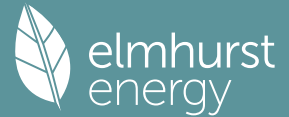


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Plot Reference	DK-35				Issued on Date	02/12/2025	
Assessment Reference	DK-35		Plot Type Ref		DK-35		
Plot Address	26 Ilex Way				SAP Version	10.2	
SAP Rating	91 B	DER	1.76	TER	7.94		
Environmental	99 A	% DER < TER				77.83	
CO ₂ Emissions (t/year)	0.1	DFEE	41.78	TFEE	42.02		
Compliance Check	See BREL	% DFEE < TFEE				0.57	
% DPER < TPER	43.25	DPER	24.45	TPER	43.09		
Assessor Details	Mr. Dominic Bibby				Assessor ID	U683-0001	
Client	client, .						

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)
Main dwelling			
Ground floor	105.0000 (1b)	2.4000 (2b)	252.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	105.0000		252.0000 (4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 252.0000 (5)

2. Ventilation rate

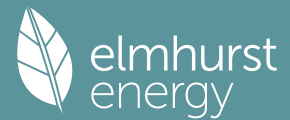
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (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) =	40.0000 / (5) = 0.1587 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4087 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.4087 (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	0.5211	0.5109	0.5007	0.4496	0.4394	0.3883	0.3883	0.3781	0.4087	0.4394	0.4598	0.4803 (22b)
Effective ac	0.6358	0.6305	0.6253	0.6011	0.5965	0.5754	0.5754	0.5715	0.5835	0.5965	0.6057	0.6153 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
w			29.8500	1.3258	39.5739		(27)
gf			105.0000	0.1200	12.6000		(28a)
External Wall 1	110.0000	29.8500	80.1500	0.1900	15.2285		(29a)
pitched flat c	105.0000		105.0000	0.0900	9.4500		(30)
Total net area of external elements Aum(A, m ²)			320.0000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	76.8524		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				0.0000	0.0190	0.0000	
E3 Sill				0.0000	0.0160	0.0000	
E4 Jamb				0.0000	0.0170	0.0000	
E5 Ground floor (normal)				46.0000	0.0540	2.4840	
E6 Intermediate floor within a dwelling				0.0000	0.0080	0.0000	
E10 Eaves (insulation at ceiling level)				0.0000	0.0480	0.0000	
E11 Eaves (insulation at rafter level)				0.0000	0.0410	0.0000	
E12 Gable (insulation at ceiling level)				0.0000	0.0560	0.0000	
E13 Gable (insulation at rafter level)				0.0000	0.0580	0.0000	
E16 Corner (normal)				0.0000	0.0400	0.0000	

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E17 Corner (inverted - internal area greater than external area)	0.0000	-0.0680	-0.0000	
R1 Head of roof window	0.0000	0.1200	0.0000	
R2 Sill of roof window	0.0000	0.1200	0.0000	
R3 Jamb of roof window	0.0000	0.1200	0.0000	
E14 Flat roof	0.0000	0.0460	0.0000	
E18 Party wall between dwellings	0.0000	0.0360	0.0000	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				2.4840 (36)
Point Thermal bridges				0.0000
Total fabric heat loss		(33) + (36) + (36a) =		79.3364 (37)

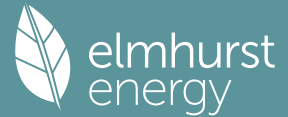
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	52.8722	52.4337	52.0039	49.9851	49.6074	47.8491	47.8491	47.5235	48.5264	49.6074	50.3715	51.1703 (38)
Average = Sum(39)m / 12 =	132.2086	131.7701	131.3403	129.3215	128.9438	127.1855	127.1855	126.8599	127.8627	128.9438	129.7079	130.5067 (39)
												129.3197
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2591	1.2550	1.2509	1.2316	1.2280	1.2113	1.2113	1.2082	1.2177	1.2280	1.2353	1.2429 (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												2.7812 (42)
Hot water usage for mixer showers												
	77.6948	76.5053	74.7523	72.0555	69.6394	66.2591	63.5856	66.7111	68.2831	71.6311	75.1177	77.6247 (42a)
Hot water usage for baths												
	29.9100	29.4585	28.8161	27.8542	26.9873	25.7939	24.8886	25.9957	26.5767	27.7592	28.9886	29.8862 (42b)
Hot water usage for other uses												
	43.1127	41.5450	39.9772	38.4095	36.8418	35.2740	35.2740	36.8418	38.4095	39.9772	41.5450	43.1127 (42c)
Average daily hot water use (litres/day)												138.5556 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	150.7174	147.5087	143.5457	138.3193	133.4685	127.3271	123.7482	129.5486	133.2693	139.3675	145.6513	150.6237 (44)
Energy content (annual)	221.8821	195.1838	205.1238	180.6795	171.9876	147.2495	136.7454	152.4810	154.5858	179.5891	196.8525	221.2019 (45)
Distribution loss	(46)m = 0.15 x (45)m											
	33.2823	29.2776	30.7686	27.1019	25.7981	22.0874	20.5118	22.8722	23.1879	26.9384	29.5279	33.1803 (46)
Water storage loss (or HIU loss):												
Store volume												210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												2.0000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0800 (55)
Total storage loss												
	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800 (56)
If cylinder contains dedicated solar storage												
	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800 (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												
	278.6245	246.4350	261.8662	235.5915	228.7300	202.1615	193.4878	209.2234	209.4978	236.3315	251.7645	277.9443 (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	278.6245	246.4350	261.8662	235.5915	228.7300	202.1615	193.4878	209.2234	209.4978	236.3315	251.7645	277.9443 (64)
12Total per year (kWh/year)												2831.6582 (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												
	119.1697	105.8996	113.5976	104.0055	102.5798	92.8901	90.8618	96.0939	95.3294	105.1073	109.3831	118.9435 (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	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	133.2418	147.5177	133.2418	137.6832	133.2418	137.6832	133.2418	133.2418	137.6832	133.2418	137.6832	133.2418 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	264.1668	266.9081	260.0003	245.2944	226.7308	209.2837	197.6280	194.8868	201.7946	216.5004	235.0640	252.5111 (68)
Pumps, fans	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062 (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)	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497 (71)
Total internal gains	160.1744	157.5887	152.6849	144.4522	137.8761	129.0140	122.1260	129.1584	132.4019	141.2733	151.9209	159.8704 (72)
	622.3017	636.7331	610.6456	592.1484	562.5674	540.6996	517.7145	522.0056	536.5983	555.7342	589.3868	610.3419 (73)

6. Solar gains												
[Jan]												
	Area											
	m2											
	Solar flux											
	Table 6a											
	W/m2											
	Specific data											
	or Table 6b											
	Specific data											
	or Table 6c											
	Access											
	factor											
	Table 6d											
	Gains											
	W											
North	3.2600											10.5940 (74)
East	10.5100											63.0844 (76)
South	3.2600											46.5790 (78)
West	12.8200											76.9497 (80)
Solar gains	197.2072	370.4666	582.7096	823.0380	995.2305	1015.2660	967.8630	838.5674	667.5592	431.4285	242.8872	164.2375 (83)
Total gains	819.5088	1007.1997	1193.3552	1415.1864	1557.7979	1555.9656	1485.5774	1360.5731	1204.1576	987.1626	832.2740	774.5794 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	55.1528	55.3363	55.5174	56.3840	56.5492	57.3310	57.3310	57.4781	57.0273	56.5492	56.2161	55.8720
alpha	4.6769	4.6891	4.7012	4.7589	4.7699	4.8221	4.8221	4.8319	4.8018	4.7699	4.7477	4.7248
util living area	0.9939	0.9838	0.9554	0.8651	0.7045	0.5119	0.3746	0.4248	0.6800	0.9262	0.9861	0.9952 (86)
Living	19.8877	20.0845	20.3595	20.6781	20.8583	20.9226	20.9334	20.9317	20.8876	20.6130	20.1942	19.8641
Non living	18.5877	18.8393	19.1837	19.5696	19.7564	19.8219	19.8279	19.8299	19.7943	19.5101	18.9927	18.5675
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	20.4310	20.0845	20.3595	20.6781	20.8583	20.9226	20.9334	20.9317	20.8876	20.6130	20.1942	20.0230 (87)
Th 2	19.8730	19.8763	19.8795	19.8948	19.8976	19.9110	19.9110	19.9135	19.9058	19.8976	19.8919	19.8858 (88)
util rest of house	0.9919	0.9786	0.9415	0.8283	0.6401	0.4297	0.2830	0.3266	0.5918	0.8963	0.9808	0.9937 (89)
MIT 2	19.3606	18.8393	19.1837	19.5696	19.7564	19.8219	19.8279	19.8299	19.7943	19.5101	18.9927	18.8051 (90)
Living area fraction									FLA = Living area / (4) =			0.1619 (91)
MIT	19.5339	19.0409	19.3740	19.7491	19.9348	20.0001	20.0069	20.0083	19.9713	19.6887	19.1872	19.0023 (92)
Temperature adjustment												0.0000
adjusted MIT	19.5339	19.0409	19.3740	19.7491	19.9348	20.0001	20.0069	20.0083	19.9713	19.6887	19.1872	19.0023 (93)

8. Space heating requirement

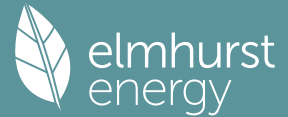
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9911	0.9735	0.9337	0.8228	0.6425	0.4366	0.2911	0.3353	0.5975	0.8893	0.9762	0.9920 (94)
Useful gains	812.2152	980.5395	1114.2792	1164.3718	1000.8189	679.3140	432.5008	456.1711	719.4657	877.9052	812.4415	768.3622 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.4000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	2014.0492	1863.3499	1690.8799	1403.0169	1061.8272	686.8139	433.3082	457.7462	750.7192	1171.9258	1567.8075	1931.7961 (97)
Space heating kWh	894.1645	593.2486	428.9909	171.8245	45.3902	0.0000	0.0000	0.0000	0.0000	218.7513	543.8635	865.5948 (98a)
Space heating requirement - total per year (kWh/year)												3761.8283
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	894.1645	593.2486	428.9909	171.8245	45.3902	0.0000	0.0000	0.0000	0.0000	218.7513	543.8635	865.5948 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3761.8283
Space heating per m2										(98c) / (4) =		35.8269 (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 %)												360.3845 (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	894.1645	593.2486	428.9909	171.8245	45.3902	0.0000	0.0000	0.0000	0.0000	218.7513	543.8635	865.5948 (98)
Space heating efficiency (main heating system 1)	360.3845	360.3845	360.3845	360.3845	360.3845	0.0000	0.0000	0.0000	0.0000	360.3845	360.3845	360.3845 (210)
Space heating fuel (main heating system)	248.1140	164.6155	119.0370	47.6781	12.5949	0.0000	0.0000	0.0000	0.0000	60.6994	150.9120	240.1865 (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	278.6245	246.4350	261.8662	235.5915	228.7300	202.1615	193.4878	209.2234	209.4978	236.3315	251.7645	277.9443 (64)
Efficiency of water heater (217)m	187.1268	187.1268	187.1268	187.1268	187.1268	187.1268	187.1268	187.1268	187.1268	187.1268	187.1268	187.1268 (216)
Fuel for water heating, kWh/month	148.8961	131.6941	139.9405	125.8994	122.2326	108.0345	103.3993	111.8084	111.9550	126.2948	134.5422	148.5326 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	28.3263	22.7244	20.4608	14.9905	11.5791	9.4602	10.5628	13.7300	17.8339	23.3990	26.4291	29.1136 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-32.9234	-51.0058	-82.0102	-101.7552	-116.6078	-110.5819	-107.7383	-97.1182	-78.6473	-60.1279	-37.2510	-27.8542 (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	-8.7963	-21.1629	-50.5897	-94.6865	-145.8411	-156.4383	-151.8871	-115.8394	-72.9333	-34.4746	-12.6696	-6.8021 (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												1043.8375 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												187.1268
Water heating fuel used												1513.2293 (219)
Space cooling fuel												0.0000 (221)

Electricity for pumps and fans:

