Full SAP Calculation Printout

Property Reference	78449-22	**Issued on Date**	18/08/2025
Assessment Reference	001	**Prop Type Ref**	Top Flat / Mid
Property	6 Shepherd Street, MANCHESTER, M9 4QW		

SAP Rating	81 B	**DER**	5.67	**TER**	14.63
Environmental	96 A	**% DER < TER**			61.24
CO_2 Emissions (t/year)	0.26	**DFEE**	35.42	**TFEE**	38.12
Compliance Check	See BREL	**% DFEE < TFEE**			7.09
% DPER < TPER	23.14	**DPER**	59.36	**TPER**	77.24

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		2.6700	(17)
Infiltration rate		0.1335	(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) =	0.1135	(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	0.1447	0.1418	0.1390	0.1248	0.1220	0.1078	0.1078	0.1050	0.1135	0.1220	0.1277	0.1333	(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	0.2442	0.2413	0.2385	0.2243	0.2215	0.2073	0.2073	0.2045	0.2130	0.2215	0.2272	0.2328	(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	54.9189	7.0600	47.8589	0.1300	6.2217	9.0000	430.7301	(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)			108.4189					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		17.3770			(33)
Main dwelling								
Party Wall 1			39.0200	0.0000	0.0000	20.0000	780.4000	(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) = 3615.2201 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 73.9763 (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)	2.0100	0.0670	0.1347
E7 Party floor between dwellings (in blocks of flats)	16.9400	0.0320	0.5421
E16 Corner (normal)	10.0800	0.0680	0.6854
E17 Corner (inverted - internal area greater than external area)	7.5600	-0.0290	-0.2192
P1 Party wall - Ground floor	5.1000	0.0560	0.2856
E18 Party wall between dwellings	11.4000	0.2400	2.7360
E25 Staggered party wall between dwellings	10.0800	0.0560	0.5645
E20 Exposed floor (normal)	1.2700	0.3200	0.4064
E21 Exposed floor (inverted)	3.8100	0.3200	1.2192
E6 Intermediate floor within a dwelling	2.5800	0.0320	0.0826
E10 Eaves (insulation at ceiling level)	11.0600	0.0420	0.4645
E12 Gable (insulation at ceiling level)	8.4600	0.0770	0.6514
E14 Flat roof	2.0100	0.2050	0.4120
E24 Eaves (insulation at ceiling level - inverted)	2.0100	0.1500	0.3015
P4 Party wall - Roof (insulation at ceiling level)	9.8200	0.1020	1.0016
P5 Party wall - Roof (insulation at rafter level)	3.0000	0.4800	1.4400

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 12.6800 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 30.0570 (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	10.0039	9.8877	9.7714	9.1903	9.0741	8.4930	8.4930	8.3767	8.7254	9.0741	9.3065	9.5390	(38)
Heat transfer coeff	40.0609	39.9447	39.8285	39.2473	39.1311	38.5500	38.5500	38.4338	38.7824	39.1311	39.3636	39.5960	(39)

Average = Sum(39)m / 12 = 39.2183

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8197	0.8174	0.8150	0.8031	0.8007	0.7888	0.7888	0.7864	0.7936	0.8007	0.8055	0.8102	(40)
HLP (average)												0.8025	
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	0.3000	0.0000	0.7700	7.0251	(74)
South	2.0500	46.7521	0.3000	0.0000	0.7700	22.1394	(78)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	29.1645	49.6839	68.9999	88.8447	103.7589	105.1931	100.4849	88.8145	75.6763	55.0894	34.9091	24.9869	(83)
Total gains	382.6836	412.0081	414.5749	421.0834	417.9715	407.5148	390.3469	379.8363	376.4628	366.8434	367.5201	371.0934	(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	25.0675	25.1405	25.2138	25.5872	25.6631	26.0500	26.0500	26.1288	25.8939	25.6631	25.5116	25.3618	
alpha	2.6712	2.6760	2.6809	2.7058	2.7109	2.7367	2.7367	2.7419	2.7263	2.7109	2.7008	2.6908	
util living area	0.8895	0.8645	0.8354	0.7724	0.6782	0.5340	0.4083	0.4330	0.5982	0.7672	0.8546	0.8960	(86)
MIT	19.1192	19.3558	19.6738	20.1367	20.5353	20.8308	20.9404	20.9284	20.7543	20.2750	19.6568	19.0870	(87)
Th 2	20.2363	20.2383	20.2404	20.2507	20.2527	20.2630	20.2630	20.2651	20.2589	20.2527	20.2486	20.2445	(88)
util rest of house	0.8795	0.8524	0.8201	0.7504	0.6452	0.4858	0.3471	0.3724	0.5523	0.7411	0.8399	0.8865	(89)
MIT 2	18.0193	18.3157	18.7146	19.2918	19.7709	20.1114	20.2205	20.2121	20.0288	19.4682	18.7039	17.9845	(90)
Living area fraction									fLA = Living area / (4) =			0.3912	(91)
MIT	18.4496	18.7226	19.0899	19.6224	20.0699	20.3929	20.5022	20.4923	20.3126	19.7839	19.0767	18.4158	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4496	18.7226	19.0899	19.6224	20.0699	20.3929	20.5022	20.4923	20.3126	19.7839	19.0767	18.4158	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8510	0.8241	0.7934	0.7299	0.6366	0.4946	0.3674	0.3916	0.5558	0.7230	0.8131	0.8585	(94)
Useful gains	325.6766	339.5315	328.9250	307.3611	266.0666	201.5546	143.4281	148.7536	209.2376	265.2150	298.8445	318.6019	(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	566.8463	552.1395	501.4359	420.8249	327.5252	223.3153	150.4285	157.2833	240.9417	359.3746	471.4464	562.8906	(97)
Space heating kWh	179.4302	142.8726	128.3481	81.6940	45.7252	0.0000	0.0000	0.0000	0.0000	70.0547	124.2733	181.7509	(98a)
Space heating requirement - total per year (kWh/year)												954.1489	
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	179.4302	142.8726	128.3481	81.6940	45.7252	0.0000	0.0000	0.0000	0.0000	70.0547	124.2733	181.7509	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												954.1489	
Space heating per m2										(98c) / (4) =		19.5242	(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	179.4302	142.8726	128.3481	81.6940	45.7252	0.0000	0.0000	0.0000	0.0000	70.0547	124.2733	181.7509	(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)	179.4302	142.8726	128.3481	81.6940	45.7252	0.0000	0.0000	0.0000	0.0000	70.0547	124.2733	181.7509	(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	954.1489	(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	1874.9853	(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	954.1489	0.1545	147.3801	(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			231.6067	(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			277.3253	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.6700	(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	954.1489	1.5719	1499.7866	(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			2408.1244	(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			2901.1206	(286)
Dwelling Primary energy Rate (DPER)			59.3600	(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	54.9189	7.0600	47.8589	0.1800	8.6146			(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)			108.4189					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		22.3643			(33)
Main dwelling								
Party Wall 1			39.0200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 73.9763 (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)	2.0100	0.1600	0.3216
E7 Party floor between dwellings (in blocks of flats)	16.9400	0.0700	1.1858
E16 Corner (normal)	10.0800	0.0900	0.9072
E17 Corner (inverted - internal area greater than external area)	7.5600	-0.0900	-0.6804
P1 Party wall - Ground floor	5.1000	0.0800	0.4080
E18 Party wall between dwellings	11.4000	0.0600	0.6840
E25 Staggered party wall between dwellings	10.0800	0.0600	0.6048
E20 Exposed floor (normal)	1.2700	0.3200	0.4064
E21 Exposed floor (inverted)	3.8100	0.3200	1.2192
E6 Intermediate floor within a dwelling	2.5800	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	11.0600	0.0600	0.6636
E12 Gable (insulation at ceiling level)	8.4600	0.0600	0.5076
E14 Flat roof	2.0100	0.0800	0.1608
E24 Eaves (insulation at ceiling level - inverted)	2.0100	0.2400	0.4824
P4 Party wall - Roof (insulation at ceiling level)	9.8200	0.1200	1.1784
P5 Party wall - Roof (insulation at rafter level)	3.0000	0.0800	0.2400

