Full SAP Calculation Printout

Property Reference	House - 37 New OS Green	Issued on Date	06/05/2023
Assessment Reference	00001	Prop Type Ref	House - 10-12 Museum Street
Property	Museum Street, London, WC1A		

SAP Rating	78 C	DER	4.16	TER	12.04
Environmental	96 A	% DER < TER			65.45
CO_2 Emissions (t/year)	0.48	DFEE	64.45	TFEE	37.19
Compliance Check	See BREL	% DFEE < TFEE			-73.32
% DPER < TPER	33.87	DPER	43.46	TPER	65.72

Assessor Details	Mr. Adrian Fell	Assessor ID	N222-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	5.4400	(1b)	x 3.1600	(2b) =	17.1904	(1b) -
First floor	44.0000	(1c)	x 3.2500	(2c) =	143.0000	(1c) -
Second floor	44.0000	(1d)	x 3.0400	(2d) =	133.7600	(1d) -
Third floor	44.0000	(1e)	x 2.8400	(2e) =	124.9600	(1e) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.4400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		418.9104	(5)

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2. Ventilation rate

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	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		10.0000 (17)
Infiltration rate		0.5000 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3875 (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	0.4941	0.4844	0.4747	0.4263	0.4166	0.3681	0.3681	0.3584	0.3875	0.4166	0.4359	0.4553	(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) =	83.7000 (23c)

Effective ac	0.5756	0.5659	0.5562	0.5078	0.4981	0.4496	0.4496	0.4399	0.4690	0.4981	0.5174	0.5368	(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 (Uw = 1.50)			20.8200	1.4151	29.4623		(27)
Solid Door			1.7900	3.0000	5.3700		(26)
Opening			1.0800	1.4151	1.5283		(27a)
GF			5.4400	0.2500	1.3600		(28a)
1F			38.5800	0.2500	9.6450		(28b)
External Wall 1	66.3700	22.6100	43.7600	0.3000	13.1280		(29a)
Sheltered Wall	41.0800		41.0800	0.3000	12.3240		(29a)
Flat Roof	44.0000	1.0800	42.9200	0.1600	6.8672		(30)
Total net area of external elements Aum(A, m2)			195.4700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		79.6848		(33)
Party Wall 1			170.3700	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		250.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)		39.0940 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	118.7788 (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	79.5660	78.2268	76.8876	70.1916	68.8524	62.1564	62.1564	60.8171	64.8348	68.8524	71.5308	74.2092	(38)
Heat transfer coeff	198.3448	197.0056	195.6664	188.9703	187.6311	180.9351	180.9351	179.5959	183.6135	187.6311	190.3096	192.9880	(39)
Average = Sum(39)m / 12 =												188.6355	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4431	1.4334	1.4236	1.3749	1.3652	1.3165	1.3165	1.3067	1.3360	1.3652	1.3847	1.4042	(40)
HLP (average)												1.3725	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy											2.9120	(42)
Hot water usage for mixer showers	73.0453	71.9476	70.3479	67.2874	65.0288	62.5100	61.0783	62.6658	64.4060	67.1104	70.2367	72.7654	(42a)
Hot water usage for baths	31.5351	31.0667	30.4072	29.1912	28.2806	27.2710	26.7256	27.3805	28.0936	29.1740	30.4150	31.4285	(42b)
Hot water usage for other uses	44.4523	42.8358	41.2194	39.6029	37.9865	36.3700	36.3700	37.9865	39.6029	41.2194	42.8358	44.4523	(42c)
Average daily hot water use (litres/day)												136.9944	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	149.0326	145.8501	141.9745	136.0815	131.2959	126.1510	124.1739	128.0328	132.1025	137.5037	143.4876	148.6462	(44)
Energy conte	236.0313	207.6886	218.2096	186.2888	176.7495	155.1174	150.1776	158.5313	162.8956	186.5913	204.4243	232.7440	(45)
Energy content (annual)										Total = Sum(45)m =		2275.4493	
Distribution loss (46)m = 0.15 x (45)m	35.4047	31.1533	32.7314	27.9433	26.5124	23.2676	22.5266	23.7797	24.4343	27.9887	30.6637	34.9116	(46)
Water storage loss:													
Store volume												172.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6300	(48)
Temperature factor from Table 2b												0.7800	(49)
Enter (49) or (54) in (55)												1.2714	(55)
Total storage loss	39.4134	35.5992	39.4134	38.1420	39.4134	38.1420	39.4134	39.4134	38.1420	39.4134	38.1420	39.4134	(56)
If cylinder contains dedicated solar storage	39.4134	35.5992	39.4134	38.1420	39.4134	38.1420	39.4134	39.4134	38.1420	39.4134	38.1420	39.4134	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	298.7071	264.2990	280.8854	246.9428	239.4253	215.7714	212.8534	221.2071	223.5496	249.2671	265.0783	295.4198	(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	298.7071	264.2990	280.8854	246.9428	239.4253	215.7714	212.8534	221.2071	223.5496	249.2671	265.0783	295.4198	(64)
										Total per year (kWh/year) = Sum(64)m =		3013.4063	(64)
12Total per year (kWh/year)												3013	(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	128.6210	114.3448	122.6953	110.4642	108.9098	100.0997	100.0747	102.8523	102.6860	112.1822	116.4943	127.5280	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	145.6023	145.6023	145.6023	145.6023	145.6023	145.6023	145.6023	145.6023	145.6023	145.6023	145.6023	145.6023	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	161.0875	178.3469	161.0875	166.4571	161.0875	166.4571	161.0875	161.0875	166.4571	161.0875	166.4571	161.0875	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	306.4821	309.6624	301.6481	284.5866	263.0494	242.8076	229.2848	226.1045	234.1188	251.1803	272.7174	292.9593	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.5602	37.5602	37.5602	37.5602	37.5602	37.5602	37.5602	37.5602	37.5602	37.5602	37.5602	37.5602	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-116.4819	-116.4819	-116.4819	-116.4819	-116.4819	-116.4819	-116.4819	-116.4819	-116.4819	-116.4819	-116.4819	-116.4819	(71)

Water heating gains (Table 5)

	172.8777	170.1559	164.9131	153.4225	146.3842	139.0274	134.5090	138.2424	142.6194	150.7826	161.7976	171.4086 (72)

Total internal gains

	707.1280	724.8459	694.3293	671.1469	637.2018	614.9727	591.5620	592.1150	609.8760	629.7311	667.6528	692.1361 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	14.5200	10.6334	0.6200	0.7000	0.7700	46.4367 (74)
Southeast	6.3000	36.7938	0.6200	0.7000	0.7700	69.7170 (77)
South	1.0800	26.0000	0.6200	0.7000	1.0000	10.9680 (82)

Solar gains	127.1217	230.2765	353.7775	506.8198	632.7847	657.5418	621.6821	522.7619	405.7540	264.7271	154.7115	107.2339 (83)
Total gains	834.2497	955.1224	1048.1068	1177.9667	1269.9866	1272.5146	1213.2441	1114.8769	1015.6300	894.4582	822.3643	799.3700 (84)

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7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	48.1205	48.4476	48.7792	50.5076	50.8681	52.7506	52.7506	53.1440	51.9812	50.8681	50.1522	49.4562	
alpha	4.2080	4.2298	4.2519	4.3672	4.3912	4.5167	4.5167	4.5429	4.4654	4.3912	4.3435	4.2971	
util living area	0.9977	0.9956	0.9908	0.9724	0.9177	0.7781	0.6189	0.6803	0.8946	0.9821	0.9957	0.9982	(86)
MIT	19.1638	19.3529	19.6637	20.1451	20.5651	20.8730	20.9657	20.9487	20.7297	20.1947	19.6338	19.1779	(87)
Th 2	19.7304	19.7378	19.7452	19.7826	19.7901	19.8280	19.8280	19.8356	19.8128	19.7901	19.7751	19.7601	(88)
util rest of house	0.9969	0.9940	0.9872	0.9605	0.8792	0.6813	0.4720	0.5360	0.8300	0.9722	0.9938	0.9975	(89)
MIT 2	17.6128	17.8595	18.2610	18.8933	19.4035	19.7512	19.8169	19.8166	19.6134	18.9670	18.2443	17.6504	(90)
Living area fraction										fLA = Living area / (4) =		0.1430	(91)
MIT	17.8346	18.0731	18.4616	19.0723	19.5697	19.9117	19.9813	19.9786	19.7730	19.1426	18.4431	17.8689	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.8346	18.0731	18.4616	19.0723	19.5697	19.9117	19.9813	19.9786	19.7730	19.1426	18.4431	17.8689	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9949	0.9907	0.9816	0.9508	0.8702	0.6892	0.4926	0.5555	0.8272	0.9643	0.9906	0.9959	(94)
Useful gains	830.0349	946.2736	1028.8131	1120.0511	1105.2041	877.0045	597.7001	619.2986	840.1399	862.5706	814.6228	796.0691	(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	2684.5255	2595.1693	2340.4906	1922.2687	1476.5940	961.0738	611.7893	642.6931	1041.6465	1602.8547	2158.6947	2637.9405	(97)
Space heating kWh	1379.7410	1108.0579	975.8881	577.5967	276.3140	0.0000	0.0000	0.0000	0.0000	550.7714	967.7318	1370.3523	(98a)
Space heating requirement - total per year (kWh/year)												7206.4532	
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	1379.7410	1108.0579	975.8881	577.5967	276.3140	0.0000	0.0000	0.0000	0.0000	550.7714	967.7318	1370.3523	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												7206.4532	
Space heating per m2											(98c) / (4) =	52.4334	(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	1700.7901	1338.9199	1364.9290	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7247	0.8116	0.7653	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1232.6372	1086.7177	1044.6045	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1381.0313	1316.1389	1205.5637	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	106.8438	170.6893	119.7536	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		0.9968	(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	26.6254	42.5357	29.8426	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												99.0037	(107)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (301)
Fraction of space heat from community system												1.0000 (302)
Fraction of heat from community Heat pump-Space and Water												1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating												1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system												1.0000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement												
	1379.7410	1108.0579	975.8881	577.5967	276.3140	0.0000	0.0000	0.0000	0.0000	550.7714	967.7318	1370.3523 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00												
307a	1379.7410	1108.0579	975.8881	577.5967	276.3140	0.0000	0.0000	0.0000	0.0000	550.7714	967.7318	1370.3523
Space heating requirement												
	1379.7410	1108.0579	975.8881	577.5967	276.3140	0.0000	0.0000	0.0000	0.0000	550.7714	967.7318	1370.3523 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Water heating												
Annual water heating requirement												
	298.7071	264.2990	280.8854	246.9428	239.4253	215.7714	212.8534	221.2071	223.5496	249.2671	265.0783	295.4198 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00												
310a	298.7071	264.2990	280.8854	246.9428	239.4253	215.7714	212.8534	221.2071	223.5496	249.2671	265.0783	295.4198
Water heating fuel												
	298.7071	264.2990	280.8854	246.9428	239.4253	215.7714	212.8534	221.2071	223.5496	249.2671	265.0783	295.4198 (310)
Cooling System Energy Efficiency Ratio												4.3000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	6.1920	9.8920	6.9401	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	48.7015	43.9885	48.7015	47.1305	48.7015	47.1305	48.7015	48.7015	47.1305	48.7015	47.1305	48.7015 (331)
Lighting	29.5941	23.7415	21.3766	15.6614	12.0973	9.8836	11.0356	14.3444	18.6320	24.4462	27.6119	30.4166 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)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 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)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 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)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 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)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 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)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 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)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 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												7206.4532 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												3013.4063 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												72.0645 (313)
Space cooling fuel												23.0241 (321)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.7000, SFP = 1.1220)												
mechanical ventilation fans (SFP = 1.1220)												573.4213 (330a)
Total electricity for the above, kWh/year												573.4213 (331)
Electricity for lighting (calculated in Appendix L)												238.8412 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (333)
Wind generation												0.0000 (334)
Hydro-electric generation (Appendix N)												0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (335)
Appendix Q - special features												
Energy saved or generated												-0.0000 (336)
Energy used												0.0000 (337)
Total delivered energy for all uses												11055.1461 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			350.0000	(367)
Space and Water heating from Heat pump	2919.9598	0.1547	318.5622	(367)
Electrical energy for heat distribution (space & water)	72.0645	0.0000	15.3949	(372)
Overall CO2 factor for heat network			0.0445	(386)
Total CO2 associated with community systems			455.2478	(373)
Space and water heating			455.2478	(376)
Space cooling	23.0241	0.1137	2.6183	(377)
Pumps, fans and electric keep-hot	573.4213	0.1387	79.5406	(378)
Energy for lighting	238.8412	0.1443	34.4722	(379)
Total CO2, kg/year			571.8789	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.1600	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			350.0000	(467a)
Space and Water heating from Heat pump	2919.9598	1.5728	3238.4020	(467)
Electrical energy for heat distribution (space & water)	72.0645	0.0000	159.1752	(472)

Overall CO2 factor for heat network			0.4606 (486)
Total CO2 associated with community systems			4707.0387 (473)
Space and water heating			4707.0387 (476)
Space cooling	23.0241	1.4192	32.6768 (477)
Pumps, fans and electric keep-hot	573.4213	1.5128	867.4718 (478)
Energy for lighting	238.8412	1.5338	366.3426 (479)
Total Primary energy kWh/year			5973.5299 (483)
Dwelling Primary energy Rate (DPER)			43.4600 (484)

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	5.4400 (1b)	x	3.1600 (2b)	=	17.1904 (1b)	-
First floor	44.0000 (1c)	x	3.2500 (2c)	=	143.0000 (1c)	-
Second floor	44.0000 (1d)	x	3.0400 (2d)	=	133.7600 (1d)	-
Third floor	44.0000 (1e)	x	2.8400 (2e)	=	124.9600 (1e)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.4400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	418.9104	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.0955	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3455	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2678	(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	0.3414	0.3347	0.3280	0.2945	0.2878	0.2544	0.2544	0.2477	0.2678	0.2878	0.3012	0.3146	(22b)
Effective ac	0.5583	0.5560	0.5538	0.5434	0.5414	0.5324	0.5324	0.5307	0.5358	0.5414	0.5454	0.5495	(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			1.7900	1.0000	1.7900			(26)
TER Opening Type (Uw = 1.20)			20.8200	1.1450	23.8397			(27)
Opening			1.0800	1.5918	1.7191			(27a)
GF			5.4400	0.1300	0.7072			(28a)
1F			38.5800	0.1300	5.0154			(28b)
External Wall 1	66.3700	22.6100	43.7600	0.1800	7.8768			(29a)
Sheltered Wall	41.0800		41.0800	0.1800	7.3944			(29a)
Flat Roof	44.0000	1.0800	42.9200	0.1100	4.7212			(30)
Total net area of external elements Aum(A, m2)			195.4700					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	53.0638			(33)
Party Wall 1			170.3700	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (User defined value 0.050 * total exposed area)							9.7735	(36)
Point Thermal bridges						(36a) =	0.0000	

Total fabric heat loss (33) + (36) + (36a) = 62.8373 (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	77.1757	76.8629	76.5562	75.1161	74.8467	73.5924	73.5924	73.3601	74.0755	74.8467	75.3918	75.9616	(38)
Heat transfer coeff	140.0130	139.7001	139.3935	137.9534	137.6840	136.4297	136.4297	136.1974	136.9128	137.6840	138.2290	138.7989	(39)

Average = Sum(39)m / 12 = 137.9521

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0187	1.0164	1.0142	1.0037	1.0018	0.9926	0.9926	0.9910	0.9962	1.0018	1.0057	1.0099	(40)
HLP (average)												1.0037	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9120 (42)

Hot water usage for mixer showers	73.0453	71.9476	70.3479	67.2874	65.0288	62.5100	61.0783	62.6658	64.4060	67.1104	70.2367	72.7654 (42a)
Hot water usage for baths	31.5351	31.0667	30.4072	29.1912	28.2806	27.2710	26.7256	27.3805	28.0936	29.1740	30.4150	31.4285 (42b)
Hot water usage for other uses	44.4523	42.8358	41.2194	39.6029	37.9865	36.3700	36.3700	37.9865	39.6029	41.2194	42.8358	44.4523 (42c)

Average daily hot water use (litres/day) 136.9944 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	149.0326	145.8501	141.9745	136.0815	131.2959	126.1510	124.1739	128.0328	132.1025	137.5037	143.4876	148.6462	(44)
Energy conte	236.0313	207.6886	218.2096	186.2888	176.7495	155.1174	150.1776	158.5313	162.8956	186.5913	204.4243	232.7440	(45)

Energy content (annual) Total = Sum(45)m = 2275.4493

Distribution loss (46)m = 0.15 x (45)m

	35.4047	31.1533	32.7314	27.9433	26.5124	23.2676	22.5266	23.7797	24.4343	27.9887	30.6637	34.9116 (46)

Water storage loss:

Store volume 172.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.5107 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.8158 (55)

Total storage loss

	25.2896	22.8422	25.2896	24.4738	25.2896	24.4738	25.2896	25.2896	24.4738	25.2896	24.4738	25.2896 (56)

If cylinder contains dedicated solar storage

	25.2896	22.8422	25.2896	24.4738	25.2896	24.4738	25.2896	25.2896	24.4738	25.2896	24.4738	25.2896 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)

Total heat required for water heating calculated for each month

	284.5833	251.5421	266.7616	233.2746	225.3015	202.1032	198.7297	207.0834	209.8814	235.1433	251.4102	281.2960 (62)
WWHRS	-33.3933	-29.5333	-30.9255	-25.6076	-23.8653	-20.4217	-19.1421	-20.3557	-21.1291	-24.9089	-28.2188	-32.7749 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	251.1900	222.0088	235.8361	207.6670	201.4362	181.6815	179.5875	186.7276	188.7523	210.2344	223.1914	248.5211 (64)

Total per year (kWh/year) = Sum(64)m = 2536.8341 (64)

12Total per year (kWh/year) 2537 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)

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

Heat gains from water heating, kWh/month

	117.3220	104.1392	111.3963	99.5297	97.6108	89.1652	88.7757	91.5533	91.7515	100.8832	105.5598	116.2290 (65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.6023	145.6023	145.6023	145.6023	145.6023	145.6023	145.6023	145.6023	145.6023	145.6023	145.6023	145.6023	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	161.0875	178.3469	161.0875	166.4571	161.0875	166.4571	161.0875	161.0875	166.4571	161.0875	166.4571	161.0875	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	306.4821	309.6624	301.6481	284.5866	263.0494	242.8076	229.2848	226.1045	234.1188	251.1803	272.7174	292.9593	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.5602	37.5602	37.5602	37.5602	37.5602	37.5602	37.5602	37.5602	37.5602	37.5602	37.5602	37.5602	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-116.4819	-116.4819	-116.4819	-116.4819	-116.4819	-116.4819	-116.4819	-116.4819	-116.4819	-116.4819	-116.4819	-116.4819	(71)
Water heating gains (Table 5)	157.6909	154.9691	149.7262	138.2357	131.1973	123.8405	119.3222	123.0555	127.4326	135.5957	146.6108	156.2218	(72)
Total internal gains	694.9411	712.6590	682.1425	658.9600	625.0150	599.7859	576.3751	576.9281	594.6891	617.5442	655.4660	679.9492	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W

North			14.5200		10.6334		0.6300		0.7000		0.7700	47.1857 (74)
Southeast			6.3000		36.7938		0.6300		0.7000		0.7700	70.8414 (77)
South			1.0800		26.0000		0.6300		0.7000		1.0000	11.1450 (82)
Solar gains	129.1721	233.9907	359.4835	514.9943	642.9910	668.1473	631.7093	531.1935	412.2984	268.9969	157.2069	108.9635 (83)
Total gains	824.1132	946.6497	1041.6260	1173.9543	1268.0059	1267.9332	1208.0844	1108.1216	1006.9876	886.5411	812.6728	788.9127 (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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.1683	68.3209	68.4712	69.1860	69.3214	69.9587	69.9587	70.0780	69.7118	69.3214	69.0480	68.7646	
alpha	5.5446	5.5547	5.5647	5.6124	5.6214	5.6639	5.6639	5.6719	5.6475	5.6214	5.6032	5.5843	
util living area	0.9980	0.9953	0.9877	0.9544	0.8531	0.6604	0.4921	0.5555	0.8212	0.9732	0.9953	0.9984	(86)
MIT	19.7888	19.9552	20.2064	20.5602	20.8407	20.9712	20.9953	20.9912	20.9055	20.5438	20.1089	19.7641	(87)
Th 2	20.0678	20.0697	20.0715	20.0802	20.0819	20.0895	20.0895	20.0909	20.0865	20.0819	20.0786	20.0751	(88)
util rest of house	0.9973	0.9937	0.9834	0.9382	0.8063	0.5780	0.3928	0.4508	0.7504	0.9605	0.9935	0.9979	(89)
MIT 2	18.6469	18.8607	19.1814	19.6268	19.9464	20.0730	20.0879	20.0877	20.0207	19.6149	19.0645	18.6206	(90)
Living area fraction									fLA = Living area / (4) =			0.1430	(91)
MIT	18.8102	19.0173	19.3280	19.7604	20.0743	20.2014	20.2177	20.2169	20.1472	19.7478	19.2139	18.7842	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8102	19.0173	19.3280	19.7604	20.0743	20.2014	20.2177	20.2169	20.1472	19.7478	19.2139	18.7842	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9960	0.9911	0.9788	0.9312	0.8059	0.5886	0.4070	0.4657	0.7557	0.9544	0.9910	0.9968	(94)
Useful gains	820.8129	938.2333	1019.4925	1093.2247	1021.8374	746.3379	491.7279	516.0569	760.9973	846.1225	805.3291	786.4117	(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	2031.6186	1972.1862	1788.1382	1498.2231	1153.0131	764.2038	493.5666	519.8525	827.9444	1259.5022	1674.4874	2024.2719	(97)
Space heating kWh	900.8395	694.8163	571.8724	291.5989	97.5947	0.0000	0.0000	0.0000	0.0000	307.5545	625.7940	920.9679	(98a)
Space heating requirement - total per year (kWh/year)												4411.0383	
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	900.8395	694.8163	571.8724	291.5989	97.5947	0.0000	0.0000	0.0000	0.0000	307.5545	625.7940	920.9679	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4411.0383	
Space heating per m2										(98c) / (4) =		32.0943	(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	900.8395	694.8163	571.8724	291.5989	97.5947	0.0000	0.0000	0.0000	0.0000	307.5545	625.7940	920.9679	(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)	975.9908	752.7804	619.5801	315.9251	105.7364	0.0000	0.0000	0.0000	0.0000	333.2118	678.0000	997.7984	(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	251.1900	222.0088	235.8361	207.6670	201.4362	181.6815	179.5875	186.7276	188.7523	210.2344	223.1914	248.5211	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.6687	86.4393	85.9690	84.8210	82.5299	79.8000	79.8000	79.8000	79.8000	84.9117	86.2429	86.7216	(217)
Fuel for water heating, kWh/month	289.8278	256.8377	274.3268	244.8299	244.0765	227.6710	225.0470	233.9945	236.5317	247.5918	258.7938	286.5736	(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	33.4708	26.8515	24.1768	17.7130	13.6820	11.1783	12.4812	16.2235	21.0727	27.6486	31.2290	34.4011	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-6.9324	-10.9407	-17.5763	-22.1577	-26.1084	-25.1966	-24.8858	-22.3579	-18.3692	-13.4764	-8.0221	-5.8651	(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	-1.0328	-2.2842	-4.7624	-7.5013	-10.2816	-10.4753	-10.3593	-8.6054	-6.0922	-3.3804	-1.4128	-0.8091	(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	4779.0231	(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	3026.1022	(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)	270.1285	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-268.8856	(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	7892.3682	(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	4779.0231	0.2100	1003.5948	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3026.1022	0.2100	635.4815	(264)
Space and water heating			1639.0763	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	270.1285	0.1443	38.9879	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-201.8888	0.1323	-26.7157	
PV Unit electricity exported	-66.9968	0.1245	-8.3424	
Total			-35.0582	(269)
Total CO2, kg/year			1654.9353	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.0400	(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	4779.0231	1.1300	5400.2961	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3026.1022	1.1300	3419.4955	(278)
Space and water heating			8819.7916	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	270.1285	1.5338	414.3321	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-201.8888	1.4889	-300.5991	
PV Unit electricity exported	-66.9968	0.4570	-30.6176	
Total			-331.2168	(283)
Total Primary energy kWh/year			9033.0077	(286)
Target Primary Energy Rate (TPER)			65.7200	(287)

Full SAP Calculation Printout

Property Reference	1.F Flat - 10-12 MS Green	Issued on Date	06/05/2023
Assessment Reference	00001	Prop Type Ref	Flat - 10-12 Museum Street
Property	Museum Street, London, WC1A		

SAP Rating	75 C	DER	6.00	TER	16.66
Environmental	96 A	% DER < TER			63.99
CO_2 Emissions (t/year)	0.27	DFEE	86.40	TFEE	43.84
Compliance Check	See BREL	% DFEE < TFEE			-97.08
% DPER < TPER	29.15	DPER	62.95	TPER	88.85

Assessor Details	Mr. Adrian Fell	Assessor ID	N222-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	52.0000	(1b)	x 3.1100	(2b) =	161.7200	(1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		161.7200	(5)

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2. Ventilation rate

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	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) =	0.1237 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			10.0000 (17)
Infiltration rate			0.6237 (18)
Number of sides sheltered			3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.4833 (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	0.6163	0.6042	0.5921	0.5317	0.5196	0.4592	0.4592	0.4471	0.4833	0.5196	0.5438	0.5679	(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	0.6899	0.6825	0.6753	0.6413	0.6350	0.6054	0.6054	0.5999	0.6168	0.6350	0.6478	0.6613	(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 (Uw = 1.50)			15.1200	1.4151	21.3962			(27)
Solid Door			1.8900	3.0000	5.6700			(26)
1F			52.0000	0.2500	13.0000			(28b)
External Wall 1	58.5900	17.0100	41.5800	0.3000	12.4740			(29a)
Total net area of external elements Aum(A, m2)			110.5900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		52.5402			(33)

Party Wall 1							38.5300	0.0000	0.0000				(32)
Party Ceiling 1							52.0000						(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												250.0000	(35)
Thermal bridges (Default value 0.200 * total exposed area)												22.1180	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss										(33) + (36) + (36a) =		74.6582	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.8178	36.4243	36.0386	34.2268	33.8879	32.3099	32.3099	32.0177	32.9177	33.8879	34.5736	35.2905	(38)
Heat transfer coeff	111.4760	111.0825	110.6968	108.8851	108.5461	106.9681	106.9681	106.6759	107.5760	108.5461	109.2318	109.9487	(39)
Average = Sum(39)m / 12 =												108.8835	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.1438	2.1362	2.1288	2.0939	2.0874	2.0571	2.0571	2.0515	2.0688	2.0874	2.1006	2.1144	(40)
HLP (average)												2.0939	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7491	(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	23.1496	22.8058	22.3217	21.4290	20.7606	20.0194	19.6190	20.0998	20.6232	21.4163	22.3274	23.0714	(42b)
Hot water usage for other uses	32.5422	31.3589	30.1755	28.9922	27.8088	26.6255	26.6255	27.8088	28.9922	30.1755	31.3589	32.5422	(42c)
Average daily hot water use (litres/day)												51.0472	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	55.6919	54.1647	52.4972	50.4212	48.5694	46.6448	46.2445	47.9086	49.6154	51.5919	53.6863	55.6136	(44)
Energy conte	88.2023	77.1298	80.6862	69.0240	65.3837	57.3553	55.9287	59.3209	61.1808	70.0097	76.4860	87.0774	(45)
Energy content (annual)											Total = Sum(45)m =	847.7848	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	74.9719	65.5603	68.5833	58.6704	55.5762	48.7520	47.5394	50.4227	52.0037	59.5082	65.0131	74.0158	(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	74.9719	65.5603	68.5833	58.6704	55.5762	48.7520	47.5394	50.4227	52.0037	59.5082	65.0131	74.0158	(64)
										Total per year (kWh/year) = Sum(64)m =		720.6170	(64)
12Total per year (kWh/year)												721	(64)
Electric shower(s)	42.8812	38.2075	41.7211	39.8139	40.5610	38.6913	39.9810	40.5610	39.8139	41.7211	40.9366	42.8812	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		487.7707	(64a)
Heat gains from water heating, kWh/month	29.4633	25.9420	27.5761	24.6211	24.0343	21.8608	21.8801	22.7459	22.9544	25.3073	26.4874	29.2242	(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	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.8814	85.1187	76.8814	79.4441	76.8814	79.4441	76.8814	76.8814	79.4441	76.8814	79.4441	76.8814	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	152.4259	154.0076	150.0218	141.5364	130.8251	120.7580	114.0326	112.4509	116.4367	124.9221	135.6334	145.7005	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	(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)	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	(71)
Water heating gains (Table 5)	39.6012	38.6041	37.0646	34.1960	32.3042	30.3622	29.4087	30.5725	31.8811	34.0152	36.7881	39.2799	(72)
Total internal gains	318.1446	326.9665	313.2039	304.4125	289.2467	279.8004	269.5588	269.1408	276.9980	285.0548	301.1016	311.0978	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

					W/m2	or Table 6b		or Table 6c		Table 6d			
Northeast					11.7600	11.2829		0.6200		0.7000	0.7700	39.9073	(75)
Southwest					3.3600	36.7938		0.6200		0.7000	0.7700	37.1824	(79)
Solar gains	77.0897	144.5679	233.0134	347.7309	443.3548	463.8430	437.3336	362.3715	272.1686	169.2716	94.7497	64.4107	(83)
Total gains	395.2343	471.5343	546.2172	652.1434	732.6015	743.6434	706.8924	631.5124	549.1665	454.3264	395.8513	375.5085	(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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	32.3936	32.5084	32.6216	33.1644	33.2680	33.7588	33.7588	33.8512	33.5680	33.2680	33.0591	32.8436	
alpha	3.1596	3.1672	3.1748	3.2110	3.2179	3.2506	3.2506	3.2567	3.2379	3.2179	3.2039	3.1896	
util living area	0.9941	0.9892	0.9782	0.9443	0.8681	0.7322	0.5937	0.6613	0.8640	0.9674	0.9900	0.9950	(86)
MIT	18.4363	18.6897	19.1266	19.7657	20.3423	20.7521	20.9098	20.8706	20.5271	19.7861	19.0206	18.4163	(87)
Th 2	19.2392	19.2441	19.2489	19.2714	19.2757	19.2956	19.2956	19.2992	19.2879	19.2757	19.2671	19.2582	(88)
util rest of house	0.9919	0.9850	0.9693	0.9196	0.8050	0.6000	0.3945	0.4641	0.7702	0.9480	0.9854	0.9932	(89)
MIT 2	17.0166	17.2712	17.7061	18.3398	18.8661	19.1963	19.2788	19.2705	19.0492	18.3759	17.6171	17.0090	(90)
Living area fraction										fLA = Living area / (4) =		0.4683	(91)
MIT	17.6814	17.9355	18.3713	19.0075	19.5574	19.9248	20.0426	20.0198	19.7413	19.0363	18.2743	17.6680	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.6814	17.9355	18.3713	19.0075	19.5574	19.9248	20.0426	20.0198	19.7413	19.0363	18.2743	17.6680	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9889	0.9805	0.9631	0.9147	0.8173	0.6548	0.4890	0.5569	0.8007	0.9443	0.9815	0.9906	(94)
Useful gains	390.8452	462.3465	526.0399	596.4941	598.7730	486.9492	345.6521	351.6669	439.7060	429.0119	388.5355	371.9734	(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	1491.7008	1448.0118	1314.1105	1100.5591	852.8889	569.5870	368.2443	386.1450	606.8637	915.7224	1220.5941	1480.7884	(97)
Space heating kWh	819.0366	662.3670	586.3245	362.9268	189.0623	0.0000	0.0000	0.0000	0.0000	362.1126	599.0822	824.9584	(98a)
Space heating requirement - total per year (kWh/year)												4405.8704	
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	819.0366	662.3670	586.3245	362.9268	189.0623	0.0000	0.0000	0.0000	0.0000	362.1126	599.0822	824.9584	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4405.8704	
Space heating per m2											(98c) / (4) =	84.7283	(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	1005.5005	791.5643	810.7370	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6929	0.7689	0.7142	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	696.6650	608.6361	579.0015	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	841.7040	800.2693	713.6337	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	104.4281	142.5751	100.1663	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	26.1070	35.6438	25.0416	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												86.7924	(107)
Energy for space heating												84.7283	(99)
Energy for space cooling												1.6691	(108)
Total												86.3974	(109)
Fabric Energy Efficiency (DFEE)												86.4	(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	52.0000 (1b)	x	3.1100 (2b)	=	161.7200 (1b)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	161.7200	(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) =	0.1237	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3737	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2896	(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	0.3692	0.3620	0.3548	0.3186	0.3113	0.2751	0.2751	0.2679	0.2896	0.3113	0.3258	0.3403	(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	0.5682	0.5655	0.5629	0.5507	0.5485	0.5378	0.5378	0.5359	0.5419	0.5485	0.5531	0.5579	(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			1.8900	1.0000	1.8900			(26)
TER Opening Type (Uw = 1.20)			11.1100	1.1450	12.7214			(27)
1F			52.0000	0.1300	6.7600			(28b)
External Wall 1	58.5900	13.0000	45.5900	0.1800	8.2062			(29a)
Total net area of external elements Aum(A, m2)			110.5900					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.5776			(33)
Party Wall 1			38.5300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (User defined value 0.050 * total exposed area)	5.5295	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 35.1071	(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	30.3217	30.1804	30.0420	29.3916	29.2699	28.7034	28.7034	28.5985	28.9216	29.2699	29.5161	29.7734	(38)
Heat transfer coeff	65.4288	65.2875	65.1490	64.4987	64.3770	63.8105	63.8105	63.7056	64.0287	64.3770	64.6231	64.8805	(39)
Average = Sum(39)m / 12 =												64.4981	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2582	1.2555	1.2529	1.2404	1.2380	1.2271	1.2271	1.2251	1.2313	1.2380	1.2428	1.2477	(40)
HLP (average)												1.2403	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.7491	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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

23.1496	22.8058	22.3217	21.4290	20.7606	20.0194	19.6190	20.0998	20.6232	21.4163	22.3274	23.0714	(42b)

Hot water usage for other uses

32.5422	31.3589	30.1755	28.9922	27.8088	26.6255	26.6255	27.8088	28.9922	30.1755	31.3589	32.5422	(42c)

Average daily hot water use (litres/day)	51.0472	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	55.6919	54.1647	52.4972	50.4212	48.5694	46.6448	46.2445	47.9086	49.6154	51.5919	53.6863	55.6136	(44)
Energy conte	88.2023	77.1298	80.6862	69.0240	65.3837	57.3553	55.9287	59.3209	61.1808	70.0097	76.4860	87.0774	(45)
Energy content (annual)										Total = Sum(45)m =		847.7848	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	74.9719	65.5603	68.5833	58.6704	55.5762	48.7520	47.5394	50.4227	52.0037	59.5082	65.0131	74.0158	(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													
	74.9719	65.5603	68.5833	58.6704	55.5762	48.7520	47.5394	50.4227	52.0037	59.5082	65.0131	74.0158	(64)
										Total per year (kWh/year) = Sum(64)m =		720.6170	(64)
12Total per year (kWh/year)												721	(64)
Electric shower(s)													
	42.8812	38.2075	41.7211	39.8139	40.5610	38.6913	39.9810	40.5610	39.8139	41.7211	40.9366	42.8812	(64a)
						Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =						487.7707	(64a)
Heat gains from water heating, kWh/month													
	29.4633	25.9420	27.5761	24.6211	24.0343	21.8608	21.8801	22.7459	22.9544	25.3073	26.4874	29.2242	(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	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	77.0079	85.2588	77.0079	79.5748	77.0079	79.5748	77.0079	77.0079	79.5748	77.0079	79.5748	77.0079	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	152.4259	154.0076	150.0218	141.5364	130.8251	120.7580	114.0326	112.4509	116.4367	124.9221	135.6334	145.7005	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	(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)													
	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	(71)
Water heating gains (Table 5)													
	39.6012	38.6041	37.0646	34.1960	32.3042	30.3622	29.4087	30.5725	31.8811	34.0152	36.7881	39.2799	(72)
Total internal gains													
	318.2711	327.1066	313.3304	304.5433	289.3733	279.9312	269.6853	269.2674	277.1287	285.1813	301.2324	311.2244	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	8.6400	11.2829	0.6300	0.7000	0.7700	29.7926	(75)
Southwest	2.4700	36.7938	0.6300	0.7000	0.7700	27.7743	(79)

Solar gains	57.5669	107.9536	173.9921	259.6427	331.0357	346.3307	326.5384	270.5718	203.2263	126.3989	70.7540	48.0992	(83)
Total gains	375.8380	435.0602	487.3225	564.1860	620.4090	626.2619	596.2237	539.8391	480.3550	411.5803	371.9864	359.3235	(84)

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7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	55.1915	55.3109	55.4285	55.9874	56.0932	56.5912	56.5912	56.6843	56.3983	56.0932	55.8795	55.6579	
alpha	4.6794	4.6874	4.6952	4.7325	4.7395	4.7727	4.7727	4.7790	4.7599	4.7395	4.7253	4.7105	
util living area													
	0.9955	0.9906	0.9778	0.9293	0.8107	0.6199	0.4640	0.5290	0.7901	0.9591	0.9909	0.9964	(86)
MIT	19.5475	19.7456	20.0527	20.4806	20.8058	20.9590	20.9916	20.9849	20.8735	20.4425	19.9262	19.5175	(87)
Th 2	19.8737	19.8758	19.8779	19.8878	19.8897	19.8984	19.8984	19.9000	19.8950	19.8897	19.8860	19.8820	(88)
util rest of house													
	0.9940	0.9874	0.9701	0.9050	0.7526	0.5264	0.3514	0.4095	0.7060	0.9399	0.9872	0.9952	(89)
MIT 2	18.5690	18.7671	19.0710	19.4860	19.7673	19.8812	19.8964	19.8961	19.8302	19.4612	18.9554	18.5455	(90)
Living area fraction										fLA = Living area / (4) =		0.4683	(91)
MIT	19.0272	19.2253	19.5307	19.9518	20.2536	20.3859	20.4093	20.4059	20.3187	19.9207	19.4100	19.0006	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0272	19.2253	19.5307	19.9518	20.2536	20.3859	20.4093	20.4059	20.3187	19.9207	19.4100	19.0006	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9925	0.9850	0.9672	0.9066	0.7732	0.5691	0.4043	0.4657	0.7410	0.9406	0.9851	0.9939	(94)
Useful gains	373.0260	428.5384	471.3209	511.4984	479.6877	356.4278	241.0716	251.3998	355.9659	387.1171	366.4595	357.1229	(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	963.5815	935.2650	848.9365	712.8231	550.6560	369.2007	243.0711	255.1988	398.1781	600.0392	795.5100	960.2729	(97)
Space heating kWh	439.3733	340.5203	280.9460	144.9537	52.8004	0.0000	0.0000	0.0000	0.0000	158.4140	308.9163	448.7436	(98a)
Space heating requirement - total per year (kWh/year)												2174.6677	
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	439.3733	340.5203	280.9460	144.9537	52.8004	0.0000	0.0000	0.0000	0.0000	158.4140	308.9163	448.7436	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2174.6677	
Space heating per m2											(98c) / (4) =	41.8205	(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	599.8189	472.1979	484.1627	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8859	0.9362	0.9055	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	531.4063	442.0519	438.4177	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	704.3630	670.7804	606.3508	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	124.5288	170.1740	124.9422	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	31.1322	42.5435	31.2356	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												104.9113	(107)
Energy for space heating												41.8205	(99)
Energy for space cooling												2.0175	(108)
Total												43.8381	(109)
Fabric Energy Efficiency (TFEE)												43.8	(109)

Full SAP Calculation Printout

Property Reference	1.F Flat - 39-41 OS Green	Issued on Date	06/05/2023
Assessment Reference	00001	Prop Type Ref	Flat - 10-12 Museum Street
Property	Museum Street, London, WC1A		

SAP Rating	76 C	DER	5.69	TER	16.75
Environmental	96 A	% DER < TER			66.03
CO_2 Emissions (t/year)	0.26	DFEE	79.29	TFEE	44.43
Compliance Check	See BREL	% DFEE < TFEE			-78.45
% DPER < TPER	33.15	DPER	59.68	TPER	89.28

Assessor Details	Mr. Adrian Fell	Assessor ID	N222-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	53.0000 (1b)	x	2.8000 (2b)	=	148.4000	(1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	148.4000	(5)

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2. Ventilation rate

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		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) =	0.1348	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		10.0000	(17)
Infiltration rate		0.6348	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.4919	(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	0.6272	0.6149	0.6026	0.5411	0.5288	0.4674	0.4674	0.4551	0.4919	0.5288	0.5534	0.5780	(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	0.6967	0.6891	0.6816	0.6464	0.6398	0.6092	0.6092	0.6035	0.6210	0.6398	0.6531	0.6671	(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 (Uw = 1.60)			13.3400	1.5038	20.0602			(27)
Solid Door			1.8900	3.0000	5.6700			(26)
GF			53.0000	0.1200	6.3600			(28b)
External Wall 1	56.1100	15.2300	40.8800	0.2100	8.5848			(29a)
Sheltered Wall	17.8600		17.8600	0.2100	3.7506			(29a)
Total net area of external elements Aum(A, m2)			126.9700					(31)

Fabric heat loss, W/K = Sum (A x U) (26)...(30) + (32) = 44.4256 (33)
Party Wall 1 25.7300 0.0000 0.0000 (32)
Party Ceiling 1 53.0000 (32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area) 25.3940 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 69.8196 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.1193	33.7452	33.3786	31.6564	31.3341	29.8341	29.8341	29.5564	30.4119	31.3341	31.9860	32.6675	(38)
Heat transfer coeff	103.9389	103.5648	103.1981	101.4759	101.1537	99.6537	99.6537	99.3759	100.2315	101.1537	101.8055	102.4870	(39)

Average = Sum(39)m / 12 = 101.4744

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.9611	1.9541	1.9471	1.9146	1.9086	1.8803	1.8803	1.8750	1.8912	1.9086	1.9209	1.9337	(40)
HLP (average)												1.9146	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7786 (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

23.3623	23.0153	22.5267	21.6258	20.9512	20.2033	19.7992	20.2844	20.8127	21.6131	22.5325	23.2833	(42b)

Hot water usage for other uses

32.8442	31.6499	30.4556	29.2612	28.0669	26.8726	26.8726	28.0669	29.2612	30.4556	31.6499	32.8442	(42c)

Average daily hot water use (litres/day) 51.5189 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	56.2065	54.6652	52.9823	50.8871	49.0181	47.0758	46.6718	48.3513	50.0739	52.0686	54.1824	56.1275	(44)
Energy conte	89.0174	77.8425	81.4318	69.6618	65.9878	57.8852	56.4455	59.8690	61.7461	70.6566	77.1928	87.8821	(45)

Energy content (annual) Total = Sum(45)m = 855.6187

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

75.6648	66.1661	69.2170	59.2126	56.0897	49.2024	47.9787	50.8887	52.4842	60.0581	65.6138	74.6998	(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

75.6648	66.1661	69.2170	59.2126	56.0897	49.2024	47.9787	50.8887	52.4842	60.0581	65.6138	74.6998	(64)

Total per year (kWh/year) = Sum(64)m = 727.2759 (64)
12Total per year (kWh/year) 727 (64)
Electric shower(s)

43.2771	38.5603	42.1064	40.1816	40.9356	39.0486	40.3502	40.9356	40.1816	42.1064	41.3146	43.2771	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 492.2750 (64a)
Heat gains from water heating, kWh/month

29.7355	26.1816	27.8308	24.8485	24.2563	22.0627	22.0822	22.9561	23.1665	25.5411	26.7321	29.4942	(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	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	78.1887	86.5660	78.1887	80.7950	78.1887	80.7950	78.1887	78.1887	80.7950	78.1887	80.7950	78.1887	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	155.0178	156.6264	152.5728	143.9431	133.0497	122.8114	115.9716	114.3630	118.4166	127.0463	137.9397	148.1780	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	(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)	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	(71)
Water heating gains (Table 5)	39.9670	38.9607	37.4070	34.5119	32.6026	30.6427	29.6804	30.8549	32.1756	34.3295	37.1279	39.6428	(72)
Total internal gains	322.8519	331.8316	317.8469	308.9283	293.5193	283.9275	273.5191	273.0850	281.0656	289.2429	305.5410	315.6879	(73)

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6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains

	m2	Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	factor Table 6d	W
North	9.2400	10.6334	0.6400	0.7000	0.7700	30.5039 (74)
Southeast	4.1000	36.7938	0.6400	0.7000	0.7700	46.8350 (77)

Solar gains	77.3388	138.0717	208.2113	294.3582	365.8251	379.8466	359.2192	302.8381	237.2896	157.5628	93.7279	65.5105 (83)
Total gains	400.1908	469.9033	526.0582	603.2866	659.3444	663.7741	632.7383	575.9231	518.3552	446.8057	399.2690	381.1984 (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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	35.4108	35.5387	35.6649	36.2702	36.3858	36.9335	36.9335	37.0367	36.7206	36.3858	36.1528	35.9124	
alpha	3.3607	3.3692	3.3777	3.4180	3.4257	3.4622	3.4622	3.4691	3.4480	3.4257	3.4102	3.3942	
util living area	0.9944	0.9899	0.9808	0.9531	0.8883	0.7602	0.6188	0.6796	0.8717	0.9687	0.9904	0.9953	(86)
MIT	18.6424	18.8790	19.2684	19.8410	20.3691	20.7622	20.9162	20.8826	20.5728	19.8997	19.1915	18.6241	(87)
Th 2	19.3594	19.3641	19.3688	19.3908	19.3950	19.4144	19.4144	19.4180	19.4069	19.3950	19.3866	19.3779	(88)
util rest of house	0.9924	0.9861	0.9731	0.9323	0.8335	0.6377	0.4281	0.4933	0.7851	0.9506	0.9860	0.9936	(89)
MIT 2	17.3009	17.5389	17.9274	18.4994	18.9884	19.3135	19.3972	19.3897	19.1842	18.5688	17.8664	17.2951	(90)
Living area fraction									fLA = Living area / (4) =			0.5202	(91)
MIT	17.9988	18.2360	18.6250	19.1973	19.7066	20.0671	20.1874	20.1663	19.9065	19.2611	18.5557	17.9864	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.9988	18.2360	18.6250	19.1973	19.7066	20.0671	20.1874	20.1663	19.9065	19.2611	18.5557	17.9864	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9899	0.9824	0.9682	0.9291	0.8462	0.6940	0.5281	0.5902	0.8178	0.9486	0.9828	0.9914	(94)
Useful gains	396.1331	461.6286	509.3487	560.5055	557.9502	460.6844	334.1238	339.8835	423.9048	423.8362	392.4207	377.9265	(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	1423.8326	1381.1388	1251.2759	1044.9264	809.8995	544.8167	357.4951	374.2795	581.9974	876.1041	1166.2562	1412.9289	(97)
Space heating kWh	764.6084	617.9108	551.9938	348.7831	187.4503	0.0000	0.0000	0.0000	0.0000	336.4873	557.1616	770.0418	(98a)
Space heating requirement - total per year (kWh/year)												4134.4372	
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	764.6084	617.9108	551.9938	348.7831	187.4503	0.0000	0.0000	0.0000	0.0000	336.4873	557.1616	770.0418	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4134.4372	
Space heating per m2										(98c) / (4) =		78.0082	(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	936.7447	737.4373	755.2569	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6819	0.7627	0.7136	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	638.7335	562.4256	538.9396	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	747.7823	713.0523	648.1424	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	78.5151	112.0662	81.2468	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	19.6288	28.0166	20.3117	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												67.9570	(107)
Energy for space heating												78.0082	(99)
Energy for space cooling												1.2822	(108)
Total												79.2905	(109)
Fabric Energy Efficiency (DFEE)												79.3	(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	53.0000 (1b)	x	2.8000 (2b)	=	148.4000 (1b) -	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	148.4000	(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) =	0.1348	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3848	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2982	(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	0.3802	0.3727	0.3653	0.3280	0.3206	0.2833	0.2833	0.2758	0.2982	0.3206	0.3355	0.3504	(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	0.5723	0.5695	0.5667	0.5538	0.5514	0.5401	0.5401	0.5380	0.5445	0.5514	0.5563	0.5614	(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			1.8900	1.0000	1.8900			(26)
TER Opening Type (Uw = 1.20)			11.3600	1.1450	13.0076			(27)
GF			53.0000	0.1300	6.8900			(28b)
External Wall 1	56.1100	13.2500	42.8600	0.1800	7.7148			(29a)
Sheltered Wall	17.8600		17.8600	0.1800	3.2148			(29a)
Total net area of external elements Aum(A, m2)			126.9700					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.7172			(33)
Party Wall 1			25.7300	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (User defined value 0.050 * total exposed area)							6.3485	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss					(33) + (36) + (36a) =		39.0657	(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	28.0255	27.8881	27.7534	27.1206	27.0022	26.4510	26.4510	26.3490	26.6633	27.0022	27.2417	27.4921	(38)
Heat transfer coeff	67.0913	66.9538	66.8191	66.1863	66.0679	65.5168	65.5168	65.4147	65.7291	66.0679	66.3074	66.5578	(39)
Average = Sum(39)m / 12 =												66.1857	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2659	1.2633	1.2607	1.2488	1.2466	1.2362	1.2362	1.2342	1.2402	1.2466	1.2511	1.2558	(40)
HLP (average)												1.2488	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7786	(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	23.3623	23.0153	22.5267	21.6258	20.9512	20.2033	19.7992	20.2844	20.8127	21.6131	22.5325	23.2833	(42b)
Hot water usage for other uses													

	32.8442	31.6499	30.4556	29.2612	28.0669	26.8726	26.8726	28.0669	29.2612	30.4556	31.6499	32.8442 (42c)
Average daily hot water use (litres/day)												51.5189 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
	56.2065	54.6652	52.9823	50.8871	49.0181	47.0758	46.6718	48.3513	50.0739	52.0686	54.1824	56.1275 (44)
Energy conte	89.0174	77.8425	81.4318	69.6618	65.9878	57.8852	56.4455	59.8690	61.7461	70.6566	77.1928	87.8821 (45)
Energy content (annual)										Total = Sum(45)m =		855.6187
Distribution loss (46)m = 0.15 x (45)m												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month												
	75.6648	66.1661	69.2170	59.2126	56.0897	49.2024	47.9787	50.8887	52.4842	60.0581	65.6138	74.6998 (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												
	75.6648	66.1661	69.2170	59.2126	56.0897	49.2024	47.9787	50.8887	52.4842	60.0581	65.6138	74.6998 (64)
										Total per year (kWh/year) = Sum(64)m =		727.2759 (64)
12Total per year (kWh/year)												727 (64)
Electric shower(s)												
	43.2771	38.5603	42.1064	40.1816	40.9356	39.0486	40.3502	40.9356	40.1816	42.1064	41.3146	43.2771 (64a)
						Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =						492.2750 (64a)
Heat gains from water heating, kWh/month												
	29.7355	26.1816	27.8308	24.8485	24.2563	22.0627	22.0822	22.9561	23.1665	25.5411	26.7321	29.4942 (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	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	78.3035	86.6931	78.3035	80.9136	78.3035	80.9136	78.3035	78.3035	80.9136	78.3035	80.9136	78.3035	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	155.0178	156.6264	152.5728	143.9431	133.0497	122.8114	115.9716	114.3630	118.4166	127.0463	137.9397	148.1780	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	(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)													
	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	(71)
Water heating gains (Table 5)													
	39.9670	38.9607	37.4070	34.5119	32.6026	30.6427	29.6804	30.8549	32.1756	34.3295	37.1279	39.6428	(72)
Total internal gains													
	322.9667	331.9587	317.9617	309.0470	293.6341	284.0461	273.6339	273.1998	281.1843	289.3577	305.6597	315.8027	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.8700	10.6334	0.6300	0.7000	0.7700	25.5752	(74)
Southeast	3.4900	36.7938	0.6300	0.7000	0.7700	39.2439	(77)

Solar gains	64.8191	115.7223	174.5142	246.7286	306.6399	318.3965	301.1047	253.8396	198.8895	132.0599	78.5554	54.9053	(83)
Total gains	387.7858	447.6810	492.4759	555.7756	600.2740	602.4426	574.7386	527.0394	480.0738	421.4176	384.2151	370.7080	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	54.8589	54.9716	55.0824	55.6090	55.7087	56.1773	56.1773	56.2649	55.9959	55.7087	55.5074	55.2986
alpha	4.6573	4.6648	4.6722	4.7073	4.7139	4.7452	4.7452	4.7510	4.7331	4.7139	4.7005	4.6866
util living area												
	0.9953	0.9902	0.9787	0.9374	0.8345	0.6527	0.4919	0.5531	0.8013	0.9589	0.9904	0.9962 (86)
MIT	19.5452	19.7423	20.0347	20.4439	20.7744	20.9481	20.9890	20.9813	20.8630	20.4375	19.9253	19.5140 (87)
Th 2	19.8677	19.8697	19.8717	19.8812	19.8829	19.8912	19.8912	19.8927	19.8880	19.8829	19.8794	19.8756 (88)
util rest of house												
	0.9937	0.9870	0.9713	0.9151	0.7792	0.5569	0.3729	0.4288	0.7182	0.9396	0.9866	0.9949 (89)
MIT 2	18.5621	18.7591	19.0486	19.4476	19.7381	19.8690	19.8886	19.8878	19.8171	19.4509	18.9493	18.5372 (90)
Living area fraction										fLA = Living area / (4) =		0.5202 (91)
MIT	19.0735	19.2706	19.5616	19.9659	20.2771	20.4303	20.4610	20.4566	20.3611	19.9641	19.4570	19.0453 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0735	19.2706	19.5616	19.9659	20.2771	20.4303	20.4610	20.4566	20.3611	19.9641	19.4570	19.0453 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9923	0.9847	0.9687	0.9170	0.8004	0.6052	0.4351	0.4937	0.7566	0.9413	0.9847	0.9937	(94)
Useful gains	384.7860	440.8449	477.0672	509.6698	480.4675	364.6267	250.0509	260.2063	363.2199	396.6667	378.3324	368.3579	(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													
	991.1743	962.1642	872.7623	732.4098	566.6736	381.9820	252.9602	265.3638	411.5390	618.6671	819.3594	988.0706	(97)
Space heating kWh													
	451.1529	350.3266	294.3972	160.3728	64.1373	0.0000	0.0000	0.0000	0.0000	165.1684	317.5394	461.0663	(98a)
Space heating requirement - total per year (kWh/year)												2264.1608	
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													
	451.1529	350.3266	294.3972	160.3728	64.1373	0.0000	0.0000	0.0000	0.0000	165.1684	317.5394	461.0663	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2264.1608	
Space heating per m2											(98c) / (4) =	42.7200	(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	615.8577	484.8242	497.1519	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8620	0.9205	0.8891	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	530.8990	446.3026	442.0231	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	675.9674	645.1370	590.8854	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	104.4493	147.9328	110.7536	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	26.1123	36.9832	27.6884	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												90.7839	(107)
Energy for space heating												42.7200	(99)
Energy for space cooling												1.7129	(108)
Total												44.4329	(109)
Fabric Energy Efficiency (TFEE)												44.4	(109)

Full SAP Calculation Printout

Property Reference	2.F Flat - 10-12 MS Green	Issued on Date	06/05/2023
Assessment Reference	00001	Prop Type Ref	Flat - 10-12 Museum Street
Property	Museum Street, London, WC1A		

SAP Rating	80 C	DER	4.57	TER	13.35
Environmental	97 A	% DER < TER			65.77
CO_2 Emissions (t/year)	0.21	DFEE	55.03	TFEE	28.62
Compliance Check	See BREL	% DFEE < TFEE			-92.29
% DPER < TPER	31.99	DPER	48.31	TPER	71.04

Assessor Details	Mr. Adrian Fell	Assessor ID	N222-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	52.0000	(1b)	x 2.7400	(2b) =	142.4800	(1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		142.4800	(5)

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2. Ventilation rate

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	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) =	0.1404 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		10.0000 (17)
Infiltration rate		0.6404 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.4963 (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	0.6328	0.6204	0.6080	0.5459	0.5335	0.4715	0.4715	0.4591	0.4963	0.5335	0.5583	0.5831	(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	0.7002	0.6924	0.6848	0.6490	0.6423	0.6111	0.6111	0.6054	0.6232	0.6423	0.6559	0.6700	(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 (Uw = 1.50)			13.3000	1.4151	18.8208			(27)
Solid Door			1.8900	3.0000	5.6700			(26)
External Wall 1	51.6200	15.1900	36.4300	0.3000	10.9290			(29a)
Total net area of external elements Aum(A, m2)			51.6200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		35.4198			(33)
Party Wall 1			33.9500	0.0000	0.0000			(32)

Party Floor 1	52.0000	(32d)
Party Ceiling 1	52.0000	(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		250.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)		10.3240 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	45.7438 (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	32.9221	32.5566	32.1983	30.5155	30.2007	28.7350	28.7350	28.4636	29.2995	30.2007	30.8376	31.5035	(38)
Heat transfer coeff	78.6659	78.3004	77.9421	76.2593	75.9444	74.4787	74.4787	74.2073	75.0433	75.9444	76.5814	77.2472	(39)
Average = Sum(39)m / 12 =												76.2578	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.5128	1.5058	1.4989	1.4665	1.4605	1.4323	1.4323	1.4271	1.4431	1.4605	1.4727	1.4855	(40)
HLP (average)												1.4665	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.7491 (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

23.1496	22.8058	22.3217	21.4290	20.7606	20.0194	19.6190	20.0998	20.6232	21.4163	22.3274	23.0714	(42b)

Hot water usage for other uses

32.5422	31.3589	30.1755	28.9922	27.8088	26.6255	26.6255	27.8088	28.9922	30.1755	31.3589	32.5422	(42c)

Average daily hot water use (litres/day)		51.0472 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	55.6919	54.1647	52.4972	50.4212	48.5694	46.6448	46.2445	47.9086	49.6154	51.5919	53.6863	55.6136	(44)
Energy conte	88.2023	77.1298	80.6862	69.0240	65.3837	57.3553	55.9287	59.3209	61.1808	70.0097	76.4860	87.0774	(45)
Energy content (annual)										Total = Sum(45)m =		847.7848	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

74.9719	65.5603	68.5833	58.6704	55.5762	48.7520	47.5394	50.4227	52.0037	59.5082	65.0131	74.0158	(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

74.9719	65.5603	68.5833	58.6704	55.5762	48.7520	47.5394	50.4227	52.0037	59.5082	65.0131	74.0158	(64)

Total per year (kWh/year) = Sum(64)m =	720.6170	(64)
12Total per year (kWh/year)	721	(64)

Electric shower(s)

42.8812	38.2075	41.7211	39.8139	40.5610	38.6913	39.9810	40.5610	39.8139	41.7211	40.9366	42.8812	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	487.7707	(64a)

Heat gains from water heating, kWh/month

29.4633	25.9420	27.5761	24.6211	24.0343	21.8608	21.8801	22.7459	22.9544	25.3073	26.4874	29.2242	(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	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.8814	85.1187	76.8814	79.4441	76.8814	79.4441	76.8814	76.8814	79.4441	76.8814	79.4441	76.8814	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	152.4259	154.0076	150.0218	141.5364	130.8251	120.7580	114.0326	112.4509	116.4367	124.9221	135.6334	145.7005	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	(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)	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	(71)
Water heating gains (Table 5)	39.6012	38.6041	37.0646	34.1960	32.3042	30.3622	29.4087	30.5725	31.8811	34.0152	36.7881	39.2799	(72)
Total internal gains	318.1446	326.9665	313.2039	304.4125	289.2467	279.8004	269.5588	269.1408	276.9980	285.0548	301.1016	311.0978	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

					W/m2	or Table 6b		or Table 6c		Table 6d			
Northeast					9.6000	11.2829		0.6200		0.7000		0.7700	32.5774 (75)
Southwest					3.7000	36.7938		0.6200		0.7000		0.7700	40.9449 (79)
Solar gains	73.5223	136.0566	214.9008	314.4489	396.1821	412.6595	389.7984	325.8646	248.9079	158.1211	90.0334	61.6446 (83)	
Total gains	391.6669	463.0230	528.1047	618.8614	685.4289	692.4599	659.3571	595.0054	525.9059	443.1759	391.1350	372.7425 (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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	45.9044	46.1187	46.3307	47.3531	47.5494	48.4851	48.4851	48.6625	48.1204	47.5494	47.1539	46.7474	
alpha	4.0603	4.0746	4.0887	4.1569	4.1700	4.2323	4.2323	4.2442	4.2080	4.1700	4.1436	4.1165	
util living area													
	0.9948	0.9892	0.9758	0.9283	0.8185	0.6369	0.4837	0.5492	0.8017	0.9585	0.9900	0.9958 (86)	
MIT	19.2131	19.4462	19.8082	20.3212	20.7165	20.9301	20.9828	20.9714	20.8117	20.2877	19.6813	19.1999 (87)	
Th 2	19.6779	19.6832	19.6883	19.7127	19.7173	19.7387	19.7387	19.7426	19.7304	19.7173	19.7080	19.6984 (88)	
util rest of house													
	0.9930	0.9855	0.9670	0.9020	0.7561	0.5317	0.3517	0.4109	0.7110	0.9378	0.9858	0.9943 (89)	
MIT 2	18.0908	18.3256	18.6857	19.1936	19.5404	19.7101	19.7350	19.7357	19.6353	19.1772	18.5788	18.0925 (90)	
Living area fraction										fLA = Living area / (4) =		0.4683 (91)	
MIT	18.6163	18.8503	19.2113	19.7216	20.0912	20.2814	20.3193	20.3143	20.1862	19.6972	19.0951	18.6111 (92)	
Temperature adjustment												0.0000	
adjusted MIT	18.6163	18.8503	19.2113	19.7216	20.0912	20.2814	20.3193	20.3143	20.1862	19.6972	19.0951	18.6111 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9910	0.9823	0.9628	0.9022	0.7761	0.5791	0.4138	0.4760	0.7472	0.9374	0.9831	0.9926 (94)	
Useful gains	388.1437	454.8396	508.4786	558.3598	531.9730	400.9949	272.8731	283.2153	392.9371	415.4349	384.5226	369.9888 (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													
	1126.2065	1092.3158	990.7480	825.2474	637.2625	423.1439	277.0082	290.4721	456.7265	690.8844	918.6000	1113.2159 (97)	
Space heating kWh													
	549.1187	428.3840	358.8085	192.1591	78.3355	0.0000	0.0000	0.0000	0.0000	204.9344	384.5357	552.9610 (98a)	
Space heating requirement - total per year (kWh/year)												2749.2369	
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													
	549.1187	428.3840	358.8085	192.1591	78.3355	0.0000	0.0000	0.0000	0.0000	204.9344	384.5357	552.9610 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												2749.2369	
Space heating per m2											(98c) / (4) =	52.8699 (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	700.1001	551.1426	563.9756	0.0000	0.0000	0.0000	0.0000 (100)	
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8507	0.9083	0.8724	0.0000	0.0000	0.0000	0.0000 (101)	
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	595.5987	500.6086	492.0091	0.0000	0.0000	0.0000	0.0000 (102)	
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	781.8791	744.7086	670.9632	0.0000	0.0000	0.0000	0.0000 (103)	
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	134.1219	181.6104	133.1419	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	33.5305	45.4026	33.2855	0.0000	0.0000	0.0000	0.0000 (107)	
Space cooling requirement												112.2185 (107)	
Energy for space heating												52.8699 (99)	
Energy for space cooling												2.1580 (108)	
Total												55.0280 (109)	
Fabric Energy Efficiency (DFEE)												55.0 (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	52.0000 (1b)	x	2.7400 (2b)	=	142.4800 (1b)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	142.4800	(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) =	0.1404	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3904	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3025	(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	0.3857	0.3782	0.3706	0.3328	0.3252	0.2874	0.2874	0.2798	0.3025	0.3252	0.3404	0.3555	(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	0.5744	0.5715	0.5687	0.5554	0.5529	0.5413	0.5413	0.5392	0.5458	0.5529	0.5579	0.5632	(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			1.8900	1.0000	1.8900			(26)
TER Opening Type (Uw = 1.20)			11.1100	1.1450	12.7214			(27)
External Wall 1	51.6200	13.0000	38.6200	0.1800	6.9516			(29a)
Total net area of external elements Aum(A, m2)			51.6200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	21.5630			(33)
Party Wall 1			33.9500	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (User defined value 0.050 * total exposed area)							2.5810	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss					(33) + (36) + (36a) =		24.1440	(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	27.0072	26.8713	26.7382	26.1128	25.9958	25.4512	25.4512	25.3503	25.6610	25.9958	26.2325	26.4800	(38)
Heat transfer coeff	51.1511	51.0153	50.8822	50.2568	50.1398	49.5951	49.5951	49.4943	49.8049	50.1398	50.3765	50.6240	(39)
Average = Sum(39)m / 12 =												50.2563	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9837	0.9811	0.9785	0.9665	0.9642	0.9538	0.9538	0.9518	0.9578	0.9642	0.9688	0.9735	(40)
HLP (average)												0.9665	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7491 (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	23.1496	22.8058	22.3217	21.4290	20.7606	20.0194	19.6190	20.0998	20.6232	21.4163	22.3274	23.0714 (42b)
Hot water usage for other uses	32.5422	31.3589	30.1755	28.9922	27.8088	26.6255	26.6255	27.8088	28.9922	30.1755	31.3589	32.5422 (42c)
Average daily hot water use (litres/day)												51.0472 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	55.6919	54.1647	52.4972	50.4212	48.5694	46.6448	46.2445	47.9086	49.6154	51.5919	53.6863	55.6136	(44)
Energy conte	88.2023	77.1298	80.6862	69.0240	65.3837	57.3553	55.9287	59.3209	61.1808	70.0097	76.4860	87.0774	(45)
Energy content (annual)											Total = Sum(45)m =	847.7848	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	74.9719	65.5603	68.5833	58.6704	55.5762	48.7520	47.5394	50.4227	52.0037	59.5082	65.0131	74.0158	(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													
	74.9719	65.5603	68.5833	58.6704	55.5762	48.7520	47.5394	50.4227	52.0037	59.5082	65.0131	74.0158	(64)
											Total per year (kWh/year) = Sum(64)m =	720.6170	(64)
12Total per year (kWh/year)												721	(64)
Electric shower(s)													
	42.8812	38.2075	41.7211	39.8139	40.5610	38.6913	39.9810	40.5610	39.8139	41.7211	40.9366	42.8812	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												487.7707	(64a)
Heat gains from water heating, kWh/month													
	29.4633	25.9420	27.5761	24.6211	24.0343	21.8608	21.8801	22.7459	22.9544	25.3073	26.4874	29.2242	(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	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	77.0079	85.2588	77.0079	79.5748	77.0079	79.5748	77.0079	77.0079	79.5748	77.0079	79.5748	77.0079	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	152.4259	154.0076	150.0218	141.5364	130.8251	120.7580	114.0326	112.4509	116.4367	124.9221	135.6334	145.7005	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	(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)													
	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	(71)
Water heating gains (Table 5)													
	39.6012	38.6041	37.0646	34.1960	32.3042	30.3622	29.4087	30.5725	31.8811	34.0152	36.7881	39.2799	(72)
Total internal gains													
	318.2711	327.1066	313.3304	304.5433	289.3733	279.9312	269.6853	269.2674	277.1287	285.1813	301.2324	311.2244	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	8.0200	11.2829	0.6300	0.7000	0.7700	27.6547	(75)
Southwest	3.0900	36.7938	0.6300	0.7000	0.7700	34.7460	(79)

Solar gains	62.4007	115.4773	182.4001	266.8990	336.2776	350.2654	330.8601	276.5903	211.2662	134.2056	76.4145	52.3196	(83)
Total gains	380.6718	442.5838	495.7305	571.4423	625.6509	630.1965	600.5454	545.8577	488.3949	419.3869	377.6469	363.5439	(84)

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7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.5969	70.7848	70.9701	71.8532	72.0208	72.8118	72.8118	72.9602	72.5051	72.0208	71.6824	71.3321	
alpha	5.7065	5.7190	5.7313	5.7902	5.8014	5.8541	5.8541	5.8640	5.8337	5.8014	5.7788	5.7555	
util living area													
	0.9945	0.9864	0.9639	0.8779	0.7054	0.4991	0.3627	0.4156	0.6741	0.9284	0.9868	0.9957	(86)
MIT	19.9888	20.1816	20.4469	20.7730	20.9467	20.9939	20.9992	20.9983	20.9692	20.7182	20.3017	19.9595	(87)
Th 2	20.0970	20.0991	20.1013	20.1114	20.1133	20.1221	20.1221	20.1237	20.1187	20.1133	20.1094	20.1054	(88)
util rest of house													
	0.9927	0.9822	0.9531	0.8467	0.6503	0.4327	0.2907	0.3373	0.5995	0.9019	0.9820	0.9943	(89)
MIT 2	19.1826	19.3745	19.6340	19.9415	20.0813	20.1195	20.1219	20.1232	20.1038	19.9025	19.5029	19.1604	(90)
Living area fraction											fLA = Living area / (4) =	0.4683	(91)
MIT	19.5601	19.7524	20.0147	20.3309	20.4865	20.5290	20.5327	20.5330	20.5090	20.2845	19.8769	19.5346	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5601	19.7524	20.0147	20.3309	20.4865	20.5290	20.5327	20.5330	20.5090	20.2845	19.8769	19.5346	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9914	0.9803	0.9519	0.8550	0.6742	0.4637	0.3245	0.3740	0.6335	0.9077	0.9805	0.9932	(94)
Useful gains	377.4060	433.8451	471.8916	488.5713	421.7945	292.2286	194.8603	204.1549	309.4165	380.6642	370.2850	361.0748	(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													
	780.5718	757.7020	687.6552	574.4788	440.5557	294.0472	195.0425	204.5602	319.2020	485.5773	643.6580	776.2970	(97)
Space heating kWh													
	299.9553	217.6319	160.5281	61.8534	13.9583	0.0000	0.0000	0.0000	0.0000	78.0553	196.8285	308.9253	(98a)
Space heating requirement - total per year (kWh/year)												1337.7363	
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													
	299.9553	217.6319	160.5281	61.8534	13.9583	0.0000	0.0000	0.0000	0.0000	78.0553	196.8285	308.9253	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1337.7363	
Space heating per m2											(98c) / (4) =	25.7257	(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	466.1944	367.0041	376.1565	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9688	0.9870	0.9772	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	451.6524	362.2300	367.5881	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	708.9620	675.8317	613.3855	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	185.2629	233.3197	182.8733	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	46.3157	58.3299	45.7183	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												150.3640	(107)
Energy for space heating												25.7257	(99)
Energy for space cooling												2.8916	(108)
Total												28.6173	(109)
Fabric Energy Efficiency (TFEE)												28.6	(109)

Full SAP Calculation Printout

Property Reference	2.F Flat - 39-41 OS Green	Issued on Date	06/05/2023
Assessment Reference	00001	Prop Type Ref	Flat - 10-12 Museum Street
Property	Museum Street, London, WC1A		

SAP Rating	80 C	DER	4.52	TER	13.69
Environmental	97 A	% DER < TER			66.98
CO_2 Emissions (t/year)	0.21	DFEE	55.54	TFEE	30.35
Compliance Check	See BREL	% DFEE < TFEE			-82.98
% DPER < TPER	34.50	DPER	47.71	TPER	72.84

Assessor Details	Mr. Adrian Fell	Assessor ID	N222-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	53.0000	(1b)	x 2.4800	(2b) =	131.4400	(1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		131.4400	(5)

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2. Ventilation rate

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	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) =	0.1522 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		10.0000 (17)
Infiltration rate		0.6522 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.5054 (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	0.6444	0.6318	0.6191	0.5560	0.5433	0.4802	0.4802	0.4675	0.5054	0.5433	0.5686	0.5939	(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	0.7076	0.6996	0.6917	0.6545	0.6476	0.6153	0.6153	0.6093	0.6277	0.6476	0.6617	0.6763	(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 (Uw = 1.60)			10.8900	1.5038	16.3759			(27)
Solid Door			1.8900	3.0000	5.6700			(26)
External Wall 1	49.7000	12.7800	36.9200	0.2100	7.7532			(29a)
Sheltered Wall	15.8200		15.8200	0.2100	3.3222			(29a)
Total net area of external elements Aum(A, m2)			65.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		33.1213			(33)

Party Wall 1	22.7900	0.0000	0.0000	(32)
Party Floor 1	53.0000			(32d)
Party Ceiling 1	53.0000			(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		250.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)		13.1040 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	46.2253 (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	30.6939	30.3441	30.0013	28.3912	28.0900	26.6876	26.6876	26.4279	27.2278	28.0900	28.6994	29.3365	(38)
Heat transfer coeff	76.9192	76.5695	76.2267	74.6166	74.3153	72.9130	72.9130	72.6533	73.4531	74.3153	74.9247	75.5619	(39)

Average = Sum(39)m / 12 = 74.6151

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4513	1.4447	1.4382	1.4079	1.4022	1.3757	1.3757	1.3708	1.3859	1.4022	1.4137	1.4257	(40)
HLP (average)												1.4078	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7786 (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

23.3623	23.0153	22.5267	21.6258	20.9512	20.2033	19.7992	20.2844	20.8127	21.6131	22.5325	23.2833	(42b)

Hot water usage for other uses

32.8442	31.6499	30.4556	29.2612	28.0669	26.8726	26.8726	28.0669	29.2612	30.4556	31.6499	32.8442	(42c)

Average daily hot water use (litres/day) 51.5189 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	56.2065	54.6652	52.9823	50.8871	49.0181	47.0758	46.6718	48.3513	50.0739	52.0686	54.1824	56.1275	(44)
Energy conte	89.0174	77.8425	81.4318	69.6618	65.9878	57.8852	56.4455	59.8690	61.7461	70.6566	77.1928	87.8821	(45)

Energy content (annual) Total = Sum(45)m = 855.6187

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

75.6648	66.1661	69.2170	59.2126	56.0897	49.2024	47.9787	50.8887	52.4842	60.0581	65.6138	74.6998	(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

75.6648	66.1661	69.2170	59.2126	56.0897	49.2024	47.9787	50.8887	52.4842	60.0581	65.6138	74.6998	(64)

Total per year (kWh/year) = Sum(64)m = 727.2759 (64)

12Total per year (kWh/year) 727 (64)

Electric shower(s)

43.2771	38.5603	42.1064	40.1816	40.9356	39.0486	40.3502	40.9356	40.1816	42.1064	41.3146	43.2771	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 492.2750 (64a)

