

Full SAP Calculation Printout



Property Reference	CPG-7172-23 P7,8,9,10,17&18		Issued on Date	12/01/2024	
Assessment Reference	SEC1 - ASHP ROI TF 0.15 improv	Prop Type Ref	DS		
Property	Plot 7, 8, 9, 10, 17 & 18, Collygree Parc, South Road, Penzance, Cornwall, TR20 9LY				
SAP Rating	100 A	DER	-1.03	TER	9.56
Environmental	101 A	% DER < TER			110.77
CO ₂ Emissions (t/year)	-0.2	DFEE	28.96	TFEE	32.55
Compliance Check	See BREL	% DFEE < TFEE			11.03
% DPER < TPER	94.88	DPER	2.55	TPER	49.85
Assessor Details	Mr. Stuart Thomas			Assessor ID	V220-0003
Client	Cornwall Planning Group, CPG				

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	52.7200 (1b)	x 2.3700 (2b)	= 124.9464 (1b) - (3b)
First floor	52.7200 (1c)	x 2.6200 (2c)	= 138.1264 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	105.4400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 263.0728 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	1.0000 (17)
Infiltration rate	0.0500 (18)
Number of sides sheltered	4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.0350 (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	0.0446	0.0437	0.0429	0.0385	0.0376	0.0332	0.0332	0.0324	0.0350	0.0376	0.0394	0.0411 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												81.0000 (23c)
Effective ac	0.1396	0.1387	0.1379	0.1335	0.1326	0.1282	0.1282	0.1274	0.1300	0.1326	0.1344	0.1361 (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
Window (Uw = 1.20)			11.9600	1.1450	13.6947		(27)
Door			2.1200	1.0000	2.1200		(26a)
Floor 1 P/a 0.39			52.7200	0.1200	6.3264	110.0000	5799.2000 (28a)
External Wall 1 Stone	48.8200	8.6800	40.1400	0.1500	6.0210	9.0000	361.2600 (29a)
External Wall 2 clad	53.9700	5.4000	48.5700	0.1500	7.2855	9.0000	437.1300 (29a)
External Roof 1 Horz	52.7200		52.7200	0.0900	4.7448	9.0000	474.4800 (30)
Total net area of external elements Aum(A, m ²)			208.2300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	40.1924		(33)
Party Wall 1			47.4000	0.0000	0.0000	20.0000	948.0000 (32)
Internal Wall 1 GF			50.0100			9.0000	450.0900 (32c)
Internal Wall 2 FF			119.9200			9.0000	1079.2800 (32c)
Internal Floor 1			52.7200			18.0000	948.9600 (32d)
Internal Ceiling 1			52.7200			9.0000	474.4800 (32e)

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

K1 Element	Length	Psi-value	Total
E16 Corner (normal)	9.9800	0.0300	0.2994
E5 Ground floor (normal)	20.6000	0.0210	0.4326
E10 Eaves (insulation at ceiling level)	11.1000	0.0440	0.4884
E12 Gable (insulation at ceiling level)	9.5000	0.0510	0.4845
E6 Intermediate floor within a dwelling	20.6000	0.0800	1.6480
P1 Party wall - Ground floor	9.5000	0.1490	1.4155
P2 Party wall - Intermediate floor within a dwelling	9.5000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	9.5000	0.4800	4.5600
E2 Other lintels (including other steel lintels)	10.2100	0.0840	0.8576
E3 Sill	9.2000	0.0430	0.3956
E4 Jamb	24.3000	0.0340	0.8262
E18 Party wall between dwellings	9.9800	0.0395	0.3942

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.8020 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 51.9944 (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	12.1214	12.0454	11.9695	11.5897	11.5137	11.1339	11.1339	11.0579	11.2858	11.5137	11.6656	11.8176 (38)
Average = Sum(39)m / 12 =	64.1158	64.0399	63.9639	63.5841	63.5081	63.1283	63.1283	63.0523	63.2802	63.5081	63.6600	63.8120 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.6081	0.6074	0.6066	0.6030	0.6023	0.5987	0.5987	0.5980	0.6002	0.6023	0.6038	0.6052 (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 2.7845 (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 81.7862 80.5716 78.8611 75.7073 73.3458 70.7272 69.3128 71.0113 72.8607 75.6626 78.8814 81.5097 (42b)

Hot water usage for other uses 43.1461 41.5771 40.0082 38.4392 36.8703 35.3013 35.3013 36.8703 38.4392 40.0082 41.5771 43.1461 (42c)

Average daily hot water use (litres/day) 115.0524 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	124.9323	122.1487	118.8693	114.1466	110.2161	106.0286	104.6142	107.8816	111.2999	115.6708	120.4585	124.6558 (44)
Energy content (annual)	197.8622	173.9381	182.6977	156.2609	148.3720	130.3745	126.5218	133.5800	137.2439	156.9642	171.6152	195.1809 (45)
Distribution loss (46)m = 0.15 x (45)m												1910.6116
Total = Sum(45)m =	29.6793	26.0907	27.4047	23.4391	22.2558	19.5562	18.9783	20.0370	20.5866	23.5446	25.7423	29.2771 (46)

Water storage loss:

Store volume 250.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.6000 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.8640 (55)

Total storage loss 26.7840 24.1920 26.7840 25.9200 26.7840 25.9200 26.7840 26.7840 25.9200 26.7840 25.9200 26.7840 (56)

If cylinder contains dedicated solar storage 26.7840 24.1920 26.7840 25.9200 26.7840 25.9200 26.7840 26.7840 25.9200 26.7840 25.9200 26.7840 (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 247.9086 219.1413 232.7441 204.6929 198.4184 178.8065 176.5682 183.6264 185.6759 207.0106 220.0472 245.2273 (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 247.9086 219.1413 232.7441 204.6929 198.4184 178.8065 176.5682 183.6264 185.6759 207.0106 220.0472 245.2273 (64)

Total per year (kWh/year) = Sum(64)m = 2499.8676 (64)

2500 (64)

12Total per year (kWh/year)

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 105.8263 93.9970 100.7841 90.7024 89.3708 82.0951 82.1056 84.4525 84.3792 92.2277 95.8077 104.9348 (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	139.2251	139.2251	139.2251	139.2251	139.2251	139.2251	139.2251	139.2251	139.2251	139.2251	139.2251	139.2251 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	150.1195	166.2037	150.1195	155.1234	150.1195	155.1234	150.1195	150.1195	155.1234	150.1195	155.1234	150.1195 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	264.8343	267.5824	260.6572	245.9141	227.3037	209.8125	198.1273	195.3792	202.3044	217.0475	235.6579	253.1491 (68)
Pumps, fans	36.9225	36.9225	36.9225	36.9225	36.9225	36.9225	36.9225	36.9225	36.9225	36.9225	36.9225	36.9225 (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)	-111.3801	-111.3801	-111.3801	-111.3801	-111.3801	-111.3801	-111.3801	-111.3801	-111.3801	-111.3801	-111.3801	-111.3801 (71)
Total internal gains	142.2397	139.8765	135.4625	125.9755	120.1221	114.0210	110.3570	113.5114	117.1933	123.9620	133.0662	141.0413 (72)
	621.9609	638.4301	611.0067	591.7806	562.3128	543.7245	523.3713	523.7775	539.3887	555.8964	588.6151	609.0774 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
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Southeast	7.4700	36.7938	0.7600	0.7000	0.7700	101.3306 (77)
Northwest	4.4900	11.2829	0.7600	0.7000	0.7700	18.6773 (81)

Solar gains	120.0078	210.6216	304.6602	405.1092	478.9668	486.5925	464.5122	407.7158	339.1794	237.2248	144.8715	101.9707 (83)
Total gains	741.9688	849.0517	915.6668	996.8898	1041.2795	1030.3169	987.8835	931.4933	878.5681	793.1212	733.4866	711.0481 (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	47.5393	47.5957	47.6522	47.9369	47.9942	48.2830	48.2830	48.3411	48.1671	47.9942	47.8797	47.657
alpha	4.1693	4.1730	4.1768	4.1958	4.1996	4.2189	4.2189	4.2227	4.2111	4.1996	4.1920	4.1844
util living area	0.9217	0.8762	0.8120	0.6915	0.5433	0.3875	0.2802	0.3098	0.4835	0.7276	0.8748	0.9314 (86)
Living	20.2552	20.4280	20.6069	20.7873	20.8831	20.9185	20.9251	20.9243	20.9060	20.7814	20.5039	20.2150
Non living	19.5361	19.7497	19.9680	20.1836	20.2910	20.3303	20.3361	20.3362	20.3176	20.1813	19.8492	19.4882
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	20.6190	20.4280	20.6069	20.7873	20.8831	20.9185	20.9251	20.9243	20.9060	20.7814	20.5039	20.3248 (87)
Th 2	20.4227	20.4234	20.4240	20.4273	20.4279	20.4312	20.4312	20.4318	20.4299	20.4279	20.4266	20.4253 (88)
util rest of house	0.9136	0.8645	0.7955	0.6681	0.5140	0.3543	0.2443	0.2721	0.4467	0.7009	0.8612	0.9242 (89)
MIT 2	20.0692	19.7497	19.9680	20.1836	20.2910	20.3303	20.3361	20.3362	20.3176	20.1813	19.8492	19.6570 (90)
Living area fraction												fLA = Living area / (4) = 0.2211 (91)
MIT	20.1908	19.8996	20.1092	20.3170	20.4219	20.4603	20.4663	20.4662	20.4477	20.3140	19.9939	19.8047 (92)
Temperature adjustment												0.0000
adjusted MIT	20.1908	19.8996	20.1092	20.3170	20.4219	20.4603	20.4663	20.4662	20.4477	20.3140	19.9939	19.8047 (93)

8. Space heating requirement

Utilisation	0.9101	0.8530	0.7859	0.6634	0.5137	0.3560	0.2466	0.2744	0.4479	0.6953	0.8499	0.9154 (94)
Useful gains	675.2755	724.2325	719.6197	661.3737	534.8941	366.7859	243.5690	255.5827	393.4674	551.4790	623.4031	650.8712 (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	1018.8508	960.5748	870.5001	725.9416	553.9102	369.9509	244.0736	256.3837	401.6823	616.9164	820.8277	995.7643 (97)
Space heating kWh	255.6200	158.8220	112.2550	46.4889	14.1480	0.0000	0.0000	0.0000	0.0000	48.6854	142.1457	256.6005 (98a)
Space heating requirement - total per year (kWh/year)												1034.7654
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	255.6200	158.8220	112.2550	46.4889	14.1480	0.0000	0.0000	0.0000	0.0000	48.6854	142.1457	256.6005 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1034.7654
Space heating per m2												(98c) / (4) = 9.8138 (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 %)												402.0893 (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	255.6200	158.8220	112.2550	46.4889	14.1480	0.0000	0.0000	0.0000	0.0000	48.6854	142.1457	256.6005 (98)
Space heating efficiency (main heating system 1)	402.0893	402.0893	402.0893	402.0893	402.0893	0.0000	0.0000	0.0000	0.0000	402.0893	402.0893	402.0893 (210)
Space heating fuel (main heating system)	63.5729	39.4992	27.9179	11.5618	3.5186	0.0000	0.0000	0.0000	0.0000	12.1081	35.3518	63.8168 (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	247.9086	219.1413	232.7441	204.6929	198.4184	178.8065	176.5682	183.6264	185.6759	207.0106	220.0472	245.2273 (64)
Efficiency of water heater (217)m	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600 (216)
Fuel for water heating, kWh/month	121.1319	107.0758	113.7223	100.0161	96.9503	87.3676	86.2739	89.7227	90.7241	101.1485	107.5184	119.8218 (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	15.5920	14.0831	15.5920	15.0890	15.5920	15.0890	15.5920	15.5920	15.0890	15.5920	15.0890	15.5920 (231)
Lighting	29.0242	23.2843	20.9649	15.3598	11.8644	9.6933	10.8231	14.0682	18.2732	23.9755	27.0802	29.8309 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(234a)m	-53.9974	-78.8119	-117.1675	-133.7606	-145.3148	-135.6761	-133.8445	-125.9092	-110.4066	-90.5935	-59.8596	-46.2146 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-25.3493	-57.2123	-122.5402	-196.6160	-268.8720	-273.5391	-269.1508	-222.5304	-156.3915	-85.6344	-35.0076	-19.6579 (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												

