

Full SAP Calculation Printout



Property Reference	Flat B				Issued on Date	29/05/2025
Assessment Reference	Flat B - FINAL DESIGN CALCS		Prop Type Ref	Flat A		
Property	Swanley Centre, 53-54, Nightingale Way, Swanley, Kent, BR8 7TQ					
SAP Rating	81 B	DER	6.71	TER		
Environmental	96 A	% DER < TER				N/A
CO ₂ Emissions (t/year)	0.23	DFEE	58.74	TFEE		
Compliance Check	N/A	% DFEE < TFEE				
% DPER < TPER		DPER	66.42	TPER		
Assessor Details	Mr. Matthew Denyer				Assessor ID	DC72-0001
Client	Mian Siddique, Mian Siddique					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	44.0000 (1b)	2.5000 (2b)	110.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	44.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	110.0000 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.2500 (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) = 0.2125 (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	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												81.0000 (23c)
Effective ac	0.3659	0.3606	0.3553	0.3287	0.3234	0.2969	0.2969	0.2916	0.3075	0.3234	0.3341	0.3447 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Upgraded Windows			13.4300	0.7752	10.4109		(27)
Front Door			1.8900	3.0000	5.6700		(26)
External Walls Existing	34.0000	13.4300	20.5700	0.2600	5.3482	9.0000	185.1300 (29a)
External Wall Semi Exposed	3.0000	1.8900	1.1100	0.2000	0.2220	17.0000	18.8700 (29a)
Flat Roof	44.0000		44.0000	0.1600	7.0400	9.0000	396.0000 (30)
Total net area of external elements Aum(A, m ²)			81.0000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.6911		(33)
Main dwelling							
Party Wall 1			19.7500	0.0000	0.0000	180.0000	3555.0000 (32)
Party Floor 1			44.0000			80.0000	3520.0000 (32d)
Internal Wall 1			43.5000			9.0000	391.5000 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		8066.5000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							183.3295 (35)
Thermal bridges (Default value 0.200 * total exposed area)							16.2000 (36)

$$\begin{aligned} & (36a) = 0.0000 \\ (33) + (36) + (36a) &= 44.8911 \quad (37) \end{aligned}$$
[illegible]

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	91.9199	89.8718	87.4590	83.9842	81.0923	78.0113	76.9707	79.3747	81.8897	85.1057	88.6282	91.7164 (44)
Energy conte	145.5786	127.9763	134.4212	114.9701	109.1658	95.9240	93.0893	98.2825	100.9782	115.4876	126.2672	143.6058 (45)
Energy content (annual)										Total =	Sum(45)m =	1405.7467

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

6. Solar gains

7. Mean internal temperature (heating season)

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	38.5167	38.6448	38.7738	39.4317	39.5660	40.2513	40.2513	40.3912	39.9744	39.5660	39.2983	39.0343
alpha	3.5678	3.5763	3.5849	3.6288	3.6377	3.6834	3.6834	3.6927	3.6650	3.6377	3.6199	3.6023
util living area	0.9773	0.9638	0.9334	0.8466	0.6965	0.5147	0.3855	0.4451	0.6930	0.8993	0.9630	0.9799 (86)
MIT	19.0116	19.2814	19.7264	20.3304	20.7471	20.9385	20.9836	20.9728	20.8196	20.2608	19.5571	18.9839 (87)
Th 2	20.3389	20.3411	20.3433	20.3543	20.3565	20.3674	20.3674	20.3696	20.3630	20.3565	20.3521	20.3477 (88)
util rest of house	0.9744	0.9593	0.9249	0.8283	0.6642	0.4702	0.3326	0.3886	0.6490	0.8829	0.9576	0.9774 (89)
MIT 2	18.6856	18.9240	19.3139	19.8382	20.1784	20.3308	20.3598	20.3563	20.2465	19.7895	19.1761	18.6677 (90)
Living area fraction	18.9245	19.1860	19.6163	20.1990	20.5952	20.7762	20.8170	20.8082	20.6665	20.1350	19.4554	18.8995 (92)
MIT	18.9245	19.1860	19.6163	20.1990	20.5952	20.7762	20.8170	20.8082	20.6665	20.1350	19.4554	18.8995 (92)
Temperature adjustment	18.8245	19.0860	19.5163	20.0990	20.4952	20.6762	20.7170	20.7082	20.5665	20.0350	19.3554	-0.1000
adjusted MIT	18.8245	19.0860	19.5163	20.0990	20.4952	20.6762	20.7170	20.7082	20.5665	20.0350	19.3554	18.7995 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9658	0.9486	0.9124	0.8204	0.6714	0.4922	0.3620	0.4193	0.6636	0.8736	0.9473	0.9695 (94)
Useful gains	372.9217	413.8090	447.8316	473.6789	435.4209	323.3533	225.5070	232.8215	319.2848	359.2524	357.9791	360.4080 (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	844.9576	822.5276	752.1961	636.3770	498.0908	338.2474	229.1845	238.9937	362.4701	534.3191	698.7700	838.0574 (97)
Space heating kWh	351.1947	274.6589	226.4472	117.1426	46.6264	0.0000	0.0000	0.0000	0.0000	130.2497	245.3694	355.3712 (98a)
Space heating requirement - total per year (kWh/year)												1747.0601
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	351.1947	274.6589	226.4472	117.1426	46.6264	0.0000	0.0000	0.0000	0.0000	130.2497	245.3694	355.3712 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1747.0601
Space heating per m2										(98c) / (4) =		39.7059 (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 %)												100.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	351.1947	274.6589	226.4472	117.1426	46.6264	0.0000	0.0000	0.0000	0.0000	130.2497	245.3694	355.3712 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	351.1947	274.6589	226.4472	117.1426	46.6264	0.0000	0.0000	0.0000	0.0000	130.2497	245.3694	355.3712 (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	153.8737	109.0672	72.2433	3.8421	0.0000	0.0000	0.0000	0.0000	17.6527	79.9225	126.4044	156.5548 (64)
Efficiency of water heater	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000 (216)
Fuel for water heating, kWh/month	153.8737	109.0672	72.2433	3.8421	0.0000	0.0000	0.0000	0.0000	17.6527	79.9225	126.4044	156.5548 (219)
Space cooling fuel requirement	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	14.1676	12.7966	14.1676	13.7106	14.1676	13.7106	14.1676	14.1676	13.7106	14.1676	13.7106	14.1676 (221)
Lighting	15.2824	12.2601	11.0388	8.0875	6.2470	5.1039	5.6988	7.4075	9.6216	12.6240	14.2588	15.7071 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-57.0211	-81.4451	-113.1650	-106.1529	-93.6903	-70.8459	-70.2204	-68.5594	-69.9346	-85.7243	-62.2939	-49.1603 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	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)	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)	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)	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)	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)	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)	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												1747.0601 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												100.0000
Water heating fuel used												719.5606 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.9375)												
mechanical ventilation fans (SFP = 0.9375)												125.8125 (230a)
central heating pump												41.0000 (230c)
Total electricity for the above, kWh/year												166.8125 (231)
Electricity for lighting (calculated in Appendix L)												123.3375 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-928.2132 (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												

