floor	47.0000 (1c)	x 2.7000 (2c)	= 126.9000 (1c) -
Second floor	24.5600 (1d)	x 1.5000 (2d)	= 36.8400 (1d) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	121.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 298.3080 (5)

2. Ventilation rate

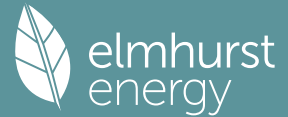
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour 40.0000 / (5) = 0.1341 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3841 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3553 (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	0.4530	0.4441	0.4352	0.3908	0.3819	0.3375	0.3375	0.3286	0.3553	0.3819	0.3997	0.4175 (22b)
Effective ac	0.6026	0.5986	0.5947	0.5764	0.5729	0.5570	0.5570	0.5540	0.5631	0.5729	0.5799	0.5871 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.20)			18.1200	1.1450	20.7481		(27)
rooflight			2.7400	1.5038	4.1203		(27a)
ground floor			49.8400	0.1300	6.4792		(28a)
External Wall 1	54.2800	18.2100	36.0700	0.1800	6.4926		(29a)
Dormer	3.9200	2.0300	1.8900	0.1800	0.3402		(29a)
Sloping ceiling	59.2400	2.7400	56.5000	0.1100	6.2150		(30)
Flat roof	6.2500		6.2500	0.1100	0.6875		(30)
Total net area of external elements Aum(A, m ²)			173.5300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		47.2029		(33)
Party Wall 1			140.0000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							420.5886 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				14.4600	0.0500	0.7230	

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E3 Sill	13.4500	0.0500	0.6725
E4 Jamb	31.5000	0.0500	1.5750
E5 Ground floor (normal)	10.0000	0.1600	1.6000
R1 Head of roof window	2.6000	0.0800	0.2080
R2 Sill of roof window	2.6000	0.0600	0.1560
R3 Jamb of roof window	6.1600	0.0800	0.4928
E6 Intermediate floor within a dwelling	20.0000	0.0000	0.0000
E11 Eaves (insulation at rafter level)	10.0000	0.0400	0.4000
E16 Corner (normal)	10.8000	0.0900	0.9720
P1 Party wall - Ground floor	10.0000	0.0800	0.8000
P2 Party wall - Intermediate floor within a dwelling	20.0000	0.0000	0.0000
R8 Roof to wall (rafter)	12.2000	0.0600	0.7320
R4 Ridge (vaulted ceiling)	5.0000	0.0800	0.4000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.7313 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	55.9342 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	59.3207	58.9285	58.5441	56.7385	56.4007	54.8280	54.8280	54.5368	55.4338	56.4007	57.0841	57.7986 (38)
Heat transfer coeff	115.2549	114.8627	114.4783	112.6727	112.3348	110.7622	110.7622	110.4710	111.3680	112.3348	113.0183	113.7328 (39)
Average = Sum(39)m / 12 =												112.6711
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9494	0.9462	0.9430	0.9281	0.9253	0.9124	0.9124	0.9100	0.9174	0.9253	0.9310	0.9368 (40)
HLP (average)												0.9281
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

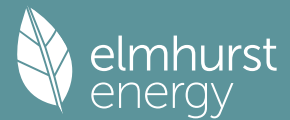
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8686 (42)
Hot water usage for mixer showers	72.3162	71.2295	69.6458	66.6158	64.3797	61.8861	60.4687	62.0404	63.7632	66.4406	69.5357	72.0392 (42a)
Hot water usage for baths	31.2216	30.7579	30.1049	28.9010	27.9995	26.9998	26.4599	27.1083	27.8143	28.8839	30.1127	31.1160 (42b)
Hot water usage for other uses	44.0070	42.4067	40.8065	39.2062	37.6060	36.0057	36.0057	37.6060	39.2062	40.8065	42.4067	44.0070 (42c)
Average daily hot water use (litres/day)												135.6268 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	147.5448	144.3941	140.5572	134.7230	129.9852	124.8916	122.9343	126.7546	130.7837	136.1310	142.0551	147.1621 (44)
Energy conte	233.6748	205.6152	216.0312	184.4290	174.9850	153.5688	148.6784	156.9487	161.2693	184.7284	202.3835	230.4204 (45)
Energy content (annual)										Total = Sum(45)m =		2252.7328
Distribution loss (46)m = 0.15 x (45)m	35.0512	30.8423	32.4047	27.6644	26.2478	23.0353	22.3018	23.5423	24.1904	27.7093	30.3575	34.5631 (46)
Water storage loss:												
Store volume												180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5520 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8381 (55)
Total storage loss	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (56)
If cylinder contains dedicated solar storage	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	282.9175	250.0925	265.2739	232.0832	224.2277	201.2230	197.9211	206.1913	208.9235	233.9711	250.0377	279.6630 (62)
WWHRS	-33.0600	-29.2385	-30.6169	-25.3520	-23.6271	-20.2179	-18.9511	-20.1526	-20.9182	-24.6603	-27.9371	-32.4477 (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	249.8576	220.8540	234.6570	206.7313	200.6005	181.0051	178.9700	186.0388	188.0053	209.3108	222.1006	247.2153 (64)
Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2525.3462 (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	117.0910	103.9489	111.2245	99.4460	97.5767	89.1850	88.8297	91.5796	91.7454	100.8163	105.4159	116.0089 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	148.3455	164.2396	148.3455	153.2903	148.3455	153.2903	148.3455	148.3455	153.2903	148.3455	153.2903	148.3455 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	287.0247	290.0031	282.4976	266.5193	246.3494	227.3927	214.7284	211.7500	219.2555	235.2338	255.4036	274.3604 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426 (71)

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Water heating gains (Table 5)												
157.3804	154.6858	149.4953	138.1195	131.1514	123.8681	119.3948	123.0908	127.4242	135.5058	146.4109	155.9259	(72)
Total internal gains	661.7791	677.9570	649.3668	626.9575	594.8748	570.5795	548.4971	549.2147	565.9984	588.1136	624.1334	647.6603 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b		Specific data or Table 6c		Access factor Table 6d		Gains W	
Northeast				12.5900	11.2829	0.6300		0.7000		0.7700		43.4130 (75)	
Southwest				5.5300	36.7938	0.6300		0.7000		0.7700		62.1830 (79)	
Northeast				2.7400	17.4137	0.6300		0.7000		1.0000		18.9375 (82)	
Solar gains	124.5336	233.8416	377.9361	565.9693	723.4590	757.7033	714.0717	590.4784	442.0562	274.0492	153.1096	104.0247 (83)	
Total gains	786.3126	911.7986	1027.3029	1192.9268	1318.3338	1328.2828	1262.5687	1139.6931	1008.0546	862.1628	777.2429	751.6850 (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	123.0592	123.4794	123.8941	125.8795	126.2581	128.0508	128.0508	128.3883	127.3543	126.2581	125.4946	124.7062	
alpha	9.2039	9.2320	9.2596	9.3920	9.4172	9.5367	9.5367	9.5592	9.4903	9.4172	9.3663	9.3137	
util living area	0.9998	0.9993	0.9955	0.9525	0.7723	0.5331	0.3860	0.4458	0.7477	0.9844	0.9993	0.9999	(86)
MIT	20.3310	20.4486	20.6253	20.8662	20.9843	20.9995	21.0000	20.9999	20.9913	20.8117	20.5323	20.3179	(87)
Th 2	20.1257	20.1284	20.1311	20.1437	20.1460	20.1570	20.1570	20.1590	20.1528	20.1460	20.1413	20.1363	(88)
util rest of house	0.9998	0.9988	0.9928	0.9286	0.7103	0.4632	0.3120	0.3643	0.6638	0.9720	0.9988	0.9998	(89)
MIT 2	19.3433	19.4961	19.7232	20.0234	20.1366	20.1568	20.1570	20.1590	20.1490	19.9688	19.6142	19.3352	(90)
Living area fraction	19.5548	19.7001	19.9164	20.2039	20.3182	20.3373	20.3375	20.3391	20.3294	20.1493	19.8108	19.5457	(92)
MIT	19.5548	19.7001	19.9164	20.2039	20.3182	20.3373	20.3375	20.3391	20.3294	20.1493	19.8108	19.5457	(93)
Temperature adjustment													
adjusted MIT	19.5548	19.7001	19.9164	20.2039	20.3182	20.3373	20.3375	20.3391	20.3294	20.1493	19.8108	19.5457	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.9997	0.9985	0.9919	0.9306	0.7233	0.4782	0.3279	0.3279	0.3818	0.6819	0.9721	0.9985	0.9998	(94)
Useful gains	786.0485	910.4522	1018.9570	1110.1087	953.4938	635.1836	413.9706	435.1305	687.3912	838.0724	776.1093	751.5175	(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	1758.1914	1699.9764	1535.8906	1273.6420	968.1226	635.4767	413.9773	435.1576	693.7549	1072.7243	1436.5531	1745.3083	(97)
Space heating kWh	723.2743	530.5602	384.5986	117.7440	10.8838	0.0000	0.0000	0.0000	0.0000	174.5809	475.5195	739.3804	(98a)
Space heating requirement - total per year (kWh/year)												3156.5418	
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	723.2743	530.5602	384.5986	117.7440	10.8838	0.0000	0.0000	0.0000	0.0000	174.5809	475.5195	739.3804	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3156.5418	
Space heating per m2												(98c) / (4) =	26.0012 (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	723.2743	530.5602	384.5986	117.7440	10.8838	0.0000	0.0000	0.0000	0.0000	174.5809	475.5195	739.3804	(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)	783.6125	574.8215	416.6832	127.5666	11.7917	0.0000	0.0000	0.0000	0.0000	189.1451	515.1891	801.0622	(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

