

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

Essex County Council's SAP Conversion Tool indicates which row numbers from the SAP Calculation Printout should be used to obtain key building characteristics to be input to the tool. The row number is provided in brackets at the end of each line on the SAP Calculation Printout. The building characteristics that must be obtained from the printout are also highlighted in yellow boxes in the example below, and on the following pages.

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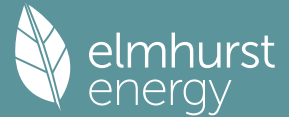
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	Area (m ²)		Storey height (m)		Volume (m ³)
Ground floor	46.6000	(1b)	x	2.6500	(2b) = 123.4900 (1b) -
First floor	46.6000	(1c)	x	2.4000	(2c) = 111.8400 (1c) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.2000				(4)
Dwelling volume		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

SAP 10 software is designed to provide compliance calculations only. It is not intended to represent real-world performance. Raw SAP 10 calculation results are not suitable for assessing performance against Essex County Council or other Local Planning Authority net zero energy performance requirements for new buildings, that are based on real-world performance.

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

Full SAP Calculation Printout



Property Reference	SD - Net Zero - Best Pr		Issued on Date	07/11/2024	
Assessment Reference	001_Copy	Prop Type Ref			
Property	Part L 2021 - Insulation - HP, ESSEX				
SAP Rating	96 A	DER	-0.14	TER	10.80
Environmental	100 A	% DER < TER	101.30		
CO ₂ Emissions (t/year)	-0.05	DFEE	26.85	TFEE	36.50
Compliance Check	See BREL	% DFEE < TFEE	26.43		
% DPER < TPER	80.79	DPER	10.82	TPER	56.32
Assessor Details	Ms. Caitlin Brown			Assessor ID	AX87-0001
Client					

CAUTION! Results should not be taken from this section

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

1. Overall dwelling characteristics

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

2. Ventilation rate

	m3 per hour											
Number of open chimneys	0 * 80 =											0.0000 (6a)
Number of open flues	0 * 20 =											0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =											0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =											0.0000 (6d)
Number of flues attached to other heater	0 * 35 =											0.0000 (6e)
Number of blocked chimneys	0 * 20 =											0.0000 (6f)
Number of intermittent extract fans	0 * 10 =											0.0000 (7a)
Number of passive vents	0 * 10 =											0.0000 (7b)
Number of flueless gas fires	0 * 40 =											0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =											0.0000 (8)
Pressure test												Yes
Pressure Test Method												Blower Door
Measured/design AP50												0.6000 (17)
Infiltration rate												0.0300 (18)
Number of sides sheltered												1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =											0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =											0.0278 (21)
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	1.1250	1.1750 (22a)
Adj infilt rate	0.0354	0.0347	0.0340	0.0305	0.0298	0.0264	0.0264	0.0257	0.0278	0.0298	0.0312	0.0326 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												79.2000 (23c)
Effective ac	0.1394	0.1387	0.1380	0.1345	0.1338	0.1304	0.1304	0.1297	0.1317	0.1338	0.1352	0.1366 (25)

3. Heat losses and heat loss parameter

Element	Gross 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
Entrance Door			2.1200	1.0000	2.1200		(26)
Window FF 0.40 (Uw = 0.80)			4.6000	0.7752	3.5659		(27)
Window FF 0.48 (Uw = 0.80)			5.2400	0.7752	4.0620		(27)
Window FF 0.52 (Uw = 0.80)			3.0900	0.7752	2.3953		(27)
Window FF 0.53 (Uw = 0.80)			0.7300	0.7752	0.5659		(27)
Window FF 0.70 (Uw = 0.80)			0.3000	0.7752	0.2326		(27)
Ground Floor			46.6000	0.0900	4.1940	75.0000	3495.0000 (28a)
Wall - NE	30.7600	9.0600	21.7000	0.1000	2.1700	70.0000	1519.0000 (29a)
Wall - SW	30.7600	7.0200	23.7400	0.1000	2.3740	70.0000	1661.8000 (29a)
Wall - NW	38.6300		38.6300	0.1000	3.8630	70.0000	2704.1000 (29a)
Roof	46.6000		46.6000	0.0900	4.1940	9.0000	419.4000 (30)
Total net area of external elements Aum(A, m ²)			193.3500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.7367		(33)
Wall - SE			38.6300	0.0000	0.0000	45.0000	1738.3500 (32)

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Heat capacity Cm = Sum(A x k)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K
 List of Thermal Bridges

Element	Length	Psi-value	Total
K1 Element	10.6200	0.0500	0.5310
E3 Sill	27.1800	0.0500	1.3590
E4 Jamb	10.6200	0.0500	0.5310
E2 Other lintels (including other steel lintels)	19.8300	0.1600	3.1728
E5 Ground floor (normal)	12.1800	0.1000	1.2180
E10 Eaves (insulation at ceiling level)	7.6500	0.1000	0.7650
E12 Gable (insulation at ceiling level)	10.1000	0.0300	0.3030
E16 Corner (normal)	10.1000	0.0300	0.3030
E18 Party wall between dwellings	7.6500	0.1300	0.9945
P1 Party wall - Ground floor	7.6500	0.0900	0.6885
P4 Party wall - Roof (insulation at ceiling level)			
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			9.8658 (36)
Point Thermal bridges			0.0000 (36a)
Total fabric heat loss			39.6025 (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	10.8242	10.7703	10.7164	10.4471	10.3932	10.1238	10.1238	10.0699	10.2316	10.3932	10.5009	10.6087 (38)
Average = Sum(39)m / 12 =	50.4267	50.3728	50.3189	50.0496	49.9957	49.7263	49.7263	49.6724	49.8341	49.9957	50.1034	50.2112 (39)
HLP	0.5411	0.5405	0.5399	0.5370	0.5364	0.5335	0.5335	0.5330	0.5347	0.5364	0.5376	Dec 0.5387 (40)
HLP (average)												0.5369
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6670 (42)

Hot water usage for mixer showers 68.9372 67.9012 66.3916 63.5031 61.3715 58.9944 57.6433 59.1415 60.7838 63.3361 66.2866 68.6731 (42a)

Hot water usage for baths 29.7685 29.3264 28.7038 27.5559 26.6963 25.7432 25.2284 25.8466 26.5198 27.5396 28.7112 29.6678 (42b)

Hot water usage for other uses 41.9431 40.4179 38.8927 37.3675 35.8423 34.3171 34.3171 35.8423 37.3675 38.8927 40.4179 41.9431 (42c)

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

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	140.6488	137.6455	133.9881	128.4265	123.9102	119.0548	117.1888	120.8304	124.6711	129.7685	135.4157	140.2840 (44)
Energy content (annual)	222.7533	196.0054	205.9347	175.8095	166.8069	146.3917	141.7297	149.6133	153.7319	176.0946	192.9245	219.6509 (45)
Distribution loss (46)m = 0.15 x (45)m	33.4130	29.4008	30.8902	26.3714	25.0210	21.9588	21.2595	22.4420	23.0598	26.4142	28.9387	32.9476 (46)
Water storage loss:												
Store volume												200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.4000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7560 (55)
Total storage loss	23.4360	21.1680	23.4360	22.6800	23.4360	22.6800	23.4360	23.4360	22.6800	23.4360	22.6800	23.4360 (56)
If cylinder contains dedicated solar storage												
Primary loss	23.4360	21.1680	23.4360	22.6800	23.4360	22.6800	23.4360	23.4360	22.6800	23.4360	22.6800	23.4360 (57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	269.4517	238.1846	252.6331	221.0015	213.5053	191.5837	188.4281	196.3117	198.9239	222.7930	238.1165	266.3493 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	269.4517	238.1846	252.6331	221.0015	213.5053	191.5837	188.4281	196.3117	198.9239	222.7930	238.1165	266.3493 (64)
Total per year (kWh/year)												2697.2824 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month	111.4242	98.9151	105.8320	94.6103	92.8220	84.8288	84.4838	87.1051	87.2695	95.9102	100.3010	110.3926 (65)

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

Metabolic gains (Table 5), Watts

(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	146.3814	162.0651	146.3814	151.2608	146.3814	151.2608	146.3814	146.3814	151.2608	146.3814	151.2608	146.3814 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	244.8433	247.3840	240.9815	227.3513	210.1457	193.9748	183.1717	180.6310	187.0335	200.6636	217.8693	234.0402 (68)
Pumps, fans	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352 (69)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (Table 5)	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815 (71)
Total internal gains	149.7637	147.1952	142.2473	131.4031	124.7608	117.8178	113.5535	117.0768	121.2076	128.9115	139.3069	148.3772 (72)
	603.9940	619.6498	592.6158	573.0208	544.2934	526.0590	506.1122	507.0947	522.5074	538.9621	571.4425	591.8043 (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
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Northeast	4.6000	11.2829	0.5500	0.4000	0.7700	7.9129 (75)
Northeast	1.3100	11.2829	0.5500	0.4800	0.7700	2.7042 (75)
Southwest	3.9300	36.7938	0.5500	0.4800	0.7700	26.4548 (79)
Southwest	3.0900	36.7938	0.5500	0.5200	0.7700	22.5337 (79)
Northeast	0.7300	11.2829	0.5500	0.5300	0.7700	1.6639 (75)
Northeast	0.3000	11.2829	0.5500	0.7000	0.7700	0.9031 (75)

Solar gains	62.1726	110.2820	162.5247	220.8728	265.1918	271.1019	258.1136	223.8529	182.5423	125.0214	75.2659	52.6907 (83)
Total gains	666.1665	729.9319	755.1404	793.8936	809.4853	797.1609	764.2258	730.9476	705.0497	663.9835	646.7084	644.4950 (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	63.5557	63.6236	63.6918	64.0346	64.1036	64.4508	64.4508	64.5207	64.3115	64.1036	63.9657	63.8284
alpha	5.2370	5.2416	5.2461	5.2690	5.2736	5.2967	5.2967	5.3014	5.2874	5.2736	5.2644	5.2552
util living area	0.9203	0.8805	0.8251	0.7096	0.5608	0.3974	0.2860	0.3121	0.4820	0.7234	0.8698	0.9296 (86)
Living	20.4623	20.6049	20.7498	20.9007	20.9742	20.9965	20.9995	20.9992	20.9906	20.9069	20.6852	20.4257
Non living	20.2169	20.3563	20.4969	20.6417	20.7096	20.7305	20.7329	20.7330	20.7251	20.6488	20.4368	20.1821
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.7250	20.6049	20.7498	20.9007	20.9742	20.9965	20.9995	20.9992	20.9906	20.9069	20.6852	20.5060 (87)
Th 2	20.7295	20.7298	20.7300	20.7315	20.7318	20.7332	20.7332	20.7335	20.7326	20.7318	20.7312	20.7306 (88)
util rest of house	0.9159	0.8745	0.8168	0.6978	0.5462	0.3811	0.2688	0.2942	0.4642	0.7098	0.8624	0.9256 (89)
MIT 2	20.4673	20.3563	20.4969	20.6417	20.7096	20.7305	20.7329	20.7330	20.7251	20.6488	20.4368	20.2588 (90)
Living area fraction									FLA = Living area / (4) =			0.3433 (91)
MIT	20.5557	20.4416	20.5838	20.7307	20.8005	20.8218	20.8244	20.8244	20.8162	20.7374	20.5221	20.3437 (92)
Temperature adjustment												0.0000
adjusted MIT	20.5557	20.4416	20.5838	20.7307	20.8005	20.8218	20.8244	20.8244	20.8162	20.7374	20.5221	20.3437 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9129	0.8677	0.8121	0.6978	0.5499	0.3865	0.2747	0.3003	0.4698	0.7100	0.8563	0.9194 (94)
Useful gains	608.1412	633.3434	613.2395	553.9476	445.1717	308.1264	209.9026	219.5070	331.2438	471.4594	553.7944	592.5373 (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	819.7236	782.8764	708.6799	592.1192	454.9834	309.3886	210.0656	219.7701	334.6971	506.8277	672.4926	810.5937 (97)
Space heating kWh	157.4173	100.4861	71.0076	27.4835	7.2999	0.0000	0.0000	0.0000	0.0000	26.3140	85.4627	162.2340 (98a)
Space heating requirement - total per year (kWh/year)												637.7052
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	157.4173	100.4861	71.0076	27.4835	7.2999	0.0000	0.0000	0.0000	0.0000	26.3140	85.4627	162.2340 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												637.7052
Space heating per m2										(98c) / (4) =		6.8423 (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 %) 307.8663 (206)
 Efficiency of main space heating system 2 (in %) 0.0000 (207)
 Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	157.4173	100.4861	71.0076	27.4835	7.2999	0.0000	0.0000	0.0000	0.0000	26.3140	85.4627	162.2340 (98)
Space heating efficiency (main heating system 1)	307.8663	307.8663	307.8663	307.8663	307.8663	0.0000	0.0000	0.0000	0.0000	307.8663	307.8663	307.8663 (210)
Space heating fuel (main heating system)	51.1317	32.6395	23.0644	8.9271	2.3711	0.0000	0.0000	0.0000	0.0000	8.5472	27.7597	52.6962 (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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Water heating requirement	269.4517	238.1846	252.6331	221.0015	213.5053	191.5837	188.4281	196.3117	198.9239	222.7930	238.1165	266.3493 (64)
Efficiency of water heater (217)m	188.3337	188.3337	188.3337	188.3337	188.3337	188.3337	188.3337	188.3337	188.3337	188.3337	188.3337	188.3337 (216)
Fuel for water heating, kWh/month	143.0714	126.4694	134.1412	117.3457	113.3654	101.7257	100.0501	104.2361	105.6231	118.2969	126.4333	141.4241 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	16.0935	14.5360	16.0935	15.5743	16.0935	15.5743	16.0935	16.0935	15.5743	16.0935	15.5743	16.0935 (231)
Lighting	34.5482	27.7158	24.9550	18.2831	14.1224	11.5381	12.8829	16.7457	21.7510	28.5385	32.2342	35.5084 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-44.8247	-66.0593	-99.1942	-114.5604	-125.5687	-117.7494	-116.1827	-108.8921	-94.8954	-76.6861	-49.9797	-38.3261 (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	-19.9751	-45.0271	-96.5671	-155.2472	-212.6838	-216.4430	-212.9301	-175.6668	-122.9897	-67.2333	-27.4952	-15.4698 (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)