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Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	228.6098 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1775.7420 (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	1009.9346 (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	1043.8375	0.1568	163.6675 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1513.2293	0.1409	213.2156 (264)
Space and water heating			376.8831 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	228.6098	0.1443	32.9955 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-903.6212	0.1329	-120.0617
PV Unit electricity exported	-872.1208	0.1210	-105.4892
Total			-225.5510 (269)
Total CO2, kg/year			184.3276 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.7600 (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	1043.8375	1.5804	1649.7093 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1513.2293	1.5210	2301.6219 (278)
Space and water heating			3951.3312 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	228.6098	1.5338	350.6493 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-903.6212	1.4910	-1347.2639
PV Unit electricity exported	-872.1208	0.4437	-386.9693
Total			-1734.2331 (283)
Total Primary energy kWh/year			2567.7474 (286)
Dwelling Primary energy Rate (DPER)			24.4500 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	105.0000 (1b)	x 2.4000 (2b)	= 252.0000 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	105.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 252.0000 (5)

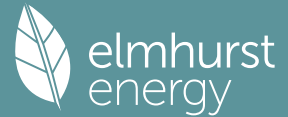
2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (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) =	40.0000 / (5) =	0.1587 (8)
Pressure Test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4087	(18)
Number of sides sheltered		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.4087 (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												

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Effective ac	0.5211	0.5109	0.5007	0.4496	0.4394	0.3883	0.3883	0.3781	0.4087	0.4394	0.4598	0.4803 (22b)
	0.6358	0.6305	0.6253	0.6011	0.5965	0.5754	0.5754	0.5715	0.5835	0.5965	0.6057	0.6153 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opening Type			26.2500	1.1450	30.0573		(27)
gf			105.0000	0.1300	13.6500		(28a)
External Wall 1	110.0000	26.2500	83.7500	0.1800	15.0750		(29a)
pitched flat c	105.0000		105.0000	0.1100	11.5500		(30)
Total net area of external elements Aum(A, m2)			320.0000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26) ... (30) + (32) =	70.3323	(33)

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

250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	0.0000	0.0500	0.0000
E3 Sill	0.0000	0.0500	0.0000
E4 Jamb	0.0000	0.0500	0.0000
E5 Ground floor (normal)	46.0000	0.1600	7.3600
E6 Intermediate floor within a dwelling	0.0000	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	0.0000	0.0600	0.0000
E11 Eaves (insulation at rafter level)	0.0000	0.0400	0.0000
E12 Gable (insulation at ceiling level)	0.0000	0.0600	0.0000
E13 Gable (insulation at rafter level)	0.0000	0.0800	0.0000
E16 Corner (normal)	0.0000	0.0900	0.0000
E17 Corner (inverted - internal area greater than external area)	0.0000	-0.0900	-0.0000
R1 Head of roof window	0.0000	0.0800	0.0000
R2 Sill of roof window	0.0000	0.0600	0.0000
R3 Jamb of roof window	0.0000	0.0800	0.0000
E14 Flat roof	0.0000	0.0800	0.0000
E18 Party wall between dwellings	0.0000	0.0600	0.0000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			7.3600 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 77.6923 (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	52.8722	52.4337	52.0039	49.9851	49.6074	47.8491	47.8491	47.5235	48.5264	49.6074	50.3715	51.1703 (38)
Heat transfer coeff	130.5644	130.1260	129.6961	127.6774	127.2996	125.5413	125.5413	125.2157	126.2186	127.2996	128.0638	128.8626 (39)
Average = Sum(39)m / 12 =												127.6755

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2435	1.2393	1.2352	1.2160	1.2124	1.1956	1.1956	1.1925	1.2021	1.2124	1.2197	1.2273 (40)
HLP (average)												1.2160
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

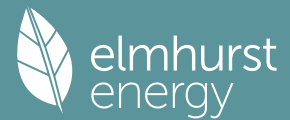
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.7812 (42)
Hot water usage for mixer showers	70.8521	69.7873	68.2357	65.2671	63.0763	60.6331	59.2444	60.7843	62.4722	65.0954	68.1278	70.5806 (42a)
Hot water usage for baths	30.5919	30.1376	29.4978	28.3181	27.4348	26.4554	25.9263	26.5616	27.2534	28.3014	29.5054	30.4885 (42b)
Hot water usage for other uses	43.1127	41.5450	39.9772	38.4095	36.8418	35.2740	35.2740	36.8418	38.4095	39.9772	41.5450	43.1127 (42c)
Average daily hot water use (litres/day)												132.8802 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	144.5567	141.4699	137.7108	131.9947	127.3529	122.3625	120.4448	124.1876	128.1351	133.3741	139.1782	144.1818 (44)
Distribution loss (46)m = 0.15 x (45)m	228.9425	201.4512	211.6563	180.6942	171.4414	150.4590	145.6675	153.7702	158.0034	180.9874	198.2849	225.7539 (45)
Water storage loss (or HIU loss):										Total = Sum(45)m =		2207.1119
Store volume	34.3414	30.2177	31.7485	27.1041	25.7162	22.5688	21.8501	23.0655	23.7005	27.1481	29.7427	33.8631 (46)
a) If manufacturer declared loss factor is known (kWh/day):												210.0000 (47)
Temperature factor from Table 2b												1.7016 (48)
Enter (49) or (54) in (55)												0.5400 (49)
Total storage loss												0.9188 (55)
If cylinder contains dedicated solar storage	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842 (56)
Primary loss	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842 (57)
Combi 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)
Total heat required for water heating calculated for each month	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)
WWHRS	280.6891	248.1901	263.4029	230.7715	223.1880	200.5363	197.4141	205.5168	208.0807	232.7340	248.3622	277.5005 (62)
PV diverter	-32.3906	-28.6465	-29.9970	-24.8387	-23.1488	-19.8086	-18.5674	-19.7445	-20.4947	-24.1610	-27.3715	-31.7908 (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	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)
12Total per year (kWh/year)	248.2985	219.5436	233.4059	205.9328	200.0392	180.7277	178.8467	185.7723	187.5860	208.5730	220.9907	245.7097 (64)
Electric shower(s)								Total per year (kWh/year) = Sum(64)m =				2515.4262 (64)
	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												
	117.5207	104.3736	111.7730	100.1427	98.4015	90.0895	89.8317	92.5259	92.5980	101.5756	105.9916	116.4605 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
133.2418	147.5177	133.2418	137.6832	133.2418	137.6832	133.2418	133.2418	137.6832	133.2418	137.6832	133.2418	133.2418 (67)

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Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	264.1668	266.9081	260.0003	245.2944	226.7308	209.2837	197.6280	194.8868	201.7946	216.5004	235.0640	252.5111 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497 (71)
Water heating gains (Table 5)	157.9579	155.3179	150.2325	139.0871	132.2601	125.1243	120.7415	124.3627	128.6083	136.5263	147.2105	156.5329 (72)
Total internal gains	623.0852	637.4623	611.1933	589.7833	559.9514	536.8099	516.3300	517.2100	532.8047	553.9872	587.6764	610.0044 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W	
North					2.8700	10.6334	0.6300	0.7000			0.7700	9.3266 (74)	
East					9.2400	19.6403	0.6300	0.7000			0.7700	55.4614 (76)	
South					2.8700	46.7521	0.6300	0.7000			0.7700	41.0067 (78)	
West					11.2700	19.6403	0.6300	0.7000			0.7700	67.6461 (80)	
Solar gains	173.4409	325.8066	512.4384	723.7589	875.1673	892.7822	851.0993	737.4093	587.0459	379.4120	213.6132	144.4464	(83)
Total gains	796.5261	963.2689	1123.6316	1313.5422	1435.1187	1429.5920	1367.4293	1254.6192	1119.8507	933.3992	801.2896	754.4508	(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	55.8473	56.0355	56.2212	57.1101	57.2796	58.0818	58.0818	58.2328	57.7701	57.2796	56.9378	56.5848
alpha	4.7232	4.7357	4.7481	4.8073	4.8186	4.8721	4.8721	4.8822	4.8513	4.8186	4.7959	4.7723
util living area	0.9945	0.9862	0.9632	0.8875	0.7401	0.5466	0.4010	0.4535	0.7114	0.9370	0.9879	0.9957 (86)
MIT	19.6064	19.8497	20.1974	20.6175	20.8771	20.9777	20.9960	20.9929	20.9249	20.5464	20.0035	19.5768 (87)
Th 2	19.8854	19.8887	19.8919	19.9072	19.9101	19.9235	19.9235	19.9260	19.9183	19.9101	19.9043	19.8983 (88)
util rest of house	0.9927	0.9818	0.9514	0.8545	0.6773	0.4613	0.3045	0.3505	0.6239	0.9105	0.9832	0.9943 (89)
MIT 2	18.2828	18.5935	19.0304	19.5410	19.8153	19.9120	19.9223	19.9237	19.8721	19.4757	18.8023	18.2540 (90)
Living area fraction	0.9927	0.9818	0.9514	0.8545	0.6773	0.4613	0.3045	0.3505	0.6239	0.9105	0.9832	0.9943 (89)
MIT	18.4971	18.7969	19.2193	19.7153	19.9872	20.0845	20.0962	20.0968	20.0425	19.6491	18.9967	18.4682 (92)
Temperature adjustment	18.4971	18.7969	19.2193	19.7153	19.9872	20.0845	20.0962	20.0968	20.0425	19.6491	18.9967	18.4682 (93)
adjusted MIT	18.4971	18.7969	19.2193	19.7153	19.9872	20.0845	20.0962	20.0968	20.0425	19.6491	18.9967	18.4682 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	788.0499	939.8340	1058.6154	1113.6444	978.8279	678.2391	437.7369	460.6460	710.8655	842.3795	783.4297	748.0749 (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	1853.6314	1808.3500	1649.6458	1380.8693	1054.9607	688.5360	438.9126	462.8985	750.0566	1151.9467	1523.5423	1838.6367 (97)
Space heating kWh	792.7927	583.6428	439.7266	192.4020	56.6428	0.0000	0.0000	0.0000	0.0000	230.3180	532.8810	811.3780 (98a)
Space heating requirement - total per year (kWh/year)	792.7927	583.6428	439.7266	192.4020	56.6428	0.0000	0.0000	0.0000	0.0000	230.3180	532.8810	811.3780 (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)
Solar heating contribution - total per year (kWh/year)	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 kWh	792.7927	583.6428	439.7266	192.4020	56.6428	0.0000	0.0000	0.0000	0.0000	230.3180	532.8810	811.3780 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	792.7927	583.6428	439.7266	192.4020	56.6428	0.0000	0.0000	0.0000	0.0000	230.3180	532.8810	811.3780 (98c)
Space heating per m2	792.7927	583.6428	439.7266	192.4020	56.6428	0.0000	0.0000	0.0000	0.0000	230.3180	532.8810	811.3780 (98c)
										(98c) / (4) =		34.6646 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	792.7927	583.6428	439.7266	192.4020	56.6428	0.0000	0.0000	0.0000	0.0000	230.3180	532.8810	811.3780 (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)	858.9303	632.3324	476.4102	208.4528	61.3682	0.0000	0.0000	0.0000	0.0000	249.5320	577.3359	879.0661 (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	248.2985	219.5436	233.4059	205.9328	200.0392	180.7277	178.8467	185.7723	187.5860	208.5730	220.9907	245.7097 (64)
Water heating requirement	86.4740	86.1444	85.4580	83.9076	81.6256	79.8000	79.8000	79.8000	79.8000	84.2827	85.9581	79.8000 (216)
Efficiency of water heater (217)m	287.1366	254.8554	273.1235	245.4280	245.0693	226.4759	224.1187	232.7974	235.0702	247.4683	257.0911	86.5316 (217)
Fuel for water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (219)
Space cooling fuel requirement (221)m	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)

