Full SAP Calculation Printout

Property Reference	78449-24	**Issued on Date**	18/08/2025
Assessment Reference	001	**Prop Type Ref**	Top Flat / End
Property	2 Shepherd Street, MANCHESTER, M9 4QW		

SAP Rating	81 B	**DER**	5.77	**TER**	15.24
Environmental	96 A	**% DER < TER**			62.14
CO_2 Emissions (t/year)	0.27	**DFEE**	35.82	**TFEE**	41.02
Compliance Check	See BREL	**% DFEE < TFEE**			12.68
% DPER < TPER	25.08	**DPER**	60.34	**TPER**	80.53

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (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)	
Main dwelling						
Ground floor	3.0200 (1b)	x	2.8500 (2b)	=	8.6070	(1b) - (3b)
First floor	45.8500 (1c)	x	2.5200 (2c)	=	115.5420	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	48.8700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	124.1490	(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				2.7900 (17)
Infiltration rate				0.1395 (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) =	0.1186 (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	0.1512	0.1482	0.1453	0.1304	0.1275	0.1126	0.1126	0.1097	0.1186	0.1275	0.1334	0.1393	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		80.1000 (23c)

Effective ac	0.2507	0.2477	0.2448	0.2299	0.2270	0.2121	0.2121	0.2092	0.2181	0.2270	0.2329	0.2388	(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	
Main dwelling								
Door			2.1500	0.7800	1.6770			(26)
Window			4.9100	0.7282	3.5752			(27)
GF			3.0200	0.0900	0.2718	75.0000	226.5000	(28a)
Exposed Floor			1.6100	0.1400	0.2254	20.0000	32.2000	(28b)
Main	71.5671	7.0600	64.5071	0.1300	8.3859	9.0000	580.5639	(29a)
PIJ	45.8500		45.8500	0.1100	5.0435	9.0000	412.6500	(30)
Flat	3.0200		3.0200	0.1200	0.3624	9.0000	27.1800	(30)
Total net area of external elements Aum(A, m2)			125.0671					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.5413			(33)
Main dwelling								
Party Wall 1			22.3800	0.0000	0.0000	20.0000	447.6000	(32)
Party Floor 1			37.9700			30.0000	1139.1000	(32d)
Timber			50.4000			9.0000	453.6000	(32c)
Internal Floor 1			6.2700			18.0000	112.8600	(32d)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 3432.2539 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 70.2323 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.1100	0.1150	0.5877
E3 Sill	5.1100	0.0170	0.0869
E4 Jamb	13.8000	0.0940	1.2972
E5 Ground floor (normal)	3.5100	0.0670	0.2352
E7 Party floor between dwellings (in blocks of flats)	17.0200	0.0320	0.5446
E16 Corner (normal)	20.8200	0.0680	1.4158
E17 Corner (inverted - internal area greater than external area)	5.0400	-0.0290	-0.1462
P1 Party wall - Ground floor	3.5100	0.0560	0.1966
E18 Party wall between dwellings	5.7000	0.2400	1.3680
E25 Staggered party wall between dwellings	5.0400	0.0560	0.2822
E20 Exposed floor (normal)	2.5400	0.3200	0.8128
E21 Exposed floor (inverted)	2.5400	0.3200	0.8128
E6 Intermediate floor within a dwelling	7.4100	0.0320	0.2371
E10 Eaves (insulation at ceiling level)	11.0600	0.0420	0.4645
E12 Gable (insulation at ceiling level)	13.3700	0.0770	1.0295
E14 Flat roof	3.5100	0.2050	0.7195
E24 Eaves (insulation at ceiling level - inverted)	2.0100	0.1500	0.3015
P4 Party wall - Roof (insulation at ceiling level)	4.9100	0.1020	0.5008
P5 Party wall - Roof (insulation at rafter level)	1.5000	0.4800	0.7200

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.4665 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 31.0078 (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	10.2703	10.1488	10.0274	9.4201	9.2987	8.6915	8.6915	8.5700	8.9344	9.2987	9.5416	9.7845	(38)
Heat transfer coeff	41.2781	41.1566	41.0352	40.4279	40.3065	39.6993	39.6993	39.5778	39.9421	40.3065	40.5494	40.7923	(39)

Average = Sum(39)m / 12 = 40.3976

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8447	0.8422	0.8397	0.8273	0.8248	0.8123	0.8123	0.8099	0.8173	0.8248	0.8297	0.8347	(40)
HLP (average)												0.8266	
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 1.6569 (42)
Hot water usage for mixer showers

52.0000	51.2186	50.0798	47.9010	46.2932	44.5001	43.4809	44.6110	45.8498	47.7751	50.0006	51.8008	(42a)

Hot water usage for baths

22.4849	22.1510	21.6808	20.8137	20.1645	19.4446	19.0557	19.5227	20.0311	20.8014	21.6863	22.4089	(42b)

Hot water usage for other uses

31.5982	30.4492	29.3001	28.1511	27.0021	25.8531	25.8531	27.0021	28.1511	29.3001	30.4492	31.5982	(42c)

Average daily hot water use (litres/day) 97.5150 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	106.0831	103.8187	101.0607	96.8659	93.4597	89.7977	88.3896	91.1358	94.0320	97.8766	102.1361	105.8079	(44)
Energy conte	168.0098	147.8365	155.3265	132.6045	125.8147	110.4167	106.8996	112.8451	115.9509	132.8176	145.5116	165.6696	(45)

Energy content (annual) Total = Sum(45)m = 1619.7032

Distribution loss (46)m = 0.15 x (45)m	25.2015	22.1755	23.2990	19.8907	18.8722	16.5625	16.0349	16.9268	17.3926	19.9226	21.8267	24.8504	(46)

Water storage loss:
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8694 (55)
Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(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

194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(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

194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(64)

Total per year (kWh/year) = Sum(64)m = 1937.0342 (64)
12Total per year (kWh/year) 1937 (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

55.8632	49.1556	51.6461	44.0910	41.8334	36.7136	35.5441	37.5210	38.5537	44.1619	48.3826	55.0851	(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	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	86.2814	95.5258	86.2814	89.1574	86.2814	89.1574	86.2814	86.2814	89.1574	86.2814	89.1574	86.2814	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	144.2994	145.7968	142.0235	133.9905	123.8503	114.3199	107.9530	106.4556	110.2290	118.2620	128.4022	137.9326	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	(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)	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	(71)
Water heating gains (Table 5)	75.0850	73.1483	69.4168	61.2375	56.2277	50.9911	47.7744	50.4314	53.5468	59.3573	67.1981	74.0392	(72)
Total internal gains	353.5191	362.3242	345.5749	332.2387	314.2126	302.3217	289.8621	291.0218	300.7865	311.7540	332.6110	346.1064	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.8600	10.6334	0.3800	0.0000	0.7700	8.8984	(74)
South	2.0500	46.7521	0.3800	0.0000	0.7700	28.0433	(78)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	36.9417	62.9330	87.3999	112.5366	131.4279	133.2445	127.2808	112.4984	95.8566	69.7799	44.2182	31.6501	(83)
Total gains	390.4608	425.2572	432.9748	444.7753	445.6406	435.5662	417.1429	403.5201	396.6431	381.5339	376.8292	377.7566	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	23.0971	23.1653	23.2338	23.5828	23.6539	24.0157	24.0157	24.0894	23.8696	23.6539	23.5122	23.3722	
alpha	2.5398	2.5444	2.5489	2.5722	2.5769	2.6010	2.6010	2.6060	2.5913	2.5769	2.5675	2.5581	
util living area	0.8819	0.8537	0.8209	0.7534	0.6557	0.5135	0.3923	0.4182	0.5817	0.7534	0.8453	0.8889	(86)
MIT	18.9869	19.2500	19.5988	20.0933	20.5131	20.8197	20.9346	20.9210	20.7346	20.2239	19.5595	18.9506	(87)
Th 2	20.2148	20.2169	20.2191	20.2298	20.2319	20.2426	20.2426	20.2448	20.2384	20.2319	20.2276	20.2234	(88)
util rest of house	0.8714	0.8411	0.8049	0.7306	0.6222	0.4655	0.3319	0.3580	0.5356	0.7267	0.8302	0.8790	(89)
MIT 2	17.8437	18.1727	18.6095	19.2247	19.7282	20.0811	20.1959	20.1862	19.9900	19.3929	18.5723	17.8039	(90)
Living area fraction										fLA = Living area / (4) =		0.3912	(91)
MIT	18.2909	18.5941	18.9965	19.5645	20.0353	20.3701	20.4849	20.4737	20.2813	19.7180	18.9585	18.2525	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.2909	18.5941	18.9965	19.5645	20.0353	20.3701	20.4849	20.4737	20.2813	19.7180	18.9585	18.2525	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8401	0.8102	0.7760	0.7088	0.6130	0.4739	0.3517	0.3768	0.5383	0.7068	0.8008	0.8483	(94)
Useful gains	328.0445	344.5250	335.9849	315.2410	273.1857	206.4160	146.7132	152.0270	213.5278	269.6747	301.7798	320.4341	(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	577.5194	563.6047	512.7981	431.1451	335.9667	229.0680	154.2290	161.2276	246.8948	367.5155	480.8562	573.2355	(97)
Space heating kWh	185.6093	147.2215	131.5490	83.4509	46.7091	0.0000	0.0000	0.0000	0.0000	72.7935	128.9350	188.0842	(98a)
Space heating requirement - total per year (kWh/year)												984.3526	
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	185.6093	147.2215	131.5490	83.4509	46.7091	0.0000	0.0000	0.0000	0.0000	72.7935	128.9350	188.0842	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												984.3526	
Space heating per m2										(98c) / (4) =		20.1423	(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)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (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	185.6093	147.2215	131.5490	83.4509	46.7091	0.0000	0.0000	0.0000	0.0000	72.7935	128.9350	188.0842	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	185.6093	147.2215	131.5490	83.4509	46.7091	0.0000	0.0000	0.0000	0.0000	72.7935	128.9350	188.0842	(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)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	60.0768	53.0567	56.1685	48.8988	47.0745	42.0617	41.2458	43.0779	43.7671	49.2324	52.8761	59.3557	(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	15.6682	14.1519	15.6682	15.1628	15.6682	15.1628	15.6682	15.6682	15.1628	15.6682	15.1628	15.6682	(231)
Lighting	17.2805	13.8631	12.4822	9.1450	7.0638	5.7712	6.4439	8.3760	10.8796	14.2746	16.1231	17.7608	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	984.3526	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	596.8921	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.2180)		
mechanical ventilation fans (SFP = 1.2180)	184.4804	(230a)
Total electricity for the above, kWh/year	184.4804	(231)
Electricity for lighting (calculated in Appendix L)	139.4638	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1905.1890	(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	984.3526	0.1545	152.0627	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	596.8921	0.1411	84.2266	(264)
Space and water heating			236.2893	(265)
Pumps, fans and electric keep-hot	184.4804	0.1387	25.5897	(267)
Energy for lighting	139.4638	0.1443	20.1289	(268)
Total CO2, kg/year			282.0079	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.7700	(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	984.3526	1.5719	1547.3245	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	596.8921	1.5218	908.3378	(278)
Space and water heating			2455.6622	(279)
Pumps, fans and electric keep-hot	184.4804	1.5128	279.0820	(281)
Energy for lighting	139.4638	1.5338	213.9142	(282)
Total Primary energy kWh/year			2948.6585	(286)
Dwelling Primary energy Rate (DPER)			60.3400	(287)

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)		
Main dwelling							
Ground floor	3.0200	(1b)	x 2.8500	(2b)	= 8.6070	(1b) - (3b)	
First floor	45.8500	(1c)	x 2.5200	(2c)	= 115.5420	(1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	48.8700					(4)	
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)		= 124.1490	(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) =	0.1611	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4111	(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) = 0.3494 (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	0.4455	0.4368	0.4281	0.3844	0.3756	0.3320	0.3320	0.3232	0.3494	0.3756	0.3931	0.4106	(22b)
Effective ac	0.5992	0.5954	0.5916	0.5739	0.5706	0.5551	0.5551	0.5522	0.5611	0.5706	0.5773	0.5843	(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	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			4.9100	1.1450	5.6221			(27)
GF			3.0200	0.1300	0.3926			(28a)
Exposed Floor			1.6100	0.1300	0.2093			(28b)
Main	71.5671	7.0600	64.5071	0.1800	11.6113			(29a)
PIJ	45.8500		45.8500	0.1100	5.0435			(30)
Flat	3.0200		3.0200	0.1100	0.3322			(30)
Total net area of external elements Aum(A, m2)			125.0671					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.3610			(33)
Main dwelling								
Party Wall 1			22.3800	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 70.2323 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.1100	0.0500	0.2555
E3 Sill	5.1100	0.0500	0.2555
E4 Jamb	13.8000	0.0500	0.6900
E5 Ground floor (normal)	3.5100	0.1600	0.5616
E7 Party floor between dwellings (in blocks of flats)	17.0200	0.0700	1.1914
E16 Corner (normal)	20.8200	0.0900	1.8738
E17 Corner (inverted - internal area greater than external area)	5.0400	-0.0900	-0.4536
P1 Party wall - Ground floor	3.5100	0.0800	0.2808
E18 Party wall between dwellings	5.7000	0.0600	0.3420
E25 Staggered party wall between dwellings	5.0400	0.0600	0.3024
E20 Exposed floor (normal)	2.5400	0.3200	0.8128
E21 Exposed floor (inverted)	2.5400	0.3200	0.8128
E6 Intermediate floor within a dwelling	7.4100	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	11.0600	0.0600	0.6636
E12 Gable (insulation at ceiling level)	13.3700	0.0600	0.8022
E14 Flat roof	3.5100	0.0800	0.2808
E24 Eaves (insulation at ceiling level - inverted)	2.0100	0.2400	0.4824
P4 Party wall - Roof (insulation at ceiling level)	4.9100	0.1200	0.5892
P5 Party wall - Roof (insulation at rafter level)	1.5000	0.0800	0.1200