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.4904 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 31.8547 (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	56.4054	56.2475	56.0927	55.3658	55.2298	54.5967	54.5967	54.4794	54.8406	55.2298	55.5049	55.7926	(39)
Average = Sum(39)m / 12 =												55.3652	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1542	1.1510	1.1478	1.1329	1.1301	1.1172	1.1172	1.1148	1.1222	1.1301	1.1358	1.1417	(40)
HLP (average)												1.1329	
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	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	17.8038	17.8537	17.9030	18.1381	18.1827	18.3936	18.3936	18.4332	18.3118	18.1827	18.0926	17.9993	
alpha	2.1869	2.1902	2.1935	2.2092	2.2122	2.2262	2.2262	2.2289	2.2208	2.2122	2.2062	2.2000	
util living area													
	0.8882	0.8658	0.8380	0.7815	0.6964	0.5686	0.4473	0.4731	0.6291	0.7775	0.8563	0.8938	(86)
MIT	18.2906	18.5708	18.9961	19.6109	20.1826	20.6426	20.8510	20.8257	20.5188	19.8236	18.9908	18.2546	(87)
Th 2	19.9568	19.9594	19.9620	19.9740	19.9763	19.9868	19.9868	19.9888	19.9828	19.9763	19.9717	19.9670	(88)
util rest of house													
	0.8761	0.8514	0.8196	0.7549	0.6557	0.5054	0.3616	0.3889	0.5707	0.7460	0.8387	0.8822	(89)
MIT 2	16.8256	17.1755	17.7079	18.4720	19.1596	19.6856	19.8920	19.8725	19.5556	18.7426	17.7133	16.7852	(90)
Living area fraction										fLA = Living area / (4) =		0.3912	(91)
MIT	17.3987	17.7214	18.2119	18.9176	19.5599	20.0600	20.2672	20.2454	19.9324	19.1655	18.2131	17.3601	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.3987	17.7214	18.2119	18.9176	19.5599	20.0600	20.2672	20.2454	19.9324	19.1655	18.2131	17.3601	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8374	0.8122	0.7817	0.7230	0.6372	0.5103	0.3865	0.4115	0.5675	0.7167	0.8010	0.8442	(94)
Useful gains	370.8562	388.7163	381.1770	361.8284	320.0366	249.6411	181.8907	187.7491	254.5936	312.0780	344.0265	362.9643	(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													
	738.8399	721.1705	656.9509	554.6318	434.0988	298.0999	200.2163	209.4976	319.8540	473.0720	616.8316	734.2333	(97)
Space heating kWh													
	273.7799	223.4093	205.1758	138.8184	84.8623	0.0000	0.0000	0.0000	0.0000	119.7795	196.4197	276.2242	(98a)
Space heating requirement - total per year (kWh/year)												1518.4691	
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													
	273.7799	223.4093	205.1758	138.8184	84.8623	0.0000	0.0000	0.0000	0.0000	119.7795	196.4197	276.2242	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1518.4691	
Space heating per m2											(98c) / (4) =	31.0716	(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													
	273.7799	223.4093	205.1758	138.8184	84.8623	0.0000	0.0000	0.0000	0.0000	119.7795	196.4197	276.2242	(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)													
	296.6196	242.0469	222.2923	150.3992	91.9418	0.0000	0.0000	0.0000	0.0000	129.7720	212.8057	299.2678	(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	(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	(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	(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	84.8686	84.6879	84.3553	83.7503	82.7625	79.8000	79.8000	79.8000	79.8000	83.3971	84.3778	84.9104 (217)
Fuel for water heating, kWh/month												
	224.8564	199.4355	213.2717	190.4072	187.7907	176.6549	175.2725	181.6404	182.9589	193.8680	202.0851	222.5081 (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	1645.1452	(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	2350.7494	(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	3014.9278	(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	1645.1452	0.2100	345.4805	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2350.7494	0.2100	493.6574	(264)
Space and water heating			839.1379	(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			715.0416	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.6300	(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	1645.1452	1.1300	1859.0141	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2350.7494	1.1300	2656.3468	(278)
Space and water heating			4515.3609	(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			3774.7437	(286)
Target Primary Energy Rate (TPER)			77.2400	(287)

Full SAP Calculation Printout

Property Reference	78449-22	**Issued on Date**	18/08/2025
Assessment Reference	001	**Prop Type Ref**	Top Flat / Mid
Property	6 Shepherd Street, MANCHESTER, M9 4QW		

SAP Rating	81 B	**DER**	5.67	**TER**	14.63
Environmental	96 A	**% DER < TER**			61.24
CO_2 Emissions (t/year)	0.26	**DFEE**	35.42	**TFEE**	38.12
Compliance Check	See BREL	**% DFEE < TFEE**			7.09
% DPER < TPER	23.14	**DPER**	59.36	**TPER**	77.24

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			2.6700	(17)
Infiltration rate			0.2946	(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) =	0.2504	(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	0.3193	0.3130	0.3067	0.2754	0.2692	0.2379	0.2379	0.2316	0.2504	0.2692	0.2817	0.2942	(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	0.5433	(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	54.9189	7.0600	47.8589	0.1300	6.2217	9.0000	430.7301	(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)			108.4189					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		17.3770			(33)
Main dwelling								
Party Wall 1			39.0200	0.0000	0.0000	20.0000	780.4000	(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) =	3615.2201 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		73.9763 (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)	2.0100	0.0670	0.1347
E7	Party floor between dwellings (in blocks of flats)	16.9400	0.0320	0.5421
E16	Corner (normal)	10.0800	0.0680	0.6854
E17	Corner (inverted - internal area greater than external area)	7.5600	-0.0290	-0.2192
P1	Party wall - Ground floor	5.1000	0.0560	0.2856
E18	Party wall between dwellings	11.4000	0.2400	2.7360
E25	Staggered party wall between dwellings	10.0800	0.0560	0.5645
E20	Exposed floor (normal)	1.2700	0.3200	0.4064
E21	Exposed floor (inverted)	3.8100	0.3200	1.2192
E6	Intermediate floor within a dwelling	2.5800	0.0320	0.0826
E10	Eaves (insulation at ceiling level)	11.0600	0.0420	0.4645
E12	Gable (insulation at ceiling level)	8.4600	0.0770	0.6514
E14	Flat roof	2.0100	0.2050	0.4120
E24	Eaves (insulation at ceiling level - inverted)	2.0100	0.1500	0.3015
P4	Party wall - Roof (insulation at ceiling level)	9.8200	0.1020	1.0016
P5	Party wall - Roof (insulation at rafter level)	3.0000	0.4800	1.4400

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 12.6800 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 30.0570 (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	22.5726	22.4916	22.4121	22.0388	21.9689	21.6438	21.6438	21.5836	21.7690	21.9689	22.1102	22.2579	(38)
Heat transfer coeff	52.6297	52.5486	52.4691	52.0958	52.0260	51.7008	51.7008	51.6406	51.8261	52.0260	52.1673	52.3150	(39)

Average = Sum(39)m / 12 = 52.0955

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0769	1.0753	1.0736	1.0660	1.0646	1.0579	1.0579	1.0567	1.0605	1.0646	1.0675	1.0705	(40)
HLP (average)												1.0660	
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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