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Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year												
Space heating fuel - main system 1											207.1371	(211)
Space heating fuel - main system 2											0.0000	(213)
Space heating fuel - secondary											0.0000	(215)
Efficiency of water heater											188.3337	
Water heating fuel used											1432.1823	(219)
Space cooling fuel											0.0000	(221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, DataSheet: in-use factor = 1.1000, SFP = 0.6600)												
mechanical ventilation fans (SFP = 0.6600)											189.4877	(230a)
Total electricity for the above, kWh/year											189.4877	(231)
Electricity for lighting (calculated in Appendix L)											278.8235	(232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation											-2420.6472	(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											-313.0165	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1 (high-rate cost)	165.7097	0.1652	27.3808 (261)
Space heating - main system 1 (low-rate cost)	41.4274	0.1387	5.7467 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating - high rate cost	1002.5276	0.1479	148.3109 (264)
Water heating - low rate cost	429.6547	0.1242	53.3460 (264)
Space and water heating			234.7843 (265)
Pumps, fans and electric keep-hot	189.4877	0.1432	26.2928 (267)
Energy for lighting	278.8235	0.1490	41.5502 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1052.9188	0.1383	-145.5902
PV Unit electricity exported	-1367.7284	0.1242	-169.9294
Total			-315.5196 (269)
Total CO2, kg/year			-12.8922 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			-0.1400 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1 (high-rate cost)	165.7097	1.2925	267.7346 (275)
Space heating - main system 1 (low-rate cost)	41.4274	1.5026	62.2505 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating - high rate cost	1002.5276	1.5530	1556.9132 (278)
Water heating - low rate cost	429.6547	1.4443	620.5632 (278)
Space and water heating			2507.4615 (279)
Pumps, fans and electric keep-hot	189.4877	1.5335	286.6864 (281)
Energy for lighting	278.8235	1.5547	433.4993 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1052.9188	1.5155	-1595.6859
PV Unit electricity exported	-1367.7284	0.4560	-623.6656
Total			-2219.3515 (283)
Total Primary energy kWh/year			1008.2957 (286)
Dwelling Primary energy Rate (DPER)			10.8200 (287)

CAUTION! Results should not be taken from this section

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

1. Overall dwelling characteristics

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

2. Ventilation rate

	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	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)

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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	30.0000 / (5) =	0.1275 (8)
Pressure test												Yes		
Pressure Test Method												Blower Door		
Measured/design AP50												5.0000	(17)	
Infiltration rate												0.3775	(18)	
Number of sides sheltered												1	(19)	
Shelter factor	(20) = 1 - [0.075 x (19)] =											0.9250	(20)	
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =											0.3492	(21)	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4452	0.4365	0.4277	0.3841	0.3754	0.3317	0.3317	0.3230	0.3492	0.3754	0.3928	0.4103 (22b)
Effective ac	0.5991	0.5952	0.5915	0.5738	0.5704	0.5550	0.5550	0.5522	0.5610	0.5704	0.5772	0.5842 (25)

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
TER Opaque door			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.20)			13.9600	1.1450	15.9847		(27)
Ground Floor			46.6000	0.1300	6.0580		(28a)
Wall - NE	30.7600	9.0600	21.7000	0.1800	3.9060		(29a)
Wall - SW	30.7600	7.0200	23.7400	0.1800	4.2732		(29a)
Wall - NW	38.6300		38.6300	0.1800	6.9534		(29a)
Roof	46.6000		46.6000	0.1100	5.1260		(30)
Total net area of external elements Aum(A, m2)			193.3500				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	44.4213	(33)
Wall - SE			38.6300	0.0000	0.0000		(32)

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

List of Thermal Bridges

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

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

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 54.2499 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	46.5253	46.2264	45.9335	44.5577	44.3002	43.1019	43.1019	42.8800	43.5635	44.3002	44.8210	45.3654 (38)
Average = Sum(39)m / 12 =	100.7752	100.4764	100.1834	98.8076	98.5502	97.3519	97.3519	97.1300	97.8134	98.5502	99.0709	99.6153 (39)
												98.8064

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

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6670 (42)
Hot water usage for mixer showers												68.9372 (42a)
Hot water usage for baths												29.7685 (42b)
Hot water usage for other uses												41.9431 (42c)
Average daily hot water use (litres/day)												129.2880 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	140.6488	137.6455	133.9881	128.4265	123.9102	119.0548	117.1888	120.8304	124.6711	129.7685	135.4157	140.2840 (44)
Energy content (annual)	222.7533	196.0054	205.9347	175.8095	166.8069	146.3917	141.7297	149.6133	153.7319	176.0946	192.9245	219.6509 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 2147.4464
Water storage loss:												
Store volume												200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6525 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8924 (55)
Total storage loss	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637 (56)
If cylinder contains dedicated solar storage												
Primary loss	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637 (57)
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												
WWHRS	273.6794	242.0031	256.8608	225.0928	217.7330	195.6750	192.6557	200.5394	203.0152	227.0206	242.2078	270.5770 (62)
PV diverter	-31.5152	-27.8723	-29.1863	-24.1674	-22.5231	-19.2732	-18.0656	-19.2109	-19.9408	-23.5080	-26.6317	-30.9316 (63a)
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 (63b)
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 (63c)
Output from w/h	242.1642	214.1308	227.6745	200.9254	195.2099	176.4018	174.5902	181.3285	183.0744	203.5126	215.5760	239.6454 (64)
Total per year (kWh/year)												Total per year (kWh/year) = Sum(64)m = 2454.2336 (64)
												2454 (64)

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Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)	
Heat gains from water heating, kWh/month	114.8063	101.9700	109.2141	97.8833	96.2042	88.1019	87.8660	90.4873	90.5425	99.2923	103.5740	113.7748	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	130.5857	144.5770	130.5857	134.9385	130.5857	134.9385	130.5857	130.5857	134.9385	130.5857	134.9385	130.5857	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	244.8433	247.3840	240.9815	227.3513	210.1457	193.9748	183.1717	180.6310	187.0335	200.6636	217.8693	234.0402	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	(71)
Water heating gains (Table 5)	154.3096	151.7410	146.7932	135.9490	129.3067	122.3637	118.0994	121.6227	125.7535	133.4574	143.8528	152.9231	(72)
Total internal gains	595.7441	609.7076	584.3659	564.2444	536.0436	514.2826	494.8623	495.8449	510.7310	530.7122	562.6662	583.5545	(73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W						
Northeast	6.9400	11.2829	0.6300	0.7000	0.7000	0.7700	23.9306	(75)					
Southwest	7.0200	36.7938	0.6300	0.7000	0.7000	0.7700	78.9376	(79)					
Solar gains	102.8682	183.1714	271.7365	372.0839	449.0667	460.0277	437.6029	377.9981	306.1449	208.1361	124.6600	87.0971	(83)
Total gains	698.6123	792.8789	856.1024	936.3283	985.1102	974.3103	932.4652	873.8430	816.8759	738.8484	687.3261	670.6515	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains for living area, nil,m (see Table 9a)													21.0000 (85)
tau	31.8025	31.8971	31.9903	32.4358	32.5205	32.9208	32.9208	32.9960	32.7655	32.5205	32.3496	32.1728	
alpha	3.1202	3.1265	3.1327	3.1624	3.1680	3.1947	3.1947	3.1997	3.1844	3.1680	3.1566	3.1449	
util living area	0.9613	0.9421	0.9117	0.8432	0.7320	0.5742	0.4379	0.4802	0.6841	0.8670	0.9409	0.9654	(86)
MIT	19.0230	19.2963	19.6835	20.2010	20.6151	20.8743	20.9603	20.9463	20.7708	20.2432	19.5641	18.9865	(87)
Th 2	20.0162	20.0188	20.0214	20.0335	20.0358	20.0464	20.0464	20.0483	20.0423	20.0358	20.0312	20.0264	(88)
util rest of house	0.9550	0.9328	0.8972	0.8170	0.6872	0.5057	0.3509	0.3918	0.6201	0.8392	0.9298	0.9598	(89)
MIT 2	17.7169	18.0616	18.5472	19.1876	19.6705	19.9512	20.0253	20.0179	19.8530	19.2527	18.4116	17.6773	(90)
Living area fraction										FLA = Living area / (4) =			0.3433 (91)
MIT	18.1654	18.4856	18.9373	19.5355	19.9948	20.2681	20.3463	20.3366	20.1681	19.5928	18.8073	18.1268	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1654	18.4856	18.9373	19.5355	19.9948	20.2681	20.3463	20.3366	20.1681	19.5928	18.8073	18.1268	(93)

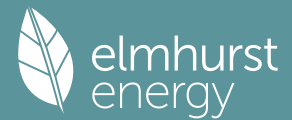
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9390	0.9142	0.8775	0.8016	0.6851	0.5224	0.3790	0.4195	0.6291	0.8241	0.9119	0.9448	(94)
Useful gains	655.9919	724.8448	751.1882	750.5875	674.9164	508.9411	353.4248	366.6001	513.9337	608.9102	626.7571	633.6043	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1397.2870	1365.0269	1246.0163	1050.8715	817.4579	551.8021	364.7122	382.3653	593.5465	886.2433	1159.8530	1387.3277	(97)
Space heating kWh	551.5236	430.2024	368.1521	216.2044	106.0509	0.0000	0.0000	0.0000	0.0000	206.3359	383.8290	560.7702	(98a)
Space heating requirement - total per year (kWh/year)												2823.0685	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	551.5236	430.2024	368.1521	216.2044	106.0509	0.0000	0.0000	0.0000	0.0000	206.3359	383.8290	560.7702	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2823.0685	
Space heating per m ²												(98c) / (4) =	30.2904 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from main system(s)													0.0000 (201)
Efficiency of main space heating system 1 (in %)													1.0000 (202)
Efficiency of main space heating system 2 (in %)													92.3000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (207)
													0.0000 (208)
Space heating requirement	551.5236	430.2024	368.1521	216.2044	106.0509	0.0000	0.0000	0.0000	0.0000	206.3359	383.8290	560.7702	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	597.5337	466.0914	398.8647	234.2410	114.8980	0.0000	0.0000	0.0000	0.0000	223.5492	415.8494	607.5517	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													