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.8632 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 35.2242 (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	24.5506	24.3928	24.2380	23.5111	23.3751	22.7419	22.7419	22.6247	22.9858	23.3751	23.6502	23.9378	(38)
Heat transfer coeff	59.7749	59.6170	59.4622	58.7353	58.5993	57.9662	57.9662	57.8489	58.2100	58.5993	58.8744	59.1621	(39)
Average = Sum(39)m / 12 =												58.7346	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2231	1.2199	1.2167	1.2019	1.1991	1.1861	1.1861	1.1837	1.1911	1.1991	1.2047	1.2106	(40)
HLP (average)												1.2019	
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 1.6569 (42)
Hot water usage for mixer showers

52.0000	51.2186	50.0798	47.9010	46.2932	44.5001	43.4809	44.6110	45.8498	47.7751	50.0006	51.8008	(42a)

Hot water usage for baths

22.4849	22.1510	21.6808	20.8137	20.1645	19.4446	19.0557	19.5227	20.0311	20.8014	21.6863	22.4089	(42b)

Hot water usage for other uses

31.5982	30.4492	29.3001	28.1511	27.0021	25.8531	25.8531	27.0021	28.1511	29.3001	30.4492	31.5982	(42c)

Average daily hot water use (litres/day) 97.5150 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	106.0831	103.8187	101.0607	96.8659	93.4597	89.7977	88.3896	91.1358	94.0320	97.8766	102.1361	105.8079	(44)
Energy conte	168.0098	147.8365	155.3265	132.6045	125.8147	110.4167	106.8996	112.8451	115.9509	132.8176	145.5116	165.6696	(45)
Energy content (annual)										Total = Sum(45)m =		1619.7032	
Distribution loss (46)m = 0.15 x (45)m	25.2015	22.1755	23.2990	19.8907	18.8722	16.5625	16.0349	16.9268	17.3926	19.9226	21.8267	24.8504	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(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	214.6047	189.9222	201.9214	177.6964	172.4096	155.5086	153.4945	159.4400	161.0427	179.4125	190.6035	212.2645	(62)
WWHRS	-23.7722	-21.0244	-22.0155	-18.2297	-16.9894	-14.5380	-13.6270	-14.4910	-15.0415	-17.7323	-20.0886	-23.3320	(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	190.8324	168.8978	179.9059	159.4667	155.4202	140.9706	139.8675	144.9490	146.0012	161.6802	170.5149	188.9325	(64)

Total per year (kWh/year) = Sum(64)m = 1947.4390 (64)

12Total per year (kWh/year) 1947 (64)

Electric shower(s)

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

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

Heat gains from water heating, kWh/month

	93.1392	82.8242	88.9220	80.1645	79.1093	72.7870	72.8200	74.7969	74.6271	81.4378	84.4561	92.3611 (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	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	(66)

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

	83.9607	92.9565	83.9607	86.7594	83.9607	86.7594	83.9607	83.9607	86.7594	83.9607	86.7594	83.9607	(67)

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

	144.2994	145.7968	142.0235	133.9905	123.8503	114.3199	107.9530	106.4556	110.2290	118.2620	128.4022	137.9326	(68)

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

	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	(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)

	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	(71)

Water heating gains (Table 5)

	125.1871	123.2503	119.5188	111.3395	106.3297	101.0931	97.8764	100.5335	103.6488	109.4594	117.3001	124.1412	(72)

Total internal gains

	404.3005	412.8569	396.3563	382.9427	364.9940	350.0257	337.6434	338.8031	348.4905	362.5354	383.3150	396.8878	(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	2.8600	10.6334	0.6300	0.7000	0.7700	9.2941	(74)
South	2.0500	46.7521	0.6300	0.7000	0.7700	29.2905	(78)

Solar gains	38.5846	65.7319	91.2869	117.5415	137.2730	139.1704	132.9415	117.5016	100.1197	72.8833	46.1847	33.0577	(83)
Total gains	442.8851	478.5888	487.6432	500.4842	502.2670	489.1961	470.5849	456.3047	448.6102	435.4187	429.4998	429.9455	(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	15.9499	15.9922	16.0338	16.2322	16.2699	16.4476	16.4476	16.4809	16.3787	16.2699	16.1939	16.1151	
alpha	2.0633	2.0661	2.0689	2.0821	2.0847	2.0965	2.0965	2.0987	2.0919	2.0847	2.0796	2.0743	
util living area	0.8866	0.8650	0.8383	0.7843	0.7030	0.5800	0.4611	0.4866	0.6385	0.7805	0.8559	0.8920	(86)
MIT	18.0140	18.3049	18.7584	19.4174	20.0444	20.5632	20.8095	20.7792	20.4244	19.6576	18.7605	17.9748	(87)
Th 2	19.9015	19.9041	19.9066	19.9185	19.9207	19.9311	19.9311	19.9330	19.9271	19.9207	19.9162	19.9115	(88)
util rest of house	0.8742	0.8503	0.8196	0.7574	0.6616	0.5147	0.3704	0.3979	0.5786	0.7486	0.8380	0.8802	(89)
MIT 2	16.4750	16.8366	17.4022	18.2179	18.9716	19.5653	19.8111	19.7872	19.4193	18.5220	17.4161	16.4297	(90)

Living area fraction fLA = Living area / (4) = 0.3912 (91)

MIT	17.0772	17.4111	17.9328	18.6872	19.3913	19.9557	20.2017	20.1753	19.8126	18.9663	17.9421	17.0342	(92)

Temperature adjustment 0.0000

adjusted MIT	17.0772	17.4111	17.9328	18.6872	19.3913	19.9557	20.2017	20.1753	19.8126	18.9663	17.9421	17.0342	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8318	0.8073	0.7776	0.7210	0.6386	0.5163	0.3948	0.4194	0.5714	0.7149	0.7964	0.8386	(94)
Useful gains	368.4121	386.3613	379.2011	360.8625	320.7348	252.5700	185.7831	191.3895	256.3543	311.3005	342.0483	360.5481	(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	763.7529	745.8724	679.8177	574.8521	450.7065	310.4503	208.7772	218.3974	332.5278	490.2585	638.3216	759.2960	(97)
Space heating kWh	294.1336	241.5914	223.6587	154.0725	96.6989	0.0000	0.0000	0.0000	0.0000	133.1447	213.3168	296.6684	(98a)

Space heating requirement - total per year (kWh/year) 1653.2851

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	294.1336	241.5914	223.6587	154.0725	96.6989	0.0000	0.0000	0.0000	0.0000	133.1447	213.3168	296.6684	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 1653.2851

Space heating per m2 (98c) / (4) = 33.8303 (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	294.1336	241.5914	223.6587	154.0725	96.6989	0.0000	0.0000	0.0000	0.0000	133.1447	213.3168	296.6684	(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)	318.6713	261.7458	242.3171	166.9258	104.7659	0.0000	0.0000	0.0000	0.0000	144.2522	231.1124	321.4176	(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												
	190.8324	168.8978	179.9059	159.4667	155.4202	140.9706	139.8675	144.9490	146.0012	161.6802	170.5149	188.9325 (64)
Efficiency of water heater												79.8000 (216)
(217)m	85.0266	84.8620	84.5491	83.9827	83.0275	79.8000	79.8000	79.8000	79.8000	83.6277	84.5632	85.0672 (217)
Fuel for water heating, kWh/month												
	224.4385	199.0264	212.7828	189.8805	187.1912	176.6549	175.2725	181.6404	182.9589	193.3333	201.6421	222.0978 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	17.4454	13.9953	12.6012	9.2322	7.1312	5.8263	6.5053	8.4559	10.9834	14.4108	16.2769	17.9302 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-23.3763	-33.2150	-48.1234	-54.5780	-59.2929	-55.5592	-54.9444	-51.7045	-45.9768	-38.2780	-25.8198	-20.1857 (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	-12.4013	-26.1875	-52.2162	-78.6423	-104.1612	-104.6692	-103.3673	-87.3742	-63.8973	-37.4382	-16.5592	-9.7931 (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	1791.2081 (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	2346.9193 (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)	140.7942 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1207.7611 (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	3157.1605 (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	1791.2081	0.2100	376.1537	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2346.9193	0.2100	492.8531	(264)
Space and water heating			869.0068	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	140.7942	0.1443	20.3210	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-511.0540	0.1344	-68.6798	
PV Unit electricity exported	-696.7070	0.1258	-87.6666	
Total			-156.3465	(269)
Total CO2, kg/year			744.9105	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.2400	(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	1791.2081	1.1300	2024.0651	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2346.9193	1.1300	2652.0188	(278)
Space and water heating			4676.0840	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	140.7942	1.5338	215.9548	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-511.0540	1.4967	-764.8772	
PV Unit electricity exported	-696.7070	0.4619	-321.7956	
Total			-1086.6729	(283)
Total Primary energy kWh/year			3935.4667	(286)
Target Primary Energy Rate (TPER)			80.5300	(287)

Full SAP Calculation Printout

Property Reference	78449-24	**Issued on Date**	18/08/2025
Assessment Reference	001	**Prop Type Ref**	Top Flat / End
Property	2 Shepherd Street, MANCHESTER, M9 4QW		

SAP Rating	81 B	**DER**	5.77	**TER**	15.24
Environmental	96 A	**% DER < TER**			62.14
CO_2 Emissions (t/year)	0.27	**DFEE**	35.82	**TFEE**	41.02
Compliance Check	See BREL	**% DFEE < TFEE**			12.68
% DPER < TPER	25.08	**DPER**	60.34	**TPER**	80.53

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (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)	
Main dwelling						
Ground floor	3.0200 (1b)	x	2.8500 (2b)	=	8.6070	(1b) - (3b)
First floor	45.8500 (1c)	x	2.5200 (2c)	=	115.5420	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	48.8700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	124.1490	(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) =	0.1611	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			2.7900	(17)
Infiltration rate			0.3006	(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) =	0.2555	(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	0.3258	0.3194	0.3130	0.2811	0.2747	0.2427	0.2427	0.2363	0.2555	0.2747	0.2874	0.3002	(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	0.5531	0.5510	0.5490	0.5395	0.5377	0.5295	0.5295	0.5279	0.5326	0.5377	0.5413	0.5451	(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	
Main dwelling								
Door			2.1500	0.7800	1.6770			(26)
Window			4.9100	0.7282	3.5752			(27)
GF			3.0200	0.0900	0.2718	75.0000	226.5000	(28a)
Exposed Floor			1.6100	0.1400	0.2254	20.0000	32.2000	(28b)
Main	71.5671	7.0600	64.5071	0.1300	8.3859	9.0000	580.5639	(29a)
PIJ	45.8500		45.8500	0.1100	5.0435	9.0000	412.6500	(30)
Flat	3.0200		3.0200	0.1200	0.3624	9.0000	27.1800	(30)
Total net area of external elements Aum(A, m2)			125.0671					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.5413			(33)
Main dwelling								
Party Wall 1			22.3800	0.0000	0.0000	20.0000	447.6000	(32)
Party Floor 1			37.9700			30.0000	1139.1000	(32d)
Timber			50.4000			9.0000	453.6000	(32c)
Internal Floor 1			6.2700			18.0000	112.8600	(32d)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		3432.2539	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							70.2323	(35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E2	Other lintels (including other steel lintels)	5.1100	0.1150	0.5877
E3	Sill	5.1100	0.0170	0.0869
E4	Jamb	13.8000	0.0940	1.2972
E5	Ground floor (normal)	3.5100	0.0670	0.2352
E7	Party floor between dwellings (in blocks of flats)	17.0200	0.0320	0.5446
E16	Corner (normal)	20.8200	0.0680	1.4158
E17	Corner (inverted - internal area greater than external area)	5.0400	-0.0290	-0.1462
P1	Party wall - Ground floor	3.5100	0.0560	0.1966
E18	Party wall between dwellings	5.7000	0.2400	1.3680
E25	Staggered party wall between dwellings	5.0400	0.0560	0.2822
E20	Exposed floor (normal)	2.5400	0.3200	0.8128
E21	Exposed floor (inverted)	2.5400	0.3200	0.8128
E6	Intermediate floor within a dwelling	7.4100	0.0320	0.2371
E10	Eaves (insulation at ceiling level)	11.0600	0.0420	0.4645
E12	Gable (insulation at ceiling level)	13.3700	0.0770	1.0295
E14	Flat roof	3.5100	0.2050	0.7195
E24	Eaves (insulation at ceiling level - inverted)	2.0100	0.1500	0.3015
P4	Party wall - Roof (insulation at ceiling level)	4.9100	0.1020	0.5008
P5	Party wall - Roof (insulation at rafter level)	1.5000	0.4800	0.7200

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.4665 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 31.0078 (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	22.6586	22.5741	22.4914	22.1027	22.0300	21.6915	21.6915	21.6288	21.8219	22.0300	22.1771	22.3309	(38)
Heat transfer coeff	53.6664	53.5819	53.4992	53.1105	53.0378	52.6993	52.6993	52.6366	52.8297	53.0378	53.1849	53.3387	(39)

Average = Sum(39)m / 12 = 53.1102

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0981	1.0964	1.0947	1.0868	1.0853	1.0784	1.0784	1.0771	1.0810	1.0853	1.0883	1.0914	(40)
HLP (average)												1.0868	
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 1.6569 (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

22.4849	22.1510	21.6808	20.8137	20.1645	19.4446	19.0557	19.5227	20.0311	20.8014	21.6863	22.4089	(42b)

Hot water usage for other uses

31.5982	30.4492	29.3001	28.1511	27.0021	25.8531	25.8531	27.0021	28.1511	29.3001	30.4492	31.5982	(42c)

Average daily hot water use (litres/day) 49.5727 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	54.0831	52.6002	50.9809	48.9648	47.1665	45.2976	44.9088	46.5247	48.1822	50.1015	52.1355	54.0071	(44)
Energy conte	85.6544	74.9019	78.3557	67.0304	63.4952	55.6987	54.3133	57.6074	59.4135	67.9873	74.2766	84.5621	(45)

