Full SAP Calculation Printout

Property Reference	First Floor Flat	**Issued on Date**	29/07/2024
Assessment Reference	1 Baseline	**Prop Type Ref**	First Floor Flat
Property			

SAP Rating	75 C	**DER**	6.19	**TER**	
Environmental	95 A	**% DER < TER**			N/A
CO_2 Emissions (t/year)	0.44	**DFEE**	35.05	**TFEE**	
Compliance Check	See BREL	**% DFEE < TFEE**			
% DPER < TPER		**DPER**	64.92	**TPER**	

Assessor Details	Mr. Sean Mills	**Assessor ID**	W382-0001
Client	VORBILD Architecture Ltd, VORBILD Architecture Ltd		

SAP 10 WORKSHEET FOR Existing dwelling (SAP) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	81.4000 (1b)	x	2.7000 (2b)	=	219.7800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.4000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	219.7800	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.0910	(8)
Number of storeys in the dwelling (ns)		1	(9)
Additional infiltration	[(9) - 1] x 0.1 =	0.0000	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0.3500	(11)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0.0000	(12)
If no draught lobby, enter 0.05, else enter 0		0.0500	(13)
Percentage of windows and doors draught stripped		100.0000	(14)
Window infiltration	0.25 - [0.2 * (14) / 100] =	0.0500	(15)

Pressure test	No	
Pressure Test Method	Blower Door	
Measured/design AP50	15.0000	(17)
Infiltration rate	0.5410	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.4599 (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	0.5863	0.5748	0.5633	0.5058	0.4943	0.4369	0.4369	0.4254	0.4599	0.4943	0.5173	0.5403	(22b)
Effective ac	0.6719	0.6652	0.6587	0.6279	0.6222	0.5954	0.5954	0.5905	0.6057	0.6222	0.6338	0.6460	(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	
New and replacement windo (Uw = 1.60)			7.5600	1.5038	11.3684			(27)
GLA Existing (Uw = 1.60)			5.6000	1.5038	8.4211			(27)
External Wall - Existing GLA	15.3900	5.6000	9.7900	0.3000	2.9370	9.0000	88.1100	(29a)
External Wall - New	15.6600	7.5600	8.1000	0.5500	4.4550	190.0000	1539.0000	(29a)
External Roof GLA Notional	8.7000		8.7000	0.1600	1.3920	9.0000	78.3000	(30)
Total net area of external elements Aum(A, m2)			39.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.5735			(33)
Party Wall to other buildings			65.3400	0.0000	0.0000	180.0000	11761.2000	(32)
Party Wall to hall			21.6000	0.0000	0.0000	20.0000	432.0000	(32)
Party Floor			81.4000			30.0000	2442.0000	(32d)
Party Ceiling			72.7000			20.0000	1454.0000	(32b)

Internal Wall						32.9400					9.0000	296.4600	(32c)
Heat capacity Cm = Sum(A x k)									(28)...(30) + (32) + (32a)...(32e) =			18091.0700	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												222.2490	(35)
Thermal bridges (Default value 0.200 * total exposed area)												7.9500	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss										(33) + (36) + (36a) =		36.5235	(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	48.7296	48.2456	47.7711	45.5425	45.1255	43.1844	43.1844	42.8250	43.9321	45.1255	45.9690	46.8509	(38)
Heat transfer coeff	85.2531	84.7690	84.2946	82.0659	81.6490	79.7079	79.7079	79.3484	80.4556	81.6490	82.4925	83.3744	(39)
Average = Sum(39)m / 12 =												82.0639	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0473	1.0414	1.0356	1.0082	1.0031	0.9792	0.9792	0.9748	0.9884	1.0031	1.0134	1.0243	(40)
HLP (average)												1.0082	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4889	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses	42.2302	40.6946	39.1589	37.6233	36.0876	34.5520	34.5520	36.0876	37.6233	39.1589	40.6946	42.2302	(42c)
Average daily hot water use (litres/day)												38.3911	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	42.2302	40.6946	39.1589	37.6233	36.0876	34.5520	34.5520	36.0876	37.6233	39.1589	40.6946	42.2302	(44)
Energy conte	66.8823	57.9485	60.1858	51.5044	48.5809	42.4857	41.7876	44.6840	46.3933	53.1383	57.9769	66.1223	(45)
Energy content (annual)											Total = Sum(45)m =	637.6901	
Distribution loss (46)m = 0.15 x (45)m	10.0324	8.6923	9.0279	7.7257	7.2871	6.3729	6.2681	6.7026	6.9590	7.9707	8.6965	9.9183	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8600	(48)
Temperature factor from Table 2b												0.7800	(49)
Enter (49) or (54) in (55)												1.4508	(55)
Total storage loss	44.9748	40.6224	44.9748	43.5240	44.9748	43.5240	44.9748	44.9748	43.5240	44.9748	43.5240	44.9748	(56)
If cylinder contains dedicated solar storage	44.9748	40.6224	44.9748	43.5240	44.9748	43.5240	44.9748	44.9748	43.5240	44.9748	43.5240	44.9748	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(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	166.7147	148.1197	160.0182	148.1164	148.4133	108.5217	110.0248	112.9212	112.4293	152.9707	154.5889	165.9547	(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	166.7147	148.1197	160.0182	148.1164	148.4133	108.5217	110.0248	112.9212	112.4293	152.9707	154.5889	165.9547	(64)
										Total per year (kWh/year) = Sum(64)m =		1688.7937	(64)
12Total per year (kWh/year)												1689	(64)
Electric shower(s)	67.8407	60.4466	66.0054	62.9882	64.1701	61.2121	63.2525	64.1701	62.9882	66.0054	64.7643	67.8407	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		771.6843	(64a)
Heat gains from water heating, kWh/month	83.0846	74.0186	80.3992	75.3426	76.0818	47.4391	48.3174	49.5099	49.1824	78.0559	77.9388	82.8319	(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	124.4444	124.4444	124.4444	124.4444	124.4444	124.4444	124.4444	124.4444	124.4444	124.4444	124.4444	124.4444	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	116.7614	129.2715	116.7614	120.6534	116.7614	120.6534	116.7614	116.7614	120.6534	116.7614	120.6534	116.7614	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	222.3416	224.6488	218.8347	206.4572	190.8328	176.1481	166.3378	164.0306	169.8447	182.2222	197.8466	212.5313	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.4444	35.4444	35.4444	35.4444	35.4444	35.4444	35.4444	35.4444	35.4444	35.4444	35.4444	35.4444	(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)	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	(71)
Water heating gains (Table 5)	111.6729	110.1467	108.0635	104.6426	102.2604	65.8877	64.9428	66.5455	68.3089	104.9139	108.2483	111.3332	(72)
Total internal gains	514.1092	527.4004	506.9929	495.0865	473.1879	423.0225	408.3753	407.6708	419.1403	467.2308	490.0816	503.9593	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.5600	10.6334	0.6300	0.7000	0.7700	24.5678	(74)
South	5.6000	46.7521	0.6300	0.7000	0.7700	80.0130	(78)

Solar gains	104.5808	177.9909	246.7025	316.8058	369.2199	373.9961	357.3905	316.4047	270.2917	197.2278	125.1502	89.6195	(83)
Total gains	618.6900	705.3913	753.6954	811.8923	842.4078	797.0186	765.7657	724.0755	689.4320	664.4586	615.2318	593.5788	(84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	58.9456	59.2822	59.6159	61.2349	61.5476	63.0464	63.0464	63.3320	62.4605	61.5476	60.9182	60.2739	
alpha	4.9297	4.9521	4.9744	5.0823	5.1032	5.2031	5.2031	5.2221	5.1640	5.1032	5.0612	5.0183	
util living area	0.9906	0.9812	0.9634	0.9072	0.7899	0.6159	0.4537	0.4970	0.7357	0.9198	0.9797	0.9922	(86)
MIT	20.0409	20.1931	20.3879	20.6533	20.8345	20.9189	20.9367	20.9349	20.8864	20.6739	20.3334	20.0368	(87)
Th 2	20.0441	20.0490	20.0538	20.0765	20.0808	20.1007	20.1007	20.1044	20.0930	20.0808	20.0722	20.0632	(88)
util rest of house	0.9880	0.9761	0.9531	0.8821	0.7389	0.5388	0.3632	0.4038	0.6621	0.8928	0.9733	0.9900	(89)
MIT 2	18.9267	19.1229	19.3709	19.7108	19.9144	20.0113	20.0229	20.0260	19.9791	19.7440	19.3204	18.9366	(90)
Living area fraction									fLA = Living area / (4) =			0.5381	(91)
MIT	19.5262	19.6987	19.9181	20.2179	20.4095	20.4997	20.5146	20.5150	20.4673	20.2444	19.8655	19.5286	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5262	19.6987	19.9181	20.2179	20.4095	20.4997	20.5146	20.5150	20.4673	20.2444	19.8655	19.5286	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9863	0.9739	0.9514	0.8863	0.7582	0.5739	0.4052	0.4471	0.6940	0.8983	0.9715	0.9885	(94)
Useful gains	610.1950	686.9515	717.0734	719.5882	638.6790	457.3770	310.2901	323.7009	478.4634	596.8552	597.7102	586.7360	(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	1298.0851	1254.4752	1131.0758	928.8165	711.1199	470.2488	312.0273	326.5220	512.2834	787.4526	1053.0574	1278.0122	(97)
Space heating kWh	511.7902	381.3759	308.0178	150.6444	53.8960	0.0000	0.0000	0.0000	0.0000	141.8044	327.8500	514.3095	(98a)
Space heating requirement - total per year (kWh/year)												2389.6882	
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	511.7902	381.3759	308.0178	150.6444	53.8960	0.0000	0.0000	0.0000	141.8044	327.8500		514.3095	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2389.6882	
Space heating per m2											(98c) / (4) =	29.3573	(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 %)	170.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	511.7902	381.3759	308.0178	150.6444	53.8960	0.0000	0.0000	0.0000	0.0000	141.8044	327.8500	514.3095	(98)
Space heating efficiency (main heating system 1)	170.0000	170.0000	170.0000	170.0000	170.0000	0.0000	0.0000	0.0000	0.0000	170.0000	170.0000	170.0000	(210)
Space heating fuel (main heating system)	301.0531	224.3388	181.1869	88.6143	31.7035	0.0000	0.0000	0.0000	0.0000	83.4144	192.8529	302.5350	(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	166.7147	148.1197	160.0182	148.1164	148.4133	108.5217	110.0248	112.9212	112.4293	152.9707	154.5889	165.9547	(64)
Efficiency of water heater												170.0000	(216)
(217)m	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	(217)
Fuel for water heating, kWh/month	98.0675	87.1292	94.1284	87.1273	87.3019	63.8363	64.7205	66.4243	66.1349	89.9828	90.9346	97.6204	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	31.1333	24.9763	22.4884	16.4760	12.7265	10.3977	11.6096	15.0905	19.6011	25.7177	29.0481	31.9986	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1405.6989	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	170.0000	
Water heating fuel used	993.4080	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	0.0000	(231)
Electricity for lighting (calculated in Appendix L)	251.2639	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		

Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3422.0551	(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	1405.6989	0.1560	219.3225	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	993.4080	0.1415	140.5436	(264)
Energy for instantaneous electric shower(s)	771.6843	0.1391	107.3583	(264a)
Space and water heating			359.8661	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	251.2639	0.1443	36.2651	(268)
Total CO2, kg/year			503.4896	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			6.1900	(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	1405.6989	1.5776	2217.6691	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	993.4080	1.5232	1513.1413	(278)
Energy for instantaneous electric shower(s)	771.6843	1.5143	1168.5878	(278a)
Space and water heating			3730.8103	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	251.2639	1.5338	385.3969	(282)
Total Primary energy kWh/year			5284.7951	(286)
Dwelling Primary energy Rate (DPER)			64.9200	(287)

SAP 10 WORKSHEET FOR Existing dwelling (SAP) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	81.4000	(1b)	x 2.7000	(2b) =	219.7800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.4000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		219.7800	(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) =	0.1365	(8)
Number of storeys in the dwelling (ns)		1	(9)
Additional infiltration	[(9) - 1] x 0.1 =	0.0000	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0.3500	(11)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0.0000	(12)
If no draught lobby, enter 0.05, else enter 0		0.0500	(13)
Percentage of windows and doors draught stripped		100.0000	(14)
Window infiltration	0.25 - [0.2 * (14) / 100] =	0.0500	(15)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.5865	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.4985	(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	0.6356	0.6232	0.6107	0.5484	0.5359	0.4736	0.4736	0.4611	0.4985	0.5359	0.5608	0.5858	(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	0.7020	0.6942	0.6865	0.6504	0.6436	0.6121	0.6121	0.6063	0.6243	0.6436	0.6573	0.6716	(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	
New and replacement windo (Uw = 1.60)			7.5600	1.5038	11.3684			(27)
GLA Existing (Uw = 1.60)			5.6000	1.5038	8.4211			(27)
External Wall - Existing GLA	15.3900	5.6000	9.7900	0.3000	2.9370	9.0000	88.1100	(29a)
External Wall - New	15.6600	7.5600	8.1000	0.5500	4.4550	190.0000	1539.0000	(29a)
External Roof GLA Notional	8.7000		8.7000	0.1600	1.3920	9.0000	78.3000	(30)
Total net area of external elements Aum(A, m2)			39.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.5735			(33)
Party Wall to other buildings			65.3400	0.0000	0.0000	180.0000	11761.2000	(32)
Party Wall to hall			21.6000	0.0000	0.0000	20.0000	432.0000	(32)
Party Floor			81.4000			30.0000	2442.0000	(32d)
Party Ceiling			72.7000			30.0000	2181.0000	(32b)
Internal Wall			32.9400			9.0000	296.4600	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	18818.0700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		231.1802 (35)
Thermal bridges (Default value 0.200 * total exposed area)		7.9500 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	36.5235 (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	50.9147	50.3458	49.7881	47.1688	46.6788	44.3975	44.3975	43.9750	45.2762	46.6788	47.6702	48.7066	(38)
Heat transfer coeff	87.4382	86.8692	86.3116	83.6923	83.2023	80.9210	80.9210	80.4985	81.7997	83.2023	84.1936	85.2301	(39)
Average = Sum(39)m / 12 =												83.6900	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0742	1.0672	1.0603	1.0282	1.0221	0.9941	0.9941	0.9889	1.0049	1.0221	1.0343	1.0471	(40)
HLP (average)												1.0281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4889	(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	28.4840	28.0609	27.4652	26.3668	25.5444	24.6324	24.1398	24.7314	25.3754	26.3513	27.4723	28.3877	(42b)
Hot water usage for other uses	40.1187	38.6598	37.2010	35.7421	34.2833	32.8244	32.8244	34.2833	35.7421	37.2010	38.6598	40.1187	(42c)
Average daily hot water use (litres/day)												62.8807	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.6027	66.7208	64.6662	62.1090	59.8276	57.4568	56.9642	59.0146	61.1176	63.5523	66.1321	68.5064	(44)
Energy conte	108.6499	95.0095	99.3895	85.0241	80.5395	70.6498	68.8933	73.0724	75.3641	86.2398	94.2173	107.2644	(45)
Energy content (annual)										Total = Sum(45)m =		1044.3136	
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	92.3524	80.7581	84.4811	72.2705	68.4586	60.0524	58.5593	62.1116	64.0594	73.3038	80.0847	91.1748	(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	92.3524	80.7581	84.4811	72.2705	68.4586	60.0524	58.5593	62.1116	64.0594	73.3038	80.0847	91.1748	(64)
									Total per year (kWh/year) = Sum(64)m =			887.6666	(64)
12Total per year (kWh/year)												888	(64)
Electric shower(s)	52.8151	47.0587	51.3863	49.0373	49.9575	47.6546	49.2431	49.9575	49.0373	51.3863	50.4200	52.8151	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							600.7688	(64a)
Heat gains from water heating, kWh/month	36.2919	31.9542	33.9669	30.3269	29.6040	26.9267	26.9506	28.0173	28.2742	31.1725	32.6262	35.9975	(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	124.4444	124.4444	124.4444	124.4444	124.4444	124.4444	124.4444	124.4444	124.4444	124.4444	124.4444	124.4444	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	116.7614	129.2715	116.7614	120.6534	116.7614	120.6534	116.7614	116.7614	120.6534	116.7614	120.6534	116.7614	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	222.3416	224.6488	218.8347	206.4572	190.8328	176.1481	166.3378	164.0306	169.8447	182.2222	197.8466	212.5313	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.4444	35.4444	35.4444	35.4444	35.4444	35.4444	35.4444	35.4444	35.4444	35.4444	35.4444	35.4444	(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)	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	(71)
Water heating gains (Table 5)	48.7794	47.5509	45.6544	42.1207	39.7903	37.3982	36.2239	37.6576	39.2697	41.8986	45.3142	48.3837	(72)
Total internal gains	448.2157	461.8046	441.5838	429.5647	407.7179	394.5331	379.6564	378.7829	390.1011	401.2155	424.1475	438.0097	(73)

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6. Solar gains

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

North				7.5600	10.6334	0.6300	0.7000	0.7700				24.5678	(74)
South				5.6000	46.7521	0.6300	0.7000	0.7700				80.0130	(78)
Solar gains	104.5808	177.9909	246.7025	316.8058	369.2199	373.9961	357.3905	316.4047	270.2917	197.2278	125.1502	89.6195	(83)
Total gains	552.7965	639.7955	688.2863	746.3705	776.9378	768.5292	737.0469	695.1876	660.3928	598.4433	549.2977	527.6292	(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	59.7822	60.1737	60.5625	62.4578	62.8257	64.5969	64.5969	64.9359	63.9029	62.8257	62.0859	61.3309	
alpha	4.9855	5.0116	5.0375	5.1639	5.1884	5.3065	5.3065	5.3291	5.2602	5.1884	5.1391	5.0887	
util living area	0.9951	0.9891	0.9772	0.9358	0.8367	0.6444	0.4778	0.5238	0.7678	0.9493	0.9890	0.9961	(86)
MIT	19.7066	19.9103	20.1751	20.5494	20.8224	20.9673	20.9943	20.9911	20.9173	20.5733	20.1019	19.7051	(87)
Th 2	20.0220	20.0277	20.0334	20.0599	20.0649	20.0882	20.0882	20.0926	20.0792	20.0649	20.0548	20.0443	(88)
util rest of house	0.9936	0.9859	0.9702	0.9158	0.7890	0.5642	0.3815	0.4249	0.6939	0.9293	0.9852	0.9949	(89)
MIT 2	18.8489	19.0552	19.3204	19.7007	19.9458	20.0730	20.0867	20.0899	20.0348	19.7327	19.2677	18.8649	(90)
Living area fraction									fLA = Living area / (4) =			0.5381	(91)
MIT	19.3104	19.5153	19.7803	20.1574	20.4175	20.5542	20.5751	20.5748	20.5097	20.1850	19.7165	19.3170	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3104	19.5153	19.7803	20.1574	20.4175	20.5542	20.5751	20.5748	20.5097	20.1850	19.7165	19.3170	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9922	0.9837	0.9679	0.9181	0.8083	0.6062	0.4334	0.4782	0.7303	0.9323	0.9834	0.9937	(94)
Useful gains	548.4775	629.3942	666.2103	685.2496	627.9713	465.8925	319.4297	332.4228	482.3081	557.9182	540.1901	524.2997	(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	1312.4836	1269.6221	1146.2424	942.1542	725.3127	481.8190	321.6679	336.0678	524.3094	797.4946	1062.2329	1288.4244	(97)
Space heating kWh	568.4205	430.2332	357.1439	184.9713	72.4220	0.0000	0.0000	0.0000	0.0000	178.2448	375.8708	568.5088	(98a)
Space heating requirement - total per year (kWh/year)												2735.8153	
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	568.4205	430.2332	357.1439	184.9713	72.4220	0.0000	0.0000	0.0000	0.0000	178.2448	375.8708	568.5088	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2735.8153	
Space heating per m2										(98c) / (4) =		33.6095	(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	760.6571	598.8152	611.7887	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8842	0.9398	0.9209	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	672.5449	562.7713	563.4200	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	849.8603	815.4573	768.8518	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	127.6671	187.9984	152.8413	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	31.9168	46.9996	38.2103	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												117.1267	(107)
Energy for space heating												33.6095	(99)
Energy for space cooling												1.4389	(108)
Total												35.0484	(109)
Fabric Energy Efficiency (DFEE)												35.0	(109)

SAP 10 WORKSHEET FOR Existing dwelling (SAP) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		81.4000 (1b)	x	2.7000 (2b)	=	219.7800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.4000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		219.7800	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)

Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.0910	(8)
Number of storeys in the dwelling (ns)		1	(9)
Additional infiltration	[(9) - 1] x 0.1 =	0.0000	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0.3500	(11)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0.0000	(12)
If no draught lobby, enter 0.05, else enter 0		0.0500	(13)
Percentage of windows and doors draught stripped		100.0000	(14)
Window infiltration	0.25 - [0.2 * (14) / 100] =	0.0500	(15)

Pressure test	No	
Pressure Test Method	Blower Door	
Measured/design AP50	15.0000	(17)
Infiltration rate	0.5410	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.4599 (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	0.5863	0.5748	0.5633	0.5058	0.4943	0.4369	0.4369	0.4254	0.4599	0.4943	0.5173	0.5403	(22b)
Effective ac	0.6719	0.6652	0.6587	0.6279	0.6222	0.5954	0.5954	0.5905	0.6057	0.6222	0.6338	0.6460	(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	
New and replacement windo (Uw = 1.60)			7.5600	1.5038	11.3684			(27)
GLA Existing (Uw = 1.60)			5.6000	1.5038	8.4211			(27)
External Wall - Existing GLA	15.3900	5.6000	9.7900	0.3000	2.9370	9.0000	88.1100	(29a)
External Wall - New	15.6600	7.5600	8.1000	0.5500	4.4550	190.0000	1539.0000	(29a)
External Roof GLA Notional	8.7000		8.7000	0.1600	1.3920	9.0000	78.3000	(30)
Total net area of external elements Aum(A, m2)			39.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.5735			(33)
Party Wall to other buildings			65.3400	0.0000	0.0000	180.0000	11761.2000	(32)
Party Wall to hall			21.6000	0.0000	0.0000	20.0000	432.0000	(32)
Party Floor			81.4000			30.0000	2442.0000	(32d)
Party Ceiling			72.7000			30.0000	2181.0000	(32b)
Internal Wall			32.9400			9.0000	296.4600	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	18818.0700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		231.1802 (35)
Thermal bridges (Default value 0.200 * total exposed area)		7.9500 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	36.5235 (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	48.7296	48.2456	47.7711	45.5425	45.1255	43.1844	43.1844	42.8250	43.9321	45.1255	45.9690	46.8509	(38)
Heat transfer coeff	85.2531	84.7690	84.2946	82.0659	81.6490	79.7079	79.7079	79.3484	80.4556	81.6490	82.4925	83.3744	(39)
Average = Sum(39)m / 12 =												82.0639	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0473	1.0414	1.0356	1.0082	1.0031	0.9792	0.9792	0.9748	0.9884	1.0031	1.0134	1.0243	(40)
HLP (average)												1.0082	
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	2.4889	(42)

Hot water usage for mixer showers

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

Hot water usage for baths

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)

Hot water usage for other uses

42.2302	40.6946	39.1589	37.6233	36.0876	34.5520	34.5520	36.0876	37.6233	39.1589	40.6946	42.2302	(42c)

Average daily hot water use (litres/day)	38.3911	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	42.2302	40.6946	39.1589	37.6233	36.0876	34.5520	34.5520	36.0876	37.6233	39.1589	40.6946	42.2302	(44)
Energy conte	66.8823	57.9485	60.1858	51.5044	48.5809	42.4857	41.7876	44.6840	46.3933	53.1383	57.9769	66.1223	(45)
Energy content (annual)										Total = Sum(45)m =		637.6901	
Distribution loss (46)m = 0.15 x (45)m	10.0324	8.6923	9.0279	7.7257	7.2871	6.3729	6.2681	6.7026	6.9590	7.9707	8.6965	9.9183	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8600	(48)
Temperature factor from Table 2b												0.7800	(49)
Enter (49) or (54) in (55)												1.4508	(55)
Total storage loss	44.9748	40.6224	44.9748	43.5240	44.9748	43.5240	44.9748	44.9748	43.5240	44.9748	43.5240	44.9748	(56)
If cylinder contains dedicated solar storage	44.9748	40.6224	44.9748	43.5240	44.9748	43.5240	44.9748	44.9748	43.5240	44.9748	43.5240	44.9748	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(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	166.7147	148.1197	160.0182	148.1164	148.4133	108.5217	110.0248	112.9212	112.4293	152.9707	154.5889	165.9547	(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													
	166.7147	148.1197	160.0182	148.1164	148.4133	108.5217	110.0248	112.9212	112.4293	152.9707	154.5889	165.9547	(64)
									Total per year (kWh/year) = Sum(64)m =			1688.7937	(64)
Electric shower(s)													
	67.8407	60.4466	66.0054	62.9882	64.1701	61.2121	63.2525	64.1701	62.9882	66.0054	64.7643	67.8407	(64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				771.6843	(64a)
Heat gains from water heating, kWh/month													
	83.0846	74.0186	80.3992	75.3426	76.0818	47.4391	48.3174	49.5099	49.1824	78.0559	77.9388	82.8319	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	35.5690	31.5921	25.6924	19.4508	14.5397	12.2750	13.2636	17.2405	23.1402	29.3818	34.2929	36.5576	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	331.8531	335.2967	326.6190	308.1451	284.8251	262.9076	248.2653	244.8217	253.4995	271.9734	295.2934	317.2109	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	(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)													
	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	(71)
Water heating gains (Table 5)													
	111.6729	110.1467	108.0635	104.6426	102.2604	65.8877	64.9428	66.5455	68.3089	104.9139	108.2483	111.3332	(72)
Total internal gains													
	584.2950	582.2355	565.5748	537.4384	506.8252	443.2702	428.6717	430.8078	447.1486	511.4691	543.0346	570.3017	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.5600	10.6334	0.6300	0.7000	0.7700	24.5678	(74)
South	5.6000	46.7521	0.6300	0.7000	0.7700	80.0130	(78)

