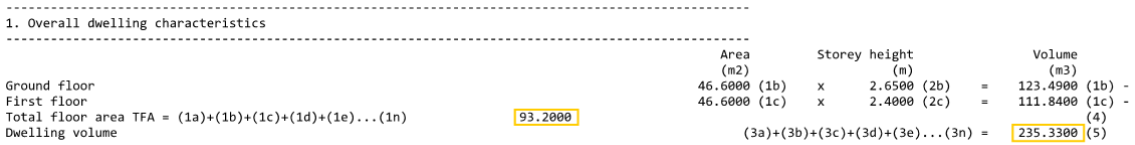
The following pages contain an example SAP calculation printout from Elmhurst's DesignSAP 10 software.

Key building characteristics from the printout that are required for Greater Manchester Combined Authority's SAP Conversion Tool have been highlighted in yellow boxes, like the examples below:



1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		46.6000 (1b)	x	2.6500 (2b)	=	123.4900 (1b)	-
First floor		46.6000 (1c)	x	2.4000 (2c)	=	111.8400 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.2000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	235.3300	(5)

SAP 10 software is designed to provide compliance calculations only. It is not intended to represent real-world performance. Raw SAP 10 calculation results are not suitable for assessing performance against Greater Manchester Combined Authority's net zero energy performance requirements for new buildings, as these are based on real-world performance.

The SAP Conversion Tool uses key building characteristics from a SAP 10 calculation to calculate more realistic energy performance, which can be used to assess performance against local net zero policy requirements. A comprehensive explanation of how this is achieved is available in the SAP Conversion Tool Methodology Report.

Full SAP Calculation Printout

Property Reference	SD - TANZ - HP - DEMO	**Issued on Date**	05/11/2025
Assessment Reference	Example SAP Calculation	**Prop Type Ref**	
Property	Part L 2021 - Insulation - HP, STREET RECORD, GMCA ARCHETYPE, MANCHESTER, GREATER MANCHESTER, M1 6EU		

SAP Rating	99 A	**DER**	-1.07	**TER**	10.80
Environmental	101 A	**% DER < TER**			109.91
CO_2 Emissions (t/year)	-0.08	**DFEE**	27.67	**TFEE**	36.50
Compliance Check	See BREL	**% DFEE < TFEE**			24.18
% DPER < TPER	89.70	**DPER**	5.80	**TPER**	56.32

Assessor Details	Ms. Caitlin Brown	**Assessor ID**	AX87-0001
Client			

CAUTION! Results should not be taken from this section

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	46.6000 (1b)	x	2.4000 (2b)	=	111.8400	(1b) - (3b)
First floor	46.6000 (1c)	x	2.6500 (2c)	=	123.4900	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.2000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	235.3300	(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		0.6000 (17)
Infiltration rate		0.0300 (18)
Number of sides sheltered		1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.0278 (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	0.0354	0.0347	0.0340	0.0305	0.0298	0.0264	0.0264	0.0257	0.0278	0.0298	0.0312	0.0326	(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) =	79.2000 (23c)

Effective ac	0.1394	0.1387	0.1380	0.1345	0.1338	0.1304	0.1304	0.1297	0.1317	0.1338	0.1352	0.1366	(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								
Entrance Door			2.1200	1.0000	2.1200			(26)
Window FF 0.40			4.6000	0.7752	3.5659			(27)
Window FF 0.48			5.2400	0.7752	4.0620			(27)
Window FF 0.52			3.0900	0.7752	2.3953			(27)
Window FF 0.53			0.7300	0.7752	0.5659			(27)
Window FF 0.70			0.3000	0.7752	0.2326			(27)
Ground Floor			46.6000	0.0900	4.1940	75.0000	3495.0000	(28a)
Wall - NE	30.7600	9.0600	21.7000	0.1100	2.3870	70.0000	1519.0000	(29a)
Wall - SW	30.7600	7.0200	23.7400	0.1100	2.6114	70.0000	1661.8000	(29a)
Wall - NW	38.6300		38.6300	0.1100	4.2493	70.0000	2704.1001	(29a)
Roof	46.6000		46.6000	0.0900	4.1940	9.0000	419.4000	(30)
Total net area of external elements Aum(A, m2)			193.3500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.5774			(33)
Main dwelling								

Wall - SE	38.6300	0.0000	0.0000	45.0000	1738.3500 (32)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 11537.6502 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 123.7945 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E3 Sill	10.6200	0.0500	0.5310
E4 Jamb	27.1800	0.0500	1.3590
E2 Other lintels (including other steel lintels)	10.6200	0.0500	0.5310
E5 Ground floor (normal)	19.8300	0.1600	3.1728
E10 Eaves (insulation at ceiling level)	12.1800	0.1000	1.2180
E12 Gable (insulation at ceiling level)	7.6500	0.1100	0.8415
E16 Corner (normal)	10.1000	0.0400	0.4040
E18 Party wall between dwellings	10.1000	0.0400	0.4040
P1 Party wall - Ground floor	7.6500	0.1300	0.9945
P4 Party wall - Roof (insulation at ceiling level)	7.6500	0.1000	0.7650

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.2208 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 40.7982 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	10.8242	10.7703	10.7164	10.4471	10.3932	10.1238	10.1238	10.0699	10.2316	10.3932	10.5009	10.6087	(38)
Heat transfer coeff	51.6224	51.5685	51.5146	51.2453	51.1914	50.9220	50.9220	50.8681	51.0298	51.1914	51.2991	51.4069	(39)

Average = Sum(39)m / 12 = 51.2318

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.5539	0.5533	0.5527	0.5498	0.5493	0.5464	0.5464	0.5458	0.5475	0.5493	0.5504	0.5516	(40)
HLP (average)												0.5497	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6670 (42)
Hot water usage for mixer showers

68.9372	67.9012	66.3916	63.5031	61.3715	58.9944	57.6433	59.1415	60.7838	63.3361	66.2866	68.6731	(42a)

Hot water usage for baths

29.7685	29.3264	28.7038	27.5559	26.6963	25.7432	25.2284	25.8466	26.5198	27.5396	28.7112	29.6678	(42b)

Hot water usage for other uses

41.9431	40.4179	38.8927	37.3675	35.8423	34.3171	34.3171	35.8423	37.3675	38.8927	40.4179	41.9431	(42c)

Average daily hot water use (litres/day) 129.2880 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	140.6488	137.6455	133.9881	128.4265	123.9102	119.0548	117.1888	120.8304	124.6711	129.7685	135.4157	140.2840	(44)
Energy conte	222.7533	196.0054	205.9347	175.8095	166.8069	146.3917	141.7297	149.6133	153.7319	176.0946	192.9245	219.6509	(45)
Energy content (annual)											Total = Sum(45)m =	2147.4464	
Distribution loss (46)m = 0.15 x (45)m	33.4130	29.4008	30.8902	26.3714	25.0210	21.9588	21.2595	22.4420	23.0598	26.4142	28.9387	32.9476	(46)
Water storage loss:													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.4000	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7560	(55)
Total storage loss	23.4360	21.1680	23.4360	22.6800	23.4360	22.6800	23.4360	23.4360	22.6800	23.4360	22.6800	23.4360	(56)
If cylinder contains dedicated solar storage	23.4360	21.1680	23.4360	22.6800	23.4360	22.6800	23.4360	23.4360	22.6800	23.4360	22.6800	23.4360	(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	269.4517	238.1846	252.6331	221.0015	213.5053	191.5837	188.4281	196.3117	198.9239	222.7930	238.1165	266.3493	(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	269.4517	238.1846	252.6331	221.0015	213.5053	191.5837	188.4281	196.3117	198.9239	222.7930	238.1165	266.3493	(64)
										Total per year (kWh/year) = Sum(64)m =		2697.2824	(64)
12Total per year (kWh/year)												2697	(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	111.4242	98.9151	105.8320	94.6103	92.8220	84.8288	84.4838	87.1051	87.2695	95.9102	100.3010	110.3926	(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	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	142.4430	157.7047	142.4430	147.1911	142.4430	147.1911	142.4430	142.4430	147.1911	142.4430	147.1911	142.4430	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	244.8433	247.3840	240.9815	227.3513	210.1457	193.9748	183.1717	180.6310	187.0335	200.6636	217.8693	234.0402	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	(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)	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	(71)
Water heating gains (Table 5)	149.7637	147.1952	142.2473	131.4031	124.7608	117.8178	113.5535	117.0768	121.2076	128.9115	139.3069	148.3772	(72)
Total internal gains	600.0555	615.2894	588.6773	568.9511	540.3550	521.9893	502.1738	503.1563	518.4377	535.0237	567.3728	587.8659	(73)

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6. Solar gains

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

Northeast	4.6000	11.2829	0.5500	0.4000	0.7700	7.9129 (75)
Northeast	1.3100	11.2829	0.5500	0.4800	0.7700	2.7042 (75)
Southwest	3.9300	36.7938	0.5500	0.4800	0.7700	26.4548 (79)
Southwest	3.0900	36.7938	0.5500	0.5200	0.7700	22.5337 (79)
Northeast	0.7300	11.2829	0.5500	0.5300	0.7700	1.6639 (75)
Northeast	0.3000	11.2829	0.5500	0.7000	0.7700	0.9031 (75)

Solar gains	62.1726	110.2820	162.5247	220.8728	265.1918	271.1019	258.1136	223.8529	182.5423	125.0214	75.2659	52.6907 (83)
Total gains	662.2281	725.5715	751.2020	789.8239	805.5469	793.0912	760.2874	727.0092	700.9800	660.0451	642.6387	640.5566 (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	62.0836	62.1484	62.2134	62.5405	62.6063	62.9375	62.9375	63.0041	62.8046	62.6063	62.4748	62.3438	
alpha	5.1389	5.1432	5.1476	5.1694	5.1738	5.1958	5.1958	5.2003	5.1870	5.1738	5.1650	5.1563	
util living area	0.9255	0.8880	0.8350	0.7228	0.5745	0.4085	0.2943	0.3213	0.4952	0.7368	0.8780	0.9342	(86)
Living	20.4178	20.5656	20.7201	20.8849	20.9688	20.9956	20.9994	20.9990	20.9883	20.8921	20.6519	20.3799	
Non living	20.1676	20.3123	20.4626	20.6209	20.6985	20.7233	20.7264	20.7264	20.7168	20.6292	20.3989	20.1315	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.7022	20.5656	20.7201	20.8849	20.9688	20.9956	20.9994	20.9990	20.9883	20.8921	20.6519	20.4666	(87)
Th 2	20.7231	20.7233	20.7236	20.7251	20.7254	20.7268	20.7268	20.7271	20.7262	20.7254	20.7248	20.7242	(88)
util rest of house	0.9212	0.8822	0.8267	0.7108	0.5593	0.3915	0.2762	0.3023	0.4766	0.7230	0.8708	0.9304	(89)
MIT 2	20.4389	20.3123	20.4626	20.6209	20.6985	20.7233	20.7264	20.7264	20.7168	20.6292	20.3989	20.2144	(90)
Living area fraction										fLA = Living area / (4) =		0.3433	(91)
MIT	20.5293	20.3992	20.5510	20.7115	20.7913	20.8168	20.8201	20.8200	20.8100	20.7194	20.4858	20.3010	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.5293	20.3992	20.5510	20.7115	20.7913	20.8168	20.8201	20.8200	20.8100	20.7194	20.4858	20.3010	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9181	0.8749	0.8214	0.7102	0.5630	0.3971	0.2824	0.3088	0.4823	0.7227	0.8642	0.9240	(94)
Useful gains	607.9758	634.7825	617.0428	560.9681	453.4957	314.9560	214.6785	224.4884	338.0988	477.0158	555.3911	591.8842	(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	837.7956	799.2733	723.8342	605.2844	465.3973	316.5716	214.8957	224.8360	342.4104	518.0285	686.6798	827.7026	(97)
Space heating kWh	170.9859	110.5379	79.4528	31.9077	8.8548	0.0000	0.0000	0.0000	0.0000	30.5135	94.5278	175.4489	(98a)
Space heating requirement - total per year (kWh/year)												702.2293	
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	170.9859	110.5379	79.4528	31.9077	8.8548	0.0000	0.0000	0.0000	0.0000	30.5135	94.5278	175.4489	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												702.2293	
Space heating per m2											(98c) / (4) =	7.5346	(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 %)	308.7634 (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	170.9859	110.5379	79.4528	31.9077	8.8548	0.0000	0.0000	0.0000	0.0000	30.5135	94.5278	175.4489	(98)
Space heating efficiency (main heating system 1)	308.7634	308.7634	308.7634	308.7634	308.7634	0.0000	0.0000	0.0000	0.0000	308.7634	308.7634	308.7634	(210)
Space heating fuel (main heating system)	55.3776	35.8002	25.7326	10.3340	2.8678	0.0000	0.0000	0.0000	0.0000	9.8825	30.6150	56.8231	(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	269.4517	238.1846	252.6331	221.0015	213.5053	191.5837	188.4281	196.3117	198.9239	222.7930	238.1165	266.3493	(64)
Efficiency of water heater												188.3395	(216)
(217)m	188.3395	188.3395	188.3395	188.3395	188.3395	188.3395	188.3395	188.3395	188.3395	188.3395	188.3395	188.3395	(217)
Fuel for water heating, kWh/month	143.0670	126.4656	134.1371	117.3421	113.3620	101.7225	100.0470	104.2329	105.6199	118.2933	126.4294	141.4198	(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	16.0935	14.5360	16.0935	15.5743	16.0935	15.5743	16.0935	16.0935	15.5743	16.0935	15.5743	16.0935	(231)
Lighting	33.6186	26.9701	24.2836	17.7912	13.7424	11.2277	12.5363	16.2952	21.1658	27.7707	31.3670	34.5530	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-54.8533	-79.1952	-116.3436	-131.0853	-140.9493	-131.1500	-129.4295	-122.6410	-108.7800	-90.4737	-60.5665	-47.0852	(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	-28.4607	-63.6302	-135.3495	-215.8102	-293.9468	-298.5260	-293.7156	-243.2205	-171.3580	-94.5656	-39.0441	-22.0809	(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	227.4328	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	188.3395	
Water heating fuel used	1432.1386	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.1000, SFP = 0.6600)		
mechanical ventilation fans (SFP = 0.6600)	189.4877	(230a)
Total electricity for the above, kWh/year	189.4877	(231)
Electricity for lighting (calculated in Appendix L)	271.3217	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-3112.2606	(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	-991.8798	(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 (high-rate cost)	181.9462	0.1651	30.0319	(261)
Space heating - main system 1 (low-rate cost)	45.4866	0.1386	6.3031	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating - high rate cost	1002.4970	0.1479	148.3064	(264)
Water heating - low rate cost	429.6416	0.1242	53.3443	(264)
Space and water heating			237.9858	(265)
Pumps, fans and electric keep-hot	189.4877	0.1432	26.2928	(267)
Energy for lighting	271.3217	0.1490	40.4323	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1212.5526	0.1388	-168.2702	
PV Unit electricity exported	-1899.7080	0.1245	-236.4252	
Total			-404.6954	(269)
Total CO2, kg/year			-99.9845	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			-1.0700	(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 (high-rate cost)	181.9462	1.2921	293.8545	(275)
Space heating - main system 1 (low-rate cost)	45.4866	1.5021	68.3236	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating - high rate cost	1002.4970	1.5530	1556.8657	(278)
Water heating - low rate cost	429.6416	1.4443	620.5443	(278)
Space and water heating			2539.5881	(279)
Pumps, fans and electric keep-hot	189.4877	1.5335	286.6864	(281)
Energy for lighting	271.3217	1.5547	421.8360	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1212.5526	1.5173	-1839.8289	
PV Unit electricity exported	-1899.7080	0.4568	-867.7366	
Total			-2707.5655	(283)
Total Primary energy kWh/year			540.5450	(286)
Dwelling Primary energy Rate (DPER)			5.8000	(287)