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Water heating requirement	249.8576	220.8540	234.6570	206.7313	200.6005	181.0051	178.9700	186.0388	188.0053	209.3108	222.1006	247.2153 (64)
Efficiency of water heater (217)m	86.3009	85.9508	85.1605	82.8469	80.2184	79.8000	79.8000	79.8000	79.8000	83.6558	85.7220	79.8000 (216)
Fuel for water heating, kWh/month	289.5189	256.9538	275.5467	249.5340	250.0680	226.8235	224.2732	233.1313	235.5956	250.2048	259.0939	286.2631 (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	30.8233	24.7276	22.2644	16.3119	12.5998	10.2941	11.4939	14.9402	19.4059	25.4616	28.7588	31.6799 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-46.7737	-66.0164	-94.9772	-106.8494	-115.2085	-107.4578	-106.0546	-100.0835	-89.6110	-75.4365	-51.4190	-40.4236 (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	-26.2019	-55.1469	-109.6853	-164.8798	-218.1884	-219.3596	-216.8531	-183.5948	-134.4988	-79.0015	-35.0213	-20.7241 (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												3419.8719 (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												3037.0068 (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)												248.7613 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-2463.4669 (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												4328.1732 (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	3419.8719	0.2100	718.1731 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3037.0068	0.2100	637.7714 (264)
Space and water heating			1355.9445 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	248.7613	0.1443	35.9039 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1000.3114	0.1346	-134.6268
PV Unit electricity exported	-1463.1555	0.1259	-184.1566
Total			-318.7834 (269)
Total CO2, kg/year			1084.9944 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			8.9400 (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	3419.8719	1.1300	3864.4553 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3037.0068	1.1300	3431.8177 (278)
Space and water heating			7296.2730 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	248.7613	1.5338	381.5584 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1000.3114	1.4974	-1497.8695
PV Unit electricity exported	-1463.1555	0.4620	-675.9779
Total			-2173.8473 (283)
Total Primary energy kWh/year			5634.0849 (286)
Target Primary Energy Rate (TPER)			46.4100 (287)

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Property Reference	Plot 004	Issued on Date	28/09/2023
Assessment Reference	Vaillant ASHP	Prop Type Ref	
Property	4, UB9 6NL		
SAP Rating	79 C	DER	4.64
Environmental	96 A	TER	10.51
CO ₂ Emissions (t/year)	0.51	% DER < TER	55.85
Compliance Check	See BREL	DFEE	37.52
% DPER < TPER	11.94	TFEE	38.89
		% DFEE < TFEE	3.51
		DFEE	48.32
		TPER	54.87
Assessor Details	Mr. Michael Woodbridge	Assessor ID	M818-0001
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	49.8400 (1b)	x 2.7000 (2b)	= 134.5680 (1b) -
First floor	47.0000 (1c)	x 2.7000 (2c)	= 126.9000 (1c) -
Second floor	24.5600 (1d)	x 1.5000 (2d)	= 36.8400 (1d) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	121.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 298.3080 (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)

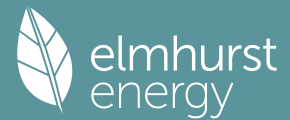
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour 0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1388 (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	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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 floor			2.1200	1.2000	2.5440		(26)
window (Uw = 1.20)			20.0100	1.1450	22.9122		(27)

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rooflight			2.7400	1.1450	3.1374			(27a)
ground floor			49.8400	0.1100	5.4824	110.0000	5482.4000	(28a)
External Wall 1	120.6600	20.1000	100.5600	0.1600	16.0896	190.0000	19106.4000	(29a)
Dormer	3.9200	2.0300	1.8900	0.1800	0.3402	9.0000	17.0100	(29a)
Sloping ceiling	59.2400	2.7400	56.5000	0.1100	6.2150	9.0000	508.5000	(30)
Flat roof	6.2500		6.2500	0.1100	0.6875	9.0000	56.2500	(30)
Total net area of external elements Aum(A, m2)			239.9100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		57.4083			(33)
Party Wall 1			70.0000	0.0000	0.0000	180.0000	12600.0000	(32)
Internal Floor 1			94.0000			18.0000	1692.0000	(32d)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 39462.5600 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 325.0623 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	14.4600	0.0500	0.7230
E3 Sill	13.4500	0.0400	0.5380
E4 Jamb	31.5000	0.0400	1.2600
E5 Ground floor (normal)	20.9000	0.1050	2.1945
R1 Head of roof window	2.6000	0.2400	0.6240
R2 Sill of roof window	2.6000	0.2400	0.6240
R3 Jamb of roof window	6.1600	0.2400	1.4784
E6 Intermediate floor within a dwelling	40.0000	0.0500	2.0000
E11 Eaves (insulation at rafter level)	10.0000	0.0800	0.8000
E13 Gable (insulation at rafter level)	12.2000	0.1000	1.2200
E16 Corner (normal)	10.8000	0.0800	0.8640
P1 Party wall - Ground floor	10.0000	0.1600	1.6000
P2 Party wall - Intermediate floor within a dwelling	20.0000	0.0000	0.0000
R8 Roof to wall (rafter)	12.2000	0.0600	0.7320
R4 Ridge (vaulted ceiling)	5.0000	0.1200	0.6000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			15.2579 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 72.6662 (37)

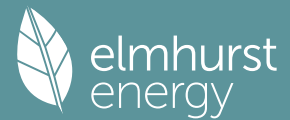
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(38)
Heat transfer coeff	49.2208	49.2208	49.2208	49.2208	49.2208	49.2208	49.2208	49.2208	49.2208	49.2208	49.2208	49.2208	
Average = Sum(39)m / 12 =	121.8870	121.8870	121.8870	121.8870	121.8870	121.8870	121.8870	121.8870	121.8870	121.8870	121.8870	121.8870	(39)
	121.8870	121.8870	121.8870	121.8870	121.8870	121.8870	121.8870	121.8870	121.8870	121.8870	121.8870	121.8870	
HLP	1.0040	1.0040	1.0040	1.0040	1.0040	1.0040	1.0040	1.0040	1.0040	1.0040	1.0040	1.0040	(40)
HLP (average)													1.0040
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8686 (42)
Hot water usage for mixer showers													
72.3162	71.2295	69.6458	66.6158	64.3797	61.8861	60.4687	62.0404	63.7632	66.4406	69.5357	72.0392	72.0392	(42a)
Hot water usage for baths													
31.2216	30.7579	30.1049	28.9010	27.9995	26.9998	26.4599	27.1083	27.8143	28.8839	30.1127	31.1160	31.1160	(42b)
Hot water usage for other uses													
44.0070	42.4067	40.8065	39.2062	37.6060	36.0057	36.0057	37.6060	39.2062	40.8065	42.4067	44.0070	44.0070	(42c)
Average daily hot water use (litres/day)													135.6268 (43)
Daily hot water use													
147.5448	144.3941	140.5572	134.7230	129.9852	124.8916	122.9343	126.7546	130.7837	136.1310	142.0551	147.1621	147.1621	(44)
Energy content (annual)													
233.6748	205.6152	216.0312	184.4290	174.9850	153.5688	148.6784	156.9487	161.2693	184.7284	202.3835	230.4204	230.4204	(45)
Distribution loss (46)m = 0.15 x (45)m													
35.0512	30.8423	32.4047	27.6644	26.2478	23.0353	22.3018	23.5423	24.1904	27.7093	30.3575	34.5631	34.5631	(46)
Water storage loss:													
Store volume													200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.2000 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.6480 (55)
Total storage loss													
20.0880	18.1440	20.0880	19.4400	20.0880	19.4400	20.0880	20.0880	19.4400	20.0880	19.4400	20.0880	20.0880	(56)
If cylinder contains dedicated solar storage													
20.0880	18.1440	20.0880	19.4400	20.0880	19.4400	20.0880	20.0880	19.4400	20.0880	19.4400	20.0880	20.0880	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
277.0252	244.7704	259.3816	226.3810	218.3354	195.5208	192.0288	200.2991	203.2213	228.0788	244.3355	273.7708	273.7708	(62)
WVHRS	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													
277.0252	244.7704	259.3816	226.3810	218.3354	195.5208	192.0288	200.2991	203.2213	228.0788	244.3355	273.7708	273.7708	(64)
Total per year (kWh/year)													
Electric shower(s)													2763.1488 (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													
112.3772	99.6912	106.5107	94.8843	92.8628	84.6232	84.1159	86.8658	87.1837	96.1025	100.8541	111.2951	111.2951	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	144.9408	160.4702	144.9408	149.7722	144.9408	149.7722	144.9408	144.9408	149.7722	144.9408	149.7722	144.9408	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	287.0247	290.0031	282.4976	266.5193	246.3494	227.3927	214.7284	211.7500	219.2555	235.2338	255.4036	274.3604	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	(71)
Water heating gains (Table 5)	151.0446	148.3500	143.1595	131.7837	124.8156	117.5323	113.0590	116.7550	121.0884	129.1701	140.0751	149.5902	(72)
Total internal gains	649.0386	664.8518	636.6264	614.1036	582.1344	560.7256	538.7566	539.4743	556.1445	575.3732	611.2794	634.9199	(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	
Northeast				12.5900	11.2829	0.5000	0.8000		0.7700		39.3769 (75)	
Southwest				5.5300	36.7938	0.5000	0.8000		0.7700		56.4019 (79)	
Northwest				1.8900	11.2829	0.5000	0.8000		0.7700		5.9112 (81)	
Northeast				2.7400	17.4137	0.7600	0.7000		1.0000		22.8453 (82)	
Solar gains	124.5352	235.9725	386.5673	586.3470	755.1965	793.1516	746.6063	613.9225	454.6510	277.9393	153.4976	103.7772 (83)
Total gains	773.5738	900.8243	1023.1937	1200.4506	1337.3309	1353.8772	1285.3630	1153.3968	1010.7955	853.3125	764.7770	738.6971 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)

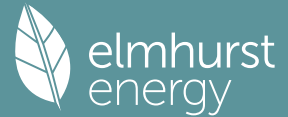
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	89.9343	89.9343	89.9343	89.9343	89.9343	89.9343	89.9343	89.9343	89.9343	89.9343	89.9343	89.9343	21.0000 (85)
alpha	6.9956	6.9956	6.9956	6.9956	6.9956	6.9956	6.9956	6.9956	6.9956	6.9956	6.9956	6.9956	
util living area	0.9993	0.9977	0.9907	0.9454	0.7922	0.5710	0.4167	0.4845	0.7819	0.9786	0.9979	0.9995	(86)
Living	20.0793	20.2243	20.4503	20.7521	20.9460	20.9948	20.9995	20.9986	20.9630	20.6845	20.3210	20.0451	
Non living	19.0032	19.1887	19.4756	19.8417	20.0412	20.0777	20.0799	20.0796	20.0592	19.7697	19.3128	18.9594	
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	20.5290	20.2243	20.4503	20.7521	20.9460	20.9948	20.9995	20.9986	20.9630	20.6845	20.3210	20.1786	(87)
Th 2	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	(88)
util rest of house	0.9990	0.9967	0.9865	0.9230	0.7328	0.4916	0.3299	0.3886	0.6991	0.9656	0.9968	0.9993	(89)
MIT 2	19.6507	19.1887	19.4756	19.8417	20.0412	20.0777	20.0799	20.0796	20.0592	19.7697	19.3128	19.1614	(90)
Living area fraction	19.8388	19.4105	19.6844	20.0367	20.2350	20.2741	20.2768	20.2765	20.2527	19.9656	19.5287	0.2142	(91)
MIT	19.8388	19.4105	19.6844	20.0367	20.2350	20.2741	20.2768	20.2765	20.2527	19.9656	19.5287	19.3792	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8388	19.4105	19.6844	20.0367	20.2350	20.2741	20.2768	20.2765	20.2527	19.9656	19.5287	19.3792	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9989	0.9956	0.9841	0.9218	0.7435	0.5085	0.3485	0.4092	0.7158	0.9635	0.9958	0.9990	(94)
Useful gains	772.7020	896.8643	1006.9541	1106.5292	994.2530	688.5099	447.9742	471.9483	723.5297	822.1372	761.5893	737.9760	(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	1893.9813	1768.6386	1607.0030	1357.4133	1040.3045	691.6042	448.1580	472.4908	749.9387	1141.5509	1514.9033	1850.1511	(97)
Space heating kWh	834.2318	585.8323	446.4364	180.6366	34.2623	0.0000	0.0000	0.0000	0.0000	237.6438	542.3861	827.4583	(98a)
Space heating requirement - total per year (kWh/year)												3688.8875	
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	834.2318	585.8323	446.4364	180.6366	34.2623	0.0000	0.0000	0.0000	0.0000	237.6438	542.3861	827.4583	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3688.8875	
Space heating per m2										(98c) / (4) =		30.3862	(99)

