Full SAP Calculation Printout

Property Reference	78449-23	**Issued on Date**	18/08/2025
Assessment Reference	001	**Prop Type Ref**	GF Flat / End
Property	4 Shepherd Street, MANCHESTER, M9 4QW		

SAP Rating	87 B	**DER**	4.57	**TER**	15.88
Environmental	97 A	**% DER < TER**			71.22
CO_2 Emissions (t/year)	0.16	**DFEE**	26.20	**TFEE**	35.74
Compliance Check	See BREL	**% DFEE < TFEE**			26.70
% DPER < TPER	42.72	**DPER**	48.17	**TPER**	84.09

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	37.9700	(1b)	x 2.3600	(2b) =	89.6092	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	37.9700					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	89.6092	(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		3.6000	(17)
Infiltration rate		0.1800	(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) =	0.1530	(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	0.1951	0.1913	0.1874	0.1683	0.1645	0.1453	0.1453	0.1415	0.1530	0.1645	0.1721	0.1798	(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	0.2946	0.2907	0.2869	0.2678	0.2640	0.2448	0.2448	0.2410	0.2525	0.2640	0.2716	0.2793	(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			4.4700	0.7282	3.2549			(27)
GF			37.9700	0.0900	3.4173	75.0000	2847.7500	(28a)
Main	38.8100	6.6200	32.1900	0.1300	4.1847	9.0000	289.7100	(29a)
Total net area of external elements Aum(A, m2)			76.7800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	12.5339			(33)
Main dwelling								
Party Wall 1			27.2200	0.0000	0.0000	20.0000	544.4000	(32)
Party Ceiling			37.9700			20.0000	759.4000	(32b)
Timber			50.4000			9.0000	453.6000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	4894.8600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		128.9139 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E2 Other lintels (including other steel lintels)	5.1000	0.1150	0.5865	
E3 Sill	5.1000	0.0170	0.0867	
E4 Jamb	10.8000	0.0940	1.0152	
E5 Ground floor (normal)	15.4000	0.0670	1.0318	
E7 Party floor between dwellings (in blocks of flats)	15.4000	0.0320	0.4928	
E16 Corner (normal)	12.6000	0.0680	0.8568	
E17 Corner (inverted - internal area greater than external area)	2.5200	-0.0290	-0.0731	
P1 Party wall - Ground floor	10.8000	0.0560	0.6048	
E18 Party wall between dwellings	2.5200	0.2400	0.6048	
E25 Staggered party wall between dwellings	5.0400	0.0560	0.2822	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				5.4886 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	18.0224 (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	8.7109	8.5978	8.4847	7.9191	7.8060	7.2405	7.2405	7.1274	7.4667	7.8060	8.0322	8.2585	(38)
Heat transfer coeff	26.7333	26.6202	26.5071	25.9415	25.8284	25.2629	25.2629	25.1498	25.4891	25.8284	26.0546	26.2809	(39)
Average = Sum(39)m / 12 =												25.9133	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7041	0.7011	0.6981	0.6832	0.6802	0.6653	0.6653	0.6624	0.6713	0.6802	0.6862	0.6921	(40)
HLP (average)												0.6825	
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												1.3535	(42)
Hot water usage for mixer showers	46.9130	46.2079	45.1806	43.2150	41.7644	40.1467	39.2272	40.2468	41.3644	43.1013	45.1092	46.7332	(42a)
Hot water usage for baths	20.2973	19.9959	19.5714	18.7887	18.2026	17.5528	17.2017	17.6233	18.0822	18.7776	19.5764	20.2287	(42b)
Hot water usage for other uses	28.4911	27.4550	26.4190	25.3830	24.3469	23.3109	23.3109	24.3469	25.3830	26.4190	27.4550	28.4911	(42c)
Average daily hot water use (litres/day)												87.9720	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.7014	93.6589	91.1710	87.3866	84.3139	81.0104	79.7399	82.2170	84.8296	88.2979	92.1406	95.4530	(44)
Energy conte	151.5676	133.3690	140.1264	119.6279	113.5028	99.6117	96.4385	101.8018	104.6034	119.8195	131.2712	149.4563	(45)
Energy content (annual)											Total = Sum(45)m =	1461.1961	
Distribution loss (46)m = 0.15 x (45)m	22.7351	20.0053	21.0190	17.9442	17.0254	14.9418	14.4658	15.2703	15.6905	17.9729	19.6907	22.4185	(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	178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(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	178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(64)
										Total per year (kWh/year) = Sum(64)m =		1778.5271	(64)
12Total per year (kWh/year)												1779	(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	50.3962	44.3452	46.5920	39.7763	37.7397	33.1209	32.0658	33.8491	34.7806	39.8400	43.6477	49.6942	(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	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	67.4075	74.6297	67.4075	69.6544	67.4075	69.6544	67.4075	67.4075	69.6544	67.4075	69.6544	67.4075	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	116.4640	117.6725	114.6270	108.1436	99.9594	92.2675	87.1288	85.9203	88.9657	95.4491	103.6333	111.3253	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	(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)	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	(71)
Water heating gains (Table 5)	67.7369	65.9899	62.6237	55.2449	50.7254	46.0012	43.0992	45.4961	48.3064	53.5483	60.6218	66.7933	(72)
Total internal gains	294.9106	301.5944	287.9606	276.3452	261.3946	251.2255	240.9378	242.1262	250.2289	259.7073	277.2118	288.8284	(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	1.6600	10.6334	0.3000	0.0000	0.7700	4.0775	(74)
South	2.8100	46.7521	0.3000	0.0000	0.7700	30.3472	(78)

Solar gains	34.4247	57.4932	76.5512	92.8227	103.2145	102.4289	98.7471	90.8067	82.0549	62.8828	41.0019	29.6220	(83)

Total gains	329.3353	359.0876	364.5117	369.1679	364.6091	353.6543	339.6849	332.9329	332.2838	322.5901	318.2137	318.4504	(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	50.8610	51.0771	51.2951	52.4134	52.6429	53.8214	53.8214	54.0634	53.3437	52.6429	52.1858	51.7366	
alpha	4.3907	4.4051	4.4197	4.4942	4.5095	4.5881	4.5881	4.6042	4.5562	4.5095	4.4791	4.4491	
util living area	0.9144	0.8792	0.8364	0.7461	0.6208	0.4502	0.3259	0.3457	0.5152	0.7367	0.8661	0.9217	(86)
MIT	20.2346	20.4047	20.5805	20.7960	20.9263	20.9869	20.9976	20.9969	20.9750	20.8355	20.5412	20.2170	(87)
Th 2	20.3372	20.3399	20.3425	20.3557	20.3583	20.3716	20.3716	20.3742	20.3663	20.3583	20.3530	20.3478	(88)
util rest of house	0.9040	0.8655	0.8182	0.7200	0.5853	0.4081	0.2799	0.2994	0.4717	0.7058	0.8492	0.9120	(89)
MIT 2	19.4516	19.6617	19.8772	20.1419	20.2886	20.3614	20.3702	20.3723	20.3458	20.1922	19.8425	19.4386	(90)
Living area fraction										fLA = Living area / (4) =		0.4772	(91)
MIT	19.8253	20.0163	20.2128	20.4541	20.5929	20.6599	20.6696	20.6704	20.6460	20.4992	20.1759	19.8101	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8253	20.0163	20.2128	20.4541	20.5929	20.6599	20.6696	20.6704	20.6460	20.4992	20.1759	19.8101	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8950	0.8582	0.8143	0.7241	0.5985	0.4276	0.3018	0.3214	0.4911	0.7128	0.8442	0.9031	(94)
Useful gains	294.7694	308.1703	296.8354	267.3117	218.2127	151.2102	102.5117	107.0005	163.1723	229.9382	268.6467	287.6024	(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	415.0416	402.3978	363.4868	299.7308	229.6904	153.0909	102.8099	107.3989	166.8526	255.6807	340.6889	410.2469	(97)
Space heating kWh	89.4825	63.3209	49.5886	23.3418	8.5394	0.0000	0.0000	0.0000	0.0000	19.1524	51.8704	91.2475	(98a)
Space heating requirement - total per year (kWh/year)												396.5434	
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	89.4825	63.3209	49.5886	23.3418	8.5394	0.0000	0.0000	0.0000	0.0000	19.1524	51.8704	91.2475	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												396.5434	
Space heating per m2											(98c) / (4) =	10.4436	(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	89.4825	63.3209	49.5886	23.3418	8.5394	0.0000	0.0000	0.0000	0.0000	19.1524	51.8704	91.2475	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	89.4825	63.3209	49.5886	23.3418	8.5394	0.0000	0.0000	0.0000	0.0000	19.1524	51.8704	91.2475	(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	178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(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	55.0102	48.5986	51.4846	44.9001	43.2806	38.7322	38.0223	39.6750	40.2704	45.2271	48.4880	54.3596	(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	11.3091	10.2147	11.3091	10.9443	11.3091	10.9443	11.3091	11.3091	10.9443	11.3091	10.9443	11.3091	(231)
Lighting	13.5004	10.8306	9.7517	7.1445	5.5186	4.5088	5.0343	6.5438	8.4997	11.1521	12.5962	13.8757	(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												396.5434	(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												548.0485	(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)	133.1557	(230a)
Total electricity for the above, kWh/year	133.1557	(231)
Electricity for lighting (calculated in Appendix L)	108.9563	(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	1186.7040	(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	396.5434	0.1566	62.0796	(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)	548.0485	0.1411	77.3114	(264)
Space and water heating			139.3910	(265)
Pumps, fans and electric keep-hot	133.1557	0.1387	18.4703	(267)
Energy for lighting	108.9563	0.1443	15.7258	(268)
Total CO2, kg/year			173.5871	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.5700	(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	396.5434	1.5796	626.3673	(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)	548.0485	1.5216	833.9227	(278)
Space and water heating			1460.2900	(279)
Pumps, fans and electric keep-hot	133.1557	1.5128	201.4379	(281)
Energy for lighting	108.9563	1.5338	167.1209	(282)
Total Primary energy kWh/year			1828.8488	(286)
Dwelling Primary energy Rate (DPER)			48.1700	(287)

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

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		37.9700	(1b) x	2.3600	(2b) =	89.6092	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	37.9700						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		89.6092	(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) =	0.2232	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4732	(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) =	0.4022	(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	0.5128	0.5028	0.4927	0.4424	0.4324	0.3821	0.3821	0.3720	0.4022	0.4324	0.4525	0.4726	(22b)
Effective ac	0.6315	0.6264	0.6214	0.5979	0.5935	0.5730	0.5730	0.5692	0.5809	0.5935	0.6024	0.6117	(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	
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			4.4700	1.1450	5.1183			(27)
GF			37.9700	0.1300	4.9361			(28a)
Main	38.8100	6.2200	32.1900	0.1800	5.7942			(29a)
Total net area of external elements Aum(A, m2)			76.7800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		17.9986			(33)
Main dwelling								
Party Wall 1			27.2200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 138.9139 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.1000	0.0500	0.2550
E3 Sill	5.1000	0.0500	0.2550
E4 Jamb	10.8000	0.0500	0.5400
E5 Ground floor (normal)	15.4000	0.1600	2.4640
E7 Party floor between dwellings (in blocks of flats)	15.4000	0.0700	1.0780
E16 Corner (normal)	12.6000	0.0900	1.1340
E17 Corner (inverted - internal area greater than external area)	2.5200	-0.0900	-0.2268
P1 Party wall - Ground floor	10.8000	0.0800	0.8640
E18 Party wall between dwellings	2.5200	0.0600	0.1512
E25 Staggered party wall between dwellings	5.0400	0.0600	0.3024

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.8168 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 24.8154 (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	18.6739	18.5229	18.3749	17.6798	17.5497	16.9442	16.9442	16.8321	17.1774	17.5497	17.8128	18.0879	(38)
Heat transfer coeff	43.4893	43.3383	43.1903	42.4952	42.3651	41.7597	41.7597	41.6475	41.9929	42.3651	42.6282	42.9033	(39)

Average = Sum(39)m / 12 = 42.4945

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1454	1.1414	1.1375	1.1192	1.1158	1.0998	1.0998	1.0969	1.1059	1.1158	1.1227	1.1299	(40)
HLP (average)												1.1192	
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 1.3535 (42)