Energy content (annual) Total = Sum(45)m = 823.2965

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

72.8063	63.6666	66.6024	56.9758	53.9710	47.3439	46.1663	48.9663	50.5015	57.7892	63.1351	71.8778	(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

72.8063	63.6666	66.6024	56.9758	53.9710	47.3439	46.1663	48.9663	50.5015	57.7892	63.1351	71.8778	(64)

Total per year (kWh/year) = Sum(64)m = 699.8020 (64)

12Total per year (kWh/year) 700 (64)

Electric shower(s)

41.6433	37.1046	40.5168	38.6647	39.3902	37.5744	38.8269	39.3902	38.6647	40.5168	39.7549	41.6433	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 473.6907 (64a)

Heat gains from water heating, kWh/month

28.6124	25.1928	26.7798	23.9101	23.3403	21.2296	21.2483	22.0891	22.2915	24.5765	25.7225	28.3803	(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	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	86.2814	95.5258	86.2814	89.1574	86.2814	89.1574	86.2814	86.2814	89.1574	86.2814	89.1574	86.2814	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	144.2994	145.7968	142.0235	133.9905	123.8503	114.3199	107.9530	106.4556	110.2290	118.2620	128.4022	137.9326	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	(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)	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	(71)
Water heating gains (Table 5)	38.4575	37.4893	35.9943	33.2085	31.3713	29.4855	28.5595	29.6897	30.9605	33.0329	35.7257	38.1455	(72)
Total internal gains	316.8917	326.6652	312.1525	304.2097	289.3563	280.8162	270.6472	270.2800	278.2002	285.4296	301.1386	310.2128	(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			
North				2.8600	10.6334	0.3800		0.0000		0.7700		8.8984	(74)
South				2.0500	46.7521	0.3800		0.0000		0.7700		28.0433	(78)
Solar gains	36.9417	62.9330	87.3999	112.5366	131.4279	133.2445	127.2808	112.4984	95.8566	69.7799	44.2182	31.6501	(83)
Total gains	353.8334	389.5982	399.5524	416.7463	420.7842	414.0607	397.9281	382.7784	374.0568	355.2095	345.3568	341.8629	(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	17.7654	17.7934	17.8209	17.9513	17.9759	18.0914	18.0914	18.1129	18.0467	17.9759	17.9262	17.8745	
alpha	2.1844	2.1862	2.1881	2.1968	2.1984	2.2061	2.2061	2.2075	2.2031	2.1984	2.1951	2.1916	
util living area	0.9162	0.8952	0.8709	0.8189	0.7400	0.6152	0.4930	0.5227	0.6789	0.8209	0.8901	0.9215	(86)
MIT	18.0272	18.3275	18.7737	19.4262	20.0496	20.5673	20.8128	20.7795	20.4211	19.6412	18.7462	17.9717	(87)
Th 2	20.0023	20.0038	20.0051	20.0117	20.0129	20.0185	20.0185	20.0196	20.0164	20.0129	20.0104	20.0078	(88)
util rest of house	0.9070	0.8838	0.8559	0.7961	0.7032	0.5542	0.4059	0.4378	0.6242	0.7942	0.8763	0.9129	(89)
MIT 2	17.2909	17.5857	18.0247	18.6624	19.2552	19.7246	19.9209	19.8992	19.6024	18.8782	18.0063	17.2400	(90)
Living area fraction									fLA = Living area / (4) =			0.3912	(91)
MIT	17.5790	17.8759	18.3178	18.9612	19.5660	20.0543	20.2698	20.2436	19.9227	19.1768	18.2958	17.5263	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.5790	17.8759	18.3178	18.9612	19.5660	20.0543	20.2698	20.2436	19.9227	19.1768	18.2958	17.5263	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8778	0.8528	0.8245	0.7675	0.6844	0.5566	0.4296	0.4585	0.6184	0.7673	0.8459	0.8845	(94)
Useful gains	310.5797	332.2571	329.4496	319.8445	287.9824	230.4721	170.9404	175.5028	231.3182	272.5464	292.1462	302.3713	(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	712.6345	695.2750	632.2404	534.3568	417.1954	287.4385	193.3981	202.3138	307.6102	454.8923	595.4459	710.8061	(97)
Space heating kWh	299.1288	243.9480	225.2763	154.4489	96.1345	0.0000	0.0000	0.0000	0.0000	135.6653	218.3757	303.8755	(98a)
Space heating requirement - total per year (kWh/year)												1676.8530	
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	299.1288	243.9480	225.2763	154.4489	96.1345	0.0000	0.0000	0.0000	0.0000	135.6653	218.3757	303.8755	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1676.8530	
Space heating per m2											(98c) / (4) =	34.3125	(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	495.3735	389.9749	400.0383	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6490	0.7182	0.6970	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	321.4914	280.0718	278.8246	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	443.1378	426.3465	410.4093	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	87.5855	108.8283	97.8991	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	21.8964	27.2071	24.4748	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												73.5782	(107)
Energy for space heating												34.3125	(99)
Energy for space cooling												1.5056	(108)
Total												35.8181	(109)
Fabric Energy Efficiency (DFEE)												35.8	(109)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	3.0200	(1b)	x 2.8500	(2b) =	8.6070	(1b) - (3b)
First floor	45.8500	(1c)	x 2.5200	(2c) =	115.5420	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	48.8700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		124.1490	(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) =	0.1611	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4111	(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) =	0.3494	(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	0.4455	0.4368	0.4281	0.3844	0.3756	0.3320	0.3320	0.3232	0.3494	0.3756	0.3931	0.4106	(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	0.5992	0.5954	0.5916	0.5739	0.5706	0.5551	0.5551	0.5522	0.5611	0.5706	0.5773	0.5843	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			4.9100	1.1450	5.6221			(27)
GF			3.0200	0.1300	0.3926			(28a)
Exposed Floor			1.6100	0.1300	0.2093			(28b)
Main	71.5671	7.0600	64.5071	0.1800	11.6113			(29a)
PIJ	45.8500		45.8500	0.1100	5.0435			(30)
Flat	3.0200		3.0200	0.1100	0.3322			(30)
Total net area of external elements Aum(A, m2)			125.0671					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.3610			(33)
Main dwelling								
Party Wall 1			22.3800	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	70.2323	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.1100	0.0500	0.2555
E3 Sill	5.1100	0.0500	0.2555
E4 Jamb	13.8000	0.0500	0.6900
E5 Ground floor (normal)	3.5100	0.1600	0.5616
E7 Party floor between dwellings (in blocks of flats)	17.0200	0.0700	1.1914
E16 Corner (normal)	20.8200	0.0900	1.8738
E17 Corner (inverted - internal area greater than external area)	5.0400	-0.0900	-0.4536
P1 Party wall - Ground floor	3.5100	0.0800	0.2808
E18 Party wall between dwellings	5.7000	0.0600	0.3420
E25 Staggered party wall between dwellings	5.0400	0.0600	0.3024
E20 Exposed floor (normal)	2.5400	0.3200	0.8128
E21 Exposed floor (inverted)	2.5400	0.3200	0.8128
E6 Intermediate floor within a dwelling	7.4100	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	11.0600	0.0600	0.6636
E12 Gable (insulation at ceiling level)	13.3700	0.0600	0.8022
E14 Flat roof	3.5100	0.0800	0.2808
E24 Eaves (insulation at ceiling level - inverted)	2.0100	0.2400	0.4824
P4 Party wall - Roof (insulation at ceiling level)	4.9100	0.1200	0.5892
P5 Party wall - Roof (insulation at rafter level)	1.5000	0.0800	0.1200

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		9.8632	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	35.2242	(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	24.5506	24.3928	24.2380	23.5111	23.3751	22.7419	22.7419	22.6247	22.9858	23.3751	23.6502	23.9378	(38)
Heat transfer coeff	59.7749	59.6170	59.4622	58.7353	58.5993	57.9662	57.9662	57.8489	58.2100	58.5993	58.8744	59.1621	(39)
Average = Sum(39)m / 12 =												58.7346	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2231	1.2199	1.2167	1.2019	1.1991	1.1861	1.1861	1.1837	1.1911	1.1991	1.2047	1.2106	(40)
HLP (average)												1.2019	
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	1.6569	(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	22.4849	22.1510	21.6808	20.8137	20.1645	19.4446	19.0557	19.5227	20.0311	20.8014	21.6863	22.4089	(42b)
Hot water usage for other uses	31.5982	30.4492	29.3001	28.1511	27.0021	25.8531	25.8531	27.0021	28.1511	29.3001	30.4492	31.5982	(42c)
Average daily hot water use (litres/day)												49.5727	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	54.0831	52.6002	50.9809	48.9648	47.1665	45.2976	44.9088	46.5247	48.1822	50.1015	52.1355	54.0071	(44)
Energy conte	85.6544	74.9019	78.3557	67.0304	63.4952	55.6987	54.3133	57.6074	59.4135	67.9873	74.2766	84.5621	(45)
Energy content (annual)										Total = Sum(45)m =		823.2965	
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	(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	(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	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

	72.8063	63.6666	66.6024	56.9758	53.9710	47.3439	46.1663	48.9663	50.5015	57.7892	63.1351	71.8778 (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

	72.8063	63.6666	66.6024	56.9758	53.9710	47.3439	46.1663	48.9663	50.5015	57.7892	63.1351	71.8778 (64)

Total per year (kWh/year) = Sum(64)m = 699.8020 (64)

12Total per year (kWh/year) 700 (64)

Electric shower(s)

	41.6433	37.1046	40.5168	38.6647	39.3902	37.5744	38.8269	39.3902	38.6647	40.5168	39.7549	41.6433 (64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 473.6907 (64a)

Heat gains from water heating, kWh/month

	28.6124	25.1928	26.7798	23.9101	23.3403	21.2296	21.2483	22.0891	22.2915	24.5765	25.7225	28.3803 (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	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	(66)

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

	83.9607	92.9565	83.9607	86.7594	83.9607	86.7594	83.9607	83.9607	86.7594	83.9607	86.7594	83.9607 (67)

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

	144.2994	145.7968	142.0235	133.9905	123.8503	114.3199	107.9530	106.4556	110.2290	118.2620	128.4022	137.9326 (68)

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

	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844 (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)

	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755 (71)

Water heating gains (Table 5)

	38.4575	37.4893	35.9943	33.2085	31.3713	29.4855	28.5595	29.6897	30.9605	33.0329	35.7257	38.1455 (72)

Total internal gains

	314.5710	324.0959	309.8318	301.8117	287.0356	278.4181	268.3266	267.9593	275.8021	283.1089	298.7406	307.8921 (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	2.8600	10.6334	0.6300	0.7000	0.7700	9.2941	(74)
South	2.0500	46.7521	0.6300	0.7000	0.7700	29.2905	(78)

Solar gains	38.5846	65.7319	91.2869	117.5415	137.2730	139.1704	132.9415	117.5016	100.1197	72.8833	46.1847	33.0577 (83)
Total gains	353.1556	389.8278	401.1187	419.3532	424.3086	417.5885	401.2680	385.4609	375.9218	355.9922	344.9253	340.9498 (84)

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7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	15.9499	15.9922	16.0338	16.2322	16.2699	16.4476	16.4476	16.4809	16.3787	16.2699	16.1939	16.1151	
alpha	2.0633	2.0661	2.0689	2.0821	2.0847	2.0965	2.0965	2.0987	2.0919	2.0847	2.0796	2.0743	
util living area													
	0.9210	0.9015	0.8786	0.8299	0.7557	0.6362	0.5169	0.5465	0.6987	0.8325	0.8968	0.9258	(86)
MIT	17.6817	17.9962	18.4798	19.1959	19.8830	20.4728	20.7614	20.7221	20.3055	19.4410	18.4711	17.6385	(87)
Th 2	19.9015	19.9041	19.9066	19.9185	19.9207	19.9311	19.9311	19.9330	19.9271	19.9207	19.9162	19.9115	(88)
util rest of house													
	0.9117	0.8900	0.8634	0.8066	0.7176	0.5712	0.4211	0.4537	0.6412	0.8054	0.8829	0.9171	(89)
MIT 2	16.8908	17.2006	17.6778	18.3819	19.0381	19.5782	19.8104	19.7853	19.4367	18.6286	17.6805	16.8544	(90)

Living area fraction fLA = Living area / (4) = 0.3912 (91)

MIT	17.2003	17.5119	17.9916	18.7004	19.3686	19.9282	20.1825	20.1518	19.7766	18.9464	17.9898	17.1612	(92)

Temperature adjustment 0.0000

adjusted MIT	17.2003	17.5119	17.9916	18.7004	19.3686	19.9282	20.1825	20.1518	19.7766	18.9464	17.9898	17.1612	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8809	0.8570	0.8296	0.7748	0.6950	0.5710	0.4454	0.4744	0.6321	0.7753	0.8506	0.8873	(94)
Useful gains	311.0985	334.0735	332.7651	324.9001	294.8942	238.4611	178.7151	182.8665	237.6034	276.0034	293.3820	302.5237	(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													
	771.1107	751.8811	683.3153	575.6282	449.3770	308.8570	207.6609	217.0384	330.4376	489.0948	641.1319	766.8096	(97)
Space heating kWh													
	342.2491	280.7667	260.8093	180.5243	114.9353	0.0000	0.0000	0.0000	0.0000	158.5400	250.3800	345.4287	(98a)

Space heating requirement - total per year (kWh/year) 1933.6333

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

	342.2491	280.7667	260.8093	180.5243	114.9353	0.0000	0.0000	0.0000	0.0000	158.5400	250.3800	345.4287	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 1933.6333

Space heating per m2 (98c) / (4) = 39.5669 (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	544.8819	428.9496	439.6517	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6103	0.6800	0.6584	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	332.5665	291.6992	289.4483	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	449.8611	432.7434	415.9721	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	84.4521	104.9369	94.1337	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	21.1130	26.2342	23.5334	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												70.8807	(107)
Energy for space heating												39.5669	(99)
Energy for space cooling												1.4504	(108)
Total												41.0173	(109)
Fabric Energy Efficiency (TFEE)												41.0	(109)

