

Full SAP Calculation Printout



Property Reference	THFC-L20-03				Issued on Date	24/07/2023
Assessment Reference	V1 THFC-L20-03 LEANboilr-PlanB		Prop Type Ref			
Property						
SAP Rating	87 B	DER	8.30	TER	10.29	
Environmental	92 A	% DER < TER				19.34
CO ₂ Emissions (t/year)	1.07	DFEE	26.53	TFEE	29.92	
Compliance Check	See BREL	% DFEE < TFEE				11.31
% DPER < TPER	11.34	DPER	49.96	TPER	56.35	
Assessor Details	Miss Laura Plazas				Assessor ID	T491-0001
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	139.6800 (1b)	x 2.9300 (2b)	= 409.2624 (1b) - (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	139.6800		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 409.2624 (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)

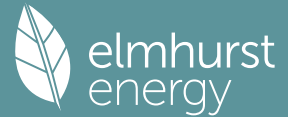
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour
Pressure test	0.0000 / (5) = 0.0000 (8)
Pressure Test Method	Yes
Measured/design AP50	Blower Door
Infiltration rate	3.0000 (17)
Number of sides sheltered	0.1500 (18)
	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1275 (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	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												80.1000 (23c)
Effective ac	0.2621	0.2589	0.2557	0.2397	0.2366	0.2206	0.2206	0.2174	0.2270	0.2366	0.2429	0.2493 (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
Glazed (U _w = 0.64)			38.6400	0.6240	24.1123		(27)
Curtain Wall	84.0000	38.6400	45.3600	0.6400	29.0304		(29a)
Total net area of external elements A _{um} (A, m ²)			84.0000				(31)

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Fabric heat loss, W/K = Sum (A x U) (26)...(30) + (32) = 53.1427 (33)
 Party Floor 1 139.6800 (32d)
 Party Ceiling 1 139.6800 (32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 100.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	0.0000	0.0500	0.0000
E4 Jamb	0.0000	0.0500	0.0000
E7 Party floor between dwellings (in blocks of flats)	51.6100	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.1500	0.0000	0.0000
E16 Corner (normal)	5.8600	0.0900	0.5274
E18 Party wall between dwellings	5.8600	0.0000	0.0000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			0.5274 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	53.6701 (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	35.3933	34.9628	34.5323	32.3798	31.9493	29.7969	29.7969	29.3664	30.6578	31.9493	32.8103	33.6713 (38)
Heat transfer coeff	89.0634	88.6329	88.2024	86.0499	85.6194	83.4670	83.4670	83.0365	84.3280	85.6194	86.4804	87.3414 (39)
Average = Sum(39)m / 12 =												85.9423
HLP	0.6376	0.6345	0.6315	0.6161	0.6130	0.5976	0.5976	0.5945	0.6037	0.6130	0.6191	0.6253 (40)
HLP (average)												0.6153
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9165 (42)
Hot water usage for mixer showers	73.1195	72.0207	70.4194	67.3558	65.0949	62.5735	61.1404	62.7295	64.4715	67.1786	70.3081	72.8394 (42a)
Hot water usage for baths	33.2284	32.7349	32.0400	30.7587	29.7992	28.7353	28.1607	28.8508	29.6021	30.7405	32.0482	33.1161 (42b)
Hot water usage for other uses	46.8396	45.1363	43.4331	41.7298	40.0266	38.3233	38.3233	40.0266	41.7298	43.4331	45.1363	46.8396 (42c)
Average daily hot water use (litres/day)												140.8032 (43)
Daily hot water use	153.1875	149.8919	145.8925	139.8442	134.9206	129.6321	127.6244	131.6068	135.8034	141.3522	147.4926	152.7950 (44)
Energy conte	242.6116	213.4441	224.2313	191.4398	181.6291	159.3978	154.3506	162.9567	167.4592	191.8136	210.1303	239.2401 (45)
Energy content (annual)										Total = Sum(45)m =		2338.7043
Distribution loss (46)m = 0.15 x (45)m	36.3917	32.0166	33.6347	28.7160	27.2444	23.9097	23.1526	24.4435	25.1189	28.7720	31.5195	35.8860 (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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	293.5705	259.4715	275.1902	240.7548	232.5880	208.7129	205.3095	213.9156	216.7742	242.7725	259.4454	290.1990 (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	293.5705	259.4715	275.1902	240.7548	232.5880	208.7129	205.3095	213.9156	216.7742	242.7725	259.4454	290.1990 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2938.7043 (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	93.4081	82.4770	87.2966	75.9825	73.1314	65.3286	64.0613	66.9228	68.0089	76.5177	82.1971	92.2871 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	145.8237	145.8237	145.8237	145.8237	145.8237	145.8237	145.8237	145.8237	145.8237	145.8237	145.8237	145.8237 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	155.8792	172.5805	155.8792	161.0752	155.8792	161.0752	155.8792	155.8792	161.0752	155.8792	161.0752	155.8792 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	309.0479	312.2549	304.1735	286.9691	265.2517	244.8403	231.2043	227.9974	236.0788	253.2832	275.0006	295.4119 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.5824	37.5824	37.5824	37.5824	37.5824	37.5824	37.5824	37.5824	37.5824	37.5824	37.5824	37.5824 (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)	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589 (71)
Water heating gains (Table 5)	125.5485	122.7337	117.3342	105.5312	98.2949	90.7341	86.1039	89.9500	94.4569	102.8464	114.1626	124.0417 (72)
Total internal gains	657.2227	674.3162	644.1340	620.3226	586.1728	563.3967	539.9345	540.5737	558.3579	578.7559	616.9855	642.0799 (73)

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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					
South				14.8500	46.7521	0.5000	1.0000		0.7700	240.5639 (78)					
West				23.7900	19.6403	0.5000	1.0000		0.7700	161.8993 (80)					
Solar gains				402.4632	710.6911	1023.4381	1327.9003	1523.1499	1464.3329	1320.1727	1130.8686	800.7486	487.0197	341.0075 (83)	
Total gains				1059.6859	1385.0073	1667.5720	1948.2229	2109.4946	2086.5466	2004.2674	1860.7464	1689.2265	1379.5045	1104.0052	983.0874 (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	43.5645	43.7761	43.9897	45.0901	45.3168	46.4854	46.4854	46.7264	46.0108	45.3168	44.8656	44.4234	
alpha	3.9043	3.9184	3.9326	4.0060	4.0211	4.0990	4.0990	4.1151	4.0674	4.0211	3.9910	3.9616	
util living area	0.9056	0.8084	0.6807	0.5133	0.3728	0.2553	0.1831	0.2050	0.3415	0.6012	0.8321	0.9217 (86)	
MIT	20.0632	20.4537	20.7440	20.9262	20.9822	20.9973	20.9995	20.9992	20.9910	20.8904	20.4930	19.9987 (87)	
Th 2	20.3963	20.3990	20.4018	20.4156	20.4183	20.4322	20.4322	20.4350	20.4267	20.4183	20.4128	20.4073 (88)	
util rest of house	0.8963	0.7934	0.6609	0.4914	0.3503	0.2328	0.1595	0.1799	0.3138	0.5740	0.8161	0.9138 (89)	
MIT 2	19.2943	19.7722	20.1184	20.3384	20.4012	20.4300	20.4319	20.4344	20.4189	20.3059	19.8381	19.2231 (90)	
Living area fraction									fLA = Living area / (4) =				0.4933 (91)
MIT	19.6736	20.1084	20.4270	20.6284	20.6878	20.7099	20.7119	20.7130	20.7011	20.5943	20.1612	19.6057 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.6736	20.1084	20.4270	20.6284	20.6878	20.7099	20.7119	20.7130	20.7011	20.5943	20.1612	19.6057 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8838	0.7857	0.6617	0.4994	0.3608	0.2438	0.1711	0.1923	0.3271	0.5823	0.8087	0.9016 (94)
Useful gains	936.5745	1088.2610	1103.5026	972.9899	761.0056	508.7751	343.0019	357.8118	552.5589	803.3212	892.7830	886.3205 (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	1369.2285	1347.9663	1228.3975	1009.2260	769.5335	509.9719	343.2073	358.1402	556.6576	855.7029	1129.5369	1345.5563 (97)
Space heating kWh	321.8946	174.5219	92.9218	26.0900	6.3448	0.0000	0.0000	0.0000	0.0000	38.9720	170.4628	341.6715 (98a)
Space heating requirement - total per year (kWh/year)												1172.8794
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	321.8946	174.5219	92.9218	26.0900	6.3448	0.0000	0.0000	0.0000	0.0000	38.9720	170.4628	341.6715 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1172.8794
Space heating per m2										(98c) / (4) =		8.3969 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
Ext. temp.	Jan 4.3000	Feb 4.9000	Mar 6.5000	Apr 8.9000	May 11.7000	Jun 14.6000	Jul 16.6000	Aug 16.4000	Sep 14.1000	Oct 10.6000	Nov 7.1000	Dec 4.2000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	784.5897	617.6557	631.0773	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9927	0.9965	0.9951	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	778.8618	615.4892	627.9665	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	2363.4150	2270.7482	2105.5848	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	1140.8783	1231.5127	1099.3480	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	255.8359	276.1602	246.5230	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling requirement	778.5191 (107)											

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 %)	88.9000 (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)
Cooling System Energy Efficiency Ratio (see Table 10c)												4.6000 (209)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	321.8946	174.5219	92.9218	26.0900	6.3448	0.0000	0.0000	0.0000	0.0000	38.9720	170.4628	341.6715 (98)
Space heating efficiency (main heating system 1)	88.9000	88.9000	88.9000	88.9000	88.9000	0.0000	0.0000	0.0000	0.0000	88.9000	88.9000	88.9000 (210)
Space heating fuel (main heating system)	362.0861	196.3126	104.5240	29.3476	7.1370	0.0000	0.0000	0.0000	0.0000	43.8380	191.7467	384.3324 (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	293.5705	259.4715	275.1902	240.7548	232.5880	208.7129	205.3095	213.9156	216.7742	242.7725	259.4454	290.1990 (64)
Efficiency of water heater	84.5793	83.5502	82.3100	81.0668	80.5068	80.3000	80.3000	80.3000	80.3000	81.3891	83.5030	84.7323 (216)
Fuel for water heating, kWh/month	347.0950	310.5576	334.3341	296.9835	288.9048	259.9165	255.6781	266.3955	269.9555	298.2863	310.7020	342.4894 (219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	55.6165	60.0348	53.5919	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	44.1128	39.8438	44.1128	42.6898	44.1128	42.6898	44.1128	44.1128	42.6898	44.1128	42.6898	44.1128 (231)
Lighting	33.4734	26.8536	24.1787	17.7144	13.6831	11.1792	12.4822	16.2248	21.0744	27.6507	31.2315	34.4037 (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												1319.3244 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												80.3000
Water heating fuel used												3581.2982 (219)
Space cooling fuel												169.2433 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.8680)												
mechanical ventilation fans (SFP = 0.8680)												433.3925 (230a)
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												519.3925 (231)
Electricity for lighting (calculated in Appendix L)												270.1496 (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												5859.4080 (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	1319.3244	0.2100	277.0581 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3581.2982	0.2100	752.0726 (264)
Space and water heating			1029.1307 (265)
Space cooling	169.2433	0.1143	19.3401 (266)
Pumps, fans and electric keep-hot	519.3925	0.1387	72.0461 (267)
Energy for lighting	270.1496	0.1443	38.9909 (268)
Total CO2, kg/year			1159.5080 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			8.3000 (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	1319.3244	1.1300	1490.8366 (275)

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Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3581.2982	1.1300	4046.8669 (278)
Space and water heating			5537.7035 (279)
Space cooling	169.2433	1.4211	240.5179 (280)
Pumps, fans and electric keep-hot	519.3925	1.5128	785.7370 (281)
Energy for lighting	270.1496	1.5338	414.3645 (282)
Total Primary energy kWh/year			6978.3229 (286)
Dwelling Primary energy Rate (DPER)			49.9600 (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	139.6800 (1b)	x 2.9300 (2b)	= 409.2624 (1b) - (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	139.6800		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 409.2624 (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) = 0.0977 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3477 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2956 (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	0.3769	0.3695	0.3621	0.3251	0.3177	0.2808	0.2808	0.2734	0.2956	0.3177	0.3325	0.3473 (22b)
Effective ac	0.5710	0.5683	0.5656	0.5529	0.5505	0.5394	0.5394	0.5374	0.5437	0.5505	0.5553	0.5603 (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 Opening Type Curtain (Uw = 1.30)			34.8900	1.2357	43.1150		(27)
Curtain Wall	84.0000	34.8900	49.1100	0.1800	8.8398		(29a)
Total net area of external elements Aum(A, m ²)			84.0000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	51.9548		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				0.0000	0.0500	0.0000	
E4 Jamb				0.0000	0.0500	0.0000	
E7 Party floor between dwellings (in blocks of flats)				51.6100	0.0700	3.6127	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation				5.1500	0.0200	0.1030	
E16 Corner (normal)				5.8600	0.0900	0.5274	
E18 Party wall between dwellings				5.8600	0.0600	0.3516	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.5947 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	56.5495 (37)

