Full SAP Calculation Printout

Property Reference	Sherwood CV Plot 250	Issued on Date	22/04/2023
Assessment Reference	Castle View	Prop Type Ref	Sherwood Plot 250
Property	Plot 250, Castle View, Netherton, HD4 7LE		

SAP Rating	91 B	DER	10.75	TER	11.55
Environmental	91 B	% DER < TER			6.93
CO_2 Emissions (t/year)	0.94	DFEE	37.57	TFEE	37.89
Compliance Check	See BREL	% DFEE < TFEE			0.84
% DPER < TPER	5.05	DPER	57.27	TPER	60.32

Assessor Details	Mr. Patrick McGuigan	Assessor ID	Y128-0001
Client			

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

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		44.2000 (1b)	x	2.3000 (2b)	=	101.6600 (1b)	-
First floor		44.2000 (1c)	x	2.5500 (2c)	=	112.7100 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.4000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	214.3700	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	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		4.5000	(17)
Infiltration rate		0.2250	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1913	(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	0.2438	0.2391	0.2343	0.2104	0.2056	0.1817	0.1817	0.1769	0.1913	0.2056	0.2152	0.2247	(22b)

Mechanical extract ventilation - decentralised

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)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
entrance			2.1000	1.2000	2.5200			(26)
glazing (Uw = 1.30)			14.2500	1.2357	17.6093			(27)
ground			44.2000	0.1200	5.3040	75.0000	3315.0000	(28a)

external wall	135.3200	16.3500	118.9700	0.2400	28.5528	60.0000	7138.2004 (29a)
cold	44.2000		44.2000	0.0900	3.9780	9.0000	397.8000 (30)
Total net area of external elements Aum(A, m2)			223.7200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		57.9641		(33)
stud			133.2000			9.0000	1198.8000 (32c)
internal			44.2000			18.0000	795.6000 (32d)
internal			44.2000			9.0000	397.8000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 13243.2004 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 149.8100 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.9000	0.0500	0.5950
E3 Sill	9.1000	0.0090	0.0819
E4 Jamb	30.3000	0.0140	0.4242
E5 Ground floor (normal)	27.9000	0.0600	1.6740
E6 Intermediate floor within a dwelling	27.9000	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	10.0000	0.0460	0.4600
E12 Gable (insulation at ceiling level)	17.9000	0.0540	0.9666
E16 Corner (normal)	24.2500	0.0480	1.1640
E5 Ground floor (normal)	0.0000	0.0900	0.0000
E20 Exposed floor (normal)	0.0000	0.0800	0.0000
E21 Exposed floor (inverted)	0.0000	-0.0060	-0.0000
E17 Corner (inverted – internal area greater than external area)	4.8500	-0.0970	-0.4704

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 4.8952 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 62.8594 (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	35.3710	35.3710	35.3710	35.3710	35.3710	35.3710	35.3710	35.3710	35.3710	35.3710	35.3710	35.3710	(38)
Heat transfer coeff	98.2304	98.2304	98.2304	98.2304	98.2304	98.2304	98.2304	98.2304	98.2304	98.2304	98.2304	98.2304	(39)
Average = Sum(39)m / 12 =												98.2304	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1112	1.1112	1.1112	1.1112	1.1112	1.1112	1.1112	1.1112	1.1112	1.1112	1.1112	1.1112	(40)
HLP (average)												1.1112	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6032 (42)
Hot water usage for mixer showers

67.8665	66.8466	65.3604	62.5169	60.4184	58.0782	56.7480	58.2229	59.8398	62.3524	65.2571	67.6065	(42a)

Hot water usage for baths

29.3081	28.8728	28.2598	27.1297	26.2834	25.3451	24.8382	25.4469	26.1096	27.1137	28.2671	29.2090	(42b)

Hot water usage for other uses

41.2892	39.7877	38.2863	36.7849	35.2835	33.7821	33.7821	35.2835	36.7849	38.2863	39.7877	41.2892	(42c)

Average daily hot water use (litres/day) 127.2795 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	138.4638	135.5072	131.9066	126.4314	121.9853	117.2053	115.3683	118.9533	122.7342	127.7524	133.3119	138.1046	(44)
Energy conte	219.2927	192.9604	202.7355	173.0783	164.2156	144.1176	139.5279	147.2890	151.3436	173.3588	189.9273	216.2385	(45)
Energy content (annual)											Total = Sum(45)m =	2114.0853	
Distribution loss (46)m = 0.15 x (45)m	32.8939	28.9441	30.4103	25.9617	24.6323	21.6176	20.9292	22.0934	22.7015	26.0038	28.4891	32.4358	(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	14.2829	12.8884	14.2431	13.7282	14.1507	13.6587	14.0914	14.1101	13.6760	14.1726	13.7686	14.2755	(61)
Total heat required for water heating calculated for each month	233.5756	205.8488	216.9786	186.8065	178.3663	157.7763	153.6193	161.3991	165.0196	187.5315	203.6959	230.5140	(62)
WWHRS	-59.7686	-52.8598	-55.3517	-45.8334	-42.7151	-36.5516	-34.2613	-36.4335	-37.8177	-44.5829	-50.5070	-58.6617	(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	173.8070	152.9890	161.6269	140.9731	135.6512	121.2246	119.3580	124.9656	127.2019	142.9485	153.1889	171.8523	(64)
										Total per year (kWh/year) = Sum(64)m =		1725.7870	(64)
12Total per year (kWh/year)												1726	(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	76.4856	67.3814	70.9703	60.9806	58.1394	51.3338	49.9159	52.5011	53.7408	61.1850	66.5930	75.4682	(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	130.1590	130.1590	130.1590	130.1590	130.1590	130.1590	130.1590	130.1590	130.1590	130.1590	130.1590	130.1590	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	124.0589	137.3509	124.0589	128.1942	124.0589	128.1942	124.0589	124.0589	128.1942	124.0589	128.1942	124.0589	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
236.1032 238.5532 232.3792 219.2356 202.6442 187.0505 176.6330 174.1830 180.3570 193.5006 210.0920 225.6857 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
36.0159 36.0159 36.0159 36.0159 36.0159 36.0159 36.0159 36.0159 36.0159 36.0159 36.0159 36.0159 (69)
Pumps, fans 3.0000 3.0000 3.0000 3.0000 0.0000 0.0000 0.0000 0.0000 3.0000 3.0000 3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)
-104.1272 -104.1272 -104.1272 -104.1272 -104.1272 -104.1272 -104.1272 -104.1272 -104.1272 -104.1272 -104.1272 -104.1272 (71)
Water heating gains (Table 5)
102.8032 100.2700 95.3902 84.6953 78.1443 71.2969 67.0912 70.5660 74.6399 82.2379 92.4902 101.4357 (72)
Total internal gains
528.0130 541.2218 516.8761 497.1728 469.8951 448.5894 429.8309 430.8557 445.2388 464.8451 495.8242 516.2280 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	4.9500	10.6334	0.4600	0.0000	0.7700	18.6434	(74)
East	0.8500	19.6403	0.4600	0.0000	0.7700	5.9131	(76)
South	7.6500	46.7521	0.4600	0.0000	0.7700	126.6808	(78)
West	0.8000	19.6403	0.4600	0.0000	0.7700	5.5653	(80)