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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 %)													200.7350 (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	834.2318	585.8323	446.4364	180.6366	34.2623	0.0000	0.0000	0.0000	0.0000	237.6438	542.3861	827.4583	(98)
Space heating efficiency (main heating system 1)	200.7350	200.7350	200.7350	200.7350	200.7350	0.0000	0.0000	0.0000	0.0000	200.7350	200.7350	200.7350	(210)
Space heating fuel (main heating system)	415.5886	291.8436	222.4009	89.9876	17.0684	0.0000	0.0000	0.0000	0.0000	118.3868	270.2000	412.2143	(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	277.0252	244.7704	259.3816	226.3810	218.3354	195.5208	192.0288	200.2991	203.2213	228.0788	244.3355	273.7708	(64)
Efficiency of water heater	170.1509	170.1509	170.1509	170.1509	170.1509	170.1509	170.1509	170.1509	170.1509	170.1509	170.1509	170.1509	(216)
Fuel for water heating, kWh/month	162.8115	143.8549	152.4421	133.0472	128.3187	114.9103	112.8579	117.7185	119.4360	134.0451	143.5993	160.8988	(217)
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	6.7228	6.0722	6.7228	6.5060	6.7228	6.5060	6.7228	6.7228	6.5060	6.7228	6.5060	6.7228	(231)
Lighting	30.1158	24.1600	21.7534	15.9375	12.3106	10.0579	11.2301	14.5973	18.9605	24.8772	28.0988	30.9528	(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													1837.6902 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													170.1509
Water heating fuel used													1623.9404 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 6.3075, total flow = 29.0000, SFP = 0.2175)													
mechanical ventilation fans (SFP = 0.2175)													79.1560 (230a)
Total electricity for the above, kWh/year													79.1560 (231)
Electricity for lighting (calculated in Appendix L)													243.0521 (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													3783.8387 (238)

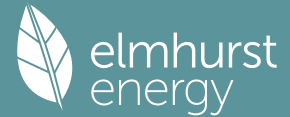
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1837.6902	0.1565	287.6763	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1623.9404	0.1410	229.0548	(264)
Space and water heating			516.7310	(265)
Pumps, fans and electric keep-hot	79.1560	0.1387	10.9799	(267)
Energy for lighting	243.0521	0.1443	35.0799	(268)
Total CO2, kg/year			562.7909	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.6400	(273)

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

	Energy	Primary energy factor	Primary energy
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Space heating - main system 1	kWh/year	kg CO2/kWh	kWh/year
Total CO2 associated with community systems	1837.6902	1.5795	2902.6833 (275)
Water heating (other fuel)	1623.9404	1.5216	0.0000 (473)
Space and water heating			2470.9140 (278)
Pumps, fans and electric keep-hot	79.1560	1.5128	5373.5972 (279)
Energy for lighting	243.0521	1.5338	119.7472 (281)
Total Primary energy kWh/year			372.8014 (282)
Dwelling Primary energy Rate (DPER)			5866.1458 (286)
			48.3200 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	49.8400 (1b)	x 2.7000 (2b)	= 134.5680 (1b) -
First floor	47.0000 (1c)	x 2.7000 (2c)	= 126.9000 (1c) -
Second floor	24.5600 (1d)	x 1.5000 (2d)	= 36.8400 (1d) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	121.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 298.3080 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1341 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3841 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3553 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infiltr rate	0.4530	0.4441	0.4352	0.3908	0.3819	0.3375	0.3375	0.3286	0.3553	0.3819	0.3997	0.4175 (22b)
Effective ac	0.6026	0.5986	0.5947	0.5764	0.5729	0.5570	0.5570	0.5540	0.5631	0.5729	0.5799	0.5871 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.20)			20.0100	1.1450	22.9122		(27)
rooflight			2.7400	1.5038	4.1203		(27a)
ground floor			49.8400	0.1300	6.4792		(28a)
External Wall 1	120.6600	20.1000	100.5600	0.1800	18.1008		(29a)
Dormer	3.9200	2.0300	1.8900	0.1800	0.3402		(29a)
Sloping ceiling	59.2400	2.7400	56.5000	0.1100	6.2150		(30)
Flat roof	6.2500		6.2500	0.1100	0.6875		(30)
Total net area of external elements Aum(A, m ²)			239.9100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	60.9752		(33)
Party Wall 1			70.0000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							325.0623 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	

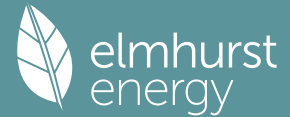
E2 Other lintels (including other steel lintels)														14.4600	0.0500	0.7230	
E3 Sill														13.4500	0.0500	0.6725	
E4 Jamb														31.5000	0.0500	1.5750	
E5 Ground floor (normal)														20.9000	0.1600	3.3440	
R1 Head of roof window														2.6000	0.0800	0.2080	
R2 Sill of roof window														2.6000	0.0600	0.1560	
R3 Jamb of roof window														6.1600	0.0800	0.4928	
E6 Intermediate floor within a dwelling														40.0000	0.0000	0.0000	
E11 Eaves (insulation at rafter level)														10.0000	0.0400	0.4000	
E13 Gable (insulation at rafter level)														12.2000	0.0800	0.9760	
E16 Corner (normal)														10.8000	0.0900	0.9720	
P1 Party wall - Ground floor														10.0000	0.0800	0.8000	
P2 Party wall - Intermediate floor within a dwelling														20.0000	0.0000	0.0000	
R8 Roof to wall (rafter)														12.2000	0.0600	0.7320	
R4 Ridge (vaulted ceiling)														5.0000	0.0800	0.4000	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)																	11.4513 (36)
Point Thermal bridges																(36a) =	0.0000
Total fabric heat loss																(33) + (36) + (36a) =	72.4265 (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	59.3207	58.9285	58.5441	56.7385	56.4007	54.8280	54.8280	54.5368	55.4338	56.4007	57.0841	57.7986	(38)				
Average = Sum(39)m / 12 =	131.7473	131.3551	130.9706	129.1650	128.8272	127.2545	127.2545	126.9633	127.8603	128.8272	129.5106	130.2251	(39)				
																	129.1634
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec					
HLP (average)	1.0852	1.0820	1.0788	1.0640	1.0612	1.0482	1.0482	1.0458	1.0532	1.0612	1.0668	1.0727	(40)				
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31					1.0639
																	31

4. Water heating energy requirements (kWh/year)																	

Assumed occupancy																	2.8686 (42)
Hot water usage for mixer showers																	
Hot water usage for baths																	
Hot water usage for other uses																	
Average daily hot water use (litres/day)																	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec					
Energy conte	147.5448	144.3941	140.5572	134.7230	129.9852	124.8916	122.9343	126.7546	130.7837	136.1310	142.0551	147.1621	(44)				
Energy content (annual)	233.6748	205.6152	216.0312	184.4290	174.9850	153.5688	148.6784	156.9487	161.2693	184.7284	202.3835	230.4204	(45)				
Distribution loss (46)m = 0.15 x (45)m																	
Water storage loss:																	
Store volume																	200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):																	1.6525 (48)
Temperature factor from Table 2b																	0.5400 (49)
Enter (49) or (54) in (55)																	0.8924 (55)
Total storage loss																	
If cylinder contains dedicated solar storage																	
Primary loss																	
Combi loss																	
Total heat required for water heating calculated for each month																	
WWHRS																	
PV diverter																	
Solar input																	
FGHRS																	
Output from w/h																	
12Total per year (kWh/year)																	
Electric shower(s)																	
Heat gains from water heating, kWh/month																	

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282	143.4282 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	146.4854	162.1802	146.4854	151.3682	146.4854	151.3682	146.4854	146.4854	151.3682	146.4854	151.3682	146.4854 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	287.0247	290.0031	282.4976	266.5193	246.3494	227.3927	214.7284	211.7500	219.2555	235.2338	255.4036	274.3604 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428	37.3428 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000 (70)