Hot water usage for mixer showers

46.9130	46.2079	45.1806	43.2150	41.7644	40.1467	39.2272	40.2468	41.3644	43.1013	45.1092	46.7332	(42a)

Hot water usage for baths

20.2973	19.9959	19.5714	18.7887	18.2026	17.5528	17.2017	17.6233	18.0822	18.7776	19.5764	20.2287	(42b)

Hot water usage for other uses

28.4911	27.4550	26.4190	25.3830	24.3469	23.3109	23.3109	24.3469	25.3830	26.4190	27.4550	28.4911	(42c)

Average daily hot water use (litres/day) 87.9720 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.7014	93.6589	91.1710	87.3866	84.3139	81.0104	79.7399	82.2170	84.8296	88.2979	92.1406	95.4530	(44)
Energy conte	151.5676	133.3690	140.1264	119.6279	113.5028	99.6117	96.4385	101.8018	104.6034	119.8195	131.2712	149.4563	(45)
Energy content (annual)										Total = Sum(45)m =		1461.1961	
Distribution loss (46)m = 0.15 x (45)m	22.7351	20.0053	21.0190	17.9442	17.0254	14.9418	14.4658	15.2703	15.6905	17.9729	19.6907	22.4185	(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

198.1625	175.4547	186.7213	164.7198	160.0977	144.7035	143.0334	148.3967	149.6953	166.4144	176.3631	196.0513	(62)
WWHRS -21.4466	-18.9676	-19.8618	-16.4463	-15.3274	-13.1158	-12.2939	-13.0734	-13.5701	-15.9976	-18.1233	-21.0495	(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

176.7158	156.4871	166.8596	148.2735	144.7703	131.5878	130.7394	135.3234	136.1252	150.4168	158.2397	175.0018	(64)
									Total per year (kWh/year) = Sum(64)m =		1810.5403	(64)

12Total per year (kWh/year) 1811 (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

87.6721	78.0138	83.8680	75.8498	75.0156	69.1944	69.3417	71.1250	70.8541	77.1159	79.7212	86.9702	(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	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	65.4789	72.4945	65.4789	67.6615	65.4789	67.6615	65.4789	65.4789	67.6615	65.4789	67.6615	65.4789	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	116.4640	117.6725	114.6270	108.1436	99.9594	92.2675	87.1288	85.9203	88.9657	95.4491	103.6333	111.3253	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	(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)	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	(71)
Water heating gains (Table 5)	117.8389	116.0919	112.7258	105.3469	100.8274	96.1033	93.2012	95.5981	98.4085	103.6504	110.7238	116.8954	(72)

Total internal gains

	346.0841	352.5612	339.1340	327.4544	312.5681	299.3346	289.1112	290.2996	298.3381	310.8808	328.3210	340.0019 (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	1.6600	10.6334	0.6300	0.7000	0.7700	5.3945	(74)
South	2.8100	46.7521	0.6300	0.7000	0.7700	40.1494	(78)

Solar gains	45.5439	76.0635	101.2772	122.8044	136.5527	135.5134	130.6424	120.1373	108.5587	83.1940	54.2455	39.1899 (83)
Total gains	391.6280	428.6248	440.4112	450.2588	449.1208	434.8480	419.7537	410.4369	406.8967	394.0747	382.5665	379.1918 (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	33.6900	33.8074	33.9232	34.4782	34.5840	35.0854	35.0854	35.1799	34.8906	34.5840	34.3706	34.1502	
alpha	3.2460	3.2538	3.2615	3.2985	3.3056	3.3390	3.3390	3.3453	3.3260	3.3056	3.2914	3.2767	
util living area	0.9331	0.9096	0.8788	0.8155	0.7152	0.5616	0.4217	0.4466	0.6260	0.8086	0.9009	0.9383	(86)
MIT	19.4276	19.6570	19.9553	20.3546	20.6802	20.8982	20.9703	20.9634	20.8456	20.4642	19.9129	19.4026	(87)
Th 2	19.9640	19.9672	19.9703	19.9852	19.9880	20.0010	20.0010	20.0034	19.9960	19.9880	19.9824	19.9765	(88)
util rest of house	0.9221	0.8952	0.8589	0.7844	0.6661	0.4891	0.3323	0.3575	0.5568	0.7713	0.8829	0.9281	(89)
MIT 2	18.1741	18.4597	18.8299	19.3211	19.6950	19.9281	19.9866	19.9845	19.8771	19.4592	18.7927	18.1516	(90)
Living area fraction										fLA = Living area / (4) =		0.4772	(91)
MIT	18.7723	19.0311	19.3669	19.8143	20.1651	20.3910	20.4560	20.4517	20.3393	19.9388	19.3273	18.7486	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7723	19.0311	19.3669	19.8143	20.1651	20.3910	20.4560	20.4517	20.3393	19.9388	19.3273	18.7486	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9066	0.8796	0.8455	0.7786	0.6753	0.5184	0.3738	0.3985	0.5816	0.7693	0.8692	0.9130	(94)
Useful gains	355.0307	377.0359	372.3463	350.5740	303.2715	225.4122	156.9122	163.5524	236.6520	303.1467	332.5204	346.2076	(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	629.3890	612.4174	555.7277	463.8067	358.6268	241.8317	161.0259	168.7415	262.0066	395.6381	521.2271	624.1838	(97)
Space heating kWh	204.1226	158.1763	136.4358	81.5275	41.1844	0.0000	0.0000	0.0000	0.0000	68.8136	135.8688	206.8142	(98a)
Space heating requirement - total per year (kWh/year)												1032.9432	
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	204.1226	158.1763	136.4358	81.5275	41.1844	0.0000	0.0000	0.0000	0.0000	68.8136	135.8688	206.8142	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1032.9432	
Space heating per m2											(98c) / (4) =	27.2042	(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	204.1226	158.1763	136.4358	81.5275	41.1844	0.0000	0.0000	0.0000	0.0000	68.8136	135.8688	206.8142	(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)	221.1512	171.3720	147.8177	88.3288	44.6201	0.0000	0.0000	0.0000	0.0000	74.5543	147.2035	224.0674	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	176.7158	156.4871	166.8596	148.2735	144.7703	131.5878	130.7394	135.3234	136.1252	150.4168	158.2397	175.0018	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.3839	84.0839	83.6121	82.7764	81.6324	79.8000	79.8000	79.8000	79.8000	82.4221	83.7199	84.4353	(217)
Fuel for water heating, kWh/month	209.4188	186.1084	199.5640	179.1253	177.3442	164.8970	163.8339	169.5781	170.5829	182.4957	189.0110	207.2613	(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	13.6052	10.9146	9.8274	7.2000	5.5615	4.5438	5.0734	6.5945	8.5657	11.2386	12.6940	13.9834	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-18.3889	-26.2500	-38.2205	-43.5891	-47.5889	-44.7066	-44.2359	-41.5216	-36.7467	-30.3811	-20.3628	-15.8670	(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	-9.4088	-19.9034	-39.7394	-59.9177	-79.4083	-79.7844	-78.7658	-66.5369	-48.6209	-28.4473	-12.5639	-7.4254	(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	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1119.1150	(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	2199.2206	(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)	109.8019	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-938.3812	(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	2575.7563	(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	1119.1150	0.2100	235.0142	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2199.2206	0.2100	461.8363	(264)
Space and water heating			696.8505	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	109.8019	0.1443	15.8478	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-407.8591	0.1343	-54.7615	
PV Unit electricity exported	-530.5221	0.1258	-66.7429	
Total			-121.5044	(269)
Total CO2, kg/year			603.1231	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.8800	(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	1119.1150	1.1300	1264.6000	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2199.2206	1.1300	2485.1192	(278)
Space and water heating			3749.7192	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	109.8019	1.5338	168.4179	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-407.8591	1.4962	-610.2410	
PV Unit electricity exported	-530.5221	0.4618	-244.9912	
Total			-855.2322	(283)
Total Primary energy kWh/year			3193.0057	(286)
Target Primary Energy Rate (TPER)			84.0900	(287)

Full SAP Calculation Printout

Property Reference	78449-23	**Issued on Date**	18/08/2025
Assessment Reference	001	**Prop Type Ref**	GF Flat / End
Property	4 Shepherd Street, MANCHESTER, M9 4QW		

SAP Rating	87 B	**DER**	4.57	**TER**	15.88
Environmental	97 A	**% DER < TER**			71.22
CO_2 Emissions (t/year)	0.16	**DFEE**	26.20	**TFEE**	35.74
Compliance Check	See BREL	**% DFEE < TFEE**			26.70
% DPER < TPER	42.72	**DPER**	48.17	**TPER**	84.09

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	37.9700	(1b)	x 2.3600	(2b) =	89.6092	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	37.9700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		89.6092	(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) =	0.2232	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.6000	(17)
Infiltration rate		0.4032	(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) =	0.3427	(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	0.4370	0.4284	0.4198	0.3770	0.3684	0.3256	0.3256	0.3170	0.3427	0.3684	0.3856	0.4027	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5955	0.5918	0.5881	0.5711	0.5679	0.5530	0.5530	0.5502	0.5587	0.5679	0.5743	0.5811	(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			4.4700	0.7282	3.2549			(27)
GF			37.9700	0.0900	3.4173	75.0000	2847.7500	(28a)
Main	38.8100	6.6200	32.1900	0.1300	4.1847	9.0000	289.7100	(29a)
Total net area of external elements Aum(A, m2)			76.7800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		12.5339			(33)
Main dwelling								
Party Wall 1			27.2200	0.0000	0.0000	20.0000	544.4000	(32)
Party Ceiling			37.9700			30.0000	1139.1000	(32b)
Timber			50.4000			9.0000	453.6000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 5274.5600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	138.9139 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.1000	0.1150	0.5865
E3 Sill	5.1000	0.0170	0.0867
E4 Jamb	10.8000	0.0940	1.0152

E5 Ground floor (normal)	15.4000	0.0670	1.0318	
E7 Party floor between dwellings (in blocks of flats)	15.4000	0.0320	0.4928	
E16 Corner (normal)	12.6000	0.0680	0.8568	
E17 Corner (inverted - internal area greater than external area)	2.5200	-0.0290	-0.0731	
P1 Party wall - Ground floor	10.8000	0.0560	0.6048	
E18 Party wall between dwellings	2.5200	0.2400	0.6048	
E25 Staggered party wall between dwellings	5.0400	0.0560	0.2822	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.4886 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 18.0224 (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	17.6086	17.4989	17.3915	16.8868	16.7924	16.3528	16.3528	16.2714	16.5221	16.7924	16.9834	17.1831	(38)
Heat transfer coeff	35.6310	35.5214	35.4139	34.9092	34.8148	34.3752	34.3752	34.2938	34.5445	34.8148	35.0058	35.2055	(39)
Average = Sum(39)m / 12 =												34.9088	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9384	0.9355	0.9327	0.9194	0.9169	0.9053	0.9053	0.9032	0.9098	0.9169	0.9219	0.9272	(40)
HLP (average)												0.9194	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.3535 (42)
Hot water usage for mixer showers

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

Hot water usage for baths

20.2973	19.9959	19.5714	18.7887	18.2026	17.5528	17.2017	17.6233	18.0822	18.7776	19.5764	20.2287	(42b)

Hot water usage for other uses

28.4911	27.4550	26.4190	25.3830	24.3469	23.3109	23.3109	24.3469	25.3830	26.4190	27.4550	28.4911	(42c)