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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	77.1189	76.7465	76.3814	74.6669	74.3461	72.8527	72.8527	72.5762	73.4279	74.3461	74.9950	75.6735	(38)
Heat transfer coeff	133.6684	133.2960	132.9310	131.2164	130.8956	129.4022	129.4022	129.1257	129.9774	130.8956	131.5445	132.2230	(39)
Average = Sum(39)m / 12 =												131.2148	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9570	0.9543	0.9517	0.9394	0.9371	0.9264	0.9264	0.9244	0.9305	0.9371	0.9418	0.9466	(40)
HLP (average)												0.9394	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9165 (42)
Hot water usage for mixer showers	73.1195	72.0207	70.4194	67.3558	65.0949	62.5735	61.1404	62.7295	64.4715	67.1786	70.3081	72.8394 (42a)
Hot water usage for baths	31.5670	31.0982	30.4380	29.2207	28.3093	27.2986	26.7526	27.4082	28.1220	29.2035	30.4458	31.4603 (42b)
Hot water usage for other uses	44.4976	42.8795	41.2614	39.6433	38.0252	36.4071	36.4071	38.0252	39.6433	41.2614	42.8795	44.4976 (42c)
Average daily hot water use (litres/day)												137.1337 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	149.1841	145.9984	142.1188	136.2198	131.4293	126.2792	124.3002	128.1629	132.2368	137.6435	143.6334	148.7973 (44)
Energy content (annual)	236.2712	207.8997	218.4314	186.4781	176.9292	155.2750	150.3303	158.6925	163.0612	186.7809	204.6321	232.9805 (45)
Distribution loss (46)m = 0.15 x (45)m												2277.7622
	35.4407	31.1850	32.7647	27.9717	26.5394	23.2913	22.5495	23.8039	24.4592	28.0171	30.6948	34.9471 (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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month												
	287.2301	253.9271	269.3903	235.7932	227.8881	204.5901	201.2892	209.6514	212.3763	237.7399	253.9472	283.9394 (62)
WWHRS	-33.4272	-29.5633	-30.9570	-25.6336	-23.8896	-20.4425	-19.1616	-20.3764	-21.1506	-24.9342	-28.2474	-32.8082 (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	253.8029	224.3638	238.4333	210.1596	203.9985	184.1476	182.1276	189.2750	191.2257	212.8056	225.6998	251.1313 (64)
	Total per year (kwh/year) = Sum(64)m =											2567.1707 (64)
12Total per year (kWh/year)												2567 (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												
	91.2999	80.6335	85.3682	74.3327	71.5687	63.9577	62.7245	65.5050	66.5466	74.8444	80.3690	90.2058 (65)

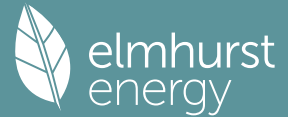
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
(66)m	145.8237	145.8237	145.8237	145.8237	145.8237	145.8237	145.8237	145.8237	145.8237	145.8237	145.8237	145.8237 (66)
Lighting gains	(calculated in Appendix L, equation L9 or L9a), also see Table 5											
	155.8792	172.5805	155.8792	161.0752	155.8792	161.0752	155.8792	155.8792	161.0752	155.8792	161.0752	155.8792 (67)
Appliances gains	(calculated in Appendix L, equation L13 or L13a), also see Table 5											
	309.0479	312.2549	304.1735	286.9691	265.2517	244.8403	231.2043	227.9974	236.0788	253.2832	275.0006	295.4119 (68)
Cooking gains	(calculated in Appendix L, equation L15 or L15a), also see Table 5											
	37.5824	37.5824	37.5824	37.5824	37.5824	37.5824	37.5824	37.5824	37.5824	37.5824	37.5824	37.5824 (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)												
	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589 (71)
Water heating gains (Table 5)												
	122.7149	119.9903	114.7422	103.2399	96.1944	88.8302	84.3072	88.0443	92.4259	100.5973	111.6235	121.2443 (72)
Total internal gains												
	657.3891	674.5728	644.5419	621.0313	587.0724	561.4928	538.1378	538.6680	556.3269	579.5068	617.4464	642.2825 (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		
South				13.4200	46.7521		0.6300		0.7000		0.7700		191.7455 (78)		
West				21.4700	19.6403		0.6300		0.7000		0.7700		128.8698 (80)		
Solar gains				320.6153	566.1264	815.1855	1057.6041	1213.1828	1213.0220	1166.1904	1051.4233	900.7229	637.8444	387.9693	271.6620 (83)
Total gains				978.0044	1240.6992	1459.7274	1678.6354	1800.2552	1774.5148	1704.3282	1590.0913	1457.0498	1217.3512	1005.4157	913.9445 (84)

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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	29.0271	29.1082	29.1881	29.5695	29.6419	29.9840	29.9840	30.0482	29.8513	29.6419	29.4957	29.3444
alpha	2.9351	2.9405	2.9459	2.9713	2.9761	2.9989	2.9989	3.0032	2.9901	2.9761	2.9664	2.9563
util living area	0.9481	0.9048	0.8393	0.7270	0.5896	0.4401	0.3257	0.3611	0.5507	0.7887	0.9158	0.9561 (86)
MIT	18.9583	19.3971	19.8991	20.4215	20.7542	20.9253	20.9773	20.9688	20.8508	20.3676	19.5717	18.8835 (87)
Th 2	20.1194	20.1216	20.1238	20.1341	20.1361	20.1451	20.1451	20.1468	20.1416	20.1361	20.1322	20.1281 (88)
util rest of house	0.9413	0.8931	0.8206	0.6977	0.5488	0.3880	0.2653	0.2983	0.4962	0.7578	0.9034	0.9502 (89)
MIT 2	17.7223	18.2710	18.8905	19.5221	19.9008	20.0861	20.1317	20.1274	20.0153	19.4773	18.5049	17.6338 (90)
Living area fraction	18.3320	18.8266	19.3881	19.9658	20.3218	20.5001	20.5489	20.5425	fLA = Living area / (4) =			0.4933 (91)
MIT	18.3320	18.8266	19.3881	19.9658	20.3218	20.5001	20.5489	20.5425	20.4275	19.9165	19.0312	18.2503 (92)
Temperature adjustment												0.0000
adjusted MIT	18.3320	18.8266	19.3881	19.9658	20.3218	20.5001	20.5489	20.5425	20.4275	19.9165	19.0312	18.2503 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9233	0.8725	0.8029	0.6917	0.5578	0.4100	0.2941	0.3278	0.5149	0.7492	0.8843	0.9336 (94)
Useful gains	903.0048	1082.5543	1172.0128	1161.0371	1004.2442	727.5807	501.2619	521.2630	750.2796	911.9854	889.1087	853.2525 (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	1875.6401	1856.3558	1713.2215	1452.0133	1128.5580	763.4897	510.9962	534.9024	822.4298	1219.4893	1569.4841	1857.7763 (97)
Space heating kWh	723.6407	519.9946	402.6593	209.5029	92.4895	0.0000	0.0000	0.0000	0.0000	228.7829	489.8703	747.3657 (98a)
Space heating requirement - total per year (kWh/year)												3414.3059
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	723.6407	519.9946	402.6593	209.5029	92.4895	0.0000	0.0000	0.0000	0.0000	228.7829	489.8703	747.3657 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3414.3059
Space heating per m2										(98c) / (4) =		24.4438 (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 %)												92.4000 (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	723.6407	519.9946	402.6593	209.5029	92.4895	0.0000	0.0000	0.0000	0.0000	228.7829	489.8703	747.3657 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	783.1609	562.7648	435.7784	226.7347	100.0968	0.0000	0.0000	0.0000	0.0000	247.6006	530.1627	808.8374 (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	253.8029	224.3638	238.4333	210.1596	203.9985	184.1476	182.1276	189.2750	191.2257	212.8056	225.6998	251.1313 (64)
Efficiency of water heater (217)m	86.4947	86.1199	85.4946	84.3747	82.7986	80.3000	80.3000	80.3000	80.3000	84.5369	85.9951	80.3000 (216)
Fuel for water heating, kWh/month	293.4319	260.5249	278.8870	249.0788	246.3790	229.3245	226.8090	235.7098	238.1391	251.7311	262.4566	290.0965 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	32.3886	25.9834	23.3951	17.1403	13.2396	10.8169	12.0776	15.6990	20.3914	26.7546	30.2193	33.2888 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-6.1914	-9.8025	-15.7982	-19.9823	-23.6065	-22.8050	-22.5233	-20.2052	-16.5583	-12.0998	-7.1749	-5.2349 (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	-0.8610	-1.9067	-3.9804	-6.2777	-8.6130	-8.7787	-8.6826	-7.2096	-5.0997	-2.8252	-1.1788	-0.6744 (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)

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

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

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

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	139.6800 (1b)	x 2.9300 (2b)	= 409.2624 (1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	139.6800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	409.2624 (5)

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2. Ventilation rate

			m3 per hour
Number of open chimneys	0 * 80 =	0.0000 (6a)	
Number of open flues	0 * 20 =	0.0000 (6b)	
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)	
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)	
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)	
Number of blocked chimneys	0 * 20 =	0.0000 (6f)	
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)	
Number of passive vents	0 * 10 =	0.0000 (7b)	
Number of flueless gas fires	0 * 40 =	0.0000 (7c)	
			Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.0977 (8)	
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000 (17)	
Infiltration rate		0.2477 (18)	
Number of sides sheltered		2 (19)	
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)	
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2106 (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	0.2685	0.2632	0.2580	0.2316	0.2264	0.2000	0.2000	0.1948	0.2106	0.2264	0.2369	0.2474 (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	0.5360	0.5346	0.5333	0.5268	0.5256	0.5200	0.5200	0.5190	0.5222	0.5256	0.5281	0.5306 (25)

3. Heat losses and heat loss parameter

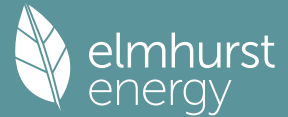
Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Glazed (Uw = 0.64)			38.6400	0.6240	24.1123		(27)
Curtain Wall	84.0000	38.6400	45.3600	0.6400	29.0304		(29a)
Total net area of external elements Aum(A, m2)			84.0000				(31)
Fabric heat loss, W/K = Sum (A x U)					53.1427		(33)
Party Floor 1			139.6800				(32d)
Party Ceiling 1			139.6800				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							100.0000 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				0.0000	0.0500	0.0000	
E4 Jamb				0.0000	0.0500	0.0000	
E7 Party floor between dwellings (in blocks of flats)				51.6100	0.0000	0.0000	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation				5.1500	0.0000	0.0000	
E16 Corner (normal)				5.8600	0.0900	0.5274	
E18 Party wall between dwellings				5.8600	0.0000	0.0000	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							0.5274 (36)
Point Thermal bridges							0.0000
Total fabric heat loss						(33) + (36) + (36a) =	53.6701 (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	72.3960	72.2070	72.0217	71.1515	70.9887	70.2307	70.2307	70.0903	70.5227	70.9887	71.3180	71.6624 (38)
Average = Sum(39)m / 12 =	126.0661	125.8771	125.6918	124.8216	124.6588	123.9008	123.9008	123.7605	124.1928	124.6588	124.9882	125.3325 (39)
												124.8208
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9025	0.9012	0.8999	0.8936	0.8925	0.8870	0.8870	0.8860	0.8891	0.8925	0.8948	0.8973 (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	2.9165 (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	31.5670	31.0982	30.4380	29.2207	28.3093	27.2986	26.7526	27.4082	28.1220	29.2035	30.4458	31.4603 (42b)
Hot water usage for other uses	44.4976	42.8795	41.2614	39.6433	38.0252	36.4071	36.4071	38.0252	39.6433	41.2614	42.8795	44.4976 (42c)
Average daily hot water use (litres/day)												69.7200 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	76.0646	73.9777	71.6994	68.8641	66.3345	63.7057	63.1598	65.4334	67.7653	70.4649	73.3253	75.9579 (44)
Energy content (annual)	120.4677	105.3433	110.1993	94.2714	89.2990	78.3336	76.3863	81.0203	83.5614	95.6202	104.4654	118.9317 (45)
	Total = Sum(45)m = 1157.8996											