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Losses e.g. evaporation (negative values) (Table 5)	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426	-114.7426 (71)
Water heating gains (Table 5)	159.1905	156.4959	151.3054	139.9296	132.9615	125.6782	121.2049	124.9009	129.2343	137.3160	148.2210	157.7361 (72)
Total internal gains	661.7291	677.7078	649.3169	626.8455	594.8248	570.4675	548.4471	549.1647	565.8865	588.0636	624.0214	647.6103 (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
Northeast					12.5900	11.2829		0.6300	0.7000	0.7700		43.4130 (75)
Southwest					5.5300	36.7938		0.6300	0.7000	0.7700		62.1830 (79)
Northwest					1.8900	11.2829		0.6300	0.7000	0.7700		6.5171 (81)
Northeast					2.7400	17.4137		0.6300	0.7000	1.0000		18.9375 (82)
Solar gains	131.0507	247.1074	401.8368	605.2212	776.2213	813.9534	766.6925	632.4283	471.1796	290.2611	161.3098	109.3469 (83)
Total gains	792.7798	924.8151	1051.1537	1232.0668	1371.0461	1384.4210	1315.1396	1181.5931	1037.0661	878.3247	785.3312	756.9573 (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	83.2034	83.4518	83.6968	84.8668	85.0894	86.1409	86.1409	86.3385	85.7328	85.0894	84.6404	84.1760
alpha	6.5469	6.5635	6.5798	6.6578	6.6726	6.7427	6.7427	6.7559	6.7155	6.6726	6.6427	6.6117
util living area	0.9992	0.9975	0.9908	0.9482	0.8043	0.5814	0.4250	0.4921	0.7905	0.9786	0.9977	0.9994 (86)
MIT	19.9855	20.1406	20.3815	20.7147	20.9311	20.9931	20.9993	20.9982	20.9548	20.6527	20.2655	19.9669 (87)
Th 2	20.0129	20.0156	20.0182	20.0304	20.0327	20.0433	20.0433	20.0453	20.0392	20.0327	20.0280	20.0232 (88)
util rest of house	0.9988	0.9964	0.9866	0.9262	0.7438	0.4980	0.3330	0.3913	0.7057	0.9654	0.9965	0.9992 (89)
MIT 2	18.8311	19.0314	19.3394	19.7553	19.9828	20.0403	20.0432	20.0449	20.0136	19.6919	19.2013	18.8151 (90)
Living area fraction									fLA = Living area / (4) =			0.2142 (91)
MIT	19.0784	19.2690	19.5626	19.9608	20.1859	20.2444	20.2479	20.2490	20.2152	19.8977	19.4293	19.0618 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0784	19.2690	19.5626	19.9608	20.1859	20.2444	20.2479	20.2490	20.2152	19.8977	19.4293	19.0618 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9983	0.9953	0.9840	0.9243	0.7541	0.5158	0.3528	0.4130	0.7226	0.9629	0.9954	0.9988 (94)
Ext temp.	791.4680	920.4284	1034.2931	1138.7685	1033.8845	714.1045	463.9485	487.9479	749.3372	845.7491	781.7355	756.0275 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Space heating kWh	1947.0080	1887.4346	1710.8196	1428.6687	1093.2114	718.2708	464.2167	488.6844	781.8903	1197.7911	1596.7689	1935.3778 (97)
Space heating requirement - total per year (kWh/year)	859.7218	649.8282	503.3357	208.7281	44.1392	0.0000	0.0000	0.0000	0.0000	261.9193	586.8240	877.4366 (98a)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)	859.7218	649.8282	503.3357	208.7281	44.1392	0.0000	0.0000	0.0000	0.0000	261.9193	586.8240	877.4366 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3991.9329
Space heating per m2										(98c) / (4) =		32.8825 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating efficiency (main heating system 1)	859.7218	649.8282	503.3357	208.7281	44.1392	0.0000	0.0000	0.0000	0.0000	261.9193	586.8240	877.4366 (98)
Space heating fuel (main heating system)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating efficiency (main heating system 2)	931.4429	704.0392	545.3258	226.1410	47.8215	0.0000	0.0000	0.0000	0.0000	283.7695	635.7790	950.6355 (211)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)

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	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 (215)
Water heating													
Water heating requirement	251.5410	222.3745	236.3404	208.3604	202.2839	182.6342	180.6534	187.7222	189.6344	210.9942	223.7297	248.8987	(64)
Efficiency of water heater	86.5895	86.3180	85.7113	84.0637	81.2755	79.8000	79.8000	79.8000	79.8000	84.5458	86.1191	79.8000	(216)
Fuel for water heating, kWh/month	290.4983	257.6225	275.7400	247.8599	248.8868	228.8649	226.3827	235.2408	237.6371	249.5621	259.7910	287.2769	(217)
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	30.4368	24.4175	21.9853	16.1073	12.4418	10.1650	11.3498	14.7529	19.1626	25.1423	28.3982	31.2827	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-46.7628	-65.9977	-94.9485	-106.8176	-115.1768	-107.4296	-106.0231	-100.0473	-89.5745	-75.4083	-51.4040	-40.4142	(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	-26.2128	-55.1656	-109.7140	-164.9116	-218.2201	-219.3878	-216.8847	-183.6310	-134.5353	-79.0298	-35.0363	-20.7335	(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												4324.9544	(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												3045.3632	(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)												245.6422	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2463.4669	(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												5238.4929	(238)

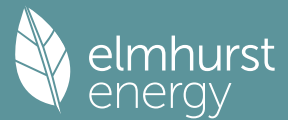
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	4324.9544	0.2100	908.2404 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3045.3632	0.2100	639.5263 (264)
Space and water heating			1547.7667 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	245.6422	0.1443	35.4538 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1000.0044	0.1346	-134.5859
PV Unit electricity exported	-1463.4625	0.1259	-184.1978
Total			-318.7837 (269)
Total CO2, kg/year			1276.3660 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.5100 (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	4324.9544	1.1300	4887.1985 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3045.3632	1.1300	3441.2605 (278)
Space and water heating			8328.4589 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	245.6422	1.5338	376.7741 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1000.0044	1.4974	-1497.4112
PV Unit electricity exported	-1463.4625	0.4620	-676.1294
Total			-2173.5405 (283)
Total Primary energy kWh/year			6661.7934 (286)
Target Primary Energy Rate (TPER)			54.8700 (287)

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Property Reference	Plot 005	Issued on Date	28/09/2023
Assessment Reference	Vaillant ASHP	Prop Type Ref	
Property	5, UB9 6NL		
SAP Rating	79 C	DER	5.06
Environmental	96 A	TER	10.95
CO ₂ Emissions (t/year)	0.41	% DER < TER	53.79
Compliance Check	See BREL	DFEE	36.20
% DPER < TPER	7.22	TFEE	37.25
		% DFEE < TFEE	2.81
		DPER	52.97
		TPER	57.09
Assessor Details	Mr. Michael Woodbridge	Assessor ID	M818-0001
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	45.8400 (1b)	x 2.3300 (2b)	= 106.8072 (1b) -
First floor	42.9900 (1c)	x 2.6300 (2c)	= 113.0637 (1c) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.8300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	219.8709 (5)

2. Ventilation rate

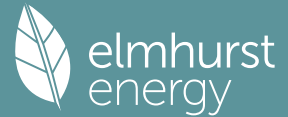
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1388 (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	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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 floor			2.1200	1.2000	2.5440		(26)
window (Uw = 1.20)			17.2600	1.1450	19.7634		(27)
ground floor			45.8400	0.1100	5.0424	110.0000	5042.4000 (28a)

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External Wall 1	106.8348	19.3800	87.4548	0.1600	13.9928	190.0000	16616.4120 (29a)
Sloping ceiling	45.8400		45.8400	0.1100	5.0424	9.0000	412.5600 (30)
Total net area of external elements Aum(A, m2)			198.5148				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	46.3849			(33)
Party Wall 1			35.0600	0.0000	0.0000	180.0000	6310.8000 (32)
Internal Wall 1			200.0000			9.0000	1800.0000 (32c)
Internal Floor 1			43.0000			18.0000	774.0000 (32d)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 30956.1720 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 348.4878 (35)

List of Thermal Bridges							
K1 Element	Length	Psi-value	Total				
E6 Intermediate floor within a dwelling	20.0000	0.0500	1.0000				
E10 Eaves (insulation at ceiling level)	22.0000	0.0800	1.7600				
E16 Corner (normal)	17.2100	0.0800	1.3768				
P1 Party wall - Ground floor	7.0700	0.1000	0.7070				
P2 Party wall - Intermediate floor within a dwelling	7.0700	0.0000	0.0000				
E2 Other lintels (including other steel lintels)	12.1600	0.0500	0.6080				
E3 Sill	11.1500	0.0400	0.4460				
E4 Jamb	27.2000	0.0400	1.0880				
E5 Ground floor (normal)	23.1300	0.1050	2.4286				
E25 Staggered party wall between dwellings	12.2600	0.2400	2.9424				
P4 Party wall - Roof (insulation at ceiling level)	7.0700	0.1000	0.7070				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.0639 (36)
Point Thermal bridges							(36a) = 0.0000
Total fabric heat loss							(33) + (36) + (36a) = 59.4488 (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	36.2787	36.2787	36.2787	36.2787	36.2787	36.2787	36.2787	36.2787	36.2787	36.2787	36.2787	36.2787	(38)
Average = Sum(39)m / 12 =	95.7275	95.7275	95.7275	95.7275	95.7275	95.7275	95.7275	95.7275	95.7275	95.7275	95.7275	95.7275	(39)
	95.7275	95.7275	95.7275	95.7275	95.7275	95.7275	95.7275	95.7275	95.7275	95.7275	95.7275	95.7275	(39)
HLP	1.0776	1.0776	1.0776	1.0776	1.0776	1.0776	1.0776	1.0776	1.0776	1.0776	1.0776	1.0776	(40)
HLP (average)													1.0776
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6094 (42)
Hot water usage for mixer showers													
Hot water usage for baths	67.9702	66.9488	65.4603	62.6124	60.5107	58.1669	56.8347	58.3119	59.9312	62.4477	65.3568	67.7098	(42a)
Hot water usage for other uses	29.3526	28.9167	28.3028	27.1710	26.3234	25.3836	24.8760	25.4856	26.1493	27.1549	28.3101	29.2534	(42b)
Average daily hot water use (litres/day)	41.3525	39.8488	38.3451	36.8413	35.3376	33.8339	33.8339	35.3376	36.8413	38.3451	39.8488	41.3525	(42c)
	41.3525	39.8488	38.3451	36.8413	35.3376	33.8339	33.8339	35.3376	36.8413	38.3451	39.8488	41.3525	(42c)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	138.6754	135.7143	132.1082	126.6247	122.1717	117.3844	115.5446	119.1351	122.9218	127.9477	133.5157	138.3157	(44)
Energy content (annual)	219.6279	193.2553	203.0453	173.3428	164.4666	144.3378	139.7411	147.5141	151.5749	173.6238	190.2176	216.5690	(45)
Distribution loss (46)m = 0.15 x (45)m													
Water storage loss:	32.9442	28.9883	30.4568	26.0014	24.6700	21.6507	20.9612	22.1271	22.7362	26.0436	28.5326	32.4853	(46)
Store volume													180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.1100 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.5994 (55)
Total storage loss	18.5814	16.7832	18.5814	17.9820	18.5814	17.9820	18.5814	18.5814	17.9820	18.5814	17.9820	18.5814	(56)
If cylinder contains dedicated solar storage	18.5814	16.7832	18.5814	17.9820	18.5814	17.9820	18.5814	18.5814	17.9820	18.5814	17.9820	18.5814	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	261.4717	231.0497	244.8891	213.8368	206.3104	184.8318	181.5849	189.3579	192.0689	215.4676	230.7116	258.4128	(62)
WVHRS	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	261.4717	231.0497	244.8891	213.8368	206.3104	184.8318	181.5849	189.3579	192.0689	215.4676	230.7116	258.4128	(64)
Total per year (kWh/year)													2609.9932 (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	106.5013	94.4929	100.9876	90.0317	88.1602	80.3875	79.9390	82.5235	82.7939	91.2049	95.6425	105.4842	(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