Full SAP Calculation Printout

Property Reference	78449-24	**Issued on Date**	18/08/2025
Assessment Reference	001	**Prop Type Ref**	Top Flat / End
Property	2 Shepherd Street, MANCHESTER, M9 4QW		

SAP Rating	81 B	**DER**	5.77	**TER**	15.24
Environmental	96 A	**% DER < TER**			62.14
CO_2 Emissions (t/year)	0.27	**DFEE**	35.82	**TFEE**	41.02
Compliance Check	See BREL	**% DFEE < TFEE**			12.68
% DPER < TPER	25.08	**DPER**	60.34	**TPER**	80.53

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (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)	
Main dwelling						
Ground floor	3.0200 (1b)	x	2.8500 (2b)	=	8.6070	(1b) - (3b)
First floor	45.8500 (1c)	x	2.5200 (2c)	=	115.5420	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	48.8700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	124.1490	(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				2.7900 (17)
Infiltration rate				0.1395 (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) =	0.1186 (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	0.1512	0.1482	0.1453	0.1304	0.1275	0.1126	0.1126	0.1097	0.1186	0.1275	0.1334	0.1393	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		80.1000 (23c)

Effective ac	0.2507	0.2477	0.2448	0.2299	0.2270	0.2121	0.2121	0.2092	0.2181	0.2270	0.2329	0.2388	(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	
Main dwelling								
Door			2.1500	0.7800	1.6770			(26)
Window			4.9100	0.7282	3.5752			(27)
GF			3.0200	0.0900	0.2718	75.0000	226.5000	(28a)
Exposed Floor			1.6100	0.1400	0.2254	20.0000	32.2000	(28b)
Main	71.5671	7.0600	64.5071	0.1300	8.3859	9.0000	580.5639	(29a)
PIJ	45.8500		45.8500	0.1100	5.0435	9.0000	412.6500	(30)
Flat	3.0200		3.0200	0.1200	0.3624	9.0000	27.1800	(30)
Total net area of external elements Aum(A, m2)			125.0671					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.5413			(33)
Main dwelling								
Party Wall 1			22.3800	0.0000	0.0000	20.0000	447.6000	(32)
Party Floor 1			37.9700			30.0000	1139.1000	(32d)
Timber			50.4000			9.0000	453.6000	(32c)
Internal Floor 1			6.2700			18.0000	112.8600	(32d)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 3432.2539 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 70.2323 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.1100	0.1150	0.5877
E3 Sill	5.1100	0.0170	0.0869
E4 Jamb	13.8000	0.0940	1.2972
E5 Ground floor (normal)	3.5100	0.0670	0.2352
E7 Party floor between dwellings (in blocks of flats)	17.0200	0.0320	0.5446
E16 Corner (normal)	20.8200	0.0680	1.4158
E17 Corner (inverted - internal area greater than external area)	5.0400	-0.0290	-0.1462
P1 Party wall - Ground floor	3.5100	0.0560	0.1966
E18 Party wall between dwellings	5.7000	0.2400	1.3680
E25 Staggered party wall between dwellings	5.0400	0.0560	0.2822
E20 Exposed floor (normal)	2.5400	0.3200	0.8128
E21 Exposed floor (inverted)	2.5400	0.3200	0.8128
E6 Intermediate floor within a dwelling	7.4100	0.0320	0.2371
E10 Eaves (insulation at ceiling level)	11.0600	0.0420	0.4645
E12 Gable (insulation at ceiling level)	13.3700	0.0770	1.0295
E14 Flat roof	3.5100	0.2050	0.7195
E24 Eaves (insulation at ceiling level - inverted)	2.0100	0.1500	0.3015
P4 Party wall - Roof (insulation at ceiling level)	4.9100	0.1020	0.5008
P5 Party wall - Roof (insulation at rafter level)	1.5000	0.4800	0.7200

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.4665 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 31.0078 (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	10.2703	10.1488	10.0274	9.4201	9.2987	8.6915	8.6915	8.5700	8.9344	9.2987	9.5416	9.7845	(38)
Heat transfer coeff	41.2781	41.1566	41.0352	40.4279	40.3065	39.6993	39.6993	39.5778	39.9421	40.3065	40.5494	40.7923	(39)

Average = Sum(39)m / 12 = 40.3976

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8447	0.8422	0.8397	0.8273	0.8248	0.8123	0.8123	0.8099	0.8173	0.8248	0.8297	0.8347	(40)
HLP (average)												0.8266	
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 1.6569 (42)
Hot water usage for mixer showers

52.0000	51.2186	50.0798	47.9010	46.2932	44.5001	43.4809	44.6110	45.8498	47.7751	50.0006	51.8008	(42a)

Hot water usage for baths

22.4849	22.1510	21.6808	20.8137	20.1645	19.4446	19.0557	19.5227	20.0311	20.8014	21.6863	22.4089	(42b)

Hot water usage for other uses

31.5982	30.4492	29.3001	28.1511	27.0021	25.8531	25.8531	27.0021	28.1511	29.3001	30.4492	31.5982	(42c)

Average daily hot water use (litres/day) 97.5150 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	106.0831	103.8187	101.0607	96.8659	93.4597	89.7977	88.3896	91.1358	94.0320	97.8766	102.1361	105.8079	(44)
Energy conte	168.0098	147.8365	155.3265	132.6045	125.8147	110.4167	106.8996	112.8451	115.9509	132.8176	145.5116	165.6696	(45)

Energy content (annual) Total = Sum(45)m = 1619.7032

Distribution loss (46)m = 0.15 x (45)m	25.2015	22.1755	23.2990	19.8907	18.8722	16.5625	16.0349	16.9268	17.3926	19.9226	21.8267	24.8504	(46)

Water storage loss:
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8694 (55)
Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(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

194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(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

194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(64)

Total per year (kWh/year) = Sum(64)m = 1937.0342 (64)
12Total per year (kWh/year) 1937 (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

55.8632	49.1556	51.6461	44.0910	41.8334	36.7136	35.5441	37.5210	38.5537	44.1619	48.3826	55.0851	(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	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	86.2814	95.5258	86.2814	89.1574	86.2814	89.1574	86.2814	86.2814	89.1574	86.2814	89.1574	86.2814	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	144.2994	145.7968	142.0235	133.9905	123.8503	114.3199	107.9530	106.4556	110.2290	118.2620	128.4022	137.9326	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	(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)	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	(71)
Water heating gains (Table 5)	75.0850	73.1483	69.4168	61.2375	56.2277	50.9911	47.7744	50.4314	53.5468	59.3573	67.1981	74.0392	(72)
Total internal gains	353.5191	362.3242	345.5749	332.2387	314.2126	302.3217	289.8621	291.0218	300.7865	311.7540	332.6110	346.1064	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.8600	10.6334	0.3800	0.0000	0.7700	8.8984	(74)
South	2.0500	46.7521	0.3800	0.0000	0.7700	28.0433	(78)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	36.9417	62.9330	87.3999	112.5366	131.4279	133.2445	127.2808	112.4984	95.8566	69.7799	44.2182	31.6501	(83)
Total gains	390.4608	425.2572	432.9748	444.7753	445.6406	435.5662	417.1429	403.5201	396.6431	381.5339	376.8292	377.7566	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	23.0971	23.1653	23.2338	23.5828	23.6539	24.0157	24.0157	24.0894	23.8696	23.6539	23.5122	23.3722	
alpha	2.5398	2.5444	2.5489	2.5722	2.5769	2.6010	2.6010	2.6060	2.5913	2.5769	2.5675	2.5581	
util living area	0.8819	0.8537	0.8209	0.7534	0.6557	0.5135	0.3923	0.4182	0.5817	0.7534	0.8453	0.8889	(86)
MIT	18.9869	19.2500	19.5988	20.0933	20.5131	20.8197	20.9346	20.9210	20.7346	20.2239	19.5595	18.9506	(87)
Th 2	20.2148	20.2169	20.2191	20.2298	20.2319	20.2426	20.2426	20.2448	20.2384	20.2319	20.2276	20.2234	(88)
util rest of house	0.8714	0.8411	0.8049	0.7306	0.6222	0.4655	0.3319	0.3580	0.5356	0.7267	0.8302	0.8790	(89)
MIT 2	17.8437	18.1727	18.6095	19.2247	19.7282	20.0811	20.1959	20.1862	19.9900	19.3929	18.5723	17.8039	(90)
Living area fraction										fLA = Living area / (4) =		0.3912	(91)
MIT	18.2909	18.5941	18.9965	19.5645	20.0353	20.3701	20.4849	20.4737	20.2813	19.7180	18.9585	18.2525	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.2909	18.5941	18.9965	19.5645	20.0353	20.3701	20.4849	20.4737	20.2813	19.7180	18.9585	18.2525	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8401	0.8102	0.7760	0.7088	0.6130	0.4739	0.3517	0.3768	0.5383	0.7068	0.8008	0.8483	(94)
Useful gains	328.0445	344.5250	335.9849	315.2410	273.1857	206.4160	146.7132	152.0270	213.5278	269.6747	301.7798	320.4341	(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	577.5194	563.6047	512.7981	431.1451	335.9667	229.0680	154.2290	161.2276	246.8948	367.5155	480.8562	573.2355	(97)
Space heating kWh	185.6093	147.2215	131.5490	83.4509	46.7091	0.0000	0.0000	0.0000	0.0000	72.7935	128.9350	188.0842	(98a)
Space heating requirement - total per year (kWh/year)												984.3526	
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	185.6093	147.2215	131.5490	83.4509	46.7091	0.0000	0.0000	0.0000	0.0000	72.7935	128.9350	188.0842	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												984.3526	
Space heating per m2										(98c) / (4) =		20.1423	(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)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (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	185.6093	147.2215	131.5490	83.4509	46.7091	0.0000	0.0000	0.0000	0.0000	72.7935	128.9350	188.0842	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	185.6093	147.2215	131.5490	83.4509	46.7091	0.0000	0.0000	0.0000	0.0000	72.7935	128.9350	188.0842	(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)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	60.0768	53.0567	56.1685	48.8988	47.0745	42.0617	41.2458	43.0779	43.7671	49.2324	52.8761	59.3557	(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	15.6682	14.1519	15.6682	15.1628	15.6682	15.1628	15.6682	15.6682	15.1628	15.6682	15.1628	15.6682	(231)
Lighting	17.2805	13.8631	12.4822	9.1450	7.0638	5.7712	6.4439	8.3760	10.8796	14.2746	16.1231	17.7608	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	984.3526	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	596.8921	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.2180)		
mechanical ventilation fans (SFP = 1.2180)	184.4804	(230a)
Total electricity for the above, kWh/year	184.4804	(231)
Electricity for lighting (calculated in Appendix L)	139.4638	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1905.1890	(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	984.3526	0.1545	152.0627	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	596.8921	0.1411	84.2266	(264)
Space and water heating			236.2893	(265)
Pumps, fans and electric keep-hot	184.4804	0.1387	25.5897	(267)
Energy for lighting	139.4638	0.1443	20.1289	(268)
Total CO2, kg/year			282.0079	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.7700	(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	984.3526	1.5719	1547.3245	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	596.8921	1.5218	908.3378	(278)
Space and water heating			2455.6622	(279)
Pumps, fans and electric keep-hot	184.4804	1.5128	279.0820	(281)
Energy for lighting	139.4638	1.5338	213.9142	(282)
Total Primary energy kWh/year			2948.6585	(286)
Dwelling Primary energy Rate (DPER)			60.3400	(287)

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)		
Main dwelling							
Ground floor	3.0200	(1b)	x 2.8500	(2b)	= 8.6070	(1b) - (3b)	
First floor	45.8500	(1c)	x 2.5200	(2c)	= 115.5420	(1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	48.8700					(4)	
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)		= 124.1490	(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) =	0.1611	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4111	(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) = 0.3494 (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	0.4455	0.4368	0.4281	0.3844	0.3756	0.3320	0.3320	0.3232	0.3494	0.3756	0.3931	0.4106	(22b)
Effective ac	0.5992	0.5954	0.5916	0.5739	0.5706	0.5551	0.5551	0.5522	0.5611	0.5706	0.5773	0.5843	(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	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			4.9100	1.1450	5.6221			(27)
GF			3.0200	0.1300	0.3926			(28a)
Exposed Floor			1.6100	0.1300	0.2093			(28b)
Main	71.5671	7.0600	64.5071	0.1800	11.6113			(29a)
PIJ	45.8500		45.8500	0.1100	5.0435			(30)
Flat	3.0200		3.0200	0.1100	0.3322			(30)
Total net area of external elements Aum(A, m2)			125.0671					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.3610			(33)
Main dwelling								
Party Wall 1			22.3800	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 70.2323 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.1100	0.0500	0.2555
E3 Sill	5.1100	0.0500	0.2555
E4 Jamb	13.8000	0.0500	0.6900
E5 Ground floor (normal)	3.5100	0.1600	0.5616
E7 Party floor between dwellings (in blocks of flats)	17.0200	0.0700	1.1914
E16 Corner (normal)	20.8200	0.0900	1.8738
E17 Corner (inverted - internal area greater than external area)	5.0400	-0.0900	-0.4536
P1 Party wall - Ground floor	3.5100	0.0800	0.2808
E18 Party wall between dwellings	5.7000	0.0600	0.3420
E25 Staggered party wall between dwellings	5.0400	0.0600	0.3024
E20 Exposed floor (normal)	2.5400	0.3200	0.8128
E21 Exposed floor (inverted)	2.5400	0.3200	0.8128
E6 Intermediate floor within a dwelling	7.4100	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	11.0600	0.0600	0.6636
E12 Gable (insulation at ceiling level)	13.3700	0.0600	0.8022
E14 Flat roof	3.5100	0.0800	0.2808
E24 Eaves (insulation at ceiling level - inverted)	2.0100	0.2400	0.4824
P4 Party wall - Roof (insulation at ceiling level)	4.9100	0.1200	0.5892
P5 Party wall - Roof (insulation at rafter level)	1.5000	0.0800	0.1200