22.4849	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	0.3000		0.0000		0.7700		7.0251	(74)
South				2.0500	46.7521	0.3000		0.0000		0.7700		22.1394	(78)
Solar gains	29.1645	49.6839	68.9999	88.8447	103.7589	105.1931	100.4849	88.8145	75.6763	55.0894	34.9091	24.9869	(83)
Total gains	346.0562	376.3492	381.1524	393.0544	393.1152	386.0092	371.1321	359.0945	353.8765	340.5190	336.0477	335.1997	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	19.0810	19.1105	19.1394	19.2766	19.3024	19.4238	19.4238	19.4465	19.3769	19.3024	19.2502	19.1958	
alpha	2.2721	2.2740	2.2760	2.2851	2.2868	2.2949	2.2949	2.2964	2.2918	2.2868	2.2833	2.2797	
util living area	0.9234	0.9053	0.8845	0.8377	0.7642	0.6413	0.5166	0.5450	0.6998	0.8356	0.8993	0.9282	(86)
MIT	18.1471	18.4210	18.8361	19.4571	20.0596	20.5715	20.8161	20.7847	20.4353	19.6847	18.8343	18.0964	(87)
Th 2	20.0197	20.0211	20.0224	20.0287	20.0299	20.0353	20.0353	20.0364	20.0332	20.0299	20.0275	20.0250	(88)
util rest of house	0.9148	0.8947	0.8706	0.8163	0.7289	0.5807	0.4281	0.4591	0.6460	0.8101	0.8862	0.9201	(89)
MIT 2	17.4147	17.6841	18.0934	18.7020	19.2771	19.7429	19.9391	19.9184	19.6281	18.9288	18.0990	17.3684	(90)
Living area fraction									fLA = Living area / (4) =			0.3912	(91)
MIT	17.7013	17.9724	18.3840	18.9974	19.5832	20.0671	20.2822	20.2574	19.9439	19.2245	18.3867	17.6532	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.7013	17.9724	18.3840	18.9974	19.5832	20.0671	20.2822	20.2574	19.9439	19.2245	18.3867	17.6532	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8881	0.8663	0.8416	0.7892	0.7104	0.5828	0.4522	0.4802	0.6405	0.7848	0.8582	0.8942	(94)
Useful gains	307.3272	326.0201	320.7854	310.1881	279.2530	224.9841	167.8394	172.4431	226.6495	267.2427	288.4067	299.7258	(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	705.3047	686.9357	623.5438	526.0331	410.1332	282.6546	190.3744	199.1972	302.8673	448.7006	588.7953	703.8047	(97)
Space heating kWh	296.0953	242.5353	225.2522	155.4084	97.3749	0.0000	0.0000	0.0000	0.0000	135.0047	216.2798	300.6347	(98a)
Space heating requirement - total per year (kWh/year)												1668.5853	
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	296.0953	242.5353	225.2522	155.4084	97.3749	0.0000	0.0000	0.0000	0.0000	135.0047	216.2798	300.6347	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1668.5853	
Space heating per m2											(98c) / (4) =	34.1433	(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	485.9880	382.5863	392.4689	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6358	0.7076	0.6878	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	308.9791	270.7055	269.9557	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	410.3504	395.0265	382.7269	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	72.9873	92.4949	83.9017	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	18.2468	23.1237	20.9754	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												62.3460	(107)
Energy for space heating												34.1433	(99)
Energy for space cooling												1.2758	(108)
Total												35.4191	(109)
Fabric Energy Efficiency (DFEE)												35.4	(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	54.9189	7.0600	47.8589	0.1800	8.6146			(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)			108.4189					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		22.3643			(33)
Main dwelling								
Party Wall 1			39.0200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		73.9763	(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)	2.0100	0.1600	0.3216
E7 Party floor between dwellings (in blocks of flats)	16.9400	0.0700	1.1858
E16 Corner (normal)	10.0800	0.0900	0.9072
E17 Corner (inverted - internal area greater than external area)	7.5600	-0.0900	-0.6804
P1 Party wall - Ground floor	5.1000	0.0800	0.4080
E18 Party wall between dwellings	11.4000	0.0600	0.6840
E25 Staggered party wall between dwellings	10.0800	0.0600	0.6048
E20 Exposed floor (normal)	1.2700	0.3200	0.4064
E21 Exposed floor (inverted)	3.8100	0.3200	1.2192
E6 Intermediate floor within a dwelling	2.5800	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	11.0600	0.0600	0.6636
E12 Gable (insulation at ceiling level)	8.4600	0.0600	0.5076
E14 Flat roof	2.0100	0.0800	0.1608
E24 Eaves (insulation at ceiling level - inverted)	2.0100	0.2400	0.4824
P4 Party wall - Roof (insulation at ceiling level)	9.8200	0.1200	1.1784
P5 Party wall - Roof (insulation at rafter level)	3.0000	0.0800	0.2400

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		9.4904	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	31.8547	(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	56.4054	56.2475	56.0927	55.3658	55.2298	54.5967	54.5967	54.4794	54.8406	55.2298	55.5049	55.7926	(39)
Average = Sum(39)m / 12 =												55.3652	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1542	1.1510	1.1478	1.1329	1.1301	1.1172	1.1172	1.1148	1.1222	1.1301	1.1358	1.1417	(40)
HLP (average)												1.1329	
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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

22.4849	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													
	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	17.8038	17.8537	17.9030	18.1381	18.1827	18.3936	18.3936	18.4332	18.3118	18.1827	18.0926	17.9993	
alpha	2.1869	2.1902	2.1935	2.2092	2.2122	2.2262	2.2262	2.2289	2.2208	2.2122	2.2062	2.2000	
util living area													
	0.9235	0.9035	0.8799	0.8291	0.7515	0.6267	0.5039	0.5341	0.6918	0.8319	0.8987	0.9284	(86)
MIT	17.9586	18.2635	18.7203	19.3946	20.0286	20.5601	20.8093	20.7755	20.4078	19.6121	18.7033	17.9183	(87)
Th 2	19.9568	19.9594	19.9620	19.9740	19.9763	19.9868	19.9868	19.9888	19.9828	19.9763	19.9717	19.9670	(88)
util rest of house													
	0.9145	0.8923	0.8651	0.8062	0.7139	0.5634	0.4126	0.4452	0.6354	0.8051	0.8851	0.9200	(89)
MIT 2	17.1904	17.4907	17.9411	18.6037	19.2073	19.6918	19.8898	19.8689	19.5636	18.8229	17.9357	17.1572	(90)
Living area fraction									fLA = Living area / (4) =			0.3912	(91)
MIT	17.4910	17.7931	18.2459	18.9131	19.5286	20.0315	20.2495	20.2236	19.8939	19.1317	18.2360	17.4550	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.4910	17.7931	18.2459	18.9131	19.5286	20.0315	20.2495	20.2236	19.8939	19.1317	18.2360	17.4550	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8865	0.8622	0.8343	0.7778	0.6951	0.5664	0.4378	0.4674	0.6299	0.7785	0.8557	0.8929	(94)
Useful gains	313.0623	336.1263	334.6622	326.1880	294.9546	236.5380	175.6769	180.1632	236.7855	277.1433	295.1655	304.4277	(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													
	744.0407	725.2031	658.8623	554.3845	432.3711	296.5418	199.2510	208.3068	317.7395	471.2035	618.1048	739.5317	(97)
Space heating kWh													
	320.6479	261.4596	241.2049	164.3015	102.2379	0.0000	0.0000	0.0000	0.0000	144.3807	232.5163	323.7174	(98a)
Space heating requirement - total per year (kWh/year)												1790.4662	
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													
	320.6479	261.4596	241.2049	164.3015	102.2379	0.0000	0.0000	0.0000	0.0000	144.3807	232.5163	323.7174	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1790.4662	
Space heating per m2											(98c) / (4) =	36.6373	(99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	513.2088	404.0154	414.0437	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6435	0.7134	0.6919	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	330.2576	288.2200	286.4756	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	86.1146	107.5254	96.3454	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	21.5286	26.8814	24.0863	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												72.4963	(107)
Energy for space heating												36.6373	(99)
Energy for space cooling												1.4835	(108)
Total												38.1208	(109)
Fabric Energy Efficiency (TFEE)												38.1	(109)