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Space heating fuel - main system 1	257.3471 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	204.6600
Water heating fuel used	1221.4734 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.5720)	
mechanical ventilation fans (SFP = 0.5720)	183.5827 (230a)
Total electricity for the above, kWh/year	183.5827 (231)
Electricity for lighting (calculated in Appendix L)	234.2419 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-2964.0577 (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	-1067.4125 (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	257.3471	0.1572	40.4585 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1221.4734	0.1409	172.0761 (264)
Space and water heating			212.5346 (265)
Pumps, fans and electric keep-hot	183.5827	0.1387	25.4652 (267)
Energy for lighting	234.2419	0.1443	33.8083 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1231.5563	0.1342	-165.2492
PV Unit electricity exported	-1732.5014	0.1243	-215.3119
Total			-380.5611 (269)
Total CO2, kg/year			-108.7530 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			-1.0300 (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	257.3471	1.5820	407.1139 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1221.4734	1.5209	1857.7469 (278)
Space and water heating			2264.8608 (279)
Pumps, fans and electric keep-hot	183.5827	1.5128	277.7239 (281)
Energy for lighting	234.2419	1.5338	359.2881 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1231.5563	1.4959	-1842.2676
PV Unit electricity exported	-1732.5014	0.4561	-790.2320
Total			-2632.4996 (283)
Total Primary energy kWh/year			269.3732 (286)
Dwelling Primary energy Rate (DPER)			2.5500 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	52.7200 (1b)	x 2.3700 (2b)	= 124.9464 (1b) - (3b)
First floor	52.7200 (1c)	x 2.6200 (2c)	= 138.1264 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	105.4400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 263.0728 (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) = 0.1520 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)

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Infiltration rate 0.4020 (18)
Number of sides sheltered 4 (19)
Shelter factor (20) = 1 - [0.075 x (19)] = 0.7000 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.2814 (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 infiltr rate													
Effective ac	0.3588	0.3518	0.3448	0.3096	0.3025	0.2674	0.2674	0.2603	0.2814	0.3025	0.3166	0.3307	(22b)
	0.5644	0.5619	0.5594	0.5479	0.5458	0.5357	0.5357	0.5339	0.5396	0.5458	0.5501	0.5547	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Semi-glazed door			2.1200	1.0000	2.1200			(26a)
TER Opening Type (Uw = 1.20)			11.9600	1.1450	13.6947			(27)
Floor 1 P/a 0.39			52.7200	0.1300	6.8536			(28a)
External Wall 1 Stone	48.8200	8.6800	40.1400	0.1800	7.2252			(29a)
External Wall 2 clad	53.9700	5.4000	48.5700	0.1800	8.7426			(29a)
External Roof 1 Horz	52.7200		52.7200	0.1100	5.7992			(30)
Total net area of external elements Aum(A, m2)			208.2300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.4353			(33)
Party Wall 1			47.4000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 104.0675 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E16 Corner (normal)	9.9800	0.0900	0.8982	
E5 Ground floor (normal)	20.6000	0.1600	3.2960	
E10 Eaves (insulation at ceiling level)	11.1000	0.0600	0.6660	
E12 Gable (insulation at ceiling level)	9.5000	0.0600	0.5700	
E6 Intermediate floor within a dwelling	20.6000	0.0000	0.0000	
P1 Party wall - Ground floor	9.5000	0.0800	0.7600	
P2 Party wall - Intermediate floor within a dwelling	9.5000	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	9.5000	0.1200	1.1400	
E2 Other lintels (including other steel lintels)	10.2100	0.0500	0.5105	
E3 Sill	9.2000	0.0500	0.4600	
E4 Jamb	24.3000	0.0500	1.2150	
E18 Party wall between dwellings	9.9800	0.0600	0.5988	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				10.1145 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	54.5498 (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	48.9960	48.7790	48.5663	47.5671	47.3801	46.5099	46.5099	46.3487	46.8451	47.3801	47.7583	48.1537	(38)
Average = Sum(39)m / 12 =	103.5458	103.3287	103.1160	102.1168	101.9299	101.0596	101.0596	100.8985	101.3948	101.9299	102.3081	102.7034	(39)
													102.1159

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.9820	0.9800	0.9780	0.9685	0.9667	0.9585	0.9585	0.9569	0.9616	0.9667	0.9703	0.9740	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	0.9685
													31

4. Water heating energy requirements (kWh/year)

Assumed occupancy														
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	(42)
Hot water usage for baths	81.7862	80.5716	78.8611	75.7073	73.3458	70.7272	69.3128	71.0113	72.8607	75.6626	78.8814	81.5097	(42b)	
Hot water usage for other uses	43.1461	41.5771	40.0082	38.4392	36.8703	35.3013	35.3013	36.8703	38.4392	40.0082	41.5771	43.1461	(42c)	
Average daily hot water use (litres/day)													115.0524 (43)	

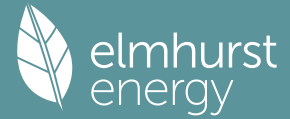
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	124.9323	122.1487	118.8693	114.1466	110.2161	106.0286	104.6142	107.8816	111.2999	115.6708	120.4585	124.6558	(44)
Energy content (annual)	197.8622	173.9381	182.6977	156.2609	148.3720	130.3745	126.5218	133.5800	137.2439	156.9642	171.6152	195.1809	(45)
Distribution loss (46)m = 0.15 x (45)m	29.6793	26.0907	27.4047	23.4391	22.2558	19.5562	18.9783	20.0370	20.5866	23.5446	25.7423	29.2771	(46)

Water storage loss:

Store volume														
a) If manufacturer declared loss factor is known (kWh/day):														1.8903 (48)
Temperature factor from Table 2b														0.5400 (49)
Enter (49) or (54) in (55)														1.0208 (55)
Total storage loss	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(56)	
If cylinder contains dedicated solar storage	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(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	252.7690	223.5314	237.6045	209.3965	203.2788	183.5101	181.4286	188.4868	190.3795	211.8710	224.7508	250.0877	(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)	
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	252.7690	223.5314	237.6045	209.3965	203.2788	183.5101	181.4286	188.4868	190.3795	211.8710	224.7508	250.0877	(64)	
Total per year (kWh/year)													2557.0947 (64)	
Electric shower(s)													2557 (64)	

12Total per year (kWh/year)														
Heat gains from water heating, kWh/month	109.7146	97.5090	104.6724	94.4652	93.2591	85.8580	85.9939	88.3408	88.1421	96.1160	99.5705	108.8231	(65)	

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	139.2251	139.2251	139.2251	139.2251	139.2251	139.2251	139.2251	139.2251	139.2251	139.2251	139.2251	139.2251	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	150.1195	166.2037	150.1195	155.1234	150.1195	155.1234	150.1195	150.1195	155.1234	150.1195	155.1234	150.1195	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	264.8343	267.5824	260.6572	245.9141	227.3037	209.8125	198.1273	195.3792	202.3044	217.0475	235.6579	253.1491	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.9225	36.9225	36.9225	36.9225	36.9225	36.9225	36.9225	36.9225	36.9225	36.9225	36.9225	36.9225	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-111.3801	-111.3801	-111.3801	-111.3801	-111.3801	-111.3801	-111.3801	-111.3801	-111.3801	-111.3801	-111.3801	-111.3801	(71)
Water heating gains (Table 5)	147.4659	145.1027	140.6887	131.2017	125.3483	119.2472	115.5832	118.7376	122.4196	129.1882	138.2924	146.2676	(72)
Total internal gains	630.1872	646.6564	619.2329	600.0068	570.5390	548.9507	528.5975	529.0038	544.6150	564.1227	596.8413	617.3037	(73)

6. Solar gains

[Jan]		Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b	Specific data or Table 6c	FF Access factor Table 6d	Gains W						
Southeast		7.4700	36.7938	0.6300	0.7000	0.7700	83.9977	(77)					
Northwest		4.4900	11.2829	0.6300	0.7000	0.7700	15.4825	(81)					
Solar gains	99.4802	174.5942	252.5472	335.8142	397.0382	403.3595	385.0561	337.9749	281.1618	196.6468	120.0909	84.5283	(83)
Total gains	729.6674	821.2506	871.7801	935.8210	967.5772	952.3102	913.6537	866.9787	825.7768	760.7695	716.9322	701.8320	(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	29.4365	29.4983	29.5592	29.8484	29.9031	30.1606	30.1606	30.2088	30.0609	29.9031	29.7926	29.6779			
alpha	2.9624	2.9666	2.9706	2.9899	2.9935	3.0107	3.0107	3.0139	3.0041	2.9935	2.9862	2.9785			
util living area	0.9536	0.9336	0.9049	0.8422	0.7419	0.5929	0.4564	0.4942	0.6851	0.8576	0.9314	0.9581	(86)		
MIT	18.9317	19.2035	19.5842	20.1001	20.5368	20.8342	20.9442	20.9279	20.7300	20.1795	19.4838	18.8864	(87)		
Th 2	20.0983	20.1001	20.1017	20.1097	20.1112	20.1181	20.1181	20.1194	20.1154	20.1112	20.1082	20.1050	(88)		
util rest of house	0.9472	0.9245	0.8914	0.8191	0.7026	0.5307	0.3749	0.4125	0.6280	0.8320	0.9205	0.9523	(89)		
MIT 2	17.6720	18.0147	18.4930	19.1338	19.6527	19.9828	20.0845	20.0736	19.8792	19.2421	18.3778	17.6191	(90)		
Living area fraction													fLA = Living area / (4) =	0.2211	(91)
MIT	17.9504	18.2776	18.7343	19.3474	19.8482	20.1710	20.2746	20.2624	20.0673	19.4494	18.6223	17.8992	(92)		
Temperature adjustment														0.0000	
adjusted MIT	17.9504	18.2776	18.7343	19.3474	19.8482	20.1710	20.2746	20.2624	20.0673	19.4494	18.6223	17.8992	(93)		

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Utilisation	0.9264	0.9008	0.8661	0.7961	0.6898	0.5347	0.3900	0.4263	0.6247	0.8094	0.8971	0.9326	(94)		
Useful gains	675.9745	739.7907	755.0066	745.0448	667.4468	509.1724	356.2857	369.6335	515.8343	615.7656	643.1399	654.5440	(95)		
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	14.0000	14.1000	10.6000	7.1000	4.2000	(96)		
Heat loss rate W	1413.4454	1382.2867	1261.5486	1066.8566	830.5438	563.0019	371.3505	389.7140	605.0528	902.0149	1178.8248	1406.9582	(97)		
Space heating kWh	548.6784	431.7573	376.8672	231.7045	121.3442	0.0000	0.0000	0.0000	0.0000	212.9694	385.6932	559.7962	(98a)		
Space heating requirement - total per year (kWh/year)													2868.8103		
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	548.6784	431.7573	376.8672	231.7045	121.3442	0.0000	0.0000	0.0000	0.0000	212.9694	385.6932	559.7962	(98c)		
Space heating requirement after solar contribution - total per year (kWh/year)													2868.8103		
Space heating per m ²													(98c) / (4) =	27.2080	(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)
Space heating requirement	548.6784	431.7573	376.8672	231.7045	121.3442	0.0000	0.0000	0.0000	0.0000	212.9694	385.6932	559.7962	(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)	594.4511	467.7761	408.3069	251.0341	131.4671	0.0000	0.0000	0.0000	0.0000	230.7361	417.8691	606.4964	(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

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Efficiency of water heater (217)m	252.7690	223.5314	237.6045	209.3965	203.2788	183.5101	181.4286	188.4868	190.3795	211.8710	224.7508	250.0877 (64)
Fuel for water heating, kWh/month	85.7498	85.5102	85.0892	84.2873	82.9423	79.8000	79.8000	79.8000	79.8000	84.0714	85.2597	79.8000 (216)
Space cooling fuel requirement (221)m	294.7749	261.4089	279.2416	248.4318	245.0847	229.9625	227.3541	236.1990	238.5709	252.0132	263.6073	291.4384 (219)
Pumps and Fa (233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Lighting (234a)m	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685 (231)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	31.1919	25.0233	22.5307	16.5069	12.7504	10.4172	11.6314	15.1189	19.6380	25.7661	29.1027	32.0588 (232)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	-48.0624	-67.1014	-95.4902	-106.2144	-113.5158	-105.5376	-104.2014	-98.8690	-89.3040	-76.1828	-52.5952	-41.6277 (233a)
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 (234a)
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 (235a)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	-29.1300	-61.0633	-120.9987	-181.2167	-239.1464	-240.1649	-237.3655	-201.2016	-147.7560	-87.1794	-38.8400	-23.0534 (233b)
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 (234b)
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 (235b)
Annual totals kWh/year												
Space heating fuel - main system 1												3108.1368 (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												3068.0873 (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)												251.7362 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-2605.8181 (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												3908.1422 (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	3108.1368	0.2100	652.7087 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3068.0873	0.2100	644.2983 (264)
Space and water heating			1297.0071 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	251.7362	0.1443	36.3333 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-998.7021	0.1348	-134.6405
PV Unit electricity exported	-1607.1160	0.1260	-202.4586
Total			-337.0991 (269)
Total CO2, kg/year			1008.1705 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.5600 (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	3108.1368	1.1300	3512.1946 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3068.0873	1.1300	3466.9386 (278)
Space and water heating			6979.1332 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	251.7362	1.5338	386.1213 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-998.7021	1.4983	-1496.3236
PV Unit electricity exported	-1607.1160	0.4624	-743.1675
Total			-2239.4911 (283)
Total Primary energy kWh/year			5255.8643 (286)
Target Primary Energy Rate (TPER)			49.8500 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	52.7200 (1b)	x 2.3700 (2b)	= 124.9464 (1b) - (3b)
First floor	52.7200 (1c)	x 2.6200 (2c)	= 138.1264 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	105.4400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 263.0728 (5)