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(66)m	130.4682	130.4682	130.4682	130.4682	130.4682	130.4682	130.4682	130.4682	130.4682	130.4682	130.4682	130.4682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.5036	132.3075	119.5036	123.4870	119.5036	123.4870	119.5036	119.5036	123.4870	119.5036	123.4870	119.5036	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	236.9087	239.3671	233.1721	219.9836	203.3355	187.6887	177.2357	174.7773	180.9723	194.1608	210.8088	226.4557	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0468	36.0468	36.0468	36.0468	36.0468	36.0468	36.0468	36.0468	36.0468	36.0468	36.0468	36.0468	(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)	-104.3746	-104.3746	-104.3746	-104.3746	-104.3746	-104.3746	-104.3746	-104.3746	-104.3746	-104.3746	-104.3746	-104.3746	(71)
Water heating gains (Table 5)	143.1469	140.6144	135.7360	125.0440	118.4949	111.6493	107.4449	110.9187	114.9915	122.5873	132.8369	141.7799	(72)
Total internal gains	561.6997	574.4295	550.5522	530.6551	503.4745	484.9656	466.3246	467.3400	481.5913	498.3921	529.2732	549.8796	(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				2.6500	10.6334	0.5000	0.8000	0.7700	7.8111 (74)			
Northeast				1.7100	11.2829	0.5000	0.8000	0.7700	5.3482 (75)			
East				0.6300	19.6403	0.5000	0.8000	0.7700	3.4299 (76)			
South				10.5600	46.7521	0.5000	0.8000	0.7700	136.8541 (78)			
Northwest				1.7100	11.2829	0.5000	0.8000	0.7700	5.3482 (81)			

Solar gains	158.7916	267.5418	361.1473	443.9640	497.4872	494.8952	476.6461	435.9577	389.3914	294.0862	189.5904	136.3222 (83)
Total gains	720.4913	841.9713	911.6994	974.6191	1000.9617	979.8608	942.9706	903.2977	870.9827	792.4783	718.8636	686.2017 (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	89.8273	89.8273	89.8273	89.8273	89.8273	89.8273	89.8273	89.8273	89.8273	89.8273	89.8273	89.8273	
alpha	6.9885	6.9885	6.9885	6.9885	6.9885	6.9885	6.9885	6.9885	6.9885	6.9885	6.9885	6.9885	
util living area	0.9979	0.9933	0.9812	0.9366	0.8181	0.6162	0.4458	0.4858	0.7286	0.9506	0.9937	0.9985	(86)
Living	20.1823	20.3448	20.5413	20.7718	20.9336	20.9918	20.9992	20.9986	20.9759	20.7748	20.4272	20.1420	
Non living	19.0811	19.2874	19.5334	19.8072	19.9723	20.0157	20.0190	20.0188	20.0070	19.8167	19.3932	19.0296	
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	20.5817	20.3448	20.5413	20.7718	20.9336	20.9918	20.9992	20.9986	20.9759	20.7748	20.4272	20.2620	(87)
Th 2	20.0191	20.0191	20.0191	20.0191	20.0191	20.0191	20.0191	20.0191	20.0191	20.0191	20.0191	20.0191	(88)
util rest of house	0.9970	0.9904	0.9728	0.9098	0.7564	0.5265	0.3470	0.3832	0.6389	0.9236	0.9904	0.9978	(89)
MIT 2	19.6452	19.2874	19.5334	19.8072	19.9723	20.0157	20.0190	20.0188	20.0070	19.8167	19.3932	19.2079	(90)
Living area fraction									fLA = Living area / (4) =			0.3569	(91)
MIT	19.9794	19.6648	19.8930	20.1515	20.3154	20.3640	20.3688	20.3685	20.3528	20.1586	19.7622	19.5841	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9794	19.6648	19.8930	20.1515	20.3154	20.3640	20.3688	20.3685	20.3528	20.1586	19.7622	19.5841	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9969	0.9890	0.9715	0.9140	0.7763	0.5586	0.3823	0.4200	0.6708	0.9282	0.9893	0.9974	(94)
Useful gains	718.2661	832.7072	885.6781	890.7912	777.0674	547.3735	360.5060	379.3734	584.2350	735.5821	711.1506	684.4348	(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	1500.9474	1413.3943	1282.0822	1077.0730	824.7277	551.7753	360.7764	379.8913	598.5628	915.0233	1212.1221	1472.6796	(97)
Space heating kWh	582.3148	390.2217	294.9246	134.1229	35.4593	0.0000	0.0000	0.0000	0.0000	133.5042	360.6995	586.4541	(98a)
Space heating requirement - total per year (kWh/year)												2517.7012	
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	582.3148	390.2217	294.9246	134.1229	35.4593	0.0000	0.0000	0.0000	0.0000	133.5042	360.6995	586.4541	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2517.7012	
Space heating per m2										(98c) / (4) =		28.3429	(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 %)	203.8564	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)

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Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	582.3148	390.2217	294.9246	134.1229	35.4593	0.0000	0.0000	0.0000	0.0000	133.5042	360.6995	586.4541 (98)
Space heating efficiency (main heating system 1)	203.8564	203.8564	203.8564	203.8564	203.8564	0.0000	0.0000	0.0000	0.0000	203.8564	203.8564	203.8564 (210)
Space heating fuel (main heating system)	285.6495	191.4199	144.6727	65.7928	17.3942	0.0000	0.0000	0.0000	0.0000	65.4893	176.9380	287.6800 (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	261.4717	231.0497	244.8891	213.8368	206.3104	184.8318	181.5849	189.3579	192.0689	215.4676	230.7116	258.4128 (64)
Efficiency of water heater	170.1600	170.1600	170.1600	170.1600	170.1600	170.1600	170.1600	170.1600	170.1600	170.1600	170.1600	170.1600 (216)
Fuel for water heating, kWh/month	153.6622	135.7838	143.9170	125.6681	121.2449	108.6224	106.7142	111.2823	112.8755	126.6265	135.5851	151.8646 (219)
Space cooling fuel requirement	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	4.9551	4.4756	4.9551	4.7953	4.9551	4.7953	4.9551	4.9551	4.7953	4.9551	4.7953	4.9551 (231)
Lighting	26.7984	21.4987	19.3572	14.1819	10.9545	8.9499	9.9931	12.9894	16.8719	22.1368	25.0035	27.5432 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												1235.0365 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												170.1600
Water heating fuel used												1533.8465 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(MEVDecentralised, Database: total watage = 6.3075, total flow = 29.0000, SFP = 0.2175)												
mechanical ventilation fans (SFP = 0.2175)												58.3427 (230a)
Total electricity for the above, kWh/year												58.3427 (231)
Electricity for lighting (calculated in Appendix L)												216.2783 (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												3043.5040 (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	1235.0365	0.1567	193.5434 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1533.8465	0.1410	216.3294 (264)
Space and water heating			409.8728 (265)
Pumps, fans and electric keep-hot	58.3427	0.1387	8.0929 (267)
Energy for lighting	216.2783	0.1443	31.2156 (268)
Total CO2, kg/year			449.1813 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.0600 (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	1235.0365	1.5801	1951.5215 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1533.8465	1.5215	2333.7646 (278)
Space and water heating			4285.2860 (279)
Pumps, fans and electric keep-hot	58.3427	1.5128	88.2609 (281)

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Energy for lighting 216.2783 1.5338 331.7349 (282)
 Total Primary energy kWh/year 4705.2819 (286)
 Dwelling Primary energy Rate (DPER) 52.9700 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	45.8400 (1b)	x 2.3300 (2b)	= 106.8072 (1b) -
First floor	42.9900 (1c)	x 2.6300 (2c)	= 113.0637 (1c) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.8300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 219.8709 (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) =	Air changes per hour 30.0000 / (5) = 0.1364 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3864 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3575 (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	0.4558	0.4468	0.4379	0.3932	0.3843	0.3396	0.3396	0.3307	0.3575	0.3843	0.4021	0.4200 (22b)
Effective ac	0.6039	0.5998	0.5959	0.5773	0.5738	0.5577	0.5577	0.5547	0.5639	0.5738	0.5809	0.5882 (25)

3. Heat losses and heat loss parameter

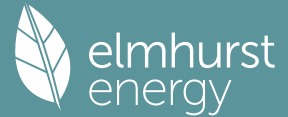
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.20)			17.2600	1.1450	19.7634		(27)
ground floor			45.8400	0.1300	5.9592		(28a)
External Wall 1	106.8348	19.3800	87.4548	0.1800	15.7419		(29a)
Sloping ceiling	45.8400		45.8400	0.1100	5.0424		(30)
Total net area of external elements Aum(A, m ²)			198.5148				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		48.6268		(33)
Party Wall 1			35.0600	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 348.4878 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E6 Intermediate floor within a dwelling	20.0000	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	22.0000	0.0600	1.3200
E16 Corner (normal)	17.2100	0.0900	1.5489
P1 Party wall - Ground floor	7.0700	0.0800	0.5656
P2 Party wall - Intermediate floor within a dwelling	7.0700	0.0000	0.0000
E2 Other lintels (including other steel lintels)	12.1600	0.0500	0.6080
E3 Sill	11.1500	0.0500	0.5575
E4 Jamb	27.2000	0.0500	1.3600
E5 Ground floor (normal)	23.1300	0.1600	3.7008
E25 Staggered party wall between dwellings	12.2600	0.0600	0.7356