Heat gains from water heating, kWh/month

29.7355	26.1816	27.8308	24.8485	24.2563	22.0627	22.0822	22.9561	23.1665	25.5411	26.7321	29.4942	(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	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	78.5370	86.9517	78.5370	81.1549	78.5370	81.1549	78.5370	78.5370	81.1549	78.5370	81.1549	78.5370	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	155.0178	156.6264	152.5728	143.9431	133.0497	122.8114	115.9716	114.3630	118.4166	127.0463	137.9397	148.1780	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	(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)	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	(71)
Water heating gains (Table 5)	39.9670	38.9607	37.4070	34.5119	32.6026	30.6427	29.6804	30.8549	32.1756	34.3295	37.1279	39.6428	(72)
Total internal gains	323.2002	332.2172	318.1952	309.2883	293.8677	284.2874	273.8674	273.4333	281.4256	289.5912	305.9010	316.0362	(73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains

	m2	Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	factor Table 6d	W
North	9.2400	10.6334	0.6400	0.7000	0.7700	30.5039 (74)
Southeast	1.6500	36.7938	0.6400	0.7000	0.7700	18.8482 (77)

Solar gains	49.3521	90.4000	142.9847	213.5393	275.3011	289.9773	272.5756	223.4349	166.6629	104.8754	60.2063	41.5597 (83)
Total gains	372.5523	422.6172	461.1799	522.8276	569.1688	574.2647	546.4430	496.8682	448.0885	394.4665	366.1072	357.5959 (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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	47.8496	48.0682	48.2843	49.3263	49.5262	50.4788	50.4788	50.6592	50.1075	49.5262	49.1234	48.7092	
alpha	4.1900	4.2045	4.2190	4.2884	4.3017	4.3653	4.3653	4.3773	4.3405	4.3017	4.2749	4.2473	
util living area	0.9960	0.9927	0.9853	0.9572	0.8809	0.7209	0.5619	0.6286	0.8591	0.9721	0.9925	0.9967	(86)
MIT	19.2485	19.4389	19.7492	20.2226	20.6331	20.8978	20.9733	20.9575	20.7637	20.2469	19.6914	19.2416	(87)
Th 2	19.7242	19.7292	19.7341	19.7573	19.7617	19.7820	19.7820	19.7858	19.7742	19.7617	19.7529	19.7437	(88)
util rest of house	0.9946	0.9901	0.9797	0.9398	0.8316	0.6175	0.4187	0.4833	0.7822	0.9574	0.9894	0.9955	(89)
MIT 2	18.1599	18.3528	18.6638	19.1415	19.5184	19.7368	19.7758	19.7744	19.6456	19.1754	18.6224	18.1673	(90)
Living area fraction										fLA = Living area / (4) =		0.5202	(91)
MIT	18.7262	18.9178	19.2284	19.7039	20.0982	20.3407	20.3987	20.3898	20.2272	19.7328	19.1785	18.7262	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7262	18.9178	19.2284	19.7039	20.0982	20.3407	20.3987	20.3898	20.2272	19.7328	19.1785	18.7262	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9931	0.9879	0.9768	0.9389	0.8468	0.6680	0.4937	0.5591	0.8145	0.9570	0.9875	0.9942	(94)
Useful gains	369.9879	417.4878	450.4636	490.9028	481.9572	383.6332	269.7528	277.7910	364.9834	377.5084	361.5154	355.5319	(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	1109.6515	1073.3370	970.2423	806.1484	624.1177	418.5738	276.9753	289.8729	450.0631	678.7076	904.9751	1097.6242	(97)
Space heating kWh	550.3097	440.7306	386.7153	226.9769	105.7675	0.0000	0.0000	0.0000	0.0000	224.0922	391.2910	552.1167	(98a)
Space heating requirement - total per year (kWh/year)												2877.9998	
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	550.3097	440.7306	386.7153	226.9769	105.7675	0.0000	0.0000	0.0000	0.0000	224.0922	391.2910	552.1167	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2877.9998	
Space heating per m2											(98c) / (4) =	54.3019	(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	685.3818	539.5559	552.1648	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7866	0.8609	0.8164	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	539.1247	464.4970	450.7790	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	642.7707	611.8134	555.3762	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	74.6251	109.6034	77.8203	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	18.6563	27.4009	19.4551	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												65.5122	(107)
Energy for space heating												54.3019	(99)
Energy for space cooling												1.2361	(108)
Total												55.5380	(109)
Fabric Energy Efficiency (DFEE)												55.5	(109)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	53.0000 (1b)	x	2.4800 (2b)	=	131.4400 (1b) -	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	131.4400 (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) =	0.1522 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4022 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3117 (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	0.3974	0.3896	0.3818	0.3428	0.3351	0.2961	0.2961	0.2883	0.3117	0.3351	0.3506	0.3662	(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	0.5790	0.5759	0.5729	0.5588	0.5561	0.5438	0.5438	0.5416	0.5486	0.5561	0.5615	0.5671	(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			1.8900	1.0000	1.8900			(26)
TER Opening Type (Uw = 1.20)			10.8900	1.1450	12.4695			(27)
External Wall 1	49.7000	12.7800	36.9200	0.1800	6.6456			(29a)
Sheltered Wall	15.8200		15.8200	0.1800	2.8476			(29a)
Total net area of external elements Aum(A, m2)			65.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.8527			(33)
Party Wall 1			22.7900	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (User defined value 0.050 * total exposed area)							3.2760	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss					(33) + (36) + (36a) =		27.1287	(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	25.1124	24.9794	24.8490	24.2368	24.1222	23.5889	23.5889	23.4902	23.7944	24.1222	24.3540	24.5962	(38)
Heat transfer coeff	52.2411	52.1081	51.9777	51.3654	51.2509	50.7176	50.7176	50.6189	50.9230	51.2509	51.4826	51.7249	(39)
Average = Sum(39)m / 12 =												51.3649	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9857	0.9832	0.9807	0.9692	0.9670	0.9569	0.9569	0.9551	0.9608	0.9670	0.9714	0.9759	(40)
HLP (average)												0.9691	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7786	(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	23.3623	23.0153	22.5267	21.6258	20.9512	20.2033	19.7992	20.2844	20.8127	21.6131	22.5325	23.2833	(42b)
Hot water usage for other uses	32.8442	31.6499	30.4556	29.2612	28.0669	26.8726	26.8726	28.0669	29.2612	30.4556	31.6499	32.8442	(42c)

Average daily hot water use (litres/day) 51.5189 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	56.2065	54.6652	52.9823	50.8871	49.0181	47.0758	46.6718	48.3513	50.0739	52.0686	54.1824	56.1275	(44)
Energy conte	89.0174	77.8425	81.4318	69.6618	65.9878	57.8852	56.4455	59.8690	61.7461	70.6566	77.1928	87.8821	(45)
Energy content (annual)											Total = Sum(45)m =	855.6187	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	75.6648	66.1661	69.2170	59.2126	56.0897	49.2024	47.9787	50.8887	52.4842	60.0581	65.6138	74.6998	(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													
	75.6648	66.1661	69.2170	59.2126	56.0897	49.2024	47.9787	50.8887	52.4842	60.0581	65.6138	74.6998	(64)
										Total per year (kWh/year) = Sum(64)m =		727.2759	(64)
12Total per year (kWh/year)												727	(64)
Electric shower(s)													
	43.2771	38.5603	42.1064	40.1816	40.9356	39.0486	40.3502	40.9356	40.1816	42.1064	41.3146	43.2771	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		492.2750	(64a)
Heat gains from water heating, kWh/month													
	29.7355	26.1816	27.8308	24.8485	24.2563	22.0627	22.0822	22.9561	23.1665	25.5411	26.7321	29.4942	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	78.5370	86.9517	78.5370	81.1549	78.5370	81.1549	78.5370	78.5370	81.1549	78.5370	81.1549	78.5370	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	155.0178	156.6264	152.5728	143.9431	133.0497	122.8114	115.9716	114.3630	118.4166	127.0463	137.9397	148.1780	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	(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)													
	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	(71)
Water heating gains (Table 5)													
	39.9670	38.9607	37.4070	34.5119	32.6026	30.6427	29.6804	30.8549	32.1756	34.3295	37.1279	39.6428	(72)
Total internal gains													
	323.2002	332.2172	318.1952	309.2883	293.8677	284.2874	273.8674	273.4333	281.4256	289.5912	305.9010	316.0362	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	9.2400	10.6334	0.6300	0.7000	0.7700	30.0273	(74)
Southeast	1.6500	36.7938	0.6300	0.7000	0.7700	18.5537	(77)

Solar gains	48.5810	88.9875	140.7505	210.2027	270.9996	285.4464	268.3166	219.9437	164.0588	103.2367	59.2656	40.9103	(83)
Total gains	371.7812	421.2047	458.9458	519.4910	564.8672	569.7338	542.1840	493.3771	445.4844	392.8279	365.1665	356.9465	(84)

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7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.4533	70.6331	70.8103	71.6543	71.8145	72.5696	72.5696	72.7112	72.2768	71.8145	71.4912	71.1564	
alpha	5.6969	5.7089	5.7207	5.7770	5.7876	5.8380	5.8380	5.8474	5.8185	5.7876	5.7661	5.7438	
util living area													
	0.9955	0.9902	0.9763	0.9172	0.7717	0.5603	0.4102	0.4688	0.7365	0.9485	0.9898	0.9964	(86)
MIT	19.9527	20.1200	20.3622	20.6966	20.9148	20.9888	20.9985	20.9968	20.9512	20.6644	20.2596	19.9278	(87)
Th 2	20.0953	20.0974	20.0994	20.1091	20.1109	20.1194	20.1194	20.1209	20.1161	20.1109	20.1073	20.1034	(88)
util rest of house													
	0.9941	0.9871	0.9686	0.8925	0.7181	0.4874	0.3289	0.3809	0.6613	0.9276	0.9860	0.9953	(89)
MIT 2	19.1454	19.3128	19.5520	19.8746	20.0577	20.1146	20.1190	20.1201	20.0915	19.8534	19.4600	19.1273	(90)
Living area fraction										fLA = Living area / (4) =		0.5202	(91)
MIT	19.5654	19.7327	19.9734	20.3022	20.5036	20.5694	20.5765	20.5761	20.5387	20.2753	19.8759	19.5437	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5654	19.7327	19.9734	20.3022	20.5036	20.5694	20.5765	20.5761	20.5387	20.2753	19.8759	19.5437	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9931	0.9855	0.9674	0.8984	0.7428	0.5251	0.3712	0.4267	0.6987	0.9321	0.9848	0.9944	(94)
Useful gains	369.1979	415.1098	443.9713	466.7099	419.5792	299.1651	201.2831	210.5375	311.2799	366.1355	359.6042	354.9424	(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													
	797.4788	772.9011	700.3187	585.6798	451.1914	302.7516	201.6774	211.3907	327.8799	495.8677	657.7383	793.6512	(97)
Space heating kWh													
	318.6409	240.4358	190.7225	85.6583	23.5195	0.0000	0.0000	0.0000	0.0000	96.5207	214.6566	326.3993	(98a)
Space heating requirement - total per year (kWh/year)												1496.5536	
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													
	318.6409	240.4358	190.7225	85.6583	23.5195	0.0000	0.0000	0.0000	0.0000	96.5207	214.6566	326.3993	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1496.5536	
Space heating per m2											(98c) / (4) =	28.2369	(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	476.7456	375.3103	384.7033	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9464	0.9760	0.9597	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	451.1967	366.3110	369.2036	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	637.4748	606.8354	551.2956	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	134.1202	178.9501	135.4765	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	33.5301	44.7375	33.8691	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												112.1367	(107)
Energy for space heating												28.2369	(99)
Energy for space cooling												2.1158	(108)
Total												30.3526	(109)
Fabric Energy Efficiency (TFEE)												30.4	(109)

Full SAP Calculation Printout

Property Reference	3.F Flat - 10-12 MS Green	Issued on Date	06/05/2023
Assessment Reference	00001	Prop Type Ref	Flat - 10-12 Museum Street
Property	Museum Street, London, WC1A		

SAP Rating	78 C	DER	5.07	TER	14.34
Environmental	96 A	% DER < TER			64.64
CO_2 Emissions (t/year)	0.23	DFEE	67.46	TFEE	33.20
Compliance Check	See BREL	% DFEE < TFEE			-103.23
% DPER < TPER	30.13	DPER	53.36	TPER	76.36

Assessor Details	Mr. Adrian Fell	Assessor ID	N222-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	52.0000 (1b)	x	2.4600 (2b)	=	127.9200 (1b)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	127.9200	(5)

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2. Ventilation rate

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	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) =	0.1563 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		10.0000 (17)
Infiltration rate		0.6563 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.5087 (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	0.6486	0.6358	0.6231	0.5595	0.5468	0.4832	0.4832	0.4705	0.5087	0.5468	0.5723	0.5977	(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	0.7103	0.7021	0.6941	0.6565	0.6495	0.6168	0.6168	0.6107	0.6294	0.6495	0.6637	0.6786	(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 (Uw = 1.50)			11.5800	1.4151	16.3868			(27)
Solid Door			1.8900	3.0000	5.6700			(26)
External Wall 1	46.3500	13.4700	32.8800	0.3000	9.8640			(29a)
External Roof 1	52.0000		52.0000	0.1600	8.3200			(30)
Total net area of external elements Aum(A, m2)			98.3500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.2408			(33)

Party Wall 1							30.4800	0.0000	0.0000				(32)
Party Floor 1							52.0000						(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												250.0000	(35)
Thermal bridges (Default value 0.200 * total exposed area)												19.6700	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss										(33) + (36) + (36a) =		59.9108	(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	29.9848	29.6400	29.3021	27.7149	27.4180	26.0356	26.0356	25.7796	26.5681	27.4180	28.0187	28.6468	(38)
Heat transfer coeff	89.8956	89.5508	89.2129	87.6257	87.3288	85.9464	85.9464	85.6904	86.4789	87.3288	87.9295	88.5576	(39)
Average = Sum(39)m / 12 =												87.6243	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.7288	1.7221	1.7156	1.6851	1.6794	1.6528	1.6528	1.6479	1.6631	1.6794	1.6910	1.7030	(40)
HLP (average)												1.6851	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7491	(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	23.1496	22.8058	22.3217	21.4290	20.7606	20.0194	19.6190	20.0998	20.6232	21.4163	22.3274	23.0714	(42b)
Hot water usage for other uses	32.5422	31.3589	30.1755	28.9922	27.8088	26.6255	26.6255	27.8088	28.9922	30.1755	31.3589	32.5422	(42c)
Average daily hot water use (litres/day)												51.0472	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	55.6919	54.1647	52.4972	50.4212	48.5694	46.6448	46.2445	47.9086	49.6154	51.5919	53.6863	55.6136	(44)
Energy conte	88.2023	77.1298	80.6862	69.0240	65.3837	57.3553	55.9287	59.3209	61.1808	70.0097	76.4860	87.0774	(45)
Energy content (annual)											Total = Sum(45)m =	847.7848	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	74.9719	65.5603	68.5833	58.6704	55.5762	48.7520	47.5394	50.4227	52.0037	59.5082	65.0131	74.0158	(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	74.9719	65.5603	68.5833	58.6704	55.5762	48.7520	47.5394	50.4227	52.0037	59.5082	65.0131	74.0158	(64)
									Total per year (kWh/year) = Sum(64)m =			720.6170	(64)
12Total per year (kWh/year)												721	(64)
Electric shower(s)	42.8812	38.2075	41.7211	39.8139	40.5610	38.6913	39.9810	40.5610	39.8139	41.7211	40.9366	42.8812	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			487.7707	(64a)
Heat gains from water heating, kWh/month	29.4633	25.9420	27.5761	24.6211	24.0343	21.8608	21.8801	22.7459	22.9544	25.3073	26.4874	29.2242	(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	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.8832	85.1207	76.8832	79.4460	76.8832	79.4460	76.8832	76.8832	79.4460	76.8832	79.4460	76.8832	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	152.4259	154.0076	150.0218	141.5364	130.8251	120.7580	114.0326	112.4509	116.4367	124.9221	135.6334	145.7005	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	(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)	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	(71)
Water heating gains (Table 5)	39.6012	38.6041	37.0646	34.1960	32.3042	30.3622	29.4087	30.5725	31.8811	34.0152	36.7881	39.2799	(72)
Total internal gains	318.1464	326.9685	313.2057	304.4144	289.2486	279.8023	269.5606	269.1427	276.9999	285.0566	301.1035	311.0997	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

					W/m2	or Table 6b		or Table 6c		Table 6d			
Northeast					8.1100	11.2829		0.6200		0.7000		0.7700	27.5211 (75)
Southwest					3.4700	36.7938		0.6200		0.7000		0.7700	38.3997 (79)
Solar gains	65.9208	121.4289	190.4255	276.6455	347.0142	360.8450	341.0930	286.0967	219.8896	140.7516	80.6226	55.3372 (83)	
Total gains	384.0672	448.3974	503.6312	581.0599	636.2627	640.6473	610.6536	555.2393	496.8894	425.8083	381.7262	366.4369 (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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	40.1701	40.3247	40.4774	41.2106	41.3508	42.0159	42.0159	42.1414	41.7572	41.3508	41.0682	40.7770	
alpha	3.6780	3.6883	3.6985	3.7474	3.7567	3.8011	3.8011	3.8094	3.7838	3.7567	3.7379	3.7185	
util living area													
	0.9950	0.9907	0.9811	0.9496	0.8740	0.7276	0.5769	0.6408	0.8566	0.9683	0.9911	0.9959 (86)	
MIT	18.9130	19.1376	19.5059	20.0449	20.5185	20.8415	20.9511	20.9274	20.6775	20.0676	19.4164	18.8971 (87)	
Th 2	19.5203	19.5250	19.5297	19.5515	19.5556	19.5748	19.5748	19.5784	19.5674	19.5556	19.5473	19.5387 (88)	
util rest of house													
	0.9933	0.9873	0.9738	0.9286	0.8184	0.6117	0.4097	0.4734	0.7709	0.9509	0.9872	0.9944 (89)	
MIT 2	17.6801	17.9064	18.2738	18.8118	19.2449	19.5074	19.5644	19.5604	19.3982	18.8464	18.2006	17.6771 (90)	
Living area fraction										fLA = Living area / (4) =		0.4683 (91)	
MIT	18.2574	18.4830	18.8507	19.3892	19.8413	20.1321	20.2138	20.2006	19.9972	19.4183	18.7699	18.2484 (92)	
Temperature adjustment												0.0000	
adjusted MIT	18.2574	18.4830	18.8507	19.3892	19.8413	20.1321	20.2138	20.2006	19.9972	19.4183	18.7699	18.2484 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9910	0.9839	0.9692	0.9256	0.8312	0.6612	0.4887	0.5521	0.8011	0.9487	0.9843	0.9925 (94)	
Useful gains	380.6283	441.1950	488.1272	537.8279	528.8744	423.6090	298.4327	306.5597	398.0698	403.9499	375.7213	363.6835 (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													
	1254.7113	1216.3657	1101.8430	919.1258	710.9667	475.4647	310.5900	325.6710	509.9852	770.0876	1026.1292	1244.0923 (97)	
Space heating kWh													
	650.3177	520.9147	456.6046	274.5345	135.4766	0.0000	0.0000	0.0000	0.0000	272.4065	468.2937	655.0241 (98a)	
Space heating requirement - total per year (kWh/year)												3433.5724	
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													
	650.3177	520.9147	456.6046	274.5345	135.4766	0.0000	0.0000	0.0000	0.0000	272.4065	468.2937	655.0241 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												3433.5724	
Space heating per m2											(98c) / (4) =	66.0302 (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	807.8961	636.0033	651.2470	0.0000	0.0000	0.0000	0.0000 (100)	
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7447	0.8215	0.7751	0.0000	0.0000	0.0000	0.0000 (101)	
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	601.6115	522.4809	504.8058	0.0000	0.0000	0.0000	0.0000 (102)	
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	721.3168	687.7804	624.4814	0.0000	0.0000	0.0000	0.0000 (103)	
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	86.1878	122.9828	89.0387	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	21.5470	30.7457	22.2597	0.0000	0.0000	0.0000	0.0000 (107)	
Space cooling requirement												74.5523 (107)	
Energy for space heating												66.0302 (99)	
Energy for space cooling												1.4337 (108)	
Total												67.4639 (109)	
Fabric Energy Efficiency (DFEE)												67.5 (109)	

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	52.0000 (1b)	x	2.4600 (2b)	=	127.9200 (1b)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	127.9200	(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) =	0.1563	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4063	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3149	(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	0.4015	0.3936	0.3858	0.3464	0.3385	0.2992	0.2992	0.2913	0.3149	0.3385	0.3543	0.3700	(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	0.5806	0.5775	0.5744	0.5600	0.5573	0.5448	0.5448	0.5424	0.5496	0.5573	0.5628	0.5685	(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			1.8900	1.0000	1.8900			(26)
TER Opening Type (Uw = 1.20)			11.1100	1.1450	12.7214			(27)
External Wall 1	46.3500	13.0000	33.3500	0.1800	6.0030			(29a)
External Roof 1	52.0000		52.0000	0.1100	5.7200			(30)
Total net area of external elements Aum(A, m2)			98.3500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.3344			(33)
Party Wall 1			30.4800	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (User defined value 0.050 * total exposed area)	4.9175	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 31.2519	(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	24.5096	24.3775	24.2480	23.6396	23.5258	22.9960	22.9960	22.8978	23.2001	23.5258	23.7561	23.9968	(38)
Heat transfer coeff	55.7615	55.6294	55.4999	54.8915	54.7777	54.2478	54.2478	54.1497	54.4519	54.7777	55.0079	55.2487	(39)
Average = Sum(39)m / 12 =												54.8910	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0723	1.0698	1.0673	1.0556	1.0534	1.0432	1.0432	1.0413	1.0472	1.0534	1.0578	1.0625	(40)
HLP (average)												1.0556	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.7491	(42)

	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	(42a)
Hot water usage for baths	23.1496	22.8058	22.3217	21.4290	20.7606	20.0194	19.6190	20.0998	20.6232	21.4163	22.3274	23.0714	(42b)
Hot water usage for other uses	32.5422	31.3589	30.1755	28.9922	27.8088	26.6255	26.6255	27.8088	28.9922	30.1755	31.3589	32.5422	(42c)
Average daily hot water use (litres/day)												51.0472	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	55.6919	54.1647	52.4972	50.4212	48.5694	46.6448	46.2445	47.9086	49.6154	51.5919	53.6863	55.6136	(44)
Energy conte	88.2023	77.1298	80.6862	69.0240	65.3837	57.3553	55.9287	59.3209	61.1808	70.0097	76.4860	87.0774	(45)
Energy content (annual)										Total = Sum(45)m =		847.7848	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	74.9719	65.5603	68.5833	58.6704	55.5762	48.7520	47.5394	50.4227	52.0037	59.5082	65.0131	74.0158	(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													
	74.9719	65.5603	68.5833	58.6704	55.5762	48.7520	47.5394	50.4227	52.0037	59.5082	65.0131	74.0158	(64)
										Total per year (kWh/year) = Sum(64)m =		720.6170	(64)
12Total per year (kWh/year)												721	(64)
Electric shower(s)													
	42.8812	38.2075	41.7211	39.8139	40.5610	38.6913	39.9810	40.5610	39.8139	41.7211	40.9366	42.8812	(64a)
							Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =					487.7707	(64a)
Heat gains from water heating, kWh/month													
	29.4633	25.9420	27.5761	24.6211	24.0343	21.8608	21.8801	22.7459	22.9544	25.3073	26.4874	29.2242	(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	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	77.0079	85.2588	77.0079	79.5748	77.0079	79.5748	77.0079	77.0079	79.5748	77.0079	79.5748	77.0079	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	152.4259	154.0076	150.0218	141.5364	130.8251	120.7580	114.0326	112.4509	116.4367	124.9221	135.6334	145.7005	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	(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)													
	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	(71)
Water heating gains (Table 5)													
	39.6012	38.6041	37.0646	34.1960	32.3042	30.3622	29.4087	30.5725	31.8811	34.0152	36.7881	39.2799	(72)
Total internal gains													
	318.2711	327.1066	313.3304	304.5433	289.3733	279.9312	269.6853	269.2674	277.1287	285.1813	301.2324	311.2244	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	7.7800	11.2829	0.6300	0.7000	0.7700	26.8271	(75)
Southwest	3.3300	36.7938	0.6300	0.7000	0.7700	37.4448	(79)

Solar gains	64.2719	118.3896	185.6548	269.7079	338.3067	351.7884	332.5330	278.9201	214.3784	137.2275	78.6056	53.9533	(83)
Total gains	382.5429	445.4962	498.9852	574.2512	627.6800	631.7196	602.2183	548.1875	491.5071	422.4088	379.8380	365.1777	(84)

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7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	64.7599	64.9137	65.0652	65.7863	65.9230	66.5669	66.5669	66.6875	66.3174	65.9230	65.6471	65.3611	
alpha	5.3173	5.3276	5.3377	5.3858	5.3949	5.4378	5.4378	5.4458	5.4212	5.3949	5.3765	5.3574	
util living area													
	0.9948	0.9877	0.9689	0.8978	0.7443	0.5398	0.3948	0.4510	0.7133	0.9396	0.9882	0.9959	(86)
MIT	19.8485	20.0468	20.3275	20.6882	20.9114	20.9870	20.9980	20.9961	20.9473	20.6374	20.1838	19.8174	(87)
Th 2	20.0235	20.0256	20.0276	20.0373	20.0391	20.0475	20.0475	20.0490	20.0442	20.0391	20.0354	20.0316	(88)
util rest of house													
	0.9931	0.9838	0.9590	0.8685	0.6867	0.4638	0.3102	0.3596	0.6335	0.9152	0.9837	0.9946	(89)
MIT 2	18.9845	19.1822	19.4578	19.8011	19.9850	20.0421	20.0470	20.0480	20.0183	19.7653	19.3270	18.9601	(90)
Living area fraction										fLA = Living area / (4) =		0.4683	(91)
MIT	19.3891	19.5871	19.8651	20.2165	20.4188	20.4846	20.4923	20.4920	20.4533	20.1737	19.7282	19.3616	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3891	19.5871	19.8651	20.2165	20.4188	20.4846	20.4923	20.4920	20.4533	20.1737	19.7282	19.3616	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9917	0.9816	0.9571	0.8745	0.7104	0.4991	0.3499	0.4025	0.6692	0.9192	0.9820	0.9934	(94)
Useful gains	379.3651	437.3152	477.5700	502.2092	445.9330	315.3189	210.6908	220.6244	328.8969	388.2716	372.9880	362.7546	(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	841.3915	817.0323	741.7600	621.1813	477.5944	319.2265	211.1505	221.5782	345.9507	524.4248	694.6521	837.6566	(97)
Space heating kWh	343.7477	255.1699	196.5573	85.6599	23.5561	0.0000	0.0000	0.0000	0.0000	101.2980	231.5981	353.3271	(98a)
Space heating requirement - total per year (kWh/year)												1590.9141	
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	343.7477	255.1699	196.5573	85.6599	23.5561	0.0000	0.0000	0.0000	0.0000	101.2980	231.5981	353.3271	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1590.9141	
Space heating per m2											(98c) / (4) =	30.5945	(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	509.9296	401.4340	411.5378	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9473	0.9755	0.9602	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	483.0793	391.6127	395.1429	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	710.7422	677.7870	616.1086	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	163.9173	212.9137	164.3984	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	40.9793	53.2284	41.0996	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												135.3074	(107)
Energy for space heating												30.5945	(99)
Energy for space cooling												2.6021	(108)
Total												33.1966	(109)
Fabric Energy Efficiency (TFEE)												33.2	(109)

Full SAP Calculation Printout

Property Reference	3.F Flat - 39-41 OS Green	Issued on Date	06/05/2023
Assessment Reference	00001	Prop Type Ref	Flat - 10-12 Museum Street
Property	Museum Street, London, WC1A		

SAP Rating	78 C	DER	5.03	TER	14.82
Environmental	96 A	% DER < TER			66.06
CO_2 Emissions (t/year)	0.23	DFEE	67.29	TFEE	35.27
Compliance Check	See BREL	% DFEE < TFEE			-90.80
% DPER < TPER	33.03	DPER	52.89	TPER	78.97

Assessor Details	Mr. Adrian Fell	Assessor ID	N222-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	53.0000 (1b)	x	2.4000 (2b)	=	127.2000 (1b)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	127.2000	(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) =	0.1572 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		10.0000 (17)
Infiltration rate		0.6572 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.5094 (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	0.6494	0.6367	0.6240	0.5603	0.5476	0.4839	0.4839	0.4712	0.5094	0.5476	0.5730	0.5985	(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	0.7109	0.7027	0.6947	0.6570	0.6499	0.6171	0.6171	0.6110	0.6297	0.6499	0.6642	0.6791	(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 (Uw = 1.60)			8.7100	1.5038	13.0977			(27)
Solid Door			1.8900	3.0000	5.6700			(26)
External Wall 1	44.0900	10.6000	33.4900	0.2100	7.0329			(29a)
Sheltered Wall	14.0400		14.0400	0.2100	2.9484			(29a)
External Roof 1	53.0000		53.0000	0.1200	6.3600			(30)
Total net area of external elements Aum(A, m2)			111.1300					(31)

Fabric heat loss, W/K = Sum (A x U)							(26)...(30) + (32) =		35.1090				(33)
Party Wall 1							20.2200	0.0000	0.0000				(32)
Party Floor 1							53.0000						(32d)
Party Ceiling 1							53.0000						(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												250.0000	(35)
Thermal bridges (Default value 0.200 * total exposed area)												22.2260	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss										(33) + (36) + (36a) =		57.3350	(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	29.8398	29.4961	29.1592	27.5767	27.2806	25.9023	25.9023	25.6470	26.4332	27.2806	27.8796	28.5058	(38)
Heat transfer coeff	87.1749	86.8311	86.4942	84.9117	84.6156	83.2373	83.2373	82.9821	83.7682	84.6156	85.2146	85.8408	(39)
Average = Sum(39)m / 12 =												84.9103	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.6448	1.6383	1.6320	1.6021	1.5965	1.5705	1.5705	1.5657	1.5805	1.5965	1.6078	1.6196	(40)
HLP (average)												1.6021	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7786	(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	23.3623	23.0153	22.5267	21.6258	20.9512	20.2033	19.7992	20.2844	20.8127	21.6131	22.5325	23.2833	(42b)
Hot water usage for other uses	32.8442	31.6499	30.4556	29.2612	28.0669	26.8726	26.8726	28.0669	29.2612	30.4556	31.6499	32.8442	(42c)
Average daily hot water use (litres/day)												51.5189	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	56.2065	54.6652	52.9823	50.8871	49.0181	47.0758	46.6718	48.3513	50.0739	52.0686	54.1824	56.1275	(44)
Energy conte	89.0174	77.8425	81.4318	69.6618	65.9878	57.8852	56.4455	59.8690	61.7461	70.6566	77.1928	87.8821	(45)
Energy content (annual)											Total = Sum(45)m =	855.6187	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	75.6648	66.1661	69.2170	59.2126	56.0897	49.2024	47.9787	50.8887	52.4842	60.0581	65.6138	74.6998	(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	75.6648	66.1661	69.2170	59.2126	56.0897	49.2024	47.9787	50.8887	52.4842	60.0581	65.6138	74.6998	(64)
									Total per year (kWh/year) = Sum(64)m =			727.2759	(64)
12Total per year (kWh/year)												727	(64)
Electric shower(s)	43.2771	38.5603	42.1064	40.1816	40.9356	39.0486	40.3502	40.9356	40.1816	42.1064	41.3146	43.2771	(64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				492.2750	(64a)
Heat gains from water heating, kWh/month	29.7355	26.1816	27.8308	24.8485	24.2563	22.0627	22.0822	22.9561	23.1665	25.5411	26.7321	29.4942	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	81.1502	89.8448	81.1502	83.8552	81.1502	83.8552	81.1502	81.1502	83.8552	81.1502	83.8552	81.1502	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	155.0178	156.6264	152.5728	143.9431	133.0497	122.8114	115.9716	114.3630	118.4166	127.0463	137.9397	148.1780	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	(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)	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	(71)
Water heating gains (Table 5)	39.9670	38.9607	37.4070	34.5119	32.6026	30.6427	29.6804	30.8549	32.1756	34.3295	37.1279	39.6428	(72)
Total internal gains	325.8134	335.1104	320.8084	311.9885	296.4808	286.9877	276.4806	276.0465	284.1258	292.2044	308.6012	318.6494	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	7.2200	10.6334	0.6400	0.7000	0.7700	23.8353 (74)
Southeast	1.4900	36.7938	0.6400	0.7000	0.7700	17.0205 (77)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	40.8558	74.5427	117.0698	173.4775	222.5324	233.9465	220.0848	181.0938	136.0140	86.2644	49.7905	34.4363	(83)
Total gains	366.6692	409.6530	437.8782	485.4660	519.0132	520.9342	496.5653	457.1403	420.1398	378.4688	358.3918	353.0856	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	42.2204	42.3875	42.5526	43.3457	43.4973	44.2176	44.2176	44.3536	43.9374	43.4973	43.1916	42.8765	
alpha	3.8147	3.8258	3.8368	3.8897	3.8998	3.9478	3.9478	3.9569	3.9292	3.8998	3.8794	3.8584	
util living area	0.9961	0.9935	0.9884	0.9707	0.9228	0.8067	0.6628	0.7208	0.9016	0.9784	0.9932	0.9967	(86)
MIT	18.9766	19.1594	19.4728	19.9606	20.4239	20.7887	20.9302	20.9018	20.6264	20.0466	19.4532	18.9687	(87)
Th 2	19.5806	19.5854	19.5900	19.6118	19.6159	19.6350	19.6350	19.6386	19.6276	19.6159	19.6076	19.5990	(88)
util rest of house	0.9947	0.9912	0.9838	0.9575	0.8833	0.7034	0.4908	0.5560	0.8339	0.9662	0.9903	0.9955	(89)
MIT 2	17.7858	17.9711	18.2858	18.7807	19.2205	19.5361	19.6183	19.6112	19.4163	18.8729	18.2804	17.7910	(90)
Living area fraction									fLA = Living area / (4) =			0.5202	(91)
MIT	18.4052	18.5892	18.9033	19.3945	19.8465	20.1877	20.3007	20.2825	20.0458	19.4835	18.8905	18.4036	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4052	18.5892	18.9033	19.3945	19.8465	20.1877	20.3007	20.2825	20.0458	19.4835	18.8905	18.4036	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9930	0.9888	0.9807	0.9548	0.8912	0.7504	0.5809	0.6415	0.8588	0.9646	0.9881	0.9940	(94)
Useful gains	364.1155	405.0666	429.4427	463.5250	462.5586	390.8861	288.4375	293.2514	360.8037	365.0685	354.1374	350.9781	(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	1229.6225	1188.6497	1072.8112	891.1056	689.3232	465.1035	308.0392	322.1819	498.0675	751.6799	1004.7212	1219.2502	(97)
Space heating kWh	643.9372	526.5678	478.6661	307.8580	168.7128	0.0000	0.0000	0.0000	0.0000	287.6388	468.4204	645.9944	(98a)
Space heating requirement - total per year (kWh/year)												3527.7957	
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	643.9372	526.5678	478.6661	307.8580	168.7128	0.0000	0.0000	0.0000	0.0000	287.6388	468.4204	645.9944	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3527.7957	
Space heating per m2											(98c) / (4) =	66.5622	(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	782.4309	615.9562	630.6638	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6631	0.7510	0.7027	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	518.8460	462.5615	443.1362	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	577.5087	550.7076	506.2077	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	42.2372	65.5807	46.9252	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	10.5593	16.3952	11.7313	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												38.6858	(107)
Energy for space heating												66.5622	(99)
Energy for space cooling												0.7299	(108)
Total												67.2921	(109)
Fabric Energy Efficiency (DFEE)												67.3	(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	53.0000 (1b)	x	2.4000 (2b)	=	127.2000 (1b)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 53.0000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	127.2000	(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) =	0.1572	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4072	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3156	(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	0.4024	0.3945	0.3866	0.3472	0.3393	0.2998	0.2998	0.2919	0.3156	0.3393	0.3551	0.3708	(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	0.5810	0.5778	0.5747	0.5603	0.5576	0.5449	0.5449	0.5426	0.5498	0.5576	0.5630	0.5688	(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			1.8900	1.0000	1.8900			(26)
TER Opening Type (Uw = 1.20)			8.7100	1.1450	9.9733			(27)
External Wall 1	44.0900	10.6000	33.4900	0.1800	6.0282			(29a)
Sheltered Wall	14.0400		14.0400	0.1800	2.5272			(29a)
External Roof 1	53.0000		53.0000	0.1100	5.8300			(30)
Total net area of external elements Aum(A, m2)			111.1300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.2487			(33)
Party Wall 1			20.2200	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (User defined value 0.050 * total exposed area)							5.5565	(36)
Point Thermal bridges					(36a) =		0.0000	
Total fabric heat loss					(33) + (36) + (36a) =		31.8052	(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	24.3864	24.2545	24.1251	23.5176	23.4039	22.8747	22.8747	22.7767	23.0785	23.4039	23.6338	23.8743	(38)
Heat transfer coeff	56.1916	56.0597	55.9303	55.3227	55.2091	54.6799	54.6799	54.5819	54.8837	55.2091	55.4390	55.6794	(39)
Average = Sum(39)m / 12 =												55.3222	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0602	1.0577	1.0553	1.0438	1.0417	1.0317	1.0317	1.0298	1.0355	1.0417	1.0460	1.0506	(40)
HLP (average)												1.0438	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7786 (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	23.3623	23.0153	22.5267	21.6258	20.9512	20.2033	19.7992	20.2844	20.8127	21.6131	22.5325	23.2833 (42b)

Hot water usage for other uses

	32.8442	31.6499	30.4556	29.2612	28.0669	26.8726	26.8726	28.0669	29.2612	30.4556	31.6499	32.8442 (42c)

Average daily hot water use (litres/day) 51.5189 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	56.2065	54.6652	52.9823	50.8871	49.0181	47.0758	46.6718	48.3513	50.0739	52.0686	54.1824	56.1275	(44)
Energy conte	89.0174	77.8425	81.4318	69.6618	65.9878	57.8852	56.4455	59.8690	61.7461	70.6566	77.1928	87.8821	(45)
Energy content (annual)										Total = Sum(45)m =		855.6187	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	75.6648	66.1661	69.2170	59.2126	56.0897	49.2024	47.9787	50.8887	52.4842	60.0581	65.6138	74.6998	(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													
	75.6648	66.1661	69.2170	59.2126	56.0897	49.2024	47.9787	50.8887	52.4842	60.0581	65.6138	74.6998	(64)
										Total per year (kWh/year) = Sum(64)m =		727.2759	(64)
12Total per year (kWh/year)												727	(64)
Electric shower(s)													
	43.2771	38.5603	42.1064	40.1816	40.9356	39.0486	40.3502	40.9356	40.1816	42.1064	41.3146	43.2771	(64a)
Heat gains from water heating, kWh/month													
	29.7355	26.1816	27.8308	24.8485	24.2563	22.0627	22.0822	22.9561	23.1665	25.5411	26.7321	29.4942	(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	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	81.1502	89.8448	81.1502	83.8552	81.1502	83.8552	81.1502	81.1502	83.8552	81.1502	83.8552	81.1502	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	155.0178	156.6264	152.5728	143.9431	133.0497	122.8114	115.9716	114.3630	118.4166	127.0463	137.9397	148.1780	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	(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)													
	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	(71)
Water heating gains (Table 5)													
	39.9670	38.9607	37.4070	34.5119	32.6026	30.6427	29.6804	30.8549	32.1756	34.3295	37.1279	39.6428	(72)
Total internal gains													
	325.8134	335.1104	320.8084	311.9885	296.4808	286.9877	276.4806	276.0465	284.1258	292.2044	308.6012	318.6494	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.2200	10.6334	0.6300	0.7000	0.7700	23.4629	(74)
Southeast	1.4900	36.7938	0.6300	0.7000	0.7700	16.7546	(77)

Solar gains	40.2174	73.3779	115.2405	170.7669	219.0553	230.2911	216.6459	178.2642	133.8888	84.9166	49.0126	33.8982	(83)
Total gains	366.0308	408.4883	436.0489	482.7554	515.5361	517.2788	493.1265	454.3107	418.0146	377.1209	357.6138	352.5476	(84)

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7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	65.5001	65.6543	65.8061	66.5288	66.6658	67.3109	67.3109	67.4318	67.0610	66.6658	66.3892	66.1026	
alpha	5.3667	5.3770	5.3871	5.4353	5.4444	5.4874	5.4874	5.4955	5.4707	5.4444	5.4259	5.4068	
util living area													
	0.9961	0.9922	0.9833	0.9463	0.8431	0.6487	0.4830	0.5429	0.8008	0.9627	0.9916	0.9968	(86)
MIT	19.8201	19.9771	20.2134	20.5615	20.8374	20.9702	20.9950	20.9909	20.9092	20.5644	20.1424	19.7970	(87)
Th 2	20.0335	20.0355	20.0375	20.0470	20.0487	20.0570	20.0570	20.0585	20.0538	20.0487	20.0452	20.0414	(88)
util rest of house													
	0.9948	0.9897	0.9776	0.9276	0.7939	0.5646	0.3821	0.4368	0.7260	0.9460	0.9884	0.9958	(89)
MIT 2	18.9643	19.1217	19.3566	19.6987	19.9422	20.0439	20.0558	20.0560	20.0058	19.7085	19.2943	18.9476	(90)
Living area fraction										fLA = Living area / (4) =		0.5202	(91)
MIT	19.4095	19.5667	19.8023	20.1475	20.4079	20.5258	20.5443	20.5423	20.4757	20.1537	19.7355	19.3895	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4095	19.5667	19.8023	20.1475	20.4079	20.5258	20.5443	20.5423	20.4757	20.1537	19.7355	19.3895	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9937	0.9882	0.9759	0.9299	0.8139	0.6075	0.4347	0.4922	0.7617	0.9482	0.9871	0.9948	(94)
Useful gains	363.7421	403.6530	425.5537	448.9099	419.5773	314.2563	214.3719	223.6149	318.3974	357.5691	352.9939	350.7283	(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													
	849.0280	822.2086	744.0008	622.2448	480.7546	324.0199	215.6757	226.0953	349.9243	527.4521	700.4986	845.7422	(97)
Space heating kWh													
	361.0527	281.2694	236.9246	124.8012	45.5159	0.0000	0.0000	0.0000	0.0000	126.3930	250.2034	368.2903	(98a)
Space heating requirement - total per year (kWh/year)												1794.4504	
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													
	361.0527	281.2694	236.9246	124.8012	45.5159	0.0000	0.0000	0.0000	0.0000	126.3930	250.2034	368.2903	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1794.4504	
Space heating per m2											(98c) / (4) =	33.8576	(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	513.9911	404.6313	414.8225	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8880	0.9419	0.9148	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	456.4360	381.1246	379.4866	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	573.2362	546.6882	502.9004	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	84.0961	123.1793	91.8199	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	21.0240	30.7948	22.9550	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												74.7738	(107)
Energy for space heating												33.8576	(99)
Energy for space cooling												1.4108	(108)
Total												35.2684	(109)
Fabric Energy Efficiency (TFEE)												35.3	(109)

Full SAP Calculation Printout

Property Reference	Flat 1 HH - Be Green.	Issued on Date	06/05/2023
Assessment Reference	Flat 1HH - Be Green.	Prop Type Ref	
Property	Flat 1 HH, West Central Street, London, WC1A		

SAP Rating	74 C	DER	7.73	TER	20.23
Environmental	95 A	% DER < TER			61.79
CO_2 Emissions (t/year)	0.35	DFEE	55.62	TFEE	56.61
Compliance Check	See BREL	% DFEE < TFEE			1.77
% DPER < TPER	24.72	DPER	81.71	TPER	108.54

Assessor Details	Mr. Adrian Fell	Assessor ID	N222-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	50.0000	(1b)	x 2.8600	(2b) =	143.0000	(1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		143.0000	(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) =	0.1399 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.2899 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2464 (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	0.3141	0.3080	0.3018	0.2710	0.2649	0.2341	0.2341	0.2279	0.2464	0.2649	0.2772	0.2895	(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	0.5493	0.5474	0.5455	0.5367	0.5351	0.5274	0.5274	0.5260	0.5304	0.5351	0.5384	0.5419	(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 (Uw = 0.95)			23.3100	0.9152	21.3338			(27)
Glazed Door (Uw = 0.95)			9.6800	0.9152	8.8593			(27)
Heat Loss Floor			32.2600	0.1000	3.2260	0.3000	9.6780	(28b)
Floor Over Retail			17.7400	0.1000	1.7740	0.3000	5.3220	(28b)
External Wall 1	81.6200	32.9900	48.6300	0.1600	7.7808	14.0000	680.8200	(29a)
Shelt Unheated Wall	8.3800		8.3800	0.1600	1.3408	14.0000	117.3200	(29a)

Total net area of external elements Aum(A, m2)	140.0000		(31)
Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =	44.3148	(33)
Sheltered Heated	6.4600 0.0000 0.0000 20.0000	129.2000	(32)
Party Ceiling 1	50.0000 40.0000	2000.0000	(32b)
Internal Wall 1	54.6800 9.0000	492.1200	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	3434.4600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		68.6892 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E20 Exposed floor (normal)	31.4700	0.1250	3.9337
E16 Corner (normal)	8.5800	0.0900	0.7722
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	5.1900	0.0000	0.0000
E1 Steel lintel with perforated steel base plate	16.2000	0.0500	0.8100
E3 Sill	16.2000	0.0500	0.8100
E4 Jamb	47.9000	0.0500	2.3950
E7 Party floor between dwellings (in blocks of flats)	31.4700	0.0700	2.2029
E18 Party wall between dwellings	5.7200	0.0600	0.3432

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		11.2670 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	55.5818 (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	25.9234	25.8330	25.7443	25.3281	25.2502	24.8877	24.8877	24.8205	25.0273	25.2502	25.4078	25.5725	(38)
Heat transfer coeff	81.5052	81.4148	81.3262	80.9099	80.8320	80.4695	80.4695	80.4023	80.6091	80.8320	80.9896	81.1543	(39)
Average = Sum(39)m / 12 =												80.9095	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.6301	1.6283	1.6265	1.6182	1.6166	1.6094	1.6094	1.6080	1.6122	1.6166	1.6198	1.6231	(40)
HLP (average)												1.6182	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.6901	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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

22.7244	22.3869	21.9117	21.0354	20.3792	19.6517	19.2587	19.7306	20.2445	21.0230	21.9173	22.6476	(42b)

Hot water usage for other uses

31.9383	30.7769	29.6155	28.4541	27.2927	26.1314	26.1314	27.2927	28.4541	29.6155	30.7769	31.9383	(42c)

Average daily hot water use (litres/day)		50.1040 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	54.6627	53.1639	51.5272	49.4895	47.6720	45.7830	45.3900	47.0234	48.6986	50.6385	52.6942	54.5859	(44)
Energy conte	86.5724	75.7046	79.1954	67.7487	64.1757	56.2956	54.8953	58.2247	60.0502	68.7160	75.0726	85.4684	(45)
Energy content (annual)										Total = Sum(45)m =		832.1197	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

73.5866	64.3489	67.3161	57.5864	54.5493	47.8512	46.6610	49.4910	51.0427	58.4086	63.8117	72.6481	(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

73.5866	64.3489	67.3161	57.5864	54.5493	47.8512	46.6610	49.4910	51.0427	58.4086	63.8117	72.6481	(64)
									Total per year (kWh/year) = Sum(64)m =		707.3017	(64)
12Total per year (kWh/year)											707	(64)

Electric shower(s)

42.0893	37.5019	40.9507	39.0787	39.8120	37.9768	39.2427	39.8120	39.0787	40.9507	40.1807	42.0893	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		478.7637	(64a)

Heat gains from water heating, kWh/month

28.9190	25.4627	27.0667	24.1663	23.5903	21.4570	21.4759	22.3258	22.5304	24.8398	25.9981	28.6844	(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	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	74.2626	82.2193	74.2626	76.7380	74.2626	76.7380	74.2626	74.2626	76.7380	74.2626	76.7380	74.2626	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	147.2339	148.7618	144.9117	136.7153	126.3689	116.6447	110.1484	108.6205	112.4706	120.6670	131.0134	140.7376	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	(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)													

	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	(71)
Water heating gains (Table 5)												
	38.8696	37.8910	36.3800	33.5643	31.7074	29.8014	28.8655	30.0077	31.2922	33.3869	36.1085	38.5542 (72)
Total internal gains												
	308.7177	317.2236	303.9058	295.3692	280.6905	271.5357	261.6280	261.2424	268.8523	276.6680	292.2114	301.9060 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	8.8000	11.2829	0.4700	0.7000	0.7700	22.6378	(75)
Southeast	14.5100	36.7938	0.4700	0.7000	0.7700	121.7227	(77)
Northeast	7.3500	11.2829	0.4700	0.7000	0.7700	18.9077	(75)
Northwest	2.3300	11.2829	0.4700	0.7000	0.7700	5.9939	(81)

Solar gains	169.2621	304.1066	458.0347	637.8298	778.5914	801.1868	760.6833	651.3536	519.6180	347.4114	205.6126	142.9923 (83)
Total gains	477.9797	621.3301	761.9405	933.1989	1059.2819	1072.7225	1022.3113	912.5960	788.4704	624.0794	497.8240	444.8983 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	11.7050	11.7180	11.7307	11.7911	11.8025	11.8556	11.8556	11.8655	11.8351	11.8025	11.7795	11.7556	
alpha	1.7803	1.7812	1.7820	1.7861	1.7868	1.7904	1.7904	1.7910	1.7890	1.7868	1.7853	1.7837	
util living area													
	0.8935	0.8409	0.7690	0.6563	0.5283	0.4031	0.3106	0.3533	0.5265	0.7318	0.8551	0.9044	(86)
MIT	17.1447	17.7440	18.5477	19.4801	20.2028	20.6561	20.8478	20.8025	20.4137	19.4068	18.0989	17.0225	(87)
Th 2	19.5913	19.5926	19.5939	19.6000	19.6012	19.6065	19.6065	19.6074	19.6044	19.6012	19.5989	19.5964	(88)
util rest of house													
	0.8797	0.8215	0.7415	0.6168	0.4747	0.3321	0.2227	0.2609	0.4526	0.6892	0.8338	0.8918	(89)
MIT 2	16.1827	16.7601	17.5276	18.3969	19.0375	19.4126	19.5472	19.5249	19.2435	18.3669	17.1241	16.0672	(90)
Living area fraction										fLA = Living area / (4) =		0.6934	(91)
MIT	16.8498	17.4424	18.2349	19.1480	19.8455	20.2748	20.4491	20.4108	20.0549	19.0880	17.8000	16.7296	(92)
Temperature adjustment												0.0000	
adjusted MIT	16.8498	17.4424	18.2349	19.1480	19.8455	20.2748	20.4491	20.4108	20.0549	19.0880	17.8000	16.7296	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8437	0.7842	0.7100	0.6027	0.4846	0.3673	0.2772	0.3158	0.4780	0.6711	0.7989	0.8569	(94)
Useful gains	403.2542	487.2458	541.0063	562.4194	513.3228	394.0316	283.3348	288.2385	376.9000	418.8363	397.6982	381.2391	(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													
	1022.8731	1021.1338	954.3553	829.1664	658.4172	456.6520	309.7314	322.4753	480.0186	686.1009	866.5887	1016.8308	(97)
Space heating kWh													
	460.9964	358.7727	307.5316	192.0578	107.9502	0.0000	0.0000	0.0000	0.0000	198.8448	337.6012	472.8802	(98a)
Space heating requirement - total per year (kWh/year)												2436.6351	
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													
	460.9964	358.7727	307.5316	192.0578	107.9502	0.0000	0.0000	0.0000	0.0000	198.8448	337.6012	472.8802	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2436.6351	
Space heating per m2											(98c) / (4) =	48.7327	(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	756.4129	595.4740	611.0577	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7823	0.8272	0.7950	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	591.7577	492.5871	485.7843	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1227.4805	1170.0301	1043.2092	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	457.7204	504.0176	414.7242	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	114.4301	126.0044	103.6810	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												344.1155	(107)
Energy for space heating												48.7327	(99)
Energy for space cooling												6.8823	(108)
Total												55.6150	(109)

Fabric Energy Efficiency (DFEE) 55.6 (109)

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	50.0000 (1b)	x	2.8600 (2b)	=	143.0000 (1b) -	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 50.0000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	143.0000 (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) =	0.1399	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3899	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3314	(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	0.4225	0.4142	0.4059	0.3645	0.3562	0.3148	0.3148	0.3065	0.3314	0.3562	0.3728	0.3894	(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	0.5893	0.5858	0.5824	0.5664	0.5635	0.5496	0.5496	0.5470	0.5549	0.5635	0.5695	0.5758	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opening Type (Uw = 1.20)			12.4900	1.1450	14.3015			(27)
Heat Loss Floor			32.2600	0.1300	4.1938			(28b)
Floor Over Retail			17.7400	0.1300	2.3062			(28b)
External Wall 1	81.6200	12.4900	69.1300	0.1800	12.4434			(29a)
Shelt Unheated Wall	8.3800		8.3800	0.1800	1.5084			(29a)
Total net area of external elements Aum(A, m2)			140.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		34.7533			(33)
Sheltered Heated			6.4600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 68.6892 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E20 Exposed floor (normal)	31.4700	0.3200	10.0704
E16 Corner (normal)	8.5800	0.0900	0.7722
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	5.1900	0.0000	0.0000
E1 Steel lintel with perforated steel base plate	16.2000	0.0500	0.8100
E3 Sill	16.2000	0.0500	0.8100
E4 Jamb	47.9000	0.0500	2.3950
E7 Party floor between dwellings (in blocks of flats)	31.4700	0.0700	2.2029
E18 Party wall between dwellings	5.7200	0.0600	0.3432

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		17.4037	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	52.1570	(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	27.8071	27.6435	27.4832	26.7302	26.5893	25.9334	25.9334	25.8120	26.1860	26.5893	26.8743	27.1723	(38)
Heat transfer coeff	79.9641	79.8005	79.6402	78.8872	78.7463	78.0904	78.0904	77.9690	78.3431	78.7463	79.0313	79.3293	(39)
Average = Sum(39)m / 12 =												78.8865	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.5993	1.5960	1.5928	1.5777	1.5749	1.5618	1.5618	1.5594	1.5669	1.5749	1.5806	1.5866	(40)
HLP (average)												1.5777	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.6901	(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	22.7244	22.3869	21.9117	21.0354	20.3792	19.6517	19.2587	19.7306	20.2445	21.0230	21.9173	22.6476	(42b)
Hot water usage for other uses	31.9383	30.7769	29.6155	28.4541	27.2927	26.1314	26.1314	27.2927	28.4541	29.6155	30.7769	31.9383	(42c)
Average daily hot water use (litres/day)												50.1040	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	54.6627	53.1639	51.5272	49.4895	47.6720	45.7830	45.3900	47.0234	48.6986	50.6385	52.6942	54.5859	(44)
Energy conte	86.5724	75.7046	79.1954	67.7487	64.1757	56.2956	54.8953	58.2247	60.0502	68.7160	75.0726	85.4684	(45)
Energy content (annual)										Total = Sum(45)m =		832.1197	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	73.5866	64.3489	67.3161	57.5864	54.5493	47.8512	46.6610	49.4910	51.0427	58.4086	63.8117	72.6481	(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	73.5866	64.3489	67.3161	57.5864	54.5493	47.8512	46.6610	49.4910	51.0427	58.4086	63.8117	72.6481	(64)
									Total per year (kWh/year) = Sum(64)m =			707.3017	(64)
12Total per year (kWh/year)												707	(64)
Electric shower(s)	42.0893	37.5019	40.9507	39.0787	39.8120	37.9768	39.2427	39.8120	39.0787	40.9507	40.1807	42.0893	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			478.7637	(64a)
Heat gains from water heating, kWh/month	28.9190	25.4627	27.0667	24.1663	23.5903	21.4570	21.4759	22.3258	22.5304	24.8398	25.9981	28.6844	(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	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	74.2626	82.2193	74.2626	76.7380	74.2626	76.7380	74.2626	74.2626	76.7380	74.2626	76.7380	74.2626	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	147.2339	148.7618	144.9117	136.7153	126.3689	116.6447	110.1484	108.6205	112.4706	120.6670	131.0134	140.7376	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	(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)	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	(71)
Water heating gains (Table 5)	38.8696	37.8910	36.3800	33.5643	31.7074	29.8014	28.8655	30.0077	31.2922	33.3869	36.1085	38.5542	(72)
Total internal gains	308.7177	317.2236	303.9058	295.3692	280.6905	271.5357	261.6280	261.2424	268.8523	276.6680	292.2114	301.9060	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	6.1100	11.2829	0.6300	0.7000	0.7700	21.0686	(75)
Southeast	5.5000	36.7938	0.6300	0.7000	0.7700	61.8457	(77)
Northwest	0.8800	11.2829	0.6300	0.7000	0.7700	3.0344	(81)

Solar gains	85.9487	154.4085	232.5340	323.7651	395.1782	406.6313	386.0805	330.6152	263.7827	176.3880	104.4047	72.6108	(83)
Total gains	394.6664	471.6321	536.4397	619.1342	675.8687	678.1670	647.7085	591.8576	532.6350	453.0560	396.6161	374.5167	(84)

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7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	11.9306	11.9550	11.9791	12.0934	12.1151	12.2168	12.2168	12.2358	12.1774	12.1151	12.0714	12.0260	
alpha	1.7954	1.7970	1.7986	1.8062	1.8077	1.8145	1.8145	1.8157	1.8118	1.8077	1.8048	1.8017	
util living area	0.9183	0.8887	0.8473	0.7714	0.6694	0.5437	0.4357	0.4788	0.6491	0.8109	0.8922	0.9248	(86)
MIT	16.9354	17.3791	18.0671	18.9906	19.8193	20.4443	20.7398	20.6805	20.1756	19.0953	17.8661	16.8588	(87)
Th 2	19.6139	19.6163	19.6186	19.6297	19.6318	19.6415	19.6415	19.6433	19.6377	19.6318	19.6276	19.6232	(88)
util rest of house	0.9073	0.8740	0.8264	0.7387	0.6182	0.4647	0.3267	0.3698	0.5769	0.7763	0.8754	0.9147	(89)
MIT 2	15.9941	16.4282	17.0996	17.9904	18.7596	19.3084	19.5316	19.4988	19.1021	18.1154	16.9222	15.9246	(90)
Living area fraction										fLA = Living area / (4) =		0.6934	(91)
MIT	16.6468	17.0876	17.7705	18.6839	19.4944	20.0960	20.3694	20.3182	19.8465	18.7949	17.5767	16.5723	(92)
Temperature adjustment												0.0000	
adjusted MIT	16.6468	17.0876	17.7705	18.6839	19.4944	20.0960	20.3694	20.3182	19.8465	18.7949	17.5767	16.5723	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8746	0.8384	0.7911	0.7120	0.6125	0.4930	0.3880	0.4272	0.5892	0.7503	0.8419	0.8831	(94)
Useful gains	345.1848	395.3964	424.3942	440.8235	413.9379	334.3048	251.2822	252.8322	313.8234	339.9422	333.9210	330.7525	(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	987.2991	972.5733	897.5859	771.8283	613.7782	429.1844	294.3526	305.4987	450.1977	645.3166	827.9895	981.4883	(97)
Space heating kWh	477.7330	387.8629	352.0546	238.3235	148.6812	0.0000	0.0000	0.0000	0.0000	227.1985	355.7293	484.1475	(98a)
Space heating requirement - total per year (kWh/year)												2671.7305	
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	477.7330	387.8629	352.0546	238.3235	148.6812	0.0000	0.0000	0.0000	0.0000	227.1985	355.7293	484.1475	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2671.7305	
Space heating per m2											(98c) / (4) =	53.4346	(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	734.0502	577.8693	592.5643	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6585	0.7179	0.6829	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	483.3509	414.8666	404.6768	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	766.3118	732.1826	668.3201	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	203.7318	236.0831	196.1507	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	50.9330	59.0208	49.0377	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												158.9914	(107)
Energy for space heating												53.4346	(99)
Energy for space cooling												3.1798	(108)
Total												56.6144	(109)
Fabric Energy Efficiency (TFEE)												56.6	(109)

Full SAP Calculation Printout

Property Reference	Flat 2 HH - Be Green.	Issued on Date	06/05/2023
Assessment Reference	Flat 2 HH - Be Green.	Prop Type Ref	
Property	Flat 1 HH, West Central Street, London, WC1A		

SAP Rating	77 C	DER	6.10	TER	14.98
Environmental	95 A	% DER < TER			59.28
CO_2 Emissions (t/year)	0.33	DFEE	39.94	TFEE	40.44
Compliance Check	See BREL	% DFEE < TFEE			1.23
% DPER < TPER	19.05	DPER	64.80	TPER	80.05

Assessor Details	Mr. Adrian Fell	Assessor ID	N222-0001
Client			

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

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		60.0000 (1b)	x	2.8600 (2b)	=	171.6000	(1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.0000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	171.6000	(5)

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2. Ventilation rate

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			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) =	0.1166	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.2666	(18)
Number of sides sheltered			2	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.2266	(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	0.2889	0.2832	0.2775	0.2492	0.2436	0.2152	0.2152	0.2096	0.2266	0.2436	0.2549	0.2662	(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	0.5417	0.5401	0.5385	0.5311	0.5297	0.5232	0.5232	0.5220	0.5257	0.5297	0.5325	0.5354	(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 (Uw = 0.95)			17.5300	0.9152	16.0438			(27)
Glazed Door (Uw = 0.95)			7.3500	0.9152	6.7269			(27)
Floor			1.8000	0.1200	0.2160			(28b)
External Wall 1	87.9200	24.8800	63.0400	0.1600	10.0864	14.0000	882.5600	(29a)
Shelt Unheated Wall	1.9700		1.9700	0.1600	0.3152	14.0000	27.5800	(29a)
Total net area of external elements Aum(A, m2)			91.6900					(31)

Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	33.3883	(33)
Sheltered Heated	11.1500	0.0000	0.0000	20.0000	223.0000 (32)
Party Floor 1	58.2000			40.0000	2328.0000 (32d)
Party Ceiling 1	60.0000			40.0000	2400.0000 (32b)
Internal Wall 1	80.6500			9.0000	725.8500 (32c)

Heat capacity Cm = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =	6586.9900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K				109.7832 (35)
List of Thermal Bridges				
K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	12.1000	0.0500	0.6050	
E3 Sill	12.1000	0.0500	0.6050	
E4 Jamb	40.0000	0.0500	2.0000	
E7 Party floor between dwellings (in blocks of flats)	62.9400	0.0700	4.4058	
E16 Corner (normal)	8.5800	0.0900	0.7722	
E18 Party wall between dwellings	2.8600	0.0600	0.1716	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.8000	0.0000	0.0000	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				8.5596 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	41.9479 (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	30.6767	30.5850	30.4951	30.0727	29.9936	29.6257	29.6257	29.5576	29.7674	29.9936	30.1535	30.3207	(38)
Heat transfer coeff	72.6247	72.5329	72.4430	72.0206	71.9415	71.5736	71.5736	71.5055	71.7154	71.9415	72.1014	72.2686	(39)
Average = Sum(39)m / 12 =												72.0202	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2104	1.2089	1.2074	1.2003	1.1990	1.1929	1.1929	1.1918	1.1953	1.1990	1.2017	1.2045	(40)
HLP (average)												1.2003	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.9816	(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	24.8265	24.4578	23.9386	22.9812	22.2644	21.4695	21.0401	21.5557	22.1171	22.9676	23.9447	24.7426	(42b)
Hot water usage for other uses	34.9239	33.6540	32.3840	31.1140	29.8441	28.5741	28.5741	29.8441	31.1140	32.3840	33.6540	34.9239	(42c)
Average daily hot water use (litres/day)												54.7671	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	59.7504	58.1117	56.3226	54.0952	52.1084	50.0436	49.6143	51.3998	53.2311	55.3516	57.5987	59.6665	(44)
Energy conte	94.6300	82.7503	86.5657	74.0537	70.1480	61.5345	60.0041	63.6437	65.6393	75.1117	82.0599	93.4233	(45)
Energy content (annual)										Total = Sum(45)m =		909.5641	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	80.4355	70.3378	73.5808	62.9456	59.6258	52.3043	51.0035	54.0971	55.7934	63.8449	69.7509	79.4098	(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	80.4355	70.3378	73.5808	62.9456	59.6258	52.3043	51.0035	54.0971	55.7934	63.8449	69.7509	79.4098	(64)
								Total per year (kWh/year) = Sum(64)m =				773.1295	(64)
12Total per year (kWh/year)												773	(64)
Electric shower(s)	46.0039	40.9899	44.7594	42.7133	43.5148	41.5089	42.8925	43.5148	42.7133	44.7594	43.9177	46.0039	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							523.2919	(64a)
Heat gains from water heating, kWh/month	31.6099	27.8319	29.5850	26.4147	25.7852	23.4533	23.4740	24.4030	24.6267	27.1511	28.4172	31.3534	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	87.2319	96.5781	87.2319	90.1396	87.2319	90.1396	87.2319	87.2319	90.1396	87.2319	90.1396	87.2319	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	172.9469	174.7416	170.2191	160.5914	148.4380	137.0156	129.3847	127.5901	132.1125	141.7403	153.8936	165.3161	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	(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)	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	(71)

Water heating gains (Table 5)

	42.4864	41.4165	39.7648	36.6871	34.6575	32.5740	31.5511	32.7997	34.2037	36.4934	39.4683	42.1417 (72)

Total internal gains

	355.3897	365.4608	349.9404	340.1426	323.0519	312.4537	300.8922	300.3462	309.1804	318.1901	336.2260	347.4141 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast	4.2000	11.2829	0.4700	0.7000	0.7700	10.8044 (75)
Southeast	11.0000	36.7938	0.4700	0.7000	0.7700	92.2777 (77)
Northwest	2.3300	11.2829	0.4700	0.7000	0.7700	5.9939 (81)
Northeast	7.3500	11.2829	0.4700	0.7000	0.7700	18.9077 (75)

Solar gains	127.9837	229.8636	346.0120	481.5286	587.5484	604.4994	573.9795	491.6430	392.4309	262.5422	155.4548	108.1298 (83)
Total gains	483.3734	595.3244	695.9524	821.6712	910.6002	916.9531	874.8717	791.9891	701.6113	580.7323	491.6808	455.5439 (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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	25.1942	25.2261	25.2574	25.4055	25.4334	25.5642	25.5642	25.5885	25.5136	25.4334	25.3770	25.3183	
alpha	2.6796	2.6817	2.6838	2.6937	2.6956	2.7043	2.7043	2.7059	2.7009	2.6956	2.6918	2.6879	
util living area	0.9471	0.9122	0.8568	0.7503	0.6099	0.4581	0.3451	0.3919	0.5937	0.8140	0.9193	0.9539	(86)
MIT	18.6235	19.0326	19.5692	20.1950	20.6407	20.8797	20.9588	20.9412	20.7523	20.1298	19.2633	18.5416	(87)
Th 2	19.9117	19.9129	19.9141	19.9197	19.9208	19.9257	19.9257	19.9266	19.9238	19.9208	19.9186	19.9164	(88)
util rest of house	0.9389	0.8993	0.8363	0.7165	0.5602	0.3922	0.2662	0.3085	0.5257	0.7795	0.9052	0.9468	(89)
MIT 2	17.7715	18.1698	18.6861	19.2726	19.6641	19.8574	19.9093	19.9016	19.7695	19.2325	18.4062	17.6947	(90)
Living area fraction										fLA = Living area / (4) =		0.7182	(91)
MIT	18.3834	18.7894	19.3203	19.9351	20.3655	20.5916	20.6630	20.6483	20.4753	19.8769	19.0217	18.3029	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3834	18.7894	19.3203	19.9351	20.3655	20.5916	20.6630	20.6483	20.4753	19.8769	19.0217	18.3029	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9244	0.8834	0.8235	0.7170	0.5814	0.4338	0.3209	0.3653	0.5618	0.7779	0.8910	0.9331	(94)
Useful gains	446.8436	525.9056	573.1042	589.1478	529.4391	397.7419	280.7605	289.3532	394.1970	451.7711	438.0812	425.0558	(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	1022.7986	1007.4405	928.7394	794.7521	623.4080	428.8407	290.8057	303.7734	457.2087	667.3955	859.5713	1019.1989	(97)
Space heating kWh	428.5105	323.5914	264.5926	148.0350	69.9129	0.0000	0.0000	0.0000	0.0000	160.4245	303.4729	442.0425	(98a)
Space heating requirement - total per year (kWh/year)												2140.5823	
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	428.5105	323.5914	264.5926	148.0350	69.9129	0.0000	0.0000	0.0000	0.0000	160.4245	303.4729	442.0425	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2140.5823	
Space heating per m2										(98c) / (4) =		35.6764	(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	672.7922	529.6449	543.4419	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8642	0.9054	0.8797	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	581.4025	479.5358	478.0483	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1039.7692	992.2990	897.1043	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	330.0240	381.4958	311.7777	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	82.5060	95.3740	77.9444	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												255.8244	(107)
Energy for space heating												35.6764	(99)
Energy for space cooling												4.2637	(108)
Total												39.9401	(109)
Fabric Energy Efficiency (DFEE)												39.9	(109)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	60.0000 (1b)	x	2.8600 (2b)	=	171.6000 (1b) -	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	171.6000	(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) =	0.1166 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3666 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3116 (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	0.3972	0.3895	0.3817	0.3427	0.3349	0.2960	0.2960	0.2882	0.3116	0.3349	0.3505	0.3661	(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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5789	0.5758	0.5728	0.5587	0.5561	0.5438	0.5438	0.5415	0.5485	0.5561	0.5614	0.5670	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opening Type (Uw = 1.20)			14.9900	1.1450	17.1641			(27)
Floor			1.8000	0.1300	0.2340			(28b)
External Wall 1	87.9200	14.9900	72.9300	0.1800	13.1274			(29a)
Shelt Unheated Wall	1.9700		1.9700	0.1800	0.3546			(29a)
Total net area of external elements Aum(A, m2)			91.6900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.8801			(33)
Sheltered Heated			11.1500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	109.7832 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	12.1000	0.0500	0.6050
E3 Sill	12.1000	0.0500	0.6050
E4 Jamb	40.0000	0.0500	2.0000
E7 Party floor between dwellings (in blocks of flats)	62.9400	0.0700	4.4058
E16 Corner (normal)	8.5800	0.0900	0.7722
E18 Party wall between dwellings	2.8600	0.0600	0.1716
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.8000	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	8.5596 (36)
Point Thermal bridges (36a) =	0.0000
Total fabric heat loss (33) + (36) + (36a) =	39.4397 (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	32.7821	32.6086	32.4386	31.6398	31.4903	30.7946	30.7946	30.6657	31.0626	31.4903	31.7926	32.1087	(38)
Heat transfer coeff													
	72.2219	72.0484	71.8783	71.0795	70.9300	70.2343	70.2343	70.1055	70.5023	70.9300	71.2324	71.5485	(39)
Average = Sum(39)m / 12 =												71.0788	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2037	1.2008	1.1980	1.1847	1.1822	1.1706	1.1706	1.1684	1.1750	1.1822	1.1872	1.1925	(40)
HLP (average)												1.1846	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.9816	(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													
	24.8265	24.4578	23.9386	22.9812	22.2644	21.4695	21.0401	21.5557	22.1171	22.9676	23.9447	24.7426	(42b)
Hot water usage for other uses													
	34.9239	33.6540	32.3840	31.1140	29.8441	28.5741	28.5741	29.8441	31.1140	32.3840	33.6540	34.9239	(42c)
Average daily hot water use (litres/day)												54.7671	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	59.7504	58.1117	56.3226	54.0952	52.1084	50.0436	49.6143	51.3998	53.2311	55.3516	57.5987	59.6665	(44)
Energy conte	94.6300	82.7503	86.5657	74.0537	70.1480	61.5345	60.0041	63.6437	65.6393	75.1117	82.0599	93.4233	(45)
Energy content (annual)										Total = Sum(45)m =		909.5641	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	80.4355	70.3378	73.5808	62.9456	59.6258	52.3043	51.0035	54.0971	55.7934	63.8449	69.7509	79.4098	(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													
	80.4355	70.3378	73.5808	62.9456	59.6258	52.3043	51.0035	54.0971	55.7934	63.8449	69.7509	79.4098	(64)
									Total per year (kWh/year) = Sum(64)m =			773.1295	(64)
12Total per year (kWh/year)												773	(64)
Electric shower(s)													
	46.0039	40.9899	44.7594	42.7133	43.5148	41.5089	42.8925	43.5148	42.7133	44.7594	43.9177	46.0039	(64a)
						Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =						523.2919	(64a)
Heat gains from water heating, kWh/month													
	31.6099	27.8319	29.5850	26.4147	25.7852	23.4533	23.4740	24.4030	24.6267	27.1511	28.4172	31.3534	(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	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	87.2319	96.5781	87.2319	90.1396	87.2319	90.1396	87.2319	87.2319	90.1396	87.2319	90.1396	87.2319	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	172.9469	174.7416	170.2191	160.5914	148.4380	137.0156	129.3847	127.5901	132.1125	141.7403	153.8936	165.3161	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	(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)													
	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	(71)
Water heating gains (Table 5)													
	42.4864	41.4165	39.7648	36.6871	34.6575	32.5740	31.5511	32.7997	34.2037	36.4934	39.4683	42.1417	(72)
Total internal gains													
	355.3897	365.4608	349.9404	340.1426	323.0519	312.4537	300.8922	300.3462	309.1804	318.1901	336.2260	347.4141	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	6.9600	11.2829	0.6300	0.7000	0.7700	23.9996	(75)
Southeast	6.6300	36.7938	0.6300	0.7000	0.7700	74.5522	(77)
Northwest	1.4000	11.2829	0.6300	0.7000	0.7700	4.8275	(81)