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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) =	0.1520 (8)											
Pressure test													Yes												
Pressure Test Method													Blower Door												
Measured/design AP50													1.0000 (17)												
Infiltration rate													0.2020 (18)												
Number of sides sheltered													4 (19)												
Shelter factor													(20) = 1 - [0.075 x (19)] =		0.7000 (20)										
Infiltration rate adjusted to include shelter factor													(21) = (18) x (20) =		0.1414 (21)										
													Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (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	0.1803	0.1768	0.1733	0.1556	0.1520	0.1344	0.1344	0.1308	0.1414	0.1520	0.1591	0.1662 (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	0.5163	0.5156	0.5150	0.5121	0.5116	0.5090	0.5090	0.5086	0.5100	0.5116	0.5127	0.5138 (25)													

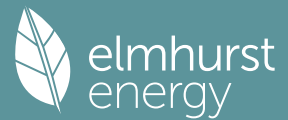
3. Heat losses and heat loss parameter

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					
Window (Uw = 1.20)			11.9600	1.1450	13.6947			(27)				
Door			2.1200	1.0000	2.1200			(26a)				
Floor 1 P/a 0.39			52.7200	0.1200	6.3264	110.0000	5799.2000	(28a)				
External Wall 1 Stone	48.8200	8.6800	40.1400	0.1500	6.0210	9.0000	361.2600	(29a)				
External Wall 2 clad	53.9700	5.4000	48.5700	0.1500	7.2855	9.0000	437.1300	(29a)				
External Roof 1 Horz	52.7200		52.7200	0.0900	4.7448	9.0000	474.4800	(30)				
Total net area of external elements Aum(A, m2)			208.2300					(31)				
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.1924			(33)				
Party Wall 1			47.4000	0.0000	0.0000	20.0000	948.0000	(32)				
Internal Wall 1 GF			50.0100			9.0000	450.0900	(32c)				
Internal Wall 2 FF			119.9200			9.0000	1079.2800	(32c)				
Internal Floor 1			52.7200			18.0000	948.9600	(32d)				
Internal Ceiling 1			52.7200			9.0000	474.4800	(32e)				
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		10972.8800	(34)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							104.0675	(35)				
List of Thermal Bridges					Length	Psi-value	Total					
K1 Element												
E16 Corner (normal)					9.9800	0.0300	0.2994					
E5 Ground floor (normal)					20.6000	0.0210	0.4326					
E10 Eaves (insulation at ceiling level)					11.1000	0.0440	0.4884					
E12 Gable (insulation at ceiling level)					9.5000	0.0510	0.4845					
E6 Intermediate floor within a dwelling					20.6000	0.0800	1.6480					
P1 Party wall - Ground floor					9.5000	0.1490	1.4155					
P2 Party wall - Intermediate floor within a dwelling					9.5000	0.0000	0.0000					
P4 Party wall - Roof (insulation at ceiling level)					9.5000	0.4800	4.5600					
E2 Other lintels (including other steel lintels)					10.2100	0.0840	0.8576					
E3 Sill					9.2000	0.0430	0.3956					
E4 Jamb					24.3000	0.0340	0.8262					
E18 Party wall between dwellings					9.9800	0.0395	0.3942					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.8020	(36)				
Point Thermal bridges							0.0000	(36a) =				
Total fabric heat loss							51.9944	(33) + (36) + (36a) = (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
	44.8185	44.7637	44.7100	44.4577	44.4104	44.1907	44.1907	44.1500	44.2753	44.4104	44.5060	44.6058 (38)
Heat transfer coeff	96.8129	96.7581	96.7044	96.4521	96.4048	96.1851	96.1851	96.1444	96.2697	96.4048	96.5004	96.6002 (39)
Average = Sum(39)m / 12 =	96.4518											
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9182	0.9177	0.9172	0.9148	0.9143	0.9122	0.9122	0.9118	0.9130	0.9143	0.9152	0.9162 (40)
HLP (average)	0.9148											
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.7845 (42)
Hot water usage for mixer showers													0.0000 (42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Hot water usage for other uses	30.6154	30.1608	29.5205	28.3399	27.4559	26.4757	25.9462	26.5820	27.2743	28.3232	29.5281	30.5119 (42b)	
Average daily hot water use (litres/day)	43.1461	41.5771	40.0082	38.4392	36.8703	35.3013	35.3013	36.8703	38.4392	40.0082	41.5771	43.1461 (42c)	
	73.7615	71.7379	69.5287	66.7791	64.3262	61.7770	61.2476	63.4523	65.7135	68.3314	71.1052	73.6580 (44)	

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Energy conte	116.8202	102.1538	106.8630	91.4173	86.5954	75.9621	74.0736	78.5672	81.0314	92.7250	101.3024	115.3307 (45)
Energy content (annual)	Total = Sum(45) m =											1122.8420
Distribution loss (46)m = 0.15 x (45)m												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month												
	99.2972	86.8307	90.8335	77.7047	73.6061	64.5677	62.9626	66.7821	68.8767	78.8163	86.1070	98.0311 (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												
	99.2972	86.8307	90.8335	77.7047	73.6061	64.5677	62.9626	66.7821	68.8767	78.8163	86.1070	98.0311 (64)
	Total per year (kWh/year) = Sum(64) m =											954.4157 (64)
12Total per year (kWh/year)												
Electric shower(s)												
	56.7845	50.5954	55.2483	52.7228	53.7121	51.2361	52.9440	53.7121	52.7228	55.2483	54.2094	56.7845 (64a)
	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a) m =											645.9202 (64a)
Heat gains from water heating, kWh/month												
	39.0204	34.3565	36.5205	32.6069	31.8295	28.9510	28.9766	30.1236	30.3999	33.5161	35.0791	38.7039 (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	139.2251	139.2251	139.2251	139.2251	139.2251	139.2251	139.2251	139.2251	139.2251	139.2251	139.2251	139.2251	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	150.1195	166.2037	150.1195	155.1234	150.1195	155.1234	150.1195	150.1195	155.1234	150.1195	155.1234	150.1195	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	264.8343	267.5824	260.6572	245.9141	227.3037	209.8125	198.1273	195.3792	202.3044	217.0475	235.6579	253.1491	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.9225	36.9225	36.9225	36.9225	36.9225	36.9225	36.9225	36.9225	36.9225	36.9225	36.9225	36.9225	(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)													
	-111.3801	-111.3801	-111.3801	-111.3801	-111.3801	-111.3801	-111.3801	-111.3801	-111.3801	-111.3801	-111.3801	-111.3801	(71)
Water heating gains (Table 5)													
	52.4468	51.1258	49.0866	45.2873	42.7816	40.2097	38.9471	40.4887	42.2220	45.0486	48.7210	52.0214	(72)
Total internal gains	532.1681	549.6795	524.6308	511.0924	484.9723	469.9132	451.9614	450.7548	464.4174	476.9830	504.2699	520.0574	(73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W							
Southeast	7.4700	36.7938	0.7600	0.7000	0.7700	101.3306	(77)						
Northwest	4.4900	11.2829	0.7600	0.7000	0.7700	18.6773	(81)						
Solar gains	120.0078	210.6216	304.6602	405.1092	478.9668	486.5925	464.5122	407.7158	339.1794	237.2248	144.8715	101.9707	(83)
Total gains	652.1759	760.3011	829.2910	916.2016	963.9391	956.5056	916.4736	858.4706	803.5968	714.2078	649.1414	622.0281	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	31.4836	31.5015	31.5190	31.6014	31.6169	31.6891	31.6891	31.7026	31.6613	31.6169	31.5856	31.5530	
alpha	3.0989	3.1001	3.1013	3.1068	3.1078	3.1126	3.1126	3.1135	3.1108	3.1078	3.1057	3.1035	
util living area	0.9633	0.9415	0.9093	0.8391	0.7285	0.5740	0.4384	0.4813	0.6806	0.8667	0.9429	0.9679	(86)
MIT	18.9751	19.2750	19.6719	20.1831	20.6013	20.8635	20.9560	20.9403	20.7592	20.2130	19.5045	18.9074	(87)
Th 2	20.1521	20.1525	20.1529	20.1550	20.1554	20.1571	20.1571	20.1574	20.1564	20.1554	20.1546	20.1538	(88)
util rest of house	0.9582	0.9336	0.8968	0.8164	0.6899	0.5145	0.3622	0.4039	0.6254	0.8429	0.9338	0.9634	(89)
MIT 2	18.2885	18.5831	18.9713	19.4626	19.8474	20.0700	20.1363	20.1276	19.9912	19.5006	18.8143	18.2230	(90)
Living area fraction	FLA = Living area / (4) =												
MIT	18.4403	18.7361	19.1262	19.6219	20.0141	20.2454	20.3175	20.3072	20.1610	19.6581	18.9669	18.3743	(92)
Temperature adjustment	0.0000												
adjusted MIT	18.4403	18.7361	19.1262	19.6219	20.0141	20.2454	20.3175	20.3072	20.1610	19.6581	18.9669	18.3743	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9447	0.9171	0.8785	0.8002	0.6829	0.5210	0.3772	0.4182	0.6257	0.8265	0.9177	0.9509	(94)
Useful gains	616.1400	697.2417	728.5200	733.1411	658.2828	498.3612	345.6695	358.9848	502.7891	590.3272	595.7147	591.5016	(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													
	1368.9608	1338.7530	1221.0089	1034.1497	801.5183	543.0078	357.5654	375.6595	583.4884	873.2436	1145.1594	1369.2420	(97)
Space heating kWh													
	560.0987	431.0956	366.4118	216.7262	106.5672	0.0000	0.0000	0.0000	0.0000	210.4898	395.6001	578.6388	(98a)
Space heating requirement - total per year (kWh/year)													
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)													
Space heating kWh													
	560.0987	431.0956	366.4118	216.7262	106.5672	0.0000	0.0000	0.0000	0.0000	210.4898	395.6001	578.6388	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)													
												2865.6282	
Space heating per m ²												(98c) / (4) =	27.1778 (99)

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8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W												
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	904.1396	711.7694	730.6971	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.8087	0.8677	0.8416	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	731.1855	617.5846	614.9544	0.0000	0.0000	0.0000	0.0000 (102)
Space cooling kWh						1045.4235	1001.9701	937.2800	0.0000	0.0000	0.0000	0.0000 (103)
Cooled fraction	0.0000	0.0000	0.0000	0.0000	0.0000	226.2514	285.9828	239.8102	0.0000	0.0000	0.0000	0.0000 (104)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	fc = cooled area / (4) =			1.0000 (105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	56.5628	71.4957	59.9526	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling requirement	0.0000	0.0000	0.0000	0.0000	0.0000	56.5628	71.4957	59.9526	0.0000	0.0000	0.0000	0.0000 (107)
Energy for space heating												188.0111 (107)
Energy for space cooling												27.1778 (99)
Total												1.7831 (108)
Fabric Energy Efficiency (DFEE)												28.9609 (109)
												29.0 (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)
Ground floor	52.7200 (1b)	x 2.3700 (2b)	= 124.9464 (1b) - (3b)
First floor	52.7200 (1c)	x 2.6200 (2c)	= 138.1264 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	105.4400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	263.0728 (5)

2. Ventilation rate

Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	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) =	0.1520 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000 (17)	
Infiltration rate	0.4020 (18)	
Number of sides sheltered	4 (19)	
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2814 (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	0.3588	0.3518	0.3448	0.3096	0.3025	0.2674	0.2674	0.2603	0.2814	0.3025	0.3166	0.3307 (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	0.5644	0.5619	0.5594	0.5479	0.5458	0.5357	0.5357	0.5339	0.5396	0.5458	0.5501	0.5547 (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
TER Semi-glazed door			2.1200	1.0000	2.1200		(26a)
TER Opening Type (Uw = 1.20)			11.9600	1.1450	13.6947		(27)
Floor 1 P/a 0.39			52.7200	0.1300	6.8536		(28a)
External Wall 1 Stone	48.8200	8.6800	40.1400	0.1800	7.2252		(29a)
External Wall 2 clad	53.9700	5.4000	48.5700	0.1800	8.7426		(29a)
External Roof 1 Horz	52.7200		52.7200	0.1100	5.7992		(30)
Total net area of external elements Aum, (m ²)			208.2300				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	44.4353	(33)
Party Wall 1			47.4000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							104.0675 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E16 Corner (normal)				9.9800	0.0900	0.8982	
E5 Ground floor (normal)				20.6000	0.1600	3.2960	

