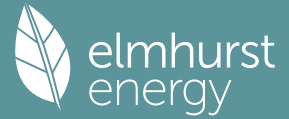


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Property Reference	P23972(3)		Issued on Date	16/10/2023	
Assessment Reference	P23972(3)	Prop Type Ref			
Property	Flat 3, The Western, 205 High Street, Rickmansworth, WD3 1BB				
SAP Rating	94 A	DER	1.69	TER	15.92
Environmental	99 A	% DER < TER			89.38
CO ₂ Emissions (t/year)	0.06	DFEE	35.75	TFEE	39.93
Compliance Check	See BREL	% DFEE < TFEE			10.45
% DPER < TPER	74.21	DPER	21.81	TPER	84.56
Assessor Details	Mr. Malcolm Lisle			Assessor ID	P736-0001
Client	SC, Sasha Archibald				

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	49.8400 (1b)	2.4000 (2b)	119.6160 (1b) - (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.8400		
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 119.6160 (5)

2. Ventilation rate

	m ³ per hour											
Number of open chimneys	0 * 80 =	0.0000 (6a)										
Number of open flues	0 * 20 =	0.0000 (6b)										
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)										
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)										
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)										
Number of blocked chimneys	0 * 20 =	0.0000 (6f)										
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)										
Number of passive vents	0 * 10 =	0.0000 (7b)										
Number of flueless gas fires	0 * 40 =	0.0000 (7c)										
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)										
Pressure test		Yes										
Pressure Test Method		Blower Door										
Measured/design AP50		1.0000 (17)										
Infiltration rate		0.0500 (18)										
Number of sides sheltered		1 (19)										
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)										
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.0463 (21)										
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.0590	0.0578	0.0567	0.0509	0.0497	0.0439	0.0439	0.0428	0.0463	0.0497	0.0520	0.0543 (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) =												81.9000 (23c)
Effective ac	0.1495	0.1483	0.1472	0.1414	0.1402	0.1344	0.1344	0.1333	0.1367	0.1402	0.1425	0.1448 (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
Windows/Doors (U _w = 1.00)			11.7400	0.9615	11.2885		(27)
Non-Vision Panels			6.6000	1.0000	6.6000		(26)
Cavity Wall	64.4400	18.3400	46.1000	0.1300	5.9930	60.0000	2766.0000 (29a)

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Flat Roof	49.8400	49.8400	0.1200	5.9808	9.0000	448.5600 (30)
Total net area of external elements Aum(A, m2)		114.2800				(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =	29.8623			(33)
Party Walls		10.6800	0.0000	0.0000	180.0000	1922.4000 (32)
Party Floor 1		49.8400			30.0000	1495.2000 (32d)
Internal Walls		75.8400			9.0000	682.5600 (32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 7314.7200 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 146.7640 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	9.8000	0.0580	0.5684
E3 Sill	5.4000	0.0450	0.2430
E4 Jamb	27.8000	0.0500	1.3900
E7 Party floor between dwellings (in blocks of flats)	26.8500	0.0000	0.0000
E16 Corner (normal)	4.8000	0.0440	0.2112
E18 Party wall between dwellings	4.8000	0.0620	0.2976
E14 Flat roof	26.8500	0.1600	4.2960

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.0062 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 36.8685 (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	5.9000	5.8544	5.8087	5.5805	5.5349	5.3067	5.3067	5.2610	5.3980	5.5349	5.6262	5.7175 (38)
Heat transfer coeff	42.7685	42.7228	42.6772	42.4490	42.4034	42.1752	42.1752	42.1295	42.2664	42.4034	42.4946	42.5859 (39)
Average = Sum(39)m / 12 =												42.4376

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.8581	0.8572	0.8563	0.8517	0.8508	0.8462	0.8462	0.8453	0.8480	0.8508	0.8526	0.8545 (40)
HLP (average)												0.8515
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.6854 (42)

Hot water usage for mixer showers 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (42a)

Hot water usage for baths 63.6313 62.6863 61.3555 58.9018 57.0645 55.0272 53.9268 55.2482 56.6871 58.8670 61.3713 63.4162 (42b)

Hot water usage for other uses 33.5685 32.3478 31.1272 29.9065 28.6858 27.4652 27.4652 28.6858 29.9065 31.1272 32.3478 33.5685 (42c)

Average daily hot water use (litres/day) 89.5131 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	97.1998	95.0341	92.4827	88.8083	85.7503	82.4924	81.3919	83.9341	86.5936	89.9942	93.7191	96.9847 (44)
Energy conte	153.9408	135.3274	142.1425	121.5741	115.4364	101.4340	98.4365	103.9279	106.7785	122.1213	133.5201	151.8546 (45)
Energy content (annual)												Total = Sum(45)m = 1486.4939

Distribution loss (46)m = 0.15 x (45)m 23.0911 20.2991 21.3214 18.2361 17.3155 15.2151 14.7655 15.5892 16.0168 18.3182 20.0280 22.7782 (46)

Water storage loss: Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day):
 Temperature factor from Table 2b 1.8600 (48)
 Enter (49) or (54) in (55) 0.7800 (49)
 Total storage loss 1.4508 (55)

44.9748 40.6224 44.9748 43.5240 44.9748 43.5240 44.9748 44.9748 43.5240 44.9748 43.5240 44.9748 44.9748 (56)

If cylinder contains dedicated solar storage 44.9748 40.6224 44.9748 43.5240 44.9748 43.5240 44.9748 44.9748 43.5240 44.9748 43.5240 44.9748 44.9748 (57)

Primary loss 54.8576 49.5488 54.8576 53.0880 54.8576 22.5120 23.2624 23.2624 22.5120 54.8576 53.0880 54.8576 (59)

Combi loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (61)

Total heat required for water heating calculated for each month 253.7732 225.4986 241.9749 218.1861 215.2688 167.4700 166.6737 172.1651 172.8145 221.9537 230.1321 251.6870 (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 253.7732 225.4986 241.9749 218.1861 215.2688 167.4700 166.6737 172.1651 172.8145 221.9537 230.1321 251.6870 (64)

Total per year (kWh/year) = Sum(64)m = 2537.5975 (64)

12Total per year (kWh/year) 2538 (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 95.0714 84.6354 91.1484 82.8938 82.2687 51.7364 51.3400 53.1659 53.5135 84.4914 86.8658 94.3777 (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	84.2696	84.2696	84.2696	84.2696	84.2696	84.2696	84.2696	84.2696	84.2696	84.2696	84.2696	84.2696 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	74.3633	82.3308	74.3633	76.8421	74.3633	76.8421	74.3633	74.3633	76.8421	74.3633	76.8421	74.3633 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	146.8184	148.3419	144.5027	136.3295	126.0123	116.3155	109.8375	108.3140	112.1532	120.3264	130.6436	140.3404 (68)

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Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4270	31.4270	31.4270	31.4270	31.4270	31.4270	31.4270	31.4270	31.4270	31.4270	31.4270	31.4270	31.4270	31.4270	31.4270	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-67.4156	-67.4156	-67.4156	-67.4156	-67.4156	-67.4156	-67.4156	-67.4156	-67.4156	-67.4156	-67.4156	-67.4156	-67.4156	-67.4156	-67.4156	(71)
Water heating gains (Table 5)	127.7841	125.9455	122.5114	115.1303	110.5762	71.8561	69.0054	71.4596	74.3242	113.5637	120.6470	126.8518	126.8518	126.8518	126.8518	(72)
Total internal gains	397.2467	404.8991	389.6582	376.5827	359.2326	313.2946	301.4871	302.4178	311.6004	356.5343	376.4136	389.8364	389.8364	389.8364	389.8364	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d	Gains W					
North	2.1000	10.6334	0.5700	0.5700	0.7000	0.7700	6.1744	(74)					
South	5.2300	46.7521	0.5700	0.5700	0.7000	0.7700	67.6096	(78)					
West	4.4100	19.6403	0.5700	0.5700	0.7000	0.7700	23.9493	(80)					
Solar gains	97.7333	169.3767	238.2523	304.1457	347.4083	347.4814	333.9612	301.5409	261.1817	189.0669	117.6193	83.2630	(83)
Total gains	494.9800	574.2757	627.9105	680.7284	706.6409	660.7760	635.4483	603.9586	572.7820	545.6012	494.0329	473.0993	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains for living area, nil,m (see Table 9a)													21.0000 (85)
tau	47.5085	47.5593	47.6101	47.8661	47.9176	48.1769	48.1769	48.2291	48.0728	47.9176	47.8147	47.7122	
alpha	4.1672	4.1706	4.1740	4.1911	4.1945	4.2118	4.2118	4.2153	4.2049	4.1945	4.1876	4.1808	
util living area	0.9216	0.8718	0.8008	0.6805	0.5356	0.4029	0.2909	0.3191	0.4941	0.7134	0.8719	0.9319	(86)
Living	20.2549	20.4390	20.6242	20.7950	20.8850	20.9169	20.9247	20.9238	20.9040	20.7915	20.5096	20.2114	
Non living	19.3420	19.5657	19.7862	19.9834	20.0787	20.1125	20.1184	20.1187	20.1006	19.9851	19.6591	19.2913	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.6188	20.4390	20.6242	20.7950	20.8850	20.9169	20.9247	20.9238	20.9040	20.7915	20.5096	20.3217	(87)
Th 2	20.2032	20.2040	20.2048	20.2087	20.2095	20.2135	20.2135	20.2142	20.2119	20.2095	20.2080	20.2064	(88)
util rest of house	0.9102	0.8551	0.7771	0.6477	0.4953	0.3552	0.2394	0.2653	0.4422	0.6756	0.8524	0.9217	(89)
MIT 2	19.8599	19.5657	19.7862	19.9834	20.0787	20.1125	20.1184	20.1187	20.1006	19.9851	19.6591	19.4562	(90)
Living area fraction									fLA = Living area / (4) =			0.4687	(91)
MIT	20.2156	19.9750	20.1790	20.3638	20.4566	20.4896	20.4963	20.4961	20.4772	20.3631	20.0577	19.8619	(92)
Temperature adjustment												0.0000	(93)
adjusted MIT	20.2156	19.9750	20.1790	20.3638	20.4566	20.4896	20.4963	20.4961	20.4772	20.3631	20.0577	19.8619	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9104	0.8499	0.7763	0.6543	0.5081	0.3721	0.2580	0.2847	0.4599	0.6833	0.8483	0.9168	(94)
Useful gains	450.6293	488.0514	487.4199	445.4276	359.0230	245.8618	163.9177	171.9369	263.4230	372.7965	419.1038	433.7412	(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	680.6862	644.0482	583.7803	486.6253	371.3096	248.3934	164.3272	172.5652	269.5405	413.9862	550.6338	666.9760	(97)
Space heating kWh	171.1623	104.8298	71.6922	29.6624	9.1412	0.0000	0.0000	0.0000	0.0000	30.6452	94.7016	173.5267	(98a)
Space heating requirement - total per year (kWh/year)												685.3615	
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	171.1623	104.8298	71.6922	29.6624	9.1412	0.0000	0.0000	0.0000	0.0000	30.6452	94.7016	173.5267	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												685.3615	
Space heating per m2										(98c) / (4) =		13.7512	(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 %)													292.9809	(206)
Efficiency of main space heating system 2 (in %)													0.0000	(207)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement	171.1623	104.8298	71.6922	29.6624	9.1412	0.0000	0.0000	0.0000	0.0000	30.6452	94.7016	173.5267	(98)	
Space heating efficiency (main heating system 1)	292.9809	292.9809	292.9809	292.9809	292.9809	0.0000	0.0000	0.0000	0.0000	292.9809	292.9809	292.9809	(210)	