Solar gains 156.8026 265.5531 361.8009 449.8710 508.3512 507.4409 488.0169 443.4328 391.8707 292.8312 187.4712 134.4452 (83)
Total gains 684.8155 806.7749 878.6770 947.0438 978.2463 956.0303 917.8478 874.2885 837.1095 757.6763 683.2954 650.6732 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	37.4494	37.4494	37.4494	37.4494	37.4494	37.4494	37.4494	37.4494	37.4494	37.4494	37.4494	37.4494	
alpha	3.4966	3.4966	3.4966	3.4966	3.4966	3.4966	3.4966	3.4966	3.4966	3.4966	3.4966	3.4966	
util living area	0.9720	0.9511	0.9201	0.8565	0.7503	0.5963	0.4524	0.4906	0.6895	0.8771	0.9535	0.9763	(86)
MIT	19.2516	19.5397	19.8955	20.3231	20.6779	20.8949	20.9695	20.9589	20.8196	20.3596	19.7197	19.1795	(87)
Th 2	19.9917	19.9917	19.9917	19.9917	19.9917	19.9917	19.9917	19.9917	19.9917	19.9917	19.9917	19.9917	(88)
util rest of house	0.9666	0.9419	0.9049	0.8287	0.7017	0.5203	0.3562	0.3933	0.6189	0.8472	0.9432	0.9716	(89)
MIT 2	17.9676	18.3288	18.7716	19.2903	19.6970	19.9176	19.9774	19.9711	19.8520	19.3457	18.5605	17.8766	(90)
Living area fraction										fLA = Living area / (4) =		0.1584	(91)
MIT	18.1710	18.5206	18.9496	19.4538	19.8524	20.0723	20.1345	20.1275	20.0053	19.5063	18.7441	18.0829	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.0210	18.3706	18.7996	19.3038	19.7024	19.9223	19.9845	19.9775	19.8553	19.3563	18.5941	17.9329	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9516	0.9224	0.8823	0.8062	0.6862	0.5147	0.3555	0.3919	0.6083	0.8241	0.9238	0.9580	(94)
Useful gains	651.6691	744.1905	775.2872	763.5368	671.2565	492.0674	326.3149	342.5947	509.2126	624.4116	631.2606	623.3271	(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	1347.8159	1323.2215	1208.1943	1021.9739	786.0779	522.8150	332.4646	351.4209	565.3426	860.1358	1129.0702	1348.9927	(97)
Space heating kWh	517.9333	389.1088	322.0829	186.0747	85.4271	0.0000	0.0000	0.0000	0.0000	175.3788	358.4229	539.8952	(98a)
Space heating requirement - total per year (kWh/year)												2574.3237	
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	517.9333	389.1088	322.0829	186.0747	85.4271	0.0000	0.0000	0.0000	0.0000	175.3788	358.4229	539.8952	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2574.3237	
Space heating per m2											(98c) / (4) =	29.1213	(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 %) 89.0000 (206)
Efficiency of main space heating system 2 (in %) 0.0000 (207)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	517.9333	389.1088	322.0829	186.0747	85.4271	0.0000	0.0000	0.0000	0.0000	175.3788	358.4229	539.8952	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	581.9475	437.2009	361.8909	209.0727	95.9855	0.0000	0.0000	0.0000	0.0000	197.0549	402.7223	606.6238	(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
173.8070 152.9890 161.6269 140.9731 135.6512 121.2246 119.3580 124.9656 127.2019 142.9485 153.1889 171.8523 (64)
Efficiency of water heater 87.3000 (216)
(217)m 88.5667 88.5136 88.4246 88.2592 87.9491 87.3000 87.3000 87.3000 87.3000 88.2285 88.4841 88.5835 (217)
Fuel for water heating, kWh/month
196.2443 172.8424 182.7849 159.7263 154.2382 138.8598 136.7217 143.1450 145.7066 162.0208 173.1259 194.0003 (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 10.2800 9.2851 10.2800 9.9483 10.2800 9.9483 10.2800 10.2800 9.9483 10.2800 9.9483 10.2800 (231)
Lighting 24.7818 19.8809 17.9005 13.1147 10.1302 8.2764 9.2411 12.0119 15.6023 20.4710 23.1220 25.4706 (232)
Electricity generated by PVs (Appendix M) (negative quantity)
(233a)m -19.2198 -28.8801 -44.2970 -53.2401 -60.4094 -57.4944 -56.7465 -52.0222 -44.2636 -34.4321 -21.7379 -16.4094 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(234a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)
(235a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)
(235c)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)
(233b)m -6.3243 -13.7456 -28.2996 -44.0536 -59.7888 -60.6796 -59.8658 -49.8625 -35.5326 -20.0593 -8.5611 -4.9667 (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 2892.4986 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 87.3000
Water heating fuel used 1959.4163 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
(MEVDecentralised, Database: total watage = 4.9570, total flow = 37.0000, SFP = 0.1340)
mechanical ventilation fans (SFP = 0.1340) 35.0381 (230a)
central heating pump 41.0000 (230c)
main heating flue fan 45.0000 (230e)
Total electricity for the above, kWh/year 121.0381 (231)
Electricity for lighting (calculated in Appendix L) 200.0033 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation -880.8921 (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 4292.0643 (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	2892.4986	0.2100	607.4247	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1959.4163	0.2100	411.4774	(264)
Space and water heating			1018.9021	(265)
Pumps, fans and electric keep-hot	121.0381	0.1387	16.7895	(267)
Energy for lighting	200.0033	0.1443	28.8667	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-489.1526	0.1333	-65.1832	
PV Unit electricity exported	-391.7395	0.1249	-48.9356	
Total			-114.1188	(269)
Total CO2, kg/year			950.4395	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			10.7500	(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	2892.4986	1.1300	3268.5234	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1959.4163	1.1300	2214.1405	(278)
Space and water heating			5482.6638	(279)
Pumps, fans and electric keep-hot	121.0381	1.5128	183.1065	(281)
Energy for lighting	200.0033	1.5338	306.7717	(282)

Energy saving/generation technologies			
PV Unit electricity used in dwelling	-489.1526	1.4924	-730.0216
PV Unit electricity exported	-391.7395	0.4585	-179.6079
Total			-909.6295 (283)
Total Primary energy kWh/year			5062.9125 (286)
Dwelling Primary energy Rate (DPER)			57.2700 (287)

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	44.2000 (1b)	x	2.3000 (2b)	=	101.6600 (1b)	-
First floor	44.2000 (1c)	x	2.5500 (2c)	=	112.7100 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.4000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	214.3700	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1399	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3899	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3315	(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	0.4226	0.4143	0.4060	0.3646	0.3563	0.3149	0.3149	0.3066	0.3315	0.3563	0.3729	0.3895	(22b)
Effective ac	0.5893	0.5858	0.5824	0.5665	0.5635	0.5496	0.5496	0.5470	0.5549	0.5635	0.5695	0.5758	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.1000	1.0000	2.1000			(26)
TER Opening Type (Uw = 1.20)			14.2500	1.1450	16.3168			(27)
ground			44.2000	0.1300	5.7460			(28a)
external wall	135.3200	16.3500	118.9700	0.1800	21.4146			(29a)
cold	44.2000		44.2000	0.1100	4.8620			(30)
Total net area of external elements Aum(A, m2)			223.7200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		50.4394			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 149.8100 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.9000	0.0500	0.5950
E3 Sill	9.1000	0.0500	0.4550
E4 Jamb	30.3000	0.0500	1.5150
E5 Ground floor (normal)	27.9000	0.1600	4.4640
E6 Intermediate floor within a dwelling	27.9000	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	10.0000	0.0600	0.6000
E12 Gable (insulation at ceiling level)	17.9000	0.0600	1.0740
E16 Corner (normal)	24.2500	0.0900	2.1825

E5 Ground floor (normal)	0.0000	0.1600	0.0000	
E20 Exposed floor (normal)	0.0000	0.3200	0.0000	
E21 Exposed floor (inverted)	0.0000	0.3200	0.0000	
E17 Corner (inverted – internal area greater than external area)	4.8500	-0.0900	-0.4365	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.4490 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 60.8884 (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	41.6881	41.4428	41.2023	40.0730	39.8617	38.8781	38.8781	38.6959	39.2570	39.8617	40.2892	40.7360	(38)
Heat transfer coeff	102.5765	102.3312	102.0907	100.9614	100.7501	99.7665	99.7665	99.5843	100.1454	100.7501	101.1775	101.6244	(39)

Average = Sum(39)m / 12 = 100.9604

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1604	1.1576	1.1549	1.1421	1.1397	1.1286	1.1286	1.1265	1.1329	1.1397	1.1445	1.1496	(40)
HLP (average)												1.1421	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6032 (42)

Hot water usage for mixer showers

67.8665	66.8466	65.3604	62.5169	60.4184	58.0782	56.7480	58.2229	59.8398	62.3524	65.2571	67.6065	(42a)

Hot water usage for baths

29.3081	28.8728	28.2598	27.1297	26.2834	25.3451	24.8382	25.4469	26.1096	27.1137	28.2671	29.2090	(42b)

Hot water usage for other uses

41.2892	39.7877	38.2863	36.7849	35.2835	33.7821	33.7821	35.2835	36.7849	38.2863	39.7877	41.2892	(42c)

Average daily hot water use (litres/day) 127.2795 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	138.4638	135.5072	131.9066	126.4314	121.9853	117.2053	115.3683	118.9533	122.7342	127.7524	133.3119	138.1046	(44)
Energy conte	219.2927	192.9604	202.7355	173.0783	164.2156	144.1176	139.5279	147.2890	151.3436	173.3588	189.9273	216.2385	(45)

Energy content (annual) Total = Sum(45)m = 2114.0853

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

32.8939	28.9441	30.4103	25.9617	24.6323	21.6176	20.9292	22.0934	22.7015	26.0038	28.4891	32.4358	(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 50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)