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Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	1828.5575 (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	1747.0601	0.1554	271.4329 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	719.5606	0.1553	111.7634 (264)
Space and water heating			383.1963 (265)
Pumps, fans and electric keep-hot	166.8125	0.1387	23.1390 (267)
Energy for lighting	123.3375	0.1443	17.8014 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-928.2132	0.1387	-128.7715
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-128.7715 (269)
Total CO2, kg/year			295.3651 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			6.7100 (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	1747.0601	1.5752	2751.9728 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	719.5606	1.5749	1133.2397 (278)
Space and water heating			3885.2125 (279)
Pumps, fans and electric keep-hot	166.8125	1.5128	252.3540 (281)
Energy for lighting	123.3375	1.5338	189.1791 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-928.2132	1.5130	-1404.4097
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-1404.4097 (283)
Total Primary energy kWh/year			2922.3359 (286)
Dwelling Primary energy Rate (DPER)			66.4200 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	44.0000 (1b)	x 2.5000 (2b)	= 110.0000 (1b) - (3b)
Ground floor			(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	44.0000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 110.0000 (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)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1818 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4318 (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) = 0.3670 (21)
Wind speed	Jan 5.1000 Feb 5.0000 Mar 4.9000 Apr 4.4000 May 4.3000 Jun 3.8000 Jul 3.8000 Aug 3.7000 Sep 4.0000 Oct 4.3000 Nov 4.5000 Dec 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 1.1750 1.1750 (22a)
Adj infilt rate	0.4680 0.4588 0.4496 0.4038 0.3946 0.3487 0.3487 0.3395 0.3670 0.3946 0.4129 0.4313 (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	0.6095 0.6053 0.6011 0.5815 0.5778 0.5608 0.5608 0.5576 0.5674 0.5778 0.5853 0.5930 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
Main dwelling													
Upgraded Windows			13.4300	0.7752	10.4109			(27)					
Front Door			1.8900	3.0000	5.6700			(26)					
External Walls Existing	34.0000	13.4300	20.5700	0.2600	5.3482	9.0000	185.1300	(29a)					
External Wall Semi Exposed	3.0000	1.8900	1.1100	0.2000	0.2220	17.0000	18.8700	(29a)					
Flat Roof	44.0000		44.0000	0.1600	7.0400	9.0000	396.0000	(30)					
Total net area of external elements Aum(A, m2)			81.0000					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.6911			(33)					
Main dwelling													
Party Wall 1			19.7500	0.0000	0.0000	180.0000	3555.0000	(32)					
Party Floor 1			44.0000			80.0000	3520.0000	(32d)					
Internal Wall 1			43.5000			9.0000	391.5000	(32c)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	8066.5000	(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							183.3295	(35)					
Thermal bridges (Default value 0.200 * total exposed area)							16.2000	(36)					
Point Thermal bridges						(36a) =	0.0000						
Total fabric heat loss						(33) + (36) + (36a) =	44.8911	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 22.1250	Feb 21.9706	Mar 21.8193	Apr 21.1087	May 20.9757	Jun 20.3568	Jul 20.3568	Aug 20.2422	Sep 20.5952	Oct 20.9757	Nov 21.2447	Dec 21.5259	(38)
Heat transfer coeff	67.0160	66.8617	66.7104	65.9998	65.8668	65.2479	65.2479	65.1332	65.4863	65.8668	66.1358	66.4170	(39)
Average = Sum(39)m / 12 =												65.9991	
HLP	Jan 1.5231	Feb 1.5196	Mar 1.5161	Apr 1.5000	May 1.4970	Jun 1.4829	Jul 1.4829	Aug 1.4803	Sep 1.4883	Oct 1.4970	Nov 1.5031	Dec 1.5095	(40)
HLP (average)												1.5000	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.5162 (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	0.0000	(42a)
Hot water usage for baths	21.4708	21.1519	20.7029	19.8750	19.2550	18.5676	18.1963	18.6422	19.1277	19.8632	20.7082	21.3982	(42b)
Hot water usage for other uses	30.1578	29.0612	27.9645	26.8679	25.7712	24.6746	24.6746	25.7712	26.8679	27.9645	29.0612	30.1578	(42c)
Average daily hot water use (litres/day)												47.3230	(43)
Daily hot water use	Jan 51.6286	Feb 50.2131	Mar 48.6674	Apr 46.7428	May 45.0262	Jun 43.2421	Jul 42.8708	Aug 44.4134	Sep 45.9955	Oct 47.8277	Nov 49.7694	Dec 51.5560	(44)
Energy conte	81.7671	71.5028	74.8000	63.9886	60.6139	53.1713	51.8485	54.9930	56.7171	64.9018	70.9056	80.7243	(45)
Energy content (annual)										Total = Sum(45)m =		785.9340	
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	69.5020	60.7774	63.5800	54.3903	51.5219	45.1956	44.0713	46.7441	48.2095	55.1665	60.2698	68.6156	(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	69.5020	60.7774	63.5800	54.3903	51.5219	45.1956	44.0713	46.7441	48.2095	55.1665	60.2698	68.6156	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		668.0439	(64)
Electric shower(s)	39.7548	35.4218	38.6793	36.9112	37.6038	35.8704	37.0661	37.6038	36.9112	38.6793	37.9520	39.7548	(64a)
Heat gains from water heating, kWh/month	27.3142	24.0498	25.5648	22.8254	22.2814	20.2665	20.2843	21.0870	21.2802	23.4615	24.5554	27.0926	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	Jan 75.8119	Feb 75.8119	Mar 75.8119	Apr 75.8119	May 75.8119	Jun 75.8119	Jul 75.8119	Aug 75.8119	Sep 75.8119	Oct 75.8119	Nov 75.8119	Dec 75.8119	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	66.4317	73.5494	66.4317	68.6461	66.4317	66.4317	66.4317	66.4317	68.6461	66.4317	68.6461	66.4317	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	131.7082	133.0749	129.6309	122.2988	113.0434	104.3446	98.5333	97.1666	100.6107	107.9427	117.1981	125.8969	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.5812	30.5812	30.5812	30.5812	30.5812	30.5812	30.5812	30.5812	30.5812	30.5812	30.5812	30.5812	(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)	-60.6496	-60.6496	-60.6496	-60.6496	-60.6496	-60.6496	-60.6496	-60.6496	-60.6496	-60.6496	-60.6496	-60.6496	(71)
Water heating gains (Table 5)	36.7126	35.7884	34.3613	31.7019	29.9481	28.1479	27.2639	28.3427	29.5558	31.5342	34.1048	36.4148	(72)
Total internal gains	280.5961	288.1563	276.1674	268.3904	255.1668	246.8822	237.9724	237.6845	244.5561	251.6522	265.6926	274.4870	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast	6.2400	11.2829	0.5700	0.7000	0.7700	19.4676 (75)

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Northwest				7.1900		11.2829		0.5700		0.7000		0.7700		22.4314 (81)
Solar gains	41.8991	85.2868	153.6597	252.3533	339.2124	361.6363	338.3033	269.6993	187.2367	104.2272	52.7199	34.2169 (83)		
Total gains	322.4952	373.4431	429.8271	520.7437	594.3792	608.5184	576.2758	507.3839	431.7928	355.8794	318.4124	308.7039 (84)		

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	33.4352	33.5124	33.5884	33.9500	34.0186	34.3413	34.3413	34.4017	34.2163	34.0186	33.8802	33.7368
alpha	3.2290	3.2342	3.2392	3.2633	3.2679	3.2894	3.2894	3.2934	3.2811	3.2679	3.2587	3.2491
util living area	0.9871	0.9785	0.9585	0.8972	0.7771	0.6083	0.4716	0.5429	0.7835	0.9398	0.9791	0.9888 (86)
MIT	18.7238	18.9774	19.4193	20.0534	20.5693	20.8641	20.9560	20.9307	20.6749	19.9980	19.2658	18.6894 (87)
Th 2	19.6702	19.6728	19.6754	19.6875	19.6898	19.7003	19.7003	19.7023	19.6963	19.6898	19.6852	19.6804 (88)
util rest of house	0.9837	0.9728	0.9471	0.8686	0.7172	0.5101	0.3437	0.4091	0.7002	0.9169	0.9726	0.9859 (89)
MIT 2	17.6442	17.8966	18.3322	18.9458	19.4039	19.6361	19.6882	19.6807	19.5126	18.9111	18.1933	17.6171 (90)
Living area fraction									fLA = Living area / (4) =			0.7330 (91)
MIT	18.4355	18.6887	19.1290	19.7576	20.2581	20.5362	20.6175	20.5969	20.3645	19.7078	18.9794	18.4031 (92)
Temperature adjustment												0.0000
adjusted MIT	18.4355	18.6887	19.1290	19.7576	20.2581	20.5362	20.6175	20.5969	20.3645	19.7078	18.9794	18.4031 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9795	0.9673	0.9412	0.8703	0.7450	0.5753	0.4356	0.5039	0.7464	0.9173	0.9680	0.9820 (94)
Useful gains	315.8685	361.2271	404.5691	453.2196	442.8190	350.1082	251.0464	255.6699	322.2999	326.4318	308.2151	303.1452 (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	947.3020	921.9391	842.4850	716.6017	563.6964	387.3242	262.1313	273.3572	410.2372	599.8990	785.6535	943.3241 (97)
Space heating kWh	469.7865	376.7984	325.8095	189.6351	89.9328	0.0000	0.0000	0.0000	0.0000	203.4596	343.7556	476.2931 (98a)
Space heating requirement - total per year (kWh/year)												2475.4706
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	469.7865	376.7984	325.8095	189.6351	89.9328	0.0000	0.0000	0.0000	0.0000	203.4596	343.7556	476.2931 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2475.4706
Space heating per m2										(98c) / (4) =		56.2607 (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	613.3298	482.8341	495.0126	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8090	0.8666	0.8196	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	496.1882	418.4334	405.7089	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	688.3289	651.9671	572.7027	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	138.3413	173.7490	124.2434	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	34.5853	43.4373	31.0608	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												109.0834 (107)
Energy for space heating												56.2607 (99)
Energy for space cooling												2.4792 (108)
Total												58.7399 (109)
Fabric Energy Efficiency (DFEE)												58.7 (109)