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Space heating fuel (main heating system)	58.4210	35.7804	24.4699	10.1243	3.1201	0.0000	0.0000	0.0000	0.0000	10.4598	32.3235	59.2280 (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 requirement	253.7732	225.4986	241.9749	218.1861	215.2688	167.4700	166.6737	172.1651	172.8145	221.9537	230.1321	251.6870 (64)
Efficiency of water heater	175.7495	175.7495	175.7495	175.7495	175.7495	175.7495	175.7495	175.7495	175.7495	175.7495	175.7495	175.7495 (216)
Fuel for water heating, kWh/month	144.3948	128.3068	137.6817	124.1461	122.4862	95.2890	94.8359	97.9605	98.3300	126.2898	130.9432	143.2078 (219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.2878	6.5825	7.2878	7.0527	7.2878	7.0527	7.2878	7.2878	7.0527	7.2878	7.0527	7.2878 (231)
Lighting	14.7679	11.8474	10.6672	7.8153	6.0367	4.9321	5.5069	7.1581	9.2977	12.1990	13.7788	15.1784 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-28.6035	-51.4649	-94.7249	-129.6119	-156.4774	-148.0404	-145.3800	-129.1967	-100.4951	-66.9502	-34.5650	-23.2515 (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)	-1.1089	-4.2735	-14.9823	-36.2761	-62.9371	-73.1436	-70.6062	-50.2204	-26.6857	-8.4735	-1.9304	-0.7469 (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												233.9270 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												175.7495 (216)
Water heating fuel used												1443.8718 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.5880)												
mechanical ventilation fans (SFP = 0.5880)												85.8077 (230a)
Total electricity for the above, kWh/year												85.8077 (231)
Electricity for lighting (calculated in Appendix L)												119.1855 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-1460.1462 (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												422.6459 (238)

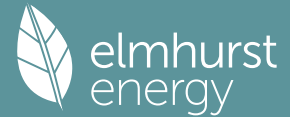
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	233.9270	0.1574	36.8086 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1443.8718	0.1415	204.2718 (264)
Space and water heating			241.0804 (265)
Pumps, fans and electric keep-hot	85.8077	0.1387	11.9026 (267)
Energy for lighting	119.1855	0.1443	17.2022 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1108.7617	0.1311	-145.3262
PV Unit electricity exported	-351.3845	0.1162	-40.8180
Total			-186.1442 (269)
Total CO2, kg/year			84.0410 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.6900 (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	233.9270	1.5825	370.1804 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1443.8718	1.5232	2199.2618 (278)
Space and water heating			2569.4422 (279)
Pumps, fans and electric keep-hot	85.8077	1.5128	129.8099 (281)
Energy for lighting	119.1855	1.5338	182.8108 (282)

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Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1108.7617	1.4842	-1645.6486
PV Unit electricity exported	-351.3845	0.4258	-149.6080
Total			-1795.2566 (283)
Total Primary energy kWh/year			1086.8063 (286)
Dwelling Primary energy Rate (DPER)			21.8100 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	49.8400 (1b)	x 2.4000 (2b)	= 119.6160 (1b) - (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.8400		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 119.6160 (5)
Dwelling volume			

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	2 * 10 =	20.0000 (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) =		20.0000 / (5) = 0.1672 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4172 (18)
Number of sides sheltered		1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3859 (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	0.4920	0.4824	0.4727	0.4245	0.4149	0.3666	0.3666	0.3570	0.3859	0.4149	0.4342	0.4534 (22b)
Effective ac	0.6211	0.6163	0.6117	0.5901	0.5861	0.5672	0.5672	0.5637	0.5745	0.5861	0.5942	0.6028 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opaque door			6.6000	1.0000	6.6000		(26)
TER Opening Type (Uw = 1.20)			5.8600	1.1450	6.7099		(27)
Cavity Wall	64.4400	12.4600	51.9800	0.1800	9.3564		(29a)
Flat Roof	49.8400		49.8400	0.1100	5.4824		(30)
Total net area of external elements Aum(A, m2)			114.2800				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 28.1487		(33)
Party Walls			10.6800	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 146.7640 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	9.8000	0.0500	0.4900
E3 Sill	5.4000	0.0500	0.2700
E4 Jamb	27.8000	0.0500	1.3900
E7 Party floor between dwellings (in blocks of flats)	26.8500	0.0700	1.8795
E16 Corner (normal)	4.8000	0.0900	0.4320
E18 Party wall between dwellings	4.8000	0.0600	0.2880
E14 Flat roof	26.8500	0.0800	2.1480
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			6.8975 (36)
Point Thermal bridges			(36a) = 0.0000

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Total fabric heat loss													(33) + (36) + (36a) =	35.0462 (37)
Ventilation heat loss calculated monthly (38) _m = 0.33 x (25) _m x (5)														
(38) _m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(38)	
Heat transfer coeff	24.5149	24.3293	24.1475	23.2932	23.1334	22.3894	22.3894	22.2516	22.6760	23.1334	23.4567	23.7948	(39)	
Average = Sum(39) _m / 12 =	59.5611	59.3756	59.1937	58.3395	58.1796	57.4356	57.4356	57.2978	57.7222	58.1796	58.5030	58.8410	58.3387	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(40)	
HLP (average)	1.1950	1.1913	1.1877	1.1705	1.1673	1.1524	1.1524	1.1496	1.1582	1.1673	1.1738	1.1806	(40)	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	(40)	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.6854 (42)
Hot water usage for mixer showers													0.0000 (42a)
Hot water usage for baths													60.4497 (42b)
Hot water usage for other uses													31.8901 (42c)
Average daily hot water use (litres/day)													85.0374 (43)
Daily hot water use													92.3398 (44)
Energy content (annual)													146.2437 (45)
Distribution loss (46) _m = 0.15 x (45) _m													21.9366 (46)
Water storage loss:													150.0000 (47)
Store volume													1.3938 (48)
a) If manufacturer declared loss factor is known (kWh/day):													0.5400 (49)
Temperature factor from Table 2b													0.7527 (55)
Enter (49) or (54) in (55)													0.7527 (55)
Total storage loss													23.3325 (56)
If cylinder contains dedicated solar storage													23.3325 (57)
Primary loss													23.2624 (59)
Combi loss													0.0000 (61)
Total heat required for water heating calculated for each month													192.8386 (62)
MWHRS													0.0000 (63a)
PV diverter													-0.0000 (63b)
Solar input													0.0000 (63c)
FGHRS													0.0000 (63d)
Output from w/h													192.8386 (64)
Total per year (kWh/year) = Sum(64) _m =													1960.7867 (64)
Electric shower(s)													1961 (64)
Heat gains from water heating, kWh/month													85.9020 (65)

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

Metabolic gains (Table 5), Watts													84.2696 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													82.5679 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													146.8184 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													31.4270 (69)
Pumps, fans													3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)													-67.4156 (71)
Water heating gains (Table 5)													115.4596 (72)
Total internal gains													396.1268 (73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains
	m ²	Table 6a	Specific data	Specific data	factor	W
		W/m ²	or Table 6b	or Table 6c	Table 6d	

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North			1.0500		10.6334		0.6300		0.7000		0.7700		3.4122 (74)
South			2.6100		46.7521		0.6300		0.7000		0.7700		37.2918 (78)
West			2.2000		19.6403		0.6300		0.7000		0.7700		13.2051 (80)

Solar gains	53.9091	93.4272	131.4200	167.7711	191.6404	191.6834	184.2240	166.3361	144.0691	104.2885	64.8781	45.9273 (83)
Total gains	450.0358	498.1773	520.2219	544.1400	550.6135	536.2026	516.8048	499.7248	486.7707	460.4139	440.8021	434.6904 (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	34.1140	34.2206	34.3257	34.8283	34.9240	35.3764	35.3764	35.4615	35.2008	34.9240	34.7310	34.5315
alpha	3.2743	3.2814	3.2884	3.3219	3.3283	3.3584	3.3584	3.3641	3.3467	3.3283	3.3154	3.3021
util living area	0.9578	0.9399	0.9140	0.8571	0.7622	0.6104	0.4653	0.4966	0.6876	0.8611	0.9353	0.9617 (86)
MIT	19.2218	19.4598	19.7899	20.2393	20.6142	20.8714	20.9610	20.9507	20.7974	20.3370	19.7279	19.1933 (87)
Th 2	19.9240	19.9269	19.9299	19.9436	19.9462	19.9583	19.9583	19.9605	19.9536	19.9462	19.9410	19.9356 (88)
util rest of house	0.9499	0.9289	0.8977	0.8288	0.7135	0.5324	0.3646	0.3961	0.6155	0.8284	0.9216	0.9546 (89)
MIT 2	17.8873	18.1866	18.5996	19.1561	19.5918	19.8669	19.9399	19.9357	19.7971	19.2840	18.5364	17.8591 (90)
Living area fraction									fLA = Living area / (4) =			
MIT	18.5128	18.7833	19.1575	19.6638	20.0710	20.3377	20.4185	20.4115	20.2660	19.7776	19.0949	18.4844 (92)
Temperature adjustment												0.0000
adjusted MIT	18.5128	18.7833	19.1575	19.6638	20.0710	20.3377	20.4185	20.4115	20.2660	19.7776	19.0949	18.4844 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9366	0.9143	0.8835	0.8203	0.7197	0.5621	0.4103	0.4411	0.6385	0.8223	0.9080	0.9419 (94)
Useful gains	421.4866	455.4757	459.6342	446.3814	396.2975	301.4133	212.0484	220.4269	310.7900	378.6189	400.2666	409.4202 (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	846.5308	824.3310	749.2447	627.9532	487.0190	329.5500	219.3182	229.8479	355.9124	533.9478	701.7353	840.5080 (97)
Space heating kWh	316.2328	247.8707	215.4702	130.7317	67.4968	0.0000	0.0000	0.0000	0.0000	115.5647	217.0574	320.7293 (98a)
Space heating requirement - total per year (kWh/year)												1631.1537
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	316.2328	247.8707	215.4702	130.7317	67.4968	0.0000	0.0000	0.0000	0.0000	115.5647	217.0574	320.7293 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1631.1537
Space heating per m2												(98c) / (4) = 32.7278 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s) 1.0000 (202)

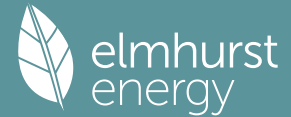
Efficiency of main space heating system 1 (in %) 92.3000 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	316.2328	247.8707	215.4702	130.7317	67.4968	0.0000	0.0000	0.0000	0.0000	115.5647	217.0574	320.7293 (98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating fuel (main heating system)	342.6141	268.5490	233.4455	141.6378	73.1276	0.0000	0.0000	0.0000	0.0000	125.2055	235.1651	347.4857 (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	192.8386	170.6467	181.6302	160.5873	156.2595	141.4541	140.1095	145.3264	146.5314	162.6101	171.9359	190.8568 (64)
Efficiency of water heater (217)m	85.1617	84.8960	84.4439	83.6024	82.3167	79.8000	79.8000	79.8000	79.8000	83.3077	84.5835	79.8000 (216)
Fuel for water heating, kWh/month	226.4382	201.0068	215.0898	192.0845	189.8273	177.2608	175.5759	182.1133	183.6234	195.1922	203.2735	223.9720 (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	17.1560	13.7632	12.3922	9.0791	7.0129	5.7296	6.3974	8.3156	10.8012	14.1717	16.0069	17.6328 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-17.1902	-25.1382	-37.4707	-43.7555	-48.6196	-45.9390	-45.4178	-42.1930	-36.7033	-29.5086	-19.2318	-14.7613 (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)												

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(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)
(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	-7.1350	-15.2495	-30.7501	-46.8209	-62.5127	-63.0002	-62.2182	-52.3664	-37.9999	-21.9708	-9.5816	-5.6213	(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												1767.2304	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2365.4576	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												138.4585	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-821.1556	(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												3535.9910	(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	1767.2304	0.2100	371.1184 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2365.4576	0.2100	496.7461 (264)
Space and water heating			867.8645 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	138.4585	0.1443	19.9838 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-405.9290	0.1338	-54.3127
PV Unit electricity exported	-415.2267	0.1255	-52.1157
Total			-106.4284 (269)
Total CO2, kg/year			793.3492 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.9200 (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	1767.2304	1.1300	1996.9704 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2365.4576	1.1300	2672.9671 (278)
Space and water heating			4669.9375 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	138.4585	1.5338	212.3723 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-405.9290	1.4945	-606.6413
PV Unit electricity exported	-415.2267	0.4607	-191.2934
Total			-797.9347 (283)
Total Primary energy kWh/year			4214.4759 (286)
Target Primary Energy Rate (TPER)			84.5600 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	49.8400 (1b)	x 2.4000 (2b)	= 119.6160 (1b) -