Average daily hot water use (litres/day) 44.7198 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	48.7884	47.4509	45.9904	44.1717	42.5496	40.8637	40.5126	41.9702	43.4652	45.1966	47.0315	48.7198	(44)
Energy conte	77.2689	67.5695	70.6855	60.4688	57.2799	50.2466	48.9965	51.9679	53.5969	61.3314	67.0049	76.2834	(45)
Energy content (annual)										Total = Sum(45)m =		742.7004	
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	65.6786	57.4341	60.0827	51.3985	48.6879	42.7096	41.6470	44.1727	45.5574	52.1317	56.9542	64.8409	(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	65.6786	57.4341	60.0827	51.3985	48.6879	42.7096	41.6470	44.1727	45.5574	52.1317	56.9542	64.8409	(64)
									Total per year (kWh/year) = Sum(64)m =			631.2953	(64)
12Total per year (kWh/year)												631	(64)
Electric shower(s)	37.5695	33.4747	36.5531	34.8822	35.5367	33.8986	35.0285	35.5367	34.8822	36.5531	35.8657	37.5695	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							427.3504	(64a)
Heat gains from water heating, kWh/month	25.8120	22.7272	24.1589	21.5702	21.0562	19.1521	19.1689	19.9274	20.1099	22.1712	23.2050	25.6026	(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	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	67.4075	74.6297	67.4075	69.6544	67.4075	69.6544	67.4075	67.4075	69.6544	67.4075	69.6544	67.4075	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	116.4640	117.6725	114.6270	108.1436	99.9594	92.2675	87.1288	85.9203	88.9657	95.4491	103.6333	111.3253	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	(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)	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	(71)
Water heating gains (Table 5)	34.6936	33.8202	32.4717	29.9586	28.3013	26.6001	25.7646	26.7841	27.9304	29.8000	32.2292	34.4121	(72)
Total internal gains	261.8673	269.4248	257.8085	251.0589	238.9705	231.8243	223.6032	223.4142	229.8529	235.9589	248.8192	256.4472	(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	1.6600	10.6334	0.3000	0.0000	0.7700	4.0775	(74)
South	2.8100	46.7521	0.3000	0.0000	0.7700	30.3472	(78)

Solar gains	34.4247	57.4932	76.5512	92.8227	103.2145	102.4289	98.7471	90.8067	82.0549	62.8828	41.0019	29.6220	(83)
Total gains	296.2921	326.9180	334.3597	343.8816	342.1850	334.2532	322.3503	314.2208	311.9078	298.8418	289.8211	286.0692	(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	41.1203	41.2472	41.3723	41.9705	42.0843	42.6225	42.6225	42.7236	42.4135	42.0843	41.8546	41.6172	
alpha	3.7414	3.7498	3.7582	3.7980	3.8056	3.8415	3.8415	3.8482	3.8276	3.8056	3.7903	3.7745	
util living area	0.9616	0.9434	0.9201	0.8643	0.7695	0.6062	0.4552	0.4838	0.6756	0.8604	0.9381	0.9656	(86)
MIT	19.5652	19.7799	20.0458	20.4175	20.7184	20.9188	20.9790	20.9731	20.8711	20.5112	20.0017	19.5367	(87)
Th 2	20.1350	20.1374	20.1398	20.1511	20.1532	20.1630	20.1630	20.1648	20.1592	20.1532	20.1489	20.1444	(88)
util rest of house	0.9552	0.9342	0.9065	0.8407	0.7285	0.5414	0.3742	0.4029	0.6149	0.8320	0.9265	0.9599	(89)
MIT 2	18.8340	19.0453	19.3059	19.6686	19.9435	20.1150	20.1543	20.1530	20.0775	19.7622	19.2736	18.8133	(90)
Living area fraction										fLA = Living area / (4) =		0.4772	(91)
MIT	19.1829	19.3959	19.6590	20.0260	20.3133	20.4986	20.5478	20.5444	20.4562	20.1197	19.6210	19.1585	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1829	19.3959	19.6590	20.0260	20.3133	20.4986	20.5478	20.5444	20.4562	20.1197	19.6210	19.1585	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9466	0.9248	0.8978	0.8368	0.7367	0.5682	0.4121	0.4404	0.6374	0.8308	0.9181	0.9517	(94)
Useful gains	280.4787	302.3497	300.1944	287.7694	252.0999	189.9326	132.8328	138.3722	198.7971	248.2710	266.0785	272.2629	(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	530.2929	514.9126	466.0115	388.3996	299.8701	202.7656	135.7074	142.1275	219.5725	331.4250	438.3092	526.6224	(97)
Space heating kWh	185.8617	142.8423	123.3679	72.4538	35.5411	0.0000	0.0000	0.0000	0.0000	61.8666	124.0061	189.2435	(98a)
Space heating requirement - total per year (kWh/year)												935.1829	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	185.8617	142.8423	123.3679	72.4538	35.5411	0.0000	0.0000	0.0000	0.0000	61.8666	124.0061	189.2435	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												935.1829	
Space heating per m2											(98c) / (4) =	24.6295	(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	323.1269	254.3765	260.6329	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8354	0.8974	0.8850	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	269.9474	228.2894	230.6489	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	361.4769	349.1434	340.9889	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	65.9012	89.9153	82.0930	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	16.4753	22.4788	20.5232	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												59.4774	(107)
Energy for space heating												24.6295	(99)
Energy for space cooling												1.5664	(108)
Total												26.1960	(109)
Fabric Energy Efficiency (DFEE)												26.2	(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		37.9700	(1b)	x 2.3600	(2b) =	89.6092	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	37.9700						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		89.6092	(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) =	0.2232	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	

Measured/design AP50	5.0000	(17)
Infiltration rate	0.4732	(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) =	0.4022	(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	0.5128	0.5028	0.4927	0.4424	0.4324	0.3821	0.3821	0.3720	0.4022	0.4324	0.4525	0.4726	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.6315	0.6264	0.6214	0.5979	0.5935	0.5730	0.5730	0.5692	0.5809	0.5935	0.6024	0.6117	(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								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			4.4700	1.1450	5.1183			(27)
GF			37.9700	0.1300	4.9361			(28a)
Main	38.8100	6.6200	32.1900	0.1800	5.7942			(29a)
Total net area of external elements Aum(A, m2)			76.7800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		17.9986			(33)
Main dwelling								
Party Wall 1			27.2200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	138.9139	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.1000	0.0500	0.2550
E3 Sill	5.1000	0.0500	0.2550
E4 Jamb	10.8000	0.0500	0.5400
E5 Ground floor (normal)	15.4000	0.1600	2.4640
E7 Party floor between dwellings (in blocks of flats)	15.4000	0.0700	1.0780
E16 Corner (normal)	12.6000	0.0900	1.1340
E17 Corner (inverted - internal area greater than external area)	2.5200	-0.0900	-0.2268
P1 Party wall - Ground floor	10.8000	0.0800	0.8640
E18 Party wall between dwellings	2.5200	0.0600	0.1512
E25 Staggered party wall between dwellings	5.0400	0.0600	0.3024

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	6.8168	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	24.8154	(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	18.6739	18.5229	18.3749	17.6798	17.5497	16.9442	16.9442	16.8321	17.1774	17.5497	17.8128	18.0879	(38)
Heat transfer coeff	43.4893	43.3383	43.1903	42.4952	42.3651	41.7597	41.7597	41.6475	41.9929	42.3651	42.6282	42.9033	(39)
Average = Sum(39)m / 12 =												42.4945	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1454	1.1414	1.1375	1.1192	1.1158	1.0998	1.0998	1.0969	1.1059	1.1158	1.1227	1.1299	(40)
HLP (average)												1.1192	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.3535	(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

	20.2973	19.9959	19.5714	18.7887	18.2026	17.5528	17.2017	17.6233	18.0822	18.7776	19.5764	20.2287	(42b)

Hot water usage for other uses

	28.4911	27.4550	26.4190	25.3830	24.3469	23.3109	23.3109	24.3469	25.3830	26.4190	27.4550	28.4911	(42c)
Average daily hot water use (litres/day)												44.7198	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	48.7884	47.4509	45.9904	44.1717	42.5496	40.8637	40.5126	41.9702	43.4652	45.1966	47.0315	48.7198	(44)
Energy conte	77.2689	67.5695	70.6855	60.4688	57.2799	50.2466	48.9965	51.9679	53.5969	61.3314	67.0049	76.2834	(45)
Energy content (annual)										Total = Sum(45)m =		742.7004	
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	65.6786	57.4341	60.0827	51.3985	48.6879	42.7096	41.6470	44.1727	45.5574	52.1317	56.9542	64.8409	(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	65.6786	57.4341	60.0827	51.3985	48.6879	42.7096	41.6470	44.1727	45.5574	52.1317	56.9542	64.8409	(64)
									Total per year (kWh/year) = Sum(64)m =			631.2953	(64)
12Total per year (kWh/year)												631	(64)

Electric shower(s)

	37.5695	33.4747	36.5531	34.8822	35.5367	33.8986	35.0285	35.5367	34.8822	36.5531	35.8657	37.5695	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												427.3504	(64a)

Heat gains from water heating, kWh/month

	25.8120	22.7272	24.1589	21.5702	21.0562	19.1521	19.1689	19.9274	20.1099	22.1712	23.2050	25.6026	(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	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	65.4789	72.4945	65.4789	67.6615	65.4789	67.6615	65.4789	65.4789	67.6615	65.4789	67.6615	65.4789	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	116.4640	117.6725	114.6270	108.1436	99.9594	92.2675	87.1288	85.9203	88.9657	95.4491	103.6333	111.3253	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	(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)													
	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	(71)
Water heating gains (Table 5)													
	34.6936	33.8202	32.4717	29.9586	28.3013	26.6001	25.7646	26.7841	27.9304	29.8000	32.2292	34.4121	(72)
Total internal gains													
	259.9388	267.2895	255.8800	249.0660	237.0420	229.8314	221.6747	221.4856	227.8600	234.0304	246.8263	254.5186	(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	1.6600	10.6334	0.6300	0.7000	0.7700	5.3945	(74)
South	2.8100	46.7521	0.6300	0.7000	0.7700	40.1494	(78)

Solar gains	45.5439	76.0635	101.2772	122.8044	136.5527	135.5134	130.6424	120.1373	108.5587	83.1940	54.2455	39.1899	(83)
Total gains	305.4827	343.3531	357.1572	371.8704	373.5947	365.3448	352.3171	341.6228	336.4186	317.2243	301.0719	293.7085	(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	33.6900	33.8074	33.9232	34.4782	34.5840	35.0854	35.0854	35.1799	34.8906	34.5840	34.3706	34.1502	
alpha	3.2460	3.2538	3.2615	3.2985	3.3056	3.3390	3.3390	3.3453	3.3260	3.3056	3.2914	3.2767	
util living area													
	0.9643	0.9468	0.9243	0.8736	0.7877	0.6384	0.4913	0.5221	0.7085	0.8751	0.9440	0.9680	(86)
MIT	19.1188	19.3743	19.7066	20.1688	20.5619	20.8498	20.9531	20.9416	20.7735	20.2838	19.6478	19.0898	(87)
Th 2	19.9640	19.9672	19.9703	19.9852	19.9880	20.0010	20.0010	20.0034	19.9960	19.9880	19.9824	19.9765	(88)
util rest of house													
	0.9578	0.9374	0.9101	0.8487	0.7434	0.5635	0.3913	0.4231	0.6405	0.8460	0.9324	0.9622	(89)
MIT 2	18.2705	18.5226	18.8492	19.3028	19.6655	19.9142	19.9826	19.9790	19.8545	19.4196	18.8051	18.2510	(90)
Living area fraction									fLA = Living area / (4) =			0.4772	(91)
MIT	18.6753	18.9291	19.2584	19.7161	20.0933	20.3607	20.4457	20.4384	20.2931	19.8320	19.2073	18.6513	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6753	18.9291	19.2584	19.7161	20.0933	20.3607	20.4457	20.4384	20.2931	19.8320	19.2073	18.6513	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9475	0.9256	0.8985	0.8412	0.7484	0.5919	0.4372	0.4678	0.6621	0.8408	0.9215	0.9526	(94)
Useful gains	289.4340	317.8246	320.8950	312.8213	279.6084	216.2368	154.0380	159.8259	222.7356	266.7334	277.4516	279.7745	(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													
	625.1719	607.9967	551.0377	459.6303	355.5811	240.5635	160.5967	168.1877	260.0653	391.1152	516.1108	620.0088	(97)
Space heating kWh													
	249.7890	194.9957	171.2262	105.7025	56.5237	0.0000	0.0000	0.0000	0.0000	92.5400	171.8347	253.1343	(98a)
Space heating requirement - total per year (kWh/year)												1295.7461	
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													
	249.7890	194.9957	171.2262	105.7025	56.5237	0.0000	0.0000	0.0000	0.0000	92.5400	171.8347	253.1343	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1295.7461	
Space heating per m2										(98c) / (4) =		34.1255	(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	392.5407	309.0214	316.5212	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7767	0.8469	0.8304	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	304.8873	261.7117	262.8314	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	399.9784	386.2413	375.0344	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	68.4656	92.6500	83.4790	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	17.1164	23.1625	20.8697	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												61.1486	(107)
Energy for space heating												34.1255	(99)
Energy for space cooling												1.6104	(108)
Total												35.7360	(109)
Fabric Energy Efficiency (TFEE)												35.7	(109)