Full SAP Calculation Printout

Property Reference	78449-22	**Issued on Date**	18/08/2025
Assessment Reference	001	**Prop Type Ref**	Top Flat / Mid
Property	6 Shepherd Street, MANCHESTER, M9 4QW		

SAP Rating	81 B	**DER**	5.67	**TER**	14.63
Environmental	96 A	**% DER < TER**			61.24
CO_2 Emissions (t/year)	0.26	**DFEE**	35.42	**TFEE**	38.12
Compliance Check	See BREL	**% DFEE < TFEE**			7.09
% DPER < TPER	23.14	**DPER**	59.36	**TPER**	77.24

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		2.6700	(17)
Infiltration rate		0.1335	(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) =	0.1135	(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	0.1447	0.1418	0.1390	0.1248	0.1220	0.1078	0.1078	0.1050	0.1135	0.1220	0.1277	0.1333	(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	0.2442	0.2413	0.2385	0.2243	0.2215	0.2073	0.2073	0.2045	0.2130	0.2215	0.2272	0.2328	(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	54.9189	7.0600	47.8589	0.1300	6.2217	9.0000	430.7301	(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)			108.4189					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		17.3770			(33)
Main dwelling								
Party Wall 1			39.0200	0.0000	0.0000	20.0000	780.4000	(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) = 3615.2201 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 73.9763 (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)	2.0100	0.0670	0.1347
E7 Party floor between dwellings (in blocks of flats)	16.9400	0.0320	0.5421
E16 Corner (normal)	10.0800	0.0680	0.6854
E17 Corner (inverted - internal area greater than external area)	7.5600	-0.0290	-0.2192
P1 Party wall - Ground floor	5.1000	0.0560	0.2856
E18 Party wall between dwellings	11.4000	0.2400	2.7360
E25 Staggered party wall between dwellings	10.0800	0.0560	0.5645
E20 Exposed floor (normal)	1.2700	0.3200	0.4064
E21 Exposed floor (inverted)	3.8100	0.3200	1.2192
E6 Intermediate floor within a dwelling	2.5800	0.0320	0.0826
E10 Eaves (insulation at ceiling level)	11.0600	0.0420	0.4645
E12 Gable (insulation at ceiling level)	8.4600	0.0770	0.6514
E14 Flat roof	2.0100	0.2050	0.4120
E24 Eaves (insulation at ceiling level - inverted)	2.0100	0.1500	0.3015
P4 Party wall - Roof (insulation at ceiling level)	9.8200	0.1020	1.0016
P5 Party wall - Roof (insulation at rafter level)	3.0000	0.4800	1.4400

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 12.6800 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 30.0570 (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	10.0039	9.8877	9.7714	9.1903	9.0741	8.4930	8.4930	8.3767	8.7254	9.0741	9.3065	9.5390	(38)
Heat transfer coeff	40.0609	39.9447	39.8285	39.2473	39.1311	38.5500	38.5500	38.4338	38.7824	39.1311	39.3636	39.5960	(39)

Average = Sum(39)m / 12 = 39.2183

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8197	0.8174	0.8150	0.8031	0.8007	0.7888	0.7888	0.7864	0.7936	0.8007	0.8055	0.8102	(40)
HLP (average)												0.8025	
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	0.3000	0.0000	0.7700	7.0251	(74)
South	2.0500	46.7521	0.3000	0.0000	0.7700	22.1394	(78)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	29.1645	49.6839	68.9999	88.8447	103.7589	105.1931	100.4849	88.8145	75.6763	55.0894	34.9091	24.9869	(83)
Total gains	382.6836	412.0081	414.5749	421.0834	417.9715	407.5148	390.3469	379.8363	376.4628	366.8434	367.5201	371.0934	(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	25.0675	25.1405	25.2138	25.5872	25.6631	26.0500	26.0500	26.1288	25.8939	25.6631	25.5116	25.3618	
alpha	2.6712	2.6760	2.6809	2.7058	2.7109	2.7367	2.7367	2.7419	2.7263	2.7109	2.7008	2.6908	
util living area	0.8895	0.8645	0.8354	0.7724	0.6782	0.5340	0.4083	0.4330	0.5982	0.7672	0.8546	0.8960	(86)
MIT	19.1192	19.3558	19.6738	20.1367	20.5353	20.8308	20.9404	20.9284	20.7543	20.2750	19.6568	19.0870	(87)
Th 2	20.2363	20.2383	20.2404	20.2507	20.2527	20.2630	20.2630	20.2651	20.2589	20.2527	20.2486	20.2445	(88)
util rest of house	0.8795	0.8524	0.8201	0.7504	0.6452	0.4858	0.3471	0.3724	0.5523	0.7411	0.8399	0.8865	(89)
MIT 2	18.0193	18.3157	18.7146	19.2918	19.7709	20.1114	20.2205	20.2121	20.0288	19.4682	18.7039	17.9845	(90)
Living area fraction									fLA = Living area / (4) =			0.3912	(91)
MIT	18.4496	18.7226	19.0899	19.6224	20.0699	20.3929	20.5022	20.4923	20.3126	19.7839	19.0767	18.4158	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4496	18.7226	19.0899	19.6224	20.0699	20.3929	20.5022	20.4923	20.3126	19.7839	19.0767	18.4158	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8510	0.8241	0.7934	0.7299	0.6366	0.4946	0.3674	0.3916	0.5558	0.7230	0.8131	0.8585	(94)
Useful gains	325.6766	339.5315	328.9250	307.3611	266.0666	201.5546	143.4281	148.7536	209.2376	265.2150	298.8445	318.6019	(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	566.8463	552.1395	501.4359	420.8249	327.5252	223.3153	150.4285	157.2833	240.9417	359.3746	471.4464	562.8906	(97)
Space heating kWh	179.4302	142.8726	128.3481	81.6940	45.7252	0.0000	0.0000	0.0000	0.0000	70.0547	124.2733	181.7509	(98a)
Space heating requirement - total per year (kWh/year)												954.1489	
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	179.4302	142.8726	128.3481	81.6940	45.7252	0.0000	0.0000	0.0000	0.0000	70.0547	124.2733	181.7509	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												954.1489	
Space heating per m2										(98c) / (4) =		19.5242	(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	179.4302	142.8726	128.3481	81.6940	45.7252	0.0000	0.0000	0.0000	0.0000	70.0547	124.2733	181.7509	(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)	179.4302	142.8726	128.3481	81.6940	45.7252	0.0000	0.0000	0.0000	0.0000	70.0547	124.2733	181.7509	(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	954.1489	(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	1874.9853	(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	954.1489	0.1545	147.3801	(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			231.6067	(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			277.3253	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.6700	(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	954.1489	1.5719	1499.7866	(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			2408.1244	(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			2901.1206	(286)
Dwelling Primary energy Rate (DPER)			59.3600	(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	54.9189	7.0600	47.8589	0.1800	8.6146			(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)			108.4189					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		22.3643			(33)
Main dwelling								
Party Wall 1			39.0200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 73.9763 (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)	2.0100	0.1600	0.3216
E7 Party floor between dwellings (in blocks of flats)	16.9400	0.0700	1.1858
E16 Corner (normal)	10.0800	0.0900	0.9072
E17 Corner (inverted - internal area greater than external area)	7.5600	-0.0900	-0.6804
P1 Party wall - Ground floor	5.1000	0.0800	0.4080
E18 Party wall between dwellings	11.4000	0.0600	0.6840
E25 Staggered party wall between dwellings	10.0800	0.0600	0.6048
E20 Exposed floor (normal)	1.2700	0.3200	0.4064
E21 Exposed floor (inverted)	3.8100	0.3200	1.2192
E6 Intermediate floor within a dwelling	2.5800	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	11.0600	0.0600	0.6636
E12 Gable (insulation at ceiling level)	8.4600	0.0600	0.5076
E14 Flat roof	2.0100	0.0800	0.1608
E24 Eaves (insulation at ceiling level - inverted)	2.0100	0.2400	0.4824
P4 Party wall - Roof (insulation at ceiling level)	9.8200	0.1200	1.1784
P5 Party wall - Roof (insulation at rafter level)	3.0000	0.0800	0.2400