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

1. Overall dwelling characteristics

Main dwelling	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	44.0000 (1b)	x 2.5000 (2b)	= 110.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	44.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	110.0000 (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)

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Number of flues attached to solid fuel boiler
Number of flues attached to other heater
Number of blocked chimneys
Number of intermittent extract fans
Number of passive vents
Number of flueless gas fires

0 * 20 = 0.0000 (6d)
0 * 35 = 0.0000 (6e)
0 * 20 = 0.0000 (6f)
0 * 10 = 0.0000 (7a)
0 * 10 = 0.0000 (7b)
0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 0.0000
Pressure test
Pressure Test Method
Measured/design AP50
Infiltration rate
Number of sides sheltered

Air changes per hour
0.0000 / (5) = 0.0000 (8)
Yes
Blower Door
5.0000 (17)
0.2500 (18)
2 (19)

Shelter factor
Infiltration rate adjusted to include shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
(21) = (18) x (20) = 0.2125 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000
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
Adj infilt rate												
	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497

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

Effective ac	0.3659	0.3606	0.3553	0.3287	0.3234	0.2969	0.2969	0.2916	0.3075	0.3234	0.3341	0.3447
--------------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

(22)
(22a)
(22b)
(23a)
(23b)
(23c)
(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
---------	-------------	----------------	---------------	------------------	--------------	-------------------	---------------

Main dwelling
Upgraded Windows
Front Door
External Walls Existing
External Wall Semi Exposed
Flat Roof
Total net area of external elements Aum(A, m2)
Fabric heat loss, W/K = Sum (A x U)
Main dwelling
Party Wall 1
Party Floor 1
Internal Wall 1

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K
Thermal bridges (Default value 0.200 * total exposed area)
Point Thermal bridges
Total fabric heat loss

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

Heat transfer coeff

Average = Sum(39)m / 12 =

HLP
HLP (average)
Days in mont

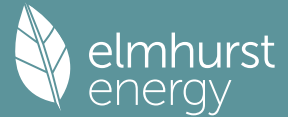
4. Water heating energy requirements (kWh/year)

Assumed occupancy
Hot water usage for mixer showers
Hot water usage for baths
Hot water usage for other uses
Average daily hot water use (litres/day)

Daily hot water use
Energy conte
Energy content (annual)
Distribution loss (46)m = 0.15 x (45)m
Water storage loss:
Store volume
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day)
Volume factor from Table 2a
Temperature factor from Table 2b
Enter (49) or (54) in (55)
Total storage loss

If cylinder contains dedicated solar storage
Primary loss
Combi loss
Total heat required for water heating calculated for each month
WWHRS
PV diverter
Solar input
FGHRS
Output from w/h

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											Total per year (kWh/year) = Sum(64)m =	719.5606 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000 (64a)
Heat gains from water heating, kWh/month	72.4162	64.2398	68.7064	61.4644	60.3090	55.1315	54.9636	56.6903	56.8121	62.4110	65.2206	71.7603 (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	90.9743	90.9743	90.9743	90.9743	90.9743	90.9743	90.9743	90.9743	90.9743	90.9743	90.9743	90.9743 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	17.4597	15.5075	12.6116	9.5478	7.1371	6.0254	6.5107	8.4628	11.3588	14.4226	16.8333	17.9450 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	196.5794	198.6193	193.4789	182.5355	168.7215	155.7382	147.0646	145.0248	150.1652	161.1086	174.9226	187.9058 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	45.6137	45.6137	45.6137	45.6137	45.6137	45.6137	45.6137	45.6137	45.6137	45.6137	45.6137	45.6137 (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)												
	-60.6496	-60.6496	-60.6496	-60.6496	-60.6496	-60.6496	-60.6496	-60.6496	-60.6496	-60.6496	-60.6496	-60.6496 (71)
Water heating gains (Table 5)												
	97.3337	95.5949	92.3473	85.3672	81.0605	76.5716	73.8758	76.1966	78.9057	83.8857	90.5842	96.4520 (72)
Total internal gains												
	390.3113	388.6602	377.3762	356.3889	335.8575	314.2737	303.3895	305.6226	316.3681	338.3553	361.2786	381.2412 (73)

6. Solar gains

[Jan]	Area		Solar flux		g		FF		Access		Gains	
	m2		Table 6a		Specific data		Specific data		factor		W	
			W/m2		or Table 6b		or Table 6c		Table 6d			
Northeast	6.2400		11.2829		0.5700		0.7000		0.7700		19.4676 (75)	
Northwest	7.1900		11.2829		0.5700		0.7000		0.7700		22.4314 (81)	
Solar gains	41.8991	85.2868	153.6597	252.3533	339.2124	361.6363	338.3033	269.6993	187.2367	104.2272	52.7199	34.2169 (83)
Total gains	432.2103	473.9470	531.0359	608.7422	675.0699	675.9100	641.6928	575.3220	503.6048	442.5825	413.9984	415.4581 (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	38.5167	38.6448	38.7738	39.4317	39.5660	40.2513	40.2513	40.3912	39.9744	39.5660	39.2983	39.0343
alpha	3.5678	3.5763	3.5849	3.6288	3.6377	3.6834	3.6834	3.6927	3.6650	3.6377	3.6199	3.6023
util living area	0.9684	0.9544	0.9185	0.8290	0.6785	0.5023	0.3748	0.4310	0.6724	0.8803	0.9521	0.9720 (86)
MIT	19.1494	19.3881	19.8259	20.3835	20.7685	20.9432	20.9851	20.9755	20.8371	20.3276	19.6590	19.1168 (87)
Th 2	20.3389	20.3411	20.3433	20.3543	20.3565	20.3674	20.3674	20.3696	20.3630	20.3565	20.3521	20.3477 (88)
util rest of house	0.9645	0.9488	0.9087	0.8094	0.6459	0.4584	0.3232	0.3759	0.6280	0.8619	0.9454	0.9686 (89)
MIT 2	18.8062	19.0167	19.3989	19.8814	20.1942	20.3337	20.3605	20.3577	20.2586	19.8445	19.2643	18.7842 (90)
Living area fraction	19.0578	19.2889	19.7119	20.2494	20.6152	20.7804	20.8183	20.8105	20.6826	20.1986	19.5536	19.0280 (92)
MIT	19.0578	19.2889	19.7119	20.2494	20.6152	20.7804	20.8183	20.8105	20.6826	20.1986	19.5536	19.0280 (92)
Temperature adjustment	18.9578	19.1889	19.6119	20.1494	20.5152	20.6804	20.7183	20.7105	20.5826	20.0986	19.4536	-0.1000
adjusted MIT	18.9578	19.1889	19.6119	20.1494	20.5152	20.6804	20.7183	20.7105	20.5826	20.0986	19.4536	18.9280 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9543	0.9370	0.8960	0.8027	0.6542	0.4804	0.3520	0.4060	0.6438	0.8536	0.9341	0.9591 (94)	
Useful gains	412.4532	444.1119	475.7902	488.6386	441.6250	324.7148	225.9017	233.5739	324.2392	377.7846	386.7306	398.4667 (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	852.7105	828.4975	757.7205	639.2458	499.2182	338.4829	229.2539	239.1257	363.3710	537.9214	704.3717	845.4334 (97)	
Space heating kWh	327.5515	258.3071	209.7561	108.4372	42.8493	0.0000	0.0000	0.0000	0.0000	119.1418	228.7016	332.5432 (98a)	
Space heating requirement - total per year (kWh/year)												1627.2878	
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	327.5515	258.3071	209.7561	108.4372	42.8493	0.0000	0.0000	0.0000	0.0000	119.1418	228.7016	332.5432 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												1627.2878	
Space heating per m2											(98c) / (4) =		36.9838 (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 %)												100.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	327.5515	258.3071	209.7561	108.4372	42.8493	0.0000	0.0000	0.0000	0.0000	119.1418	228.7016	332.5432 (98)
Space heating efficiency (main heating system 1)												
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)												
	327.5515	258.3071	209.7561	108.4372	42.8493	0.0000	0.0000	0.0000	0.0000	119.1418	228.7016	332.5432 (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)