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E10 Eaves (insulation at ceiling level)	11.1000	0.0600	0.6660
E12 Gable (insulation at ceiling level)	9.5000	0.0600	0.5700
E6 Intermediate floor within a dwelling	20.6000	0.0000	0.0000
P1 Party wall - Ground floor	9.5000	0.0800	0.7600
P2 Party wall - Intermediate floor within a dwelling	9.5000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	9.5000	0.1200	1.1400
E2 Other lintels (including other steel lintels)	10.2100	0.0500	0.5105
E3 Sill	9.2000	0.0500	0.4600
E4 Jamb	24.3000	0.0500	1.2150
E18 Party wall between dwellings	9.9800	0.0600	0.5988

Thermal bridges (Sum(L x Psi) calculated using Appendix K)
 Point Thermal bridges (36a) = 10.1145 (36)
 Total fabric heat loss (33) + (36) + (36a) = 54.5498 (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	48.9960	48.7790	48.5663	47.5671	47.3801	46.5099	46.5099	46.3487	46.8451	47.3801	47.7583	48.1537 (38)
Average = Sum(39)m / 12 =	103.5458	103.3287	103.1160	102.1168	101.9299	101.0596	101.0596	100.8985	101.3948	101.9299	102.3081	102.7034 (39)
												102.1159

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9820	0.9800	0.9780	0.9685	0.9667	0.9585	0.9585	0.9569	0.9616	0.9667	0.9703	0.9740 (40)
HLP (average)												0.9685
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.7845 (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	30.6154	30.1608	29.5205	28.3399	27.4559	26.4757	25.9462	26.5820	27.2743	28.3232	29.5281	30.5119 (42b)
Hot water usage for other uses	43.1461	41.5771	40.0082	38.4392	36.8703	35.3013	35.3013	36.8703	38.4392	40.0082	41.5771	43.1461 (42c)
Average daily hot water use (litres/day)												67.6091 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	73.7615	71.7379	69.5287	66.7791	64.3262	61.7770	61.2476	63.4523	65.7135	68.3314	71.1052	73.6580 (44)
Energy content	116.8202	102.1538	106.8630	91.4173	86.5954	75.9621	74.0736	78.5672	81.0314	92.7250	101.3024	115.3307 (45)
Energy content (annual)												Total = Sum(45)m = 1122.8420

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Water storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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 (57)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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 (59)

Total heat required for water heating calculated for each month

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
WWHRS	99.2972	86.8307	90.8335	77.7047	73.6061	64.5677	62.9626	66.7821	68.8767	78.8163	86.1070	98.0311 (62)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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 (63a)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Total per year (kWh/year) = Sum(64)m =	99.2972	86.8307	90.8335	77.7047	73.6061	64.5677	62.9626	66.7821	68.8767	78.8163	86.1070	98.0311 (64)

12Total per year (kWh/year)
 Electric shower(s) 56.7845 50.5954 55.2483 52.7228 53.7121 51.2361 52.9440 53.7121 52.7228 55.2483 54.2094 56.7845 (64a)
 Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 645.9202 (64a)

Heat gains from water heating, kWh/month
 39.0204 34.3565 36.5205 32.6069 31.8295 28.9510 28.9766 30.1236 30.3999 33.5161 35.0791 38.7039 (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	139.2251	139.2251	139.2251	139.2251	139.2251	139.2251	139.2251	139.2251	139.2251	139.2251	139.2251	139.2251 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	150.1195	166.2037	150.1195	155.1234	150.1195	155.1234	150.1195	150.1195	155.1234	150.1195	155.1234	150.1195 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	264.8343	267.5824	260.6572	245.9141	227.3037	209.8125	198.1273	195.3792	202.3044	217.0475	235.6579	253.1491 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.9225	36.9225	36.9225	36.9225	36.9225	36.9225	36.9225	36.9225	36.9225	36.9225	36.9225	36.9225 (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)	-111.3801	-111.3801	-111.3801	-111.3801	-111.3801	-111.3801	-111.3801	-111.3801	-111.3801	-111.3801	-111.3801	-111.3801 (71)
Water heating gains (Table 5)	52.4468	51.1258	49.0866	45.2873	42.7816	40.2097	38.9471	40.4887	42.2220	45.0486	48.7210	52.0214 (72)
Total internal gains	532.1681	549.6795	524.6308	511.0924	484.9723	469.9132	451.9614	450.7548	464.4174	476.9830	504.2699	520.0574 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b g	Specific data or Table 6c FF	Access factor Table 6d	Gains W						
Southeast	7.4700	36.7938	0.6300	0.7000	0.7700	83.9977 (77)						
Northwest	4.4900	11.2829	0.6300	0.7000	0.7700	15.4825 (81)						
Solar gains	99.4802	174.5942	252.5472	335.8142	397.0382	403.3595	385.0561	337.9749	281.1618	196.6468	120.0909	84.5283 (83)
Total gains	631.6483	724.2737	777.1780	846.9066	882.0106	873.2727	837.0175	788.7297	745.5793	673.6299	624.3607	604.5857 (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	29.4365	29.4983	29.5592	29.8484	29.9031	30.1606	30.1606	30.2088	30.0609	29.9031	29.7926	29.6779
alpha	2.9624	2.9666	2.9706	2.9899	2.9935	3.0107	3.0107	3.0139	3.0041	2.9935	2.9862	2.9785
util living area	0.9673	0.9503	0.9257	0.8694	0.7759	0.6295	0.4910	0.5329	0.7259	0.8878	0.9501	0.9710 (86)
MIT	18.7618	19.0464	19.4451	19.9957	20.4696	20.8041	20.9320	20.9114	20.6806	20.0702	19.3340	18.7150 (87)
Th 2	20.0983	20.1001	20.1017	20.1097	20.1112	20.1181	20.1181	20.1194	20.1154	20.1112	20.1082	20.1050 (88)
util rest of house	0.9625	0.9431	0.9146	0.8489	0.7389	0.5669	0.4056	0.4478	0.6707	0.8661	0.9418	0.9667 (89)
MIT 2	18.0410	18.3224	18.7152	19.2534	19.6973	19.9918	20.0857	20.0748	19.8939	19.3342	18.6151	17.9993 (90)
Living area fraction									fLA = Living area / (4) =			0.2211 (91)
MIT	18.2004	18.4824	18.8766	19.4175	19.8680	20.1713	20.2728	20.2597	20.0678	19.4969	18.7740	18.1575 (92)
Temperature adjustment												0.0000
adjusted MIT	18.2004	18.4824	18.8766	19.4175	19.8680	20.1713	20.2728	20.2597	20.0678	19.4969	18.7740	18.1575 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9491	0.9267	0.8959	0.8303	0.7276	0.5710	0.4213	0.4621	0.6674	0.8480	0.9256	0.9543 (94)
Useful gains	599.5203	671.1724	696.2464	703.1864	641.7294	498.5963	352.6013	364.4705	497.6154	571.2580	577.9084	576.9775 (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	1439.3229	1403.4544	1276.2209	1074.0127	832.5629	563.0379	371.1705	389.4403	605.1062	906.8633	1194.3436	1433.4879 (97)
Space heating kWh	624.8132	492.0935	431.5010	266.9949	141.9801	0.0000	0.0000	0.0000	0.0000	249.6904	443.8334	637.2438 (98a)
Space heating requirement - total per year (kWh/year)												3288.1503
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	624.8132	492.0935	431.5010	266.9949	141.9801	0.0000	0.0000	0.0000	0.0000	249.6904	443.8334	637.2438 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3288.1503
Space heating per m2										(98c) / (4) =		31.1850 (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	949.9605	747.8412	766.8283	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7499	0.8185	0.7904	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	712.4194	612.1415	606.1245	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	948.1383	909.0994	855.7647	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	169.7176	220.9366	185.7323	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	42.4294	55.2342	46.4331	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												144.0966 (107)
Energy for space heating												31.1850 (99)
Energy for space cooling												1.3666 (108)
Total												32.5517 (109)
Fabric Energy Efficiency (TFEE)												32.6 (109)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	52.7200 (1b)	x	2.3700 (2b)
First floor	52.7200 (1c)	x	2.6200 (2c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	105.4400		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	263.0728 (5)

2. Ventilation rate

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

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Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											Air changes per hour	0.0000 / (5) =	0.0000 (8)
Pressure test												Yes		
Pressure Test Method												Blower Door		
Measured/design AP50												1.0000	(17)	
Infiltration rate												0.0500	(18)	
Number of sides sheltered												4	(19)	
Shelter factor	(20) = 1 - [0.075 x (19)] =											0.7000	(20)	
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =											0.0350	(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	0.0446	0.0437	0.0429	0.0385	0.0376	0.0332	0.0332	0.0324	0.0350	0.0376	0.0394	0.0411 (22b)	
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												81.0000	(23c)
Effective ac	0.1396	0.1387	0.1379	0.1335	0.1326	0.1282	0.1282	0.1274	0.1300	0.1326	0.1344	0.1361 (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
Window (Uw = 1.20)			11.9600	1.1450	13.6947		
Door			2.1200	1.0000	2.1200		
Floor 1 P/a 0.39			52.7200	0.1200	6.3264	110.0000	5799.2000 (28a)
External Wall 1 Stone	48.8200	8.6800	40.1400	0.1500	6.0210	9.0000	361.2600 (29a)
External Wall 2 clad	53.9700	5.4000	48.5700	0.1500	7.2855	9.0000	437.1300 (29a)
External Roof 1 Horz	52.7200		52.7200	0.0900	4.7448	9.0000	474.4800 (30)
Total net area of external elements Aum(A, m2)			208.2300				
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	40.1924		
Party Wall 1			47.4000	0.0000	0.0000	20.0000	948.0000 (32)
Internal Wall 1 GF			50.0100			9.0000	450.0900 (32c)
Internal Wall 2 FF			119.9200			9.0000	1079.2800 (32c)
Internal Floor 1			52.7200			18.0000	948.9600 (32d)
Internal Ceiling 1			52.7200			9.0000	474.4800 (32e)
Heat capacity Cm = Sum(A x k)						(28) ... (30) + (32) + (32a) ... (32e) =	10972.8800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							104.0675 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E16 Corner (normal)	9.9800	0.0300	0.2994
E5 Ground floor (normal)	20.6000	0.0210	0.4326
E10 Eaves (insulation at ceiling level)	11.1000	0.0440	0.4884
E12 Gable (insulation at ceiling level)	9.5000	0.0510	0.4845
E6 Intermediate floor within a dwelling	20.6000	0.0800	1.6480
P1 Party wall - Ground floor	9.5000	0.1490	1.4155
P2 Party wall - Intermediate floor within a dwelling	9.5000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	9.5000	0.4800	4.5600
E2 Other lintels (including other steel lintels)	10.2100	0.0840	0.8576
E3 Sill	9.2000	0.0430	0.3956
E4 Jamb	24.3000	0.0340	0.8262
E18 Party wall between dwellings	9.9800	0.0395	0.3942
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			11.8020 (36)
Point Thermal bridges			0.0000 (36a) =
Total fabric heat loss			(33) + (36) + (36a) = 51.9944 (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	12.1214	12.0454	11.9695	11.5897	11.5137	11.1339	11.1339	11.0579	11.2858	11.5137	11.6656	11.8176 (38)
Average = Sum(39)m / 12 =	64.1158	64.0399	63.9639	63.5841	63.5081	63.1283	63.1283	63.0523	63.2802	63.5081	63.6600	63.8120 (39)
												63.5651

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.6081	0.6074	0.6066	0.6030	0.6023	0.5987	0.5987	0.5980	0.6002	0.6023	0.6038	0.6052 (40)
HLP (average)												0.6029
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.7845 (42)
Hot water usage for mixer showers												0.0000 (42a)	
Hot water usage for baths	81.7862	80.5716	78.8611	75.7073	73.3458	70.7272	69.3128	71.0113	72.8607	75.6626	78.8814	81.5097 (42b)	
Hot water usage for other uses	43.1461	41.5771	40.0082	38.4392	36.8703	35.3013	35.3013	36.8703	38.4392	40.0082	41.5771	43.1461 (42c)	
Average daily hot water use (litres/day)												115.0524 (43)	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	124.9323	122.1487	118.8693	114.1466	110.2161	106.0286	104.6142	107.8816	111.2999	115.6708	120.4585	124.6558 (44)
Energy conte	197.8622	173.9381	182.6977	156.2609	148.3720	130.3745	126.5218	133.5800	137.2439	156.9642	171.6152	195.1809 (45)
Energy content (annual)												Total = Sum(45)m = 1910.6116
Distribution loss (46)m = 0.15 x (45)m	29.6793	26.0907	27.4047	23.4391	22.2558	19.5562	18.9783	20.0370	20.5866	23.5446	25.7423	29.2771 (46)
Water storage loss:												
Store volume												250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8640 (55)
Total storage loss	26.7840	24.1920	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	25.9200	26.7840	25.9200	26.7840 (56)
If cylinder contains dedicated solar storage												
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 (57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Total heat required for water heating calculated for each month												