Solar gains	104.5808	177.9909	246.7025	316.8058	369.2199	373.9961	357.3905	316.4047	270.2917	197.2278	125.1502	89.6195	(83)
Total gains	688.8758	760.2264	812.2774	854.2442	876.0451	817.2663	786.0622	747.2125	717.4403	708.6969	668.1848	659.9212	(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	61.3144	61.6645	62.0116	63.6956	64.0209	65.5800	65.5800	65.8771	64.9705	64.0209	63.3663	62.6960	
alpha	5.0876	5.1110	5.1341	5.2464	5.2681	5.3720	5.3720	5.3918	5.3314	5.2681	5.2244	5.1797	
util living area													
	0.9870	0.9771	0.9552	0.8959	0.7749	0.6046	0.4429	0.4832	0.7182	0.9059	0.9743	0.9892	(86)
MIT	20.1421	20.2722	20.4602	20.6951	20.8542	20.9249	20.9395	20.9382	20.8986	20.7172	20.4060	20.1351	(87)
Th 2	20.0441	20.0490	20.0538	20.0765	20.0808	20.1007	20.1007	20.1044	20.0930	20.0808	20.0722	20.0632	(88)
util rest of house													
	0.9834	0.9708	0.9428	0.8682	0.7220	0.5275	0.3541	0.3918	0.6433	0.8751	0.9661	0.9861	(89)
MIT 2	19.0519	19.2194	19.4572	19.7575	19.9335	20.0165	20.0257	20.0290	19.9896	19.7918	19.4084	19.0585	(90)
Living area fraction										fLA = Living area / (4) =		0.5381	(91)
MIT	19.6385	19.7859	19.9969	20.2620	20.4289	20.5053	20.5174	20.5182	20.4788	20.2898	19.9452	19.6378	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6385	19.7859	19.9969	20.2620	20.4289	20.5053	20.5174	20.5182	20.4788	20.2898	19.9452	19.6378	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9815	0.9688	0.9419	0.8743	0.7431	0.5629	0.3955	0.4345	0.6765	0.8829	0.9648	0.9844	(94)
Useful gains	676.1145	736.4776	765.1092	746.8653	650.9554	460.0782	310.9229	324.6353	485.3824	625.7022	644.6599	649.6516	(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													
	1307.6558	1261.8629	1137.7164	932.4310	712.7047	470.6956	312.2470	326.7732	513.2066	791.1599	1059.6308	1287.1168	(97)
Space heating kWh													
	469.8668	353.0589	277.2198	133.6073	45.9414	0.0000	0.0000	0.0000	0.0000	123.1005	298.7791	474.2741	(98a)
Space heating requirement - total per year (kWh/year)												2175.8479	
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													
	469.8668	353.0589	277.2198	133.6073	45.9414	0.0000	0.0000	0.0000	0.0000	123.1005	298.7791	474.2741	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2175.8479	
Space heating per m2											(98c) / (4) =	26.7303	(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 %)	170.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	469.8668	353.0589	277.2198	133.6073	45.9414	0.0000	0.0000	0.0000	0.0000	123.1005	298.7791	474.2741	(98)
Space heating efficiency (main heating system 1)													

	170.0000	170.0000	170.0000	170.0000	170.0000	0.0000	0.0000	0.0000	0.0000	170.0000	170.0000	170.0000 (210)
Space heating fuel (main heating system)												
	276.3922	207.6817	163.0705	78.5925	27.0244	0.0000	0.0000	0.0000	0.0000	72.4121	175.7524	278.9848 (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												
	166.7147	148.1197	160.0182	148.1164	148.4133	108.5217	110.0248	112.9212	112.4293	152.9707	154.5889	165.9547 (64)
Efficiency of water heater												170.0000 (216)
(217)m	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000 (217)
Fuel for water heating, kWh/month												
	98.0675	87.1292	94.1284	87.1273	87.3019	63.8363	64.7205	66.4243	66.1349	89.9828	90.9346	97.6204 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	31.1333	24.9763	22.4884	16.4760	12.7265	10.3977	11.6096	15.0905	19.6011	25.7177	29.0481	31.9986 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1279.9105 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	170.0000
Water heating fuel used	993.4080 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	251.2639 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	3296.2667 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1279.9105	16.4900	211.0572	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	993.4080	16.4900	163.8130	(247)
Energy for instantaneous electric shower(s)	771.6843	16.4900	127.2507	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Energy for lighting	251.2639	16.4900	41.4334	(250)
Additional standing charges			0.0000	(251)
Total energy cost			543.5544	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.5481 (257)
SAP value		74.9053
SAP rating (Section 12)		75 (258)
SAP band		C

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	1279.9105	0.1562	199.8979	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	993.4080	0.1415	140.5436	(264)
Energy for instantaneous electric shower(s)	771.6843	0.1391	107.3583	(264a)
Space and water heating			340.4415	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	251.2639	0.1443	36.2651	(268)
Total CO2, kg/year			484.0650	(272)
CO2 emissions per m2			5.9500	(273)
EI value			94.8683	
EI rating			95	(274)
EI band			A	

SAP 10 WORKSHEET FOR Existing dwelling (SAP) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	81.4000 (1b)	x	2.7000 (2b)	=	219.7800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.4000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	219.7800	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.0910 (8)
Number of storeys in the dwelling (ns)		1 (9)
Additional infiltration	[(9) - 1] x 0.1 =	0.0000 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0.3500 (11)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0.0000 (12)
If no draught lobby, enter 0.05, else enter 0		0.0500 (13)
Percentage of windows and doors draught stripped		100.0000 (14)
Window infiltration	0.25 - [0.2 * (14) / 100] =	0.0500 (15)

Pressure test		No
Pressure Test Method		Blower Door
Measured/design AP50		15.0000 (17)
Infiltration rate		0.5410 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.4599 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	4.7000	4.6000	4.3000	4.3000	4.0000	4.0000	3.9000	4.0000	4.5000	4.4000	4.7000	(22)
Wind factor	1.2750	1.1750	1.1500	1.0750	1.0750	1.0000	1.0000	0.9750	1.0000	1.1250	1.1000	1.1750	(22a)
Adj infilt rate	0.5863	0.5403	0.5288	0.4943	0.4943	0.4599	0.4599	0.4484	0.4599	0.5173	0.5058	0.5403	(22b)
Effective ac	0.6719	0.6460	0.6398	0.6222	0.6222	0.6057	0.6057	0.6005	0.6057	0.6338	0.6279	0.6460	(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	
New and replacement windo (Uw = 1.60)			7.5600	1.5038	11.3684			(27)
GLA Existing (Uw = 1.60)			5.6000	1.5038	8.4211			(27)
External Wall - Existing GLA	15.3900	5.6000	9.7900	0.3000	2.9370	9.0000	88.1100	(29a)
External Wall - New	15.6600	7.5600	8.1000	0.5500	4.4550	190.0000	1539.0000	(29a)
External Roof GLA Notional	8.7000		8.7000	0.1600	1.3920	9.0000	78.3000	(30)
Total net area of external elements Aum(A, m2)			39.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.5735			(33)
Party Wall to other buildings			65.3400	0.0000	0.0000	180.0000	11761.2000	(32)
Party Wall to hall			21.6000	0.0000	0.0000	20.0000	432.0000	(32)
Party Floor			81.4000			30.0000	2442.0000	(32d)
Party Ceiling			72.7000			30.0000	2181.0000	(32b)
Internal Wall			32.9400			9.0000	296.4600	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	18818.0700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		231.1802 (35)
Thermal bridges (Default value 0.200 * total exposed area)		7.9500 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	36.5235 (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	48.7296	46.8509	46.4052	45.1255	45.1255	43.9321	43.9321	43.5535	43.9321	45.9690	45.5425	46.8509	(38)
Heat transfer coeff	85.2531	83.3744	82.9286	81.6490	81.6490	80.4556	80.4556	80.0769	80.4556	82.4925	82.0659	83.3744	(39)
Average = Sum(39)m / 12 =												82.0192	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0473	1.0243	1.0188	1.0031	1.0031	0.9884	0.9884	0.9837	0.9884	1.0134	1.0082	1.0243	(40)
HLP (average)												1.0076	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.4889 (42)

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

Hot water usage for baths
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (42b)
Hot water usage for other uses
42.2302 40.6946 39.1589 37.6233 36.0876 34.5520 34.5520 36.0876 37.6233 39.1589 40.6946 42.2302 (42c)
Average daily hot water use (litres/day) 38.3911 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	42.2302	40.6946	39.1589	37.6233	36.0876	34.5520	34.5520	36.0876	37.6233	39.1589	40.6946	42.2302	(44)
Energy conte	66.8823	57.9485	60.1858	51.5044	48.5809	42.4857	41.7876	44.6840	46.3933	53.1383	57.9769	66.1223	(45)
Energy content (annual)										Total = Sum(45)m =		637.6901	
Distribution loss (46)m = 0.15 x (45)m													
	10.0324	8.6923	9.0279	7.7257	7.2871	6.3729	6.2681	6.7026	6.9590	7.9707	8.6965	9.9183	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8600	(48)
Temperature factor from Table 2b												0.7800	(49)
Enter (49) or (54) in (55)												1.4508	(55)
Total storage loss													
	44.9748	40.6224	44.9748	43.5240	44.9748	43.5240	44.9748	44.9748	43.5240	44.9748	43.5240	44.9748	(56)
If cylinder contains dedicated solar storage													
	44.9748	40.6224	44.9748	43.5240	44.9748	43.5240	44.9748	44.9748	43.5240	44.9748	43.5240	44.9748	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(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													
	166.7147	148.1197	160.0182	148.1164	148.4133	108.5217	110.0248	112.9212	112.4293	152.9707	154.5889	165.9547	(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													
	166.7147	148.1197	160.0182	148.1164	148.4133	108.5217	110.0248	112.9212	112.4293	152.9707	154.5889	165.9547	(64)
										Total per year (kWh/year) = Sum(64)m =		1688.7937	(64)
Electric shower(s)													
	67.8407	60.4466	66.0054	62.9882	64.1701	61.2121	63.2525	64.1701	62.9882	66.0054	64.7643	67.8407	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 771.6843 (64a)													
Heat gains from water heating, kWh/month													
	83.0846	74.0186	80.3992	75.3426	76.0818	47.4391	48.3174	49.5099	49.1824	78.0559	77.9388	82.8319	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	35.5690	31.5921	25.6924	19.4508	14.5397	12.2750	13.2636	17.2405	23.1402	29.3818	34.2929	36.5576	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	331.8531	335.2967	326.6190	308.1451	284.8251	262.9076	248.2653	244.8217	253.4995	271.9734	295.2934	317.2109	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	(71)
Water heating gains (Table 5)													
	111.6729	110.1467	108.0635	104.6426	102.2604	65.8877	64.9428	66.5455	68.3089	104.9139	108.2483	111.3332	(72)
Total internal gains													
	584.2950	582.2355	565.5748	537.4384	506.8252	443.2702	428.6717	430.8078	447.1486	511.4691	543.0346	570.3017	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.5600	13.8645	0.6300	0.7000	0.7700	32.0331	(74)
South	5.6000	58.2505	0.6300	0.7000	0.7700	99.6918	(78)

Solar gains	131.7250	191.9279	266.2061	351.7098	394.7115	434.0057	404.3034	363.3111	310.4437	225.3129	156.2399	107.7700	(83)
Total gains	716.0200	774.1634	831.7810	889.1482	901.5367	877.2759	832.9750	794.1189	757.5923	736.7819	699.2745	678.0717	(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	61.3144	62.6960	63.0330	64.0209	64.0209	64.9705	64.9705	65.2777	64.9705	63.3663	63.6956	62.6960	
alpha	5.0876	5.1797	5.2022	5.2681	5.2681	5.3314	5.3314	5.3518	5.3314	5.2244	5.2464	5.1797	
util living area													
	0.9798	0.9690	0.9382	0.8591	0.7082	0.5063	0.3564	0.3719	0.6150	0.8515	0.9545	0.9828	(86)
MIT	20.2658	20.3746	20.5570	20.7607	20.8899	20.9349	20.9410	20.9410	20.9236	20.7988	20.5451	20.2665	(87)
Th 2	20.0441	20.0632	20.0677	20.0808	20.0808	20.0930	20.0930	20.0969	20.0930	20.0722	20.0765	20.0632	(88)
util rest of house													
	0.9739	0.9604	0.9213	0.8239	0.6467	0.4276	0.2696	0.2818	0.5313	0.8055	0.9398	0.9778	(89)
MIT 2	19.2082	19.3593	19.5868	19.8345	19.9668	20.0150	20.0182	20.0223	20.0083	19.8730	19.5836	19.2251	(90)
Living area fraction									fLA = Living area / (4) =			0.5381	(91)
MIT	19.7772	19.9056	20.1089	20.3329	20.4635	20.5100	20.5147	20.5167	20.5008	20.3711	20.1009	19.7855	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7772	19.9056	20.1089	20.3329	20.4635	20.5100	20.5147	20.5167	20.5008	20.3711	20.1009	19.7855	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9719	0.9587	0.9221	0.8343	0.6732	0.4642	0.3101	0.3238	0.5699	0.8216	0.9403	0.9760	(94)
Useful gains	695.9353	742.2158	767.0024	741.8115	606.9575	407.2564	258.2935	257.1598	431.7337	605.3183	657.5199	661.7867	(95)
Ext temp.	5.4000	5.7000	7.3000	9.6000	12.6000	15.4000	17.3000	17.3000	15.0000	11.8000	8.4000	5.5000	(96)
Heat loss rate W													

	1225.7051	1184.3834	1062.2229	876.3263	642.0481	411.1299	258.6431	257.5806	442.5720	707.0538	960.2480	1191.0407	(97)
Space heating kWh													
	394.1487	297.1367	219.6441	96.8507	26.1074	0.0000	0.0000	0.0000	0.0000	75.6912	217.9642	393.7649	(98a)
Space heating requirement - total per year (kWh/year)												1721.3079	
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													
	394.1487	297.1367	219.6441	96.8507	26.1074	0.0000	0.0000	0.0000	0.0000	75.6912	217.9642	393.7649	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1721.3079	
Space heating per m2											(98c) / (4) =	21.1463	(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 %)												170.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	394.1487	297.1367	219.6441	96.8507	26.1074	0.0000	0.0000	0.0000	0.0000	75.6912	217.9642	393.7649	(98)
Space heating efficiency (main heating system 1)													
	170.0000	170.0000	170.0000	170.0000	170.0000	0.0000	0.0000	0.0000	0.0000	170.0000	170.0000	170.0000	(210)
Space heating fuel (main heating system)													
	231.8522	174.7863	129.2024	56.9710	15.3573	0.0000	0.0000	0.0000	0.0000	44.5242	128.2142	231.6264	(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													
	166.7147	148.1197	160.0182	148.1164	148.4133	108.5217	110.0248	112.9212	112.4293	152.9707	154.5889	165.9547	(64)
Efficiency of water heater												170.0000	(216)
(217)m	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	(217)
Fuel for water heating, kWh/month													
	98.0675	87.1292	94.1284	87.1273	87.3019	63.8363	64.7205	66.4243	66.1349	89.9828	90.9346	97.6204	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	31.1333	24.9763	22.4884	16.4760	12.7265	10.3977	11.6096	15.0905	19.6011	25.7177	29.0481	31.9986	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1012.5340	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	170.0000	
Water heating fuel used	993.4080	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	0.0000	(231)
Electricity for lighting (calculated in Appendix L)	251.2639	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3028.8902	(238)

10a. Fuel costs - using BEDF prices (550)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1012.5340	26.0600	263.8664	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	993.4080	26.0600	258.8821	(247)
Energy for instantaneous electric shower(s)	771.6843	26.0600	201.1009	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Energy for lighting	251.2639	26.0600	65.4794	(250)
Additional standing charges			0.0000	(251)
Total energy cost			789.3288	(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	1012.5340	0.1569	158.8704	(261)
Total CO2 associated with community systems			0.0000	(373)

Water heating (other fuel)	993.4080	0.1415	140.5436	(264)
Energy for instantaneous electric shower(s)	771.6843	0.1391	107.3583	(264a)
Space and water heating			299.4140	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	251.2639	0.1443	36.2651	(268)
Total CO2, kg/year			443.0375	(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	1012.5340	1.5809	1600.7040	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	993.4080	1.5232	1513.1413	(278)
Energy for instantaneous electric shower(s)	771.6843	1.5143	1168.5878	(278a)
Space and water heating			3113.8453	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	251.2639	1.5338	385.3969	(282)
Total Primary energy kWh/year			4667.8301	(286)

SAP 10 EPC IMPROVEMENTS

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1 Baseline

Current energy efficiency rating: C 75
Current environmental impact rating: A 95

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

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

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

Potential energy efficiency rating: C 75
Potential environmental impact rating: A 95

Fuel prices for cost data on this page from database revision number 550 TEST (28 Jun 2024)
Recommendation texts revision number 6.1 (11 Jun 2019)

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

	Current	Potential	Saving
Electricity	£789	£789	£0
Space heating	£264	£264	£0
Water heating	£460	£460	£0
Lighting	£65	£65	£0
Total cost of fuels	£789	£789	£0
Total cost of uses	£789	£789	£0
Delivered energy	37 kWh/m²	37 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.4 tonnes	0.4 tonnes	0.0 tonnes
CO2 emissions per m²	5 kg/m²	5 kg/m²	0 kg/m²
Primary energy	57 kWh/m²	57 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR Existing dwelling (SAP) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	81.4000	(1b)	x 2.7000	(2b) =	219.7800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.4000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	219.7800	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)

Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.0910 (8)
Number of storeys in the dwelling (ns)		1 (9)
Additional infiltration	[(9) - 1] x 0.1 =	0.0000 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0.3500 (11)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0.0000 (12)
If no draught lobby, enter 0.05, else enter 0		0.0500 (13)
Percentage of windows and doors draught stripped		100.0000 (14)
Window infiltration	0.25 - [0.2 * (14) / 100] =	0.0500 (15)
Pressure test		No
Pressure Test Method		Blower Door
Measured/design AP50		15.0000 (17)
Infiltration rate		0.5410 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.4599 (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	0.5863	0.5748	0.5633	0.5058	0.4943	0.4369	0.4369	0.4254	0.4599	0.4943	0.5173	0.5403	(22b)
Effective ac	0.6719	0.6652	0.6587	0.6279	0.6222	0.5954	0.5954	0.5905	0.6057	0.6222	0.6338	0.6460	(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	
New and replacement windo (Uw = 1.60)			7.5600	1.5038	11.3684			(27)
GLA Existing (Uw = 1.60)			5.6000	1.5038	8.4211			(27)
External Wall - Existing GLA	15.3900	5.6000	9.7900	0.3000	2.9370	9.0000	88.1100	(29a)
External Wall - New	15.6600	7.5600	8.1000	0.5500	4.4550	190.0000	1539.0000	(29a)
External Roof GLA Notional	8.7000		8.7000	0.1600	1.3920	9.0000	78.3000	(30)
Total net area of external elements Aum(A, m2)			39.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.5735			(33)
Party Wall to other buildings			65.3400	0.0000	0.0000	180.0000	11761.2000	(32)
Party Wall to hall			21.6000	0.0000	0.0000	20.0000	432.0000	(32)
Party Floor			81.4000			30.0000	2442.0000	(32d)
Party Ceiling			72.7000			30.0000	2181.0000	(32b)
Internal Wall			32.9400			9.0000	296.4600	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	18818.0700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		231.1802 (35)
Thermal bridges (Default value 0.200 * total exposed area)		7.9500 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	36.5235 (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	48.7296	48.2456	47.7711	45.5425	45.1255	43.1844	43.1844	42.8250	43.9321	45.1255	45.9690	46.8509	(38)
Heat transfer coeff	85.2531	84.7690	84.2946	82.0659	81.6490	79.7079	79.7079	79.3484	80.4556	81.6490	82.4925	83.3744	(39)
Average = Sum(39)m / 12 =												82.0639	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0473	1.0414	1.0356	1.0082	1.0031	0.9792	0.9792	0.9748	0.9884	1.0031	1.0134	1.0243	(40)
HLP (average)												1.0082	
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		2.4889 (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

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)

Hot water usage for other uses

	42.2302	40.6946	39.1589	37.6233	36.0876	34.5520	34.5520	36.0876	37.6233	39.1589	40.6946	42.2302	(42c)
Average daily hot water use (litres/day)												38.3911	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	42.2302	40.6946	39.1589	37.6233	36.0876	34.5520	34.5520	36.0876	37.6233	39.1589	40.6946	42.2302	(44)
Energy conte	66.8823	57.9485	60.1858	51.5044	48.5809	42.4857	41.7876	44.6840	46.3933	53.1383	57.9769	66.1223	(45)
Energy content (annual)											Total = Sum(45)m =	637.6901	
Distribution loss (46)m = 0.15 x (45)m	10.0324	8.6923	9.0279	7.7257	7.2871	6.3729	6.2681	6.7026	6.9590	7.9707	8.6965	9.9183	(46)

Water storage loss:		
Store volume		150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):		1.8600 (48)
Temperature factor from Table 2b		0.7800 (49)
Enter (49) or (54) in (55)		1.4508 (55)

Total storage loss

	44.9748	40.6224	44.9748	43.5240	44.9748	43.5240	44.9748	44.9748	43.5240	44.9748	43.5240	44.9748	(56)

If cylinder contains dedicated solar storage

	44.9748	40.6224	44.9748	43.5240	44.9748	43.5240	44.9748	44.9748	43.5240	44.9748	43.5240	44.9748	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(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

	166.7147	148.1197	160.0182	148.1164	148.4133	108.5217	110.0248	112.9212	112.4293	152.9707	154.5889	165.9547	(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

	166.7147	148.1197	160.0182	148.1164	148.4133	108.5217	110.0248	112.9212	112.4293	152.9707	154.5889	165.9547	(64)
										Total per year (kWh/year) = Sum(64)m =		1688.7937	(64)

Electric shower(s)