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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												
102.3976	89.5418	93.6694	80.1307	75.9041	66.5836	64.9283	68.8672	71.0272	81.2772	88.7956	101.0919	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	102.3976	89.5418	93.6694	80.1307	75.9041	66.5836	64.9283	68.8672	71.0272	81.2772	88.7956	101.0919 (64)
												984 (64)
12Total per year (kWh/year)												
Electric shower(s)	58.5565	52.1744	56.9724	54.3681	55.3883	52.8350	54.5962	55.3883	54.3681	56.9724	55.9011	58.5565 (64a)
												666.0772 (64a)
Heat gains from water heating, kWh/month	40.2385	35.4290	37.6605	33.6247	32.8231	29.8546	29.8811	31.0639	31.3488	34.5624	36.1742	39.9121 (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	145.8237	145.8237	145.8237	145.8237	145.8237	145.8237	145.8237	145.8237	145.8237	145.8237	145.8237	145.8237	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	155.8792	172.5805	155.8792	161.0752	155.8792	161.0752	155.8792	155.8792	161.0752	155.8792	161.0752	155.8792	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	309.0479	312.2549	304.1735	286.9691	265.2517	244.8403	231.2043	227.9974	236.0788	253.2832	275.0006	295.4119	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.5824	37.5824	37.5824	37.5824	37.5824	37.5824	37.5824	37.5824	37.5824	37.5824	37.5824	37.5824	(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)	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589	(71)
Water heating gains (Table 5)	54.0840	52.7218	50.6189	46.7010	44.1171	41.4648	40.1628	41.7525	43.5400	46.4548	50.2419	53.6453	(72)
Total internal gains	585.7583	604.3043	577.4186	561.4923	531.9950	514.1274	493.9934	492.3762	507.4411	522.3643	553.0648	571.6835	(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			
South			14.8500	46.7521	0.5000	1.0000		0.7700	240.5639 (78)			
West			23.7900	19.6403	0.5000	1.0000		0.7700	161.8993 (80)			
Solar gains	402.4632	710.6911	1023.4381	1327.9003	1523.3218	1523.1499	1464.3329	1320.1727	1130.8686	800.7486	487.0197	341.0075 (83)
Total gains	988.2215	1314.9954	1600.8567	1889.3927	2055.3168	2037.2773	1958.3263	1812.5488	1638.3097	1323.1129	1040.0844	912.6910 (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, n11,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	30.7775	30.8237	30.8691	31.0844	31.1250	31.3154	31.3154	31.3509	31.2418	31.1250	31.0429	30.9576	
alpha	3.0518	3.0549	3.0579	3.0723	3.0750	3.0877	3.0877	3.0901	3.0828	3.0750	3.0695	3.0638	
util living area	0.9446	0.8867	0.8001	0.6646	0.5172	0.3760	0.2745	0.3080	0.4866	0.7469	0.9051	0.9547	(86)
MIT	19.1289	19.6251	20.1341	20.5921	20.8458	20.9569	20.9877	20.9823	20.9042	20.5059	19.7253	19.0252	(87)
Th 2	20.1653	20.1665	20.1676	20.1729	20.1739	20.1785	20.1785	20.1794	20.1768	20.1739	20.1719	20.1698	(88)
util rest of house	0.9376	0.8738	0.7795	0.6347	0.4794	0.3312	0.2246	0.2551	0.4369	0.7144	0.8920	0.9488	(89)
MIT 2	18.4511	18.9321	19.4162	19.8399	20.0601	20.1522	20.1729	20.1709	20.1142	19.7760	19.0410	18.3529	(90)
Living area fraction									fLA = Living area / (4) =			0.4933	(91)
MIT	18.7854	19.2740	19.7704	20.2110	20.4477	20.5492	20.5749	20.5712	20.5040	20.1361	19.3786	18.6846	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7854	19.2740	19.7704	20.2110	20.4477	20.5492	20.5749	20.5712	20.5040	20.1361	19.3786	18.6846	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9232	0.8580	0.7688	0.6362	0.4922	0.3516	0.2488	0.2806	0.4571	0.7128	0.8771	0.9356	(94)

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Useful gains	912.3055	1128.2767	1230.7717	1201.9958	1011.6107	716.4006	487.2804	508.5673	748.7928	943.1542	912.2880	853.9026 (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	1826.1239	1809.3549	1667.9765	1411.8598	1090.4754	737.1049	492.4938	516.2296	795.3270	1188.7575	1534.6828	1815.3919 (97)
Space heating kWh	679.8809	457.6845	325.2804	151.1021	58.6753	0.0000	0.0000	0.0000	0.0000	182.7289	448.1243	715.3480 (98a)
Space heating requirement - total per year (kWh/year)												3018.8244
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	679.8809	457.6845	325.2804	151.1021	58.6753	0.0000	0.0000	0.0000	0.0000	182.7289	448.1243	715.3480 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3018.8244
Space heating per m2										(98c) / (4) =		21.6124 (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	1164.6678	916.8662	940.5796	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9366	0.9609	0.9496	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1090.7984	881.0237	893.2190	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	2314.5868	2225.2838	2058.0069	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	881.1277	1000.1295	866.6022	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	220.2819	250.0324	216.6505	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												686.9648 (107)
Energy for space heating												21.6124 (99)
Energy for space cooling												4.9181 (108)
Total												26.5306 (109)
Fabric Energy Efficiency (DFEE)												26.5 (109)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	139.6800 (1b)	x 2.9300 (2b)	= 409.2624 (1b) - (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	139.6800		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	409.2624 (5)

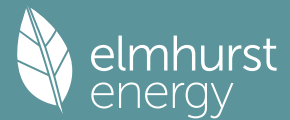
2. Ventilation rate

	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) =	0.0977 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3477	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2956	(21)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infiltr rate	0.3769	0.3695	0.3621	0.3251	0.3177	0.2808	0.2808	0.2734	0.2956	0.3177	0.3325	0.3473 (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	0.5710	0.5683	0.5656	0.5529	0.5505	0.5394	0.5394	0.5374	0.5437	0.5505	0.5553	0.5603 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opening Type Curtain (Uw = 1.30)			34.8900	1.2357	43.1150		(27)
Curtain Wall	84.0000	34.8900	49.1100	0.1800	8.8398		(29a)
Total net area of external elements Aum(A, m2)			84.0000				(31)
Fabric heat loss, W/K = Sum (A x U)					51.9548		(33)
(26)...(30) + (32) =							
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							100.0000 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				0.0000	0.0500	0.0000	
E4 Jamb				0.0000	0.0500	0.0000	
E7 Party floor between dwellings (in blocks of flats)				51.6100	0.0700	3.6127	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation				5.1500	0.0200	0.1030	
E16 Corner (normal)				5.8600	0.0900	0.5274	
E18 Party wall between dwellings				5.8600	0.0600	0.3516	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.5947 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	56.5495 (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	77.1189	76.7465	76.3814	74.6669	74.3461	72.8527	72.8527	72.5762	73.4279	74.3461	74.9950	75.6735 (38)
Average = Sum(39)m / 12 =	133.6684	133.2960	132.9310	131.2164	130.8956	129.4022	129.4022	129.1257	129.9774	130.8956	131.5445	132.2230 (39)
												131.2148
HLP	0.9570	0.9543	0.9517	0.9394	0.9371	0.9264	0.9264	0.9244	0.9305	0.9371	0.9418	0.9466 (40)
HLP (average)												0.9394
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9165 (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	31.5670	31.0982	30.4380	29.2207	28.3093	27.2986	26.7526	27.4082	28.1220	29.2035	30.4458	31.4603 (42b)
Hot water usage for other uses	44.4976	42.8795	41.2614	39.6433	38.0252	36.4071	36.4071	38.0252	39.6433	41.2614	42.8795	44.4976 (42c)
Average daily hot water use (litres/day)												69.7200 (43)
Daily hot water use	76.0646	73.9777	71.6994	68.8641	66.3345	63.7057	63.1598	65.4334	67.7653	70.4649	73.3253	75.9579 (44)
Energy conte	120.4677	105.3433	110.1993	94.2714	89.2990	78.3336	76.3863	81.0203	83.5614	95.6202	104.4654	118.9317 (45)
Energy content (annual)										Total = Sum(45)m =		1157.8996
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	102.3976	89.5418	93.6694	80.1307	75.9041	66.5836	64.9283	68.8672	71.0272	81.2772	88.7956	101.0919 (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	102.3976	89.5418	93.6694	80.1307	75.9041	66.5836	64.9283	68.8672	71.0272	81.2772	88.7956	101.0919 (64)
Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		984.2147 (64)
Electric shower(s)	58.5565	52.1744	56.9724	54.3681	55.3883	52.8350	54.5962	55.3883	54.3681	56.9724	55.9011	58.5565 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												666.0772 (64a)
Heat gains from water heating, kWh/month	40.2385	35.4290	37.6605	33.6247	32.8231	29.8546	29.8811	31.0639	31.3488	34.5624	36.1742	39.9121 (65)

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

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Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	145.8237	145.8237	145.8237	145.8237	145.8237	145.8237	145.8237	145.8237	145.8237	145.8237	145.8237	145.8237 (66)
Lighting gains	(calculated in Appendix L, equation L9 or L9a), also see Table 5											
	155.8792	172.5805	155.8792	161.0752	155.8792	161.0752	155.8792	155.8792	161.0752	155.8792	161.0752	155.8792 (67)
Appliances gains	(calculated in Appendix L, equation L13 or L13a), also see Table 5											
	309.0479	312.2549	304.1735	286.9691	265.2517	244.8403	231.2043	227.9974	236.0788	253.2832	275.0006	295.4119 (68)
Cooking gains	(calculated in Appendix L, equation L15 or L15a), also see Table 5											
	37.5824	37.5824	37.5824	37.5824	37.5824	37.5824	37.5824	37.5824	37.5824	37.5824	37.5824	37.5824 (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)	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589 (71)
Water heating gains (Table 5)	54.0840	52.7218	50.6189	46.7010	44.1171	41.4648	40.1628	41.7525	43.5400	46.4548	50.2419	53.6453 (72)
Total internal gains	585.7583	604.3043	577.4186	561.4923	531.9950	514.1274	493.9934	492.3762	507.4411	522.3643	553.0648	571.6835 (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				
South			13.4200	46.7521	0.6300	0.7000	0.7700	191.7455 (78)				
West			21.4700	19.6403	0.6300	0.7000	0.7700	128.8698 (80)				
Solar gains	320.6153	566.1264	815.1855	1057.6041	1213.1828	1213.0220	1166.1904	1051.4233	900.7229	637.8444	387.9693	271.6620 (83)
Total gains	906.3735	1170.4306	1392.6041	1619.0964	1745.1779	1727.1494	1660.1838	1543.7995	1408.1640	1160.2087	941.0340	843.3455 (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	29.0271	29.1082	29.1881	29.5695	29.6419	29.9840	29.9840	30.0482	29.8513	29.6419	29.4957	29.3444
alpha	2.9351	2.9405	2.9459	2.9713	2.9761	2.9989	2.9989	3.0032	2.9901	2.9761	2.9664	2.9563
util living area	0.9566	0.9158	0.8526	0.7408	0.6027	0.4504	0.3337	0.3710	0.5650	0.8048	0.9271	0.9638 (86)
MIT	18.8640	19.3177	19.8397	20.3886	20.7390	20.9205	20.9758	20.9664	20.8400	20.3261	19.4957	18.7878 (87)
Th 2	20.1194	20.1216	20.1238	20.1341	20.1361	20.1451	20.1451	20.1468	20.1416	20.1361	20.1322	20.1281 (88)
util rest of house	0.9507	0.9052	0.8349	0.7121	0.5617	0.3975	0.2721	0.3067	0.5100	0.7752	0.9161	0.9588 (89)
MIT 2	18.1592	18.6033	19.1074	19.6284	19.9407	20.0960	20.1339	20.1305	20.0356	19.5862	18.7912	18.0903 (90)
Living area fraction									fLA = Living area / (4) =			0.4933 (91)
MIT	18.5069	18.9558	19.4687	20.0034	20.3345	20.5028	20.5492	20.5429	20.4324	19.9512	19.1388	18.4344 (92)
Temperature adjustment												0.0000
adjusted MIT	18.5069	18.9558	19.4687	20.0034	20.3345	20.5028	20.5492	20.5429	20.4324	19.9512	19.1388	18.4344 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9369	0.8884	0.8200	0.7075	0.5715	0.4200	0.3015	0.3370	0.5293	0.7682	0.9008	0.9463 (94)
Useful gains	849.2182	1039.8534	1141.8686	1145.4511	997.2885	725.4813	500.6166	520.2452	745.2919	891.2418	847.6510	798.0851 (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	1899.0131	1873.5764	1723.9393	1456.9490	1130.2236	763.8319	511.0407	534.9523	823.0752	1224.0340	1583.6366	1882.1135 (97)
Space heating kWh	781.0474	560.2618	433.0606	224.2785	98.9038	0.0000	0.0000	0.0000	0.0000	247.5974	529.9096	806.5171 (98a)
Space heating requirement - total per year (kWh/year)												3681.5762
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	781.0474	560.2618	433.0606	224.2785	98.9038	0.0000	0.0000	0.0000	0.0000	247.5974	529.9096	806.5171 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3681.5762
Space heating per m ²										(98c) / (4) =		26.3572 (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	1216.3810	957.5765	981.3552	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8926	0.9302	0.9136	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1085.7017	890.7037	896.5362	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1952.0997	1876.8056	1743.8842	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	623.8066	733.6598	630.4269	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	155.9516	183.4149	157.6067	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												496.9733 (107)
Energy for space heating												26.3572 (99)
Energy for space cooling												3.5579 (108)
Total												29.9152 (109)
Fabric Energy Efficiency (TFEE)												29.9 (109)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	139.6800 (1b)	x 2.9300 (2b)	= 409.2624 (1b) - (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	139.6800		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 409.2624 (5)