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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	(213)
	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 requirement	242.1642	214.1308	227.6745	200.9254	195.2099	176.4018	174.5902	181.3285	183.0744	203.5126	215.5760	239.6454	(64)
Efficiency of water heater (217)m	85.8459	85.5919	85.1312	84.2245	82.7524	79.8000	79.8000	79.8000	79.8000	84.0907	85.3385	79.8000	(216)
Fuel for water heating, kWh/month	282.0916	250.1763	267.4395	238.5594	235.8962	221.0549	218.7847	227.2286	229.4165	242.0156	252.6129	278.9837	(219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	(231)
Lighting	27.1331	21.7672	19.5989	14.3590	11.0913	9.0617	10.1179	13.1516	17.0826	22.4133	25.3158	27.8872	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-42.9407	-60.1977	-86.0351	-96.1474	-103.1600	-96.0746	-94.8601	-89.7939	-80.7910	-68.5387	-47.0772	-37.1626	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	-25.2908	-53.0890	-105.3227	-157.9172	-208.5635	-209.4971	-207.0561	-175.4431	-128.7498	-75.8596	-33.7438	-20.0100	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1													3058.5791 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													79.8000
Water heating fuel used													2944.2600 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year													86.0000 (231)
Electricity for lighting (calculated in Appendix L)													218.9798 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-2303.3218 (233)
Wind generation													0.0000 (234)
Hydro-electric generation (Appendix N)													0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)													0.0000 (235)
Appendix Q - special features													
Energy saved or generated													-0.0000 (236)
Energy used													0.0000 (237)
Total delivered energy for all uses													4004.4972 (238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3058.5791	0.2100	642.3016 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2944.2600	0.2100	618.2946 (264)
Space and water heating			1260.5962 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	218.9798	0.1443	31.6056 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-902.7790	0.1347	-121.6198
PV Unit electricity exported	-1400.5427	0.1259	-176.3892
Total			-298.0091 (269)
Total CO2, kg/year			1006.1220 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.8000 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	3058.5791	1.1300	3456.1944 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2944.2600	1.1300	3327.0138 (278)
Space and water heating			6783.2082 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	218.9798	1.5338	335.8785 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-902.7790	1.4979	-1352.2720
PV Unit electricity exported	-1400.5427	0.4623	-647.4725
Total			-1999.7444 (283)
Total Primary energy kWh/year			5249.4431 (286)
Target Primary Energy Rate (TPER)			56.3200 (287)

CAUTION! Results should not be taken from this section

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

1. Overall dwelling characteristics

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

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1275	(8)
Pressure test	Yes		
Pressure Test Method	Blower Door		
Measured/design AP50	0.6000		(17)
Infiltration rate	0.1575		(18)
Number of sides sheltered	1		(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1457	(21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750
	0.1857	0.1821	0.1784	0.1602	0.1566	0.1384	0.1384	0.1347	0.1457	0.1566	0.1639	0.1712
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000
Effective ac	0.5172	0.5166	0.5159	0.5128	0.5123	0.5096	0.5096	0.5091	0.5106	0.5123	0.5134	0.5146

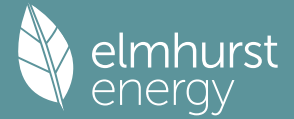
3. Heat losses and heat loss parameter

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					
Entrance Door			2.1200	1.0000	2.1200		(26)					
Window FF 0.40 (Uw = 0.80)			4.6000	0.7752	3.5659		(27)					
Window FF 0.48 (Uw = 0.80)			5.2400	0.7752	4.0620		(27)					
Window FF 0.52 (Uw = 0.80)			3.0900	0.7752	2.3953		(27)					
Window FF 0.53 (Uw = 0.80)			0.7300	0.7752	0.5659		(27)					
Window FF 0.70 (Uw = 0.80)			0.3000	0.7752	0.2326		(27)					
Ground Floor			46.6000	0.0900	4.1940	75.0000	3495.0000 (28a)					
Wall - NE	30.7600	9.0600	21.7000	0.1000	2.1700	70.0000	1519.0000 (29a)					
Wall - SW	30.7600	7.0200	23.7400	0.1000	2.3740	70.0000	1661.8000 (29a)					
Wall - NW	38.6300		38.6300	0.1000	3.8630	70.0000	2704.1000 (29a)					
Roof	46.6000		46.6000	0.0900	4.1940	9.0000	419.4000 (30)					
Total net area of external elements Aum(A, m2)			193.3500				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.7367		(33)					
Wall - SE			38.6300	0.0000	0.0000	45.0000	1738.3500 (32)					
Heat capacity Cm = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =				11537.6500 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							123.7945 (35)					
List of Thermal Bridges												
K1 Element				Length	Psi-value	Total						
E3 Sill				10.6200	0.0500	0.5310						
E4 Jamb				27.1800	0.0500	1.3590						
E2 Other lintels (including other steel lintels)				10.6200	0.0500	0.5310						
E5 Ground floor (normal)				19.8300	0.1600	3.1728						
E10 Eaves (insulation at ceiling level)				12.1800	0.1000	1.2180						
E12 Gable (insulation at ceiling level)				7.6500	0.1000	0.7650						
E16 Corner (normal)				10.1000	0.0300	0.3030						
E18 Party wall between dwellings				10.1000	0.0300	0.3030						
P1 Party wall - Ground floor				7.6500	0.1300	0.9945						
P4 Party wall - Roof (insulation at ceiling level)				7.6500	0.0900	0.6885						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.8658 (36)					
Point Thermal bridges							0.0000 (36a)					
Total fabric heat loss							(33) + (36) + (36a) = 39.6025 (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	40.1689	40.1169	40.0659	39.8264	39.7816	39.5731	39.5731	39.5344	39.6534	39.7816	39.8723	39.9670
Average = Sum(39)m / 12 =	79.7714	79.7194	79.6684	79.4289	79.3841	79.1756	79.1756	79.1369	79.2559	79.3841	79.4748	79.5695
	79.4287											79.4287
HLP (average)	0.8559	0.8554	0.8548	0.8522	0.8518	0.8495	0.8495	0.8491	0.8504	0.8518	0.8527	0.8538
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6670 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	29.7685	29.3264	28.7038	27.5559	26.6963	25.7432	25.2284	25.8466	26.5198	27.5396	28.7112	29.6678 (42b)
Hot water usage for other uses	41.9431	40.4179	38.8927	37.3675	35.8423	34.3171	34.3171	35.8423	37.3675	38.8927	40.4179	41.9431 (42c)

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Average daily hot water use (litres/day)												65.7302 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	71.7116	69.7443	67.5965	64.9234	62.5386	60.0603	59.5455	61.6889	63.8873	66.4323	69.1291	71.6110 (44)
Energy content	113.5736	99.3149	103.8933	88.8769	84.1890	73.8512	72.0151	76.3838	78.7794	90.1480	98.4871	112.1255 (45)
Energy content (annual)	Total = Sum(45)m =											1091.6379
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:	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)
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 (57)
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 (59)
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 (61)
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 (62)
Total heat required for water heating calculated for each month	96.5376	84.4177	88.3093	75.5453	71.5607	62.7735	61.2129	64.9262	66.9625	76.6258	83.7140	95.3066 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	96.5376	84.4177	88.3093	75.5453	71.5607	62.7735	61.2129	64.9262	66.9625	76.6258	83.7140	95.3066 (64)
Total per year (kWh/year) = Sum(64)m =												927.8923 (64)
12												928 (64)
Electric shower(s)	55.2072	49.1901	53.7137	51.2583	52.2202	49.8130	51.4734	52.2202	51.2583	53.7137	52.7037	55.2072 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												627.9788 (64a)
Heat gains from water heating, kWh/month	37.9362	33.4019	35.5058	31.7009	30.9452	28.1466	28.1716	29.2866	29.5552	32.5849	34.1044	37.6285 (65)

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	146.3814	162.0651	146.3814	151.2608	146.3814	151.2608	146.3814	146.3814	151.2608	146.3814	151.2608	146.3814 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	244.8433	247.3840	240.9815	227.3513	210.1457	193.9748	183.1717	180.6310	187.0335	200.6636	217.8693	234.0402 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815 (71)
Water heating gains (Table 5)	50.9895	49.7053	47.7228	44.0290	41.5930	39.0925	37.8650	39.3637	41.0489	43.7969	47.3672	50.5759 (72)
Total internal gains	505.2198	522.1599	498.0912	485.6467	461.1257	447.3337	430.4237	429.3816	442.3487	453.8475	479.5029	494.0030 (73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b g	Specific data or Table 6c FF	Access factor Table 6d	Gains W						
Northeast	4.6000	11.2829	0.5500	0.4000	0.7700	7.9129 (75)						
Northeast	1.3100	11.2829	0.5500	0.4800	0.7700	2.7042 (75)						
Southwest	3.9300	36.7938	0.5500	0.4800	0.7700	26.4548 (79)						
Southwest	3.0900	36.7938	0.5500	0.5200	0.7700	22.5337 (79)						
Northeast	0.7300	11.2829	0.5500	0.5300	0.7700	1.6639 (75)						
Northeast	0.3000	11.2829	0.5500	0.7000	0.7700	0.9031 (75)						
Solar gains	62.1726	110.2820	162.5247	220.8728	265.1918	271.1019	258.1136	223.8529	182.5423	125.0214	75.2659	52.6907 (83)
Total gains	567.3923	632.4420	660.6159	706.5195	726.3175	718.4356	688.5373	653.2345	624.8910	578.8689	554.7687	546.6937 (84)

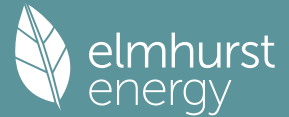
7. Mean internal temperature (heating season)

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	40.1761	40.2023	40.2280	40.3493	40.3721	40.4784	40.4784	40.4982	40.4374	40.3721	40.3260	40.2780
alpha	3.6784	3.6802	3.6819	3.6900	3.6915	3.6986	3.6986	3.6999	3.6958	3.6915	3.6884	3.6852
util living area	0.9747	0.9611	0.9410	0.8886	0.7932	0.6344	0.4850	0.5270	0.7317	0.9006	0.9591	0.9778 (86)
MIT	19.3627	19.5799	19.8784	20.2988	20.6588	20.8927	20.9696	20.9583	20.8113	20.3598	19.7955	19.3130 (87)
Th 2	20.2051	20.2056	20.2061	20.2083	20.2087	20.2106	20.2106	20.2110	20.2099	20.2087	20.2079	20.2070 (88)
util rest of house	0.9707	0.9550	0.9314	0.8697	0.7574	0.5738	0.4056	0.4471	0.6776	0.8800	0.9517	0.9742 (89)
MIT 2	18.6963	18.9106	19.2041	19.6114	19.9449	20.1433	20.1968	20.1909	20.0818	19.6756	19.1271	18.6486 (90)
Living area fraction	18.9251	19.1404	19.4356	19.8474	20.1901	20.4006	20.4621	20.4544	20.3323	19.9105	19.3566	0.3433 (91)
Temperature adjustment	flA = Living area / (4) =											18.8767 (92)
adjusted MIT	18.9251	19.1404	19.4356	19.8474	20.1901	20.4006	20.4621	20.4544	20.3323	19.9105	19.3566	18.8767 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9625	0.9450	0.9202	0.8600	0.7565	0.5891	0.4316	0.4725	0.6866	0.8711	0.9419	0.9666 (94)
Useful gains	546.1037	597.6584	607.9183	607.5822	549.4505	423.1965	297.1488	308.6563	429.0210	504.2341	522.5235	528.4393 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	14.1000	10.6000	7.1000	4.2000	4.2000 (96)
Heat loss rate W	1166.6668	1135.2378	1030.5594	869.5392	673.9754	459.2650	305.7848	320.8494	493.9443	739.1061	974.0919	1167.8212 (97)
Space heating kWh	461.6990	361.2533	314.4449	188.6091	92.6465	0.0000	0.0000	0.0000	0.0000	174.7448	325.1293	475.7001 (98a)