Solar gains	103.3793	185.6683	279.4729	388.9107	474.5234	488.2075	463.5614	397.0738	316.9590	212.0605	125.5682	87.3428	(83)
Total gains	458.7689	551.1291	629.4132	729.0533	797.5752	800.6612	764.4536	697.4200	626.1394	530.2506	461.7943	434.7569	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	25.3347	25.3957	25.4558	25.7419	25.7961	26.0517	26.0517	26.0995	25.9526	25.7961	25.6866	25.5732	
alpha	2.6890	2.6930	2.6971	2.7161	2.7197	2.7368	2.7368	2.7400	2.7302	2.7197	2.7124	2.7049	
util living area													
	0.9526	0.9244	0.8797	0.7881	0.6586	0.5041	0.3833	0.4306	0.6343	0.8380	0.9284	0.9583	(86)
MIT	18.5740	18.9462	19.4562	20.0939	20.5732	20.8536	20.9491	20.9292	20.7157	20.0683	19.2196	18.5136	(87)
Th 2	19.9170	19.9194	19.9216	19.9323	19.9343	19.9436	19.9436	19.9453	19.9400	19.9343	19.9302	19.9260	(88)
util rest of house													
	0.9452	0.9131	0.8616	0.7570	0.6099	0.4355	0.2987	0.3425	0.5669	0.8064	0.9156	0.9517	(89)
MIT 2	17.7271	18.0916	18.5867	19.1950	19.6241	19.8587	19.9228	19.9145	19.7593	19.1894	18.3729	17.6738	(90)
Living area fraction										fLA = Living area / (4) =		0.7182	(91)
MIT	18.3353	18.7053	19.2111	19.8405	20.3057	20.5732	20.6598	20.6432	20.4461	19.8206	18.9810	18.2769	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3353	18.7053	19.2111	19.8405	20.3057	20.5732	20.6598	20.6432	20.4461	19.8206	18.9810	18.2769	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9314	0.8975	0.8477	0.7540	0.6276	0.4773	0.3569	0.4018	0.6005	0.8026	0.9018	0.9387	(94)
Useful gains	427.2866	494.6320	533.5801	549.7262	500.5838	382.1254	272.8024	280.2404	376.0153	425.5605	416.4348	408.1057	(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													
	1013.6575	994.6493	913.6532	777.6485	610.4023	419.5232	285.1397	297.4734	447.4153	654.0175	846.3121	1007.1807	(97)
Space heating kWh													
	436.2599	336.0117	282.7744	164.1040	81.7050	0.0000	0.0000	0.0000	0.0000	169.9720	309.5117	445.7118	(98a)
Space heating requirement - total per year (kWh/year)												2226.0504	
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													
	436.2599	336.0117	282.7744	164.1040	81.7050	0.0000	0.0000	0.0000	0.0000	169.9720	309.5117	445.7118	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2226.0504	
Space heating per m2											(98c) / (4) =	37.1008	(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	660.2024	519.7338	532.8015	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8348	0.8832	0.8553	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	551.1480	459.0315	455.7237	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	903.8436	863.2388	786.5690	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	253.9408	300.7303	246.1489	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	63.4852	75.1826	61.5372	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												200.2050	(107)
Energy for space heating												37.1008	(99)
Energy for space cooling												3.3368	(108)
Total												40.4376	(109)
Fabric Energy Efficiency (TFEE)												40.4	(109)

Full SAP Calculation Printout

Property Reference	Flat 3 HH - Be Green	Issued on Date	06/05/2023
Assessment Reference	Flat 3 HH - Be Green	Prop Type Ref	
Property	Flat 1 HH, West Central Street, London, WC1A		

SAP Rating	77 C	DER	6.10	TER	14.98
Environmental	95 A	% DER < TER			59.28
CO_2 Emissions (t/year)	0.33	DFEE	39.94	TFEE	40.44
Compliance Check	See BREL	% DFEE < TFEE			1.23
% DPER < TPER	19.05	DPER	64.80	TPER	80.05

Assessor Details	Mr. Adrian Fell	Assessor ID	N222-0001
Client			

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

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		60.0000 (1b)	x	2.8600 (2b)	=	171.6000	(1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.0000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	171.6000	(5)

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2. Ventilation rate

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			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) =	0.1166	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.2666	(18)
Number of sides sheltered			2	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.2266	(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	0.2889	0.2832	0.2775	0.2492	0.2436	0.2152	0.2152	0.2096	0.2266	0.2436	0.2549	0.2662	(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	0.5417	0.5401	0.5385	0.5311	0.5297	0.5232	0.5232	0.5220	0.5257	0.5297	0.5325	0.5354	(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 (Uw = 0.95)			17.5300	0.9152	16.0438			(27)
Glazed Door (Uw = 0.95)			7.3500	0.9152	6.7269			(27)
Floor			1.8000	0.1200	0.2160			(28b)
External Wall 1	87.9200	24.8800	63.0400	0.1600	10.0864	14.0000	882.5600	(29a)
Shelt Unheated Wall	1.9700		1.9700	0.1600	0.3152	14.0000	27.5800	(29a)
Total net area of external elements Aum(A, m2)			91.6900					(31)

Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	33.3883	(33)
Sheltered Heated	11.1500	0.0000	0.0000	20.0000	223.0000 (32)
Party Floor 1	58.2000			40.0000	2328.0000 (32d)
Party Ceiling 1	60.0000			40.0000	2400.0000 (32b)
Internal Wall 1	80.6500			9.0000	725.8500 (32c)

Heat capacity Cm = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =	6586.9900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K				109.7832 (35)
List of Thermal Bridges				
K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	12.1000	0.0500	0.6050	
E3 Sill	12.1000	0.0500	0.6050	
E4 Jamb	40.0000	0.0500	2.0000	
E7 Party floor between dwellings (in blocks of flats)	62.9400	0.0700	4.4058	
E16 Corner (normal)	8.5800	0.0900	0.7722	
E18 Party wall between dwellings	2.8600	0.0600	0.1716	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.8000	0.0000	0.0000	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				8.5596 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	41.9479 (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	30.6767	30.5850	30.4951	30.0727	29.9936	29.6257	29.6257	29.5576	29.7674	29.9936	30.1535	30.3207	(38)
Heat transfer coeff	72.6247	72.5329	72.4430	72.0206	71.9415	71.5736	71.5736	71.5055	71.7154	71.9415	72.1014	72.2686	(39)
Average = Sum(39)m / 12 =												72.0202	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2104	1.2089	1.2074	1.2003	1.1990	1.1929	1.1929	1.1918	1.1953	1.1990	1.2017	1.2045	(40)
HLP (average)												1.2003	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.9816	(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	24.8265	24.4578	23.9386	22.9812	22.2644	21.4695	21.0401	21.5557	22.1171	22.9676	23.9447	24.7426	(42b)
Hot water usage for other uses	34.9239	33.6540	32.3840	31.1140	29.8441	28.5741	28.5741	29.8441	31.1140	32.3840	33.6540	34.9239	(42c)
Average daily hot water use (litres/day)												54.7671	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	59.7504	58.1117	56.3226	54.0952	52.1084	50.0436	49.6143	51.3998	53.2311	55.3516	57.5987	59.6665	(44)
Energy conte	94.6300	82.7503	86.5657	74.0537	70.1480	61.5345	60.0041	63.6437	65.6393	75.1117	82.0599	93.4233	(45)
Energy content (annual)										Total = Sum(45)m =		909.5641	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	80.4355	70.3378	73.5808	62.9456	59.6258	52.3043	51.0035	54.0971	55.7934	63.8449	69.7509	79.4098	(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	80.4355	70.3378	73.5808	62.9456	59.6258	52.3043	51.0035	54.0971	55.7934	63.8449	69.7509	79.4098	(64)
								Total per year (kWh/year) = Sum(64)m =				773.1295	(64)
12Total per year (kWh/year)												773	(64)
Electric shower(s)	46.0039	40.9899	44.7594	42.7133	43.5148	41.5089	42.8925	43.5148	42.7133	44.7594	43.9177	46.0039	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							523.2919	(64a)
Heat gains from water heating, kWh/month	31.6099	27.8319	29.5850	26.4147	25.7852	23.4533	23.4740	24.4030	24.6267	27.1511	28.4172	31.3534	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	87.2319	96.5781	87.2319	90.1396	87.2319	90.1396	87.2319	87.2319	90.1396	87.2319	90.1396	87.2319	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	172.9469	174.7416	170.2191	160.5914	148.4380	137.0156	129.3847	127.5901	132.1125	141.7403	153.8936	165.3161	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	(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)	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	(71)

Water heating gains (Table 5)

	42.4864	41.4165	39.7648	36.6871	34.6575	32.5740	31.5511	32.7997	34.2037	36.4934	39.4683	42.1417 (72)

Total internal gains

	355.3897	365.4608	349.9404	340.1426	323.0519	312.4537	300.8922	300.3462	309.1804	318.1901	336.2260	347.4141 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast	4.2000	11.2829	0.4700	0.7000	0.7700	10.8044 (75)
Southeast	11.0000	36.7938	0.4700	0.7000	0.7700	92.2777 (77)
Northwest	2.3300	11.2829	0.4700	0.7000	0.7700	5.9939 (81)
Northeast	7.3500	11.2829	0.4700	0.7000	0.7700	18.9077 (75)

Solar gains	127.9837	229.8636	346.0120	481.5286	587.5484	604.4994	573.9795	491.6430	392.4309	262.5422	155.4548	108.1298 (83)
Total gains	483.3734	595.3244	695.9524	821.6712	910.6002	916.9531	874.8717	791.9891	701.6113	580.7323	491.6808	455.5439 (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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	25.1942	25.2261	25.2574	25.4055	25.4334	25.5642	25.5642	25.5885	25.5136	25.4334	25.3770	25.3183	
alpha	2.6796	2.6817	2.6838	2.6937	2.6956	2.7043	2.7043	2.7059	2.7009	2.6956	2.6918	2.6879	
util living area	0.9471	0.9122	0.8568	0.7503	0.6099	0.4581	0.3451	0.3919	0.5937	0.8140	0.9193	0.9539	(86)
MIT	18.6235	19.0326	19.5692	20.1950	20.6407	20.8797	20.9588	20.9412	20.7523	20.1298	19.2633	18.5416	(87)
Th 2	19.9117	19.9129	19.9141	19.9197	19.9208	19.9257	19.9257	19.9266	19.9238	19.9208	19.9186	19.9164	(88)
util rest of house	0.9389	0.8993	0.8363	0.7165	0.5602	0.3922	0.2662	0.3085	0.5257	0.7795	0.9052	0.9468	(89)
MIT 2	17.7715	18.1698	18.6861	19.2726	19.6641	19.8574	19.9093	19.9016	19.7695	19.2325	18.4062	17.6947	(90)
Living area fraction										fLA = Living area / (4) =		0.7182	(91)
MIT	18.3834	18.7894	19.3203	19.9351	20.3655	20.5916	20.6630	20.6483	20.4753	19.8769	19.0217	18.3029	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3834	18.7894	19.3203	19.9351	20.3655	20.5916	20.6630	20.6483	20.4753	19.8769	19.0217	18.3029	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9244	0.8834	0.8235	0.7170	0.5814	0.4338	0.3209	0.3653	0.5618	0.7779	0.8910	0.9331	(94)
Useful gains	446.8436	525.9056	573.1042	589.1478	529.4391	397.7419	280.7605	289.3532	394.1970	451.7711	438.0812	425.0558	(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	1022.7986	1007.4405	928.7394	794.7521	623.4080	428.8407	290.8057	303.7734	457.2087	667.3955	859.5713	1019.1989	(97)
Space heating kWh	428.5105	323.5914	264.5926	148.0350	69.9129	0.0000	0.0000	0.0000	0.0000	160.4245	303.4729	442.0425	(98a)
Space heating requirement - total per year (kWh/year)												2140.5823	
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	428.5105	323.5914	264.5926	148.0350	69.9129	0.0000	0.0000	0.0000	0.0000	160.4245	303.4729	442.0425	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2140.5823	
Space heating per m2										(98c) / (4) =		35.6764	(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	672.7922	529.6449	543.4419	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8642	0.9054	0.8797	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	581.4025	479.5358	478.0483	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1039.7692	992.2990	897.1043	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	330.0240	381.4958	311.7777	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	82.5060	95.3740	77.9444	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												255.8244	(107)
Energy for space heating												35.6764	(99)
Energy for space cooling												4.2637	(108)
Total												39.9401	(109)
Fabric Energy Efficiency (DFEE)												39.9	(109)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	60.0000 (1b)	x	2.8600 (2b)	=	171.6000 (1b) -	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	171.6000	(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) =	0.1166 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3666 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3116 (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	0.3972	0.3895	0.3817	0.3427	0.3349	0.2960	0.2960	0.2882	0.3116	0.3349	0.3505	0.3661	(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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5789	0.5758	0.5728	0.5587	0.5561	0.5438	0.5438	0.5415	0.5485	0.5561	0.5614	0.5670	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opening Type (Uw = 1.20)			14.9900	1.1450	17.1641			(27)
Floor			1.8000	0.1300	0.2340			(28b)
External Wall 1	87.9200	14.9900	72.9300	0.1800	13.1274			(29a)
Shelt Unheated Wall	1.9700		1.9700	0.1800	0.3546			(29a)
Total net area of external elements Aum(A, m2)			91.6900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.8801			(33)
Sheltered Heated			11.1500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	109.7832 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	12.1000	0.0500	0.6050
E3 Sill	12.1000	0.0500	0.6050
E4 Jamb	40.0000	0.0500	2.0000
E7 Party floor between dwellings (in blocks of flats)	62.9400	0.0700	4.4058
E16 Corner (normal)	8.5800	0.0900	0.7722
E18 Party wall between dwellings	2.8600	0.0600	0.1716
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.8000	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	8.5596 (36)
Point Thermal bridges (36a) =	0.0000
Total fabric heat loss (33) + (36) + (36a) =	39.4397 (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	32.7821	32.6086	32.4386	31.6398	31.4903	30.7946	30.7946	30.6657	31.0626	31.4903	31.7926	32.1087	(38)
Heat transfer coeff													
	72.2219	72.0484	71.8783	71.0795	70.9300	70.2343	70.2343	70.1055	70.5023	70.9300	71.2324	71.5485	(39)
Average = Sum(39)m / 12 =												71.0788	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2037	1.2008	1.1980	1.1847	1.1822	1.1706	1.1706	1.1684	1.1750	1.1822	1.1872	1.1925	(40)
HLP (average)												1.1846	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.9816	(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													
	24.8265	24.4578	23.9386	22.9812	22.2644	21.4695	21.0401	21.5557	22.1171	22.9676	23.9447	24.7426	(42b)
Hot water usage for other uses													
	34.9239	33.6540	32.3840	31.1140	29.8441	28.5741	28.5741	29.8441	31.1140	32.3840	33.6540	34.9239	(42c)
Average daily hot water use (litres/day)												54.7671	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	59.7504	58.1117	56.3226	54.0952	52.1084	50.0436	49.6143	51.3998	53.2311	55.3516	57.5987	59.6665	(44)
Energy conte	94.6300	82.7503	86.5657	74.0537	70.1480	61.5345	60.0041	63.6437	65.6393	75.1117	82.0599	93.4233	(45)
Energy content (annual)										Total = Sum(45)m =		909.5641	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	80.4355	70.3378	73.5808	62.9456	59.6258	52.3043	51.0035	54.0971	55.7934	63.8449	69.7509	79.4098	(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													
	80.4355	70.3378	73.5808	62.9456	59.6258	52.3043	51.0035	54.0971	55.7934	63.8449	69.7509	79.4098	(64)
									Total per year (kWh/year) = Sum(64)m =			773.1295	(64)
12Total per year (kWh/year)												773	(64)
Electric shower(s)													
	46.0039	40.9899	44.7594	42.7133	43.5148	41.5089	42.8925	43.5148	42.7133	44.7594	43.9177	46.0039	(64a)
						Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =						523.2919	(64a)
Heat gains from water heating, kWh/month													
	31.6099	27.8319	29.5850	26.4147	25.7852	23.4533	23.4740	24.4030	24.6267	27.1511	28.4172	31.3534	(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	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	87.2319	96.5781	87.2319	90.1396	87.2319	90.1396	87.2319	87.2319	90.1396	87.2319	90.1396	87.2319	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	172.9469	174.7416	170.2191	160.5914	148.4380	137.0156	129.3847	127.5901	132.1125	141.7403	153.8936	165.3161	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	(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)													
	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	(71)
Water heating gains (Table 5)													
	42.4864	41.4165	39.7648	36.6871	34.6575	32.5740	31.5511	32.7997	34.2037	36.4934	39.4683	42.1417	(72)
Total internal gains													
	355.3897	365.4608	349.9404	340.1426	323.0519	312.4537	300.8922	300.3462	309.1804	318.1901	336.2260	347.4141	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	6.9600	11.2829	0.6300	0.7000	0.7700	23.9996	(75)
Southeast	6.6300	36.7938	0.6300	0.7000	0.7700	74.5522	(77)
Northwest	1.4000	11.2829	0.6300	0.7000	0.7700	4.8275	(81)

Solar gains	103.3793	185.6683	279.4729	388.9107	474.5234	488.2075	463.5614	397.0738	316.9590	212.0605	125.5682	87.3428	(83)
Total gains	458.7689	551.1291	629.4132	729.0533	797.5752	800.6612	764.4536	697.4200	626.1394	530.2506	461.7943	434.7569	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	25.3347	25.3957	25.4558	25.7419	25.7961	26.0517	26.0517	26.0995	25.9526	25.7961	25.6866	25.5732	
alpha	2.6890	2.6930	2.6971	2.7161	2.7197	2.7368	2.7368	2.7400	2.7302	2.7197	2.7124	2.7049	
util living area													
	0.9526	0.9244	0.8797	0.7881	0.6586	0.5041	0.3833	0.4306	0.6343	0.8380	0.9284	0.9583	(86)
MIT	18.5740	18.9462	19.4562	20.0939	20.5732	20.8536	20.9491	20.9292	20.7157	20.0683	19.2196	18.5136	(87)
Th 2	19.9170	19.9194	19.9216	19.9323	19.9343	19.9436	19.9436	19.9453	19.9400	19.9343	19.9302	19.9260	(88)
util rest of house													
	0.9452	0.9131	0.8616	0.7570	0.6099	0.4355	0.2987	0.3425	0.5669	0.8064	0.9156	0.9517	(89)
MIT 2	17.7271	18.0916	18.5867	19.1950	19.6241	19.8587	19.9228	19.9145	19.7593	19.1894	18.3729	17.6738	(90)
Living area fraction										fLA = Living area / (4) =		0.7182	(91)
MIT	18.3353	18.7053	19.2111	19.8405	20.3057	20.5732	20.6598	20.6432	20.4461	19.8206	18.9810	18.2769	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3353	18.7053	19.2111	19.8405	20.3057	20.5732	20.6598	20.6432	20.4461	19.8206	18.9810	18.2769	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9314	0.8975	0.8477	0.7540	0.6276	0.4773	0.3569	0.4018	0.6005	0.8026	0.9018	0.9387	(94)
Useful gains	427.2866	494.6320	533.5801	549.7262	500.5838	382.1254	272.8024	280.2404	376.0153	425.5605	416.4348	408.1057	(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													
	1013.6575	994.6493	913.6532	777.6485	610.4023	419.5232	285.1397	297.4734	447.4153	654.0175	846.3121	1007.1807	(97)
Space heating kWh													
	436.2599	336.0117	282.7744	164.1040	81.7050	0.0000	0.0000	0.0000	0.0000	169.9720	309.5117	445.7118	(98a)
Space heating requirement - total per year (kWh/year)												2226.0504	
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													
	436.2599	336.0117	282.7744	164.1040	81.7050	0.0000	0.0000	0.0000	0.0000	169.9720	309.5117	445.7118	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2226.0504	
Space heating per m2											(98c) / (4) =	37.1008	(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	660.2024	519.7338	532.8015	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8348	0.8832	0.8553	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	551.1480	459.0315	455.7237	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	903.8436	863.2388	786.5690	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	253.9408	300.7303	246.1489	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	63.4852	75.1826	61.5372	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												200.2050	(107)
Energy for space heating												37.1008	(99)
Energy for space cooling												3.3368	(108)
Total												40.4376	(109)
Fabric Energy Efficiency (TFEE)												40.4	(109)

Full SAP Calculation Printout

Property Reference	Flat 4 HH - Be Green	Issued on Date	06/05/2023
Assessment Reference	Flat 4 HH-Gree Unheated Corrid	Prop Type Ref	
Property	Flat 1 HH, West Central Street, London, WC1A		

SAP Rating	77 C	DER	4.74	TER	13.65
Environmental	95 A	% DER < TER			65.27
CO_2 Emissions (t/year)	0.54	DFEE	46.47	TFEE	49.71
Compliance Check	See BREL	% DFEE < TFEE			6.52
% DPER < TPER	30.85	DPER	50.05	TPER	72.37

Assessor Details	Mr. Adrian Fell	Assessor ID	N222-0001
Client			

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

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		64.0800 (1b)	x	2.8600 (2b)	=	183.2688 (1b)	-
First floor		62.3200 (1c)	x	3.1500 (2c)	=	196.3080 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	126.4000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	379.5768	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		4 * 10 =	40.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		40.0000 / (5) =	0.1054	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.2554	(18)
Number of sides sheltered			2	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.2171	(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	0.2768	0.2713	0.2659	0.2388	0.2334	0.2062	0.2062	0.2008	0.2171	0.2334	0.2442	0.2551	(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	0.5383	0.5368	0.5354	0.5285	0.5272	0.5213	0.5213	0.5202	0.5236	0.5272	0.5298	0.5325	(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 (Uw = 0.95)			22.8600	0.9152	20.9220			(27)
Glazed Door (Uw = 0.95)			5.7500	0.9152	5.2625			(27)
Curtain Wall (Uw = 1.40)			36.3200	1.3258	48.1515			(27)
Solid Door			1.8700	0.8000	1.4960			(26)
External Wall 1	130.2300	28.6100	101.6200	0.1600	16.2592	14.0000	1422.6799	(29a)

Curtain Wall	36.5000	36.3200	0.1800	0.1600	0.0288	0.0000	0.0000 (29a)
Corridor Wall	16.6400	1.8700	14.7700	0.1600	2.3632	14.0000	206.7800 (29a)
Terrace	14.6300		14.6300	0.1000	1.4630	9.0000	131.6700 (30)
Green Roof	62.3200		62.3200	0.1000	6.2320	9.0000	560.8800 (30)
Total net area of external elements Aum(A, m2)			260.3200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		102.1782		(33)
Party Floor 1			64.0800			40.0000	2563.2000 (32d)
Internal Wall 1			164.7300			9.0000	1482.5700 (32c)
Internal Floor 1			62.3200			20.0000	1246.4000 (32d)
Internal Ceiling 1			64.0800			20.0000	1281.6000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 8895.7799 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 70.3780 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	13.0000	0.0500	0.6500
E3 Sill	13.0000	0.0500	0.6500
E4 Jamb	41.0000	0.0500	2.0500
E6 Intermediate floor within a dwelling	18.3700	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	37.8400	0.0700	2.6488
E15 Flat roof with parapet	56.1400	0.1560	8.7578
E16 Corner (normal)	8.8200	0.0900	0.7938
E16 Corner (normal)	15.7500	0.0900	1.4175
E18 Party wall between dwellings	5.6800	0.0600	0.3408
E17 Corner (inverted – internal area greater than external area)	9.1400	-0.0900	-0.8226

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 16.4861 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 118.6643 (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	67.4277	67.2414	67.0588	66.2011	66.0406	65.2936	65.2936	65.1553	65.5814	66.0406	66.3653	66.7047	(38)
Heat transfer coeff	186.0920	185.9057	185.7231	184.8655	184.7050	183.9580	183.9580	183.8196	184.2457	184.7050	185.0296	185.3690	(39)
Average = Sum(39)m / 12 =												184.8647	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4722	1.4708	1.4693	1.4625	1.4613	1.4554	1.4554	1.4543	1.4576	1.4613	1.4638	1.4665	(40)
HLP (average)												1.4625	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8850 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

31.3401	30.8747	30.2192	29.0107	28.1058	27.1024	26.5604	27.2112	27.9199	28.9936	30.2270	31.2342	(42b)

Hot water usage for other uses

44.1754	42.5690	40.9626	39.3562	37.7498	36.1435	36.1435	37.7498	39.3562	40.9626	42.5690	44.1754	(42c)

Average daily hot water use (litres/day) 69.2166 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.5155	73.4437	71.1818	68.3669	65.8556	63.2458	62.7038	64.9611	67.2761	69.9562	72.7960	75.4095	(44)
Energy conte	119.5980	104.5828	109.4038	93.5909	88.6543	77.7681	75.8349	80.4354	82.9582	94.9299	103.7112	118.0731	(45)
Energy content (annual)										Total = Sum(45)m =		1149.5406	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	101.6583	88.8954	92.9932	79.5523	75.3562	66.1029	64.4596	68.3701	70.5145	80.6904	88.1545	100.3621	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	101.6583	88.8954	92.9932	79.5523	75.3562	66.1029	64.4596	68.3701	70.5145	80.6904	88.1545	100.3621	(64)
										Total per year (kWh/year) = Sum(64)m =		977.1095	(64)
12Total per year (kWh/year)												977	(64)
Electric shower(s)													
	58.1340	51.7979	56.5613	53.9758	54.9886	52.4538	54.2023	54.9886	53.9758	56.5613	55.4977	58.1340	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		661.2711	(64a)
Heat gains from water heating, kWh/month													
	39.9481	35.1733	37.3886	33.3820	32.5862	29.6392	29.6655	30.8397	31.1226	34.3129	35.9131	39.6240	(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	144.2503	144.2503	144.2503	144.2503	144.2503	144.2503	144.2503	144.2503	144.2503	144.2503	144.2503	144.2503	(66)

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

	147.9499	163.8016	147.9499	152.8815	147.9499	152.8815	147.9499	147.9499	152.8815	147.9499	152.8815	147.9499 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	293.3272	296.3710	288.7006	272.3714	251.7587	232.3857	219.4433	216.3995	224.0699	240.3991	261.0118	280.3848 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	37.4250	37.4250	37.4250	37.4250	37.4250	37.4250	37.4250	37.4250	37.4250	37.4250	37.4250	37.4250 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
	-115.4003	-115.4003	-115.4003	-115.4003	-115.4003	-115.4003	-115.4003	-115.4003	-115.4003	-115.4003	-115.4003	-115.4003 (71)
Water heating gains (Table 5)												
	53.6937	52.3412	50.2535	46.3639	43.7987	41.1655	39.8729	41.4512	43.2258	46.1195	49.8793	53.2581 (72)
Total internal gains												
	561.2458	578.7889	553.1792	537.8920	509.7824	492.7079	473.5413	472.0757	486.4522	500.7436	530.0476	547.8679 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast	4.0000	11.2829	0.4700	0.7000	0.7700	10.2899 (75)
Southeast	14.2100	36.7938	0.4700	0.7000	0.7700	119.2060 (77)
Northwest	4.6500	11.2829	0.4700	0.7000	0.7700	11.9620 (81)
Southeast	5.7500	36.7938	0.4700	0.7000	0.7700	48.2361 (77)
Southeast	23.3100	36.7938	0.4700	1.0000	0.7700	279.3498 (77)
Southwest	13.0100	36.7938	0.4700	1.0000	0.7700	155.9134 (79)

Solar gains	624.9572	1071.9246	1486.2863	1874.4876	2129.6181	2127.4295	2045.5710	1853.2123	1620.4099	1189.9984	749.9007	533.9622 (83)
Total gains	1186.2030	1650.7135	2039.4655	2412.3795	2639.4004	2620.1374	2519.1122	2325.2880	2106.8622	1690.7420	1279.9484	1081.8301 (84)

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7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	13.2786	13.2920	13.3050	13.3667	13.3784	13.4327	13.4327	13.4428	13.4117	13.3784	13.3549	13.3304	
alpha	1.8852	1.8861	1.8870	1.8911	1.8919	1.8955	1.8955	1.8962	1.8941	1.8919	1.8903	1.8887	
util living area													
	0.8927	0.8221	0.7397	0.6292	0.5090	0.3891	0.2950	0.3277	0.4838	0.6951	0.8451	0.9070	(86)
MIT	17.4736	18.1823	18.9591	19.7574	20.3531	20.7264	20.8851	20.8553	20.5636	19.7108	18.4263	17.3203	(87)
Th 2	19.7084	19.7095	19.7106	19.7157	19.7167	19.7211	19.7211	19.7220	19.7194	19.7167	19.7147	19.7127	(88)
util rest of house													
	0.8795	0.8022	0.7121	0.5914	0.4594	0.3246	0.2171	0.2469	0.4168	0.6529	0.8239	0.8953	(89)
MIT 2	16.5687	17.2486	17.9852	18.7258	19.2531	19.5625	19.6739	19.6588	19.4472	18.7139	17.5050	16.4229	(90)
Living area fraction										fLA = Living area / (4) =		0.3052	(91)
MIT	16.8449	17.5336	18.2824	19.0407	19.5888	19.9178	20.0436	20.0240	19.7880	19.0182	17.7862	16.6968	(92)
Temperature adjustment												0.0000	
adjusted MIT	16.8449	17.5336	18.2824	19.0407	19.5888	19.9178	20.0436	20.0240	19.7880	19.0182	17.7862	16.6968	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8401	0.7607	0.6764	0.5694	0.4541	0.3350	0.2375	0.2669	0.4206	0.6265	0.7834	0.8577	(94)
Useful gains	996.4910	1255.7192	1379.4479	1373.6253	1198.6102	877.7319	598.1888	620.5220	886.2305	1059.2384	1002.6656	927.8866	(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													
	2334.5102	2348.6563	2188.2665	1874.6646	1457.1042	978.2466	633.4743	666.1604	1047.9839	1554.8764	1977.2671	2316.5246	(97)
Space heating kWh													
	995.4863	734.4537	601.7611	360.7483	192.3196	0.0000	0.0000	0.0000	0.0000	368.7547	701.7131	1033.1467	(98a)
Space heating requirement - total per year (kWh/year)												4988.3833	
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													
	995.4863	734.4537	601.7611	360.7483	192.3196	0.0000	0.0000	0.0000	0.0000	368.7547	701.7131	1033.1467	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4988.3833	
Space heating per m2											(98c) / (4) =	39.4651	(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	1729.2049	1361.2889	1397.0292	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8130	0.8565	0.8344	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1405.8877	1165.9713	1165.7500	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	3000.4560	2885.2102	2661.6046	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	1148.0892	1279.1137	1112.9158	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	287.0223	319.7784	278.2290	0.0000	0.0000	0.0000	0.0000 (107)

Space cooling requirement 885.0297 (107)
Energy for space heating 39.4651 (99)
Energy for space cooling 7.0018 (108)
Total 46.4669 (109)
Fabric Energy Efficiency (DFEE) 46.5 (109)

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	64.0800 (1b)	x	2.8600 (2b)	=	183.2688 (1b)	-
First floor	62.3200 (1c)	x	3.1500 (2c)	=	196.3080 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	126.4000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	379.5768 (5)	

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1054 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3554 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3021 (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													
	0.3851	0.3776	0.3700	0.3323	0.3247	0.2870	0.2870	0.2794	0.3021	0.3247	0.3398	0.3549	(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	0.5742	0.5713	0.5685	0.5552	0.5527	0.5412	0.5412	0.5390	0.5456	0.5527	0.5577	0.5630	(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			1.8700	1.0000	1.8700			(26)
TER Opening Type (Uw = 1.20)			13.0900	1.1450	14.9885			(27)
TER Opening Type Curtain (Uw = 1.30)			16.6300	1.2357	20.5504			(27)
External Wall 1	130.2300	13.0900	117.1400	0.1800	21.0852			(29a)
Curtain Wall	36.5000	16.6300	19.8700	0.1800	3.5766			(29a)
Corridor Wall	16.6400	1.8700	14.7700	0.1800	2.6586			(29a)
Terrace	14.6300		14.6300	0.1100	1.6093			(30)
Green Roof	62.3200		62.3200	0.1100	6.8552			(30)
Total net area of external elements Aum(A, m2)			260.3200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	73.1938			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 70.3780 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	13.0000	0.0500	0.6500
E3 Sill	13.0000	0.0500	0.6500
E4 Jamb	41.0000	0.0500	2.0500
E6 Intermediate floor within a dwelling	18.3700	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	37.8400	0.0700	2.6488
E15 Flat roof with parapet	56.1400	0.5600	31.4384
E16 Corner (normal)	8.8200	0.0900	0.7938
E16 Corner (normal)	15.7500	0.0900	1.4175
E18 Party wall between dwellings	5.6800	0.0600	0.3408
E17 Corner (inverted – internal area greater than external area)	9.1400	-0.0900	-0.8226

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 39.1667 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 112.3605 (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	71.9205	71.5597	71.2061	69.5452	69.2345	67.7879	67.7879	67.5200	68.3451	69.2345	69.8631	70.5203	(38)
Heat transfer coeff	184.2810	183.9202	183.5666	181.9057	181.5950	180.1484	180.1484	179.8805	180.7056	181.5950	182.2236	182.8808	(39)

Average = Sum(39)m / 12 = 181.9042

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4579	1.4551	1.4523	1.4391	1.4367	1.4252	1.4252	1.4231	1.4296	1.4367	1.4416	1.4468	(40)
HLP (average)												1.4391	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8850 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

31.3401	30.8747	30.2192	29.0107	28.1058	27.1024	26.5604	27.2112	27.9199	28.9936	30.2270	31.2342	(42b)

Hot water usage for other uses

44.1754	42.5690	40.9626	39.3562	37.7498	36.1435	36.1435	37.7498	39.3562	40.9626	42.5690	44.1754	(42c)

Average daily hot water use (litres/day) 69.2166 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.5155	73.4437	71.1818	68.3669	65.8556	63.2458	62.7038	64.9611	67.2761	69.9562	72.7960	75.4095	(44)
Energy conte	119.5980	104.5828	109.4038	93.5909	88.6543	77.7681	75.8349	80.4354	82.9582	94.9299	103.7112	118.0731	(45)

Energy content (annual) Total = Sum(45)m = 1149.5406

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

101.6583	88.8954	92.9932	79.5523	75.3562	66.1029	64.4596	68.3701	70.5145	80.6904	88.1545	100.3621	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

101.6583	88.8954	92.9932	79.5523	75.3562	66.1029	64.4596	68.3701	70.5145	80.6904	88.1545	100.3621	(64)

Total per year (kWh/year) = Sum(64)m = 977.1095 (64)
12Total per year (kWh/year) 977 (64)
Electric shower(s)

58.1340	51.7979	56.5613	53.9758	54.9886	52.4538	54.2023	54.9886	53.9758	56.5613	55.4977	58.1340	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 661.2711 (64a)
Heat gains from water heating, kWh/month

39.9481	35.1733	37.3886	33.3820	32.5862	29.6392	29.6655	30.8397	31.1226	34.3129	35.9131	39.6240	(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	144.2503	144.2503	144.2503	144.2503	144.2503	144.2503	144.2503	144.2503	144.2503	144.2503	144.2503	144.2503	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	147.9499	163.8016	147.9499	152.8815	147.9499	152.8815	147.9499	147.9499	152.8815	147.9499	152.8815	147.9499	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	293.3272	296.3710	288.7006	272.3714	251.7587	232.3857	219.4433	216.3995	224.0699	240.3991	261.0118	280.3848	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.4250	37.4250	37.4250	37.4250	37.4250	37.4250	37.4250	37.4250	37.4250	37.4250	37.4250	37.4250	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-115.4003	-115.4003	-115.4003	-115.4003	-115.4003	-115.4003	-115.4003	-115.4003	-115.4003	-115.4003	-115.4003	-115.4003	(71)
Water heating gains (Table 5)	53.6937	52.3412	50.2535	46.3639	43.7987	41.1655	39.8729	41.4512	43.2258	46.1195	49.8793	53.2581	(72)
Total internal gains	561.2458	578.7889	553.1792	537.8920	509.7824	492.7079	473.5413	472.0757	486.4522	500.7436	530.0476	547.8679	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	1.8300	11.2829	0.6300	0.7000	0.7700	6.3102	(75)
Southeast	9.1300	36.7938	0.6300	0.7000	0.7700	102.6639	(77)
Northwest	2.1300	11.2829	0.6300	0.7000	0.7700	7.3447	(81)
Southeast	10.6700	36.7938	0.6300	0.7000	0.7700	119.9807	(77)
Southwest	5.9600	36.7938	0.6300	0.7000	0.7700	67.0183	(79)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	303.3177	521.1979	725.1731	918.7179	1047.4721	1048.0048	1007.0145	909.7186	792.0060	579.2830	364.1307	259.0423	(83)
Total gains	864.5635	1099.9868	1278.3523	1456.6099	1557.2545	1540.7126	1480.5558	1381.7943	1278.4583	1080.0266	894.1783	806.9101	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	13.4091	13.4354	13.4613	13.5842	13.6075	13.7167	13.7167	13.7372	13.6745	13.6075	13.5605	13.5118	
alpha	1.8939	1.8957	1.8974	1.9056	1.9072	1.9144	1.9144	1.9158	1.9116	1.9072	1.9040	1.9008	
util living area	0.9334	0.8980	0.8532	0.7796	0.6823	0.5588	0.4456	0.4829	0.6483	0.8164	0.9063	0.9407	(86)
MIT	17.0695	17.5802	18.2743	19.1415	19.9065	20.4878	20.7670	20.7188	20.2681	19.2421	17.9988	16.9776	(87)
Th 2	19.7192	19.7214	19.7235	19.7335	19.7353	19.7440	19.7440	19.7457	19.7407	19.7353	19.7316	19.7276	(88)
util rest of house	0.9245	0.8849	0.8339	0.7491	0.6345	0.4843	0.3426	0.3807	0.5803	0.7841	0.8920	0.9328	(89)
MIT 2	16.1840	16.6841	17.3614	18.1995	18.9128	19.4273	19.6403	19.6126	19.2549	18.3175	17.1107	16.0987	(90)
Living area fraction									fLA = Living area / (4) =			0.3052	(91)
MIT	16.4543	16.9576	17.6401	18.4870	19.2161	19.7510	19.9842	19.9502	19.5641	18.5997	17.3818	16.3670	(92)
Temperature adjustment												0.0000	
adjusted MIT	16.4543	16.9576	17.6401	18.4870	19.2161	19.7510	19.9842	19.9502	19.5641	18.5997	17.3818	16.3670	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8919	0.8464	0.7933	0.7130	0.6120	0.4847	0.3639	0.3988	0.5694	0.7477	0.8553	0.9021	(94)
Useful gains	771.1236	931.0647	1014.0914	1038.5347	953.0916	746.8077	538.7081	551.1048	727.9001	807.4870	764.7772	727.9522	(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	2239.8082	2217.6349	2044.9453	1743.9329	1364.8859	927.9455	609.6528	638.6108	987.4007	1452.7036	1873.5815	2225.1058	(97)
Space heating kWh	1092.7013	864.5752	766.9553	507.8867	306.3750	0.0000	0.0000	0.0000	0.0000	480.0412	798.3391	1113.8823	(98a)
Space heating requirement - total per year (kWh/year)												5930.7559	
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	1092.7013	864.5752	766.9553	507.8867	306.3750	0.0000	0.0000	0.0000	0.0000	480.0412	798.3391	1113.8823	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5930.7559	
Space heating per m2											(98c) / (4) =	46.9205	(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	1693.3950	1333.0982	1367.0919	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6655	0.7280	0.6992	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1127.0133	970.5169	955.8435	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1738.7907	1671.3130	1558.8197	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	440.4797	521.3923	448.6143	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	110.1199	130.3481	112.1536	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												352.6216	(107)
Energy for space heating												46.9205	(99)
Energy for space cooling												2.7897	(108)
Total												49.7103	(109)
Fabric Energy Efficiency (TFEE)												49.7	(109)

Full SAP Calculation Printout

Property Reference	Flat 101 VL - Be Green.	Issued on Date	06/05/2023
Assessment Reference	Flat 101 VL - Be Green	Prop Type Ref	Flat 103 VL - Be Green
Property	MFMTF, Vine Lane, London, WC1A		

SAP Rating	84 B	DER	2.90	TER	14.40
Environmental	97 A	% DER < TER			79.86
CO_2 Emissions (t/year)	0.23	DFEE	36.82	TFEE	43.28
Compliance Check	See BREL	% DFEE < TFEE			14.94
% DPER < TPER	59.83	DPER	30.78	TPER	76.63

Assessor Details	Mr. Adrian Fell	Assessor ID	N222-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	88.0000	(1b)	x 2.5800	(2b) =	227.4000	(1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		227.4000	(5)

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2. Ventilation rate

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

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1321 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.2821 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2187 (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	0.2788	0.2733	0.2679	0.2405	0.2351	0.2077	0.2077	0.2023	0.2187	0.2351	0.2460	0.2569	(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	0.5389	0.5374	0.5359	0.5289	0.5276	0.5216	0.5216	0.5205	0.5239	0.5276	0.5303	0.5330	(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	
Glazed Door (Uw = 0.95)			13.2600	0.9152	12.1358			(27)
Window (Uw = 0.95)			3.6000	0.9152	3.2948			(27)
Door			1.8900	0.8000	1.5120			(26)
Heatloss Floor 1			88.0000	0.1200	10.5600	30.0000	2640.0000	(28b)
External Wall 1	93.2700	18.7500	74.5200	0.1500	11.1780	14.0000	1043.2800	(29a)
Total net area of external elements Aum(A, m2)			181.2700					(31)

Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =	38.6806			(33)
Party Wall 1	13.6700	0.0000	0.0000	20.0000	273.4000 (32)
Party Ceiling 1	88.0000			40.0000	3520.0000 (32b)
Internal Wall 1	103.6100			9.0000	932.4900 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	8409.1700 (34)		
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		95.5587 (35)		
List of Thermal Bridges				
K1 Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	36.1500	0.0700	2.5305	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.9800	0.4430	2.6491	
E20 Exposed floor (normal)	36.1500	0.1250	4.5187	
E16 Corner (normal)	10.3200	0.0900	0.9288	
E17 Corner (inverted – internal area greater than external area)	2.5800	-0.0900	-0.2322	
E18 Party wall between dwellings	2.5800	0.0600	0.1548	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	5.3000	0.0000	0.0000	
P7 Party Wall - Exposed floor (normal)	5.3000	0.1600	0.8480	
E1 Steel lintel with perforated steel base plate	10.1000	0.0500	0.5050	
E3 Sill	9.2000	0.0500	0.4600	
E4 Jamb	24.2000	0.0500	1.2100	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			13.5728 (36)	
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	52.2534 (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	40.3732	40.2601	40.1493	39.6288	39.5314	39.0780	39.0780	38.9941	39.2526	39.5314	39.7284	39.9343	(38)
Heat transfer coeff	92.6266	92.5135	92.4027	91.8822	91.7848	91.3314	91.3314	91.2475	91.5061	91.7848	91.9818	92.1878	(39)
Average = Sum(39)m / 12 =												91.8817	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0526	1.0513	1.0500	1.0441	1.0430	1.0379	1.0379	1.0369	1.0398	1.0430	1.0452	1.0476	(40)
HLP (average)												1.0441	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5973 (42)
Hot water usage for mixer showers												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths												
29.2660	28.8313	28.2193	27.0907	26.2457	25.3087	24.8025	25.4103	26.0721	27.0747	28.2265	29.1670	(42b)
Hot water usage for other uses												
41.2294	39.7301	38.2309	36.7316	35.2324	33.7331	33.7331	35.2324	36.7316	38.2309	39.7301	41.2294	(42c)
Average daily hot water use (litres/day)												64.6154 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	70.4954	68.5615	66.4501	63.8224	61.4781	59.0418	58.5357	60.6427	62.8037	65.3056	67.9567	70.3964	(44)
Energy conte	111.6474	97.6306	102.1314	87.3696	82.7613	72.5988	70.7938	75.0884	77.4433	88.6191	96.8167	110.2238	(45)
Energy content (annual)										Total = Sum(45)m =		1073.1242	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	94.9003	82.9860	86.8117	74.2642	70.3471	61.7090	60.1748	63.8251	65.8268	75.3262	82.2942	93.6902	(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													
	94.9003	82.9860	86.8117	74.2642	70.3471	61.7090	60.1748	63.8251	65.8268	75.3262	82.2942	93.6902	(64)
									Total per year (kWh/year) = Sum(64)m =			912.1556	(64)
12Total per year (kWh/year)												912	(64)
Electric shower(s)													
	54.2714	48.3563	52.8032	50.3894	51.3350	48.9686	50.6009	51.3350	50.3894	52.8032	51.8103	54.2714	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			617.3340	(64a)
Heat gains from water heating, kWh/month													
	37.2929	32.8356	34.9037	31.1634	30.4205	27.6694	27.6939	28.7900	29.0541	32.0324	33.5261	36.9904	(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	129.8672	129.8672	129.8672	129.8672	129.8672	129.8672	129.8672	129.8672	129.8672	129.8672	129.8672	129.8672	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	120.1473	133.0203	120.1473	124.1522	120.1473	124.1522	120.1473	120.1473	124.1522	120.1473	124.1522	120.1473	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	235.3498	237.7919	231.6377	218.5360	201.9975	186.4537	176.0694	173.6272	179.7815	192.8831	209.4216	224.9655	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.9867	35.9867	35.9867	35.9867	35.9867	35.9867	35.9867	35.9867	35.9867	35.9867	35.9867	35.9867	(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)	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937	(71)
Water heating gains (Table 5)	50.1249	48.8625	46.9136	43.2825	40.8878	38.4297	37.2230	38.6963	40.3529	43.0542	46.5641	49.7183	(72)
Total internal gains	467.5821	481.6348	460.6588	447.9309	424.9928	410.9958	395.3999	394.4310	406.2467	418.0449	442.0981	456.7913	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	11.2800	11.2829	0.4700	0.7000	0.7700	29.0175	(75)
Southeast	1.9800	36.7938	0.4700	0.7000	0.7700	16.6100	(77)
Southwest	3.6000	36.7938	0.4700	0.7000	0.7700	30.2000	(79)

Solar gains	75.8275	138.8007	215.5147	309.9451	386.3324	400.7674	379.2127	319.5904	247.8007	160.3072	92.5791	63.7568	(83)
Total gains	543.4096	620.4355	676.1735	757.8760	811.3252	811.7631	774.6126	714.0213	654.0474	578.3521	534.6772	520.5480	(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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	25.2183	25.2491	25.2794	25.4226	25.4495	25.5759	25.5759	25.5994	25.5271	25.4495	25.3950	25.3383	
alpha	2.6812	2.6833	2.6853	2.6948	2.6966	2.7051	2.7051	2.7066	2.7018	2.6966	2.6930	2.6892	
util living area	0.9599	0.9420	0.9141	0.8503	0.7477	0.6023	0.4724	0.5210	0.7169	0.8790	0.9421	0.9640	(86)
MIT	18.4713	18.7668	19.2182	19.8437	20.3888	20.7629	20.9109	20.8816	20.5973	19.8955	19.0837	18.4130	(87)
Th 2	20.0398	20.0408	20.0418	20.0467	20.0476	20.0519	20.0519	20.0527	20.0503	20.0476	20.0458	20.0439	(88)
util rest of house	0.9543	0.9341	0.9018	0.8280	0.7083	0.5378	0.3850	0.4331	0.6600	0.8561	0.9327	0.9589	(89)
MIT 2	17.7229	18.0144	18.4581	19.0652	19.5736	19.8998	20.0096	19.9931	19.7707	19.1268	18.3342	17.6682	(90)
Living area fraction										fLA = Living area / (4) =		0.5440	(91)
MIT	18.1300	18.4237	18.8716	19.4887	20.0170	20.3693	20.4999	20.4764	20.2203	19.5450	18.7419	18.0733	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1300	18.4237	18.8716	19.4887	20.0170	20.3693	20.4999	20.4764	20.2203	19.5450	18.7419	18.0733	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9397	0.9170	0.8834	0.8129	0.7069	0.5605	0.4276	0.4740	0.6711	0.8418	0.9164	0.9451	(94)
Useful gains	510.6212	568.9153	597.3596	616.0803	573.5260	454.9665	331.2600	338.4730	438.9144	486.8337	489.9961	491.9914	(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	1281.0260	1251.1255	1143.1682	972.9150	763.3752	526.9155	356.1846	371.9620	560.0483	821.0123	1070.8455	1278.9510	(97)
Space heating kWh	573.1812	458.4453	406.0815	256.9210	141.2478	0.0000	0.0000	0.0000	0.0000	248.6289	418.2116	585.4980	(98a)
Space heating requirement - total per year (kWh/year)												3088.2153	
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	573.1812	458.4453	406.0815	256.9210	141.2478	0.0000	0.0000	0.0000	0.0000	248.6289	418.2116	585.4980	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3088.2153	
Space heating per m2											(98c) / (4) =	35.0934	(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	858.5155	675.8526	693.4809	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7474	0.8109	0.7764	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	641.6515	548.0747	538.4167	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	900.7888	859.7361	791.2818	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	186.5788	231.8760	188.1316	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	46.6447	57.9690	47.0329	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												151.6466	(107)
Energy for space heating												35.0934	(99)
Energy for space cooling												1.7233	(108)

Total 36.8166 (109)
Fabric Energy Efficiency (DFEE) 36.8 (109)

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	88.0000 (1b)	x	2.5800 (2b)	=	227.0400	(1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	227.0400	(5)

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2. Ventilation rate
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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1321	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3821	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2962	(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	0.3776	0.3702	0.3628	0.3258	0.3184	0.2813	0.2813	0.2739	0.2962	0.3184	0.3332	0.3480	(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	0.5713	0.5685	0.5658	0.5531	0.5507	0.5396	0.5396	0.5375	0.5439	0.5507	0.5555	0.5605	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Opening Type (Uw = 1.20)			16.8600	1.1450	19.3053			(27)
Heatloss Floor 1			88.0000	0.1300	11.4400			(28b)
External Wall 1	93.2700	18.7500	74.5200	0.1800	13.4136			(29a)
Total net area of external elements Aum(A, m2)			181.2700					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.0489			(33)
Party Wall 1			13.6700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 95.5587 (35)
List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E7	Party floor between dwellings (in blocks of flats)	36.1500	0.0700	2.5305
E23	Balcony within or between dwellings, balcony support penetrates wall insulation	5.9800	0.0200	0.1196
E20	Exposed floor (normal)	36.1500	0.3200	11.5680
E16	Corner (normal)	10.3200	0.0900	0.9288
E17	Corner (inverted – internal area greater than external area)	2.5800	-0.0900	-0.2322
E18	Party wall between dwellings	2.5800	0.0600	0.1548
P3	Party wall - Intermediate floor between dwellings (in blocks of flats)	5.3000	0.0000	0.0000
P7	Party Wall - Exposed floor (normal)	5.3000	0.1600	0.8480
E1	Steel lintel with perforated steel base plate	10.1000	0.0500	0.5050
E3	Sill	9.2000	0.0500	0.4600
E4	Jamb	24.2000	0.0500	1.2100

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 18.0925 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 64.1414 (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	42.8029	42.5955	42.3922	41.4373	41.2586	40.4269	40.4269	40.2729	40.7473	41.2586	41.6200	41.9979	(38)
Heat transfer coeff	106.9443	106.7369	106.5336	105.5787	105.4000	104.5684	104.5684	104.4143	104.8887	105.4000	105.7615	106.1393	(39)

Average = Sum(39)m / 12 = 105.5778

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2153	1.2129	1.2106	1.1998	1.1977	1.1883	1.1883	1.1865	1.1919	1.1977	1.2018	1.2061	(40)
HLP (average)												1.1997	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5973 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.2660	28.8313	28.2193	27.0907	26.2457	25.3087	24.8025	25.4103	26.0721	27.0747	28.2265	29.1670	(42b)

Hot water usage for other uses

41.2294	39.7301	38.2309	36.7316	35.2324	33.7331	33.7331	35.2324	36.7316	38.2309	39.7301	41.2294	(42c)

Average daily hot water use (litres/day) 64.6154 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.4954	68.5615	66.4501	63.8224	61.4781	59.0418	58.5357	60.6427	62.8037	65.3056	67.9567	70.3964	(44)
Energy conte	111.6474	97.6306	102.1314	87.3696	82.7613	72.5988	70.7938	75.0884	77.4433	88.6191	96.8167	110.2238	(45)

Energy content (annual) Total = Sum(45)m = 1073.1242

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

94.9003	82.9860	86.8117	74.2642	70.3471	61.7090	60.1748	63.8251	65.8268	75.3262	82.2942	93.6902	(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

94.9003	82.9860	86.8117	74.2642	70.3471	61.7090	60.1748	63.8251	65.8268	75.3262	82.2942	93.6902	(64)

Total per year (kWh/year) = Sum(64)m = 912.1556 (64)

12Total per year (kWh/year) 912 (64)

Electric shower(s)

54.2714	48.3563	52.8032	50.3894	51.3350	48.9686	50.6009	51.3350	50.3894	52.8032	51.8103	54.2714	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 617.3340 (64a)

Heat gains from water heating, kWh/month

37.2929	32.8356	34.9037	31.1634	30.4205	27.6694	27.6939	28.7900	29.0541	32.0324	33.5261	36.9904	(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	129.8672	129.8672	129.8672	129.8672	129.8672	129.8672	129.8672	129.8672	129.8672	129.8672	129.8672	129.8672	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	120.1473	133.0203	120.1473	124.1522	120.1473	124.1522	120.1473	120.1473	124.1522	120.1473	124.1522	120.1473	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	235.3498	237.7919	231.6377	218.5360	201.9975	186.4537	176.0694	173.6272	179.7815	192.8831	209.4216	224.9655	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.9867	35.9867	35.9867	35.9867	35.9867	35.9867	35.9867	35.9867	35.9867	35.9867	35.9867	35.9867	(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)	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937	(71)
Water heating gains (Table 5)	50.1249	48.8625	46.9136	43.2825	40.8878	38.4297	37.2230	38.6963	40.3529	43.0542	46.5641	49.7183	(72)
Total internal gains	467.5821	481.6348	460.6588	447.9309	424.9928	410.9958	395.3999	394.4310	406.2467	418.0449	442.0981	456.7913	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	11.2800	11.2829	0.6300	0.7000	0.7700	38.8958	(75)
Southeast	1.9800	36.7938	0.6300	0.7000	0.7700	22.2645	(77)

Southwest			3.6000		36.7938		0.6300		0.7000		0.7700		40.4808 (79)
Solar gains	101.6411	186.0520	288.8814	415.4583	517.8498	537.1988	508.3064	428.3871	332.1584	214.8799	124.0954	85.4612 (83)	
Total gains	569.2233	667.6869	749.5402	863.3893	942.8426	948.1946	903.7063	822.8181	738.4051	632.9247	566.1935	542.2525 (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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	21.8420	21.8845	21.9262	22.1245	22.1620	22.3383	22.3383	22.3713	22.2701	22.1620	22.0863	22.0077	
alpha	2.4561	2.4590	2.4617	2.4750	2.4775	2.4892	2.4892	2.4914	2.4847	2.4775	2.4724	2.4672	
util living area													
	0.9581	0.9378	0.9055	0.8347	0.7261	0.5818	0.4577	0.5087	0.7058	0.8728	0.9397	0.9625 (86)	
MIT	18.1134	18.4563	18.9816	19.6974	20.3080	20.7238	20.8908	20.8550	20.5249	19.7270	18.8071	18.0560 (87)	
Th 2	19.9078	19.9097	19.9115	19.9202	19.9218	19.9294	19.9294	19.9308	19.9265	19.9218	19.9185	19.9151 (88)	
util rest of house													
	0.9519	0.9288	0.8912	0.8090	0.6818	0.5112	0.3624	0.4124	0.6430	0.8472	0.9293	0.9569 (89)	
MIT 2	17.2847	17.6229	18.1384	18.8323	19.3980	19.7590	19.8809	19.8619	19.6066	18.8770	17.9793	17.2328 (90)	
Living area fraction										fLA = Living area / (4) =		0.5440 (91)	
MIT	17.7355	18.0763	18.5971	19.3029	19.8930	20.2838	20.4302	20.4021	20.1061	19.3393	18.4296	17.6806 (92)	
Temperature adjustment												0.0000	
adjusted MIT	17.7355	18.0763	18.5971	19.3029	19.8930	20.2838	20.4302	20.4021	20.1061	19.3393	18.4296	17.6806 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9352	0.9090	0.8699	0.7920	0.6805	0.5359	0.4086	0.4569	0.6545	0.8306	0.9107	0.9413 (94)	
Useful gains	532.3601	606.9134	652.0046	683.7612	641.6182	508.1050	369.2765	375.9160	483.2825	525.6808	515.6563	510.4129 (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													
	1436.8487	1406.3958	1288.7459	1098.3209	863.5462	594.3502	400.5229	417.8768	629.9722	921.1278	1198.2362	1430.8208 (97)	
Space heating kWh													
	672.9396	537.2521	473.7355	298.4830	165.1144	0.0000	0.0000	0.0000	0.0000	294.2126	491.4575	684.7835 (98a)	
Space heating requirement - total per year (kWh/year)												3617.9782	
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													
	672.9396	537.2521	473.7355	298.4830	165.1144	0.0000	0.0000	0.0000	0.0000	294.2126	491.4575	684.7835 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												3617.9782	
Space heating per m2											(98c) / (4) =	41.1134 (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	982.9426	773.8059	793.5490	0.0000	0.0000	0.0000	0.0000 (100)	
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7399	0.8011	0.7636	0.0000	0.0000	0.0000	0.0000 (101)	
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	727.2511	619.8924	605.9727	0.0000	0.0000	0.0000	0.0000 (102)	
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1060.2542	1010.6248	918.4468	0.0000	0.0000	0.0000	0.0000 (103)	
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	239.7622	290.7049	232.4807	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	59.9405	72.6762	58.1202	0.0000	0.0000	0.0000	0.0000 (107)	
Space cooling requirement												190.7369 (107)	
Energy for space heating												41.1134 (99)	
Energy for space cooling												2.1675 (108)	
Total												43.2809 (109)	
Fabric Energy Efficiency (TFEE)												43.3 (109)	

Full SAP Calculation Printout

Property Reference	Flat 101 WCS - Green	Issued on Date	06/05/2023
Assessment Reference	Flat 101 WCS - Green	Prop Type Ref	Flat 102 WCS - Green
Property	West Central Street, London, WC1A		

SAP Rating	83 B	DER	3.56	TER	17.06
Environmental	97 A	% DER < TER			79.13
CO_2 Emissions (t/year)	0.2	DFEE	42.99	TFEE	46.93
Compliance Check	See BREL	% DFEE < TFEE			8.38
% DPER < TPER	58.80	DPER	37.73	TPER	91.58

Assessor Details	Mr. Adrian Fell	Assessor ID	N222-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	61.0000 (1b)	x	2.7500 (2b)	=	167.7500 (1b)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	167.7500	(5)

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2. Ventilation rate

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	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) =	0.1192 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.2692 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2086 (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	0.2660	0.2608	0.2556	0.2295	0.2243	0.1982	0.1982	0.1930	0.2086	0.2243	0.2347	0.2452	(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	0.5354	0.5340	0.5327	0.5263	0.5252	0.5196	0.5196	0.5186	0.5218	0.5252	0.5275	0.5301	(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 (Uw = 0.95)			19.3800	0.9152	17.7370			(27)
Glazed Doors (Uw = 0.95)			2.0500	0.9152	1.8762			(27)
Solid Door			2.0000	0.8000	1.6000			(26)
Heatloss Floor 1			61.0000	0.1200	7.3200			(28b)
External Wall 1	87.5300	23.4300	64.1000	0.1500	9.6150	14.0000	897.4000	(29a)
Total net area of external elements Aum(A, m2)			148.5300					(31)

Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =	38.1482			(33)
Party Wall 1	9.7900	0.0000	0.0000	20.0000	195.8000 (32)
Party Ceiling 1	61.0000			40.0000	2440.0000 (32b)
Internal Wall 1	92.2900			9.0000	830.6100 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	4363.8100	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		71.5379	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E16 Corner (normal)	13.7500	0.0900	1.2375
E17 Corner (inverted – internal area greater than external area)	5.5000	-0.0900	-0.4950
E20 Exposed floor (normal)	31.8300	0.1250	3.9787
E1 Steel lintel with perforated steel base plate	10.2600	0.0500	0.5130
E3 Sill	9.3100	0.0500	0.4655
E4 Jamb	31.8000	0.0500	1.5900
E7 Party floor between dwellings (in blocks of flats)	31.8300	0.0700	2.2281
E18 Party wall between dwellings	2.7500	0.0600	0.1650
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7400	0.4430	2.9858
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	3.5600	0.0000	0.0000
P7 Party Wall - Exposed floor (normal)	3.5600	0.1600	0.5696

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		13.2383	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	51.3865	(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	29.6376	29.5615	29.4870	29.1368	29.0713	28.7662	28.7662	28.7098	28.8837	29.0713	29.2038	29.3424	(38)
Heat transfer coeff	81.0241	80.9480	80.8734	80.5232	80.4577	80.1527	80.1527	80.0962	80.2702	80.4577	80.5903	80.7288	(39)

Average = Sum(39)m / 12 = 80.5229

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3283	1.3270	1.3258	1.3201	1.3190	1.3140	1.3140	1.3131	1.3159	1.3190	1.3212	1.3234	(40)
HLP (average)												1.3200	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0098	(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	25.0293	24.6576	24.1341	23.1690	22.4462	21.6449	21.2120	21.7318	22.2978	23.1553	24.1403	24.9447	(42b)
Hot water usage for other uses	35.2120	33.9315	32.6511	31.3707	30.0902	28.8098	28.8098	30.0902	31.3707	32.6511	33.9315	35.2120	(42c)
Average daily hot water use (litres/day)												55.2170	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	60.2413	58.5891	56.7852	54.5396	52.5365	50.4547	50.0218	51.8221	53.6685	55.8064	58.0719	60.1567	(44)
Energy conte	95.4075	83.4301	87.2768	74.6620	70.7242	62.0399	60.4971	64.1665	66.1786	75.7287	82.7340	94.1908	(45)
Energy content (annual)										Total = Sum(45)m =		917.0363	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	81.0963	70.9156	74.1853	63.4627	60.1156	52.7339	51.4225	54.5416	56.2518	64.3694	70.3239	80.0622	(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	81.0963	70.9156	74.1853	63.4627	60.1156	52.7339	51.4225	54.5416	56.2518	64.3694	70.3239	80.0622	(64)
								Total per year (kWh/year) = Sum(64)m =				779.4808	(64)
12Total per year (kWh/year)												779	(64)
Electric shower(s)	46.3816	41.3264	45.1268	43.0640	43.8721	41.8497	43.2447	43.8721	43.0640	45.1268	44.2783	46.3816	(64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				527.5882	(64a)
Heat gains from water heating, kWh/month	31.8695	28.0605	29.8280	26.6317	25.9969	23.6459	23.6668	24.6034	24.8289	27.3741	28.6506	31.6109	(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	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	88.5003	97.9825	88.5003	91.4503	88.5003	91.4503	88.5003	88.5003	91.4503	88.5003	91.4503	88.5003	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	175.4617	177.2825	172.6943	162.9265	150.5964	139.0079	131.2661	129.4454	134.0336	143.8013	156.1314	167.7199	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	(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)	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	(71)
Water heating gains (Table 5)	42.8353	41.7567	40.0914	36.9884	34.9421	32.8415	31.8102	33.0691	34.4847	36.7931	39.7924	42.4878	(72)
Total internal gains	359.9438	370.1681	354.4324	344.5117	327.1853	316.4462	304.7230	304.1612	313.1150	322.2412	340.5206	351.8545	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	7.4800	36.7938	0.4700	0.7000	0.7700	62.7488	(77)
Southwest	5.1800	36.7938	0.4700	0.7000	0.7700	43.4544	(79)
Northwest	6.7200	11.2829	0.4700	0.7000	0.7700	17.2870	(81)
Southeast	2.0500	36.7938	0.4700	0.7000	0.7700	17.1972	(77)

Solar gains	140.6875	245.3849	350.9983	460.4685	539.0973	545.4627	521.6129	461.3831	388.6618	275.3150	169.5569	119.7226	(83)
Total gains	500.6313	615.5530	705.4308	804.9802	866.2825	861.9089	826.3359	765.5443	701.7768	597.5561	510.0775	471.5770	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	14.9606	14.9747	14.9885	15.0537	15.0659	15.1232	15.1232	15.1339	15.1011	15.0659	15.0411	15.0153	
alpha	1.9974	1.9983	1.9992	2.0036	2.0044	2.0082	2.0082	2.0089	2.0067	2.0044	2.0027	2.0010	
util living area	0.9089	0.8682	0.8156	0.7283	0.6173	0.4876	0.3788	0.4167	0.5861	0.7712	0.8756	0.9178	(86)
MIT	17.6308	18.1143	18.7569	19.5395	20.1960	20.6502	20.8505	20.8133	20.4624	19.5845	18.4658	17.5289	(87)
Th 2	19.8188	19.8197	19.8207	19.8252	19.8260	19.8299	19.8299	19.8306	19.8284	19.8260	19.8243	19.8225	(88)
util rest of house	0.8979	0.8530	0.7941	0.6962	0.5702	0.4200	0.2917	0.3281	0.5208	0.7364	0.8585	0.9077	(89)
MIT 2	16.7880	17.2574	17.8788	18.6233	19.2240	19.6142	19.7626	19.7417	19.4728	18.6877	17.6137	16.6909	(90)
Living area fraction										fLA = Living area / (4) =		0.3654	(91)
MIT	17.0959	17.5705	18.1997	18.9581	19.5792	19.9928	20.1601	20.1333	19.8344	19.0154	17.9251	16.9971	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.0959	17.5705	18.1997	18.9581	19.5792	19.9928	20.1601	20.1333	19.8344	19.0154	17.9251	16.9971	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8638	0.8161	0.7584	0.6691	0.5593	0.4300	0.3175	0.3523	0.5212	0.7079	0.8229	0.8750	(94)
Useful gains	432.4617	502.3284	534.9869	538.6106	484.5451	370.6319	262.3317	269.7194	365.7496	422.9840	419.7326	412.6084	(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	1036.7789	1025.6524	946.1938	809.9100	633.9387	432.2440	285.3555	299.0197	460.3014	677.0828	872.3965	1033.0964	(97)
Space heating kWh	449.6120	351.6737	305.9379	195.3356	111.1488	0.0000	0.0000	0.0000	0.0000	189.0495	325.9179	461.6431	(98a)
Space heating requirement - total per year (kWh/year)												2390.3185	
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	449.6120	351.6737	305.9379	195.3356	111.1488	0.0000	0.0000	0.0000	0.0000	189.0495	325.9179	461.6431	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2390.3185	
Space heating per m2											(98c) / (4) =	39.1855	(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	753.4355	593.1301	608.7314	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7490	0.8034	0.7761	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	564.3074	476.5351	472.4280	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	974.8769	935.0378	865.6895	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	295.6101	341.1260	292.5866	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	73.9025	85.2815	73.1466	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												232.3307	(107)
Energy for space heating												39.1855	(99)

Energy for space cooling 3.8087 (108)
Total 42.9942 (109)
Fabric Energy Efficiency (DFEE) 43.0 (109)

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	61.0000 (1b)	x	2.7500 (2b)	=	167.7500 (1b)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 61.0000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	167.7500	(5)

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2. Ventilation rate

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		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) =	0.1192	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3692	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2861	(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	0.3648	0.3577	0.3505	0.3148	0.3076	0.2718	0.2718	0.2647	0.2861	0.3076	0.3219	0.3362	(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	0.5666	0.5640	0.5614	0.5495	0.5473	0.5369	0.5369	0.5350	0.5409	0.5473	0.5518	0.5565	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.0000	1.0000	2.0000			(26)
TER Opening Type (Uw = 1.20)			13.2500	1.1450	15.1718			(27)
Heatloss Floor 1			61.0000	0.1300	7.9300			(28b)
External Wall 1	87.5300	15.2500	72.2800	0.1800	13.0104			(29a)
Total net area of external elements Aum(A, m2)			148.5300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	38.1122			(33)
Party Wall 1			9.7900	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 71.5379 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E16 Corner (normal)	13.7500	0.0900	1.2375
E17 Corner (inverted – internal area greater than external area)	5.5000	-0.0900	-0.4950
E20 Exposed floor (normal)	31.8300	0.3200	10.1856
E1 Steel lintel with perforated steel base plate	10.2600	0.0500	0.5130
E3 Sill	9.3100	0.0500	0.4655
E4 Jamb	31.8000	0.0500	1.5900
E7 Party floor between dwellings (in blocks of flats)	31.8300	0.0700	2.2281
E18 Party wall between dwellings	2.7500	0.0600	0.1650
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7400	0.0200	0.1348
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	3.5600	0.0000	0.0000

P7 Party Wall - Exposed floor (normal)									3.5600	0.1600	0.5696		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												16.5941	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	54.7063	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	31.3630	31.2200	31.0797	30.4211	30.2978	29.7242	29.7242	29.6179	29.9451	30.2978	30.5471	30.8078	(38)
Heat transfer coeff	86.0693	85.9262	85.7860	85.1273	85.0041	84.4304	84.4304	84.3242	84.6514	85.0041	85.2534	85.5140	(39)
Average = Sum(39)m / 12 =												85.1267	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4110	1.4086	1.4063	1.3955	1.3935	1.3841	1.3841	1.3824	1.3877	1.3935	1.3976	1.4019	(40)
HLP (average)												1.3955	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0098	(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	25.0293	24.6576	24.1341	23.1690	22.4462	21.6449	21.2120	21.7318	22.2978	23.1553	24.1403	24.9447	(42b)
Hot water usage for other uses	35.2120	33.9315	32.6511	31.3707	30.0902	28.8098	28.8098	30.0902	31.3707	32.6511	33.9315	35.2120	(42c)
Average daily hot water use (litres/day)												55.2170	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	60.2413	58.5891	56.7852	54.5396	52.5365	50.4547	50.0218	51.8221	53.6685	55.8064	58.0719	60.1567	(44)
Energy conte	95.4075	83.4301	87.2768	74.6620	70.7242	62.0399	60.4971	64.1665	66.1786	75.7287	82.7340	94.1908	(45)
Energy content (annual)										Total = Sum(45)m =		917.0363	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	81.0963	70.9156	74.1853	63.4627	60.1156	52.7339	51.4225	54.5416	56.2518	64.3694	70.3239	80.0622	(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	81.0963	70.9156	74.1853	63.4627	60.1156	52.7339	51.4225	54.5416	56.2518	64.3694	70.3239	80.0622	(64)
										Total per year (kWh/year) = Sum(64)m =		779.4808	(64)
12Total per year (kWh/year)												779	(64)
Electric shower(s)	46.3816	41.3264	45.1268	43.0640	43.8721	41.8497	43.2447	43.8721	43.0640	45.1268	44.2783	46.3816	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		527.5882	(64a)
Heat gains from water heating, kWh/month	31.8695	28.0605	29.8280	26.6317	25.9969	23.6459	23.6668	24.6034	24.8289	27.3741	28.6506	31.6109	(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	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	88.5730	98.0630	88.5730	91.5254	88.5730	91.5254	88.5730	88.5730	91.5254	88.5730	91.5254	88.5730	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	175.4617	177.2825	172.6943	162.9265	150.5964	139.0079	131.2661	129.4454	134.0336	143.8013	156.1314	167.7199	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	(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)	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	(71)
Water heating gains (Table 5)	42.8353	41.7567	40.0914	36.9884	34.9421	32.8415	31.8102	33.0691	34.4847	36.7931	39.7924	42.4878	(72)
Total internal gains	360.0165	370.2486	354.5051	344.5868	327.2580	316.5213	304.7958	304.2339	313.1901	322.3139	340.5957	351.9272	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	5.9000	36.7938	0.6300	0.7000	0.7700	66.3436	(77)

Southwest			3.2000		36.7938		0.6300		0.7000		0.7700		35.9830 (79)
Northwest			4.1500		11.2829		0.6300		0.7000		0.7700		14.3101 (81)
Solar gains	116.6366	203.4285	290.9652	381.6822	446.8317	452.0968	432.3338	382.4304	322.1768	228.2360	140.5694	99.2565	(83)
Total gains	476.6531	573.6771	645.4704	726.2690	774.0897	768.6182	737.1295	686.6643	635.3669	550.5499	481.1651	451.1837	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	14.0836	14.1071	14.1302	14.2395	14.2601	14.3570	14.3570	14.3751	14.3195	14.2601	14.2184	14.1751	
alpha	1.9389	1.9405	1.9420	1.9493	1.9507	1.9571	1.9571	1.9583	1.9546	1.9507	1.9479	1.9450	
util living area	0.9182	0.8853	0.8426	0.7680	0.6680	0.5412	0.4287	0.4664	0.6334	0.8010	0.8896	0.9254	(86)
MIT	17.3717	17.8194	18.4546	19.2753	20.0007	20.5436	20.7963	20.7517	20.3345	19.3808	18.2380	17.2879	(87)
Th 2	19.7549	19.7567	19.7585	19.7668	19.7683	19.7755	19.7755	19.7769	19.7728	19.7683	19.7652	19.7619	(88)
util rest of house	0.9078	0.8711	0.8225	0.7371	0.6204	0.4685	0.3301	0.3679	0.5661	0.7676	0.8735	0.9159	(89)
MIT 2	16.4975	16.9346	17.5533	18.3436	19.0170	19.4934	19.6845	19.6590	19.3311	18.4646	17.3590	16.4197	(90)
Living area fraction										fLA = Living area / (4) =		0.3654	(91)
MIT	16.8169	17.2579	17.8826	18.6841	19.3764	19.8772	20.0908	20.0583	19.6978	18.7994	17.6802	16.7369	(92)
Temperature adjustment												0.0000	
adjusted MIT	16.8169	17.2579	17.8826	18.6841	19.3764	19.8772	20.0908	20.0583	19.6978	18.7994	17.6802	16.7369	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8738	0.8336	0.7845	0.7051	0.6034	0.4750	0.3571	0.3923	0.5614	0.7355	0.8373	0.8833	(94)
Useful gains	416.4953	478.2067	506.3977	512.0855	467.0655	365.0908	263.2221	269.3635	356.7182	404.9184	402.8776	398.5316	(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	1077.3236	1061.8692	976.4713	832.8913	652.5269	445.5523	294.7279	308.4821	473.8597	696.9809	901.9949	1072.0847	(97)
Space heating kWh	491.6562	392.2212	349.7348	230.9801	137.9833	0.0000	0.0000	0.0000	0.0000	217.2945	359.3645	501.1235	(98a)
Space heating requirement - total per year (kWh/year)												2680.3581	
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	491.6562	392.2212	349.7348	230.9801	137.9833	0.0000	0.0000	0.0000	0.0000	217.2945	359.3645	501.1235	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2680.3581	
Space heating per m2											(98c) / (4) =	43.9403	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	793.6459	624.7850	640.8637	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6902	0.7507	0.7220	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	547.7575	469.0078	462.6968	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	865.7543	830.6925	773.4160	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	228.9577	269.0934	231.1751	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	57.2394	67.2733	57.7938	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												182.3065	(107)
Energy for space heating												43.9403	(99)
Energy for space cooling												2.9886	(108)
Total												46.9289	(109)
Fabric Energy Efficiency (TFEE)												46.9	(109)

Full SAP Calculation Printout

Property Reference	Flat 102 VL - Be Green	Issued on Date	06/05/2023
Assessment Reference	Flat 102 VL - Be Green	Prop Type Ref	Flat 103 VL - Be Green
Property	MFMTF, Vine Lane, London, WC1A		

SAP Rating	83 B	DER	3.62	TER	17.62
Environmental	97 A	% DER < TER			79.46
CO_2 Emissions (t/year)	0.17	DFEE	40.11	TFEE	44.41
Compliance Check	See BREL	% DFEE < TFEE			9.69
% DPER < TPER	59.41	DPER	38.49	TPER	94.82

Assessor Details	Mr. Adrian Fell	Assessor ID	N222-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	51.6300 (1b)	x	2.5800 (2b)	=	133.2054	(1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 51.6300						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	133.2054	(5)

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2. Ventilation rate

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	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) =	0.1501 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.3001 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2326 (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	0.2966	0.2908	0.2849	0.2559	0.2501	0.2210	0.2210	0.2152	0.2326	0.2501	0.2617	0.2733	(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	0.5440	0.5423	0.5406	0.5327	0.5313	0.5244	0.5244	0.5231	0.5271	0.5313	0.5342	0.5374	(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	
Glazed Door (Uw = 0.95)			1.9800	0.9152	1.8121			(27)
Window (Uw = 0.95)			11.2800	0.9152	10.3237			(27)
Door			1.8900	0.8000	1.5120			(26)
Heatloss Floor 1			51.6300	0.1200	6.1956	30.0000	1548.9000	(28b)
External Wall 1	46.8500	15.1500	31.7000	0.1500	4.7550	14.0000	443.8000	(29a)
Total net area of external elements Aum(A, m2)			98.4800					(31)

Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	24.5984		(33)
Party Wall 1	31.7900	0.0000	0.0000	20.0000	635.8000	(32)
Party Ceiling 1	51.6300			40.0000	2065.2000	(32b)
Internal Wall 1	48.6600			9.0000	437.9400	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	5131.6400	(34)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		99.3926	(35)	

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E1 Steel lintel with perforated steel base plate	6.4900	0.0500	0.3245
E3 Sill	6.4900	0.0500	0.3245
E4 Jamb	18.2000	0.0500	0.9100
E7 Party floor between dwellings (in blocks of flats)	18.1600	0.0700	1.2712
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.1900	0.4430	2.7422
E20 Exposed floor (normal)	18.1600	0.1250	2.2700
E16 Corner (normal)	2.5800	0.0900	0.2322
E17 Corner (inverted – internal area greater than external area)	2.5800	-0.0900	-0.2322
E18 Party wall between dwellings	10.3200	0.0600	0.6192
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.3200	0.0000	0.0000
P7 Party Wall - Exposed floor (normal)	12.3200	0.1600	1.9712

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		10.4328	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	35.0312	(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	23.9121	23.8371	23.7635	23.4179	23.3532	23.0522	23.0522	22.9964	23.1681	23.3532	23.4840	23.6208	(38)
Heat transfer coeff	58.9434	58.8683	58.7947	58.4491	58.3844	58.0834	58.0834	58.0276	58.1993	58.3844	58.5152	58.6520	(39)
Average = Sum(39)m / 12 =												58.4488	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1416	1.1402	1.1388	1.1321	1.1308	1.1250	1.1250	1.1239	1.1272	1.1308	1.1334	1.1360	(40)
HLP (average)												1.1321	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy											1.7382	(42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	23.0709	22.7283	22.2458	21.3561	20.6900	19.9513	19.5523	20.0314	20.5531	21.3435	22.2515	22.9929	(42b)
Hot water usage for other uses	32.4304	31.2512	30.0719	28.8926	27.7133	26.5340	26.5340	27.7133	28.8926	30.0719	31.2512	32.4304	(42c)
Average daily hot water use (litres/day)												50.8726	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	55.5014	53.9794	52.3176	50.2487	48.4033	46.4853	46.0863	47.7447	49.4457	51.4154	53.5026	55.4234	(44)
Energy conte	87.9006	76.8660	80.4103	68.7880	65.1601	57.1591	55.7374	59.1180	60.9715	69.7702	76.2243	86.7796	(45)
Energy content (annual)										Total = Sum(45)m =		844.8850	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	74.7155	65.3361	68.3487	58.4698	55.3861	48.5852	47.3768	50.2503	51.8258	59.3047	64.7907	73.7627	(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	74.7155	65.3361	68.3487	58.4698	55.3861	48.5852	47.3768	50.2503	51.8258	59.3047	64.7907	73.7627	(64)
								Total per year (kWh/year) = Sum(64)m =				718.1522	(64)
12Total per year (kWh/year)												718	(64)
Electric shower(s)	42.7346	38.0769	41.5785	39.6778	40.4224	38.5590	39.8443	40.4224	39.6778	41.5785	40.7966	42.7346	(64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				486.1034	(64a)
Heat gains from water heating, kWh/month	29.3625	25.8532	27.4818	24.5369	23.9521	21.7861	21.8053	22.6682	22.8759	25.2208	26.3968	29.1243	(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	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.3972	84.5826	76.3972	78.9438	76.3972	78.9438	76.3972	76.3972	78.9438	76.3972	78.9438	76.3972	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	151.4660	153.0378	149.0770	140.6451	130.0013	119.9976	113.3145	111.7427	115.7035	124.1354	134.7793	144.7830	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	(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)	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	(71)
Water heating gains (Table 5)	39.4658	38.4721	36.9379	34.0790	32.1937	30.2584	29.3082	30.4680	31.7721	33.8989	36.6623	39.1456	(72)
Total internal gains	316.4013	325.1648	311.4845	302.7402	287.6645	278.2721	268.0922	267.6802	275.4917	283.5039	299.4576	309.3981	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	1.9800	11.2829	0.4700	0.7000	0.7700	5.0935	(81)
Northeast	11.2800	11.2829	0.4700	0.7000	0.7700	29.0175	(75)

Solar gains	34.1110	69.4340	125.0980	205.4469	276.1609	294.4167	275.4208	219.5687	152.4339	84.8539	42.9205	27.8568	(83)
Total gains	350.5124	394.5988	436.5825	508.1871	563.8254	572.6889	543.5130	487.2489	427.9256	368.3578	342.3782	337.2549	(84)

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7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	24.1835	24.2143	24.2446	24.3880	24.4150	24.5415	24.5415	24.5651	24.4926	24.4150	24.3604	24.3036	
alpha	2.6122	2.6143	2.6163	2.6259	2.6277	2.6361	2.6361	2.6377	2.6328	2.6277	2.6240	2.6202	
util living area	0.9555	0.9383	0.9070	0.8308	0.7106	0.5571	0.4338	0.4908	0.7013	0.8736	0.9375	0.9595	(86)
MIT	18.4181	18.7028	19.1831	19.8630	20.4319	20.7893	20.9208	20.8888	20.5946	19.8610	19.0367	18.3639	(87)
Th 2	19.9670	19.9681	19.9693	19.9747	19.9757	19.9805	19.9805	19.9814	19.9787	19.9757	19.9737	19.9715	(88)
util rest of house	0.9491	0.9294	0.8931	0.8051	0.6664	0.4892	0.3451	0.3994	0.6397	0.8485	0.9269	0.9536	(89)
MIT 2	17.6181	17.8986	18.3694	19.0247	19.5470	19.8512	19.9454	19.9286	19.7053	19.0385	18.2354	17.5678	(90)
Living area fraction										fLA = Living area / (4) =		0.6328	(91)
MIT	18.1243	18.4075	18.8843	19.5551	20.1070	20.4448	20.5626	20.5362	20.2680	19.5590	18.7425	18.0716	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1243	18.4075	18.8843	19.5551	20.1070	20.4448	20.5626	20.5362	20.2680	19.5590	18.7425	18.0716	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9340	0.9124	0.8754	0.7932	0.6725	0.5213	0.3970	0.4508	0.6585	0.8365	0.9109	0.9392	(94)
Useful gains	327.3633	360.0206	382.1717	403.0833	379.1528	298.5356	215.7523	219.6508	281.7817	308.1167	311.8560	316.7597	(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	814.8508	795.1625	728.1325	622.7821	490.8349	339.4840	230.1617	240.0140	358.9754	523.0643	681.2622	813.5942	(97)
Space heating kWh	362.6906	292.4153	257.3948	158.1832	83.0915	0.0000	0.0000	0.0000	0.0000	159.9210	265.9725	369.6449	(98a)
Space heating requirement - total per year (kWh/year)												1949.3138	
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	362.6906	292.4153	257.3948	158.1832	83.0915	0.0000	0.0000	0.0000	0.0000	159.9210	265.9725	369.6449	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1949.3138	
Space heating per m2											(98c) / (4) =	37.7554	(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	545.9838	429.8171	441.0101	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7808	0.8368	0.7969	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	426.3295	359.6547	351.4242	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	642.0974	609.5077	545.2055	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	155.3529	185.8906	144.1733	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	38.8382	46.4726	36.0433	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												121.3542	(107)
Energy for space heating												37.7554	(99)
Energy for space cooling												2.3505	(108)
Total												40.1059	(109)

Fabric Energy Efficiency (DFEE) 40.1 (109)

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	51.6300 (1b)	x	2.5800 (2b)	=	133.2054 (1b)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 51.6300						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	133.2054 (5)	

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2. Ventilation rate
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		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) =	0.1501	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4001	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3101	(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	0.3954	0.3876	0.3799	0.3411	0.3334	0.2946	0.2946	0.2869	0.3101	0.3334	0.3489	0.3644	(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	0.5782	0.5751	0.5722	0.5582	0.5556	0.5434	0.5434	0.5411	0.5481	0.5556	0.5609	0.5664	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Opening Type (Uw = 1.20)			11.0300	1.1450	12.6298			(27)
Heatloss Floor 1			51.6300	0.1300	6.7119			(28b)
External Wall 1	46.8500	12.9200	33.9300	0.1800	6.1074			(29a)
Total net area of external elements Aum(A, m2)			98.4800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.3391			(33)
Party Wall 1			31.7900	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 99.3926 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	6.4900	0.0500	0.3245
E3 Sill	6.4900	0.0500	0.3245
E4 Jamb	18.2000	0.0500	0.9100
E7 Party floor between dwellings (in blocks of flats)	18.1600	0.0700	1.2712
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.1900	0.0200	0.1238
E20 Exposed floor (normal)	18.1600	0.3200	5.8112
E16 Corner (normal)	2.5800	0.0900	0.2322
E17 Corner (inverted – internal area greater than external area)	2.5800	-0.0900	-0.2322
E18 Party wall between dwellings	10.3200	0.0600	0.6192
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.3200	0.0000	0.0000
P7 Party Wall - Exposed floor (normal)	12.3200	0.1600	1.9712

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.3556 (36)

Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 38.6947 (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	25.4150	25.2815	25.1508	24.5365	24.4215	23.8865	23.8865	23.7874	24.0926	24.4215	24.6540	24.8971	(38)
Heat transfer coeff	64.1096	63.9762	63.8454	63.2311	63.1162	62.5812	62.5812	62.4821	62.7873	63.1162	63.3487	63.5918	(39)

Average = Sum(39)m / 12 = 63.2306

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2417	1.2391	1.2366	1.2247	1.2225	1.2121	1.2121	1.2102	1.2161	1.2225	1.2270	1.2317	(40)
HLP (average)												1.2247	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7382 (42)

	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	(42a)
Hot water usage for baths	23.0709	22.7283	22.2458	21.3561	20.6900	19.9513	19.5523	20.0314	20.5531	21.3435	22.2515	22.9929	(42b)
Hot water usage for other uses	32.4304	31.2512	30.0719	28.8926	27.7133	26.5340	26.5340	27.7133	28.8926	30.0719	31.2512	32.4304	(42c)

Average daily hot water use (litres/day) 50.8726 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	55.5014	53.9794	52.3176	50.2487	48.4033	46.4853	46.0863	47.7447	49.4457	51.4154	53.5026	55.4234	(44)
Energy conte	87.9006	76.8660	80.4103	68.7880	65.1601	57.1591	55.7374	59.1180	60.9715	69.7702	76.2243	86.7796	(45)

Energy content (annual) Total = Sum(45)m = 844.8850

Distribution loss (46)m = 0.15 x (45)m

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

	74.7155	65.3361	68.3487	58.4698	55.3861	48.5852	47.3768	50.2503	51.8258	59.3047	64.7907	73.7627	(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

	74.7155	65.3361	68.3487	58.4698	55.3861	48.5852	47.3768	50.2503	51.8258	59.3047	64.7907	73.7627	(64)

Total per year (kWh/year) = Sum(64)m = 718.1522 (64)

12Total per year (kWh/year) 718 (64)

Electric shower(s)

	42.7346	38.0769	41.5785	39.6778	40.4224	38.5590	39.8443	40.4224	39.6778	41.5785	40.7966	42.7346	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 486.1034 (64a)

Heat gains from water heating, kWh/month

	29.3625	25.8532	27.4818	24.5369	23.9521	21.7861	21.8053	22.6682	22.8759	25.2208	26.3968	29.1243	(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	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.5233	84.7223	76.5233	79.0741	76.5233	79.0741	76.5233	76.5233	79.0741	76.5233	79.0741	76.5233	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	151.4660	153.0378	149.0770	140.6451	130.0013	119.9976	113.3145	111.7427	115.7035	124.1354	134.7793	144.7830	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	(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)	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	(71)
Water heating gains (Table 5)	39.4658	38.4721	36.9379	34.0790	32.1937	30.2584	29.3082	30.4680	31.7721	33.8989	36.6623	39.1456	(72)
Total internal gains	316.5274	325.3044	311.6106	302.8705	287.7906	278.4024	268.2183	267.8063	275.6220	283.6300	299.5880	309.5242	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	9.3800	11.2829	0.6300	0.7000	0.7700	32.3442	(75)
Northwest	1.6500	11.2829	0.6300	0.7000	0.7700	5.6896	(81)

Solar gains	38.0338	77.4189	139.4842	229.0732	307.9193	328.2745	307.0941	244.8190	169.9637	94.6120	47.8564	31.0603	(83)
Total gains	354.5612	402.7233	451.0948	531.9437	595.7099	606.6769	575.3124	512.6253	445.5857	378.2420	347.4443	340.5845	(84)

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7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	22.2347	22.2810	22.3267	22.5436	22.5846	22.7777	22.7777	22.8138	22.7029	22.5846	22.5017	22.4157	
alpha	2.4823	2.4854	2.4884	2.5029	2.5056	2.5185	2.5185	2.5209	2.5135	2.5056	2.5001	2.4944	
util living area	0.9560	0.9387	0.9067	0.8296	0.7095	0.5575	0.4365	0.4948	0.7053	0.8755	0.9384	0.9599	(86)
MIT	18.1892	18.4931	19.0114	19.7489	20.3645	20.7583	20.9059	20.8689	20.5389	19.7423	18.8592	18.1421	(87)
Th 2	19.8868	19.8888	19.8908	19.9003	19.9021	19.9103	19.9103	19.9119	19.9071	19.9021	19.8985	19.8947	(88)
util rest of house	0.9493	0.9294	0.8922	0.8026	0.6630	0.4859	0.3420	0.3977	0.6407	0.8496	0.9276	0.9538	(89)
MIT 2	17.3411	17.6409	18.1495	18.8625	19.4276	19.7647	19.8699	19.8514	19.6005	18.8744	18.0125	17.2998	(90)
Living area fraction										fLA = Living area / (4) =		0.6328	(91)
MIT	17.8777	18.1801	18.6949	19.4234	20.0204	20.3935	20.5254	20.4952	20.1943	19.4236	18.5483	17.8328	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.8777	18.1801	18.6949	19.4234	20.0204	20.3935	20.5254	20.4952	20.1943	19.4236	18.5483	17.8328	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9333	0.9112	0.8729	0.7893	0.6684	0.5190	0.3968	0.4517	0.6591	0.8361	0.9104	0.9386	(94)
Useful gains	330.9173	366.9441	393.7683	419.8436	398.1874	314.8700	228.2797	231.5376	293.6864	316.2375	316.3261	319.6767	(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	870.4644	849.6135	778.5897	665.4057	525.1536	362.5615	245.6588	255.8794	382.6448	556.9119	725.2329	866.9336	(97)
Space heating kWh	401.4231	324.3539	286.3071	176.8047	94.4628	0.0000	0.0000	0.0000	0.0000	179.0618	294.4129	407.1591	(98a)
Space heating requirement - total per year (kWh/year)												2163.9853	
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	401.4231	324.3539	286.3071	176.8047	94.4628	0.0000	0.0000	0.0000	0.0000	179.0618	294.4129	407.1591	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2163.9853	
Space heating per m2											(98c) / (4) =	41.9133	(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	588.2630	463.1007	474.8639	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7663	0.8228	0.7805	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	450.8133	381.0328	370.6467	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	681.6824	646.5403	574.7343	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	166.2258	197.5376	151.8412	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	41.5564	49.3844	37.9603	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												128.9011	(107)
Energy for space heating												41.9133	(99)
Energy for space cooling												2.4966	(108)
Total												44.4100	(109)
Fabric Energy Efficiency (TFEE)												44.4	(109)

Full SAP Calculation Printout

Property Reference	Flat 102 WCS - Green	Issued on Date	06/05/2023
Assessment Reference	Flat 102 WCS - Green	Prop Type Ref	Flat 102 WCS - Green
Property	West Central Street, London, WC1A		

SAP Rating	82 B	DER	3.72	TER	18.04
Environmental	97 A	% DER < TER			79.38
CO_2 Emissions (t/year)	0.18	DFEE	42.84	TFEE	47.18
Compliance Check	See BREL	% DFEE < TFEE			9.21
% DPER < TPER	59.17	DPER	39.47	TPER	96.67

Assessor Details	Mr. Adrian Fell	Assessor ID	N222-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	52.0000 (1b)	x	2.7500 (2b)	=	143.0000	(1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	143.0000	(5)

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2. Ventilation rate

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	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) =	0.1399 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.2899 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2246 (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	0.2864	0.2808	0.2752	0.2471	0.2415	0.2134	0.2134	0.2078	0.2246	0.2415	0.2527	0.2640	(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	0.5410	0.5394	0.5379	0.5305	0.5292	0.5228	0.5228	0.5216	0.5252	0.5292	0.5319	0.5348	(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 (Uw = 0.95)			12.4200	0.9152	11.3671			(27)
Glazed Doors (Uw = 0.95)			4.1000	0.9152	3.7524			(27)
Solid Door			2.0000	0.8000	1.6000			(26)
Heatloss Floor 1			52.0000	0.1200	6.2400			(28b)
External Wall 1	72.8800	18.5200	54.3600	0.1500	8.1540	14.0000	761.0400	(29a)
Total net area of external elements Aum(A, m2)			124.8800					(31)

Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =	31.1135			(33)
Party Wall 1	20.0800	0.0000	0.0000	20.0000	401.6000 (32)
Party Ceiling 1	52.0000			40.0000	2080.0000 (32b)
Internal Wall 1	49.2300			9.0000	443.0700 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	3685.7100 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		70.8790 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	8.1300	0.0500	0.4065
E3 Sill	7.1800	0.0500	0.3590
E4 Jamb	27.2000	0.0500	1.3600
E18 Party wall between dwellings	11.0000	0.0600	0.6600
E16 Corner (normal)	2.7500	0.0900	0.2475
E17 Corner (inverted – internal area greater than external area)	5.5000	-0.0900	-0.4950
E20 Exposed floor (normal)	26.5000	0.1250	3.3125
E7 Party floor between dwellings (in blocks of flats)	26.5000	0.0700	1.8550
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7400	0.4430	2.9858
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.3000	0.0000	0.0000
P7 Party Wall - Exposed floor (normal)	7.3000	0.1600	1.1680

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		11.8593 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	42.9728 (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	25.5306	25.4555	25.3818	25.0357	24.9710	24.6696	24.6696	24.6138	24.7857	24.9710	25.1020	25.2389	(38)
Heat transfer coeff	68.5034	68.4282	68.3546	68.0085	67.9438	67.6424	67.6424	67.5866	67.7585	67.9438	68.0748	68.2117	(39)

Average = Sum(39)m / 12 = 68.0082

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3174	1.3159	1.3145	1.3079	1.3066	1.3008	1.3008	1.2997	1.3030	1.3066	1.3091	1.3118	(40)
HLP (average)												1.3079	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7491 (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	23.1496	22.8058	22.3217	21.4290	20.7606	20.0194	19.6190	20.0998	20.6232	21.4163	22.3274	23.0714 (42b)
Hot water usage for other uses	32.5422	31.3589	30.1755	28.9922	27.8088	26.6255	26.6255	27.8088	28.9922	30.1755	31.3589	32.5422 (42c)
Average daily hot water use (litres/day)												51.0472 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	55.6919	54.1647	52.4972	50.4212	48.5694	46.6448	46.2445	47.9086	49.6154	51.5919	53.6863	55.6136	(44)
Energy conte	88.2023	77.1298	80.6862	69.0240	65.3837	57.3553	55.9287	59.3209	61.1808	70.0097	76.4860	87.0774	(45)
Energy content (annual)										Total = Sum(45)m =		847.7848	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	74.9719	65.5603	68.5833	58.6704	55.5762	48.7520	47.5394	50.4227	52.0037	59.5082	65.0131	74.0158	(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	74.9719	65.5603	68.5833	58.6704	55.5762	48.7520	47.5394	50.4227	52.0037	59.5082	65.0131	74.0158	(64)
									Total per year (kWh/year) = Sum(64)m =			720.6170	(64)
12Total per year (kWh/year)												721	(64)
Electric shower(s)	42.8812	38.2075	41.7211	39.8139	40.5610	38.6913	39.9810	40.5610	39.8139	41.7211	40.9366	42.8812	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			487.7707	(64a)
Heat gains from water heating, kWh/month	29.4633	25.9420	27.5761	24.6211	24.0343	21.8608	21.8801	22.7459	22.9544	25.3073	26.4874	29.2242	(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	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.8814	85.1187	76.8814	79.4441	76.8814	79.4441	76.8814	76.8814	79.4441	76.8814	79.4441	76.8814	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	152.4259	154.0076	150.0218	141.5364	130.8251	120.7580	114.0326	112.4509	116.4367	124.9221	135.6334	145.7005	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	(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)	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	(71)
Water heating gains (Table 5)	39.6012	38.6041	37.0646	34.1960	32.3042	30.3622	29.4087	30.5725	31.8811	34.0152	36.7881	39.2799	(72)
Total internal gains	318.1446	326.9665	313.2039	304.4125	289.2467	279.8004	269.5588	269.1408	276.9980	285.0548	301.1016	311.0978	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	12.4200	36.7938	0.4700	0.7000	0.7700	104.1899	(77)
Southeast	2.0500	36.7938	0.4700	0.7000	0.7700	17.1972	(77)
Southwest	2.0500	36.7938	0.4700	0.7000	0.7700	17.1972	(79)

Solar gains	138.5844	236.0604	322.9882	400.1980	448.2551	445.0136	429.0406	393.1878	349.7279	260.8971	165.9921	118.5993	(83)
Total gains	456.7289	563.0269	636.1921	704.6105	737.5018	724.8140	698.5993	662.3286	626.7259	545.9519	467.0937	429.6972	(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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	14.9454	14.9618	14.9779	15.0541	15.0685	15.1356	15.1356	15.1481	15.1097	15.0685	15.0395	15.0093	
alpha	1.9964	1.9975	1.9985	2.0036	2.0046	2.0090	2.0090	2.0099	2.0073	2.0046	2.0026	2.0006	
util living area	0.8974	0.8523	0.7992	0.7173	0.6145	0.4889	0.3783	0.4087	0.5663	0.7486	0.8600	0.9073	(86)
MIT	17.7408	18.2379	18.8547	19.5851	20.2032	20.6489	20.8511	20.8202	20.4973	19.6717	18.5746	17.6357	(87)
Th 2	19.8272	19.8284	19.8295	19.8347	19.8357	19.8402	19.8402	19.8410	19.8384	19.8357	19.8337	19.8316	(88)
util rest of house	0.8854	0.8359	0.7768	0.6849	0.5678	0.4219	0.2921	0.3221	0.5019	0.7124	0.8416	0.8963	(89)
MIT 2	16.9004	17.3814	17.9763	18.6712	19.2380	19.6226	19.7727	19.7550	19.5067	18.7719	17.7235	16.8010	(90)
Living area fraction										fLA = Living area / (4) =		0.6488	(91)
MIT	17.4457	17.9372	18.5462	19.2642	19.8643	20.2885	20.4724	20.4462	20.1494	19.3557	18.2757	17.3426	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.4457	17.9372	18.5462	19.2642	19.8643	20.2885	20.4724	20.4462	20.1494	19.3557	18.2757	17.3426	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8538	0.8034	0.7479	0.6672	0.5690	0.4489	0.3405	0.3688	0.5202	0.6954	0.8110	0.8656	(94)
Useful gains	389.9531	452.3501	475.8077	470.1025	419.6283	325.3601	237.8651	244.2991	326.0371	379.6376	378.8037	371.9639	(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	900.5251	892.1110	823.4161	704.8505	554.7123	384.7815	261.9366	273.4673	409.8999	594.8978	760.7834	896.4807	(97)
Space heating kWh	379.8655	295.5193	258.6206	169.0186	100.5025	0.0000	0.0000	0.0000	0.0000	160.1536	275.0254	390.2405	(98a)
Space heating requirement - total per year (kWh/year)												2028.9460	
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	379.8655	295.5193	258.6206	169.0186	100.5025	0.0000	0.0000	0.0000	0.0000	160.1536	275.0254	390.2405	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2028.9460	
Space heating per m2											(98c) / (4) =	39.0182	(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	635.8384	500.5536	513.6579	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7480	0.8040	0.7833	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	475.6015	402.4457	402.3490	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	819.6956	790.5761	749.6527	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	247.7477	288.7690	258.3939	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	61.9369	72.1923	64.5985	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												198.7277	(107)
Energy for space heating												39.0182	(99)
Energy for space cooling												3.8217	(108)

Total 42.8399 (109)
Fabric Energy Efficiency (DFEE) 42.8 (109)

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

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		52.0000 (1b)	x	2.7500 (2b)	=	143.0000 (1b)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.0000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	143.0000	(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) =	0.1399	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3899	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3021	(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	0.3852	0.3777	0.3701	0.3324	0.3248	0.2870	0.2870	0.2795	0.3021	0.3248	0.3399	0.3550	(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	0.5742	0.5713	0.5685	0.5552	0.5527	0.5412	0.5412	0.5391	0.5456	0.5527	0.5578	0.5630	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.0000	1.0000	2.0000			(26)
TER Opening Type (Uw = 1.20)			11.0100	1.1450	12.6069			(27)
Heatloss Floor 1			52.0000	0.1300	6.7600			(28b)
External Wall 1	72.8800	13.0100	59.8700	0.1800	10.7766			(29a)
Total net area of external elements Aum(A, m2)			124.8800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.1435			(33)
Party Wall 1			20.0800	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 70.8790 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E1 Steel lintel with perforated steel base plate	8.1300	0.0500	0.4065
E3 Sill	7.1800	0.0500	0.3590
E4 Jamb	27.2000	0.0500	1.3600
E18 Party wall between dwellings	11.0000	0.0600	0.6600
E16 Corner (normal)	2.7500	0.0900	0.2475
E17 Corner (inverted – internal area greater than external area)	5.5000	-0.0900	-0.4950
E20 Exposed floor (normal)	26.5000	0.3200	8.4800
E7 Party floor between dwellings (in blocks of flats)	26.5000	0.0700	1.8550
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7400	0.0200	0.1348
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.3000	0.0000	0.0000
P7 Party Wall - Exposed floor (normal)	7.3000	0.1600	1.1680

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 14.1758 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 46.3193 (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	27.0966	26.9606	26.8273	26.2013	26.0842	25.5390	25.5390	25.4380	25.7490	26.0842	26.3211	26.5688	(38)
Heat transfer coeff	73.4158	73.2799	73.1466	72.5206	72.4035	71.8582	71.8582	71.7573	72.0682	72.4035	72.6404	72.8881	(39)

Average = Sum(39)m / 12 = 72.5200

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4118	1.4092	1.4067	1.3946	1.3924	1.3819	1.3819	1.3799	1.3859	1.3924	1.3969	1.4017	(40)
HLP (average)												1.3946	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7491 (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

23.1496	22.8058	22.3217	21.4290	20.7606	20.0194	19.6190	20.0998	20.6232	21.4163	22.3274	23.0714	(42b)

Hot water usage for other uses

32.5422	31.3589	30.1755	28.9922	27.8088	26.6255	26.6255	27.8088	28.9922	30.1755	31.3589	32.5422	(42c)

Average daily hot water use (litres/day) 51.0472 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	55.6919	54.1647	52.4972	50.4212	48.5694	46.6448	46.2445	47.9086	49.6154	51.5919	53.6863	55.6136	(44)
Energy conte	88.2023	77.1298	80.6862	69.0240	65.3837	57.3553	55.9287	59.3209	61.1808	70.0097	76.4860	87.0774	(45)

Energy content (annual) Total = Sum(45)m = 847.7848

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

74.9719	65.5603	68.5833	58.6704	55.5762	48.7520	47.5394	50.4227	52.0037	59.5082	65.0131	74.0158	(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

74.9719	65.5603	68.5833	58.6704	55.5762	48.7520	47.5394	50.4227	52.0037	59.5082	65.0131	74.0158	(64)

Total per year (kWh/year) = Sum(64)m = 720.6170 (64)

12Total per year (kWh/year) 721 (64)

Electric shower(s)

42.8812	38.2075	41.7211	39.8139	40.5610	38.6913	39.9810	40.5610	39.8139	41.7211	40.9366	42.8812	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 487.7707 (64a)

Heat gains from water heating, kWh/month

29.4633	25.9420	27.5761	24.6211	24.0343	21.8608	21.8801	22.7459	22.9544	25.3073	26.4874	29.2242	(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	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	77.0499	85.3052	77.0499	79.6182	77.0499	79.6182	77.0499	77.0499	79.6182	77.0499	79.6182	77.0499	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	152.4259	154.0076	150.0218	141.5364	130.8251	120.7580	114.0326	112.4509	116.4367	124.9221	135.6334	145.7005	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	(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)	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	(71)
Water heating gains (Table 5)	39.6012	38.6041	37.0646	34.1960	32.3042	30.3622	29.4087	30.5725	31.8811	34.0152	36.7881	39.2799	(72)
Total internal gains	318.3130	327.1530	313.3724	304.5866	289.4152	279.9745	269.7273	269.3093	277.1721	285.2233	301.2757	311.2663	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.6400	36.7938	0.6300	0.7000	0.7700	108.3987	(77)
Southwest	1.3700	36.7938	0.6300	0.7000	0.7700	15.4052	(79)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	123.8039	210.8838	288.5404	357.5155	400.4472	397.5513	383.2819	351.2530	312.4282	233.0715	148.2885	105.9503	(83)
Total gains	442.1169	538.0368	601.9127	662.1021	689.8624	677.5259	653.0092	620.5623	589.6003	518.2948	449.5642	417.2166	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	13.9453	13.9712	13.9967	14.1175	14.1403	14.2476	14.2476	14.2677	14.2061	14.1403	14.0942	14.0463	
alpha	1.9297	1.9314	1.9331	1.9412	1.9427	1.9498	1.9498	1.9512	1.9471	1.9427	1.9396	1.9364	
util living area	0.9059	0.8673	0.8214	0.7477	0.6521	0.5284	0.4154	0.4459	0.6032	0.7738	0.8727	0.9144	(86)
MIT	17.4723	17.9493	18.5755	19.3545	20.0376	20.5593	20.8056	20.7690	20.3884	19.4842	18.3460	17.3829	(87)
Th 2	19.7543	19.7563	19.7582	19.7675	19.7692	19.7772	19.7772	19.7787	19.7741	19.7692	19.7657	19.7620	(88)
util rest of house	0.8943	0.8515	0.7997	0.7157	0.6041	0.4563	0.3189	0.3501	0.5356	0.7380	0.8548	0.9038	(89)
MIT 2	16.5954	17.0591	17.6666	18.4151	19.0479	19.5054	19.6906	19.6698	19.3720	18.5572	17.4626	16.5130	(90)
Living area fraction										fLA = Living area / (4) =		0.6488	(91)
MIT	17.1644	17.6367	18.2563	19.0246	19.6901	20.1892	20.4141	20.3830	20.0315	19.1587	18.0358	17.0774	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.1644	17.6367	18.2563	19.0246	19.6901	20.1892	20.4141	20.3830	20.0315	19.1587	18.0358	17.0774	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8621	0.8175	0.7679	0.6935	0.6008	0.4820	0.3711	0.3997	0.5509	0.7172	0.8229	0.8727	(94)
Useful gains	381.1662	439.8649	462.2370	459.1788	414.4427	326.5860	242.3610	248.0085	324.8356	371.7216	369.9419	364.0886	(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	944.4505	933.3440	859.9332	734.2437	578.5093	401.6333	274.0730	285.8092	427.4719	619.6776	794.3792	938.6093	(97)
Space heating kWh	419.0836	331.6180	295.8860	198.0468	122.0656	0.0000	0.0000	0.0000	0.0000	184.4793	305.5949	427.4434	(98a)
Space heating requirement - total per year (kWh/year)												2284.2175	
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	419.0836	331.6180	295.8860	198.0468	122.0656	0.0000	0.0000	0.0000	0.0000	184.4793	305.5949	427.4434	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2284.2175	
Space heating per m2										(98c) / (4) =		43.9273	(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	675.4674	531.7509	545.3552	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7009	0.7617	0.7399	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	473.4419	405.0126	403.5155	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	764.2350	737.1079	700.6587	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	209.3710	247.0789	221.0745	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	52.3427	61.7697	55.2686	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												169.3811	(107)
Energy for space heating												43.9273	(99)
Energy for space cooling												3.2573	(108)
Total												47.1846	(109)
Fabric Energy Efficiency (TFEE)												47.2	(109)

Full SAP Calculation Printout

Property Reference	Flat 103 VL - Be Green	Issued on Date	06/05/2023
Assessment Reference	Flat 103 VL - Be Green	Prop Type Ref	Flat 103 VL - Be Green
Property	MFMTF, Vine Lane, London, WC1A		

SAP Rating	83 B	DER	3.59	TER	17.45
Environmental	97 A	% DER < TER			79.43
CO_2 Emissions (t/year)	0.17	DFEE	39.39	TFEE	43.62
Compliance Check	See BREL	% DFEE < TFEE			9.70
% DPER < TPER	59.29	DPER	38.22	TPER	93.90

Assessor Details	Mr. Adrian Fell	Assessor ID	N222-0001
Client			

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

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		51.6300 (1b)	x	2.5800 (2b)	=	133.2054 (1b) -	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.6300						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	133.2054 (5)	

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2. Ventilation rate

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		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) =	0.1501	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3001	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2326	(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	0.2966	0.2908	0.2849	0.2559	0.2501	0.2210	0.2210	0.2152	0.2326	0.2501	0.2617	0.2733	(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	0.5440	0.5423	0.5406	0.5327	0.5313	0.5244	0.5244	0.5231	0.5271	0.5313	0.5342	0.5374	(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	
Glazed Door (Uw = 0.95)			1.9800	0.9152	1.8121			(27)
Window (Uw = 0.95)			11.2800	0.9152	10.3237			(27)
Door			1.8900	0.8000	1.5120			(26)
Heatloss Floor 1			51.6300	0.1200	6.1956	30.0000	1548.9000	(28b)
External Wall 1	46.8500	15.1500	31.7000	0.1500	4.7550	14.0000	443.8000	(29a)
Total net area of external elements Aum(A, m2)			98.4800					(31)

Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	24.5984		(33)
Party Wall 1	31.7900	0.0000	0.0000	20.0000	635.8000	(32)
Party Ceiling 1	51.6300			40.0000	2065.2000	(32b)
Internal Wall 1	48.6600			9.0000	437.9400	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	5131.6400	(34)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		99.3926	(35)	

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E1 Steel lintel with perforated steel base plate	6.4900	0.0500	0.3245
E3 Sill	6.4900	0.0500	0.3245
E4 Jamb	18.2000	0.0500	0.9100
E7 Party floor between dwellings (in blocks of flats)	18.1600	0.0700	1.2712
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.1900	0.4430	2.7422
E20 Exposed floor (normal)	18.1600	0.1250	2.2700
E16 Corner (normal)	2.5800	0.0900	0.2322
E17 Corner (inverted – internal area greater than external area)	2.5800	-0.0900	-0.2322
E18 Party wall between dwellings	10.3200	0.0600	0.6192
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.3200	0.0000	0.0000
P7 Party Wall - Exposed floor (normal)	12.3200	0.1600	1.9712

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		10.4328	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	35.0312	(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	23.9121	23.8371	23.7635	23.4179	23.3532	23.0522	23.0522	22.9964	23.1681	23.3532	23.4840	23.6208	(38)
Heat transfer coeff	58.9434	58.8683	58.7947	58.4491	58.3844	58.0834	58.0834	58.0276	58.1993	58.3844	58.5152	58.6520	(39)
Average = Sum(39)m / 12 =												58.4488	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1416	1.1402	1.1388	1.1321	1.1308	1.1250	1.1250	1.1239	1.1272	1.1308	1.1334	1.1360	(40)
HLP (average)												1.1321	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy											1.7382	(42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	23.0709	22.7283	22.2458	21.3561	20.6900	19.9513	19.5523	20.0314	20.5531	21.3435	22.2515	22.9929	(42b)
Hot water usage for other uses	32.4304	31.2512	30.0719	28.8926	27.7133	26.5340	26.5340	27.7133	28.8926	30.0719	31.2512	32.4304	(42c)
Average daily hot water use (litres/day)												50.8726	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	55.5014	53.9794	52.3176	50.2487	48.4033	46.4853	46.0863	47.7447	49.4457	51.4154	53.5026	55.4234	(44)
Energy conte	87.9006	76.8660	80.4103	68.7880	65.1601	57.1591	55.7374	59.1180	60.9715	69.7702	76.2243	86.7796	(45)
Energy content (annual)										Total = Sum(45)m =		844.8850	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	74.7155	65.3361	68.3487	58.4698	55.3861	48.5852	47.3768	50.2503	51.8258	59.3047	64.7907	73.7627	(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	74.7155	65.3361	68.3487	58.4698	55.3861	48.5852	47.3768	50.2503	51.8258	59.3047	64.7907	73.7627	(64)
								Total per year (kWh/year) = Sum(64)m =				718.1522	(64)
12Total per year (kWh/year)												718	(64)
Electric shower(s)	42.7346	38.0769	41.5785	39.6778	40.4224	38.5590	39.8443	40.4224	39.6778	41.5785	40.7966	42.7346	(64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				486.1034	(64a)
Heat gains from water heating, kWh/month	29.3625	25.8532	27.4818	24.5369	23.9521	21.7861	21.8053	22.6682	22.8759	25.2208	26.3968	29.1243	(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	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.3972	84.5826	76.3972	78.9438	76.3972	78.9438	76.3972	76.3972	78.9438	76.3972	78.9438	76.3972	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	151.4660	153.0378	149.0770	140.6451	130.0013	119.9976	113.3145	111.7427	115.7035	124.1354	134.7793	144.7830	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	(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)	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	(71)
Water heating gains (Table 5)	39.4658	38.4721	36.9379	34.0790	32.1937	30.2584	29.3082	30.4680	31.7721	33.8989	36.6623	39.1456	(72)
Total internal gains	316.4013	325.1648	311.4845	302.7402	287.6645	278.2721	268.0922	267.6802	275.4917	283.5039	299.4576	309.3981	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	1.9800	36.7938	0.4700	0.7000	0.7700	16.6100	(77)
Northeast	11.2800	11.2829	0.4700	0.7000	0.7700	29.0175	(75)

Solar gains	45.6275	87.3590	145.1299	222.7349	288.6497	303.7910	285.7172	233.9078	171.5888	103.4531	56.4065	37.9119	(83)
Total gains	362.0289	412.5238	456.6144	525.4751	576.3142	582.0631	553.8094	501.5881	447.0805	386.9570	355.8642	347.3099	(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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	24.1835	24.2143	24.2446	24.3880	24.4150	24.5415	24.5415	24.5651	24.4926	24.4150	24.3604	24.3036	
alpha	2.6122	2.6143	2.6163	2.6259	2.6277	2.6361	2.6361	2.6377	2.6328	2.6277	2.6240	2.6202	
util living area	0.9524	0.9325	0.8987	0.8213	0.7024	0.5506	0.4270	0.4797	0.6848	0.8621	0.9323	0.9569	(86)
MIT	18.4572	18.7601	19.2404	19.9005	20.4486	20.7952	20.9238	20.8948	20.6187	19.9081	19.0798	18.3987	(87)
Th 2	19.9670	19.9681	19.9693	19.9747	19.9757	19.9805	19.9805	19.9814	19.9787	19.9757	19.9737	19.9715	(88)
util rest of house	0.9455	0.9229	0.8839	0.7948	0.6579	0.4830	0.3393	0.3896	0.6224	0.8354	0.9210	0.9506	(89)
MIT 2	17.6564	17.9541	18.4239	19.0586	19.5607	19.8551	19.9468	19.9317	19.7234	19.0813	18.2770	17.6018	(90)
Living area fraction										fLA = Living area / (4) =		0.6328	(91)
MIT	18.1632	18.4641	18.9405	19.5913	20.1226	20.4499	20.5650	20.5411	20.2900	19.6045	18.7850	18.1060	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1632	18.4641	18.9405	19.5913	20.1226	20.4499	20.5650	20.5411	20.2900	19.6045	18.7850	18.1060	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9299	0.9053	0.8661	0.7836	0.6647	0.5153	0.3908	0.4406	0.6428	0.8242	0.9046	0.9358	(94)
Useful gains	336.6441	373.4612	395.4797	411.7762	383.0930	299.9321	216.4144	221.0017	287.3612	318.9218	321.9271	325.0016	(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	817.1406	798.4958	731.4381	624.8977	491.7457	339.7841	230.2990	240.2981	360.2514	525.7203	683.7503	815.6172	(97)
Space heating kWh	357.4894	285.6232	249.9530	153.4474	80.8376	0.0000	0.0000	0.0000	0.0000	153.8581	260.5127	365.0180	(98a)
Space heating requirement - total per year (kWh/year)												1906.7395	
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	357.4894	285.6232	249.9530	153.4474	80.8376	0.0000	0.0000	0.0000	0.0000	153.8581	260.5127	365.0180	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1906.7395	
Space heating per m2											(98c) / (4) =	36.9308	(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	545.9838	429.8171	441.0101	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7863	0.8420	0.8062	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	429.3097	361.9127	355.5254	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	653.0543	621.5424	561.9656	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	161.0962	193.1645	153.5915	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	40.2740	48.2911	38.3979	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												126.9630	(107)
Energy for space heating												36.9308	(99)
Energy for space cooling												2.4591	(108)
Total												39.3899	(109)

Fabric Energy Efficiency (DFEE) 39.4 (109)

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	51.6300 (1b)	x	2.5800 (2b)	=	133.2054 (1b) -	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 51.6300						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	133.2054 (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) =	0.1501	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4001	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3101	(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	0.3954	0.3876	0.3799	0.3411	0.3334	0.2946	0.2946	0.2869	0.3101	0.3334	0.3489	0.3644	(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	0.5782	0.5751	0.5722	0.5582	0.5556	0.5434	0.5434	0.5411	0.5481	0.5556	0.5609	0.5664	(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			1.8900	1.0000	1.8900			(26)
TER Opening Type (Uw = 1.20)			11.0300	1.1450	12.6298			(27)
Heatloss Floor 1			51.6300	0.1300	6.7119			(28b)
External Wall 1	46.8500	12.9200	33.9300	0.1800	6.1074			(29a)
Total net area of external elements Aum(A, m2)			98.4800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.3391			(33)
Party Wall 1			31.7900	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 99.3926 (35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E1	Steel lintel with perforated steel base plate	6.4900	0.0500	0.3245
E3	Sill	6.4900	0.0500	0.3245
E4	Jamb	18.2000	0.0500	0.9100
E7	Party floor between dwellings (in blocks of flats)	18.1600	0.0700	1.2712
E23	Balcony within or between dwellings, balcony support penetrates wall insulation	6.1900	0.0200	0.1238
E20	Exposed floor (normal)	18.1600	0.3200	5.8112
E16	Corner (normal)	2.5800	0.0900	0.2322
E17	Corner (inverted – internal area greater than external area)	2.5800	-0.0900	-0.2322
E18	Party wall between dwellings	10.3200	0.0600	0.6192
P3	Party wall - Intermediate floor between dwellings (in blocks of flats)	12.3200	0.0000	0.0000
P7	Party Wall - Exposed floor (normal)	12.3200	0.1600	1.9712

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.3556 (36)

Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 38.6947 (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	25.4150	25.2815	25.1508	24.5365	24.4215	23.8865	23.8865	23.7874	24.0926	24.4215	24.6540	24.8971	(38)
Heat transfer coeff	64.1096	63.9762	63.8454	63.2311	63.1162	62.5812	62.5812	62.4821	62.7873	63.1162	63.3487	63.5918	(39)

Average = Sum(39)m / 12 = 63.2306

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2417	1.2391	1.2366	1.2247	1.2225	1.2121	1.2121	1.2102	1.2161	1.2225	1.2270	1.2317	(40)
HLP (average)												1.2247	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7382 (42)

	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	(42a)
Hot water usage for baths	23.0709	22.7283	22.2458	21.3561	20.6900	19.9513	19.5523	20.0314	20.5531	21.3435	22.2515	22.9929	(42b)
Hot water usage for other uses	32.4304	31.2512	30.0719	28.8926	27.7133	26.5340	26.5340	27.7133	28.8926	30.0719	31.2512	32.4304	(42c)

Average daily hot water use (litres/day) 50.8726 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	55.5014	53.9794	52.3176	50.2487	48.4033	46.4853	46.0863	47.7447	49.4457	51.4154	53.5026	55.4234	(44)
Energy conte	87.9006	76.8660	80.4103	68.7880	65.1601	57.1591	55.7374	59.1180	60.9715	69.7702	76.2243	86.7796	(45)

Energy content (annual) Total = Sum(45)m = 844.8850

Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	74.7155	65.3361	68.3487	58.4698	55.3861	48.5852	47.3768	50.2503	51.8258	59.3047	64.7907	73.7627	(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	74.7155	65.3361	68.3487	58.4698	55.3861	48.5852	47.3768	50.2503	51.8258	59.3047	64.7907	73.7627	(64)

Total per year (kWh/year) = Sum(64)m = 718.1522 (64)

12Total per year (kWh/year) 718 (64)

Electric shower(s)	42.7346	38.0769	41.5785	39.6778	40.4224	38.5590	39.8443	40.4224	39.6778	41.5785	40.7966	42.7346	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 486.1034 (64a)

Heat gains from water heating, kWh/month	29.3625	25.8532	27.4818	24.5369	23.9521	21.7861	21.8053	22.6682	22.8759	25.2208	26.3968	29.1243	(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	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.5233	84.7223	76.5233	79.0741	76.5233	79.0741	76.5233	76.5233	79.0741	76.5233	79.0741	76.5233	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	151.4660	153.0378	149.0770	140.6451	130.0013	119.9976	113.3145	111.7427	115.7035	124.1354	134.7793	144.7830	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	(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)	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	(71)
Water heating gains (Table 5)	39.4658	38.4721	36.9379	34.0790	32.1937	30.2584	29.3082	30.4680	31.7721	33.8989	36.6623	39.1456	(72)
Total internal gains	316.5274	325.3044	311.6106	302.8705	287.7906	278.4024	268.2183	267.8063	275.6220	283.6300	299.5880	309.5242	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	9.3800	11.2829	0.6300	0.7000	0.7700	32.3442	(75)
Southeast	1.6500	36.7938	0.6300	0.7000	0.7700	18.5537	(77)

Solar gains	50.8980	97.4415	161.8602	248.3843	321.8695	338.7458	318.5953	260.8361	191.3602	115.3878	62.9205	42.2920	(83)
Total gains	367.4254	422.7459	473.4708	551.2548	609.6601	617.1482	586.8136	528.6424	466.9821	399.0178	362.5085	351.8162	(84)

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7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	22.2347	22.2810	22.3267	22.5436	22.5846	22.7777	22.7777	22.8138	22.7029	22.5846	22.5017	22.4157	
alpha	2.4823	2.4854	2.4884	2.5029	2.5056	2.5185	2.5185	2.5209	2.5135	2.5056	2.5001	2.4944	
util living area	0.9527	0.9325	0.8981	0.8198	0.7011	0.5509	0.4294	0.4832	0.6881	0.8635	0.9330	0.9571	(86)
MIT	18.2317	18.5554	19.0737	19.7899	20.3830	20.7651	20.9093	20.8759	20.5663	19.7942	18.9062	18.1799	(87)
Th 2	19.8868	19.8888	19.8908	19.9003	19.9021	19.9103	19.9103	19.9119	19.9071	19.9021	19.8985	19.8947	(88)
util rest of house	0.9456	0.9225	0.8825	0.7919	0.6542	0.4795	0.3360	0.3874	0.6226	0.8359	0.9214	0.9507	(89)
MIT 2	17.3826	17.7013	18.2088	18.8995	19.4426	19.7691	19.8716	19.8550	19.6208	18.9216	18.0578	17.3368	(90)
Living area fraction										fLA = Living area / (4) =		0.6328	(91)
MIT	17.9199	18.2417	18.7561	19.4630	20.0377	20.3993	20.5282	20.5010	20.2191	19.4737	18.5947	17.8703	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.9199	18.2417	18.7561	19.4630	20.0377	20.3993	20.5282	20.5010	20.2191	19.4737	18.5947	17.8703	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9290	0.9036	0.8632	0.7793	0.6605	0.5128	0.3904	0.4411	0.6428	0.8232	0.9038	0.9349	(94)
Useful gains	341.3227	382.0130	408.6792	429.6043	402.6625	316.4980	229.0815	233.1634	300.1531	328.4595	327.6432	328.9124	(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	873.1686	853.5519	782.4957	667.9078	526.2427	362.9285	245.8329	256.2378	384.2027	560.0753	728.1724	869.3166	(97)
Space heating kWh	395.6933	316.8742	278.1195	171.5785	91.9437	0.0000	0.0000	0.0000	0.0000	172.3221	288.3810	402.0607	(98a)
Space heating requirement - total per year (kWh/year)												2116.9730	
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	395.6933	316.8742	278.1195	171.5785	91.9437	0.0000	0.0000	0.0000	0.0000	172.3221	288.3810	402.0607	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2116.9730	
Space heating per m2											(98c) / (4) =	41.0028	(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	588.2630	463.1007	474.8639	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7721	0.8284	0.7905	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	454.2112	383.6536	375.3961	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	693.9216	659.9833	593.4557	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	172.5915	205.5893	162.2363	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	43.1479	51.3973	40.5591	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												135.1043	(107)
Energy for space heating												41.0028	(99)
Energy for space cooling												2.6168	(108)
Total												43.6195	(109)
Fabric Energy Efficiency (TFEE)												43.6	(109)

Full SAP Calculation Printout

Property Reference	Flat 103 WCS - Green	Issued on Date	06/05/2023
Assessment Reference	Flat 103 WCS - Green	Prop Type Ref	Flat 102 WCS - Green
Property	West Central Street, London, WC1A		

SAP Rating	83 B	DER	3.33	TER	15.71
Environmental	97 A	% DER < TER			78.80
CO_2 Emissions (t/year)	0.22	DFEE	40.70	TFEE	44.50
Compliance Check	See BREL	% DFEE < TFEE			8.54
% DPER < TPER	57.71	DPER	35.59	TPER	84.16

Assessor Details	Mr. Adrian Fell	Assessor ID	N222-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	73.0000 (1b)	x	2.7500 (2b)	=	200.7500 (1b)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	200.7500	(5)

2. Ventilation rate

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

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1494 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.2994 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2321 (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	0.2959	0.2901	0.2843	0.2553	0.2495	0.2205	0.2205	0.2147	0.2321	0.2495	0.2611	0.2727	(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	0.5438	0.5421	0.5404	0.5326	0.5311	0.5243	0.5243	0.5230	0.5269	0.5311	0.5341	0.5372	(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 (Uw = 0.95)			19.9200	0.9152	18.2312			(27)
Glazed Doors (Uw = 0.95)			4.1000	0.9152	3.7524			(27)
Solid Door			2.0000	0.8000	1.6000			(26)
Heatloss Floor 1			73.0000	0.1200	8.7600			(28b)
External Wall 1	74.8600	26.0200	48.8400	0.1500	7.3260	14.0000	683.7600	(29a)
Total net area of external elements Aum(A, m2)			147.8600					(31)

Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	39.6696	(33)
Party Wall 1	10.4500	0.0000	0.0000	20.0000	209.0000 (32)
Corridor Wall	37.1300	0.0000	0.0000	20.0000	742.6000 (32)
Party Ceiling 1	73.0000			40.0000	2920.0000 (32b)
Internal Wall 1	96.8000			9.0000	871.2000 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	5426.5601	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		74.3364	(35)

List of Thermal Bridges

	Length	Psi-value	Total
E16 Corner (normal)	11.0000	0.0900	0.9900
E17 Corner (inverted – internal area greater than external area)	2.7500	-0.0900	-0.2475
E20 Exposed floor (normal)	27.2200	0.1250	3.4025
E18 Party wall between dwellings	2.7500	0.0600	0.1650
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.8600	0.4430	2.1530
E1 Steel lintel with perforated steel base plate	11.3900	0.0500	0.5695
E3 Sill	10.4400	0.0500	0.5220
E4 Jamb	41.0000	0.0500	2.0500
E7 Party floor between dwellings (in blocks of flats)	27.2200	0.0700	1.9054
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	17.3000	0.0000	0.0000
P7 Party Wall - Exposed floor (normal)	17.3000	0.1600	2.7680

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		14.2779	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	53.9475	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.0236	35.9110	35.8007	35.2822	35.1852	34.7337	34.7337	34.6501	34.9076	35.1852	35.3815	35.5866	(38)
Heat transfer coeff	89.9711	89.8585	89.7482	89.2297	89.1327	88.6812	88.6812	88.5976	88.8551	89.1327	89.3290	89.5341	(39)
Average = Sum(39)m / 12 =												89.2293	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2325	1.2309	1.2294	1.2223	1.2210	1.2148	1.2148	1.2137	1.2172	1.2210	1.2237	1.2265	(40)
HLP (average)												1.2223	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3167	(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	27.2424	26.8378	26.2681	25.2176	24.4310	23.5588	23.0876	23.6534	24.2694	25.2027	26.2748	27.1503	(42b)
Hot water usage for other uses	38.3553	36.9606	35.5658	34.1711	32.7764	31.3816	31.3816	32.7764	34.1711	35.5658	36.9606	38.3553	(42c)
Average daily hot water use (litres/day)												60.1265	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	65.5978	63.7984	61.8339	59.3887	57.2073	54.9404	54.4693	56.4298	58.4405	60.7685	63.2354	65.5057	(44)
Energy conte	103.8908	90.8481	95.0365	81.3002	77.0121	67.5556	65.8758	69.8718	72.0630	82.4623	90.0905	102.5660	(45)
Energy content (annual)										Total = Sum(45)m =		998.5727	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	88.3072	77.2209	80.7810	69.1051	65.4603	57.4223	55.9945	59.3910	61.2535	70.0930	76.5769	87.1811	(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	88.3072	77.2209	80.7810	69.1051	65.4603	57.4223	55.9945	59.3910	61.2535	70.0930	76.5769	87.1811	(64)
									Total per year (kWh/year) = Sum(64)m =			848.7868	(64)
12Total per year (kWh/year)												849	(64)
Electric shower(s)	50.5030	44.9986	49.1368	46.8906	47.7705	45.5684	47.0874	47.7705	46.8906	49.1368	48.2128	50.5030	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							574.4692	(64a)
Heat gains from water heating, kWh/month	34.7026	30.5549	32.4794	28.9989	28.3077	25.7477	25.7705	26.7904	27.0360	29.8074	31.1974	34.4210	(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	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	102.9930	114.0280	102.9930	106.4261	102.9930	106.4261	102.9930	102.9930	106.4261	102.9930	106.4261	102.9930	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	204.1952	206.3141	200.9745	189.6072	175.2580	161.7717	152.7621	150.6432	155.9828	167.3501	181.6993	195.1856	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													

	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	(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	(70)
Losses e.g. evaporation (negative values) (Table 5)												
	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	(71)
Water heating gains (Table 5)												
	46.6432	45.4686	43.6552	40.2763	38.0480	35.7607	34.6377	36.0086	37.5501	40.0638	43.3298	46.2648 (72)
Total internal gains												
	411.5819	423.5612	405.3732	394.0601	374.0495	361.7090	348.1434	347.3953	357.7095	368.1574	389.2057	402.1939 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	1.7000	11.2829	0.4700	0.7000	0.7700	4.3732	(75)
Southeast	11.5000	36.7938	0.4700	0.7000	0.7700	96.4722	(77)
Northwest	6.7200	11.2829	0.4700	0.7000	0.7700	17.2870	(81)
Southeast	2.0500	36.7938	0.4700	0.7000	0.7700	17.1972	(77)
Southwest	2.0500	36.7938	0.4700	0.7000	0.7700	17.1972	(79)

Solar gains	152.5268	267.0043	384.4372	508.3682	598.6518	607.1831	580.0374	510.7156	427.0459	300.2492	184.0022	129.6834 (83)
Total gains	564.1088	690.5654	789.8104	902.4283	972.7013	968.8922	928.1808	858.1109	784.7553	668.4067	573.2079	531.8773 (84)

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7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	16.7540	16.7750	16.7956	16.8932	16.9116	16.9977	16.9977	17.0138	16.9644	16.9116	16.8745	16.8358	
alpha	2.1169	2.1183	2.1197	2.1262	2.1274	2.1332	2.1332	2.1343	2.1310	2.1274	2.1250	2.1224	
util living area													
	0.9176	0.8788	0.8272	0.7387	0.6245	0.4904	0.3793	0.4186	0.5937	0.7828	0.8856	0.9260	(86)
MIT	17.8529	18.3147	18.9269	19.6749	20.2889	20.7026	20.8773	20.8443	20.5267	19.7039	18.6462	17.7596	(87)
Th 2	19.8941	19.8953	19.8965	19.9022	19.9032	19.9082	19.9082	19.9091	19.9063	19.9032	19.9011	19.8989	(88)
util rest of house													
	0.9077	0.8649	0.8073	0.7083	0.5795	0.4261	0.2970	0.3347	0.5314	0.7500	0.8700	0.9170	(89)
MIT 2	17.0471	17.4967	18.0898	18.8032	19.3654	19.7218	19.8513	19.8328	19.5883	18.8507	17.8335	16.9589	(90)
Living area fraction									fLA = Living area / (4) =			0.5347	(91)
MIT	17.4779	17.9340	18.5373	19.2692	19.8592	20.2462	20.3998	20.3736	20.0900	19.3069	18.2680	17.3870	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.4779	17.9340	18.5373	19.2692	19.8592	20.2462	20.3998	20.3736	20.0900	19.3069	18.2680	17.3870	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8793	0.8340	0.7780	0.6886	0.5775	0.4469	0.3353	0.3718	0.5426	0.7294	0.8408	0.8897	(94)
Useful gains	496.0117	575.9433	614.4772	621.3884	561.7441	432.9676	311.1773	319.0223	425.8117	487.5546	481.9334	473.2156	(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													
	1185.6299	1171.2193	1080.3276	925.2422	727.2509	500.7083	336.9748	352.0519	532.2433	776.0674	997.6282	1180.6850	(97)
Space heating kWh													
	513.0759	400.0255	346.5927	218.7747	123.1370	0.0000	0.0000	0.0000	0.0000	214.6535	371.3003	526.3572	(98a)
Space heating requirement - total per year (kWh/year)												2713.9169	
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													
	513.0759	400.0255	346.5927	218.7747	123.1370	0.0000	0.0000	0.0000	0.0000	214.6535	371.3003	526.3572	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2713.9169	
Space heating per m2										(98c) / (4) =		37.1769	(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	833.6032	656.2408	673.3415	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7674	0.8210	0.7935	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	639.6892	538.7484	534.3175	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1093.4680	1047.8948	967.9972	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	326.7207	378.8049	322.6577	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	81.6802	94.7012	80.6644	0.0000	0.0000	0.0000	0.0000	(107)

Space cooling requirement 257.0458 (107)
Energy for space heating 37.1769 (99)
Energy for space cooling 3.5212 (108)
Total 40.6981 (109)
Fabric Energy Efficiency (DFEE) 40.7 (109)

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	73.0000 (1b)	x	2.7500 (2b)	=	200.7500 (1b)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 73.0000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	200.7500	(5)

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2. Ventilation rate

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

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1494	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3994	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3096	(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	0.3947	0.3870	0.3792	0.3405	0.3328	0.2941	0.2941	0.2863	0.3096	0.3328	0.3483	0.3637	(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	0.5779	0.5749	0.5719	0.5580	0.5554	0.5432	0.5432	0.5410	0.5479	0.5554	0.5606	0.5662	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.0000	1.0000	2.0000			(26)
TER Opening Type (Uw = 1.20)			16.2600	1.1450	18.6183			(27)
Heatloss Floor 1			73.0000	0.1300	9.4900			(28b)
External Wall 1	74.8600	18.2600	56.6000	0.1800	10.1880			(29a)
Total net area of external elements Aum(A, m2)			147.8600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	40.2963			(33)
Party Wall 1			10.4500	0.0000	0.0000			(32)
Corridor Wall			37.1300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 74.3364 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E16 Corner (normal)	11.0000	0.0900	0.9900
E17 Corner (inverted – internal area greater than external area)	2.7500	-0.0900	-0.2475
E20 Exposed floor (normal)	27.2200	0.3200	8.7104
E18 Party wall between dwellings	2.7500	0.0600	0.1650
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.8600	0.0200	0.0972
E1 Steel lintel with perforated steel base plate	11.3900	0.0500	0.5695
E3 Sill	10.4400	0.0500	0.5220

E4 Jamb	41.0000	0.0500	2.0500	
E7 Party floor between dwellings (in blocks of flats)	27.2200	0.0700	1.9054	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	17.3000	0.0000	0.0000	
P7 Party Wall - Exposed floor (normal)	17.3000	0.1600	2.7680	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 17.5300 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 57.8263 (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	38.2839	38.0836	37.8872	36.9646	36.7920	35.9885	35.9885	35.8397	36.2980	36.7920	37.1412	37.5062	(38)
Heat transfer coeff	96.1103	95.9099	95.7135	94.7909	94.6183	93.8149	93.8149	93.6661	94.1244	94.6183	94.9675	95.3326	(39)

Average = Sum(39)m / 12 = 94.7901

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3166	1.3138	1.3111	1.2985	1.2961	1.2851	1.2851	1.2831	1.2894	1.2961	1.3009	1.3059	(40)
HLP (average)												1.2985	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3167 (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

27.2424	26.8378	26.2681	25.2176	24.4310	23.5588	23.0876	23.6534	24.2694	25.2027	26.2748	27.1503	(42b)

Hot water usage for other uses

38.3553	36.9606	35.5658	34.1711	32.7764	31.3816	31.3816	32.7764	34.1711	35.5658	36.9606	38.3553	(42c)

Average daily hot water use (litres/day) 60.1265 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	65.5978	63.7984	61.8339	59.3887	57.2073	54.9404	54.4693	56.4298	58.4405	60.7685	63.2354	65.5057	(44)
Energy conte	103.8908	90.8481	95.0365	81.3002	77.0121	67.5556	65.8758	69.8718	72.0630	82.4623	90.0905	102.5660	(45)

Energy content (annual) Total = Sum(45)m = 998.5727

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

88.3072	77.2209	80.7810	69.1051	65.4603	57.4223	55.9945	59.3910	61.2535	70.0930	76.5769	87.1811	(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

88.3072	77.2209	80.7810	69.1051	65.4603	57.4223	55.9945	59.3910	61.2535	70.0930	76.5769	87.1811	(64)

Total per year (kWh/year) = Sum(64)m = 848.7868 (64)

12Total per year (kWh/year) 849 (64)

Electric shower(s)

50.5030	44.9986	49.1368	46.8906	47.7705	45.5684	47.0874	47.7705	46.8906	49.1368	48.2128	50.5030	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 574.4692 (64a)

Heat gains from water heating, kWh/month

34.7026	30.5549	32.4794	28.9989	28.3077	25.7477	25.7705	26.7904	27.0360	29.8074	31.1974	34.4210	(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	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	102.9950	114.0302	102.9950	106.4282	102.9950	106.4282	102.9950	102.9950	106.4282	102.9950	106.4282	102.9950	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	204.1952	206.3141	200.9745	189.6072	175.2580	161.7717	152.7621	150.6432	155.9828	167.3501	181.6993	195.1856	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	(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)	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	(71)
Water heating gains (Table 5)	46.6432	45.4686	43.6552	40.2763	38.0480	35.7607	34.6377	36.0086	37.5501	40.0638	43.3298	46.2648	(72)
Total internal gains	411.5839	423.5634	405.3752	394.0622	374.0515	361.7111	348.1454	347.3973	357.7115	368.1594	389.2078	402.1959	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

					W/m2	or Table 6b		or Table 6c		Table 6d			
Northeast					1.1500	11.2829		0.6300		0.7000	0.7700	3.9654	(75)
Southeast					9.1700	36.7938		0.6300		0.7000	0.7700	103.1137	(77)
Southwest					1.3900	36.7938		0.6300		0.7000	0.7700	15.6301	(79)
Northwest					4.5500	11.2829		0.6300		0.7000	0.7700	15.6894	(81)
Solar gains	138.3986	242.2725	348.8288	461.2818	543.2043	550.9459	526.3142	463.4123	387.4912	272.4383	166.9585	117.6710	(83)
Total gains	549.9825	665.8359	754.2040	855.3440	917.2558	912.6570	874.4596	810.8096	745.2027	640.5977	556.1663	519.8670	(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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	15.6838	15.7166	15.7489	15.9021	15.9311	16.0676	16.0676	16.0931	16.0147	15.9311	15.8726	15.8118	
alpha	2.0456	2.0478	2.0499	2.0601	2.0621	2.0712	2.0712	2.0729	2.0676	2.0621	2.0582	2.0541	
util living area													
	0.9236	0.8899	0.8451	0.7655	0.6593	0.5272	0.4136	0.4530	0.6267	0.8031	0.8948	0.9308	(86)
MIT	17.6076	18.0543	18.6745	19.4674	20.1424	20.6267	20.8399	20.8009	20.4299	19.5364	18.4416	17.5296	(87)
Th 2	19.8279	19.8300	19.8321	19.8420	19.8439	19.8525	19.8525	19.8541	19.8492	19.8439	19.8401	19.8362	(88)
util rest of house													
	0.9139	0.8765	0.8258	0.7355	0.6133	0.4583	0.3222	0.3611	0.5621	0.7709	0.8797	0.9221	(89)
MIT 2	16.7674	17.2040	17.8079	18.5712	19.1954	19.6194	19.7794	19.7577	19.4670	18.6570	17.5982	16.6961	(90)
Living area fraction										fLA = Living area / (4) =		0.5347	(91)
MIT	17.2166	17.6587	18.2713	19.0504	19.7017	20.1580	20.3464	20.3154	19.9818	19.1272	18.0491	17.1418	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.2166	17.6587	18.2713	19.0504	19.7017	20.1580	20.3464	20.3154	19.9818	19.1272	18.0491	17.1418	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8850	0.8446	0.7943	0.7119	0.6070	0.4777	0.3632	0.3999	0.5702	0.7473	0.8495	0.8944	(94)
Useful gains	486.7518	562.3478	599.0837	608.9328	556.8183	436.0043	317.5826	324.2469	424.9032	478.7036	472.4518	464.9801	(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													
	1241.4192	1223.6813	1126.6673	962.1639	757.1092	521.4205	351.4693	366.7444	553.6220	806.8311	1039.8120	1233.7711	(97)
Space heating kWh													
	561.4725	444.4162	392.5222	254.3264	149.0165	0.0000	0.0000	0.0000	0.0000	244.1269	408.4993	571.9805	(98a)
Space heating requirement - total per year (kWh/year)												3026.3603	
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													
	561.4725	444.4162	392.5222	254.3264	149.0165	0.0000	0.0000	0.0000	0.0000	244.1269	408.4993	571.9805	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3026.3603	
Space heating per m2											(98c) / (4) =	41.4570	(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	881.8597	694.2299	711.8621	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7244	0.7828	0.7538	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	638.8190	543.4571	536.6371	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1027.7363	985.1016	912.7079	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	280.0205	328.5836	279.7967	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	70.0051	82.1459	69.9492	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												222.1002	(107)
Energy for space heating												41.4570	(99)
Energy for space cooling												3.0425	(108)
Total												44.4995	(109)
Fabric Energy Efficiency (TFEE)												44.5	(109)

Full SAP Calculation Printout

Property Reference	Flat 104 VL - Be Green	Issued on Date	06/05/2023
Assessment Reference	Flat 104 VL - Be Green	Prop Type Ref	Flat 103 VL - Be Green
Property	MFMTF, Vine Lane, London, WC1A		

SAP Rating	83 B	DER	3.67	TER	17.37
Environmental	97 A	% DER < TER			78.87
CO_2 Emissions (t/year)	0.17	DFEE	41.22	TFEE	44.54
Compliance Check	See BREL	% DFEE < TFEE			7.46
% DPER < TPER	58.12	DPER	38.99	TPER	93.10

Assessor Details	Mr. Adrian Fell	Assessor ID	N222-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	52.0000 (1b)	x	2.5800 (2b)	=	134.1600	(1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	134.1600	(5)

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2. Ventilation rate

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		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) =	0.1491	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2991	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2318	(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	0.2955	0.2897	0.2839	0.2550	0.2492	0.2202	0.2202	0.2144	0.2318	0.2492	0.2608	0.2723	(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	0.5437	0.5420	0.5403	0.5325	0.5310	0.5242	0.5242	0.5230	0.5269	0.5310	0.5340	0.5371	(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	
Glazed Door (Uw = 0.95)			15.1600	0.9152	13.8748			(27)
Window (Uw = 0.95)			0.9000	0.9152	0.8237			(27)
Door			1.8900	0.8000	1.5120			(26)
Heatloss Floor 1			52.0000	0.1200	6.2400	30.0000	1560.0000	(28b)
External Wall 1	50.3100	17.9500	32.3600	0.1500	4.8540	14.0000	453.0400	(29a)
Total net area of external elements Aum(A, m2)			102.3100					(31)

Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =	27.3045			(33)
Party Wall 1	23.2500	0.0000	0.0000	20.0000	465.0000 (32)
Party Ceiling 1	52.0000			40.0000	2080.0000 (32b)
Internal Wall 1	46.5400			9.0000	418.8600 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	4976.9000 (34)		
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		95.7096 (35)		
List of Thermal Bridges				
K1 Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	19.5000	0.0700	1.3650	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.7000	0.4430	2.5251	
E20 Exposed floor (normal)	19.5000	0.1250	2.4375	
E16 Corner (normal)	7.7400	0.0900	0.6966	
E17 Corner (inverted – internal area greater than external area)	2.5800	-0.0900	-0.2322	
E18 Party wall between dwellings	5.1600	0.0600	0.3096	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.3200	0.0000	0.0000	
P7 Party Wall - Exposed floor (normal)	12.3200	0.1600	1.9712	
E1 Steel lintel with perforated steel base plate	8.0400	0.0500	0.4020	
E3 Sill	7.1400	0.0500	0.3570	
E4 Jamb	25.4000	0.0500	1.2700	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			11.1018 (36)	
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	38.4063 (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	24.0697	23.9946	23.9210	23.5754	23.5107	23.2097	23.2097	23.1540	23.3256	23.5107	23.6415	23.7783	(38)
Heat transfer coeff	62.4759	62.4009	62.3273	61.9816	61.9170	61.6160	61.6160	61.5602	61.7319	61.9170	62.0478	62.1846	(39)
Average = Sum(39)m / 12 =												61.9813	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2015	1.2000	1.1986	1.1920	1.1907	1.1849	1.1849	1.1839	1.1872	1.1907	1.1932	1.1959	(40)
HLP (average)												1.1919	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7491	(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	23.1496	22.8058	22.3217	21.4290	20.7606	20.0194	19.6190	20.0998	20.6232	21.4163	22.3274	23.0714	(42b)
Hot water usage for other uses	32.5422	31.3589	30.1755	28.9922	27.8088	26.6255	26.6255	27.8088	28.9922	30.1755	31.3589	32.5422	(42c)
Average daily hot water use (litres/day)												51.0472	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	55.6919	54.1647	52.4972	50.4212	48.5694	46.6448	46.2445	47.9086	49.6154	51.5919	53.6863	55.6136	(44)
Energy conte	88.2023	77.1298	80.6862	69.0240	65.3837	57.3553	55.9287	59.3209	61.1808	70.0097	76.4860	87.0774	(45)
Energy content (annual)										Total = Sum(45)m =		847.7848	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	74.9719	65.5603	68.5833	58.6704	55.5762	48.7520	47.5394	50.4227	52.0037	59.5082	65.0131	74.0158	(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	74.9719	65.5603	68.5833	58.6704	55.5762	48.7520	47.5394	50.4227	52.0037	59.5082	65.0131	74.0158	(64)
									Total per year (kWh/year) = Sum(64)m =			720.6170	(64)
12Total per year (kWh/year)												721	(64)
Electric shower(s)	42.8812	38.2075	41.7211	39.8139	40.5610	38.6913	39.9810	40.5610	39.8139	41.7211	40.9366	42.8812	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			487.7707	(64a)
Heat gains from water heating, kWh/month	29.4633	25.9420	27.5761	24.6211	24.0343	21.8608	21.8801	22.7459	22.9544	25.3073	26.4874	29.2242	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.8814	85.1187	76.8814	79.4441	76.8814	79.4441	76.8814	76.8814	79.4441	76.8814	79.4441	76.8814	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	152.4259	154.0076	150.0218	141.5364	130.8251	120.7580	114.0326	112.4509	116.4367	124.9221	135.6334	145.7005	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	(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)	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	(71)
Water heating gains (Table 5)	39.6012	38.6041	37.0646	34.1960	32.3042	30.3622	29.4087	30.5725	31.8811	34.0152	36.7881	39.2799	(72)
Total internal gains	318.1446	326.9665	313.2039	304.4125	289.2467	279.8004	269.5588	269.1408	276.9980	285.0548	301.1016	311.0978	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	13.1800	11.2829	0.4700	0.7000	0.7700	33.9052	(75)
Southeast	1.9800	36.7938	0.4700	0.7000	0.7700	16.6100	(77)
Southwest	0.9000	36.7938	0.4700	0.7000	0.7700	7.5500	(79)

Solar gains	58.0652	110.1685	180.6511	273.9755	352.6409	370.2215	348.5556	286.7900	212.4837	129.8252	71.5997	48.3646	(83)
Total gains	376.2098	437.1350	493.8550	578.3881	641.8877	650.0220	618.1143	555.9309	489.4817	414.8800	372.7013	359.4625	(84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
tau	22.1281	22.1547	22.1809	22.3045	22.3278	22.4369	22.4369	22.4572	22.3948	22.3278	22.2808	22.2318	
alpha	2.4752	2.4770	2.4787	2.4870	2.4885	2.4958	2.4958	2.4971	2.4930	2.4885	2.4854	2.4821	
util living area	0.9473	0.9239	0.8845	0.7988	0.6737	0.5236	0.4053	0.4582	0.6626	0.8481	0.9254	0.9524	(86)
MIT	18.2843	18.6238	19.1523	19.8578	20.4309	20.7854	20.9180	20.8868	20.5963	19.8410	18.9481	18.2181	(87)
Th 2	19.9188	19.9200	19.9211	19.9264	19.9274	19.9321	19.9321	19.9329	19.9303	19.9274	19.9254	19.9233	(88)
util rest of house	0.9397	0.9132	0.8679	0.7700	0.6272	0.4553	0.3177	0.3675	0.5979	0.8194	0.9131	0.9456	(89)
MIT 2	17.4590	17.7919	18.3072	18.9820	19.5034	19.8025	19.8965	19.8804	19.6632	18.9847	18.1197	17.3969	(90)
Living area fraction										fLA = Living area / (4) =		0.5727	(91)
MIT	17.9316	18.2683	18.7912	19.4836	20.0346	20.3654	20.4815	20.4567	20.1975	19.4751	18.5941	17.8672	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.9316	18.2683	18.7912	19.4836	20.0346	20.3654	20.4815	20.4567	20.1975	19.4751	18.5941	17.8672	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9215	0.8926	0.8471	0.7566	0.6321	0.4841	0.3639	0.4135	0.6153	0.8052	0.8938	0.9282	(94)
Useful gains	346.6875	390.1926	418.3576	437.5929	405.7557	314.6735	224.9402	229.8788	301.1815	334.0497	333.1158	333.6672	(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	851.6490	834.1937	766.0744	655.9867	516.0541	355.2417	239.1639	249.7342	376.4130	549.5210	713.1866	849.8882	(97)
Space heating kWh	375.6913	298.3688	258.7013	157.2436	82.0620	0.0000	0.0000	0.0000	0.0000	160.3106	273.6510	384.0684	(98a)
Space heating requirement - total per year (kWh/year)												1990.0969	
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	375.6913	298.3688	258.7013	157.2436	82.0620	0.0000	0.0000	0.0000	0.0000	160.3106	273.6510	384.0684	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1990.0969	
Space heating per m2											(98c) / (4) =	38.2711	(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	579.1900	455.9581	467.8576	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7919	0.8447	0.8085	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	458.6667	385.1603	378.2846	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	732.2763	696.5027	625.2917	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	196.9989	231.6387	183.7733	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	49.2497	57.9097	45.9433	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												153.1027	(107)
Energy for space heating												38.2711	(99)
Energy for space cooling												2.9443	(108)