CAUTION! Results should not be taken from this section

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

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		46.6000	(1b) x	2.4000	(2b) =	111.8400	(1b) - (3b)
First floor		46.6000	(1c) x	2.6500	(2c) =	123.4900	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.2000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		235.3300	(5)

2. Ventilation rate

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

Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1275 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3775 (18)
Number of sides sheltered		1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3492 (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	0.4452	0.4365	0.4277	0.3841	0.3754	0.3317	0.3317	0.3230	0.3492	0.3754	0.3928	0.4103	(22b)
Effective ac	0.5991	0.5952	0.5915	0.5738	0.5704	0.5550	0.5550	0.5522	0.5610	0.5704	0.5772	0.5842	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.1200	1.0000	2.1200			(26)
TER Opening Type			13.9600	1.1450	15.9847			(27)
Ground Floor			46.6000	0.1300	6.0580			(28a)
Wall - NE	30.7600	9.0600	21.7000	0.1800	3.9060			(29a)
Wall - SW	30.7600	7.0200	23.7400	0.1800	4.2732			(29a)
Wall - NW	38.6300		38.6300	0.1800	6.9534			(29a)
Roof	46.6000		46.6000	0.1100	5.1260			(30)
Total net area of external elements Aum(A, m2)			193.3500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		44.4213			(33)
Main dwelling								
Wall - SE			38.6300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	123.7945 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E3 Sill	10.6200	0.0500	0.5310
E4 Jamb	27.1800	0.0500	1.3590
E2 Other lintels (including other steel lintels)	10.6200	0.0500	0.5310
E5 Ground floor (normal)	19.8300	0.1600	3.1728
E10 Eaves (insulation at ceiling level)	12.1800	0.0600	0.7308
E12 Gable (insulation at ceiling level)	7.6500	0.0600	0.4590
E16 Corner (normal)	10.1000	0.0900	0.9090
E18 Party wall between dwellings	10.1000	0.0600	0.6060
P1 Party wall - Ground floor	7.6500	0.0800	0.6120
P4 Party wall - Roof (insulation at ceiling level)	7.6500	0.1200	0.9180

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		9.8286 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	54.2499 (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	46.5253	46.2264	45.9335	44.5577	44.3002	43.1019	43.1019	42.8800	43.5635	44.3002	44.8210	45.3654	(38)
Heat transfer coeff	100.7752	100.4764	100.1834	98.8076	98.5502	97.3519	97.3519	97.1300	97.8134	98.5502	99.0709	99.6153	(39)
Average = Sum(39)m / 12 =												98.8064	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0813	1.0781	1.0749	1.0602	1.0574	1.0445	1.0445	1.0422	1.0495	1.0574	1.0630	1.0688	(40)
HLP (average)												1.0602	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.6670 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
68.9372	67.9012	66.3916	63.5031	61.3715	58.9944	57.6433	59.1415	60.7838	63.3361	66.2866	68.6731	(42a)

Hot water usage for baths

29.7685	29.3264	28.7038	27.5559	26.6963	25.7432	25.2284	25.8466	26.5198	27.5396	28.7112	29.6678	(42b)

Hot water usage for other uses

41.9431	40.4179	38.8927	37.3675	35.8423	34.3171	34.3171	35.8423	37.3675	38.8927	40.4179	41.9431	(42c)

Average daily hot water use (litres/day)	129.2880 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	140.6488	137.6455	133.9881	128.4265	123.9102	119.0548	117.1888	120.8304	124.6711	129.7685	135.4157	140.2840	(44)
Energy conte	222.7533	196.0054	205.9347	175.8095	166.8069	146.3917	141.7297	149.6133	153.7319	176.0946	192.9245	219.6509	(45)
Energy content (annual)										Total = Sum(45)m =		2147.4464	

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

33.4130	29.4008	30.8902	26.3714	25.0210	21.9588	21.2595	22.4420	23.0598	26.4142	28.9387	32.9476	(46)

Water storage loss:	
Store volume	200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	1.6525 (48)
Temperature factor from Table 2b	0.5400 (49)
Enter (49) or (54) in (55)	0.8924 (55)

Total storage loss

27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637	(56)

If cylinder contains dedicated solar storage

27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637	(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

273.6794	242.0031	256.8608	225.0928	217.7330	195.6750	192.6557	200.5394	203.0152	227.0206	242.2078	270.5770	(62)
WWHRS -31.5152	-27.8723	-29.1863	-24.1674	-22.5231	-19.2732	-18.0656	-19.2109	-19.9408	-23.5080	-26.6317	-30.9316	(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													
242.1642	214.1308	227.6745	200.9254	195.2099	176.4018	174.5902	181.3285	183.0744	203.5126	215.5760	239.6454	(64)

Total per year (kWh/year) = Sum(64)m = 2454.2336 (64)

12Total per year (kWh/year) 2454 (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

114.8063	101.9700	109.2141	97.8833	96.2042	88.1019	87.8660	90.4873	90.5425	99.2923	103.5740	113.7748	(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	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	130.5856	144.5770	130.5856	134.9385	130.5856	134.9385	130.5856	130.5856	134.9385	130.5856	134.9385	130.5856	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	244.8433	247.3840	240.9815	227.3513	210.1457	193.9748	183.1717	180.6310	187.0335	200.6636	217.8693	234.0402	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	(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)													
	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	(71)
Water heating gains (Table 5)													
	154.3096	151.7410	146.7932	135.9490	129.3067	122.3637	118.0994	121.6227	125.7535	133.4574	143.8528	152.9231	(72)
Total internal gains													
	595.7441	609.7075	584.3659	564.2444	536.0436	514.2826	494.8623	495.8449	510.7310	530.7122	562.6661	583.5544	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	6.9400	11.2829	0.6300	0.7000	0.7700	23.9306	(75)
Southwest	7.0200	36.7938	0.6300	0.7000	0.7700	78.9376	(79)

Solar gains	102.8682	183.1714	271.7365	372.0839	449.0667	460.0277	437.6029	377.9981	306.1449	208.1361	124.6600	87.0971	(83)
Total gains	698.6123	792.8789	856.1024	936.3283	985.1102	974.3103	932.4652	873.8429	816.8759	738.8484	687.3261	670.6515	(84)

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7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	31.8025	31.8971	31.9903	32.4358	32.5205	32.9208	32.9208	32.9960	32.7655	32.5205	32.3496	32.1728	
alpha	3.1202	3.1265	3.1327	3.1624	3.1680	3.1947	3.1947	3.1997	3.1844	3.1680	3.1566	3.1449	
util living area													
	0.9613	0.9421	0.9117	0.8432	0.7320	0.5742	0.4379	0.4802	0.6841	0.8670	0.9409	0.9654	(86)
MIT	19.0230	19.2963	19.6835	20.2010	20.6151	20.8743	20.9603	20.9463	20.7708	20.2432	19.5641	18.9865	(87)
Th 2	20.0162	20.0188	20.0214	20.0335	20.0358	20.0464	20.0464	20.0483	20.0423	20.0358	20.0312	20.0264	(88)
util rest of house													
	0.9550	0.9328	0.8972	0.8170	0.6872	0.5057	0.3509	0.3918	0.6201	0.8392	0.9298	0.9598	(89)
MIT 2	17.7169	18.0616	18.5472	19.1876	19.6705	19.9512	20.0253	20.0179	19.8530	19.2527	18.4116	17.6773	(90)
Living area fraction									fLA = Living area / (4) =			0.3433	(91)
MIT	18.1654	18.4856	18.9373	19.5355	19.9948	20.2681	20.3463	20.3366	20.1681	19.5928	18.8073	18.1268	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1654	18.4856	18.9373	19.5355	19.9948	20.2681	20.3463	20.3366	20.1681	19.5928	18.8073	18.1268	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9390	0.9142	0.8775	0.8016	0.6851	0.5224	0.3790	0.4195	0.6291	0.8241	0.9119	0.9448	(94)
Useful gains	655.9919	724.8448	751.1882	750.5875	674.9164	508.9411	353.4248	366.6001	513.9337	608.9102	626.7571	633.6043	(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													
	1397.2870	1365.0269	1246.0163	1050.8715	817.4579	551.8021	364.7122	382.3653	593.5465	886.2434	1159.8530	1387.3277	(97)
Space heating kWh													
	551.5236	430.2024	368.1521	216.2045	106.0509	0.0000	0.0000	0.0000	0.0000	206.3359	383.8290	560.7702	(98a)
Space heating requirement - total per year (kWh/year)												2823.0686	
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													
	551.5236	430.2024	368.1521	216.2045	106.0509	0.0000	0.0000	0.0000	0.0000	206.3359	383.8290	560.7702	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2823.0686	
Space heating per m2											(98c) / (4) =	30.2904	(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													
	551.5236	430.2024	368.1521	216.2045	106.0509	0.0000	0.0000	0.0000	0.0000	206.3359	383.8290	560.7702	(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)													
	597.5337	466.0914	398.8647	234.2410	114.8980	0.0000	0.0000	0.0000	0.0000	223.5492	415.8494	607.5517	(211)
Space heating efficiency (main heating system 2)													