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Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 49.8400 (4)
 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 119.6160 (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 2 * 10 = 20.0000 (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) = 20.0000 / (5) = 0.1672 (8)
 Pressure test Yes
 Pressure Test Method Blower Door
 Measured/design AP50 1.0000 (17)
 Infiltration rate 0.2172 (18)
 Number of sides sheltered 1 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.9250 (20)
 Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.2009 (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	0.2562	0.2511	0.2461	0.2210	0.2160	0.1909	0.1909	0.1858	0.2009	0.2160	0.2260	0.2361 (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	0.5328	0.5315	0.5303	0.5244	0.5233	0.5182	0.5182	0.5173	0.5202	0.5233	0.5255	0.5279 (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
Windows/Doors (Uw = 1.00)			11.7400	0.9615	11.2885		(27)
Non-Vision Panels			6.6000	1.0000	6.6000		(26)
Cavity Wall	64.4400	18.3400	46.1000	0.1300	5.9930	60.0000	2766.0000 (29a)
Flat Roof	49.8400		49.8400	0.1200	5.9808	9.0000	448.5600 (30)
Total net area of external elements Aum(A, m2)			114.2800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.8623		(33)
Party Walls			10.6800	0.0000	0.0000	180.0000	1922.4000 (32)
Party Floor 1			49.8400			30.0000	1495.2000 (32d)
Internal Walls			75.8400			9.0000	682.5600 (32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 7314.7200 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 146.7640 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	9.8000	0.0580	0.5684
E3 Sill	5.4000	0.0450	0.2430
E4 Jamb	27.8000	0.0500	1.3900
E7 Party floor between dwellings (in blocks of flats)	26.8500	0.0000	0.0000
E16 Corner (normal)	4.8000	0.0440	0.2112
E18 Party wall between dwellings	4.8000	0.0620	0.2976
E14 Flat roof	26.8500	0.1600	4.2960

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

Point Thermal bridges (36a) = 7.0062 (36)
 Total fabric heat loss (33) + (36) + (36a) = 36.8685 (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	21.0317	20.9815	20.9322	20.7006	20.6573	20.4556	20.4556	20.4183	20.5333	20.6573	20.7449	20.8366 (38)
Heat transfer coeff	57.9002	57.8499	57.8006	57.5691	57.5258	57.3241	57.3241	57.2868	57.4018	57.5258	57.6134	57.7050 (39)
Average = Sum(39)m / 12 =												57.5689

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1617	1.1607	1.1597	1.1551	1.1542	1.1502	1.1502	1.1494	1.1517	1.1542	1.1560	1.1578 (40)
HLP (average)												1.1551
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.6854 (42)
 Hot water usage for mixer showers

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Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for other uses	22.6905	22.3535	21.8789	21.0040	20.3488	19.6223	19.2299	19.7011	20.2142	20.9916	21.8846	22.6138	22.6138	(42b)
Average daily hot water use (litres/day)	31.8901	30.7305	29.5708	28.4112	27.2515	26.0919	26.0919	27.2515	28.4112	29.5708	30.7305	31.8901	50.0286	(42c)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Energy content (annual)	54.5806	53.0839	51.4497	49.4151	47.6003	45.7142	45.3218	46.9527	48.6254	50.5624	52.6150	54.5038	54.5038	(44)
Distribution loss (46)m = 0.15 x (45)m	86.4423	75.5908	79.0763	67.6468	64.0792	56.2109	54.8128	58.1372	59.9599	68.6127	74.9597	85.3399	85.3399	(45)
Water storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	73.4759	64.2522	67.2149	57.4998	54.4673	47.7793	46.5909	49.4166	50.9660	58.3208	63.7158	72.5389	72.5389	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	73.4759	64.2522	67.2149	57.4998	54.4673	47.7793	46.5909	49.4166	50.9660	58.3208	63.7158	72.5389	72.5389	(64)
Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =											706	(64)	
Electric shower(s)	42.0261	37.4456	40.8892	39.0200	39.7522	37.9198	39.1837	39.7522	39.0200	40.8892	40.1203	42.0261	42.0261	(64a)
Heat gains from water heating, kWh/month	28.8755	25.4244	27.0260	24.1300	23.5549	21.4248	21.4437	22.2922	22.4965	24.8025	25.9590	28.6412	28.6412	(65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 478.0444 (64a)														

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	84.2696	84.2696	84.2696	84.2696	84.2696	84.2696	84.2696	84.2696	84.2696	84.2696	84.2696	84.2696	84.2696	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	74.3633	82.3308	74.3633	76.8421	74.3633	76.8421	74.3633	74.3633	76.8421	74.3633	76.8421	74.3633	74.3633	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	146.8184	148.3419	144.5027	136.3295	126.0123	116.3155	109.8375	108.3140	112.1532	120.3264	130.6436	140.3404	140.3404	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4270	31.4270	31.4270	31.4270	31.4270	31.4270	31.4270	31.4270	31.4270	31.4270	31.4270	31.4270	31.4270	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-67.4156	-67.4156	-67.4156	-67.4156	-67.4156	-67.4156	-67.4156	-67.4156	-67.4156	-67.4156	-67.4156	-67.4156	-67.4156	(71)
Water heating gains (Table 5)	38.8112	37.8340	36.3253	33.5138	31.6598	29.7566	28.8221	29.9626	31.2451	33.3367	36.0542	38.4963	38.4963	(72)
Total internal gains	308.2737	316.7876	303.4722	294.9663	280.3162	271.1951	261.3038	260.9208	268.5213	276.3072	291.8208	301.4808	301.4808	(73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains
	m2	Table 6a	Specific data	Specific data	factor	W
		W/m2	or Table 6b	or Table 6c	Table 6d	
North	2.1000	10.6334	0.5700	0.7000	0.7700	6.1744 (74)
South	5.2300	46.7521	0.5700	0.7000	0.7700	67.6096 (78)
West	4.4100	19.6403	0.5700	0.7000	0.7700	23.9493 (80)

Solar gains	97.7333	169.3767	238.2523	304.1457	347.4083	347.4814	333.9612	301.5409	261.1817	189.0669	117.6193	83.2630	83.2630	(83)
Total gains	406.0071	486.1642	541.7244	599.1119	627.7245	618.6765	595.2649	562.4617	529.7029	465.3741	409.4401	384.7438	384.7438	(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	35.0926	35.1231	35.1530	35.2944	35.3210	35.4452	35.4452	35.4683	35.3973	35.3210	35.2673	35.2113	
alpha	3.3395	3.3415	3.3435	3.3530	3.3547	3.3630	3.3630	3.3646	3.3598	3.3547	3.3512	3.3474	
util living area	0.9673	0.9421	0.9033	0.8246	0.7054	0.5466	0.4098	0.4483	0.6489	0.8562	0.9454	0.9722	(86)
MIT	19.1722	19.4928	19.8891	20.3540	20.7060	20.9084	20.9735	20.9638	20.8329	20.3627	19.6810	19.1027	(87)
Th 2	19.9507	19.9516	19.9524	19.9561	19.9568	19.9601	19.9601	19.9607	19.9588	19.9568	19.9554	19.9539	(88)
util rest of house	0.9610	0.9315	0.8856	0.7930	0.6539	0.4717	0.3186	0.3549	0.5765	0.8229	0.9336	0.9668	(89)
MIT 2	18.3082	18.6211	19.0039	19.4414	19.7510	19.9108	19.9507	19.9468	19.8600	19.4615	18.8128	18.2424	(90)

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Living area fraction											fLA = Living area / (4) =	0.4687 (91)
MIT	18.7131	19.0297	19.4188	19.8692	20.1986	20.3784	20.4301	20.4235	20.3160	19.8839	19.2197	18.6456 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.7131	19.0297	19.4188	19.8692	20.1986	20.3784	20.4301	20.4235	20.3160	19.8839	19.2197	18.6456 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9516	0.9202	0.8751	0.7901	0.6666	0.5028	0.3606	0.3975	0.6026	0.8203	0.9233	0.9581 (94)
Useful gains	386.3465	447.3905	474.0877	473.3618	418.4113	311.0947	214.6511	223.5889	319.2170	381.7346	378.0556	368.6128 (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	834.5238	817.4005	746.7152	631.4846	488.8891	331.2407	219.5554	230.4921	356.8087	534.0613	698.2593	833.5835 (97)
Space heating kWh	333.4440	248.6467	202.8349	113.8485	52.4355	0.0000	0.0000	0.0000	0.0000	113.3311	230.5466	345.9381 (98a)
Space heating requirement - total per year (kWh/year)												1641.0254
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	333.4440	248.6467	202.8349	113.8485	52.4355	0.0000	0.0000	0.0000	0.0000	113.3311	230.5466	345.9381 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1641.0254
Space heating per m2												(98c) / (4) = 32.9259 (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	538.8466	424.1984	435.3794	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8583	0.9089	0.8901	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	462.4677	385.5542	387.5515	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	696.5210	670.6390	633.7198	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	168.5184	212.1030	183.1492	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	42.1296	53.0258	45.7873	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												140.9427 (107)
Energy for space heating												32.9259 (99)
Energy for space cooling												2.8279 (108)
Total												35.7538 (109)
Fabric Energy Efficiency (DFEE)												35.8 (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	49.8400 (1b)	x 2.4000 (2b)	= 119.6160 (1b) - (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.8400		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 119.6160 (5)
Dwelling volume			

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	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

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Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											Air changes per hour	20.0000 / (5) =	0.1672 (8)
Pressure test												Yes		
Pressure Test Method												Blower Door		
Measured/design AP50													5.0000 (17)	
Infiltration rate													0.4172 (18)	
Number of sides sheltered													1 (19)	
Shelter factor												(20) = 1 - [0.075 x (19)] =	0.9250 (20)	
Infiltration rate adjusted to include shelter factor												(21) = (18) x (20) =	0.3859 (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	0.4920	0.4824	0.4727	0.4245	0.4149	0.3666	0.3666	0.3570	0.3859	0.4149	0.4342	0.4534	(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	0.6211	0.6163	0.6117	0.5901	0.5861	0.5672	0.5672	0.5637	0.5745	0.5861	0.5942	0.6028	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			6.6000	1.0000	6.6000			(26)
TER Opening Type (Uw = 1.20)			5.8600	1.1450	6.7099			(27)
Cavity Wall	64.4400	12.4600	51.9800	0.1800	9.3564			(29a)
Flat Roof	49.8400		49.8400	0.1100	5.4824			(30)
Total net area of external elements Aum(A, m2)			114.2800					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	28.1487		(33)
Party Walls			10.6800	0.0000	0.0000			(32)

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

146.7640 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	9.8000	0.0500	0.4900	
E3 Sill	5.4000	0.0500	0.2700	
E4 Jamb	27.8000	0.0500	1.3900	
E7 Party floor between dwellings (in blocks of flats)	26.8500	0.0700	1.8795	
E16 Corner (normal)	4.8000	0.0900	0.4320	
E18 Party wall between dwellings	4.8000	0.0600	0.2880	
E14 Flat roof	26.8500	0.0800	2.1480	

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

Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =		35.0462	(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	24.5149	24.3293	24.1475	23.2932	23.1334	22.3894	22.3894	22.2516	22.6760	23.1334	23.4567	23.7948	(38)
Average = Sum(39)m / 12 =	59.5611	59.3756	59.1937	58.3395	58.1796	57.4356	57.4356	57.2978	57.7222	58.1796	58.5030	58.8410	(39)
													58.3387