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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	153.8737	109.0672	72.2433	3.8421	0.0000	0.0000	0.0000	0.0000	17.6527	79.9225	126.4044	156.5548	(64)
Efficiency of water heater	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(216)
Fuel for water heating, kWh/month	153.8737	109.0672	72.2433	3.8421	0.0000	0.0000	0.0000	0.0000	17.6527	79.9225	126.4044	156.5548	(217)
Space cooling fuel requirement	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	14.1676	12.7966	14.1676	13.7106	14.1676	13.7106	14.1676	14.1676	13.7106	14.1676	13.7106	14.1676	(231)
Lighting	15.2824	12.2601	11.0388	8.0875	6.2470	5.1039	5.6988	7.4075	9.6216	12.6240	14.2588	15.7071	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-56.6764	-80.8268	-111.7393	-104.4017	-92.4703	-70.8459	-70.2204	-68.5594	-69.9346	-84.8059	-61.8706	-48.8990	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	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)	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)	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)	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)	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)	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)	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												1627.2878	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												100.0000	
Water heating fuel used												719.5606	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.9375)													
mechanical ventilation fans (SFP = 0.9375)												125.8125	(230a)
central heating pump												41.0000	(230c)
Total electricity for the above, kWh/year												166.8125	(231)
Electricity for lighting (calculated in Appendix L)												123.3375	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-921.2502	(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												1715.7483	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1627.2878	16.4900	268.3398	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	719.5606	16.4900	118.6556	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	166.8125	16.4900	27.5074	(249)
Energy for lighting	123.3375	16.4900	20.3383	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-921.2502	16.4900	-151.9142	
PV Unit electricity exported	0.0000	5.5900	0.0000	
Total			-151.9142	(252)
Total energy cost			282.9269	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)		1.1444	(257)
SAP value	[(255) x (256)] / [(4) + 45.0] =	81.4489	
SAP rating (Section 12)		81	(258)
SAP band		B	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1627.2878	0.1554	252.9171	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	719.5606	0.1553	111.7634	(264)
Space and water heating			364.6805	(265)
Pumps, fans and electric keep-hot	166.8125	0.1387	23.1390	(267)
Energy for lighting	123.3375	0.1443	17.8014	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-921.2502	0.1387	-127.7554	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-127.7554	(269)
Total CO2, kg/year			277.8655	(272)
CO2 emissions per m2			6.3200	(273)
EI value			95.8164	
EI rating			96	(274)

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EI band

A

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	44.0000 (1b)	x 2.5000 (2b)	= 110.0000 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	44.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 110.0000 (5)

2. Ventilation rate

	m ³ per hour											
Number of open chimneys	0 * 80 = 0.0000 (6a)											
Number of open flues	0 * 20 = 0.0000 (6b)											
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)											
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)											
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)											
Number of blocked chimneys	0 * 20 = 0.0000 (6f)											
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)											
Number of passive vents	0 * 10 = 0.0000 (7b)											
Number of flueless gas fires	0 * 40 = 0.0000 (7c)											
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 0.0000 / (5) = 0.0000 (8)											
Pressure test	Yes											
Pressure Test Method	Blower Door											
Measured/design AP50	5.0000 (17)											
Infiltration rate	0.2500 (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) = 0.2125 (21)											
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	4.4000	4.2000	4.1000	3.5000	3.5000	3.2000	3.3000	3.1000	3.3000	3.5000	3.5000	3.9000
Wind factor	1.1000	1.0500	1.0250	0.8750	0.8750	0.8000	0.8250	0.7750	0.8250	0.8750	0.8750	0.9750
Adj infilt rate	0.2338	0.2231	0.2178	0.1859	0.1859	0.1700	0.1753	0.1647	0.1753	0.1859	0.1859	0.2072
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation	0.5000 (23a)											
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)											
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	81.0000 (23c)											
Effective ac	0.3287	0.3181	0.3128	0.2809	0.2809	0.2650	0.2703	0.2597	0.2703	0.2809	0.2809	0.3022

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Main dwelling												
Upgraded Windows			13.4300	0.7752	10.4109		(27)					
Front Door			1.8900	3.0000	5.6700		(26)					
External Walls Existing	34.0000	13.4300	20.5700	0.2600	5.3482	9.0000	185.1300 (29a)					
External Wall Semi Exposed	3.0000	1.8900	1.1100	0.2000	0.2220	17.0000	18.8700 (29a)					
Flat Roof	44.0000		44.0000	0.1600	7.0400	9.0000	396.0000 (30)					
Total net area of external elements Aum(A, m2)			81.0000				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.6911		(33)					
Main dwelling												
Party Wall 1			19.7500	0.0000	0.0000	180.0000	3555.0000 (32)					
Party Floor 1			44.0000			80.0000	3520.0000 (32d)					
Internal Wall 1			43.5000			9.0000	391.5000 (32c)					
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) = 8066.5000 (34)								
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K				183.3295 (35)								
Thermal bridges (Default value 0.200 * total exposed area)				16.2000 (36)								
Point Thermal bridges				(36a) = 0.0000								
Total fabric heat loss				(33) + (36) + (36a) = 44.8911 (37)								
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	11.9336	11.5479	11.3551	10.1980	10.1980	9.6195	9.8123	9.4267	9.8123	10.1980	10.1980	10.9694 (38)
Heat transfer coeff	56.8247	56.4390	56.2461	55.0891	55.0891	54.5106	54.7034	54.3177	54.7034	55.0891	55.0891	55.8605 (39)
Average = Sum(39)m / 12 =				55.3301								
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1.2915	1.2827	1.2783	1.2520	1.2520	1.2389	1.2433	1.2345	1.2433	1.2520	1.2520	1.2696 (40)
HLP (average)				1.2575								
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.5162 (42)
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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	60.1748	59.2811	58.0226	55.7022	53.9647	52.0381	50.9974	52.2471	53.6078	55.6693	58.0376	59.9714 (42b)
Hot water usage for other uses	31.7451	30.5907	29.4363	28.2820	27.1276	25.9732	25.9732	27.1276	28.2820	29.4363	30.5907	31.7451 (42c)
Average daily hot water use (litres/day)												84.6507 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	91.9199	89.8718	87.4590	83.9842	81.0923	78.0113	76.9707	79.3747	81.8897	85.1057	88.6282	91.7164 (44)
Distribution loss (46)m = 0.15 x (45)m	145.5786	127.9763	134.4212	114.9701	109.1658	95.9240	93.0893	98.2825	100.9782	115.4876	126.2672	143.6058 (45)
Water storage loss:	21.8368	19.1964	20.1632	17.2455	16.3749	14.3886	13.9634	14.7424	15.1467	17.3231	18.9401	21.5409 (46)
Store volume												100.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)
Volume factor from Table 2a												1.0627 (52)
Temperature factor from Table 2b												0.6000 (53)
Enter (49) or (54) in (55)												0.9682 (55)
Total storage loss	30.0142	27.1096	30.0142	29.0460	30.0142	29.0460	30.0142	30.0142	29.0460	30.0142	29.0460	30.0142 (56)
If cylinder contains dedicated solar storage	30.0142	27.1096	30.0142	29.0460	30.0142	29.0460	30.0142	30.0142	29.0460	30.0142	29.0460	30.0142 (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	175.5928	155.0859	164.4354	144.0161	139.1800	124.9700	123.1035	128.2967	130.0242	145.5018	155.3132	173.6200 (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	-25.3689	-45.3233	-91.7192	-148.8820	-190.1432	-208.0922	-205.1097	-173.9495	-126.7771	-73.6301	-34.8614	-19.6717 (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	150.2239	109.7626	72.7161	0.0000	0.0000	0.0000	0.0000	0.0000	3.2472	71.8717	120.4518	153.9483 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Heat gains from water heating, kWh/month	72.4162	64.2398	68.7064	61.4644	60.3090	55.1315	54.9636	56.6903	56.8121	62.4110	65.2206	71.7603 (65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												