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WWHRS	247.9086	219.1413	232.7441	204.6929	198.4184	178.8065	176.5682	183.6264	185.6759	207.0106	220.0472	245.2273 (62)
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 (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)
	247.9086	219.1413	232.7441	204.6929	198.4184	178.8065	176.5682	183.6264	185.6759	207.0106	220.0472	245.2273 (64)
Total per year (kWh/year) = Sum(64)m =												2499.8676 (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	105.8263	93.9970	100.7841	90.7024	89.3708	82.0951	82.1056	84.4525	84.3792	92.2277	95.8077	104.9348 (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	167.0701	167.0701	167.0701	167.0701	167.0701	167.0701	167.0701	167.0701	167.0701	167.0701	167.0701	167.0701 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	33.1594	29.4519	23.9519	18.1331	13.5547	11.4435	12.3651	16.0726	21.5726	27.3913	31.9697	34.0810 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	395.2751	399.3768	389.0406	367.0360	339.2593	313.1530	295.7124	291.6107	301.9469	323.9514	351.7282	377.8345 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.4915	54.4915	54.4915	54.4915	54.4915	54.4915	54.4915	54.4915	54.4915	54.4915	54.4915	54.4915 (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)	-111.3801	-111.3801	-111.3801	-111.3801	-111.3801	-111.3801	-111.3801	-111.3801	-111.3801	-111.3801	-111.3801	-111.3801 (71)
Water heating gains (Table 5)	142.2397	139.8765	135.4625	125.9755	120.1221	114.0210	110.3570	113.5114	117.1933	123.9620	133.0662	141.0413 (72)
Total internal gains	680.8557	678.8867	658.6365	621.3262	583.1176	548.7990	528.6160	531.3762	550.8944	585.4863	626.9457	663.1383 (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	
Southeast	7.4700		36.7938		0.7600		0.7000		0.7700		101.3306 (77)	
Northwest	4.4900		11.2829		0.7600		0.7000		0.7700		18.6773 (81)	
Solar gains	120.0078	210.6216	304.6602	405.1092	478.9668	486.5925	464.5122	407.7158	339.1794	237.2248	144.8715	101.9707 (83)
Total gains	800.8635	889.5083	963.2967	1026.4354	1062.0843	1035.3915	993.1282	939.0920	890.0737	822.7111	771.8172	765.1090 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												
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	47.5393	47.5957	47.6522	47.9369	47.9942	48.2830	48.2830	48.3411	48.1671	47.9942	47.8797	47.7657
alpha	4.1693	4.1730	4.1768	4.1958	4.1996	4.2189	4.2189	4.2227	4.2111	4.1996	4.1920	4.1844
util living area	0.9034	0.8612	0.7912	0.6774	0.5341	0.3857	0.2788	0.3074	0.4778	0.7104	0.8583	0.9155 (86)
Living	20.3239	20.4665	20.6393	20.7977	20.8857	20.9186	20.9251	20.9244	20.9069	20.7943	20.5400	20.2812
Non living	19.6207	19.7962	20.0062	20.1951	20.2936	20.3304	20.3361	20.3362	20.3184	20.1953	19.8923	19.5702
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	20.6541	20.4665	20.6393	20.7977	20.8857	20.9186	20.9251	20.9244	20.9069	20.7943	20.5400	20.3817 (87)
Th 2	20.4227	20.4234	20.4240	20.4273	20.4279	20.4312	20.4312	20.4318	20.4299	20.4279	20.4266	20.4253 (88)
util rest of house	0.8939	0.8487	0.7740	0.6539	0.5051	0.3526	0.2431	0.2699	0.4413	0.6833	0.8435	0.9070 (89)
MIT 2	20.1030	19.7962	20.0062	20.1951	20.2936	20.3304	20.3361	20.3362	20.3184	20.1953	19.8923	19.7243 (90)
Living area fraction												fLA = Living area / (4) =
MIT	20.2248	19.9444	20.1461	20.3284	20.4245	20.4604	20.4663	20.4663	20.4485	20.3277	20.0355	19.8696 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2248	19.9444	20.1461	20.3284	20.4245	20.4604	20.4663	20.4663	20.4485	20.3277	20.0355	19.8696 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8905	0.8375	0.7651	0.6497	0.5049	0.3543	0.2453	0.2722	0.4425	0.6784	0.8326	0.8979 (94)
Useful gains	713.1341	744.9351	737.0480	666.9075	536.2344	366.8505	243.5809	255.6110	393.8768	558.1289	642.6239	686.9763 (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	1021.0329	963.4392	872.8602	726.6615	554.0795	369.9590	244.0752	256.3874	401.7341	617.7911	823.4746	999.9096 (97)
Space heating kWh	229.0767	146.8347	101.0443	43.0228	13.2767	0.0000	0.0000	0.0000	0.0000	44.3886	130.2125	232.8224 (98a)
Space heating requirement - total per year (kWh/year)												940.6788
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	229.0767	146.8347	101.0443	43.0228	13.2767	0.0000	0.0000	0.0000	0.0000	44.3886	130.2125	232.8224 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												940.6788
Space heating per m2												(98c) / (4) =
												8.9215 (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 %)	402.0893 (206)

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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	229.0767	146.8347	101.0443	43.0228	13.2767	0.0000	0.0000	0.0000	0.0000	44.3886	130.2125	232.8224 (98)
Space heating efficiency (main heating system 1)	402.0893	402.0893	402.0893	402.0893	402.0893	0.0000	0.0000	0.0000	0.0000	402.0893	402.0893	402.0893 (210)
Space heating fuel (main heating system)	56.9716	36.5179	25.1298	10.6998	3.3019	0.0000	0.0000	0.0000	0.0000	11.0395	32.3840	57.9032 (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	247.9086	219.1413	232.7441	204.6929	198.4184	178.8065	176.5682	183.6264	185.6759	207.0106	220.0472	245.2273 (64)
Efficiency of water heater	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600 (216)
Fuel for water heating, kWh/month	121.1319	107.0758	113.7223	100.0161	96.9503	87.3676	86.2739	89.7227	90.7241	101.1485	107.5184	119.8218 (219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	15.5920	14.0831	15.5920	15.0890	15.5920	15.0890	15.5920	15.5920	15.0890	15.5920	15.0890	15.5920 (231)
Lighting	29.0242	23.2843	20.9649	15.3598	11.8644	9.6933	10.8231	14.0682	18.2732	23.9755	27.0802	29.8309 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-53.8669	-78.6716	-116.9208	-133.6349	-145.2725	-135.6761	-133.8445	-125.9092	-110.4066	-90.5135	-59.7676	-46.1202 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	-25.4797	-57.3526	-122.7869	-196.7418	-268.9143	-273.5391	-269.1508	-222.5304	-156.3915	-85.7144	-35.0997	-19.7523 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												233.9477 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												204.6600
Water heating fuel used												1221.4734 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.5720)												
mechanical ventilation fans (SFP = 0.5720)												183.5827 (230a)
Total electricity for the above, kWh/year												183.5827 (231)
Electricity for lighting (calculated in Appendix L)												234.2419 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-2964.0577 (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												-1090.8119 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	233.9477	16.4900	38.5780 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1221.4734	16.4900	201.4210 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	183.5827	16.4900	30.2728 (249)
Energy for lighting	234.2419	16.4900	38.6265 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1230.6044	16.4900	-202.9267
PV Unit electricity exported	-1733.4533	5.5900	-96.9000
Total			-299.8267 (252)
Total energy cost			9.0715 (255)

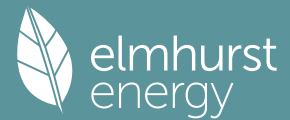
11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.0217 (257)
SAP value		99.6481
SAP rating (Section 12)		100 (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	233.9477	0.1572	36.7696 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1221.4734	0.1409	172.0761 (264)
Space and water heating			208.8457 (265)

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Pumps, fans and electric keep-hot	183.5827	0.1387	25.4652 (267)
Energy for lighting	234.2419	0.1443	33.8083 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1230.6044	0.1342	-165.1041
PV Unit electricity exported	-1733.4533	0.1243	-215.4772
Total			-380.5812 (269)
Total CO2, kg/year			-112.4620 (272)
CO2 emissions per m2			-1.0700 (273)
EI value			101.0017
EI rating			101 (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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	52.7200 (1b)	x 2.3700 (2b)	= 124.9464 (1b) - (3b)
First floor	52.7200 (1c)	x 2.6200 (2c)	= 138.1264 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	105.4400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 263.0728 (5)

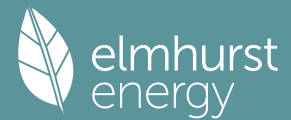
2. Ventilation rate

	m3 per hour												
Number of open chimneys	0 * 80 =											0.0000 (6a)	
Number of open flues	0 * 20 =											0.0000 (6b)	
Number of chimneys / flues attached to closed fire	0 * 10 =											0.0000 (6c)	
Number of flues attached to solid fuel boiler	0 * 20 =											0.0000 (6d)	
Number of flues attached to other heater	0 * 35 =											0.0000 (6e)	
Number of blocked chimneys	0 * 20 =											0.0000 (6f)	
Number of intermittent extract fans	0 * 10 =											0.0000 (7a)	
Number of passive vents	0 * 10 =											0.0000 (7b)	
Number of flueless gas fires	0 * 40 =											0.0000 (7c)	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =												0.0000 / (5) =	0.0000 (8)
Pressure test	Yes												
Pressure Test Method	Blower Door												
Measured/design AP50	1.0000 (17)												
Infiltration rate	0.0500 (18)												
Number of sides sheltered	4 (19)												
Shelter factor	(20) = 1 - [0.075 x (19)] =											0.7000 (20)	
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =											0.0350 (21)	
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	6.6000	6.2000	6.1000	5.6000	5.5000	4.7000	4.6000	4.5000	5.0000	5.8000	6.0000	6.5000 (22)	
Adj infilt rate	1.6500	1.5500	1.5250	1.4000	1.3750	1.1750	1.1500	1.1250	1.2500	1.4500	1.5000	1.6250 (22a)	
Balanced mechanical ventilation with heat recovery	0.0577	0.0542	0.0534	0.0490	0.0481	0.0411	0.0402	0.0394	0.0437	0.0507	0.0525	0.0569 (22b)	
If mechanical ventilation												0.5000 (23a)	
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)	
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												81.0000 (23c)	
Effective ac	0.1527	0.1492	0.1484	0.1440	0.1431	0.1361	0.1352	0.1344	0.1387	0.1457	0.1475	0.1519 (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
Window (Uw = 1.20)			11.9600	1.1450	13.6947		(27)
Door			2.1200	1.0000	2.1200		(26a)
Floor 1 P/a 0.39			52.7200	0.1200	6.3264	110.0000	5799.2000 (28a)
External Wall 1 Stone	48.8200	8.6800	40.1400	0.1500	6.0210	9.0000	361.2600 (29a)
External Wall 2 clad	53.9700	5.4000	48.5700	0.1500	7.2855	9.0000	437.1300 (29a)
External Roof 1 Horz	52.7200		52.7200	0.0900	4.7448	9.0000	474.4800 (30)
Total net area of external elements Aum(A, m2)			208.2300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	40.1924		(33)
Party Wall 1			47.4000	0.0000	0.0000	20.0000	948.0000 (32)
Internal Wall 1 GF			50.0100			9.0000	450.0900 (32c)
Internal Wall 2 FF			119.9200			9.0000	1079.2800 (32c)
Internal Floor 1			52.7200			18.0000	948.9600 (32d)
Internal Ceiling 1			52.7200			9.0000	474.4800 (32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =	10972.8800 (34)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K						104.0675 (35)	
List of Thermal Bridges				Length	Psi-value	Total	
K1 Element				9.9800	0.0300	0.2994	
E16 Corner (normal)				20.6000	0.0210	0.4326	
E10 Eaves (insulation at ceiling level)				11.1000	0.0440	0.4884	
E12 Gable (insulation at ceiling level)				9.5000	0.0510	0.4845	
E6 Intermediate floor within a dwelling				20.6000	0.0800	1.6480	
P1 Party wall - Ground floor				9.5000	0.1490	1.4155	
P2 Party wall - Intermediate floor within a dwelling				9.5000	0.0000	0.0000	

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P4 Party wall - Roof (insulation at ceiling level)	9.5000	0.4800	4.5600
E2 Other lintels (including other steel lintels)	10.2100	0.0840	0.8576
E3 Sill	9.2000	0.0430	0.3956
E4 Jamb	24.3000	0.0340	0.8262
E18 Party wall between dwellings	9.9800	0.0395	0.3942
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			11.8020 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 51.9944 (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	13.2608	12.9570	12.8810	12.5012	12.4253	11.8176	11.7416	11.6656	12.0454	12.6531	12.8051	13.1849 (38)
Heat transfer coeff	65.2552	64.9514	64.8754	64.4956	64.4197	63.8120	63.7360	63.6600	64.0399	64.6476	64.7995	65.1793 (39)
Average = Sum(39)m / 12 =												64.4893