Total heat required for water heating calculated for each month

270.2516	238.9878	253.6944	222.3934	215.1745	193.4326	190.4868	198.2479	200.6587	224.3177	239.2424	267.1974	(62)
WWHRS -31.0257	-27.4394	-28.7330	-23.7920	-22.1733	-18.9739	-17.7850	-18.9125	-19.6311	-23.1429	-26.2181	-30.4512	(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

239.2259	211.5484	224.9614	198.6013	193.0012	174.4588	172.7018	179.3354	181.0276	201.1748	213.0243	236.7462	(64)

Total per year (kWh/year) = Sum(64)m = 2425.8071 (64)

12Total per year (kWh/year) 2426 (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

85.6546	75.6662	80.1493	69.8773	67.3414	60.2479	59.1328	61.7133	62.6505	70.3815	75.4796	84.6390	(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	130.1590	130.1590	130.1590	130.1590	130.1590	130.1590	130.1590	130.1590	130.1590	130.1590	130.1590	130.1590	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	124.0589	137.3509	124.0589	128.1942	124.0589	128.1942	124.0589	124.0589	128.1942	124.0589	128.1942	124.0589	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	236.1032	238.5532	232.3792	219.2356	202.6442	187.0505	176.6330	174.1830	180.3570	193.5006	210.0920	225.6857	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0159	36.0159	36.0159	36.0159	36.0159	36.0159	36.0159	36.0159	36.0159	36.0159	36.0159	36.0159	(69)
Pumps, fans 3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)	-104.1272	-104.1272	-104.1272	-104.1272	-104.1272	-104.1272	-104.1272	-104.1272	-104.1272	-104.1272	-104.1272	-104.1272	(71)
Water heating gains (Table 5)	115.1271	112.5985	107.7275	97.0518	90.5127	83.6776	79.4795	82.9480	87.0146	94.5988	104.8328	113.7621	(72)
Total internal gains	540.3369	553.5503	529.2134	509.5294	482.2635	460.9701	442.2192	443.2377	457.6135	477.2061	508.1667	528.5544	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

					W/m2	or Table 6b	or Table 6c	Table 6d				
North					4.9500	10.6334	0.6300	0.7000	0.7700			16.0860 (74)
East					0.8500	19.6403	0.6300	0.7000	0.7700			5.1020 (76)
South					7.6500	46.7521	0.6300	0.7000	0.7700			109.3035 (78)
West					0.8000	19.6403	0.6300	0.7000	0.7700			4.8019 (80)
Solar gains	135.2934	229.1262	312.1713	388.1605	438.6187	437.8333	421.0737	382.6054	338.1162	252.6624	161.7550	116.0028 (83)
Total gains	675.6302	782.6765	841.3847	897.6898	920.8821	898.8033	863.2929	825.8431	795.7298	729.8685	669.9217	644.5572 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	35.8627	35.9486	36.0333	36.4364	36.5128	36.8728	36.8728	36.9402	36.7333	36.5128	36.3585	36.1986	
alpha	3.3908	3.3966	3.4022	3.4291	3.4342	3.4582	3.4582	3.4627	3.4489	3.4342	3.4239	3.4132	
util living area	0.9737	0.9565	0.9311	0.8762	0.7811	0.6298	0.4831	0.5201	0.7177	0.8903	0.9571	0.9773	(86)
MIT	19.1323	19.4076	19.7647	20.2261	20.6126	20.8707	20.9609	20.9490	20.7862	20.2916	19.6398	19.0875	(87)
Th 2	19.9518	19.9541	19.9563	19.9666	19.9685	19.9776	19.9776	19.9792	19.9741	19.9685	19.9646	19.9605	(88)
util rest of house	0.9685	0.9480	0.9174	0.8505	0.7342	0.5520	0.3810	0.4179	0.6473	0.8622	0.9473	0.9728	(89)
MIT 2	17.7914	18.1391	18.5871	19.1590	19.6101	19.8851	19.9591	19.9533	19.8066	19.2500	18.4432	17.7404	(90)
Living area fraction									fLA = Living area / (4) =			0.1584	(91)
MIT	18.0038	18.3400	18.7736	19.3280	19.7689	20.0412	20.1178	20.1110	19.9617	19.4149	18.6327	17.9537	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.0038	18.3400	18.7736	19.3280	19.7689	20.0412	20.1178	20.1110	19.9617	19.4149	18.6327	17.9537	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9549	0.9307	0.8975	0.8316	0.7240	0.5572	0.3956	0.4318	0.6463	0.8437	0.9303	0.9603	(94)
Useful gains	645.1482	728.4195	755.1475	746.4760	666.7101	500.8164	341.5194	356.5865	514.3119	615.7960	623.2378	618.9805	(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	1405.6876	1375.3277	1253.0209	1052.8236	812.9403	542.8496	350.9544	369.5575	587.0254	888.1071	1166.8513	1397.7169	(97)
Space heating kWh	565.8413	434.7223	370.4178	220.5703	108.7952	0.0000	0.0000	0.0000	0.0000	202.5994	391.4018	579.3799	(98a)
Space heating requirement - total per year (kWh/year)												2873.7280	
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	565.8413	434.7223	370.4178	220.5703	108.7952	0.0000	0.0000	0.0000	0.0000	202.5994	391.4018	579.3799	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2873.7280	
Space heating per m2											(98c) / (4) =	32.5082	(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 %)	92.4000 (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	565.8413	434.7223	370.4178	220.5703	108.7952	0.0000	0.0000	0.0000	0.0000	202.5994	391.4018	579.3799	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	612.3823	470.4787	400.8851	238.7124	117.7438	0.0000	0.0000	0.0000	0.0000	219.2634	423.5950	627.0345	(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	239.2259	211.5484	224.9614	198.6013	193.0012	174.4588	172.7018	179.3354	181.0276	201.1748	213.0243	236.7462	(64)
Efficiency of water heater												80.3000	(216)
(217)m	86.1581	85.8890	85.4424	84.6068	83.2015	80.3000	80.3000	80.3000	80.3000	84.3966	85.6665	86.2213	(217)
Fuel for water heating, kWh/month	277.6593	246.3045	263.2901	234.7344	231.9684	217.2587	215.0708	223.3317	225.4391	238.3685	248.6671	274.5797	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	25.7770	20.6793	18.6194	13.6414	10.5370	8.6088	9.6122	12.4943	16.2288	21.2931	24.0505	26.4934	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-40.8993	-57.4259	-82.2068	-92.0306	-98.8876	-92.1561	-90.9956	-86.0642	-77.3241	-65.4585	-44.8725	-35.3857	(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	(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	(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	(235c)

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

(233b)m	-23.8182	-50.0263	-99.2957	-148.9491	-196.7814	-197.6780	-195.3713	-165.5125	-121.4250	-71.5030	-31.7860	-18.8424 (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	(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	(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	(235d)

Annual totals kWh/year

Space heating fuel - main system 1	3110.0952	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	2896.6722	(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)	208.0351	(232)

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

PV generation	-2184.6958	(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	4116.1068	(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	3110.0952	0.2100	653.1200	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2896.6722	0.2100	608.3012	(264)
Space and water heating			1261.4212	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	208.0351	0.1443	30.0259	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-863.7068	0.1347	-116.3238	
PV Unit electricity exported	-1320.9889	0.1259	-166.3528	
Total			-282.6766	(269)
Total CO2, kg/year			1020.6997	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.5500	(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	3110.0952	1.1300	3514.4076	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2896.6722	1.1300	3273.2396	(278)
Space and water heating			6787.6472	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	208.0351	1.5338	319.0912	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-863.7068	1.4978	-1293.6247	
PV Unit electricity exported	-1320.9889	0.4623	-610.6309	
Total			-1904.2556	(283)
Total Primary energy kWh/year			5332.5836	(286)
Target Primary Energy Rate (TPER)			60.3200	(287)

Full SAP Calculation Printout

Property Reference	Sherwood CV Plot 250	Issued on Date	22/04/2023
Assessment Reference	Castle View	Prop Type Ref	Sherwood Plot 250
Property	Plot 250, Castle View, Netherton, HD4 7LE		

SAP Rating	91 B	DER	10.75	TER	11.55
Environmental	91 B	% DER < TER			6.93
CO_2 Emissions (t/year)	0.94	DFEE	37.57	TFEE	37.89
Compliance Check	See BREL	% DFEE < TFEE			0.84
% DPER < TPER	5.05	DPER	57.27	TPER	60.32