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1950	1.1913	1.1877	1.1705	1.1673	1.1524	1.1524	1.1496	1.1582	1.1673	1.1738	1.1806	(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													1.6854 (42)
Hot water usage for mixer showers													0.0000 (42a)
Hot water usage for baths													22.6905 (42b)
Hot water usage for other uses													31.8901 (42c)
Average daily hot water use (litres/day)													50.0286 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	54.5806	53.0839	51.4497	49.4151	47.6003	45.7142	45.3218	46.9527	48.6254	50.5624	52.6150	54.5038	(44)
Energy content (annual)	86.4423	75.5908	79.0763	67.6468	64.0792	56.2109	54.8128	58.1372	59.9599	68.6127	74.9597	85.3399	(45)
Distribution loss (46)m = 0.15 x (45)m													830.8685
Water storage loss:													0.0000 (46)
Total storage loss													0.0000 (56)
If cylinder contains dedicated solar storage													0.0000 (57)
Primary loss													0.0000 (59)
Combi loss													0.0000 (61)
Total heat required for water heating calculated for each month													
WWHRS	73.4759	64.2522	67.2149	57.4998	54.4673	47.7793	46.5909	49.4166	50.9660	58.3208	63.7158	72.5389	(62)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)

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PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	73.4759	64.2522	67.2149	57.4998	54.4673	47.7793	46.5909	49.4166	50.9660	58.3208	63.7158	72.5389	(64)	
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =												706.2383 (64)	
Electric shower(s)	42.0261	37.4456	40.8892	39.0200	39.7522	37.9198	39.1837	39.7522	39.0200	40.8892	40.1203	42.0261	(64a)	
	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												478.0444 (64a)	
Heat gains from water heating, kWh/month	28.8755	25.4244	27.0260	24.1300	23.5549	21.4248	21.4437	22.2922	22.4965	24.8025	25.9590	28.6412	(65)	

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

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
	84.2696	84.2696	84.2696	84.2696	84.2696	84.2696	84.2696	84.2696	84.2696	84.2696	84.2696	84.2696	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	82.5679	91.4144	82.5679	85.3201	82.5679	85.3201	82.5679	82.5679	85.3201	82.5679	85.3201	82.5679	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	146.8184	148.3419	144.5027	136.3295	126.0123	116.3155	109.8375	108.3140	112.1532	120.3264	130.6436	140.3404	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.4270	31.4270	31.4270	31.4270	31.4270	31.4270	31.4270	31.4270	31.4270	31.4270	31.4270	31.4270	(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)													
	-67.4156	-67.4156	-67.4156	-67.4156	-67.4156	-67.4156	-67.4156	-67.4156	-67.4156	-67.4156	-67.4156	-67.4156	(71)
Water heating gains (Table 5)													
	38.8112	37.8340	36.3253	33.5138	31.6598	29.7566	28.8221	29.9626	31.2451	33.3367	36.0542	38.4963	(72)
Total internal gains	316.4783	325.8712	311.6767	303.4443	288.5208	279.6731	269.5084	269.1254	276.9993	284.5118	300.2988	309.6854	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W						
North	1.0500	10.6334	0.6300	0.7000	0.7700	3.4122 (74)						
South	2.6100	46.7521	0.6300	0.7000	0.7700	37.2918 (78)						
West	2.2000	19.6403	0.6300	0.7000	0.7700	13.2051 (80)						
Solar gains	53.9091	93.4272	131.4200	167.7711	191.6404	191.6834	184.2240	166.3361	144.0691	104.2885	64.8781	45.9273 (83)
Total gains	370.3874	419.2984	443.0967	471.2154	480.1612	471.3565	453.7324	435.4614	421.0684	388.8003	365.1769	355.6128 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(85)
alpha	34.1140	34.2206	34.3257	34.8283	34.9240	35.3764	35.3764	35.4615	35.2008	34.9240	34.7310	34.5315	
util living area	3.2743	3.2814	3.2884	3.3219	3.3283	3.3584	3.3584	3.3641	3.3467	3.3283	3.3154	3.3021	
	0.9749	0.9613	0.9416	0.8948	0.8126	0.6673	0.5195	0.5556	0.7481	0.9038	0.9600	0.9778	(86)
MIT	19.0012	19.2540	19.6056	20.0973	20.5204	20.8307	20.9457	20.9309	20.7346	20.1937	19.5322	18.9706	(87)
Th 2	19.9240	19.9269	19.9299	19.9436	19.9462	19.9583	19.9583	19.9605	19.9536	19.9462	19.9410	19.9356	(88)
util rest of house													
	0.9699	0.9537	0.9295	0.8718	0.7686	0.5888	0.4109	0.4483	0.6792	0.8782	0.9508	0.9734	(89)
MIT 2	18.1215	18.3721	18.7188	19.2022	19.5944	19.8618	19.9378	19.9325	19.7883	19.3031	18.6591	18.0995	(90)
Living area fraction													
	fLA = Living area / (4) =												
MIT	18.5338	18.7855	19.1345	19.6218	20.0284	20.3159	20.4102	20.4004	20.2318	19.7206	19.0683	18.5078	(92)
Temperature adjustment													
adjusted MIT	18.5338	18.7855	19.1345	19.6218	20.0284	20.3159	20.4102	20.4004	20.2318	19.7206	19.0683	18.5078	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(94)
Useful gains	0.9615	0.9434	0.9185	0.8636	0.7724	0.6174	0.4598	0.4957	0.6992	0.8717	0.9412	0.9656	(94)
Ext temp.	356.1140	395.5775	406.9778	406.9615	370.8967	291.0187	208.6275	215.8712	294.3970	338.9020	343.6963	343.3807	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Space heating kWh	847.7820	824.4577	747.8824	625.5021	484.5442	328.2965	218.8407	229.2162	353.9427	530.6312	700.1809	841.8836	(97)
Space heating requirement - total per year (kWh/year)	365.8010	288.2075	253.6330	157.3493	84.5537	0.0000	0.0000	0.0000	0.0000	142.6465	256.6689	370.8862	(98a)
Solar heating kWh	Solar heating requirement - total per year (kWh/year)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)													
	Space heating kWh												

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365.8010 288.2075 253.6330 157.3493 84.5537 0.0000 0.0000 0.0000 0.0000 142.6465 256.6689 370.8862 (98c)
 Space heating requirement after solar contribution - total per year (kWh/year) 1919.7462
 Space heating per m2 (98c) / (4) = 38.5182 (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	539.8948	425.0235	435.4635	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7522	0.8264	0.8044	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	406.0829	351.2228	350.2908	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	515.1373	496.3972	476.6964	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	78.5192	108.0098	94.0457	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	19.6298	27.0024	23.5114	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												70.1437 (107)
Energy for space heating												38.5182 (99)
Energy for space cooling												1.4074 (108)
Total												39.9256 (109)
Fabric Energy Efficiency (TFEE)												39.9 (109)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	49.8400 (1b)	2.4000 (2b)	119.6160 (1b) - (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.8400		
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 119.6160 (5)

2. Ventilation rate

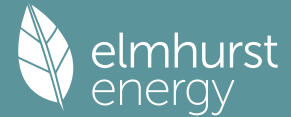
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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)

	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	1.0000 (17)
Infiltration rate	0.0500 (18)
Number of sides sheltered	1 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.9250 (20)
 Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.0463 (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	0.0590	0.0578	0.0567	0.0509	0.0497	0.0439	0.0439	0.0428	0.0463	0.0497	0.0520	0.0543 (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)												81.9000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.1495	0.1483	0.1472	0.1414	0.1402	0.1344	0.1344	0.1333	0.1367	0.1402	0.1425	0.1448 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Windows/Doors (Uw = 1.00)			11.7400	0.9615	11.2885		(27)
Non-Vision Panels			6.6000	1.0000	6.6000		(26)
Cavity Wall	64.4400	18.3400	46.1000	0.1300	5.9930	60.0000	2766.0000 (29a)
Flat Roof	49.8400		49.8400	0.1200	5.9808	9.0000	448.5600 (30)
Total net area of external elements Aum(A, m2)			114.2800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.8623		(33)
Party Walls			10.6800	0.0000	0.0000	180.0000	1922.4000 (32)
Party Floor 1			49.8400			30.0000	1495.2000 (32d)
Internal Walls			75.8400			9.0000	682.5600 (32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 7314.7200 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 146.7640 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	9.8000	0.0580	0.5684
E3 Sill	5.4000	0.0450	0.2430
E4 Jamb	27.8000	0.0500	1.3900
E7 Party floor between dwellings (in blocks of flats)	26.8500	0.0000	0.0000
E16 Corner (normal)	4.8000	0.0440	0.2112
E18 Party wall between dwellings	4.8000	0.0620	0.2976
E14 Flat roof	26.8500	0.1600	4.2960

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.0062 (36)

Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 36.8685 (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	5.9000	5.8544	5.8087	5.5805	5.5349	5.3067	5.3067	5.2610	5.3980	5.5349	5.6262	5.7175 (38)
Average = Sum(39)m / 12 =	42.7685	42.7228	42.6772	42.4490	42.4034	42.1752	42.1752	42.1295	42.2664	42.4034	42.4946	42.5859 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8581	0.8572	0.8563	0.8517	0.8508	0.8462	0.8462	0.8453	0.8480	0.8508	0.8526	0.8545 (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													1.6854 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	63.6313	62.6863	61.3555	58.9018	57.0645	55.0272	53.9268	55.2482	56.6871	58.8670	61.3713	63.4162	63.4162 (42b)
Hot water usage for other uses	33.5685	32.3478	31.1272	29.9065	28.6858	27.4652	27.4652	28.6858	29.9065	31.1272	32.3478	33.5685	33.5685 (42c)
Average daily hot water use (litres/day)													89.5131 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	97.1998	95.0341	92.4827	88.8083	85.7503	82.4924	81.3919	83.9341	86.5936	89.9942	93.7191	96.9847 (44)
Energy content (annual)	153.9408	135.3274	142.1425	121.5741	115.4364	101.4340	98.4365	103.9279	106.7785	122.1213	133.5201	151.8546 (45)
Distribution loss (46)m = 0.15 x (45)m	23.0911	20.2991	21.3214	18.2361	17.3155	15.2151	14.7655	15.5892	16.0168	18.3182	20.0280	22.7782 (46)

Water storage loss:
 Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day):
 Temperature factor from Table 2b 1.8600 (48)
 Enter (49) or (54) in (55) 0.7800 (49)
 Total storage loss 1.4508 (55)

44.9748 40.6224 44.9748 43.5240 44.9748 43.5240 44.9748 44.9748 43.5240 44.9748 43.5240 44.9748 44.9748 (56)

If cylinder contains dedicated solar storage

44.9748 40.6224 44.9748 43.5240 44.9748 43.5240 44.9748 44.9748 43.5240 44.9748 43.5240 44.9748 44.9748 (57)

Primary loss 54.8576 49.5488 54.8576 53.0880 54.8576 22.5120 23.2624 23.2624 22.5120 54.8576 53.0880 54.8576 (59)

Combi loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (61)

Total heat required for water heating calculated for each month

253.7732 225.4986 241.9749 218.1861 215.2688 167.4700 166.6737 172.1651 172.8145 221.9537 230.1321 251.6870 (62)

WWHRS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63a)

PV diverter -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 (63b)

Solar input 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63c)

FGHRS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63d)

Output from w/h 253.7732 225.4986 241.9749 218.1861 215.2688 167.4700 166.6737 172.1651 172.8145 221.9537 230.1321 251.6870 (64)

Total per year (kWh/year) = Sum(64)m = 2537.5975 (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 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 95.0714 84.6354 91.1484 82.8938 82.2687 51.7364 51.3400 53.1659 53.5135 84.4914 86.8658 94.3777 (65)