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.4904 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 31.8547 (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	56.4054	56.2475	56.0927	55.3658	55.2298	54.5967	54.5967	54.4794	54.8406	55.2298	55.5049	55.7926	(39)
Average = Sum(39)m / 12 =												55.3652	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1542	1.1510	1.1478	1.1329	1.1301	1.1172	1.1172	1.1148	1.1222	1.1301	1.1358	1.1417	(40)
HLP (average)												1.1329	
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	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	17.8038	17.8537	17.9030	18.1381	18.1827	18.3936	18.3936	18.4332	18.3118	18.1827	18.0926	17.9993	
alpha	2.1869	2.1902	2.1935	2.2092	2.2122	2.2262	2.2262	2.2289	2.2208	2.2122	2.2062	2.2000	
util living area													
	0.8882	0.8658	0.8380	0.7815	0.6964	0.5686	0.4473	0.4731	0.6291	0.7775	0.8563	0.8938	(86)
MIT	18.2906	18.5708	18.9961	19.6109	20.1826	20.6426	20.8510	20.8257	20.5188	19.8236	18.9908	18.2546	(87)
Th 2	19.9568	19.9594	19.9620	19.9740	19.9763	19.9868	19.9868	19.9888	19.9828	19.9763	19.9717	19.9670	(88)
util rest of house													
	0.8761	0.8514	0.8196	0.7549	0.6557	0.5054	0.3616	0.3889	0.5707	0.7460	0.8387	0.8822	(89)
MIT 2	16.8256	17.1755	17.7079	18.4720	19.1596	19.6856	19.8920	19.8725	19.5556	18.7426	17.7133	16.7852	(90)
Living area fraction										fLA = Living area / (4) =		0.3912	(91)
MIT	17.3987	17.7214	18.2119	18.9176	19.5599	20.0600	20.2672	20.2454	19.9324	19.1655	18.2131	17.3601	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.3987	17.7214	18.2119	18.9176	19.5599	20.0600	20.2672	20.2454	19.9324	19.1655	18.2131	17.3601	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8374	0.8122	0.7817	0.7230	0.6372	0.5103	0.3865	0.4115	0.5675	0.7167	0.8010	0.8442	(94)
Useful gains	370.8562	388.7163	381.1770	361.8284	320.0366	249.6411	181.8907	187.7491	254.5936	312.0780	344.0265	362.9643	(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													
	738.8399	721.1705	656.9509	554.6318	434.0988	298.0999	200.2163	209.4976	319.8540	473.0720	616.8316	734.2333	(97)
Space heating kWh													
	273.7799	223.4093	205.1758	138.8184	84.8623	0.0000	0.0000	0.0000	0.0000	119.7795	196.4197	276.2242	(98a)
Space heating requirement - total per year (kWh/year)												1518.4691	
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													
	273.7799	223.4093	205.1758	138.8184	84.8623	0.0000	0.0000	0.0000	0.0000	119.7795	196.4197	276.2242	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1518.4691	
Space heating per m2											(98c) / (4) =	31.0716	(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													
	273.7799	223.4093	205.1758	138.8184	84.8623	0.0000	0.0000	0.0000	0.0000	119.7795	196.4197	276.2242	(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)													
	296.6196	242.0469	222.2923	150.3992	91.9418	0.0000	0.0000	0.0000	0.0000	129.7720	212.8057	299.2678	(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	(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	(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	(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	84.8686	84.6879	84.3553	83.7503	82.7625	79.8000	79.8000	79.8000	79.8000	83.3971	84.3778	84.9104 (217)
Fuel for water heating, kWh/month												
	224.8564	199.4355	213.2717	190.4072	187.7907	176.6549	175.2725	181.6404	182.9589	193.8680	202.0851	222.5081 (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	1645.1452	(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	2350.7494	(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	3014.9278	(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	1645.1452	0.2100	345.4805	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2350.7494	0.2100	493.6574	(264)
Space and water heating			839.1379	(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			715.0416	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.6300	(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	1645.1452	1.1300	1859.0141	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2350.7494	1.1300	2656.3468	(278)
Space and water heating			4515.3609	(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			3774.7437	(286)
Target Primary Energy Rate (TPER)			77.2400	(287)

Full SAP Calculation Printout

Property Reference	78449-22	**Issued on Date**	18/08/2025
Assessment Reference	001	**Prop Type Ref**	Top Flat / Mid
Property	6 Shepherd Street, MANCHESTER, M9 4QW		

SAP Rating	81 B	**DER**	5.67	**TER**	14.63
Environmental	96 A	**% DER < TER**			61.24
CO_2 Emissions (t/year)	0.26	**DFEE**	35.42	**TFEE**	38.12
Compliance Check	See BREL	**% DFEE < TFEE**			7.09
% DPER < TPER	23.14	**DPER**	59.36	**TPER**	77.24

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		2.6700	(17)
Infiltration rate		0.1335	(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) =	0.1135	(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	0.1447	0.1418	0.1390	0.1248	0.1220	0.1078	0.1078	0.1050	0.1135	0.1220	0.1277	0.1333	(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	0.2442	0.2413	0.2385	0.2243	0.2215	0.2073	0.2073	0.2045	0.2130	0.2215	0.2272	0.2328	(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	54.9189	7.0600	47.8589	0.1300	6.2217	9.0000	430.7301	(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)			108.4189					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		17.3770			(33)
Main dwelling								
Party Wall 1			39.0200	0.0000	0.0000	20.0000	780.4000	(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) = 3615.2201 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 73.9763 (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)	2.0100	0.0670	0.1347
E7 Party floor between dwellings (in blocks of flats)	16.9400	0.0320	0.5421
E16 Corner (normal)	10.0800	0.0680	0.6854
E17 Corner (inverted - internal area greater than external area)	7.5600	-0.0290	-0.2192
P1 Party wall - Ground floor	5.1000	0.0560	0.2856
E18 Party wall between dwellings	11.4000	0.2400	2.7360
E25 Staggered party wall between dwellings	10.0800	0.0560	0.5645
E20 Exposed floor (normal)	1.2700	0.3200	0.4064
E21 Exposed floor (inverted)	3.8100	0.3200	1.2192
E6 Intermediate floor within a dwelling	2.5800	0.0320	0.0826
E10 Eaves (insulation at ceiling level)	11.0600	0.0420	0.4645
E12 Gable (insulation at ceiling level)	8.4600	0.0770	0.6514
E14 Flat roof	2.0100	0.2050	0.4120
E24 Eaves (insulation at ceiling level - inverted)	2.0100	0.1500	0.3015
P4 Party wall - Roof (insulation at ceiling level)	9.8200	0.1020	1.0016
P5 Party wall - Roof (insulation at rafter level)	3.0000	0.4800	1.4400