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Lighting	27.6850	22.2100	19.9976	14.6511	11.3169	9.2460	10.3237	13.4191	17.4301	22.8692	25.8307	28.4545	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-78.0469	-101.1753	-133.8574	-138.1435	-139.3001	-126.6622	-124.9591	-122.3822	-116.9194	-109.2317	-82.5207	-68.5549	(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	-75.6937	-154.0844	-297.3136	-434.3197	-563.0811	-561.8577	-555.3242	-475.2548	-355.2220	-216.1294	-99.5867	-60.2675	(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												3943.4278	(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												3012.5881	(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)												223.4340	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-5189.8881	(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												2075.5619	(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	3943.4278	0.2100	828.1198 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3012.5881	0.2100	632.6435 (264)
Space and water heating			1460.7634 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	223.4340	0.1443	32.2484 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1341.7533	0.1364	-183.0635
PV Unit electricity exported	-3848.1347	0.1267	-487.6788
Total			-670.7423 (269)
Total CO2, kg/year			834.1987 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			7.9400 (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	3943.4278	1.1300	4456.0735 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3012.5881	1.1300	3404.2246 (278)
Space and water heating			7860.2980 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	223.4340	1.5338	342.7105 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1341.7533	1.5043	-2018.4591
PV Unit electricity exported	-3848.1347	0.4652	-1790.2562
Total			-3808.7153 (283)
Total Primary energy kWh/year			4524.3940 (286)
Target Primary Energy Rate (TPER)			43.0900 (287)

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

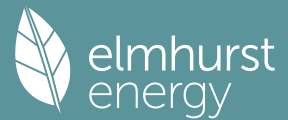
1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	105.0000 (1b)	x 2.4000 (2b)	= 252.0000 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)... (1n)	105.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)... (3n)	= 252.0000 (5)

2. Ventilation rate

m³ per hour

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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	4 * 10 =	40.0000 (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) =	40.0000 / (5) =	0.1587 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4087	(18)
Number of sides sheltered		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.4087	(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	(22)
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	(22a)
	0.5211	0.5109	0.5007	0.4496	0.4394	0.3883	0.3883	0.3781	0.4087	0.4394	0.4598	0.4803	(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	0.6358	0.6305	0.6253	0.6011	0.5965	0.5754	0.5754	0.5715	0.5835	0.5965	0.6057	0.6153	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
w			29.8500	1.3258	39.5739			(27)
gf			105.0000	0.1200	12.6000			(28a)
External Wall 1	110.0000	29.8500	80.1500	0.1900	15.2285			(29a)
pitched flat c	105.0000		105.0000	0.0900	9.4500			(30)
Total net area of external elements Aum(A, m2)			320.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	76.8524			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	0.0000	0.0190	0.0000	
E3 Sill	0.0000	0.0160	0.0000	
E4 Jamb	0.0000	0.0170	0.0000	
E5 Ground floor (normal)	46.0000	0.0540	2.4840	
E6 Intermediate floor within a dwelling	0.0000	0.0080	0.0000	
E10 Eaves (insulation at ceiling level)	0.0000	0.0480	0.0000	
E11 Eaves (insulation at rafter level)	0.0000	0.0410	0.0000	
E12 Gable (insulation at ceiling level)	0.0000	0.0560	0.0000	
E13 Gable (insulation at rafter level)	0.0000	0.0580	0.0000	
E16 Corner (normal)	0.0000	0.0400	0.0000	
E17 Corner (inverted - internal area greater than external area)	0.0000	-0.0680	-0.0000	
R1 Head of roof window	0.0000	0.1200	0.0000	
R2 Sill of roof window	0.0000	0.1200	0.0000	
R3 Jamb of roof window	0.0000	0.1200	0.0000	
E14 Flat roof	0.0000	0.0460	0.0000	
E18 Party wall between dwellings	0.0000	0.0360	0.0000	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 2.4840 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 79.3364 (37)

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

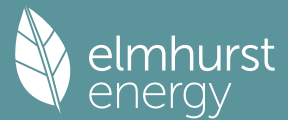
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	52.8722	52.4337	52.0039	49.9851	49.6074	47.8491	47.8491	47.5235	48.5264	49.6074	50.3715	51.1703	(38)
Average = Sum(39)m / 12 =	132.2086	131.7701	131.3403	129.3215	128.9438	127.1855	127.1855	126.8599	127.8627	128.9438	129.7079	130.5067	(39)
												129.3197	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.2591	1.2550	1.2509	1.2316	1.2280	1.2113	1.2113	1.2082	1.2177	1.2280	1.2353	1.2429	(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													2.7812 (42)
Hot water usage for mixer showers													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
29.9100	29.4585	28.8161	27.8542	26.9873	25.7939	24.8886	25.9957	26.5767	27.7592	28.9886	29.8862	29.8862	(42b)
Hot water usage for other uses													
43.1127	41.5450	39.9772	38.4095	36.8418	35.2740	35.2740	36.8418	38.4095	39.9772	41.5450	43.1127	43.1127	(42c)
Average daily hot water use (litres/day)												66.9270	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	73.0227	71.0034	68.7934	66.2637	63.8291	61.0680	60.1626	62.8374	64.9862	67.7364	70.5335	72.9989	(44)
Energy conte	107.5020	93.9519	98.3043	86.5570	82.2502	70.6231	66.4814	73.9608	75.3808	87.2852	95.3284	107.2043	(45)
Energy content (annual)										Total = Sum(45)m =		1044.8294	
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	0.0000	(46)
Water storage loss (or HIU 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	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													
91.3767	79.8591	83.5587	73.5734	69.9127	60.0296	56.5092	62.8667	64.0736	74.1924	81.0292	91.1237	91.1237	(62)

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WVHRS	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 (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	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	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	0.0000 (63d)
Output from w/h	91.3767	79.8591	83.5587	73.5734	69.9127	60.0296	56.5092	62.8667	64.0736	74.1924	81.0292	91.1237	(64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =												888.1050 (64)
Electric shower(s)	56.7407	50.5564	55.2057	52.6821	53.6707	51.1966	52.9032	53.6707	52.6821	55.2057	54.1676	56.7407	(64a)
Heat gains from water heating, kWh/month	37.0294	32.6039	34.6911	31.5639	30.8958	27.8066	27.3531	29.1343	29.1889	32.3495	33.7992	36.9661	(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	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.2418	147.5177	133.2418	137.6832	133.2418	137.6832	133.2418	133.2418	137.6832	133.2418	137.6832	133.2418	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	264.1668	266.9081	260.0003	245.2944	226.7308	209.2837	197.6280	194.8868	201.7946	216.5004	235.0640	252.5111	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	(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)	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	(71)
Water heating gains (Table 5)	49.7706	48.5177	46.6278	43.8387	41.5267	38.6202	36.7649	39.1591	40.5402	43.4806	46.9433	49.6856	(72)
Total internal gains	511.8979	527.6621	504.5885	491.5350	466.2180	450.3058	432.3534	432.0063	444.7366	457.9415	484.4092	500.1572	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
North				3.2600	10.6334		0.6300		0.7000		0.7700		10.5940 (74)
East				10.5100	19.6403		0.6300		0.7000		0.7700		63.0844 (76)
South				3.2600	46.7521		0.6300		0.7000		0.7700		46.5790 (78)
West				12.8200	19.6403		0.6300		0.7000		0.7700		76.9497 (80)
Solar gains	197.2072	370.4666	582.7096	823.0380	995.2305	1015.2660	967.8630	838.5674	667.5592	431.4285	242.8872	164.2375	(83)
Total gains	709.1051	898.1287	1087.2981	1314.5730	1461.4485	1465.5718	1400.2163	1270.5737	1112.2959	889.3699	727.2964	664.3947	(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	55.1528	55.3363	55.5174	56.3840	56.5492	57.3310	57.3310	57.4781	57.0273	56.5492	56.2161	55.8720	
alpha	4.6769	4.6891	4.7012	4.7589	4.7699	4.8221	4.8221	4.8319	4.8018	4.7699	4.7477	4.7248	
util living area	0.9966	0.9897	0.9679	0.8898	0.7363	0.5404	0.3968	0.4534	0.7202	0.9476	0.9919	0.9975	(86)
MIT	19.4973	19.7652	20.1458	20.6026	20.8761	20.9778	20.9959	20.9925	20.9182	20.4985	19.9128	19.4642	(87)
Th 2	19.8730	19.8763	19.8795	19.8948	19.8976	19.9110	19.9110	19.9135	19.9058	19.8976	19.8919	19.8858	(88)
util rest of house	0.9955	0.9863	0.9573	0.8571	0.6728	0.4549	0.3001	0.3494	0.6322	0.9244	0.9887	0.9967	(89)
MIT 2	18.5186	18.7867	19.1614	19.5979	19.8234	19.9021	19.9101	19.9116	19.8663	19.5184	18.9467	18.4955	(90)
Living area fraction	18.6771	18.9451	19.3208	19.7606	19.9938	20.0763	20.0859	20.0866	20.0366	19.6771	19.1032	18.6523	(91)
MIT	18.6771	18.9451	19.3208	19.7606	19.9938	20.0763	20.0859	20.0866	20.0366	19.6771	19.1032	18.6523	(92)
Temperature adjustment	18.6771	18.9451	19.3208	19.7606	19.9938	20.0763	20.0859	20.0866	20.0366	19.6771	19.1032	18.6523	(93)

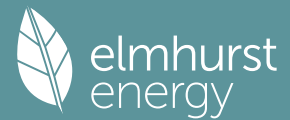
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9937	0.9824	0.9506	0.8525	0.6788	0.4682	0.3158	0.3662	0.6436	0.9185	0.9855	0.9953	(94)
Ext temp.	704.6707	882.2916	1033.5819	1120.7005	991.9854	686.2526	442.1679	465.3123	715.8802	816.8733	716.7170	661.2763	(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	1900.7737	1850.7281	1683.8809	1404.5027	1069.4380	696.5020	443.3525	467.6816	759.0736	1170.4303	1556.9031	1886.1221	(97)
Space heating requirement - total per year (kWh/year)	889.9006	650.7893	483.8225	204.3376	57.6247	0.0000	0.0000	0.0000	0.0000	263.0464	604.9340	911.2853	(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 contribution - total per year (kWh/year)	889.9006	650.7893	483.8225	204.3376	57.6247	0.0000	0.0000	0.0000	0.0000	263.0464	604.9340	911.2853	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)	889.9006	650.7893	483.8225	204.3376	57.6247	0.0000	0.0000	0.0000	0.0000	263.0464	604.9340	911.2853	(98c)
Space heating per m2	(98c) / (4) =												38.7213 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1195.5433	941.1724	964.1349	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9325	0.9655	0.9469	0.0000	0.0000	0.0000	0.0000	(101)

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Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1114.8034	908.6935	912.9778	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1659.4102	1585.6910	1436.6462	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	392.1169	503.6862	389.6093	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fc = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	98.0292	125.9215	97.4023	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												321.3531 (107)
Energy for space heating												38.7213 (99)
Energy for space cooling												3.0605 (108)
Total												41.7818 (109)
Fabric Energy Efficiency (DFEE)												41.8 (109)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	105.0000 (1b)	x 2.4000 (2b)	= 252.0000 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	105.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	252.0000 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour 40.0000 / (5) = 0.1587 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4087 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.4087 (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	0.5211	0.5109	0.5007	0.4496	0.4394	0.3883	0.3883	0.3781	0.4087	0.4394	0.4598	0.4803 (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	0.6358	0.6305	0.6253	0.6011	0.5965	0.5754	0.5754	0.5715	0.5835	0.5965	0.6057	0.6153 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
TER Opening Type			26.2500	1.1450	30.0573		(27)
gf			105.0000	0.1300	13.6500		(28a)
External Wall 1	110.0000	26.2500	83.7500	0.1800	15.0750		(29a)
pitched flat c	105.0000		105.0000	0.1100	11.5500		(30)
Total net area of external elements Aum(A, m ²)			320.0000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	70.3323		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value		Total
E2 Other lintels (including other steel lintels)				0.0000	0.0500		0.0000
E3 Sill				0.0000	0.0500		0.0000
E4 Jamb				0.0000	0.0500		0.0000
E5 Ground floor (normal)				46.0000	0.1600		7.3600
E6 Intermediate floor within a dwelling				0.0000	0.0000		0.0000
E10 Eaves (insulation at ceiling level)				0.0000	0.0600		0.0000
E11 Eaves (insulation at rafter level)				0.0000	0.0400		0.0000
E12 Gable (insulation at ceiling level)				0.0000	0.0600		0.0000
E13 Gable (insulation at rafter level)				0.0000	0.0800		0.0000
E16 Corner (normal)				0.0000	0.0900		0.0000
E17 Corner (inverted - internal area greater than external area)				0.0000	-0.0900		-0.0000
R1 Head of roof window				0.0000	0.0800		0.0000
R2 Sill of roof window				0.0000	0.0600		0.0000
R3 Jamb of roof window				0.0000	0.0800		0.0000
E14 Flat roof				0.0000	0.0800		0.0000
E18 Party wall between dwellings				0.0000	0.0600		0.0000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.3600 (36)