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating												
Water heating requirement												
	242.1642	214.1308	227.6745	200.9254	195.2099	176.4018	174.5902	181.3285	183.0744	203.5126	215.5760	239.6454 (64)
Efficiency of water heater												79.8000 (216)
(217)m	85.8459	85.5919	85.1312	84.2245	82.7524	79.8000	79.8000	79.8000	79.8000	84.0907	85.3385	85.8994 (217)
Fuel for water heating, kWh/month												
	282.0916	250.1763	267.4395	238.5594	235.8962	221.0549	218.7847	227.2286	229.4165	242.0156	252.6129	278.9837 (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	27.1331	21.7672	19.5989	14.3590	11.0913	9.0617	10.1179	13.1516	17.0826	22.4133	25.3158	27.8872 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-42.9407	-60.1977	-86.0351	-96.1474	-103.1600	-96.0746	-94.8601	-89.7939	-80.7910	-68.5387	-47.0772	-37.1626 (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	-25.2908	-53.0890	-105.3227	-157.9172	-208.5635	-209.4971	-207.0561	-175.4431	-128.7498	-75.8596	-33.7438	-20.0100 (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	3058.5792 (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	2944.2600 (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)	218.9798 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-2303.3217 (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	4004.4973 (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	3058.5792	0.2100	642.3016	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2944.2600	0.2100	618.2946	(264)
Space and water heating			1260.5962	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	218.9798	0.1443	31.6056	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-902.7790	0.1347	-121.6198	
PV Unit electricity exported	-1400.5427	0.1259	-176.3892	
Total			-298.0090	(269)
Total CO2, kg/year			1006.1220	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.8000	(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	3058.5792	1.1300	3456.1945	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2944.2600	1.1300	3327.0137	(278)
Space and water heating			6783.2082	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	218.9798	1.5338	335.8785	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-902.7790	1.4979	-1352.2719	
PV Unit electricity exported	-1400.5427	0.4623	-647.4725	
Total			-1999.7444	(283)
Total Primary energy kWh/year			5249.4432	(286)
Target Primary Energy Rate (TPER)			56.3200	(287)

CAUTION! Results should not be taken from this section

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	46.6000 (1b)	x	2.4000 (2b)	=	111.8400 (1b) - (3b)	
First floor	46.6000 (1c)	x	2.6500 (2c)	=	123.4900 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.2000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	235.3300	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1275	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		0.6000	(17)
Infiltration rate		0.1575	(18)
Number of sides sheltered		1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1457	(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	0.1857	0.1821	0.1784	0.1602	0.1566	0.1384	0.1384	0.1347	0.1457	0.1566	0.1639	0.1712	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5172	0.5166	0.5159	0.5128	0.5123	0.5096	0.5096	0.5091	0.5106	0.5123	0.5134	0.5146	(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								
Entrance Door			2.1200	1.0000	2.1200			(26)
Window FF 0.40			4.6000	0.7752	3.5659			(27)
Window FF 0.48			5.2400	0.7752	4.0620			(27)
Window FF 0.52			3.0900	0.7752	2.3953			(27)
Window FF 0.53			0.7300	0.7752	0.5659			(27)
Window FF 0.70			0.3000	0.7752	0.2326			(27)
Ground Floor			46.6000	0.0900	4.1940	75.0000	3495.0000	(28a)
Wall - NE	30.7600	9.0600	21.7000	0.1100	2.3870	70.0000	1519.0000	(29a)
Wall - SW	30.7600	7.0200	23.7400	0.1100	2.6114	70.0000	1661.8000	(29a)
Wall - NW	38.6300		38.6300	0.1100	4.2493	70.0000	2704.1001	(29a)
Roof	46.6000		46.6000	0.0900	4.1940	9.0000	419.4000	(30)
Total net area of external elements Aum(A, m2)			193.3500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.5774			(33)
Main dwelling								
Wall - SE			38.6300	0.0000	0.0000	45.0000	1738.3500	(32)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11537.6502 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		123.7945 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element				
E3 Sill	10.6200	0.0500	0.5310	
E4 Jamb	27.1800	0.0500	1.3590	
E2 Other lintels (including other steel lintels)	10.6200	0.0500	0.5310	
E5 Ground floor (normal)	19.8300	0.1600	3.1728	
E10 Eaves (insulation at ceiling level)	12.1800	0.1000	1.2180	
E12 Gable (insulation at ceiling level)	7.6500	0.1100	0.8415	
E16 Corner (normal)	10.1000	0.0400	0.4040	
E18 Party wall between dwellings	10.1000	0.0400	0.4040	
P1 Party wall - Ground floor	7.6500	0.1300	0.9945	
P4 Party wall - Roof (insulation at ceiling level)	7.6500	0.1000	0.7650	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			10.2208	(36)
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =		40.7982	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.1689	40.1169	40.0659	39.8264	39.7816	39.5731	39.5731	39.5344	39.6534	39.7816	39.8723	39.9670	(38)
Heat transfer coeff	80.9671	80.9151	80.8641	80.6246	80.5798	80.3713	80.3713	80.3326	80.4516	80.5798	80.6705	80.7652	(39)
Average = Sum(39)m / 12 =												80.6244	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8687	0.8682	0.8676	0.8651	0.8646	0.8624	0.8624	0.8619	0.8632	0.8646	0.8656	0.8666	(40)
HLP (average)												0.8651	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.6670 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													

	29.7685	29.3264	28.7038	27.5559	26.6963	25.7432	25.2284	25.8466	26.5198	27.5396	28.7112	29.6678	(42b)
Hot water usage for other uses													
	41.9431	40.4179	38.8927	37.3675	35.8423	34.3171	34.3171	35.8423	37.3675	38.8927	40.4179	41.9431	(42c)
Average daily hot water use (litres/day)												65.7302	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	71.7116	69.7443	67.5965	64.9234	62.5386	60.0603	59.5455	61.6889	63.8873	66.4323	69.1291	71.6110	(44)
Energy conte	113.5736	99.3149	103.8933	88.8769	84.1890	73.8512	72.0151	76.3838	78.7794	90.1480	98.4871	112.1255	(45)
Energy content (annual)										Total = Sum(45)m =		1091.6379	
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													
	96.5376	84.4177	88.3093	75.5453	71.5607	62.7735	61.2129	64.9262	66.9625	76.6258	83.7140	95.3066	(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													
	96.5376	84.4177	88.3093	75.5453	71.5607	62.7735	61.2129	64.9262	66.9625	76.6258	83.7140	95.3066	(64)
										Total per year (kWh/year) = Sum(64)m =		927.8922	(64)
12Total per year (kWh/year)												928	(64)
Electric shower(s)													
	55.2072	49.1901	53.7137	51.2583	52.2202	49.8130	51.4734	52.2202	51.2583	53.7137	52.7037	55.2072	(64a)
						Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =						627.9788	(64a)
Heat gains from water heating, kWh/month													
	37.9362	33.4019	35.5058	31.7009	30.9452	28.1466	28.1716	29.2866	29.5552	32.5849	34.1044	37.6285	(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	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	142.4430	157.7047	142.4430	147.1911	142.4430	147.1911	142.4430	142.4430	147.1911	142.4430	147.1911	142.4430	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	244.8433	247.3840	240.9815	227.3513	210.1457	193.9748	183.1717	180.6310	187.0335	200.6636	217.8693	234.0402	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	(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)													
	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	(71)
Water heating gains (Table 5)													
	50.9895	49.7053	47.7228	44.0290	41.5930	39.0925	37.8650	39.3637	41.0489	43.7969	47.3672	50.5759	(72)
Total internal gains													
	501.2813	517.7996	494.1528	481.5770	457.1873	443.2640	426.4852	425.4432	438.2790	449.9091	475.4332	490.0646	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	4.6000	11.2829	0.5500	0.4000	0.7700	7.9129	(75)
Northeast	1.3100	11.2829	0.5500	0.4800	0.7700	2.7042	(75)
Southwest	3.9300	36.7938	0.5500	0.4800	0.7700	26.4548	(79)
Southwest	3.0900	36.7938	0.5500	0.5200	0.7700	22.5337	(79)
Northeast	0.7300	11.2829	0.5500	0.5300	0.7700	1.6639	(75)
Northeast	0.3000	11.2829	0.5500	0.7000	0.7700	0.9031	(75)

Solar gains	62.1726	110.2820	162.5247	220.8728	265.1918	271.1019	258.1136	223.8529	182.5423	125.0214	75.2659	52.6907	(83)
Total gains	563.4539	628.0816	656.6775	702.4498	722.3791	714.3659	684.5988	649.2961	620.8213	574.9305	550.6990	542.7553	(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	39.5828	39.6082	39.6332	39.7509	39.7730	39.8762	39.8762	39.8954	39.8364	39.7730	39.7283	39.6817	
alpha	3.6389	3.6405	3.6422	3.6501	3.6515	3.6584	3.6584	3.6597	3.6558	3.6515	3.6486	3.6454	
util living area													
	0.9754	0.9624	0.9429	0.8922	0.7992	0.6427	0.4932	0.5355	0.7393	0.9041	0.9605	0.9784	(86)
MIT	19.3208	19.5386	19.8417	20.2692	20.6394	20.8841	20.9665	20.9543	20.7985	20.3332	19.7592	19.2708	(87)
Th 2	20.1941	20.1946	20.1951	20.1973	20.1977	20.1996	20.1996	20.2000	20.1989	20.1977	20.1969	20.1960	(88)
util rest of house													
	0.9715	0.9564	0.9335	0.8736	0.7635	0.5813	0.4120	0.4539	0.6850	0.8839	0.9533	0.9750	(89)
MIT 2	18.6468	18.8618	19.1601	19.5747	19.9187	20.1267	20.1843	20.1779	20.0618	19.6420	19.0835	18.5989	(90)
Living area fraction										fLA = Living area / (4) =		0.3433	(91)
MIT	18.8782	19.0942	19.3941	19.8131	20.1661	20.3868	20.4529	20.4445	20.3147	19.8793	19.3155	18.8296	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8782	19.0942	19.3941	19.8131	20.1661	20.3868	20.4529	20.4445	20.3147	19.8793	19.3155	18.8296	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9634	0.9464	0.9222	0.8634	0.7620	0.5964	0.4384	0.4797	0.6935	0.8745	0.9434	0.9674	(94)
Useful gains	542.8134	594.4153	605.5749	606.5282	550.4602	426.0396	300.1155	311.4881	430.5228	502.7879	519.5434	525.0641	(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													

	1180.3571	1148.5246	1042.6708	879.8682	682.1997	465.0908	309.6616	324.9017	499.9852	747.7241	985.4305	1181.5624	(97)
Space heating kWh													
	474.3325	372.3614	325.1994	196.8048	98.0142	0.0000	0.0000	0.0000	0.0000	182.2325	335.4387	488.4347	(98a)
Space heating requirement - total per year (kWh/year)												2472.8183	
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													
	474.3325	372.3614	325.1994	196.8048	98.0142	0.0000	0.0000	0.0000	0.0000	182.2325	335.4387	488.4347	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2472.8183	
Space heating per m2											(98c) / (4) =	26.5324	(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	755.4899	594.7474	610.5281	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7902	0.8591	0.8332	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	596.9846	510.9413	508.6845	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	764.9528	733.4237	695.1233	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	120.9371	165.5269	138.7104	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	30.2343	41.3817	34.6776	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												106.2936	(107)
Energy for space heating												26.5324	(99)
Energy for space cooling												1.1405	(108)
Total												27.6729	(109)
Fabric Energy Efficiency (DFEE)												27.7	(109)

CAUTION! Results should not be taken from this section

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	46.6000	(1b)	x 2.4000	(2b) =	111.8400	(1b) - (3b)
First floor	46.6000	(1c)	x 2.6500	(2c) =	123.4900	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.2000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		235.3300	(5)

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2. Ventilation rate

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1275	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3775	(18)
Number of sides sheltered		1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3492	(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													
	0.4452	0.4365	0.4277	0.3841	0.3754	0.3317	0.3317	0.3230	0.3492	0.3754	0.3928	0.4103	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5991	0.5952	0.5915	0.5738	0.5704	0.5550	0.5550	0.5522	0.5610	0.5704	0.5772	0.5842	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.1200	1.0000	2.1200			(26)
TER Opening Type			13.9600	1.1450	15.9847			(27)
Ground Floor			46.6000	0.1300	6.0580			(28a)

Wall - NE	30.7600	9.0600	21.7000	0.1800	3.9060	(29a)
Wall - SW	30.7600	7.0200	23.7400	0.1800	4.2732	(29a)
Wall - NW	38.6300		38.6300	0.1800	6.9534	(29a)
Roof	46.6000		46.6000	0.1100	5.1260	(30)
Total net area of external elements Aum(A, m2)			193.3500			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		44.4213	(33)
Main dwelling						
Wall - SE			38.6300	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 123.7945 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E3 Sill	10.6200	0.0500	0.5310
E4 Jamb	27.1800	0.0500	1.3590
E2 Other lintels (including other steel lintels)	10.6200	0.0500	0.5310
E5 Ground floor (normal)	19.8300	0.1600	3.1728
E10 Eaves (insulation at ceiling level)	12.1800	0.0600	0.7308
E12 Gable (insulation at ceiling level)	7.6500	0.0600	0.4590
E16 Corner (normal)	10.1000	0.0900	0.9090
E18 Party wall between dwellings	10.1000	0.0600	0.6060
P1 Party wall - Ground floor	7.6500	0.0800	0.6120
P4 Party wall - Roof (insulation at ceiling level)	7.6500	0.1200	0.9180

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.8286 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 54.2499 (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	46.5253	46.2264	45.9335	44.5577	44.3002	43.1019	43.1019	42.8800	43.5635	44.3002	44.8210	45.3654	(38)
Heat transfer coeff	100.7752	100.4764	100.1834	98.8076	98.5502	97.3519	97.3519	97.1300	97.8134	98.5502	99.0709	99.6153	(39)
Average = Sum(39)m / 12 =												98.8064	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0813	1.0781	1.0749	1.0602	1.0574	1.0445	1.0445	1.0422	1.0495	1.0574	1.0630	1.0688	(40)
HLP (average)												1.0602	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6670 (42)