Assessor Details	Mr. Patrick McGuigan	Assessor ID	Y128-0001
Client			

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

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		44.2000 (1b)	x	2.3000 (2b)	=	101.6600 (1b)	-
First floor		44.2000 (1c)	x	2.5500 (2c)	=	112.7100 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.4000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	214.3700	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1399	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.5000	(17)
Infiltration rate		0.3649	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3102	(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	0.3955	0.3878	0.3800	0.3412	0.3335	0.2947	0.2947	0.2869	0.3102	0.3335	0.3490	0.3645	(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	0.5782	0.5752	0.5722	0.5582	0.5556	0.5434	0.5434	0.5412	0.5481	0.5556	0.5609	0.5664	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
entrance			2.1000	1.2000	2.5200			(26)
glazing (Uw = 1.30)			14.2500	1.2357	17.6093			(27)
ground			44.2000	0.1200	5.3040	75.0000	3315.0000	(28a)
external wall	135.3200	16.3500	118.9700	0.2400	28.5528	60.0000	7138.2004	(29a)
cold	44.2000		44.2000	0.0900	3.9780	9.0000	397.8000	(30)

Total net area of external elements Aum(A, m2)	223.7200			(31)
Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =	57.9641		(33)
stud	133.2000	9.0000	1198.8000	(32c)
internal	44.2000	18.0000	795.6000	(32d)
internal	44.2000	9.0000	397.8000	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	13243.2004 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		149.8100 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.9000	0.0500	0.5950
E3 Sill	9.1000	0.0090	0.0819
E4 Jamb	30.3000	0.0140	0.4242
E5 Ground floor (normal)	27.9000	0.0600	1.6740
E6 Intermediate floor within a dwelling	27.9000	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	10.0000	0.0460	0.4600
E12 Gable (insulation at ceiling level)	17.9000	0.0540	0.9666
E16 Corner (normal)	24.2500	0.0480	1.1640
E5 Ground floor (normal)	0.0000	0.0900	0.0000
E20 Exposed floor (normal)	0.0000	0.0800	0.0000
E21 Exposed floor (inverted)	0.0000	-0.0060	-0.0000
E17 Corner (inverted – internal area greater than external area)	4.8500	-0.0970	-0.4704

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		4.8952 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	62.8594 (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	40.9041	40.6892	40.4786	39.4894	39.3044	38.4428	38.4428	38.2833	38.7747	39.3044	39.6788	40.0702	(38)
Heat transfer coeff	103.7634	103.5486	103.3380	102.3488	102.1637	101.3022	101.3022	101.1426	101.6340	102.1637	102.5381	102.9295	(39)

Average = Sum(39)m / 12 = 102.3479

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1738	1.1714	1.1690	1.1578	1.1557	1.1460	1.1460	1.1441	1.1497	1.1557	1.1599	1.1644	(40)
HLP (average)												1.1578	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6032 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.3081	28.8728	28.2598	27.1297	26.2834	25.3451	24.8382	25.4469	26.1096	27.1137	28.2671	29.2090	(42b)

Hot water usage for other uses

41.2892	39.7877	38.2863	36.7849	35.2835	33.7821	33.7821	35.2835	36.7849	38.2863	39.7877	41.2892	(42c)

Average daily hot water use (litres/day) 64.7088 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.5972	68.6605	66.5462	63.9146	61.5669	59.1271	58.6203	60.7303	62.8945	65.4000	68.0548	70.4981	(44)
Energy conte	111.8087	97.7717	102.2790	87.4959	82.8809	72.7037	70.8961	75.1969	77.5552	88.7472	96.9566	110.3831	(45)

Energy content (annual) Total = Sum(45)m = 1074.6749

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

95.0374	83.1059	86.9371	74.3715	70.4488	61.7981	60.2617	63.9173	65.9219	75.4351	82.4131	93.8256	(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

95.0374	83.1059	86.9371	74.3715	70.4488	61.7981	60.2617	63.9173	65.9219	75.4351	82.4131	93.8256	(64)

Total per year (kWh/year) = Sum(64)m = 913.4736 (64)

12Total per year (kWh/year) 913 (64)

Electric shower(s)

54.3498	48.4261	52.8794	50.4622	51.4091	49.0393	50.6739	51.4091	50.4622	52.8794	51.8851	54.3498	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 618.2256 (64a)

Heat gains from water heating, kWh/month

37.3468	32.8830	34.9541	31.2084	30.4645	27.7094	27.7339	28.8316	29.0960	32.0786	33.5746	37.0438	(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	130.1590	130.1590	130.1590	130.1590	130.1590	130.1590	130.1590	130.1590	130.1590	130.1590	130.1590	130.1590	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

124.0589	137.3509	124.0589	128.1942	124.0589	128.1942	124.0589	124.0589	128.1942	124.0589	128.1942	124.0589	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

236.1032	238.5532	232.3792	219.2356	202.6442	187.0505	176.6330	174.1830	180.3570	193.5006	210.0920	225.6857	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	36.0159	36.0159	36.0159	36.0159	36.0159	36.0159	36.0159	36.0159	36.0159	36.0159	36.0159	(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	(70)
Losses e.g. evaporation (negative values) (Table 5)												
	-104.1272	-104.1272	-104.1272	-104.1272	-104.1272	-104.1272	-104.1272	-104.1272	-104.1272	-104.1272	-104.1272	(71)
Water heating gains (Table 5)												
	50.1973	48.9330	46.9814	43.3450	40.9469	38.4852	37.2768	38.7522	40.4112	43.1164	46.6313	49.7901 (72)
Total internal gains												
	472.4071	486.8849	465.4672	452.8226	429.6977	415.7777	400.0164	399.0418	411.0101	422.7237	446.9653	461.5824 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	4.9500	10.6334	0.4600	0.0000	0.7700	18.6434	(74)
East	0.8500	19.6403	0.4600	0.0000	0.7700	5.9131	(76)
South	7.6500	46.7521	0.4600	0.0000	0.7700	126.6808	(78)
West	0.8000	19.6403	0.4600	0.0000	0.7700	5.5653	(80)

Solar gains	156.8026	265.5531	361.8009	449.8710	508.3512	507.4409	488.0169	443.4328	391.8707	292.8312	187.4712	134.4452	(83)
Total gains	629.2097	752.4380	827.2681	902.6936	938.0489	923.2186	888.0333	842.4746	802.8807	715.5549	634.4365	596.0276	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	35.4524	35.5260	35.5984	35.9425	36.0076	36.3138	36.3138	36.3711	36.1952	36.0076	35.8761	35.7397	
alpha	3.3635	3.3684	3.3732	3.3962	3.4005	3.4209	3.4209	3.4247	3.4130	3.4005	3.3917	3.3826	
util living area													
	0.9786	0.9612	0.9348	0.8767	0.7777	0.6233	0.4771	0.5174	0.7185	0.8967	0.9633	0.9820	(86)
MIT	19.0297	19.3341	19.7194	20.2081	20.6090	20.8705	20.9608	20.9478	20.7792	20.2541	19.5588	18.9773	(87)
Th 2	19.9410	19.9430	19.9449	19.9539	19.9556	19.9635	19.9635	19.9649	19.9604	19.9556	19.9522	19.9486	(88)
util rest of house													
	0.9743	0.9535	0.9215	0.8508	0.7301	0.5448	0.3746	0.4143	0.6475	0.8696	0.9547	0.9783	(89)
MIT 2	18.1597	18.4600	18.8375	19.3104	19.6745	19.8918	19.9492	19.9444	19.8259	19.3645	18.6915	18.1134	(90)
Living area fraction									fLA = Living area / (4) =			0.1584	(91)
MIT	18.2975	18.5985	18.9772	19.4526	19.8225	20.0468	20.1094	20.1033	19.9769	19.5054	18.8289	18.2502	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.2975	18.5985	18.9772	19.4526	19.8225	20.0468	20.1094	20.1033	19.9769	19.5054	18.8289	18.2502	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9651	0.9408	0.9063	0.8363	0.7233	0.5516	0.3897	0.4288	0.6487	0.8554	0.9425	0.9701	(94)
Useful gains	607.2466	707.8945	749.7854	754.9280	678.4759	509.2430	346.0406	361.2368	520.8384	612.0855	597.9864	578.1878	(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													
	1452.4293	1418.4551	1289.3655	1080.0420	829.8275	551.7743	355.5103	374.5631	597.2926	909.8039	1202.6551	1446.1804	(97)
Space heating kWh													
	628.8160	477.4967	401.4476	234.0820	112.6056	0.0000	0.0000	0.0000	0.0000	221.5025	435.3615	645.7865	(98a)
Space heating requirement - total per year (kWh/year)												3157.0985	
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													
	628.8160	477.4967	401.4476	234.0820	112.6056	0.0000	0.0000	0.0000	0.0000	221.5025	435.3615	645.7865	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3157.0985	
Space heating per m2											(98c) / (4) =	35.7138	(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	952.2405	749.6361	768.6840	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8021	0.8670	0.8440	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	763.7722	649.9401	648.7346	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1026.9185	988.3322	937.5564	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	189.4653	251.7638	214.8834	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	47.3663	62.9409	53.7209	0.0000	0.0000	0.0000	0.0000	(107)