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Point Thermal bridges
Total fabric heat loss

(33) + (36) + (36a) = 0.0000
77.6923 (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	52.8722	52.4337	52.0039	49.9851	49.6074	47.8491	47.8491	47.5235	48.5264	49.6074	50.3715	51.1703	(38)
Heat transfer coeff	130.5644	130.1260	129.6961	127.6774	127.2996	125.5413	125.5413	125.2157	126.2186	127.2996	128.0638	128.8626	(39)
Average = Sum(39)m / 12 =												127.6755	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2435	1.2393	1.2352	1.2160	1.2124	1.1956	1.1956	1.1925	1.2021	1.2124	1.2197	1.2273	(40)
HLP (average)												1.2160	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.7812 (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	30.5919	30.1376	29.4978	28.3181	27.4348	26.4554	25.9263	26.5616	27.2534	28.3014	29.5054	30.4885	(42b)
Hot water usage for other uses	43.1127	41.5450	39.9772	38.4095	36.8418	35.2740	35.2740	36.8418	38.4095	39.9772	41.5450	43.1127	(42c)
Average daily hot water use (litres/day)												67.5569	(43)
Daily hot water use	73.7046	71.6826	69.4750	66.7276	64.2766	61.7294	61.2003	63.4034	65.6629	68.2787	71.0504	73.6012	(44)
Energy content (annual)	116.7301	102.0750	106.7806	91.3468	86.5286	75.9035	74.0165	78.5066	80.9689	92.6535	101.2243	115.2417	(45)
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 (or HIU 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	99.2206	86.7638	90.7635	77.6448	73.5493	64.5180	62.9140	66.7306	68.8235	78.7555	86.0406	97.9555	(63a)
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	(63b)
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	(63c)
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	(63d)
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	(64)
Output from w/h	99.2206	86.7638	90.7635	77.6448	73.5493	64.5180	62.9140	66.7306	68.8235	78.7555	86.0406	97.9555	(64a)
12Total per year (kWh/year)												954	(64)
Electric shower(s)	56.7407	50.5564	55.2057	52.6821	53.6707	51.1966	52.9032	53.6707	52.6821	55.2057	54.1676	56.7407	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												645.4223	(64a)
Heat gains from water heating, kWh/month	38.9903	34.3301	36.4923	32.5817	31.8050	28.9286	28.9543	30.1003	30.3764	33.4903	35.0521	38.6740	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.2418	147.5177	133.2418	137.6832	133.2418	137.6832	133.2418	133.2418	137.6832	133.2418	137.6832	133.2418	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	264.1668	266.9081	260.0003	245.2944	226.7308	209.2837	197.6280	194.8868	201.7946	216.5004	235.0640	252.5111	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	(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)	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	(71)
Water heating gains (Table 5)	52.4064	51.0864	49.0488	45.2524	42.7487	40.1787	38.9171	40.4574	42.1895	45.0138	48.6834	51.9812	(72)
Total internal gains	514.5337	530.2308	507.0095	492.9486	467.4400	451.8643	434.5055	433.3047	446.3859	459.4747	486.1493	502.4528	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W
North					2.8700	10.6334	0.6300	0.7000			0.7700	9.3266 (74)
East					9.2400	19.6403	0.6300	0.7000			0.7700	55.4614 (76)
South					2.8700	46.7521	0.6300	0.7000			0.7700	41.0067 (78)
West					11.2700	19.6403	0.6300	0.7000			0.7700	67.6461 (80)
Solar gains	173.4409	325.8066	512.4384	723.7589	875.1673	892.7822	851.0993	737.4093	587.0459	379.4120	213.6132	144.4464 (83)
Total gains	687.9746	856.0374	1019.4479	1216.7075	1342.6073	1344.6464	1285.6048	1170.7139	1033.4318	838.8867	699.7624	646.8992 (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)													
tau	55.8473	56.0355	56.2212	57.1101	57.2796	58.0818	58.0818	58.2328	57.7701	57.2796	56.9378	56.5848	
alpha	4.7232	4.7357	4.7481	4.8073	4.8186	4.8721	4.8721	4.8822	4.8513	4.8186	4.7959	4.7723	
util living area													

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	0.9971	0.9914	0.9742	0.9102	0.7723	0.5770	0.4256	0.4840	0.7514	0.9563	0.9931	0.9978 (86)
MIT	19.4998	19.7479	20.1079	20.5586	20.8516	20.9720	20.9948	20.9906	20.9045	20.4734	19.9060	19.4703 (87)
Th 2	19.8854	19.8887	19.8919	19.9072	19.9101	19.9235	19.9235	19.9260	19.9183	19.9101	19.9043	19.8983 (88)
util rest of house												
	0.9960	0.9885	0.9655	0.8816	0.7112	0.4886	0.3236	0.3751	0.6653	0.9362	0.9903	0.9970 (89)
MIT 2	18.5306	18.7794	19.1353	19.5716	19.8190	19.9120	19.9223	19.9236	19.8709	19.5065	18.9498	18.5110 (90)
Living area fraction									FLA = Living area / (4) =			0.1619 (91)
MIT	18.6875	18.9362	19.2928	19.7314	19.9861	20.0836	20.0959	20.0963	20.0383	19.6630	19.1046	18.6663 (92)
Temperature adjustment												0.0000
adjusted MIT	18.6875	18.9362	19.2928	19.7314	19.9861	20.0836	20.0959	20.0963	20.0383	19.6630	19.1046	18.6663 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9945	0.9851	0.9594	0.8762	0.7158	0.5022	0.3402	0.3928	0.6758	0.9303	0.9874	0.9958 (94)
Useful gains	684.1685	843.3057	978.0118	1066.0920	961.0885	675.2912	437.3448	459.8114	698.3675	780.4417	690.9228	644.1883 (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	1878.4939	1826.4795	1659.1728	1382.9257	1054.8235	688.4229	438.8854	462.8395	749.5214	1153.7229	1537.3556	1864.1685 (97)
Space heating kWh	888.5781	660.6928	506.7838	228.1203	69.7389	0.0000	0.0000	0.0000	0.0000	277.7212	609.4316	907.6653 (98a)
Space heating requirement - total per year (kWh/year)												4148.7319
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	888.5781	660.6928	506.7838	228.1203	69.7389	0.0000	0.0000	0.0000	0.0000	277.7212	609.4316	907.6653 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4148.7319
Space heating per m2										(98c) / (4) =		39.5117 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1180.0887	929.0060	951.6396	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9154	0.9558	0.9338	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1080.2790	887.9826	888.6560	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1517.8058	1451.3661	1319.7078	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	315.0193	419.1573	320.7025	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fc = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	78.7548	104.7893	80.1756	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												263.7198 (107)
Energy for space heating												39.5117 (99)
Energy for space cooling												2.5116 (108)
Total												42.0233 (109)
Fabric Energy Efficiency (TFEE)												42.0 (109)

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)
Main dwelling	105.0000 (1b)	x 2.4000 (2b)	= 252.0000 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	105.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	252.0000 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (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) =	40.0000 / (5) = 0.1587 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4087 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.4087 (21)

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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	0.5211	0.5109	0.5007	0.4496	0.4394	0.3883	0.3883	0.3781	0.4087	0.4394	0.4598	0.4803 (22b)
Effective ac	0.6358	0.6305	0.6253	0.6011	0.5965	0.5754	0.5754	0.5715	0.5835	0.5965	0.6057	0.6153 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
w			29.8500	1.3258	39.5739		(27)
gf			105.0000	0.1200	12.6000		(28a)
External Wall 1	110.0000	29.8500	80.1500	0.1900	15.2285		(29a)
pitched flat c	105.0000		105.0000	0.0900	9.4500		(30)
Total net area of external elements Aum(A, m2)			320.0000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		76.8524		(33)

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

250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	0.0000	0.0190	0.0000
E3 Sill	0.0000	0.0160	0.0000
E4 Jamb	0.0000	0.0170	0.0000
E5 Ground floor (normal)	46.0000	0.0540	2.4840
E6 Intermediate floor within a dwelling	0.0000	0.0080	0.0000
E10 Eaves (insulation at ceiling level)	0.0000	0.0480	0.0000
E11 Eaves (insulation at rafter level)	0.0000	0.0410	0.0000
E12 Gable (insulation at ceiling level)	0.0000	0.0560	0.0000
E13 Gable (insulation at rafter level)	0.0000	0.0580	0.0000
E16 Corner (normal)	0.0000	0.0400	0.0000
E17 Corner (inverted - internal area greater than external area)	0.0000	-0.0680	-0.0000
R1 Head of roof window	0.0000	0.1200	0.0000
R2 Sill of roof window	0.0000	0.1200	0.0000
R3 Jamb of roof window	0.0000	0.1200	0.0000
E14 Flat roof	0.0000	0.0460	0.0000
E18 Party wall between dwellings	0.0000	0.0360	0.0000

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

2.4840 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 79.3364 (37)

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

(38)m	Jan 52.8722	Feb 52.4337	Mar 52.0039	Apr 49.9851	May 49.6074	Jun 47.8491	Jul 47.8491	Aug 47.5235	Sep 48.5264	Oct 49.6074	Nov 50.3715	Dec 51.1703 (38)
Heat transfer coeff	132.2086	131.7701	131.3403	129.3215	128.9438	127.1855	127.1855	126.8599	127.8627	128.9438	129.7079	130.5067 (39)
Average = Sum(39)m / 12 =												129.3197

HLP	Jan 1.2591	Feb 1.2550	Mar 1.2509	Apr 1.2316	May 1.2280	Jun 1.2113	Jul 1.2113	Aug 1.2082	Sep 1.2177	Oct 1.2280	Nov 1.2353	Dec 1.2429 (40)
HLP (average)												1.2316
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

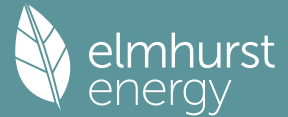
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.7812 (42)
Hot water usage for mixer showers												
77.6948	76.5053	74.7523	72.0555	69.6394	66.2591	63.5856	66.7111	68.2831	71.6311	75.1177	77.6247	(42a)
Hot water usage for baths												
29.9100	29.4585	28.8161	27.8542	26.9873	25.7939	24.8886	25.9957	26.5767	27.7592	28.9886	29.8862	(42b)
Hot water usage for other uses												
43.1127	41.5450	39.9772	38.4095	36.8418	35.2740	35.2740	36.8418	38.4095	39.9772	41.5450	43.1127	(42c)
Average daily hot water use (litres/day)												138.5556 (43)

Daily hot water use	Jan 150.7174	Feb 147.5087	Mar 143.5457	Apr 138.3193	May 133.4685	Jun 127.3271	Jul 123.7482	Aug 129.5486	Sep 133.2693	Oct 139.3675	Nov 145.6513	Dec 150.6237 (44)
Energy conte	221.8821	195.1838	205.1238	180.6795	171.9876	147.2495	136.7454	152.4810	154.5858	179.5891	196.8525	221.2019 (45)
Energy content (annual)										Total = Sum(45)m =		2163.5622
Distribution loss (46)m = 0.15 x (45)m												
33.2823	29.2776	30.7686	27.1019	25.7981	22.0874	20.5118	22.8722	23.1879	26.9384	29.5279	33.1803	(46)
Water storage loss (or HIU loss):												
Store volume												210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												2.0000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0800 (55)
Total storage loss												
33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(56)
If cylinder contains dedicated solar storage												
33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	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	(61)
Total heat required for water heating calculated for each month												
278.6245	246.4350	261.8662	235.5915	228.7300	202.1615	193.4878	209.2234	209.4978	236.3315	251.7645	277.9443	(62)
WWHRS	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	(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	(63c)
FGHRS	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												
278.6245	246.4350	261.8662	235.5915	228.7300	202.1615	193.4878	209.2234	209.4978	236.3315	251.7645	277.9443	(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												
119.1697	105.8996	113.5976	104.0055	102.5798	92.8901	90.8618	96.0939	95.3294	105.1073	109.3831	118.9435	(65)