2. Ventilation rate

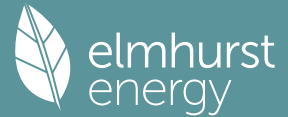
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1275 (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	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												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)												80.1000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2621	0.2589	0.2557	0.2397	0.2366	0.2206	0.2206	0.2174	0.2270	0.2366	0.2429	0.2493 (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
Glazed (Uw = 0.64)			38.6400	0.6240	24.1123		(27)
Curtain Wall	84.0000	38.6400	45.3600	0.6400	29.0304		(29a)
Total net area of external elements Aum(A, m ²)			84.0000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 53.1427		(33)
Party Floor 1			139.6800				(32d)
Party Ceiling 1			139.6800				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	

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E2 Other lintels (including other steel lintels)	0.0000	0.0500	0.0000
E4 Jamb	0.0000	0.0500	0.0000
E7 Party floor between dwellings (in blocks of flats)	51.6100	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.1500	0.0000	0.0000
E16 Corner (normal)	5.8600	0.0900	0.5274
E18 Party wall between dwellings	5.8600	0.0000	0.0000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			0.5274 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	53.6701 (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	35.3933	34.9628	34.5323	32.3798	31.9493	29.7969	29.7969	29.3664	30.6578	31.9493	32.8103	33.6713 (38)
Average = Sum(39)m / 12 =	89.0634	88.6329	88.2024	86.0499	85.6194	83.4670	83.4670	83.0365	84.3280	85.6194	86.4804	87.3414 (39)
												85.9423
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.6376	0.6345	0.6315	0.6161	0.6130	0.5976	0.5976	0.5945	0.6037	0.6130	0.6191	0.6253 (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	2.9165 (42)											
Hot water usage for mixer showers	73.1195	72.0207	70.4194	67.3558	65.0949	62.5735	61.1404	62.7295	64.4715	67.1786	70.3081	72.8394 (42a)
Hot water usage for baths	33.2284	32.7349	32.0400	30.7587	29.7992	28.7353	28.1607	28.8508	29.6021	30.7405	32.0482	33.1161 (42b)
Hot water usage for other uses	46.8396	45.1363	43.4331	41.7298	40.0266	38.3233	38.3233	40.0266	41.7298	43.4331	45.1363	46.8396 (42c)
Average daily hot water use (litres/day)												140.8032 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	153.1875	149.8919	145.8925	139.8442	134.9206	129.6321	127.6244	131.6068	135.8034	141.3522	147.4926	152.7950 (44)
Energy content (annual)	242.6116	213.4441	224.2313	191.4398	181.6291	159.3978	154.3506	162.9567	167.4592	191.8136	210.1303	239.2401 (45)
Distribution loss (46)m = 0.15 x (45)m	36.3917	32.0166	33.6347	28.7160	27.2444	23.9097	23.1526	24.4435	25.1189	28.7720	31.5195	35.8860 (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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	293.5705	259.4715	275.1902	240.7548	232.5880	208.7129	205.3095	213.9156	216.7742	242.7725	259.4454	290.1990 (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	293.5705	259.4715	275.1902	240.7548	232.5880	208.7129	205.3095	213.9156	216.7742	242.7725	259.4454	290.1990 (64)
												Total per year (kWh/year) = Sum(64)m = 2938.7043 (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	93.4081	82.4770	87.2966	75.9825	73.1314	65.3286	64.0613	66.9228	68.0089	76.5177	82.1971	92.2871 (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	174.9884	174.9884	174.9884	174.9884	174.9884	174.9884	174.9884	174.9884	174.9884	174.9884	174.9884	174.9884 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	38.2425	33.9666	27.6235	20.9128	15.6325	13.1977	14.2605	18.5364	24.8795	31.5902	36.8705	39.3054 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	461.2656	466.0520	453.9902	428.3121	395.8980	365.4334	345.0811	340.2946	352.3564	378.0346	410.4486	440.9133 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.4153	55.4153	55.4153	55.4153	55.4153	55.4153	55.4153	55.4153	55.4153	55.4153	55.4153	55.4153 (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)	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589 (71)
Water heating gains (Table 5)	125.5485	122.7337	117.3342	105.5312	98.2949	90.7341	86.1039	89.9500	94.4569	102.8464	114.1626	124.0417 (72)
Total internal gains	738.8013	736.4971	712.6927	668.5009	623.5702	583.1099	559.1903	562.5258	585.4375	626.2160	675.2265	718.0052 (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
South West				14.8500 23.7900	46.7521 19.6403	0.5000 0.5000		1.0000 1.0000		0.7700 0.7700		240.5639 (78) 161.8993 (80)
Solar gains	402.4632	710.6911	1023.4381	1327.9003	1523.3218	1523.1499	1464.3329	1320.1727	1130.8686	800.7486	487.0197	341.0075 (83)
Total gains	1141.2645	1447.1882	1736.1308	1996.4012	2146.8920	2106.2598	2023.5232	1882.6985	1716.3061	1426.9646	1162.2462	1059.0127 (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	43.5645	43.7761	43.9897	45.0901	45.3168	46.4854	46.4854	46.7264	46.0108	45.3168	44.8656	44.4234
alpha	3.9043	3.9184	3.9326	4.0060	4.0211	4.0990	4.0990	4.1151	4.0674	4.0211	3.9910	3.9616
util living area	0.8862	0.7910	0.6618	0.5024	0.3665	0.2529	0.1814	0.2027	0.3363	0.5851	0.8129	0.9046 (86)
MIT	20.1552	20.4984	20.7686	20.9316	20.9832	20.9974	20.9995	20.9992	20.9915	20.9005	20.5397	20.0912 (87)
Th 2	20.3963	20.3990	20.4018	20.4156	20.4183	20.4322	20.4322	20.4350	20.4267	20.4183	20.4128	20.4073 (88)
util rest of house	0.8757	0.7754	0.6418	0.4808	0.3444	0.2307	0.1580	0.1778	0.3090	0.5581	0.7958	0.8954 (89)
MIT 2	19.4072	19.8253	20.1463	20.3441	20.4022	20.4301	20.4319	20.4344	20.4193	20.3165	19.8932	19.3374 (90)
Living area fraction	fLA = Living area / (4) = 0.4933 (91)											
MIT	19.7762	20.1574	20.4533	20.6339	20.6889	20.7099	20.7119	20.7131	20.7016	20.6046	20.2122	19.7093 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.7762	20.1574	20.4533	20.6339	20.6889	20.7099	20.7119	20.7131	20.7016	20.6046	20.2122	19.7093 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8637	0.7688	0.6436	0.4889	0.3547	0.2416	0.1695	0.1901	0.3221	0.5669	0.7897	0.8833 (94)
Useful gains	985.6598	1112.6308	1117.3507	976.0773	761.5968	508.8239	343.0107	357.8289	552.8250	808.9335	917.7857	935.4334 (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	1378.3642	1352.3075	1230.7146	1009.7047	769.6222	509.9791	343.2086	358.1427	556.6970	856.5909	1133.9446	1354.6024 (97)
Space heating kWh	292.1721	161.0627	84.3428	24.2117	5.9709	0.0000	0.0000	0.0000	0.0000	35.4571	155.6343	311.8617 (98a)
Space heating requirement - total per year (kWh/year)												1070.7134
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	292.1721	161.0627	84.3428	24.2117	5.9709	0.0000	0.0000	0.0000	0.0000	35.4571	155.6343	311.8617 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1070.7134
Space heating per m2	(98c) / (4) =											7.6655 (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	784.5897	617.6557	631.0773	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9927	0.9965	0.9951	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	778.8618	615.4892	627.9665	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	2363.4150	2270.7482	2105.5848	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	1140.8783	1231.5127	1099.3480	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction	fC = cooled area / (4) =											0.8970 (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	255.8359	276.1602	246.5230	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												778.5191 (107)
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 %)												88.9000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Cooling System Energy Efficiency Ratio (see Table 10c)												4.6000 (209)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	292.1721	161.0627	84.3428	24.2117	5.9709	0.0000	0.0000	0.0000	0.0000	35.4571	155.6343	311.8617 (98)
Space heating efficiency (main heating system 1)	88.9000	88.9000	88.9000	88.9000	88.9000	0.0000	0.0000	0.0000	0.0000	88.9000	88.9000	88.9000 (210)

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Space heating fuel (main heating system)	328.6525	181.1729	94.8737	27.2347	6.7165	0.0000	0.0000	0.0000	0.0000	39.8843	175.0668	350.8006 (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	293.5705	259.4715	275.1902	240.7548	232.5880	208.7129	205.3095	213.9156	216.7742	242.7725	259.4454	290.1990 (64)
Efficiency of water heater	84.3712	83.3896	82.1646	81.0161	80.4949	80.3000	80.3000	80.3000	80.3000	81.3023	83.3223	80.3000 (216)
Fuel for water heating, kWh/month	347.9510	311.1557	334.9255	297.1690	288.9475	259.9165	255.6781	266.3955	269.9555	298.6047	311.3758	84.5360 (217)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	55.6165	60.0348	53.5919	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	44.1128	39.8438	44.1128	42.6898	44.1128	42.6898	44.1128	44.1128	42.6898	44.1128	42.6898	0.0000 (231)
Lighting	33.4734	26.8536	24.1787	17.7144	13.6831	11.1792	12.4822	16.2248	21.0744	27.6507	31.2315	44.1128 (231)
Electricity generated by PVs (Appendix M) (negative quantity)												34.4037 (232)
(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												1204.4021 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												80.3000
Water heating fuel used												3585.3591 (219)
Space cooling fuel												169.2433 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.8680)												
mechanical ventilation fans (SFP = 0.8680)												433.3925 (230a)
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												519.3925 (231)
Electricity for lighting (calculated in Appendix L)												270.1496 (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												5748.5466 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1204.4021	3.6400	43.8402 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3585.3591	3.6400	130.5071 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Space cooling	169.2433	16.4900	27.9082 (248)
Pumps, fans and electric keep-hot	519.3925	16.4900	85.6478 (249)
Energy for lighting	270.1496	16.4900	44.5477 (250)
Additional standing charges			92.0000 (251)
Total energy cost			424.4510 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.8274 (257)
SAP value		86.5880
SAP rating (Section 12)		87 (258)
SAP band		B

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

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	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1204.4021	0.2100	252.9244 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3585.3591	0.2100	752.9254 (264)
Space and water heating			1005.8499 (265)
Space cooling	169.2433	0.1143	19.3401 (266)
Pumps, fans and electric keep-hot	519.3925	0.1387	72.0461 (267)
Energy for lighting	270.1496	0.1443	38.9909 (268)
Total CO2, kg/year			1136.2271 (272)
CO2 emissions per m2			8.1300 (273)
EI value			91.7558
EI rating			92 (274)
EI band			A

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	139.6800 (1b)	x 2.9300 (2b)	= 409.2624 (1b) - (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	139.6800		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 409.2624 (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	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	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate	0.1339	0.1275	0.1275	0.1179	0.1179	0.1052	0.1084	0.1020	0.1052	0.1116	0.1116	0.1211 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												80.1000 (23c)
Effective ac	0.2334	0.2270	0.2270	0.2174	0.2174	0.2047	0.2079	0.2015	0.2047	0.2111	0.2111	0.2206 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Glazed (Uw = 0.64)			38.6400	0.6240	24.1123		(27)
Curtain Wall	84.0000	38.6400	45.3600	0.6400	29.0304		(29a)
Total net area of external elements Aum(A, m2)			84.0000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	53.1427		(33)
Party Floor 1			139.6800				(32d)
Party Ceiling 1			139.6800				(32b)