Total 41.2154 (109)
Fabric Energy Efficiency (DFEE) 41.2 (109)

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	52.0000 (1b)	x	2.5800 (2b)	=	134.1600	(1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	134.1600	(5)

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2. Ventilation rate
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		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) =	0.1491	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3991	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3093	(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	0.3943	0.3866	0.3789	0.3402	0.3325	0.2938	0.2938	0.2861	0.3093	0.3325	0.3479	0.3634	(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	0.5778	0.5747	0.5718	0.5579	0.5553	0.5432	0.5432	0.5409	0.5478	0.5553	0.5605	0.5660	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Opening Type (Uw = 1.20)			11.1000	1.1450	12.7099			(27)
Heatloss Floor 1			52.0000	0.1300	6.7600			(28b)
External Wall 1	50.3100	12.9900	37.3200	0.1800	6.7176			(29a)
Total net area of external elements Aum(A, m2)			102.3100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.0775			(33)
Party Wall 1			23.2500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 95.7096 (35)
List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E7	Party floor between dwellings (in blocks of flats)	19.5000	0.0700	1.3650
E23	Balcony within or between dwellings, balcony support penetrates wall insulation	5.7000	0.0200	0.1140
E20	Exposed floor (normal)	19.5000	0.3200	6.2400
E16	Corner (normal)	7.7400	0.0900	0.6966
E17	Corner (inverted – internal area greater than external area)	2.5800	-0.0900	-0.2322
E18	Party wall between dwellings	5.1600	0.0600	0.3096
P3	Party wall - Intermediate floor between dwellings (in blocks of flats)	12.3200	0.0000	0.0000
P7	Party Wall - Exposed floor (normal)	12.3200	0.1600	1.9712
E1	Steel lintel with perforated steel base plate	8.0400	0.0500	0.4020
E3	Sill	7.1400	0.0500	0.3570
E4	Jamb	25.4000	0.0500	1.2700

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 12.4932 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 40.5707 (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	25.5786	25.4450	25.3140	24.6986	24.5834	24.0474	24.0474	23.9482	24.2539	24.5834	24.8163	25.0599	(38)
Heat transfer coeff	66.1494	66.0157	65.8847	65.2693	65.1541	64.6182	64.6182	64.5189	64.8246	65.1541	65.3871	65.6306	(39)

Average = Sum(39)m / 12 = 65.2687

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2721	1.2695	1.2670	1.2552	1.2530	1.2427	1.2427	1.2407	1.2466	1.2530	1.2574	1.2621	(40)
HLP (average)												1.2552	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7491 (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

23.1496	22.8058	22.3217	21.4290	20.7606	20.0194	19.6190	20.0998	20.6232	21.4163	22.3274	23.0714	(42b)

Hot water usage for other uses

32.5422	31.3589	30.1755	28.9922	27.8088	26.6255	26.6255	27.8088	28.9922	30.1755	31.3589	32.5422	(42c)

Average daily hot water use (litres/day) 51.0472 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	55.6919	54.1647	52.4972	50.4212	48.5694	46.6448	46.2445	47.9086	49.6154	51.5919	53.6863	55.6136	(44)
Energy conte	88.2023	77.1298	80.6862	69.0240	65.3837	57.3553	55.9287	59.3209	61.1808	70.0097	76.4860	87.0774	(45)

Energy content (annual) Total = Sum(45)m = 847.7848

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

74.9719	65.5603	68.5833	58.6704	55.5762	48.7520	47.5394	50.4227	52.0037	59.5082	65.0131	74.0158	(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

74.9719	65.5603	68.5833	58.6704	55.5762	48.7520	47.5394	50.4227	52.0037	59.5082	65.0131	74.0158	(64)

Total per year (kWh/year) = Sum(64)m = 720.6170 (64)

12Total per year (kWh/year) 721 (64)

Electric shower(s)

42.8812	38.2075	41.7211	39.8139	40.5610	38.6913	39.9810	40.5610	39.8139	41.7211	40.9366	42.8812	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 487.7707 (64a)

Heat gains from water heating, kWh/month

29.4633	25.9420	27.5761	24.6211	24.0343	21.8608	21.8801	22.7459	22.9544	25.3073	26.4874	29.2242	(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	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	77.0119	85.2631	77.0119	79.5789	77.0119	79.5789	77.0119	77.0119	79.5789	77.0119	79.5789	77.0119	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	152.4259	154.0076	150.0218	141.5364	130.8251	120.7580	114.0326	112.4509	116.4367	124.9221	135.6334	145.7005	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	(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)	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	(71)
Water heating gains (Table 5)	39.6012	38.6041	37.0646	34.1960	32.3042	30.3622	29.4087	30.5725	31.8811	34.0152	36.7881	39.2799	(72)
Total internal gains	318.2750	327.1109	313.3344	304.5474	289.3772	279.9353	269.6893	269.2713	277.1328	285.1853	301.2365	311.2283	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	9.1100	11.2829	0.6300	0.7000	0.7700	31.4132	(75)
Southeast	1.3700	36.7938	0.6300	0.7000	0.7700	15.4052	(77)

Southwest				0.6200		36.7938		0.6300		0.7000		0.7700	6.9717 (79)
Solar gains	53.7901	102.0587	167.3563	253.8173	326.6983	342.9869	322.9142	265.6903	196.8478	120.2693	66.3283	44.8036 (83)	
Total gains	372.0652	429.1696	480.6906	558.3646	616.0755	622.9221	592.6035	534.9616	473.9806	405.4546	367.5648	356.0319 (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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	20.8993	20.9416	20.9832	21.1811	21.2185	21.3945	21.3945	21.4274	21.3263	21.2185	21.1429	21.0645	
alpha	2.3933	2.3961	2.3989	2.4121	2.4146	2.4263	2.4263	2.4285	2.4218	2.4146	2.4095	2.4043	
util living area													
	0.9497	0.9289	0.8941	0.8170	0.7012	0.5544	0.4341	0.4867	0.6870	0.8594	0.9296	0.9543 (86)	
MIT	18.1014	18.4353	18.9690	19.7056	20.3246	20.7342	20.8945	20.8579	20.5265	19.7219	18.8008	18.0470 (87)	
Th 2	19.8628	19.8648	19.8668	19.8761	19.8779	19.8860	19.8860	19.8875	19.8829	19.8779	19.8743	19.8706 (88)	
util rest of house													
	0.9423	0.9185	0.8782	0.7889	0.6543	0.4823	0.3387	0.3893	0.6211	0.8313	0.9175	0.9476 (89)	
MIT 2	17.2437	17.5722	18.0947	18.8054	19.3741	19.7256	19.8407	19.8221	19.5697	18.8394	17.9433	17.1953 (90)	
Living area fraction										fLA = Living area / (4) =			0.5727 (91)
MIT	17.7349	18.0665	18.5954	19.3209	19.9185	20.3032	20.4442	20.4153	20.1176	19.3448	18.4344	17.6831 (92)	
Temperature adjustment												0.0000	
adjusted MIT	17.7349	18.0665	18.5954	19.3209	19.9185	20.3032	20.4442	20.4153	20.1176	19.3448	18.4344	17.6831 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9237	0.8973	0.8562	0.7729	0.6561	0.5106	0.3881	0.4374	0.6362	0.8154	0.8976	0.9299 (94)	
Useful gains	343.6669	385.1082	411.5620	431.5767	404.2204	318.0600	229.9665	234.0147	301.5464	330.6075	329.9237	331.0688 (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													
	888.7091	869.1938	796.8998	680.1666	535.4663	368.5318	248.4029	259.0648	390.0902	569.7586	741.1203	884.9018 (97)	
Space heating kWh													
	405.5114	325.3055	286.6913	178.9847	97.6469	0.0000	0.0000	0.0000	0.0000	177.9284	296.0615	412.0517 (98a)	
Space heating requirement - total per year (kWh/year)												2180.1815	
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													
	405.5114	325.3055	286.6913	178.9847	97.6469	0.0000	0.0000	0.0000	0.0000	177.9284	296.0615	412.0517 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												2180.1815	
Space heating per m2											(98c) / (4) =	41.9266 (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	607.4107	478.1744	490.3436	0.0000	0.0000	0.0000	0.0000 (100)	
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7567	0.8142	0.7762	0.0000	0.0000	0.0000	0.0000 (101)	
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	459.6269	389.3400	380.5888	0.0000	0.0000	0.0000	0.0000 (102)	
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	700.4550	666.5446	600.6457	0.0000	0.0000	0.0000	0.0000 (103)	
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	173.3962	206.2403	163.7223	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	43.3491	51.5601	40.9306	0.0000	0.0000	0.0000	0.0000 (107)	
Space cooling requirement												135.8397 (107)	
Energy for space heating												41.9266 (99)	
Energy for space cooling												2.6123 (108)	
Total												44.5389 (109)	
Fabric Energy Efficiency (TFEE)												44.5 (109)	

Full SAP Calculation Printout

Property Reference	Flat 105 VL - Be Green	Issued on Date	06/05/2023
Assessment Reference	Flat 105 VL - Be Green	Prop Type Ref	Flat 103 VL - Be Green
Property	MFMTF, Vine Lane, London, WC1A		

SAP Rating	82 B	DER	3.84	TER	18.62
Environmental	97 A	% DER < TER			79.38
CO_2 Emissions (t/year)	0.18	DFEE	45.29	TFEE	50.17
Compliance Check	See BREL	% DFEE < TFEE			9.73
% DPER < TPER	59.19	DPER	40.74	TPER	99.83

Assessor Details	Mr. Adrian Fell	Assessor ID	N222-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	52.0000 (1b)	x	2.5800 (2b)	=	134.1600	(1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	134.1600	(5)

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2. Ventilation rate

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		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) =	0.1491	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2991	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2318	(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	0.2955	0.2897	0.2839	0.2550	0.2492	0.2202	0.2202	0.2144	0.2318	0.2492	0.2608	0.2723	(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	0.5437	0.5420	0.5403	0.5325	0.5310	0.5242	0.5242	0.5230	0.5269	0.5310	0.5340	0.5371	(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	
Glazed Door (Uw = 0.95)			17.1000	0.9152	15.6503			(27)
Window (Uw = 0.95)			1.8000	0.9152	1.6474			(27)
Door			1.8900	0.8000	1.5120			(26)
Heatloss Floor 1			52.0000	0.1200	6.2400	30.0000	1560.0000	(28b)
External Wall 1	74.4300	20.7900	53.6400	0.1500	8.0460	14.0000	750.9600	(29a)
Total net area of external elements Aum(A, m2)			126.4300					(31)

Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =	33.0957		(33)
Party Wall 1	9.0300	0.0000	0.0000	20.0000	180.6000 (32)
Party Ceiling 1	52.0000			40.0000	2080.0000 (32b)
Internal Wall 1	52.8900			9.0000	476.0100 (32c)

Heat capacity Cm = Sum(A x k)		(28)...(30) + (32) + (32a)...(32e) =	5047.5700 (34)		
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K			97.0687 (35)		
List of Thermal Bridges					
K1 Element		Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)		28.8500	0.0700	2.0195	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation		4.3000	0.4430	1.9049	
E20 Exposed floor (normal)		28.8500	0.1250	3.6063	
E16 Corner (normal)		10.3200	0.0900	0.9288	
E17 Corner (inverted – internal area greater than external area)		2.5800	-0.0900	-0.2322	
E18 Party wall between dwellings		2.5800	0.0600	0.1548	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)		3.5000	0.0000	0.0000	
P7 Party Wall - Exposed floor (normal)		3.5000	0.1600	0.5600	
E1 Steel lintel with perforated steel base plate		9.6000	0.0500	0.4800	
E3 Sill		8.7000	0.0500	0.4350	
E4 Jamb		25.4000	0.0500	1.2700	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				11.1271 (36)	
Point Thermal bridges			(36a) =	0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	44.2227 (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	24.0697	23.9946	23.9210	23.5754	23.5107	23.2097	23.2097	23.1540	23.3256	23.5107	23.6415	23.7783	(38)
Heat transfer coeff	68.2924	68.2173	68.1438	67.7981	67.7335	67.4324	67.4324	67.3767	67.5484	67.7335	67.8643	68.0010	(39)
Average = Sum(39)m / 12 =												67.7978	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3133	1.3119	1.3105	1.3038	1.3026	1.2968	1.2968	1.2957	1.2990	1.3026	1.3051	1.3077	(40)
HLP (average)												1.3038	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7491	(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	23.1496	22.8058	22.3217	21.4290	20.7606	20.0194	19.6190	20.0998	20.6232	21.4163	22.3274	23.0714	(42b)
Hot water usage for other uses	32.5422	31.3589	30.1755	28.9922	27.8088	26.6255	26.6255	27.8088	28.9922	30.1755	31.3589	32.5422	(42c)
Average daily hot water use (litres/day)												51.0472	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	55.6919	54.1647	52.4972	50.4212	48.5694	46.6448	46.2445	47.9086	49.6154	51.5919	53.6863	55.6136	(44)
Energy conte	88.2023	77.1298	80.6862	69.0240	65.3837	57.3553	55.9287	59.3209	61.1808	70.0097	76.4860	87.0774	(45)
Energy content (annual)										Total = Sum(45)m =		847.7848	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	74.9719	65.5603	68.5833	58.6704	55.5762	48.7520	47.5394	50.4227	52.0037	59.5082	65.0131	74.0158	(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	74.9719	65.5603	68.5833	58.6704	55.5762	48.7520	47.5394	50.4227	52.0037	59.5082	65.0131	74.0158	(64)
								Total per year (kWh/year) = Sum(64)m =				720.6170	(64)
12Total per year (kWh/year)												721	(64)
Electric shower(s)	42.8812	38.2075	41.7211	39.8139	40.5610	38.6913	39.9810	40.5610	39.8139	41.7211	40.9366	42.8812	(64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				487.7707	(64a)
Heat gains from water heating, kWh/month	29.4633	25.9420	27.5761	24.6211	24.0343	21.8608	21.8801	22.7459	22.9544	25.3073	26.4874	29.2242	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.8814	85.1187	76.8814	79.4441	76.8814	79.4441	76.8814	76.8814	79.4441	76.8814	79.4441	76.8814	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	152.4259	154.0076	150.0218	141.5364	130.8251	120.7580	114.0326	112.4509	116.4367	124.9221	135.6334	145.7005	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	(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)	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	(71)
Water heating gains (Table 5)	39.6012	38.6041	37.0646	34.1960	32.3042	30.3622	29.4087	30.5725	31.8811	34.0152	36.7881	39.2799	(72)
Total internal gains	318.1446	326.9665	313.2039	304.4125	289.2467	279.8004	269.5588	269.1408	276.9980	285.0548	301.1016	311.0978	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	11.2800	11.2829	0.4700	0.7000	0.7700	29.0175	(75)
Southeast	5.8200	36.7938	0.4700	0.7000	0.7700	48.8233	(77)
Northwest	1.8000	11.2829	0.4700	0.7000	0.7700	4.6305	(81)

Solar gains	82.4713	151.6556	237.1887	343.6478	430.3325	447.1985	422.8332	355.1083	273.5739	175.6161	100.8169	69.2612	(83)
Total gains	400.6159	478.6221	550.3925	648.0604	719.5792	726.9990	692.3919	624.2491	550.5719	460.6709	401.9186	380.3591	(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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	20.5309	20.5535	20.5757	20.6806	20.7003	20.7927	20.7927	20.8099	20.7570	20.7003	20.6604	20.6188	
alpha	2.3687	2.3702	2.3717	2.3787	2.3800	2.3862	2.3862	2.3873	2.3838	2.3800	2.3774	2.3746	
util living area	0.9439	0.9161	0.8716	0.7817	0.6560	0.5098	0.3942	0.4447	0.6439	0.8347	0.9200	0.9498	(86)
MIT	18.1225	18.5082	19.0793	19.8119	20.4020	20.7687	20.9097	20.8772	20.5768	19.7882	18.8292	18.0460	(87)
Th 2	19.8304	19.8315	19.8327	19.8378	19.8388	19.8434	19.8434	19.8442	19.8416	19.8388	19.8369	19.8348	(88)
util rest of house	0.9356	0.9040	0.8527	0.7498	0.6060	0.4373	0.3018	0.3489	0.5744	0.8026	0.9063	0.9423	(89)
MIT 2	17.2418	17.6189	18.1733	18.8699	19.4024	19.7082	19.8063	19.7902	19.5700	18.8690	17.9439	17.1696	(90)
Living area fraction										fLA = Living area / (4) =		0.6206	(91)
MIT	17.7884	18.1708	18.7355	19.4545	20.0228	20.3663	20.4910	20.4647	20.1948	19.4394	18.4933	17.7135	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.7884	18.1708	18.7355	19.4545	20.0228	20.3663	20.4910	20.4647	20.1948	19.4394	18.4933	17.7135	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9163	0.8822	0.8316	0.7381	0.6145	0.4713	0.3548	0.4020	0.5971	0.7897	0.8861	0.9240	(94)
Useful gains	367.0871	422.2427	457.6849	478.3035	442.1582	342.6532	245.6695	250.9596	328.7352	363.8131	356.1579	351.4395	(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	921.1533	905.2984	833.7744	715.5745	563.7291	388.8340	262.3820	273.8687	411.6950	598.7258	773.1973	918.9291	(97)
Space heating kWh	412.2253	324.6135	279.8106	170.8351	90.4488	0.0000	0.0000	0.0000	0.0000	174.7750	300.2684	422.2123	(98a)
Space heating requirement - total per year (kWh/year)												2175.1889	
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	412.2253	324.6135	279.8106	170.8351	90.4488	0.0000	0.0000	0.0000	0.0000	174.7750	300.2684	422.2123	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2175.1889	
Space heating per m2											(98c) / (4) =	41.8306	(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	633.8649	499.0000	512.0628	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7898	0.8419	0.8072	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	500.5972	420.1123	413.3438	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	822.2494	783.3207	705.1441	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	231.5896	270.2271	217.0995	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	57.8974	67.5568	54.2749	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												179.7290	(107)
Energy for space heating												41.8306	(99)
Energy for space cooling												3.4563	(108)

Total 45.2869 (109)
Fabric Energy Efficiency (DFEE) 45.3 (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	52.0000 (1b)	x	2.5800 (2b)	=	134.1600	(1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	134.1600	(5)

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2. Ventilation rate
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		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) =	0.1491	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3991	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3093	(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	0.3943	0.3866	0.3789	0.3402	0.3325	0.2938	0.2938	0.2861	0.3093	0.3325	0.3479	0.3634	(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	0.5778	0.5747	0.5718	0.5579	0.5553	0.5432	0.5432	0.5409	0.5478	0.5553	0.5605	0.5660	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Opening Type (Uw = 1.20)			11.1100	1.1450	12.7214			(27)
Heatloss Floor 1			52.0000	0.1300	6.7600			(28b)
External Wall 1	74.4300	13.0000	61.4300	0.1800	11.0574			(29a)
Total net area of external elements Aum(A, m2)			126.4300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.4288			(33)
Party Wall 1			9.0300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 97.0687 (35)
List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E7	Party floor between dwellings (in blocks of flats)	28.8500	0.0700	2.0195
E23	Balcony within or between dwellings, balcony support penetrates wall insulation	4.3000	0.0200	0.0860
E20	Exposed floor (normal)	28.8500	0.3200	9.2320
E16	Corner (normal)	10.3200	0.0900	0.9288
E17	Corner (inverted – internal area greater than external area)	2.5800	-0.0900	-0.2322
E18	Party wall between dwellings	2.5800	0.0600	0.1548
P3	Party wall - Intermediate floor between dwellings (in blocks of flats)	3.5000	0.0000	0.0000
P7	Party Wall - Exposed floor (normal)	3.5000	0.1600	0.5600
E1	Steel lintel with perforated steel base plate	9.6000	0.0500	0.4800
E3	Sill	8.7000	0.0500	0.4350
E4	Jamb	25.4000	0.0500	1.2700

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 14.9339 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 47.3627 (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	25.5786	25.4450	25.3140	24.6986	24.5834	24.0474	24.0474	23.9482	24.2539	24.5834	24.8163	25.0599	(38)
Heat transfer coeff	72.9413	72.8076	72.6766	72.0612	71.9461	71.4101	71.4101	71.3108	71.6166	71.9461	72.1790	72.4225	(39)

Average = Sum(39)m / 12 = 72.0607

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4027	1.4001	1.3976	1.3858	1.3836	1.3733	1.3733	1.3714	1.3772	1.3836	1.3881	1.3927	(40)
HLP (average)												1.3858	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7491 (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

23.1496	22.8058	22.3217	21.4290	20.7606	20.0194	19.6190	20.0998	20.6232	21.4163	22.3274	23.0714	(42b)

Hot water usage for other uses

32.5422	31.3589	30.1755	28.9922	27.8088	26.6255	26.6255	27.8088	28.9922	30.1755	31.3589	32.5422	(42c)

Average daily hot water use (litres/day) 51.0472 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	55.6919	54.1647	52.4972	50.4212	48.5694	46.6448	46.2445	47.9086	49.6154	51.5919	53.6863	55.6136	(44)
Energy conte	88.2023	77.1298	80.6862	69.0240	65.3837	57.3553	55.9287	59.3209	61.1808	70.0097	76.4860	87.0774	(45)

Energy content (annual) Total = Sum(45)m = 847.7848

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

74.9719	65.5603	68.5833	58.6704	55.5762	48.7520	47.5394	50.4227	52.0037	59.5082	65.0131	74.0158	(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

74.9719	65.5603	68.5833	58.6704	55.5762	48.7520	47.5394	50.4227	52.0037	59.5082	65.0131	74.0158	(64)

Total per year (kWh/year) = Sum(64)m = 720.6170 (64)
12Total per year (kWh/year) 721 (64)
Electric shower(s)

42.8812	38.2075	41.7211	39.8139	40.5610	38.6913	39.9810	40.5610	39.8139	41.7211	40.9366	42.8812	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 487.7707 (64a)
Heat gains from water heating, kWh/month

29.4633	25.9420	27.5761	24.6211	24.0343	21.8608	21.8801	22.7459	22.9544	25.3073	26.4874	29.2242	(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	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	77.0079	85.2588	77.0079	79.5748	77.0079	79.5748	77.0079	77.0079	79.5748	77.0079	79.5748	77.0079	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	152.4259	154.0076	150.0218	141.5364	130.8251	120.7580	114.0326	112.4509	116.4367	124.9221	135.6334	145.7005	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	(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)	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	(71)
Water heating gains (Table 5)	39.6012	38.6041	37.0646	34.1960	32.3042	30.3622	29.4087	30.5725	31.8811	34.0152	36.7881	39.2799	(72)
Total internal gains	318.2711	327.1066	313.3304	304.5433	289.3733	279.9312	269.6853	269.2674	277.1287	285.1813	301.2324	311.2244	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	6.6300	11.2829	0.6300	0.7000	0.7700	22.8617	(75)
Southeast	3.4200	36.7938	0.6300	0.7000	0.7700	38.4568	(77)

Northwest				1.0600		11.2829		0.6300		0.7000		0.7700	3.6551 (81)
Solar gains	64.9735	119.4818	186.8753	270.7613	339.0677	352.3596	333.1604	279.7938	215.5454	138.3607	79.4273	54.5659 (83)	
Total gains	383.2446	446.5883	500.2057	575.3045	628.4409	632.2908	602.8457	549.0611	492.6742	423.5421	380.6597	365.7903 (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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	19.2223	19.2576	19.2923	19.4571	19.4882	19.6345	19.6345	19.6618	19.5779	19.4882	19.4254	19.3600	
alpha	2.2815	2.2838	2.2862	2.2971	2.2992	2.3090	2.3090	2.3108	2.3052	2.2992	2.2950	2.2907	
util living area													
	0.9499	0.9287	0.8953	0.8246	0.7184	0.5790	0.4585	0.5081	0.6985	0.8615	0.9300	0.9546 (86)	
MIT	17.8696	18.2214	18.7753	19.5348	20.1974	20.6635	20.8602	20.8183	20.4455	19.5862	18.6089	17.8100 (87)	
Th 2	19.7613	19.7632	19.7652	19.7742	19.7759	19.7839	19.7839	19.7854	19.7808	19.7759	19.7725	19.7689 (88)	
util rest of house													
	0.9421	0.9177	0.8786	0.7954	0.6691	0.5005	0.3514	0.4002	0.6284	0.8320	0.9173	0.9474 (89)	
MIT 2	16.9510	17.2969	17.8392	18.5728	19.1839	19.5851	19.7265	19.7051	19.4214	18.6407	17.6899	16.8972 (90)	
Living area fraction											fLA = Living area / (4) =	0.6206 (91)	
MIT	17.5210	17.8706	18.4201	19.1698	19.8129	20.2543	20.4300	20.3959	20.0570	19.2275	18.2602	17.4636 (92)	
Temperature adjustment												0.0000	
adjusted MIT	17.5210	17.8706	18.4201	19.1698	19.8129	20.2543	20.4300	20.3959	20.0570	19.2275	18.2602	17.4636 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9229	0.8958	0.8559	0.7787	0.6708	0.5326	0.4106	0.4571	0.6459	0.8159	0.8969	0.9292 (94)	
Useful gains	353.6842	400.0464	428.1239	447.9871	421.5413	336.7772	247.5086	250.9668	318.2087	345.5778	341.3988	339.9034 (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													
	964.3597	944.3601	866.3150	740.0556	583.6904	403.7766	273.5010	284.9505	426.6181	620.7125	805.5331	960.5850 (97)	
Space heating kWh													
	454.3426	365.7788	326.0142	210.2893	120.6390	0.0000	0.0000	0.0000	0.0000	204.7002	334.1767	461.7871 (98a)	
Space heating requirement - total per year (kWh/year)												2477.7279	
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													
	454.3426	365.7788	326.0142	210.2893	120.6390	0.0000	0.0000	0.0000	0.0000	204.7002	334.1767	461.7871 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												2477.7279	
Space heating per m2											(98c) / (4) =	47.6486 (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	671.2550	528.4348	541.9625	0.0000	0.0000	0.0000	0.0000 (100)	
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7178	0.7793	0.7419	0.0000	0.0000	0.0000	0.0000 (101)	
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	481.8213	411.8150	402.0587	0.0000	0.0000	0.0000	0.0000 (102)	
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	711.4098	678.5203	617.1297	0.0000	0.0000	0.0000	0.0000 (103)	
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	165.3037	198.4287	160.0128	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	41.3259	49.6072	40.0032	0.0000	0.0000	0.0000	0.0000 (107)	
Space cooling requirement												130.9363 (107)	
Energy for space heating												47.6486 (99)	
Energy for space cooling												2.5180 (108)	
Total												50.1666 (109)	
Fabric Energy Efficiency (TFEE)												50.2 (109)	

Full SAP Calculation Printout

Property Reference	Flat 201 VL - Be Green	Issued on Date	06/05/2023
Assessment Reference	Flat 201 VL - Be Green	Prop Type Ref	Flat 103 VL - Be Green
Property	MFMTF, Vine Lane, London, WC1A		

SAP Rating	86 B	DER	2.56	TER	11.86
Environmental	98 A	% DER < TER			78.41
CO_2 Emissions (t/year)	0.21	DFEE	29.24	TFEE	31.69
Compliance Check	See BREL	% DFEE < TFEE			7.75
% DPER < TPER	56.65	DPER	27.30	TPER	62.97

Assessor Details	Mr. Adrian Fell	Assessor ID	N222-0001
Client			

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

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		88.0000 (1b)	x	2.5800 (2b)	=	227.0400 (1b) -	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.0000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	227.0400	(5)

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2. Ventilation rate

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1321	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2821	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2187	(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	0.2788	0.2733	0.2679	0.2405	0.2351	0.2077	0.2077	0.2023	0.2187	0.2351	0.2460	0.2569	(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	0.5389	0.5374	0.5359	0.5289	0.5276	0.5216	0.5216	0.5205	0.5239	0.5276	0.5303	0.5330	(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	
Glazed Door (Uw = 0.95)			13.2600	0.9152	12.1358			(27)
Window (Uw = 0.95)			3.6000	0.9152	3.2948			(27)
Door			1.8900	0.8000	1.5120			(26)
External Wall 1	93.2700	18.7500	74.5200	0.1500	11.1780	14.0000	1043.2800	(29a)
Total net area of external elements Aum(A, m2)			93.2700					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.1206			(33)

Party Wall 1	13.6700	0.0000	0.0000	20.0000	273.4000 (32)
Party Floor 1	88.0000			40.0000	3520.0000 (32d)
Party Ceiling 1	88.0000			40.0000	3520.0000 (32b)
Internal Wall 1	103.6100			9.0000	932.4900 (32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 9289.1700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 105.5587 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	72.3000	0.0700	5.0610
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.9800	0.4430	2.6491
E16 Corner (normal)	10.3200	0.0900	0.9288
E17 Corner (inverted – internal area greater than external area)	2.5800	-0.0900	-0.2322
E18 Party wall between dwellings	2.5800	0.0600	0.1548
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.6000	0.0000	0.0000
E1 Steel lintel with perforated steel base plate	10.1000	0.0500	0.5050
E3 Sill	9.2000	0.0500	0.4600
E4 Jamb	24.2000	0.0500	1.2100

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.7365 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 38.8572 (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	40.3732	40.2601	40.1493	39.6288	39.5314	39.0780	39.0780	38.9941	39.2526	39.5314	39.7284	39.9343	(38)
Heat transfer coeff	79.2303	79.1173	79.0064	78.4859	78.3885	77.9352	77.9352	77.8512	78.1098	78.3885	78.5856	78.7915	(39)

Average = Sum(39)m / 12 = 78.4855

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9003	0.8991	0.8978	0.8919	0.8908	0.8856	0.8856	0.8847	0.8876	0.8908	0.8930	0.8954	(40)
HLP (average)												0.8919	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5973 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.2660	28.8313	28.2193	27.0907	26.2457	25.3087	24.8025	25.4103	26.0721	27.0747	28.2265	29.1670	(42b)

Hot water usage for other uses

41.2294	39.7301	38.2309	36.7316	35.2324	33.7331	33.7331	35.2324	36.7316	38.2309	39.7301	41.2294	(42c)

Average daily hot water use (litres/day) 64.6154 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.4954	68.5615	66.4501	63.8224	61.4781	59.0418	58.5357	60.6427	62.8037	65.3056	67.9567	70.3964	(44)
Energy conte	111.6474	97.6306	102.1314	87.3696	82.7613	72.5988	70.7938	75.0884	77.4433	88.6191	96.8167	110.2238	(45)

Energy content (annual) Total = Sum(45)m = 1073.1242

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

94.9003	82.9860	86.8117	74.2642	70.3471	61.7090	60.1748	63.8251	65.8268	75.3262	82.2942	93.6902	(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

94.9003	82.9860	86.8117	74.2642	70.3471	61.7090	60.1748	63.8251	65.8268	75.3262	82.2942	93.6902	(64)

Total per year (kWh/year) = Sum(64)m = 912.1556 (64)
12Total per year (kWh/year) 912 (64)
Electric shower(s)

54.2714	48.3563	52.8032	50.3894	51.3350	48.9686	50.6009	51.3350	50.3894	52.8032	51.8103	54.2714	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 617.3340 (64a)

Heat gains from water heating, kWh/month

37.2929	32.8356	34.9037	31.1634	30.4205	27.6694	27.6939	28.7900	29.0541	32.0324	33.5261	36.9904	(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	129.8672	129.8672	129.8672	129.8672	129.8672	129.8672	129.8672	129.8672	129.8672	129.8672	129.8672	129.8672	(66)

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

120.1473	133.0203	120.1473	124.1522	120.1473	124.1522	120.1473	120.1473	124.1522	120.1473	124.1522	120.1473	(67)

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

235.3498	237.7919	231.6377	218.5360	201.9975	186.4537	176.0694	173.6272	179.7815	192.8831	209.4216	224.9655	(68)

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

35.9867	35.9867	35.9867	35.9867	35.9867	35.9867	35.9867	35.9867	35.9867	35.9867	35.9867	35.9867	(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)

	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937	(71)
Water heating gains (Table 5)												
	50.1249	48.8625	46.9136	43.2825	40.8878	38.4297	37.2230	38.6963	40.3529	43.0542	46.5641	49.7183 (72)
Total internal gains												
	467.5821	481.6348	460.6588	447.9309	424.9928	410.9958	395.3999	394.4310	406.2467	418.0449	442.0981	456.7913 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast	11.2800	11.2829	0.4700	0.7000	0.7700	29.0175 (75)
Southeast	1.9800	36.7938	0.4700	0.7000	0.7700	16.6100 (77)
Southwest	3.6000	36.7938	0.4700	0.7000	0.7700	30.2000 (79)

Solar gains	75.8275	138.8007	215.5147	309.9451	386.3324	400.7674	379.2127	319.5904	247.8007	160.3072	92.5791	63.7568 (83)
Total gains	543.4096	620.4355	676.1735	757.8760	811.3252	811.7631	774.6126	714.0213	654.0474	578.3521	534.6772	520.5480 (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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	32.5674	32.6139	32.6597	32.8763	32.9171	33.1086	33.1086	33.1443	33.0346	32.9171	32.8346	32.7488	
alpha	3.1712	3.1743	3.1773	3.1918	3.1945	3.2072	3.2072	3.2096	3.2023	3.1945	3.1890	3.1833	
util living area	0.9641	0.9450	0.9137	0.8393	0.7194	0.5574	0.4240	0.4727	0.6839	0.8728	0.9449	0.9683	(86)
MIT	19.0441	19.3168	19.7073	20.2301	20.6431	20.8861	20.9644	20.9493	20.7746	20.2376	19.5594	18.9905	(87)
Th 2	20.1672	20.1683	20.1694	20.1744	20.1753	20.1797	20.1797	20.1805	20.1780	20.1753	20.1734	20.1714	(88)
util rest of house	0.9590	0.9374	0.9016	0.8167	0.6808	0.4995	0.3513	0.3978	0.6295	0.8499	0.9361	0.9638	(89)
MIT 2	18.3661	18.6348	19.0174	19.5217	19.9003	20.1074	20.1629	20.1552	20.0230	19.5392	18.8806	18.3163	(90)
Living area fraction									fLA = Living area / (4) =			0.5440	(91)
MIT	18.7349	19.0058	19.3927	19.9071	20.3043	20.5310	20.5989	20.5871	20.4319	19.9191	19.2499	18.6830	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7349	19.0058	19.3927	19.9071	20.3043	20.5310	20.5989	20.5871	20.4319	19.9191	19.2499	18.6830	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9481	0.9246	0.8884	0.8087	0.6872	0.5250	0.3891	0.4357	0.6472	0.8419	0.9241	0.9536	(94)
Useful gains	515.2089	573.6669	600.7126	612.8907	557.5422	426.1600	301.3866	311.1247	423.2708	486.8874	494.0732	496.3697	(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	1143.6814	1116.0118	1018.6047	863.9013	674.4822	462.2331	311.6544	325.9737	494.5804	730.5133	954.8044	1141.1394	(97)
Space heating kWh	467.5836	364.4558	310.9117	180.7276	87.0033	0.0000	0.0000	0.0000	0.0000	181.2577	331.7264	479.7087	(98a)
Space heating requirement - total per year (kWh/year)												2403.3748	
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	467.5836	364.4558	310.9117	180.7276	87.0033	0.0000	0.0000	0.0000	0.0000	181.2577	331.7264	479.7087	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2403.3748	
Space heating per m2											(98c) / (4) =	27.3111	(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	732.5907	576.7204	591.6694	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8343	0.8876	0.8594	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	611.2251	511.8765	508.4960	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	900.7888	859.7361	791.2818	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	208.4859	258.8076	210.3926	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	52.1215	64.7019	52.5981	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												169.4215	(107)
Energy for space heating												27.3111	(99)
Energy for space cooling												1.9252	(108)
Total												29.2363	(109)
Fabric Energy Efficiency (DFEE)												29.2	(109)

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

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		88.0000 (1b)	x	2.5800 (2b)	=	227.0400 (1b) -	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.0000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	227.0400	(5)

2. Ventilation rate

			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		3 * 10 =	30.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		30.0000 / (5) =	0.1321	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			5.0000	(17)
Infiltration rate			0.3821	(18)
Number of sides sheltered			3	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.2962	(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	0.3776	0.3702	0.3628	0.3258	0.3184	0.2813	0.2813	0.2739	0.2962	0.3184	0.3332	0.3480	(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	0.5713	0.5685	0.5658	0.5531	0.5507	0.5396	0.5396	0.5375	0.5439	0.5507	0.5555	0.5605	(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			1.8900	1.0000	1.8900			(26)
TER Opening Type (Uw = 1.20)			16.8600	1.1450	19.3053			(27)
External Wall 1	93.2700	18.7500	74.5200	0.1800	13.4136			(29a)
Total net area of external elements Aum(A, m2)			93.2700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		34.6089			(33)
Party Wall 1			13.6700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 105.5587 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	72.3000	0.0700	5.0610
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.9800	0.0200	0.1196
E16 Corner (normal)	10.3200	0.0900	0.9288
E17 Corner (inverted – internal area greater than external area)	2.5800	-0.0900	-0.2322
E18 Party wall between dwellings	2.5800	0.0600	0.1548
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.6000	0.0000	0.0000
E1 Steel lintel with perforated steel base plate	10.1000	0.0500	0.5050
E3 Sill	9.2000	0.0500	0.4600
E4 Jamb	24.2000	0.0500	1.2100

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.2070 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 42.8159 (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	42.8029	42.5955	42.3922	41.4373	41.2586	40.4269	40.4269	40.2729	40.7473	41.2586	41.6200	41.9979	(38)
Heat transfer coeff													
	85.6188	85.4114	85.2081	84.2532	84.0745	83.2429	83.2429	83.0888	83.5632	84.0745	84.4360	84.8138	(39)
Average = Sum(39)m / 12 =												84.2523	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9729	0.9706	0.9683	0.9574	0.9554	0.9459	0.9459	0.9442	0.9496	0.9554	0.9595	0.9638	(40)
HLP (average)												0.9574	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5973	(42)
Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	29.2660	28.8313	28.2193	27.0907	26.2457	25.3087	24.8025	25.4103	26.0721	27.0747	28.2265	29.1670	(42b)
Hot water usage for other uses													
	41.2294	39.7301	38.2309	36.7316	35.2324	33.7331	33.7331	35.2324	36.7316	38.2309	39.7301	41.2294	(42c)
Average daily hot water use (litres/day)												64.6154	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	70.4954	68.5615	66.4501	63.8224	61.4781	59.0418	58.5357	60.6427	62.8037	65.3056	67.9567	70.3964	(44)
Energy conte	111.6474	97.6306	102.1314	87.3696	82.7613	72.5988	70.7938	75.0884	77.4433	88.6191	96.8167	110.2238	(45)
Energy content (annual)										Total = Sum(45)m =		1073.1242	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	94.9003	82.9860	86.8117	74.2642	70.3471	61.7090	60.1748	63.8251	65.8268	75.3262	82.2942	93.6902	(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													
	94.9003	82.9860	86.8117	74.2642	70.3471	61.7090	60.1748	63.8251	65.8268	75.3262	82.2942	93.6902	(64)
										Total per year (kWh/year) = Sum(64)m =		912.1556	(64)
12Total per year (kWh/year)												912	(64)
Electric shower(s)													
	54.2714	48.3563	52.8032	50.3894	51.3350	48.9686	50.6009	51.3350	50.3894	52.8032	51.8103	54.2714	(64a)
							Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =					617.3340	(64a)
Heat gains from water heating, kWh/month													
	37.2929	32.8356	34.9037	31.1634	30.4205	27.6694	27.6939	28.7900	29.0541	32.0324	33.5261	36.9904	(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	129.8672	129.8672	129.8672	129.8672	129.8672	129.8672	129.8672	129.8672	129.8672	129.8672	129.8672	129.8672	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	120.1473	133.0203	120.1473	124.1522	120.1473	124.1522	120.1473	120.1473	124.1522	120.1473	124.1522	120.1473	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	235.3498	237.7919	231.6377	218.5360	201.9975	186.4537	176.0694	173.6272	179.7815	192.8831	209.4216	224.9655	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.9867	35.9867	35.9867	35.9867	35.9867	35.9867	35.9867	35.9867	35.9867	35.9867	35.9867	35.9867	(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)													
	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937	(71)
Water heating gains (Table 5)													
	50.1249	48.8625	46.9136	43.2825	40.8878	38.4297	37.2230	38.6963	40.3529	43.0542	46.5641	49.7183	(72)
Total internal gains													
	467.5821	481.6348	460.6588	447.9309	424.9928	410.9958	395.3999	394.4310	406.2467	418.0449	442.0981	456.7913	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	11.2800	11.2829	0.6300	0.7000	0.7700	38.8958	(75)
Southeast	1.9800	36.7938	0.6300	0.7000	0.7700	22.2645	(77)
Southwest	3.6000	36.7938	0.6300	0.7000	0.7700	40.4808	(79)

Solar gains	101.6411	186.0520	288.8814	415.4583	517.8498	537.1988	508.3064	428.3871	332.1584	214.8799	124.0954	85.4612	(83)
Total gains	569.2233	667.6869	749.5402	863.3893	942.8426	948.1946	903.7063	822.8181	738.4051	632.9247	566.1935	542.2525	(84)

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7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	30.1374	30.2105	30.2826	30.6258	30.6909	30.9976	30.9976	31.0550	30.8787	30.6909	30.5595	30.4234	
alpha	3.0092	3.0140	3.0188	3.0417	3.0461	3.0665	3.0665	3.0703	3.0586	3.0461	3.0373	3.0282	
util living area	0.9614	0.9383	0.8995	0.8112	0.6786	0.5154	0.3898	0.4398	0.6541	0.8586	0.9403	0.9661	(86)
MIT	18.8960	19.2139	19.6597	20.2351	20.6591	20.8939	20.9663	20.9510	20.7750	20.2060	19.4640	18.8451	(87)
Th 2	20.1059	20.1079	20.1099	20.1190	20.1207	20.1286	20.1286	20.1301	20.1256	20.1207	20.1172	20.1136	(88)
util rest of house	0.9559	0.9298	0.8855	0.7855	0.6370	0.4566	0.3180	0.3647	0.5966	0.8331	0.9306	0.9612	(89)
MIT 2	18.1770	18.4900	18.9256	19.4789	19.8631	20.0630	20.1133	20.1064	19.9742	19.4654	18.7465	18.1322	(90)
Living area fraction										fLA = Living area / (4) =		0.5440	(91)
MIT	18.5681	18.8838	19.3249	19.8903	20.2961	20.5150	20.5773	20.5659	20.4098	19.8683	19.1368	18.5200	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5681	18.8838	19.3249	19.8903	20.2961	20.5150	20.5773	20.5659	20.4098	19.8683	19.1368	18.5200	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9437	0.9154	0.8710	0.7783	0.6457	0.4833	0.3555	0.4031	0.6162	0.8248	0.9173	0.9499	(94)
Useful gains	537.1841	611.1948	652.8615	671.9343	608.7941	458.2778	321.2655	331.6651	455.0365	522.0540	519.3590	515.0858	(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	1221.6203	1194.3737	1092.7886	925.9650	722.7142	492.3828	331.0801	346.1378	527.2695	779.2285	1016.3391	1214.5351	(97)
Space heating kWh	509.2206	391.8962	327.3058	182.9021	84.7565	0.0000	0.0000	0.0000	0.0000	191.3379	357.8257	520.3903	(98a)
Space heating requirement - total per year (kWh/year)												2565.6350	
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	509.2206	391.8962	327.3058	182.9021	84.7565	0.0000	0.0000	0.0000	0.0000	191.3379	357.8257	520.3903	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2565.6350	
Space heating per m2											(98c) / (4) =	29.1549	(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	782.4829	615.9972	631.4752	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8545	0.9013	0.8736	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	668.6260	555.1694	551.6379	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1060.2542	1010.6248	918.4468	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	281.9722	338.8588	272.9058	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	70.4931	84.7147	68.2264	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												223.4342	(107)
Energy for space heating												29.1549	(99)
Energy for space cooling												2.5390	(108)
Total												31.6940	(109)
Fabric Energy Efficiency (TFEE)												31.7	(109)

Full SAP Calculation Printout

Property Reference	Flat 201 WCS - Green	Issued on Date	06/05/2023
Assessment Reference	Flat 201 WCS - Green	Prop Type Ref	Flat 102 WCS - Green
Property	West Central Street, London, WC1A		

SAP Rating	84 B	DER	3.07	TER	13.79
Environmental	98 A	% DER < TER			77.74
CO_2 Emissions (t/year)	0.17	DFEE	33.41	TFEE	32.59
Compliance Check	See BREL	% DFEE < TFEE			-2.50
% DPER < TPER	55.60	DPER	32.68	TPER	73.62

Assessor Details	Mr. Adrian Fell	Assessor ID	N222-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	61.0000 (1b)	x	2.5200 (2b)	=	153.7200 (1b)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	153.7200	(5)

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2. Ventilation rate

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	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) =	0.1301	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2801	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2171	(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	0.2768	0.2714	0.2659	0.2388	0.2334	0.2062	0.2062	0.2008	0.2171	0.2334	0.2442	0.2551	(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	0.5383	0.5368	0.5354	0.5285	0.5272	0.5213	0.5213	0.5202	0.5236	0.5272	0.5298	0.5325	(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 (Uw = 0.95)			19.3800	0.9152	17.7370			(27)
Glazed Doors (Uw = 0.95)			2.0500	0.9152	1.8762			(27)
Solid Door			2.0000	0.8000	1.6000			(26)
External Wall 1	80.2100	23.4300	56.7800	0.1500	8.5170	14.0000	794.9200	(29a)
Total net area of external elements Aum(A, m2)			80.2100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.7302			(33)

Party Wall 1	8.9700	0.0000	0.0000	20.0000	179.4000 (32)
Party Floor 1	61.0000			40.0000	2440.0000 (32d)
Party Ceiling 1	61.0000			40.0000	2440.0000 (32b)
Internal Wall 1	84.5700			9.0000	761.1300 (32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 6615.4500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 108.4500 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E16 Corner (normal)	12.6000	0.0900	1.1340
E17 Corner (inverted – internal area greater than external area)	5.0400	-0.0900	-0.4536
E1 Steel lintel with perforated steel base plate	10.2600	0.0500	0.5130
E3 Sill	9.3100	0.0500	0.4655
E4 Jamb	31.8000	0.0500	1.5900
E7 Party floor between dwellings (in blocks of flats)	63.6600	0.0700	4.4562
E18 Party wall between dwellings	2.5200	0.0600	0.1512
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7400	0.4430	2.9858
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.1200	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.8421 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 40.5723 (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	27.3069	27.2314	27.1574	26.8101	26.7451	26.4425	26.4425	26.3865	26.5591	26.7451	26.8766	27.0140	(38)
Heat transfer coeff	67.8792	67.8037	67.7298	67.3824	67.3174	67.0148	67.0148	66.9588	67.1314	67.3174	67.4489	67.5863	(39)
Average = Sum(39)m / 12 =												67.3821	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1128	1.1115	1.1103	1.1046	1.1036	1.0986	1.0986	1.0977	1.1005	1.1036	1.1057	1.1080	(40)
HLP (average)												1.1046	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.0098 (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

25.0293	24.6576	24.1341	23.1690	22.4462	21.6449	21.2120	21.7318	22.2978	23.1553	24.1403	24.9447	(42b)

Hot water usage for other uses

35.2120	33.9315	32.6511	31.3707	30.0902	28.8098	28.8098	30.0902	31.3707	32.6511	33.9315	35.2120	(42c)

Average daily hot water use (litres/day) 55.2170 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	60.2413	58.5891	56.7852	54.5396	52.5365	50.4547	50.0218	51.8221	53.6685	55.8064	58.0719	60.1567	(44)
Energy conte	95.4075	83.4301	87.2768	74.6620	70.7242	62.0399	60.4971	64.1665	66.1786	75.7287	82.7340	94.1908	(45)
Energy content (annual)										Total = Sum(45)m =		917.0363	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	81.0963	70.9156	74.1853	63.4627	60.1156	52.7339	51.4225	54.5416	56.2518	64.3694	70.3239	80.0622	(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	81.0963	70.9156	74.1853	63.4627	60.1156	52.7339	51.4225	54.5416	56.2518	64.3694	70.3239	80.0622	(64)
									Total per year (kWh/year) = Sum(64)m =			779.4808	(64)
12Total per year (kWh/year)												779	(64)
Electric shower(s)	46.3816	41.3264	45.1268	43.0640	43.8721	41.8497	43.2447	43.8721	43.0640	45.1268	44.2783	46.3816	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			527.5882	(64a)
Heat gains from water heating, kWh/month	31.8695	28.0605	29.8280	26.6317	25.9969	23.6459	23.6668	24.6034	24.8289	27.3741	28.6506	31.6109	(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	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	88.5003	97.9825	88.5003	91.4503	88.5003	91.4503	88.5003	88.5003	91.4503	88.5003	91.4503	88.5003	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	175.4617	177.2825	172.6943	162.9265	150.5964	139.0079	131.2661	129.4454	134.0336	143.8013	156.1314	167.7199	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	(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)													

	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	(71)
Water heating gains (Table 5)												
	42.8353	41.7567	40.0914	36.9884	34.9421	32.8415	31.8102	33.0691	34.4847	36.7931	39.7924	42.4878 (72)
Total internal gains												
	359.9438	370.1681	354.4324	344.5117	327.1853	316.4462	304.7230	304.1612	313.1150	322.2412	340.5206	351.8545 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Southeast	7.4800	36.7938	0.4700	0.7000	0.7700	62.7488 (77)
Southwest	5.1800	36.7938	0.4700	0.7000	0.7700	43.4544 (79)
Northwest	6.7200	11.2829	0.4700	0.7000	0.7700	17.2870 (81)
Southeast	2.0500	36.7938	0.4700	0.7000	0.7700	17.1972 (77)

Solar gains	140.6875	245.3849	350.9983	460.4685	539.0973	545.4627	521.6129	461.3831	388.6618	275.3150	169.5569	119.7226 (83)
Total gains	500.6313	615.5530	705.4308	804.9802	866.2825	861.9089	826.3359	765.5443	701.7768	597.5561	510.0775	471.5770 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	27.0720	27.1021	27.1317	27.2716	27.2979	27.4212	27.4212	27.4441	27.3736	27.2979	27.2447	27.1893	
alpha	2.8048	2.8068	2.8088	2.8181	2.8199	2.8281	2.8281	2.8296	2.8249	2.8199	2.8163	2.8126	
util living area													
	0.9410	0.9015	0.8448	0.7428	0.6099	0.4603	0.3441	0.3835	0.5729	0.7935	0.9090	0.9488	(86)
MIT	18.8662	19.2707	19.7552	20.2979	20.6842	20.8959	20.9661	20.9532	20.8021	20.2701	19.4701	18.7805	(87)
Th 2	19.9904	19.9914	19.9924	19.9971	19.9979	20.0020	20.0020	20.0027	20.0004	19.9979	19.9962	19.9943	(88)
util rest of house													
	0.9324	0.8882	0.8242	0.7103	0.5631	0.3983	0.2706	0.3068	0.5094	0.7589	0.8942	0.9413	(89)
MIT 2	18.0635	18.4559	18.9208	19.4287	19.7691	19.9413	19.9879	19.9821	19.8755	19.4191	18.6605	17.9827	(90)
Living area fraction										fLA = Living area / (4) =		0.3654	(91)
MIT	18.3568	18.7536	19.2257	19.7463	20.1035	20.2902	20.3453	20.3370	20.2141	19.7301	18.9563	18.2742	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3568	18.7536	19.2257	19.7463	20.1035	20.2902	20.3453	20.3370	20.2141	19.7301	18.9563	18.2742	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9148	0.8684	0.8062	0.7015	0.5682	0.4167	0.2964	0.3331	0.5236	0.7485	0.8756	0.9247	(94)
Useful gains	457.9837	534.5573	568.7468	564.6742	492.2591	359.1650	244.9174	255.0064	367.4785	447.2755	446.6019	436.0873	(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													
	954.1648	939.3286	861.9082	730.8522	565.7021	381.3251	250.9913	263.6147	410.4476	614.6125	799.6966	951.2234	(97)
Space heating kWh													
	369.1588	272.0063	218.1121	119.6482	54.6416	0.0000	0.0000	0.0000	0.0000	124.4988	254.2282	383.2613	(98a)
Space heating requirement - total per year (kWh/year)												1795.5553	
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													
	369.1588	272.0063	218.1121	119.6482	54.6416	0.0000	0.0000	0.0000	0.0000	124.4988	254.2282	383.2613	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1795.5553	
Space heating per m2											(98c) / (4) =	29.4353	(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	629.9396	495.9099	508.8870	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8733	0.9143	0.8946	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	550.1126	453.4132	455.2304	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	974.8769	935.0378	865.6895	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	305.8303	358.3287	305.3816	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	76.4576	89.5822	76.3454	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												242.3852	(107)
Energy for space heating												29.4353	(99)
Energy for space cooling												3.9735	(108)
Total												33.4089	(109)

Fabric Energy Efficiency (DFEE) 33.4 (109)

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	61.0000 (1b)	x	2.5200 (2b)	=	153.7200 (1b) -	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 61.0000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	153.7200	(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) =	0.1301	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3801	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2946	(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	0.3756	0.3682	0.3609	0.3240	0.3167	0.2799	0.2799	0.2725	0.2946	0.3167	0.3314	0.3461	(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	0.5705	0.5678	0.5651	0.5525	0.5501	0.5392	0.5392	0.5371	0.5434	0.5501	0.5549	0.5599	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.0000	1.0000	2.0000			(26)
TER Opening Type (Uw = 1.20)			13.2500	1.1450	15.1718			(27)
External Wall 1	80.2100	15.2500	64.9600	0.1800	11.6928			(29a)
Total net area of external elements Aum(A, m2)			80.2100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.8646			(33)
Party Wall 1			8.9700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 108.4500 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E16 Corner (normal)	12.6000	0.0900	1.1340
E17 Corner (inverted – internal area greater than external area)	5.0400	-0.0900	-0.4536
E1 Steel lintel with perforated steel base plate	10.2600	0.0500	0.5130
E3 Sill	9.3100	0.0500	0.4655
E4 Jamb	31.8000	0.0500	1.5900
E7 Party floor between dwellings (in blocks of flats)	63.6600	0.0700	4.4562
E18 Party wall between dwellings	2.5200	0.0600	0.1512
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7400	0.0200	0.1348
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.1200	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		7.9911	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	36.8557	(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	28.9419	28.8029	28.6667	28.0271	27.9074	27.3502	27.3502	27.2471	27.5648	27.9074	28.1495	28.4026	(38)
Heat transfer coeff													
	65.7975	65.6586	65.5224	64.8827	64.7630	64.2059	64.2059	64.1027	64.4205	64.7630	65.0052	65.2583	(39)
Average = Sum(39)m / 12 =												64.8821	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0786	1.0764	1.0741	1.0637	1.0617	1.0526	1.0526	1.0509	1.0561	1.0617	1.0657	1.0698	(40)
HLP (average)												1.0636	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0098	(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													
	25.0293	24.6576	24.1341	23.1690	22.4462	21.6449	21.2120	21.7318	22.2978	23.1553	24.1403	24.9447	(42b)
Hot water usage for other uses													
	35.2120	33.9315	32.6511	31.3707	30.0902	28.8098	28.8098	30.0902	31.3707	32.6511	33.9315	35.2120	(42c)
Average daily hot water use (litres/day)												55.2170	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	60.2413	58.5891	56.7852	54.5396	52.5365	50.4547	50.0218	51.8221	53.6685	55.8064	58.0719	60.1567	(44)
Energy conte	95.4075	83.4301	87.2768	74.6620	70.7242	62.0399	60.4971	64.1665	66.1786	75.7287	82.7340	94.1908	(45)
Energy content (annual)										Total = Sum(45)m =		917.0363	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	81.0963	70.9156	74.1853	63.4627	60.1156	52.7339	51.4225	54.5416	56.2518	64.3694	70.3239	80.0622	(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													
	81.0963	70.9156	74.1853	63.4627	60.1156	52.7339	51.4225	54.5416	56.2518	64.3694	70.3239	80.0622	(64)
									Total per year (kWh/year) = Sum(64)m =			779.4808	(64)
12Total per year (kWh/year)												779	(64)
Electric shower(s)													
	46.3816	41.3264	45.1268	43.0640	43.8721	41.8497	43.2447	43.8721	43.0640	45.1268	44.2783	46.3816	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							527.5882	(64a)
Heat gains from water heating, kWh/month													
	31.8695	28.0605	29.8280	26.6317	25.9969	23.6459	23.6668	24.6034	24.8289	27.3741	28.6506	31.6109	(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	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	88.5730	98.0630	88.5730	91.5254	88.5730	91.5254	88.5730	88.5730	91.5254	88.5730	91.5254	88.5730	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	175.4617	177.2825	172.6943	162.9265	150.5964	139.0079	131.2661	129.4454	134.0336	143.8013	156.1314	167.7199	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	(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)													
	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	(71)
Water heating gains (Table 5)													
	42.8353	41.7567	40.0914	36.9884	34.9421	32.8415	31.8102	33.0691	34.4847	36.7931	39.7924	42.4878	(72)
Total internal gains													
	360.0165	370.2486	354.5051	344.5868	327.2580	316.5213	304.7958	304.2339	313.1901	322.3139	340.5957	351.9272	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	5.9000	36.7938	0.6300	0.7000	0.7700	66.3436	(77)
Southwest	3.2000	36.7938	0.6300	0.7000	0.7700	35.9830	(79)
Northwest	4.1500	11.2829	0.6300	0.7000	0.7700	14.3101	(81)

Solar gains	116.6366	203.4285	290.9652	381.6822	446.8317	452.0968	432.3338	382.4304	322.1768	228.2360	140.5694	99.2565	(83)

Total gains	476.6531	573.6771	645.4704	726.2690	774.0897	768.6182	737.1295	686.6643	635.3669	550.5499	481.1651	451.1837 (84)

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7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	27.9285	27.9876	28.0458	28.3223	28.3746	28.6208	28.6208	28.6669	28.5255	28.3746	28.2689	28.1593	
alpha	2.8619	2.8658	2.8697	2.8882	2.8916	2.9081	2.9081	2.9111	2.9017	2.8916	2.8846	2.8773	
util living area	0.9460	0.9124	0.8637	0.7710	0.6440	0.4905	0.3684	0.4077	0.6005	0.8125	0.9169	0.9528	(86)
MIT	18.8892	19.2600	19.7191	20.2628	20.6599	20.8886	20.9639	20.9510	20.7932	20.2588	19.4869	18.8222	(87)
Th 2	20.0183	20.0202	20.0220	20.0306	20.0322	20.0398	20.0398	20.0412	20.0369	20.0322	20.0290	20.0256	(88)
util rest of house	0.9382	0.9004	0.8451	0.7407	0.5985	0.4282	0.2933	0.3301	0.5382	0.7803	0.9034	0.9458	(89)
MIT 2	18.1057	18.4674	18.9111	19.4274	19.7822	19.9735	20.0244	20.0189	19.9039	19.4383	18.7012	18.0453	(90)
Living area fraction										fLA = Living area / (4) =		0.3654	(91)
MIT	18.3920	18.7570	19.2063	19.7326	20.1029	20.3079	20.3677	20.3595	20.2289	19.7381	18.9883	18.3292	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3920	18.7570	19.2063	19.7326	20.1029	20.3079	20.3677	20.3595	20.2289	19.7381	18.9883	18.3292	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9216	0.8816	0.8272	0.7305	0.6020	0.4462	0.3194	0.3565	0.5513	0.7692	0.8856	0.9303	(94)
Useful gains	439.2991	505.7269	533.9499	530.5487	466.0177	342.9298	235.4611	244.8038	350.2797	423.5079	426.1402	419.7456	(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	927.2193	909.8326	832.5502	702.8504	544.1981	366.4823	241.9077	253.8151	394.8264	591.8125	772.7999	922.0477	(97)
Space heating kWh	363.0126	271.5590	222.1586	124.0572	58.1662	0.0000	0.0000	0.0000	0.0000	125.2186	249.5949	373.7127	(98a)
Space heating requirement - total per year (kWh/year)												1787.4800	
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	363.0126	271.5590	222.1586	124.0572	58.1662	0.0000	0.0000	0.0000	0.0000	125.2186	249.5949	373.7127	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1787.4800	
Space heating per m2											(98c) / (4) =	29.3030	(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	603.5354	475.1236	487.1807	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8597	0.9050	0.8847	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	518.8395	429.9787	431.0133	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	865.7543	830.6925	773.4160	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	249.7787	298.1310	254.7476	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	62.4447	74.5328	63.6869	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												200.6643	(107)
Energy for space heating												29.3030	(99)
Energy for space cooling												3.2896	(108)
Total												32.5925	(109)
Fabric Energy Efficiency (TFEE)												32.6	(109)

Full SAP Calculation Printout

Property Reference	Flat 202 VL - Be Green	Issued on Date	06/05/2023
Assessment Reference	Flat 202 VL - Be Green	Prop Type Ref	Flat 203 VL - Be Green
Property	MFMTF, Vine Lane, London, WC1A		

SAP Rating	84 B	DER	3.23	TER	14.90
Environmental	98 A	% DER < TER			78.32
CO_2 Emissions (t/year)	0.15	DFEE	31.35	TFEE	32.01
Compliance Check	See BREL	% DFEE < TFEE			2.06
% DPER < TPER	56.93	DPER	34.52	TPER	80.14

Assessor Details	Mr. Adrian Fell	Assessor ID	N222-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	51.6300 (1b)	x	2.5800 (2b)	=	133.2054	(1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.6300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	133.2054	(5)

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2. Ventilation rate

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		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) =	0.1501	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3001	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2326	(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	0.2966	0.2908	0.2849	0.2559	0.2501	0.2210	0.2210	0.2152	0.2326	0.2501	0.2617	0.2733	(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	0.5440	0.5423	0.5406	0.5327	0.5313	0.5244	0.5244	0.5231	0.5271	0.5313	0.5342	0.5374	(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	
Glazed Door (Uw = 0.95)			1.9800	0.9152	1.8121			(27)
Window (Uw = 0.95)			11.2800	0.9152	10.3237			(27)
Door			1.8900	0.8000	1.5120			(26)
External Wall 1	46.8500	15.1500	31.7000	0.1500	4.7550	14.0000	443.8000	(29a)
Total net area of external elements Aum(A, m2)			46.8500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		18.4028			(33)

Party Wall 1	31.7900	0.0000	0.0000	20.0000	635.8000 (32)
Party Floor 1	51.6300			40.0000	2065.2000 (32d)
Party Ceiling 1	51.6300			40.0000	2065.2000 (32b)
Internal Wall 1	48.6600			9.0000	437.9400 (32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 5647.9400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 109.3926 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	6.4900	0.0500	0.3245
E3 Sill	6.4900	0.0500	0.3245
E4 Jamb	18.2000	0.0500	0.9100
E7 Party floor between dwellings (in blocks of flats)	36.3200	0.0700	2.5424
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.1900	0.4430	2.7422
E16 Corner (normal)	2.5800	0.0900	0.2322
E17 Corner (inverted – internal area greater than external area)	2.5800	-0.0900	-0.2322
E18 Party wall between dwellings	10.3200	0.0600	0.6192
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	24.6400	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.4628 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.8656 (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	23.9121	23.8371	23.7635	23.4179	23.3532	23.0522	23.0522	22.9964	23.1681	23.3532	23.4840	23.6208	(38)
Heat transfer coeff	49.7778	49.7027	49.6291	49.2835	49.2188	48.9178	48.9178	48.8620	49.0337	49.2188	49.3496	49.4864	(39)

Average = Sum(39)m / 12 = 49.2832

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9641	0.9627	0.9612	0.9546	0.9533	0.9475	0.9475	0.9464	0.9497	0.9533	0.9558	0.9585	(40)
HLP (average)												0.9545	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7382 (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

23.0709	22.7283	22.2458	21.3561	20.6900	19.9513	19.5523	20.0314	20.5531	21.3435	22.2515	22.9929	(42b)

Hot water usage for other uses

32.4304	31.2512	30.0719	28.8926	27.7133	26.5340	26.5340	27.7133	28.8926	30.0719	31.2512	32.4304	(42c)

Average daily hot water use (litres/day) 50.8726 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	55.5014	53.9794	52.3176	50.2487	48.4033	46.4853	46.0863	47.7447	49.4457	51.4154	53.5026	55.4234	(44)
Energy conte	87.9006	76.8660	80.4103	68.7880	65.1601	57.1591	55.7374	59.1180	60.9715	69.7702	76.2243	86.7796	(45)

Energy content (annual) Total = Sum(45)m = 844.8850

Distribution loss (46)m = 0.15 x (45)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:												
Total storage loss												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month												
74.7155	65.3361	68.3487	58.4698	55.3861	48.5852	47.3768	50.2503	51.8258	59.3047	64.7907	73.7627	(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												
74.7155	65.3361	68.3487	58.4698	55.3861	48.5852	47.3768	50.2503	51.8258	59.3047	64.7907	73.7627	(64)

Total per year (kWh/year) = Sum(64)m = 718.1522 (64)
12Total per year (kWh/year) 718 (64)
Electric shower(s)

42.7346	38.0769	41.5785	39.6778	40.4224	38.5590	39.8443	40.4224	39.6778	41.5785	40.7966	42.7346	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 486.1034 (64a)

Heat gains from water heating, kWh/month												
29.3625	25.8532	27.4818	24.5369	23.9521	21.7861	21.8053	22.6682	22.8759	25.2208	26.3968	29.1243	(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	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
76.3972	84.5826	76.3972	78.9438	76.3972	78.9438	76.3972	76.3972	78.9438	76.3972	78.9438	76.3972	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
151.4660	153.0378	149.0770	140.6451	130.0013	119.9976	113.3145	111.7427	115.7035	124.1354	134.7793	144.7830	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	(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)													

	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	(71)
Water heating gains (Table 5)												
	39.4658	38.4721	36.9379	34.0790	32.1937	30.2584	29.3082	30.4680	31.7721	33.8989	36.6623	39.1456 (72)
Total internal gains												
	316.4013	325.1648	311.4845	302.7402	287.6645	278.2721	268.0922	267.6802	275.4917	283.5039	299.4576	309.3981 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	1.9800	11.2829	0.4700	0.7000	0.7700	5.0935	(81)
Northeast	11.2800	11.2829	0.4700	0.7000	0.7700	29.0175	(75)

Solar gains	34.1110	69.4340	125.0980	205.4469	276.1609	294.4167	275.4208	219.5687	152.4339	84.8539	42.9205	27.8568 (83)
Total gains	350.5124	394.5988	436.5825	508.1871	563.8254	572.6889	543.5130	487.2489	427.9256	368.3578	342.3782	337.2549 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	31.5175	31.5651	31.6119	31.8336	31.8755	32.0716	32.0716	32.1082	31.9958	31.8755	31.7910	31.7031	
alpha	3.1012	3.1043	3.1075	3.1222	3.1250	3.1381	3.1381	3.1405	3.1331	3.1250	3.1194	3.1135	
util living area													
	0.9591	0.9403	0.9045	0.8142	0.6738	0.5061	0.3827	0.4385	0.6630	0.8650	0.9392	0.9633	(86)
MIT	19.0289	19.2905	19.7059	20.2707	20.6889	20.9069	20.9709	20.9555	20.7815	20.2277	19.5451	18.9796	(87)
Th 2	20.1133	20.1146	20.1158	20.1214	20.1224	20.1273	20.1273	20.1282	20.1254	20.1224	20.1203	20.1181	(88)
util rest of house													
	0.9532	0.9318	0.8908	0.7884	0.6317	0.4474	0.3115	0.3630	0.6050	0.8399	0.9291	0.9580	(89)
MIT 2	18.3097	18.5670	18.9726	19.5128	19.8891	20.0706	20.1143	20.1071	19.9791	19.4858	18.8250	18.2646	(90)
Living area fraction										fLA = Living area / (4) =		0.6328	(91)
MIT	18.7648	19.0248	19.4366	19.9924	20.3952	20.5998	20.6564	20.6439	20.4868	19.9553	19.2806	18.7170	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7648	19.0248	19.4366	19.9924	20.3952	20.5998	20.6564	20.6439	20.4868	19.9553	19.2806	18.7170	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9419	0.9192	0.8786	0.7843	0.6453	0.4798	0.3551	0.4084	0.6300	0.8345	0.9175	0.9473	(94)
Useful gains	330.1553	362.7058	383.5613	398.5754	363.8292	274.7571	193.0105	198.9801	269.6042	307.3925	314.1383	319.4728	(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													
	720.0231	702.0404	642.0330	546.6717	427.9669	293.4967	198.4284	207.3672	313.1702	460.4545	601.1093	718.3945	(97)
Space heating kWh													
	290.0617	228.0329	192.3030	106.6294	47.7185	0.0000	0.0000	0.0000	0.0000	113.8781	206.6191	296.7977	(98a)
Space heating requirement - total per year (kWh/year)												1482.0402	
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													
	290.0617	228.0329	192.3030	106.6294	47.7185	0.0000	0.0000	0.0000	0.0000	113.8781	206.6191	296.7977	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1482.0402	
Space heating per m2											(98c) / (4) =	28.7050	(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	459.8272	361.9916	371.3515	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8671	0.9105	0.8801	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	398.6944	329.5824	326.8179	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	642.0974	609.5077	545.2055	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	175.2502	208.2644	162.4804	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	43.8125	52.0661	40.6201	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												136.4987	(107)
Energy for space heating												28.7050	(99)
Energy for space cooling												2.6438	(108)
Total												31.3488	(109)
Fabric Energy Efficiency (DFEE)												31.3	(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	51.6300 (1b)	x	2.5800 (2b)	=	133.2054 (1b)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.6300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	133.2054	(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) =	0.1501	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4001	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3101	(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	0.3954	0.3876	0.3799	0.3411	0.3334	0.2946	0.2946	0.2869	0.3101	0.3334	0.3489	0.3644	(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	0.5782	0.5751	0.5722	0.5582	0.5556	0.5434	0.5434	0.5411	0.5481	0.5556	0.5609	0.5664	(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			1.8900	1.0000	1.8900			(26)
TER Opening Type (Uw = 1.20)			11.0300	1.1450	12.6298			(27)
External Wall 1	46.8500	12.9200	33.9300	0.1800	6.1074			(29a)
Total net area of external elements Aum(A, m2)			46.8500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		20.6272			(33)
Party Wall 1			31.7900	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 109.3926 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E1 Steel lintel with perforated steel base plate	6.4900	0.0500	0.3245
E3 Sill	6.4900	0.0500	0.3245
E4 Jamb	18.2000	0.0500	0.9100
E7 Party floor between dwellings (in blocks of flats)	36.3200	0.0700	2.5424
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.1900	0.0200	0.1238
E16 Corner (normal)	2.5800	0.0900	0.2322
E17 Corner (inverted – internal area greater than external area)	2.5800	-0.0900	-0.2322
E18 Party wall between dwellings	10.3200	0.0600	0.6192
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	24.6400	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		4.8444	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	25.4716	(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	25.4150	25.2815	25.1508	24.5365	24.4215	23.8865	23.8865	23.7874	24.0926	24.4215	24.6540	24.8971	(38)
Heat transfer coeff													
	50.8865	50.7531	50.6223	50.0080	49.8931	49.3581	49.3581	49.2590	49.5642	49.8931	50.1256	50.3687	(39)
Average = Sum(39)m / 12 =												50.0075	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9856	0.9830	0.9805	0.9686	0.9664	0.9560	0.9560	0.9541	0.9600	0.9664	0.9709	0.9756	(40)
HLP (average)												0.9686	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7382	(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													
	23.0709	22.7283	22.2458	21.3561	20.6900	19.9513	19.5523	20.0314	20.5531	21.3435	22.2515	22.9929	(42b)
Hot water usage for other uses													
	32.4304	31.2512	30.0719	28.8926	27.7133	26.5340	26.5340	27.7133	28.8926	30.0719	31.2512	32.4304	(42c)
Average daily hot water use (litres/day)												50.8726	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	55.5014	53.9794	52.3176	50.2487	48.4033	46.4853	46.0863	47.7447	49.4457	51.4154	53.5026	55.4234	(44)
Energy conte	87.9006	76.8660	80.4103	68.7880	65.1601	57.1591	55.7374	59.1180	60.9715	69.7702	76.2243	86.7796	(45)
Energy content (annual)											Total = Sum(45)m =	844.8850	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	74.7155	65.3361	68.3487	58.4698	55.3861	48.5852	47.3768	50.2503	51.8258	59.3047	64.7907	73.7627	(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													
	74.7155	65.3361	68.3487	58.4698	55.3861	48.5852	47.3768	50.2503	51.8258	59.3047	64.7907	73.7627	(64)
										Total per year (kWh/year) = Sum(64)m =		718.1522	(64)
12Total per year (kWh/year)												718	(64)
Electric shower(s)													
	42.7346	38.0769	41.5785	39.6778	40.4224	38.5590	39.8443	40.4224	39.6778	41.5785	40.7966	42.7346	(64a)
							Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =					486.1034	(64a)
Heat gains from water heating, kWh/month													
	29.3625	25.8532	27.4818	24.5369	23.9521	21.7861	21.8053	22.6682	22.8759	25.2208	26.3968	29.1243	(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	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	76.5233	84.7223	76.5233	79.0741	76.5233	79.0741	76.5233	76.5233	79.0741	76.5233	79.0741	76.5233	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	151.4660	153.0378	149.0770	140.6451	130.0013	119.9976	113.3145	111.7427	115.7035	124.1354	134.7793	144.7830	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	(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)													
	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	(71)
Water heating gains (Table 5)													
	39.4658	38.4721	36.9379	34.0790	32.1937	30.2584	29.3082	30.4680	31.7721	33.8989	36.6623	39.1456	(72)
Total internal gains													
	316.5274	325.3044	311.6106	302.8705	287.7906	278.4024	268.2183	267.8063	275.6220	283.6300	299.5880	309.5242	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	9.3800	11.2829	0.6300	0.7000	0.7700	32.3442	(75)
Northwest	1.6500	11.2829	0.6300	0.7000	0.7700	5.6896	(81)