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 12.6800 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 30.0570 (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	10.0039	9.8877	9.7714	9.1903	9.0741	8.4930	8.4930	8.3767	8.7254	9.0741	9.3065	9.5390	(38)
Heat transfer coeff	40.0609	39.9447	39.8285	39.2473	39.1311	38.5500	38.5500	38.4338	38.7824	39.1311	39.3636	39.5960	(39)

Average = Sum(39)m / 12 = 39.2183

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8197	0.8174	0.8150	0.8031	0.8007	0.7888	0.7888	0.7864	0.7936	0.8007	0.8055	0.8102	(40)
HLP (average)												0.8025	
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	0.3000	0.0000	0.7700	7.0251	(74)
South	2.0500	46.7521	0.3000	0.0000	0.7700	22.1394	(78)

Solar gains	29.1645	49.6839	68.9999	88.8447	103.7589	105.1931	100.4849	88.8145	75.6763	55.0894	34.9091	24.9869	(83)
Total gains	419.1003	437.7105	444.3885	440.6001	432.6439	413.3600	396.4810	387.4402	386.3238	387.0015	392.5224	404.9228	(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	25.0675	25.1405	25.2138	25.5872	25.6631	26.0500	26.0500	26.1288	25.8939	25.6631	25.5116	25.3618	
alpha	2.6712	2.6760	2.6809	2.7058	2.7109	2.7367	2.7367	2.7419	2.7263	2.7109	2.7008	2.6908	
util living area	0.8695	0.8493	0.8155	0.7569	0.6647	0.5283	0.4028	0.4258	0.5877	0.7486	0.8371	0.8775	(86)
MIT	19.2564	19.4451	19.7659	20.1842	20.5590	20.8353	20.9424	20.9313	20.7650	20.3228	19.7404	19.2182	(87)
Th 2	20.2363	20.2383	20.2404	20.2507	20.2527	20.2630	20.2630	20.2651	20.2589	20.2527	20.2486	20.2445	(88)
util rest of house	0.8581	0.8363	0.7991	0.7342	0.6314	0.4803	0.3423	0.3659	0.5419	0.7216	0.8213	0.8668	(89)
MIT 2	18.1887	18.4250	18.8258	19.3474	19.7969	20.1156	20.2220	20.2143	20.0395	19.5229	18.8052	18.1469	(90)
Living area fraction									fLA = Living area / (4) =			0.3912	(91)
MIT	18.6064	18.8241	19.1936	19.6748	20.0950	20.3972	20.5038	20.4949	20.3234	19.8359	19.1711	18.5660	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6064	18.8241	19.1936	19.6748	20.0950	20.3972	20.5038	20.4949	20.3234	19.8359	19.1711	18.5660	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8295	0.8083	0.7734	0.7150	0.6239	0.4893	0.3625	0.3851	0.5461	0.7051	0.7952	0.8385	(94)
Useful gains	347.6347	353.8232	343.7076	315.0289	269.9454	202.2770	143.7214	149.1964	210.9716	272.8640	312.1379	339.5154	(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	573.1295	556.1939	505.5683	422.8817	328.5077	223.4824	150.4926	157.3808	241.3574	361.4102	475.1611	568.8371	(97)
Space heating kWh	167.7681	135.9931	120.4244	77.6540	43.5704	0.0000	0.0000	0.0000	0.0000	65.8784	117.3767	170.6153	(98a)
Space heating requirement - total per year (kWh/year)												899.2804	
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	167.7681	135.9931	120.4244	77.6540	43.5704	0.0000	0.0000	0.0000	0.0000	65.8784	117.3767	170.6153	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												899.2804	
Space heating per m2											(98c) / (4) =	18.4015	(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	167.7681	135.9931	120.4244	77.6540	43.5704	0.0000	0.0000	0.0000	0.0000	65.8784	117.3767	170.6153	(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)	167.7681	135.9931	120.4244	77.6540	43.5704	0.0000	0.0000	0.0000	0.0000	65.8784	117.3767	170.6153	(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	899.2804	(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	1820.1167	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	899.2804	16.4900	148.2913	(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			300.1372	(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] =	1.1511	(257)
SAP value		81.3414	
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	899.2804	0.1544	138.8795	(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			223.1061	(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			268.8248	(272)
CO2 emissions per m2			5.5000	(273)
EI value			96.1625	
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		2.6700 (17)
Infiltration rate		0.1335 (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) =	0.1135 (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	0.1305	0.1277	0.1277	0.1163	0.1191	0.1050	0.0993	0.0993	0.1050	0.1163	0.1163	0.1191	(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	0.2300	0.2272	0.2272	0.2158	0.2186	0.2045	0.1988	0.1988	0.2045	0.2158	0.2158	0.2186	(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	54.9189	7.0600	47.8589	0.1300	6.2217	9.0000	430.7301	(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)			108.4189					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		17.3770			(33)
Main dwelling								
Party Wall 1			39.0200	0.0000	0.0000	20.0000	780.4000	(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) =	3615.2201 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		73.9763 (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)	2.0100	0.0670	0.1347
E7 Party floor between dwellings (in blocks of flats)	16.9400	0.0320	0.5421
E16 Corner (normal)	10.0800	0.0680	0.6854
E17 Corner (inverted - internal area greater than external area)	7.5600	-0.0290	-0.2192
P1 Party wall - Ground floor	5.1000	0.0560	0.2856
E18 Party wall between dwellings	11.4000	0.2400	2.7360
E25 Staggered party wall between dwellings	10.0800	0.0560	0.5645
E20 Exposed floor (normal)	1.2700	0.3200	0.4064
E21 Exposed floor (inverted)	3.8100	0.3200	1.2192
E6 Intermediate floor within a dwelling	2.5800	0.0320	0.0826
E10 Eaves (insulation at ceiling level)	11.0600	0.0420	0.4645
E12 Gable (insulation at ceiling level)	8.4600	0.0770	0.6514
E14 Flat roof	2.0100	0.2050	0.4120
E24 Eaves (insulation at ceiling level - inverted)	2.0100	0.1500	0.3015
P4 Party wall - Roof (insulation at ceiling level)	9.8200	0.1020	1.0016
P5 Party wall - Roof (insulation at rafter level)	3.0000	0.4800	1.4400