Full SAP Calculation Printout

Property Reference	78449-23	**Issued on Date**	18/08/2025
Assessment Reference	001	**Prop Type Ref**	GF Flat / End
Property	4 Shepherd Street, MANCHESTER, M9 4QW		

SAP Rating	87 B	**DER**	4.57	**TER**	15.88
Environmental	97 A	**% DER < TER**			71.22
CO_2 Emissions (t/year)	0.16	**DFEE**	26.20	**TFEE**	35.74
Compliance Check	See BREL	**% DFEE < TFEE**			26.70
% DPER < TPER	42.72	**DPER**	48.17	**TPER**	84.09

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	37.9700	(1b)	x 2.3600	(2b) =	89.6092	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	37.9700					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	89.6092	(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		3.6000	(17)
Infiltration rate		0.1800	(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) =	0.1530	(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	0.1951	0.1913	0.1874	0.1683	0.1645	0.1453	0.1453	0.1415	0.1530	0.1645	0.1721	0.1798	(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	0.2946	0.2907	0.2869	0.2678	0.2640	0.2448	0.2448	0.2410	0.2525	0.2640	0.2716	0.2793	(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			4.4700	0.7282	3.2549			(27)
GF			37.9700	0.0900	3.4173	75.0000	2847.7500	(28a)
Main	38.8100	6.6200	32.1900	0.1300	4.1847	9.0000	289.7100	(29a)
Total net area of external elements Aum(A, m2)			76.7800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	12.5339			(33)
Main dwelling								
Party Wall 1			27.2200	0.0000	0.0000	20.0000	544.4000	(32)
Party Ceiling			37.9700			20.0000	759.4000	(32b)
Timber			50.4000			9.0000	453.6000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	4894.8600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		128.9139 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E2 Other lintels (including other steel lintels)	5.1000	0.1150	0.5865	
E3 Sill	5.1000	0.0170	0.0867	
E4 Jamb	10.8000	0.0940	1.0152	
E5 Ground floor (normal)	15.4000	0.0670	1.0318	
E7 Party floor between dwellings (in blocks of flats)	15.4000	0.0320	0.4928	
E16 Corner (normal)	12.6000	0.0680	0.8568	
E17 Corner (inverted - internal area greater than external area)	2.5200	-0.0290	-0.0731	
P1 Party wall - Ground floor	10.8000	0.0560	0.6048	
E18 Party wall between dwellings	2.5200	0.2400	0.6048	
E25 Staggered party wall between dwellings	5.0400	0.0560	0.2822	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				5.4886 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	18.0224 (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	8.7109	8.5978	8.4847	7.9191	7.8060	7.2405	7.2405	7.1274	7.4667	7.8060	8.0322	8.2585	(38)
Heat transfer coeff	26.7333	26.6202	26.5071	25.9415	25.8284	25.2629	25.2629	25.1498	25.4891	25.8284	26.0546	26.2809	(39)
Average = Sum(39)m / 12 =												25.9133	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7041	0.7011	0.6981	0.6832	0.6802	0.6653	0.6653	0.6624	0.6713	0.6802	0.6862	0.6921	(40)
HLP (average)												0.6825	
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												1.3535	(42)
Hot water usage for mixer showers	46.9130	46.2079	45.1806	43.2150	41.7644	40.1467	39.2272	40.2468	41.3644	43.1013	45.1092	46.7332	(42a)
Hot water usage for baths	20.2973	19.9959	19.5714	18.7887	18.2026	17.5528	17.2017	17.6233	18.0822	18.7776	19.5764	20.2287	(42b)
Hot water usage for other uses	28.4911	27.4550	26.4190	25.3830	24.3469	23.3109	23.3109	24.3469	25.3830	26.4190	27.4550	28.4911	(42c)
Average daily hot water use (litres/day)												87.9720	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.7014	93.6589	91.1710	87.3866	84.3139	81.0104	79.7399	82.2170	84.8296	88.2979	92.1406	95.4530	(44)
Energy conte	151.5676	133.3690	140.1264	119.6279	113.5028	99.6117	96.4385	101.8018	104.6034	119.8195	131.2712	149.4563	(45)
Energy content (annual)											Total = Sum(45)m =	1461.1961	
Distribution loss (46)m = 0.15 x (45)m	22.7351	20.0053	21.0190	17.9442	17.0254	14.9418	14.4658	15.2703	15.6905	17.9729	19.6907	22.4185	(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	178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(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	178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(64)
										Total per year (kWh/year) = Sum(64)m =		1778.5271	(64)
12Total per year (kWh/year)												1779	(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	50.3962	44.3452	46.5920	39.7763	37.7397	33.1209	32.0658	33.8491	34.7806	39.8400	43.6477	49.6942	(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	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	67.4075	74.6297	67.4075	69.6544	67.4075	69.6544	67.4075	67.4075	69.6544	67.4075	69.6544	67.4075	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	116.4640	117.6725	114.6270	108.1436	99.9594	92.2675	87.1288	85.9203	88.9657	95.4491	103.6333	111.3253	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	(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)	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	(71)
Water heating gains (Table 5)	67.7369	65.9899	62.6237	55.2449	50.7254	46.0012	43.0992	45.4961	48.3064	53.5483	60.6218	66.7933	(72)
Total internal gains	294.9106	301.5944	287.9606	276.3452	261.3946	251.2255	240.9378	242.1262	250.2289	259.7073	277.2118	288.8284	(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	1.6600	10.6334	0.3000	0.0000	0.7700	4.0775	(74)
South	2.8100	46.7521	0.3000	0.0000	0.7700	30.3472	(78)

Solar gains	34.4247	57.4932	76.5512	92.8227	103.2145	102.4289	98.7471	90.8067	82.0549	62.8828	41.0019	29.6220	(83)

Total gains	329.3353	359.0876	364.5117	369.1679	364.6091	353.6543	339.6849	332.9329	332.2838	322.5901	318.2137	318.4504	(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	50.8610	51.0771	51.2951	52.4134	52.6429	53.8214	53.8214	54.0634	53.3437	52.6429	52.1858	51.7366	
alpha	4.3907	4.4051	4.4197	4.4942	4.5095	4.5881	4.5881	4.6042	4.5562	4.5095	4.4791	4.4491	
util living area	0.9144	0.8792	0.8364	0.7461	0.6208	0.4502	0.3259	0.3457	0.5152	0.7367	0.8661	0.9217	(86)
MIT	20.2346	20.4047	20.5805	20.7960	20.9263	20.9869	20.9976	20.9969	20.9750	20.8355	20.5412	20.2170	(87)
Th 2	20.3372	20.3399	20.3425	20.3557	20.3583	20.3716	20.3716	20.3742	20.3663	20.3583	20.3530	20.3478	(88)
util rest of house	0.9040	0.8655	0.8182	0.7200	0.5853	0.4081	0.2799	0.2994	0.4717	0.7058	0.8492	0.9120	(89)
MIT 2	19.4516	19.6617	19.8772	20.1419	20.2886	20.3614	20.3702	20.3723	20.3458	20.1922	19.8425	19.4386	(90)
Living area fraction										fLA = Living area / (4) =		0.4772	(91)
MIT	19.8253	20.0163	20.2128	20.4541	20.5929	20.6599	20.6696	20.6704	20.6460	20.4992	20.1759	19.8101	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8253	20.0163	20.2128	20.4541	20.5929	20.6599	20.6696	20.6704	20.6460	20.4992	20.1759	19.8101	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8950	0.8582	0.8143	0.7241	0.5985	0.4276	0.3018	0.3214	0.4911	0.7128	0.8442	0.9031	(94)
Useful gains	294.7694	308.1703	296.8354	267.3117	218.2127	151.2102	102.5117	107.0005	163.1723	229.9382	268.6467	287.6024	(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	415.0416	402.3978	363.4868	299.7308	229.6904	153.0909	102.8099	107.3989	166.8526	255.6807	340.6889	410.2469	(97)
Space heating kWh	89.4825	63.3209	49.5886	23.3418	8.5394	0.0000	0.0000	0.0000	0.0000	19.1524	51.8704	91.2475	(98a)
Space heating requirement - total per year (kWh/year)												396.5434	
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	89.4825	63.3209	49.5886	23.3418	8.5394	0.0000	0.0000	0.0000	0.0000	19.1524	51.8704	91.2475	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												396.5434	
Space heating per m2											(98c) / (4) =	10.4436	(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	89.4825	63.3209	49.5886	23.3418	8.5394	0.0000	0.0000	0.0000	0.0000	19.1524	51.8704	91.2475	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	89.4825	63.3209	49.5886	23.3418	8.5394	0.0000	0.0000	0.0000	0.0000	19.1524	51.8704	91.2475	(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	178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(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	55.0102	48.5986	51.4846	44.9001	43.2806	38.7322	38.0223	39.6750	40.2704	45.2271	48.4880	54.3596	(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	11.3091	10.2147	11.3091	10.9443	11.3091	10.9443	11.3091	11.3091	10.9443	11.3091	10.9443	11.3091	(231)
Lighting	13.5004	10.8306	9.7517	7.1445	5.5186	4.5088	5.0343	6.5438	8.4997	11.1521	12.5962	13.8757	(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												396.5434	(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												548.0485	(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)	133.1557	(230a)
Total electricity for the above, kWh/year	133.1557	(231)
Electricity for lighting (calculated in Appendix L)	108.9563	(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	1186.7040	(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	396.5434	0.1566	62.0796	(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)	548.0485	0.1411	77.3114	(264)
Space and water heating			139.3910	(265)
Pumps, fans and electric keep-hot	133.1557	0.1387	18.4703	(267)
Energy for lighting	108.9563	0.1443	15.7258	(268)
Total CO2, kg/year			173.5871	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.5700	(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	396.5434	1.5796	626.3673	(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)	548.0485	1.5216	833.9227	(278)
Space and water heating			1460.2900	(279)
Pumps, fans and electric keep-hot	133.1557	1.5128	201.4379	(281)
Energy for lighting	108.9563	1.5338	167.1209	(282)
Total Primary energy kWh/year			1828.8488	(286)
Dwelling Primary energy Rate (DPER)			48.1700	(287)

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

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		37.9700	(1b) x	2.3600	(2b) =	89.6092	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	37.9700						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		89.6092	(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) =	0.2232	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4732	(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) =	0.4022	(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	0.5128	0.5028	0.4927	0.4424	0.4324	0.3821	0.3821	0.3720	0.4022	0.4324	0.4525	0.4726	(22b)
Effective ac	0.6315	0.6264	0.6214	0.5979	0.5935	0.5730	0.5730	0.5692	0.5809	0.5935	0.6024	0.6117	(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	
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			4.4700	1.1450	5.1183			(27)
GF			37.9700	0.1300	4.9361			(28a)
Main	38.8100	6.2200	32.1900	0.1800	5.7942			(29a)
Total net area of external elements Aum(A, m2)			76.7800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		17.9986			(33)
Main dwelling								
Party Wall 1			27.2200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 138.9139 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.1000	0.0500	0.2550
E3 Sill	5.1000	0.0500	0.2550
E4 Jamb	10.8000	0.0500	0.5400
E5 Ground floor (normal)	15.4000	0.1600	2.4640
E7 Party floor between dwellings (in blocks of flats)	15.4000	0.0700	1.0780
E16 Corner (normal)	12.6000	0.0900	1.1340
E17 Corner (inverted - internal area greater than external area)	2.5200	-0.0900	-0.2268
P1 Party wall - Ground floor	10.8000	0.0800	0.8640
E18 Party wall between dwellings	2.5200	0.0600	0.1512
E25 Staggered party wall between dwellings	5.0400	0.0600	0.3024