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P4 Party wall - Roof (insulation at ceiling level) 7.0700 0.1200 0.8484
 Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.2448 (36)
 Point Thermal bridges 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 59.8716 (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
	43.8145	43.5219	43.2350	41.8878	41.6357	40.4623	40.4623	40.2450	40.9143	41.6357	42.1457	42.6787 (38)
Heat transfer coeff	103.6861	103.3935	103.1066	101.7594	101.5074	100.3340	100.3340	100.1167	100.7859	101.5074	102.0173	102.5504 (39)
Average = Sum(39)m / 12 =												101.7582
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1672	1.1639	1.1607	1.1456	1.1427	1.1295	1.1295	1.1271	1.1346	1.1427	1.1485	1.1545 (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												2.6094 (42)
Hot water usage for mixer showers												
	67.9702	66.9488	65.4603	62.6124	60.5107	58.1669	56.8347	58.3119	59.9312	62.4477	65.3568	67.7098 (42a)
Hot water usage for baths												
	29.3526	28.9167	28.3028	27.1710	26.3234	25.3836	24.8760	25.4856	26.1493	27.1549	28.3101	29.2534 (42b)
Hot water usage for other uses												
	41.3525	39.8488	38.3451	36.8413	35.3376	33.8339	33.8339	35.3376	36.8413	38.3451	39.8488	41.3525 (42c)
Average daily hot water use (litres/day)												127.4740 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	138.6754	135.7143	132.1082	126.6247	122.1717	117.3844	115.5446	119.1351	122.9218	127.9477	133.5157	138.3157 (44)
Energy conte	219.6279	193.2553	203.0453	173.3428	164.4666	144.3378	139.7411	147.5141	151.5749	173.6238	190.2176	216.5690 (45)
Energy content (annual)												Total = Sum(45)m = 2117.3162
Distribution loss (46)m = 0.15 x (45)m												
	32.9442	28.9883	30.4568	26.0014	24.6700	21.6507	20.9612	22.1271	22.7362	26.0436	28.5326	32.4853 (46)
Water storage loss:												
Store volume												180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5520 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8381 (55)
Total storage loss												
	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (56)
If cylinder contains dedicated solar storage												
	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month												
	268.8706	237.7325	252.2880	220.9970	213.7093	191.9920	188.9838	196.7568	199.2291	222.8664	237.8717	265.8117 (62)
WWHRS	-31.0731	-27.4813	-28.7769	-23.8284	-22.2072	-19.0029	-17.8122	-18.9414	-19.6611	-23.1783	-26.2582	-30.4977 (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	237.7974	210.2512	223.5111	197.1686	191.5021	172.9891	171.1717	177.8153	179.5680	199.6882	211.6136	235.3139 (64)
Total per year (kWh/year) = Sum(64)m =												2408.3903 (64)
12Total per year (kWh/year)												
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month												
	112.4204	99.8392	106.9067	95.7598	94.0793	86.1157	85.8581	88.4426	88.5220	97.1240	101.3707	111.4033 (65)

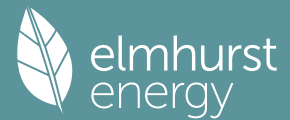
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	130.4682	130.4682	130.4682	130.4682	130.4682	130.4682	130.4682	130.4682	130.4682	130.4682	130.4682	130.4682 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	120.7294	133.6647	120.7294	124.7537	120.7294	124.7537	120.7294	120.7294	124.7537	120.7294	124.7537	120.7294 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	236.9087	239.3671	233.1721	219.9836	203.3355	187.6887	177.2357	174.7773	180.9723	194.1608	210.8088	226.4557 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	36.0468	36.0468	36.0468	36.0468	36.0468	36.0468	36.0468	36.0468	36.0468	36.0468	36.0468	36.0468 (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)												
	-104.3746	-104.3746	-104.3746	-104.3746	-104.3746	-104.3746	-104.3746	-104.3746	-104.3746	-104.3746	-104.3746	-104.3746 (71)
Water heating gains (Table 5)												
	151.1027	148.5702	143.6918	132.9998	126.4506	119.6051	115.4006	118.8744	122.9472	130.5431	140.7926	149.7356 (72)
Total internal gains	573.8813	586.7424	562.7337	542.8776	515.6560	494.1880	475.5062	476.5216	490.8137	510.5737	541.4956	562.0612 (73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains
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			m2		Table 6a W/m2	Specific data or Table 6b		Specific data or Table 6c		factor Table 6d		W
North			2.6500		10.6334		0.6300	0.7000		0.7700		8.6117 (74)
Northeast			1.7100		11.2829		0.6300	0.7000		0.7700		5.8964 (75)
East			0.6300		19.6403		0.6300	0.7000		0.7700		3.7815 (76)
South			10.5600		46.7521		0.6300	0.7000		0.7700		150.8817 (78)
Northwest			1.7100		11.2829		0.6300	0.7000		0.7700		5.8964 (81)
Solar gains	175.0678	294.9649	398.1649	489.4703	548.4797	545.6220	525.5023	480.6434	429.3041	324.2300	209.0235	150.2952 (83)
Total gains	748.9490	881.7073	960.8986	1032.3479	1064.1357	1039.8100	1001.0084	957.1650	920.1178	834.8037	750.5191	712.3563 (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	82.9324	83.1671	83.3985	84.5026	84.7124	85.7031	85.7031	85.8892	85.3188	84.7124	84.2890	83.8509
alpha	6.5288	6.5445	6.5599	6.6335	6.6475	6.7135	6.7135	6.7259	6.6879	6.6475	6.6193	6.5901
util living area	0.9976	0.9926	0.9796	0.9321	0.8118	0.6080	0.4400	0.4793	0.7237	0.9473	0.9930	0.9983 (86)
MIT	20.0963	20.2750	20.4912	20.7523	20.9262	20.9909	20.9991	20.9984	20.9728	20.7560	20.3808	20.0696 (87)
Th 2	19.9463	19.9490	19.9516	19.9638	19.9661	19.9768	19.9768	19.9788	19.9727	19.9661	19.9615	19.9566 (88)
util rest of house	0.9965	0.9893	0.9705	0.9035	0.7475	0.5158	0.3383	0.3740	0.6308	0.9185	0.9892	0.9975 (89)
MIT 2	18.9145	19.1433	19.4158	19.7356	19.9145	19.9730	19.9766	19.9784	19.9592	19.7486	19.2887	18.8883 (90)
Living area fraction	fLA = Living area / (4) = 0.3569 (91)											
MIT	19.3362	19.5471	19.7996	20.0984	20.2755	20.3363	20.3415	20.3424	20.3209	20.1081	19.6784	19.3099 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.3362	19.5471	19.7996	20.0984	20.2755	20.3363	20.3415	20.3424	20.3209	20.1081	19.6784	19.3099 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9956	0.9877	0.9688	0.9078	0.7681	0.5488	0.3747	0.4117	0.6638	0.9232	0.9879	0.9968 (94)
Useful gains	745.6903	870.8368	930.9654	937.1278	817.3768	570.6449	375.0746	394.1016	610.7696	770.6872	741.4195	710.0530 (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	1559.0476	1514.4157	1371.2755	1139.5453	870.4797	575.5415	375.3990	394.7017	626.9765	965.1453	1283.2150	1549.5228 (97)
Space heating kWh	605.1378	432.4850	327.5908	145.7406	39.5085	0.0000	0.0000	0.0000	0.0000	144.6769	390.0927	624.5655 (98a)
Space heating requirement - total per year (kWh/year)												2709.7978
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	605.1378	432.4850	327.5908	145.7406	39.5085	0.0000	0.0000	0.0000	0.0000	144.6769	390.0927	624.5655 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2709.7978
Space heating per m2	(98c) / (4) =											30.5054 (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	605.1378	432.4850	327.5908	145.7406	39.5085	0.0000	0.0000	0.0000	0.0000	144.6769	390.0927	624.5655 (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)	655.6206	468.5645	354.9196	157.8988	42.8044	0.0000	0.0000	0.0000	0.0000	156.7464	422.6357	676.6690 (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	237.7974	210.2512	223.5111	197.1686	191.5021	172.9891	171.1717	177.8153	179.5680	199.6882	211.6136	235.3139 (64)
Efficiency of water heater	86.0618	85.6405	84.9159	83.3922	81.2076	79.8000	79.8000	79.8000	79.8000	83.3490	85.4122	79.8000 (216)
Fuel for water heating, kWh/month	276.3100	245.5045	263.2149	236.4354	235.8178	216.7784	214.5008	222.8262	225.0226	239.5807	247.7557	273.1719 (219)
Space cooling fuel requirement	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	25.0852	20.1243	18.1197	13.2752	10.2542	8.3778	9.3542	12.1590	15.7933	20.7216	23.4050	25.7824 (232)

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Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-42.0596	-58.8781	-84.0428	-93.8119	-100.5773	-93.6513	-92.4621	-87.5481	-78.8226	-66.9693	-46.0780	-36.4097 (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	(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	(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	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-25.0592	-52.5610	-104.1941	-156.1091	-206.0623	-206.9369	-204.5301	-173.3631	-127.3008	-75.0741	-33.4249	-19.8305 (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	(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	(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	(235d)
Annual totals kWh/year												
Space heating fuel - main system 1												2935.8589 (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												2896.9189 (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)												202.4518 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-2265.7568 (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												3855.4728 (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	2935.8589	0.2100	616.5304 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2896.9189	0.2100	608.3530 (264)
Space and water heating			1224.8833 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	202.4518	0.1443	29.2201 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-881.3108	0.1347	-118.7496
PV Unit electricity exported	-1384.4460	0.1260	-174.3925
Total			-293.1421 (269)
Total CO2, kg/year			972.8906 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.9500 (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	2935.8589	1.1300	3317.5206 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2896.9189	1.1300	3273.5184 (278)
Space and water heating			6591.0389 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	202.4518	1.5338	310.5273 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-881.3108	1.4980	-1320.1971
PV Unit electricity exported	-1384.4460	0.4624	-640.1444
Total			-1960.3415 (283)
Total Primary energy kWh/year			5071.3256 (286)
Target Primary Energy Rate (TPER)			57.0900 (287)

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Property Reference	Plot 006	Issued on Date	28/09/2023
Assessment Reference	Vaillant ASHP	Prop Type Ref	
Property	6, UB9 6NL		
SAP Rating	78 C	DER	5.20
Environmental	96 A	TER	11.34
CO ₂ Emissions (t/year)	0.42	% DER < TER	54.14
Compliance Check	See BREL	DFEE	37.86
% DPER < TPER	7.93	TFEE	38.75
		% DFEE < TFEE	2.32
		TPER	59.13
Assessor Details	Mr. Michael Woodbridge	Assessor ID	M818-0001
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	44.3100 (1b)	x 2.3300 (2b)	= 103.2423 (1b) -
First floor	44.3100 (1c)	x 2.6300 (2c)	= 116.5353 (1c) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.6200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	219.7776 (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)

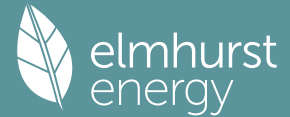
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	3.0000	(17)
Infiltration rate	0.1500	(18)
Number of sides sheltered	1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1388 (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	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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 foor			2.1200	1.2000	2.5440		(26)
window (Uw = 1.20)			21.4200	1.1450	24.5267		(27)
ground floor			44.3100	0.1100	4.8741	110.0000	4874.1000 (28a)