Space cooling requirement	164.0281 (107)
Energy for space heating	35.7138 (99)
Energy for space cooling	1.8555 (108)
Total	37.5693 (109)
Fabric Energy Efficiency (DFEE)	37.6 (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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	44.2000 (1b)	x	2.3000 (2b)	=	101.6600 (1b)	-
First floor	44.2000 (1c)	x	2.5500 (2c)	=	112.7100 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.4000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	214.3700	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1399	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3899	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3315	(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	0.4226	0.4143	0.4060	0.3646	0.3563	0.3149	0.3149	0.3066	0.3315	0.3563	0.3729	0.3895	(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	0.5893	0.5858	0.5824	0.5665	0.5635	0.5496	0.5496	0.5470	0.5549	0.5635	0.5695	0.5758	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.1000	1.0000	2.1000			(26)
TER Opening Type (Uw = 1.20)			14.2500	1.1450	16.3168			(27)
ground			44.2000	0.1300	5.7460			(28a)
external wall	135.3200	16.3500	118.9700	0.1800	21.4146			(29a)
cold	44.2000		44.2000	0.1100	4.8620			(30)
Total net area of external elements Aum(A, m2)			223.7200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		50.4394			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	149.8100 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.9000	0.0500	0.5950
E3 Sill	9.1000	0.0500	0.4550
E4 Jamb	30.3000	0.0500	1.5150
E5 Ground floor (normal)	27.9000	0.1600	4.4640
E6 Intermediate floor within a dwelling	27.9000	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	10.0000	0.0600	0.6000
E12 Gable (insulation at ceiling level)	17.9000	0.0600	1.0740

E16 Corner (normal)	24.2500	0.0900	2.1825	
E5 Ground floor (normal)	0.0000	0.1600	0.0000	
E20 Exposed floor (normal)	0.0000	0.3200	0.0000	
E21 Exposed floor (inverted)	0.0000	0.3200	0.0000	
E17 Corner (inverted – internal area greater than external area)	4.8500	-0.0900	-0.4365	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.4490 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 60.8884 (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	41.6881	41.4428	41.2023	40.0730	39.8617	38.8781	38.8781	38.6959	39.2570	39.8617	40.2892	40.7360	(38)
Heat transfer coeff	102.5765	102.3312	102.0907	100.9614	100.7501	99.7665	99.7665	99.5843	100.1454	100.7501	101.1775	101.6244	(39)

Average = Sum(39)m / 12 = 100.9604

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1604	1.1576	1.1549	1.1421	1.1397	1.1286	1.1286	1.1265	1.1329	1.1397	1.1445	1.1496	(40)
HLP (average)												1.1421	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6032 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.3081	28.8728	28.2598	27.1297	26.2834	25.3451	24.8382	25.4469	26.1096	27.1137	28.2671	29.2090	(42b)

Hot water usage for other uses

41.2892	39.7877	38.2863	36.7849	35.2835	33.7821	33.7821	35.2835	36.7849	38.2863	39.7877	41.2892	(42c)

Average daily hot water use (litres/day) 64.7088 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.5972	68.6605	66.5462	63.9146	61.5669	59.1271	58.6203	60.7303	62.8945	65.4000	68.0548	70.4981	(44)
Energy conte	111.8087	97.7717	102.2790	87.4959	82.8809	72.7037	70.8961	75.1969	77.5552	88.7472	96.9566	110.3831	(45)

Energy content (annual) Total = Sum(45)m = 1074.6749

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

95.0374	83.1059	86.9371	74.3715	70.4488	61.7981	60.2617	63.9173	65.9219	75.4351	82.4131	93.8256	(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

95.0374	83.1059	86.9371	74.3715	70.4488	61.7981	60.2617	63.9173	65.9219	75.4351	82.4131	93.8256	(64)

Total per year (kWh/year) = Sum(64)m = 913.4736 (64)

12Total per year (kWh/year) 913 (64)

Electric shower(s)

54.3498	48.4261	52.8794	50.4622	51.4091	49.0393	50.6739	51.4091	50.4622	52.8794	51.8851	54.3498	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 618.2256 (64a)

Heat gains from water heating, kWh/month

37.3468	32.8830	34.9541	31.2084	30.4645	27.7094	27.7339	28.8316	29.0960	32.0786	33.5746	37.0438	(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	130.1590	130.1590	130.1590	130.1590	130.1590	130.1590	130.1590	130.1590	130.1590	130.1590	130.1590	130.1590	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	124.0589	137.3509	124.0589	128.1942	124.0589	128.1942	124.0589	124.0589	128.1942	124.0589	128.1942	124.0589	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	236.1032	238.5532	232.3792	219.2356	202.6442	187.0505	176.6330	174.1830	180.3570	193.5006	210.0920	225.6857	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.0159	36.0159	36.0159	36.0159	36.0159	36.0159	36.0159	36.0159	36.0159	36.0159	36.0159	36.0159	(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)													
	-104.1272	-104.1272	-104.1272	-104.1272	-104.1272	-104.1272	-104.1272	-104.1272	-104.1272	-104.1272	-104.1272	-104.1272	(71)
Water heating gains (Table 5)													
	50.1973	48.9330	46.9814	43.3450	40.9469	38.4852	37.2768	38.7522	40.4112	43.1164	46.6313	49.7901	(72)
Total internal gains													
	472.4071	486.8849	465.4672	452.8226	429.6977	415.7777	400.0164	399.0418	411.0101	422.7237	446.9653	461.5824	(73)

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6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains

	m2	Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	factor Table 6d	W	
North	4.9500	10.6334	0.6300	0.7000	0.7700	16.0860	(74)
East	0.8500	19.6403	0.6300	0.7000	0.7700	5.1020	(76)
South	7.6500	46.7521	0.6300	0.7000	0.7700	109.3035	(78)
West	0.8000	19.6403	0.6300	0.7000	0.7700	4.8019	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	135.2934	229.1262	312.1713	388.1605	438.6187	437.8333	421.0737	382.6054	338.1162	252.6624	161.7550	116.0028	(83)
Total gains	607.7005	716.0111	777.6385	840.9830	868.3163	853.6110	821.0901	781.6472	749.1263	675.3861	608.7203	577.5852	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	35.8627	35.9486	36.0333	36.4364	36.5128	36.8728	36.8728	36.9402	36.7333	36.5128	36.3585	36.1986	
alpha	3.3908	3.3966	3.4022	3.4291	3.4342	3.4582	3.4582	3.4627	3.4489	3.4342	3.4239	3.4132	
util living area	0.9806	0.9658	0.9436	0.8929	0.8030	0.6529	0.5042	0.5440	0.7429	0.9083	0.9669	0.9835	(86)
MIT	19.0226	19.3065	19.6766	20.1627	20.5733	20.8550	20.9554	20.9414	20.7603	20.2269	19.5464	18.9777	(87)
Th 2	19.9518	19.9541	19.9563	19.9666	19.9685	19.9776	19.9776	19.9792	19.9741	19.9685	19.9646	19.9605	(88)
util rest of house	0.9766	0.9589	0.9318	0.8696	0.7582	0.5749	0.3991	0.4391	0.6741	0.8835	0.9591	0.9801	(89)
MIT 2	18.1605	18.4415	18.8056	19.2800	19.6575	19.8959	19.9609	19.9557	19.8256	19.3506	18.6887	18.1222	(90)
Living area fraction									fLA = Living area / (4) =			0.1584	(91)
MIT	18.2970	18.5785	18.9435	19.4198	19.8026	20.0478	20.1184	20.1118	19.9736	19.4893	18.8246	18.2577	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.2970	18.5785	18.9435	19.4198	19.8026	20.0478	20.1184	20.1118	19.9736	19.4893	18.8246	18.2577	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9680	0.9471	0.9175	0.8549	0.7500	0.5807	0.4143	0.4536	0.6740	0.8693	0.9477	0.9724	(94)
Useful gains	588.2636	678.1374	713.4510	718.9519	651.2401	495.6678	340.1391	354.5312	504.9420	587.1289	576.8777	561.6528	(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	1435.7638	1399.7347	1270.3667	1062.0959	816.3353	543.5036	351.0230	369.6362	588.2131	895.6026	1186.2625	1428.6069	(97)
Space heating kWh	630.5402	484.9134	414.3453	247.0637	122.8308	0.0000	0.0000	0.0000	0.0000	229.5044	438.7570	645.0139	(98a)
Space heating requirement - total per year (kWh/year)												3212.9687	
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	630.5402	484.9134	414.3453	247.0637	122.8308	0.0000	0.0000	0.0000	0.0000	229.5044	438.7570	645.0139	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3212.9687	
Space heating per m2											(98c) / (4) =	36.3458	(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	937.8049	738.2719	756.8409	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7789	0.8490	0.8252	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	730.4340	626.8164	624.5710	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	945.5589	910.0870	866.4594	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	154.8899	210.7533	179.9650	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	38.7225	52.6883	44.9912	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												136.4020	(107)
Energy for space heating												36.3458	(99)
Energy for space cooling												1.5430	(108)
Total												37.8888	(109)
Fabric Energy Efficiency (TFEE)												37.9	(109)