	67.8407	60.4466	66.0054	62.9882	64.1701	61.2121	63.2525	64.1701	62.9882	66.0054	64.7643	67.8407 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												771.6843 (64a)
Heat gains from water heating, kWh/month												
	83.0846	74.0186	80.3992	75.3426	76.0818	47.4391	48.3174	49.5099	49.1824	78.0559	77.9388	82.8319 (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	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	35.5690	31.5921	25.6924	19.4508	14.5397	12.2750	13.2636	17.2405	23.1402	29.3818	34.2929	36.5576	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	331.8531	335.2967	326.6190	308.1451	284.8251	262.9076	248.2653	244.8217	253.4995	271.9734	295.2934	317.2109	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	(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)													
	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	(71)
Water heating gains (Table 5)													
	111.6729	110.1467	108.0635	104.6426	102.2604	65.8877	64.9428	66.5455	68.3089	104.9139	108.2483	111.3332	(72)
Total internal gains													
	584.2950	582.2355	565.5748	537.4384	506.8252	443.2702	428.6717	430.8078	447.1486	511.4691	543.0346	570.3017	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.5600	10.6334	0.6300	0.7000	0.7700	24.5678	(74)
South	5.6000	46.7521	0.6300	0.7000	0.7700	80.0130	(78)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	104.5808	177.9909	246.7025	316.8058	369.2199	373.9961	357.3905	316.4047	270.2917	197.2278	125.1502	89.6195	(83)
Total gains	688.8758	760.2264	812.2774	854.2442	876.0451	817.2663	786.0622	747.2125	717.4403	708.6969	668.1848	659.9212	(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	61.3144	61.6645	62.0116	63.6956	64.0209	65.5800	65.5800	65.8771	64.9705	64.0209	63.3663	62.6960	
alpha	5.0876	5.1110	5.1341	5.2464	5.2681	5.3720	5.3720	5.3918	5.3314	5.2681	5.2244	5.1797	
util living area													
	0.9870	0.9771	0.9552	0.8959	0.7749	0.6046	0.4429	0.4832	0.7182	0.9059	0.9743	0.9892	(86)
MIT	20.1421	20.2722	20.4602	20.6951	20.8542	20.9249	20.9395	20.9382	20.8986	20.7172	20.4060	20.1351	(87)
Th 2	20.0441	20.0490	20.0538	20.0765	20.0808	20.1007	20.1007	20.1044	20.0930	20.0808	20.0722	20.0632	(88)
util rest of house													
	0.9834	0.9708	0.9428	0.8682	0.7220	0.5275	0.3541	0.3918	0.6433	0.8751	0.9661	0.9861	(89)
MIT 2	19.0519	19.2194	19.4572	19.7575	19.9335	20.0165	20.0257	20.0290	19.9896	19.7918	19.4084	19.0585	(90)
Living area fraction										fLA = Living area / (4) =		0.5381	(91)
MIT	19.6385	19.7859	19.9969	20.2620	20.4289	20.5053	20.5174	20.5182	20.4788	20.2898	19.9452	19.6378	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6385	19.7859	19.9969	20.2620	20.4289	20.5053	20.5174	20.5182	20.4788	20.2898	19.9452	19.6378	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9815	0.9688	0.9419	0.8743	0.7431	0.5629	0.3955	0.4345	0.6765	0.8829	0.9648	0.9844	(94)
Useful gains	676.1145	736.4776	765.1092	746.8653	650.9554	460.0782	310.9229	324.6353	485.3824	625.7022	644.6599	649.6516	(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													
	1307.6558	1261.8629	1137.7164	932.4310	712.7047	470.6956	312.2470	326.7732	513.2066	791.1599	1059.6308	1287.1168	(97)
Space heating kWh													
	469.8668	353.0589	277.2198	133.6073	45.9414	0.0000	0.0000	0.0000	0.0000	123.1005	298.7791	474.2741	(98a)
Space heating requirement - total per year (kWh/year)												2175.8479	
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													
	469.8668	353.0589	277.2198	133.6073	45.9414	0.0000	0.0000	0.0000	0.0000	123.1005	298.7791	474.2741	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2175.8479	
Space heating per m2											(98c) / (4) =	26.7303	(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 %)												170.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	469.8668	353.0589	277.2198	133.6073	45.9414	0.0000	0.0000	0.0000	0.0000	123.1005	298.7791	474.2741	(98)
Space heating efficiency (main heating system 1)													
	170.0000	170.0000	170.0000	170.0000	170.0000	0.0000	0.0000	0.0000	0.0000	170.0000	170.0000	170.0000	(210)
Space heating fuel (main heating system)													
	276.3922	207.6817	163.0705	78.5925	27.0244	0.0000	0.0000	0.0000	0.0000	72.4121	175.7524	278.9848	(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

	166.7147	148.1197	160.0182	148.1164	148.4133	108.5217	110.0248	112.9212	112.4293	152.9707	154.5889	165.9547 (64)
Efficiency of water heater												170.0000 (216)
(217)m	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000 (217)
Fuel for water heating, kWh/month												
	98.0675	87.1292	94.1284	87.1273	87.3019	63.8363	64.7205	66.4243	66.1349	89.9828	90.9346	97.6204 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	31.1333	24.9763	22.4884	16.4760	12.7265	10.3977	11.6096	15.0905	19.6011	25.7177	29.0481	31.9986 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1279.9105 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	170.0000
Water heating fuel used	993.4080 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	251.2639 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	3296.2667 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1279.9105	16.4900	211.0572	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	993.4080	16.4900	163.8130	(247)
Energy for instantaneous electric shower(s)	771.6843	16.4900	127.2507	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Energy for lighting	251.2639	16.4900	41.4334	(250)
Additional standing charges			0.0000	(251)
Total energy cost			543.5544	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.5481 (257)
SAP value		74.9053
SAP rating (Section 12)		75 (258)
SAP band		C

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	1279.9105	0.1562	199.8979	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	993.4080	0.1415	140.5436	(264)
Energy for instantaneous electric shower(s)	771.6843	0.1391	107.3583	(264a)
Space and water heating			340.4415	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	251.2639	0.1443	36.2651	(268)
Total CO2, kg/year			484.0650	(272)
CO2 emissions per m2			5.9500	(273)
EI value			94.8683	
EI rating			95	(274)
EI band			A	

SAP 10 WORKSHEET FOR Existing dwelling (SAP) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	81.4000 (1b)	x	2.7000 (2b)	=	219.7800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.4000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	219.7800	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.0910 (8)
Number of storeys in the dwelling (ns)		1 (9)
Additional infiltration	[(9) - 1] x 0.1 =	0.0000 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0.3500 (11)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0.0000 (12)
If no draught lobby, enter 0.05, else enter 0		0.0500 (13)
Percentage of windows and doors draught stripped		100.0000 (14)
Window infiltration	0.25 - [0.2 * (14) / 100] =	0.0500 (15)

Pressure test		No
Pressure Test Method		Blower Door
Measured/design AP50		15.0000 (17)
Infiltration rate		0.5410 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.4599 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	4.7000	4.6000	4.3000	4.3000	4.0000	4.0000	3.9000	4.0000	4.5000	4.4000	4.7000	(22)
Wind factor	1.2750	1.1750	1.1500	1.0750	1.0750	1.0000	1.0000	0.9750	1.0000	1.1250	1.1000	1.1750	(22a)
Adj infilt rate	0.5863	0.5403	0.5288	0.4943	0.4943	0.4599	0.4599	0.4484	0.4599	0.5173	0.5058	0.5403	(22b)
Effective ac	0.6719	0.6460	0.6398	0.6222	0.6222	0.6057	0.6057	0.6005	0.6057	0.6338	0.6279	0.6460	(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	
New and replacement windo (Uw = 1.60)			7.5600	1.5038	11.3684			(27)
GLA Existing (Uw = 1.60)			5.6000	1.5038	8.4211			(27)
External Wall - Existing GLA	15.3900	5.6000	9.7900	0.3000	2.9370	9.0000	88.1100	(29a)
External Wall - New	15.6600	7.5600	8.1000	0.5500	4.4550	190.0000	1539.0000	(29a)
External Roof GLA Notional	8.7000		8.7000	0.1600	1.3920	9.0000	78.3000	(30)
Total net area of external elements Aum(A, m2)			39.7500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.5735			(33)
Party Wall to other buildings			65.3400	0.0000	0.0000	180.0000	11761.2000	(32)
Party Wall to hall			21.6000	0.0000	0.0000	20.0000	432.0000	(32)
Party Floor			81.4000			30.0000	2442.0000	(32d)
Party Ceiling			72.7000			30.0000	2181.0000	(32b)
Internal Wall			32.9400			9.0000	296.4600	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	18818.0700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		231.1802 (35)
Thermal bridges (Default value 0.200 * total exposed area)		7.9500 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	36.5235 (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	48.7296	46.8509	46.4052	45.1255	45.1255	43.9321	43.9321	43.5535	43.9321	45.9690	45.5425	46.8509	(38)
Heat transfer coeff	85.2531	83.3744	82.9286	81.6490	81.6490	80.4556	80.4556	80.0769	80.4556	82.4925	82.0659	83.3744	(39)
Average = Sum(39)m / 12 =												82.0192	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0473	1.0243	1.0188	1.0031	1.0031	0.9884	0.9884	0.9837	0.9884	1.0134	1.0082	1.0243	(40)
HLP (average)												1.0076	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.4889 (42)

Hot water usage for mixer showers

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

Hot water usage for baths

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)

Hot water usage for other uses

42.2302	40.6946	39.1589	37.6233	36.0876	34.5520	34.5520	36.0876	37.6233	39.1589	40.6946	42.2302	(42c)

Average daily hot water use (litres/day)		38.3911 (43)

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

Daily hot water use

	42.2302	40.6946	39.1589	37.6233	36.0876	34.5520	34.5520	36.0876	37.6233	39.1589	40.6946	42.2302	(44)
Energy conte	66.8823	57.9485	60.1858	51.5044	48.5809	42.4857	41.7876	44.6840	46.3933	53.1383	57.9769	66.1223	(45)
Energy content (annual)											Total = Sum(45)m =	637.6901	
Distribution loss (46)m = 0.15 x (45)m													
	10.0324	8.6923	9.0279	7.7257	7.2871	6.3729	6.2681	6.7026	6.9590	7.9707	8.6965	9.9183	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8600	(48)
Temperature factor from Table 2b												0.7800	(49)
Enter (49) or (54) in (55)												1.4508	(55)
Total storage loss													
	44.9748	40.6224	44.9748	43.5240	44.9748	43.5240	44.9748	44.9748	43.5240	44.9748	43.5240	44.9748	(56)
If cylinder contains dedicated solar storage													
	44.9748	40.6224	44.9748	43.5240	44.9748	43.5240	44.9748	44.9748	43.5240	44.9748	43.5240	44.9748	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(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													
	166.7147	148.1197	160.0182	148.1164	148.4133	108.5217	110.0248	112.9212	112.4293	152.9707	154.5889	165.9547	(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													
	166.7147	148.1197	160.0182	148.1164	148.4133	108.5217	110.0248	112.9212	112.4293	152.9707	154.5889	165.9547	(64)
										Total per year (kWh/year) = Sum(64)m =		1688.7937	(64)
Electric shower(s)													
	67.8407	60.4466	66.0054	62.9882	64.1701	61.2121	63.2525	64.1701	62.9882	66.0054	64.7643	67.8407	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		771.6843	(64a)
Heat gains from water heating, kWh/month													
	83.0846	74.0186	80.3992	75.3426	76.0818	47.4391	48.3174	49.5099	49.1824	78.0559	77.9388	82.8319	(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	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	35.5690	31.5921	25.6924	19.4508	14.5397	12.2750	13.2636	17.2405	23.1402	29.3818	34.2929	36.5576	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	331.8531	335.2967	326.6190	308.1451	284.8251	262.9076	248.2653	244.8217	253.4995	271.9734	295.2934	317.2109	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	(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)													
	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	(71)
Water heating gains (Table 5)													
	111.6729	110.1467	108.0635	104.6426	102.2604	65.8877	64.9428	66.5455	68.3089	104.9139	108.2483	111.3332	(72)
Total internal gains													
	584.2950	582.2355	565.5748	537.4384	506.8252	443.2702	428.6717	430.8078	447.1486	511.4691	543.0346	570.3017	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.5600	13.8645	0.6300	0.7000	0.7700	32.0331	(74)
South	5.6000	58.2505	0.6300	0.7000	0.7700	99.6918	(78)

Solar gains	131.7250	191.9279	266.2061	351.7098	394.7115	434.0057	404.3034	363.3111	310.4437	225.3129	156.2399	107.7700	(83)
Total gains	716.0200	774.1634	831.7810	889.1482	901.5367	877.2759	832.9750	794.1189	757.5923	736.7819	699.2745	678.0717	(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	61.3144	62.6960	63.0330	64.0209	64.0209	64.9705	64.9705	65.2777	64.9705	63.3663	63.6956	62.6960	
alpha	5.0876	5.1797	5.2022	5.2681	5.2681	5.3314	5.3314	5.3518	5.3314	5.2244	5.2464	5.1797	
util living area													
	0.9798	0.9690	0.9382	0.8591	0.7082	0.5063	0.3564	0.3719	0.6150	0.8515	0.9545	0.9828	(86)
MIT	20.2658	20.3746	20.5570	20.7607	20.8899	20.9349	20.9410	20.9410	20.9236	20.7988	20.5451	20.2665	(87)
Th 2	20.0441	20.0632	20.0677	20.0808	20.0808	20.0930	20.0930	20.0969	20.0930	20.0722	20.0765	20.0632	(88)
util rest of house													
	0.9739	0.9604	0.9213	0.8239	0.6467	0.4276	0.2696	0.2818	0.5313	0.8055	0.9398	0.9778	(89)
MIT 2	19.2082	19.3593	19.5868	19.8345	19.9668	20.0150	20.0182	20.0223	20.0083	19.8730	19.5836	19.2251	(90)
Living area fraction										fLA = Living area / (4) =		0.5381	(91)
MIT	19.7772	19.9056	20.1089	20.3329	20.4635	20.5100	20.5147	20.5167	20.5008	20.3711	20.1009	19.7855	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7772	19.9056	20.1089	20.3329	20.4635	20.5100	20.5147	20.5167	20.5008	20.3711	20.1009	19.7855	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9719	0.9587	0.9221	0.8343	0.6732	0.4642	0.3101	0.3238	0.5699	0.8216	0.9403	0.9760	(94)
Useful gains	695.9353	742.2158	767.0024	741.8115	606.9575	407.2564	258.2935	257.1598	431.7337	605.3183	657.5199	661.7867	(95)
Ext temp.	5.4000	5.7000	7.3000	9.6000	12.6000	15.4000	17.3000	17.3000	15.0000	11.8000	8.4000	5.5000	(96)
Heat loss rate W													
	1225.7051	1184.3834	1062.2229	876.3263	642.0481	411.1299	258.6431	257.5806	442.5720	707.0538	960.2480	1191.0407	(97)
Space heating kWh													
	394.1487	297.1367	219.6441	96.8507	26.1074	0.0000	0.0000	0.0000	0.0000	75.6912	217.9642	393.7649	(98a)
Space heating requirement - total per year (kWh/year)												1721.3079	
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

394.1487	297.1367	219.6441	96.8507	26.1074	0.0000	0.0000	0.0000	0.0000	75.6912	217.9642	393.7649	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 1721.3079

Space heating per m2 (98c) / (4) = 21.1463 (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 %) 170.0000 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	394.1487	297.1367	219.6441	96.8507	26.1074	0.0000	0.0000	0.0000	0.0000	75.6912	217.9642	393.7649	(98)
Space heating efficiency (main heating system 1)													
	170.0000	170.0000	170.0000	170.0000	170.0000	0.0000	0.0000	0.0000	0.0000	170.0000	170.0000	170.0000	(210)
Space heating fuel (main heating system)													
	231.8522	174.7863	129.2024	56.9710	15.3573	0.0000	0.0000	0.0000	0.0000	44.5242	128.2142	231.6264	(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													
	166.7147	148.1197	160.0182	148.1164	148.4133	108.5217	110.0248	112.9212	112.4293	152.9707	154.5889	165.9547	(64)
Efficiency of water heater												170.0000	(216)
(217)m	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	(217)
Fuel for water heating, kWh/month													
	98.0675	87.1292	94.1284	87.1273	87.3019	63.8363	64.7205	66.4243	66.1349	89.9828	90.9346	97.6204	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	31.1333	24.9763	22.4884	16.4760	12.7265	10.3977	11.6096	15.0905	19.6011	25.7177	29.0481	31.9986	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year

Space heating fuel - main system 1 1012.5340 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 170.0000

Water heating fuel used 993.4080 (219)

Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:

Total electricity for the above, kWh/year 0.0000 (231)

Electricity for lighting (calculated in Appendix L) 251.2639 (232)

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

PV generation 0.0000 (233)

Wind generation 0.0000 (234)

Hydro-electric generation (Appendix N) 0.0000 (235a)

Electricity generated - Micro CHP (Appendix N) 0.0000 (235)

Appendix Q - special features

Energy saved or generated -0.0000 (236)

Energy used 0.0000 (237)

Total delivered energy for all uses 3028.8902 (238)

10a. Fuel costs - using BEDF prices (550)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1012.5340	26.0600	263.8664	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	993.4080	26.0600	258.8821	(247)
Energy for instantaneous electric shower(s)	771.6843	26.0600	201.1009	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Energy for lighting	251.2639	26.0600	65.4794	(250)
Additional standing charges			0.0000	(251)
Total energy cost			789.3288	(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	1012.5340	0.1569	158.8704	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	993.4080	0.1415	140.5436	(264)
Energy for instantaneous electric shower(s)	771.6843	0.1391	107.3583	(264a)
Space and water heating			299.4140	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	251.2639	0.1443	36.2651	(268)
Total CO2, kg/year			443.0375	(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	1012.5340	1.5809	1600.7040	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	993.4080	1.5232	1513.1413	(278)
Energy for instantaneous electric shower(s)	771.6843	1.5143	1168.5878	(278a)
Space and water heating			3113.8453	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	251.2639	1.5338	385.3969	(282)
Total Primary energy kWh/year			4667.8301	(286)

Full SAP Calculation Printout

Property Reference	First Floor Flat	**Issued on Date**	29/07/2024
Assessment Reference	2 Lean & Clean	**Prop Type Ref**	First Floor Flat
Property			

SAP Rating	77 C	**DER**	5.67	**TER**	
Environmental	95 A	**% DER < TER**			N/A
CO_2 Emissions (t/year)	0.41	**DFEE**	29.28	**TFEE**	
Compliance Check	See BREL	**% DFEE < TFEE**			
% DPER < TPER		**DPER**	59.74	**TPER**	

Assessor Details	Mr. Sean Mills	**Assessor ID**	W382-0001
Client	VORBILD Architecture Ltd, VORBILD Architecture Ltd		

SAP 10 WORKSHEET FOR Existing dwelling (SAP) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	81.4000 (1b)	x	2.7000 (2b)	=	219.7800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.4000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	219.7800	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.0910	(8)
Number of storeys in the dwelling (ns)		1	(9)
Additional infiltration	[(9) - 1] x 0.1 =	0.0000	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0.3500	(11)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0.0000	(12)
If no draught lobby, enter 0.05, else enter 0		0.0500	(13)
Percentage of windows and doors draught stripped		100.0000	(14)
Window infiltration	0.25 - [0.2 * (14) / 100] =	0.0500	(15)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.5410	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.4599	(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	0.5863	0.5748	0.5633	0.5058	0.4943	0.4369	0.4369	0.4254	0.4599	0.4943	0.5173	0.5403	(22b)
Effective ac	0.6719	0.6652	0.6587	0.6279	0.6222	0.5954	0.5954	0.5905	0.6057	0.6222	0.6338	0.6460	(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	
New and replacement windo (Uw = 1.00)			7.5600	0.9615	7.2692			(27)
Replaced Existing (Uw = 1.00)			5.6000	0.9615	5.3846			(27)
External Wall - Existing GLA	15.3900	5.6000	9.7900	0.1800	1.7622	9.0000	88.1100	(29a)
External Wall - New	15.6600	7.5600	8.1000	0.1400	1.1340	190.0000	1539.0000	(29a)
External Roof GLA Notional	8.7000		8.7000	0.1300	1.1310	9.0000	78.3000	(30)
Total net area of external elements Aum(A, m2)			39.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.6810			(33)
Party Wall to other buildings			65.3400	0.0000	0.0000	180.0000	11761.2000	(32)
Party Wall to hall			21.6000	0.0000	0.0000	20.0000	432.0000	(32)
Party Floor			81.4000			30.0000	2442.0000	(32d)
Party Ceiling			72.7000			20.0000	1454.0000	(32b)

Internal Wall						32.9400					9.0000	296.4600	(32c)
Heat capacity Cm = Sum(A x k)									(28)...(30) + (32) + (32a)...(32e) =			18091.0700	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												222.2490	(35)
Thermal bridges (Default value 0.200 * total exposed area)												7.9500	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss										(33) + (36) + (36a) =		24.6310	(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	48.7296	48.2456	47.7711	45.5425	45.1255	43.1844	43.1844	42.8250	43.9321	45.1255	45.9690	46.8509	(38)
Heat transfer coeff	73.3607	72.8766	72.4021	70.1735	69.7565	67.8155	67.8155	67.4560	68.5631	69.7565	70.6001	71.4819	(39)
Average = Sum(39)m / 12 =												70.1715	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9012	0.8953	0.8895	0.8621	0.8570	0.8331	0.8331	0.8287	0.8423	0.8570	0.8673	0.8782	(40)
HLP (average)												0.8621	
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												2.4889	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses	42.2302	40.6946	39.1589	37.6233	36.0876	34.5520	34.5520	36.0876	37.6233	39.1589	40.6946	42.2302	(42c)
Average daily hot water use (litres/day)												38.3911	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	42.2302	40.6946	39.1589	37.6233	36.0876	34.5520	34.5520	36.0876	37.6233	39.1589	40.6946	42.2302	(44)
Energy conte	66.8823	57.9485	60.1858	51.5044	48.5809	42.4857	41.7876	44.6840	46.3933	53.1383	57.9769	66.1223	(45)
Energy content (annual)											Total = Sum(45)m =	637.6901	
Distribution loss (46)m = 0.15 x (45)m	10.0324	8.6923	9.0279	7.7257	7.2871	6.3729	6.2681	6.7026	6.9590	7.9707	8.6965	9.9183	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8600	(48)
Temperature factor from Table 2b												0.7800	(49)
Enter (49) or (54) in (55)												1.4508	(55)
Total storage loss	44.9748	40.6224	44.9748	43.5240	44.9748	43.5240	44.9748	44.9748	43.5240	44.9748	43.5240	44.9748	(56)
If cylinder contains dedicated solar storage	44.9748	40.6224	44.9748	43.5240	44.9748	43.5240	44.9748	44.9748	43.5240	44.9748	43.5240	44.9748	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(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	166.7147	148.1197	160.0182	148.1164	148.4133	108.5217	110.0248	112.9212	112.4293	152.9707	154.5889	165.9547	(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	166.7147	148.1197	160.0182	148.1164	148.4133	108.5217	110.0248	112.9212	112.4293	152.9707	154.5889	165.9547	(64)
										Total per year (kWh/year) = Sum(64)m =		1688.7937	(64)
12Total per year (kWh/year)												1689	(64)
Electric shower(s)	67.8407	60.4466	66.0054	62.9882	64.1701	61.2121	63.2525	64.1701	62.9882	66.0054	64.7643	67.8407	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		771.6843	(64a)
Heat gains from water heating, kWh/month	83.0846	74.0186	80.3992	75.3426	76.0818	47.4391	48.3174	49.5099	49.1824	78.0559	77.9388	82.8319	(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	124.4444	124.4444	124.4444	124.4444	124.4444	124.4444	124.4444	124.4444	124.4444	124.4444	124.4444	124.4444	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	116.7614	129.2715	116.7614	120.6534	116.7614	120.6534	116.7614	116.7614	120.6534	116.7614	120.6534	116.7614	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	222.3416	224.6488	218.8347	206.4572	190.8328	176.1481	166.3378	164.0306	169.8447	182.2222	197.8466	212.5313	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.4444	35.4444	35.4444	35.4444	35.4444	35.4444	35.4444	35.4444	35.4444	35.4444	35.4444	35.4444	(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)	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	(71)
Water heating gains (Table 5)	111.6729	110.1467	108.0635	104.6426	102.2604	65.8877	64.9428	66.5455	68.3089	104.9139	108.2483	111.3332	(72)
Total internal gains	514.1092	527.4004	506.9929	495.0865	473.1879	423.0225	408.3753	407.6708	419.1403	467.2308	490.0816	503.9593	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.5600	10.6334	0.4000	0.7000	0.7700	15.5986	(74)
South	5.6000	46.7521	0.4000	0.7000	0.7700	50.8019	(78)

Solar gains	66.4005	113.0101	156.6365	201.1465	234.4253	237.4578	226.9146	200.8919	171.6138	125.2240	79.4604	56.9013	(83)
Total gains	580.5097	640.4105	663.6294	696.2331	707.6133	660.4803	635.2899	608.5627	590.7541	592.4548	569.5421	560.8605	(84)

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7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	68.5012	68.9562	69.4081	71.6125	72.0405	74.1025	74.1025	74.4974	73.2944	72.0405	71.1798	70.3016	
alpha	5.5667	5.5971	5.6272	5.7742	5.8027	5.9402	5.9402	5.9665	5.8863	5.8027	5.7453	5.6868	
util living area	0.9917	0.9844	0.9708	0.9226	0.8135	0.6375	0.4669	0.5054	0.7457	0.9243	0.9811	0.9929	(86)
MIT	20.2044	20.3253	20.4816	20.7088	20.8625	20.9327	20.9457	20.9448	20.9097	20.7420	20.4611	20.2082	(87)
Th 2	20.1664	20.1715	20.1765	20.1998	20.2042	20.2247	20.2247	20.2285	20.2168	20.2042	20.1954	20.1861	(88)
util rest of house	0.9895	0.9802	0.9627	0.9017	0.7686	0.5680	0.3861	0.4229	0.6797	0.9000	0.9753	0.9910	(89)
MIT 2	19.2330	19.3902	19.5908	19.8875	20.0628	20.1483	20.1569	20.1604	20.1227	19.9338	19.5827	19.2539	(90)
Living area fraction									fLA = Living area / (4) =			0.5381	(91)
MIT	19.7557	19.8934	20.0701	20.3294	20.4931	20.5704	20.5813	20.5825	20.5462	20.3687	20.0554	19.7674	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7557	19.8934	20.0701	20.3294	20.4931	20.5704	20.5813	20.5825	20.5462	20.3687	20.0554	19.7674	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9881	0.9786	0.9615	0.9055	0.7858	0.5996	0.4235	0.4611	0.7086	0.9056	0.9741	0.9898	(94)
Useful gains	573.6051	626.6809	638.0563	630.4099	556.0493	396.0261	269.0296	280.5844	418.6325	536.5107	554.8051	555.1503	(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	1133.8415	1092.6649	982.5074	802.0406	613.3763	404.8847	269.9950	282.1335	441.9710	681.4290	914.6486	1112.7874	(97)
Space heating kWh	416.8158	313.1413	256.2716	123.5741	42.6513	0.0000	0.0000	0.0000	0.0000	107.8193	259.0873	414.8820	(98a)
Space heating requirement - total per year (kWh/year)												1934.2428	
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	416.8158	313.1413	256.2716	123.5741	42.6513	0.0000	0.0000	0.0000	0.0000	107.8193	259.0873	414.8820	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1934.2428	
Space heating per m2											(98c) / (4) =	23.7622	(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 %)	170.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	416.8158	313.1413	256.2716	123.5741	42.6513	0.0000	0.0000	0.0000	0.0000	107.8193	259.0873	414.8820	(98)
Space heating efficiency (main heating system 1)	170.0000	170.0000	170.0000	170.0000	170.0000	0.0000	0.0000	0.0000	0.0000	170.0000	170.0000	170.0000	(210)
Space heating fuel (main heating system)	245.1858	184.2008	150.7480	72.6907	25.0890	0.0000	0.0000	0.0000	0.0000	63.4231	152.4043	244.0482	(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	166.7147	148.1197	160.0182	148.1164	148.4133	108.5217	110.0248	112.9212	112.4293	152.9707	154.5889	165.9547	(64)
Efficiency of water heater												170.0000	(216)
(217)m	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	(217)
Fuel for water heating, kWh/month	98.0675	87.1292	94.1284	87.1273	87.3019	63.8363	64.7205	66.4243	66.1349	89.9828	90.9346	97.6204	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	31.1333	24.9763	22.4884	16.4760	12.7265	10.3977	11.6096	15.0905	19.6011	25.7177	29.0481	31.9986	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1137.7899	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												170.0000	
Water heating fuel used												993.4080	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												251.2639	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													

Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3154.1460	(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	1137.7899	0.1561	177.6268	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	993.4080	0.1415	140.5436	(264)
Energy for instantaneous electric shower(s)	771.6843	0.1391	107.3583	(264a)
Space and water heating			318.1704	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	251.2639	0.1443	36.2651	(268)
Total CO2, kg/year			461.7939	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.6700	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1137.7899	1.5780	1795.4040	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	993.4080	1.5232	1513.1413	(278)
Energy for instantaneous electric shower(s)	771.6843	1.5143	1168.5878	(278a)
Space and water heating			3308.5453	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	251.2639	1.5338	385.3969	(282)
Total Primary energy kWh/year			4862.5300	(286)
Dwelling Primary energy Rate (DPER)			59.7400	(287)

SAP 10 WORKSHEET FOR Existing dwelling (SAP) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	81.4000	(1b)	x 2.7000	(2b) =	219.7800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.4000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		219.7800	(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) =	0.1365	(8)
Number of storeys in the dwelling (ns)		1	(9)
Additional infiltration	[(9) - 1] x 0.1 =	0.0000	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0.3500	(11)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0.0000	(12)
If no draught lobby, enter 0.05, else enter 0		0.0500	(13)
Percentage of windows and doors draught stripped		100.0000	(14)
Window infiltration	0.25 - [0.2 * (14) / 100] =	0.0500	(15)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.5865	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.4985	(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	0.6356	0.6232	0.6107	0.5484	0.5359	0.4736	0.4736	0.4611	0.4985	0.5359	0.5608	0.5858	(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	0.7020	0.6942	0.6865	0.6504	0.6436	0.6121	0.6121	0.6063	0.6243	0.6436	0.6573	0.6716	(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	
New and replacement windo (Uw = 1.00)			7.5600	0.9615	7.2692			(27)
Replaced Existing (Uw = 1.00)			5.6000	0.9615	5.3846			(27)
External Wall - Existing GLA	15.3900	5.6000	9.7900	0.1800	1.7622	9.0000	88.1100	(29a)
External Wall - New	15.6600	7.5600	8.1000	0.1400	1.1340	190.0000	1539.0000	(29a)
External Roof GLA Notional	8.7000		8.7000	0.1300	1.1310	9.0000	78.3000	(30)
Total net area of external elements Aum(A, m2)			39.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.6810			(33)
Party Wall to other buildings			65.3400	0.0000	0.0000	180.0000	11761.2000	(32)
Party Wall to hall			21.6000	0.0000	0.0000	20.0000	432.0000	(32)
Party Floor			81.4000			30.0000	2442.0000	(32d)
Party Ceiling			72.7000			30.0000	2181.0000	(32b)
Internal Wall			32.9400			9.0000	296.4600	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	18818.0700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		231.1802 (35)
Thermal bridges (Default value 0.200 * total exposed area)		7.9500 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	24.6310 (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	50.9147	50.3458	49.7881	47.1688	46.6788	44.3975	44.3975	43.9750	45.2762	46.6788	47.6702	48.7066	(38)
Heat transfer coeff	75.5457	74.9768	74.4192	71.7999	71.3098	69.0285	69.0285	68.6061	69.9073	71.3098	72.3012	73.3377	(39)
Average = Sum(39)m / 12 =												71.7975	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9281	0.9211	0.9142	0.8821	0.8760	0.8480	0.8480	0.8428	0.8588	0.8760	0.8882	0.9010	(40)
HLP (average)												0.8820	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.4889 (42)

Hot water usage for mixer showers

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

Hot water usage for baths

28.4840	28.0609	27.4652	26.3668	25.5444	24.6324	24.1398	24.7314	25.3754	26.3513	27.4723	28.3877	(42b)

Hot water usage for other uses

40.1187	38.6598	37.2010	35.7421	34.2833	32.8244	32.8244	34.2833	35.7421	37.2010	38.6598	40.1187	(42c)

Average daily hot water use (litres/day)		62.8807 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.6027	66.7208	64.6662	62.1090	59.8276	57.4568	56.9642	59.0146	61.1176	63.5523	66.1321	68.5064	(44)
Energy conte	108.6499	95.0095	99.3895	85.0241	80.5395	70.6498	68.8933	73.0724	75.3641	86.2398	94.2173	107.2644	(45)
Energy content (annual)										Total = Sum(45)m =		1044.3136	

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

	92.3524	80.7581	84.4811	72.2705	68.4586	60.0524	58.5593	62.1116	64.0594	73.3038	80.0847	91.1748	(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

	92.3524	80.7581	84.4811	72.2705	68.4586	60.0524	58.5593	62.1116	64.0594	73.3038	80.0847	91.1748	(64)
									Total per year (kWh/year) = Sum(64)m =			887.6666	(64)
12Total per year (kWh/year)												888	(64)

Electric shower(s)

	52.8151	47.0587	51.3863	49.0373	49.9575	47.6546	49.2431	49.9575	49.0373	51.3863	50.4200	52.8151	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							600.7688	(64a)

Heat gains from water heating, kWh/month

	36.2919	31.9542	33.9669	30.3269	29.6040	26.9267	26.9506	28.0173	28.2742	31.1725	32.6262	35.9975	(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	124.4444	124.4444	124.4444	124.4444	124.4444	124.4444	124.4444	124.4444	124.4444	124.4444	124.4444	124.4444	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	116.7614	129.2715	116.7614	120.6534	116.7614	120.6534	116.7614	116.7614	120.6534	116.7614	120.6534	116.7614	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	222.3416	224.6488	218.8347	206.4572	190.8328	176.1481	166.3378	164.0306	169.8447	182.2222	197.8466	212.5313	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.4444	35.4444	35.4444	35.4444	35.4444	35.4444	35.4444	35.4444	35.4444	35.4444	35.4444	35.4444	(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)	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	(71)
Water heating gains (Table 5)	48.7794	47.5509	45.6544	42.1207	39.7903	37.3982	36.2239	37.6576	39.2697	41.8986	45.3142	48.3837	(72)
Total internal gains	448.2157	461.8046	441.5838	429.5647	407.7179	394.5331	379.6564	378.7829	390.1011	401.2155	424.1475	438.0097	(73)

6. Solar gains

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

North				7.5600		10.6334		0.4000		0.7000		0.7700	15.5986 (74)
South				5.6000		46.7521		0.4000		0.7000		0.7700	50.8019 (78)
Solar gains	66.4005	113.0101	156.6365	201.1465	234.4253	237.4578	226.9146	200.8919	171.6138	125.2240	79.4604	56.9013 (83)	
Total gains	514.6162	574.8147	598.2203	630.7113	642.1432	631.9909	606.5710	579.6748	561.7149	526.4395	503.6079	494.9110 (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	69.1931	69.7181	70.2405	72.8029	73.3032	75.7258	75.7258	76.1921	74.7739	73.3032	72.2981	71.2764	
alpha	5.6129	5.6479	5.6827	5.8535	5.8869	6.0484	6.0484	6.0795	5.9849	5.8869	5.8199	5.7518	
util living area	0.9961	0.9920	0.9841	0.9527	0.8682	0.6728	0.4969	0.5382	0.7843	0.9574	0.9910	0.9968	(86)
MIT	19.9041	20.0668	20.2805	20.6043	20.8437	20.9753	20.9965	20.9946	20.9379	20.6486	20.2537	19.9132	(87)
Th 2	20.1437	20.1496	20.1554	20.1828	20.1879	20.2119	20.2119	20.2164	20.2027	20.1879	20.1775	20.1667	(88)
util rest of house	0.9950	0.9897	0.9791	0.9376	0.8284	0.6003	0.4099	0.4497	0.7183	0.9409	0.9879	0.9959	(89)
MIT 2	19.1416	19.3079	19.5238	19.8597	20.0794	20.2000	20.2109	20.2147	20.1683	19.9093	19.5167	19.1691	(90)
Living area fraction										fLA = Living area / (4) =		0.5381	(91)
MIT	19.5519	19.7162	19.9310	20.2604	20.4907	20.6172	20.6336	20.6343	20.5824	20.3071	19.9133	19.5695	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5519	19.7162	19.9310	20.2604	20.4907	20.6172	20.6336	20.6343	20.5824	20.3071	19.9133	19.5695	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9940	0.9882	0.9776	0.9392	0.8443	0.6385	0.4568	0.4974	0.7512	0.9437	0.9866	0.9951	(94)
Useful gains	511.5130	568.0151	584.7932	592.3928	542.1647	403.4996	277.0735	288.3121	421.9870	496.7766	496.8831	492.4614	(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	1152.2169	1110.8742	999.5213	815.6746	626.8638	415.3581	278.4362	290.5016	453.1682	692.2139	926.4162	1127.1618	(97)
Space heating kWh	476.6838	364.8013	308.5577	160.7629	63.0161	0.0000	0.0000	0.0000	0.0000	145.4054	309.2639	472.2171	(98a)
Space heating requirement - total per year (kWh/year)												2300.7081	
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	476.6838	364.8013	308.5577	160.7629	63.0161	0.0000	0.0000	0.0000	0.0000	145.4054	309.2639	472.2171	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2300.7081	
Space heating per m2										(98c) / (4) =		28.2642	(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	648.8683	510.8112	521.4062	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8832	0.9436	0.9277	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	573.1040	482.0024	483.7318	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	690.2701	662.9530	633.8368	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	84.3596	134.6272	111.6782	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	21.0899	33.6568	27.9195	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												82.6662	(107)
Energy for space heating												28.2642	(99)
Energy for space cooling												1.0156	(108)
Total												29.2798	(109)
Fabric Energy Efficiency (DFEE)												29.3	(109)

SAP 10 WORKSHEET FOR Existing dwelling (SAP) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		81.4000 (1b)	x	2.7000 (2b)	=	219.7800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.4000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		219.7800	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)

Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.0910	(8)
Number of storeys in the dwelling (ns)		1	(9)
Additional infiltration	[(9) - 1] x 0.1 =	0.0000	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0.3500	(11)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0.0000	(12)
If no draught lobby, enter 0.05, else enter 0		0.0500	(13)
Percentage of windows and doors draught stripped		100.0000	(14)
Window infiltration	0.25 - [0.2 * (14) / 100] =	0.0500	(15)

Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.5410	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.4599	(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	0.5863	0.5748	0.5633	0.5058	0.4943	0.4369	0.4369	0.4254	0.4599	0.4943	0.5173	0.5403	(22b)
Effective ac	0.6719	0.6652	0.6587	0.6279	0.6222	0.5954	0.5954	0.5905	0.6057	0.6222	0.6338	0.6460	(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	
New and replacement windo (Uw = 1.00)			7.5600	0.9615	7.2692			(27)
Replaced Existing (Uw = 1.00)			5.6000	0.9615	5.3846			(27)
External Wall - Existing GLA	15.3900	5.6000	9.7900	0.1800	1.7622	9.0000	88.1100	(29a)
External Wall - New	15.6600	7.5600	8.1000	0.1400	1.1340	190.0000	1539.0000	(29a)
External Roof GLA Notional	8.7000		8.7000	0.1300	1.1310	9.0000	78.3000	(30)
Total net area of external elements Aum(A, m2)			39.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.6810			(33)
Party Wall to other buildings			65.3400	0.0000	0.0000	180.0000	11761.2000	(32)
Party Wall to hall			21.6000	0.0000	0.0000	20.0000	432.0000	(32)
Party Floor			81.4000			30.0000	2442.0000	(32d)
Party Ceiling			72.7000			30.0000	2181.0000	(32b)
Internal Wall			32.9400			9.0000	296.4600	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	18818.0700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		231.1802 (35)
Thermal bridges (Default value 0.200 * total exposed area)		7.9500 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	24.6310 (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	48.7296	48.2456	47.7711	45.5425	45.1255	43.1844	43.1844	42.8250	43.9321	45.1255	45.9690	46.8509	(38)
Heat transfer coeff	73.3607	72.8766	72.4021	70.1735	69.7565	67.8155	67.8155	67.4560	68.5631	69.7565	70.6001	71.4819	(39)
Average = Sum(39)m / 12 =												70.1715	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9012	0.8953	0.8895	0.8621	0.8570	0.8331	0.8331	0.8287	0.8423	0.8570	0.8673	0.8782	(40)
HLP (average)												0.8621	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.4889 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses	42.2302	40.6946	39.1589	37.6233	36.0876	34.5520	34.5520	36.0876	37.6233	39.1589	40.6946	42.2302	(42c)
Average daily hot water use (litres/day)												38.3911	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	42.2302	40.6946	39.1589	37.6233	36.0876	34.5520	34.5520	36.0876	37.6233	39.1589	40.6946	42.2302	(44)
Energy conte	66.8823	57.9485	60.1858	51.5044	48.5809	42.4857	41.7876	44.6840	46.3933	53.1383	57.9769	66.1223	(45)
Energy content (annual)										Total = Sum(45)m =		637.6901	
Distribution loss (46)m = 0.15 x (45)m	10.0324	8.6923	9.0279	7.7257	7.2871	6.3729	6.2681	6.7026	6.9590	7.9707	8.6965	9.9183	(46)

Water storage loss:		
Store volume		150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):		1.8600 (48)
Temperature factor from Table 2b		0.7800 (49)
Enter (49) or (54) in (55)		1.4508 (55)

Total storage loss	44.9748	40.6224	44.9748	43.5240	44.9748	43.5240	44.9748	44.9748	43.5240	44.9748	43.5240	44.9748	(56)
If cylinder contains dedicated solar storage	44.9748	40.6224	44.9748	43.5240	44.9748	43.5240	44.9748	44.9748	43.5240	44.9748	43.5240	44.9748	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(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	166.7147	148.1197	160.0182	148.1164	148.4133	108.5217	110.0248	112.9212	112.4293	152.9707	154.5889	165.9547	(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													
	166.7147	148.1197	160.0182	148.1164	148.4133	108.5217	110.0248	112.9212	112.4293	152.9707	154.5889	165.9547	(64)
									Total per year (kWh/year) = Sum(64)m =			1688.7937	(64)
Electric shower(s)													
	67.8407	60.4466	66.0054	62.9882	64.1701	61.2121	63.2525	64.1701	62.9882	66.0054	64.7643	67.8407	(64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				771.6843	(64a)
Heat gains from water heating, kWh/month													
	83.0846	74.0186	80.3992	75.3426	76.0818	47.4391	48.3174	49.5099	49.1824	78.0559	77.9388	82.8319	(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	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	35.5690	31.5921	25.6924	19.4508	14.5397	12.2750	13.2636	17.2405	23.1402	29.3818	34.2929	36.5576	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	331.8531	335.2967	326.6190	308.1451	284.8251	262.9076	248.2653	244.8217	253.4995	271.9734	295.2934	317.2109	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	(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)													
	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	(71)
Water heating gains (Table 5)													
	111.6729	110.1467	108.0635	104.6426	102.2604	65.8877	64.9428	66.5455	68.3089	104.9139	108.2483	111.3332	(72)
Total internal gains													
	584.2950	582.2355	565.5748	537.4384	506.8252	443.2702	428.6717	430.8078	447.1486	511.4691	543.0346	570.3017	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.5600	10.6334	0.4000	0.7000	0.7700	15.5986	(74)
South	5.6000	46.7521	0.4000	0.7000	0.7700	50.8019	(78)

Solar gains	66.4005	113.0101	156.6365	201.1465	234.4253	237.4578	226.9146	200.8919	171.6138	125.2240	79.4604	56.9013	(83)
Total gains	650.6955	695.2456	722.2114	738.5850	741.2505	680.7281	655.5863	631.6997	618.7623	636.6931	622.4950	627.2030	(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	71.2540	71.7273	72.1973	74.4902	74.9355	77.0804	77.0804	77.4911	76.2398	74.9355	74.0402	73.1268	
alpha	5.7503	5.7818	5.8132	5.9660	5.9957	6.1387	6.1387	6.1661	6.0827	5.9957	5.9360	5.8751	
util living area													
	0.9875	0.9796	0.9615	0.9088	0.7942	0.6224	0.4532	0.4881	0.7232	0.9066	0.9744	0.9894	(86)
MIT	20.3033	20.4026	20.5535	20.7502	20.8814	20.9378	20.9480	20.9474	20.9204	20.7831	20.5313	20.3038	(87)
Th 2	20.1664	20.1715	20.1765	20.1998	20.2042	20.2247	20.2247	20.2285	20.2168	20.2042	20.1954	20.1861	(88)
util rest of house													
	0.9841	0.9742	0.9511	0.8850	0.7471	0.5532	0.3744	0.4079	0.6559	0.8779	0.9666	0.9865	(89)
MIT 2	19.3559	19.4852	19.6775	19.9343	20.0814	20.1528	20.1593	20.1630	20.1319	19.9792	19.6681	19.3730	(90)
Living area fraction										fLA = Living area / (4) =		0.5381	(91)
MIT	19.8657	19.9788	20.1489	20.3733	20.5119	20.5752	20.5837	20.5851	20.5562	20.4118	20.1326	19.8738	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8657	19.9788	20.1489	20.3733	20.5119	20.5752	20.5837	20.5851	20.5562	20.4118	20.1326	19.8738	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9827	0.9727	0.9507	0.8906	0.7661	0.5850	0.4110	0.4452	0.6861	0.8861	0.9659	0.9852	(94)
Useful gains	639.4143	676.2967	686.5990	657.8075	567.9031	398.2517	269.4647	281.2181	424.5393	564.1778	601.2869	617.8949	(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													
	1141.9074	1098.8926	988.2080	805.1218	614.6856	405.2132	270.1536	282.3097	442.6557	684.4376	920.0997	1120.3959	(97)
Space heating kWh													
	373.8549	283.9845	224.3971	106.0662	34.8062	0.0000	0.0000	0.0000	0.0000	89.4732	229.5452	373.8608	(98a)
Space heating requirement - total per year (kWh/year)												1715.9881	
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													
	373.8549	283.9845	224.3971	106.0662	34.8062	0.0000	0.0000	0.0000	0.0000	89.4732	229.5452	373.8608	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1715.9881	
Space heating per m2											(98c) / (4) =	21.0809	(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 %)	170.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	373.8549	283.9845	224.3971	106.0662	34.8062	0.0000	0.0000	0.0000	0.0000	89.4732	229.5452	373.8608	(98)
Space heating efficiency (main heating system 1)													

	170.0000	170.0000	170.0000	170.0000	170.0000	0.0000	0.0000	0.0000	0.0000	170.0000	170.0000	170.0000 (210)
Space heating fuel (main heating system)												
	219.9147	167.0497	131.9983	62.3919	20.4742	0.0000	0.0000	0.0000	0.0000	52.6313	135.0266	219.9181 (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												
	166.7147	148.1197	160.0182	148.1164	148.4133	108.5217	110.0248	112.9212	112.4293	152.9707	154.5889	165.9547 (64)
Efficiency of water heater												170.0000 (216)
(217)m	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000 (217)
Fuel for water heating, kWh/month												
	98.0675	87.1292	94.1284	87.1273	87.3019	63.8363	64.7205	66.4243	66.1349	89.9828	90.9346	97.6204 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	31.1333	24.9763	22.4884	16.4760	12.7265	10.3977	11.6096	15.0905	19.6011	25.7177	29.0481	31.9986 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1009.4048 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	170.0000
Water heating fuel used	993.4080 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	251.2639 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	3025.7609 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1009.4048	16.4900	166.4508	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	993.4080	16.4900	163.8130	(247)
Energy for instantaneous electric shower(s)	771.6843	16.4900	127.2507	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Energy for lighting	251.2639	16.4900	41.4334	(250)
Additional standing charges			0.0000	(251)
Total energy cost			498.9480	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.4211 (257)
SAP value		76.9647
SAP rating (Section 12)		77 (258)
SAP band		C

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	1009.4048	0.1563	157.7879	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	993.4080	0.1415	140.5436	(264)
Energy for instantaneous electric shower(s)	771.6843	0.1391	107.3583	(264a)
Space and water heating			298.3315	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	251.2639	0.1443	36.2651	(268)
Total CO2, kg/year			441.9550	(272)
CO2 emissions per m2			5.4300	(273)
EI value			95.3147	
EI rating			95	(274)
EI band			A	

SAP 10 WORKSHEET FOR Existing dwelling (SAP) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	81.4000 (1b)	x	2.7000 (2b)	=	219.7800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.4000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	219.7800	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.0910 (8)
Number of storeys in the dwelling (ns)		1 (9)
Additional infiltration	[(9) - 1] x 0.1 =	0.0000 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0.3500 (11)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0.0000 (12)
If no draught lobby, enter 0.05, else enter 0		0.0500 (13)
Percentage of windows and doors draught stripped		100.0000 (14)
Window infiltration	0.25 - [0.2 * (14) / 100] =	0.0500 (15)

Pressure test		No
Pressure Test Method		Blower Door
Measured/design AP50		15.0000 (17)
Infiltration rate		0.5410 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.4599 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	4.7000	4.6000	4.3000	4.3000	4.0000	4.0000	3.9000	4.0000	4.5000	4.4000	4.7000	(22)
Wind factor	1.2750	1.1750	1.1500	1.0750	1.0750	1.0000	1.0000	0.9750	1.0000	1.1250	1.1000	1.1750	(22a)
Adj infilt rate	0.5863	0.5403	0.5288	0.4943	0.4943	0.4599	0.4599	0.4484	0.4599	0.5173	0.5058	0.5403	(22b)
Effective ac	0.6719	0.6460	0.6398	0.6222	0.6222	0.6057	0.6057	0.6005	0.6057	0.6338	0.6279	0.6460	(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	
New and replacement windo (Uw = 1.00)			7.5600	0.9615	7.2692			(27)
Replaced Existing (Uw = 1.00)			5.6000	0.9615	5.3846			(27)
External Wall - Existing GLA	15.3900	5.6000	9.7900	0.1800	1.7622	9.0000	88.1100	(29a)
External Wall - New	15.6600	7.5600	8.1000	0.1400	1.1340	190.0000	1539.0000	(29a)
External Roof GLA Notional	8.7000		8.7000	0.1300	1.1310	9.0000	78.3000	(30)
Total net area of external elements Aum(A, m2)			39.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.6810			(33)
Party Wall to other buildings			65.3400	0.0000	0.0000	180.0000	11761.2000	(32)
Party Wall to hall			21.6000	0.0000	0.0000	20.0000	432.0000	(32)
Party Floor			81.4000			30.0000	2442.0000	(32d)
Party Ceiling			72.7000			30.0000	2181.0000	(32b)
Internal Wall			32.9400			9.0000	296.4600	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	18818.0700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		231.1802 (35)
Thermal bridges (Default value 0.200 * total exposed area)		7.9500 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	24.6310 (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	48.7296	46.8509	46.4052	45.1255	45.1255	43.9321	43.9321	43.5535	43.9321	45.9690	45.5425	46.8509	(38)
Heat transfer coeff	73.3607	71.4819	71.0362	69.7565	69.7565	68.5631	68.5631	68.1845	68.5631	70.6001	70.1735	71.4819	(39)
Average = Sum(39)m / 12 =												70.1268	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9012	0.8782	0.8727	0.8570	0.8570	0.8423	0.8423	0.8376	0.8423	0.8673	0.8621	0.8782	(40)
HLP (average)												0.8615	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.4889 (42)

Hot water usage for mixer showers

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

Hot water usage for baths

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)