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	90.9743	90.9743	90.9743	90.9743	90.9743	90.9743	90.9743	90.9743	90.9743	90.9743	90.9743	90.9743 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.4597	15.5075	12.6116	9.5478	7.1371	6.0254	6.5107	8.4628	11.3588	14.4226	16.8333	17.9450 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	196.5794	198.6193	193.4789	182.5355	168.7215	155.7382	147.0646	145.0248	150.1652	161.1086	174.9226	187.9058 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.6137	45.6137	45.6137	45.6137	45.6137	45.6137	45.6137	45.6137	45.6137	45.6137	45.6137	45.6137 (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)	-60.6496	-60.6496	-60.6496	-60.6496	-60.6496	-60.6496	-60.6496	-60.6496	-60.6496	-60.6496	-60.6496	-60.6496 (71)
Water heating gains (Table 5)	97.3337	95.5949	92.3473	85.3672	81.0605	76.5716	73.8758	76.1966	78.9057	83.8857	90.5842	96.4520 (72)
Total internal gains	390.3113	388.6602	377.3762	356.3889	335.8575	314.2737	303.3895	305.6226	316.3681	338.3553	361.2786	381.2412 (73)

6. Solar gains

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

Northeast					6.2400	12.9148	0.5700	0.7000	0.7700			22.2832 (75)
Northwest					7.1900	12.9148	0.5700	0.7000	0.7700			25.6757 (81)

Solar gains	47.9589	86.7890	157.9554	272.1843	353.8397	402.1485	376.4973	304.1085	211.9672	117.1433	61.9398	38.7096 (83)
Total gains	438.2701	475.4492	535.3317	628.5733	689.6972	716.4222	679.8868	609.7312	528.3353	455.4986	423.2183	419.9508 (84)

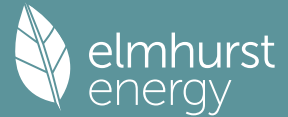
7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	39.4317	39.7012	39.8373	40.6740	40.6740	41.1057	40.9608	41.2516	40.9608	40.6740	40.6740	40.1124
alpha	3.6288	3.6467	3.6558	3.7116	3.7116	3.7404	3.7307	3.7501	3.7307	3.7116	3.7116	3.6742
util living area	0.9620	0.9484	0.9030	0.7874	0.6117	0.4090	0.2563	0.3005	0.5918	0.8423	0.9379	0.9660 (86)
MIT	19.3572	19.5499	20.0106	20.5476	20.8611	20.9768	20.9972	20.9950	20.9098	20.5064	19.8961	19.3472 (87)
Th 2	20.3543	20.3586	20.3608	20.3740	20.3740	20.3806	20.3784	20.3828	20.3784	20.3740	20.3740	20.3652 (88)
util rest of house	0.9573	0.9422	0.8913	0.7646	0.5760	0.3656	0.2070	0.2469	0.5436	0.8188	0.9292	0.9617 (89)
MIT 2	19.0002	19.1716	19.5720	20.0334	20.2806	20.3680	20.3774	20.3809	20.3241	20.0078	19.4875	19.0000 (90)
Living area fraction	19.2618	19.4489	19.8934	20.4103	20.7061	20.8142	20.8317	20.8310	20.7534	20.3732	19.7870	19.2545 (92)
MIT	19.2618	19.4489	19.8934	20.4103	20.7061	20.8142	20.8317	20.8310	20.7534	20.3732	19.7870	19.2545 (92)
Temperature adjustment	19.1618	19.3489	19.7934	20.3103	20.6061	20.7142	20.7317	20.7310	20.6534	20.2732	19.6870	-0.1000
adjusted MIT	19.1618	19.3489	19.7934	20.3103	20.6061	20.7142	20.7317	20.7310	20.6534	20.2732	19.6870	19.1545 (93)

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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Utilisation	0.9466	0.9304	0.8796	0.7621	0.5895	0.3891	0.2351	0.2772	0.5654	0.8146	0.9180	0.9516 (94)
Useful gains	414.8643	442.3344	470.8538	479.0652	406.6085	278.7604	159.8127	169.0456	298.7140	371.0658	388.5093	399.6385 (95)
Ext temp.	5.0000	5.4000	7.2000	9.6000	12.6000	15.5000	17.8000	17.6000	14.8000	11.4000	7.9000	5.0000 (96)
Heat loss rate W	804.7423	787.2605	708.3325	590.0211	441.0482	284.2290	160.3730	170.0692	320.1985	488.8171	649.3357	790.6761 (97)
Space heating kWh	290.0692	231.7903	176.6841	79.8882	25.6232	0.0000	0.0000	0.0000	0.0000	87.6069	187.7950	290.9320 (98a)
Space heating requirement - total per year (kWh/year)												1370.3890
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	290.0692	231.7903	176.6841	79.8882	25.6232	0.0000	0.0000	0.0000	0.0000	87.6069	187.7950	290.9320 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1370.3890
Space heating per m2										(98c) / (4) =		31.1452 (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 %)												100.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	290.0692	231.7903	176.6841	79.8882	25.6232	0.0000	0.0000	0.0000	0.0000	87.6069	187.7950	290.9320 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	290.0692	231.7903	176.6841	79.8882	25.6232	0.0000	0.0000	0.0000	0.0000	87.6069	187.7950	290.9320 (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	150.2239	109.7626	72.7161	0.0000	0.0000	0.0000	0.0000	0.0000	3.2472	71.8717	120.4518	153.9483 (64)
Efficiency of water heater	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000 (216)
Fuel for water heating, kWh/month	150.2239	109.7626	72.7161	0.0000	0.0000	0.0000	0.0000	0.0000	3.2472	71.8717	120.4518	153.9483 (219)
Space cooling fuel requirement	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	14.1676	12.7966	14.1676	13.7106	14.1676	13.7106	14.1676	14.1676	13.7106	14.1676	13.7106	14.1676 (231)
Lighting	15.2824	12.2601	11.0388	8.0875	6.2470	5.1039	5.6988	7.4075	9.6216	12.6240	14.2588	15.7071 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-61.3310	-79.1468	-108.5166	-99.2717	-87.0530	-71.6655	-71.0426	-69.8084	-67.6353	-85.6632	-67.1788	-52.5845 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	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)	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)	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)	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)	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)	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)	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												1370.3890 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												100.0000
Water heating fuel used												682.2216 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.9375)												
mechanical ventilation fans (SFP = 0.9375)												125.8125 (230a)
central heating pump												41.0000 (230c)
Total electricity for the above, kWh/year												166.8125 (231)
Electricity for lighting (calculated in Appendix L)												123.3375 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-920.8973 (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												1421.8632 (238)

10a. Fuel costs - using BEDF prices (571)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1370.3890	26.0600	357.1234 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	682.2216	26.0600	177.7869 (247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000 (247a)
Pumps, fans and electric keep-hot	166.8125	26.0600	43.4713 (249)
Energy for lighting	123.3375	26.0600	32.1417 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-920.8973	26.0600	-239.9858
PV Unit electricity exported	0.0000	5.8100	0.0000
Total			-239.9858 (252)

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Total energy cost

370.5376 (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	1370.3890	0.1561	213.9002 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	682.2216	0.1563	106.6266 (264)
Space and water heating			320.5268 (265)
Pumps, fans and electric keep-hot	166.8125	0.1387	23.1390 (267)
Energy for lighting	123.3375	0.1443	17.8014 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-920.8973	0.1389	-127.8714
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-127.8714 (269)
Total CO2, kg/year			233.5957 (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	1370.3890	1.5779	2162.3046 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	682.2216	1.5786	1076.9265 (278)
Space and water heating			3239.2311 (279)
Pumps, fans and electric keep-hot	166.8125	1.5128	252.3540 (281)
Energy for lighting	123.3375	1.5338	189.1791 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-920.8973	1.5135	-1393.7509
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-1393.7509 (283)
Total Primary energy kWh/year			2287.0132 (286)