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.8632 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 35.2242 (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	24.5506	24.3928	24.2380	23.5111	23.3751	22.7419	22.7419	22.6247	22.9858	23.3751	23.6502	23.9378	(38)
Heat transfer coeff	59.7749	59.6170	59.4622	58.7353	58.5993	57.9662	57.9662	57.8489	58.2100	58.5993	58.8744	59.1621	(39)
Average = Sum(39)m / 12 =												58.7346	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2231	1.2199	1.2167	1.2019	1.1991	1.1861	1.1861	1.1837	1.1911	1.1991	1.2047	1.2106	(40)
HLP (average)												1.2019	
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 1.6569 (42)
Hot water usage for mixer showers

52.0000	51.2186	50.0798	47.9010	46.2932	44.5001	43.4809	44.6110	45.8498	47.7751	50.0006	51.8008	(42a)

Hot water usage for baths

22.4849	22.1510	21.6808	20.8137	20.1645	19.4446	19.0557	19.5227	20.0311	20.8014	21.6863	22.4089	(42b)

Hot water usage for other uses

31.5982	30.4492	29.3001	28.1511	27.0021	25.8531	25.8531	27.0021	28.1511	29.3001	30.4492	31.5982	(42c)

Average daily hot water use (litres/day) 97.5150 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	106.0831	103.8187	101.0607	96.8659	93.4597	89.7977	88.3896	91.1358	94.0320	97.8766	102.1361	105.8079	(44)
Energy conte	168.0098	147.8365	155.3265	132.6045	125.8147	110.4167	106.8996	112.8451	115.9509	132.8176	145.5116	165.6696	(45)
Energy content (annual)										Total = Sum(45)m =		1619.7032	
Distribution loss (46)m = 0.15 x (45)m	25.2015	22.1755	23.2990	19.8907	18.8722	16.5625	16.0349	16.9268	17.3926	19.9226	21.8267	24.8504	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(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	214.6047	189.9222	201.9214	177.6964	172.4096	155.5086	153.4945	159.4400	161.0427	179.4125	190.6035	212.2645	(62)
WWHRS	-23.7722	-21.0244	-22.0155	-18.2297	-16.9894	-14.5380	-13.6270	-14.4910	-15.0415	-17.7323	-20.0886	-23.3320	(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	190.8324	168.8978	179.9059	159.4667	155.4202	140.9706	139.8675	144.9490	146.0012	161.6802	170.5149	188.9325	(64)

Total per year (kWh/year) = Sum(64)m = 1947.4390 (64)

12Total per year (kWh/year) 1947 (64)

Electric shower(s)

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

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

Heat gains from water heating, kWh/month

	93.1392	82.8242	88.9220	80.1645	79.1093	72.7870	72.8200	74.7969	74.6271	81.4378	84.4561	92.3611 (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	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	(66)

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

	83.9607	92.9565	83.9607	86.7594	83.9607	86.7594	83.9607	83.9607	86.7594	83.9607	86.7594	83.9607	(67)

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

	144.2994	145.7968	142.0235	133.9905	123.8503	114.3199	107.9530	106.4556	110.2290	118.2620	128.4022	137.9326	(68)

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

	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	(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)

	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	(71)

Water heating gains (Table 5)

	125.1871	123.2503	119.5188	111.3395	106.3297	101.0931	97.8764	100.5335	103.6488	109.4594	117.3001	124.1412	(72)

Total internal gains

	404.3005	412.8569	396.3563	382.9427	364.9940	350.0257	337.6434	338.8031	348.4905	362.5354	383.3150	396.8878	(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	2.8600	10.6334	0.6300	0.7000	0.7700	9.2941	(74)
South	2.0500	46.7521	0.6300	0.7000	0.7700	29.2905	(78)

Solar gains	38.5846	65.7319	91.2869	117.5415	137.2730	139.1704	132.9415	117.5016	100.1197	72.8833	46.1847	33.0577	(83)
Total gains	442.8851	478.5888	487.6432	500.4842	502.2670	489.1961	470.5849	456.3047	448.6102	435.4187	429.4998	429.9455	(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	15.9499	15.9922	16.0338	16.2322	16.2699	16.4476	16.4476	16.4809	16.3787	16.2699	16.1939	16.1151	
alpha	2.0633	2.0661	2.0689	2.0821	2.0847	2.0965	2.0965	2.0987	2.0919	2.0847	2.0796	2.0743	
util living area	0.8866	0.8650	0.8383	0.7843	0.7030	0.5800	0.4611	0.4866	0.6385	0.7805	0.8559	0.8920	(86)
MIT	18.0140	18.3049	18.7584	19.4174	20.0444	20.5632	20.8095	20.7792	20.4244	19.6576	18.7605	17.9748	(87)
Th 2	19.9015	19.9041	19.9066	19.9185	19.9207	19.9311	19.9311	19.9330	19.9271	19.9207	19.9162	19.9115	(88)
util rest of house	0.8742	0.8503	0.8196	0.7574	0.6616	0.5147	0.3704	0.3979	0.5786	0.7486	0.8380	0.8802	(89)
MIT 2	16.4750	16.8366	17.4022	18.2179	18.9716	19.5653	19.8111	19.7872	19.4193	18.5220	17.4161	16.4297	(90)

Living area fraction fLA = Living area / (4) = 0.3912 (91)

MIT	17.0772	17.4111	17.9328	18.6872	19.3913	19.9557	20.2017	20.1753	19.8126	18.9663	17.9421	17.0342	(92)

Temperature adjustment 0.0000

adjusted MIT	17.0772	17.4111	17.9328	18.6872	19.3913	19.9557	20.2017	20.1753	19.8126	18.9663	17.9421	17.0342	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8318	0.8073	0.7776	0.7210	0.6386	0.5163	0.3948	0.4194	0.5714	0.7149	0.7964	0.8386	(94)
Useful gains	368.4121	386.3613	379.2011	360.8625	320.7348	252.5700	185.7831	191.3895	256.3543	311.3005	342.0483	360.5481	(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	763.7529	745.8724	679.8177	574.8521	450.7065	310.4503	208.7772	218.3974	332.5278	490.2585	638.3216	759.2960	(97)
Space heating kWh	294.1336	241.5914	223.6587	154.0725	96.6989	0.0000	0.0000	0.0000	0.0000	133.1447	213.3168	296.6684	(98a)

Space heating requirement - total per year (kWh/year) 1653.2851

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	294.1336	241.5914	223.6587	154.0725	96.6989	0.0000	0.0000	0.0000	0.0000	133.1447	213.3168	296.6684	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 1653.2851

Space heating per m2 (98c) / (4) = 33.8303 (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	294.1336	241.5914	223.6587	154.0725	96.6989	0.0000	0.0000	0.0000	0.0000	133.1447	213.3168	296.6684	(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)	318.6713	261.7458	242.3171	166.9258	104.7659	0.0000	0.0000	0.0000	0.0000	144.2522	231.1124	321.4176	(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												
	190.8324	168.8978	179.9059	159.4667	155.4202	140.9706	139.8675	144.9490	146.0012	161.6802	170.5149	188.9325 (64)
Efficiency of water heater												79.8000 (216)
(217)m	85.0266	84.8620	84.5491	83.9827	83.0275	79.8000	79.8000	79.8000	79.8000	83.6277	84.5632	85.0672 (217)
Fuel for water heating, kWh/month												
	224.4385	199.0264	212.7828	189.8805	187.1912	176.6549	175.2725	181.6404	182.9589	193.3333	201.6421	222.0978 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	17.4454	13.9953	12.6012	9.2322	7.1312	5.8263	6.5053	8.4559	10.9834	14.4108	16.2769	17.9302 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-23.3763	-33.2150	-48.1234	-54.5780	-59.2929	-55.5592	-54.9444	-51.7045	-45.9768	-38.2780	-25.8198	-20.1857 (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	-12.4013	-26.1875	-52.2162	-78.6423	-104.1612	-104.6692	-103.3673	-87.3742	-63.8973	-37.4382	-16.5592	-9.7931 (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	1791.2081 (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	2346.9193 (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)	140.7942 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1207.7611 (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	3157.1605 (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	1791.2081	0.2100	376.1537	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2346.9193	0.2100	492.8531	(264)
Space and water heating			869.0068	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	140.7942	0.1443	20.3210	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-511.0540	0.1344	-68.6798	
PV Unit electricity exported	-696.7070	0.1258	-87.6666	
Total			-156.3465	(269)
Total CO2, kg/year			744.9105	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.2400	(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	1791.2081	1.1300	2024.0651	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2346.9193	1.1300	2652.0188	(278)
Space and water heating			4676.0840	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	140.7942	1.5338	215.9548	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-511.0540	1.4967	-764.8772	
PV Unit electricity exported	-696.7070	0.4619	-321.7956	
Total			-1086.6729	(283)
Total Primary energy kWh/year			3935.4667	(286)
Target Primary Energy Rate (TPER)			80.5300	(287)

Full SAP Calculation Printout

Property Reference	78449-24	**Issued on Date**	18/08/2025
Assessment Reference	001	**Prop Type Ref**	Top Flat / End
Property	2 Shepherd Street, MANCHESTER, M9 4QW		

SAP Rating	81 B	**DER**	5.77	**TER**	15.24
Environmental	96 A	**% DER < TER**			62.14
CO_2 Emissions (t/year)	0.27	**DFEE**	35.82	**TFEE**	41.02
Compliance Check	See BREL	**% DFEE < TFEE**			12.68
% DPER < TPER	25.08	**DPER**	60.34	**TPER**	80.53

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	3.0200 (1b)	x	2.8500 (2b)	=	8.6070	(1b) - (3b)
First floor	45.8500 (1c)	x	2.5200 (2c)	=	115.5420	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	48.8700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	124.1490	(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		2.7900	(17)
Infiltration rate		0.1395	(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) =	0.1186	(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	0.1512	0.1482	0.1453	0.1304	0.1275	0.1126	0.1126	0.1097	0.1186	0.1275	0.1334	0.1393	(22b)

Balanced mechanical ventilation with heat recovery		
If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		80.1000 (23c)

Effective ac	0.2507	0.2477	0.2448	0.2299	0.2270	0.2121	0.2121	0.2092	0.2181	0.2270	0.2329	0.2388	(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	
Main dwelling								
Door			2.1500	0.7800	1.6770			(26)
Window			4.9100	0.7282	3.5752			(27)
GF			3.0200	0.0900	0.2718	75.0000	226.5000	(28a)
Exposed Floor			1.6100	0.1400	0.2254	20.0000	32.2000	(28b)
Main	71.5671	7.0600	64.5071	0.1300	8.3859	9.0000	580.5639	(29a)
PIJ	45.8500		45.8500	0.1100	5.0435	9.0000	412.6500	(30)
Flat	3.0200		3.0200	0.1200	0.3624	9.0000	27.1800	(30)
Total net area of external elements Aum(A, m2)			125.0671					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.5413			(33)
Main dwelling								
Party Wall 1			22.3800	0.0000	0.0000	20.0000	447.6000	(32)
Party Floor 1			37.9700			30.0000	1139.1000	(32d)
Timber			50.4000			9.0000	453.6000	(32c)
Internal Floor 1			6.2700			18.0000	112.8600	(32d)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 3432.2539 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 70.2323 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.1100	0.1150	0.5877
E3 Sill	5.1100	0.0170	0.0869
E4 Jamb	13.8000	0.0940	1.2972
E5 Ground floor (normal)	3.5100	0.0670	0.2352
E7 Party floor between dwellings (in blocks of flats)	17.0200	0.0320	0.5446
E16 Corner (normal)	20.8200	0.0680	1.4158
E17 Corner (inverted - internal area greater than external area)	5.0400	-0.0290	-0.1462
P1 Party wall - Ground floor	3.5100	0.0560	0.1966
E18 Party wall between dwellings	5.7000	0.2400	1.3680
E25 Staggered party wall between dwellings	5.0400	0.0560	0.2822
E20 Exposed floor (normal)	2.5400	0.3200	0.8128
E21 Exposed floor (inverted)	2.5400	0.3200	0.8128
E6 Intermediate floor within a dwelling	7.4100	0.0320	0.2371
E10 Eaves (insulation at ceiling level)	11.0600	0.0420	0.4645
E12 Gable (insulation at ceiling level)	13.3700	0.0770	1.0295
E14 Flat roof	3.5100	0.2050	0.7195
E24 Eaves (insulation at ceiling level - inverted)	2.0100	0.1500	0.3015
P4 Party wall - Roof (insulation at ceiling level)	4.9100	0.1020	0.5008
P5 Party wall - Roof (insulation at rafter level)	1.5000	0.4800	0.7200

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.4665 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 31.0078 (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	10.2703	10.1488	10.0274	9.4201	9.2987	8.6915	8.6915	8.5700	8.9344	9.2987	9.5416	9.7845	(38)
Heat transfer coeff	41.2781	41.1566	41.0352	40.4279	40.3065	39.6993	39.6993	39.5778	39.9421	40.3065	40.5494	40.7923	(39)

Average = Sum(39)m / 12 = 40.3976

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8447	0.8422	0.8397	0.8273	0.8248	0.8123	0.8123	0.8099	0.8173	0.8248	0.8297	0.8347	(40)
HLP (average)												0.8266	
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 1.6569 (42)
Hot water usage for mixer showers

52.0000	51.2186	50.0798	47.9010	46.2932	44.5001	43.4809	44.6110	45.8498	47.7751	50.0006	51.8008	(42a)

Hot water usage for baths

22.4849	22.1510	21.6808	20.8137	20.1645	19.4446	19.0557	19.5227	20.0311	20.8014	21.6863	22.4089	(42b)