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.6189	0.6160	0.6153	0.6117	0.6110	0.6052	0.6045	0.6038	0.6074	0.6131	0.6146	0.6182 (40)
HLP (average)												0.6116
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.7845 (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 81.7862 80.5716 78.8611 75.7073 73.3458 70.7272 69.3128 71.0113 72.8607 75.6626 78.8814 81.5097 (42b)

Hot water usage for other uses 43.1461 41.5771 40.0082 38.4392 36.8703 35.3013 35.3013 36.8703 38.4392 40.0082 41.5771 43.1461 (42c)

Average daily hot water use (litres/day) 115.0524 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	124.9323	122.1487	118.8693	114.1466	110.2161	106.0286	104.6142	107.8816	111.2999	115.6708	120.4585	124.6558 (44)
Energy conte	197.8622	173.9381	182.6977	156.2609	148.3720	130.3745	126.5218	133.5800	137.2439	156.9642	171.6152	195.1809 (45)
Energy content (annual)												Total = Sum(45)m = 1910.6116
Distribution loss (46)m = 0.15 x (45)m	29.6793	26.0907	27.4047	23.4391	22.2558	19.5562	18.9783	20.0370	20.5866	23.5446	25.7423	29.2771 (46)
Water storage loss:												250.0000 (47)
Store volume												1.6000 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.8640 (55)
Enter (49) or (54) in (55)												
Total storage loss	26.7840	24.1920	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	25.9200	26.7840	25.9200	26.7840 (56)
If cylinder contains dedicated solar storage	26.7840	24.1920	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	25.9200	26.7840	25.9200	26.7840 (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	247.9086	219.1413	232.7441	204.6929	198.4184	178.8065	176.5682	183.6264	185.6759	207.0106	220.0472	245.2273 (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	247.9086	219.1413	232.7441	204.6929	198.4184	178.8065	176.5682	183.6264	185.6759	207.0106	220.0472	245.2273 (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	105.8263	93.9970	100.7841	90.7024	89.3708	82.0951	82.1056	84.4525	84.3792	92.2277	95.8077	104.9348 (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	167.0701	167.0701	167.0701	167.0701	167.0701	167.0701	167.0701	167.0701	167.0701	167.0701	167.0701	167.0701 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	33.1594	29.4519	23.9519	18.1331	13.5547	11.4435	12.3651	16.0726	21.5726	27.3913	31.9697	34.0810 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	395.2751	399.3768	389.0406	367.0360	339.2593	313.1530	295.7124	291.6107	301.9469	323.9514	351.7282	377.8345 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.4915	54.4915	54.4915	54.4915	54.4915	54.4915	54.4915	54.4915	54.4915	54.4915	54.4915	54.4915 (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)	-111.3801	-111.3801	-111.3801	-111.3801	-111.3801	-111.3801	-111.3801	-111.3801	-111.3801	-111.3801	-111.3801	-111.3801 (71)
Water heating gains (Table 5)	142.2397	139.8765	135.4625	125.9755	120.1221	114.0210	110.3570	113.5114	117.1933	123.9620	133.0662	141.0413 (72)
Total internal gains	680.8557	678.8867	658.6365	621.3262	583.1176	548.7990	528.6160	531.3762	550.8944	585.4863	626.9457	663.1383 (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					
Southeast		7.4700	48.0626	0.7600	0.7000	0.7700	132.3649 (77)					
Northwest		4.4900	15.8649	0.7600	0.7000	0.7700	26.2620 (81)					
Solar gains	158.6269	240.4722	345.7648	474.8196	535.2879	594.5035	512.1726	482.2537	405.4614	279.9330	183.7237	130.6733 (83)
Total gains	839.4825	919.3589	1004.4013	1096.1458	1118.4054	1143.3025	1040.7887	1013.6299	956.3558	865.4193	810.6694	793.8116 (84)

7. Mean internal temperature (heating season)

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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	46.7092	46.9277	46.9827	47.2594	47.3151	47.7657	47.8226	47.8797	47.5957	47.1483	47.0378	46.7637
alpha	4.1139	4.1285	4.1322	4.1506	4.1543	4.1844	4.1882	4.1920	4.1730	4.1432	4.1359	4.1176
util living area	0.8369	0.7917	0.7257	0.6225	0.5015	0.3595	0.2927	0.2939	0.4089	0.6015	0.7584	0.8410 (86)
Living	20.5607	20.6452	20.7385	20.8340	20.8930	20.9195	20.9240	20.9241	20.9156	20.8642	20.7334	20.5697
Non living	19.9044	20.0069	20.1165	20.2282	20.2933	20.3251	20.3298	20.3305	20.3198	20.2631	20.1153	19.9171
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	20.7753	20.6452	20.7385	20.8340	20.8930	20.9195	20.9240	20.9241	20.9156	20.8642	20.7334	20.6299 (87)
Th 2	20.4130	20.4156	20.4163	20.4195	20.4201	20.4253	20.4260	20.4266	20.4234	20.4182	20.4169	20.4137 (88)
util rest of house	0.8209	0.7732	0.7040	0.5973	0.4723	0.3285	0.2581	0.2585	0.3725	0.5680	0.7342	0.8245 (89)
MIT 2	20.2103	20.0069	20.1165	20.2282	20.2933	20.3251	20.3298	20.3305	20.3198	20.2631	20.1153	20.0066 (90)
Living area fraction									FLA = Living area / (4) =			0.2211 (91)
MIT	20.3352	20.1480	20.2540	20.3621	20.4258	20.4565	20.4611	20.4618	20.4515	20.3960	20.2520	20.1444 (92)
Temperature adjustment												0.0000 (92)
adjusted MIT	20.3352	20.1480	20.2540	20.3621	20.4258	20.4565	20.4611	20.4618	20.4515	20.3960	20.2520	20.1444 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8186	0.7642	0.6978	0.5947	0.4726	0.3302	0.2602	0.2607	0.3743	0.5667	0.7270	0.8163 (94)
Useful gains	687.2267	702.5715	700.8322	651.8877	528.5853	377.5566	270.8641	264.2307	357.9984	490.4383	589.3853	647.9917 (95)
Ext temp.	7.0000	7.3000	8.1000	9.6000	12.0000	14.5000	16.2000	16.3000	14.8000	12.4000	9.8000	7.6000 (96)
Heat loss rate W	870.1903	834.4943	788.4985	694.1104	542.7897	380.0950	271.5875	264.9372	361.9241	516.9195	677.2820	817.6339 (97)
Space heating kWh	136.1249	88.6521	65.2237	30.4004	10.5681	0.0000	0.0000	0.0000	0.0000	19.7020	63.2856	126.2138 (98a)
Space heating requirement - total per year (kWh/year)												540.1707
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	136.1249	88.6521	65.2237	30.4004	10.5681	0.0000	0.0000	0.0000	0.0000	19.7020	63.2856	126.2138 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												540.1707
Space heating per m2										(98c) / (4) =		5.1230 (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 %) 402.2892 (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	136.1249	88.6521	65.2237	30.4004	10.5681	0.0000	0.0000	0.0000	0.0000	19.7020	63.2856	126.2138 (98)
Space heating efficiency (main heating system 1)	402.2892	402.2892	402.2892	402.2892	402.2892	0.0000	0.0000	0.0000	0.0000	402.2892	402.2892	402.2892 (210)
Space heating fuel (main heating system)	33.8376	22.0369	16.2131	7.5569	2.6270	0.0000	0.0000	0.0000	0.0000	4.8975	15.7314	31.3739 (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	247.9086	219.1413	232.7441	204.6929	198.4184	178.8065	176.5682	183.6264	185.6759	207.0106	220.0472	245.2273 (64)
Efficiency of water heater	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600 (216)
Fuel for water heating, kWh/month	121.1319	107.0758	113.7223	100.0161	96.9503	87.3676	86.2739	89.7227	90.7241	101.1485	107.5184	119.8218 (219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	15.5920	14.0831	15.5920	15.0890	15.5920	15.0890	15.5920	15.5920	15.0890	15.5920	15.0890	15.5920 (231)
Lighting	29.0242	23.2843	20.9649	15.3598	11.8644	9.6933	10.8231	14.0682	18.2732	23.9755	27.0802	29.8309 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-68.1749	-87.5330	-127.3976	-145.4483	-152.8422	-147.2404	-139.6238	-136.4561	-122.5199	-102.0106	-72.4465	-57.2345 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	-40.3499	-72.7984	-151.2988	-246.6425	-312.0070	-353.3615	-305.8224	-279.2595	-202.7274	-112.1863	-51.9951	-30.1275 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												134.2742 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												204.6600
Water heating fuel used												1221.4734 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.5720)												
mechanical ventilation fans (SFP = 0.5720)												183.5827 (230a)
Total electricity for the above, kWh/year												183.5827 (231)
Electricity for lighting (calculated in Appendix L)												234.2419 (232)

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Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-3517.5040 (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	-1743.9317 (238)

10a. Fuel costs - using BEDF prices (535)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	134.2742	25.1600	33.7834 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1221.4734	25.1600	307.3227 (247)
Energy for instantaneous electric shower(s)	0.0000	25.1600	0.0000 (247a)
Pumps, fans and electric keep-hot	183.5827	25.1600	46.1894 (249)
Energy for lighting	234.2419	25.1600	58.9353 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1358.9277	25.1600	-341.9062
PV Unit electricity exported	-2158.5763	5.8100	-125.4133
Total			-467.3195 (252)
Total energy cost			-21.0887 (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	134.2742	0.1572	21.1049 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1221.4734	0.1409	172.0761 (264)
Space and water heating			193.1810 (265)
Pumps, fans and electric keep-hot	183.5827	0.1387	25.4652 (267)
Energy for lighting	234.2419	0.1443	33.8083 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1358.9277	0.1348	-183.1236
PV Unit electricity exported	-2158.5763	0.1252	-270.2699
Total			-453.3935 (269)
Total CO2, kg/year			-200.9389 (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	134.2742	1.5819	212.4021 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1221.4734	1.5209	1857.7469 (278)
Space and water heating			2070.1490 (279)
Pumps, fans and electric keep-hot	183.5827	1.5128	277.7239 (281)
Energy for lighting	234.2419	1.5338	359.2881 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1358.9277	1.4980	-2035.7144
PV Unit electricity exported	-2158.5763	0.4596	-992.0549
Total			-3027.7692 (283)
Total Primary energy kWh/year			-320.6082 (286)

SAP 10 EPC IMPROVEMENTS

SEC1 - ASHP ROI TF 0.15 improv

Current energy efficiency rating: A 100
 Current environmental impact rating: A 101

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

Recommended measures:
 N Solar water heating SAP change + 1.4 Cost change -£ 69 CO2 change -41 kg (20.4%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£69	0.39 kg/m ²	A 101 A 101
Total Savings	£69	0.39 kg/m²	

Potential energy efficiency rating: A 101
 Potential environmental impact rating: A 101

Fuel prices for cost data on this page from database revision number 535 TEST (04 Jan 2024)
 Recommendation texts revision number 6.1 (11 Jun 2019)

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

	Current	Potential	Saving
Electricity	£446	£363	£83
Space heating	£80	£100	-£20

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Water heating	£307	£204	£103
Lighting	£59	£59	£0
Generated (PV)	-£467	-£454	-£14
Total cost of fuels	-£21	-£91	£69
Total cost of uses	-£21	-£91	£69
Delivered energy	-17 kWh/m ²	-20 kWh/m ²	3 kWh/m ²
Carbon dioxide emissions	-0.2 tonnes	-0.2 tonnes	0.0 tonnes
CO2 emissions per m ²	-2 kg/m ²	-2 kg/m ²	0 kg/m ²
Primary energy	-3 kWh/m ²	-7 kWh/m ²	4 kWh/m ²

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	52.7200 (1b)	x 2.3700 (2b)	= 124.9464 (1b) - (3b)
First floor	52.7200 (1c)	x 2.6200 (2c)	= 138.1264 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	105.4400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 263.0728 (5)