Hot water usage for mixer showers

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

Hot water usage for baths

29.7685	29.3264	28.7038	27.5559	26.6963	25.7432	25.2284	25.8466	26.5198	27.5396	28.7112	29.6678	(42b)

Hot water usage for other uses

41.9431	40.4179	38.8927	37.3675	35.8423	34.3171	34.3171	35.8423	37.3675	38.8927	40.4179	41.9431	(42c)

Average daily hot water use (litres/day) 65.7302 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	71.7116	69.7443	67.5965	64.9234	62.5386	60.0603	59.5455	61.6889	63.8873	66.4323	69.1291	71.6110	(44)
Energy conte	113.5736	99.3149	103.8933	88.8769	84.1890	73.8512	72.0151	76.3838	78.7794	90.1480	98.4871	112.1255	(45)
Energy content (annual)										Total = Sum(45)m =		1091.6379	
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	96.5376	84.4177	88.3093	75.5453	71.5607	62.7735	61.2129	64.9262	66.9625	76.6258	83.7140	95.3066	(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	96.5376	84.4177	88.3093	75.5453	71.5607	62.7735	61.2129	64.9262	66.9625	76.6258	83.7140	95.3066	(64)
										Total per year (kWh/year) = Sum(64)m =		927.8922	(64)
12Total per year (kWh/year)												928	(64)
Electric shower(s)	55.2072	49.1901	53.7137	51.2583	52.2202	49.8130	51.4734	52.2202	51.2583	53.7137	52.7037	55.2072	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												627.9788	(64a)
Heat gains from water heating, kWh/month	37.9362	33.4019	35.5058	31.7009	30.9452	28.1466	28.1716	29.2866	29.5552	32.5849	34.1044	37.6285	(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	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	130.5856	144.5770	130.5856	134.9385	130.5856	134.9385	130.5856	130.5856	134.9385	130.5856	134.9385	130.5856	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	244.8433	247.3840	240.9815	227.3513	210.1457	193.9748	183.1717	180.6310	187.0335	200.6636	217.8693	234.0402	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	(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)	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	(71)
Water heating gains (Table 5)	50.9895	49.7053	47.7228	44.0290	41.5930	39.0925	37.8650	39.3637	41.0489	43.7969	47.3672	50.5759	(72)
Total internal gains	489.4240	504.6718	482.2955	469.3244	445.3299	431.0114	414.6279	413.5859	426.0264	438.0517	463.1806	478.2072	(73)

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6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains

	m2	Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	factor Table 6d	W	
Northeast	6.9400	11.2829	0.6300	0.7000	0.7700	23.9306	(75)
Southwest	7.0200	36.7938	0.6300	0.7000	0.7700	78.9376	(79)

Solar gains	102.8682	183.1714	271.7365	372.0839	449.0667	460.0277	437.6029	377.9981	306.1449	208.1361	124.6600	87.0971	(83)
Total gains	592.2922	687.8432	754.0320	841.4083	894.3966	891.0391	852.2308	791.5840	732.1713	646.1878	587.8405	565.3043	(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	31.8025	31.8971	31.9903	32.4358	32.5205	32.9208	32.9208	32.9960	32.7655	32.5205	32.3496	32.1728	
alpha	3.1202	3.1265	3.1327	3.1624	3.1680	3.1947	3.1947	3.1997	3.1844	3.1680	3.1566	3.1449	
util living area	0.9747	0.9591	0.9339	0.8731	0.7693	0.6129	0.4732	0.5211	0.7292	0.8996	0.9598	0.9779	(86)
MIT	18.8388	19.1256	19.5341	20.0930	20.5501	20.8479	20.9505	20.9321	20.7216	20.1264	19.4020	18.8008	(87)
Th 2	20.0162	20.0188	20.0214	20.0335	20.0358	20.0464	20.0464	20.0483	20.0423	20.0358	20.0312	20.0264	(88)
util rest of house	0.9704	0.9522	0.9224	0.8502	0.7268	0.5433	0.3813	0.4281	0.6672	0.8766	0.9518	0.9741	(89)
MIT 2	18.0437	18.3280	18.7304	19.2765	19.6982	19.9552	20.0255	20.0177	19.8592	19.3201	18.6126	18.0133	(90)
Living area fraction									fLA = Living area / (4) =			0.3433	(91)
MIT	18.3167	18.6019	19.0063	19.5568	19.9907	20.2617	20.3431	20.3317	20.1553	19.5969	18.8837	18.2837	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3167	18.6019	19.0063	19.5568	19.9907	20.2617	20.3431	20.3317	20.1553	19.5969	18.8837	18.2837	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9603	0.9394	0.9075	0.8371	0.7247	0.5599	0.4109	0.4570	0.6752	0.8641	0.9396	0.9649	(94)
Useful gains	568.7961	646.1435	684.3022	704.3555	648.1323	498.8892	350.1729	361.7536	494.3485	558.3695	552.3266	545.4895	(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	1412.5362	1376.7131	1252.9281	1052.9758	817.0490	551.1789	364.3951	381.8812	592.2883	886.6490	1167.4182	1402.9522	(97)
Space heating kWh	627.7426	490.9427	423.0577	251.0066	125.6740	0.0000	0.0000	0.0000	0.0000	244.2400	442.8660	637.9523	(98a)
Space heating requirement - total per year (kWh/year)												3243.4819	
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	627.7426	490.9427	423.0577	251.0066	125.6740	0.0000	0.0000	0.0000	0.0000	244.2400	442.8660	637.9523	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3243.4819	
Space heating per m2										(98c) / (4) =		34.8013	(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	915.1076	720.4039	738.1877	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7887	0.8522	0.8217	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	721.7852	613.8989	606.6036	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	984.7376	942.0954	873.8358	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	189.3257	244.1782	198.8208	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	47.3314	61.0445	49.7052	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												158.0812	(107)
Energy for space heating												34.8013	(99)
Energy for space cooling												1.6961	(108)
Total												36.4975	(109)
Fabric Energy Efficiency (TFEE)												36.5	(109)

CAUTION! Results should not be taken from this section

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

1. Overall dwelling characteristics

	Area		Storey height		Volume	
	(m2)		(m)		(m3)	
Main dwelling						
Ground floor	46.6000	(1b) x	2.4000	(2b) =	111.8400	(1b) - (3b)
First floor	46.6000	(1c) x	2.6500	(2c) =	123.4900	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.2000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		235.3300	(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		0.6000	(17)
Infiltration rate		0.0300	(18)
Number of sides sheltered		1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.0278	(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	0.0354	0.0347	0.0340	0.0305	0.0298	0.0264	0.0264	0.0257	0.0278	0.0298	0.0312	0.0326	(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) =	79.2000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.1394	0.1387	0.1380	0.1345	0.1338	0.1304	0.1304	0.1297	0.1317	0.1338	0.1352	0.1366	(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								
Entrance Door			2.1200	1.0000	2.1200			(26)
Window FF 0.40			4.6000	0.7752	3.5659			(27)
Window FF 0.48			5.2400	0.7752	4.0620			(27)
Window FF 0.52			3.0900	0.7752	2.3953			(27)
Window FF 0.53			0.7300	0.7752	0.5659			(27)
Window FF 0.70			0.3000	0.7752	0.2326			(27)
Ground Floor			46.6000	0.0900	4.1940	75.0000	3495.0000	(28a)
Wall - NE	30.7600	9.0600	21.7000	0.1100	2.3870	70.0000	1519.0000	(29a)
Wall - SW	30.7600	7.0200	23.7400	0.1100	2.6114	70.0000	1661.8000	(29a)
Wall - NW	38.6300		38.6300	0.1100	4.2493	70.0000	2704.1001	(29a)
Roof	46.6000		46.6000	0.0900	4.1940	9.0000	419.4000	(30)
Total net area of external elements Aum(A, m2)			193.3500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.5774			(33)
Main dwelling								
Wall - SE			38.6300	0.0000	0.0000	45.0000	1738.3500	(32)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11537.6502 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		123.7945 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E3 Sill	10.6200	0.0500	0.5310
E4 Jamb	27.1800	0.0500	1.3590
E2 Other lintels (including other steel lintels)	10.6200	0.0500	0.5310
E5 Ground floor (normal)	19.8300	0.1600	3.1728
E10 Eaves (insulation at ceiling level)	12.1800	0.1000	1.2180
E12 Gable (insulation at ceiling level)	7.6500	0.1100	0.8415
E16 Corner (normal)	10.1000	0.0400	0.4040
E18 Party wall between dwellings	10.1000	0.0400	0.4040
P1 Party wall - Ground floor	7.6500	0.1300	0.9945
P4 Party wall - Roof (insulation at ceiling level)	7.6500	0.1000	0.7650

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		10.2208 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	40.7982 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	10.8242	10.7703	10.7164	10.4471	10.3932	10.1238	10.1238	10.0699	10.2316	10.3932	10.5009	10.6087	(38)
Heat transfer coeff	51.6224	51.5685	51.5146	51.2453	51.1914	50.9220	50.9220	50.8681	51.0298	51.1914	51.2991	51.4069	(39)
Average = Sum(39)m / 12 =												51.2318	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.5539	0.5533	0.5527	0.5498	0.5493	0.5464	0.5464	0.5458	0.5475	0.5493	0.5504	0.5516	(40)
HLP (average)												0.5497	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6670	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
68.9372	67.9012	66.3916	63.5031	61.3715	58.9944	57.6433	59.1415	60.7838	63.3361	66.2866	68.6731	(42a)

Hot water usage for baths

29.7685	29.3264	28.7038	27.5559	26.6963	25.7432	25.2284	25.8466	26.5198	27.5396	28.7112	29.6678	(42b)

Hot water usage for other uses

41.9431	40.4179	38.8927	37.3675	35.8423	34.3171	34.3171	35.8423	37.3675	38.8927	40.4179	41.9431	(42c)

Average daily hot water use (litres/day)	129.2880	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	140.6488	137.6455	133.9881	128.4265	123.9102	119.0548	117.1888	120.8304	124.6711	129.7685	135.4157	140.2840	(44)
Energy conte	222.7533	196.0054	205.9347	175.8095	166.8069	146.3917	141.7297	149.6133	153.7319	176.0946	192.9245	219.6509	(45)
Energy content (annual)										Total = Sum(45)m =		2147.4464	

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

33.4130	29.4008	30.8902	26.3714	25.0210	21.9588	21.2595	22.4420	23.0598	26.4142	28.9387	32.9476	(46)

Water storage loss:

Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.4000	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7560	(55)
Total storage loss	23.4360	21.1680	23.4360	22.6800	23.4360	22.6800	23.4360	23.4360	22.6800	23.4360	22.6800	23.4360	(56)
If cylinder contains dedicated solar storage	23.4360	21.1680	23.4360	22.6800	23.4360	22.6800	23.4360	23.4360	22.6800	23.4360	22.6800	23.4360	(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	269.4517	238.1846	252.6331	221.0015	213.5053	191.5837	188.4281	196.3117	198.9239	222.7930	238.1165	266.3493	(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	269.4517	238.1846	252.6331	221.0015	213.5053	191.5837	188.4281	196.3117	198.9239	222.7930	238.1165	266.3493	(64)
									Total per year (kWh/year) = Sum(64)m =			2697.2824	(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	111.4242	98.9151	105.8320	94.6103	92.8220	84.8288	84.4838	87.1051	87.2695	95.9102	100.3010	110.3926	(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	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	38.4084	34.1140	27.7434	21.0035	15.7004	13.2549	14.3224	18.6168	24.9874	31.7273	37.0304	39.4759	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	365.4377	369.2298	359.6739	339.3303	313.6503	289.5147	273.3906	269.5985	279.1544	299.4980	325.1780	349.3137	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	(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)	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	(71)
Water heating gains (Table 5)	149.7637	147.1952	142.2473	131.4031	124.7608	117.8178	113.5535	117.0768	121.2076	128.9115	139.3069	148.3772	(72)
Total internal gains	660.6198	657.5490	636.6745	598.7470	561.1214	527.5974	508.2765	512.3021	532.3595	567.1468	608.5254	644.1767	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	4.6000	11.2829	0.5500	0.4000	0.7700	7.9129	(75)
Northeast	1.3100	11.2829	0.5500	0.4800	0.7700	2.7042	(75)
Southwest	3.9300	36.7938	0.5500	0.4800	0.7700	26.4548	(79)
Southwest	3.0900	36.7938	0.5500	0.5200	0.7700	22.5337	(79)
Northeast	0.7300	11.2829	0.5500	0.5300	0.7700	1.6639	(75)
Northeast	0.3000	11.2829	0.5500	0.7000	0.7700	0.9031	(75)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	62.1726	110.2820	162.5247	220.8728	265.1918	271.1019	258.1136	223.8529	182.5423	125.0214	75.2659	52.6907	(83)
Total gains	722.7924	767.8310	799.1992	819.6198	826.3133	798.6993	766.3901	736.1550	714.9018	692.1682	683.7913	696.8675	(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	62.0836	62.1484	62.2134	62.5405	62.6063	62.9375	62.9375	63.0041	62.8046	62.6063	62.4748	62.3438	
alpha	5.1389	5.1432	5.1476	5.1694	5.1738	5.1958	5.1958	5.2003	5.1870	5.1738	5.1650	5.1563	
util living area	0.9012	0.8681	0.8078	0.7035	0.5616	0.4057	0.2920	0.3173	0.4861	0.7122	0.8548	0.9129	(86)
Living	20.5077	20.6175	20.7630	20.8983	20.9718	20.9957	20.9994	20.9990	20.9892	20.9078	20.6993	20.4681	
Non living	20.2554	20.3625	20.5034	20.6333	20.7012	20.7234	20.7264	20.7264	20.7176	20.6434	20.4444	20.2178	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.7482	20.6175	20.7630	20.8983	20.9718	20.9957	20.9994	20.9990	20.9892	20.9078	20.6993	20.5425	(87)
Th 2	20.7231	20.7233	20.7236	20.7251	20.7254	20.7268	20.7268	20.7271	20.7262	20.7254	20.7248	20.7242	(88)
util rest of house	0.8960	0.8616	0.7989	0.6915	0.5466	0.3888	0.2740	0.2986	0.4678	0.6982	0.8468	0.9081	(89)
MIT 2	20.4838	20.3625	20.5034	20.6333	20.7012	20.7234	20.7264	20.7264	20.7176	20.6434	20.4444	20.2886	(90)
Living area fraction									fLA = Living area / (4) =			0.3433	(91)
MIT	20.5746	20.4500	20.5926	20.7243	20.7941	20.8169	20.8201	20.8200	20.8108	20.7342	20.5319	20.3758	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.5746	20.4500	20.5926	20.7243	20.7941	20.8169	20.8201	20.8200	20.8108	20.7342	20.5319	20.3758	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8931	0.8548	0.7946	0.6914	0.5504	0.3944	0.2801	0.3050	0.4735	0.6987	0.8410	0.9018	(94)
Useful gains	645.5006	656.3652	635.0504	566.7050	454.7852	315.0130	214.6877	224.5109	338.4898	483.6190	575.0568	628.4199	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	840.1326	801.8921	725.9731	605.9379	465.5390	316.5778	214.8967	224.8384	342.4528	518.7825	689.0454	831.5466	(97)
Space heating kWh	144.8062	97.7940	67.6465	28.2477	8.0008	0.0000	0.0000	0.0000	0.0000	26.1616	82.0718	151.1263	(98a)
Space heating requirement - total per year (kWh/year)												605.8549	

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

144.8062	97.7940	67.6465	28.2477	8.0008	0.0000	0.0000	0.0000	0.0000	26.1616	82.0718	151.1263	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 605.8549

Space heating per m2 (98c) / (4) = 6.5006 (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 %) 308.7634 (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													
	144.8062	97.7940	67.6465	28.2477	8.0008	0.0000	0.0000	0.0000	0.0000	26.1616	82.0718	151.1263	(98)
Space heating efficiency (main heating system 1)													
	308.7634	308.7634	308.7634	308.7634	308.7634	0.0000	0.0000	0.0000	0.0000	308.7634	308.7634	308.7634	(210)
Space heating fuel (main heating system)													
	46.8988	31.6728	21.9088	9.1486	2.5913	0.0000	0.0000	0.0000	0.0000	8.4730	26.5808	48.9456	(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													
	269.4517	238.1846	252.6331	221.0015	213.5053	191.5837	188.4281	196.3117	198.9239	222.7930	238.1165	266.3493	(64)
Efficiency of water heater												188.3395	(216)
(217)m	188.3395	188.3395	188.3395	188.3395	188.3395	188.3395	188.3395	188.3395	188.3395	188.3395	188.3395	188.3395	(217)
Fuel for water heating, kWh/month													
	143.0670	126.4656	134.1371	117.3421	113.3620	101.7225	100.0470	104.2329	105.6199	118.2933	126.4294	141.4198	(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	16.0935	14.5360	16.0935	15.5743	16.0935	15.5743	16.0935	16.0935	15.5743	16.0935	15.5743	16.0935	(231)
Lighting	33.6186	26.9701	24.2836	17.7912	13.7424	11.2277	12.5363	16.2952	21.1658	27.7707	31.3670	34.5530	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-54.6876	-79.0080	-116.0238	-130.9248	-140.8998	-131.1500	-129.4295	-122.6410	-108.7800	-90.3741	-60.4451	-46.9608	(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	-28.6264	-63.8173	-135.6693	-215.9707	-293.9963	-298.5260	-293.7156	-243.2205	-171.3580	-94.6651	-39.1655	-22.2053	(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 1 196.2198 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 188.3395

Water heating fuel used 1432.1386 (219)

Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.1000, SFP = 0.6600)

mechanical ventilation fans (SFP = 0.6600) 189.4877 (230a)

Total electricity for the above, kWh/year 189.4877 (231)

Electricity for lighting (calculated in Appendix L) 271.3217 (232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation -3112.2606 (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 -1023.0928 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1 (high-rate cost)	156.9758	17.5600	30.7673	(240)
Space heating - main system 1 (low-rate cost)	39.2440	0.0940	3.6889	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (electric off-peak tariff)				
High-rate fraction			0.7000	(243)
Low-rate fraction			0.3000	(244)
High-rate cost	1002.4970	19.6000	196.4894	(245)
Low-rate cost	429.6416	9.4000	40.3863	(246)
Energy for instantaneous electric shower(s)	0.0000	18.5800	0.0000	(247a)
Pumps, fans and electric keep-hot (0.90*19.60 + 0.10*9.40)	189.4877	18.5800	31.5345	(249)
Energy for lighting (0.90*19.60 + 0.10*9.40)	271.3217	18.5800	50.4116	(250)
Additional standing charges			7.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1211.3248	18.5800	-225.0641	
PV Unit electricity exported	-1900.9359	5.5900	-106.2623	
Total			-331.3265	(252)
Total energy cost			28.9516	(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] =	0.0754 (257)
SAP value		98.7775
SAP rating (Section 12)		99 (258)
SAP band		A

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1 (high-rate cost)	156.9758	0.1650	25.9032	(261)
Space heating - main system 1 (low-rate cost)	39.2440	0.1385	5.4367	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating - high rate cost	1002.4970	0.1479	148.3064	(264)
Water heating - low rate cost	429.6416	0.1242	53.3443	(264)
Space and water heating			232.9906	(265)
Pumps, fans and electric keep-hot	189.4877	0.1432	26.2928	(267)
Energy for lighting	271.3217	0.1490	40.4323	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1211.3248	0.1388	-168.0765	
PV Unit electricity exported	-1900.9359	0.1245	-236.6389	
Total			-404.7154	(269)
Total CO2, kg/year			-104.9997	(272)
CO2 emissions per m2			-1.1300	(273)
EI value			101.0181	
EI rating			101	(274)
EI band			A	

CAUTION! Results should only be taken from this section for the EPC Costs

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	46.6000 (1b)	x	2.4000 (2b)	=	111.8400	(1b) - (3b)
First floor	46.6000 (1c)	x	2.6500 (2c)	=	123.4900	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.2000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	235.3300	(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		0.6000	(17)
Infiltration rate		0.0300	(18)
Number of sides sheltered		1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.0278	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.2000	4.2000	3.8000	4.0000	3.4000	3.3000	3.3000	3.4000	3.8000	3.8000	3.9000	(22)
Wind factor	1.0750	1.0500	1.0500	0.9500	1.0000	0.8500	0.8250	0.8250	0.8500	0.9500	0.9500	0.9750	(22a)
Adj infilt rate	0.0298	0.0291	0.0291	0.0264	0.0278	0.0236	0.0229	0.0229	0.0236	0.0264	0.0264	0.0271	(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) =	79.2000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.1338	0.1331	0.1331	0.1304	0.1317	0.1276	0.1269	0.1269	0.1276	0.1304	0.1304	0.1311	(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								
Entrance Door			2.1200	1.0000	2.1200			(26)
Window FF 0.40			4.6000	0.7752	3.5659			(27)

Window FF 0.48			5.2400	0.7752	4.0620			(27)
Window FF 0.52			3.0900	0.7752	2.3953			(27)
Window FF 0.53			0.7300	0.7752	0.5659			(27)
Window FF 0.70			0.3000	0.7752	0.2326			(27)
Ground Floor			46.6000	0.0900	4.1940	75.0000	3495.0000	(28a)
Wall - NE	30.7600	9.0600	21.7000	0.1100	2.3870	70.0000	1519.0000	(29a)
Wall - SW	30.7600	7.0200	23.7400	0.1100	2.6114	70.0000	1661.8000	(29a)
Wall - NW	38.6300		38.6300	0.1100	4.2493	70.0000	2704.1001	(29a)
Roof	46.6000		46.6000	0.0900	4.1940	9.0000	419.4000	(30)
Total net area of external elements Aum(A, m2)			193.3500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.5774			(33)
Main dwelling								
Wall - SE			38.6300	0.0000	0.0000	45.0000	1738.3500	(32)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11537.6502 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		123.7945 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E3 Sill	10.6200	0.0500	0.5310
E4 Jamb	27.1800	0.0500	1.3590
E2 Other lintels (including other steel lintels)	10.6200	0.0500	0.5310
E5 Ground floor (normal)	19.8300	0.1600	3.1728
E10 Eaves (insulation at ceiling level)	12.1800	0.1000	1.2180
E12 Gable (insulation at ceiling level)	7.6500	0.1100	0.8415
E16 Corner (normal)	10.1000	0.0400	0.4040
E18 Party wall between dwellings	10.1000	0.0400	0.4040
P1 Party wall - Ground floor	7.6500	0.1300	0.9945
P4 Party wall - Roof (insulation at ceiling level)	7.6500	0.1000	0.7650

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		10.2208 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	40.7982 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	10.3932	10.3393	10.3393	10.1238	10.2316	9.9083	9.8544	9.8544	9.9083	10.1238	10.1238	10.1777	(38)
Heat transfer coeff	51.1914	51.1375	51.1375	50.9220	51.0298	50.7065	50.6526	50.6526	50.7065	50.9220	50.9220	50.9759	(39)
Average = Sum(39)m / 12 =												50.9130	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.5493	0.5487	0.5487	0.5464	0.5475	0.5441	0.5435	0.5435	0.5441	0.5464	0.5464	0.5470	(40)
HLP (average)												0.5463	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6670	(42)
Hot water usage for mixer showers	68.9372	67.9012	66.3916	63.5031	61.3715	58.9944	57.6433	59.1415	60.7838	63.3361	66.2866	68.6731	(42a)
Hot water usage for baths	29.7685	29.3264	28.7038	27.5559	26.6963	25.7432	25.2284	25.8466	26.5198	27.5396	28.7112	29.6678	(42b)
Hot water usage for other uses	41.9431	40.4179	38.8927	37.3675	35.8423	34.3171	34.3171	35.8423	37.3675	38.8927	40.4179	41.9431	(42c)
Average daily hot water use (litres/day)												129.2880	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	140.6488	137.6455	133.9881	128.4265	123.9102	119.0548	117.1888	120.8304	124.6711	129.7685	135.4157	140.2840	(44)
Energy conte	222.7533	196.0054	205.9347	175.8095	166.8069	146.3917	141.7297	149.6133	153.7319	176.0946	192.9245	219.6509	(45)
Energy content (annual)										Total = Sum(45)m =		2147.4464	
Distribution loss (46)m = 0.15 x (45)m	33.4130	29.4008	30.8902	26.3714	25.0210	21.9588	21.2595	22.4420	23.0598	26.4142	28.9387	32.9476	(46)
Water storage loss:													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.4000	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7560	(55)
Total storage loss	23.4360	21.1680	23.4360	22.6800	23.4360	22.6800	23.4360	23.4360	22.6800	23.4360	22.6800	23.4360	(56)
If cylinder contains dedicated solar storage	23.4360	21.1680	23.4360	22.6800	23.4360	22.6800	23.4360	23.4360	22.6800	23.4360	22.6800	23.4360	(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	269.4517	238.1846	252.6331	221.0015	213.5053	191.5837	188.4281	196.3117	198.9239	222.7930	238.1165	266.3493	(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	269.4517	238.1846	252.6331	221.0015	213.5053	191.5837	188.4281	196.3117	198.9239	222.7930	238.1165	266.3493	(64)
										Total per year (kWh/year) = Sum(64)m =		2697.2824	(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	111.4242	98.9151	105.8320	94.6103	92.8220	84.8288	84.4838	87.1051	87.2695	95.9102	100.3010	110.3926	(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	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	38.4084	34.1140	27.7434	21.0035	15.7004	13.2549	14.3224	18.6168	24.9874	31.7273	37.0304	39.4759	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	365.4377	369.2298	359.6739	339.3303	313.6503	289.5147	273.3906	269.5985	279.1544	299.4980	325.1780	349.3137	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	(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)	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	(71)
Water heating gains (Table 5)	149.7637	147.1952	142.2473	131.4031	124.7608	117.8178	113.5535	117.0768	121.2076	128.9115	139.3069	148.3772	(72)
Total internal gains													