Hot water usage for other uses

31.5982	30.4492	29.3001	28.1511	27.0021	25.8531	25.8531	27.0021	28.1511	29.3001	30.4492	31.5982	(42c)

Average daily hot water use (litres/day) 97.5150 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	106.0831	103.8187	101.0607	96.8659	93.4597	89.7977	88.3896	91.1358	94.0320	97.8766	102.1361	105.8079	(44)
Energy conte	168.0098	147.8365	155.3265	132.6045	125.8147	110.4167	106.8996	112.8451	115.9509	132.8176	145.5116	165.6696	(45)
Energy content (annual)										Total = Sum(45)m =		1619.7032	
Distribution loss (46)m = 0.15 x (45)m	25.2015	22.1755	23.2990	19.8907	18.8722	16.5625	16.0349	16.9268	17.3926	19.9226	21.8267	24.8504	(46)
Water storage loss:													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(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	194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(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	194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(64)
										Total per year (kWh/year) = Sum(64)m =		1937.0342	(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	55.8632	49.1556	51.6461	44.0910	41.8334	36.7136	35.5441	37.5210	38.5537	44.1619	48.3826	55.0851	(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	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.7425	17.5352	14.2605	10.7962	8.0702	6.8132	7.3620	9.5693	12.8440	16.3083	19.0342	20.2913	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	215.3723	217.6072	211.9753	199.9858	184.8511	170.6267	161.1239	158.8890	164.5209	176.5104	191.6451	205.8695	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	(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)	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	(71)
Water heating gains (Table 5)	75.0850	73.1483	69.4168	61.2375	56.2277	50.9911	47.7744	50.4314	53.5468	59.3573	67.1981	74.0392	(72)
Total internal gains	389.9358	388.0265	375.3886	351.7554	328.8850	308.1670	295.9962	298.6258	310.6475	331.9121	357.6133	379.9359	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.8600	10.6334	0.3800	0.0000	0.7700	8.8984	(74)
South	2.0500	46.7521	0.3800	0.0000	0.7700	28.0433	(78)

Solar gains	36.9417	62.9330	87.3999	112.5366	131.4279	133.2445	127.2808	112.4984	95.8566	69.7799	44.2182	31.6501	(83)
Total gains	426.8775	450.9595	462.7885	464.2920	460.3129	441.4115	423.2770	411.1241	406.5041	401.6920	401.8315	411.5860	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	23.0971	23.1653	23.2338	23.5828	23.6539	24.0157	24.0157	24.0894	23.8696	23.6539	23.5122	23.3722	
alpha	2.5398	2.5444	2.5489	2.5722	2.5769	2.6010	2.6010	2.6060	2.5913	2.5769	2.5675	2.5581	
util living area	0.8620	0.8388	0.8016	0.7386	0.6432	0.5083	0.3874	0.4116	0.5720	0.7356	0.8282	0.8705	(86)
MIT	19.1247	19.3388	19.6895	20.1394	20.5358	20.8240	20.9365	20.9239	20.7452	20.2712	19.6433	19.0826	(87)
Th 2	20.2148	20.2169	20.2191	20.2298	20.2319	20.2426	20.2426	20.2448	20.2384	20.2319	20.2276	20.2234	(88)
util rest of house	0.8503	0.8253	0.7845	0.7152	0.6094	0.4606	0.3276	0.3521	0.5260	0.7080	0.8120	0.8595	(89)
MIT 2	18.0138	18.2814	18.7187	19.2784	19.7529	20.0852	20.1974	20.1885	20.0005	19.4471	18.6737	17.9672	(90)
Living area fraction										fLA = Living area / (4) =		0.3912	(91)
MIT	18.4484	18.6951	19.0985	19.6152	20.0592	20.3742	20.4866	20.4762	20.2918	19.7695	19.0531	18.4036	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4484	18.6951	19.0985	19.6152	20.0592	20.3742	20.4866	20.4762	20.2918	19.7695	19.0531	18.4036	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8189	0.7948	0.7568	0.6947	0.6014	0.4692	0.3473	0.3708	0.5294	0.6898	0.7834	0.8284	(94)
Useful gains	349.5769	358.4224	350.2183	322.5311	276.8308	207.0989	146.9977	152.4606	215.2039	277.0942	314.7886	340.9672	(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	584.0203	567.7595	516.9829	433.1949	336.9314	229.2328	154.2939	161.3273	247.3155	369.5909	484.6890	579.3970	(97)
Space heating kWh	174.4259	140.6745	124.0728	79.6779	44.7148	0.0000	0.0000	0.0000	0.0000	68.8175	122.3283	177.3918	(98a)
Space heating requirement - total per year (kWh/year)												932.1036	
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	174.4259	140.6745	124.0728	79.6779	44.7148	0.0000	0.0000	0.0000	0.0000	68.8175	122.3283	177.3918	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												932.1036	
Space heating per m2										(98c) / (4) =		19.0731	(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)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (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	174.4259	140.6745	124.0728	79.6779	44.7148	0.0000	0.0000	0.0000	0.0000	68.8175	122.3283	177.3918	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	174.4259	140.6745	124.0728	79.6779	44.7148	0.0000	0.0000	0.0000	0.0000	68.8175	122.3283	177.3918	(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)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	60.0768	53.0567	56.1685	48.8988	47.0745	42.0617	41.2458	43.0779	43.7671	49.2324	52.8761	59.3557	(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	15.6682	14.1519	15.6682	15.1628	15.6682	15.1628	15.6682	15.6682	15.1628	15.6682	15.1628	15.6682	(231)
Lighting	17.2805	13.8631	12.4822	9.1450	7.0638	5.7712	6.4439	8.3760	10.8796	14.2746	16.1231	17.7608	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	932.1036	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	596.8921	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.2180)		
mechanical ventilation fans (SFP = 1.2180)	184.4804	(230a)
Total electricity for the above, kWh/year	184.4804	(231)
Electricity for lighting (calculated in Appendix L)	139.4638	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1852.9400	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	932.1036	16.4900	153.7039	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	596.8921	16.4900	98.4275	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	184.4804	16.4900	30.4208	(249)
Energy for lighting	139.4638	16.4900	22.9976	(250)
Additional standing charges			0.0000	(251)
Total energy cost			305.5498	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.1718	(257)
SAP value		81.0049	
SAP rating (Section 12)		81	(258)
SAP band		B	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	932.1036	0.1545	143.9644	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	596.8921	0.1411	84.2266	(264)
Space and water heating			228.1910	(265)
Pumps, fans and electric keep-hot	184.4804	0.1387	25.5897	(267)
Energy for lighting	139.4638	0.1443	20.1289	(268)
Total CO2, kg/year			273.9097	(272)
CO2 emissions per m2			5.6000	(273)
EI value			96.0899	
EI rating			96	(274)
EI band			A	

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	3.0200	(1b) x	2.8500	(2b) =	8.6070	(1b) - (3b)
First floor	45.8500	(1c) x	2.5200	(2c) =	115.5420	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 48.8700						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		124.1490	(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		2.7900 (17)
Infiltration rate		0.1395 (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) =	0.1186 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.5000	4.5000	4.1000	4.2000	3.7000	3.5000	3.5000	3.7000	4.1000	4.1000	4.2000	(22)
Wind factor	1.1500	1.1250	1.1250	1.0250	1.0500	0.9250	0.8750	0.8750	0.9250	1.0250	1.0250	1.0500	(22a)
Adj infilt rate	0.1364	0.1334	0.1334	0.1215	0.1245	0.1097	0.1038	0.1038	0.1097	0.1215	0.1215	0.1245	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		80.1000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2359	0.2329	0.2329	0.2210	0.2240	0.2092	0.2033	0.2033	0.2092	0.2210	0.2210	0.2240	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Door			2.1500	0.7800	1.6770			(26)
Window			4.9100	0.7282	3.5752			(27)
GF			3.0200	0.0900	0.2718	75.0000	226.5000	(28a)
Exposed Floor			1.6100	0.1400	0.2254	20.0000	32.2000	(28b)
Main	71.5671	7.0600	64.5071	0.1300	8.3859	9.0000	580.5639	(29a)
PIJ	45.8500		45.8500	0.1100	5.0435	9.0000	412.6500	(30)
Flat	3.0200		3.0200	0.1200	0.3624	9.0000	27.1800	(30)
Total net area of external elements Aum(A, m2)			125.0671					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.5413			(33)
Main dwelling								
Party Wall 1			22.3800	0.0000	0.0000	20.0000	447.6000	(32)
Party Floor 1			37.9700			30.0000	1139.1000	(32d)
Timber			50.4000			9.0000	453.6000	(32c)
Internal Floor 1			6.2700			18.0000	112.8600	(32d)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	3432.2539 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		70.2323 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.1100	0.1150	0.5877
E3 Sill	5.1100	0.0170	0.0869
E4 Jamb	13.8000	0.0940	1.2972
E5 Ground floor (normal)	3.5100	0.0670	0.2352
E7 Party floor between dwellings (in blocks of flats)	17.0200	0.0320	0.5446
E16 Corner (normal)	20.8200	0.0680	1.4158
E17 Corner (inverted - internal area greater than external area)	5.0400	-0.0290	-0.1462
P1 Party wall - Ground floor	3.5100	0.0560	0.1966
E18 Party wall between dwellings	5.7000	0.2400	1.3680
E25 Staggered party wall between dwellings	5.0400	0.0560	0.2822
E20 Exposed floor (normal)	2.5400	0.3200	0.8128
E21 Exposed floor (inverted)	2.5400	0.3200	0.8128
E6 Intermediate floor within a dwelling	7.4100	0.0320	0.2371
E10 Eaves (insulation at ceiling level)	11.0600	0.0420	0.4645
E12 Gable (insulation at ceiling level)	13.3700	0.0770	1.0295
E14 Flat roof	3.5100	0.2050	0.7195
E24 Eaves (insulation at ceiling level - inverted)	2.0100	0.1500	0.3015
P4 Party wall - Roof (insulation at ceiling level)	4.9100	0.1020	0.5008
P5 Party wall - Roof (insulation at rafter level)	1.5000	0.4800	0.7200

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		11.4665 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	31.0078 (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	9.6630	9.5416	9.5416	9.0558	9.1772	8.5700	8.3271	8.3271	8.5700	9.0558	9.0558	9.1772	(38)
Heat transfer coeff	40.6708	40.5494	40.5494	40.0636	40.1850	39.5778	39.3349	39.3349	39.5778	40.0636	40.0636	40.1850	(39)
Average = Sum(39)m / 12 =												40.0130	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8322	0.8297	0.8297	0.8198	0.8223	0.8099	0.8049	0.8049	0.8099	0.8198	0.8198	0.8223	(40)
HLP (average)												0.8188	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.6569 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
52.0000	51.2186	50.0798	47.9010	46.2932	44.5001	43.4809	44.6110	45.8498	47.7751	50.0006	51.8008	(42a)

Hot water usage for baths

22.4849	22.1510	21.6808	20.8137	20.1645	19.4446	19.0557	19.5227	20.0311	20.8014	21.6863	22.4089	(42b)

Hot water usage for other uses

31.5982	30.4492	29.3001	28.1511	27.0021	25.8531	25.8531	27.0021	28.1511	29.3001	30.4492	31.5982	(42c)

Average daily hot water use (litres/day)		97.5150 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	106.0831	103.8187	101.0607	96.8659	93.4597	89.7977	88.3896	91.1358	94.0320	97.8766	102.1361	105.8079	(44)