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.8168 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 24.8154 (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	18.6739	18.5229	18.3749	17.6798	17.5497	16.9442	16.9442	16.8321	17.1774	17.5497	17.8128	18.0879	(38)
Heat transfer coeff	43.4893	43.3383	43.1903	42.4952	42.3651	41.7597	41.7597	41.6475	41.9929	42.3651	42.6282	42.9033	(39)

Average = Sum(39)m / 12 = 42.4945

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1454	1.1414	1.1375	1.1192	1.1158	1.0998	1.0998	1.0969	1.1059	1.1158	1.1227	1.1299	(40)
HLP (average)												1.1192	
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 1.3535 (42)

Hot water usage for mixer showers

46.9130	46.2079	45.1806	43.2150	41.7644	40.1467	39.2272	40.2468	41.3644	43.1013	45.1092	46.7332	(42a)

Hot water usage for baths

20.2973	19.9959	19.5714	18.7887	18.2026	17.5528	17.2017	17.6233	18.0822	18.7776	19.5764	20.2287	(42b)

Hot water usage for other uses

28.4911	27.4550	26.4190	25.3830	24.3469	23.3109	23.3109	24.3469	25.3830	26.4190	27.4550	28.4911	(42c)

Average daily hot water use (litres/day) 87.9720 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.7014	93.6589	91.1710	87.3866	84.3139	81.0104	79.7399	82.2170	84.8296	88.2979	92.1406	95.4530	(44)
Energy conte	151.5676	133.3690	140.1264	119.6279	113.5028	99.6117	96.4385	101.8018	104.6034	119.8195	131.2712	149.4563	(45)
Energy content (annual)										Total = Sum(45)m =		1461.1961	
Distribution loss (46)m = 0.15 x (45)m	22.7351	20.0053	21.0190	17.9442	17.0254	14.9418	14.4658	15.2703	15.6905	17.9729	19.6907	22.4185	(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

198.1625	175.4547	186.7213	164.7198	160.0977	144.7035	143.0334	148.3967	149.6953	166.4144	176.3631	196.0513	(62)
WWHRS -21.4466	-18.9676	-19.8618	-16.4463	-15.3274	-13.1158	-12.2939	-13.0734	-13.5701	-15.9976	-18.1233	-21.0495	(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

176.7158	156.4871	166.8596	148.2735	144.7703	131.5878	130.7394	135.3234	136.1252	150.4168	158.2397	175.0018	(64)
									Total per year (kWh/year) = Sum(64)m =		1810.5403	(64)

12Total per year (kWh/year) 1811 (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

87.6721	78.0138	83.8680	75.8498	75.0156	69.1944	69.3417	71.1250	70.8541	77.1159	79.7212	86.9702	(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	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	65.4789	72.4945	65.4789	67.6615	65.4789	67.6615	65.4789	65.4789	67.6615	65.4789	67.6615	65.4789	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	116.4640	117.6725	114.6270	108.1436	99.9594	92.2675	87.1288	85.9203	88.9657	95.4491	103.6333	111.3253	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	(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)	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	(71)
Water heating gains (Table 5)	117.8389	116.0919	112.7258	105.3469	100.8274	96.1033	93.2012	95.5981	98.4085	103.6504	110.7238	116.8954	(72)

Total internal gains

	346.0841	352.5612	339.1340	327.4544	312.5681	299.3346	289.1112	290.2996	298.3381	310.8808	328.3210	340.0019 (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	1.6600	10.6334	0.6300	0.7000	0.7700	5.3945	(74)
South	2.8100	46.7521	0.6300	0.7000	0.7700	40.1494	(78)

Solar gains	45.5439	76.0635	101.2772	122.8044	136.5527	135.5134	130.6424	120.1373	108.5587	83.1940	54.2455	39.1899 (83)
Total gains	391.6280	428.6248	440.4112	450.2588	449.1208	434.8480	419.7537	410.4369	406.8967	394.0747	382.5665	379.1918 (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	33.6900	33.8074	33.9232	34.4782	34.5840	35.0854	35.0854	35.1799	34.8906	34.5840	34.3706	34.1502	
alpha	3.2460	3.2538	3.2615	3.2985	3.3056	3.3390	3.3390	3.3453	3.3260	3.3056	3.2914	3.2767	
util living area	0.9331	0.9096	0.8788	0.8155	0.7152	0.5616	0.4217	0.4466	0.6260	0.8086	0.9009	0.9383	(86)
MIT	19.4276	19.6570	19.9553	20.3546	20.6802	20.8982	20.9703	20.9634	20.8456	20.4642	19.9129	19.4026	(87)
Th 2	19.9640	19.9672	19.9703	19.9852	19.9880	20.0010	20.0010	20.0034	19.9960	19.9880	19.9824	19.9765	(88)
util rest of house	0.9221	0.8952	0.8589	0.7844	0.6661	0.4891	0.3323	0.3575	0.5568	0.7713	0.8829	0.9281	(89)
MIT 2	18.1741	18.4597	18.8299	19.3211	19.6950	19.9281	19.9866	19.9845	19.8771	19.4592	18.7927	18.1516	(90)
Living area fraction										fLA = Living area / (4) =		0.4772	(91)
MIT	18.7723	19.0311	19.3669	19.8143	20.1651	20.3910	20.4560	20.4517	20.3393	19.9388	19.3273	18.7486	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7723	19.0311	19.3669	19.8143	20.1651	20.3910	20.4560	20.4517	20.3393	19.9388	19.3273	18.7486	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9066	0.8796	0.8455	0.7786	0.6753	0.5184	0.3738	0.3985	0.5816	0.7693	0.8692	0.9130	(94)
Useful gains	355.0307	377.0359	372.3463	350.5740	303.2715	225.4122	156.9122	163.5524	236.6520	303.1467	332.5204	346.2076	(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	629.3890	612.4174	555.7277	463.8067	358.6268	241.8317	161.0259	168.7415	262.0066	395.6381	521.2271	624.1838	(97)
Space heating kWh	204.1226	158.1763	136.4358	81.5275	41.1844	0.0000	0.0000	0.0000	0.0000	68.8136	135.8688	206.8142	(98a)
Space heating requirement - total per year (kWh/year)												1032.9432	
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	204.1226	158.1763	136.4358	81.5275	41.1844	0.0000	0.0000	0.0000	0.0000	68.8136	135.8688	206.8142	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1032.9432	
Space heating per m2											(98c) / (4) =	27.2042	(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	204.1226	158.1763	136.4358	81.5275	41.1844	0.0000	0.0000	0.0000	0.0000	68.8136	135.8688	206.8142	(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)	221.1512	171.3720	147.8177	88.3288	44.6201	0.0000	0.0000	0.0000	0.0000	74.5543	147.2035	224.0674	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	176.7158	156.4871	166.8596	148.2735	144.7703	131.5878	130.7394	135.3234	136.1252	150.4168	158.2397	175.0018	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.3839	84.0839	83.6121	82.7764	81.6324	79.8000	79.8000	79.8000	79.8000	82.4221	83.7199	84.4353	(217)
Fuel for water heating, kWh/month	209.4188	186.1084	199.5640	179.1253	177.3442	164.8970	163.8339	169.5781	170.5829	182.4957	189.0110	207.2613	(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	13.6052	10.9146	9.8274	7.2000	5.5615	4.5438	5.0734	6.5945	8.5657	11.2386	12.6940	13.9834	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-18.3889	-26.2500	-38.2205	-43.5891	-47.5889	-44.7066	-44.2359	-41.5216	-36.7467	-30.3811	-20.3628	-15.8670	(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	-9.4088	-19.9034	-39.7394	-59.9177	-79.4083	-79.7844	-78.7658	-66.5369	-48.6209	-28.4473	-12.5639	-7.4254	(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	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1119.1150	(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	2199.2206	(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)	109.8019	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-938.3812	(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	2575.7563	(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	1119.1150	0.2100	235.0142	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2199.2206	0.2100	461.8363	(264)
Space and water heating			696.8505	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	109.8019	0.1443	15.8478	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-407.8591	0.1343	-54.7615	
PV Unit electricity exported	-530.5221	0.1258	-66.7429	
Total			-121.5044	(269)
Total CO2, kg/year			603.1231	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.8800	(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	1119.1150	1.1300	1264.6000	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2199.2206	1.1300	2485.1192	(278)
Space and water heating			3749.7192	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	109.8019	1.5338	168.4179	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-407.8591	1.4962	-610.2410	
PV Unit electricity exported	-530.5221	0.4618	-244.9912	
Total			-855.2322	(283)
Total Primary energy kWh/year			3193.0057	(286)
Target Primary Energy Rate (TPER)			84.0900	(287)

Full SAP Calculation Printout

Property Reference	78449-23	**Issued on Date**	18/08/2025
Assessment Reference	001	**Prop Type Ref**	GF Flat / End
Property	4 Shepherd Street, MANCHESTER, M9 4QW		

SAP Rating	87 B	**DER**	4.57	**TER**	15.88
Environmental	97 A	**% DER < TER**			71.22
CO_2 Emissions (t/year)	0.16	**DFEE**	26.20	**TFEE**	35.74
Compliance Check	See BREL	**% DFEE < TFEE**			26.70
% DPER < TPER	42.72	**DPER**	48.17	**TPER**	84.09

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	37.9700	(1b)	x 2.3600	(2b) =	89.6092	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	37.9700					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	89.6092	(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		3.6000 (17)
Infiltration rate		0.1800 (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) =	0.1530 (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	0.1951	0.1913	0.1874	0.1683	0.1645	0.1453	0.1453	0.1415	0.1530	0.1645	0.1721	0.1798	(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	0.2946	0.2907	0.2869	0.2678	0.2640	0.2448	0.2448	0.2410	0.2525	0.2640	0.2716	0.2793	(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			4.4700	0.7282	3.2549			(27)
GF			37.9700	0.0900	3.4173	75.0000	2847.7500	(28a)
Main	38.8100	6.6200	32.1900	0.1300	4.1847	9.0000	289.7100	(29a)
Total net area of external elements Aum(A, m2)			76.7800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	12.5339			(33)
Main dwelling								
Party Wall 1			27.2200	0.0000	0.0000	20.0000	544.4000	(32)
Party Ceiling			37.9700			30.0000	1139.1000	(32b)
Timber			50.4000			9.0000	453.6000	(32c)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			5274.5600	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							138.9139	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E2 Other lintels (including other steel lintels)	5.1000	0.1150	0.5865	
E3 Sill	5.1000	0.0170	0.0867	
E4 Jamb	10.8000	0.0940	1.0152	
E5 Ground floor (normal)	15.4000	0.0670	1.0318	
E7 Party floor between dwellings (in blocks of flats)	15.4000	0.0320	0.4928	
E16 Corner (normal)	12.6000	0.0680	0.8568	
E17 Corner (inverted - internal area greater than external area)	2.5200	-0.0290	-0.0731	
P1 Party wall - Ground floor	10.8000	0.0560	0.6048	
E18 Party wall between dwellings	2.5200	0.2400	0.6048	
E25 Staggered party wall between dwellings	5.0400	0.0560	0.2822	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.4886 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 18.0224 (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	8.7109	8.5978	8.4847	7.9191	7.8060	7.2405	7.2405	7.1274	7.4667	7.8060	8.0322	8.2585	(38)
Heat transfer coeff	26.7333	26.6202	26.5071	25.9415	25.8284	25.2629	25.2629	25.1498	25.4891	25.8284	26.0546	26.2809	(39)
Average = Sum(39)m / 12 =												25.9133	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7041	0.7011	0.6981	0.6832	0.6802	0.6653	0.6653	0.6624	0.6713	0.6802	0.6862	0.6921	(40)
HLP (average)												0.6825	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.3535 (42)
Hot water usage for mixer showers

46.9130	46.2079	45.1806	43.2150	41.7644	40.1467	39.2272	40.2468	41.3644	43.1013	45.1092	46.7332	(42a)