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

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	101.1235	101.1235	101.1235	101.1235	101.1235	101.1235	101.1235	101.1235	101.1235	101.1235	101.1235	101.1235	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.8719	14.9855	12.1870	9.2264	6.8968	5.8226	6.2915	8.1779	10.9764	13.9371	16.2666	17.3409	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.1319	221.4058	215.6757	203.4768	188.0780	173.6052	163.9366	161.6627	167.3928	179.5917	194.9905	209.4633	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	46.7977	46.7977	46.7977	46.7977	46.7977	46.7977	46.7977	46.7977	46.7977	46.7977	46.7977	46.7977	(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)	-67.4156	-67.4156	-67.4156	-67.4156	-67.4156	-67.4156	-67.4156	-67.4156	-67.4156	-67.4156	-67.4156	-67.4156	(71)
Water heating gains (Table 5)	127.7841	125.9455	122.5114	115.1303	110.5762	71.8561	69.0054	71.4596	74.3242	113.5637	120.6470	126.8518	(72)
Total internal gains	444.2936	442.8424	430.8796	408.3390	386.0566	331.7895	319.7391	321.8058	333.1991	387.5980	412.4097	434.1615	(73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W							
North	2.1000	10.6334	0.5700	0.7000	0.7700	6.1744 (74)							
South	5.2300	46.7521	0.5700	0.7000	0.7700	67.6096 (78)							
West	4.4100	19.6403	0.5700	0.7000	0.7700	23.9493 (80)							
Solar gains	97.7333	169.3767	238.2523	304.1457	347.4083	347.4814	333.9612	301.5409	261.1817	189.0669	117.6193	83.2630	(83)
Total gains	542.0269	612.2191	669.1319	712.4847	733.4648	679.2709	653.7002	623.3467	594.3807	576.6649	530.0290	517.4245	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, n _{l,m} (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	47.5085	47.5593	47.6101	47.8661	47.9176	48.1769	48.1769	48.2291	48.0728	47.9176	47.8147	47.7122	
alpha	4.1672	4.1706	4.1740	4.1911	4.1945	4.2118	4.2118	4.2153	4.2049	4.1945	4.1876	4.1808	
util living area	0.8995	0.8505	0.7740	0.6584	0.5185	0.3924	0.2829	0.3093	0.4778	0.6870	0.8483	0.9122	(86)
Living	20.3364	20.4912	20.6634	20.8103	20.8897	20.9179	20.9249	20.9242	20.9066	20.8096	20.5588	20.2924	
Non living	19.4407	19.6272	19.8303	19.9993	20.0829	20.1132	20.1185	20.1189	20.1027	20.0035	19.7162	19.3900	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.6605	20.4912	20.6634	20.8103	20.8897	20.9179	20.9249	20.9242	20.9066	20.8096	20.5588	20.3914	(87)
Th 2	20.2032	20.2040	20.2048	20.2087	20.2095	20.2135	20.2135	20.2142	20.2119	20.2095	20.2080	20.2064	(88)
util rest of house	0.8858	0.8322	0.7490	0.6255	0.4789	0.3458	0.2327	0.2572	0.4271	0.6488	0.8267	0.8999	(89)
MIT 2	19.8993	19.6272	19.8303	19.9993	20.0829	20.1132	20.1185	20.1189	20.1027	20.0035	19.7162	19.5371	(90)
Living area fraction	f _{LA} = Living area / (4) =											0.4687 (91)	
MIT	20.2561	20.0321	20.2208	20.3794	20.4611	20.4903	20.4964	20.4963	20.4795	20.3813	20.1111	19.9375	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.2561	20.0321	20.2208	20.3794	20.4611	20.4903	20.4964	20.4963	20.4795	20.3813	20.1111	19.9375	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8868	0.8279	0.7495	0.6328	0.4917	0.3624	0.2508	0.2760	0.4446	0.6574	0.8239	0.8953	(94)
Useful gains	480.6556	506.8630	501.5089	450.8842	360.6098	246.1359	163.9663	172.0186	264.2440	379.0948	436.6882	463.2548	(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	682.4168	646.4874	585.5648	487.2904	371.4982	248.4261	164.3333	172.5753	269.6386	414.7607	552.9037	670.1973	(97)
Space heating kWh	150.1103	93.8277	62.5376	26.2125	8.1010	0.0000	0.0000	0.0000	0.0000	26.5354	83.6751	153.9652	(98a)
Space heating requirement - total per year (kWh/year)												604.9648	
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	150.1103	93.8277	62.5376	26.2125	8.1010	0.0000	0.0000	0.0000	0.0000	26.5354	83.6751	153.9652	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												604.9648	
Space heating per m ²												(98c) / (4) =	12.1381 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
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Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													292.9809 (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	150.1103	93.8277	62.5376	26.2125	8.1010	0.0000	0.0000	0.0000	0.0000	26.5354	83.6751	153.9652	(98)
Space heating efficiency (main heating system 1)	292.9809	292.9809	292.9809	292.9809	292.9809	0.0000	0.0000	0.0000	0.0000	292.9809	292.9809	292.9809	(210)
Space heating fuel (main heating system)	51.2355	32.0252	21.3453	8.9468	2.7650	0.0000	0.0000	0.0000	0.0000	9.0570	28.5599	52.5513	(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	253.7732	225.4986	241.9749	218.1861	215.2688	167.4700	166.6737	172.1651	172.8145	221.9537	230.1321	251.6870	(64)
Efficiency of water heater (217)m	175.7495	175.7495	175.7495	175.7495	175.7495	175.7495	175.7495	175.7495	175.7495	175.7495	175.7495	175.7495	(216)
Fuel for water heating, kWh/month	144.3948	128.3068	137.6817	124.1461	122.4862	95.2890	94.8359	97.9605	98.3300	126.2898	130.9432	143.2078	(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	7.2878	6.5825	7.2878	7.0527	7.2878	7.0527	7.2878	7.0527	7.2878	7.0527	7.2878	7.0527	(231)
Lighting	14.7679	11.8474	10.6672	7.8153	6.0367	4.9321	5.5069	7.1581	9.2977	12.1990	13.7788	15.1784	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-28.5849	-51.4223	-94.6089	-129.4972	-156.4172	-148.0404	-145.3800	-129.1967	-100.4951	-66.9155	-34.5451	-23.2396	(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	-1.1274	-4.3160	-15.0984	-36.3908	-62.9973	-73.1436	-70.6062	-50.2204	-26.6857	-8.5082	-1.9502	-0.7588	(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													206.4861 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													175.7495
Water heating fuel used													1443.8718 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.5880)													
mechanical ventilation fans (SFP = 0.5880)													85.8077 (230a)
Total electricity for the above, kWh/year													85.8077 (231)
Electricity for lighting (calculated in Appendix L)													119.1855 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-1460.1462 (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													395.2050 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	206.4861	16.4900	34.0496 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1443.8718	16.4900	238.0945 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	85.8077	16.4900	14.1497 (249)
Energy for lighting	119.1855	16.4900	19.6537 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1108.3431	16.4900	-182.7658
PV Unit electricity exported	-351.8031	5.5900	-19.6658
Total			-202.4316 (252)
Total energy cost			103.5158 (255)

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11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.3929 (257)
SAP value		93.6306
SAP rating (Section 12)		94 (258)
SAP band		A

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	206.4861	0.1574	32.4958 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1443.8718	0.1415	204.2718 (264)
Space and water heating			236.7676 (265)
Pumps, fans and electric keep-hot	85.8077	0.1387	11.9026 (267)
Energy for lighting	119.1855	0.1443	17.2022 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1108.3431	0.1311	-145.2646
PV Unit electricity exported	-351.8031	0.1162	-40.8858
Total			-186.1504 (269)
Total CO2, kg/year			79.7220 (272)
CO2 emissions per m2			1.6000 (273)
EI value			98.8736
EI rating			99 (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 (m ²)	Storey height (m)	Volume (m ³)
Ground floor	49.8400 (1b)	x 2.4000 (2b)	= 119.6160 (1b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.8400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 119.6160 (5)

2. Ventilation rate

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

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		1.0000	(17)
Infiltration rate		0.0500	(18)
Number of sides sheltered		1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.0463 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.1000	4.3000	3.9000	3.7000	3.4000	3.5000	3.2000	3.6000	3.9000	3.5000	3.9000 (22)
Wind factor	1.0500	1.0250	1.0750	0.9750	0.9250	0.8500	0.8750	0.8000	0.9000	0.9750	0.8750	0.9750 (22a)
Adj infilt rate	0.0486	0.0474	0.0497	0.0451	0.0428	0.0393	0.0405	0.0370	0.0416	0.0451	0.0405	0.0451 (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) =												81.9000 (23c)

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Effective ac 0.1391 0.1379 0.1402 0.1356 0.1333 0.1298 0.1310 0.1275 0.1321 0.1356 0.1310 0.1356 (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
Windows/Doors (Uw = 1.00)			11.7400	0.9615	11.2885		(27)
Non-Vision Panels			6.6000	1.0000	6.6000		(26)
Cavity Wall	64.4400	18.3400	46.1000	0.1300	5.9930	60.0000	2766.0000 (29a)
Flat Roof	49.8400		49.8400	0.1200	5.9808	9.0000	448.5600 (30)
Total net area of external elements Aum(A, m2)			114.2800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.8623		(33)
Party Walls			10.6800	0.0000	0.0000	180.0000	1922.4000 (32)
Party Floor 1			49.8400			30.0000	1495.2000 (32d)
Internal Walls			75.8400			9.0000	682.5600 (32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 7314.7200 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 146.7640 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	9.8000	0.0580	0.5684
E3 Sill	5.4000	0.0450	0.2430
E4 Jamb	27.8000	0.0500	1.3900
E7 Party floor between dwellings (in blocks of flats)	26.8500	0.0000	0.0000
E16 Corner (normal)	4.8000	0.0440	0.2112
E18 Party wall between dwellings	4.8000	0.0620	0.2976
E14 Flat roof	26.8500	0.1600	4.2960

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.0062 (36)

Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 36.8685 (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	5.4893	5.4436	5.5349	5.3523	5.2610	5.1241	5.1698	5.0328	5.2154	5.3523	5.1698	5.3523 (38)
Average = Sum(39)m / 12 =	42.3577	42.3121	42.4034	42.2208	42.1295	41.9926	42.0382	41.9013	42.0839	42.2208	42.0382	42.2208 (39)
	42.1599											

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8499	0.8490	0.8508	0.8471	0.8453	0.8425	0.8435	0.8407	0.8444	0.8471	0.8435	0.8471 (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													1.6854 (42)
Hot water usage for mixer showers													0.0000 (42a)
Hot water usage for baths	63.6313	62.6863	61.3555	58.9018	57.0645	55.0272	53.9268	55.2482	56.6871	58.8670	61.3713	63.4162 (42b)	
Hot water usage for other uses	33.5685	32.3478	31.1272	29.9065	28.6858	27.4652	27.4652	28.6858	29.9065	31.1272	32.3478	33.5685 (42c)	
Average daily hot water use (litres/day)													89.5131 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	97.1998	95.0341	92.4827	88.8083	85.7503	82.4924	81.3919	83.9341	86.5936	89.9942	93.7191	96.9847 (44)	
Energy content (annual)	153.9408	135.3274	142.1425	121.5741	115.4364	101.4340	98.4365	103.9279	106.7785	122.1213	133.5201	151.8546 (45)	
Distribution loss (46)m = 0.15 x (45)m													Total = Sum(45)m = 1486.4939
Water storage loss:	23.0911	20.2991	21.3214	18.2361	17.3155	15.2151	14.7655	15.5892	16.0168	18.3182	20.0280	22.7782 (46)	
Store volume													150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.8600 (48)
Temperature factor from Table 2b													0.7800 (49)
Enter (49) or (54) in (55)													1.4508 (55)
Total storage loss	44.9748	40.6224	44.9748	43.5240	44.9748	43.5240	44.9748	44.9748	43.5240	44.9748	43.5240	44.9748 (56)	
If cylinder contains dedicated solar storage	44.9748	40.6224	44.9748	43.5240	44.9748	43.5240	44.9748	44.9748	43.5240	44.9748	43.5240	44.9748 (57)	
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576 (59)	
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)	
Total heat required for water heating calculated for each month	253.7732	225.4986	241.9749	218.1861	215.2688	167.4700	166.6737	172.1651	172.8145	221.9537	230.1321	251.6870 (62)	
WVHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)	
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)	
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)	
Output from w/h	253.7732	225.4986	241.9749	218.1861	215.2688	167.4700	166.6737	172.1651	172.8145	221.9537	230.1321	251.6870 (64)	
Electric shower(s)													Total per year (kWh/year) = Sum(64)m = 2537.5975 (64)
Heat gains from water heating, kWh/month	95.0714	84.6354	91.1484	82.8938	82.2687	51.7364	51.3400	53.1659	53.5135	84.4914	86.8658	94.3777 (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	101.1235	101.1235	101.1235	101.1235	101.1235	101.1235	101.1235	101.1235	101.1235	101.1235	101.1235	101.1235	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.8719	14.9855	12.1870	9.2264	6.8968	5.8226	6.2915	8.1779	10.9764	13.9371	16.2666	17.3409	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.1319	221.4058	215.6757	203.4768	188.0780	173.6052	163.9366	161.6627	167.3928	179.5917	194.9905	209.4633	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	46.7977	46.7977	46.7977	46.7977	46.7977	46.7977	46.7977	46.7977	46.7977	46.7977	46.7977	46.7977	(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)	-67.4156	-67.4156	-67.4156	-67.4156	-67.4156	-67.4156	-67.4156	-67.4156	-67.4156	-67.4156	-67.4156	-67.4156	(71)
Water heating gains (Table 5)	127.7841	125.9455	122.5114	115.1303	110.5762	71.8561	69.0054	71.4596	74.3242	113.5637	120.6470	126.8518	(72)
Total internal gains	444.2936	442.8424	430.8796	408.3390	386.0566	331.7895	319.7391	321.8058	333.1991	387.5980	412.4097	434.1615	(73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b	g	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	2.1000	11.9957	0.5700	0.5700	0.7000	0.7700	6.9655 (74)
South	5.2300	51.1372	0.5700	0.5700	0.7000	0.7700	73.9511 (75)
West	4.4100	22.3485	0.5700	0.5700	0.7000	0.7700	27.2517 (80)