SAP 10 EPC IMPROVEMENTS

Flat B - FINAL DESIGN CALCS

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

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

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

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

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

Fuel prices for cost data on this page from database revision number 571 TEST (07 May 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

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

	Current £611	Potential £611	Saving £0
Electricity			
Space heating	£401	£401	£0
Water heating	£178	£178	£0
Lighting	£32	£32	£0
Generated (PV)	-£240	-£240	£0
Total cost of fuels	£371	£371	£0
Total cost of uses	£371	£371	£0
Delivered energy	32 kWh/m²	32 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.2 tonnes	0.2 tonnes	0.0 tonnes
CO2 emissions per m²	5 kg/m²	5 kg/m²	0 kg/m²
Primary energy	52 kWh/m²	52 kWh/m²	0 kWh/m²

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

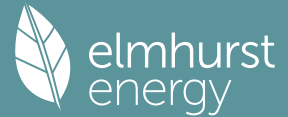
1. Overall dwelling characteristics

Area

Storey height

Volume

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Main dwelling		(m2)		(m)		(m3)
Ground floor		44.0000 (1b)	x	2.5000 (2b)	=	110.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	44.0000					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	110.0000 (5)

2. Ventilation rate

						m3 per hour
Number of open chimneys		0 * 80 =		0.0000 (6a)		
Number of open flues		0 * 20 =		0.0000 (6b)		
Number of chimneys / flues attached to closed fire		0 * 10 =		0.0000 (6c)		
Number of flues attached to solid fuel boiler		0 * 20 =		0.0000 (6d)		
Number of flues attached to other heater		0 * 35 =		0.0000 (6e)		
Number of blocked chimneys		0 * 20 =		0.0000 (6f)		
Number of intermittent extract fans		0 * 10 =		0.0000 (7a)		
Number of passive vents		0 * 10 =		0.0000 (7b)		
Number of flueless gas fires		0 * 40 =		0.0000 (7c)		
Air changes per hour						
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =		0.0000 (8)		
Pressure test				Yes		
Pressure Test Method				Blower Door		
Measured/design AP50				5.0000 (17)		
Infiltration rate				0.2500 (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) =		0.2125 (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	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												81.0000 (23c)
Effective ac	0.3659	0.3606	0.3553	0.3287	0.3234	0.2969	0.2969	0.2916	0.3075	0.3234	0.3341	0.3447 (25)

3. Heat losses and heat loss parameter

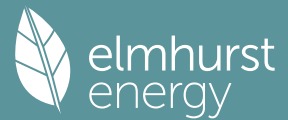
Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
Upgraded Windows			13.4300	0.7752	10.4109		(27)
Front Door			1.8900	3.0000	5.6700		(26)
External Walls Existing	34.0000	13.4300	20.5700	0.2600	5.3482	9.0000	185.1300 (29a)
External Wall Semi Exposed	3.0000	1.8900	1.1100	0.2000	0.2220	17.0000	18.8700 (29a)
Flat Roof	44.0000		44.0000	0.1600	7.0400	9.0000	396.0000 (30)
Total net area of external elements Aum(A, m2)			81.0000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.6911		(33)
Main dwelling							
Party Wall 1			19.7500	0.0000	0.0000	180.0000	3555.0000 (32)
Party Floor 1			44.0000			80.0000	3520.0000 (32d)
Internal Wall 1			43.5000			9.0000	391.5000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	8066.5000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							183.3295 (35)
Thermal bridges (Default value 0.200 * total exposed area)							16.2000 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	44.8911 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	13.2835	13.0907	12.8978	11.9336	11.7408	10.7766	10.7766	10.5837	11.1623	11.7408	12.1265	12.5122 (38)
Average = Sum(39)m / 12 =	58.1746	57.9817	57.7889	56.8247	56.6318	55.6676	55.6676	55.4748	56.0533	56.6318	57.0175	57.4032 (39)
												56.7765
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.3221	1.3178	1.3134	1.2915	1.2871	1.2652	1.2652	1.2608	1.2739	1.2871	1.2959	1.3046 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.5162 (42)
Hot water usage for mixer showers												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	60.1748	59.2811	58.0226	55.7022	53.9647	52.0381	50.9974	52.2471	53.6078	55.6693	58.0376	59.9714 (42c)
Average daily hot water use (litres/day)	31.7451	30.5907	29.4363	28.2820	27.1276	25.9732	25.9732	27.1276	28.2820	29.4363	30.5907	31.7451 (42c)
												84.6507 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	91.9199	89.8718	87.4590	83.9842	81.0923	78.0113	76.9707	79.3747	81.8897	85.1057	88.6282	91.7164 (44)
Energy content (annual)	145.5786	127.9763	134.4212	114.9701	109.1658	95.9240	93.0893	98.2825	100.9782	115.4876	126.2672	143.6058 (45)
Distribution loss (46)m = 0.15 x (45)m												1405.7467
	21.8368	19.1964	20.1632	17.2455	16.3749	14.3886	13.9634	14.7424	15.1467	17.3231	18.9401	21.5409 (46)
Water storage loss:												
Store volume												100.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)
Volume factor from Table 2a												1.0627 (52)

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Temperature factor from Table 2b												0.6000 (53)
Enter (49) or (54) in (55)												0.9682 (55)
Total storage loss	30.0142	27.1096	30.0142	29.0460	30.0142	29.0460	30.0142	30.0142	29.0460	30.0142	29.0460	30.0142 (56)
If cylinder contains dedicated solar storage	30.0142	27.1096	30.0142	29.0460	30.0142	29.0460	30.0142	30.0142	29.0460	30.0142	29.0460	30.0142 (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	175.5928	155.0859	164.4354	144.0161	139.1800	124.9700	123.1035	128.2967	130.0242	145.5018	155.3132	173.6200 (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	-21.7192	-46.0187	-92.1921	-140.1741	-185.8503	-187.0285	-184.4583	-154.5371	-112.3715	-65.5792	-28.9088	-17.0652 (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	153.8737	109.0672	72.2433	3.8421	0.0000	0.0000	0.0000	0.0000	17.6527	79.9225	126.4044	156.5548 (64)
	Total per year (kWh/year) = Sum(64)m =											719.5606 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											0.0000 (64a)
Heat gains from water heating, kWh/month	72.4162	64.2398	68.7064	61.4644	60.3090	55.1315	54.9636	56.6903	56.8121	62.4110	65.2206	71.7603 (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	90.9743	90.9743	90.9743	90.9743	90.9743	90.9743	90.9743	90.9743	90.9743	90.9743	90.9743	90.9743	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.4597	15.5075	12.6116	9.5478	7.1371	6.0254	6.5107	8.4628	11.3588	14.4226	16.8333	17.9450	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	196.5794	198.6193	193.4789	182.5355	168.7215	155.7382	147.0646	145.0248	150.1652	161.1086	174.9226	187.9058	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.6137	45.6137	45.6137	45.6137	45.6137	45.6137	45.6137	45.6137	45.6137	45.6137	45.6137	45.6137	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-60.6496	-60.6496	-60.6496	-60.6496	-60.6496	-60.6496	-60.6496	-60.6496	-60.6496	-60.6496	-60.6496	-60.6496	(71)
Water heating gains (Table 5)	97.3337	95.5949	92.3473	85.3672	81.0605	76.5716	73.8758	76.1966	78.9057	83.8857	90.5842	96.4520	(72)
Total internal gains	390.3113	388.6602	377.3762	356.3889	335.8575	314.2737	303.3895	305.6226	316.3681	338.3553	361.2786	381.2412	(73)