Solar gains	38.0338	77.4189	139.4842	229.0732	307.9193	328.2745	307.0941	244.8190	169.9637	94.6120	47.8564	31.0603	(83)
Total gains	354.5612	402.7233	451.0948	531.9437	595.7099	606.6769	575.3124	512.6253	445.5857	378.2420	347.4443	340.5845	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	30.8308	30.9118	30.9917	31.3724	31.4447	31.7855	31.7855	31.8495	31.6534	31.4447	31.2988	31.1478	
alpha	3.0554	3.0608	3.0661	3.0915	3.0963	3.1190	3.1190	3.1233	3.1102	3.0963	3.0866	3.0765	
util living area													
	0.9585	0.9384	0.8995	0.8019	0.6549	0.4857	0.3660	0.4221	0.6493	0.8597	0.9378	0.9627	(86)
MIT	18.9849	19.2628	19.7005	20.2903	20.7061	20.9153	20.9737	20.9591	20.7900	20.2295	19.5269	18.9448	(87)
Th 2	20.0954	20.0975	20.0996	20.1096	20.1115	20.1202	20.1202	20.1218	20.1168	20.1115	20.1077	20.1037	(88)
util rest of house													
	0.9524	0.9296	0.8851	0.7750	0.6121	0.4280	0.2969	0.3482	0.5907	0.8338	0.9275	0.9573	(89)
MIT 2	18.2537	18.5275	18.9549	19.5201	19.8926	20.0689	20.1085	20.1025	19.9772	19.4783	18.7980	18.2202	(90)
Living area fraction											fLA = Living area / (4) =	0.6328	(91)
MIT	18.7163	18.9928	19.4267	20.0075	20.4074	20.6045	20.6560	20.6446	20.4916	19.9536	19.2592	18.6787	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7163	18.9928	19.4267	20.0075	20.4074	20.6045	20.6560	20.6446	20.4916	19.9536	19.2592	18.6787	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9409	0.9166	0.8727	0.7717	0.6269	0.4603	0.3394	0.3928	0.6166	0.8287	0.9157	0.9464	(94)
Useful gains	333.5957	369.1300	393.6483	410.4911	373.4529	279.2458	195.2803	201.3714	274.7581	313.4410	318.1380	322.3212	(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													
	733.5976	715.2540	654.3801	555.4630	434.4375	296.3691	200.1943	209.0835	316.7919	466.6814	609.4875	729.2735	(97)
Space heating kWh													
	297.6014	232.5954	193.9844	104.3798	45.3726	0.0000	0.0000	0.0000	0.0000	114.0109	209.7717	302.7725	(98a)
Space heating requirement - total per year (kWh/year)												1500.4887	
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													
	297.6014	232.5954	193.9844	104.3798	45.3726	0.0000	0.0000	0.0000	0.0000	114.0109	209.7717	302.7725	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1500.4887	
Space heating per m2											(98c) / (4) =	29.0623	(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	463.9659	365.2497	374.3683	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8790	0.9190	0.8898	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	407.8297	335.6669	333.1097	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	681.6824	646.5403	574.7343	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	197.1739	231.2898	179.7688	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	49.2935	57.8224	44.9422	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												152.0581	(107)
Energy for space heating												29.0623	(99)
Energy for space cooling												2.9452	(108)
Total												32.0075	(109)
Fabric Energy Efficiency (TFEE)												32.0	(109)

Full SAP Calculation Printout

Property Reference	Flat 202 WCS - Green	Issued on Date	06/05/2023
Assessment Reference	Flat 202 WCS - Green	Prop Type Ref	Flat 102 WCS - Green
Property	West Central Street, London, WC1A		

SAP Rating	84 B	DER	3.20	TER	14.53
Environmental	98 A	% DER < TER			77.98
CO_2 Emissions (t/year)	0.15	DFEE	31.94	TFEE	31.43
Compliance Check	See BREL	% DFEE < TFEE			-1.62
% DPER < TPER	56.13	DPER	34.13	TPER	77.79

Assessor Details	Mr. Adrian Fell	Assessor ID	N222-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	52.0000 (1b)	x	2.5200 (2b)	=	131.0400	(1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	131.0400	(5)

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2. Ventilation rate

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		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) =	0.1526	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3026	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2345	(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	0.2990	0.2932	0.2873	0.2580	0.2521	0.2228	0.2228	0.2169	0.2345	0.2521	0.2639	0.2756	(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	0.5447	0.5430	0.5413	0.5333	0.5318	0.5248	0.5248	0.5235	0.5275	0.5318	0.5348	0.5380	(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 (Uw = 0.95)			12.4200	0.9152	11.3671			(27)
Glazed Doors (Uw = 0.95)			4.1000	0.9152	3.7524			(27)
Solid Door			2.0000	0.8000	1.6000			(26)
External Wall 1	66.7800	18.5200	48.2600	0.1500	7.2390	14.0000	675.6400	(29a)
Total net area of external elements Aum(A, m2)			66.7800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.9585			(33)

Party Wall 1	18.4000	0.0000	0.0000	20.0000	368.0000 (32)
Party Floor 1	52.0000			40.0000	2080.0000 (32d)
Party Ceiling 1	52.0000			40.0000	2080.0000 (32b)
Internal Wall 1	45.1100			9.0000	405.9900 (32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 5609.6300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 107.8775 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	8.1300	0.0500	0.4065
E3 Sill	7.1800	0.0500	0.3590
E4 Jamb	27.2000	0.0500	1.3600
E18 Party wall between dwellings	7.5600	0.0600	0.4536
E16 Corner (normal)	2.5200	0.0900	0.2268
E17 Corner (inverted – internal area greater than external area)	5.0400	-0.0900	-0.4536
E7 Party floor between dwellings (in blocks of flats)	53.0000	0.0700	3.7100
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7400	0.4430	2.9858
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	14.6000	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.0481 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 33.0066 (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	23.5550	23.4799	23.4063	23.0607	22.9960	22.6950	22.6950	22.6392	22.8109	22.9960	23.1268	23.2636	(38)
Heat transfer coeff	56.5616	56.4865	56.4129	56.0673	56.0026	55.7015	55.7015	55.6458	55.8175	56.0026	56.1334	56.2702	(39)
Average = Sum(39)m / 12 =												56.0670	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0877	1.0863	1.0849	1.0782	1.0770	1.0712	1.0712	1.0701	1.0734	1.0770	1.0795	1.0821	(40)
HLP (average)												1.0782	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7491 (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

23.1496	22.8058	22.3217	21.4290	20.7606	20.0194	19.6190	20.0998	20.6232	21.4163	22.3274	23.0714	(42b)

Hot water usage for other uses

32.5422	31.3589	30.1755	28.9922	27.8088	26.6255	26.6255	27.8088	28.9922	30.1755	31.3589	32.5422	(42c)

Average daily hot water use (litres/day) 51.0472 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	55.6919	54.1647	52.4972	50.4212	48.5694	46.6448	46.2445	47.9086	49.6154	51.5919	53.6863	55.6136	(44)
Energy conte	88.2023	77.1298	80.6862	69.0240	65.3837	57.3553	55.9287	59.3209	61.1808	70.0097	76.4860	87.0774	(45)
Energy content (annual)										Total = Sum(45)m =		847.7848	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	74.9719	65.5603	68.5833	58.6704	55.5762	48.7520	47.5394	50.4227	52.0037	59.5082	65.0131	74.0158	(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	74.9719	65.5603	68.5833	58.6704	55.5762	48.7520	47.5394	50.4227	52.0037	59.5082	65.0131	74.0158	(64)
									Total per year (kWh/year) = Sum(64)m =			720.6170	(64)
12Total per year (kWh/year)												721	(64)
Electric shower(s)	42.8812	38.2075	41.7211	39.8139	40.5610	38.6913	39.9810	40.5610	39.8139	41.7211	40.9366	42.8812	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			487.7707	(64a)
Heat gains from water heating, kWh/month	29.4633	25.9420	27.5761	24.6211	24.0343	21.8608	21.8801	22.7459	22.9544	25.3073	26.4874	29.2242	(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	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.8814	85.1187	76.8814	79.4441	76.8814	79.4441	76.8814	76.8814	79.4441	76.8814	79.4441	76.8814	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	152.4259	154.0076	150.0218	141.5364	130.8251	120.7580	114.0326	112.4509	116.4367	124.9221	135.6334	145.7005	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	(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)													

	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	(71)
Water heating gains (Table 5)												
	39.6012	38.6041	37.0646	34.1960	32.3042	30.3622	29.4087	30.5725	31.8811	34.0152	36.7881	39.2799 (72)
Total internal gains												
	318.1446	326.9665	313.2039	304.4125	289.2467	279.8004	269.5588	269.1408	276.9980	285.0548	301.1016	311.0978 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	12.4200	36.7938	0.4700	0.7000	0.7700	104.1899	(77)
Southeast	2.0500	36.7938	0.4700	0.7000	0.7700	17.1972	(77)
Southwest	2.0500	36.7938	0.4700	0.7000	0.7700	17.1972	(79)

Solar gains	138.5844	236.0604	322.9882	400.1980	448.2551	445.0136	429.0406	393.1878	349.7279	260.8971	165.9921	118.5993 (83)
Total gains	456.7289	563.0269	636.1921	704.6105	737.5018	724.8140	698.5993	662.3286	626.7259	545.9519	467.0937	429.6972 (84)

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7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	27.5493	27.5859	27.6219	27.7922	27.8243	27.9746	27.9746	28.0027	27.9165	27.8243	27.7594	27.6919	
alpha	2.8366	2.8391	2.8415	2.8528	2.8550	2.8650	2.8650	2.8668	2.8611	2.8550	2.8506	2.8461	
util living area	0.9299	0.8839	0.8243	0.7263	0.6021	0.4569	0.3393	0.3705	0.5451	0.7640	0.8921	0.9392	(86)
MIT	19.0127	19.4252	19.8766	20.3607	20.7055	20.9025	20.9690	20.9594	20.8329	20.3658	19.6062	18.9250	(87)
Th 2	20.0109	20.0121	20.0132	20.0187	20.0197	20.0244	20.0244	20.0253	20.0226	20.0197	20.0176	20.0155	(88)
util rest of house	0.9202	0.8691	0.8024	0.6936	0.5562	0.3963	0.2682	0.2975	0.4838	0.7277	0.8755	0.9307	(89)
MIT 2	18.2205	18.6186	19.0495	19.5021	19.8059	19.9673	20.0114	20.0073	19.9175	19.5201	18.8056	18.1386	(90)
Living area fraction										fLA = Living area / (4) =		0.6488	(91)
MIT	18.7345	19.1419	19.5861	20.0592	20.3896	20.5741	20.6328	20.6251	20.5114	20.0688	19.3251	18.6488	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7345	19.1419	19.5861	20.0592	20.3896	20.5741	20.6328	20.6251	20.5114	20.0688	19.3251	18.6488	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9050	0.8539	0.7919	0.6950	0.5741	0.4310	0.3130	0.3430	0.5153	0.7297	0.8620	0.9160	(94)
Useful gains	413.3188	480.7738	503.8133	489.7027	423.3905	312.4145	218.6513	227.1763	322.9617	398.3875	402.6150	393.5987	(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	816.4369	804.4768	738.2271	625.6664	486.6385	332.7673	224.6313	235.1069	357.8700	530.2779	686.2358	813.0390	(97)
Space heating kWh	299.9199	217.5285	174.4038	97.8938	47.0565	0.0000	0.0000	0.0000	0.0000	98.1264	204.2070	312.0636	(98a)
Space heating requirement - total per year (kWh/year)												1451.1996	
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	299.9199	217.5285	174.4038	97.8938	47.0565	0.0000	0.0000	0.0000	0.0000	98.1264	204.2070	312.0636	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1451.1996	
Space heating per m2										(98c) / (4) =		27.9077	(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	523.5945	412.1915	422.9081	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8785	0.9194	0.9052	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	459.9700	378.9804	382.8096	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	819.6956	790.5761	749.6527	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	259.0024	306.2272	272.9313	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	64.7506	76.5568	68.2328	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												209.5402	(107)
Energy for space heating												27.9077	(99)
Energy for space cooling												4.0296	(108)
Total												31.9373	(109)
Fabric Energy Efficiency (DFEE)												31.9	(109)

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

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		52.0000 (1b)	x	2.5200 (2b)	=	131.0400 (1b) -	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.0000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	131.0400	(5)

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2. Ventilation rate

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	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) =	0.1526 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4026 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3120 (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	0.3978	0.3900	0.3822	0.3432	0.3354	0.2964	0.2964	0.2886	0.3120	0.3354	0.3510	0.3666	(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	0.5791	0.5761	0.5731	0.5589	0.5563	0.5439	0.5439	0.5417	0.5487	0.5563	0.5616	0.5672	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.0000	1.0000	2.0000			(26)
TER Opening Type (Uw = 1.20)			11.0100	1.1450	12.6069			(27)
External Wall 1	66.7800	13.0100	53.7700	0.1800	9.6786			(29a)
Total net area of external elements Aum(A, m2)			66.7800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.2855			(33)
Party Wall 1			18.4000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K				107.8775 (35)
List of Thermal Bridges				
K1 Element	Length	Psi-value	Total	
E1 Steel lintel with perforated steel base plate	8.1300	0.0500	0.4065	
E3 Sill	7.1800	0.0500	0.3590	
E4 Jamb	27.2000	0.0500	1.3600	
E18 Party wall between dwellings	7.5600	0.0600	0.4536	
E16 Corner (normal)	2.5200	0.0900	0.2268	
E17 Corner (inverted – internal area greater than external area)	5.0400	-0.0900	-0.4536	
E7 Party floor between dwellings (in blocks of flats)	53.0000	0.0700	3.7100	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7400	0.0200	0.1348	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	14.6000	0.0000	0.0000	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				6.1971 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	30.4826 (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	25.0439	24.9110	24.7807	24.1689	24.0544	23.5215	23.5215	23.4229	23.7268	24.0544	24.2860	24.5281	(38)
Heat transfer coeff													
	55.5264	55.3935	55.2633	54.6515	54.5370	54.0041	54.0041	53.9054	54.2094	54.5370	54.7686	55.0107	(39)
Average = Sum(39)m / 12 =												54.6509	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0678	1.0653	1.0628	1.0510	1.0488	1.0385	1.0385	1.0366	1.0425	1.0488	1.0532	1.0579	(40)
HLP (average)												1.0510	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7491	(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													
	23.1496	22.8058	22.3217	21.4290	20.7606	20.0194	19.6190	20.0998	20.6232	21.4163	22.3274	23.0714	(42b)
Hot water usage for other uses													
	32.5422	31.3589	30.1755	28.9922	27.8088	26.6255	26.6255	27.8088	28.9922	30.1755	31.3589	32.5422	(42c)
Average daily hot water use (litres/day)												51.0472	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	55.6919	54.1647	52.4972	50.4212	48.5694	46.6448	46.2445	47.9086	49.6154	51.5919	53.6863	55.6136	(44)
Energy conte	88.2023	77.1298	80.6862	69.0240	65.3837	57.3553	55.9287	59.3209	61.1808	70.0097	76.4860	87.0774	(45)
Energy content (annual)										Total = Sum(45)m =		847.7848	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	74.9719	65.5603	68.5833	58.6704	55.5762	48.7520	47.5394	50.4227	52.0037	59.5082	65.0131	74.0158	(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													
	74.9719	65.5603	68.5833	58.6704	55.5762	48.7520	47.5394	50.4227	52.0037	59.5082	65.0131	74.0158	(64)
									Total per year (kWh/year) = Sum(64)m =			720.6170	(64)
12Total per year (kWh/year)												721	(64)
Electric shower(s)													
	42.8812	38.2075	41.7211	39.8139	40.5610	38.6913	39.9810	40.5610	39.8139	41.7211	40.9366	42.8812	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							487.7707	(64a)
Heat gains from water heating, kWh/month													
	29.4633	25.9420	27.5761	24.6211	24.0343	21.8608	21.8801	22.7459	22.9544	25.3073	26.4874	29.2242	(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	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	77.0499	85.3052	77.0499	79.6182	77.0499	79.6182	77.0499	77.0499	79.6182	77.0499	79.6182	77.0499	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	152.4259	154.0076	150.0218	141.5364	130.8251	120.7580	114.0326	112.4509	116.4367	124.9221	135.6334	145.7005	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	(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)													
	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	(71)
Water heating gains (Table 5)													
	39.6012	38.6041	37.0646	34.1960	32.3042	30.3622	29.4087	30.5725	31.8811	34.0152	36.7881	39.2799	(72)
Total internal gains													
	318.3130	327.1530	313.3724	304.5866	289.4152	279.9745	269.7273	269.3093	277.1721	285.2233	301.2757	311.2663	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.6400	36.7938	0.6300	0.7000	0.7700	108.3987	(77)
Southwest	1.3700	36.7938	0.6300	0.7000	0.7700	15.4052	(79)

Solar gains	123.8039	210.8838	288.5404	357.5155	400.4472	397.5513	383.2819	351.2530	312.4282	233.0715	148.2885	105.9503	(83)
Total gains	442.1169	538.0368	601.9127	662.1021	689.8624	677.5259	653.0092	620.5623	589.6003	518.2948	449.5642	417.2166	(84)

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7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	28.0629	28.1302	28.1965	28.5121	28.5720	28.8539	28.8539	28.9067	28.7447	28.5720	28.4512	28.3260	
alpha	2.8709	2.8753	2.8798	2.9008	2.9048	2.9236	2.9236	2.9271	2.9163	2.9048	2.8967	2.8884	
util living area	0.9338	0.8920	0.8372	0.7432	0.6213	0.4725	0.3516	0.3828	0.5604	0.7764	0.8978	0.9422	(86)
MIT	19.0201	19.4133	19.8534	20.3450	20.6955	20.9009	20.9688	20.9594	20.8307	20.3617	19.6166	18.9491	(87)
Th 2	20.0272	20.0293	20.0314	20.0411	20.0429	20.0513	20.0513	20.0529	20.0481	20.0429	20.0392	20.0354	(88)
util rest of house	0.9246	0.8780	0.8165	0.7117	0.5761	0.4122	0.2802	0.3097	0.4998	0.7415	0.8822	0.9341	(89)
MIT 2	18.2395	18.6207	19.0432	19.5082	19.8198	19.9925	20.0380	20.0345	19.9404	19.5367	18.8321	18.1763	(90)
Living area fraction									fLA = Living area / (4) =			0.6488	(91)
MIT	18.7460	19.1349	19.5689	20.0511	20.3880	20.5820	20.6420	20.6346	20.5181	20.0720	19.3412	18.6777	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7460	19.1349	19.5689	20.0511	20.3880	20.5820	20.6420	20.6346	20.5181	20.0720	19.3412	18.6777	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9099	0.8630	0.8055	0.7121	0.5929	0.4465	0.3251	0.3551	0.5306	0.7427	0.8688	0.9199	(94)
Useful gains	402.2609	464.3346	484.8642	471.4576	409.0527	302.5399	212.2995	220.3888	312.8481	384.9202	390.6035	383.8175	(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	802.1340	788.5234	722.2294	609.4258	473.8174	323.0500	218.2824	228.2693	347.9187	516.5739	670.4304	796.4297	(97)
Space heating kWh	297.5056	217.8549	176.5998	99.3371	48.1849	0.0000	0.0000	0.0000	0.0000	97.9504	201.4754	306.9834	(98a)
Space heating requirement - total per year (kWh/year)												1445.8915	
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	297.5056	217.8549	176.5998	99.3371	48.1849	0.0000	0.0000	0.0000	0.0000	97.9504	201.4754	306.9834	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1445.8915	
Space heating per m2										(98c) / (4) =		27.8056	(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	507.6386	399.6304	409.6813	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8730	0.9159	0.9017	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	443.1458	366.0347	369.4202	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	764.2350	737.1079	700.6587	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	231.1842	276.0784	246.4414	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	57.7961	69.0196	61.6104	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												188.4260	(107)
Energy for space heating												27.8056	(99)
Energy for space cooling												3.6236	(108)
Total												31.4292	(109)
Fabric Energy Efficiency (TFEE)												31.4	(109)

Full SAP Calculation Printout

Property Reference	Flat 203 VL - Be Green	Issued on Date	06/05/2023
Assessment Reference	Flat 203 VL - Be Green	Prop Type Ref	Flat 203 VL - Be Green
Property	MFMTF, Vine Lane, London, WC1A		

SAP Rating	84 B	DER	3.21	TER	14.73
Environmental	98 A	% DER < TER			78.21
CO_2 Emissions (t/year)	0.15	DFEE	30.64	TFEE	31.23
Compliance Check	See BREL	% DFEE < TFEE			1.91
% DPER < TPER	56.72	DPER	34.30	TPER	79.25

Assessor Details	Mr. Adrian Fell	Assessor ID	N222-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	51.6300 (1b)	x	2.5800 (2b)	=	133.2054	(1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.6300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	133.2054	(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) =	0.1501	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3001	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2326	(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	0.2966	0.2908	0.2849	0.2559	0.2501	0.2210	0.2210	0.2152	0.2326	0.2501	0.2617	0.2733	(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	0.5440	0.5423	0.5406	0.5327	0.5313	0.5244	0.5244	0.5231	0.5271	0.5313	0.5342	0.5374	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Glazed Door (Uw = 0.95)			1.9800	0.9152	1.8121			(27)
Window (Uw = 0.95)			11.2800	0.9152	10.3237			(27)
Door			1.8900	0.8000	1.5120			(26)
External Wall 1	46.8500	15.1500	31.7000	0.1500	4.7550	14.0000	443.8000	(29a)
Total net area of external elements Aum(A, m2)			46.8500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		18.4028			(33)

Party Wall 1	31.7900	0.0000	0.0000	20.0000	635.8000 (32)
Party Floor 1	51.6300			40.0000	2065.2000 (32d)
Party Ceiling 1	51.6300			40.0000	2065.2000 (32b)
Internal Wall 1	48.6600			9.0000	437.9400 (32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 5647.9400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 109.3926 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	6.4900	0.0500	0.3245
E3 Sill	6.4900	0.0500	0.3245
E4 Jamb	18.2000	0.0500	0.9100
E7 Party floor between dwellings (in blocks of flats)	36.3200	0.0700	2.5424
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.1900	0.4430	2.7422
E16 Corner (normal)	2.5800	0.0900	0.2322
E17 Corner (inverted – internal area greater than external area)	2.5800	-0.0900	-0.2322
E18 Party wall between dwellings	10.3200	0.0600	0.6192
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	24.6400	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.4628 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.8656 (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	23.9121	23.8371	23.7635	23.4179	23.3532	23.0522	23.0522	22.9964	23.1681	23.3532	23.4840	23.6208	(38)
Heat transfer coeff	49.7778	49.7027	49.6291	49.2835	49.2188	48.9178	48.9178	48.8620	49.0337	49.2188	49.3496	49.4864	(39)

Average = Sum(39)m / 12 = 49.2832

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9641	0.9627	0.9612	0.9546	0.9533	0.9475	0.9475	0.9464	0.9497	0.9533	0.9558	0.9585	(40)
HLP (average)												0.9545	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7382 (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

23.0709	22.7283	22.2458	21.3561	20.6900	19.9513	19.5523	20.0314	20.5531	21.3435	22.2515	22.9929	(42b)

Hot water usage for other uses

32.4304	31.2512	30.0719	28.8926	27.7133	26.5340	26.5340	27.7133	28.8926	30.0719	31.2512	32.4304	(42c)

Average daily hot water use (litres/day) 50.8726 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	55.5014	53.9794	52.3176	50.2487	48.4033	46.4853	46.0863	47.7447	49.4457	51.4154	53.5026	55.4234	(44)
Energy conte	87.9006	76.8660	80.4103	68.7880	65.1601	57.1591	55.7374	59.1180	60.9715	69.7702	76.2243	86.7796	(45)

Energy content (annual) Total = Sum(45)m = 844.8850

Distribution loss (46)m = 0.15 x (45)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:												
Total storage loss												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month												
74.7155	65.3361	68.3487	58.4698	55.3861	48.5852	47.3768	50.2503	51.8258	59.3047	64.7907	73.7627	(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												
74.7155	65.3361	68.3487	58.4698	55.3861	48.5852	47.3768	50.2503	51.8258	59.3047	64.7907	73.7627	(64)

Total per year (kWh/year) = Sum(64)m = 718.1522 (64)
12Total per year (kWh/year) 718 (64)
Electric shower(s)

42.7346	38.0769	41.5785	39.6778	40.4224	38.5590	39.8443	40.4224	39.6778	41.5785	40.7966	42.7346	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 486.1034 (64a)

Heat gains from water heating, kWh/month												
29.3625	25.8532	27.4818	24.5369	23.9521	21.7861	21.8053	22.6682	22.8759	25.2208	26.3968	29.1243	(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	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
76.3972	84.5826	76.3972	78.9438	76.3972	78.9438	76.3972	76.3972	78.9438	76.3972	78.9438	76.3972	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
151.4660	153.0378	149.0770	140.6451	130.0013	119.9976	113.3145	111.7427	115.7035	124.1354	134.7793	144.7830	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	(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)													

	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	(71)
Water heating gains (Table 5)												
	39.4658	38.4721	36.9379	34.0790	32.1937	30.2584	29.3082	30.4680	31.7721	33.8989	36.6623	39.1456 (72)
Total internal gains												
	316.4013	325.1648	311.4845	302.7402	287.6645	278.2721	268.0922	267.6802	275.4917	283.5039	299.4576	309.3981 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	1.9800	36.7938	0.4700	0.7000	0.7700	16.6100	(77)
Northeast	11.2800	11.2829	0.4700	0.7000	0.7700	29.0175	(75)

Solar gains	45.6275	87.3590	145.1299	222.7349	288.6497	303.7910	285.7172	233.9078	171.5888	103.4531	56.4065	37.9119 (83)
Total gains	362.0289	412.5238	456.6144	525.4751	576.3142	582.0631	553.8094	501.5881	447.0805	386.9570	355.8642	347.3099 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	31.5175	31.5651	31.6119	31.8336	31.8755	32.0716	32.0716	32.1082	31.9958	31.8755	31.7910	31.7031	
alpha	3.1012	3.1043	3.1075	3.1222	3.1250	3.1381	3.1381	3.1405	3.1331	3.1250	3.1194	3.1135	
util living area													
	0.9557	0.9337	0.8949	0.8030	0.6645	0.4994	0.3762	0.4275	0.6444	0.8513	0.9334	0.9605	(86)
MIT	19.0679	19.3468	19.7605	20.3034	20.7013	20.9104	20.9723	20.9586	20.7989	20.2709	19.5874	19.0143	(87)
Th 2	20.1133	20.1146	20.1158	20.1214	20.1224	20.1273	20.1273	20.1282	20.1254	20.1224	20.1203	20.1181	(88)
util rest of house													
	0.9493	0.9245	0.8801	0.7764	0.6223	0.4411	0.3060	0.3534	0.5861	0.8246	0.9226	0.9548	(89)
MIT 2	18.3478	18.6215	19.0244	19.5420	19.8989	20.0728	20.1150	20.1086	19.9918	19.5246	18.8657	18.2986	(90)
Living area fraction										fLA = Living area / (4) =		0.6328	(91)
MIT	18.8035	19.0805	19.4902	20.0238	20.4066	20.6028	20.6575	20.6464	20.5025	19.9968	19.3224	18.7515	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8035	19.0805	19.4902	20.0238	20.4066	20.6028	20.6575	20.6464	20.5025	19.9968	19.3224	18.7515	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9377	0.9116	0.8681	0.7732	0.6365	0.4735	0.3491	0.3981	0.6123	0.8204	0.9108	0.9437	(94)
Useful gains	339.4751	376.0370	396.4084	406.3043	366.8173	275.5806	193.3208	199.6812	273.7298	317.4472	324.1170	327.7667	(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													
	721.9506	704.8065	644.6917	548.2204	428.5306	293.6425	198.4825	207.4902	313.9409	462.5004	603.1693	720.0999	(97)
Space heating kWh													
	284.5618	220.9331	184.7227	102.1795	45.9147	0.0000	0.0000	0.0000	0.0000	107.9196	200.9177	291.8960	(98a)
Space heating requirement - total per year (kWh/year)												1439.0452	
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													
	284.5618	220.9331	184.7227	102.1795	45.9147	0.0000	0.0000	0.0000	0.0000	107.9196	200.9177	291.8960	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1439.0452	
Space heating per m2											(98c) / (4) =	27.8723	(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	459.8272	361.9916	371.3515	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8715	0.9143	0.8874	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	400.7420	330.9638	329.5397	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	653.0543	621.5424	561.9656	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	181.6649	216.1904	172.9248	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	45.4162	54.0476	43.2312	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												142.6950	(107)
Energy for space heating												27.8723	(99)
Energy for space cooling												2.7638	(108)
Total												30.6361	(109)
Fabric Energy Efficiency (DFEE)												30.6	(109)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	51.6300 (1b)	x	2.5800 (2b)	=	133.2054 (1b)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.6300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	133.2054	(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) =	0.1501	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4001	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3101	(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	0.3954	0.3876	0.3799	0.3411	0.3334	0.2946	0.2946	0.2869	0.3101	0.3334	0.3489	0.3644	(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	0.5782	0.5751	0.5722	0.5582	0.5556	0.5434	0.5434	0.5411	0.5481	0.5556	0.5609	0.5664	(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			1.8900	1.0000	1.8900			(26)
TER Opening Type (Uw = 1.20)			11.0300	1.1450	12.6298			(27)
External Wall 1	46.8500	12.9200	33.9300	0.1800	6.1074			(29a)
Total net area of external elements Aum(A, m2)			46.8500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		20.6272			(33)
Party Wall 1			31.7900	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 109.3926 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E1 Steel lintel with perforated steel base plate	6.4900	0.0500	0.3245
E3 Sill	6.4900	0.0500	0.3245
E4 Jamb	18.2000	0.0500	0.9100
E7 Party floor between dwellings (in blocks of flats)	36.3200	0.0700	2.5424
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.1900	0.0200	0.1238
E16 Corner (normal)	2.5800	0.0900	0.2322
E17 Corner (inverted – internal area greater than external area)	2.5800	-0.0900	-0.2322
E18 Party wall between dwellings	10.3200	0.0600	0.6192
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	24.6400	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		4.8444	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	25.4716	(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	25.4150	25.2815	25.1508	24.5365	24.4215	23.8865	23.8865	23.7874	24.0926	24.4215	24.6540	24.8971	(38)
Heat transfer coeff													
	50.8865	50.7531	50.6223	50.0080	49.8931	49.3581	49.3581	49.2590	49.5642	49.8931	50.1256	50.3687	(39)
Average = Sum(39)m / 12 =												50.0075	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9856	0.9830	0.9805	0.9686	0.9664	0.9560	0.9560	0.9541	0.9600	0.9664	0.9709	0.9756	(40)
HLP (average)												0.9686	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7382	(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													
	23.0709	22.7283	22.2458	21.3561	20.6900	19.9513	19.5523	20.0314	20.5531	21.3435	22.2515	22.9929	(42b)
Hot water usage for other uses													
	32.4304	31.2512	30.0719	28.8926	27.7133	26.5340	26.5340	27.7133	28.8926	30.0719	31.2512	32.4304	(42c)
Average daily hot water use (litres/day)												50.8726	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	55.5014	53.9794	52.3176	50.2487	48.4033	46.4853	46.0863	47.7447	49.4457	51.4154	53.5026	55.4234	(44)
Energy conte	87.9006	76.8660	80.4103	68.7880	65.1601	57.1591	55.7374	59.1180	60.9715	69.7702	76.2243	86.7796	(45)
Energy content (annual)											Total = Sum(45)m =	844.8850	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	74.7155	65.3361	68.3487	58.4698	55.3861	48.5852	47.3768	50.2503	51.8258	59.3047	64.7907	73.7627	(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													
	74.7155	65.3361	68.3487	58.4698	55.3861	48.5852	47.3768	50.2503	51.8258	59.3047	64.7907	73.7627	(64)
										Total per year (kWh/year) = Sum(64)m =		718.1522	(64)
12Total per year (kWh/year)												718	(64)
Electric shower(s)													
	42.7346	38.0769	41.5785	39.6778	40.4224	38.5590	39.8443	40.4224	39.6778	41.5785	40.7966	42.7346	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		486.1034	(64a)
Heat gains from water heating, kWh/month													
	29.3625	25.8532	27.4818	24.5369	23.9521	21.7861	21.8053	22.6682	22.8759	25.2208	26.3968	29.1243	(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	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	76.5233	84.7223	76.5233	79.0741	76.5233	79.0741	76.5233	76.5233	79.0741	76.5233	79.0741	76.5233	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	151.4660	153.0378	149.0770	140.6451	130.0013	119.9976	113.3145	111.7427	115.7035	124.1354	134.7793	144.7830	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	(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)													
	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	(71)
Water heating gains (Table 5)													
	39.4658	38.4721	36.9379	34.0790	32.1937	30.2584	29.3082	30.4680	31.7721	33.8989	36.6623	39.1456	(72)
Total internal gains													
	316.5274	325.3044	311.6106	302.8705	287.7906	278.4024	268.2183	267.8063	275.6220	283.6300	299.5880	309.5242	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	9.3800	11.2829	0.6300	0.7000	0.7700	32.3442	(75)
Southeast	1.6500	36.7938	0.6300	0.7000	0.7700	18.5537	(77)

Solar gains	50.8980	97.4415	161.8602	248.3843	321.8695	338.7458	318.5953	260.8361	191.3602	115.3878	62.9205	42.2920	(83)
Total gains	367.4254	422.7459	473.4708	551.2548	609.6601	617.1482	586.8136	528.6424	466.9821	399.0178	362.5085	351.8162	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	30.8308	30.9118	30.9917	31.3724	31.4447	31.7855	31.7855	31.8495	31.6534	31.4447	31.2988	31.1478	
alpha	3.0554	3.0608	3.0661	3.0915	3.0963	3.1190	3.1190	3.1233	3.1102	3.0963	3.0866	3.0765	
util living area													
	0.9547	0.9310	0.8887	0.7896	0.6451	0.4788	0.3594	0.4107	0.6293	0.8446	0.9314	0.9596	(86)
MIT	19.0281	19.3249	19.7601	20.3249	20.7187	20.9186	20.9750	20.9622	20.8082	20.2765	19.5737	18.9833	(87)
Th 2	20.0954	20.0975	20.0996	20.1096	20.1115	20.1202	20.1202	20.1218	20.1168	20.1115	20.1077	20.1037	(88)
util rest of house													
	0.9482	0.9214	0.8732	0.7619	0.6022	0.4216	0.2914	0.3384	0.5706	0.8170	0.9202	0.9538	(89)
MIT 2	18.2959	18.5875	19.0111	19.5508	19.9025	20.0710	20.1091	20.1040	19.9903	19.5205	18.8430	18.2579	(90)
Living area fraction											fLA = Living area / (4) =	0.6328	(91)
MIT	18.7592	19.0541	19.4850	20.0406	20.4190	20.6074	20.6570	20.6470	20.5078	19.9988	19.3054	18.7169	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7592	19.0541	19.4850	20.0406	20.4190	20.6074	20.6570	20.6470	20.5078	19.9988	19.3054	18.7169	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9362	0.9081	0.8611	0.7596	0.6176	0.4538	0.3333	0.3822	0.5976	0.8131	0.9082	0.9424	(94)
Useful gains	343.9806	383.9057	407.7247	418.7192	376.5121	280.0499	195.5787	202.0597	279.0663	324.4376	329.2199	331.5639	(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													
	735.7788	718.3657	657.3320	557.1211	435.0157	296.5115	200.2466	209.2045	317.5983	468.9371	611.8008	731.1979	(97)
Space heating kWh													
	291.4978	224.7571	185.7079	99.6494	43.5267	0.0000	0.0000	0.0000	0.0000	107.5076	203.4582	297.3277	(98a)
Space heating requirement - total per year (kWh/year)												1453.4324	
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													
	291.4978	224.7571	185.7079	99.6494	43.5267	0.0000	0.0000	0.0000	0.0000	107.5076	203.4582	297.3277	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1453.4324	
Space heating per m2											(98c) / (4) =	28.1509	(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	463.9659	365.2497	374.3683	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8834	0.9227	0.8970	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	409.8507	337.0136	335.8228	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	693.9216	659.9833	593.4557	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	204.5311	240.2894	191.6789	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction											fC = cooled area / (4) =	1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	51.1328	60.0724	47.9197	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												159.1248	(107)
Energy for space heating												28.1509	(99)
Energy for space cooling												3.0820	(108)
Total												31.2330	(109)
Fabric Energy Efficiency (TFEE)												31.2	(109)

Full SAP Calculation Printout

Property Reference	Flat 203 WCS - Green	Issued on Date	06/05/2023
Assessment Reference	Flat 203 WCS - Green	Prop Type Ref	Flat 102 WCS - Green
Property	West Central Street, London, WC1A		

SAP Rating	85 B	DER	2.83	TER	12.20
Environmental	98 A	% DER < TER			76.80
CO_2 Emissions (t/year)	0.2	DFEE	29.56	TFEE	29.79
Compliance Check	See BREL	% DFEE < TFEE			0.79
% DPER < TPER	53.17	DPER	30.41	TPER	64.93

Assessor Details	Mr. Adrian Fell	Assessor ID	N222-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	74.0000 (1b)	x	2.5200 (2b)	=	186.4800	(1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	186.4800	(5)

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2. Ventilation rate

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

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1609 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.3109 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2409 (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	0.3072	0.3012	0.2951	0.2650	0.2590	0.2289	0.2289	0.2229	0.2409	0.2590	0.2710	0.2831	(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	0.5472	0.5453	0.5436	0.5351	0.5335	0.5262	0.5262	0.5248	0.5290	0.5335	0.5367	0.5401	(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 (Uw = 0.95)			19.9200	0.9152	18.2312			(27)
Glazed Doors (Uw = 0.95)			4.1000	0.9152	3.7524			(27)
Solid Door			2.0000	0.8000	1.6000			(26)
External Wall 1	68.5900	26.0200	42.5700	0.1500	6.3855	14.0000	595.9799	(29a)
Total net area of external elements Aum(A, m2)			68.5900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.9691			(33)

Party Wall 1	9.5800	0.0000	0.0000	20.0000	191.6000 (32)
Corridor Wall	34.0200	0.0000	0.0000	20.0000	680.4000 (32)
Party Floor 1	74.0000			40.0000	2960.0000 (32d)
Party Ceiling 1	74.0000			40.0000	2960.0000 (32b)
Internal Wall 1	88.7000			9.0000	798.3000 (32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 8186.2799 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 110.6254 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E16 Corner (normal)	10.0800	0.0900	0.9072
E17 Corner (inverted – internal area greater than external area)	2.5200	-0.0900	-0.2268
E18 Party wall between dwellings	2.5200	0.0600	0.1512
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.8600	0.4430	2.1530
E1 Steel lintel with perforated steel base plate	11.3900	0.0500	0.5695
E3 Sill	10.4400	0.0500	0.5220
E4 Jamb	41.0000	0.0500	2.0500
E7 Party floor between dwellings (in blocks of flats)	54.4400	0.0700	3.8108
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	34.6000	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.9369 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 39.9060 (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	33.6726	33.5599	33.4494	32.9303	32.8332	32.3811	32.3811	32.2974	32.5552	32.8332	33.0297	33.2351	(38)
Heat transfer coeff	73.5786	73.4659	73.3554	72.8363	72.7392	72.2871	72.2871	72.2034	72.4612	72.7392	72.9357	73.1411	(39)
Average = Sum(39)m / 12 =												72.8358	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9943	0.9928	0.9913	0.9843	0.9830	0.9769	0.9769	0.9757	0.9792	0.9830	0.9856	0.9884	(40)
HLP (average)												0.9843	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3392 (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

27.4046	26.9976	26.4245	25.3677	24.5764	23.6990	23.2251	23.7942	24.4139	25.3527	26.4313	27.3120	(42b)

Hot water usage for other uses

38.5857	37.1826	35.7795	34.3763	32.9732	31.5701	31.5701	32.9732	34.3763	35.7795	37.1826	38.5857	(42c)

Average daily hot water use (litres/day) 60.4863 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	65.9903	64.1802	62.2039	59.7441	57.5497	55.2691	54.7952	56.7674	58.7902	61.1322	63.6138	65.8977	(44)
Energy conte	104.5125	91.3917	95.6051	81.7866	77.4729	67.9598	66.2700	70.2899	72.4942	82.9558	90.6296	103.1798	(45)
Energy content (annual)										Total = Sum(45)m =		1004.5481	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	88.8356	77.6830	81.2644	69.5186	65.8520	57.7659	56.3295	59.7464	61.6201	70.5124	77.0351	87.7028	(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	88.8356	77.6830	81.2644	69.5186	65.8520	57.7659	56.3295	59.7464	61.6201	70.5124	77.0351	87.7028	(64)
									Total per year (kWh/year) = Sum(64)m =			853.8659	(64)
12Total per year (kWh/year)												854	(64)
Electric shower(s)	50.8051	45.2677	49.4306	47.1711	48.0562	45.8410	47.3690	48.0562	47.1711	49.4306	48.5012	50.8051	(64a)
						Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =						577.9048	(64a)
Heat gains from water heating, kWh/month	34.9102	30.7377	32.6738	29.1724	28.4770	25.9017	25.9246	26.9507	27.1978	29.9858	31.3841	34.6270	(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	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	104.1289	115.2856	104.1289	107.5999	104.1289	107.5999	104.1289	104.1289	107.5999	104.1289	107.5999	104.1289	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	206.4473	208.5895	203.1911	191.6984	177.1909	163.5559	154.4469	152.3047	157.7031	169.1958	183.7033	197.3383	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	(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)												
	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	(71)
Water heating gains (Table 5)												
	46.9223	45.7406	43.9163	40.5173	38.2756	35.9746	34.8449	36.2240	37.7747	40.3035	43.5890	46.5416 (72)
Total internal gains												
	415.5864	427.7037	409.3243	397.9034	377.6834	365.2183	351.5087	350.7455	361.1656	371.7161	392.9801	406.0968 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast	1.7000	11.2829	0.4700	0.7000	0.7700	4.3732 (75)
Southeast	11.5000	36.7938	0.4700	0.7000	0.7700	96.4722 (77)
Northwest	6.7200	11.2829	0.4700	0.7000	0.7700	17.2870 (81)
Southeast	2.0500	36.7938	0.4700	0.7000	0.7700	17.1972 (77)
Southwest	2.0500	36.7938	0.4700	0.7000	0.7700	17.1972 (79)

Solar gains	152.5268	267.0043	384.4372	508.3682	598.6518	607.1831	580.0374	510.7156	427.0459	300.2492	184.0022	129.6834 (83)
Total gains	568.1132	694.7079	793.7615	906.2716	976.3352	972.4015	931.5461	861.4611	788.2115	671.9654	576.9823	535.7801 (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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	30.9053	30.9527	30.9993	31.2202	31.2619	31.4574	31.4574	31.4939	31.3818	31.2619	31.1777	31.0902	
alpha	3.0604	3.0635	3.0666	3.0813	3.0841	3.0972	3.0972	3.0996	3.0921	3.0841	3.0785	3.0727	
util living area													
	0.9470	0.9087	0.8514	0.7443	0.6045	0.4495	0.3333	0.3729	0.5671	0.7979	0.9155	0.9544	(86)
MIT	19.1152	19.4943	19.9406	20.4340	20.7636	20.9300	20.9791	20.9702	20.8547	20.3965	19.6712	19.0386	(87)
Th 2	20.0881	20.0894	20.0906	20.0965	20.0976	20.1027	20.1027	20.1036	20.1007	20.0976	20.0953	20.0930	(88)
util rest of house													
	0.9394	0.8965	0.8323	0.7138	0.5610	0.3935	0.2683	0.3047	0.5086	0.7655	0.9022	0.9479	(89)
MIT 2	18.3747	18.7433	19.1721	19.6348	19.9246	20.0611	20.0937	20.0900	20.0076	19.6142	18.9260	18.3034	(90)
Living area fraction										fLA = Living area / (4) =		0.5274	(91)
MIT	18.7653	19.1394	19.5774	20.0563	20.3671	20.5194	20.5607	20.5543	20.4544	20.0268	19.3191	18.6911	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7653	19.1394	19.5774	20.0563	20.3671	20.5194	20.5607	20.5543	20.4544	20.0268	19.3191	18.6911	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9259	0.8817	0.8203	0.7124	0.5744	0.4200	0.3018	0.3394	0.5323	0.7627	0.8886	0.9352	(94)
Useful gains	526.0414	612.5484	651.1077	645.5969	560.8110	408.3674	281.1317	292.4215	419.5940	512.5310	512.7187	501.0547	(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													
	1064.3349	1046.1121	959.3007	812.5851	630.4415	427.8941	286.3067	299.9510	460.4458	685.6990	891.2048	1059.8980	(97)
Space heating kWh													
	400.4904	291.3548	229.2955	120.2315	51.8051	0.0000	0.0000	0.0000	0.0000	128.8370	272.5100	415.7794	(98a)
Space heating requirement - total per year (kWh/year)												1910.3037	
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													
	400.4904	291.3548	229.2955	120.2315	51.8051	0.0000	0.0000	0.0000	0.0000	128.8370	272.5100	415.7794	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1910.3037	
Space heating per m2											(98c) / (4) =	25.8149	(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	679.4988	534.9246	548.7457	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8996	0.9354	0.9180	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	611.2505	500.3432	503.7610	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1097.0516	1051.3314	971.4394	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	349.7768	409.9352	347.9527	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	87.4442	102.4838	86.9882	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												276.9162	(107)
Energy for space heating												25.8149	(99)

Energy for space cooling 3.7421 (108)
Total 29.5570 (109)
Fabric Energy Efficiency (DFEE) 29.6 (109)

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	74.0000 (1b)	x	2.5200 (2b)	=	186.4800 (1b)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 74.0000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	186.4800	(5)

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2. Ventilation rate

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

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1609	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4109	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3184	(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	0.4060	0.3980	0.3901	0.3503	0.3423	0.3025	0.3025	0.2945	0.3184	0.3423	0.3582	0.3742	(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	0.5824	0.5792	0.5761	0.5613	0.5586	0.5458	0.5458	0.5434	0.5507	0.5586	0.5642	0.5700	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.0000	1.0000	2.0000			(26)
TER Opening Type (Uw = 1.20)			16.5100	1.1450	18.9046			(27)
External Wall 1	68.5900	18.5100	50.0800	0.1800	9.0144			(29a)
Total net area of external elements Aum(A, m2)			68.5900					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.9190			(33)
Party Wall 1			9.5800	0.0000	0.0000			(32)
Corridor Wall			34.0200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 110.6254 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E16 Corner (normal)	10.0800	0.0900	0.9072
E17 Corner (inverted – internal area greater than external area)	2.5200	-0.0900	-0.2268
E18 Party wall between dwellings	2.5200	0.0600	0.1512
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.8600	0.0200	0.0972
E1 Steel lintel with perforated steel base plate	11.3900	0.0500	0.5695
E3 Sill	10.4400	0.0500	0.5220
E4 Jamb	41.0000	0.0500	2.0500
E7 Party floor between dwellings (in blocks of flats)	54.4400	0.0700	3.8108
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	34.6000	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.8811 (36)

Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 37.8001 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.8410	35.6440	35.4510	34.5443	34.3746	33.5849	33.5849	33.4387	33.8891	34.3746	34.7178	35.0766	(38)
Heat transfer coeff	73.6411	73.4441	73.2511	72.3443	72.1747	71.3850	71.3850	71.2387	71.6892	72.1747	72.5179	72.8767	(39)

Average = Sum(39)m / 12 = 72.3435

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9951	0.9925	0.9899	0.9776	0.9753	0.9647	0.9647	0.9627	0.9688	0.9753	0.9800	0.9848	(40)
HLP (average)												0.9776	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3392 (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

27.4046	26.9976	26.4245	25.3677	24.5764	23.6990	23.2251	23.7942	24.4139	25.3527	26.4313	27.3120	(42b)

Hot water usage for other uses

38.5857	37.1826	35.7795	34.3763	32.9732	31.5701	31.5701	32.9732	34.3763	35.7795	37.1826	38.5857	(42c)

Average daily hot water use (litres/day) 60.4863 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	65.9903	64.1802	62.2039	59.7441	57.5497	55.2691	54.7952	56.7674	58.7902	61.1322	63.6138	65.8977	(44)
Energy conte	104.5125	91.3917	95.6051	81.7866	77.4729	67.9598	66.2700	70.2899	72.4942	82.9558	90.6296	103.1798	(45)

Energy content (annual) Total = Sum(45)m = 1004.5481

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

88.8356	77.6830	81.2644	69.5186	65.8520	57.7659	56.3295	59.7464	61.6201	70.5124	77.0351	87.7028	(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

88.8356	77.6830	81.2644	69.5186	65.8520	57.7659	56.3295	59.7464	61.6201	70.5124	77.0351	87.7028	(64)

Total per year (kWh/year) = Sum(64)m = 853.8659 (64)

12Total per year (kWh/year) 854 (64)

Electric shower(s)

50.8051	45.2677	49.4306	47.1711	48.0562	45.8410	47.3690	48.0562	47.1711	49.4306	48.5012	50.8051	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 577.9048 (64a)

Heat gains from water heating, kWh/month

34.9102	30.7377	32.6738	29.1724	28.4770	25.9017	25.9246	26.9507	27.1978	29.9858	31.3841	34.6270	(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	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	104.1276	115.2841	104.1276	107.5985	104.1276	107.5985	104.1276	104.1276	107.5985	104.1276	107.5985	104.1276	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	206.4473	208.5895	203.1911	191.6984	177.1909	163.5559	154.4469	152.3047	157.7031	169.1958	183.7033	197.3383	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	(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)	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	(71)
Water heating gains (Table 5)	46.9223	45.7406	43.9163	40.5173	38.2756	35.9746	34.8449	36.2240	37.7747	40.3035	43.5890	46.5416	(72)
Total internal gains	415.5850	427.7021	409.3229	397.9020	377.6820	365.2169	351.5073	350.7441	361.1642	371.7147	392.9787	406.0954	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	1.1700	11.2829	0.6300	0.7000	0.7700	4.0344	(75)
Southeast	9.3100	36.7938	0.6300	0.7000	0.7700	104.6879	(77)
Southwest	1.4100	36.7938	0.6300	0.7000	0.7700	15.8550	(79)

Northwest			4.6200		11.2829		0.6300		0.7000		0.7700		15.9307 (81)
Solar gains	140.5081	245.9688	354.1600	468.3465	551.5362	559.4018	534.3899	470.5144	393.4183	276.5973	169.5039	119.4642 (83)	
Total gains	556.0931	673.6709	763.4829	866.2485	929.2182	924.6187	885.8972	821.2585	754.5825	648.3121	562.4826	525.5595 (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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	30.8791	30.9619	31.0435	31.4325	31.5064	31.8550	31.8550	31.9204	31.7198	31.5064	31.3573	31.2029	
alpha	3.0586	3.0641	3.0696	3.0955	3.1004	3.1237	3.1237	3.1280	3.1147	3.1004	3.0905	3.0802	
util living area	0.9496	0.9146	0.8619	0.7598	0.6230	0.4649	0.3455	0.3852	0.5820	0.8084	0.9198	0.9564 (86)	
MIT	19.0859	19.4538	19.8958	20.4039	20.7465	20.9255	20.9778	20.9686	20.8472	20.3779	19.6547	19.0245 (87)	
Th 2	20.0874	20.0896	20.0918	20.1020	20.1039	20.1129	20.1129	20.1145	20.1094	20.1039	20.1001	20.0960 (88)	
util rest of house	0.9424	0.9031	0.8437	0.7301	0.5796	0.4081	0.2791	0.3158	0.5234	0.7770	0.9070	0.9501 (89)	
MIT 2	18.3457	18.7048	19.1314	19.6136	19.9173	20.0683	20.1032	20.1001	20.0108	19.6036	18.9140	18.2918 (90)	
Living area fraction										fLA = Living area / (4) =		0.5274 (91)	
MIT	18.7361	19.0998	19.5346	20.0305	20.3547	20.5204	20.5645	20.5582	20.4520	20.0120	19.3046	18.6782 (92)	
Temperature adjustment												0.0000	
adjusted MIT	18.7361	19.0998	19.5346	20.0305	20.3547	20.5204	20.5645	20.5582	20.4520	20.0120	19.3046	18.6782 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9292	0.8883	0.8312	0.7276	0.5922	0.4347	0.3132	0.3511	0.5467	0.7735	0.8935	0.9377 (94)	
Useful gains	516.7098	598.4212	634.5900	630.2467	550.2942	401.9191	277.5028	288.3065	412.5594	501.4564	502.5964	492.8283 (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	1063.0907	1042.8948	954.7957	805.2261	624.6471	422.6299	283.0051	296.2233	455.3679	679.3058	885.0540	1055.1267 (97)	
Space heating kWh	406.5074	298.6863	238.2330	125.9851	55.3186	0.0000	0.0000	0.0000	0.0000	132.3200	275.3695	418.3500 (98a)	
Space heating requirement - total per year (kWh/year)												1950.7699	
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	406.5074	298.6863	238.2330	125.9851	55.3186	0.0000	0.0000	0.0000	0.0000	132.3200	275.3695	418.3500 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												1950.7699	
Space heating per m2											(98c) / (4) =	26.3618 (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	671.0188	528.2489	541.4144	0.0000	0.0000	0.0000	0.0000 (100)	
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8923	0.9304	0.9127	0.0000	0.0000	0.0000	0.0000 (101)	
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	598.7265	491.4980	494.1408	0.0000	0.0000	0.0000	0.0000 (102)	
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1041.2031	997.9770	924.4508	0.0000	0.0000	0.0000	0.0000 (103)	
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	318.5831	376.8204	320.1506	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	79.6458	94.2051	80.0376	0.0000	0.0000	0.0000	0.0000 (107)	
Space cooling requirement												253.8885 (107)	
Energy for space heating												26.3618 (99)	
Energy for space cooling												3.4309 (108)	
Total												29.7927 (109)	
Fabric Energy Efficiency (TFEE)												29.8 (109)	

Full SAP Calculation Printout

Property Reference	Flat 204 VL - Be Green	Issued on Date	06/05/2023
Assessment Reference	Flat 204 VL - Be Green	Prop Type Ref	Flat 103 VL - Be Green
Property	MFMTF, Vine Lane, London, WC1A		

SAP Rating	83 B	DER	3.67	TER	17.37
Environmental	97 A	% DER < TER			78.87
CO_2 Emissions (t/year)	0.17	DFEE	41.22	TFEE	44.54
Compliance Check	See BREL	% DFEE < TFEE			7.46
% DPER < TPER	58.12	DPER	38.99	TPER	93.10

Assessor Details	Mr. Adrian Fell	Assessor ID	N222-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	52.0000	(1b)	x 2.5800	(2b) =	134.1600	(1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		134.1600	(5)

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2. Ventilation rate

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	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) =	0.1491 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.2991 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2318 (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	0.2955	0.2897	0.2839	0.2550	0.2492	0.2202	0.2202	0.2144	0.2318	0.2492	0.2608	0.2723	(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	0.5437	0.5420	0.5403	0.5325	0.5310	0.5242	0.5242	0.5230	0.5269	0.5310	0.5340	0.5371	(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	
Glazed Door (Uw = 0.95)			15.1600	0.9152	13.8748			(27)
Window (Uw = 0.95)			0.9000	0.9152	0.8237			(27)
Door			1.8900	0.8000	1.5120			(26)
Heatloss Floor 1			52.0000	0.1200	6.2400	30.0000	1560.0000	(28b)
External Wall 1	50.3100	17.9500	32.3600	0.1500	4.8540	14.0000	453.0400	(29a)
Total net area of external elements Aum(A, m2)			102.3100					(31)

Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =	27.3045			(33)
Party Wall 1	23.2500	0.0000	0.0000	20.0000	465.0000 (32)
Party Ceiling 1	52.0000			40.0000	2080.0000 (32b)
Internal Wall 1	46.5400			9.0000	418.8600 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	4976.9000 (34)		
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		95.7096 (35)		
List of Thermal Bridges				
K1 Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	19.5000	0.0700	1.3650	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.7000	0.4430	2.5251	
E20 Exposed floor (normal)	19.5000	0.1250	2.4375	
E16 Corner (normal)	7.7400	0.0900	0.6966	
E17 Corner (inverted – internal area greater than external area)	2.5800	-0.0900	-0.2322	
E18 Party wall between dwellings	5.1600	0.0600	0.3096	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.3200	0.0000	0.0000	
P7 Party Wall - Exposed floor (normal)	12.3200	0.1600	1.9712	
E1 Steel lintel with perforated steel base plate	8.0400	0.0500	0.4020	
E3 Sill	7.1400	0.0500	0.3570	
E4 Jamb	25.4000	0.0500	1.2700	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			11.1018 (36)	
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	38.4063 (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	24.0697	23.9946	23.9210	23.5754	23.5107	23.2097	23.2097	23.1540	23.3256	23.5107	23.6415	23.7783	(38)
Heat transfer coeff	62.4759	62.4009	62.3273	61.9816	61.9170	61.6160	61.6160	61.5602	61.7319	61.9170	62.0478	62.1846	(39)
Average = Sum(39)m / 12 =												61.9813	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2015	1.2000	1.1986	1.1920	1.1907	1.1849	1.1849	1.1839	1.1872	1.1907	1.1932	1.1959	(40)
HLP (average)												1.1919	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7491	(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	23.1496	22.8058	22.3217	21.4290	20.7606	20.0194	19.6190	20.0998	20.6232	21.4163	22.3274	23.0714	(42b)
Hot water usage for other uses	32.5422	31.3589	30.1755	28.9922	27.8088	26.6255	26.6255	27.8088	28.9922	30.1755	31.3589	32.5422	(42c)
Average daily hot water use (litres/day)												51.0472	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	55.6919	54.1647	52.4972	50.4212	48.5694	46.6448	46.2445	47.9086	49.6154	51.5919	53.6863	55.6136	(44)
Energy conte	88.2023	77.1298	80.6862	69.0240	65.3837	57.3553	55.9287	59.3209	61.1808	70.0097	76.4860	87.0774	(45)
Energy content (annual)										Total = Sum(45)m =		847.7848	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	74.9719	65.5603	68.5833	58.6704	55.5762	48.7520	47.5394	50.4227	52.0037	59.5082	65.0131	74.0158	(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	74.9719	65.5603	68.5833	58.6704	55.5762	48.7520	47.5394	50.4227	52.0037	59.5082	65.0131	74.0158	(64)
									Total per year (kWh/year) = Sum(64)m =			720.6170	(64)
12Total per year (kWh/year)												721	(64)
Electric shower(s)	42.8812	38.2075	41.7211	39.8139	40.5610	38.6913	39.9810	40.5610	39.8139	41.7211	40.9366	42.8812	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			487.7707	(64a)
Heat gains from water heating, kWh/month	29.4633	25.9420	27.5761	24.6211	24.0343	21.8608	21.8801	22.7459	22.9544	25.3073	26.4874	29.2242	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.8814	85.1187	76.8814	79.4441	76.8814	79.4441	76.8814	76.8814	79.4441	76.8814	79.4441	76.8814	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	152.4259	154.0076	150.0218	141.5364	130.8251	120.7580	114.0326	112.4509	116.4367	124.9221	135.6334	145.7005	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	(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)	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	(71)
Water heating gains (Table 5)	39.6012	38.6041	37.0646	34.1960	32.3042	30.3622	29.4087	30.5725	31.8811	34.0152	36.7881	39.2799	(72)
Total internal gains	318.1446	326.9665	313.2039	304.4125	289.2467	279.8004	269.5588	269.1408	276.9980	285.0548	301.1016	311.0978	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	13.1800	11.2829	0.4700	0.7000	0.7700	33.9052	(75)
Southeast	1.9800	36.7938	0.4700	0.7000	0.7700	16.6100	(77)
Southwest	0.9000	36.7938	0.4700	0.7000	0.7700	7.5500	(79)

Solar gains	58.0652	110.1685	180.6511	273.9755	352.6409	370.2215	348.5556	286.7900	212.4837	129.8252	71.5997	48.3646	(83)
Total gains	376.2098	437.1350	493.8550	578.3881	641.8877	650.0220	618.1143	555.9309	489.4817	414.8800	372.7013	359.4625	(84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
tau	22.1281	22.1547	22.1809	22.3045	22.3278	22.4369	22.4369	22.4572	22.3948	22.3278	22.2808	22.2318	
alpha	2.4752	2.4770	2.4787	2.4870	2.4885	2.4958	2.4958	2.4971	2.4930	2.4885	2.4854	2.4821	
util living area	0.9473	0.9239	0.8845	0.7988	0.6737	0.5236	0.4053	0.4582	0.6626	0.8481	0.9254	0.9524	(86)
MIT	18.2843	18.6238	19.1523	19.8578	20.4309	20.7854	20.9180	20.8868	20.5963	19.8410	18.9481	18.2181	(87)
Th 2	19.9188	19.9200	19.9211	19.9264	19.9274	19.9321	19.9321	19.9329	19.9303	19.9274	19.9254	19.9233	(88)
util rest of house	0.9397	0.9132	0.8679	0.7700	0.6272	0.4553	0.3177	0.3675	0.5979	0.8194	0.9131	0.9456	(89)
MIT 2	17.4590	17.7919	18.3072	18.9820	19.5034	19.8025	19.8965	19.8804	19.6632	18.9847	18.1197	17.3969	(90)
Living area fraction										fLA = Living area / (4) =		0.5727	(91)
MIT	17.9316	18.2683	18.7912	19.4836	20.0346	20.3654	20.4815	20.4567	20.1975	19.4751	18.5941	17.8672	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.9316	18.2683	18.7912	19.4836	20.0346	20.3654	20.4815	20.4567	20.1975	19.4751	18.5941	17.8672	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9215	0.8926	0.8471	0.7566	0.6321	0.4841	0.3639	0.4135	0.6153	0.8052	0.8938	0.9282	(94)
Useful gains	346.6875	390.1926	418.3576	437.5929	405.7557	314.6735	224.9402	229.8788	301.1815	334.0497	333.1158	333.6672	(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	851.6490	834.1937	766.0744	655.9867	516.0541	355.2417	239.1639	249.7342	376.4130	549.5210	713.1866	849.8882	(97)
Space heating kWh	375.6913	298.3688	258.7013	157.2436	82.0620	0.0000	0.0000	0.0000	0.0000	160.3106	273.6510	384.0684	(98a)
Space heating requirement - total per year (kWh/year)												1990.0969	
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	375.6913	298.3688	258.7013	157.2436	82.0620	0.0000	0.0000	0.0000	0.0000	160.3106	273.6510	384.0684	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1990.0969	
Space heating per m2											(98c) / (4) =	38.2711	(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	579.1900	455.9581	467.8576	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7919	0.8447	0.8085	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	458.6667	385.1603	378.2846	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	732.2763	696.5027	625.2917	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	196.9989	231.6387	183.7733	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	49.2497	57.9097	45.9433	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												153.1027	(107)
Energy for space heating												38.2711	(99)
Energy for space cooling												2.9443	(108)

Total 41.2154 (109)
Fabric Energy Efficiency (DFEE) 41.2 (109)

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	52.0000 (1b)	x	2.5800 (2b)	=	134.1600	(1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	134.1600	(5)

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2. Ventilation rate
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		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) =	0.1491	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3991	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3093	(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	0.3943	0.3866	0.3789	0.3402	0.3325	0.2938	0.2938	0.2861	0.3093	0.3325	0.3479	0.3634	(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	0.5778	0.5747	0.5718	0.5579	0.5553	0.5432	0.5432	0.5409	0.5478	0.5553	0.5605	0.5660	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Opening Type (Uw = 1.20)			11.1000	1.1450	12.7099			(27)
Heatloss Floor 1			52.0000	0.1300	6.7600			(28b)
External Wall 1	50.3100	12.9900	37.3200	0.1800	6.7176			(29a)
Total net area of external elements Aum(A, m2)			102.3100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.0775			(33)
Party Wall 1			23.2500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 95.7096 (35)
List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E7	Party floor between dwellings (in blocks of flats)	19.5000	0.0700	1.3650
E23	Balcony within or between dwellings, balcony support penetrates wall insulation	5.7000	0.0200	0.1140
E20	Exposed floor (normal)	19.5000	0.3200	6.2400
E16	Corner (normal)	7.7400	0.0900	0.6966
E17	Corner (inverted – internal area greater than external area)	2.5800	-0.0900	-0.2322
E18	Party wall between dwellings	5.1600	0.0600	0.3096
P3	Party wall - Intermediate floor between dwellings (in blocks of flats)	12.3200	0.0000	0.0000
P7	Party Wall - Exposed floor (normal)	12.3200	0.1600	1.9712
E1	Steel lintel with perforated steel base plate	8.0400	0.0500	0.4020
E3	Sill	7.1400	0.0500	0.3570
E4	Jamb	25.4000	0.0500	1.2700

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 12.4932 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 40.5707 (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	25.5786	25.4450	25.3140	24.6986	24.5834	24.0474	24.0474	23.9482	24.2539	24.5834	24.8163	25.0599	(38)
Heat transfer coeff	66.1494	66.0157	65.8847	65.2693	65.1541	64.6182	64.6182	64.5189	64.8246	65.1541	65.3871	65.6306	(39)

Average = Sum(39)m / 12 = 65.2687

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2721	1.2695	1.2670	1.2552	1.2530	1.2427	1.2427	1.2407	1.2466	1.2530	1.2574	1.2621	(40)
HLP (average)												1.2552	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7491 (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

23.1496	22.8058	22.3217	21.4290	20.7606	20.0194	19.6190	20.0998	20.6232	21.4163	22.3274	23.0714	(42b)

Hot water usage for other uses

32.5422	31.3589	30.1755	28.9922	27.8088	26.6255	26.6255	27.8088	28.9922	30.1755	31.3589	32.5422	(42c)

Average daily hot water use (litres/day) 51.0472 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	55.6919	54.1647	52.4972	50.4212	48.5694	46.6448	46.2445	47.9086	49.6154	51.5919	53.6863	55.6136	(44)
Energy conte	88.2023	77.1298	80.6862	69.0240	65.3837	57.3553	55.9287	59.3209	61.1808	70.0097	76.4860	87.0774	(45)

Energy content (annual) Total = Sum(45)m = 847.7848

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

74.9719	65.5603	68.5833	58.6704	55.5762	48.7520	47.5394	50.4227	52.0037	59.5082	65.0131	74.0158	(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

74.9719	65.5603	68.5833	58.6704	55.5762	48.7520	47.5394	50.4227	52.0037	59.5082	65.0131	74.0158	(64)

Total per year (kWh/year) = Sum(64)m = 720.6170 (64)

12Total per year (kWh/year) 721 (64)

Electric shower(s)

42.8812	38.2075	41.7211	39.8139	40.5610	38.6913	39.9810	40.5610	39.8139	41.7211	40.9366	42.8812	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 487.7707 (64a)

Heat gains from water heating, kWh/month

29.4633	25.9420	27.5761	24.6211	24.0343	21.8608	21.8801	22.7459	22.9544	25.3073	26.4874	29.2242	(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	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	77.0119	85.2631	77.0119	79.5789	77.0119	79.5789	77.0119	77.0119	79.5789	77.0119	79.5789	77.0119	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	152.4259	154.0076	150.0218	141.5364	130.8251	120.7580	114.0326	112.4509	116.4367	124.9221	135.6334	145.7005	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	(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)	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	(71)
Water heating gains (Table 5)	39.6012	38.6041	37.0646	34.1960	32.3042	30.3622	29.4087	30.5725	31.8811	34.0152	36.7881	39.2799	(72)
Total internal gains	318.2750	327.1109	313.3344	304.5474	289.3772	279.9353	269.6893	269.2713	277.1328	285.1853	301.2365	311.2283	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	9.1100	11.2829	0.6300	0.7000	0.7700	31.4132	(75)
Southeast	1.3700	36.7938	0.6300	0.7000	0.7700	15.4052	(77)

Southwest				0.6200		36.7938		0.6300		0.7000		0.7700	6.9717 (79)
Solar gains	53.7901	102.0587	167.3563	253.8173	326.6983	342.9869	322.9142	265.6903	196.8478	120.2693	66.3283	44.8036 (83)	
Total gains	372.0652	429.1696	480.6906	558.3646	616.0755	622.9221	592.6035	534.9616	473.9806	405.4546	367.5648	356.0319 (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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	20.8993	20.9416	20.9832	21.1811	21.2185	21.3945	21.3945	21.4274	21.3263	21.2185	21.1429	21.0645	
alpha	2.3933	2.3961	2.3989	2.4121	2.4146	2.4263	2.4263	2.4285	2.4218	2.4146	2.4095	2.4043	
util living area													
	0.9497	0.9289	0.8941	0.8170	0.7012	0.5544	0.4341	0.4867	0.6870	0.8594	0.9296	0.9543 (86)	
MIT	18.1014	18.4353	18.9690	19.7056	20.3246	20.7342	20.8945	20.8579	20.5265	19.7219	18.8008	18.0470 (87)	
Th 2	19.8628	19.8648	19.8668	19.8761	19.8779	19.8860	19.8860	19.8875	19.8829	19.8779	19.8743	19.8706 (88)	
util rest of house													
	0.9423	0.9185	0.8782	0.7889	0.6543	0.4823	0.3387	0.3893	0.6211	0.8313	0.9175	0.9476 (89)	
MIT 2	17.2437	17.5722	18.0947	18.8054	19.3741	19.7256	19.8407	19.8221	19.5697	18.8394	17.9433	17.1953 (90)	
Living area fraction										fLA = Living area / (4) =			0.5727 (91)
MIT	17.7349	18.0665	18.5954	19.3209	19.9185	20.3032	20.4442	20.4153	20.1176	19.3448	18.4344	17.6831 (92)	
Temperature adjustment												0.0000	
adjusted MIT	17.7349	18.0665	18.5954	19.3209	19.9185	20.3032	20.4442	20.4153	20.1176	19.3448	18.4344	17.6831 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9237	0.8973	0.8562	0.7729	0.6561	0.5106	0.3881	0.4374	0.6362	0.8154	0.8976	0.9299 (94)	
Useful gains	343.6669	385.1082	411.5620	431.5767	404.2204	318.0600	229.9665	234.0147	301.5464	330.6075	329.9237	331.0688 (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													
	888.7091	869.1938	796.8998	680.1666	535.4663	368.5318	248.4029	259.0648	390.0902	569.7586	741.1203	884.9018 (97)	
Space heating kWh													
	405.5114	325.3055	286.6913	178.9847	97.6469	0.0000	0.0000	0.0000	0.0000	177.9284	296.0615	412.0517 (98a)	
Space heating requirement - total per year (kWh/year)												2180.1815	
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													
	405.5114	325.3055	286.6913	178.9847	97.6469	0.0000	0.0000	0.0000	0.0000	177.9284	296.0615	412.0517 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												2180.1815	
Space heating per m2											(98c) / (4) =	41.9266 (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	607.4107	478.1744	490.3436	0.0000	0.0000	0.0000	0.0000 (100)	
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7567	0.8142	0.7762	0.0000	0.0000	0.0000	0.0000 (101)	
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	459.6269	389.3400	380.5888	0.0000	0.0000	0.0000	0.0000 (102)	
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	700.4550	666.5446	600.6457	0.0000	0.0000	0.0000	0.0000 (103)	
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	173.3962	206.2403	163.7223	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	43.3491	51.5601	40.9306	0.0000	0.0000	0.0000	0.0000 (107)	
Space cooling requirement												135.8397 (107)	
Energy for space heating												41.9266 (99)	
Energy for space cooling												2.6123 (108)	
Total												44.5389 (109)	
Fabric Energy Efficiency (TFEE)												44.5 (109)	

Full SAP Calculation Printout

Property Reference	Flat 205 VL - Be Green	Issued on Date	06/05/2023
Assessment Reference	Flat 205 VL - Be Green	Prop Type Ref	Flat 103 VL - Be Green
Property	MFMTF, Vine Lane, London, WC1A		

SAP Rating	83 B	DER	3.50	TER	15.76
Environmental	98 A	% DER < TER			77.79
CO_2 Emissions (t/year)	0.17	DFEE	37.80	TFEE	37.14
Compliance Check	See BREL	% DFEE < TFEE			-1.78
% DPER < TPER	55.94	DPER	37.21	TPER	84.44

Assessor Details	Mr. Adrian Fell	Assessor ID	N222-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	52.0000 (1b)	x	2.5800 (2b)	=	134.1600	(1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	134.1600	(5)

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2. Ventilation rate

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		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) =	0.1491	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2991	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2318	(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	0.2955	0.2897	0.2839	0.2550	0.2492	0.2202	0.2202	0.2144	0.2318	0.2492	0.2608	0.2723	(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	0.5437	0.5420	0.5403	0.5325	0.5310	0.5242	0.5242	0.5230	0.5269	0.5310	0.5340	0.5371	(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	
Glazed Door (Uw = 0.95)			17.1000	0.9152	15.6503			(27)
Window (Uw = 0.95)			1.8000	0.9152	1.6474			(27)
Door			1.8900	0.8000	1.5120			(26)
External Wall 1	74.4300	20.7900	53.6400	0.1500	8.0460	14.0000	750.9600	(29a)
Total net area of external elements Aum(A, m2)			74.4300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.8557			(33)

Party Wall 1	9.0300	0.0000	0.0000	20.0000	180.6000 (32)
Party Floor 1	52.0000			40.0000	2080.0000 (32d)
Party Ceiling 1	52.0000			40.0000	2080.0000 (32b)
Internal Wall 1	52.8900			9.0000	476.0100 (32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 5567.5700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 107.0687 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	57.7000	0.0700	4.0390
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.3000	0.4430	1.9049
E16 Corner (normal)	10.3200	0.0900	0.9288
E17 Corner (inverted – internal area greater than external area)	2.5800	-0.0900	-0.2322
E18 Party wall between dwellings	2.5800	0.0600	0.1548
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.0000	0.0000	0.0000
E1 Steel lintel with perforated steel base plate	9.6000	0.0500	0.4800
E3 Sill	8.7000	0.0500	0.4350
E4 Jamb	25.4000	0.0500	1.2700

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.9803 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 35.8360 (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	24.0697	23.9946	23.9210	23.5754	23.5107	23.2097	23.2097	23.1540	23.3256	23.5107	23.6415	23.7783	(38)
Heat transfer coeff	59.9057	59.8306	59.7570	59.4114	59.3467	59.0457	59.0457	58.9899	59.1616	59.3467	59.4775	59.6143	(39)
Average = Sum(39)m / 12 =												59.4111	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1520	1.1506	1.1492	1.1425	1.1413	1.1355	1.1355	1.1344	1.1377	1.1413	1.1438	1.1464	(40)
HLP (average)												1.1425	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7491 (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

23.1496	22.8058	22.3217	21.4290	20.7606	20.0194	19.6190	20.0998	20.6232	21.4163	22.3274	23.0714	(42b)

Hot water usage for other uses

32.5422	31.3589	30.1755	28.9922	27.8088	26.6255	26.6255	27.8088	28.9922	30.1755	31.3589	32.5422	(42c)