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External Wall 1	116.6096	23.5400	93.0696	0.1600	14.8911	110.0000	10237.6560 (29a)
Sloping ceiling	44.3100		44.3100	0.1100	4.8741	9.0000	398.7900 (30)
Total net area of external elements Aum(A, m2)			205.2296				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	51.7101			(33)
Party Wall 1			35.0600	0.0000	0.0000	110.0000	3856.6000 (32)
Internal Wall 1			200.0000			9.0000	1800.0000 (32c)
Internal Floor 1			43.0000			18.0000	774.0000 (32d)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 21941.1460 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 247.5868 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E6 Intermediate floor within a dwelling	23.5100	0.0500	1.1755
E10 Eaves (insulation at ceiling level)	23.5100	0.0800	1.8808
E16 Corner (normal)	19.8400	0.0800	1.5872
P1 Party wall - Ground floor	7.0700	0.1000	0.7070
P2 Party wall - Intermediate floor within a dwelling	7.0700	0.0000	0.0000
E5 Ground floor (normal)	23.5100	0.1050	2.4686
E25 Staggered party wall between dwellings	12.2600	0.2400	2.9424
P4 Party wall - Roof (insulation at ceiling level)	7.0700	0.1000	0.7070
E2 Other lintels (including other steel lintels)	14.3200	0.0500	0.7160
E3 Sill	13.3100	0.0400	0.5324
E4 Jamb	31.4000	0.0400	1.2560

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.9729 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 65.6829 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	36.2633	36.2633	36.2633	36.2633	36.2633	36.2633	36.2633	36.2633	36.2633	36.2633	36.2633	36.2633 (38)
Heat transfer coeff	101.9462	101.9462	101.9462	101.9462	101.9462	101.9462	101.9462	101.9462	101.9462	101.9462	101.9462	101.9462 (39)
Average = Sum(39)m / 12 =												101.9462

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1504	1.1504	1.1504	1.1504	1.1504	1.1504	1.1504	1.1504	1.1504	1.1504	1.1504	1.1504 (40)
HLP (average)												1.1504
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6064 (42)
Hot water usage for mixer showers	67.9198	66.8991	65.4117	62.5659	60.4658	58.1237	56.7925	58.2686	59.8867	62.4014	65.3083	67.6595 (42a)
Hot water usage for baths	29.3309	28.8953	28.2819	27.1509	26.3040	25.3649	24.8576	25.4668	26.1300	27.1348	28.2892	29.2318 (42b)
Hot water usage for other uses	41.3217	39.8191	38.3165	36.8139	35.3113	33.8087	33.8087	35.3113	36.8139	38.3165	39.8191	41.3217 (42c)
Average daily hot water use (litres/day)												127.3793 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	138.5724	135.6135	132.0101	126.5307	122.0810	117.2973	115.4588	119.0466	122.8306	127.8527	133.4166	138.2130 (44)
Energy conte	219.4648	193.1118	202.8946	173.2141	164.3445	144.2307	139.6374	147.4046	151.4624	173.4949	190.0763	216.4082 (45)
Energy content (annual)										Total = Sum(45)m =		2115.7445
Distribution loss (46)m = 0.15 x (45)m	32.9197	28.9668	30.4342	25.9821	24.6517	21.6346	20.9456	22.1107	22.7194	26.0242	28.5115	32.4612 (46)

Water storage loss:

Store volume 180.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.1100 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.5994 (55)

Total storage loss	18.5814	16.7832	18.5814	17.9820	18.5814	17.9820	18.5814	18.5814	17.9820	18.5814	17.9820	18.5814 (56)
If cylinder contains dedicated solar storage	18.5814	16.7832	18.5814	17.9820	18.5814	17.9820	18.5814	18.5814	17.9820	18.5814	17.9820	18.5814 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	261.3086	230.9062	244.7384	213.7081	206.1883	184.7247	181.4812	189.2484	191.9564	215.3387	230.5703	258.2520 (62)
WVHRS	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 261.3086 230.9062 244.7384 213.7081 206.1883 184.7247 181.4812 189.2484 191.9564 215.3387 230.5703 258.2520 (64)

Total per year (kWh/year) = Sum(64)m = 2608.4215 (64)

2608 (64)

12Total per year (kWh/year)

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

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

Heat gains from water heating, kWh/month 106.4471 94.4452 100.9375 89.9889 88.1196 80.3519 79.9045 82.4871 82.7564 91.1621 95.5956 105.4308 (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
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(66)m	130.3178	130.3178	130.3178	130.3178	130.3178	130.3178	130.3178	130.3178	130.3178	130.3178	130.3178	130.3178	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.2951	132.0767	119.2951	123.2716	119.2951	123.2716	119.2951	119.2951	123.2716	119.2951	123.2716	119.2951	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	236.5159	238.9702	232.7854	219.6188	202.9984	187.3775	176.9418	174.4875	180.6722	193.8388	210.4593	226.0802	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0318	36.0318	36.0318	36.0318	36.0318	36.0318	36.0318	36.0318	36.0318	36.0318	36.0318	36.0318	(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)	-104.2543	-104.2543	-104.2543	-104.2543	-104.2543	-104.2543	-104.2543	-104.2543	-104.2543	-104.2543	-104.2543	-104.2543	(71)
Water heating gains (Table 5)	143.0741	140.5435	135.6687	124.9846	118.4403	111.5999	107.3985	110.8697	114.9395	122.5297	132.7716	141.7080	(72)
Total internal gains	560.9804	573.6857	549.8445	529.9704	502.8291	484.3443	465.7307	466.7477	480.9787	497.7589	528.5979	549.1786	(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				3.2800	10.6334	0.5000	0.8000	0.7700	9.6680 (74)			
Northeast				1.1500	11.2829	0.5000	0.8000	0.7700	3.5968 (75)			
East				3.7800	19.6403	0.5000	0.8000	0.7700	20.5794 (76)			
South				12.0600	46.7521	0.5000	0.8000	0.7700	156.2936 (78)			
Northwest				1.1500	11.2829	0.5000	0.8000	0.7700	3.5968 (81)			

Solar gains	193.7346	329.3452	450.1343	558.9648	628.6893	625.6834	602.5553	550.0404	487.6086	363.7433	231.8995	165.9100 (83)
Total gains	754.7150	903.0308	999.9788	1088.9352	1131.5184	1110.0277	1068.2861	1016.7880	968.5873	861.5023	760.4973	715.0886 (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	59.7841	59.7841	59.7841	59.7841	59.7841	59.7841	59.7841	59.7841	59.7841	59.7841	59.7841	59.7841	
alpha	4.9856	4.9856	4.9856	4.9856	4.9856	4.9856	4.9856	4.9856	4.9856	4.9856	4.9856	4.9856	
util living area	0.9903	0.9765	0.9490	0.8803	0.7518	0.5699	0.4167	0.4559	0.6789	0.9064	0.9787	0.9925	(86)
Living	19.8359	20.0742	20.3549	20.6648	20.8812	20.9758	20.9958	20.9934	20.9441	20.6595	20.1800	19.7775	
Non living	18.6284	18.9280	19.2747	19.6391	19.8668	19.9470	19.9587	19.9578	19.9258	19.6431	19.0645	18.5544	
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	20.4045	20.0742	20.3549	20.6648	20.8812	20.9758	20.9958	20.9934	20.9441	20.6595	20.1800	19.9485	(87)
Th 2	19.9599	19.9599	19.9599	19.9599	19.9599	19.9599	19.9599	19.9599	19.9599	19.9599	19.9599	19.9599	(88)
util rest of house	0.9873	0.9695	0.9341	0.8471	0.6916	0.4849	0.3199	0.3556	0.5943	0.8724	0.9711	0.9901	(89)
MIT 2	19.4291	18.9280	19.2747	19.6391	19.8668	19.9470	19.9587	19.9578	19.9258	19.6431	19.0645	18.8077	(90)
Living area fraction									fLA = Living area / (4) =			0.3284	(91)
MIT	19.7494	19.3044	19.6294	19.9760	20.1999	20.2849	20.2992	20.2978	20.2602	19.9768	19.4308	19.1823	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7494	19.3044	19.6294	19.9760	20.1999	20.2849	20.2992	20.2978	20.2602	19.9768	19.4308	19.1823	(93)

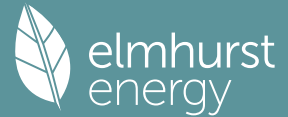
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9865	0.9639	0.9284	0.8477	0.7064	0.5121	0.3517	0.3886	0.6200	0.8731	0.9661	0.9878	(94)
Useful gains	744.5544	870.4645	928.3661	923.0517	799.2514	568.4780	375.7602	395.1250	600.4909	752.1686	734.7022	706.3474	(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	1575.0038	1468.4709	1338.4916	1129.1515	866.5329	579.5504	377.1207	397.3700	628.0102	955.9303	1257.0779	1527.3891	(97)
Space heating kWh	617.8544	401.8603	305.1334	148.3919	50.0574	0.0000	0.0000	0.0000	0.0000	151.5987	376.1105	610.8550	(98a)
Space heating requirement - total per year (kWh/year)												2661.8616	
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	617.8544	401.8603	305.1334	148.3919	50.0574	0.0000	0.0000	0.0000	0.0000	151.5987	376.1105	610.8550	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2661.8616	
Space heating per m2										(98c) / (4) =		30.0368	(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 %)	202.8437	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)

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Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	617.8544	401.8603	305.1334	148.3919	50.0574	0.0000	0.0000	0.0000	0.0000	151.5987	376.1105	610.8550 (98)
Space heating efficiency (main heating system 1)	202.8437	202.8437	202.8437	202.8437	202.8437	0.0000	0.0000	0.0000	0.0000	202.8437	202.8437	202.8437 (210)
Space heating fuel (main heating system)	304.5962	198.1132	150.4278	73.1557	24.6778	0.0000	0.0000	0.0000	0.0000	74.7367	185.4188	301.1456 (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	261.3086	230.9062	244.7384	213.7081	206.1883	184.7247	181.4812	189.2484	191.9564	215.3387	230.5703	258.2520 (64)
Efficiency of water heater	170.1600	170.1600	170.1600	170.1600	170.1600	170.1600	170.1600	170.1600	170.1600	170.1600	170.1600	170.1600 (216)
Fuel for water heating, kWh/month	153.5664	135.6995	143.8284	125.5925	121.1732	108.5594	106.6533	111.2179	112.8093	126.5507	135.5021	151.7701 (219)
Space cooling fuel requirement	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	4.9530	4.4737	4.9530	4.7933	4.9530	4.7933	4.9530	4.9530	4.7933	4.9530	4.7933	4.9530 (231)
Lighting	26.7767	21.4813	19.3415	14.1704	10.9456	8.9427	9.9850	12.9788	16.8582	22.1189	24.9833	27.5209 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												1312.2719 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												170.1600
Water heating fuel used												1532.9228 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(MEV)Decentralised, Database: total watage = 6.3075, total flow = 29.0000, SFP = 0.2175)												
mechanical ventilation fans (SFP = 0.2175)												58.3180 (230a)
Total electricity for the above, kWh/year												58.3180 (231)
Electricity for lighting (calculated in Appendix L)												216.1033 (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												3119.6160 (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	1312.2719	0.1565	205.3307 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1532.9228	0.1410	216.1986 (264)
Space and water heating			421.5293 (265)
Pumps, fans and electric keep-hot	58.3180	0.1387	8.0894 (267)
Energy for lighting	216.1033	0.1443	31.1904 (268)
Total CO2, kg/year			460.8091 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.2000 (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	1312.2719	1.5792	2072.3766 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1532.9228	1.5215	2332.3573 (278)
Space and water heating			4404.7338 (279)
Pumps, fans and electric keep-hot	58.3180	1.5128	88.2234 (281)