	660.6198	657.5490	636.6745	598.7470	561.1214	527.5974	508.2765	512.3021	532.3595	567.1468	608.5254	644.1767 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	4.6000	9.5471	0.5500	0.4000	0.7700	6.6955	(75)
Northeast	1.3100	9.5471	0.5500	0.4800	0.7700	2.2881	(75)
Southwest	3.9300	31.1332	0.5500	0.4800	0.7700	22.3848	(79)
Southwest	3.0900	31.1332	0.5500	0.5200	0.7700	19.0670	(79)
Northeast	0.7300	9.5471	0.5500	0.5300	0.7700	1.4079	(75)
Northeast	0.3000	9.5471	0.5500	0.7000	0.7700	0.7642	(75)

Solar gains	52.6075	98.0285	152.3669	213.5104	248.6174	260.2578	241.7254	206.7431	176.1930	119.3386	68.4235	47.6725	(83)
Total gains	713.2274	755.5775	789.0414	812.2574	809.7388	787.8553	750.0020	719.0452	708.5525	686.4854	676.9489	691.8493	(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	62.6063	62.6722	62.6722	62.9375	62.8046	63.2050	63.2722	63.2722	63.2050	62.9375	62.9375	62.8710	
alpha	5.1738	5.1781	5.1781	5.1958	5.1870	5.2137	5.2181	5.2181	5.2137	5.1958	5.1958	5.1914	
util living area	0.8880	0.8524	0.7880	0.6647	0.5085	0.3530	0.2565	0.2815	0.4537	0.6830	0.8356	0.8989	(86)
Living	20.5773	20.6762	20.8036	20.9286	20.9843	20.9981	20.9997	20.9995	20.9929	20.9293	20.7505	20.5464	
Non living	20.3257	20.4217	20.5442	20.6632	20.7131	20.7266	20.7281	20.7280	20.7224	20.6647	20.4957	20.2966	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.7838	20.6762	20.8036	20.9286	20.9843	20.9981	20.9997	20.9995	20.9929	20.9293	20.7505	20.6098	(87)
Th 2	20.7254	20.7257	20.7257	20.7268	20.7262	20.7280	20.7283	20.7283	20.7280	20.7268	20.7268	20.7265	(88)
util rest of house	0.8820	0.8451	0.7784	0.6516	0.4926	0.3357	0.2382	0.2625	0.4352	0.6681	0.8266	0.8934	(89)
MIT 2	20.5209	20.4217	20.5442	20.6632	20.7131	20.7266	20.7281	20.7280	20.7224	20.6647	20.4957	20.3568	(90)
Living area fraction									fLA = Living area / (4) =			0.3433	(91)
MIT	20.6111	20.5091	20.6333	20.7543	20.8062	20.8198	20.8213	20.8212	20.8153	20.7556	20.5832	20.4437	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.6111	20.5091	20.6333	20.7543	20.8062	20.8198	20.8213	20.8212	20.8153	20.7556	20.5832	20.4437	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8795	0.8391	0.7750	0.6529	0.4973	0.3415	0.2445	0.2690	0.4411	0.6696	0.8217	0.8874	(94)
Useful gains	627.2490	633.9993	611.5355	530.3414	402.6459	269.0837	183.3416	193.4038	312.5755	459.7024	556.2747	613.9772	(95)
Ext temp.	5.1000	5.7000	7.2000	9.8000	12.8000	15.5000	17.2000	17.0000	14.6000	11.2000	7.8000	5.0000	(96)
Heat loss rate W	794.0371	757.3007	686.9445	557.8171	408.5558	269.7484	183.4308	193.5540	315.1542	486.5881	650.9445	787.2542	(97)
Space heating kWh	124.0904	82.8585	56.1043	19.7825	4.3970	0.0000	0.0000	0.0000	0.0000	20.0029	68.1622	128.9181	(98a)
Space heating requirement - total per year (kWh/year)												504.3160	
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	124.0904	82.8585	56.1043	19.7825	4.3970	0.0000	0.0000	0.0000	0.0000	20.0029	68.1622	128.9181	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												504.3160	
Space heating per m2											(98c) / (4) =	5.4111	(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 %)	308.5279	(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	124.0904	82.8585	56.1043	19.7825	4.3970	0.0000	0.0000	0.0000	0.0000	20.0029	68.1622	128.9181	(98)
Space heating efficiency (main heating system 1)	308.5279	308.5279	308.5279	308.5279	308.5279	0.0000	0.0000	0.0000	0.0000	308.5279	308.5279	308.5279	(210)
Space heating fuel (main heating system)	40.2201	26.8561	18.1845	6.4119	1.4252	0.0000	0.0000	0.0000	0.0000	6.4833	22.0927	41.7849	(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	269.4517	238.1846	252.6331	221.0015	213.5053	191.5837	188.4281	196.3117	198.9239	222.7930	238.1165	266.3493	(64)
Efficiency of water heater												188.3380	(216)
(217)m	188.3380	188.3380	188.3380	188.3380	188.3380	188.3380	188.3380	188.3380	188.3380	188.3380	188.3380	188.3380	(217)
Fuel for water heating, kWh/month	143.0682	126.4666	134.1382	117.3430	113.3629	101.7234	100.0478	104.2337	105.6207	118.2942	126.4304	141.4209	(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	16.0935	14.5360	16.0935	15.5743	16.0935	15.5743	16.0935	16.0935	15.5743	16.0935	15.5743	16.0935	(231)
Lighting	33.6186	26.9701	24.2836	17.7912	13.7424	11.2277	12.5363	16.2952	21.1658	27.7707	31.3670	34.5530	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-47.7892	-72.5095	-111.2477	-128.3370	-136.8163	-129.0267	-126.0388	-118.3054	-106.7923	-87.5971	-56.1496	-43.2158	(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	-22.7073	-54.4463	-124.7146	-206.9953	-270.8988	-283.4623	-270.2400	-219.5922	-163.6018	-89.0313	-34.4055	-19.3631	(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	163.4588	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	188.3380	
Water heating fuel used	1432.1500	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.1000, SFP = 0.6600)		
mechanical ventilation fans (SFP = 0.6600)	189.4877	(230a)
Total electricity for the above, kWh/year	189.4877	(231)
Electricity for lighting (calculated in Appendix L)	271.3217	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2923.2837	(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	-866.8654	(238)

10a. Fuel costs - using BEDF prices (585)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1 (high-rate cost)	130.7670	30.8400	45.2454	(240)
Space heating - main system 1 (low-rate cost)	32.6918	0.1580	5.1653	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (electric off-peak tariff)				
High-rate fraction			0.7000	(243)
Low-rate fraction			0.3000	(244)
High-rate cost	1002.5050	34.6000	346.8667	(245)
Low-rate cost	429.6450	15.8000	67.8839	(246)
Energy for instantaneous electric shower(s)	0.0000	32.7200	0.0000	(247a)
Pumps, fans and electric keep-hot (0.90*34.60 + 0.10*15.80)	189.4877	32.7200	55.2319	(249)
Energy for lighting (0.90*34.60 + 0.10*15.80)	271.3217	32.7200	88.7765	(250)
Additional standing charges			8.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1163.8252	32.7200	-380.8036	
PV Unit electricity exported	-1759.4585	5.8100	-102.2245	
Total			-483.0281	(252)
Total energy cost			134.1416	(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 (high-rate cost)	130.7670	0.1654	21.6309	(261)
Space heating - main system 1 (low-rate cost)	32.6918	0.1389	4.5399	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating - high rate cost	1002.5050	0.1479	148.3075	(264)
Water heating - low rate cost	429.6450	0.1242	53.3448	(264)
Space and water heating			227.8231	(265)
Pumps, fans and electric keep-hot	189.4877	0.1432	26.2928	(267)
Energy for lighting	271.3217	0.1490	40.4323	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1163.8252	0.1384	-161.0549	
PV Unit electricity exported	-1759.4585	0.1242	-218.4794	
Total			-379.5344	(269)
Total CO2, kg/year			-84.9861	(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 (high-rate cost)	130.7670	1.2931	211.3643	(275)
Space heating - main system 1 (low-rate cost)	32.6918	1.5032	49.1439	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating - high rate cost	1002.5050	1.5530	1556.8781	(278)
Water heating - low rate cost	429.6450	1.4443	620.5492	(278)
Space and water heating			2437.9355	(279)
Pumps, fans and electric keep-hot	189.4877	1.5335	286.6864	(281)
Energy for lighting	271.3217	1.5547	421.8360	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1163.8252	1.5159	-1764.2413	
PV Unit electricity exported	-1759.4585	0.4558	-801.9798	
Total			-2566.2211	(283)
Total Primary energy kWh/year			580.2368	(286)

SAP 10 EPC IMPROVEMENTS

Example SAP Calculation

Current energy efficiency rating: A 99
Current environmental impact rating: A 101

N Solar water heating	Cancelled by user
U Solar photovoltaic panels	Already installed
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: A 99
Potential environmental impact rating: A 101

Fuel prices for cost data on this page from database revision number 585 TEST (31 Oct 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	£617	£617	£0
Space heating	£114	£114	£0
Water heating	£415	£415	£0
Lighting	£89	£89	£0
Generated (PV)	-£483	-£483	£0
Total cost of fuels	£134	£134	£0
Total cost of uses	£135	£135	£0
Delivered energy	-9 kWh/m²	-9 kWh/m²	0 kWh/m²
Carbon dioxide emissions	-0.1 tonnes	-0.1 tonnes	0.0 tonnes
CO2 emissions per m²	-1 kg/m²	-1 kg/m²	0 kg/m²
Primary energy	6 kWh/m²	6 kWh/m²	0 kWh/m²

CAUTION! Results should not be taken from this section

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	46.6000 (1b)	x	2.4000 (2b)	=	111.8400 (1b) - (3b)	
First floor	46.6000 (1c)	x	2.6500 (2c)	=	123.4900 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.2000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	235.3300	(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		0.6000 (17)
Infiltration rate		0.0300 (18)
Number of sides sheltered		1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.0278 (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	0.0354	0.0347	0.0340	0.0305	0.0298	0.0264	0.0264	0.0257	0.0278	0.0298	0.0312	0.0326	(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) =	79.2000 (23c)

Effective ac	0.1394	0.1387	0.1380	0.1345	0.1338	0.1304	0.1304	0.1297	0.1317	0.1338	0.1352	0.1366	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Entrance Door			2.1200	1.0000	2.1200			(26)
Window FF 0.40			4.6000	0.7752	3.5659			(27)
Window FF 0.48			5.2400	0.7752	4.0620			(27)
Window FF 0.52			3.0900	0.7752	2.3953			(27)
Window FF 0.53			0.7300	0.7752	0.5659			(27)
Window FF 0.70			0.3000	0.7752	0.2326			(27)
Ground Floor			46.6000	0.0900	4.1940	75.0000	3495.0000	(28a)
Wall - NE	30.7600	9.0600	21.7000	0.1100	2.3870	70.0000	1519.0000	(29a)
Wall - SW	30.7600	7.0200	23.7400	0.1100	2.6114	70.0000	1661.8000	(29a)
Wall - NW	38.6300		38.6300	0.1100	4.2493	70.0000	2704.1001	(29a)
Roof	46.6000		46.6000	0.0900	4.1940	9.0000	419.4000	(30)
Total net area of external elements Aum(A, m2)			193.3500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.5774			(33)
Main dwelling								
Wall - SE			38.6300	0.0000	0.0000	45.0000	1738.3500	(32)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11537.6502 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		123.7945 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E3 Sill	10.6200	0.0500	0.5310
E4 Jamb	27.1800	0.0500	1.3590
E2 Other lintels (including other steel lintels)	10.6200	0.0500	0.5310
E5 Ground floor (normal)	19.8300	0.1600	3.1728
E10 Eaves (insulation at ceiling level)	12.1800	0.1000	1.2180
E12 Gable (insulation at ceiling level)	7.6500	0.1100	0.8415
E16 Corner (normal)	10.1000	0.0400	0.4040
E18 Party wall between dwellings	10.1000	0.0400	0.4040
P1 Party wall - Ground floor	7.6500	0.1300	0.9945
P4 Party wall - Roof (insulation at ceiling level)	7.6500	0.1000	0.7650