2. Ventilation rate

	m3 per hour												
Number of open chimneys	0 * 80 =											0.0000 (6a)	
Number of open flues	0 * 20 =											0.0000 (6b)	
Number of chimneys / flues attached to closed fire	0 * 10 =											0.0000 (6c)	
Number of flues attached to solid fuel boiler	0 * 20 =											0.0000 (6d)	
Number of flues attached to other heater	0 * 35 =											0.0000 (6e)	
Number of blocked chimneys	0 * 20 =											0.0000 (6f)	
Number of intermittent extract fans	0 * 10 =											0.0000 (7a)	
Number of passive vents	0 * 10 =											0.0000 (7b)	
Number of flueless gas fires	0 * 40 =											0.0000 (7c)	
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											0.0000 / (5) =	0.0000 (8)
Pressure test												Yes	
Pressure Test Method												Blower Door	
Measured/design AP50												1.0000 (17)	
Infiltration rate												0.0500 (18)	
Number of sides sheltered												4 (19)	
Shelter factor	(20) = 1 - [0.075 x (19)] =											0.7000 (20)	
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =											0.0350 (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)
Balanced mechanical ventilation with heat recovery	0.0446	0.0437	0.0429	0.0385	0.0376	0.0332	0.0332	0.0324	0.0350	0.0376	0.0394	0.0411	(22b)
If mechanical ventilation												0.5000 (23a)	
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)	
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												81.0000 (23c)	
Effective ac	0.1396	0.1387	0.1379	0.1335	0.1326	0.1282	0.1282	0.1274	0.1300	0.1326	0.1344	0.1361	(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
Window (Uw = 1.20)			11.9600	1.1450	13.6947		(27)
Door			2.1200	1.0000	2.1200		(26a)
Floor 1 P/a 0.39			52.7200	0.1200	6.3264	110.0000	5799.2000 (28a)
External Wall 1 Stone	48.8200	8.6800	40.1400	0.1500	6.0210	9.0000	361.2600 (29a)
External Wall 2 clad	53.9700	5.4000	48.5700	0.1500	7.2855	9.0000	437.1300 (29a)
External Roof 1 Horz	52.7200		52.7200	0.0900	4.7448	9.0000	474.4800 (30)
Total net area of external elements Aum(A, m ²)			208.2300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.1924		(33)
Party Wall 1			47.4000	0.0000	0.0000	20.0000	948.0000 (32)
Internal Wall 1 GF			50.0100			9.0000	450.0900 (32c)
Internal Wall 2 FF			119.9200			9.0000	1079.2800 (32c)
Internal Floor 1			52.7200			18.0000	948.9600 (32d)
Internal Ceiling 1			52.7200			9.0000	474.4800 (32e)
Heat capacity Cm = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =				10972.8800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							104.0675 (35)
List of Thermal Bridges							
K1 Element	Length	Psi-value	Total				
E16 Corner (normal)	9.9800	0.0300	0.2994				
E5 Ground floor (normal)	20.6000	0.0210	0.4326				
E10 Eaves (insulation at ceiling level)	11.1000	0.0440	0.4884				
E12 Gable (insulation at ceiling level)	9.5000	0.0510	0.4845				
E6 Intermediate floor within a dwelling	20.6000	0.0800	1.6480				
P1 Party wall - Ground floor	9.5000	0.1490	1.4155				
P2 Party wall - Intermediate floor within a dwelling	9.5000	0.0000	0.0000				
P4 Party wall - Roof (insulation at ceiling level)	9.5000	0.4800	4.5600				

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[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
Southeast		7.4700	36.7938	0.7600	0.7000	0.7700	101.3306 (77)
Northwest		4.4900	11.2829	0.7600	0.7000	0.7700	18.6773 (81)

Solar gains	120.0078	210.6216	304.6602	405.1092	478.9668	486.5925	464.5122	407.7158	339.1794	237.2248	144.8715	101.9707 (83)
Total gains	800.8635	889.5083	961.7959	1018.9314	1048.3270	1021.3840	979.1207	926.0850	884.0705	821.2103	771.8172	765.1090 (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	47.5393	47.5957	47.6522	47.9369	47.9942	48.2830	48.2830	48.3411	48.1671	47.9942	47.8797	47.7657
alpha	4.1693	4.1730	4.1768	4.1958	4.1996	4.2189	4.2189	4.2227	4.2111	4.1996	4.1920	4.1844
util living area	0.9034	0.8612	0.7919	0.6810	0.5401	0.3907	0.2827	0.3116	0.4807	0.7112	0.8583	0.9155 (86)
Living	20.3239	20.4665	20.6384	20.7952	20.8840	20.9182	20.9251	20.9242	20.9064	20.7936	20.5400	20.2812
Non living	19.6207	19.7962	20.0050	20.1923	20.2919	20.3300	20.3361	20.3362	20.3180	20.1947	19.8923	19.5702
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	20.6541	20.4665	20.6384	20.7952	20.8840	20.9182	20.9251	20.9242	20.9064	20.7936	20.5400	20.3817 (87)
Th 2	20.4227	20.4234	20.4240	20.4273	20.4279	20.4312	20.4312	20.4318	20.4299	20.4279	20.4266	20.4253 (88)
util rest of house	0.8939	0.8487	0.7746	0.6575	0.5109	0.3573	0.2465	0.2737	0.4441	0.6842	0.8435	0.9070 (89)
MIT 2	20.1030	19.7962	20.0050	20.1923	20.2919	20.3300	20.3361	20.3362	20.3180	20.1947	19.8923	19.7243 (90)
Living area fraction									FLA = Living area / (4) =			0.2211 (91)
MIT	20.2248	19.9444	20.1450	20.3256	20.4228	20.4601	20.4663	20.4662	20.4481	20.3271	20.0355	19.8696 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2248	19.9444	20.1450	20.3256	20.4228	20.4601	20.4663	20.4662	20.4481	20.3271	20.0355	19.8696 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8905	0.8375	0.7658	0.6532	0.5107	0.3590	0.2487	0.2760	0.4453	0.6793	0.8326	0.8979 (94)
Useful gains	713.1341	744.9351	736.5264	665.5464	535.3593	366.6687	243.5486	255.5619	393.6659	557.8074	642.6239	686.9763 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	14.6000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1021.0329	963.4392	872.7898	726.4847	553.9690	369.9361	244.0710	256.3810	401.7074	617.7489	823.4746	999.9096 (97)
Space heating kWh	229.0767	146.8347	101.3800	43.8756	13.8456	0.0000	0.0000	0.0000	0.0000	44.5965	130.2125	232.8224 (98a)
Space heating requirement - total per year (kWh/year)												942.6439
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	229.0767	146.8347	101.3800	43.8756	13.8456	0.0000	0.0000	0.0000	0.0000	44.5965	130.2125	232.8224 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												942.6439
Space heating per m2										(98c) / (4) =		8.9401 (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 %)	402.0893 (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	229.0767	146.8347	101.3800	43.8756	13.8456	0.0000	0.0000	0.0000	0.0000	44.5965	130.2125	232.8224 (98)
Space heating efficiency (main heating system 1)	402.0893	402.0893	402.0893	402.0893	402.0893	0.0000	0.0000	0.0000	0.0000	402.0893	402.0893	402.0893 (210)
Space heating fuel (main heating system)	56.9716	36.5179	25.2133	10.9119	3.4434	0.0000	0.0000	0.0000	0.0000	11.0912	32.3840	57.9032 (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	247.9086	202.9109	173.6687	119.2272	83.6932	72.3870	70.4524	89.6814	123.3050	177.0304	220.0472	245.2273 (64)
Efficiency of water heater (217)m	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600 (216)
Fuel for water heating, kWh/month	121.1319	99.1454	84.8572	58.2562	40.8938	35.3694	34.4241	43.8197	60.2487	86.4998	107.5184	119.8218 (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	22.3865	20.2200	22.3865	21.6643	22.3865	21.6643	22.3865	22.3865	21.6643	22.3865	21.6643	22.3865 (231)
Lighting	29.0242	23.2843	20.9649	15.3598	11.8644	9.6933	10.8231	14.0682	18.2732	23.9755	27.0802	29.8309 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-54.0012	-78.5866	-114.9166	-128.2939	-135.0647	-125.2563	-123.5354	-118.2666	-106.9731	-89.9221	-59.9705	-46.2285 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	-25.3455	-57.4375	-124.7911	-202.0828	-279.1221	-283.9590	-279.4599	-230.1729	-159.8250	-86.3058	-34.8968	-19.6440 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)

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Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year												
Space heating fuel - main system 1											234.4364	(211)
Space heating fuel - main system 2											0.0000	(213)
Space heating fuel - secondary											0.0000	(215)
Efficiency of water heater											204.6600	
Water heating fuel used											891.9864	(219)
Space cooling fuel											0.0000	(221)

Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.5720)												
mechanical ventilation fans (SFP = 0.5720)											183.5827	(230a)
pump for solar water heating											80.0000	(230g)
Total electricity for the above, kWh/year											263.5827	(231)
Electricity for lighting (calculated in Appendix L)											234.2419	(232)

Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation											-2964.0577	(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											-1339.8103	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	234.4364	16.4900	38.6586	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	891.9864	16.4900	147.0886	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	183.5827	16.4900	30.2728	(249)
Pump for solar water heating	80.0000	16.4900	13.1920	(249)
Energy for lighting	234.2419	16.4900	38.6265	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1181.0156	16.4900	-194.7495	
PV Unit electricity exported	-1783.0422	5.5900	-99.6721	
Total			-294.4215	(252)
Total energy cost			-26.5831	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):			0.3600	(256)
Energy cost factor (ECF)		[(255) x (256)] / [(4) + 45.0] =	-0.0636	(257)
SAP value			101.0312	
SAP rating (Section 12)			101	(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	234.4364	0.1571	36.8384	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	891.9864	0.1459	130.1733	(264)
Space and water heating			167.0117	(265)
Pumps, fans and electric keep-hot	263.5827	0.1387	36.5622	(267)
Energy for lighting	234.2419	0.1443	33.8083	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1181.0156	0.1346	-158.9928	
PV Unit electricity exported	-1783.0422	0.1240	-221.1191	
Total			-380.1119	(269)
Total CO2, kg/year			-142.7297	(272)
CO2 emissions per m2			-1.3500	(273)
EI value			101.2713	
EI rating			101	(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)	
Ground floor	52.7200 (1b)	x 2.3700 (2b)	= 124.9464 (1b) - (3b)	
First floor	52.7200 (1c)	x 2.6200 (2c)	= 138.1264 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	105.4400		(4)	
Dwelling volume		(3a) + (3b) + (3c) + (3d) + (3e) ... (3n) =	263.0728 (5)	

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2. Ventilation rate

												m3 per hour	
Number of open chimneys												0 * 80 =	0.0000 (6a)
Number of open flues												0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire												0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler												0 * 20 =	0.0000 (6d)
Number of flues attached to other heater												0 * 35 =	0.0000 (6e)
Number of blocked chimneys												0 * 20 =	0.0000 (6f)
Number of intermittent extract fans												0 * 10 =	0.0000 (7a)
Number of passive vents												0 * 10 =	0.0000 (7b)
Number of flueless gas fires												0 * 40 =	0.0000 (7c)
												Air changes per hour	
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											0.0000 / (5) =	0.0000 (8)
Pressure test												Yes	
Pressure Test Method												Blower Door	
Measured/design AP50												1.0000	(17)
Infiltration rate												0.0500	(18)
Number of sides sheltered												4	(19)
Shelter factor												(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor												(21) = (18) x (20) =	0.0350 (21)
												Effective ac	
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	6.6000	6.2000	6.1000	5.6000	5.5000	4.7000	4.6000	4.5000	5.0000	5.8000	6.0000	6.5000	(22)
Adj infilt rate	1.6500	1.5500	1.5250	1.4000	1.3750	1.1750	1.1500	1.2500	1.2500	1.4500	1.5000	1.6250	(22a)
Balanced mechanical ventilation with heat recovery	0.0577	0.0542	0.0534	0.0490	0.0481	0.0411	0.0402	0.0394	0.0437	0.0507	0.0525	0.0569	(22b)
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												81.0000	(23c)
Effective ac	0.1527	0.1492	0.1484	0.1440	0.1431	0.1361	0.1352	0.1344	0.1387	0.1457	0.1475	0.1519	(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	
Window (Uw = 1.20)			11.9600	1.1450	13.6947			(27)
Door			2.1200	1.0000	2.1200			(26a)
Floor 1 P/a 0.39			52.7200	0.1200	6.3264	110.0000	5799.2000	(28a)
External Wall 1 Stone	48.8200	8.6800	40.1400	0.1500	6.0210	9.0000	361.2600	(29a)
External Wall 2 clad	53.9700	5.4000	48.5700	0.1500	7.2855	9.0000	437.1300	(29a)
External Roof 1 Horz	52.7200		52.7200	0.0900	4.7448	9.0000	474.4800	(30)
Total net area of external elements Aum(A, m2)			208.2300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	40.1924			(33)
Party Wall 1			47.4000	0.0000	0.0000	20.0000	948.0000	(32)
Internal Wall 1 GF			50.0100			9.0000	450.0900	(32c)
Internal Wall 2 FF			119.9200			9.0000	1079.2800	(32c)
Internal Floor 1			52.7200			18.0000	948.9600	(32d)
Internal Ceiling 1			52.7200			9.0000	474.4800	(32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	10972.8800	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							104.0675	(35)
List of Thermal Bridges				Length	Psi-value	Total		
K1 Element				9.9800	0.0300	0.2994		
E16 Corner (normal)				20.6000	0.0210	0.4326		
E5 Ground floor (normal)				11.1000	0.0440	0.4884		
E10 Eaves (insulation at ceiling level)				9.5000	0.0510	0.4845		
E12 Gable (insulation at ceiling level)				20.6000	0.0800	1.6480		
E6 Intermediate floor within a dwelling				9.5000	0.1490	1.4155		
P1 Party wall - Ground floor				9.5000	0.0000	0.0000		
P2 Party wall - Intermediate floor within a dwelling				9.5000	0.4800	4.5600		
P4 Party wall - Roof (insulation at ceiling level)				10.2100	0.0840	0.8576		
E2 Other lintels (including other steel lintels)				9.2000	0.0430	0.3956		
E3 Sill				24.3000	0.0340	0.8262		
E4 Jamb				9.9800	0.0395	0.3942		
E18 Party wall between dwellings							11.8020	(36)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)						(36a) =	0.0000	
Point Thermal bridges						(33) + (36) + (36a) =	51.9944	(37)
Total fabric heat loss								