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

100.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	0.0000	0.0500	0.0000
E4 Jamb	0.0000	0.0500	0.0000
E7 Party floor between dwellings (in blocks of flats)	51.6100	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.1500	0.0000	0.0000
E16 Corner (normal)	5.8600	0.0900	0.5274
E18 Party wall between dwellings	5.8600	0.0000	0.0000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			0.5274 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 53.6701 (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	31.5188	30.6578	30.6578	29.3664	29.3664	27.6444	28.0749	27.2139	27.6444	28.5054	28.5054	29.7969 (38)
Heat transfer coeff	85.1890	84.3280	84.3280	83.0365	83.0365	81.3145	81.7450	80.8840	81.3145	82.1755	82.1755	83.4670 (39)
Average = Sum(39)m / 12 =												82.7495
HLP	0.6099	0.6037	0.6037	0.5945	0.5945	0.5821	0.5852	0.5791	0.5821	0.5883	0.5883	0.5976 (40)
HLP (average)												0.5924
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9165 (42)
Hot water usage for mixer showers	73.1195	72.0207	70.4194	67.3558	65.0949	62.5735	61.1404	62.7295	64.4715	67.1786	70.3081	72.8394 (42a)
Hot water usage for baths	33.2284	32.7349	32.0400	30.7587	29.7992	28.7353	28.1607	28.8508	29.6021	30.7405	32.0482	33.1161 (42b)
Hot water usage for other uses	46.8396	45.1363	43.4331	41.7298	40.0266	38.3233	38.3233	40.0266	41.7298	43.4331	45.1363	46.8396 (42c)
Average daily hot water use (litres/day)												140.8032 (43)
Daily hot water use	153.1875	149.8919	145.8925	139.8442	134.9206	129.6321	127.6244	131.6068	135.8034	141.3522	147.4926	152.7950 (44)
Energy conte	242.6116	213.4441	224.2313	191.4398	181.6291	159.3978	154.3506	162.9567	167.4592	191.8136	210.1303	239.2401 (45)
Energy content (annual)										Total = Sum(45)m =		2338.7043
Distribution loss (46)m = 0.15 x (45)m	36.3917	32.0166	33.6347	28.7160	27.2444	23.9097	23.1526	24.4435	25.1189	28.7720	31.5195	35.8860 (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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	293.5705	259.4715	275.1902	240.7548	232.5880	208.7129	205.3095	213.9156	216.7742	242.7725	259.4454	290.1990 (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	293.5705	259.4715	275.1902	240.7548	232.5880	208.7129	205.3095	213.9156	216.7742	242.7725	259.4454	290.1990 (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	93.4081	82.4770	87.2966	75.9825	73.1314	65.3286	64.0613	66.9228	68.0089	76.5177	82.1971	92.2871 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	174.9884	174.9884	174.9884	174.9884	174.9884	174.9884	174.9884	174.9884	174.9884	174.9884	174.9884	174.9884 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	38.2425	33.9666	27.6235	20.9128	15.6325	13.1977	14.2605	18.5364	24.8795	31.5902	36.8705	39.3054 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	461.2656	466.0520	453.9902	428.3121	395.8980	365.4334	345.0811	340.2946	352.3564	378.0346	410.4486	440.9133 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.4153	55.4153	55.4153	55.4153	55.4153	55.4153	55.4153	55.4153	55.4153	55.4153	55.4153	55.4153 (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)	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589 (71)
Water heating gains (Table 5)	125.5485	122.7337	117.3342	105.5312	98.2949	90.7341	86.1039	89.9500	94.4569	102.8464	114.1626	124.0417 (72)
Total internal gains	738.8013	736.4971	712.6927	668.5009	623.5702	583.1099	559.1903	562.5258	585.4375	626.2160	675.2265	718.0052 (73)

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6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W	
South				14.8500	50.9848		0.5000		1.0000	0.7700	262.3437 (78)	
West				23.7900	22.3313		0.5000		1.0000	0.7700	184.0823 (80)	
Solar gains	446.4260	709.5055	1010.3811	1354.4531	1518.0261	1626.7139	1545.9971	1421.8151	1211.1920	853.7705	553.4522	374.6077 (83)
Total gains	1185.2273	1446.0026	1723.0738	2022.9540	2141.5964	2209.8238	2105.1875	1984.3409	1796.6295	1479.9865	1228.6787	1092.6129 (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	45.5458	46.0108	46.0108	46.7264	46.7264	47.7160	47.4647	47.9699	47.7160	47.2160	47.2160	46.4854
alpha	4.0364	4.0674	4.0674	4.1151	4.1151	4.1811	4.1643	4.1980	4.1811	4.1477	4.1477	4.0990
util living area	0.8510	0.7573	0.6169	0.4457	0.3084	0.1839	0.1204	0.1304	0.2618	0.5045	0.7457	0.8734 (86)
MIT	20.3789	20.6335	20.8489	20.9636	20.9933	20.9995	20.9999	20.9999	20.9976	20.9532	20.7243	20.3268 (87)
Th 2	20.4211	20.4267	20.4267	20.4350	20.4350	20.4461	20.4433	20.4489	20.4461	20.4405	20.4405	20.4322 (88)
util rest of house	0.8381	0.7404	0.5963	0.4245	0.2870	0.1635	0.0988	0.1080	0.2370	0.4775	0.7255	0.8618 (89)
MIT 2	19.7024	20.0116	20.2624	20.3979	20.4289	20.4457	20.4433	20.4488	20.4442	20.3944	20.1361	19.6488 (90)
Living area fraction									fLA = Living area / (4) =			0.4933 (91)
MIT	20.0361	20.3184	20.5518	20.6770	20.7073	20.7189	20.7179	20.7207	20.7173	20.6701	20.4263	19.9833 (92)
Temperature adjustment												0.0000
adjusted MIT	20.0361	20.3184	20.5518	20.6770	20.7073	20.7189	20.7179	20.7207	20.7173	20.6701	20.4263	19.9833 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8288	0.7371	0.6008	0.4336	0.2974	0.1735	0.1094	0.1190	0.2491	0.4886	0.7250	0.8518 (94)
Useful gains	982.3355	1065.8753	1035.3040	877.2148	636.8676	383.5070	230.3292	236.2114	447.6140	723.1848	890.7752	930.6940 (95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate W	1272.3932	1241.1712	1109.0618	894.8841	639.9883	383.7170	230.3497	236.2388	448.6328	745.3388	1021.1367	1242.2629 (97)
Space heating kWh	215.8029	117.7988	54.8758	12.7219	2.3218	0.0000	0.0000	0.0000	0.0000	16.4825	93.8603	231.8072 (98a)
Space heating requirement - total per year (kWh/year)												745.6713
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	215.8029	117.7988	54.8758	12.7219	2.3218	0.0000	0.0000	0.0000	0.0000	16.4825	93.8603	231.8072 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												745.6713
Space heating per m2										(98c) / (4) =		5.3384 (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.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000
Heat loss rate W												
	0.0000	0.0000	0.0000	0.0000	0.0000	650.5162	498.6446	501.4810	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9973	0.9988	0.9985	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	648.7438	498.0434	500.7335	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	2484.4638	2366.2000	2224.3876	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	1321.7184	1389.9085	1282.3986	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fC = cooled area / (4) =			0.8970 (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	296.3884	311.6796	287.5711	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												895.6391 (107)

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 %)												88.9000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Cooling System Energy Efficiency Ratio (see Table 10c)												4.0000 (209)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

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Space heating requirement	215.8029	117.7988	54.8758	12.7219	2.3218	0.0000	0.0000	0.0000	0.0000	16.4825	93.8603	231.8072 (98)
Space heating efficiency (main heating system 1)	88.9000	88.9000	88.9000	88.9000	88.9000	0.0000	0.0000	0.0000	0.0000	88.9000	88.9000	88.9000 (210)
Space heating fuel (main heating system)	242.7479	132.5071	61.7275	14.3104	2.6117	0.0000	0.0000	0.0000	0.0000	18.5405	105.5796	260.7506 (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	293.5705	259.4715	275.1902	240.7548	232.5880	208.7129	205.3095	213.9156	216.7742	242.7725	259.4454	290.1990 (64)
Efficiency of water heater	83.7317	82.8010	81.6126	80.6918	80.3769	80.3000	80.3000	80.3000	80.3000	80.7969	82.4181	80.3000 (216)
Fuel for water heating, kWh/month	350.6086	313.3674	337.1909	298.3635	289.3719	259.9165	255.6781	266.3955	269.9555	300.4725	314.7917	83.9044 (217)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	64.4323	67.7564	62.5155	0.0000	0.0000	0.0000	345.8686 (219)
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	64.4323	67.7564	62.5155	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	44.1128	39.8438	44.1128	42.6898	44.1128	42.6898	44.1128	44.1128	42.6898	44.1128	42.6898	44.1128 (231)
Lighting	33.4734	26.8536	24.1787	17.7144	13.6831	11.1792	12.4822	16.2248	21.0744	27.6507	31.2315	34.4037 (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												838.7754 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												80.3000
Water heating fuel used												3601.9807 (219)
Space cooling fuel												194.7041 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.8680)												
mechanical ventilation fans (SFP = 0.8680)												433.3925 (230a)
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												519.3925 (231)
Electricity for lighting (calculated in Appendix L)												270.1496 (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												5425.0024 (238)

10a. Fuel costs - using BEDF prices (522)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	838.7754	4.8000	40.2612 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3601.9807	4.8000	172.8951 (247)
Energy for instantaneous electric shower(s)	0.0000	21.5100	0.0000 (247a)
Space cooling	194.7041	21.5100	41.8809 (248)
Pumps, fans and electric keep-hot	519.3925	21.5100	111.7213 (249)
Energy for lighting	270.1496	21.5100	58.1092 (250)
Additional standing charges			98.0000 (251)
Total energy cost			522.8677 (255)

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	838.7754	0.2100	176.1428 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3601.9807	0.2100	756.4159 (264)
Space and water heating			932.5588 (265)

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Space cooling	194.7041	0.1143	22.2546 (266)
Pumps, fans and electric keep-hot	519.3925	0.1387	72.0461 (267)
Energy for lighting	270.1496	0.1443	38.9909 (268)
Total CO2, kg/year			1065.8504 (272)

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	838.7754	1.1300	947.8162 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3601.9807	1.1300	4070.2381 (278)
Space and water heating			5018.0544 (279)
Space cooling	194.7041	1.4212	276.7178 (280)
Pumps, fans and electric keep-hot	519.3925	1.5128	785.7370 (281)
Energy for lighting	270.1496	1.5338	414.3645 (282)
Total Primary energy kWh/year			6494.8737 (286)

SAP 10 EPC IMPROVEMENTS

V1 THFC-L20-03 LEANboilr-PlanB

Current energy efficiency rating:	B 87
Current environmental impact rating:	A 92

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
	Total Savings	£0	0.00 kg/m²

Potential energy efficiency rating:	B 87
Potential environmental impact rating:	A 92

Fuel prices for cost data on this page from database revision number 522 TEST (30 Jun 2023)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

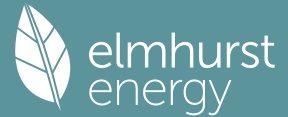
	Current	Potential	Saving
Electricity	£212	£212	£0
Mains gas	£311	£311	£0
Space heating	£250	£250	£0
Space cooling	£42	£42	£0
Water heating	£173	£173	£0
Lighting	£58	£58	£0
Total cost of fuels	£523	£523	£0
Total cost of uses	£523	£523	£0
Delivered energy	39 kWh/m²	39 kWh/m²	0 kWh/m²
Carbon dioxide emissions	1.1 tonnes	1.1 tonnes	0.0 tonnes
CO2 emissions per m²	8 kg/m²	8 kg/m²	0 kg/m²
Primary energy	46 kWh/m²	46 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m²)	Storey height (m)	Volume (m³)
Ground floor	139.6800 (1b)	x 2.9300 (2b)	= 409.2624 (1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	139.6800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 409.2624 (5)

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2. Ventilation rate

											m3 per hour			
Number of open chimneys											0 * 80 =	0.0000 (6a)		
Number of open flues											0 * 20 =	0.0000 (6b)		
Number of chimneys / flues attached to closed fire											0 * 10 =	0.0000 (6c)		
Number of flues attached to solid fuel boiler											0 * 20 =	0.0000 (6d)		
Number of flues attached to other heater											0 * 35 =	0.0000 (6e)		
Number of blocked chimneys											0 * 20 =	0.0000 (6f)		
Number of intermittent extract fans											0 * 10 =	0.0000 (7a)		
Number of passive vents											0 * 10 =	0.0000 (7b)		
Number of flueless gas fires											0 * 40 =	0.0000 (7c)		
											Air changes per hour			
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											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											2 (19)			
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.8500 (20)		
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.1275 (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	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)	
Balanced mechanical ventilation with heat recovery														
If mechanical ventilation														0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)														0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =														80.1000 (23c)
Effective ac	0.2621	0.2589	0.2557	0.2397	0.2366	0.2206	0.2206	0.2174	0.2270	0.2366	0.2429	0.2493	(25)	