Hot water usage for baths

20.2973	19.9959	19.5714	18.7887	18.2026	17.5528	17.2017	17.6233	18.0822	18.7776	19.5764	20.2287	(42b)

Hot water usage for other uses

28.4911	27.4550	26.4190	25.3830	24.3469	23.3109	23.3109	24.3469	25.3830	26.4190	27.4550	28.4911	(42c)

Average daily hot water use (litres/day) 87.9720 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.7014	93.6589	91.1710	87.3866	84.3139	81.0104	79.7399	82.2170	84.8296	88.2979	92.1406	95.4530	(44)
Energy conte	151.5676	133.3690	140.1264	119.6279	113.5028	99.6117	96.4385	101.8018	104.6034	119.8195	131.2712	149.4563	(45)
Energy content (annual)											Total = Sum(45)m =	1461.1961	
Distribution loss (46)m = 0.15 x (45)m	22.7351	20.0053	21.0190	17.9442	17.0254	14.9418	14.4658	15.2703	15.6905	17.9729	19.6907	22.4185	(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

178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(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	178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(64)
										Total per year (kWh/year) = Sum(64)m =		1778.5271	(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

50.3962	44.3452	46.5920	39.7763	37.7397	33.1209	32.0658	33.8491	34.7806	39.8400	43.6477	49.6942	(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	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	15.4239	13.6994	11.1411	8.4345	6.3049	5.3229	5.7515	7.4761	10.0344	12.7409	14.8705	15.8526	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	173.8268	175.6306	171.0851	161.4084	149.1932	137.7127	130.0430	128.2392	132.7847	142.4614	154.6766	166.1571	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	(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)	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	(71)
Water heating gains (Table 5)	67.7369	65.9899	62.6237	55.2449	50.7254	46.0012	43.0992	45.4961	48.3064	53.5483	60.6218	66.7933	(72)
Total internal gains	328.5318	326.8640	316.3941	296.6319	277.7677	260.5810	250.4379	252.7556	262.6697	280.2949	301.7131	320.3472	(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	1.6600	10.6334	0.3000	0.0000	0.7700	4.0775	(74)
South	2.8100	46.7521	0.3000	0.0000	0.7700	30.3472	(78)

Solar gains	34.4247	57.4932	76.5512	92.8227	103.2145	102.4289	98.7471	90.8067	82.0549	62.8828	41.0019	29.6220	(83)
Total gains	362.9565	384.3573	392.9453	389.4546	380.9821	363.0099	349.1850	343.5623	344.7246	343.1777	342.7150	349.9692	(84)

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7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	54.8064	55.0393	55.2741	56.4791	56.7265	57.9964	57.9964	58.2572	57.4816	56.7265	56.2339	55.7499	
alpha	4.6538	4.6693	4.6849	4.7653	4.7818	4.8664	4.8664	4.8838	4.8321	4.7818	4.7489	4.7167	
util living area	0.8966	0.8653	0.8149	0.7274	0.6029	0.4405	0.3175	0.3356	0.5003	0.7131	0.8480	0.9057	(86)
MIT	20.3979	20.5220	20.6802	20.8467	20.9473	20.9911	20.9985	20.9981	20.9829	20.8803	20.6421	20.3781	(87)
Th 2	20.3372	20.3399	20.3425	20.3557	20.3583	20.3716	20.3716	20.3742	20.3663	20.3583	20.3530	20.3478	(88)
util rest of house	0.8841	0.8500	0.7947	0.6999	0.5671	0.3988	0.2725	0.2904	0.4572	0.6809	0.8291	0.8942	(89)
MIT 2	19.6489	19.8013	19.9931	20.1977	20.3096	20.3649	20.3707	20.3731	20.3527	20.2401	19.9605	19.6338	(90)
Living area fraction										fLA = Living area / (4) =		0.4772	(91)
MIT	20.0063	20.1452	20.3210	20.5074	20.6139	20.6637	20.6703	20.6714	20.6534	20.5456	20.2858	19.9890	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0063	20.1452	20.3210	20.5074	20.6139	20.6637	20.6703	20.6714	20.6534	20.5456	20.2858	19.9890	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8774	0.8452	0.7940	0.7066	0.5816	0.4183	0.2939	0.3119	0.4769	0.6905	0.8271	0.8873	(94)
Useful gains	318.4459	324.8700	312.0150	275.1839	221.5661	151.8488	102.6393	107.1708	164.4048	236.9802	283.4456	310.5269	(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	419.8826	405.8303	366.3541	301.1140	230.2325	153.1869	102.8286	107.4237	167.0410	256.8787	343.5509	414.9477	(97)
Space heating kWh	75.4689	54.4053	40.4283	18.6697	6.4478	0.0000	0.0000	0.0000	0.0000	14.8045	43.2758	77.6891	(98a)
Space heating requirement - total per year (kWh/year)												331.1894	
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	75.4689	54.4053	40.4283	18.6697	6.4478	0.0000	0.0000	0.0000	0.0000	14.8045	43.2758	77.6891	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												331.1894	
Space heating per m2											(98c) / (4) =	8.7224	(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	75.4689	54.4053	40.4283	18.6697	6.4478	0.0000	0.0000	0.0000	0.0000	14.8045	43.2758	77.6891	(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)	75.4689	54.4053	40.4283	18.6697	6.4478	0.0000	0.0000	0.0000	0.0000	14.8045	43.2758	77.6891	(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	178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(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	55.0102	48.5986	51.4846	44.9001	43.2806	38.7322	38.0223	39.6750	40.2704	45.2271	48.4880	54.3596	(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	11.3091	10.2147	11.3091	10.9443	11.3091	10.9443	11.3091	11.3091	10.9443	11.3091	10.9443	11.3091	(231)
Lighting	13.5004	10.8306	9.7517	7.1445	5.5186	4.5088	5.0343	6.5438	8.4997	11.1521	12.5962	13.8757	(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 1 331.1894 (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 548.0485 (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)	133.1557	(230a)
Total electricity for the above, kWh/year	133.1557	(231)
Electricity for lighting (calculated in Appendix L)	108.9563	(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	1121.3499	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	331.1894	16.4900	54.6131	(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)	548.0485	16.4900	90.3732	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	133.1557	16.4900	21.9574	(249)
Energy for lighting	108.9563	16.4900	17.9669	(250)
Additional standing charges			0.0000	(251)
Total energy cost			184.9106	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.8023	(257)
SAP value		86.9945	
SAP rating (Section 12)		87	(258)
SAP band		B	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	331.1894	0.1568	51.9241	(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)	548.0485	0.1411	77.3114	(264)
Space and water heating			129.2355	(265)
Pumps, fans and electric keep-hot	133.1557	0.1387	18.4703	(267)
Energy for lighting	108.9563	0.1443	15.7258	(268)
Total CO2, kg/year			163.4316	(272)
CO2 emissions per m2			4.3000	(273)
EI value			97.3605	
EI rating			97	(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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	37.9700 (1b)	x 2.3600 (2b)	= 89.6092	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	37.9700			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	89.6092	(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		3.6000	(17)
Infiltration rate		0.1800	(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) = 0.1530 (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	0.1759	0.1721	0.1721	0.1568	0.1607	0.1415	0.1339	0.1339	0.1415	0.1568	0.1568	0.1607	(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	0.2754	0.2716	0.2716	0.2563	0.2601	0.2410	0.2334	0.2334	0.2410	0.2563	0.2563	0.2601	(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								
Door			2.1500	0.7800	1.6770			(26)
Window			4.4700	0.7282	3.2549			(27)
GF			37.9700	0.0900	3.4173	75.0000	2847.7500	(28a)
Main	38.8100	6.6200	32.1900	0.1300	4.1847	9.0000	289.7100	(29a)
Total net area of external elements Aum(A, m2)			76.7800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		12.5339			(33)
Main dwelling								
Party Wall 1			27.2200	0.0000	0.0000	20.0000	544.4000	(32)
Party Ceiling			37.9700			30.0000	1139.1000	(32b)
Timber			50.4000			9.0000	453.6000	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 5274.5600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 138.9139 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.1000	0.1150	0.5865
E3 Sill	5.1000	0.0170	0.0867
E4 Jamb	10.8000	0.0940	1.0152
E5 Ground floor (normal)	15.4000	0.0670	1.0318
E7 Party floor between dwellings (in blocks of flats)	15.4000	0.0320	0.4928
E16 Corner (normal)	12.6000	0.0680	0.8568
E17 Corner (inverted - internal area greater than external area)	2.5200	-0.0290	-0.0731
P1 Party wall - Ground floor	10.8000	0.0560	0.6048
E18 Party wall between dwellings	2.5200	0.2400	0.6048
E25 Staggered party wall between dwellings	5.0400	0.0560	0.2822

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.4886 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 18.0224 (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	8.1453	8.0322	8.0322	7.5798	7.6929	7.1274	6.9011	6.9011	7.1274	7.5798	7.5798	7.6929	(38)
Heat transfer coeff	26.1678	26.0546	26.0546	25.6022	25.7153	25.1498	24.9236	24.9236	25.1498	25.6022	25.6022	25.7153	(39)
Average = Sum(39)m / 12 =												25.5551	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6892	0.6862	0.6862	0.6743	0.6773	0.6624	0.6564	0.6564	0.6624	0.6743	0.6743	0.6773	(40)
HLP (average)												0.6730	
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 1.3535 (42)
Hot water usage for mixer showers

46.9130	46.2079	45.1806	43.2150	41.7644	40.1467	39.2272	40.2468	41.3644	43.1013	45.1092	46.7332	(42a)

Hot water usage for baths

20.2973	19.9959	19.5714	18.7887	18.2026	17.5528	17.2017	17.6233	18.0822	18.7776	19.5764	20.2287	(42b)

Hot water usage for other uses

28.4911	27.4550	26.4190	25.3830	24.3469	23.3109	23.3109	24.3469	25.3830	26.4190	27.4550	28.4911	(42c)

Average daily hot water use (litres/day) 87.9720 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.7014	93.6589	91.1710	87.3866	84.3139	81.0104	79.7399	82.2170	84.8296	88.2979	92.1406	95.4530	(44)
Energy conte	151.5676	133.3690	140.1264	119.6279	113.5028	99.6117	96.4385	101.8018	104.6034	119.8195	131.2712	149.4563	(45)
Energy content (annual)										Total = Sum(45)m =		1461.1961	
Distribution loss (46)m = 0.15 x (45)m	22.7351	20.0053	21.0190	17.9442	17.0254	14.9418	14.4658	15.2703	15.6905	17.9729	19.6907	22.4185	(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

178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(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													
178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(64)
									Total per year (kWh/year) = Sum(64)m =		1778.5271	(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

	50.3962	44.3452	46.5920	39.7763	37.7397	33.1209	32.0658	33.8491	34.7806	39.8400	43.6477	49.6942	(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	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	15.4239	13.6994	11.1411	8.4345	6.3049	5.3229	5.7515	7.4761	10.0344	12.7409	14.8705	15.8526	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	173.8268	175.6306	171.0851	161.4084	149.1932	137.7127	130.0430	128.2392	132.7847	142.4614	154.6766	166.1571	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	(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)													
	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	(71)
Water heating gains (Table 5)													
	67.7369	65.9899	62.6237	55.2449	50.7254	46.0012	43.0992	45.4961	48.3064	53.5483	60.6218	66.7933	(72)
Total internal gains													
	328.5318	326.8640	316.3941	296.6319	277.7677	260.5810	250.4379	252.7556	262.6697	280.2949	301.7131	320.3472	(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	1.6600	8.9975	0.3000	0.0000	0.7700	3.4502	(74)
South	2.8100	39.5594	0.3000	0.0000	0.7700	25.6784	(78)