Hot water usage for other uses

42.2302	40.6946	39.1589	37.6233	36.0876	34.5520	34.5520	36.0876	37.6233	39.1589	40.6946	42.2302	(42c)

Average daily hot water use (litres/day) 38.3911 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	42.2302	40.6946	39.1589	37.6233	36.0876	34.5520	34.5520	36.0876	37.6233	39.1589	40.6946	42.2302	(44)
Energy conte	66.8823	57.9485	60.1858	51.5044	48.5809	42.4857	41.7876	44.6840	46.3933	53.1383	57.9769	66.1223	(45)
Energy content (annual)										Total = Sum(45)m =		637.6901	
Distribution loss (46)m = 0.15 x (45)m													
	10.0324	8.6923	9.0279	7.7257	7.2871	6.3729	6.2681	6.7026	6.9590	7.9707	8.6965	9.9183	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8600	(48)
Temperature factor from Table 2b												0.7800	(49)
Enter (49) or (54) in (55)												1.4508	(55)
Total storage loss													
	44.9748	40.6224	44.9748	43.5240	44.9748	43.5240	44.9748	44.9748	43.5240	44.9748	43.5240	44.9748	(56)
If cylinder contains dedicated solar storage													
	44.9748	40.6224	44.9748	43.5240	44.9748	43.5240	44.9748	44.9748	43.5240	44.9748	43.5240	44.9748	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(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													
	166.7147	148.1197	160.0182	148.1164	148.4133	108.5217	110.0248	112.9212	112.4293	152.9707	154.5889	165.9547	(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													
	166.7147	148.1197	160.0182	148.1164	148.4133	108.5217	110.0248	112.9212	112.4293	152.9707	154.5889	165.9547	(64)
										Total per year (kWh/year) = Sum(64)m =		1688.7937	(64)
Electric shower(s)													
	67.8407	60.4466	66.0054	62.9882	64.1701	61.2121	63.2525	64.1701	62.9882	66.0054	64.7643	67.8407	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												771.6843	(64a)
Heat gains from water heating, kWh/month													
	83.0846	74.0186	80.3992	75.3426	76.0818	47.4391	48.3174	49.5099	49.1824	78.0559	77.9388	82.8319	(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	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	35.5690	31.5921	25.6924	19.4508	14.5397	12.2750	13.2636	17.2405	23.1402	29.3818	34.2929	36.5576	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	331.8531	335.2967	326.6190	308.1451	284.8251	262.9076	248.2653	244.8217	253.4995	271.9734	295.2934	317.2109	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	(71)
Water heating gains (Table 5)													
	111.6729	110.1467	108.0635	104.6426	102.2604	65.8877	64.9428	66.5455	68.3089	104.9139	108.2483	111.3332	(72)
Total internal gains													
	584.2950	582.2355	565.5748	537.4384	506.8252	443.2702	428.6717	430.8078	447.1486	511.4691	543.0346	570.3017	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.5600	13.8645	0.4000	0.7000	0.7700	20.3385	(74)
South	5.6000	58.2505	0.4000	0.7000	0.7700	63.2964	(78)

Solar gains	83.6349	121.8590	169.0198	223.3078	250.6105	275.5591	256.7005	230.6737	197.1071	143.0558	99.1999	68.4254	(83)
Total gains	667.9299	704.0945	734.5946	760.7462	757.4357	718.8294	685.3722	661.4815	644.2557	654.5248	642.2345	638.7271	(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	71.2540	73.1268	73.5856	74.9355	74.9355	76.2398	76.2398	76.6632	76.2398	74.0402	74.4902	73.1268	
alpha	5.7503	5.8751	5.9057	5.9957	5.9957	6.0827	6.0827	6.1109	6.0827	5.9360	5.9660	5.8751	
util living area													
	0.9807	0.9718	0.9456	0.8753	0.7285	0.5286	0.3696	0.3807	0.6228	0.8525	0.9545	0.9830	(86)
MIT	20.4061	20.4933	20.6383	20.8042	20.9102	20.9445	20.9485	20.9487	20.9376	20.8460	20.6463	20.4149	(87)
Th 2	20.1664	20.1861	20.1908	20.2042	20.2042	20.2168	20.2168	20.2208	20.2168	20.1954	20.1998	20.1861	(88)
util rest of house													
	0.9753	0.9643	0.9311	0.8448	0.6733	0.4572	0.2917	0.3009	0.5482	0.8102	0.9406	0.9781	(89)
MIT 2	19.4858	19.6111	19.7934	19.9991	20.1085	20.1491	20.1512	20.1555	20.1449	20.0392	19.8135	19.5137	(90)
Living area fraction									fLA = Living area / (4) =			0.5381	(91)
MIT	19.9810	20.0858	20.2480	20.4323	20.5399	20.5771	20.5802	20.5823	20.5714	20.4734	20.2616	19.9987	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9810	20.0858	20.2480	20.4323	20.5399	20.5771	20.5802	20.5823	20.5714	20.4734	20.2616	19.9987	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9739	0.9632	0.9323	0.8541	0.6974	0.4904	0.3279	0.3380	0.5826	0.8258	0.9418	0.9768	(94)
Useful gains	650.4775	678.1962	684.8578	649.7880	528.2014	352.4823	224.7312	223.6055	375.3609	540.5221	604.8714	623.9300	(95)
Ext temp.	5.4000	5.7000	7.3000	9.6000	12.6000	15.4000	17.3000	17.3000	15.0000	11.8000	8.4000	5.5000	(96)
Heat loss rate W													

	1069.6697	1028.3271	919.7795	755.6271	553.8610	354.9563	224.9033	223.8026	381.9956	612.3395	832.3722	1036.3918	(97)
Space heating kWh													
	311.8790	235.2880	174.7817	76.2042	19.0907	0.0000	0.0000	0.0000	0.0000	53.4321	163.8006	306.8715	(98a)
Space heating requirement - total per year (kWh/year)												1341.3479	
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													
	311.8790	235.2880	174.7817	76.2042	19.0907	0.0000	0.0000	0.0000	0.0000	53.4321	163.8006	306.8715	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1341.3479	
Space heating per m2											(98c) / (4) =	16.4785	(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 %)												170.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	311.8790	235.2880	174.7817	76.2042	19.0907	0.0000	0.0000	0.0000	0.0000	53.4321	163.8006	306.8715	(98)
Space heating efficiency (main heating system 1)													
	170.0000	170.0000	170.0000	170.0000	170.0000	0.0000	0.0000	0.0000	0.0000	170.0000	170.0000	170.0000	(210)
Space heating fuel (main heating system)													
	183.4583	138.4047	102.8128	44.8260	11.2298	0.0000	0.0000	0.0000	0.0000	31.4307	96.3533	180.5127	(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													
	166.7147	148.1197	160.0182	148.1164	148.4133	108.5217	110.0248	112.9212	112.4293	152.9707	154.5889	165.9547	(64)
Efficiency of water heater												170.0000	(216)
(217)m	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	(217)
Fuel for water heating, kWh/month													
	98.0675	87.1292	94.1284	87.1273	87.3019	63.8363	64.7205	66.4243	66.1349	89.9828	90.9346	97.6204	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	31.1333	24.9763	22.4884	16.4760	12.7265	10.3977	11.6096	15.0905	19.6011	25.7177	29.0481	31.9986	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												789.0282	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												170.0000	
Water heating fuel used												993.4080	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												251.2639	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												2805.3843	(238)

10a. Fuel costs - using BEDF prices (550)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	789.0282	26.0600	205.6207	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	993.4080	26.0600	258.8821	(247)
Energy for instantaneous electric shower(s)	771.6843	26.0600	201.1009	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Energy for lighting	251.2639	26.0600	65.4794	(250)
Additional standing charges			0.0000	(251)
Total energy cost			731.0832	(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	789.0282	0.1571	123.9187	(261)
Total CO2 associated with community systems			0.0000	(373)

Water heating (other fuel)	993.4080	0.1415	140.5436	(264)
Energy for instantaneous electric shower(s)	771.6843	0.1391	107.3583	(264a)
Space and water heating			264.4623	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	251.2639	0.1443	36.2651	(268)
Total CO2, kg/year			408.0858	(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	789.0282	1.5814	1247.8042	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	993.4080	1.5232	1513.1413	(278)
Energy for instantaneous electric shower(s)	771.6843	1.5143	1168.5878	(278a)
Space and water heating			2760.9455	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	251.2639	1.5338	385.3969	(282)
Total Primary energy kWh/year			4314.9303	(286)

SAP 10 EPC IMPROVEMENTS

2 Lean & Clean

Current energy efficiency rating: C 77
Current environmental impact rating: A 95

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

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

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

Potential energy efficiency rating: C 77
Potential environmental impact rating: A 95

Fuel prices for cost data on this page from database revision number 550 TEST (28 Jun 2024)
Recommendation texts revision number 6.1 (11 Jun 2019)

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

	Current	Potential	Saving
Electricity	£731	£731	£0
Space heating	£206	£206	£0
Water heating	£460	£460	£0
Lighting	£65	£65	£0
Total cost of fuels	£731	£731	£0
Total cost of uses	£731	£731	£0
Delivered energy	34 kWh/m²	34 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.4 tonnes	0.4 tonnes	0.0 tonnes
CO2 emissions per m²	5 kg/m²	5 kg/m²	0 kg/m²
Primary energy	53 kWh/m²	53 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR Existing dwelling (SAP) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	81.4000	(1b)	x 2.7000	(2b) =	219.7800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.4000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		219.7800	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)

Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.0910	(8)
Number of storeys in the dwelling (ns)		1	(9)
Additional infiltration	[(9) - 1] x 0.1 =	0.0000	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0.3500	(11)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0.0000	(12)
If no draught lobby, enter 0.05, else enter 0		0.0500	(13)
Percentage of windows and doors draught stripped		100.0000	(14)
Window infiltration	0.25 - [0.2 * (14) / 100] =	0.0500	(15)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.5410	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.4599	(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	0.5863	0.5748	0.5633	0.5058	0.4943	0.4369	0.4369	0.4254	0.4599	0.4943	0.5173	0.5403	(22b)
Effective ac	0.6719	0.6652	0.6587	0.6279	0.6222	0.5954	0.5954	0.5905	0.6057	0.6222	0.6338	0.6460	(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	
New and replacement windo (Uw = 1.00)			7.5600	0.9615	7.2692			(27)
Replaced Existing (Uw = 1.00)			5.6000	0.9615	5.3846			(27)
External Wall - Existing GLA	15.3900	5.6000	9.7900	0.1800	1.7622	9.0000	88.1100	(29a)
External Wall - New	15.6600	7.5600	8.1000	0.1400	1.1340	190.0000	1539.0000	(29a)
External Roof GLA Notional	8.7000		8.7000	0.1300	1.1310	9.0000	78.3000	(30)
Total net area of external elements Aum(A, m2)			39.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.6810			(33)
Party Wall to other buildings			65.3400	0.0000	0.0000	180.0000	11761.2000	(32)
Party Wall to hall			21.6000	0.0000	0.0000	20.0000	432.0000	(32)
Party Floor			81.4000			30.0000	2442.0000	(32d)
Party Ceiling			72.7000			30.0000	2181.0000	(32b)
Internal Wall			32.9400			9.0000	296.4600	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		18818.0700	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							231.1802	(35)
Thermal bridges (Default value 0.200 * total exposed area)							7.9500	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss					(33) + (36) + (36a) =		24.6310	(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	48.7296	48.2456	47.7711	45.5425	45.1255	43.1844	43.1844	42.8250	43.9321	45.1255	45.9690	46.8509	(38)
Heat transfer coeff	73.3607	72.8766	72.4021	70.1735	69.7565	67.8155	67.8155	67.4560	68.5631	69.7565	70.6001	71.4819	(39)
Average = Sum(39)m / 12 =												70.1715	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9012	0.8953	0.8895	0.8621	0.8570	0.8331	0.8331	0.8287	0.8423	0.8570	0.8673	0.8782	(40)
HLP (average)												0.8621	
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		2.4889	(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

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)

Hot water usage for other uses

	42.2302	40.6946	39.1589	37.6233	36.0876	34.5520	34.5520	36.0876	37.6233	39.1589	40.6946	42.2302	(42c)

Average daily hot water use (litres/day)		38.3911	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	42.2302	40.6946	39.1589	37.6233	36.0876	34.5520	34.5520	36.0876	37.6233	39.1589	40.6946	42.2302	(44)
Energy conte	66.8823	57.9485	60.1858	51.5044	48.5809	42.4857	41.7876	44.6840	46.3933	53.1383	57.9769	66.1223	(45)
Energy content (annual)											Total = Sum(45)m =	637.6901	
Distribution loss (46)m = 0.15 x (45)m	10.0324	8.6923	9.0279	7.7257	7.2871	6.3729	6.2681	6.7026	6.9590	7.9707	8.6965	9.9183	(46)

Water storage loss:		
Store volume	150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.8600	(48)
Temperature factor from Table 2b	0.7800	(49)
Enter (49) or (54) in (55)	1.4508	(55)

Total storage loss

	44.9748	40.6224	44.9748	43.5240	44.9748	43.5240	44.9748	44.9748	43.5240	44.9748	43.5240	44.9748	(56)

If cylinder contains dedicated solar storage

	44.9748	40.6224	44.9748	43.5240	44.9748	43.5240	44.9748	44.9748	43.5240	44.9748	43.5240	44.9748	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(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

	166.7147	148.1197	160.0182	148.1164	148.4133	108.5217	110.0248	112.9212	112.4293	152.9707	154.5889	165.9547	(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

	166.7147	148.1197	160.0182	148.1164	148.4133	108.5217	110.0248	112.9212	112.4293	152.9707	154.5889	165.9547	(64)

Total per year (kWh/year) = Sum(64)m =	1688.7937	(64)
Electric shower(s)		

	67.8407	60.4466	66.0054	62.9882	64.1701	61.2121	63.2525	64.1701	62.9882	66.0054	64.7643	67.8407	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												771.6843	(64a)
Heat gains from water heating, kWh/month													
	83.0846	74.0186	80.3992	75.3426	76.0818	47.4391	48.3174	49.5099	49.1824	78.0559	77.9388	82.8319	(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	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	35.5690	31.5921	25.6924	19.4508	14.5397	12.2750	13.2636	17.2405	23.1402	29.3818	34.2929	36.5576	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	331.8531	335.2967	326.6190	308.1451	284.8251	262.9076	248.2653	244.8217	253.4995	271.9734	295.2934	317.2109	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	(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)													
	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	(71)
Water heating gains (Table 5)													
	111.6729	110.1467	108.0635	104.6426	102.2604	65.8877	64.9428	66.5455	68.3089	104.9139	108.2483	111.3332	(72)
Total internal gains													
	584.2950	582.2355	565.5748	537.4384	506.8252	443.2702	428.6717	430.8078	447.1486	511.4691	543.0346	570.3017	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.5600	10.6334	0.4000	0.7000	0.7700	15.5986	(74)
South	5.6000	46.7521	0.4000	0.7000	0.7700	50.8019	(78)

Solar gains	66.4005	113.0101	156.6365	201.1465	234.4253	237.4578	226.9146	200.8919	171.6138	125.2240	79.4604	56.9013	(83)
Total gains	650.6955	695.2456	722.2114	738.5850	741.2505	680.7281	655.5863	631.6997	618.7623	636.6931	622.4950	627.2030	(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	71.2540	71.7273	72.1973	74.4902	74.9355	77.0804	77.0804	77.4911	76.2398	74.9355	74.0402	73.1268	
alpha	5.7503	5.7818	5.8132	5.9660	5.9957	6.1387	6.1387	6.1661	6.0827	5.9957	5.9360	5.8751	
util living area													
	0.9875	0.9796	0.9615	0.9088	0.7942	0.6224	0.4532	0.4881	0.7232	0.9066	0.9744	0.9894	(86)
MIT	20.3033	20.4026	20.5535	20.7502	20.8814	20.9378	20.9480	20.9474	20.9204	20.7831	20.5313	20.3038	(87)
Th 2	20.1664	20.1715	20.1765	20.1998	20.2042	20.2247	20.2247	20.2285	20.2168	20.2042	20.1954	20.1861	(88)
util rest of house													
	0.9841	0.9742	0.9511	0.8850	0.7471	0.5532	0.3744	0.4079	0.6559	0.8779	0.9666	0.9865	(89)
MIT 2	19.3559	19.4852	19.6775	19.9343	20.0814	20.1528	20.1593	20.1630	20.1319	19.9792	19.6681	19.3730	(90)
Living area fraction										fLA = Living area / (4) =		0.5381	(91)
MIT	19.8657	19.9788	20.1489	20.3733	20.5119	20.5752	20.5837	20.5851	20.5562	20.4118	20.1326	19.8738	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8657	19.9788	20.1489	20.3733	20.5119	20.5752	20.5837	20.5851	20.5562	20.4118	20.1326	19.8738	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9827	0.9727	0.9507	0.8906	0.7661	0.5850	0.4110	0.4452	0.6861	0.8861	0.9659	0.9852	(94)
Useful gains	639.4143	676.2967	686.5990	657.8075	567.9031	398.2517	269.4647	281.2181	424.5393	564.1778	601.2869	617.8949	(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													
	1141.9074	1098.8926	988.2080	805.1218	614.6856	405.2132	270.1536	282.3097	442.6557	684.4376	920.0997	1120.3959	(97)
Space heating kWh													
	373.8549	283.9845	224.3971	106.0662	34.8062	0.0000	0.0000	0.0000	0.0000	89.4732	229.5452	373.8608	(98a)
Space heating requirement - total per year (kWh/year)												1715.9881	
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													
	373.8549	283.9845	224.3971	106.0662	34.8062	0.0000	0.0000	0.0000	0.0000	89.4732	229.5452	373.8608	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1715.9881	
Space heating per m2											(98c) / (4) =	21.0809	(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 %)	170.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	373.8549	283.9845	224.3971	106.0662	34.8062	0.0000	0.0000	0.0000	0.0000	89.4732	229.5452	373.8608	(98)
Space heating efficiency (main heating system 1)													
	170.0000	170.0000	170.0000	170.0000	170.0000	0.0000	0.0000	0.0000	0.0000	170.0000	170.0000	170.0000	(210)
Space heating fuel (main heating system)													
	219.9147	167.0497	131.9983	62.3919	20.4742	0.0000	0.0000	0.0000	0.0000	52.6313	135.0266	219.9181	(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

166.7147	148.1197	160.0182	148.1164	148.4133	108.5217	110.0248	112.9212	112.4293	152.9707	154.5889	165.9547	(64)

Efficiency of water heater 170.0000 (216)

(217)m 170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	(217)

Fuel for water heating, kWh/month

98.0675	87.1292	94.1284	87.1273	87.3019	63.8363	64.7205	66.4243	66.1349	89.9828	90.9346	97.6204	(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 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting 31.1333	24.9763	22.4884	16.4760	12.7265	10.3977	11.6096	15.0905	19.6011	25.7177	29.0481	31.9986	(232)

Electricity generated by PVs (Appendix M) (negative quantity)

(233a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)

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

(235a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)

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

(235c)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

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

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

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

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

Annual totals kWh/year

Space heating fuel - main system 1	1009.4048	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	170.0000	
Water heating fuel used	993.4080	(219)
Space cooling fuel	0.0000	(221)

Electricity for pumps and fans:

Total electricity for the above, kWh/year	0.0000	(231)
Electricity for lighting (calculated in Appendix L)	251.2639	(232)

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

PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3025.7609	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1009.4048	16.4900	166.4508	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	993.4080	16.4900	163.8130	(247)
Energy for instantaneous electric shower(s)	771.6843	16.4900	127.2507	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Energy for lighting	251.2639	16.4900	41.4334	(250)
Additional standing charges			0.0000	(251)
Total energy cost			498.9480	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.4211	(257)
SAP value		76.9647	
SAP rating (Section 12)		77	(258)
SAP band		C	

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	1009.4048	0.1563	157.7879	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	993.4080	0.1415	140.5436	(264)
Energy for instantaneous electric shower(s)	771.6843	0.1391	107.3583	(264a)
Space and water heating			298.3315	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	251.2639	0.1443	36.2651	(268)
Total CO2, kg/year			441.9550	(272)
CO2 emissions per m2			5.4300	(273)
EI value			95.3147	
EI rating			95	(274)
EI band			A	

SAP 10 WORKSHEET FOR Existing dwelling (SAP) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	81.4000 (1b)	x	2.7000 (2b)	=	219.7800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.4000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	219.7800	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.0910 (8)
Number of storeys in the dwelling (ns)		1 (9)
Additional infiltration	[(9) - 1] x 0.1 =	0.0000 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0.3500 (11)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0.0000 (12)
If no draught lobby, enter 0.05, else enter 0		0.0500 (13)
Percentage of windows and doors draught stripped		100.0000 (14)
Window infiltration	0.25 - [0.2 * (14) / 100] =	0.0500 (15)

Pressure test		No
Pressure Test Method		Blower Door
Measured/design AP50		15.0000 (17)
Infiltration rate		0.5410 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.4599 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	4.7000	4.6000	4.3000	4.3000	4.0000	4.0000	3.9000	4.0000	4.5000	4.4000	4.7000	(22)
Wind factor	1.2750	1.1750	1.1500	1.0750	1.0750	1.0000	1.0000	0.9750	1.0000	1.1250	1.1000	1.1750	(22a)
Adj infilt rate	0.5863	0.5403	0.5288	0.4943	0.4943	0.4599	0.4599	0.4484	0.4599	0.5173	0.5058	0.5403	(22b)
Effective ac	0.6719	0.6460	0.6398	0.6222	0.6222	0.6057	0.6057	0.6005	0.6057	0.6338	0.6279	0.6460	(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	
New and replacement windo (Uw = 1.00)			7.5600	0.9615	7.2692			(27)
Replaced Existing (Uw = 1.00)			5.6000	0.9615	5.3846			(27)
External Wall - Existing GLA	15.3900	5.6000	9.7900	0.1800	1.7622	9.0000	88.1100	(29a)
External Wall - New	15.6600	7.5600	8.1000	0.1400	1.1340	190.0000	1539.0000	(29a)
External Roof GLA Notional	8.7000		8.7000	0.1300	1.1310	9.0000	78.3000	(30)
Total net area of external elements Aum(A, m2)			39.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.6810			(33)
Party Wall to other buildings			65.3400	0.0000	0.0000	180.0000	11761.2000	(32)
Party Wall to hall			21.6000	0.0000	0.0000	20.0000	432.0000	(32)
Party Floor			81.4000			30.0000	2442.0000	(32d)
Party Ceiling			72.7000			30.0000	2181.0000	(32b)
Internal Wall			32.9400			9.0000	296.4600	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	18818.0700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		231.1802 (35)
Thermal bridges (Default value 0.200 * total exposed area)		7.9500 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	24.6310 (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	48.7296	46.8509	46.4052	45.1255	45.1255	43.9321	43.9321	43.5535	43.9321	45.9690	45.5425	46.8509	(38)
Heat transfer coeff	73.3607	71.4819	71.0362	69.7565	69.7565	68.5631	68.5631	68.1845	68.5631	70.6001	70.1735	71.4819	(39)
Average = Sum(39)m / 12 =												70.1268	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9012	0.8782	0.8727	0.8570	0.8570	0.8423	0.8423	0.8376	0.8423	0.8673	0.8621	0.8782	(40)
HLP (average)												0.8615	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.4889 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses	42.2302	40.6946	39.1589	37.6233	36.0876	34.5520	34.5520	36.0876	37.6233	39.1589	40.6946	42.2302	(42c)
Average daily hot water use (litres/day)												38.3911	(43)

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

Daily hot water use

	42.2302	40.6946	39.1589	37.6233	36.0876	34.5520	34.5520	36.0876	37.6233	39.1589	40.6946	42.2302	(44)
Energy conte	66.8823	57.9485	60.1858	51.5044	48.5809	42.4857	41.7876	44.6840	46.3933	53.1383	57.9769	66.1223	(45)
Energy content (annual)											Total = Sum(45)m =	637.6901	
Distribution loss (46)m = 0.15 x (45)m													
	10.0324	8.6923	9.0279	7.7257	7.2871	6.3729	6.2681	6.7026	6.9590	7.9707	8.6965	9.9183	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8600	(48)
Temperature factor from Table 2b												0.7800	(49)
Enter (49) or (54) in (55)												1.4508	(55)
Total storage loss													
	44.9748	40.6224	44.9748	43.5240	44.9748	43.5240	44.9748	44.9748	43.5240	44.9748	43.5240	44.9748	(56)
If cylinder contains dedicated solar storage													
	44.9748	40.6224	44.9748	43.5240	44.9748	43.5240	44.9748	44.9748	43.5240	44.9748	43.5240	44.9748	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(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													
	166.7147	148.1197	160.0182	148.1164	148.4133	108.5217	110.0248	112.9212	112.4293	152.9707	154.5889	165.9547	(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													
	166.7147	148.1197	160.0182	148.1164	148.4133	108.5217	110.0248	112.9212	112.4293	152.9707	154.5889	165.9547	(64)
										Total per year (kWh/year) = Sum(64)m =		1688.7937	(64)
Electric shower(s)													
	67.8407	60.4466	66.0054	62.9882	64.1701	61.2121	63.2525	64.1701	62.9882	66.0054	64.7643	67.8407	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		771.6843	(64a)
Heat gains from water heating, kWh/month													
	83.0846	74.0186	80.3992	75.3426	76.0818	47.4391	48.3174	49.5099	49.1824	78.0559	77.9388	82.8319	(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	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	35.5690	31.5921	25.6924	19.4508	14.5397	12.2750	13.2636	17.2405	23.1402	29.3818	34.2929	36.5576	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	331.8531	335.2967	326.6190	308.1451	284.8251	262.9076	248.2653	244.8217	253.4995	271.9734	295.2934	317.2109	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	(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)													
	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	(71)
Water heating gains (Table 5)													
	111.6729	110.1467	108.0635	104.6426	102.2604	65.8877	64.9428	66.5455	68.3089	104.9139	108.2483	111.3332	(72)
Total internal gains													
	584.2950	582.2355	565.5748	537.4384	506.8252	443.2702	428.6717	430.8078	447.1486	511.4691	543.0346	570.3017	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.5600	13.8645	0.4000	0.7000	0.7700	20.3385	(74)
South	5.6000	58.2505	0.4000	0.7000	0.7700	63.2964	(78)