Solar gains	108.1683	171.7409	237.2577	312.1630	348.3019	373.3013	352.9928	322.9980	279.4544	201.1824	129.9448	91.2670	(83)
Total gains	552.4618	614.5833	668.1373	720.5020	734.3585	705.0908	672.7318	644.8037	612.6535	588.7804	542.3545	525.4285	(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	47.9692	48.0210	47.9176	48.1248	48.2291	48.3863	48.3338	48.4917	48.2814	48.1248	48.3338	48.1248	
alpha	4.1979	4.2014	4.1945	4.2083	4.2153	4.2258	4.2223	4.2328	4.2188	4.2083	4.2223	4.2083	
util living area	0.8875	0.8424	0.7570	0.6260	0.4752	0.3256	0.2184	0.2336	0.4255	0.6514	0.8264	0.9010	(86)
Living	20.3938	20.5223	20.6974	20.8366	20.9029	20.9232	20.9263	20.9263	20.9151	20.8367	20.6152	20.3552	
Non living	19.5167	19.6706	19.8741	20.0313	20.1004	20.1205	20.1217	20.1243	20.1130	20.0349	19.7893	19.4725	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.6899	20.5223	20.6974	20.8366	20.9029	20.9232	20.9263	20.9263	20.9151	20.8367	20.6152	20.4454	(87)
Th 2	20.2103	20.2111	20.2095	20.2127	20.2142	20.2166	20.2158	20.2182	20.2150	20.2127	20.2158	20.2127	(88)
util rest of house	0.8726	0.8234	0.7305	0.5916	0.4345	0.2800	0.1696	0.1830	0.3749	0.6110	0.8026	0.8873	(89)
MIT 2	19.9338	19.6706	19.8741	20.0313	20.1004	20.1205	20.1217	20.1243	20.1130	20.0349	19.7893	19.6059	(90)
Living area fraction									flA = Living area / (4) =			0.4687	(91)
MIT	20.2882	20.0698	20.2600	20.4088	20.4765	20.4968	20.4988	20.5002	20.4889	20.4107	20.1764	19.9994	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.2882	20.0698	20.2600	20.4088	20.4765	20.4968	20.4988	20.5002	20.4889	20.4107	20.1764	19.9994	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8741	0.8197	0.7323	0.6004	0.4483	0.2963	0.1873	0.2013	0.3927	0.6215	0.8013	0.8832	(94)
Useful gains	482.9280	503.7897	489.2598	432.5783	329.1763	208.9462	125.9790	129.7846	240.5975	365.9243	434.6058	464.0640	(95)
Ext temp.	4.6000	5.1000	7.0000	9.5000	12.5000	15.5000	17.5000	17.4000	14.7000	11.1000	7.5000	4.6000	(96)
Heat loss rate W	664.5152	633.4026	562.2678	460.5762	336.0474	209.8270	126.0661	129.9023	243.6209	393.1041	532.8941	650.1737	(97)
Space heating kWh	135.1009	87.0998	54.3179	20.1585	5.1121	0.0000	0.0000	0.0000	0.0000	20.2218	70.7676	138.4656	(98a)
Space heating requirement - total per year (kWh/year)												531.2442	
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	135.1009	87.0998	54.3179	20.1585	5.1121	0.0000	0.0000	0.0000	0.0000	20.2218	70.7676	138.4656	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												531.2442	
Space heating per m ²										(98c) / (4) =		10.6590	(99)

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

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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 %)													292.4385 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement	135.1009	87.0998	54.3179	20.1585	5.1121	0.0000	0.0000	0.0000	0.0000	20.2218	70.7676	138.4656	(98)
Space heating efficiency (main heating system 1)	292.4385	292.4385	292.4385	292.4385	292.4385	0.0000	0.0000	0.0000	0.0000	292.4385	292.4385	292.4385	(210)
Space heating fuel (main heating system)	46.1980	29.7840	18.5741	6.8932	1.7481	0.0000	0.0000	0.0000	0.0000	6.9149	24.1991	47.3486	(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 requirement	253.7732	225.4986	241.9749	218.1861	215.2688	167.4700	166.6737	172.1651	172.8145	221.9537	230.1321	251.6870	(64)
Efficiency of water heater (217)m	175.5532	175.5532	175.5532	175.5532	175.5532	175.5532	175.5532	175.5532	175.5532	175.5532	175.5532	175.5532	(216)
Fuel for water heating, kWh/month	144.5563	128.4503	137.8356	124.2849	122.6231	95.3956	94.9420	98.0700	98.4400	126.4310	131.0896	143.3679	(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	7.2878	6.5825	7.2878	7.0527	7.2878	7.0527	7.2878	7.2878	7.0527	7.2878	7.0527	7.2878	(231)
Lighting	14.7679	11.8474	10.6672	7.8153	6.0367	4.9321	5.5069	7.1581	9.2977	12.1990	13.7788	15.1784	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-32.7815	-54.0238	-97.0363	-134.5104	-158.4623	-155.9929	-151.9205	-137.4408	-108.4554	-73.0733	-39.4396	-26.4333	(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	-1.5020	-4.8111	-16.0993	-40.2250	-65.5233	-85.0976	-80.0646	-59.1180	-31.9964	-10.3499	-2.5854	-0.9935	(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													181.6601 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													175.5532
Water heating fuel used													1445.4863 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.5880) mechanical ventilation fans (SFP = 0.5880)													85.8077 (230a)
Total electricity for the above, kWh/year													85.8077 (231)
Electricity for lighting (calculated in Appendix L)													119.1855 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-1567.9365 (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													264.2032 (238)

10a. Fuel costs - using BEDF prices (528)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	181.6601	21.5100	39.0751 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1445.4863	21.5100	310.9241 (247)
Energy for instantaneous electric shower(s)	0.0000	21.5100	0.0000 (247a)
Pumps, fans and electric keep-hot	85.8077	21.5100	18.4572 (249)
Energy for lighting	119.1855	21.5100	25.6368 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1169.5702	21.5100	-251.5746
PV Unit electricity exported	-398.3663	5.5900	-22.2687
Total			-273.8432 (252)
Total energy cost			120.2500 (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	181.6601	0.1578	28.6664 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1445.4863	0.1415	204.5002 (264)
Space and water heating			233.1666 (265)
Pumps, fans and electric keep-hot	85.8077	0.1387	11.9026 (267)
Energy for lighting	119.1855	0.1443	17.2022 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1169.5702	0.1312	-153.3950
PV Unit electricity exported	-398.3663	0.1157	-46.0976
Total			-199.4926 (269)
Total CO2, kg/year			62.7787 (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	181.6601	1.5841	287.7749 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1445.4863	1.5232	2201.7209 (278)
Space and water heating			2489.4957 (279)
Pumps, fans and electric keep-hot	85.8077	1.5128	129.8099 (281)
Energy for lighting	119.1855	1.5338	182.8108 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1169.5702	1.4845	-1736.2609
PV Unit electricity exported	-398.3663	0.4240	-168.9191
Total			-1905.1800 (283)
Total Primary energy kWh/year			896.9364 (286)

 SAP 10 EPC IMPROVEMENTS

P23972(3)

Current energy efficiency rating: A 94
 Current environmental impact rating: A 99

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 Environmental
 (none) Total Savings £0 0.00 kg/m² efficiency impact

Potential energy efficiency rating: A 94
 Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 528 TEST (04 Oct 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	£394	£394	£0
Space heating	£58	£58	£0
Water heating	£311	£311	£0
Lighting	£26	£26	£0
Generated (PV)	-£274	-£274	£0
Total cost of fuels	£120	£120	£0
Total cost of uses	£121	£121	£0
Delivered energy	5 kWh/m ²	5 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m ²	1 kg/m ²	1 kg/m ²	0 kg/m ²
Primary energy	18 kWh/m ²	18 kWh/m ²	0 kWh/m ²