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		12.6800 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	30.0570 (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	9.4228	9.3065	9.3065	8.8416	8.9579	8.3767	8.1443	8.1443	8.3767	8.8416	8.8416	8.9579	(38)
Heat transfer coeff	39.4798	39.3636	39.3636	38.8987	39.0149	38.4338	38.2013	38.2013	38.4338	38.8987	38.8987	39.0149	(39)
Average = Sum(39)m / 12 =												38.8502	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8079	0.8055	0.8055	0.7960	0.7983	0.7864	0.7817	0.7817	0.7864	0.7960	0.7960	0.7983	(40)
HLP (average)												0.7950	
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	0.3000	0.0000	0.7700	5.9443	(74)
South	2.0500	39.5594	0.3000	0.0000	0.7700	18.7334	(78)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	24.6777	44.1635	64.6874	84.6986	96.7335	99.9334	93.5732	81.4604	71.7279	50.9160	30.6777	22.6072	(83)
Total gains	414.6134	432.1900	440.0760	436.4540	425.6186	408.1004	389.5694	380.0862	382.3755	382.8280	388.2910	402.5431	(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	25.4365	25.5116	25.5116	25.8165	25.7396	26.1288	26.2878	26.2878	26.1288	25.8165	25.8165	25.7396	
alpha	2.6958	2.7008	2.7008	2.7211	2.7160	2.7419	2.7525	2.7525	2.7419	2.7211	2.7211	2.7160	
util living area													
	0.8646	0.8440	0.8123	0.7464	0.6439	0.5068	0.4061	0.4229	0.5890	0.7442	0.8302	0.8717	(86)
MIT	19.3592	19.5407	19.8161	20.2512	20.6219	20.8617	20.9425	20.9349	20.7676	20.3524	19.8261	19.3292	(87)
Th 2	20.2465	20.2486	20.2486	20.2568	20.2548	20.2651	20.2692	20.2692	20.2651	20.2568	20.2568	20.2548	(88)
util rest of house													
	0.8528	0.8305	0.7956	0.7225	0.6079	0.4565	0.3457	0.3621	0.5435	0.7165	0.8136	0.8605	(89)
MIT 2	18.3245	18.5516	18.8938	19.4333	19.8719	20.1452	20.2281	20.2217	20.0478	19.5619	18.9173	18.2930	(90)
Living area fraction									fLA = Living area / (4) =			0.3912	(91)
MIT	18.7293	18.9386	19.2546	19.7533	20.1653	20.4255	20.5076	20.5008	20.3294	19.8711	19.2728	18.6984	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7293	18.9386	19.2546	19.7533	20.1653	20.4255	20.5076	20.5008	20.3294	19.8711	19.2728	18.6984	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8247	0.8033	0.7706	0.7049	0.6034	0.4678	0.3658	0.3819	0.5477	0.7008	0.7884	0.8327	(94)
Useful gains	341.9357	347.1848	339.1206	307.6466	256.8089	190.9181	142.5216	145.1384	209.4223	268.2869	306.1268	335.2011	(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													
	553.8743	536.8637	494.1953	406.6186	306.8651	208.5229	149.2743	152.8340	239.4197	352.8555	457.9481	550.0492	(97)
Space heating kWh													
	157.6823	127.4642	115.3756	71.2599	37.2418	0.0000	0.0000	0.0000	0.0000	62.9190	109.3113	159.8469	(98a)
Space heating requirement - total per year (kWh/year)												841.1010	
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													
	157.6823	127.4642	115.3756	71.2599	37.2418	0.0000	0.0000	0.0000	0.0000	62.9190	109.3113	159.8469	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 841.1010
Space heating per m2 (98c) / (4) = 17.2110 (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	157.6823	127.4642	115.3756	71.2599	37.2418	0.0000	0.0000	0.0000	0.0000	62.9190	109.3113	159.8469	(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)	157.6823	127.4642	115.3756	71.2599	37.2418	0.0000	0.0000	0.0000	0.0000	62.9190	109.3113	159.8469	(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 1 841.1010 (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 1761.9374 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	841.1010	28.4300	239.1250	(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			500.9188	(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	841.1010	0.1545	129.9731	(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			214.1997 (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			259.9183 (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	841.1010	1.5721	1322.3043	(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			2230.6421	(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			2723.6383	(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)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(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	£501	£501	£0
Space heating	£292	£292	£0
Water heating	£170	£170	£0
Lighting	£40	£40	£0
Total cost of fuels	£501	£501	£0
Total cost of uses	£502	£502	£0
Delivered energy	36 kWh/m²	36 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	56 kWh/m²	56 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		2.6700	(17)
Infiltration rate		0.1335	(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) =	0.1135	(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	0.1447	0.1418	0.1390	0.1248	0.1220	0.1078	0.1078	0.1050	0.1135	0.1220	0.1277	0.1333	(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	0.2442	0.2413	0.2385	0.2243	0.2215	0.2073	0.2073	0.2045	0.2130	0.2215	0.2272	0.2328	(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	
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	54.9189	7.0600	47.8589	0.1300	6.2217	9.0000	430.7301	(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)			108.4189					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		17.3770			(33)
Main dwelling								
Party Wall 1			39.0200	0.0000	0.0000	20.0000	780.4000	(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) =	3615.2201 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		73.9763 (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)	2.0100	0.0670	0.1347
E7 Party floor between dwellings (in blocks of flats)	16.9400	0.0320	0.5421
E16 Corner (normal)	10.0800	0.0680	0.6854
E17 Corner (inverted - internal area greater than external area)	7.5600	-0.0290	-0.2192
P1 Party wall - Ground floor	5.1000	0.0560	0.2856
E18 Party wall between dwellings	11.4000	0.2400	2.7360
E25 Staggered party wall between dwellings	10.0800	0.0560	0.5645
E20 Exposed floor (normal)	1.2700	0.3200	0.4064
E21 Exposed floor (inverted)	3.8100	0.3200	1.2192
E6 Intermediate floor within a dwelling	2.5800	0.0320	0.0826
E10 Eaves (insulation at ceiling level)	11.0600	0.0420	0.4645
E12 Gable (insulation at ceiling level)	8.4600	0.0770	0.6514
E14 Flat roof	2.0100	0.2050	0.4120
E24 Eaves (insulation at ceiling level - inverted)	2.0100	0.1500	0.3015
P4 Party wall - Roof (insulation at ceiling level)	9.8200	0.1020	1.0016
P5 Party wall - Roof (insulation at rafter level)	3.0000	0.4800	1.4400

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		12.6800 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	30.0570 (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	10.0039	9.8877	9.7714	9.1903	9.0741	8.4930	8.4930	8.3767	8.7254	9.0741	9.3065	9.5390	(38)
Heat transfer coeff	40.0609	39.9447	39.8285	39.2473	39.1311	38.5500	38.5500	38.4338	38.7824	39.1311	39.3636	39.5960	(39)
Average = Sum(39)m / 12 =												39.2183	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8197	0.8174	0.8150	0.8031	0.8007	0.7888	0.7888	0.7864	0.7936	0.8007	0.8055	0.8102	(40)
HLP (average)												0.8025	
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)
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	0.3000	0.0000	0.7700	7.0251	(74)
South	2.0500	46.7521	0.3000	0.0000	0.7700	22.1394	(78)

Solar gains	29.1645	49.6839	68.9999	88.8447	103.7589	105.1931	100.4849	88.8145	75.6763	55.0894	34.9091	24.9869	(83)
Total gains	419.1003	437.7105	444.3885	440.6001	432.6439	413.3600	396.4810	387.4402	386.3238	387.0015	392.5224	404.9228	(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	25.0675	25.1405	25.2138	25.5872	25.6631	26.0500	26.0500	26.1288	25.8939	25.6631	25.5116	25.3618	
alpha	2.6712	2.6760	2.6809	2.7058	2.7109	2.7367	2.7367	2.7419	2.7263	2.7109	2.7008	2.6908	
util living area													
	0.8695	0.8493	0.8155	0.7569	0.6647	0.5283	0.4028	0.4258	0.5877	0.7486	0.8371	0.8775	(86)
MIT	19.2564	19.4451	19.7659	20.1842	20.5590	20.8353	20.9424	20.9313	20.7650	20.3228	19.7404	19.2182	(87)
Th 2	20.2363	20.2383	20.2404	20.2507	20.2527	20.2630	20.2630	20.2651	20.2589	20.2527	20.2486	20.2445	(88)
util rest of house													
	0.8581	0.8363	0.7991	0.7342	0.6314	0.4803	0.3423	0.3659	0.5419	0.7216	0.8213	0.8668	(89)
MIT 2	18.1887	18.4250	18.8258	19.3474	19.7969	20.1156	20.2220	20.2143	20.0395	19.5229	18.8052	18.1469	(90)
Living area fraction										fLA = Living area / (4) =		0.3912	(91)
MIT	18.6064	18.8241	19.1936	19.6748	20.0950	20.3972	20.5038	20.4949	20.3234	19.8359	19.1711	18.5660	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6064	18.8241	19.1936	19.6748	20.0950	20.3972	20.5038	20.4949	20.3234	19.8359	19.1711	18.5660	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8295	0.8083	0.7734	0.7150	0.6239	0.4893	0.3625	0.3851	0.5461	0.7051	0.7952	0.8385	(94)
Useful gains	347.6347	353.8232	343.7076	315.0289	269.9454	202.2770	143.7214	149.1964	210.9716	272.8640	312.1379	339.5154	(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													
	573.1295	556.1939	505.5683	422.8817	328.5077	223.4824	150.4926	157.3808	241.3574	361.4102	475.1611	568.8371	(97)
Space heating kWh													
	167.7681	135.9931	120.4244	77.6540	43.5704	0.0000	0.0000	0.0000	0.0000	65.8784	117.3767	170.6153	(98a)
Space heating requirement - total per year (kWh/year)												899.2804	
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													
	167.7681	135.9931	120.4244	77.6540	43.5704	0.0000	0.0000	0.0000	0.0000	65.8784	117.3767	170.6153	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												899.2804	
Space heating per m2											(98c) / (4) =	18.4015	(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													
	167.7681	135.9931	120.4244	77.6540	43.5704	0.0000	0.0000	0.0000	0.0000	65.8784	117.3767	170.6153	(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)													
	167.7681	135.9931	120.4244	77.6540	43.5704	0.0000	0.0000	0.0000	0.0000	65.8784	117.3767	170.6153	(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												899.2804	(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												1820.1167	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	899.2804	16.4900	148.2913	(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			300.1372	(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] =	1.1511	(257)
SAP value		81.3414	
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	899.2804	0.1544	138.8795 (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			223.1061 (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			268.8248 (272)
CO2 emissions per m2			5.5000 (273)
EI value			96.1625
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)