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Space heating requirement - total per year (kWh/year)														2394.2271
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	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)														0.0000
Space heating kWh	461.6990	361.2533	314.4449	188.6091	92.6465	0.0000	0.0000	0.0000	0.0000	174.7448	325.1293	475.7001		(98c)
Space heating requirement after solar contribution - total per year (kWh/year)														2394.2271
Space heating per m2														(98c) / (4) = 25.6891 (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													
Utilisation	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 (100)
Useful 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	0.0000 (101)
Total gains	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 (102)
Space cooling 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	0.0000 (103)
Cooled fraction													
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	0.2500 (104)
Space cooling 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	0.0000 (105)
Space cooling requirement													
Energy for space heating													108.3630 (107)
Energy for space cooling													25.6891 (99)
Total													1.1627 (108)
Fabric Energy Efficiency (DFEE)													26.8518 (109)
													26.9 (109)

CAUTION! Results should not be taken from this section

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

1. Overall dwelling characteristics

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

2. Ventilation rate

Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1275 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3775	(18)
Number of sides sheltered	1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3492 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4452	0.4365	0.4277	0.3841	0.3754	0.3317	0.3317	0.3230	0.3492	0.3754	0.3928	0.4103	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													0.0000 (23c)
Effective ac	0.5991	0.5952	0.5915	0.5738	0.5704	0.5550	0.5550	0.5522	0.5610	0.5704	0.5772	0.5842	(25)

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
TER Opaque door			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.20)			13.9600	1.1450	15.9847		(27)
Ground Floor			46.6000	0.1300	6.0580		(28a)
Wall - NE	30.7600	9.0600	21.7000	0.1800	3.9060		(29a)
Wall - SW	30.7600	7.0200	23.7400	0.1800	4.2732		(29a)
Wall - NW	38.6300		38.6300	0.1800	6.9534		(29a)

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Roof	46.6000	46.6000	0.1100	5.1260	(30)
Total net area of external elements Aum(A, m ²)		193.3500			(31)
Fabric heat loss, W/K = Sum (A x U)		(26) ... (30) + (32) =		44.4213	(32)
Wall - SE		38.6300	0.0000	0.0000	(33)

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

List of Thermal Bridges

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

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.8286 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 54.2499 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
46.5253	46.2264	45.9335	44.5577	44.3002	43.1019	43.1019	42.8800	43.5635	44.3002	44.8210	45.3654	(38)
Heat transfer coeff	100.7752	100.4764	100.1834	98.8076	98.5502	97.3519	97.3519	97.1300	97.8134	98.5502	99.0709	99.6153 (39)
Average = Sum(39)m / 12 =	98.8064											

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

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6670 (42)
Hot water usage for mixer showers												(42a)
Hot water usage for baths												(42b)
Hot water usage for other uses												(42c)
Average daily hot water use (litres/day)												(43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
71.7116	69.7443	67.5965	64.9234	62.5386	60.0603	59.5455	61.6889	63.8873	66.4323	69.1291	71.6110	(44)
Energy conte	113.5736	99.3149	103.8933	88.8769	84.1890	73.8512	72.0151	76.3838	78.7794	90.1480	98.4871	112.1255 (45)
Energy content (annual)												Total = Sum(45)m = 1091.6379

Distribution loss (46)m = 0.15 x (45)m
 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (46)

Water storage loss:
 Total storage loss
 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (56)

If cylinder contains dedicated solar storage
 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (57)
 Primary loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (59)
 Combi loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (61)

Total heat required for water heating calculated for each month	96.5376	84.4177	88.3093	75.5453	71.5607	62.7735	61.2129	64.9262	66.9625	76.6258	83.7140	95.3066 (62)
WWHRs	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)

Output from w/h 96.5376 84.4177 88.3093 75.5453 71.5607 62.7735 61.2129 64.9262 66.9625 76.6258 83.7140 95.3066 (64)
 Total per year (kWh/year) = Sum(64)m = 927.8923 (64)
 928 (64)

12Total per year (kWh/year)
 Electric shower(s) 55.2072 49.1901 53.7137 51.2583 52.2202 49.8130 51.4734 52.2202 51.2583 53.7137 52.7037 55.2072 (64a)
 Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 627.9788 (64a)

Heat gains from water heating, kWh/month
 37.9362 33.4019 35.5058 31.7009 30.9452 28.1466 28.1716 29.2866 29.5552 32.5849 34.1044 37.6285 (65)

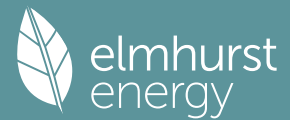
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
(66)m	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	130.5857	144.5770	130.5857	134.9385	130.5857	134.9385	130.5857	134.9385	130.5857	134.9385	130.5857	130.5857 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	244.8433	247.3840	240.9815	227.3513	210.1457	193.9748	183.1717	180.6310	187.0335	200.6636	217.8693	234.0402 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815 (71)
Water heating gains (Table 5)	50.9895	49.7053	47.7228	44.0290	41.5930	39.0925	37.8650	39.3637	41.0489	43.7969	47.3672	50.5759 (72)
Total internal gains	489.4240	504.6718	482.2955	469.3244	445.3299	431.0114	414.6279	413.5859	426.0264	438.0517	463.1806	478.2073 (73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast	6.9400	11.2829	0.6300	0.7000	0.7700	23.9306 (75)

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Southwest		7.0200	36.7938	0.6300	0.7000	0.7700	78.9376 (79)
Solar gains	102.8682	183.1714	271.7365	372.0839	449.0667	460.0277	437.6029
Total gains	592.2922	687.8432	754.0320	841.4084	894.3966	891.0391	852.2308

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	31.8025	31.8971	31.9903	32.4358	32.5205	32.9208	32.9208	32.9960	32.7655	32.5205	32.3496	32.1728	
alpha	3.1202	3.1265	3.1327	3.1624	3.1680	3.1947	3.1947	3.1997	3.1844	3.1680	3.1566	3.1449	
util living area	0.9747	0.9591	0.9339	0.8731	0.7693	0.6129	0.4732	0.5211	0.7292	0.8996	0.9598	0.9779 (86)	
MIT	18.8388	19.1256	19.5341	20.0930	20.5501	20.8479	20.9505	20.9321	20.7216	20.1264	19.4020	18.8008 (87)	
Th 2	20.0162	20.0188	20.0214	20.0335	20.0358	20.0464	20.0464	20.0483	20.0423	20.0358	20.0312	20.0264 (88)	
util rest of house	0.9704	0.9522	0.9224	0.8502	0.7268	0.5433	0.3813	0.4281	0.6672	0.8766	0.9518	0.9741 (89)	
MIT 2	18.0437	18.3280	18.7304	19.2765	19.6982	19.9552	20.0255	20.0177	19.8592	19.3201	18.6126	18.0133 (90)	
Living area fraction	18.3167	18.6019	19.0063	19.5568	19.9907	20.2617	20.3431	20.3317	20.1553	19.5969	18.8837	18.2837 (92)	
Temperature adjustment	18.3167	18.6019	19.0063	19.5568	19.9907	20.2617	20.3431	20.3317	20.1553	19.5969	18.8837	18.2837 (93)	
adjusted MIT												0.0000	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9603	0.9394	0.9075	0.8371	0.7247	0.5599	0.4109	0.4570	0.6752	0.8641	0.9396	0.9649 (94)
Ext temp.	568.7961	646.1435	684.3022	704.3555	648.1323	498.8892	350.1729	361.7536	494.3485	558.3695	552.3266	545.4895 (95)
Heat loss rate W	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)
Space heating kWh	1412.5362	1376.7131	1252.9281	1052.9758	817.0490	551.1789	364.3951	381.8812	592.2883	886.6490	1167.4182	1402.9522 (97)
Space heating requirement - total per year (kWh/year)	627.7426	490.9427	423.0577	251.0066	125.6740	0.0000	0.0000	0.0000	0.0000	244.2399	442.8659	637.9523 (98a)
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)
Space heating requirement after solar contribution - total per year (kWh/year)	627.7426	490.9427	423.0577	251.0066	125.6740	0.0000	0.0000	0.0000	0.0000	244.2399	442.8659	637.9523 (98c)
Space heating per m2												34.8013 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	915.1076	720.4039	738.1877	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.7887	0.8522	0.8217	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	721.7852	613.8989	606.6036	0.0000	0.0000	0.0000	0.0000 (102)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	984.7376	942.0954	873.8358	0.0000	0.0000	0.0000	0.0000 (103)
Cooled fraction	0.0000	0.0000	0.0000	0.0000	0.0000	189.3257	244.1782	198.8208	0.0000	0.0000	0.0000	0.0000 (104)
Intermittency factor (Table 10b)	fc = cooled area / (4) =											
Space cooling kWh	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (105)
Space cooling requirement	0.0000	0.0000	0.0000	0.0000	0.0000	47.3314	61.0445	49.7052	0.0000	0.0000	0.0000	0.0000 (107)
Energy for space heating												158.0812 (107)
Energy for space cooling												34.8013 (99)
Total												1.6961 (108)
Fabric Energy Efficiency (TFEE)												36.4975 (109)

CAUTION! Results should not be taken from this section

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

1. Overall dwelling characteristics

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

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)

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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 0.6000 (17)
 Infiltration rate 0.0300 (18)
 Number of sides sheltered 1 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.9250 (20)
 Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.0278 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.0354	0.0347	0.0340	0.0305	0.0298	0.0264	0.0264	0.0257	0.0278	0.0298	0.0312	0.0326 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												79.2000 (23c)
Effective ac	0.1394	0.1387	0.1380	0.1345	0.1338	0.1304	0.1304	0.1297	0.1317	0.1338	0.1352	0.1366 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Entrance Door			2.1200	1.0000	2.1200		(26)
Window FF 0.40 (Uw = 0.80)			4.6000	0.7752	3.5659		(27)
Window FF 0.48 (Uw = 0.80)			5.2400	0.7752	4.0620		(27)
Window FF 0.52 (Uw = 0.80)			3.0900	0.7752	2.3953		(27)
Window FF 0.53 (Uw = 0.80)			0.7300	0.7752	0.5659		(27)
Window FF 0.70 (Uw = 0.80)			0.3000	0.7752	0.2326		(27)
Ground Floor			46.6000	0.0900	4.1940	75.0000	3495.0000 (28a)
Wall - NE	30.7600	9.0600	21.7000	0.1000	2.1700	70.0000	1519.0000 (29a)
Wall - SW	30.7600	7.0200	23.7400	0.1000	2.3740	70.0000	1661.8000 (29a)
Wall - NW	38.6300		38.6300	0.1000	3.8630	70.0000	2704.1000 (29a)
Roof	46.6000		46.6000	0.0900	4.1940	9.0000	419.4000 (30)
Total net area of external elements Aum(A, m2)			193.3500				(31)
Fabric heat loss, W/K = Sum (A x U)					29.7367		(32)
Wall - SE			38.6300	0.0000	0.0000	45.0000	1738.3500 (32)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) = 11537.6500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							123.7945 (35)

List of Thermal Bridges
 K1 Element Length Psi-value Total
 E3 Sill 10.6200 0.0500 0.5310
 E4 Jamb 27.1800 0.0500 1.3590
 E2 Other lintels (including other steel lintels) 10.6200 0.0500 0.5310
 E5 Ground floor (normal) 19.8300 0.1600 3.1728
 E10 Eaves (insulation at ceiling level) 12.1800 0.1000 1.2180
 E12 Gable (insulation at ceiling level) 7.6500 0.1000 0.7650
 E16 Corner (normal) 10.1000 0.0300 0.3030
 E18 Party wall between dwellings 10.1000 0.0300 0.3030
 P1 Party wall - Ground floor 7.6500 0.1300 0.9945
 P4 Party wall - Roof (insulation at ceiling level) 7.6500 0.0900 0.6885
 Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.8658 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 39.6025 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	10.8242	10.7703	10.7164	10.4471	10.3932	10.1238	10.1238	10.0699	10.2316	10.3932	10.5009	10.6087 (38)
Heat transfer coeff	50.4267	50.3728	50.3189	50.0496	49.9957	49.7263	49.7263	49.6724	49.8341	49.9957	50.1034	50.2112 (39)
Average = Sum(39)m / 12 =												50.0361