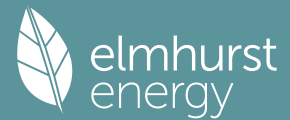
3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
Glazed (Uw = 0.64)			38.6400	0.6240	24.1123		(27)						
Curtain Wall	84.0000	38.6400	45.3600	0.6400	29.0304		(29a)						
Total net area of external elements Aum(A, m2)			84.0000				(31)						
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	53.1427		(33)						
Party Floor 1			139.6800				(32d)						
Party Ceiling 1			139.6800				(32b)						
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							100.0000 (35)						
List of Thermal Bridges													
K1 Element				Length	Psi-value	Total							
E2 Other lintels (including other steel lintels)				0.0000	0.0500	0.0000							
E4 Jamb				0.0000	0.0500	0.0000							
E7 Party floor between dwellings (in blocks of flats)				51.6100	0.0000	0.0000							
E23 Balcony within or between dwellings, balcony support penetrates wall insulation				5.1500	0.0000	0.0000							
E16 Corner (normal)				5.8600	0.0900	0.5274							
E18 Party wall between dwellings				5.8600	0.0000	0.0000							
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							0.5274 (36)						
Point Thermal bridges							(36a) = 0.0000						
Total fabric heat loss							(33) + (36) + (36a) = 53.6701 (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	35.3933	34.9628	34.5323	32.3798	31.9493	29.7969	29.7969	29.3664	30.6578	31.9493	32.8103	33.6713	(38)
Average = Sum(39)m / 12 =	89.0634	88.6329	88.2024	86.0499	85.6194	83.4670	83.4670	83.0365	84.3280	85.6194	86.4804	87.3414	(39)
												85.9423	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.6376	0.6345	0.6315	0.6161	0.6130	0.5976	0.5976	0.5945	0.6037	0.6130	0.6191	0.6253	(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													2.9165 (42)
Hot water usage for mixer showers													
	73.1195	72.0207	70.4194	67.3558	65.0949	62.5735	61.1404	62.7295	64.4715	67.1786	70.3081	72.8394	(42a)
Hot water usage for baths													
	33.2284	32.7349	32.0400	30.7587	29.7992	28.7353	28.1607	28.8508	29.6021	30.7405	32.0482	33.1161	(42b)
Hot water usage for other uses													

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Average daily hot water use (litres/day)	46.8396	45.1363	43.4331	41.7298	40.0266	38.3233	38.3233	40.0266	41.7298	43.4331	45.1363	46.8396 (42c) 140.8032 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	153.1875	149.8919	145.8925	139.8442	134.9206	129.6321	127.6244	131.6068	135.8034	141.3522	147.4926	152.7950 (44)
Energy content (annual)	242.6116	213.4441	224.2313	191.4398	181.6291	159.3978	154.3506	162.9567	167.4592	191.8136	210.1303	239.2401 (45)
Distribution loss (46)m = 0.15 x (45)m	36.3917	32.0166	33.6347	28.7160	27.2444	23.9097	23.1526	24.4435	25.1189	28.7720	31.5195	35.8860 (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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month												
WWHRS	293.5705	259.4715	275.1902	240.7548	232.5880	208.7129	205.3095	213.9156	216.7742	242.7725	259.4454	290.1990 (62)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (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	293.5705	259.4715	275.1902	240.7548	232.5880	208.7129	205.3095	213.9156	216.7742	242.7725	259.4454	290.1990 (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)
Heat gains from water heating, kWh/month	93.4081	82.4770	87.2966	75.9825	73.1314	65.3286	64.0613	66.9228	68.0089	76.5177	82.1971	92.2871 (65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)												
Total per year (kWh/year) = Sum(64)m = 2938.7043 (64)												

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	174.9884	174.9884	174.9884	174.9884	174.9884	174.9884	174.9884	174.9884	174.9884	174.9884	174.9884	174.9884 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	38.2425	33.9666	27.6235	20.9128	15.6325	13.1977	14.2605	18.5364	24.8795	31.5902	36.8705	39.3054 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	461.2656	466.0520	453.9902	428.3121	395.8980	365.4334	345.0811	340.2946	352.3564	378.0346	410.4486	440.9133 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.4153	55.4153	55.4153	55.4153	55.4153	55.4153	55.4153	55.4153	55.4153	55.4153	55.4153	55.4153 (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)	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589 (71)
Water heating gains (Table 5)	125.5485	122.7337	117.3342	105.5312	98.2949	90.7341	86.1039	89.9500	94.4569	102.8464	114.1626	124.0417 (72)
Total internal gains	738.8013	736.4971	712.6927	668.5009	623.5702	583.1099	559.1903	562.5258	585.4375	626.2160	675.2265	718.0052 (73)

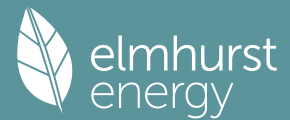
6. Solar gains

[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				
South			14.8500	46.7521	0.5000	1.0000	0.7700	240.5639 (78)				
West			23.7900	19.6403	0.5000	1.0000	0.7700	161.8993 (80)				
Solar gains	402.4632	710.6911	1023.4381	1327.9003	1523.3218	1523.1499	1464.3329	1320.1727	1130.8686	800.7486	487.0197	341.0075 (83)
Total gains	1141.2645	1447.1882	1736.1308	1996.4012	2146.8920	2106.2598	2023.5232	1882.6985	1716.3061	1426.9646	1162.2462	1059.0127 (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	43.5645	43.7761	43.9897	45.0901	45.3168	46.4854	46.4854	46.7264	46.0108	45.3168	44.8656	44.4234
alpha	3.9043	3.9184	3.9326	4.0060	4.0211	4.0990	4.0990	4.1151	4.0674	4.0211	3.9910	3.9616
util living area	0.8862	0.7910	0.6618	0.5024	0.3665	0.2529	0.1814	0.2027	0.3363	0.5851	0.8129	0.9046 (86)
MIT	20.1552	20.4984	20.7686	20.9316	20.9832	20.9974	20.9995	20.9992	20.9915	20.9005	20.5397	20.0912 (87)
Th 2	20.3963	20.3990	20.4018	20.4156	20.4183	20.4322	20.4322	20.4350	20.4267	20.4183	20.4128	20.4073 (88)
util rest of house	0.8757	0.7754	0.6418	0.4808	0.3444	0.2307	0.1580	0.1778	0.3090	0.5581	0.7958	0.8954 (89)
MIT 2	19.4072	19.8253	20.1463	20.3441	20.4022	20.4301	20.4319	20.4344	20.4193	20.3165	19.8932	19.3374 (90)
Living area fraction	19.7762	20.1574	20.4533	20.6339	20.6889	20.7099	20.7119	20.7131	20.7016	20.6046	20.2122	19.7093 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7762	20.1574	20.4533	20.6339	20.6889	20.7099	20.7119	20.7131	20.7016	20.6046	20.2122	19.7093 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8637	0.7688	0.6436	0.4889	0.3547	0.2416	0.1695	0.1901	0.3221	0.5669	0.7897	0.8833	(94)
Useful gains	985.6598	1112.6308	1117.3507	976.0773	761.5968	508.8239	343.0107	357.8289	552.8250	808.9335	917.7857	935.4334	(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	1378.3642	1352.3075	1230.7146	1009.7047	769.6222	509.9791	343.2086	358.1427	556.6970	856.5909	1133.9446	1354.6024	(97)
Space heating kWh	292.1721	161.0627	84.3428	24.2117	5.9709	0.0000	0.0000	0.0000	0.0000	35.4571	155.6343	311.8617	(98a)
Space heating requirement - total per year (kWh/year)												1070.7134	
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	292.1721	161.0627	84.3428	24.2117	5.9709	0.0000	0.0000	0.0000	0.0000	35.4571	155.6343	311.8617	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1070.7134	
Space heating per m2										(98c) / (4) =		7.6655	(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	784.5897	617.6557	631.0773	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9927	0.9965	0.9951	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	778.8618	615.4892	627.9665	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	2363.4150	2270.7482	2105.5848	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	1140.8783	1231.5127	1099.3480	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			0.8970	(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	255.8359	276.1602	246.5230	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												778.5191	(107)

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

Fraction of space heat from secondary/supplementary system (Table 11)

Fraction of space heat from main system(s)	0.0000	(201)
Efficiency of main space heating system 1 (in %)	1.0000	(202)
Efficiency of main space heating system 2 (in %)	88.9000	(206)
Efficiency of secondary/supplementary heating system, %	0.0000	(207)
Cooling System Energy Efficiency Ratio (see Table 10c)	0.0000	(208)
	4.6000	(209)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	292.1721	161.0627	84.3428	24.2117	5.9709	0.0000	0.0000	0.0000	0.0000	35.4571	155.6343	311.8617	(98)
Space heating efficiency (main heating system 1)	88.9000	88.9000	88.9000	88.9000	88.9000	0.0000	0.0000	0.0000	0.0000	88.9000	88.9000	88.9000	(210)
Space heating fuel (main heating system)	328.6525	181.1729	94.8737	27.2347	6.7165	0.0000	0.0000	0.0000	0.0000	39.8843	175.0668	350.8006	(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	293.5705	259.4715	275.1902	240.7548	232.5880	208.7129	205.3095	213.9156	216.7742	242.7725	259.4454	290.1990	(64)
Efficiency of water heater	84.3712	83.3896	82.1646	81.0161	80.4949	80.3000	80.3000	80.3000	80.3000	81.3023	83.3223	84.5360	(216)
Fuel for water heating, kWh/month	347.9510	311.1557	334.9255	297.1690	288.9475	259.9165	255.6781	266.3955	269.9555	298.6047	311.3758	343.2843	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	55.6165	60.0348	53.5919	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	44.1128	39.8438	44.1128	42.6898	44.1128	42.6898	44.1128	44.1128	42.6898	44.1128	42.6898	44.1128	(231)
Lighting	33.4734	26.8536	24.1787	17.7144	13.6831	11.1792	12.4822	16.2248	21.0744	27.6507	31.2315	34.4037	(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)

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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												1204.4021 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												80.3000
Water heating fuel used												3585.3591 (219)
Space cooling fuel												169.2433 (221)

Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.8680)												
mechanical ventilation fans (SFP = 0.8680)												433.3925 (230a)
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												519.3925 (231)
Electricity for lighting (calculated in Appendix L)												270.1496 (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												5748.5466 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1204.4021	3.6400	43.8402 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3585.3591	3.6400	130.5071 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Space cooling	169.2433	16.4900	27.9082 (248)
Pumps, fans and electric keep-hot	519.3925	16.4900	85.6478 (249)
Energy for lighting	270.1496	16.4900	44.5477 (250)
Additional standing charges			92.0000 (251)
Total energy cost			424.4510 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.8274 (257)
SAP value		86.5880
SAP rating (Section 12)		87 (258)
SAP band		B

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	1204.4021	0.2100	252.9244 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3585.3591	0.2100	752.9254 (264)
Space and water heating			1005.8499 (265)
Space cooling	169.2433	0.1143	19.3401 (266)
Pumps, fans and electric keep-hot	519.3925	0.1387	72.0461 (267)
Energy for lighting	270.1496	0.1443	38.9909 (268)
Total CO2, kg/year			1136.2271 (272)
CO2 emissions per m2			8.1300 (273)
EI value			91.7558
EI rating			92 (274)
EI band			A

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

Area Storey height Volume

Full SAP Calculation Printout



Ground floor
 Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 139.6800
 Dwelling volume (m2) 139.6800 (1b) x (m) 2.9300 (2b) = (m3) 409.2624 (1b) - (4)
 (3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 409.2624 (5)

2. Ventilation rate

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)
 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 2 (19)
 Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
 Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1275 (21)
 m3 per hour
 Wind speed Jan 4.2000 Feb 4.0000 Mar 4.0000 Apr 3.7000 May 3.7000 Jun 3.3000 Jul 3.4000 Aug 3.2000 Sep 3.3000 Oct 3.5000 Nov 3.5000 Dec 3.8000 (22)
 Wind factor 1.0500 1.0000 1.0000 0.9250 0.9250 0.8250 0.8500 0.8000 0.8250 0.8750 0.8750 0.9500 (22a)
 Adj infilt rate 0.1339 0.1275 0.1275 0.1179 0.1179 0.1052 0.1084 0.1020 0.1052 0.1116 0.1116 0.1211 (22b)
 Balanced mechanical ventilation with heat recovery
 If mechanical ventilation 0.5000 (23a)
 If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)
 If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 80.1000 (23c)
 Effective ac 0.2334 0.2270 0.2270 0.2174 0.2174 0.2047 0.2079 0.2015 0.2047 0.2111 0.2111 0.2206 (25)

3. Heat losses and heat loss parameter

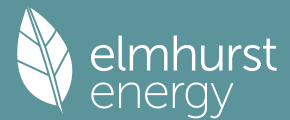
Element Gross m2 Openings m2 NetArea m2 U-value W/m2K A x U W/K K-value kJ/m2K A x K kJ/K
 Glazed (Uw = 0.64) 38.6400 0.6240 24.1123 (27)
 Curtain Wall 84.0000 0.6400 29.0304 (29a)
 Total net area of external elements Aum(A, m2) 84.0000 (31)
 Fabric heat loss, W/K = Sum (A x U) (26)...(30) + (32) = 53.1427 (33)
 Party Floor 1 139.6800 (32d)
 Party Ceiling 1 139.6800 (32b)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 100.0000 (35)
 List of Thermal Bridges
 K1 Element Length Psi-value Total
 E2 Other lintels (including other steel lintels) 0.0000 0.0500 0.0000
 E4 Jamb 0.0000 0.0500 0.0000
 E7 Party floor between dwellings (in blocks of flats) 51.6100 0.0000 0.0000
 E23 Balcony within or between dwellings, balcony support penetrates wall insulation 5.1500 0.0000 0.0000
 E16 Corner (normal) 5.8600 0.0900 0.5274
 E18 Party wall between dwellings 5.8600 0.0000 0.0000
 Thermal bridges (Sum(L x Psi) calculated using Appendix K) 0.5274 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 53.6701 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)
 (38)m Jan 31.5188 Feb 30.6578 Mar 30.6578 Apr 29.3664 May 29.3664 Jun 27.6444 Jul 28.0749 Aug 27.2139 Sep 27.6444 Oct 28.5054 Nov 28.5054 Dec 29.7969 (38)
 Heat transfer coeff 85.1890 84.3280 84.3280 83.0365 83.0365 81.3145 81.7450 80.8840 81.3145 82.1755 82.1755 83.4670 (39)
 Average = Sum(39)m / 12 = 82.7495
 HLP Jan 0.6099 Feb 0.6037 Mar 0.6037 Apr 0.5945 May 0.5945 Jun 0.5821 Jul 0.5852 Aug 0.5791 Sep 0.5821 Oct 0.5883 Nov 0.5883 Dec 0.5976 (40)
 HLP (average) 0.5924
 Days in mont 31 28 31 30 31 30 31 31 30 31 30 31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9165 (42)
 Hot water usage for mixer showers