Average daily hot water use (litres/day) 51.0472 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	55.6919	54.1647	52.4972	50.4212	48.5694	46.6448	46.2445	47.9086	49.6154	51.5919	53.6863	55.6136	(44)
Energy conte	88.2023	77.1298	80.6862	69.0240	65.3837	57.3553	55.9287	59.3209	61.1808	70.0097	76.4860	87.0774	(45)
Energy content (annual)										Total = Sum(45)m =		847.7848	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	74.9719	65.5603	68.5833	58.6704	55.5762	48.7520	47.5394	50.4227	52.0037	59.5082	65.0131	74.0158	(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	74.9719	65.5603	68.5833	58.6704	55.5762	48.7520	47.5394	50.4227	52.0037	59.5082	65.0131	74.0158	(64)
									Total per year (kWh/year) = Sum(64)m =			720.6170	(64)
12Total per year (kWh/year)												721	(64)
Electric shower(s)	42.8812	38.2075	41.7211	39.8139	40.5610	38.6913	39.9810	40.5610	39.8139	41.7211	40.9366	42.8812	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			487.7707	(64a)
Heat gains from water heating, kWh/month	29.4633	25.9420	27.5761	24.6211	24.0343	21.8608	21.8801	22.7459	22.9544	25.3073	26.4874	29.2242	(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	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.8814	85.1187	76.8814	79.4441	76.8814	79.4441	76.8814	76.8814	79.4441	76.8814	79.4441	76.8814	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	152.4259	154.0076	150.0218	141.5364	130.8251	120.7580	114.0326	112.4509	116.4367	124.9221	135.6334	145.7005	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	(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)													

	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	(71)
Water heating gains (Table 5)												
	39.6012	38.6041	37.0646	34.1960	32.3042	30.3622	29.4087	30.5725	31.8811	34.0152	36.7881	39.2799 (72)
Total internal gains												
	318.1446	326.9665	313.2039	304.4125	289.2467	279.8004	269.5588	269.1408	276.9980	285.0548	301.1016	311.0978 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	11.2800	11.2829	0.4700	0.7000	0.7700	29.0175	(75)
Southeast	5.8200	36.7938	0.4700	0.7000	0.7700	48.8233	(77)
Northwest	1.8000	11.2829	0.4700	0.7000	0.7700	4.6305	(81)

Solar gains	82.4713	151.6556	237.1887	343.6478	430.3325	447.1985	422.8332	355.1083	273.5739	175.6161	100.8169	69.2612 (83)
Total gains	400.6159	478.6221	550.3925	648.0604	719.5792	726.9990	692.3919	624.2491	550.5719	460.6709	401.9186	380.3591 (84)

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7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	25.8164	25.8488	25.8806	26.0312	26.0595	26.1924	26.1924	26.2171	26.1410	26.0595	26.0022	25.9426	
alpha	2.7211	2.7233	2.7254	2.7354	2.7373	2.7462	2.7462	2.7478	2.7427	2.7373	2.7335	2.7295	
util living area													
	0.9486	0.9191	0.8701	0.7690	0.6295	0.4745	0.3589	0.4086	0.6162	0.8287	0.9233	0.9546	(86)
MIT	18.6679	19.0317	19.5418	20.1685	20.6268	20.8755	20.9573	20.9385	20.7395	20.1118	19.2824	18.5957	(87)
Th 2	19.9586	19.9597	19.9609	19.9663	19.9673	19.9720	19.9720	19.9728	19.9701	19.9673	19.9652	19.9631	(88)
util rest of house													
	0.9409	0.9075	0.8516	0.7375	0.5819	0.4099	0.2808	0.3261	0.5507	0.7970	0.9102	0.9478	(89)
MIT 2	17.8494	18.2046	18.6980	19.2894	19.6960	19.8994	19.9543	19.9456	19.8036	19.2552	18.4599	17.7818	(90)
Living area fraction										fLA = Living area / (4) =		0.6206	(91)
MIT	18.3573	18.7179	19.2216	19.8350	20.2736	20.5052	20.5768	20.5618	20.3844	19.7868	18.9703	18.2868	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3573	18.7179	19.2216	19.8350	20.2736	20.5052	20.5768	20.5618	20.3844	19.7868	18.9703	18.2868	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9259	0.8907	0.8364	0.7332	0.5967	0.4442	0.3274	0.3743	0.5783	0.7908	0.8948	0.9336	(94)
Useful gains	370.9257	426.2933	460.3650	475.1542	429.3435	322.9102	226.7055	233.6814	318.3786	364.2762	359.6476	355.0879	(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													
	842.1125	826.7318	760.2053	649.6609	508.8174	348.6751	234.8108	245.5039	371.7949	545.2045	706.0175	839.7772	(97)
Space heating kWh													
	350.5630	269.0947	223.0812	125.6448	59.1286	0.0000	0.0000	0.0000	0.0000	134.6107	249.3863	360.6088	(98a)
Space heating requirement - total per year (kWh/year)												1772.1180	
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													
	350.5630	269.0947	223.0812	125.6448	59.1286	0.0000	0.0000	0.0000	0.0000	134.6107	249.3863	360.6088	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1772.1180	
Space heating per m2											(98c) / (4) =	34.0792	(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	555.0294	436.9381	448.3235	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8567	0.8997	0.8715	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	475.4845	393.1303	390.7324	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	822.2494	783.3207	705.1441	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	249.6707	290.3017	233.9224	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	62.4177	72.5754	58.4806	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												193.4737	(107)
Energy for space heating												34.0792	(99)
Energy for space cooling												3.7206	(108)
Total												37.7998	(109)
Fabric Energy Efficiency (DFEE)												37.8	(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		52.0000 (1b)	x	2.5800 (2b)	=	134.1600 (1b) -	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.0000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	134.1600	(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) =	0.1491	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3991	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3093	(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	0.3943	0.3866	0.3789	0.3402	0.3325	0.2938	0.2938	0.2861	0.3093	0.3325	0.3479	0.3634	(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	0.5778	0.5747	0.5718	0.5579	0.5553	0.5432	0.5432	0.5409	0.5478	0.5553	0.5605	0.5660	(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			1.8900	1.0000	1.8900			(26)
TER Opening Type (Uw = 1.20)			11.1100	1.1450	12.7214			(27)
External Wall 1	74.4300	13.0000	61.4300	0.1800	11.0574			(29a)
Total net area of external elements Aum(A, m2)			74.4300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.6688			(33)
Party Wall 1			9.0300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K				107.0687	(35)
List of Thermal Bridges					
K1 Element	Length	Psi-value	Total		
E7 Party floor between dwellings (in blocks of flats)	57.7000	0.0700	4.0390		
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.3000	0.0200	0.0860		
E16 Corner (normal)	10.3200	0.0900	0.9288		
E17 Corner (inverted – internal area greater than external area)	2.5800	-0.0900	-0.2322		
E18 Party wall between dwellings	2.5800	0.0600	0.1548		
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.0000	0.0000	0.0000		
E1 Steel lintel with perforated steel base plate	9.6000	0.0500	0.4800		
E3 Sill	8.7000	0.0500	0.4350		
E4 Jamb	25.4000	0.0500	1.2700		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				7.1614	(36)
Point Thermal bridges			(36a) =	0.0000	
Total fabric heat loss			(33) + (36) + (36a) =	32.8302	(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	25.5786	25.4450	25.3140	24.6986	24.5834	24.0474	24.0474	23.9482	24.2539	24.5834	24.8163	25.0599	(38)
Heat transfer coeff													
	58.4088	58.2751	58.1441	57.5287	57.4136	56.8776	56.8776	56.7783	57.0841	57.4136	57.6465	57.8900	(39)
Average = Sum(39)m / 12 =												57.5282	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1232	1.1207	1.1182	1.1063	1.1041	1.0938	1.0938	1.0919	1.0978	1.1041	1.1086	1.1133	(40)
HLP (average)												1.1063	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7491	(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													
	23.1496	22.8058	22.3217	21.4290	20.7606	20.0194	19.6190	20.0998	20.6232	21.4163	22.3274	23.0714	(42b)
Hot water usage for other uses													
	32.5422	31.3589	30.1755	28.9922	27.8088	26.6255	26.6255	27.8088	28.9922	30.1755	31.3589	32.5422	(42c)
Average daily hot water use (litres/day)												51.0472	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	55.6919	54.1647	52.4972	50.4212	48.5694	46.6448	46.2445	47.9086	49.6154	51.5919	53.6863	55.6136	(44)
Energy conte	88.2023	77.1298	80.6862	69.0240	65.3837	57.3553	55.9287	59.3209	61.1808	70.0097	76.4860	87.0774	(45)
Energy content (annual)										Total = Sum(45)m =		847.7848	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	74.9719	65.5603	68.5833	58.6704	55.5762	48.7520	47.5394	50.4227	52.0037	59.5082	65.0131	74.0158	(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													
	74.9719	65.5603	68.5833	58.6704	55.5762	48.7520	47.5394	50.4227	52.0037	59.5082	65.0131	74.0158	(64)
									Total per year (kWh/year) = Sum(64)m =			720.6170	(64)
12Total per year (kWh/year)												721	(64)
Electric shower(s)													
	42.8812	38.2075	41.7211	39.8139	40.5610	38.6913	39.9810	40.5610	39.8139	41.7211	40.9366	42.8812	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							487.7707	(64a)
Heat gains from water heating, kWh/month													
	29.4633	25.9420	27.5761	24.6211	24.0343	21.8608	21.8801	22.7459	22.9544	25.3073	26.4874	29.2242	(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	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	77.0079	85.2588	77.0079	79.5748	77.0079	79.5748	77.0079	77.0079	79.5748	77.0079	79.5748	77.0079	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	152.4259	154.0076	150.0218	141.5364	130.8251	120.7580	114.0326	112.4509	116.4367	124.9221	135.6334	145.7005	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	(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)													
	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	(71)
Water heating gains (Table 5)													
	39.6012	38.6041	37.0646	34.1960	32.3042	30.3622	29.4087	30.5725	31.8811	34.0152	36.7881	39.2799	(72)
Total internal gains													
	318.2711	327.1066	313.3304	304.5433	289.3733	279.9312	269.6853	269.2674	277.1287	285.1813	301.2324	311.2244	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	6.6300	11.2829	0.6300	0.7000	0.7700	22.8617	(75)
Southeast	3.4200	36.7938	0.6300	0.7000	0.7700	38.4568	(77)
Northwest	1.0600	11.2829	0.6300	0.7000	0.7700	3.6551	(81)

Solar gains	64.9735	119.4818	186.8753	270.7613	339.0677	352.3596	333.1604	279.7938	215.5454	138.3607	79.4273	54.5659	(83)
Total gains	383.2446	446.5883	500.2057	575.3045	628.4409	632.2908	602.8457	549.0611	492.6742	423.5421	380.6597	365.7903	(84)

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7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	26.4780	26.5387	26.5985	26.8830	26.9370	27.1908	27.1908	27.2383	27.0925	26.9370	26.8281	26.7153	
alpha	2.7652	2.7692	2.7732	2.7922	2.7958	2.8127	2.8127	2.8159	2.8062	2.7958	2.7885	2.7810	
util living area	0.9527	0.9286	0.8889	0.8019	0.6740	0.5169	0.3939	0.4430	0.6503	0.8472	0.9300	0.9578	(86)
MIT	18.6837	19.0113	19.4851	20.1040	20.5784	20.8573	20.9510	20.9311	20.7186	20.0899	19.2940	18.6306	(87)
Th 2	19.9819	19.9840	19.9860	19.9957	19.9975	20.0059	20.0059	20.0075	20.0027	19.9975	19.9938	19.9900	(88)
util rest of house	0.9457	0.9182	0.8726	0.7733	0.6281	0.4512	0.3123	0.3581	0.5865	0.8182	0.9180	0.9515	(89)
MIT 2	17.8810	18.2026	18.6642	19.2573	19.6855	19.9208	19.9849	19.9761	19.8190	19.2602	18.4917	17.8345	(90)
Living area fraction										fLA = Living area / (4) =		0.6206	(91)
MIT	18.3792	18.7044	19.1736	19.7827	20.2396	20.5020	20.5844	20.5688	20.3773	19.7751	18.9896	18.3286	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3792	18.7044	19.1736	19.7827	20.2396	20.5020	20.5844	20.5688	20.3773	19.7751	18.9896	18.3286	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9315	0.9022	0.8572	0.7666	0.6398	0.4848	0.3606	0.4072	0.6118	0.8109	0.9033	0.9381	(94)
Useful gains	356.9823	402.9021	428.7835	441.0267	402.0624	306.5529	217.3785	223.5704	301.3991	343.4297	343.8614	343.1371	(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	822.3467	804.4548	736.8974	626.0701	490.2903	335.6906	226.6248	236.6953	358.3322	526.7746	685.3922	817.9030	(97)
Space heating kWh	346.2311	269.8434	229.2367	133.2312	65.6416	0.0000	0.0000	0.0000	0.0000	136.4086	245.9022	353.2258	(98a)
Space heating requirement - total per year (kWh/year)												1779.7207	
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	346.2311	269.8434	229.2367	133.2312	65.6416	0.0000	0.0000	0.0000	0.0000	136.4086	245.9022	353.2258	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1779.7207	
Space heating per m2											(98c) / (4) =	34.2254	(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	534.6495	420.8943	431.5155	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8323	0.8817	0.8525	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	444.9901	371.1227	367.8756	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	711.4098	678.5203	617.1297	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	191.8222	228.7038	185.4451	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	47.9556	57.1759	46.3613	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												151.4928	(107)
Energy for space heating												34.2254	(99)
Energy for space cooling												2.9133	(108)
Total												37.1387	(109)
Fabric Energy Efficiency (TFEE)												37.1	(109)

Full SAP Calculation Printout

Property Reference	Flat 301 VL - Be Green	Issued on Date	06/05/2023
Assessment Reference	Flat 301 VL - Be Green	Prop Type Ref	Flat 103 VL - Be Green
Property	MFMTF, Vine Lane, London, WC1A		

SAP Rating	83 B	DER	3.42	TER	16.09
Environmental	97 A	% DER < TER			78.74
CO_2 Emissions (t/year)	0.21	DFEE	41.97	TFEE	46.76
Compliance Check	See BREL	% DFEE < TFEE			10.23
% DPER < TPER	57.45	DPER	36.21	TPER	85.08

Assessor Details	Mr. Adrian Fell	Assessor ID	N222-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	67.0000 (1b)	x	2.4000 (2b)	=	160.8000	(1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	67.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	160.8000	(5)

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2. Ventilation rate

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	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) =	0.1244	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2744	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2126	(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	0.2711	0.2658	0.2605	0.2339	0.2286	0.2020	0.2020	0.1967	0.2126	0.2286	0.2392	0.2499	(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	0.5368	0.5353	0.5339	0.5274	0.5261	0.5204	0.5204	0.5193	0.5226	0.5261	0.5286	0.5312	(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	
Glazed Door (Uw = 0.95)			23.4600	0.9152	21.4711			(27)
Window (Uw = 0.95)			2.4000	0.9152	2.1965			(27)
Door			1.8900	0.8000	1.5120			(26)
External Wall 1	66.4800	27.7500	38.7300	0.1500	5.8095	14.0000	542.2200	(29a)
External Roof 1	67.0000		67.0000	0.1000	6.7000	9.0000	603.0000	(30)
Total net area of external elements Aum(A, m2)			133.4800					(31)

Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	37.6891		(33)
Party Wall 1	12.5500	0.0000	0.0000	20.0000	251.0000	(32)
Party Floor 1	67.0000			40.0000	2680.0000	(32d)
Internal Wall 1	97.6300			9.0000	878.6700	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	4954.8900	(34)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		73.9536	(35)	
List of Thermal Bridges				
K1 Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	27.7000	0.0700	1.9390	
E16 Corner (normal)	7.2000	0.0900	0.6480	
E17 Corner (inverted – internal area greater than external area)	2.4000	-0.0900	-0.2160	
E18 Party wall between dwellings	2.4000	0.0600	0.1440	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	5.2300	0.0000	0.0000	
E1 Steel lintel with perforated steel base plate	13.1500	0.0500	0.6575	
E3 Sill	12.2500	0.0500	0.6125	
E4 Jamb	36.6000	0.0500	1.8300	
P4 Party wall - Roof (insulation at ceiling level)	5.2300	0.1200	0.6276	
E15 Flat roof with parapet	27.7000	0.3000	8.3100	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			14.5526	(36)
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =		52.2417	(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	28.4823	28.4065	28.3323	27.9836	27.9184	27.6147	27.6147	27.5585	27.7317	27.9184	28.0504	28.1883	(38)
Heat transfer coeff	80.7240	80.6483	80.5740	80.2254	80.1601	79.8565	79.8565	79.8002	79.9734	80.1601	80.2921	80.4301	(39)
Average = Sum(39)m / 12 =												80.2251	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2048	1.2037	1.2026	1.1974	1.1964	1.1919	1.1919	1.1910	1.1936	1.1964	1.1984	1.2004	(40)
HLP (average)												1.1974	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1711	(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	26.1929	25.8039	25.2561	24.2461	23.4898	22.6512	22.1982	22.7422	23.3344	24.2318	25.2626	26.1044	(42b)
Hot water usage for other uses	36.8647	35.5242	34.1837	32.8431	31.5026	30.1621	30.1621	31.5026	32.8431	34.1837	35.5242	36.8647	(42c)
Average daily hot water use (litres/day)												57.7984	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	63.0577	61.3281	59.4398	57.0892	54.9924	52.8132	52.3603	54.2448	56.1776	58.4155	60.7868	62.9691	(44)
Energy conte	99.8679	87.3305	91.3568	78.1523	74.0303	64.9400	63.3252	67.1663	69.2726	79.2692	86.6020	98.5944	(45)
Energy content (annual)										Total = Sum(45)m =		959.9076	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	84.8878	74.2309	77.6533	66.4295	62.9258	55.1990	53.8264	57.0914	58.8817	67.3788	73.6117	83.8053	(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	84.8878	74.2309	77.6533	66.4295	62.9258	55.1990	53.8264	57.0914	58.8817	67.3788	73.6117	83.8053	(64)
								Total per year (kWh/year) = Sum(64)m =				815.9214	(64)
12Total per year (kWh/year)												816	(64)
Electric shower(s)	48.5486	43.2572	47.2352	45.0760	45.9218	43.8050	45.2652	45.9218	45.0760	47.2352	46.3470	48.5486	(64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				552.2379	(64a)
Heat gains from water heating, kWh/month	33.3591	29.3720	31.2221	27.8764	27.2119	24.7510	24.7729	25.7533	25.9894	28.6535	29.9897	33.0885	(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	108.5574	108.5574	108.5574	108.5574	108.5574	108.5574	108.5574	108.5574	108.5574	108.5574	108.5574	108.5574	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	95.9323	106.2108	95.9323	99.1300	95.9323	99.1300	95.9323	95.9323	99.1300	95.9323	99.1300	95.9323	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	190.1965	192.1702	187.1966	176.6086	163.2431	150.6814	142.2895	140.3158	145.2893	155.8774	169.2429	181.8045	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.8557	33.8557	33.8557	33.8557	33.8557	33.8557	33.8557	33.8557	33.8557	33.8557	33.8557	33.8557	(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)

	-86.8459	-86.8459	-86.8459	-86.8459	-86.8459	-86.8459	-86.8459	-86.8459	-86.8459	-86.8459	-86.8459	(71)

Water heating gains (Table 5)

	44.8375	43.7084	41.9652	38.7172	36.5751	34.3764	33.2969	34.6147	36.0964	38.5128	41.6523	44.4738 (72)

Total internal gains

	386.5335	397.6565	380.6614	370.0230	351.3178	339.7551	327.0859	326.4300	336.0830	345.8897	365.5925	377.7778 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast	11.8800	11.2829	0.4700	0.7000	0.7700	30.5610 (75)
Southwest	1.9800	36.7938	0.4700	0.7000	0.7700	16.6100 (79)
Northwest	9.6000	11.2829	0.4700	0.7000	0.7700	24.6958 (81)
Southwest	2.4000	36.7938	0.4700	0.7000	0.7700	20.1333 (79)

Solar gains	92.0001	175.0643	288.2823	438.9111	566.2030	594.9163	559.9097	459.9285	339.6535	206.6281	113.5374	76.5701 (83)
Total gains	478.5336	572.7208	668.9437	808.9341	917.5207	934.6714	886.9956	786.3585	675.7366	552.5177	479.1298	454.3479 (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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	17.0502	17.0662	17.0819	17.1561	17.1701	17.2354	17.2354	17.2475	17.2102	17.1701	17.1419	17.1125	
alpha	2.1367	2.1377	2.1388	2.1437	2.1447	2.1490	2.1490	2.1498	2.1473	2.1447	2.1428	2.1408	
util living area	0.9266	0.8948	0.8430	0.7416	0.6090	0.4672	0.3616	0.4136	0.6110	0.8077	0.8998	0.9335	(86)
MIT	17.8069	18.2246	18.8649	19.6871	20.3386	20.7360	20.8912	20.8515	20.5074	19.6280	18.5761	17.7219	(87)
Th 2	19.9161	19.9170	19.9179	19.9221	19.9229	19.9265	19.9265	19.9272	19.9251	19.9229	19.9213	19.9196	(88)
util rest of house	0.9177	0.8825	0.8246	0.7117	0.5645	0.4052	0.2834	0.3317	0.5497	0.7776	0.8859	0.9254	(89)
MIT 2	17.0169	17.4251	18.0472	18.8298	19.4227	19.7612	19.8759	19.8538	19.5905	18.7977	17.7803	16.9358	(90)
Living area fraction										fLA = Living area / (4) =		0.7145	(91)
MIT	17.5813	17.9963	18.6314	19.4424	20.0771	20.4577	20.6013	20.5666	20.2456	19.3909	18.3489	17.4975	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.5813	17.9963	18.6314	19.4424	20.0771	20.4577	20.6013	20.5666	20.2456	19.3909	18.3489	17.4975	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8927	0.8550	0.7985	0.6970	0.5712	0.4368	0.3335	0.3817	0.5692	0.7603	0.8603	0.9013	(94)
Useful gains	427.1707	489.7018	534.1314	563.7902	524.0844	408.2525	295.7930	300.1922	384.5984	420.0789	412.1722	409.4940	(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	1072.1202	1056.1963	977.4774	845.7649	671.5087	467.7712	319.5301	332.4976	491.4860	704.6797	903.1977	1069.5174	(97)
Space heating kWh	479.8425	380.6843	329.8494	203.0218	109.6837	0.0000	0.0000	0.0000	0.0000	211.7430	353.5384	491.0574	(98a)
Space heating requirement - total per year (kWh/year)												2559.4205	
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	479.8425	380.6843	329.8494	203.0218	109.6837	0.0000	0.0000	0.0000	0.0000	211.7430	353.5384	491.0574	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2559.4205	
Space heating per m2											(98c) / (4) =	38.2003	(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	750.6507	590.9378	606.4817	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7893	0.8374	0.7999	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	592.5113	494.8752	485.1424	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1056.6455	1002.7998	887.0302	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	334.1766	377.8959	299.0045	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	83.5442	94.4740	74.7511	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												252.7693	(107)
Energy for space heating												38.2003	(99)
Energy for space cooling												3.7727	(108)

Total 41.9730 (109)
Fabric Energy Efficiency (DFEE) 42.0 (109)

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	67.0000 (1b)	x	2.4000 (2b)	=	160.8000	(1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	67.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	160.8000	(5)

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2. Ventilation rate

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	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) =	0.1244	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3744	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2901	(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	0.3699	0.3627	0.3554	0.3192	0.3119	0.2756	0.2756	0.2684	0.2901	0.3119	0.3264	0.3409	(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	0.5684	0.5658	0.5632	0.5509	0.5486	0.5380	0.5380	0.5360	0.5421	0.5486	0.5533	0.5581	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Opening Type (Uw = 1.20)			14.8700	1.1450	17.0267			(27)
External Wall 1	66.4800	16.7600	49.7200	0.1800	8.9496			(29a)
External Roof 1	67.0000		67.0000	0.1100	7.3700			(30)
Total net area of external elements Aum(A, m2)			133.4800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		35.2363			(33)
Party Wall 1			12.5500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K			73.9536 (35)
List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	27.7000	0.0700	1.9390
E16 Corner (normal)	7.2000	0.0900	0.6480
E17 Corner (inverted – internal area greater than external area)	2.4000	-0.0900	-0.2160
E18 Party wall between dwellings	2.4000	0.0600	0.1440
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	5.2300	0.0000	0.0000
E1 Steel lintel with perforated steel base plate	13.1500	0.0500	0.6575
E3 Sill	12.2500	0.0500	0.6125
E4 Jamb	36.6000	0.0500	1.8300
P4 Party wall - Roof (insulation at ceiling level)	5.2300	0.1200	0.6276
E15 Flat roof with parapet	27.7000	0.5600	15.5120
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			21.7546 (36)

Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 56.9909 (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	30.1629	30.0219	29.8837	29.2346	29.1131	28.5478	28.5478	28.4431	28.7655	29.1131	29.3588	29.6157	(38)
Heat transfer coeff	87.1538	87.0128	86.8746	86.2255	86.1041	85.5387	85.5387	85.4340	85.7565	86.1041	86.3497	86.6066	(39)

Average = Sum(39)m / 12 = 86.2249

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3008	1.2987	1.2966	1.2869	1.2851	1.2767	1.2767	1.2751	1.2799	1.2851	1.2888	1.2926	(40)
HLP (average)												1.2869	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.1711 (42)

	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	(42a)
Hot water usage for baths	26.1929	25.8039	25.2561	24.2461	23.4898	22.6512	22.1982	22.7422	23.3344	24.2318	25.2626	26.1044	(42b)
Hot water usage for other uses	36.8647	35.5242	34.1837	32.8431	31.5026	30.1621	30.1621	31.5026	32.8431	34.1837	35.5242	36.8647	(42c)

Average daily hot water use (litres/day) 57.7984 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	63.0577	61.3281	59.4398	57.0892	54.9924	52.8132	52.3603	54.2448	56.1776	58.4155	60.7868	62.9691	(44)
Energy conte	99.8679	87.3305	91.3568	78.1523	74.0303	64.9400	63.3252	67.1663	69.2726	79.2692	86.6020	98.5944	(45)

Energy content (annual) Total = Sum(45)m = 959.9076

Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	84.8878	74.2309	77.6533	66.4295	62.9258	55.1990	53.8264	57.0914	58.8817	67.3788	73.6117	83.8053	(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	84.8878	74.2309	77.6533	66.4295	62.9258	55.1990	53.8264	57.0914	58.8817	67.3788	73.6117	83.8053	(64)

Total per year (kWh/year) = Sum(64)m = 815.9214 (64)

12Total per year (kWh/year) 816 (64)

Electric shower(s)	48.5486	43.2572	47.2352	45.0760	45.9218	43.8050	45.2652	45.9218	45.0760	47.2352	46.3470	48.5486	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 552.2379 (64a)

Heat gains from water heating, kWh/month	33.3591	29.3720	31.2221	27.8764	27.2119	24.7510	24.7729	25.7533	25.9894	28.6535	29.9897	33.0885	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	108.5574	108.5574	108.5574	108.5574	108.5574	108.5574	108.5574	108.5574	108.5574	108.5574	108.5574	108.5574	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	95.9418	106.2213	95.9418	99.1399	95.9418	99.1399	95.9418	95.9418	99.1399	95.9418	99.1399	95.9418	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	190.1965	192.1702	187.1966	176.6086	163.2431	150.6814	142.2895	140.3158	145.2893	155.8774	169.2429	181.8045	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.8557	33.8557	33.8557	33.8557	33.8557	33.8557	33.8557	33.8557	33.8557	33.8557	33.8557	33.8557	(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)	-86.8459	-86.8459	-86.8459	-86.8459	-86.8459	-86.8459	-86.8459	-86.8459	-86.8459	-86.8459	-86.8459	-86.8459	(71)
Water heating gains (Table 5)	44.8375	43.7084	41.9652	38.7172	36.5751	34.3764	33.2969	34.6147	36.0964	38.5128	41.6523	44.4738	(72)
Total internal gains	386.5431	397.6671	380.6709	370.0329	351.3273	339.7650	327.0954	326.4395	336.0929	345.8992	365.6023	377.7874	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	6.8300	11.2829	0.6300	0.7000	0.7700	23.5513	(75)
Southwest	2.5200	36.7938	0.6300	0.7000	0.7700	28.3366	(79)
Northwest	5.5200	11.2829	0.6300	0.7000	0.7700	19.0341	(81)

Solar gains	70.9220	134.9516	222.2187	338.3163	436.4246	458.5530	431.5718	354.5131	261.8133	159.2806	87.5242	59.0276	(83)
Total gains	457.4651	532.6187	602.8897	708.3492	787.7519	798.3180	758.6672	680.9527	597.9062	505.1799	453.1265	436.8150	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	15.7923	15.8179	15.8430	15.9623	15.9848	16.0905	16.0905	16.1102	16.0496	15.9848	15.9393	15.8921	
alpha	2.0528	2.0545	2.0562	2.0642	2.0657	2.0727	2.0727	2.0740	2.0700	2.0657	2.0626	2.0595	
util living area	0.9344	0.9103	0.8719	0.7922	0.6793	0.5421	0.4300	0.4814	0.6708	0.8385	0.9121	0.9398	(86)
MIT	17.5063	17.8843	18.5015	19.3525	20.0917	20.6065	20.8279	20.7763	20.3467	19.3864	18.3130	17.4391	(87)
Th 2	19.8402	19.8419	19.8435	19.8511	19.8525	19.8591	19.8591	19.8604	19.8566	19.8525	19.8496	19.8466	(88)
util rest of house	0.9260	0.8990	0.8552	0.7643	0.6343	0.4731	0.3369	0.3870	0.6079	0.8103	0.8991	0.9320	(89)
MIT 2	16.6770	17.0484	17.6527	18.4745	19.1607	19.6115	19.7795	19.7501	19.4105	18.5281	17.4816	16.6147	(90)
Living area fraction									fLA = Living area / (4) =			0.7145	(91)
MIT	17.2695	17.6457	18.2592	19.1018	19.8259	20.3224	20.5285	20.4833	20.0794	19.1414	18.0756	17.2037	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.2695	17.6457	18.2592	19.1018	19.8259	20.3224	20.5285	20.4833	20.0794	19.1414	18.0756	17.2037	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9008	0.8711	0.8269	0.7432	0.6331	0.5025	0.3932	0.4407	0.6213	0.7892	0.8728	0.9079	(94)
Useful gains	412.0729	463.9671	498.5186	526.4792	498.7387	401.1284	298.3379	300.1208	371.4675	398.6956	395.4961	396.5728	(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	1130.3425	1109.0362	1021.5725	879.6559	699.6718	489.4876	336.0416	348.8519	512.7730	735.4454	947.7416	1126.2064	(97)
Space heating kWh	534.3926	433.4864	389.1521	254.2873	149.4942	0.0000	0.0000	0.0000	0.0000	250.5419	397.6168	542.8474	(98a)
Space heating requirement - total per year (kWh/year)												2951.8187	
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	534.3926	433.4864	389.1521	254.2873	149.4942	0.0000	0.0000	0.0000	0.0000	250.5419	397.6168	542.8474	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2951.8187	
Space heating per m2										(98c) / (4) =		44.0570	(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	804.0637	632.9863	649.2984	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7107	0.7683	0.7277	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	571.4818	486.3470	472.4680	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	897.2606	852.7954	763.8185	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	234.5607	272.6376	216.7648	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	58.6402	68.1594	54.1912	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												180.9908	(107)
Energy for space heating												44.0570	(99)
Energy for space cooling												2.7014	(108)
Total												46.7583	(109)
Fabric Energy Efficiency (TFEE)												46.8	(109)

Full SAP Calculation Printout

Property Reference	Flat 301 WCS - Green	Issued on Date	06/05/2023
Assessment Reference	Flat 301 WCS - Green	Prop Type Ref	Flat 102 WCS - Green
Property	West Central Street, London, WC1A		

SAP Rating	84 B	DER	3.07	TER	13.79
Environmental	98 A	% DER < TER			77.74
CO_2 Emissions (t/year)	0.17	DFEE	33.41	TFEE	32.59
Compliance Check	See BREL	% DFEE < TFEE			-2.50
% DPER < TPER	55.60	DPER	32.68	TPER	73.62

Assessor Details	Mr. Adrian Fell	Assessor ID	N222-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	61.0000 (1b)	x	2.5200 (2b)	=	153.7200 (1b)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	153.7200	(5)

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2. Ventilation rate

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		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) =	0.1301	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2801	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2171	(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	0.2768	0.2714	0.2659	0.2388	0.2334	0.2062	0.2062	0.2008	0.2171	0.2334	0.2442	0.2551	(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	0.5383	0.5368	0.5354	0.5285	0.5272	0.5213	0.5213	0.5202	0.5236	0.5272	0.5298	0.5325	(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 (Uw = 0.95)			19.3800	0.9152	17.7370			(27)
Glazed Doors (Uw = 0.95)			2.0500	0.9152	1.8762			(27)
Solid Door			2.0000	0.8000	1.6000			(26)
External Wall 1	80.2100	23.4300	56.7800	0.1500	8.5170	14.0000	794.9200	(29a)
Total net area of external elements Aum(A, m2)			80.2100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.7302			(33)

Party Wall 1	8.9700	0.0000	0.0000	20.0000	179.4000 (32)
Party Floor 1	61.0000			40.0000	2440.0000 (32d)
Party Ceiling 1	61.0000			40.0000	2440.0000 (32b)
Internal Wall 1	84.5700			9.0000	761.1300 (32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 6615.4500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 108.4500 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E16 Corner (normal)	12.6000	0.0900	1.1340
E17 Corner (inverted – internal area greater than external area)	5.0400	-0.0900	-0.4536
E1 Steel lintel with perforated steel base plate	10.2600	0.0500	0.5130
E3 Sill	9.3100	0.0500	0.4655
E4 Jamb	31.8000	0.0500	1.5900
E7 Party floor between dwellings (in blocks of flats)	63.6600	0.0700	4.4562
E18 Party wall between dwellings	2.5200	0.0600	0.1512
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7400	0.4430	2.9858
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.1200	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.8421 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 40.5723 (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	27.3069	27.2314	27.1574	26.8101	26.7451	26.4425	26.4425	26.3865	26.5591	26.7451	26.8766	27.0140	(38)
Heat transfer coeff	67.8792	67.8037	67.7298	67.3824	67.3174	67.0148	67.0148	66.9588	67.1314	67.3174	67.4489	67.5863	(39)
Average = Sum(39)m / 12 =												67.3821	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1128	1.1115	1.1103	1.1046	1.1036	1.0986	1.0986	1.0977	1.1005	1.1036	1.1057	1.1080	(40)
HLP (average)												1.1046	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.0098 (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

25.0293	24.6576	24.1341	23.1690	22.4462	21.6449	21.2120	21.7318	22.2978	23.1553	24.1403	24.9447	(42b)

Hot water usage for other uses

35.2120	33.9315	32.6511	31.3707	30.0902	28.8098	28.8098	30.0902	31.3707	32.6511	33.9315	35.2120	(42c)

Average daily hot water use (litres/day) 55.2170 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	60.2413	58.5891	56.7852	54.5396	52.5365	50.4547	50.0218	51.8221	53.6685	55.8064	58.0719	60.1567	(44)
Energy conte	95.4075	83.4301	87.2768	74.6620	70.7242	62.0399	60.4971	64.1665	66.1786	75.7287	82.7340	94.1908	(45)
Energy content (annual)										Total = Sum(45)m =		917.0363	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	81.0963	70.9156	74.1853	63.4627	60.1156	52.7339	51.4225	54.5416	56.2518	64.3694	70.3239	80.0622	(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	81.0963	70.9156	74.1853	63.4627	60.1156	52.7339	51.4225	54.5416	56.2518	64.3694	70.3239	80.0622	(64)
									Total per year (kWh/year) = Sum(64)m =			779.4808	(64)
12Total per year (kWh/year)												779	(64)
Electric shower(s)	46.3816	41.3264	45.1268	43.0640	43.8721	41.8497	43.2447	43.8721	43.0640	45.1268	44.2783	46.3816	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			527.5882	(64a)
Heat gains from water heating, kWh/month	31.8695	28.0605	29.8280	26.6317	25.9969	23.6459	23.6668	24.6034	24.8289	27.3741	28.6506	31.6109	(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	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	88.5003	97.9825	88.5003	91.4503	88.5003	91.4503	88.5003	88.5003	91.4503	88.5003	91.4503	88.5003	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	175.4617	177.2825	172.6943	162.9265	150.5964	139.0079	131.2661	129.4454	134.0336	143.8013	156.1314	167.7199	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	(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)													

	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	(71)
Water heating gains (Table 5)												
	42.8353	41.7567	40.0914	36.9884	34.9421	32.8415	31.8102	33.0691	34.4847	36.7931	39.7924	42.4878 (72)
Total internal gains												
	359.9438	370.1681	354.4324	344.5117	327.1853	316.4462	304.7230	304.1612	313.1150	322.2412	340.5206	351.8545 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Southeast	7.4800	36.7938	0.4700	0.7000	0.7700	62.7488 (77)
Southwest	5.1800	36.7938	0.4700	0.7000	0.7700	43.4544 (79)
Northwest	6.7200	11.2829	0.4700	0.7000	0.7700	17.2870 (81)
Southeast	2.0500	36.7938	0.4700	0.7000	0.7700	17.1972 (77)

Solar gains	140.6875	245.3849	350.9983	460.4685	539.0973	545.4627	521.6129	461.3831	388.6618	275.3150	169.5569	119.7226 (83)
Total gains	500.6313	615.5530	705.4308	804.9802	866.2825	861.9089	826.3359	765.5443	701.7768	597.5561	510.0775	471.5770 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	27.0720	27.1021	27.1317	27.2716	27.2979	27.4212	27.4212	27.4441	27.3736	27.2979	27.2447	27.1893	
alpha	2.8048	2.8068	2.8088	2.8181	2.8199	2.8281	2.8281	2.8296	2.8249	2.8199	2.8163	2.8126	
util living area													
	0.9410	0.9015	0.8448	0.7428	0.6099	0.4603	0.3441	0.3835	0.5729	0.7935	0.9090	0.9488	(86)
MIT	18.8662	19.2707	19.7552	20.2979	20.6842	20.8959	20.9661	20.9532	20.8021	20.2701	19.4701	18.7805	(87)
Th 2	19.9904	19.9914	19.9924	19.9971	19.9979	20.0020	20.0020	20.0027	20.0004	19.9979	19.9962	19.9943	(88)
util rest of house													
	0.9324	0.8882	0.8242	0.7103	0.5631	0.3983	0.2706	0.3068	0.5094	0.7589	0.8942	0.9413	(89)
MIT 2	18.0635	18.4559	18.9208	19.4287	19.7691	19.9413	19.9879	19.9821	19.8755	19.4191	18.6605	17.9827	(90)
Living area fraction										fLA = Living area / (4) =		0.3654	(91)
MIT	18.3568	18.7536	19.2257	19.7463	20.1035	20.2902	20.3453	20.3370	20.2141	19.7301	18.9563	18.2742	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3568	18.7536	19.2257	19.7463	20.1035	20.2902	20.3453	20.3370	20.2141	19.7301	18.9563	18.2742	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9148	0.8684	0.8062	0.7015	0.5682	0.4167	0.2964	0.3331	0.5236	0.7485	0.8756	0.9247	(94)
Useful gains	457.9837	534.5573	568.7468	564.6742	492.2591	359.1650	244.9174	255.0064	367.4785	447.2755	446.6019	436.0873	(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													
	954.1648	939.3286	861.9082	730.8522	565.7021	381.3251	250.9913	263.6147	410.4476	614.6125	799.6966	951.2234	(97)
Space heating kWh													
	369.1588	272.0063	218.1121	119.6482	54.6416	0.0000	0.0000	0.0000	0.0000	124.4988	254.2282	383.2613	(98a)
Space heating requirement - total per year (kWh/year)												1795.5553	
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													
	369.1588	272.0063	218.1121	119.6482	54.6416	0.0000	0.0000	0.0000	0.0000	124.4988	254.2282	383.2613	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1795.5553	
Space heating per m2											(98c) / (4) =	29.4353	(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	629.9396	495.9099	508.8870	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8733	0.9143	0.8946	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	550.1126	453.4132	455.2304	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	974.8769	935.0378	865.6895	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	305.8303	358.3287	305.3816	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	76.4576	89.5822	76.3454	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												242.3852	(107)
Energy for space heating												29.4353	(99)
Energy for space cooling												3.9735	(108)
Total												33.4089	(109)

Fabric Energy Efficiency (DFEE) 33.4 (109)

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	61.0000 (1b)	x	2.5200 (2b)	=	153.7200 (1b) -	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 61.0000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	153.7200	(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) =	0.1301	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3801	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2946	(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	0.3756	0.3682	0.3609	0.3240	0.3167	0.2799	0.2799	0.2725	0.2946	0.3167	0.3314	0.3461	(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	0.5705	0.5678	0.5651	0.5525	0.5501	0.5392	0.5392	0.5371	0.5434	0.5501	0.5549	0.5599	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.0000	1.0000	2.0000			(26)
TER Opening Type (Uw = 1.20)			13.2500	1.1450	15.1718			(27)
External Wall 1	80.2100	15.2500	64.9600	0.1800	11.6928			(29a)
Total net area of external elements Aum(A, m2)			80.2100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.8646			(33)
Party Wall 1			8.9700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 108.4500 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E16 Corner (normal)	12.6000	0.0900	1.1340
E17 Corner (inverted – internal area greater than external area)	5.0400	-0.0900	-0.4536
E1 Steel lintel with perforated steel base plate	10.2600	0.0500	0.5130
E3 Sill	9.3100	0.0500	0.4655
E4 Jamb	31.8000	0.0500	1.5900
E7 Party floor between dwellings (in blocks of flats)	63.6600	0.0700	4.4562
E18 Party wall between dwellings	2.5200	0.0600	0.1512
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7400	0.0200	0.1348
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.1200	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		7.9911	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	36.8557	(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	28.9419	28.8029	28.6667	28.0271	27.9074	27.3502	27.3502	27.2471	27.5648	27.9074	28.1495	28.4026	(38)
Heat transfer coeff													
	65.7975	65.6586	65.5224	64.8827	64.7630	64.2059	64.2059	64.1027	64.4205	64.7630	65.0052	65.2583	(39)
Average = Sum(39)m / 12 =												64.8821	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0786	1.0764	1.0741	1.0637	1.0617	1.0526	1.0526	1.0509	1.0561	1.0617	1.0657	1.0698	(40)
HLP (average)												1.0636	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0098	(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													
	25.0293	24.6576	24.1341	23.1690	22.4462	21.6449	21.2120	21.7318	22.2978	23.1553	24.1403	24.9447	(42b)
Hot water usage for other uses													
	35.2120	33.9315	32.6511	31.3707	30.0902	28.8098	28.8098	30.0902	31.3707	32.6511	33.9315	35.2120	(42c)
Average daily hot water use (litres/day)												55.2170	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	60.2413	58.5891	56.7852	54.5396	52.5365	50.4547	50.0218	51.8221	53.6685	55.8064	58.0719	60.1567	(44)
Energy conte	95.4075	83.4301	87.2768	74.6620	70.7242	62.0399	60.4971	64.1665	66.1786	75.7287	82.7340	94.1908	(45)
Energy content (annual)										Total = Sum(45)m =		917.0363	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	81.0963	70.9156	74.1853	63.4627	60.1156	52.7339	51.4225	54.5416	56.2518	64.3694	70.3239	80.0622	(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													
	81.0963	70.9156	74.1853	63.4627	60.1156	52.7339	51.4225	54.5416	56.2518	64.3694	70.3239	80.0622	(64)
									Total per year (kWh/year) = Sum(64)m =			779.4808	(64)
12Total per year (kWh/year)												779	(64)
Electric shower(s)													
	46.3816	41.3264	45.1268	43.0640	43.8721	41.8497	43.2447	43.8721	43.0640	45.1268	44.2783	46.3816	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							527.5882	(64a)
Heat gains from water heating, kWh/month													
	31.8695	28.0605	29.8280	26.6317	25.9969	23.6459	23.6668	24.6034	24.8289	27.3741	28.6506	31.6109	(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	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	88.5730	98.0630	88.5730	91.5254	88.5730	91.5254	88.5730	88.5730	91.5254	88.5730	91.5254	88.5730	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	175.4617	177.2825	172.6943	162.9265	150.5964	139.0079	131.2661	129.4454	134.0336	143.8013	156.1314	167.7199	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	(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)													
	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	(71)
Water heating gains (Table 5)													
	42.8353	41.7567	40.0914	36.9884	34.9421	32.8415	31.8102	33.0691	34.4847	36.7931	39.7924	42.4878	(72)
Total internal gains													
	360.0165	370.2486	354.5051	344.5868	327.2580	316.5213	304.7958	304.2339	313.1901	322.3139	340.5957	351.9272	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	5.9000	36.7938	0.6300	0.7000	0.7700	66.3436	(77)
Southwest	3.2000	36.7938	0.6300	0.7000	0.7700	35.9830	(79)
Northwest	4.1500	11.2829	0.6300	0.7000	0.7700	14.3101	(81)

Solar gains	116.6366	203.4285	290.9652	381.6822	446.8317	452.0968	432.3338	382.4304	322.1768	228.2360	140.5694	99.2565	(83)

Total gains	476.6531	573.6771	645.4704	726.2690	774.0897	768.6182	737.1295	686.6643	635.3669	550.5499	481.1651	451.1837 (84)

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7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	27.9285	27.9876	28.0458	28.3223	28.3746	28.6208	28.6208	28.6669	28.5255	28.3746	28.2689	28.1593	
alpha	2.8619	2.8658	2.8697	2.8882	2.8916	2.9081	2.9081	2.9111	2.9017	2.8916	2.8846	2.8773	
util living area	0.9460	0.9124	0.8637	0.7710	0.6440	0.4905	0.3684	0.4077	0.6005	0.8125	0.9169	0.9528	(86)
MIT	18.8892	19.2600	19.7191	20.2628	20.6599	20.8886	20.9639	20.9510	20.7932	20.2588	19.4869	18.8222	(87)
Th 2	20.0183	20.0202	20.0220	20.0306	20.0322	20.0398	20.0398	20.0412	20.0369	20.0322	20.0290	20.0256	(88)
util rest of house	0.9382	0.9004	0.8451	0.7407	0.5985	0.4282	0.2933	0.3301	0.5382	0.7803	0.9034	0.9458	(89)
MIT 2	18.1057	18.4674	18.9111	19.4274	19.7822	19.9735	20.0244	20.0189	19.9039	19.4383	18.7012	18.0453	(90)
Living area fraction										fLA = Living area / (4) =		0.3654	(91)
MIT	18.3920	18.7570	19.2063	19.7326	20.1029	20.3079	20.3677	20.3595	20.2289	19.7381	18.9883	18.3292	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3920	18.7570	19.2063	19.7326	20.1029	20.3079	20.3677	20.3595	20.2289	19.7381	18.9883	18.3292	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9216	0.8816	0.8272	0.7305	0.6020	0.4462	0.3194	0.3565	0.5513	0.7692	0.8856	0.9303	(94)
Useful gains	439.2991	505.7269	533.9499	530.5487	466.0177	342.9298	235.4611	244.8038	350.2797	423.5079	426.1402	419.7456	(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	927.2193	909.8326	832.5502	702.8504	544.1981	366.4823	241.9077	253.8151	394.8264	591.8125	772.7999	922.0477	(97)
Space heating kWh	363.0126	271.5590	222.1586	124.0572	58.1662	0.0000	0.0000	0.0000	0.0000	125.2186	249.5949	373.7127	(98a)
Space heating requirement - total per year (kWh/year)												1787.4800	
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	363.0126	271.5590	222.1586	124.0572	58.1662	0.0000	0.0000	0.0000	0.0000	125.2186	249.5949	373.7127	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1787.4800	
Space heating per m2											(98c) / (4) =	29.3030	(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	603.5354	475.1236	487.1807	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8597	0.9050	0.8847	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	518.8395	429.9787	431.0133	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	865.7543	830.6925	773.4160	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	249.7787	298.1310	254.7476	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	62.4447	74.5328	63.6869	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												200.6643	(107)
Energy for space heating												29.3030	(99)
Energy for space cooling												3.2896	(108)
Total												32.5925	(109)
Fabric Energy Efficiency (TFEE)												32.6	(109)

Full SAP Calculation Printout

Property Reference	Flat 302 VL - Be Green	Issued on Date	06/05/2023
Assessment Reference	Flat 302 VL - Be Green	Prop Type Ref	Flat 302 VL - Be Green
Property	MFMTF, Vine Lane, London, WC1A		

SAP Rating	82 B	DER	3.80	TER	18.47
Environmental	97 A	% DER < TER			79.43
CO_2 Emissions (t/year)	0.18	DFEE	43.81	TFEE	49.06
Compliance Check	See BREL	% DFEE < TFEE			10.69
% DPER < TPER	59.19	DPER	40.40	TPER	98.99

Assessor Details	Mr. Adrian Fell	Assessor ID	N222-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	51.6300 (1b)	x	2.8300 (2b)	=	146.1129 (1b)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.6300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	146.1129	(5)

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2. Ventilation rate

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	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) =	0.1369 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.2869 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2223 (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	0.2835	0.2779	0.2724	0.2446	0.2390	0.2112	0.2112	0.2057	0.2223	0.2390	0.2501	0.2612	(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	0.5402	0.5386	0.5371	0.5299	0.5286	0.5223	0.5223	0.5211	0.5247	0.5286	0.5313	0.5341	(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	
Glazed Door (Uw = 0.95)			1.9800	0.9152	1.8121			(27)
Window (Uw = 0.95)			11.2800	0.9152	10.3237			(27)
Door			1.8900	0.8000	1.5120			(26)
External Wall 1	51.3900	15.1500	36.2400	0.1500	5.4360	14.0000	507.3600	(29a)
External Roof 1	51.6300		51.6300	0.1000	5.1630	9.0000	464.6700	(30)
Total net area of external elements Aum(A, m2)			103.0200					(31)

Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =	24.2468				(33)
Party Wall 1	34.8700	0.0000	0.0000	20.0000	697.4000	(32)
Party Floor 1	51.6300			40.0000	2065.2000	(32d)
Internal Wall 1	53.3700			9.0000	480.3300	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	4214.9600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		81.6378 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E1 Steel lintel with perforated steel base plate	6.4900	0.0500	0.3245
E3 Sill	6.4900	0.0500	0.3245
E4 Jamb	18.2000	0.0500	0.9100
E7 Party floor between dwellings (in blocks of flats)	18.1600	0.0700	1.2712
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.1900	0.4430	2.7422
E16 Corner (normal)	2.4000	0.0900	0.2160
E17 Corner (inverted – internal area greater than external area)	2.4000	-0.0900	-0.2160
E18 Party wall between dwellings	9.6000	0.0600	0.5760
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.3200	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	12.3200	0.1200	1.4784
E15 Flat roof with parapet	18.1600	0.3000	5.4480

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		13.0748 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	37.3216 (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	26.0459	25.9707	25.8970	25.5506	25.4858	25.1842	25.1842	25.1283	25.3004	25.4858	25.6169	25.7540	(38)
Heat transfer coeff	63.3675	63.2923	63.2186	62.8722	62.8074	62.5058	62.5058	62.4499	62.6220	62.8074	62.9385	63.0756	(39)

Average = Sum(39)m / 12 = 62.8719

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2273	1.2259	1.2245	1.2177	1.2165	1.2106	1.2106	1.2096	1.2129	1.2165	1.2190	1.2217	(40)
HLP (average)												1.2177	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7382	(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	23.0709	22.7283	22.2458	21.3561	20.6900	19.9513	19.5523	20.0314	20.5531	21.3435	22.2515	22.9929	(42b)
Hot water usage for other uses	32.4304	31.2512	30.0719	28.8926	27.7133	26.5340	26.5340	27.7133	28.8926	30.0719	31.2512	32.4304	(42c)
Average daily hot water use (litres/day)												50.8726	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	55.5014	53.9794	52.3176	50.2487	48.4033	46.4853	46.0863	47.7447	49.4457	51.4154	53.5026	55.4234	(44)
Energy conte	87.9006	76.8660	80.4103	68.7880	65.1601	57.1591	55.7374	59.1180	60.9715	69.7702	76.2243	86.7796	(45)
Energy content (annual)										Total = Sum(45)m =		844.8850	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	74.7155	65.3361	68.3487	58.4698	55.3861	48.5852	47.3768	50.2503	51.8258	59.3047	64.7907	73.7627	(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	74.7155	65.3361	68.3487	58.4698	55.3861	48.5852	47.3768	50.2503	51.8258	59.3047	64.7907	73.7627	(64)
								Total per year (kWh/year) = Sum(64)m =				718.1522	(64)
12Total per year (kWh/year)												718	(64)
Electric shower(s)	42.7346	38.0769	41.5785	39.6778	40.4224	38.5590	39.8443	40.4224	39.6778	41.5785	40.7966	42.7346	(64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				486.1034	(64a)
Heat gains from water heating, kWh/month	29.3625	25.8532	27.4818	24.5369	23.9521	21.7861	21.8053	22.6682	22.8759	25.2208	26.3968	29.1243	(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	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.3972	84.5826	76.3972	78.9438	76.3972	78.9438	76.3972	76.3972	78.9438	76.3972	78.9438	76.3972	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	151.4660	153.0378	149.0770	140.6451	130.0013	119.9976	113.3145	111.7427	115.7035	124.1354	134.7793	144.7830	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	(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)	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	(71)
Water heating gains (Table 5)	39.4658	38.4721	36.9379	34.0790	32.1937	30.2584	29.3082	30.4680	31.7721	33.8989	36.6623	39.1456	(72)
Total internal gains	316.4013	325.1648	311.4845	302.7402	287.6645	278.2721	268.0922	267.6802	275.4917	283.5039	299.4576	309.3981	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	1.9800	11.2829	0.4700	0.7000	0.7700	5.0935	(81)
Northeast	11.2800	11.2829	0.4700	0.7000	0.7700	29.0175	(75)

Solar gains	34.1110	69.4340	125.0980	205.4469	276.1609	294.4167	275.4208	219.5687	152.4339	84.8539	42.9205	27.8568	(83)
Total gains	350.5124	394.5988	436.5825	508.1871	563.8254	572.6889	543.5130	487.2489	427.9256	368.3578	342.3782	337.2549	(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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	18.4767	18.4986	18.5202	18.6222	18.6415	18.7314	18.7314	18.7482	18.6967	18.6415	18.6026	18.5622	
alpha	2.2318	2.2332	2.2347	2.2415	2.2428	2.2488	2.2488	2.2499	2.2464	2.2428	2.2402	2.2375	
util living area	0.9416	0.9228	0.8902	0.8158	0.7038	0.5620	0.4454	0.4997	0.6953	0.8570	0.9218	0.9461	(86)
MIT	17.8612	18.1757	18.7216	19.5024	20.1893	20.6608	20.8570	20.8100	20.4169	19.5392	18.5820	17.8009	(87)
Th 2	19.8982	19.8993	19.9005	19.9058	19.9068	19.9115	19.9115	19.9124	19.9097	19.9068	19.9048	19.9027	(88)
util rest of house	0.9339	0.9126	0.8752	0.7897	0.6601	0.4936	0.3527	0.4058	0.6342	0.8309	0.9099	0.9389	(89)
MIT 2	17.0487	17.3582	17.8938	18.6486	19.2867	19.6975	19.8452	19.8185	19.5092	18.7016	17.7671	16.9922	(90)
Living area fraction										fLA = Living area / (4) =		0.6328	(91)
MIT	17.5628	17.8755	18.4176	19.1889	19.8578	20.3070	20.4854	20.4459	20.0835	19.2316	18.2827	17.5040	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.5628	17.8755	18.4176	19.1889	19.8578	20.3070	20.4854	20.4459	20.0835	19.2316	18.2827	17.5040	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9120	0.8885	0.8501	0.7699	0.6579	0.5197	0.4033	0.4539	0.6449	0.8114	0.8868	0.9179	(94)
Useful gains	319.6653	350.5941	371.1399	391.2751	370.9586	297.6327	219.1803	221.1802	275.9717	298.8885	303.6320	309.5682	(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	840.4339	821.2499	753.4142	646.8852	512.3723	356.7231	242.8618	252.6661	374.7008	542.1302	703.8247	839.1546	(97)
Space heating kWh	387.4518	316.2806	284.4121	184.0392	105.2118	0.0000	0.0000	0.0000	0.0000	180.9719	288.1388	394.0123	(98a)
Space heating requirement - total per year (kWh/year)												2140.5185	
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	387.4518	316.2806	284.4121	184.0392	105.2118	0.0000	0.0000	0.0000	0.0000	180.9719	288.1388	394.0123	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2140.5185	
Space heating per m2											(98c) / (4) =	41.4588	(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	587.5543	462.5427	474.6193	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7223	0.7810	0.7387	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	424.3917	361.2366	350.6197	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	642.0974	609.5077	545.2055	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	156.7481	184.7137	144.7718	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	39.1870	46.1784	36.1930	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												121.5584	(107)
Energy for space heating												41.4588	(99)
Energy for space cooling												2.3544	(108)
Total												43.8132	(109)

Fabric Energy Efficiency (DFEE) 43.8 (109)

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	51.6300 (1b)	x	2.8300 (2b)	=	146.1129 (1b) -	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 51.6300						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	146.1129 (5)	

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2. Ventilation rate
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	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) =	0.1369 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3869 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2998 (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	0.3823	0.3748	0.3673	0.3298	0.3223	0.2848	0.2848	0.2773	0.2998	0.3223	0.3373	0.3523	(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	0.5731	0.5702	0.5675	0.5544	0.5519	0.5406	0.5406	0.5385	0.5449	0.5519	0.5569	0.5621	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Opening Type (Uw = 1.20)			11.0300	1.1450	12.6298			(27)
External Wall 1	51.3900	12.9200	38.4700	0.1800	6.9246			(29a)
External Roof 1	51.6300		51.6300	0.1100	5.6793			(30)
Total net area of external elements Aum(A, m2)			103.0200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	27.1237			(33)
Party Wall 1			34.8700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 81.6378 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	6.4900	0.0500	0.3245
E3 Sill	6.4900	0.0500	0.3245
E4 Jamb	18.2000	0.0500	0.9100
E7 Party floor between dwellings (in blocks of flats)	18.1600	0.0700	1.2712
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.1900	0.0200	0.1238
E16 Corner (normal)	2.4000	0.0900	0.2160
E17 Corner (inverted – internal area greater than external area)	2.4000	-0.0900	-0.2160
E18 Party wall between dwellings	9.6000	0.0600	0.5760
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.3200	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	12.3200	0.1200	1.4784
E15 Flat roof with parapet	18.1600	0.5600	10.1696

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.1780 (36)

Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 42.3017 (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	27.6319	27.4951	27.3610	26.7311	26.6133	26.0647	26.0647	25.9631	26.2760	26.6133	26.8517	27.1009	(38)
Heat transfer coeff													
	69.9336	69.7968	69.6627	69.0328	68.9149	68.3663	68.3663	68.2647	68.5777	68.9149	69.1534	69.4026	(39)
Average = Sum(39)m / 12 =												69.0322	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3545	1.3519	1.3493	1.3371	1.3348	1.3242	1.3242	1.3222	1.3283	1.3348	1.3394	1.3442	(40)
HLP (average)												1.3371	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7382 (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

23.0709	22.7283	22.2458	21.3561	20.6900	19.9513	19.5523	20.0314	20.5531	21.3435	22.2515	22.9929	(42b)

Hot water usage for other uses

32.4304	31.2512	30.0719	28.8926	27.7133	26.5340	26.5340	27.7133	28.8926	30.0719	31.2512	32.4304	(42c)

Average daily hot water use (litres/day) 50.8726 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	55.5014	53.9794	52.3176	50.2487	48.4033	46.4853	46.0863	47.7447	49.4457	51.4154	53.5026	55.4234	(44)
Energy conte	87.9006	76.8660	80.4103	68.7880	65.1601	57.1591	55.7374	59.1180	60.9715	69.7702	76.2243	86.7796	(45)
Energy content (annual)										Total = Sum(45)m =		844.8850	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	74.7155	65.3361	68.3487	58.4698	55.3861	48.5852	47.3768	50.2503	51.8258	59.3047	64.7907	73.7627	(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													
	74.7155	65.3361	68.3487	58.4698	55.3861	48.5852	47.3768	50.2503	51.8258	59.3047	64.7907	73.7627	(64)
										Total per year (kWh/year) = Sum(64)m =		718.1522	(64)
12Total per year (kWh/year)												718	(64)
Electric shower(s)													
	42.7346	38.0769	41.5785	39.6778	40.4224	38.5590	39.8443	40.4224	39.6778	41.5785	40.7966	42.7346	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		486.1034	(64a)
Heat gains from water heating, kWh/month													
	29.3625	25.8532	27.4818	24.5369	23.9521	21.7861	21.8053	22.6682	22.8759	25.2208	26.3968	29.1243	(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	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	76.5233	84.7223	76.5233	79.0741	76.5233	79.0741	76.5233	76.5233	79.0741	76.5233	79.0741	76.5233	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	151.4660	153.0378	149.0770	140.6451	130.0013	119.9976	113.3145	111.7427	115.7035	124.1354	134.7793	144.7830	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	(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)													
	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	(71)
Water heating gains (Table 5)													
	39.4658	38.4721	36.9379	34.0790	32.1937	30.2584	29.3082	30.4680	31.7721	33.8989	36.6623	39.1456	(72)
Total internal gains													
	316.5274	325.3044	311.6106	302.8705	287.7906	278.4024	268.2183	267.8063	275.6220	283.6300	299.5880	309.5242	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	9.3800	11.2829	0.6300	0.7000	0.7700	32.3442	(75)
Northwest	1.6500	11.2829	0.6300	0.7000	0.7700	5.6896	(81)

Solar gains	38.0338	77.4189	139.4842	229.0732	307.9193	328.2745	307.0941	244.8190	169.9637	94.6120	47.8564	31.0603	(83)
Total gains	354.5612	402.7233	451.0948	531.9437	595.7099	606.6769	575.3124	512.6253	445.5857	378.2420	347.4443	340.5845	(84)

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7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	16.7419	16.7747	16.8070	16.9604	16.9894	17.1257	17.1257	17.1512	17.0729	16.9894	16.9308	16.8700	
alpha	2.1161	2.1183	2.1205	2.1307	2.1326	2.1417	2.1417	2.1434	2.1382	2.1326	2.1287	2.1247	
util living area	0.9427	0.9239	0.8910	0.8165	0.7053	0.5656	0.4513	0.5069	0.7016	0.8603	0.9237	0.9471	(86)
MIT	17.5716	17.9059	18.4942	19.3405	20.0856	20.6076	20.8288	20.7747	20.3333	19.3792	18.3523	17.5185	(87)
Th 2	19.7984	19.8004	19.8024	19.8119	19.8137	19.8220	19.8220	19.8235	19.8188	19.8137	19.8101	19.8063	(88)
util rest of house	0.9348	0.9134	0.8753	0.7890	0.6590	0.4925	0.3511	0.4056	0.6369	0.8331	0.9113	0.9397	(89)
MIT 2	16.7040	17.0335	17.6111	18.4313	19.1237	19.5800	19.7459	19.7161	19.3688	18.4889	17.4849	16.6565	(90)
Living area fraction										fLA = Living area / (4) =		0.6328	(91)
MIT	17.2530	17.5855	18.1699	19.0066	19.7324	20.2302	20.4312	20.3859	19.9791	19.0522	18.0337	17.2020	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.2530	17.5855	18.1699	19.0066	19.7324	20.2302	20.4312	20.3859	19.9791	19.0522	18.0337	17.2020	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9116	0.8876	0.8482	0.7671	0.6555	0.5194	0.4051	0.4566	0.6467	0.8117	0.8868	0.9175	(94)
Useful gains	323.2296	357.4652	382.6080	408.0379	390.4715	315.0956	233.0317	234.0571	288.1555	307.0118	308.1156	312.4962	(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	905.8512	885.4085	812.9549	697.6889	553.5510	384.9165	261.9227	272.0991	403.1767	582.4861	756.1040	902.3712	(97)
Space heating kWh	433.4705	354.7779	320.1782	208.5487	121.3311	0.0000	0.0000	0.0000	0.0000	204.9529	322.5516	438.8670	(98a)
Space heating requirement - total per year (kWh/year)												2404.6778	
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	433.4705	354.7779	320.1782	208.5487	121.3311	0.0000	0.0000	0.0000	0.0000	204.9529	322.5516	438.8670	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2404.6778	
Space heating per m2											(98c) / (4) =	46.5752	(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	642.6435	505.9109	518.8120	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7016	0.7606	0.7160	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	450.8568	384.7859	371.4854	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	681.6824	646.5403	574.7343	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	166.1945	194.7452	151.2172	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	41.5486	48.6863	37.8043	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												128.0392	(107)
Energy for space heating												46.5752	(99)
Energy for space cooling												2.4799	(108)
Total												49.0551	(109)
Fabric Energy Efficiency (TFEE)												49.1	(109)

Full SAP Calculation Printout

Property Reference	Flat 302 WCS - Green	Issued on Date	06/05/2023
Assessment Reference	Flat 302 WCS - Green	Prop Type Ref	Flat 102 WCS - Green
Property	West Central Street, London, WC1A		

SAP Rating	83 B	DER	3.41	TER	15.66
Environmental	98 A	% DER < TER			78.22
CO_2 Emissions (t/year)	0.16	DFEE	37.03	TFEE	36.62
Compliance Check	See BREL	% DFEE < TFEE			-1.11
% DPER < TPER	56.73	DPER	36.30	TPER	83.89

Assessor Details	Mr. Adrian Fell	Assessor ID	N222-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	52.0000 (1b)	x	2.5200 (2b)	=	131.0400	(1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	131.0400	(5)

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2. Ventilation rate

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		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) =	0.1526	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3026	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2345	(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	0.2990	0.2932	0.2873	0.2580	0.2521	0.2228	0.2228	0.2169	0.2345	0.2521	0.2639	0.2756	(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	0.5447	0.5430	0.5413	0.5333	0.5318	0.5248	0.5248	0.5235	0.5275	0.5318	0.5348	0.5380	(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 (Uw = 0.95)			12.4200	0.9152	11.3671			(27)
Glazed Doors (Uw = 0.95)			4.1000	0.9152	3.7524			(27)
Solid Door			2.0000	0.8000	1.6000			(26)
External Wall 1	66.7800	18.5200	48.2600	0.1500	7.2390	14.0000	675.6400	(29a)
External Roof 1	4.0100		4.0100	0.1000	0.4010	9.0000	36.0900	(30)
Total net area of external elements Aum(A, m2)			70.7900					(31)

Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	24.3595	(33)
Party Wall 1	18.4000	0.0000	0.0000	20.0000	368.0000 (32)
Party Floor 1	52.0000			40.0000	2080.0000 (32d)
Party Ceiling 1	47.9900			40.0000	1919.6000 (32b)
Internal Wall 1	45.1100			9.0000	405.9900 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	5485.3200	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		105.4869	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E1 Steel lintel with perforated steel base plate	8.1300	0.0500	0.4065
E3 Sill	7.1800	0.0500	0.3590
E4 Jamb	27.2000	0.0500	1.3600
E18 Party wall between dwellings	7.5600	0.0600	0.4536
E16 Corner (normal)	2.5200	0.0900	0.2268
E17 Corner (inverted – internal area greater than external area)	5.0400	-0.0900	-0.4536
E7 Party floor between dwellings (in blocks of flats)	53.0000	0.0700	3.7100
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7400	0.4430	2.9858
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	14.6000	0.0000	0.0000
E15 Flat roof with parapet	6.5300	0.5600	3.6568
E24 Eaves (insulation at ceiling level - inverted)	6.5300	0.2400	1.5672

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		14.2721	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	38.6316	(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	23.5550	23.4799	23.4063	23.0607	22.9960	22.6950	22.6950	22.6392	22.8109	22.9960	23.1268	23.2636	(38)
Heat transfer coeff	62.1866	62.1115	62.0379	61.6923	61.6276	61.3265	61.3265	61.2708	61.4425	61.6276	61.7584	61.8952	(39)
Average = Sum(39)m / 12 =												61.6920	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1959	1.1945	1.1930	1.1864	1.1851	1.1794	1.1794	1.1783	1.1816	1.1851	1.1877	1.1903	(40)
HLP (average)												1.1864	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7491	(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	23.1496	22.8058	22.3217	21.4290	20.7606	20.0194	19.6190	20.0998	20.6232	21.4163	22.3274	23.0714	(42b)
Hot water usage for other uses	32.5422	31.3589	30.1755	28.9922	27.8088	26.6255	26.6255	27.8088	28.9922	30.1755	31.3589	32.5422	(42c)
Average daily hot water use (litres/day)												51.0472	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	55.6919	54.1647	52.4972	50.4212	48.5694	46.6448	46.2445	47.9086	49.6154	51.5919	53.6863	55.6136	(44)
Energy conte	88.2023	77.1298	80.6862	69.0240	65.3837	57.3553	55.9287	59.3209	61.1808	70.0097	76.4860	87.0774	(45)
Energy content (annual)										Total = Sum(45)m =		847.7848	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	74.9719	65.5603	68.5833	58.6704	55.5762	48.7520	47.5394	50.4227	52.0037	59.5082	65.0131	74.0158	(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	74.9719	65.5603	68.5833	58.6704	55.5762	48.7520	47.5394	50.4227	52.0037	59.5082	65.0131	74.0158	(64)
									Total per year (kWh/year) = Sum(64)m =			720.6170	(64)
12Total per year (kWh/year)												721	(64)
Electric shower(s)	42.8812	38.2075	41.7211	39.8139	40.5610	38.6913	39.9810	40.5610	39.8139	41.7211	40.9366	42.8812	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							487.7707	(64a)
Heat gains from water heating, kWh/month	29.4633	25.9420	27.5761	24.6211	24.0343	21.8608	21.8801	22.7459	22.9544	25.3073	26.4874	29.2242	(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	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.8814	85.1187	76.8814	79.4441	76.8814	79.4441	76.8814	76.8814	79.4441	76.8814	79.4441	76.8814	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	152.4259	154.0076	150.0218	141.5364	130.8251	120.7580	114.0326	112.4509	116.4367	124.9221	135.6334	145.7005	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													

	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	(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)													
	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	(71)
Water heating gains (Table 5)													
	39.6012	38.6041	37.0646	34.1960	32.3042	30.3622	29.4087	30.5725	31.8811	34.0152	36.7881	39.2799	(72)
Total internal gains													
	318.1446	326.9665	313.2039	304.4125	289.2467	279.8004	269.5588	269.1408	276.9980	285.0548	301.1016	311.0978	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	12.4200	36.7938	0.4700	0.7000	0.7700	104.1899	(77)
Southeast	2.0500	36.7938	0.4700	0.7000	0.7700	17.1972	(77)
Southwest	2.0500	36.7938	0.4700	0.7000	0.7700	17.1972	(79)

Solar gains	138.5844	236.0604	322.9882	400.1980	448.2551	445.0136	429.0406	393.1878	349.7279	260.8971	165.9921	118.5993	(83)
Total gains	456.7289	563.0269	636.1921	704.6105	737.5018	724.8140	698.5993	662.3286	626.7259	545.9519	467.0937	429.6972	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	24.5021	24.5317	24.5608	24.6984	24.7243	24.8457	24.8457	24.8683	24.7988	24.7243	24.6719	24.6174	
alpha	2.6335	2.6354	2.6374	2.6466	2.6483	2.6564	2.6564	2.6579	2.6533	2.6483	2.6448	2.6412	
util living area													
	0.9322	0.8902	0.8361	0.7464	0.6294	0.4871	0.3667	0.3991	0.5744	0.7812	0.8977	0.9408	(86)
MIT	18.7090	19.1344	19.6242	20.1727	20.5913	20.8516	20.9487	20.9343	20.7597	20.1955	19.3537	18.6193	(87)
Th 2	19.9233	19.9244	19.9256	19.9309	19.9319	19.9366	19.9366	19.9374	19.9348	19.9319	19.9299	19.9278	(88)
util rest of house													
	0.9224	0.8754	0.8142	0.7130	0.5808	0.4198	0.2849	0.3157	0.5081	0.7445	0.8812	0.9321	(89)
MIT 2	17.8660	18.2775	18.7472	19.2629	19.6357	19.8502	19.9155	19.9088	19.7843	19.2991	18.5025	17.7817	(90)
Living area fraction										fLA = Living area / (4) =		0.6488	(91)
MIT	18.4130	18.8335	19.3162	19.8532	20.2557	20.5000	20.5859	20.5742	20.4172	19.8808	19.0548	18.3252	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4130	18.8335	19.3162	19.8532	20.2557	20.5000	20.5859	20.5742	20.4172	19.8808	19.0548	18.3252	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9053	0.8576	0.8002	0.7104	0.5962	0.4563	0.3356	0.3666	0.5393	0.7426	0.8651	0.9158	(94)
Useful gains	413.4767	482.8672	509.0837	500.5644	439.7265	330.7559	234.4589	242.8390	337.9891	405.4023	404.0985	393.4985	(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													
	877.6393	865.4283	795.0910	675.7296	527.2699	361.8249	244.4389	255.7540	388.1446	571.9512	738.3122	874.2804	(97)
Space heating kWh													
	345.3370	257.0811	212.7895	126.1189	65.1323	0.0000	0.0000	0.0000	0.0000	123.9124	240.6338	357.7017	(98a)
Space heating requirement - total per year (kWh/year)												1728.7066	
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													
	345.3370	257.0811	212.7895	126.1189	65.1323	0.0000	0.0000	0.0000	0.0000	123.9124	240.6338	357.7017	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1728.7066	
Space heating per m2											(98c) / (4) =	33.2444	(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	576.4695	453.8165	465.6581	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8391	0.8877	0.8704	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	483.7134	402.8741	405.3264	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	819.6956	790.5761	749.6527	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	241.9072	288.4503	256.1787	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	60.4768	72.1126	64.0447	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												196.6340	(107)
Energy for space heating												33.2444	(99)

Energy for space cooling	3.7814 (108)
Total	37.0258 (109)
Fabric Energy Efficiency (DFEE)	37.0 (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		52.0000 (1b)	x	2.5200 (2b)	=	131.0400 (1b)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.0000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	131.0400	(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) =	0.1526 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4026 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3120 (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	0.3978	0.3900	0.3822	0.3432	0.3354	0.2964	0.2964	0.2886	0.3120	0.3354	0.3510	0.3666	(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	0.5791	0.5761	0.5731	0.5589	0.5563	0.5439	0.5439	0.5417	0.5487	0.5563	0.5616	0.5672	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.0000	1.0000	2.0000			(26)
TER Opening Type (Uw = 1.20)			11.0100	1.1450	12.6069			(27)
External Wall 1	66.7800	13.0100	53.7700	0.1800	9.6786			(29a)
External Roof 1	4.0100		4.0100	0.1100	0.4411			(30)
Total net area of external elements Aum(A, m2)			70.7900					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	24.7266			(33)
Party Wall 1			18.4000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	105.4869 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	8.1300	0.0500	0.4065
E3 Sill	7.1800	0.0500	0.3590
E4 Jamb	27.2000	0.0500	1.3600
E18 Party wall between dwellings	7.5600	0.0600	0.4536
E16 Corner (normal)	2.5200	0.0900	0.2268
E17 Corner (inverted – internal area greater than external area)	5.0400	-0.0900	-0.4536
E7 Party floor between dwellings (in blocks of flats)	53.0000	0.0700	3.7100
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7400	0.0200	0.1348
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	14.6000	0.0000	0.0000
E15 Flat roof with parapet	6.5300	0.5600	3.6568