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

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Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	32.3621	28.7437	23.3760	17.6971	13.2288	11.1683	12.0677	15.6861	21.0539	26.7327	31.2010	33.2615	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	394.2789	398.3702	388.0601	366.1110	338.4042	312.3638	294.9671	290.8758	301.1859	323.1350	350.8418	376.8822	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	(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)	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	(71)
Water heating gains (Table 5)	160.1744	157.5887	152.6849	144.4522	137.8761	129.0140	122.1260	129.1584	132.4019	141.2733	151.9209	159.8704	(72)
Total internal gains	696.9088	694.7962	674.2145	638.3538	599.6026	562.6396	539.2544	545.8138	564.7352	601.2345	644.0573	680.1076	(73)

6. Solar gains

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

North						3.2600	10.6334	0.6300	0.7000	1.0000	13.7585 (74)	
East						10.5100	19.6403	0.6300	0.7000	1.0000	81.9278 (76)	
South						3.2600	46.7521	0.6300	0.7000	1.0000	60.4922 (78)	
West						12.8200	19.6403	0.6300	0.7000	1.0000	99.9347 (80)	

Solar gains	256.1132	481.1255	756.7657	1068.8806	1292.5072	1318.5273	1256.9649	1089.0486	866.9601	560.2967	315.4379	213.2955 (83)
Total gains	953.0220	1175.9216	1430.9802	1707.2344	1892.1098	1881.1669	1796.2194	1634.8625	1431.6953	1161.5312	959.4952	893.4031 (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	55.1528	55.3363	55.5174	56.3840	56.5492	57.3310	57.3310	57.4781	57.0273	56.5492	56.2161	55.8720	
alpha	4.6769	4.6891	4.7012	4.7589	4.7699	4.8221	4.8221	4.8319	4.8018	4.7699	4.7477	4.7248	
util living area	0.9887	0.9710	0.9193	0.7885	0.6054	0.4283	0.3108	0.3554	0.5916	0.8803	0.9759	0.9914 (86)	
Living	19.9837	20.1979	20.4914	20.7700	20.8945	20.9296	20.9347	20.9340	20.9089	20.6947	20.2815	19.9506	
Non living	18.7091	18.9801	19.3388	19.6634	19.7852	19.8256	19.8283	19.8306	19.8080	19.5976	19.1009	18.6773	
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	20.4801	20.1979	20.4914	20.7700	20.8945	20.9296	20.9347	20.9340	20.9089	20.6947	20.2815	20.0974 (87)	
Th 2	19.8730	19.8763	19.8795	19.8948	19.8976	19.9110	19.9110	19.9135	19.9058	19.8976	19.8919	19.8858 (88)	
util rest of house	0.9852	0.9624	0.8975	0.7433	0.5428	0.3574	0.2343	0.2723	0.5076	0.8395	0.9673	0.9887 (89)	
MIT 2	19.4090	18.9801	19.3388	19.6634	19.7852	19.8256	19.8283	19.8306	19.8080	19.5976	19.1009	18.8951 (90)	
Living area fraction									fLA = Living area / (4) =			0.1619 (91)	
MIT	19.5824	19.1772	19.5254	19.8425	19.9648	20.0043	20.0074	20.0093	19.9862	19.7752	19.2920	19.0897 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.5824	19.1772	19.5254	19.8425	19.9648	20.0043	20.0074	20.0093	19.9862	19.7752	19.2920	19.0897 (93)	

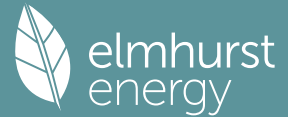
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9841	0.9555	0.8894	0.7410	0.5467	0.3636	0.2411	0.2796	0.5140	0.8342	0.9611	0.9861 (94)	
Useful gains	937.8216	1123.6283	1272.7275	1265.0627	1034.4522	683.9424	433.0305	457.1678	735.9468	968.9488	922.1897	880.9792 (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	2020.4643	1881.3112	1710.7583	1415.1034	1065.6984	687.3503	433.3768	457.8717	752.6258	1183.0857	1581.3985	1943.2110 (97)	
Space heating kWh	805.4861	509.1629	325.8949	108.0293	23.2472	0.0000	0.0000	0.0000	0.0000	159.3179	474.6303	790.3005 (98a)	
Space heating requirement - total per year (kWh/year)												3196.0691	
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	805.4861	509.1629	325.8949	108.0293	23.2472	0.0000	0.0000	0.0000	0.0000	159.3179	474.6303	790.3005 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												3196.0691	
Space heating per m2										(98c) / (4) =		30.4388 (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 %)													360.3845 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	805.4861	509.1629	325.8949	108.0293	23.2472	0.0000	0.0000	0.0000	0.0000	159.3179	474.6303	790.3005 (98)	
Space heating efficiency (main heating system 1)	360.3845	360.3845	360.3845	360.3845	360.3845	0.0000	0.0000	0.0000	0.0000	360.3845	360.3845	360.3845 (210)	
Space heating fuel (main heating system)	223.5074	141.2833	90.4298	29.9761	6.4507	0.0000	0.0000	0.0000	0.0000	44.2078	131.7011	219.2937 (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)	

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Water heating requirement	278.6245	246.4350	261.8662	235.5915	228.7300	202.1615	193.4878	209.2234	209.4978	236.3315	251.7645	277.9443 (64)
Efficiency of water heater (217)m	187.1268	187.1268	187.1268	187.1268	187.1268	187.1268	187.1268	187.1268	187.1268	187.1268	187.1268	187.1268 (216)
Fuel for water heating, kWh/month	148.8961	131.6941	139.9405	125.8994	122.2326	108.0345	103.3993	111.8084	111.9550	126.2948	134.5422	148.5326 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	28.3263	22.7244	20.4608	14.9905	11.5791	9.4602	10.5628	13.7300	17.8339	23.3990	26.4291	29.1136 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-32.7872	-50.6467	-80.9966	-100.4375	-115.8889	-110.5819	-107.7383	-97.1182	-78.6473	-59.6271	-37.0629	-27.7617 (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	-8.9325	-21.5220	-51.6033	-96.0042	-146.5600	-156.4383	-151.8871	-115.8394	-72.9333	-34.9754	-12.8577	-6.8946 (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												886.8498 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												187.1268
Water heating fuel used												1513.2293 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												0.0000 (231)
Electricity for lighting (calculated in Appendix L)												228.6098 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-1775.7420 (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												852.9469 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	886.8498	16.4900	146.2415 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1513.2293	16.4900	249.5315 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	228.6098	16.4900	37.6978 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-899.2942	16.4900	-148.2936
PV Unit electricity exported	-876.4478	5.5900	-48.9934
Total			-197.2870 (252)
Total energy cost			236.1838 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)		0.5668 (257)
SAP value	$[(255) \times (256)] / [(4) + 45.0] =$	90.8115
SAP rating (Section 12)		91 (258)
SAP band		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	886.8498	0.1575	139.6549 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1513.2293	0.1409	213.2156 (264)
Space and water heating			352.8705 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	228.6098	0.1443	32.9955 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-899.2942	0.1328	-119.4321
PV Unit electricity exported	-876.4478	0.1211	-106.1750
Total			-225.6071 (269)
Total CO2, kg/year			160.2588 (272)
CO2 emissions per m2			1.5300 (273)
EI value			98.5684
EI rating			99 (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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	105.0000 (1b)	2.4000 (2b)	252.0000 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	105.0000		252.0000 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	252.0000 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (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) =	40.0000 / (5) = 0.1587 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4087 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.4087 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.8000	4.5000	4.4000	3.9000	3.9000	3.6000	3.7000	3.5000	3.7000	4.0000	4.1000	4.4000 (22)
Wind factor	1.2000	1.1250	1.1000	0.9750	0.9750	0.9000	0.9250	0.8750	0.9250	1.0000	1.0250	1.1000 (22a)
Adj infilt rate	0.4905	0.4598	0.4496	0.3985	0.3985	0.3679	0.3781	0.3576	0.3781	0.4087	0.4189	0.4496 (22b)
Effective ac	0.6203	0.6057	0.6011	0.5794	0.5794	0.5677	0.5715	0.5640	0.5715	0.5835	0.5878	0.6011 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
w			29.8500	1.3258	39.5739		(27)
gf			105.0000	0.1200	12.6000		(28a)
External Wall 1	110.0000	29.8500	80.1500	0.1900	15.2285		(29a)
pitched flat c	105.0000		105.0000	0.0900	9.4500		(30)
Total net area of external elements Aum(A, m ²)			320.0000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	76.8524		(33)

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

List of Thermal Bridges	Length	Psi-value	Total
K1 Element	0.0000	0.0190	0.0000
E2 Other lintels (including other steel lintels)	0.0000	0.0160	0.0000
E3 Sill	0.0000	0.0170	0.0000
E4 Jamb	0.0000	0.0540	2.4840
E5 Ground floor (normal)	0.0000	0.0080	0.0000
E6 Intermediate floor within a dwelling	0.0000	0.0480	0.0000
E10 Eaves (insulation at ceiling level)	0.0000	0.0410	0.0000
E11 Eaves (insulation at rafter level)	0.0000	0.0560	0.0000
E12 Gable (insulation at ceiling level)	0.0000	0.0580	0.0000
E13 Gable (insulation at rafter level)	0.0000	0.0400	0.0000
E16 Corner (normal)	0.0000	-0.0680	-0.0000
E17 Corner (inverted - internal area greater than external area)	0.0000	0.1200	0.0000
R1 Head of roof window	0.0000	0.1200	0.0000
R2 Sill of roof window	0.0000	0.1200	0.0000
R3 Jamb of roof window	0.0000	0.0460	0.0000
E14 Flat roof	0.0000	0.0360	0.0000
E18 Party wall between dwellings			
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			2.4840 (36)
Point Thermal Bridges			0.0000
Total fabric heat loss	(33) + (36) + (36a) =		79.3364 (37)

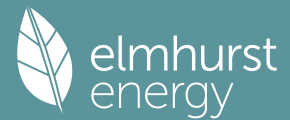
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	51.5828	50.3715	49.9851	48.1834	48.1834	47.2066	47.5235	46.8983	47.5235	48.5264	48.8780	49.9851 (38)
Heat transfer coeff	130.9191	129.7079	129.3215	127.5198	127.5198	126.5429	126.8599	126.2347	126.8599	127.8627	128.2144	129.3215 (39)
Average = Sum(39)m / 12 =												128.0737
HLP	1.2468	1.2353	1.2316	1.2145	1.2145	1.2052	1.2082	1.2022	1.2082	1.2177	1.2211	1.2316 (40)
HLP (average)												1.2197
Days in month	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.7812 (42)
Hot water usage for mixer showers	

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Hot water usage for baths	77.6948	76.5053	74.7523	72.0555	69.6394	66.2591	63.5856	66.7111	68.2831	71.6311	75.1177	77.6247 (42a)
Hot water usage for other uses	29.9100	29.4585	28.8161	27.8542	26.9873	25.7939	24.8886	25.9957	26.5767	27.7592	28.9886	29.8862 (42b)
Average daily hot water use (litres/day)	43.1127	41.5450	39.9772	38.4095	36.8418	35.2740	35.2740	36.8418	38.4095	39.9772	41.5450	43.1127 (42c)
												138.5556 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	150.7174	147.5087	143.5457	138.3193	133.4685	127.3271	123.7482	129.5486	133.2693	139.3675	145.6513	150.6237 (44)
Distribution loss (46)m = 0.15 x (45)m	221.8821	195.1838	205.1238	180.6795	171.9876	147.2495	136.7454	152.4810	154.5858	179.5891	196.8525	221.2019 (45)
Water storage loss (or HIU loss):	33.2823	29.2776	30.7686	27.1019	25.7981	22.0874	20.5118	22.8722	23.1879	26.9384	29.5279	33.1803 (46)
Store volume												210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												2.0000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0800 (55)
Total storage loss	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800 (56)
If cylinder contains dedicated solar storage	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800 (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	278.6245	246.4350	261.8662	235.5915	228.7300	202.1615	193.4878	209.2234	209.4978	236.3315	251.7645	277.9443 (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	278.6245	246.4350	261.8662	235.5915	228.7300	202.1615	193.4878	209.2234	209.4978	236.3315	251.7645	277.9443 (64)
												2831.6582 (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)
												0.0000 (64a)
Heat gains from water heating, kWh/month	119.1697	105.8996	113.5976	104.0055	102.5798	92.8901	90.8618	96.0939	95.3294	105.1073	109.3831	118.9435 (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	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	32.3621	28.7437	23.3760	17.6971	13.2288	11.1683	12.0677	15.6861	21.0539	26.7327	31.2010	33.2615 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	394.2789	398.3702	388.0601	366.1110	338.4042	312.3638	294.9671	290.8758	301.1859	323.1350	350.8418	376.8822 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687 (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)	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497 (71)
Water heating gains (Table 5)	160.1744	157.5887	152.6849	144.4522	137.8761	129.0140	122.1260	129.1584	132.4019	141.2733	151.9209	159.8704 (72)
Total internal gains	696.9088	694.7962	674.2145	638.3538	599.6026	562.6396	539.2544	545.8138	564.7352	601.2345	644.0573	680.1076 (73)