Energy conte	168.0098	147.8365	155.3265	132.6045	125.8147	110.4167	106.8996	112.8451	115.9509	132.8176	145.5116	165.6696	(45)
Energy content (annual)										Total = Sum(45)m =		1619.7032	
Distribution loss (46)m = 0.15 x (45)m													
	25.2015	22.1755	23.2990	19.8907	18.8722	16.5625	16.0349	16.9268	17.3926	19.9226	21.8267	24.8504	(46)
Water storage loss:													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss													
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage													
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(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													
	194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(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													
	194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(64)
										Total per year (kWh/year) = Sum(64)m =		1937.0342	(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													
	55.8632	49.1556	51.6461	44.0910	41.8334	36.7136	35.5441	37.5210	38.5537	44.1619	48.3826	55.0851	(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	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	19.7425	17.5352	14.2605	10.7962	8.0702	6.8132	7.3620	9.5693	12.8440	16.3083	19.0342	20.2913	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	215.3723	217.6072	211.9753	199.9858	184.8511	170.6267	161.1239	158.8890	164.5209	176.5104	191.6451	205.8695	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	(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)													
	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	(71)
Water heating gains (Table 5)													
	75.0850	73.1483	69.4168	61.2375	56.2277	50.9911	47.7744	50.4314	53.5468	59.3573	67.1981	74.0392	(72)
Total internal gains													
	389.9358	388.0265	375.3886	351.7554	328.8850	308.1670	295.9962	298.6258	310.6475	331.9121	357.6133	379.9359	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.8600	8.9975	0.3800	0.0000	0.7700	7.5294	(74)
South	2.0500	39.5594	0.3800	0.0000	0.7700	23.7289	(78)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	31.2584	55.9404	81.9374	107.2849	122.5292	126.5823	118.5261	103.1832	90.8554	64.4936	38.8584	28.6358	(83)
Total gains	421.1942	443.9670	457.3260	459.0403	451.4142	434.7493	414.5222	401.8090	401.5029	396.4056	396.4717	408.5717	(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	23.4420	23.5122	23.5122	23.7973	23.7253	24.0894	24.2381	24.2381	24.0894	23.7973	23.7973	23.7253	
alpha	2.5628	2.5675	2.5675	2.5865	2.5817	2.6060	2.6159	2.6159	2.6060	2.5865	2.5865	2.5817	
util living area													
	0.8577	0.8342	0.7989	0.7287	0.6239	0.4884	0.3917	0.4101	0.5740	0.7321	0.8220	0.8650	(86)
MIT	19.2291	19.4351	19.7393	20.2071	20.5990	20.8509	20.9362	20.9272	20.7471	20.3004	19.7304	19.1973	(87)
Th 2	20.2255	20.2276	20.2276	20.2362	20.2341	20.2448	20.2491	20.2491	20.2448	20.2362	20.2362	20.2341	(88)
util rest of house													
	0.8455	0.8203	0.7816	0.7042	0.5876	0.4384	0.3318	0.3497	0.5284	0.7039	0.8050	0.8535	(89)
MIT 2	18.1518	18.4090	18.7865	19.3654	19.8285	20.1155	20.2034	20.1959	20.0083	19.4857	18.7879	18.1181	(90)
Living area fraction									fLA = Living area / (4) =			0.3912	(91)
MIT	18.5733	18.8105	19.1593	19.6947	20.1300	20.4032	20.4901	20.4820	20.2973	19.8044	19.1567	18.5403	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5733	18.8105	19.1593	19.6947	20.1300	20.4032	20.4901	20.4820	20.2973	19.8044	19.1567	18.5403	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8148	0.7905	0.7545	0.6852	0.5824	0.4492	0.3515	0.3689	0.5317	0.6864	0.7773	0.8230	(94)
Useful gains	343.1995	350.9748	345.0622	314.5507	262.8964	195.3085	145.6979	148.2239	213.4772	272.0967	308.1964	336.2675	(95)
Ext temp.	4.7000	5.3000	6.7000	9.3000	12.3000	15.0000	16.6000	16.5000	14.1000	10.8000	7.5000	4.6000	(96)
Heat loss rate W													
	564.2369	547.8415	505.2154	416.4506	314.6473	213.8470	153.0176	156.6328	245.2775	360.7504	467.0087	560.1930	(97)
Space heating kWh													
	164.4518	132.2944	119.1540	73.3680	38.5027	0.0000	0.0000	0.0000	0.0000	65.9583	114.3449	166.6006	(98a)
Space heating requirement - total per year (kWh/year)												874.6747	
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													
	164.4518	132.2944	119.1540	73.3680	38.5027	0.0000	0.0000	0.0000	0.0000	65.9583	114.3449	166.6006	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 874.6747
Space heating per m2 (98c) / (4) = 17.8980 (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)
Fraction of main heating from main system 2 0.0000 (203)
Fraction of total heating from main system 1 1.0000 (204)
Fraction of total heating from main system 2 0.0000 (205)
Efficiency of main space heating system 1 (in %) 100.0000 (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	164.4518	132.2944	119.1540	73.3680	38.5027	0.0000	0.0000	0.0000	0.0000	65.9583	114.3449	166.6006	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	164.4518	132.2944	119.1540	73.3680	38.5027	0.0000	0.0000	0.0000	0.0000	65.9583	114.3449	166.6006	(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)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	60.0768	53.0567	56.1685	48.8988	47.0745	42.0617	41.2458	43.0779	43.7671	49.2324	52.8761	59.3557	(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	15.6682	14.1519	15.6682	15.1628	15.6682	15.1628	15.6682	15.6682	15.1628	15.6682	15.1628	15.6682	(231)
Lighting	17.2805	13.8631	12.4822	9.1450	7.0638	5.7712	6.4439	8.3760	10.8796	14.2746	16.1231	17.7608	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year
Space heating fuel - main system 1 874.6747 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 324.5200
Water heating fuel used 596.8921 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.2180)
mechanical ventilation fans (SFP = 1.2180) 184.4804 (230a)
Total electricity for the above, kWh/year 184.4804 (231)
Electricity for lighting (calculated in Appendix L) 139.4638 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation 0.0000 (233)
Wind generation 0.0000 (234)
Hydro-electric generation (Appendix N) 0.0000 (235a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
Appendix Q - special features
Energy saved or generated -0.0000 (236)
Energy used 0.0000 (237)
Total delivered energy for all uses 1795.5111 (238)

10a. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	874.6747	28.4300	248.6700	(240)
Space heating - main system 2	0.0000	28.4300	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	596.8921	28.4300	169.6964	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	184.4804	28.4300	52.4478	(249)
Energy for lighting	139.4638	28.4300	39.6496	(250)
Additional standing charges			0.0000	(251)
Total energy cost			510.4638	(255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	874.6747	0.1545	135.1696	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	596.8921	0.1411	84.2266	(264)

Space and water heating			219.3962	(265)
Pumps, fans and electric keep-hot	184.4804	0.1387	25.5897	(267)
Energy for lighting	139.4638	0.1443	20.1289	(268)
Total CO2, kg/year			265.1149	(272)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	874.6747	1.5721	1375.1148	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	596.8921	1.5218	908.3378	(278)
Space and water heating			2283.4526	(279)
Pumps, fans and electric keep-hot	184.4804	1.5128	279.0820	(281)
Energy for lighting	139.4638	1.5338	213.9142	(282)
Total Primary energy kWh/year			2776.4488	(286)

SAP 10 EPC IMPROVEMENTS

001

Current energy efficiency rating: B 81
Current environmental impact rating: A 96

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

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

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

Potential energy efficiency rating: B 81
Potential environmental impact rating: A 96

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, West Pennines (England)):

	Current	Potential	Saving
Electricity	£510	£510	£0
Space heating	£301	£301	£0
Water heating	£170	£170	£0
Lighting	£40	£40	£0
Total cost of fuels	£510	£510	£0
Total cost of uses	£511	£511	£0
Delivered energy	37 kWh/m²	37 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.3 tonnes	0.3 tonnes	0.0 tonnes
CO2 emissions per m²	5 kg/m²	5 kg/m²	0 kg/m²
Primary energy	57 kWh/m²	57 kWh/m²	0 kWh/m²

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	3.0200	(1b) x	2.8500	(2b) =	8.6070	(1b) - (3b)
First floor	45.8500	(1c) x	2.5200	(2c) =	115.5420	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	48.8700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		124.1490	(5)

2. Ventilation rate

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.7900	(17)
Infiltration rate		0.1395	(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) =	0.1186	(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	0.1512	0.1482	0.1453	0.1304	0.1275	0.1126	0.1126	0.1097	0.1186	0.1275	0.1334	0.1393	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2507	0.2477	0.2448	0.2299	0.2270	0.2121	0.2121	0.2092	0.2181	0.2270	0.2329	0.2388	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Door			2.1500	0.7800	1.6770			(26)
Window			4.9100	0.7282	3.5752			(27)
GF			3.0200	0.0900	0.2718	75.0000	226.5000	(28a)
Exposed Floor			1.6100	0.1400	0.2254	20.0000	32.2000	(28b)
Main	71.5671	7.0600	64.5071	0.1300	8.3859	9.0000	580.5639	(29a)
PIJ	45.8500		45.8500	0.1100	5.0435	9.0000	412.6500	(30)
Flat	3.0200		3.0200	0.1200	0.3624	9.0000	27.1800	(30)
Total net area of external elements Aum(A, m2)			125.0671					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.5413			(33)
Main dwelling								
Party Wall 1			22.3800	0.0000	0.0000	20.0000	447.6000	(32)
Party Floor 1			37.9700			30.0000	1139.1000	(32d)
Timber			50.4000			9.0000	453.6000	(32c)
Internal Floor 1			6.2700			18.0000	112.8600	(32d)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	3432.2539 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		70.2323 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.1100	0.1150	0.5877
E3 Sill	5.1100	0.0170	0.0869
E4 Jamb	13.8000	0.0940	1.2972
E5 Ground floor (normal)	3.5100	0.0670	0.2352
E7 Party floor between dwellings (in blocks of flats)	17.0200	0.0320	0.5446
E16 Corner (normal)	20.8200	0.0680	1.4158
E17 Corner (inverted - internal area greater than external area)	5.0400	-0.0290	-0.1462
P1 Party wall - Ground floor	3.5100	0.0560	0.1966
E18 Party wall between dwellings	5.7000	0.2400	1.3680
E25 Staggered party wall between dwellings	5.0400	0.0560	0.2822
E20 Exposed floor (normal)	2.5400	0.3200	0.8128
E21 Exposed floor (inverted)	2.5400	0.3200	0.8128
E6 Intermediate floor within a dwelling	7.4100	0.0320	0.2371
E10 Eaves (insulation at ceiling level)	11.0600	0.0420	0.4645
E12 Gable (insulation at ceiling level)	13.3700	0.0770	1.0295
E14 Flat roof	3.5100	0.2050	0.7195
E24 Eaves (insulation at ceiling level - inverted)	2.0100	0.1500	0.3015
P4 Party wall - Roof (insulation at ceiling level)	4.9100	0.1020	0.5008
P5 Party wall - Roof (insulation at rafter level)	1.5000	0.4800	0.7200

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		11.4665 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	31.0078 (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	10.2703	10.1488	10.0274	9.4201	9.2987	8.6915	8.6915	8.5700	8.9344	9.2987	9.5416	9.7845	(38)
Heat transfer coeff	41.2781	41.1566	41.0352	40.4279	40.3065	39.6993	39.6993	39.5778	39.9421	40.3065	40.5494	40.7923	(39)

Average = Sum(39)m / 12 =	40.3976

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8447	0.8422	0.8397	0.8273	0.8248	0.8123	0.8123	0.8099	0.8173	0.8248	0.8297	0.8347	(40)
HLP (average)												0.8266	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.6569 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	52.0000	51.2186	50.0798	47.9010	46.2932	44.5001	43.4809	44.6110	45.8498	47.7751	50.0006	51.8008	(42a)
Hot water usage for baths	22.4849	22.1510	21.6808	20.8137	20.1645	19.4446	19.0557	19.5227	20.0311	20.8014	21.6863	22.4089	(42b)
Hot water usage for other uses	31.5982	30.4492	29.3001	28.1511	27.0021	25.8531	25.8531	27.0021	28.1511	29.3001	30.4492	31.5982	(42c)

Average daily hot water use (litres/day)	97.5150 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	106.0831	103.8187	101.0607	96.8659	93.4597	89.7977	88.3896	91.1358	94.0320	97.8766	102.1361	105.8079	(44)
Energy conte	168.0098	147.8365	155.3265	132.6045	125.8147	110.4167	106.8996	112.8451	115.9509	132.8176	145.5116	165.6696	(45)
Energy content (annual)										Total = Sum(45)m =		1619.7032	
Distribution loss (46)m = 0.15 x (45)m	25.2015	22.1755	23.2990	19.8907	18.8722	16.5625	16.0349	16.9268	17.3926	19.9226	21.8267	24.8504	(46)

Water storage loss:	
Store volume	200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	1.6100 (48)

Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss													
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage													
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(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													
	194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(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													
	194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(64)
									Total per year (kWh/year) = Sum(64)m =			1937.0342	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Heat gains from water heating, kWh/month													
	55.8632	49.1556	51.6461	44.0910	41.8334	36.7136	35.5441	37.5210	38.5537	44.1619	48.3826	55.0851	(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	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	19.7425	17.5352	14.2605	10.7962	8.0702	6.8132	7.3620	9.5693	12.8440	16.3083	19.0342	20.2913	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	215.3723	217.6072	211.9753	199.9858	184.8511	170.6267	161.1239	158.8890	164.5209	176.5104	191.6451	205.8695	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	(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)													
	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	(71)
Water heating gains (Table 5)													
	75.0850	73.1483	69.4168	61.2375	56.2277	50.9911	47.7744	50.4314	53.5468	59.3573	67.1981	74.0392	(72)
Total internal gains													
	389.9358	388.0265	375.3886	351.7554	328.8850	308.1670	295.9962	298.6258	310.6475	331.9121	357.6133	379.9359	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.8600	10.6334	0.3800	0.0000	0.7700	8.8984	(74)
South	2.0500	46.7521	0.3800	0.0000	0.7700	28.0433	(78)

Solar gains	36.9417	62.9330	87.3999	112.5366	131.4279	133.2445	127.2808	112.4984	95.8566	69.7799	44.2182	31.6501	(83)
Total gains	426.8775	450.9595	462.7885	464.2920	460.3129	441.4115	423.2770	411.1241	406.5041	401.6920	401.8315	411.5860	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	23.0971	23.1653	23.2338	23.5828	23.6539	24.0157	24.0157	24.0894	23.8696	23.6539	23.5122	23.3722	
alpha	2.5398	2.5444	2.5489	2.5722	2.5769	2.6010	2.6010	2.6060	2.5913	2.5769	2.5675	2.5581	
util living area													
	0.8620	0.8388	0.8016	0.7386	0.6432	0.5083	0.3874	0.4116	0.5720	0.7356	0.8282	0.8705	(86)
MIT	19.1247	19.3388	19.6895	20.1394	20.5358	20.8240	20.9365	20.9239	20.7452	20.2712	19.6433	19.0826	(87)
Th 2	20.2148	20.2169	20.2191	20.2298	20.2319	20.2426	20.2426	20.2448	20.2384	20.2319	20.2276	20.2234	(88)
util rest of house													
	0.8503	0.8253	0.7845	0.7152	0.6094	0.4606	0.3276	0.3521	0.5260	0.7080	0.8120	0.8595	(89)
MIT 2	18.0138	18.2814	18.7187	19.2784	19.7529	20.0852	20.1974	20.1885	20.0005	19.4471	18.6737	17.9672	(90)
Living area fraction										fLA = Living area / (4) =		0.3912	(91)
MIT	18.4484	18.6951	19.0985	19.6152	20.0592	20.3742	20.4866	20.4762	20.2918	19.7695	19.0531	18.4036	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4484	18.6951	19.0985	19.6152	20.0592	20.3742	20.4866	20.4762	20.2918	19.7695	19.0531	18.4036	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8189	0.7948	0.7568	0.6947	0.6014	0.4692	0.3473	0.3708	0.5294	0.6898	0.7834	0.8284	(94)
Useful gains	349.5769	358.4224	350.2183	322.5311	276.8308	207.0989	146.9977	152.4606	215.2039	277.0942	314.7886	340.9672	(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													
	584.0203	567.7595	516.9829	433.1949	336.9314	229.2328	154.2939	161.3273	247.3155	369.5909	484.6890	579.3970	(97)
Space heating kWh													
	174.4259	140.6745	124.0728	79.6779	44.7148	0.0000	0.0000	0.0000	0.0000	68.8175	122.3283	177.3918	(98a)
Space heating requirement - total per year (kWh/year)												932.1036	
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													
	174.4259	140.6745	124.0728	79.6779	44.7148	0.0000	0.0000	0.0000	0.0000	68.8175	122.3283	177.3918	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												932.1036	
Space heating per m2											(98c) / (4) =	19.0731	(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)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(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													
	174.4259	140.6745	124.0728	79.6779	44.7148	0.0000	0.0000	0.0000	0.0000	68.8175	122.3283	177.3918	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	174.4259	140.6745	124.0728	79.6779	44.7148	0.0000	0.0000	0.0000	0.0000	68.8175	122.3283	177.3918	(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)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	60.0768	53.0567	56.1685	48.8988	47.0745	42.0617	41.2458	43.0779	43.7671	49.2324	52.8761	59.3557	(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	15.6682	14.1519	15.6682	15.1628	15.6682	15.1628	15.6682	15.6682	15.1628	15.6682	15.1628	15.6682	(231)
Lighting	17.2805	13.8631	12.4822	9.1450	7.0638	5.7712	6.4439	8.3760	10.8796	14.2746	16.1231	17.7608	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												932.1036	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												596.8921	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.2180)													
mechanical ventilation fans (SFP = 1.2180)												184.4804	(230a)
Total electricity for the above, kWh/year												184.4804	(231)
Electricity for lighting (calculated in Appendix L)												139.4638	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												1852.9400	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	932.1036	16.4900	153.7039	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	596.8921	16.4900	98.4275	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	184.4804	16.4900	30.4208	(249)
Energy for lighting	139.4638	16.4900	22.9976	(250)
Additional standing charges			0.0000	(251)
Total energy cost			305.5498	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.1718	(257)
SAP value		81.0049	
SAP rating (Section 12)		81	(258)
SAP band		B	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	