Solar gains	29.1286	51.1051	71.7667	88.4909	96.2260	97.3074	91.9550	83.2877	77.7738	58.1190	36.0320	26.8008	(83)
Total gains	357.6604	377.9691	388.1608	385.1229	373.9937	357.8884	342.3929	336.0432	340.4435	338.4139	337.7451	347.1481	(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	55.9909	56.2339	56.2339	57.2277	56.9760	58.2572	58.7860	58.7860	58.2572	57.2277	57.2277	56.9760	
alpha	4.7327	4.7489	4.7489	4.8152	4.7984	4.8838	4.9191	4.9191	4.8838	4.8152	4.8152	4.7984	
util living area													
	0.8896	0.8570	0.8087	0.7107	0.5767	0.4180	0.3195	0.3327	0.5002	0.7067	0.8374	0.8972	(86)
MIT	20.4584	20.5740	20.7064	20.8702	20.9596	20.9935	20.9986	20.9983	20.9837	20.8896	20.6846	20.4468	(87)
Th 2	20.3504	20.3530	20.3530	20.3636	20.3610	20.3742	20.3795	20.3795	20.3742	20.3636	20.3636	20.3610	(88)
util rest of house													
	0.8764	0.8410	0.7882	0.6823	0.5392	0.3756	0.2748	0.2873	0.4576	0.6739	0.8174	0.8849	(89)
MIT 2	19.7342	19.8757	20.0334	20.2315	20.3247	20.3695	20.3787	20.3785	20.3612	20.2553	20.0204	19.7292	(90)
Living area fraction										fLA = Living area / (4) =		0.4772	(91)
MIT	20.0798	20.2090	20.3546	20.5363	20.6277	20.6673	20.6745	20.6743	20.6583	20.5580	20.3374	20.0716	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0798	20.2090	20.3546	20.5363	20.6277	20.6673	20.6745	20.6743	20.6583	20.5580	20.3374	20.0716	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8705	0.8372	0.7882	0.6902	0.5551	0.3956	0.2961	0.3089	0.4771	0.6842	0.8166	0.8787	(94)
Useful gains	311.3320	316.4182	305.9558	265.7987	207.5867	141.5702	101.3711	103.8133	162.4356	231.5270	275.7897	305.0532	(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													
	402.4542	388.4482	355.7653	287.6738	214.1499	142.5307	101.5522	104.0382	164.9399	249.8256	328.6654	397.8573	(97)
Space heating kWh													
	67.7949	48.4042	37.0583	15.7501	4.8830	0.0000	0.0000	0.0000	0.0000	13.6142	38.0705	69.0462	(98a)
Space heating requirement - total per year (kWh/year)												294.6213	
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													
	67.7949	48.4042	37.0583	15.7501	4.8830	0.0000	0.0000	0.0000	0.0000	13.6142	38.0705	69.0462	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												294.6213	
Space heating per m2											(98c) / (4) =	7.7593	(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													
	67.7949	48.4042	37.0583	15.7501	4.8830	0.0000	0.0000	0.0000	0.0000	13.6142	38.0705	69.0462	(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)													
	67.7949	48.4042	37.0583	15.7501	4.8830	0.0000	0.0000	0.0000	0.0000	13.6142	38.0705	69.0462	(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

178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(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

	55.0102	48.5986	51.4846	44.9001	43.2806	38.7322	38.0223	39.6750	40.2704	45.2271	48.4880	54.3596	(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	11.3091	10.2147	11.3091	10.9443	11.3091	10.9443	11.3091	11.3091	10.9443	11.3091	10.9443	11.3091	(231)
Lighting	13.5004	10.8306	9.7517	7.1445	5.5186	4.5088	5.0343	6.5438	8.4997	11.1521	12.5962	13.8757	(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 1 294.6213 (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 548.0485 (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) 133.1557 (230a)
Total electricity for the above, kWh/year 133.1557 (231)
Electricity for lighting (calculated in Appendix L) 108.9563 (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 1084.7819 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	294.6213	28.4300	83.7608	(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)	548.0485	28.4300	155.8102	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	133.1557	28.4300	37.8562	(249)
Energy for lighting	108.9563	28.4300	30.9763	(250)
Additional standing charges			0.0000	(251)
Total energy cost			308.4035	(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	294.6213	0.1569	46.2167	(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)	548.0485	0.1411	77.3114	(264)
Space and water heating			123.5281	(265)
Pumps, fans and electric keep-hot	133.1557	0.1387	18.4703	(267)
Energy for lighting	108.9563	0.1443	15.7258	(268)
Total CO2, kg/year			157.7242	(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	294.6213	1.5807	465.7210	(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)	548.0485	1.5216	833.9227	(278)
Space and water heating			1299.6438	(279)
Pumps, fans and electric keep-hot	133.1557	1.5128	201.4379	(281)
Energy for lighting	108.9563	1.5338	167.1209	(282)
Total Primary energy kWh/year			1668.2025	(286)

SAP 10 EPC IMPROVEMENTS

001

Current energy efficiency rating: B 87
Current environmental impact rating: A 97

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

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

Typical annual savings | Energy efficiency | Environmental impact

Recommended measures
(none)

Total Savings £0 0.00 kg/m²

Potential energy efficiency rating: B 87
Potential environmental impact rating: A 97

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	£308	£308	£0
Space heating	£122	£122	£0
Water heating	£156	£156	£0
Lighting	£31	£31	£0
Total cost of fuels	£308	£308	£0
Total cost of uses	£309	£309	£0
Delivered energy	29 kWh/m²	29 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.2 tonnes	0.2 tonnes	0.0 tonnes
CO2 emissions per m²	4 kg/m²	4 kg/m²	0 kg/m²
Primary energy	44 kWh/m²	44 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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	37.9700	(1b)	x 2.3600	(2b) =	89.6092	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	37.9700					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	89.6092	(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		3.6000	(17)
Infiltration rate		0.1800	(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) =	0.1530	(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	0.1951	0.1913	0.1874	0.1683	0.1645	0.1453	0.1453	0.1415	0.1530	0.1645	0.1721	0.1798	(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	0.2946	0.2907	0.2869	0.2678	0.2640	0.2448	0.2448	0.2410	0.2525	0.2640	0.2716	0.2793	(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								
Door			2.1500	0.7800	1.6770			(26)
Window			4.4700	0.7282	3.2549			(27)
GF			37.9700	0.0900	3.4173	75.0000	2847.7500	(28a)
Main	38.8100	6.2200	32.1900	0.1300	4.1847	9.0000	289.7100	(29a)
Total net area of external elements Aum(A, m2)			76.7800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		12.5339			(33)
Main dwelling								
Party Wall 1			27.2200	0.0000	0.0000	20.0000	544.4000	(32)
Party Ceiling			37.9700			30.0000	1139.1000	(32b)
Timber			50.4000			9.0000	453.6000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	5274.5600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		138.9139 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.1000	0.1150	0.5865
E3 Sill	5.1000	0.0170	0.0867
E4 Jamb	10.8000	0.0940	1.0152
E5 Ground floor (normal)	15.4000	0.0670	1.0318
E7 Party floor between dwellings (in blocks of flats)	15.4000	0.0320	0.4928
E16 Corner (normal)	12.6000	0.0680	0.8568
E17 Corner (inverted - internal area greater than external area)	2.5200	-0.0290	-0.0731
P1 Party wall - Ground floor	10.8000	0.0560	0.6048
E18 Party wall between dwellings	2.5200	0.2400	0.6048
E25 Staggered party wall between dwellings	5.0400	0.0560	0.2822

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		5.4886 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	18.0224 (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	8.7109	8.5978	8.4847	7.9191	7.8060	7.2405	7.2405	7.1274	7.4667	7.8060	8.0322	8.2585	(38)
Heat transfer coeff	26.7333	26.6202	26.5071	25.9415	25.8284	25.2629	25.2629	25.1498	25.4891	25.8284	26.0546	26.2809	(39)
Average = Sum(39)m / 12 =												25.9133	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7041	0.7011	0.6981	0.6832	0.6802	0.6653	0.6653	0.6624	0.6713	0.6802	0.6862	0.6921	(40)
HLP (average)												0.6825	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.3535 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
46.9130	46.2079	45.1806	43.2150	41.7644	40.1467	39.2272	40.2468	41.3644	43.1013	45.1092	46.7332	(42a)

Hot water usage for baths

20.2973	19.9959	19.5714	18.7887	18.2026	17.5528	17.2017	17.6233	18.0822	18.7776	19.5764	20.2287	(42b)

Hot water usage for other uses

28.4911	27.4550	26.4190	25.3830	24.3469	23.3109	23.3109	24.3469	25.3830	26.4190	27.4550	28.4911	(42c)
Average daily hot water use (litres/day)												87.9720	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.7014	93.6589	91.1710	87.3866	84.3139	81.0104	79.7399	82.2170	84.8296	88.2979	92.1406	95.4530	(44)
Energy conte	151.5676	133.3690	140.1264	119.6279	113.5028	99.6117	96.4385	101.8018	104.6034	119.8195	131.2712	149.4563	(45)
Energy content (annual)										Total = Sum(45)m =		1461.1961	
Distribution loss (46)m = 0.15 x (45)m	22.7351	20.0053	21.0190	17.9442	17.0254	14.9418	14.4658	15.2703	15.6905	17.9729	19.6907	22.4185	(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	178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(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	178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(64)
										Total per year (kWh/year) = Sum(64)m =		1778.5271	(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	50.3962	44.3452	46.5920	39.7763	37.7397	33.1209	32.0658	33.8491	34.7806	39.8400	43.6477	49.6942	(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	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	15.4239	13.6994	11.1411	8.4345	6.3049	5.3229	5.7515	7.4761	10.0344	12.7409	14.8705	15.8526	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	173.8268	175.6306	171.0851	161.4084	149.1932	137.7127	130.0430	128.2392	132.7847	142.4614	154.6766	166.1571	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	(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)	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	(71)
Water heating gains (Table 5)	67.7369	65.9899	62.6237	55.2449	50.7254	46.0012	43.0992	45.4961	48.3064	53.5483	60.6218	66.7933	(72)

Total internal gains

	328.5318	326.8640	316.3941	296.6319	277.7677	260.5810	250.4379	252.7556	262.6697	280.2949	301.7131	320.3472 (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	1.6600	10.6334	0.3000	0.0000	0.7700	4.0775	(74)
South	2.8100	46.7521	0.3000	0.0000	0.7700	30.3472	(78)