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Energy for lighting	216.1033	1.5338	331.4664 (282)
Total Primary energy kWh/year			4824.4237 (286)
Dwelling Primary energy Rate (DPER)			54.4400 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	44.3100 (1b)	x 2.3300 (2b)	= 103.2423 (1b) -
First floor	44.3100 (1c)	x 2.6300 (2c)	= 116.5353 (1c) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.6200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 219.7776 (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) =	Air changes per hour 30.0000 / (5) = 0.1365 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3865 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3575 (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	0.4558	0.4469	0.4380	0.3933	0.3843	0.3396	0.3396	0.3307	0.3575	0.3843	0.4022	0.4201 (22b)
Effective ac	0.6039	0.5999	0.5959	0.5773	0.5739	0.5577	0.5577	0.5547	0.5639	0.5739	0.5809	0.5882 (25)

3. Heat losses and heat loss parameter

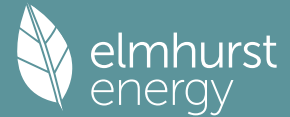
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.20)			20.0500	1.1450	22.9580		(27)
ground floor			44.3100	0.1300	5.7603		(28a)
External Wall 1	116.6096	22.1700	94.4396	0.1800	16.9991		(29a)
Sloping ceiling	44.3100		44.3100	0.1100	4.8741		(30)
Total net area of external elements Aum(A, m ²)			205.2296				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		52.7115		(33)
Party Wall 1			35.0600	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 247.5868 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E6 Intermediate floor within a dwelling	23.5100	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	23.5100	0.0600	1.4106
E16 Corner (normal)	19.8400	0.0900	1.7856
P1 Party wall - Ground floor	7.0700	0.0800	0.5656
P2 Party wall - Intermediate floor within a dwelling	7.0700	0.0000	0.0000
E5 Ground floor (normal)	23.5100	0.1600	3.7616
E25 Staggered party wall between dwellings	12.2600	0.0600	0.7356
P4 Party wall - Roof (insulation at ceiling level)	7.0700	0.1200	0.8484
E2 Other lintels (including other steel lintels)	14.3200	0.0500	0.7160
E3 Sill	13.3100	0.0500	0.6655

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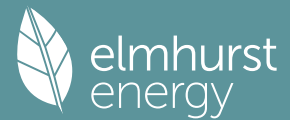
E4 Jamb													
Thermal bridges (Sum(L x Psi) calculated using Appendix K)													
Point Thermal bridges													
Total fabric heat loss													
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	43.7981	43.5056	43.2188	41.8717	41.6197	40.4464	40.4464	40.2292	40.8983	41.6197	42.1295	42.6626	(38)
Average = Sum(39)m / 12 =	108.5686	108.2760	107.9892	106.6421	106.3901	105.2169	105.2169	104.9996	105.6688	106.3901	106.9000	107.4330	(39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.2251	1.2218	1.2186	1.2034	1.2005	1.1873	1.1873	1.1848	1.1924	1.2005	1.2063	1.2123	(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													
Hot water usage for mixer showers													
Hot water usage for baths													
Hot water usage for other uses													
Average daily hot water use (litres/day)													
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	138.5724	135.6135	132.0101	126.5307	122.0810	117.2973	115.4588	119.0466	122.8306	127.8527	133.4166	138.2130	(44)
Energy content (annual)	219.4648	193.1118	202.8946	173.2141	164.3445	144.2307	139.6374	147.4046	151.4624	173.4949	190.0763	216.4082	(45)
Distribution loss (46)m = 0.15 x (45)m													
Water storage loss:													
Store volume													
a) If manufacturer declared loss factor is known (kWh/day):													
Temperature factor from Table 2b													
Enter (49) or (54) in (55)													
Total storage loss													
If cylinder contains dedicated solar storage													
Primary loss													
Combi loss													
Total heat required for water heating calculated for each month													
WWHRS													
PV diverter													
Solar input													
FGHRS													
Output from w/h													
12Total per year (kWh/year)													
Electric shower(s)													
Heat gains from water heating, kWh/month													

5. Internal gains (see Table 5 and 5a)													
Metabolic gains (Table 5), Watts													
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
Pumps, fans													
Losses e.g. evaporation (negative values) (Table 5)													
Water heating gains (Table 5)													
Total internal gains													

6. Solar gains													
[Jan]		Area	Solar flux	g	FF	Access	Gains						

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				m2	Table 6a W/m2	Specific data or Table 6b		Specific data or Table 6c		factor Table 6d		W
North				3.0700	10.6334	0.6300		0.7000		0.7700		9.9766 (74)
Northeast				1.0800	11.2829	0.6300		0.7000		0.7700		3.7241 (75)
East				3.5400	19.6403	0.6300		0.7000		0.7700		21.2482 (76)
South				11.2800	46.7521	0.6300		0.7000		0.7700		161.1691 (78)
Northwest				1.0800	11.2829	0.6300		0.7000		0.7700		3.7241 (81)
Solar gains	199.8420	339.7461	464.3957	576.7456	648.7487	645.6723	621.7949	567.5610	503.0819	375.2432	239.2134	171.1379 (83)
Total gains	771.7557	924.3627	1025.1735	1117.6485	1162.5112	1137.9492	1095.4590	1042.2420	991.9931	883.9355	778.7439	731.2499 (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	56.1374	56.2891	56.4386	57.1515	57.2869	57.9257	57.9257	58.0456	57.6780	57.2869	57.0137	56.7308
alpha	4.7425	4.7526	4.7626	4.8101	4.8191	4.8617	4.8617	4.8697	4.8452	4.8191	4.8009	4.7821
util living area	0.9899	0.9763	0.9497	0.8815	0.7554	0.5720	0.4189	0.4575	0.6825	0.9065	0.9781	0.9921 (86)
MIT	19.7386	19.9885	20.2871	20.6317	20.8656	20.9728	20.9951	20.9925	20.9370	20.6315	20.1262	19.6991 (87)
Th 2	19.9000	19.9026	19.9052	19.9173	19.9196	19.9302	19.9302	19.9322	19.9261	19.9196	19.9150	19.9102 (88)
util rest of house	0.9868	0.9692	0.9346	0.8479	0.6938	0.4847	0.3190	0.3543	0.5957	0.8720	0.9702	0.9895 (89)
MIT 2	18.4618	18.7780	19.1491	19.5653	19.8144	19.9158	19.9287	19.9297	19.8878	19.5776	18.9639	18.4191 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.8811	19.1755	19.5228	19.9155	20.1595	20.2629	20.2789	20.2787	20.2323	19.9236	19.3455	18.8394 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.8811	19.1755	19.5228	19.9155	20.1595	20.2629	20.2789	20.2787	20.2323	19.9236	19.3455	18.8394 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9827	0.9632	0.9283	0.8478	0.7084	0.5126	0.3519	0.3883	0.6218	0.8722	0.9648	0.9861 (94)
Useful gains	758.4356	890.3185	951.6210	947.5738	823.5696	583.3316	385.4846	404.6976	616.8656	770.9420	751.3310	721.0831 (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	1583.0481	1545.6918	1406.3210	1174.7129	900.0125	595.8298	387.0803	407.2628	647.9965	991.9419	1309.0484	1572.7580 (97)
Space heating kWh	613.5117	440.4109	338.2968	163.5402	56.8735	0.0000	0.0000	0.0000	0.0000	164.4240	401.5565	633.6461 (98a)
Space heating requirement - total per year (kWh/year)												2812.2597
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	613.5117	440.4109	338.2968	163.5402	56.8735	0.0000	0.0000	0.0000	0.0000	164.4240	401.5565	633.6461 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2812.2597
Space heating per m2	(98c) / (4) =											31.7339 (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	613.5117	440.4109	338.2968	163.5402	56.8735	0.0000	0.0000	0.0000	0.0000	164.4240	401.5565	633.6461 (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)	664.6931	477.1515	366.5188	177.1833	61.6181	0.0000	0.0000	0.0000	0.0000	178.1408	435.0558	686.5072 (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	237.6574	210.1281	223.3818	197.0576	191.3964	172.8961	171.0811	177.7199	179.4701	199.5765	211.4919	235.1758 (64)
Efficiency of water heater	86.0890	85.6788	84.9880	83.6448	81.6968	79.8000	79.8000	79.8000	79.8000	83.6287	85.4744	79.8000 (216)
Fuel for water heating, kWh/month	276.0600	245.2511	262.8393	235.5887	234.2766	216.6618	214.3874	222.7066	224.8998	238.6460	247.4331	272.9226 (219)
Space cooling fuel requirement	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	24.7825	19.8814	17.9010	13.1151	10.1305	8.2767	9.2413	12.0122	15.6027	20.4716	23.1226	25.4713 (232)

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Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-40.9609	-57.4986	-82.2997	-92.1291	-98.9946	-92.2571	-91.0845	-86.1329	-77.3789	-65.5182	-44.9300	-35.4397 (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	-23.9176	-50.2210	-99.6544	-149.4504	-197.4102	-198.2983	-195.9950	-166.0699	-121.8648	-71.7841	-31.9194	-18.9233 (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												3046.8685 (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												2891.6731 (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)												200.0090 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-2190.1328 (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												4034.4178 (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	3046.8685	0.2100	639.8424 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2891.6731	0.2100	607.2513 (264)
Space and water heating			1247.0937 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	200.0090	0.1443	28.8675 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-864.6243	0.1347	-116.4499
PV Unit electricity exported	-1325.5084	0.1259	-166.9305
Total			-283.3804 (269)
Total CO2, kg/year			1004.5101 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.3400 (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	3046.8685	1.1300	3442.9614 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2891.6731	1.1300	3267.5906 (278)
Space and water heating			6710.5520 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	200.0090	1.5338	306.7805 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-864.6243	1.4978	-1295.0083
PV Unit electricity exported	-1325.5084	0.4623	-612.7518
Total			-1907.7600 (283)
Total Primary energy kWh/year			5239.6732 (286)
Target Primary Energy Rate (TPER)			59.1300 (287)