Solar gains	83.6349	121.8590	169.0198	223.3078	250.6105	275.5591	256.7005	230.6737	197.1071	143.0558	99.1999	68.4254	(83)
Total gains	667.9299	704.0945	734.5946	760.7462	757.4357	718.8294	685.3722	661.4815	644.2557	654.5248	642.2345	638.7271	(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	71.2540	73.1268	73.5856	74.9355	74.9355	76.2398	76.2398	76.6632	76.2398	74.0402	74.4902	73.1268	
alpha	5.7503	5.8751	5.9057	5.9957	5.9957	6.0827	6.0827	6.1109	6.0827	5.9360	5.9660	5.8751	
util living area													
	0.9807	0.9718	0.9456	0.8753	0.7285	0.5286	0.3696	0.3807	0.6228	0.8525	0.9545	0.9830	(86)
MIT	20.4061	20.4933	20.6383	20.8042	20.9102	20.9445	20.9485	20.9487	20.9376	20.8460	20.6463	20.4149	(87)
Th 2	20.1664	20.1861	20.1908	20.2042	20.2042	20.2168	20.2168	20.2208	20.2168	20.1954	20.1998	20.1861	(88)
util rest of house													
	0.9753	0.9643	0.9311	0.8448	0.6733	0.4572	0.2917	0.3009	0.5482	0.8102	0.9406	0.9781	(89)
MIT 2	19.4858	19.6111	19.7934	19.9991	20.1085	20.1491	20.1512	20.1555	20.1449	20.0392	19.8135	19.5137	(90)
Living area fraction										fLA = Living area / (4) =		0.5381	(91)
MIT	19.9810	20.0858	20.2480	20.4323	20.5399	20.5771	20.5802	20.5823	20.5714	20.4734	20.2616	19.9987	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9810	20.0858	20.2480	20.4323	20.5399	20.5771	20.5802	20.5823	20.5714	20.4734	20.2616	19.9987	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9739	0.9632	0.9323	0.8541	0.6974	0.4904	0.3279	0.3380	0.5826	0.8258	0.9418	0.9768	(94)
Useful gains	650.4775	678.1962	684.8578	649.7880	528.2014	352.4823	224.7312	223.6055	375.3609	540.5221	604.8714	623.9300	(95)
Ext temp.	5.4000	5.7000	7.3000	9.6000	12.6000	15.4000	17.3000	17.3000	15.0000	11.8000	8.4000	5.5000	(96)
Heat loss rate W													
	1069.6697	1028.3271	919.7795	755.6271	553.8610	354.9563	224.9033	223.8026	381.9956	612.3395	832.3722	1036.3918	(97)
Space heating kWh													
	311.8790	235.2880	174.7817	76.2042	19.0907	0.0000	0.0000	0.0000	0.0000	53.4321	163.8006	306.8715	(98a)
Space heating requirement - total per year (kWh/year)												1341.3479	
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

311.8790	235.2880	174.7817	76.2042	19.0907	0.0000	0.0000	0.0000	0.0000	53.4321	163.8006	306.8715	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 1341.3479

Space heating per m2 (98c) / (4) = 16.4785 (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 %)											170.0000	(206)
Efficiency of main space heating system 2 (in %)											0.0000	(207)
Efficiency of secondary/supplementary heating system, %											0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	311.8790	235.2880	174.7817	76.2042	19.0907	0.0000	0.0000	0.0000	0.0000	53.4321	163.8006	306.8715	(98)
Space heating efficiency (main heating system 1)													
	170.0000	170.0000	170.0000	170.0000	170.0000	0.0000	0.0000	0.0000	0.0000	170.0000	170.0000	170.0000	(210)
Space heating fuel (main heating system)													
	183.4583	138.4047	102.8128	44.8260	11.2298	0.0000	0.0000	0.0000	0.0000	31.4307	96.3533	180.5127	(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													
	166.7147	148.1197	160.0182	148.1164	148.4133	108.5217	110.0248	112.9212	112.4293	152.9707	154.5889	165.9547	(64)
Efficiency of water heater												170.0000	(216)
(217)m	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	(217)
Fuel for water heating, kWh/month													
	98.0675	87.1292	94.1284	87.1273	87.3019	63.8363	64.7205	66.4243	66.1349	89.9828	90.9346	97.6204	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	31.1333	24.9763	22.4884	16.4760	12.7265	10.3977	11.6096	15.0905	19.6011	25.7177	29.0481	31.9986	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year

Space heating fuel - main system 1	789.0282	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	170.0000	
Water heating fuel used	993.4080	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	0.0000	(231)
Electricity for lighting (calculated in Appendix L)	251.2639	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2805.3843	(238)

10a. Fuel costs - using BEDF prices (550)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	789.0282	26.0600	205.6207	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	993.4080	26.0600	258.8821	(247)
Energy for instantaneous electric shower(s)	771.6843	26.0600	201.1009	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Energy for lighting	251.2639	26.0600	65.4794	(250)
Additional standing charges			0.0000	(251)
Total energy cost			731.0832	(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	789.0282	0.1571	123.9187	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	993.4080	0.1415	140.5436	(264)
Energy for instantaneous electric shower(s)	771.6843	0.1391	107.3583	(264a)
Space and water heating			264.4623	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	251.2639	0.1443	36.2651	(268)
Total CO2, kg/year			408.0858	(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	789.0282	1.5814	1247.8042	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	993.4080	1.5232	1513.1413	(278)
Energy for instantaneous electric shower(s)	771.6843	1.5143	1168.5878	(278a)
Space and water heating			2760.9455	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	251.2639	1.5338	385.3969	(282)
Total Primary energy kWh/year			4314.9303	(286)

Full SAP Calculation Printout

Property Reference	First Floor Flat	**Issued on Date**	29/07/2024
Assessment Reference	3 Green	**Prop Type Ref**	First Floor Flat
Property			

SAP Rating	83 B	**DER**	3.96	**TER**	
Environmental	97 A	**% DER < TER**			N/A
CO_2 Emissions (t/year)	0.25	**DFEE**	29.28	**TFEE**	
Compliance Check	See BREL	**% DFEE < TFEE**			
% DPER < TPER		**DPER**	45.59	**TPER**	

Assessor Details	Mr. Sean Mills	**Assessor ID**	W382-0001
Client	VORBILD Architecture Ltd, VORBILD Architecture Ltd		

SAP 10 WORKSHEET FOR Existing dwelling (SAP) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	81.4000 (1b)	x	2.7000 (2b)	=	219.7800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.4000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	219.7800	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.0910	(8)
Number of storeys in the dwelling (ns)		1	(9)
Additional infiltration	[(9) - 1] x 0.1 =	0.0000	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0.3500	(11)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0.0000	(12)
If no draught lobby, enter 0.05, else enter 0		0.0500	(13)
Percentage of windows and doors draught stripped		100.0000	(14)
Window infiltration	0.25 - [0.2 * (14) / 100] =	0.0500	(15)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.5410	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.4599	(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	0.5863	0.5748	0.5633	0.5058	0.4943	0.4369	0.4369	0.4254	0.4599	0.4943	0.5173	0.5403	(22b)
Effective ac	0.6719	0.6652	0.6587	0.6279	0.6222	0.5954	0.5954	0.5905	0.6057	0.6222	0.6338	0.6460	(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	
New and replacement windo (Uw = 1.00)			7.5600	0.9615	7.2692			(27)
Replaced Existing (Uw = 1.00)			5.6000	0.9615	5.3846			(27)
External Wall - Existing GLA	15.3900	5.6000	9.7900	0.1800	1.7622	9.0000	88.1100	(29a)
External Wall - New	15.6600	7.5600	8.1000	0.1400	1.1340	190.0000	1539.0000	(29a)
External Roof GLA Notional	8.7000		8.7000	0.1300	1.1310	9.0000	78.3000	(30)
Total net area of external elements Aum(A, m2)			39.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.6810			(33)
Party Wall to other buildings			65.3400	0.0000	0.0000	180.0000	11761.2000	(32)
Party Wall to hall			21.6000	0.0000	0.0000	20.0000	432.0000	(32)
Party Floor			81.4000			30.0000	2442.0000	(32d)
Party Ceiling			72.7000			20.0000	1454.0000	(32b)

Internal Wall						32.9400					9.0000	296.4600	(32c)
Heat capacity Cm = Sum(A x k)									(28)...(30) + (32) + (32a)...(32e) =			18091.0700	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												222.2490	(35)
Thermal bridges (Default value 0.200 * total exposed area)												7.9500	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	24.6310	(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	48.7296	48.2456	47.7711	45.5425	45.1255	43.1844	43.1844	42.8250	43.9321	45.1255	45.9690	46.8509	(38)
Heat transfer coeff	73.3607	72.8766	72.4021	70.1735	69.7565	67.8155	67.8155	67.4560	68.5631	69.7565	70.6001	71.4819	(39)
Average = Sum(39)m / 12 =												70.1715	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9012	0.8953	0.8895	0.8621	0.8570	0.8331	0.8331	0.8287	0.8423	0.8570	0.8673	0.8782	(40)
HLP (average)												0.8621	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4889	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses	42.2302	40.6946	39.1589	37.6233	36.0876	34.5520	34.5520	36.0876	37.6233	39.1589	40.6946	42.2302	(42c)
Average daily hot water use (litres/day)												38.3911	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	42.2302	40.6946	39.1589	37.6233	36.0876	34.5520	34.5520	36.0876	37.6233	39.1589	40.6946	42.2302	(44)
Energy conte	66.8823	57.9485	60.1858	51.5044	48.5809	42.4857	41.7876	44.6840	46.3933	53.1383	57.9769	66.1223	(45)
Energy content (annual)											Total = Sum(45)m =	637.6901	
Distribution loss (46)m = 0.15 x (45)m	10.0324	8.6923	9.0279	7.7257	7.2871	6.3729	6.2681	6.7026	6.9590	7.9707	8.6965	9.9183	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8600	(48)
Temperature factor from Table 2b												0.7800	(49)
Enter (49) or (54) in (55)												1.4508	(55)
Total storage loss	44.9748	40.6224	44.9748	43.5240	44.9748	43.5240	44.9748	44.9748	43.5240	44.9748	43.5240	44.9748	(56)
If cylinder contains dedicated solar storage	44.9748	40.6224	44.9748	43.5240	44.9748	43.5240	44.9748	44.9748	43.5240	44.9748	43.5240	44.9748	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(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	166.7147	148.1197	160.0182	148.1164	148.4133	108.5217	110.0248	112.9212	112.4293	152.9707	154.5889	165.9547	(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	166.7147	148.1197	160.0182	148.1164	148.4133	108.5217	110.0248	112.9212	112.4293	152.9707	154.5889	165.9547	(64)
										Total per year (kWh/year) = Sum(64)m =		1688.7937	(64)
12Total per year (kWh/year)												1689	(64)
Electric shower(s)	67.8407	60.4466	66.0054	62.9882	64.1701	61.2121	63.2525	64.1701	62.9882	66.0054	64.7643	67.8407	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		771.6843	(64a)
Heat gains from water heating, kWh/month	83.0846	74.0186	80.3992	75.3426	76.0818	47.4391	48.3174	49.5099	49.1824	78.0559	77.9388	82.8319	(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	124.4444	124.4444	124.4444	124.4444	124.4444	124.4444	124.4444	124.4444	124.4444	124.4444	124.4444	124.4444	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	116.7614	129.2715	116.7614	120.6534	116.7614	120.6534	116.7614	116.7614	120.6534	116.7614	120.6534	116.7614	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	222.3416	224.6488	218.8347	206.4572	190.8328	176.1481	166.3378	164.0306	169.8447	182.2222	197.8466	212.5313	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.4444	35.4444	35.4444	35.4444	35.4444	35.4444	35.4444	35.4444	35.4444	35.4444	35.4444	35.4444	(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)	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	(71)
Water heating gains (Table 5)	111.6729	110.1467	108.0635	104.6426	102.2604	65.8877	64.9428	66.5455	68.3089	104.9139	108.2483	111.3332	(72)
Total internal gains	514.1092	527.4004	506.9929	495.0865	473.1879	423.0225	408.3753	407.6708	419.1403	467.2308	490.0816	503.9593	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.5600	10.6334	0.4000	0.7000	0.7700	15.5986	(74)
South	5.6000	46.7521	0.4000	0.7000	0.7700	50.8019	(78)

Solar gains	66.4005	113.0101	156.6365	201.1465	234.4253	237.4578	226.9146	200.8919	171.6138	125.2240	79.4604	56.9013	(83)
Total gains	580.5097	640.4105	663.6294	696.2331	707.6133	660.4803	635.2899	608.5627	590.7541	592.4548	569.5421	560.8605	(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	68.5012	68.9562	69.4081	71.6125	72.0405	74.1025	74.1025	74.4974	73.2944	72.0405	71.1798	70.3016	
alpha	5.5667	5.5971	5.6272	5.7742	5.8027	5.9402	5.9402	5.9665	5.8863	5.8027	5.7453	5.6868	
util living area													
	0.9917	0.9844	0.9708	0.9226	0.8135	0.6375	0.4669	0.5054	0.7457	0.9243	0.9811	0.9929	(86)
MIT	20.2044	20.3253	20.4816	20.7088	20.8625	20.9327	20.9457	20.9448	20.9097	20.7420	20.4611	20.2082	(87)
Th 2	20.1664	20.1715	20.1765	20.1998	20.2042	20.2247	20.2247	20.2285	20.2168	20.2042	20.1954	20.1861	(88)
util rest of house													
	0.9895	0.9802	0.9627	0.9017	0.7686	0.5680	0.3861	0.4229	0.6797	0.9000	0.9753	0.9910	(89)
MIT 2	19.2330	19.3902	19.5908	19.8875	20.0628	20.1483	20.1569	20.1604	20.1227	19.9338	19.5827	19.2539	(90)
Living area fraction									fLA = Living area / (4) =			0.5381	(91)
MIT	19.7557	19.8934	20.0701	20.3294	20.4931	20.5704	20.5813	20.5825	20.5462	20.3687	20.0554	19.7674	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7557	19.8934	20.0701	20.3294	20.4931	20.5704	20.5813	20.5825	20.5462	20.3687	20.0554	19.7674	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9881	0.9786	0.9615	0.9055	0.7858	0.5996	0.4235	0.4611	0.7086	0.9056	0.9741	0.9898	(94)
Useful gains	573.6051	626.6809	638.0563	630.4099	556.0493	396.0261	269.0296	280.5844	418.6325	536.5107	554.8051	555.1503	(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													
	1133.8415	1092.6649	982.5074	802.0406	613.3763	404.8847	269.9950	282.1335	441.9710	681.4290	914.6486	1112.7874	(97)
Space heating kWh													
	416.8158	313.1413	256.2716	123.5741	42.6513	0.0000	0.0000	0.0000	0.0000	107.8193	259.0873	414.8820	(98a)
Space heating requirement - total per year (kWh/year)												1934.2428	
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													
	416.8158	313.1413	256.2716	123.5741	42.6513	0.0000	0.0000	0.0000	0.0000	107.8193	259.0873	414.8820	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1934.2428	
Space heating per m2											(98c) / (4) =	23.7622	(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 %)												170.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	416.8158	313.1413	256.2716	123.5741	42.6513	0.0000	0.0000	0.0000	0.0000	107.8193	259.0873	414.8820	(98)
Space heating efficiency (main heating system 1)													
	170.0000	170.0000	170.0000	170.0000	170.0000	0.0000	0.0000	0.0000	0.0000	170.0000	170.0000	170.0000	(210)
Space heating fuel (main heating system)													
	245.1858	184.2008	150.7480	72.6907	25.0890	0.0000	0.0000	0.0000	0.0000	63.4231	152.4043	244.0482	(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													
	166.7147	148.1197	160.0182	148.1164	148.4133	108.5217	110.0248	112.9212	112.4293	152.9707	154.5889	165.9547	(64)
Efficiency of water heater												170.0000	(216)
(217)m	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	(217)
Fuel for water heating, kWh/month													
	98.0675	87.1292	94.1284	87.1273	87.3019	63.8363	64.7205	66.4243	66.1349	89.9828	90.9346	97.6204	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	31.1333	24.9763	22.4884	16.4760	12.7265	10.3977	11.6096	15.0905	19.6011	25.7177	29.0481	31.9986	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-20.5211	-33.9719	-57.6493	-73.7001	-85.3995	-79.8137	-78.7415	-70.4640	-56.4749	-41.4618	-23.8539	-17.0551	(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	-4.1713	-10.6500	-26.5183	-49.4730	-74.6838	-80.5479	-78.2638	-61.6431	-39.6725	-17.8903	-6.1306	-3.1268	(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												1137.7899	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												170.0000	
Water heating fuel used												993.4080	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												251.2639	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1091.8783	(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	2062.2677	(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	1137.7899	0.1561	177.6268	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	993.4080	0.1415	140.5436	(264)
Energy for instantaneous electric shower(s)	771.6843	0.1391	107.3583	(264a)
Space and water heating			318.1704	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	251.2639	0.1443	36.2651	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-639.1069	0.1323	-84.5332	
PV Unit electricity exported	-452.7714	0.1207	-54.6414	
Total			-139.1746	(269)
Total CO2, kg/year			322.6193	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.9600	(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	1137.7899	1.5780	1795.4040	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	993.4080	1.5232	1513.1413	(278)
Energy for instantaneous electric shower(s)	771.6843	1.5143	1168.5878	(278a)
Space and water heating			3308.5453	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	251.2639	1.5338	385.3969	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-639.1069	1.4887	-951.4506	
PV Unit electricity exported	-452.7714	0.4427	-200.4417	
Total			-1151.8923	(283)
Total Primary energy kWh/year			3710.6377	(286)
Dwelling Primary energy Rate (DPER)			45.5900	(287)

SAP 10 WORKSHEET FOR Existing dwelling (SAP) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	81.4000	(1b)	x 2.7000	(2b) =	219.7800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.4000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		219.7800	(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) =	0.1365	(8)
Number of storeys in the dwelling (ns)		1	(9)
Additional infiltration	[(9) - 1] x 0.1 =	0.0000	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0.3500	(11)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0.0000	(12)
If no draught lobby, enter 0.05, else enter 0		0.0500	(13)
Percentage of windows and doors draught stripped		100.0000	(14)
Window infiltration	0.25 - [0.2 * (14) / 100] =	0.0500	(15)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.5865	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.4985	(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	0.6356	0.6232	0.6107	0.5484	0.5359	0.4736	0.4736	0.4611	0.4985	0.5359	0.5608	0.5858	(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	0.7020	0.6942	0.6865	0.6504	0.6436	0.6121	0.6121	0.6063	0.6243	0.6436	0.6573	0.6716	(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	
New and replacement windo (Uw = 1.00)			7.5600	0.9615	7.2692			(27)
Replaced Existing (Uw = 1.00)			5.6000	0.9615	5.3846			(27)
External Wall - Existing GLA	15.3900	5.6000	9.7900	0.1800	1.7622	9.0000	88.1100	(29a)
External Wall - New	15.6600	7.5600	8.1000	0.1400	1.1340	190.0000	1539.0000	(29a)
External Roof GLA Notional	8.7000		8.7000	0.1300	1.1310	9.0000	78.3000	(30)
Total net area of external elements Aum(A, m2)			39.7500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	16.6810			(33)
Party Wall to other buildings			65.3400	0.0000	0.0000	180.0000	11761.2000	(32)
Party Wall to hall			21.6000	0.0000	0.0000	20.0000	432.0000	(32)
Party Floor			81.4000			30.0000	2442.0000	(32d)
Party Ceiling			72.7000			30.0000	2181.0000	(32b)
Internal Wall			32.9400			9.0000	296.4600	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	18818.0700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		231.1802 (35)
Thermal bridges (Default value 0.200 * total exposed area)		7.9500 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	24.6310 (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	50.9147	50.3458	49.7881	47.1688	46.6788	44.3975	44.3975	43.9750	45.2762	46.6788	47.6702	48.7066	(38)
Heat transfer coeff	75.5457	74.9768	74.4192	71.7999	71.3098	69.0285	69.0285	68.6061	69.9073	71.3098	72.3012	73.3377	(39)
Average = Sum(39)m / 12 =												71.7975	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9281	0.9211	0.9142	0.8821	0.8760	0.8480	0.8480	0.8428	0.8588	0.8760	0.8882	0.9010	(40)
HLP (average)												0.8820	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4889	(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	28.4840	28.0609	27.4652	26.3668	25.5444	24.6324	24.1398	24.7314	25.3754	26.3513	27.4723	28.3877	(42b)
Hot water usage for other uses	40.1187	38.6598	37.2010	35.7421	34.2833	32.8244	32.8244	34.2833	35.7421	37.2010	38.6598	40.1187	(42c)
Average daily hot water use (litres/day)												62.8807	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.6027	66.7208	64.6662	62.1090	59.8276	57.4568	56.9642	59.0146	61.1176	63.5523	66.1321	68.5064	(44)
Energy conte	108.6499	95.0095	99.3895	85.0241	80.5395	70.6498	68.8933	73.0724	75.3641	86.2398	94.2173	107.2644	(45)
Energy content (annual)										Total = Sum(45)m =		1044.3136	
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	92.3524	80.7581	84.4811	72.2705	68.4586	60.0524	58.5593	62.1116	64.0594	73.3038	80.0847	91.1748	(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	92.3524	80.7581	84.4811	72.2705	68.4586	60.0524	58.5593	62.1116	64.0594	73.3038	80.0847	91.1748	(64)
									Total per year (kWh/year) = Sum(64)m =			887.6666	(64)
12Total per year (kWh/year)												888	(64)
Electric shower(s)	52.8151	47.0587	51.3863	49.0373	49.9575	47.6546	49.2431	49.9575	49.0373	51.3863	50.4200	52.8151	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			600.7688	(64a)
Heat gains from water heating, kWh/month	36.2919	31.9542	33.9669	30.3269	29.6040	26.9267	26.9506	28.0173	28.2742	31.1725	32.6262	35.9975	(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	124.4444	124.4444	124.4444	124.4444	124.4444	124.4444	124.4444	124.4444	124.4444	124.4444	124.4444	124.4444	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	116.7614	129.2715	116.7614	120.6534	116.7614	120.6534	116.7614	116.7614	120.6534	116.7614	120.6534	116.7614	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	222.3416	224.6488	218.8347	206.4572	190.8328	176.1481	166.3378	164.0306	169.8447	182.2222	197.8466	212.5313	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.4444	35.4444	35.4444	35.4444	35.4444	35.4444	35.4444	35.4444	35.4444	35.4444	35.4444	35.4444	(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)	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	(71)
Water heating gains (Table 5)	48.7794	47.5509	45.6544	42.1207	39.7903	37.3982	36.2239	37.6576	39.2697	41.8986	45.3142	48.3837	(72)
Total internal gains	448.2157	461.8046	441.5838	429.5647	407.7179	394.5331	379.6564	378.7829	390.1011	401.2155	424.1475	438.0097	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.5600	10.6334	0.4000	0.7000	0.7700	15.5986	(74)
South	5.6000	46.7521	0.4000	0.7000	0.7700	50.8019	(78)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	66.4005	113.0101	156.6365	201.1465	234.4253	237.4578	226.9146	200.8919	171.6138	125.2240	79.4604	56.9013	(83)
Total gains	514.6162	574.8147	598.2203	630.7113	642.1432	631.9909	606.5710	579.6748	561.7149	526.4395	503.6079	494.9110	(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	69.1931	69.7181	70.2405	72.8029	73.3032	75.7258	75.7258	76.1921	74.7739	73.3032	72.2981	71.2764	
alpha	5.6129	5.6479	5.6827	5.8535	5.8869	6.0484	6.0484	6.0795	5.9849	5.8869	5.8199	5.7518	
util living area	0.9961	0.9920	0.9841	0.9527	0.8682	0.6728	0.4969	0.5382	0.7843	0.9574	0.9910	0.9968	(86)
MIT	19.9041	20.0668	20.2805	20.6043	20.8437	20.9753	20.9965	20.9946	20.9379	20.6486	20.2537	19.9132	(87)
Th 2	20.1437	20.1496	20.1554	20.1828	20.1879	20.2119	20.2119	20.2164	20.2027	20.1879	20.1775	20.1667	(88)
util rest of house	0.9950	0.9897	0.9791	0.9376	0.8284	0.6003	0.4099	0.4497	0.7183	0.9409	0.9879	0.9959	(89)
MIT 2	19.1416	19.3079	19.5238	19.8597	20.0794	20.2000	20.2109	20.2147	20.1683	19.9093	19.5167	19.1691	(90)
Living area fraction										fLA = Living area / (4) =		0.5381	(91)
MIT	19.5519	19.7162	19.9310	20.2604	20.4907	20.6172	20.6336	20.6343	20.5824	20.3071	19.9133	19.5695	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5519	19.7162	19.9310	20.2604	20.4907	20.6172	20.6336	20.6343	20.5824	20.3071	19.9133	19.5695	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9940	0.9882	0.9776	0.9392	0.8443	0.6385	0.4568	0.4974	0.7512	0.9437	0.9866	0.9951	(94)
Useful gains	511.5130	568.0151	584.7932	592.3928	542.1647	403.4996	277.0735	288.3121	421.9870	496.7766	496.8831	492.4614	(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	1152.2169	1110.8742	999.5213	815.6746	626.8638	415.3581	278.4362	290.5016	453.1682	692.2139	926.4162	1127.1618	(97)
Space heating kWh	476.6838	364.8013	308.5577	160.7629	63.0161	0.0000	0.0000	0.0000	0.0000	145.4054	309.2639	472.2171	(98a)
Space heating requirement - total per year (kWh/year)												2300.7081	
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	476.6838	364.8013	308.5577	160.7629	63.0161	0.0000	0.0000	0.0000	0.0000	145.4054	309.2639	472.2171	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2300.7081	
Space heating per m2											(98c) / (4) =	28.2642	(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	648.8683	510.8112	521.4062	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8832	0.9436	0.9277	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	573.1040	482.0024	483.7318	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	690.2701	662.9530	633.8368	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	84.3596	134.6272	111.6782	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	21.0899	33.6568	27.9195	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												82.6662	(107)
Energy for space heating												28.2642	(99)
Energy for space cooling												1.0156	(108)
Total												29.2798	(109)
Fabric Energy Efficiency (DFEE)												29.3	(109)