Full SAP Calculation Printout

Property Reference	Sherwood CV Plot 250	Issued on Date	22/04/2023
Assessment Reference	Castle View	Prop Type Ref	Sherwood Plot 250
Property	Plot 250, Castle View, Netherton, HD4 7LE		

SAP Rating	91 B	DER	10.75	TER	11.55
Environmental	91 B	% DER < TER			6.93
CO_2 Emissions (t/year)	0.94	DFEE	37.57	TFEE	37.89
Compliance Check	See BREL	% DFEE < TFEE			0.84
% DPER < TPER	5.05	DPER	57.27	TPER	60.32

Assessor Details	Mr. Patrick McGuigan	Assessor ID	Y128-0001
Client			

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

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		44.2000 (1b)	x	2.3000 (2b)	=	101.6600 (1b)	-
First floor		44.2000 (1c)	x	2.5500 (2c)	=	112.7100 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.4000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	214.3700	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	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		4.5000	(17)
Infiltration rate		0.2250	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1913	(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	0.2438	0.2391	0.2343	0.2104	0.2056	0.1817	0.1817	0.1769	0.1913	0.2056	0.2152	0.2247	(22b)

Mechanical extract ventilation - decentralised

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)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
entrance			2.1000	1.2000	2.5200			(26)
glazing (Uw = 1.30)			14.2500	1.2357	17.6093			(27)
ground			44.2000	0.1200	5.3040	75.0000	3315.0000	(28a)

external wall	135.3200	16.3500	118.9700	0.2400	28.5528	60.0000	7138.2004 (29a)
cold	44.2000		44.2000	0.0900	3.9780	9.0000	397.8000 (30)
Total net area of external elements Aum(A, m2)			223.7200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		57.9641		(33)
stud			133.2000			9.0000	1198.8000 (32c)
internal			44.2000			18.0000	795.6000 (32d)
internal			44.2000			9.0000	397.8000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 13243.2004 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 149.8100 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.9000	0.0500	0.5950
E3 Sill	9.1000	0.0090	0.0819
E4 Jamb	30.3000	0.0140	0.4242
E5 Ground floor (normal)	27.9000	0.0600	1.6740
E6 Intermediate floor within a dwelling	27.9000	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	10.0000	0.0460	0.4600
E12 Gable (insulation at ceiling level)	17.9000	0.0540	0.9666
E16 Corner (normal)	24.2500	0.0480	1.1640
E5 Ground floor (normal)	0.0000	0.0900	0.0000
E20 Exposed floor (normal)	0.0000	0.0800	0.0000
E21 Exposed floor (inverted)	0.0000	-0.0060	-0.0000
E17 Corner (inverted – internal area greater than external area)	4.8500	-0.0970	-0.4704

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 4.8952 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 62.8594 (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	35.3710	35.3710	35.3710	35.3710	35.3710	35.3710	35.3710	35.3710	35.3710	35.3710	35.3710	35.3710	(38)
Heat transfer coeff	98.2304	98.2304	98.2304	98.2304	98.2304	98.2304	98.2304	98.2304	98.2304	98.2304	98.2304	98.2304	(39)
Average = Sum(39)m / 12 =												98.2304	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1112	1.1112	1.1112	1.1112	1.1112	1.1112	1.1112	1.1112	1.1112	1.1112	1.1112	1.1112	(40)
HLP (average)												1.1112	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6032 (42)
Hot water usage for mixer showers

67.8665	66.8466	65.3604	62.5169	60.4184	58.0782	56.7480	58.2229	59.8398	62.3524	65.2571	67.6065	(42a)

Hot water usage for baths

29.3081	28.8728	28.2598	27.1297	26.2834	25.3451	24.8382	25.4469	26.1096	27.1137	28.2671	29.2090	(42b)

Hot water usage for other uses

41.2892	39.7877	38.2863	36.7849	35.2835	33.7821	33.7821	35.2835	36.7849	38.2863	39.7877	41.2892	(42c)

Average daily hot water use (litres/day) 127.2795 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	138.4638	135.5072	131.9066	126.4314	121.9853	117.2053	115.3683	118.9533	122.7342	127.7524	133.3119	138.1046	(44)
Energy conte	219.2927	192.9604	202.7355	173.0783	164.2156	144.1176	139.5279	147.2890	151.3436	173.3588	189.9273	216.2385	(45)
Energy content (annual)											Total = Sum(45)m =	2114.0853	
Distribution loss (46)m = 0.15 x (45)m	32.8939	28.9441	30.4103	25.9617	24.6323	21.6176	20.9292	22.0934	22.7015	26.0038	28.4891	32.4358	(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	14.2829	12.8884	14.2431	13.7282	14.1507	13.6587	14.0914	14.1101	13.6760	14.1726	13.7686	14.2755	(61)
Total heat required for water heating calculated for each month	233.5756	205.8488	216.9786	186.8065	178.3663	157.7763	153.6193	161.3991	165.0196	187.5315	203.6959	230.5140	(62)
WWHRS	-59.7686	-52.8598	-55.3517	-45.8334	-42.7151	-36.5516	-34.2613	-36.4335	-37.8177	-44.5829	-50.5070	-58.6617	(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	173.8070	152.9890	161.6269	140.9731	135.6512	121.2246	119.3580	124.9656	127.2019	142.9485	153.1889	171.8523	(64)
										Total per year (kWh/year) = Sum(64)m =		1725.7870	(64)
12Total per year (kWh/year)												1726	(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	76.4856	67.3814	70.9703	60.9806	58.1394	51.3338	49.9159	52.5011	53.7408	61.1850	66.5930	75.4682	(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	130.1590	130.1590	130.1590	130.1590	130.1590	130.1590	130.1590	130.1590	130.1590	130.1590	130.1590	130.1590	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	124.0589	137.3509	124.0589	128.1942	124.0589	128.1942	124.0589	124.0589	128.1942	124.0589	128.1942	124.0589	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
236.1032 238.5532 232.3792 219.2356 202.6442 187.0505 176.6330 174.1830 180.3570 193.5006 210.0920 225.6857 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
36.0159 36.0159 36.0159 36.0159 36.0159 36.0159 36.0159 36.0159 36.0159 36.0159 36.0159 36.0159 (69)
Pumps, fans 3.0000 3.0000 3.0000 3.0000 0.0000 0.0000 0.0000 0.0000 3.0000 3.0000 3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)
-104.1272 -104.1272 -104.1272 -104.1272 -104.1272 -104.1272 -104.1272 -104.1272 -104.1272 -104.1272 -104.1272 -104.1272 (71)
Water heating gains (Table 5)
102.8032 100.2700 95.3902 84.6953 78.1443 71.2969 67.0912 70.5660 74.6399 82.2379 92.4902 101.4357 (72)
Total internal gains
528.0130 541.2218 516.8761 497.1728 469.8951 448.5894 429.8309 430.8557 445.2388 464.8451 495.8242 516.2280 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	4.9500	10.6334	0.4600	0.0000	0.7700	18.6434	(74)
East	0.8500	19.6403	0.4600	0.0000	0.7700	5.9131	(76)
South	7.6500	46.7521	0.4600	0.0000	0.7700	126.6808	(78)
West	0.8000	19.6403	0.4600	0.0000	0.7700	5.5653	(80)