6. Solar gains

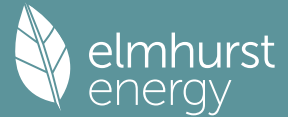
[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	3.2600	12.7054	0.6300	0.7000	1.0000	16.4394 (74)
East	10.5100	23.7288	0.6300	0.7000	1.0000	98.9828 (76)
South	3.2600	53.5774	0.6300	0.7000	1.0000	69.3234 (78)
West	12.8200	23.7288	0.6300	0.7000	1.0000	120.7383 (80)

Solar gains	305.4839	510.8277	800.8544	1190.9994	1383.3265	1507.7079	1420.9053	1243.8826	981.9655	636.3518	380.0670	245.9379 (83)
Total gains	1002.3927	1205.6238	1475.0689	1829.3532	1982.9291	2070.3475	1960.1597	1789.6965	1546.7007	1237.5863	1024.1243	926.0456 (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	55.6960	56.2161	56.3840	57.1807	57.1807	57.6221	57.4781	57.7628	57.4781	57.0273	56.8709	56.3840
alpha	4.7131	4.7477	4.7589	4.8120	4.8120	4.8415	4.8319	4.8509	4.8319	4.8018	4.7914	4.7589
util living area	0.9836	0.9636	0.8970	0.7258	0.5270	0.3410	0.2328	0.2467	0.4839	0.8107	0.9592	0.9872 (86)
Living	20.1001	20.2851	20.5770	20.8306	20.9159	20.9341	20.9357	20.9359	20.9262	20.7950	20.4277	20.0831
Non living	18.8641	19.1009	19.4521	19.7365	19.8130	19.8330	19.8312	19.8363	19.8267	19.7093	19.2905	18.8528
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	20.5396	20.2851	20.5770	20.8306	20.9159	20.9341	20.9357	20.9359	20.9262	20.7950	20.4277	20.2114 (87)
Th 2	19.8827	19.8919	19.8948	19.9084	19.9084	19.9159	19.9135	19.9182	19.9135	19.9058	19.9032	19.8948 (88)
util rest of house	0.9783	0.9528	0.8702	0.6752	0.4633	0.2756	0.1626	0.1705	0.4000	0.7530	0.9444	0.9830 (89)
MIT 2	19.4766	19.1009	19.4521	19.7365	19.8130	19.8330	19.8312	19.8363	19.8267	19.7093	19.2905	19.0406 (90)
Living area fraction									fLA = Living area / (4) =			0.1619 (91)
MIT	19.6487	19.2927	19.6342	19.9136	19.9916	20.0113	20.0100	20.0143	20.0047	19.8851	19.4746	19.2301 (92)
Temperature adjustment												0.0000
adjusted MIT	19.6487	19.2927	19.6342	19.9136	19.9916	20.0113	20.0100	20.0143	20.0047	19.8851	19.4746	19.2301 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9770	0.9455	0.8629	0.6755	0.4683	0.2814	0.1689	0.1773	0.4072	0.7518	0.9371	0.9796	(94)
Useful gains	979.3426	1139.9029	1272.8350	1235.6906	928.5867	582.6131	331.0549	317.3318	629.8062	930.4435	959.7549	907.1863	(95)
Ext temp.	5.0000	5.4000	7.1000	9.5000	12.6000	15.4000	17.4000	17.5000	15.0000	11.7000	8.1000	5.2000	(96)
Heat loss rate W	1917.7979	1801.9872	1620.9441	1327.9434	942.5742	583.5247	331.1060	317.3911	634.9011	1046.5660	1458.3932	1814.3950	(97)
Space heating kWh	698.2107	444.9206	258.9932	66.4220	10.4067	0.0000	0.0000	0.0000	0.0000	86.3951	359.0196	674.9633	(98a)
Space heating requirement - total per year (kWh/year)												2599.3312	
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	698.2107	444.9206	258.9932	66.4220	10.4067	0.0000	0.0000	0.0000	0.0000	86.3951	359.0196	674.9633	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2599.3312	
Space heating per m2										(98c) / (4) =		24.7555	(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 %)													359.7392	(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	698.2107	444.9206	258.9932	66.4220	10.4067	0.0000	0.0000	0.0000	0.0000	86.3951	359.0196	674.9633	(98)	
Space heating efficiency (main heating system 1)	359.7392	359.7392	359.7392	359.7392	359.7392	0.0000	0.0000	0.0000	0.0000	359.7392	359.7392	359.7392	(210)	
Space heating fuel (main heating system)	194.0880	123.6787	71.9947	18.4639	2.8928	0.0000	0.0000	0.0000	0.0000	24.0160	99.8000	187.6257	(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	278.6245	246.4350	261.8662	235.5915	228.7300	202.1615	193.4878	209.2234	209.4978	236.3315	251.7645	277.9443	(64)	
Efficiency of water heater (217)m	187.2032	187.2032	187.2032	187.2032	187.2032	187.2032	187.2032	187.2032	187.2032	187.2032	187.2032	187.2032	(216)	
Fuel for water heating, kWh/month	148.8354	131.6404	139.8834	125.8481	122.1828	107.9905	103.3571	111.7628	111.9093	126.2433	134.4873	148.4720	(219)	
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)	
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)	
Lighting	28.3263	22.7244	20.4608	14.9905	11.5791	9.4602	10.5628	13.7300	17.8339	23.3990	26.4291	29.1136	(232)	
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-38.1450	-53.2701	-84.6828	-107.9313	-121.2033	-119.7497	-116.0370	-106.0382	-86.2438	-65.4556	-43.1171	-31.3718	(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	-11.8219	-24.0591	-57.7902	-114.9263	-164.5221	-190.4449	-182.3085	-141.5906	-88.3638	-43.2487	-17.3675	-8.6960	(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													722.5599	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													187.2032	
Water heating fuel used													1512.6123	(219)
Space cooling fuel													0.0000	(221)
Electricity for pumps and fans:														
Total electricity for the above, kWh/year													0.0000	(231)
Electricity for lighting (calculated in Appendix L)													228.6098	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-2018.3854	(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													445.3966	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	722.5599	28.4300	205.4238	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1512.6123	28.4300	430.0357	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Energy for lighting	228.6098	28.4300	64.9938	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-973.2459	28.4300	-276.6938	
PV Unit electricity exported	-1045.1395	5.8100	-60.7226	

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Total	-337.4164 (252)
Total energy cost	363.0368 (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	722.5599	0.1583	114.3813 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1512.6123	0.1409	213.1287 (264)
Space and water heating			327.5100 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	228.6098	0.1443	32.9955 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-973.2459	0.1329	-129.3047
PV Unit electricity exported	-1045.1395	0.1208	-126.2727
Total			-255.5774 (269)
Total CO2, kg/year			104.9280 (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	722.5599	1.5860	1145.9485 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1512.6123	1.5210	2300.6834 (278)
Space and water heating			3446.6319 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	228.6098	1.5338	350.6493 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-973.2459	1.4909	-1451.0275
PV Unit electricity exported	-1045.1395	0.4432	-463.1582
Total			-1914.1856 (283)
Total Primary energy kWh/year			1883.0956 (286)

SAP 10 EPC IMPROVEMENTS

DK-35

Current energy efficiency rating:	B 91
Current environmental impact rating:	A 99

N Solar water heating	Recommended
U Solar photovoltaic panels	Already installed
V2 Wind turbine	Not applicable
Recommended measures:	
N Solar water heating	SAP change + 1.6 Cost change -£ 82 CO2 change -40 kg (37.7%)

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
Solar water heating	£82	0.38 kg/m²	A 92 A 99
Total Savings	£82	0.38 kg/m²	
Potential energy efficiency rating:		A 92	
Potential environmental impact rating:			A 99

Fuel prices for cost data on this page from database revision number 585 TEST (31 Oct 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

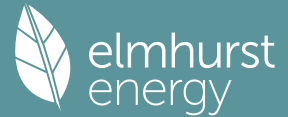
Typical heating and lighting costs of this home (per year, South East England):

	Current £700	Potential £608	Saving £92
Electricity			
Space heating	£205	£228	-£23
Water heating	£430	£315	£115
Lighting	£65	£65	£0
Generated (PV)	-£337	-£327	-£10
Total cost of fuels	£363	£281	£82
Total cost of uses	£363	£281	£82
Delivered energy	4 kWh/m²	1 kWh/m²	3 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	18 kWh/m²	14 kWh/m²	4 kWh/m²

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

1. Overall dwelling characteristics

Full SAP Calculation Printout



Main dwelling	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	105.0000 (1b)	x 2.4000 (2b)	= 252.0000 (1b) - (3b)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	105.0000			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 252.0000 (5)	

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (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)+(7a)+(7b)+(7c) =	Air changes per hour 40.0000 / (5) =	0.1587 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.4087	(18)
Number of sides sheltered	0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.4087 (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	0.5211	0.5109	0.5007	0.4496	0.4394	0.3883	0.3883	0.3781	0.4087	0.4394	0.4598	0.4803	(22b)
Effective ac	0.6358	0.6305	0.6253	0.6011	0.5965	0.5754	0.5754	0.5715	0.5835	0.5965	0.6057	0.6153	(25)

3. Heat losses and heat loss parameter

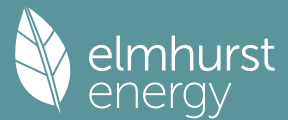
Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
w			29.8500	1.3258	39.5739			(27)
gf			105.0000	0.1200	12.6000			(28a)
External Wall 1	110.0000	29.8500	80.1500	0.1900	15.2285			(29a)
pitched flat c	105.0000		105.0000	0.0900	9.4500			(30)
Total net area of external elements Aum(A, m2)			320.0000					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 76.8524			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
List of Thermal Bridges								
K1 Element				Length	Psi-value	Total		
E2 Other lintels (including other steel lintels)				0.0000	0.0190	0.0000		
E3 Sill				0.0000	0.0160	0.0000		
E4 Jamb				0.0000	0.0170	0.0000		
E5 Ground floor (normal)				46.0000	0.0540	2.4840		
E6 Intermediate floor within a dwelling				0.0000	0.0080	0.0000		
E10 Eaves (insulation at ceiling level)				0.0000	0.0480	0.0000		
E11 Eaves (insulation at rafter level)				0.0000	0.0410	0.0000		
E12 Gable (insulation at ceiling level)				0.0000	0.0560	0.0000		
E13 Gable (insulation at rafter level)				0.0000	0.0580	0.0000		
E16 Corner (normal)				0.0000	0.0400	0.0000		
E17 Corner (inverted - internal area greater than external area)				0.0000	-0.0680	-0.0000		
R1 Head of roof window				0.0000	0.1200	0.0000		
R2 Sill of roof window				0.0000	0.1200	0.0000		
R3 Jamb of roof window				0.0000	0.1200	0.0000		
E14 Flat roof				0.0000	0.0460	0.0000		
E18 Party wall between dwellings				0.0000	0.0360	0.0000		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							2.4840	(36)
Point Thermal bridges							(36a) = 0.0000	
Total fabric heat loss							(33) + (36) + (36a) = 79.3364	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 52.8722	Feb 52.4337	Mar 52.0039	Apr 49.9851	May 49.6074	Jun 47.8491	Jul 47.8491	Aug 47.5235	Sep 48.5264	Oct 49.6074	Nov 50.3715	Dec 51.1703	(38)
Heat transfer coeff	132.2086	131.7701	131.3403	129.3215	128.9438	127.1855	127.1855	126.8599	127.8627	128.9438	129.7079	130.5067	(39)
Average = Sum(39)m / 12 =												129.3197	
HLP	Jan 1.2591	Feb 1.2550	Mar 1.2509	Apr 1.2316	May 1.2280	Jun 1.2113	Jul 1.2113	Aug 1.2082	Sep 1.2177	Oct 1.2280	Nov 1.2353	Dec 1.2429	(40)
HLP (average)												1.2316	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.7812 (42)
Hot water usage for mixer showers													
77.6948	76.5053	74.7523	72.0555	69.6394	66.2591	63.5856	66.7111	68.2831	71.6311	75.1177	77.6247	77.6247	(42a)
Hot water usage for baths													
29.9100	29.4585	28.8161	27.8542	26.9873	25.7939	24.8886	25.9957	26.5767	27.7592	28.9886	29.8862	29.8862	(42b)
Hot water usage for other uses													
43.1127	41.5450	39.9772	38.4095	36.8418	35.2740	35.2740	36.8418	38.4095	39.9772	41.5450	43.1127	43.1127	(42c)
Average daily hot water use (litres/day)												138.5556	(43)
Daily hot water use	Jan 150.7174	Feb 147.5087	Mar 143.5457	Apr 138.3193	May 133.4685	Jun 127.3271	Jul 123.7482	Aug 129.5486	Sep 133.2693	Oct 139.3675	Nov 145.6513	Dec 150.6237	(44)
Energy conte	221.8821	195.1838	205.1238	180.6795	171.9876	147.2495	136.7454	152.4810	154.5858	179.5891	196.8525	221.2019	(45)