SAP 10 WORKSHEET FOR Existing dwelling (SAP) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		81.4000 (1b)	x	2.7000 (2b)	=	219.7800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.4000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		219.7800	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.0910	(8)
Number of storeys in the dwelling (ns)		1	(9)
Additional infiltration	[(9) - 1] x 0.1 =	0.0000	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0.3500	(11)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0.0000	(12)
If no draught lobby, enter 0.05, else enter 0		0.0500	(13)
Percentage of windows and doors draught stripped		100.0000	(14)
Window infiltration	0.25 - [0.2 * (14) / 100] =	0.0500	(15)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.5410	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.4599	(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	0.5863	0.5748	0.5633	0.5058	0.4943	0.4369	0.4369	0.4254	0.4599	0.4943	0.5173	0.5403	(22b)
Effective ac	0.6719	0.6652	0.6587	0.6279	0.6222	0.5954	0.5954	0.5905	0.6057	0.6222	0.6338	0.6460	(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	
New and replacement windo (Uw = 1.00)			7.5600	0.9615	7.2692			(27)
Replaced Existing (Uw = 1.00)			5.6000	0.9615	5.3846			(27)
External Wall - Existing GLA	15.3900	5.6000	9.7900	0.1800	1.7622	9.0000	88.1100	(29a)
External Wall - New	15.6600	7.5600	8.1000	0.1400	1.1340	190.0000	1539.0000	(29a)
External Roof GLA Notional	8.7000		8.7000	0.1300	1.1310	9.0000	78.3000	(30)
Total net area of external elements Aum(A, m2)			39.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.6810			(33)
Party Wall to other buildings			65.3400	0.0000	0.0000	180.0000	11761.2000	(32)
Party Wall to hall			21.6000	0.0000	0.0000	20.0000	432.0000	(32)
Party Floor			81.4000			30.0000	2442.0000	(32d)
Party Ceiling			72.7000			30.0000	2181.0000	(32b)
Internal Wall			32.9400			9.0000	296.4600	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		18818.0700	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							231.1802	(35)
Thermal bridges (Default value 0.200 * total exposed area)							7.9500	(36)
Point Thermal bridges					(36a) =		0.0000	
Total fabric heat loss					(33) + (36) + (36a) =		24.6310	(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	48.7296	48.2456	47.7711	45.5425	45.1255	43.1844	43.1844	42.8250	43.9321	45.1255	45.9690	46.8509	(38)
Heat transfer coeff	73.3607	72.8766	72.4021	70.1735	69.7565	67.8155	67.8155	67.4560	68.5631	69.7565	70.6001	71.4819	(39)
Average = Sum(39)m / 12 =												70.1715	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9012	0.8953	0.8895	0.8621	0.8570	0.8331	0.8331	0.8287	0.8423	0.8570	0.8673	0.8782	(40)
HLP (average)												0.8621	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.4889	(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	0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000		(42b)
Hot water usage for other uses	42.2302 40.6946 39.1589 37.6233 36.0876 34.5520 34.5520 36.0876 37.6233 39.1589 40.6946 42.2302		(42c)
Average daily hot water use (litres/day)		38.3911	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	42.2302	40.6946	39.1589	37.6233	36.0876	34.5520	34.5520	36.0876	37.6233	39.1589	40.6946	42.2302	(44)
Energy conte	66.8823	57.9485	60.1858	51.5044	48.5809	42.4857	41.7876	44.6840	46.3933	53.1383	57.9769	66.1223	(45)
Energy content (annual)										Total = Sum(45)m =		637.6901	
Distribution loss (46)m = 0.15 x (45)m	10.0324	8.6923	9.0279	7.7257	7.2871	6.3729	6.2681	6.7026	6.9590	7.9707	8.6965	9.9183	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8600	(48)
Temperature factor from Table 2b												0.7800	(49)

Enter (49) or (54) in (55)												1.4508	(55)
Total storage loss													
	44.9748	40.6224	44.9748	43.5240	44.9748	43.5240	44.9748	44.9748	43.5240	44.9748	43.5240	44.9748	(56)
If cylinder contains dedicated solar storage													
	44.9748	40.6224	44.9748	43.5240	44.9748	43.5240	44.9748	44.9748	43.5240	44.9748	43.5240	44.9748	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(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													
	166.7147	148.1197	160.0182	148.1164	148.4133	108.5217	110.0248	112.9212	112.4293	152.9707	154.5889	165.9547	(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													
	166.7147	148.1197	160.0182	148.1164	148.4133	108.5217	110.0248	112.9212	112.4293	152.9707	154.5889	165.9547	(64)
										Total per year (kWh/year) = Sum(64)m =		1688.7937	(64)
Electric shower(s)													
	67.8407	60.4466	66.0054	62.9882	64.1701	61.2121	63.2525	64.1701	62.9882	66.0054	64.7643	67.8407	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		771.6843	(64a)
Heat gains from water heating, kWh/month													
	83.0846	74.0186	80.3992	75.3426	76.0818	47.4391	48.3174	49.5099	49.1824	78.0559	77.9388	82.8319	(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	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	35.5690	31.5921	25.6924	19.4508	14.5397	12.2750	13.2636	17.2405	23.1402	29.3818	34.2929	36.5576	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	331.8531	335.2967	326.6190	308.1451	284.8251	262.9076	248.2653	244.8217	253.4995	271.9734	295.2934	317.2109	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	(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)													
	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	(71)
Water heating gains (Table 5)													
	111.6729	110.1467	108.0635	104.6426	102.2604	65.8877	64.9428	66.5455	68.3089	104.9139	108.2483	111.3332	(72)
Total internal gains													
	584.2950	582.2355	565.5748	537.4384	506.8252	443.2702	428.6717	430.8078	447.1486	511.4691	543.0346	570.3017	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.5600	10.6334	0.4000	0.7000	0.7700	15.5986	(74)
South	5.6000	46.7521	0.4000	0.7000	0.7700	50.8019	(78)

Solar gains	66.4005	113.0101	156.6365	201.1465	234.4253	237.4578	226.9146	200.8919	171.6138	125.2240	79.4604	56.9013	(83)
Total gains	650.6955	695.2456	722.2114	738.5850	741.2505	680.7281	655.5863	631.6997	618.7623	636.6931	622.4950	627.2030	(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	71.2540	71.7273	72.1973	74.4902	74.9355	77.0804	77.0804	77.4911	76.2398	74.9355	74.0402	73.1268	
alpha	5.7503	5.7818	5.8132	5.9660	5.9957	6.1387	6.1387	6.1661	6.0827	5.9957	5.9360	5.8751	
util living area													
	0.9875	0.9796	0.9615	0.9088	0.7942	0.6224	0.4532	0.4881	0.7232	0.9066	0.9744	0.9894	(86)
MIT	20.3033	20.4026	20.5535	20.7502	20.8814	20.9378	20.9480	20.9474	20.9204	20.7831	20.5313	20.3038	(87)
Th 2	20.1664	20.1715	20.1765	20.1998	20.2042	20.2247	20.2247	20.2285	20.2168	20.2042	20.1954	20.1861	(88)
util rest of house													
	0.9841	0.9742	0.9511	0.8850	0.7471	0.5532	0.3744	0.4079	0.6559	0.8779	0.9666	0.9865	(89)
MIT 2	19.3559	19.4852	19.6775	19.9343	20.0814	20.1528	20.1593	20.1630	20.1319	19.9792	19.6681	19.3730	(90)
Living area fraction										fLA = Living area / (4) =		0.5381	(91)
MIT	19.8657	19.9788	20.1489	20.3733	20.5119	20.5752	20.5837	20.5851	20.5562	20.4118	20.1326	19.8738	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8657	19.9788	20.1489	20.3733	20.5119	20.5752	20.5837	20.5851	20.5562	20.4118	20.1326	19.8738	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9827	0.9727	0.9507	0.8906	0.7661	0.5850	0.4110	0.4452	0.6861	0.8861	0.9659	0.9852	(94)
Useful gains	639.4143	676.2967	686.5990	657.8075	567.9031	398.2517	269.4647	281.2181	424.5393	564.1778	601.2869	617.8949	(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													
	1141.9074	1098.8926	988.2080	805.1218	614.6856	405.2132	270.1536	282.3097	442.6557	684.4376	920.0997	1120.3959	(97)
Space heating kWh													
	373.8549	283.9845	224.3971	106.0662	34.8062	0.0000	0.0000	0.0000	0.0000	89.4732	229.5452	373.8608	(98a)
Space heating requirement - total per year (kWh/year)												1715.9881	
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													
	373.8549	283.9845	224.3971	106.0662	34.8062	0.0000	0.0000	0.0000	0.0000	89.4732	229.5452	373.8608	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1715.9881	
Space heating per m2											(98c) / (4) =	21.0809	(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 %)												170.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	373.8549	283.9845	224.3971	106.0662	34.8062	0.0000	0.0000	0.0000	0.0000	89.4732	229.5452	373.8608	(98)
Space heating efficiency (main heating system 1)													
	170.0000	170.0000	170.0000	170.0000	170.0000	0.0000	0.0000	0.0000	0.0000	170.0000	170.0000	170.0000	(210)
Space heating fuel (main heating system)													
	219.9147	167.0497	131.9983	62.3919	20.4742	0.0000	0.0000	0.0000	0.0000	52.6313	135.0266	219.9181	(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													
	166.7147	148.1197	160.0182	148.1164	148.4133	108.5217	110.0248	112.9212	112.4293	152.9707	154.5889	165.9547	(64)
Efficiency of water heater												170.0000	(216)
(217)m	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	(217)
Fuel for water heating, kWh/month													
	98.0675	87.1292	94.1284	87.1273	87.3019	63.8363	64.7205	66.4243	66.1349	89.9828	90.9346	97.6204	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	31.1333	24.9763	22.4884	16.4760	12.7265	10.3977	11.6096	15.0905	19.6011	25.7177	29.0481	31.9986	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-20.4500	-33.8334	-57.2900	-73.2779	-85.0954	-79.8137	-78.7415	-70.4640	-56.4749	-41.2827	-23.7666	-17.0029	(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	-4.2425	-10.7885	-26.8777	-49.8952	-74.9879	-80.5479	-78.2638	-61.6431	-39.6725	-18.0694	-6.2179	-3.1790	(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												1009.4048	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												170.0000	
Water heating fuel used												993.4080	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												251.2639	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1091.8783	(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												1933.8826	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1009.4048	16.4900	166.4508	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	993.4080	16.4900	163.8130	(247)
Energy for instantaneous electric shower(s)	771.6843	16.4900	127.2507	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Energy for lighting	251.2639	16.4900	41.4334	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-637.4928	16.4900	-105.1226	
PV Unit electricity exported	-454.3855	5.5900	-25.4001	
Total			-130.5227	(252)
Total energy cost			368.4253	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.0493	(257)
SAP value		82.9906	
SAP rating (Section 12)		83	(258)
SAP band		B	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1009.4048	0.1563	157.7879	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	993.4080	0.1415	140.5436	(264)

Energy for instantaneous electric shower(s)	771.6843	0.1391	107.3583	(264a)
Space and water heating			298.3315	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	251.2639	0.1443	36.2651	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-637.4928	0.1322	-84.2979	
PV Unit electricity exported	-454.3855	0.1208	-54.8982	
Total			-139.1961	(269)
Total CO2, kg/year			302.7590	(272)
CO2 emissions per m2			3.7200	(273)
EI value			96.7904	
EI rating			97	(274)
EI band			A	

SAP 10 WORKSHEET FOR Existing dwelling (SAP) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	81.4000 (1b)	x	2.7000 (2b)	=	219.7800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.4000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	219.7800	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.0910	(8)
Number of storeys in the dwelling (ns)		1	(9)
Additional infiltration	[(9) - 1] x 0.1 =	0.0000	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0.3500	(11)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0.0000	(12)
If no draught lobby, enter 0.05, else enter 0		0.0500	(13)
Percentage of windows and doors draught stripped		100.0000	(14)
Window infiltration	0.25 - [0.2 * (14) / 100] =	0.0500	(15)

Pressure test	No	
Pressure Test Method	Blower Door	
Measured/design AP50	15.0000	(17)
Infiltration rate	0.5410	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.4599 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	4.7000	4.6000	4.3000	4.3000	4.0000	4.0000	3.9000	4.0000	4.5000	4.4000	4.7000	(22)
Wind factor	1.2750	1.1750	1.1500	1.0750	1.0750	1.0000	1.0000	0.9750	1.0000	1.1250	1.1000	1.1750	(22a)
Adj infilt rate	0.5863	0.5403	0.5288	0.4943	0.4943	0.4599	0.4599	0.4484	0.4599	0.5173	0.5058	0.5403	(22b)
Effective ac	0.6719	0.6460	0.6398	0.6222	0.6222	0.6057	0.6057	0.6005	0.6057	0.6338	0.6279	0.6460	(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	
New and replacement windo (Uw = 1.00)			7.5600	0.9615	7.2692			(27)
Replaced Existing (Uw = 1.00)			5.6000	0.9615	5.3846			(27)
External Wall - Existing GLA	15.3900	5.6000	9.7900	0.1800	1.7622	9.0000	88.1100	(29a)
External Wall - New	15.6600	7.5600	8.1000	0.1400	1.1340	190.0000	1539.0000	(29a)
External Roof GLA Notional	8.7000		8.7000	0.1300	1.1310	9.0000	78.3000	(30)
Total net area of external elements Aum(A, m2)			39.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.6810			(33)
Party Wall to other buildings			65.3400	0.0000	0.0000	180.0000	11761.2000	(32)
Party Wall to hall			21.6000	0.0000	0.0000	20.0000	432.0000	(32)
Party Floor			81.4000			30.0000	2442.0000	(32d)
Party Ceiling			72.7000			30.0000	2181.0000	(32b)
Internal Wall			32.9400			9.0000	296.4600	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	18818.0700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		231.1802 (35)
Thermal bridges (Default value 0.200 * total exposed area)		7.9500 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	24.6310 (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	48.7296	46.8509	46.4052	45.1255	45.1255	43.9321	43.9321	43.5535	43.9321	45.9690	45.5425	46.8509	(38)
Heat transfer coeff													
	73.3607	71.4819	71.0362	69.7565	69.7565	68.5631	68.5631	68.1845	68.5631	70.6001	70.1735	71.4819	(39)
Average = Sum(39)m / 12 =												70.1268	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9012	0.8782	0.8727	0.8570	0.8570	0.8423	0.8423	0.8376	0.8423	0.8673	0.8621	0.8782	(40)
HLP (average)												0.8615	
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												2.4889	(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													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses													
	42.2302	40.6946	39.1589	37.6233	36.0876	34.5520	34.5520	36.0876	37.6233	39.1589	40.6946	42.2302	(42c)
Average daily hot water use (litres/day)												38.3911	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	42.2302	40.6946	39.1589	37.6233	36.0876	34.5520	34.5520	36.0876	37.6233	39.1589	40.6946	42.2302	(44)
Energy conte	66.8823	57.9485	60.1858	51.5044	48.5809	42.4857	41.7876	44.6840	46.3933	53.1383	57.9769	66.1223	(45)
Energy content (annual)										Total = Sum(45)m =		637.6901	
Distribution loss (46)m = 0.15 x (45)m													
	10.0324	8.6923	9.0279	7.7257	7.2871	6.3729	6.2681	6.7026	6.9590	7.9707	8.6965	9.9183	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8600	(48)
Temperature factor from Table 2b												0.7800	(49)
Enter (49) or (54) in (55)												1.4508	(55)
Total storage loss													
	44.9748	40.6224	44.9748	43.5240	44.9748	43.5240	44.9748	44.9748	43.5240	44.9748	43.5240	44.9748	(56)
If cylinder contains dedicated solar storage													
	44.9748	40.6224	44.9748	43.5240	44.9748	43.5240	44.9748	44.9748	43.5240	44.9748	43.5240	44.9748	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(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													
	166.7147	148.1197	160.0182	148.1164	148.4133	108.5217	110.0248	112.9212	112.4293	152.9707	154.5889	165.9547	(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													
	166.7147	148.1197	160.0182	148.1164	148.4133	108.5217	110.0248	112.9212	112.4293	152.9707	154.5889	165.9547	(64)
										Total per year (kWh/year) = Sum(64)m =		1688.7937	(64)
Electric shower(s)													
	67.8407	60.4466	66.0054	62.9882	64.1701	61.2121	63.2525	64.1701	62.9882	66.0054	64.7643	67.8407	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		771.6843	(64a)
Heat gains from water heating, kWh/month													
	83.0846	74.0186	80.3992	75.3426	76.0818	47.4391	48.3174	49.5099	49.1824	78.0559	77.9388	82.8319	(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	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	35.5690	31.5921	25.6924	19.4508	14.5397	12.2750	13.2636	17.2405	23.1402	29.3818	34.2929	36.5576	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	331.8531	335.2967	326.6190	308.1451	284.8251	262.9076	248.2653	244.8217	253.4995	271.9734	295.2934	317.2109	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	(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)													
	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	(71)
Water heating gains (Table 5)													
	111.6729	110.1467	108.0635	104.6426	102.2604	65.8877	64.9428	66.5455	68.3089	104.9139	108.2483	111.3332	(72)
Total internal gains													
	584.2950	582.2355	565.5748	537.4384	506.8252	443.2702	428.6717	430.8078	447.1486	511.4691	543.0346	570.3017	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.5600	13.8645	0.4000	0.7000	0.7700	20.3385	(74)
South	5.6000	58.2505	0.4000	0.7000	0.7700	63.2964	(78)

Solar gains	83.6349	121.8590	169.0198	223.3078	250.6105	275.5591	256.7005	230.6737	197.1071	143.0558	99.1999	68.4254	(83)
Total gains	667.9299	704.0945	734.5946	760.7462	757.4357	718.8294	685.3722	661.4815	644.2557	654.5248	642.2345	638.7271	(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	71.2540	73.1268	73.5856	74.9355	74.9355	76.2398	76.2398	76.6632	76.2398	74.0402	74.4902	73.1268	
alpha	5.7503	5.8751	5.9057	5.9957	5.9957	6.0827	6.0827	6.1109	6.0827	5.9360	5.9660	5.8751	
util living area													
	0.9807	0.9718	0.9456	0.8753	0.7285	0.5286	0.3696	0.3807	0.6228	0.8525	0.9545	0.9830	(86)
MIT	20.4061	20.4933	20.6383	20.8042	20.9102	20.9445	20.9485	20.9487	20.9376	20.8460	20.6463	20.4149	(87)

Th 2	20.1664	20.1861	20.1908	20.2042	20.2042	20.2168	20.2168	20.2208	20.2168	20.1954	20.1998	20.1861	(88)
util rest of house	0.9753	0.9643	0.9311	0.8448	0.6733	0.4572	0.2917	0.3009	0.5482	0.8102	0.9406	0.9781	(89)
MIT 2	19.4858	19.6111	19.7934	19.9991	20.1085	20.1491	20.1512	20.1555	20.1449	20.0392	19.8135	19.5137	(90)
Living area fraction										fLA = Living area / (4) =		0.5381	(91)
MIT	19.9810	20.0858	20.2480	20.4323	20.5399	20.5771	20.5802	20.5823	20.5714	20.4734	20.2616	19.9987	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9810	20.0858	20.2480	20.4323	20.5399	20.5771	20.5802	20.5823	20.5714	20.4734	20.2616	19.9987	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9739	0.9632	0.9323	0.8541	0.6974	0.4904	0.3279	0.3380	0.5826	0.8258	0.9418	0.9768	(94)
Useful gains	650.4775	678.1962	684.8578	649.7880	528.2014	352.4823	224.7312	223.6055	375.3609	540.5221	604.8714	623.9300	(95)
Ext temp.	5.4000	5.7000	7.3000	9.6000	12.6000	15.4000	17.3000	17.3000	15.0000	11.8000	8.4000	5.5000	(96)
Heat loss rate W	1069.6697	1028.3271	919.7795	755.6271	553.8610	354.9563	224.9033	223.8026	381.9956	612.3395	832.3722	1036.3918	(97)
Space heating kWh	311.8790	235.2880	174.7817	76.2042	19.0907	0.0000	0.0000	0.0000	0.0000	53.4321	163.8006	306.8715	(98a)
Space heating requirement - total per year (kWh/year)												1341.3479	
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	311.8790	235.2880	174.7817	76.2042	19.0907	0.0000	0.0000	0.0000	0.0000	53.4321	163.8006	306.8715	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1341.3479	
Space heating per m2											(98c) / (4) =	16.4785	(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 %)												170.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	311.8790	235.2880	174.7817	76.2042	19.0907	0.0000	0.0000	0.0000	0.0000	53.4321	163.8006	306.8715	(98)
Space heating efficiency (main heating system 1)	170.0000	170.0000	170.0000	170.0000	170.0000	0.0000	0.0000	0.0000	0.0000	170.0000	170.0000	170.0000	(210)
Space heating fuel (main heating system)	183.4583	138.4047	102.8128	44.8260	11.2298	0.0000	0.0000	0.0000	0.0000	31.4307	96.3533	180.5127	(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	166.7147	148.1197	160.0182	148.1164	148.4133	108.5217	110.0248	112.9212	112.4293	152.9707	154.5889	165.9547	(64)
Efficiency of water heater												170.0000	(216)
(217)m	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	(217)
Fuel for water heating, kWh/month	98.0675	87.1292	94.1284	87.1273	87.3019	63.8363	64.7205	66.4243	66.1349	89.9828	90.9346	97.6204	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	31.1333	24.9763	22.4884	16.4760	12.7265	10.3977	11.6096	15.0905	19.6011	25.7177	29.0481	31.9986	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-26.2232	-37.4204	-62.2820	-79.7133	-89.1528	-88.1509	-85.7675	-78.3378	-64.0110	-47.3438	-29.9134	-20.9697	(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	-6.5908	-13.2475	-32.4842	-60.7192	-84.4168	-99.6667	-93.8610	-76.5663	-50.5296	-23.8761	-9.5738	-4.6336	(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												789.0282	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												170.0000	
Water heating fuel used												993.4080	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												251.2639	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1265.4514	(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												1539.9329	(238)

10a. Fuel costs - using BEDF prices (550)