Solar gains 156.8026 265.5531 361.8009 449.8710 508.3512 507.4409 488.0169 443.4328 391.8707 292.8312 187.4712 134.4452 (83)
Total gains 684.8155 806.7749 878.6770 947.0438 978.2463 956.0303 917.8478 874.2885 837.1095 757.6763 683.2954 650.6732 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	37.4494	37.4494	37.4494	37.4494	37.4494	37.4494	37.4494	37.4494	37.4494	37.4494	37.4494	37.4494	
alpha	3.4966	3.4966	3.4966	3.4966	3.4966	3.4966	3.4966	3.4966	3.4966	3.4966	3.4966	3.4966	
util living area	0.9720	0.9511	0.9201	0.8565	0.7503	0.5963	0.4524	0.4906	0.6895	0.8771	0.9535	0.9763	(86)
MIT	19.2516	19.5397	19.8955	20.3231	20.6779	20.8949	20.9695	20.9589	20.8196	20.3596	19.7197	19.1795	(87)
Th 2	19.9917	19.9917	19.9917	19.9917	19.9917	19.9917	19.9917	19.9917	19.9917	19.9917	19.9917	19.9917	(88)
util rest of house	0.9666	0.9419	0.9049	0.8287	0.7017	0.5203	0.3562	0.3933	0.6189	0.8472	0.9432	0.9716	(89)
MIT 2	17.9676	18.3288	18.7716	19.2903	19.6970	19.9176	19.9774	19.9711	19.8520	19.3457	18.5605	17.8766	(90)
Living area fraction										fLA = Living area / (4) =		0.1584	(91)
MIT	18.1710	18.5206	18.9496	19.4538	19.8524	20.0723	20.1345	20.1275	20.0053	19.5063	18.7441	18.0829	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.0210	18.3706	18.7996	19.3038	19.7024	19.9223	19.9845	19.9775	19.8553	19.3563	18.5941	17.9329	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9516	0.9224	0.8823	0.8062	0.6862	0.5147	0.3555	0.3919	0.6083	0.8241	0.9238	0.9580	(94)
Useful gains	651.6691	744.1905	775.2872	763.5368	671.2565	492.0674	326.3149	342.5947	509.2126	624.4116	631.2606	623.3271	(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	1347.8159	1323.2215	1208.1943	1021.9739	786.0779	522.8150	332.4646	351.4209	565.3426	860.1358	1129.0702	1348.9927	(97)
Space heating kWh	517.9333	389.1088	322.0829	186.0747	85.4271	0.0000	0.0000	0.0000	0.0000	175.3788	358.4229	539.8952	(98a)
Space heating requirement - total per year (kWh/year)												2574.3237	
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	517.9333	389.1088	322.0829	186.0747	85.4271	0.0000	0.0000	0.0000	0.0000	175.3788	358.4229	539.8952	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2574.3237	
Space heating per m2											(98c) / (4) =	29.1213	(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 %) 89.0000 (206)
Efficiency of main space heating system 2 (in %) 0.0000 (207)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	517.9333	389.1088	322.0829	186.0747	85.4271	0.0000	0.0000	0.0000	0.0000	175.3788	358.4229	539.8952	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	581.9475	437.2009	361.8909	209.0727	95.9855	0.0000	0.0000	0.0000	0.0000	197.0549	402.7223	606.6238	(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
173.8070 152.9890 161.6269 140.9731 135.6512 121.2246 119.3580 124.9656 127.2019 142.9485 153.1889 171.8523 (64)
Efficiency of water heater 87.3000 (216)
(217)m 88.5667 88.5136 88.4246 88.2592 87.9491 87.3000 87.3000 87.3000 87.3000 88.2285 88.4841 88.5835 (217)
Fuel for water heating, kWh/month
196.2443 172.8424 182.7849 159.7263 154.2382 138.8598 136.7217 143.1450 145.7066 162.0208 173.1259 194.0003 (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 10.2800 9.2851 10.2800 9.9483 10.2800 9.9483 10.2800 10.2800 9.9483 10.2800 9.9483 10.2800 (231)
Lighting 24.7818 19.8809 17.9005 13.1147 10.1302 8.2764 9.2411 12.0119 15.6023 20.4710 23.1220 25.4706 (232)
Electricity generated by PVs (Appendix M) (negative quantity)
(233a)m -19.2198 -28.8801 -44.2970 -53.2401 -60.4094 -57.4944 -56.7465 -52.0222 -44.2636 -34.4321 -21.7379 -16.4094 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(234a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)
(235a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)
(235c)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)
(233b)m -6.3243 -13.7456 -28.2996 -44.0536 -59.7888 -60.6796 -59.8658 -49.8625 -35.5326 -20.0593 -8.5611 -4.9667 (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 2892.4986 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 87.3000
Water heating fuel used 1959.4163 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
(MEVDecentralised, Database: total watage = 4.9570, total flow = 37.0000, SFP = 0.1340)
mechanical ventilation fans (SFP = 0.1340) 35.0381 (230a)
central heating pump 41.0000 (230c)
main heating flue fan 45.0000 (230e)
Total electricity for the above, kWh/year 121.0381 (231)
Electricity for lighting (calculated in Appendix L) 200.0033 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation -880.8921 (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 4292.0643 (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	2892.4986	0.2100	607.4247	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1959.4163	0.2100	411.4774	(264)
Space and water heating			1018.9021	(265)
Pumps, fans and electric keep-hot	121.0381	0.1387	16.7895	(267)
Energy for lighting	200.0033	0.1443	28.8667	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-489.1526	0.1333	-65.1832	
PV Unit electricity exported	-391.7395	0.1249	-48.9356	
Total			-114.1188	(269)
Total CO2, kg/year			950.4395	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			10.7500	(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	2892.4986	1.1300	3268.5234	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1959.4163	1.1300	2214.1405	(278)
Space and water heating			5482.6638	(279)
Pumps, fans and electric keep-hot	121.0381	1.5128	183.1065	(281)
Energy for lighting	200.0033	1.5338	306.7717	(282)

Energy saving/generation technologies			
PV Unit electricity used in dwelling	-489.1526	1.4924	-730.0216
PV Unit electricity exported	-391.7395	0.4585	-179.6079
Total			-909.6295 (283)
Total Primary energy kWh/year			5062.9125 (286)
Dwelling Primary energy Rate (DPER)			57.2700 (287)

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	44.2000 (1b)	x	2.3000 (2b)	=	101.6600 (1b)	-
First floor	44.2000 (1c)	x	2.5500 (2c)	=	112.7100 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.4000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	214.3700	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1399	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3899	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3315	(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	0.4226	0.4143	0.4060	0.3646	0.3563	0.3149	0.3149	0.3066	0.3315	0.3563	0.3729	0.3895	(22b)
Effective ac	0.5893	0.5858	0.5824	0.5665	0.5635	0.5496	0.5496	0.5470	0.5549	0.5635	0.5695	0.5758	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.1000	1.0000	2.1000			(26)
TER Opening Type (Uw = 1.20)			14.2500	1.1450	16.3168			(27)
ground			44.2000	0.1300	5.7460			(28a)
external wall	135.3200	16.3500	118.9700	0.1800	21.4146			(29a)
cold	44.2000		44.2000	0.1100	4.8620			(30)
Total net area of external elements Aum(A, m2)			223.7200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		50.4394			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 149.8100 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.9000	0.0500	0.5950
E3 Sill	9.1000	0.0500	0.4550
E4 Jamb	30.3000	0.0500	1.5150
E5 Ground floor (normal)	27.9000	0.1600	4.4640
E6 Intermediate floor within a dwelling	27.9000	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	10.0000	0.0600	0.6000
E12 Gable (insulation at ceiling level)	17.9000	0.0600	1.0740
E16 Corner (normal)	24.2500	0.0900	2.1825

E5 Ground floor (normal)	0.0000	0.1600	0.0000	
E20 Exposed floor (normal)	0.0000	0.3200	0.0000	
E21 Exposed floor (inverted)	0.0000	0.3200	0.0000	
E17 Corner (inverted – internal area greater than external area)	4.8500	-0.0900	-0.4365	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.4490 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 60.8884 (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	41.6881	41.4428	41.2023	40.0730	39.8617	38.8781	38.8781	38.6959	39.2570	39.8617	40.2892	40.7360	(38)
Heat transfer coeff	102.5765	102.3312	102.0907	100.9614	100.7501	99.7665	99.7665	99.5843	100.1454	100.7501	101.1775	101.6244	(39)

Average = Sum(39)m / 12 = 100.9604

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1604	1.1576	1.1549	1.1421	1.1397	1.1286	1.1286	1.1265	1.1329	1.1397	1.1445	1.1496	(40)
HLP (average)												1.1421	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6032 (42)

Hot water usage for mixer showers

67.8665	66.8466	65.3604	62.5169	60.4184	58.0782	56.7480	58.2229	59.8398	62.3524	65.2571	67.6065	(42a)

Hot water usage for baths

29.3081	28.8728	28.2598	27.1297	26.2834	25.3451	24.8382	25.4469	26.1096	27.1137	28.2671	29.2090	(42b)