E24 Eaves (insulation at ceiling level - inverted) 6.5300 0.2400 1.5672

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.4211 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 36.1477 (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	25.0439	24.9110	24.7807	24.1689	24.0544	23.5215	23.5215	23.4229	23.7268	24.0544	24.2860	24.5281	(38)
Heat transfer coeff	61.1915	61.0586	60.9284	60.3166	60.2021	59.6692	59.6692	59.5705	59.8745	60.2021	60.4337	60.6758	(39)

Average = Sum(39)m / 12 = 60.3160

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1768	1.1742	1.1717	1.1599	1.1577	1.1475	1.1475	1.1456	1.1514	1.1577	1.1622	1.1668	(40)
HLP (average)												1.1599	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7491 (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

23.1496	22.8058	22.3217	21.4290	20.7606	20.0194	19.6190	20.0998	20.6232	21.4163	22.3274	23.0714	(42b)

Hot water usage for other uses

32.5422	31.3589	30.1755	28.9922	27.8088	26.6255	26.6255	27.8088	28.9922	30.1755	31.3589	32.5422	(42c)

Average daily hot water use (litres/day) 51.0472 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	55.6919	54.1647	52.4972	50.4212	48.5694	46.6448	46.2445	47.9086	49.6154	51.5919	53.6863	55.6136	(44)
Energy conte	88.2023	77.1298	80.6862	69.0240	65.3837	57.3553	55.9287	59.3209	61.1808	70.0097	76.4860	87.0774	(45)

Energy content (annual) Total = Sum(45)m = 847.7848

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

74.9719	65.5603	68.5833	58.6704	55.5762	48.7520	47.5394	50.4227	52.0037	59.5082	65.0131	74.0158	(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

74.9719	65.5603	68.5833	58.6704	55.5762	48.7520	47.5394	50.4227	52.0037	59.5082	65.0131	74.0158	(64)

Total per year (kWh/year) = Sum(64)m = 720.6170 (64)

12Total per year (kWh/year) 721 (64)

Electric shower(s)

42.8812	38.2075	41.7211	39.8139	40.5610	38.6913	39.9810	40.5610	39.8139	41.7211	40.9366	42.8812	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 487.7707 (64a)

Heat gains from water heating, kWh/month

29.4633	25.9420	27.5761	24.6211	24.0343	21.8608	21.8801	22.7459	22.9544	25.3073	26.4874	29.2242	(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	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	(66)

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

77.0499	85.3052	77.0499	79.6182	77.0499	79.6182	77.0499	77.0499	79.6182	77.0499	79.6182	77.0499	(67)

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

152.4259	154.0076	150.0218	141.5364	130.8251	120.7580	114.0326	112.4509	116.4367	124.9221	135.6334	145.7005	(68)

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

31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	(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)

-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	(71)

Water heating gains (Table 5)

39.6012	38.6041	37.0646	34.1960	32.3042	30.3622	29.4087	30.5725	31.8811	34.0152	36.7881	39.2799	(72)

Total internal gains

318.3130	327.1530	313.3724	304.5866	289.4152	279.9745	269.7273	269.3093	277.1721	285.2233	301.2757	311.2663	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.6400	36.7938	0.6300	0.7000	0.7700	108.3987	(77)

Southwest				1.3700		36.7938		0.6300		0.7000		0.7700	15.4052 (79)
Solar gains	123.8039	210.8838	288.5404	357.5155	400.4472	397.5513	383.2819	351.2530	312.4282	233.0715	148.2885	105.9503 (83)	
Total gains	442.1169	538.0368	601.9127	662.1021	689.8624	677.5259	653.0092	620.5623	589.6003	518.2948	449.5642	417.2166 (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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	24.9005	24.9547	25.0080	25.2617	25.3098	25.5358	25.5358	25.5781	25.4482	25.3098	25.2128	25.1122	
alpha	2.6600	2.6636	2.6672	2.6841	2.6873	2.7024	2.7024	2.7052	2.6965	2.6873	2.6809	2.6741	
util living area													
	0.9359	0.8979	0.8484	0.7630	0.6491	0.5043	0.3808	0.4132	0.5908	0.7935	0.9033	0.9437 (86)	
MIT	18.7120	19.1173	19.5949	20.1500	20.5755	20.8472	20.9474	20.9330	20.7542	20.1865	19.3594	18.6383 (87)	
Th 2	19.9386	19.9407	19.9427	19.9522	19.9540	19.9622	19.9622	19.9638	19.9591	19.9540	19.9504	19.9466 (88)	
util rest of house													
	0.9267	0.8839	0.8278	0.7310	0.6014	0.4373	0.2983	0.3295	0.5254	0.7583	0.8877	0.9355 (89)	
MIT 2	17.8796	18.2734	18.7337	19.2613	19.6434	19.8722	19.9402	19.9341	19.8033	19.3098	18.5231	17.8132 (90)	
Living area fraction										fLA = Living area / (4) =		0.6488 (91)	
MIT	18.4197	18.8210	19.2925	19.8379	20.2482	20.5048	20.5937	20.5822	20.4203	19.8787	19.0657	18.3486 (92)	
Temperature adjustment												0.0000	
adjusted MIT	18.4197	18.8210	19.2925	19.8379	20.2482	20.5048	20.5937	20.5822	20.4203	19.8787	19.0657	18.3486 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9101	0.8664	0.8133	0.7273	0.6155	0.4732	0.3494	0.3804	0.5555	0.7555	0.8719	0.9197 (94)	
Useful gains	402.3698	466.1723	489.5588	481.5205	424.5895	320.6280	228.1289	236.0653	327.5472	391.5611	391.9961	383.7104 (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													
	864.0054	849.9951	779.4240	659.7382	514.6182	352.3374	238.3004	249.1375	378.4221	558.5961	723.1336	858.4753 (97)	
Space heating kWh													
	343.4569	257.9289	215.6597	128.3168	66.9814	0.0000	0.0000	0.0000	0.0000	124.2740	238.4190	353.2251 (98a)	
Space heating requirement - total per year (kWh/year)												1728.2617	
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													
	343.4569	257.9289	215.6597	128.3168	66.9814	0.0000	0.0000	0.0000	0.0000	124.2740	238.4190	353.2251 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												1728.2617	
Space heating per m2											(98c) / (4) =	33.2358 (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	560.8906	441.5522	452.7360	0.0000	0.0000	0.0000	0.0000 (100)	
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8309	0.8819	0.8646	0.0000	0.0000	0.0000	0.0000 (101)	
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	466.0242	389.4028	391.4226	0.0000	0.0000	0.0000	0.0000 (102)	
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	764.2350	737.1079	700.6587	0.0000	0.0000	0.0000	0.0000 (103)	
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	214.7118	258.6926	230.0716	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	53.6779	64.6731	57.5179	0.0000	0.0000	0.0000	0.0000 (107)	
Space cooling requirement												175.8690 (107)	
Energy for space heating												33.2358 (99)	
Energy for space cooling												3.3821 (108)	
Total												36.6179 (109)	
Fabric Energy Efficiency (TFEE)												36.6 (109)	

Full SAP Calculation Printout

Property Reference	Flat 303 VL - Be Green	Issued on Date	06/05/2023
Assessment Reference	Flat 303 VL - Be Green	Prop Type Ref	Flat 203 VL - Be Green
Property	MFMTF, Vine Lane, London, WC1A		

SAP Rating	84 B	DER	3.31	TER	15.14
Environmental	98 A	% DER < TER			78.14
CO_2 Emissions (t/year)	0.16	DFEE	33.38	TFEE	34.14
Compliance Check	See BREL	% DFEE < TFEE			2.23
% DPER < TPER	56.42	DPER	35.35	TPER	81.11

Assessor Details	Mr. Adrian Fell	Assessor ID	N222-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	51.6300 (1b)	x	2.8300 (2b)	=	146.1129	(1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 51.6300						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	146.1129	(5)

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2. Ventilation rate

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	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) =	0.1369 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.2869 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2223 (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	0.2835	0.2779	0.2724	0.2446	0.2390	0.2112	0.2112	0.2057	0.2223	0.2390	0.2501	0.2612	(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	0.5402	0.5386	0.5371	0.5299	0.5286	0.5223	0.5223	0.5211	0.5247	0.5286	0.5313	0.5341	(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	
Glazed Door (Uw = 0.95)			1.9800	0.9152	1.8121			(27)
Window (Uw = 0.95)			11.2800	0.9152	10.3237			(27)
Door			1.8900	0.8000	1.5120			(26)
External Wall 1	51.3900	15.1500	36.2400	0.1500	5.4360	14.0000	507.3600	(29a)
Total net area of external elements Aum(A, m2)			51.3900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0838			(33)

Party Wall 1	34.8700	0.0000	0.0000	20.0000	697.4000 (32)
Party Floor 1	51.6300			40.0000	2065.2000 (32d)
Party Ceiling 1	51.6300			40.0000	2065.2000 (32b)
Internal Wall 1	53.3700			9.0000	480.3300 (32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 5815.4900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 112.6378 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	6.4900	0.0500	0.3245
E3 Sill	6.4900	0.0500	0.3245
E4 Jamb	18.2000	0.0500	0.9100
E7 Party floor between dwellings (in blocks of flats)	36.3200	0.0700	2.5424
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.1900	0.4430	2.7422
E16 Corner (normal)	2.8300	0.0900	0.2547
E17 Corner (inverted – internal area greater than external area)	2.8300	-0.0900	-0.2547
E18 Party wall between dwellings	11.3200	0.0600	0.6792
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	24.6400	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.5228 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 26.6066 (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	26.0459	25.9707	25.8970	25.5506	25.4858	25.1842	25.1842	25.1283	25.3004	25.4858	25.6169	25.7540	(38)
Heat transfer coeff	52.6525	52.5773	52.5036	52.1572	52.0924	51.7908	51.7908	51.7349	51.9070	52.0924	52.2235	52.3606	(39)
Average = Sum(39)m / 12 =												52.1569	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0198	1.0183	1.0169	1.0102	1.0090	1.0031	1.0031	1.0020	1.0054	1.0090	1.0115	1.0142	(40)
HLP (average)												1.0102	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7382 (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

23.0709	22.7283	22.2458	21.3561	20.6900	19.9513	19.5523	20.0314	20.5531	21.3435	22.2515	22.9929	(42b)

Hot water usage for other uses

32.4304	31.2512	30.0719	28.8926	27.7133	26.5340	26.5340	27.7133	28.8926	30.0719	31.2512	32.4304	(42c)

Average daily hot water use (litres/day) 50.8726 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	55.5014	53.9794	52.3176	50.2487	48.4033	46.4853	46.0863	47.7447	49.4457	51.4154	53.5026	55.4234	(44)
Energy conte	87.9006	76.8660	80.4103	68.7880	65.1601	57.1591	55.7374	59.1180	60.9715	69.7702	76.2243	86.7796	(45)
Energy content (annual)										Total = Sum(45)m =		844.8850	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	74.7155	65.3361	68.3487	58.4698	55.3861	48.5852	47.3768	50.2503	51.8258	59.3047	64.7907	73.7627	(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	74.7155	65.3361	68.3487	58.4698	55.3861	48.5852	47.3768	50.2503	51.8258	59.3047	64.7907	73.7627	(64)
									Total per year (kWh/year) = Sum(64)m =			718.1522	(64)
12Total per year (kWh/year)												718	(64)
Electric shower(s)	42.7346	38.0769	41.5785	39.6778	40.4224	38.5590	39.8443	40.4224	39.6778	41.5785	40.7966	42.7346	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			486.1034	(64a)
Heat gains from water heating, kWh/month	29.3625	25.8532	27.4818	24.5369	23.9521	21.7861	21.8053	22.6682	22.8759	25.2208	26.3968	29.1243	(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	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.3972	84.5826	76.3972	78.9438	76.3972	78.9438	76.3972	76.3972	78.9438	76.3972	78.9438	76.3972	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	151.4660	153.0378	149.0770	140.6451	130.0013	119.9976	113.3145	111.7427	115.7035	124.1354	134.7793	144.7830	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	(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)													

	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	(71)
Water heating gains (Table 5)												
	39.4658	38.4721	36.9379	34.0790	32.1937	30.2584	29.3082	30.4680	31.7721	33.8989	36.6623	39.1456 (72)
Total internal gains												
	316.4013	325.1648	311.4845	302.7402	287.6645	278.2721	268.0922	267.6802	275.4917	283.5039	299.4576	309.3981 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	1.9800	36.7938	0.4700	0.7000	0.7700	16.6100	(77)
Northeast	11.2800	11.2829	0.4700	0.7000	0.7700	29.0175	(75)

Solar gains	45.6275	87.3590	145.1299	222.7349	288.6497	303.7910	285.7172	233.9078	171.5888	103.4531	56.4065	37.9119 (83)
Total gains	362.0289	412.5238	456.6144	525.4751	576.3142	582.0631	553.8094	501.5881	447.0805	386.9570	355.8642	347.3099 (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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	30.6806	30.7245	30.7677	30.9720	31.0105	31.1912	31.1912	31.2248	31.1213	31.0105	30.9327	30.8517	
alpha	3.0454	3.0483	3.0512	3.0648	3.0674	3.0794	3.0794	3.0817	3.0748	3.0674	3.0622	3.0568	
util living area													
	0.9594	0.9394	0.9037	0.8182	0.6853	0.5213	0.3953	0.4481	0.6657	0.8635	0.9392	0.9638	(86)
MIT	18.9620	19.2407	19.6630	20.2267	20.6558	20.8920	20.9655	20.9491	20.7669	20.2016	19.4952	18.9083	(87)
Th 2	20.0669	20.0681	20.0693	20.0748	20.0759	20.0807	20.0807	20.0816	20.0789	20.0759	20.0738	20.0716	(88)
util rest of house													
	0.9533	0.9305	0.8893	0.7916	0.6415	0.4588	0.3185	0.3676	0.6049	0.8371	0.9287	0.9584	(89)
MIT 2	18.2086	18.4825	18.8944	19.4333	19.8197	20.0159	20.0658	20.0582	19.9252	19.4233	18.7404	18.1592	(90)
Living area fraction										fLA = Living area / (4) =		0.6328	(91)
MIT	18.6853	18.9622	19.3807	19.9354	20.3488	20.5703	20.6351	20.6219	20.4578	19.9158	19.2180	18.6332	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6853	18.9622	19.3807	19.9354	20.3488	20.5703	20.6351	20.6219	20.4578	19.9158	19.2180	18.6332	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9419	0.9176	0.8769	0.7872	0.6550	0.4928	0.3654	0.4158	0.6311	0.8319	0.9169	0.9476	(94)
Useful gains	341.0107	378.5265	400.4276	413.6393	377.5032	286.8483	202.3873	208.5770	282.1466	321.9099	326.2901	329.1013	(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													
	757.4226	739.3550	676.2847	575.5743	450.5357	309.2065	208.9823	218.4216	330.0140	485.2816	632.8442	755.7325	(97)
Space heating kWh													
	309.8105	242.4768	205.2377	116.5933	54.3362	0.0000	0.0000	0.0000	0.0000	121.5485	220.7190	317.4136	(98a)
Space heating requirement - total per year (kWh/year)												1588.1354	
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													
	309.8105	242.4768	205.2377	116.5933	54.3362	0.0000	0.0000	0.0000	0.0000	121.5485	220.7190	317.4136	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1588.1354	
Space heating per m2											(98c) / (4) =	30.7599	(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	486.8333	383.2517	393.1853	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8525	0.8995	0.8698	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	415.0133	344.7446	341.9856	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	653.0543	621.5424	561.9656	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	171.3896	205.9375	163.6651	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	42.8474	51.4844	40.9163	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												135.2480	(107)
Energy for space heating												30.7599	(99)
Energy for space cooling												2.6196	(108)
Total												33.3795	(109)
Fabric Energy Efficiency (DFEE)												33.4	(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	51.6300 (1b)	x	2.8300 (2b)	=	146.1129 (1b)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.6300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	146.1129	(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) =	0.1369	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3869	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2998	(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	0.3823	0.3748	0.3673	0.3298	0.3223	0.2848	0.2848	0.2773	0.2998	0.3223	0.3373	0.3523	(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	0.5731	0.5702	0.5675	0.5544	0.5519	0.5406	0.5406	0.5385	0.5449	0.5519	0.5569	0.5621	(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			1.8900	1.0000	1.8900			(26)
TER Opening Type (Uw = 1.20)			11.0300	1.1450	12.6298			(27)
External Wall 1	51.3900	12.9200	38.4700	0.1800	6.9246			(29a)
Total net area of external elements Aum(A, m2)			51.3900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.4444			(33)
Party Wall 1			34.8700	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							112.6378	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E1 Steel lintel with perforated steel base plate	6.4900	0.0500	0.3245
E3 Sill	6.4900	0.0500	0.3245
E4 Jamb	18.2000	0.0500	0.9100
E7 Party floor between dwellings (in blocks of flats)	36.3200	0.0700	2.5424
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.1900	0.0200	0.1238
E16 Corner (normal)	2.8300	0.0900	0.2547
E17 Corner (inverted – internal area greater than external area)	2.8300	-0.0900	-0.2547
E18 Party wall between dwellings	11.3200	0.0600	0.6792
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	24.6400	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		4.9044	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	26.3488	(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	27.6319	27.4951	27.3610	26.7311	26.6133	26.0647	26.0647	25.9631	26.2760	26.6133	26.8517	27.1009	(38)
Heat transfer coeff													
	53.9807	53.8439	53.7098	53.0799	52.9620	52.4134	52.4134	52.3118	52.6248	52.9620	53.2005	53.4497	(39)
Average = Sum(39)m / 12 =												53.0793	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0455	1.0429	1.0403	1.0281	1.0258	1.0152	1.0152	1.0132	1.0193	1.0258	1.0304	1.0352	(40)
HLP (average)												1.0281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7382	(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													
	23.0709	22.7283	22.2458	21.3561	20.6900	19.9513	19.5523	20.0314	20.5531	21.3435	22.2515	22.9929	(42b)
Hot water usage for other uses													
	32.4304	31.2512	30.0719	28.8926	27.7133	26.5340	26.5340	27.7133	28.8926	30.0719	31.2512	32.4304	(42c)
Average daily hot water use (litres/day)												50.8726	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	55.5014	53.9794	52.3176	50.2487	48.4033	46.4853	46.0863	47.7447	49.4457	51.4154	53.5026	55.4234	(44)
Energy conte	87.9006	76.8660	80.4103	68.7880	65.1601	57.1591	55.7374	59.1180	60.9715	69.7702	76.2243	86.7796	(45)
Energy content (annual)											Total = Sum(45)m =	844.8850	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	74.7155	65.3361	68.3487	58.4698	55.3861	48.5852	47.3768	50.2503	51.8258	59.3047	64.7907	73.7627	(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													
	74.7155	65.3361	68.3487	58.4698	55.3861	48.5852	47.3768	50.2503	51.8258	59.3047	64.7907	73.7627	(64)
										Total per year (kWh/year) = Sum(64)m =		718.1522	(64)
12Total per year (kWh/year)												718	(64)
Electric shower(s)													
	42.7346	38.0769	41.5785	39.6778	40.4224	38.5590	39.8443	40.4224	39.6778	41.5785	40.7966	42.7346	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		486.1034	(64a)
Heat gains from water heating, kWh/month													
	29.3625	25.8532	27.4818	24.5369	23.9521	21.7861	21.8053	22.6682	22.8759	25.2208	26.3968	29.1243	(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	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	86.9077	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	76.5233	84.7223	76.5233	79.0741	76.5233	79.0741	76.5233	76.5233	79.0741	76.5233	79.0741	76.5233	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	151.4660	153.0378	149.0770	140.6451	130.0013	119.9976	113.3145	111.7427	115.7035	124.1354	134.7793	144.7830	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	31.6908	(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)													
	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	-69.5262	(71)
Water heating gains (Table 5)													
	39.4658	38.4721	36.9379	34.0790	32.1937	30.2584	29.3082	30.4680	31.7721	33.8989	36.6623	39.1456	(72)
Total internal gains													
	316.5274	325.3044	311.6106	302.8705	287.7906	278.4024	268.2183	267.8063	275.6220	283.6300	299.5880	309.5242	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	9.3800	11.2829	0.6300	0.7000	0.7700	32.3442	(75)
Southeast	1.6500	36.7938	0.6300	0.7000	0.7700	18.5537	(77)

Solar gains	50.8980	97.4415	161.8602	248.3843	321.8695	338.7458	318.5953	260.8361	191.3602	115.3878	62.9205	42.2920	(83)
Total gains	367.4254	422.7459	473.4708	551.2548	609.6601	617.1482	586.8136	528.6424	466.9821	399.0178	362.5085	351.8162	(84)

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7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
tau	29.9258	30.0018	30.0767	30.4336	30.5013	30.8206	30.8206	30.8805	30.6968	30.5013	30.3647	30.2231	
alpha	2.9951	3.0001	3.0051	3.0289	3.0334	3.0547	3.0547	3.0587	3.0465	3.0334	3.0243	3.0149	
util living area													
	0.9586	0.9370	0.8983	0.8060	0.6671	0.5015	0.3789	0.4319	0.6517	0.8575	0.9374	0.9631	(86)
MIT	18.9136	19.2103	19.6550	20.2436	20.6717	20.9003	20.9683	20.9527	20.7748	20.2023	19.4742	18.8689	(87)
Th 2	20.0456	20.0478	20.0499	20.0600	20.0619	20.0707	20.0707	20.0723	20.0673	20.0619	20.0581	20.0541	(88)
util rest of house													
	0.9523	0.9277	0.8831	0.7781	0.6224	0.4396	0.3040	0.3528	0.5902	0.8302	0.9266	0.9574	(89)
MIT 2	18.1461	18.4380	18.8717	19.4356	19.8194	20.0114	20.0571	20.0508	19.9201	19.4124	18.7086	18.1081	(90)
Living area fraction										fLA = Living area / (4) =		0.6328	(91)
MIT	18.6318	18.9267	19.3673	19.9469	20.3587	20.5739	20.6337	20.6215	20.4609	19.9122	19.1931	18.5895	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6318	18.9267	19.3673	19.9469	20.3587	20.5739	20.6337	20.6215	20.4609	19.9122	19.1931	18.5895	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9405	0.9144	0.8705	0.7745	0.6371	0.4738	0.3499	0.4004	0.6173	0.8252	0.9145	0.9463	(94)
Useful gains	345.5658	386.5558	412.1343	426.9465	388.4340	292.3775	205.3413	211.6637	288.2873	329.2884	331.5093	332.9403	(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													
	773.6386	755.2502	691.1008	586.3681	458.5838	313.1121	211.4197	220.8343	334.7432	493.1941	643.3574	769.1148	(97)
Space heating kWh													
	318.4862	247.7627	207.5511	114.7835	52.1915	0.0000	0.0000	0.0000	0.0000	121.9458	224.5306	324.5138	(98a)
Space heating requirement - total per year (kWh/year)												1611.7652	
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													
	318.4862	247.7627	207.5511	114.7835	52.1915	0.0000	0.0000	0.0000	0.0000	121.9458	224.5306	324.5138	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1611.7652	
Space heating per m2											(98c) / (4) =	31.2176	(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	492.6863	387.8594	397.5700	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8643	0.9081	0.8793	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	425.8210	352.1994	349.5928	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	693.9216	659.9833	593.4557	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	193.0325	228.9913	181.4340	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	48.2581	57.2478	45.3585	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												150.8644	(107)
Energy for space heating												31.2176	(99)
Energy for space cooling												2.9220	(108)
Total												34.1396	(109)
Fabric Energy Efficiency (TFEE)												34.1	(109)

Full SAP Calculation Printout

Property Reference	Flat 303 WCS - Green	Issued on Date	06/05/2023
Assessment Reference	Flat 303 WCS - Green	Prop Type Ref	Flat 102 WCS - Green
Property	West Central Street, London, WC1A		

SAP Rating	85 B	DER	2.83	TER	12.20
Environmental	98 A	% DER < TER			76.80
CO_2 Emissions (t/year)	0.2	DFEE	29.56	TFEE	29.79
Compliance Check	See BREL	% DFEE < TFEE			0.79
% DPER < TPER	53.17	DPER	30.41	TPER	64.93

Assessor Details	Mr. Adrian Fell	Assessor ID	N222-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	74.0000 (1b)	x	2.5200 (2b)	=	186.4800	(1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	186.4800	(5)

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2. Ventilation rate

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

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1609 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.3109 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2409 (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	0.3072	0.3012	0.2951	0.2650	0.2590	0.2289	0.2289	0.2229	0.2409	0.2590	0.2710	0.2831	(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	0.5472	0.5453	0.5436	0.5351	0.5335	0.5262	0.5262	0.5248	0.5290	0.5335	0.5367	0.5401	(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 (Uw = 0.95)			19.9200	0.9152	18.2312			(27)
Glazed Doors (Uw = 0.95)			4.1000	0.9152	3.7524			(27)
Solid Door			2.0000	0.8000	1.6000			(26)
External Wall 1	68.5900	26.0200	42.5700	0.1500	6.3855	14.0000	595.9799	(29a)
Total net area of external elements Aum(A, m2)			68.5900					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.9691			(33)

Party Wall 1	9.5800	0.0000	0.0000	20.0000	191.6000 (32)
Corridor Wall	34.0200	0.0000	0.0000	20.0000	680.4000 (32)
Party Floor 1	74.0000			40.0000	2960.0000 (32d)
Party Ceiling 1	74.0000			40.0000	2960.0000 (32b)
Internal Wall 1	88.7000			9.0000	798.3000 (32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 8186.2799 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 110.6254 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E16 Corner (normal)	10.0800	0.0900	0.9072
E17 Corner (inverted – internal area greater than external area)	2.5200	-0.0900	-0.2268
E18 Party wall between dwellings	2.5200	0.0600	0.1512
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.8600	0.4430	2.1530
E1 Steel lintel with perforated steel base plate	11.3900	0.0500	0.5695
E3 Sill	10.4400	0.0500	0.5220
E4 Jamb	41.0000	0.0500	2.0500
E7 Party floor between dwellings (in blocks of flats)	54.4400	0.0700	3.8108
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	34.6000	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.9369 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 39.9060 (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	33.6726	33.5599	33.4494	32.9303	32.8332	32.3811	32.3811	32.2974	32.5552	32.8332	33.0297	33.2351	(38)
Heat transfer coeff	73.5786	73.4659	73.3554	72.8363	72.7392	72.2871	72.2871	72.2034	72.4612	72.7392	72.9357	73.1411	(39)
Average = Sum(39)m / 12 =												72.8358	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9943	0.9928	0.9913	0.9843	0.9830	0.9769	0.9769	0.9757	0.9792	0.9830	0.9856	0.9884	(40)
HLP (average)												0.9843	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3392 (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

27.4046	26.9976	26.4245	25.3677	24.5764	23.6990	23.2251	23.7942	24.4139	25.3527	26.4313	27.3120	(42b)

Hot water usage for other uses

38.5857	37.1826	35.7795	34.3763	32.9732	31.5701	31.5701	32.9732	34.3763	35.7795	37.1826	38.5857	(42c)

Average daily hot water use (litres/day) 60.4863 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	65.9903	64.1802	62.2039	59.7441	57.5497	55.2691	54.7952	56.7674	58.7902	61.1322	63.6138	65.8977	(44)
Energy conte	104.5125	91.3917	95.6051	81.7866	77.4729	67.9598	66.2700	70.2899	72.4942	82.9558	90.6296	103.1798	(45)
Energy content (annual)										Total = Sum(45)m =		1004.5481	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	88.8356	77.6830	81.2644	69.5186	65.8520	57.7659	56.3295	59.7464	61.6201	70.5124	77.0351	87.7028	(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	88.8356	77.6830	81.2644	69.5186	65.8520	57.7659	56.3295	59.7464	61.6201	70.5124	77.0351	87.7028	(64)
									Total per year (kWh/year) = Sum(64)m =			853.8659	(64)
12Total per year (kWh/year)												854	(64)
Electric shower(s)	50.8051	45.2677	49.4306	47.1711	48.0562	45.8410	47.3690	48.0562	47.1711	49.4306	48.5012	50.8051	(64a)
						Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =						577.9048	(64a)
Heat gains from water heating, kWh/month	34.9102	30.7377	32.6738	29.1724	28.4770	25.9017	25.9246	26.9507	27.1978	29.9858	31.3841	34.6270	(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	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	104.1289	115.2856	104.1289	107.5999	104.1289	107.5999	104.1289	104.1289	107.5999	104.1289	107.5999	104.1289	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	206.4473	208.5895	203.1911	191.6984	177.1909	163.5559	154.4469	152.3047	157.7031	169.1958	183.7033	197.3383	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	(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)												
	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	(71)
Water heating gains (Table 5)												
	46.9223	45.7406	43.9163	40.5173	38.2756	35.9746	34.8449	36.2240	37.7747	40.3035	43.5890	46.5416 (72)
Total internal gains												
	415.5864	427.7037	409.3243	397.9034	377.6834	365.2183	351.5087	350.7455	361.1656	371.7161	392.9801	406.0968 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast	1.7000	11.2829	0.4700	0.7000	0.7700	4.3732 (75)
Southeast	11.5000	36.7938	0.4700	0.7000	0.7700	96.4722 (77)
Northwest	6.7200	11.2829	0.4700	0.7000	0.7700	17.2870 (81)
Southeast	2.0500	36.7938	0.4700	0.7000	0.7700	17.1972 (77)
Southwest	2.0500	36.7938	0.4700	0.7000	0.7700	17.1972 (79)

Solar gains	152.5268	267.0043	384.4372	508.3682	598.6518	607.1831	580.0374	510.7156	427.0459	300.2492	184.0022	129.6834 (83)
Total gains	568.1132	694.7079	793.7615	906.2716	976.3352	972.4015	931.5461	861.4611	788.2115	671.9654	576.9823	535.7801 (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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	30.9053	30.9527	30.9993	31.2202	31.2619	31.4574	31.4574	31.4939	31.3818	31.2619	31.1777	31.0902	
alpha	3.0604	3.0635	3.0666	3.0813	3.0841	3.0972	3.0972	3.0996	3.0921	3.0841	3.0785	3.0727	
util living area													
	0.9470	0.9087	0.8514	0.7443	0.6045	0.4495	0.3333	0.3729	0.5671	0.7979	0.9155	0.9544	(86)
MIT	19.1152	19.4943	19.9406	20.4340	20.7636	20.9300	20.9791	20.9702	20.8547	20.3965	19.6712	19.0386	(87)
Th 2	20.0881	20.0894	20.0906	20.0965	20.0976	20.1027	20.1027	20.1036	20.1007	20.0976	20.0953	20.0930	(88)
util rest of house													
	0.9394	0.8965	0.8323	0.7138	0.5610	0.3935	0.2683	0.3047	0.5086	0.7655	0.9022	0.9479	(89)
MIT 2	18.3747	18.7433	19.1721	19.6348	19.9246	20.0611	20.0937	20.0900	20.0076	19.6142	18.9260	18.3034	(90)
Living area fraction										fLA = Living area / (4) =		0.5274	(91)
MIT	18.7653	19.1394	19.5774	20.0563	20.3671	20.5194	20.5607	20.5543	20.4544	20.0268	19.3191	18.6911	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7653	19.1394	19.5774	20.0563	20.3671	20.5194	20.5607	20.5543	20.4544	20.0268	19.3191	18.6911	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9259	0.8817	0.8203	0.7124	0.5744	0.4200	0.3018	0.3394	0.5323	0.7627	0.8886	0.9352	(94)
Useful gains	526.0414	612.5484	651.1077	645.5969	560.8110	408.3674	281.1317	292.4215	419.5940	512.5310	512.7187	501.0547	(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													
	1064.3349	1046.1121	959.3007	812.5851	630.4415	427.8941	286.3067	299.9510	460.4458	685.6990	891.2048	1059.8980	(97)
Space heating kWh													
	400.4904	291.3548	229.2955	120.2315	51.8051	0.0000	0.0000	0.0000	0.0000	128.8370	272.5100	415.7794	(98a)
Space heating requirement - total per year (kWh/year)												1910.3037	
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													
	400.4904	291.3548	229.2955	120.2315	51.8051	0.0000	0.0000	0.0000	0.0000	128.8370	272.5100	415.7794	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1910.3037	
Space heating per m2											(98c) / (4) =	25.8149	(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	679.4988	534.9246	548.7457	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8996	0.9354	0.9180	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	611.2505	500.3432	503.7610	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1097.0516	1051.3314	971.4394	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	349.7768	409.9352	347.9527	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	87.4442	102.4838	86.9882	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												276.9162	(107)
Energy for space heating												25.8149	(99)

Energy for space cooling 3.7421 (108)
Total 29.5570 (109)
Fabric Energy Efficiency (DFEE) 29.6 (109)

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	74.0000 (1b)	x	2.5200 (2b)	=	186.4800 (1b)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 74.0000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	186.4800	(5)

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2. Ventilation rate

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

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1609	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4109	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3184	(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	0.4060	0.3980	0.3901	0.3503	0.3423	0.3025	0.3025	0.2945	0.3184	0.3423	0.3582	0.3742	(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	0.5824	0.5792	0.5761	0.5613	0.5586	0.5458	0.5458	0.5434	0.5507	0.5586	0.5642	0.5700	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.0000	1.0000	2.0000			(26)
TER Opening Type (Uw = 1.20)			16.5100	1.1450	18.9046			(27)
External Wall 1	68.5900	18.5100	50.0800	0.1800	9.0144			(29a)
Total net area of external elements Aum(A, m2)			68.5900					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.9190			(33)
Party Wall 1			9.5800	0.0000	0.0000			(32)
Corridor Wall			34.0200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 110.6254 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E16 Corner (normal)	10.0800	0.0900	0.9072
E17 Corner (inverted – internal area greater than external area)	2.5200	-0.0900	-0.2268
E18 Party wall between dwellings	2.5200	0.0600	0.1512
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.8600	0.0200	0.0972
E1 Steel lintel with perforated steel base plate	11.3900	0.0500	0.5695
E3 Sill	10.4400	0.0500	0.5220
E4 Jamb	41.0000	0.0500	2.0500
E7 Party floor between dwellings (in blocks of flats)	54.4400	0.0700	3.8108
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	34.6000	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.8811 (36)

Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 37.8001 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.8410	35.6440	35.4510	34.5443	34.3746	33.5849	33.5849	33.4387	33.8891	34.3746	34.7178	35.0766	(38)
Heat transfer coeff	73.6411	73.4441	73.2511	72.3443	72.1747	71.3850	71.3850	71.2387	71.6892	72.1747	72.5179	72.8767	(39)

Average = Sum(39)m / 12 = 72.3435

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9951	0.9925	0.9899	0.9776	0.9753	0.9647	0.9647	0.9627	0.9688	0.9753	0.9800	0.9848	(40)
HLP (average)												0.9776	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3392 (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

27.4046	26.9976	26.4245	25.3677	24.5764	23.6990	23.2251	23.7942	24.4139	25.3527	26.4313	27.3120	(42b)

Hot water usage for other uses

38.5857	37.1826	35.7795	34.3763	32.9732	31.5701	31.5701	32.9732	34.3763	35.7795	37.1826	38.5857	(42c)

Average daily hot water use (litres/day) 60.4863 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	65.9903	64.1802	62.2039	59.7441	57.5497	55.2691	54.7952	56.7674	58.7902	61.1322	63.6138	65.8977	(44)
Energy conte	104.5125	91.3917	95.6051	81.7866	77.4729	67.9598	66.2700	70.2899	72.4942	82.9558	90.6296	103.1798	(45)

Energy content (annual) Total = Sum(45)m = 1004.5481

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

88.8356	77.6830	81.2644	69.5186	65.8520	57.7659	56.3295	59.7464	61.6201	70.5124	77.0351	87.7028	(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

88.8356	77.6830	81.2644	69.5186	65.8520	57.7659	56.3295	59.7464	61.6201	70.5124	77.0351	87.7028	(64)

Total per year (kWh/year) = Sum(64)m = 853.8659 (64)

12Total per year (kWh/year) 854 (64)

Electric shower(s)

50.8051	45.2677	49.4306	47.1711	48.0562	45.8410	47.3690	48.0562	47.1711	49.4306	48.5012	50.8051	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 577.9048 (64a)

Heat gains from water heating, kWh/month

34.9102	30.7377	32.6738	29.1724	28.4770	25.9017	25.9246	26.9507	27.1978	29.9858	31.3841	34.6270	(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	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	116.9597	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	104.1276	115.2841	104.1276	107.5985	104.1276	107.5985	104.1276	104.1276	107.5985	104.1276	107.5985	104.1276	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	206.4473	208.5895	203.1911	191.6984	177.1909	163.5559	154.4469	152.3047	157.7031	169.1958	183.7033	197.3383	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	34.6960	(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)	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	-93.5678	(71)
Water heating gains (Table 5)	46.9223	45.7406	43.9163	40.5173	38.2756	35.9746	34.8449	36.2240	37.7747	40.3035	43.5890	46.5416	(72)
Total internal gains	415.5850	427.7021	409.3229	397.9020	377.6820	365.2169	351.5073	350.7441	361.1642	371.7147	392.9787	406.0954	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	1.1700	11.2829	0.6300	0.7000	0.7700	4.0344	(75)
Southeast	9.3100	36.7938	0.6300	0.7000	0.7700	104.6879	(77)
Southwest	1.4100	36.7938	0.6300	0.7000	0.7700	15.8550	(79)

Northwest			4.6200		11.2829		0.6300		0.7000		0.7700		15.9307 (81)
Solar gains	140.5081	245.9688	354.1600	468.3465	551.5362	559.4018	534.3899	470.5144	393.4183	276.5973	169.5039	119.4642 (83)	
Total gains	556.0931	673.6709	763.4829	866.2485	929.2182	924.6187	885.8972	821.2585	754.5825	648.3121	562.4826	525.5595 (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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	30.8791	30.9619	31.0435	31.4325	31.5064	31.8550	31.8550	31.9204	31.7198	31.5064	31.3573	31.2029	
alpha	3.0586	3.0641	3.0696	3.0955	3.1004	3.1237	3.1237	3.1280	3.1147	3.1004	3.0905	3.0802	
util living area	0.9496	0.9146	0.8619	0.7598	0.6230	0.4649	0.3455	0.3852	0.5820	0.8084	0.9198	0.9564 (86)	
MIT	19.0859	19.4538	19.8958	20.4039	20.7465	20.9255	20.9778	20.9686	20.8472	20.3779	19.6547	19.0245 (87)	
Th 2	20.0874	20.0896	20.0918	20.1020	20.1039	20.1129	20.1129	20.1145	20.1094	20.1039	20.1001	20.0960 (88)	
util rest of house	0.9424	0.9031	0.8437	0.7301	0.5796	0.4081	0.2791	0.3158	0.5234	0.7770	0.9070	0.9501 (89)	
MIT 2	18.3457	18.7048	19.1314	19.6136	19.9173	20.0683	20.1032	20.1001	20.0108	19.6036	18.9140	18.2918 (90)	
Living area fraction										fLA = Living area / (4) =		0.5274 (91)	
MIT	18.7361	19.0998	19.5346	20.0305	20.3547	20.5204	20.5645	20.5582	20.4520	20.0120	19.3046	18.6782 (92)	
Temperature adjustment												0.0000	
adjusted MIT	18.7361	19.0998	19.5346	20.0305	20.3547	20.5204	20.5645	20.5582	20.4520	20.0120	19.3046	18.6782 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9292	0.8883	0.8312	0.7276	0.5922	0.4347	0.3132	0.3511	0.5467	0.7735	0.8935	0.9377 (94)	
Useful gains	516.7098	598.4212	634.5900	630.2467	550.2942	401.9191	277.5028	288.3065	412.5594	501.4564	502.5964	492.8283 (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	1063.0907	1042.8948	954.7957	805.2261	624.6471	422.6299	283.0051	296.2233	455.3679	679.3058	885.0540	1055.1267 (97)	
Space heating kWh	406.5074	298.6863	238.2330	125.9851	55.3186	0.0000	0.0000	0.0000	0.0000	132.3200	275.3695	418.3500 (98a)	
Space heating requirement - total per year (kWh/year)												1950.7699	
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	406.5074	298.6863	238.2330	125.9851	55.3186	0.0000	0.0000	0.0000	0.0000	132.3200	275.3695	418.3500 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												1950.7699	
Space heating per m2											(98c) / (4) =	26.3618 (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	671.0188	528.2489	541.4144	0.0000	0.0000	0.0000	0.0000 (100)	
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8923	0.9304	0.9127	0.0000	0.0000	0.0000	0.0000 (101)	
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	598.7265	491.4980	494.1408	0.0000	0.0000	0.0000	0.0000 (102)	
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1041.2031	997.9770	924.4508	0.0000	0.0000	0.0000	0.0000 (103)	
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	318.5831	376.8204	320.1506	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	79.6458	94.2051	80.0376	0.0000	0.0000	0.0000	0.0000 (107)	
Space cooling requirement												253.8885 (107)	
Energy for space heating												26.3618 (99)	
Energy for space cooling												3.4309 (108)	
Total												29.7927 (109)	
Fabric Energy Efficiency (TFEE)												29.8 (109)	

Full SAP Calculation Printout

Property Reference	Flat 304 VL - Be Green	Issued on Date	06/05/2023
Assessment Reference	Flat 304 VL - Be Green	Prop Type Ref	Flat 103 VL - Be Green
Property	MFMTF, Vine Lane, London, WC1A		

SAP Rating	83 B	DER	3.45	TER	15.27
Environmental	98 A	% DER < TER			77.41
CO_2 Emissions (t/year)	0.16	DFEE	36.78	TFEE	36.44
Compliance Check	See BREL	% DFEE < TFEE			-0.94
% DPER < TPER	54.82	DPER	36.76	TPER	81.36

Assessor Details	Mr. Adrian Fell	Assessor ID	N222-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	52.0000 (1b)	x	2.8300 (2b)	=	147.1600	(1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	147.1600	(5)

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2. Ventilation rate

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		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) =	0.1359	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2859	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2216	(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	0.2825	0.2770	0.2714	0.2437	0.2382	0.2105	0.2105	0.2050	0.2216	0.2382	0.2493	0.2604	(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	0.5399	0.5384	0.5368	0.5297	0.5284	0.5222	0.5222	0.5210	0.5245	0.5284	0.5311	0.5339	(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	
Glazed Door (Uw = 0.95)			15.1600	0.9152	13.8748			(27)
Window (Uw = 0.95)			0.9000	0.9152	0.8237			(27)
Door			1.8900	0.8000	1.5120			(26)
External Wall 1	55.1900	17.9500	37.2400	0.1500	5.5860	14.0000	521.3600	(29a)
Total net area of external elements Aum(A, m2)			55.1900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.7965			(33)

Party Wall 1	25.5000	0.0000	0.0000	20.0000	510.0000 (32)
Party Floor 1	52.0000			40.0000	2080.0000 (32d)
Party Ceiling 1	52.0000			40.0000	2080.0000 (32b)
Internal Wall 1	51.0500			9.0000	459.4500 (32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 5650.8100 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 108.6694 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	39.0000	0.0700	2.7300
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.7000	0.4430	2.5251
E16 Corner (normal)	8.4900	0.0900	0.7641
E17 Corner (inverted – internal area greater than external area)	2.8300	-0.0900	-0.2547
E18 Party wall between dwellings	5.6600	0.0600	0.3396
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	9.0100	0.0000	0.0000
P7 Party Wall - Exposed floor (normal)	9.0100	0.1600	1.4416
E1 Steel lintel with perforated steel base plate	8.0400	0.0500	0.4020
E3 Sill	7.1400	0.0500	0.3570
E4 Jamb	25.4000	0.0500	1.2700

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.5747 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 31.3712 (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	26.2194	26.1441	26.0703	25.7239	25.6591	25.3573	25.3573	25.3014	25.4735	25.6591	25.7902	25.9273	(38)
Heat transfer coeff	57.5905	57.5153	57.4415	57.0950	57.0302	56.7285	56.7285	56.6726	56.8447	57.0302	57.1614	57.2984	(39)

Average = Sum(39)m / 12 = 57.0947

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1075	1.1061	1.1046	1.0980	1.0967	1.0909	1.0909	1.0899	1.0932	1.0967	1.0993	1.1019	(40)
HLP (average)												1.0980	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7491 (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

23.1496	22.8058	22.3217	21.4290	20.7606	20.0194	19.6190	20.0998	20.6232	21.4163	22.3274	23.0714	(42b)

Hot water usage for other uses

32.5422	31.3589	30.1755	28.9922	27.8088	26.6255	26.6255	27.8088	28.9922	30.1755	31.3589	32.5422	(42c)

Average daily hot water use (litres/day) 51.0472 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	55.6919	54.1647	52.4972	50.4212	48.5694	46.6448	46.2445	47.9086	49.6154	51.5919	53.6863	55.6136	(44)
Energy conte	88.2023	77.1298	80.6862	69.0240	65.3837	57.3553	55.9287	59.3209	61.1808	70.0097	76.4860	87.0774	(45)

Energy content (annual) Total = Sum(45)m = 847.7848
Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

74.9719	65.5603	68.5833	58.6704	55.5762	48.7520	47.5394	50.4227	52.0037	59.5082	65.0131	74.0158	(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

74.9719	65.5603	68.5833	58.6704	55.5762	48.7520	47.5394	50.4227	52.0037	59.5082	65.0131	74.0158	(64)

Total per year (kWh/year) = Sum(64)m = 720.6170 (64)
12Total per year (kWh/year) 721 (64)
Electric shower(s)

42.8812	38.2075	41.7211	39.8139	40.5610	38.6913	39.9810	40.5610	39.8139	41.7211	40.9366	42.8812	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 487.7707 (64a)
Heat gains from water heating, kWh/month

29.4633	25.9420	27.5761	24.6211	24.0343	21.8608	21.8801	22.7459	22.9544	25.3073	26.4874	29.2242	(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	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	76.8814	85.1187	76.8814	79.4441	76.8814	79.4441	76.8814	76.8814	79.4441	76.8814	79.4441	76.8814	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	152.4259	154.0076	150.0218	141.5364	130.8251	120.7580	114.0326	112.4509	116.4367	124.9221	135.6334	145.7005	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	(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)

-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628 (71)

Water heating gains (Table 5)

39.6012	38.6041	37.0646	34.1960	32.3042	30.3622	29.4087	30.5725	31.8811	34.0152	36.7881	39.2799 (72)

Total internal gains

318.1446	326.9665	313.2039	304.4125	289.2467	279.8004	269.5588	269.1408	276.9980	285.0548	301.1016	311.0978 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast	13.1800	11.2829	0.4700	0.7000	0.7700	33.9052 (75)
Southeast	1.9800	36.7938	0.4700	0.7000	0.7700	16.6100 (77)
Southwest	0.9000	36.7938	0.4700	0.7000	0.7700	7.5500 (79)

Solar gains	58.0652	110.1685	180.6511	273.9755	352.6409	370.2215	348.5556	286.7900	212.4837	129.8252	71.5997	48.3646 (83)
Total gains	376.2098	437.1350	493.8550	578.3881	641.8877	650.0220	618.1143	555.9309	489.4817	414.8800	372.7013	359.4625 (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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	27.2557	27.2914	27.3264	27.4922	27.5235	27.6699	27.6699	27.6972	27.6133	27.5235	27.4603	27.3946	
alpha	2.8170	2.8194	2.8218	2.8328	2.8349	2.8447	2.8447	2.8465	2.8409	2.8349	2.8307	2.8263	
util living area	0.9555	0.9326	0.8922	0.8008	0.6652	0.5059	0.3850	0.4384	0.6532	0.8538	0.9341	0.9604	(86)
MIT	18.7233	19.0397	19.5158	20.1365	20.6079	20.8699	20.9558	20.9355	20.7246	20.0936	19.3079	18.6618	(87)
Th 2	19.9947	19.9959	19.9970	20.0025	20.0035	20.0082	20.0082	20.0091	20.0064	20.0035	20.0014	19.9993	(88)
util rest of house	0.9488	0.9226	0.8762	0.7719	0.6191	0.4408	0.3048	0.3541	0.5894	0.8254	0.9227	0.9544	(89)
MIT 2	17.9273	18.2376	18.7009	19.2918	19.7146	19.9312	19.9895	19.9800	19.8270	19.2681	18.5095	17.8700	(90)
Living area fraction										fLA = Living area / (4) =		0.5727	(91)
MIT	18.3831	18.6969	19.1676	19.7756	20.2262	20.4688	20.5429	20.5272	20.3411	19.7409	18.9667	18.3235	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3831	18.6969	19.1676	19.7756	20.2262	20.4688	20.5429	20.5272	20.3411	19.7409	18.9667	18.3235	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9350	0.9068	0.8607	0.7647	0.6300	0.4719	0.3488	0.3992	0.6121	0.8168	0.9080	0.9413	(94)
Useful gains	351.7378	396.4074	425.0576	442.3108	404.3600	306.7155	215.5908	221.9459	299.6250	338.8906	338.4170	338.3559	(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	811.0549	793.5345	727.6448	620.9400	486.2483	332.9282	223.6734	233.8991	354.7712	521.3071	678.3188	809.2531	(97)
Space heating kWh	341.7319	266.8695	225.1249	128.6130	60.9249	0.0000	0.0000	0.0000	0.0000	135.7178	244.7293	350.3475	(98a)
Space heating requirement - total per year (kWh/year)												1754.0587	
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	341.7319	266.8695	225.1249	128.6130	60.9249	0.0000	0.0000	0.0000	0.0000	135.7178	244.7293	350.3475	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1754.0587	
Space heating per m2											(98c) / (4) =	33.7319	(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	533.2475	419.7906	430.7116	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8435	0.8902	0.8586	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	449.8050	373.7096	369.8097	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	732.2763	696.5027	625.2917	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	203.3794	240.1581	190.0786	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	50.8448	60.0395	47.5196	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												158.4040	(107)
Energy for space heating												33.7319	(99)
Energy for space cooling												3.0462	(108)
Total												36.7781	(109)

Fabric Energy Efficiency (DFEE) 36.8 (109)

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	52.0000 (1b)	x	2.8300 (2b)	=	147.1600 (1b) -	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 52.0000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	147.1600 (5)	

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2. Ventilation rate

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	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) =	0.1359 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3859 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2991 (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	0.3813	0.3738	0.3664	0.3290	0.3215	0.2841	0.2841	0.2766	0.2991	0.3215	0.3365	0.3514	(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	0.5727	0.5699	0.5671	0.5541	0.5517	0.5404	0.5404	0.5383	0.5447	0.5517	0.5566	0.5617	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Opening Type (Uw = 1.20)			11.1000	1.1450	12.7099			(27)
External Wall 1	55.1900	12.9900	42.2000	0.1800	7.5960			(29a)
Total net area of external elements Aum(A, m2)			55.1900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		22.1959			(33)
Party Wall 1			25.5000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 108.6694 (35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E7	Party floor between dwellings (in blocks of flats)	39.0000	0.0700	2.7300
E23	Balcony within or between dwellings, balcony support penetrates wall insulation	5.7000	0.0200	0.1140
E16	Corner (normal)	8.4900	0.0900	0.7641
E17	Corner (inverted – internal area greater than external area)	2.8300	-0.0900	-0.2547
E18	Party wall between dwellings	5.6600	0.0600	0.3396
P3	Party wall - Intermediate floor between dwellings (in blocks of flats)	9.0100	0.0000	0.0000
P7	Party Wall - Exposed floor (normal)	9.0100	0.1600	1.4416
E1	Steel lintel with perforated steel base plate	8.0400	0.0500	0.4020
E3	Sill	7.1400	0.0500	0.3570
E4	Jamb	25.4000	0.0500	1.2700

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.1636 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 29.3595 (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	27.8121	27.6750	27.5406	26.9094	26.7913	26.2415	26.2415	26.1397	26.4533	26.7913	27.0302	27.2800	(38)
Heat transfer coeff	57.1716	57.0345	56.9001	56.2689	56.1508	55.6011	55.6011	55.4993	55.8128	56.1508	56.3897	56.6395	(39)
Average = Sum(39)m / 12 =												56.2684	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0995	1.0968	1.0942	1.0821	1.0798	1.0693	1.0693	1.0673	1.0733	1.0798	1.0844	1.0892	(40)
HLP (average)												1.0821	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7491	(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	23.1496	22.8058	22.3217	21.4290	20.7606	20.0194	19.6190	20.0998	20.6232	21.4163	22.3274	23.0714	(42b)
Hot water usage for other uses	32.5422	31.3589	30.1755	28.9922	27.8088	26.6255	26.6255	27.8088	28.9922	30.1755	31.3589	32.5422	(42c)
Average daily hot water use (litres/day)												51.0472	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	55.6919	54.1647	52.4972	50.4212	48.5694	46.6448	46.2445	47.9086	49.6154	51.5919	53.6863	55.6136	(44)
Energy conte	88.2023	77.1298	80.6862	69.0240	65.3837	57.3553	55.9287	59.3209	61.1808	70.0097	76.4860	87.0774	(45)
Energy content (annual)											Total = Sum(45)m =	847.7848	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	74.9719	65.5603	68.5833	58.6704	55.5762	48.7520	47.5394	50.4227	52.0037	59.5082	65.0131	74.0158	(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	74.9719	65.5603	68.5833	58.6704	55.5762	48.7520	47.5394	50.4227	52.0037	59.5082	65.0131	74.0158	(64)
										Total per year (kWh/year) = Sum(64)m =		720.6170	(64)
12Total per year (kWh/year)												721	(64)
Electric shower(s)	42.8812	38.2075	41.7211	39.8139	40.5610	38.6913	39.9810	40.5610	39.8139	41.7211	40.9366	42.8812	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		487.7707	(64a)
Heat gains from water heating, kWh/month	29.4633	25.9420	27.5761	24.6211	24.0343	21.8608	21.8801	22.7459	22.9544	25.3073	26.4874	29.2242	(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	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	77.0119	85.2631	77.0119	79.5789	77.0119	79.5789	77.0119	77.0119	79.5789	77.0119	79.5789	77.0119	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	152.4259	154.0076	150.0218	141.5364	130.8251	120.7580	114.0326	112.4509	116.4367	124.9221	135.6334	145.7005	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	(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)	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	(71)
Water heating gains (Table 5)	39.6012	38.6041	37.0646	34.1960	32.3042	30.3622	29.4087	30.5725	31.8811	34.0152	36.7881	39.2799	(72)
Total internal gains	318.2750	327.1109	313.3344	304.5474	289.3772	279.9353	269.6893	269.2713	277.1328	285.1853	301.2365	311.2283	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	9.1100	11.2829	0.6300	0.7000	0.7700	31.4132	(75)
Southeast	1.3700	36.7938	0.6300	0.7000	0.7700	15.4052	(77)
Southwest	0.6200	36.7938	0.6300	0.7000	0.7700	6.9717	(79)

Solar gains	53.7901	102.0587	167.3563	253.8173	326.6983	342.9869	322.9142	265.6903	196.8478	120.2693	66.3283	44.8036 (83)
Total gains	372.0652	429.1696	480.6906	558.3646	616.0755	622.9221	592.6035	534.9616	473.9806	405.4546	367.5648	356.0319 (84)

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7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	27.4554	27.5214	27.5864	27.8958	27.9545	28.2309	28.2309	28.2827	28.1238	27.9545	27.8361	27.7133	
alpha	2.8304	2.8348	2.8391	2.8597	2.8636	2.8821	2.8821	2.8855	2.8749	2.8636	2.8557	2.8476	
util living area	0.9564	0.9348	0.8970	0.8093	0.6772	0.5162	0.3933	0.4459	0.6608	0.8577	0.9354	0.9610	(86)
MIT	18.7300	19.0384	19.5045	20.1270	20.5994	20.8687	20.9556	20.9359	20.7250	20.0988	19.3239	18.6823	(87)
Th 2	20.0013	20.0034	20.0055	20.0155	20.0173	20.0260	20.0260	20.0276	20.0227	20.0173	20.0136	20.0096	(88)
util rest of house	0.9499	0.9252	0.8816	0.7814	0.6318	0.4514	0.3131	0.3620	0.5979	0.8301	0.9243	0.9551	(89)
MIT 2	17.9384	18.2419	18.6968	19.2942	19.7205	19.9476	20.0070	19.9983	19.8423	19.2839	18.5338	17.8973	(90)
Living area fraction										fLA = Living area / (4) =		0.5727	(91)
MIT	18.3917	18.6981	19.1594	19.7711	20.2238	20.4751	20.5503	20.5352	20.3478	19.7506	18.9863	18.3469	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3917	18.6981	19.1594	19.7711	20.2238	20.4751	20.5503	20.5352	20.3478	19.7506	18.9863	18.3469	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9363	0.9097	0.8662	0.7737	0.6419	0.4821	0.3570	0.4069	0.6200	0.8215	0.9099	0.9423	(94)
Useful gains	348.3507	390.3972	416.3555	432.0044	395.4295	300.3382	211.5554	217.6616	293.8824	333.0725	334.4441	335.4859	(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	805.6467	786.9659	720.3203	611.7079	478.6208	326.6633	219.6388	229.5032	348.7093	513.8130	670.2628	801.2715	(97)
Space heating kWh	340.2283	266.4942	226.1498	129.3865	61.8944	0.0000	0.0000	0.0000	0.0000	134.4709	241.7895	346.5445	(98a)
Space heating requirement - total per year (kWh/year)												1746.9581	
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	340.2283	266.4942	226.1498	129.3865	61.8944	0.0000	0.0000	0.0000	0.0000	134.4709	241.7895	346.5445	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1746.9581	
Space heating per m2											(98c) / (4) =	33.5953	(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	522.6501	411.4479	421.7944	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8393	0.8874	0.8562	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	438.6444	365.1215	361.1477	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	700.4550	666.5446	600.6457	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	188.5036	224.2588	178.1865	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	47.1259	56.0647	44.5466	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												147.7372	(107)
Energy for space heating												33.5953	(99)
Energy for space cooling												2.8411	(108)
Total												36.4364	(109)
Fabric Energy Efficiency (TFEE)												36.4	(109)

Full SAP Calculation Printout

Property Reference	Flat 305 VL - Be Green	Issued on Date	06/05/2023
Assessment Reference	Flat 305 VL - Be Green	Prop Type Ref	Flat 103 VL - Be Green
Property	MFMTF, Vine Lane, London, WC1A		

SAP Rating	83 B	DER	3.61	TER	16.49
Environmental	97 A	% DER < TER			78.11
CO_2 Emissions (t/year)	0.17	DFEE	40.78	TFEE	40.48
Compliance Check	See BREL	% DFEE < TFEE			-0.76
% DPER < TPER	56.47	DPER	38.44	TPER	88.32

Assessor Details	Mr. Adrian Fell	Assessor ID	N222-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	52.0000 (1b)	x	2.8300 (2b)	=	147.1600	(1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 52.0000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	147.1600	(5)

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2. Ventilation rate

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	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) =	0.1359 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.2859 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2216 (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	0.2825	0.2770	0.2714	0.2437	0.2382	0.2105	0.2105	0.2050	0.2216	0.2382	0.2493	0.2604	(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	0.5399	0.5384	0.5368	0.5297	0.5284	0.5222	0.5222	0.5210	0.5245	0.5284	0.5311	0.5339	(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	
Glazed Door (Uw = 0.95)			17.1000	0.9152	15.6503			(27)
Window (Uw = 0.95)			1.8000	0.9152	1.6474			(27)
Door			1.8900	0.8000	1.5120			(26)
External Wall 1	81.6500	20.7900	60.8600	0.1500	9.1290	14.0000	852.0400	(29a)
Total net area of external elements Aum(A, m2)			81.6500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.9387			(33)

Party Wall 1	9.9100	0.0000	0.0000	20.0000	198.2000 (32)
Party Floor 1	52.0000			40.0000	2080.0000 (32d)
Party Ceiling 1	52.0000			40.0000	2080.0000 (32b)
Internal Wall 1	58.0200			9.0000	522.1800 (32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 5732.4200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 110.2388 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	57.7000	0.0700	4.0390
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.3000	0.4430	1.9049
E16 Corner (normal)	11.3200	0.0900	1.0188
E17 Corner (inverted – internal area greater than external area)	2.8300	-0.0900	-0.2547
E18 Party wall between dwellings	2.8300	0.0600	0.1698
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.0000	0.0000	0.0000
E1 Steel lintel with perforated steel base plate	9.6000	0.0500	0.4800
E3 Sill	8.7000	0.0500	0.4350
E4 Jamb	25.4000	0.0500	1.2700

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.0628 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 37.0015 (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	26.2194	26.1441	26.0703	25.7239	25.6591	25.3573	25.3573	25.3014	25.4735	25.6591	25.7902	25.9273	(38)
Heat transfer coeff	63.2209	63.1456	63.0718	62.7254	62.6605	62.3588	62.3588	62.3029	62.4750	62.6605	62.7917	62.9288	(39)

Average = Sum(39)m / 12 = 62.7251

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2158	1.2143	1.2129	1.2063	1.2050	1.1992	1.1992	1.1981	1.2014	1.2050	1.2075	1.2102	(40)
HLP (average)												1.2063	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7491 (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

23.1496	22.8058	22.3217	21.4290	20.7606	20.0194	19.6190	20.0998	20.6232	21.4163	22.3274	23.0714	(42b)

Hot water usage for other uses

32.5422	31.3589	30.1755	28.9922	27.8088	26.6255	26.6255	27.8088	28.9922	30.1755	31.3589	32.5422	(42c)

Average daily hot water use (litres/day) 51.0472 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	55.6919	54.1647	52.4972	50.4212	48.5694	46.6448	46.2445	47.9086	49.6154	51.5919	53.6863	55.6136	(44)
Energy conte	88.2023	77.1298	80.6862	69.0240	65.3837	57.3553	55.9287	59.3209	61.1808	70.0097	76.4860	87.0774	(45)

Energy content (annual) Total = Sum(45)m = 847.7848
Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

74.9719	65.5603	68.5833	58.6704	55.5762	48.7520	47.5394	50.4227	52.0037	59.5082	65.0131	74.0158	(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

74.9719	65.5603	68.5833	58.6704	55.5762	48.7520	47.5394	50.4227	52.0037	59.5082	65.0131	74.0158	(64)

Total per year (kWh/year) = Sum(64)m = 720.6170 (64)
12Total per year (kWh/year) 721 (64)
Electric shower(s)

42.8812	38.2075	41.7211	39.8139	40.5610	38.6913	39.9810	40.5610	39.8139	41.7211	40.9366	42.8812	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 487.7707 (64a)
Heat gains from water heating, kWh/month

29.4633	25.9420	27.5761	24.6211	24.0343	21.8608	21.8801	22.7459	22.9544	25.3073	26.4874	29.2242	(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	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.8814	85.1187	76.8814	79.4441	76.8814	79.4441	76.8814	76.8814	79.4441	76.8814	79.4441	76.8814	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	152.4259	154.0076	150.0218	141.5364	130.8251	120.7580	114.0326	112.4509	116.4367	124.9221	135.6334	145.7005	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	(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)													

	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	(71)
Water heating gains (Table 5)												
	39.6012	38.6041	37.0646	34.1960	32.3042	30.3622	29.4087	30.5725	31.8811	34.0152	36.7881	39.2799 (72)
Total internal gains												
	318.1446	326.9665	313.2039	304.4125	289.2467	279.8004	269.5588	269.1408	276.9980	285.0548	301.1016	311.0978 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	11.2800	11.2829	0.4700	0.7000	0.7700	29.0175	(75)
Southeast	5.8200	36.7938	0.4700	0.7000	0.7700	48.8233	(77)
Northwest	1.8000	11.2829	0.4700	0.7000	0.7700	4.6305	(81)

Solar gains	82.4713	151.6556	237.1887	343.6478	430.3325	447.1985	422.8332	355.1083	273.5739	175.6161	100.8169	69.2612 (83)
Total gains	400.6159	478.6221	550.3925	648.0604	719.5792	726.9990	692.3919	624.2491	550.5719	460.6709	401.9186	380.3591 (84)

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7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	25.1869	25.2169	25.2464	25.3859	25.4121	25.5351	25.5351	25.5580	25.4876	25.4121	25.3591	25.3038	
alpha	2.6791	2.6811	2.6831	2.6924	2.6941	2.7023	2.7023	2.7039	2.6992	2.6941	2.6906	2.6869	
util living area	0.9524	0.9251	0.8795	0.7839	0.6486	0.4940	0.3760	0.4270	0.6355	0.8406	0.9290	0.9580	(86)
MIT	18.5616	18.9237	19.4418	20.0897	20.5791	20.8548	20.9490	20.9272	20.7051	20.0404	19.1891	18.4899	(87)
Th 2	19.9074	19.9085	19.9097	19.9150	19.9160	19.9206	19.9206	19.9215	19.9188	19.9160	19.9140	19.9119	(88)
util rest of house	0.9449	0.9138	0.8612	0.7521	0.5991	0.4249	0.2909	0.3377	0.5670	0.8089	0.9162	0.9513	(89)
MIT 2	17.7080	18.0619	18.5639	19.1767	19.6121	19.8373	19.9002	19.8902	19.7323	19.1499	18.3317	17.6407	(90)
Living area fraction										fLA = Living area / (4) =		0.6206	(91)
MIT	18.2378	18.5967	19.1087	19.7433	20.2122	20.4688	20.5510	20.5338	20.3360	19.7026	18.8638	18.1677	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.2378	18.5967	19.1087	19.7433	20.2122	20.4688	20.5510	20.5338	20.3360	19.7026	18.8638	18.1677	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9302	0.8969	0.8455	0.7465	0.6133	0.4609	0.3415	0.3896	0.5949	0.8018	0.9009	0.9374	(94)
Useful gains	372.6356	429.2865	465.3316	483.8049	441.3235	335.0980	236.4390	243.1961	327.5456	369.3587	362.0702	356.5473	(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	881.1570	864.8882	795.2543	680.1481	533.3778	365.9686	246.3821	257.5455	389.5951	570.3717	738.6670	878.9718	(97)
Space heating kWh	378.3399	292.7243	245.4625	141.3671	68.4884	0.0000	0.0000	0.0000	0.0000	149.5537	271.1497	388.6838	(98a)
Space heating requirement - total per year (kWh/year)												1935.7694	
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	378.3399	292.7243	245.4625	141.3671	68.4884	0.0000	0.0000	0.0000	0.0000	149.5537	271.1497	388.6838	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1935.7694	
Space heating per m2										(98c) / (4) =		37.2263	(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	586.1726	461.4550	473.5021	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8390	0.8855	0.8549	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	491.7708	408.6304	404.7912	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	822.2494	783.3207	705.1441	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	237.9446	278.7696	223.4626	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	59.4862	69.6924	55.8656	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												185.0442	(107)
Energy for space heating												37.2263	(99)
Energy for space cooling												3.5585	(108)
Total												40.7849	(109)
Fabric Energy Efficiency (DFEE)												40.8	(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		52.0000 (1b)	x	2.8300 (2b)	=	147.1600 (1b) -	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.0000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	147.1600	(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) =	0.1359	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3859	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2991	(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	0.3813	0.3738	0.3664	0.3290	0.3215	0.2841	0.2841	0.2766	0.2991	0.3215	0.3365	0.3514	(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	0.5727	0.5699	0.5671	0.5541	0.5517	0.5404	0.5404	0.5383	0.5447	0.5517	0.5566	0.5617	(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			1.8900	1.0000	1.8900			(26)
TER Opening Type (Uw = 1.20)			11.1100	1.1450	12.7214			(27)
External Wall 1	81.6500	13.0000	68.6500	0.1800	12.3570			(29a)
Total net area of external elements Aum(A, m2)			81.6500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.9684			(33)
Party Wall 1			9.9100	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K				110.2388	(35)
List of Thermal Bridges					
K1 Element	Length	Psi-value	Total		
E7 Party floor between dwellings (in blocks of flats)	57.7000	0.0700	4.0390		
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.3000	0.0200	0.0860		
E16 Corner (normal)	11.3200	0.0900	1.0188		
E17 Corner (inverted – internal area greater than external area)	2.8300	-0.0900	-0.2547		
E18 Party wall between dwellings	2.8300	0.0600	0.1698		
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.0000	0.0000	0.0000		
E1 Steel lintel with perforated steel base plate	9.6000	0.0500	0.4800		
E3 Sill	8.7000	0.0500	0.4350		
E4 Jamb	25.4000	0.0500	1.2700		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				7.2439	(36)
Point Thermal bridges			(36a) =	0.0000	
Total fabric heat loss			(33) + (36) + (36a) =	34.2123	(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	27.8121	27.6750	27.5406	26.9094	26.7913	26.2415	26.2415	26.1397	26.4533	26.7913	27.0302	27.2800	(38)
Heat transfer coeff													
	62.0244	61.8873	61.7529	61.1217	61.0036	60.4538	60.4538	60.3520	60.6656	61.0036	61.2425	61.4923	(39)
Average = Sum(39)m / 12 =												61.1211	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1928	1.1901	1.1876	1.1754	1.1731	1.1626	1.1626	1.1606	1.1666	1.1731	1.1777	1.1825	(40)
HLP (average)												1.1754	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7491	(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													
	23.1496	22.8058	22.3217	21.4290	20.7606	20.0194	19.6190	20.0998	20.6232	21.4163	22.3274	23.0714	(42b)
Hot water usage for other uses													
	32.5422	31.3589	30.1755	28.9922	27.8088	26.6255	26.6255	27.8088	28.9922	30.1755	31.3589	32.5422	(42c)
Average daily hot water use (litres/day)												51.0472	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	55.6919	54.1647	52.4972	50.4212	48.5694	46.6448	46.2445	47.9086	49.6154	51.5919	53.6863	55.6136	(44)
Energy conte	88.2023	77.1298	80.6862	69.0240	65.3837	57.3553	55.9287	59.3209	61.1808	70.0097	76.4860	87.0774	(45)
Energy content (annual)										Total = Sum(45)m =		847.7848	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	74.9719	65.5603	68.5833	58.6704	55.5762	48.7520	47.5394	50.4227	52.0037	59.5082	65.0131	74.0158	(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													
	74.9719	65.5603	68.5833	58.6704	55.5762	48.7520	47.5394	50.4227	52.0037	59.5082	65.0131	74.0158	(64)
									Total per year (kWh/year) = Sum(64)m =			720.6170	(64)
12Total per year (kWh/year)												721	(64)
Electric shower(s)													
	42.8812	38.2075	41.7211	39.8139	40.5610	38.6913	39.9810	40.5610	39.8139	41.7211	40.9366	42.8812	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							487.7707	(64a)
Heat gains from water heating, kWh/month													
	29.4633	25.9420	27.5761	24.6211	24.0343	21.8608	21.8801	22.7459	22.9544	25.3073	26.4874	29.2242	(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	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	77.0079	85.2588	77.0079	79.5748	77.0079	79.5748	77.0079	77.0079	79.5748	77.0079	79.5748	77.0079	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	152.4259	154.0076	150.0218	141.5364	130.8251	120.7580	114.0326	112.4509	116.4367	124.9221	135.6334	145.7005	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	(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)													
	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	(71)
Water heating gains (Table 5)													
	39.6012	38.6041	37.0646	34.1960	32.3042	30.3622	29.4087	30.5725	31.8811	34.0152	36.7881	39.2799	(72)
Total internal gains													
	318.2711	327.1066	313.3304	304.5433	289.3733	279.9312	269.6853	269.2674	277.1287	285.1813	301.2324	311.2244	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	6.6300	11.2829	0.6300	0.7000	0.7700	22.8617	(75)
Southeast	3.4200	36.7938	0.6300	0.7000	0.7700	38.4568	(77)
Northwest	1.0600	11.2829	0.6300	0.7000	0.7700	3.6551	(81)

Solar gains	64.9735	119.4818	186.8753	270.7613	339.0677	352.3596	333.1604	279.7938	215.5454	138.3607	79.4273	54.5659	(83)
Total gains	383.2446	446.5883	500.2057	575.3045	628.4409	632.2908	602.8457	549.0611	492.6742	423.5421	380.6597	365.7903	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	25.6728	25.7297	25.7857	26.0519	26.1024	26.3398	26.3398	26.3842	26.2478	26.1024	26.0006	25.8949	
alpha	2.7115	2.7153	2.7190	2.7368	2.7402	2.7560	2.7560	2.7589	2.7499	2.7402	2.7334	2.7263	
util living area													
	0.9564	0.9342	0.8976	0.8165	0.6941	0.5391	0.4141	0.4644	0.6711	0.8591	0.9355	0.9611	(86)
MIT	18.5617	18.8882	19.3709	20.0115	20.5193	20.8305	20.9399	20.9166	20.6769	20.0079	19.1873	18.5089	(87)
Th 2	19.9258	19.9279	19.9300	19.9397	19.9415	19.9501	19.9501	19.9516	19.9468	19.9415	19.9378	19.9340	(88)
util rest of house													
	0.9495	0.9241	0.8816	0.7878	0.6466	0.4687	0.3247	0.3721	0.6046	0.8302	0.9239	0.9549	(89)
MIT 2	17.7206	18.0415	18.5127	19.1280	19.5881	19.8504	19.9252	19.9147	19.7380	19.1413	18.3471	17.6743	(90)
Living area fraction										fLA = Living area / (4) =		0.6206	(91)
MIT	18.2426	18.5669	19.0453	19.6763	20.1660	20.4586	20.5549	20.5364	20.3207	19.6791	18.8685	18.1922	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.2426	18.5669	19.0453	19.6763	20.1660	20.4586	20.5549	20.5364	20.3207	19.6791	18.8685	18.1922	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9356	0.9081	0.8658	0.7798	0.6573	0.5039	0.3773	0.4250	0.6297	0.8219	0.9092	0.9418	(94)
Useful gains	358.5510	405.5478	433.0633	448.6278	413.0940	318.6037	227.4481	233.3257	310.2488	348.0979	346.0994	344.4920	(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													
	864.7807	845.8097	774.7065	658.6645	516.4558	354.1777	239.0866	249.6421	377.3797	553.8579	720.7322	860.4143	(97)
Space heating kWh													
	376.6349	295.8560	254.1825	151.2264	76.9012	0.0000	0.0000	0.0000	0.0000	153.0855	269.7356	383.8462	(98a)
Space heating requirement - total per year (kWh/year)												1961.4684	
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													
	376.6349	295.8560	254.1825	151.2264	76.9012	0.0000	0.0000	0.0000	0.0000	153.0855	269.7356	383.8462	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1961.4684	
Space heating per m2											(98c) / (4) =	37.7205	(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	568.2659	447.3583	458.6753	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8099	0.8633	0.8316	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	460.2510	386.2145	381.4121	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	711.4098	678.5203	617.1297	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	180.8343	217.4755	175.3739	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	45.2086	54.3689	43.8435	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												143.4209	(107)
Energy for space heating												37.7205	(99)
Energy for space cooling												2.7581	(108)
Total												40.4786	(109)
Fabric Energy Efficiency (TFEE)												40.5	(109)