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.5411	0.5405	0.5399	0.5370	0.5364	0.5335	0.5335	0.5330	0.5347	0.5364	0.5376	0.5387 (40)
HLP (average)												0.5369
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

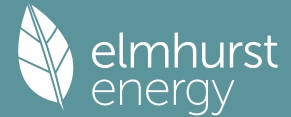
Assumed occupancy 2.6670 (42)

Hot water usage for mixer showers

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hot water usage for mixer showers	68.9372	67.9012	66.3916	63.5031	61.3715	58.9944	57.6433	59.1415	60.7838	63.3361	66.2866	68.6731 (42a)
Hot water usage for baths	29.7685	29.3264	28.7038	27.5559	26.6963	25.7432	25.2284	25.8466	26.5198	27.5396	28.7112	29.6678 (42b)
Hot water usage for other uses	41.9431	40.4179	38.8927	37.3675	35.8423	34.3171	34.3171	35.8423	37.3675	38.8927	40.4179	41.9431 (42c)
Average daily hot water use (litres/day)												129.2880 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	140.6488	137.6455	133.9881	128.4265	123.9102	119.0548	117.1888	120.8304	124.6711	129.7685	135.4157	140.2840 (44)
Energy conte	222.7533	196.0054	205.9347	175.8095	166.8069	146.3917	141.7297	149.6133	153.7319	176.0946	192.9245	219.6509 (45)
Energy content (annual)												Total = Sum(45)m = 2147.4464
Distribution loss (46)m = 0.15 x (45)m												
Distribution loss	33.4130	29.4008	30.8902	26.3714	25.0210	21.9588	21.2595	22.4420	23.0598	26.4142	28.9387	32.9476 (46)
Water storage loss:												
Store volume												200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.4000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7560 (55)

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Total storage loss	23.4360	21.1680	23.4360	22.6800	23.4360	22.6800	23.4360	23.4360	22.6800	23.4360	22.6800	23.4360	(56)
If cylinder contains dedicated solar storage	23.4360	21.1680	23.4360	22.6800	23.4360	22.6800	23.4360	23.4360	22.6800	23.4360	22.6800	23.4360	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	269.4517	238.1846	252.6331	221.0015	213.5053	191.5837	188.4281	196.3117	198.9239	222.7930	238.1165	266.3493	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	269.4517	238.1846	252.6331	221.0015	213.5053	191.5837	188.4281	196.3117	198.9239	222.7930	238.1165	266.3493	(64)
								Total per year (kWh/year) = Sum(64)m =				2697.2824	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				0.0000	(64a)
Heat gains from water heating, kWh/month	111.4242	98.9151	105.8320	94.6103	92.8220	84.8288	84.4838	87.1051	87.2695	95.9102	100.3010	110.3926	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	39.4704	35.0572	28.5104	21.5842	16.1345	13.6214	14.7184	19.1315	25.6783	32.6045	38.0543	40.5674	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	365.4377	369.2298	359.6739	339.3303	313.6503	289.5147	273.3906	269.5985	279.1545	299.4980	325.1780	349.3137	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	(71)
Water heating gains (Table 5)	149.7637	147.1952	142.2473	131.4031	124.7608	117.8178	113.5535	117.0768	121.2076	128.9115	139.3069	148.3772	(72)
Total internal gains	661.6818	658.4922	637.4416	599.3277	561.5555	527.9639	508.6725	512.8168	533.0503	568.0240	609.5492	645.2682	(73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast	4.6000	11.2829	0.5500	0.4000	0.7700	7.9129 (75)
Northeast	1.3100	11.2829	0.5500	0.4800	0.7700	2.7042 (75)
Southwest	3.9300	36.7938	0.5500	0.4800	0.7700	26.4548 (79)
Southwest	3.0900	36.7938	0.5500	0.5200	0.7700	22.5337 (79)
Northeast	0.7300	11.2829	0.5500	0.5300	0.7700	1.6639 (75)
Northeast	0.3000	11.2829	0.5500	0.7000	0.7700	0.9031 (75)

Solar gains	62.1726	110.2820	162.5247	220.8728	265.1918	271.1019	258.1136	223.8529	182.5423	125.0214	75.2659	52.6907	(83)
Total gains	723.8544	768.7743	799.9663	820.2006	826.7474	799.0658	766.7861	736.6697	715.5927	693.0454	684.8151	697.9589	(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	63.5557	63.6236	63.6918	64.0346	64.1036	64.4508	64.4508	64.5207	64.3115	64.1036	63.9657	63.8284	
alpha	5.2370	5.2416	5.2461	5.2690	5.2736	5.2967	5.2967	5.3014	5.2874	5.2736	5.2644	5.2552	
util living area	0.8959	0.8614	0.7989	0.6924	0.5502	0.3964	0.2851	0.3097	0.4753	0.7009	0.8474	0.9081	(86)
Living	20.5456	20.6506	20.7874	20.9114	20.9764	20.9966	20.9995	20.9993	20.9912	20.9197	20.7270	20.5074	
Non living	20.2980	20.4004	20.5326	20.6516	20.7115	20.7305	20.7329	20.7330	20.7255	20.6604	20.4768	20.2618	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.7675	20.6506	20.7874	20.9114	20.9764	20.9966	20.9995	20.9993	20.9912	20.9197	20.7270	20.5763	(87)
Th 2	20.7295	20.7298	20.7300	20.7315	20.7318	20.7332	20.7332	20.7335	20.7326	20.7318	20.7312	20.7306	(88)
util rest of house	0.8906	0.8547	0.7900	0.6805	0.5357	0.3802	0.2679	0.2919	0.4577	0.6871	0.8392	0.9033	(89)
MIT 2	20.5087	20.4004	20.5326	20.6516	20.7115	20.7305	20.7329	20.7330	20.7255	20.6604	20.4768	20.3274	(90)
Living area fraction									fLA = Living area / (4) =			0.3433	(91)
MIT	20.5976	20.4863	20.6201	20.7408	20.8024	20.8219	20.8244	20.8244	20.8168	20.7494	20.5627	20.4128	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.5976	20.4863	20.6201	20.7408	20.8024	20.8219	20.8244	20.8244	20.8168	20.7494	20.5627	20.4128	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	642.7000	652.2958	628.9937	558.5078	446.0891	308.1420	209.9056	219.5180	331.4894	476.8442	571.0942	626.2168	(94)
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	(95)
Heat loss rate W	821.8336	785.1256	710.5084	592.6269	455.0821	309.3902	210.0659	219.7712	334.7232	507.4285	674.5271	814.0655	(97)
Space heating kWh	133.2754	89.2616	60.6469	24.5657	6.6908	0.0000	0.0000	0.0000	0.0000	22.7547	74.4717	139.7594	(98a)
Space heating requirement - total per year (kWh/year)												551.4264	
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	133.2754	89.2616	60.6469	24.5657	6.6908	0.0000	0.0000	0.0000	0.0000	22.7547	74.4717	139.7594	(98c)

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Space heating requirement after solar contribution - total per year (kWh/year)
 Space heating per m2

(98c) / (4) = 551.4264
 5.9166 (99)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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 %)													307.8663 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement	133.2754	89.2616	60.6469	24.5657	6.6908	0.0000	0.0000	0.0000	0.0000	22.7547	74.4717	139.7594	(98)
Space heating efficiency (main heating system 1)	307.8663	307.8663	307.8663	307.8663	307.8663	0.0000	0.0000	0.0000	0.0000	307.8663	307.8663	307.8663	(210)
Space heating fuel (main heating system)	43.2900	28.9936	19.6991	7.9793	2.1733	0.0000	0.0000	0.0000	0.0000	7.3911	24.1896	45.3961	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	269.4517	238.1846	252.6331	221.0015	213.5053	191.5837	188.4281	196.3117	198.9239	222.7930	238.1165	266.3493	(64)
Efficiency of water heater	188.3337	188.3337	188.3337	188.3337	188.3337	188.3337	188.3337	188.3337	188.3337	188.3337	188.3337	188.3337	(216)
Fuel for water heating, kWh/month	143.0714	126.4694	134.1412	117.3457	113.3654	101.7257	100.0501	104.2361	105.6231	118.2969	126.4333	141.4241	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	16.0935	14.5360	16.0935	15.5743	16.0935	15.5743	16.0935	16.0935	15.5743	16.0935	15.5743	16.0935	(231)
Lighting	34.5482	27.7158	24.9550	18.2831	14.1224	11.5381	12.8829	16.7457	21.7510	28.5385	32.2342	35.5084	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-44.7138	-65.9373	-98.9822	-114.4615	-125.5410	-117.7494	-116.1827	-108.8921	-94.8954	-76.6252	-49.9014	-38.2430	(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	-20.0860	-45.1491	-96.7791	-155.3461	-212.7116	-216.4430	-212.9301	-175.6668	-122.9897	-67.2942	-27.5735	-15.5529	(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													179.1123 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													188.3337
Water heating fuel used													1432.1823 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, DataSheet: in-use factor = 1.1000, SFP = 0.6600) mechanical ventilation fans (SFP = 0.6600)													189.4877 (230a)
Total electricity for the above, kWh/year													189.4877 (231)
Electricity for lighting (calculated in Appendix L)													278.8235 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-2420.6472 (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													-341.0413 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1 (high-rate cost)	143.2898	17.5600	28.0848 (240)
Space heating - main system 1 (low-rate cost)	35.8225	0.0940	3.3673 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (electric off-peak tariff)			
High-rate fraction			0.7000 (243)
Low-rate fraction			0.3000 (244)
High-rate cost	1002.5276	19.6000	196.4954 (245)
Low-rate cost	429.6547	9.4000	40.3875 (246)
Energy for instantaneous electric shower(s)	0.0000	18.5800	0.0000 (247a)
Pumps, fans and electric keep-hot (0.90*19.60 + 0.10*9.40)	189.4877	18.5800	31.5345 (249)
Energy for lighting (0.90*19.60 + 0.10*9.40)	278.8235	18.5800	51.8054 (250)
Additional standing charges			7.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1052.1249	18.5800	-195.4848
PV Unit electricity exported	-1368.5222	5.5900	-76.5004
Total			-271.9852 (252)
Total energy cost			86.6898 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12): 0.3600 (256)

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Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] = 0.2258 (257)
 SAP value 96.3395
 SAP rating (Section 12) 96 (258)
 SAP band A

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1 (high-rate cost)	143.2898	0.1652	23.6668 (261)
Space heating - main system 1 (low-rate cost)	35.8225	0.1387	4.9673 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating - high rate cost	1002.5276	0.1479	148.3109 (264)
Water heating - low rate cost	429.6547	0.1242	53.3460 (264)
Space and water heating			230.2910 (265)
Pumps, fans and electric keep-hot	189.4877	0.1432	26.2928 (267)
Energy for lighting	278.8235	0.1490	41.5502 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1052.1249	0.1383	-145.4647
PV Unit electricity exported	-1368.5222	0.1243	-170.0681
Total			-315.5328 (269)
Total CO2, kg/year			-17.3988 (272)
CO2 emissions per m2			-0.1900 (273)
EI value			100.1687
EI rating			100 (274)
EI band			A

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

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

1. Overall dwelling characteristics

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

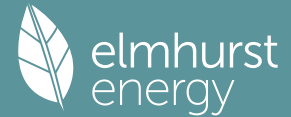
2. Ventilation rate

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	0.6000		(17)
Infiltration rate	0.0300		(18)
Number of sides sheltered	1		(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.0278 (21)
Wind speed	Jan 4.9000 Feb 4.8000 Mar 4.7000 Apr 4.2000 May 4.2000 Jun 3.7000 Jul 3.8000 Aug 3.8000 Sep 4.0000 Oct 4.2000 Nov 4.3000 Dec 4.5000		(22)
Wind factor	1.2250 1.2000 1.1750 1.0500 1.0500 0.9250 0.9500 0.9500 1.0000 1.0500 1.0750 1.1250		(22a)
Adj infilt rate	0.0340 0.0333 0.0326 0.0291 0.0291 0.0257 0.0264 0.0264 0.0278 0.0291 0.0298 0.0312		(22b)
Balanced mechanical ventilation with heat recovery			
If mechanical ventilation			0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)			0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =			79.2000 (23c)
Effective ac	0.1380 0.1373 0.1366 0.1331 0.1331 0.1297 0.1304 0.1304 0.1317 0.1331 0.1338 0.1352		(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
Entrance Door			2.1200	1.0000	2.1200		(26)
Window FF 0.40 (Uw = 0.80)			4.6000	0.7752	3.5659		(27)
Window FF 0.48 (Uw = 0.80)			5.2400	0.7752	4.0620		(27)
Window FF 0.52 (Uw = 0.80)			3.0900	0.7752	2.3953		(27)
Window FF 0.53 (Uw = 0.80)			0.7300	0.7752	0.5659		(27)
Window FF 0.70 (Uw = 0.80)			0.3000	0.7752	0.2326		(27)
Ground Floor			46.6000	0.0900	4.1940	75.0000	3495.0000 (28a)