Hot water usage for other uses

41.2892	39.7877	38.2863	36.7849	35.2835	33.7821	33.7821	35.2835	36.7849	38.2863	39.7877	41.2892	(42c)

Average daily hot water use (litres/day) 127.2795 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	138.4638	135.5072	131.9066	126.4314	121.9853	117.2053	115.3683	118.9533	122.7342	127.7524	133.3119	138.1046	(44)
Energy conte	219.2927	192.9604	202.7355	173.0783	164.2156	144.1176	139.5279	147.2890	151.3436	173.3588	189.9273	216.2385	(45)

Energy content (annual) Total = Sum(45)m = 2114.0853

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

32.8939	28.9441	30.4103	25.9617	24.6323	21.6176	20.9292	22.0934	22.7015	26.0038	28.4891	32.4358	(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 50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)

Total heat required for water heating calculated for each month

270.2516	238.9878	253.6944	222.3934	215.1745	193.4326	190.4868	198.2479	200.6587	224.3177	239.2424	267.1974	(62)
WWHRS -31.0257	-27.4394	-28.7330	-23.7920	-22.1733	-18.9739	-17.7850	-18.9125	-19.6311	-23.1429	-26.2181	-30.4512	(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

239.2259	211.5484	224.9614	198.6013	193.0012	174.4588	172.7018	179.3354	181.0276	201.1748	213.0243	236.7462	(64)

Total per year (kWh/year) = Sum(64)m = 2425.8071 (64)

12Total per year (kWh/year) 2426 (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

85.6546	75.6662	80.1493	69.8773	67.3414	60.2479	59.1328	61.7133	62.6505	70.3815	75.4796	84.6390	(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	130.1590	130.1590	130.1590	130.1590	130.1590	130.1590	130.1590	130.1590	130.1590	130.1590	130.1590	130.1590	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	124.0589	137.3509	124.0589	128.1942	124.0589	128.1942	124.0589	124.0589	128.1942	124.0589	128.1942	124.0589	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	236.1032	238.5532	232.3792	219.2356	202.6442	187.0505	176.6330	174.1830	180.3570	193.5006	210.0920	225.6857	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0159	36.0159	36.0159	36.0159	36.0159	36.0159	36.0159	36.0159	36.0159	36.0159	36.0159	36.0159	(69)
Pumps, fans 3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)	-104.1272	-104.1272	-104.1272	-104.1272	-104.1272	-104.1272	-104.1272	-104.1272	-104.1272	-104.1272	-104.1272	-104.1272	(71)
Water heating gains (Table 5)	115.1271	112.5985	107.7275	97.0518	90.5127	83.6776	79.4795	82.9480	87.0146	94.5988	104.8328	113.7621	(72)
Total internal gains	540.3369	553.5503	529.2134	509.5294	482.2635	460.9701	442.2192	443.2377	457.6135	477.2061	508.1667	528.5544	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

					W/m2	or Table 6b	or Table 6c	Table 6d				
North					4.9500	10.6334	0.6300	0.7000	0.7700			16.0860 (74)
East					0.8500	19.6403	0.6300	0.7000	0.7700			5.1020 (76)
South					7.6500	46.7521	0.6300	0.7000	0.7700			109.3035 (78)
West					0.8000	19.6403	0.6300	0.7000	0.7700			4.8019 (80)
Solar gains	135.2934	229.1262	312.1713	388.1605	438.6187	437.8333	421.0737	382.6054	338.1162	252.6624	161.7550	116.0028 (83)
Total gains	675.6302	782.6765	841.3847	897.6898	920.8821	898.8033	863.2929	825.8431	795.7298	729.8685	669.9217	644.5572 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	35.8627	35.9486	36.0333	36.4364	36.5128	36.8728	36.8728	36.9402	36.7333	36.5128	36.3585	36.1986	
alpha	3.3908	3.3966	3.4022	3.4291	3.4342	3.4582	3.4582	3.4627	3.4489	3.4342	3.4239	3.4132	
util living area	0.9737	0.9565	0.9311	0.8762	0.7811	0.6298	0.4831	0.5201	0.7177	0.8903	0.9571	0.9773	(86)
MIT	19.1323	19.4076	19.7647	20.2261	20.6126	20.8707	20.9609	20.9490	20.7862	20.2916	19.6398	19.0875	(87)
Th 2	19.9518	19.9541	19.9563	19.9666	19.9685	19.9776	19.9776	19.9792	19.9741	19.9685	19.9646	19.9605	(88)
util rest of house	0.9685	0.9480	0.9174	0.8505	0.7342	0.5520	0.3810	0.4179	0.6473	0.8622	0.9473	0.9728	(89)
MIT 2	17.7914	18.1391	18.5871	19.1590	19.6101	19.8851	19.9591	19.9533	19.8066	19.2500	18.4432	17.7404	(90)
Living area fraction									fLA = Living area / (4) =			0.1584	(91)
MIT	18.0038	18.3400	18.7736	19.3280	19.7689	20.0412	20.1178	20.1110	19.9617	19.4149	18.6327	17.9537	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.0038	18.3400	18.7736	19.3280	19.7689	20.0412	20.1178	20.1110	19.9617	19.4149	18.6327	17.9537	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9549	0.9307	0.8975	0.8316	0.7240	0.5572	0.3956	0.4318	0.6463	0.8437	0.9303	0.9603	(94)
Useful gains	645.1482	728.4195	755.1475	746.4760	666.7101	500.8164	341.5194	356.5865	514.3119	615.7960	623.2378	618.9805	(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	1405.6876	1375.3277	1253.0209	1052.8236	812.9403	542.8496	350.9544	369.5575	587.0254	888.1071	1166.8513	1397.7169	(97)
Space heating kWh	565.8413	434.7223	370.4178	220.5703	108.7952	0.0000	0.0000	0.0000	0.0000	202.5994	391.4018	579.3799	(98a)
Space heating requirement - total per year (kWh/year)												2873.7280	
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	565.8413	434.7223	370.4178	220.5703	108.7952	0.0000	0.0000	0.0000	0.0000	202.5994	391.4018	579.3799	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2873.7280	
Space heating per m2											(98c) / (4) =	32.5082	(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 %)	92.4000 (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	565.8413	434.7223	370.4178	220.5703	108.7952	0.0000	0.0000	0.0000	0.0000	202.5994	391.4018	579.3799	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	612.3823	470.4787	400.8851	238.7124	117.7438	0.0000	0.0000	0.0000	0.0000	219.2634	423.5950	627.0345	(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	239.2259	211.5484	224.9614	198.6013	193.0012	174.4588	172.7018	179.3354	181.0276	201.1748	213.0243	236.7462	(64)
Efficiency of water heater												80.3000	(216)
(217)m	86.1581	85.8890	85.4424	84.6068	83.2015	80.3000	80.3000	80.3000	80.3000	84.3966	85.6665	86.2213	(217)
Fuel for water heating, kWh/month	277.6593	246.3045	263.2901	234.7344	231.9684	217.2587	215.0708	223.3317	225.4391	238.3685	248.6671	274.5797	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	25.7770	20.6793	18.6194	13.6414	10.5370	8.6088	9.6122	12.4943	16.2288	21.2931	24.0505	26.4934	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-40.8993	-57.4259	-82.2068	-92.0306	-98.8876	-92.1561	-90.9956	-86.0642	-77.3241	-65.4585	-44.8725	-35.3857	(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	(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	(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	(235c)

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

(233b)m	-23.8182	-50.0263	-99.2957	-148.9491	-196.7814	-197.6780	-195.3713	-165.5125	-121.4250	-71.5030	-31.7860	-18.8424 (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	(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	(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	(235d)

Annual totals kWh/year

Space heating fuel - main system 1	3110.0952	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	2896.6722	(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)	208.0351	(232)

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

PV generation	-2184.6958	(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	4116.1068	(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	3110.0952	0.2100	653.1200	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2896.6722	0.2100	608.3012	(264)
Space and water heating			1261.4212	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	208.0351	0.1443	30.0259	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-863.7068	0.1347	-116.3238	
PV Unit electricity exported	-1320.9889	0.1259	-166.3528	
Total			-282.6766	(269)
Total CO2, kg/year			1020.6997	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.5500	(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	3110.0952	1.1300	3514.4076	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2896.6722	1.1300	3273.2396	(278)
Space and water heating			6787.6472	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	208.0351	1.5338	319.0912	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-863.7068	1.4978	-1293.6247	
PV Unit electricity exported	-1320.9889	0.4623	-610.6309	
Total			-1904.2556	(283)
Total Primary energy kWh/year			5332.5836	(286)
Target Primary Energy Rate (TPER)			60.3200	(287)