	Fuel	Fuel price	Fuel cost

	kWh/year	p/kWh	£/year	
Space heating - main system 1	789.0282	26.0600	205.6207	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	993.4080	26.0600	258.8821	(247)
Energy for instantaneous electric shower(s)	771.6843	26.0600	201.1009	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Energy for lighting	251.2639	26.0600	65.4794	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-709.2857	26.0600	-184.8398	
PV Unit electricity exported	-556.1657	5.8100	-32.3132	
Total			-217.1531	(252)
Total energy cost			513.9301	(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	789.0282	0.1571	123.9187	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	993.4080	0.1415	140.5436	(264)
Energy for instantaneous electric shower(s)	771.6843	0.1391	107.3583	(264a)
Space and water heating			264.4623	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	251.2639	0.1443	36.2651	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-709.2857	0.1325	-94.0132	
PV Unit electricity exported	-556.1657	0.1211	-67.3779	
Total			-161.3910	(269)
Total CO2, kg/year			246.6948	(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	789.0282	1.5814	1247.8042	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	993.4080	1.5232	1513.1413	(278)
Energy for instantaneous electric shower(s)	771.6843	1.5143	1168.5878	(278a)
Space and water heating			2760.9455	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	251.2639	1.5338	385.3969	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-709.2857	1.4897	-1056.6562	
PV Unit electricity exported	-556.1657	0.4444	-247.1524	
Total			-1303.8086	(283)
Total Primary energy kWh/year			3011.1216	(286)

SAP 10 EPC IMPROVEMENTS

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3 Green

Current energy efficiency rating: B 83
Current environmental impact rating: A 97

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

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

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

Potential energy efficiency rating: B 83
Potential environmental impact rating: A 97

Fuel prices for cost data on this page from database revision number 550 TEST (28 Jun 2024)
Recommendation texts revision number 6.1 (11 Jun 2019)

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

	Current	Potential	Saving
Electricity	£731	£731	£0
Space heating	£206	£206	£0
Water heating	£460	£460	£0
Lighting	£65	£65	£0
Generated (PV)	-£217	-£217	£0
Total cost of fuels	£514	£514	£0
Total cost of uses	£514	£514	£0
Delivered energy	19 kWh/m²	19 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.2 tonnes	0.2 tonnes	0.0 tonnes
CO2 emissions per m²	3 kg/m²	3 kg/m²	0 kg/m²
Primary energy	37 kWh/m²	37 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR Existing dwelling (SAP) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	81.4000	(1b)	x 2.7000	(2b) =	219.7800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.4000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	219.7800	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.0910	(8)
Number of storeys in the dwelling (ns)		1	(9)
Additional infiltration	[(9) - 1] x 0.1 =	0.0000	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0.3500	(11)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0.0000	(12)
If no draught lobby, enter 0.05, else enter 0		0.0500	(13)
Percentage of windows and doors draught stripped		100.0000	(14)
Window infiltration	0.25 - [0.2 * (14) / 100] =	0.0500	(15)

Pressure test	No	
Pressure Test Method	Blower Door	
Measured/design AP50	15.0000	(17)
Infiltration rate	0.5410	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.4599 (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	0.5863	0.5748	0.5633	0.5058	0.4943	0.4369	0.4369	0.4254	0.4599	0.4943	0.5173	0.5403	(22b)
Effective ac	0.6719	0.6652	0.6587	0.6279	0.6222	0.5954	0.5954	0.5905	0.6057	0.6222	0.6338	0.6460	(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	
New and replacement windo (Uw = 1.00)			7.5600	0.9615	7.2692			(27)
Replaced Existing (Uw = 1.00)			5.6000	0.9615	5.3846			(27)
External Wall - Existing GLA	15.3900	5.6000	9.7900	0.1800	1.7622	9.0000	88.1100	(29a)
External Wall - New	15.6600	7.5600	8.1000	0.1400	1.1340	190.0000	1539.0000	(29a)
External Roof GLA Notional	8.7000		8.7000	0.1300	1.1310	9.0000	78.3000	(30)
Total net area of external elements Aum(A, m2)			39.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.6810			(33)
Party Wall to other buildings			65.3400	0.0000	0.0000	180.0000	11761.2000	(32)
Party Wall to hall			21.6000	0.0000	0.0000	20.0000	432.0000	(32)
Party Floor			81.4000			30.0000	2442.0000	(32d)
Party Ceiling			72.7000			30.0000	2181.0000	(32b)
Internal Wall			32.9400			9.0000	296.4600	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	18818.0700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		231.1802 (35)
Thermal bridges (Default value 0.200 * total exposed area)		7.9500 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	24.6310 (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	48.7296	48.2456	47.7711	45.5425	45.1255	43.1844	43.1844	42.8250	43.9321	45.1255	45.9690	46.8509	(38)
Heat transfer coeff	73.3607	72.8766	72.4021	70.1735	69.7565	67.8155	67.8155	67.4560	68.5631	69.7565	70.6001	71.4819	(39)
Average = Sum(39)m / 12 =												70.1715	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9012	0.8953	0.8895	0.8621	0.8570	0.8331	0.8331	0.8287	0.8423	0.8570	0.8673	0.8782	(40)
HLP (average)												0.8621	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4889 (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
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (42b)
Hot water usage for other uses
42.2302 40.6946 39.1589 37.6233 36.0876 34.5520 34.5520 36.0876 37.6233 39.1589 40.6946 42.2302 (42c)
Average daily hot water use (litres/day) 38.3911 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	42.2302	40.6946	39.1589	37.6233	36.0876	34.5520	34.5520	36.0876	37.6233	39.1589	40.6946	42.2302	(44)
Energy conte	66.8823	57.9485	60.1858	51.5044	48.5809	42.4857	41.7876	44.6840	46.3933	53.1383	57.9769	66.1223	(45)
Energy content (annual)										Total = Sum(45)m =		637.6901	
Distribution loss (46)m = 0.15 x (45)m													
	10.0324	8.6923	9.0279	7.7257	7.2871	6.3729	6.2681	6.7026	6.9590	7.9707	8.6965	9.9183	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8600	(48)
Temperature factor from Table 2b												0.7800	(49)
Enter (49) or (54) in (55)												1.4508	(55)
Total storage loss													
	44.9748	40.6224	44.9748	43.5240	44.9748	43.5240	44.9748	44.9748	43.5240	44.9748	43.5240	44.9748	(56)
If cylinder contains dedicated solar storage													
	44.9748	40.6224	44.9748	43.5240	44.9748	43.5240	44.9748	44.9748	43.5240	44.9748	43.5240	44.9748	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(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													
	166.7147	148.1197	160.0182	148.1164	148.4133	108.5217	110.0248	112.9212	112.4293	152.9707	154.5889	165.9547	(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													
	166.7147	148.1197	160.0182	148.1164	148.4133	108.5217	110.0248	112.9212	112.4293	152.9707	154.5889	165.9547	(64)
										Total per year (kWh/year) = Sum(64)m =		1688.7937	(64)
Electric shower(s)													
	67.8407	60.4466	66.0054	62.9882	64.1701	61.2121	63.2525	64.1701	62.9882	66.0054	64.7643	67.8407	(64a)
Heat gains from water heating, kWh/month													
	83.0846	74.0186	80.3992	75.3426	76.0818	47.4391	48.3174	49.5099	49.1824	78.0559	77.9388	82.8319	(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	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	35.5690	31.5921	25.6924	19.4508	14.5397	12.2750	13.2636	17.2405	23.1402	29.3818	34.2929	36.5576	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	331.8531	335.2967	326.6190	308.1451	284.8251	262.9076	248.2653	244.8217	253.4995	271.9734	295.2934	317.2109	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	(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)													
	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	(71)
Water heating gains (Table 5)													
	111.6729	110.1467	108.0635	104.6426	102.2604	65.8877	64.9428	66.5455	68.3089	104.9139	108.2483	111.3332	(72)
Total internal gains													
	584.2950	582.2355	565.5748	537.4384	506.8252	443.2702	428.6717	430.8078	447.1486	511.4691	543.0346	570.3017	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.5600	10.6334	0.4000	0.7000	0.7700	15.5986	(74)
South	5.6000	46.7521	0.4000	0.7000	0.7700	50.8019	(78)

Solar gains	66.4005	113.0101	156.6365	201.1465	234.4253	237.4578	226.9146	200.8919	171.6138	125.2240	79.4604	56.9013	(83)
Total gains	650.6955	695.2456	722.2114	738.5850	741.2505	680.7281	655.5863	631.6997	618.7623	636.6931	622.4950	627.2030	(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	71.2540	71.7273	72.1973	74.4902	74.9355	77.0804	77.0804	77.4911	76.2398	74.9355	74.0402	73.1268	
alpha	5.7503	5.7818	5.8132	5.9660	5.9957	6.1387	6.1387	6.1661	6.0827	5.9957	5.9360	5.8751	
util living area													
	0.9875	0.9796	0.9615	0.9088	0.7942	0.6224	0.4532	0.4881	0.7232	0.9066	0.9744	0.9894	(86)
MIT	20.3033	20.4026	20.5535	20.7502	20.8814	20.9378	20.9480	20.9474	20.9204	20.7831	20.5313	20.3038	(87)
Th 2	20.1664	20.1715	20.1765	20.1998	20.2042	20.2247	20.2247	20.2285	20.2168	20.2042	20.1954	20.1861	(88)
util rest of house													
	0.9841	0.9742	0.9511	0.8850	0.7471	0.5532	0.3744	0.4079	0.6559	0.8779	0.9666	0.9865	(89)
MIT 2	19.3559	19.4852	19.6775	19.9343	20.0814	20.1528	20.1593	20.1630	20.1319	19.9792	19.6681	19.3730	(90)
Living area fraction										fLA = Living area / (4) =		0.5381	(91)
MIT	19.8657	19.9788	20.1489	20.3733	20.5119	20.5752	20.5837	20.5851	20.5562	20.4118	20.1326	19.8738	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8657	19.9788	20.1489	20.3733	20.5119	20.5752	20.5837	20.5851	20.5562	20.4118	20.1326	19.8738	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9827	0.9727	0.9507	0.8906	0.7661	0.5850	0.4110	0.4452	0.6861	0.8861	0.9659	0.9852	(94)
Useful gains	639.4143	676.2967	686.5990	657.8075	567.9031	398.2517	269.4647	281.2181	424.5393	564.1778	601.2869	617.8949	(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	1141.9074	1098.8926	988.2080	805.1218	614.6856	405.2132	270.1536	282.3097	442.6557	684.4376	920.0997	1120.3959	(97)
Space heating kWh	373.8549	283.9845	224.3971	106.0662	34.8062	0.0000	0.0000	0.0000	0.0000	89.4732	229.5452	373.8608	(98a)
Space heating requirement - total per year (kWh/year)												1715.9881	
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	373.8549	283.9845	224.3971	106.0662	34.8062	0.0000	0.0000	0.0000	0.0000	89.4732	229.5452	373.8608	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1715.9881	
Space heating per m2											(98c) / (4) =	21.0809	(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 %)												170.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	373.8549	283.9845	224.3971	106.0662	34.8062	0.0000	0.0000	0.0000	0.0000	89.4732	229.5452	373.8608	(98)
Space heating efficiency (main heating system 1)	170.0000	170.0000	170.0000	170.0000	170.0000	0.0000	0.0000	0.0000	0.0000	170.0000	170.0000	170.0000	(210)
Space heating fuel (main heating system)	219.9147	167.0497	131.9983	62.3919	20.4742	0.0000	0.0000	0.0000	0.0000	52.6313	135.0266	219.9181	(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	166.7147	148.1197	160.0182	148.1164	148.4133	108.5217	110.0248	112.9212	112.4293	152.9707	154.5889	165.9547	(64)
Efficiency of water heater												170.0000	(216)
(217)m	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	(217)
Fuel for water heating, kWh/month	98.0675	87.1292	94.1284	87.1273	87.3019	63.8363	64.7205	66.4243	66.1349	89.9828	90.9346	97.6204	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	31.1333	24.9763	22.4884	16.4760	12.7265	10.3977	11.6096	15.0905	19.6011	25.7177	29.0481	31.9986	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-20.4500	-33.8334	-57.2900	-73.2779	-85.0954	-79.8137	-78.7415	-70.4640	-56.4749	-41.2827	-23.7666	-17.0029	(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	-4.2425	-10.7885	-26.8777	-49.8952	-74.9879	-80.5479	-78.2638	-61.6431	-39.6725	-18.0694	-6.2179	-3.1790	(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												1009.4048	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												170.0000	
Water heating fuel used												993.4080	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												251.2639	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1091.8783	(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												1933.8826	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1009.4048	16.4900	166.4508	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	993.4080	16.4900	163.8130	(247)
Energy for instantaneous electric shower(s)	771.6843	16.4900	127.2507	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Energy for lighting	251.2639	16.4900	41.4334	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-637.4928	16.4900	-105.1226	
PV Unit electricity exported	-454.3855	5.5900	-25.4001	
Total			-130.5227	(252)
Total energy cost			368.4253	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.0493	(257)
SAP value		82.9906	
SAP rating (Section 12)		83	(258)
SAP band		B	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1009.4048	0.1563	157.7879	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	993.4080	0.1415	140.5436	(264)
Energy for instantaneous electric shower(s)	771.6843	0.1391	107.3583	(264a)
Space and water heating			298.3315	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	251.2639	0.1443	36.2651	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-637.4928	0.1322	-84.2979	
PV Unit electricity exported	-454.3855	0.1208	-54.8982	
Total			-139.1961	(269)
Total CO2, kg/year			302.7590	(272)
CO2 emissions per m2			3.7200	(273)
EI value			96.7904	
EI rating			97	(274)
EI band			A	

SAP 10 WORKSHEET FOR Existing dwelling (SAP) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	81.4000	(1b)	x 2.7000	(2b) =	219.7800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.4000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		219.7800	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.0910	(8)
Number of storeys in the dwelling (ns)		1	(9)
Additional infiltration	[(9) - 1] x 0.1 =	0.0000	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0.3500	(11)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0.0000	(12)
If no draught lobby, enter 0.05, else enter 0		0.0500	(13)
Percentage of windows and doors draught stripped		100.0000	(14)
Window infiltration	0.25 - [0.2 * (14) / 100] =	0.0500	(15)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.5410	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.4599	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	4.7000	4.6000	4.3000	4.3000	4.0000	4.0000	3.9000	4.0000	4.5000	4.4000	4.7000	(22)
Wind factor	1.2750	1.1750	1.1500	1.0750	1.0750	1.0000	1.0000	0.9750	1.0000	1.1250	1.1000	1.1750	(22a)
Adj infilt rate	0.5863	0.5403	0.5288	0.4943	0.4943	0.4599	0.4599	0.4484	0.4599	0.5173	0.5058	0.5403	(22b)
Effective ac	0.6719	0.6460	0.6398	0.6222	0.6222	0.6057	0.6057	0.6005	0.6057	0.6338	0.6279	0.6460	(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	
New and replacement windo (Uw = 1.00)			7.5600	0.9615	7.2692			(27)

Replaced Existing (Uw = 1.00)			5.6000	0.9615	5.3846		(27)
External Wall - Existing GLA	15.3900	5.6000	9.7900	0.1800	1.7622	9.0000	88.1100 (29a)
External Wall - New	15.6600	7.5600	8.1000	0.1400	1.1340	190.0000	1539.0000 (29a)
External Roof GLA Notional	8.7000		8.7000	0.1300	1.1310	9.0000	78.3000 (30)
Total net area of external elements Aum(A, m2)			39.7500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.6810		(33)
Party Wall to other buildings			65.3400	0.0000	0.0000	180.0000	11761.2000 (32)
Party Wall to hall			21.6000	0.0000	0.0000	20.0000	432.0000 (32)
Party Floor			81.4000			30.0000	2442.0000 (32d)
Party Ceiling			72.7000			30.0000	2181.0000 (32b)
Internal Wall			32.9400			9.0000	296.4600 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	18818.0700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		231.1802 (35)
Thermal bridges (Default value 0.200 * total exposed area)		7.9500 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	24.6310 (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	48.7296	46.8509	46.4052	45.1255	45.1255	43.9321	43.9321	43.5535	43.9321	45.9690	45.5425	46.8509	(38)
Heat transfer coeff	73.3607	71.4819	71.0362	69.7565	69.7565	68.5631	68.5631	68.1845	68.5631	70.6001	70.1735	71.4819	(39)
Average = Sum(39)m / 12 =												70.1268	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9012	0.8782	0.8727	0.8570	0.8570	0.8423	0.8423	0.8376	0.8423	0.8673	0.8621	0.8782	(40)
HLP (average)												0.8615	
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												2.4889	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses	42.2302	40.6946	39.1589	37.6233	36.0876	34.5520	34.5520	36.0876	37.6233	39.1589	40.6946	42.2302	(42c)
Average daily hot water use (litres/day)												38.3911	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	42.2302	40.6946	39.1589	37.6233	36.0876	34.5520	34.5520	36.0876	37.6233	39.1589	40.6946	42.2302	(44)
Energy conte	66.8823	57.9485	60.1858	51.5044	48.5809	42.4857	41.7876	44.6840	46.3933	53.1383	57.9769	66.1223	(45)
Energy content (annual)										Total = Sum(45)m =		637.6901	
Distribution loss (46)m = 0.15 x (45)m	10.0324	8.6923	9.0279	7.7257	7.2871	6.3729	6.2681	6.7026	6.9590	7.9707	8.6965	9.9183	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8600	(48)
Temperature factor from Table 2b												0.7800	(49)
Enter (49) or (54) in (55)												1.4508	(55)
Total storage loss	44.9748	40.6224	44.9748	43.5240	44.9748	43.5240	44.9748	44.9748	43.5240	44.9748	43.5240	44.9748	(56)
If cylinder contains dedicated solar storage	44.9748	40.6224	44.9748	43.5240	44.9748	43.5240	44.9748	44.9748	43.5240	44.9748	43.5240	44.9748	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(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	166.7147	148.1197	160.0182	148.1164	148.4133	108.5217	110.0248	112.9212	112.4293	152.9707	154.5889	165.9547	(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	166.7147	148.1197	160.0182	148.1164	148.4133	108.5217	110.0248	112.9212	112.4293	152.9707	154.5889	165.9547	(64)
										Total per year (kWh/year) = Sum(64)m =		1688.7937	(64)
Electric shower(s)	67.8407	60.4466	66.0054	62.9882	64.1701	61.2121	63.2525	64.1701	62.9882	66.0054	64.7643	67.8407	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		771.6843	(64a)
Heat gains from water heating, kWh/month	83.0846	74.0186	80.3992	75.3426	76.0818	47.4391	48.3174	49.5099	49.1824	78.0559	77.9388	82.8319	(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	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	149.3333	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	35.5690	31.5921	25.6924	19.4508	14.5397	12.2750	13.2636	17.2405	23.1402	29.3818	34.2929	36.5576	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	331.8531	335.2967	326.6190	308.1451	284.8251	262.9076	248.2653	244.8217	253.4995	271.9734	295.2934	317.2109	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	52.4222	(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)	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	-99.5555	(71)
Water heating gains (Table 5)	111.6729	110.1467	108.0635	104.6426	102.2604	65.8877	64.9428	66.5455	68.3089	104.9139	108.2483	111.3332	(72)
Total internal gains	584.2950	582.2355	565.5748	537.4384	506.8252	443.2702	428.6717	430.8078	447.1486	511.4691	543.0346	570.3017	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.5600	13.8645	0.4000	0.7000	0.7700	20.3385	(74)
South	5.6000	58.2505	0.4000	0.7000	0.7700	63.2964	(78)

Solar gains	83.6349	121.8590	169.0198	223.3078	250.6105	275.5591	256.7005	230.6737	197.1071	143.0558	99.1999	68.4254	(83)
Total gains	667.9299	704.0945	734.5946	760.7462	757.4357	718.8294	685.3722	661.4815	644.2557	654.5248	642.2345	638.7271	(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	71.2540	73.1268	73.5856	74.9355	74.9355	76.2398	76.2398	76.6632	76.2398	74.0402	74.4902	73.1268	
alpha	5.7503	5.8751	5.9057	5.9957	5.9957	6.0827	6.0827	6.1109	6.0827	5.9360	5.9660	5.8751	
util living area													
	0.9807	0.9718	0.9456	0.8753	0.7285	0.5286	0.3696	0.3807	0.6228	0.8525	0.9545	0.9830	(86)
MIT	20.4061	20.4933	20.6383	20.8042	20.9102	20.9445	20.9485	20.9487	20.9376	20.8460	20.6463	20.4149	(87)
Th 2	20.1664	20.1861	20.1908	20.2042	20.2042	20.2168	20.2168	20.2208	20.2168	20.1954	20.1998	20.1861	(88)
util rest of house													
	0.9753	0.9643	0.9311	0.8448	0.6733	0.4572	0.2917	0.3009	0.5482	0.8102	0.9406	0.9781	(89)
MIT 2	19.4858	19.6111	19.7934	19.9991	20.1085	20.1491	20.1512	20.1555	20.1449	20.0392	19.8135	19.5137	(90)
Living area fraction									fLA = Living area / (4) =			0.5381	(91)
MIT	19.9810	20.0858	20.2480	20.4323	20.5399	20.5771	20.5802	20.5823	20.5714	20.4734	20.2616	19.9987	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9810	20.0858	20.2480	20.4323	20.5399	20.5771	20.5802	20.5823	20.5714	20.4734	20.2616	19.9987	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9739	0.9632	0.9323	0.8541	0.6974	0.4904	0.3279	0.3380	0.5826	0.8258	0.9418	0.9768	(94)
Useful gains	650.4775	678.1962	684.8578	649.7880	528.2014	352.4823	224.7312	223.6055	375.3609	540.5221	604.8714	623.9300	(95)
Ext temp.	5.4000	5.7000	7.3000	9.6000	12.6000	15.4000	17.3000	17.3000	15.0000	11.8000	8.4000	5.5000	(96)
Heat loss rate W													
	1069.6697	1028.3271	919.7795	755.6271	553.8610	354.9563	224.9033	223.8026	381.9956	612.3395	832.3722	1036.3918	(97)
Space heating kWh													
	311.8790	235.2880	174.7817	76.2042	19.0907	0.0000	0.0000	0.0000	0.0000	53.4321	163.8006	306.8715	(98a)
Space heating requirement - total per year (kWh/year)												1341.3479	
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													
	311.8790	235.2880	174.7817	76.2042	19.0907	0.0000	0.0000	0.0000	0.0000	53.4321	163.8006	306.8715	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1341.3479	
Space heating per m2											(98c) / (4) =	16.4785	(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 %)												170.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	311.8790	235.2880	174.7817	76.2042	19.0907	0.0000	0.0000	0.0000	0.0000	53.4321	163.8006	306.8715	(98)
Space heating efficiency (main heating system 1)													
	170.0000	170.0000	170.0000	170.0000	0.0000	0.0000	0.0000	0.0000	170.0000	170.0000	170.0000	170.0000	(210)
Space heating fuel (main heating system)													
	183.4583	138.4047	102.8128	44.8260	11.2298	0.0000	0.0000	0.0000	0.0000	31.4307	96.3533	180.5127	(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													
	166.7147	148.1197	160.0182	148.1164	148.4133	108.5217	110.0248	112.9212	112.4293	152.9707	154.5889	165.9547	(64)
Efficiency of water heater												170.0000	(216)
(217)m	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	(217)
Fuel for water heating, kWh/month													
	98.0675	87.1292	94.1284	87.1273	87.3019	63.8363	64.7205	66.4243	66.1349	89.9828	90.9346	97.6204	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	31.1333	24.9763	22.4884	16.4760	12.7265	10.3977	11.6096	15.0905	19.6011	25.7177	29.0481	31.9986	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-26.2232	-37.4204	-62.2820	-79.7133	-89.1528	-88.1509	-85.7675	-78.3378	-64.0110	-47.3438	-29.9134	-20.9697	(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	-6.5908	-13.2475	-32.4842	-60.7192	-84.4168	-99.6667	-93.8610	-76.5663	-50.5296	-23.8761	-9.5738	-4.6336	(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												789.0282	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												170.0000	
Water heating fuel used												993.4080	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:

Total electricity for the above, kWh/year	0.0000	(231)
Electricity for lighting (calculated in Appendix L)	251.2639	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1265.4514	(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	1539.9329	(238)

10a. Fuel costs - using BEDF prices (550)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	789.0282	26.0600	205.6207	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	993.4080	26.0600	258.8821	(247)
Energy for instantaneous electric shower(s)	771.6843	26.0600	201.1009	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Energy for lighting	251.2639	26.0600	65.4794	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-709.2857	26.0600	-184.8398	
PV Unit electricity exported	-556.1657	5.8100	-32.3132	
Total			-217.1531	(252)
Total energy cost			513.9301	(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	789.0282	0.1571	123.9187	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	993.4080	0.1415	140.5436	(264)
Energy for instantaneous electric shower(s)	771.6843	0.1391	107.3583	(264a)
Space and water heating			264.4623	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	251.2639	0.1443	36.2651	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-709.2857	0.1325	-94.0132	
PV Unit electricity exported	-556.1657	0.1211	-67.3779	
Total			-161.3910	(269)
Total CO2, kg/year			246.6948	(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	789.0282	1.5814	1247.8042	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	993.4080	1.5232	1513.1413	(278)
Energy for instantaneous electric shower(s)	771.6843	1.5143	1168.5878	(278a)
Space and water heating			2760.9455	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	251.2639	1.5338	385.3969	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-709.2857	1.4897	-1056.6562	
PV Unit electricity exported	-556.1657	0.4444	-247.1524	
Total			-1303.8086	(283)
Total Primary energy kWh/year			3011.1216	(286)