Space heating - main system 1	932.1036	0.1545	143.9644	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	596.8921	0.1411	84.2266	(264)
Space and water heating			228.1910	(265)
Pumps, fans and electric keep-hot	184.4804	0.1387	25.5897	(267)
Energy for lighting	139.4638	0.1443	20.1289	(268)
Total CO2, kg/year			273.9097	(272)
CO2 emissions per m2			5.6000	(273)
EI value			96.0899	
EI rating			96	(274)
EI band			A	

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	3.0200	(1b) x	2.8500	(2b) =	8.6070	(1b) - (3b)
First floor	45.8500	(1c) x	2.5200	(2c) =	115.5420	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	48.8700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		124.1490	(5)

2. Ventilation rate

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

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.7900 (17)
Infiltration rate		0.1395 (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) =	0.1186 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.5000	4.5000	4.1000	4.2000	3.7000	3.5000	3.5000	3.7000	4.1000	4.1000	4.2000	(22)
Wind factor	1.1500	1.1250	1.1250	1.0250	1.0500	0.9250	0.8750	0.8750	0.9250	1.0250	1.0250	1.0500	(22a)
Adj infilt rate	0.1364	0.1334	0.1334	0.1215	0.1245	0.1097	0.1038	0.1038	0.1097	0.1215	0.1215	0.1245	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		80.1000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2359	0.2329	0.2329	0.2210	0.2240	0.2092	0.2033	0.2033	0.2092	0.2210	0.2210	0.2240	(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	
Main dwelling								
Door			2.1500	0.7800	1.6770			(26)
Window			4.9100	0.7282	3.5752			(27)
GF			3.0200	0.0900	0.2718	75.0000	226.5000	(28a)
Exposed Floor			1.6100	0.1400	0.2254	20.0000	32.2000	(28b)
Main	71.5671	7.0600	64.5071	0.1300	8.3859	9.0000	580.5639	(29a)
PIJ	45.8500		45.8500	0.1100	5.0435	9.0000	412.6500	(30)
Flat	3.0200		3.0200	0.1200	0.3624	9.0000	27.1800	(30)
Total net area of external elements Aum(A, m2)			125.0671					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.5413			(33)
Main dwelling								
Party Wall 1			22.3800	0.0000	0.0000	20.0000	447.6000	(32)
Party Floor 1			37.9700			30.0000	1139.1000	(32d)
Timber			50.4000			9.0000	453.6000	(32c)
Internal Floor 1			6.2700			18.0000	112.8600	(32d)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	3432.2539 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		70.2323 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.1100	0.1150	0.5877
E3 Sill	5.1100	0.0170	0.0869
E4 Jamb	13.8000	0.0940	1.2972
E5 Ground floor (normal)	3.5100	0.0670	0.2352
E7 Party floor between dwellings (in blocks of flats)	17.0200	0.0320	0.5446
E16 Corner (normal)	20.8200	0.0680	1.4158

E17 Corner (inverted - internal area greater than external area)	5.0400	-0.0290	-0.1462
P1 Party wall - Ground floor	3.5100	0.0560	0.1966
E18 Party wall between dwellings	5.7000	0.2400	1.3680
E25 Staggered party wall between dwellings	5.0400	0.0560	0.2822
E20 Exposed floor (normal)	2.5400	0.3200	0.8128
E21 Exposed floor (inverted)	2.5400	0.3200	0.8128
E6 Intermediate floor within a dwelling	7.4100	0.0320	0.2371
E10 Eaves (insulation at ceiling level)	11.0600	0.0420	0.4645
E12 Gable (insulation at ceiling level)	13.3700	0.0770	1.0295
E14 Flat roof	3.5100	0.2050	0.7195
E24 Eaves (insulation at ceiling level - inverted)	2.0100	0.1500	0.3015
P4 Party wall - Roof (insulation at ceiling level)	4.9100	0.1020	0.5008
P5 Party wall - Roof (insulation at rafter level)	1.5000	0.4800	0.7200

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.4665 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 31.0078 (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	9.6630	9.5416	9.5416	9.0558	9.1772	8.5700	8.3271	8.3271	8.5700	9.0558	9.0558	9.1772	(38)
Heat transfer coeff	40.6708	40.5494	40.5494	40.0636	40.1850	39.5778	39.3349	39.3349	39.5778	40.0636	40.0636	40.1850	(39)
Average = Sum(39)m / 12 =												40.0130	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8322	0.8297	0.8297	0.8198	0.8223	0.8099	0.8049	0.8049	0.8099	0.8198	0.8198	0.8223	(40)
HLP (average)												0.8188	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.6569 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	52.0000	51.2186	50.0798	47.9010	46.2932	44.5001	43.4809	44.6110	45.8498	47.7751	50.0006	51.8008	(42a)
Hot water usage for baths	22.4849	22.1510	21.6808	20.8137	20.1645	19.4446	19.0557	19.5227	20.0311	20.8014	21.6863	22.4089	(42b)
Hot water usage for other uses	31.5982	30.4492	29.3001	28.1511	27.0021	25.8531	25.8531	27.0021	28.1511	29.3001	30.4492	31.5982	(42c)
Average daily hot water use (litres/day)												97.5150	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	106.0831	103.8187	101.0607	96.8659	93.4597	89.7977	88.3896	91.1358	94.0320	97.8766	102.1361	105.8079	(44)
Energy conte	168.0098	147.8365	155.3265	132.6045	125.8147	110.4167	106.8996	112.8451	115.9509	132.8176	145.5116	165.6696	(45)
Energy content (annual)										Total = Sum(45)m =		1619.7032	
Distribution loss (46)m = 0.15 x (45)m	25.2015	22.1755	23.2990	19.8907	18.8722	16.5625	16.0349	16.9268	17.3926	19.9226	21.8267	24.8504	(46)
Water storage loss:													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(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	194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(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	194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(64)
										Total per year (kWh/year) = Sum(64)m =		1937.0342	(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	55.8632	49.1556	51.6461	44.0910	41.8334	36.7136	35.5441	37.5210	38.5537	44.1619	48.3826	55.0851	(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	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.7425	17.5352	14.2605	10.7962	8.0702	6.8132	7.3620	9.5693	12.8440	16.3083	19.0342	20.2913	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	215.3723	217.6072	211.9753	199.9858	184.8511	170.6267	161.1239	158.8890	164.5209	176.5104	191.6451	205.8695	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	(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)	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	(71)
Water heating gains (Table 5)	75.0850	73.1483	69.4168	61.2375	56.2277	50.9911	47.7744	50.4314	53.5468	59.3573	67.1981	74.0392	(72)
Total internal gains	389.9358	388.0265	375.3886	351.7554	328.8850	308.1670	295.9962	298.6258	310.6475	331.9121	357.6133	379.9359	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.8600	8.9975	0.3800	0.0000	0.7700	7.5294	(74)
South	2.0500	39.5594	0.3800	0.0000	0.7700	23.7289	(78)

Solar gains	31.2584	55.9404	81.9374	107.2849	122.5292	126.5823	118.5261	103.1832	90.8554	64.4936	38.8584	28.6358	(83)
Total gains	421.1942	443.9670	457.3260	459.0403	451.4142	434.7493	414.5222	401.8090	401.5029	396.4056	396.4717	408.5717	(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	23.4420	23.5122	23.5122	23.7973	23.7253	24.0894	24.2381	24.2381	24.0894	23.7973	23.7973	23.7253	
alpha	2.5628	2.5675	2.5675	2.5865	2.5817	2.6060	2.6159	2.6159	2.6060	2.5865	2.5865	2.5817	
util living area	0.8577	0.8342	0.7989	0.7287	0.6239	0.4884	0.3917	0.4101	0.5740	0.7321	0.8220	0.8650	(86)
MIT	19.2291	19.4351	19.7393	20.2071	20.5990	20.8509	20.9362	20.9272	20.7471	20.3004	19.7304	19.1973	(87)
Th 2	20.2255	20.2276	20.2276	20.2362	20.2341	20.2448	20.2491	20.2491	20.2448	20.2362	20.2362	20.2341	(88)
util rest of house	0.8455	0.8203	0.7816	0.7042	0.5876	0.4384	0.3318	0.3497	0.5284	0.7039	0.8050	0.8535	(89)
MIT 2	18.1518	18.4090	18.7865	19.3654	19.8285	20.1155	20.2034	20.1959	20.0083	19.4857	18.7879	18.1181	(90)
Living area fraction									fLA = Living area / (4) =			0.3912	(91)
MIT	18.5733	18.8105	19.1593	19.6947	20.1300	20.4032	20.4901	20.4820	20.2973	19.8044	19.1567	18.5403	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5733	18.8105	19.1593	19.6947	20.1300	20.4032	20.4901	20.4820	20.2973	19.8044	19.1567	18.5403	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8148	0.7905	0.7545	0.6852	0.5824	0.4492	0.3515	0.3689	0.5317	0.6864	0.7773	0.8230	(94)
Useful gains	343.1995	350.9748	345.0622	314.5507	262.8964	195.3085	145.6979	148.2239	213.4772	272.0967	308.1964	336.2675	(95)
Ext temp.	4.7000	5.3000	6.7000	9.3000	12.3000	15.0000	16.6000	16.5000	14.1000	10.8000	7.5000	4.6000	(96)
Heat loss rate W	564.2369	547.8415	505.2154	416.4506	314.6473	213.8470	153.0176	156.6328	245.2775	360.7504	467.0087	560.1930	(97)
Space heating kWh	164.4518	132.2944	119.1540	73.3680	38.5027	0.0000	0.0000	0.0000	0.0000	65.9583	114.3449	166.6006	(98a)
Space heating requirement - total per year (kWh/year)												874.6747	
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	164.4518	132.2944	119.1540	73.3680	38.5027	0.0000	0.0000	0.0000	0.0000	65.9583	114.3449	166.6006	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												874.6747	
Space heating per m2											(98c) / (4) =	17.8980	(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)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (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	164.4518	132.2944	119.1540	73.3680	38.5027	0.0000	0.0000	0.0000	0.0000	65.9583	114.3449	166.6006	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	164.4518	132.2944	119.1540	73.3680	38.5027	0.0000	0.0000	0.0000	0.0000	65.9583	114.3449	166.6006	(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)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	60.0768	53.0567	56.1685	48.8988	47.0745	42.0617	41.2458	43.0779	43.7671	49.2324	52.8761	59.3557	(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	15.6682	14.1519	15.6682	15.1628	15.6682	15.1628	15.6682	15.6682	15.1628	15.6682	15.1628	15.6682	(231)
Lighting	17.2805	13.8631	12.4822	9.1450	7.0638	5.7712	6.4439	8.3760	10.8796	14.2746	16.1231	17.7608	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												874.6747	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												596.8921	(219)

Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.2180)		
mechanical ventilation fans (SFP = 1.2180)	184.4804	(230a)
Total electricity for the above, kWh/year	184.4804	(231)
Electricity for lighting (calculated in Appendix L)	139.4638	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1795.5111	(238)

10a. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	874.6747	28.4300	248.6700	(240)
Space heating - main system 2	0.0000	28.4300	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	596.8921	28.4300	169.6964	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	184.4804	28.4300	52.4478	(249)
Energy for lighting	139.4638	28.4300	39.6496	(250)
Additional standing charges			0.0000	(251)
Total energy cost			510.4638	(255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	874.6747	0.1545	135.1696	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	596.8921	0.1411	84.2266	(264)
Space and water heating			219.3962	(265)
Pumps, fans and electric keep-hot	184.4804	0.1387	25.5897	(267)
Energy for lighting	139.4638	0.1443	20.1289	(268)
Total CO2, kg/year			265.1149	(272)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	874.6747	1.5721	1375.1148	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	596.8921	1.5218	908.3378	(278)
Space and water heating			2283.4526	(279)
Pumps, fans and electric keep-hot	184.4804	1.5128	279.0820	(281)
Energy for lighting	139.4638	1.5338	213.9142	(282)
Total Primary energy kWh/year			2776.4488	(286)