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Energy content (annual)	Total = Sum(45)m = 2163.5622										
Distribution loss (46)m = 0.15 x (45)m											
33.2823 29.2776 30.7686 27.1019 25.7981 22.0874 20.5118 22.8722 23.1879 26.9384 29.5279 33.1803 (46)											
Water storage loss (or HIU loss):											
Store volume	210.0000 (47)										
a) If manufacturer declared loss factor is known (kWh/day):	2.0000 (48)										
Temperature factor from Table 2b	0.5400 (49)										
Enter (49) or (54) in (55)	1.0800 (55)										
Total storage loss											
33.4800 30.2400 33.4800 32.4000 33.4800 32.4000 33.4800 33.4800 32.4000 33.4800 32.4000 33.4800 (56)											
If cylinder contains dedicated solar storage											
33.4800 30.2400 33.4800 32.4000 33.4800 32.4000 33.4800 33.4800 32.4000 33.4800 32.4000 33.4800 (57)											
Primary loss	23.2624 21.0112 21.8667 15.7584 10.4681 9.9053 10.2355 11.1660 17.1091 21.8667 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 (61)										
Total heat required for water heating calculated for each month											
278.6245 246.4350 260.4704 228.8379 215.9357 189.5548 180.4608 197.1270 204.0949 234.9358 251.7645 277.9443 (62)											
WWHRS	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 (63b)										
Aperture area of solar collector	3.0000 (H1)										
Zero-loss collector efficiency	0.8000 (H2)										
Collector linear heat loss coefficient	1.8000 (H3)										
Collector 2nd order heat loss coefficient	0.0000 (H4)										
Collector loop efficiency	0.9000 (H5)										
Incidence angle modifier	1.0000 (H6)										
Overshading factor	0.8000 (H8)										
Overall heat loss coefficient of system	6.5000 (H10)										
Heat loss coefficient of collector loop	3.9667 (H11)										
Dedicated solar storage volume	75.0000 (H12)										
Effective solar volume	75.0000 (H14)										
Reference volume	225.0000 (H15)										
Storage tank correction coefficient	1.3161 (H16)										
Heat delivered to hot water	587.7702 (H24)										
Heat delivered to space heating	0.0000 (H29)										
Solar input	587.7702										
Solar input	-0.0000 -10.1099 -52.0948 -77.4542 -103.1863 -93.7239 -90.7262 -81.5028 -54.1433 -24.8288 -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 (63d)										
Output from w/h											
278.6245 236.3252 208.3757 151.3838 112.7494 95.8309 89.7347 115.6241 149.9516 210.1070 251.7645 277.9443 (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											
119.1697 105.8996 112.4810 98.6027 92.3443 82.8047 80.4402 86.4167 91.0071 103.9907 109.3831 118.9435 (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	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	32.3621	28.7437	23.3760	17.6971	13.2288	11.1683	12.0677	15.6861	21.0539	26.7327	31.2010	33.2615 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	394.2789	398.3702	388.0601	366.1110	338.4042	312.3638	294.9671	290.8758	301.1859	323.1350	350.8418	376.8822 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687 (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)	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497 (71)
Water heating gains (Table 5)	160.1744	157.5887	151.1841	136.9482	124.1187	115.0065	108.1186	116.1515	126.3987	139.7725	151.9209	159.8704 (72)
Total internal gains	696.9088	694.7962	672.7137	630.8498	585.8453	548.6321	525.2470	532.8069	558.7320	599.7337	644.0573	680.1076 (73)

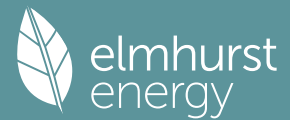
6. Solar gains

[Jan]						Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W	
North						3.2600	10.6334	0.6300	0.7000			1.0000	13.7585 (74)	
East						10.5100	19.6403	0.6300	0.7000			1.0000	81.9278 (76)	
South						3.2600	46.7521	0.6300	0.7000			1.0000	60.4922 (78)	
West						12.8200	19.6403	0.6300	0.7000			1.0000	99.9347 (80)	
Solar gains	256.1132	481.1255	756.7657	1068.8806	1292.5072	1318.5273	1256.9649	1089.0486	866.9601	560.2967	315.4379	213.2955 (83)		
Total gains	953.0220	1175.9216	1429.4794	1699.7304	1878.3525	1867.1594	1782.2119	1621.8555	1425.6921	1160.0304	959.4952	893.4031 (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	55.1528	55.3363	55.5174	56.3840	56.5492	57.3310	57.3310	57.4781	57.0273	56.5492	56.2161	55.8720
alpha	4.6769	4.6891	4.7012	4.7589	4.7699	4.8221	4.8221	4.8319	4.8018	4.7699	4.7477	4.7248
util living area	0.9887	0.9710	0.9196	0.7905	0.6091	0.4314	0.3132	0.3582	0.5937	0.8808	0.9759	0.9914 (86)
Living	19.9837	20.1979	20.4906	20.7681	20.8935	20.9294	20.9347	20.9339	20.9085	20.6940	20.2815	19.9506
Non living	18.7091	18.9801	19.3379	19.6615	19.7844	19.8255	19.8283	19.8306	19.8077	19.5969	19.1009	18.6773
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	20.4801	20.1979	20.4906	20.7681	20.8935	20.9294	20.9347	20.9339	20.9085	20.6940	20.2815	20.0974 (87)
Th 2	19.8730	19.8763	19.8795	19.8948	19.8976	19.9110	19.9110	19.9135	19.9058	19.8976	19.8919	19.8858 (88)
util rest of house	0.9852	0.9624	0.8978	0.7455	0.5463	0.3600	0.2361	0.2744	0.5096	0.8400	0.9673	0.9887 (89)
MIT 2	19.4090	18.9801	19.3379	19.6615	19.7844	19.8255	19.8283	19.8306	19.8077	19.5969	19.1009	18.8951 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.5824	19.1772	19.5245	19.8406	19.9640	20.0042	20.0074	20.0092	19.9859	19.7746	19.2920	19.0897 (92)
Temperature adjustment	0.0000											

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adjusted MIT 19.5824 19.1772 19.5245 19.8406 19.9640 20.0042 20.0074 20.0092 19.9859 19.7746 19.2920 19.0897 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9841	0.9555	0.8897	0.7431	0.5502	0.3662	0.2430	0.2819	0.5160	0.8347	0.9611	0.9861	(94)
Useful gains	937.8216	1123.6283	1271.8294	1263.0135	1033.5060	683.8181	433.0162	457.1387	735.6450	968.2690	922.1897	880.9792	(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	2020.4643	1881.3112	1710.6460	1414.8606	1065.5903	687.3359	433.3749	457.8680	752.5909	1183.0030	1581.3985	1943.2110	(97)
Space heating kWh	805.4861	509.1629	326.4795	109.3299	23.8707	0.0000	0.0000	0.0000	0.0000	159.7621	474.6303	790.3005	(98a)
Space heating requirement - total per year (kWh/year)												3199.0221	
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	805.4861	509.1629	326.4795	109.3299	23.8707	0.0000	0.0000	0.0000	0.0000	159.7621	474.6303	790.3005	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3199.0221	
Space heating per m2										(98c) / (4) =		30.4669	(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 %)													360.3845 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement	805.4861	509.1629	326.4795	109.3299	23.8707	0.0000	0.0000	0.0000	0.0000	159.7621	474.6303	790.3005	(98)
Space heating efficiency (main heating system 1)	360.3845	360.3845	360.3845	360.3845	360.3845	0.0000	0.0000	0.0000	0.0000	360.3845	360.3845	360.3845	(210)
Space heating fuel (main heating system)	223.5074	141.2833	90.5920	30.3370	6.6237	0.0000	0.0000	0.0000	0.0000	44.3310	131.7011	219.2937	(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	278.6245	236.3252	208.3757	151.3838	112.7494	95.8309	89.7347	115.6241	149.9516	210.1070	251.7645	277.9443	(64)
Efficiency of water heater	187.1268	187.1268	187.1268	187.1268	187.1268	187.1268	187.1268	187.1268	187.1268	187.1268	187.1268	187.1268	(216)
Fuel for water heating, kWh/month	148.8961	126.2914	111.3553	80.8990	60.2529	51.2118	47.9539	61.7892	80.1337	112.2805	134.5422	148.5326	(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	6.7945	6.1370	6.7945	6.5753	6.7945	6.5753	6.7945	6.7945	6.5753	6.7945	6.5753	6.7945	(231)
Lighting	28.3263	22.7244	20.4608	14.9905	11.5791	9.4602	10.5628	13.7300	17.8339	23.3990	26.4291	29.1136	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-32.8254	-50.6583	-80.1858	-97.3884	-108.8797	-103.0688	-100.5034	-92.1061	-76.7422	-59.4044	-37.1282	-27.7922	(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	-8.8942	-21.5104	-52.4142	-99.0533	-153.5692	-163.9513	-159.1221	-120.8516	-74.8384	-35.1981	-12.7924	-6.8641	(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												887.6692	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												187.1268	
Water heating fuel used												1164.1385	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
pump for solar water heating												80.0000	(230g)
Total electricity for the above, kWh/year												80.0000	(231)
Electricity for lighting (calculated in Appendix L)												228.6098	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1775.7420	(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												584.6754	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	887.6692	16.4900	146.3767	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1164.1385	16.4900	191.9664	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)

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Pump for solar water heating	80.0000	16.4900	13.1920 (249)
Energy for lighting	228.6098	16.4900	37.6978 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-866.6828	16.4900	-142.9160
PV Unit electricity exported	-909.0592	5.5900	-50.8164
Total			-193.7324 (252)
Total energy cost			195.5004 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.4692 (257)
SAP value		92.3943
SAP rating (Section 12)		92 (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	887.6692	0.1575	139.7709 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1164.1385	0.1452	168.9978 (264)
Space and water heating			308.7687 (265)
Pumps, fans and electric keep-hot	80.0000	0.1387	11.0970 (267)
Energy for lighting	228.6098	0.1443	32.9955 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-866.6828	0.1332	-115.4410
PV Unit electricity exported	-909.0592	0.1208	-109.8293
Total			-225.2703 (269)
Total CO2, kg/year			127.5909 (272)
CO2 emissions per m2			1.2200 (273)
EI value			98.8602
EI rating			99 (274)
EI band			A

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	105.0000 (1b)	x 2.4000 (2b)	= 252.0000 (1b) - (3b)
Ground floor			(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	105.0000		(5)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	252.0000 (5)