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		10.2208 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	40.7982 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	10.8242	10.7703	10.7164	10.4471	10.3932	10.1238	10.1238	10.0699	10.2316	10.3932	10.5009	10.6087	(38)
Heat transfer coeff	51.6224	51.5685	51.5146	51.2453	51.1914	50.9220	50.9220	50.8681	51.0298	51.1914	51.2991	51.4069	(39)
Average = Sum(39)m / 12 =												51.2318	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.5539	0.5533	0.5527	0.5498	0.5493	0.5464	0.5464	0.5458	0.5475	0.5493	0.5504	0.5516	(40)
HLP (average)												0.5497	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6670	(42)
Hot water usage for mixer showers	68.9372	67.9012	66.3916	63.5031	61.3715	58.9944	57.6433	59.1415	60.7838	63.3361	66.2866	68.6731	(42a)
Hot water usage for baths	29.7685	29.3264	28.7038	27.5559	26.6963	25.7432	25.2284	25.8466	26.5198	27.5396	28.7112	29.6678	(42b)
Hot water usage for other uses	41.9431	40.4179	38.8927	37.3675	35.8423	34.3171	34.3171	35.8423	37.3675	38.8927	40.4179	41.9431	(42c)
Average daily hot water use (litres/day)												129.2880	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	140.6488	137.6455	133.9881	128.4265	123.9102	119.0548	117.1888	120.8304	124.6711	129.7685	135.4157	140.2840	(44)
Energy conte	222.7533	196.0054	205.9347	175.8095	166.8069	146.3917	141.7297	149.6133	153.7319	176.0946	192.9245	219.6509	(45)
Energy content (annual)										Total = Sum(45)m =		2147.4464	
Distribution loss (46)m = 0.15 x (45)m	33.4130	29.4008	30.8902	26.3714	25.0210	21.9588	21.2595	22.4420	23.0598	26.4142	28.9387	32.9476	(46)
Water storage loss:													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.4000	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7560	(55)
Total storage loss	23.4360	21.1680	23.4360	22.6800	23.4360	22.6800	23.4360	23.4360	22.6800	23.4360	22.6800	23.4360	(56)
If cylinder contains dedicated solar storage	23.4360	21.1680	23.4360	22.6800	23.4360	22.6800	23.4360	23.4360	22.6800	23.4360	22.6800	23.4360	(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	269.4517	238.1846	252.6331	221.0015	213.5053	191.5837	188.4281	196.3117	198.9239	222.7930	238.1165	266.3493	(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	269.4517	238.1846	252.6331	221.0015	213.5053	191.5837	188.4281	196.3117	198.9239	222.7930	238.1165	266.3493	(64)
										Total per year (kWh/year) = Sum(64)m =		2697.2824	(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	111.4242	98.9151	105.8320	94.6103	92.8220	84.8288	84.4838	87.1051	87.2695	95.9102	100.3010	110.3926	(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	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	(66)

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

	38.4084	34.1140	27.7434	21.0035	15.7004	13.2549	14.3224	18.6168	24.9874	31.7273	37.0304	39.4759 (67)

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

	365.4377	369.2298	359.6739	339.3303	313.6503	289.5147	273.3906	269.5985	279.1544	299.4980	325.1780	349.3137 (68)

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

	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693 (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)

	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815 (71)

Water heating gains (Table 5)

	149.7637	147.1952	142.2473	131.4031	124.7608	117.8178	113.5535	117.0768	121.2076	128.9115	139.3069	148.3772 (72)

Total internal gains

	660.6198	657.5490	636.6745	598.7470	561.1214	527.5974	508.2765	512.3021	532.3595	567.1468	608.5254	644.1767 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	4.6000	11.2829	0.5500	0.4000	0.7700	7.9129	(75)
Northeast	1.3100	11.2829	0.5500	0.4800	0.7700	2.7042	(75)
Southwest	3.9300	36.7938	0.5500	0.4800	0.7700	26.4548	(79)
Southwest	3.0900	36.7938	0.5500	0.5200	0.7700	22.5337	(79)
Northeast	0.7300	11.2829	0.5500	0.5300	0.7700	1.6639	(75)
Northeast	0.3000	11.2829	0.5500	0.7000	0.7700	0.9031	(75)

Solar gains	62.1726	110.2820	162.5247	220.8728	265.1918	271.1019	258.1136	223.8529	182.5423	125.0214	75.2659	52.6907	(83)
Total gains	722.7924	767.8310	799.1992	819.6198	826.3133	798.6993	766.3901	736.1550	714.9018	692.1682	683.7913	696.8675	(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	62.0836	62.1484	62.2134	62.5405	62.6063	62.9375	62.9375	63.0041	62.8046	62.6063	62.4748	62.3438	
alpha	5.1389	5.1432	5.1476	5.1694	5.1738	5.1958	5.1958	5.2003	5.1870	5.1738	5.1650	5.1563	
util living area													
	0.9012	0.8681	0.8078	0.7035	0.5616	0.4057	0.2920	0.3173	0.4861	0.7122	0.8548	0.9129	(86)
Living	20.5077	20.6175	20.7630	20.8983	20.9718	20.9957	20.9994	20.9990	20.9892	20.9078	20.6993	20.4681	
Non living	20.2554	20.3625	20.5034	20.6333	20.7012	20.7234	20.7264	20.7264	20.7176	20.6434	20.4444	20.2178	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.7482	20.6175	20.7630	20.8983	20.9718	20.9957	20.9994	20.9990	20.9892	20.9078	20.6993	20.5425	(87)
Th 2	20.7231	20.7233	20.7236	20.7251	20.7254	20.7268	20.7268	20.7271	20.7262	20.7254	20.7248	20.7242	(88)
util rest of house													
	0.8960	0.8616	0.7989	0.6915	0.5466	0.3888	0.2740	0.2986	0.4678	0.6982	0.8468	0.9081	(89)
MIT 2	20.4838	20.3625	20.5034	20.6333	20.7012	20.7234	20.7264	20.7264	20.7176	20.6434	20.4444	20.2886	(90)
Living area fraction										fLA = Living area / (4) =		0.3433	(91)
MIT	20.5746	20.4500	20.5926	20.7243	20.7941	20.8169	20.8201	20.8200	20.8108	20.7342	20.5319	20.3758	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.5746	20.4500	20.5926	20.7243	20.7941	20.8169	20.8201	20.8200	20.8108	20.7342	20.5319	20.3758	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8931	0.8548	0.7946	0.6914	0.5504	0.3944	0.2801	0.3050	0.4735	0.6987	0.8410	0.9018	(94)
Useful gains	645.5006	656.3652	635.0504	566.7050	454.7852	315.0130	214.6877	224.5109	338.4898	483.6190	575.0568	628.4199	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	840.1326	801.8921	725.9731	605.9379	465.5390	316.5778	214.8967	224.8384	342.4528	518.7825	689.0454	831.5466	(97)
Space heating kWh													
	144.8062	97.7940	67.6465	28.2477	8.0008	0.0000	0.0000	0.0000	0.0000	26.1616	82.0718	151.1263	(98a)
Space heating requirement - total per year (kWh/year)												605.8549	
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													
	144.8062	97.7940	67.6465	28.2477	8.0008	0.0000	0.0000	0.0000	0.0000	26.1616	82.0718	151.1263	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												605.8549	
Space heating per m2											(98c) / (4) =	6.5006	(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 %)	308.7634	(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													
	144.8062	97.7940	67.6465	28.2477	8.0008	0.0000	0.0000	0.0000	0.0000	26.1616	82.0718	151.1263	(98)
Space heating efficiency (main heating system 1)													
	308.7634	308.7634	308.7634	308.7634	308.7634	0.0000	0.0000	0.0000	0.0000	308.7634	308.7634	308.7634	(210)
Space heating fuel (main heating system)													
	46.8988	31.6728	21.9088	9.1486	2.5913	0.0000	0.0000	0.0000	0.0000	8.4730	26.5808	48.9456	(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

	269.4517	238.1846	252.6331	221.0015	213.5053	191.5837	188.4281	196.3117	198.9239	222.7930	238.1165	266.3493 (64)
Efficiency of water heater												188.3395 (216)
(217)m	188.3395	188.3395	188.3395	188.3395	188.3395	188.3395	188.3395	188.3395	188.3395	188.3395	188.3395	188.3395 (217)
Fuel for water heating, kWh/month												
	143.0670	126.4656	134.1371	117.3421	113.3620	101.7225	100.0470	104.2329	105.6199	118.2933	126.4294	141.4198 (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	16.0935	14.5360	16.0935	15.5743	16.0935	15.5743	16.0935	16.0935	15.5743	16.0935	15.5743	16.0935 (231)
Lighting	33.6186	26.9701	24.2836	17.7912	13.7424	11.2277	12.5363	16.2952	21.1658	27.7707	31.3670	34.5530 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-54.6876	-79.0080	-116.0238	-130.9248	-140.8998	-131.1500	-129.4295	-122.6410	-108.7800	-90.3741	-60.4451	-46.9608 (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	-28.6264	-63.8173	-135.6693	-215.9707	-293.9963	-298.5260	-293.7156	-243.2205	-171.3580	-94.6651	-39.1655	-22.2053 (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	196.2198 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	188.3395
Water heating fuel used	1432.1386 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.1000, SFP = 0.6600)	
mechanical ventilation fans (SFP = 0.6600)	189.4877 (230a)
Total electricity for the above, kWh/year	189.4877 (231)
Electricity for lighting (calculated in Appendix L)	271.3217 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-3112.2606 (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	-1023.0928 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1 (high-rate cost)	156.9758	17.5600	30.7673	(240)
Space heating - main system 1 (low-rate cost)	39.2440	0.0940	3.6889	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (electric off-peak tariff)				
High-rate fraction			0.7000	(243)
Low-rate fraction			0.3000	(244)
High-rate cost	1002.4970	19.6000	196.4894	(245)
Low-rate cost	429.6416	9.4000	40.3863	(246)
Energy for instantaneous electric shower(s)	0.0000	18.5800	0.0000	(247a)
Pumps, fans and electric keep-hot (0.90*19.60 + 0.10*9.40)	189.4877	18.5800	31.5345	(249)
Energy for lighting (0.90*19.60 + 0.10*9.40)	271.3217	18.5800	50.4116	(250)
Additional standing charges			7.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1211.3248	18.5800	-225.0641	
PV Unit electricity exported	-1900.9359	5.5900	-106.2623	
Total			-331.3265	(252)
Total energy cost			28.9516	(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] =	0.0754 (257)
SAP value		98.7775
SAP rating (Section 12)		99 (258)
SAP band		A

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1 (high-rate cost)	156.9758	0.1650	25.9032	(261)
Space heating - main system 1 (low-rate cost)	39.2440	0.1385	5.4367	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating - high rate cost	1002.4970	0.1479	148.3064	(264)
Water heating - low rate cost	429.6416	0.1242	53.3443	(264)
Space and water heating			232.9906	(265)
Pumps, fans and electric keep-hot	189.4877	0.1432	26.2928	(267)
Energy for lighting	271.3217	0.1490	40.4323	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1211.3248	0.1388	-168.0765	
PV Unit electricity exported	-1900.9359	0.1245	-236.6389	
Total			-404.7154	(269)
Total CO2, kg/year			-104.9997	(272)
CO2 emissions per m2			-1.1300	(273)
EI value			101.0181	
EI rating			101	(274)

EI band A

CAUTION! Results should not be taken from this section

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	46.6000	(1b)	x 2.4000	(2b) =	111.8400	(1b) - (3b)
First floor	46.6000	(1c)	x 2.6500	(2c) =	123.4900	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.2000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		235.3300	(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		0.6000	(17)
Infiltration rate		0.0300	(18)
Number of sides sheltered		1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.0278	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.2000	4.2000	3.8000	4.0000	3.4000	3.3000	3.3000	3.4000	3.8000	3.8000	3.9000	(22)
Wind factor	1.0750	1.0500	1.0500	0.9500	1.0000	0.8500	0.8250	0.8250	0.8500	0.9500	0.9500	0.9750	(22a)
Adj infilt rate	0.0298	0.0291	0.0291	0.0264	0.0278	0.0236	0.0229	0.0229	0.0236	0.0264	0.0264	0.0271	(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) =	79.2000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.1338	0.1331	0.1331	0.1304	0.1317	0.1276	0.1269	0.1269	0.1276	0.1304	0.1304	0.1311	(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								
Entrance Door			2.1200	1.0000	2.1200			(26)
Window FF 0.40			4.6000	0.7752	3.5659			(27)
Window FF 0.48			5.2400	0.7752	4.0620			(27)
Window FF 0.52			3.0900	0.7752	2.3953			(27)
Window FF 0.53			0.7300	0.7752	0.5659			(27)
Window FF 0.70			0.3000	0.7752	0.2326			(27)
Ground Floor			46.6000	0.0900	4.1940	75.0000	3495.0000	(28a)
Wall - NE	30.7600	9.0600	21.7000	0.1100	2.3870	70.0000	1519.0000	(29a)
Wall - SW	30.7600	7.0200	23.7400	0.1100	2.6114	70.0000	1661.8000	(29a)
Wall - NW	38.6300		38.6300	0.1100	4.2493	70.0000	2704.1001	(29a)
Roof	46.6000		46.6000	0.0900	4.1940	9.0000	419.4000	(30)
Total net area of external elements Aum(A, m2)			193.3500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.5774			(33)
Main dwelling								
Wall - SE			38.6300	0.0000	0.0000	45.0000	1738.3500	(32)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 11537.6502 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	123.7945 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E3 Sill	10.6200	0.0500	0.5310
E4 Jamb	27.1800	0.0500	1.3590
E2 Other lintels (including other steel lintels)	10.6200	0.0500	0.5310
E5 Ground floor (normal)	19.8300	0.1600	3.1728
E10 Eaves (insulation at ceiling level)	12.1800	0.1000	1.2180
E12 Gable (insulation at ceiling level)	7.6500	0.1100	0.8415
E16 Corner (normal)	10.1000	0.0400	0.4040
E18 Party wall between dwellings	10.1000	0.0400	0.4040
P1 Party wall - Ground floor	7.6500	0.1300	0.9945
P4 Party wall - Roof (insulation at ceiling level)	7.6500	0.1000	0.7650