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	13.2608	12.9570	12.8810	12.5012	12.4253	11.8176	11.7416	11.6656	12.0454	12.6531	12.8051	13.1849
Average = Sum(39)m / 12 =	65.2552	64.9514	64.8754	64.4956	64.4197	63.8120	63.7360	63.6600	64.0399	64.6476	64.7995	65.1793
HLP (average)	0.6189	0.6160	0.6153	0.6117	0.6110	0.6052	0.6045	0.6038	0.6074	0.6131	0.6146	0.6182
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.7845	(42)
Hot water usage for mixer showers												0.0000	(42a)
Hot water usage for baths	81.7862	80.5716	78.8611	75.7073	73.3458	70.7272	69.3128	71.0113	72.8607	75.6626	78.8814	81.5097	(42b)
Hot water usage for other uses	43.1461	41.5771	40.0082	38.4392	36.8703	35.3013	35.3013	36.8703	38.4392	40.0082	41.5771	43.1461	(42c)
Average daily hot water use (litres/day)												115.0524	(43)
Daily hot water use	124.9323	122.1487	118.8693	114.1466	110.2161	106.0286	104.6142	107.8816	111.2999	115.6708	120.4585	124.6558	(44)
Energy conte	197.8622	173.9381	182.6977	156.2609	148.3720	130.3745	126.5218	133.5800	137.2439	156.9642	171.6152	195.1809	(45)

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Energy content (annual)												Total = Sum(45)m =	1910.6116	
Distribution loss (46)m = 0.15 x (45)m														
	29.6793	26.0907	27.4047	23.4391	22.2558	19.5562	18.9783	20.0370	20.5866	23.5446	25.7423	29.2771	(46)	
Water storage loss:														
Store volume												250.0000	(47)	
a) If manufacturer declared loss factor is known (kWh/day):												1.6000	(48)	
Temperature factor from Table 2b												0.5400	(49)	
Enter (49) or (54) in (55)												0.8640	(55)	
Total storage loss	26.7840	24.1920	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	25.9200	26.7840	25.9200	26.7840	(56)	
If cylinder contains dedicated solar storage	26.7840	24.1920	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	25.9200	26.7840	25.9200	26.7840	(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	247.9086	219.1413	231.3483	197.9393	185.6241	166.1998	163.5412	171.5299	180.2731	205.6149	220.0472	245.2273	(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)	
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												774.0647	(H24)	
Heat delivered to space heating												0.0000	(H29)	
Solar input												774.0647		
Solar input	-9.5153	-27.9861	-73.4158	-97.4122	-115.1141	-114.8004	-102.7382	-99.5894	-75.5671	-44.9833	-12.9427	-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	238.3933	191.1552	157.9325	100.5271	70.5101	51.3993	60.8030	71.9406	104.7059	160.6316	207.1045	245.2273	(64)	
												Total per year (kWh/year) = Sum(64)m =	1660.3304	(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	105.8263	93.9970	99.6675	85.2995	79.1354	72.0097	71.6841	74.7753	80.0569	91.1111	95.8077	104.9348	(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	167.0701	167.0701	167.0701	167.0701	167.0701	167.0701	167.0701	167.0701	167.0701	167.0701	167.0701	167.0701	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	33.1594	29.4519	23.9519	18.1331	13.5547	11.4435	12.3651	16.0726	21.5726	27.3913	31.9697	34.0810	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	395.2751	399.3768	389.0406	367.0360	339.2593	313.1530	295.7124	291.6107	301.9469	323.9514	351.7282	377.8345	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.4915	54.4915	54.4915	54.4915	54.4915	54.4915	54.4915	54.4915	54.4915	54.4915	54.4915	54.4915	(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)	-111.3801	-111.3801	-111.3801	-111.3801	-111.3801	-111.3801	-111.3801	-111.3801	-111.3801	-111.3801	-111.3801	-111.3801	(71)
Water heating gains (Table 5)	142.2397	139.8765	133.9617	118.4715	106.3647	100.0135	96.3495	100.5044	111.1901	122.4612	133.0662	141.0413	(72)
Total internal gains	680.8557	678.8867	657.1357	613.8222	569.3603	534.7915	514.6086	518.3693	544.8912	583.9855	626.9457	663.1383	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b g	Specific data or Table 6c FF	Access factor Table 6d	Gains W							
Southeast	7.4700	48.0626	0.7600	0.7000	0.7700	132.3649	(77)						
Northwest	4.4900	15.8649	0.7600	0.7000	0.7700	26.2620	(81)						
Solar gains	158.6269	240.4722	345.7648	474.8196	535.2879	594.5035	512.1726	482.2537	405.4614	279.9330	183.7237	130.6733	(83)
Total gains	839.4825	919.3589	1002.9005	1088.6418	1104.6481	1129.2950	1026.7812	1000.6230	950.3526	863.9185	810.6694	793.8116	(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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
alpha	4.1139	4.1285	4.1322	4.1506	4.1543	4.1844	4.1882	4.1920	4.1730	4.1432	4.1359	4.1176		
util living area	0.8369	0.7917	0.7264	0.6258	0.5071	0.3638	0.2966	0.2977	0.4113	0.6023	0.7584	0.8410	(86)	
Living	20.5607	20.6452	20.7379	20.8322	20.8916	20.9192	20.9239	20.9240	20.9153	20.8639	20.7334	20.5697		
Non living	19.9044	20.0069	20.1158	20.2262	20.2919	20.3248	20.3297	20.3305	20.3196	20.2628	20.1153	19.9171		
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	20.7753	20.6452	20.7379	20.8322	20.8916	20.9192	20.9239	20.9240	20.9153	20.8639	20.7334	20.6299	(87)	
Th 2	20.4130	20.4156	20.4163	20.4195	20.4201	20.4253	20.4260	20.4266	20.4234	20.4182	20.4169	20.4137	(88)	
util rest of house	0.8209	0.7732	0.7047	0.6006	0.4777	0.3325	0.2616	0.2618	0.3748	0.5688	0.7342	0.8245	(89)	
MIT 2	20.2103	20.0069	20.1158	20.2262	20.2919	20.3248	20.3297	20.3305	20.3196	20.2628	20.1153	20.0066	(90)	
Living area fraction												FLA = Living area / (4) =	0.2211	(91)
MIT	20.3352	20.1480	20.2533	20.3602	20.4245	20.4562	20.4610	20.4617	20.4513	20.3956	20.2520	20.1444	(92)	
Temperature adjustment												0.0000		
adjusted MIT	20.3352	20.1480	20.2533	20.3602	20.4245	20.4562	20.4610	20.4617	20.4513	20.3956	20.2520	20.1444	(93)	

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8186	0.7642	0.6984	0.5979	0.4779	0.3342	0.2638	0.2640	0.3766	0.5675	0.7270	0.8163	(94)
Useful gains	687.2267	702.5715	700.4661	650.9266	527.9119	377.4216	270.8198	264.1894	357.8961	490.2816	589.3853	647.9917	(95)
Ext temp.	7.0000	7.3000	8.1000	9.6000	12.0000	14.5000	16.2000	16.3000	14.8000	12.4000	9.8000	7.6000	(96)
Heat loss rate W	870.1903	834.4943	788.4495	693.9860	542.7041	380.0779	271.5817	264.9319	361.9111	516.8991	677.2820	817.6339	(97)
Space heating kWh	136.1249	88.6521	65.4597	31.0028	11.0054	0.0000	0.0000	0.0000	0.0000	19.8034	63.2856	126.2138	(98a)
Space heating requirement - total per year (kWh/year)												541.5478	
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	136.1249	88.6521	65.4597	31.0028	11.0054	0.0000	0.0000	0.0000	0.0000	19.8034	63.2856	126.2138	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												541.5478	
Space heating per m2										(98c) / (4) =		5.1361	(99)

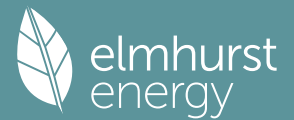
9a. Energy requirements - Individual heating systems, including micro-CHP

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 %)													402.2892	(206)
Efficiency of main space heating system 2 (in %)													0.0000	(207)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement	136.1249	88.6521	65.4597	31.0028	11.0054	0.0000	0.0000	0.0000	0.0000	19.8034	63.2856	126.2138	(98)	
Space heating efficiency (main heating system 1)	402.2892	402.2892	402.2892	402.2892	402.2892	0.0000	0.0000	0.0000	0.0000	402.2892	402.2892	402.2892	(210)	
Space heating fuel (main heating system)	33.8376	22.0369	16.2718	7.7066	2.7357	0.0000	0.0000	0.0000	0.0000	4.9227	15.7314	31.3739	(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	238.3933	191.1552	157.9325	100.5271	70.5101	51.3993	60.8030	71.9406	104.7059	160.6316	207.1045	245.2273	(64)	
Efficiency of water heater (217)m	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	(216)	
Fuel for water heating, kWh/month	116.4826	93.4014	77.1683	49.1191	34.4523	25.1145	29.7093	35.1513	51.1609	78.4870	101.1944	119.8218	(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	22.3865	20.2200	22.3865	21.6643	22.3865	21.6643	22.3865	22.3865	21.6643	22.3865	21.6643	22.3865	(231)	
Lighting	29.0242	23.2843	20.9649	15.3598	11.8644	9.6933	10.8231	14.0682	18.2732	23.9755	27.0802	29.8309	(232)	
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-68.2426	-87.0764	-124.0906	-137.2612	-139.8346	-131.7269	-127.0624	-125.2762	-116.6312	-100.4636	-72.4580	-57.4024	(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	-40.2822	-73.2550	-154.6058	-254.8296	-325.0146	-368.8750	-318.3838	-290.4394	-208.6160	-113.7333	-51.9835	-29.9596	(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													134.6165	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													204.6600	
Water heating fuel used													811.2628	(219)
Space cooling fuel													0.0000	(221)
Electricity for pumps and fans:														
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.5720)														
mechanical ventilation fans (SFP = 0.5720)													183.5827	(230a)
pump for solar water heating													80.0000	(230g)
Total electricity for the above, kWh/year													263.5827	(231)
Electricity for lighting (calculated in Appendix L)													234.2419	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-3517.5040	(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													-2073.8000	(238)

10a. Fuel costs - using BEDF prices (535)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	134.6165	25.1600	33.8695	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	811.2628	25.1600	204.1137	(247)
Energy for instantaneous electric shower(s)	0.0000	25.1600	0.0000	(247a)
Pumps, fans and electric keep-hot	183.5827	25.1600	46.1894	(249)

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Pump for solar water heating	80.0000	25.1600	20.1280 (249)
Energy for lighting	234.2419	25.1600	58.9353 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1287.5262	25.1600	-323.9416
PV Unit electricity exported	-2229.9778	5.8100	-129.5617
Total			-453.5033 (252)
Total energy cost			-90.2674 (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	134.6165	0.1571	21.1530 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	811.2628	0.1470	119.2849 (264)
Space and water heating			140.4380 (265)
Pumps, fans and electric keep-hot	263.5827	0.1387	36.5622 (267)
Energy for lighting	234.2419	0.1443	33.8083 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1287.5262	0.1353	-174.2601
PV Unit electricity exported	-2229.9778	0.1249	-278.5187
Total			-452.7788 (269)
Total CO2, kg/year			-241.9703 (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	134.6165	1.5817	212.9228 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	811.2628	1.5440	1252.5566 (278)
Space and water heating			1465.4794 (279)
Pumps, fans and electric keep-hot	263.5827	1.5128	398.7479 (281)
Energy for lighting	234.2419	1.5338	359.2881 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1287.5262	1.5002	-1931.6059
PV Unit electricity exported	-2229.9778	0.4584	-1022.3047
Total			-2953.9105 (283)
Total Primary energy kWh/year			-730.3951 (286)