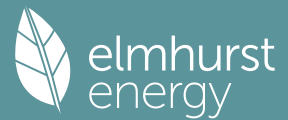
2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (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) =	40.0000 / (5) = 0.1587 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4087 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.4087 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.8000	4.5000	4.4000	3.9000	3.9000	3.6000	3.7000	3.5000	3.7000	4.0000	4.1000	4.4000 (22)
Wind factor	1.2000	1.1250	1.1000	0.9750	0.9750	0.9000	0.9250	0.8750	0.9250	1.0000	1.0250	1.1000 (22a)
Adj infilt rate	0.4905	0.4598	0.4496	0.3985	0.3985	0.3679	0.3781	0.3576	0.3781	0.4087	0.4189	0.4496 (22b)
Effective ac	0.6203	0.6057	0.6011	0.5794	0.5794	0.5677	0.5715	0.5640	0.5715	0.5835	0.5878	0.6011 (25)

3. Heat losses and heat loss parameter

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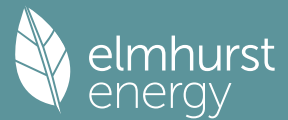
Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K						
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K						
w			29.8500	1.3258	39.5739		(27)						
gf			105.0000	0.1200	12.6000		(28a)						
External Wall 1	110.0000	29.8500	80.1500	0.1900	15.2285		(29a)						
pitched flat c	105.0000		105.0000	0.0900	9.4500		(30)						
Total net area of external elements Aum(A, m2)			320.0000				(31)						
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		76.8524		(33)						
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)						
List of Thermal Bridges				Length	Psi-value	Total							
K1 Element				0.0000	0.0190	0.0000							
E2 Other lintels (including other steel lintels)				0.0000	0.0160	0.0000							
E3 Sill				0.0000	0.0170	0.0000							
E4 Jamb				46.0000	0.0540	2.4840							
E5 Ground floor (normal)				0.0000	0.0080	0.0000							
E6 Intermediate floor within a dwelling				0.0000	0.0480	0.0000							
E10 Eaves (insulation at ceiling level)				0.0000	0.0410	0.0000							
E11 Eaves (insulation at rafter level)				0.0000	0.0560	0.0000							
E12 Gable (insulation at ceiling level)				0.0000	0.0580	0.0000							
E13 Gable (insulation at rafter level)				0.0000	0.0400	0.0000							
E16 Corner (normal)				0.0000	-0.0680	-0.0000							
E17 Corner (inverted - internal area greater than external area)				0.0000	0.1200	0.0000							
R1 Head of roof window				0.0000	0.1200	0.0000							
R2 Sill of roof window				0.0000	0.1200	0.0000							
R3 Jamb of roof window				0.0000	0.0460	0.0000							
E14 Flat roof				0.0000	0.0360	0.0000							
E18 Party wall between dwellings													
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							2.4840 (36)						
Point Thermal bridges						(36a) =	0.0000						
Total fabric heat loss						(33) + (36) + (36a) =	79.3364 (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	51.5828	50.3715	49.9851	48.1834	48.1834	47.2066	47.5235	46.8983	47.5235	48.5264	48.8780	49.9851	(38)
Average = Sum(39)m / 12 =	130.9191	129.7079	129.3215	127.5198	127.5198	126.5429	126.8599	126.2347	126.8599	127.8627	128.2144	129.3215	(39)
												128.0737	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.2468	1.2353	1.2316	1.2145	1.2145	1.2052	1.2082	1.2022	1.2082	1.2177	1.2211	1.2316	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	
												31	

4. Water heating energy requirements (kWh/year)													

Assumed occupancy													2.7812 (42)
Hot water usage for mixer showers													
	77.6948	76.5053	74.7523	72.0555	69.6394	66.2591	63.5856	66.7111	68.2831	71.6311	75.1177	77.6247	(42a)
Hot water usage for baths													
	29.9100	29.4585	28.8161	27.8542	26.9873	25.7939	24.8886	25.9957	26.5767	27.7592	28.9886	29.8862	(42b)
Hot water usage for other uses													
	43.1127	41.5450	39.9772	38.4095	36.8418	35.2740	35.2740	36.8418	38.4095	39.9772	41.5450	43.1127	(42c)
Average daily hot water use (litres/day)													138.5556 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	150.7174	147.5087	143.5457	138.3193	133.4685	127.3271	123.7482	129.5486	133.2693	139.3675	145.6513	150.6237	(44)
Energy content (annual)	221.8821	195.1838	205.1238	180.6795	171.9876	147.2495	136.7454	152.4810	154.5858	179.5891	196.8525	221.2019	(45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		2163.5622	
	33.2823	29.2776	30.7686	27.1019	25.7981	22.0874	20.5118	22.8722	23.1879	26.9384	29.5279	33.1803	(46)
Water storage loss (or HIU loss):													
Store volume													210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													2.0000 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													1.0800 (55)
Total storage loss													
	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(56)
If cylinder contains dedicated solar storage													
	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	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													
	278.6245	246.4350	260.4704	228.8379	215.9357	189.5548	180.4608	197.1270	204.0949	234.9358	251.7645	277.9443	(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)
FV 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)
Aperture area of solar collector													3.0000 (H1)
Zero-loss collector efficiency													0.8000 (H2)
Collector linear heat loss coefficient													1.8000 (H3)
Collector 2nd order heat loss coefficient													0.0000 (H4)
Collector loop efficiency													0.9000 (H5)
Incidence angle modifier													1.0000 (H6)
Overshading factor													0.8000 (H8)
Overall heat loss coefficient of system													6.5000 (H10)
Heat loss coefficient of collector loop													3.9667 (H11)
Dedicated solar storage volume													75.0000 (H12)
Effective solar volume													75.0000 (H14)
Reference volume													225.0000 (H15)
Storage tank correction coefficient													1.3161 (H16)
Heat delivered to hot water													690.9356 (H24)
Heat delivered to space heating													0.0000 (H29)
Solar input													690.9356
Solar input	-0.0000	-13.8035	-57.8881	-90.0362	-112.4438	-109.8109	-105.0914	-97.2905	-66.7588	-35.6542	-2.1581	-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													
	278.6245	232.6315	202.5824	138.8017	103.4919	79.7439	75.3695	99.8365	137.3361	199.2816	249.6064	277.9443	(64)
												2075.2502	(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)
													0.0000 (64a)
Heat gains from water heating, kWh/month													
	119.1697	105.8996	112.4810	98.6027	92.3443	82.8047	80.4402	86.4167	91.0071	103.9907	109.3831	118.9435	(65)

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

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Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	32.3621	28.7437	23.3760	17.6971	13.2288	11.1683	12.0677	15.6861	21.0539	26.7327	31.2010	33.2615 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	394.2789	398.3702	388.0601	366.1110	338.4042	312.3638	294.9671	290.8758	301.1859	323.1350	350.8418	376.8822 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687 (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)	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497 (71)
Water heating gains (Table 5)	160.1744	157.5887	151.1841	136.9482	124.1187	115.0065	108.1186	116.1515	126.3987	139.7725	151.9209	159.8704 (72)
Total internal gains	696.9088	694.7962	672.7137	630.8498	585.8453	548.6321	525.2470	532.8069	558.7320	599.7337	644.0573	680.1076 (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			
-----	-----													
North	3.2600				12.7054		0.6300		0.7000		1.0000		16.4394 (74)	
East	10.5100				23.7288		0.6300		0.7000		1.0000		98.9828 (76)	
South	3.2600				53.5774		0.6300		0.7000		1.0000		69.3234 (78)	
West	12.8200				23.7288		0.6300		0.7000		1.0000		120.7383 (80)	
-----	-----													
Solar gains	305.4839	510.8277	800.8544	1190.9994	1383.3265	1507.7079	1420.9053	1243.8826	981.9655	636.3518	380.0670	245.9379	(83)	
Total gains	1002.3927	1205.6238	1473.5681	1821.8492	1969.1718	2056.3400	1946.1523	1776.6895	1540.6975	1236.0855	1024.1243	926.0456	(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	55.6960	56.2161	56.3840	57.1807	57.1807	57.6221	57.4781	57.7628	57.4781	57.0273	56.8709	56.3840
alpha	4.7131	4.7477	4.7589	4.8120	4.8120	4.8415	4.8319	4.8509	4.8319	4.8018	4.7914	4.7589
util living area	0.9836	0.9636	0.8973	0.7278	0.5303	0.3433	0.2345	0.2485	0.4856	0.8112	0.9592	0.9872 (86)
Living	20.1001	20.2851	20.5763	20.8293	20.9153	20.9340	20.9357	20.9359	20.9261	20.7946	20.4277	20.0831
Non living	18.8641	19.1009	19.4513	19.7353	19.8127	19.8330	19.8312	19.8363	19.8267	19.7089	19.2905	18.8528
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	20.5396	20.2851	20.5763	20.8293	20.9153	20.9340	20.9357	20.9359	20.9261	20.7946	20.4277	20.2114 (87)
Th 2	19.8827	19.8919	19.8948	19.9084	19.9084	19.9159	19.9135	19.9182	19.9135	19.9058	19.9032	19.8948 (88)
util rest of house	0.9783	0.9528	0.8705	0.6773	0.4664	0.2775	0.1638	0.1718	0.4015	0.7536	0.9444	0.9830 (89)
MIT 2	19.4766	19.1009	19.4513	19.7353	19.8127	19.8330	19.8312	19.8363	19.8267	19.7089	19.2905	19.0406 (90)
Living area fraction	19.6487	19.2927	19.6335	19.9124	19.9912	20.0112	20.0100	20.0143	20.0047	19.8847	19.4746	19.2301 (91)
MIT	19.6487	19.2927	19.6335	19.9124	19.9912	20.0112	20.0100	20.0143	20.0047	19.8847	19.4746	19.2301 (92)
Temperature adjustment	19.6487	19.2927	19.6335	19.9124	19.9912	20.0112	20.0100	20.0143	20.0047	19.8847	19.4746	0.0000
adjusted MIT	19.6487	19.2927	19.6335	19.9124	19.9912	20.0112	20.0100	20.0143	20.0047	19.8847	19.4746	19.2301 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9770	0.9455	0.8632	0.6775	0.4713	0.2833	0.1701	0.1786	0.4087	0.7524	0.9371	0.9796 (94)
Useful gains	979.3426	1139.9029	1272.0490	1234.3498	928.1479	582.5814	331.0529	317.3294	629.7125	930.0123	959.7549	907.1863 (95)
Ext temp.	5.0000	5.4000	7.1000	9.5000	12.6000	15.4000	17.4000	17.5000	15.0000	11.7000	8.1000	5.2000 (96)
Heat loss rate W	1917.7979	1801.9872	1620.8477	1327.7890	942.5246	583.5209	331.1057	317.3907	634.8902	1046.5150	1458.3932	1814.3950 (97)
Space heating kWh	698.2107	444.9206	259.5062	67.2762	10.6963	0.0000	0.0000	0.0000	0.0000	86.6780	359.0196	674.9633 (98a)
Space heating requirement - total per year (kWh/year)												2601.2709
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	698.2107	444.9206	259.5062	67.2762	10.6963	0.0000	0.0000	0.0000	0.0000	86.6780	359.0196	674.9633 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2601.2709
Space heating per m ²										(98c) / (4) =		24.7740 (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 %)												359.7392 (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	698.2107	444.9206	259.5062	67.2762	10.6963	0.0000	0.0000	0.0000	0.0000	86.6780	359.0196	674.9633 (98)
Space heating efficiency (main heating system 1)	359.7392	359.7392	359.7392	359.7392	359.7392	0.0000	0.0000	0.0000	0.0000	359.7392	359.7392	359.7392 (210)
Space heating fuel (main heating system)	194.0880	123.6787	72.1373	18.7014	2.9733	0.0000	0.0000	0.0000	0.0000	24.0947	99.8000	187.6257 (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)

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	723.0991	1.5859	1146.7734 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1108.5551	1.5403	1707.5173 (278)
Space and water heating			2854.2906 (279)
Pumps, fans and electric keep-hot	80.0000	1.5128	121.0240 (281)
Energy for lighting	228.6098	1.5338	350.6493 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-928.7668	1.4928	-1386.4891
PV Unit electricity exported	-1089.6185	0.4418	-481.3746
Total			-1867.8637 (283)

Total Primary energy kWh/year

1458.1002 (286)