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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 (m ²)		Storey height (m)		Volume (m ³)
Ground floor		49.8400	(1b)	x 2.4000	(2b)	= 119.6160 (1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.8400					(4)
Dwelling volume						(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 119.6160 (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												1.0000 (17)	
Infiltration rate												0.0500 (18)	
Number of sides sheltered												1 (19)	
Shelter factor												(20) = 1 - [0.075 x (19)] = 0.9250 (20)	
Infiltration rate adjusted to include shelter factor												(21) = (18) x (20) = 0.0463 (21)	
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.0590	0.0578	0.0567	0.0509	0.0497	0.0439	0.0439	0.0428	0.0463	0.0497	0.0520	0.0543	(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) =													81.9000 (23c)
Effective ac	0.1495	0.1483	0.1472	0.1414	0.1402	0.1344	0.1344	0.1333	0.1367	0.1402	0.1425	0.1448	(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
Windows/Doors (Uw = 1.00)			11.7400	0.9615	11.2885		(27)
Non-Vision Panels			6.6000	1.0000	6.6000		(26)
Cavity Wall	64.4400	18.3400	46.1000	0.1300	5.9930	60.0000	2766.0000 (29a)
Flat Roof	49.8400		49.8400	0.1200	5.9808	9.0000	448.5600 (30)
Total net area of external elements Aum(A, m ²)			114.2800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.8623		(33)
Party Walls			10.6800	0.0000	0.0000	180.0000	1922.4000 (32)
Party Floor 1			49.8400			30.0000	1495.2000 (32d)
Internal Walls			75.8400			9.0000	682.5600 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 7314.7200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							146.7640 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value		Total
E2 Other lintels (including other steel lintels)				9.8000	0.0580		0.5684
E3 Sill				5.4000	0.0450		0.2430
E4 Jamb				27.8000	0.0500		1.3900
E7 Party floor between dwellings (in blocks of flats)				26.8500	0.0000		0.0000
E16 Corner (normal)				4.8000	0.0440		0.2112
E18 Party wall between dwellings				4.8000	0.0620		0.2976
E14 Flat roof				26.8500	0.1600		4.2960
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.0062 (36)
Point Thermal bridges							(36a) = 0.0000
Total fabric heat loss							(33) + (36) + (36a) = 36.8685 (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
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(38)m	5.9000	5.8544	5.8087	5.5805	5.5349	5.3067	5.3067	5.2610	5.3980	5.5349	5.6262	5.7175 (38)
Heat transfer coeff	42.7685	42.7228	42.6772	42.4490	42.4034	42.1752	42.1752	42.1295	42.2664	42.4034	42.4946	42.5859 (39)
Average = Sum(39)m / 12 =												42.4376
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8581	0.8572	0.8563	0.8517	0.8508	0.8462	0.8462	0.8453	0.8480	0.8508	0.8526	0.8545 (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												1.6854 (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	63.6313	62.6863	61.3555	58.9018	57.0645	55.0272	53.9268	55.2482	56.6871	58.8670	61.3713	63.4162 (42b)
Hot water usage for other uses	33.5685	32.3478	31.1272	29.9065	28.6858	27.4652	27.4652	28.6858	29.9065	31.1272	32.3478	33.5685 (42c)
Average daily hot water use (litres/day)												89.5131 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	97.1998	95.0341	92.4827	88.8083	85.7503	82.4924	81.3919	83.9341	86.5936	89.9942	93.7191	96.9847 (44)
Energy content (annual)	153.9408	135.3274	142.1425	121.5741	115.4364	101.4340	98.4365	103.9279	106.7785	122.1213	133.5201	151.8546 (45)
Distribution loss (46)m = 0.15 x (45)m	23.0911	20.2991	21.3214	18.2361	17.3155	15.2151	14.7655	15.5892	16.0168	18.3182	20.0280	22.7782 (46)
Water storage loss:												150.0000 (47)
Store volume												1.8600 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.7800 (49)
Temperature factor from Table 2b												1.4508 (55)
Enter (49) or (54) in (55)												
Total storage loss	44.9748	40.6224	44.9748	43.5240	44.9748	43.5240	44.9748	44.9748	43.5240	44.9748	43.5240	44.9748 (56)
If cylinder contains dedicated solar storage	44.9748	40.6224	44.9748	43.5240	44.9748	43.5240	44.9748	44.9748	43.5240	44.9748	43.5240	44.9748 (57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	253.7732	225.4986	241.9749	218.1861	215.2688	167.4700	166.6737	172.1651	172.8145	221.9537	230.1321	251.6870 (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	253.7732	225.4986	241.9749	218.1861	215.2688	167.4700	166.6737	172.1651	172.8145	221.9537	230.1321	251.6870 (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	95.0714	84.6354	91.1484	82.8938	82.2687	51.7364	51.3400	53.1659	53.5135	84.4914	86.8658	94.3777 (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	101.1235	101.1235	101.1235	101.1235	101.1235	101.1235	101.1235	101.1235	101.1235	101.1235	101.1235	101.1235 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.8719	14.9855	12.1870	9.2264	6.8968	5.8226	6.2915	8.1779	10.9764	13.9371	16.2666	17.3409 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.1319	221.4058	215.6757	203.4768	188.0780	173.6052	163.9366	161.6627	167.3928	179.5917	194.9905	209.4633 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	46.7977	46.7977	46.7977	46.7977	46.7977	46.7977	46.7977	46.7977	46.7977	46.7977	46.7977	46.7977 (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)	-67.4156	-67.4156	-67.4156	-67.4156	-67.4156	-67.4156	-67.4156	-67.4156	-67.4156	-67.4156	-67.4156	-67.4156 (71)
Water heating gains (Table 5)	127.7841	125.9455	122.5114	115.1303	110.5762	71.8561	69.0054	71.4596	74.3242	113.5637	120.6470	126.8518 (72)
Total internal gains	444.2936	442.8424	430.8796	408.3390	386.0566	331.7895	319.7391	321.8058	333.1991	387.5980	412.4097	434.1615 (73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains
	m2	Table 6a	Specific data	Specific data	factor	W
		W/m2	or Table 6b	or Table 6c	Table 6d	
North	2.1000	10.6334	0.5700	0.7000	0.7700	6.1744 (74)
South	5.2300	46.7521	0.5700	0.7000	0.7700	67.6096 (78)
West	4.4100	19.6403	0.5700	0.7000	0.7700	23.9493 (80)

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Solar gains	97.7333	169.3767	238.2523	304.1457	347.4083	347.4814	333.9612	301.5409	261.1817	189.0669	117.6193	83.2630 (83)
Total gains	542.0269	612.2191	669.1319	712.4847	733.4648	679.2709	653.7002	623.3467	594.3807	576.6649	530.0290	517.4245 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, n_{l,m} (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	47.5085	47.5593	47.6101	47.8661	47.9176	48.1769	48.1769	48.2291	48.0728	47.9176	47.8147	47.7122
alpha	4.1672	4.1706	4.1740	4.1911	4.1945	4.2118	4.2118	4.2153	4.2049	4.1945	4.1876	4.1808
util living area	0.8995	0.8505	0.7740	0.6584	0.5185	0.3924	0.2829	0.3093	0.4778	0.6870	0.8483	0.9122 (86)
Living	20.3364	20.4912	20.6634	20.8103	20.8897	20.9179	20.9249	20.9242	20.9066	20.8096	20.5588	20.2924
Non living	19.4407	19.6272	19.8303	19.9993	20.0829	20.1132	20.1185	20.1189	20.1027	20.0035	19.7162	19.3900
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.6605	20.4912	20.6634	20.8103	20.8897	20.9179	20.9249	20.9242	20.9066	20.8096	20.5588	20.3914 (87)
Th 2	20.2032	20.2040	20.2048	20.2087	20.2095	20.2135	20.2135	20.2142	20.2119	20.2095	20.2080	20.2064 (88)
util rest of house	0.8858	0.8322	0.7490	0.6255	0.4789	0.3458	0.2327	0.2572	0.4271	0.6488	0.8267	0.8999 (89)
MIT 2	19.8993	19.6272	19.8303	19.9993	20.0829	20.1132	20.1185	20.1189	20.1027	20.0035	19.7162	19.5371 (90)
Living area fraction									f _{LA} = Living area / (4) =			
MIT	20.2561	20.0321	20.2208	20.3794	20.4611	20.4903	20.4964	20.4963	20.4795	20.3813	20.1111	19.9375 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2561	20.0321	20.2208	20.3794	20.4611	20.4903	20.4964	20.4963	20.4795	20.3813	20.1111	19.9375 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8868	0.8279	0.7495	0.6328	0.4917	0.3624	0.2508	0.2760	0.4446	0.6574	0.8239	0.8953 (94)
Useful gains	480.6556	506.8630	501.5089	450.8842	360.6098	246.1359	163.9663	172.0186	264.2440	379.0948	436.6882	463.2548 (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	682.4168	646.4874	585.5648	487.2904	371.4982	248.4261	164.3333	172.5753	269.6386	414.7607	552.9037	670.1973 (97)
Space heating kWh	150.1103	93.8277	62.5376	26.2125	8.1010	0.0000	0.0000	0.0000	0.0000	26.5354	83.6751	153.9652 (98a)
Space heating requirement - total per year (kWh/year)												604.9648
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	150.1103	93.8277	62.5376	26.2125	8.1010	0.0000	0.0000	0.0000	0.0000	26.5354	83.6751	153.9652 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												604.9648
Space heating per m ²										(98c) / (4) =		12.1381 (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 %) 292.9809 (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	150.1103	93.8277	62.5376	26.2125	8.1010	0.0000	0.0000	0.0000	0.0000	26.5354	83.6751	153.9652 (98)
Space heating efficiency (main heating system 1)	292.9809	292.9809	292.9809	292.9809	292.9809	0.0000	0.0000	0.0000	0.0000	292.9809	292.9809	292.9809 (210)
Space heating fuel (main heating system)	51.2355	32.0252	21.3453	8.9468	2.7650	0.0000	0.0000	0.0000	0.0000	9.0570	28.5599	52.5513 (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	253.7732	225.4986	241.9749	218.1861	215.2688	167.4700	166.6737	172.1651	172.8145	221.9537	230.1321	251.6870 (64)
Efficiency of water heater (217)m	175.7495	175.7495	175.7495	175.7495	175.7495	175.7495	175.7495	175.7495	175.7495	175.7495	175.7495	175.7495 (216)
Fuel for water heating, kWh/month	144.3948	128.3068	137.6817	124.1461	122.4862	95.2890	94.8359	97.9605	98.3300	126.2898	130.9432	143.2078 (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	7.2878	6.5825	7.2878	7.0527	7.2878	7.0527	7.2878	7.2878	7.0527	7.2878	7.0527	7.2878 (231)
Lighting	14.7679	11.8474	10.6672	7.8153	6.0367	4.9321	5.5069	7.1581	9.2977	12.1990	13.7788	15.1784 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-28.5849	-51.4223	-94.6089	-129.4972	-156.4172	-148.0404	-145.3800	-129.1967	-100.4951	-66.9155	-34.5451	-23.2396 (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)												

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(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)
(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	-1.1274	-4.3160	-15.0984	-36.3908	-62.9973	-73.1436	-70.6062	-50.2204	-26.6857	-8.5082	-1.9502	-0.7588	(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													206.4861 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													175.7495
Water heating fuel used													1443.8718 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.5880)													
mechanical ventilation fans (SFP = 0.5880)													85.8077 (230a)
Total electricity for the above, kWh/year													85.8077 (231)
Electricity for lighting (calculated in Appendix L)													119.1855 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-1460.1462 (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													395.2050 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	206.4861	16.4900	34.0496 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1443.8718	16.4900	238.0945 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	85.8077	16.4900	14.1497 (249)
Energy for lighting	119.1855	16.4900	19.6537 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1108.3431	16.4900	-182.7658
PV Unit electricity exported	-351.8031	5.5900	-19.6658
Total			-202.4316 (252)
Total energy cost			103.5158 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.3929 (257)
SAP value		93.6306
SAP rating (Section 12)		94 (258)
SAP band		A

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	206.4861	0.1574	32.4958 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1443.8718	0.1415	204.2718 (264)
Space and water heating			236.7676 (265)
Pumps, fans and electric keep-hot	85.8077	0.1387	11.9026 (267)
Energy for lighting	119.1855	0.1443	17.2022 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1108.3431	0.1311	-145.2646
PV Unit electricity exported	-351.8031	0.1162	-40.8858
Total			-186.1504 (269)
Total CO2, kg/year			79.7220 (272)
CO2 emissions per m2			1.6000 (273)
EI value			98.8736
EI rating			99 (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 (m ²)	x	Storey height (m)	=	Volume (m ³)
Ground floor	49.8400 (1b)		2.4000 (2b)		119.6160 (1b) - (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.8400				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 119.6160 (5)
Dwelling volume					

2. Ventilation rate

		m ³ per hour
Number of open chimneys		0 * 80 = 0.0000 (6a)
Number of open flues		0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 = 0.0000 (6d)
Number of flues attached to other heater		0 * 35 = 0.0000 (6e)
Number of blocked chimneys		0 * 20 = 0.0000 (6f)
Number of intermittent extract fans		0 * 10 = 0.0000 (7a)
Number of passive vents		0 * 10 = 0.0000 (7b)
Number of flueless gas fires		0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) = 0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		1.0000 (17)
Infiltration rate		0.0500 (18)
Number of sides sheltered		1 (19)
Shelter factor		(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) = 0.0463 (21)
Wind speed	Jan 4.2000 Feb 4.1000 Mar 4.3000 Apr 3.9000 May 3.7000 Jun 3.4000 Jul 3.5000 Aug 3.2000 Sep 3.6000 Oct 3.9000 Nov 3.5000 Dec 3.9000	(22)
Wind factor	1.0500 1.0250 1.0750 0.9750 0.9250 0.8500 0.8750 0.8000 0.9000 0.9750 0.8750	(22a)
Adj infilt rate	0.0486 0.0474 0.0497 0.0451 0.0428 0.0393 0.0405 0.0370 0.0416 0.0451 0.0405 0.0451	(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)		81.9000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		
Effective ac	0.1391 0.1379 0.1402 0.1356 0.1333 0.1298 0.1310 0.1275 0.1321 0.1356 0.1310 0.1356	(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
Windows/Doors (Uw = 1.00)			11.7400	0.9615	11.2885		(27)
Non-Vision Panels			6.6000	1.0000	6.6000		(26)
Cavity Wall	64.4400	18.3400	46.1000	0.1300	5.9930	60.0000	2766.0000 (29a)
Flat Roof	49.8400		49.8400	0.1200	5.9808	9.0000	448.5600 (30)
Total net area of external elements Aum(A, m ²)			114.2800				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 29.8623		(33)
Party Walls			10.6800	0.0000	0.0000	180.0000	1922.4000 (32)
Party Floor 1			49.8400			30.0000	1495.2000 (32d)
Internal Walls			75.8400			9.0000	682.5600 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 7314.7200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							146.7640 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value		Total
E2 Other lintels (including other steel lintels)				9.8000	0.0580		0.5684
E3 Sill				5.4000	0.0450		0.2430
E4 Jamb				27.8000	0.0500		1.3900
E7 Party floor between dwellings (in blocks of flats)				26.8500	0.0000		0.0000
E16 Corner (normal)				4.8000	0.0440		0.2112
E18 Party wall between dwellings				4.8000	0.0620		0.2976
E14 Flat roof				26.8500	0.1600		4.2960
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.0062 (36)
Point Thermal bridges							(36a) = 0.0000
Total fabric heat loss							(33) + (36) + (36a) = 36.8685 (37)