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Hot water usage for baths	73.1195	72.0207	70.4194	67.3558	65.0949	62.5735	61.1404	62.7295	64.4715	67.1786	70.3081	72.8394 (42a)
Hot water usage for other uses	33.2284	32.7349	32.0400	30.7587	29.7992	28.7353	28.1607	28.8508	29.6021	30.7405	32.0482	33.1161 (42b)
Average daily hot water use (litres/day)	46.8396	45.1363	43.4331	41.7298	40.0266	38.3233	38.3233	40.0266	41.7298	43.4331	45.1363	46.8396 (42c)
												140.8032 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	153.1875	149.8919	145.8925	139.8442	134.9206	129.6321	127.6244	131.6068	135.8034	141.3522	147.4926	152.7950 (44)
Distribution loss (46)m = 0.15 x (45)m	242.6116	213.4441	224.2313	191.4398	181.6291	159.3978	154.3506	162.9567	167.4592	191.8136	210.1303	239.2401 (45)
Total storage loss	36.3917	32.0166	33.6347	28.7160	27.2444	23.9097	23.1526	24.4435	25.1189	28.7720	31.5195	35.8860 (46)
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 (56)
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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (59)
Total heat required for water heating calculated for each month	293.5705	259.4715	275.1902	240.7548	232.5880	208.7129	205.3095	213.9156	216.7742	242.7725	259.4454	290.1990 (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	293.5705	259.4715	275.1902	240.7548	232.5880	208.7129	205.3095	213.9156	216.7742	242.7725	259.4454	290.1990 (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	93.4081	82.4770	87.2966	75.9825	73.1314	65.3286	64.0613	66.9228	68.0089	76.5177	82.1971	92.2871 (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	174.9884	174.9884	174.9884	174.9884	174.9884	174.9884	174.9884	174.9884	174.9884	174.9884	174.9884	174.9884 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	38.2425	33.9666	27.6235	20.9128	15.6325	13.1977	14.2605	18.5364	24.8795	31.5902	36.8705	39.3054 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	461.2656	466.0520	453.9902	428.3121	395.8980	365.4334	345.0811	340.2946	352.3564	378.0346	410.4486	440.9133 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.4153	55.4153	55.4153	55.4153	55.4153	55.4153	55.4153	55.4153	55.4153	55.4153	55.4153	55.4153 (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)	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589	-116.6589 (71)
Water heating gains (Table 5)	125.5485	122.7337	117.3342	105.5312	98.2949	90.7341	86.1039	89.9500	94.4569	102.8464	114.1626	124.0417 (72)
Total internal gains	738.8013	736.4971	712.6927	668.5009	623.5702	583.1099	559.1903	562.5258	585.4375	626.2160	675.2265	718.0052 (73)

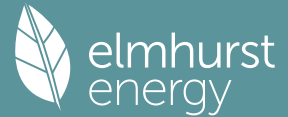
6. Solar gains

[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				
South			14.8500	50.9848	0.5000	1.0000	0.7700	262.3437 (78)				
West			23.7900	22.3313	0.5000	1.0000	0.7700	184.0823 (80)				
Solar gains	446.4260	709.5055	1010.3811	1354.4531	1518.0261	1626.7139	1545.9971	1421.8151	1211.1920	853.7705	553.4522	374.6077 (83)
Total gains	1185.2273	1446.0026	1723.0738	2022.9540	2141.5964	2209.8238	2105.1875	1984.3409	1796.6295	1479.9865	1228.6787	1092.6129 (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	45.5458	46.0108	46.0108	46.7264	46.7264	47.7160	47.4647	47.9699	47.7160	47.2160	47.2160	46.4854
alpha	4.0364	4.0674	4.0674	4.1151	4.1151	4.1811	4.1643	4.1980	4.1811	4.1477	4.1477	4.0990
util living area	0.8510	0.7573	0.6169	0.4457	0.3084	0.1839	0.1204	0.1304	0.2618	0.5045	0.7457	0.8734 (86)
MIT	20.3789	20.6335	20.8489	20.9636	20.9933	20.9995	20.9999	20.9999	20.9976	20.9532	20.7243	20.3268 (87)
Th 2	20.4211	20.4267	20.4267	20.4350	20.4350	20.4461	20.4433	20.4489	20.4461	20.4405	20.4405	20.4322 (88)
util rest of house	0.8381	0.7404	0.5963	0.4245	0.2870	0.1635	0.0988	0.1080	0.2370	0.4775	0.7255	0.8618 (89)
MIT 2	19.7024	20.0116	20.2624	20.3979	20.4289	20.4457	20.4433	20.4488	20.4442	20.3944	20.1361	19.6488 (90)
Living area fraction									fLA = Living area / (4) =			0.4933 (91)
MIT	20.0361	20.3184	20.5518	20.6770	20.7073	20.7189	20.7179	20.7207	20.7173	20.6701	20.4263	19.9833 (92)

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Temperature adjustment												0.0000
adjusted MIT	20.0361	20.3184	20.5518	20.6770	20.7073	20.7189	20.7179	20.7207	20.7173	20.6701	20.4263	19.9833 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8288	0.7371	0.6008	0.4336	0.2974	0.1735	0.1094	0.1190	0.2491	0.4886	0.7250	0.8518 (94)
Useful gains	982.3355	1065.8753	1035.3040	877.2148	636.8676	383.5070	230.3292	236.2114	447.6140	723.1848	890.7752	930.6940 (95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate W	1272.3932	1241.1712	1109.0618	894.8841	639.9883	383.7170	230.3497	236.2388	448.6328	745.3388	1021.1367	1242.2629 (97)
Space heating kWh	215.8029	117.7988	54.8758	12.7219	2.3218	0.0000	0.0000	0.0000	0.0000	16.4825	93.8603	231.8072 (98a)
Space heating requirement - total per year (kWh/year)												745.6713
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	215.8029	117.7988	54.8758	12.7219	2.3218	0.0000	0.0000	0.0000	0.0000	16.4825	93.8603	231.8072 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												745.6713
Space heating per m2										(98c) / (4) =		5.3384 (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.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	650.5162	498.6446	501.4810	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9973	0.9988	0.9985	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	648.7438	498.0434	500.7335	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	2484.4638	2366.2000	2224.3876	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	1321.7184	1389.9085	1282.3986	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fc = cooled area / (4) =			0.8970 (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	296.3884	311.6796	287.5711	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												895.6391 (107)

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 %)												88.9000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Cooling System Energy Efficiency Ratio (see Table 10c)												4.6000 (209)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	215.8029	117.7988	54.8758	12.7219	2.3218	0.0000	0.0000	0.0000	0.0000	16.4825	93.8603	231.8072 (98)
Space heating efficiency (main heating system 1)	88.9000	88.9000	88.9000	88.9000	88.9000	0.0000	0.0000	0.0000	0.0000	88.9000	88.9000	88.9000 (210)
Space heating fuel (main heating system)	242.7479	132.5071	61.7275	14.3104	2.6117	0.0000	0.0000	0.0000	0.0000	18.5405	105.5796	260.7506 (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	293.5705	259.4715	275.1902	240.7548	232.5880	208.7129	205.3095	213.9156	216.7742	242.7725	259.4454	290.1990 (64)
Efficiency of water heater												80.3000 (216)
(217)m	83.7317	82.8010	81.6126	80.6918	80.3769	80.3000	80.3000	80.3000	80.3000	80.7969	82.4181	83.9044 (217)
Fuel for water heating, kWh/month	350.6086	313.3674	337.1909	298.3635	289.3719	259.9165	255.6781	266.3955	269.9555	300.4725	314.7917	345.8686 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	64.4323	67.7564	62.5155	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	44.1128	39.8438	44.1128	42.6898	44.1128	42.6898	44.1128	44.1128	42.6898	44.1128	42.6898	44.1128 (231)
Lighting	33.4734	26.8536	24.1787	17.7144	13.6831	11.1792	12.4822	16.2248	21.0744	27.6507	31.2315	34.4037 (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)

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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											838.7754	(211)
Space heating fuel - main system 2											0.0000	(213)
Space heating fuel - secondary											0.0000	(215)
Efficiency of water heater											80.3000	
Water heating fuel used											3601.9807	(219)
Space cooling fuel											194.7041	(221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.8680)												
mechanical ventilation fans (SFP = 0.8680)											433.3925	(230a)
central heating pump											41.0000	(230c)
main heating flue fan											45.0000	(230e)
Total electricity for the above, kWh/year											519.3925	(231)
Electricity for lighting (calculated in Appendix L)											270.1496	(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											5425.0024	(238)

10a. Fuel costs - using BEDF prices (522)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	838.7754	4.8000	40.2612 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3601.9807	4.8000	172.8951 (247)
Energy for instantaneous electric shower(s)	0.0000	21.5100	0.0000 (247a)
Space cooling	194.7041	21.5100	41.8809 (248)
Pumps, fans and electric keep-hot	519.3925	21.5100	111.7213 (249)
Energy for lighting	270.1496	21.5100	58.1092 (250)
Additional standing charges			98.0000 (251)
Total energy cost			522.8677 (255)

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	838.7754	0.2100	176.1428 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3601.9807	0.2100	756.4159 (264)
Space and water heating			932.5588 (265)
Space cooling	194.7041	0.1143	22.2546 (266)
Pumps, fans and electric keep-hot	519.3925	0.1387	72.0461 (267)
Energy for lighting	270.1496	0.1443	38.9909 (268)
Total CO2, kg/year			1065.8504 (272)

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	838.7754	1.1300	947.8162 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3601.9807	1.1300	4070.2381 (278)
Space and water heating			5018.0544 (279)
Space cooling	194.7041	1.4212	276.7178 (280)
Pumps, fans and electric keep-hot	519.3925	1.5128	785.7370 (281)
Energy for lighting	270.1496	1.5338	414.3645 (282)
Total Primary energy kWh/year			6494.8737 (286)

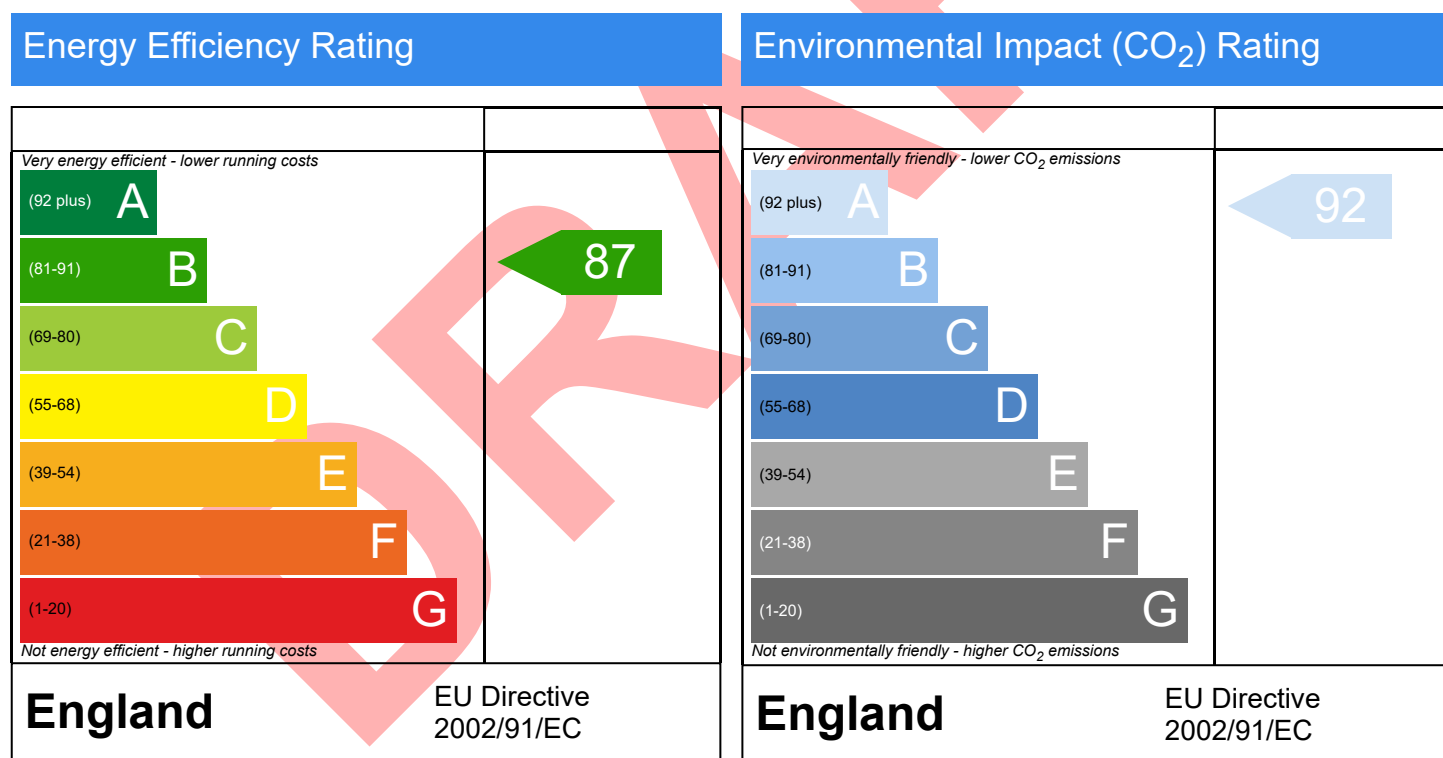
Predicted Energy Assessment



Dwelling type: Flat, End-Terrace
Date of assessment: 24/07/2023
Produced by: Laura Plazas
Total floor area: 139.68 m²
DRRN:

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO₂) emissions. The higher the rating the less impact it has on the environment.