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Wall - NE	30.7600	9.0600	21.7000	0.1000	2.1700	70.0000	1519.0000 (29a)
Wall - SW	30.7600	7.0200	23.7400	0.1000	2.3740	70.0000	1661.8000 (29a)
Wall - NW	38.6300		38.6300	0.1000	3.8630	70.0000	2704.1000 (29a)
Roof	46.6000		46.6000	0.0900	4.1940	9.0000	419.4000 (30)
Total net area of external elements Aum(A, m ²)			193.3500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		29.7367		(33)
Wall - SE			38.6300	0.0000	0.0000	45.0000	1738.3500 (32)

Heat capacity Cm = Sum(A x k) (28) ... (30) + (32) + (32a) ... (32e) = 11537.6500 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K (35) = 123.7945

List of Thermal Bridges

Element	Length	Psi-value	Total
K1 Element	10.6200	0.0500	0.5310
E3 Sill	27.1800	0.0500	1.3590
E4 Jamb	10.6200	0.0500	0.5310
E2 Other lintels (including other steel lintels)	19.8300	0.1600	3.1728
E5 Ground floor (normal)	12.1800	0.1000	1.2180
E10 Eaves (insulation at ceiling level)	7.6500	0.1000	0.7650
E12 Gable (insulation at ceiling level)	10.1000	0.0300	0.3030
E16 Corner (normal)	10.1000	0.0300	0.3030
E18 Party wall between dwellings	7.6500	0.1300	0.9945
P1 Party wall - Ground floor	7.6500	0.0900	0.6885
P4 Party wall - Roof (insulation at ceiling level)			

Thermal bridges (Sum(L x Psi) calculated using Appendix K) (36) = 9.8658
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 39.6025 (37)

VENTILATION HEAT LOSS CALCULATED MONTHLY (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	10.7164	10.6626	10.6087	10.3393	10.3393	10.0699	10.1238	10.1238	10.2316	10.3393	10.3932	10.5009 (38)
Heat transfer coeff	50.3189	50.2651	50.2112	49.9418	49.9418	49.6724	49.7263	49.7263	49.8341	49.9418	49.9957	50.1034 (39)
Average = Sum(39)m / 12 =												49.9732

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.5399	0.5393	0.5387	0.5359	0.5359	0.5330	0.5335	0.5335	0.5347	0.5359	0.5364	0.5376 (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												2.6670 (42)
Hot water usage for mixer showers	68.9372	67.9012	66.3916	63.5031	61.3715	58.9944	57.6433	59.1415	60.7838	63.3361	66.2866	68.6731 (42a)
Hot water usage for baths	29.7685	29.3264	28.7038	27.5559	26.6963	25.7432	25.2284	25.8466	26.5198	27.5396	28.7112	29.6678 (42b)
Hot water usage for other uses	41.9431	40.4179	38.8927	37.3675	35.8423	34.3171	34.3171	35.8423	37.3675	38.8927	40.4179	41.9431 (42c)
Average daily hot water use (litres/day)												129.2880 (43)
Daily hot water use	140.6488	137.6455	133.9881	128.4265	123.9102	119.0548	117.1888	120.8304	124.6711	129.7685	135.4157	140.2840 (44)
Energy content (annual)	222.7533	196.0054	205.9347	175.8095	166.8069	146.3917	141.7297	149.6133	153.7319	176.0946	192.9245	219.6509 (45)
Distribution loss (46)m = 0.15 x (45)m	33.4130	29.4008	30.8902	26.3714	25.0210	21.9588	21.2595	22.4420	23.0598	26.4142	28.9387	32.9476 (46)
Water storage loss:												200.0000 (47)
Store volume												1.4000 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.7560 (55)
Enter (49) or (54) in (55)												
Total storage loss	23.4360	21.1680	23.4360	22.6800	23.4360	22.6800	23.4360	23.4360	22.6800	23.4360	22.6800	23.4360 (56)
If cylinder contains dedicated solar storage	23.4360	21.1680	23.4360	22.6800	23.4360	22.6800	23.4360	23.4360	22.6800	23.4360	22.6800	23.4360 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	269.4517	238.1846	252.6331	221.0015	213.5053	191.5837	188.4281	196.3117	198.9239	222.7930	238.1165	266.3493 (62)
WWHRs	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRs	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	269.4517	238.1846	252.6331	221.0015	213.5053	191.5837	188.4281	196.3117	198.9239	222.7930	238.1165	266.3493 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower (s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month	111.4242	98.9151	105.8320	94.6103	92.8220	84.8288	84.4838	87.1051	87.2695	95.9102	100.3010	110.3926 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	39.4704	35.0572	28.5104	21.5842	16.1345	13.6214	14.7184	19.1315	25.6783	32.6045	38.0543	40.5674 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	365.4377	369.2298	359.6739	339.3303	313.6503	289.5147	273.3906	269.5985	279.1545	299.4980	325.1780	349.3137 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815 (71)
Water heating gains (Table 5)	149.7637	147.1952	142.2473	131.4031	124.7608	117.8178	113.5535	117.0768	121.2076	128.9115	139.3069	148.3772 (72)
Total internal gains	661.6818	658.4922	637.4416	599.3277	561.5555	527.9639	508.6725	512.8168	533.0503	568.0240	609.5492	645.2682 (73)

6. Solar gains

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Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	-24.1155	-48.9086	-102.1220	-174.2538	-226.7407	-242.8398	-235.9638	-197.1560	-139.6191	-77.2973	-34.2001	-18.4387	(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												153.7361	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												188.3334	
Water heating fuel used												1432.1847	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, DataSheet: in-use factor = 1.1000, SFP = 0.6600)													
mechanical ventilation fans (SFP = 0.6600)												189.4877	(230a)
Total electricity for the above, kWh/year												189.4877	(231)
Electricity for lighting (calculated in Appendix L)												278.8235	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2625.9647	(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												-571.7327	(238)

10a. Fuel costs - using BEDF prices (554)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1 (high-rate cost)	122.9889	27.8600	38.3725	(240)
Space heating - main system 1 (low-rate cost)	30.7472	0.1450	4.4583	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (electric off-peak tariff)				
High-rate fraction			0.7000	(243)
Low-rate fraction			0.3000	(244)
High-rate cost	1002.5293	31.2000	312.7891	(245)
Low-rate cost	429.6554	14.5000	62.3000	(246)
Energy for instantaneous electric shower(s)	0.0000	29.5300	0.0000	(247a)
Pumps, fans and electric keep-hot (0.90*31.20 + 0.10*14.50)	189.4877	29.5300	49.9433	(249)
Energy for lighting (0.90*31.20 + 0.10*14.50)	278.8235	29.5300	82.3366	(250)
Additional standing charges			3.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1104.3093	29.5300	-326.1025	
PV Unit electricity exported	-1521.6554	5.8100	-88.4082	
Total			-414.5107	(252)
Total energy cost			138.6892	(255)

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

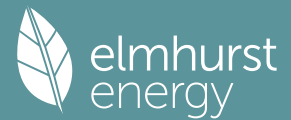
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1 (high-rate cost)	122.9889	0.1658	20.3951	(261)
Space heating - main system 1 (low-rate cost)	30.7472	0.1392	4.2805	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating - high rate cost	1002.5293	0.1479	148.3111	(264)
Water heating - low rate cost	429.6554	0.1242	53.3461	(264)
Space and water heating			226.3328	(265)
Pumps, fans and electric keep-hot	189.4877	0.1432	26.2928	(267)
Energy for lighting	278.8235	0.1490	41.5502	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1104.3093	0.1384	-152.8623	
PV Unit electricity exported	-1521.6554	0.1242	-189.0236	
Total			-341.8858	(269)
Total CO2, kg/year			-47.7100	(272)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1 (high-rate cost)	122.9889	1.2943	198.9741	(275)
Space heating - main system 1 (low-rate cost)	30.7472	1.5046	46.2628	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating - high rate cost	1002.5293	1.5530	1556.9158	(278)
Water heating - low rate cost	429.6554	1.4443	620.5642	(278)
Space and water heating			2422.7168	(279)
Pumps, fans and electric keep-hot	189.4877	1.5335	286.6864	(281)
Energy for lighting	278.8235	1.5547	433.4993	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1104.3093	1.5160	-1674.1744	
PV Unit electricity exported	-1521.6554	0.4559	-693.7066	
Total			-2367.8810	(283)
Total Primary energy kWh/year			775.0216	(286)

SAP 10 EPC IMPROVEMENTS

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Current energy efficiency rating: A 96
 Current environmental impact rating: A 100

N Solar water heating Cancelled by user
 U Solar photovoltaic panels Already installed
 V2 Wind turbine Not applicable

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

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

Potential energy efficiency rating: A 96
 Potential environmental impact rating: A 100

Fuel prices for cost data on this page from database revision number 554 TEST (31 Oct 2024)
 Recommendation texts revision number 6.1 (11 Jun 2019)

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

	Current	Potential	Saving
	£553	£553	£0
Electricity			
Space heating	£96	£96	£0
Water heating	£375	£375	£0
Lighting	£82	£82	£0
Generated (PV)	-£415	-£415	£0
Total cost of fuels	£138	£138	£0
Total cost of uses	£138	£138	£0
Delivered energy	-6 kWh/m ²	-6 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	-0.0 tonnes	-0.0 tonnes	0.0 tonnes
CO2 emissions per m ²	-1 kg/m ²	-1 kg/m ²	0 kg/m ²
Primary energy	8 kWh/m ²	8 kWh/m ²	0 kWh/m ²

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

CAUTION! Results should not be taken from this section

1. Overall dwelling characteristics

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

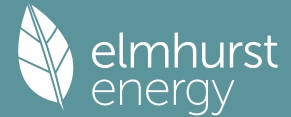
2. Ventilation rate

	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		0.6000 (17)
Infiltration rate		0.0300 (18)
Number of sides sheltered		1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.0278 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.0354	0.0347	0.0340	0.0305	0.0298	0.0264	0.0264	0.0257	0.0278	0.0298	0.0312	0.0326 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												79.2000 (23c)
Effective ac	0.1394	0.1387	0.1380	0.1345	0.1338	0.1304	0.1304	0.1297	0.1317	0.1338	0.1352	0.1366 (25)