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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		2.6700	(17)
Infiltration rate		0.1335	(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) =	0.1135	(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	0.1305	0.1277	0.1277	0.1163	0.1191	0.1050	0.0993	0.0993	0.1050	0.1163	0.1163	0.1191	(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	0.2300	0.2272	0.2272	0.2158	0.2186	0.2045	0.1988	0.1988	0.2045	0.2158	0.2158	0.2186	(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	54.9189	7.0600	47.8589	0.1300	6.2217	9.0000	430.7301	(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)			108.4189					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		17.3770			(33)
Main dwelling								
Party Wall 1			39.0200	0.0000	0.0000	20.0000	780.4000	(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) =	3615.2201 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		73.9763 (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)	2.0100	0.0670	0.1347
E7 Party floor between dwellings (in blocks of flats)	16.9400	0.0320	0.5421
E16 Corner (normal)	10.0800	0.0680	0.6854

E17 Corner (inverted - internal area greater than external area)	7.5600	-0.0290	-0.2192	
P1 Party wall - Ground floor	5.1000	0.0560	0.2856	
E18 Party wall between dwellings	11.4000	0.2400	2.7360	
E25 Staggered party wall between dwellings	10.0800	0.0560	0.5645	
E20 Exposed floor (normal)	1.2700	0.3200	0.4064	
E21 Exposed floor (inverted)	3.8100	0.3200	1.2192	
E6 Intermediate floor within a dwelling	2.5800	0.0320	0.0826	
E10 Eaves (insulation at ceiling level)	11.0600	0.0420	0.4645	
E12 Gable (insulation at ceiling level)	8.4600	0.0770	0.6514	
E14 Flat roof	2.0100	0.2050	0.4120	
E24 Eaves (insulation at ceiling level - inverted)	2.0100	0.1500	0.3015	
P4 Party wall - Roof (insulation at ceiling level)	9.8200	0.1020	1.0016	
P5 Party wall - Roof (insulation at rafter level)	3.0000	0.4800	1.4400	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 12.6800 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 30.0570 (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	9.4228	9.3065	9.3065	8.8416	8.9579	8.3767	8.1443	8.1443	8.3767	8.8416	8.8416	8.9579	(38)
Heat transfer coeff	39.4798	39.3636	39.3636	38.8987	39.0149	38.4338	38.2013	38.2013	38.4338	38.8987	38.8987	39.0149	(39)

Average = Sum(39)m / 12 = 38.8502

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8079	0.8055	0.8055	0.7960	0.7983	0.7864	0.7817	0.7817	0.7864	0.7960	0.7960	0.7983	(40)
HLP (average)												0.7950	
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	0.3000	0.0000	0.7700	5.9443	(74)
South	2.0500	39.5594	0.3000	0.0000	0.7700	18.7334	(78)

Solar gains	24.6777	44.1635	64.6874	84.6986	96.7335	99.9334	93.5732	81.4604	71.7279	50.9160	30.6777	22.6072	(83)
Total gains	414.6134	432.1900	440.0760	436.4540	425.6186	408.1004	389.5694	380.0862	382.3755	382.8280	388.2910	402.5431	(84)

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7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	25.4365	25.5116	25.5116	25.8165	25.7396	26.1288	26.2878	26.2878	26.1288	25.8165	25.8165	25.7396	
alpha	2.6958	2.7008	2.7008	2.7211	2.7160	2.7419	2.7525	2.7525	2.7419	2.7211	2.7211	2.7160	
util living area	0.8646	0.8440	0.8123	0.7464	0.6439	0.5068	0.4061	0.4229	0.5890	0.7442	0.8302	0.8717	(86)
MIT	19.3592	19.5407	19.8161	20.2512	20.6219	20.8617	20.9425	20.9349	20.7676	20.3524	19.8261	19.3292	(87)
Th 2	20.2465	20.2486	20.2486	20.2568	20.2548	20.2651	20.2692	20.2692	20.2651	20.2568	20.2568	20.2548	(88)
util rest of house	0.8528	0.8305	0.7956	0.7225	0.6079	0.4565	0.3457	0.3621	0.5435	0.7165	0.8136	0.8605	(89)
MIT 2	18.3245	18.5516	18.8938	19.4333	19.8719	20.1452	20.2281	20.2217	20.0478	19.5619	18.9173	18.2930	(90)
Living area fraction									fLA = Living area / (4) =			0.3912	(91)
MIT	18.7293	18.9386	19.2546	19.7533	20.1653	20.4255	20.5076	20.5008	20.3294	19.8711	19.2728	18.6984	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7293	18.9386	19.2546	19.7533	20.1653	20.4255	20.5076	20.5008	20.3294	19.8711	19.2728	18.6984	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8247	0.8033	0.7706	0.7049	0.6034	0.4678	0.3658	0.3819	0.5477	0.7008	0.7884	0.8327	(94)
Useful gains	341.9357	347.1848	339.1206	307.6466	256.8089	190.9181	142.5216	145.1384	209.4223	268.2869	306.1268	335.2011	(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	553.8743	536.8637	494.1953	406.6186	306.8651	208.5229	149.2743	152.8340	239.4197	352.8555	457.9481	550.0492	(97)
Space heating kWh	157.6823	127.4642	115.3756	71.2599	37.2418	0.0000	0.0000	0.0000	0.0000	62.9190	109.3113	159.8469	(98a)
Space heating requirement - total per year (kWh/year)												841.1010	
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	157.6823	127.4642	115.3756	71.2599	37.2418	0.0000	0.0000	0.0000	0.0000	62.9190	109.3113	159.8469	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												841.1010	
Space heating per m2											(98c) / (4) =	17.2110	(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	157.6823	127.4642	115.3756	71.2599	37.2418	0.0000	0.0000	0.0000	0.0000	62.9190	109.3113	159.8469	(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)	157.6823	127.4642	115.3756	71.2599	37.2418	0.0000	0.0000	0.0000	0.0000	62.9190	109.3113	159.8469	(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												841.1010	(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	1761.9374	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	841.1010	28.4300	239.1250	(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			500.9188	(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	841.1010	0.1545	129.9731	(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			214.1997	(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			259.9183	(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	841.1010	1.5721	1322.3043	(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			2230.6421	(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			2723.6383	(286)