Summary for Input Data

Property Reference	THFC-L20-03	Issued on Date	24/07/2023
Assessment Reference	V1 THFC-L20-03 LEANboilr-PlanB	Prop Type Ref	
Property			

SAP Rating	87 B	DER	8.30	TER	10.29
Environmental	92 A	% DER < TER			19.34
CO ₂ Emissions (t/year)	1.07	DFEE	26.53	TFEE	29.92
Compliance Check	See BREL	% DFEE < TFEE			11.31
% DPER < TPER	11.34	DPER	49.96	TPER	56.35

Assessor Details	Miss Laura Plazas	Assessor ID	T491-0001
Client			

SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

Orientation	West	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, End-Terrace	
Position of Flat	Mid-floor flat	
Which Floor	20	
2.0 Number of Storeys	1	
3.0 Date Built	2024	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Enter TMP value	
Thermal Mass	100.00	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements	Ground floor:	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
		63.95 m	139.68 m ²	2.93 m

8.0 Living Area	68.91	m ²
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9.0 External Walls	Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area(m ²)	Nett Area (m ²)	Shelter Res	Shelter	Openings	Area Calculation Type
	Curtain Wall	Curtain Walling	Other	0.64		84.00	45.36	0.00	None	38.64	Enter Gross Area

10.1 Party Ceilings	Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
	Party Ceiling 1	Concrete floor slab, carpeted	100.00	139.68

11.1 Party Floors	Description	Storey Index	Construction	Kappa (kJ/m ² K)	Area (m ²)
	Party Floor 1	Lowest occupied	Concrete floor slab, carpeted	100.00	139.68

12.0 Opening Types	Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m ² K)
	Glazed	Manufacturer	Window	Triple Low-E Soft 0.05			0.50		1.00	0.64

13.0 Openings	Name	Opening Type	Location	Orientation	Area (m ²)	Pitch
	Glazed W	Glazed	Curtain Wall	West	1.93	
	Glazed W	Glazed	Curtain Wall	West	3.60	
	Glazed S	Glazed	Curtain Wall	South	9.49	
	Glazed S	Glazed	Curtain Wall	South	5.36	
	Glazed W	Glazed	Curtain Wall	West	3.60	

Summary for Input Data

Glazed W	Glazed	Curtain Wall	West	3.60
Glazed W	Glazed	Curtain Wall	West	3.60
Glazed W	Glazed	Curtain Wall	West	3.60
Glazed W	Glazed	Curtain Wall	West	1.93
Glazed W	Glazed	Curtain Wall	West	1.93

14.0 Conservatory

15.0 Draught Proofing

 %

16.0 Draught Lobby

17.0 Thermal Bridging

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E2 Other lintels (including other steel lintels)	Independently assessed	0.00	0.05	0.05	No
E4 Jamb	Independently assessed	0.00	0.05	0.05	No
E7 Party floor between dwellings (in blocks of flats)	Independently assessed	51.61	0.00	0.00	No
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	Independently assessed	5.15	0.00	0.00	No
E16 Corner (normal)	Independently assessed	5.86	0.09	0.09	No
E18 Party wall between dwellings	Independently assessed	5.86	0.00	0.00	No

Y-value W/m²K

18.0 Pressure Testing

Designed AP₅₀ m²/(h.m²) @ 50 Pa

Test Method

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present

Approved Installation

Mechanical Ventilation data Type

Type

MV Reference Number

Configuration

Manufacturer SFP

Duct Type

MVHR Efficiency

Wet Rooms

SFP from Installer Commissioning Certificate

MVHR System Location

Duct Installation Specification

20.0 Fans, Open Fireplaces, Flues

21.0 Fixed Cooling System

Cooled Area m²

Data Source

Energy Class

22.0 Lighting

No Fixed Lighting

Name	Efficacy	Power	Capacity	Count
low energy lighting	75.00	20	1500	10

24.0 Main Heating 1

Description

Percentage of Heat %

Fuel Type

SAP Code

In Winter

In Summer

Summary for Input Data

Model Name	Gas boilers (LEAN)
Manufacturer	Gas boilers (LEAN)
System Type	Gas boilers (LEAN)
Controls SAP Code	2110
Delayed Start Stat	No
Burner Control	Modulating
Flue Type	None or Unknown
Fan Assisted Flue	Yes
Is MHS Pumped	Pump in unheated space
Heating Pump Age	2013 or later
Heat Emitter	Radiators
Flow Temperature	Enter value
Flow Temperature Value	55.00
Boiler Interlock	Yes
Combi boiler type	Standard Combi
Combi keep hot type	None

25.0 Main Heating 2

26.0 Heat Networks

Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1									
Heat source 2									
Heat source 3									
Heat source 4									
Heat source 5									

28.0 Water Heating	
Water Heating	Main Heating 1
SAP Code	901
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	No
Cold Water Source	From mains
Bath Count	3

28.1 Showers					
Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	None
In Airing Cupboard	No

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

Typical Cost	Typical savings per year	SAP rating	Ratings after improvement	Environmental Impact
		0		0
		0		0
		0		0

Thermal Bridging

Property Reference	THFC-L20-03	Issued on Date	24/07/2023
Assessment Reference	V1 THFC-L20-03 LEANboilr-PlanB	Prop Type Ref	End-Terrace Flat
Property			

SAP Rating	87 B	DER	8.30	TER	10.29
Environmental	92 A	% DER < TER			19.34
CO ₂ Emissions (t/year)	1.07	DFEE	26.53	TFEE	29.92
Compliance Check	See BREL	% DFEE < TFEE			11.31
% DPER < TPER	11.34	DPER	49.96	TPER	56.35

Assessor Details	Miss Laura Plazas	Assessor ID	T491-0001
Client			

	Junction details	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.050	0.00	0.00	
External wall	E4 Jamb	Independently assessed	0.050	0.00	0.00	
External wall	E7 Party floor between dwellings (in blocks of flats)	Independently assessed	0.000	51.61	0.00	
External wall	E23 Balcony within or between dwellings, balcony support penetrates wall insulation	Independently assessed	0.000	5.15	0.00	
External wall	E16 Corner (normal)	Independently assessed	0.090	5.86	0.53	
External wall	E18 Party wall between dwellings	Independently assessed	0.000	5.86	0.00	

Total: 68.48 W/mK:
Y-Value: 0.01 W/m²K:

Overview Report

Dwelling Address	
Report Date	24/07/2023
Property Type	Flat, End-Terrace
Floor Area [m ²]	140

This document is not an Energy Performance Certificate (EPC) as required by the Energy Performance of Buildings Regulations

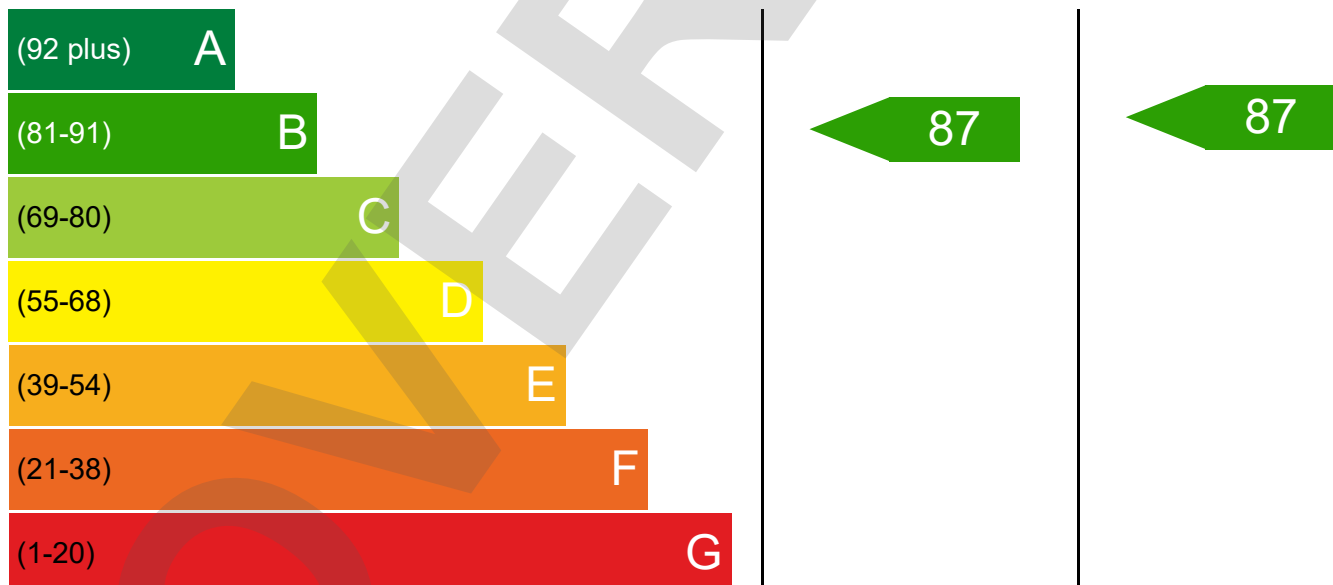
Energy Rating

The current energy rating represents the overall energy efficiency of the dwelling. The potential energy rating is the overall energy rating of the dwelling after all of the recommend measures provided on the next page have been installed. A higher score represents a more energy efficient dwelling with lower fuel bills.

Most energy efficient - lower running costs

CURRENT

POTENTIAL



Least energy efficient - higher running costs

Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor

Poor

Average

Good

Very Good

Feature	Description	Energy Performance
Walls	Average thermal transmittance 0.64 W/m ² K	Good
Windows	High performance glazing	Very Good
Main heating	Boiler and radiators, mains gas	Very Good
Main heating controls	Time and temperature zone control	Very Good
Secondary heating	None	
Hot water	From main system	Good
Lighting	Good lighting efficiency	Good
Air tightness	Air permeability [AP50] = 3.0 m ³ /h.m ² (assumed)	Good

Primary Energy use

The primary energy use for this property per year is 46 kilowatt hour (kWh) per square metre

Estimated CO₂ emissions of the dwelling

The estimated CO rating provides an indication of the dwelling's impact on the environment in terms of carbon dioxide emissions; the higher the rating the less impact it has on the environment.

The estimated CO emissions for this dwellings is: **1.1** per year

With the recommended measures the potential CO emissions could be: **1** per year

Recommendations

Overview Report

The recommended measures provided below will help to improve the energy efficiency of the dwelling. To reach the dwelling's potential energy rating all of the recommended measures shown below would need to be installed. Having these measures installed individually or in any other order may give a different result when compared with the cumulative potential rating.

Recommended measure	Typical Yearly Saving	Potential Rating after measure installed	Cumulative savings (per year)	Cumulative Potential Rating
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Estimated energy use and potential savings

Estimated energy cost for this property over a year

£523

Over a year you could save

£0

The estimated cost and savings show how much the average household would spend in this property for heating, lighting and hot water. It is not based on how energy is used by the people living at the property.

Contacting the assessor and the accreditation scheme

Assessor contact details	
Assessor name	Miss Laura Plazas
Assessor's accreditation number	
Email Address	

Accreditation scheme contact details	
Accreditation scheme	
Telephone	
Email Address	

Assessment details	
Related party disclosure	
Date of assessment	20/07/2023
Date of certificate	20/07/2023
Type of assessment	SAP, new dwelling