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Losses e.g. evaporation (negative values) (Table 5)	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	(71)
Water heating gains (Table 5)	149.7637	147.1952	142.2473	131.4031	124.7608	117.8178	113.5535	117.0768	121.2076	128.9115	139.3069	148.3772	(72)
Total internal gains	661.6818	658.4922	637.4416	599.3277	561.5555	527.9639	508.6725	512.8168	533.0503	568.0240	609.5492	645.2682	(73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W							
Northeast	4.6000	11.2829	0.5500	0.4000	0.7700	7.9129 (75)							
Northeast	1.3100	11.2829	0.5500	0.4800	0.7700	2.7042 (75)							
Southwest	3.9300	36.7938	0.5500	0.4800	0.7700	26.4548 (79)							
Southwest	3.0900	36.7938	0.5500	0.5200	0.7700	22.5337 (79)							
Northeast	0.7300	11.2829	0.5500	0.5300	0.7700	1.6639 (75)							
Northeast	0.3000	11.2829	0.5500	0.7000	0.7700	0.9031 (75)							
Solar gains	62.1726	110.2820	162.5247	220.8728	265.1918	271.1019	258.1136	223.8529	182.5423	125.0214	75.2659	52.6907	(83)
Total gains	723.8544	768.7743	799.9663	820.2006	826.7474	799.0658	766.7861	736.6697	715.5927	693.0454	684.8151	697.9589	(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	63.5557	63.6236	63.6918	64.0346	64.1036	64.4508	64.4508	64.5207	64.3115	64.1036	63.9657	63.8284	
alpha	5.2370	5.2416	5.2461	5.2690	5.2736	5.2967	5.2967	5.3014	5.2874	5.2736	5.2644	5.2552	
util living area	0.8959	0.8614	0.7989	0.6924	0.5502	0.3964	0.2851	0.3097	0.4753	0.7009	0.8474	0.9081	(86)
Living	20.5456	20.6506	20.7874	20.9114	20.9764	20.9966	20.9995	20.9993	20.9912	20.9197	20.7270	20.5074	
Non living	20.2980	20.4004	20.5326	20.6516	20.7115	20.7305	20.7329	20.7330	20.7255	20.6604	20.4768	20.2618	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.7675	20.6506	20.7874	20.9114	20.9764	20.9966	20.9995	20.9993	20.9912	20.9197	20.7270	20.5763	(87)
Th 2	20.7295	20.7298	20.7300	20.7315	20.7318	20.7332	20.7332	20.7335	20.7326	20.7318	20.7312	20.7306	(88)
util rest of house	0.8906	0.8547	0.7900	0.6805	0.5357	0.3802	0.2679	0.2919	0.4577	0.6871	0.8392	0.9033	(89)
MIT 2	20.5087	20.4004	20.5326	20.6516	20.7115	20.7305	20.7329	20.7330	20.7255	20.6604	20.4768	20.3274	(90)
Living area fraction													fLA = Living area / (4) = 0.3433 (91)
MIT	20.5976	20.4863	20.6201	20.7408	20.8024	20.8219	20.8244	20.8244	20.8168	20.7494	20.5627	20.4128	(92)
Temperature adjustment													0.0000
adjusted MIT	20.5976	20.4863	20.6201	20.7408	20.8024	20.8219	20.8244	20.8244	20.8168	20.7494	20.5627	20.4128	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8879	0.8485	0.7863	0.6809	0.5396	0.3856	0.2737	0.2980	0.4632	0.6880	0.8339	0.8972	(94)
Useful gains	642.7000	652.2958	628.9937	558.5078	446.0891	308.1420	209.9056	219.5180	331.4894	476.8442	571.0942	626.2168	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	14.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	821.8336	785.1256	710.5084	592.6269	455.0821	309.3902	210.0659	219.7712	334.7232	507.4285	674.5271	814.0655	(97)
Space heating kWh	133.2754	89.2616	60.6469	24.5657	6.6908	0.0000	0.0000	0.0000	0.0000	22.7547	74.4717	139.7594	(98a)
Space heating requirement - total per year (kWh/year)													551.4264
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	133.2754	89.2616	60.6469	24.5657	6.6908	0.0000	0.0000	0.0000	0.0000	22.7547	74.4717	139.7594	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)													551.4264
Space heating per m ²													(98c) / (4) = 5.9166 (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 %)													307.8663 (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	133.2754	89.2616	60.6469	24.5657	6.6908	0.0000	0.0000	0.0000	0.0000	22.7547	74.4717	139.7594	(98)
Space heating efficiency (main heating system 1)	307.8663	307.8663	307.8663	307.8663	307.8663	0.0000	0.0000	0.0000	0.0000	307.8663	307.8663	307.8663	(210)
Space heating fuel (main heating system)	43.2900	28.9936	19.6991	7.9793	2.1733	0.0000	0.0000	0.0000	0.0000	7.3911	24.1896	45.3961	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	269.4517	238.1846	252.6331	221.0015	213.5053	191.5837	188.4281	196.3117	198.9239	222.7930	238.1165	266.3493	(64)
Efficiency of water heater (217)m	188.3337	188.3337	188.3337	188.3337	188.3337	188.3337	188.3337	188.3337	188.3337	188.3337	188.3337	188.3337	(216)
Fuel for water heating, kWh/month	143.0714	126.4694	134.1412	117.3457	113.3654	101.7257	100.0501	104.2361	105.6231	118.2969	126.4333	141.4241	(219)
Space cooling fuel requirement													

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(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	0.0000	(221)
Pumps and Fa	16.0935	14.5360	16.0935	15.5743	16.0935	15.5743	16.0935	16.0935	15.5743	16.0935	15.5743	16.0935	16.0935	(231)
Lighting	34.5482	27.7158	24.9550	18.2831	14.1224	11.5381	12.8829	16.7457	21.7510	28.5385	32.2342	35.5084	(232)	
Electricity generated by PVs (Appendix M) (negative quantity)														
(233a)m	-44.7138	-65.9373	-98.9822	-114.4615	-125.5410	-117.7494	-116.1827	-108.8921	-94.8954	-76.6252	-49.9014	-38.2430	(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	-20.0860	-45.1491	-96.7791	-155.3461	-212.7116	-216.4430	-212.9301	-175.6668	-122.9897	-67.2942	-27.5735	-15.5529	(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													179.1123	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													188.3337	
Water heating fuel used													1432.1823	(219)
Space cooling fuel													0.0000	(221)
Electricity for pumps and fans:														
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.1000, SFP = 0.6600)														
mechanical ventilation fans (SFP = 0.6600)													189.4877	(230a)
Total electricity for the above, kWh/year													189.4877	(231)
Electricity for lighting (calculated in Appendix L)													278.8235	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-2420.6472	(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													-341.0413	(238)

 10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1 (high-rate cost)	143.2898	17.5600	28.0848	(240)
Space heating - main system 1 (low-rate cost)	35.8225	0.0940	3.3673	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (electric off-peak tariff)				
High-rate fraction			0.7000	(243)
Low-rate fraction			0.3000	(244)
High-rate cost	1002.5276	19.6000	196.4954	(245)
Low-rate cost	429.6547	9.4000	40.3875	(246)
Energy for instantaneous electric shower(s)	0.0000	18.5800	0.0000	(247a)
Pumps, fans and electric keep-hot (0.90*19.60 + 0.10*9.40)	189.4877	18.5800	31.5345	(249)
Energy for lighting (0.90*19.60 + 0.10*9.40)	278.8235	18.5800	51.8054	(250)
Additional standing charges			7.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1052.1249	18.5800	-195.4848	
PV Unit electricity exported	-1368.5222	5.5900	-76.5004	
Total			-271.9852	(252)
Total energy cost			86.6898	(255)

 11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)		0.2258	(257)
SAP value	[(255) x (256)] / [(4) + 45.0] =	96.3395	
SAP rating (Section 12)		96	(258)
SAP band		A	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1 (high-rate cost)	143.2898	0.1652	23.6668	(261)
Space heating - main system 1 (low-rate cost)	35.8225	0.1387	4.9673	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating - high rate cost	1002.5276	0.1479	148.3109	(264)
Water heating - low rate cost	429.6547	0.1242	53.3460	(264)
Space and water heating			230.2910	(265)
Pumps, fans and electric keep-hot	189.4877	0.1432	26.2928	(267)
Energy for lighting	278.8235	0.1490	41.5502	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1052.1249	0.1383	-145.4647	
PV Unit electricity exported	-1368.5222	0.1243	-170.0681	
Total			-315.5328	(269)
Total CO2, kg/year			-17.3988	(272)
CO2 emissions per m2			-0.1900	(273)
EI value			100.1687	
EI rating			100	(274)
EI band			A	

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

CAUTION! Results should not be taken from this section

1. Overall dwelling characteristics

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

2. Ventilation rate

												m3 per hour	
Number of open chimneys											0 * 80 =	0.0000 (6a)	
Number of open flues											0 * 20 =	0.0000 (6b)	
Number of chimneys / flues attached to closed fire											0 * 10 =	0.0000 (6c)	
Number of flues attached to solid fuel boiler											0 * 20 =	0.0000 (6d)	
Number of flues attached to other heater											0 * 35 =	0.0000 (6e)	
Number of blocked chimneys											0 * 20 =	0.0000 (6f)	
Number of intermittent extract fans											0 * 10 =	0.0000 (7a)	
Number of passive vents											0 * 10 =	0.0000 (7b)	
Number of flueless gas fires											0 * 40 =	0.0000 (7c)	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											0.0000 / (5) =	0.0000 (8)	
Pressure test											Yes		
Pressure Test Method											Blower Door		
Measured/design AP50											0.6000 (17)		
Infiltration rate											0.0300 (18)		
Number of sides sheltered											1 (19)		
Shelter factor											(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =		0.0278 (21)
Wind speed	Jan 4.9000	Feb 4.8000	Mar 4.7000	Apr 4.2000	May 4.2000	Jun 3.7000	Jul 3.8000	Aug 3.8000	Sep 4.0000	Oct 4.2000	Nov 4.3000	Dec 4.5000 (22)	
Wind factor	1.2250	1.2000	1.1750	1.0500	1.0500	0.9250	0.9500	0.9500	1.0000	1.0500	1.0750	1.1250 (22a)	
Adj infilt rate	0.0340	0.0333	0.0326	0.0291	0.0291	0.0257	0.0264	0.0264	0.0278	0.0291	0.0298	0.0312 (22b)	
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation											0.5000 (23a)		
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)											0.5000 (23b)		
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =											79.2000 (23c)		
Effective ac	0.1380	0.1373	0.1366	0.1331	0.1331	0.1297	0.1304	0.1304	0.1317	0.1331	0.1338	0.1352 (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					
Entrance Door			2.1200	1.0000	2.1200		(26)					
Window FF 0.40 (Uw = 0.80)			4.6000	0.7752	3.5659		(27)					
Window FF 0.48 (Uw = 0.80)			5.2400	0.7752	4.0620		(27)					
Window FF 0.52 (Uw = 0.80)			3.0900	0.7752	2.3953		(27)					
Window FF 0.53 (Uw = 0.80)			0.7300	0.7752	0.5659		(27)					
Window FF 0.70 (Uw = 0.80)			0.3000	0.7752	0.2326		(27)					
Ground floor			46.6000	0.0900	4.1940	75.0000	3495.0000 (28a)					
Wall - NE	30.7600	9.0600	21.7000	0.1000	2.1700	70.0000	1519.0000 (29a)					
Wall - SW	30.7600	7.0200	23.7400	0.1000	2.3740	70.0000	1661.8000 (29a)					
Wall - NW	38.6300		38.6300	0.1000	3.8630	70.0000	2704.1000 (29a)					
Roof	46.6000		46.6000	0.0900	4.1940	9.0000	419.4000 (30)					
Total net area of external elements Aum(A, m ²)			193.3500				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.7367		(33)					
Wall - SE			38.6300	0.0000	0.0000	45.0000	1738.3500 (32)					
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =	11537.6500 (34)						
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K					123.7945 (35)							
List of Thermal Bridges												
K1 Element				Length	Psi-value	Total						
E3 Sill				10.6200	0.0500	0.5310						
E4 Jamb				27.1800	0.0500	1.3590						
E2 Other lintels (including other steel lintels)				10.6200	0.0500	0.5310						
E5 Ground floor (normal)				19.8300	0.1600	3.1728						
E10 Eaves (insulation at ceiling level)				12.1800	0.1000	1.2180						
E12 Gable (insulation at ceiling level)				7.6500	0.1000	0.7650						
E16 Corner (normal)				10.1000	0.0300	0.3030						
E18 Party wall between dwellings				10.1000	0.0300	0.3030						
P1 Party wall - Ground floor				7.6500	0.1300	0.9945						
P4 Party wall - Roof (insulation at ceiling level)				7.6500	0.0900	0.6885						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)						9.8658 (36)						
Point Thermal bridges						(36a) = 0.0000						
Total fabric heat loss						(33) + (36) + (36a) = 39.6025 (37)						
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 10.7164	Feb 10.6626	Mar 10.6087	Apr 10.3393	May 10.3393	Jun 10.0699	Jul 10.1238	Aug 10.1238	Sep 10.2316	Oct 10.3393	Nov 10.3932	Dec 10.5009 (38)
Heat transfer coeff	50.3189	50.2651	50.2112	49.9418	49.9418	49.6724	49.7263	49.7263	49.8341	49.9418	49.9957	50.1034 (39)
Average = Sum(39)m / 12 =	49.9732											
HLP	Jan 0.5399	Feb 0.5393	Mar 0.5387	Apr 0.5359	May 0.5359	Jun 0.5330	Jul 0.5335	Aug 0.5335	Sep 0.5347	Oct 0.5359	Nov 0.5364	Dec 0.5376 (40)
HLP (average) 0.5362												