6. Solar gains

[Jan]												Gains
	Area				Solar flux	g		FF		Access		W
	m2				Table 6a	Specific data		Specific data		factor		
					W/m2	or Table 6b		or Table 6c		Table 6d		
Northeast	6.2400				11.2829	0.5700		0.7000		0.7700		19.4676 (75)
Northwest	7.1900				11.2829	0.5700		0.7000		0.7700		22.4314 (81)
Solar gains	41.8991	85.2868	153.6597	252.3533	339.2124	361.6363	338.3033	269.6993	187.2367	104.2272	52.7199	34.2169 (83)
Total gains	432.2103	473.9470	531.0359	608.7422	675.0699	675.9100	641.6928	575.3220	503.6048	442.5825	413.9984	415.4581 (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	38.5167	38.6448	38.7738	39.4317	39.5660	40.2513	40.2513	40.3912	39.9744	39.5660	39.2983	39.0343
alpha	3.5678	3.5763	3.5849	3.6288	3.6377	3.6834	3.6834	3.6927	3.6650	3.6377	3.6199	3.6023
util living area	0.9684	0.9544	0.9185	0.8290	0.6785	0.5023	0.3748	0.4310	0.6724	0.8803	0.9521	0.9720 (86)
MIT	19.1494	19.3881	19.8259	20.3835	20.7685	20.9432	20.9851	20.9755	20.8371	20.3276	19.6590	19.1168 (87)
Th 2	20.3389	20.3411	20.3433	20.3543	20.3565	20.3674	20.3674	20.3696	20.3630	20.3565	20.3521	20.3477 (88)
util rest of house	0.9645	0.9488	0.9087	0.8094	0.6459	0.4584	0.3232	0.3759	0.6280	0.8619	0.9454	0.9686 (89)
MIT 2	18.8062	19.0167	19.3989	19.8814	20.1942	20.3337	20.3605	20.3577	20.2586	19.8445	19.2643	18.7842 (90)
Living area fraction	19.0578	19.2889	19.7119	20.2494	20.6152	20.7804	20.8183	20.8105	20.6826	20.1986	19.5536	19.0280 (91)
MIT	19.0578	19.2889	19.7119	20.2494	20.6152	20.7804	20.8183	20.8105	20.6826	20.1986	19.5536	19.0280 (92)
Temperature adjustment	18.9578	19.1889	19.6119	20.1494	20.5152	20.6804	20.7183	20.7105	20.5826	20.0986	19.4536	-0.1000
adjusted MIT	18.9578	19.1889	19.6119	20.1494	20.5152	20.6804	20.7183	20.7105	20.5826	20.0986	19.4536	18.9280 (93)

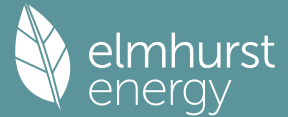
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9543	0.9370	0.8960	0.8027	0.6542	0.4804	0.3520	0.4060	0.6438	0.8536	0.9341	0.9591	(94)
Useful gains	412.4532	444.1119	475.7902	488.6386	441.6250	324.7148	225.9017	233.5739	324.2392	377.7846	386.7306	398.4667	(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	852.7105	828.4975	757.7205	639.2458	499.2182	338.4829	229.2539	239.1257	363.3710	537.9214	704.3717	845.4334	(97)
Space heating kWh	327.5515	258.3071	209.7561	108.4372	42.8493	0.0000	0.0000	0.0000	0.0000	119.1418	228.7016	332.5432	(98a)
Space heating requirement - total per year (kWh/year)												1627.2878	
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	327.5515	258.3071	209.7561	108.4372	42.8493	0.0000	0.0000	0.0000	0.0000	119.1418	228.7016	332.5432	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1627.2878	
Space heating per m ²												(98c) / (4) =	36.9838 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP			
	Energy	Emission factor	Emissions

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Space heating - main system 1	kWh/year	kg CO ₂ /kWh	kg CO ₂ /year
Total CO ₂ associated with community systems	1627.2878	0.1554	252.9171 (261)
Water heating (other fuel)			0.0000 (373)
Space and water heating	719.5606	0.1553	111.7634 (264)
Pumps, fans and electric keep-hot	166.8125	0.1387	364.6805 (265)
Energy for lighting	123.3375	0.1443	23.1390 (267)
			17.8014 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-921.2502	0.1387	-127.7554
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-127.7554 (269)
Total CO ₂ , kg/year			277.8655 (272)
CO ₂ emissions per m ²			6.3200 (273)
EI value			95.8164
EI rating			96 (274)
EI band			A

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

1. Overall dwelling characteristics

Main dwelling	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	44.0000 (1b)	x 2.5000 (2b)	= 110.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	44.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	110.0000 (5)

2. Ventilation rate

Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.2500	(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) =	0.2125 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	4.4000	4.2000	4.1000	3.5000	3.5000	3.2000	3.3000	3.1000	3.3000	3.5000	3.5000	3.9000 (22)
Adj infilt rate	1.1000	1.0500	1.0250	0.8750	0.8750	0.8000	0.8250	0.7750	0.8250	0.8750	0.8750	0.9750 (22a)
Balanced mechanical ventilation with heat recovery	0.2338	0.2231	0.2178	0.1859	0.1859	0.1700	0.1753	0.1647	0.1753	0.1859	0.1859	0.2072 (22b)
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												81.0000 (23c)
Effective ac	0.3287	0.3181	0.3128	0.2809	0.2809	0.2650	0.2703	0.2597	0.2703	0.2809	0.2809	0.3022 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Main dwelling												
Upgraded Windows			13.4300	0.7752	10.4109		(27)					
Front Door			1.8900	3.0000	5.6700		(26)					
External Walls Existing	34.0000	13.4300	20.5700	0.2600	5.3482	9.0000	185.1300 (29a)					
External Wall Semi Exposed	3.0000	1.8900	1.1100	0.2000	0.2220	17.0000	18.8700 (29a)					
Flat Roof	44.0000		44.0000	0.1600	7.0400	9.0000	396.0000 (30)					
Total net area of external elements Aum(A, m2)			81.0000				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	28.6911			(33)					
Main dwelling												
Party Wall 1			19.7500	0.0000	0.0000	180.0000	3555.0000 (32)					
Party Floor 1			44.0000			80.0000	3520.0000 (32d)					
Internal Wall 1			43.5000			9.0000	391.5000 (32c)					
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		8066.5000 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							183.3295 (35)					
Thermal bridges (Default value 0.200 * total exposed area)							16.2000 (36)					
Point Thermal bridges						(36a) =	0.0000					
Total fabric heat loss					(33) + (36) + (36a) =		44.8911 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 11.9336	Feb 11.5479	Mar 11.3551	Apr 10.1980	May 10.1980	Jun 9.6195	Jul 9.8123	Aug 9.4267	Sep 9.8123	Oct 10.1980	Nov 10.1980	Dec 10.9694 (38)