Solar gains	34.4247	57.4932	76.5512	92.8227	103.2145	102.4289	98.7471	90.8067	82.0549	62.8828	41.0019	29.6220 (83)
Total gains	362.9565	384.3573	392.9453	389.4546	380.9821	363.0099	349.1850	343.5623	344.7246	343.1777	342.7150	349.9692 (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	54.8064	55.0393	55.2741	56.4791	56.7265	57.9964	57.9964	58.2572	57.4816	56.7265	56.2339	55.7499	
alpha	4.6538	4.6693	4.6849	4.7653	4.7818	4.8664	4.8664	4.8838	4.8321	4.7818	4.7489	4.7167	
util living area	0.8966	0.8653	0.8149	0.7274	0.6029	0.4405	0.3175	0.3356	0.5003	0.7131	0.8480	0.9057	(86)
MIT	20.3979	20.5220	20.6802	20.8467	20.9473	20.9911	20.9985	20.9981	20.9829	20.8803	20.6421	20.3781	(87)
Th 2	20.3372	20.3399	20.3425	20.3557	20.3583	20.3716	20.3716	20.3742	20.3663	20.3583	20.3530	20.3478	(88)
util rest of house	0.8841	0.8500	0.7947	0.6999	0.5671	0.3988	0.2725	0.2904	0.4572	0.6809	0.8291	0.8942	(89)
MIT 2	19.6489	19.8013	19.9931	20.1977	20.3096	20.3649	20.3707	20.3731	20.3527	20.2401	19.9605	19.6338	(90)
Living area fraction										fLA = Living area / (4) =		0.4772	(91)
MIT	20.0063	20.1452	20.3210	20.5074	20.6139	20.6637	20.6703	20.6714	20.6534	20.5456	20.2858	19.9890	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0063	20.1452	20.3210	20.5074	20.6139	20.6637	20.6703	20.6714	20.6534	20.5456	20.2858	19.9890	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8774	0.8452	0.7940	0.7066	0.5816	0.4183	0.2939	0.3119	0.4769	0.6905	0.8271	0.8873	(94)
Useful gains	318.4459	324.8700	312.0150	275.1839	221.5661	151.8488	102.6393	107.1708	164.4048	236.9802	283.4456	310.5269	(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	419.8826	405.8303	366.3541	301.1140	230.2325	153.1869	102.8286	107.4237	167.0410	256.8787	343.5509	414.9477	(97)
Space heating kWh	75.4689	54.4053	40.4283	18.6697	6.4478	0.0000	0.0000	0.0000	0.0000	14.8045	43.2758	77.6891	(98a)
Space heating requirement - total per year (kWh/year)												331.1894	
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	75.4689	54.4053	40.4283	18.6697	6.4478	0.0000	0.0000	0.0000	0.0000	14.8045	43.2758	77.6891	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												331.1894	
Space heating per m2										(98c) / (4) =		8.7224	(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	75.4689	54.4053	40.4283	18.6697	6.4478	0.0000	0.0000	0.0000	0.0000	14.8045	43.2758	77.6891	(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)	75.4689	54.4053	40.4283	18.6697	6.4478	0.0000	0.0000	0.0000	0.0000	14.8045	43.2758	77.6891	(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	178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(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	55.0102	48.5986	51.4846	44.9001	43.2806	38.7322	38.0223	39.6750	40.2704	45.2271	48.4880	54.3596	(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	11.3091	10.2147	11.3091	10.9443	11.3091	10.9443	11.3091	11.3091	10.9443	11.3091	10.9443	11.3091	(231)
Lighting	13.5004	10.8306	9.7517	7.1445	5.5186	4.5088	5.0343	6.5438	8.4997	11.1521	12.5962	13.8757	(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	331.1894	(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	548.0485	(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)	133.1557	(230a)
Total electricity for the above, kWh/year	133.1557	(231)
Electricity for lighting (calculated in Appendix L)	108.9563	(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	1121.3499	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	331.1894	16.4900	54.6131	(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)	548.0485	16.4900	90.3732	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	133.1557	16.4900	21.9574	(249)
Energy for lighting	108.9563	16.4900	17.9669	(250)
Additional standing charges			0.0000	(251)
Total energy cost			184.9106	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.8023	(257)
SAP value		86.9945	
SAP rating (Section 12)		87	(258)
SAP band		B	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	331.1894	0.1568	51.9241	(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)	548.0485	0.1411	77.3114	(264)
Space and water heating			129.2355	(265)
Pumps, fans and electric keep-hot	133.1557	0.1387	18.4703	(267)
Energy for lighting	108.9563	0.1443	15.7258	(268)
Total CO2, kg/year			163.4316	(272)
CO2 emissions per m2			4.3000	(273)
EI value			97.3605	
EI rating			97	(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		37.9700	(1b)	x 2.3600	(2b) =	89.6092	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	37.9700						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		89.6092	(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		3.6000	(17)
Infiltration rate		0.1800	(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) =	0.1530	(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	0.1759	0.1721	0.1721	0.1568	0.1607	0.1415	0.1339	0.1339	0.1415	0.1568	0.1568	0.1607	(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	0.2754	0.2716	0.2716	0.2563	0.2601	0.2410	0.2334	0.2334	0.2410	0.2563	0.2563	0.2601	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			2.1500	0.7800	1.6770			(26)
Window			4.4700	0.7282	3.2549			(27)
GF			37.9700	0.0900	3.4173	75.0000	2847.7500	(28a)
Main	38.8100	6.6200	32.1900	0.1300	4.1847	9.0000	289.7100	(29a)
Total net area of external elements Aum(A, m2)			76.7800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		12.5339			(33)
Main dwelling								
Party Wall 1			27.2200	0.0000	0.0000	20.0000	544.4000	(32)
Party Ceiling			37.9700			30.0000	1139.1000	(32b)
Timber			50.4000			9.0000	453.6000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	5274.5600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		138.9139 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.1000	0.1150	0.5865
E3 Sill	5.1000	0.0170	0.0867
E4 Jamb	10.8000	0.0940	1.0152
E5 Ground floor (normal)	15.4000	0.0670	1.0318
E7 Party floor between dwellings (in blocks of flats)	15.4000	0.0320	0.4928
E16 Corner (normal)	12.6000	0.0680	0.8568
E17 Corner (inverted - internal area greater than external area)	2.5200	-0.0290	-0.0731
P1 Party wall - Ground floor	10.8000	0.0560	0.6048
E18 Party wall between dwellings	2.5200	0.2400	0.6048
E25 Staggered party wall between dwellings	5.0400	0.0560	0.2822

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		5.4886 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	18.0224 (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	8.1453	8.0322	8.0322	7.5798	7.6929	7.1274	6.9011	6.9011	7.1274	7.5798	7.5798	7.6929	(38)
Heat transfer coeff	26.1678	26.0546	26.0546	25.6022	25.7153	25.1498	24.9236	24.9236	25.1498	25.6022	25.6022	25.7153	(39)
Average = Sum(39)m / 12 =												25.5551	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6892	0.6862	0.6862	0.6743	0.6773	0.6624	0.6564	0.6564	0.6624	0.6743	0.6743	0.6773	(40)
HLP (average)												0.6730	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.3535	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	46.9130	46.2079	45.1806	43.2150	41.7644	40.1467	39.2272	40.2468	41.3644	43.1013	45.1092	46.7332	(42a)
Hot water usage for baths	20.2973	19.9959	19.5714	18.7887	18.2026	17.5528	17.2017	17.6233	18.0822	18.7776	19.5764	20.2287	(42b)
Hot water usage for other uses	28.4911	27.4550	26.4190	25.3830	24.3469	23.3109	23.3109	24.3469	25.3830	26.4190	27.4550	28.4911	(42c)
Average daily hot water use (litres/day)												87.9720	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.7014	93.6589	91.1710	87.3866	84.3139	81.0104	79.7399	82.2170	84.8296	88.2979	92.1406	95.4530	(44)
Energy conte	151.5676	133.3690	140.1264	119.6279	113.5028	99.6117	96.4385	101.8018	104.6034	119.8195	131.2712	149.4563	(45)
Energy content (annual)										Total = Sum(45)m =		1461.1961	
Distribution loss (46)m = 0.15 x (45)m	22.7351	20.0053	21.0190	17.9442	17.0254	14.9418	14.4658	15.2703	15.6905	17.9729	19.6907	22.4185	(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

	178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077 (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

	178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077 (64)

Total per year (kWh/year) = Sum(64)m = 1778.5271 (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

	50.3962	44.3452	46.5920	39.7763	37.7397	33.1209	32.0658	33.8491	34.7806	39.8400	43.6477	49.6942 (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	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	(66)

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

	15.4239	13.6994	11.1411	8.4345	6.3049	5.3229	5.7515	7.4761	10.0344	12.7409	14.8705	15.8526	(67)

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

	173.8268	175.6306	171.0851	161.4084	149.1932	137.7127	130.0430	128.2392	132.7847	142.4614	154.6766	166.1571	(68)

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

	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	(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)

	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	(71)

Water heating gains (Table 5)

	67.7369	65.9899	62.6237	55.2449	50.7254	46.0012	43.0992	45.4961	48.3064	53.5483	60.6218	66.7933	(72)

Total internal gains

	328.5318	326.8640	316.3941	296.6319	277.7677	260.5810	250.4379	252.7556	262.6697	280.2949	301.7131	320.3472	(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	1.6600	8.9975	0.3000	0.0000	0.7700	3.4502	(74)
South	2.8100	39.5594	0.3000	0.0000	0.7700	25.6784	(78)

Solar gains	29.1286	51.1051	71.7667	88.4909	96.2260	97.3074	91.9550	83.2877	77.7738	58.1190	36.0320	26.8008	(83)
Total gains	357.6604	377.9691	388.1608	385.1229	373.9937	357.8884	342.3929	336.0432	340.4435	338.4139	337.7451	347.1481	(84)

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7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	55.9909	56.2339	56.2339	57.2277	56.9760	58.2572	58.7860	58.7860	58.2572	57.2277	57.2277	56.9760	
alpha	4.7327	4.7489	4.7489	4.8152	4.7984	4.8838	4.9191	4.9191	4.8838	4.8152	4.8152	4.7984	
util living area	0.8896	0.8570	0.8087	0.7107	0.5767	0.4180	0.3195	0.3327	0.5002	0.7067	0.8374	0.8972	(86)
MIT	20.4584	20.5740	20.7064	20.8702	20.9596	20.9935	20.9986	20.9983	20.9837	20.8896	20.6846	20.4468	(87)
Th 2	20.3504	20.3530	20.3530	20.3636	20.3610	20.3742	20.3795	20.3795	20.3742	20.3636	20.3636	20.3610	(88)
util rest of house	0.8764	0.8410	0.7882	0.6823	0.5392	0.3756	0.2748	0.2873	0.4576	0.6739	0.8174	0.8849	(89)
MIT 2	19.7342	19.8757	20.0334	20.2315	20.3247	20.3695	20.3787	20.3785	20.3612	20.2553	20.0204	19.7292	(90)
Living area fraction										fLA = Living area / (4) =		0.4772	(91)
MIT	20.0798	20.2090	20.3546	20.5363	20.6277	20.6673	20.6745	20.6743	20.6583	20.5580	20.3374	20.0716	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0798	20.2090	20.3546	20.5363	20.6277	20.6673	20.6745	20.6743	20.6583	20.5580	20.3374	20.0716	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8705	0.8372	0.7882	0.6902	0.5551	0.3956	0.2961	0.3089	0.4771	0.6842	0.8166	0.8787	(94)
Useful gains	311.3320	316.4182	305.9558	265.7987	207.5867	141.5702	101.3711	103.8133	162.4356	231.5270	275.7897	305.0532	(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

	402.4542	388.4482	355.7653	287.6738	214.1499	142.5307	101.5522	104.0382	164.9399	249.8256	328.6654	397.8573	(97)

Space heating kWh

	67.7949	48.4042	37.0583	15.7501	4.8830	0.0000	0.0000	0.0000	0.0000	13.6142	38.0705	69.0462	(98a)

Space heating requirement - total per year (kWh/year) 294.6213

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

	67.7949	48.4042	37.0583	15.7501	4.8830	0.0000	0.0000	0.0000	0.0000	13.6142	38.0705	69.0462	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 294.6213

Space heating per m2 (98c) / (4) = 7.7593 (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													
	67.7949	48.4042	37.0583	15.7501	4.8830	0.0000	0.0000	0.0000	0.0000	13.6142	38.0705	69.0462	(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)													
	67.7949	48.4042	37.0583	15.7501	4.8830	0.0000	0.0000	0.0000	0.0000	13.6142	38.0705	69.0462	(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													
	178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(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													
	55.0102	48.5986	51.4846	44.9001	43.2806	38.7322	38.0223	39.6750	40.2704	45.2271	48.4880	54.3596	(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	11.3091	10.2147	11.3091	10.9443	11.3091	10.9443	11.3091	11.3091	10.9443	11.3091	10.9443	11.3091	(231)
Lighting	13.5004	10.8306	9.7517	7.1445	5.5186	4.5088	5.0343	6.5438	8.4997	11.1521	12.5962	13.8757	(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												294.6213	(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												548.0485	(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)												133.1557	(230a)
Total electricity for the above, kWh/year												133.1557	(231)
Electricity for lighting (calculated in Appendix L)												108.9563	(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												1084.7819	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	294.6213	28.4300	83.7608	(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)	548.0485	28.4300	155.8102	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	133.1557	28.4300	37.8562	(249)
Energy for lighting	108.9563	28.4300	30.9763	(250)
Additional standing charges			0.0000	(251)
Total energy cost			308.4035	(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	294.6213	0.1569	46.2167	(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)	548.0485	0.1411	77.3114	(264)
Space and water heating			123.5281	(265)
Pumps, fans and electric keep-hot	133.1557	0.1387	18.4703	(267)
Energy for lighting	108.9563	0.1443	15.7258	(268)
Total CO2, kg/year			157.7242	(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	294.6213	1.5807	465.7210	(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)	548.0485	1.5216	833.9227	(278)
Space and water heating			1299.6438	(279)
Pumps, fans and electric keep-hot	133.1557	1.5128	201.4379	(281)
Energy for lighting	108.9563	1.5338	167.1209	(282)
Total Primary energy kWh/year			1668.2025	(286)