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Days in mont	31	28	31	30	31	30	31	31	30	31	30	31
4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.6670 (42)
Hot water usage for mixer showers	68.9372	67.9012	66.3916	63.5031	61.3715	58.9944	57.6433	59.1415	60.7838	63.3361	66.2866	68.6731 (42a)
Hot water usage for baths	29.7685	29.3264	28.7038	27.5559	26.6963	25.7432	25.2284	25.8466	26.5198	27.5396	28.7112	29.6678 (42b)
Hot water usage for other uses	41.9431	40.4179	38.8927	37.3675	35.8423	34.3171	34.3171	35.8423	37.3675	38.8927	40.4179	41.9431 (42c)
Average daily hot water use (litres/day)												129.2880 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	140.6488	137.6455	133.9881	128.4265	123.9102	119.0548	117.1888	120.8304	124.6711	129.7685	135.4157	140.2840 (44)
Energy content (annual)	222.7533	196.0054	205.9347	175.8095	166.8069	146.3917	141.7297	149.6133	153.7319	176.0946	192.9245	219.6509 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 2147.4464
Water storage loss:	33.4130	29.4008	30.8902	26.3714	25.0210	21.9588	21.2595	22.4420	23.0598	26.4142	28.9387	32.9476 (46)
Store volume												200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.4000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7560 (55)
Total storage loss	23.4360	21.1680	23.4360	22.6800	23.4360	22.6800	23.4360	23.4360	22.6800	23.4360	22.6800	23.4360 (56)
If cylinder contains dedicated solar storage	23.4360	21.1680	23.4360	22.6800	23.4360	22.6800	23.4360	23.4360	22.6800	23.4360	22.6800	23.4360 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	269.4517	238.1846	252.6331	221.0015	213.5053	191.5837	188.4281	196.3117	198.9239	222.7930	238.1165	266.3493 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	269.4517	238.1846	252.6331	221.0015	213.5053	191.5837	188.4281	196.3117	198.9239	222.7930	238.1165	266.3493 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower (s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month	111.4242	98.9151	105.8320	94.6103	92.8220	84.8288	84.4838	87.1051	87.2695	95.9102	100.3010	110.3926 (65)
5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	39.4704	35.0572	28.5104	21.5842	16.1345	13.6214	14.7184	19.1315	25.6783	32.6045	38.0543	40.5674 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	365.4377	369.2298	359.6739	339.3303	313.6503	289.5147	273.3906	269.5985	279.1545	299.4980	325.1780	349.3137 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815 (71)
Water heating gains (Table 5)	149.7637	147.1952	142.2473	131.4031	124.7608	117.8178	113.5535	117.0768	121.2076	128.9115	139.3069	148.3772 (72)
Total internal gains	661.6818	658.4922	637.4416	599.3277	561.5555	527.9639	508.6725	512.8168	533.0503	568.0240	609.5492	645.2682 (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	4.6000	12.9465	0.5500	0.4000	0.7700	9.0796 (75)						
Northeast	1.3100	12.9465	0.5500	0.4800	0.7700	3.1029 (75)						
Southwest	3.9300	40.9830	0.5500	0.4800	0.7700	29.4668 (79)						
Southwest	3.0900	40.9830	0.5500	0.5200	0.7700	25.0993 (79)						
Northeast	0.7300	12.9465	0.5500	0.5300	0.7700	1.9092 (75)						
Northeast	0.3000	12.9465	0.5500	0.7000	0.7700	1.0363 (75)						
Solar gains	69.6941	115.3763	167.5564	239.9682	278.4689	296.8010	279.7514	244.2496	199.7256	136.8037	86.4681	58.4756 (83)
Total gains	731.3759	773.8685	804.9980	839.2959	840.0244	824.7649	788.4239	757.0664	732.7760	704.8277	696.0173	703.7438 (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	63.6918	63.7600	63.8284	64.1727	64.1727	64.5207	64.4508	64.4508	64.3115	64.1727	64.1036	63.9657
alpha	5.2461	5.2507	5.2552	5.2782	5.2782	5.3014	5.2967	5.2967	5.2874	5.2782	5.2736	5.2644
util living area	0.8839	0.8507	0.7783	0.6522	0.4984	0.3366	0.2144	0.2233	0.4059	0.6490	0.8208	0.8958 (86)
Living	20.5920	20.6809	20.8204	20.9366	20.9864	20.9986	20.9999	20.9999	20.9963	20.9482	20.7798	20.5622
Non living	20.3439	20.4303	20.5647	20.6754	20.7206	20.7325	20.7332	20.7332	20.7298	20.6869	20.5280	20.3161
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.7913	20.6809	20.8204	20.9366	20.9864	20.9986	20.9999	20.9999	20.9963	20.9482	20.7798	20.6235 (87)

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Th 2	20.7300	20.7303	20.7306	20.7321	20.7321	20.7335	20.7332	20.7332	20.7326	20.7321	20.7318	20.7312 (88)
util rest of house	0.8780	0.8437	0.7687	0.6396	0.4836	0.3207	0.1976	0.2058	0.3882	0.6340	0.8116	0.8904 (89)
MIT 2	20.5325	20.4303	20.5647	20.6754	20.7206	20.7325	20.7332	20.7332	20.7298	20.6869	20.5280	20.3741 (90)
Living area fraction									FLA = Living area / (4) =			0.3433 (91)
MIT	20.6214	20.5163	20.6525	20.7651	20.8118	20.8239	20.8248	20.8247	20.8213	20.7766	20.6145	20.4597 (92)
Temperature adjustment												0.0000
adjusted MIT	20.6214	20.5163	20.6525	20.7651	20.8118	20.8239	20.8248	20.8247	20.8213	20.7766	20.6145	20.4597 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8756	0.8378	0.7659	0.6412	0.4880	0.3261	0.2034	0.2118	0.3941	0.6365	0.8074	0.8846	(94)
Useful gains	640.3765	648.3753	616.5243	538.1555	409.9605	268.9347	160.3275	160.3205	288.7911	448.6164	561.9923	622.5004	(95)
Ext temp.	4.7000	5.2000	7.0000	9.5000	12.5000	15.4000	17.6000	17.6000	15.0000	11.4000	7.7000	4.7000	(96)
Heat loss rate W	801.1458	769.8756	685.5080	562.5978	415.1079	269.4168	160.3553	160.3545	290.1008	468.2845	645.6684	789.6176	(97)
Space heating kWh	119.6124	81.6482	51.3239	17.5984	3.8297	0.0000	0.0000	0.0000	0.0000	14.6330	60.2468	124.3352	(98a)
Space heating requirement - total per year (kWh/year)												473.2276	
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	119.6124	81.6482	51.3239	17.5984	3.8297	0.0000	0.0000	0.0000	0.0000	14.6330	60.2468	124.3352	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												473.2276	
Space heating per m2												5.0775	(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 %)													307.8181	(206)
Efficiency of main space heating system 2 (in %)													0.0000	(207)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement	119.6124	81.6482	51.3239	17.5984	3.8297	0.0000	0.0000	0.0000	0.0000	14.6330	60.2468	124.3352	(98)	
Space heating efficiency (main heating system 1)	307.8181	307.8181	307.8181	307.8181	307.8181	0.0000	0.0000	0.0000	0.0000	307.8181	307.8181	307.8181	(210)	
Space heating fuel (main heating system)	38.8581	26.5248	16.6734	5.7172	1.2441	0.0000	0.0000	0.0000	0.0000	4.7538	19.5722	40.3924	(211)	
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)	
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)	
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)	
Water heating														
Water heating requirement	269.4517	238.1846	252.6331	221.0015	213.5053	191.5837	188.4281	196.3117	198.9239	222.7930	238.1165	266.3493	(64)	
Efficiency of water heater	188.3334	188.3334	188.3334	188.3334	188.3334	188.3334	188.3334	188.3334	188.3334	188.3334	188.3334	188.3334	(216)	
Fuel for water heating, kWh/month	143.0716	126.4696	134.1414	117.3459	113.3656	101.7258	100.0503	104.2363	105.6233	118.2971	126.4335	141.4243	(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	16.0935	14.5360	16.0935	15.5743	16.0935	15.5743	16.0935	16.0935	15.5743	16.0935	15.5743	16.0935	(231)	
Lighting	34.5482	27.7158	24.9550	18.2831	14.1224	11.5381	12.8829	16.7457	12.7510	28.5385	32.2342	35.5084	(232)	
Electricity generated by PVs (Appendix M) (negative quantity)	-49.4314	-68.6140	-101.2629	-119.7626	-128.4235	-122.6381	-120.4989	-113.8110	-100.1700	-81.7821	-55.8953	-42.0195	(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)	-24.1155	-48.9086	-102.1220	-174.2538	-226.7407	-242.8398	-235.9638	-197.1560	-139.6191	-77.2973	-34.2001	-18.4387	(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													153.7361	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													188.3334	
Water heating fuel used													1432.1847	(219)
Space cooling fuel													0.0000	(221)
Electricity for pumps and fans:														
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.1000, SFP = 0.6600)														
mechanical ventilation fans (SFP = 0.6600)													189.4877	(230a)
Total electricity for the above, kWh/year													189.4877	(231)
Electricity for lighting (calculated in Appendix L)													278.8235	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-2625.9647	(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													-571.7327	(238)

10a. Fuel costs - using BEDF prices (554)

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	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1 (high-rate cost)	122.9889	27.8600	38.3725 (240)
Space heating - main system 1 (low-rate cost)	30.7472	0.1450	4.4583 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (electric off-peak tariff)			
High-rate fraction			0.7000 (243)
Low-rate fraction			0.3000 (244)
High-rate cost	1002.5293	31.2000	312.7891 (245)
Low-rate cost	429.6554	14.5000	62.3000 (246)
Energy for instantaneous electric shower(s)	0.0000	29.5300	0.0000 (247a)
Pumps, fans and electric keep-hot (0.90*31.20 + 0.10*14.50)	189.4877	29.5300	49.9433 (249)
Energy for lighting (0.90*31.20 + 0.10*14.50)	278.8235	29.5300	82.3366 (250)
Additional standing charges			3.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1104.3093	29.5300	-326.1025
PV Unit electricity exported	-1521.6554	5.8100	-88.4082
Total			-414.5107 (252)
Total energy cost			138.6892 (255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1 (high-rate cost)	122.9889	0.1658	20.3951 (261)
Space heating - main system 1 (low-rate cost)	30.7472	0.1392	4.2805 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating - high rate cost	1002.5293	0.1479	148.3111 (264)
Water heating - low rate cost	429.6554	0.1242	53.3461 (264)
Space and water heating			226.3328 (265)
Pumps, fans and electric keep-hot	189.4877	0.1432	26.2928 (267)
Energy for lighting	278.8235	0.1490	41.5502 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1104.3093	0.1384	-152.8623
PV Unit electricity exported	-1521.6554	0.1242	-189.0236
Total			-341.8858 (269)
Total CO2, kg/year			-47.7100 (272)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1 (high-rate cost)	122.9889	1.2943	198.9741 (275)
Space heating - main system 1 (low-rate cost)	30.7472	1.5046	46.2628 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating - high rate cost	1002.5293	1.5530	1556.9158 (278)
Water heating - low rate cost	429.6554	1.4443	620.5642 (278)
Space and water heating			2422.7168 (279)
Pumps, fans and electric keep-hot	189.4877	1.5335	286.6864 (281)
Energy for lighting	278.8235	1.5547	433.4993 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1104.3093	1.5160	-1674.1744
PV Unit electricity exported	-1521.6554	0.4559	-693.7066
Total			-2367.8810 (283)
Total Primary energy kWh/year			775.0216 (286)