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	10.2208 (36)
Point Thermal bridges	(36a) = 0.0000
Total fabric heat loss	(33) + (36) + (36a) = 40.7982 (37)

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

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

(38)m	10.3932	10.3393	10.3393	10.1238	10.2316	9.9083	9.8544	9.8544	9.9083	10.1238	10.1238	10.1777	(38)
Heat transfer coeff													
	51.1914	51.1375	51.1375	50.9220	51.0298	50.7065	50.6526	50.6526	50.7065	50.9220	50.9220	50.9759	(39)
Average = Sum(39)m / 12 =												50.9130	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.5493	0.5487	0.5487	0.5464	0.5475	0.5441	0.5435	0.5435	0.5441	0.5464	0.5464	0.5470	(40)
HLP (average)												0.5463	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6670	(42)
Hot water usage for mixer showers													
	68.9372	67.9012	66.3916	63.5031	61.3715	58.9944	57.6433	59.1415	60.7838	63.3361	66.2866	68.6731	(42a)
Hot water usage for baths													
	29.7685	29.3264	28.7038	27.5559	26.6963	25.7432	25.2284	25.8466	26.5198	27.5396	28.7112	29.6678	(42b)
Hot water usage for other uses													
	41.9431	40.4179	38.8927	37.3675	35.8423	34.3171	34.3171	35.8423	37.3675	38.8927	40.4179	41.9431	(42c)
Average daily hot water use (litres/day)												129.2880	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	140.6488	137.6455	133.9881	128.4265	123.9102	119.0548	117.1888	120.8304	124.6711	129.7685	135.4157	140.2840	(44)
Energy conte	222.7533	196.0054	205.9347	175.8095	166.8069	146.3917	141.7297	149.6133	153.7319	176.0946	192.9245	219.6509	(45)
Energy content (annual)										Total = Sum(45)m =		2147.4464	
Distribution loss (46)m = 0.15 x (45)m													
	33.4130	29.4008	30.8902	26.3714	25.0210	21.9588	21.2595	22.4420	23.0598	26.4142	28.9387	32.9476	(46)
Water storage loss:													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.4000	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7560	(55)
Total storage loss													
	23.4360	21.1680	23.4360	22.6800	23.4360	22.6800	23.4360	23.4360	22.6800	23.4360	22.6800	23.4360	(56)
If cylinder contains dedicated solar storage													
	23.4360	21.1680	23.4360	22.6800	23.4360	22.6800	23.4360	23.4360	22.6800	23.4360	22.6800	23.4360	(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													
	269.4517	238.1846	252.6331	221.0015	213.5053	191.5837	188.4281	196.3117	198.9239	222.7930	238.1165	266.3493	(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													
	269.4517	238.1846	252.6331	221.0015	213.5053	191.5837	188.4281	196.3117	198.9239	222.7930	238.1165	266.3493	(64)
										Total per year (kWh/year) = Sum(64)m =		2697.2824	(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													
	111.4242	98.9151	105.8320	94.6103	92.8220	84.8288	84.4838	87.1051	87.2695	95.9102	100.3010	110.3926	(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	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	38.4084	34.1140	27.7434	21.0035	15.7004	13.2549	14.3224	18.6168	24.9874	31.7273	37.0304	39.4759	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	365.4377	369.2298	359.6739	339.3303	313.6503	289.5147	273.3906	269.5985	279.1544	299.4980	325.1780	349.3137	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	(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)													
	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	(71)
Water heating gains (Table 5)													
	149.7637	147.1952	142.2473	131.4031	124.7608	117.8178	113.5535	117.0768	121.2076	128.9115	139.3069	148.3772	(72)
Total internal gains													
	660.6198	657.5490	636.6745	598.7470	561.1214	527.5974	508.2765	512.3021	532.3595	567.1468	608.5254	644.1767	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	4.6000	9.5471	0.5500	0.4000	0.7700	6.6955	(75)
Northeast	1.3100	9.5471	0.5500	0.4800	0.7700	2.2881	(75)
Southwest	3.9300	31.1332	0.5500	0.4800	0.7700	22.3848	(79)
Southwest	3.0900	31.1332	0.5500	0.5200	0.7700	19.0670	(79)
Northeast	0.7300	9.5471	0.5500	0.5300	0.7700	1.4079	(75)
Northeast	0.3000	9.5471	0.5500	0.7000	0.7700	0.7642	(75)

Solar gains	52.6075	98.0285	152.3669	213.5104	248.6174	260.2578	241.7254	206.7431	176.1930	119.3386	68.4235	47.6725	(83)
Total gains	713.2274	755.5775	789.0414	812.2574	809.7388	787.8553	750.0020	719.0452	708.5525	686.4854	676.9489	691.8493	(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	62.6063	62.6722	62.6722	62.9375	62.8046	63.2050	63.2722	63.2722	63.2050	62.9375	62.9375	62.8710	
alpha	5.1738	5.1781	5.1781	5.1958	5.1870	5.2137	5.2181	5.2181	5.2137	5.1958	5.1958	5.1914	
util living area													

	0.8880	0.8524	0.7880	0.6647	0.5085	0.3530	0.2565	0.2815	0.4537	0.6830	0.8356	0.8989	(86)
Living	20.5773	20.6762	20.8036	20.9286	20.9843	20.9981	20.9997	20.9995	20.9929	20.9293	20.7505	20.5464	
Non living	20.3257	20.4217	20.5442	20.6632	20.7131	20.7266	20.7281	20.7280	20.7224	20.6647	20.4957	20.2966	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.7838	20.6762	20.8036	20.9286	20.9843	20.9981	20.9997	20.9995	20.9929	20.9293	20.7505	20.6098	(87)
Th 2	20.7254	20.7257	20.7257	20.7268	20.7262	20.7280	20.7283	20.7283	20.7280	20.7268	20.7268	20.7265	(88)
util rest of house													
	0.8820	0.8451	0.7784	0.6516	0.4926	0.3357	0.2382	0.2625	0.4352	0.6681	0.8266	0.8934	(89)
MIT 2	20.5209	20.4217	20.5442	20.6632	20.7131	20.7266	20.7281	20.7280	20.7224	20.6647	20.4957	20.3568	(90)
Living area fraction										fLA = Living area / (4) =		0.3433	(91)
MIT	20.6111	20.5091	20.6333	20.7543	20.8062	20.8198	20.8213	20.8212	20.8153	20.7556	20.5832	20.4437	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.6111	20.5091	20.6333	20.7543	20.8062	20.8198	20.8213	20.8212	20.8153	20.7556	20.5832	20.4437	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8795	0.8391	0.7750	0.6529	0.4973	0.3415	0.2445	0.2690	0.4411	0.6696	0.8217	0.8874	(94)
Useful gains	627.2490	633.9993	611.5355	530.3414	402.6459	269.0837	183.3416	193.4038	312.5755	459.7024	556.2747	613.9772	(95)
Ext temp.	5.1000	5.7000	7.2000	9.8000	12.8000	15.5000	17.2000	17.0000	14.6000	11.2000	7.8000	5.0000	(96)
Heat loss rate W													
	794.0371	757.3007	686.9445	557.8171	408.5558	269.7484	183.4308	193.5540	315.1542	486.5881	650.9445	787.2542	(97)
Space heating kWh													
	124.0904	82.8585	56.1043	19.7825	4.3970	0.0000	0.0000	0.0000	0.0000	20.0029	68.1622	128.9181	(98a)
Space heating requirement - total per year (kWh/year)												504.3160	
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													
	124.0904	82.8585	56.1043	19.7825	4.3970	0.0000	0.0000	0.0000	0.0000	20.0029	68.1622	128.9181	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												504.3160	
Space heating per m2											(98c) / (4) =	5.4111	(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 %)	308.5279	(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													
	124.0904	82.8585	56.1043	19.7825	4.3970	0.0000	0.0000	0.0000	0.0000	20.0029	68.1622	128.9181	(98)
Space heating efficiency (main heating system 1)													
	308.5279	308.5279	308.5279	308.5279	308.5279	0.0000	0.0000	0.0000	0.0000	308.5279	308.5279	308.5279	(210)
Space heating fuel (main heating system)													
	40.2201	26.8561	18.1845	6.4119	1.4252	0.0000	0.0000	0.0000	0.0000	6.4833	22.0927	41.7849	(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													
	269.4517	238.1846	252.6331	221.0015	213.5053	191.5837	188.4281	196.3117	198.9239	222.7930	238.1165	266.3493	(64)
Efficiency of water heater												188.3380	(216)
(217)m	188.3380	188.3380	188.3380	188.3380	188.3380	188.3380	188.3380	188.3380	188.3380	188.3380	188.3380	188.3380	(217)
Fuel for water heating, kWh/month													
	143.0682	126.4666	134.1382	117.3430	113.3629	101.7234	100.0478	104.2337	105.6207	118.2942	126.4304	141.4209	(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	16.0935	14.5360	16.0935	15.5743	16.0935	15.5743	16.0935	16.0935	15.5743	16.0935	15.5743	16.0935	(231)
Lighting	33.6186	26.9701	24.2836	17.7912	13.7424	11.2277	12.5363	16.2952	21.1658	27.7707	31.3670	34.5530	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-47.7892	-72.5095	-111.2477	-128.3370	-136.8163	-129.0267	-126.0388	-118.3054	-106.7923	-87.5971	-56.1496	-43.2158	(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	-22.7073	-54.4463	-124.7146	-206.9953	-270.8988	-283.4623	-270.2400	-219.5922	-163.6018	-89.0313	-34.4055	-19.3631	(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	163.4588	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	188.3380	
Water heating fuel used	1432.1500	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.1000, SFP = 0.6600)		
mechanical ventilation fans (SFP = 0.6600)	189.4877	(230a)
Total electricity for the above, kWh/year	189.4877	(231)
Electricity for lighting (calculated in Appendix L)	271.3217	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2923.2837	(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			-866.8654 (238)

10a. Fuel costs - using BEDF prices (585)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1 (high-rate cost)	130.7670	30.8400	45.2454	(240)
Space heating - main system 1 (low-rate cost)	32.6918	0.1580	5.1653	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (electric off-peak tariff)				
High-rate fraction			0.7000	(243)
Low-rate fraction			0.3000	(244)
High-rate cost	1002.5050	34.6000	346.8667	(245)
Low-rate cost	429.6450	15.8000	67.8839	(246)
Energy for instantaneous electric shower(s)	0.0000	32.7200	0.0000	(247a)
Pumps, fans and electric keep-hot (0.90*34.60 + 0.10*15.80)	189.4877	32.7200	55.2319	(249)
Energy for lighting (0.90*34.60 + 0.10*15.80)	271.3217	32.7200	88.7765	(250)
Additional standing charges			8.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1163.8252	32.7200	-380.8036	
PV Unit electricity exported	-1759.4585	5.8100	-102.2245	
Total			-483.0281	(252)
Total energy cost			134.1416	(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 (high-rate cost)	130.7670	0.1654	21.6309	(261)
Space heating - main system 1 (low-rate cost)	32.6918	0.1389	4.5399	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating - high rate cost	1002.5050	0.1479	148.3075	(264)
Water heating - low rate cost	429.6450	0.1242	53.3448	(264)
Space and water heating			227.8231	(265)
Pumps, fans and electric keep-hot	189.4877	0.1432	26.2928	(267)
Energy for lighting	271.3217	0.1490	40.4323	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1163.8252	0.1384	-161.0549	
PV Unit electricity exported	-1759.4585	0.1242	-218.4794	
Total			-379.5344	(269)
Total CO2, kg/year			-84.9861	(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 (high-rate cost)	130.7670	1.2931	211.3643	(275)
Space heating - main system 1 (low-rate cost)	32.6918	1.5032	49.1439	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating - high rate cost	1002.5050	1.5530	1556.8781	(278)
Water heating - low rate cost	429.6450	1.4443	620.5492	(278)
Space and water heating			2437.9355	(279)
Pumps, fans and electric keep-hot	189.4877	1.5335	286.6864	(281)
Energy for lighting	271.3217	1.5547	421.8360	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1163.8252	1.5159	-1764.2413	
PV Unit electricity exported	-1759.4585	0.4558	-801.9798	
Total			-2566.2211	(283)
Total Primary energy kWh/year			580.2368	(286)