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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	5.4893	5.4436	5.5349	5.3523	5.2610	5.1241	5.1698	5.0328	5.2154	5.3523	5.1698	5.3523 (38)
Average = Sum(39)m / 12 =	42.3577	42.3121	42.4034	42.2208	42.1295	41.9926	42.0382	41.9013	42.0839	42.2208	42.0382	42.2208 (39)
HLP	0.8499	0.8490	0.8508	0.8471	0.8453	0.8425	0.8435	0.8407	0.8444	0.8471	0.8435	0.8471 (40)
HLP (average)												0.8459
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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 (42)
Hot water usage for baths	63.6313	62.6863	61.3555	58.9018	57.0645	55.0272	53.9268	55.2482	56.6871	58.8670	61.3713	63.4162 (42b)
Hot water usage for other uses	33.5685	32.3478	31.1272	29.9065	28.6858	27.4652	27.4652	28.6858	29.9065	31.1272	32.3478	33.5685 (42c)
Average daily hot water use (litres/day)												89.5131 (43)
Daily hot water use	97.1998	95.0341	92.4827	88.8083	85.7503	82.4924	81.3919	83.9341	86.5936	89.9942	93.7191	96.9847 (44)
Energy content (annual)	153.9408	135.3274	142.1425	121.5741	115.4364	101.4340	98.4365	103.9279	106.7785	122.1213	133.5201	151.8546 (45)
Distribution loss (46)m = 0.15 x (45)m	23.0911	20.2991	21.3214	18.2361	17.3155	15.2151	14.7655	15.5892	16.0168	18.3182	20.0280	22.7782 (46)
Water storage loss:												150.0000 (47)
Store volume												1.8600 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.7800 (49)
Temperature factor from Table 2b												1.4508 (55)
Enter (49) or (54) in (55)												
Total storage loss	44.9748	40.6224	44.9748	43.5240	44.9748	43.5240	44.9748	44.9748	43.5240	44.9748	43.5240	44.9748 (56)
If cylinder contains dedicated solar storage	44.9748	40.6224	44.9748	43.5240	44.9748	43.5240	44.9748	44.9748	43.5240	44.9748	43.5240	44.9748 (57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	253.7732	225.4986	241.9749	218.1861	215.2688	167.4700	166.6737	172.1651	172.8145	221.9537	230.1321	251.6870 (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	253.7732	225.4986	241.9749	218.1861	215.2688	167.4700	166.6737	172.1651	172.8145	221.9537	230.1321	251.6870 (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	95.0714	84.6354	91.1484	82.8938	82.2687	51.7364	51.3400	53.1659	53.5135	84.4914	86.8658	94.3777 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.8719	14.9855	12.1870	9.2264	6.8968	5.8226	6.2915	8.1779	10.9764	13.9371	16.2666	17.3409 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.1319	221.4058	215.6757	203.4768	188.0780	173.6052	163.9366	161.6627	167.3928	179.5917	194.9905	209.4633 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	46.7977	46.7977	46.7977	46.7977	46.7977	46.7977	46.7977	46.7977	46.7977	46.7977	46.7977	46.7977 (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)	-67.4156	-67.4156	-67.4156	-67.4156	-67.4156	-67.4156	-67.4156	-67.4156	-67.4156	-67.4156	-67.4156	-67.4156 (71)
Water heating gains (Table 5)	127.7841	125.9455	122.5114	115.1303	110.5762	71.8561	69.0054	71.4596	74.3242	113.5637	120.6470	126.8518 (72)
Total internal gains	444.2936	442.8424	430.8796	408.3390	386.0566	331.7895	319.7391	321.8058	333.1991	387.5980	412.4097	434.1615 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b g	Specific data or Table 6c FF	Access factor Table 6d	Gains W
North	2.1000	11.9957	0.5700	0.7000	0.7700	6.9655 (74)
South	5.2300	51.1372	0.5700	0.7000	0.7700	73.9511 (78)
West	4.4100	22.3485	0.5700	0.7000	0.7700	27.2517 (80)

Solar gains	108.1683	171.7409	237.2577	312.1630	348.3019	373.3013	352.9928	322.9980	279.4544	201.1824	129.9448	91.2670 (83)
Total gains	552.4618	614.5833	668.1373	720.5020	734.3585	705.0908	672.7318	644.8037	612.6535	588.7804	542.3545	525.4285 (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	47.9692	48.0210	47.9176	48.1248	48.2291	48.3863	48.3338	48.4917	48.2814	48.1248	48.3338	48.1248
alpha	4.1979	4.2014	4.1945	4.2083	4.2153	4.2258	4.2223	4.2328	4.2188	4.2083	4.2223	4.2083
util living area	0.8875	0.8424	0.7570	0.6260	0.4752	0.3256	0.2184	0.2336	0.4255	0.6514	0.8264	0.9010 (86)
Living	20.3938	20.5223	20.6974	20.8366	20.9029	20.9232	20.9263	20.9263	20.9151	20.8367	20.6152	20.3552
Non living	19.5167	19.6706	19.8741	20.0313	20.1004	20.1205	20.1217	20.1243	20.1130	20.0349	19.7893	19.4725
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.6899	20.5223	20.6974	20.8366	20.9029	20.9232	20.9263	20.9263	20.9151	20.8367	20.6152	20.4454 (87)
Th 2	20.2103	20.2111	20.2095	20.2127	20.2142	20.2166	20.2158	20.2182	20.2150	20.2127	20.2158	20.2127 (88)
util rest of house	0.8726	0.8234	0.7305	0.5916	0.4345	0.2800	0.1696	0.1830	0.3749	0.6110	0.8026	0.8873 (89)
MIT 2	19.9338	19.6706	19.8741	20.0313	20.1004	20.1205	20.1217	20.1243	20.1130	20.0349	19.7893	19.6059 (90)
Living area fraction												fLA = Living area / (4) =
MIT	20.2882	20.0698	20.2600	20.4088	20.4765	20.4968	20.4988	20.5002	20.4889	20.4107	20.1764	19.9994 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2882	20.0698	20.2600	20.4088	20.4765	20.4968	20.4988	20.5002	20.4889	20.4107	20.1764	19.9994 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8741	0.8197	0.7323	0.6004	0.4483	0.2963	0.1873	0.2013	0.3927	0.6215	0.8013	0.8832 (94)
Useful gains	482.9280	503.7897	489.2598	432.5783	329.1763	208.9462	125.9790	129.7846	240.5975	365.9243	434.6058	464.0640 (95)
Ext temp.	4.6000	5.1000	7.0000	9.5000	12.5000	15.5000	17.5000	17.4000	14.7000	11.1000	7.5000	4.6000 (96)
Heat loss rate W	664.5152	633.4026	562.2678	460.5762	336.0474	209.8270	126.0661	129.9023	243.6209	393.1041	532.8941	650.1737 (97)
Space heating kWh	135.1009	87.0998	54.3179	20.1585	5.1121	0.0000	0.0000	0.0000	0.0000	20.2218	70.7676	138.4656 (98a)
Space heating requirement - total per year (kWh/year)												531.2442
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	135.1009	87.0998	54.3179	20.1585	5.1121	0.0000	0.0000	0.0000	0.0000	20.2218	70.7676	138.4656 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												531.2442
Space heating per m2												(98c) / (4) =
												10.6590 (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 %)												292.4385 (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	135.1009	87.0998	54.3179	20.1585	5.1121	0.0000	0.0000	0.0000	0.0000	20.2218	70.7676	138.4656 (98)
Space heating efficiency (main heating system 1)	292.4385	292.4385	292.4385	292.4385	292.4385	0.0000	0.0000	0.0000	0.0000	292.4385	292.4385	292.4385 (210)
Space heating fuel (main heating system)	46.1980	29.7840	18.5741	6.8932	1.7481	0.0000	0.0000	0.0000	0.0000	6.9149	24.1991	47.3486 (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	253.7732	225.4986	241.9749	218.1861	215.2688	167.4700	166.6737	172.1651	172.8145	221.9537	230.1321	251.6870 (64)
Efficiency of water heater (217)m	175.5532	175.5532	175.5532	175.5532	175.5532	175.5532	175.5532	175.5532	175.5532	175.5532	175.5532	175.5532 (216)
Fuel for water heating, kWh/month	144.5563	128.4503	137.8356	124.2849	122.6231	95.3956	94.9420	98.0700	98.4400	126.4310	131.0896	143.3679 (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	7.2878	6.5825	7.2878	7.0527	7.2878	7.0527	7.2878	7.2878	7.0527	7.2878	7.0527	7.2878 (231)
Lighting	14.7679	11.8474	10.6672	7.8153	6.0367	4.9321	5.5069	7.1581	9.2977	12.1990	13.7788	15.1784 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-32.7815	-54.0238	-97.0363	-134.5104	-158.4623	-155.9929	-151.9205	-137.4408	-108.4554	-73.0733	-39.4396	-26.4333 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												

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(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-1.5020	-4.8111	-16.0993	-40.2250	-65.5233	-85.0976	-80.0646	-59.1180	-31.9964	-10.3499	-2.5854	-0.9935	(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													181.6601 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													175.5532
Water heating fuel used													1445.4863 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.5880)													
mechanical ventilation fans (SFP = 0.5880)													85.8077 (230a)
Total electricity for the above, kWh/year													85.8077 (231)
Electricity for lighting (calculated in Appendix L)													119.1855 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-1567.9365 (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													264.2032 (238)

10a. Fuel costs - using BEDF prices (528)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	181.6601	21.5100	39.0751 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1445.4863	21.5100	310.9241 (247)
Energy for instantaneous electric shower(s)	0.0000	21.5100	0.0000 (247a)
Pumps, fans and electric keep-hot	85.8077	21.5100	18.4572 (249)
Energy for lighting	119.1855	21.5100	25.6368 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1169.5702	21.5100	-251.5746
PV Unit electricity exported	-398.3663	5.5900	-22.2687
Total			-273.8432 (252)
Total energy cost			120.2500 (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	181.6601	0.1578	28.6664 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1445.4863	0.1415	204.5002 (264)
Space and water heating			233.1666 (265)
Pumps, fans and electric keep-hot	85.8077	0.1387	11.9026 (267)
Energy for lighting	119.1855	0.1443	17.2022 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1169.5702	0.1312	-153.3950
PV Unit electricity exported	-398.3663	0.1157	-46.0976
Total			-199.4926 (269)
Total CO2, kg/year			62.7787 (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	181.6601	1.5841	287.7749 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1445.4863	1.5232	2201.7209 (278)
Space and water heating			2489.4957 (279)
Pumps, fans and electric keep-hot	85.8077	1.5128	129.8099 (281)
Energy for lighting	119.1855	1.5338	182.8108 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1169.5702	1.4845	-1736.2609

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PV Unit electricity exported	-398.3663	0.4240	-168.9191
Total			-1905.1800 (283)
Total Primary energy kWh/year			896.9364 (286)