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Heat transfer coeff	56.8247	56.4390	56.2461	55.0891	55.0891	54.5106	54.7034	54.3177	54.7034	55.0891	55.0891	55.8605 (39)
Average = Sum(39)m / 12 =												55.3301
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2915	1.2827	1.2783	1.2520	1.2520	1.2389	1.2433	1.2345	1.2433	1.2520	1.2520	1.2696 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	1.2575 (40)
												31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.5162 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths												0.0000 (42b)
Hot water usage for other uses												0.0000 (42c)
Average daily hot water use (litres/day)												84.6507 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	91.9199	89.8718	87.4590	83.9842	81.0923	78.0113	76.9707	79.3747	81.8897	85.1057	88.6282	91.7164 (44)
Energy content (annual)	145.5786	127.9763	134.4212	114.9701	109.1658	95.9240	93.0893	98.2825	100.9782	115.4876	126.2672	143.6058 (45)
Distribution loss (46)m = 0.15 x (45)m												1405.7467
Water storage loss:	21.8368	19.1964	20.1632	17.2455	16.3749	14.3886	13.9634	14.7424	15.1467	17.3231	18.9401	21.5409 (46)
Store volume												100.0000 (47)
b) If manufacturer declared loss factor is not known :												0.0152 (51)
Hot water storage loss factor from Table 2 (kWh/litre/day)												1.0627 (52)
Volume factor from Table 2a												0.6000 (53)
Temperature factor from Table 2b												0.9682 (55)
Enter (49) or (54) in (55)												
Total storage loss	30.0142	27.1096	30.0142	29.0460	30.0142	29.0460	30.0142	30.0142	29.0460	30.0142	29.0460	30.0142 (56)
If cylinder contains dedicated solar storage	30.0142	27.1096	30.0142	29.0460	30.0142	29.0460	30.0142	30.0142	29.0460	30.0142	29.0460	30.0142 (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	175.5928	155.0859	164.4354	144.0161	139.1800	124.9700	123.1035	128.2967	130.0242	145.5018	155.3132	173.6200 (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	-25.3689	-45.3233	-91.7192	-148.8820	-190.1432	-208.0922	-205.1097	-173.9495	-126.7771	-73.6301	-34.8614	-19.6717 (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	150.2239	109.7626	72.7161	0.0000	0.0000	0.0000	0.0000	0.0000	3.2472	71.8717	120.4518	153.9483 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month	72.4162	64.2398	68.7064	61.4644	60.3090	55.1315	54.9636	56.6903	56.8121	62.4110	65.2206	71.7603 (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	90.9743	90.9743	90.9743	90.9743	90.9743	90.9743	90.9743	90.9743	90.9743	90.9743	90.9743	90.9743 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.4597	15.5075	12.6116	9.5478	7.1371	6.0254	6.5107	8.4628	11.3588	14.4226	16.8333	17.9450 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	196.5794	198.6193	193.4789	182.5355	168.7215	155.7382	147.0646	145.0248	150.1652	161.1086	174.9226	187.9058 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.6137	45.6137	45.6137	45.6137	45.6137	45.6137	45.6137	45.6137	45.6137	45.6137	45.6137	45.6137 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-60.6496	-60.6496	-60.6496	-60.6496	-60.6496	-60.6496	-60.6496	-60.6496	-60.6496	-60.6496	-60.6496	-60.6496 (71)
Water heating gains (Table 5)	97.3337	95.5949	92.3473	85.3672	81.0605	76.5716	73.8758	76.1966	78.9057	83.8857	90.5842	96.4520 (72)
Total internal gains	390.3113	388.6602	377.3762	356.3889	335.8575	314.2737	303.3895	305.6226	316.3681	338.3553	361.2786	381.2412 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d			Gains W
Northeast					6.2400	12.9148	0.5700	0.7000	0.7700			22.2832 (75)
Northwest					7.1900	12.9148	0.5700	0.7000	0.7700			25.6757 (81)
Solar gains	47.9589	86.7890	157.9554	272.1843	353.8397	402.1485	376.4973	304.1085	211.9672	117.1433	61.9398	38.7096 (83)
Total gains	438.2701	475.4492	535.3317	628.5733	689.6972	716.4222	679.8868	609.7312	528.3353	455.4986	423.2183	419.9508 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	39.4317	39.7012	39.8373	40.6740	40.6740	41.1057	40.9608	41.2516	40.9608	40.6740	40.6740	40.1124
alpha	3.6288	3.6467	3.6558	3.7116	3.7116	3.7404	3.7307	3.7501	3.7307	3.7116	3.7116	3.6742
util living area	0.9620	0.9484	0.9030	0.7874	0.6117	0.4090	0.2563	0.3005	0.5918	0.8423	0.9379	0.9660 (86)
MIT	19.3572	19.5499	20.0106	20.5476	20.8611	20.9768	20.9972	20.9950	20.9098	20.5064	19.8961	19.3472 (87)

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Th 2	20.3543	20.3586	20.3608	20.3740	20.3740	20.3806	20.3784	20.3828	20.3784	20.3740	20.3740	20.3652 (88)
util rest of house	0.9573	0.9422	0.8913	0.7646	0.5760	0.3656	0.2070	0.2469	0.5436	0.8188	0.9292	0.9617 (89)
MIT 2	19.0002	19.1716	19.5720	20.0334	20.2806	20.3680	20.3774	20.3809	20.3241	20.0078	19.4875	19.0000 (90)
Living area fraction									fLA = Living area / (4) =			0.7330 (91)
MIT	19.2618	19.4489	19.8934	20.4103	20.7061	20.8142	20.8317	20.8310	20.7534	20.3732	19.7870	19.2545 (92)
Temperature adjustment												-0.1000
adjusted MIT	19.1618	19.3489	19.7934	20.3103	20.6061	20.7142	20.7317	20.7310	20.6534	20.2732	19.6870	19.1545 (93)

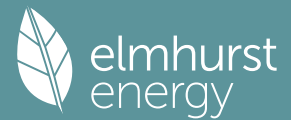
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9466	0.9304	0.8796	0.7621	0.5895	0.3891	0.2351	0.2772	0.5654	0.8146	0.9180	0.9516	(94)
Useful gains	414.8643	442.3344	470.8538	479.0652	406.6085	278.7604	159.8127	169.0456	298.7140	371.0658	388.5093	399.6385	(95)
Ext temp.	5.0000	5.4000	7.2000	9.6000	12.6000	15.5000	17.8000	17.6000	14.8000	11.4000	7.9000	5.0000	(96)
Heat loss rate W	804.7423	787.2605	708.3325	590.0211	441.0482	284.2290	160.3730	170.0692	320.1985	488.8171	649.3357	790.6761	(97)
Space heating kWh	290.0692	231.7903	176.6841	79.8882	25.6232	0.0000	0.0000	0.0000	0.0000	87.6069	187.7950	290.9320	(98a)
Space heating requirement - total per year (kWh/year)												1370.3890	
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	290.0692	231.7903	176.6841	79.8882	25.6232	0.0000	0.0000	0.0000	0.0000	87.6069	187.7950	290.9320	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1370.3890	
Space heating per m2											(98c) / (4) =	31.1452	(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 %)													100.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	290.0692	231.7903	176.6841	79.8882	25.6232	0.0000	0.0000	0.0000	0.0000	87.6069	187.7950	290.9320	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	290.0692	231.7903	176.6841	79.8882	25.6232	0.0000	0.0000	0.0000	0.0000	87.6069	187.7950	290.9320	(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	150.2239	109.7626	72.7161	0.0000	0.0000	0.0000	0.0000	0.0000	3.2472	71.8717	120.4518	153.9483	(64)
Efficiency of water heater	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month	150.2239	109.7626	72.7161	0.0000	0.0000	0.0000	0.0000	0.0000	3.2472	71.8717	120.4518	153.9483	(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	14.1676	12.7966	14.1676	13.7106	14.1676	13.7106	14.1676	14.1676	13.7106	14.1676	13.7106	14.1676	(231)
Lighting	15.2824	12.2601	11.0388	8.0875	6.2470	5.1039	5.6988	7.4075	9.6216	12.6240	14.2588	15.7071	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-61.3310	-79.1468	-108.5166	-99.2717	-87.0530	-71.6655	-71.0426	-69.8084	-67.6353	-85.6632	-67.1788	-52.5845	(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												1370.3890	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												100.0000	
Water heating fuel used												682.2216	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.9375)													
mechanical ventilation fans (SFP = 0.9375)												125.8125	(230a)
central heating pump												41.0000	(230c)
Total electricity for the above, kWh/year												166.8125	(231)
Electricity for lighting (calculated in Appendix L)												123.3375	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-920.8973	(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												1421.8632	(238)

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10a. Fuel costs - using BEDF prices (571)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1370.3890	26.0600	357.1234 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	682.2216	26.0600	177.7869 (247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000 (247a)
Pumps, fans and electric keep-hot	166.8125	26.0600	43.4713 (249)
Energy for lighting	123.3375	26.0600	32.1417 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-920.8973	26.0600	-239.9858
PV Unit electricity exported	0.0000	5.8100	0.0000
Total			-239.9858 (252)
Total energy cost			370.5376 (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	1370.3890	0.1561	213.9002 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	682.2216	0.1563	106.6266 (264)
Space and water heating			320.5268 (265)
Pumps, fans and electric keep-hot	166.8125	0.1387	23.1390 (267)
Energy for lighting	123.3375	0.1443	17.8014 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-920.8973	0.1389	-127.8714
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-127.8714 (269)
Total CO2, kg/year			233.5957 (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	1370.3890	1.5779	2162.3046 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	682.2216	1.5786	1076.9265 (278)
Space and water heating			3239.2311 (279)
Pumps, fans and electric keep-hot	166.8125	1.5128	252.3540 (281)
Energy for lighting	123.3375	1.5338	189.1791 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-920.8973	1.5135	-1393.7509
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-1393.7509 (283)
Total Primary energy kWh/year			2287.0132 (286)